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*Historic Resources Evaluation*

(Mason Architects, Inc.)

# Historic Resources Evaluation

## Dillingham Ranch, Oahu, HI

Prepared by Mason Architects, Inc. for  
Dillingham Ranch Aina, LLC

**February 2017**





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## Introduction

Mason Architects, Inc., (MAI) was hired by Dillingham Ranch Aina, LLC to perform an architectural Reconnaissance Level Survey (RLS) to identify historic architectural resources found on the Dillingham Ranch property proposed for an agricultural subdivision. MAI completed RLS forms for a total of 13 buildings. Of these, eight were identified as eligible for listing on the State and/or National Register of Historic Places (NRHP). The RLS forms were submitted to SHPD for review and comment in advance of the EIS, and SHPD accepted the findings of the survey and provided recommendations for mitigation in a letter dated December 13, 2016 (provided in Appendix A). The following information was developed in advance of the project's Environmental Impact Statement (EIS).

## Historic Properties/Statements of Significance

See Appendix B, Table 1: for a list of the 13 properties surveyed and associated significance evaluations made for each by MAI after the RLS survey. The 13 individual RLS forms attached in Appendix D provide more detailed information for each of the resources.

## Dillingham Ranch Historical Overview

Development of the property known today as Dillingham Ranch was initiated in the 1880s by a Portuguese rancher named Gaspar Silva. Artesian wells were drilled on site and used primarily for the cultivation of rice at that time. There was also a store operated on the property. When Silva sold the land in 1897, the property contained a dozen artesian wells irrigating the fields, and at least one house, which is extant today (the Dillingham Compound "Dollhouse"). Purchased in 1897 by Benjamin Franklin (B.F.) Dillingham, the property became known as Mokuleia Ranch, and by 1900 it was managed as a family estate by B.F. Dillingham's son, Walter.

In November 17, 1903, Emma L. Dillingham, wife of B.F. Dillingham, hosted an important gathering of women (all daughters of American missionaries) in the residence originally constructed by Gaspar Silva ("Dollhouse"). The women foresaw the looming loss of Hawaiian culture and in an inaugural meeting, their gathering gave rise to the "The Daughters of Hawaii" in an effort to preserve that culture.

During the early years of the twentieth century, B.F. Dillingham Co. Ltd. ran into financial trouble and all of its properties- except for Mokuleia Ranch - became encumbered in debt. After B.F. experienced a physical and mental breakdown, his son Walter stepped up to manage the business affairs and by 1911, B.F. Dillingham Co. Ltd., was back in the black. In celebration of becoming debt-free for probably the first time in over forty years, B.F. Dillingham gave away shares of stock to family members and gifted \$10,000 to build a new, graceful residential compound. The existing ranch house ("Dollhouse") and some nearby land at Mokuleia Ranch was deeded by B.F. Dillingham to three of his children; Walter, Harold, and Marion [Erdman]. Income from this land's rice and sugar leases often paid a dividend to the three owners. The three built the new residential compound ca. 1913 using the gifted \$10,000. Comprised of several wings, this compound is extant today as the Dillingham Compound Main House and East, West, and Kitchen Wings.

The Dillingham Ranch estate was perhaps most important to B.F. Dillingham's son, Walter, who carried on his entrepreneurial legacy. Dillingham Ranch would become a "splendid county estate"

and a "center of the [Dillingham] family's leisure time together." Mokuleia Ranch was incorporated as Mokuleia Ranch and Land Co. in 1926.

Ca. 1931, the family estate at Mokuleia Ranch was improved by Walter's addition of a stable complex about  $\frac{3}{4}$  mile northwest of the 1913 home, named Crowbar Ranch, which was inspired by Walter's love of polo. The Ranch addition was intended to provide for a herd of polo horses and consisted of a bunkhouse (extant today and referred to as the "Crowbar Ranch Office"), stables with stalls for twenty-six animals, feed rooms, tack room, and servant's quarters, all surrounded by paddocks. In 1936, Crowbar Ranch was included with the Mokuleia Ranch and Land Co.'s property, which consisted of 3,220 acres.

Although Mokuleia Ranch was primarily a country retreat and recreation center for the Dillingham family, over the years it became a tax liability and maintenance costs escalated. Walter Dillingham, as manager of the family ranch, was forced to make business arrangements in order to keep the property viable.

During World War II, the Army requisitioned most of Crowbar Ranch, and built the adjacent Mokuleia Army Airfield (later renamed Dillingham Field) on former Mokuleia Ranch land. The airfield was activated within days of the December 7, 1941, Japanese attack on Pearl Harbor.

After the war, Dillingham continued a small breeding and training program at Crowbar Ranch and in 1950 Walter Dillingham purchased about 200 head of cattle. In the mid-1950s, Mokuleia Ranch and Land Co. became Dillingham Ranch and by 1963 it was supporting 1,000 head of cattle.

In 1979, the majority of Dillingham Ranch lands, about 3,000 acres, was sold to Northwestern Mutual Life Insurance Co. with plans to subdivide the land into parcels of several acres.

### **Proposed Action**

The proposed action is to consolidate and subdivide over 2,700 acres of agriculturally zoned land, known as the Dillingham Ranch, into 70 privately owned agricultural lots to be kept consistent with the rural character of the existing ranch and surrounding area. The proposed action includes demolition of two buildings evaluated as eligible; the Potable Pumphouse and the Ag Pumphouse.

The developable area on each lot will be limited to 5,000 square feet with the majority of the parcel left for open land and agricultural purposes. All agricultural lot owners will be required to comply with Design Guidelines and CC&Rs (Covenants, Conditions, and Restrictions) that will be prepared by Dillingham Ranch Aina LLC after final subdivision approval to ensure compliance with appropriate design and land use standards. The project will provide infrastructure and utility upgrades to support the individual lots and the existing amenities such as the Dillingham Compound/Lodge (the residential compound built ca. 1913). The palm tree plantation, and equestrian support areas will be treated as common areas.

## **Application of Criteria of Adverse Effect**

As outlined in the Assessment of Adverse Effect 36 CFR 800.5(1),

An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative.

Assessment of Adverse Effect 36 CFR 800.5 section (2) provides the following examples of adverse effects, stating that;

“Adverse effects on historic properties include, but are not limited to:

- (i) Physical destruction of or damage to all or part of the property;
- (ii) Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation and provision of handicapped access, that is not consistent with the Secretary's Standards for the Treatment of Historic Properties (36 CFR part 68) and applicable guidelines;
- (iii) Removal of the property from its historic location;
- (iv) Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;
- (v) Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features;
- (vi) Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and
- (vii) Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance.”

In keeping with the Adverse Effect definition and examples provided above, the proposed subdivision and demolition of two NRHP-eligible buildings will have an adverse effect on the feeling, association and setting of the Dillingham Ranch. SHPD has been consulted and their mitigation recommendations are outlined below.



## Mitigation Measures

SHPD architectural staff has been consulted on the proposed action, made a visit to the site, reviewed and concurred with the findings in the RLS forms, and provided recommendations for mitigation in a follow-up letter dated December 13, 2016 (provided in Appendix A). These mitigation measures are explained below.

## Preservation Zones

To mitigate the subdivision of the Dillingham Ranch, SHPD recommends adherence to historic preservation planning measures developed by HHF Planners and MAI as a means of retaining historic architectural fabric as well as some of the ranch's key historic open spaces, landscape features, transportation corridors, and view planes. These measures are illustrated as Preservation Zones in the Appendix C Map of Preservation Zones. Although the features are not architectural, they serve as character-defining features and contribute greatly to the historic interpretation of this agricultural property. The retention of open space around the historic buildings is critically important in retaining their 'setting', 'feeling' and 'association' aspects of integrity.

This preservation planning approach acknowledges the clusters of historic resources into Preservation Zones, by intentionally focusing development in other areas. For example; Proposed development will be considerably set back from the Farrington Highway public corridor, and the two historic roadways into the property from Farrington Highway will be preserved with development setbacks. This will ensure that the public's existing *mauka* view planes will not be significantly affected. Throughout the property, various open spaces will be retained, including equestrian fields, polo fields, pastures, and paddocks, which continues the historic ranching/equestrian use of the property. (Archaeological sites previously identified within the property will also be preserved; see archaeology section in EIS for more information.)

The proposed project incorporates the retention of six of the eight buildings that were evaluated as eligible for the NRHP, as well as adjacent key open spaces and landscape features. These six historic buildings make up two separate groupings that have been defined for preservation planning purposes as "Dillingham Ranch Compound Historic Preservation Management Zone #1" (Zone 1), and "Crowbar Ranch Historic Management Zone #2" (Zone 2). As their full zone names suggest, the two groupings are tied to different historical aspects of the Dillingham Ranch, namely; the early development of the property by the Dillingham family as a family retreat/compound (Zone 1), and; the Dillingham family's slightly later development of the Crowbar Ranch (Zone 2).

These Preservation Zones include character-defining landscape and circulation features in addition to historic buildings. These Preservation Zones are delineated in a manner to define no-build/preservation areas, so as to retain the integrity of the ranch's historic setting and feeling. Each zone is protected by a no-build/preservation buffer of 100' feet. Further, the historic roadways are protected with a 200'-wide no-build preservation easement. This translates to a setback (or no-build area) of approximately 90 feet on either side of each of the select historic roadways (Lodge Road, a portion of Crowbar Ranch Road, and Cane Haul Road).

Zone 1 includes the open spaces and vegetation including the existing mango orchard surrounding the Dillingham Lodge/Compound; a double row of Royal Palms behind the compound; the original, linear front drive (Lodge Road); and an undulating former railroad right-of-way (now the Cane Haul Road) that cuts across the property. (Although it is not known whether the mature mango orchard is historic, attempts will be made to retain it in its current condition, in specie and spacing. However, if the mango trees become termite-damaged, diseased, or begin to die, they will be removed and the site will be re-planted with fruit trees.)

Zone 2 includes the Crowbar Ranch access road (before it was extended to meet the Cane Haul Road) and the open spaces around the former Crowbar Ranch Bunkhouse.

There will be no adverse effect to the six historic structures that are proposed for retention since the construction of residences within the subdivision parcels will be set back from them by a distance of approximately 100' feet.

## Documentation

The proposed action includes demolition of two buildings evaluated as eligible; the Potable Pumphouse and the Ag Pumphouse. These buildings, while evaluated as historic, are not as imperative to telling the story of the Dillingham Compound/Lodge or the Dillingham's Crowbar Ranch to the same degree that the other historic buildings are. Nevertheless, their demolition results in an adverse effect. Two of the buildings evaluated in the RLS as eligible for the NRHP (the Ag Pumphouse and the Potable Pumphouse) are slated for demolition under the proposed action, resulting in an adverse effect. SHPD has been consulted on this, and recommends completion of an Intensive Level Survey (ILS) for each of these buildings.

## Preservation Plan

For the six NRHP-eligible architectural properties that will be retained, SHPD recommends development of a preservation plan according to Hawaii Administrative Rules 13-277.

These six buildings are as follows:

1. Dillingham Compound Main House
2. Dillingham Compound East Bedroom Wing
3. Dillingham Compound West Bedroom Wing
4. Dillingham Compound Kitchen Wing
5. Dillingham Compound Dollhouse
6. Crowbar Ranch Office

## Bibliography

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# Appendices



# Appendix A, SHPD Correspondence



DAVID Y. IGE  
GOVERNOR OF HAWAII



## STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION  
KAKUHIHEWA BUILDING  
601 KAMOKILA BLVD, STE 555  
KAPOLEI, HAWAII 96707

SUZANNE D. CASE  
CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES  
COMMISSION ON WATER RESOURCE MANAGEMENT

KEKOA KALUHIWA  
FIRST DEPUTY

JEFFREY T. PEARSON  
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  
KAPOLOWE ISLAND RESERVE COMMISSION  
LAND  
STATE PARKS

December 13, 2016

Department of Planning & Permitting  
City & County of Honolulu  
650 South King Street  
Honolulu, HI 96813

**IN REPLY REFER TO:**

**LOG NO:** 2016.02756

**DOC NO:** 1612AB01

Architecture

Dear Mr. Challacombe:

**SUBJECT: Chapter 6E-42 Historic Preservation Review  
Subdivision of a portion of Dillingham Ranch for an agricultural community  
68-434 Farrington Highway  
Owner Name: Dillingham Ranch Aina LLC  
Mokulē'ia Ahupua'a, Waialua District, Island of O'ahu  
TMK: (1) 6-8-003:006**

Thank you for the opportunity to comment on this request from Kennedy Wilson via Mason Architects, Inc. for the review and comment of the Reconnaissance Level Survey (RLS) and the historic resources section of the draft Environmental Impact Statement (EIS). The State Historic Preservation Division (SHPD) received this submittal on November 23, 2016.

The property is approximately 2,721 acres and located in Mokulē'ia on O'ahu's North Shore. Dillingham Ranch was initially developed in the 1880s by Gaspar Silva and sold to Benjamin Franklin Dillingham in 1897. The RLS surveyed thirteen buildings from the late 19<sup>th</sup> to mid 20<sup>th</sup> century. Eight buildings were identified as individually eligible for listing in the National and Hawaii Registers of Historic Places and five of the buildings were identified as ineligible. The proposed scope of work includes subdividing approximately 503 acres into 70 farm dwelling lots and demolishing two eligible pumphouses, which were built in the 1930s.

Based on this submittal, **SHPD accepts the RLS documentation.**

SHPD has reviewed the historic resource section of the draft EIS and has the following comments and recommendations:

- The proposed subdivision will have an effect on the feeling, association and setting of the existing ranch, affecting its historic integrity. SHPD suggests identifying the subdivision as an effect and specifying the two historic preservation management zones, buffer zones, and preservation of archaeological districts as mitigation for the subdivision.
- Completion of Intensive Level Surveys (ILS) for the two pumphouses as mitigation for the proposed demolition.
- Creation of a preservation plan for the eligible architectural properties identified in the RLS according to Hawaii's Administrative Rules 13-277.

These comments are for architectural properties. Please consult with the SHPD's Archaeology Branch regarding the treatment of archaeological properties. SHPD looks forward to reviewing the Final Environmental Impact Statement.

(Continued on Reverse)

Please contact Anna Broverman, Architectural Historian, at (808) 692-8028 or at [anna.e.broverman@hawaii.gov](mailto:anna.e.broverman@hawaii.gov) regarding architectural resources or this letter.

Aloha,



Alan S. Downer, PhD  
Administrator, State Historic Preservation Division  
Deputy State Historic Preservation Officer

cc: Polly Tice  
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HHF Planners  
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## Appendix B, Table 1: RLS Survey Findings, Evaluation of Effect, and Mitigation

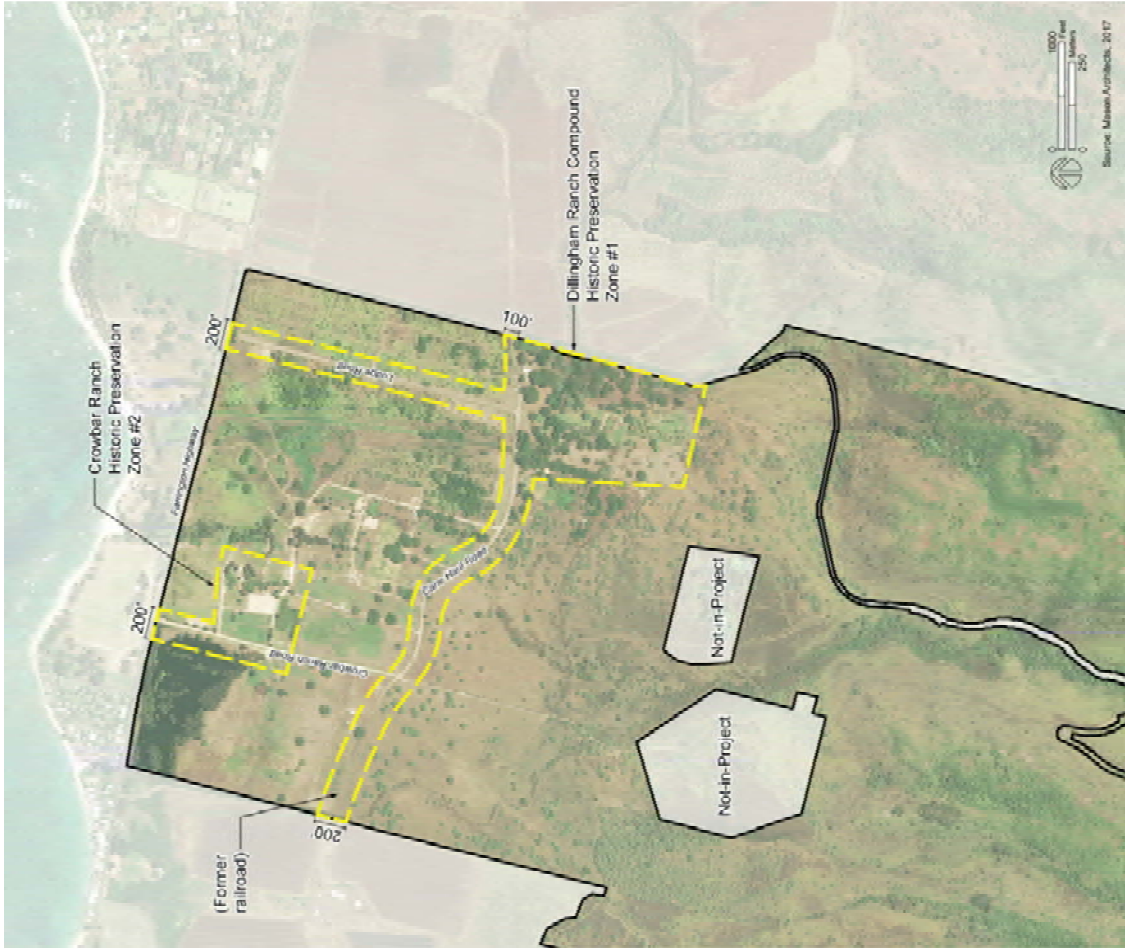
(See following page)



Appendix B, Table 1: RLS Survey Findings, Evaluation of Effect, and Mitigation							
No	Current Name*	Year Built	NRHP Eligible?	EIS Proposed Action	Evaluation of effect	SHPD Mitigation Recommendation	Photo
1	Dillingham Compound Main House	ca. 1913	Yes - Criterion B for association with renowned Hawaii businessman Walter F. Dillingham and his father Benjamin Franklin Dillingham, and Criterion C for its distinctive architecture	Retain structure	No adverse effect	Develop Preservation Plan according to Hawaii Administrative Rules 13-277.	
2	Dillingham Compound East Bedroom Wing	ca. 1913	Yes - Criterion B for association with renowned Hawaii businessman Walter F. Dillingham and his father Benjamin Franklin Dillingham, and Criterion C for its distinctive architecture	Retain structure	No adverse effect	Develop Preservation Plan according to Hawaii Administrative Rules 13-277.	
3	Dillingham Compound West Bedroom Wing	ca. 1913	Yes - Criterion B for association with renowned Hawaii businessman Walter F. Dillingham and his father Benjamin Franklin Dillingham, and Criterion C for its distinctive architecture	Retain structure	No adverse effect	Develop Preservation Plan according to Hawaii Administrative Rules 13-277.	
4	Dillingham Compound Kitchen Wing	ca. 1913	Yes - Criterion B for association with renowned Hawaii businessman Walter F. Dillingham and his father Benjamin Franklin Dillingham, and Criterion C for its distinctive architecture	Retain structure	No adverse effect	Develop Preservation Plan according to Hawaii Administrative Rules 13-277.	
5	Dillingham Compound Dollhouse	ca. 1897	Yes - Criterion A as the site of the first Daughters of Hawaii meeting (founding of the preservation movement in Hawaii); Criterion B for association with Benjamin and Emma Dillingham, and Criterion C for its distinctive architecture.	Retain structure	No adverse effect	Develop Preservation Plan according to Hawaii Administrative Rules 13-277.	
6	Crowbar Ranch Office	ca. 1936	Yes - Eligible under criterion B for its association with renowned Hawaii businessman Walter F. Dillingham and his father Benjamin Franklin Dillingham	Retain structure	No adverse effect	Develop Preservation Plan according to Hawaii Administrative Rules 13-277.	
7	Crowbar Ranch Manager's House	ca. 1973	Not Eligible	Demo	N/A (since not eligible)	N/A	
8	Crowbar Ranch Manager's Stable	unkno wn	Not Eligible	Demo	N/A (since not eligible)	N/A	
9	Crowbar Ranch Stable	unkno wn	Not Eligible	Demo	N/A (since not eligible)	N/A	
10	Crowbar Ranch Potable Pumphouse	ca. 1930s	Yes - Eligible under criterion A for providing a continuous supply of potable water to the ranch and its agricultural activities for roughly eighty years. Under Criterion C, it is distinctive as an intact example of Transite construction.	Demo	Adverse effect	Intensive Level Survey (ILS)	
11	Crowbar Ranch Ag Pump House (non-potable)	ca. 1930s	Yes - Eligible under criterion A for providing a continuous supply of non-potable water to Dillingham Ranch's agricultural activities for roughly eighty years.	Demo	Adverse effect	Intensive Level Survey (ILS)	
12	Crowbar Ranch Maintenance Shop	unkno wn	Not Eligible	Demo	N/A (since not eligible)	N/A	
13	Crowbar Ranch Feed Barn	ca. 2000s	Not Eligible	Demo	N/A (since not eligible)	N/A	

\*See RLS forms for historic building names

# Appendix C, Map of Preservation Zones



**Inset 1**



**Inset 2**



- 1. Dillingham Compound Main House
- 2. Dillingham Compound East Bedroom Wing
- 3. Dillingham Compound West Bedroom Wing
- 4. Dillingham Compound Kitchen Wing
- 5. Dillingham Compound Doilhouse
- 6. Dillingham Compound Office
- 7. Crowder Ranch Possible Penhouse
- 8. Crowder Ranch Ag Pump House (non-potable)

## Dillingham Ranch Historically Eligible Buildings and Historic Preservation Zones

## Appendix D, RLS Forms



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**I. GENERAL INFORMATION**

Common / Present Name: Dillingham Ranch, Dillingham Compound, Main House

Historic Name: Mokuleia Ranch, Main House

Property Owner: Dillingham Ranch Aina LLC

Address: 68-434 Farrington Highway

City/ Town/ Location: Mokuleia

County: Honolulu

TMK: (1)-6-8-003:006

Subdivision/Neighborhood: [Click here to enter text.](#)

Latitude: N21.566682°

Longitude: W-158.167430°

Parcel Number: [Click here to enter text.](#)

Historic District: [Click here to enter text.](#)

Original Use: Residential

Current Use: Commercial

Architect/ Builder (if known): [Click here to enter text.](#)

Date of Construction (if known): original ca. 1913, renovation ca. 2008

**II. Photograph of Resource**



Prepared By: Dee Ruzicka

Consulting Firm: Mason Architects

Address: 119 Merchant Street, Suite 501, Honolulu, HI 96813

Telephone Number: 808.536.0556

Email: [dr@masonarch.com](mailto:dr@masonarch.com)

Date: June 23, 2016



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

FOR SHPD USE ONLY:

Site # [Click here to enter text.](#)

TMK # [Click here to enter text.](#)

III. CONDITION ASSESSMENT

Category (select all that apply):

- Building(s)
  - Residential
  - Commercial
  - Educational
  - Public/Civic
  - Religious
- Structure(s)
- Object(s)
- Site(s)/Landscape(s)
- Archaeology or potential for archaeology (Please provide a description of the potential for archaeology within VI. Description of Resource Features below.)

Condition:

- Excellent
- Good
- Fair

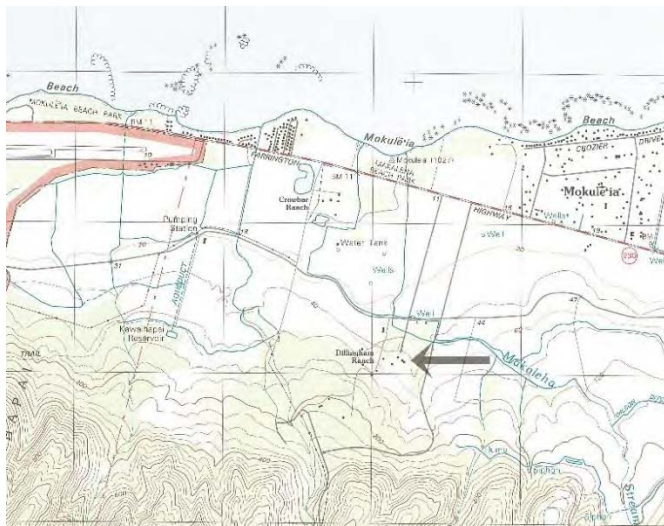
Eligibility (select all that apply):

- National Register of Historic Places
- State Register of Historic Places
  - Not Eligible
  - Eligible
  - Listed
  - Contributing to Historic District: Name of District: [Click here to enter text.](#)
  - Unknown

Criteria of Significance (select all that apply)

- A: Associated with Events
- B: Associated with Significant Person(s)
- C: Distinctive characteristics of a type, period or method of construction; work of a master; possess high artistic values (Architecture, Engineering, Design)
- D: Have yielded or may be likely to yield information important to history or prehistory.

IV. MAP





HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

FOR SHPD USE ONLY:

Site # [Click here to enter text.](#)

TMK # [Click here to enter text.](#)

V. DESCRIPTION

Materials (please check those materials that are visible):

Height

Stories: 1

Other: [Click here to enter text.](#)

Below Ground: First floor on West side

N/A

Exterior Walls (siding):

Aluminum Siding

Metal

Plywood

Asbestos

Shingles-Asphalt

OSB

Brick

Shingles-Wood

Fiberboard

Ceramic

Stone

Fiber Cement

Concrete

Stucco

Vinyl Siding

Horizontal Wood Siding

Vertical Wood Siding

Other:

Log

Engineered Siding

Board and batten

Roof:

Asphalt, shingle

Slate

Wood Shingle

Asphalt, roll

Built Up

None

Metal

Ceramic Tile

Other: [Click here to enter text.](#)

Foundation:

Brick

Concrete Slab

Stone

Concrete Block

Poured Concrete

Raised/Pile

Other: [Click here to enter text.](#)

Structural Support:

Baled Hay

Frame-wood

Puddled Clay

Concrete Block

Frame-metal/steel

Rammed Earth

Concrete Framed

Brick-load bearing

Sod

Concrete Poured

Stone-load bearing

Other: [Click here to enter text.](#)

Windows:

Double Hung Sash

Jalousie

Stained Glass

Single Hung Sash

Glass Block

Replacement

Casement

None/Unknown

Aluminum

Fixed

Ribbon

Vinyl

Other: Hopper

Lanai(s)

Arcade

Recessed

Wrap-around

Balcony

Stoop

Verandah

Porte-Cochere

Portico

None

Other: [Click here to enter text.](#)

Chimney

Brick

Stuccoed Masonry

Stove Pipe

Concrete

Stone

Siding

None

Other: [Click here to enter text.](#)



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –**Reconnaissance Level**

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**Narrative Description**

The Main House at Dillingham Ranch is the central focus of the five-building Dillingham residential compound. The compound is located about 0.7 mile south (inland) of Farrington Highway, on a gently sloping grade, which is dotted with large trees. Three of the compound's buildings form a U in plan that is oriented with the open side facing north-northeast. The Main House is the center building of the complex, forming the base of the U. It is oriented facing the facing the grassy courtyard formed with the East and West Bedroom Wing buildings.

The Main House has a rectangular footprint with overall dimensions of about 62' x 45'. This includes the approximate 25' x 50' footprint of the building and a 20' wide lanai along the north side, facing the courtyard. The steep gable roof of the Main House has a flared eave on the north elevation building that transitions into the attached lower-slope hip roof covers the lanai; both are covered with wood shingles.

The lanai wraps around the sides of the building on the east and west, extending about six feet past each end of the building. The lanai terminates at the chimney on the west side of the building. At the east side, the lanai is partially enclosed with a screened porch, exterior access to which is through a three-panel screen door, located on the north side, featuring prominent and historic 12" double-acting spring hinges, a metal push-plate, and interior turn-knob bolt. Both the screened porch and the lanai roof connect to the adjacent Kitchen building and there is an additional door at the south wall of the screened porch that leads into the Kitchen building.

The single story Main House is wood framed with double wall construction, and rests on a concrete slab foundation. Exterior wall surfaces are painted board and batten. Each gable end of the building has two small, rectangular vent openings that have fixed louvers near the peak of the gable. The building has a stone chimney at the west gable that is about 7' wide at its base, projects 26", and tapers to about four feet square where it intersects the roof. The lanai roof is supported by large, seven foot high, painted wooden columns with a Tuscan base and capital, and a deep entablature. The columns are 10" in diameter at the base, tapering to about 9" in diameter at the capital. Each column rests on a 17" square, 5" high stone plinth with quarry-faced sides. The lanai has rectangular pavers with a stone curb with quarry-faced edges that was added, along with the plinths, ca. 2008.

The roof has wide eaves with a three foot overhang. The rafters are exposed, on 2'-0" spacing, and have decorative cut tails. The ceiling of the lanai is board and batten, running parallel to the length of the front lanai, and continuing in this direction on the ceiling of the east and west lanai areas.

The only two windows in the building are located on the west elevation, flanking the chimney, and are 6/6 double hung sash. There are three sets of doors on each of the long elevations (north and south) and one pair centered on the east elevation that open onto the enclosed screened porch. All of the doors are paired French doors with eighteen-lights flanked by narrow six-light sidelights. Above the doors are six-light transom windows with small two-light transoms above the sidelights. Doors have replacement hardware that was added ca. 2008. These feature glass doorknobs replicating the historical knobs. The rear (south) side of the building has an open



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lanai extending the full length of the building and extending approximately 15' from the building. The southeast corner of the Main House is attached to the northwest corner of the Kitchen building at the wall and the roofline of the buildings.

The interior of the Main House is a single large room with wood plank floors and board and batten on the walls and ceiling. A large stone fireplace dominates the west wall.

### Statement of Significance

The Main House building at Dillingham Ranch is eligible for the NRHP as one of the buildings making up the Dillingham Compound. It is important under Criterion B for its association with renowned Hawaii businessman Walter F. Dillingham and his father Benjamin Franklin Dillingham. Additionally, under Criterion C it is significant as an example of Dutch Colonial architectural style adapted to act as a gentlemen's ranch house.

Although the building was renovated ca. 2008, it retains integrity of location, setting, design, materials workmanship, feeling and association sufficient enough to convey its significance as a major component of the Dillingham Ranch property.

### References

City & County of Honolulu Real Property Tax Assessment Division, Land Appraisal Cards for TMK (1) 6-8-003:006

City & County of Honolulu Real Property Assessment Division. Website:  
<http://www.qpublic.net/hi/honolulu/search.html> for TMK: (1) 6-8-003:006, accessed January 18, 2016.

Melendy, Howard Brett. *Walter Francis Dillingham, 1875-1963: Hawaiian entrepreneur and statesman.* Lewiston NY: The Edwin Mellon Press. 1996.

Yardley, Paul T. *Millstones and Milestones, The career of B.F. Dillingham.* Honolulu: The University Press of Hawaii. 1981.





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HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

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Site # [Click here to enter text.](#)

TMK # [Click here to enter text.](#)

**I. GENERAL INFORMATION**

Common / Present Name: Dillingham Ranch, Dillingham Compound, East Bedroom Wing

Historic Name: Mokuleia Ranch, bedroom wing

Property Owner: Dillingham Ranch Aina LLC

Address: 68-434 Farrington Highway

City/ Town/ Location: Mokuleia

County: Honolulu

TMK: (1)-6-8-003:006

Subdivision/Neighborhood: [Click here to enter text.](#)

Latitude: N21.566722°

Longitude: W-158.167227°

Parcel Number: [Click here to enter text.](#)

Historic District: [Click here to enter text.](#)

Original Use: Residential

Current Use: Commercial

Architect/ Builder (if known): [Click here to enter text.](#)

Date of Construction (if known): original ca. 1913, renovation ca. 2008

**II. Photograph of Resource**



Prepared By: Dee Ruzicka

Consulting Firm: Mason Architects

Address: 119 Merchant Street, Suite 501, Honolulu, HI 96813

Telephone Number: 808.536.0556

Email: [dr@masonarch.com](mailto:dr@masonarch.com)

Date: June 23, 2016



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TMK # [Click here to enter text.](#)

III. CONDITION ASSESSMENT

Category (select all that apply):

- Building(s)
  - Residential     Commercial     Educational     Public/Civic     Religious
- Structure(s)
- Object(s)
- Site(s)/Landscape(s)
- Archaeology or potential for archaeology (Please provide a description of the potential for archaeology within VI. Description of Resource Features below.)

Condition:

- Excellent
- Good
- Fair

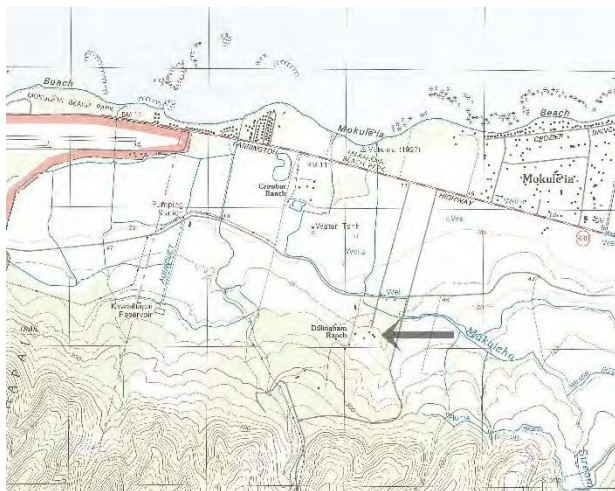
Eligibility (select all that apply):

- National Register of Historic Places
- State Register of Historic Places
  - Not Eligible
  - Eligible
  - Listed
  - Contributing to Historic District: Name of District: [Click here to enter text.](#)
  - Unknown

Criteria of Significance (select all that apply)

- A: Associated with Events
- B: Associated with Significant Person(s)
- C: Distinctive characteristics of a type, period or method of construction; work of a master; possess high artistic values (Architecture, Engineering, Design)
- D: Have yielded or may be likely to yield information important to history or prehistory.

IV. MAP





HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

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Site # [Click here to enter text.](#)

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V. DESCRIPTION

Materials (please check those materials that are visible):

Height

Stories: 1

Other: [Click here to enter text.](#)

Below Ground: First floor on West side

N/A

Exterior Walls (siding):

Aluminum Siding

Metal

Plywood

Asbestos

Shingles-Asphalt

OSB

Brick

Shingles-Wood

Fiberboard

Ceramic

Stone

Fiber Cement

Concrete

Stucco

Vinyl Siding

Horizontal Wood Siding

Vertical Wood Siding

Other:

Log

Engineered Siding

Board and batten

Roof:

Asphalt, shingle

Slate

Wood Shingle

Asphalt, roll

Built Up

None

Metal

Ceramic Tile

Other: [Click here to enter text.](#)

Foundation:

Brick

Concrete Slab

Stone

Concrete Block

Poured Concrete

Raised/Pile

Other: [Click here to enter text.](#)

Structural Support:

Baled Hay

Frame-wood

Puddled Clay

Concrete Block

Frame-metal/steel

Rammed Earth

Concrete Framed

Brick-load bearing

Sod

Concrete Poured

Stone-load bearing

Other: [Click here to enter text.](#)

Windows:

Double Hung Sash

Jalousie

Stained Glass

Single Hung Sash

Glass Block

Replacement

Casement

None/Unknown

Aluminum

Fixed

Ribbon

Vinyl

Other: Hopper

Lanai(s)

Arcade

Recessed

Wrap-around

Balcony

Stoop

Verandah

Porte-Cochere

Portico

None

Other: [Click here to enter text.](#)

Chimney

Brick

Concrete

Stuccoed Masonry



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HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

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**TMK #** [Click here to enter text.](#)

Stone

Stove Pipe

Siding

None

Other: [Click here to enter text.](#)

**Narrative Description**

The East Bedroom Wing at Dillingham Ranch is one of five buildings that make up the Dillingham Compound. The residential compound is located about 0.7 mile south (inland) of Farrington Highway, on a gently sloping grade, which is dotted with large trees. Three of the compound’s buildings form a U in plan that is oriented with the open side facing north-northeast. The East Bedroom Wing forms the east (right) side of the U-shape. An L-shaped rock wall attaches the southeast corner of this bedroom wing to the northeast corner of the Kitchen Wing, creating a small, partially enclosed, landscaped area and shielding parking beyond. The East Bedroom Wing has a rectangular footprint with overall dimensions of approximately 71' x 25'. This includes an 8'-2" wide full length covered arcade along its west side, facing the grassy courtyard formed with the Main House and the West Bedroom Wing buildings. The building has a steep gable roof with a lower sloped hip roof section covering the lanai, and it rests on a concrete slab foundation.

The East Bedroom Wing is single story, and of wood frame, double wall construction. Exterior wall surfaces are painted board and batten with a 7" high base board at the lanai that extends around the remainder of the building as a water table. Each end of the building has a small rectangular vent opening with fixed louvers near the peak of the gable. Below this is a decorative lattice of battens aligned on top of the building battens. The roof of the building is covered with wood shingles. The hipped roof at the lanai is supported by large, seven foot high, painted wooden columns with a Tuscan base and capital, and a deep entablature. The columns are 10" in diameter at the base, tapering to about 9" in diameter at the capital. Each column rests on a 17" square, 5" high stone plinth with quarry-faced sides. The lanai has rectangular pavers with a stone curb with quarry-faced edges that was added, along with the plinths, ca. 2008.

The roof has wide eaves with a three foot overhang. The rafters are exposed, on 2'-0" spacing, and have decorative cut tails. The ceiling of the lanai is board and batten, running parallel to the length of the lanai. Windows along the north and east elevations of the building are 6/6 double hung. Small hopper windows with four small lights over a single light are located along the west elevation, under the lanai. Doors leading into the rooms and out to the outdoor showers are two panel that have a large rectangular vision panel, high on the door, which is divided by crossed horizontal, vertical, and diagonal muntins into eight lights. The doors leading into the rooms have an interior screen door within the same frame with operable wood louvers. Framed into the door opening of the doors leading to the shower enclosures, is a board and batten panel topped by a small, operable hopper transom window. Doors have replacement hardware that was added ca. 2008. These feature glass doorknobs replicating the historical knobs.

At the rear (east) side of the building there are two groups of attached, open top, outside showers, with two showers in each enclosure. Each shower enclosure has a concrete base and curb, about two feet high, which is topped by a stained wood privacy fence of vertical boards with a wood cap.



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The interior of the East Bedroom Wing contains four bedrooms. Each bedroom has its own lanai entrance and its own bathroom and outside shower. Interior walls and ceiling are board and batten and the floors are wood.

### Statement of Significance

The East Bedroom Wing at the Dillingham Ranch is eligible for the NRHP as one of the buildings making up the Dillingham Compound. It is important under Criterion B for its association with renowned Hawaii businessman Walter F. Dillingham and his father Benjamin Franklin Dillingham. Additionally, it is significant under Criterion C as an example of Dutch Colonial architectural style adapted to act as a gentlemen's ranch house.

Although the building was renovated ca. 2008, it retains integrity of location, setting, design, materials workmanship, feeling and association sufficient enough to convey its significance as a major component of the Dillingham Ranch property.

### References

City & County of Honolulu Real Property Tax Assessment Division, Land Appraisal Cards for TMK (1) 6-8-003:006

City & County of Honolulu Real Property Assessment Division. Website:  
<http://www.qpublic.net/hi/honolulu/search.html> for TMK: (1) 6-8-003:006, accessed January 18, 2016.

Melendy, Howard Brett. *Walter Francis Dillingham, 1875-1963: Hawaiian entrepreneur and statesman.* Lewiston NY: The Edwin Mellon Press. 1996.

Yardley, Paul T. *Millstones and Milestones, The career of B.F. Dillingham.* Honolulu: The University Press of Hawaii. 1981.



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HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

**FOR SHPD USE ONLY:**                      **Site #** [Click here to enter text.](#)                      **TMK #** [Click here to enter text.](#)

**I. GENERAL INFORMATION**

Common / Present Name: Dillingham Ranch, Dillingham Compound, West Bedroom Wing

Historic Name: Mokuleia Ranch, bedroom wing

Property Owner: Dillingham Ranch Aina LLC

Address: 68-434 Farrington Highway

City/ Town/ Location: Mokuleia

County: Honolulu

TMK: (1)-6-8-003:006

Subdivision/Neighborhood: [Click here to enter text.](#)

Latitude: N21.566847°

Longitude: W-158.167549°

Parcel Number: [Click here to enter text.](#)

Historic District: [Click here to enter text.](#)

Original Use: Residential

Current Use: Commercial

Architect/ Builder (if known): [Click here to enter text.](#)

Date of Construction (if known): original ca. 1913, renovation ca. 2008

**II. Photograph of Resource**



Prepared By: Dee Ruzicka                      Consulting Firm: Mason Architects  
Address: 119 Merchant Street, Suite 501, Honolulu, HI 96813  
Telephone Number: 808.536.0556                      Email: [dr@masonarch.com](mailto:dr@masonarch.com)                      Date: June 23, 2016



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HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

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TMK # [Click here to enter text.](#)

**III. CONDITION ASSESSMENT**

Category (select all that apply):

- Building(s)
  - Residential
  - Commercial
  - Educational
  - Public/Civic
  - Religious
- Structure(s)
- Object(s)
- Site(s)/Landscape(s)
- Archaeology or potential for archaeology (Please provide a description of the potential for archaeology within VI. Description of Resource Features below.)

Condition:

- Excellent
- Good
- Fair

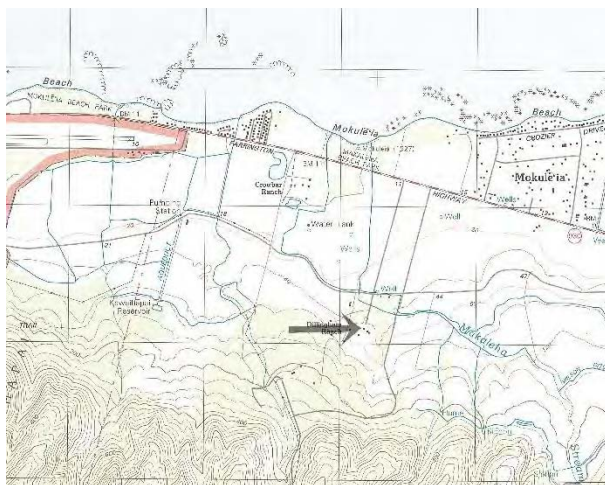
Eligibility (select all that apply):

- National Register of Historic Places
- State Register of Historic Places
  - Not Eligible
  - Eligible
  - Listed
  - Contributing to Historic District: Name of District: [Click here to enter text.](#)
  - Unknown

Criteria of Significance (select all that apply)

- A: Associated with Events
- B: Associated with Significant Person(s)
- C: Distinctive characteristics of a type, period or method of construction; work of a master; possess high artistic values (Architecture, Engineering, Design)
- D: Have yielded or may be likely to yield information important to history or prehistory.

**IV. MAP**





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HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

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TMK # [Click here to enter text.](#)

V. DESCRIPTION

Materials (please check those materials that are visible):

Height

Stories: 1

Other: [Click here to enter text.](#)

Below Ground: First floor on West side

N/A

Exterior Walls (siding):

Aluminum Siding

Metal

Plywood

Asbestos

Shingles-Asphalt

OSB

Brick

Shingles-Wood

Fiberboard

Ceramic

Stone

Fiber Cement

Concrete

Stucco

Vinyl Siding

Horizontal Wood Siding

Vertical Wood Siding

Other:

Log

Engineered Siding

Board and batten

Roof:

Asphalt, shingle

Slate

Wood Shingle

Asphalt, roll

Built Up

None

Metal

Ceramic Tile

Other: [Click here to enter text.](#)

Foundation:

Brick

Concrete Slab

Stone

Concrete Block

Poured Concrete

Raised/Pile

Other: [Click here to enter text.](#)

Structural Support:

Baled Hay

Frame-wood

Puddled Clay

Concrete Block

Frame-metal/steel

Rammed Earth

Concrete Framed

Brick-load bearing

Sod

Concrete Poured

Stone-load bearing

Other: [Click here to enter text.](#)

Windows:

Double Hung Sash

Jalousie

Stained Glass

Single Hung Sash

Glass Block

Replacement

Casement

None/Unknown

Aluminum

Fixed

Ribbon

Vinyl

Other: Hopper

Lanai(s)

Arcade

Recessed

Wrap-around

Balcony

Stoop

Verandah

Porte-Cochere

Portico

None

Other: [Click here to enter text.](#)

Chimney

Brick

Concrete

Stuccoed Masonry





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HISTORIC RESOURCE INVENTORY FORM –**Reconnaissance Level**

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

Stone

Stove Pipe

Siding

None

Other: [Click here to enter text.](#)

**Narrative Description**

The West Bedroom Wing at Dillingham Ranch is one of five buildings that make up the Dillingham Compound. The compound is located about 0.7 mile south (inland) of Farrington Highway, on a gently sloping grade, which is dotted with large trees. Three of the compound's buildings form a U in plan that is oriented with the open side facing north-northeast. The West Bedroom Wing makes up the west (left) side of the U. It has a rectangular footprint with overall dimensions of about 71' x 25'. This includes an 8'-2" wide full length covered arcade along its west side, facing the grassy courtyard formed with the Main House and the East Bedroom Wing buildings. The West Bedroom Wing building has a steep gable roof with a lower sloped hip roof section covering the lanai, and it rests on a concrete slab foundation.

The West Bedroom Wing is single story, and of wood frame, double wall construction. Exterior wall surfaces are painted board and batten with a 7" high base board at the lanai that extends around the remainder of the building as a water table. Each end of the building has a small rectangular vent opening with fixed louvers near the peak of the gable. Below this is a decorative lattice of battens aligned on top of the building battens. The roof of the building is covered with wood shingles. The hipped roof at the lanai is supported by large, seven foot high, painted wooden columns with a Tuscan base and capital, and a deep entablature. The columns are 10" in diameter at the base, tapering to about 9" in diameter at the capital. Each column rests on a 17" square, 5" high stone plinth with quarry-faced sides. The lanai has rectangular pavers with a stone curb with quarry-faced edges that was added, along with the plinths, ca. 2008.

The roof has wide eaves with about 3' overhang. The rafters are exposed, on 2'-0" spacing, and have decorative cut tails. The ceiling of the lanai is board and batten, running parallel to the length of the lanai. Windows along the north and west elevations of the building are 6/6 double hung. Small hopper windows with four small lights over a single light are located along the east elevation, under the lanai. Doors leading into the rooms and out to the outdoor showers are two panel that have a large rectangular vision panel, high on the door, which is divided by crossed horizontal, vertical, and diagonal muntins into eight lights. The doors leading into the rooms have an interior screen door within the same frame with operable wood louvers. Framed into the door opening of the doors leading to the shower enclosures, is a board and batten panel topped by a small, operable hopper transom window. Doors have replacement hardware that was added ca. 2008. These feature glass doorknobs replicating the historical knobs.

At the rear (west) side of the building there are two groups of attached, open top, outside showers, with two showers in each enclosure. Each shower enclosure has a concrete base and curb, about two feet high, which is topped by a stained wood privacy fence of vertical boards with a wood cap.

The interior of the East Bedroom Wing contains four bedrooms. Each bedroom has its own lanai entrance and its own bathroom and outside shower. Interior walls and ceiling are board and batten and the floors are wood.



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HISTORIC RESOURCE INVENTORY FORM –**Reconnaissance Level**

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**TMK #** [Click here to enter text.](#)

### Statement of Significance

The West Bedroom Wing at the Dillingham Ranch is eligible for the NRHP as one of the buildings making up the Dillingham Compound. It is important under Criterion B for its association with renowned Hawaii businessman Walter F. Dillingham and his father Benjamin Franklin Dillingham. Additionally, it is significant under Criterion C as an example of Dutch Colonial architectural style adapted to act as a gentlemen's ranch house.

Although the building was renovated ca. 2008, it retains integrity of location, setting, design, materials workmanship, feeling and association sufficient enough to convey its significance as a major component of the Dillingham Ranch property.

### References

City & County of Honolulu Real Property Tax Assessment Division, Land Appraisal Cards for TMK (1) 6-8-003:006

City & County of Honolulu Real Property Assessment Division. Website:  
<http://www.qpublic.net/hi/honolulu/search.html> for TMK: (1) 6-8-003:006, accessed January 18, 2016.

Melendy, Howard Brett. *Walter Francis Dillingham, 1875-1963: Hawaiian entrepreneur and statesman*. Lewiston NY: The Edwin Mellon Press. 1996.

Yardley, Paul T. *Millstones and Milestones, The career of B.F. Dillingham*. Honolulu: The University Press of Hawaii. 1981.



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – **Reconnaissance Level**

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**I. GENERAL INFORMATION**

Common / Present Name: Dillingham Ranch, Dillingham Compound, Kitchen Wing

Historic Name: Mokuleia Ranch, the big house, kitchen wing

Property Owner: Dillingham Ranch Aina LLC

Address: 68-434 Farrington Highway

City/ Town/ Location: Mokuleia

County: Honolulu

TMK: (1)-6-8-003:006

Subdivision/Neighborhood: [Click here to enter text.](#)

Latitude: N21.566541°

Longitude: W-158.167366°

Parcel Number: [Click here to enter text.](#)

Historic District: [Click here to enter text.](#)

Original Use: Residential

Current Use: Commercial

Architect/ Builder (if known): [Click here to enter text.](#)

Date of Construction (if known): original ca. 1913, renovation ca. 2008

**II. Photograph of Resource**



Prepared By: Dee Ruzicka

Consulting Firm: Mason Architects

Address: 119 Merchant Street, Suite 501, Honolulu, HI 96813

Telephone Number: 808.536.0556

Email: [dr@masonarch.com](mailto:dr@masonarch.com)

Date: June 23, 2016



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

FOR SHPD USE ONLY:

Site # [Click here to enter text.](#)

TMK # [Click here to enter text.](#)

III. CONDITION ASSESSMENT

Category (select all that apply):

- Building(s)
  - Residential
  - Commercial
  - Educational
  - Public/Civic
  - Religious
- Structure(s)
- Object(s)
- Site(s)/Landscape(s)
- Archaeology or potential for archaeology (Please provide a description of the potential for archaeology within VI. Description of Resource Features below.)

Condition:

- Excellent
- Good
- Fair

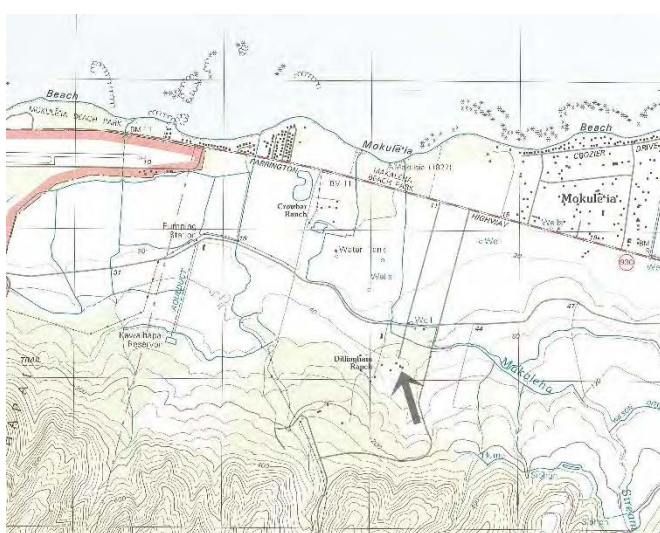
Eligibility (select all that apply):

- National Register of Historic Places
- State Register of Historic Places
  - Not Eligible
  - Eligible
  - Listed
  - Contributing to Historic District: Name of District: [Click here to enter text.](#)
  - Unknown

Criteria of Significance (select all that apply)

- A: Associated with Events
- B: Associated with Significant Person(s)
- C: Distinctive characteristics of a type, period or method of construction; work of a master; possess high artistic values (Architecture, Engineering, Design)
- D: Have yielded or may be likely to yield information important to history or prehistory.

IV. MAP





HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –**Reconnaissance Level**

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**V. DESCRIPTION**

Materials (please check those materials that are visible):

Height

Stories: 1

Other: [Click here to enter text.](#)

Below Ground: First floor on West side

N/A

**Exterior Walls (siding):**

Aluminum Siding

Metal

Plywood

Asbestos

Shingles-Asphalt

OSB

Brick

Shingles-Wood

Fiberboard

Ceramic

Stone

Fiber Cement

Concrete

Stucco

Vinyl Siding

Horizontal Wood Siding

Vertical Wood Siding

Other:

Log

Engineered Siding

Board and batten

Roof:

Asphalt, shingle

Slate

Wood Shingle

Asphalt, roll

Built Up

None

Metal

Ceramic Tile

Other: [Click here to enter text.](#)

Foundation:

Brick

Concrete Slab

Stone

Concrete Block

Poured Concrete

Raised/Pile

Other: [Click here to enter text.](#)

Structural Support:

Baled Hay

Frame-wood

Puddled Clay

Concrete Block

Frame-metal/steel

Rammed Earth

Concrete Framed

Brick-load bearing

Sod

Concrete Poured

Stone-load bearing

Other: [Click here to enter text.](#)

Windows:

Double Hung Sash

Jalousie

Stained Glass

Single Hung Sash

Glass Block

Replacement

Casement

None/Unknown

Aluminum

Fixed

Ribbon

Vinyl

Other: Sliding

Lanai(s)

Arcade

Recessed

Wrap-around

Balcony

Stoop

Verandah

Porte-Cochere

Portico

None

Other: [Click here to enter text.](#)

Chimney

Brick

Concrete

Stuccoed Masonry



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

Stone

Stove Pipe

Siding

None

Other: [Click here to enter text.](#)

**Narrative Description**

The Kitchen Wing building at Dillingham Ranch is one of five buildings that make up the Dillingham residential compound. The compound is located about 0.7 mile south (inland) of Farrington Highway, on a gently sloping grade, which is dotted with large trees. Three of the compound's buildings form a U in plan that is oriented with the open side facing north-northeast. The kitchen wing sits behind (south of) the three residential buildings and is connected at its northwest corner to the Main House. The Kitchen is separated from the East Bedroom Wing by a six foot rock wall that extends east along a parking court from the northeast corner of the Kitchen building and makes a right turn past a second rock wall that extends from the southeast corner of the Bedroom wing, creating a concealed passage through to the front yard of the compound.

The Kitchen building has a rectangular footprint with overall dimensions of about 45' x 25', oriented in a north-south direction. The single story building is wood framed with double wall construction, and rests on a concrete slab foundation. Exterior wall surfaces are painted board and batten. Each gable end of the building has a rectangular vent opening with fixed louvers near the peak of the gable. The steep gabled roof is clad with wood shingles, and has wide eaves with a three foot overhang. The rafters are exposed, on 2'-0" spacing, and have decorative cut tails. The northwest gable end intersects with the Main House gable end creating a valley condition. A wood-shingled projecting visor roof is located along the north elevation and a portion of the east elevation, just under the upper eave level. This roof ties into the Main House lanai roof and provides protection to the windows below.

Windows are 6/6 double hung, two are located adjacent to the doors along the east elevation, and an assembly of four are set into the south elevation. Smaller, single-light triple-sliding windows are located under the visor roof, one at the east elevation and a pair spanning the north elevation. Exterior doors are also located in the south and east elevations and are single panel over two-panel, with a single-light hopper transom above. A nine-light vision panel over two panel door provides access to the Main House via the screened porch. The west elevation is devoid of fenestration.

The interior of the Kitchen Wing contains a large commercial kitchen, laundry room, and storage room, each with their own exterior access. Floors are 4x4 tile and the walls and ceiling are board and batten. Interior doors are single panel over two-panel, like the exterior. The door to the laundry area has a fixed clear glass transom above.

This building was renovated ca. 2008.



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –**Reconnaissance Level**

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**TMK #** [Click here to enter text.](#)

### Statement of Significance

The Kitchen Wing building at the Dillingham Ranch is eligible for the NRHP as one of the buildings making up the Dillingham Compound. It is important under Criterion B for its association with renowned Hawaii businessman Walter F. Dillingham and his father Benjamin Franklin Dillingham. Additionally, it is significant under Criterion C as an example of Dutch Colonial architectural style adapted to act as a gentlemen's ranch house.

Although the building was renovated ca. 2008, it retains integrity of location, setting, design, materials workmanship, feeling and association sufficient enough to convey its significance as a major component of the Dillingham Ranch property.

### References

City & County of Honolulu Real Property Tax Assessment Division, Land Appraisal Cards for TMK (1) 6-8-003:006

City & County of Honolulu Real Property Assessment Division. Website:  
<http://www.qpublic.net/hi/honolulu/search.html> for TMK: (1) 6-8-003:006, accessed January 18, 2016.

Melendy, Howard Brett. *Walter Francis Dillingham, 1875-1963: Hawaiian entrepreneur and statesman.* Lewiston NY: The Edwin Mellon Press. 1996.

Yardley, Paul T. *Millstones and Milestones, The career of B.F. Dillingham.* Honolulu: The University Press of Hawaii. 1981.



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

**FOR SHPD USE ONLY:** Site # [Click here to enter text.](#) TMK # [Click here to enter text.](#)

**I. GENERAL INFORMATION**

Common / Present Name: Dillingham Ranch, Dillingham Compound (“Dollhouse”)

Historic Name: Gaspar Silva Ranch Residence

Property Owner: Dillingham Ranch Aina LLC

Address: 68-434 Farrington Highway

City/ Town/ Location: Mokuleia

County: Honolulu

TMK: (1)-6-8-003:006

Subdivision/Neighborhood: [Click here to enter text.](#)

Latitude: N21.566865°

Longitude: W-158.167800°

Parcel Number: [Click here to enter text.](#)

Historic District: [Click here to enter text.](#)

Original Use: Residential

Current Use: Vacant

Architect/ Builder (if known): Gaspar Silva (?)

Date of Construction (if known): Ca. 1897

**II. Photograph of Resource**



Prepared By: Dee Ruzicka Consulting Firm: Mason Architects, Inc.  
 Address: 119 Merchant Street, Suite 501, Honolulu, HI 96813  
 Telephone Number: 808.536.0556 Email: dr@masonarch.com Date: June 23, 2016





HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

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Site # [Click here to enter text.](#)

TMK # [Click here to enter text.](#)

**III. CONDITION ASSESSMENT**

Category (select all that apply):

- Building(s)
  - Residential
  - Commercial
  - Educational
  - Public/Civic
  - Religious

- Structure(s)
- Object(s)
- Site(s)/Landscape(s)

Archaeology or potential for archaeology (Please provide a description of the potential for archaeology within VI. Description of Resource Features below.)

Condition:

- Excellent
- Good
- Fair

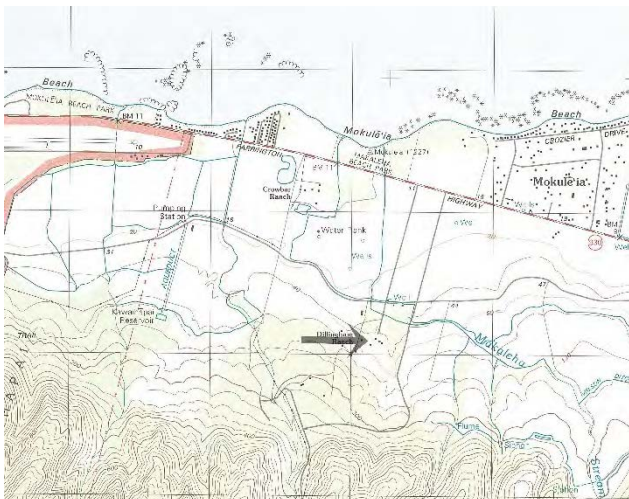
Eligibility (select all that apply):

- National Register of Historic Places
- State Register of Historic Places
  - Not Eligible
  - Eligible
  - Listed
  - Contributing to Historic District: Name of District: [Click here to enter text.](#)
  - Unknown

Criteria of Significance (select all that apply)

- A: Associated with Events
- B: Associated with Significant Person(s)
- C: Distinctive characteristics of a type, period or method of construction; work of a master; possess high artistic values (Architecture, Engineering, Design)
- D: Have yielded or may be likely to yield information important to history or prehistory.

**IV. MAP**





HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

FOR SHPD USE ONLY:

Site # [Click here to enter text.](#)

TMK # [Click here to enter text.](#)

V. DESCRIPTION

Materials (please check those materials that are visible):

Height

Stories: 1

Other: [Click here to enter text.](#)

Below Ground: First floor on West side

N/A

Exterior Walls (siding):

Aluminum Siding

Metal

Plywood

Asbestos

Shingles-Asphalt

OSB

Brick

Shingles-Wood

Fiberboard

Ceramic

Stone

Fiber Cement

Concrete

Stucco

Vinyl Siding

Horizontal Wood Siding

Vertical Wood Siding

Other:

Log

Engineered Siding

Roof:

Asphalt, shingle

Slate

Wood Shingle

Asphalt, roll

Built Up

None

Metal

Ceramic Tile

Other: [Click here to enter text.](#)

Foundation:

Brick

Concrete Slab

Stone

Concrete Block

Poured Concrete

Raised/Pile

Other: Wood post on concrete block

Structural Support:

Baled Hay

Frame-wood

Puddled Clay

Concrete Block

Frame-metal/steel

Rammed Earth

Concrete Framed

Brick-load bearing

Sod

Concrete Poured

Stone-load bearing

Other: [Click here to enter text.](#)

Windows:

Double Hung Sash

Jalousie

Stained Glass

Single Hung Sash

Glass Block

Replacement

Casement

None/Unknown

Aluminum

Fixed

Ribbon

Vinyl

Other: sliding

Lanai(s)

Arcade

Recessed

Wrap-around

Balcony

Stoop

Verandah

Porte-Cochere

Portico

None

Other: Enclosed porch.

Chimney

Brick

Stuccoed Masonry

Stove Pipe

Concrete

Stone

Siding

None

Other: [Click here to enter text.](#)



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

**FOR SHPD USE ONLY:**

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**Narrative Description**

The Gaspar Silva Ranch Residence (currently referred to as the “Dollhouse”) building at Dillingham Ranch is one of five buildings that make up the Dillingham residential Compound. The compound is located about 0.7 mile south (inland) of Farrington Highway, on a gently sloping grade, which is dotted with large trees. The Gaspar Silva Ranch Residence building is a single story structure, set away from the other compound buildings, and surrounded by lawn and open pasture; a large tree shades most of the building. The residence is about 75' west of the other Dillingham residential compound buildings. The building is rectangular with a shed- roofed utility room addition at the southeast corner. Overall dimensions are approximately 47' x 38'.

The wood frame residence has a steep gable roof covered with asphalt shingles that transitions to a lower slope hip roof that surrounds all sides except the east elevation. The hip roof is covered in corrugated metal and a portion of it encloses the space that was originally an open lanai to the north. It is unknown when the remainder of the hipped and shed roof portions of the building were added.

There is no roof overhang at the gable ends and hip-roofed portions of the building have a minimal overhang of about 12 inches. The overhang at the shed roof section is greater, about 30". Exterior wall surfaces are primarily vertical tongue and groove boards, with the east elevation being T1-11. The utility room is sheathed in painted plywood and has a concrete slab foundation. The main portions of the residence have a relatively new foundation of wood posts set on either on stones or short lengths of 2x4.

Windows in the building vary but all are believed to be replacement. The exterior windows at the enclosed lanai are a combination of jalousie and fixed picture windows. The three windows on the east elevation are a paired jalousies, a paired double hung, and a single jalousie. The utility room has openings set high in the walls with no glass or screen. The interior wall of the lanai spaces was originally exterior wall and original window openings remain extant, although either the original windows have been replaced with newer single pane double hung windows, been left as cased openings, or the openings have been boarded over.

The wood front door has a large vision panel over two vertical panels. The door at the utility room is wood louvers over a bottom panel, and the door from the utility room into the house is a half glass single panel. None of the entry doors are original.

The interior has been extensively altered, although evidence of the original, double-wall construction remains in some places.



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

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### Statement of Significance

This building is eligible for the NRHP. Under Criterion A, it is significant as the site of the house party hosted by Emma L. Dillingham (wife of B.F. Dillingham) at which the Daughters of Hawaii was founded in 1903. The Daughters of Hawaii are credited with beginning Hawaii's preservation movement, and the group's initial membership was made up of prominent members of Hawaii's society, mostly descended from the early missionary families. In addition to Emma Dillingham, attending the meeting were Anna M. Paris (daughter of Reverend John Davis Paris of the Ninth Company of American Protestant Missionaries), Sarah Coan Waters (daughter of Reverend Titus Coan of the Seventh Company of Missionaries), Annie Dickey, (daughter of Reverend William Alexander of the Fifth Company of Missionaries, sister of Samuel Alexander, one of the founders of Alexander and Baldwin, as well as mother of prominent local architect C.W. Dickey), Lucinda Severance (daughter of Reverend Ephraim Clark of the Third Company of Missionaries), and Ellen Weaver (daughter of Reverend Richard Armstrong of the Fifth Company of Missionaries).

This building is also significant under Criterion B as part of the ranch property purchased by Benjamin Franklin Dillingham in 1897 to be used for family getaways to the country. It is also eligible under Criterion C for its distinctive late-19<sup>th</sup> century Hall-and-Parlor form, with a side-gable, (infilled) front porch, and extended rear.

Although altered, the building is still recognizable from its historic period. Despite the enclosure of the front porch and other alterations, the integrity of location, setting, design, feeling, and association are retained sufficiently for the house to be considered eligible.

### References

City & County of Honolulu Real Property Tax Assessment Division, Land Appraisal Cards for TMK (1) 6-8-003:006

City & County of Honolulu Real Property Assessment Division. Website:

<http://www.qpublic.net/hi/honolulu/search.html> for TMK: (1) 6-8-003:006, accessed January 18, 2016.

Del Piano, Barbara. *Na Lani Kaumaka: Daughters of Hawaii: Century of Historic Preservation*. Daughters of Hawaii. 2005.

Melendy, Howard Brett. *Walter Francis Dillingham, 1875-1963: Hawaiian entrepreneur and statesman*. Lewiston NY: The Edwin Mellon Press. 1996.

Yardley, Paul T. *Millstones and Milestones, The career of B.F. Dillingham*. Honolulu: The University Press of Hawaii. 1981.



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

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**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**I. GENERAL INFORMATION**

Common / Present Name: Dillingham Ranch, Crowbar Ranch, Office

Historic Name: Crowbar Ranch Bunkhouse

Property Owner: Dillingham Ranch Aina LLC

Address: 68-502 Farrington Highway

City/ Town/ Location: Mokuleia

County: Honolulu

TMK: (1)-6-8-003:019

Subdivision/Neighborhood: [Click here to enter text.](#)

Latitude: N21.576389°

Longitude: W-158.171711°

Parcel Number: [Click here to enter text.](#)

Historic District: [Click here to enter text.](#)

Original Use: Bunkhouse

Current Use: Office

Architect/ Builder (if known): [Click here to enter text.](#)

Date of Construction (if known): ca. 1936, renovation ca. 2008

**II. Photograph of Resource**



Prepared By: Dee Ruzicka

Consulting Firm: Mason Architects

Address: 119 Merchant Street, Suite 501, Honolulu, HI 96813

Telephone Number: 808.536.0556

Email: [dr@masonarch.com](mailto:dr@masonarch.com)

Date: June 23, 2016



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

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TMK # [Click here to enter text.](#)

III. CONDITION ASSESSMENT

Category (select all that apply):

- Building(s)
  - Residential
  - Commercial
  - Educational
  - Public/Civic
  - Religious
- Structure(s)
- Object(s)
- Site(s)/Landscape(s)
- Archaeology or potential for archaeology (Please provide a description of the potential for archaeology within VI. Description of Resource Features below.)

Condition:

- Excellent
- Good
- Fair

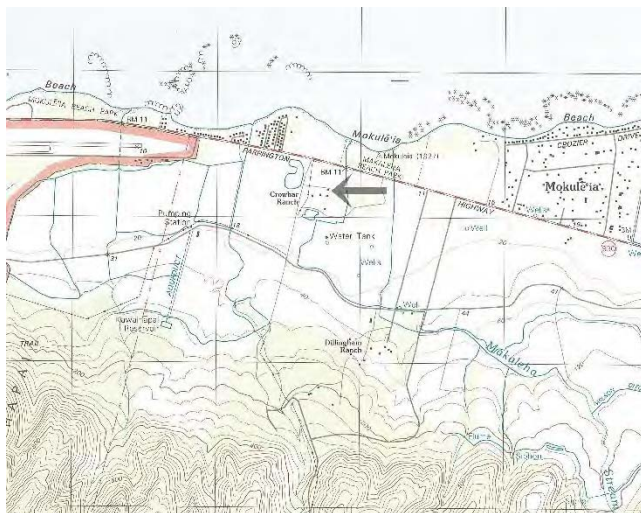
Eligibility (select all that apply):

- National Register of Historic Places
- State Register of Historic Places
- Not Eligible
- Eligible
- Listed
- Contributing to Historic District: Name of District: [Click here to enter text.](#)
- Unknown

Criteria of Significance (select all that apply)

- A: Associated with Events
- B: Associated with Significant Person(s)
- C: Distinctive characteristics of a type, period or method of construction; work of a master; possess high artistic values (Architecture, Engineering, Design)
- D: Have yielded or may be likely to yield information important to history or prehistory.

IV. MAP



V. DESCRIPTION



HAWAII STATE HISTORIC PRESERVATION DIVISION  
 HISTORIC RESOURCE INVENTORY FORM –**Reconnaissance Level**

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Materials (please check those materials that are visible):

Height

- Stories: 1  Other: [Click here to enter text.](#)  
 Below Ground: First floor on West side  
 N/A

**Exterior Walls (siding):**

- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Aluminum Siding        | <input type="checkbox"/> Metal                | <input type="checkbox"/> Plywood          |
| <input type="checkbox"/> Asbestos               | <input type="checkbox"/> Shingles-Asphalt     | <input type="checkbox"/> OSB              |
| <input type="checkbox"/> Brick                  | <input type="checkbox"/> Shingles-Wood        | <input type="checkbox"/> Fiberboard       |
| <input type="checkbox"/> Ceramic                | <input type="checkbox"/> Stone                | <input type="checkbox"/> Fiber Cement     |
| <input type="checkbox"/> Concrete               | <input checked="" type="checkbox"/> Stucco    | <input type="checkbox"/> Vinyl Siding     |
| <input type="checkbox"/> Horizontal Wood Siding | <input type="checkbox"/> Vertical Wood Siding | <input type="checkbox"/> Other:           |
| <input type="checkbox"/> Log                    | <input type="checkbox"/> Engineered Siding    | <a href="#">Click here to enter text.</a> |

Roof:

- |   |                                       |  |
|---|---------------------------------------|--|
| <input type="checkbox"/> Asphalt, shingle                                 | <input type="checkbox"/> Slate        | <input checked="" type="checkbox"/> Wood Shingle |
| <input type="checkbox"/> Asphalt, roll                                    | <input type="checkbox"/> Built Up     | <input type="checkbox"/> None                    |
| <input type="checkbox"/> Metal  | <input type="checkbox"/> Ceramic Tile |  |
| <input type="checkbox"/> Other: <a href="#">Click here to enter text.</a> |                                       |  |

Foundation:

- |   |   |   |
|---|---|---|
| <input type="checkbox"/> Brick  | <input checked="" type="checkbox"/> Concrete Slab | <input checked="" type="checkbox"/> Stone |
| <input type="checkbox"/> Concrete Block                                   | <input type="checkbox"/> Poured Concrete          | <input type="checkbox"/> Raised/Pile      |
| <input type="checkbox"/> Other: <a href="#">Click here to enter text.</a> |   |   |

Structural Support:

- |   |  |                                       |
|---|--|---------------------------------------|
| <input type="checkbox"/> Baled Hay  | <input checked="" type="checkbox"/> Frame-wood | <input type="checkbox"/> Puddled Clay |
| <input type="checkbox"/> Concrete Block                                   | <input type="checkbox"/> Frame-metal/steel     | <input type="checkbox"/> Rammed Earth |
| <input type="checkbox"/> Concrete Framed                                  | <input type="checkbox"/> Brick-load bearing    | <input type="checkbox"/> Sod          |
| <input type="checkbox"/> Concrete Poured                                  | <input type="checkbox"/> Stone-load bearing    |                                       |
| <input type="checkbox"/> Other: <a href="#">Click here to enter text.</a> |  |                                       |

Windows:

- |   |  |  |
|---|--|--|
| <input checked="" type="checkbox"/> Double Hung Sash                      | <input checked="" type="checkbox"/> Jalousie | <input type="checkbox"/> Stained Glass |
| <input type="checkbox"/> Single Hung Sash                                 | <input type="checkbox"/> Glass Block         | <input type="checkbox"/> Replacement   |
| <input type="checkbox"/> Casement   | <input type="checkbox"/> None/Unknown        | <input type="checkbox"/> Aluminum      |
| <input checked="" type="checkbox"/> Fixed                                 | <input type="checkbox"/> Ribbon              | <input type="checkbox"/> Vinyl         |
| <input type="checkbox"/> Other: <a href="#">Click here to enter text.</a> |  |  |

Lanai(s)

- |   |                                   |                                      |
|---|-----------------------------------|--------------------------------------|
| <input checked="" type="checkbox"/> Arcade                                | <input type="checkbox"/> Recessed | <input type="checkbox"/> Wrap-around |
| <input type="checkbox"/> Balcony  | <input type="checkbox"/> Stoop    | <input type="checkbox"/> Verandah    |
| <input type="checkbox"/> Porte-Cochere                                    | <input type="checkbox"/> Portico  | <input type="checkbox"/> None        |
| <input type="checkbox"/> Other: <a href="#">Click here to enter text.</a> |                                   |                                      |

Chimney

- |  |   |                                     |
|--|---|-------------------------------------|
| <input type="checkbox"/> Brick           | <input type="checkbox"/> Stuccoed Masonry                                 | <input type="checkbox"/> Stove Pipe |
| <input type="checkbox"/> Concrete        | <input type="checkbox"/> Stone  | <input type="checkbox"/> Siding     |
| <input checked="" type="checkbox"/> None | <input type="checkbox"/> Other: <a href="#">Click here to enter text.</a> |                                     |

**Narrative Description**



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –**Reconnaissance Level**

**FOR SHPD USE ONLY:**

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**TMK #** [Click here to enter text.](#)

This single story building, currently used as an office, is located on the Dillingham Ranch about 0.15 mile south (inland) of Farrington Highway. It stands amidst a small grove of trees within a large open pasture. The building, constructed ca. 1936, was originally a bunkhouse for ranch hands on Walter Dillingham's Crowbar Ranch. The building, with overall dimensions of 82' x 38', has a U-shaped plan organized around a grassy courtyard bounded by a covered walkway that provides access to the rooms.

The wood-frame, double wall constructed building has a hip roof covered with wood shingles, closed eaves with a wide overhang (approximately three feet), and a painted stucco exterior wall surfaces with a single wood girt at windowsill level. The building has a concrete slab foundation with a low concrete curb along the rear (eastern) portion. Along the inside of its U-shaped plan, the building has a seven foot wide covered exterior walkway, or lanai, to shelter the doors to the individual rooms. The roof at the lanai extends lower than around the exterior of the building and is supported by 4" square wood posts with wood base and capitals. The lanai floor has a stone curb with quarry-faced edge and rectangular pavers that were added during the latest renovation in 2008.

The north wing (northern, or right, leg of the U) contains two standard bunk rooms, approximately 15' x 11'. The bunk rooms are open, generally with a single window opposite the door, and with an outset, small closet adjacent to the entry door. The floors are painted concrete with a 2'x2' grid pattern. Most of the bunk rooms were not accessible but appear to be now be used for tack and general storage.

A larger space at the northeast corner bumps out approximately two feet for a distance of approximately 15' along the north and east sides while maintaining the roofline above. This room was also not accessible but may have been a larger living area that includes a bath room and second exterior door as evidenced at the rear elevation. This space bridges the north and east wings. The east wing contains three additional standard bunk rooms, a unisex bathroom, and an office. The bath and office doors are located along a four foot wide corridor dividing the east and south wings.

As mentioned, the southern wing (left leg of the U) is detached from the rest of the building, separated by a corridor but still covered by the main roof. This wing is occupied by the large, single room, main office. The wide covered lanai walkway extends around the corner of the office to the front (west side) of the building and is supported by wood posts near each corner.

Windows in the building are typically 6/6 double hung, with two pairs of replacement jalousie windows at the rear elevation in the office at the end of the east wing. Most doors in the building are wood, six-light half panel over single panel, and appear to be original. A band of fixed transom windows extends along the wall above the doorways of the east wing, some of which have been boarded and stuccoed over. A newer, double French door, leads to the main office in the south wing, north elevation, and single French doors, to both offices, are located along the corridor between the wings.





HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –**Reconnaissance Level**

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**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**Statement of Significance**

This building at the Dillingham Ranch is eligible for the NRHP under Criterion B for its association with renowned Hawaii businessman Walter F. Dillingham. It is also eligible under Criterion C for its distinctive layout and design as a ranch bunkhouse, and still contains tack rooms and bedrooms from this function. The building retains integrity of location, setting, materials, design, workmanship, feeling and association, and conveys its significance as a component of the Crowbar Ranch.

**References**

City & County of Honolulu Real Property Tax Assessment Division, Land Appraisal Cards for TMK (1) 6-8-003:019

City & County of Honolulu Real Property Assessment Division. Website:  
<http://www.qpublic.net/hi/honolulu/search.html> for TMK: (1) 6-8-003:019, accessed January 18, 2016.

Melendy, Howard Brett. *Walter Francis Dillingham, 1875-1963: Hawaiian entrepreneur and statesman.* Lewiston NY: The Edwin Mellon Press. 1996.

Yardley, Paul T. *Millstones and Milestones, The career of B.F. Dillingham.* Honolulu: The University Press of Hawaii. 1981.



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – **Reconnaissance Level**

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**I. GENERAL INFORMATION**

Common / Present Name: Dillingham Ranch, Crowbar Ranch, Ranch Manager's House

Historic Name: [Click here to enter text.](#)

Property Owner: Dillingham Ranch Aina LLC

Address: 68-434 Farrington Highway

City/ Town/ Location: Mokuleia

County: Honolulu

TMK: (1)-6-8-003:006

Subdivision/Neighborhood: [Click here to enter text.](#)

Latitude: N21.566067°

Longitude: W-158.169027°

Parcel Number: [Click here to enter text.](#)

Historic District: [Click here to enter text.](#)

Original Use: Residential

Current Use: Residential

Architect/ Builder (if known): Hicks Construction Company, Honolulu.

Date of Construction (if known): ca. 1973

**II. Photograph of Resource**



Prepared By: Dee Ruzicka

Consulting Firm: Mason Architects, Inc.

Address: 119 Merchant Street, Suite 501, Honolulu, HI 96813

Telephone Number: 808.536.0556

Email: [dr@masonarch.com](mailto:dr@masonarch.com)

Date: June 23 2016



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

FOR SHPD USE ONLY:

Site # [Click here to enter text.](#)

TMK # [Click here to enter text.](#)

III. CONDITION ASSESSMENT

Category (select all that apply):

- Building(s)
  - Residential
  - Commercial
  - Educational
  - Public/Civic
  - Religious

- Structure(s)
- Object(s)
- Site(s)/Landscape(s)

Archaeology or potential for archaeology (Please provide a description of the potential for archaeology within VI. Description of Resource Features below.)

Condition:

- Excellent
- Good
- Fair

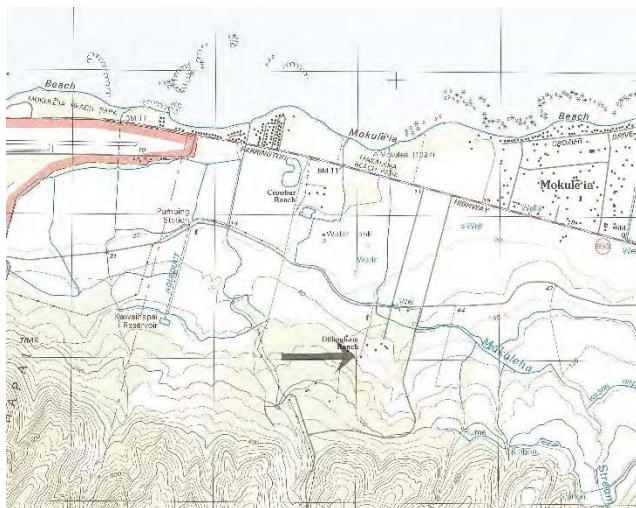
Eligibility (select all that apply):

- National Register of Historic Places
- State Register of Historic Places
  - Not Eligible
  - Eligible
  - Listed
  - Contributing to Historic District: Name of District: [Click here to enter text.](#)
  - Unknown

Criteria of Significance (select all that apply)

- A: Associated with Events
- B: Associated with Significant Person(s)
- C: Distinctive characteristics of a type, period or method of construction; work of a master; possess high artistic values (Architecture, Engineering, Design)
- D: Have yielded or may be likely to yield information important to history or prehistory.

IV. MAP





HAWAII STATE HISTORIC PRESERVATION DIVISION  
 HISTORIC RESOURCE INVENTORY FORM –**Reconnaissance Level**

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**V. DESCRIPTION**

Materials (please check those materials that are visible):

Height

Stories: 1

Other: [Click here to enter text.](#)

Below Ground: First floor on West side

N/A

**Exterior Walls (siding):**

Aluminum Siding

Metal

Plywood

Asbestos

Shingles-Asphalt

OSB

Brick

Shingles-Wood

Fiberboard

Ceramic

Stone

Fiber Cement

Concrete

Stucco

Vinyl Siding

Horizontal Wood Siding

Vertical Wood Siding

Other:

Log

Engineered Siding

Roof:

Asphalt, shingle

Slate

Wood Shingle

Asphalt, roll

Built Up

None

Metal

Ceramic Tile

Other: Roll membrane

Foundation:

Brick

Concrete Slab

Stone

Concrete Block

Poured Concrete

Raised/Pile

Other: Wood post on concrete block

Structural Support:

Baled Hay

Frame-wood

Puddled Clay

Concrete Block

Frame-metal/steel

Rammed Earth

Concrete Framed

Brick-load bearing

Sod

Concrete Poured

Stone-load bearing

Other: [Click here to enter text.](#)

Windows:

Double Hung Sash

Jalousie

Stained Glass

Single Hung Sash

Glass Block

Replacement

Casement

None/Unknown

Aluminum

Fixed

Ribbon

Vinyl

Other:

Lanai(s)

Arcade

Recessed

Wrap-around

Balcony

Stoop

Verandah

Porte-Cochere

Portico

None

Other:

Chimney

Brick

Stuccoed Masonry

Stove Pipe

Concrete

Stone

Siding

None

Other: [Click here to enter text.](#)



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –**Reconnaissance Level**

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**Narrative Description**

The Ranch Manager's House at Dillingham Ranch is a Hicks Home single story building located about 0.75 miles south (inland) of Farrington Highway, and about 500' southwest of the big house complex. The site is on a gently sloping grade of both grazed and overgrown pasture that is dotted with large trees. The building is rectangular with an "L" bump-out at the front entry and an attached veranda (lanai) at the rear. Overall dimensions of are approximately 44' x 24'.

The wood frame building is of single wall construction. It has a hip roof with an intersecting hip extension at the front entry area. The roof is sheathed in plywood that is covered by rolled membrane. An attached shed-roof section with a lower slope and covered in asphalt shingles tops the open lanai on the east side of the building. The roof has exposed rafters on 2'-0" spacing with a fascia board. The exterior wall surface is painted, vertical tongue and groove boards with a single 5" high girt. The building foundation is wood posts on concrete blocks and is screened by horizontal wood slats.

Windows in the building are primarily jalousie, with a large picture window over wood jalousies at the front elevation. There is a multi-light single door at the (west) front entrance, which is accessed by four steps up to a small stoop with no railings. A double French door is located at the lanai, which is also up four steps.

The interior was not accessed for this survey.

**Statement of Significance**

This building is not individually eligible for the NRHP. Research indicates that its likely construction date is ca. 1973. It does not meet the level of exceptional importance necessary under Criterion Consideration G for properties less than 50 years old.

This building was designed and constructed by the Hicks Construction Company of Honolulu, which was a supplier of low cost homes from about 1951. Primary markets for Hicks houses were first-time home buyers and subdivision developers.



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –**Reconnaissance Level**

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**References**

City & County of Honolulu Real Property Tax Assessment Division, Land Appraisal Cards for TMK (1) 6-8-003:006

City & County of Honolulu Real Property Assessment Division. Website:

<http://www.qpublic.net/hi/honolulu/search.html> for TMK: (1) 6-8-003:006, accessed January 18, 2016.

Cran, J. Gordon. Interview "J. Gordon Cran, SC Ranch, Hawaii, Kapapala Ranch, Hawaii." March 14, 2003. At website: [hicattle.org/CNDocs](http://hicattle.org/CNDocs) accessed January 20, 2016.

Melendy, Howard Brett. *Walter Francis Dillingham, 1875-1963: Hawaiian entrepreneur and statesman.* Lewiston NY: The Edwin Mellon Press. 1996.

Silva, Edward T. Interview "Edward T. "Eddie" Silva, Dillingham Ranch, Oahu, Kaala Ranch, Oahu." July 14, 2003. At website: [hicattle.org/CMDocs](http://hicattle.org/CMDocs) accessed January 20, 2016.

Yardley, Paul T. *Millstones and Milestones, The career of B.F. Dillingham.* Honolulu: The University Press of Hawaii. 1981.



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – **Reconnaissance Level**

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**I. GENERAL INFORMATION**

Common / Present Name: Dillingham Ranch, Crowbar Ranch, Manager's Stable

Historic Name: [Click here to enter text.](#)

Property Owner: Dillingham Ranch Aina LLC

Address: 68-414 Farrington Highway

City/ Town/ Location: Mokuleia

County: Honolulu

TMK: (1)-6-8-003:031

Subdivision/Neighborhood: [Click here to enter text.](#)

Latitude: N21.567478°

Longitude: W-158.170031°

Parcel Number: [Click here to enter text.](#)

Historic District: [Click here to enter text.](#)

Original Use: Recreation, Sports Facility

Current Use: Recreation, Sports Facility

Architect/ Builder (if known): [Click here to enter text.](#)

Date of Construction (if known): [Click here to enter text.](#)

**II. Photograph of Resource**



Prepared By: Dee Ruzicka

Consulting Firm: Mason Architects, Inc.

Address: 119 Merchant Street, Suite 501, Honolulu, HI 96813

Telephone Number: 808.536.0556

Email: [dr@masonarch.com](mailto:dr@masonarch.com)

Date: June 23 2016



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

FOR SHPD USE ONLY:

Site # [Click here to enter text.](#)

TMK # [Click here to enter text.](#)

**III. CONDITION ASSESSMENT**

Category (select all that apply):

- Building(s)
  - Residential
  - Commercial
  - Educational
  - Public/Civic
  - Religious

- Structure(s)
- Object(s)
- Site(s)/Landscape(s)

Archaeology or potential for archaeology (Please provide a description of the potential for archaeology within VI. Description of Resource Features below.)

Condition:

- Excellent
- Good
- Fair

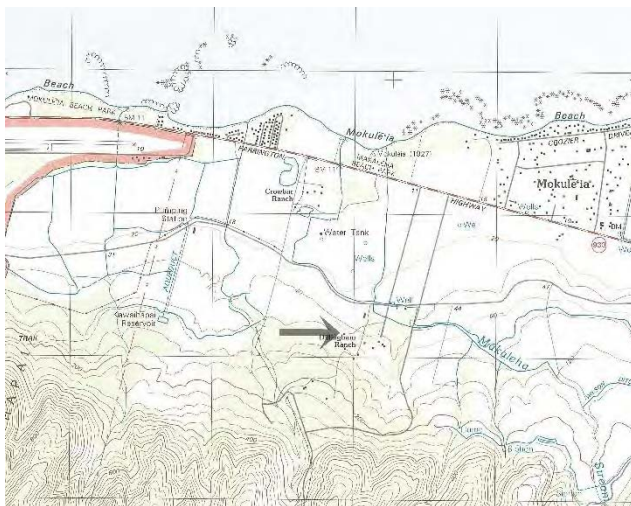
Eligibility (select all that apply):

- National Register of Historic Places
- State Register of Historic Places
  - Not Eligible
  - Eligible
  - Listed
- Contributing to Historic District: Name of District: [Click here to enter text.](#)
- Unknown

Criteria of Significance (select all that apply)

- A: Associated with Events
- B: Associated with Significant Person(s)
- C: Distinctive characteristics of a type, period or method of construction; work of a master; possess high artistic values (Architecture, Engineering, Design)
- D: Have yielded or may be likely to yield information important to history or prehistory.

**IV. MAP**







HAWAII STATE HISTORIC PRESERVATION DIVISION  
 HISTORIC RESOURCE INVENTORY FORM –**Reconnaissance Level**

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**V. DESCRIPTION**

Materials (please check those materials that are visible):

Height

- Stories: 1  Other: [Click here to enter text.](#)  
 Below Ground: First floor on West side  
 N/A

**Exterior Walls (siding):**

- |   |   |                                       |
|---|---|---------------------------------------|
| <input type="checkbox"/> Aluminum Siding        | <input type="checkbox"/> Metal                        | <input type="checkbox"/> Plywood      |
| <input type="checkbox"/> Asbestos               | <input type="checkbox"/> Shingles-Asphalt             | <input type="checkbox"/> OSB          |
| <input type="checkbox"/> Brick                  | <input type="checkbox"/> Shingles-Wood                | <input type="checkbox"/> Fiberboard   |
| <input type="checkbox"/> Ceramic                | <input type="checkbox"/> Stone                        | <input type="checkbox"/> Fiber Cement |
| <input type="checkbox"/> Concrete               | <input type="checkbox"/> Stucco                       | <input type="checkbox"/> Vinyl Siding |
| <input type="checkbox"/> Horizontal Wood Siding | <input type="checkbox"/> Vertical Wood Siding         | <input type="checkbox"/> Other:       |
| <input type="checkbox"/> Log                    | <input checked="" type="checkbox"/> Engineered Siding |                                       |

Roof:

- |   |                                       |                                       |
|---|---------------------------------------|---------------------------------------|
| <input type="checkbox"/> Asphalt, shingle | <input type="checkbox"/> Slate        | <input type="checkbox"/> Wood Shingle |
| <input type="checkbox"/> Asphalt, roll    | <input type="checkbox"/> Built Up     | <input type="checkbox"/> None         |
| <input checked="" type="checkbox"/> Metal | <input type="checkbox"/> Ceramic Tile |                                       |
| <input type="checkbox"/> Other:           |                                       |                                       |

Foundation:

- |  |   |                                      |
|--|---|--------------------------------------|
| <input type="checkbox"/> Brick                     | <input checked="" type="checkbox"/> Concrete Slab | <input type="checkbox"/> Stone       |
| <input checked="" type="checkbox"/> Concrete Block | <input type="checkbox"/> Poured Concrete          | <input type="checkbox"/> Raised/Pile |
| <input type="checkbox"/> Other:                    |   |                                      |

Structural Support:

- |   |  |                                       |
|---|--|---------------------------------------|
| <input type="checkbox"/> Baled Hay  | <input checked="" type="checkbox"/> Frame-wood | <input type="checkbox"/> Puddled Clay |
| <input type="checkbox"/> Concrete Block                                   | <input type="checkbox"/> Frame-metal/steel     | <input type="checkbox"/> Rammed Earth |
| <input type="checkbox"/> Concrete Framed                                  | <input type="checkbox"/> Brick-load bearing    | <input type="checkbox"/> Sod          |
| <input type="checkbox"/> Concrete Poured                                  | <input type="checkbox"/> Stone-load bearing    |                                       |
| <input type="checkbox"/> Other: <a href="#">Click here to enter text.</a> |  |                                       |

Windows:

- |  |                                       |  |
|--|---------------------------------------|--|
| <input type="checkbox"/> Double Hung Sash                    | <input type="checkbox"/> Jalousie     | <input type="checkbox"/> Stained Glass |
| <input type="checkbox"/> Single Hung Sash                    | <input type="checkbox"/> Glass Block  | <input type="checkbox"/> Replacement   |
| <input type="checkbox"/> Casement                            | <input type="checkbox"/> None/Unknown | <input type="checkbox"/> Aluminum      |
| <input type="checkbox"/> Fixed                               | <input type="checkbox"/> Ribbon       | <input type="checkbox"/> Vinyl         |
| <input checked="" type="checkbox"/> Other: screened openings |                                       |  |

Lanai(s)

- |  |                                   |                                      |
|--|-----------------------------------|--------------------------------------|
| <input type="checkbox"/> Arcade                              | <input type="checkbox"/> Recessed | <input type="checkbox"/> Wrap-around |
| <input type="checkbox"/> Balcony                             | <input type="checkbox"/> Stoop    | <input type="checkbox"/> Verandah    |
| <input type="checkbox"/> Porte-Cochere                       | <input type="checkbox"/> Portico  | <input type="checkbox"/> None        |
| <input checked="" type="checkbox"/> Other: covered work area |                                   |                                      |

Chimney

- |  |   |                                     |
|--|---|-------------------------------------|
| <input type="checkbox"/> Brick           | <input type="checkbox"/> Stuccoed Masonry                                 | <input type="checkbox"/> Stove Pipe |
| <input type="checkbox"/> Concrete        | <input type="checkbox"/> Stone  | <input type="checkbox"/> Siding     |
| <input checked="" type="checkbox"/> None | <input type="checkbox"/> Other: <a href="#">Click here to enter text.</a> |                                     |



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

FOR SHPD USE ONLY:

Site # [Click here to enter text.](#)

TMK # [Click here to enter text.](#)

### Narrative Description

The Manager's Stable building at Dillingham Ranch is a single story workshop building located about 0.6 mile south of Farrington Highway. The sloping site is an overgrown paddock dotted with large trees. The building has an irregular rectangle-shaped footprint with overall measurements about 42' x 17'. It is set back slightly into the adjacent slope and has a 2'-6" high CMU retaining wall that forms part of the rear wall.

This single-story building is wood-frame construction and has a concrete slab foundation with CMU retaining walls on the uphill (south) and west sides. These walls are sheathed in 12" vertical tongue and groove boards, whereas the building's north and east walls are T1-11. The east elevation has T1-11 double doors leading into the space, with the area above the door lintel height being completely open. The north wall has a large screened opening near its center and an additional single door. The west wall continues past the front wall of the building to form a wing wall adjacent to the single door.

At the west end of the building, wide T&G boards form the two side walls of a 10' x 11' area that is attached to the stable building and only enclosed on three sides, with the south side being a partial-height wall. This area is framed with 4x8s, has a CMU perimeter foundation, and dirt floor. Another open area, about 16'-8" x 12', is located at the east end. The CMU retaining wall defines the south side of the space and is topped with 4x6s that support the roof and provide framing for a partial height T&G wall. The other two sides of the space are completely open and the roof overhead is supported by both a 4x8 and a metal post. The concrete slab in this area slopes unevenly around its perimeter into the dirt. A low-slope corrugated metal shed roof covers all sections of the building and has overhangs of about three feet.

### Statement of Significance

This building is not eligible for the NRHP because it has no known association with a significant event or person, nor does it exhibit any architectural distinction. Further, it is highly modified and lacking integrity of design, materials, and workmanship.

### References

City & County of Honolulu Real Property Tax Assessment Division, Land Appraisal Cards for TMK (1) 6-8-003:031

City & County of Honolulu Real Property Assessment Division. Website:

<http://www.qpublic.net/hi/honolulu/search.html> for TMK: (1) 6-8-003:031, accessed January 18, 2016.

Melendy, Howard Brett. *Walter Francis Dillingham, 1875-1963: Hawaiian entrepreneur and statesman.* Lewiston NY: The Edwin Mellon Press. 1996.



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –**Reconnaissance Level**

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

Yardley, Paul T. *Millstones and Milestones, The career of B.F. Dillingham.* Honolulu: The University Press of Hawaii. 1981.



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – **Reconnaissance Level**

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**I. GENERAL INFORMATION**

Common / Present Name: Dillingham Ranch, Crowbar Ranch, Ranch Stable

Historic Name: [Click here to enter text.](#)

Property Owner: Dillingham Ranch Aina LLC

Address: 68-414 Farrington Highway

City/ Town/ Location: Mokuleia

County: Honolulu

TMK: (1)-6-8-003:031

Subdivision/Neighborhood: [Click here to enter text.](#)

Latitude: N21.568553°

Longitude: W-158.168603°

Parcel Number: [Click here to enter text.](#)

Historic District: [Click here to enter text.](#)

Original Use: Recreation, Sports Facility

Current Use: Recreation, Sports Facility

Architect/ Builder (if known): [Click here to enter text.](#)

Date of Construction (if known): [Click here to enter text.](#)

**II. Photograph of Resource**



Prepared By: Dee Ruzicka

Consulting Firm: Mason Architects, Inc.

Address: 119 Merchant Street, Suite 501, Honolulu, HI 96813

Telephone Number: 808.536.0556

Email: [dr@masonarch.com](mailto:dr@masonarch.com)

Date: June 23, 2016



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

FOR SHPD USE ONLY:

Site # [Click here to enter text.](#)

TMK # [Click here to enter text.](#)

III. CONDITION ASSESSMENT

Category (select all that apply):

- Building(s)
  - Residential
  - Commercial
  - Educational
  - Public/Civic
  - Religious
- Structure(s)
- Object(s)
- Site(s)/Landscape(s)
- Archaeology or potential for archaeology (Please provide a description of the potential for archaeology within VI. Description of Resource Features below.)

Condition:

- Excellent
- Good
- Fair

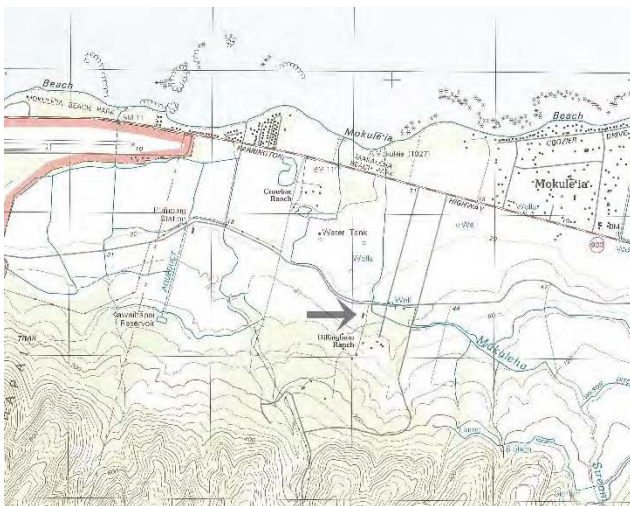
Eligibility (select all that apply):

- National Register of Historic Places
- State Register of Historic Places
- Not Eligible
- Eligible
- Listed
- Contributing to Historic District: Name of District: [Click here to enter text.](#)
- Unknown

Criteria of Significance (select all that apply)

- A: Associated with Events
- B: Associated with Significant Person(s)
- C: Distinctive characteristics of a type, period or method of construction; work of a master; possess high artistic values (Architecture, Engineering, Design)
- D: Have yielded or may be likely to yield information important to history or prehistory.

IV. MAP





HAWAII STATE HISTORIC PRESERVATION DIVISION  
 HISTORIC RESOURCE INVENTORY FORM –**Reconnaissance Level**

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**V. DESCRIPTION**

Materials (please check those materials that are visible):

Height

Stories: 1

Other: [Click here to enter text.](#)

Below Ground: First floor on West side

N/A

**Exterior Walls (siding):**

Aluminum Siding

Metal

Plywood

Asbestos

Shingles-Asphalt

OSB

Brick

Shingles-Wood

Fiberboard

Ceramic

Stone

Fiber Cement

Concrete

Stucco

Vinyl Siding

Horizontal Wood Siding

Vertical Wood Siding

Other:

Log

Engineered Siding

Roof:

Asphalt, shingle

Slate

Wood Shingle

Asphalt, roll

Built Up

None

Metal

Ceramic Tile

Other:

Foundation:

Brick

Concrete Slab

Stone

Concrete Block

Poured Concrete

Raised/Pile

Other:

Structural Support:

Baled Hay

Frame-wood

Puddled Clay

Concrete Block

Frame-metal/steel

Rammed Earth

Concrete Framed

Brick-load bearing

Sod

Concrete Poured

Stone-load bearing

Other: Metal pipe posts 4½" dia. and metal pipe beams

Windows:

Double Hung Sash

Jalousie

Stained Glass

Single Hung Sash

Glass Block

Replacement

Casement

None/Unknown

Aluminum

Fixed

Ribbon

Vinyl

Other: screened openings

Lanai(s)

Arcade

Recessed

Wrap-around

Balcony

Stoop

Verandah

Porte-Cochere

Portico

None

Other: covered work area and covered stables

Chimney

Brick

Stuccoed Masonry

Stove Pipe

Concrete

Stone

Siding

None

Other: [Click here to enter text.](#)



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**Narrative Description**

The Ranch Stable at Dillingham Ranch is located about 0.5 mile south of Farrington Highway in a relatively level area of overgrown paddock dotted with large trees. This building consists of a large open-sided shed-roof structure that has a footprint of approximately 100' x 40'. The ribbed metal panel roof covers several horse pens and is supported by 4½" diameter metal pipe posts laid out in 3 by 7 grid, which in turn support a framework of 2" diameter rafter pipes. The northeast corner of the stable structure has a grade-level concrete slab that measures approximately 30' x 30', with the remainder of the covered area having a packed dirt floor.

On top of the concrete slab is a second, 6" raised concrete slab, approximately 24' x 20', on which is constructed a tack shed for the storage of saddles and supplies. The tack shed has a notched rectangle-shaped footprint and T1-11 siding sheaths the building, both inside and out, with some interior walls being unpainted plywood. The tack shed is affixed to the metal pipe framework of the stable and shares its roof. Window openings are set high in the walls and are insect screens or jalousies. Doors to the building include single flush wood, double multi-panel wood, and double French doors.

**Statement of Significance**

This building is not eligible for the NRHP. It is not known to be associated with any significant events or people, and its architecture is not distinctive. Further, its construction date cannot be definitively determined, and it lacks integrity of design, materials, and workmanship.

**References**

City & County of Honolulu Real Property Tax Assessment Division, Land Appraisal Cards for TMK (1) 6-8-003:031

City & County of Honolulu Real Property Assessment Division. Website:  
<http://www.qpublic.net/hi/honolulu/search.html> for TMK: (1) 6-8-003:031, accessed January 18, 2016.

Melendy, Howard Brett. *Walter Francis Dillingham, 1875-1963: Hawaiian entrepreneur and statesman.* Lewiston NY: The Edwin Mellon Press. 1996.

Yardley, Paul T. *Millstones and Milestones, The career of B.F. Dillingham.* Honolulu: The University Press of Hawaii. 1981.



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**I. GENERAL INFORMATION**

Common / Present Name: Dillingham Ranch, Crowbar Ranch, Potable Pump House

Historic Name: Drilled well number 288

Property Owner: Dillingham Ranch Aina LLC

Address: 68-438 Farrington Highway

City/ Town/ Location: Mokuleia

County: Honolulu

TMK: (1)-6-8-003:040

Subdivision/Neighborhood: [Click here to enter text.](#)

Latitude: N21.573450°

Longitude: W-158.171518°

Parcel Number: [Click here to enter text.](#)

Historic District: [Click here to enter text.](#)

Original Use: Agriculture, Irrigation Facility

Current Use: Agriculture, Outbuilding, pump house

Architect/ Builder (if known): [Click here to enter text.](#)

Date of Construction (if known): ca. 1930s

**II. Photograph of Resource**



Prepared By: Dee Ruzicka

Consulting Firm: Mason Architects, Inc.

Address: 119 Merchant Street, Suite 501, Honolulu, HI 96813

Telephone Number: 808.536.0556

Email: dr@masonarch.com

Date: June 23, 2016





HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

FOR SHPD USE ONLY:

Site # [Click here to enter text.](#)

TMK # [Click here to enter text.](#)

III. CONDITION ASSESSMENT

Category (select all that apply):

- Building(s)
  - Residential
  - Commercial
  - Educational
  - Public/Civic
  - Religious
- Structure(s)
- Object(s)
- Site(s)/Landscape(s)
- Archaeology or potential for archaeology (Please provide a description of the potential for archaeology within VI. Description of Resource Features below.)

Condition:

- Excellent
- Good
- Fair

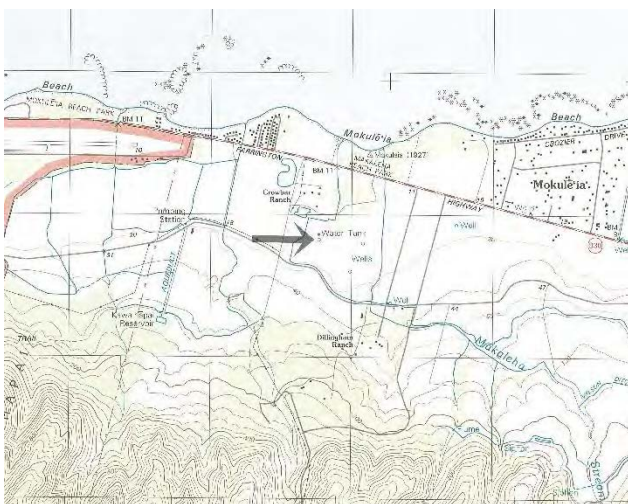
Eligibility (select all that apply):

- National Register of Historic Places
- State Register of Historic Places
  - Not Eligible
  - Eligible
  - Listed
- Contributing to Historic District: Name of District
- Unknown

Criteria of Significance (select all that apply)

- A: Associated with Events
- B: Associated with Significant Person(s)
- C: Distinctive characteristics of a type, period or method of construction; work of a master; possess high artistic values (Architecture, Engineering, Design)
- D: Have yielded or may be likely to yield information important to history or prehistory.

IV. MAP





HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

FOR SHPD USE ONLY:

Site # [Click here to enter text.](#)

TMK # [Click here to enter text.](#)

V. DESCRIPTION

Materials (please check those materials that are visible):

Height

Stories: 1

Other: [Click here to enter text.](#)

Below Ground: First floor on West side

N/A

Exterior Walls (siding):

Aluminum Siding

Shingles-Asphalt

Fiberboard

Asbestos

Shingles-Wood

Fiber Cement

Brick

Stone

Vinyl Siding

Ceramic

Stucco

Other:

Concrete

Vertical Wood Siding

Corrugated asbestos

Horizontal Wood Siding

Engineered Siding

cement panels

Log

Plywood

Metal

OSB

Roof:

Asphalt, shingle

Slate

Wood Shingle

Asphalt, roll

Built Up

None

Metal

Ceramic Tile

Other: Corrugated asbestos cement panels

Foundation:

Brick

Concrete Slab

Stone

Concrete Block

Poured Concrete

Raised/Pile

Other: With CMU curb

Structural Support:

Baled Hay

Frame-wood

Puddled Clay

Concrete Block

Frame-metal/steel

Rammed Earth

Concrete Framed

Brick-load bearing

Sod

Concrete Poured

Stone-load bearing

Other:

Windows:

Double Hung Sash

Jalousie

Stained Glass

Single Hung Sash

Glass Block

Replacement

Casement

None/Unknown

Aluminum

Fixed

Ribbon

Vinyl

Other: 4 lite metal frame awning, fixed louver openings

Lanai(s)

Arcade

Recessed

Wrap-around

Balcony

Stoop

Verandah

Porte-Cochere

Portico

None

Other: Covered carport

Chimney

Brick

Stuccoed Masonry

Stove Pipe

Concrete

Stone

Siding

None

Other: [Click here to enter text.](#)



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**Narrative Description**

The Potable Pump House at Dillingham Ranch is located about 0.3 mile south of Farrington Highway in a level area of horse paddocks. The building is about 1,000 feet south of the Dillingham Ranch Office building. The Potable Pump House has an irregular rectangle-shaped footprint measuring about 33' x 25' which includes the 25' x 18' Potable Pump House building and an attached, 15' x 19' carport, which appears to be a later addition.

The metal framed Potable Pump House building consists of a single span rigid frame with a 3'-0" concrete slab perimeter wall foundation, the top of which is at grade. The building has a gable-roof covered in ¼" thick, corrugated asbestos-cement panels (commonly known as Transite, a brand name that became the generic term for this type of construction material) and capped with transite ridge roll. Eave overhang is approximately 6 inches and the gable ends have exposed steel I-beam purlins. The walls are also sheathed transite panels, applied like large shingles with rounded corner rolls bolted to each corner of the building. The end walls have a large central panel of fixed metal louvers. The two windows, located on the east side of the building, are metal frame four-light awning type with plywood awning sunscreens supported by a 2x4 wood frame affixed over each window. The door is made of vertical boards held together by a wood frame at the inside of the door.

The wood frame carport has a corrugated metal shed roof. The sides of the carport are enclosed by T1-11 siding panels, one panel of siding having fallen off along the south side. The carport roof is supported by four telephone pole-type posts at each corner and placed directly in the earth with a center 2x6 wood support post.

The interior of the building is accessed through the single door located on the east side of the building, inside the carport. Five wood steps lead down to the concrete floor slab. The concrete perimeter foundation wall is visible from the interior and is penetrated by pump piping, as is the floor slab. The structural rigid frame is bolted to the top of the perimeter wall. The pumping equipment is located in the center of the space and the electrical controls are on a panel accessed via a raised wood platform adjacent to the entry door. Conduit for the pump controls exit through this east wall and wrap the building exterior to the west gable end wall, terminating in a large electrical panel affixed adjacent to the louver window.

The area around the Pump House is covered in rough sized gravel and enclosed by a wire mesh fence topped with two rows of barbed wire. Fence supports are a combination of telephone pole-type posts and metal T-posts. An actual telephone pole stands inside the fenced area and provides the power to the Pump House.

Slightly north of the Pump House are additional pump lines, and foundation blocks that may belong to an earlier pump house.



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

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TMK # [Click here to enter text.](#)

### Statement of Significance

This building is eligible for the NRHP under Criterion A as an important utilitarian structure that has provided a continuous supply of potable water for the ranch and its agricultural activities for roughly eighty years. This building is the pump station for the water well formerly known as Drilled Well Number 288. In 1938 the well was listed as an 8" diameter well, used for irrigation. The date of activation for this well is not known, but it was prior to January 1934. (Stearns, *Records*. 1938. P. 178)

Under Criterion C, this building is also distinctive as an intact example of Transite construction. Transite was developed in 1929 by Johns-Manville as an asbestos cement brand for fire-proof construction materials. The name was later used generically to refer to other companies' similar product lines, and this building adheres closely to the typical form, which is no longer built.

### References

City & County of Honolulu Real Property Tax Assessment Division, Land Appraisal Cards for TMK (1) 6-8-003:040

City & County of Honolulu Real Property Assessment Division. Website:

<http://www.qpublic.net/hi/honolulu/search.html> for TMK: (1) 6-8-003:040, accessed January 18, 2016.

Johns-Manville. Corrugated and Flat Transite [sales brochure]. 1948.

McCandless, James Sutton. *A Brief History of the McCandless Brothers and Their Part in the Development of Artesian Well Water in the Hawaiian Islands, 1880-1936*. (Honolulu: Privately published, J.S. McCandless). 1936.

Melendy, Howard Brett. *Walter Francis Dillingham, 1875-1963: Hawaiian entrepreneur and statesman*. Lewiston NY: The Edwin Mellon Press. 1996.

Stearns, Harold T., and Knute N. Vaksvik. *Records of the Drilled Wells on the Island of Oahu, Hawaii*. US Geological Survey. August 1938.

Yardley, Paul T. *Millstones and Milestones, The career of B.F. Dillingham*. Honolulu: The University Press of Hawaii. 1981.



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**I. GENERAL INFORMATION**

Common / Present Name: Dillingham Ranch, Crowbar Ranch, Ag Pump House [non-potable]

Historic Name: Drilled Well Number 291

Property Owner: Dillingham Ranch Aina LLC

Address: 68-438 Farrington Highway

City/ Town/ Location: Mokuleia

County: Honolulu

TMK: (1)-6-8-003:040

Subdivision/Neighborhood: [Click here to enter text.](#)

Latitude: N21.569249°

Longitude: W-158.166403°

Parcel Number: [Click here to enter text.](#)

Historic District: [Click here to enter text.](#)

Original Use: Agriculture, Irrigation Facility

Current Use: Agriculture, Irrigation Facility

Architect/ Builder (if known): [Click here to enter text.](#)

Date of Construction (if known): ca. 1930s

**II. Photograph of Resource**



Prepared By: Dee Ruzicka

Consulting Firm: Mason Architects, Inc.

Address: 119 Merchant Street, Suite 501, Honolulu, HI 96813

Telephone Number: 808.536.0556

Email: [dr@masonarch.com](mailto:dr@masonarch.com)

Date: June 23, 2016



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

FOR SHPD USE ONLY:

Site # [Click here to enter text.](#)

TMK # [Click here to enter text.](#)

**III. CONDITION ASSESSMENT**

Category (select all that apply):

- Building(s)
  - Residential
  - Commercial
  - Educational
  - Public/Civic
  - Religious
- Structure(s)
- Object(s)
- Site(s)/Landscape(s)
- Archaeology or potential for archaeology (Please provide a description of the potential for archaeology within VI. Description of Resource Features below.)

Condition:

- Excellent
- Good
- Fair

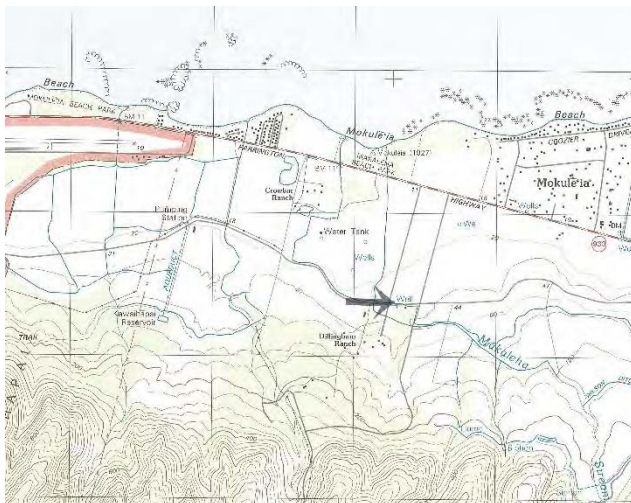
Eligibility (select all that apply):

- National Register of Historic Places
- State Register of Historic Places
  - Not Eligible
  - Eligible
  - Listed
- Contributing to Historic District: Name of District
- Unknown

Criteria of Significance (select all that apply)

- A: Associated with Events
- B: Associated with Significant Person(s)
- C: Distinctive characteristics of a type, period or method of construction; work of a master; possess high artistic values (Architecture, Engineering, Design)
- D: Have yielded or may be likely to yield information important to history or prehistory.

**IV. MAP**





HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

FOR SHPD USE ONLY:

Site # [Click here to enter text.](#)

TMK # [Click here to enter text.](#)

V. DESCRIPTION

Materials (please check those materials that are visible):

Height

Stories: 1

Other: [Click here to enter text.](#)

Below Ground: First floor on West side

N/A

Exterior Walls (siding):

Aluminum Siding

Metal

Plywood

Asbestos

Shingles-Asphalt

OSB

Brick

Shingles-Wood

Fiberboard

Ceramic

Stone

Fiber Cement

Concrete

Stucco

Vinyl Siding

Horizontal Wood Siding

Vertical Wood Siding

Other:

Log

Engineered Siding

Roof:

Asphalt, shingle

Slate

Wood Shingle

Asphalt, roll

Built Up

None

Metal

Ceramic Tile

Other:

Foundation:

Brick

Concrete Slab

Stone

Concrete Block

Poured Concrete

Raised/Pile

Other: With CMU curb

Structural Support:

Baled Hay

Frame-wood

Puddled Clay

Concrete Block

Frame-metal/steel

Rammed Earth

Concrete Framed

Brick-load bearing

Sod

Concrete Poured

Stone-load bearing

Other:

Windows:

Double Hung Sash

Jalousie

Stained Glass

Single Hung Sash

Glass Block

Replacement

Casement

None/Unknown

Aluminum

Fixed

Ribbon

Vinyl

Other: Fixed louver openings

Lanai(s)

Arcade

Recessed

Wrap-around

Balcony

Stoop

Verandah

Porte-Cochere

Portico

None

Other:

Chimney

Brick

Stuccoed Masonry

Stove Pipe

Concrete

Stone

Siding

None

Other: [Click here to enter text.](#)



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

**FOR SHPD USE ONLY:**

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**Narrative Description**

The Ag Pump House [non-potable] at Dillingham Ranch is located about 0.5 mile south of Farrington Highway in a level area of pasture near the edge of a large grove of coconut trees. This building is about .25 mile *makai* of the big house complex. The Ag Pump House has two parts: the square 17'x17' pump house and the A-frame pit shelter measuring 10' x 17'.

The pump house is a single story, wood frame building is single wall construction sheathed in vertical, 7" wide tongue and groove boards, with an interior 2x4 girt. It has a gable roof of ribbed metal panels with a concrete slab floor and a CMU perimeter foundation wall. The roof has an 18" overhang with rafter tails that are covered with a fascia board. The gable ends have rectangular vent openings with fixed louvers and a paired jalousie window with metal mesh security screens is located on the south elevation. The double entry door to the space is made of vertical tongue and groove boards on a 2x4 frame. A small, (approximate 3' x 4' footprint) shed roofed shelter with no door projects on the south side to protect a section of pipe that goes underground after exiting the building. The roof of this shelter is corrugated metal and tucks under the roof of the pump house.

Attached to the west elevation of the shed is the A-frame pit shelter structure covered in corrugated metal. The peak of the roof is approximately six feet above grade and sits on a poured concrete perimeter wall, with no side walls. This roof covers a sunken concrete pit accessed from inside the pump house. The exposed gable end of this A-frame is entirely fixed wood louvers.

The interior of the pump house contains some pumping equipment, but is mostly open. There are numerous covered pits in the floor around the room covered in plywood. There is also a slightly raised concrete and steel platform that appears to have once held other equipment. Pump controls are mounted to the east wall and exit through the top of the east wall near the southeast corner, inside metal conduit and a metal pole. The wiring exits at the top of the pole and then stretches to a nearby telephone pole. A framed opening in the lower center of the west wall leads out and down to an approximately six foot deep concrete pit, located beneath the A-frame roof structure. The pit is accessed via a simple wooden ladder and leads to a large pipe that travels through the bottom of the pit in an east/west direction and connects to the pump house equipment via a smaller vertical pipe.

**Statement of Significance**

This building is eligible for the NRHP under Criterion A as an important utilitarian structure that has provided a continuous supply of non-potable water for Dillingham Ranch's agriculture activities. The pump station for the water well formerly known as Drilled Well Number 291. In 1938 the well was listed as a 10" diameter well, used for irrigation. The date of activation for this well is not known, but it was prior to January 1934.





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**References**

City & County of Honolulu Real Property Tax Assessment Division, Land Appraisal Cards for TMK (1) 6-8-003:040

City & County of Honolulu Real Property Assessment Division. Website:

<http://www.qpublic.net/hi/honolulu/search.html> for TMK: (1) 6-8-003:040, accessed January 18, 2016.

McCandless, James Sutton. *A Brief History of the McCandless Brothers and Their Part in the Development of Artesian Well Water in the Hawaiian Islands, 1880-1936*. (Honolulu: Privately published, J.S. McCandless). 1936.

Melendy, Howard Brett. *Walter Francis Dillingham, 1875-1963: Hawaiian entrepreneur and statesman*. Lewiston NY: The Edwin Mellon Press. 1996.

Stearns, Harold T., and Knute N. Vaksvik. *Records of the Drilled Wells on the Island of Oahu, Hawaii*. US Geological Survey. August 1938.

Yardley, Paul T. *Millstones and Milestones, The career of B.F. Dillingham*. Honolulu: The University Press of Hawaii. 1981.



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**I. GENERAL INFORMATION**

Common / Present Name: Dillingham Ranch, Crowbar Ranch, Maintenance Shop

Historic Name: [Click here to enter text.](#)

Property Owner: Dillingham Ranch Aina LLC

Address: 68-434 Farrington Highway

City/ Town/ Location: Mokuleia

County: Honolulu

TMK: (1)-6-8-003:006

Subdivision/Neighborhood: [Click here to enter text.](#)

Latitude: N21.568971°

Longitude: W-158.165847°

Parcel Number: [Click here to enter text.](#)

Historic District: [Click here to enter text.](#)

Original Use: Agriculture, Outbuilding

Current Use: Agriculture, Outbuilding

Architect/ Builder (if known): [Click here to enter text.](#)

Date of Construction (if known): [Click here to enter text.](#)

**II. Photograph of Resource**



Prepared By: Dee Ruzicka

Consulting Firm: Mason Architects, Inc.

Address: 119 Merchant Street, Suite 501, Honolulu, HI 96813

Telephone Number: 808.536.0556

Email: [dr@masonarch.com](mailto:dr@masonarch.com)

Date: June 23, 2016



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HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

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Site # [Click here to enter text.](#)

TMK # [Click here to enter text.](#)

III. CONDITION ASSESSMENT

Category (select all that apply):

- Building(s)
  - Residential
  - Commercial
  - Educational
  - Public/Civic
  - Religious
- Structure(s)
- Object(s)
- Site(s)/Landscape(s)
- Archaeology or potential for archaeology (Please provide a description of the potential for archaeology within VI. Description of Resource Features below.)

Condition:

- Excellent
- Good
- Fair

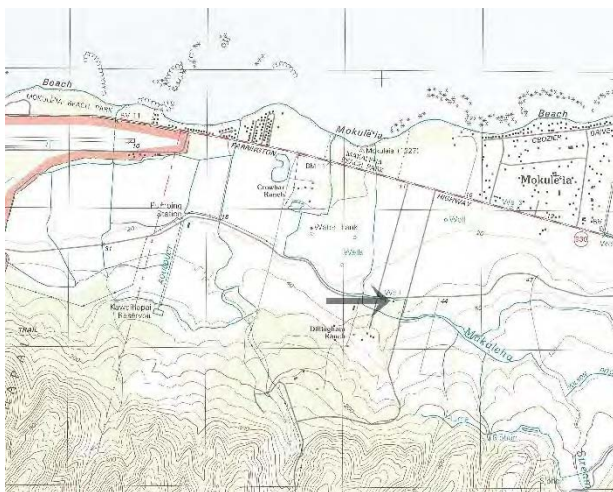
Eligibility (select all that apply):

- National Register of Historic Places
- State Register of Historic Places
- Not Eligible
- Eligible
- Listed
- Contributing to Historic District: Name of District: [Click here to enter text.](#)
- Unknown

Criteria of Significance (select all that apply)

- A: Associated with Events
- B: Associated with Significant Person(s)
- C: Distinctive characteristics of a type, period or method of construction; work of a master; possess high artistic values (Architecture, Engineering, Design)
- D: Have yielded or may be likely to yield information important to history or prehistory.

IV. MAP





HAWAII STATE HISTORIC PRESERVATION DIVISION  
 HISTORIC RESOURCE INVENTORY FORM –**Reconnaissance Level**

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**TMK #** [Click here to enter text.](#)

**V. DESCRIPTION**

Materials (please check those materials that are visible):

Height

- Stories: 1
- Below Ground: First floor on West side
- N/A
- Other: [Click here to enter text.](#)

**Exterior Walls (siding):**

- |   |   |                                       |
|---|---|---------------------------------------|
| <input type="checkbox"/> Aluminum Siding        | <input checked="" type="checkbox"/> Metal             | <input type="checkbox"/> Plywood      |
| <input type="checkbox"/> Asbestos               | <input type="checkbox"/> Shingles-Asphalt             | <input type="checkbox"/> OSB          |
| <input type="checkbox"/> Brick                  | <input type="checkbox"/> Shingles-Wood                | <input type="checkbox"/> Fiberboard   |
| <input type="checkbox"/> Ceramic                | <input type="checkbox"/> Stone                        | <input type="checkbox"/> Fiber Cement |
| <input type="checkbox"/> Concrete               | <input type="checkbox"/> Stucco                       | <input type="checkbox"/> Vinyl Siding |
| <input type="checkbox"/> Horizontal Wood Siding | <input type="checkbox"/> Vertical Wood Siding         | <input type="checkbox"/> Other:       |
| <input type="checkbox"/> Log                    | <input checked="" type="checkbox"/> Engineered Siding |                                       |

Roof:

- |   |                                       |                                       |
|---|---------------------------------------|---------------------------------------|
| <input type="checkbox"/> Asphalt, shingle | <input type="checkbox"/> Slate        | <input type="checkbox"/> Wood Shingle |
| <input type="checkbox"/> Asphalt, roll    | <input type="checkbox"/> Built Up     | <input type="checkbox"/> None         |
| <input checked="" type="checkbox"/> Metal | <input type="checkbox"/> Ceramic Tile |                                       |
| <input type="checkbox"/> Other:           |                                       |                                       |

Foundation:

- |   |   |                                      |
|---|---|--------------------------------------|
| <input type="checkbox"/> Brick          | <input checked="" type="checkbox"/> Concrete Slab | <input type="checkbox"/> Stone       |
| <input type="checkbox"/> Concrete Block | <input type="checkbox"/> Poured Concrete          | <input type="checkbox"/> Raised/Pile |
| <input type="checkbox"/> Other:         |   |                                      |

Structural Support:

- |   |   |                                       |
|---|---|---------------------------------------|
| <input type="checkbox"/> Baled Hay  | <input checked="" type="checkbox"/> Frame-wood        | <input type="checkbox"/> Puddled Clay |
| <input type="checkbox"/> Concrete Block                                   | <input checked="" type="checkbox"/> Frame-metal/steel | <input type="checkbox"/> Rammed Earth |
| <input type="checkbox"/> Concrete Framed                                  | <input type="checkbox"/> Brick-load bearing           | <input type="checkbox"/> Sod          |
| <input type="checkbox"/> Concrete Poured                                  | <input type="checkbox"/> Stone-load bearing           |                                       |
| <input type="checkbox"/> Other: <a href="#">Click here to enter text.</a> |   |                                       |

Windows:

- |  |  |  |
|--|--|--|
| <input type="checkbox"/> Double Hung Sash  | <input checked="" type="checkbox"/> Jalousie | <input type="checkbox"/> Stained Glass |
| <input type="checkbox"/> Single Hung Sash  | <input type="checkbox"/> Glass Block         | <input type="checkbox"/> Replacement   |
| <input type="checkbox"/> Casement  | <input type="checkbox"/> None/Unknown        | <input type="checkbox"/> Aluminum      |
| <input type="checkbox"/> Fixed   | <input type="checkbox"/> Ribbon              | <input type="checkbox"/> Vinyl         |
| <input checked="" type="checkbox"/> Other: 6 lite metal frame w/ 4 lite awning section |  |  |

Lanai(s)

- |  |                                   |                                      |
|--|-----------------------------------|--------------------------------------|
| <input type="checkbox"/> Arcade                            | <input type="checkbox"/> Recessed | <input type="checkbox"/> Wrap-around |
| <input type="checkbox"/> Balcony                           | <input type="checkbox"/> Stoop    | <input type="checkbox"/> Verandah    |
| <input type="checkbox"/> Porte-Cochere                     | <input type="checkbox"/> Portico  | <input type="checkbox"/> None        |
| <input type="checkbox"/> Other: Covered work area/ carport |                                   |                                      |

Chimney

- |                                |                                   |   |
|--------------------------------|-----------------------------------|---|
| <input type="checkbox"/> Brick | <input type="checkbox"/> Concrete | <input type="checkbox"/> Stuccoed Masonry |
|--------------------------------|-----------------------------------|---|



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –**Reconnaissance Level**

**FOR SHPD USE ONLY:**

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Stone

Stove Pipe

Siding

None

Other: [Click here to enter text.](#)

**Narrative Description**

The Maintenance Shop building at Dillingham Ranch is located about 0.5 mile south of Farrington Highway in a relatively level, open woodlot of large trees. The building is about .25 mile *makai* of the Dillingham Compound. The Maintenance Shop has an irregular footprint with overall measurements about 60' x 40' and consists of two attached but distinct sections: an open, metal framed, auto maintenance building and a wood framed shop and storage building.

The auto maintenance building consists of a three bay, single span rigid frame, completely open on the front and south side, with the southern bay being open on all sides. This gable roofed building has a footprint of about 60' x 20' and is approximately 15' high at the ridge. Steel I-beam columns support the north and center bay, while pipe columns support the southern, end bay. Both the roof and walls are clad with ribbed metal panels and the floor is a concrete slab. There is a rectangular pit in the slab of the north bay for servicing vehicles from below. The pit is protected by a lumber cover held in place by steel Z-braces set into the slab.

As previously mentioned, the north end bay is enclosed on the side and back; in addition, about half of the bay is further enclosed by the wood framed plywood walls of two workspaces that still contain miscellaneous tools and mechanical parts. Doors lead to the spaces from inside the maintenance building and a five-panel door leads out to the front (west) of the building. The front wall appears to have originally had wire mesh opening for light and ventilation, but these have been covered over with plywood. A metal frame, six light window with a four-light operable awning section is located in the north wall of the rear room. The north bay also contains a wood framed service office at the rear of the bay, complete with a glass customer service window.

Attached to the rear (east) of the maintenance building is a wood frame storage and workshop structure that shares its southern, metal, wall with the maintenance shop. The workshop has a corrugated metal shed roof that tucks under the roof of the maintenance building and continues at the same slope. The workshop building has T1-11 exterior siding and rests on a concrete slab foundation. There are paired jalousie windows at the north and east elevations and doors to the enclosed area, also sheathed in T1-11, are located on the south and east sides.

**Statement of Significance**

This building is not eligible for the NRHP because it has no known association with a significant event or person, nor does it exhibit distinctive architecture. Further, it has been altered and lacks integrity of design, materials, and workmanship.

**References**



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –**Reconnaissance Level**

**FOR SHPD USE ONLY:**

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**TMK #** [Click here to enter text.](#)

City & County of Honolulu Real Property Tax Assessment Division, Land Appraisal Cards for TMK (1) 6-8-003:006

City & County of Honolulu Real Property Assessment Division. Website:

<http://www.qpublic.net/hi/honolulu/search.html> for TMK: (1) 6-8-003:006, accessed January 18, 2016.

Melendy, Howard Brett. *Walter Francis Dillingham, 1875-1963: Hawaiian entrepreneur and statesman.*

Lewiston NY: The Edwin Mellon Press. 1996.

Yardley, Paul T. *Millstones and Milestones, The career of B.F. Dillingham.* Honolulu: The University Press of Hawaii. 1981.



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**I. GENERAL INFORMATION**

Common / Present Name: Dillingham Ranch, Crowbar Ranch, Feedbarn

Historic Name: [Click here to enter text.](#)

Property Owner: Dillingham Ranch Aina LLC

Address: 68-502 Farrington Highway

City/ Town/ Location: Mokuleia

County: Honolulu

TMK: (1)-6-8-003:019

Subdivision/Neighborhood: [Click here to enter text.](#)

Latitude: N21.575030°

Longitude: W-158.171228°

Parcel Number: [Click here to enter text.](#)

Historic District: [Click here to enter text.](#)

Original Use: Agriculture, outbuilding

Current Use: Agriculture, outbuilding

Architect/ Builder (if known): [Click here to enter text.](#)

Date of Construction (if known): ca. 2000s

**II. Photograph of Resource**



Prepared By: Dee Ruzicka

Consulting Firm: Mason Architects

Address: 119 Merchant Street, Suite 501, Honolulu, HI 96813

Telephone Number: 808.536.0556

Email: [dr@masonarch.com](mailto:dr@masonarch.com)

Date: June 23, 2016



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM – Reconnaissance Level

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TMK # [Click here to enter text.](#)

**III. CONDITION ASSESSMENT**

Category (select all that apply):

- Building(s)
  - Residential
  - Commercial
  - Educational
  - Public/Civic
  - Religious
- Structure(s)
- Object(s)
- Site(s)/Landscape(s)
- Archaeology or potential for archaeology (Please provide a description of the potential for archaeology within VI. Description of Resource Features below.)

Condition:

- Excellent
- Good
- Fair

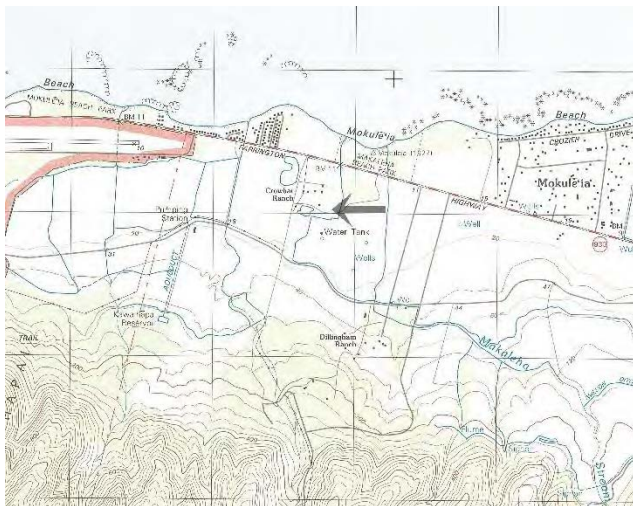
Eligibility (select all that apply):

- National Register of Historic Places
- State Register of Historic Places
  - Not Eligible
  - Eligible
  - Listed
- Contributing to Historic District: Name of District: [Click here to enter text.](#)
- Unknown

Criteria of Significance (select all that apply)

- A: Associated with Events
- B: Associated with Significant Person(s)
- C: Distinctive characteristics of a type, period or method of construction; work of a master; possess high artistic values (Architecture, Engineering, Design)
- D: Have yielded or may be likely to yield information important to history or prehistory.

**IV. MAP**







HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –**Reconnaissance Level**

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

**V. DESCRIPTION**

Materials (please check those materials that are visible):

Height

Stories: 1

Other: [Click here to enter text.](#)

Below Ground: First floor on West side

N/A

**Exterior Walls (siding):**

Aluminum Siding

Metal

Plywood

Asbestos

Shingles-Asphalt

OSB

Brick

Shingles-Wood

Fiberboard

Ceramic

Stone

Fiber Cement

Concrete

Stucco

Vinyl Siding

Horizontal Wood Siding

Vertical Wood Siding

Other: Coated fabric

Log

Engineered Siding

[Click here to enter text.](#)

Roof:

Asphalt, shingle

Slate

Wood Shingle

Asphalt, roll

Built Up

None

Metal

Ceramic Tile

Other: Coated fabric

Foundation:

Brick

Concrete Slab

Stone

Concrete Block

Poured Concrete

Raised/Pile

Other: [Click here to enter text.](#)

Structural Support:

Baled Hay

Frame-wood

Puddled Clay

Concrete Block

Frame-metal/steel

Rammed Earth

Concrete Framed

Brick-load bearing

Sod

Concrete Poured

Stone-load bearing

Other: Metal pipe frame (fabric Quonset)

Windows:

Double Hung Sash

Jalousie

Stained Glass

Single Hung Sash

Glass Block

Replacement

Casement

None/Unknown

Aluminum

Fixed

Ribbon

Vinyl

Other: Screened opening

Lanai(s)

Arcade

Recessed

Wrap-around

Balcony

Stoop

Verandah

Porte-Cochere

Portico

None

Other: [Click here to enter text.](#)

Chimney

Brick

Concrete

Stuccoed Masonry



HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –Reconnaissance Level

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

Stone  
 None

Stove Pipe  
 Other: [Click here to enter text.](#)

Siding

**Narrative Description**

The Feedbarn at Dillingham Ranch is located about 0.2 mile south of Farrington highway in a level area of horse paddocks. The Feedbarn has an irregular footprint with overall measurements of about 68' x 30'.

The Feedbarn is constructed of heavy-weight, white, coated fabric that is stretched over a metal frame with shade structures erected at both ends. The fabric covered section is a half-cylinder Quonset hut-shape with footprint dimensions of 42' x 25'. Its support framework consists of transverse arcs of metal pipe (approximate 12'-6" radius) joined by purlins of smaller diameter metal pipe. The foundation is a concrete slab, and there are two roof turbine vents for ventilation.

The east end of the fabric structure has a wood framed window with screen mesh set into the wall and can be covered with a tarp that rolls up around a stick at the exterior. This window is The east end of the fabric section has a large window opening with heavy wire mesh. This opening is protected by a wood frame, shed roof that is supported by two telephone-type poles and has coated fabric roofing.

The west entrance to the fabric structure is completely open except for a section at the top of the arc. This entrance is cordoned off by a chain-link enclosed shade cover supported by telephone-type pole posts. This 30' x 18' enclosure is approximately 14' high with a wood-framed flat roof flanked to the north and south by two smaller sections of shed roof, all of which are covered with ribbed metal panels. Access to the shade enclosure is through a pivoting chain-link gate on the western end.

The Feedbarn appears to be of very recent construction and is considered temporary construction.

**Statement of Significance**

This building is not eligible for the NRHP. The building appears to be very recently constructed, and is considered temporary construction and therefore does not achieve the level of significance necessary for NRHP eligibility.

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HAWAII STATE HISTORIC PRESERVATION DIVISION  
HISTORIC RESOURCE INVENTORY FORM –**Reconnaissance Level**

**FOR SHPD USE ONLY:**

**Site #** [Click here to enter text.](#)

**TMK #** [Click here to enter text.](#)

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# *Cultural Impact Assessment Report*

(Cultural Surveys Hawai'i, Inc.)

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**Cultural Impact Assessment Report for the  
Dillingham Ranch Agricultural Subdivision EIS Project,  
Mokulē‘ia and Kawaihāpai Ahupua‘a,  
Waialua District, O‘ahu  
TMKs: [1] 6-8-002:006; 6-8-003:005, 006  
015, 019, 030, 031, 033, 035, and 040**

**Prepared for  
Dillingham Ranch Aina, LLC**

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(Job Code: MOKULEIA 5)**

**February 2017**

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## Management Summary

<b>Reference</b>	Cultural Impact Assessment Report for the Dillingham Ranch Agricultural Subdivision EIS Project, Mokulē‘ia and Kawaihāpai Ahupua‘a, Waialua District, O‘ahu, TMKs: [1] 6-8-002:006; 6-8-003:005, 006, 015, 019, 030, 031, 033, 035, and 040 (Beauchan et al. 2017)
<b>Date</b>	February 2017
<b>Project Number(s)</b>	Cultural Surveys Hawai‘i, Inc. (CSH) Job Code: MOKULEIA 5
<b>Agencies</b>	State of Hawai‘i, Department of Health, Office of Environmental Quality Control (DOH/OEQC)
<b>Project Funding and Land Jurisdiction</b>	Private, Dillingham Ranch Aina, LLC
<b>Project Location</b>	The Dillingham Ranch Agricultural Subdivision project area is located <i>mauka</i> (toward the mountain) of Farrington Highway within the Dillingham Ranch property. <i>Makai</i> (toward the ocean) of the proposed Dillingham Ranch Agricultural Subdivision project area is Makaleha Beach Park. To the west of the Dillingham Ranch Agricultural Subdivision project area are Dillingham Airfield and Dillingham Military Reservation. The 1,101-hectare (2,721-acre) Dillingham Ranch Agricultural Subdivision project area, which includes existing infrastructure, is depicted on the 1998 Kaena U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle map.
<b>Project Description</b>	<p>The proposed project will continue the existing operations at Dillingham Ranch, which include equestrian activities (such as boarding, recreational riding, and polo); coconut tree farming; limited cattle grazing; and the rental of the Dillingham Ranch Lodge for private functions. Added operations consistent with agricultural use include designated acreage in the vicinity of Dillingham Lodge to be utilized for farm to table farmers and 70 agricultural lots spanning from 2 acres to 77 acres.</p> <p>The proposed project will be supported by a private road network; a private wastewater treatment plant to process wastewater generated on site; a water distribution system (including potable and agricultural wells); and a maintenance complex for storage and machinery and vehicles.</p>
<b>Project Acreage</b>	The Dillingham Ranch Agricultural Subdivision project area is 2,721 acres.

<p><b>Document Purpose</b></p>	<p>This cultural impact assessment (CIA) was prepared to comply with the State of Hawai‘i’s environmental review process under Hawai‘i Revised Statutes (HRS) §343, which requires consideration of the proposed project’s potential effect on cultural beliefs, practices, and resources. Through document research and cultural consultation efforts, this report provides information compiled to date pertinent to the assessment of the proposed project’s potential impacts to cultural beliefs, practices, and resources (pursuant to the Office of Environmental Quality Control’s <i>Guidelines for Assessing Cultural Impacts</i>) which may include traditional cultural properties (TCPs). These TCPs may be significant historic properties under State of Hawai‘i significance criterion e, pursuant to Hawai‘i Administrative Rules (HAR) §13-275-6 and §13-284-6. Significance criterion e refers to historic properties that “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” (HAR §13-275-6 and §13-284-6). The document will support the project’s historic preservation review under HRS §6E and HAR §13-275 and §13-284. The document is intended to support the project’s environmental review and may serve to support the project’s historic preservation review under HRS §6E-8 and HAR §13-284.</p>
<p><b>Results of Background Research</b></p>	<p>Background research for this study yielded the following results:</p> <ol style="list-style-type: none"> <li>1. The <i>moku</i> (district) of Waialua contained a set of centrally located productive lands and peripheral areas that were ecologically marginal but that had access to abundant ocean resources. Large swaths of <i>lo‘i kalo</i> (taro fields) were located on the floodplains of four major streams that flowed from gorges within the Wai‘anae Mountains, and two large <i>loko i‘a</i> (fishponds), ‘Uko‘a and Lokoea, were located around Waialua Bay. Small fishing communities were also located at the extreme western and eastern edges of Waialua Moku, at Ka‘ena and Kāpaeloa. Although located on the fringes, the small fishing communities had access to very rich deep-sea fishing grounds (Sahlins 1992:20).</li> <li>2. The <i>ahupua‘a</i> of Mokulē‘ia and Kawaihāpai receive an average of 904.5 mm (35 inches) of annual rainfall (Giambelluca et al. 2016). The overall lack of rainfall within the district may be ascribed to the topography of the area itself. While lacking in rainfall, the area retains traces of surface water. <i>Mauka</i> portions of Mokulē‘ia are cut by many ephemeral streams that run northward from the main crest of the Waianae Range down to</li> </ol>

	<p>the sea (Wirawan 1974:6). These streams were often modified via <i>'auwai</i> (channels) to feed fishponds and agricultural fields within the area.</p> <ol style="list-style-type: none"> <li>3. Numerous <i>ko'a</i> (fishing shrines and fishing grounds), including Keauau Shrine, Kōlea Shrine, Kuakea Shrine, Pu'u o Hekili Shrine, and Mokupaoa were known to exist along the coastline and just offshore. These <i>ko'a</i> not only represented places of worship, but were also physical fishing grounds known for their abundance of <i>i'a</i> (fish), lobster, and <i>limu</i> (seaweed).</li> <li>4. Three <i>heiau</i> (temple) are said to have been associated with the Mokulē'ia and Kawaihāpai area: Kawailoa Heiau, Nalowale Heiau, and Poloaiae Heiau. Within greater Waialua Moku, are the sacred sites of Ka'ena Point (<i>leina ka 'uhane</i> (leaping place of souls)), Kūkaniloko, and Mauna Ka'ala; these sites are often connected in some way to <i>mo'olelo</i> (stories) associated with both Mokulē'ia and Kawaihāpai Ahupua'a.</li> <li>5. Prior to Western Contact, the population for the whole of Waialua Moku (including the <i>ahupua'a</i> of Mokulē'ia and Kawaihāpai) had been estimated at 6,000 to 8,000 people (Sahlins 1992:20). The first missionary census of Waialua Moku in 1831-1832 recorded 2,640 people in Waialua, representing a decline of about 20-30% from the first decade of the century. The population within Mokulē'ia and Kawaihāpai Ahupua'a also witnessed a decline. By 1848, the population for Waialua Moku was reduced to 1,616 persons. The steep population decline was attributed to a high death rate from newly introduced diseases such as smallpox, typhus, and venereal diseases.</li> <li>6. Following the initiation of the Māhele and Kuleana Act in 1845, many of the Native Hawaiians living within Waialua Moku bought the lands they lived and worked on through the Waialua land agent and missionary John Emerson. A total of 27 land grants were purchased in the <i>ahupua'a</i> of Mokulē'ia and 16 in the <i>ahupua'a</i> of Kawaihāpai. Portions of 21 land grants are located within the Dillingham Ranch property, and were granted from 1850-1855. In 1850, a law passed that allowed foreigners to buy land fee-simple. Two descendants of missionaries, William Emerson and John T. Gulick, were the first foreigners to buy land in Mokulē'ia and Kawaihāpai.</li> <li>7. By the early 1900s, sugarcane plantations and large ranches came to dominate the lands of western Waialua. In 1897, B.F. Dillingham purchased the Kawailoa Ranch in Mokulē'ia, including over 2,000 head of cattle and over 100 horses and mules (Yardley 1981:193). Dillingham also leased additional property in Mokulē'ia, including the Gaspar Silva Ranch, the</li> </ol>
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	<p>James Gay Estate, and other lands in the area that he could secure. Following the construction of the OR&amp;L railroad in 1898, Dillingham began selling off or subleasing much of his lands in western Waialua. However, Dillingham retained as his personal ranch “a great strip of mountainside and beaches with flat land in between and a homestead in the middle” (Yardley 1981:206).</p> <p>8. By the mid- to late twentieth century lands within Mokulē‘ia and Kawaihāpai were occupied by the Crowbar Ranch, Campbell Ranch, and Dillingham Ranch. These land holdings were later consolidated under the control of the Mokuleia Land Company.</p>
<p><b>Results of Community Consultation</b></p>	<p>CSH attempted to contact Native Hawaiian Organizations (NHOs), agencies, and community members. Consultation was received from the following community members:</p> <ol style="list-style-type: none"> <li>1. Levi Rita, <i>paniolo</i> (cowboy) and livestock manager for Dillingham Ranch</li> <li>2. Thomas Shirai, Jr., Office of Hawaiian Affairs-Native Hawaiian Historic Preservation Council; O‘ahu Island Burial Council; and cultural and lineal Descendant for Waialua; Kawaihapai ‘Ohana – NHO</li> <li>3. Mike Dailey, <i>kama‘āina</i> (longtime resident) of Waialua; father introduced polo to Mokulē‘ia</li> <li>4. Kawika Dowsett, <i>kama‘āina</i> of Waialua; father was former Dillingham Ranch Manager</li> <li>5. Jan Becket, author, photographer, and retired teacher from Kamehameha Schools. Kona Moku Representative, Council of Hawaiian Civic Club’s Committee on the Preservation of Historic Sites and Cultural Properties</li> </ol>
<p><b>Potential Impacts</b></p>	<p>Information was gathered from the cultural and historical background research and the community consultation. Potential impacts to cultural sites within the Dillingham Ranch Agricultural Subdivision project area were identified.</p> <ol style="list-style-type: none"> <li>1. Previous archaeological studies have indicated the presence of 16 State Inventory of Historic Places historic properties within the current Dillingham Ranch Agricultural Subdivision project area. The sites represent traditional Hawaiian agricultural, ceremonial, and habitation complexes, and post-Contact ranching complexes.</li> <li>2. Previous archaeological studies conducted within 200 to 1,500 meters of the current Dillingham Ranch Agricultural Subdivision project area have identified six burials (SIHP #s 50-80-03-6708, -3747, -4451, -5766, -5467, and -5599). All six of these burials are located outside of the current Dillingham</li> </ol>

	<p>Ranch Agricultural Subdivision project area. According to soil survey data, these burials are located within Jaucas sand (JaC) sediments. The <i>makai</i> portion of the Dillingham Ranch Agricultural Subdivision project area borders Jaucas sand, a sediment type known to yield ancient Hawaiian burials. Based on these findings, there is a possibility <i>iwi kūpuna</i> (ancestors) and other burial sites may be present within the project area and land-disturbing activities during construction may uncover presently undetected burials or other cultural finds. During community consultation with Mr. Thomas Shirai, Jr., it was articulated that <i>iwi kūpuna</i> and other cultural finds might be present within the project area.</p> <p>3. The community articulated a concern regarding the access to, and preservation of cultural sites within the Dillingham Ranch Agricultural Subdivision project area.</p>
<p><b>Recommendations</b></p>	<p>Information was gathered from the cultural and historical background research, and the community consultation. The following preliminary recommendations were made.</p> <ol style="list-style-type: none"> <li>1. Preservation is required for SIHP #s 50-80-03-4439, -4772 through -4780 (mitigation recommendations for SIHP # -4777 Feature C is presently under discussion with SHPD), -4782, -4786 resulting from the SHPD acceptance of the Drolet and Schilz (1992) archaeological inventory survey report Tulchin and Hammatt (2008a) address preservation of SIHP #s -4772 through -4780, -4782, and -4786 and these preservation measures shall be followed. Although the neighboring historic properties recommended for preservation (SIHP # -4778 through -4780) and addressed in the Tulchin and Hammatt (2008a) preservation plan are located outside of the Dillingham Ranch Agricultural Subdivision project area, enactment of preservation measures for those historic properties is recommended. SIHP # -4439, originally designated by Drolet and Schilz (1992) and recommended for preservation by the SHPD, is now considered a component of SIHP # 50-80-03-7653.</li> </ol> <p>Preservation is required for SIHP # 50-80-03-7653 resulting from the SHPD acceptance of the Lauer and Reith (2014) archaeological inventory survey report. This historic property shall be addressed in a preservation plan, and the provisions followed once accepted by the SHPD.</p> <p>Based on the findings of the Belluomini et al. (2017 draft) AIS, preservation is recommended for SIHP # 50-80-03-7977 and SIHP # 50-80-03-7978. Preservation is similarly recommended for 50-80-03-7653 as recommended by Lauer and Rieth (2014).</p>

	<p>Based on the documented conditions, Belluomini et al. (2017 draft) recommended no further work for a newly identified feature (Feature C) of SIHP # 50-80-03-4777 and a newly identified historic property, SIHP # 50-80-03-7976. The mitigation requirements addressed in the Belluomini et al. (2017 draft) report are still under review with the SHPD at this time (February 2017).</p> <p>Thus, following SHPD acceptance of the Belluomini et al. (2017 draft) AIS report and any further mitigation required by the SHPD, a preservation plan shall be completed for SIHP # 50-80-03-7653, -7977, and -7978 for SHPD review and acceptance, and subsequently the provisions of the accepted preservation plan shall be enacted.</p> <ol style="list-style-type: none"> <li>2. The provisions of the Tulchin and Hammatt (2008b) archaeological monitoring plan shall be followed.</li> <li>3. Should burials (or other cultural finds) be encountered during ground disturbance or via construction activities, all work shall cease immediately and the SHPD notified pursuant to HAR §13-280-3.</li> <li>4. In the event that <i>iwi kūpuna</i> are identified, all earth moving activities in the area will stop, the area will be cordoned off, and the SHPD and Police Department will be notified pursuant to HAR §13-300-40.</li> <li>5. In the event of an inadvertent discovery of human remains, the completion of a burial site component of the preservation plan and/or the burial site component of the archaeological data recovery plan, in compliance with HAR §13-300-40 and HRS §6E-43.6, is required (specifics to be determined in consultation with the SHPD O'ahu burial sites specialist). Additionally, all lineal and cultural descendants of Waialua shall be contacted.</li> <li>6. Mr. Thomas Shirai, Jr., a lineal and cultural descendant of Waialua, has requested to be consulted with, and to serve as the cultural monitor should burials (or other cultural finds) be encountered during ground disturbance. In the event of an inadvertent discovery of human remains consultation with Mr. Shirai is recommended.</li> <li>7. Project workers and all other personnel involved in construction and related ground-disturbing activities shall be informed at the beginning of their involvement with the project fieldwork of the possibility of inadvertent cultural finds, including human remains.</li> </ol>
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## Section 1 Introduction

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### 1.1 Project Background

At the request of Dillingham Ranch Aina, LLC, Cultural Surveys Hawai‘i, Inc. (CSH) has prepared this cultural impact assessment (CIA) for the proposed Dillingham Ranch Agricultural Subdivision project, Mokolē‘ia 2, Auku‘u, Kikahi, and Kawaihāpai Ahupua‘a, Waialua District, O‘ahu, TMKs: [1] 6-8-002:006; 6-8-003:005, 006, 015, 019,030, 031, 033, 035, and 040. The Dillingham Ranch Agricultural Subdivision project area is located immediately *mauka* (toward the mountain) of Farrington Highway, roughly between the Mokolē‘ia residential community to the east and the Dillingham Airfield to the west. The Dillingham Ranch Agricultural Subdivision project area extends *mauka* to approximately 200 m (650 feet [ft]) elevation and includes the foothills of the Wai‘anae Mountain Range, up to the base of the coastal cliffs. The 1,101-hectare (2,721-acre) Dillingham Ranch Agricultural Subdivision project area, which includes existing infrastructure, is depicted on the 1998 Kaena U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle map (Figure 1), tax map plats (Figure 2 and Figure 3), and a 2014 aerial photograph (Figure 4).

Dillingham Ranch currently operates as a coconut plantation, equestrian boarding and recreational facility (utilized by recreational riders and polo participants), and pasture for limited cattle grazing. The Dillingham Ranch Lodge is also rented for weddings and other celebrations or events. The proposed Dillingham Ranch Agricultural Subdivision project is owned by Dillingham Ranch Aina, LLC based in California. The proposed Dillingham Ranch Agricultural Subdivision project will continue with the existing ranch operations (described above) with the addition of primary development components consistent with the current equestrian and agricultural use including a subdivision of 70 agricultural lots spanning from 2 acres to 77 acres, with farm dwellings, farm to table agricultural activities, expansion of the equestrian facility, employee dwellings, offices, polo fields, barns, and trails. The proposed project will be supported by a private road network; a private wastewater treatment plant to process wastewater generated on site; a water distribution system (including potable and agricultural wells); and a maintenance complex for storage and machinery and vehicles.

### 1.2 Document Purpose

This CIA was prepared to comply with the State of Hawai‘i’s environmental review process under Hawai‘i Revised Statutes (HRS) §343, which requires consideration of the proposed project’s potential effect on cultural beliefs, practices, and resources. Through document research and cultural consultation efforts, this report provides information compiled to date pertinent to the assessment of the proposed project’s potential impacts to cultural beliefs, practices, and resources (pursuant to the Office of Environmental Quality Control’s *Guidelines for Assessing Cultural Impacts*) which may include traditional cultural properties (TCPs). These TCPs may be significant historic properties under State of Hawai‘i significance criterion e, pursuant to Hawai‘i Administrative Rules (HAR) §13-275-6 and §13-284-6. Significance criterion e refers to historic properties that “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

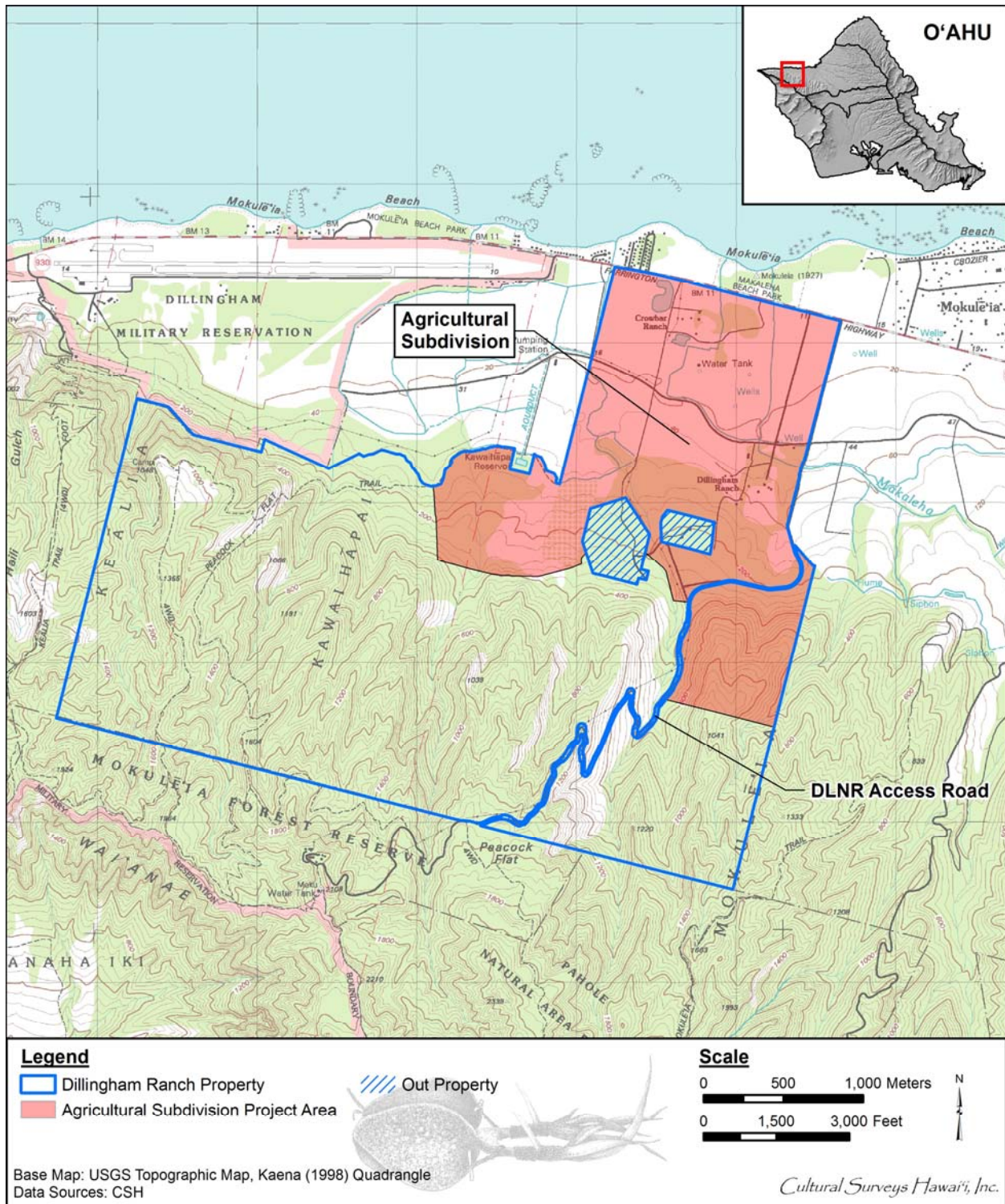


Figure 1. Portion of the 1998 Kaena USGS 7.5-minute topographic quadrangle, showing the location Dillingham Ranch Property and the Dillingham Ranch Agricultural Subdivision project area

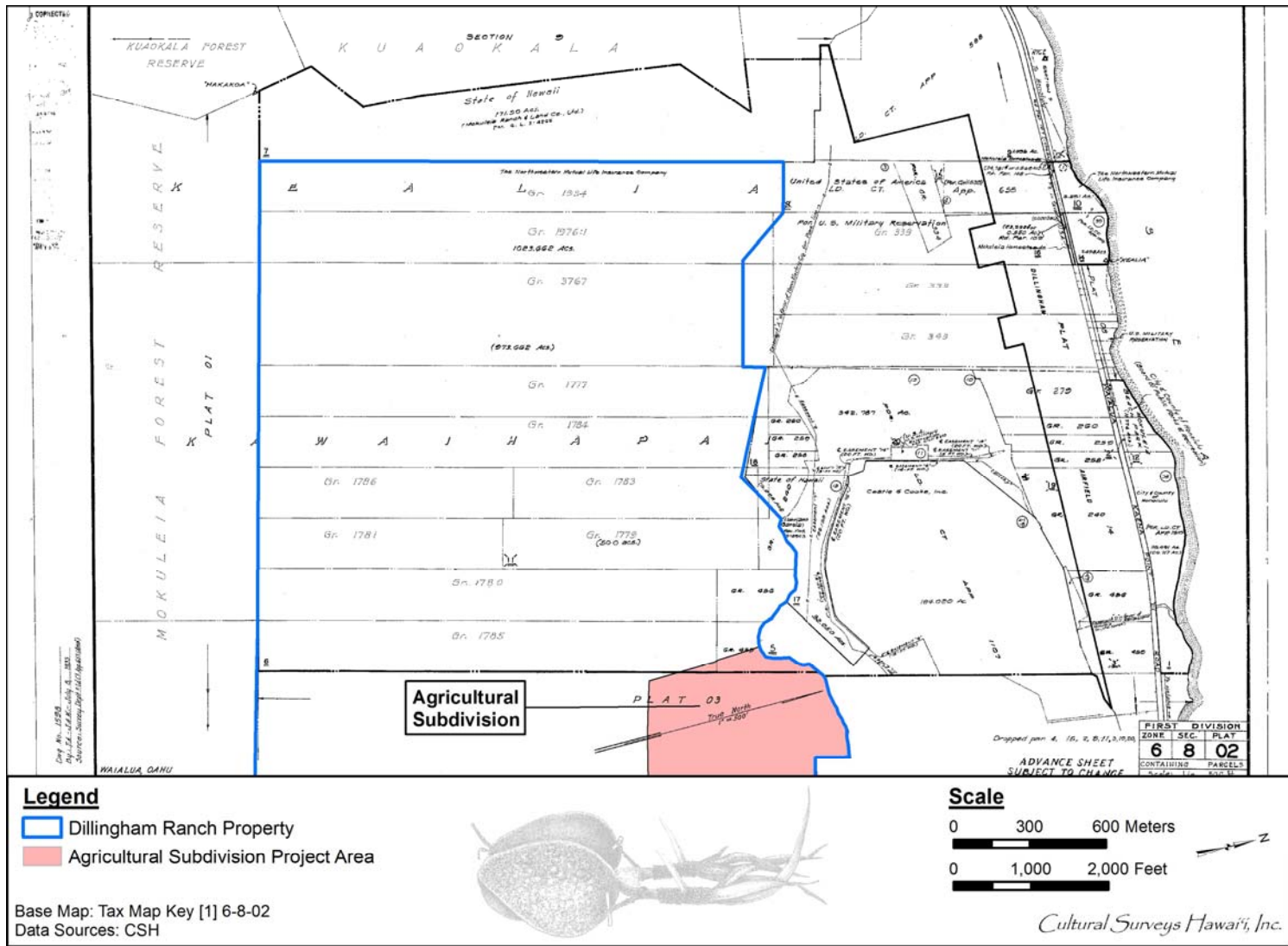


Figure 2. Tax Map Key (TMK) [1] 6-8-002, showing the west portion of the Dillingham Ranch Agricultural Subdivision project area and the western Dillingham Ranch property boundaries (Hawai'i TMK Service 2014)

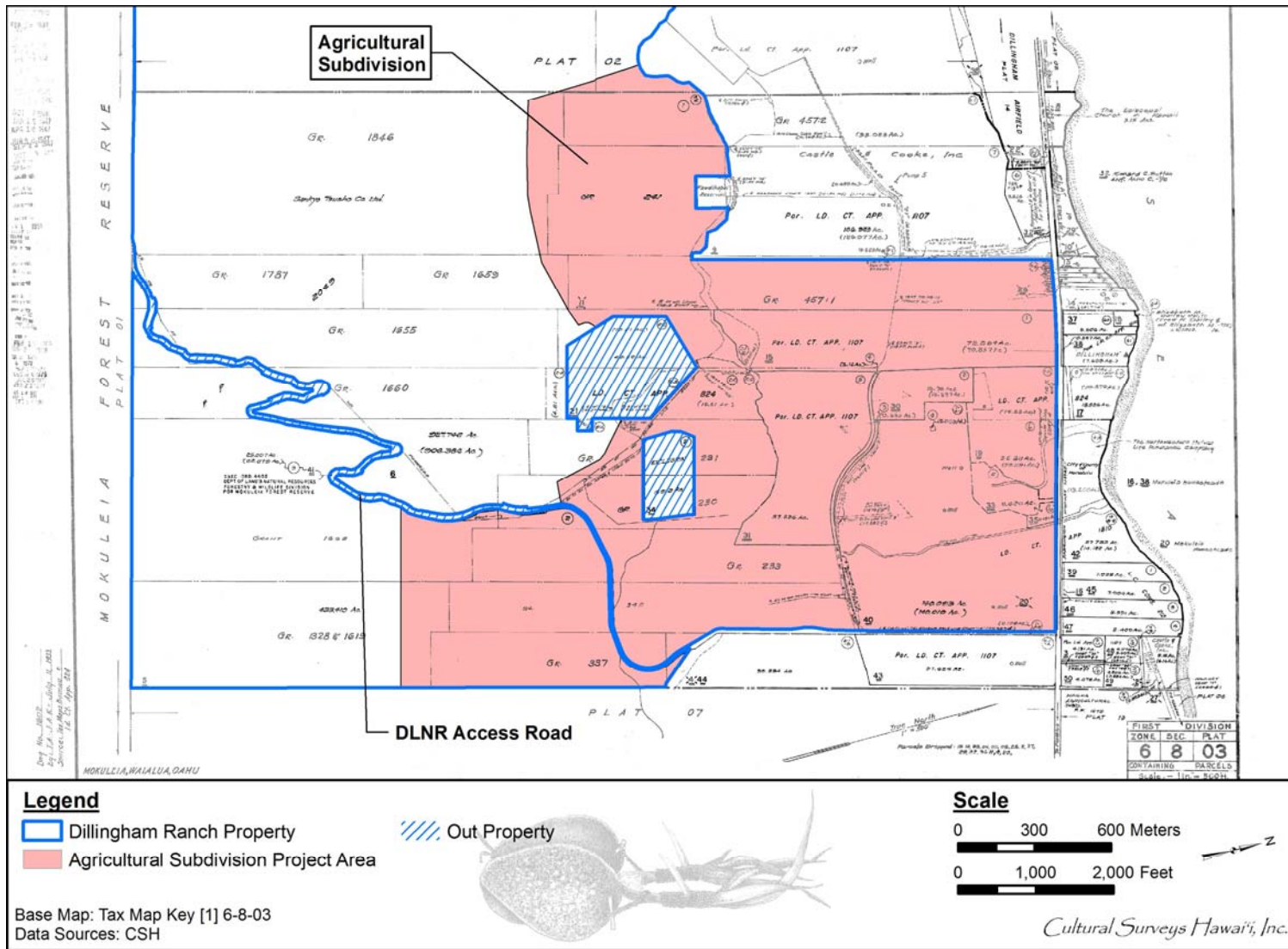


Figure 3. TMK: [1] 6-8-003, showing the Dillingham Ranch Agricultural Subdivision project area and northeastern Dillingham Ranch property boundaries in the vicinity (Hawai'i TMK Service 2014)

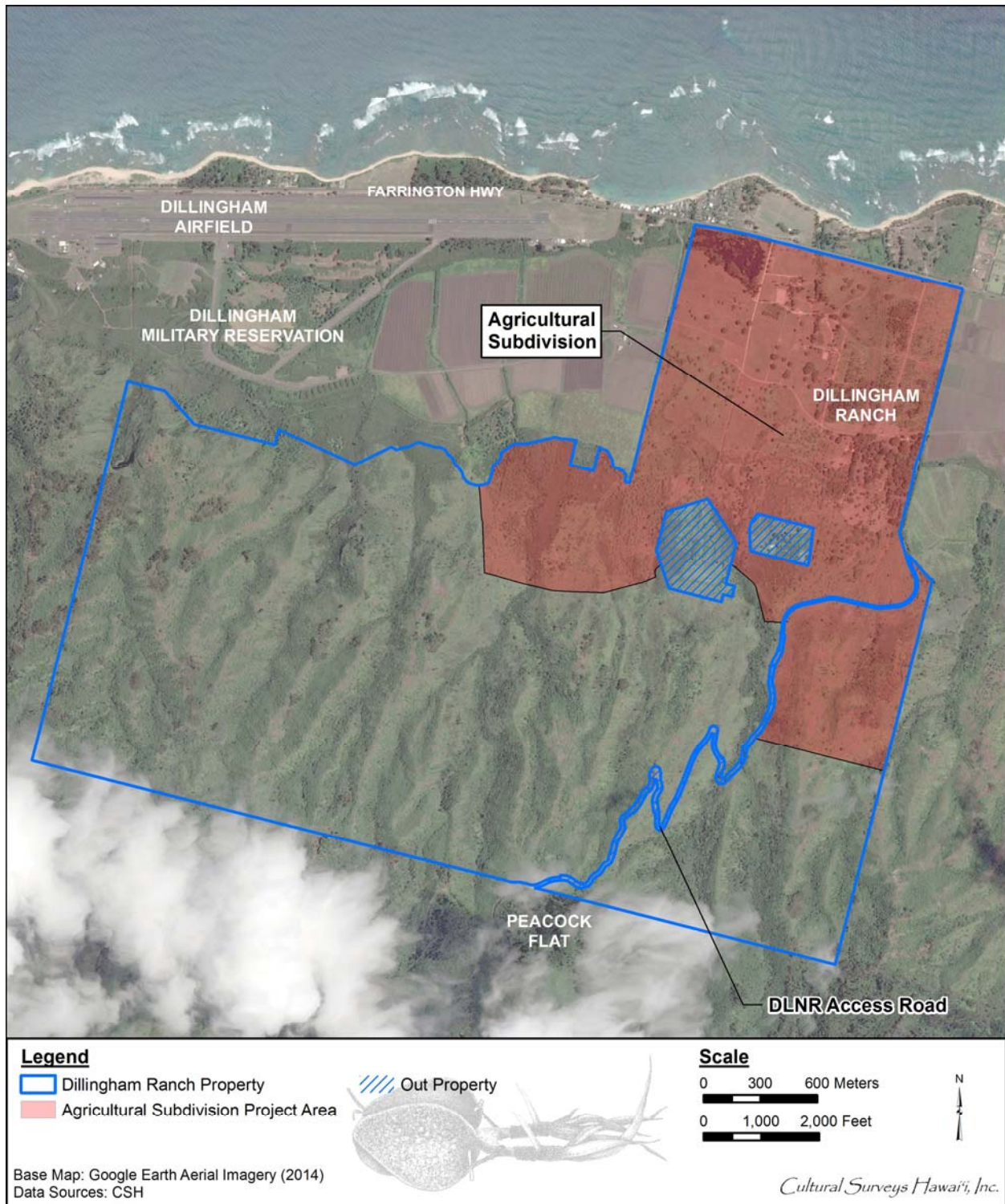


Figure 4. Aerial photograph showing the location of the Dillingham Ranch Agricultural Subdivision project area and the Dillingham Ranch property boundaries (Google Earth 2014)



being important to the group's history and cultural identity" (HAR §13-275-6 and §13-284-6). The document will likely also support the project's historic preservation review under HRS §6E and HAR §13-275 and §13-284. The document is intended to support the project's environmental review and may serve to support the project's historic preservation review under HRS §6E-8 and HAR §13-284.

### 1.3 Scope of Work

The scope of work for this CIA includes the following:

1. Examination of cultural and historical resources including Land Commission documents, historic maps, and previous research reports with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal, and other resources or agricultural pursuits as may be indicated in the historic record.
2. Review of previous archaeological work at and near the subject parcel that may be relevant to reconstructions of traditional land use activities and to the identification and description of cultural resources, practices, and beliefs associated with the parcel.
3. Consultation and interviews with knowledgeable parties regarding cultural and natural resources and practices at or near the parcel; present and past uses of the parcel; and/or other practices, uses, or traditions associated with the parcel and environs.
4. Preparation of a report that summarizes the results of these research activities and provides recommendations based on findings.

### 1.4 Environmental Setting

#### 1.4.1 Natural Environment

The approximately 2,721-acre Dillingham Ranch Agricultural Subdivision project area includes lands within the level coastal plain of Mokolē'ia and the lower foothills of the Wai'anae Mountain Range. The foothills consist of gently to moderately sloping lands dissected by multiple seasonal drainage gullies. Vertical exposed basalt cliffs are also common along the *mauka* boundary of the Dillingham Ranch Agricultural Subdivision project area. Elevations within the Dillingham Ranch Agricultural Subdivision project area range from approximately 1-200 m (3-650 ft) above mean sea level. The annual average air temperature is between 23.2°C (73.8°F) and 23.6°C (74.5°F) (Giambelluca et al. 2014).

Vegetation in the equestrian portions of the Dillingham Ranch Agricultural Subdivision project area generally consists of exotic grasses, ironwood, monkeypod, coconut, and other landscaping species. Vegetation within the active and former pasture areas primarily consists of exotic grasses and weeds, *koa haole* (*Leucaena leucocephala*), *kiawe* (Algaroba; *Prosopis pallida*), Java plum, and *klu*. Additional species include *wiliwili* (*Erythrina sandwicensis*), *'a'ali'i* (*Dodonaea viscosa*), *'ilie'e* (Wild plumbago; *Plumbago zeylanica*), *naio* (Bastard sandalwood; *Myoporum sandwicense*), silk oak, guava (*Psidium guajava*), strawberry guava (*Psidium cattleianum*), Christmas berry (*Schinus terebinthifolius*), and *kukui* (candlenut; *Aleurites moluccana*).

#### 1.4.2 Ka Lepo (The Soils)

According to Foote et al (1972) and the U.S. Department of Agriculture (USDA) Soils Survey Geographic Database (SSURGO) (2001), soils within the *makai* (toward the ocean) or northern

portion of the Dillingham Ranch Agricultural Subdivision project area consist of Pulehu Clay Loam (PsA), Pearl Harbor Clay (Ph), and Mokuleia Clay Loam (Mt). The *makai* portion of the Dillingham Ranch Agricultural Subdivision project area borders Jaucas sand (JaC), a variety of soil known to yield ancient Hawaiian burials. Soils within the *mauka* portion of the Dillingham Ranch Agricultural Subdivision project area include Ewa Silty Clay Loam (EaC), Ewa Stony Silty Clay (EwC), Helemano Silty Clay (HLMG), Kaena Clay (KaB), Kaena Stony Clay (KaeB, KaeC, and KaeD), Kaena Very Stony Clay (KanE), Kawaihapai Clay Loam (KIA), Kawaihapai Stony Clay Loam (KIaA and KIaB), Kemoo Silty Clay (KpF), Pulehu Stony Clay Loam (PuB), Rock Land (rRK), and Stony Steep land (rSY) (Figure 5).

Soils of the Pulehu Series consist of “well-drained soils on alluvial fans and stream terraces and in basins . . . developed in alluvium washed from basic igneous rock” (Foote et al. 1972).

Soils of the Pearl Harbor Series consist of “very poorly drained soils on nearly level coastal plains on the island of Oahu . . . developed in alluvium overlying organic material” (Foote et al. 1972).

Soils of the Mokuleia Series consist of “well-drained soils along the coastal plains . . . formed in recent alluvium deposited over coral sand” (Foote et al. 1972).

Soils of the Ewa Series consist of “well-drained soils in basins and on alluvial fans . . . developed in alluvium derived from basic igneous rock” (Foote et al. 1972).

Soils of the Helemano Series consist of “well-drained soils on alluvial fans and colluvial slopes on the sides of gulches . . . developed in alluvium and colluvium derived from basic igneous rock” (Foote et al. 1972).

Soils of the Kaena Series consist of “very deep, poorly drained soils on alluvial fans and talus slopes . . . developed in alluvium and colluvium from basic igneous material” (Foote et al. 1972).

Soils of the Kawaihapai Series consist of “well-drained soils in drainage ways and on alluvial fans on the coastal plains . . . formed in alluvium derived from basic igneous rock in humid uplands” (Foote et al. 1972).

Soils of the Kemoo Series consist of “well-drained soils on uplands . . . developed in material weathered from basic igneous rock” (Foote et al. 1972).

Areas of Stony Steep land (rSY) are located at the *mauka* edge of the Dillingham Ranch Agricultural Subdivision project area.

### 1.4.3 *Ka Ua* (The Rain)

The Dillingham Ranch Agricultural Subdivision project area receives an average of 904.5 mm (35 inches) of annual rainfall (Giambelluca et al. 2016). The lack of rainfall within Waialua Moku (located on the leeward side of O‘ahu Island) in comparison to the windward side of O‘ahu, may be ascribed to the topography of the island itself. According to Giambelluca et al. (1986),

The formation of clouds and rainfall occur when air is cooled, usually the result of its ascent. The primary rainfall-producing mechanism in Hawai‘i is the orographic [resulting from the effects of mountains, their position and form, in forcing moist air to rise] lifting of moisture-laden northeast trade winds up the windward slopes of each island. In addition, thermally-driven diurnal circulations, that is, sea-breeze-

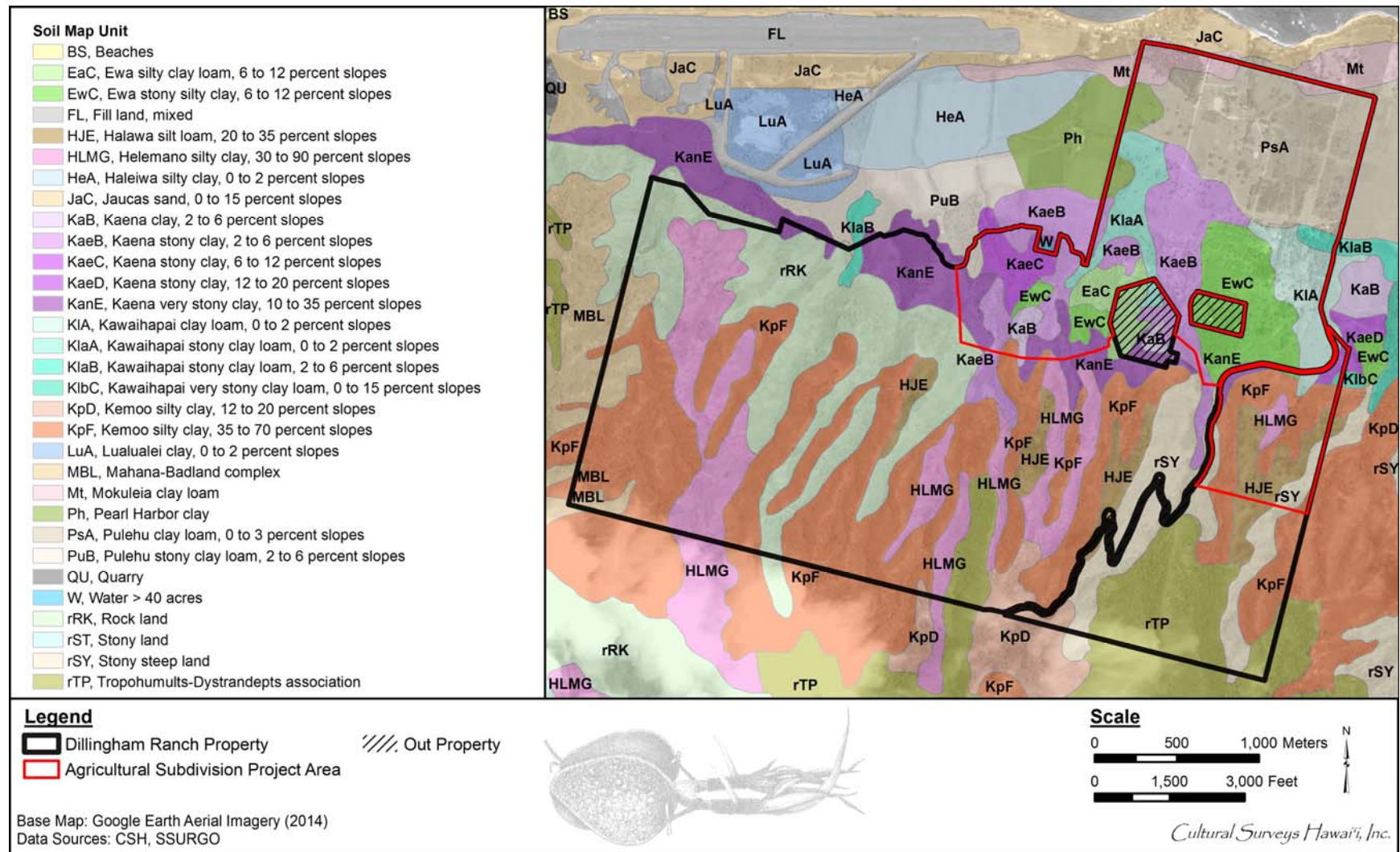


Figure 5. 2014 aerial photograph (Google Earth 2014) of the Dillingham Ranch property and Dillingham Ranch Agricultural Subdivision project area with an overlay of the USDA SSURGO database (2001) and soil survey data gathered by Foote et al. (1972)

land breeze systems and mountain-valley winds, contribute to rainfall by reinforcing tradewind-orographic lifting, inducing areas of low level convergence with the prevailing trades, or producing orographic uplift in areas not exposed to trades (Leopold 1949). Convective uplift occurs on the larger islands, often in conjunction with sea-breeze circulation. Open ocean rainfall near Hawai‘i is almost exclusively produced by large-scale storm systems which produce rainfall with a relatively uniform spatial distribution. Drier areas of the state receive most of their rainfall from such storms. [Giambelluca et al. 1986:13]

Within the *ahupua‘a* (traditional land division) of Mokulē‘ia and Kawaihāpai, prior to Western Contact, rainfall was known and acknowledged to be severely limited. The lack of abundant water was so apparent that *kahuna* (priest) prayed for rain. Sterling and Summers (1978) document the occurrence of such prayers within a discussion of the naming of Kawaihāpai Ahupua‘a, recounting the following,

There were two old men who belonged to the priestly class of old, and they remained, setting up the kapu with prayers and after praying they saw a hog shaped cloud coming directly from Kahuku point and they guessed that it was going to rain, that their prayers were heard. They were waiting for rain and heard the splashing of raindrops on the cliff. When they went to look, they saw water pouring from the cliff and they told everybody to stay for water was found. [Sterling and Summers 1978:99]

The lack of regularity in rainfall, due largely in part to the area receiving most of its rainfall from storm systems, has resulted in no known rain names for either Mokulē‘ia or Kawaihāpai Ahupua‘a. According to Akana and Gonzalez (2015),

Rain names are a precious legacy from our kūpuna who were keen observers of the world around them and who had a nuanced understanding of the forces of nature. They knew that one place could have several types of rain, each distinct from the other. They knew when a particular rain would fall, its color, its duration, its intensity, its path, its sound, its scent, and its effect on the land and their lives . . . Rain names are a treasure of cultural, historical, and environmental information. [Akana and Gonzalez 2015:n.p.]

Although no rain names have been documented in association with either Mokulē‘ia or Kawaihāpai Ahupua‘a, several rains are known to be associated with Waialua, the *moku* (district) in which both Mokulē‘ia and Kawaihāpai Ahupua‘a are located. In particular, the Līlīlehua and Nāulu rains are traditionally known to be specific to Waialua.

The Līlīlehua rain, a rain of Pālolo as well as Waialua, is referenced within a *kanikau* (lament) for J. Henry (Akana and Gonzalez 2015:160). Within the mourning chant, a bereaved wife calls to her “dear husband from the Līlīlehua rain of Waialua:”

1. *Ku‘u kāne mai ka ua Līlīlehua o Waialua*  
*Mai ka ua Pō‘aipuni o Kemo‘o*  
*Nānā aku ‘o ka lā la‘ila‘i o Ka‘ena*  
*Auē ku‘u kāne ē*

My Dear husband from the Līlīehua rain of Waialua

From the Pō'aipuni rain of Kemo'o

Behold, the still sun of Ka'ena

Pity for my dear husband!

[Akana and Gonzalez 2015:160]

Another rain associated with Waialua at large, is the Nāulu rain. This rain is described in a *mele ho'āeae* (love chant):

2. 'A'ole wahi ho'ohalahala 'ana

*A ka ua Nāulu I ke kula*

*He like wale nō ā mai Ka'ena a Waialua*

*Pili pono akula ka lā*

Having nothing to criticize

The Nāulu rain on the plains

From Ka'ena to Waialua it is the same

The sun clings tightly

[Akana and Gonzalez 2015:197]

According to Akana, translator of the above *mele ho'āeae*, the line “*He like wale nō ā mai Ka'ena a Waialua*” is similar to the *'ōlelo no'eau* (proverb), “*Like nō Ka'ena me Waialua,*” meaning Ka'ena and Waialua are one” (Akana 2015:198; Pukui 1983:215). The Nāulu rain, as referenced in the above chant, serves as a mnemonic, memorializing Waialua while simultaneously providing a poetic image of the beauties known and shared by two lovers. Through this *mele ho'āeae*, one is able to gain intimate insight into the way that *kama'āina* experienced the land, loved and cared for one another, and ultimately mourned the loss of a loved one (Leidemann 2001). Other rains associated with Waialua include the Ki'owao, Kīpu'upu'u, Kuahine, Līhau, Paliloa, Pō'aipuni, 'Ula, and Wa'ahila.

#### 1.4.4 *Nā Kahawai* (The Streams)

Although lacking in rainfall, other freshwater resources in the form of small streams and springs were utilized by inhabitants of both Mokulē'ia and Kawaihāpai *ahupua'a*. The watersheds for the current Dillingham Ranch Agricultural Subdivision project area include Makaleha (“to look about in wonder or admiration”), 'Āweoweo (“red fishes”), Pahole (“bruised, skinned, scraped”), and Kawaihāpai (“carried waters”). These watersheds are bounded on their southern end by the Wai'anae Mountain ridgeline within the Mokulē'ia Forest Reserve. According to Wirawan (1974:6), “The north facing slope of the Mokuleia area is cut by many ephemeral streams that run northward from the main crest of the Waianae Range forming steep gulches and narrow ridges that are more or less parallel to each other.”

Currently, there are three major streams within Mokulē'ia *Ahupua'a*; these include the non-perennial 'Āweoweo Stream, the intermittent Makaleha Stream, and the intermittent Pahole Stream. There are two major streams within Kawaihāpai *Ahupua'a*; these include the perennial

Kawaihāpai Stream and the non-perennial Mokulē'ia Stream. Three streams are currently within the Dillingham Ranch Agricultural Subdivision project area; these streams are the Makaleha, the Pahole, and the Kawaihāpai. Cutting a path *mauka* to *makai*, streams were often modified via *'auwai* (channels) to feed fishponds and agricultural fields such as taro *lo'i* (terraced ponds). Waialua Moku, according to Sterling and Summers (1978), takes its name from a *lo'i kalo* (taro patch) rather than its twin streams:

Waialua district, Oahu, is said by natives to take its name from a *lo'i* (taro patch) ... and not from its twin streams as is generally supposed; the natural definition of the name being two waters. It was an ancient saying of the people that if one visited and traveled through the district and did not see this identical *lo'i*, he had not seen Waialua. [Sterling and Summers 1978:88]

The twin streams, also known as the Kaukonahua River and Anahulu River, respectively, are recognized waterways within Waialua District. The Kaukonahua River empties into Kaiaka Bay, and the Anahulu River empties into Waialua Bay. Sterling and Summers (1978) also make note of Anahulu River in relation to traditional trails connecting to Mokulē'ia and Kamananui:

From the stream of Anahulu and from Kamani the trail went above the village to the banks of the taro patches along the front of Ku'oko'a's house lot and the church; straight on to the fresh water pool of 'Opae-'ula and Halemano; to the source of the Pa'ala'a stream; down to Po'oamoho stream; up to the place where the trail from Mokule'ia and Kamananui meets with that of Ke-awawa-ihe. A mark to prohibit trespassing was set up below the trail for Kukaniloko the birth place of chiefs. A short distance below the trail is the ascent to the stream of Kuaikua. [Sterling and Summers 1978:89]

Regarding the aquatic and riparian resources of Kawaihāpai, Handy (1940) notes numerous terraces watered by Kawaihāpai Stream. It was also noted that a stream existed at the foot of the Wai'anae Mountains within Kawaihāpai Ahupua'a, although the name of this stream was not confirmed.

There is a sizable area of terraces in the lowlands (now surrounded by sugar cane), watered by Kawaihapai Stream. These terraces have evidently been lying fallow for some time, though several were being plowed for rice or taro in the summer of 1935. At the foot of the cliffs, watered by a stream the name of which was not learned, are several small terraces in which taro is grown by David Keaau. [Handy 1940:85]

#### 1.4.5 *Ka Makani* (The Wind)

Each small geographic area on O'ahu had a Hawaiian name for its own wind, rain (see Section 1.4.3 *Ua*), and seas (see Section 1.4.6 *Ke Kai ame ka Moana*). The name of the winds of O'ahu are listed in a chant concerning a powerful gourd called *The Wind Gourd of La'amaao*. According to Handy and Handy (1972), the gourd is a *kino lau* (embodiment) of Lono, god of agriculture and fertility (Handy and Handy: 1972:220). Handy and Handy elaborate, "Lono is the gourd; the cosmic gourd is the heavens whence come winds, clouds, and rain" (Handy and Handy 1972:220). When the gourd was opened, a specific wind could be called to fill the sails of a canoe and take the person in the desired direction. It is within this chant that the wind of Mokulē'ia,

Hinakokea is noted. Kūapāka'a, the son of Pāka'a and descendant of La'amaomao offers the following chant:

<i>Huilua nā makani o Kaena</i>	The wind of Kaena turns in two directions
<i>He Hinakokea ko Mokulē'ia,</i>	Hinakokea is of Mokulē'ia,
<i>No Waialua ka makani ke pā mai,</i>	The winds of Waialua blow,
<i>He nihi mai ma ka lae o Kaena</i>	Moving silently at the cape of Kaena

[Nakuina 1992:51]

The winds of Kawaihāpai are also noted in the *Legend of Pele and Hi'iaka* (Emerson 1915). In Emerson's version of the epic tale, the protagonist Hi'iaka, sister of the goddess Pele, is given the task of retrieving Pele's husband, the young chief Lohi'au, and returning him to Pele's home at the crater of Moku'āweoweo. Emerson details Hi'iaka's travels around the islands as she works to complete the task set forth by her sister. During this journey, Hi'iaka lands her canoe on the sands of Mokulē'ia. Hi'iaka leaves her companions to pay respect to her ancestor, Pōhaku-o-Kaua'i, and to her ancestral divinity Ka'ena. She passes Ka'ena Point on O'ahu and enters the hot and arid region of Waialua. As she climbs up into the Wai'anae Mountains, above the lands of Keālia and Kawaihāpai, she offers this chant:

<i>Kunihi Kaena, holo i ka malie,</i>	Ka'ena's profile fleets through the calm,
<i>Wela i ka La ke alo o ka pali;</i>	With flanks ablaze in the sunlight –
<i>Auamo mai i ka La o Kilauea;</i>	A furnace heat like Kilauea;
<i>Ikiiki i ka La na Ke-awa-ula,</i>	Ke-awa-ula shelters in heat;
<i>Ola i ka makani Kai-a-ulu Koholalele</i>	Kohola-lele revives in the breeze,
<i>Kai-a-ulu. He makani ia no lalo . . .</i>	That breath from the sea,

[Emerson 1915:157–158]

Within the chant, Hi'iaka describes the wind known as Koholālele. The Koholālele, literally translated as the leaping whale, is the name of a wind blowing from east to west (Elbert and Pukui 1971:10). However, the Koholālele wind is also known as Kiu and Koholāpehu. In some localities, the Kiu wind is known as Mālualua or Māluaki'iwai; conversely, this wind is described as a “strong, moderately cold northwesterly wind” (Elbert and Pukui 1971:10). The Mālua wind is also noted as a wind of Ka'ena Point.

Ka'ena Point is often included in descriptions of Mokulē'ia and Waialua District at large. As Pukui notes within an aforementioned *'ōlelo no'eau* (see Section 1.4.3), “*Like nō Ka'ena me Waialua,*” (Pukui 1983:215), Ka'ena and Waialua are often understood as one. Due to the transmutative nature of the locality, it is key to note Ka'ena Point's unique *makani* known as the Mālua. The Mālua wind is a brisk sea breeze, often distinguished in traditional songs; it is famously referenced in one such *mele* (song) entitled *Mai Hō'eu'eu Mai 'Oe*:

<i>Mai hō‘eu‘eu mai ‘oe</i>	You must not be anxious to rush
<i>I ka wai ua lana mālie</i>	Into the water that appears serene
<i>E kakali mālie ‘oe</i>	You must wait patiently
<i>A la‘i pono ka makani</i>	Until the wind calms down
<i>‘Auhea wale ana ‘oe</i>	Pay attention
<i>Uhiwai o Ka‘ala</i>	Fog of Ka‘ala
<i>I pili me ka Malua</i>	Associated with the Malua wind
<i>Ka makani o ka ‘āina</i>	The wind of the land
<i>Ho‘okahi au mea uluhua</i>	The one thing I worry about
<i>Ka makani anu la he Kiu</i>	Is the strong, chilly, northwesterly wind
<i>Houhou ana i ka ili</i>	That pierces the skin
<i>Konikoni i ka iwi hilo</i>	And causes my bones to shiver
<i>‘A‘ole i piliwi ia</i>	Unbelievable
<i>Leo hone o ke kahuli</i>	The sweet voice of the land shells
<i>Hone ana i ka pō la‘i</i>	Singing in the still night
<i>I ke kulukulu aumoe</i>	In the late night
[Huapala n.d.]	

Mount Ka‘ala, referenced in the above *mele*, figures prominently within the landscape of Waialua Moku. Pukui and Elbert also note an additional wind for Waialua Moku, the Pu‘uka‘ala, a wind at Mount Ka‘ala (Pukui and Elbert 1986:359).

#### 1.4.6 *Lihikai ame Ka Moana (Seashore and Ocean)*

According to Wentworth, in his *Geology of Oahu* (1971), “From Kaena to Kahuku Point, the coast is low and sandy but with no extensive coral flat” (Wentworth 1971:15). This low and sandy stretch of coast is a striking and well-known feature of Waialua Moku. The section of shoreline within Waialua Moku known as Mokulē‘ia Beach is particularly well known for its abundance of marine resources. John Clark gives the most common translation of the name Mokulē‘ia, as “district of abundance,” which he says probably refers to the time when this large land division in the district of Waialua easily supported several substantial Hawaiian settlements (Clark 1977:106). It may also be inferred that the “abundance” implied within Mokulē‘ia’s place name also refers to the wealth of seashore and ocean resources within the area. Traditionally, the seashore and ocean area of this region was vitally important for resource extraction in the early days of settlement. Fishermen along the coast maintained a respected status within traditional Hawaiian society. Kanahale asserts that “early Hawaiians regarded fishing as the oldest, and hence the most prestigious of professions (Kanahale 1995:17). It is perhaps also key to note that Mokulē‘ia is also another name for a youthful stage of the *kāhala*, the amberjack fish. Thrum (1905) elaborates further on the resources of *ke kai* and *ka moana* for Mokulē‘ia:



The fish that frequented the waters of Mokuleia were the aweoweo, kala, manini, and many other varieties that find their habitat inside the coral reefs. Crabs of the white variety burrowed in the sand near the seashore and were dug out by the people, young and old. The squid also were speared by the skillful fishermen and were eaten stewed, or salted and sun-dried and roasted on the coals.

The salt likely came from Kaena point from salt water evaporation in the holes of rocks so plentiful on that stormy cape. Or it may have been made on the salt pans of Paukauwila, near the stream of that name, where a few years ago this industry, on a small scale, existed. [Thrum 1905:146]

Although several beaches in nearby *ahupua'a* also carry the name Mokolē'ia, the actual beaches in the *ahupua'a* of Mokolē'ia are noted for their diving, shorecasting, swimming, and beachcombing activities. He notes that “the section of Mokolē'ia Beach that actually lies in the land division of Mokolē'ia was the first and largest shoreline residential area to be developed in western Waialua. The popularity of this section and its subsequent growth led to the entire coast, from Camp Erdman to Pu'uiki, being called Mokolē'ia Beach” (Clark 1977:107).

Clark also indicates the coastal and offshore areas of Mokolē'ia were historical and cultural locus points. In particular, Clark makes note of an estuary known as Polipoli. This estuary is located where Kawaihāpai Stream meets the ocean. The place name Polipoli, is a direct reference to a type of soft, porous stone used for polishing wood surfaces and for squid lure sinkers; Clark notes that *polipoli* were once commonly found in this region. Immediately west of Polipoli, a *ko'a* (fishing shrine or fishing grounds) by the name of Kuakea was known to exist. An additional *ko'a*, called Kōlea after the Pacific golden plover, was known to be located to the west of the mouth of Makaleha Stream (Clark 1977:107). During the historic period, Japanese fisherman also erected “their own shrine in the vicinity, which was similar in purpose to the statue of O-Jizōsan at Halona Point near Koko Crater” (Clark 1977:107).

The Makaleha Stream empties into a large bay called Kai'ahulu (“the foamy sea”) located *makai* of the Mokolē'ia Polo Field. Kapala'au Stream (“the wooden fence”) is also known to flow into Kai'ahulu Bay. Near the sandy point that forms the eastern boundary of Kai'ahulu Bay is a recreational area for the business firm of Castle and Cooke. The land was bequeathed to the company by Edward Tenney, an employee for many years, and was set aside for the use of Castle and Cooke personnel.

To the west of Kai'ahulu and Polipoli is Mokolē'ia Beach Park, located within Kawaihāpai Ahupua'a. Mokule'ia Beach Park remains one of the few developed public areas along the northwestern stretch of the Waialua coastline. The park consists of 12 acres and includes a comfort station, a large grassy playground, and picnic facilities (Clark 1977:105). It continues to attract beachgoers, campers, and fishermen. The beach lies on the leeward side of a sandy point and remains somewhat sheltered by a broken offshore reef (Clark 1977:105). The coastal area of Kawaihāpai today remains relatively free of large-scale development except for Dillingham Air Field, a small U.S. Air Force landing strip (Clark 1977:105).

The waters of the entire shoreline of Mokolē'ia Beach, situated within the land division of Mokolē'ia, are generally safe; however, rough, dangerous swimming conditions are known to occur during the winter months when the area is subjected to strong currents and large ocean swells (Clark 1977:107).

At the far western edge of Waialua Moku is Ka'ena Point. This area is primarily recognized as one of the last coastal sand dune habitats on O'ahu Island, providing a sanctuary for native plants and seabirds. In winter months, the waters off the northwest coast of O'ahu, including Ka'ena Point, become populated by humpback whales engaging in mating activities and calving. The ocean conditions within this far northwestern region are generally considered hazardous, however, the area is also traditionally known as the location where Hi'iakaikapoliopole launched her canoe to set forth towards Kaua'i. In describing the area, the goddess Hi'iaka identifies the name of the sea adjacent to Ka'ena Point as Moanawaikao'o. The goddess states, "this sea reaches Kahiki Kū and Kahiki Moe. When we reach the point, that is where we will depart for Kaua'i" (Ho'oulumāhie 2008:164).

#### 1.4.7 *Ka Lewa (Sky)*

Currently, Dillingham Airfield within Mokulē'ia is a designated dark sky place. As part of the dark sky movement, a dark sky site works to preserve and protect nighttime skies. Regarding the conditions at the Mokulē'ia dark sky site, it was noted as the best star observing site on O'ahu:

The population centers of Honolulu are close enough (25 miles) to create moderate light domes to the South/SE. Also, the site is at sea level, so there is a lot of atmosphere above. Seeing is variable. It is not a particularly good planetary site, with only rare nights steady enough for detailed observation. But deep sky is good in most directions. Also, it tends to get humid as the night progresses and trade wind clouds come and go, but this is one of the least cloudy parts of the island.

Typical naked-eye magnitude limit on a clear, moonless night:

At the zenith: 6.3

East: 5.5

West: 5 (due to bright local lights at the airfield)

North: 6.3

South: 5.5

Best horizon (direction and approximate altitude cut-off): North, just distant line of trees between you and the ocean. Can see down to a few degrees altitude.

Worst horizon (direction and approximate altitude cut-off): South, 20 degrees due to mountains and also worst for light pollution (SE). But, trees to the West and East can block up to 30 degrees, depending on what spot you choose. [Observing Sites n.d.]

Traditionally, the night skies played an integral role in the formation of the Hawaiian worldview. According to the University of Hawai'i Institute for Astronomy (2015), "many of the early Polynesian gods and demi-gods derived from or dwelt in the heavens, and many of the legendary exploits took place among the heavenly bodies." Kamakau in particular notes the various godly realms contained within the firmament:

In the *ao 'aumakua* were a *lani kuaka'a* (the highest heaven), a *lani kuakini* [a heaven of myriads], a *lani kuamanomano* [a heaven of multitudes], the *lewa*

*lani* [the heavenly firmament], the *lewa nu'u* [the cloud firmament], *na paia ku a Kane* (the standing walls of Kane), *nakukulu o ka lani* (the supporting pillars of heaven), those [spirits] of the spread-out earth (*ko ka honua palahalaha*), the ever-beautiful sun (*ko ka la mau nani*), the bright-shining moon (*ko ka mahina koha'iha'i*), the ever-adorning stars (*ko na hoku mau ho'ohiwahiwa*), and all the other places, too numerous to mention, that were called realms of the 'aumakua. [Kamakau 1991:49]

Besides informing religious views and creation stories, the sky—specifically the stars of the night sky—played a key role in navigation and in understanding the seasons:

. . . the early Polynesians were highly skilled sailors and navigators who sailed thousands of miles over open ocean between the Society Islands, the Marquesas, Easter Island in the east, the Hawaiian Islands in the north, and New Zealand in the southwest. Navigation was accomplished primarily, we believe, by a thorough knowledge of the stars, their rising and setting points along the horizon and their meridian passage as a function of latitude. Of course, there were other indicators in nature that helped guide them: the winds, the waves, the ocean swells, cloud formations, and birds and fish. [University of Hawai'i Institute for Astronomy 2015]

The means by which the night skies informed an understanding of the changing seasons was described by Kamakau (1976):

Here is the way some people divided the year into seasons, that is, the *po'e kilo hoku* (astronomers) of Oahu and Kauai, who were very skilled in reckoning the months of the year and in discerning the ways of the sun, the moon, and the stars, as well as knowing the configurations of the earth (*papa hulihonua*). They were known as *po'e kuhikuhi pu'uone* (site experts) and as *po'e kilo hoku holo moana* (navigators); and as the people who went to stay at Waimea, on Kauai [to make their observations].

When the sun reached the equator and moved on [northward] it set-*kau*-right over the islet of Ka'ula and then moved on until it set over Kawaihoa on Niihau. For the setting-*kau ana*-of the sun from Ka'ula to Kawaihoa, the Makali'i season was called Kau. It was also called Kau for Kaulana-a-Kane, the resting place of Kane [on Ka'ula]. When the sun set at Ka'ula and moved to the south, the season was called Ho'oilo.

For the same reason, the Oahu people who reckoned the time (*Oahu po'e helu*) called the season Kau for the setting of the sun from Pu'uokapolei, a hill in Honolulu, 'Ewa, to the opening of Mahinaona (*i ke kawaha o Mahinaona*). When the sun moved south from Pu'uokapolei and during the season of the sun in the south—for the coming-of coolness and for the sprouting of new buds on growing things--the season was called Ho'oilo. [Kamakau 1976:14]

The notation of the changing of the seasons was especially vital for *mahi'ai* (farmer) and *lawai'a* (fisherman) as the changing seasons coincided with the yearly farming cycle; the seasons also marked periods when deep-sea fishing was *kapu*. Currently, “star parties” are hosted at

Dillingham Airfield in Mokulē'ia where globular clusters, double stars, galaxies, and nebulae are observed. Additionally, a Waialua community member, Mr. Kawika Dowsett noted Mokulē'ia is the second best site (following after Mauna Kea) in the Islands to observe stars.

#### **1.4.8 Built Environment**

The *makai* portion of the Dillingham Ranch Agricultural Subdivision project area, along the level coastal plain, is currently used for equestrian activities. Existing ranch components include stables, fenced activity areas, ranch office structures, ranch employee residences, and the Dillingham Ranch Lodge. A commercial plant nursery for palm trees is also located in the *makai* portion of the Dillingham Ranch Agricultural Subdivision project area. The *mauka* portion of the Dillingham Ranch Agricultural Subdivision project area is largely undeveloped, with limited ranch-related infrastructure including fences, walls, water troughs, and a corral.

The surrounding area is rural, primarily consisting of pasturelands for grazing livestock and cultivated diversified agricultural lands. The Dillingham Airfield and glider port is located approximately 1 km (0.6 miles) west of the Dillingham Ranch Agricultural Subdivision project area. The residential community of Mokulē'ia is located approximately 0.25 km (0.15 miles) east of the Dillingham Ranch Agricultural Subdivision project area. Lands to the south of the Dillingham Ranch Agricultural Subdivision project area include the undeveloped Mokulē'ia Forest Reserve. *Makai* of the Dillingham Ranch Agricultural Subdivision project area are Farrington Highway, the Mokulē'ia Polo Field, and shoreline.

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## Section 2 Methods

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### 2.1 Archival Research

Research centers on Hawaiian activities including *ka‘ao* (legends), *wahi pana* (storied places), *‘ōlelo no‘eau* (proverbs), *oli* (chants), *mele* (songs), traditional *ka‘ao* (legends) and *mo‘olelo* (stories), traditional subsistence and gathering methods, ritual and ceremonial practices, and more. Background research focuses on land transformation, development, and population changes beginning with the early post-Contact era to the present day.

Cultural documents, primary and secondary cultural and historical sources, historic maps, and photographs were reviewed for information pertaining to the study area. Research was primarily conducted at the CSH library. Other archives and libraries including the Hawai‘i State Archives, the Bishop Museum Archives, the University of Hawai‘i at Mānoa’s Hamilton Library, Ulukau, The Hawaiian Electronic Library (Ulukau.org 2004), the State Historic Preservation Division (SHPD) Library, the State of Hawai‘i Land Survey Division, the Hawaiian Historical Society, and the Hawaiian Mission Houses Historic Site and Archives are also repositories where CSH cultural researchers gather information. Information on Land Commission Awards (LCAs) were accessed via Waihona ‘Aina Corporation’s Māhele database (Waihona ‘Aina 2000), the Office of Hawaiian Affairs (OHA) Papakilo Database (Office of Hawaiian Affairs 2015), and the Ava Konohiki Ancestral Visions of ‘Āina website (Ava Konohiki 2015).

### 2.2 Community Consultation

#### 2.2.1 Scoping for Participants

The cultural department commences our consultation efforts by utilizing our previous community contact list to facilitate the interview process. We then review an in-house database of *kūpuna* (elders), *kama‘āina* (native born), cultural practitioners, lineal and cultural descendants, Native Hawaiian Organizations (NHOs; includes Hawaiian Civic Clubs and those listed on the Department of Interior’s NHO list), and community groups. CSH also contacts agencies such as State Historic Preservation Division (SHPD), OHA, and the appropriate Island Burial Council where the proposed project is located for their response on the project and to identify lineal and cultural descendants, individuals and/or NHO with cultural expertise and/or knowledge of the study area. CSH is also open to referrals and new contacts.

#### 2.2.2 “Talk Story” Sessions

Prior to the interview, CSH cultural researchers explain the role of a CIA, how the consent process works, the project purpose, the intent of the study, and how their *‘ike* (knowledge) and *mana‘o* (thought, opinion) will be used in the report. The interviewee is given an Authorization and Release Form to read and sign.

“Talk Story” sessions range from the formal (e.g., sit down and *kūkā* [consultation, discussion] in the participant’s place of choice over set interview questions) to the informal (e.g., hiking to cultural sites near the study area and asking questions based on findings during the field outing). In some cases, interviews are recorded and transcribed later.

CSH also conducts group interviews, which range in size. Group interviews usually begin with set, formal questions. As the group interview progresses, questions are based on interviewees' answers. Group interviews are always transcribed and notes are taken. Recorded interviews assist the cultural researcher in 1) conveying accurate information for interview summaries, 2) reducing misinterpretation, and 3) adding missing details to *mo'olelo*.

CSH seeks *kōkua* (assistance) and guidance in identifying past and current traditional cultural practices of the study area. Those aspects include general history of the *ahupua'a* (traditional land division extending from the mountain to the sea); past and present land use of the study area; knowledge of cultural sites (for example, *wahi pana*, archaeological sites, and burials); knowledge of traditional gathering practices (past and present) within the study area; cultural associations (*ka'ao* and *mo'olelo*); referrals; and any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the study area.

### 2.2.3 Interview Completion

After an interview, CSH cultural researchers transcribe and create an interview summary based on information provided by the interviewee. Cultural researchers give a copy of the transcription and interview summary to the interviewee for review and ask that they make any necessary edits. Once the interviewee has made those edits, CSH incorporates their *'ike* and *mana'o* into the report. When the draft report is submitted to the client, cultural researchers then prepare a finalized packet of the participant's transcription, interview summary, and any photos taken during the interview. We also include a thank you card and honoraria.

It is important that CSH cultural researchers cultivate and maintain community relationships. The CIA report may be completed, but CSH researchers continuously keep in touch with the community and interviewees throughout the year—such as checking in to say hello via email or by phone, volunteering with past interviewees on community service projects, and sending holiday cards to them and their *'ohana* (family). CSH researchers feel this is an important component to building relationships and being part of an *'ohana* and community.

“*I ulu no ka lālā i ke kumu—the branches grow because of the trunk,*” is an *'ōlelo no'eau* (#1261) shared by Mary Kawena Pukui with the simple explanation: “Without our ancestors we would not be here” (Pukui 1983:137). As cultural researchers, we often lose our *kūpuna* but we do not lose their wisdom and words. We routinely check obituaries and gather information from other community contacts if we have lost our *kūpuna*. CSH makes it a point to reach out to the *'ohana* of our *kūpuna* who have passed on and pay our respects including sending all past transcriptions, interview summaries, and photos for families to have on file for genealogical and historical reference.

## Section 3 *Ka'ao and Mo'olelo*

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Hawaiian storytellers of old were greatly honored; they were a major source of entertainment and their stories contained teachings while interweaving elements of Hawaiian lifestyles, genealogy, history, relationships, arts, and the natural environment (Pukui and Green 1995:IX). According to Pukui and Green (1995), storytelling is better heard rather than read for much becomes lost in the transfer from the spoken to the written word and *ka'ao* (legends) are often full of *kaona* or double meanings.

*Ka'ao* are defined by Pukui and Elbert as a “legend, tale [...], romance, [and/or], fiction” (Pukui and Elbert 1986:108). *Ka'ao* may be thought of as oral literature or legends, often fictional or mythic in origin, and have been “consciously composed to tickle the fancy rather than to inform the mind as to supposed events” (Beckwith 1970:1). Conversely, Pukui and Elbert define *mo'olelo* as a “story, tale, myth, history, [and/or] tradition” (Pukui and Elbert 1986:254). The *mo'olelo* are generally traditional stories about the gods, historic figures or stories that cover historic events and locate the events with known places. *Mo'olelo* are often intimately connected to a tangible place or space.

In differentiating *ka'ao* and *mo'olelo* it may be useful to think of *ka'ao* as expressly delving into the *wao akua* (realm of the gods), discussing the exploits of *akua* in a primordial time. However, it is also necessary to note there are exceptions, and not all *ka'ao* discuss gods of an ancient past. *Mo'olelo* on the other hand, reference a host of characters from *ali'i* (chief), to *akua* and *kupua* (supernatural beings), to finally *maka'āinana* (commoners), and discuss their varied and complex interactions within the *wao kānaka* (realm of man). Beckwith elaborates, “In reality, the distinction between *ka'ao* as fiction and *mo'olelo* as fact cannot be pressed too closely. It is rather in the intention than in the fact” (Beckwith 1970:1). Thus a so-called *mo'olelo*, which may be enlivened by fantastic adventures of *kupua*, “nevertheless corresponds with the Hawaiian view of the relation between nature and man” (Beckwith 1970:1).

Both *ka'ao* and *mo'olelo* provide important insight into a specific geographical area, adding to a rich fabric of traditional knowledge. The preservation and passing on of these stories through oration remains a highly valued tradition. Additionally, oral traditions associated with the study area communicate the intrinsic value and meaning of a place, specifically its meaning to both *kama'āina* as well as others who also value that place.

The following section presents traditional accounts of ancient Hawaiians living in the vicinity of the Dillingham Ranch Agricultural Subdivision project area. Many relate an age of mythical characters whose epic adventures inadvertently lead to the Hawaiian race of *ali'i* and *maka'āinana*. The *ka'ao* in and around the Dillingham Ranch Agricultural Subdivision project area shared below are some of the oldest Hawaiian stories that have survived; they still speak to the characteristics and environment of the area and its people.

### 3.1 *Ka'ao*

#### 3.1.1 The Marriage of Kelea of Maui to Lo-Lae of Waialua

Lo-Lae was the brother of the high chief of O'ahu, Piliwale, whose court was established at Waialua. Piliwale desired that his brother marry in order to strengthen their court. Their mother,

Kalonaiki, had married Kikinui and “thus infused into the family the native and aristocratic blood of Maweke, of the ancient line of Nanaula” (Kalākaua 1990:232). As a result of the high rank of Lo-Lale, he felt there was no woman on O‘ahu he would agree to take as his wife. His cousin Kalamakua was sent on a mission to find a woman who would be a suitable match. His first stop was at Moloka‘i where he did not find anyone to his liking. He then departed for Maui and heard that the court of Kawao, *mo‘ī* (king, sovereign) of Maui, was at Hamakuapoko. Proceeding to meet with the court, he came across Kelea swimming in the ocean and invited her to ride the canoe into shore. After finding out she was the sister of the king, he invited her for another round of canoe surfing. She consented to a second and third ride when a storm came in and carried them out to sea. When the storm ceased, Kalamakua knew she would be a match for his cousin both in rank and beauty and he tricked her into coming to O‘ahu. When nearing Waialua he told her of his mission to find a wife for his cousin. After meeting Lo-Lale she agreed to marry him.

Following the marriage of Lo-Lale to Kelea at Waialua, their nuptials were celebrated with games, feasting, dancing and the commencement of a new heiau [pre-Christian place of worship] near Waialua, which was dedicated to Lono with a large image of Laamaomao . . . at the inner entrance, in poetic commemoration of the winds that drove Kelea away from the coast of Maui. [Kalākaua 1990:240]

Kelea was taken to Lihu‘e by royal procession and the celebrations continued there for many more days; this was the official union of Kelea, sister to Kawao, *mo‘ī* of Maui and Lo-Lale, brother of Piliwale, the King of O‘ahu. Although this union did not last, the couple had three children, one of whom, Kaholi, married his cousin Kohipa, the daughter of Piliwale and sister to his successor Kukaniloko. Kelea married Kalamakua, the aforementioned cousin of Lo-Lale. Together they had one daughter, Laielohelohe, who later became the wife of Pi‘ilani (Kalākaua 1990:228–246).

### 3.1.2 The Epic Tale of Hi‘iakaikapoliopole

In the *ka'ao* of Hi‘iakaikapoliopole, Hi‘iaka and her *aikāne* (friend), Wahine‘ōma‘o, travel the island of O‘ahu. The pair travel the *moku* of Waialua and to Mokulē‘ia where Hi‘iaka stops and chants:

Waialua of the booming seas

Heard in the uplands of Līhu‘e

Wahiawā is aroar

The voice of the sea resounds

The voice resounds

A voice from the sea. [Ho‘oulumāhiehie 2008:161]

Wahine‘ōma‘o asks her friend, “What is this sudden urge of emotion that makes you scorn the sea? The whole presence of the sea is maligned in the chant you just uttered. What did the sea do wrong?” Hi‘iaka explains to her friend that her chanting comes from a deep affection of the ocean continuing, “This is Waialua in the sea spray of Pua‘ena. We will not leave these sands until we go once again by sea, with Kaua‘i as our destination” (Ho‘oulumāhiehie 2008:161). They continue on to Mokulē‘ia where they see the spirit of Lohi‘au in the clouds. A somber Hi‘iaka begins to cry and the two women continue on their journey where they encounter Wahinepō‘aimoku, a woman who is also traveling the island. They cross paths with Wahinepō‘aimoku, and she begins to chant:



Ka'ena is wreathed in a cloak of sea spray by the wind  
 Spread out in the uplands of Poloea  
 The summit of Kamae is adorned by mist  
 Splendid is Waialua, there  
 As is Līhu'e, beloved indeed  
 The highlands of Kamaoha  
 Malamanui is beautiful, joined with Kawaikōloa  
 Suffused with the aroma of ferns  
 Fragrant are the blooms of the fine grasses  
 Carried all the way to Kokoloea  
 The red blossom in the forest of Ka'au, there  
 Entertaining are the thoughts, taming the man  
 Adorning this body, is it you, there  
 The Kuahine rain dwells in Kanoenoe  
 The rains gather in the plains  
 The Ki'owao rain is like a handsome man  
 The red blossom in the upland of Kahui, there  
 Beautiful is Ka'ala, flawless in the calm  
 Grand mountain of Wai'anae  
 The Kaiāulu wind unfurls  
 From Kuaiwa to Pōka'i, there  
 Do not be cruel, my friend, to me  
 Recognize the need for your welcoming call  
 Is it you? [Ho'oulumāhiehie 2008:162]

Hi'iaka points out these *wahi* (places) in her chant, traversing from *makai* to *mauka* through Waialua to Wai'anae Moku. Continuing their journey, they pass Kawaihāpai Ahupua'a and rest on a small *pu'u* (hill) where they can see Ka'ena Point. Hi'iaka can also see her brothers Ka'ena and Pōhakuokaua'i from where she sits. Embarrassed by not having a *makana* (gift) in hand, she turns to her traveling party and begins to chant:

Ka'ena soars like a breeze in the calm  
 Like the swooping of an 'ua'u [Hawaiian petrel] bird  
 The billows, the billows of Ka'ie'iewaho  
 Like a man gorging on the sea in the calm

With the white caps in the face of the rocks  
 Thrashed by the sea 'til red  
 The faces of the billows  
 Sink into the sea Kāpeku  
 The winter sea splashes  
 A dark gloom rises over the water  
 A sea omen upon the land  
 The breaking sea of Kahulumanu  
 Exposed are the cloud banks, the reeling stormy banks  
 Kanaloa's multitudes, allies  
 Raging at the cape of Kalā'au  
 Torn at by the sea of Wawālua  
 A bit of water placed on the cliffs  
 Such water placed among the trees  
 The native of the place conceals  
 Those knowledgeable of the waters  
 The cliff-laced path reaching the foundation  
 The inner foundation, lying expansive  
 At the arrival of this wind  
 I have no proper gift, to my shame  
 My shame before the both of you. [Ho'oulumāhie 2008:163]

## 3.2 *Mo'olelo*

### 3.2.1 The Hīnālea Fish Basket

Sterling and Summers (1978:101–103) tell the story of the *'e'epa* (extraordinary, abnormal, as persons with miraculous powers), or *mo'o*, “lizard” woman, Kalamainu'u and her husband Puna'aikoa'e. This *mo'olelo* of the Hinalea Fish Basket was originally collected and published by Samuel Kamakau within *The Works of the People of Old* or *Na Hana a ka Po'e Kahiko* (Kamakau 1976). Sterling and Summers note that the *hinalea* (convict fish; *Hepatus triostegus*) trap was a traditional type of basket that “may have been that after which Kahuku, Weleki, Weleka, Pauhakaki, and Pauhakaka patterned the *kala* (unicorn fish; *Naso unicornis*) baskets of Ka'ena and after which Ku'ula and Hinahela wove the *kala* fish basket of Hamoa in Hana.” (Sterling and Summers 1978:101–103) The legend, as collected by Kamakau and later retold by Sterling and Summers (1978) is as follows.

Kalamainu'u lived at Makaleha, Mokulē'ia, in Waialua, O'ahu. Puna'aikoa'e lived in Kapa'a on Kaua'i but was brought to O'ahu after he fell for the beauty of Kalamainu'u. Sterling and Summers (1978) write:

Puna'aikoa'e was the son of Punanuikaialokele, the son of Punanuikaianaina. He had many 'grandparents' (kūpuna), chiefs of Kauai, who lived at Kapa'a, in the Puna district, and it was from there that Puna'aikoa'e was taken by Kalamainu'u. Puna'aikoa'e was a skilled surfer, well accustomed to the surfs of Makaiwa and Kaohala and Kalehuawehe, the surf of Wailua near to Kapa'a. Kalamainu'u was in search of a husband, and she found Puna'aikoa'e surfing on the surf of Kalehuawehe. As the chiefs surfing party was going ashore, he saw this beautiful woman on a long surfboard. He abandoned his own board and leaped upon hers to make love to her, and the mana of this astonishing woman drew him out to the ocean. They landed at Ka'ena, went up by way of Kuaokala to Kamae, Kaipukalo, and Pu'ukapele, then descended to the ravine of Waile'a. She took him by way of the mountains lest Hinale report that Puna'aikoa'e had been stolen by Kalamainu'u.

The land of Makaleha produced much food-kihi, lapa, and momona sweet potatoes, poi, 'awa, and bananas; and the woman broiled the fishes of that land caught by torch fishing-the kumu, uhu, ula, and others. Kalamainu'u and Puna'aikoa'e were together constantly, day and night. They lived in loving association as husband and wife, he not knowing that she was an 'e'epa. After a few months the handsome man grew pale and wan from this constant companionship. [Sterling and Summers 1978:101–103]

Sterling and Summers (1978) explain that Kalamainu'u and Puna'aikoa'e lived as husband and wife spending every waking moment with one another. During this time Puna'aikoa'e did not know that his wife was an 'e'epa. After months of being together, Puna'aikoa'e "grew pale and wan from this constant companionship" (Sterling and Summers 1978:101–103). Puna'aikoa'e desired to go back to ocean to surf and went to go ask his wife for permission to do so. Kalamianu'u consented to his request but warned her husband to not speak to anyone. Sterling and Summers recount the warning that Kalamianu'u gave and Kalamainu'u's conversation with Hinale and 'Akilolo:

One day he went up to a ridge facing the sea, and when he saw the surf of Pekue breaking and rolling in toward Waialua, and saw the surfs of Kapapale and Kauanui, and the break and spread of the surf of Pua'ena, he yearned for the surfs of that land. When he went back to their home he saw his wife sitting there doing up into a knot her lime-bleached hair that had turned the beautiful golden yellow of chiefesses' hair. He said to her "Auhea 'oe. Yours is a land with surfs, and that being so, I am asking you to consent to my going surfing, for I yearn for the surfs of the land.'

Kalamainu'u replied, 'I consent; go down and surf. But do not speak to anyone on the way. If you meet two men cultivating by the roadside and they call you, do not stop to speak to them. This is my command. Go and enjoy yourself, and when you are through with your pleasure, come back.' The 'e'epa woman pointed to the surfboard lying in the depths of the cave. Puna'aikoa'e drew it out, and went down.

He passed Pu'e'a, passed Hinale's heiau, passed Makapu'uhale, and went down to Kanoa, where Hinale and 'Akilolo were doing their cultivating. They called out to him, but he paid no attention; they called two or three times, but he did not glance their way. He went on down, and the two ran after him saying, 'We speak to you of life; if you refuse to listen you will die.'

Puna'aikoa'e turned and looked at them and said, 'My wife laid down her decree saying that I must speak to no one; but perhaps she does not know that I am talking to you two.'

The men said, 'Your wife is an *akua*; we cannot hide our talking together. She is Kalamainu'u, a mo'o of "forty thousand" (kini) mo'o, a mo'o of "four hundred thousand" (lehu) mo'o. Those are bodies of your wife. Because we pity you, we are telling you this. The surfboard you are carrying is your wife's tongue.'

'How can I be saved?' asked Puna'aikoa'e.

'There is no place here—your wife has many bodies, and can move swiftly. There is only one place you can escape to; if you can reach Hawaii where Pele is, then you can escape.'

'How can I get to Hawaii?' asked Puna'aikoa'e.

They explained to him, and when they were through, they said, 'Go and bathe in fresh water, and then go back and see for yourself the [*mo'o*] body of your wife. On your return, when you get to the short ridge go along the easterly side of the ravine and at the depression, climb up to the large flat rock there. From there you will see the [*mo'o*] body of your wife. Then go back along the trail that you ascended and take the trail that leads to your home. Whistle as you climb up, or you will die; she will not be expecting you so soon. She will change herself into a real woman, and when you meet she will tell you that we have been talking together and that you have seen her [*mo'o*] form. When she shows you her *akua* forms, be courageous or you will die. Instead, she will come to kill the two of us. [Sterling and Summers 1978:101–103]

After the conversation, Puna'aikoa'e does as he is instructed and goes to confront Kalamainu'u. She discovers that Puna'aikoa'e did not heed her warning and reveals her true form to him. Kalamainu'u is furious and promises to kill Hinale and 'Aikolo but fails in her attempts to do so. Sterling and Summers describe these events:

As she saw her husband come up, the 'e'epa received a premonition of the conversation he had had, and when he arrived she said, 'Just see how evil men are! You went down to go surfing—just to go surfing—however it was a trip that resulted in a vile attack on another! But that is not your fault. It is the fault of those insignificant kauwa-kauwa iki huahua makawele a kauhaha! I shall kill them!' At these words of the 'e'epa woman Puna'aikoa'e was filled with dread and thought within himself, I am terrified by the *akua* and grieved and agonized. But while she spoke he made no answer, being speechless with fright. The 'e'epa showed him her supernatural selves, kino *akua*, dreadful and terrifying, and creeping around his body, his mouth, his nostrils, his ears. He withstood it courageously while she

showed all her *akua* forms. Then the 'e'epa returned to the form of a woman. Because of her aloha for her husband, her anger subsided.

The 'e'epa went down to kill Hinale and his companion, but as she came down, the two ran into the sea. She pursued them there; they went into a cave—she pursued them there; then into a billow—she pursued them there; then into the pitted coral—she pursued them there. They went into the sea floor full of small holes—and there she could not go. Wearing by her efforts, she went ashore and fell asleep in the sun. Kuaō and Ahilea saw her and said, 'That is our mistress asleep in the sun; what is she doing there? Let us go and ask her.' They went to where she was sleeping, woke her up and inquired as to why she was tired and slept in the sun. She told her story from beginning to end and the two blamed Hinale and his companion.

'They were certainly in the wrong; they were supposed to be good brothers. You should kill them. They like the 'ohiki crabs of this beach to eat with the sweet potatoes which they cultivate in Kanoa, Keone'ae, and the uplands of Makaleha, but they are unskilled in torch fishing. You can cause their deaths through their fondness of 'ohiki. Go gather some 'inalua vines, observing a kapu, and on your return weave them into a trap. Begin at the entrance and when the part that goes in [the funnel] is finished, then bend [the warps] back to form the container. Spread apart (pu'umana a'e) the 'inalua kukulu [the warps], and bind them to shape the round part of the basket. When you see that the container has filled out and is big enough, then decrease its size by pushing together (hu'e) the 'inalua kukulu until the hina'i is completed. When the weaving of the hina'i is completed, the kapu will be over. Then go and dig 'ohiki crabs, take the hina'i into the sea, put in lots of pebbles from the tide pools, and set it in a good place, where there is a crevice so that the sea runs in and out. The name of such a "good place" is au [haunt]. Remove pebbles until the hina'i is properly balanced. Then go to a coral head, chew the 'ohiki, dive into the sea and place them in the hina'i and then go off to some distance. After a while dive again—Hinale and 'Akilolo will have come to eat their favorite food and you will find your enemies there in the hina'i.'

Kalamainu'u heeded these words and carried them out. All went as they had said it would, and she killed her enemies and tore them into little pieces, which became hinalea fish. From that time down to the overthrow of the ancient tabus, those who wove hina'i hinalea observed those tabu rules. In those days there were always plenty of hinalea caught by setting traps from the water (wai) of Kumalaekawa to the cape of Ka'ena—so many that a stench arose from the racks where they were drying. Kalamainu'u became an 'aumakua for trap fishing, 'aumakua ho'olu'ulu'u, at these places. [Sterling and Summers 1978:102]

### 3.2.1 Waia

In this particular *mo'olelo* regarding the *ali'i* Waia, another meaning or literal translation for the *moku* of Waialua is put forward. In this alternate translation of the place name, Waialua is translated as "doubly (*lua*) disgraced (*waia*)." This translation appears as a significant variation from the typically ascribed meaning of Waialua (derived from the name of a *lo'i* within the district). The former translation of Waialua, however, provides particular insights into the ancient

rulers of the district; it is believed that this translation of “doubly (*lua*) disgraced (*waia*)” in fact alludes to a traditional story of a hated *ali'i* who purportedly lived in the area (Handy and Handy 1972:466; Monahan et al. 2007; Pukui and Elbert 1986). According to Handy and Handy (1972), citing *Hoku o Hawaii* (1928):

Waia, the grandson of Wakea, was said to be a cruel chief. He cared nothing for the gods or for doing good. He had men and women killed for the fun of killing them. When he saw a maiden with shapely legs, he ordered them cut off, and if a man or woman had beautiful tattooing, he was put to death. Because of this he was driven away by the people. In the legend of Hi'iaka, it was said that Waia lived and practiced his evil deeds at Waialua. The people suffered so much there that the place was named for him Waia-lua (Doubly disgraceful). [Handy and Handy 1972:466]

David Malo (1951) also discussed the cruel chief Waia, son of Haloa and grandson of Wakea,

It is said that during Waia's reign a portent was seen in the heavens, a head without a body, and a voice came from it, uttering the words, 'What king on the earth below lives an honest life?' The answer returned was 'Kahiko.'

Then the voice came a second time from the head and asked the question, 'What good has Kahiko done?' Again came the answer from below, 'Kahiko is well-skilled in all the departments of the government; he is priest and diviner; he looks after the people in his government; Kahiko is patient and forbearing.'

Thereupon the voice from the portent said, 'Then it is Kahiko who is the righteous, the benevolent man.'

Again the head asked, 'What king on earth lives corruptly?' Then the people of the earth answered with a shout, 'Waia is the wicked king.' 'What sin has he committed?' asked the head.

'He utters no prayers, he employs no priests, he has no diviner, he knows not how to govern,' said the people.

'Then he is the wicked king,' said the head, and thereupon it withdrew into the heavens.

During Waia's reign Hawaii nei was visited by a pestilence, *mai ahulau*, which resulted in a great mortality among the people. Only twenty-six persons were left alive, and these were saved and cured by the use of two remedies, *pilikai* and *loloi*. [Malo 1951:245]

### 3.2.2 Legend of O'ahunui

The legend of O'ahunui briefly references the plains of Mokolē'ia in relation to a family of South Sea chiefs known as the Lo 'Aikanaka. This group was reviled by the *kama'āina* of Mokolē'ia as they were known to have a particular fondness for the taste of human flesh. Their practice of cannibalism was not only abhorred by the residents, but feared as well. The Lo-Aikanaka frequently “furnish[ed] material for their cannibal feasts” directly from the Waialua populace:

In the legend of Oahunui these cannibals are said to have come from the south: At Helemano . . . the last of the cannibal chiefs from the South Seas finally settled when driven from the plains of Mokuleia and Waialua by the inhabitants of those districts; for the people had been exasperated by the frequent requisitions on the *kamaainas* (old inhabitants) by the stranger chiefs to furnish material for their cannibal feasts. [McAllister 1933:138]

During the time that the Lo 'Aikanaka were living at Helemano, O'ahunui reigned as king. During the entertaining of the two courts, and the exchanging of civilities between O'ahunui and the Lo 'Aikanaka, he was invited to a feast hosted by the Lo 'Aikanaka. During the meal, O'ahunui feasts on human flesh, discovering a fondness for the taste; his desire for human flesh ultimately culminates with the sacrifice of his two young nephews. The legend concerning O'ahunui's cannibalism was related by Emma M. Nakuina, and documented in full within *Thrum's Hawaiian Almanac and Annual for 1894*:

On the plateau, or table-land, lying between Ewa and Waialua, on the island of Oahu, and about a mile off, and mauka of the Kaukonahua bridge, is the historical place called Kukaniloko.

This was the ancient birthplace of the Oahu kings and rulers. It was incumbent on all women of the royal line to retire to this place when about to give birth to a child, on pain of forfeiting the rank, privileges, and prerogatives of her expected offspring, should that event happen in a less sacred place.

The stones were still standing ten years ago, and may be are yet undisturbed, where the royal accouchements took place. In ancient times this locality was taboo ground, for here the high priest of the island had his headquarters. Himself descended from the chief families, and being, in many instances, an uncle or younger brother of the reigning king, or connected by marriage with those of the royal line, and being also at the head of a numerous, well organized, and powerful priesthood, his influence was hardly second to that of the king, and in some matters his authority was paramount.

A few miles mauka of Kukaniloko, toward the Waimea Mountains, is Helemano, where the last of the cannibal chiefs from the South Seas finally settled when driven from the plains of Mokuleia and Waialua by the inhabitants of those districts; for the people had been exasperated by the frequent requisitions on the *kamaainas* (original inhabitants) by the stranger chiefs to furnish material for their cannibal feasts.

To the east of Helemano, and about the same distance from Kukaniloko, is Oahunui (Greater Oahu), another historical place. This was the residence of the kings of the island. Tradition has it that previous to the advent of the cannibal strangers the place was known by another name.

When the Lo Aikanaka, as the last of the man-eating chiefs are called, were constrained to take up their residence in upper Helemano, a district just outside of the boundaries of those reserved for the royal and priestly residences, a young man called Oahunui was king. An elder sister named Kilikiliula, who had been as a

mother to him, was supposed to share equally with him the royal power and prerogative. This sister was married to a chief named Lehuanui, of the priestly line, but one not otherwise directly connected with royalty, and was the mother of three children; the two eldest being boys and the youngest a girl. They all lived together in the royal enclosure, but in separate houses, according to ancient custom.

Now, the Lo Aikanaka, on establishing themselves in upper Helemano, had at first behaved very well. They had been circumspect and prudent in their intercourse with the royal retainers, and had visited the young King to render their homage with every appearance of humility.

Oahunui was quite captivated by the plausible, suave manners of the ingratiating southern chief and those of his immediate retainers, and he invited them to a feast.

This civility was reciprocated, and the King dined with the strangers. Here it was strongly suspected that the dish of honor placed before the King was human flesh, served under the guise of pork.

The King found the dish very much to his liking, and intimated to the Lo Aikanaka chief that his *aipuupu* (chief cook or steward) understood the preparation and cooking of pork better than the royal cook did.

The Lo Aikanaka took the hint, and the young King became a very frequent guest at the Southerner's board—or rather, mat table. Some excuse or other would be given to invite the royal guest, such as a challenge to the King to a game of *konane* (a game like checkers); or a contest of skill in the different athletic and warlike sports would be arranged, and Oahunui would be asked to be the judge, or simply invited to view them. As a matter of course, it would be expected that the King would remain after the sports and partake of food when on friendly visits of this nature. Thus with one excuse or another he spent a great deal of his time with his new subjects and friends.

To supply the particular dainty craved by the royal visitor, the Lo Aikanaka had to send out warriors to the passes leading to Waianae from Lihue and Kalena, and also to the lonely pathway leading up to Kalakini, on the Waimea side, there to lie in ambush for any lone traveller, or belated person after la-i, aaho, or ferns. Such a one would fall an easy prey to the Lo Aikanaka stalwarts, skilful in the art of the *lua* (to kill by breaking the bones).

This went on for some time, until the unaccountable disappearance of so many people began to be connected with the frequent entertainments by the southern chief. Oahunui's subjects began to hint that their young King had acquired the taste for human flesh at these feasts, and that it was to gratify his unnatural appetite for the horrid dish that he paid his frequent visits to those who were his inferiors, contrary to all royal precedent.

The people's disapproval of the intimacy of Oahunui with his new friends was expressed more and more openly, and the murmurs of discontent grew loud and deep. His chiefs and high priest became alarmed, and begged him to discontinue his visits, or they would not be answerable for the consequences. The King was



thereby forced to heed their admonitions and promised to keep away from Lo's, and did so for quite a while.

Now, all the male members of the royal family ate their meals with the King when he was at home. This included, among others, Lehuanui, his sister's husband, and their two sons—healthy, chubby little lads of about eight and six years of age. One day after breakfast, as the roar of the surf at Waialua could be distinctly heard, the King remarked that the fish of Ukoa pond at Waialua must be pressing on to the *makaha* (floodgates) and he would like some aholehole.

This observation really meant a command to his brother-in-law to go and get the fish, as he was the highest chief present except his two royal nephews, too small to assume such duties.

Lehuanui, Kilikiliula's husband, accordingly went to Waialua with a few of his own family retainers and a number of those belonging to the King. They found the fish packed thick at the *makaha*, and were soon busily engaged in scooping out, cleaning, and salting them. It was quite late at night when Lehuanui, fatigued with the labors of the day, lay down to rest. He had been asleep but a short time when he seemed to see his two sons standing by his head. The eldest spoke to him: 'Why do you sleep, my father? While you are down here we are being eaten by your brother-in-law, the King. We were cooked and eaten up, and our skulls are now hanging in a net from a branch of the lehua-tree you are called after, and the rest of our bones are tied in a bundle and buried under the tree by the big root running to the setting sun.'

Then they seemed to fade away, and Lehuanui started up, shivering with fear. He hardly knew whether he had been dreaming or had actually seen an apparition of his little sons. He had no doubt they were dead, and as he remembered all the talk and innuendoes about the King's supposed reasons for visiting the strangers and the enforced cessation of those visits at the urgent request of the high priest and the chiefs, he came to the conclusion that the King had expressed a desire for fish in his presence only to send him out of the way. He reasoned that no doubt the King had noticed the chubby forms and rounded limbs of the little lads, and being debarred a chance of partaking surreptitiously of human flesh, had compelled his servants to kill, cook, and serve up his own nephews. In satisfying his depraved appetite, he had also got rid of two who might become formidable rivals; for it was quite within the possibilities that the priests and chiefs in the near future, should he be suspected of a desire for a further indulgence in cannibal diet, might depose him, and proclaim either one of the young nephews his successor. [Thrum 1893:90–93]

Upon being visited by the spirits of his recently sacrificed sons, Lehuanui sets forth to confront O'ahunui and the king's sister, Kilikiliula (Lehuanui's wife). For their roles in the death and cannibalism of his sons, Lehuanui puts both O'ahunui and Kilikiliula to death. The bodies of both O'ahunui and his sister Kilikiliula were said to have turned to stone:

The father was so troubled that he aroused his immediate body servant, and the two left Waialua for home shortly after midnight. They arrived at the royal enclosure at

dawn, and went first to the lehua-tree spoken of by the apparition of the child, and on looking up amid the branches, sure enough there dangled two little skulls in a large-meshed fishing-net. Lehuanui then stooped down and scraped away the leaves and loose dirt from the root indicated, and out rolled a bundle of tapa, which on being opened was found to contain the bones of two children. The father reached up for the net containing the skulls, and putting the bundle of tapa in it, tied the net around his neck. The servant stood by, a silent and grieved spectator of a scene whose meaning he fully understood.

The father procured a stone adze and went to the King's sleeping-house, the servant still following. Here every one but an old woman tending the kukui-nut candle was asleep. Oahunui was stretched out on a pile of soft mats covered with his *paiula*, the royal red kapa of old. The cruel wretch had eaten to excess of the hateful dish he craved, and having accompanied it with copious draughts of awa juice, was in a heavy, drunken sleep.

Lehuanui stood over him, adze in hand, and called, 'O King, where are my children?' The stupefied King only stirred uneasily, and would not, or could not, awake. Lehuanui called him three times, and the sight of the drunken brute, gorged with his flesh and blood, so enraged the father that he struck at Oahunui's neck with his stone adze, and severed the head from the body at one blow.

The father and husband then strode to his own sleeping-house, where his wife lay asleep with their youngest child in her arms. He aroused her and asked for his boys. The mother could only weep, without answering. He upbraided her for her devotion to her brother, and for having tamely surrendered her children to satisfy the appetite of the inhuman monster. He reminded her that she had equal power with her brother, and that the latter was very unpopular, and had she chosen to resist his demands and called on the retainers to defend her children, the King would have been killed and her children saved.

He then informed her that, as she had given up his children to be killed for her brother, he had killed him in retaliation, and, saying, 'You have preferred your brother to me and mine, so you will see no more of me and mine,' he tore the sleeping child from her arms and turned to leave the house. The poor wife and mother followed, and, flinging herself on her husband, attempted to detain him by clinging to his knees; but the father, crazed by his loss and the thought of her greater affection for a cruel, inhuman brother than for her own children, struck at her with all his might, exclaiming, 'Well, then, follow your brother,' and rushed away, followed by all his retainers.

Kilikiliula fell on the side of the stream opposite to where the lehua-tree stood, and is said to have turned to stone. The stone is pointed out to this day, balanced on the hillside of the ravine formed by the stream, and is one of the objects for the Hawaiian sightseer.

The headless body of Oahunui lay where he was killed, abandoned by every one. The story runs that in process of time it also turned to stone, as a witness to the

anger of the gods and their detestation of his horrible crime. All the servants who had in any way been concerned, in obedience to royal mandate, in killing and cooking the young princes were, at the death of Kilikiliula, likewise turned to stone, just as they were, in the various positions of crouching, kneeling, or sitting.

All of the rest of the royal retainers, with the lesser chiefs and guards, fled in fear and disgust from the place, and thus the once sacred royal home of the Oahuan chiefs was abandoned and deserted.

The ban of the great god Kane's curse, it is believed, still hangs over the desolate spot, in proof of which, it is asserted that, although all this happened hundreds of years ago, no one has ever lived there since. [Thrum 1893:93–95]

### 3.2.3 Legend of Ma'ikohā

Within the Legend of Ma'ikohā, originally documented within Fornander's *Collection of Hawaiian Antiquities* (1918:5[2]), "the seashore at Kealia in Mokuleia, Kawaihapai, Waialua" is mentioned as the location where Kāne'aukai, a god of fisherman and brother to Ma'ikohā, changes into human form and proceeds to provide his name to two old fishermen at Kapaeloa (Sterling and Summers 1978:53). Ma'ikohā functions in this tale as the god of *kapa* (bark cloth) makers, "it is said from his grave in Kaupō, on the island of Maui, grew the first *wauke* (paper mulberry; *Broussonetia papyrifera*) plant" (Krauss 1993:60). When Ma'ikohā's sisters came searching for him on Maui, they found only the living *wauke* plant, and thus decided to continue their journey to O'ahu. On O'ahu, the sisters found husbands and settled into marriage; sometime afterward, their eldest brother Kāne'aukai (also sibling to Ma'ikohā) came in search of them:

Maikoha was a brave and fearless young man who broke the kapu poles, the sacred places of worship, the kapu insignia and all the different sacred things. When his father Konikonia found which of his 10 children had done such an unholy thing Maikoha was banished from his home. He went to Kaupo, Maui where he changed into the wauke plant and it is at Kaupo that this plant first grew. Because Maikoha's body was very hairy the wauke plant is therefore the same. Maikoha's sisters came to Maui in search of him and after finding him already changed into the wauke plant continued on their journey to Oahu.

Upon their arrival on Oahu, Kaihuopalaai saw a goodly man by the name of Kapapaapuhi who was living at Honouliuli, Ewa; she fell in love with him and they were united, so Kaihuopalaai has remained in Ewa to this day. She was changed into that fish pond in which mullet are kept and fattened and this fish pond is used for that purpose to this day. When Kaihuopalaai decided to live in Ewa, her sisters proceeded on to Waianae, where Kaihukoa decided to make her home and she was married to Kaena a man who was living at this place, a very handsome man and a chief of Waianae. So she remained in Waianae and she is there to this day. She changed into that fishing ground directly out from the Kaena Point, and the fishes that came with her were the ulua, the kahala, and the mahimahi.

When Kaihukoa decided to stay in Waianae, the remaining sisters continued on to Waialua, where Kawailoa met Ihukoko. Kawailoa was a single man and as he fell in love with Ihukoko the two were united and they became husband and wife.

Ihukoko remained here, and the fish that accompanied her from their home was the *aholehole*.

When Ihukoko decided to remain in Waialua, the sister that was left, Kahukuuna, continued on her way until she came to Laie where she met Laniloa, a goodly man, and they lived together as husband and wife. The fish that came with her was the mullet and it too remained there to this day. After the sisters were all married and had been living with their husbands on Oahu for some time, Kaneaukai (a popular god of fisher folk) their oldest brother came in search of them. This man's body was in the shape of a log of wood, and after he had, floated on the surface of the ocean for several days, it drifted to the seashore at Kealia in Mokuleia, Kawaihapai, Waialua, where it was carried in and out by the tide. After being in this form for some time it changed into a human being and journeyed to Kapaeloa, where two old men were living.

When he approached the home of the two old men, he saw them watching an umu (oven), and after it was covered up they set out to the beach to do some fishing. After fishing for some time without success Kaneaukai called out to them: 'Say, you old men, which god do you worship and keep?' The old men replied: 'We are worshipping a god, but we do not know his name.' Kaneaukai then said: 'You will now hear and know his name. When you let down your net again, call out, "Here is the food and fish, Kaneaukai," that is the name of the god.' The old men assented to this, saying: 'Yes, this is the first time that we have learned his name.' Because of this fact, Kaneaukai is the fish god worshiped by many to this day, for Kaneaukai became their fish god, and from them others, if they so desired. [Fornander 1918:270 in Sterling and Summers 1978:53–54]

### 3.2.4 Kaloulu and the Pule Ho'ōla

In *Ka Poe Kahiko* (1991), revered historian Samuel Kamakau tells the modern story of a *kahuna* who saves a couple from death during "a great fish-poisoning day (*la halahala nui*) from Waialua to the fishing grounds at Mokuleia" (Kamakau 1991:127):

Here is a good thing I have seen. There was a great fish-poisoning day (*la halahala nui*) from Waialua to the fishing grounds at Mokuleia, called a '*hola moku*,' a district poisoning. A woman named Kihewakeoho was with a man at Waialua. One of them caught a *manini* fish, and the other an *aholehole*, and bit their heads. The fishes wriggled down into their throats, and stuck. The two struggled about on the surface of the water, and, as there were many people there, they were pulled ashore. They were almost dead. The fishes were too big to push in or to pull out, and their fins stood upright. The two were so near death that wailing began. A man named Kaloulu arrived, who was a *kahuna 'ana'ana* and *kahuna kuni*. He forecast life or death thus: 'As I pray, if my prayer does not go well [literally, goes obliquely, *a'e ka pule*], they will die; wail for them. But if my prayer goes well (*lele wale*), they will not die.' Then he called upon all the '*aumakua*,' and then began his prayer, a prayer to heal.

## PULE HO'OLA

Choke and live; strangle and live.

Soften O fish, cook through, O fish,

Fall to pieces, O fish, grow soft, O fish;

Let the bones decay, let the bones turn to ash.

You ate the manini fish,

You are strangled and choked; life draws out fine;

You are doubled up; life draws out fine;

You are doubled over, helpless; life draws out fine.

You ate the aholehole fish,

You are strangled and choked; life draws out fine;

You are doubled over, helpless; life draws out fine . . .

And so on he went. As the kahuna prayed, the fishes became as soft as fishes cooked in a fire and they came out, and the persons got their breaths again. *Pomaika'i ke ola na ke Akua*, 'Blessed is life from God.' [Kamakau 1991:127–128]

### 3.2.5 The Menehune Lights of Kawaihāpai

Sterling and Summers (1978) include documentation of numerous accounts (from eye witnesses) describing the lights of *menehune* (a legendary race of small people who worked at night, building fishponds, roads, temples). Those who had observed the lights noted that, “it is the menehunes at their fishing, working fast against the coming of the dawn” (Raphaelson in “Kings, Gods and Wars Along Oahu’s Roads, etc.” *Honolulu Star-Bulletin* 17 January 1925 in Sterling and Summers 1978:100). Two residents, Mr. Tom Low and Mrs. Margaret Kaimoku (Mrs. Figera), also noted that the *menehune* lights “are said to be seen off of Kawaihapai looking from Kawaihoa” (Sterling and Summers 1978:100). In addition to the *menehune* lights, other supernatural occurrences have been noted in the area. According to two eyewitnesses, a line of lights was observed moving down a ridge between Mokulē‘ia and Kawaihāpai Ahupua‘a by Dillingham Airfield:

Ricky, a security guard at the Cades Schutte building, claims he once caught a glimpse of the night marchers during a brief trip to Waialua some 19 years ago. Ricky and his then-girlfriend, Jennifer, visited their friend Richard and his son Ryan, who were camping on Mokulē‘ia Beach. Ricky remembers the exact date: July 5, 1995. They arrived on the beach between 10 and 11 p.m. A distant flash of light caught their attention in the dark: It looked like a line of fire ants marching down the mountain by Dillingham Airfield.

‘I thought people were hunting, but there was a long line of torches,’ he says.

It was a strange sight at first, because it looked like a[n] endless line of torches disappearing off the mountain ridge. But he later realized those weren’t hunters, but night marchers. He recalls hearing the legend of the night marchers as a kid at

YMCA Camp Erdman. One staffer always used to warn young campers about a night marchers path in the same spot he saw them. [Lee 2016]

### 3.3 *Wahi Pana*

*Wahi pana* are legendary or storied places of an area. These legendary or storied places may include a variety of natural or human-made structures. Oftentimes dating to the pre-Contact period, most *wahi pana* are in some way connected to a particular *mo'olelo*, however, a *wahi pana* may exist without a connection to any particular story. Davianna McGregor outlines the types of natural and human-made structures that may constitute *wahi pana*:

Natural places have mana, and are sacred because of the presence of the gods, the akua, and the ancestral guardian spirits, the 'aumakua. Human-made structures for the Hawaiian religion and family religious practices are also sacred. These structures and places include temples, and shrines, or heiau, for war, peace, agriculture, fishing, healing, and the like; pu'uhonua, places of refuge and sanctuaries for healing and rebirth; agricultural sites and sites of food production such as the lo'i pond fields and terraces slopes, 'auwai irrigation ditches, and the fishponds; and special function sites such as trails, salt pans, holua slides, quarries, petroglyphs, gaming sites, and canoe landings. [McGregor 1996:22]

As McGregor makes clear, *wahi pana* can refer to natural geographic locations such as streams, peaks, rock formations, ridges, offshore islands and reefs, or they can refer to Hawaiian land divisions such as *ahupua'a* or *'ili*, and man-made structures such as fishponds. In this way, the *wahi pana* of Mokulē'ia and Kawaihāpai tangibly link the *kama'āina* of Mokulē'ia and Kawaihāpai to their past. It is common for places and landscape features to have multiple names, some of which may only be known to certain *'ohana* or even certain individuals within an *'ohana*, and many have been lost, forgotten or kept secret through time. Place names also convey *kaona* (hidden meanings) and *huna* (secret) information that may even have political or subversive undertones. Before the introduction of writing to the Hawaiian Islands, cultural information was exclusively preserved and perpetuated orally. Hawaiians gave names to literally everything in their environment, including individual garden plots and *'auwai*, house sites, intangible phenomena such as meteorological and atmospheric effects, *pōhaku* (rock, stone), *pūnāwai* (freshwater springs), and many others. According to Landgraf (1994), Hawaiian *wahi pana* “physically and poetically describes an area while revealing its historical or legendary significance” (Landgraf 1994:v).

The *wahi pana* listed below span the length and breadth of Waialua Moku. Most of these *wahi pana* remain firmly within the *ahupua'a* of Mokulē'ia and Kawaihāpai, however, two sites, Ka'ena Point and Kukaniloko are situated beyond *ahupua'a* boundaries. These *wahi pana* are included in this discussion of legendary sites due to their association with *mo'olelo*, *'ōlelo no'eau* (proverbs), and/or *oli* and *mele* integral to understanding the over-arching narrative of both Mokulē'ia and Kawaihāpai Ahupua'a.

#### 3.3.1 Hidden Waters

According to Sterling and Summers (1978), the *wahi pana* known as the Hidden Waters refers to a location “mountain side of Kawaihoa Heiau” (see Section 3.3.3) that consists of four springs associated with the goddess Hi'iaka. *Mo'olelo* regarding the site recounts how Hi'iaka was refused

water by the old residents of Mokulē'ia. This refusal prompts Hi'iaka to call forth the waters; in calling forth the waters, she identifies each by name:

Their names, as given by Hookala, are Ulunui, Koheiki, Ulehulu, and Waiakaaiea. Further toward Kaena Point is another water known as Kawaikumuole, which is a conjunction of Kanaloa and Waihuna a Kaalai. Another hidden water, which Hookala says is mentioned in the Hiiaka chant is Kuilaau o Kealia, but he does not know its location. [McAllister 1933 in Sterling and Summers 1978:100]

### 3.3.2 Ka'ena Point

Ka'ena Point, described as “a dry, hot region on the western extremity of Oahu” (McAllister 1933 in Sterling and Summers 1978:92) is a known *leina a ka 'uhane* (leaping point for the souls of the deceased). Ka'ena Point is often included in descriptions of Mokulē'ia and Waialua District at large. The inclusion of this *wahi pana* within general descriptions and stories for Mokulē'ia, Kawaihāpai, and Waialua can be understood through the *'ōlelo no 'eau* (see Section 1.4.3), “*Like nō Ka'ena me Waialua,*” (Pukui et al. 1983:215), Ka'ena and Waialua are often understood as one. An informant for McAllister (1933) by the name of Hookala noted the following regarding the *wahi pana* of Ka'ena Point:

. . . when an individual lay on the deathbed his soul left the body and wandered about, first going to a fishing shrine (ko'a) named Hauone (site 189). If all earthly obligations had been fulfilled, the soul continued wandering, otherwise it was returned to the body. In its continued wandering it then approached Leina Kauhane at Kaena Point. Here it was taken by two minor gods . . . and thrown into a pit known as Lua ahi a Kehena. It was at the time that the soul was thrown into this pit that death actually came upon the body. The soul then went to a ulu o le'i walo (near Kinimakalehua?) on the boundary between Ewa and Honolulu Districts. Here the road divided, the clean good soul went to the right, and the other to the left. [Sterling and Summers 1978:92]

Conversely, Nathaniel Emerson details how the *'aumakua* of a wandering soul (souls were known to frequently wander from their bodies during sleep or unconsciousness) would either guide the soul back into the body or guide the soul to the leaping place (called “leina uhane” by Emerson) at the edge of the “nether world” (Sterling and Summers 1978:92). This “nether world” was known as “Ka-paa-heo:”

This was an insubstantial land of twilight and shades, a barren and waterless waste, unblest by grass, or flower, or tree, or growing herb. Here the famished ghosts of men, who fled each other's presence in fear and suspicion, strove to appease their hunger by eating butterflies, moths, and lizards. This region was under the sway of Milu, and hence was called ka lua o Milu. It was from this place that Hiku rescued the ghost of his sister or bride, kawelu. Entrance to Milu was supposed to be gained through a pit situated in the mouth of Waipio valley on Hawaii, also in some other places [Emerson in Sterling and Summers 1978:92].

Besides functioning as a leaping point for souls, Kamakau notes that Ka'ena Point represents the location where the demi-god Maui attempted to unite Kaua'i and O'ahu. Sterling and Summers (1978) attribute this knowledge to Emerson:

. . . after stationing himself on the western extremity of Oahu, . . . from which the island of Kauai is clearly visible on a bright day, Maui cast his wonderful hook, Mana-ia-ka-lani, far out into the ocean that it might engage itself in the foundations of Kauai. When he felt that it had taken a good hold, he gave a mighty tug at the line. A huge boulder, the Pohaku o Kaua'i, fell at his feet. [Emerson 1915:104]

According to Annie Keahipaka (the great-great-grand aunt of Thomas Shirai, Jr., a lineal and cultural descendant of Mokulē'ia and Kawaihāpai Ahupua'a,

Maui had many helpers tugging at the line. One disobeyed orders and looked back as Kauai was being drawn up to Oahu. This caused the line to break and Kauai to slip back into the ocean, with only the fragment Pohaku o Kauai remaining, which to this day is proof of Maui's mighty effort [Sterling and Summers 1978:93].

Emerson elaborates further upon the legend of Maui at Ka'ena Point: "The mystic hook, having freed itself from the entanglement, dropped into Pālolo Valley and hollowed out the crater, that is its grave." Frustrated that he is unable to free the entire land mass of Kaua'i, Māui throws his hook into the sky where it becomes a constellation, still easy to see in the spring and summer months, known by Western astronomers as the tail of Scorpio (Ho'okuleana LLC 2014)

In the Hawaiian sky, during the season of Kau (summer season, May to October), Manaiakalani (The Chief's Fishline) is visible for most of the night, just as Ke Ka o Makali'i (The Canoe-Bailer of Makali'i) is visible for most of the night in the sky of Ho'oilo (winter season, November to April) (Ho'okuleana LLC 2014). Manaiakalani is used in celestial navigation, an important guide for seafarers. The *ahupua'a* of Mokulē'ia and Kawaihāpai are noted as a favored location to observe the night sky (see Section 1.4.7):

### 3.3.3 Kawailoa Heiau

According to Rudy Mitchell this *heiau* is located within Mokulē'ia Ahupua'a; the function of this *heiau*, however, was not noted. Sterling and Summers (1978) note that only a portion of two terraces remain:

The upper terrace is 66 feet long and 4 feet high, and is excellently paved with small stones a few inches in size. The southwest limits can not be discerned. On the east end is a wall 1.5 feet high which can be followed for about 10 feet. The lower terrace was 25 feet wide with a facing 2 feet high, which can only be traced a short distance. The houses (kahua hale) in which the kahunas lived were known as 'Paweo', according to Hookala. This is undoubtedly the site referred to by Thrum [1909] as Paweu, 'A small heiau 58 by 65 feet at the base of the hill: badly damaged by freshets.' [McAllister 1933 in Sterling and Summers 1978:99–100]

### 3.3.4 Keālia Trail

According to Handy (1985), Keālia was a "large area of lowland terraces between the cliff and elevated coral," and remained mostly within the *ahupua'a* of Kawaihāpai (Handy 1985:85). The current Keālia Trail traverses sections of Kawaihāpai Ahupua'a above Dillingham Airfield; the trail primarily consists of 2.5 miles of switchbacks and rises to an elevation of 1,600 ft:

At one (1) mile, the trail crests the cliff, becomes a dirt road and continues up the ridge. This road connects with the Kuaokala Access Road. This short trail offers



great views of Waialua and Haleiwa towns and the north shore. There are also great views of Dillingham Airfield and the fixed-wing gliders as they soar overhead. [Nā Ala Hele Trail and Access Program n.d.]

The Nā Ala Hele Trail and Access Program notes that the trail is historic in nature, having been built in 1934 by the Civilian Conservation Corps (CCC):

A 42-man crew from the Wahiawa Camp began construction in March [of 1934] and finally finished in September. Whole sections of the route had to be blasted out of the lava rock. Look for some historical graffiti left by a trail crew member, probably during lunch break. He carved his initials, the date, and 'C. C. C.' on a rock face just after the eleventh switchback. The holes near the inscription are not left over from CCC blasting, but were drilled more recently by geologists studying changes in the earth's magnetic field. In early 1993, Na Ala Hele, the State trail program, completely renovated the switchback section, which had gradually deteriorated over the years. On June 6, renowned trail builder Richard H. (Dick) Davis led an evening procession up the refurbished route to celebrate National Trails Day. About 240 people climbed to the top of the pali by flashlight. [Nā Ala Hele Trail and Access Program n.d.]

### 3.3.5 Keauau Shrine

The Keauau fishing shrine or *ko'a* was once located on the beach at Pu'uiki, at the Ka'ena end of a long row of ironwood trees. McAllister identifies this *wahi pana* as Site 201, noting that nothing remains of the site (McAllister 1933 in Sterling and Summers 1978:105).

### 3.3.6 Kōlea Shrine

The Kōlea fishing shrine or *ko'a* (identified by McAllister [1933] as Site 195) is located within the *ahupua'a* of Mokolē'ia. The shrine is located on the beach in a direct line with the current Dillingham Ranch stables. The stones have been removed and only an indistinct line of stones measuring approximately 15 by 30 ft remains to mark the original foundation of the *ko'a* (McAllister 1933 in Sterling and Summers 1978:101). A stone in the water, called Mokupaoa, still exists in front of Kōlea; Mokupaoa functions as a personal *ko'a* for the 'ohana of Thomas Shirai, Jr.

### 3.3.7 Kuakea Shrine

The Kuakea fishing shrine (*ko'a*), located within Kawaihāpai Ahupua'a, was formerly located on the beach in a direct line with Kawailoa Heiau. McAllister identifies this *wahi pana* as Site 193, noting that nothing marks the site (McAllister 1933:120).

### 3.3.8 Kūkaniloko

According to historian Samuel M. Kamakau, "the chiefs of Lihue, Wahiawa, and Halemano on Oahu were called *Lo* chiefs, *po'e Lo Ali'i* [people from whom to obtain a chief], because they preserved their chiefly kapus" (Kamakau 1964:5); amongst the ranks of *Lo ali'i* was a chief by the name of Kūkaniloko. Kamakau elaborates on this chiefly class to whom Kūkaniloko belonged:

. . . They lived in the mountains (*i kuahiwi*); and if the kingdom was without a chief, there in the mountains could be found a high chief (*ali'i nui*) for the kingdom. Or

if a chief was without a wife, there one could be found—one from chiefly ancestors.  
[Kamakau 1964:5]

Kūkaniloko also is the name of “one of the two famous places in the Hawaiian Islands for the birth of children of tapu chiefs . . . Kūkaniloko is said to have been established by Nanakaoko and his wife Kahihiokalani, whose son, Kapawa, heads the list of the important *alii* born here” (McAllister 1933:134, 135). It is located approximately 200 m west of the intersection of Kamehameha Highway and Whitmore Road. Associated with, and located near, Kūkaniloko was Ho‘olonopahu Heiau where “were kept the sacred drums of Opaku and Hawea which announced the birth of an alii” (McAllister 1933:147). Sacred sites like Kūkaniloko and Ho‘olonopahu were not only significant to the Wahiawā area, but to the *moku* of Waialua at large. These sites were considered the *piko* (navel) and suggest the significance of the *moku* in the Hawaiian consciousness during pre-Contact times. Additionally, these *wahi pana* prove integral to understanding the multiple over-arching narratives of both Mokulē‘ia and Kawaihāpai Ahupua‘a. In 1925, John Holani Hao (1925) composed the following *mele* in honor of Kūkaniloko:

<i>He Mele No Kukaniloko</i>	Song for Kukaniloko
<i>No Kukaniloko ko'u aloha,</i>	For Kukaniloko is my aloha,
<i>Ke kupa noho kula a o Kalakoa,</i>	Native dwelling on the plains of Kalakoa,
<i>Kahi hanau hoi o na alii,</i>	Birthplace of the alii,
<i>Wohi hoi a o Hawaii nei;</i>	Wohi chiefs of Hawaii nei;
<i>Walea i ke kui lei Ahihi,</i>	Taking pleasure in stringing lei of Ahihi,
<i>Lei hookipa no ka malihini;</i>	A lei of welcome for the visitor;
<i>Paa mai uka i ka uhiwai,</i>	The uplands are covered by fog,
<i>O ke kehau anu ko ke kuahiwi;</i>	The cold mist of the mountains;
<i>Halihali mai ana i ke ala,</i>	Carrying along the scent,
<i>Ke ala o maile Nohoanu;</i>	The fragrance of maile in the cold;
<i>Auau aku i ka wai o Kuaikua,</i>	Bathing in the waters of Kuaikua,
<i>Wai hooheno a na'lii;</i>	Cherished waters of the alii;
<i>Na mamō hoi a Kakuhihewa,</i>	The descendants of Kakuhihewa,
<i>A na pua a ka Na'i Aupuni;</i>	And progeny of the Conqueror of the Nation;
<i>Nana i rula mai a pololei,</i>	Who ruled with righteousness,
<i>Me ka ihe laumeki i ka lima;</i>	With barbed spear in hand;
<i>A he puuwai koa me ka wiwoole;</i>	And a brave and fearless heart;
<i>Imi maluhia no ka lahui;</i>	In pursuit of peace for the people;
<i>Hui pau ia mai na ailana,</i>	Completely joining the islands,
<i>Mai Hawaii a Niihau,</i>	From Hawaii to Niihau,

<i>Noho hoomalu ia me ke kaulike,</i>	Living in peace with equality,
<i>Mamalahoā kanawai;</i>	The law of Mamalahoā;
<i>Hainaia mai ana ka puana,</i>	Let the refrain be told,
<i>No Kukaniloko ko'u aloha.</i>	For Kukaniloko is my aloha.

[Hao 1925]

Due to Kūkaniloko's cultural and historical significance, McAllister (1933) reported "this site is the only site on Oahu that is being officially preserved." The site is listed on the National and Hawai'i Registers of Historic Places. Currently, the Hawai'i State Parks maintains and manages Kūkaniloko Birthstones State Historic Site in partnership with the Friends of Kūkaniloko, and the Hawaiian Civic Club of Wahiawā.

### 3.3.9 Kumaipo Trail

According to Sterling and Summers (1978), a branch of the Kumaipo Trail leading up to Mauna Ka'ala allowed individuals to access the flat and level lands of Waialua and Mokulē'ia:

There was also a trail going up from Waianae and then down Makaha-uka, called Kumaipo. Below that trail was a fortress in the olden days, named Kawiwi. The fortress is on a ridge leading down from a mountain, and it lies between Waianae and Makaha, overlooking Kamaile. The trail, Kumaipo, went down to the food patches of Makaha and the homes on that land. A branch of the trail went up the mountain that looked down on Waialua and Mokuleia, where the people could travel down to the flat and level lands. It was customary to have dwelling places along the mountain trails that lead downward from there into Kamaile, and also along the beach trail of Makaha. [Na hunahuna no ka moolelo Hawaii, *Ka Nūpepa Kū'oko 'a* 1 January 1870, HEN:1:2705 in Sterling and Summers 1978:77]

### 3.3.10 Makaleha

The *wahi pana* known as Makaleha refers to a terrace area, stream, and valley. According to Handy, two *lo'i kalo* were once prominent features of Makaleha; these terraced areas later became patches planted with Chinese bananas and sugarcane:

There are two extensive old terrace areas in Mokuleia on the flatland near the sea. One is just below the Dillingham Ranch, watered by an underground flow from a gulch west of the ranch house. This area of old terraces is now entirely planted in Chinese bananas. The other large area, which is now planted mostly in bananas but partly in cane, is seaward of Makaleha Stream. Wild taro grows in Makaleha Valley and its subsidiaries. Kamakau, speaks of the 'abundance of food' grown in Makaleha, of the kihi and lapa varieties of taro, of sweet potatoes, awa, bananas... [Handy 1985:85]

### 3.3.11 Mauna Ka'ala

The northern point of the Wai'anae Mountain Range is at Ka'ala (possibly "laughter" or "the path"). Mauna Ka'ala is the highest peak on the island of O'ahu, at 4020 ft amsl (above mean sea level):

Its flat-top profile is a familiar sight to most residents of the island. The product of volcanic eruptions nearly four million years ago, the Wai'anae Mountains have seen eons of wind and rain, cutting huge valleys and sharp ridges into the extinct volcano. Today, only a small remnant of the mountain's original flat summit remains, surrounded by wet cliffs and narrow ridges, to which gnarled 'ohi'a trees cling. There, often hidden by clouds, an ancient Hawaiian rain forest grows on a fog-bound plateau. [State of Hawai'i 2016]

The goddess Kaiona is said to reside at Mauna Ka'ala, and was known to protect travelers traversing the mountain, oftentimes sending an *'iwa* (Great frigatebird) to guide lost travelers out of the dense ancient rain forest. According to lineal and cultural descendant of Waialua, Mr. Thomas Shirai, Jr., the profile of Mauna Ka'ala also resembles that of a pregnant woman lying down, with the remainder of her limbs (including her womb) stretching out across Waialua Moku toward the *ahupua'a* of Mokulē'ia and Kawaihāpai. Mauna Ka'ala is currently within the Mokulē'ia Forest Reserve. In addition to this peak, the area known as Kama'i (Peacock Flats) is also contained within the forest reserve. Mr. Shirai noted that Kama'i is a reference to the menstrual cycle of a woman, and that both *wahi pana*, Ka'ala and Kama'i, are connected to each other.

### 3.3.12 Mokupaoa

Mokupaoa, a *pōhaku* located in the waters directly fronting the *ko'a* of Kōlea is itself a *ko'a*. Lineal and cultural descendant Mr. Thomas Shirai, Jr. discussed the significance of the cultural site in a letter addressed to Aaron's Dive Shop (the letter urged the dive shop to identify the cultural site by its traditional Hawaiian name):

I appreciate the diving tours that your company offers to the public . . . However I have a great concern about the names (labelled) sites that are used. As a kamaaina of Waialua (specifically Mokuleia) whose roots goes [*sic*] back generations of fisherman and taro farming, I'm very upset with the descriptive words used to name a dive site. The site is Devils Rock. This is not pono. This is a documented Hawaiian cultural site in The Bishop Museum's publication entitled Archaeology of Oahu by McAllister in 1933. This is an underwater Heiau called Mokupaoa and is a personal fishing koa for my ohana. The shore fishing Koa is called Kolea (Site 195) is in direct line with this important religious and cultural site that my grandfather and his elders utilized for subsistence purposes. This koa once had an abundance of lobsters, fish which includes akule and where my Grandfather and his elders pay tribute to the Shark (mano) which is our family aumakua and guardian. This koa is still utilized today by my ohana and others . . . [excerpt of a 2002 letter provided to CSH by Mr. Thomas Shirai, Jr. during consultation for the current project].

### 3.3.13 Nalowale Heiau

Nalowale ("lost" or "forgotten") is a *heiau* within the *ahupua'a* of Mokulē'ia. McAllister (1933) identifies this *wahi pana* as Site 194: "On the Kaena side of Dillingham's ranch, near the plantation reservoir in the western part of Mokuleia, is said to be an old heiau site. Poloaiae is the name of a former Mokuleia heiau about which nothing else is known" (McAllister 1933:129).

McAllister (1933) does not provide additional details differentiating Nalowale and Poloaiae Heiau from each other.

### 3.3.14 Poloaiae Heiau

Poloaiae is the name of a *heiau* once located with the *ahupua'a* of Mokulē'ia. Not much is known about this particular *heiau*, however, McAllister (1933) identifies this *wahi pana* as Site 194:

On the Kaena side of Dillingham's ranch, near the plantation reservoir in the western part of Mokuleia, is said to be an old heiau site. The straggling stone wall near a group of rather large rocks is covered with a dense growth of Lantana. It is doubtful that this site was ever of importance, as it suggests a house site rather than the location of a heiau. Poloaiae is the name given me of a former Mokuleia heiau about which nothing else is known. [McAllister 1933:129; Mitchell 1987:5]

### 3.3.15 Pu'u o Hekili Shrine

Pu'u o Hekili, or Site 190 (McAllister 1933), was classified as an *'āhua* (a heap or mound) and was once located on the beach below the Kawaihāpai (railroad) Station. According to McAllister's informant Hookala, an *'āhua* is "bent instead of angular in construction" and was evidently a type of fishing shrine (*ko'a*). McAllister, however, notes within his *Sites of O'ahu*, that nothing remains of the *wahi pana* known as Pu'u o Hekili (McAllister 193 in Sterling and Summers 1978:99).

## 3.4 'Ōlelo No'eau

Hawaiian knowledge was shared by way of oral histories. Indeed, one's *leo* (voice) is oftentimes presented as *ho'okupu* ("to cause growth," a gift given to convey appreciation, to strengthen bonds); the high valuation of the spoken word underscores the importance of the oral tradition (in this case, Hawaiian sayings or expressions), and its ability to impart traditional Hawaiian "aesthetic, historic, and educational values" (Pukui 1983:vii). Thus, in many ways these expressions may be understood as inspiring growth within the reader or between speaker and listener:

They reveal with each new reading ever deeper layers of meaning, giving understanding not only of Hawai'i and its people but of all humanity. Since the sayings carry the immediacy of the spoken word, considered to be the highest form of cultural expression in old Hawai'i, they bring us closer to the everyday thoughts and lives of the Hawaiians who created them. Taken together, the sayings offer a basis for an understanding of the essence and origins of traditional Hawaiian values. The sayings may be categorized, in Western terms, as proverbs, aphorisms, didactic adages, jokes, riddles, epithets, lines from chants, etc., and they present a variety of literary techniques such as metaphor, analogy, allegory, personification, irony, pun, and repetition. It is worth noting, however, that the sayings were spoken, and that their meanings and purposes should not be assessed by the Western concepts of literary types and techniques. [Pukui 1983:vii]

Simply, *'ōlelo no'eau* may be understood as proverbs. The Webster dictionary notes it as "a phrase which is often repeated; especially, a sentence which briefly and forcibly expresses some practical truth, or the result of experience and observation." It is a pithy or short form of folk wisdom. Pukui equates proverbs as a treasury of Hawaiian expressions (Pukui 1995:xii).

Oftentimes within these Hawaiian expressions or proverbs are references to places. This section draws from the collection of author and historian Mary Kawena Pukui and her knowledge of Hawaiian proverbs describing *'āina* (land), chiefs, plants, and places. The following proverbs concerning Mokulē'ia come from Mary Kawena Pukui's *Ōlelo No'eau* (Pukui 1983).

### 3.4.1 *Ōlelo No'eau* #1263

The proverb describes the swiftness with which news can travel on an island. The sound of fighting in one location is quickly heard in another locality (Pukui 1983:137):

*I Waialua ka po 'ina a ke kai, 'o ka leo kā 'Ewa e ho 'olono nei.*

The dashing of the waves is at Waialua but the sound is being heard at 'Ewa.

### 3.4.2 *Ōlelo No'eau* #2902

The next proverb is said in admiration for the *moku* of Waialua. The weather of Waialua is usually pleasant and the life of the people who reside there is tranquil (Pukui 1983:318):

*Waialua, 'āina ku pālua i ka la'i.*

Waialua, land that stands doubly becalmed.

### 3.4.3 *Ōlelo No'eau* #1486

The following saying describes the landscape of Mokulē'ia as “it is as varied and pretty as a patterned mat” (Pukui et al. 1983:161):

*Ka moena pāwehe o Mokulē'ia.*

The patterned mat of Mokulē'ia [O'ahu].

### 3.4.4 *Ōlelo No'eau* #2112

Pukui relates the following proverb “to one who has gone off his course” (Pukui et al. 1983:230). She continues, “Once, a red-eyed person left Mokulē'ia, O'ahu, intending to go to Mākaha, but went by way of Kawaihāpai and arrived at Mākua instead.”

*Mākole iho hewa i Mākua.*

Red-eyed one goes to Mākua by mistake.

### 3.4.5 *Ōlelo No'eau* #1655

The following proverb relates a *mo'olelo* of Kawaihāpai's resources:

*Ka wai kumu 'ole.*

The water without source.

Kawaihāpai, O'ahu. A drought once came there in ancient times and drove out everyone except two aged priests. Instead of going with the others, they remained to plead with their gods for relief. One day they saw a cloud approaching from the ocean. It passed over their house to the cliff behind. They heard a splash and when they ran to look, they found water. Because it was brought there by a cloud in answer to their prayers, the place was renamed Ka-wai-hāpai (The-carried-water)

and the water supply was named Ka-wai-kumu-'ole (Water-without-a-source).  
[Pukui et al. 1983:179]

### 3.5 *Oli*

*Oli*, according to Mary Kawena Pukui (Pukui 1995:xvi–xvii) are often grouped according to content. Chants often were imbued with *mana* (spiritual power); such *mana* was made manifest through the use of themes and *kaona* (hidden meanings). According to Pukui, chants for the gods (prayers) came first, and chants for the *ali'i*, “the descendants of the gods,” came second in significance. Chants “concerning the activities of the earth peopled by common humans,” were last in this hierarchy (Pukui 1995:xvi–xvii). Emerson conversely states:

In its most familiar form the Hawaiians—many of whom [were lyrical masters]—used the *oli* not only for the songful expression of joy and affection, but as the vehicle of humorous or sarcastic narrative in the entertainment of their comrades. The dividing line, then, between the *oli* and those other weightier forms of the *mele*, the *inoa*, the *kanikau* (threnody), the *pule*, and that unnamed variety of *mele* in which the poet dealt with historic or mythologic subjects, is to be found almost wholly in the mood of the singer. [Emerson 1965:254]

While *oli* may vary thematically, subject to the perspective of the *ho'opa'a* (chanter), it was undoubtedly a valued art form used to preserve oral histories, genealogies, and traditions, to recall special places and events, and to offer prayers to *akua* (gods) and *'aumākua* (family gods) alike. Perhaps most importantly, as Alameida (1993:26) writes, “chants . . . created a mystic beauty . . . confirming the special feeling for the environment among Hawaiians: their *one hānau* (birthplace), their *kula iwi* (land of their ancestors).”

#### 3.5.1 *O Kapawa, 'o ke Ali'i o Wai'alua (Kapawa, the Chief of Waialua)*

According to Kamakau, the birth of Kapawa marks the importance and memorialization of the birth place of chiefs—Kūkaniloko. Kapawa was the son of Nanakaoko and it is with him that a special birthing place for chiefs was established. This place is Kūkaniloko, Wai'alua, O'ahu. The *oli* “*O Kapawa, 'o ke ali'i o Wai'alua*” speaks about the birth and early life of Kapawa. It also mentions important *wahi pana* in the Waialua area and makes a connection to important chiefly sites on Maui:

<i>'O Kapawa, 'o ke ali'i o Wai'alua</i>	Kapawa, the chief of Wai'alua
<i>I hanau i Kūkaniloko;</i>	Was born at Kūkaniloko;
<i>'O Wahiwā ke kahua;</i>	Wahiwā the site;
<i>'O Līhu'e ke ēwe,</i>	At Līhu'e the placenta,
<i>'O Ka'ala ka piko,</i>	At Ka'ala the navel cord,
<i>'O Kapukapuākea ka a'a</i>	At Kapukakuakea [heiau] the caul;
<i>O Kaiaka i Māeaea;</i>	[Heiau] of Kaiaka at Māeaea
<i>Ha'ule i Nukea i Wainakia.</i>	He died at Nukea at Wainakia
<i>I 'A'aka i Hāleu,</i>	Through [the surf of] 'A'aka at Hāleu,

<i>I ka la'i malino o Hauola,</i>	Through the calm stillness of <i>Hauola</i> ,
<i>Keli'i 'o Kapawa ho'i no,</i>	The chief Kapawa was taken,
<i>Ho'i no i uka ka waihona,</i>	Taken upland [in 'Īao] for laying away,
<i>Ho'i no i ka pali kapu o nā li'i . . .</i>	Taken to the sacred pali of the chiefs . . .
<i>He kia'i Kalāhiki no Kaka'e</i>	Kalāhiki is the 'watchman' of [the Burial cave called Ka-pela-kapu-o-] Kaka'e.
<i>'O Heleipawa ke keiki a Kapawa,</i>	Heleipawa was the son of Kapawa,
<i>He keiki ali'i no Wai'alua O'ahu . . .</i>	A chiefly child of Wai'alua, O'ahu.

[Kamakau 1991:136–137; Pukui and Korn 1973:33]

### 3.5.2 *Ka Inoa O Kūali'i* (The Name of Kūali'i)

Kūali'i was a legendary eighteenth century chief of O'ahu (Cordy 2002:32). Within the *mele* or chant of Kūali'i, his connection to the highest families on Maui, Moloka'i, and Kaua'i is reinforced (Fornander 1996:279) amongst a broader description of his lands in O'ahu and Kaua'i. In the excerpt provided below, the general aspect of the land along Mokulē'ia Beach is illustrated. Ka'ala is the highest mountain in the Wai'anae Range, and its sharp ridgeline resembles the tail of a shark, running down to the sea. The sloping flat land at the foothills of the mountains in Mokulē'ia resembles a bowl or pond.

<i>He lae Kaena</i>	Kaena is a point,
<i>He hala o Kahuku He kuamauna</i>	Kahuku is hala-wreathed, covered with
<i>hono i kehau Kaala</i>	dew is the back of Kaala;
<i>Noho mai ana Waialua i lalo-e–</i>	There below doth Waialua sit,
<i>O Waialua ia.</i>	That is Waialua.
<i>O Mokuleia, Kahala ka ipu</i>	Mokuleia with its dish of Kahala;
<i>Ka loko ia mano lalawalu,</i>	A fish-pond, like cooked shark,
<i>Hiu lalakea o Kaena,</i>	The tail of the hammer-headed shark is Kaena,
<i>Mano hele lalo o Kauai-e–</i>	The shark that travels at the bottom of Kauai,
<i>Olalo o Kauai, kuu aina;</i>	At the bottom of Kauai my land;

[Fornander 1996:374]



### 3.5.3 *Ke Kai O Waialua* (The Surf at Waialua)

Waialua is also mentioned in a chant “Ke Kai O Waialua.” Due to the style of the *oli* resulting in “the rhythmic sound of voices chanting in unison,” this chant was “compared to the rise and fall of the large waves at Waialua or to the beat of the *ka la'au* (stick dancing) in time” (Alameida 1993:6). The *oli*, “Ke Kai O Waialua,” also proved to be a useful teaching exercise in the schools (Alameida 1993:6). The use of chant and song exhilarated the people and created a learning environment in which they excelled at unprecedented rates. It is said that the “rhythmical sound of the voices in unison as they rose and fell was like that of the breakers that rise and fall at Waialua or like the beat of the stick *hula* in the time of Peleioholani and Kalani'opu'u” (Kamakau 1992:422–423).

This chant and others were used during the time of Kamehameha III. In a speech he made at Honuakaha in Honolulu, he proclaimed that Hawai'i would be a “Government of learning, in which chiefs should teach commoners and each one teach another” (Kamakau 1992:442–423). By the end of his reign, there were nearly 423 schools in Hawai'i, with most of these utilizing the Hawaiian language and traditional practices, such as *oli*, to teach Western concepts and precepts.

Due to its usefulness as a teaching exercise, variations of this traditional *oli* have been created. These new chants kept the rhythmic sound of the traditional chants and songs while lyrically incorporating new concepts and ideas. The incorporation of new concepts and ideas are evidenced through the replacement of traditional verses with those inspired by Judeo-Christian tradition. Lines such as, “*A ea mai ke kai o Waialua* (Let the sea of Waialua rise)” were replaced with “*Mai malama hou i na akua laau* (Keep no more wooden gods)” and “*E huli kākou i ke 'li'i ola mau* (Turn to the lord of eternal life).” This was one of the methods used to teach Christianity to the Hawaiian people during the first half of the nineteenth century (Pukui and Korn 1973:30).

<i>A ea mai ke kai o Waialua</i>	Let the sea of Waialua rise,
<i>Wawa no olelo okoa i pali,</i>	Let the roar echo over the hills,
<i>Nunu me he ihu o ka pua'a hae la</i>	Rumble like the grunt of the wild pig.
<i>Ako ka lau o ka nalu pii ka pali,</i>	Let the rising wave break the leaf form the cliff.
<i>Ku pali Kaiaka i ka ino,</i>	Kaiaka cliff stands above the storm,
<i>Ino ka lae o Kukuilaunia,</i>	Stormy is the cape of Kukuilaania,
<i>He Maka-nui</i>	Windy indeed it is.
<i>Makani me he ao la ka leo o ke kai,</i>	The voice of the sea rise upon the wind
<i>Kuli paia wawa ka uka a Lihue</i>	Deafening those in the uplands of Lihue,
<i>Ome ha okaa i ke kula</i>	As it is born over the plain,
<i>Ke kula hahi a ke kai e halulu nei</i>	The rumbling of the sea treading upon the plain,
<i>Halulu ma ke Koolau</i>	Rumbling over the Koolau.
<i>Hoolono Ewa</i>	Ewa listens,

*Aole i ike i ka po ana a ka nalu*      She has not seen the rising of the waves,  
*Kuhihewa wale no Wahiawae*      And mistakes it for Wahiawa  
 [Pukui and Korn 1973:33]

### 3.6 *Mele*

A number of late nineteenth, twentieth, and twenty-first century *mele* concern or mention Mokulē‘ia, Kawaihāpai Ahupua‘a and/or Waialua Moku. These particular *mele* may also be classified as *mele wahi pana* (songs for legendary or historic places). *Mele wahi pana* such as those presented here may or may not be accompanied by *hula* (dance) or *hula wahi pana* (dance for legendary or historic places). As the Hula Preservation Society notes,

Hula Wahi Pana comprise a large class of dances that honor places of such emotional, spiritual, historical, or cultural significance that chants were composed for them. Only the composers of the chants could know the deepest meanings, as they would be reflections of their feelings and experiences . . . Since the subjects of Wahi Pana compositions are extremely varied, their implementation through hula are as well. Coupled with the differences from one hula style and tradition to the next, Hula Wahi Pana can be exceptionally diverse. They can be done sitting or standing, with limited body movement or wide free movement; with or without the use of implements or instruments; with the dancers themselves chanting and/or playing an implement or being accompanied by the ho‘opa‘a [drummer and *hula* chanter (memorizer)]. Beyond the particular hula tradition, what ultimately determines the manner in which a Hula Wahi Pana is performed are the specific place involved, why it is significant, the story being shared about it, and its importance in the composer’s view. [Hula Preservation Society 2014]

#### 3.6.1 *Hoopono oe, he aina kai Waialua i ka hau*

The following is a *pauku* (stanza) within a *mele* composed for the *hula ‘āla‘apapa*. Although listed as *mele*, the words were chanted. *Hula ‘āla‘apapa* is best understood as a type of hula:

. . . a little-known hula genre of the Kamehameha dynasty which predates ‘modern’ hula ku‘i of the Kalakaua era. It is a type of hula in the ancient performance stream, in which the *mele* is chanted rather than sung, the movements are vigorous and bombastic rather than soft and languid, and the instrumental accompaniment is provided by the indigenous double-gourd ipu rather than Western guitar and ukulele. [Bishop Museum 2004]

According to Kamakau, *hula ‘āla‘apapa* was one of the two most popular dances of the period of about 1780; the other popular style was the *hula kāla‘au* (Barrère et al. 1980:63; Kamakau 1961:14). This particular *mele*, chanted rather than sung, makes reference to the ocean mist of Waialua Moku. The shoreline and surf are well known within this northern location that includes Mokulē‘ia Beach. Mokulē‘ia Beach is a 6-mile stretch of shoreline spanning the *ahupua‘a* of Ka‘ena, Keālia, Kawaihāpai, and Mokulē‘ia within Waialua Moku. The sacred site of Kukaniloko is also mentioned within this *mele*. The fourth through ninth lines of this *pauku* “represent a dialogue between two lovers” (Emerson 1965:60).

<i>Hoopono oe, he aina kai Waialua i ka hau;</i>	Look now, Waialua, land clothed with ocean-mist—
<i>Ke olelo wale no la i ka lani.</i>	Its wilderness-cries heaven's ear only hears,
<i>Lohe ka uka o ka pehu i Ku-kani-loko.</i>	The wilderness-gods of Ku-kani-loko
<i>I-loko, i-waho kaua la, e ka hoa,</i>	Within or without shall we stay, friend,
<i>I kahi e pau ai o ka oni?</i>	Until we have stilled the motion?
<i>Oni ana i ka manawa o ka lili.</i>	To toss is a sign of impatience.
<i>Pee oe, pee ana iloko o ka hilahila.</i>	You hide, hiding as if from shame.
<i>I hilahila wale ia no e oe;</i>	I am bashful because of your presence;
<i>Nou no ka hale, komo mai maloko</i>	The house is yours, you've only to enter.

[Emerson 1965:60]

### 3.6.2 Kalena Kai

Charles E. King later set this *mele*, originally composed as a chant by King Liholiho, to music. This *mele* in particular honors numerous *wahi* within Waialua Moku. According to Mr. Thomas Shirai, Jr. and his Kawaihāpai 'Ohana, Liholiho, the *haku mele* or composer, wrote this *mele* in remembrance of an 1820 visit with Queen Ka'ahumanu to the district. This visit to Waialua was only a short stop on a much longer journey to Kaua'i Island (the royal party were intending on visiting the last ruling chief of Kaua'i, Kaumuali'i).

In particular, verse two of this *mele*, “praises the agricultural productivity of the fields of Mokulē'ia, which resemble a patterned mat” (Huapala n.d.). For Mr. Shirai and the Kawaihāpai 'Ohana, this *mele* is in fact their *ohana mele* (family song). Mr. Shirai noted that his ancestors provided supplies and most likely entertained the royal retinue. This particular *mele* has most recently been included on the album *E Ku'u Lei, E Ku'u Ipo* recorded by Ku'uipo Kumukahi.

<i>'O Kalena kai Hale 'au 'au</i>	Kalena kai, the bathhouse
<i>A'o līhu 'e i Mālama nui</i>	The chill at Mālama nui
<i>'O ka 'ehu 'ehu o ke kai</i>	The sea spray
<i>Ka moena pāwehe o Mokulē'ia</i>	Geometric designs of the plains of Mokulē'ia
<i>'O ka wai iho ia olu kāua</i>	The descending water refreshes us
<i>A'o Ka'ala kau mai i luna</i>	Mount Ka'ala rises above
<i>Ka lae 'o Ka'ena oni ma mua</i>	The cape of Ka'ena appears ahead
<i>'O Lauhulu no me Pu'ukapu</i>	With Lauhulu and Pu'ukapu

<i>‘O Halemano lūlū i ka lehua</i>	Halemano is verdant with lehua
<i>‘O Waimalu no noho i ka malu</i>	Waimalu is there in peace
<i>Ha‘ina ‘ia mai ana ka puana</i>	Tell the refrain
<i>O ka lua o nā lani e ō mai</i>	The graves of the chiefs, they call
<i>Ha‘ina ‘ia mai ana ka puana</i>	Tell the refrain
<i>A‘o līhu‘e i Mālama nui</i>	The chill at Mālama nui

### 3.6.3 Lanakila Ke Ka‘a Ahi Ali‘i (Lanakila, the Royal Train)

This particular *mele* pays homage to the royal train called *Lanakila*. In paying homage to this train, the *mele* also pays homage to its most honored and well-known passenger, Queen Lili‘uokalani. *Ku‘e Hao o ka Lanakila* is the 82nd *mele* in *Buke Mele Lāhui* (Book of National Songs). This publication, originally published by Francisco Jose Testa in 1895, consists of over 100 Hawaiian political and patriotic songs, or *mele aloha ‘āina*. The compilation of songs into this book was intended as a means of bringing together expressions of

...abiding devotion to Hawai‘i-the land, the ruling monarchs, the independent and sovereign kingdom. Many of these expressions are direct response to the turmoil of the late 19<sup>th</sup> century, in particular the 1887 promulgation of the Bayonet Constitution that disenfranchised so many subjects of the Hawaiian kingdom, the 1889 revolt that attempted to reverse the erosion of those civil rights, the 1893 overthrow of Queen Lili‘uokalani, and the counterrevolution in 1895 by loyalists trying to restore the Queen to the throne. [Hawaiian Historical Society 2003:xiii–xiv]

In analyzing this *mele*, cultural historian Kīhei de Silva notes that *Lanakila ke Ka‘a Ahi Ali‘i* is the first of three chants that make up *hō‘alo i ka ihu o ka Lanakila* (Three Train Chants for Lili‘uokalani). He adds that these songs, “when considered in chronological succession . . . add a Hawaiian dimension to the story of B.F. Dillingham’s Oahu Railway and Land Company (OR&L), a story that otherwise reads far too much like an early script of *How the West was Won*” (de Silva 2003). De Silva provides a chronology of Benjamin Franklin (B.F.) Dillingham’s rise to influence within Hawaiian political spheres, and his eventual founding and construction of the OR&L line. Dillingham also figures prominently within Mokulē‘ia and Kawaihāpai during the late nineteenth century, largely due to his purchase of Kawailoa Ranch, the Gaspar Silva Ranch, and the James Gay Estate in Mokulē‘ia. Dillingham anticipated these lands in northwest O‘ahu would indeed become valuable real estate upon the completion of his railroad around Ka‘ena Point and along the north shore. Dillingham later established a 5,000-acre family pleasure retreat, the Dillingham Ranch, in Mokulē‘ia and Kawaihāpai Ahupua‘a (Loomis 2006:83). Dillingham’s personal history is described by de Silva as follows:

- Arrived in Honolulu in 1865 as first mate of the *Whistler*.
- He promptly fell off a horse and broke his leg. When his ship left without him, he took a job as a clerk in a hardware store.

- 20 years later, in 1885, he had become Hawai‘i’s first big-time land speculator, buying and leasing vast tracts of property in West O‘ahu in hopes of reselling it to housing and ag. interests.
- When no one, in fact, took interest in his largely inaccessible property, he decided to build a railroad through it.
- In 1888, Dillingham convinced Kalākaua to sign a franchise giving him three years to build a line running from Honolulu to the far end of Pearl River Lagoon. His critics called it ‘Dillingham’s Folly,’ but Dillingham boasted that he would put his railroad into operation by Sept. 4, 1889, his 45th birthday.
- Things did not go well in the early months of construction, and in order to fulfill this boast, Dillingham had to fire up a miniscule saddle-tank engine named *Kauila*, hitch it to a flatcar that carried his passengers on jury-rigged seats, and send it bucking, wheezing, and spewing greasy foam down a mile-and-a-half of track that ended in the rice paddies of Pālama.
- Despite this farcical beginning, the construction of Dillingham’s railroad then proceeded in rather impressive fashion: the line was opened to ‘Aiea in November 1889, to Mānana in January 1890, to Honouliuli and ‘Ewa Mill in June and July 1890, to Wai‘anae in July 1895, to Waialua in June, 1898, and to Kahuku in January 1899. [de Silva 2003]

In 1890, as construction of the railway moved forward, B.F. Dillingham bought and shipped to Hawai‘i a passenger coach named *The Pearl* and a locomotive named *General Valleho*. According to de Silva (2003), the *Pearl* was built in San Francisco and was “paneled in rich woods and outfitted with plush chairs, velvet drapes, electric lights, a kitchen, a lānai with a striped canvas awning, and a new-fangled contraption called a flush toilet.” The *General Valleho* was renamed the *Lanakila* by Dillingham:

... [He] gave it the number 45, a tribute to his 45th birthday boast and erstwhile victory in the rice paddies of Pālama. The *Lanakila* became Dillingham’s 4th locomotive—after the *Kauila*, *Leahi*, and *Ka‘ala*—and for many years it was regarded as the most attractive engine in the OR&L stable. Dillingham apparently wasted no time in hitching the *Pearl* to the *Lanakila* and using the pair as his wine-‘em and dine-‘em celebrity train, the vehicle in which he wooed financial and political support for his business ventures. [de Silva 2003]

As part of Dillingham’s plans to woo the influential, he invited King Kalākaua on the inaugural ride on the *Lanakila*. Dillingham also insisted the luxury coach *Pearl* serve as the king’s own royal car. De Silva (2003) notes it is “safe for us to assume that Queen Lili‘u[okalani] rode in the *Pearl* when the *Lanakila* took her on the train rides.”

*Kahea:*

*O Lanakila Ke Ka Ahi Ali ‘i*

*O Lanakila ke ka ahi ali ‘i*

*Nana lawe mai kahu aupuni*

Call:

Lanakila, The Royal Train

Lanakila was the royal train

That bore hither the crown princess

<i>A hiki o kalani i Moanalua Ka uwapo holuholu a'o Hāлана</i>	Bearing her through Moanalua Over the swaying bridge at Hāлана
<i>Alawa iho 'oe ma ka 'ao'ao Ka nome ka huila i ke alahao</i>	A glance out the sides showed The wheels rolling over the track
<i>A'ohe ou loa a e Mānana I ke ku 'upau a na wilikī</i>	Mānana did not seem far When the engineers' did their work
<i>Ho'okahi na leo a'o ke kuhina Ho'opa'a ia mai na mikini</i>	The minister spoke just once "Make the engine stop here"
<i>Kunou welo pāpale ke aloha Nā kupa nā kini ou e kalani</i>	Greeted by bows and waving hats By her subjects, her people
<i>A kau o kalani i ke ka'a pio Huli aku a noho ho'ola'ila'i</i>	The princess boarded a carriage There she turned and sat calmly
<i>Kiani ka uwepa ha'a nā lio Kiliopu i ke kula o Leilehua</i>	The whip was snapped, the horses Pranced over the plain of Leilehua
<i>He aku mākou o mai 'oe O Lili'uokalani la he inoa</i>	We call to you, o answer us Lili'uokalani is your name
<i>Kahea: He inoa no Lili'uokalani</i>	Call: For the name of Lili'uokalani
[Huapala n.d.]	

De Silva (2003) provides a remarkable breakdown of this *mele*, delving into the subtext to reveal another layer of understanding, of *kaona*:

As described in 'Lanakila ke Ka'a Ahi Ali'i,' the royal train conveys Lili'u from the Kūwili Station in Honolulu to the Mānana Station in what is now Pearl City. It's my guess that Mānana was then at the end of the line; the train stops, the crown princess disembarks, her subjects bow and wave their hats, and she continues her journey by carriage, across the Leilehua plain, presumably to her country residence in Waialua.

For me, the imagery of this *mele* centers on efficiency and harmony. In 'Lanakila ke Ka'a Ahi Ali'i' everything works without a hitch, everything responds as it should. The wheels roll inexorably over the track; the miles fall away when the engineers pull out all the stops; a single command is all it takes to bring the train to

a halt; heads bow and hats wave in a perfectly choreographed display of affection for the disembarking princess; the horses of her carriage respond with graceful prancing to the snap of the driver's whip; and through it all, Lili'u remains poised, calm, and in complete control. The mele, then, places Lili'u at the still point of this flawless dance; the mele extols her capacity as Queen-to-be; she brings man, nature, and machinery into harmony; all work to a single purpose under her calm leadership. The message of the mele is unmistakable: with Lili'u at the helm, victory—lanakila—is ours. [de Silva 2003]

### 3.6.4 *Ka Lae 'O Ka'ena (At the Point of Ka'ena)*

This *mele* was included within a compilation of Hawaiian cowboy songs entitled *Nā Mele Paniolo*. Music has played an integral part of the *paniolo* (cowboy) lifestyle, becoming a “part of the ranching traditions of Hawai'i and an important ingredient of the *paniolo* lifestyle” (Trimillos 2004:4). *Paniolo* music is generally sung in the Hawaiian language with compositions focusing on a particular personality or event, or may celebrate cherished places on ranch land (Trimillos 2004:4). A particularly salient feature of *nā mele paniolo* is their specificity to a locality:

Hawai'i's rural ranches [such as Dillingham Ranch] proved to be an ideal resource . . . for great music that was passed on through the 'ohana (extended family) as they sang at home and at social gatherings. Many of the favorite numbers were specific to the area and sung with spirited community pride. [Fujitani 2004 in Introduction to *Nā Mele Paniolo*]

Within this *mele*, Ka'ena Point figures prominently. Ka'ena Point also figured prominently for many guests visiting Dillingham Ranch lands. The book *Na Lani Kaumaka, Daughters of Hawaii* describes the ranch lands of Mokulē'ia and the arrival of guests to the ranch:

The Dillingham Ranch was on a huge property that stretched from the mountains to the sea. Emma's husband, B.F. Dillingham, had acquired the land and house in 1897, and it was a favorite recreation area for family and friends. A railroad siding ran right through the property. The train trip took several hours to reach the ranch, but the ladies traveled in comfort to their destination through 'Ewa, along the Wai'anae Coast, and around Ka'ena Point, ensconced in the luxurious Dillingham parlor car. [Del Piano 2005]

This *mele* is in fact a love song recounting how an “island boy fell in love with a fair-skinned girl whose mother owned a candy store” (Hawai'i State Foundation on Culture and the Arts 2004:31). Due to the use of English for this *mele*'s chorus, it may be considered as part of the *hapa-haole* (a Hawaiian type of song with English and Hawaiian words) genre:

<i>Ka lae 'o Ka'ena</i>	At the point of Ka'ena
<i>E hui ai Kāua,</i>	Let's get together
<i>Ko aloha welawela,</i>	Your warm love
<i>Ko aloha ia'u nei,</i>	Your love that I have now
<i>Me 'oe ho'i au e ho'oipo ai,</i>	With you I will make love,
<i>Hoa pili o ka 'āina malihini.</i>	My companion of a foreign land

*Hui* (Chorus)  
Eyes so blue, love so true,  
Pretty feet across the street,  
Her name is Nova,  
And I adore her,  
Her mother keeps a little candy store.

‘Auhea ‘oe ka‘u e li‘a nei,                 Where art thou?  
Nā hola a pau i pili mau ‘ia,             With whom I’ve been with all these past  
  hours,

*E ho‘omana‘o ana i kou leo nani,*     I’m reminded of your beautiful voice,  
*A pa‘a mau nei i ku‘u pu‘uwai.*        That I’ve been cuddling in my heart.

[Hawai‘i State Foundation on Culture and the Arts 2004:31]

### 3.6.5 Maika‘i Ka ‘Ōiwi O Ka‘ala

The following is a *mele ho‘oipo‘ipo* (lovmaking song) adapted by Kalena Silva, and edited by Puakea Nogelmeier. Songs of this genre were generally dedicated to specific, though often unnamed individuals (Koskoff 2008:753). This particular *mele* has most recently been included on the album *Lei Hali‘a* by Keali‘i Reichel. Both Mokulē‘ia and Kawaihāpai Ahupua‘a are described within this love song:

<i>Maika‘i ka ‘ōiwi O Ka‘ala</i>	The form of Mt. Ka‘ala is fine and attractive
<i>Molale i ka mālie</i>	Clear there in the calm
<i>Mālō nā kīpo‘ohiwi</i>	Straight and firm are the squared shoulders
<i>O Kamaoha i ka nani</i>	of Kamaoha in its beauty
<i>Pāpū i ke anu</i>	Clearly visible in the cold
<i>I ka uka o Kalena</i>	Of the uplands of Kalena
<i>Ka umauma henahena</i>	Is the exposed heart
<i>O ke kupukupu</i>	Of the kupukupu fern
<i>Nanahe ka poli</i>	Soft is the bosom
<i>O Kānehōa i ka nani</i>	of Kānehōa hill in the beauty
<i>Pahe‘e ke alo</i>	smooth are the flanks
<i>Pakika i ka Waikōloa</i>	Slippery in the Waikōloa wind
<i>Waliwali ka iwi ‘ao‘ao</i>	Softly shaped is the rib
<i>O Mālamānui</i>	Of Mālamānui
<i>Nopa ke ho‘ohuli mai</i>	Sedate when turning its attention
<i>lā Kanoenoe</i>	to Kanoenoe



<i>Oki kalaina</i>	Extraordinary is the carving
<i>A ke Kiuwailehua</i>	of the shafts of the Kiuwailehua wind
<i>Kāu mea 'ū palu, wali, unahe</i>	that which you find gentle, soft and sweet
<i>'O ka pua i ka lā</i>	is the flower in the sun
<i>Ke 'alawa iho 'oe</i>	When you glance down
<i>Iā Waialua ē</i>	Toward Waialua
<i>Pākelakela Mokulē'ia</i>	Mokulē'ia excels all others
<i>Na ka maika 'i</i>	Because of its beauty
<i>Pākahalaha, mākolukolu</i>	Spread out, expansive,
<i>Ākea ka waihona a ke Ko'olau</i>	Broad are the Ko'olau mountains
<i>Mole 'ua'u ka lae</i>	A home for the 'ua'u birds is the cape
<i>'O Ka'ena i ke kai</i>	Ka'ena Point, there in the sea
<i>Hapapū nā lima</i>	An unfinished work are the hands
<i>O Ka'aiea i ka nani</i>	Of Ka'aiea in the splendor
<i>'Ae'ae ka 'ā'i</i>	Downy soft is the neck
<i>O ke koloa inu wai</i>	Of the koloa bird as it drinks
<i>E ake nō a ho'olale</i>	Eager to stir up
<i>Iā Kawaihāpai</i>	To motivate Kawaihāpai
<i>Kōkōhia mai</i>	Held back, though, and restrained
<i>E Nēnēle'a</i>	By Nenele'a
<i>Kāo'o Pōniu'ō hua</i>	Pōniu'ōhua braces itself
<i>Pupue i ke anu</i>	Crouching in the cold
<i>Liki honua i ke anu</i>	Suddenly stiff from the chill
<i>Me ke ko'eko'e</i>	And from the dampness
<i>Ō mai 'o Kalākaua</i>	Respond to the call, o Kalākaua
<i>Ke ali'i nona ia inoa!</i>	The chief whose praise we proclaim
[Huapala n.d.]	

## Section 4 Traditional and Historical Accounts of Mokulē'ia and Kawaihāpai Ahupua'a

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The district of Waialua is rich in legends, stories, proverbs, and myths. Waialua, literally translated as “two waters” (Clark 2002) may refer to the two large stream drainages (Anahulu and Helemano-Poamoho-Kaukonahua) once used to irrigate extensive taro fields in the *ahupua'a* of Kamananui, Pa'ala'a, and Kawailoa, the more populous *ahupua'a* (traditional land division) on the eastern side of the district. The *ahupua'a* of Keālia, Kawaihāpai, and Mokulē'ia, on the western side of the district, were not as well-watered as the three eastern *ahupua'a*. However, these western lands were famed for their warm climate, cooling breezes, plant resources, and especially marine resources.

### 4.1 Traditional Accounts

#### 4.1.1 Waialua Moku

*Mo'olelo* chronicle the rise of divine kingship in the uplands of Waialua (Kirch 2010). Located near what some consider the *piko* of O'ahu (Becket and Singer 1999:64), Kūkaniloko was a site of *mana* (divine power). The gods recognized a child born there as “an ali'i, an akua, a wela—a chief, a god, a blaze of heat” (Kamakau 1992:38). The first to be born there was Kapawa around AD 1100 (Kamakau 1964:12). Kūkaniloko was the sacred birthing place of *ali'i kapu* (sacred chiefs), who were “the akua of the land” (Kamakau 1992:53). These *ali'i* were Lo Ali'i, a class of *ali'i* who lived in the mountains above Waialua, preserving their chiefly *kapu* (taboo) by intermarrying among themselves (Kamakau 1964:5; Sahlins 1992:23).

In approximately AD 1310 (a time estimate based on an average length of generational intervals in chiefly genealogies), Māweke partitioned O'ahu into three districts: the Kona region; the 'Ewa, Wai'anae, and Waialua region; and the windward Ko'olau region. Then, in approximately AD 1490, the *'aha ali'i* (council of chiefs) chose Mā'ilikūhahi, an *ali'i kapu* who was born at Kūkaniloko, to be the new *ali'i nui* (paramount chief) of O'ahu. After his paramountship was installed at the *heiau* (pre-Christian place of worship) of Kapukapuākea (Site 225; McAllister 1933:140) in central Waialua, Mā'ilikūhahi instituted an explicit land division and administration structure. O'ahu was divided into six *moku* (district)—Kona, 'Ewa, Wai'anae, Waialua, Ko'olauloa, and Ko'olaupoko—that were further divided into 86 *ahupua'a* (land division usually extending from the uplands to the sea) and smaller territorial units (Kirch 2010:84–90).

The *moku* of Waialua contained a set of centrally located productive lands and peripheral areas that were ecologically marginal but that had access to abundant ocean resources. The fertile center consisted of the area surrounding Kaiaka and Waialua Bays located in the *makai* regions of the *ahupua'a* of Kamananui, Pa'ala'a, and Kawailoa. Large irrigated taro fields were located on the floodplains of four major streams that flowed from mountain gorges to these bays, and two large fishponds, 'Uko'a and Lokoea, were located around Waialua Bay. This core productive region likely supported the majority of the Waialua population (approximately 6,000–8,000 people prior to Western Contact). In marked contrast, small fishing communities were located at the extreme western and eastern edges of Waialua—Ka'ena and Kāpaeloa—in sandy coastal soils. These marginal lands were offset by access to very rich deep-sea fishing grounds (Sahlins 1992:20).

The distant lands of Ka'ala to the northeast coastal region of Kāpaeloa, were also once connected culturally and politically. According to anthropologist Marshall Sahlins, Kamananui Ahupua'a was once the dominant political and ritual center of Waialua Moku that included detached, outlying lands, including the remote fishing community of Kāpaeloa at the eastern border and Ka'ena at the western border of Waialua with its prime marine resources controlled by *konohiki* (headman of an *ahupua'a* land division under the chief) of Kamananui proper (Sahlins 1992:20–21).

#### 4.1.2 Mokulē'ia Ahupua'a

Research on the meaning of Mokulē'ia produced two different translations concerning cultivation. According to “Place Names of Hawaii”, Mokulē'ia means “isle [of] abundance” (Pukui et al. 1974:155). The second translation, which may be of relatively modern origin, has the name as moku-leia, from the saying *Moena pāwehe o Mokulē'ia* (the patterned map of Mokulē'ia). This refers to the pattern of agricultural fields on the lowlands of Mokulē'ia in the early post-Contact Period (Pukui 1983:161). The above *ōlelo no'eau* was most likely derived from observations of travelers noting the presence of irrigated terraces of *kalo* (taro; *Colocasia esculenta*). For spiritual and dietary reasons, *kalo* was a sacred staple in the Hawaiian diet. According to Hawaiian mythology, man was born from the taro plant. According to the *Kumulipo* (origin, genesis), Hāloa, “he of the long breath,” is the second son of Wākea (Father Sky) and Papa (Mother Earth). Wākea and Papa's first born, Hāloa-naka was born premature and died shortly after his birth (Kanahele 1995:17). After burying Hāloa-naka, a *kalo* plant sprouted at his grave. Shortly after, a second son (Hāloa) was born. A human child, Hāloa symbolizes *kalo* and man. *Kalo* is a metaphor for life, Kanahele explains as follows:

In the mythologies of many cultures, plants have been used to symbolize human spiritual growth. Hawaiians made taro a metaphor for life because, like the taro plant, it needs to be rooted in good soil and to be constantly nourished with the waters of Kāne. As the stalk grows taller with its leaves reaching toward the light of the sun, symbolized by Wākea, so Hawaiians grow aspiring to be closer to their heavenly spirit. Just as every young shoot can become a full-grown plant, so can they become gods as descendants of Hāloa. As every plant must die, however, they too must die. And from the remains a new plant lives again. In this continuity of life, both plant and man repeat the mystery of the unending cycle. [Kanahele 1995:18]

Historic Hawaiian language newspapers also note the importance of *kalo* and its centrality to agricultural and subsistence practices within Mokulē'ia. In a 16 June 1858 article within *Ka Hae Hawaii*, the following was written about a particularly well-formed *kalo* identified as “Hokeo,”

*He Kalo Nui.*

*E ka Hae Hawaii e:*

*ALOHA.OE: Ke hai aku nei au ia oe no kekahi mau kalo nui a'u i ike ai i keia kakahiaka no, ua lawe ia mai ma ko'u hale nei kekahi mau kalo elua, mai ka makou wahi kanu kalo mai, ua like no ko lana nui kekahi me kekahi. Eia ka loa o ka kalo hookahi elua kapuai, a eia ke anapuni, akahi kapuni ehiku iniha, nui maoli no, me he ape la ke ano ke nana aku; aka, he huli maoli no ia i kanuia, he hokeo ka inoa.*

*Aole he mau kalo e ae kekahi i oi aku ka nui mamua o keia mau kalo, aole wahi e ae o makou i ike ia ka nui o ke kalo, e like me keia wahi; aka, he waihua he wai-mapuna hoi, aole nae he nui i loa, aole hoi he wai niau; aka, he maloo no i ka wa la, a ua aneane maloo loa ka wai i keia wa, a oia paha auanei ka mea hewa nui.*

*Ninau mai paha kekahi, nawai ia kalo i kanu? Eia no, na Aa, he elemakule kokoke kanaono makahiki ona i keia wa, i ka nana aku, he kino ikaika kona, a he lima hana mau, aole hoolewalewa wale e like me kekahi poe kanaka ui manao ole.*

*Oia iho la kahi makana ia oe e ka Hae Hawaii. E aloha auanei.*

S W. HAIA.

*Mokuleia, Oahu, June 1, 1858.*

A large taro.

To the Hae Hawaii:

GREETINGS TO YOU: I say to you I know of some large taro this morning, brought here to my house, two taro from the place where we plant, in trust with each other. The taro is planted in two feet measurement, the first seven inches, great success, giving the characteristics of *ape* [Elephant's Ear, is related to and resembles a large taro plant] when you look at it, but a real good taro top for planting. Hokeo is the name of the taro. Some other taro as well are not as good as the bigger taro, we have never seen in any other place with taro so big like this place; but a water drop, a bubbling spring, not very much, no running water too; but is extremely dry for the time and it is near the dry season, and maybe a great mistake.

Perhaps it is asked, who planted the taro? Here, by Aa, an old man almost 60 years of age at this time, look, he has a strong body, and working hands, not like some young man without ideas.

This is a gift to you *Ka Hae Hawaii*

S W. HAIA

*Mokuleia, Oahu, June 1, 1858.*

[Translation by Aulii Mitchell]

An additional newspaper article, within *Ka Nūpepa Kū'oko'a* and dated 29 August 1868 (Vol. 7, No. 35) discusses the arrival of a canoe fleet and the lighting of a great *imu* from Kahuku Point to Ka'ena Point. Resources appear to have been gathered from throughout Waialua Moku; the food products produced from these natural resources are noted in the text. The residents of Mokulē'ia are mentioned as joining the other residents of the *moku* to greet the canoe fleet:

*KA HIKI ANA MAI O KA AU-WAA O HOOMAILEANUE MAWAHO PONO O WAIALUA, A PAE IUKA.*

*I ka wanaao pulehulehu o kekahi la ae, ua ike aku la na kanaka ala kakahiaka nui i keia mea uliuli, a hauwalaau, a wawa, e hoonakeke ai mawaho iho, eia ka o ka auwaa o ua hunona nei a ua o Kaukanapokii; o ka hoala ia aku la no ia o na kanaka a pau, a hoa mai la i ka imu o ka puua, mai ka Lae o Kahuku a ka Lae o Kaena ka a o ua mea he imu puua, ka ilio, ke koelepalau, ka maia kulolo, a me ka ulu, ke kalo kulolo, ahiawela ua mea he ahi, o ka a mai la no hoi mai uka o Kawailoa a hiki i kai o na alii, hele a malamalama o uka, hele no hoi a malamalama o kai, a koku ike ole ia no ke awa e hookomo mai ai ka auwaa. A no ka manao no kekahi o ka poe malihini o ke ao ae no ia, noho no lakou i waho a no loa ae. I lawa no i ke ao ana, halakika ana kahi waa kialoa o ua mau wahi luna elele nei a Hoomaileanue, a pae i kaha-one, he mea manawa ole ia, o ka waa o ua mau wahi kanaka nei, he mea ole ia i na kamaaina, hiki ana i kahi kau-waa, a hele e auau, a wehe ka malo wai, aahu ke kapa maloo, a hele aku la i hahi o Kaukanapokii, a hai aku la i na olelo a pau, a kii ia aku la ka auwaa e hookomo mai. A ua pae mai la na poe a pau iuka, a ua hookipa ia ae la kela a me keia ma kauhale kamaaina, mai Waimea a hiki i Mokuleia ka paa i na kauhale a me na kanaka, a o kekahi poe no, noho oihuaauwaa iho la no. A ua hookipa ia ae la o Hoomaileanue ma kekahi hale nui a nani, a maikai loa, me ka ike oleia mai e na poe e ae, o Kaukanapokii wale no, a me na Kahu o ua keiki la o Kukulu o Kahiki, a pela i hana ia ai na mea e pili ana ia ia, a hiki i ka wa i hoohalawai ai laua me ka moopuna kua-lua a Hawea o lumi o Kaala, kela kuahiwi a ka nani i noho ai.*

#### THE ARRIVAL OF THE CANOE FLEET OF HOOMAILEANUE OUTSIDE OF WAIALUA, AND ITS LANDING ASHORE

One day as twilight fell, the people awoke in the dark of the early morning and saw, and looked out, ranting and alleging, that there was rattling outside, here was the fleet of canoe of Kaukanapokii's in-law, when everyone had awakened, the imu for the pig was lit, from Kahuku Point to Kaena Point, the imu of the pig was lit, dog, breadfruit poi, banana pudding, breadfruit, taro pudding, the fire was hot, a fire truly burning from the uplands of Kawailoa to the sea of the chiefs, the uplands were brightened, toward the sea was brightened as well, not in the same way as the harbor that the fleet of canoe entered. As for feelings of the guests of the day, they stayed outside for quite a while. When they had enough of being cautious, a smaller swift canoe of the high representatives of Hoomaileanue powerfully past above and landed on the sandy beach, not for a short time, to the people of the canoe and the native people it was nothing, to arrive to the place of the canoe, and go swimming, and untie the wet malo, and gird on dry kapa, and go to the place where the canoe landed of Kaukanapokii, and it was told of all the oratories, the canoe fleet was summoned to enter. All the people of the uplands came ashore, everyone was welcomed in the village, from Waimea to Mokuleia the whole village and its people sat at the floor of the canoe. Hoomaileanue was greeted at a beautiful house, real fine, not seen by other people, only by Kaukanapokii and the concierges of the child Kukulu o Kahiki, and all was done regarding this until the time came they met with the great-great grandchild of Haweaolumi of Kaala, that upland beauty in which they lived.

[Translated by Aulii Mitchell]

Besides being agriculturally “abundant,” the offshore area of Mokulē‘ia was replete with marine resources. Several legends about Mokulē‘ia concern marine resources, fishing practices, and ceremonial rites related to fishing. In an archaeological survey of the Mokulē‘ia area conducted in the 1920s and 1930s, four surviving *ko‘a* (shrine) were recorded (McAllister 1933). *Ko‘a* are usually natural boulders or rock mounds, used as shrines where fishermen could beseech the gods for a good catch or place offerings to thank the gods. One of the gods honored by the Hawaiians was Kāne‘aukai, who first revealed himself to the people in Waialua. The following passage describes the appearance of Kāne‘aukai to two fisherman, who were tasked with praying to him for a plentiful supply of fish:

One morning on going out upon the seashore they found a log of wood, somewhat resembling the human form, which they took home and set in a corner of their lowly hut, and continued their habit of praying to Kaneaukai. One evening, after having prepared a scanty supper of poi and salt, with perhaps a few roasted kukui-nuts, as a relish, and a couple of cocoanut cups of awa as their usual drink, they saw a handsome young man approaching, who entered their hut and saluted them. He introduced himself by saying, ‘I am Kaneaukai to whom you have been praying, and that which you have set up is my image; you have done well in caring for it.’

He sat down, after the Hawaiian custom, as if to share their evening meal, which the two old men invited him to partake of with them, but regretted the scanty supply of awa. He said: ‘Pour the awa back into the bowl and divide into three.’ This they did and at once shared their meal with their guest.

After supper Kaneaukai said to the two old men, ‘Go to Keawanui and you will get fish enough for the present.’ He then disappeared, and the fishermen went as instructed and obtained three fishes; one they gave to an old sorceress who lived nearby, and the other two they kept for themselves.

Soon after this there was a large school of fish secured by the fishermen of Mokuleia. So abundant were the fish that after salting all they could, there was enough to give away to the neighbors; and even the dogs had more than they desired. [Thrum 1998:251]

The two fishermen also described the variety of marine resources found at Mokulē‘ia:

The fish that frequented the waters of Mokuleia are the aweoweo [bigeyes; *Priacanthus* sp.], kala [surgeonfish; *Naso* sp.], manini, [surgeonfish; *Acanthurus* sp.] and many other varieties that find their habitat inside the coral reefs. Crabs of the white variety burrowed in the sand near the seashore and were dug out by the people, young and old. The squid also were speared by the skillful fishermen, and were eaten stewed, or salted and sun-dried and roasted on the coals. [Thrum 1998:250]

The wooden image was eventually moved to Waimea Valley, O‘ahu and placed next to a stone image also representing the god Kāne‘aukai. The stone image was still in place when Thrum recorded this tale in 1907, but the wooden image had disappeared. Thrum speculated that it may have been destroyed on one of Ka‘ahumanu’s trips around the island, when she spread the word of Christianity and ordered all idols of the Hawaiian gods to be burned (Thrum 1998:253).

In the legend of Māikoha, the types of fish resources associated with certain *ahupua'a* are mentioned (Fornander 1919:5[2]). This legend concerns a man named Māikoha and his four sisters. Māikoha was sent away by his father for breaking several *kapu*. He left his family and settled in Kaupō, Maui. His four sisters later went in search of him, and found that he had changed into a *wauke* (paper mulberry; *Broussonetia papyrifera*) plant. After they had found him, they left again on a journey to O'ahu. The first sister, Kaihuopala'āina, met a man named Kapapa'apuhi in Honouliuli, 'Ewa. She married him, settled down, and eventually changed into a fishpond still present in the area. As the remaining three sisters traveled on, the second sister, Kaihukoa, met a man named Ka'ena in Wai'anae, and decided to marry him. She settled in the area and changed into a fishing ground directly out from Ka'ena Point, famous for its *ulu*a (trevally or jack), *kahala* (amberjack, *Seriola* sp.), and the *mahimahi* (dolphin fish; *Coryphaena hippurus*). The remaining two sisters traveled on to Waialua, where Ihukoko met a man named Kawailoa. They married and settled in the area, and Ihukoko was accompanied to the area by the fish *āholehole* (Hawaiian flagtail; *Kuhlia malo*). The final sister traveled to Lā'ie where she married a man named Laniloa. She brought with her the 'ama'ama (mullet; Mugilidae) (Fornander 1919:5[2]:270–272).

#### 4.1.3 Kawaihāpai Ahupua'a

Although not as extensively cultivated as the more populous eastern portion of the district, Kawaihāpai and Mokulē'ia had several smaller streams and springs that could be used to irrigate crops such as *kalo*. Kawaihāpai literally translates as “the carried water” (Pukui et al. 1974:99), with the origin of the place name described by the following passage:

Life on this land in the olden days was a life of plenty until trouble came, for plants died because of the lack of water. Everybody thought of going and leaving the land.

There were two old men who belonged to the priestly class of old, and they remained, setting up the *kapu* with prayers and after praying they saw a hog shaped cloud coming directly from Kahuku point and they guessed that it was going to rain, that their prayers were heard. They were waiting for rain and heard the splashing of raindrops on the cliff. When they went to look they saw water pouring from the cliff and they told everybody to stay for water was found.

This place where this strange water created by God is on the hill facing the length and breadth of the district of land called Kawaihāpai that lies between Waianae and Waialua, Oahu.

Because God created this water on the cliff, the name of the land from old was called Ka-wai-hapai (Lifted-water) because this water was lifted up and placed above and because no one knew the source of this water it is called Ka-wai-kumu-ole-i-ka-pa-i (Water-without-source-on-the-cliff) to this day. [Liokakele 1911 in Sterling and Summers 1978:99]

Although wetland cultivation in Keālia is not mentioned, several legends refer to specific plants in the area. Keālia means “the salt bed” (Clark 1977:105). There is no known salt pond at Keālia, but an association with salt is mentioned in a legend concerning Pele and another of her sisters, Ka'ōhelo. Ka'ōhelo told her son that when she died, she wanted him to take her body to the top of Kīlauea, the home of her sister Pele. When he took her body to Kīlauea, her flesh became the creeping vine portion of the 'ōhelo plant (*Vaccinium reticulatum*), and the bones became the bush-

plant portion of the *'ōhelo*. Pele “retained Ka‘ōhelo’s head, which became the smoldering fire in the volcano; the rest of the body was thrown over to Haleakalā, Maui and to salty Keālia, O‘ahu; some of it was thrown on Kaua‘i, and some of it was left on Hawaii” (Fornander 1985:576). The *'ōhelo* plant grows at high elevations and was considered a sacred offering to Pele.

In the legend of Kalelealuaka (Thrum 1998:94–100), the hero uses his miraculous powers to fly to different parts of the island of O‘ahu and wreathes himself in plants particular to those regions. At the start of one battle, he flies to Wai‘anae and covers himself with the fine-leaved *maile* (*Maile lauli‘i*). Before the second battle, he flies to Waialua to array himself “in the rough and shaggy wreaths of *uki* (native sedges) from the lagoons of ‘U‘koa (a fishpond in eastern Waialua) and of *hinahina* (*Heliotropium anomalam*) from Keālia” (Thrum 1998:98). Before the third battle, he flies to Kahuku and adorns himself in a wreath of the pandanus fruit and flowers of the sugarcane. The heliotrope from Keālia is a low, spreading beach plant with small, white fragrant flowers.

## 4.2 Early Historic Period to Mid-1800s

During a 20 year period from 1720-1740, the island of O‘ahu was united under the high chief Kūali‘i after a series of battles with the chiefs of Kona and ‘Ewa. Kūali‘i continued his wars of conquest by carrying out raids on the islands of Moloka‘i and Hawai‘i. This began a period of intra-island and inter-island wars referred to as the Conquest Period (Sahlins 1992:36).

In 1783, forces from the Maui chief Kahekili gained control of O‘ahu by defeating the island’s *mō‘ī* Kahahana. Kahekili, following an unsuccessful rebellion against the Maui invaders, killed Elani, father of Kahahana, and other O‘ahu chiefs. Elani’s body was left to decompose on a ledge at Pua‘ena Point: “The place became known as Kahakakau Kanaka. As the odor came to the sands at Haleiwa they became known as Maeaea [literally, smelly]; the point on the other side became known as Kupava” (McAllister 1933:141–142).

In 1794, Ka‘eokūlani recruited the “warriors of Waialua and Wai‘anae” to make war on his nephew Kalanikūpule, then ruler of O‘ahu (Kamakau 1992:168); by December 1794, Ka‘eo had been killed and his forces were defeated. Kalanikūpule would himself be deposed the following year when the invading Hawai‘i Island forces of Kamehameha prevailed at the Battle of Nu‘uanu in April 1795. Kamehameha’s success at the Battle of Nu‘uanu in 1795 would effectively mark the culmination of nearly 75 years of intra-island and inter-island conflicts known as the Conquest Period.

By the time of the arrival of Kamehameha’s forces in 1795 and their settlement onto the O‘ahu landscape, shifting cultivation and forest product extraction supported several household groups living in the rock shelters in the upper Anahulu Valley, and foreign material goods had begun to arrive from the lowlands. Then a rapid, radical transformation of land use and agricultural intensification occurred.

In 1804, the Hawai‘i chiefs who supported Kamehameha occupied O‘ahu, taking control of the lands of the former ruling chiefs. Kamehameha encouraged the expansion and intensification of agricultural production to sustain his invading forces when they returned to O‘ahu in 1804, including the peripheral lands of the upper Anahulu Valley. The rock shelters were abandoned, and descendants of Kamehameha’s conquering forces constructed a series of open house sites in association with intensive pond field irrigation of taro on the alluvial terraces at the bends of the



main stream and adjacent *kula* (dryland agriculture) lands. They also made clearings in the smaller forested valleys and ravines to cultivate bananas, yams, *wauke*, sweet potatoes, and dry land taro (Kirch and Sahlins 1992:57–59). In 1806, Kamehameha traveled around the island of O‘ahu to encourage people to rebuild their war-ravaged agricultural fields and fishponds by his own example.

Kamehameha stayed for only one day to farm at Wai‘anae, then went to Waialua. He stayed at least 3 or 4 days with the chiefs and people of Waialua working in the lo‘i [irrigated fields] which extended from the famous pawehe (geometric patterns) mats [of Mokule‘ia] to the waters of Waimea. From Waialua he went to Laie and farmed there. [*Ka Nai Aupuni* newspaper article in Alameida 1993:39]

Kamehameha not only encouraged his people to rebuild areas devastated by the wars, but also to expand into new areas. “He cleared the land at Waikiki, Honolulu, Kapalama, Kapa‘auki, Keone‘ula, Kapa‘eli, and all the other places, and when all the lands were under cultivation he cultivated mauka in Nu‘uanu as far as Keawewawapu‘ahanui” (Kamakau 1961:192). This passage indicates there may have been an intensification of agriculture after 1804, which included expanding the irrigation system into new lands upland (*mauka*) of the former pre-Contact fields (Sahlins 1992:52). Some of these agricultural endeavors may be connected to the new trade that developed with visiting foreign ships. During the Conquest Period, food and other provisions were sold to visiting ships involved in the Canton trade. Ships would travel to the Northwest Coast for furs, stop in Hawai‘i for provisions, and journey on to Canton, China to trade the furs for luxury goods such as fine ceramics and silk (Sahlins 1992).

The changes to the landscape, as a result of Kamehameha’s encouragement for the expansion and intensification of agricultural production, are often noted in the recorded accounts of early foreign explorers. Such accounts note the presence of many large villages and/or extensive terracing. Captain Charles Clerke, after anchoring in Waimea Bay, described the highly populated and lush northwest coast of O‘ahu:

I stood into a Bay just to the Wtward [Westward] of this point the Eastern Shore of which was by far the most beautifull Country we have yet seen among these Isles, here was a fine expanse of Low Land bounteously cloath’d with Verdure, on which were situate many large Villages and extensive plantations; at the Water side it terminated in a fine sloping, sand Beach . . . This Bay, its Geographical situation consider’d is by no means a bad Roadsted, being sheltered from the NEbN [Northeast by North] SEterly [Southeasterly] to SWbW [Southwest by West] with a good depth of Water and a fine firm sandy Bottom; it lays on the NW [Northwest] side of this Island of Wouahoo [O‘ahu] . . . surrounded by a fine pleasant fertile Country. [Beaglehole 1967:569]

In 1813, Waialua was described by John Whitman, an early missionary visitor, as follows:

. . . a large district on the N.E. extremity of the island, embracing a large quantity of taro land, many excellent fishing grounds and several large fish ponds one of which deserves particular notice for its size and the labour bestowed in building the wall which encloses it. [Holt 1979:78]

Another missionary, Levi Chamberlain, described the vicinity of Kawaihāpai in 1826:

At 11 o'ck [*sic*] we set out and walked along a path leading over an extended plain covered with high grass. After walking about 3 miles we took a path leading over a marshy tract to the mountains which we were designing to cross in order that we might avoid a bad piece of traveling along the western shore. The mountains here run in nearly a N.W. and N.E. direction being somewhat circular. We ascended by a rough & difficult path, shrubs, long grass, wild plants and bushes sprung up grew luxuriantly among the rocks being plentifully moistened by little streams which trickled down the steep sides of the mountains. After ascending several hundred feet, we came to a beautiful little run of water conducted by sprouts [*sic*] furnishing sufficient moisture for a number of taro patches below. I was told that the water never failed and the district into which it passes is called Kawaihapai (Water lifted Up) on account of the water's being conducted from such an elevation.

The prospect from the acclivity is very fine. The whole district of Waialua is spread out before the eye with its cluster of settlements, straggling houses, scattering trees, cultivated plats & growing in broad perspectives the wide extending ocean tossing its restless waves and throwing in its white foaming billows fringing the shores all along the whole extent of the district. [Chamberlain 1823-1827 in Almeida 1993:14-15]

However, the experiences of some early foreign explorers were not nearly as pleasant as those described by Clerke, Whitman, and Chamberlain above. In May 1792, the *Daedalus*, a British naval storeship within Captain George Vancouver's fleet (Vancouver would later gift cattle to Kamehameha I, thereby initiating ranching and *paniolo* culture within Hawai'i), anchored off the mouth of the Waimea Stream to collect fresh water. According to Kuykendall (1967),

The commander, Lieutenant Hergest, foolishly went on shore unarmed and accompanied only by the astronomer Gooch and two seamen. Walking a little way up the river, the party was attacked by a crowd of natives and all killed except one of the seamen. [Kuykendall 1967:81]

Kamakau notes the reasoning behind the killing of Hergest and Gooch; their deaths arose out of a need to acquire arms as intra-island and inter-island conflicts were at their peak (this period of warfare was also known as the Conquest Period):

The two men who were killed were dragged along from Waimea to Waialua and from there to Mokuleia, all because of hatred for the foreigners. In the hearts of [the plotters] there was no fear of God who had made all men of one blood. I met one of the men who did the killing and he told me, "The men were killed to get the guns; the chiefs had commanded the lesser chiefs and warriors who lived in the back country that if a ship came into those parts with guns [they were] to kill the strangers and get the guns." The guns and swords were taken to Ka-lani-ku-pule at Waikiki, and when the chief saw what Koi had seized he rejoiced to have the muskets, for those were times of war on this group from Kauai to Hawaii, war both within the island and with other islands. [Kamakau 1992:164]

Fornander, however, elaborates on the final disposition of Hergest and Gooch's bodies. After their bodies were secured by Koi, an important courtier of Kahekili and priest of the Kaleopu'upuu order, they were taken to Mokolē'ia, "where they were dissected and the bones kept for future use" (Fornander 1996:249).

Despite these events, Western interests continued pushing inwards into Waialua Moku, driven by mercantile desires and the prevalence of valuable commodities such as sandalwood. When Kamehameha died in 1819, his son Liholiho and wife Ka'ahumanu shared the duties of ruling the new kingdom. In 1823, Liholiho addressed a gathering of chiefs at Maui and told them that he wished to visit England. He selected his younger brother Kauikeaouli to be his chief during his absence and heir in the event that he did not return. Both Liholiho and his wife died in 1824 while in England, and Kauikeaouli, later known as Kamehameha III, became king at the age of nine, with a guardian Kahalai'a as his *kahu* (personal attendant). This took place during the Sandalwood Period (AD 1812-1830), when the *ali'i* (high chiefs) made enormous demands upon the common people to gather sandalwood in the upland forests. The wood was sold to foreigners in trade for western luxury goods (Sahlins 1992:82).

Kau-i-ke-aouli's assumption of control was marked by the selection of a group of young chiefs and children of important persons, of resident foreigners, and of commoners, to become his favorites, friends, members of his household, and soldiers and sailors to form his bodyguard. After Kahala'ia's death all repaired to the uplands of Waialua adjoining Waimea, to upper Kolokini, Wao'ala, 'Aikanaka, Kaloka in upper Makaleha, and to upper Mokule'ia to cut sandalwood. Kau-i-ke-aouli was but a boy in his thirteenth year while cutting at upper Wao'ala and lower Maeaea, but he attended to the work himself and when he sailed in his two-masted boat to Mokule'ia or other places after sugarcane, sweet potatoes, melons, pigs, and fowl, he handled the boat in true sailor fashion, dressed in his sailor blouse and cap. [Kamakau 1992:278–279]

This period ended with the exhaustion of sandalwood in the Islands. Trade continued with visiting whaling ships during the Whaling Period (AD 1830-1848) for provisions, but this did not generate the same profits for the *ali'i* as did the early sandalwood trade. The *ali'i* became greatly indebted to western merchants, and made increasing demands upon the common people for goods and work to pay off these debts and to buy yet more goods (Sahlins 1992:108).

#### 4.2.1 Protestant Missionaries in Waialua, 1820s

By the 1820s, Hawaiian *ali'i* had established close links with the company of missionaries sent to the Hawaiian Islands in 1819. From July to August 1826, Ka'ahumanu (Kamehameha's widow) and an entourage consisting of up to 300 persons conducted a proselytizing tour around O'ahu. Rev. Hiram Bingham's account of the proceedings at Waialua suggests the extent of the missionaries' inroads in the district:

A very large concourse of people assembled on the Lord's day, for public worship in the open air. To the listening throngs I endeavored to proclaim the great salvation  
...

After the Sabbath we examined and encouraged, and partially supplied with books, the incipient schools established there under the particular patronage of Lydia

Namahana and Gideon Laanui, to whom the district belonged. There were found under Maiao and his assistant teachers, four hundred and ninety-five male and female pupils, and under Kaoo, one hundred and sixty-four, amounting together to six hundred and fifty-nine pupils, chiefly men and women. [Bingham 1847:295–296]

Paralleling the general decline of sovereign powers, the royal rights to Waialua's famous fishponds seem to have declined thereafter, the benefits falling more to the Ka'ahumanu lords of the land and de facto control going to the resident chiefs Pi'ia and La'anui. La'anui soon confirmed the change by making the lower Anahulu River the ritual center; in 1830 he built a *luakini* (chiefly temple) there, which later became the site of the first Protestant church in Waialua (Kirch and Sahlins 1992:95–96).

La'anui was living at Kawailoa in 1832 (Namahana had died in 1829) when the Rev. John S. Emerson (1800–1867) and his wife arrived at Waialua Bay to establish a mission station in the Waialua district. Emerson reported in a letter:

The wind was against us as we entered the harbor at Waialua, and we were obliged to 'beat in.' As soon as we approached the land, Laanui, our chief, came alongside in a canoe to welcome us, presenting us with a good watermelon, of which we ate freely and were at once relieved of our seasickness. [Emerson 1928:55]

Emerson gave the name Hale'iwa ("home of the frigate bird") to their settlement. Emerson's son, John Pomeroy Emerson, recounts an episode revealing the authority La'anui possessed within Waialua:

The new [meeting] house [at Waialua] was opened for the first time for dedication and public worship on September 25th, 1833, and Dr. Judd, Mr. Bingham and Mr. Brinsmade, a merchant, came from Honolulu for the occasion.

When they got to the meeting with my father, they found an immense crowd of natives filling every part of the house and others crowding around all the windows and doors, utterly unable to enter. 'Truly the Spirit of God is here working on the hearts of this people, who are hungering for instruction,' thought my father. Dr. Judd, who had been in the country four years longer than he, began to ask questions, and found that Laanui had issued positive commands that everyone in the entire district of Waialua should attend this service under threat of severe penalty . . . When Laanui had filled the meeting-house with the crowd of people standing, he ordered them to sit down on the floor packed together as close as possible, but a great many were still compelled to stand outside. After the services were over, Dr. Judd and my father kindly explained to Laanui that he should not force his people to attend church in that way . . . [Emerson 1928:88–89]

#### 4.2.2 Population Decline, 1830s

In the pre-Contact period, villages in the Waialua District were concentrated along the coast and the well-watered valleys of the *ahupua'a* on the eastern side of the district. The population of these *ahupua'a* has been estimated at 6,000 to 8,000 people before Western Contact (Sahlins 1992:20).

In 1832, the missionary Ephraim Walter Clark reported that:

Waialua on the eastern part of the island is a populous region. A mission can be located at a central point in this vicinity, [and] by preaching at different places that are within 5 or 6 miles of each other & of easy access, [we] would probably have 3,000 or 4,000 bearers [followers]. [Letter from E.W. Clark 1932 in Alameida 1993:4]

A small school was also established at Kawaihāpai in 1839, near Kawaihāpai Stream. By the time this school was established, the population of both Mokulē‘ia and Kawaihāpai was in decline. Historic Hawaiian newspapers provide particular insights into this population decline.

Two articles in *Ke Kumu Hawaii* quantify this population decline. The first of these articles, dated 30 September 1835, is in fact a census for Waialua reporting a line item for “Kaena, Mokuleia, and Kawaihapai:”

*Kaena a me Mokuleia a me Kawaihapai*

*Na kane.172*

*Na wahine 156*

*Na keiki Kane 72*

*Na Kaikamahine 55*

*O ka hui ana o lakou a pau 455*

Kaena, Mokuleia and Kawaihapai

Men 172

Women 156

Boys 72

Girls 55

Total 455

The second article within *Ke Kumu Hawaii* notes that most of the deaths have stricken the young, severely limiting the number of individuals surviving to reproductive age and thus resulting in the de-stabilization of Mokulē‘ia and Kawaihāpai’s population:

*NO KA EMI ANA O NA KANAKA.*

*Eia ka pepa e akaka ai ka poe i make ma kekahi mau aina ma Waialua a Koolau i ka makahiki 1838.*

*Ka aina. Mokuleia a me Mananui,*

*Ua hanauia. 10*

*Na keiki make. 1*

*Na kane opiopio make. 9*

*Na wahine opiopio make. 10*

*Na elemakule make. 0*

*Na luwahine make. 0*

*Pau loa make. 20*

*Ka nui o na kanaka ma ia mau aina i ka makahiki 1835: 1,129*

Regarding the decreasing population

This is a tabulation of the population decline in the lands of Waialua and Ko'olau in the year 1838

For the lands of Mokulē'ia and Kamananui [Ke Kumu Hawaii. Buke 1, Pepa 20, Aoao 153. Sepatemaba 30, 1835].

Births 10

The children that died 1

The young men that died 9

The young women that died 10

The old men that died 0

The old women that died 0

The total deaths 20

The number of people in the year 1835: 1,129 [Ke Kumu Hawaii. Buke 4, Pepa 23, Aoao 89. Aperila 10, 1839].

The first missionary census of the district in 1831-1832 recorded 2,640 people in Waialua, probably down 20-30% from the first decade of the century. The population continued to decline in the first part of the nineteenth century and by 1848, the population was 1,616 persons. Much of this decline was due to a high death rates from newly introduced diseases such as smallpox, typhus, and venereal diseases.

In 1850, the missionary Emerson wrote the following:

I went to Kawaihapai, distant about 6 miles to preach to a small congregation. Found many sick on the road calling for medicine; & when [I] arrived at the place of meeting I found two unburned corpses, but a few steps from the schoolhouse & other sick-apparently nigh unto death . . . The past epidemic has been of a very strange character. Many were taken with violent pains in the head or stomach, which would soon spread over the whole system; & some times in one or two days the patient would die, but more frequently he would linger along six or ten days. [Emerson 1850 in Alameida 1993:84; Letter, Emerson to Anderson, 22 May 1850, Hawaiian Mission Children's Society Library]

The adult to child ratio in 1831-1832 was three to one (Schmitt 1977:9). This is not only a reflection of the low birth rate during these years, but also indicates many young people were

moving out of the district. They left to escape the increasing demands of the *ali'i* during the Sandalwood Period and to seek a better life in the new urban centers of the Islands. Between 1830 and 1850, the demands of the *ali'i* on the *maka'āinana* (common people) were severe. The missionary John Emerson, commenting on the burdensome taxes on the people, wrote that the ruling chiefs “get hungry often and send a vessel to Waialua for food quite as often as it is welcomed by the people” (MsL: 10 Feb 1834 in Sahlins 1992:145). The chiefs also demanded food be brought to them, from Waialua to Honolulu:

Last Sat some 2 or 300 men went from this place to H[onolulu] to carry food for the chiefs and this [is] often done . . . Each man carried enough food to maintain 4 persons one week & will cost each man beside the time spent in [indecipherable] and cooking it 4 days time and 70 miles travel to get it to H[onolulu], and yet each man's load would only bring 50 cts. [Locke, journal, 26 June 1837; cf. MsL: Emerson, 11 Jan 1835 in Sahlins 1992:145]

By the time Protestant missionaries were establishing their presence in Waialua in the 1830s, the sandalwood trade that had driven commerce in the Hawaiian Islands had collapsed. However, new enterprises were emerging to fill the void and activity at Waialua continued apace. In October 1819, two whaling ships anchored in the Hawaiian Islands. During the next decades, other whaling ships followed, as the Islands became a victualing and layover base in the mid-Pacific. Supplies of beef, fresh and salted, and produce were in demand and a trade in hide and tallow was also developing. As had happened during the years of the sandalwood trade, authority to commandeer valued goods from the commoners of Waialua was vested in the chiefs:

The variety, as well as amount of things being appropriated from Waialua by the ruling chiefs is impressive. The Aloha Gidiona [Gideon La'anui] letters speak of ocean fish taken in sweeps as well as great quantities of fish shipped from the old royal ponds of 'Uko'a and Lokoea, of dry cooked taro (*pai'ai*) as well as poi [pounded taro], of sweet potato, breadfruit, shrimp, goats and pigs, timbers of different kinds, chickens, oranges and lemons—and often, of cash money. [Kirch and Sahlins 1992:145]

This trend in population decline (due to numerous factors including disease and migration), continued until 1866, when the population reached a low of 851 persons (Schmitt 1977:13–14).

### 4.3 The Māhele and the Kuleana Act

Following the death of Ka'ahumanu's father, Ke'eaumoku, in 1804, Ka'ahumanu's brother Kahekili Ke'eaumoku, also known as George Cox, became the *ali'i 'ai moku* (governing high chief) of Waialua. In 1824, Kahekili Ke'eaumoku died and his sister, Lydia Nāmāhana Kekuapi'ia, also known as Pi'ia, inherited the entire *moku* (district) of Waialua. When she died, her husband La'anui was confirmed as the *luna* (landlord or supervisor) by Ka'ahumanu, who was again considered the owner. Ka'ahumanu, who died in 1832, willed all of her lands to her niece, Kīna'u. After Kīna'u's death in 1839, the *kalana* (land division smaller than a *moku*) within Waialua was inherited by her daughter, Victoria Kamāmalu, along with many other lands in the Islands (Kame'eleihiwa 1992:106, 120–124).

In 1845, the Board of Commissioners to Quiet Land Titles, also called the Land Commission, was established “for the investigation and final ascertainment or rejection of all claims of private individuals, whether natives or foreigners, to any landed property” (Chinen 1958:8). This led to the Māhele, the division of lands among the king of Hawai‘i, the *ali‘i*, and the common people, which introduced the concept of private property into Hawaiian society.

To maintain sovereignty of the land, the *mō‘ī* Kamehameha III in 1846–1848 supervised the Māhele—the division of Hawaiian lands—that transformed the land system in Hawai‘i from collective to private ownership. Modeled after western concepts, Crown Lands were reserved for himself and the royal house, Konohiki Lands were claimed by *ali‘i* (chief) and their *konohiki* (supervisor), and Government Lands were set aside to generate revenue for the government. In 1850, these three categories of land were subject to the rights of the *maka‘āinana* (commoner) and other tenants (naturalized foreigners, non-Hawaiians born in the Islands, or long-term resident foreigners) who could make claims for their habitation and agricultural plots, known as *kuleana* (Native land rights) parcels (Chinen 1958:8–15).

Under the Kuleana Act of 1850, the *maka‘āinana* were required to file their claims with the Board of Commissioners to Quiet Land Titles (Land Commission) within a specified time period in order to apply for fee-simple title to their lands. The claim could only be filed after the claimant arranged and paid for a survey, and two witnesses testified that they knew the claimant and the boundaries of the land, knew that the claimant had lived on the land since 1839, and knew that no one had challenged the claim. Then the *maka‘āinana* could present their claims to the Land Commission to receive their Land Commission Award (LCA) (Kame‘eleihiwa 1992:11).

Not everyone who was eligible to apply for *kuleana* lands did so, and not all of those claims filed were awarded. Some claimants failed to follow through and come before the Land Commission, some did not produce two witnesses, and some did not get their land surveyed. In addition, some *maka‘āinana* may have been reluctant to claim *‘āina* that had been traditionally controlled by their *ali‘i*, some may have not been familiar with the concept of private land ownership, and some may have not known about the Māhele, the process of making claims, or the strict deadline for making claims. Further, the Land Commission was comprised largely of foreign missionaries, so the small number of claimants and awards may reflect only those *maka‘āinana* who were in good standing with the church (Kame‘eleihiwa 1992:296–297). Significantly, the surveying of the land was not standardized.

Upon the confirmation of a land claim, the *ali‘i* were required to pay a commutation to the government. This commutation (meaning a substitution of one form of payment or charge for another) could be satisfied with a cash payment or the return of land of equal value. This payment was usually one-third of the value of the unimproved land at the date of the award (Chinen 1958:9–12). Victoria Kamāmalu gave up all of her lands in Kamananui, Mokulē‘ia, Kawaihāpai, Keālia, and Ka‘ena, all within the Waialua District, to the Government to satisfy the one-third-commutation requirement in order to claim all of her other extensive land titles. These *ahupua‘a* then became Government Lands. In 1848, Government Lands became available for purchase, “in lots of from one to fifty acres in fee simple, to residents only, at a minimum price of fifty cents per acre” (Chamberlain n.d.). These costs did not include the survey fee, which was to be paid by the interested buyer.



Many of the Native Hawaiians living in the area bought the lands they lived and worked on through the Waialua land agent, the missionary John Emerson. Emerson had encouraged the natives of these five *ahupua'a* in western Waialua to withdraw from the Māhele and not prosecute their claims through the Kuleana Act of 1850. Instead, he encouraged them to buy the lands they worked. In this way they could not only obtain house and agricultural lots, but also pasturage and upper forest lands, which were usually not awarded as *kuleana* claims (Sahlins 1992:168).

A total of 27 land grants were purchased in the *ahupua'a* of Mokulē'ia and 16 in the *ahupua'a* of Kawaihāpai (Figure 6). Portions of 21 land grants are located within the Dillingham Ranch property, granted from 1850-1855 (Table 1). The land grants in the vicinity generally consisted of long, narrow rectangular pieces of land with the long axis running *mauka-makai*. There were also two rows of land grants extending from the shoreline to the forest reserve line. The *makai* row included the coastal plains and lower foothills. The *mauka* row consisted of the upper mountainous areas.

In 1850, a law passed that allowed foreigners to buy land fee-simple. Two descendants of missionaries, William Emerson and John T. Gulick, were the first foreigners to buy land in Mokulē'ia and Kawaihāpai. Over the next few years, Emerson continued to buy land from the original grantees or later owners until he owned a total of 2,605 acres in Waialua (Alameida 1993:xii).

In 1852, the first Chinese were brought to the Islands to work in the sugarcane fields. Some of these Chinese later moved to Waialua to begin rice cultivation. A market for rice in California had developed as increasing numbers of Chinese laborers immigrated there since the mid-nineteenth century. Similarly, as Chinese immigration to the Islands also accelerated, a domestic market for rice developed:

By 1876 there was still a considerable amount of former taro land available for rice farming. The great demand for rice land brought disused taro patches into requisition—especially because water rights attached to them . . .

As the demand for rice continued, it became profitable to bring into use land hitherto unused. The land most easily rendered fit for rice cultivation was swamp or marsh land of which there was a large amount in the islands. At Waialua on Oahu, about three hundred acres of swamp land were reclaimed for rice farming. [Coulter and Chun 1937:11]

In 1892, there were 180 acres of land under cultivation for rice in the Waialua District; these rice fields were located in the *ahupua'a* of Mokulē'ia, Kamanau, and Kawaihoa (Coulter and Chun 1937:12, 21). The immigrant Chinese may account for the rise in the Waialua District population during the last quarter of the nineteenth century. In 1866, the population of Waialua had reached a low of 851 persons. This trend reversed in 1878, with a small increase to 939 people and a count of 1,349 in 1886 (Schmitt 1977:13–14).

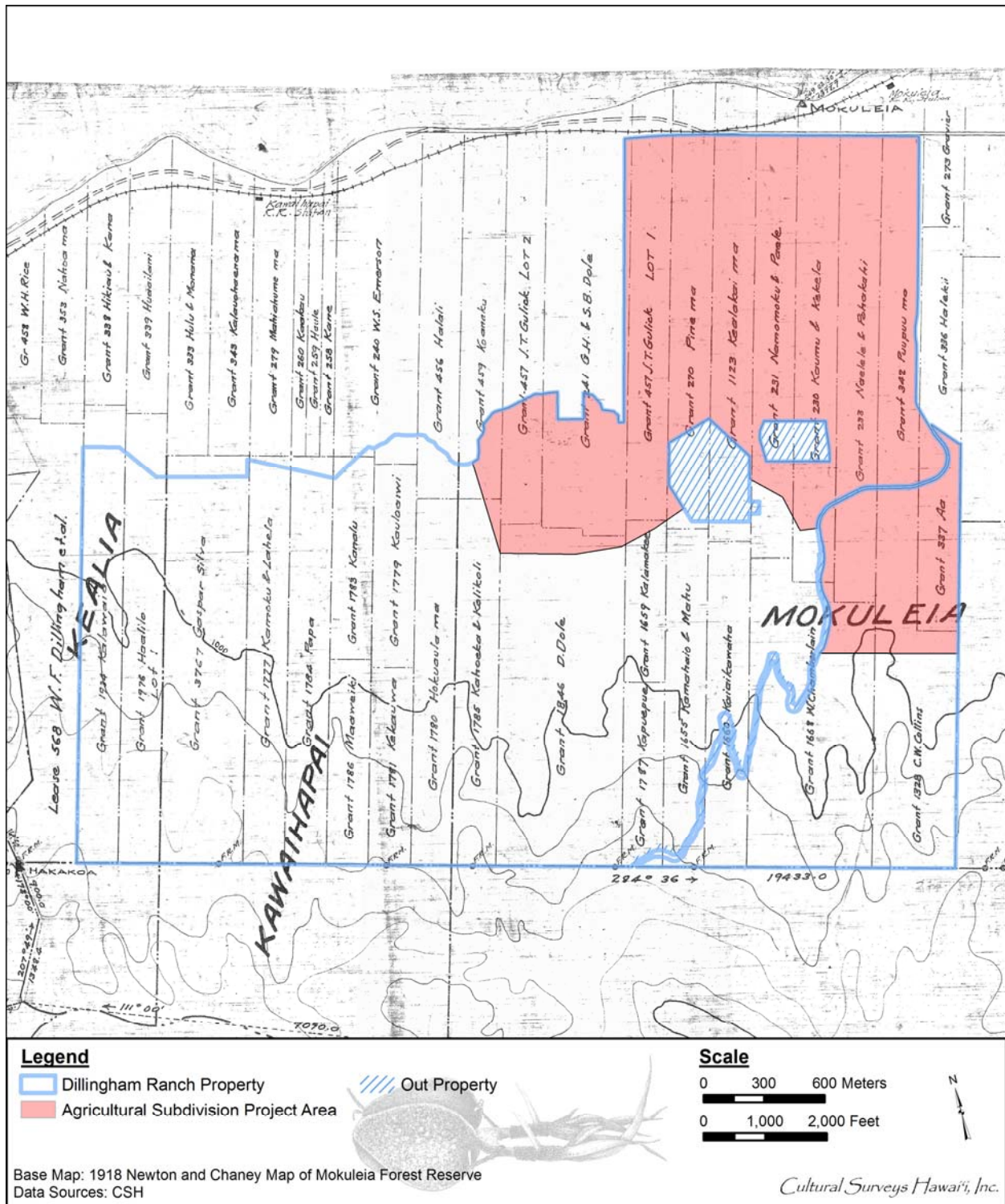


Figure 6. Portion of the 1918 Newton and Chaney map of the Mokuleia Forest Reserve, showing the distribution of land grants in the vicinity of the Dillingham Ranch Agricultural Subdivision project area

Table 1. Land Grants Located within the Dillingham Ranch property

<b>Grant #</b>	<b>Grantee</b>	<b>Year</b>	<b>Location</b>
230	Kaumu and Kekela	1850	Mokulē'ia
231	Namoku and Paele	1850	Mokulē'ia
233	Pohakahi and Naelele	1850	Mokulē'ia
240	Wm. S. Emerson	1850	Kawaihāpai
241	Geo. H. Dole and S.B. Dole	1850	Mokulē'ia
270	Pine Pao and Mahiai	1850	Mokulē'ia
336	Haleki	1850	Mokulē'ia
337	Aa	1850	Mokulē'ia
342	Puupuu et al.	1850	Mokulē'ia
456	I Halali	1850	Kawaihāpai
457	John T. Gulick	1850	Mokulē'ia
459	Koanaku et al.	1850	Mokulē'ia
1655	Mahu and Kamahalo	1855	Mokulē'ia
1659	Kalamaku	1855	Mokulē'ia
1779	Kauloaiwi	1855	Kawaihāpai
1780	Hokuaulani and Kaawelu	1855	Kawaihāpai
1783	Kanalu	1855	Kawaihāpai
1784	Papa	1855	Kawaihāpai
1785	Kahoeka C. Kolikoli	1855	Mokulē'ia
1846	Daniel Dole	1855	Mokulē'ia

Source: Waihona 'Aina 2000, Office of Hawaiian Affairs 2015, and Ava Konohiki 2015.

## 4.4 1900s

By the early 1900s, sugarcane plantations and large ranches came to dominate the lands of western Waialua. Cattle were known to have grazed on the lowlands of Waialua as early as the 1840s (Sahlins 1992:148). In 1897, B.F. Dillingham purchased the Kawailoa Ranch in Mokulē'ia. The ranch included over 2,000 head of cattle and over 100 horses and mules on 10,000 acres of land (Yardley 1981:193). Dillingham also leased additional property in Mokulē'ia, including the Gaspar Silva Ranch, the James Gay Estate, and other lands in the area that he could secure. Dillingham's plan was to later sublease or sell the land at a profit as the lands had potential for being developed into large-scale sugar plantations. He anticipated the land would become valuable once extensive irrigation systems were in place, and when the O'ahu Railway and Land Company (OR&L) railroad was constructed around Ka'ena Point and along the north shore to Kahuku.

By 1898, the OR&L railroad was constructed through Waialua District, with stations in both Kawaihāpai and Mokulē'ia. Soon thereafter, Dillingham began selling off or subleasing much of his lands in western Waialua. However, Dillingham retained as his personal ranch "a great strip of mountainside and beaches with flat land in between and a homestead in the middle" (Yardley 1981:206). This land would remain ranch land, with sugar plantations located to the east and west. The Dillingham Ranch was developed into a horse ranch including stables, pastures, equestrian areas, and a polo field, along with a large, wood-framed house for the Dillingham family (Yardley 1981:193–194).

Also in 1898, the Halstead Brothers had a small sugarcane plantation and mill at Waialua town. B.F. Dillingham believed the Halstead Brothers' land could be turned into a profitable sugar plantation, especially since there was now a rail line to Honolulu. The Waialua Agricultural Company was established in 1898 by J.B. Atherton, E.D. Tenney, B.F. Dillingham, W.A. Bowen, H. Waterhouse, and M.R. Robinson (Moblo 1991:4), and was incorporated by the company Castle & Cooke (Dorrance and Morgan 2000:47). They bought the Halstead Brothers' land and mill and began to buy or lease the adjacent lands, many owned by Native Hawaiians. They acquired many of the former irrigated taro lands in order to control the water rights of the region.

Ditches to control water flow began to be built around 1902 in Waialua. The Ito Ditch, built after 1911, diverted water from Kaukonahua Stream to the Mokulē'ia sugarcane fields. The Waialua Agricultural Company was famous for its system of flume irrigation. The portable concrete flumes were set around the fields in a herringbone pattern and water was released to the field by small tin gates (Wilcox 1996:110). In addition, various artesian wells, pumping stations, reservoirs, and associated water control infrastructure were constructed to support the growing sugar plantations.

Land for a new railroad that would carry cane from the fields to the mill began to be surveyed in 1898 and by 1908 the new railroad connected the plantation lands in Waialua, Helemano, and Kawailoa. In 1910, it was reported in the *Louisiana Planter*:

Waialua is reached either by railroad, a distance from Honolulu of 58 miles, or wagon road, 28 miles. The plantation lands extend along the seacoast 15 miles and 10 miles back toward the mountains. The plantation has a good railway system.

There are nearly 600 cane cars and five locomotives: with 30 miles of permanent track and eight of portable track. One stretch of road is nine miles long. [Condé and Best 1973:341]

A 1919 U.S. Army War Department fire control map (Figure 7) illustrates the extent of plantation development in the vicinity of the Dillingham Ranch Agricultural Subdivision project area. In general, cane lands extend from the OR&L/Government Road that parallels the shoreline, to the base of the foothills of the Wai'anae Range. The *mauka* extent of plantation cultivation appears to be the Ito Ditch, indicated crossing east-west through the *mauka* portion of the Dillingham Ranch Agricultural Subdivision project area, along the base of the foothills. Various fence lines are indicated *mauka* of the ditch, as these areas remained pasture for grazing livestock.

There are several structures indicated on the 1919 map, most of which are regularly spaced around the railroad tracks. These may be worker's houses and camps, or other structures associated with the sugar plantation. Structures are also clustered near the coast at Kawaihāpai. These possible houses and walls are adjacent to three delineated areas of marsh, bounded by stone walls and fencing. These may be fields used to grow taro or rice, which may have been irrigated. The 1919 map also indicates the extent of Dillingham's personal ranch (labeled "Dillingham Ranch"), which was not cultivated in cane. The narrow strip of land extends from the Government Road up into the foothills and is bordered by fence lines. Cattle walls are also indicated near the *mauka* end of the Dillingham Ranch.

In 1918, the Waialua plantation railroad lines were connected to the main OR&L lines. In 1927, the rail line was extended to the upper levels of the cane fields. Water flumes had been used to transport the cane in these upper fields to the lower tracks, but the use of these flumes caused a serious depletion of the water supply and it was considered more economical to build more tracks. The 1929 series USGS map (Figure 8) continues to show the various plantation ditches, railroad lines, and various other plantation-related structures in the vicinity of the Dillingham Ranch Agricultural Subdivision project area. The Kawaihāpai Reservoir is now indicated, suggesting a need for additional irrigation infrastructure for the expanding sugar plantation lands. Also of note are two large cattle paddocks located in the western portion of the Dillingham Ranch Agricultural Subdivision project area. These rectangular paddocks are indicated to be bordered on three sides by stone walls—which must have been fairly large structures to be indicated on the topographic map—that extend from the foothills down to the plantation ditch fed by the Kawaihāpai Reservoir. The locations of these paddocks correspond to the *mauka* boundaries of Land Grant 457, Lots 1 and 2 to J.T. Gulick (see Figure 6). At this time, Dillingham's personal ranch lands appear to remain confined to the strip of land along the eastern end of the Dillingham Ranch Agricultural Subdivision project area, bordered by cattle walls and fence lines.

Major land use changes occurred in western Waialua when the U.S. military began development in the area. Kawaihāpai Military Reservation was established ca. 1927 at the site of the present Dillingham Airfield. Following the entrance of the U.S. into World War II, Kawaihāpai Military Reservation was expanded and became known as Mokuleia Airfield (Payette 2003). A small sand and grass runway was built and in use within a week after the attack on Pearl Harbor. The airfield was a training base for fighter planes, P-38s, and later, P-51s. The continuation of the war required the expansion of the airfield and by April 1942, the airfield had become an 8,000-ft runway, later expanded to 9,500 ft. It was the longest runway in the Hawaiian Islands at that time (Allen

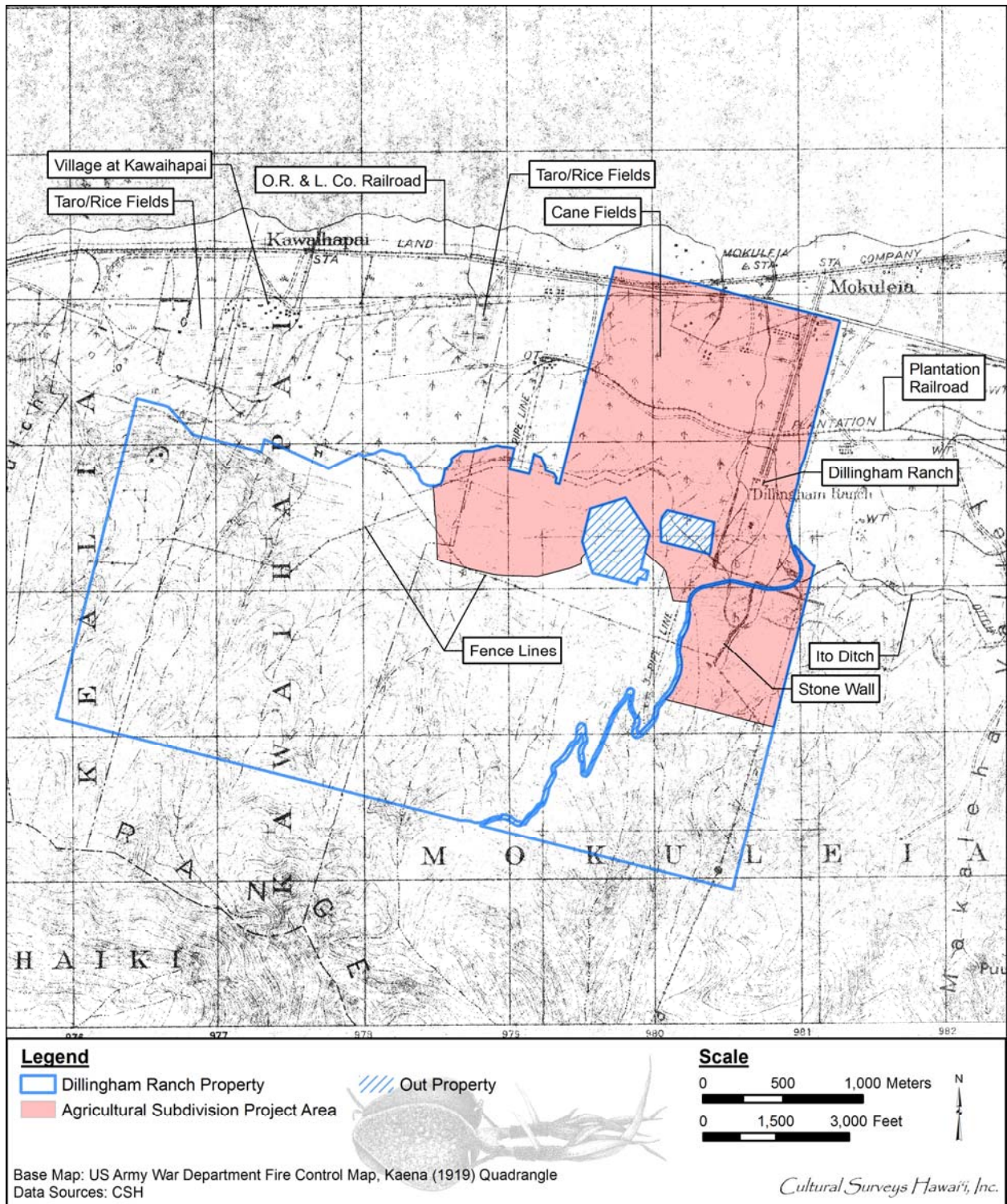


Figure 7. Portion of the 1919 U.S. Army War Department fire control map, Kaena Quadrangle, showing the extent of plantation development in the vicinity of the Dillingham Ranch Agricultural Subdivision project area

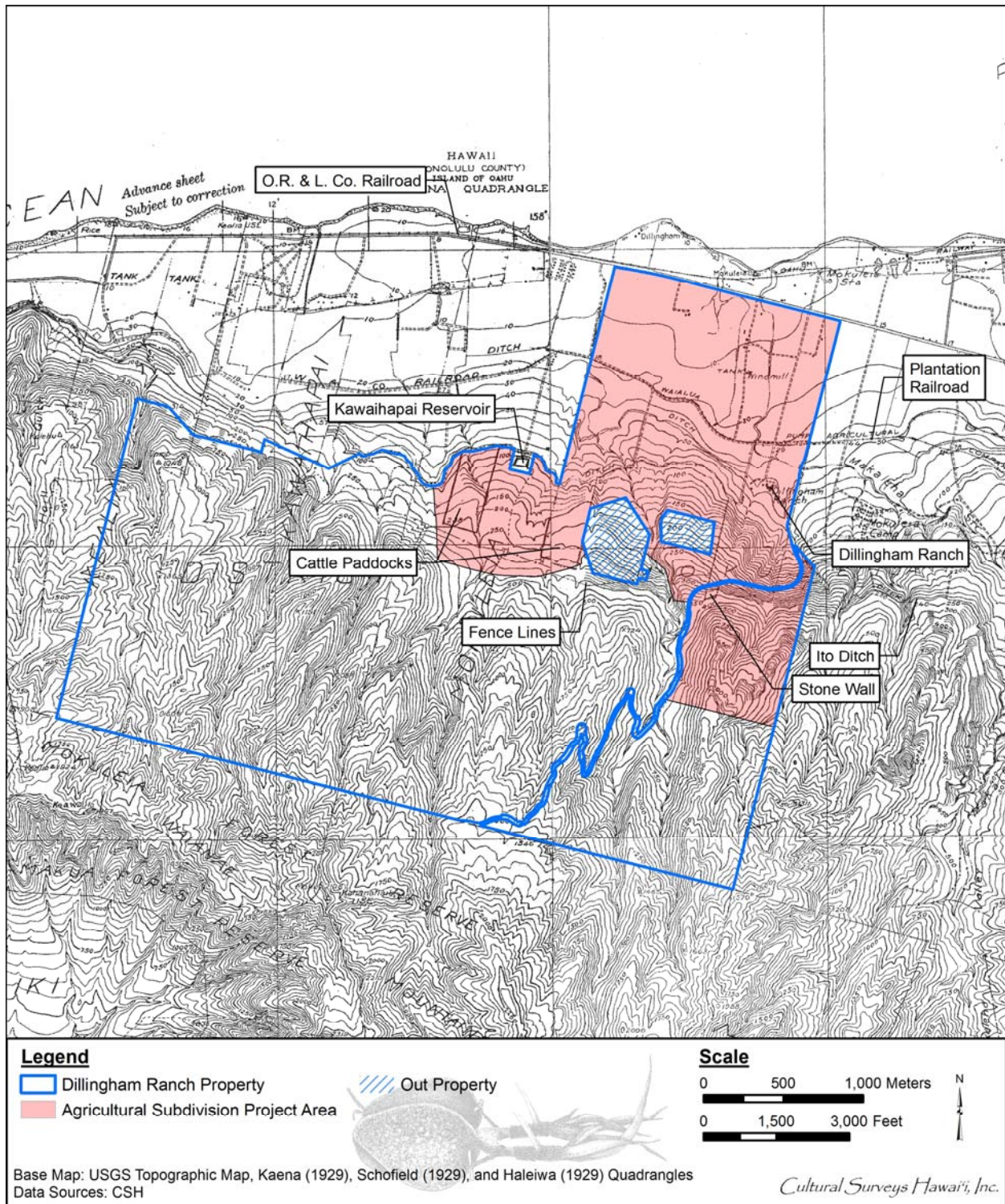


Figure 8. Portion of the 1929 USGS Topographic Pap, Kaena, Schofield, and Haleiwa quadrangles, showing development in the vicinity of the Dillingham Ranch Agricultural Subdivision project area

1971:226–227). Also located at Mokuleia Airfield was Battery Dillingham, in use from 1942–1944. Battery Dillingham included a series of naval gun emplacements located both along the beach and further inland, and served as a field artillery training range (Payette 2003). Mokuleia Airfield was renamed Dillingham Air Force Base when the U.S. Air Force was formed in 1947. In 1948, the base was deactivated but continued to be used for training activities by the U.S. Army. The site was also used as a Nike missile base during the 1950s (Payette 2003).

Mokuleia Military Reservation, including Battery Mokuleia, was also established in 1942 and consisted of four gun emplacements located 2 miles inland (Payette 2003). The extent of military development in the vicinity of the Dillingham Ranch Agricultural Subdivision project area is shown on the 1943 U.S. Army War Department map (Figure 9). Dillingham Airfield is shown to dominate the landscape of coastal Kawaihāpai, though ranching and plantation agriculture remain throughout the vicinity of the Dillingham Ranch Agricultural Subdivision project area.

In 1946, Robert P. Patterson, Secretary of War of the United States, executed a “Declaration of Taking,” which stated that the land of Mokulē‘ia, Auku‘u, Kawaihāpai, Keālia, and Ka‘ena, Waialua, O‘ahu, Territory of Hawaii; Mokuleia Ranch and Land Company, Limited, et al. “is taken . . . to provide for a military airfield, an ordnance storage area, and related military purposes incident thereto. The said land has been selected by me for acquisition by the United States for use in connection with such purposes, and for such other uses as may be authorized by Congress or by Executive Order, and is [r]equired for immediate use.” Several of the Native Hawaiian families, who had retained their small plots of land through the nineteenth and early twentieth centuries, now lost the lands through this confiscation (Alameida 1993:113).

#### 4.5 Historic English Language Newspaper Accounts of Mokulē‘ia and Kawaihāpai Ahupua‘a

The analysis of textual sources such as early English language newspaper accounts serves to strengthen the historical writing about a region, in this case, the *ahupua‘a* of Mokulē‘ia and Kawaihāpai. The following section is a demonstrated effort to cease viewing texts as “purely literary phenomena,” and instead understand them as “eloquent, historically contextualisable and contextualizing artifacts” (Briggs 2000:398). Secondary historical literature adds further support to the historic accounts documented in the preceding section. Additionally, historical literature such as early English language newspapers allow for new interpretive frameworks of the archaeological record. Early newspaper accounts are “not neutral epistles,” nor are they “disinterested bearers of information about the past” (Moreland 2001:31).

Like other products of human creativity, they were, in fact, active in the production, negotiation and transformation of social relations. More particularly, they contributed to the creation and reproduction of technologies of oppression—as well as providing new opportunities for resistance [e.g. *Ka Nūpepa Kū‘oko‘a*]. [Moreland 2001:31]

Although the newspaper accounts discussed below are largely reflective of Euro-American voices, and were most likely intended for an English-speaking audience, they are useful in understanding aspects of historic land use and occupation within Mokulē‘ia and Kawaihāpai Ahupua‘a. A complete table of early English language newspaper accounts for Mokulē‘ia and Kawaihāpai is presented in Appendix D. The newspaper accounts referenced below are drawn from the period 1836–1922.



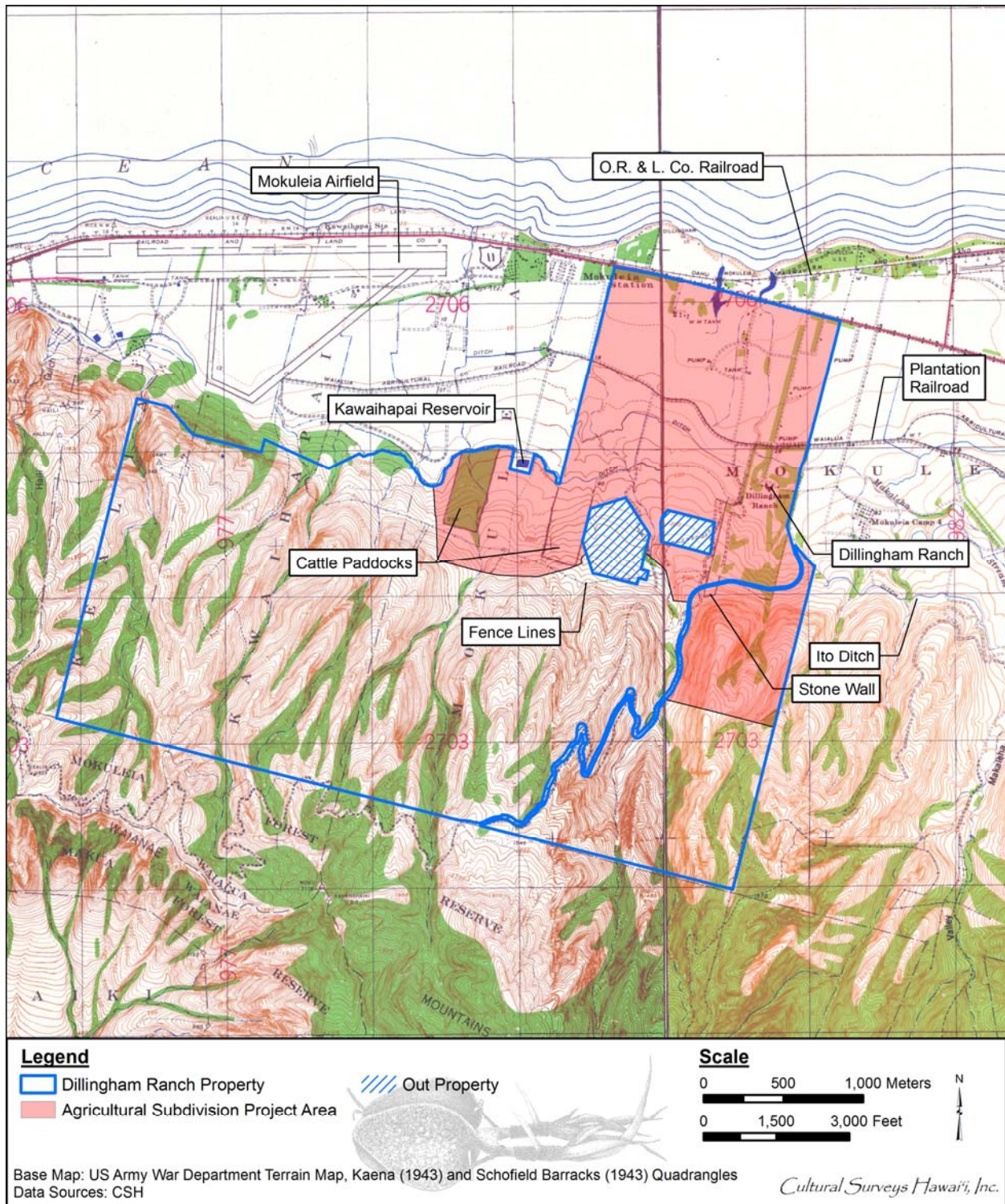


Figure 9. Portions of the 1943 U.S. Army War Department Terrain Map, Kaena and Schofield Barracks Quadrangles, showing development in the vicinity of the Dillingham Ranch Agricultural Subdivision project area

### 4.5.1 Shipping and Commerce

Throughout the nineteenth and early twentieth centuries, Mokulē'ia was a busy shipping port for the island of O'ahu that witnessed a consistent exchange of goods, food items, and livestock. A wharf existed at Mokulē'ia, in addition to several smaller landings at the rice plantations scattered throughout the *ahupua'a*. Newspaper articles from various local publications such as *The Pacific Commercial Advertiser*, *The Hawaiian Star*, and *The Daily Bulletin* documented regular stops made at Mokulē'ia as part of a larger ocean commerce network. Shipping intelligence logs in several newspapers recorded the names of vessels, captains, and various ports of entry. It may be inferred from these shipping intelligence logs that Mokulē'ia Ahupua'a was a popular stopping ground for many steamers and freight ships. Trade goods such as rice, sugar, iron, and cattle were commonly shipped between Mokulē'ia and the Port of Honolulu; these goods were the most recorded items on shipping manifests of the day. Of particular note, the general direction of goods was from Mokulē'ia to the Port of Honolulu; it may thus be inferred that a substantial quantity of goods were being produced within Waialua Moku and then shipped (via steamers such as the *James Makee*, *C.R. Bishop*, and *Waimanalo*) for consumption within Kona Moku. The quantity of goods carried around the island ranged from "942 bags sugar, 11 tons old iron and 25 head of cattle," to "3,056 bags sugar" and "1,741 bags paddy" (*Pacific Commercial Advertiser*, 13 July 1885, 10 July and 2 August 1886).

### 4.5.2 Recreational Activities

Horse racing and hunting were two popular pastimes in Mokulē'ia. Many of the prominent ranch owners in the area had ample lands to house horses; additionally, many ranchers owned horses that were popular for racing. The breeder James Gay from Mokulē'ia and his stud Governor Stanford were commonly mentioned in newspaper ads and articles of the time. In an advertisement for *The Daily Bulletin* dated 23 April 1890, two colts are offered to any interested "sportsmen." The colts are noted as being from the James Gay Estate: "Jas. Gay, Mokuleia, Waialua. 1 Gray Colt, 3 years old, by Gov. Stanford, dam Idle Girl, and the Gray Filly, 3 years old, by Gov. Stanford, damn Faiamana." Additionally, an advertisement for stud services placed by "Mokuleia Stock Farm" within *The Daily Bulletin* reports that "Senator Stanford will cover ten mares at \$30 each . . . Fine horses for sale" (*Daily Bulletin* 1894). Such an advertisement demonstrates the popularity of not only Governor Stanford as a stud, but also the popularity of breeding and racing horses within Mokulē'ia Ahupua'a near the turn of the twentieth century.

Mokulē'ia was also a popular area for horse racing competitions. In November 1894, *The Daily Bulletin* reported Christmas celebrations would be observed at Mokulē'ia Ranch, complete with horse races: "Christmas Day will be observed at Mokuleia Ranch with horse races...Horse racing has been for years all the go among the ranchmen...A number of town people intend going to Mokuleia that day."

Near the end of the nineteenth century, the Mokulē'ia Track was a well-known pleasure ground. Historically, horse racing gained a following amongst the aristocracy and royalty; within Hawai'i it gained a following from wealthy landowners and successful businessmen. King Kalākaua himself was a proponent of the sport, perhaps influencing the moniker of "favorite sport of Hawaiian royalty." In 1872, with the support of John Dominis, Samuel Parker, and Archibald Cleghorn, Kalākaua founded the Hawaiian Jockey Club.

Newspapers such as *The Pacific Commercial Advertiser* also reported on the popularity of hunting within Mokulē‘ia Ahupua‘a. According to an article dated 6 July 1905 in *The Pacific Commercial Advertiser*, doves were particularly plentiful; “those who went as far as Mokuleia and over the Pali report plenty of birds [for hunting].”

### 4.5.3 The Chinese

The Chinese were amongst the first groups of immigrant populations contracted to work within Hawai‘i’s sugar fields. According to Nordyke and Lee (1989):

[The] Chinese pioneered the development of the sugar industry in Hawai‘I . . . In 1802, Wong Tze-Chun, a Chinese entrepreneur, brought a mill and boilers to Hawai‘i aboard a sandalwood trading ship and established on Lana‘i the first commercial effort toward sugar production. [Nordyke and Lee 1989:197]

Soon after Wong Tze-Chun’s first attempts to commercialize sugar production, groups of Chinese contract laborers were brought to the Islands by the Royal Hawaiian Agricultural Society. It was reported that Chinese workers employed by the sugar plantation were “willing, able, and cooperative workers, and they quickly learned the Hawaiian language” (Nordyke and Lee 1989:199). Upon completion of their contracts, populations of free immigrants and plantation workers began to establish a permanent Chinese community:

The majority were Cantonese, or Punti, from the Chungshan district in the lower part of the Pearl River Delta. A significant group, speaking variants of the Southern Min dialect, also originated from areas in Chungshan. About one-fourth were Hakkas, mostly from districts on both sides of the Pearl River estuary. There were also smaller numbers from the Sze Yap and other districts. Some intergroup antagonisms arose, especially between the Punti and Hakka. Hostility and sometimes open violence marked their relations during the early period of settlement. [Nordyke and Lee 1989:199]

Early English language newspapers also report on the violence and hostility surrounding populations of Chinese immigrants. However, most newspaper accounts of Chinese populations within Mokulē‘ia Ahupua‘a are heavily tinged with xenophobia and notably influenced by the prevailing nineteenth century theory of “Yellow Peril.” In particular, a newspaper article within the *The Hawaiian Gazette* dated 21 February 1896 recounts an encounter between Deputy Sherriff Cox and a group of Chinese men living in Mokulē‘ia:

Fifty [Chinese] did come, and then a hundred more joined the ranks of their pig-tailed brethren from adjoining plantations . . . ‘Yes, they penned us up, and made war-like preparations . . . The Chinamen threatened to kill us, believing that one of us had shot the member of their colony who was hit in the leg . . . [but] my men were not the only ones that did the shooting.’ . . . ‘When the Chinamen said they were going to kill us I grabbed Ah Ho, one of the head men of the plantation and told his associates that if any such move were made, I would shoot him . . . When Dr. Reid arrived we were released . . . a decision will then be reached as to the best mode of procedure . . . [*Hawaiian Gazette*, 21 February 1896].

The debacle between the Deputy Sherriff and the Chinese men was further elaborated upon in an article entitled, “Captain Parker and Posse Arrests the Mokuleia Chinamen” published by *The Pacific Commerical Advertiser* on 26 February 1896:

[The posse road horses] to the large Mokuleia plantation house, the headquarters of the Chinese . . . Before arrival Captain Parker noticed a flag being quickly hoisted on a pole over the house. Immediately some 300 Chinamen came swarming from the fields and rushed into the house. The ‘ten ringleaders’ were picked out with no resistance and were transported by two-wheeled wagon, a brake, and horseback back to a station house where they were locked up. [*Pacific Commerical Advertiser*, 26 February 1896]

Despite animosity and hardship, the Chinese continued to settle in Mokulē‘ia and Waialua Moku at large. In 1892, 180 acres were planted in rice in the Waialua District; these rice fields were located in the *ahupua‘a* of Mokulē‘ia, Kamananui, and Kawailoa (Coulter and Chun 1937:12, 21). The immigrant Chinese may account for the rise in the Waialua District population during the last quarter of the nineteenth century. Government censuses record populations of 939 in 1878, 1,265 in 1884, and 1,286 in 1890 (Schmitt 1977:13). Accounts from a young Chinese laborer Chang Wah provide further insights into Chinese settlement within Mokulē‘ia:

En route to Hawaii Chang Wah met several other Changs on the boat and through them he heard that a Chang from his village was operating a rice plantation at Mokuleia, Oahu. He started with this man as a laborer at nine dollars a month, plus board and lodging, and he remained with him for ten years. The work was hard but he felt at the time that he was well paid. On this plantation there were no beasts of burden to do the hard work, and he and the other men had to pull the carts themselves and carry the rice from the field to the threshing floor. His relative finally sold out his business and returned to China. Chang Wah then worked for another planter, at Waialua, earning nine dollars a month for the next five years. [Glick 1980:53]

Chinese agricultural practices have also been recorded in early English language newspapers. A co-partnership notice, dated 20 December 1895 and placed in *The Hawaiian Gazette* stated the following:

Notice is given that: Chun Kow, Pang Wah Chup, Wong Yau Yick, Lau Kit Kiu, Lau Hop, Pang Say Mau, Ung Sam Ling, Hung Yee, Lau Sat Tong, Lam Sun, L. Akau and Wong Chong Hee ‘all of Mokuleia’ are doing business under the firm name of Wing On Wai Co. and is planting, cultivating, producing and selling rice at Mokulē‘ia. [*Hawaiian Gazette*, 20 December 1895]

#### 4.5.4 Ranching in Mokulē‘ia

Mokulē‘ia Ahupua‘a has a long history as both an agricultural center and stock farm. Evidence of this storied past is contained within early English language newspaper articles. One such article discusses the sale of Mokulē‘ia ranch lands in 1872 consisting of 3,100 acres of pasture land, 1,400 acres of which were described as rich soiled lands ideal for farming. Numerous structures were also included within the listing; structures present on the property at the time of sale included a stone dwelling, 2 miles of stone wall, an old wool press, and an iron ox cart:

Three thousand one hundred acres pasture land! Of which fourteen hundred acres are RICH BOTTOM LAND near the sea . . . One Stone Dwelling House . . . two miles of Stone wall . . . Also, on old Wool Press, on Iron Axle Ox Cart . . . [Submitted by S.N. Emerson]. [*Pacific Commercial Advertiser*, 9 March 1872]

Livestock such as horses, cows, and oxen were also included as part of the sale.

Due to the plenitude of available land at Mokulē'ia, diversified land use practices developed. These diversified practices included agriculture, stock raising, and horse breeding. The viability of each of these enterprises is unknown based on newspaper accounts of the area, however, there are many advertisements for land and jobs, in addition to reports regarding notable Mokulē'ia ranchers and landowners. One such example is an ad posted by S.N. Emerson (whose exact role is not quite clear), inquiring for an experienced milker with practice breaking or training steers. The ad calls for “one who understands and can practice of ‘breaking’ or training heifers or steers.” (*The Pacific Commercial Advertiser*, 4 September 1875).

Farming and stock raising are well documented in Mokulē'ia Ahupua'a throughout the nineteenth and twentieth centuries. Mr. Gaspar Silva (also spelled Sylva) and Joseph Mendonca, both notable landowners within Mokulē'ia, are often mentioned in relation to the area. In 1878, *The Pacific Commercial Advertiser* ran numerous advertisements on behalf of both Silva and Mendonca, informing all cattle and horse owners without rights to pasturage that they would have 30 days to remove their animals or the animals would be impounded (*The Pacific Commercial Advertiser*, 22 June 1878). The ads posted by the men establish exclusive rights to use, thereby increasing the value of the land, and in some ways reflecting a kind of enclosure of Mokulē'ia common land.

Another person of interest, J.E. Wiseman, a general business agent acting on behalf of Joseph Mendonca, “offers to lease the Mokuleia Ranch covering some 3,000 acres of land and to sell several hundred head of fine imported breeding stock, also 5 cottages, outbuildings, carriages, carts, teams, etc . . . a superior cattle, hog and dairy ranch. The owner sells on account of ill health.” (*The Daily Bulletin*, 12 April 1884). A later ad also published by the *The Daily Bulletin* specifically lists what is included in the lease of the ranch. “800 Choice and Select head of Cattle, 17 Bullocks, 40 Horses, 100 Hogs, 300 Fowl, Wagons, Carriages, Carts, Implements, and Goods and Chattles . . . generally . . . The Ranch is laid out in Paddocks and for a first class Cattle, Hog and Dairy Ranch it cannot be excelled” (*The Daily Bulletin*, 14 April 1884). The ads also included the lease of six artesian wells supplying the entirety of the lands and several cultivated fields.

#### 4.5.5 Artesian Wells and Water

The construction of artesian wells on both Mokulē'ia Ranch and other various portions of Mokulē'ia were very important to nineteenth century agricultural and farming practices within the *ahupua'a*. The drilling for artesian wells began in 1879 with cattle rancher James Campbell on the 'Ewa Plains (Board of Water Supply, City and County of Honolulu 2017). Utilizing a well driller, Campbell drilled several hundred feet down until reaching a large supply of pure, fresh water (Board of Water Supply, City and County of Honolulu 2017). According to the Board of Water Supply (2017):

This discovery led to a water boom on the island, as ranchers and plantation developers began drilling furiously for more of the precious resource. Within 20

years, the boom came to a bust. Artesian wells, abandoned and neglected, wasted millions of gallons of water. By the turn of the century, Oahu suffered a water panic. Wells were salting up. Water levels were dropping. The problem was that the system had grown too much, too fast and too haphazardly. [Board of Water Supply 2017]

Just as it was across the whole of the Hawaiian Islands, water was a precious resource within Mokulē'ia and Kawaihāpai Ahupua'a. Reports of successful wells and abundant water date to around 1882. Most notably, a well bored in Mokulē'ia for Gaspar Sylva was described as having "a substantial amount of water flowing from the well" (*The Daily Bulletin*, 18 March 1882) and that "water was struck at a depth of 400 feet" (*The Pacific Commercial Advertiser*, 18 March 1882:3). A well bored by Mr. Ashley, an artesian well borer, in May 1882 made the "News of the Week" for the *The Pacific Commercial Advertiser*. According to the news report, "water was reached at a depth of 457 feet at the well bored on the premises of J. Mendoza, at Mokuleia" (*The Pacific Commercial Advertiser*, 27 May 1882). The report also noted the quality of the water was excellent. Later in that year, *The Hawaiian Gazette* reported "the artesian well at Mokuleia has flowing water. This well is the fifth in that locality. The water from the well is used for irrigating rice fields" (*The Hawaiian Gazette*, 6 December 1882).

The continued drilling of artesian wells naturally resulted in the demand for individuals skilled at groundwater prospecting. Water prospectors were employed across O'ahu, including Mokulē'ia. In particular, an article dated 1 August 1900 in *The Pacific Commercial Advertiser* documents a curious event involving a water prospector within Mokulē'ia. The article, entitled "Blew His Head Off," discusses the apparent suicide of a water prospector, W.R. Miller, employed by the Waialua Plantation. The article details the gruesome incident involving "giant powder." He was found dead in his tent "west of Gaspar Silva's ranch at Mokuleia near Gay's place." It was noted that:

A wire fence had been built around it [Miller's tent] by Miller to keep out cattle and horses which pastured on the mountains . . . The body was buried . . . about three feet away from the tent. The tent was built on an incline and beneath a couple of kukui trees. [*Pacific Commercial Advertiser*, 1 August 1900]

The body was discovered by employees of McCandless Brothers out shooting goats in the vicinity, and the article notes "some Japanese" were sent to fetch the spattered tent. Miller had "been employed by the Waialua plantation for several months as a water prospector and had dug several tunnels" utilizing "giant caps" and "giant powder sticks" and fuse.

#### 4.5.6 The Railroad

In 1897, an article entitled "A Big Land Deal" appeared in *The Independent*. This article announced the divestment of Mokulē'ia lands owned by Gaspar Silva (spelled "Sylva" in the article). Silva sold his lands to the OR&L; the sale was spearheaded by Henry Waterhouse on behalf of the Waialua Plantation and Benjamin Franklin Dillingham, a businessman and railroad tycoon who established his fortune during the late Kingdom of Hawai'i era. An 1898 article entitled "Another Big Plantation: B.F. Dillingham's Latest Enterprise" and published in *The Hawaiian Star* elaborates further on the sale. According to the article, "the lands of Mokuleia are included in the deal"; the lands once known as the "Gaspar Sylva Ranch," had been recently purchased by Henry Waterhouse for \$150,000, made in the interest of Benjamin Franklin

Dillingham (*The Hawaiian Star*, 26 August 1898). These early newspaper articles also describe Dillingham's dreams to convert the ranch land into sugar land. Within an *Evening Bulletin* article published on 26 August 1898, Dillingham's newly purchased lands were reported to have favorable soils (based on soil analysis at the time of sale). Additionally, the former Silva ranch lands were noted to include nearly 500 acres containing 16 artesian wells. It was also recorded that "250 acres are now [at the time of the land purchase] in rice at an annual rental of \$8,000 to the company" but upon the expiration of the lease "it will be converted into sugar land" (*Evening Bulletin*, 26 August 1898). The article concluded by stating the Waialua Plantation (led by B.F. Dillingham) had also absorbed the 660-acre James Gay Estate and other properties.

Besides purchasing the Gaspar Silva Ranch, Dillingham later went on to acquire the lands making up Kawaihoa Ranch and the James Gay Estate in Mokulē'ia. Dillingham anticipated the real estate value of lands within Waialua District would increase significantly upon the completion of his railroad around Ka'ena Point. It was posited that Mr. Gaspar, upon the completion of the land sale, would return to his native home of Portugal. His Mokulē'ia lands were deemed to be "the most fertile lands on this island." It is noted, "The Mendonca lands, under lease to the Gay estate, adjoins the land purchased from Mr. Silva" (*The Independent*, 31 December 1897).

Upon completion of the new extension of the OR&L line, connecting Waialua and Wai'anae (the route navigated the coastline along Ka'ena Point), members of the media were invited to document the newly established route. Junketing newspapermen traversed the new extension beginning in Wai'anae and continuing on to Waialua, and were furnished most liberally with refreshments and dinner at Mokuleia Ranch courtesy of the manager Mr. Walter Dillingham (son of Benjamin Franklin Dillingham). The "fruits of the place" were enumerated; reporters described orchards of peaches, figs, grapes, water melons, limes, and mangoes. According to the report published in *The Pacific Commercial Advertiser* (10 June 1898), the peach orchard was in commercial production and the milk produced at the ranch was sent to market every day. The newspaper also commended the Dillinghams (father and son), toasting them for their aid to the "Portuguese Colony" and the Chinese. The article also noted that a "goose neck dray [pulled by horses was] used as a hack between the railway and the ranch" (*The Pacific Commercial Advertiser*, 10 June 1898).

## 4.6 Modern Land Use

With the announcement of the Oahu Railway and Land Company's decision to discontinue service in 1947, the Waialua Agricultural Company began to switch to truck transportation. The change was made slowly, until the last railroad line was closed in 1952. Subsequent historic maps and aerial photographs indicate a general lack of development in the area through the 1970s. The 1964 USGS map (Figure 10) indicates the Crowbar and Campbell ranches in the coastal portion of the Dillingham Ranch Agricultural Subdivision project area, north of the Dillingham Ranch. The railroad lines have been replaced by roads, though much of the plantation infrastructure remains in use. A 1977 aerial photograph (Figure 11) clearly depicts the various land use areas within and in the vicinity of the Dillingham Ranch Agricultural Subdivision project area. Lands in the *makai* portion of the Dillingham Ranch Agricultural Subdivision project area consist of improved pasture and ranch activity areas, including the Dillingham family residence and other smaller residences. Lands in the *mauka* foothills portion of the Dillingham Ranch Agricultural

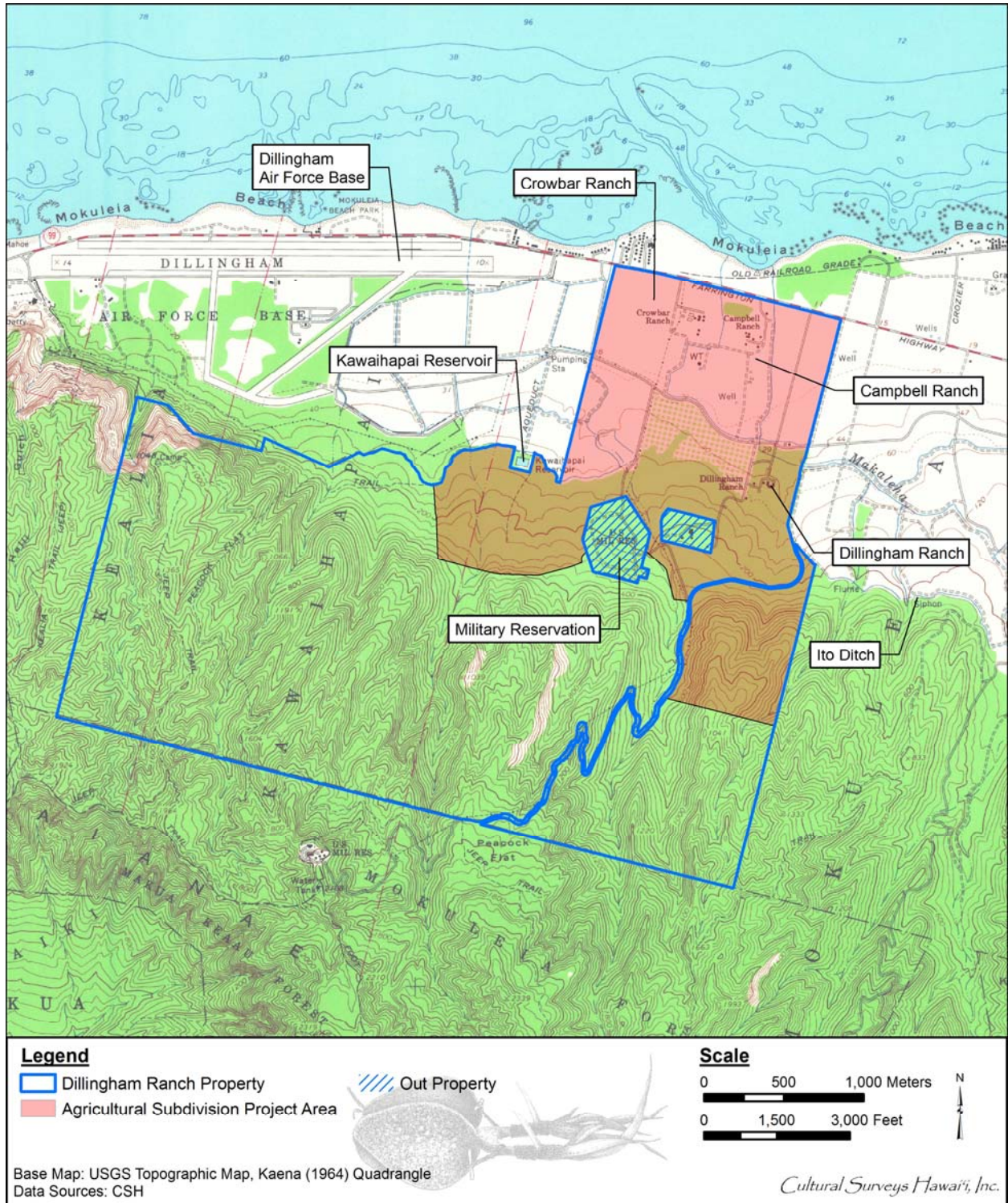


Figure 10. Portion of the 1964 Kaena USGS topographic quadrangle map, showing development in the vicinity of the Dillingham Ranch Agricultural Subdivision project area



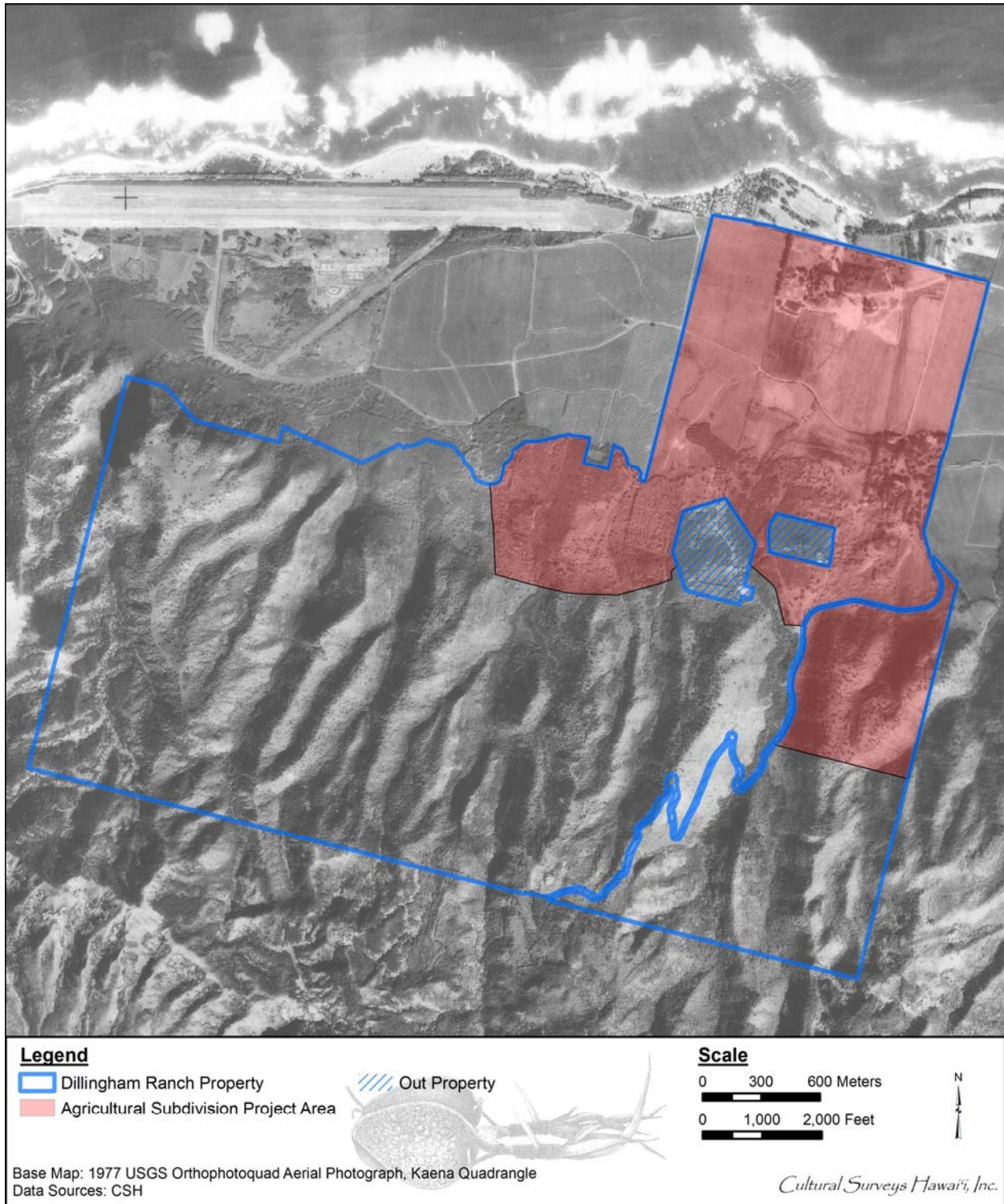


Figure 11. 1977 USGS Orthophotoquad, Kaena Quadrangle, showing development in the vicinity of the Dillingham Ranch Agricultural Subdivision project area

Subdivision project area generally appear to be unimproved pasture areas. To the east and west of the Dillingham Ranch Agricultural Subdivision project area are extensive sugar plantation fields.

The lands occupied by the Crowbar Ranch, Campbell Ranch, and Dillingham Ranch were later consolidated under the control of the Mokuleia Land Company. At present, the Dillingham Ranch Agricultural Subdivision project area, again known as the Dillingham Ranch, is an active horse and cattle ranch. Much of the level coastal plain portion of the Dillingham Ranch Agricultural Subdivision project area is used for equestrian stables and activity areas. The sloping foothills of the Dillingham Ranch Agricultural Subdivision project area are used as pasture for grazing cattle. The Dillingham residence remains on the property, as well as a coconut and palm tree farm.

## 4.7 Notable Residents of Mokulē'ia and Kawaihāpai Ahupua'a

During consultation with Mr. Thomas Shirai Jr., a lineal and cultural descendant of Mokulē'ia and Kawaihāpai Ahupua'a, a request was made for the inclusion of research documenting the notable residents of Mokulē'ia and Kawaihāpai Ahupua'a. The following research represents a good faith effort to document these historic and notable residents per the request of Mr. Thomas Shirai Jr. and his 'ohana. Notable residents or persons associated with Mokulē'ia and/or Kawaihāpai Ahupua'a are listed below in approximate chronological order.

### 4.7.1 La'akona

La'akona (also identified as Lakona of 'Ewa), was the 'ai moku (ruler of a district) of 'Ewa, Wai'anae, and Waialua on O'ahu. During La'akona's reign, O'ahu was divided among the descendants of Māweke, an early eleventh century *ali'i nui* from Tahiti. The grandchildren of Māweke were said to be the very highest of nobility. La'akona was one of Māweke's high-ranking grandchildren. His father, Keaunui of 'Ewa was one of Māweke's sons.

From Keaunui and Wehelani, three children were born; La'akona, a son, Nu'akea, a daughter (sister of La'akona), and Mo'i, a son (brother of La'akona). Nu'akea would later become the Queen consort of Moloka'i as the wife of Ke'olo'ewa-a-Kamauaua. Mo'i would eventually become a *kāula* or prophet under the service of Ke'olo'ewa-a-Kamauaua's brother, Kaupe'epe'e-nui-kauila. La'akona's first cousins were Kumuhonua, Mo'ikeha, 'Olopana, Hainakolo, and Hinakaimauli'awa.

La'akona inherited 'Ewa Moku from Keaunui, his father:

Oral accounts indicate that during the A.D. 14CCs, the island was unified into one polity, which can be called the O'ahu Kingdom. Around A.D. 1420-1440, La'akona was the ruler of 'Ewa, Wai'anae and Waialua Districts, and evidently he was also recognized as the overall ruler by the other districts, for in his line descended the dignity of Moi of Oahu. [Fornander 1880:88 in Cordy 1996].

### 4.7.2 King Kamehameha III (Kauikeaouli) and Ka'ahumanu

In 1827, Kauikeaouli, or King Kamehameha III, journeyed to Mokulē'ia upon the death of his prime minister William Pitt Kalanimoku in Kailua. Upon his arrival to Waialua District, he established residency at a place known as Wao'ala. Ka'ahumanu was known to have visited him at Wao'ala during her third trip around O'ahu.

The Hawaiian language newspaper *Ka Nūpepa Kū'oko'a* also documents the residency of Kauikeaouli and Ka'ahumanu. In the article written by Samuel Kamakau, he notes the King, Kauikeaouli dwell[s] at “Waoala in Waialua [O'ahu]” and Ka'ahumanu dwell[s] at Waialua:

*NA S.M. KAMAKAU. HELU 72.*

*No KA NOHO ALII ANA O KAUIKEAOULI*

*MALUNAO KE AUPUNI, A UA KAPAIA*

*O KAMEHAMEHA III.*

*I ka la 22 o ia malama, komo ia ka Halepule, nui o Mokuaikea ma Kailua. I ka makahiki 1827, mahope iho o ka make ana o Kalanimoku ma Kailua, Hawaii, hoi mai la o Kaahumanu ma mai laila mai, a kaapuni hou iho la ia Oahu.*

*O ke kolu ia o kana kaapuni ana ia Oahu, e hai aku ana i ka olelo a ke Akua. E noho ana hoi ka Moi Kauikeaouli ma Waoala i Waialua, a noho iho la o Kaahumanu ma Waialua, ia wa ka hoike ana o ke daimana i a ai ma ke kaha o Mokuleia.*

By S.M. KAMAKAU. NUMBER 72.

For THE RULE OF KAUIKEAOULI

UPON THE GOVERNMENT CALLED KAMEHAMEHA III

On the 22nd day of this month, entering the Church, many of Mokuaikea in Kailua. In the year 1827, after the death of Kalanimoku at Kailua, Hawai'i, Kaahumanu returned from there, and toured again Oahu. The third time she toured Oahu, preaching the word of God. The King Kauikeaouli was living at Waoala in Waialua, and Kaahumanu was staying at Waialua, at the time the diamond was presented at Mokuleia. [*Ka Nūpepa Kū'oko'a*, 16 May 1868 Translation by Aulii Mitchell]

Kamakau's translation of his original Hawaiian text notes the “sparkle of a diamond” at Mokulē'ia:

In 1827, after the death in Kailua of Ka-lani-moku, Ka-'ahu-manu returned and made a third trip about Oahu preaching the word of God. She stayed at Waialua where the young king [Kauikeaouli] was living at Wao'ala, and it was at this time that the sparkle of a diamond was seen on the beach at Mokulē'ia. [Kamakau 1992:274]

Wao'ala was established as the king's residence in part due to Chief Boki. As a young man, Kauikeaouli would accompany Boki on sandalwood harvests in the Wai'anae Mountains. “Kauikeaouli worked side by side with the men cutting and hauling wood to the dock at Mokulē'ia” (Kleiger 2015:120). Samuel Kamakau, a *kupa 'ai au* (native-born long attached to a place) of Mokulē'ia himself, describes in detail the *mauka* lands of Waialua (going so far as to specifically reference each by name), and the visits of district residents to the uplands in order to satisfy the sandalwood tax that had been placed upon them; it may be inferred from Kamakau's descriptions that these *mauka* lands were a prime location for the harvesting of sandalwood:

. . . all repaired to the uplands of Waialua adjoining Waimea, to upper Kolokini, Wao'ala, 'Aikanaka, Kaloka in upper Makaleha, and to upper Mokule'ia, to cut sandalwood. Kauī-ke-aouli was but a boy in his thirteenth year while cutting at upper Wao'ala and lower Maeaea, but he attended to the work himself and when he sailed in his two-masted boat to Mokule'ia or other places after sugarcane, sweet potatoes, melons, pigs, and fowl, he handled the boat in true sailor fashion, dressed in his sailor blouse and cap. He hauled the ropes and helped heave the anchor, saying, "Kamehameha's kingdom of work has come. [Kamakau 1999:278–279]"

#### 4.7.3 Gideon Pele'ioholani La'anui

Pele'ioholani La'anui, an *ali'i* and grandnephew of Kamehameha I, was born to *ali'i wahine* Kaohelani (formerly heir to Hana, Kīpahulu, and Kaupo and daughter of *ali'i* Kalokuokamaile and *ali'i wahine* Kaloioikalani) and *ali'i* Nuhi (ruler of Waimea and son of *ali'i* Hinai of Waimea and Kupapaoiwi). As members of Kamehameha's royal court, the marriage of Kaohelani and Nuhi was an arranged one and resulted in two offspring, a son La'anui and a daughter Kekaikuihala. Born in 1797 and raised within Waimea Moku (where his father presided as ruler) on Hawai'i Island, La'anui passed into adulthood during a period when Kamehameha desired to wrest control of the district from Nuhi. When La'anui was a boy, Kamehameha was still trying to control the District of Waimea. Despite political machinations, La'anui interacted frequently with Kamehameha as a young man. La'anui was renowned for his surfing skills; his teacher was none other than Kamehameha himself. Kamehameha taught the young La'anui the art of wave sliding and together "they were often seen . . . gliding on the surf outside of Haleumiumiiole at Kawaihae and at Kapuni, outside of Kiikiakoi" (I'i 1983:135–136).

They would allow waves to go by until they saw one they wished to glide on, then ride it to the spot where they chose to land. There are ways of selecting waves which will go all the way to shore, and the king and his pupil were unusually skillful at this. Such things were actually taught. [I'i 1983:136]

La'anui later passed his knowledge of *he'e nalu* (surfing) to the young sons of Kamehameha at Ali'i Beach in Hale'iwa (Royal House of Keoua Nui et al. 2016). Despite numerous interactions, Kamehameha still desired the lands of Waimea, and intended to utilize La'anui to attain control over those lands. While visiting Kamehameha's court, a marriage was arranged by Kamehameha and Ka'ahumanu, with La'anui set to marry Lydia Nāmāhāna Kekuwaipi'ia (ten years his senior):

Among the visitors to the royal court was Kekuwaipi'ia, who had just become a widow, coming as a guest of her sister, Queen Kaahumanu. Laanui was a boy growing to maturity. The king had not forgotten the great wish of his heart, coveting possession of Waimea and hoping to gain it, if not in battle, through a matrimonial alliance. His failure to accomplish this end through Kaohelani was a sting to the old warrior's pride, and now he chose a new agent of his ambition by inviting Laanui to the court. The invitation was gladly accepted and the visit lasted for months. Kamehameha was loath to have Laanui depart while he was slyly intriguing with Kaahumanu to negotiate a marriage between Piia and Laanui. Piia is described as being a person heavily built and not prepossessing in appearance like her sisters Kaahumanu and Kaheiheimalie. When at last the proposition was put squarely to Laanui, that it was the united wish of the king and queen that the marriage should

take place, for a moment he was dejected. To wed a woman very many years his senior was not the desire of his heart. Yet realizing that it might be perilous to go contrary to the express desire of the powerful monarch he quietly consented 'to take the bitter pill.' [Pratt 1920:46]

Upon their marriage, Kamehameha and Ka'ahumanu arranged a move for the newlywed couple, sending them to Waialua, O'ahu to govern that district. As husband and wife, La'anui and Pi'ia were among the first couples to be baptized in Kawaiaha'o Church, wherein La'anui received his baptismal name of Gideon. La'anui and Pi'ia eventually established their home site in Hale'iwa; their estate would later be developed into the Hale'iwa Hotel. As the High Chief of Waialua Moku, La'anui established (jointly with Reverend John and Ursula Emerson) the first congregation in the district. Additionally, La'anui donated a portion of his Waialua lands for the future establishment of a church. The church, dedicated in 1832, was known originally as Ka Ahahui Kahu Malama Waiwai O Ka Ekalesia O Kawailoa Ma Waialua; a charter amendment in 1932 eventually led to the renaming of the church as "Lili'uokalani Church." La'anui also partially funded the purchase of a 400-pound bronze bell, ultimately replacing the *pū* (conch shell) call to worship.

The passing of Chiefess Lydia Nāmāhāna Kekuaipi'ia in 1829 marked the end of La'anui's first marriage. The marriage of La'anui and Pi'ia produced no heirs. However, La'anui's second marriage with Theresa Owana Kaheiheimālie Rives produced two children. The eldest of their offspring was a daughter named Elizabeth Keka'aniauokalani La'anui; the youngest, or *muli loa* was a son named Gideon Kailipalaki-o-Keheanui La'anui. The House of La'anui was continued through these two children. La'anui himself passed away on 12 September 1849. La'anui is buried within the Lili'uokalani Church cemetery grounds.

#### 4.7.4 Lydia Nāmāhāna Kekuaipi'ia

Lydia Nāmāhāna Kekuaipi'ia was the youngest sister of Queen Ka'ahumanu. Although formerly one of the queens of Kamehameha, a marriage between Pi'ia and La'anui was arranged by Kamehameha and Ka'ahumanu (see Section 4.7.3). Following their marriage, Pi'ia and La'anui established their residence in Waialua Moku, "upon one of the divisions of land which Piia had received as her portion out of her father's [Ke'eaumoku Pāpa'iahiahi] large estate" (Pratt 1920:48). The estate established by Pi'ia and La'anui within Waialua Moku was treasured by them both. According to Pratt (1920:48), "they found the climate there so salubrious and balmy that they loved it, visiting Honolulu only when their presence at court was demanded." Although finding sanctuary in far-flung Waialua, both Pi'ia and La'anui figured largely in politics with Pi'ia also serving as governor of O'ahu; she was succeeded in the governorship by Boki. Pratt (1920) adds, however, that Pi'ia and La'anui's time together on O'ahu was short and in 1829 Pi'ia fell ill. Upon her death bed, Pi'ia and La'anui shared a final intimate exchange, with Pi'ia asking for La'anui's forgiveness:

La'anui, I wish to divulge a secret in my heart to you. It was not my work that you gave up your patrimonial inheritance to me. It was at the instigation of Kamehameha that I played coyly toward you in order to gratify his selfish motives. For your cheerful sacrifice of what was so dear to your heart I feel it is my duty to repay you. Therefore, in return for great kindness I leave this dear Waialua to you, as well as all the other lands, which I own, for my token of love for you. I cannot

die happy without making this reparation while the breath is in my body. Forgive me for the part I took in the wrongful measure.

La'anui, in the presence of their large retinue of friends, relatives and retainers, pronounced the desired forgiveness. A few days later Piia was no more [Pratt 1920:48–49].

#### **4.7.5 Theresa Owana Kaheiheimālie Rives**

Following the death of Pi'ia, La'anui was introduced to one of the adopted daughters of Queen Ka'ahumanu, Theresa Owana Kaheiheimālie Rives. Theresa Owana Kaheiheimālie Rives was in fact the biological daughter of Jean Baptiste Rives, the royal secretary of Kamehameha II, and the chiefess Holau. The union of Theresa Owana Kaheiheimālie Rives and La'anui resulted in two heirs, Elizabeth Kekaaniauokalani and Gideon Kailipalaki-o-Keheananui La'anui II.

#### **4.7.6 Gideon Kailipalaki-o-Keheananui La'anui II**

Gideon Kailipalaki-o-Keheananui La'anui, son of Gideon Pele'ioholani La'anui and Theresa Owana Kaheiheimālie Rives, was born in April 1840 at his father's home in Waialua Moku. He was given his father's Christian name of Gideon as well as the honorific name Kailipalaki-o-Keheananui. Although a member of the House of La'anui, La'anui II also maintained genealogical ties to the House of Kamehameha. La'anui II was in fact the great-grandnephew of Kamehameha I, and also the great grandson of Kalokuokamaile, the eldest brother of Kamehameha I.

In his formative years, La'anui II attended the Royal School run by Reverend Edward G. Beckwith alongside future monarchs David Kalākaua and Lili'uokalani (Honolulu Almanac and Directory 1884:73). In 1860, La'anui II married Elizabeth Kamaikaopaokalani; their union produced only one heir, a daughter, Theresa Owana Kaohelani La'anui (Royal House of Keoua Nui et al. 2016). La'anui II passed away in 1871 at the age of 31; he was laid to rest at his father's original Waialua Estate, now the Lili'uokalani Church and Cemetery (Royal House of Keoua Nui et al. 2016).

#### **4.7.7 Samuel Manaiākalani Kamakau**

Samuel Manaiākalani Kamakau was born on 29 October 1815 in Mokulē'ia Ahupua'a. Kamakau is best remembered and honored as a Hawaiian historian and scholar. His work and writings had a profound impact on the Hawaiian people, serving as a means of perpetuation and preservation during a time of great cultural change. However, Kamakau is also remembered as *kupa* (citizen) of Mokulē'ia, the son of Kapakanaka'okalani and Kihapupu. Although born on O'ahu, Kamakau was educated on Maui, attending the Lahainaluna Seminary School under the direction of Reverend Sheldon Dibble. Dibble encouraged his students to continue collecting information on all aspects of Hawaiian culture; with this information in hand, students such as Kamakau then set forth to preserve it (Gordon 2006). In response to this encouragement, Kamakau founded the Hawaiian Historical Society in 1841. Kamakau provided his reasoning for the founding of such a society: "A society was started at Lahainaluna according to the desire of the teachers. As the people of Alebione (Albion) had their British history and read about the Saxons and William, so the Hawaiians should read their history" (Westervelt 1913:10).

Kamakau's devotion to the preservation of Hawaiian history and culture did not stop with the founding of the Royal Hawaiian Historical Society. From 1866 to 1871, Kamakau published a

series of articles in two Hawaiian language newspapers, *Ke Au 'Oko 'a* and *Ka Nūpepa Kū'oko 'a*. The three series were entitled: “*Ka Mo'olelo o Kamehameha I*” (A History of Kamehameha I); “*Ka Mo'olelo o Nā Kamehameha*” (A History of the House of Kamehameha); and “*Ka Mo'olelo Hawai'i*” (A History of Hawai'i). Kamakau was known to retreat to Waialua and pursue his writings within Mokulē'ia Ahupua'a. After a period wherein Kamakau did not publish any works, the public responded with an editorial expressing their fears of losing such an invaluable expert on ancient traditional knowledge:

S.M. Kamakau, a few miles out from Waialua [within Mokulē'ia], was found confined to his house where he had been six months unattended save by kahunas. He had sent for medicines but could get none. Next we hear of him may be his obituary or kanikau, and he who surpasses all living Hawaiians in his knowledge of the ancient traditions and history of his race will have passed away. In ancient traditional knowledge of the Hawaiians the late David Malo alone excelled him. [Honolulu Advertiser 1866]

Kamakau passed away in Honolulu on 5 September 1876, and was buried in the Ma'ema'e Chapel Cemetery in Nu'uauu Valley (Thrum 1918:51).

Kamakau's connection to Mokulē'ia is especially underscored in a death announcement in the Hawaiian language newspaper *Ka Lahui Hawaii*. The announcement, listed in *Buke 2, Helu 37, Aoo 1*, and dated *Septemaba 7, 1876* (7 September 1876) states the following,

*Hon. S. M. Kamakau, ua hala!*

*ME KA luuluu makou e pahola aku nei i ka lono kaumaha imua o na makamaka i keia kakahiaka, i ka haalele ana mai o ka uhane o ka Hon. S. M. Kamakau i kona hale, a waiho iho la i ke kino lepo mahope nei. Ua make iho la oia i ka pora 2 o ka auina la o ka Poalua nei, ma kona home, ma Kahehuna. Ua hanau ia keia kanaka Hawaii kaulana, i ke ehū kai o lalo, ma Mokuleia, Waialua, Oahu nei, ma ka la 29 o Okatoba, M. H. 1815. O Kapakanaka kona makuakane, keiki a Kuhemu, keiki a Haupū. O kaooakakahaiaka kona makuahine, kaikamahine a Leihulu me Kaonohiakala. Ua mareia oia me S. Hai, kana wahine e u nei, i ka malu ulu o Lele, Lahaina, ma ka la 24 o Novemaba, 1844. Iloko o ko laua mau la o ka noho maluhia ana, ua loaa mai he ekiku mau keiki, eha i make a ekolu e ola nei. He kanaka oia i ike ia e ka lahui Hawaii no kona paanaau i ka mookuauhau o na'lii o Hawaii nei, a me ka moolelo o keia pae moku, a me he la, ma kona make ana, ua kau mai he poho nui maluna o Hawaii i ka nele ana i ke kuhikuhi puuone ma ia mau mea, oiai, me he la, oia hookahi ka mea i hehi i ka papapele o ia kulana.*

The beginning of the announcement cries out that “The honorable Samuel M. Kamakau has passed away!” Of particular relevance in this announcement is the proclamation that Samuel Kamakau was indeed *kupa* of Mokulē'ia. In later lines it is stated, “This famous Hawaiian was born in the sea spray of Mokulē'ia, Waialua, O'ahu on the 29th of October in the Year of the Lord 1815.” The importance and influence of Samuel Kamakau within Mokulē'ia has also been noted by lineal and cultural descendant Thomas Shirai, Jr. During consultation with CSH, Mr. Shirai noted that Samuel Kamakau made numerous contributions to Hawaiian culture and history, and has been

of great service to the people of Hawai'i. In honor of this service, Mr. Shirai successfully petitioned for the declaration of Samuel Manaiākalani Kamakau Day on 29 October 2005 (Figure 12).

#### 4.7.8 Reverend James Kekela

Reverend James Kekela was born on 22 May 1824 in Mokulē'ia Ahupua'a. Reverend Kekela was given a Christian education under the tutelage of Reverend John S. Emerson. Reverend Emerson was stationed in Waialua in the early nineteenth century to conduct missionary work; the education of local youth was a key component of missionary work. Reverend Kekela continued his formal education at the Lahainaluna Seminary School on Maui. It was through the financial support of Captain James Hunnewell that Kekela was able to pursue his education on the island of Maui. Kekela later adopted the name "James Hunnewell" in honor of the captain and his generosity (Emerson 1919:142; *Pacific Commercial Advertiser* 1904:2).

Upon completion of his formal education, Kekela was ordained as a Protestant minister, the first Native Hawaiian to be ordained. Kekela began his work in Kahuku, preaching to a small congregation, however, in 1853, Kekela and his wife Naomi (Figure 13) were asked to join the new Protestant mission in the Marquesas Islands (Lange 2006:59). Kekela continued his mission work in the Marquesas until his retirement in 1899. His retirement also marked his return to the Hawaiian Islands. Reverend Kekela died on 29 November 1904, and was laid to rest at Kawaiaha'o Church (Figure 14).

#### 4.7.9 Gaspar Silva

Gaspar Silva, an immigrant of Portuguese descent originally from the Azores, was the original owner of Mokuleia Ranch. His ranch lands were later purchased by Benjamin Franklin Dillingham and subsequently incorporated into Dillingham Ranch. Following the sale of his ranch lands in Mokulē'ia, Gaspar Silva continued to live in Hawai'i. During a trip to Portugal, Gaspar Silva passed away at the age of 82. The following is the announcement of the death of Gaspar Silva as printed in the 12 January 1916 edition of the *Honolulu Star-Bulletin*:

##### Rich Honolulu Pioneer Kills Self in Lisbon

Gaspar Silva, Aged 82, Takes Own Life; First wife had filed suit in Portugal. News of the death by suicide of Gaspar Silva, former resident of Honolulu, and rich ranch owner, reached his relatives and friends last week. At the time of his death, Mr. Silva was in Lisbon, Portugal. He left here 17 years ago for his native home in San George, Azores Islands. On leaving Honolulu, Mr. Silva sold his cow and horse ranches valued at \$150,000 to several trust companies of the city. The largest of his ranches was the Mokuleia Ranch, situated in Waialua. He owned several other ranches on other Islands of the territory. He still has in Honolulu some land on Liliha Street and money deposited in the various banks of the city, amounting to a total of \$50,000.

Mr. Silva was divorced from his first wife and after several years married again. His divorced wife sued him claiming that she had a legal right to some of his property. After their separation, Mr. Silva gave his first wife \$6000, then with his second wife sailed to San George, Azores. He remained there until called to Lisbon to attend to some business regarding his land holdings in Portugal.



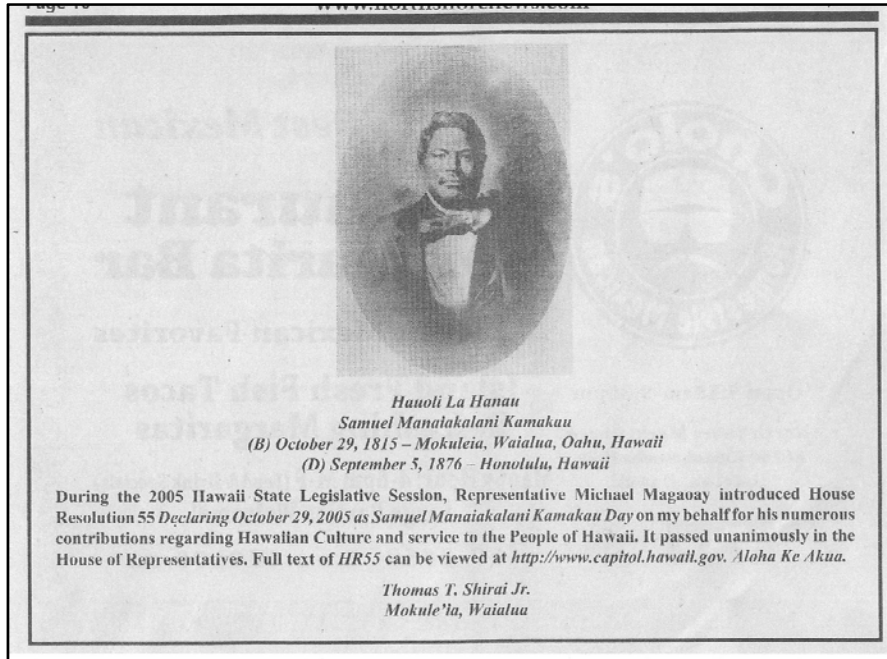


Figure 12. Notice of successful petition for the declaration of 29 October 2005 as Samuel Manaiakalani Kamakau Day (Image provided by Mr. Thomas Shirai, Jr.)

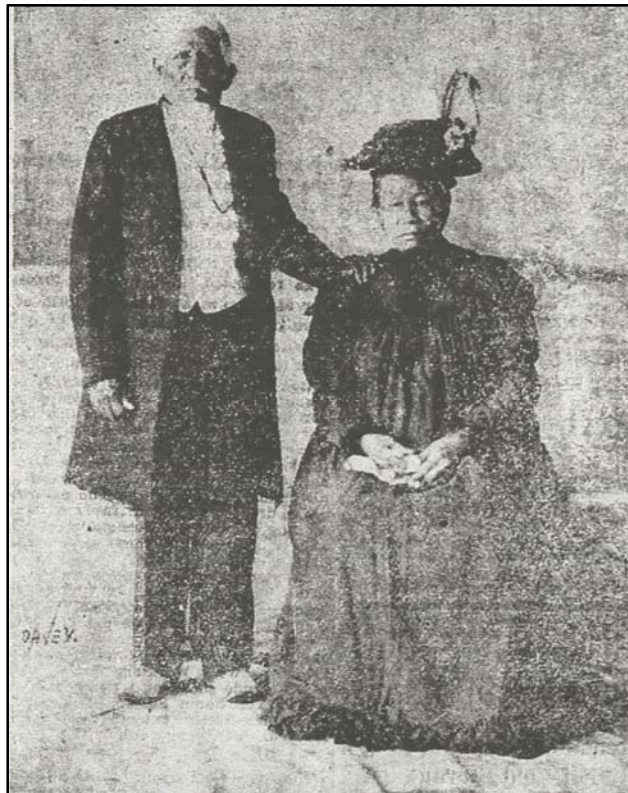


Figure 13. Photograph of Reverend James Kekela and wife (Photograph provided by Mr. Thomas Shirai, Jr.)



Figure 14. Photograph of Reverend James Kekela Memorial at Kawaiaha‘o Church (Photograph provided by Mr. Thomas Shirai, Jr.)

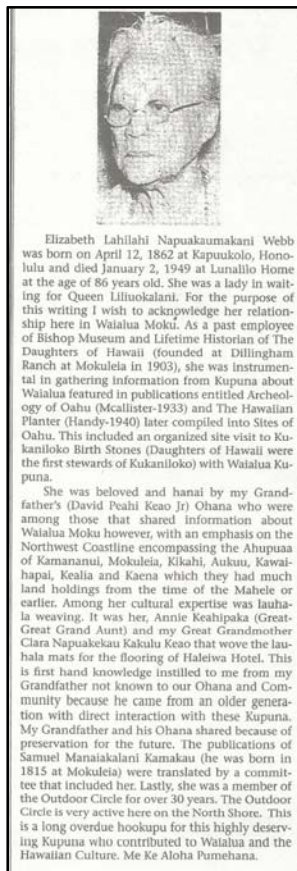


Figure 15. Obituary composed by Mr. Thomas Shirai, Jr. for Ms. Elizabeth Lahilahi Napukaumakani Webb (Photograph provided by Mr. Thomas Shirai, Jr.)

Followed Him Abroad.

His first wife, not losing hope by the loss of the case in Honolulu, followed him to Portugal. In the Azores and Portugal, according to law, there is no such thing as a divorce. By law, Mr. Silva and his former wife still remained husband and wife. The divorced wife, seeing her opportunity, sued him again.

While the case was on, Mr. Silva, oppressed by melancholy and failing health, shot himself in the head, dying almost instantly. The shot entered the right temple and came out above his left ear. He shot himself and died on November 21, 1915.

After his death, the court which handled the case in Lisbon, handed down a decision that his divorced wife has no legal right whatever to the estate. The entire estate of land and money is being divided up between the second wife, the daughter and his son. The son at the present time is 17 years of age, while the daughter is 15. Mr. Silva and his second wife were married 19 years ago. Both children were born in the old country.

Mr. Silva was a member of the San Antonio Society. [Honolulu Star-Bulletin, 12 January 1916]

#### **4.7.10 Elizabeth Lahilahi Napuakaumakani Webb**

Elizabeth Lahilahi Napuakaumakani Webb was born on 12 April 1862 at Kapuukolo, Honolulu. Webb was a known lady-in-waiting and confidant of Queen Lili'uokalani as well as an authority on Hawaiian history for Bishop Museum. Mr. Thomas Shirai Jr., has written the following regarding Elizabeth Lahilahi Napuakaumakani Webb (see Figure 15):

As a past employee of Bishop Museum and Lifetime Historian of The Daughters of Hawaii (founded at Dillingham Ranch at Mokuleia in 1903), she was instrumental in gathering information from Kupuna about Waialua featured in publications entitled *Archaeology of Oahu* (McAllister 1933) and *The Hawaiian Planter* (Handy 1940) later compiled into *Sites of Oahu*. This included an organized site visit to Kukaniloko Birth Stones (Daughters of Hawaii were the first stewards of Kukaniloko) with Waialua Kupuna.

## Section 5 Previous Archaeological Research

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Archaeological studies in the vicinity of the Dillingham Ranch Agricultural Subdivision project area have largely been limited to the inadvertent finds of burial remains along the beach and short one or two-day reconnaissance surveys in the inland areas. Figure 16 illustrates the locations of previously conducted archaeological studies. Table 2 presents the findings of the archaeological studies in the vicinity of the Dillingham Ranch Agricultural Subdivision project area. Several of these studies have focused on locating archaeological sites first identified in early archaeological studies. Historic properties located within and near the Dillingham Ranch Agricultural Subdivision project area are illustrated on Figure 17 and summarized in Table 3.

### 5.1 Early Archaeological Studies

Two early archaeological studies were conducted in the vicinity of the Dillingham Ranch Agricultural Subdivision project area. These consist of Gilbert McAllister in his island-wide survey conducted in 1930 (McAllister 1933) and Handy's ethnographic survey of Hawaiian farming (Handy 1940).

McAllister (1933) identified eight sites within Mokulē'ia and Kawaihāpai Ahupua'a, in the vicinity of the Dillingham Ranch Agricultural Subdivision project area. Four sites were located along the coast and consisted of *ko'a*, or fishing shrines. Sites 190, 193, 195, and 201 are described as follows:

#### Site 190 Pu'u o Hekili Ko'a

Pu'u o Hekili, an ahua which was once located on the beach below the Kawaihāpai [railroad] station. According to Hookala, an ahua is 'bent instead of angular in construction' and was evidently a type of fishing shrine (*ko'a*). Unfortunately nothing remains of the site. [McAllister 1933 in Sterling and Summers 1978:99]

#### Site 193. Fishing Shrine (destroyed)

Kuakea fishing shrine (*ko'a*), Kawaihāpai, was formerly located on the beach in a direct line with Kawailoa heiau. Nothing marks the site. [McAllister 1933 in Sterling and Summers 1978:100]

#### Site 195. Kolea fishing shrine (*ko'a*), Mokuleia, Fishing Shrine (destroyed)

The shrine is located on the beach in a direct line with the Dillingham stables. The stones have been removed and only an indistinct line of stones 15 by 30 feet remains to mark the foundation. A stone in the water in front of Kolea was known as Mokupaoa. [McAllister 1933 in Sterling and Summers 1978:101]

#### Site 201. Fishing Shrine

Keauau fishing shrine was once located on the beach at Puuiki, at the Kaena end of a long row of ironwood trees. Nothing remains of the site. [McAllister 1933 in Sterling and Summers 1978:105]

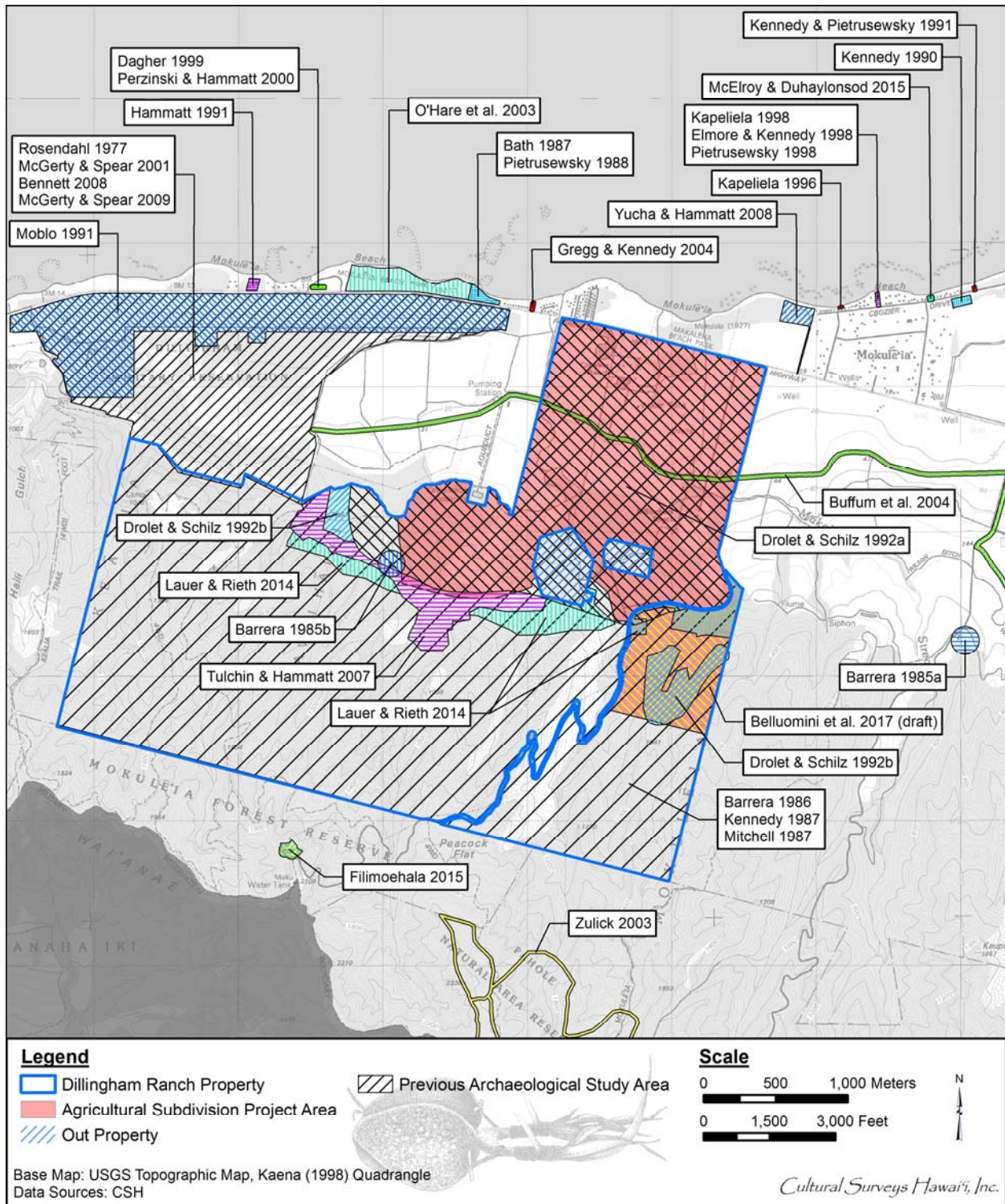


Figure 16. Portion of the 1998 Kaena USGS topographic quadrangle showing the locations of previous archaeological studies in the vicinity of the Dillingham Ranch Agricultural Subdivision project area

Table 2. Previous archaeological studies in the vicinity of the Dillingham Ranch Agricultural Subdivision project area

Reference	Type	Location	SIHP # 50-80-03-	Results
Rosendahl 1977	Archaeological survey and inventory of sites	Dillingham Military Reservation (DMR); Keālia and Kawaihāpai	416	Confirmed Keālia- Kawaihāpai Complex of agricultural terraces, designated State Inventory of Historic Places (SIHP) # -416
Barrera 1985a	Archaeological survey	Mokulē'ia I (II) well location; Mokulē'ia		No historic properties or cultural materials identified
Barrera 1985b	Archaeological survey	Kawaihāpai well location; Kawaihāpai		No historic properties or cultural materials identified
Barrera 1986	Archaeological reconnaissance survey	Dillingham Ranch property; Kawaihāpai and Mokulē'ia	4439; 4785	Identified two sites, no SIHP number assigned; see Drolet and Schilz (1992a and 1992b) (not included on Fig. 16)
Bath 1987 Pietrusewsky 1988	Inadvertent find of human remains	Camp Mokulē'ia; Kawaihāpai	3747	Identified 13 adults and eight sub-adults; location of burials designated SIHP # -3747
Kennedy 1987	Archaeological literature review and reconnaissance survey	Dillingham Ranch property; Kawaihāpai and Mokulē'ia	190 through 196	Confirmed previously identified historic properties, no new historic properties identified (not included on Fig. 16)

Table 2. Previous archaeological studies in the vicinity of the Dillingham Ranch Agricultural Subdivision project area (cont.)

Reference	Type	Location	SIHP # 50-80-03-	Results
Mitchell 1987	Archaeological reconnaissance survey	Dillingham Ranch property; Kawaihāpai and Mokulē'ia	416; 4439; 4772 through 4777; 4785; 4786	Identified five sites, no SIHP site number assigned; see Drolett and Schilz (1992a and 1992b)
Kennedy 1990	Subsurface testing	Lot 2C, Crozier Dr; Mokulē'ia		No historic properties or cultural materials identified
Hammatt 1991	Subsurface testing	Keālia Coastal Subdivision		No historic properties or cultural materials identified
Kennedy and Pietruszewsky 1991	Inadvertent find of human remains	Crozier Dr. TMK: [1] 6-8-005:001	4451	Two sets of human skeletal remains (SIHP # -4451) scattered over an area of a septic pit
Moblo 1991	Literature review and archaeological reconnaissance survey	Dillingham Airfield; Ka'ena, Keālia, Kawaihāpai, and Mokulē'ia		No historic properties or cultural materials identified
Drolet and Schilz 1992a	Archaeological inventory survey	Dillingham Ranch property; Kawaihāpai and Mokulē'ia	4772 through 4786	Identified 15 pre- and post-Contact sites with 40 component features, primarily religious, habitation or agricultural sites, designated SIHP #s -4772 through -4786

Table 2. Previous archaeological studies in the vicinity of the Dillingham Ranch Agricultural Subdivision project area (cont.)

Reference	Type	Location	SIHP # 50-80-03-	Results
Drolet and Schilz 1992b	Addendum archaeological inventory survey	Dillingham Ranch property; Kawaihāpai and Mokulē'ia	4439 through 4442	Identified four sites; SIHP # -4439, a 300 m stone wall; SIHP # -4440, a remnant stone wall, disturbed by stream cuts; SIHP # -4441, an approximately 200-m long stone wall and associated barbed wire fence, interpreted to be a historic cattle wall; SIHP # -4442, a terrace with damage due to erosion and stream cuts
Kapeliela 1996	Inadvertent find of human remains	68-711 Crozier Dr, Mokulē'ia	5467	Two human cranium fragments recovered from the water's edge in the beach area fronting 68-711 Crozier Dr, at the east end of Mokulē'ia Ahupua'a; no other bones recovered, though additional remains believed to have been washed away by heavy surf; burial location designated SIHP # -5467
Kapeliela 1998 Elmore and Kennedy 1998 Pietrusewsky 1998	Inadvertent find of human remains	63-639 Crozier Dr; Mokulē'ia 2	5599	Identified seven individuals, all of probable Hawaiian ancestry; glass trade beads found with one burial, suggesting an early post-Contact date; remaining six burials probably pre-Contact; area designated SIHP # -5599
Dagher 1999 Perzinski and Hammatt 2000	Inadvertent find of human remains	Mokulē'ia Beach Park; Kawaihāpai	5766	Documented adult skeletal remains of probable Hawaiian ancestry, designated SIHP # -5766



Table 2. Previous archaeological studies in the vicinity of the Dillingham Ranch Agricultural Subdivision project area (cont.)

Reference	Type	Location	SIHP # 50-80-03-	Results
McGerty and Spear 2001	Archaeological inventory survey	DMR	191; 416; 5479 through 5492	Recorded or reidentified 16 pre- and post-Contact sites; seven traditional Hawaiian sites associated with agriculture, settlement, and ceremonial/religious activities; remaining nine sites attributed to post-Contact ranching and U.S. military activities and training; Site 416 agricultural complex, originally identified or recorded by Handy (1940) and recorded by Rosendahl (1977) subdivided into five specific site areas: SIHP #s -416 and -5483 through -5486
O'Hare et al. 2003	Archaeological inventory survey	Mokulē'ia Beach Park; Kawaihāpai	6638	Identified one historic property: SIHP # -6638, subsurface cultural layer, containing both pre- and post-Contact archaeological features
Zulick 2003	Environmental assessment Kapuna Watershed project	Pahole Natural Area Reserve and Mokulē'ia Forest Reserve		No historic properties identified
Buffum et al. 2004	Archaeological inventory survey	SBMR Dillingham Trail between Schofield Barracks and DMR		Concrete bridge spans identified on west boundary of current Dillingham Ranch project; site evaluated as not National Register of Historic Places (NRHP) eligible and no SIHP number assigned; recorded plantation-era ditch (Wilson Ditch) and Halstead Mill smokestack and three ca. 1952 concrete span bridges; bridge spans on western boundary of current Dillingham project evaluated as not NRHP eligible

Table 2. Previous archaeological studies in the vicinity of the Dillingham Ranch Agricultural Subdivision project area (cont.)

Reference	Type	Location	SIHP # 50-80-03-	Results
Gregg and Kennedy 2004	Inadvertent find of human remains	68-681 Farrington Hwy; Mokulē'ia	6708	Partial remains of one individual consistent with Hawaiian/Polynesian ancestry, designated SIHP # -6708
Tulchin and Hammatt 2007	Archaeological inventory survey	Dillingham Ranch property; Kawaihāpai, Kikahi, Auku'u, and Mokulē'ia 2	6884 through 6888	Identified five historic properties consisting of five agricultural complexes designated SIHP #s -6884, -6885, -6886, -6687, and -6888
Bennett 2008	Site visit report	Mokuleia Military Reservation		Identified features of the Mokuleia Military Reservation (no SIHP # designated in report)
Yucha and Hammatt 2008	Preservation plan	Mokulē'ia 2, Auku'u, Kikahi, and Kawaihāpai	4772 through 4780; 4782 through 4786; 6885 through 6888	Fifteen historic properties recommended to be preserved through avoidance and protection in proposed 820-acre Dillingham Ranch Development project
McGerty and Spear 2009	Archaeological inventory survey	Dillingham Military Reservation; TMKs: [1] 6-8-002 and 014	419; 5479 through 5486; 5488 through 5492	Fourteen historic properties identified consisting of rock alignments, rock-faced/rock-surfaced terraces, rock-faced/soil-surfaced terraces, rock mounds, rock platforms, rock lined channels, water diversion features, wells, cement foundations, buildings, and bunkers

Table 2. Previous archaeological studies in the vicinity of the Dillingham Ranch Agricultural Subdivision project area (cont.)

Reference	Type	Location	SIHP # 50-80-03-	Results
Lauer and Rieth 2014	Archaeological inventory survey	Dillingham Ranch property; Kawaihāpai, Kikahi, Auku'u, and Mokulē'ia 2	7653 and unmodified seeps	Identified one historic property and two unmodified seeps; SIHP # -7653 consists of four discontinuous rock walls once used as ranch-era paddocks and enclosures
Filimoehala 2015	Archaeological inventory survey	ICSD Pahole Radio Facility at Pahole Rare Plant Facility, Kawaihāpai		No historic properties or cultural materials identified
McElroy and Duhaylonsod 2015	Archaeological inventory survey	TMKs: [1] 6-8- 004:017 and 030 in Mokule'ia 2		No historic properties or cultural materials identified
Belluomini et al. 2017	Archaeological inventory survey	TMK: [1] 6-8- 003:005	4777, 7653; 7976, 7977, 7978	Identified five historic properties consisting of wall alignments (SIHP #s -4777, -7653, and -7976), a terrace complex (SIHP # -7977), and a platform (SIHP # -7978)

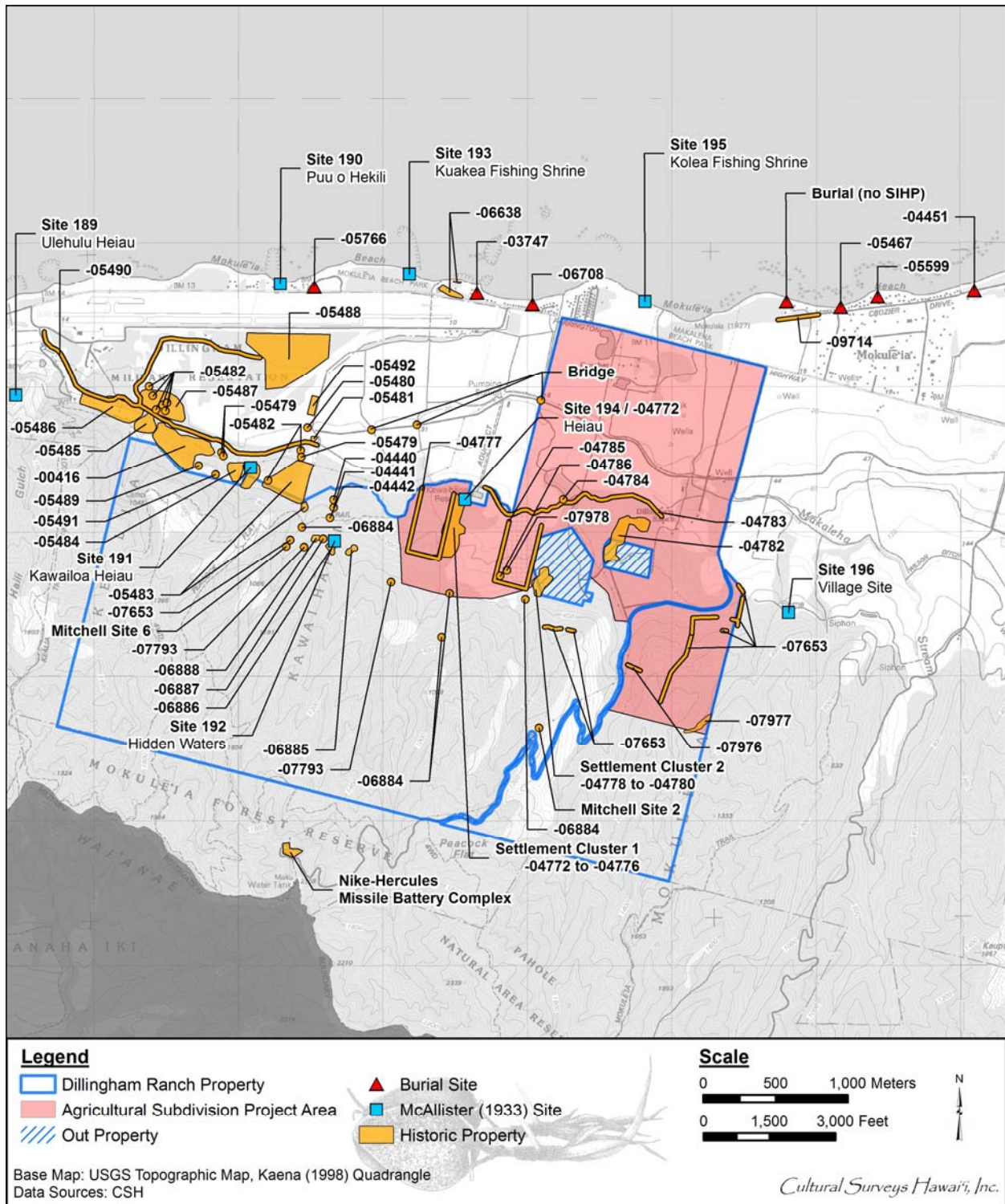


Figure 17. Portion of the 1998 Kaena USGS topographic quadrangle map showing the locations of historic properties in the vicinity of the Dillingham Ranch Agricultural Subdivision project area

Table 3. Historic properties identified within the Dillingham Ranch Agricultural Subdivision project area

SIHP # 50-80-03-	Site Type	Source	Comment
4439 (now included in 7653)	Wall	Barerra (1986); Mitchell (1987); Drolet and Schilz (1992b)	Possible pre-Contact wall with an undetermined function, located in <i>mauka</i> portion of Dillingham Ranch Agricultural Subdivision project area
4772 (Site 194)	<i>Heiau</i>	Mitchell (1987); Drolet and Schilz (1992a); Tulchin and Hammatt (2008)	25 m square enclosure with internal wall section; possibly <i>Poloaiae Heiau</i> , originally designated Site 194 by McAllister (1933)
4773	Complex (habitation/agriculture)	Mitchell (1987); Drolet and Schilz (1992a); Tulchin and Hammatt (2008)	Feature cluster that covers an area of 80 m by 40 m in size and is composed of five units, consisting of a platform (Fea. A) and enclosures (Fea. B-C)
4774	Platform (habitation)	Mitchell (1987); Drolet and Schilz (1992a); Tulchin and Hammatt (2008)	Platform measures 2.0 m by 3.5 m in size
4775	Enclosure (habitation)	Mitchell (1987); Drolet and Schilz (1992a); Tulchin and Hammatt (2008)	Enclosure with a wall segment, measures 18 m by 9 m in size
4776	Habitation-religious/ceremonial-agricultural complex	Mitchell (1987); Drolet and Schilz (1992a); Tulchin and Hammatt (2008)	Enclosures (3), terraces (3), walls (2), alignment, mound, and clearing
4782	Agricultural-habitation complex	Drolet and Schilz (1992a); Tulchin and Hammatt (2008)	Walled field complex with habitation features covering 8 hectares; large enclosures, terraces, and mound
4783	Historic agricultural complex	Drolet and Schilz (1992a)	Plantation-era irrigation ditch with associated rock wall and clearing mounds
4784	Agricultural ditch	Drolet and Schilz (1992a)	Possible remnant ' <i>auwai</i>
4785	Ranch enclosure-paddock	Barerra (1986); Mitchell (1987); Kennedy (1987); Drolet and Schilz (1992a)	Large paddock disturbed by subsequent development

Table 3. Historic properties identified within the Dillingham Ranch Agricultural Subdivision project area (cont.)

<b>SIHP #</b> <b>50-80-03-</b>	<b>Site Type</b>	<b>Source</b>	<b>Comment</b>
4786	Platform-terrace complex with religious/ceremonial function	Barerra (1986); Mitchell (1987); Kennedy (1987); Drolet and Schilz (1992a); Tulchin and Hammatt (2008)	In southwest corner of SIHP # -4785; site includes undocumented and unrecorded terrace identified during CSH 2008 monitoring
6884	Ranch-related walls in gully features	Tulchin and Hammatt (2007); Tulchin and Hammatt (2008)	Three areas of rock wall sections (Features A–D) located in east, central, and west portions of Dillingham Ranch Agricultural Subdivision project area
7653	Ranch enclosure-paddock complex	Lauer and Rieth (2014)	Rock wall section in eastern and central survey areas (Features 1–3)
7976	Wall	Belluomini et al. (2017-draft)	Rock wall measuring 1 m wide, 0.8 to 1.2 m in height, and extending 115 m in east/west orientation
7977	Terraces	Belluomini et al. (2017-draft)	System of nine terraces on both the west and east side of the stream
7978	Platform	Belluomini et al. (2017-draft)	Platform measures approximately 6.7 m in width and 7.8 m in length, with a maximum height of 1.5 m. Possible religious/ceremonial function

The presence of four *ko'a* in the immediate area attests to the abundance of marine resources, as described in traditional and historic accounts. McAllister (1933) also identified four sites in the foothills above the coastal plain. Site 191 is Kawailoa Heiau, indicated to be located in the area *mauka* of the present Dillingham Airfield, west of the Dillingham Ranch Agricultural Subdivision project area:

Only a portion of two terraces remains. The upper terrace is 66 feet long and 4 feet high, and is excellently paved with small stones a few inches in size. The southwest limits can not be discerned. On the east end is a wall 1.5 feet high which can be followed for about 10 feet. The lower terrace was 25 feet wide with a facing 2 feet high, which can only be traced a short distance. The houses (*kahua hale*) in which the *kahunas* lived were known as 'Paweo', according to Hookala. This is undoubtedly the site referred to by Thrum [1909] as Paweu, 'A small heiau 58 by 65 feet at the base of the hill: badly damaged by freshets.' [McAllister 1933 in Sterling and Summers 1978:99–100]

Site 196 was identified by McAllister (1933) as a village site, indicated to be located east of the current Dillingham Ranch Agricultural Subdivision project area. The following description was provided.

In the valley near the mountain side of the Greenfield house was once evidently a large Hawaiian settlement. Old coconut palms and the dead trunks of others, portions of house sites, isolated sections of terracing, can still be found, despite the inroads of roaming cattle. Water freshets have also obliterated many remains. These sites are thought to have furnished the stones for the numerous walls, probably of later construction, on the hillside and in the valley. [McAllister 1933 in Sterling and Summers 1978:101]

Two of McAllister's sites were indicated to be located within Dillingham Ranch property, although outside the Dillingham Ranch Agricultural Subdivision project area. Site 192 consists of "hidden waters," or natural freshwater springs, located in the hills of Kawaihāpai. The following description was provided.

These are the four hidden waters upon which Hiiaka called when she was refused water by the old inhabitants. Their names, as given by Hookala, are Ulunui, Koheiki, Ulehulu, and Waiakaaiea. Farther toward Kaena Point is another water known as Kawaikumuole, which is a conjunction of Kanaloa and Waihuna a Kaalai. Another hidden water, which Hookala says is mentioned in the Hiiaka chant is Kuilaau o Kealia, but he does not know its location. [McAllister 1933 in Sterling and Summers 1978:100]

The general location of Site 192 was provided by Sterling and Summers (1978: Waialua District Map) based on notes taken by McAllister (1933), placing it in the western portion of Dillingham Ranch property, outside the current Dillingham Ranch Agricultural Subdivision project area. This location is consistent with traditional accounts that describe the springs of Kawaihāpai up in the hills at the base of cliffs (see Section 2.1).

Located within the Dillingham Ranch Agricultural Subdivision project area is McAllister's (1933) Site 194, Poloaiæ Heiau. The site, noted by McAllister to have been destroyed, was described as follows:

On the Kaena side of Dillingham's ranch, near the plantation reservoir in the western part of Mokuleia, is said to be an old heiau site. The straggling stone wall near a group of rather large rocks is covered with a dense growth of lantana. It is doubtful that this site was ever of importance, as it suggests a house site rather than the location of a heiau. Poloaiæ is the name given me of a former Mokuleia heiau about which nothing else is known. [McAllister 1933 in Sterling and Summers 1978:101]

In an ethnographic survey of Hawaiian farming, Handy noted that in 1940 there were agricultural terraces, possibly for taro, in the lowlands of Kawaihāpai extending into Keālia. Handy describes the features:

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

The large area of lowland terraces between the cliff and the elevated coral, though mostly in Kawaihāpai, extends a short way into Keālia. Otherwise this small ahupua'a offered little opportunity for cultivation, unless for sweet potatoes. [Handy 1940]

The site was confirmed during a 1977 survey of the Dillingham Military Reservation by the Bishop Museum (Rosendahl 1977) and the extent of these terraces was mapped. These terraces were given the designation of SIHP # 50-80-03-416, and later listed as destroyed (Rosendahl 1977). The terraces are located 2,250-4,500 ft inland, on the *mauka* edge of the military reservation, at elevations of 80-140 ft AMSL. The site was described as an "extensive complex of agricultural and associated occupation features spread over virtually entire rocky sloping area between flat land of airfield and sheer cliffs" (Rosendahl 1977:1-25). In 1987, during a day-long survey on horseback of portions of the Dillingham Ranch property, Mitchell (1987) was informed that there was "a great deal of rock terracing" in the area along the western end of the Dillingham Ranch property, which he designated as Site 6. Mitchell did not locate the site but, based on informant information, placed it in the vicinity of SIHP # -416, as the informant was likely referring to components of SIHP # -416. Additional portions of SIHP # -416 were again identified in later archaeological surveys of the Dillingham Airfield (Moblo 1991), Dillingham Military Reservation (McGerty and Spear 2001), and the Dillingham Ranch project (Tulchin and Hammatt 2007).



## 5.2 Archaeological Studies in Vicinity of the Dillingham Ranch Agricultural Subdivision Project Area

The following is a summary of previously conducted archaeological studies and identified historic properties within the vicinity of the Dillingham Ranch Agricultural Subdivision project area. Previously conducted archaeological studies within the Dillingham Ranch Agricultural Subdivision project area per se are discussed in Section 5.3.

In 1985, an archaeological survey was conducted for numerous proposed Board of Water Supply well sites, including the proposed wells at Kawaihāpai near Dillingham Airfield and Mokulē'ia I, east of Makaleha Stream (Barrera 1985a and 1985b). No historic properties were identified.

In 1987, human remains were inadvertently uncovered during the excavation of a boathouse at Camp Mokulē'ia, east of Mokulē'ia Beach Park in Kawaihāpai Ahupua'a (Bath and Pietruszewsky 1987). Osteological analysis by Michael Pietruszewsky identified 13 adults and eight sub-adults from the recovered remains. The location of the remains was designated SIHP # -3747 (Pietruszewsky 1988).

In 1990, Archaeological Consultants of Hawaii (ACH) conducted subsurface testing at Lot 2C Crozier Drive in Mokulē'ia Ahupua'a (Kennedy 1990). Nine backhoe trenches were excavated through various sandy topsoil, calcareous sand, and coarse sand layers. No historic properties were identified.

In 1991, CSH conducted subsurface testing with hand and backhoe trenches to investigate archaeological impacts on a proposed subdivision at a beachfront lot located at 68-999 Farrington Highway near Dillingham Airfield (Hammatt 1991). Nine backhoe trenches and three shovel test trenches were excavated within the project area. No subsurface archaeological features or cultural materials were identified.

In 1991, the International Archaeological Research Institute (IARII) conducted a literature review and archaeological reconnaissance survey for the Dillingham Airfield Master Plan. Dillingham Airfield is located inland of Farrington Highway at the base of the Waianae Mountains (Moblo 1991). During the survey, Moblo (1991) attempted to confirm SIHP # -416, the cultivation terraces associated with the Keālia-Kawaihāpai Complex documented in Rosendahl (1977) and Handy (1940). Unfortunately, the probable site was located outside the project area; this combined with dense vegetation made it too difficult to determine if it was the Keālia-Kawaihāpai Complex site. Moblo also noted a few rock features on the southwest corner of the project area could be an extension of Site 416. No other historic properties were identified.

In 1991, an inadvertent burial discovery consisted of two sets of human skeletal remains at 68-421 Crozier Drive at the east end of Mokulē'ia Ahupua'a (Kennedy and Pietruszewsky 1991). The skeletal remains were scattered across a septic pit. Analysis of the skeletal remains determined the remains were previously disturbed and represent a secondary burial.

In 1996, an inadvertent burial discovery consisting of two human cranium fragments was recovered from the water's edge in the beach area fronting 68-711 Crozier Drive, at the east end of Mokulē'ia Ahupua'a. No other bones were recovered, though additional remains were believed

to have been washed away by heavy surf. The burial location was designated SIHP # -5467 (Kapeliela 1996).

In 1998, seven inadvertent burial finds were encountered at 68-637 Crozier Drive in Mokolē'ia Ahupua'a by a construction crew during excavations for a house foundation (Elmore and Kennedy 1998; Kapeliela 1998; Pietruszewsky 1998). The burials were found at a depth of approximately 4.5 to 5 ft. Based on osteological features and the burial location, the remains were determined to be of Hawaiian ethnicity. Six of the burials were deemed pre-Contact, while the seventh burial was more likely to be from the early post-Contact period based on the presence of western trade items. The burial site was designated SIHP # -5599.

In 1999, human remains were inadvertently discovered during excavations associated with the installation of a leach field at Mokolē'ia Beach Park, Kawaihāpai Ahupua'a (Dagher 1999; Perzinski and Hammatt 2000). The remains were determined to be from a single individual, likely Native Hawaiian. Following the recovery of the remains, archaeological monitoring was conducted for the remaining leach field excavations. A possible posthole was also noted in the excavations. The burial location was designated SIHP # -5766.

In 2001, Scientific Consultant Services (SCS) completed an archaeological inventory survey (AIS) comprising 504 acres of the Dillingham Military Reservation (DMR). A pedestrian survey was conducted in the southwest portion of the DMR project area and previously identified sites were tested to determine association with the Kealia-Kawaihāpai Complex, a portion of which was determined to be within the project area (McGerty and Spear 2001). Sixteen sites of various functions were again identified or recorded during the project AIS. Features identified during the AIS included rock alignments, rock-surfaced terraces, modified outcrops, enclosures, stacked rock rolls, core-filled rock walls, rock mounds, rock platforms, and water diversion features (McGerty and Spear 2001). The recorded sites were designated SIHP #s -5479 through -5492.

In 2003, CSH conducted an archaeological inventory survey, including a program of subsurface testing, for the proposed expansion of Mokolē'ia Beach Park (O'Hare et al. 2003). No surface archaeological features were identified. Seventeen shovel tests were excavated along the beach bank and 32 backhoe trenches were excavated within the project area. A grayish cultural layer (SIHP # 50-80-04-6638) exposed on the beach bank was also found in five trenches on the east side of the project area. In two trenches, the cultural layer was also associated with five subsurface features including two fire pits, two possible postholes, and a feature of undetermined function. Charcoal from one fire pit was dated to AD 1280-1440.

In 2003, the Department of Land and Natural Resources conducted an environmental assessment of the Pahole Natural Area Reserve and the Mokolē'ia Forest Reserve as part of a proposal to construct new fences within the Pahole Natural Area Reserve extending to the Mokolē'ia Forest Reserve (Zulick 2003). A pedestrian survey was completed and no historic properties were observed or encountered along the fence line route.

In 2004, human remains were inadvertently encountered during excavations associated with the repair of a seawall at 68-681 Farrington Highway, in Mokolē'ia Ahupua'a (Gregg and Kennedy 2004). The partial set of fragmented human remains was determined to likely have been previously disturbed. The location of the remains suggested they were of pre-Contact, Native Hawaiian origin. The burial site was designated SIHP # 50-80-03-6708.

Over the course of several years of site inspections, John D. Bennett provided a site visit report for the Mokuleia Military Reservation. Only areas open to the public were observed and features of the reservation were located and documented. Sites include World War II-era structures including former coast artillery batteries (Bennett 2008).

In 2003, SCS conducted a survey to evaluate and test sites previously identified by McGerty and Spear (2001) (SIHP #s -416, -5479 through -5486, and -5488 and -5492). The sites are associated with World War II-era military buildings and complexes as well as pre-Contact and post-Contact agricultural and habitation sites and sites related to historic sugarcane production and ranching activities (McGerty and Spear 2009).

### **5.3 Archaeological Studies within the Dillingham Ranch Agricultural Subdivision Project Area**

With the exception of McAllister's (1933) island-wide survey that possibly identified one historic property within the Dillingham Ranch Agricultural Subdivision project area (Site 194, Poloiaie Heiau), most of the previous archaeological studies were triggered by development plans for portions of the Dillingham Ranch property (Barrera 1986; Drolet and Schilz 1992a; Drolet and Schilz 1992b; Kennedy 1987; Lauer and Rieth 2014; Mitchell 1987; Tulchin and Hammatt 2007) (reports that have been reviewed and accepted by the SHPD are identified in Appendix C). These project-specific studies are discussed below.

#### **5.3.1 Barrera (1986)**

Barrera conducted the first archaeological reconnaissance survey of the approximately 2,800-acre Dillingham Ranch property in 1986. The brief two-day reconnaissance identified two archaeological sites within the property. These included a stone wall on the end of the ridge south of the Dillingham Ranch, and another stone wall southeast of the Kawaihāpai Reservoir, described to be a portion of a historic paddock (Barrera 1986). Barrera did not provide a site location map. However, based on the general location information and brief site descriptions, it is believed these two sites were later confirmed in subsequent archaeological studies within the Dillingham Ranch property and are discussed further below.

#### **5.3.2 Kennedy (1987)**

The following year, Kennedy (1987) reviewed previous archaeological studies within and in the vicinity of the Dillingham Ranch, and conducted another brief two-day reconnaissance of the Dillingham Ranch property. The study was conducted to assess the archaeological potential within the property and generate recommendations for future archaeological work. The reconnaissance survey confirmed the stone wall southeast of the Kawaihāpai Reservoir previously identified by Barrera (1986). In the vicinity of the wall, Kennedy (1987) noted the presence of two platforms which he thought may be *heiau* structures. The wall and platforms were later confirmed by subsequent archaeological studies within the Dillingham Ranch property and are discussed further below. Based on the literature review and reconnaissance survey, Kennedy (1987) indicated the archaeological potential of the Dillingham Ranch property was high and recommended intensive survey and documentation of sites, a program of subsurface testing, and historic background research be conducted prior to any development of the property.

### 5.3.3 Mitchell (1987)

In 1987, Mitchell (1987) conducted an additional archaeological reconnaissance of portions of the Dillingham Ranch property that were then proposed for golf course and residential development. The reconnaissance was made on horseback and was led by local informants who directed Mitchell to archaeological sites they knew of within the Dillingham Ranch property. A total of six site areas were documented. Site 1 consisted of a stone wall situated along a ridge south of the Dillingham Ranch. Site 2 consisted of a large wall structure, indicated to be a possible World War II military construction, located at approximately 1,100 ft elevation. Site 2 is indicated to be *mauka* of subsequent proposed development areas and has not been confirmed. Site 3 included a large, rectangular wall structure and platform structures within the enclosure, located southeast of the Kawaihāpai Reservoir. Site 4 refers to McAllister (1933) Site 192, the hidden waters springs that Mitchell indicates “were still producing water for the reservoir” (Mitchell 1987:3). Site 5, based solely on informant information, included a large wall and many rock structures located south of the Kawaihāpai Reservoir. Site 5 was later confirmed by subsequent archaeological studies. Site 6, also based solely on informant information, included “a great deal of rock terracing” located near the base of the cliffs at the western end of the Dillingham Ranch property (Mitchell 1987:4). The informants were likely referring to the terracing located *mauka* of the Dillingham Airfield, originally described by Handy (1940) later designated SIHP # -416 by Rosendahl (1977).

### 5.3.4 Drolet and Schilz (1992a and 1992b)

In 1992, Drolet and Schilz (1992a) conducted an AIS of an approximately 840-acre portion of the Dillingham Ranch property proposed for golf course and residential development. The inventory survey consisted of a systematic pedestrian survey of the entire project area and a program of subsurface testing with a backhoe within the coastal plain portion of the project area. A total of 28 trenches were excavated throughout the testing area. No cultural material was recovered from the test excavations.

A total of 15 archaeological sites with 40 component features were identified through the pedestrian survey. Eleven of the 15 sites were located within three site complexes described by Drolet and Schilz (1992a) as “settlement clusters.” These settlement clusters are generally located in the foothills above the coastal plain to the base of the coastal cliffs. The sites are situated along gently sloping upland terraces adjacent to natural stream drainages and consist of agricultural field systems with associated habitation structures constructed during the pre-Contact or early post-Contact period. It was also noted that the settlement clusters were likely much more extensive than what was documented, as significant land alteration by ranching and military activities was observed in the vicinity of the sites. Drolet and Schilz (1992a) suggested the principal villages were located along the coastal plain, though ranching and plantation agriculture had removed any evidence of this. No archaeological sites were identified in the coastal plain portion of the project area.

Settlement Cluster 1, located southeast of the Kawaihāpai Reservoir, includes six historic properties (SIHP #s -4772 through -4777) comprised of 19 individual features. Settlement Cluster 1 measures approximately 470 m north/south by 150 m east/west, covering approximately 13 acres. Settlement Cluster 1 was previously referred to by Mitchell (1987) as Site 5. The primary feature of Settlement Cluster 1 is SIHP # -4772, a large rectangular enclosure located near the southwest corner of the Kawaihāpai Reservoir property. This enclosure was interpreted to be

Poloaia Heiau, documented by McAllister (1933) as Site 194. SIHP #s -4773 through -4776 consist of enclosures, platforms, terraces, walls, alignments, and mounds located *mauka* of the *heiau*. SIHP # -4777 is a long north-south (*makai-mauka*) oriented stone wall. The wall was interpreted to represent an *ahupua'a* boundary marker dividing Mokulē'ia and Kawaihāpai Ahupua'a. However, recent archaeological investigations associated with the current study, as well as a preservation plan for sites within the Dillingham Ranch project area (Tulchin and Hammatt 2008), have determined the wall is actually the eastern portion of a historic paddock, similar to SIHP # -4785 identified by Drolet and Schilz (1992a) and described below. The two historic paddocks are also indicated on historic maps of the area (see Figure 8). The existence and location of the southern and western walls of the paddock were confirmed during CSH inventory survey fieldwork in October 2006 (Tulchin and Hammatt 2007). Drolet and Schilz (1992a) did not locate the southern and western walls of the paddock or note the location of the paddock on historic maps.

Settlement Cluster 2, located approximately 600 m southeast of Settlement Cluster 1, includes three historic properties (SIHP #s -4778 through -4780) and 17+ individual features. Settlement Cluster 2 measures approximately 190 m north/south by 135 m east/west, covering approximately 4 acres. SIHP #s -4778 through -4780 consist of rectangular enclosures, terraces, and platforms. Damage to the sites due to military road construction was noted.

Settlement Cluster 3, located approximately 500 m northeast of Settlement Cluster 2, includes one historic property (SIHP # -4782) comprised of six individual features. Settlement Cluster 3 measures approximately 300 m north/south by 290 m east/west, covering approximately 9 acres. SIHP # -4782 consists of a network of large rectangular enclosures bordered by field walls, mounds, terraces, and paved areas.

Drolet and Schilz (1992a) also identified four sites located outside the boundaries of the three designated settlement clusters. SIHP # -4783 consists of a plantation-era irrigation ditch and associated stone wall and clearing mounds. SIHP # -4784 is an earthen ditch, possibly an *'auwai*, a traditional Hawaiian ditch used to irrigate crops like taro. SIHP # -4785 is a large stone walled enclosure interpreted to be a historic paddock. The paddock, along with a second located approximately 450 m to the west, is indicated on historic maps of the area (see Figure 10 and Figure 11). SIHP # -4786, located within the SIHP # -4785 paddock, is a large, well-constructed stone platform, interpreted to be a *heiau* structure. SIHP #s -4785 and -4786 were originally referred to by Barrera (1986), Kennedy (1987), and later designated Site 3 by Mitchell (1987). Kennedy (1987) and Mitchell (1987) indicated the presence of at least two platforms within the enclosure, which was confirmed during recent archaeological investigations associated with the current study, as well as a preservation plan for sites within the project area (Tulchin and Hammatt 2008). Drolet and Schilz (1992a) did not locate the second platform, nor did they note the existence of two platforms based on the previous archaeological work within the project area. Subsequent to the AIS of the approximately 840-acre portion of the Dillingham Ranch property, Drolet and Schilz (1992b) surveyed an additional approximately 53 acres, documented in an addendum inventory survey report.

The additional lands consisted of an approximately 42-acre parcel located south of the Dillingham house, *mauka* of the coastal cliffs, and an approximately 11-acre parcel located west of the western extent of the original survey area. One site, SIHP # -4439, was identified in the *mauka* parcel. SIHP # -4439 is an approximately 300-m long stone wall oriented in a north-south

direction along a ridge. This wall was previously identified by Barrera (1986) and later designated Site 1 by Mitchell (1987). Three additional sites were located in the western parcel. SIHP # -4440 consisted of a remnant stone wall, disturbed by stream cuts. SIHP # -4441 consisted of an approximately 200-m long stone wall and associated barbed wire fence, interpreted to be a historic cattle wall. SIHP # -4442 consisted of a terrace, with damage due to erosion and stream cuts.

### 5.3.5 Buffum et al. (2004)

In 2004, an AIS was conducted for a number of proposed military training areas at Schofield Barracks Military Reservation, Kahuku Training Area, Wheeler Army Airfield, and military vehicle trails running from Schofield Barracks to the Dillingham Training Area, a portion of which cross through the present project area (Buffum et al. 2004). Survey methods included pedestrian survey that included transects set at 15 m intervals to ensure area coverage. No historic properties were identified.

### 5.3.6 Tulchin and Hammatt (2007)

In 2006, Tulchin and Hammatt (2007) conducted an AIS investigation within the project area on adjacent *mauka* lands not covered by the Drolet and Schilz (1992a and 1992b) inventory survey. The survey areas were added as part of the current Dillingham Ranch Agricultural Subdivision development plan. Six historic properties comprising 28 individual archaeological features were identified within the approximately 78-acre study area.

SIHP # -6884 contains four historic, ranch-related stone wall features located within gully areas in the eastern, central, and western portions of the study area. SIHP # -6885 is an agricultural complex located within a gully area in the western portion of the study area. The complex consists of three terraces and a retaining wall. SIHP #s -6886 and -6888 consist of agricultural complexes composed mostly of crudely constructed mounds and terraces situated along or immediately downslope of exposed cliff faces. Although no natural springs or seeps were identified in the area, the last two historic properties were located along a prominent hillside indicated by McAllister (1933) as the location of SIHP # -192 referred to as “hidden waters.” SIHP # -6887 is a modified overhang shelter, also located on the prominent hillside in the vicinity of Site 192. The overhang shelter was modified with the construction of a retaining wall and level terrace across the entrance of the overhang.

An eastern extension of the previously identified SIHP # -416 agricultural and habitation complex was identified in the northwestern corner of the study area. Six features including walls, terraces, and a mound were located within the study area, though numerous associated archaeological features were observed to continue to the northwest, as previously identified or documented in archaeological studies by Handy (1940), Rosendahl (1977), and Moblo (1991).

Historic properties identified by Tulchin and Hammatt (2007) represent two distinct periods of land use within the Dillingham Ranch property. SIHP #s -416, -6885, -6886, and -6888 are late pre-Contact to early post-Contact traditional Hawaiian agricultural complexes. The agricultural complexes were built to utilize limited water resources on the inland coastal terrace, particularly along stream drainages and at the base of exposed cliff faces near the *mauka* or southern boundary of the project area. The location, feature types, and pattern of relatively dense site clustering are similar to the “settlement clusters” identified by Drolet and Schilz (1992a) within adjacent stream drainages of the project area.

The four ranch-related rock walls (SIHP # -6884 Features A–D) are affiliated with the post-Contact ranching period. The ranching period has a long history in the Waialua District, with large ranches developing ca. the mid- to late 1800s.

### **5.3.7 Tulchin and Hammatt (2008a)**

In 2008, CSH completed a preservation plan for sites located within an earlier design plan of the Dillingham Ranch Agricultural Subdivision project (Tulchin and Hammatt 2008a). The plan addressed all historic properties in their 820-acre project area, including properties identified by Drolet and Schilz (1992) and Tulchin and Hammatt (2007). In accordance with the previous inventory surveys' Hawai'i Register of Historic Places significance evaluations and treatment recommendations, and following consultation among CSH, SHPD, and the property owner, the preservation plan provided proposed interim and long-term preservation measures for 16 traditional Hawaiian sites: SIHP #s -416, -4772 through -4780, -4782, -4786, and -6885 through -6888.

### **5.3.8 Tulchin and Hammatt (2008b)**

In 2008, CSH completed a monitoring plan for the Dillingham Ranch Agricultural Subdivision project (Tulchin and Hammatt 2008b). The plan covers ranch improvement projects and the initial subdivision infrastructure construction activities undertaken by Dillingham Ranch Aina, LLC. This includes initial grubbing, grading, and excavation work. Subsequent construction within the subdivision development lots by individual lot owners is not covered by the monitoring plan.

### **5.3.9 Lauer and Rieth (2014)**

In 2014, IARII conducted an AIS of approximately 85.3 acres along the southern or *mauka* portion of the Dillingham Ranch Agricultural Subdivision project area (Lauer and Rieth 2014). The survey area represented additional, unsurveyed property in the proposed subdivision. The AIS covered three separate parcels. Lauer and Rieth (2014) identified one historic property (SIHP # -7653) with four discontinuous rock wall sections (Features 1–4). SIHP # -7653 was interpreted as nineteenth or early twentieth century ranch walls that were enclosures and exclosures used for grazing cattle in the upper and steeper slopes of the Dillingham Ranch project. Two unmodified springs or seeps were also identified in the southwestern portion of the Dillingham project area (their westernmost survey parcel), on the prominent hillside indicated by McAllister (1933) as the location of freshwater springs referred to as “hidden waters” (SIHP # -192).

Four shovel test probes were excavated at SIHP # -7653 Feature 3 wall and an adjoining unmodified rock shelter (Lauer and Rieth 2014). No cultural deposits were identified in the floor of the rock shelter nor among the colluvial deposits retained upslope by the Feature 3 wall.

Because the site had been fully documented during the inventory survey, Lauer and Rieth (2014:47) recommended no further work at SIHP # -7653. Protection of the two unmodified springs, however, was recommended because of their potential associations with the “hidden waters” (SIHP # -192), natural water springs, as documented in oral history and by McAllister (1933).

### **5.3.10 Belluomini et al. (2017)**

In 2017, CSH conducted an AIS of approximately 113.5 acres east of Mokuleia Access Road, on a portion of the Dillingham Ranch Agricultural Subdivision project area (Belluomini et al.

2017). The survey area covered the previously unsurveyed area in the proposed subdivision. Belluomini et al. (2017–draft) identified two new historic properties (SIHP # -7976 and SIHP # -7977) and one previously identified historic property (SIHP # -7653 Feature 1). The two historic properties identified during the 2008 archaeological monitoring (SIHP # -7978 and SIHP # -4777 Feature C) were fully documented.

SIHP # -7976 consists of a basalt rock wall construction measuring approximately 1 m wide and extending approximately 115 m in an east/west orientation terminating at the ridgeline in the northwest portion of the Dillingham Ranch Agricultural Subdivision project area. SIHP # -7976 is consistent with cattle walls seen throughout the Dillingham Ranch property. SIHP # -7977, located in the southwestern corner of the project area along Makaleha Streambed, consists of a system of terraces on both the west and east side of the stream extending to the western extent of the project area and includes nine features. SIHP # -7978 was originally observed during archaeological monitoring associated with Dillingham Ranch improvements in 2008 but was left undocumented except for a photograph and GPS location of the feature observed. The platform was located, photographed, and documented during the current archaeological pedestrian survey. The platform consisted of a rock-filled rectangular structure of stacked basalt stones of varying wall heights and aligned stones.

SIHP # -4777 consists of a property boundary wall related to Land Grant 457 awarded to J.T. Gulick. Portions of the wall were identified in three different studies. Features A and B were initially identified by Drolet and Schilz (1992a). An additional extent of Feature A was identified by Tulchin and Hammatt 2008a. The newly identified Feature C is the continuation of the wall to the west and north from the portion identified by Tulchin and Hammatt 2008a.

SIHP # -7653 consists of five areas of rock wall segments (Features 1–4) located along the southern boundary of the proposed Dillingham Ranch Agricultural Subdivision project and on the western edge of the Dillingham Ranch Agricultural Subdivision project area. Only two of the wall sections, Feature 1 and Feature 2, are located within the Dillingham Ranch Agricultural Subdivision project area in the southeast corner.

## 5.4 Summary of Significance Assessments

Of the 11 historic properties located in the proposed Dillingham Ranch Agricultural Subdivision project area, three historic properties were deemed not significant (Table 4). Seven historic properties were evaluated as being significant under one or more of the broad criteria established for assessing State of Hawai'i historic property significance. To be considered significant, a historic property must possess integrity of location, design, setting, materials, workmanship, feeling, and/or association and meet one or more of the following broad cultural/historic significance criteria (in accordance with HAR §13-284-6):

- 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, represents the work of a master, or possesses high artistic value;



Table 4. Significance evaluations and mitigation for historic properties in the project area

SIHP # 50-80-03-	Type	Age	Significance Criteria	Hawaii Register	Mitigation	Source
4772	<i>Heiau</i> (ceremonial)	Pre-Contact	d and e	C, D, and E	Preservation	Drolet and Schilz 1992a:41-43; Tulchin and Hammatt 2008a:14
4773	Complex (habitation/agriculture)	Pre-Contact	d	C and D	Preservation	Drolet and Schilz 1992a:41-43; Tulchin and Hammatt 2008a:14
4774	Platform (habitation)	Pre-Contact	d	C and D	Preservation	Drolet and Schilz 1992a:41-43; Tulchin and Hammatt 2008a:14
4775	Enclosure (habitation)	Pre-Contact	d	C and D	Preservation	Drolet and Schilz 1992a:41-43; Tulchin and Hammatt 2008a:14
4776	Complex (habitation/ agriculture/ceremonial)	Pre-Contact	d and e	C, D, and E	Preservation	Drolet and Schilz 1992a:41-43; Tulchin and Hammatt 2008a:14
4777	Wall (marker)	Pre-Contact	d	C and D	Preservation	Drolet and Schilz 1992a:41-43; Tulchin and Hammatt 2008a:14 Belluomini et al. 2017:108-109
4782	Complex (habitation/agriculture)	Pre-Contact	d	D	Preservation	Drolet and Schilz 1992a:41-43; Tulchin and Hammatt 2008a:14
4783	Complex (agriculture)	Post-Contact	Not significant	Not significant	No further work	Drolet and Schilz 1992a:41-43;
4784	Ditch (agriculture)	Post-Contact	Not significant	Not significant	No further work	Drolet and Schilz 1992a:41-43;
4785	Enclosure (ranch paddock; agriculture)	Post-Contact	Not significant	Not significant	No further work	Drolet and Schilz 1992a:41-43;
4786	Complex (ceremonial)	Pre-Contact	d and e	D and E	Preservation	Drolet and Schilz 1992a:41-43; Tulchin and Hammatt 2008a:15

Table 4. Significance evaluations and mitigation for historic properties in the project area (cont.)

<b>SIHP # 50-80-03-</b>	<b>Type</b>	<b>Age</b>	<b>Significance Criteria</b>	<b>Hawaii Register</b>	<b>Mitigation</b>	<b>Source</b>
6884	Walls (agriculture)	Post-Contact	N/A	D	No further work	Tulchin and Hammatt 2008a:12-13
7653	Walls (agriculture)	Post-Contact	d	D	Preservation	Lauer and Rieth 2014:iii
7976	Wall	Post-Contact	d	–	No further work	Belluomini et al. 2017:109
7977	Terraces	Pre- and early Post-Contact	d and e	–	Preservation	Belluomini et al. 2017:109
7978	Platform	Pre- and early Post-Contact	d and e	–	Preservation	Belluomini et al. 2017:109

- d. Have yielded, or is likely to yield information important for research on prehistory or history; or
- 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 history accounts—these associations being important to the group's history and cultural identity.

Pursuant to HAR §13-198-8, two historic properties were previously evaluated for eligibility for listing on the Hawai'i Register of Historic Places. To be considered eligible for listing on the Hawai'i Register of Historic Places, a historic property should possess integrity as described above, and meet one or more of the following broad significance criteria:

- A. Associated with events that have made a significant contribution to the broad patterns of our history;
- B. Associated with the lives of persons significant in our past;
- C. Embody the distinctive characteristics of a type, period, or method of construction, or that represent that work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction;
- D. Have yielded, or may be likely to yield, information important in 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 history accounts—these associations being important to the group's history and cultural identity.

## 5.5 Mitigation Requirements

Following consultation among CSH, SHPD, and landowner representatives in 2008, it was agreed that preservation of the historic properties evaluated as significant (with the exception of SIHP # -6884) is to be included in a preservation plan (Tulchin and Hammatt 2008a) and require interim and long-term protection measures within the confines of the proposed Dillingham Ranch Agricultural Subdivision project area (see Table 4). Figure 18 illustrates the current understanding of mitigation, specifically in regards to preservation associated with the Dillingham Ranch Agricultural Subdivision project.

Based on the findings from four AIS reports, preservation is required for SIHP #s -4772 through -4777, -4782, -4786, and -7653.

Tulchin and Hammatt (2008a) address preservation of SIHP #s -4772 through -4777, -4782, and -4786. No further work is required for SIHP #s -4783, -4784, -4785, and -6884. One site that requires preservation (SIHP # -7653) is not currently covered under a preservation plan. Mitigation recommendations have been made for four historic properties identified in Belluomini et al. 2017 (SIHP #s -7976, -7977, -7978, and -4777 Feature C), however, the SHPD has not addressed proper mitigation requirements for these new historic properties/features.

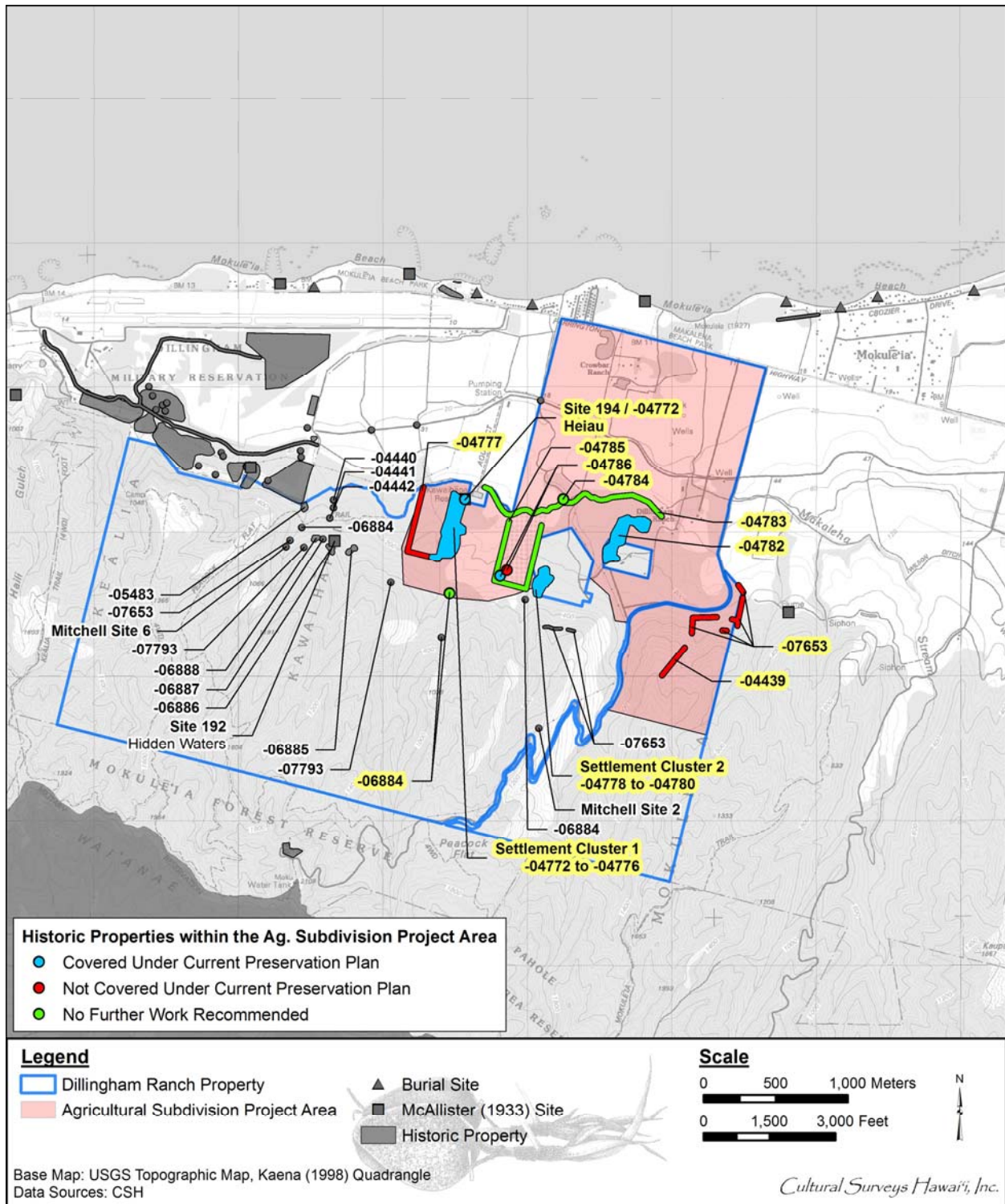


Figure 18. Portion of a 1998 Kaena USGS topographic quadrangle, showing the locations of historic properties within the Dillingham Ranch Agricultural Subdivision project area and their respective mitigation requirements.

## Section 6 Previous Oral History Research

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This section draws from previous oral history research conducted by the University of Hawai'i's Center for Oral History (UHCOH) in 1977 to highlight the voices of several people who had deep knowledge of the culture and history of the *moku* of Waialua; of particular note are the references to aquatic resources within the district. Additionally, an interview with Edward T. "Eddie" Silva (descendant of Joseph Paul Mendonça and Gaspar Silva and a former *paniolo* of Dillingham Ranch) conducted by the Hawai'i Cattlemen's Council in 2003 is also included. Their *mo'olelo* color the cultural and historical background with nuanced recollections and add depth to the information provided by *kūpuna* (elders) and *kama'āina* who gave oral and/or written statements as well as those who were interviewed for this CIA. Summaries and excerpts from this collection of oral histories are presented below.

### 6.1.1 Adam Holmberg

The UHCOH documented the autobiography of Adam Holmberg on 10 June 1976 in Hale'iwa, O'ahu. Mr. Holmberg was of Portuguese-Swedish descent and born in 1911. His father was born on Kaua'i and his mother was born in Portugal. Mr. Holmberg was one of 17 children. He later went on to work for Waialua Sugar Company from 1927 to 1940. Mr. Holmberg shared his recollections of fishing in Waialua Moku:

Well, when I used to live in town, I didn't have a boat, so I used to go out, shore casting. With the reel. Then after I moved Waialua, and then I had—well, I had a boat, and I used to go out on my boat at night. For akulis [*akule*]. Catch akulis [*akule*]. And day time, I'd go out for, oh, moana—well, let's put it this way, anything that would bite the hook.

At night, you could almost tell what kind of fish you were gonna bite, that you were gonna catch. And you would be out—you see, the—two type. You'd either catch akulis [*akule*] or opelos [*ōpelu*]. That's it.

Well, I tell you. It's getting to be that its, cheaper to buy the fish. Not much fish out here now. Fish is getting scarce. Like they say, it's a big ocean. It is big, but where's the fish, I don't know. Since I retired, I haven't been fishing. At night, people been going out, and . . . they been coming in with very little fish. [UHCOH 1977:8:128]

### 6.1.2 Manabu Nonaka

Manabu Nonaka was born in Honolulu in 1915. His father came from Kumamoto, Japan. His mother was from the same area and came to Hawai'i as a picture bride. His father was a harnessman in Honolulu and a taxi driver in Waialua. After his father's passing in 1922, Manabu's mother remarried several years later and ran a store. His stepfather was a pump man for the Haleiwa Hotel. Manabu later helped with his stepfather's trucking business, which he later took over after his stepfather was paralyzed. Manabu operated the trucking business from 1934 to 1957, later selling the business and working for the Board of Water Supply. Other work experiences included working for the pineapple company during the Great Depression, Civilian Conservation Corps work, and soda fountain work. Mr. Nonaka described a typical day during his childhood in Hale'iwa with his friends entertaining the tourists at Haleiwa Hotel and making money:

They used to have a bridge going across Haleiwa Hotel. Tourist used to come by the train, and they have to go across the beach to get to the Haleiwa Hotel. So then, we stay in the water. We tell 'em, 'Drop a nickel.' And you know the deep place was about ten, 15 feet. Sometime we can't go down to get the money. But the older boys was good enough. They go way down to get the money. And, you know, the good divers, they make quite a bit of money, too. Some people used to make two dollars, three dollars.

And in those days, two dollars, three dollars was hell of a lot of money. You know, we used to work in the cane field when we was very young. Say, about ten years old, we used to only get 25¢, 35¢ for the whole day. [UHCOH 1977:6:431]

Mr. Nonaka described other recreational activities he participated in growing up:

Well, recreation was very limited those days, and we had to make our own recreation. So what we used to do was we had Anahulu Stream right close by. And we used to make akakai boat. Akakai those days used to come so tall. Used to come better than eight feet. So, we bundle 'em up together, and we tie it up and shape it like a boat, and we used to ride on it. We go fishing, and go joy riding up and down the Anahulu Stream.

[Akakai] well, that's a weed. I still see it growing, but it doesn't grow as tall as it used to. It's a weed growing in the water that float if you cut it and bundle it together.

Well, the river, then, was not as much polluted as today, and it was much shallower than what it is now, because those days was doing natural; no digging was done by any mechanical equipment.

There used to be some fishermen [in the river]. Very few, but the fishing boat used to be more close to the ocean, the mouth of the river. [UHCOH 1977:6:431–432]

He described his main diet growing up and gathering activities in the Hale'iwa to Waialua area:

Well, our main diet was mostly fish, because fish used to be cheap, those days. The fishermen used to catch the fish, and the wife used to peddle the fish. So you could get a bunch of akule which was maybe five, six pound for 25¢. And because was near the ocean and river, fish was kind of . . . we eat plenty fish. Meat was very expensive, so . . . not expensive, but compared to those days, was expensive. We only made about one dollar one day for ten hours work.

Chicken, we used to have our own. Everybody used to raise their own chicken so they can get their own eggs. So whenever we had an occasion, we had to kill the rooster or hen, whichever it was to have, you know, party. And this is one of the delicacy, chicken hekka [stir fry with meat, vegetables, and noodles]. Today is common, but those days was delicacy.

Well, my younger days, I used to be crazy about fishing and those days, they had so many fish. I'm talking about something when I was teenager, you know. 1920s. We used to go the river or the mouth and we used to hook papio [*pāpio*; juvenile crevalle], holehole [*āholehole*]. During the season, papio [*pāpio*], I used to hook about hundred, hundred fifty. And holehole [*āholehole*] . . . holehole [*āholehole*]

was smart fish, then. Still is today. During the season, we used to have the baby moi and we hook lot of ooama [*'oama*], too. And we used to catch lot of shrimp. And that shrimp, we used to eat. We use it for okazu [side dish], too, just like aside for the rice. And we used to pick some seaweed, but some of the vegetable, we used to raise, so we didn't have to buy too many things.

I used to love my tako [octopus], and I used to catch enough tako right around the Haleiwa area from, let's say, the Haleiwa Park to the Waialua Park today. And those days, at least you know when you go squidding, you know you catch tako. But today, you got to be very lucky to catch one tako.

Well, opihi was something we had to go Waimea Bay to get, and we wasn't that good a swimmer so, that was left up to the bigger boys who pick some opihi. But today, I don't think we have any there already.

Ogo [seaweed], you find plenty in Haleiwa Bay. It wasn't dirty like it is today, but there was plenty from before. [UHCOH 1977:6:434-436]

### 6.1.3 Lucy Robello

Lucy Robello was born in Waialua in 1905. Both of her parents were from San Miguel, Portugal and came as children on the same ship to Hawai'i with their parents. Mrs. Robello married Seraphine Robello in 1926 and they were the parents of three children. They resided in Waialua. Mrs. Robello recalled her father driving a stagecoach from Pearl City to Kahuku to deliver mail and carry passengers. Most of his passengers were described as "high class" and he would sometimes make a drop off at Haleiwa Hotel:

I remember seeing the Haleiwa Hotel. Was very nice. Something really nice to see. And that's where like the royal people used to come and spend their time over there. They used to have some great dances and things over there. Really nice times. That was for the higher class people. Not like us. We never went. We only saw it from the outside. Never inside you know.

Queen Emma used to come. And at the same, she used to go to that church then: Liliuokalani Church over there. The royal ones and then the richer haole's [foreigner] like the Bishop, what do you call . . . Castle and Cooke, the big Bishop Estate owner . . . Yeah, he was married to Bernice. So they did those trips over here. That was for the high class people. [UHCOH 1977:9:215]

### 6.1.4 Nobuyoshi Nakatsu

One of 12 children, Nobuyoshi Nakatsu was born in Waialua Moku in 1904. Completing only nine years of school, Mr. Nakatsu began working on the plantation at age 14 where his duties consisted of cutting, loading, and irrigating cane. After the 1920 strike, he worked for a pineapple company and later returned to work on the plantation in the mill laboratory. In 1948, he became the International Longshore and Warehouse Union (ILWU) president for the Waialua Unit. Mr. Nakatsu shared the common practices of the plantation:

Before, olden day, when they get plenty molasses, well, you know, the pollution stuff was not there, eh, those days. They wen just dump 'em anything they don't want in the ocean, see. Even the mill oil or those opala [*'ōpala*, trash] like that, eh. Was all went to the ocean. Yeah.

Yeah, common practice in the old days. Nobody talk about pollution those days.  
[UHCOH 1977:6:246]

Mr. Nakatsu recalled the plantation supplying the workers with necessities such as firewood and kerosene:

We use to get free firewood, free kerosene. Of course, free house, too, eh, in those days. They use to bring that firewood cut by contractor who cut the firewood. That is not actually plantation people. Was outside contractor use to cut firewood up in the mountain. And they load on the flat car, they call that. One locomotive pull down to the camp and leave 'em right by the camp. People go over there and pick up the firewood. Sometime they use to unload that and make a fire. But most time was all on that car there. People go there and pick up their own firewood, eh.

No, not kiawe. Those days, didn't have kiawe wood for firewood. They use to get what do you call that? What you call that?

No plum, but some kind of ironwood. And what they call that yellow kind wood? I forget the name. Valuable stuff.

No, no. Yeah. Had koa [*Acacia koa*]. And one more yellow wood. Oh, really, was all yellow. Was nice wood though. But to burn wasn't too good. I forgot now. Maui had plenty. The Chinese like it.

Yeah, sandalwood! That's it. [UHCOH 1977:6:246–247]

### 6.1.5 Edward T. “Eddie” Silva

Mr. Edward T. “Eddie” Silva was interviewed by the Hawai'i Cattlemen's Council in 2003. In the interview, Mr. Silva discussed his life as a *paniolo* working for the Dillingham Ranch. Mr. Silva worked for Dillingham Ranch for over 20 years, however, after the sale of the ranch to a mainland company, Mr. Silva decided to begin his own ranching enterprise, founding Ka'ala Ranch in Waialua. According to the Hawai'i Cattleman's Council (2003), Mr. Silva's happiest memories were of working at Dillingham Ranch:

Some of his happiest moments working at Dillingham happened during the time he and his family spent at their ranch house, high in the mountains. He recalls waking up to find pheasants perched on the fence, and nights so quiet and peaceful it felt like they were the only people on the planet. Eddie's proudest of his ability at hands-on ranch work—'Raising cattle, jump on a horse, move cattle, breed cattle, get the calf on the ground.'

Mr. Silva made clear that ranching had always been in his blood. His father was employed by the Mendonsa (Mendonça) Estate. As part of his employment, Mr. Silva's father received free water and housing. Mr. Silva stated, “Medonsa gave him that property to live in with six boys and four girls.” Mr. Silva also discussed the process of learning to ranch alongside his father:

With my old man. Like I told you, the ranch never paid much money with the pile of kids we had. So he was raising calves, he was raising pigs and everything, and I was helping all with the pigs, the cows and everything he had around the yard. Go school and come home, pigs and stuff like that. Then I went work in the chicken farm, Campbell chicken farm down there. I stayed there about two or three years,



but I had to get out of there because I just never like chickens. Strictly cows and horses [Hawai'i Cattleman's Council 2003].

Mr. Silva's father worked for the Mendonsa Estate up until his passing. Mr. Silva described the lands belonging to the Mendonsa Estate:

. . . they had from the forest lands to the beach, along the Dillingham's boundary right down to the ocean. All that land to the ocean was theirs. They had the water rights and everything. Then Medonsa sold to Castle & Cooke and my lease went to Castle & Cooke. This is almost 1,500 acres. [Hawai'i Cattleman's Council 2003].

Mr. Silva discussed how he first came to be employed by Dillingham Ranch, elaborating on his work as a *paniolo*:

Well, they needed men but they never wanted to get men, because they never knew what was coming, I think. But when Lowell went up to the Big Island and they bought Puuwaawaa Ranch, and it was overstocked with cattle. When they brought them down, some couldn't move. So they needed men to go cut the koa when the cattle come down, check the fences so they're not going all over the place . . . Gee, he must have brought over about 300 or 400 head. We'd separate the steers, separate the old cows, but some of those old cows was hapai. And when they came over here they bloomed, and they came out to be nice-looking cows. So they needed men to go cut that koa. That's why when he give me that job he tell me, maybe four months, five months, just till the cows pick up some weight where they can move around. So we took them all down the airbase, and just let them go. Some lay there till they got their strength back, then they get up, they drink water, and when they got strong enough then we segregate them. Some of them turned out to be beautiful cattle. Puuwaawaa had nice looking cattle but they were so skinny, they were overstocked. That's why I was there. [Hawai'i Cattleman's Council 2003].

Mr. Silva shared his reasoning as to why he continued to work as a *paniolo* at Dillingham Ranch, despite better-paying jobs being available at Schofield Barracks at the time:

I didn't want to go! I just—come down the ranch, get on your horse, work cattle, stay with your dogs. The hours never mean nothing, because everybody used to get together, and we had more fun than anything else. And the bunch that I was with was all old-timers, not young boys, all old-timers. We used to talk stories, oh, I used to like that. So that went, went, went. And I stayed with Dillingham, he raised me up, put me on truck and I went full-time cowboy. When Dillingham sold, that went to Mokuleia Ranch and Land Company, that was the (Dillingham) family. That's when they brought Gordon Cran in. Gordon Cran came in, and he took over everything. Then he needed me to go, because I knew the area, and he wanted me to work for them.

But Joe Pedro, he used to work for Walter F. Dillingham, he was the number-one boy, like Akau and John Morgan. He was with the horses, he used to raise the polo ponies, all high-class horses. And the old man Hinazumi, the foreman for the cattle, used to raise the pure-bred cattle, Herefords. So I was with him working. We went till we clean out the cattle, then Joe Pedro wanted to put me with the horses, which I never want, because horses can cripple you up, and I had plenty falls already.

Then I meet Gordon and Gordon says, 'Gee, when are you going to come work for us, because I need you' because I knew the area and the dairymen want to give us a lot of Holstein heifers. So Gordon said he wanted me to go up and check one pasture and see if it's ready to bring in cattle. So I tell him, 'Well, Gordon, let me see tomorrow.' I went down and, same thing, when pau with the cattle he put me with the horses, so I never went with the horses, I came up and met Gordon. Said, 'Okay, Gordon, I'm ready to go.' He said, 'Did they let you go?' I said, 'No.' He said, 'Gee, Dillingham might be . . .' I said, 'No, we try it that way.' Because Joe Pedro knowed me that I never like go with the horses, so Joe Pedro never make a fuss. So I went with the cattle, then he told me, 'Your job is with the cattle. Whatever cattle come, you take care of the cattle. If you do your job right, you're alright. If you don't do your job, we'll get another man.' So I stayed there. We went up to 700 dairy cattle and 500 beef cattle. [Hawai'i Cattleman's Council 2003].

Mr. Silva continued his discussion on Walter Dillingham and Joe Pedro, noting that both men were excellent horsemen and especially good polo players. Mr. Silva also commented that Walter Dillingham was a "good man" and that "he love[d] his horses:"

He used to come down weekends. You ought to have seen Crowbar Ranch at that time. And Joe Pedro was a good polo player, he could train horses. But when Walter F. come down . . . his colts got to be all on one side of the stables, and the mares all on one side. All full, all horses. Then he come down the line and just look at that, all nice. That was what made him feel happy and got him out of town, you know? Beautiful, beautiful!

. . . When I was down there, Walter F., he used to come along, but he was kind of old already. His wife was kind of old too. But Joe used to put 'em on a horse, the old lady, and lead 'em. The roads was all sand. They never wanted no paved roads, so when the kids ride, the horses no slide. Summertime, the kids would be all down, riding and everything. Joe would bring all the horses in. Then when they were all pau summer, they go back school or whatever, all out to pasture. And Joe used to break those horses. Good polo player. [Hawai'i Cattleman's Council 2003].

Regarding his own recreational pursuits, Mr. Silva noted that he used to be an avid hunter and occasionally enjoyed catching squid *makai* of Dillingham Ranch:

I used to like my hunting, too. At that time, I was down at the old man's house [former Mendonsa Estate lands]. I was about 16, 17. I had about 16 dogs, all well-kept. We used to come in the morning, go, chase a big boar with the dogs, fight him, get all cut up, run away. Then I put the dogs in the car, go home, have a couple beers, talk story, throw the other bunch in the truck, go where the boar was fighting, because when the boar get hurt, he no go too far too, eh? Then the dogs brought it down, put it in my truck, bring the boar home, that was a fun time . . . Hunting was one thing, and summertime we'd go down, catch the squid down the ocean. [Hawai'i Cattleman's Council 2003].

## Section 7 Community Consultation

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### 7.1 Introduction

Throughout the course of this assessment, an effort was made to contact and consult with Native Hawaiian Organizations (NHO), agencies, and community members including descendants of the area, in order to identify individuals with cultural expertise and/or knowledge of the *ahupua'a* of Mokulē'ia and Kawaihāpai. CSH initiated its outreach effort in June 2016 through letters, email, telephone calls, and in-person contact. Community consultation is still ongoing.

### 7.2 Community Contact Letter

Letters (Figure 19 and Figure 20) along with a map and an aerial photograph of the project were mailed with the following text:

At the request of Helber Hastert & Fee Planners (HHF), on behalf of Dillingham Ranch Aina LLC, Cultural Surveys Hawai'i Inc. (CSH) is conducting a Cultural Impact Assessment (CIA) for the proposed Dillingham Ranch Agricultural Subdivision, Mokulē'ia Ahupua'a, Waialua District, O'ahu, Tax Map Keys (TMKs): Multiple. The project area is depicted on a portion of the 1998 Kaena U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle and a 2013 aerial photograph (see attachments), and covers approximately 2,722-acres.

The proposed project will continue the existing operations at Dillingham Ranch, which includes equestrian activities (such as boarding, recreational riding, and polo); coconut tree farming; limited cattle grazing; and the rental of the Dillingham Ranch Lodge for private functions. Added operations consistent with agricultural use include: designated acreage in the vicinity of Dillingham Lodge to be utilized for farm to table farmers; and 70 agricultural lots spanning from two acres to 77-acres.

The proposed project will be supported by a private road network of appropriate rural design; a private wastewater treatment plant to process wastewater generated on-site; a water distribution system (including potable and agricultural wells); and a maintenance complex for storage and machinery and vehicles.

The purpose of the CIA is to gather information about the project area and its surroundings through research and interviews with individuals that are knowledgeable about this area in order to assess potential impacts to the cultural resources, cultural practices, and beliefs identified as a result of the planned project. We are seeking your *kōkua* (assistance) and guidance regarding the following aspects of our study:

- General history and present and past land use of the project area.**
- Knowledge of cultural sites in the project area, including historic sites, archaeological sites, and burials.**

**Cultural Surveys Hawai'i, Inc.**  
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June 2016

Aloha mai e kāua,

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- **General history and present and past land use of the project area.**
- **Knowledge of cultural sites in the project area, including historic sites, archaeological sites, and burials.**
- **Knowledge of traditional gathering practices in the project area, both past and ongoing.**
- **Cultural associations of the project area, such as legends and traditional uses.**
- **Referrals of *kūpuna* or elders and *kama'āina* (native born) who might be willing to share their cultural knowledge of the project area and the surrounding *ahupua'a* (land division) lands.**
- **Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the project area.**

1

Figure 19. Community consultation letter, page one

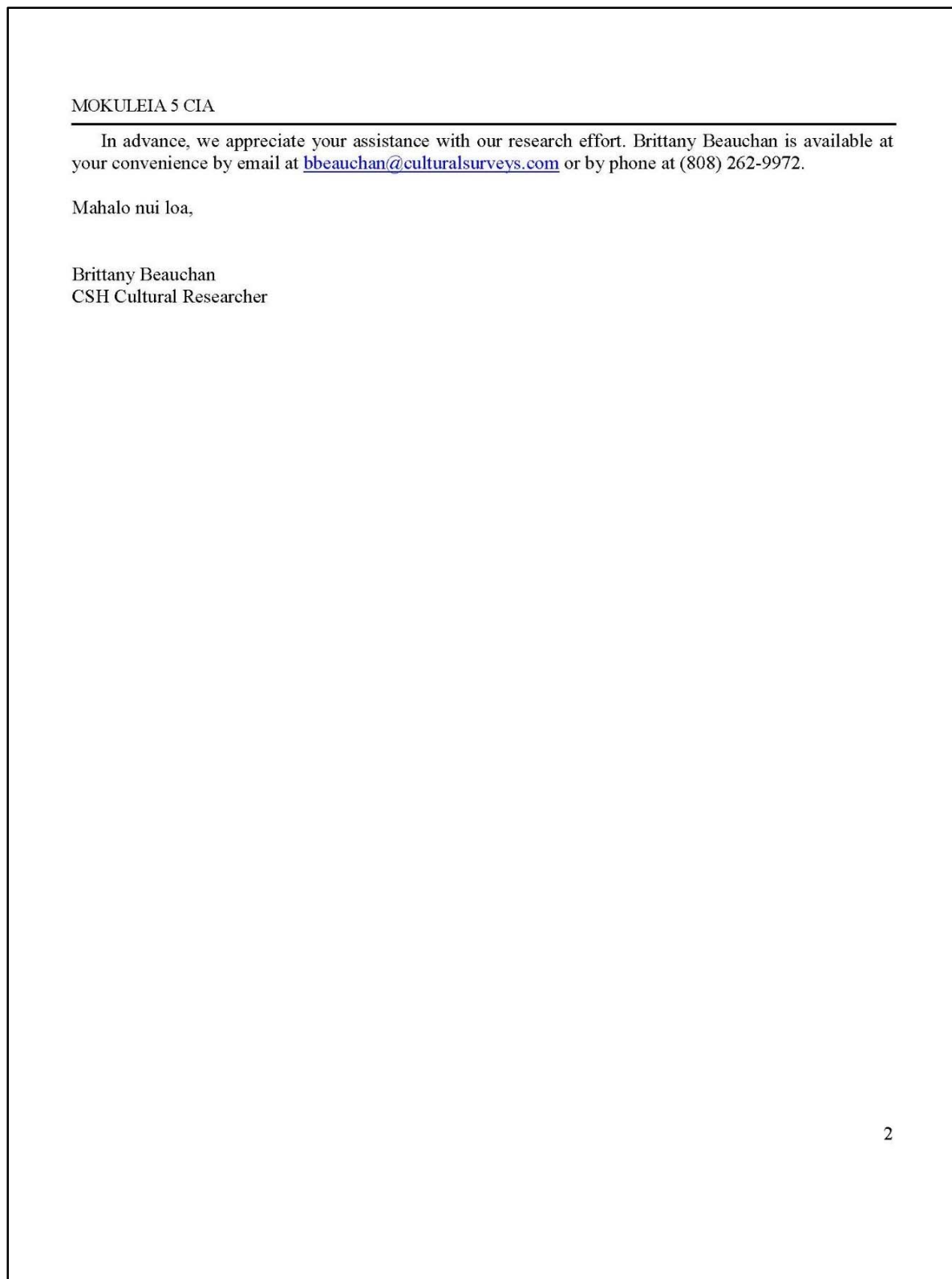


Figure 20. Community consultation letter, page two

- **Knowledge of traditional gathering practices in the project area, both past and ongoing.**
- **Cultural associations of the project area, such as legends and traditional uses.**
- **Referrals of *kūpuna* or elders and *kama'āina* (native born) who might be willing to share their cultural knowledge of the project area and the surrounding *ahupua'a* (land division) lands.**
- **Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the project area.**

In most cases, two or three attempts were made to contact individuals, organizations, and agencies.

### 7.3 Community Contact Table

Table 5 lists names, affiliations, dates of contact, and comments from NHOs, individuals, organizations, and agencies contacted for this project. Results are presented below in alphabetical order.

Table 5. Results of community consultation

Name	Affiliation	Comments
Abrigo, Marlene	<i>Kama'āina</i> of Waialua	Letter and figures sent out via U.S. Postal Service (USPS) 28 June 2016
Agadar, Lavina (Aunty Maile)	<i>Kama'āina</i> of Waialua	Letter and figures sent out via USPS 28 June 2016
Alquiza, Leilani	Dillingham Ranch, Operations Assistant Manager	Letter and figures sent via email 18 July 2016
Anana, Manu	<i>Kama'āina</i> of Waialua, president for Waialua Community Association	Letter and figures sent via email 18 July 2016
Au, Kawika	President, Waialua Hawaiian Civic Club	Letter and figures sent out via USPS 28 June 2016
Becket, Jan	Author, photographer, and retired teacher from Kamehameha Schools Knowledgeable in cultural sites	Letter and figures sent via email 10 August 2016 Mr. Becket replied 10 August 2016 via email: <i>Nicole let me know that you will be conducting consultations for the project by Dillingham Field. I'd love to consult on that</i>

Table 5. Results of community consultation (cont.)

Name	Affiliation	Comments
Becket, Jan (continued)	Kona Moku Representative, Council of Hawaiian Civic Club's Committee on the Preservation of Historic Sites and Cultural Properties	<p><i>one. I do know a few things about that area, and have been to Kawailoa Heiau, behind the airfield - would like to photograph it.</i></p> <p>CSH replied on 10 August 2016 via email regarding scheduling a <i>huaka'i</i> (journey) to cultural sites in Mokulē'ia and Kawaihāpai.</p> <p>Mr. Becket replied 10 August 2016 via email regarding scheduling for a <i>huaka'i</i>.</p> <p>CSH replied 11 August 2016 via email regarding scheduling for a <i>huaka'i</i>.</p> <p>Mr. Becket replied 12 September 2016 via email regarding scheduling for a <i>huaka'i</i>.</p> <p>CSH replied 12 September 2016 via email regarding scheduling a <i>huaka'i</i>.</p> <p>Mr. Becket replied 13 September 2016 via email:</p> <p><i>I'll have to stay tentative about any dates for the Dillingham huaka'i - .</i></p> <p>CSH replied 13 September 2016 regarding scheduling for a <i>huaka'i</i>.</p> <p>CSH reached out to Mr. Becket 2 November 2016 via email regarding scheduling for a <i>huaka'i</i>.</p> <p>Mr. Becket replied 2 November 2016 via email:</p> <p><i>...I have been thinking of the CS project behind Dillingham Airfield. All pau by now? I really wanted to get back to Kawailoa Heiau, behind the airstrip. There is also a heiau on the Ka'ena side of Dillingham, in a former quarry - I forget the name. Rudy Mitchell had a great story about that place - I would love to re-locate it.</i></p> <p>CSH replied 3 November 2016 via email regarding scheduling for a <i>huaka'i</i> and inquired about contacting Thomas Shirai, Jr, a lineal and cultural descendant for the area, prior to any site visits.</p>

Table 5. Results of community consultation (cont.)

Name	Affiliation	Comments
Becket, Jan (continued)		<p>Mr. Becket replied 3 November 2016 via email:</p> <p><i>... Please do contact Thomas to see if he is ok with going to Kawailoa....I wish I had the coordinates for the adjacent heiau near the quarry on the Ka'ena side of Dillingham, across from the beach park. I could at least share the story with you that Rudy told me. A guy with a truck was removing stones from the heiau when the truck stalled. He got out to check, and then somehow the truck rolled over him and killed him. Supposedly the truck is still there, according to Rudy. Nobody removed it afterwards. I have always dreamed of photographing it ...</i></p> <p><i>Let me know how it goes w/ Thomas. I know him pretty well, so no problem mentioning my name.</i></p> <p>Interview scheduled for 9 November 2016, will meet at Kailua Recreational Center and drive to Dillingham Airfield in Mokulē'ia and Kawaihāpai Ahupua'a for <i>huaka'i</i>. CSH interviewed Mr. Becket 9 November, 2016, authorization forms signed. Mr. Becket sent photographs of Kawailoa Heiau 15 November 2016 via email CSH sent interview summary 29 December 2016 via email. Mr. Becket approved summary 30 December 2016 via telephone.</p>
Crabbe, Dr. Kamana'opono	Administrator, Office of Hawaiian Affairs	Letter and figures sent out via USPS 28 June 2016
Dailey, Mike	Referred by Moana Palama; <i>Kama'āina</i> of Waialua, father introduced polo to Mokulē'ia	CSH contacted Mr. Dailey via telephone 10 August 2016; he stated he was aware of the project and willing to participate in consultation. Letters and figures sent via email on 11 August 2016



Table 5. Results of community consultation (cont.)

Name	Affiliation	Comments
Dailey, Mike (continued)		<p>Interview scheduled for 25 August 2016. CSH interviewed Mr. Dailey at the Equus Hotel in Waikīkī on 25 August 2016. CSH sent interview summary via email on 18 October 2016. CSH sent follow up email on 25 October 2016. Mr. Dailey replied via email on 31 October 2016. CSH replied via email on 03 November 2016 regarding edits to summary. CSH reached out to Mr. Dailey via telephone on 15 November 2016 regarding edits to interview summary. Mr. Dailey replied via email on 16 November 2016. CSH sent revised and approved interview summary via email on 29 November 2016.</p>
Dowsett, Kawika	<i>Kama'āina</i> of Waialua; father was former Dillingham Ranch caretaker	<p>CSH contacted Mr. Dowsett via telephone 13 July 2016 Mr. Dowsett contacted CSH 13 July 2016; he stated he was aware of the project and was willing to participate in consultation. Letter and figures sent via email 13 July 2016 Interview scheduled for 10 August 2016 Interview re-scheduled for 18 August 2016 CSH interviewed Mr. Dowsett at his private residence on 18 August 2016. CSH sent interview summary to Mr. Dowsett via email on 27 October 2016. CSH sent a follow up message via short message service (SMS) on 11 November 2016 CSH sent a follow up email on 28 November 2016 regarding edits to interview summary. CSH sent a follow up message via SMS on 6 December 2016</p>

Table 5. Results of community consultation (cont.)

Name	Affiliation	Comments
Dowsett, Kawika (continued)		Mr. Dowsett replied via SMS on 22 December 2016. Mr. Dowsett notified CSH that he will call on 23 December 2016 to provide his requested edits and comments. Mr. Dowsett contacted CSH via telephone on 23 December 2016 with suggested edits. CSH sent revised interview summary on 26 December 2016. Mr. Dowsett approved revised summary on 28 December 2016.
Eguires, Eddie	Former Meadow Gold <i>paniolo</i> (cowboy) (50 years)	CSH contacted Mr. Levi Rita, grandson of Mr. Eddie Eguires, 10 August 2016; he stated he was aware of the project and willing to participate in consultation Letter and figures hand delivered 15 August 2016
Evans, Malia	<i>Kama'āina</i> of North Shore area	Letter and figures sent via email 18 July 2016 Ms. Evans replied via email 18 July 2016: Mahalo for your email. Yes, there was a contentious NS Neighborhood board meeting regarding this proposed development last year. I'll send this out to Waiialua contacts who may be interested in providing comments, etc...aloha, CSH replied via email 19 July 2016 thanking Ms. Evans for passing on to her contacts
Gamiao, Auntie Alma	<i>Kama'āina</i> of Waiialua	Letter and figures sent 18 July 2016
Hirota, John	<i>Kama'āina</i> of Waiialua	Letter and figures sent via USPS 1 July 2016
Labra, Moki	<i>Kama'āina</i> of Kawaiiloa	Letter and figures sent out via USPS 28 June 2016

Table 5. Results of community consultation (cont.)

Name	Affiliation	Comments
Leinau, Bob	<i>Kama'āina</i> of Pupukea-Waimea; Former Waimea Falls Park General Manager; Affiliate of Kathy Pahinui	Letter given to Bob Leinau by Kathy Pahinui. Mr. Leinau contacted CSH via telephone on 7 July 2016. CSH returned Mr. Leinau's call on 7 July 2016 and 8 July 2016. CSH spoke with Mr. Leinau on 8 July 2016, he referred CSH to Jamie Dowsett, former resident of Dillingham Ranch due to his "ground truth" and intimate knowledge of project area. Mr. Dowsett's wife was also a cultural specialist.
Lenchanko, Thomas	President, Hawaiian Civic Club of Wahiawā	Letter and figures sent via email on 1 July 2016
Lyman, Kimo	Referred by Moana Palama <i>Kama'āina</i> of Waialua; owns a <i>kuleana</i> parcel near Ka'ena Beach Park	Letter and figures hand delivered on 15 August 2016 CSH reached out to Mr. Lyman via telephone on 15 November 2016.
Lyons, Michael	North Shore Neighborhood Board	Letter and figures sent via email on 1 July 2016
Mark, Keona	Mahu 'Ohana, NHO	Letter and figures sent out via USPS 28 June 2016
North Shore Community Land Trust	N/A	Letter and figures sent via email 18 July 2016
North Shore Outdoor Circle	N/A	Letter and figures sent via email 18 July 2016
Osullivan, Lloyd	<i>Kama'āina</i> of Waialua	Letter and figures sent via email 01 July 2016
Pahinui, Kathleen	<i>North Shore Neighborhood Board, Subdistrict 2 (Chair)</i>	Letter and figures sent via email 1 July 2016 Ms. Pahinui replied via email on 4 July 2016: Mahalo Nicole! Yes please call me to discuss. I work in town so can meet at a location that works for both of us. <i>I will also share with the rest of the North Shore Neighborhood Board if that is ok with you.</i>

Table 5. Results of community consultation (cont.)

Name	Affiliation	Comments
Pahinui, Kathleen (continued)		<p>CSH replied via email on 6 July 2016 attempting to set up an interview for 14 July 2016 and will call to follow up</p> <p>CSH called and left a message on 8 July 2016; and emailed to follow up on scheduling an interview</p> <p>CSH called and left a message on 18 July 2016</p> <p>Ms. Pahinui called CSH back 18 July 2016; she commented with the following: <i>Make sure we do what need to do; making sure we talk to Thomas Shirai since this is his area of expertise; will send meeting minutes of last year's meeting for the ranch</i></p>
Palama, Moana Kinimaka	Manager, Dillingham Ranch	<p>Letter and figures sent via email 18 July 2016</p> <p>Ms. Palama replied via email 19 July 2016 stating she will send CSH a list of suggested contacts</p> <p>CSH replied 19 July 2016 thanking Ms. Palama for her assistance</p> <p>Ms. Palama replied via email 19 July 2016: <i>Here are a few leads and phone numbers to start with. I've also solicited additional suggestions from those I spoke with and may have a few more leads later. But I would say this is an excellent jumping off point.</i></p> <ol style="list-style-type: none"> <li><i>1. Roland Silva- His father was the DR Lodge caretaker and lived in the "Doll House" at Dillingham for a number of years next to the lodge.</i></li> <li><i>2. Bobby Titcomb His family has been at Mokuleia for three generations.</i></li> <li><i>3. Mike Dailey another multi-generational and his mother "Murph" is still living as well at 90 some years.</i></li> <li><i>4. Thomas Shirai Multi-generational resident. Loves to share mana'o!</i></li> <li><i>5. Donald Rohrbach Long-time resident.</i></li> </ol>

Table 5. Results of community consultation (cont.)

Name	Affiliation	Comments
Palama, Moana Kinimaka (continued)		<p>6. <i>Eddie Eguires and Levi Rita</i> Eddie was the old Meadow Gold cowboy 50 yrs. His grandson Levi is currently DR's Livestock manager.</p> <p>7. <i>Kimo Lyman (A'ole Phone?)</i> Kimo resides on the far west Kuleana near Kaena Beach Park. His wife was very involved in the community but has recently passed away.</p>
Rita, Levi	Referred by Moana Palama Paniolo; Livestock Manager, Dillingham Ranch	<p>CSH contacted Mr. Levi Rita, grandson of Mr. Eddie Eguires, 10 August 2016; he stated he was aware of the project and willing to participate in consultation</p> <p>Interview scheduled for 15 August 2016, will meet at Dillingham Ranch.</p> <p>CSH interviewed Mr. Rita on 15 August 2016 at Dillingham Ranch.</p> <p>CSH sent interview summary via email to Leilani Alquiza on 06 October 2016</p> <p>CSH sent follow up email on 20 October 2016.</p> <p>Leilani Alquiza, on behalf of Mr. Levi Rita, replied via email on 21 October 2016.</p> <p>Interview summary approved on 21 October 2016.</p>
Rohrbach, Donald	Referred by Moana Palama Long-time resident of Waialua	<p>CSH contacted Mr. Rohrbach via telephone 10 August 2016; left voice message regarding project</p>
Shirai, Thomas	Office of Hawaiian Affairs-Native Hawaiian Historic Preservation Council; O'ahu Island Burial Council; Lineal and Cultural Descendant, Waialua; Kawaihāpai 'Ohana - NHO	<p>Letter and figures sent via email 20 July 2016</p> <p>CSH contacted Mr. Shirai by telephone 10 August 2016; scheduled interview for 16 August 2016</p> <p>Letter and figures sent via email 11 August 2016</p> <p>CSH interviewed Mr. Shirai at McDonald's in Hale'iwa on 16 August 2016.</p> <p>CSH met with Mr. Shirai at McDonald's in Hale'iwa on 14 October 2016 to review interview summary.</p>

Table 5. Results of community consultation (cont.)

Name	Affiliation	Comments
Shirai, Thomas (continued)		<p>CSH sent Mr. Shirai revised interview summary via email on 20 October 2016. Mr. Shirai replied via email on 21 October 2016.</p> <p>CSH sent Mr. Shirai revised interview summary via email on 27 October 2016. Mr. Shirai replied via email on 28 October 2016.</p> <p>CSH sent Mr. Shirai revised interview summary via email on 28 October 2016. Mr. Shirai approved interview summary via email on 30 October 2016.</p> <p>CSH reached out to Mr. Shirai mid-November 2016 via telephone regarding permission to visit, and possible interest in accompanying Mr. Jan Becket and CSH on a site visit to Kawailoa Heiau. Mr. Shirai informed CSH he would be unable to make the site visit to Kawailoa Heiau, however, he noted that only Brittany Beauchan and Jan Becket were permitted to visit. Mr. Shirai also noted that Kawailoa Heiau is located within U.S. Army lands.</p>
Silva, Roland	Referred by Moana Palama <i>Kama'āina</i> of Waialua Father was Dillingham Ranch caretaker and resided on the property	<p>CSH contacted Mr. Silva via telephone 10 August 2016; Mr. Silva was aware of the project and was willing to participate after reviewing letters and figures.</p> <p>Letter and figures sent via email 11 August 2016.</p> <p>CSH contacted Mr. Silva during the week of 19 September 2016 regarding possible interview; Mr. Silva stated he would confer with Mr. Kimo Lyman and email back a list of possible dates for consultation.</p> <p>CSH reached out to Mr. Silva 01 November 2016 via telephone.</p> <p>CSH sent a follow up email to Mr. Silva on 02 November 2016.</p>

Table 5. Results of community consultation (cont.)

Name	Affiliation	Comments
Silva, Roland (continued)		CSH reached out to Mr. Silva 15 November 2016 via telephone.
Solis, Ka'āhiki	Cultural Historian, SHPD	<p>Letter and figures sent via email 1 July 2016. Ms. Solis replied via email on 1 July 2016: <i>All is well and mahalo for your concern with my hana. I am enjoying my present work very much!</i></p> <p><i>I have a few people that might be interested in commenting on your CIA from the Waialua Moku. I will send an inquiry and if they respond I will share the contact information with you folks.</i></p> <p><i>We are currently accepting Cultural Impact Assessments for comment only. Per the OEQC Guidelines and I will be happy to offer comment once it is generated.</i></p> <p>CSH replied to SHPD via email on 6 July 2016: <i>Excellent! Mahalo for your kokua. We look forward to maybe hearing from your referrals.</i></p> <p>SHPD replied via email 6 July 2016: <i>I have reached out to some folks in Waialua and have no response yet. I will follow up and get back to you before Friday.</i></p>
Titcomb, Bobby	Referred by Moana Palama; <i>Kama'āina</i> of Waialua	CSH contact Mr. Titcomb via telephone 10 August 2016; CSH informed him of project, Mr. Titcomb stated he will call back
Waialua Community Association	N/A	Letter and figures sent via USPS 1 July 2016
Waialua Farmers Cooperative	N/A	Letter and figures sent via USPS 1 July 2016

## 7.4 *Kama'āina* Interviews

The authors and researchers of this report extend our deep appreciation to everyone who took time to speak and share their *mana'o* and *'ike* with CSH whether in interviews or brief consultations. We request that if these interviews are used in future documents, the words of contributors are reproduced accurately and in no way altered, and that if large excerpts from interviews are used, report preparers obtain the express written consent of the interviewee/s. Additionally, interviewees were allowed the freedom to discuss a range of topics, including cultural practices occurring outside of the current Dillingham Ranch Agricultural Subdivision project area and all concerns or recommendations that they may have regarding the proposed project. As part of a good faith effort to document the *mana'o* of these interviewees, CSH has included discussion of all concerns and recommendations within the summaries presented below.

### 7.4.1 Summary of Levi Rita Interview

Levi Rita, a *paniolo*, is the current Livestock Manager for Dillingham Ranch. Mr. Rita currently manages a herd of 130 head for Dillingham Ranch. While Mr. Rita's responsibilities mostly revolve around the care of cattle and horses, they also include the maintenance of ranch grounds including the removal of vegetation and the occasional repair of machinery necessary for ranch operations. Although *kupa 'ai au* (native-born long attached to a place) of Ko'olauloa Moku, Mr. Rita has acquired an intimate knowledge of, and familiarity with, the project area and lands of Mokolē'ia from his work as a livestock manager and *paniolo*.

On 15 August 2016, Mr. Rita led CSH on a *huaka'i* to inspect the project area and discuss the lands of Dillingham Ranch. CSH began the interview by inquiring about the presence of historic properties within ranch-held lands. Mr. Rita commented that he was aware of where most of the cultural sites such as *heiau* were, however, he added that he did not believe any traditional cultural practitioners were currently utilizing these sites. In reference to cultural practitioners, he states, "They never did really, I think in their lifetime, I don't think they went [to these sites]." Mr. Rita then continued with a brief history of Dillingham Ranch, noting that the creation of the ranch was stimulated by the success of Parker Ranch on Hawai'i Island. He elaborated that "this ranch was one of the few ranches, it started after Parker Ranch." During the recounting of the general history of the ranch, Mr. Rita led CSH on a visit to the historic standing buildings located within the project area. Amongst these buildings, CSH was given a tour of Dillingham Lodge or the "Big House." While also functioning as a working ranch, Dillingham Ranch also functioned as a "family pleasure retreat" (Loomis 2006:83). According to Loomis, author of *Rough Riders; Hawai'i's Paniolo and Their Stories* (2006), the Big House and associated lodgings were truly a private and luxurious escape supported by the profits of the Dillingham company railroad:

While the average *paniolo*'s life was one of simplicity and hardship, the upper class of ranchers enjoyed a comfortable existence. On a large, profitable ranch the owner's or manager's home could be equipped with a capacious kitchen, a wide veranda, plenty of guest rooms, and a generous garden; all cared for by maids, a cook, and yard keepers, and with a budget that covered miscellaneous costs like entertaining... One such estate was the beautiful 5,000-acre Dillingham Ranch, bought in 1893 by Honolulu businessman Ben Dillingham. Shady banyans and palms, a large and rambling main house, extensive gardens, ponds, trellises,



fountains, a swimming pool, tennis courts, croquet lawns, and pony stables- the ranch was...easily accessible from Honolulu by the Dillingham company railroad. [Loomis 2006:82–83]

The Big House was constructed in 1913 from funds willed by Benjamin Franklin Dillingham to his three children: Walter, Harold, and Marion (Erdman). From these funds the Dillingham heirs constructed a residence consisting of a 3,000 square foot great room complete with hardwood floors, a fireplace, a kitchen, and two separate bedroom wings flanking the eastern and western sides of the great room. A large fireplace of dressed basalt was observed on the western side of the lodge. The northern face of the lodge is identifiable by a portico supported by 12 ionic columns. A modern stacked basalt and mortar wall forms a border around the lodge and its landscaped grounds. The grounds of the lodge are landscaped with *kī* (ti; *Cordyline fruticosa*) and ornamentals such as plumeria (*Plumeria rubra*). Immediately northwest of the lodge is a grove of royal palms (*Roystonea* sp.); these palms were originally planted during the 1913 construction of the Big House (Figure 21 through Figure 26).

In recounting the historic establishment of the ranch, Mr. Rita also discussed the visits of *ali'i* to the area,

[the ranch was one of the] very few places that the king and queen [not specified] ever did come . . . they gave horses, they gave a stud horse, and that's what really made them [the ranch] famous. So they had the stud horse there, and everybody came to play polo.

According to Dan Cisco, author of *Hawai'i Sports; History, Facts, and Statistics*, "Polo was introduced to Hawaii during the reign of King David Kalakaua. Hawaii's first polo match was played November 3, 1880, at Palama between British naval officers of the HMS *Gannet* and local residents" (Cisco 1999:221).

Additionally, historic newspapers have documented King Kalākaua purchasing horses from the mainland. *The New York Times* published an article on 4 October 1881 entitled "King Kalakaua Buying Horses;" the article went on to describe the following,

Cincinnati, Oct. 3. – King Kalakaua and suite arrived here this morning from Washington, and started by the first train for Lexington, Ky., where the king expects to buy some blooded horses. [New York Times 1881]

While King Kalakaua played a vital role in the genesis of the sport of polo in the Islands, it was perhaps *paniolo* culture that worked to solidify the popularity of the sport and horsemanship during the early nineteenth century. The importance of *paniolo* culture both at Dillingham Ranch and in Hawai'i at large has been commented on by the United States Polo Association Circuit Governor representing the Hawaiian Islands:

. . . at the root of polo in Hawaii, is the rich Paniolo culture. Swimming with horses and cattle to be loaded onto the big ships, these men were some of the most skilled horsemen, fearless Paniolos. They even won rodeos in the mid-west of the US mainland, where they competed against the 'original' cowboys. [Dawson Media n.d.]



Figure 21. General overview of north-facing portico of the “Big House,” view to southwest



Figure 22. General overview of bedroom located within the eastern wing of the lodge, view to northeast



Figure 23. General overview of western wing of lodge; the western wing contains four bedrooms, view to northwest



Figure 24. General overview of interior of great room, view to northwest



Figure 25. General overview of western side of great room; basalt fireplace visible in center of photograph, view to southeast



Figure 26. General overview of original grove of royal palms (first planted in 1913), view to south

In a documentary entitled “The Last of the Hawaiian Cowboys,” a *paniolo* for Palekoki Ranch named Shane Ho‘opai remarks, “We were brought up that we survive off the pork, to feed our families, because when my dad used to work for Parker Ranch he didn’t bring home that much, that’s what we pretty much lived off of was pork” (Cumes 2013). Hunting has also arisen as a tool to combat forest degradation and promote the general conservation of upland watershed areas. According to *The Garden Island*, the “conservation of necessary forest growth,” and the “development of land and natural resources” (HRS §183C-4[b]) is increasingly threatened by feral pigs (Lyte 2015). The newspaper states the introduction of European swine by westerners coupled with the introduction of alien species such as earthworms, mango, and guava resulted in the unchecked explosion of feral pig populations in *kula* and *mauka* lands. In time, the effects of feral animal populations upon the forested uplands were observed. Delicate native flora and streams were ravaged, resulting in the watershed crisis of the late nineteenth century (Maly et al. n.d.:3). In response, *kama‘āina* across all islands initiated mitigation measures in the form of fencing, feral animal control, and reforestation; King Kalākaua himself aided in these measures in 1878, leading a reforestation effort in Nu‘uanu Valley, O‘ahu (Maly et al. n.d.:3).

Initially, western-style hunting was adopted as a means of resource management; additionally, the skills learned by *kama‘āina* to manage feral animal populations have been passed down from one family generation to the next for nearly 150 years (Maly et al. n.d.:4). Pig hunting, “a cherished modern practice” (Maly et al. n.d.:4), represents an aspect of modern land use in Mokulē‘ia Ahupua‘a. Currently, portions of conservation land in the *mauka* portion of Mokulē‘ia Ahupua‘a are designated as a public hunting area per HAR §13-123-15(4).

Besides hunting, the *paniolo* lifestyle also involves caring for herds of cattle and teams of horses. As a participant observer during the *huaka‘i*, CSH was able to accompany Mr. Rita as he worked on the ranch. In addition to showing CSH the herd of cattle he currently manages (Figure 27), Mr. Rita also explained the importance of the ranching industry in Hawai‘i’s history, as well as its importance in relation to Dillingham Ranch’s history. He explained there are currently 130 head of cattle on the ranch, however, once the animals reach one year in age, they are shipped to the mainland for slaughter. He continued by stating, “When this ranch was fully operational I think they had about a little bit over a 1,000 head [of cattle]. A 1,000 of these cows. Right now they only have 130.” He elaborated further by discussing how the herd size has fluctuated largely in part to the shifting of management, and the subsequent sale of the ranch in 1987 to the Japan-based Sankyo Tsusho Company. He remarked that famed cowboy and former boss of the ranch Jamie Dowsett had run the ranch during “its prime,” keeping alive its cattle ranching roots. Mr. Rita explained further,

And then after him I think the Chinese people bought it. When the Chinese bought it, I think it was the Chinese or Japanese, but when the Chinese bought it, I don’t think they believe in cattle or something, they got rid of all the cattle. They got rid of all the cattle and then it went to goats. They had goats in these small pens for a while but not very many . . . A lot of people don’t realize that cattle made Hawai‘i. All the ships had to stop in for the salt beef. They used to carry them on . . . Most of the cattle came here [to Mokulē‘ia] from all the rest of the islands. To this island, and they had all the slaughterhouses down in Waikīkī [and Kaka‘ako]. They had about 200 slaughterhouses . . . Yeah before they used to drive the cattle from here, before they had the train [O.R. and L.], they used to drive the cattle all the way to

Waikīkī, all the way up the windy road, all the way down through Pearl City, and then all the way across.

CSH inquired as to how long a cattle drive of that distance would take on average. Mr. Rita replied that it would take only one day: “They would start at 3’oclock in the morning. [But] then they had the [O.R. and L.] train. The train came, they started to have that sugar cane train, and load ‘em up, and they used to take them all the way around.”

CSH inquired if Dillingham Ranch was the main cattle ranch for O‘ahu. Mr. Rita clarified that it was one of the first cattle ranches on O‘ahu. Originally, the ranch at Mokulē‘ia had been run by Gaspar Silva. Silva maintained ownership up into the late nineteenth century. Benjamin Franklin Dillingham, “working through Henry Waterhouse . . . executed a pincers movement on Waialua by getting control of Mokulē‘ia Ranch late in 1897” (Yardley 1981:193). Mr. Rita further commented, “But it’s funny, after Parker Ranch everybody, right after that everybody started getting cattle. It happened so fast.” He added,

Once the people found out about the beef, once they started making the salt beef, because the thing never did spoil, yeah. What they used to do was put ‘em in barrels. What you do is put salt, put over the whole thing, is just salt, and you stick the meat in, and the salt cures the meat. And the meat never did spoil. And when you cook it, what you gotta do is boil it. You boil it for like an hour, then you take out the salt. Boil it again, take out the salt. Boil it again, then you cook it.

*Pipi* (cattle) remained at the heart of ranching, and as such became an important part of the *kama‘āina* diet as well as a vital provision for seafarers in its salted and preserved state. “In the days before refrigeration, meat that was salted, dried or smoked to keep it from spoiling became an important part of the local diet” (Hiura 2009:22). Following the inspection of Dillingham Ranch’s cattle, Mr. Rita showed CSH his team of horses (Figure 28). As a *paniolo*, Mr. Rita rides every day; he often rides the trails located *mauka* of Dillingham Ranch. Mr. Rita commented that he has ridden the 6-7 hours to Yokohama Bay and back, and often rides up to Peacock Flats. When asked if he has seen cultural sites while riding in the Waianae Range, Mr. Rita commented that he had not. Mr. Rita also plays polo and participates in rodeo tournaments.

Mr. Rita took CSH to the most *mauka* portions of the ranch, driving along Mokulē‘ia Forest Reserve (Nike) Road (currently owned by the State of Hawai‘i), and pointing out the limits to the ranch’s holdings. Mr. Rita and CSH skirted the edge of the reserve, observing the project area from *mauka* to *makai* (Figure 29 through Figure 31). While conducting a visual inspection of the area, CSH noted that hunting is allowed in the Mokulē‘ia Forest Reserve. In addition to being an informal equestrian and recreation area, the State has zoned the *mauka* section of the project area as conservation land. Regarding conservation lands, the department, defined as the Department of Land and Natural Resources per HRS §183C-2,

shall adopt rules governing the use of land within the boundaries of the conservation district that are consistent with the conservation of necessary forest growth, the conservation and development of land and natural resources adequate for present and future needs, and the conservation and preservation of open space areas for public use and enjoyment. [HRS §183C-4(b)]



Figure 27. General overview of Dillingham Ranch cattle, view to southeast



Figure 28. General overview of Mr. Rita's team of horses, view to southwest



Figure 29. Mokulē'ia Forest Reserve (Nike) Road (currently owned by the State of Hawai'i), view to southeast



Figure 30. General overview of makai portion of Mokulē'ia Ahupua'a (northwest corner of project area just outside photograph frame), view to northwest





Figure 31. General overview of *mauka* and *makai* portions of Mokulē'ia Ahupua'a and Dillingham Ranch land holdings (mountainous terrain in foreground is currently owned by Dillingham Ranch), view to northwest

Accordingly, the “department shall establish zones within the conservation district, which shall be restricted to certain uses” (HRS §183C-4[d]). Specifically:

The department, by rules, may specify the land uses permitted therein which may include, but are not limited to, farming, flower gardening, operation of nurseries or orchards, growth of commercial timber, grazing, recreational or hunting pursuits, or residential use. The rules may control the extent, manner, and times of the uses, and may specifically prohibit unlimited cutting of forest growth, soil mining, or other activities detrimental to good conservation practices. [HRS §183C-4(d)]

CSH inquired if Mr. Rita was familiar with, or had knowledge of the extent of development planned for the area. Mr. Rita informed CSH that to his understanding, no work would be occurring around Nike Road, near the Mokulē‘ia Forest Reserve. Mr. Rita also informed CSH that he had wanted to have the Dillingham Ranch cows graze and remove the heavy vegetation surrounding Nike Road as the vegetation posed a significant fire risk. However, individuals from DLNR representing the Division of Forestry and Wildlife had informed him that endangered plants were located in proximity to Nike Road. In particular, officials mentioned that an endangered species of flowering plant is located within the reserve. Endangered species previously identified within the Mokulē‘ia Reserve have included ‘ōhā or ‘ōhā wai (lobelia family). Traditionally, ‘ōhā wai was used not only as a food source but also for *lā‘au lapa‘au* (Hawaiian herbal medicine and healing). While Mr. Rita discussed fire hazards in the area, he was also quick to note that the project area is prone to flooding.

One thing you gotta realize, there’s a river down here, I’ll show you, we’re gonna cross the bridge, that water comes from the high school [Waialua]. From the high school, there’s a ditch and it goes all the way across [follows a northwest path towards the ranch] and it ends up right here, and goes out. But the beach, when the waves hit, the thing builds up the sand, and the State never opens up the river mouth so, when the first rain comes and it doesn’t break, the water backs up and floods all the way to where you parked your truck [near Dillingham Ranch front offices]. It’ll fill all the way up, and then when the river mouth breaks, then everything goes. It’s kinda crazy ‘cause when they built, when the plantation built that housing and all the stuff below the fields they didn’t want to deal with the rivers going out so they cut that ditch all the way across. So now all this mountain water hits that ditch and comes all the way across.

Regarding cultural sites and/or historic properties such as *heiau* and burials, Mr. Rita stated he believes they are located *makai*. However, he noted burials may possibly be located in *mauka* areas, just off Mokulē‘ia Forest Reserve (Nike) Road. Currently, the area between Crow Bar Road and Road D is designated as an archaeological area and protected.

Yeah mostly, I think the other stuff is down below, they have a couple places, burial type of deals, like on the sides over here [indicating towards heavily overgrown area off Mokuleia Forest Reserve (Nike) Road]. You can kinda tell, it’s like terraced, but nobody really knows [if burials are located there] . . . I know more or less what things look like. . . The sand they used to bury them ‘cause it’s easy yeah? But the more important you get, back in the day, they take you like [higher, more elevated areas].

CSH inquired if Mr. Rita was referring to the practice of utilizing burial caves for the deposition of human remains. Mr. Rita clarified that,

mostly like the fisherman or what not, they bury them by the beach, and the mountain people they bury them up [and] behind [the *kula* and *kahakai*]. When you think about it, you die, you old, you a mountain person, and they not going to bury you at the beach.

According to Green and Beckwith, in a discussion of *Hawaiian Customs and Beliefs Relating to Sickness and Death*, the remains of the deceased were moved in a particular fashion.

When the time came to carry the body out of the house for burial, it was in old days disposed for carriage in one of three ways: it might be wrapped in a fine bark cloth, rolled in a mat and bound with cords; it might be deposited, wrapped in bark cloth, in a canoe with the knees bent to fit into the body of the canoe, or with the ends of the canoe knocked out to receive the body at full length, a flat board being added to fill out the length; or the knees might be drawn up to the chest with the hands doubled into fists against the cheeks and the body placed in a large covered *umeke* or calabash hollowed out of some native hard wood like the *koa* tree (*acacia koa*), *kou* (*cordia subcordata*), *kamani* (*calophyllum inophyllum*), or *milo* (*hibiscus populneus*). A net, called *koko*, made of *olona* fibre (*touchardia latijolia*) was spread upon the floor and upon it was placed the body in its receptacle, together with various valuable possessions of the deceased. The net was then drawn together and slung upon a pole for carriage, but if the net was not strong enough to hold the body, the whole was first rolled in a coarse mat and tied with *olona* cords or cords of *hau* fibre (*parilium tiliaceum*) or of pandanus root, or with *koali* [awa] withes [tough, flexible branch used for tying], a species of convolvulus. [Green and Beckwith 1926:179]

Additionally, caves were often utilized as sacred spaces for burial:

Although disposal in burial caves was the most common form of burial in ancient times there were particular cases in which other forms were [practiced]. In olden times, those who wished the spirit of the deceased to follow the sun-god, built a [*pū'o'a*] or high platform of sticks and stones upon which the corpse was laid for a day so that the sun might strike the body and cause the spirit to follow the sun. Afterwards the corpse might be concealed in a cave. These [*pū'o'a*] were stationary on the hills probably near the spot where the dead were finally laid, and were used as the family needed them. [Green and Beckwith 1926:184]

Mr. Rita added that he was aware of a *heiau* supposedly located in an overgrown area off Crowbar Ranch Road. Regarding that *heiau*, Mr. Rita stated the following,

They keep saying there's a big *heiau* over here, but I never did find it . . . but if anything I think it's in the *kiawe* trees over here on the right [of Crowbar Ranch Road], but I don't know, I think it might be over here. Because the cows eat down this grass all the time, and I've never seen it. So I think it's back in there, but there is a place, couple rock walls. But the other guys' cows come and eat the grass sometimes, and so I kinda saw it. But they keep saying, three or four guys the last

meeting talked about it. But I never did find it. There's one on the far side, it's right above one of the horse [stables], but that one I don't know, I don't think it's one of those good *heiau*'s. I used to go with a girl on the Big Island before, and her grandfather them, they used to, they pure Hawaiians over there, they told me before some *heiau*'s is good and some *heiau*'s is bad.

Upon completing the visual inspection of the *mauka* areas of the ranch, CSH and Mr. Rita continued toward the *makai* portion of the project area. In particular, Mr. Rita discussed the grove of coconut trees currently located in the northeastern portion of the project area:

The coconut trees they put them in about twenty years ago, they planted this. This used to be all alfalfa fields [where coconut grove is currently located]. Yeah, and the dairy, I don't know if you've ever heard of the Kawailoa Dairy? Where they used to have Lani Moo and stuff, the dairy used to green chop this, the alfalfa, and they used to take it and feed it to the cattle over there. That's why the roads are built like this [raised from the surrounding elevation and sloped for runoff] they used to flood irrigate all inside here. Yeah these used to be nice pastures before, used to have a white picket fence going all the way down. Then they planted the coconut trees . . . there's a Tongan guy he comes and takes the coconuts. But he cannot keep up. They sell them down Waikīkī every night, but he just comes pick up a truck load.

In regards to questions concerning modern land use and resource extraction within the current project area, Mr. Rita began a discussion of sand mining occurring at Mokulē'ia in the late twentieth and into the early twenty-first century. He commented, "Over here is a big pond, man-made, the Ameron Quarry, the one over by the H-3, B&C that was the company before, they used to come and mine the sand over here." The sand mined at Mokulē'ia was used to make either concrete or to "re-sand Waikīkī Beach." Mr. Rita also discussed the presence of the Keālia Trail near the western boundary of the project area (the area is demarcated by the current ranch fence line and numerous trail ribbons). Mr. Rita stated to CSH that a woman had discussed with him creating a new trail to supplant the current Keālia Trail located behind Dillingham Airfield. Mr. Rita was quick to note, however, that he does not believe the trail was utilized as an *ala hele* (trail) in ancient times and that it is most likely historic in nature. He commented that he was not sure how the trail would be rebuilt or maintained for future use.

#### 7.4.2 Summary of Thomas Shirai, Jr. Interview

CSH interviewed Thomas Shirai, Jr. on 16 August 2016 at the McDonald's in Hale'iwa Town. He was born in 1961 at Kapi'olani Hospital in Honolulu. He was born to Thomas Shirai, Sr. and Laverna Keao. Through his matrilineal line, Mr. Shirai is rooted within the Ahupua'a of Mokulē'ia and Kawaihāpai (Figure 32 and Figure 33). Mr. Shirai was born an only child. His father was a tour guide driver and worked with Trade Wind Tours. His mother was a manager for a commercial laundry business then later worked for the Department of Health as the Waimano Homelands Laundry Manager.

Growing up, Mr. Shirai explained to CSH the unique relationship he shared with both his parents and grandparents. As *kama kahi* (only child), Mr. Shirai spent his childhood surrounded by 'ohana who instilled in him traditional knowledge and values. Mr. Shirai explained his living

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AUXILIARY OF THE UNITED STATES AIR FORCE  
Bolling Air Force Base, Washington 25, D. C.

17 May 1954

DCSS TNG 4-4

Cadet Laverna Keao  
Mokuleia, Waiialua, Oahu, T.H.

Dear Cadet Keao:

I am very happy to know you have been selected to attend the Civil Air Patrol National Summer Encampment for Girl Cadets, 21 through 30 June 1954. This is an honor signifying that you are an outstanding cadet of your wing. The information contained in this letter is forwarded to help you plan for the encampment.

A list of encampment officers is as follows:

- 1 - Major Ila M. Clark, Maine Wing, Encampment Commander
- 2 - Major Carolyn Weiss, Virginia Wing, Executive Officer
- 3 - Major Cynthia Wilbur, Massachusetts Wing, Public Information Officer
- 4 - Captain Louise C. Ottenheimer, Utah Wing, Personnel Officer and Adjutant

You will be quartered in WAF barracks at Lackland - perhaps two to one room. You will eat in a military dining hall, and meals will cost \$1.10 per day. This means \$11.00 for food for the encampment period. You should also take with you sufficient funds for purchasing toilet articles, personal items, and souvenirs.

You will need the following:

a. Uniform

- ✓(1) 2 two-piece WAF type summer dress uniforms of fine wale, blue, black, and white cotton cord.
- (2) 1 flight cap.
- ✓(3) 1 pair of black plain leather oxfords, closed toe and heel (may be of commercial design).

Figure 32. Documentary evidence of Mr. Thomas Shirai's mother, Ms. Laverna Keao's residency within Mokulē'ia Ahupua'a, Waiialua District (Letter provided by Mr. Thomas Shirai)

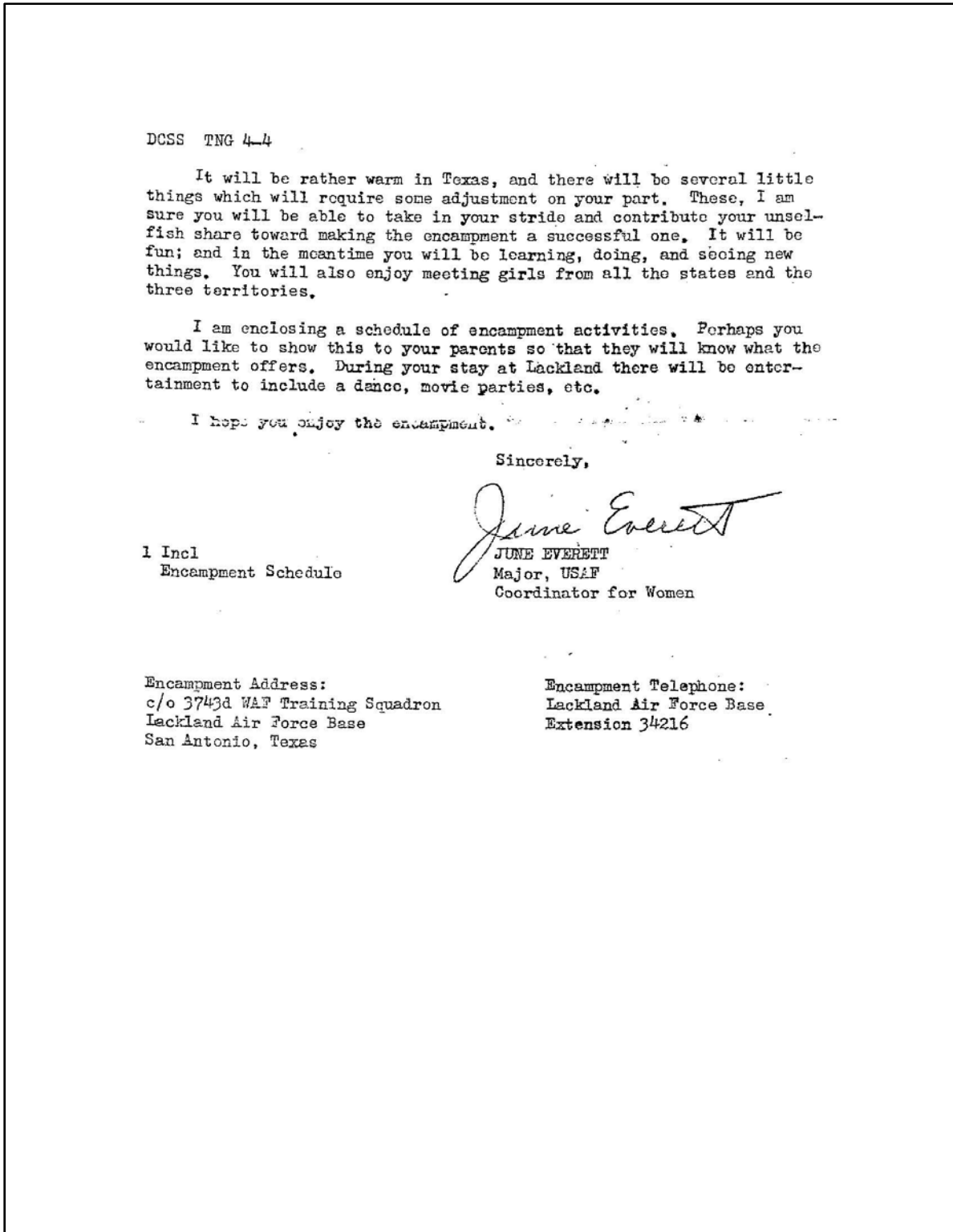


Figure 33. Documentary evidence of Mr. Thomas Shirai's mother, Ms. Laverna Keao's residency within Mokulē'ia Ahupua'a, Waialua District (Letter provided by Mr. Thomas Shirai)

conditions: he spent the school week living with his parents in Kapahulu, while weekends and holidays were spent with his maternal grandparents in the *ahupua'a* of Kawaihāpai and Mokulē'ia, Waialua Moku. Mr. Shirai's grandfather, Mr. David Peahi Keao Jr., was an important figure in his life; Mr. Keao was responsible for instilling key values, and passed on invaluable *'ike* and *mana'o* regarding the history of his family, of Waialua Moku, and of traditional Hawaiian cultural practices. It may be inferred that Mr. Shirai, as *kama kahi*, inherited the responsibilities of the *punahele*, the favorite child. As Pukui et al. (1972:40) point out in *Nānā I Ke Kumu*, "the *punahele* was the 'spring from which continuity of tradition flowed.'" Instead of material things, Mr. Shirai's maternal *'ohana* provided him with history books and records as a young man. Fueling his passion for history and music, Mr. Shirai's *'ohana* laid the foundation for his later career in music as well as his subsequent involvement with numerous Native Hawaiian organizations dedicated to the protection and preservation of Native Hawaiian history and culture.

Learning history was more than a hobby for Mr. Shirai—it was his legacy. As a direct descendant of Olopana, and *kupa* (native) of Kawaihāpai Ahupua'a, Waialua Moku, Mr. Shirai has developed an intimate knowledge of many *wahi pana*. The term "*kupa*," in this instance, references a long-standing and intimate familiarity with a place. As *kupa*, it may be inferred that Mr. Shirai, his ancestors, as well as his extended Kawaihāpai 'Ohana possess "personal and lasting relationships" with the people of Waialua and the "*mo'olelo* (story) of that place, both ancient and modern" (Lopes 2016:33). Mr. Shirai made particular note of his ancestors. During consultation, Mr. Shirai referred CSH to a previous community consultation letter he drafted for a *Preservation Plan for SIHP #s 50-80-03-416, -4772 to -4780, -4782, -4786, and -6885 to -6888 in the Proposed 820-Acre Dillingham Ranch Development Project Mokulē'ia 2, Auku'u, Kikahi, and Kawaihāpai Ahupua'a, Waialua District, Island of O'ahu TMK: [1] 6-8-002:006 por.; 6-8-003:006 por., 015, 019, 030, 031, 033, 035, 040* (Tulchin and Hammatt 2008). Mr. Shirai noted, "A lot of my sentiments are in the community section, it's already written already." In this letter, included in Appendix E and F of the Tulchin and Hammatt (2008) report (see Appendix A), Mr. Shirai states the following,

I am a recognized lineal descendant of Kawaihapai Ahupua'a by the State Historic Preservation Division. I'm also the po'o of the Kawaihapai Ohana which is recognized by the Department of Interior as a Native Hawaiian Organization. My Kupuna were cultural informants of Waialua Moku for Bishop Museum and featured in their publications entitled:

The Hawaiian Planter – (Handy 1940)

Kaaemoku Kakulu – Great-Great Grandfather

David Maikai Keao – Great Grandfather

Annie Keahipaka – Great-Great Grand Aunt/Grandmother (po'olua)

Archaeology of Oahu – McAllister 1933

Annie Keahipaka

These are foremost the Kupuna of my beloved Grandfather (David Peahi Keao Jr). He is the oldest sibling of David Maikai Keao and Clara Napuakekau Kakulu being born in 1913. He was raised and lived extensively at Kawaihapai Ahupua'a which

extended throughout the entire Waialua Moku with an emphasis on the Northwest Coastline of Wailau Moku that included Mokule'ia Ahupua'a. After marrying my Grandmother (Abigail Kalomi Akau) they resided at a few Plantation Camps that included Gay Camp (Mokuleia 1), Mokuleia Camp (Mokuleia 2) and Kawaihapai Camp where they raised my Mother (Laverna Tailomi Kao) and their siblings until they bought their own property where my Wife and I reside here in Mokule'ia. As another point of interest, my grandparents first met on the beach fronting the Salvation Army's Camp Homelani is situated in Mokule'ia which is just up the street from our residence.

In particular, Mr. Shirai made note of his ancestor Kaaemoku Kakulu (also spelled Kaaimoku). Mr. Shirai shared with CSH a page from the *Polk's Directory* identifying his great-great grandfather (Figure 34 and Figure 35) as a resident of Mokulē'ia and Kawaihāpai. Mr. Shirai also shared with CSH documentation of Grant 1123 identifying his great-great grandfather Kaaemoku's parcel within Mokulē'ia Ahupua'a (Figure 36 and Figure 37).

Mr. Shirai added that his ancestors also played a pivotal role as informants for Bishop Museum in identifying the correct names of *wahi pana* throughout Waialua Moku. However, Mr. Shirai was also keen to note that his family would not have been informants for Bishop Museum if it had not been for the actions of Ms. Elizabeth Lahilahi Web. Regarding the efforts of Ms. Web (whom Mr. Shirai refers to as *Kupuna Wahine*), Mr. Shirai elaborated:

Much of our family legacy recording in both *Archaeology of Oahu* and *The Hawaiian Planter* was thru the efforts of this beloved *Kupuna Wahine* who visited my Grandfather and his Ohana asking them to share about Waialua Moku. Among her many contributions and the Hawaiian Community and Culture, she became a member of The Daughters of Hawaii in the 1930's and served as Historian for many years, retaining the title of Honorary Assistant Historian for life. The Daughters of Hawaii which originated at Dillingham Ranch in Mokule'ia and it's kuleana is preserving Hawaii's historical places. They were the original caretakers of Kukaniloko Birth Stones [excerpt from community consultation letter included in Tulchin and Hammatt (2008) report].

Mr. Shirai identified the book, *Achatinella mustelina of the Waianae Mountains* by D'Alte A. Welch (1938), as a particular resource in which his ancestor Kaaimoku is recognized as the paramount informant for Waialua Moku. On page six of the book, Mr. Shirai's ancestor Kaaimoku is identified; according to Welch, "Kaaimoku, an old Hawaiian who lived in the district of Kawaihapai, conceded to be the unquestioned authority for the region between Makaleha and Kaena Point" (Welch 1938:6). Mr. Shirai further elaborated on his ancestor Kaaemoku or Kaaimoku:

. . . but there is one specific thing that I did not share, and that I would really like to see and in your report be put in, and what it does . . . I may have it, I may not have it. Ok here it is. My family were informants of Bishop Museum, for that area, what I'm gonna show you is that this paper is from this, these were combined into 'Sites of Oahu.' And I'd really like to honor my grandfather, my great-great grandfather. That's the man who was the informant. You read that sentence, I think you catch how I got my knowledge, passed down. It's a family knowledge, from



**NAMES APPEARING in LARGE TYPE in this Directory represent the ENERGY and PUSH of HAWAII. Patronize them—they ACCOMPLISH the WONDERS here and make the TERRITORY what it is**

ISLAND OF OAHU. 403

Kakuda K, restaurant 1244 Fort, r same.  
 Kakulu Kaaemoku, fisherman, Mokuleia, p o Waialua.  
 Kakunishi S, agt R Tanaka, Waialua, p o Haleiwa.  
 Kala Henry, emp U S N, Pearl Harbor.  
 Kala Joseph, seaman s s Intrepid, r Fort cor Kukui.  
 Kala Keawe, lab Custom House, r 995 Dowsett lane.  
 Kala Mary A, emp Mercantile Printing Co, bds 995 Dowsett lane.  
 Kala Mitchell, lab, r 42 Magoon blk.  
 Kala Moses, mariner John H Wilson.  
 Kala Thomas, lab, r 12th av 3 makai Maunalei av.  
 Kalaanui George K, lab U S N, r 1216 N King.  
 Kalaau David, lab U S Eng, r Waialae rd cor Kapahulu rd.  
 Kalaau James, brakeman O R & L Co, r 1222 Liliha.  
 Kalaauala inmate Lunalilo Home.  
 Kalaaukahi Martin, lab, bds James Iwa.  
 Kalaaukehiki Leleiwa, lab, bds 322 Kapahulu rd.  
 Kalaauunui John K, lab U S N, Pearl Harbor.  
 Kalabin Michael, emp Hon Planing Mill, r Tim Kee lane.  
 Kalabin Paul, carp Hon Planing Mill, r Tim Kee lane.  
 Kalaeloa Albert P, stevedore, r School cor Fort.  
 Kalaeloa Samuel, bds Harry D Joe.  
 Kalaeloa Wm, stevedore, r 741 Richards.  
 Kalaepaa David, emp Spalding Constr Co, r Kalihi Camp.  
 Kalaepaa Keahi, lab, r rear 1635 Gulick av.  
 Kalaepohaku Cemetery, School cor Kapalama av.  
 Kalahala Lawea, taro planter Hauula.  
 Kalahela Samuel, lab, bds 319 N School.  
 Kalahiki David, seaman s s James Makee, r 971 Alapai lane.  
 Kalahiki Hakoli, lab, r 968-i Alapai lane.  
 Kalahiki John, taro planter Kaalaea, p o Libbyville.  
 Kalahiki Joseph, lab, r Kellett lane.  
 Kalahiki Kamaka, emp Mutual Tel Co, bds 968-i Alapai lane.  
 Kalahiki Samuel, emp Hawn Dredging Co, Pearl Harbor.  
 Kalahikiolle Friday, lab, r Rice Mill lane, Iwilei.  
 Kalahookahi Kala, lab, r Prospect nr San Antonio av.  
 Kalahoolewa Wm R, watchman Allen & Robinson, r 106 \$ School.  
 Kalahui Boniface, tmstr, r 812 Lanawai.  
 Kalai Andrew, appr Catton, Neill & Co, 2300 Pauoa rd.  
 Kalai Daniel, draftsman Catton, Neill & Co, r 1930r Mendonca lane.  
 Kalai Wm A, janitor Pauoa School, r Liko lane 8 waikiki Pauoa rd.  
 Kalaikini, see Kaleikini.  
 Kalaiwaa Charles H, cond H R T & L Co, r School nr Asylum rd.

**Kim Chow Shoe Store**

SHOE REPAIRS NEATLY and PROMPTLY DONE

1018-1022 Nuuanu Street  
 P. O. Box 990  
 Telephone 5613

**ICE and Cold Storage**

Oahu Ice & Electric Co.

Telephone 1128

Figure 34. *Polk's Directory* page identifying Mr. Thomas Shirai's ancestor "Kakulu Kaaemoku, fisherman Mokuleia" (Photograph provided by Mr. Thomas Shirai)

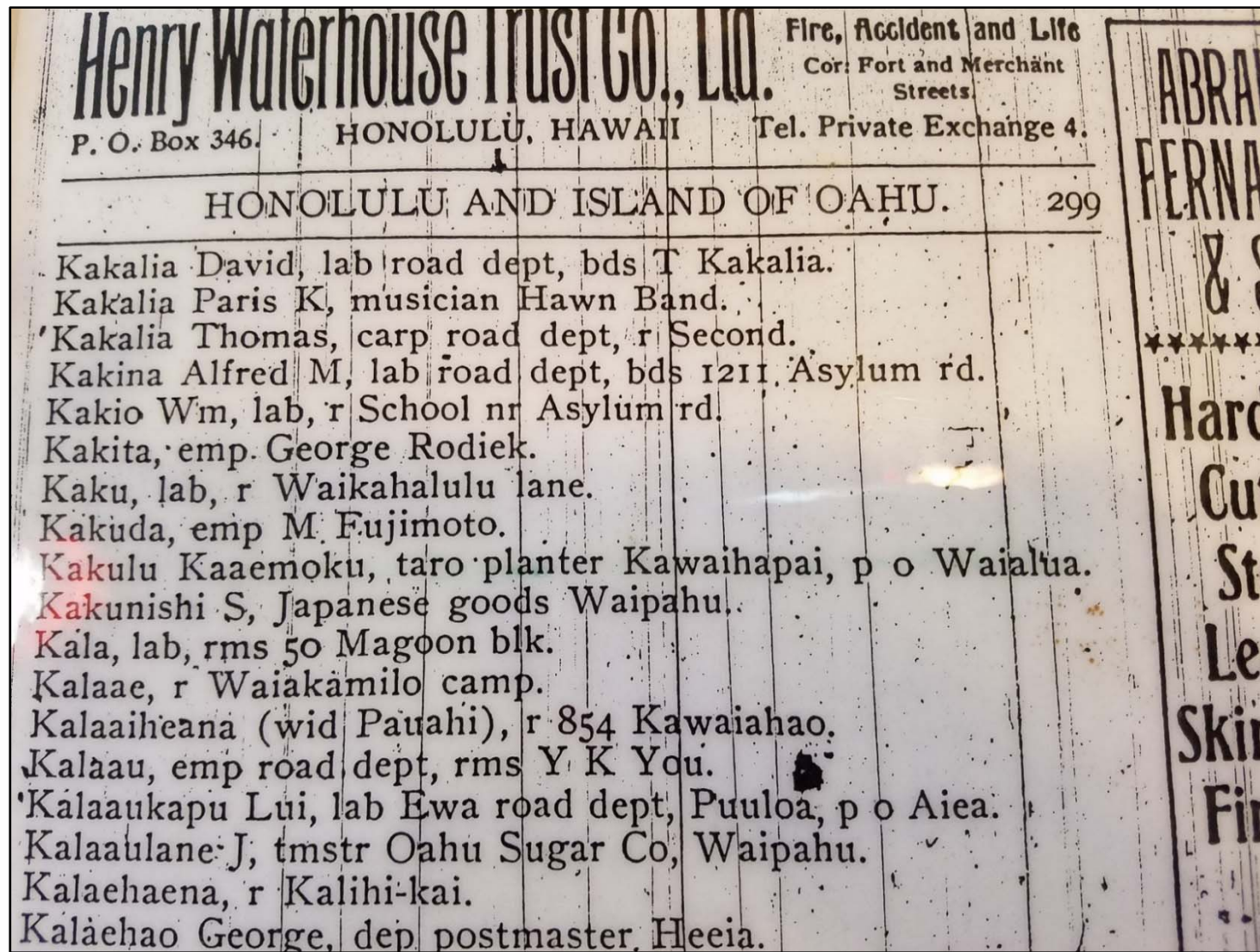


Figure 35. *Polk's Directory* page identifying Mr. Thomas Shirai's ancestor "Kakulu Kaaemoku, taro planter Kawaihapai" (CSH photograph)

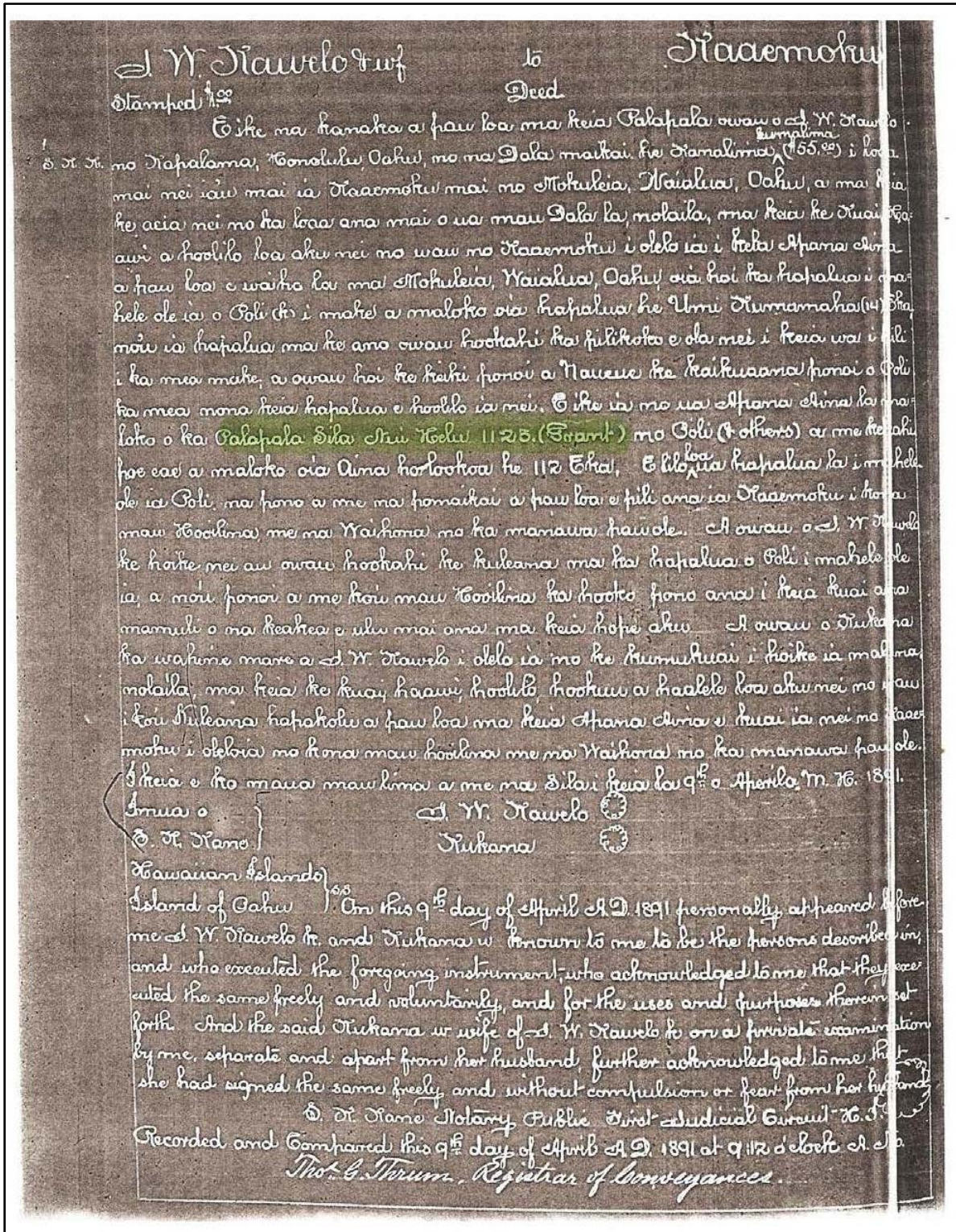


Figure 36. Grant 1123 identifying ownership of a parcel by Kaaemoku (Great-great grandfather of Mr. Thomas Shirai) with Mokulē'ia Ahupua'a (Document provided by Mr. Thomas Shirai)

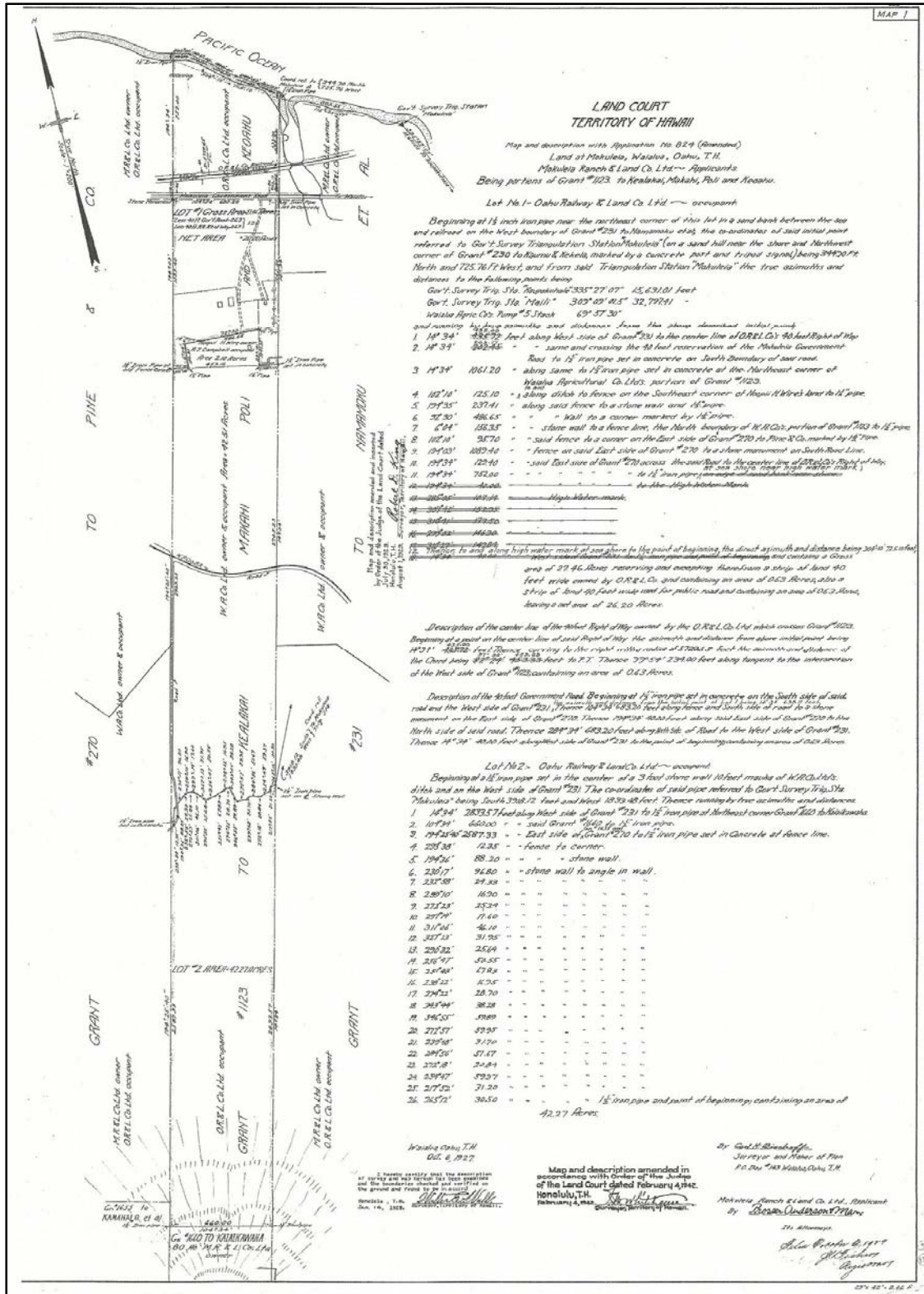


Figure 37. Map identifying portions of Grant 1123 within Mokuia Ahupua'a (Map provided by Mr. Thomas Shirai)

him to my grandfather to me. You know whatever direction, you wanna go deeper or, but in my family so far it ends with me. It ends with me, in this time, area, it's me.

CSH researched the Welch resource and identified a map with specific *wahi pana* marked throughout. The *ahupua'a* of Kawaihāpai and Mokulē'ia are listed by Welch as Roman numerals XI and XII (Figure 38); the *wahi pana* of Kawaihāpai and Mokulē'ia are later listed under Roman numeral headings XI and XII (Figure 39). When asked if there were place names CSH should pay particular attention to, Mr. Shirai responded that there were.

. . . back here is the next page, they get the geographical name, and it has, the parenthesis represents who identified it for them. But you'll see some about Mokulē'ia. And there's one, in very particular, that'd I'd like to see in your report. There's a Hawaiian name for Peacock Flats. He's the one that knows it. It's unknown, till today, it's unknown in our community. Only through my grandpa and me, through family, only family members know about it. That's a significant thing in itself, saying that Peacock Flats has a Hawaiian name. You know, and I've shared it with a lot of people, some of them are lifetime residents.

CSH continued by asking Mr. Shirai if the area known as Peacock Flats was traditionally called Kamai. Mr. Shirai confirmed the traditional name for Peacock Flats was indeed Kama'i, he elaborated further,

. . . there is a spinoff from that there is a lot of interconnected things with these because, you came here through . . . you passed through Mililani on the freeway? Did you look at the Wai'anae Mountain Range? Did you see Mount Ka'ala? Was it clear? When you get a chance, everything revolves around that. It's . . . one of the places over there that's, well where my family originates from, it's a tiny *ahupua'a* that's where the Dillingham Airfield is. And a lot of people didn't know what the *ahupua'a*'s name was. In fact, the whole area is called Mokulē'ia, and that's wrong, there's a whole different *ahupua'a*. Well that airfield there's an *ahupua'a* called Kawaihāpai, I'm sure you're familiar with that, you've seen the Pukui definition that is 'lifted waters,' but the thing about there, from an academic point, to people from that place, they missed the mark on the meaning of the place. They missed it big time. Yes, you break it apart, *hāpai* in Hawaiian . . . *hāpai* is carry. But they could only see us physically, manually carrying objects, or stuff like that. *Hāpai* means blessed. Given the word inside there has *wai*. Blessed water, that's what it means. And when you read, when you read that, that's why there's a lot of farmland. When you read everything in it, the history of the place, revolves around that mountain. The *hāpai*, the *ka ma'i*, it's the menstrual cycle of women. There's a gulch further up that's called Waiū, that's [translated] as breasts. So when you go traveling there's Mount Ka'ala, and Mount Ka'ala is the pregnant part. There's another mountain that shows the breasts, another mountain shows the head, and the body parts form towards Mokulē'ia and Kaena Point. Yeah and that's giving that water, menstrual cycle, that's why you see all waters, all the streams, and underneath there's the aquifer. It's extremely significant. It's just like, it's just . . . forgotten. Until I raised it.

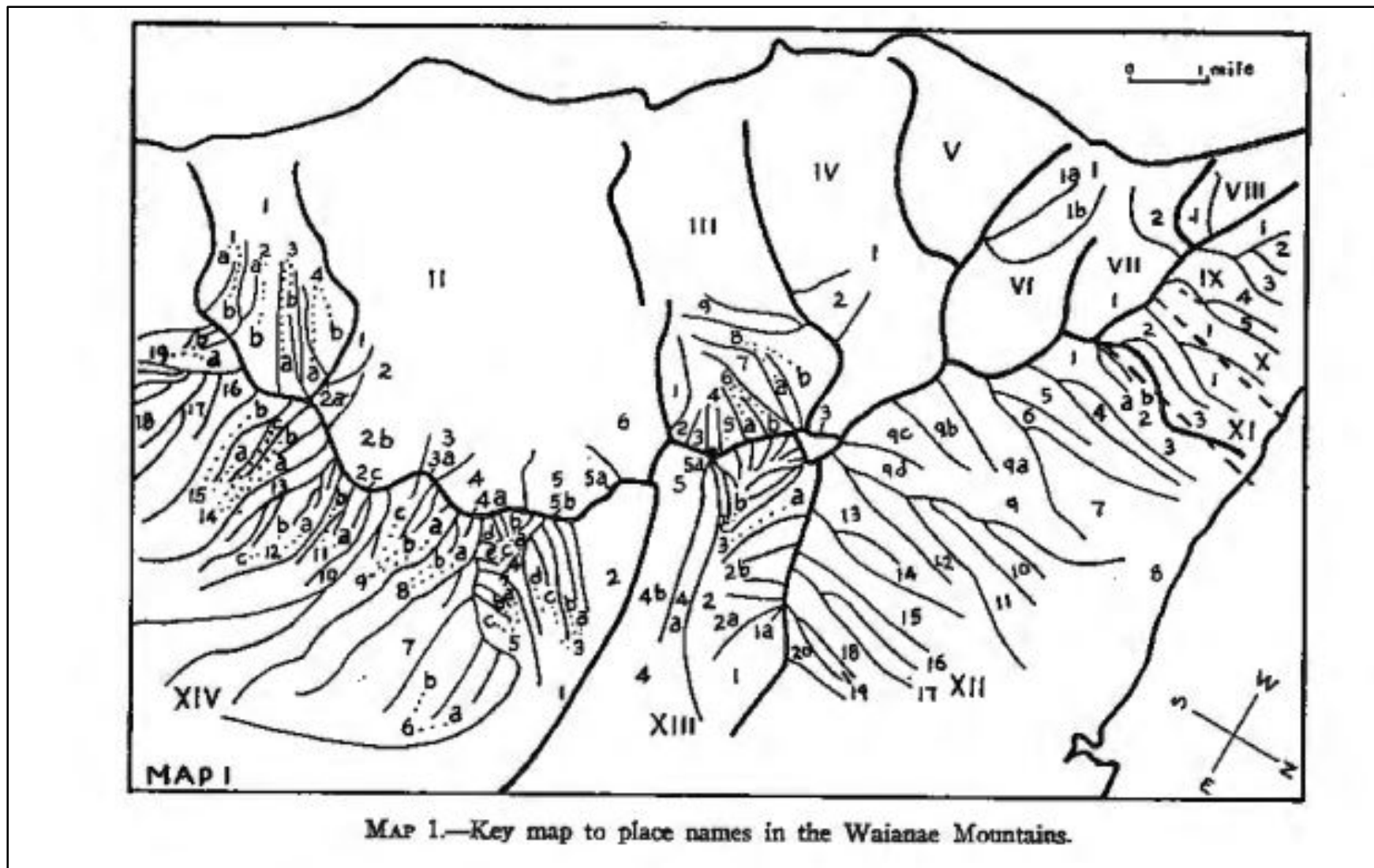


Figure 38. Map of the *ahupua'a* of Kawaihāpai and Mokulē'ia as identified by “Kaaimoku” and listed by Welch (note Kawaihāpai Ahupua'a is identified as Roman numeral XI and Mokulē'ia Ahupua'a is identified as Roman numeral XII) (Welch 1938:8)

**IX. Kuaokala (Kaena, a district just below or north of Kuaokala is not shown on the map. The streams run through both districts.)** 1, Manini Gulch; 2, Uluhulu Gulch; 3, Nihoa Gulch; 4, Keekee Gulch; 5, Haili Gulch.

**X. Kealia.** 1, Kawaiu Gulch (Kaaимoku).

**XI. Kawaihapai.** 1, Kalepeamoā Gulch; 2, Kapuhi Gulch; 3, Waikoekoe Gulch (three place names obtained from Kaaимoku).

**XII. Mokuleia.** 1, Pahole Gulch (Kaaимoku); 2, Kapuahikahi Gulch (Kaaимoku); 2a, East Kapuahikahi (Welch); 2b, West Kapuahikahi (Welch); 3, Kukuīula (lower section of Pahole Gulch according to Cox, a Gulick place name); 4, Kamimi Gulch (Kaaимoku); 5, Kapuna Gulch (Kaaимoku); 6, Keawapilau Gulch (Kaaимoku); 7, Western Subvalleys of Makaleha (Welch); 8, Kaeleku (a district on the plains below Makaleha and Kapuna Gulches, a Gulick place name) (Kaaимoku); 9, Makaleha Valley; 9a, West Makaleha Valley (Welch); 9b, Central Makaleha Valley (Welch); 9c, East Makaleha Valley West Branch; 9d, East Makaleha Valley East Branch (Welch); 10, Kaupakuhale Gulch; 11, Pamoā Gulch; 12, Kaawa Gulch; 13, Kaumokunui Gulch; 14, Kaumokuiki Gulch; 15, Manuwai Gulch (Gulches 10-15, Waialua Plantation map, Silver, Cox, Emerson maps); 16, Alaiheihē Gulch (Silver, Emerson map); 17, Kaimuhole Gulch; 18, Palikea Gulch; 19, Kihakapu Gulch; 20, Puulu Gulch (17-20, Emerson ms. map). The large flat ridge between Pahole and Kapuna Gulches is often called Peacock Flats, Kaaимoku tells me that the Hawaiian name is Kamaī. But this place name is not used because all ridges are described from the valleys on either side of the ridge.

Figure 39. The *wahi pana* of Kawaihāpai and Mokulē'ia Ahupua'a as identified by "Kaaимoku" and listed by Welch (Welch 1938:9)

The common mislabeling of Kawaihāpai as Mokulē'ia prompted Mr. Shirai to discuss the general geography of Waialua Moku. Mr. Shirai commented,

The *ahupua'a* are short and small, they're not huge, not like the kind you guys are normally accustomed to, like Makua, huge ones. They're short in distance, so to be specific, Mokulē'ia Beach Park, if you're really looking for, is in Kawaihāpai, and it's about an eighth to a quarter of a mile Wailua-bound. That's Mokulē'ia! You know, that's, may not sound like a significant amount of land in distance, rather, Mokulē'ia is so big, if you look at the Māhele, there's Mokulē'ia 1 and Mokulē'ia 2. Dillingham Ranch is Mokulē'ia 2.

Mr. Shirai continued the discussion of the geography and landscape of Mokulē'ia with a reference to the song "Kalena Kai."

There's a song on [Huapala.org] called *Kalena Kai*. You'll see two things that's significant, number one is you'll see at the very bottom who's the informant, it's me. Number two, the thing is this, there's an emphasis on verse number two which talks about Mokulē'ia. There's great *kaona* [hidden meaning] in that verse. The verse is like, *ka moena pāwehe o Mokulē'ia*, they're talking about a mat. They're using the metaphor, *lauhala* [pandanus] mat as a checker board describing the agriculture. That's significant. And that's the kings . . . King Liholiho went there.

CSH asked if the song was describing the richness or verdant nature of the lands, Mr. Shirai responded "yes." Mr. Shirai commented on the lands of Mokulē'ia being *'āina momona* (fertile and rich); evidence of such richness remains visible through place names and street names (such as Laau Paina Place *makai* of the Dillingham Ranch property). Mr. Shirai explained to CSH:

When you go down to Mokulē'ia, you start having names like Laau Paina or Mahinaai Street, These things show you a breadbasket . . . That's the real meaning of these places. Food. That is the basis for this area. Laaupaina what does it mean . . . That is the pharmacy. That is Longs Drugs.

Mr. Shirai added that evidence of *noni* (Indian mulberry; *Morinda citrifolia*) and *wauke* used for *lā'au lapa'au* (traditional herbal medicine) is evident in the Land Commission Awards (LCAs): "Mokulē'ia is a documented area that had medicinal plants. Especially Noni featured in the LCA's (www.waihona.com)." Mr. Shirai also noted that material culture related to the practice of *lā'au lapa'au* was recovered within Mokulē'ia Ahupua'a. In particular, Mr. Shirai referenced a Bishop Museum artifact inventory of Mokulē'ia and the northwest coastline of Waialua (Figure 40 and Figure 41): "The stone artifacts are from Mokule'ia. The mortars although found at Keālia, are used in Laau and relate to Laau Paina street name."

*Noni* fruit was used for a variety of ailments including boils, kidney and bladder disorders, deep lacerations, and constipation (Krauss 1993:103). *Wauke* was not only utilized for *kapa* or clothing material, but also prepared alongside *māmaki* (*Pipturus*) and *ko'oko'olau* (*Bidens*) as a general cleansing agent (Krauss 1993:103). As Mr. Shirai pointed out to CSH, LCAs documented claimants' lands in detail, providing particular insights into traditional land usage. Mr. Shirai added that claimants often noted their lands in Mokulē'ia had "a grove of this, a *mala* (garden) of that. It's beyond land, taro patches, fishing grounds, when you see *mala* you should see a different perspective, about the *'āina momona*."



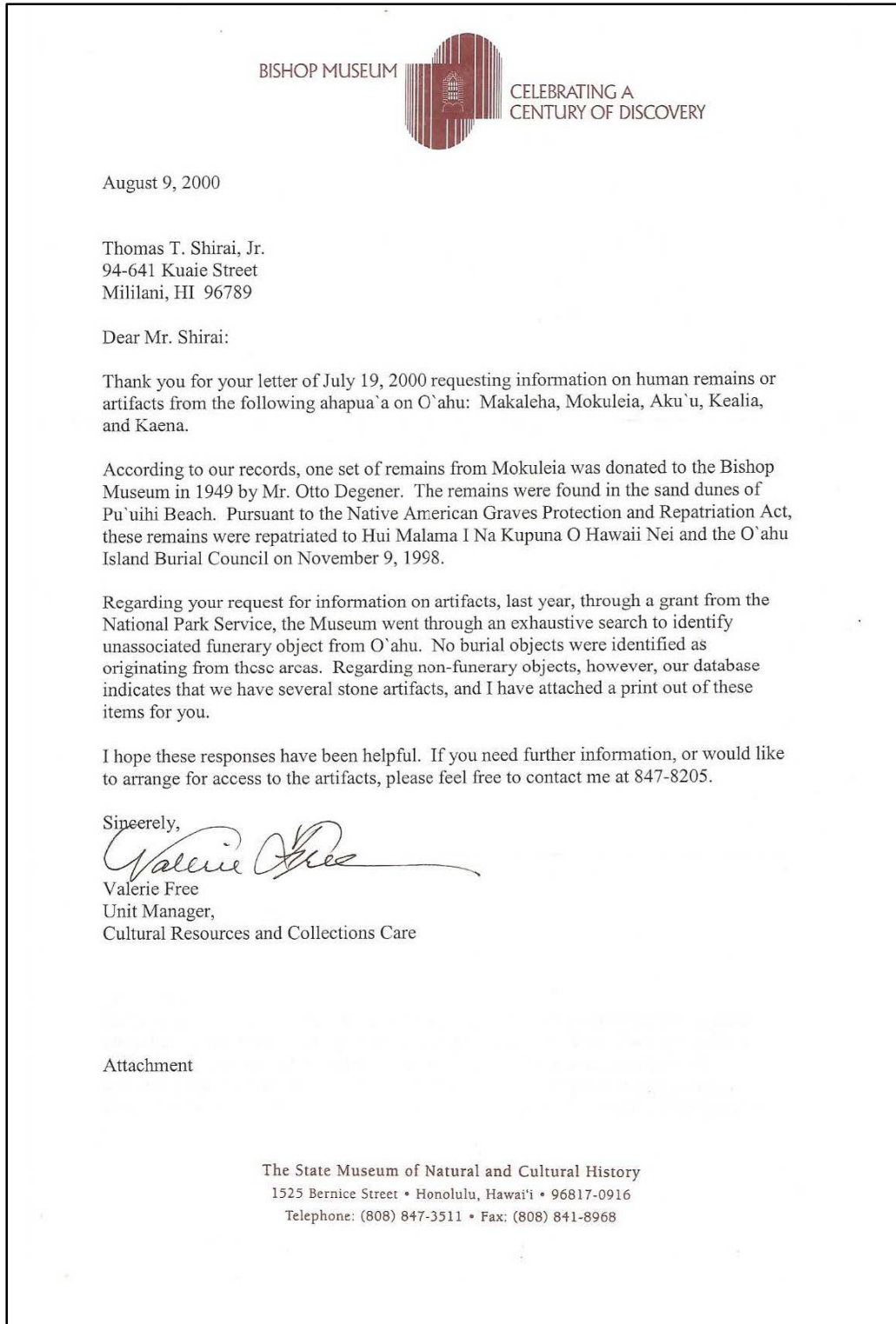


Figure 40. Correspondence between Bishop Museum and Mr. Thomas Shirai regarding artifact inventory of Mokulē'ia and the northwest coastline of Waialua (Letter provided by Mr. Thomas Shirai)



Figure 41. Correspondence between Bishop Museum and Mr. Thomas Shirai with photographs of stone mortars recovered from Mokulē'ia (Letter provided by Mr. Thomas Shirai)

The song goes beyond describing the richness and beauty of the lands of Mokulē'ia, but also functions as an *'ohana mele* (family song). The Kawaihāpai 'Ohana, to whom Mr. Shirai belongs, provided supplies and probably entertained the royal retinue (Huapala n.d.). Mr. Shirai also clarified that the song is not written by Charles E. King, although it is noted on the Huapala website as such. According to Mr. Shirai,

[Charles E. King] composed the melody line; the words are King Liholiho's words . . . it's documented he did come to [Mokulē'ia] in the 1820's . . . he came [to Mokulē'ia] with Queen Ka'ahumanu before he went to Kaua'i to visit King Kaumuali'i. They wanted supplies, and so one of the places he stopped, and *Kalena Kai* talks about all the places in Waialua . . . the last verse talks about Kūkaniloko. The first verse talks about Hale'au'au near Kolekole Pass and Schofield Barracks, that's Līhu'e. It's not Līhu'e, Kaua'i, it's Līhu'e, O'ahu. That's where the chiefs were.

Mr. Shirai remarked that it seems individuals do not know the ancient history of Waialua Moku very well, and key aspects of its "ancient history" are often overlooked or misinterpreted. He elaborated further through an explanation of the deep, complex history of Mokulē'ia to CSH, revealing that discussions of the ancient history for the area often incorrectly revolve around Queen Lili'uokalani Church and Reverend Emerson. He stated that most individuals interested in the history of Mokulē'ia and Waialua Moku at large, do not realize the history of the area is much "deeper" than the oft-repeated historic descriptions of the church and missionary families. Mr. Shirai provided an example of this deeper history by drawing upon information provided within *The Wind Gourd of La'amaomao*. He noted that Mokulē'ia has its own wind, Hinakokea. In *The Wind Gourd of La'amaomao*, Kūapāka'a, the son of Pāka'a and descendant of the wind god La'amaomao chants the following:

<i>Huilua nā makani o Kaena</i>	The wind of Kaena turns in two directions
<i>He Hinakokea ko Mokulē'ia,</i>	Hinakokea is of Mokulē'ia,
<i>No Waialua ka makani ke pā mai,</i>	The winds of Waialua blow,
<i>He nihi mai ma ka lae o Kaena</i>	Moving silently at the cape of Kaena

[Nakuina 1992:51]

Mr. Shirai added, "That's why you see the parachutes and the glider rides. You know all these things make sense." Mr. Shirai shared another example of *kaona* contained within the ancient and complex history of Mokulē'ia. In this example, Mr. Shirai drew upon the second verse of "Kalena Kai" that speaks of *'o ka'ehu'ehu o ke kai*, or the sea spray. He noted that the common translation is "salt breeze." However, if one dissects the line word by word, a new meaning comes to light. Mr. Shirai shared,

*Ehu* is red or maroon. What does that red mean? It means two things . . . there's a street named 'Aweoweo, *'aweoweo* is a fish, there's certain things associated with red fish. But the more applicable meaning, and it's in the Hawaiian newspaper . . . it's also a known place for seaweed. *Limu* was abundant. The seaweed that they're talking about for that *ehukai*, that's another family name, these are [Kawaihāpai 'Ohana] things, and that's *limu kohu*, that maroon color.

Mr. Shirai elaborated that the area where this type of *limu* grows within Mokulē'ia Ahupua'a is quite large, surpassing the well-known *limu* stands of One'ula Beach Park in Honouliuli. However, Mr. Shirai added that the area has been over-harvested throughout the years.

Many of Mr. Shirai's ancestors worked and gathered throughout the lands of Mokulē'ia and Kawaihāpai. The legacy of Mr. Shirai's ancestors, and their connection to the lands of Mokulē'ia and Kawaihāpai have also been noted in numerous documentary resources, in particular the *Polk's Directory* documents the historic occupations of his ancestors (see Figure 34 and Figure 35). His grandfather's mother, Clara Keao, inherited land throughout Waialua Moku. Mr. Shirai commented that "she was quite a significant woman," but had experienced a hard life due to her sizeable land inheritance throughout the *moku*. Mr. Shirai recounted to CSH the tragic story of his grandmother, the false accusations of leprosy, her exile at Kalaupapa, and the prejudiced seizure of her land inheritance. According to Mr. Shirai,

To get the land, one of the techniques they used, [her own family] conjured up with the government, they made up a story that she had leprosy. That's how terrible people were back then, to get the land they would do things of that sort. It's known, not only my great grandmother, but many others. They put them in there [Kalaupapa], and in there she caught the leprosy while there. There's a difference between diabetes and leprosy, and they ignored the diabetes. Luckily, she became an outpatient, but she caught leprosy in there; she didn't stay that long at Kalaupapa. Plus, they were gonna try take away . . . the rest of the family . . . when she came out, she was an outpatient at Kalihi Hospital, and this is the sad part for all the communities around, they're healed, they go back to their own original communities, and they're treated as outcasts. That's the ignorance, the stigma of everything . . . they took away not just the land, [they took away their] pride, their dignity. Technically, this is hers, this is her knowledge. Within the family, if you break it down to the knowledge, it's her lineage, it's her branch of the family. They erased that part of the family's history.

Mr. Shirai took the opportunity to also discuss the stigma of leprosy that often followed patients for their entire lifetime; he commented that his great-grandmother Clara Keao had endured prejudice long after she had returned from Kalaupapa. According to Mr. Shirai, she was still treated as a pariah by her own Hawaiian community within Waialua Moku. Mr. Shirai added that such treatment was a primary cause for so many patients remaining at Kalaupapa long after they had been cured of Hansen's Disease. Despite these tragic events, Mr. Shirai's *'ohana* maintained their connection to the lands of Waialua Moku.

Due to his *'ohana*'s well-documented connection to the lands of Waialua Moku, Mr. Shirai has been identified as a lineal and cultural descendant of the area. Mr. Shirai also formerly served as a member of the O'ahu Island Burial Council; per state rules no council member may serve more than two consecutive terms. Mr. Shirai's term on the council recently expired on 30 June 2016. Mr. Shirai's descendancy has been established through numerous historical documents, with the Kawaihāpai 'Ohana's lands stretching all the way to Kaena Point.

According to Mr. Shirai, his *'ohana*'s original farm lands included the current Dillingham Airfield and extended all the way to the current Hawai'i Polo Club field. Mr. Shirai's ancestors cultivated and gathered throughout Waialua Moku, caring for a large swath of land extending all

the way to Ka'ena Point. Regarding cultural sites in their charge, the *leina ka 'uhane* (leaping point for spirits) at Ka'ena Point was discussed. Many of the cultural sites identified in *Sites of O'ahu* by Sterling and Summers (1978), belonged to and were cared for by his family. The Kawaihāpai 'Ohana were *kia 'i* (guardians) of numerous sites such as Kawailoa Heiau, Poloaia Heiau, Kuakea Fishing Shrine, and Kolea Fishing Shrine. Mr. Shirai elaborated on cultural sites located in the vicinity of the project area:

The most significant part when you walk about Ka'ena Point is, it's in the deed. It's a natural area preserve, they had the fishing shrines in there. And when you go the beach park, Mokulē'ia Beach Park, it's the same story, there are fishing shrines . . . these are not places that you know, I believe they got it not because of random choices, or even in the Māhele when you could buy the land . . . they got [it] because they know the value of it [the land and the cultural sites]. You know they chose wisely, even in that Kawaihāpai area, up that airfield, they chose the part that had the water . . . had the water and the taro patches.

The *lo'i kalo* (referenced by Mr. Shirai above) that once proliferated throughout the *ahupua'a*, however, have long since vanished. It was noted during consultation that the U.S. Army was responsible for the in-filling and subsequent removal of traditional *lo'i kalo* within Mokulē'ia and Kawaihāpai Ahupua'a. He noted, however, that a spring is known to exist where the current Lyman home near Ka'ena Point is located. Mr. Shirai also noted that although portions of Waialua Moku may appear dry, fresh water remains available via a subterranean or karstic system.

Mr. Shirai and his 'ohana also discussed with CSH the history of the airfield (located immediately west of the current project area). The airfield was constructed in the late 1930s to the early 1940s (prior to the onset of World War II) by the Dillinghams, in an area once known as Kawaihāpai Camp. Kawaihāpai Camp had been the location of numerous homes and infrastructure owned by Native Hawaiian farmers and fisherman. According to the Shirai 'Ohana,

These were Hawaiian farmers, they didn't give back the land after the war, they gave back to the *haole* ranchers . . . so what they did was give them a settlement . . . on that land that the Dillingham's [acquired] had a school, had a church, had everything. And you know the Hawaiians, in those days, they buried their people around their house. That's why in that land now, they have a lot of burials. They couldn't take them out. They only had one month and the government told them they had to go. They took their possessions, and everything was left as is, and the Hawaiians had to get off the land. But, they were given a settlement of I think, \$10,000.

Regarding the presence of burials or *iwi kūpuna* (ancestors) within the project area, CSH was referred back to Mr. Shirai's original 2008 consultation letter. Mr. Shirai's comments and concerns are outlined in Figure 42. As Figure 42 shows, Mr. Shirai has "found documentation that this project may encounter and disturb several *iwi kūpuna* documented and were buried in Mokulē'ia Ahupua'a which potentially [may] be within the geographical perimeters of this project." Mr. Shirai's comments regarding the disturbance of *iwi kūpuna* within Mokulē'ia as a result of improper sand mining are documented in numerous newspaper articles (Figure 42 through Figure 48). The articles outline how Mr. Shirai was responsible for, and guided the re-interment of his

***Na Iwi Kupuna of Mokule'ia Ahupua'a***

Thru my research, I've found documentation that this project may encounter and disturb several *Iwi Kupuna* documented and were buried in *Mokule'ia Ahupua'a* which potentially be within the geographical perimeters of this project. Among my documentation is a mentioning of a **Family Cemetery at Mokule'ia and a Kupuna named Kaakau (?)** who maybe an original patentee of **Grant 1123 (Makahi, Poli, Kaakau, Keoahu)**. Before continuing, it's known that *Iwi Kupuna* were buried in sand. During the casting of the Television Series "Lost", clearing of *Makaleha Stream* and especially *Sand Minning* permitted, I expressed concerns when serving on the *Oahu Island Burial Council's Waialua Moku Representative*. It was not taken seriously and shortly after *Iwi Kupuna* were disturbed on *Dillingham (Kawaihapai) Airfield* due to sand minning.

On March 18, 1973 *Dillingham Ranch* got approval from the Honolulu City Council to sand minning on their property despite opposition from the community. It was during that time **only one Kupuna** knew what was going to happen. **He was my Grandfather** and visited the sand minning location just past *Makaleha Stream Bridge* in the cattle pasture on the immediate right of *Farrington Highway*. I'd also like to note that a seaward cattle pasture that encompasses the current *Makaleha Beach Access* was also cleared for sand minning however it was never used because of the quality of sand.

Figure 42. Mr. Shirai's 2008 comments regarding the presence of iwi kūpuna within the current project area previously stated within a community consultation letter drafted for a *Preservation Plan for SIHP #s 50-80-03-416, -4772 to -4780, -4782, -4786, and -6885 to -6888 in the Proposed 820-Acre Dillingham Ranch Development Project Mokulē'ia 2, Auku'u, Kikahi, and Kawaihāpai Ahupua'a, Waialua District, Island of O'ahu TMK: [1] 6-8-002:006 por.; 6-8-003:006 por., 015, 019, 030, 031, 033, 035, 040* (Tulchin and Hammatt 2008)

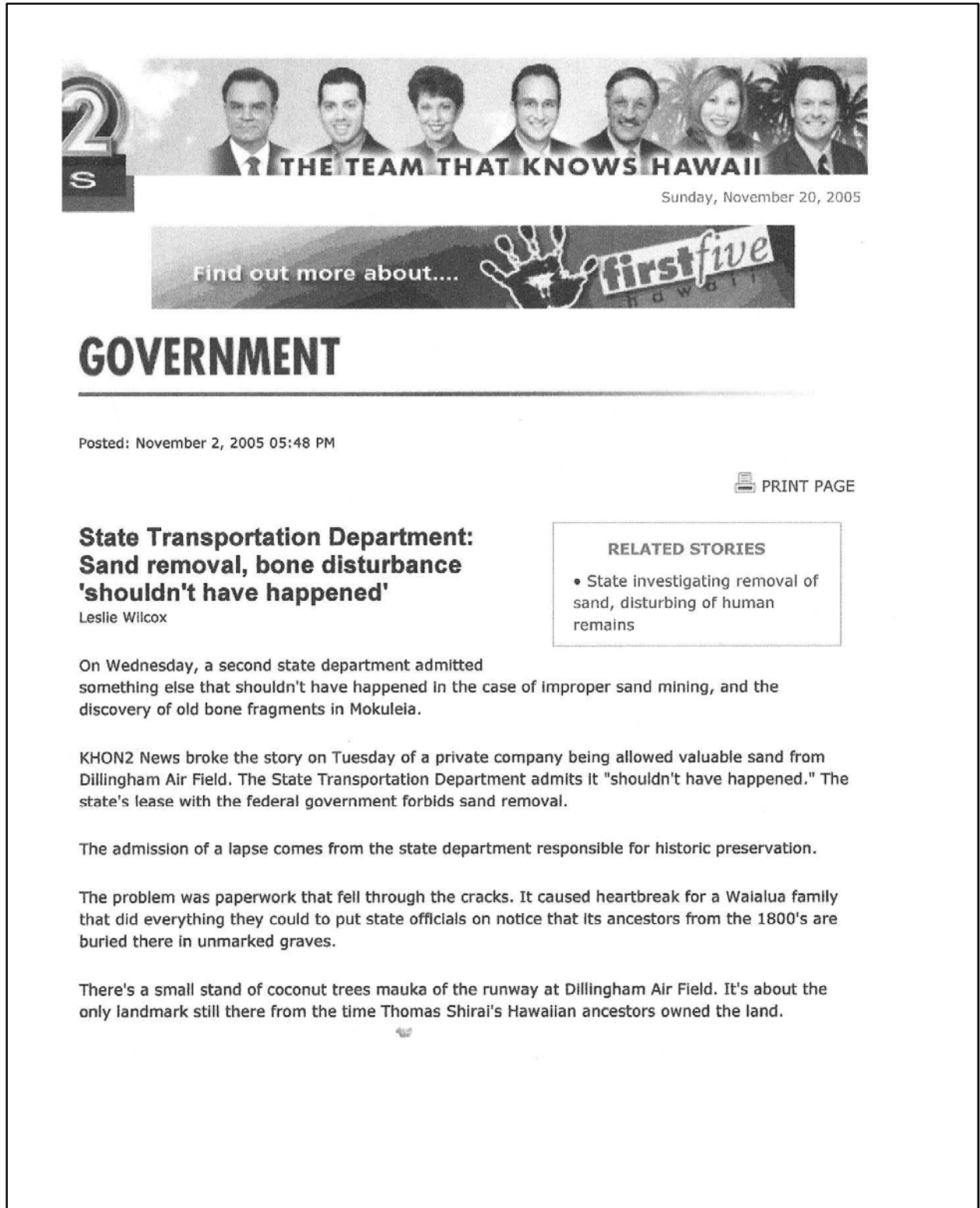


Figure 43. Wilcox (2005) article with Mr. Shirai’s comments regarding the disturbance of *iwi kūpuna* within Mokulē‘ia (news articles courtesy of Mr. Thomas Shirai)

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"The big kupuna had a house in the back. There was a hill and had all these graves around. That's the way it was," says Thomas Shirai, Jr.

Human bone fragments, including part of a leg, turned up after sand was dug up at the site of the old family burial ground.

"This is the home, and where that bone was, was maybe a few feet away," says Shirai, Jr.

He's taken pains to amass records, going back to documents handwritten in Hawaii, and continuing into present-day, informing officials about cultural sites that remain at Dillingham.

Back in 1997, Shirai and his family filed notice with state authorities that this was an ancestral settlement and an unmarked burial ground.

The family described the location of the burials and provided names and death certificates for family members laid to rest in the area, known then as Kawaihapai.

Shirai says he updated the burial site registration form in the year 2000.

"We just don't have a record of that," says David Brown, state archeologist.

A newly hired state historic preservation archaeologist says the key paperwork wasn't kept on file.

"We are working to correct some of the things that have happened in the past, and we are accountable for what happened. We are more than willing to work with Thomas Shirai to ensure this thing doesn't happen again in the area," says Brown.

Shirai says he also informed the airport's division of his family burial ground.

Shirai feels additional hurt because he's a Transportation Department employee.

And it pains him to wonder if more 'iwi,' or bones, will turn up in sand that left the airfield.


An unsuspecting Mokulela homeowner who bought six truckloads of the sand found part of a human jawbone.

"There may be more for all I know," says Steve Tilford, Mokulela homeowner.

The bone fragments may not be from Shirai's ancestors. We'll never know, because state law and Hawaiian belief systems don't allow invasive testing.

Figure 44. Mr. Shirai's comments regarding the disturbance of *iwi kūpuna* within Mokulē'ia (news articles courtesy of Mr. Thomas Shirai)







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**LOCAL TOP STORIES**



**State apologizes for unearthed iwi**

By Kirk Matthews

An apology can mean a lot, especially if it's been a long time coming. That's the case for Thomas Shirai whom we first met two years ago, when his ancestors' bones were disturbed.

Thomas Shirai lives in the family home on the North Shore, not far from where his ancestors were buried. Years ago, a private contractor working with the state and department of defense unearthed iwi kupuna, the bones of his ancestors.

The bones are safe, but Thomas wanted an apology from the state. It didn't come for two years, until now.

"Please rest assured that we will work with the Army and the state historic preservation commission to return the remains and further protect the site with fencing," said Thomas Shirai.

Then Thomas reads the most important part of the letter from State Transportation director Barry Fukunaga.

"Please accept our sincere regret for this incident and pledge that no further excavation will occur at Dillingham Airfield," said Shirai. "I cried. I was very happy."

Figure 45. Matthews (2007) article with Mr. Shirai's comments regarding the disturbance of *iwi kūpuna* within Mokulē'ia (news articles courtesy Mr. Thomas Shirai)

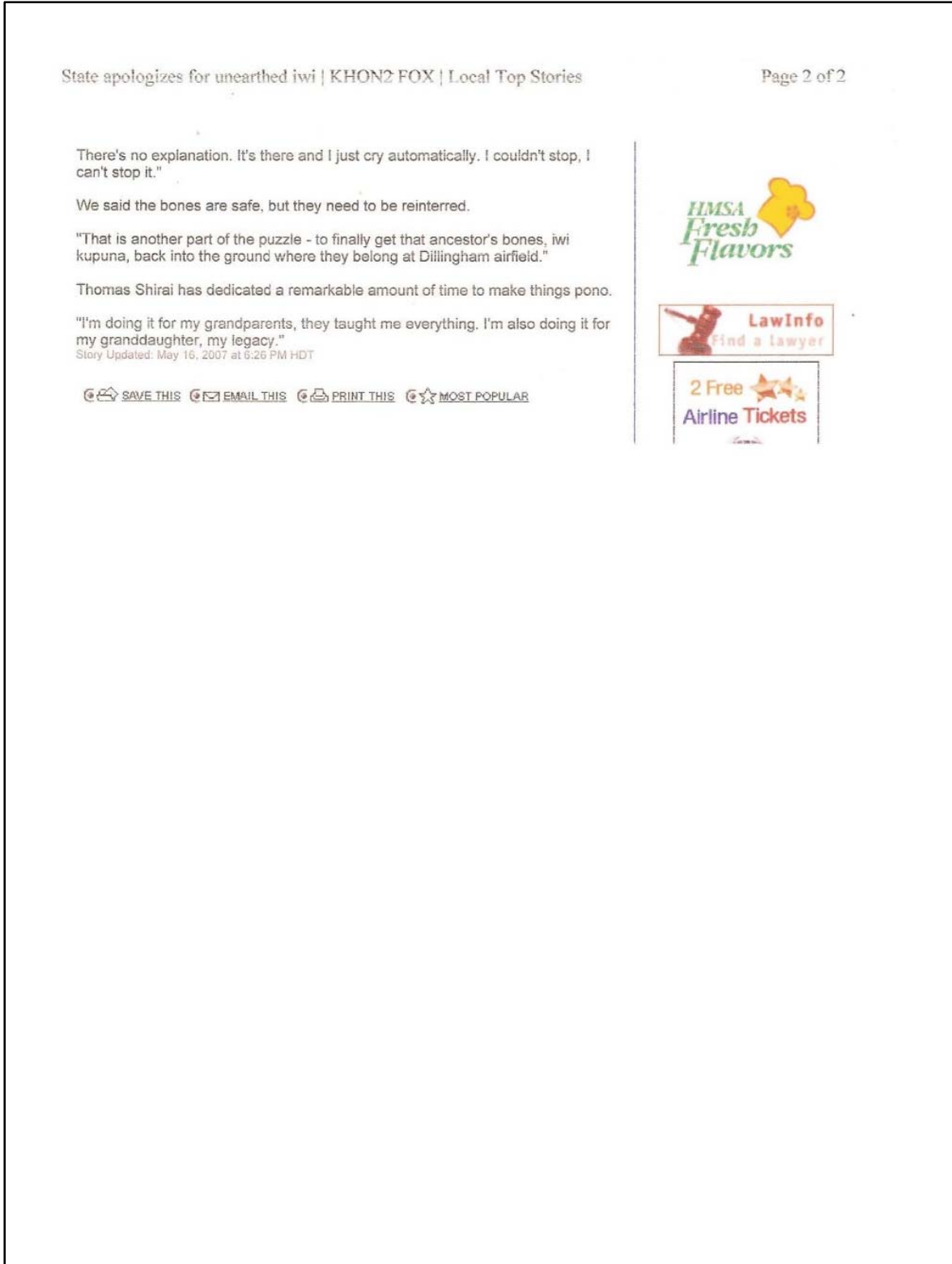





Figure 46. Matthews (2007) article with Mr. Shirai’s comments regarding the disturbance of *iwi kūpuna* within Mokulē‘ia (news articles courtesy of Mr. Thomas Shirai)





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**LOCAL TOP STORIES**



**Ancestral Iwi Returned to Mokuleia**  
 By Andrew Pereira

More than two years after ancestral bones were removed from Dillingham Airfield, a Mokuleia man who is a lineal descendant of the remains has put them back where they belong.

It's believed Thomas Shirai Jr. is the first person not affiliated with any native Hawaiian group to reinter his ancestor's iwi. "This is our Christmas present," said Shirai, "to put back our tutu."

Shirai believes the bones are from his great, great, great grandmother, Napuakau Kakulu who died September 13, 1896. She was buried in an area next to the airstrip at Dillingham.

Shirai, who kept meticulous records of his family's history in the area once known as Kawaihapai, says it was those records that convinced the Historic Preservation Division to return the iwi directly to him.

"The big kupuna had a house in the back," said Shirai. "There was a hill and had all these graves around. That's the way it was." In 1997 Shirai registered the unmarked burial ground with the Department of Land and Natural Resources,

Figure 47. Pereira (2007) article with Mr. Shirai's comments regarding the disturbance of *iwi kūpuna* within Mokulē'ia (news articles courtesy of Mr. Thomas Shirai)

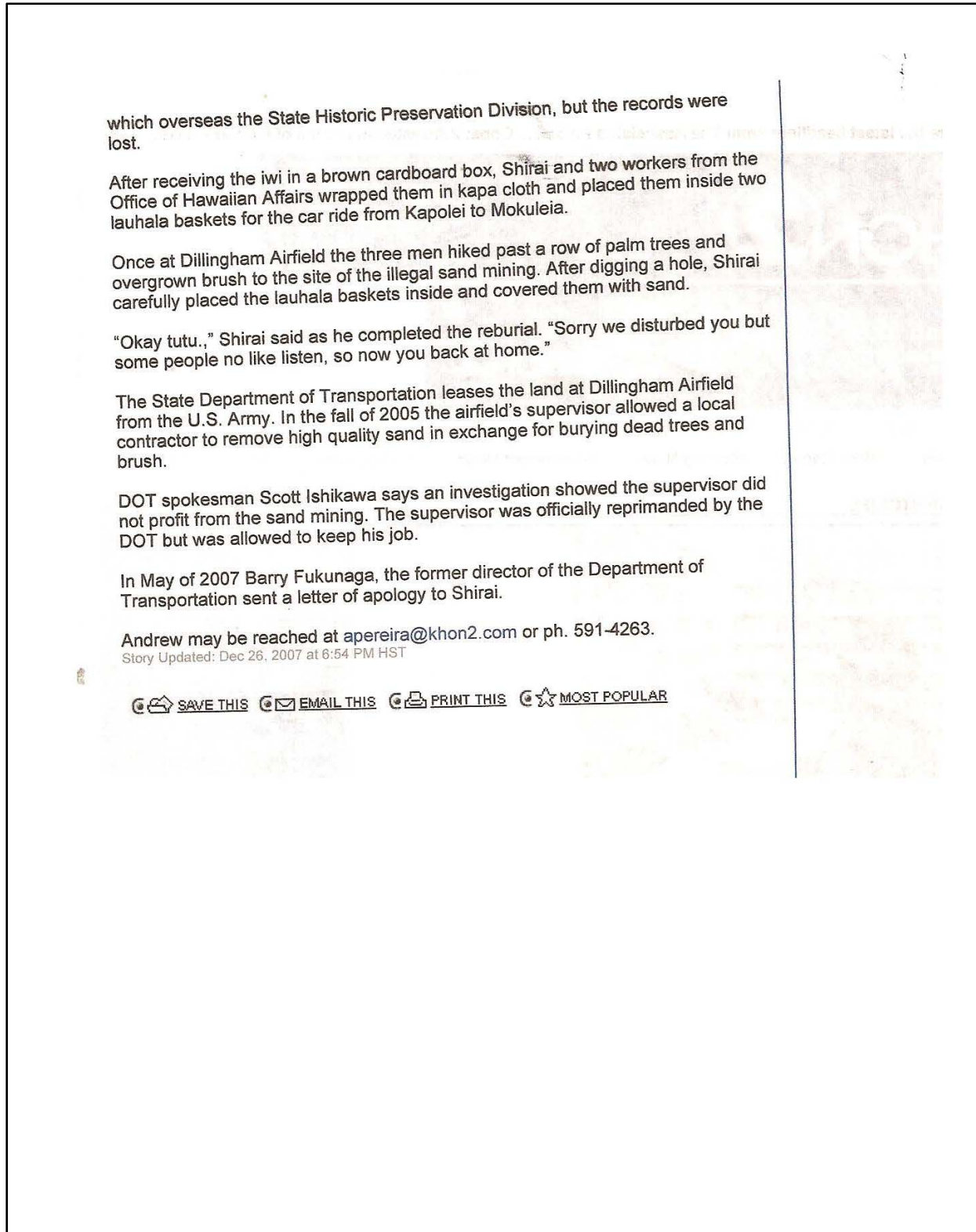


Figure 48. Pereira (2007) article with Mr. Shirai's comments regarding the disturbance of *iwi kūpuna* within Mokulē'ia (news articles courtesy of Mr. Thomas Shirai)

*tūtū wahine* (grandmother), Ms. Napuakau Kakulu, following the disturbance of her burial during illegal sand mining activities within the Dillingham Airfield area. During the construction of the airfield, strange or supernatural occurrences were also noted,

All the stuff on the airfield, they couldn't take. But as the Hawaiians were working in the construction, because they had to pick out everything, make roads [for airfield construction], and grandpa, grandpa told me there was a huge boulder in the shape of a donut. They couldn't move it; the machine couldn't move it. Finally, they got it moved to another area. The next morning, it was back in the same spot. So a lot of the Hawaiians, including [Mr. Shirai's] uncle, family were working on it, and they quit. After that thing happened, they didn't want to be involved . . . till today, when they come to the airfield and dive, they have accidents because there's a lot of spirits in there.

Mr. Shirai added that the road connecting Dillingham Ranch with Dillingham Airfield begins within the current project area. According to Mr. Shirai, supernatural activity was associated with the original construction of the road. He elaborated further on this activity by sharing the *mo'olelo* of the moving *pōhaku*,

The National Guard made a road leading to the airfield, it hugs the mountain. And see, part of the *mo'olelo*, the stuff my wife is talking about, my uncle was with them, with that battalion, and he said when they cut the mountain, when they were grading the mountain, the color of the dirt looks like blood. Pretty heavy stuff, it looked like that. And what my wife says is that they moved the stone, two things happened. The operator died right there. He died, and that stone came back the next day. And all the Hawaiians, they walked off, quit, they didn't want anything to do with it.

The conversation with Mr. Shirai then turned to the discussion of renaming the airfield. Mr. Shirai shared feelings of disappointment that the airfield, and many of the place names for Mokulē'ia and its environs, do not reflect the cultural history of the area nor pay homage to the descendants of the original Hawaiian families that once occupied the area. In attempting to reconceptualize Dillingham Airfield, Mr. Shirai offered a suggestion from his *'ohana's* own personal *mo'olelo*. Mr. Shirai shared the heroic deeds of his grandfather, saving a soldier from drowning at Kawaihāpai Beach. Mr. Shirai continued by sharing a letter from the commanding Major General of the U.S. Army, written to his grandfather Mr. David Keao, thanking him for his "prompt and brave actions" (Figure 49).

Regarding the current project, Mr. Shirai stated he supports the project and its vision to be a low-density agricultural subdivision. Mr. Shirai acknowledged it is often difficult to stop development and he understands it is a reality within Hawai'i. He also added that he found the option of a low impact, low-density development preferable to the option of a high-impact, high-density development (such as those developments that occurred in 'Ewa and Kapolei). While he supports the project, Mr. Shirai shared, however, a concern and recommendation for cultural sites within Mokulē'ia. With the creation of an agricultural subdivision and the increase in population associated with it, Mr. Shirai is concerned that certain cultural sites may be at risk for abuse or exploitation. Mr. Shirai shared with CSH that the "social media phenomenon" brings attention to many cultural sites; "*maha'oi*" (bold, impertinent, insolent, presumptuous) individuals draw

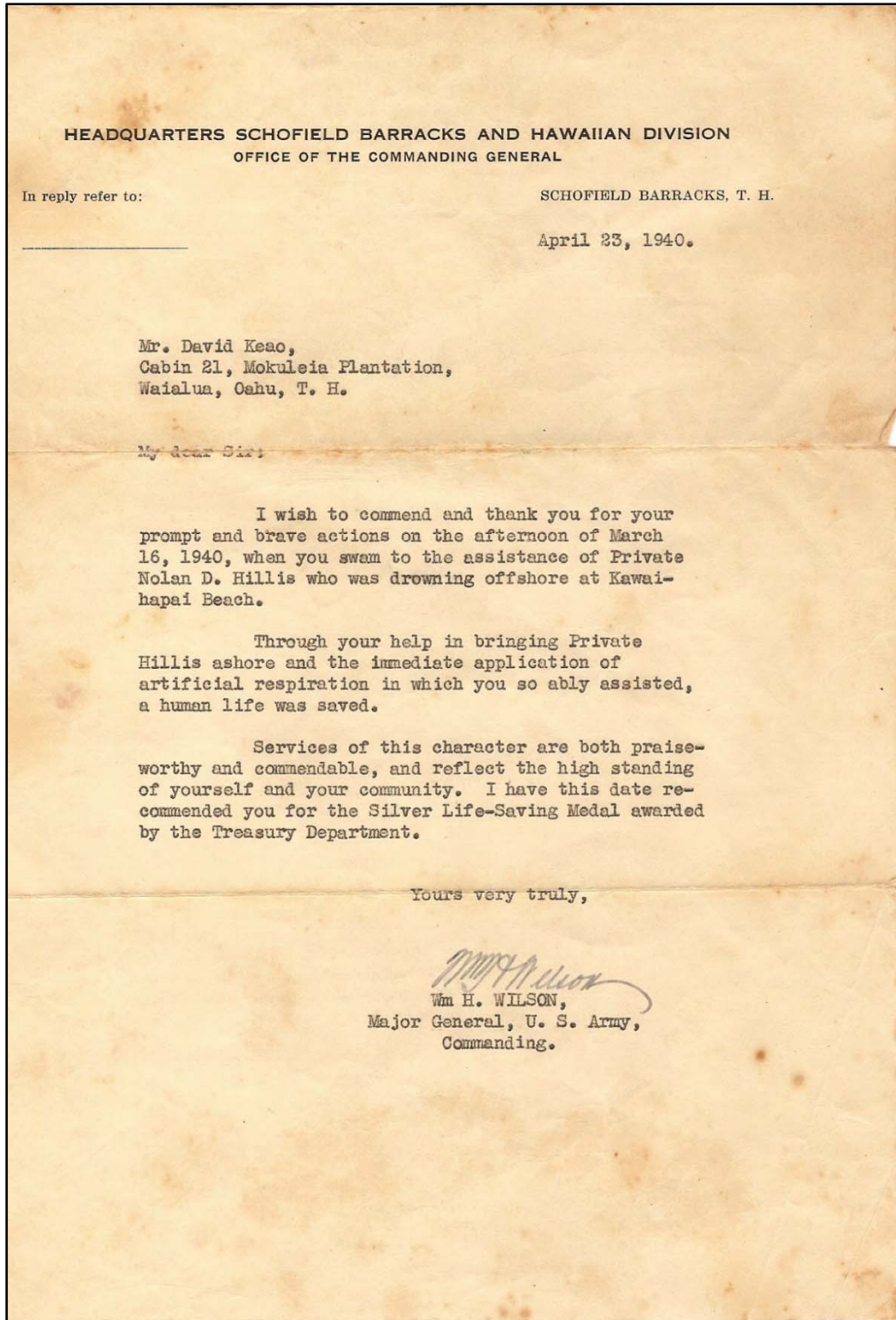


Figure 49. Copy of letter from the commanding Major General of the U.S. Army, written to Mr. Thomas Shirai's grandfather Mr. David Keao, thanking him for his "prompt and brave actions" (photograph courtesy of Mr. Thomas Shirai)

attention to these sacred sites with posts to their social media accounts. He added that these sites are not “attractions,” and access to these sites should remain restricted. Mr. Shirai also made note of sand mining conducted by the ranch in the early 1970s within the *mauka* portion of Farrington Highway. Mr. Shirai inquired if ground disturbance associated with the current Dillingham Ranch Agricultural Subdivision project will also occur in the area once sand mined in the 1970s. He commented, “If this is within the APE, I would like access and be the cultural monitor.” He also shared that during previous sand mining activities within the area, he collected a “Hollister round bottom” bottle. Mr. Shirai also shared with CSH resources regarding the history of Hollister Soda Works in Hawai‘i. He also expressed concern regarding the protection and stewardship of multiple coastal resources. He stated the following regarding the first resource: “the next area of concern, it’s the *muliwai* (river mouth) on the Waialua end of the polo field. It also contains the remnants of the railroad bridge I’d like to see preserved and restricted.” In regards to the second resource, Mr. Shirai noted he is *kia‘i* of an “offshore *pōhaku* (*heiau*) off [of] the project area.” This resource is known as Mokupaoa, and is a personal fishing *ko‘a* for Mr. Shirai and his ‘*ohana*. Mr. Shirai has been an advocate for the use of the traditional Hawaiian name of this *wahi pana*; through letters and education he has successfully had the site’s name changed from Devil’s Rock to its correct Hawaiian name of Mokupaoa. Mr. Shirai and his ‘*ohana* are also stewards of the Pu‘u Hekili Fishing Shrine (located in Kawaihāpai within Mokulē‘ia Beach Park) and the Hauone Fishing Shrine located in Keālia.

#### 7.4.3 Summary of Mike Dailey Interview

CSH interviewed Mr. Mike Dailey on 25 August 2016 at the The Equus Hotel in Waikīkī. Mr. Dailey was born to Fred W. Dailey and Elizabeth “Murph” Dailey, renowned hoteliers within the Waikīkī hospitality industry. The family was most recognized for their development of the Waikikian Hotel and Tahitian Lanai Restaurant. Working amongst Hawai‘i’s top entrepreneurs, developers, and investors, the Dailey ‘*Ohana* forged numerous friendships. In particular, Fred Dailey’s friendship with Walter Dillingham would prove the catalyst for the Dailey ‘*Ohana*’s move to Mokulē‘ia and the later establishment of the sport of polo in Mokulē‘ia.

Mr. Dailey shared with CSH that his ‘*ohana* moved to Mokulē‘ia in 1963, his connection to the area has been established by over 50 years of residency. Mr. Dailey stated,

I’ve been out there since 1963 – when I first moved out there. I know the ranch pretty intimately; I’ve been very involved... watching it just grow. My dad was friends with Walter Dillingham and leased the polo field from Walter. Walter wanted polo to start up again, so they made arrangements. He paid a dollar a year. It was just grounds, it wasn’t polo grounds [yet], so he had to develop it.

Due to Fred Dailey’s friendship with Walter Dillingham, in addition to Walter Dillingham’s desire for a polo revival, lands near Dillingham Ranch were designated for development, specifically the development of a polo field. Walter Dillingham sold Fred Dailey the land and soon thereafter Mr. Mike Dailey’s father eventually began building a family home there. Mr. Dailey clarified,

And then he bought his property from Walter, and put his house up there. And that’s where we lived. That’s how it all got started. It’s been a ranch. It’s one of the last, the few historical operating ranches on O‘ahu.

In regards to the ranch being one of the “few historical operating ranches on O‘ahu,” Mr. Dailey elaborated further by expressing how he believes it is an historical, as well as a cultural and environmental treasure for the people who live up there. Mr. Dailey shared with CSH that the ranch, prior to its acquisition by Benjamin Franklin Dillingham (father to Walter Dillingham), belonged to Gaspar Silva. The Silva name is known throughout Mokulē‘ia today, with the surname still used to describe specific locations throughout Waialua Moku. Mr. Dailey provided an example of how the Silva surname continues to live on:

That’s the name of the surf spot out there, it’s Silva Channels, not Silver Channels, It’s Silva Channels. That whole area was Silva Ranch. Then Ben Dillingham bought it from Silva’s in the late 1800’s, when he was building the railroad around the island. The railroad opened up the North Shore and the west side for the sugar corporations, so they had a way to get their sugar to market. So then it became Dillingham Ranch. That was the 1880s or 1890s.

Mr. Dailey continued discussing the historic value of the ranch through his descriptions of the Dillingham Estate House. According to Mr. Dailey, the estate house or the big house was a favored Dillingham family gathering place. Dillingham Ranch Big House was the families summer and holiday home. La Pietra by Kapiolani Park was the family home in town.

In the sense where the school is now -- that was their permanent home. But it was their summer vacation [home]. And it was geared for the gathering of extended families. That’s why it has the eight bedrooms with eight baths, a big room and a giant industrial kitchen, and a little house on the side...which was called the “Doll House” ... And that’s where all the kids would stay. That’s where they put all the kids, in the little house with the bunk beds... And the adults would have the eight rooms too. The Erdman’s, the Dillingham’s. And they were very into polo.

Regarding the Erdman and Dillingham families’ passion for polo, Mr. Dailey stated,

...in the heyday of polo, in the early 1900s, one of the big teams in the State was the O‘ahu Blues, which was the Dillingham Family team. And that was Walter; Benjamin Dillingham’s eldest son. Ben was the founder of the family and the Dillingham fortune. Walter was his son. He had a couple of sons, but Walter was the one who carried on all the traditions in that area. And then, Walter had three sons, that he played with, and a stable manager pro, called Joe Pedro. Joe ran the stable operation. They bred a lot of horses, and sold some of those horses, which was pretty big dollars back on the East Coast...So they had a very good breed, and they had polo there at the ranch and they played at Kapi‘olani Park, they played at the field at Moanalua, against the military, the army up at Schofield, and elsewhere...There were probably a dozen [polo] fields around O‘ahu.

Mr. Dailey elaborated that the ubiquity of polo fields (and horse stables) on O‘ahu was largely attributable to the military and their cavalry units. However, such infrastructure devoted to horse cavalry were subsequently phased out following technological advances in warfare during WWII. Mr. Dailey noted,

The Cavalry was still the horse cavalry, up until WWII, when it became mechanized cavalry. When the German Panzer tanks invaded Poland, the Polish cavalry tried to



fight them that was pretty much the death-knell of cavalry everywhere. Most cavalry operations folded up at that point.

While polo waned in the islands, cattle ranching continued. Mr. Dailey shared with CSH that “at one time [Dillingham Ranch managed] several thousand head of cattle. It extended all the way out to Ka‘ena Point.” Regarding Mokulē‘ia lands held by the Dillingham Family, Mr. Dailey shared that “the airfield was part of their property, and that [property] was expropriated right after Pearl Harbor.” Following the attack on Pearl Harbor and the military takeover of the airfield, the existing strip was constructed. Mr. Dailey shared with CSH that the military owns and operates the airfield and the land behind it. “They lease the airfield to the Department of Transportation, Airfields Division, from sunup to sundown.” He explained to CSH the current lease agreement for Dillingham Airfield:

So when, at night, the gate gets shut and it reverts to military use. They land helicopters and things like that. Yeah, they do a lot of maneuvers around that area. Which is going to be, you know, that is going to be an issue for a subdivision. Because the area next to it is a very active military training area... that whole zone from there down towards Ka‘ena Point behind the airfield.

Regarding traditional cultural practices and Hawaiian history, Mr. Dailey referred CSH to Mr. Thomas Shirai or Mr. Kimo Lyman. Mr. Dailey clarified that his area of expertise was the Dillingham Ranching era of the mid-twentieth century, wherein cattle ranching and polo were the primary practices (as popularized by Walter Dillingham and his family):

My era is just the Dillingham era and the ranching, and the horses and polo, which has always been a part of me...the polo field, it's been a big part of the community for the last almost 60 years. And before that, it was active in the 20s, 30s, & 40s. It stopped with WWII. It didn't start up again until my dad and Walter decided, “Hey let's bring polo back.” Because Polo was playing in Kapi‘olani Park up until that time. They shut the stables in Kapi‘olani Park in about 1960-61. Polo in the park stopped about the same time as we started out here. So that was the impetus. It needed another place to go.

CSH inquired if Mr. Dailey was familiar with the *paniolo* or *paniola* (cowboy) history of the ranch. Mr. Dailey remarked, “When you talk about *paniolo*, whenever you talk about ranch, it's all *paniolo*. You should talk to Roland Silva.

CSH asked Mr. Dailey to clarify the location of his family home in Mokulē‘ia. Mr. Dailey clarified for CSH that they lived on a piece of property next to the polo field. After acquiring this piece of property, as part of the arrangement with Walter Dillingham to bring back polo to O‘ahu, Mr. Dailey's father then purchased an additional piece of property just next door. On this newly acquired property, Mr. Dailey's father built the Mokulē‘ia Beach Colony in the mid-1960s, while opening the polo fields at the same time.

CSH inquired if Mr. Dailey had any concerns or recommendations regarding the current project. Mr. Dailey articulated to CSH a few of his concerns and recommendations. He recommended that future development remain low-density, and that future lots remain devoted to equestrian and/or agricultural practices:

Well, I'd like to see what the layout is. I think it's really critical to keep the number of lots down, and keep them equestrian, agricultural. It's a working ranch and it should be maintained, even if you have to put in some houses. There are ways to do it so that it remains a working ranch. Yeah, it's one of the last great working ranches in the islands. I know it has [had] its struggles and its hard times because it's been kind of ignored, and not taken care of for long periods of time.

Mr. Dailey continued by discussing the decline of cattle ranching at Dillingham Ranch. He noted that when the Japan-based Sankyo Tsusho Co. bought the ranch, they neglected the cattle:

And their attitude was raising cattle is not something they wanted to be involved with, because it was too low class. So they took the cattle off the ranch, and everything became overgrown, and when we first came back on the ranch in 2002, and 2003. We spent two years just cleaning it up, putting fences back in and restoring water lines. The water system used to go all the way up to Peacock Flats. And so there are historical water lines that follow the Nike Road... That pumped the water up to the cistern at the top, and then with gravity the water flowed all the way down to all the pastures... So they had pastures back above the airfield, they had pastures in the mountains, they had lots of pastures. They ran several thousand head of cattle. And then there was a dairy, in the area where there are some lovely rolling hills behind the airfield, it was called Buttermilk Flats. There was a dairy there, before my time, but I've seen remnants of it. And the dairy used to bring its dairy goods or products down by donkeys to the train to go to market.

Mr. Dailey also noted possible historic properties associated with historic cattle ranching and dairy farming activities may be located along Nike Road as well as *mauka* (towards the mountain) portions of the project area.

#### 7.4.4 Summary of Kawika Dowsett Interview

David "Kawika" Cartwright Dowsett, a *kama'āina* of Mokulē'ia and son of former Dillingham Ranch manager and *paniolo* James "Jamie" Alexander Dowsett and famed 'olapa (expert hula dancer) Mary Anne "Queenie" Kalanihelemaluna'ohawai'i Ventura Dowsett, has developed a connection to the *ahupua'a* (traditional land division) of Mokulē'ia through his years spent living and working on Dillingham Ranch. For years Mr. Dowsett has spent time traversing the *mauka* (inland) portions of the *ahupua'a* on both foot and horseback. On 18 August 2016, CSH interviewed Mr. Dowsett at his private residence in Mokulē'ia. CSH began the interview by inquiring of the history of Mr. Dowsett's family, and how his father came to be the manager for the whole of Dillingham Ranch.

Mr. Dowsett began by relaying his family history to CSH. He noted that he was originally born on Hawai'i Island in Honoka'a. His father, James Alexander Dowsett, had been working as a ranch manager at Parker Ranch at the time. He clarified to CSH that his parents were also long-time *kama'āina*, "Both my parents were also born here, here in Hawai'i." In describing his family's deep connections to the *pae 'āina* (archipelago), he began relating to CSH the *mo'okū'auhau* (genealogy) of his maternal line. He provided CSH with the name of his grandmother, Sophia Kalili, who was the wife to Peter Ventura (his maternal grandfather). He noted, however, that his

grandfather Peter Ventura had not been born in Hawai'i, but was in fact an émigré to the Islands. He clarified that his mother's ancestors, through his maternal grandmother, were Native Hawaiian and members of the Kalili 'Ohana; this 'ohana (family) was known to be intimately connected to Lā'ie Ahupua'a. CSH continued the discussion of genealogy with an inquiry into Mr. Dowsett's paternal ancestors. Mr. Dowsett's patrilineal descent can be traced back through the generations:

My grandmother on my dad's side was born here, and her name was Mary Anne Dowsett. My grandfather on my dad's side was also [born in the islands]. I don't know there's a little bit of gray cloud over that one . . . but, my dad ended up getting my grandmother's [sur]name 'Dowsett.' My great-grandfather, on my dad's side, his name was also James Gaka Dowsett. He was also born here in Hawai'i. His dad was named Isaac Dowsett, and he was a sea captain from Australia and a missionary. So that's how we got here. My family on my dad's side are missionary descendants; Dowsett is a family name that still resounds and has a local connection. In fact, we have a street that's named after us. My mom's side, however, are all Hawaiians. Total Hawaiian heritage. So Hawai'i is the only thing I know. I've traveled on my own around the world quite a few times, I spent about seven years traveling, living in other parts of the world. Hawai'i is my home, I don't really have another home. It's not like I'm from California or the Midwest, this is where our family comes from . . . we have long standing roots. Our family has been here a long time.

Upon the establishment of Mr. Dowsett's family history and connection to the Hawaiian Islands, CSH inquired into Mr. Dowsett's current occupation. He replied, "I am a custom home and design builder." CSH inquired if Mr. Dowsett lived and worked within Waialua. He confirmed that "he lives in the area, and near the current project area. This is my backyard." He also noted that he occasionally divides his time between Kailua, O'ahu and Waimea, Hawai'i:

I spend a lot of time on the Big Island too. My mom lives on the Big Island in Waimea. My dad passed away last year, so it's just my mom now. So I travel to Kamuela, and go visit my mom.

Although Mr. Dowsett travels between islands, he considers his home town to be Waialua and Mokulē'ia. Mr. Dowsett shared with CSH his reasoning for permanently positioning himself within Waialua District:

I spend a lot of time surfing, and that is why I live here. I've decided that my passion should be a lifestyle that I live every day, rather than something that I would hope to get to one day. I decided to figure out a way to live on the North Shore, make a good living, and utilize the extra two hours after work to jump in the ocean. Instead of drive an hour, jump in the ocean for an hour, and drive another hour. We used to do that when we were kids living in Kailua, my brother and I. We used to drive to the North Shore, go surf, drive home in the dark, and then my parents would be like, 'Where are you guys?' That was a primary reason as to why I decided to move out here. Today, I couldn't say that's the only reason. I'm older now, I don't surf huge surf like I used to, and my priorities have changed; I have six children now . .

While discussing his *'ohana* and children, CSH asked Mr. Dowsett to elaborate on his personal as well as his family's connection to the *ahupua'a* of Mokulē'ia, Kawaihāpai, and/or the North Shore area in general. Mr. Dowsett was quick to note the following:

I have to say my family is very connected to the North Shore. First of all, our family comes from Lā'ie. It's on the north side of this island; Lā'ie, Kahuku, all the way to Sunset Beach, is an area my great-grandfather on my mother's side used to fish, and they were part of the *hukilau* (fishing with a seine). You know, 'Oh we're going to the *hukilau* . . . ' [song] well the *hukilau* is in Lā'ie. My grandfather and my granduncles were all a huge part of that whole cultural practice and time period. They were also Mormon. We're a Mormon family, but some of us are practicing Mormons, and some of us are non-practicing. But, you know, we have been out here on the North Shore for ages, and we are still perpetuating and participating in Hawaiian cultural practices. These practices included fishing; as fisherman they also believed in preserving a family stone or rock that would ensure an individual had the gift of the sea. You know, one of my uncles supposedly, his name was Roland, he had the gift. He could bring in schools of fish like nobody else could. He just had that gift. . . My grandmother was the first *lei* (garland) seller in Hawai'i. She and Agnes were the first two *lei* sellers that strung and sold flower *lei* on the docks when the [SS] *Lurline* first came to Hawai'i. So that's back in the 30s and 40s. As a matter of fact, her *lei* stand still continues to exist, it's Sophie's. Sophie's at the airport. Sophia was my grandmother, and that originally was my grandmother's *lei* stand. After she passed away, the *lei* stand went to my aunty, her name was Joyce but she passed away. So now my cousin Stacy, Joyce's daughter, runs Sophie's *lei* stand. My grandmother had eight kids, my mom was the oldest of the eight kids, and of course they all learned the flower business. My grandmother was a tenacious business woman, from stringing *leis* to selling flowers, to opening flower shops in Kailua.

Upon hearing about Mr. Dowsett's mother, CSH inquired if Mr. Dowsett would share more about his mother's *hula* training:

My mom was a *hula* dancer. [She was taught by] 'Iolani Luahine . . . Aunty 'Io was my mom's teacher, and mentor. My mom was a *hula* soloist. She danced for Alfred Apaka, Don Ho, Danny Kaleikini, and Ed Kenney. She traveled and danced at the Seattle World's Fair in 1968. She was also very good friends with Uncle George Na'ope, who was father of the Merrie Monarch [Festival and *hula* competition]. She's very close friends with Nona Beamer . . . and she still performs occasionally at the age of 87. She is well-known in the *hula* community.

Mr. Dowsett continued describing his immediate *'ohana*; he shared with CSH his remembrances of his father:

My dad was a cowboy; he was a *paniolo*. So that's the connection to Mokulē'ia. He was hired by Dillingham Ranch, what the entity, or actual owners name was, I don't remember, perhaps Mr. Hong? A Korean man who managed out of a Japan-based office. But my dad was a very talented land and ranch manager. He knew a lot about the land in this area of Mokulē'ia . . . he had a real passion and interest in

ranching. He loved horses and cattle, and the *paniolo* way of life. [The then-current owners of Dillingham Ranch] hired him to manage the on-going operations of Mokulē'ia and Dillingham Ranch. He was a very talented guy, a highly decorated cowboy amongst many talented *paniolos* in this state. He was a horseman, well known by all of the cowboys here in Hawai'i. He was also a trainer, and a mentor to many. He was also a great competitor. Prior to his passing, he was interviewed and filmed for a short piece called, 'The Last of the Hawaiian Paniolo's.' It's fabulous; it's a very short piece but it focuses on how the *paniolo* lifestyle came to be, and the culture of the Hawaiian cowboy. Not just a cowboy, but a Hawaiian cowboy. This was a lifestyle that revolved around family, love, and music. Music, you know the whole slack-key music was all tied to it [*paniolo* culture]. In fact, the families of *paniolo* would live, and many still do live, on the ranches. My dad worked at the Parker Ranch when I was a young boy, we lived on the Big Island. I was born there when my dad was working at Parker Ranch. He was a ranch foreman up at Mauna Kea. That was his thing, he worked with five or six other guys, and their life consisted of waking up early in the morning, arriving at the breaking pens at Parker Ranch, and taking the youngest, newest horses (that really needed to be rode hard), and ride the wild out of them. They would ride twelve hours a day into the roughest terrain, so the horses would just get tired and stop bucking. He was a smart guy as well. He was educated at Punahou School and graduated from Oregon State. He then went on to serve in the military and fought in the Korean War in the U.S. Army. My dad had a lot of academic and real life experience.

Mr. Dowsett elaborated about his life as a child, growing up within the *paniolo* culture:

My brother and I were happy living on the Big Island. We worked all the time on the ranch. We had 300 acres of Hawaiian Homes Land because of my mom's Hawaiian ancestry. Growing up, we didn't spend time down at the park, we just went up to the ranch, no matter which ranch it was. We rode horses, and we lived the ranch life. We learned how to brand cattle, fix fences, fix water troughs, and rodeo . . . at the age of eleven, my parents moved to O'ahu. When we came to O'ahu my brother and I were happy because we were like 'we don't have to do that anymore.' But sure enough, my dad managed to find someplace to keep going, back to the fencing, back to the troughs and gates, and the whole deal! We finally weaned ourselves off and found the ocean and surfing. One day I vowed that I wasn't going to ride horses anymore, just ride surf board, a surf board doesn't kick!

As a result of his entrenchment in the cowboy lifestyle and *paniolo* culture, Mr. Dowsett developed an understanding and recognition that his father was hired by Dillingham Ranch largely in part for his *paniolo* skills, "his cultural finesse," and talent in regards to ranch and land management. Mr. Jamie Dowsett's skill in understanding and managing the ranch lands under his care was well known. His *paniolo* skills and *mana'o* of Dillingham Ranch lands were respected to such a degree that he was appealed to as a cultural consultant. Mr. Dowsett recalled that his father knew where most of the cultural sites were located. In 1987, archaeologist and cultural researcher Rudy Mitchell accompanied Mr. Jamie Dowsett on an archaeological reconnaissance of Mokulē'ia and Kawaihāpai Ahupua'a. Mr. Mitchell summarized their findings:

The party included Mr. Jamie Dowsett of Mokuleia Ranch, his granddaughter and Mr. Bob Reeves of the North Shore Neighborhood Board. Mr. Jamie Dowsett guided the reconnaissance, provided information and pointed out locations of particular sites in question.

These sites are those which are within the old Dillingham property boundary, and within the proposed development project (golf course) area which lay in the Ahupua'a of Mokuleia (my legend sites 1, 2 & 3). In the Ahupua'a of Kawaihapai (my legend sites 4, 5 & 6), the sites were crudely marked on Joyce Bath's 'Kaena Quadrangle Island of Oahu Topographic Map.' No actual site measurements were made, however, estimates as to wall heights and widths are given. Elevations are according to the topo map and the site's orientation.

Some confusion exists as to the boundary lines and site markings when compared between the topo map and 'Sites of Oahu' Bishop Museum map 1259, E.P.S. Either all of sites 1-4 are within the Mokuleia Ahupua'a, or just sites 1-3. I am using the Kawaihapai Reservoir as the boundary dividing the Ahupua'a of Mokuleia and Kawaihapai. Anyway, I stand to be corrected on this.

Photographs of sites 1-3 were taken and will be turned over to your office as soon as they are developed.

#### Ahupua'a of Mokuleia

##### SITE 1

Remnant of the wall on bluff, east ridge of gulch, at it's [*sic*] northern tip is 400 ft. in elevation. It's [*sic*] north face is 4 to 5 ft. in height. It's [*sic*] inner south face is 2 to 3 ft. in height and the wall is core filled. The whole of this area is rough and rocky, with tall growth of California grass throughout. The wall is said to have been part of an old trail exiting the gulch where a partially washed-out army road is now situated. It seems to me that this trail was constructed before the present army road was built, probably early World War II, and was improved with the present road. No recording in McAllister was found.

##### SITE 2

Large wall structure on the west ridge of gulch situated on it's [*sic*] northernmost tip is 1100 ft. in elevation. This wall is visible and very pronounced from site 1, perhaps of World War II army construction.

##### SITE 3

Possible site 191 – 'Kawailoa Heiau'. I am confused here with McAllister's orientation as placing this site in the Ahupua'a of Kawaihapai. I found this structure to be east of Kawaihapai Reservoir which is within the (my) boundary of Mokuleia.

There is a continuous wall structure 3 to 4 ft. high and 3 ft. wide, and it is core filled. The wall runs south, east and west. It is in good condition with a four-strand, barbed wire fence following the wall. Within there is what looks like remnants of

platforms situated about the center of the enclosure. This could, however, be from the action of a bulldozer piling rocks for hauling away the story line below implies.

It was difficult to delineate the structure's configuration because of the tall California grass growth. It seems that much rock work was removed [page 3] from the interior of this structure, as evidenced by an abandoned dump truck deteriorating in the brush with it's [sic] load of rocks still intact, situated in the center of the enclosure.

Two unfortunate, said to be mythical, incidences occurred here. A bulldozer was used to pile rocks together to be gathered by laborers who loaded the dump truck by hand. While the bulldozer was maneuvering the area, it's engine failed. The operator walked on the dozer tracks to check the engine and when he squatted to look, the bulldozer started and lurched forward, throwing him in front of the tractor. It continued it's [sic] forward movement, running over the operator and killing him instantly. Then the tractor's engine stalled again. There was much confusion and panic among the workers who finally managed to remove the body from the site. The tractor was also restarted and removed from the site. The foreman then ordered the truck driver to move the truck and it's [sic] load out of the site. When the driver started the truck, the engine stalled and died. The driver opened the door to step down from the cab and he fell to the ground dead. Everyone fled the site, leaving the truck and it's [sic] load there. This incidence happened about forty-seven years ago.

#### Ahupua'a of Kawaihapai

##### SITE 4

Site 192 - Hidden Waters Spring is south-east of Kawaihapai Reservoir. This spring is still producing water for the reservoir.

##### SITE 5

We did not venture beyond the reservoir area, as the California grass was too tall and very thick. Information was given by Mr. Dowsett who said that just to the southwest of the reservoir there is a fairly large wall running to the south of the reservoir. No dimensions were given. To the east of this wall, and south of the reservoir, are many rock structures scattered about. This may be the heiau site 194, called Paloaiaie, or possibly rock windbreaks for protection of crops [Mitchell 1987:1-3].

During the survey work, Mr. Jamie Dowsett and Mr. Rudy Mitchell observed a remnant of a wall (Site 1), which is said to have been part of an old trail coming out of the gulch. This site was not recorded by McAllister. The party also found a large walled structure on the west ridge of the gulch (Site 2), which is very visible from the former site. It is possibly a World War II army construction. Their survey work also resulted in the possible locating of "Kawaihoa Heiau" (Site 3). McAllister placed this site in the Ahupua'a of Kawaihāpai, but Mitchell (1987) noted that it is east of the Kawaihāpai Reservoir, and thus within the *ahupua'a* of Mokuē'ia. Mitchell (1987) described the site and its current condition. Mitchell noted the historic property remained in good condition, however, it was difficult to ascertain its dimensions due to the overgrowth of vegetation.

Mitchell (1987) also noted the site appeared to be disturbed, with basalt stone work removed from portions of the observed feature. Mitchell (1987) commented that disturbance was evidenced by the presence of a dump truck in the center of the enclosure. Mr. Jamie Dowsett also pointed out many scattered rock structures believed to either be the *heiau* (temple) named Paloaiae (Site 194) or rock windbreaks associated with historic farming of the area.

Mr. Kawika Dowsett has inherited some of his father's *'ike* (insight) regarding the lands of Mokulē'ia and Kawaihāpai, however, he has also acquired knowledge of the area through his own ground inspections of the area. He added that he rides up into Peacock Flats about four times a week, commenting that he spends "a lot" of time within the Wai'anae Mountains and the Mokulē'ia Forest Reserve. He also noted he has observed low walls in the *mauka* portions of Mokulē'ia Ahupua'a and believes they most likely marked the limits of individual *kuleana* parcels. When presented with maps of the project area Mr. Dowsett commented, "I know this land pretty well." Utilizing the maps, Mr. Dowsett proceeded to explain to CSH the land use and land ownership history for the area. In particular, Mr. Dowsett discussed Peacock Flats Road (also a trail). This road cuts across the *mauka* lands of Mokulē'ia Ahupua'a. He commented that this trail is his "favorite part" of the Wai'anae Moku landscape, the trail is the "most incredible bike ride or hike." He noted that the road is owned by the State, however, that had not always been the case. He elaborated further, recalling how his father, Jamie Dowsett, had negotiated a deal that involved the exchange of 40 acres of State-owned land for Peacock Flats Road:

. . . when he worked for Dillingham Ranch, he worked with the Department of Land and Natural Resources and the owner of this property to create and trade the ownership of this road, which once belonged to Mokulē'ia Ranch, to the State in exchange for 40 acres that were land locked and State owned. The State gave the ranch the land because the State really wanted the access to the top of the mountain; in return for the land, the ranch gave the State the road. The State has made it a public road, they don't allow vehicles, cars and trucks. Only the State registered vehicles can go up that road. But everybody is welcome to hike, walk, bike. It's pretty fabulous. I love it. It's a great recreational facility, it's beautiful!

Mr. Dowsett noted that his father worked at Dillingham Ranch until "ownership had changed hands;" Mr. Jamie Dowsett, during his years spent at the ranch, had made significant changes to the landscape. Mr. Jamie Dowsett's legacy remains visible within the current Dillingham Ranch landscape:

They brought in new management and started changing the direction . . . my dad and his crew, under the direction of the Japanese owners at the time, planted all the coconut trees. That grove you see when you drive in, left and right, was planted by my dad and his crew. [John] 'Jr.' Primacio, he's from Kahuku, who worked for Campbell Estate under the direction of Fred Trotter, was my dad's friend. Jr. was the guy who helped direct the actual planting of all the coconut trees with my dad . . . they were planning, at the time, the hopes were, and it was more than just hopes they were actually working on a development plan. Gray Hong Bills was working on a development plan to build a hotel and a golf course. They were going to use the coconut trees on the golf course. That was the plan, and then of course they were anticipating being able to build something similar to what you have here



[referring to current Dillingham Ranch Agricultural Subdivision project description within CSH's community consultation letter] around the golf course, like 'Ewa, like Hoakalei, except it would have been less density. So it was going to be two- and five-acre parcels around the golf course. The golf course was going to have an equestrian element to it, with horse trails for riding. They were going to build a hotel, a Maui, Ka'anapali-style beach hotel down at Lapakū ('excessively active'). So they wanted to build the hotel right there, on this parcel right there . . . and the golf course was going to be right here where all the red is [referring to the current Dillingham Ranch Agricultural Subdivision project area]. Because this is low land, and once you get up here [*mauka*] it all starts to go vertical. I've seen quite a few of these plans come and go.

Mr. Dowsett added, while discussing the parcel known as Lapakū (located *makai* of the current Dillingham Ranch Agricultural Subdivision project area), that he has gone diving and fishing in the area. Mr. Dowsett continued to discuss the history of planned development in the area, while sharing his *mana'o* on the current project: "This is at least the third or fourth one [development plan] I've seen . . . and I've stood up and testified at some of the local meetings to support a lower density type project. I like this project. I support this project."

While Mr. Dowsett stated that he supported the project, he iterated a few recommendations for project developers to take into account. Of utmost concern to Mr. Dowsett is the way in which the developer will "give back to the community," or practice generosity. In a discussion of traditional Hawaiian beliefs, Chun (2011) notes that,

. . . [i]n practicing generosity by contributing the products of their skill or knowledge, and by teaching the next generation, all the important individual values like compassion, patience, humbleness, and so on are brought into the process [Chun 2011:xxvii].

Indeed, the practice of generosity and its connection to the uplifting of an entire community is discussed by Samuel Kamakau, a native son of Mokulē'ia:

[Ka'ahumanu's] mind ran in the same channels with those of the old counselors who had passed on before her. Whenever a member of family obtained land, whether a district, an ahupua'a, or some smaller division, the whole family were informed of it, and the property divided among them all. Each member worked for the good of the others and they thus learned to love each other. The home of one was the home of all, and they were all well acquainted with each other, as was common with the chiefs of old. This accounts for their devotion to each other. [...] This working for the common good of the family was a fine practice which it would be well for our people today to emulate. [Kamakau 1992:314 in Chun 2011:5]

In discussing concerns and recommendations with CSH, Mr. Dowsett elaborated further, making clear that the developer should work to upgrade local existing infrastructure (thus improving community safety and health while responsibly accounting for the evolving carrying capacity of the area), keep the project a "green" one, invest in the "farm to table" community, while keeping alive and honoring traditional Hawaiian values and culture. Mr. Dowsett believes if these suggestions are taken into account, it will allow for a project that is *pono* (proper):

However, I think there needs to be more diversity in its development concept. Not just equestrian, it needs to have an ocean going element to it as well. This community is connected to the ocean, not just the horses. The community is made up of ocean-going people. Of these people there are fisherman, surfers, windsurfers, kite surfers, stand up paddlers, divers, and canoe paddlers. All of whom are tremendously devoted to the ocean and that way of life. In order to garner support from the community, the developer must appeal to all of these different groups of ocean-going people. There has to be some sort of benefit, every group needs to see some sort of benefit. The opposition is going to state that this is just some gentleman's development for the rich, servicing the polo clientele, and those that have that kind of money, because that takes serious money to have four horses, you know, you jump on one each quarter or each chucker, whatever it is, and of course to stall them and trailer them. Vet bills and feed bills, it's just huge, big money. I don't think the long-time residents here, that have the local mindset, are going to support that. But my friends who have also owned property around here, who think this is an opportunity to stay like this.

CSH inquired if he meant that area residents would like to see Mokulē'ia and Kawaihāpai Ahupua'a remain relatively undeveloped, or colloquially "keep it country." Mr. Dowsett clarified for CSH, "Country, but like Maui upcountry. Like Kula, like Olinda, like Makawao. So you have to let it happen otherwise later on they are going to subdivide the land even smaller." Mr. Dowsett continued discussing his vision for the development to be more comprehensive, addressing a "larger group of special interests," and supporting the community at large:

My concerns are the road. If they are going to continue this project, the road out here, Farrington Highway needs work. I'm concerned about the telephone poles down Farrington Highway, and the proximity of some of them to the actual road itself. It's super dangerous. There's going to be people running into those poles when you have more people out here. That's life. What can be done? I don't know. Should the developer, should they carry the burden of burying the lines underground and putting them underground? I don't know, I don't know if it's fair to them, because we all have power out here right now, and this developer didn't have to do that, so why should they? But at the same time, it's normal for developers to have to give back to the community in order to get approvals. I would, I think the things they need to give back is, one of them is that they have to address the road. The road needs to be widened, there needs to be a bike path down here, to that area. Currently, the bike path ends right at the beginning of Crozier Drive . . . but the bike path needs to continue down Farrington Highway. This would allow people to safely commute, because there's tons of runners and bikers riding down that road that are getting passed at 60 mph. That is not safe. So together with the City and County, as they work through their application processes for approvals, I would like to see the givebacks of a safe and viable bike path and walking path from Waialua High School all the way down to Waialua Rec Center. Now that would be a collaborative effort with the City and County. But to get those approvals done and get them on the plan is important. Because if we're talking about doing a community that is a farm to table type of community, then they must have that too.

Members of that community should be able to walk or bike to town, what kind of farm to table community only drives their BMWs? . . . Let's be complete about it. Let's truly make it right, make it so you can jump on your bike and ride all the way to Hale'iwa with your little cart of goodies to take to the Farmer's Market.

Regarding the "farm to table" community, Mr. Dowsett suggested that such an agricultural community be supported and invested in by means of an agricultural center. He explained,

Because the development is looking to have a farm to table sort of lifestyle, what they're promoting is a farm to table environment. It would be really good if there was a center there for ag. For ag development, for ag research also, so we can continue to be, and they can continue to be a viable part of this community. In turn, this would contribute to maintaining a green outlook for this community.

In keeping the development "green," specifically maintaining the environmental well-being of both Mokulē'ia and Kawaihāpai Ahupua'a, Mr. Dowsett suggested a well-thought out sanitation system be put in place to support the proposed development:

The developer needs to provide some sort of well thought out sanitation system or wastewater treatment facility. I build IWS systems. Those are individual wastewater systems. I think they could work just fine up there so long as the method and engineering that is done for each one is done responsibly and with qualified civil engineers. You could also mandate that you only have a central system. I don't know what they're proposing right now but the alternatives are either, establish a well-defined set of specifications outlining how each individual waste water system is designed. These specifications would help prevent potential adverse impacts to the water table and our coastline. Or secondly, mandate a central system that is well-designed, and placed in an area where it will not have a gigantic impact on this community.

Mr. Dowsett continued the discussion by turning to his concerns regarding the preservation and perpetuation of Hawaiian culture and history within Mokulē'ia and Kawaihāpai Ahupua'a:

My next recommendation is to create an outreach facility. This facility is the owner's connection to this community, and also a place to hold events, similar in design to Lanikuhonua at Ko Olina. Something where it's just beautiful. The people can go, it's not really developed, and you and I could just like have a big party there . . . and yeah it's privately owned but it can be used by the public through a private arrangement.

Mr. Dowsett referenced the James Campbell Company-owned Lanikuhonua as an example of a community center grounded in Hawaiian history and culture. Mr. Dowsett suggested a similar center be constructed as part of the current Dillingham Ranch Agricultural Subdivision project. This center would similarly be dedicated to the preservation and promotion of Hawaiian culture, in many ways mirroring Lanikuhonua's own cultural initiatives:

Lanikuhonua is the gorgeous beachfront property at Ko Olina, which the James Campbell Company dedicated to the preservation and promotion of the Hawaiian culture through the Lanikuhonua Cultural Institute. For over a decade, the Institute

has sponsored Hawaiian studies classes for area elementary school students. In recent years, Lanikuhonua expanded its programs to include Lei O Lanikuhonua Hula Festival and the Lauhoe O Lanikuhonua Canoe Festival, both annual events targeted at high school students. It also launched the Mele & Hula at Lanikuhonua summer concert series, featuring island music and dance. [Lanikuhonua n.d.]

Regarding the preservation and perpetuation of culture, Mr. Dowsett elaborated further:

[The development should be] honoring its history. Beautifying it with today's standards, and maintaining it. You just can't build it and let it fall apart, let the homeless people move in. We've had problems with that. The Army Beach Park down here was once completely overrun with homeless people . . . but it needs to be maintained.

The beauty of the natural landscape, and access to these natural areas was an additional issue raised by Mr. Dowsett. Mr. Dowsett was particularly concerned about access to Peacock Flats. He noted that access to the area should not be restricted, "I know it's owned by the State, and maybe it's a non-issue, but that needs to remain open to the public. At no time can these guys close it off." In discussing the environment and its relationship to Hawaiian culture within the context of the proposed agricultural subdivision development, Mr. Dowsett concluded with the following:

Culturally, there is a responsibility to maintain the Hawaiian culture and honor the old. Equally, you have the *haole* (foreigner) side of science, which would be a research center primarily directed towards ag and sustainability. Lastly and foremost, the entire development should be developed in a green manner . . . with a sustainable methodology. Solar, PV, if they're going to use wind, however, it has to be done in a place where it's non-visual. But hugely, PV, all facilities out there have to be designed, and should be designed and engineered to be net zero buildings . . . to create a community out there that is a model community, honoring the cultural connection, our local families and the *'ohana*, bridging it, and staying connected to the community. Science should also be encouraged. Mokolē'ia, next to Mauna Kea is one of the best viewing spots for the night sky. So continue to keep those things alive, those important things about what Mokolē'ia is. There are a lot of families that live in Waialua and Hale'iwa that use Mokolē'ia for recreation. There are also a few families that really claim at one time their ancestors lived there, we're talking about in the *ahupua'a*. Traditionally, at one time, it was a golden community. But not many of the people still exist in the community, there's a few . . . from an archaeological side, regarding the *iwi* (ancestors), it was an actual burial site, so that for sure would have to have [archaeological monitoring]. There's no doubt you're going to run into some *iwi*. [In the event a burial is encountered] that [burial] needs to be honored, and honored in a way with delight from the developer. That should be one of the first things that they go, 'OK we're gonna set aside this project right now, and we're going to talk to the families and the local people, and get them together, and we want to do an honorable thing here.' Set up a nice parcel, it doesn't matter where it is, you give the families what they want.

Both CSH and Mr. Dowsett concluded the interview with additional discussion of Mr. Jamie Dowsett. Mr. Dowsett and CSH watched a mini documentary entitled, *The Last of the Hawaiian Cowboys* by Julia Cumes (2013). CSH took particular note of Mr. Jamie Dowsett's words:

Most cowboys will always be cowboys, even though they're driving a tractor or taxi or something now because of the changes and hard times. But they'll always have a horse in their backyard for as long as they can or even a few cows, it's just you know, like it is in myself, I'm 85 years old I still think cows and horses are the best things to ever have walked on the earth. I would give anything if I could still be a cowboy, being out there on the land, nobody bothers you out in the open where it's quiet. Cows don't talk to you, the horses are giving you a wonderful ride out in the beautiful country side. And that is a feeling not many people have the opportunity to experience. [Cumes 2013]

Upon hearing his father's words, Mr. Dowsett was inspired to share additional comments regarding *paniolo* culture. He noted that Dillingham Ranch looks somewhat in disrepair, and he understands that the ranch may need to diversify its operations, but Hawaiian *paniolo* history, traditions, and culture should be preserved and perpetuated at Dillingham Ranch.

#### 7.4.5 Summary of Jan Becket Interview

Jan Becket, a retired Kamehameha Schools teacher, is a specialist with knowledge of cultural sites throughout the island of O'ahu. As a photographer and author, Mr. Becket is well-recognized for his black-and-white photographic documentation of sacred sites. He has conducted extensive archival research on sites of cultural significance, learned from *kūpuna* (elders), and photographed many undocumented sites on O'ahu, which resulted in a co-written book, *Pana O'ahu* (Becket and Singer 1999). He is a member of the Committee for the Preservation of Historic Sites and Properties under the O'ahu Council of Hawaiian Civic Clubs, and reports back to the chair of the committee (Shad Kāne) on issues concerning cultural sites in the Kona district of O'ahu.

On 9 November 2016, Mr. Becket led CSH on a *huaka'i* to locate Kawailoa Heiau within the *ahupua'a* (traditional land division) of Kawaihāpai. During the *huaka'i*, CSH and Mr. Becket also crossed through the *ahupua'a* of Mokulē'ia. The *huaka'i* included a vehicular inspection along a portion of the length of Farrington Highway and also included a pedestrian inspection of the *mauka* areas of Kawaihāpai Ahupua'a, southeast of the Keālia Trail Head and south of the Dillingham Airfield. Before setting out on the *huaka'i*, CSH contacted Mr. Thomas Shirai, a lineal and cultural descendant of Mokulē'ia and Kawaihāpai Ahupua'a (Waiialua Moku) and *kia'i* (guardian) of cultural sites throughout both *ahupua'a*, for permission to visit and photograph cultural sites. Mr. Shirai commented that he would be unable to accompany CSH and Mr. Becket on a *huaka'i*, and clarified that only one CSH researcher was permitted to accompany Mr. Becket to the site. Where applicable, photographic documentation of potential cultural sites also occurred.

On 9 November 2016, CSH met Mr. Becket at Kailua Recreational Park and then began traveling by motor vehicle along Kamehameha Highway, through multiple *ahupua'a*, until reaching Kawaihāpai Ahupua'a. Within Kawaihāpai Ahupua'a, Mr. Becket and CSH began a visual inspection of the Wai'anae Mountain Range, attempting to locate a trail linking the *makai* portions of Kawaihāpai Ahupua'a with the *mauka* portions of Kawaihāpai Ahupua'a. While traversing a partially asphalted path, both CSH and Mr. Becket met with members of the U.S.

Army who granted permission for CSH and Mr. Becket to continue the *huaka'i* to locate the *wahi pana* known as Kawailoa Heiau. Within Kawaihāpai Ahupua'a, between the coast and Wai'anae Mountain Range, sits the Dillingham Airfield. The airfield and associated Dillingham Military Reservation occupies nearly 550 acres immediately northwest of Dillingham Ranch Property, and the Dillingham Ranch Agricultural Subdivision Project Area. In a site report of the military reservation, John D. Bennett (2008) discusses the history of military activity within the area:

The land tract formerly known as Mokuleia Military Reservation, now known as the Dillingham Military Reservation presently encompasses 550 acres of leased land. The tract included the former Mokuleia Army Airfield built during World War II that became known as Dillingham Army Airfield and in 1947 Dillingham Air Force Base, currently as Dillingham Airfield. The reservation saw extensive construction during the war, including building, lengthening and paving of the runway, which gave it the distinction of being the longest paved runway built on Oahu at the time, and construction of infrastructures that included support facilities and civil works.

World War II emergency coast artillery gun batteries were emplaced nearby to provide airfield defenses and against enemy landings at Mokuleia, and in the neighboring Kaena Ahupua'a. Other defenses constructed during the war included emplacements for antiaircraft artillery (37 and 40 mm automatic weapons) and .50 caliber and .30 caliber machine guns, as well as beach and airfield defense positions. Units of Infantry occupied beach defenses as well as trail blocking defenses in the regions above the airfield.

The Army Signal Corps laid communications lines, and engineers built civil engineering works such as sewage lines, a 100,000 gallon water storage tank and water mains to accommodate the airfield and other base camps located in the area. Electrical power was supplied commercially.

The former Oahu Railway and Land Company narrow-gauge (36'-0") mainline ran past the reservation from Honolulu to Kahuku with a station located at Kawaihāpai near the reservation, which provided an additional means of transporting supplies and personnel needed to maintain the defenses of the north shore.

The reservation is presently utilized by the 25th Infantry Division (Light) based at Schofield Barracks, Wahiawa, and supporting helicopter units based at nearby Wheeler Army Airfield; Marine Corps troops and helicopters based at Marine Corps Base, Hawaii, Kaneohe Bay occasionally make use of the military reservation.

The State of Hawaii has been granted a license to operate the airfield on days the military is not conducting maneuvers. Small Clircraft, glider and parachute businesses are conducted at the airfield.

The majority of World War II-era constructions have been demolished, as they were temporary structures, except for the runways and aircraft revetments. The old control tower was dismantled with only cement foundations and slabs extant. A few

auxiliary World War II structures remain outside of the reservation on the fringes of Mokuleia Beach. [Bennett 2008:12-13]

Dillingham Airfield is generally considered a civilian airfield utilized “mainly for recreation, such as glider soaring, hang-gliding, parachuting, and sky jumping. No major facility improvements are planned” (Global Security 2011), although it has been additionally noted that,

[...] the FAA is pursuing an initiative for the implementation of joint-use military airfields and/or adaptation of former military facilities to civilian use for capacity enhancement to the overall aviation system. The joint-use facilities at Dillingham Army Airfield, Hawaii [...] have provided congestion relief to the airports at Honolulu [...]. [Global Security 2011]

Kawailoa Heiau is situated *mauka* of the airfield, at the base of the Wai‘anae Mountain Range. The *wahi pana* or *wahi kapu* (sacred site) of Kawailoa Heiau is known to be imbued with *mana* due to the “presence of the gods, the *akua*, and the ancestral guardian spirits, the ‘*aumakua*’ within that sacred space (McGregor 1996:22). Mr. Becket shared one particular *mo‘olelo*, describing how he had visited Kawailoa Heiau many years ago with a young man, a *malihini* (recent newcomer to the islands), who was interested in *wahi kapu* such as *heiau*. The man, through previous research, had located the site and asked if Mr. Becket would accompany him on a site visit. Following the site visit, the young man contacted Mr. Becket again, stating that he believed something had followed him home. According to the young man, he occasionally saw the apparition or shadow of a large figure “from the corner of his eye.” Mr. Becket elaborated further, stating that he then advised the young man that he should refrain from visiting such sacred sites in the future.

As CSH and Mr. Becket continued traveling southeast, along the base of the Wai‘anae Mountain Range and along the northwest facing boundary of Dillingham Ranch owned-property, numerous structures of varying condition and significance were observed. Mr. Becket commented on the historic nature of some of the features, and eluded to the possibility of the features being associated with previous ranching activity. Mr. Becket also suggested that the area may possibly be associated with a historic road or path once utilized by *paniolo* to drive cattle to market. Additionally, he noted that the features were not associated with, or in close proximity to Kawailoa Heiau. CSH and Mr. Becket continued the *huaka‘i*, traversing by foot in a southeasterly direction until reaching a small rise. Upon climbing the sloping face of the rise, Mr. Becket identified the outer limits of Kawailoa Heiau and its associated terraces. Based on field observations and previous written descriptions of the site by J.G. McAllister, Mr. Becket confirmed the site to be Kawailoa Heiau. J. G. McAllister provided the first written description of the Kawailoa Heiau in 1933:

Site 191. Only a portion of two terraces remains. The upper terrace is 66 feet long and 4 feet high, and is excellently paved with small stones a few inches in size. The southwest limits can not be discerned. On the east end is a wall 1.5 feet high which can be followed for about 10 feet. The lower terrace was 25 feet wide with a facing 2 feet high, which can only be traced a short distance. The houses (*kahua hale*) in which the *kahunas* lived were known as ‘Paweo,’ according to Hookala. This is undoubtedly the site referred to by Thrum as Paweu, ‘A small heiau 58 by 65 feet at the base of the hill; badly damaged by freshets.’ [Sterling and Summers 1978:99-100]

Mr. Becket commented on the remarkably good condition of the site. Despite the condition of the site, it was difficult to determine a specific *heiau* type. The presence of the terraces may be indicative of either a terraced *heiau* or a composite *heiau*. A terraced *heiau* is described as

...an open court without boundary walls. The court was level, paved with dirt, sand or flat stones. Most terraced *heiau* were built on sloping ground, so the court had to be built up to make it level. To enlarge the terrace, it was easier to build a succession of terraces rather than do extensive excavation. Some *heiau* had as many as four terraces. Commonly the smallest terrace was on the top with the being larger. Steps were usually found between the various 3 levels. [Neller 1989:8]

A composite *heiau* is described as an admixture of a walled and terraced *heiau*. A walled *heiau* varied from a terraced *heiau* in that the court or *kahua* was enclosed by either a *pā pōhaku* (stone wall) or *pā lā'au* (wooden fence) (Neller 1989:8). Mr. Becket made note of a prominent *pōhaku* jutting north towards the sea (Figure 50), and an upright stone located near the southwest corner of the uppermost terraces (Figure 51). The *heiau* would have once commanded a view of the northwest coastline and the ocean; indeed, the ocean, both visually and aurally, gave constant reminders of its presence. The pounding of the ocean waves could occasionally be heard within Kawaihāpai-uka.

The *pōhaku*, such as those observed and noted by Mr. Becket, serve as a powerful symbol, especially within a site constructed to function in service of the *akua* (gods) (Figure 52 through Figure 54). According to Pukui, Haertig, and Lee,

Stones, all but indestructible, yet often small enough to own and handle, were rich in symbolism. In pre-Christian belief, a stone could be “the stone of *Kāne*.” This was a kind of “altar stone” around which men of the family prayed and made offerings to the gods. How to find such a stone? Often a dream directed one. Stones might contain the *mana* (supernatural or divine power) of a god or spirit...Stones were sometimes personified. Many Hawaiians have told of stones that were male and female; that mated and had little stones. They took on personalities and had quirks and preferences. [Pukui et al. 1972:179]

CSH noted an approximately 1-1.5-meter-high wall oriented east to west (Figure 55). The dry stacked basalt stone wall was located in the southwest portion of the Kawailoa Heiau complex. During previous consultation with Mr. Becket, he has noted that the presence of branch coral at a structure might indicate a ceremonial function or a burial, however, upon inspection of the site, no branch coral was observed. However, CSH and Mr. Becket did note the presence of *kī* and *kukui* (*Aleurites moluccana*) along the southern boundary of the uppermost terrace (Figure 56). The presence of *kī* has been known to announce a *kapu*, while *kukui* is known to be a *kinolau* (embodiment) of Lono. In addition to the aforementioned plants, CSH also observed *hau* (*Hibiscus tiliaceus*) and *laua'e* (*Phymatosorus grossus*) (Figure 57). *Hau* was utilized as cordage, for the spars of outriggers, and as floats for fishing nets; Emerson also notes its appearance upon *hula* (dance) *kuahu* (altars) (Emerson 1965:20). *Hau* was also noted as a *kinolau* of Lupea, the sister of Hina. *Laua'e* is also utilized for *hula kuahu*, and as *hula* adornment (Pukui 1942).

CSH commented on the presence of numerous loose boulders and inquired as to why there also appeared to be terracing surrounding the *heiau* itself (Figure 58 and Figure 59). Mr. Becket





Figure 50. Kawailoa Heiau with prominent *pōhaku* visible in middle ground and jutting *makai*, view to northeast (Photograph provided by Mr. Jan Beckett)



Figure 51. Upright stone or *pōhaku* located in the southwest corner of Kawailoa Heiau, view to southwest (Photograph provided by Mr. Jan Becket)



Figure 52. Panoramic view of lower terrace of Kawailoa Heiau, view to northeast



Figure 53. General view of prominent *pōhaku* jutting *makai*, view to north



Figure 54. General view of upright stone or *pōhaku*, view to southwest



Figure 55. General view of approximately 1-1.5-m high wall running east to west, view to south



Figure 56. *Kī* and *kukui* along the southern boundary of the uppermost terrace, view to south



Figure 57. General view of *laua'e* within uppermost terrace, view to south

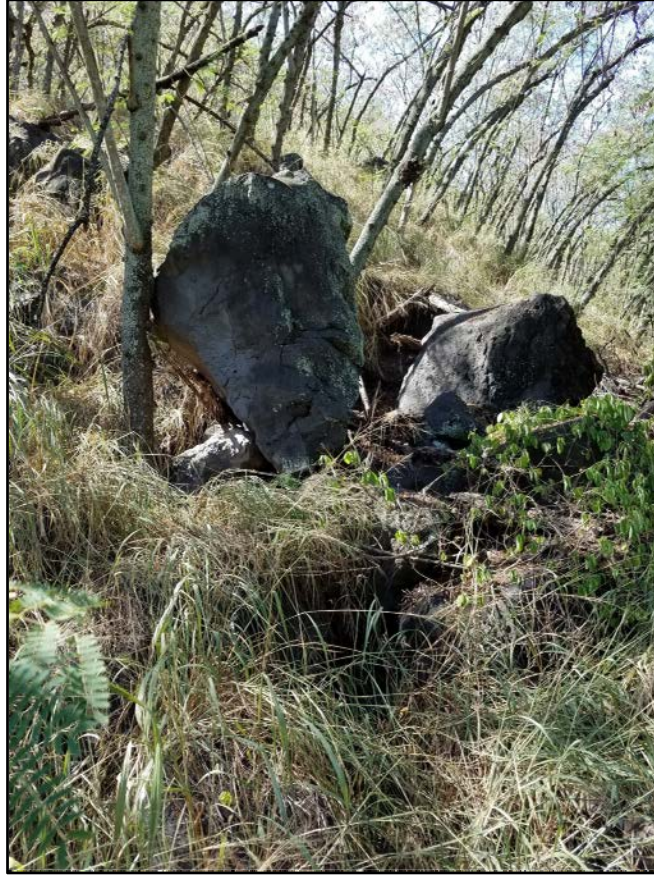


Figure 58. General overview of rock falls within Kawaihāpai-*uka*



Figure 59. General overview of terracing surrounding Kawaihoa Heiau, view to southwest

suggested the terracing was perhaps reflective of traditional Hawaiian engineering and a type of rock fall mitigation. He noted that the area, from Mokulē'ia to Ka'ena, is also known for rock falls.

Additionally, *mauka* of Kawaioloa Heiau, McAllister describes Site 192 known as “Hidden Waters.” This site is associated with Hi'iakaikapoliopole and in fact describes the four hidden waters, Ulunui, Kohe'iki, Ulehulu, and Waiaka'aiea, which were called forth by the goddess after she was “refused water by the old inhabitants” (McAllister 1933:129). In her chant, Hi'iaka offers the following:

<i>I kihe ia e ke kai o Wawalu,</i>	Besprayed by the sea of Wawalu,
<i>Na owaewae pali o Unu-lau</i>	Forefront Unulau's gullied cliffs.
<i>Inu aku I ka wai o Kohe'iki i ka pali-</i>	I drink of the water distilled
<i>I ka pali I ka wai,</i>	By the dripping <i>pali</i> walls,
<i>Kau pu me ka laau.</i>	Led forth in a hollowed log.
<i>Hoole ke kupa, junā I ka wai</i>	The rustic [native] denies it and hides it:
<i>Ehā ka muliwai, wai o Ka'ena</i>	Four water-streams has Ka'ena.

[Alameida 2003:79-80].

Additional sites have been noted *makai* of Kawaioloa Heiau; in particular, the Kuakea fishing shrine or *ko'a* was once located “on the beach in a direct line with Kawaioloa Heiau” (McAllister 1933:129). Historic written sources have indicated an archaeologically rich landscape. Field observations from the *huaka'i* with Mr. Becket also corroborated historic texts.

Mr. Becket expressed a concern regarding accessibility to cultural sites. Mr. Becket recommended that cultural sites throughout Mokulē'ia and Kawaihāpai Ahupua'a remain open and accessible to descendants. By maintaining accessibility to culturally significant sites, Mr. Becket hopes that the preservation and perpetuation of these *wahi pana* can continue with future generations of *kupa'ai au*. Mr. Becket recommended periodic checks of sites in an effort to combat potential degradation and deterioration.

## 7.5 Summary of *Kama'āina* Interviews

CSH interviewed Levi Rita, a *paniolo* and current Livestock Manager for Dillingham Ranch; Thomas Shirai, Jr., a lineal and cultural descendant for both Mokulē'ia and Kawaihāpai Ahupua'a, as well as *kia'i* of numerous *wahi pana* throughout Waialua Moku; Mike Dailey, a *kama'āina* of Mokulē'ia whose father Fred Dailey revived the sport of polo in Mokulē'ia at the behest of Walter Dillingham; Kawika Dowsett, a *kama'āina* of Mokulē'ia and son of former Dillingham Ranch manager and *paniolo* James “Jamie” Alexander Dowsett; and Jan Becket a retired Kamehameha Schools teacher who is a specialist with knowledge of cultural sites throughout the island of O'ahu.

Mr. Rita provided CSH with a brief history of Dillingham Ranch, noting that the ranch followed Parker Ranch's successful model. Mr. Rita led CSH on a site visit to the historic standing buildings located within the project area. Amongst these buildings, CSH was given a tour of Dillingham Lodge or the “Big House.” Mr. Rita also discussed the visits of *ali'i* to the area:



[the ranch was one of the] very few places that the king and queen ever did come . . . they gave horses, they gave a stud horse, and that's what really made them [the ranch] famous. So they had the stud horse there, and everybody came to play polo.

Although, King Kalakaua was an ardent supporter of horse and polo culture, it was in fact *paniolo* culture that worked to solidify the popularity of the sport (and general equestrian skill) during the early nineteenth century. Mr. Rita himself is both a *paniolo* and polo player. As a *paniolo* at Dillingham Ranch, Mr. Rita is responsible for nearly 130 head of cattle. Mr. Rita also noted that portions of conservation land in the *mauka* portion of Mokulē'ia Ahupua'a are designated as a public hunting area per HAR §13-123-15(4).

Mr. Shirai, a cultural and lineal descendant of both Mokulē'ia and Kawaihāpai Ahupua'a, was born to Thomas Shirai, Sr. and Laverna Keao. Through his matrilineal line, Mr. Shirai has established long-standing connections to the *ahupua'a* of Mokulē'ia and Kawaihāpai, and Waialua Moku at large. Mr. Shirai is also the *kama kahi*; he has gathered and retained traditional knowledge and values from his *kūpuna*, particularly from his grandfather Mr. David Peahi Keao Jr. Mr. Shirai explained that as a child he spent weekends and holidays with his maternal grandparents in the *ahupua'a* of Kawaihāpai and Mokulē'ia, Waialua Moku. Due to his time spent learning with his maternal grandparents, Mr. Shirai has inherited the responsibilities of the *punahēle*. As the *punahēle*, Mr. Shirai is the "spring" from which tradition may continue to flow (Pukui et al. 1972:40). By placing primacy upon cultural traditions and values, Mr. Shirai's *kūpuna* in fact laid the foundation for his career in Hawaiian music and involvement with numerous Native Hawaiian organizations dedicated to the protection and preservation of Native Hawaiian history and culture.

As a direct descendant of Olopana and *kupa* of Mokulē'ia and Kawaihāpai Ahupua'a, Mr. Shirai maintains knowledge of many *wahi pana*. As *kupa*, Mr. Shirai also possesses "personal and lasting relationships" with the people of Waialua and the "*mo'olelo* (story) of that place, both ancient and modern" (Lopes 2016:33). In particular, Mr. Shirai shared with CSH the *mo'olelo* associated with the *mele* known as "Kalena Kai." Mr. Shirai noted that the area is reknowned for its richness, citing verses from the *mele* "Kalena Kai" as proof of the area being *'āina momona*. He uttered the verse *ka moena pāwehe o Mokulē'ia*, explaining to CSH that the verse references the *ahupua'a*'s numerous fertile fields. The numerous fields with their varying shades of green resembled the crosshatch pattern of a *lauhala* mat. During discussion of the area's fecundity, Mr. Shirai noted the traditional name for Peacock Flats. He clarified that Peacock Flats is in fact the area known as Kama'i:

. . . there's an *ahupua'a* called Kawaihāpai, I'm sure you're familiar with that, you've seen the Pukui definition that is 'lifted waters,' but the thing about there, from an academic point, to people from that place, they missed the mark on the meaning of the place. . . you break it apart, *hāpai* in Hawaiian . . . *hāpai* is carry. But they could only see us physically, manually carrying objects, or stuff like that. *Hāpai* means blessed. Given the word inside there has *wai*. Blessed water, that's what it means. And when you read, when you read that, that's why there's a lot of farmland. When you read everything in it, the history of the place, revolves around that mountain. The *hāpai*, the *ka ma'i*, it's the menstrual cycle of women. There's a gulch further up that's called Waiū, that's [translated] as breasts. So when you go traveling there's Mount Ka'ala, and Mount Ka'ala is the pregnant part. There's another mountain that shows the breasts, another mountain shows the head, and the

body parts form towards Mokolē'ia and Kaena Point. Yeah and that's giving that water, menstrual cycle, that's why you see all waters, all the streams, and underneath there's the aquifer. It's extremely significant.

The land, as described above, reflects a cycle of fertility and abundance; Mr. Shirai's *mo'olelo* pays homage not only to a woman's ability to be a life giver and sustainer, but also of the land's ability to give and sustain life as well. Both the female cycle and the land itself are understood as being similarly connected to creation. In regards to the sustenance of life, Mr. Shirai also noted that both Mokolē'ia and Kawaihāpai Ahupua'a were perfectly suited to the practice of *lā'au lapa'au*. The area was known for its *noni* and *wauke* as evidenced within LCAs: "Mokolē'ia is a documented area that had medicinal plants. Especially Noni featured in the LCA's (www.waihona.com)." Mr. Shirai also noted that stone mortars associated with *lā'au lapa'au* were recovered within Mokolē'ia Ahupua'a. Mr. Shirai also added that these mortars are evidence of traditional *lā'au lapa'au* practice occurring within the area, thus inspiring the Laau Paina street name.

Mr. Shirai also discussed his ancestors, who were both *lawai'a* and *mahi'ai* within Mokolē'ia and Kawaihāpai Ahupua'a. As his *kulāiwi* (land of his ancestors), Mr. Shirai has "found documentation that this project may encounter and disturb several *iwi kupuna* documented and were buried in Mokolē'ia Ahupua'a which potentially [may] be within the geographical perimeters of this project." Mr. Shirai also made the request to be the cultural monitor should any *iwi kūpuna* or cultural material be inadvertently discovered during ground work. Mr. Shirai also expressed concerns regarding the abuse or exploitation of *wahi pana* (via social media), and added that access to these sites should remain restricted. Mr. Shirai is *kia'i* of numerous *wahi pana* such as Kawailoa Heiau, Mokupaoa (a personal fishing *ko'a* for Mr. Shirai and his 'ohana), Pu'u Hekili Fishing Shrine, and the Hauone Fishing Shrine. Mr. Shirai also requested that the remnants of Dillingham's OR&L railroad bridge be preserved.

While Mr. Shirai made brief mention of the historic-era railway and ranching era of the area, Mr. Dailey and Mr. Dowsett elaborated further upon the subject. In particular, Mr. Dailey discussed the history of polo within the area in relation to his own family history. Moving to Mokolē'ia in 1963, the Dailey 'Ohana was tasked with the responsibility of reviving the polo grounds near Dillingham Ranch. Walter Dillingham sold the Dailey 'Ohana the land *makai* of the ranch, and soon thereafter a family home was established. Mr. Dailey also noted that Dillingham Ranch is one of the "few historical operating ranches on O'ahu." As a historic property and an operating ranch, *paniolo* culture permeates the entirety of the lands at Dillingham Ranch. Mr. Dailey re-iterated the importance of *paniolo* culture at the ranch, "when you talk about *paniolo*, whenever you talk about ranch, it's all *paniolo*." Mr. Dowsett described to CSH his enculturation within the cowboy lifestyle and *paniolo* culture. He discussed living on Hawai'i Island during his youth, describing his father's employment at Parker Ranch. His father also managed a ranch on their own personal family-owned lands that included nearly 300 acres of Hawaiian Homes Lands on Hawai'i Island. Mr. Dowsett described the *paniolo* life:

Not just a cowboy, but a Hawaiian cowboy. This was a lifestyle that revolved around family, love, and music. Music, you know the whole slack-key music was all tied to it [*paniolo* culture]. In fact, the families of *paniolo* would live, and many still do live, on the ranches. My dad worked at the Parker Ranch when I was a young boy, we lived on the Big Island. I was born there when my dad was working

at Parker Ranch . . . Growing up, we didn't spend time down at the park, we just went up to the ranch, no matter which ranch it was. We rode horses, and we lived the ranch life. We learned how to brand cattle, fix fences, fix water troughs, and rodeo

However, at the age of eleven, his parents moved to O'ahu. The move to O'ahu marked a change in Mr. Dowsett's recreational activities. Although he still participated in ranch work, his family's move to Mokulē'ia sparked a passion in ocean-going activities. Mr. Dowsett commented, "we finally weaned ourselves off [the ranch work] and found the ocean and surfing. One day I vowed that I wasn't going to ride horses anymore, just ride surf board, a surf board doesn't kick!" Mr. Dowsett himself frequents the coastal area known as Lapaku (*makai* of the Dillingham Ranch Agricultural Subdivision project). His passion for the ocean has only grown over time, and he has established a connection to the watermen and waterwomen of the North Shore of O'ahu.

CSH concluded the consultation process with Mr. Becket, accompanying him on a *huaka'i* to visit Kawailoa Heiau. Prior to the *huaka'i* CSH sought permission to visit the site from Mr. Shirai, the *kia'i* of that *wahi kapu*. During the *huaka'i* Mr. Becket noted general aspects of *heiau*, and commented on differentiating these sites from natural features and/or rockfall. Additionally, he shared two *mo'olelo*, discussing supernatural phenomena purported to be associated with these cultural sites. The first of these *mo'olelo* (originally provided to him by Rudy Mitchell) involved the *heiau* near the quarry on the Ka'ena side of Dillingham (Mitchell identifies the *heiau* associated with this story as "Kawailoa Heiau" in his report), across from the beach park. According to Mr. Becket,

A guy with a truck was removing stones from the heiau when the truck stalled. He got out to check, and then somehow the truck rolled over him and killed him. Supposedly the truck is still there, according to Rudy.

The second *mo'olelo* provided by Mr. Becket related to his last visit to the *heiau*. Mr. Becket shared one particular *mo'olelo*, describing how he had visited Kawailoa Heiau many years ago with a young man, a *malihini* who was interested in learning about O'ahu Island *heiau*. The young man, through his own previous research, had located the site and asked if Mr. Becket would accompany him on a site visit. Following the site visit, the young man contacted Mr. Becket again, stating that he believed something had followed him home. According to the young man, he occasionally saw the apparition or shadow of a large figure "from the corner of his eye." Mr. Becket advised the young man that he should refrain from visiting such sacred sites in the future. Kawailoa Heiau, *mauka* of Dillingham Airfield and at the base of the Wai'anae Mountain Range is indeed a sacred site. The *mana* contained within that sacred space is attributable to the "presence of the gods, the *akua*, and the ancestral guardian spirits, the '*aumakua*'" (McGregor 1996:22).

Upon reaching Kawailoa Heiau, both Mr. Becket and CSH noted the presence of *kī*, *kukui*, *laua'e*, and *hau*. Traditionally, *kī* has been known to announce a *kapu*, while *kukui* is known to be a *kinolau* of Lono. *Hau* was utilized as cordage, for the spars of outriggers, as floats for fishing nets; and as an offering on *hula kuahu* (Emerson 1965:20). *Hau* was also noted as a *kinolau* of Lupea, the sister of Hina. *Laua'e*, the *maile*-scented fern was also utilized for *hula kuahu*, and as *hula* adornment (Pukui 1942). Mr. Becket shared with CSH his concern regarding accessibility to cultural sites for descendants of Mokulē'ia and Kawaihāpai Ahupua'a. Mr. Becket additionally recommended periodic condition checks for these cultural sites.

## Section 8 Traditional Cultural Practices

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Timothy R. Pauketat succinctly describes the importance of traditions, especially in regards to the active manifestation of one's culture or aspects thereof. According to Pauketat,

People have always had traditions, practiced traditions, resisted traditions, or created traditions . . . Power, plurality, and human agency are all a part of how traditions come about. Traditions do not simply exist without people and their struggles involved every step of the way. [Pauketat 2001:1]

It is understood that traditional practices are developed within the group, in this case, within the Hawaiian culture. These traditions are meant to mark or represent aspects of Hawaiian culture that have been practiced since ancient times. As with most human constructs, traditions are evolving and prone to change resulting from multiple influences, including modernization as well as other cultures. It is well known that within Hawai'i, a "broader "local" multicultural perspective exists" (Kawelu 2015:3) While this "local" multicultural culture is deservedly celebrated, it must be noted that it has often come into contact with "traditional Hawaiian culture." This contact between cultures and traditions has undoubtedly resulted in numerous cultural entanglements. These cultural entanglements have prompted questions regarding the legitimacy of newly evolved traditional practices. The influences of "local" culture are well noted throughout this section, and understood to represent survivance or "the active sense of presence, the continuance of native stories, not a mere reaction, or a survivable name. Native survivance stories are renunciations of dominance, tragedy and victimry" (Vizenor 1999:vii). Acknowledgement of these "local" influences help to inform nuanced understandings of entanglement and of a "living [Hawaiian] contemporary culture" (Kawelu 2015:3). This section strives to articulate traditional Hawaiian cultural practices as were practiced within the *ahupua'a* in ancient times, and the aspects of these traditional practices that continue to be practiced today; however, this section also challenges "tropes of authenticity," (Cipolla 2013) and acknowledges the multicultural influences and entanglements that may "change" or "create" a tradition.

This section integrates information from Sections 3-9 in examining cultural resources and practices identified within or in proximity of the Dillingham Ranch Agricultural Subdivision project area in the broader context of the encompassing Mokulē'ia and Kawaihāpai landscape.

### 8.1 Gathering of Plant and Food Resources

Located along the northwest coast of O'ahu and extending *mauka* towards the Wai'anae Mountain Range, the *ahupua'a* of Mokulē'ia and Kawaihāpai traditionally were known for their agricultural and aquacultural activities. Historic documents from the late eighteenth century are amongst the first written observations of the Mokulē'ia and Kawaihāpai environments; included in these observations are notes on the area's agricultural and aquacultural practices. In particular, the expansion and intensification of agricultural production following Kamehameha's wars of conquest can be understood and analyzed through the recorded accounts of early foreign explorers. Such accounts note the presence of many large villages and terracing. Captain Charles Clerke, after anchoring in Waimea Bay, described the highly populated and lush northwest coast of O'ahu. Descriptions of Waialua Moku by John Whitman, in 1813 describe numerous *lo'i kalo* and *ko'a*:

. . . a large district on the N.E. extremity of the island, embracing a large quantity of taro land, many excellent fishing grounds and several large fish ponds one of which deserves particular notice for its size and the labour bestowed in building the wall which encloses it. [Holt 1979:78]

The area was also noted for its aquaculture, specifically *limu*, *ula* (lobster), and *i'a* (fish). The production (and consumption) of *kalo* or taro was vitally important to Mokulē'ia and Kawaihāpai Ahupua'a (in addition to Waialua Moku as a whole). Captain James King (1779) noted that "the natives of these islands are, in general, above the middle size and well made; they walk very gracefully, run nimbly and are capable of bearing great fatigue" (Shintani 1993:10). Accordingly, the high level of physical activity and physical fitness described by Captain King was a normal part of Hawaiian life, and largely attributable to the availability of plant and food resources such as *kalo*, '*uala* (sweet potato), *niu*, *mai'a* (banana), *limu*, and *i'a*. Besides the observed contributions to stamina and health, *kalo* was also a revered staple food, believed to have derived from the first-born son of Wakea and Papa.

. . . the supreme god Kane in the form of Wakea (a form associated with the earth) produced two sequential offspring: the first became *kalo* (taro) plant, the second became Hāloa, the ancestor of man . . . thus, in kinship terms, the taro is the elder brother and the senior branch of the family tree, mankind belongs to the junior branch, stemming from the younger brother.' [Trask 2006:75]

Interviewee Thomas Shirai, Jr. noted to CSH that Mokulē'ia and Kawaihāpai Ahupua'a were '*āina momona*:

When you go down to Mokulē'ia, you start having names like Laau Paina or Mahinaai Street, These things show you a breadbasket . . . That's the real meaning of these places. Food. That is the basis for this area. Laaupaina what does it mean . . . That is the pharmacy. That is Longs Drugs.

Mr. Shirai added that evidence of *noni* and *wauke* used for *lā'au lapa'au* is evident in the Land Commission Awards (LCAs) as well as the archaeological record. According to Mr. Shirai, stone mortars, traditionally utilized to grind herbs for healing, were recovered within Mokulē'ia Ahupua'a. Mr. Shirai elaborated further, discussing how LCA records can provide particular insights into traditional land usage. Mr. Shirai added that claimants often noted their lands in Mokulē'ia had "a grove of this, a *mala* of that. It's beyond land, taro patches, fishing grounds, when you see *mala* you should see a different perspective, about the '*āina momona*."

Previous oral history research conducted by the University of Hawai'i's Center for Oral History (UHCOH) in 1977 also points to the richness of the lands and offshore waters of Mokulē'ia and Kawaihāpai. References to aquatic resources within Waialua Moku are particularly salient; specifically, interviewees Adam Holmberg, Manabu Nonaka, and Lucy Robello individually identify the varieties of fish populating the waters of Waialua District. The varieties caught and consumed included *akule*, '*ōpelu*, *pāpio*, *āholehole*, *moi*, '*oama*, *he'e*, and '*opihi*. Regarding *mauka* resources, interviewee Nobuyoshi Nakatsu discussed the gathering of endemic woods such as *koa* and '*iliahi* (sandalwood) for firewood. Historic records also indicate the prevalence of '*iliahi* in the *mauka* portions of Mokulē'ia. Kauikeaouli or King Kamehameha III himself, was noted to collect sandalwood in the uplands of Waialua, including Mokulē'ia, during the early nineteenth century (Kamakau 1999:278–279).

Interviewee Levi Rita discussed the current gathering of *niu* (coconut) within the Dillingham Ranch Agricultural Subdivision project area; he noted that the *niu* are sold for consumption in Waikīkī. Interviewee Jan Becket, alongside CSH, observed *kī* growing in the *mauka* sections of Kawaihāpai Ahupua'a, adjacent to Kawaioloa Heiau. *Kī* were frequently planted around *heiau*, and often the presence of *kī* indicated a *kapu*. Although figuring largely within religious ceremonies, *kī* had many utilitarian uses and was frequently availed to for clothing, cooking, healing, and fishing. Coincidentally, Kawaioloa Heiau is located in a direct line with a fishing *ko'a* once known as the Kuakea fishing shrine. McAllister notes, however, that nothing remains of the site (McAllister 1933:120). The term *ko'a* is often used in reference to a shrine (usually consisting of circular piles of coral or stone built along the shore or by ponds and streams) used in ceremonies to make fish multiply; however, the term *ko'a* also may reference fishing grounds, usually identified by lining up with marks on shore (Pukui and Elbert 1986:156). Additional *ko'a* are located within Mokulē'ia and Kawaihāpai Ahupua'a, these include Mokupaoa and Pu'u Hekili. Mokupaoa is a personal fishing *ko'a* for Mr. Shirai and his 'ohana. Additionally, Mr. Shirai and his 'ohana are also stewards of the Pu'u Hekili Fishing Shrine (located in Mokulē'ia Beach Park within Kawaihāpai Ahupua'a) and the Hauone Fishing Shrine located in Keālia.

## 8.2 Religion and Burials

Several *heiau* stood in Mokulē'ia and Kawaihāpai Ahupua'a including Kawaioloa Heiau, Nalowale Heiau, and Pōloaia Heiau. Although *heiau* existed in both *ahupua'a*, it appears that coastal *ko'a* outnumbered formal temple structures within Mokulē'ia and Kawaihāpai Ahupua'a. *Ko'a* or fishing shrines also functioned as religious sites within both Mokulē'ia and Kawaihāpai. Traditionally, the seashore and ocean area of this region was vitally important for resource extraction in the early days of settlement. Fishermen along the coast maintained a respected status within traditional Hawaiian society; Kanahale asserts that “early Hawaiians regarded fishing as the oldest, and hence the most prestigious of professions (Kanahale 1995:17).

Traditionally, prior to any undertaking, prayers were offered to the multitude of ancestor gods and spirits, to *akua*, 'aumākua, and *kūpua* alike. As Mary Kawena Pukui notes, “long before the missionaries came, Hawaiians were *haipule*, religious. Everything they did, they did with prayer” (Pukui et al. 1972:121). The offering of prayers to the gods is especially evident within the *mo'olelo* of Ma'ikohā. In this legend, “the seashore at Kealia in Mokuleia, Kawaihāpai, Waialua” is mentioned as the location where Kāne'aukai, a god of fisherman and brother to Ma'ikohā, changes into human form and proceeds to provide his name to two old fishermen at Kapaeloa (Sterling and Summers 1978:53). Henceforth, Kāne'aukai is worshipped as the fish god for the area. Prayers were also offered upon the death and subsequent burial of an individual. In particular, the 'aumākua was a revered intercessor, providing the “closest man-with-god relationship” (Pukui et al. 1972:123). As Pukui (1972) also notes:

For these deities had once been living beings; they were long departed ancestors become gods. From the long corridors of time the 'aumākua watched their descendants. And though they judged and punished, they were also special advocates and protectors. For 'ohana (family) loyalty continued into eternity. [Pukui 1972:123]

Upon death, the spirit of the recently deceased was said to leave the body and then proceed towards a leaping place (Handy and Pukui 1972:146). For O'ahu, the *leina a ka 'uhane* or leaping place is located at Ka'ena Point, to the west of the current Dillingham Ranch Agricultural Subdivision project area. It was in fact the *'aumākua* that guided the spirit to and over the *leina* for its leap into Pō, the world of the “unseen” (Handy and Pukui 1972:146).

Burials have been encountered in the coastal areas of Mokolē'ia. Previous archaeological studies conducted in the vicinity of, and *makai* of the Dillingham Ranch Agricultural Subdivision project area have identified six burials (SIHP #s -6708, -3747, -4451, -5766, -5467, and -5599). All six of these burials are located outside of the current Dillingham Ranch Agricultural Subdivision project area. According to soil survey data, these burials are located within Jaucas sand sediments. The *makai* portion of the Dillingham Ranch Agricultural Subdivision project area borders Jaucas sand, a sediment known to yield traditional Hawaiian burials.

Interviewee Thomas Shirai Jr., discussed the probability of the proposed project encountering *iwi kūpuna* during ground disturbing activities. Mr. Shirai commented that he has “found documentation that this project may encounter and disturb several *iwi kūpuna* documented and were buried in Mokolē'ia Ahupua'a which potentially [may] be within the geographical perimeters of this project.” Mr. Shirai also discussed his *kuleana*, as a lineal and cultural descendant, to care and safeguard *iwi kūpuna*. In particular, Mr. Shirai detailed how he guided the re-interment process and ceremony for his *tūtū wahine*, Ms. Napuakau Kakulu, following the disturbance of her burial during illegal sand mining activities within the Dillingham Airfield area. Interviewee Kawika Dowsett also commented on the presence of burials, and stated that he believes the project will encounter *iwi kūpuna*. He commented that should any inadvertent finds of human remains be made, that these remains be treated respectfully, that the respective *'ohana* are contacted, and the resultant reinterment process follow the correct cultural protocol.

### 8.3 Animal Husbandry

Only three animals were traditional domesticates within Ancient Hawai'i, these were the *pua'a* (pig), *'īlio* (dog), and *moa* (chicken). All three of these animals were introduced by Polynesian wayfinders to the islands, and later raised by the *maka'āinana* as a food source. These animals were mostly fed a vegetarian diet, including sweet potato tubers, vines, and food scraps consisting of taro peels, arrowroot shoots, and roots (Hommon 2013:78). Dogs were also given vegetable scraps, as well as *poi*; dogs fattened on *poi* were especially prized for their taste (Hommon 2013:80). Chickens were generally free-range and foraged for their own food. These animals also figured largely within religious practice as they were deemed acceptable offerings for the gods (Hommon 2013:78).

Hommon (2013) notes that the pig or *pua'a* played a prominent role in the social, political, and ritual life of Hawai'i; Hommon citing Malo (1951:138) adds that only pork from pigs that had been ritually sacrificed in a temple could be eaten (Hommon 2013:78). The consumption of pork during large-scale feasts is documented within Waialua Moku. Within an 1868 newspaper article entitled, “The Arrival of the Canoe Fleet of Hoomaileanue Outside of Waialua, and its Landing Ashore,” and published in *Ka Nūpepa Kū'oko'a* (Vol. 7, No. 35), the arrival of a canoe fleet and the preparation of a great *imu* is discussed:

...the imu for the pig was lit, from Kahuku Point to Kaena Point, the imu of the pig was lit, dog, breadfruit poi, banana pudding, breadfruit, taro pudding, the fire was hot, a fire truly burning from the uplands of Kawaioloa to the sea of the chiefs, the uplands were brightened, toward the sea was brightened as well...

It must be noted that the feral pigs hunted and prepared for consumption today “bear little physical or cultural resemblance to the smaller, domesticated pigs brought to the islands by voyaging Polynesians” (Maly et al. n.d.:1). In the paper *Pigs in Hawai'i, from Traditional to Modern* (Maly et al. n.d.), the authors underscore:

[...] pigs were never hunted game for ancient Hawaiians. The Polynesian interaction with these animals was one of near-complete domestication. Despite references to hunting rats with bow and arrow, no historic or traditional knowledge sources describe ancient Hawaiians hunting pigs for either food or recreation. Even in the legend of Kamapua‘a where the demi-god is pursued by man, he is sought so that he might be punished for his mischievous actions, not for sport or sustenance. [Maly et al. n.d.:2]

Although pig hunting is not a traditional cultural practice, it remains a “cherished modern practice for island sportsmen” (Maly et al. n.d.:4), and plays a role in conservation land management. Pig hunting has become an especially cherished tradition for *paniolo*.

The introduction of *pipi* to Hawai'i in 1793, followed by the introduction of *lio* (horse) nearly ten years later, spurred the creation of the *paniolo* culture. Loomis (2006) details the feelings of Hawaiians for these introduced animals, noting that cattle were recognized as “oversize[d] pests,” yet also a “valuable commodity.” The horse or *lio* was respected for its strength and its ability to help with work and transport. Together these two animals helped to forge a new unique culture rooted in both traditional Hawaiian and Western values. Loomis (2006) poetically captures the essence of the *paniolo*, of a culture delicately balanced between a Western and Hawaiian consciousness:

He was typically Western and uniquely Hawaiian. He roped cattle on horseback, then dragged them through the surf and swam with them to ships. He wore the classic cowboy hat, woven of *lau hala* and fancied up with a flower *lei*. He barbecued beef, but he ate it with *poi*.

The true *paniolo* embodied the best of Hawaiian masculinity. He needed enough hardness to force a steer to the ground and press a red-hot iron against its skin, as well as a gentle touch to guide a slippery calf out of the womb. The taming of a bucking horse and the roping of a wild bull became tests of manhood in a world where the ancient rites of passage were fading away. [Loomis 2006]

Interviewees Mike Dailey and Kawika Dowsett discussed the uniquely Hawaiian *paniolo* tradition that evolved at Dillingham Ranch, and expressed a desire to maintain this tradition. Additionally, both interviewees requested that *paniolo* culture in some way be memorialized and perpetuated at Dillingham Ranch, one of the oldest operating ranches on O‘ahu.



## Section 9 Summary and Recommendations

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CSH undertook this CIA at the request of Dillingham Ranch Aina, LLC. The research broadly covered the entire *ahupua'a* of Mokulē'ia and Kawaihāpai, but focused on the current Dillingham Ranch Agricultural Subdivision project area; research also covered the *moku* of Waialua where appropriate and applicable.

### 9.1 Results of Background Research

Background research for this study yielded the following results as follows:

1. The *moku* of Waialua contained a set of centrally located productive lands and peripheral areas that were ecologically marginal but that had access to abundant ocean resources. Large swaths of *lo'i kalo* were located on the floodplains of four major streams that flowed from gorges within the Wai'anae Mountains, and two large *loko i'a*, 'Uko'a and Lokoea, were located around Waialua Bay. Small fishing communities were also located at the extreme western and eastern edges of Waialua Moku, at Ka'ena and Kāpaeloā. Although located on the fringe, the small fishing communities had access to very rich deep-sea fishing grounds (Sahlins 1992:20).
2. The *ahupua'a* of Mokulē'ia and Kawaihāpai receive an average of 904.5 mm (35 inches) of annual rainfall (Giambelluca et al. 2016). The overall lack of rainfall within the district may be ascribed to the topography of the area itself. While lacking in rainfall, the area retains traces of surface water. *Mauka* portions of Mokulē'ia are cut by many ephemeral streams that run northward from the main crest of the Waianae Range down to the sea (Wirawan 1974:6). These streams were often modified via *'auwai* to feed fishponds and agricultural fields within the area.
3. Numerous *ko'a*, including Keauau Shrine, Kōlea Shrine, Kuakea Shrine, Pu'u o Hekili Shrine, and Mokupaoa were known to exist along the coastline and just offshore. These *ko'a* not only represented places of worship, but were also physical fishing grounds known for their abundance of *i'a*, lobster, and *limu*.
4. Three *heiau* are said to have been associated with the Mokulē'ia and Kawaihāpai area: Kawailoa Heiau, Nalowale Heiau, and Poloaiāe Heiau. Within greater Waialua Moku, are the sacred sites of Ka'ena Point (*leina ka 'uhane*), Kūkaniloko, and Mauna Ka'ala; these sites are often connected in some way to *mo'olelo* associated with both Mokulē'ia and Kawaihāpai Ahupua'a.
5. Prior to Western Contact, the population for the whole of Waialua Moku (including the *ahupua'a* of Mokulē'ia and Kawaihāpai) had been estimated at 6,000 to 8,000 people (Sahlins 1992:20). The first missionary census of Waialua Moku in 1831-1832 recorded 2,640 people in Waialua, representing a decline of about 20-30% from the first decade of the century. The population within Mokulē'ia and Kawaihāpai Ahupua'a also witnessed a decline. By 1848, the population for Waialua Moku was reduced to 1,616 persons. The steep population decline was attributed to a high death rate from newly introduced diseases such as smallpox, typhus, and venereal diseases.
6. Following the initiation of the Māhele and Kuleana Act in 1845, many of the Native Hawaiians living within Waialua Moku bought the lands they lived and worked on through the Waialua land agent and missionary John Emerson. A total of 27 land grants were

purchased in the *ahupua'a* of Mokulē'ia and 16 in the *ahupua'a* of Kawaihāpai. Portions of 21 land grants are located within the Dillingham Ranch property, and were granted from 1850-1855. In 1850, a law passed that allowed foreigners to buy land fee-simple. Two descendants of missionaries, William Emerson and John T. Gulick, were the first foreigners to buy land in Mokulē'ia and Kawaihāpai.

7. By the early 1900s, sugarcane plantations and large ranches came to dominate the lands of western Waialua. In 1897, B.F. Dillingham purchased the Kawaihāpai Ranch in Mokulē'ia, including over 2,000 head of cattle and over 100 horses and mules (Yardley 1981:193). Dillingham also leased additional property in Mokulē'ia, including the Gaspar Silva Ranch, the James Gay Estate, and other lands in the area that he could secure. Following the construction of the OR&L railroad in 1898, Dillingham began selling off or subleasing much of his lands in western Waialua. However, Dillingham retained as his personal ranch "a great strip of mountainside and beaches with flat land in between and a homestead in the middle" (Yardley 1981:206).
8. By the mid to late twentieth century lands within Mokulē'ia and Kawaihāpai were occupied by the Crowbar Ranch, Campbell Ranch, and Dillingham Ranch. These land holdings were later consolidated under the control of the Mokuleia Land Company.

## 9.2 Results of Community Consultations

CSH attempted to contact NHOs, agencies, and community members. Consultation was received from the following community members:

1. Levi Rita, *paniolo* and livestock manager for Dillingham Ranch
2. Thomas Shirai, Jr., Office of Hawaiian Affairs-Native Hawaiian Historic Preservation Council; O'ahu Island Burial Council; and cultural and lineal Descendant for Waialua; Kawaihāpai 'Ohana - NHO
3. Mike Dailey, *kama'āina* of Waialua; father introduced polo to Mokulē'ia
4. Kawika Dowsett, *kama'āina* of Waialua; father was former Dillingham Ranch Manager
5. Jan Becket, author, photographer, and retired teacher from Kamehameha Schools. Kona Moku Representative, Council of Hawaiian Civic Club's Committee on the Preservation of Historic Sites and Cultural Properties

## 9.3 Impacts and Recommendations

Information was gathered from the cultural and historical background research, and the community consultation. Potential impacts to cultural sites within the Dillingham Ranch Agricultural Subdivision project area were identified and the following preliminary recommendations were made.

### 9.3.1 Potential Impacts

1. Previous archaeological studies have indicated the presence of 11 State Inventory of Historic Places sites within the current Dillingham Ranch Agricultural Subdivision project area. The sites represent traditional Hawaiian agricultural, ceremonial, and habitation complexes, and post-Contact ranching complexes.
2. Previous archaeological studies within 200 to 1,500 meters of the current Dillingham Ranch Agricultural Subdivision project area have identified six burials (SIHP #s 50-80-

03-6708, -3747, -4451, -5766, -5467, and -5599). All six of these burials are located outside of the current Dillingham Ranch Agricultural Subdivision project area. According to soil survey data, these burials are located within Jaucas sand sediments. The *makai* portion of the Dillingham Ranch Agricultural Subdivision project area borders Jaucas sand, a variety of sediment known to yield ancient Hawaiian burials. Based on these findings, there is a possibility that *iwi kūpuna* and other burial sites may be present within the project area and that land-disturbing activities during construction may uncover presently undetected burials or other cultural finds. During community consultation with Mr. Thomas Shirai, Jr. it was articulated that *iwi kūpuna* and other cultural finds may be present within the project area.

3. The community articulated a concern regarding the access to, and preservation of cultural sites within the Dillingham Ranch Agricultural Subdivision project area.

### 9.3.2 Recommendations

1. Preservation is required for SIHP #s 50-80-03-4439, -4772 through -4780 (mitigation recommendations for SIHP # -4777 Feature C is presently under discussion with SHPD), -4782, -4786 resulting from the SHPD acceptance (dated April 24, 1992, Log No. 5155, Doc No. 0682t; see Appendix C) of the Drolet and Schilz (1992) archaeological inventory survey report (see Table 4). Tulchin and Hammatt (2008a) address preservation of SIHP #s -4772 through -4780, -4782, and -4786 and these preservation measures shall be followed. Although the neighboring historic properties recommended for preservation (SIHP # -4778 through -4780) and addressed in the Tulchin and Hammatt (2008a) preservation plan are located outside of the Dillingham Ranch Agricultural Subdivision project area, enactment of preservation measures for those historic properties is recommended. SIHP # -4439, originally designated by Drolet and Schilz (1992) and recommended for preservation by the SHPD, is now considered a component of SIHP # 50-80-03-7653.

Preservation is required for SIHP # 50-80-03-7653 resulting from the SHPD acceptance (dated July 17, 2015, Log No. 2014.02945, Doc. No. 1507SL07; see Appendix C) of the Lauer and Reith (2014) archaeological inventory survey report (see Table 4). This historic property shall be addressed in a preservation plan, and the provisions followed once accepted by the SHPD.

Based on the findings of the Belluomini et al. (2017 draft) AIS, preservation is recommended for SIHP # 50-80-03-7977 and SIHP # 50-80-03-7978 (see Table 4). Preservation is similarly recommended for 50-80-03-7653 as recommended by Lauer and Rieth (2014). Based on the documented conditions, Belluomini et al. (2017 draft) recommended no further work for a newly identified feature (Feature C) of SIHP # 50-80-03-4777 and a newly identified historic property, SIHP # 50-80-03-7976. The mitigation requirements addressed in the Belluomini et al. (2017 draft) report are still under review with the SHPD at this time (February 2017).

Thus, following SHPD acceptance of the Belluomini et al. (2017 draft) AIS report and any further mitigation required by the SHPD, a preservation plan shall be completed for SIHP # 50-80-03-7653, -7977, and -7978 for SHPD review and acceptance, and subsequently the provisions of the accepted preservation plan shall be enacted.

2. The provisions of the Tulchin and Hammatt (2008b) archaeological monitoring plan (accepted by the SHPD in a review letter dated 30 October 2008, Log No.: 2008.4774, Doc. No.:0810LM42; see Appendix C) shall be followed.
3. Should burials (or other cultural finds) be encountered during ground disturbance or via construction activities, all work shall cease immediately and the SHPD notified pursuant to HAR §13-280-3.
4. In the event that *iwi kūpuna* are identified, all earth moving activities in the area will stop, the area will be cordoned off, and the SHPD and Police Department will be notified pursuant to HAR §13-300-40.
5. In the event of an inadvertent discovery of human remains, the completion of a burial site component of the preservation plan and/or the burial site component of the archaeological data recovery plan, in compliance with HAR §13-300-40 and HRS §6E-43.6, is required (specifics to be determined in consultation with the SHPD O'ahu burial sites specialist). Additionally, all lineal and cultural descendants of Waialua shall be contacted.
6. Mr. Thomas Shirai, Jr., a lineal and cultural descendant of Waialua, has requested to be consulted with, and to serve as the cultural monitor should burials (or other cultural finds) be encountered during ground disturbance. In the event of an inadvertent discovery of human remains consultation with Mr. Shirai is recommended.
7. Project workers and all other personnel involved in construction and related ground-disturbing activities shall be informed at the beginning of their involvement with the project fieldwork of the possibility of inadvertent cultural finds, including human remains.

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# Appendix A Thomas Shirai, Jr. Consultation Reply Letter

Thomas T Shirai Jr

P O Box 601

Waialua, HI 96791

Email: [Kawaihapai@hawaii.rr.com](mailto:Kawaihapai@hawaii.rr.com)

June 19, 2008

Todd Tulchin

Cultural Surveys Hawaii

P O Box 1114

Kailua, HI 96734

**RE: Comments Regarding DRAFT Preservation Plan for Dillingham Ranch Development Project**

***Aloha Todd,***

Thank you for the opportunity to provide comments regarding this draft preservation plan. Before going further I'd like to acknowledge my beloved Grandfather (***David Peahi Keao Jr***) who taught me much of what I'm sharing below. As you are aware, I'm a recognized *lineal descendant* of *Kawaihapai Ahupua'a* by the State Historic Preservation Division. I'm also the *Po'o* of the *Kawaihapai Ohana* which is recognized by the *Department of Interior* as a *Native Hawaiian Organization*. My *Kupuna* were cultural informants of *Waialua Moku for Bishop Museum* and featured in their publications entitled:

***The Hawaiian Planter – (Handy 1940):***

***Kaaemoku Kakulu – Great-Great Grandfather***

***David Maikai Keao – Great Grandfather***

***Annie Keahipaka – Great-Great Grand Aunt/Grandmother (po'olua)***

***Archeology of Oahu – (McAllister 1933):***

***Annie Keahipaka – previously noted***

These are foremost the *Kupuna* of my beloved ***Grandfather (David Peahi Keao Jr)***. He is the oldest sibling of ***David Maikai Keao and Clara Napuakekau Kakulu*** being born in 1913. He was raised and lived extensively at *Kawaihapai Ahupua'a* which extended throughout the entire *Waialua Moku* with an emphasis on the *Northwest Coastline of Waialua Moku* that included *Mokule'ia Ahupua'a*. After marrying my ***Grandmother (Abigail Kalomi Akau)*** they resided at a few Plantation Camps that included

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*Gay Camp (Mokuleia 1), Mokuleia Camp (Mokuleia 2) and Kawaihapai Camp* where they raised my Mother (**Laverna Tailomi Keao**) and their siblings until they bought their own property where my Wife and I reside here is *Mokule'ia*. As another point of interest, my Grandparents first met on the beach fronting the *Salvation Army's Camp Homelani* is situated in *Mokule'ia* which is just up the street from our residence. In 1940, my Grandfather was awarded the *Silver Lifesaving Medal* from the *Commanding Office of Schofield Barracks* for saving a soldier from drowning at *Kawaihapai Beach*. He was residing at *Mokule'ia Camp* at that time. In 1952 while serving in the *Civil Air Patrol*, my Mother was chosen as the outstanding cadet in her unit based at *Mokule'ia Field* and extended to the entire *Territory of Hawaii*.

**Ohana Legacy & Land Tenure Pertaining to Dillingham Ranch Preservation Plan**

Another aspect of my family's legacy and tenure along the *Northwest Coastline of Waialua Moku* is that we once owned several parcels of land along this coastline dating back to the time of *The Mahele* which in some instances the original *patentee(s)*. There are (2) two parcels within this preservation plan:

**Grant 1123 (Makahiki, Poli, Kaakau & Keoahu) - Part of Mokuleia Polo Field**

**Grant 1123** was a significant parcel because on the shoreline portion of this parcel was a large warehouse was where employees of my Great-Great Grandfather (**Kaaemoku Kakulu**) housed employees and their families to live. There were once remnants of old pieces of wood along that shoreline to verify its existence. He was also the last *Konohiki* of *Kawaihapai Ahupua'a* and his tenureship is noted in the *1920 Federal Population Census* where it listed him having **13 (thirteen) employees** which is quite an accomplishment for a **Pure Hawaiian**. This parcel was used for raising a horse which was used for tending crops and also utilized in fishing to coordinate surround schools of fish along with throwing net while on the horse. Not many instances are known with this utilization. West of the *Mokule'ia Polo Field* is a huge reef that my Grandfather called *Papaloa* and the channel he called *Kanaha* which also the site of a special cultural site called *Mokupaoa*. This is where they fed and paid tribute to *Mano (Aumakua)*. **Mokupaoa is connected to Kalakiki Heiau (site 197) located in Kamananui Ahupua'a and situated within the confines of the Catholic Monastery grounds. It is dedicated to the Shark God Keanini.**

*Aaron's Dive Shop* has complied with my request to **reinstate the name of Mokupaoa** on their website which featured this dive site previously they listed it on their website as *Devil's Rock* which totally disrespectful and insensitive to the *Hawaiian Culture*.

**Grant 1779 (Kalauoiwi) – Part of Peacock Flats**

**Grant 1779** was had a house lot on it and *Peacock Flats* is an area where my Grandfather and his family utilized for hunting pigs and fowl. They also did some hunting where the current *Mokuleia Public Hunting Area* encompasses. This continues till today by some of my *Ohana*.

**Page 3*****Nana I Ke Kumu – Acknowledging Kupuna***

Acknowledging our ancestors is a major part of bridging the past and present. The geographical area which this project encompasses has some very significant *Kupuna* and a organization that with deep connection to *Mokule'ia* and contributed greatly to the *Hawaiian* Culture and History:

***King Liholiho – Kamehameha II (1797 – 1824)***

In 1820, *King Liholiho* and *Queen Kaahumanu* visited *Waialua Moku* for supplies before going to *Kauai* to visit *King Kaumualii*. Among the places within *Waialua Moku*, was ***Mokule'ia Ahupua'a*** where various food that included *Kalo* were given to him by *Kupuna* and other *Poe Kanaka of Mokule'ia*. **To show his appreciation for the *Poe Kanaka of Waialua Moku* for their hospitality, cooperation and generosity he composed a chant entitled *Kalena Kai*. Within this chant, verse 2 describes *Mokule'ia Ahupua'a* and it's agricultural sustainability which includes *Kalo (Taro)* productivity:**

***Kalena Kai – King Liholiho*****VERSE 2:**

***'O ka 'ehu 'ehu o ke kai – The sea spray***

***Ka moena pawehe o Mokule'ia – Geometric designs of the plains of Mokule'ia***

The archeological work done for this project has verified the *mana'o* of *King Liholiho* regarding the agricultural sustainability and productivity of *Mokule'ia Ahupua'a* which extends throughout the *Northwest Coastline* encompassing the *Ahupua'a of Kamananui, Mokule'ia, Kikahi, Auku'u, Kawaihapai, Kealia and Kaena*. It also corrects the time period prior to the 1870's because the historical and cultural sites (especially those regarding agriculture) are pre western. Persons of rank such as *King Liholiho* would have preference rather than others. I treat this *mele* as apart of my *Ohana* and my *kuleana* is to credit and clarify that ***King Liholiho composed Kalena Kai and Charles E King only set it to music***. The biographical sketch of this *mele* states that it was composed about a swimming hole in *Kakaako (Watertown)* and is insulting to the people of *Waialua Moku*. Later music composers include verse 2 of *Kalena Kai* regarding their compositions of or about *Waialua Moku*. Only the *Hiiaka Chant* is earlier than *Kalena Kai* regarding *Mokule'ia*. **With this project, I can justify to *Bishop Museum* that *King Liholiho* is the composer of *Kalena Kai* and that *Charles E King* only set it to music.**

***Samuel Manaiakalani Kamakau (1815 – 1876)***

He is a paramount *Hawaiian* historian who served in other Governmental capacities which included being a member of the *House of Nobles* during the era of the *Hawaiian Kingdom*. During his tenure in

**Page 4**

this capacity he represented *Waialua Moku*. His works printed in his publications are treasures because they represent the little that we have about *Hawaiian* Culture and History. One of his works includes a *mo'olelo* entitled "*The Hinalea Fish Basket*" about *Kalamainui* who was a *mo'o* who resided in a cave at *Makaleha Valley*. Below he also describes the agricultural sustainability and productivity.

Today we have a *Hawaiian* Immersion School named *Ke Kula O Samuel Kamakau* in his honor however **he was born October 29, 1815 at Mokule'ia, Waialua, Oahu**. During the *2005 Hawaii State legislative Session* I initiated **HR 55 (Declaring October 29, 2005 as Samuel Manaiakalani Kamakau Day)** thru Representative *Michael Magaooay* and it was passed during that session.

**Elizabeth Lahilahi Web (1862 – 1940)**

Much of our family legacy recording in both *Archeology of Oahu* and *The Hawaiian Planter* was thru the efforts of this beloved *Kupuna Wahine* who visited my Grandfather and his *Ohana* asking them to share about *Waialua Moku*. Among her many contributions and the *Hawaiian Community and Culture*, **she became a member of *The Daughters of Hawaii* in the 1930's and served as *Historian* for many years, retaining the title of *Honorary Assistant Historian* for life. *The Daughters of Hawaii* which originated at *Dillingham Ranch* in *Mokule'ia* and it's *kuleana* is preserving *Hawaii's* historical places. They were the original caretakers of *Kukaniloko Birth Stones*.**

**Reverend James Kekela (1824 – 1904)**

He was born at **Mokule'ia** and is the first ordained *Hawaiian Minister* who did extensive missionary work in the *Marqueses Islands*

**Na Iwi Kupuna of Mokule'ia Ahupua'a**

Thru my research, I've found documentation that this project may encounter and disturb several *Iwi Kupuna* documented and were buried in *Mokule'ia Ahupua'a* which potentially be within the geographical perimeters of this project. Among my documentation is a mentioning of a **Family Cemetery at Mokule'ia and a Kupuna named Kaakau (?) who maybe an original patentee of Grant 1123 (Makahi, Poli, Kaakau, Keoahu)**. Before continuing, **it's known that Iwi Kupuna were buried in sand**. During the casting of the Television Series "*Lost*", clearing of *Makaleha Stream* and especially *Sand Mining* permitted, I expressed concerns when serving on the *Oahu Island Burial Council's Waialua Moku Representative*. It was not taken seriously and shortly after *Iwi Kupuna* were disturbed on *Dillingham (Kawaihapai) Airfield* due to sand minning.

On March 18, 1973 *Dillingham Ranch* got approval from the Honolulu City Council to sand minning on their property despite opposition from the community. It was during that time **only one Kupuna** knew what was going to happen. **He was my Grandfather** and visited the sand minning location just past *Makaleha Stream Bridge* in the cattle pasture on the immediate right of *Farrington Highway*. I'd also like to note that a seaward cattle pasture that encompasses the current *Makaleha Beach Access* was also cleared for sand minning however it was never used because of the quality of sand.

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However on the *mauka* side of *Farrington Highway*, they eventually encountered an old refuse pit where many bottles were found. Among them, Grandfather found a *Hollister & Company* round bottom blob top soda bottle. *Hollister & Company* was the first soda company in *Hawaii* in 1863. What was kept quiet was that while sand minning at that location, they may have disturbed some *iwi kupuna* however there were no burial laws at that time. The only thing that I recalled my Grandfather telling me is that when he found the bottle, the Payloader operator tried to run him over and cover the location with sand and suddenly the Payloader had a breakdown. A similar situation occurred during the construction of the *Dillingham Airfield (Mokule'ia Field)*.

Potentially contributing to the refuse pit is that on the **eastern end** of *Mokule'ia Polo* foundation of the railroad bridge that crossed this *muliwai* and situated nearby was ***Chinese Store called E Chan Store***. Earlier in 1973, my Grandfather took me with him to do some shorecasting fronting the area where the sand minning occurred. After entering the gate and proceeded towards the beach on the pathway, I found an adz blade on the surface. Having shared these instances, is the reason why I have much sentimental memories of this area and why I would like to continue in this process.

***Addition Comments, Recommendations and Request******Hidden Waters – Site 192***

The *Hidden Waters* was a major source and although ***Sites 6886, 6887 and 6888*** are located outside of this project they peritent and connected to ***Site 192*** they also need to be protected because of it's relationship to the ***Legendary Springs of Kawaihapai*** which includes ***Ka Wai Kumuole***:

***The Hawaiian Planter – Handy (1940):******Kaena***

***“This ahupua’a must have grown sweet potatoes exclusively, except for one group of about 20 taro patches, terraced with rock facings, on the slopes below Uluhulu Gulch.”***

***“David Keaau (David Keao) of Kawaihapai says no taro was grown between these terraces and Kaena Point.”***

***“Kaaimoku Kekulu (Kaaemoku Kakulu), native of the district says that the name of the spring and the terrace section noted above is Kaaiea.”***

***Kawaihapai***

***“At the foot of the cliffs, watered by a stream the name of which was not learned, are several small terraces in which taro is grown by David Keaau.” ( David Keao)***



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***“There are two extensive old terrace areas in Mokule’ia on the flat land near the sea. One is just below Dillingham Ranch, watered by an underground flow from a gulch west of the ranch house. This area of old terraces is now entirely planted mostly in Chinese bananas.”***

***“Wild taro grows in Makaleha Valley and it’s subsidiaries. Kamakau (40) speaks of the abundance of food grown in Makaleha Valley of the Kihī and lapa varieties of taro, of sweet potatoes, awa, bananas....”***

As you can see, the agricultural sustainability and productively extends to the lowlands (*Mokule’ia Waena and Mokule’ia Kai*) and not limited to *Mokule’ia Uka*. Everything along this Northwest Coastline of *Waialua Moku* is connected.

**Recommendations**

After reviewing the *Draft Preservation Plan for the Dillingham Ranch Development Plan*, I support it with the following amendments:

1. I’m concerned that I was not consulted by *Cultural Surveys Hawaii* earlier especially when *OHA’s (Office of Hawaiian Affairs)* letter is dated *December 26, 2006* which is **TWO YEARS** before being asked. Also if it was researched, my *Ohana* had the most relevant and *mana’o* regarding this project. Furthermore, I’m a past member of the *Oahu Island Burial Council* serving as *Waialua Moku* Representative and have knowledge of *HRS Chapter 6E and Native American Graves Protection Act (NAGPRA)*.
2. I would like to request a site visit to those areas mentioned in this *Preservation Plan*.
3. I would like to request *access* to those areas during and after completion of this project. This would continue the relationship during my Grandfather’s era when *Dillingham Ranch* was gracious to let him and his *ohana* access and transit their property to *Kawaihapai Ahupua’a* since the *1940’s*. Although I’m requesting this humble and well deserved request, I’d like to ensure that access to the historic and cultural sites be safe guarded and highly restricted.
4. Ensure the ***Mokule’ia Community Association*** be kept informed and updated because **it is the immediate community that would be impacted by this project.**
5. I would like to request a letter supporting that *King Liholiho (Kamehameha II)* be credited as the composer of the chant entitled *Kalena Kai* be sent to *Bishop Museum*. This has been a great unjust for well over a 100 years

Thank you for the opportunity to provide comments regarding the *Preservation Plan for the Dillingham Ranch Development Project* protecting this *Wahi Pana of Mokule’ia*. Look forwarding to hearing from you. *Malama Pono*.

**Thomas T Shirai Jr**


# Appendix B Authorization and Release Forms

## B.1 Levi Rita

15 August 2016

Mr. Levi Rita

**Cultural Surveys Hawai'i, Inc.**  
Archaeological and Cultural Impact Studies  
Hallett H. Hammatt, Ph.D., President



P.O. Box 1114      Kailua, Hawai'i 96734      Ph: (808) 262-9972      Fax: (808) 262-4950  
Job code: MOKULEIA 5      [bbeauchan@culturalsurveys.com](mailto:bbeauchan@culturalsurveys.com)      [www.culturalsurveys.com](http://www.culturalsurveys.com)

**AUTHORIZATION AND RELEASE FORM**

Cultural Surveys Hawai'i (CSH) appreciates the generosity of the *kūpuna* and *kama'āina* who are sharing their knowledge of cultural and historic properties, and experiences of past and present cultural practices for the proposed Dillingham Ranch Agricultural Subdivision, Mokulē'ia Ahupua'a, Waialua District, O'ahu, Tax Map Keys (TMKs): Multiple.

We understand our responsibility in respecting the wishes and concerns of the interviewees participating in our study. Here are the procedures we promise to follow:

1. The interview will not be tape-recorded without your knowledge and explicit permission.
2. If recorded, you will have the opportunity to review the written transcript of our interview with you. At that time you may make any additions, deletions or corrections you wish.
3. If recorded, you will be given a copy of the interview notes for your records.
4. You will be given a copy of this release form for your records.
5. You will be given any photographs taken of you during the interview.

For your protection, we need your written confirmation that:

1. You consent to the use of the complete transcript and/or interview quotes for reports on cultural sites and practices, historic documentation, and/or academic purposes.
2. You agree that the interview shall be made available to the public.
3. If a photograph is taken during the interview, you consent to the photograph being included in any report/s or publication/s generated by this cultural study.

I, Levi Rita, agree to the procedures outlined above and, by my  
(Please print your name here)  
signature, give my consent and release for this interview to be used as specified.

Levi Rita  
(Signature)


August 15, 2016  
(Date)

## B.2 Thomas Shirai, Jr.

16 August 2016

Mr. Tom Shirai

**Cultural Surveys Hawai'i, Inc.**  
Archaeological and Cultural Impact Studies  
Hallett H. Hammatt, Ph.D., President



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2. You agree that the interview shall be made available to the public.
3. If a photograph is taken during the interview, you consent to the photograph being included in any report/s or publication/s generated by this cultural study.

I, Thomas Shirai Jr, agree to the procedures outlined above and, by my  
(Please print your name here)  
signature, give my consent and release for this interview to be used as specified.

[Signature]  
(Signature)

August 16, 2016  
(Date)

---

# B.3 Mike Dailey

25 August 2016

**Cultural Surveys Hawai'i, Inc.**  
Archaeological and Cultural Impact Studies  
Hallett H. Hammatt, Ph.D., President



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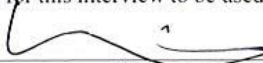
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1. You consent to the use of the complete transcript and/or interview quotes for reports on cultural sites and practices, historic documentation, and/or academic purposes.
2. You agree that the interview shall be made available to the public.
3. If a photograph is taken during the interview, you consent to the photograph being included in any report/s or publication/s generated by this cultural study.

I, Mike Dailey, agree to the procedures outlined above and, by my signature, give my consent and release for this interview to be used as specified.

  
(Signature)

8/25/16  
(Date)

# B.4 Kawika Dowsett

18 August 2016

Mr. Kawika Dowsett

**Cultural Surveys Hawai'i, Inc.**  
Archaeological and Cultural Impact Studies  
Hallett H. Hammatt, Ph.D., President



P.O. Box 1114      Kailua, Hawai'i 96734      Ph: (808) 262-9972      Fax: (808) 262-4950  
Job code: MOKULEIA 5      [bbeauchan@culturalsurveys.com](mailto:bbeauchan@culturalsurveys.com)      [www.culturalsurveys.com](http://www.culturalsurveys.com)

### AUTHORIZATION AND RELEASE FORM

Cultural Surveys Hawai'i (CSH) appreciates the generosity of the *kūpuna* and *kama'āina* who are sharing their knowledge of cultural and historic properties, and experiences of past and present cultural practices for the proposed Dillingham Ranch Agricultural Subdivision, Mokulē'ia Ahupua'a, Waialua District, O'ahu, Tax Map Keys (TMKs): Multiple.

We understand our responsibility in respecting the wishes and concerns of the interviewees participating in our study. Here are the procedures we promise to follow:

1. The interview will not be tape-recorded without your knowledge and explicit permission.
2. If recorded, you will have the opportunity to review the written transcript of our interview with you. At that time you may make any additions, deletions or corrections you wish.
3. If recorded, you will be given a copy of the interview notes for your records.
4. You will be given a copy of this release form for your records.
5. You will be given any photographs taken of you during the interview.

For your protection, we need your written confirmation that:

1. You consent to the use of the complete transcript and/or interview quotes for reports on cultural sites and practices, historic documentation, and/or academic purposes.
2. You agree that the interview shall be made available to the public.
3. If a photograph is taken during the interview, you consent to the photograph being included in any report/s or publication/s generated by this cultural study.

I, KAWIKA DOWSETT, agree to the procedures outlined above and, by my signature, give my consent and release for this interview to be used as specified.

(Signature)

8-18-2016

(Date)

# B.5 Jan Becket

9 November 2016

Jan Becket

**Cultural Surveys Hawai'i, Inc.**  
Archaeological and Cultural Impact Studies  
Hallett H. Hammatt, Ph.D., President



P.O. Box 1114      Kailua, Hawai'i 96734      Ph: (808) 262-9972      Fax: (808) 262-4950  
Job code: MOKULEIA 5      [bbeauchan@culturalsurveys.com](mailto:bbeauchan@culturalsurveys.com)      [www.culturalsurveys.com](http://www.culturalsurveys.com)

### AUTHORIZATION AND RELEASE FORM

Cultural Surveys Hawai'i (CSH) appreciates the generosity of the *kūpuna* and *kama'āina* who are sharing their knowledge of cultural and historic properties, and experiences of past and present cultural practices for the proposed Dillingham Ranch Agricultural Subdivision, Mokulē'ia Ahupua'a, Waialua District, O'ahu, Tax Map Keys (TMKs): Multiple.

We understand our responsibility in respecting the wishes and concerns of the interviewees participating in our study. Here are the procedures we promise to follow:

1. The interview will not be tape-recorded without your knowledge and explicit permission.
2. If recorded, you will have the opportunity to review the written transcript of our interview with you. At that time you may make any additions, deletions or corrections you wish.
3. If recorded, you will be given a copy of the interview notes for your records.
4. You will be given a copy of this release form for your records.
5. You will be given any photographs taken of you during the interview.

For your protection, we need your written confirmation that:

1. You consent to the use of the complete transcript and/or interview quotes for reports on cultural sites and practices, historic documentation, and/or academic purposes.
2. You agree that the interview shall be made available to the public.
3. If a photograph is taken during the interview, you consent to the photograph being included in any report/s or publication/s generated by this cultural study.


I, Jan Becket, agree to the procedures outlined above and, by my  
(Please print your name here)  
signature, give my consent and release for this interview to be used as specified.

Jan Becket  
(Signature)

11/9/16  
(Date)

# Appendix C SHPD Acceptance Letters

## SHPD Acceptance for the Drolet and Schilz (1992) AIS

JOHN WAHNEE GOVERNOR OF HAWAII		WILLIAM W. FATY, CHAIRPERSON BOARD OF LAND AND NATURAL RESOURCES
	STATE OF HAWAII	DEPUTIES
	DEPARTMENT OF LAND AND NATURAL RESOURCES	JOHN P. KEPPELER, II DONA L. MANAHE
	STATE HISTORIC PRESERVATION DIVISION 33 SOUTH KING STREET, 8TH FLOOR HONOLULU, HAWAII 96813	AQUACULTURE DEVELOPMENT PROGRAM
April 24, 1992		AQUATIC RESOURCES CONSERVATION AND ENVIRONMENTAL AFFAIRS
		CONSERVATION AND RESOURCES ENFORCEMENT CONVEYANCES
		FORESTRY AND WILDLIFE HISTORIC PRESERVATION DIVISION LAND MANAGEMENT STATE PARKS WATER AND LAND DEVELOPMENT
		LOG NO. 5155 DOC NO. 0682t
Mr. Allan J. Schilz Ogden Environmental & Energy Services 680 Iwilei Rd., Suite 660 Honolulu, HI 96817		
Dear Mr. Schilz:		
SUBJECT: Chapter 6E Review -- Archaeological Inventory Survey and Evaluation Prepared for Mokuleia Land Company (February 1992) Mokule'ia and Kawaihapai, Waialua, O'ahu <u>TMK: 6-8-02 and -03 various</u>		
Thank you for the copy of this report which adequately addresses concerns with an earlier draft noted in our letter of October 7, 1991 and in a subsequent meeting and telephone conversations. We now believe that this is an acceptable inventory survey report.		
A total of 840 acres was inventoried through a combination of pedestrian survey and backhoe test excavation. These survey techniques were adequate to locate all extant historic sites. Fifteen historic sites (comprising 40 features) were found and have been assigned state numbers 50-80-03-4424 through -4438. Table 2 on p.41 offers a preliminary significance assessment for each of the 40 features; technically, the site is the unit of analysis for significance determinations. Abstracting from this table, three sites (-4424, -4428, and -4438) are assessed as significant for their information content (criterion D) and for their historical value to the Hawaiian ethnic group (criterion E); eight sites (-4425, -4426, -4427, -4429, -4430, -4431, -4432, and -4434) for criterion D alone; and four sites (-4433, -4435, -4436, and -4437) are no longer significant because their location and description exhaust the information about Hawaiian history and pre-history that they contain. Based on the information presented in this report we disagree with the significance assessments for the six sites (-4424, -4425, -4426, -4427, -4428, and -4429) comprising Settlement Cluster 1. Given these sites' excellent integrity, the fact that they represent a related group of sites characteristic of the type that was built on the coastal terrace of Mokule'ia during prehistoric times, and because other site groups of this type in the region might have less		

Mr. Allan Schilz  
April 24, 1992  
Page 2

integrity, we believe that these sites are also significant because they embody the distinctive characteristics of a type (criterion C). Our disagreement on this point does not affect the acceptability of the inventory survey report. It does require that consultation to resolve the differences take place; this could be a letter from Mokuleia Land Company, or you as their agent, agreeing to our assessment. If you do not agree, then we will need to schedule a meeting.

Once concurrence on significance assessments is reached, the next step will be to determine the effect of Mokuleia Land Company's proposed development on significant historic sites, and once these effects have been agreed upon, to develop a mitigation plan. It is at this stage that recommendations for excavation and/or preservation are appropriate.

If you have any questions please call Tom Dye at 587-0014.

Sincerely,





DON HIBBARD, Administrator  
State Historic Preservation Division

TD:amk

APR 28 1992



## SHPD Acceptance for the Tulchin and Hammatt (2007) AIS

 <p>LINDA LINGLE GOVERNOR OF HAWAII</p>		<p>LAURA H. THELEN CHAIRPERSON BOARD OF LAND AND NATURAL RESOURCES COMMISSION ON WATER RESEARCH/ MANAGEMENT</p> <p>RUSSELL Y. TSUJI FIRST DEPUTY</p> <p>KEN C. KAWAHARA DEPUTY DIRECTOR, WATER</p> <p>AQUATIC RESOURCES BOATING AND FISHING RECREATION BUREAU OF CONSERVATION COMMISSION ON WATER RESEARCH/ MANAGEMENT CONSERVATION AND COASTAL LANDS CONSERVATION AND RESOURCES ENFORCEMENT ENGINEERING FORESTRY AND WILDLIFE HISTORIC PRESERVATION KAMŌHŌE ISLAND RESERVE COMMISSION LAND STATE PARKS</p>
<p>STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES STATE HISTORIC PRESERVATION DIVISION 601 KAMŌHŌE BOULEVARD, ROOM 555 KAPŌLEI, HAWAII 96707</p>		
<p>December 19, 2007</p>		
<p>Todd Tulchin Cultural Surveys Hawai'i P.O. Box 114 Kailua, Hawai'i 96734</p>	<p>LOG NO: 2007.2421 DOC NO: 0712LM03 Archaeology</p>	
<p>Dear Mr. Tulchin:</p>		
<p><b>SUBJECT: Chapter 6E-42 Historic Preservation Review – Archaeological Inventory Survey of an Approximate 75-Acre Portion of the Proposed 861-Acre Dillingham Ranch Development Project, Auku'u, Kikahi, and Kawaihāpai Ahupua'a, Wailua District, Island of O'ahu TMK: (1) 6-8-002:006 por.; 6-8-003:006 por.</b></p>		
<p>Thank you for the opportunity to review the aforementioned report, which we received on July 11, 2007. We apologize for the delay in reviewing this project. The archaeological inventory survey, of approximately 75 acres of the mauka portion within the overall 861 acre Dillingham Ranch Development Project, identified six historically significant properties. Approximately 787 acres of the 861 acre Dillingham Ranch project area were covered by a previous archaeological inventory survey in 1992 (Drolet and Schilt:1992). This survey was reviewed and accepted by SHPD in 1992 (Log No. 5155, Doc No. 0682t).</p>		
<p>Two of the identified significant historic properties, sites 50-80-03-6884 and -6885 are located within the 75 acre survey area. The four other sites, -416, -6886, -6887, and -6888 are located outside of the 75 acre survey area. These sites were originally a part of a 78 acre survey area but the property boundaries were adjusted to exclude the approximately three acres where these four sites are located thus reducing the project area to 75 acres. This approximately 3 acre area will not be affected by the current development and should be classified as a preservation easement. Portions of Site -416 were previously identified in an adjacent property (Rosendahl 1977; Moblo 1991). The four historically significant properties are located on the boundaries of the overall 861 acre project area or the Area of Potential Effect (APE) and will not be affected by the proposed development project. Site -6884 consists of four historic, ranch related stone walls and is eligible for the Hawai'i Register under Criterion D, informational content relevant to research of historic era ranching in the Wailua area. Site -6885 consists of a pre-contact/early historic agricultural complex including terraces and a retaining wall which is eligible for the Hawai'i Register of Historic Places under Criteria C and D. Site -416, an agricultural complex, is eligible for the Hawai'i Register under Criteria C and D. Site -6886, an agricultural complex, is eligible for the Hawai'i Register under Criteria D and E due to its possible association with the legendary springs of Kawaihāpai. Site -6887, modified overhang, is eligible for the Hawai'i Register under Criteria D. Site -6888, an agricultural complex, is eligible for the Hawai'i Register under Criteria D and E due to its possible association with the legendary springs of Kawaihāpai. The following proposed mitigation recommendations were developed in consultation with community members knowledgeable of the history and culture of the area and with the Office of Hawaiian Affairs (OHA). We concur with the proposed mitigation.</p>		

Mr. Tulchin

Page 2

The proposed mitigation recommendation for Site -6884, the four ranching era stone walls, is no further work recommended. Sufficient information regarding the location, function, age, and construction methods was compiled by the current survey investigation to mitigate any adverse effect. We concur with this recommendation, but we recommend that these stone walls be incorporated into the design of the project. Breaching of the walls for access and other needs can be accomplished without the destruction of the entire site. The stone walls will add character and increased value to the community and reflect its post-contact land use for ranching.

The proposed mitigation for Site -6885, an agricultural complex which includes distinctive remnants of Mokuē'ia and Kawaihāpai's pre-contact/early historic land use and is a future resource for both the Hawaiian community and further archaeological research, is preservation, in the form of avoidance and protection. We concur with this recommendation, but we would suggest that an ongoing maintenance program be established to take care of the site in perpetuity ie; periodic hand clearing of invasive alien vegetation.

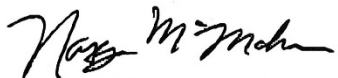
Sites -416, -6886, -6887, and -6888 which are located outside of the project area but in close proximity to the project areas boundary. Due to the sites proximity to the project area mitigation recommendations for these sites were included in the current study. The proposed mitigation for the sites located outside of the project area is preservation, in the form of avoidance and protection. Again we suggest that an ongoing maintenance program be established to take care of the site(s) in perpetuity ie; periodic hand clearing of invasive alien vegetation.

The introduction, methods, background research and previous archaeology sections are excellent and effectively provide a logical context for the inventory survey work.

This archaeological inventory survey is accepted as fulfilling the requirements of Hawai'i Administrative Rules (HAR) Chapter 13-276. We look forward to reviewing the Preservation Plan and we suggest that you interview Mr. Thomas Shirai a recognized lineal descendent of the Kawaihāpai area and any other knowledgeable persons that he might recommend for this plan.

Please contact Lauren Morawski (O'ahu Archaeologist) at (808) 692-8015 if you have any questions or concerns regarding this letter.



Aloha,



Nancy McMahon  
Acting Archaeology Branch Chief and Kaua'i Archaeologist  
State Historic Preservation Division

LM

# SHPD Acceptance for the Tulchin and Hammatt (2008a) Preservation Plan

 <p>LINDA LINGLE GOVERNOR OF HAWAII</p>		<p>LAURA H. THEILEN CHAIRPERSON BOARD OF LAND AND NATURAL RESOURCES COMMISSION ON WATER RESOURCE MANAGEMENT</p> <p>RUSSELL Y. TSUJI FIRST DEPUTY</p> <p>KEN C. KAWAHARA DEPUTY DIRECTOR - WATER</p> <p>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 KAOHOLAWE ISLAND RESERVE COMMISSION LAND STATE PARKS</p>
<p>STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES STATE HISTORIC PRESERVATION DIVISION 601 KAMOKILA BOULEVARD, ROOM 555 KAPOLEI, HAWAII 96707</p>		
<p>September 29, 2008</p>		
<p>Todd Tulchin Cultural Surveys Hawai'i, Inc. P.O. Box 1114 Kailua Hawai'i 96734</p>	<p>LOG NO: 2008.2963 DOC NO: 0809LM07 Archaeology</p>	
<p>Dear Mr. Tulchin:</p>		
<p><b>SUBJECT: Chapter 6E-42 Historic Preservation Review – Revised Archaeological Preservation Plan For SIHP #'s 50-80-03-416, -4772 to -4780, -4780, -4782, -4786, and -6885 to -6888 in the Proposed 820 Acre Dillingham Ranch Development Project Mokulē'ia 2, Auku`u, Kikahi, and Kawaihāpai Ahupua`a, Waialua District, Island of O`ahu <u>TMK: (1) 6-8-002; 006 por.; 6-8-003 por.; 015, 019, 030, 031, 033, 035, 040</u></b></p>		
<p>Thank you for the opportunity to review the aforementioned revised preservation plan (Tulchin and Hammatt 2008), which we received on July 18, 2008. The plan details both the interim and long term preservation measures that will be established before construction activities commence on the subject parcel.</p>		
<p>Interim preservation measures include the identification and marking, with brightly colored flagging tape all archaeological features to be preserved. Following the marking of all identified archaeological features orange web event fencing or some similar highly visible continuous fencing will be erected around an area 15.0 meters (50 feet) in radius from the perimeter of all historic properties designated for preservation. These continuous barriers will act as heavy machinery exclusion zones during all construction activities in the vicinity and will be re-established as needed. The erection of this continuous barrier will be supervised by qualified archaeologists prior to the commencement of construction activities. No land disturbing activities or stockpiling of construction materials will be permitted within these interim buffer zones. The boundaries of the designated heavy machinery exclusion zones will be accurately located by licensed land surveyor and indicated on all construction plans. A preconstruction meeting will be held for all project construction personnel to inform them of the conditions of the preservation plan and the location and significance of each of the archaeological preserve areas. Any construction activities in the immediately vicinity of the designated preserve areas will be supervised by qualified archaeologists. Specific archaeological monitoring measures will be outlined in the Archaeological Monitoring Plan (Tulchin and Hammatt 2008 currently under review).</p>		
<p>Long term preservation methods for the archaeological preserves will include permanent buffer zones of 15.0 meters (50 feet). These permanent buffers zones will be drawn from the perimeters of all features designated within the archaeological preserves. All long-term preservation buffer zones will be demarcated with permanent land survey markers and by using permanent fencing and/or boulder barriers. Any construction activity within these buffer zones is prohibited. The style of permanent fencing will be</p>		

Mr. Tulchin  
Page 2

determined in consultation with community members with familial ties to the area, in particular those who were consulted during the preparation of this preservation plan.

Access to historic properties shall be provided for those community members with familial ties to the area and those individuals and groups that desire to conduct cultural activities at these sites. Access agreements between the landowner or representatives and individuals and groups who desire access for cultural practices and or educational/research purposes will be granted with prior written consent of the landowner or representatives. Currently any requests for access can be obtained by contacting Dillingham Ranch Aina, LLC 68-540 Farrington Highway Waiialua HI 96791. After the implementation of the preservation plan access requests should be directed to the Dillingham Ranch Community Association.

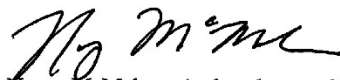
An Archaeological Monitoring Plan is currently under review by our office and pending acceptance will be carried out to insure that sites identified within the project area are not impacted during construction activities and that any subsurface cultural deposits and/or 'iwi kūpuna (human burials) receive appropriate treatment and or mitigation pursuant to compliance with procedures outlined in Hawai'i Revised Statutes (HRS) Chapter 6E-43.

Given the above information, we believe that any effect on the known historic properties by the proposed undertaking will be mitigated through adherence to the conditions of the accepted preservation plan and the archaeological monitoring plan. Via this letter the applicant is notified that the conditions in the preservation plan shall be adhered to pursuant to Section 6E-42, HRS. This includes notifying the State Historic Preservation Division, Lauren Morawski (O'ahu Archaeologist) at (808) 692-8015 or by email at Lauren.M.Morawski@hawaii.gov, that the interim protection measures are in place prior to the commencement of construction activities. The Division shall then verify in writing the County that these measures are in place prior to the commencement of any ground altering activities.

The requested revisions, SHPD Log No. 2008.0202 Doc No. 0806LM06, have been incorporated into the preservation plan. This Revised Preservation Plan is accepted as satisfying the requirements of Hawai'i Administrative Rules (HAR) Chapter 13-277.

Please contact Lauren Morawski (O'ahu Archaeologist) at (808) 692-8015 if you have any questions or concerns regarding this letter.

Aloha,





Nancy McMahon, Archaeology and Historic Preservation Manager  
State Historic Preservation Division

LM

Cc: ✓ Cliff Smith-Dillingham Ranch LLC

## SHPD Acceptance for the Tulchin and Hammatt (2008b) Archaeological Monitoring Plan

 <p>LINDA LINGLE GOVERNOR OF HAWAII</p>		<p>LAURA H. THELEN CHAIRPERSON BOARD OF LAND AND NATURAL RESOURCES COMMISSION ON WATER RESOURCE MANAGEMENT</p> <p>RUSSELL Y. TSUJI FIRST DEPUTY</p> <p>KEN C. KAWAHARA DEPUTY DIRECTOR - WATER</p> <p>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</p>
<p>STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES STATE HISTORIC PRESERVATION DIVISION 601 KAMOKILA BOULEVARD, ROOM 555 KAPOLEI, HAWAII 96707</p>		
<p>October 30, 2008</p>		
<p>Todd Tulchin Cultural Surveys Hawai'i, Inc. P.O. Box 1114 Kailua Hawai'i 96734</p>	<p>LOG NO: 2008.4774 DOC NO: 0810LM42 Archaeology</p>	
<p>Dear Mr. Tulchin:</p>		
<p><b>SUBJECT: Chapter 6E-42 Historic Preservation Review – Revised-Archaeological Monitoring Plan for the 820 Acre Dillingham Ranch Development Project; Mokulē'ia 2, Auku'u, Kikahi and Kawaiāpai Ahupua'a, Waiālua District, Island of O'ahu <u>TMK: (1) 6-8-002:006 por.; 6-8-003:006 por., 015, 019, 030, 031, 033, 035 and 040</u></b></p>		
<p>Thank you for the opportunity to review the aforementioned revised archaeological monitoring plan (Tulchin and Hammatt 2008), which we received on October 27, 2008. The monitoring plan details the program of archaeological monitoring to be conducted during ranch improvement projects and initial subdivision infrastructure construction activities undertaken by Dillingham Ranch Aina LLC. Planned land-disturbing activities include: grubbing, grading and excavations associated with ranch drainage improvements; grubbing and grading associated with subdivision road construction; grubbing and grading associated with water well, water tank and access road construction; excavations for subsurface utilities; and rockfall remediation work, including grubbing and grading associated with access road construction, excavations for geotechnical testing, boulder removal and stabilization work, and excavations for rockfall catchment ditches and/or fencing. Subsequent construction activities within subdivision development lots by individual lot owners and are not covered by this plan. Subsequent construction activities on individual lots will be subject to permit approval by the Honolulu City and County Department of Planning and Permitting and the State Historic Preservation Division will provide comments and recommendation for individual lot owners at that time to the City and County Department of Planning and Permitting.</p>		
<p>The aforementioned plan (Tulchin and Hammatt 2008) recommends on-site monitoring of all initial grubbing and grading activities within the project area, including; subdivision road construction; water well; water tank; and access road construction; utility corridor construction; geotechnical testing; and rockfall mediation work. Grubbing, grading and excavation associated with ranch drainage improvement activities, including work in the vicinity of the old Dillingham Ranch house and maintenance of the Makaleha Stream channel will require full time on-site monitoring. Additionally full time on-site archaeological monitoring of any construction activities occurring within 30 meters (100 ft.) of designated archaeological preserve areas will occur throughout the duration of the proposed construction of the subdivision and its associated infrastructure. The remaining construction activities will be monitored on an on-call basis with weekly site visits to document the progress of construction activities and to coordinate with project contractors on upcoming and future construction activities.</p>		

Mr. Tulchin  
Page 2

The archaeological monitoring program implemented under the plan includes provisions that ensure that historic properties previously identified within the project area, SIHP 50-80-03-416, -4772 to -4780, -4782, -4786 and -6885 to 6888, are not adversely affected by construction activities. Additionally the program of archaeological monitoring will ensure the proper documentation of any additional historic properties identified during construction activities. Also if `iwi kūpuna (human remains) are identified during the program of archaeological monitoring compliance with procedures outlined in Hawai'i Revised Statutes (HRS) Chapter 6E-43 will be followed.

We accept this archaeological monitoring plan as fulfilling the requirements of Hawai'i Administrative Rules (HAR) Chapter 13-279. Please submit a copy of this acceptance letter and an electronic (pdf) copy of the report on a CD to the Kapolei SHPD office.

Please contact Lauren Morawski (O'ahu Archaeologist) at (808) 692-8015 if you have any questions or concerns regarding this letter.



Aloha,



Nancy McMahon, Archaeology and Historic Preservation Manager  
State Historic Preservation Division

LM

# SHPD Acceptance for the Lauer and Rieth (2014) Archaeological Inventory Survey

 <p>DAVID Y. IGE GOVERNOR OF HAWAII</p>	 <p><b>STATE OF HAWAII</b> <b>DEPARTMENT OF LAND AND NATURAL RESOURCES</b></p> <p>STATE HISTORIC PRESERVATION DIVISION KAKUHIHEWA BUILDING 601 KAMOKILA BLVD, STE 555 KAPOLEI, HAWAII 96707</p>	<p>SUZANNE D. CASE CHAIRPERSON BOARD OF LAND AND NATURAL RESOURCES COMMISSION ON WATER RESOURCE MANAGEMENT</p> <p>KEKO A. KALUHIWA FIRST DEPUTY</p> <p>W. ROY HARDY ACTING DEPUTY DIRECTOR - WATER</p> <p>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</p>
<p>July 17, 2015</p> <p>Mr. George I. Atta, FAICP, Director Department of Planning and Permitting City and County of Honolulu</p> <p>Mr. Clifford R. Smith, Sr. Vice President Kennedy Wilson Commercial Investment Group 9701 Wilshire Boulevard, Suite 700 Beverly Hills, CA 90212</p> <p>Dear Mr. Smith:</p> <p><b>SUBJECT: Chapter 6E-42 Historic Preservation Review – Archaeological Inventory Survey of the Mauka Lands, Dillingham Ranch Agricultural Subdivision Kawaihāpai, Kīkaʻi, Aukūʻu, and Mokulēʻia 2 Ahupuaʻa, Waialua District, Island of Oʻahu TMK: (1) 6-8-002:006 por., 6-8-003:005 por., 006 por.</b></p> <p>Thank you for the opportunity to review the draft report titled <i>Archaeological Inventory Survey of the Mauka Lands, Dillingham Ranch Agricultural Subdivision, Kawaihāpai, Kīkaʻi, Aukūʻu, and Mokulēʻia 2 Ahupuaʻa, Waialua District, Oʻahu, Hawaiʻi, Tax Map Key (1) 6-8-002:006 (portion), 6-8-003:005 (portion), 006 (portion)</i>. We received the initial draft (Lauer and Rieth, June 2014) on June 25, 2014, and the revised draft (Lauer and Rieth, July 2015) via email on July 15, 2015.</p> <p>Related reports and plans reviewed and accepted for portions of the Dillingham Ranch Agricultural Subdivision property are summarized below:</p> <p>1987 - Reconnaissance survey by horseback. Sites identified but not assigned site numbers [no information on SHPD review located];</p> <p>1992 - AIS for 840-acre portion [783 acres (1992a) and 55 acres (1992b)], TMK: (1) 6-8-002:006 por., 015, 019, 021, 030, 031, 033, 034, 035, 040 (Drolet and Schilz 1992 [a,b]), accepted in 1992 (Log No. 5155, Doc. No. 0682t);</p> <p>2007 - AIS for 75-acre portion, TMK: (1) 6-8-002:006 por., 6-8-003:006 por. (Tulchin and Hammatt 2007), accepted December 21, 2007 (Log No. 2007.2421, Doc. No. 0712LM03);</p> <p>2008 - PP for SIHP #s 50-80-03-416, 4772 to 4780, 4782, 4786 and 6885 to 6888, TMK: (1) 6-8-002:006 por., 6-8-003:006 por., 015, 019, 030, 031, 033, 035, 040 (Tulchin and Hammatt 2008), accepted on September 29, 2008 (Log No. 2008.2963, Doc. No. 0809LM07); and</p> <p>2008 - AMP for 820-acre portion, TMK: (1) 6-8-002:006 por., 6-8-003:006 por., 015, 019, 030, 031, 033, 035, 040 (Tulchin and Hammatt 2008), accepted October 30, 2008 (Log No. 2008.4774, Doc. No. 0810LM42)</p>		
<p>Log No. 2014.02945 Doc. No. 1507SL07 Archaeology</p>		

Mr. Smith  
July 15, 2015  
Page 2

International Archaeology, LLC (IA) completed an archaeological inventory survey (AIS) of approximately 85.3 acres for the landowner, Dillingham Ranch Aina, LLC. The landowner initiated the project in support of their proposed Dillingham Ranch Agricultural Subdivision (Subdivision Application No. 2014/SUB-149). The project acreage consists of three areas that will largely be used for pasturage but also residential development—an eastern parcel (30.1 acres), a central parcel (38.2 acres), and a western parcel (17 acres). The roughly 400-acre portion immediately south of the eastern survey parcel will continue to be used to graze cattle, and will not be subject to development.

Earlier archaeological inventory survey (AIS) studies were completed for portions of the subdivision area (Drolet and Schilz 1992a, 1992b; Tulchin and Hammatt 2007). The current AIS fieldwork included a pedestrian survey involving transects spaced 5-10 m apart, and excavation of three shovel test pits at two features. Sites and features were recorded using a Global Positioning System (GPS) unit, tape-and-compass mapping, photography, and detailed descriptions.

One archaeological site and one cultural property were recorded. The archaeological site (Site 50-80-03-7653) consists of four discontinuous historical ranching walls. In places, the dry-stacked stone walls incorporate large colluvial boulders and bedrock exposures. Wall segments either parallel the slope contours (generally east-west) or run cross contour (generally north-south). Slope erosion and collapse has affected numerous portions of these walls. The remaining segments are consistent with the extensive 19th/early 20th century ranching infrastructure in this area. These walls, and the components of previously recorded Site 50-80-03-6884 (walls recorded by Tulchin and Hammatt 2007), likely once formed an integrated enclosure/exclosure system for the ranch. Two unmodified fresh water seeps (Site 50-80-03-7793) were noted within the western survey parcel. They are located along the colluvial slopes, are in the general location of Site 192, "Hidden Waters" springs, recorded by McAllister (1933), and are considered a significant cultural property by some community members.

Site 50-80-03-7653 is assessed as significant per Hawaii Administrative Rules (HAR) §13-284-6 under Criterion d and is evaluated as eligible for listing on the Hawai'i Register of Historic Places per HAR §13-198-8 under Criterion D. Specifically, the distribution and characteristics of the various historical walls provide information about ranching activities and land divisions. The site features have been recorded in detail and no further work is recommended prior to the initiation of development activities. The site is recommended for preservation.

Site 50-80-03-7793 is assessed as significant per HAR §13-284-6 under Criterion e and is evaluated as eligible for listing on the Hawai'i Register of Historic Places per HAR §13-198-8 under Criterion D. Although the springs noted during the survey are not culturally modified features, their potential correlation with the "Hidden Waters" recorded in oral history and by McAllister (1933) and their importance to certain native Hawaiian community members warrants this evaluation. The site will be preserved.

In addition, the report indicates that if future development is considered for any previously un-surveyed portions of the ranch (e.g., the southern extension of Lots 90 and 91), the SHPD must be consulted for potential historic properties review requirements (e.g., archaeological inventory survey) prior to initiating development in these areas.

The AIS report adequately describes the project area, environment, cultural and historical background, previous investigations, anticipated findings, research objectives, field and laboratory methods, cultural consultation, and findings. SHPD concurs with the site significance assessments and mitigation recommendations for the current project area, and the stipulation that SHPD will be consulted regarding historic properties review requirements prior to initiating any future development in un-surveyed areas.

The report meets the standards set forth in HAR §13-276-5. It is accepted by SHPD. Please send one hardcopy of the document, clearly marked **FINAL**, along with a copy of this review letter and a text-searchable PDF version on CD to the Kapolei SHPD office, attention SHPD Library.

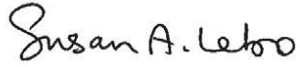
SHPD looks forward to receiving for review a preservation plan for Sites 50-80-03-7653 and 50-80-03-7793 that meets the requirements specified in HAR §13-277.

Please contact me at [Susan.A.Lebo@hawaii.gov](mailto:Susan.A.Lebo@hawaii.gov) or at (808) 692-8019 if you have any questions or concerns regarding archaeological resources or this letter.

Aloha,



Mr. Smith  
July 15, 2015  
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Susan A. Lebo, PhD  
Archaeology Branch Chief

cc: Timothy Rieth, International Archaeology, LLC ([trieth@iarii.org](mailto:trieth@iarii.org))

## Appendix D Pre-WWII English Language Newspaper Accounts of Mokulē'ia to 1922

The following articles were obtained through the Chronicling America Library of Congress (LOC) website.

Reference	Title of Article	Gist of Article
<i>The Pacific Commercial Advertiser</i> , March 09, 1872	“For Sale: Mokuleia Ranch”	For sale notice for Mokuleia Ranch. Described as, “Three thousand on hundred acres pasture land! Of which fourteen hundred acres are RICH BOTTOM LAND near the sea...One Stone Dwelling House...two miles of Stone wall...Also, on old Wool Press, on Iron Axle Ox Cart...” Ad includes available stock that also comes with the sale of the ranch including horses, cows, and oxen. [Submitted by S.N. Emerson]
<i>The Pacific Commercial Advertiser</i> , March 30, 1872	“For Sale: Mokuleia Ranch”	Repeat of Ad from March 9, 1872.
<i>The Pacific Commercial Advertiser</i> , April 06, 1872	“For Sale: Mokuleia Ranch”	Repeat of Ad from March 9, 1872.
<i>The Pacific Commercial Advertiser</i> , April 20, 1872	“For Sale: Mokuleia Ranch”	Repeat of Ad from March 9, 1872.
<i>The Pacific Commercial Advertiser</i> , September 04, 1875	“Wanted”	Wanted ad for a milker, “one who understands and can practice of ‘breaking’ or training heifers or steers.” [Add created by S.N. Emerson] Inquiries to Emerson or on the Mokuleia Batter Ranch to T.E. Cook.
<i>The Pacific Commercial Advertiser</i> , September 11, 1875	“Wanted”	Repeat of add from September 04, 1875. [see above]

<b>Reference</b>	<b>Title of Article</b>	<b>Gist of Article</b>
<i>The Pacific Commercial Advertiser</i> , September 18, 1875	“Wanted”	Repeat of add from September 04, 1875. [see above]
<i>The Pacific Commercial Advertiser</i> , September 18, 1875	“Notes of the Week”	Announcement for a new plantation. Messrs Chamberlain and Mitchell purchased the sugar mill of J.R. Williams, Esq., of Halawa. They “intend to commence planting cane at once on the plains of Mokuleia.”
<i>The Pacific Commercial Advertiser</i> , October 02, 1875	“Wanted”	Repeat of add from Septemeber 04, 1875. [see above]
<i>The Pacific Commercial Advertiser</i> , October 09, 1875	“Wanted”	Repeat of add from Septemeber 04, 1875. [see above]
<i>The Pacific Commercial Advertiser</i> , October 30, 1875	“Wanted”	Repeat of add from Septemeber 04, 1875. [see above]
<i>The Pacific Commercial Advertiser</i> , November 13, 1875	“Wanted”	Repeat of add from Septemeber 04, 1875. [see above]
<i>The Pacific Commercial Advertiser</i> , February 24, 1877	“Lease of Sugar and Pasture Lands”	For lease ad of a 190 acre parcel of land “Royal Patent 457, situate at Mokuleia, district of Waialua.”
<i>The Pacific Commercial Advertiser</i> , February 24, 1877	“Lease of Sugar and Pasture Lands”	Repeat of ad from February 24, 1877 [see above].
<i>The Pacific Commercial Advertiser</i> , June 15, 1878	“Notice”	Notice is to inform owners of cattle or horses running on Mokuleia plains without rights to pasturage that they have 30 days to remove them or animals will be impounded.

<b>Reference</b>	<b>Title of Article</b>	<b>Gist of Article</b>
<i>The Pacific Commercial Advertiser</i> , June 22, 1878	“Notice” and “Notice”	Notice is warning people against trespassing onto Mokuleia Ranch after dark. [issued by Mendonca and Silva] Notice is to inform owners of cattle or horses running on Mokuleia plains without rights to pasturage that they have 30 days to remove them or animals will be impounded.
<i>The Pacific Commercial Advertiser</i> , June 29, 1878	“Notice” and “Notice”	Repeat of notice ads from June 22, 1878. (see above)
<i>The Pacific Commercial Advertiser</i> , July 06, 1878	“Notice”	Notice is to inform owners of cattle or horses running on Mokuleia plains without rights to pasturage that they have 30 days to remove them or animals will be impounded.
<i>The Hawaiian Gazette</i> , September 11, 1878	“Notes of the Week”	Death announcement for “His Ex. Gov. W. L. Moehonua” who was born at Mokuleia, Waialua.
<i>The Daily Bulletin</i> , March 18, 1882	[No Title] “News was received yesterday...”	The Artesian from Waialua, “bored for MR. Gaspar Sylva, at Mokuleia, a short distance beyond Mr. Halstead’s place at Waialua,” has a substantial amount of water flowing from the well.
<i>The Pacific Commercial Advertiser</i> , March 18, 1882, Page 3	“Notes of the Week”	Boring of the artesian well by Mr. Slyva at Mokuleia has proven successful. “Water was struck at a dept of 400 feet.”
<i>The Pacific Commercial Advertiser</i> , May 27, 1882, Page	“News of the Week”	Mr. Ashley, an artesian well borer, reported that on the “19 <sup>th</sup> instant, water was reached at a depth of 457 feet at the well bored on the premises of J. Mendoza, at Mokuleia.” The quality of the water was excellent.
<i>The Hawaiian Gazette</i> , December 06, 1882	“Island Locals: Oahu”	The artesian well at Mokuleia has flowing water. This well is the fifth in that locality. The water from the well is used for irrigating rice fields.
<i>The Daily Bulletin</i> , April 12, 1884	[No Title]	J.E. Wiseman, a General Business Agent, “offers to lease the Mokuleia Ranch covering some 3,0000 acres of land and to sell several hundred head of fine imported breeding stock, also 5 cottages, outbuildings, carriages, carts, teams, etc.... a superior cattle, hog and dairy ranch. The owner sells on account of ill health.”

<b>Reference</b>	<b>Title of Article</b>	<b>Gist of Article</b>
<i>The Daily Bulletin.</i> , April 14, 1884	“Fine Investment, to Ranchers Generally For Lease and For Sale”	“The Mokuleia Ranch...covering 3000 acres more or less with five Dwellings, Outbuildings, six Artesian Wells supplying entire premises, several acres cultivated, to lease for a term of years.” For Sale” On the above ranch, over 800 Choice and Select head of Cattle, 17 Bullocks, 40 Horses, 100 Hogs, 300 Fowl, Wagons, Carriages, Carts, Impliments, and Goods and Chattles, Generally....The Ranch is laid out in Paddocks and for a first class Cattle, Hog and Dairy Ranch it cannot be excelled. ...apply to Joseph Mendonca on the Ranch.... Or to J.E. Wiseman, General Business Agent Honolulu.
<i>The Daily Bulletin.</i> , April 16, 1884,	“Fine Investment, to Ranchers Generally For Lease and For Sale”	Repeat of ad of April 14, 1884 (above)
<i>The Daily Bulletin.</i> , April 17, 1884	“Fine Investment, to Ranchers Generally For Lease and For Sale”	Repeat of ad of April 14, 1884 (above).
<i>The Daily Bulletin.</i> , April 18, 1884	“Fine Investment, to Ranchers Generally For Lease and For Sale”	Repeat of ad of April 14, 1884 (above).
<i>The Daily Bulletin.</i> , April 19, 1884	“Fine Investment, to Ranchers Generally For Lease and For Sale”	Repeat of ad of April 14, 1884 (above).
<i>The Hawaiian Gazette</i> , June 18, 1884	[No Title] “Mokuleia Stock Farm”	“Mokuleia Stock Farm... b e Col. Gift 3 Time 52 ¼”
<i>The Pacific Commercial Advertiser</i> , March 06, 1885	“Local and General”	Update that everything in the areas of Waialua and Mokuleia look green and nice, with plenty of rainfall.
<i>The Daily Bulletin</i> , June 12, 1885	”Kamehameha Day...Full Account of the Races”	A horse from Mokuleia Stock Farm appears to have placed third in the eight race.
<i>The Pacific Commercial Advertiser</i> , June 12, 1885	[No Title] “Mokuleia Stock Farm...”	“Mokuleia Stock Farm... c h Faiamma Sire, Monday; dam, Abbie W. Black Jacet, red sash, black cap.”

<b>Reference</b>	<b>Title of Article</b>	<b>Gist of Article</b>
<i>Saturday Press</i> , June 13, 1885	"The Races"	Race results for the various races. A horse from Mokuleia stock farm finished fourth in the Grazier's Plate.
<i>The Pacific Commercial Advertiser</i> , July 13, 1885	"Shipping Notes"	"The steamer C.R. Bishop brought 942 bags sugar, 11 tons old iron and 25 head of cattle from Kauai and Mokuleia."
<i>The Pacific Commercial Advertiser</i> , June 24, 1886	"Port of Honolulu, H.I."	"Stmr C R Bishop, Macaulay, from Mokuleia."
<i>The Pacific Commercial Advertiser</i> , June 30, 1886	"Shipping Notes"	"The steamer James Makee brought 3,056 bags sugar from Mokuleia, Oahu."
<i>The Pacific Commercial Advertiser</i> , July 10, 1886	"Shipping Notes"	Steamer Bishop arrived with 3,520 bags sugar reporting find weather. She left to Mokuleia to bring paddy there.
<i>The Pacific Commercial Advertiser</i> , July 12, 1886	"Arrivals" and "Shipping Notes"	Steamer C R Bishop, Nye, from Mokuleia arriving into port. The steamer brought 1700 bags paddy from Mokuleia.
<i>The Pacific Commercial Advertiser</i> , July 20, 1886	"Shipping Notes"	"The steamer James Makee sailed July 19 <sup>th</sup> for Kauai, via Mokuleia and Waialua."
<i>The Pacific Commercial Advertiser</i> , July 29, 1886	"Shipping Notes"	"The steamer James Makee sailed for Waialua and Mokuleia, this island, for paddy."
<i>The Pacific Commercial Advertiser</i> , August 02, 1886	"Shipping Notes"	"The steamer James Makee arrived from Waialua and Mokuleia, Oahu...with 840 bags sugar and 1,741 bags paddy."
<i>The Pacific Commercial Advertiser</i> , November 18, 1886	"Shipping Notes"	"The steamer C.R. Bishop will leave to-morrow morning for Waianae, Waialua, and Mokuleia."

<b>Reference</b>	<b>Title of Article</b>	<b>Gist of Article</b>
<i>The Pacific Commercial Advertiser</i> , December 07, 1886	“Shipping Notes”	“The steamer C.R. Bishop brought 1,200 bags paddy from Mokuleia, Oahu, December 5 <sup>th</sup> , and leaves again at noon to-day for Waianae, Hanamaulu and Nawiliwili, Kauai, returning here with cattle from the latter place.
<i>The Pacific Commercial Advertiser</i> , January 27, 1887	“Shipping Notes”	“The schooner Kaulilua arrived from Kaneohe, Koolau...with 570 bags sugar and 43 bags rice, and will leave again...for Mokuleia.”
<i>The Pacific Commercial Advertiser</i> , March 21, 1887	“Sale of Government Lands and Leases on the Islands of Oahu, Maui and Hawaii”	Announcement for the lease of two parcels of land at Mokuleia on the condition that the water hole is left accessible to the stock on the land of Kuokala. It is a 10 year lease for \$50 per year, to be paid semi-annually in advance.
<i>The Pacific Commercial Advertiser</i> , June 27, 1887	“Shipping Notes”	“The schooner Sarah and Eliza brought 530 bags paddy from Mokuleia.”
<i>The Hawaiian Gazette</i> , June 19, 1888, Page 6	“Supreme Court of the Hawaiian Islands—In Banco April Term 1888.”	In the case of James W. Gay v. Joseph P. Mendonca regarding a “breach of covenant contained in a lease of certain lands situate at Mokuleia” involving a lease of 200 acres (including 150 acres “fit and at a proper level to be cultivated in rice”) for 50 years for \$20,000. It was alleged that significantly less rice land was indeed made available. Problems were found with a jury decision. A new trial is ordered.
<i>The Pacific Commercial Advertiser</i> , January 09, 1890	“Shipping Intelligence: Vessels Leaving To-morrow”	“Stmr C R Bishop, Le Claire, for Waianae, Waialua, Mokuleia and Koolau, 9 a m.”
<i>The Pacific Commercial Advertiser</i> , January 10, 1890	“Shipping Intelligence: Vessels Leaving To-day”	“Stmr C R Bishop, Le Claire, for Waianae, Waialua, Mokuleia and Koolau, 9 a m.”
<i>The Pacific Commercial Advertiser</i> , January 11, 1890	“Shipping Intelligence: Departures”	“Stmr C R Bishop, Le Claire, for Waianae, Waialua, Mokuleia and Koolau.”

<b>Reference</b>	<b>Title of Article</b>	<b>Gist of Article</b>
<i>The Hawaiian Gazette</i> , January 21, 1890, Page 10	“Departures”	“Stmr C R Bishop, Le Claire, for Waianae, Waialua, Mokuleia and Koolau, 9 a m.”
<i>The Pacific Commercial Advertiser</i> , January 24, 1890	“Shipping Intelligence: Vessels Leaving To-day”	“Stmr C R Bishop, Le Claire, for Waianae, Waialua, Mokuleia and Koolau, 9 a m.”
<i>The Pacific Commercial Advertiser</i> , January 25, 1890	“Shipping Intelligence: Departures”	“Stmr C R Bishop, Le Claire, for Waianae, Waialua, Mokuleia and Koolau.”
<i>The Pacific Commercial Advertiser</i> , February 08, 1890	“Shipping Intelligence: Departures”	“Stmr C R Bishop, Le Claire, for Waianae, Waialua, Mokuleia and Koolau, at 9 a m.”
<i>The Hawaiian Gazette</i> , February 11, 1890, Page 10	“Departures”	“Stmr C R Bishop, Le Claire, for Waianae, Waialua, Mokuleia and Koolau, 9 a m.”
<i>The Pacific Commercial Advertiser</i> , February 17, 1890	“Shipping Intelligence: Departures”	“Stmr C R Bishop, Le Claire, for Waianae, Waialua, Mokuleia and Koolau.”
<i>The Hawaiian Gazette</i> , February 18, 1890, Page 10	“Departures”	“Stmr C R Bishop, Le Claire, for Waianae, Waialua, Mokuleia and Koolau.”
<i>The Pacific Commercial Advertiser</i> , March 10, 1890	“Vessels Leaving To-Day”	“Stmr C R Bishop, Le Claire, For Waianae, Waialua, Waialua, Mokuleia and Koolau, at 9 a m.”
<i>The Pacific Commercial Advertiser</i> , March 17, 1890	“Shipping Intelligence: Departures”	“Stmr C R Bishop, Le Claire, for Waianae, Waialua, Mokuleia and Koolau, 9 a m.”



<b>Reference</b>	<b>Title of Article</b>	<b>Gist of Article</b>
<i>The Hawaiian Gazette</i> , March 18, 1890, Page 10	“Departures”	“Stmr C R Bishop, Le Claire, for Waianae, Waialua, Mokuleia and Koolau, 9 a m.”
<i>The Pacific Commercial Advertiser</i> , March 21, 1890	“Vessels Leaving To-Day”	“Stmr C R Bishop, Le Claire, For Waianae, Waialua, Waialua, Mokuleia and Koolau, at 9 a m.”
<i>The Pacific Commercial Advertiser</i> , March 22, 1890	“Shipping Intelligence: Departures”	“Stmr C R Bishop, Le Claire, for Waianae, Waialua, Mokuleia and Koolau.”
<i>The Hawaiian Gazette</i> , March 25, 1890, Page 10	“Departures”	“Stmr C R Bishop, Le Claire, for Waianae, Waialua, Mokuleia and Koolau.”
<i>The Pacific Commercial Advertiser</i> , March 28, 1890	“Vessels Leaving To-Day”	“Stmr C R Bishop, Le Claire, For Waianae, Waialua, Mokuleia, Laie and Punalui at 9 a m.”
<i>The Hawaiian Gazette</i> , April 15, 1890, Page 10	“Departures”	“Stmr C R Bishop, Le Claire, for Waianae, Waialua, Mokuleia and Koolau.
<i>The Daily Bulletin</i> , April 23, 1890,	“To Sportsmen!”	Ad informing men the sale of two colts by “Jas. Gay, Mokuleia, Waialua.” [1 Gray Colt, 3 years old, by Gov. Stanford, dam Idle Girl, and the Gray Filly, 3 years old, by Gov. Stanford, damn Faiamana.”]
<i>The Hawaiian Gazette</i> , September 02, 1890, Page 10	“Departures”	“Stmr C R Bishop, Le Claire, for Waianae, Waialua, and Mokuleia.”
<i>The Daily Bulletin</i> , July 23, 1891	“Departures”	“Stmr Kaala for Waianae, Waialua and Mokuleia at 9 a m”
<i>The Daily Bulletin</i> , July 28, 1891	“Vessels Leaving To-morrow”	“Stmr Kaala for Waianae, Waialua, and Mokuleia at 9 a m”

<b>Reference</b>	<b>Title of Article</b>	<b>Gist of Article</b>
<i>The Daily Bulletin</i> , October 12, 1891	“Departures”	“Stmr Akamai for Waianae, Mokuleia and Waialua”
<i>The Daily Bulletin</i> , October 16, 1891	“Steamer “Akamai””	“The steamer ‘Akamai’ will sail for Waianae, Mokuleia and Waialua every Monday.” Captained by Joseph Paiko.
<i>The Pacific Commercial Advertiser</i> , January 20, 1892	“Shipping Intelligence: Departures”	“Stmr C.R. Bishop, Le Claire, for Waianae, Waialua and Mokuleia.”
<i>The Pacific Commercial Advertiser.</i> , April 02, 1892,	“New Advertisements: For sale or for lease!”	For sale or for lease announcement for the June 11 <sup>th</sup> races for thoroughbred horses from 2 to 5 years old. [“Apply to James Gay, Mokuleia”]
<i>The Pacific Commercial Advertiser.</i> , May 06, 1893,	“Board of Health: Important matters under discussion”,	Board of Health meeting dealing with instances of fluke [disease] among bullock livestock. “...2 from Mokuleia, Oahu, had the fluke disease, but the animals were in prime condition.” [report of Inspector G.W.C. Jones]
<i>The Pacific Commercial Advertiser</i> , August 18, 1893,	“Steamer Waimanalo: She will likely prove to be a total wreck”	The steamer Waimanalo was grounded at Keawanui. Mr. Gaspar Silva, “who keeps a store at Mokuleia” notified the appropriate authorities of the condition of the Waimanalo and deemed it was not in a very dangerous position after sailing his schooner over to the Waimanalo.
<i>The Daily Bulletin</i> , October 17, 1893	“Tong Hoon Hoo’s Murder”	“Captain Parker received a telephone message...that the Chinese murderer had been located at Mokuleia...” Parker called the police at Wailua but by the time they got to Mokuleia the suspect had fled. “It is Captain Parker’s opinion that the Chinese at Mokuleia are afraid of the man and, although not helping to hide him, are keeping out of his way.”
<i>The Pacific Commercial Advertiser</i> , October 17, 1893	“The Murderer Located”	“Liung Yao, the Chinese murderer was located last evening at Mokuleia, about ten miles from Waialua...The Chinamen at Mokuleia were afraid to touch Liung Yao, in spite of the fact of a reward of \$100 having been offered for his capture.”

Reference	Title of Article	Gist of Article
<i>The Pacific Commercial Advertiser</i> , October 18, 1893	“Local and General”	No further information has been received at the Chinese murderer Liung Yao since the night before and was last seen in Mokuleia.
<i>The Pacific Commercial Advertiser</i> , November 10, 1893	“The Kaala Goes Ashore at Waialua”	Gaspar Silva of Mokulē‘ia telephones that he could see the lights of the <i>Kaala</i> and <i>James Makee</i> at Pu‘uiki but not yet those of the rescue tug <i>Eleu</i> .
<i>The Pacific Commercial Advertiser</i> , December 12, 1893	“Shipping Intelligence: Vessels Leaving To-day”	“Stmr C R Bishop, Le Claire, for Waianae and Mokuleia, at 9 am.”
<i>The Hawaiian Star</i> , December 15, 1893, Page 3	“Flotsam and Jetsam: Arrivals” and “Imports and Consignees”	“Stmr C R Bishop, Le Claire ,from Mokuleia.” “Ex C R Bishop – 3687 bags padd and 6 bdls empty bags from Mokuleia.”
<i>The Hawaiian Star</i> , December 21, 1893, Page 3	“Imports and Consignees”	“Per stmr C R Bishop – 2767 bags paddy Mokuleia plantation.”
<i>The Hawaiian Star</i> , January 10, 1894, Page 3	“Departures”	“Stmr James Makee, Haglund, for Waianae and Mokuleia.”
<i>The Pacific Commercial Advertiser</i> , January 10, 1894, Page 8	Vessels Leaving Today” and “Wharf and Wave”	Steamer <i>James Makee</i> , Captain Haglund departing “for Waianae and Mokuleia”
<i>The Hawaiian Gazette</i> , January 12, 1894, Page 8	“Shipping Intelligence: Departures”	“Stmr C R Bishop, Le Claire, for Waialua and Mokuleia.”
<i>Hawaii Holomua.</i> , January 16, 1894,	“Local News”	“The schooner Mahimahi under the directions of Capt. Wm Davies will run regularly between this port [Honolulu] and Waialua, Kawaihapai, Mokuleia, Keawenui and Kuiki on the Island of Oahu. For freight etc. applications ....”

Reference	Title of Article	Gist of Article
<i>Hawaii Holomua</i> , January 18, 1894	“WM. Davies, Rigger and Stevedore” (advertisement)	Advertisement for freight that “The Schooner Mahimahi, will run regularly between this port [understood as Honolulu] and Waialua, Kawaihapai, Mokuleia, Keawenui and Kuiki on the island of Oahu”
<i>The Hawaiian Star</i> , January 18, 1894, Page 3	“Projected Departures”	“Stmr C R Bishop, Le Claire, for Waianae and Mokuleia, to-morrow at 9 a m.”
<i>The Hawaiian Star</i> , January 19, 1894, Page 3	“Departures”	“Stmr C R Bishop, Le Claire, for Waianae and Mokuleia.”
<i>The Hawaiian Gazette</i> , January 19, 1894, Page 8	“Shipping Intelligence: Vessels Leaving To-day”	““Stmr C R Bishop, Le Claire, for Waialua and Mokuleia, at 9 am.”
<i>Hawaii Holomua</i> , January 19, 1894	“WM. Davies, Rigger and Stevedore” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>Hawaii Holomua</i> , January 22, 1894	“WM. Davies, Rigger and Stevedore” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>Hawaii Holomua</i> , January 23, 1894,	“WM. Davies, Rigger and Stevedore” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>The Hawaiian Gazette</i> , January 23, 1894, Page 8	“Shipping Intelligence: Departures”	“Stmr C R Bishop, Le Claire, for Waialua and Mokuleia.”
<i>Hawaii Holomua</i> , January 25, 1894	“WM. Davies, Rigger and Stevedore” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
The Pacific Commercial Advertiser, February 01, 1894,	“The C.R. Bishop is a wreck”,	Inter-Island Company has a fund for insuring their own vessels, so no outside insurance is required “She has been ashore several times, once of Molokai on her trail, and at Mokuleia, near Waialua.”

Reference	Title of Article	Gist of Article
<i>Hawaii Holomua</i> , February 3, 1894	“WM. Davies, Rigger and Stevedore” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
The Daily Bulletin, February 05, 1894	“Mokuleia Stock Farm” (advertisement)	Advertisement for Mokuleia Stock Farm horse stud services and horses for sale: “Senator Stanford will cover ten mares at \$30 each...Fine horses for sale”
<i>The Pacific Commercial Advertiser</i> , February 08, 1894, Page 8	“Departures”	“Steamer <i>Kaala</i> , Captain Thompson, departing “for Mokuleia and Kahuku”
<i>The Hawaiian Star</i> , February 08, 1894, Page 3	“Marine Intelligence: Passengers”	“From Mokuleia, per stmr <i>Kaala</i> . Feb 7 – Mrs. Malone, and 20 on deck.”
<i>Hawaii Holomua</i> , February 12, 1894	“WM. Davies, Rigger and Stevedore” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>Hawaii Holomua</i> , February 15, 1894	“WM. Davies, Rigger, Stevedore and Wrecker” (advertisement)	Slightly revised Advertisement for freight that “The Schooner <i>Mahimahi</i> , will run regularly between this port [understood as Honolulu] and Waialua, Kawaihapai, Mokuleia, Keawenui and Kuiki on the island of Oahu”
<i>The Hawaiian Star</i> , February 17, 1894, Page 3	“Island Steamers Rush in with Big Cargoes”	The James Makee steamer leaves for Waianae and Mokuleia instead of usual route to Kauai.
<i>The Daily Bulletin</i> , February 27, 1894	“Mokuleia Stock Farm” (advertisement)	Advertisement for Mokuleia Stock Farm horse stud services and horses for sale: “Senator Stanford will cover ten mares at \$30 each...Fine horses for sale”
<i>Hawaii Holomua</i> , February 28, 1894	“WM. Davies, Rigger, Stevedore and Wrecker” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>Hawaii Holomua</i> , March 01, 1894,	“Local News”	Regarding a forged check “purported to be signed by Mrs. Mary Gay of Mokukeia”

<b>Reference</b>	<b>Title of Article</b>	<b>Gist of Article</b>
<i>The Daily Bulletin</i> , March 2, 1894	“Mokuleia Stock Farm” (advertisement)	Advertisement for Mokuleia Stock Farm horse stud services and horses for sale: “Senator Stanford will cover ten mares at \$30 each...Fine horses for sale”
<i>Hawaii Holomua</i> , March 2, 1894	“WM. Davies, Rigger, Stevedore and Wrecker” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>The Daily Bulletin</i> , March 24, 1894	“Mokuleia Stock Farm” (advertisement)	Advertisement for Mokuleia Stock Farm horse stud services and horses for sale: “Senator Stanford will cover ten mares at \$30 each...Fine horses for sale”
<i>The Daily Bulletin</i> , March 26, 1894	“Mokuleia Stock Farm” (advertisement)	Advertisement for Mokuleia Stock Farm horse stud services and horses for sale: “Senator Stanford will cover ten mares at \$30 each...Fine horses for sale”
<i>The Daily Bulletin</i> , March 28, 1894	“Mokuleia Stock Farm” (advertisement)	Advertisement for Mokuleia Stock Farm horse stud services and horses for sale: “Senator Stanford will cover ten mares at \$30 each...Fine horses for sale”
<i>Hawaii Holomua</i> , April 2, 1894	“WM. Davies, Rigger, Stevedore and Wrecker” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>Hawaii Holomua</i> , April 6, 1894	“WM. Davies, Rigger, Stevedore and Wrecker” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>Hawaii Holomua</i> , April 11, 1894	“WM. Davies, Rigger, Stevedore and Wrecker” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>Hawaii Holomua</i> , April 12, 1894	“WM. Davies, Rigger, Stevedore and Wrecker” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>The Daily Bulletin</i> , April 16, 1894	“Mokuleia Stock Farm” (advertisement)	Advertisement for Mokuleia Stock Farm horse stud services and horses for sale: “Senator Stanford will cover ten mares at \$30 each...Fine horses for sale”
<i>Hawaii Holomua</i> , April 16, 1894	“WM. Davies, Rigger, Stevedore and Wrecker” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations

<b>Reference</b>	<b>Title of Article</b>	<b>Gist of Article</b>
<i>Hawaii Holomua</i> , April 19, 1894	“WM. Davies, Rigger, Stevedore and Wrecker” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>Hawaii Holomua</i> , April 20, 1894	“WM. Davies, Rigger, Stevedore and Wrecker” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>The Daily Bulletin</i> , April 24, 1894	“Mokuleia Stock Farm” (advertisement)	Advertisement for Mokuleia Stock Farm horse stud services and horses for sale: “Senator Stanford will cover ten mares at \$30 each...Fine horses for sale”
<i>Hawaii Holomua</i> , May 2, 1894	“WM. Davies, Rigger, Stevedore and Wrecker” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>Hawaii Holomua</i> , May 07, 1894,	“WM. Davies, Rigger, Stevedore and Wrecker” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>The Hawaiian Gazette</i> , May 08, 1894, Page 8	“Arrivals”	“Stmr Kaala, Thompson, for Waianae, Mokuleia and Kahuku.”
<i>Hawaii Holomua</i> , May 11, 1894	“WM. Davies, Rigger, Stevedore and Wrecker” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>Hawaii Holomua</i> , May 17, 1894	“WM. Davies, Rigger, Stevedore and Wrecker” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>Hawaii Holomua</i> , May 22, 1894	“WM. Davies, Rigger, Stevedore and Wrecker” (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>Hawaii Holomua</i> , June 12, 1894	“The 11 <sup>th</sup> of June”	Discusses the success of Mokuleia bred horses at the horse races.
<i>The Daily Bulletin</i> , June 12, 1894	“2nd Race-Kalakaua Purse \$100”	Mokuleia Stables “Leilani” comes in second of two.

Reference	Title of Article	Gist of Article
<i>The Hawaiian Gazette</i> , June 12, 1894,	“At the Races.”	Discussing races of “Autonomy, a new colt of the Mokuleia Stables” and another Mokuleia horse “Stanford”
<i>The Pacific Commercial Advertiser</i> , June 12, 1894	At the Races	Discussing races of “Autonomy, a new colt of the Mokuleia Stables” and another Mokuleia horse “Stanford”[Same as the account in <i>The Hawaiian Gazette</i> for the date]
<i>Hawaii Holomua</i> , June 15, 1894	“Local Notes”	“Mokuleia horses went home yesterday. They will return next year.”
<i>Hawaii Holomua</i> , June 23, 1894	WM. Davies, Rigger, Stevedore and Wrecker (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>Hawaii Holomua</i> , June 23, 1894	“Sale of the Waimanalo”	“the steamer Waimanalo was sold...the steamer recently was wrecked near Mokuleia...”
<i>The Hawaiian Star</i> , June 28, 1894, Page 2	“WM. Davies”	Announcing the regular route of the S.S. Waimanalo to Mokuleia and other destinations.
<i>Hawaii Holomua</i> , June 28, 1894	WM. Davies, Rigger, Stevedore and Wrecker (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>Hawaii Holomua</i> , July 02, 1894	WM. Davies, Rigger, Stevedore and Wrecker (advertisement)	Repeat of an ad for freight between Honolulu and Mokuleia among other destinations
<i>The Hawaiian Star</i> , July 16, 1894	“WM. Davies”	Announcing the regular route of the S.S. Waimanalo to Mokuleia and other destinations.
<i>The Hawaiian Star</i> , July 21, 1894	“WM. Davies”	Announcing the regular route of the S.S. Waimanalo to Mokuleia and other destinations.
<i>The Hawaiian Star</i> , August 08, 1894	“WM. Davies”	Announcing the regular route of the S.S. Waimanalo to Mokuleia and other destinations.
<i>The Hawaiian Star</i> , August 10, 1894	“WM. Davies”	Announcing the regular route of the S.S. Waimanalo to Mokuleia and other destinations.
<i>The Hawaiian Star</i> , August 11, 1894	“WM. Davies”	Announcing the regular route of the S.S. Waimanalo to Mokuleia and other destinations.



Reference	Title of Article	Gist of Article
<i>The Hawaiian Star</i> , August 13, 1894	“WM. Davies”	Announcing the regular route of the S.S. Waimanalo to Mokuleia and other destinations.
<i>The Hawaiian Star</i> , August 15, 1894	“The Steamship: Waimanalo”	Announcement of the regular route of the steamship Waimanalo to Mokuleia and other destinations.
<i>The Hawaiian Star</i> , September 06, 1894	“The Steamship: Waimanalo”	Announcement of the regular route of the steamship Waimanalo to Mokuleia and other destinations.
<i>Hawaii Holomua</i> , September 11, 1894,	“Locl [Local] Notes”	“Mr. Th. Gay arrived from Mokuleia this morning.”
<i>The Hawaiian Gazette</i> , October 02, 1894, Page 8	“Shipping Intelligence: Vessels Leaving Today”	“Stmr Kaala, Thompson, for Waianae, Waialua and Mokuleia, at 9 a m.”
<i>The Hawaiian Gazette</i> , October 09, 1894, Page 8	“Shipping Intelligence: Departures”	“Stmr Kaala, Thompson, for Kahuku, Mokuleia, Waialua and Waianae.”
<i>The Hawaiian Star</i> , October 11, 1894	“The Steamship: Waimanalo”	Announcement of the regular route of the steamship Waimanalo to Mokuleia and other destinations.
<i>The Hawaiian Star</i> , October 24, 1894	“The Steamship: Waimanalo”	Announcement of the regular route of the steamship Waimanalo to Mokuleia and other destinations.
<i>The Daily Bulletin</i> , November 07, 1894,	“Horse Races Christmas”,	“Christmas Day will be observed at Mokuleia Ranch with horse races...Horse racing has been for years all the go among the ranchmen...A number of town people intend going to Mokuleia that day.”
<i>The Hawaiian Star</i> , November 22, 1894	“The Steamship: Waimanalo”	Announcement of the regular route of the steamship Waimanalo to Mokuleia and other destinations.
<i>Hawaii Holomua</i> , December 15, 1894,	“The Waialua Races”	“...usual holiday races at Waialua will come off on the Mokuleia track on Christmas.”

Reference	Title of Article	Gist of Article
<i>The Daily Bulletin</i> , April 06, 1895, Page 6	“Very Sad Accident”	Mrs Gay, Widow of James Gay, proprietor of Mokuleia Ranch was driving home [seemingly to Mokuleia] from Waialua “when her horse shied at a Japanese standing in the road” and she was thrown out of the carriage and died.
<i>The Pacific Commercial Advertiser</i> , April 15, 1895, Page 7	“Local Brevities”	“C. Burlingame, a well-known Coast jockey, arrived by the Arawa. He comes to handle the stock of the Gay estate at Mokuleia.”
<i>The Pacific Commercial Advertiser</i> , May 01, 1895, Page 7,	[No Title]	Announcing the sale of a tract of Government land at Mokuleia, on June 4 <sup>th</sup> , possession of which to be given on October 21 <sup>st</sup> .
<i>The Pacific Commercial Advertiser</i> , May 01, 1895, Page 2	“Sale of a Tract of Government Land at Mokuleia, Waialua, Oahu”	Announcing a sale of a 220 acre tract of Government land at Mokulē‘ia with an upset price of \$450.00
<i>The Pacific Commercial Advertiser</i> , May 03, 1895, Page 2	“Sale of a Tract of Government Land at Mokuleia, Waialua, Oahu”	[Repeat] Announcing a sale of a 220 acre tract of Government land at Mokulē‘ia with an upset price of \$450.00
<i>The Hawaiian Star</i> , May 06, 1895	“All Along the Docks”	“The Kaala arrived late Saturday from Mokuleia.”
<i>The Daily Bulletin</i> , May 13, 1895, Page 4	“An Employee on the Steamer Kaala Meets With an Accident”	A donkey-driver on the steamer <i>Kaala</i> was injured “taking in freight for Waianae, Mokuleia and adjoining ports...”
<i>The Pacific Commercial Advertiser</i> , May 28, 1895, Page 7	[No Title]	Steamer Waimanalo, Captain John Calway, “makes quick dispatch for Waianae, Mokuleia, and Waialua. Apply on board for rates.”
<i>The Independent</i> , June 07, 1895,	“Sports: Race track notes”	A listing of horse ownership: “Mokuleia Ranch: Autonomy, Antidote, and Stanford.”
<i>The Independent</i> , June 13, 1895	The Next Meet	Mokuleia horses are in training for “trotting races” on the 4 <sup>th</sup> of July

Reference	Title of Article	Gist of Article
<i>The Independent</i> , June 13, 1895	Glorious Eleventh	Mokuleia Stables has an entry in horse race and merits of their stallion "Senator Stanford" are touted as "the champion horse in the islands."
<i>The Hawaiian Star</i> , September 16, 1895	"Departures"	"Stmr Kaala, Thompson, for Waianae, Waialua, Mokuleia, Kahuku and Punaluu.
<i>Evening Bulletin</i> , September 26, 1895, Page 8,	"Liner Monowai Arrives",	"The steamer Keauhou arrived in port this morning from a circuit of this island bringing a cargo of 1695 bags of paddy from Mokuleia."
<i>The Pacific Commercial Advertiser</i> , October 10, 1895, Page 8	"Ports of Oahu"	Stmr. Waimanalo, captained by John Calway, making a "Quick dispatch for Waianae, Mokuleia, and Waialua."
<i>The Hawaiian Star</i> , December 09, 1895	"All Along the Docks"	"The Kaala discharged 1000 bags of sugar this morning at the Nuuanu street wharf. She will leave on Wednesday at 10 a.m. for Waianae, Waialua, and Mokuleia."
<i>The Hawaiian Gazette</i> , December 20, 1895, Page 3	Copartnership Notice	Notice is given that: Chun Kow, Pang Wah Chup, Wong Yau Yick, Lau Kit Kiu, Lau Hop, Pang Say Mau, Ung Sam Ling, Hung Yee, Lau Sat Tong, Lam Sun, L. Akau and Wong Chong Hee "all of Mokuleia" are doing business under the firm name of Wing On Wai Co. and is planting, cultivating, producing and selling rice at Mokulē'ia
<i>The Hawaiian Gazette</i> , December 24, 1895, Page 3	Copartnership Notice	Repeat announcement of a new firm Wing On Wai Co. involved in a rice production business at Mokulē'ia
<i>The Hawaiian Gazette</i> , January 03, 1896, Page 5	"Copartnership Notice"	Repeat announcement of a new firm Wing On Wai Co. involved in a rice production business at Mokulē'ia
<i>The Hawaiian Star</i> , January 20, 1896	"Departures"	"Stmr Kaala, Thompson, for Waianae, Mokuleia, Kahuku and Punaluu."

Reference	Title of Article	Gist of Article
<i>The Hawaiian Gazette</i> , February 21, 1896, Page 5	"Deputy Sheriff Cox"	Deputy Sherrif Cox recounts "his encounter with the Chinese at Mokuleia." Fifty [Chinese] did come, and then a hundred more joined the ranks of their pig-tailed brethren from adjoining plantations... 'Yes, they penned us up, and made war-like preparations....The Chinamen threatened to kill us, believing that one of us had shot the member of their colony who was hit in the leg...[but] my men were not the only ones that did the shooting.'... "When the Chinamen said they were going to kill us I grabbed Ah Ho, one of the head men of the plantation and told his associates that if any such move were made, I would shoot him....When Dr. Reid arrived we were released...a decision will then be reached as to the best mode of procedure....
<i>The Pacific Commercial Advertiser</i> , February 21, 1896	Deputy Sheriff Cox	Seemingly verbatim on the account of the event in <i>The Hawaiian Gazette</i> (above) of that date.
The Pacific Commercial Advertiser, February 22, 1896	"Local Brevities"	Deputy Marshal Hitchcock and the Deputy Attorney-General went to Mokuleia "to investigate the trouble of Wednesday night..."
The Pacific Commercial Advertiser, February 24, 1896, Page 7	"Local Brevities"	Deputy Marshal Hitchcock and E.P. Dole returned from Mokuleia "after having made a thorough investigation into the trouble at that place..."
The Hawaiian Gazette, February 25, 1896	"Off to Mokuleia"	A "posse" of nine is sent to address "the recent disturbance at Mokuleia"
<i>The Pacific Commercial Advertiser</i> , February 25, 1896, Page 7	Off to Mokuleia	A "posse" of nine is sent to address "the recent disturbance at Mokuleia" [verbatim as account in <i>The Hawaiian Gazette</i> of the same date above]

Reference	Title of Article	Gist of Article
<i>The Pacific Commercial Advertiser</i> , February 26, 1896, Page 5	Ten Men Locked Up	“Captain Parker and Posse Arrests the Mokuleia chinamen.” The posse road horses “to the large Mokuleia plantation house, the headquarters of the Chinese....Before arrival Captain Parker noticed a flag being quickly hoisted on a pole over the house. Immediately some 300 Chinamen came swarming from the fields and rushed into the house.” The “ten ringleaders” were picked out with no resistance and were transported by two-wheeled wagon, a brake, and horseback back to a station house where they were locked up.
<i>The Pacific Commercial Advertiser</i> , February 27, 1896, Page 7	“Local Brevities”	“Wo Sing & Co. bailed out the ten rice plantation Chinamen from Mokuleia yesterday morning. It cost the firm just \$10,000 or \$1000 apiece to get the men out.
<i>The Pacific Commercial Advertiser</i> , February 29, 1896, Page 2,	“Trial of Mokuleia Rioters”	Announcement of the trial for “The rioting Mokuleia Chinamen.” All the men plead guilty to the charge of resisting police officers. “Ah Ho was allowed to go free...it having been proved that he attempted to quell the riot.” For the 5 of the smaller offenders sentencing was suspended. The other four were sent to do “four months’ time on the reef.”
<i>The Hawaiian Star</i> , April 02, 1896	“All Along the Docks”	“The steamer Kaena sailed ta noon today for Waialua, Puuiki, Mokuleia and Keawenui, expecting to return on Sunday morning.”
<i>The Pacific Commercial Advertiser</i> , May 18, 1896, Page 6,	“The June Races: Cornwell’s Horses May be Run. Antidote and Royalist.”	Announcement that the Gay horses, Antidote and Royalist are advertised for sale. “These horses are in training on the Mokuleia track and are in excellent condition.”
<i>The Pacific Commercial Advertiser</i> , June 15, 1896, Page 6	“Chinese Injured”	“A Chinaman” rode from Mokuleia to Waialua and was thrown from his horse and was dying.
<i>The Pacific Commercial Advertiser</i> , July 06, 1896, Page 8	“Severe Accident”	Dr. Reed attended a teamster injured under the wheels of a heavy dray while breaking in a team of mules at Gasper Silva’s ranch at Mokuleia.

Reference	Title of Article	Gist of Article
<i>The Hawaiian Star</i> , August 02, 1896, Page 4	“Vessels Leaving Tomorrow”	“Stmr Kaala, Thompson, for Kahuku, Punaluu, Mokuleia, Keawenui, Waialua and Puuiki.”
<i>The Hawaiian Star</i> August 14, 1896, Page 2,	“All Along the Docks”	“The Schooner Luka was taken from rotten Row this morning and put in commission again. She left this afternoon for Mokuleia and Waialua...”Boots,” formerly stevedore for the Oceanic Steamship Company, went as chief officer...Boots was discharged from the Oceanic Steamship Co’s service for ‘insubordination’.”
<i>The Hawaiian Star</i> , August 27, 1896,	“Poison Fish”	Deputy Sherriff Cox of Waialua and a party of thirteen native women and men went over to Mokuleia...on a fishing excursion. While there they went to a native house for dinner and ate poi and fish. In a short time twelve of the party including Mr. Cox, were taken sick. A physician was summoned and pronounced the trouble fish-poisoning.”
<i>The Pacific Commercial Advertiser</i> , October 31, 1896, Page 5,	“Grand Concert”	Song list that will be performed by four glee clubs, for the benefit of the old Kamoiliili Church. [...11. Ka Moena Pawehe O Mokuleia...Kamehameha Alumni Club”]
<i>The Pacific Commercial Advertiser</i> , January 15, 1897, Page 8	“Wharf and Wave”	The steamer Kaala returned from Oahu ports with a report stating, “Left at Mokuleia 952 bags paddy, at Puuiki 1,000 bags sugar, at Waialua 800 bags paddy, at Punaluu 250 bags ice, at Haaula 2,300 bags paddy...”
<i>The Pacific Commercial Advertiser</i> , February 08, 1897, Page 8	“Vessels Leaving Today” and “Wharf and Wave”, Honolulu.	Steamer <i>Ke Au Hou</i> , Captain Thompson, “for Waialua, Puuiki and Mokuleia”
<i>The Hawaiian Star</i> , March 22, 1897, Page 2,	[No Title]	Steamer <i>Kaena</i> , Captain Wilson, “for Waialua, Puuiki and Mokuleia.”
<i>Evening Bulletin</i> , May 12, 1897,	“Schools of the Islands: New School Buildings”	“[School] Buildings are urgently needed at...Mokuleia.”
<i>The Hawaiian Star</i> , May 21, 1897, Page 4	“Oahu Railroad”	“Beyond Waianae the country is in a deep sleep and continues to slumber till well around the point into Mokuleia. This the railroad extension to Waialua will arouse.

<b>Reference</b>	<b>Title of Article</b>	<b>Gist of Article</b>
<i>The Pacific Commercial Advertiser</i> , May 27, 1897, Page 8	“Shipping Intelligence: Vessels Leaving Today”	“Stmr. Kaena, Wilson, for Waialua, Mokuleia and Puuiki, at 10 a.m.”
<i>The Hawaiian Star</i> , July 02, 1897, Page 2	All Along the Docks	In a summary of shipping it is asserted that the <i>Kaena</i> ship sailed [presumably from Honolulu harbor] “for a flying trip to Mokuleia.”
<i>The Pacific Commercial Advertiser</i> , October 06, 1897, Page 8	“Shipping Intelligence: Vessels Leaving Today”	“Stmr. Kaena, Parker, for Waialua. Puuiki and Mokuleia at 12 m.”
<i>The Pacific Commercial Advertiser</i> , October 18, 1897, Page 8	“Shipping Intelligence: Vessels Leaving Today”	“Stmr. Kaena, Parker, for Waialua, Puuiki and Mokuleia, at 10 a.m.”
<i>The Pacific Commercial Advertiser</i> , October 21, 1897, Page 8	“Shipping Intelligence: Vessels Leaving Today”	“Strm. Kaena, Parker, for Waialua, Puuiki and Mokuleia, at 9 a.m.”
<i>The Pacific Commercial Advertiser</i> , October 25, 1897, Page 8	“Shipping Intelligence: Vessels Leaving Today”	“Strm. Kaena, Parker, for Waialua, Puuiki and Mokuleia, at 9 a.m.”
<i>The Pacific Commercial Advertiser</i> , November 05, 1897, Page 8	“Shipping Intelligence: Vessels Leaving Today”	“Strm. Kaena, Parker, for Waialua, Puuiki and Mokuleia, at 9 a.m.”
<i>The Pacific Commercial Advertiser</i> , November 29, 1897, Page 8	“Vessels Leaving Today”	“Stmr. Kaena, Parker, for Waialua. Puuiki and Mokuleia at 12 m.”
<i>The Pacific Commercial Advertiser</i> , November 30, 1897, Page 8	“Shipping Intelligence: Departures”	“Strm. Kaena, Parker, for Waialua, Puuiki and Mokuleia.”

Reference	Title of Article	Gist of Article
<i>The Pacific Commercial Advertiser</i> , December 11, 1897, Page 10	“Shipping Intelligence: Departures”	“Strm. Kaena, Parker, for Waialua, Puuiki and Mokuleia.”
<i>The Independent</i> , December 31, 1897	“A Big Land Deal”	Announcing that Gaspar Sylva sold to the Oahu Railroad and Land Company his “fine property at Mokuleia” for \$150,000 and that a sugar plantation would be developed there. It is posited that Mr. Gaspar would return to his native home and that those lands were “the most fertile lands on this island.” It is noted that “The Mendonca lands, under lease to the Gay estate, adjoins the land purchased from Mr. Silva...”
<i>Evening Bulletin</i> , January 10, 1898, Page 8	“Items from Harbor Front”	“Steamers on the berth to sail tomorrow are...the Waialeale for Mokuleia.”
<i>The Pacific Commercial Advertiser</i> , January 11, 1898, Page 8	“Shipping Intelligence: Departures”	“Strm. Kaena, Wilson, for Waialua, Puuiki and Mokuleia.”
<i>The Independent</i> , January 12, 1898	[No Title] “A race took place at Hilo...”	Race winning horse “Surprise” “belongs to the Mokuleia racing stock.”
<i>Evening Bulletin</i> , January 13, 1898, Page 8	“Items from Harbor Front”	“Kaena with Mokuleia Paddy” ...”Pe Kaena—500 bags paddy for J.A. Hoppe.
<i>The Pacific Commercial Advertiser</i> , January 14, 1898	“Wharf and Wave”	Discusses boating port and weather conditions for the Waialeale. “...last night reports Puuiki and Mokuleia cleared out.”
<i>Evening Bulletin</i> , January 26, 1898, Page 8	“Items from Harbor Front”	The Kaena came into port with a full cargo of Waialua sugar. “fresh northeast and easterly winds and sea very choppy at Mokuleia.”



Reference	Title of Article	Gist of Article
<i>The Pacific Commercial Advertiser</i> , January 31, 1898, Page 8,	“Shipping Intelligence: Vessels Leaving Today”	“Stmr. Kaena, Mosher, for Waialua, Puuiki and Mokuleia at 9 a.m.”
<i>The Pacific Commercial Advertiser</i> , February 24, 1898, Page 8	“Shipping Intelligence: Vessels Leaving Today”	“Stmr. Kaena, Parker, for Mokuleia at 10 a.m.”
<i>The Hawaiian Star</i> , April 01, 1898, Page 2,	“Departures”	Steamer Kaena, captained by Mosher, “for Mokuleia.” Leaving “Iuu and Kahuku, at 9 a.m.”
<i>The Pacific Commercial Advertiser</i> , April 04, 1898	“The Flood Path”	Discusses a Superintendent of Public Works inspection tour of widespread flood damage, Mokuleia appears to have been unscathed.
<i>The Hawaiian Gazette</i> , April 05, 1898, Page 3,	“The Flood Path: Shores marked with wreckage. Kahuku Plantation hit hard. Roads, boulders, repair plans.”	The “Long Bridge” on the Halstead’s mill and property “in the direction of Mokuleia from Halstead’s was lately repaired and held together in good style.” [“wooden piles replaced by stone abutments”]
<i>Evening Bulletin</i> , April 13, 1898, Page 6	“Principal Landings in the Hawaiian Islands”	“Mokuleia-There is a wharf there alongside of which the boats come, and there are several smaller landings at the rice plantations. All of these are private.
<i>The Pacific Commercial Advertiser</i> , May 02, 1898, Page 8”	“Vessels Leaving Today”	Shipping accounts including: “Stmr. Kaena, Mosher, for Mokuleia and Waialua...Waialeale, Parker for Oahu Ports ... (no freight for Waialua or Mokuleia)
<i>The Pacific Commercial Advertiser</i> , May 03, 1898, Page 6	“Light Braham Eggs”	Eggs “from thoroughbred Light Brahma fowls ... from Mokuleia Ranch, formerly owned by Gaspar Silva” are advertised. “Apply to Henry Waterhouse and Co.”
<i>The Pacific Commercial Advertiser</i> , May 06, 1898, Page 7	[No Title] “A limited number of eggs for setting...”	Eggs “from thoroughbred Light Brahma fowls ... from Mokuleia Ranch, formerly owned by Gaspar Silva” are advertised. “Apply to Henry Waterhouse and Co.”

Reference	Title of Article	Gist of Article
<i>The Pacific Commercial Advertiser</i> , May 07, 1898, Page 9	[No Title] "A limited number of eggs for setting..."	Eggs "from thoroughbred Light Brahma fowls ... from Mokuleia Ranch, formerly owned by Gaspar Silva" are advertised. "Apply to Henry Waterhouse and Co."
<i>The Pacific Commercial Advertiser</i> , May 09, 1898, [No Title] "A limited number of Eggs for setting..."	[No Title] "A limited number of Eggs for setting..."	Eggs "from thoroughbred Light Brahma fowls ... from Mokuleia Ranch, formerly owned by Gaspar Silva" are advertised. "Apply to Henry Waterhouse and Co."
<i>The Hawaiian Star</i> , May 16, 1898, Page 2,	"Departures"	"Stmr. Kaena, Mosher, at 3 p.m., for Waialea and Mokuleia."
<i>The Pacific Commercial Advertiser</i> , May 23, 1898, Page 8	"Shipping Intelligence: Vessels Leaving Today"	"Stmr. Kaena, Mosher, for Waialua, Puuiki and Mokuleia at 12 m."
<i>The Hawaiian Star</i> , May 26, 1898, Page 2	<i>What Sailor Men Talk Of</i> "	Stmr. Kaena, Mosher, for Waialea, Puuiki, Mokuleia, and Waimea"
<i>The Hawaiian Star</i> , June 06, 1898, Page 2,	"Departures"	"Stmr. Kaena, Mosher, for Waialua, Puuiki, Waimea and Mokuleia,"
<i>The Pacific Commercial Advertiser</i> , June 06, 1898, Page 8	"Shipping Intelligence: Vessels Leaving Today"	"Stmr. Kaena, Mosher, for Waialua, Puuiki and Mokuleia at 12 m."

Reference	Title of Article	Gist of Article
<i>The Pacific Commercial Advertiser</i> , June 10, 1898	110 Miles by Rail	Junketing newspaper men traverse a new extension of the ORL from Wai'anae to Waialua and are furnished most liberally with refreshments and dinner at Mokuleia Ranch courtesy of Manager Mr. Walter Dillingham. "Fruits of the place" are enumerated to include peaches, figs, grapes, water melons, limes and mangoes. The peach orchard is in commercial production and milk is sent to market every day. The Dillinghams (father and son) are toasted for their aid to the "Portuguese colony" and on behalf of the Chinese. A "goose neck dray [pulled by horses was] used as a hack between the railway and the ranch
<i>The Pacific Commercial Advertiser</i> , June 13, 1898, Page 8	"Shipping Intelligence: Vessels Leaving Today"	"Stmr. Kaena, Mosher, for Waialua, Puuiki and Mokuleia at 9 a.m."
<i>The Hawaiian Gazette</i> , June 14, 1898, Page 6	110 Miles by Rail	A very similar account (much verbatim) of a press excursion to that above but adds "The striking feature is the Mokuleia Plain...There are already in this area seventeen artesian wells...and a large sugar estate will be established within a year. The value of the rice now produced is heavy and the dairy interest is not small." "Mokuleia is the old Gasper Silva possession."
<i>The Hawaiian Star</i> , June 15, 1898, Page 2	"Vessels to Sail Tomorrow"	"Stmr. Kaena, Mosher, for Puuiki, Mokuleia, Waialua and Waimea"
<i>Evening Bulletin</i> , June 21, 1898	"Interesting Equity Case"	A Ms. Kalei filed three "bills in equity against Polua, Kealoha and Hoopii Hilajila w....[that she] was wronged in a partition of land at Mokuleia... when Gasper Silva bought an interest in the land..."
<i>The Hawaiian Star</i> , July 01, 1898	"An Accident"	One of Walter Dillingham's colts after the snapping of its harness died due to its colliding with the fence at Mokuleia, a splinter 18 inches long stabbing the colt.
<i>The Independent</i> , July 06, 1898	Excursion to Waialua	Discusses an excursion of a train of 12 cars on the 4 <sup>th</sup> of July. "Mokuleia is a large track of fertile land and occupies about a third of the whole of the Waialua District."

Reference	Title of Article	Gist of Article
<i>Evening Bulletin</i> , July 12, 1898, Page 8,	“Schooner Labrador is Placed on Marine Railway for Repairs”,	Steamer Waialeale in need of repairs on the marine railway “made necessary by her touching the reef at Mokuleia.” Work done by Soren son & Lyle. The place of the steamer replaced by Schooner Labrador.
<i>The Hawaiian Star</i> , July 30, 1898, Page 2	“Vessels to Sail Tomorrow”	“Stmr. Kaena, Mosher, for Waialua, Puuiki, Mokuleia, and Waimea”
August 01, 1898, Page 2,	“Departures”	Stmr Kaena, Mosher, for Waialua, Puuiki, Mokuleia and Waimea”
<i>Evening Bulletin</i> , August 4, 1898	“Departures”	“Stmr Kaena, Parker, for Waialua, Puuiki, Mokuleia and Waimea at 3 pm.
August 04, 1898, Page 2,	“Departures”	“Stmr Kaena, Mosher, for Waialua, Puuiki, Mokuleia and Waimea”
<i>The Hawaiian Star</i> , August 08, 1898, Page 2	“Departures”	“Stmr. Kaena, Parker, for Waialua, Mokuleia, Puuihi and Waimea, 3 p.m.”
<i>The Hawaiian Star</i> , August 13, 1898, Page 2	“Shipping Intelligence: Vessels to Sail Monday”	“Stmr. Kaena, Mosher, for Mokuleia, Keawenui, Puniki and Waialua, at 10 a.m.”
<i>The Pacific Commercial Advertiser</i> , August 18, 1898, Page 4	“Waialua Plantation”	Plans for the new Waialua plantation are discussed here, more specifically about the lands it will acquire. “The new property is to include the present Halstead plantation, the upper levels of the Mokuleia land lately bought by Henry Waterhouse and the Gay and the Dickson lands.”
<i>The Hawaiian Star</i> , August 26, 1898	“Another Big Plantation: B.F. Dillingham’s Latest Enterprise”	Announcement for B.F. Dillingham’s new venture under the name of the Waialua Agricultural Company. “The lands of Mokuleia are included in the deal,” which is known as the Gaspar Sylva ranch, recently purchased by Henry Waterhouse for \$150,000 made in the interest of Dillingham.

Reference	Title of Article	Gist of Article
<i>Evening Bulletin</i> , August 26, 1898	New Plantation at Waialua	B. F. Dillingham's new Waialua plantation is described. Favorable results are reported for Mokuleia soil analysis. Asserted that Waialua plantation includes 500 acres of the former Silva Ranch with sixteen artesian wells and "of which 250 acres are now in rice at an annual rental of \$8,000 to the company but that when "the lease expires it will be converted into sugar land." Waialua plantation also absorbed the 660 acre Mokuleia Gay Ranch and other properties.
<i>The Independent</i> , August 26, 1898	"Local and General News"	Thos. Gay sells "two fine horses of the celebrated Mokuleia breed."
<i>The Pacific Commercial Advertiser</i> , December 29, 1898	"For Colony No. 1"	Discussion of the Settler's Association plan for a colony created by Byron O. Clark, secretary of the Board of Agriculture. "The selection [of land (1300 acres)] is back of the pass into Waianae from Mokuleia plains." [The full article details the plans of the colony more specifically.]
<i>The Pacific Commercial Advertiser</i> , June 05, 1899, Page 11	"Local Brevities"	Miss Dillingham gave a party at Mokuleia Ranch, the guests travelled by train.
<i>The Independent</i> , July 19, 1899,	"Our Wailuku Letter"[Society Column]	Miss Ethel Gay, of Mokuleia, is spending her vacation with Miss Dorcus Richardson, her aunt.
<i>The Independent</i> , August 10, 1899	"Conveyances"	Pahukoa and husband of Waialua convey interest in R.P. 1780 at Mokuleia to Jas. R. Holt, Jr. for \$340.
<i>The Independent</i> , August 29, 1899	"A Trip to Waialua",	The author takes a [presumably horseback] ride into the mountains at Mokuleia with rancher T.W. Gay. Damage to the forests by cattle is discussed and Mr. Gay asserts "the forests in the Waialua mountains have not suffered from the cattle but on the contrary had largely increased."
<i>The Independent</i> , October 26, 1899	"The Waialua Matter"	Discussing the organization of Waialua Plantation among Castle & Cooke, Dillingham and Waterhouse it is noted that Mr. Waterhouse contributed "500 acres of Mokuleia land and 14 artesian wells" gaining shares worth \$187,000.

Reference	Title of Article	Gist of Article
<i>The Pacific Commercial Advertiser</i> , August 03, 1899	“Hotel Arrivals”	A listing of hotel arrivals includes “S.F. Thomas, Mokuleia” at the Arlington Hotel.
<i>The Pacific Commercial Advertiser</i> , September 04, 1899, Page 6	“At ‘Haleiwa’: List of Those Reigstered at Waia Iua Hotel the Past Two Weeks”	List Thomas W. Gay, from Mokuleia, as one of the guests present
<i>The Independent</i> , September 20, 1899	“Conveyances”	H. Waterhouse to W.F. Frear consideration \$1.00 Lands at Mokuleia
<i>The Independent</i> , July 31, 1900	“Case for Investigation”	Initial report of notification to the High Sheriff of the discovery of “the mangled body of a white man named W.E. Miller “on the lands of the Mokuleia plantation.”
<i>The Pacific Commercial Advertiser</i> , August 01, 1900, Page 10	“Blew His Head Off”	A coroner’s Jury found that a water prospector” employed by the Waialua Plantation, W.R. Miller committed suicide by “giant powder” He was found dead in his tent “west of Gaspar Silva’s ranch at Mokuleia near Gay’s place.” It is noted that “A wire fence had been built around it [Miller’s tent] by Miller to keep out cattle and horses which pastured on the mountains.” “The body was buried...about three feet away from the tent.” “The tent was built on an incline and beneath a couple of kukui trees.” There is a reference to the scene being discovered by an employee of McCandless Brothers out shooting goats in the vicinity and that “some Japanese” were sent to fetch the spattered tent. Miller had “been employed by the Waialua plantation for several months as a water prospector and had dug several tunnels” utilizing “giant caps” and “giant powder sticks” and fuse..
<i>The Independent</i> , August 23, 1900.	“Local and General News”	“Mr. Thomas Gay, the manager of Mokuleia ranch has returned from Kona where he went in search of health.”

Reference	Title of Article	Gist of Article
<i>The Pacific Commercial Advertiser</i> , October 19, 1900, Page 2	“All Honolulu Society Saw the Happy Couple Wedded”	Announcement and description of the wedding of Mr. and Mrs. Smith. Their honeymoon to be had at “Mokuleia, [at] the country home of B. F. Dillingham, where they will spend their honeymoon, returning to this City in the course of a few weeks.”
<i>The Honolulu Republican</i> , October 21, 1900, Page 3,	“Fashion and Society”	[Honeymoon for newlyweds, Frederick C. Smith and Alice Wall. “his best man...Mr. Walter Dillingham.”] “Mr. and Mrs. Smith took the 9 o'clock train to Mokuleia on a special car.”
<i>The Independent</i> , January 04, 1901	“Local and General News”	A horse race announced between a horse of Tom Gay and one of “contractor Wilson” ...”at the Mokuleia track.”
<i>The Independent</i> , February 07, 1901	“Death of Thomas W. Gay”	Thomas W. Gay, manager of the Mokuleia Ranch dies at age about 55. He was from Scotland by way of Australia where he became an expert on sheep raising. He was invited to Hawaii by his brother James W. Gay circa 1880 and after the death of James took over the Mokuleia Ranch.
<i>The Hawaiian Star</i> , February 07, 1901	“A Noted Horseman Dead: Thomas Gay of Mokuleia is No More”	Announcement of death of Thomas Gay, stock man and manager of Mokuleia ranch, from a long illness. Thomas Gay died at 55. He spent most of his younger life in Australia where he became an expert sheep rancher. Arrived in Honolulu about 20 years ago and became manager of Mokuleia ranch when his brother, James W. Gay, past.
<i>The Honolulu Republican</i> , February 08, 1901	“Thomas W. Gay Passes to his Long Home”	Announcement of the death of Thomas W. Gay
<i>The Pacific Commercial Advertiser</i> , February 08, 1901, Page 2,	“Noted Horseman to go to Australian Tracks”,	Announcement of the death of Tom Gay.
<i>The Pacific Commercial Advertiser</i> , February 08, 1901, Page 6,	“Thomas W. Gay Died Yesterday”	Announcement for the death of Thomas W. Gay, “The well-known manager of the Mokuleia Ranch passes away.”

Reference	Title of Article	Gist of Article
<i>The Pacific Commercial Advertiser</i> , November 19, 1901, Page 14	“Takes a Vacation”	Mrs. H.C. Brown of the Y.W.C.A. leaves for Mokuleia for a vacation.
<i>The Pacific Commercial Advertiser</i> , January 01, 1902 Page 6,	“Old Cannon at Haleiwa”	An account of two cannon salvaged at Haleiwa (and two others still on the sea floor) discounts that “Natives all credit the schooner Malola therewith but this vessel was lost at Mokuleia, some miles distant, and comparatively recently ...”
<i>The Pacific Commercial Advertiser</i> , July 26, 1902, Page 5,	“Lantana a costly pest”	H. Flocke and Cecil Brown filed their annual account of the James Gay estate. “The balance \$7,951.04 are receipts from Mokuleia Ranch. The expense of the ranch was \$5,146.70, including \$2,300 spent ‘for eradicating lantana, and notwithstanding which outlay the trustees as yet have not been able to get this pest to pasture land under full control.”
<i>The Pacific Commercial Advertiser</i> , October 17, 1902, Page 12,	“Real Estate Transactions”	W.F. Frear and wife convey to W.F. Dillingham Mokuleia land for the consideration of \$1.
<i>The Independent</i> , November 14, 1902	“Joined in Wedlock”	A newly married couple, Arthur A. and Kate L. Braymer left by train for Mokuleia to spend their honeymoon.
<i>The Pacific Commercial Advertiser</i> , November 22, 1902, Page 5	[No Title] “Mr. and Mrs. A.A. Braymer ...” and “Mrs. J.S. Walker...”	“Mr. and Mrs. A.A. Braymer returned from Mokuleia yesterday from their honeymoon” and “Mrs. J.S. Walker, who had been visiting the Braymers at Mokuleia” also returned.
The Pacific Commercial Advertiser, January 05, 1903	“Mrs E. M. Taylor, Florist”,	[Advertisement] “Mrs E. M. Taylor, Florist” as “Headquarters for Mokuleia Carnations”
The Pacific Commercial Advertiser, January 07, 1903, Page 7	“Mrs E. M. Taylor, Florist”	[Advertisement] “Mrs E. M. Taylor, Florist” as “Headquarters for Mokuleia Carnations”



Reference	Title of Article	Gist of Article
<i>The Pacific Commercial Advertiser</i> , January 08, 1903, Page 7	"Mrs E. M. Taylor, Florist"	[Advertisement] "Mrs E. M. Taylor, Florist" as "Headquarters for Mokuleia Carnations"
<i>The Pacific Commercial Advertiser</i> , January 09, 1903, Page 7	"Mrs E. M. Taylor, Florist"	[Advertisement] "Mrs E. M. Taylor, Florist" as "Headquarters for Mokuleia Carnations"
<i>The Pacific Commercial Advertiser</i> , January 10, 1903, Page 7	"Mrs E. M. Taylor, Florist"	[Advertisement] "Mrs E. M. Taylor, Florist" as "Headquarters for Mokuleia Carnations"
<i>The Pacific Commercial Advertiser</i> , January 13, 1903, Page 8	"Mrs E. M. Taylor, Florist"	[Advertisement] "Mrs E. M. Taylor, Florist" as "Headquarters for Mokuleia Carnations"
<i>The Pacific Commercial Advertiser</i> , May 15, 1903, Page 6	"Real Estate Transactions"	"Chong Sing Wai Co.; Co. P. D. ; farming, Mokuleia, Waialua, Oahu; Capitol Stock \$23,000 for 16 yrs. term."
<i>The Pacific Commercial Advertiser</i> , September 15, 1903, Page 5	"Real Estate Transactions"	Hop Chong Wai Co; "rice planting & c, Mokuleia, Waialua, Oahu; Cap Stock \$21,000, 21 years."
<i>The Pacific Commercial Advertiser</i> , September 21, 1903, Page 5	"Real Estate Transactions"	"H Oponui to W F Dillingham; D; int in Gr 1123, Mokuleia, Waialua, Oahu; \$250. B 250, p. 6. Dated Aug. 8, 1903."
<i>The Pacific Commercial Advertiser</i> , October 04, 1903, Page 6	[No Title] "A Young Couple just starting on their honeymoon..."	[Society Column] An account of a couple journeying by train from Pearl City for Mokuleia Station being embarrassed by a posted sign announcing they have just been married.

Reference	Title of Article	Gist of Article
<i>The Pacific Commercial Advertiser</i> , October 13, 1903, Page 9	"Local Brevities"	Mr. and Mrs. Charles R. Frazier have returned from their honeymoon visit to Mokuleia....
<i>The Pacific Commercial Advertiser</i> , December 22, 1903, Page 6,	[No Title] "First National Bank of Wailuku for purpose of electing..."	Mokuleia, Oahu: "Fong Kee to Hung Fat, B. S. 1-2 int. in Chong Sing Wai Co., farmers, Mokuleia, \$1,000. July 16, '03."
<i>The Hawaiian Star</i> , February 25, 1904, Second Edition, Page Six,	"Waialua's Annual Meeting"	At the annual meeting of the stockholders of Waialua Agricultural Company it was noted that "A siphon is to be built across the Kaukonahua Gulch, which will deliver water from the Kaukonahua stream at the 250 foot level on the Mokuleia side of the plantation."
<i>The Pacific Commercial Advertiser</i> , February 25, 1904, Page 8,	"Oahu Trains Move Cautiously"	Trains running from end to end on the Oahu Railway are moving slowly due to the track not yet being in perfect condition. "Deputy Sheriff Andrew Cox, who was a passenger on the train, states that the passage was very slow, especially near Mokuleia and Makaha."
<i>The Pacific Commercial Advertiser</i> , May 24, 1904, Page 5,	"Discovery of Haleiwa Hotel"	Introduction to the amenities and operation of the Haleiwa Hotel. The kitchen at the hotel has advantages such as locally sourced food and vegetables raised on the 40 acres belonging to the hotel. "Butter and milk are obtained from the Mokuleia Ranch."
<i>The Hawaiian Star</i> , June 22, 1904, SECOND EDITION, Page FIVE	"Public Lands Notice"	Grazing lands situated at Mokuleia, Waialua containing an area of 208 acres up for auction for a term of 21 years from July 25, 1904. "Upset rental: \$40.00 per annum, payable semi-annually in advance. First semi-annual payment to be made at the fall of the hammer:"
<i>The Pacific Commercial Advertiser</i> , July 07, 1904, Page 6	"Slaughter of Doves not a Sportsmanlike Thing"	Editor Advertiser (submitted by Sportsman) seeking to implore sportsmen to realize the difference between the excessive slaughters of doves and shooting for sport, and to realize the islands limited resources as there is no regulatory body for the sport. "...dove shooters drove over to Mokuleia three mornings and took back 1080 doves in all as a result of their shoot. The birds are fat and plentiful."

Reference	Title of Article	Gist of Article
<i>The Pacific Commercial Advertiser</i> , July 08, 1904, Page 8	“Thinks Doves were not Slaughtered”	A response to previous day’s article (July 07, 1904, above) stating that the birds were not wasted at Haleiwa. “There were other guns at Mokuleia on these days who may or may not have shot wantonly but it is not fair to couple Haleiwa with such suggestions of waste.” [submitted by Allan Dunn]
<i>The Pacific Commercial Advertiser</i> , July 21, 1904, Page 9“	“Local Brevities”	Commissioner J.W. Pratt sold at auction a lease for 21 years of 203 acres of public land at Mokuleia bought by W.F., H.G. and Marion Dillingham for \$56 per annum.
<i>The Pacific Commercial Advertiser</i> , August 17, 1904	“Realty Transactions: Recorded Aug. 10, 1904”	Lau Aho “by mtgee” to Now Chong Wai Co. Forced sale of interest in 2 “leaseholds” [sic.], mills, crops, livestock, toolse [sic.], etc. Mokuleia \$2250.
<i>The Hawaiian Star</i> , August 17, 1904, Second Edition, Page Two	“Realty Transfers”	Lau Aho “by mtgee” to Now Chong Wai Co. Forced sale of interest in 2 “leaseholds” [sic.], mills, crops, livestock, toolse [sic.], etc. Mokuleia \$2250.
<i>The Hawaiian Star</i> , September 09, 1904, SECOND EDITION, Page THREE	“Realty Transfers”	Between You Tim and Lau Jim. “1-20 int in bus of Chong Sing Wai Co, Mokuleia, Waialua, Oahu; \$1000.”
The Pacific Commercial Advertiser, November 24, 1904, Page 7,	“Realty Transactions”	Documents a lease from the Waialua Agricultural Company Ltd. To Choy Sam et als. For portions of Grants 273, 230, 231, 233, well, etc. at Mokulē’ia for a period of 5 years and six months for the sum of \$2,384.10 per annum
<i>The Pacific Commercial Advertiser</i> , February 19, 1905, Sunday Advertiser, Page 8	“Society”	“Mr. Harold Dillingham was the host for a week-end party at Mokuleia last week.”

<b>Reference</b>	<b>Title of Article</b>	<b>Gist of Article</b>
<i>The Pacific Commercial Advertiser</i> , February 21, 1905, Page 3	“The Senate”	A resolution was introduced to the territorial senate for appropriations of \$4,000 for “Bridges, piers, abutments, and approaches across...Mokuleia ... gulches” and \$6,000 for a “New road from new Paukauwila bridge to Mokuleia railroad station.”
<i>The Pacific Commercial Advertiser</i> , July 06, 1905, Page 5	“Hunting”	Report of the hunting conditions for doves over the weekend. “Those who went as far as Mokuleia and over the Pali report plenty of birds.”
<i>The Pacific Commercial Advertiser</i> , July 16, 1905, Sunday Advertiser, Page 10	“Society”	“Mrs. W.G. Irwin, Miss Helene Irwin and Miss Hyde-Smith yesterday joined an over-Sunday party at Mokuleia.”
<i>The Pacific Commercial Advertiser</i> , July 27, 1905, Page 6	“Hunting”	Hunting season update on the outlook of birds. “A number of hunters went down the line last Sunday, quire a number going to Mokuleia and around Waialua.” Reported decent sized bags.
<i>The Pacific Commercial Advertiser</i> , August 03, 1905, Page 8	“Gay Estate Does Well”	A report from H. Focke and Cecil Brown, trustees of the will of James Gay, deceased makes reference to an income of \$1,948.55 “From sale of milk, butter, pasturage, etc., Mokuleia Ranch”, \$221.50 “from sales of cattle” [seemingly from Mokuleia Ranch] and \$2,603.50 “Rentals from rice lands, Mokuleia.” “The general expenses of the ranch at Mokuleia...” are reported as \$1873.12 of which “\$338.58 was spent in destroying lantana. The amount expended for the same cause the previous year was \$1405.83, and for the year ending June 30, 1903, \$2420.86.”
<i>The Pacific Commercial Advertiser</i> , October 11, 1905, Page 5	“Realty Transactions”	“Hoopi H Wire and hsb (M) et al to Eliza Johnson, M; 16 8-10 acr of R P 1123, Mokuleia, Waialua, Oahu. \$300. B 276, p. 122.”

<b>Reference</b>	<b>Title of Article</b>	<b>Gist of Article</b>
<i>The Pacific Commercial Advertiser</i> , April 22, 1906, Sunday Advertiser, Page 6	[No Title] "A house party..."	"A house party over Sunday is being entertained by Mr. Walter Dillingham at his ranch house at Mokuleia."
<i>The Pacific Commercial Advertiser</i> , April 29, 1906, Sunday Advertiser, Page 11	"Only Six Months for the Shooter"	In the matter of the lease of Mokuleia ranch and the sale of personal property, Judge Robinson made the order, "that the sum of \$670, being the amount realized from the increase of cattle...be paid over to the trustees" to be distributed to the beneficiaries of James Gay's trust contained in his will. The balance of money by the sale of cattle will be reinvested as outlined by the will.
The Pacific Commercial Advertiser, May 26, 1906, Page 6	"Realty Transactions"	"Eliza Johnson to N G Peterson, A M; mtg H H Wire et al on 16 8-10 a of R P 1123, Mokuleia, Waialua, Oahu. \$1.
<i>The Pacific Commercial Advertiser</i> , June 8, 1906	Realty Transactions	Documents land transactions ("interest in grants") at Mokulē'ia: for grs 233 and 337 from S.M. Kamakau to R.L. Colburn, for grs. 233 and 337 from J.K. Kamakau to S.M. Kamakau, for grs 233 and 337 from R.L. Colburn to "Walter F. Dillingham et al.", for grs 233 and 337 from S.M. Kamakau to J.F. Colburn, for grs 233 and 337 from J.F. Colburn to Walter F. Dillingham et al.
<i>The Pacific Commercial Advertiser</i> , June 17, 1906, Sunday Advertiser, Page 3	"The Game Situation"	Article discusses the extremely low numbers of available game of all species for the upcoming season. Points to 4 principle reasons as the cause: 1. Shooting out of season 2. Mongoose 3. Excessive bags 4. The decrease of lantana. Example of cause 1, "W. F. Dillingham found a Jap shooting doves at Mokuleia about two week ago." He took the gun from the man. The article claims the Japanese are the worst offenders as far as game laws are concerned.
<i>The Pacific Commercial Advertiser</i> , July 03, 1906, Page 2	"Koreans and the Recent Hangings"	Representatives of the Korean community including Cho Han Sik of Waialua and Mokuleia thank D.L. Withington [and seemingly the Social Science Asssocation] for their intercession in sparing two Koreans (out of 5) the death penalty.

<b>Reference</b>	<b>Title of Article</b>	<b>Gist of Article</b>
<i>The Pacific Commercial Advertiser</i> , August 08, 1906, Page 9	“Guest of the Week at Haleiwa”	Mr. and Mrs. Chalmers from Mokuleia were guests at Haleiwa.
<i>The Pacific Commercial Advertiser</i> , August 14, 1906, Page 6,	“Foursome and Horse Race”	Announcement about a good game of golf on Sunday and on Saturday, “a race between running horses owned by Yamamoto and Louis Warren, at Mokuleia, for a \$400 purse.”
<i>The Pacific Commercial Advertiser</i> , August 15, 1906, Page 5	“Indigo Won in a Canter”	Announcement of horse race results “at Mokuleia on Saturday last.”
<i>The Pacific Commercial Advertiser</i> , October 16, 1906, Page 5	“Realty Transactions”	Pang Tim to Wong Leong 1-20 interest in Chong Sing Wai Co., Mokuleia, \$1,000.
<i>The Hawaiian Star</i> , October 18, 1906, Second Edition, Page Seven,	“Realty Transfers”	Pang Tim to Wong Leong 1-20 interest in Chong Sing Wai Co., Mokuleia, \$1,000.
<i>The Pacific Commercial Advertiser</i> , December 28, 1906, Page 5,	“Waialua to Have Races”	Announcement of “True to its past traditions” Waialua to celebrate New Year’s Day with horse races “at the Mokuleia track.”
<i>Evening Bulletin</i> , May 14, 1907, 3:30 O’CLOCK EDITION, Page 8	“Real Estate Transactions”	Chow Chu Fai to Choy Lock. “...int in Chong Sing Wai Company, Mokuleia, Waialua, Oahu. \$1050.”
<i>The Hawaiian Star</i> , July 13, 1907, BASEBALL EDITION, Page SIX	“Social Events of the Week”	“Mrs. J.S. Walker and Miss Cornwell are at Mokuleia for a few weeks.”

Reference	Title of Article	Gist of Article
<i>The Pacific Commercial Advertiser</i> , November 02, 1907, Page 6	“Realty Transactions”	1 share in Chong Sing Wai Co., from Wong Gum Chung to Lum Tim for \$1000.
<i>The Pacific Commercial Advertiser</i> , December 07, 1907, Page 9	“Realty Transactions”	Young Kow to Yong Soy, BS. 1-20 int in Chong Sing Wai Co. “Mokuleia, Waialua, Oahu. \$1000.”
<i>The Hawaiian Gazette</i> , March 20, 1908	[No Title] “N G Peterson to...”	“N G Peterson to William Savidge tr, A M; mtg H H Wire on 16 8-10 acr of R P 1123, Mokuleia, Waialua, Oahu.”
<i>The Pacific Commercial Advertiser</i> , October 29, 1908, Second Section,	“Mortgages and Assessments”	Notes recordation for J.P. Mendonca land at Mokuleia
<i>The Hawaiian Gazette</i> , October 30, 1908	“Mortgages and Assignments”	Notes recordation for J.P. Mendonca land at Mokuleia
<i>The Pacific Commercial Advertiser</i> , June 08, 1909	“Another Waialua Section Deserts Makino—More threats”	Article about the workers’ strike on the Ewa plantation and current updates. Strikers from the Mokuleia section of the Ewa plantation returned to their tasks, which totaled about 400 workers.
<i>The Pacific Commercial Advertiser</i> , December 22, 1909, Second Section, Page 10	“Real Estate Transactions”	“Lum Tim to Yong Lung, B S; 1 share in Chong Sing Wai Co. Mokuleia, Waialua, Oahu; \$1000.
<i>The Pacific Commercial Advertiser</i> , February 01, 1910, Second Section, Page 12	“Realty Transactions”	Documents the lease from Joseph P. Mendonca to Kong Lee Wai Co. of two pieces of land and water rigghts at Mokuleia for 20 years at \$3,500 per year, and lease from the Estate of James Gay to Kwong Lee Wai Co. of two pieces of land, buildings, artesian wells, etc. at Mokuleia for 20 years at \$1,540 per year, and lease of a premises at Mokuleia from the Estate of James Gay to Kwong Lee Wai Co.

<b>Reference</b>	<b>Title of Article</b>	<b>Gist of Article</b>
<i>The Hawaiian Gazette</i> , February 04, 1910, Page 7	“Real Estate Transactions”	Estate of James gay to Kwong Lee Wai Co, 2 parcels of land, buildings, artisan wells etc. For 20 years at \$1540 per years.
<i>The Hawaiian Star</i> , January 11, 1911, SECOND EDITION, Page FIVE	“Dissolution of Co-Partnership Notice”	Notice of the partnership of numerous men carrying on business as rice planters under the firm name of Hop Chong Wai Company has by mutual consent been dissolved.
<i>The Hawaiian Gazette</i> , April 28, 1911, Page 8	“Tuberculosis Control Work”	The assistant territorial veterinarian returned to the city from Mokuleia and reported 189 of 3057 dairy cattle as having tuberculous.
<i>The Hawaiian Star</i> , July 31, 1911, SECOND EDITION, Page FIVE	“3415 Cows in Clean Dairies”	A list of dairies in the City and County of Honolulu entitled to permits to sell milk created by Dr. Norgaard. “P. M. Pond, Mokuleia, Oahu” with 168 cows and given permit number 2.
<i>The Hawaiian Gazette</i> , May 07, 1912, Page 3	“Kicks at Taxes Forms Long List”	A tax protest from J.P. Mendonca for lands leased to the estate of James Gay
<i>Honolulu Star-Bulletin.</i> , October 24, 1912, 3:30 Edition, Page 6,	“New Today: Shooting Notice”	Notice of warning to persons shooting on “O.R. & L. Co. ranch lands of Kahuku, Waimea, Kawailoa and Mokuleia, the shooting rights being held by the Haleiwa Hotel Co. for its guests.” Ad is per order of Haleiwa Hotel. [“Clifford Kimball, Mgr.”]
<i>Honolulu Star-Bulletin.</i> , October 28, 1912, 3:30 Edition, Page 6,	“Shooting Notice”	Repeat of ad from October 24, 1912 (above)
<i>Honolulu Star-Bulletin.</i> , May 31, 1913, 3:30 Edition, Page 13,	“Society”	“Mr. and Mrs. Walter Dillingham spent Decoration Day at their place at Mokuleia.”



<b>Reference</b>	<b>Title of Article</b>	<b>Gist of Article</b>
<i>Honolulu Star-Bulletin</i> , June 19, 1913, 2:30 Edition, Page 7	“Makua-Keaau Forest Reserve”	Description of boundaries for the forest reserve.
<i>Honolulu Star-Bulletin</i> , September 16, 1913, 2:30 Edition, Page FIVE	“Died”	Announcement of the death of Moses C. Whre, at Mokuleia. Association with the Silva family: “Funeral from the undertaking parlos of M.E. Silva.”
<i>Honolulu Star-Bulletin</i> , October 14, 1913, 2:30 Edition, Page TWELVE	“Sport”	Percy M Pond to the estate of James Gay, 1 parcel of land at Mokuleia.
<i>Honolulu Star-Bulletin</i> , October 16, 1913, 2:30 Edition, Page TWELVE	“Real Estate Transactions”	Estate of James Gay to Percy M. Pong. “...to Mtg of leasehold, Mokuleia, Waialua, Oahu.” Percy M Pond to William R Castle. “...leasehold, bldgs., live stock, engines, rents, etc, Mokuleia, Waialua, Oahu; \$5000.”
<i>Honolulu Star-Bulletin</i> , February 07, 1914, 3:30 Edition, Page Ten,	“White House Reports on Road Work”	City Engineer Whitehouse reports “The road from the Waialua Mill to Mokuleia which was repaired nearly two years ago, is standing up in excellent shape.” Specifics of road construction are presented.
<i>Honolulu Star-Bulletin</i> , February 14, 1914, 3:30 Edition, Page FOURTEEN	“Society Personals”	“Mrs. Walter Dillingham entertained at luncheon last Sunday at her country home at Mokuleia.”
<i>Honolulu Star-Bulletin</i> , February 23, 1914, 3:30 Edition, Page FIVE	“Rev. R.E. Smith to Superintend M.E. Missions”	Appointed church officials on the islands. “Waialua and Mokuleia, Won Sook Choi”

Reference	Title of Article	Gist of Article
<i>Honolulu Star-Bulletin</i> , March 21, 1914, 3:30 Edition, Page Fourteen,	“Society”	Regarding “the social world to make the annual summer move to their country places...The Harold Dillinghams to Mokuleia ...”
<i>The Hawaiian Gazette</i> , June 02, 1914, Page 7	“Kinney Announces Personnel of Teachers”	Article announcing the appointment of teachers to the territorial school on Oahu. “One teacher remains to be appointed for the Mokuleia School and two for the Boys’ Industrial School at Wailee.”
<i>Honolulu Star-Bulletin</i> , June 02, 1914, 2:30 Edition, Page Eight	“Teacher List Announced by Superintendent”	In a listing of appointed teachers is the comment “Mokuleia –(to be appointed later.)
<i>Honolulu Star-Bulletin</i> , February 06, 1915, 3:30 Edition, Page THIRTEEN	“Society”	Mr. and Mrs. Dillingham hosted a picnic for Mr. and Mrs. De Guigne. “The party motored to the country and spend the day swimming and boating.”
<i>Honolulu Star-Bulletin</i> , April 27, 1915, 2:30 Edition, Page Two	“Chinese Runs Amuck; Wounds 3 Countrymen”	“A Chinese believed to have become temporarily insane is in custody... charged with an assault upon three countrymen with a knife...The affray took place at a plantation camp some miles from Waialua station. The men are said to have been employed on a rice plantation near Mokuleia
<i>Honolulu Star-Bulletin</i> , May 03, 1915, 3:30 Edition, Page Seven	[No Title] “Chow Ma Nin, a Chinese...”	“Chow Ma Nin, a Chinese who was stabbed in a fight which is said to have taken place at Mokuleia April 26 [1915] died at the Queen’s hospital.
<i>The Maui News</i> , May 08, 1915, Page 6	“Died”	“Smith – In Honolulu, April 30, 1915. Henry C. Smith, of Mokuleia.”
<i>Honolulu Star-Bulletin</i> , June 04, 1915, 2:30 Edition, Page SEVEN	“Many Good Hits by Battery E at Schofield”	B Battery went to the northern part of the island for shooting practice. On the way back they stopped one night in Mokuleia before returning to their post.
<i>The Hawaiian Gazette</i> , October 19, 1915, Page 6	“Proposed Reserve at Mokuleia”	“Two days were spent on the government land back of Mokuleia, Oahu, examining the forested area with a view to the creation of a forest reserve there.”

<b>Reference</b>	<b>Title of Article</b>	<b>Gist of Article</b>
<i>Honolulu Star-Bulletin</i> , October 20, 1915, 2:30 Edition, Page Eight	“Closed Season for Game Birds Asked of Board”	“Suggestions signed by 66 residents...that the [game] birds [thought to be ring-neck pheasants]... be turned free at...Mokuleia [and several other locations and be protected for three years].
<i>The Hawaiian Gazette</i> , October 22, 1915, Page 6	“Sportsmen Ask Supervisors to Protect Birds”	Well-known sportsmen signed a memorial given to the supervisors which asked for the spread of birds which are being released on Oahu to be released at Mokuleia and other various places on Oahu.
<i>Honolulu Star-Bulletin</i> , January 14, 1916, 3:30 Edition, Page Eight,	“Memo’s of Meeting of City Supervisor”	“Chairman Horner of the police committee reported to the board...that the recent shipment of gamebirds has been distributed as follows: Mokuleia 10...from the orient. [thought to be ring-neck pheasants]
<i>Honolulu Star-Bulletin</i> , January 22, 1916, 3:30 Edition, Page NINE	“Society”	“Mr. and Mrs. Dillingham entertained delightfully at a weekend party at their beautiful home, Mokuleia, las week. Mr. and Mrs. Clifford Kimball and Mr. and Mrs. Gerrit Wilder were their guests.”
<i>Honolulu Star-Bulletin</i> , March 24, 1916, 2:30 Edition, Page Eight	“Schofield Notes”	Troops from Schofield returned from “ten days scattered along the coast for reconnaissance ...Battery A First Field Artillery returned yesterday from Mokuleia”
<i>Honolulu Star-Bulletin</i> , April 28, 1916, 2:30 Edition	“Hilo Railroad First Case in Quinn’s Court”	Judge Quinn shipped his livestock to the Mokuleia ranch at Waialua in preparation for his trip to the big island for Hilo Railroad case.
<i>Honolulu Star-Bulletin</i> , May 13, 1916, 3:30 Edition, Page Thirteen	[No Title, Society Column]	“Friday, Mrs. Walter Dillingham had a day in the country for Miss Mary and Miss Rachel White of Boston” at Mokuleia and a very jolly and happy day it was...” (Ms. Castle, Swanzy, Cooke and others were also guests)
<i>Honolulu Star-Bulletin</i> , June 02, 1916, 3:30 Edition, Extra, Page Five,	“Remainder of Oahu Teachers are Announced”	Mrs. Mary A. Peterson is announced as a teacher for Mokuleia.

<b>Reference</b>	<b>Title of Article</b>	<b>Gist of Article</b>
<i>Honolulu Star-Bulletin</i> , July 08, 1916, 3:30 Edition, Page NINE	“Society”	“Mr. and Mrs. Jay Gould will be the guests of honor at a day in the country given by the Harold Dillinghams at their beautiful Mokuleia summer home.”
<i>Honolulu Star-Bulletin</i> , July 21, 1916, 3:30 Edition, SPORTS, CLASSIFIED AND SHIPPING SECTION, Page NINE	“Forestry Work During June is Told in Report”	Survey prepared by C.S. Judd, the department of forestry Superintendent, proposing new forest reserve on the north-slope of Waianae mountains back of Waialua and Mokuleia. The survey covered “a total of 6650 acres, 95 per cent of which is government land.”
<i>Honolulu Star-Bulletin</i> , August 05, 1916, 3:30 Edition, Page TWENTY ONE	“News and Notes from Hawaiian Board”	Reverend and Mrs. Norman C. Schenck and family enjoyed a short vacation as guests to Reverend and Mrs. John P. Erdman at their Mokuleia country home.
<i>Honolulu Star-Bulletin</i> , August 26, 1916, 3:30 Edition, Page TWENTY TWO	“News and Notes from Hawaiian Mission Board”	Reverend John P. Erdman and his family have moved from their country place at Mokuleia and are currently staying at the Peninsula.
<i>Honolulu Star-Bulletin</i> , June 07, 1917, 2:30 Edition	“News of the Courts”	Resolutions appropriate funds in the amount of \$1100 for the Mokuleia bridge.
<i>Honolulu Star-Bulletin</i> , June 07, 1917, 3:30 Edition	“Warrants for Improvements are Indorsed”	Resolution for appropriating \$1,100 for reconstruction of the Mokuleia bridge
<i>Honolulu Star-Bulletin</i> , June 14, 1917, 3:30 Edition	“Logan Objects to Being Goat”	“Supervisor Daniel Logan announced at the meeting of the board...that he would no longer be the goat for the money matters” when he objected to the money proposed for bridge repairs at multiple locations including Mokuleia.

<b>Reference</b>	<b>Title of Article</b>	<b>Gist of Article</b>
<i>Honolulu Star-Bulletin</i> , September 11, 1917, 2:30 Edition, Page FOUR	“Weekly Produce Report”	Reporting a shipment of Irish potatoes received from Mokuleia that are of good quality and selling for 3 dollars a bag. [Add created by “A.T. Longley, Marketing Superintendent.”]
<i>The Hawaiian Gazette</i> , September 21, 1917, Page 7	“Enrollment in School Increased”	Reporting numbers in enrollment in schools. For Mokuleia enrollment has gone down from 51 in June to 45 in September.
<i>The Garden Island</i> , February 24, 1920, Page 7	“The Voice of Americanism”	An “open” response letter from the Hawaiian Sugar Planters Association to the Honolulu Japanese Merchants’ Association discussing labor unrest where Japanese “Federation agitators” got “the Japanese” to break their “promise” to cut a Waialua Plantation field at Mokuleia.
<i>The Maui News</i> , February 27, 1920, Page Five	The Voice of Americanism	Same “open” response letter from the Hawaiian Sugar Planters Association to the Honolulu Japanese Merchants’ Association as published in <i>The Garden Island</i> .

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# *Agricultural Plan*

(Plasch Econ Pacific, LLC)

***DILLINGHAM RANCH:  
AGRICULTURAL PLAN, FEASIBILITY AND IMPACTS***

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*PREPARED FOR:*  
**Dillingham Ranch Aina LLC**

*PREPARED BY:*  
**Plasch Econ Pacific LLC**

**September 2017**

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## ACRONYMS

**ALISH:** Agricultural Lands of Importance in the State of Hawai‘i

**AMF:** Agriculture Management Firm

**CC&Rs:** Covenants, Conditions and Restrictions

**DLNR:** Department of Land and Natural Resources, State of Hawai‘i

**DPP:** Department of Planning and Permitting, City and County of Honolulu

**DRA:** Dillingham Ranch Aina LLC

**FEMA:** Federal Emergency Management Agency

**FIRM:** Flood Insurance Rate Maps

**High-quality farmland:** agricultural land that is rated Prime or Unique by ALISH, or A or B by the LSB

**IAL:** Important Agricultural Lands

**LOA:** Lot Owners’ Association

**LSB:** University of Hawai‘i, Land Study Bureau

**LUC:** Land Use Commission, State of Hawai‘i

**mgd:** million gallons per day

**NRCS:** Natural Resources Conservation Service

**Project:** the proposed agricultural subdivision

**Project Area or Site:** the area to be subdivided

**PUC:** Public Utilities Commission, State of Hawai‘i

**Ranch or Property:** Dillingham Ranch

**TMK:** Tax Map Key



# EXECUTIVE SUMMARY

Dillingham Ranch Aina LLC (“**DRA**”) proposes to develop an agricultural subdivision (the “**Project**”) at Dillingham Ranch (the “**Ranch**” or the “**Property**”), Waialua District, O‘ahu. The Property encompasses about 2,721 acres, while the proposed subdivision covers about 1,150 acres (the “**Project Area**” or the “**Project Site**”).

## 1. AGRICULTURAL CONDITIONS

About 380 acres of the Property have highly-rated soils, nearly all of which are located on the lower-elevation flatlands. About 288 acres are located outside the floodways, and about 92 acres are in the floodways.

The highly rated land outside the floodways would be suitable for a variety of low-elevation crops. The highly-rated land in floodways would be suitable for pasture operations, especially since the grasses would trap soil and pollutants, thereby reducing their runoff into the ocean. These lands would not be suitable for field farming due to periodic crop losses after periods of heavy rain. Nor would they be suitable for orchards since the trees would restrict water flow across the land.

Lower-quality land in the foothills would be suitable for grazing cattle, and possibly for some orchard crops.

Most of the land at the higher elevations would be unsuitable for agricultural use due to steep slopes.

## 2. CURRENT AGRICULTURAL ACTIVITIES

Current agricultural activities on the Property include:

- Cattle ranching (unirrigated pastures).
- Equestrian activities.
- A palm plantation (commercial, unmanaged, unirrigated).
- A mango orchard (not commercial, unmanaged, unirrigated).

## 3. PLANNED AGRICULTURAL ACTIVITIES

### a. Objectives

The Agricultural Plan was designed to meet the following objectives:

- Preserve most of the good farmland and use it at its highest and best agricultural use.

- Preserve current agricultural activities at levels that are near or higher than current levels of activity.
- Add agricultural activities on all of the agricultural lots.
- Increase food production significantly.
- Help train future farmers in high-yield hydroponic farming.
- Preserve and enhance the current ranching and farming ambiance.

## **b. Planned Agricultural Activities and Components**

### Ownership and Management of Agricultural Lots

Seventy agriculture/farm-dwelling lots will be owned and managed by individual owners. An additional 11 lots and other common areas will be owned by the Lot Owners' Association ("LOA") and managed by the LOA with the assistance of an Agricultural Management Firm ("AMF").

Before transferring ownership and management control of the common areas to the LOA, the DRA will lease usable agricultural land to various farmers and ranchers.

### Agriculture/Farm-Dwelling Lots: about 779 acres (about 335 acres usable)

Of the 70 agriculture/farm-dwelling lots, 69 will range in size from 3 acres to 10.4 acres, and averaging 5.1 acres. One lot will encompass about 429 acres (Lot 70), of which about 5 acres will be usable and the remainder unusable due to steep mountainsides.

Each of the 70 agriculture/farm-dwelling lots will have an orchard (see below) and possibly other agricultural activities. Also, each lot will have a single farm dwelling located in a designated developable footprint no larger than 5,000 square feet (about 0.115 acre).

The lots will be marketed in publications and on websites catering to farmers. For lot buyers who do not have relevant experience in commercial farming or who have not taken appropriate courses on farming, they must stipulate that, within 2 years of purchasing their lot, they will participate in a course arranged by DRA on how to cultivate orchard trees and sell crops.

### Cattle Ranching: about 300 acres

Grazing lands will decrease from about 360 acres to about 300 acres, with all grazing operations located in the foothills and to the west of the Project Area. However, calf production is expected to remain near recent levels, which will be possible due to supplemental irrigation of some pastures.

DRA will dedicate the cattle-ranching land to agriculture, discount the initial rents to allow viable operations, provide water lines to supply drinking water for the herd and to

allow some pastures to be irrigated during dry conditions, and pay to fence off the grazing lands from the agriculture/farm-dwelling lots.

The rancher will pay for mauka fencing where needed, paddock fencing, irrigation lines and sprinklers, water troughs, gates, corrals, chutes, etc.

The economic viability of the existing operation will continue with little or no change, or could be enhanced somewhat because some pastures will be irrigated during drought.

#### Riding and Working Horses: about 217 acres

The area for riding and working horses will be increased from about 185 irrigated acres to about 217 acres. Pastures and equestrian areas will occupy most of the good agricultural land that is located in the floodways. This is regarded as the highest and best agricultural use of this land. The number of horses will increase from about 150 to about 175 head.

DRA will dedicate the land to agriculture. DRA or the rancher will pay for upgrades, new pastures and paddocks, riding trails, and accessory structures.

The existing profitability of equestrian operations at the Ranch will be enhanced by (1) a slightly larger operation, and (2) the addition of residents, some of whom are likely to board horses at the equestrian center and/or engage in equestrian activities at the center.

#### Palm Plantation: about 49 acres

The palm plantation will be reduced in size from about 68 acres to about 49 acres. However, production is expected to increase due to a change from unirrigated and unmanaged lands to irrigated and managed lands.

DRA will dedicate the land to agriculture, discount the initial rents to allow viable operations for the farmer, and install an irrigation system for the palm trees.

The existing profitability will be enhanced due to increased production made possible by the irrigation and active management of the plantation.

#### Mango Orchard: about 10 acres

The existing orchard will be increased from about 5 acres of unirrigated/unmanaged land to about 10 acres of irrigated/managed land. Also, the operation will be changed from non-commercial to commercial.

DRA will dedicate the land to agriculture, clear the additional 5 acres, install an irrigation system to increase yields, discount the initial rents to allow viable operations, and provide the farmer with sufficient credit at a local nursery to plant the additional 5 acres in mangos.

The planned mango orchard is feasible as evidenced by the presence of many commercial mango farms in Hawai'i. Also, about 5 acres of Ranch land already have mature fruit-

bearing trees; DRA will provide substantial support as indicated above; and the orchard will be on O‘ahu so the fruit can be transported easily to Honolulu markets.

New Orchards: over 110 acres

The vision for the Ranch is to have orchard trees planted on each of the 70 agriculture/farm-dwelling lots.

In order to ensure implementation of the vision, the LOA Declaration of Covenants, Conditions and Restrictions (“**CC&Rs**”) will require each lot owner to plant and maintain an orchard on their property. The minimum size of an orchard will be the larger of (1) 1 acre or (2) 30% the total lot area (or 5 acres in the case of Lot 70). The seedlings must be planted within 3 years after a lot is purchased. Based on these minimum requirements, individual orchards will range in size from 1 acre to 3.1 acres, and average about 1.55 acres. Total required orchard acreage will be about 108 acres. In practice, these acreages may be somewhat higher since some lot owners are likely to exceed their minimum requirement. Thus, total orchard plantings are expected to exceed 110 acres.

DRA will provide to each lot buyer a subsidy applicable to the required minimum acreage to be planted in orchard crops. The subsidy will be used by lot buyers to purchase (1) seedlings from approved nurseries, and/or (2) services from approved providers to help them develop their farms. This subsidy will be (1) a \$9,000 base amount, plus (2) \$5,500 per acre for each required acre in orchards over 1 acre. The orchard-development subsidies will range from \$9,000 per lot up to \$20,550 per lot, and average about \$12,000 per lot. For all 70 lots, the subsidy will total about \$840,000.

Lot buyers will be free to plant whatever varieties of orchard trees they wish. A major advantage of orchard trees is that they are likely to remain in production for decades.

Some of the orchards are likely to be commercial operations, while others may not be commercial but will provide the residents a farming lifestyle. In either case, produce from the trees will increase Hawai‘i’s supply of locally grown food.

In addition to subsidizing the purchases of trees, DRA will provide water lines to the lots for irrigation water, and provide contact information and the expertise of farming consultants and service providers.

Lot owners will be responsible for developing and operating their farms, and for selling the crops. Once the farms are developed with the assistance of the DRA subsidy, farm consultants, and service providers, it is anticipated that a number of the farmers will join together to (1) hire service providers to help manage their farms and sell their crops, and/or (2) form a cooperative to hire employees to perform these functions.

The feasibility of orchard crops is evidenced by the large number of small commercial orchards in Hawai‘i. At the Ranch, the feasibility of orchard operations will be enhanced by the tree subsidies, improvements, and support described above. Since the orchards will be on O‘ahu, the crops can be transported easily to Honolulu markets.

Hydroponic Farm: about 5 acres (equivalent to about 55 acres of field farming)

Another new addition to the Ranch will be a commercial low-tech hydroponic farm for growing vegetables. Hydroponic farming involves plants grown in a water solution, typically in a greenhouse. Hydroponics has a bright future for food production, but Hawai'i lags behind the mainland and Europe in developing hydroponic farms. Advantages of hydroponic farming over field farming include: much higher yields, greatly reduced requirements for land and water, consistent year-round production, higher quality, no pesticides or herbicides, no crop losses to storms or drought, better working conditions and higher pay, and better security since plants are grown inside a building.

DRA will dedicate the land for the hydroponic farm to agriculture, discount the initial rents to allow viable operations, build a concrete slab and a greenhouse structure, and provide a water line to the farm.

The farmer will provide the interior improvements, manage the farm, and sell the produce. The farmer will also be obligated to participate in a hydroponic farm training program (see next section).

The feasibility of small low-tech hydroponic farms is evidenced by their widespread success in Europe, the mainland U.S., Mexico and elsewhere. Also, Hawai'i has about a dozen commercial hydroponic farms, some of which are on O'ahu. In order to enhance the feasibility of the hydroponic farm, DRA will provide the support described above. Since the farm will be on O'ahu, the produce can be transported easily to Honolulu markets.

#### Hydroponic Farm Training Program

DRA will require the hydroponics farmer to participate in a hydroponic farm training program for a period of at least 10 years. In addition, DRA will contribute \$50,000 per year for 10 years to help pay the salary of an instructor and incidental expenses. Participating organizations could include, but would not be limited to: Waialua High and Intermediate, UH West O'ahu, and UH Leeward College.

Such a program is needed in Hawai'i given the economic promise of hydroponic farming and its advantages over field farming.

#### Employee Housing

At full development of the Property, four homes will be provided to employees, including a home for the Ranch manager, and three homes for higher level employees of the AMF who will help the LOA manage the agricultural leases and common lands.

#### Agricultural Support

Further to the information provided above, DRA will:

- Dedicate lands to agriculture in order to (1) insure long-term agricultural use of the lands designated for ranching and farming, and (2) reduce the property taxes on these lands. (Land dedicated to agriculture for 10 years and used for commercial crop production is assessed at 1% of market value. If it is used for pasture, the dedication period is 5 years.)
- Provide various improvements to support ranching and farming such as: water lines for livestock and irrigation, irrigation systems for the palm plantation and mango farm, fencing to separate ranching from farm dwellings, and the slab and structure for the hydroponic farm.
- Provide long-term leases (10 to 20 years), with initial rents being discounted sufficiently to attract ranchers and farmers.
- Provide each agriculture/farm-dwelling lot buyer a subsidy to help develop their orchard farm, with the subsidies ranging from \$9,000 for the smallest lot to \$20,550 for the largest lot.
- Assemble and provide to lot buyers contact information and expertise of farm consultants and service providers.
- Set aside land for a baseyard for shared agricultural equipment.
- Provide \$50,000 per year for 10 years to support a hydroponic farm training program.

The improvements, discounted rents, and subsidies provided by DRA will be justified financially by the returns generated from selling agriculture/farm-dwelling lots. Without selling lots, far less agricultural activity would otherwise occur.

#### **4. AGRICULTURAL IMPACTS AND BENEFITS**

##### **a. Land Use**

The Property encompasses about 2,721 acres of which about 694 acres (25.5%) will be used for agriculture, and about 43 acres (1.6%) will be used for non-agriculture improvements. About 1,980 acres (73%) will remain in non-agricultural open space.

##### Agriculture/Farm Dwelling Lots

The 70 agriculture/farm dwelling lots will include:

- About 110 acres or more of orchards and possibly other crops.
- About 11 acres of developed land (farm dwellings, barns, sheds, etc.).
- About 658 acres of open space (some yards on agricultural lots, but primarily undeveloped foothills and mountainsides).

Much of the development will occur on lower-quality agricultural lands, with less than 3 acres of high-quality farmland used for farm dwellings.

Also, the subdivision will rule out any future possibility of extensive development on the Property.

### Agricultural Land Use

As mentioned above, about 694 acres of the Property will be used for agriculture: about 517 acres for cattle and horse operations, and about 174 acres for crop farming.

Much of the good farmland will be preserved and used at its highest and best agricultural use. The highest and best agricultural use of the good farmland in the floodways is pasture, and that outside the floodways is crop production, including orchards.

The Project will result in a significant increase in land used for food production and other agriculture:

- Cattle-grazing acreage will decrease, but in terms of irrigated pasture equivalents, it will remain at about 180 acres.
- Land used for horses will increase 17%, from 185 acres to 217 acres.
- Land used for crops (palms, mangos, new orchards on the 70 agriculture/farm-dwelling lots, and the hydroponic farm) will increase about 138%, from 73 acres to 174 acres. In terms of irrigated-field-farm equivalents, the increase will exceed 500%—from 37 acres to 224 acres.

### Non-Agricultural Land Use

Non-agricultural development (Lodge, Office, farm dwellings, roads, etc.) will use about 43 acres, including about 29 acres which have already been developed, and about 14 acres still to be developed. Some of the 14 acres will be high-quality farmland and some low-quality land.

Most of the Property will remain in non-agricultural open space: about 1,980 acres, or about 73% of the entire Property. This will include yards and undeveloped portions of lots, archaeological and culture sites, ponds, and mountainous areas.

## **b. Food and Other Agricultural Production**

The increase in acreage used for growing crops—combined with the change to irrigated pastures and farms, managed farms, and hydroponic farming—will result in a major increase in agricultural production. This will include increased production of coconuts, palm trees for landscaping, and mangos; beef production will remain near its current level; new orchards will add fruits and other produce; and hydroponic farming will add vegetable crops.

As indicated above, total crop production will increase by about 500%, while the percentage increase of food-crop production will be higher than 500%.

Thus, the Project will result in a substantial increase in food production on the Property, thereby contributing to the State's goal to increase the production of locally grown food. This increased food production will occur only because DRA will subsidize various improvements and crop plantings, and will discount rents. In turn, this will be possible only if the agriculture/farm-dwelling lots can be created and sold as proposed.

**c. Growth of Diversified Agriculture**

The Project will result in the development of about 14 acres of agricultural land, including both high- and low-quality farmland. This small loss of agricultural land will not adversely affect the growth of diversified agriculture. For perspective, Hawai'i is about one-third self-sufficient in fresh vegetables and fruits, while using about 15,000 acres. However, over 200,000 acres of former sugarcane and pineapple land are fallow or are in a low-value use.

More importantly, the Project will contribute to increased agricultural production as discussed above.

**d. Agricultural Employment**

Agricultural employment at the Ranch is expected to increase from about three full-time-equivalent ("FTE") jobs to about 14 to 23 FTE jobs. In addition, the hydroponic farm training program is expected to provide part-time employment for an instructor for a 10-year period.

**e. Nuisance Issues**

Although no significant farm/residential nuisance issues are anticipated, the following actions are recommended:

- Inform lot buyers of nearby agricultural operations and the nature of these operations.
- Inform lot buyers of ways to reduce nuisance impacts utilizing landscaping and fencing.

**f. Ranch and Farm Ambiance**

The Project will enhance the ranch and farm ambiance of the Property: cattle operations will continue; equestrian operations will increase; the palm plantation will continue; the mango orchard will be expanded; new orchards will be planted throughout the Property Area; and a hydroponic farm will be added.

Buyers will participate directly in farming by having orchards on their property, and will participate indirectly in ranching and farming through their membership in the LOA.



In summary, the Project will contribute directly to “keeping the country country.” In fact, it will create a lasting country ambiance which most residential communities on the North Shore do not provide.

## **5. CONSISTENCY WITH STATE AND COUNTY POLICIES**

The Project is consistent with State and County agricultural policies.

# **DILLINGHAM RANCH: AGRICULTURAL PLAN, FEASIBILITY AND IMPACTS**

## **1. INTRODUCTION**

Dillingham Ranch Aina LLC (“**DRA**”) proposes to develop an agricultural subdivision (the “**Project**”) at Dillingham Ranch (the “**Ranch**” or the “**Property**”), Waialua District, O‘ahu.

This Report summarizes the agricultural plan (“**Ag Plan**”) for the subdivision, along with the impacts on agriculture. The following sections cover: Project Information, Agronomic Conditions, Current and Planned Agricultural Activities, Agricultural Impacts and Benefits, and Consistency with State and County Plans. The material on Planned Agricultural activities also includes the feasibility of the various agricultural activities. All figures and tables follow the body of the report.

## **2. PROJECT INFORMATION**

### **a. Project Location**

The Ranch is located on the North Shore of O‘ahu between Dillingham Airfield to the west and Waialua to the east, and mauka of Farrington Highway (see Figure 1).

The Tax Map Keys (“**TMKs**”) for the Ranch are shown in Figure 2.

### **b. Ranch Property and Subdivision Area**

The Property encompasses about 2,721 acres, while the proposed subdivision covers about 1,150 acres (the “**Project Area**” or the “**Project Site**”).

### **c. Project Description**

Current and planned land uses are shown in Figures 3 and 4, respectively. Major components of the Ag Plan include:

- 70 agricultural lots, each having a single farm dwelling.
- An additional 11 agricultural lots to be owned in common.
- Pastures and facilities for cattle, riding horses, and working horses.
- Crop farms throughout the Property Area.
- The existing Dillingham Lodge and Office.
- Four homes for on-site employees.

- Roadways, utilities, and a base yard for equipment.
- Existing ponds, archaeological and cultural sites, and the undeveloped land in the foothills.

A Lot Owners' Association ("LOA") will own and be responsible for all common areas within the subdivision, including the above-mentioned 11 agricultural lots.

### 3. AGRICULTURAL CONDITIONS

#### a. Soil Types

Figure 5 shows the soil types for the Property based on maps prepared by the Soil Conservation Service, currently known as the Natural Resources Conservation Service ("NRCS"). As discussed in Subsection 3.c below, NRCS has rated these soils as to their quality for agricultural use.

Soils suitable for farming include the following:

- High Quality Soils Suitable for Farming (Rated I or II)
  - KIA: Kawaihapai clay loam, 0 to 2% slopes, rated I

This soil is neutral, permeability is moderate, runoff is slow, and the erosion hazard slight. The substratum is stony and gravelly. In some places the soil is subject to flooding.
  - PsA: Pulehu clay loam, 0 to 3% slopes, rated I

This soil is neutral in the surface layer and neutral to mildly alkaline below the surface layer. Permeability is moderate, runoff is slow, and the erosion hazard is slight. Low areas are subject to flooding.
  - KlaA: Kawaihapai stony clay loam, 0 to 2% slopes, rated IIs

This soil is similar to KIA, except that there are enough stones to hinder, but not prevent, cultivation. Workability is slightly difficult because of stoniness.
  - Mt: Mokuleia clay loam, various slopes, rated IIs

This soil is neutral in the surface layer, and the underlying material is moderately alkaline. Permeability is moderate in the surface layer and rapid in the subsoil. Runoff is very slow, and the erosion hazard is no more than slight.
- Moderate Quality Soils Suitable for Farming (Rated III or IV)
  - EaC: Ewa silty clay loam, 6 to 12% slopes, rated IIIe

This soil is neutral in the surface layer and subsoil. Permeability is moderate, runoff is slow to medium, and the erosion hazard is slight to moderate.

- EwC: Ewa stony silty clay, 6 to 12% slopes, rated IIIe  
This soil is similar to EaC except that surface stones interfere with tillage but do not make inter-tilled crops impracticable.
  - KaB: Kaena clay, 2 to 6% slopes, rated IIIw  
This soil is slightly acid to neutral. Permeability and runoff are slow, and the erosion hazard is slight. Also, the soil is very sticky and very plastic. Workability is difficult because of the narrow range of moisture content within which the soils can be cultivated. The shrink-swell potential is very high. In places the soil is affected by seepage.
  - KaeB: Kaena stony clay, 2 to 6% slopes, rated IIIw  
This soil is similar to KaB except that there are sufficient stones to hinder, but not prevent, cultivation.
  - KaeC: Kaena stony clay, 6 to 12% slopes, rated IIIw  
This soil is similar to KaeB except that the permeability is slow to moderate, and the erosion hazard is slight to moderate.
  - Ph: Pearl Harbor clay, rated IVw  
This soil is on low coastal plains adjacent to the ocean, and the terrain is level or nearly level. Permeability is very slow, runoff is very slow to ponded, and the erosion hazard is no more than slight. Workability is very difficult.
- Low Quality Soils Suitable for Cattle Grazing (Rated V to VII)
- HJE: Halawa silt Loam, 20 to 35% slopes, rated VIe  
For this soil, permeability is moderately rapid, runoff is medium to rapid, and the erosion hazard is moderate to severe. Tillage is difficult because of the slopes.
  - KanE: Kaena very stony clay, 10 to 35% slopes, rated VIi  
The soil is very sticky and very plastic, slightly acid to neutral, and there are many stones on the surface and in the profile. Permeability is slow, runoff is medium to rapid, and the erosion hazard is moderate to severe. Workability is difficult because the soil is stony, steep, and very sticky and very plastic.
  - HLMG: Helemano silty clay, 30 to 90% slopes, rated VIIe  
This soil is neutral in the surface layer and neutral to slightly acid in the subsoil. Permeability is moderately rapid, runoff is medium to very rapid, and the erosion hazard is severe to very severe.
  - KpF: Kemo‘o silty clay, 35 to 70% slopes, rated VIIe  
The soil is slightly acid in the surface layer and slightly acid to

neutral in the subsoil. Permeability is moderate to moderately rapid, runoff is rapid, and the erosion hazard is severe.

- rRK: Rock Land, rated VIIIs

Rock land is made up of areas where exposed rock covers 25 to 90% of the surface, and the soils are very shallow. The terrain is nearly level to very steep.

## **b. Soil Characteristics**

The better soils in the Project Area—i.e., the soils makai of Cane Haul Road—exhibit a number of favorable characteristics for farming: the soil depth exceeds 30 inches, the texture is moderately fine, the terrain is flat or nearly flat, the soils are non-stony and well drained, and the land is tillable. However, much of this land is located in areas defined by floodways.

## **c. Soil Ratings**

Three classification systems are commonly used to rate Hawai'i soils: (1) Land Capability Grouping, (2) Agricultural Lands of Importance to the State of Hawai'i, and (3) Overall Productivity Rating.

### Land Capability Grouping (NRCS Rating)

The 1972 Land Capability Grouping by the U.S. Department of Agriculture, NRCS rates soils according to eight levels, ranging from the highest classification level "I" to the lowest "VIII." The soil ratings for the soils on the Property that are suitable for agriculture are shown in Subsection 3.a.

High-quality soils suitable for farming are rated I or II. Class I soils have few limitations that restrict their use. Class II soils have moderate limitations that reduce the choice of plants or require moderate conservation practices. The subclassification "s" indicates that the limitation is due to stoniness, unfavorable texture, shallow soils, or low water-holding capacity. The subclassification "e" indicates that the limitation is due to erosion. The subclassification "w" indicates that the limitation is due to excess water.

Moderate-quality soils suitable for farming are rated III or IV. Class III soils have severe limitations that reduce the choice of plants, require special conservation practices, or both. Class IV soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Soils suitable for grazing are rated V to VII. These soils are generally unsuitable for farming but, depending on largely on slopes, are generally suitable for grazing cattle.

### Agricultural Lands of Importance in the State of Hawai‘i (“ALISH”)

ALISH ratings were developed in 1977 by the NRCS, UH College of Tropical Agriculture and Human Resources, and by the State of Hawai‘i, Department of Agriculture. This system classifies land into three broad categories: (a) “Prime” agricultural land which is land that is best suited for producing crops because of its ability to sustain high yields with relatively little input and with the least damage to the environment; (b) “Unique” agricultural land which is non-Prime agricultural land used to produce specific high-value crops; and (c) “Other” agricultural land which is non-Prime and non-Unique agricultural land that is important to the production of crops.

About 314 acres have soils that are rated Prime, none of the land is rated Unique, about 398 acres are rated Other, and about 2,009 acres are unclassified (see Figure 6).

### Overall Productivity Rating (LSB Rating)

In 1972, the UH Land Study Bureau (“LSB”) developed for O‘ahu the Overall Productivity Rating, which classifies soils according to five levels, with “A” representing the class of highest productivity and “E” the lowest.

About 224 acres of the Property have soils that are rated A, about 71 acres are rated B, about 17 acres C, and about 349 acres D, and 2,017 acres E. Another 43 acres are Unclassified (see Figure 7).

### Summary Evaluation of Soil Quality

In this report, the term “**high-quality farmland**” is used to describe land that is rated Prime or Unique by ALISH, or A or B by the LSB. All or nearly all of the lands rated I or II by NRCS are included. Under this definition, about 380 acres consist of high-quality farmland (see Figure 8).

#### **d. Elevations**

The elevation of the Property ranges from about 5 feet near Farrington Highway, to about 1,700 feet at the mauka borderline. All of the farm dwellings will be below the 320-foot elevation.

#### **e. Slopes**

Slopes within the Property range from flat or nearly flat between Cane Haul Road and Farrington Highway, to steep mountainsides. Only about 632 acres (23%) of the Property have slopes of less than 10%, while about 1,730 acres (64%) have slopes exceeding 40% (see Figure 9).

## **f. Climatic Conditions**

Like other areas in Hawai‘i, the Project Site has a mild *semitropical* climate that is due primarily to three factors: (1) Hawai‘i’s mid-Pacific location near the Tropic of Cancer, (2) the surrounding warm ocean waters that vary little in temperature between the winter and summer seasons, and (3) the prevailing northeasterly tradewinds that bring air having temperatures which are close to those of the surrounding waters.

### Solar Radiation

The Project Area receives considerable sunshine, with average daily insolation of nearly 450 calories per square centimeter per day.

### Rainfall

Rainfall in the Project Area averages about 35 inches per year. Most of this rainfall occurs during the winter rainy season (October through April), while the summer months (May through September) are hot and dry.

### Temperatures

Temperatures at the Ranch average about 75°F, and range from an average low of 59°F in the winter to an average high of 87°F in the summer.

### Winds

The prevailing surface winds are tradewinds that blow from a northeasterly direction. The average windspeed is about 9 mph.

## **g. Flood Hazards**

Figure 10 shows flood hazards for the Property, based on (1) the Flood Insurance Rate Maps (“**FIRM**”) prepared by the Federal Emergency Management Agency (“**FEMA**”), and (2) a study prepared by River Focus, a water resource consulting firm. FEMA and the River Focus hazards are based on a 1% annual chance of occurrence.

These two sources indicated that about 155 acres of the Property are within a floodway, while about 225 additional acres are located in the 100-year floodplain. Much of the land subject to flood hazards includes high-quality farmland (compare Figures 8 and 10).

Pastures are appropriate for a floodway, but orchards or other crops that could restrict drainage are not. If drainage were to be restricted, then the area subject to flooding would be increased. Crop farming can take place in a floodplain if the farmer is willing to accept the risk of occasional crop losses due to flooding.

#### **h. Water Supply**

Wells on the Property have a permitted use of 2.8 million gallons per day (“**mgd**”). The wells are owned by DRA.

#### **i. Road Access**

Crowbar Ranch Road and Lodge Road provide access to Farrington Highway (see Figure 4). Cane Haul Road crosses the Property, and runs roughly parallel to Farrington Highway.

#### **j. Surrounding Land Uses**

Surrounding land uses are shown in Figures 1:

- Makai of the Property are Farrington Highway, a polo field, beach-front homes, and undeveloped land.
- To the east and west are former sugarcane fields which are now used to cultivate a variety of crops.
- Farther west is Dillingham Airfield.
- The Wai‘anae Range lies mauka of the Property.

#### **k. Locational Advantages and Disadvantages**

The Project location is suitable for supplying crops to the Honolulu and mainland markets. This is due to a truck-transport time of less than 1 hour to the Honolulu markets, the Daniel K. Inouye International Airport, and Honolulu Harbor.

For the U.S. mainland markets, however, farmers in Hawai‘i must compete against producers on the mainland and in Mexico, Central and South America, and elsewhere. Most of the competing farm areas have lower production and delivery costs than does Hawai‘i. Competing against Mexico is particularly difficult given the North America Free Trade Agreement (NAFTA) and Mexico’s close proximity to major U.S. markets.

#### **l. Summary of Agricultural Conditions and Suitable Agricultural Activities**

About 380 acres of the Property have highly-rated soils, nearly all of which are located on the lower-elevation flatlands (see Figure 8), with about 288 acres being located outside the floodways, and about 92 acres in the floodways.

The highly rated land outside floodways would be suitable for a variety of low-elevation crops, including but not limited to: asparagus, beans (green, bush and snap), bell peppers, bittermelon, cantaloupe, Chinese peas, cucumbers, daikon, dry onions, eggplant, flowers/nursery products, ginger root, green onions, green peppers, head and semi-head lettuces, herbs, honeydew melons, limes, lotus root, lychee, Manoa lettuce, mango, mustard cabbage,



Oriental squash, oranges, parsley, pineapple, pumpkins, seed crops, sweet corn, sweet potatoes, tangerines, and watermelons.

The highly rated land within floodways would be suitable for pasture operations, especially since the grasses would trap soil and pollutants, thereby reducing their runoff into the ocean. These lands would not be suitable for field farming due to periodic crop losses after periods of heavy rain. Nor would they be suitable for orchards since the trees would restrict the flow of water across the land.

Lower-quality land in the foothills would be suitable for grazing cattle, and possibly some orchard crops.

Most of the land at the higher elevations would be unsuitable for agricultural use because of steep slopes.

#### **4. CURRENT AND PLANNED AGRICULTURAL ACTIVITIES**

The current and planned agricultural activities on the Ranch are shown in Figures 3 and 4, respectively, and the acreages of the various activities are summarized in Table 1. As shown, agricultural land uses that do not benefit from irrigation are converted to their equivalent acreage assuming irrigation. That is, the annual production from larger unirrigated acreages would be about the same as that from the smaller irrigated acreage. By utilizing irrigated equivalents, valid comparisons can be made between (1) the current unirrigated agricultural activities and (2) the planned irrigated activities.

##### **a. Overview**

###### Current Activities

Current agricultural activities on the Property include:

- Cattle ranching (unirrigated pastures).
- Equestrian activities.
- A palm plantation (commercial, unmanaged, unirrigated).
- A mango orchard (not commercial, unmanaged, unirrigated).

###### Planned Activities

The Ag Plan was designed to meet the following objectives:

- Preserve most of the good farmland and use it at its highest and best agricultural use.
- Preserve all the current agricultural activities at levels that are near, or significantly higher, than their current levels of activity.
- Add agricultural activities on all of the agricultural lots.

- Increase food production significantly.
- Help train future farmers in high-yield hydroponic farming.
- Preserve the ranch and farm ambiance.

Planned agricultural activities and components will include:

- Ownership and Management
  - Agriculture/farm-dwelling lots owned and managed by individual owners.
  - Common areas owned and managed by the LOA.
  - An Agricultural Management Firm (“AMF”) to assist with managing the farm and ranch leases, the agricultural water system, internal roads, etc.
- Agricultural Lots
  - 70 agriculture/farm-dwelling lots, each with an orchard.
  - An additional 11 agricultural lots owned by the LOA.
- Cattle and Horses
  - Continued cattle ranching, with some irrigated pastures so that production can continue near its current level.
  - Continued equestrian operations at an increased level.
- Crop Production
  - Continued palm operations at an increased level of production.
  - An expanded, irrigated, and managed mango orchard.
  - New orchard farms on all of the agriculture/farm-dwelling lots.
  - A new high-yield hydroponic farm.
- Education
  - A new education program to train future farmers in hydroponic farming
- Agricultural Support
  - Long-term leases with initial rents discounted by DRA.
  - Land dedicated to agriculture.
  - Various agricultural improvements to be provided by DRA.
  - A base yard for shared agricultural equipment.
  - Support for the Education Program by DRA.
  - A structure to provide information and expertise on orchard farming.
  - Agricultural subsidies made possible by the sale of agricultural lots.

The Proposed Project will continue and expand some of the historical agricultural uses that have occurred at the Ranch since the 1890s, and provide opportunities for new agricultural activities. DRA will provide capital and support to necessary to insure expansion of

bona fide agricultural activities that further State goals for agricultural production and beneficial use of agricultural lands.

## **b. Ownership and Management**

### Current Ownership and Management

Currently, DRA owns all of the Property and employs an AMF to manage the farms, ranches, the lodge, water system, internal roads, etc. In addition, the AMF employs as needed various service providers to help operate and maintain the Ranch—for example, specialists to address challenging agricultural issues,

### Planned Ownership and Management

Once sold, the 70 agricultural lots with farm dwellings will be owned and managed by individual lot owners, although farm consultants and service providers will be available to help develop and operate the farms.

The remaining 11 agricultural lots and other common areas will be owned by the LOA. This organization will be governed by a Board elected by the lot owners.

Before transferring management control of the common areas to the LOA, DRA will lease all or portions of the 11 agricultural lots for (1) a cattle ranch, (2) a ranch for working and riding horses, (3) a palm plantation, (4) a mango orchard, and (5) a hydroponic farm. As discussed below, the farm and ranch leases will be set at affordable rents; the leases will be long term (10 to 20 years); and the land will be “dedicated to agriculture.” In addition, DRA will provide access to water for farm animals and irrigation.

Upon sale of the 36<sup>th</sup> lot, DRA will transfer ownership and management control of the common areas to the LOA, subject to the existing leases. However, for those common areas that are planned for ranching or farming but have not yet been leased, their transfers will be delayed until the leases are executed.

The DRA will employ an AMF to manage the common areas, farm leases, ranch leases and agricultural water system. After the common areas are transferred to the LOA, the Board may continue with the same AMF, or may replace it with another firm. The AMF will continue to employ various service providers as needed to maintain the common areas.

Although the LOA will inherit the farm and ranch leases, it will not be directly involved in the farm and ranch operations located on the 11 agricultural lots owned in common. After the initial long-term leases expire, the LOA will be responsible for renewing the leases or drafting new ones, possibly with new tenants. The AMF will assist the LOA with this effort.

Management and maintenance costs for the common areas will be borne by the LOA.

### c. Agriculture/Farm-Dwelling Lots

#### Current Ag/Farm-Dwelling Lots

Currently, none of the 70 agricultural lots have farm dwellings on them.

#### Planned Ag/Farm-Dwelling Lots

About 779 acres are to be subdivided into 70 agricultural lots, including one large lot (Lot 70) and 69 smaller ones. All lots will be mauka of the Cane Haul Road, and some will extend into the foothills (see Figure 4).

The State Department of Land and Natural Resources (“**DLNR**”) access requirements allow two lots mauka of the DLNR Access Road to the Waianae Range. Beginning at the first bend of the Access Road, Lot 69 will encompass about 429 acres, of which about 5 acres will be usable and the remainder unusable due to steep mountainsides. At the second bend, Lot 70 will be a standard-sized lot located mauka of the Access Road.

Except for Lot 69, the lots will range from 3 acres to about 10.4 acres. The average and median sizes will be about 5.1 and 4.4 acres, respectively.

Taking into account the steepness of the mountainsides, less than 355 acres of the agriculture/farm-dwelling lots are usable for homes and agriculture (based on slopes of less than 10%).

Assuming a 10-year development period, an average of about 7 farm dwellings will be built annually. However, lot sales are expected to occur over a shorter period.

At full development, each lot will be required to have an orchard, the development of which will be partially subsidized by DRA (see Subsections 4.i and 4.m). In addition, some lot owners are likely to add non-orchard crops, and some may build barns and other facilities for their horses.

In accordance with State law (HRS, Section 205-4.6), all agricultural uses that are permitted by the State in the Agricultural District and permitted by the County on lands zoned for agriculture will be allowed—there will be no restrictions as to agricultural uses on the lots.

In addition to the agricultural activities, each lot is expected to have a single farm dwelling, with the LOA Declaration of Covenants, Conditions and Restrictions (“**CC&Rs**”) written to limit development to just one dwelling per lot. Also, each dwelling will be located in a developable footprint no larger than 5,000 square feet (about 0.115 acre).

These farm dwellings will be single-family homes used in connection with farm operations on the lots. The close proximity of the dwellings to the orchards and possible other agricultural activities will make it easier to manage farm operations and will also provide farm security. Theft of crops and equipment is a major problem for many farmers throughout Hawai‘i.

DRA will provide water lines to the lots, provide subsidies to lot owners to help develop the required orchards, and specify the location of the farm dwellings. Dwellings will be located near access roads in order to reduce infrastructure costs.

Lot owners will be responsible for developing their farm dwellings, clearing and preparing their land for planting, installing agricultural improvements, planting and managing crops, and possibly managing livestock. However, DRA will assist with developing the required orchards (see Subsection 4.h).

The lots will be marketed in publications and on websites catering to farmers. For lot buyers who do not have relevant experience in commercial farming or who have not taken appropriate courses on farming, they must stipulate that, within 2 years of purchasing their lot, they will participate in a course arranged by DRA on how to cultivate orchard trees and sell crops. This could take place in a classroom setting and/or an online course. The purpose would be to ensure that the lot owners have a basic understanding of operating or managing a commercial orchard, even if many of the functions are performed by farm-service providers. Having basic knowledge of commercial farming will be in their own best interests. Once DRA transfers control to the LOA, the LOA with the help of the AMF will be expected to continue offering the course.

#### **d. Cattle Ranching**

##### Current Ranching, Cattle

Cattle ranching has occurred on the Property since the late 1890s. In recent years, about 160 head have grazed about 92 acres of unirrigated land abutting and mauka of Cane Haul Road (see Figure 3), plus an estimated 280 or more acres in the foothills. The size of the herd is based on the carrying capacity of the land assuming low rainfall. This guarantees that sufficient feed will be available during most years. The existing grazing land is equivalent to about 180 acres of pastures with supplemental irrigation.

Ranching provides employment for two part-time ranchhands.

##### Planned Ranching, Cattle

Grazing operations will be decreased to about 300 acres, with all grazing operations located in the foothills and to the west of the Project Area (see Figure 5).

DRA will provide water lines to supply drinking water for the cattle, and to allow some pastures to be irrigated during dry conditions, thereby increasing the carrying capacity of these pasture. Assuming supplemental irrigation on about 90 acres or more, the herd size is expected to remain about the same as it has been in the recent past.

In addition to water improvements, DRA will pay for the cost of the fencing separating the grazing lands from the agriculture/farm-dwelling lots.

DRA will lease the land long-term to a rancher; discount the initial rents to allow viable operations; and dedicate the land to agriculture. Subject to the ranch lease, DRA will transfer ownership of the ranch land to the LOA after the later of (1) execution of the lease, or (2) sale of 36 of the ag lots. The AMF will manage the ranch lease—first for DRA, then for the LOA.

The rancher will pay for mauka fencing where needed, paddock fencing, irrigation lines and sprinklers, water troughs, gates, corrals, chutes, etc. In addition, the rancher will manage the cattle operations and market the calves.

Continued cattle ranching will provide a number of benefits to the community and to the residents of the Project, including but not limited to:

- food production
- continued ambiance of a working cattle ranch
- reduced risk of fire due to cows feeding on grasses near homes
- open space
- reduced property taxes.

#### Feasibility of Planned Cattle Ranching

Like many cattle operations throughout Hawai‘i, the one at the Ranch is marginally profitable, but it is economically viable when combined with the economic benefits provided by the reduced property taxes and the reduced fire hazard.

Sufficient land of suitable quality is available to relocate the entire cattle operation to mauka pastures, and the size of the herd can be maintained with supplemental irrigation to some pastures. As mentioned above, DRA will provide water lines and fencing.

Thus, the economic viability of the existing operation will continue with little or no change, or could be enhanced somewhat with irrigated pastures during droughts.

Also, during unprofitable years, operating subsidies may be justifiable by the economic benefits of reduced fire hazards and reduced property taxes. If necessary, the subsidies would be financed with LOA fees.

#### **e. Riding and Working Horses**

##### Current Ranching, Horses

Horses have been kept on the Property since at least the 1890s for working the cattle. At present, most of them are now riding horses. Currently, about 150 riding and working horses are kept at the Ranch, and about 185 acres are used for irrigated pastures, equestrian activities, barns, and other facilities.

The equestrian activity is a commercial operation with revenues derived from boarding horses, renting pasture areas, storing feed and tack, etc. Commercial equestrian activities are recognized as agriculture by both the State and the County.

Managing the equestrian facilities and activities provides employment to two part-time workers.

### Planned Ranching, Horses

The area for riding and working horses will be expanded to about 217 acres, which will allow about 175 head to be kept at the Ranch.

Irrigated pastures and equestrian areas will occupy most of the good agricultural land that is located in the floodways. This is regarded as the highest and best agricultural use of this land given that floodways are generally unsuitable for field farming or orchard crops (see Subsections 3.g and 3.1).

DRA will lease the land long-term to a rancher; discount the initial rents to allow viable operations; and dedicate the land to agriculture. Subject to the ranch lease, DRA will transfer ownership of the ranch land to the LOA after the later of (1) execution of the lease, or (2) sale of 36 of the ag lots. The AMF will manage the ranch lease—first for DRA, then for the LOA.

DRA or the rancher will pay for the expanded irrigation system, upgrades and new improvements, new pastures and paddocks, new riding trails, and accessory structures.

In addition to the above improvements, a number of the property owners are likely to construct barns and other improvements for their horses.

Like cattle, the horses will contribute to the continuation of the ranch ambiance.

### Feasibility of Planned Horse Ranching

The existing profitability of equestrian operations at the Ranch will be enhanced by (1) a slightly larger operation, and (2) the addition of residents, some of whom are likely to board horses at the equestrian center and/or engage in equestrian activities at the center.

## **f. Palm Plantation**

### Current Palm Plantation

The Ranch features the largest palm plantation in Hawai'i: 68 acres of coconut trees, royal palms, Manila palms, and Phoenix palms. The trees was planted in the 1970s and 1980s. In terms of production, the current plantation is equivalent to less about 34 acres of irrigated and managed trees.

The plantation is a commercial operation with revenues derived from selling coconuts for food and decoration, and palm trees for landscaping. However, there is no active management of the plantation to increase yields. It is not irrigated, fertilized, weeded, or replanted, etc. In terms of production, the current plantation is equivalent to less than 34 acres of irrigated and managed palms.

Harvesting and selling the coconuts and palms provides employment to one part-time worker.

#### Planned Palm Plantation

The plantation will be reduced to about 49 acres. To offset the decrease in acreage, DRA will install an irrigation system that will allow production to be increased.

Also, DRA will lease the land long-term to a farmer, discount the initial rents to allow viable operations, and dedicate the land to agriculture. Subject to the farm lease, DRA will transfer ownership of the farmland to the LOA after the later of (1) execution of the lease, or (2) sale of 36 of the ag lots. The AMF will manage the farm lease—first for DRA, then for the LOA.

The farmer will manage the plantation and market the coconuts and trees.

#### Feasibility of Planned Palm Plantation

The existing palm plantation is profitable. Even though the acreage will be reduced, production is expected to increase and profitably enhanced due to the irrigation system and the active management of the plantation.

### **g. Mango Orchard**

#### Current Mango Orchard

About 5 acres of mango trees were planted in the 1970s and 1980s. The orchard is not irrigated nor managed, and the mangoes are not sold. In terms of production, the current orchard is equivalent to less than 2.5 acres of irrigated and managed trees.

#### Planned Mango Orchard

The orchard will be increased from about 5 acres to about 10 acres.

To help develop the orchard and increase yields, DRA will clear the additional 5 acres for planting; install an irrigation system that covers the entire 10-acres; and provide sufficient credit at a local nursery to plant the additional 5 acres in mangos.

Also, DRA will lease the land long term to a farmer; discount the initial rents to allow viable operations; and dedicate the land to agriculture. Subject to the farm lease, DRA will transfer ownership of the farmland to the LOA after the later of (1) execution of the lease, or



(2) sale of 36 of the ag lots. The AMF will manage the farm lease—first for DRA, then for the LOA.

The farmer will plant the additional 5 acres in mangos, manage the entire mango orchard, and market the crop.

#### Feasibility of Planned Mango Orchard

Commercial mango farms are feasible in Hawai‘i, as indicated by the large number of commercial operations. Although the data on tropical specialty fruit farms are no longer collected and published, the most recent data indicate that Hawai‘i had about 130 commercial mango orchards in 2008, and about 350 acres were in crop. The average size of a mango farm was about 2.7 acres.

The planned mango farm is feasible as indicated by: (1) the presence of other commercial mango farms in Hawai‘i, (2) about 5 acres already have mature fruit-bearing trees, (3) DRA will clear the additional 5 acres to be planted (4) DRA will cover the cost of the trees for the additional acreage, (5) DRA will provide irrigation which will contribute to higher yields, (6) DRA will discount initial rents and provide other favorable lease terms in order to insure viability of the operation, and (7) the farm will be on O‘ahu so the fruit can be transported easily to Honolulu markets.

#### **h. New Orchards**

##### Current Orchards on Ag/Farm-Dwelling Lots

No orchards are located on any of the 70 agricultural lots that are to be sold.

##### Planned Orchards on Ag/Farm-Dwelling Lots

The vision for the proposed Ag Plan is to have orchard crops planted on each of the 70 agriculture/farm-dwelling lots. In order to ensure implementation of the vision, the CC&Rs will require the following:

- Each lot owner must plant and maintain an orchard on their property at densities typical of commercial orchards.
- The minimum amount of land that must be planted and maintained will be the larger of:
  - 1 acre
  - 30% the lot area, rounded to the nearest 10<sup>th</sup> acre.
- Seedlings for an orchard must be planted within 3 years after a lot is purchased.

With one exception, the above percentage calculation will be based on the total area of each lot, and not on the usable area. The exception is Lot 70, which has 429 acres of mostly

mountainous land. For this lot, 5 acres of usable land will be used for the percentage calculation.

Based on these minimum requirements, individual orchards will range in size from 1 acre to 3.1 acres, and average about 1.55 acres. Total required orchard acreage will be about 108 acres. In practice, these acreages may be somewhat higher since some lot owners are likely to exceed their minimum requirement. Thus, total orchard plantings are expected to exceed 110 acres.

Lot owners can plant whatever varieties of orchard trees they wish, or multiple varieties. In 2015, the North Shore Pineapple Company identified avocado, mango and citrus as promising crops for Dillingham Ranch based on the agronomic and market conditions. Other commercial orchard crops grown in Hawai'i include, but are not limited to: abiu, atemoya, bilimbi, biriba, breadfruit, cacao, cashew nuts, cherimoya, coconuts and other palm trees, coffee, durian, egg fruit, feijoa, fig, guava, jaboticaba, jackfruit, kukui nut, longan, lychee, macadamia nuts, mamey sapote, mangosteen, mountain apple, mulberry, neem, noni, olive, Persimmon, plum, rambutan, rollinea, sandalwood, sapote, soursop, star apple, star fruit, surinam cherry, sweetsop, and tamarind.

Depending on the type of tree, densities for commercial orchards can range from about 50 trees per acre (mango) to about 145 trees per acre (citrus). For avocados, densities average about 90 trees per acre. At about \$40 per seedling, the cost of seedlings will range from about \$2,000 per acre to nearly \$6,000 per acre.

It is expected that the Ranch will end up with a variety of orchard crops, which will provide two advantages for commercial operations. First, supplying a variety of crops avoids the risk of flooding the market and having prices collapse as could be the case if all the farms were planted with the same type of orchard. Second, commercial farms have a high risk of failure, so having a variety of crops increases the probability that at least some of the farms will be profitable. Typically, profitable operations are copied by other farmers.

A major advantage of orchard crops is that they are likely to remain in production for decades, while vegetable or melon crops must be replanted after each harvest and may not be kept in production if returns are low.

Many of the orchard farms are likely to be commercial operations, while some may be non-commercial which provide the resident a farming lifestyle. In either case, produce from the trees will increase Hawai'i's supply of locally grown food. Advantages of commercial operations to the lot owner include (1) revenues from selling the crops that will be produced and (2) greatly reduced property taxes on land that is used to grow a commercial crop or crops, and which is "dedicated to agriculture."

In order to provide a strong start for orchard farming at the Ranch, DRA will:

- Require orchard crops to be planted and maintained as described above.
- Provide water lines to the lots for irrigation.

- 
- Market the lots in publications and on websites catering to farmers (see Subsection 4.c).
  - Require lot buyers to (1) have appropriate education and/or experience in commercial farming, or (2) agree to participate in a course arranged by DRA on cultivating orchards and selling crops (see Subsection 4.c).
  - Provide lot buyers relevant consultant reports on agronomic conditions at the Ranch, and on the assessments of promising crops.
  - Provide contact information of nurseries selling orchard seedlings.
  - Provide contact information of farm consultants and service providers who can assist them with developing an orchard farm, including:
    - + Advising on the best orchard crops given the agronomic conditions of the lot.
    - + Designing the farm layout and irrigation system.
    - + Preparing the land for planting.
    - + Installing an irrigation system.
    - + Transporting the seedlings from the nursery to farm.
    - + Planting the seedlings.
  - Provide contact information of service providers who can assist with operating the orchards, including:
    - + Cultivating the trees (monitoring irrigation, apply fertilizers, controlling weeds and pests, pruning the trees, etc.)
    - + Harvesting the crops.
    - + Selling the crops.
  - Provide to each lot buyer a subsidy applicable to the required minimum acreage to be planted in orchard crops. The subsidy may be used by lot buyers to purchase (1) seedlings from approved nurseries, and/or (2) services from approved providers to help them develop their farms. The subsidy will be in the form of vouchers provided to lot buyers at the time of purchase.

The orchard-development subsidy to lot buyers will be (1) a \$9,000 base amount, plus (2) \$5,500 per acre for each required acre in orchards over 1 acre. This schedule of subsidies reflects the fact that some development costs (e.g., the orchard and irrigation plan) do not increase significantly with larger orchards. Also, discounts are often available for larger-purchases, such as for land clearing, irrigation systems, trees, plantings, etc. As a result, doubling the size of an orchard (say from 1 acre to 2 acres) does not double the development costs.

The orchard-development subsidies will range from \$9,000 per lot up to \$20,550 per lot, and average about \$12,000 per lot. For all 70 lots, the subsidy will total about \$840,000.

Lot owners will be responsible for developing and operating their farms, and for selling the crops. Once the farms are developed with the assistance of the DRA subsidy, farm

consultants, and service providers, it is anticipated that a number of the farmers will join together to (1) hire service providers to help manage their farms and sell their crops, and/or (2) form a cooperative to hire employees to perform these functions.

As mentioned above, DRA will provide information to lot buyers on farm consultants and farm service providers who can help develop and operate the orchard farms. Once the orchards are developed and DRA transfers control to the LOA, this information will be transferred to the LOA to maintain with the help of the AMF.

Some equipment will be available for rent to help develop and manage the farms—e.g., a bulldozer to clear land, a backhoe, trucks for hauling heavy or bulky items, etc. Initially, this equipment will be available from DRA. After 36 ag lots are sold, any equipment owned by DRA that is in good working order will be transferred to the LOA. Additional equipment will be purchased by the LOA for use by the AMF to support agriculture and manage the common areas.

### Feasibility of Planned Orchards

The feasibility of orchard crops is evidenced by the large number of commercial orchards in Hawai‘i. The “Statistics of Hawai‘i Agriculture,” with partial updates by the U.S. Department of Agriculture National Agricultural Statistics Service, indicate that Hawai‘i has about 2,000 orchard farms covering over 25,000 acres, with the largest acreage in macadamia nuts and coffee. Many of these farms are small commercial operations. In 2011, there were about 280 avocado farms averaging about 1.6 acres in size, and in 2008 there were about 130 mango farms averaging about 2.7 acres. Data on citrus farms have not been disclosed.

The feasibility of the orchard farms will be enhanced by the subsidies and information provided by DRA. As mentioned above, these will include:

- Water lines to the lots for irrigation.
- Information on: potential crops suitable for the Ranch lots, nurseries where seedlings can be purchased, farm consultants and service providers who can help develop the orchard farms, and farm service providers who can help with operations.
- A subsidy of about \$840,000 for developing the orchard farms.

Since the farms will be on O‘ahu, the produce can be transported easily to Honolulu markets.

## **i. Hydroponic Farm**

### Current Hydroponic Farm

Currently, no hydroponic farms operate at the Ranch.

### Planned Hydroponic Farm

In many developed countries, hydroponic farming of vegetables is replacing field farming. Hydroponics has a bright future for food production, but Hawai‘i currently lags behind the mainland and Europe in developing hydroponic farms.

In comparison to field farming, hydroponic farming has many advantages:

- Land having low-quality soils can be used.
- Water requirements are much lower for the same levels of production.
- Yields per acre are far higher.
- Quality of the produce is higher and more consistent.
- No pesticides or herbicides.
- Consistent levels of production year-round.
- No crop losses caused by storms or droughts.
- Better working conditions and higher pay.
- Better security since plants are grown inside a building.

An alternative form of hydroponics is aquaponics whereby fish are added to the irrigation system to provide fertilizer and an additional product. Aquaponics is a newer technology than pure hydroponics, and is yet to be proven a commercial success at a large scale.

Hydroponic farms range from (1) small low-tech farms that require a small capital investment and are suitable for supplying small markets; to (2) very large high-tech farms that require a large capital investment but can supply large markets. A number of the smaller low-tech operations already exist in Hawai‘i, while a 5-acre high-tech operation is planned for Lāna‘i.

The economic potential of small low-tech hydroponic farms is exemplified by their large concentration in southern Spain, which supply fresh vegetables to much of Europe. Collectively, these small farms cover as much as 100,000 acres, and can be seen easily on Google Earth (about 160 miles ENE from the Strait of Gibraltar).

To help develop the farm, DRA will build a concrete slab and greenhouse, and provide a water line to the farm.

Also, DRA will lease the land long-term to a farmer; discount the initial rents to allow viable operations; and dedicate the land to agriculture. Subject to the farm lease, DRA will transfer ownership of the farmland to the LOA after the later of (1) execution of the lease, or (2) sale of 36 of the ag lots. The AMF will manage the farm lease—first for DRA, then for the LOA.

The farmer will equip the hydroponic farm, manage it, and sell the produce. Also, the farmer will be obligated to participate in a hydroponics training program (see next section).

### Feasibility of Planned Hydroponic Farm

The feasibility of small low-tech hydroponic farms is evidenced by their widespread success in Europe, the mainland U.S., Mexico and elsewhere. Also, Hawai‘i has about a dozen or so commercial hydroponic farms, many of which are on O‘ahu.

In order to enhance the feasibility of the hydroponic farm, DRA will provide the above-mentioned improvements and favorable lease terms. Since the farm will be on O‘ahu, the produce can be transported easily to Honolulu markets.

## **j. Hydroponics Training Program**

### Current Hydroponic Farming Program

Currently, a hydroponic farming program is not offered in the Waialua area.

### Planned Hydroponic Farming Program

DRA will require the hydroponics farmer to participate in a hydroponics training program for a period of at least 10 years. In addition, DRA will contribute \$50,000 per year for 10 years—\$500,000 in total—to help pay the salary of an instructor, plus incidental expenses. Participating organizations could include, but would not be limited to: Waialua High and Intermediate, UH West O‘ahu, and UH Leeward College. DRA will make the arrangements with one or more schools.

Such a program is needed in Hawai‘i given the economic promise of hydroponic farming, and its advantages over field farming.

## **k. Water Use**

### Current Water Use

Current water use on the property is less than 0.14 mgd. The water is supplied by the North Shore Water Co., which is a utility managed by DRA and regulated by the State Public Utilities Commission (“PUC”).

### Planned Water Use

At full development, agricultural water use at the Ranch is projected to average about 809,000 mgd, or about 83% of the total agricultural and non-agricultural use of 971,000 mgd (see Table 2). This total excludes the reuse of treated wastewater. Because the wastewater will be rated R-1, it can be used to irrigate crops and pastures without restrictions.

Wells at the Ranch also supply an average of about 100,000 mgd to the Mokulē‘ia community makai of Farrington Highway.

Thus, the total water use by the Ranch users and the Mokulē‘ia community will average about 1.1 mgd, with a maximum use of about 1.6 mgd. These totals are well below the permitted use of 2.85 mgd for the wells on the Property (see Subsection 3.h).

The North Shore Water Co. will deliver potable water from two higher-elevation wells to dwellings at the Ranch, the 70 ag lots, landscaped areas along roadways, and the Mokulē‘ia community. This company will continue to be managed by DRA.

With the assistance of the AMF, the LOA will deliver non-potable water from a low-elevation well to the leased farms and ranches, and to landscaped areas at the lodge. As soon as 36 ag lots are sold, ownership of the non-potable well and related distribution system will be transferred from the DRA to the LOA.

For both the potable and non-potable water systems, water rates will be based on delivery costs, not on the value of the water.

## **I. Employee Housing**

### Current Employee Housing

Currently, a single house on the Property is used for employee housing.

### Planned Employee Housing

At full development of the Property, four homes will be provided to employees, including a home for the ranch manager for the equestrian facilities, and three homes for higher level employees of the AMF who will help the LOA manage the agricultural leases and common lands.

## **m. Agricultural Support**

### Current Agricultural Support

Currently, areas used for agricultural production are dedicated to agriculture; improvements are limited to internal roads, water systems, equestrian facilities, offices, and one employee home; and none of the agricultural lands are leased.

### Planned Agricultural Support

Further to the information provided above, DRA will:

- Negotiate long-term leases (10 to 20 years) for two ranches and three farms, with initial rents discounted sufficiently to attract tenants.
- Add dedication or rededicate lands to agriculture in order to (1) insure long-term agricultural use of the land designated for ranching and farming, and (2) reduce the property taxes on these lands. (Land dedicated to agricultural for 10 years, and used for commercial crop production, is assessed at 1% of market value. If it is used for pasture, the dedication period is 5 years.)
- Provide various improvements to support ranching and farming, such as water lines for livestock and irrigation, irrigation systems for the palm plantation and

mango farm, fencing to separate ranching from farm dwellings, and the slab and structure for the hydroponic farm.

- Set aside land for a baseyard for shared agricultural equipment.
- Provide subsidies to help develop the orchards.
- Assemble and provide to lot buyers contact information and expertise of farm consultants and service providers.
- Provide subsidies to support a hydroponic education program.

The improvements, discounted rents, and subsidies provided by DRA will be justified financially by the returns generated from selling agriculture/farm-dwelling lots. Without selling lots, far less agricultural activity would otherwise occur.

## **5. AGRICULTURAL IMPACTS AND BENEFITS**

### **a. Land Use**

The current and planned land use of the Property is summarized in Figures 3 and 4, and in Table 1. The Property encompasses about 2,721 acres of which about 694 acres (25.5%) will be used for agriculture, and about 43 acres (1.6%) will be used for non-agricultural improvements. About 1,980 acres (73%) will remain in non-agricultural open space.

#### Agriculture/Farm Dwelling Lots

The 70 agriculture/farm dwelling lots will include:

- About 110 acres or more of orchards and possibly other crops.
- About 11 acres of developed land (farm dwellings, barns, sheds, etc.).
- About 658 acres of open space (some yards on agricultural lots, but primarily undeveloped foothills and mountainsides).

Much of the development will occur on lower-quality agricultural lands (see Figures 4 and 8), with less than 3 acres of high-quality farmland lost to farm dwellings (based on at most 20 dwellings located on high-quality farmland, and at most 5,000 sq. ft. per dwelling.)

Also, the subdivision will rule out any possibility of extensive development of the Property in the future. If the Property were developed at the maximum density allowed given its agricultural zoning (2-acre lots), then over 300 farm dwellings could be built compared to the 70 farm dwellings that are planned.

#### Agricultural Land Use

In total, about 694 acres of the Property will be used for agriculture: about 517 acres for cattle and horse operations, and about 174 acres for crop farming. Much of the good



farmland will be preserved and used at its highest and best agricultural use (see Figures 4 and 8).

The highest and best agricultural use of the good farmland in the floodways is pasture since this use allows an unrestricted flow of water, and pasture grasses help retain soils and help filter the water before it is discharged into the ocean. The highest and best agricultural use of good farmland outside the floodways is crop production, including orchards.

As shown in Table 1, the Project will result in a significant increase in land used for food production and other agriculture:

- Land used for grazing cattle will decrease in acreage. But in terms of irrigated pasture equivalents, the acreage will remain at about 180 acres.
- Land used for riding and working horses will increase 17%, from 185 acres to 217 acres.
- Land used for crops (palms, mangos, new orchards on the 70 agriculture/farm-dwelling lots, and the hydroponic farm) will increase about 138%, from 73 acres to 174 acres. In terms of irrigated-field-farm equivalents, the increase will exceed 500%—from 37 acres to 224 acres.

#### Non-Agricultural Land Use

Non-agricultural development (Lodge, Office, farm dwellings, roads, etc.) will use about 43 acres, including about 29 acres which have already been developed and about 14 acres to be developed. Some of the 14 acres will be high-quality farmland and some low-quality land.

Most of the Property will remain in non-agricultural open space: about 1,980 acres, or about 73% of the entire Property. This will include yards and undeveloped portions of lots, archaeological and culture sites, ponds, and mountainous areas.

#### **b. Food and Other Agricultural Production**

The increase in acreage used for growing crops—combined with the change to irrigated pastures and farms, managed farms, and hydroponic farming—will result in a major increase in agricultural production. This will include an increase in the production of coconuts, trees for landscaping, and mangoes. Beef production will remain at its current level. The new orchards will add fruits and other produce, and the hydroponic farm will add vegetable crops.

As indicated above, crop production will increase by about 500%. The percentage increase of food-crop production will be higher than 500% since not all palm trees bear coconuts.

Thus, the Project will result in a substantial increase in food production on the Property compared to current production, and will produce more food than it would were the land simply made available for farming and ranching without the DRA investments and subsidies.

Furthermore, the increased food production at the Ranch will contribute to the State’s goal to substantially increase the production of locally grown food.

This increased food production will be possible only because of DRA’s subsidized improvements and discounted rents which, in turn, will be possible only with the sale of the agriculture/farm-dwelling lots.

### c. Growth of Diversified Agriculture

The Property has about 288 acres of good farmland located outside the floodways. As indicated on the second page of Table 1, the Project will result in the loss of about 14 acres of agricultural land, including both high- and low-quality farmland. This small loss of agricultural land will not adversely affect the growth of diversified agriculture.

For perspective, Hawai‘i is about one-third self-sufficient in fresh vegetables and fruits using just 15,000 acres. However, over 200,000 acres of former sugarcane and pineapple land are fallow or are used in a low value use.

Even though farm dwellings will be located on good farmland, the Project will contribute to increased agricultural production—see previous subsection.

### d. Agricultural Employment

#### Current Employment

Agricultural activities at the Ranch currently provide about three full-time-equivalent (“FTE”) jobs including: two part-time cowhands, two part-time workers involved with equestrian activities, one part-time worker for the palm operations, and one part-time agriculture manager.

#### Planned Employment

At full development and after the orchard trees mature, agricultural employment at the Ranch is expected to increase to approximately 14 to 23 FTE agriculture jobs, including:

— Ranching	0.75 to 1 job
— Equestrian	1.5 to 2.5 jobs
— Palm plantation	2 to 4 jobs
— Mango orchard	0.5 to 1 job
— Orchards on ag/farm-dwelling lots	5 to 8 jobs
— Hydroponic farm	3 to 4 jobs
— Ag management, AMF	1 to 2 jobs

In addition, the hydroponics training program is expected to provide part-time employment for a trainer for a 10-year period.

### e. Nuisance Issues

Nuisances arising from nearby farm or intensive livestock operations can become an issue for residents as well as for farm operators. Some residents who are close to and downwind from such operations may object to occasional noise, dust, odors, chemical spraying, etc. In turn, farmers may need to change their operations in order to address these issues.

#### Nuisance Issues, On-site Agricultural Operations

Agricultural activities at the Ranch will include cattle and horse operations, orchards, and hydroponic farming. With minor exceptions, none of these operations will cause significant nuisance issues for residents of the Ranch.

The orchards may require occasional spraying for pests, and harvesting may cause occasional noise. However, the greatest nuisance impacts will affect residents of the farm dwellings that are near orchards on the same lot. Presumably, the residents of a given lot will manage their farming operations to minimize any nuisance impacts they generate on their lot. In any case, the Hawai'i's Right to Farm Act protects farmers from nuisance actions, provided that the operation is conducted in a manner consistent with generally accepted agricultural and management practices.

#### Nuisance Issues, Nearby Farms

About 10 of the agriculture/farm-dwelling lots will abut or be near farm operations located between the Project Site and Dillingham Airfield, and an additional two lots will abut or be near farm operations east of the Project.

Since each lot will be relatively large (3 acres or more), and each farm dwelling will be sited at the front of the lot near the access road, residents will be buffered from nearby farm operations by the distance from the back of the dwelling to the rear of the lot, and by any trees, plants, and farm structures located there. Also, additional landscaping can be planted and fencing installed to reduce potential nuisance impacts from nearby farms. Presumably, buyers will tolerate nearby agricultural operations since they will be buying agricultural lots that are designed for agricultural activities.

Recommended mitigation measures include:

- Informing lot buyers of nearby agricultural operations and the nature of these operations.
- Providing information on how to reduce nuisance impacts by installing landscaping and building a fence.

### Nuisance Issues, Nearby Homes and Recreational Activities

A few homes are makai of the pond in the north-west corner of the Property fronting Farrington Highway, and a few homes are makai of the existing equestrian areas fronting the Highway. Also, polo and beach activities take place makai of the existing equestrian areas fronting the Highway.

There are no existing or planned activities on the Property that cause or will cause nuisance problems to the residents of the nearby homes, or to residents who use the polo field and beach for recreation.

#### **f. Ranch and Farm Ambiance**

The Project will enhance the ranch and farm ambiance of the Property: cattle operations will continue, equestrian operations will increase, the palm plantation will continue, orchards will be planted throughout the Property Area, and a hydroponic farm will be added.

Lot owners will participate directly in farming by having orchards on their property, and will indirectly participate in ranching and farming through their membership in the LOA. As mentioned, this organization will own 11 agricultural lots, and will lease out properties for ranch and farm operations.

In summary, the Project will contribute directly to “keeping the country country.” In fact, it will create a lasting country ambiance which most residential communities on the North Shore do not provide.

## **6. CONSISTENCY WITH STATE AND COUNTY POLICIES**

### **a. Availability of Lands for Agriculture**

The *Hawai‘i State Constitution*, the *Hawai‘i State Plan*, the *State Agriculture Functional Plan*, the *O‘ahu General Plan (Second Public Review Draft)*, the *County’s North Shore Sustainable Communities Plan* call directly or implicitly for preserving the economic viability of plantation agriculture and promoting the growth of diversified agriculture. To accomplish this, an adequate supply of agriculturally suitable lands and water must be assured.

The Project will preserve nearly all of the good farmland on the Property, and water for agriculture will remain available. With regard to plantation agriculture, the Project Area was never part of a sugarcane or pineapple plantation. With regard to diversified agriculture, the Proposed Project will result in a significant increase in agricultural production.

### **b. Conservation of Agricultural Lands**

In addition to the above, State and City policies call for conserving and protecting prime agricultural lands, including protecting farmland from urban development.

As mentioned, the Proposed Project will preserve nearly all of the good farmland within the Property. Less than 14 acres of good farmland outside the area encumbered by floodways will be developed. Any potential production loss will be offset by the development of a high-yield hydroponic farm.

### **c. Important Agricultural Lands**

In 1978, the State Constitutional Convention proposed the identification and designation of Important Agricultural Lands (“**IAL**”). After nearly 30 years, the State Legislature adopted in 2005 and 2008 legislation to fulfill the intent and purpose of the Constitutional mandate. As stated in HRS Chapter 205: “The objective for the identification of important agricultural lands is to identify and plan for the maintenance of a strategic agricultural land resource base that can support a diversity of agricultural activities and opportunities that expand agricultural income and job opportunities and increase agricultural self-sufficiency for current and future generations.” IALs are defined as lands that: “(1) Are capable of producing sustained high agricultural yields when treated and managed according to accepted farming methods and technology; (2) Contribute to the State's economic base and produce agricultural commodities for export or local consumption; or (3) Are needed to promote the expansion of agricultural activities and income for the future, even if currently not in production.”

The IAL designation is a supplemental State land use classification administered by the State Land Use Commission (“**LUC**”). This designation provides access to incentives that promote profitable farming of IALs. Incentives include the approval to construct on-site farm dwellings and employee housing, income tax credits for agricultural costs, financing opportunities, loan guarantees, and expedited State-level permitting for agricultural processing facilities. The designation does not change existing land classifications (i.e., State Land Use Districts, County community plan designations, County zoning, etc.), nor does it restrict allowable uses of IAL-designated agricultural land.

Landowners can petition the LUC independently to designate all or portions of their agricultural land as IAL. In addition, each county is required to identify, map and recommend lands within its jurisdiction that have potential for IAL designation in keeping with the standards, criteria and procedures established by law. After the LUC reviews a County’s recommendations, the LUC is responsible for designating IALs.

Hawai‘i Revised Statutes, Chapter 205–44 identifies standards and criteria that need to be considered when identifying lands which are worthy of the IAL designation. Over the last few years, the Department of Planning and Permitting (“**DPP**”), City and County of Honolulu, has worked with a Technical Advisory Committee to map the criteria and develop a process to use the criteria to select lands which should be considered for IAL. The Advisory Committee recommended using three criteria:

- Land currently used for agricultural production.
- Land with soil qualities and growing conditions that support agricultural production of food, fiber, or fuel- and energy-producing crops.
- Land with sufficient quantities of water to support viable agricultural production.

A map showing lands to be considered for IAL is available at: <http://mapoahuagland.com/maps/>. This map is based on lands that meet at least one of the three criteria listed above.

Based on this map, all of the Ranch is being considered for IAL. Most but not all of the lower-elevation lands meet at least one of the criteria (the ponds clearly do not). But the mountainous areas—which comprises about 64% of the Property—do not meet any of the three criteria.

Regardless, an IAL designation would benefit the Project given the incentives for agricultural production.

#### **d. Regional Land-Use Plan**

The County's *North Shore Sustainable Communities Plan* shows two land uses for the Property: Agriculture for the lower-elevation lands and Preservation for the mountainous areas.

The Proposed Project is consistent with these designations.

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Figure 1. Project Location



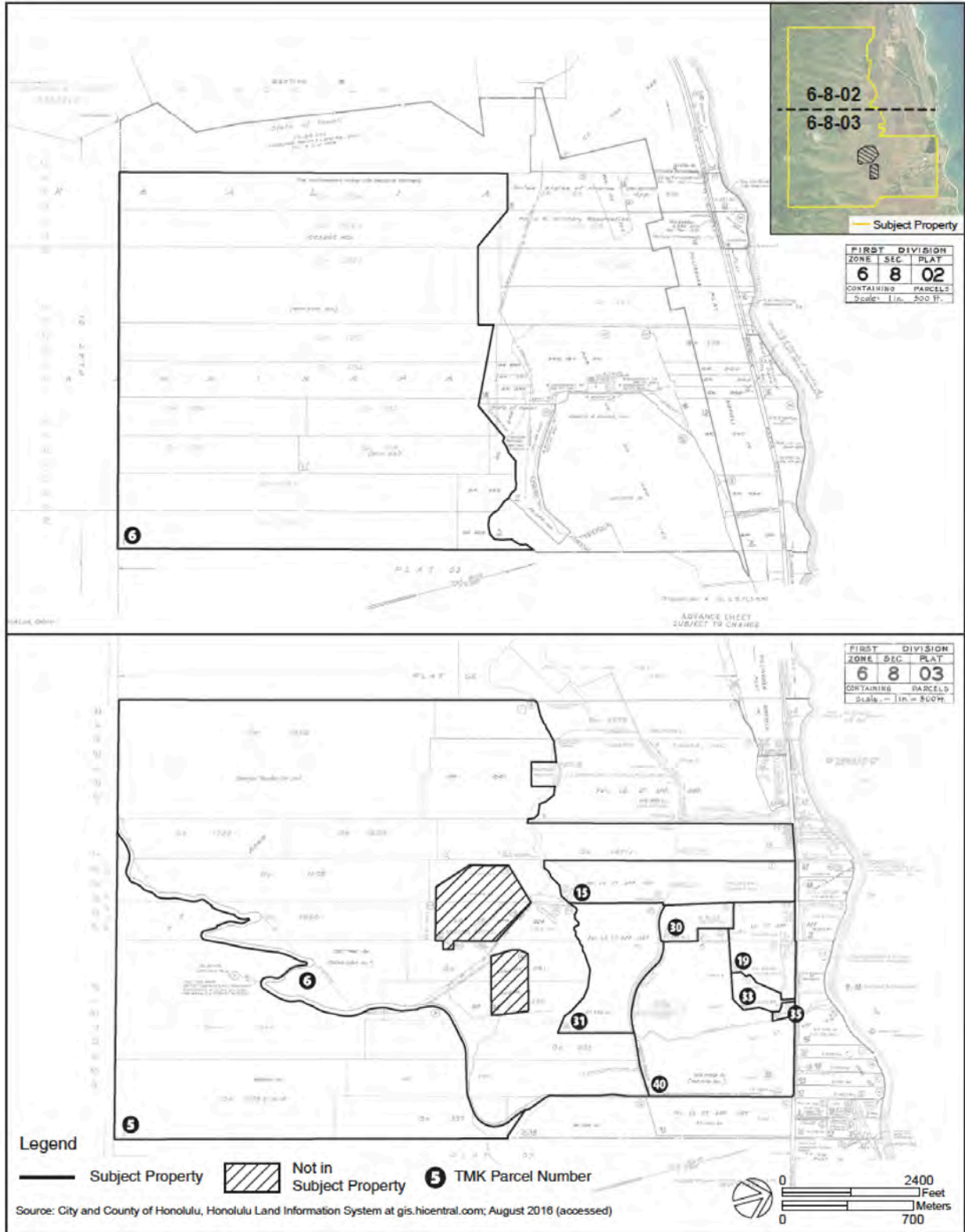


Figure 2. TMK Map

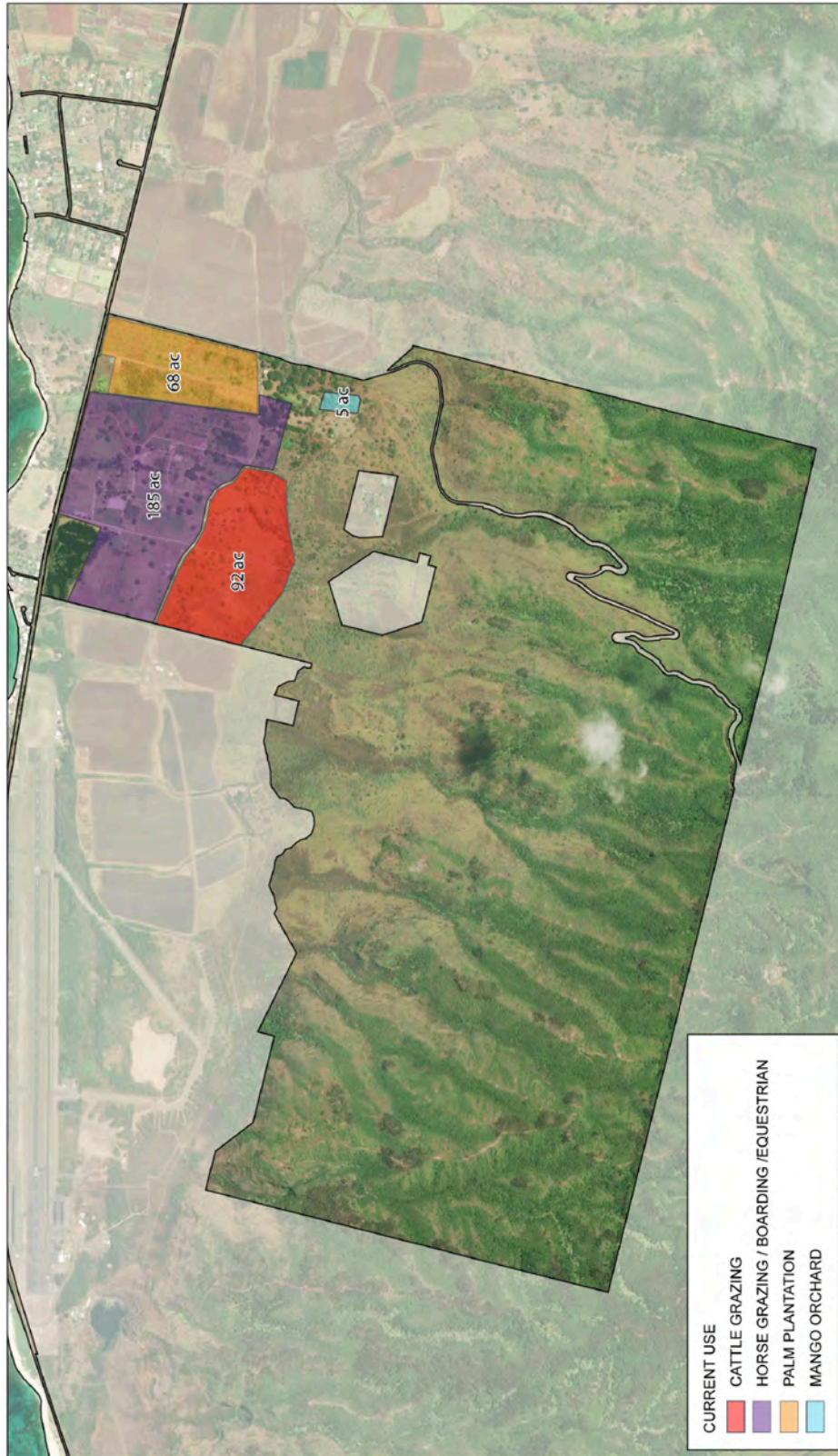


Figure 3. Current Land Use

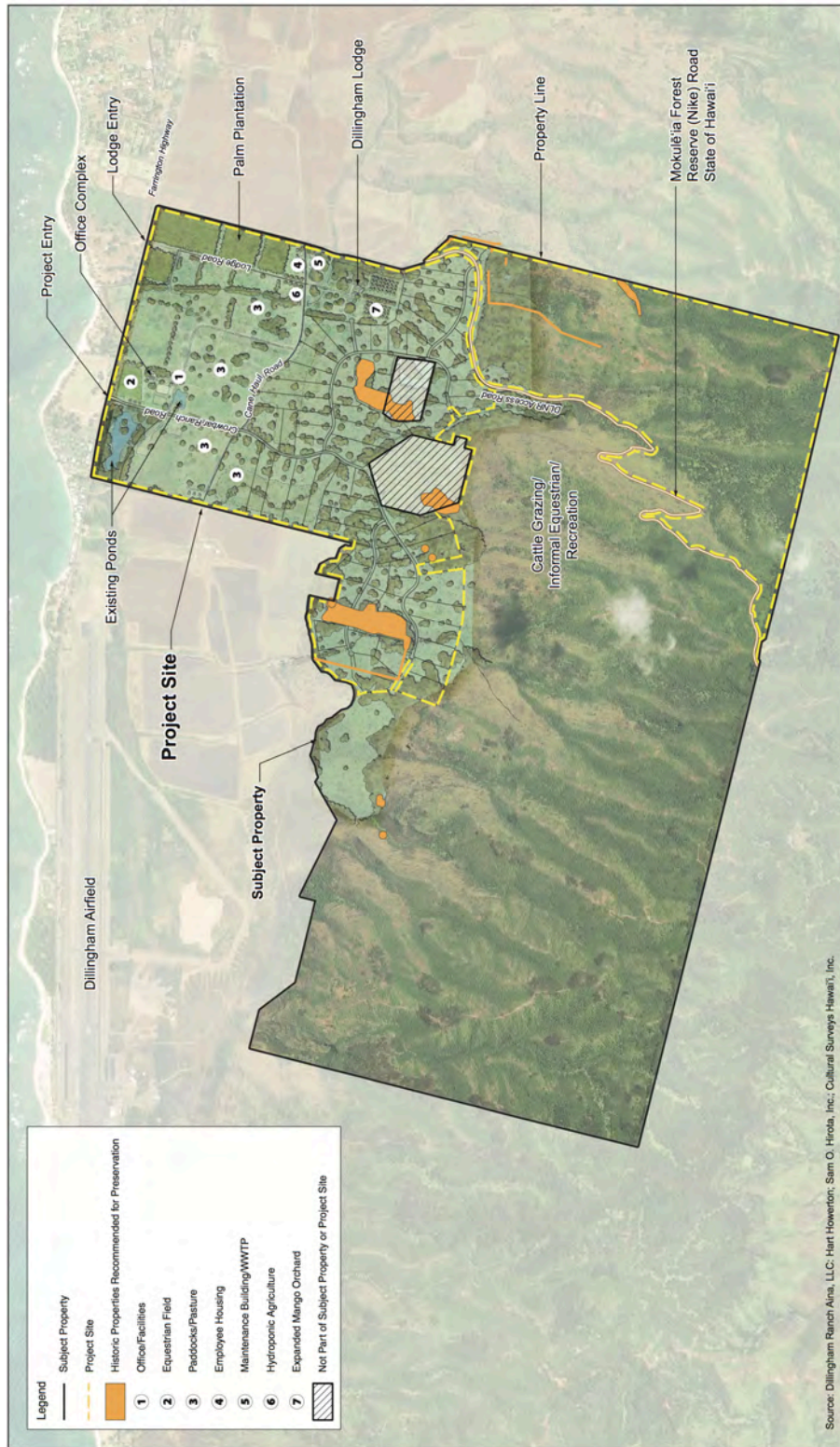


Figure 4. Planned Land Use

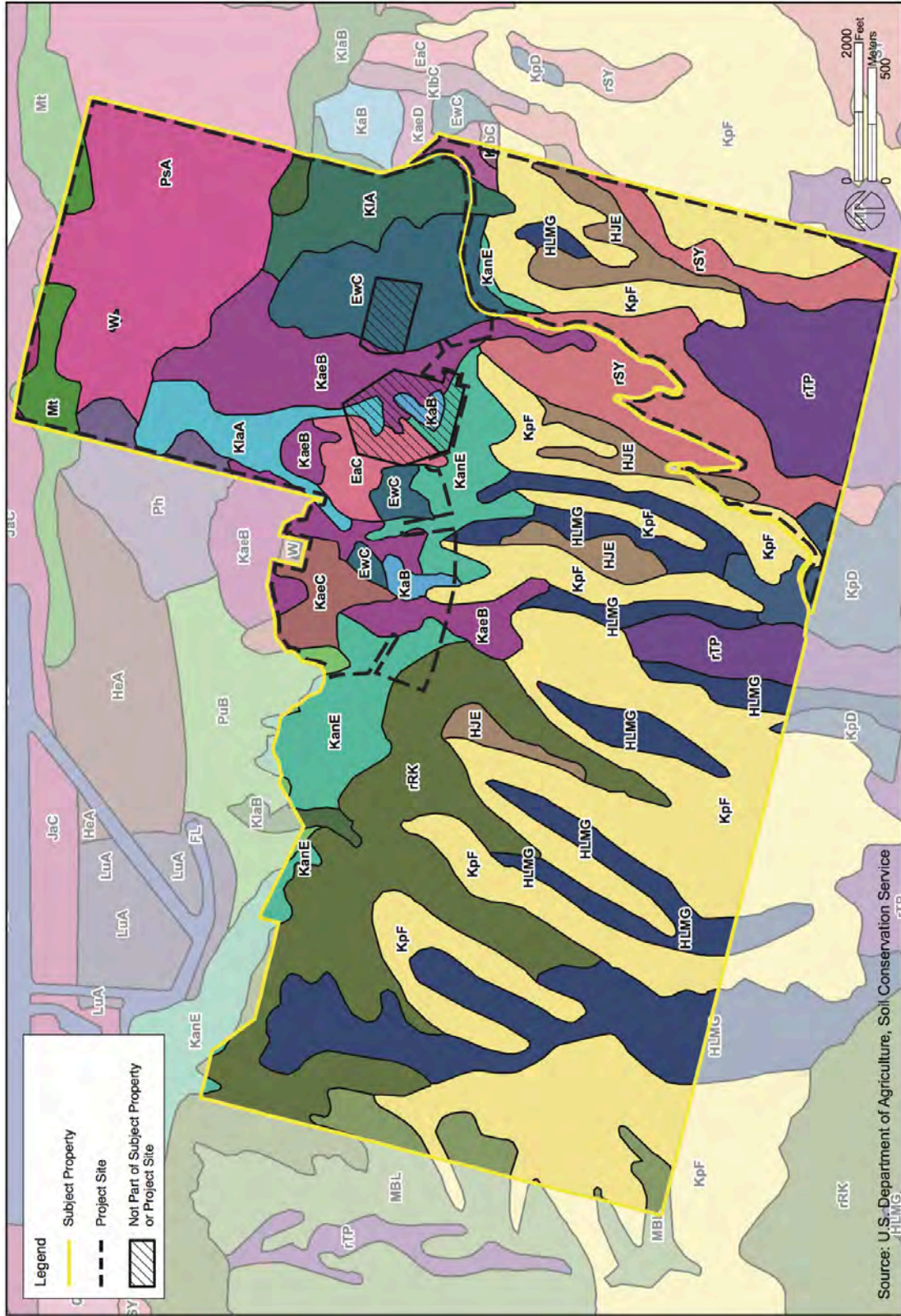


Figure 5. Soils Map

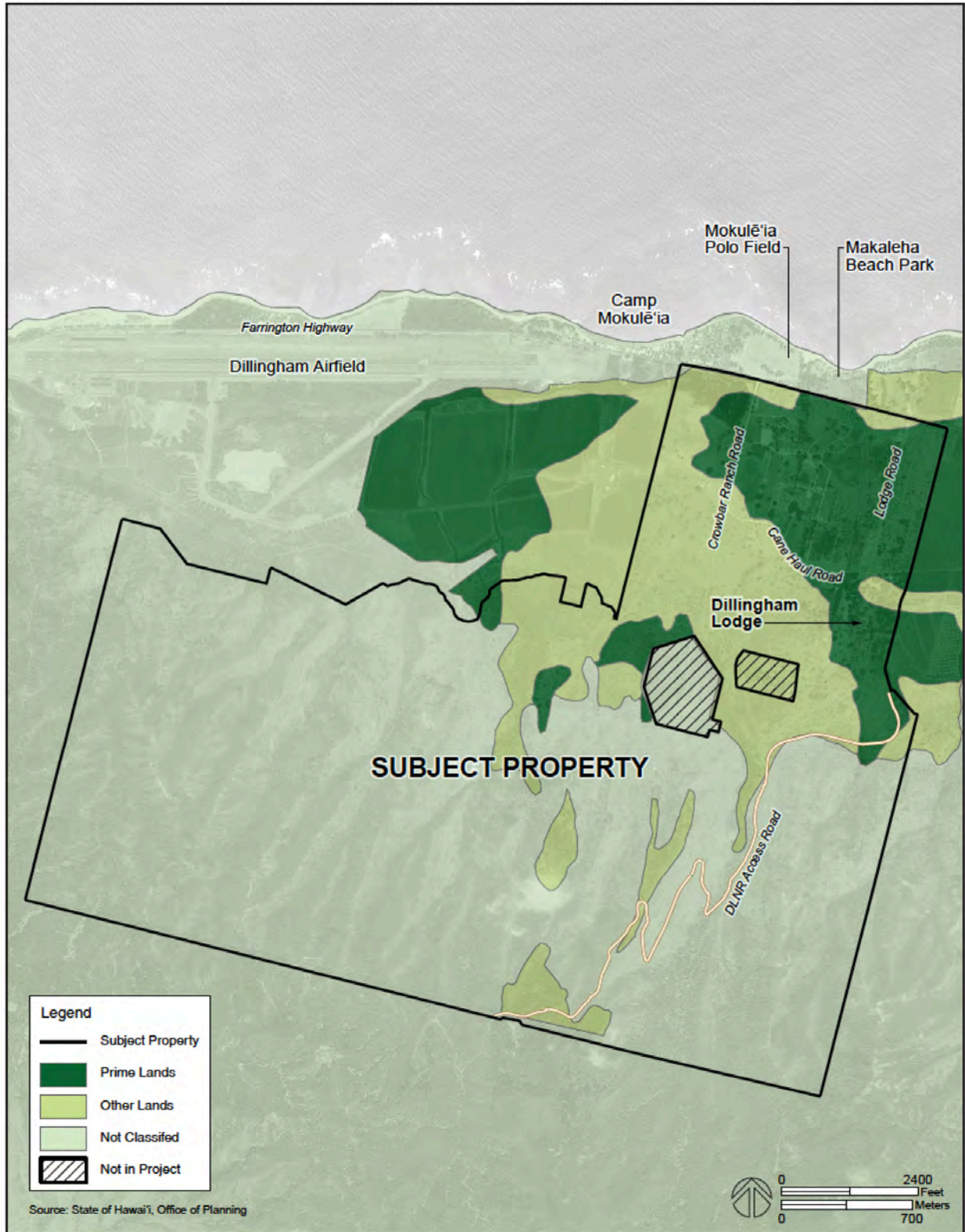


Figure 6. ALISH Map

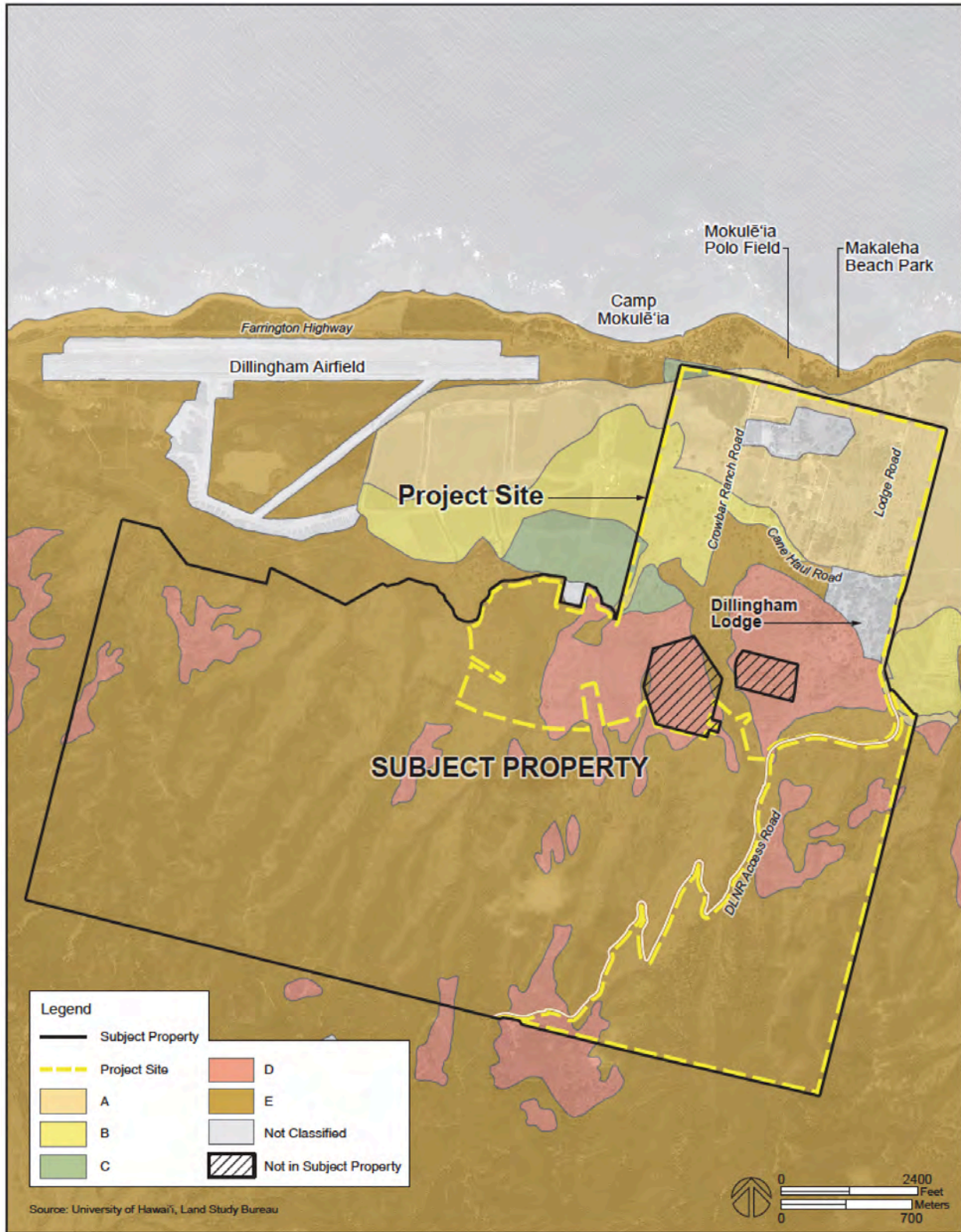


Figure 7. LSB Map

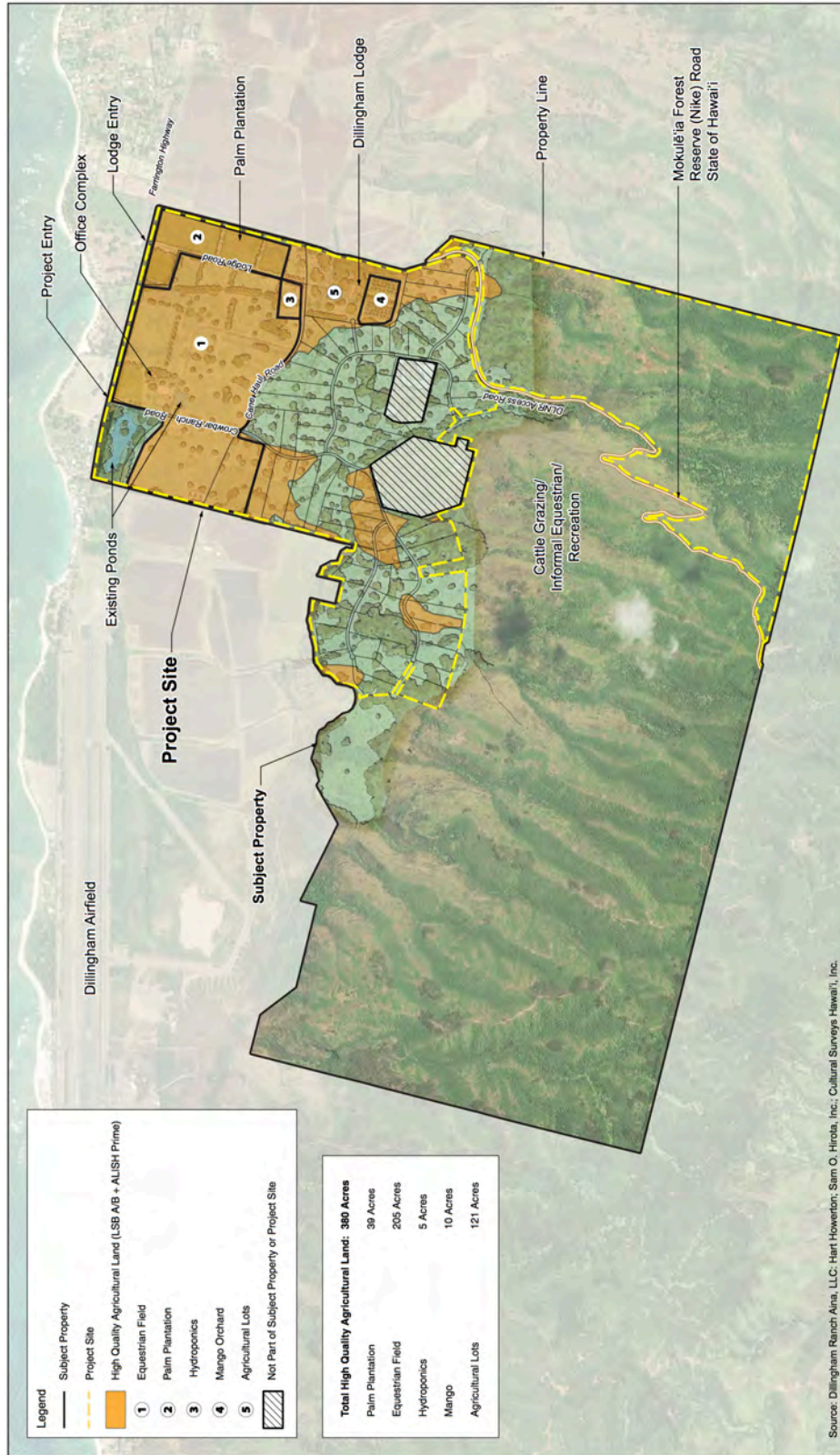


Figure 8. High-Quality Farmland Map

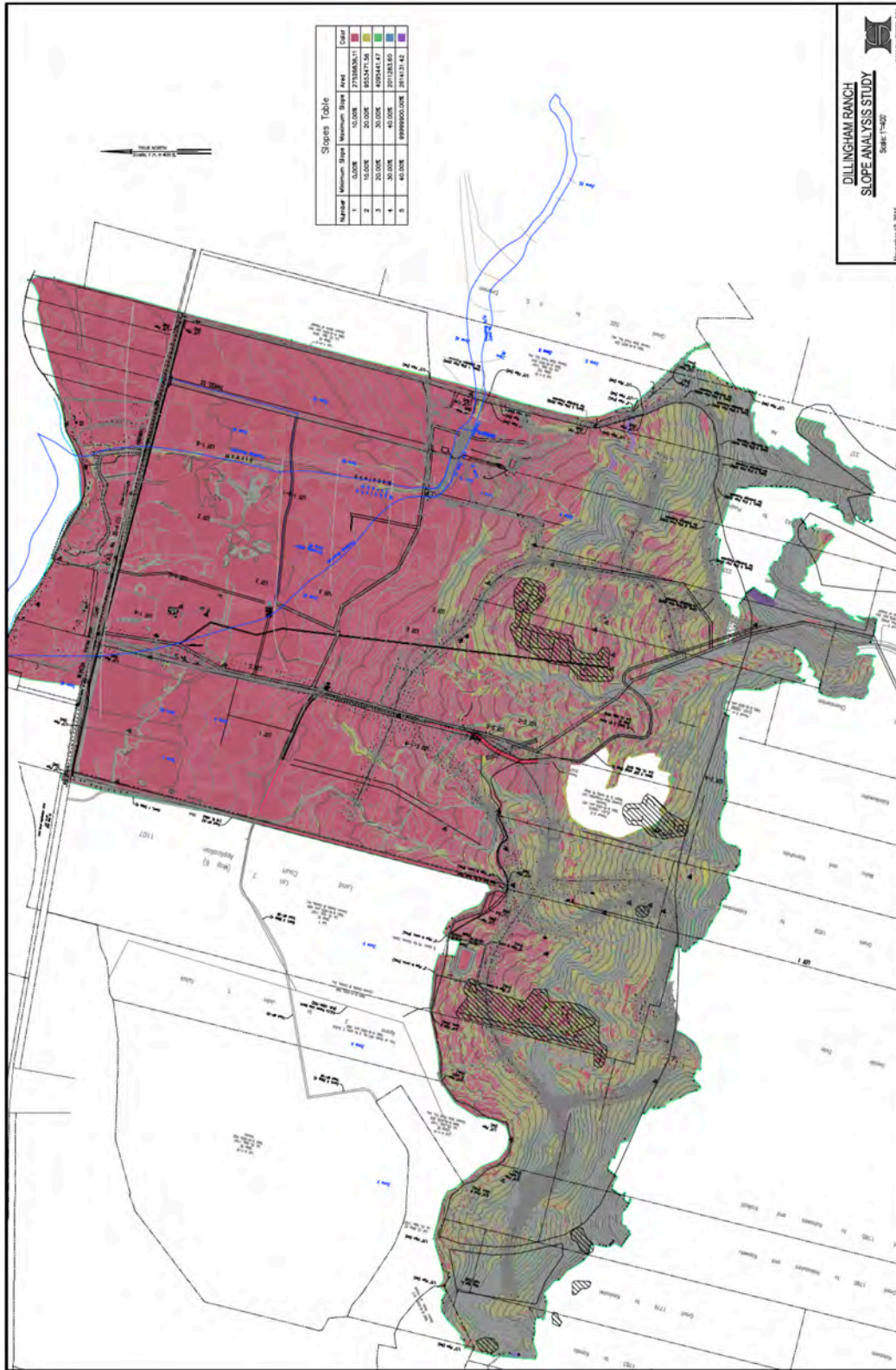


Figure 9. Slopes Map



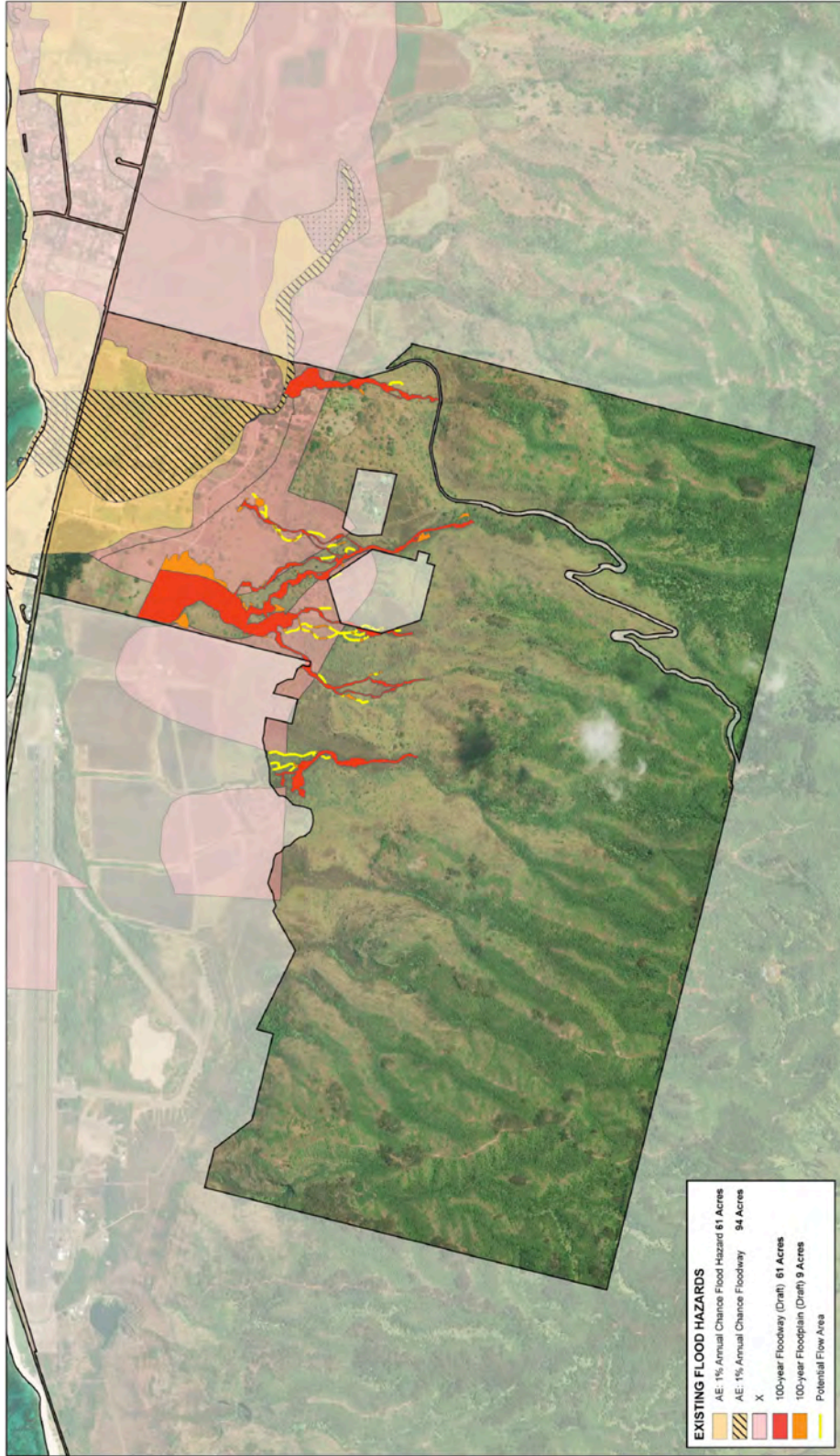


Figure 10. Flood Hazard Map

**Table 1. Current and Planned Land Uses**

Land Use	Current (acres)		Planned (acres)		Change (acres)	
<b>Ag /Ranch Home Lots</b>						
Orchards	-	0.0%	110	4.0%	110	n.e.
Farm Dwellings ( 70 homes of up to 5,000 sf)	-	0.0%	8	0.3%	8	n.e.
Barns, Sheds, etc. ( about 2,000 sf for each Ag lot)		0.0%	3	0.1%	3	n.e.
Open Space (yards and undeveloped land)	-	0.0%	658	24.2%	658	n.e.
<b>Total, Ag Lots</b>	-	0.0%	779	28.6%	779	n.e.
<b>Ag Use</b>						
<b>Cattle and Horses</b>						
Cattle Pastures (approximate	360	13.2%	300	11.0%	(60)	-16.7%
Irrigated		no		partial		
Equivalent if Irrigated	180		180		-	0.0%
Pastures & Facilities for Riding and Working Horses	185	6.8%	217	8.0%	32	17.3%
Irrigated		yes		yes		
<b>Total for Cattle and Horses</b>	545		517	19.0%	(28)	-5.1%
<b>Total Equivalent if Irrigated</b>	365		397	14.6%	32	8.8%
<b>Crops</b>						
Palm Plantation	68	2.5%	49	1.8%	(19)	-27.9%
Commercial		yes		yes		
Managed		no		yes		
Irrigated		no		yes		
Equivalent if Managed and Irrigated	34		49		15	44.1%
Mango Orchard	5	0.2%	10	0.4%	5	100.0%
Commercial		no		yes		
Managed		no		yes		
Irrigated		no		yes		
Equivalent if Managed and Irrigated	3		10		7	233.3%
Orchards, Ag Lots	-	0.0%	110	4.0%	110	n.e.
Irrigated				yes		
Hydroponic Farm (vegetables)	-		5	0.2%	5	n.e.
Equivalent to Typical Field Farming			55		55	
<b>Total for Crops</b>	73		174	6.4%	101	138.4%
<b>Total Irrigated Field-Farm Equivalent</b>	37		224		187	505.4%
<b>Barns and Sheds, Ag Lots</b>	-	0.0%	3	0.1%	3	n.e.
<b>Total Ag Use</b>	618	22.7%	694	25.5%	73	11.8%
<b>Total Equivalent if Irrigated</b>	402		621		219	54.5%

**Table 1. Current and Planned Land Uses**  
(continued)

Land Use	Current (acres)		Planned (acres)		Change (acres)	
<b>Developed, Non Ag</b>						
Lodge and Office	2	0.1%	2	0.1%	-	0.0%
Ranch Homes	-	0.0%	8	0.3%	8	n.e.
Employee Housing	6	0.2%	6	0.2%	-	0.0%
Baseyard for Equipment	1	0.0%	1	0.0%	-	0.0%
Roadways and Utilities	20	0.7%	26	1.0%	6	30.0%
<b>Total Developed</b>	<b>29</b>	<b>1.1%</b>	<b>43</b>	<b>1.6%</b>	<b>14</b>	<b>48.3%</b>
<b>Open Space, Non Ag</b>						
Yards and Undeveloped Portions of Ag Lots	-	0.0%	658	24.2%	658	n.e.
Yards of Lodge, Office, and Employee Homes	2	0.1%	2	0.1%	-	0.0%
Archaeological and Cultural Sites	19	0.7%	19	0.7%	-	0.0%
Ponds	21	0.8%	21	0.8%	-	0.0%
Mountains and Other Undeveloped Land	2,032	74.7%	1,284	47.2%	(748)	-36.8%
<b>Total Open Space, Non Ag</b>	<b>2,074</b>	<b>76.2%</b>	<b>1,984</b>	<b>72.9%</b>	<b>(90)</b>	<b>-4.3%</b>
<b>TOTAL</b>	<b>2,721</b>	<b>100.0%</b>	<b>2,721</b>	<b>100.0%</b>		

**Table 2. Water Use**

Land Use	Units	Gallons per Day			
		Average		Maximum	
		Per Unit	Total	Per Unit	Total
<b>Non-Potable Water</b>					
Ag Use					
Cattle and Horses					
Pastures, Cattle	90 acres	1,500	135,000	2,250	202,500
Cattle	160 head	15	2,400	23	3,680
Pastures, Riding and Working Horses	197 acres	1,500	295,500	2,250	443,250
Equestrian Facilities, Grounds	20 acres	3,500	70,000	5,250	105,000
Equestrian Facilities, Horses	175 horses	30	5,250	45	7,875
Crops				-	
Palm Plantation	49 acres	1,500	73,500	2,250	110,250
Mango Orchard	10 acres	1,500	15,000	2,250	22,500
Hydroponic Farm (vegetables)	5 acres	4,000	20,000	6,000	30,000
Total Ag Water Use (gallons/day)			<b>616,650</b>		<b>925,055</b>
Non-Ag Use			87,500		131,250
Total, Non-Potable Water Use			704,150		1,056,305
Less Reuse of Treated Waste Water			(38,000)		(57,000)
Total, Non-Potable Well Water			666,150		999,305
<b>Potable Water</b>					
Ag Use					
Orchards, Ag Lots	110 acres	1,750	<b>192,500</b>	2,625	<b>288,750</b>
Non-Ag Use					
Dillingham Ranch			112,800		169,200
Mokuleia Community			100,000		161,000
Total, Potable Water Use			405,300		618,950
<b>TOTAL WELL-WATER USE</b>			<b>1,071,450</b>		<b>1,618,255</b>
<b>Total Well-Water Use, Dillingham Ranch</b>			<b>971,450</b>		<b>1,457,255</b>
<b>Total Ag Use, Dillingham Ranch</b>			<b>809,150</b>		<b>1,213,805</b>
Percent of Total, Dillingham Ranch			83.3%		83.3%

Source: Tom Nance Water Resources Engineering. September 2017.



# *Traffic Impact Analysis Report*

(Austin, Tsutsumi & Associates, Inc.)

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# **DILLINGHAM RANCH AGRICULTURAL SUBDIVISION TRAFFIC IMPACT ANALYSIS REPORT**

Mokuleia, Oahu, Hawaii

February 9, 2017

Prepared for:

HHF Planners  
Pacific Guardian Center, Makai Tower  
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**DILLINGHAM RANCH  
AGRICULTURAL SUBDIVISION  
TRAFFIC IMPACT ANALYSIS REPORT**  
Mokuleia, Oahu, Hawaii

Prepared for  
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- C. LEVEL OF SERVICE CALCULATIONS



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# **TRAFFIC IMPACT ANALYSIS REPORT**

## **DILLINGHAM RANCH AGRICULTURAL SUBDIVISION**

### **Mokuleia, Oahu, Hawaii**

## **1. INTRODUCTION**

This report documents the findings of a traffic study conducted by Austin, Tsutsumi, and Associates, Inc. (ATA) to evaluate the traffic impacts resulting from the proposed agricultural subdivision of the Dillingham Ranch (hereinafter referred to as the “Project”).

### **1.1 Project Location**

The Project is located on the existing Dillingham Ranch in the Mokuleia area of northwest Oahu, less than a mile east of the Dillingham Airfield. It is bound by Farrington Highway to the north, agricultural land to the east and west, and Mokuleia Forest Reserve to the south. Vehicle access to the Project will continue to be provided via two (2) driveways along Farrington Highway. See Figure 1.1 for the Project location.

### **1.2 Project Description**

Dillingham Ranch is approximately 2,721 acres and currently provides a combination of several activities including equestrian boarding (paddocks, exercise areas, arenas, and jumping areas), a coconut tree farm, limited cattle grazing, and the Dillingham Ranch Lodge available for weddings and other special events. The equestrian facilities primarily serve recreational riders and polo participants.

The Project proposes to continue the existing operations on the Ranch. It will expand its current equestrian use of the Ranch and provide a Ranch office, four (4) employee dwellings, two (2) practice polo fields, paddocks for various horse breeds, exercise arenas, and barns. Currently, polo events are held on the Hawaii Polo Club (HPC) field located north of the Project site. The Project will also expand its agricultural use and reallocate several acres within the Dillingham Lodge for farm-to-table farmers, and create 70 agricultural lots ranging in size from 2 acres to 77 acres. In accordance with City & County zoning requirements, “each farm dwelling and any accessory users shall be contained within an area not to exceed 5,000 square feet of the lot.” As previously mentioned, the Project will continue to use the two (2) existing driveways along



Farrington Highway, hereinafter referred to as the “Project West Driveway” and “Project East Driveway”. The Project is expected to be completed and occupied by the Year 2025; therefore, the Year 2025 was used as the horizon for which future traffic conditions (With Project and Without the Project) are estimated. See Figure 1.2 for the Project Site Plan.

### 1.3 Study Methodology

This study will address the following:

- Assess existing traffic operating conditions within the study area, bounded by the study intersections shown on Figure 1.1, during the weekday AM and PM peak commute traffic period and during an equestrian/polo event on the weekend:
- Traffic Projections for Base Year 2025 (without the Project).
- Estimate the vehicular trips that will be generated by the Project.
- Traffic projections for the Project for Future Year 2025 (with project).
- Recommendations for roadway improvements or other mitigative measures, as appropriate, to reduce or eliminate any adverse impacts resulting from traffic generated by the Project.
- Recommendations for intersection improvements or other mitigative measures, as appropriate, to reduce or eliminate any impacts resulting from the Project including conceptual intersection options such as roundabouts.

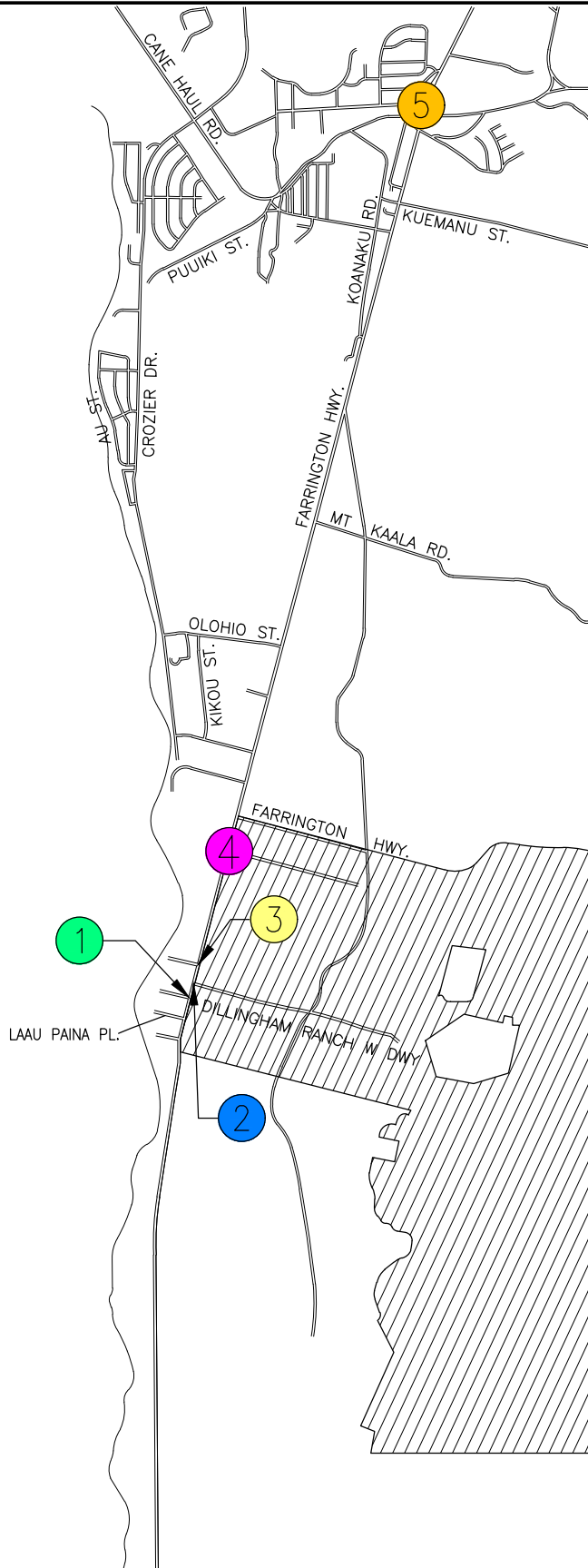
### 1.4 Analysis Methodology

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), dated 2010, includes methods for calculating volume to capacity ratios, delays, and corresponding Levels of Service that were utilized in this study. See Appendix B for Level of Service Criteria.

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 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.



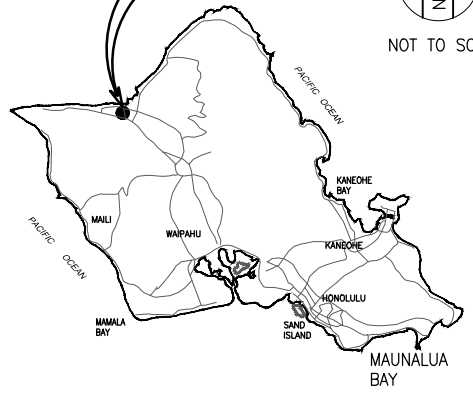
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PROJECT LOCATIONS



NOT TO SCALE



ISLAND OF OAHU

KEY FOR STUDY INTERSECTIONS

- ① POLO FIELD WEST DWY. & FARRINGTON HWY.
- ② PROJECT WEST DWY. & FARRINGTON HWY.
- ③ POLO FIELD EAST DWY. & FARRINGTON HWY.
- ④ PROJECT EAST DWY. & FARRINGTON HWY.
- ⑤ GOODALE AVE. & FARRINGTON HWY.

PROJECT SITE

DILLINGHAM RANCH  
AGRICULTURAL  
SUBDIVISION

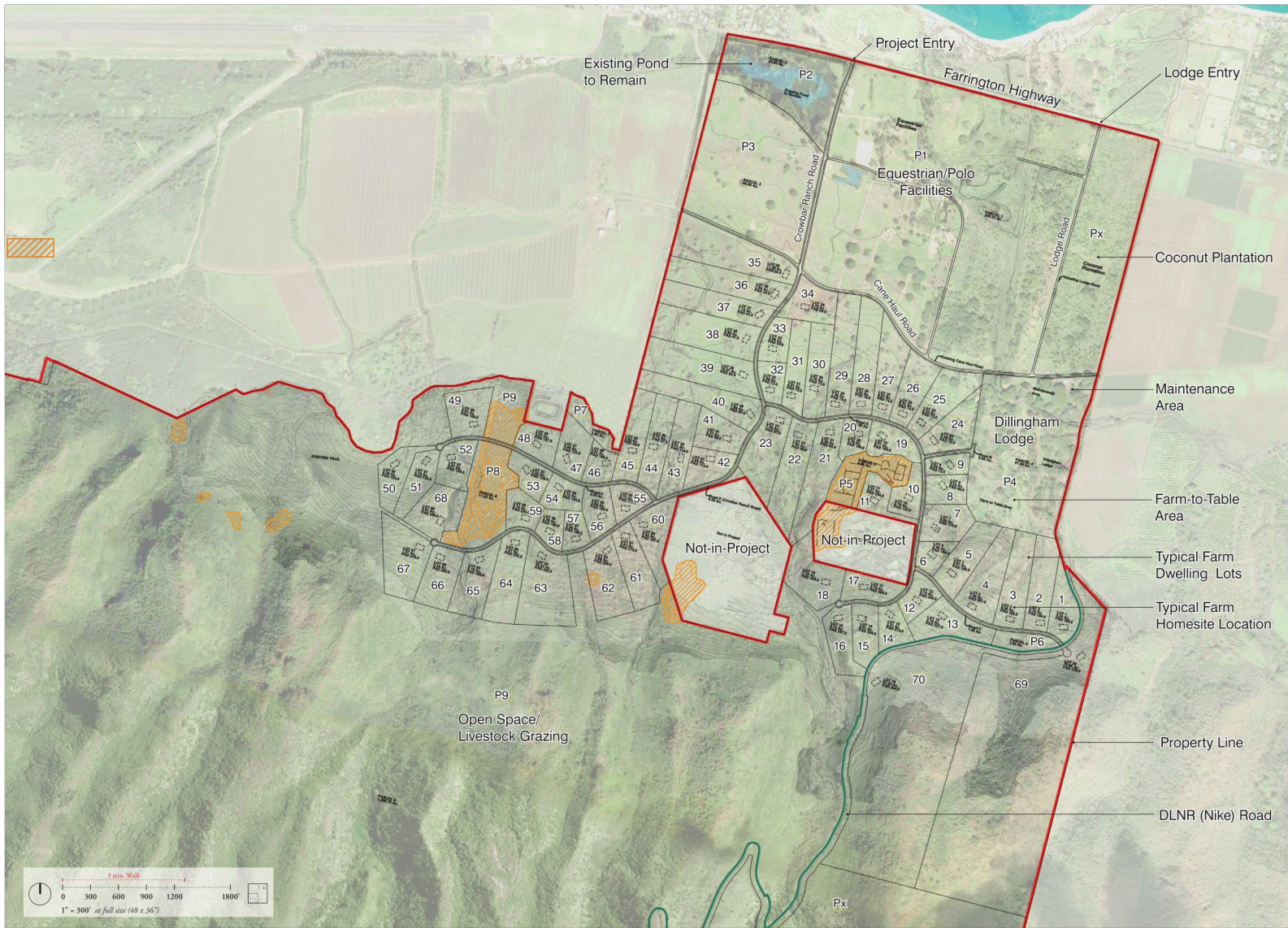


AUSTIN, TSUTSUMI & ASSOCIATES, INC.  
ENGINEERS, SURVEYORS HONOLULU, HAWAII

FIGURE

LOCATION MAP AND STUDY INTERSECTIONS

1.1



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Parcel Layout (based on SOH Plan 11.17.2016)  
 November 2016

DILLINGHAM RANCH  
 AGRICULTURAL  
 SUBDIVISION

**ATA** AUSTIN, TSUTSUMI & ASSOCIATES, INC.  
 ENGINEERS, SURVEYORS • HONOLULU, HAWAII

**PROJECT SITE PLAN**

FIGURE

**1.2**



## 2. EXISTING TRAFFIC CONDITIONS

### 2.1 Roadway System

The following are brief descriptions of the existing roadways studied within the vicinity of the Project:

Farrington Highway is an east-west, two-way, two-lane road in the vicinity of the Project and provides access to Waialua and Mokuleia. This State roadway begins to the east at its intersection with Kaukonahua Road and terminates at Kaena Point approximately 4.5 miles west of the Project. The posted speed limit along this roadway in the vicinity of the Project is 35 miles per hour (mph).

Goodale Avenue is a north-south, two-way, two-lane roadway that provides a link between Farrington Highway and Waialua Beach Road. The posted speed limit along this City & County roadway is 25 mph.

Polo Field East Driveway is a north-south, two-way, two-lane unpaved main access to the HPC field. The ticket booth and driveway gate are located approximately 60 feet north from Farrington Highway. This driveway is located approximately 300 feet east of the Project West Driveway.

Polo Field West Driveway is a north-south, two-way, two-lane unpaved driveway located west of the main polo field driveway. It is currently used as a second exit during a polo or special event only. This driveway is approximately 400 feet west of the Project West Driveway.

Project East Driveway (Lodge Road) is a north-south, two-way, two-lane unpaved and gated driveway that currently provides access to the Dillingham Lodge and Ranch. It is approximately a half mile east of the Polo Field East Driveway.

Project West Driveway (Crowber Ranch Road) is a north-south, two-way, two-lane unpaved driveway that serves as the main access to the Dillingham Ranch.

### 2.2 Sustainable Transportation

#### 2.2.1 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...”*



## 2.2.2 Public Transit

Oahu Transit Services (OTS) operates TheBus, which currently operates a fleet of 519 buses servicing the most populated areas of the island. TheBus is the primary form of public transit in Oahu. The cost of service is \$2.50 for each one-way ride (with one (1) free transfer), \$60 for a monthly pass, and \$660 for an annual pass<sup>1</sup>.

Mokuleia is one of the few areas that have no direct access to TheBus. The nearest bus stops are approximately 3 miles to the west in Waiialua town and are serviced by Route 76.

## 2.2.3 Pedestrian and Bicycle Accessibility

The Project is located within Mokuleia, the north-west end of the island of Oahu. Mokuleia consists primarily of agricultural and conservation lands. It is one of the few areas on Oahu that public transit does not service and is generally accessed by personal vehicle.

Within the Project vicinity, there were very light pedestrian and bike activities that were observed along Farrington Highway. The segment of Farrington Highway fronting the Project site does not provide sidewalks or bicycle lanes. However, pedestrians are able to use grassy roadside areas to walk along Farrington Highway.

A proposed bike route along Goodale Avenue between Farrington Highway and Waiialua Beach Road and along Farrington Highway from Waiialua to Kaena Beach were listed as projects in the Oahu Bike Plan, A Bicycle Master Plan, dated August 2012. The projects were categorized as a priority one and two respectively.

## 2.3 Existing Traffic Volumes

Manual turning movement traffic counts and field observations were conducted at the following intersections:

- Polo Field West Driveway/Farrington Highway (Unsignalized)
- Project West Driveway/Farrington Highway (Unsignalized)
- Polo Field East Driveway/Farrington Highway (Unsignalized)
- Project East Driveway/Farrington Highway (Unsignalized)
- Goodale Avenue/Farrington Highway (Unsignalized)

Currently, the polo events are held at the HPC field. Polo season starts in April and ends on Labor Day weekend in September. These events are held on a weekend, generally on a Sunday between 11:00 AM and 7:00 PM. The existing traffic volumes data utilized in this report were collected on Sunday, September 4, 2016 during a polo event and Thursday, September 8, 2016 during the AM and PM peak commute traffic period.

Based on the traffic count data, the Sunday mid-day (WE) peak hour of traffic was determined to be from 1:15 PM to 2:15 PM. The weekday AM and PM peak hours of traffic were determined to occur from 8:00 AM to 9:00 AM and 3:00 PM to 4:00 PM, respectively.

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<sup>1</sup> Based on 2016 TheBus information.





24-hour machine tube counts were also collected on Tuesday, August 31 to Thursday, September 8 at the following locations:

- Farrington Highway between Laau Paina Place and Polo Field West Driveway
- Farrington Highway between Project West Driveway and Polo Field East Driveway
- Farrington Highway between Polo Field East Driveway and Project East Driveway

The traffic count data is provided in Appendix A.

## **2.4 Existing Observations and Analysis**

### **2.4.1 Regional Analysis**

The Project is located in the Mokuleia area at the west end of the Waialua District. It is one of the few areas on Oahu that public transit does not service. Mokuleia is accessed via Farrington Highway, the regional west-east corridor. The area is generally characterized by agricultural, conservation, and small pockets of residential land uses.

Dillingham Airfield is located approximately 1 mile west of the Dillingham Ranch. The State operates the single 5,000-foot runway primarily for commercial glider and sky diving operations. Another mile to the west is the YMCA Camp Erdman which provides camping opportunities during the summer. Farrington Highway then terminates as a dead-end at the Kaena State Park approximately 5 miles from the Dillingham Ranch.

### **2.4.2 Intersection Observations and Analysis**

#### Polo Game and Wedding observations – Sunday, September 4<sup>th</sup>, 2016

The polo event was held at the HPC field, located north of Farrington Highway and Dillingham Ranch. This event was the last polo match of the season followed by an after party. The season starts in April and ends in September with games held on Sundays. For all games, gates open at 11:00 AM with the first game starting at 1:30 PM, the featured game at 3:30 PM and after party at 5:00 pm; event ends when the sun goes down. The season finale was attended by approximately 400 attendees, a typical attendance for a normal polo match.

Primary vehicular ingress and egress to the HPC field is provided via the Polo Field East Driveway. A ticket attendant collecting entry fees or checking off members was stationed at the driveway gate as the vehicles entered the parking lot. Approximately three (3) to four (4) vehicles are able to stack up before backing up onto the highway. A secondary egress is provided via the Polo Field West Driveway.

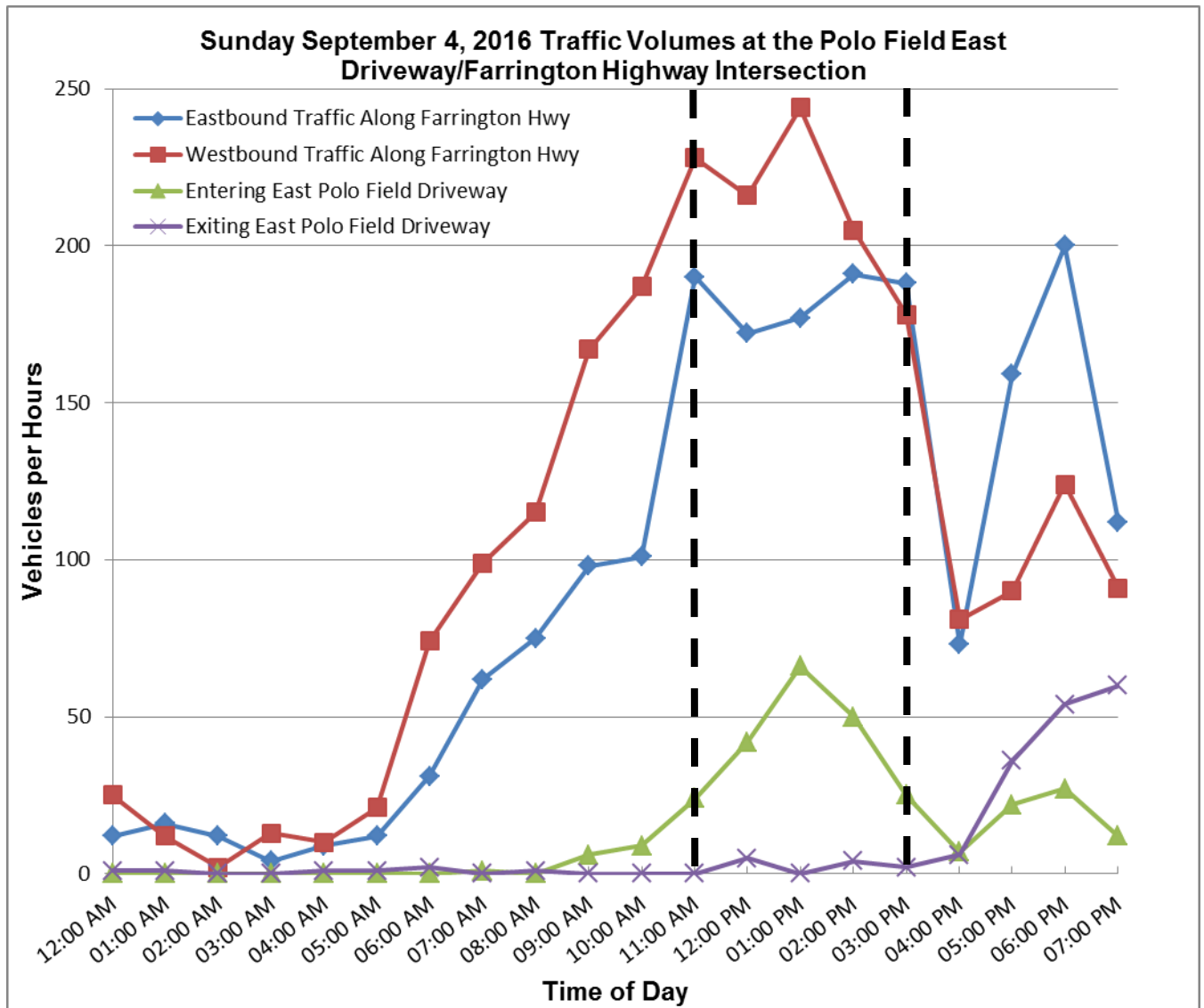
Banners and signs were posted to indicate the access location; the gate opened at 11:00 AM for tailgating and the polo matches started at 1:00 PM. The peak hour for the Polo Field East Driveway was determined to be from 1:15 PM to 2:15 PM with approximately 97 vehicles entering the polo event. During the peak hour, the driveway gate was observed to briefly queue about six (6) vehicles. This queue extended onto Farrington Highway in the eastbound direction as vehicles wanting to make a left-turn into the driveway were not immediately able to. However, the left-turn volume was low and these queues were only observed to occur briefly on two (2) occasions during the peak hour.



The polo match ended around 5:00 PM followed by an after party which ended at 7:00 PM. Vehicles exited via the Polo Field East and West Driveways. Vehicles were observed to exit the polo field throughout the later part of the day; therefore, no specific exit peak occurred. Figure 2.1 illustrates Sunday September 4, 2016 traffic patterns in the vicinity of the Polo Field East driveway and shows that the entering peak period generally occurred during the peak along Farrington Highway.

In addition to the Sunday polo event, a 100-guest wedding was held at the Dillingham Lodge within the Project site. The wedding ceremony started at 5:30 PM and was followed by the reception. A sign for the wedding was posted at the Project East Driveway, which is the access wedding guests and vendors are recommended to use. It was, however, also accessible via the Project West Driveway, the main entrance to the Dillingham Ranch. The hour preceding the ceremony until the end of the data collection at 7:00 PM did not indicate any surge in traffic. In fact, based on the manual counts, between 4:30 and 7:00 PM a total of 17 vehicles were counted entering the Project East Driveway and 23 entering the Project West Driveway.

Figure 2.1 – Sunday September 4, 2016 Traffic Volumes at the Polo Field East Driveway/Farrington Highway Intersection



Commuter AM and PM peak hours – Thursday September 8, 2016

Overall, traffic was observed to operate smoothly during both AM and PM peak hours of traffic with traffic volumes not exceeding 200 vehicles per hour in either direction within the project vicinity.

Figure 2.2 illustrates the existing lane configuration, existing traffic volumes, and LOS for each study intersection. Table 2.1 summarizes the existing LOS at the study intersections. LOS worksheets are provided in Appendix C.



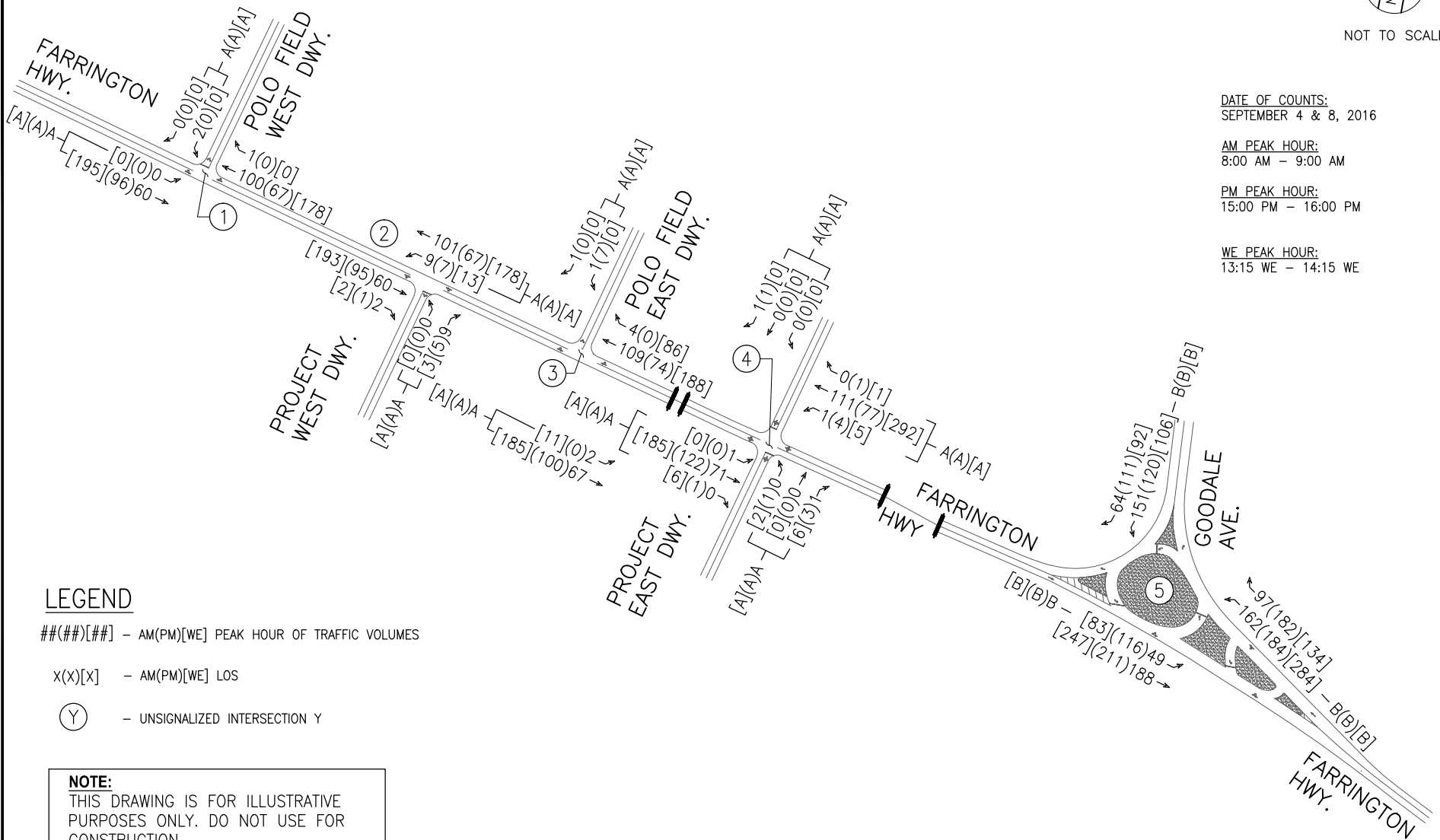
NOT TO SCALE

DATE OF COUNTS:  
SEPTEMBER 4 & 8, 2016

AM PEAK HOUR:  
8:00 AM - 9:00 AM

PM PEAK HOUR:  
15:00 PM - 16:00 PM

WE PEAK HOUR:  
13:15 WE - 14:15 WE



### LEGEND

##(##)[##] - AM(PM)[WE] PEAK HOUR OF TRAFFIC VOLUMES

X(X)[X] - AM(PM)[WE] LOS

Y - UNSIGNALIZED INTERSECTION Y

#### NOTE:

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FIGURE

EXISTING LANE CONFIGURATION, TRAFFIC VOLUMES AND LOS

2.2

Table 2.1: Existing Level of Service Summary

	Existing Conditions								
	AM			PM			WE		
	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS
<b>1: Farrington Hwy &amp; Polo Field West Dwy</b>									
EB LT/TH	0.0	0.0	A	0.0	0.0	A	0.0	0.0	A
SB LT/RT	9.4	0.00	A	0.0	0.00	A	0.0	0.0	A
<b>2: Project West Dwy &amp; Farrington Hwy</b>									
NB LT/RT	8.6	0.0	A	8.8	0.0	A	8.8	0.0	A
WB LT/TH	7.4	0.0	A	7.4	0.0	A	7.4	0.0	A
<b>3: Farrington Hwy &amp; Polo Field East Dwy</b>									
EB LT/TH	7	0.00	A	0	0.00	A	0.0	0.0	A
SB LT/RT	9.2	0.00	A	9.0	0.01	A	9.3	0.01	A
<b>4: Project East Dwy &amp; Farrington Hwy</b>									
NB LT/TH/RT	8.7	0.00	A	9.2	0.01	A	9.2	0.01	A
EB LT/TH/RT	7.5	0.0	A	0.0	0.0	A	0.0	0.0	A
WB LT/TH/RT	7.4	0.0	A	7.5	0.0	A	7.5	0.0	A
SB LT/TH/RT	8.9	0.0	A	0.0	0.0	A	8.7	0.0	A
<b>5: Goodale Ave &amp; Farrington Hwy</b>									
NB LT	10.5	0.1	B	12.5	0.2	B	12.6	0.2	B
WB LT	11.2	0.2	B	11.7	0.3	B	12.7	0.4	B
SB LT	11.8	0.2	B	12.7	0.2	B	11.2	0.2	B

\*Source: ATA 2016



### **3. BASE YEAR 2025 TRAFFIC CONDITIONS**

The year 2025 was selected to reflect the Project completion year. The Base Year 2025 scenario represents the traffic conditions within the study area without the addition of the Project. Traffic projections were formulated by applying a defacto growth rate to the existing 2016 traffic count volumes as well as trips generated by known future developments in the vicinity of the Project.

#### **3.1 Defacto Growth Rate**

Projections for Base Year 2025 traffic were based upon traffic counts performed by the State of Hawaii Department of Transportation and known nearby developments in the immediate vicinity of the Project. The resulting annual growth rate along Farrington Highway was determined to be approximately 2.5 percent per year. This annual growth rate was applied on all major movements to represent regional traffic growth in the vicinity of the Project through year 2025.

#### **3.2 Traffic Forecasts for Known Developments**

The project area does not have any proposed new development that would generate additional trips in the immediate Project vicinity. Farrington Highway in the vicinity of the Project is a dead end approximately 4.5 miles west of the Project; therefore, the majority of vehicles headed in that direction are beach goers, residents, those headed to the Dillingham Airfield and the YMCA Camp Erdman users.

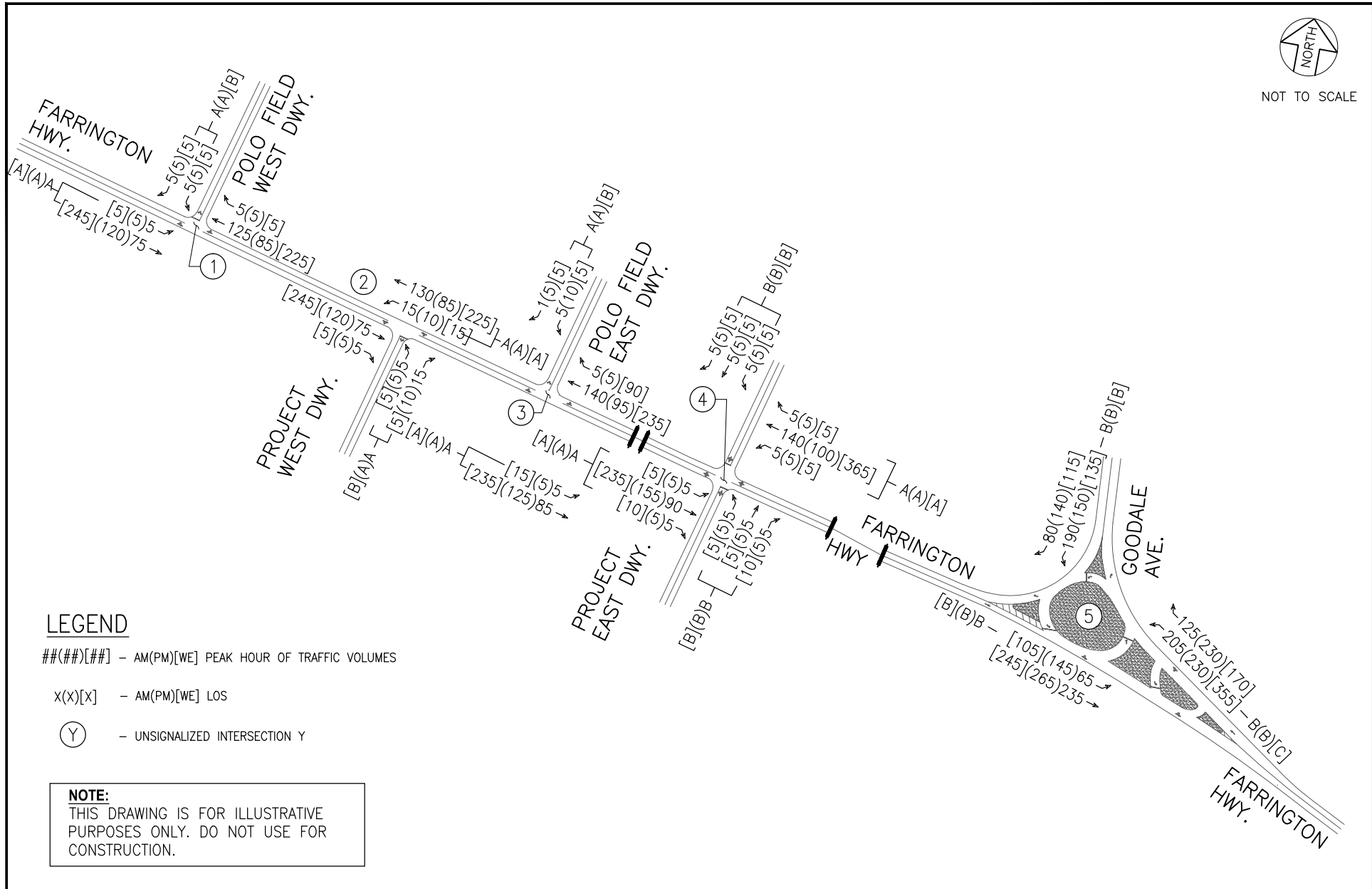
#### **3.3 Base Year 2025 Analysis**

By the year 2025 without the Project, all movements at the study intersections are forecast to operate at LOS C or better during the AM, PM, and WE peak hours of traffic.

Figure 3.1 illustrates the Base Year 2025 forecast traffic volumes and LOS for the study intersection movements. Table 3.1 summarizes the Base Year 2025 LOS at the study intersections compared to existing conditions. LOS worksheets are provided in Appendix C.



NOT TO SCALE



**LEGEND**

##(##)[##] - AM(PM)[WE] PEAK HOUR OF TRAFFIC VOLUMES

X(X)[X] - AM(PM)[WE] LOS

Y - UNSIGNALIZED INTERSECTION Y

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FIGURE

BASE YEAR LANE CONFIGURATION, TRAFFIC VOLUMES AND LOS

3.1

Table 3.1: Existing and Base Year 2025 Level of Service Summary

Intersection	Existing Conditions									Base Year 2025 Conditions								
	AM			PM			WE			AM			PM			WE		
	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS
<b>1: Farrington Hwy &amp; Polo Field West Dwy</b>																		
EB LT/TH	0.0	0.0	A	0.0	0.0	A	0.0	0.0	A	7.5	0.0	A	7.4	0.0	A	7.7	0.0	A
SB LT/RT	9.4	0.00	A	0.0	0.00	A	0.0	0.0	A	9.4	0.01	A	9.3	0.01	A	10.9	0.0	B
<b>2: Project West Dwy &amp; Farrington Hwy</b>																		
NB LT/RT	8.6	0.0	A	8.8	0.0	A	8.8	0.0	A	9.1	0.0	A	9.3	0.0	A	11.1	0.0	B
WB LT/TH	7.4	0.0	A	7.4	0.0	A	7.4	0.0	A	7.4	0.0	A	7.5	0.0	A	7.8	0.0	A
<b>3: Farrington Hwy &amp; Polo Field East Dwy</b>																		
EB LT/TH	7	0.00	A	0	0.00	A	0.0	0.0	A	8	0.00	A	7	0.00	A	8.0	0.0	A
SB LT/RT	9.2	0.00	A	9.0	0.01	A	9.3	0.01	A	9.6	0.01	A	9.6	0.02	A	11.5	0.02	B
<b>4: Project East Dwy &amp; Farrington Hwy</b>																		
NB LT/TH/RT	8.7	0.00	A	9.2	0.01	A	9.2	0.01	A	10.1	0.02	B	10.4	0.02	B	12.6	0.03	B
EB LT/TH/RT	7.5	0.0	A	0.0	0.0	A	0.0	0.0	A	7.5	0.0	A	7.5	0.0	A	8.1	0.0	A
WB LT/TH/RT	7.4	0.0	A	7.5	0.0	A	7.5	0.0	A	7.4	0.0	A	7.6	0.0	A	7.8	0.0	A
SB LT/TH/RT	8.9	0.0	A	0.0	0.0	A	8.7	0.0	A	10.2	0.0	B	10.3	0.0	B	13.5	0.0	B
<b>5: Goodale Ave &amp; Farrington Hwy</b>																		
NB LT	10.5	0.1	B	12.5	0.2	B	12.6	0.2	B	11.3	0.1	B	14.6	0.3	B	14.2	0.2	B
WB LT	11.2	0.2	B	11.7	0.3	B	12.7	0.4	B	12.6	0.3	B	13.4	0.4	B	15.7	0.5	C
SB LT	11.8	0.2	B	12.7	0.2	B	11.2	0.2	B	12.8	0.3	B	13.8	0.3	B	12.6	0.2	B

\*Source: ATA 2016





## 4. FUTURE YEAR 2025 TRAFFIC CONDITIONS

The Future Year 2025 scenario represents the traffic conditions within the Project study area with the full build-out of the Project.

### 4.1 Background

The proposed Project consists of the expansion of the equestrian use of the Ranch, a Ranch office, four (4) employee dwellings, two (2) practice polo fields, paddocks for the different types of horses, exercise trials and barns. The new equestrian activities and facilities will continue to primarily serve recreational riders and polo participants. The traffic count collected on Sunday, September 4 will be used to generate traffic during a typical polo event. During the event, the total entering and exiting vehicles were 352/227<sup>2</sup> between 11:00 AM and 7:00 PM and 97/3 during the peak entering hour of 1:15 PM to 2:15 PM.

The Project will also expand its agricultural use to reallocate several acres within the Dillingham Lodge for farm-to-table farmers and creating 70 agricultural lots ranging in size from 2 acres to 77 acres. These agricultural lots will have a developable footprint no larger than 5,000 square feet for a farm dwelling and accessory uses.

### 4.2 Travel Demand Estimations

#### 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 Manual, 9th 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 rooms to Gross Floor Area (GFA) for commercial or office development.

To estimate the trips generated by the 70 agricultural lots, the ITE code 210 “Single-Family Detached Housing” was used. To determine the typical polo game trip generation, field data collected during the September 4, 2016 polo game was used. Table 4.1 below shows the total trips generated by the September 4 polo game and its trips generated during the peak hour. Table 4.2 show the trip generation rates used and Table 4.3 shows the projected trip generation.

---

<sup>2</sup> Manual turning movement counts was collected between 11:00 AM to 2:30 PM and 4:30 PM to 7:15 PM. 24-hour tube data was used to estimate the number of vehicles entering the HPC field between 2:30 PM to 4:30 PM.



Table 4.1 – Existing Polo Game Trip Generation

Land Use	Independent Variable	Polo Match Total Trip Generation (see footnote 2)			Sunday Peak Hour (1:15-2:15 PM)		
		Enter (vph)	Exit (vph)	Total (vph)	Enter (vph)	Exit (vph)	Total (vph)
Polo Match @ HPC Field	400 Attendees	352	227	579	97	3	100

Note: Trips generation derived from the data collected on Sunday September 4<sup>th</sup>, 2016 end of season game between the hours of 11:00 AM and 7:15 PM.

Table 4.2- Trip Generation Rates

Land Use (ITE Code)	Independent Variable	Weekday AM Peak Hour		Weekday PM Peak Hour		Sunday Peak Hour	
		Trip Rate	% Enter	Trip Rate	% Enter	Trip Rate	% Enter
Single-Family Detached Housing (210)	DU	[a]	25%	[b]	63%	[c]	53%

[a]  $T = 0.7*(X)+9.74$

[b]  $T = EXP(0.9*LN(X)+0.51)$

[c]  $T = 8.63(X)-0.63$

T = trips generated by units

X = number of units

DU = dwelling units

Table 4.3 – Project Trip Generation

Land Use (ITE Code)	Independent Variable	Weekday AM Peak Hour			Weekday PM Peak Hour			Sunday Peak Hour		
		Enter (vph)	Exit (vph)	Total (vph)	Enter (vph)	Exit (vph)	Total (vph)	Enter (vph)	Exit (vph)	Total (vph)
Single-Family Detached Housing (210)	70 DU	15	44	59	48	28	76	35	31	66
Polo Match	400 Attendees	N/A	N/A	N/A	N/A	N/A	N/A	97	3	100



The trips generated by the expansion of the equestrian use of the Ranch, four (4) employee dwellings, two (2) practice polo fields, and facilities to accommodate different types of horses would be minimal. To account for this small growth in traffic, the ambient growth was applied to the entering/exiting movements at the driveways yielding an increase in traffic of 4(5)[7] trips during the AM, PM and WE peak hours of traffic respectively.

#### **4.2.2 Trip Distribution & Assignment**

Trips generated by the Project were assigned throughout the study area based upon existing travel patterns and future Project accesses. The traffic generated by the Project was added to the forecast Base Year 2025 traffic volumes within the vicinity of the Project to constitute the traffic volumes for the Future Year 2025 traffic conditions. Figure 4.1 illustrates the Project-generated trip distribution.

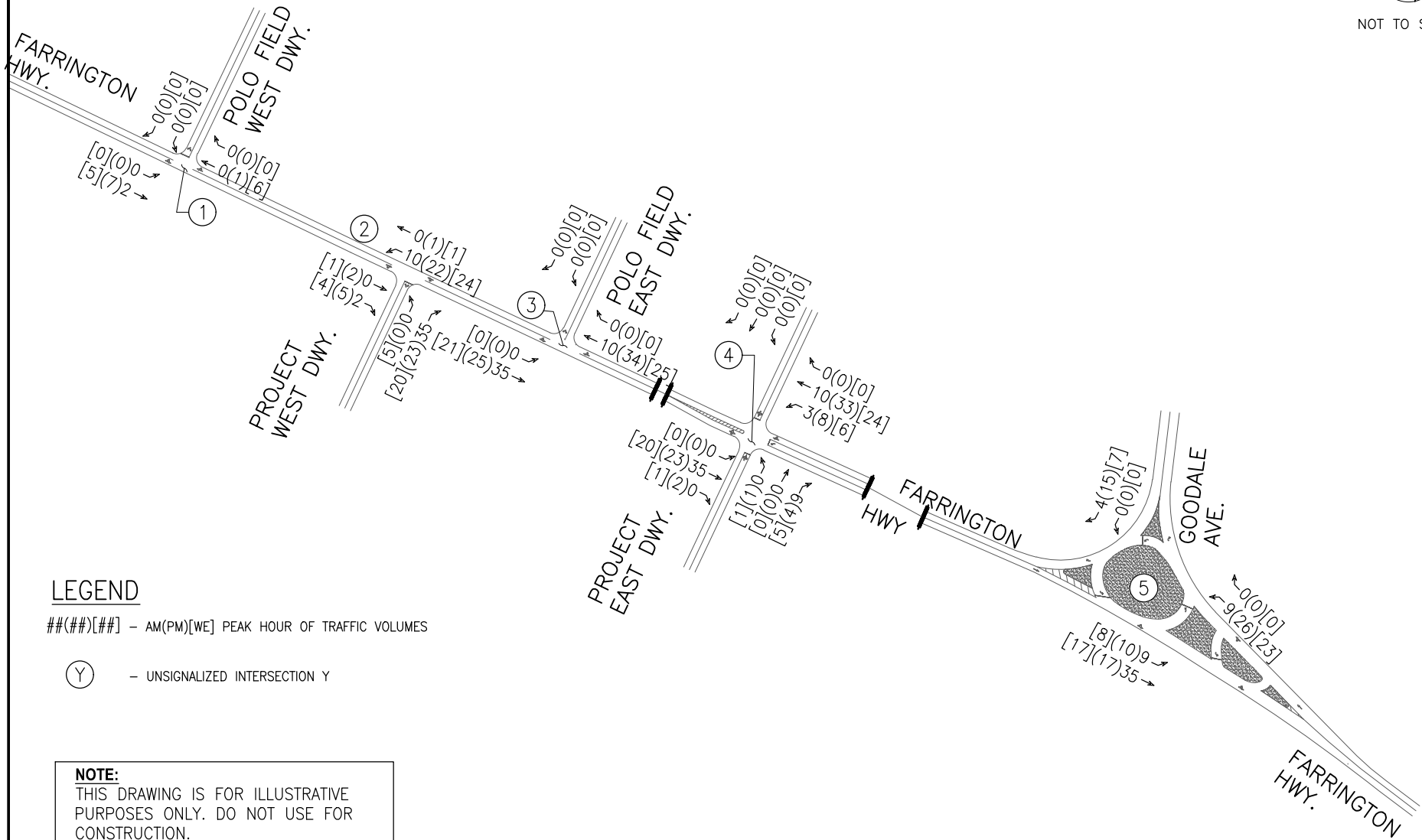
#### **4.3 Future Year 2025 Analysis**

At the study intersections, upon completion of the Project, all study intersections are forecast to operate at LOS C or better during the AM, PM, and WE peak hour of traffic.

See Figure 4.2 for the Future Year 2025 with Project traffic volumes and LOS. Table 4.4 summarizes the Existing, Base Year 2025, and Future Year 2025 with Project LOS at the study intersections. LOS worksheets are provided in Appendix C.



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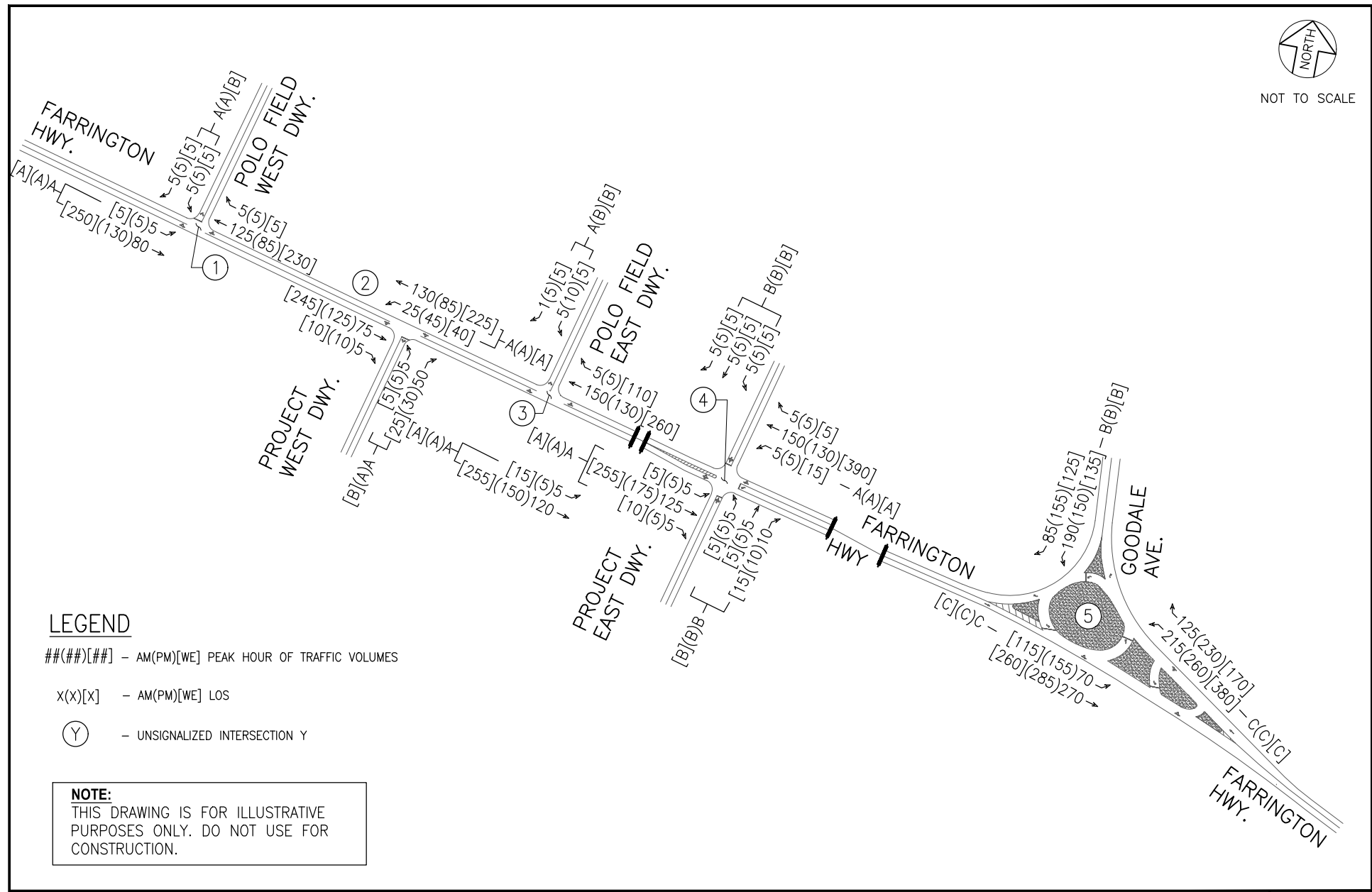
**PROJECT GENERATED TRAFFIC VOLUMES**

FIGURE

**4.1**



NOT TO SCALE



**LEGEND**

- ##(##)[##] - AM(PM)[WE] PEAK HOUR OF TRAFFIC VOLUMES
- X(X)[X] - AM(PM)[WE] LOS
- Y - UNSIGNALIZED INTERSECTION Y

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**FUTURE YEAR LANE CONFIGURATION, TRAFFIC VOLUMES AND LOS**

FIGURE

**4.2**

Table 4.4: Existing, Base Year 2025 and Year 2025 with Project Level of Service Summary

Intersection	Existing Conditions									Base Year 2025 Conditions									Year 2025 with Project Conditions											
	AM			PM			WE			AM			PM			WE			AM			PM			WE					
	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS	HCM Delay (sec)	v/c Ratio	LOS			
<b>1: Farrington Hwy &amp; Polo Field West Dwy</b>																														
EB LT/TH	0.0	0.0	A	0.0	0.0	A	0.0	0.0	A	7.5	0.0	A	7.4	0.0	A	7.7	0.0	A	7.5	0.0	A	7.4	0.0	A	7.8	0.0	A	7.8	0.0	A
SB LT/RT	9.4	0.00	A	0.0	0.00	A	0.0	0.0	A	9.4	0.01	A	9.3	0.01	A	10.9	0.0	B	9.4	0.01	A	9.4	0.01	A	11.0	0.0	B	11.0	0.0	B
<b>2: Project West Dwy &amp; Farrington Hwy</b>																														
NB LT/RT	8.6	0.0	A	8.8	0.0	A	8.8	0.0	A	9.1	0.0	A	9.3	0.0	A	11.1	0.0	B	9.1	0.1	A	9.4	0.0	A	10.5	0.0	B	10.5	0.0	B
WB LT/TH	7.4	0.0	A	7.4	0.0	A	7.4	0.0	A	7.4	0.0	A	7.5	0.0	A	7.8	0.0	A	7.4	0.0	A	7.6	0.0	A	7.9	0.0	A	7.9	0.0	A
<b>3: Farrington Hwy &amp; Polo Field East Dwy</b>																														
EB LT/TH	7	0.00	A	0	0.00	A	0.0	0.0	A	8	0.00	A	7	0.00	A	8.0	0.0	A	8	0.00	A	8	0.00	A	8.2	0.0	A	8.2	0.0	A
SB LT/RT	9.2	0.00	A	9.0	0.01	A	9.3	0.01	A	9.6	0.01	A	9.6	0.02	A	11.5	0.02	B	9.8	0.01	A	10.0	0.02	B	11.9	0.02	B	11.9	0.02	B
<b>4: Project East Dwy &amp; Farrington Hwy</b>																														
NB LT/TH/RT	8.7	0.00	A	9.2	0.01	A	9.2	0.01	A	10.1	0.02	B	10.4	0.02	B	12.6	0.03	B	10.1	0.03	B	10.6	0.03	B	11.8	0.04	B	11.8	0.04	B
EB LT/TH/RT	7.5	0.0	A	0.0	0.0	A	0.0	0.0	A	7.5	0.0	A	7.5	0.0	A	8.1	0.0	A	7.6	0.0	A	7.5	0.0	A	8.2	0.0	A	8.2	0.0	A
WB LT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.5	0.00	A	7.6	0.01	A	7.9	0.02	A	7.9	0.02	A
WB LT/TH/RT	7.4	0.0	A	7.5	0.0	A	7.5	0.0	A	7.4	0.0	A	7.6	0.0	A	7.8	0.0	A	-	-	-	-	-	-	-	-	-	-	-	
SB LT/TH/RT	8.9	0.0	A	0.0	0.0	A	8.7	0.0	A	10.2	0.0	B	10.3	0.0	B	13.5	0.0	B	10.5	0.0	B	10.9	0.0	B	14.1	0.0	B	14.1	0.0	B
<b>5: Goodale Ave &amp; Farrington Hwy</b>																														
NB LT	10.5	0.1	B	12.5	0.2	B	12.6	0.2	B	11.3	0.1	B	14.6	0.3	B	14.2	0.2	B	11.5	0.1	B	15.6	0.3	C	15.6	0.3	C	15.6	0.3	C
WB LT	11.2	0.2	B	11.7	0.3	B	12.7	0.4	B	12.6	0.3	B	13.4	0.4	B	15.7	0.5	C	17.4	0.4	C	21.3	0.6	C	17.0	0.6	C	17.0	0.6	C
SB LT	11.8	0.2	B	12.7	0.2	B	11.2	0.2	B	12.8	0.3	B	13.8	0.3	B	12.6	0.2	B	13.5	0.3	B	14.4	0.3	B	12.9	0.2	B	12.9	0.2	B

\*Source: ATA 2016



## **5. CONCLUSIONS AND RECOMMENDATIONS**

The proposed Project entails the expansion of the equestrian use of the Ranch and provides a Ranch office, four (4) employee dwellings, a premier polo field, two (2) practice polo fields, and paddocks for the different types of horses, exercise trials and barns.

It will also expand its agricultural uses to reserve several acres within the Dillingham Lodge for farm to table farmers and create 70 agricultural lots ranging in size from 2 acres to 77 acres. These agricultural lots will have a developable footprint, no larger than 5,000 square feet for farm dwelling and accessory uses.

### **5.1 Existing Conditions**

During a polo event, traffic operations are generally smooth except during the peak entering period where traffic was observed to queue along Farrington Highway in the westbound direction at the Polo Field East Driveway twice for short periods. This was observed as a result of short stacking distance to the ticket booth.

During a regular weekday all movements at each intersection were observed to operate at LOS B or better during the AM, PM, and WE peak hours of traffic.

### **5.2 Base Year 2025**

By the year 2025, the minimal increase in traffic would not impact traffic operations at the study intersections. All intersections are forecast to operate at LOS C or better during the AM, PM and WE peak hours of traffic.

### **5.3 Future Year 2025**

By year 2025 with the proposed Project, traffic operations during the weekday AM and PM peak hours of traffic are anticipated to remain similar to existing conditions with all movements operating at LOS C or better.

During the weekend peak during a typical polo event which generates the most trips with 400 attendees, traffic operations are anticipated to be satisfactory at LOS C or better on all movements.



## 6. REFERENCES

1. American Association of State Highway Transportation Officials, A Policy on Geometric Design of Highways and Street, 2011
2. City and County of Honolulu, Land Use Ordinance Chapter 21, Article 5. Revised Ordinances of Honolulu.
3. City and County of Honolulu, Oahu Bike Plan, a Bicycle Master Plan. August 2012.
4. Institute of Transportation Engineers, Trip Generation, 9th Edition, 2012.
5. Transportation Research Board, Highway Capacity Manual, 2010.





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# APPENDICES

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# APPENDIX A

## TRAFFIC COUNT DATA

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# Austin Tsutsumi & Associates

501 Sumner Street, Suite 521  
Honolulu, HI 96817-5031

*Phone: (808) 533-3646 Fax: (808) 526-1267*

File Name : AM\_Dillingham Ranch East Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/8/2016

Page No : 1

Groups Printed- Unshifted - Bank 1

Start Time	Southbound				FARRINGTON HWY Westbound				DILLINGHAM RANCH EAST DWY Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
07:00 AM	0	0	0	0	1	13	0	0	0	0	2	0	0	10	0	0	26
07:15 AM	0	0	0	1	0	11	0	0	0	0	0	0	0	11	0	0	23
07:30 AM	0	0	1	0	0	13	0	0	0	0	1	0	0	15	0	0	30
07:45 AM	0	0	1	0	0	20	0	0	0	0	1	0	0	22	0	0	44
Total	0	0	2	1	1	57	0	0	0	0	4	0	0	58	0	0	123
08:00 AM	0	0	0	0	1	30	0	0	0	0	0	0	0	6	0	0	37
08:15 AM	0	0	0	0	0	34	0	0	0	0	0	0	1	32	0	0	67
08:30 AM	0	0	0	0	0	21	0	0	0	0	0	0	0	14	0	0	35
08:45 AM	0	0	1	0	0	26	0	0	0	0	1	0	0	19	0	0	47
Total	0	0	1	0	1	111	0	0	0	0	1	0	1	71	0	0	186
09:00 AM	0	0	0	0	0	32	0	0	0	0	0	0	0	15	0	0	47
Grand Total	0	0	3	1	2	200	0	0	0	0	5	0	1	144	0	0	356
Apprch %	0	0	75	25	1	99	0	0	0	0	100	0	0.7	99.3	0	0	
Total %	0	0	0.8	0.3	0.6	56.2	0	0	0	0	1.4	0	0.3	40.4	0	0	
Unshifted	0	0	3	1	2	200	0	0	0	0	5	0	1	144	0	0	356
% Unshifted	0	0	100	100	100	100	0	0	0	0	100	0	100	100	0	0	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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Start Date : 9/8/2016

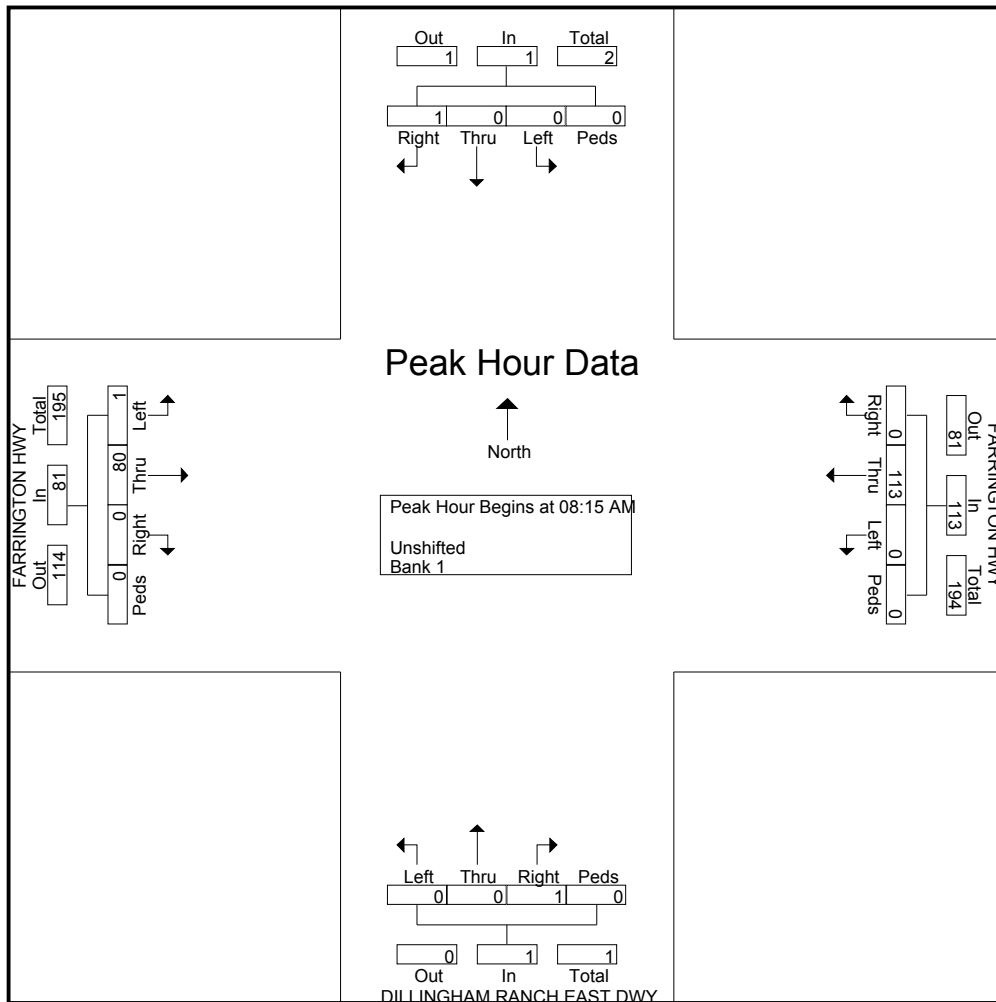
Page No : 2

Start Time	Southbound					FARRINGTON HWY Westbound					DILLINGHAM RANCH EAST DWY Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	

Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 08:15 AM

08:15 AM	0	0	0	0	0	0	34	0	0	34	0	0	0	0	0	1	32	0	0	33	67
08:30 AM	0	0	0	0	0	0	21	0	0	21	0	0	0	0	0	0	14	0	0	14	35
08:45 AM	0	0	1	0	1	0	26	0	0	26	0	0	1	0	1	0	19	0	0	19	47
09:00 AM	0	0	0	0	0	0	32	0	0	32	0	0	0	0	0	0	15	0	0	15	47
Total Volume	0	0	1	0	1	0	113	0	0	113	0	0	1	0	1	1	80	0	0	81	196
% App. Total	0	0	100	0		0	100	0	0		0	0	100	0		1.2	98.8	0	0		
PHF	.000	.000	.250	.000	.250	.000	.831	.000	.000	.831	.000	.000	.250	.000	.250	.250	.625	.000	.000	.614	.731



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File Name : WE\_PM\_Goodale Ave - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 1

Groups Printed- Unshifted

Start Time	GOODALE AVE Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
04:30 PM	21	0	20	0	0	31	23	0	0	0	0	0	24	41	0	0	160
04:45 PM	30	0	9	0	0	34	37	0	0	0	0	0	18	57	0	0	185
Total	51	0	29	0	0	65	60	0	0	0	0	0	42	98	0	0	345
05:00 PM	12	0	10	0	0	15	15	0	0	0	0	0	23	59	0	0	134
05:15 PM	21	0	8	0	0	37	24	0	0	0	0	0	29	72	0	0	191
05:30 PM	24	0	19	0	0	36	25	0	0	0	0	0	28	59	0	0	191
05:45 PM	13	0	16	0	0	35	34	0	0	0	0	0	21	54	0	0	173
Total	70	0	53	0	0	123	98	0	0	0	0	0	101	244	0	0	689
06:00 PM	22	0	13	0	0	36	26	0	0	0	0	0	14	53	0	0	164
06:15 PM	24	0	22	0	0	43	21	0	0	0	0	0	17	49	0	0	176
06:30 PM	14	0	10	0	0	28	23	0	0	0	0	0	16	57	0	0	148
06:45 PM	17	0	13	0	0	27	16	0	0	0	0	0	21	46	0	0	140
Total	77	0	58	0	0	134	86	0	0	0	0	0	68	205	0	0	628
07:00 PM	18	0	14	0	0	24	14	0	0	0	0	0	17	57	0	0	144
Grand Total	216	0	154	0	0	346	258	0	0	0	0	0	228	604	0	0	1806
Apprch %	58.4	0	41.6	0	0	57.3	42.7	0	0	0	0	0	27.4	72.6	0	0	
Total %	12	0	8.5	0	0	19.2	14.3	0	0	0	0	0	12.6	33.4	0	0	

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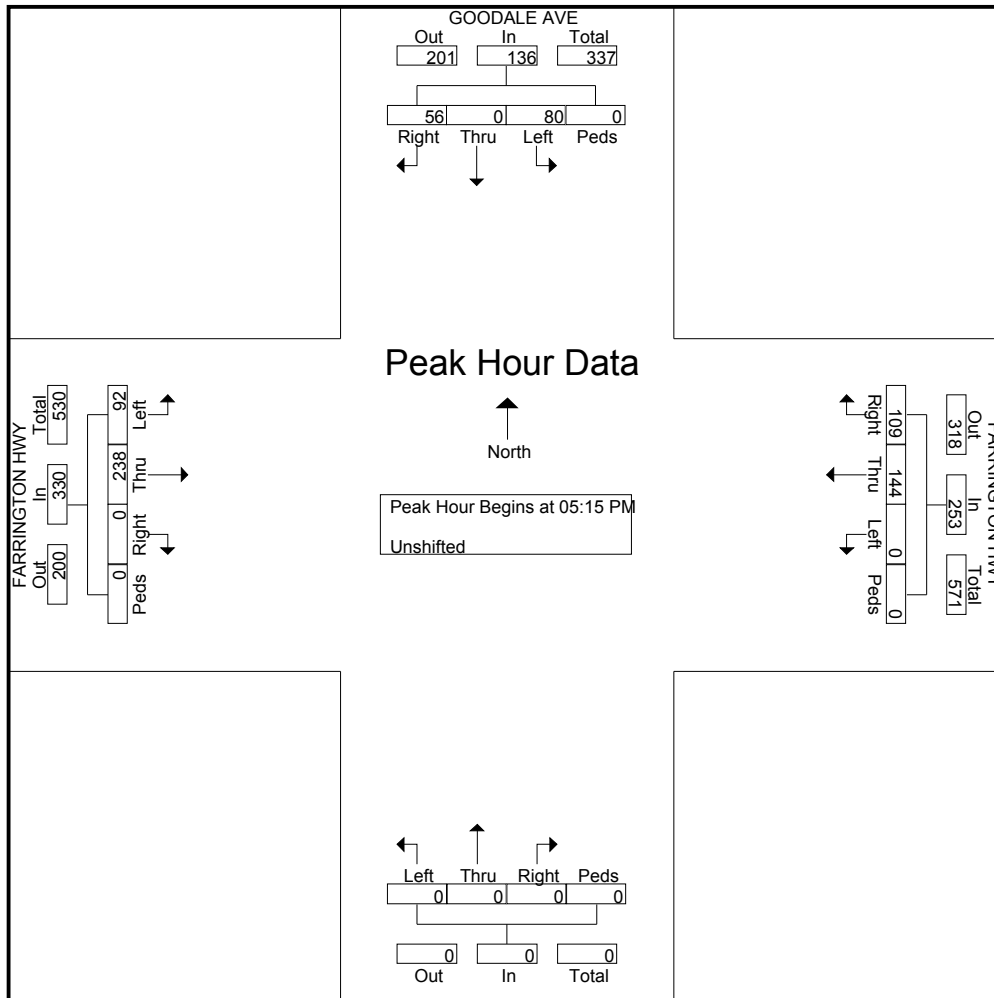
File Name : WE\_PM\_Goodale Ave - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 2

Start Time	GOODALE AVE Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 04:30 PM to 07:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:15 PM																					
05:15 PM	21	0	8	0	29	0	37	24	0	61	0	0	0	0	0	29	72	0	0	101	191
05:30 PM	24	0	19	0	43	0	36	25	0	61	0	0	0	0	0	28	59	0	0	87	191
05:45 PM	13	0	16	0	29	0	35	34	0	69	0	0	0	0	0	21	54	0	0	75	173
06:00 PM	22	0	13	0	35	0	36	26	0	62	0	0	0	0	0	14	53	0	0	67	164
Total Volume	80	0	56	0	136	0	144	109	0	253	0	0	0	0	0	92	238	0	0	330	719
% App. Total	58.8	0	41.2	0		0	56.9	43.1	0		0	0	0	0		27.9	72.1	0	0		
PHF	.833	.000	.737	.000	.791	.000	.973	.801	.000	.917	.000	.000	.000	.000	.000	.793	.826	.000	.000	.817	.941



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Site Code : 00000000

Start Date : 9/4/2016

Page No : 1

Groups Printed- Unshifted

Start Time	Southbound				FARRINGTON HWY Westbound				DILLINGHAM RANCH WEST DWY Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
04:30 PM	0	0	0	0	3	16	0	0	3	0	2	0	0	35	0	0	59
04:45 PM	0	0	0	0	8	14	0	0	1	0	4	0	0	50	0	0	77
Total	0	0	0	0	11	30	0	0	4	0	6	0	0	85	0	0	136
05:00 PM	0	0	0	0	4	28	0	0	0	0	3	0	0	51	0	0	86
05:15 PM	0	0	0	0	1	24	0	0	0	0	6	0	0	60	0	0	91
05:30 PM	0	0	0	0	1	22	0	0	0	0	0	0	0	43	1	0	67
05:45 PM	0	0	0	0	0	30	0	0	1	0	1	0	0	36	0	0	68
Total	0	0	0	0	6	104	0	0	1	0	10	0	0	190	1	0	312
06:00 PM	0	0	0	0	3	19	0	0	0	0	2	0	0	25	0	0	49
06:15 PM	0	0	0	0	0	29	0	0	0	0	0	0	0	27	1	0	57
06:30 PM	0	0	0	0	1	20	0	0	0	0	3	0	0	27	0	0	51
06:45 PM	0	0	0	0	0	19	0	0	0	0	6	0	0	22	0	0	47
Total	0	0	0	0	4	87	0	0	0	0	11	0	0	101	1	0	204
07:00 PM	0	0	0	0	1	19	0	0	1	0	3	0	0	35	0	0	59
Grand Total	0	0	0	0	22	240	0	0	6	0	30	0	0	411	2	0	711
Apprch %	0	0	0	0	8.4	91.6	0	0	16.7	0	83.3	0	0	99.5	0.5	0	
Total %	0	0	0	0	3.1	33.8	0	0	0.8	0	4.2	0	0	57.8	0.3	0	

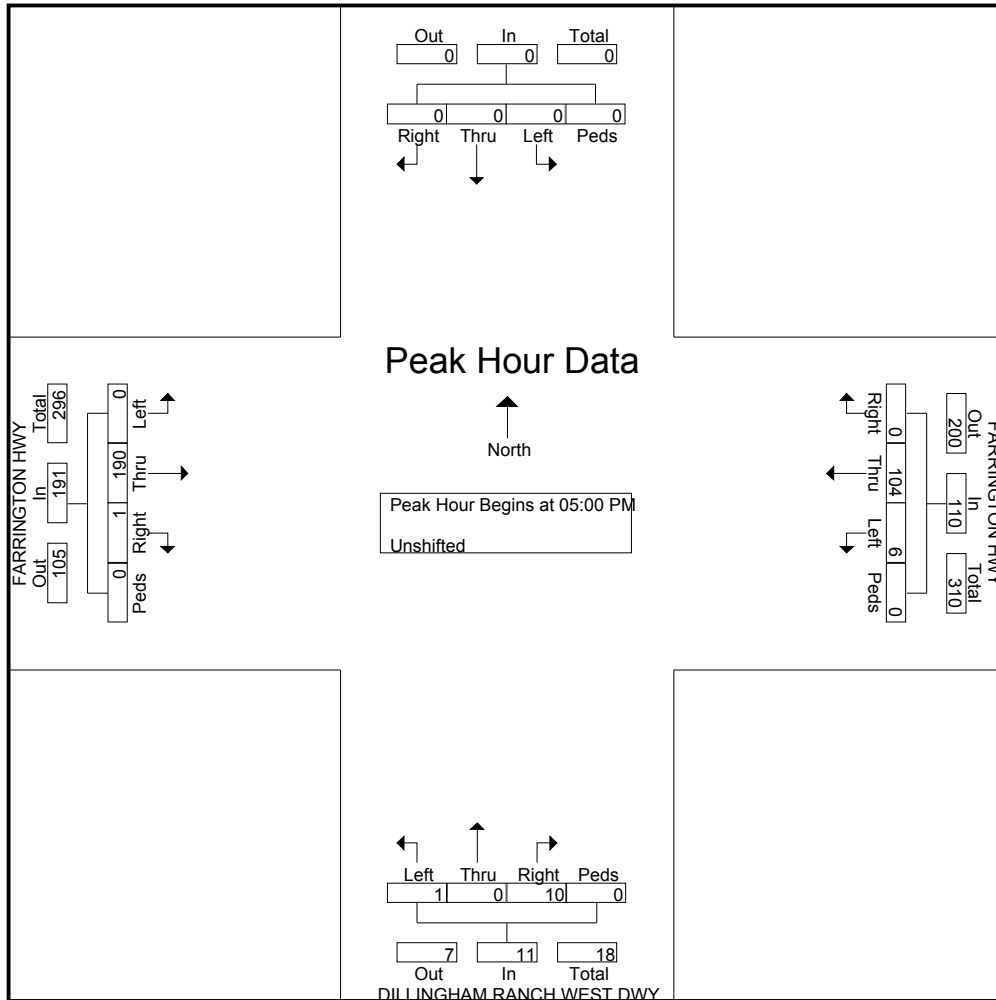
# Austin Tsutsumi & Associates

501 Sumner Street, Suite 521  
Honolulu, HI 96817-5031

*Phone: (808) 533-3646 Fax: (808) 526-1267*

File Name : WE\_PM\_Dillingham Ranch West Dwy - Farrington Hwy  
Site Code : 00000000  
Start Date : 9/4/2016  
Page No : 2

Start Time	Southbound					FARRINGTON HWY Westbound					DILLINGHAM RANCH WEST DWY Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 05:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	0	0	0	0	4	28	0	0	32	0	0	3	0	3	0	51	0	0	51	86
05:15 PM	0	0	0	0	0	1	24	0	0	25	0	0	6	0	6	0	60	0	0	60	91
05:30 PM	0	0	0	0	0	1	22	0	0	23	0	0	0	0	0	0	43	1	0	44	67
05:45 PM	0	0	0	0	0	0	30	0	0	30	1	0	1	0	2	0	36	0	0	36	68
Total Volume	0	0	0	0	0	6	104	0	0	110	1	0	10	0	11	0	190	1	0	191	312
% App. Total	0	0	0	0	0	5.5	94.5	0	0		9.1	0	90.9	0		0	99.5	0.5	0		
PHF	.000	.000	.000	.000	.000	.375	.867	.000	.000	.859	.250	.000	.417	.000	.458	.000	.792	.250	.000	.796	.857





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Page No : 1

Groups Printed- Unshifted

Start Time	Southbound				FARRINGTON HWY Westbound				DILLINGHAM RANCH WEST DWY Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
04:30 PM	0	0	0	0	3	16	0	0	3	0	2	0	0	35	0	0	59
04:45 PM	0	0	0	0	8	14	0	0	1	0	4	0	0	50	0	0	77
Total	0	0	0	0	11	30	0	0	4	0	6	0	0	85	0	0	136
05:00 PM	0	0	0	0	4	28	0	0	0	0	3	0	0	51	0	0	86
05:15 PM	0	0	0	0	1	24	0	0	0	0	6	0	0	60	0	0	91
05:30 PM	0	0	0	0	1	22	0	0	0	0	0	0	0	43	1	0	67
05:45 PM	0	0	0	0	0	30	0	0	1	0	1	0	0	36	0	0	68
Total	0	0	0	0	6	104	0	0	1	0	10	0	0	190	1	0	312
06:00 PM	0	0	0	0	3	19	0	0	0	0	2	0	0	25	0	0	49
06:15 PM	0	0	0	0	0	29	0	0	0	0	0	0	0	27	1	0	57
06:30 PM	0	0	0	0	1	20	0	0	0	0	3	0	0	27	0	0	51
06:45 PM	0	0	0	0	0	19	0	0	0	0	6	0	0	22	0	0	47
Total	0	0	0	0	4	87	0	0	0	0	11	0	0	101	1	0	204
07:00 PM	0	0	0	0	1	19	0	0	1	0	3	0	0	35	0	0	59
Grand Total	0	0	0	0	22	240	0	0	6	0	30	0	0	411	2	0	711
Apprch %	0	0	0	0	8.4	91.6	0	0	16.7	0	83.3	0	0	99.5	0.5	0	
Total %	0	0	0	0	3.1	33.8	0	0	0.8	0	4.2	0	0	57.8	0.3	0	

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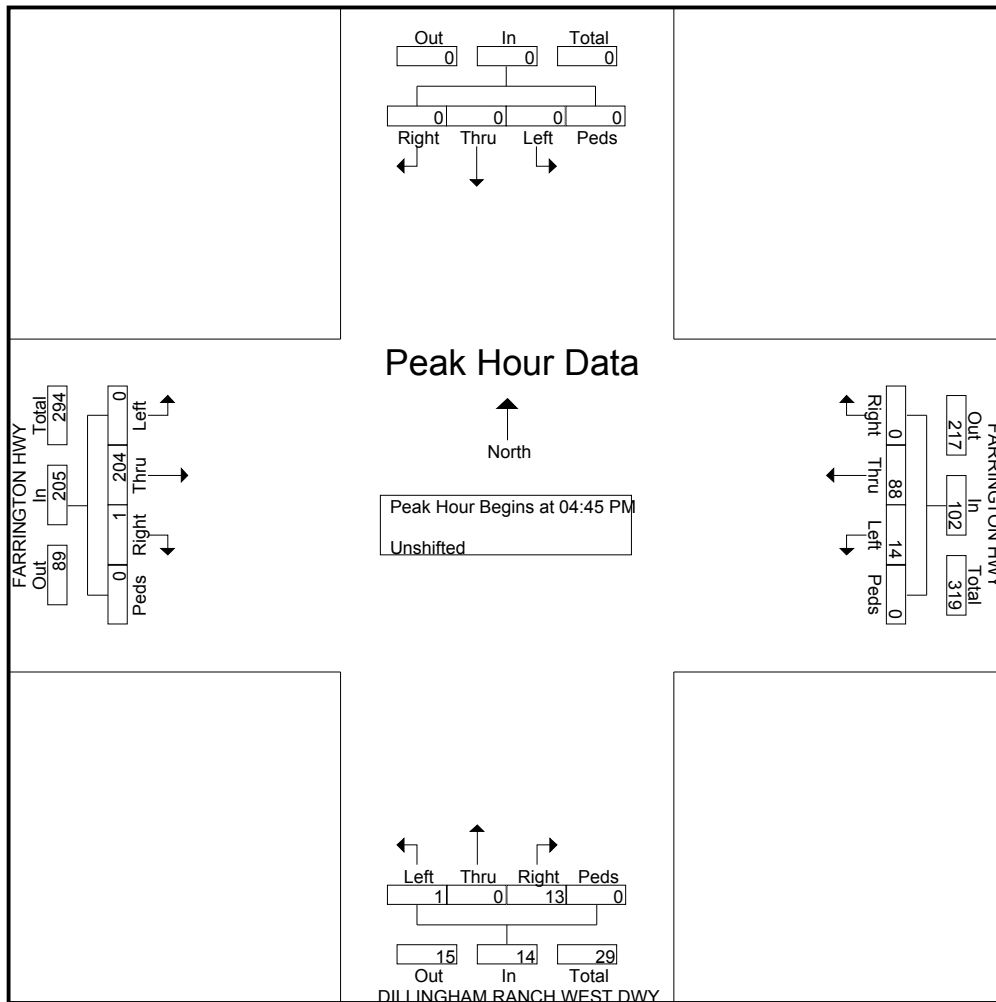
Page No : 2

Start Time	Southbound					FARRINGTON HWY Westbound					DILLINGHAM RANCH WEST DWY Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	

Peak Hour Analysis From 04:30 PM to 07:00 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 04:45 PM

04:45 PM	0	0	0	0	0	8	14	0	0	22	1	0	4	0	5	0	50	0	0	50	77
05:00 PM	0	0	0	0	0	4	28	0	0	32	0	0	3	0	3	0	51	0	0	51	86
05:15 PM	0	0	0	0	0	1	24	0	0	25	0	0	6	0	6	0	60	0	0	60	91
05:30 PM	0	0	0	0	0	1	22	0	0	23	0	0	0	0	0	0	43	1	0	44	67
Total Volume	0	0	0	0	0	14	88	0	0	102	1	0	13	0	14	0	204	1	0	205	321
% App. Total	0	0	0	0	0	13.7	86.3	0	0		7.1	0	92.9	0		0	99.5	0.5	0		
PHF	.000	.000	.000	.000	.000	.438	.786	.000	.000	.797	.250	.000	.542	.000	.583	.000	.850	.250	.000	.854	.882



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Groups Printed- Unshifted - Bank 1

Start Time	Southbound				FARRINGTON HWY Westbound				DILLINGHAM RANCH EAST DWY Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
04:30 PM	0	1	0	0	0	28	0	0	1	1	2	0	0	47	1	0	81
04:45 PM	0	0	0	0	3	33	1	0	0	0	3	0	0	69	5	0	114
Total	0	1	0	0	3	61	1	0	1	1	5	0	0	116	6	0	195
05:00 PM	0	0	0	0	0	39	0	0	0	0	1	0	0	66	0	0	106
05:15 PM	0	0	0	0	0	31	0	0	0	0	1	0	0	82	1	0	115
05:30 PM	0	0	0	0	0	27	0	0	0	0	0	0	0	62	0	0	89
05:45 PM	0	0	0	0	2	32	0	0	0	0	0	0	0	55	2	0	91
Total	0	0	0	0	2	129	0	0	0	0	2	0	0	265	3	0	401
06:00 PM	0	0	0	0	1	24	0	0	0	0	0	0	0	46	0	0	71
06:15 PM	0	0	0	0	1	27	0	0	0	0	1	0	0	49	0	0	78
06:30 PM	0	0	0	0	1	21	0	0	0	0	0	0	0	39	0	0	61
06:45 PM	0	0	0	0	0	20	0	0	0	0	0	0	1	52	0	0	73
Total	0	0	0	0	3	92	0	0	0	0	1	0	1	186	0	0	283
07:00 PM	0	0	1	0	0	21	0	0	0	0	1	0	0	69	0	0	92
Grand Total	0	1	1	0	8	303	1	0	1	1	9	0	1	636	9	0	971
Apprch %	0	50	50	0	2.6	97.1	0.3	0	9.1	9.1	81.8	0	0.2	98.5	1.4	0	
Total %	0	0.1	0.1	0	0.8	31.2	0.1	0	0.1	0.1	0.9	0	0.1	65.5	0.9	0	
Unshifted	0	1	1	0	8	303	1	0	1	1	9	0	1	636	9	0	971
% Unshifted	0	100	100	0	100	100	100	0	100	100	100	0	100	100	100	0	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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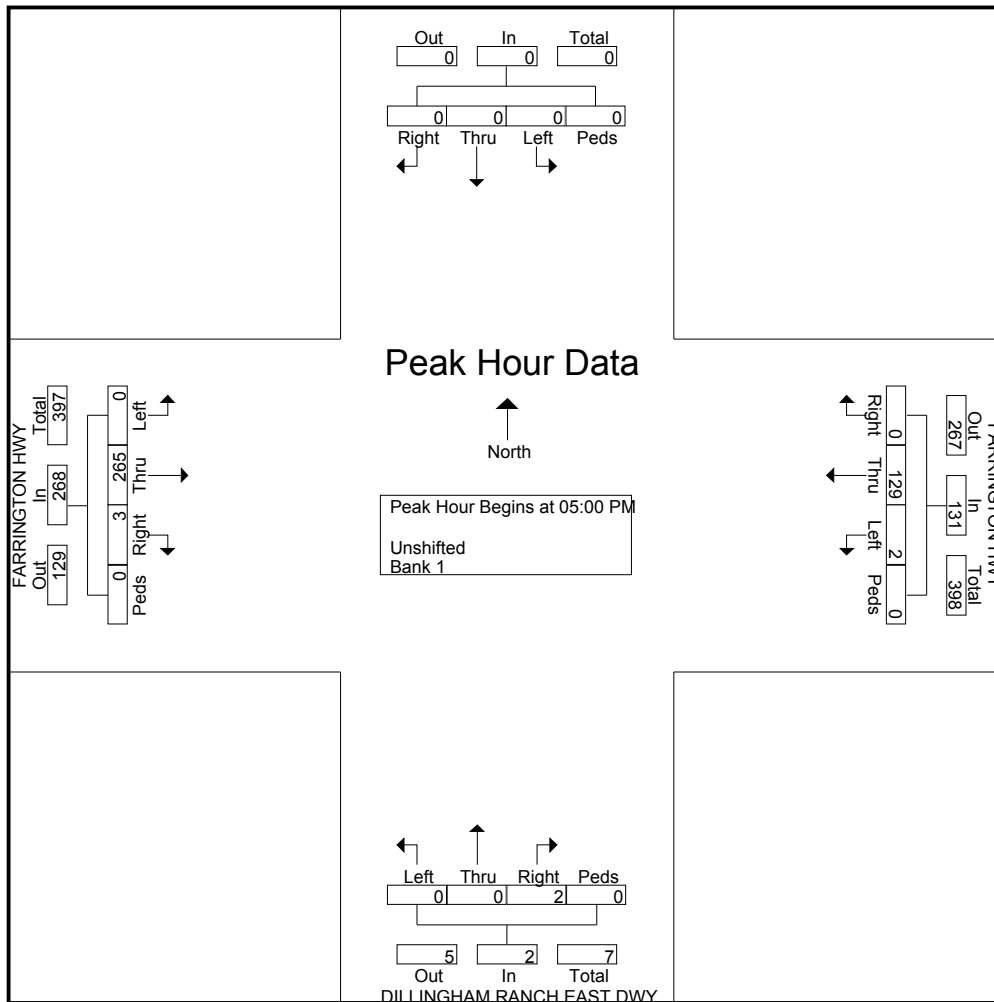
File Name : WE\_PM\_Dillingham Ranch East Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 2

Start Time	Southbound					FARRINGTON HWY Westbound					DILLINGHAM RANCH EAST DWY Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 05:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	0	0	0	0	0	0	<b>39</b>	0	0	<b>39</b>	0	0	<b>1</b>	0	<b>1</b>	0	66	0	0	66	106
05:15 PM	0	0	0	0	0	0	31	0	0	31	0	0	1	0	1	0	<b>82</b>	1	0	<b>83</b>	<b>115</b>
05:30 PM	0	0	0	0	0	0	27	0	0	27	0	0	0	0	0	0	62	0	0	62	89
05:45 PM	0	0	0	0	0	<b>2</b>	32	0	0	34	0	0	0	0	0	0	55	<b>2</b>	0	57	91
Total Volume	0	0	0	0	0	2	129	0	0	131	0	0	2	0	2	0	265	3	0	268	401
% App. Total	0	0	0	0	0	1.5	98.5	0	0		0	0	100	0		0	98.9	1.1	0		
PHF	.000	.000	.000	.000	.000	.250	.827	.000	.000	.840	.000	.000	.500	.000	.500	.000	.808	.375	.000	.807	.872



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File Name : WE\_PM\_Dillingham Ranch East Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 1

Groups Printed- Unshifted - Bank 1

Start Time	Southbound				FARRINGTON HWY Westbound				DILLINGHAM RANCH EAST DWY Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
04:30 PM	0	1	0	0	0	28	0	0	1	1	2	0	0	47	1	0	81
04:45 PM	0	0	0	0	3	33	1	0	0	0	3	0	0	69	5	0	114
Total	0	1	0	0	3	61	1	0	1	1	5	0	0	116	6	0	195
05:00 PM	0	0	0	0	0	39	0	0	0	0	1	0	0	66	0	0	106
05:15 PM	0	0	0	0	0	31	0	0	0	0	1	0	0	82	1	0	115
05:30 PM	0	0	0	0	0	27	0	0	0	0	0	0	0	62	0	0	89
05:45 PM	0	0	0	0	2	32	0	0	0	0	0	0	0	55	2	0	91
Total	0	0	0	0	2	129	0	0	0	0	2	0	0	265	3	0	401
06:00 PM	0	0	0	0	1	24	0	0	0	0	0	0	0	46	0	0	71
06:15 PM	0	0	0	0	1	27	0	0	0	0	1	0	0	49	0	0	78
06:30 PM	0	0	0	0	1	21	0	0	0	0	0	0	0	39	0	0	61
06:45 PM	0	0	0	0	0	20	0	0	0	0	0	0	1	52	0	0	73
Total	0	0	0	0	3	92	0	0	0	0	1	0	1	186	0	0	283
07:00 PM	0	0	1	0	0	21	0	0	0	0	1	0	0	69	0	0	92
Grand Total	0	1	1	0	8	303	1	0	1	1	9	0	1	636	9	0	971
Apprch %	0	50	50	0	2.6	97.1	0.3	0	9.1	9.1	81.8	0	0.2	98.5	1.4	0	
Total %	0	0.1	0.1	0	0.8	31.2	0.1	0	0.1	0.1	0.9	0	0.1	65.5	0.9	0	
Unshifted	0	1	1	0	8	303	1	0	1	1	9	0	1	636	9	0	971
% Unshifted	0	100	100	0	100	100	100	0	100	100	100	0	100	100	100	0	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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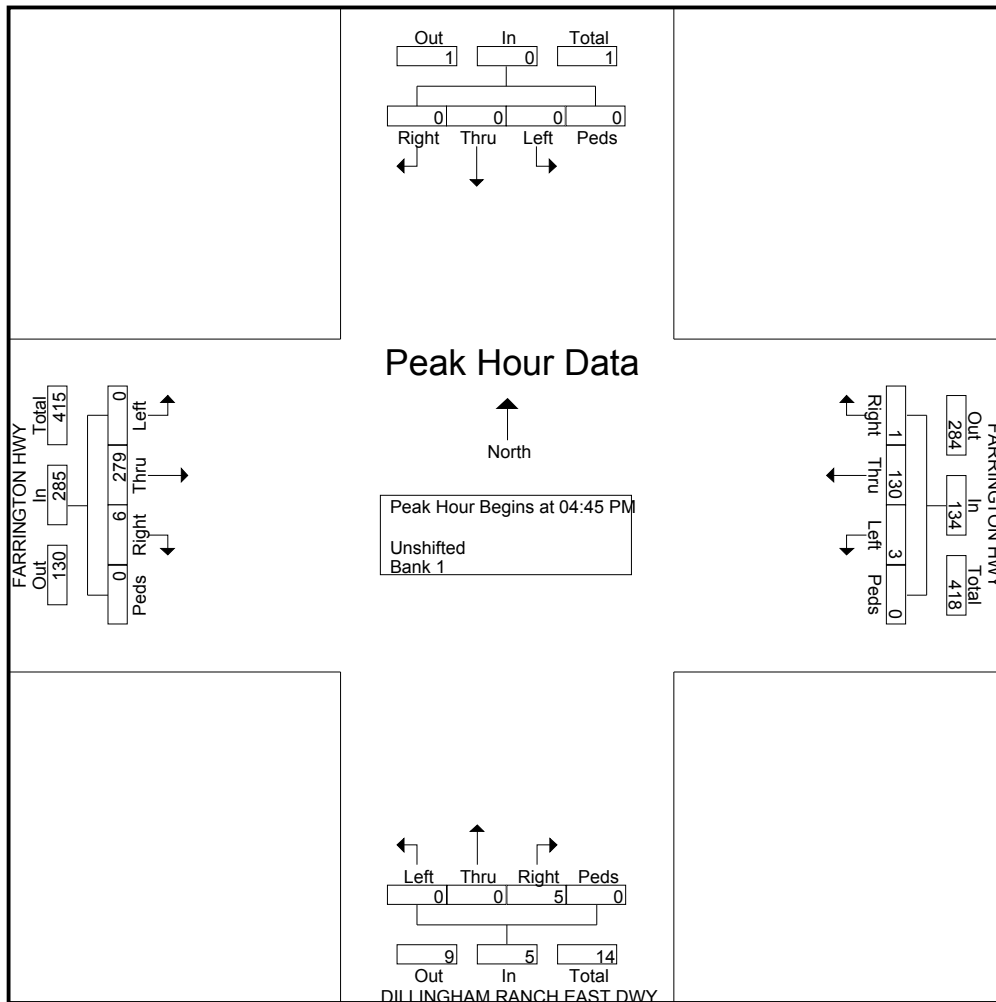
File Name : WE\_PM\_Dillingham Ranch East Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 2

Start Time	Southbound					FARRINGTON HWY Westbound					DILLINGHAM RANCH EAST DWY Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 04:30 PM to 07:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	0	0	0	0	3	33	1	0	37	0	0	3	0	3	0	69	5	0	74	114
05:00 PM	0	0	0	0	0	0	39	0	0	39	0	0	1	0	1	0	66	0	0	66	106
05:15 PM	0	0	0	0	0	0	31	0	0	31	0	0	1	0	1	0	82	1	0	83	115
05:30 PM	0	0	0	0	0	0	27	0	0	27	0	0	0	0	0	0	62	0	0	62	89
Total Volume	0	0	0	0	0	3	130	1	0	134	0	0	5	0	5	0	279	6	0	285	424
% App. Total	0	0	0	0	0	2.2	97	0.7	0		0	0	100	0		0	97.9	2.1	0		
PHF	.000	.000	.000	.000	.000	.250	.833	.250	.000	.859	.000	.000	.417	.000	.417	.000	.851	.300	.000	.858	.922



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Site Code : 00000000

Start Date : 9/4/2016

Page No : 1

Groups Printed- Unshifted

Start Time	POLO FIELD WEST DWY Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
11:00 AM	0	0	1	0	0	51	0	0	0	0	0	0	0	50	0	0	102
11:15 AM	1	0	0	0	0	62	1	0	0	0	0	0	0	52	0	0	116
11:30 AM	1	0	0	0	0	58	1	0	0	0	0	0	0	41	0	0	101
11:45 AM	0	0	0	0	0	54	0	0	0	0	0	0	0	53	0	0	107
Total	2	0	1	0	0	225	2	0	0	0	0	0	0	196	0	0	426
12:00 PM	1	0	0	0	0	39	0	0	0	0	0	0	0	52	0	0	92
12:15 PM	0	0	0	0	0	41	0	0	0	0	0	0	0	38	0	0	79
12:30 PM	0	0	0	0	0	42	0	0	0	0	0	0	0	43	0	0	85
12:45 PM	0	0	0	0	0	51	0	0	0	0	0	0	0	28	0	0	79
Total	1	0	0	0	0	173	0	0	0	0	0	0	0	161	0	0	335
01:00 PM	0	0	0	0	0	49	0	0	0	0	0	0	0	42	0	0	91
01:15 PM	0	0	0	0	0	42	0	0	0	0	0	0	0	55	0	0	97
01:30 PM	0	0	0	0	0	52	0	0	0	0	0	0	0	38	0	0	90
01:45 PM	0	0	0	0	0	54	0	0	0	0	0	0	0	44	0	0	98
Total	0	0	0	0	0	197	0	0	0	0	0	0	0	179	0	0	376
02:00 PM	0	0	0	0	0	30	0	0	0	0	0	0	0	58	0	0	88
02:15 PM	0	0	0	0	0	35	0	0	0	0	0	0	0	54	0	0	89
Grand Total	3	0	1	0	0	660	2	0	0	0	0	0	0	648	0	0	1314
Approch %	75	0	25	0	0	99.7	0.3	0	0	0	0	0	0	100	0	0	
Total %	0.2	0	0.1	0	0	50.2	0.2	0	0	0	0	0	0	49.3	0	0	

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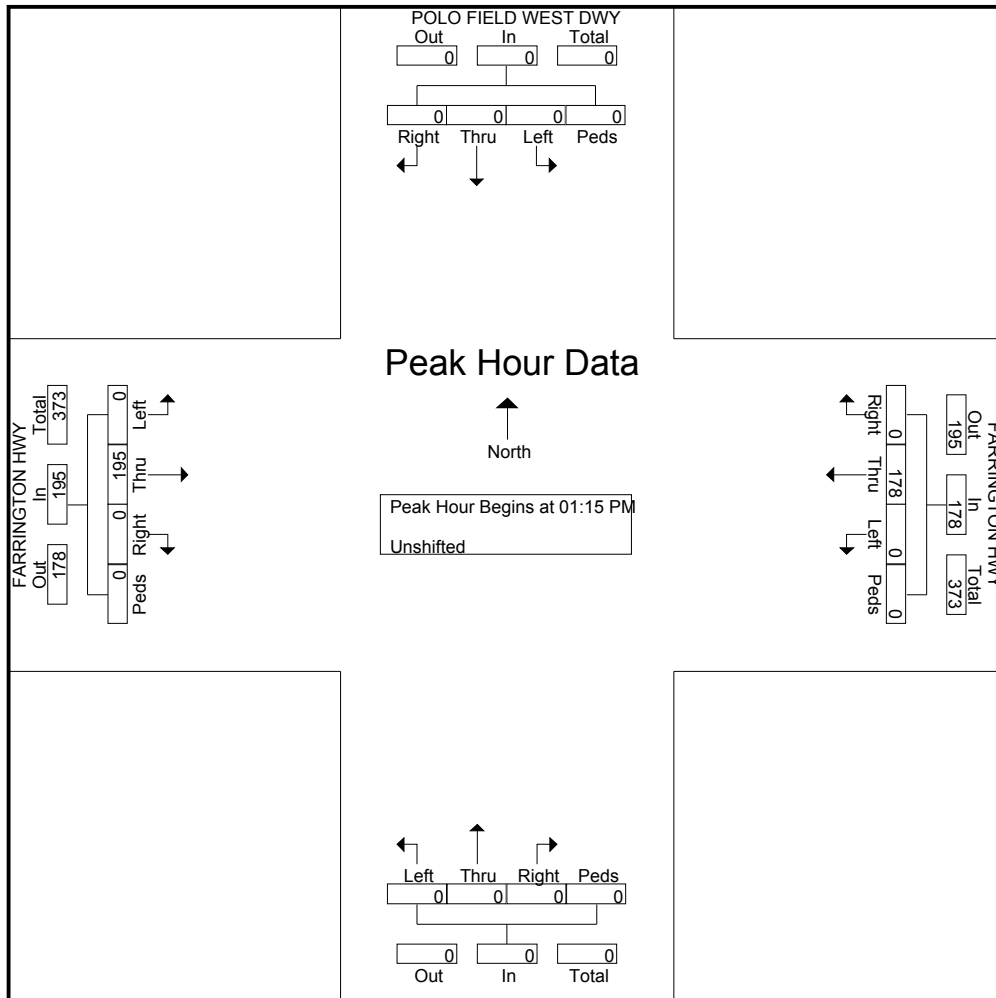
File Name : WE\_MD\_Polo Field West Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 2

Start Time	POLO FIELD WEST DWY Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 01:15 PM to 02:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 01:15 PM																					
01:15 PM	0	0	0	0	0	0	42	0	0	42	0	0	0	0	0	0	55	0	0	55	97
01:30 PM	0	0	0	0	0	0	52	0	0	52	0	0	0	0	0	0	38	0	0	38	90
01:45 PM	0	0	0	0	0	0	54	0	0	54	0	0	0	0	0	0	44	0	0	44	98
02:00 PM	0	0	0	0	0	0	30	0	0	30	0	0	0	0	0	0	58	0	0	58	88
Total Volume	0	0	0	0	0	0	178	0	0	178	0	0	0	0	0	0	195	0	0	195	373
% App. Total	0	0	0	0	0	0	100	0	0	100	0	0	0	0	0	0	100	0	0	100	
PHF	.000	.000	.000	.000	.000	.000	.824	.000	.000	.824	.000	.000	.000	.000	.000	.000	.841	.000	.000	.841	.952





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Site Code : 00000000

Start Date : 9/4/2016

Page No : 1

Groups Printed- Unshifted

Start Time	POLO FIELD WEST DWY Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
11:00 AM	0	0	1	0	0	51	0	0	0	0	0	0	0	50	0	0	102
11:15 AM	1	0	0	0	0	62	1	0	0	0	0	0	0	52	0	0	116
11:30 AM	1	0	0	0	0	58	1	0	0	0	0	0	0	41	0	0	101
11:45 AM	0	0	0	0	0	54	0	0	0	0	0	0	0	53	0	0	107
Total	2	0	1	0	0	225	2	0	0	0	0	0	0	196	0	0	426
12:00 PM	1	0	0	0	0	39	0	0	0	0	0	0	0	52	0	0	92
12:15 PM	0	0	0	0	0	41	0	0	0	0	0	0	0	38	0	0	79
12:30 PM	0	0	0	0	0	42	0	0	0	0	0	0	0	43	0	0	85
12:45 PM	0	0	0	0	0	51	0	0	0	0	0	0	0	28	0	0	79
Total	1	0	0	0	0	173	0	0	0	0	0	0	0	161	0	0	335
01:00 PM	0	0	0	0	0	49	0	0	0	0	0	0	0	42	0	0	91
01:15 PM	0	0	0	0	0	42	0	0	0	0	0	0	0	55	0	0	97
01:30 PM	0	0	0	0	0	52	0	0	0	0	0	0	0	38	0	0	90
01:45 PM	0	0	0	0	0	54	0	0	0	0	0	0	0	44	0	0	98
Total	0	0	0	0	0	197	0	0	0	0	0	0	0	179	0	0	376
02:00 PM	0	0	0	0	0	30	0	0	0	0	0	0	0	58	0	0	88
02:15 PM	0	0	0	0	0	35	0	0	0	0	0	0	0	54	0	0	89
Grand Total	3	0	1	0	0	660	2	0	0	0	0	0	0	648	0	0	1314
Approch %	75	0	25	0	0	99.7	0.3	0	0	0	0	0	0	100	0	0	
Total %	0.2	0	0.1	0	0	50.2	0.2	0	0	0	0	0	0	49.3	0	0	

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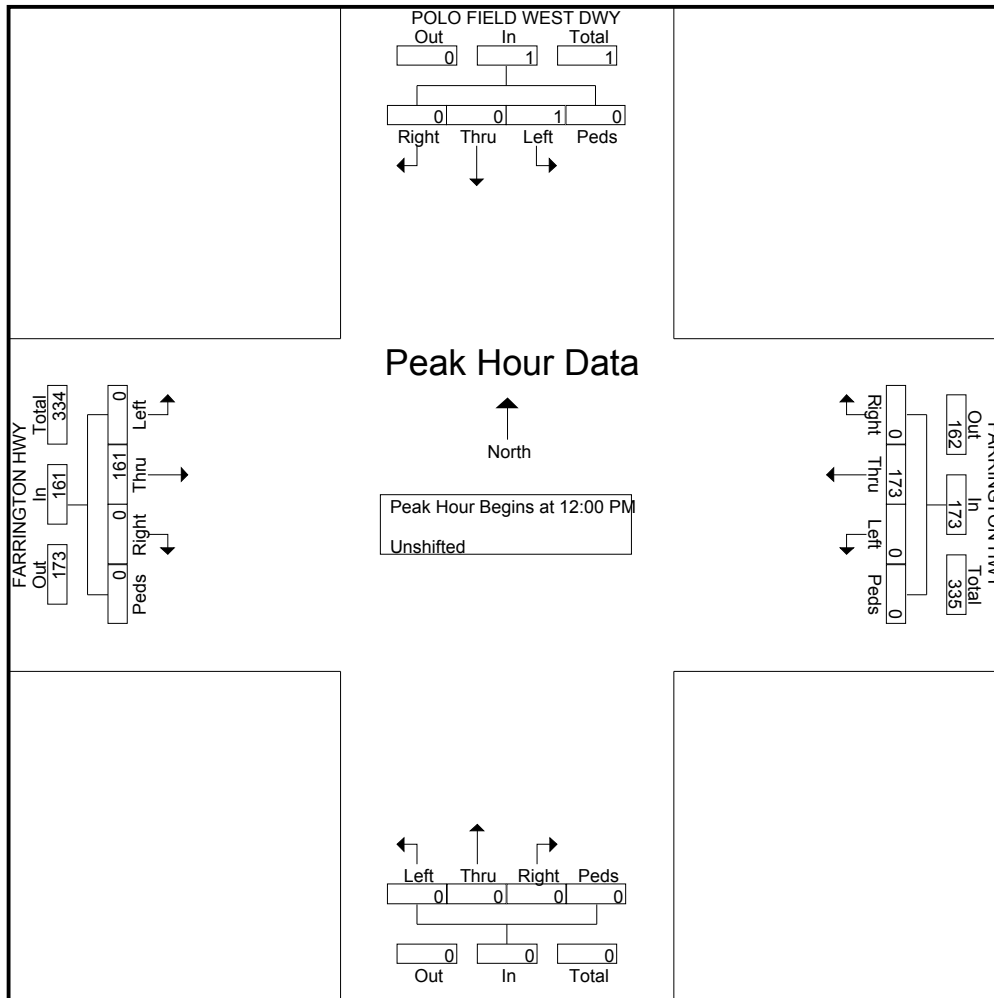
File Name : WE\_MD\_Polo Field West Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 2

Start Time	POLO FIELD WEST DWY Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 12:00 PM to 12:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 12:00 PM																					
12:00 PM	1	0	0	0	1	0	39	0	0	39	0	0	0	0	0	0	52	0	0	52	92
12:15 PM	0	0	0	0	0	0	41	0	0	41	0	0	0	0	0	0	38	0	0	38	79
12:30 PM	0	0	0	0	0	0	42	0	0	42	0	0	0	0	0	0	43	0	0	43	85
12:45 PM	0	0	0	0	0	0	51	0	0	51	0	0	0	0	0	0	28	0	0	28	79
Total Volume	1	0	0	0	1	0	173	0	0	173	0	0	0	0	0	0	161	0	0	161	335
% App. Total	100	0	0	0		0	100	0	0		0	0	0	0		0	100	0	0		
PHF	.250	.000	.000	.000	.250	.000	.848	.000	.000	.848	.000	.000	.000	.000	.000	.000	.774	.000	.000	.774	.910



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Site Code : 00000000

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Page No : 1

Groups Printed- Unshifted

Start Time	POLO FIELD WEST DWY Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
11:00 AM	0	0	1	0	0	51	0	0	0	0	0	0	0	50	0	0	102
11:15 AM	1	0	0	0	0	62	1	0	0	0	0	0	0	52	0	0	116
11:30 AM	1	0	0	0	0	58	1	0	0	0	0	0	0	41	0	0	101
11:45 AM	0	0	0	0	0	54	0	0	0	0	0	0	0	53	0	0	107
Total	2	0	1	0	0	225	2	0	0	0	0	0	0	196	0	0	426
12:00 PM	1	0	0	0	0	39	0	0	0	0	0	0	0	52	0	0	92
12:15 PM	0	0	0	0	0	41	0	0	0	0	0	0	0	38	0	0	79
12:30 PM	0	0	0	0	0	42	0	0	0	0	0	0	0	43	0	0	85
12:45 PM	0	0	0	0	0	51	0	0	0	0	0	0	0	28	0	0	79
Total	1	0	0	0	0	173	0	0	0	0	0	0	0	161	0	0	335
01:00 PM	0	0	0	0	0	49	0	0	0	0	0	0	0	42	0	0	91
01:15 PM	0	0	0	0	0	42	0	0	0	0	0	0	0	55	0	0	97
01:30 PM	0	0	0	0	0	52	0	0	0	0	0	0	0	38	0	0	90
01:45 PM	0	0	0	0	0	54	0	0	0	0	0	0	0	44	0	0	98
Total	0	0	0	0	0	197	0	0	0	0	0	0	0	179	0	0	376
02:00 PM	0	0	0	0	0	30	0	0	0	0	0	0	0	58	0	0	88
02:15 PM	0	0	0	0	0	35	0	0	0	0	0	0	0	54	0	0	89
Grand Total	3	0	1	0	0	660	2	0	0	0	0	0	0	648	0	0	1314
Approch %	75	0	25	0	0	99.7	0.3	0	0	0	0	0	0	100	0	0	
Total %	0.2	0	0.1	0	0	50.2	0.2	0	0	0	0	0	0	49.3	0	0	

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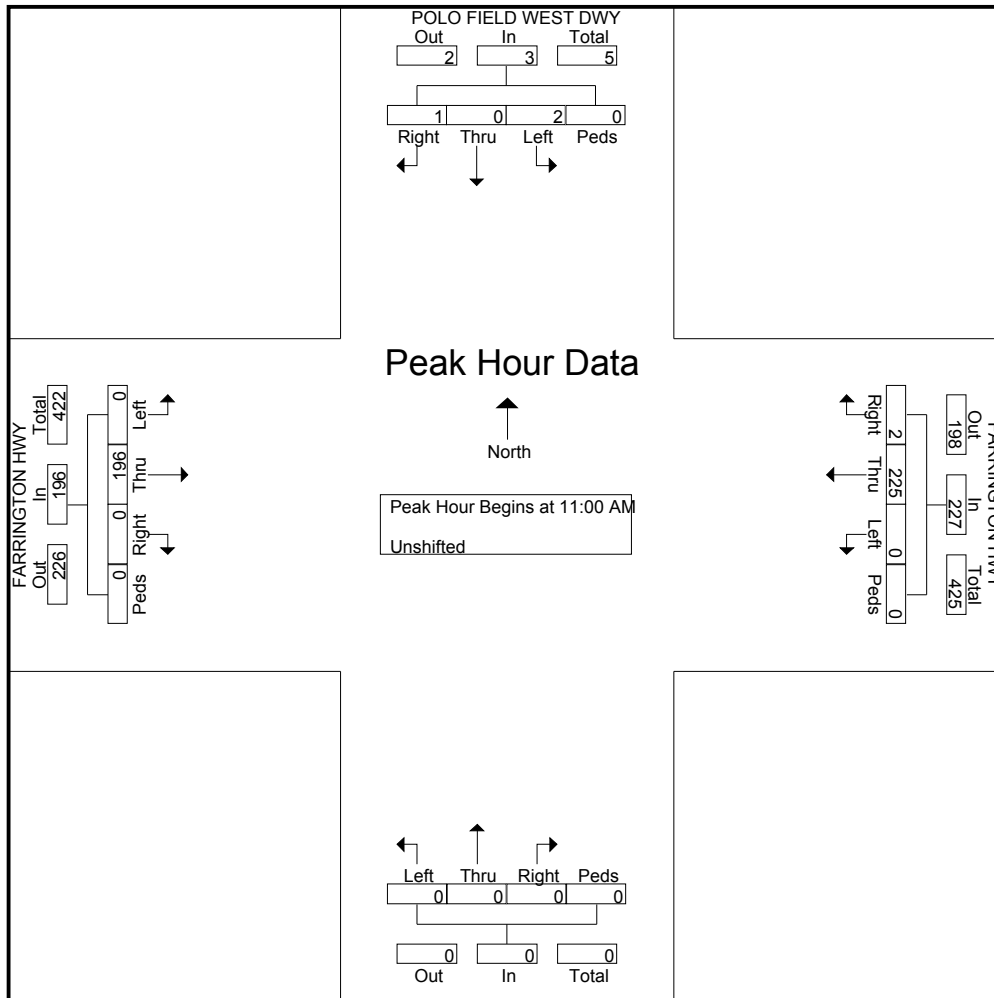
File Name : WE\_MD\_Polo Field West Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 2

Start Time	POLO FIELD WEST DWY Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 11:00 AM to 02:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 11:00 AM																					
11:00 AM	0	0	1	0	1	0	51	0	0	51	0	0	0	0	0	0	50	0	0	50	102
11:15 AM	1	0	0	0	1	0	62	1	0	63	0	0	0	0	0	0	52	0	0	52	116
11:30 AM	1	0	0	0	1	0	58	1	0	59	0	0	0	0	0	0	41	0	0	41	101
11:45 AM	0	0	0	0	0	0	54	0	0	54	0	0	0	0	0	0	53	0	0	53	107
Total Volume	2	0	1	0	3	0	225	2	0	227	0	0	0	0	0	0	196	0	0	196	426
% App. Total	66.7	0	33.3	0		0	99.1	0.9	0		0	0	0	0		0	100	0	0		
PHF	.500	.000	.250	.000	.750	.000	.907	.500	.000	.901	.000	.000	.000	.000	.000	.000	.925	.000	.000	.925	.918



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Groups Printed- Unshifted

Start Time	POLO FIELD EAST DWY Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
11:00 AM	0	0	0	0	0	53	10	0	0	0	0	0	1	48	0	0	112
11:15 AM	0	0	0	0	0	63	6	0	0	0	0	0	1	54	0	0	124
11:30 AM	0	0	0	0	0	57	9	0	0	0	0	0	2	42	0	0	110
11:45 AM	0	0	2	0	0	55	7	0	0	0	0	0	3	53	0	0	120
Total	0	0	2	0	0	228	32	0	0	0	0	0	7	197	0	0	466
12:00 PM	0	0	0	0	0	39	6	0	0	0	0	0	1	55	0	0	101
12:15 PM	2	0	2	0	0	47	16	0	0	0	0	0	3	44	0	0	114
12:30 PM	1	0	1	0	0	41	14	0	0	0	0	0	2	43	0	0	102
12:45 PM	0	0	1	0	0	51	9	0	0	0	0	0	0	29	0	0	90
Total	3	0	4	0	0	178	45	0	0	0	0	0	6	171	0	0	407
01:00 PM	0	0	0	0	0	51	10	0	0	0	0	0	3	44	0	0	108
01:15 PM	0	0	0	0	0	45	17	0	0	0	0	0	7	49	0	0	118
01:30 PM	0	0	2	0	0	51	17	0	0	0	0	0	2	37	0	0	109
01:45 PM	0	0	0	0	0	58	26	0	0	0	0	0	1	43	0	0	128
Total	0	0	2	0	0	205	70	0	0	0	0	0	13	173	0	0	463
02:00 PM	0	0	1	0	0	34	26	0	0	0	0	0	1	56	0	0	118
02:15 PM	2	0	2	0	0	34	14	0	0	0	0	0	2	52	0	0	106
Grand Total	5	0	11	0	0	679	187	0	0	0	0	0	29	649	0	0	1560
Approch %	31.2	0	68.8	0	0	78.4	21.6	0	0	0	0	0	4.3	95.7	0	0	
Total %	0.3	0	0.7	0	0	43.5	12	0	0	0	0	0	1.9	41.6	0	0	

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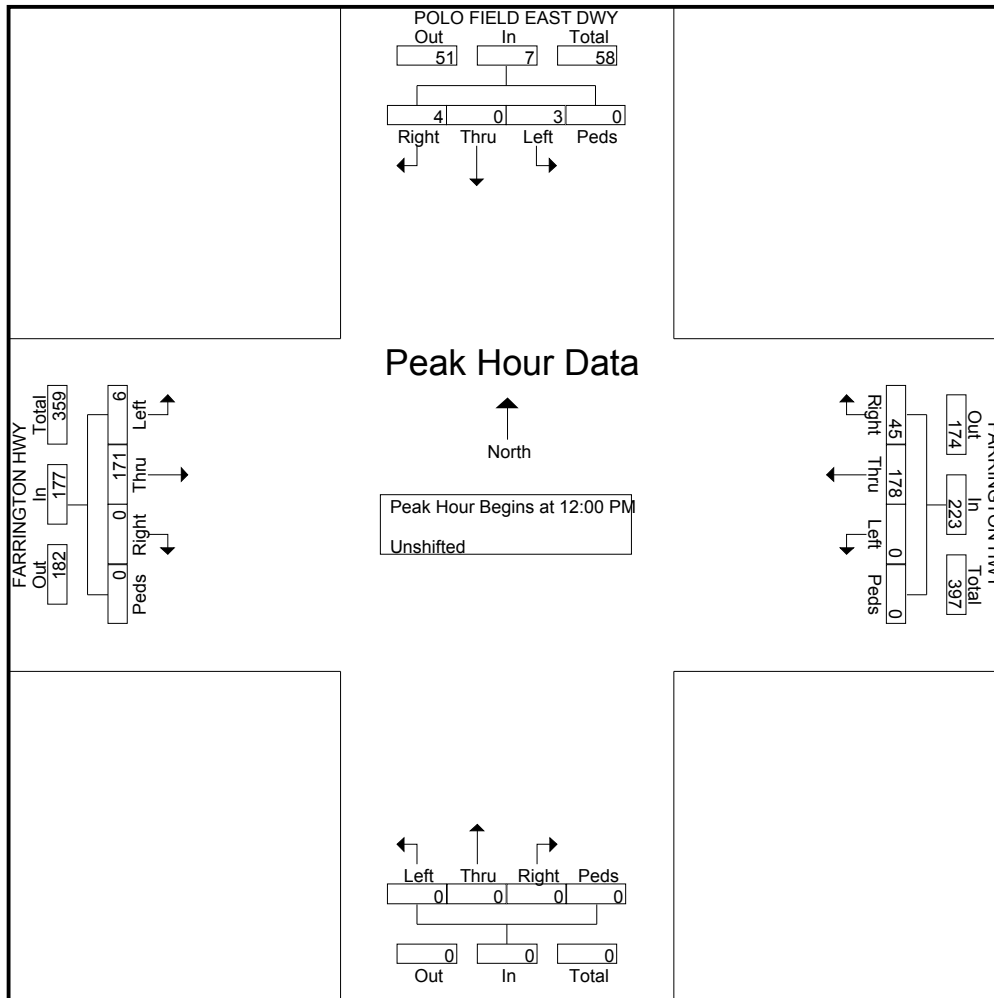
File Name : WE\_MD\_Polo Field East Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 2

Start Time	POLO FIELD EAST DWY Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 12:00 PM to 12:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 12:00 PM																					
12:00 PM	0	0	0	0	0	0	39	6	0	45	0	0	0	0	0	1	55	0	0	56	101
12:15 PM	2	0	2	0	4	0	47	16	0	63	0	0	0	0	0	3	44	0	0	47	114
12:30 PM	1	0	1	0	2	0	41	14	0	55	0	0	0	0	0	2	43	0	0	45	102
12:45 PM	0	0	1	0	1	0	51	9	0	60	0	0	0	0	0	0	29	0	0	29	90
Total Volume	3	0	4	0	7	0	178	45	0	223	0	0	0	0	0	6	171	0	0	177	407
% App. Total	42.9	0	57.1	0		0	79.8	20.2	0		0	0	0	0		3.4	96.6	0	0		
PHF	.375	.000	.500	.000	.438	.000	.873	.703	.000	.885	.000	.000	.000	.000	.000	.500	.777	.000	.000	.790	.893



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Site Code : 00000000

Start Date : 9/4/2016

Page No : 1

Groups Printed- Unshifted

Start Time	POLO FIELD EAST DWY Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
11:00 AM	0	0	0	0	0	53	10	0	0	0	0	0	1	48	0	0	112
11:15 AM	0	0	0	0	0	63	6	0	0	0	0	0	1	54	0	0	124
11:30 AM	0	0	0	0	0	57	9	0	0	0	0	0	2	42	0	0	110
11:45 AM	0	0	2	0	0	55	7	0	0	0	0	0	3	53	0	0	120
Total	0	0	2	0	0	228	32	0	0	0	0	0	7	197	0	0	466
12:00 PM	0	0	0	0	0	39	6	0	0	0	0	0	1	55	0	0	101
12:15 PM	2	0	2	0	0	47	16	0	0	0	0	0	3	44	0	0	114
12:30 PM	1	0	1	0	0	41	14	0	0	0	0	0	2	43	0	0	102
12:45 PM	0	0	1	0	0	51	9	0	0	0	0	0	0	29	0	0	90
Total	3	0	4	0	0	178	45	0	0	0	0	0	6	171	0	0	407
01:00 PM	0	0	0	0	0	51	10	0	0	0	0	0	3	44	0	0	108
01:15 PM	0	0	0	0	0	45	17	0	0	0	0	0	7	49	0	0	118
01:30 PM	0	0	2	0	0	51	17	0	0	0	0	0	2	37	0	0	109
01:45 PM	0	0	0	0	0	58	26	0	0	0	0	0	1	43	0	0	128
Total	0	0	2	0	0	205	70	0	0	0	0	0	13	173	0	0	463
02:00 PM	0	0	1	0	0	34	26	0	0	0	0	0	1	56	0	0	118
02:15 PM	2	0	2	0	0	34	14	0	0	0	0	0	2	52	0	0	106
Grand Total	5	0	11	0	0	679	187	0	0	0	0	0	29	649	0	0	1560
Approch %	31.2	0	68.8	0	0	78.4	21.6	0	0	0	0	0	4.3	95.7	0	0	
Total %	0.3	0	0.7	0	0	43.5	12	0	0	0	0	0	1.9	41.6	0	0	

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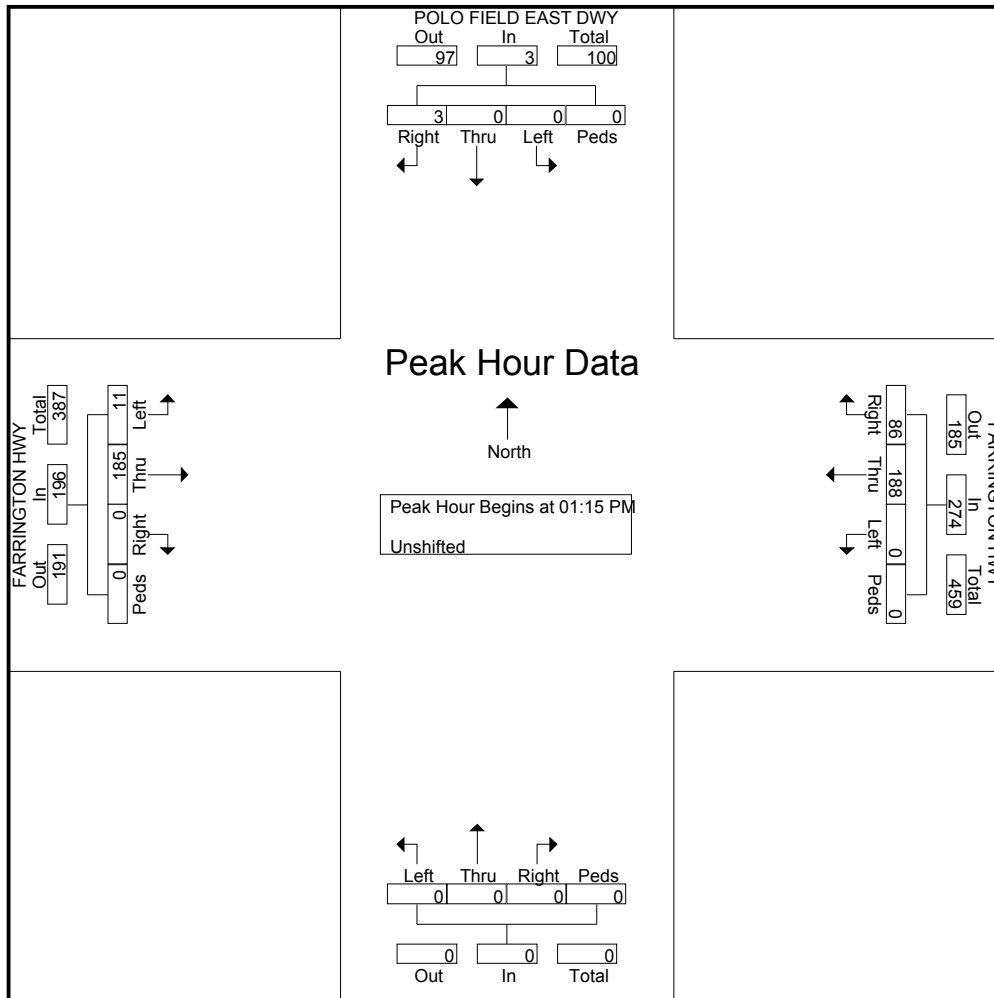
File Name : WE\_MD\_Polo Field East Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 2

Start Time	POLO FIELD EAST DWY Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 11:00 AM to 02:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 01:15 PM																					
01:15 PM	0	0	0	0	0	0	45	17	0	62	0	0	0	0	0	7	49	0	0	56	118
01:30 PM	0	0	2	0	2	0	51	17	0	68	0	0	0	0	0	2	37	0	0	39	109
01:45 PM	0	0	0	0	0	0	58	26	0	84	0	0	0	0	0	1	43	0	0	44	128
02:00 PM	0	0	1	0	1	0	34	26	0	60	0	0	0	0	0	1	56	0	0	57	118
Total Volume	0	0	3	0	3	0	188	86	0	274	0	0	0	0	0	11	185	0	0	196	473
% App. Total	0	0	100	0		0	68.6	31.4	0		0	0	0	0		5.6	94.4	0	0		
PHF	.000	.000	.375	.000	.375	.000	.810	.827	.000	.815	.000	.000	.000	.000	.000	.393	.826	.000	.000	.860	.924





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File Name : WE\_MD\_Goodale Ave - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 1

Groups Printed- Unshifted

Start Time	GOODALE AVE Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
11:00 AM	45	0	22	0	0	78	25	0	0	0	0	0	18	38	0	0	226
11:15 AM	28	0	14	0	0	65	32	0	0	0	0	0	16	54	0	0	209
11:30 AM	27	0	16	0	0	65	27	0	0	0	0	0	29	51	0	0	215
11:45 AM	25	0	19	1	0	65	21	0	0	0	0	0	22	66	0	0	219
Total	125	0	71	1	0	273	105	0	0	0	0	0	85	209	0	0	869
12:00 PM	28	0	21	0	0	62	41	0	0	0	0	0	29	73	0	0	254
12:15 PM	23	0	30	0	0	55	38	0	0	0	0	0	21	49	0	0	216
12:30 PM	29	0	12	0	0	69	41	0	0	0	0	0	25	48	0	0	224
12:45 PM	24	0	21	0	0	56	29	0	0	0	0	0	15	41	0	0	186
Total	104	0	84	0	0	242	149	0	0	0	0	0	90	211	0	0	880
01:00 PM	22	0	29	0	0	50	32	0	0	0	0	0	17	42	0	0	192
01:15 PM	27	0	33	0	0	81	37	0	0	0	0	0	22	42	0	0	242
01:30 PM	27	0	21	0	0	63	22	0	0	0	0	0	21	52	0	0	206
01:45 PM	23	0	21	0	0	76	40	0	0	0	0	0	19	47	0	0	226
Total	99	0	104	0	0	270	131	0	0	0	0	0	79	183	0	0	866
02:00 PM	29	0	17	0	0	64	35	0	0	0	0	0	21	52	0	0	218
02:15 PM	20	0	19	0	0	66	38	0	0	0	0	0	27	47	0	0	217
Grand Total	377	0	295	1	0	915	458	0	0	0	0	0	302	702	0	0	3050
Approch %	56	0	43.8	0.1	0	66.6	33.4	0	0	0	0	0	30.1	69.9	0	0	
Total %	12.4	0	9.7	0	0	30	15	0	0	0	0	0	9.9	23	0	0	

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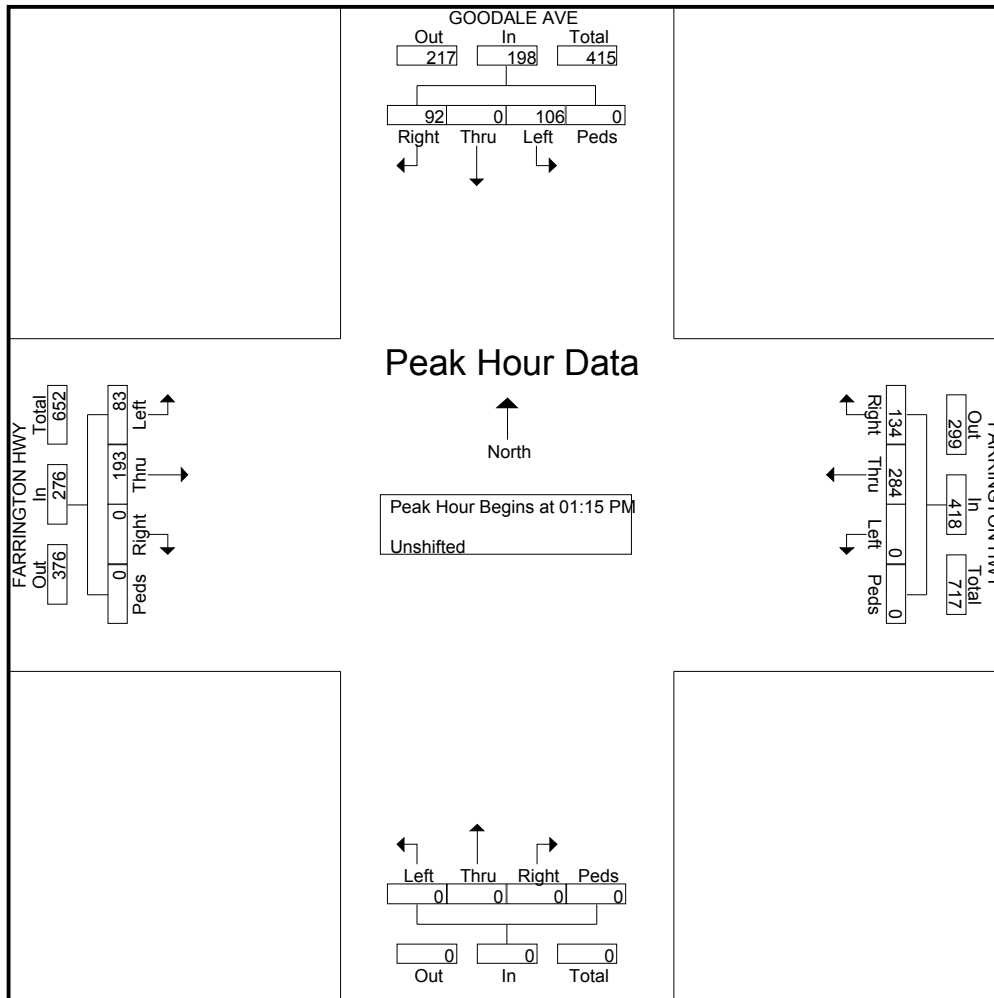
File Name : WE\_MD\_Goodale Ave - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 2

Start Time	GOODALE AVE Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 01:15 PM to 02:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 01:15 PM																					
01:15 PM	27	0	33	0	60	0	81	37	0	118	0	0	0	0	0	22	42	0	0	64	242
01:30 PM	27	0	21	0	48	0	63	22	0	85	0	0	0	0	0	21	52	0	0	73	206
01:45 PM	23	0	21	0	44	0	76	40	0	116	0	0	0	0	0	19	47	0	0	66	226
02:00 PM	29	0	17	0	46	0	64	35	0	99	0	0	0	0	0	21	52	0	0	73	218
Total Volume	106	0	92	0	198	0	284	134	0	418	0	0	0	0	0	83	193	0	0	276	892
% App. Total	53.5	0	46.5	0		0	67.9	32.1	0		0	0	0	0		30.1	69.9	0	0		
PHF	.914	.000	.697	.000	.825	.000	.877	.838	.000	.886	.000	.000	.000	.000	.000	.943	.928	.000	.000	.945	.921



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Site Code : 00000000

Start Date : 9/4/2016

Page No : 1

Groups Printed- Unshifted

Start Time	GOODALE AVE Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
11:00 AM	45	0	22	0	0	78	25	0	0	0	0	0	18	38	0	0	226
11:15 AM	28	0	14	0	0	65	32	0	0	0	0	0	16	54	0	0	209
11:30 AM	27	0	16	0	0	65	27	0	0	0	0	0	29	51	0	0	215
11:45 AM	25	0	19	1	0	65	21	0	0	0	0	0	22	66	0	0	219
Total	125	0	71	1	0	273	105	0	0	0	0	0	85	209	0	0	869
12:00 PM	28	0	21	0	0	62	41	0	0	0	0	0	29	73	0	0	254
12:15 PM	23	0	30	0	0	55	38	0	0	0	0	0	21	49	0	0	216
12:30 PM	29	0	12	0	0	69	41	0	0	0	0	0	25	48	0	0	224
12:45 PM	24	0	21	0	0	56	29	0	0	0	0	0	15	41	0	0	186
Total	104	0	84	0	0	242	149	0	0	0	0	0	90	211	0	0	880
01:00 PM	22	0	29	0	0	50	32	0	0	0	0	0	17	42	0	0	192
01:15 PM	27	0	33	0	0	81	37	0	0	0	0	0	22	42	0	0	242
01:30 PM	27	0	21	0	0	63	22	0	0	0	0	0	21	52	0	0	206
01:45 PM	23	0	21	0	0	76	40	0	0	0	0	0	19	47	0	0	226
Total	99	0	104	0	0	270	131	0	0	0	0	0	79	183	0	0	866
02:00 PM	29	0	17	0	0	64	35	0	0	0	0	0	21	52	0	0	218
02:15 PM	20	0	19	0	0	66	38	0	0	0	0	0	27	47	0	0	217
Grand Total	377	0	295	1	0	915	458	0	0	0	0	0	302	702	0	0	3050
Approch %	56	0	43.8	0.1	0	66.6	33.4	0	0	0	0	0	30.1	69.9	0	0	
Total %	12.4	0	9.7	0	0	30	15	0	0	0	0	0	9.9	23	0	0	

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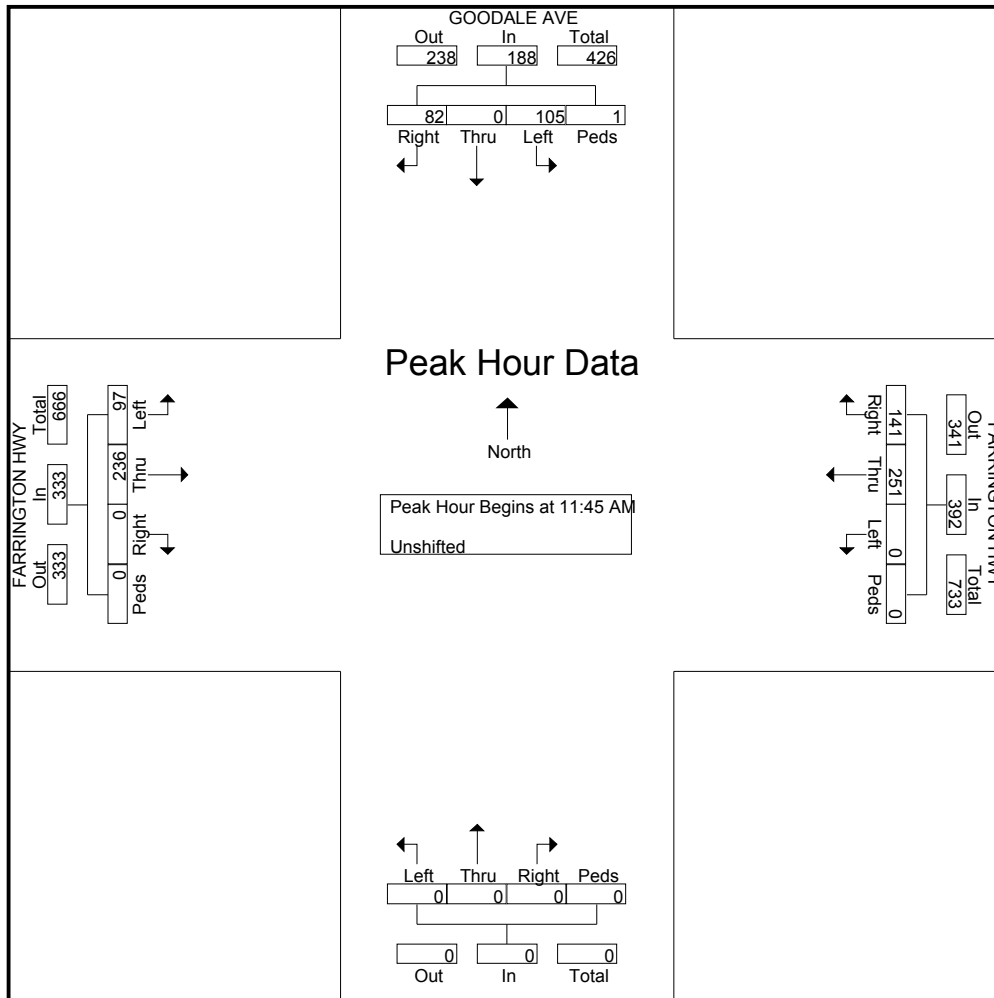
File Name : WE\_MD\_Goodale Ave - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 2

Start Time	GOODALE AVE Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 11:00 AM to 02:15 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 11:45 AM																					
11:45 AM	25	0	19	1	45	0	65	21	0	86	0	0	0	0	0	22	66	0	0	88	219
12:00 PM	28	0	21	0	49	0	62	41	0	103	0	0	0	0	0	29	73	0	0	102	254
12:15 PM	23	0	30	0	53	0	55	38	0	93	0	0	0	0	0	21	49	0	0	70	216
12:30 PM	29	0	12	0	41	0	69	41	0	110	0	0	0	0	0	25	48	0	0	73	224
Total Volume	105	0	82	1	188	0	251	141	0	392	0	0	0	0	0	97	236	0	0	333	913
% App. Total	55.9	0	43.6	0.5		0	64	36	0		0	0	0	0		29.1	70.9	0	0		
PHF	.905	.000	.683	.250	.887	.000	.909	.860	.000	.891	.000	.000	.000	.000	.000	.836	.808	.000	.000	.816	.899



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File Name : WE\_MD\_Dillingham Ranch West Dwy - Farrington Hwy  
Site Code : 00000000  
Start Date : 9/4/2016  
Page No : 1

Groups Printed- Unshifted

Start Time	Southbound				FARRINGTON HWY Westbound				DILLINGHAM RANCH WEST DWY Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
11:00 AM	0	0	0	0	3	50	0	0	1	0	1	0	0	48	2	0	105
11:15 AM	0	0	0	0	0	63	0	0	0	0	2	0	0	53	0	0	118
11:30 AM	0	0	0	0	0	57	0	0	2	0	3	0	0	41	1	0	104
11:45 AM	0	0	0	0	3	54	0	0	0	0	4	0	0	52	1	0	114
Total	0	0	0	0	6	224	0	0	3	0	10	0	0	194	4	0	441
12:00 PM	0	0	0	0	0	39	0	0	0	0	4	0	0	52	1	0	96
12:15 PM	0	0	0	0	8	41	0	0	0	0	9	0	0	38	0	0	96
12:30 PM	0	0	0	0	0	42	0	0	0	0	2	0	0	43	0	0	87
12:45 PM	0	0	0	0	2	50	0	0	1	0	1	0	0	28	0	0	82
Total	0	0	0	0	10	172	0	0	1	0	16	0	0	161	1	0	361
01:00 PM	0	0	0	0	2	49	0	0	0	0	5	0	0	42	0	0	98
01:15 PM	0	0	0	0	3	42	0	0	0	0	1	0	0	55	0	0	101
01:30 PM	0	0	0	0	1	52	0	0	0	0	2	0	0	37	1	0	93
01:45 PM	0	0	0	0	4	54	0	0	0	0	0	0	0	44	0	0	102
Total	0	0	0	0	10	197	0	0	0	0	8	0	0	178	1	0	394
02:00 PM	0	0	0	0	5	30	0	0	0	0	0	0	0	57	1	0	93
02:15 PM	0	0	0	0	1	35	0	0	0	0	0	0	0	54	0	0	90
Grand Total	0	0	0	0	32	658	0	0	4	0	34	0	0	644	7	0	1379
Apprch %	0	0	0	0	4.6	95.4	0	0	10.5	0	89.5	0	0	98.9	1.1	0	
Total %	0	0	0	0	2.3	47.7	0	0	0.3	0	2.5	0	0	46.7	0.5	0	

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Site Code : 00000000

Start Date : 9/4/2016

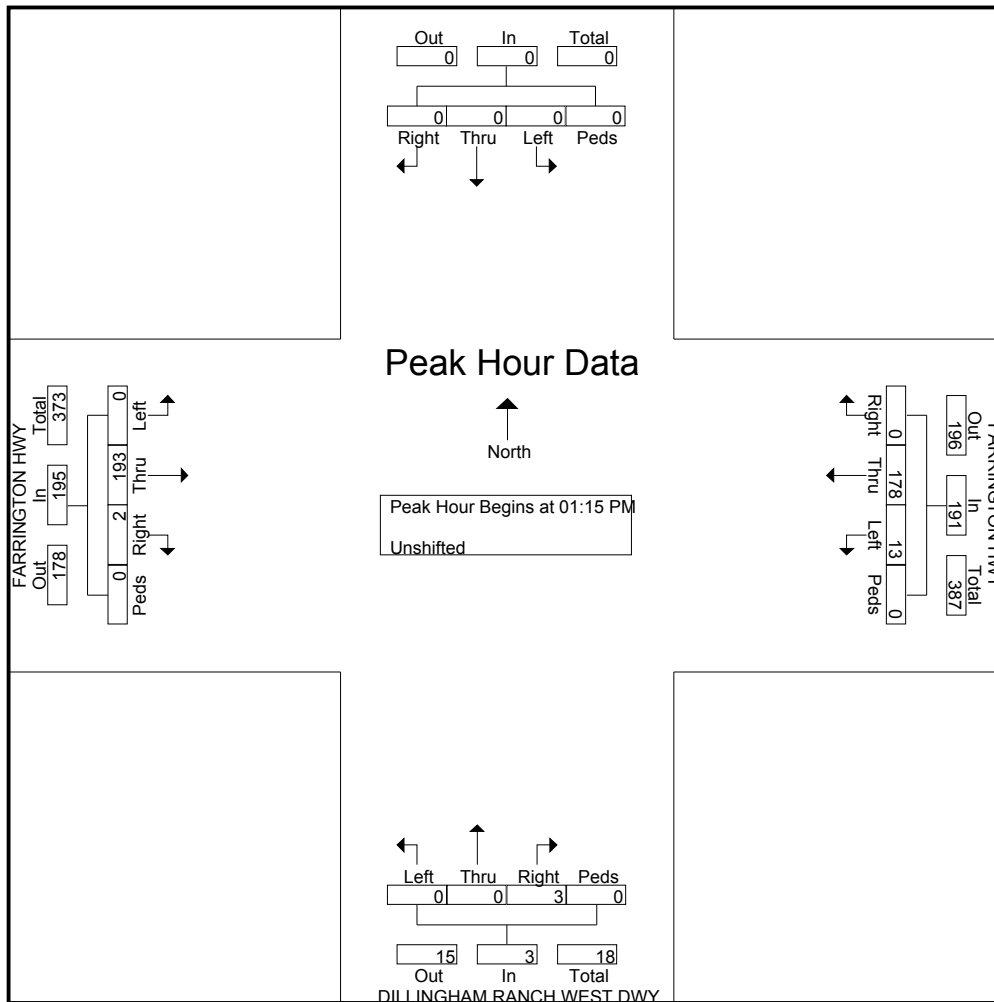
Page No : 2

Start Time	Southbound					FARRINGTON HWY Westbound					DILLINGHAM RANCH WEST DWY Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	

Peak Hour Analysis From 01:15 PM to 02:00 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 01:15 PM

01:15 PM	0	0	0	0	0	3	42	0	0	45	0	0	1	0	1	0	55	0	0	55	101
01:30 PM	0	0	0	0	0	1	52	0	0	53	0	0	2	0	2	0	37	1	0	38	93
01:45 PM	0	0	0	0	0	4	54	0	0	58	0	0	0	0	0	0	44	0	0	44	102
02:00 PM	0	0	0	0	0	5	30	0	0	35	0	0	0	0	0	0	57	1	0	58	93
Total Volume	0	0	0	0	0	13	178	0	0	191	0	0	3	0	3	0	193	2	0	195	389
% App. Total	0	0	0	0	0	6.8	93.2	0	0		0	0	100	0		0	99	1	0		
PHF	.000	.000	.000	.000	.000	.650	.824	.000	.000	.823	.000	.000	.375	.000	.375	.000	.846	.500	.000	.841	.953



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Page No : 1

Groups Printed- Unshifted

Start Time	Southbound				FARRINGTON HWY Westbound				DILLINGHAM RANCH WEST DWY Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
11:00 AM	0	0	0	0	3	50	0	0	1	0	1	0	0	48	2	0	105
11:15 AM	0	0	0	0	0	63	0	0	0	0	2	0	0	53	0	0	118
11:30 AM	0	0	0	0	0	57	0	0	2	0	3	0	0	41	1	0	104
11:45 AM	0	0	0	0	3	54	0	0	0	0	4	0	0	52	1	0	114
Total	0	0	0	0	6	224	0	0	3	0	10	0	0	194	4	0	441
12:00 PM	0	0	0	0	0	39	0	0	0	0	4	0	0	52	1	0	96
12:15 PM	0	0	0	0	8	41	0	0	0	0	9	0	0	38	0	0	96
12:30 PM	0	0	0	0	0	42	0	0	0	0	2	0	0	43	0	0	87
12:45 PM	0	0	0	0	2	50	0	0	1	0	1	0	0	28	0	0	82
Total	0	0	0	0	10	172	0	0	1	0	16	0	0	161	1	0	361
01:00 PM	0	0	0	0	2	49	0	0	0	0	5	0	0	42	0	0	98
01:15 PM	0	0	0	0	3	42	0	0	0	0	1	0	0	55	0	0	101
01:30 PM	0	0	0	0	1	52	0	0	0	0	2	0	0	37	1	0	93
01:45 PM	0	0	0	0	4	54	0	0	0	0	0	0	0	44	0	0	102
Total	0	0	0	0	10	197	0	0	0	0	8	0	0	178	1	0	394
02:00 PM	0	0	0	0	5	30	0	0	0	0	0	0	0	57	1	0	93
02:15 PM	0	0	0	0	1	35	0	0	0	0	0	0	0	54	0	0	90
Grand Total	0	0	0	0	32	658	0	0	4	0	34	0	0	644	7	0	1379
Apprch %	0	0	0	0	4.6	95.4	0	0	10.5	0	89.5	0	0	98.9	1.1	0	
Total %	0	0	0	0	2.3	47.7	0	0	0.3	0	2.5	0	0	46.7	0.5	0	

# Austin Tsutsumi & Associates

501 Sumner Street, Suite 521  
Honolulu, HI 96817-5031

*Phone: (808) 533-3646 Fax: (808) 526-1267*

File Name : WE\_MD\_Dillingham Ranch West Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

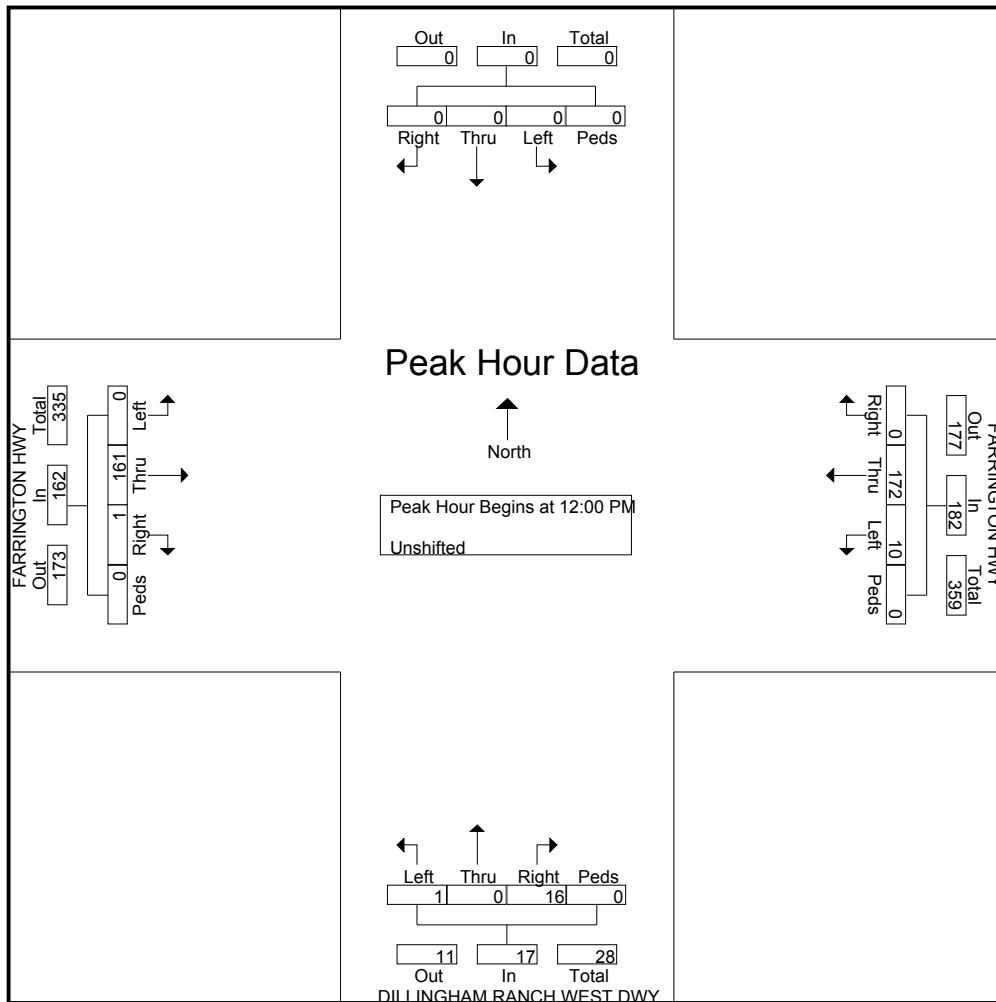
Page No : 2

Start Time	Southbound					FARRINGTON HWY Westbound					DILLINGHAM RANCH WEST DWY Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	

Peak Hour Analysis From 12:00 PM to 12:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 12:00 PM

12:00 PM	0	0	0	0	0	0	39	0	0	39	0	0	4	0	4	0	52	1	0	53	96
12:15 PM	0	0	0	0	0	8	41	0	0	49	0	0	9	0	9	0	38	0	0	38	96
12:30 PM	0	0	0	0	0	0	42	0	0	42	0	0	2	0	2	0	43	0	0	43	87
12:45 PM	0	0	0	0	0	2	50	0	0	52	1	0	1	0	2	0	28	0	0	28	82
Total Volume	0	0	0	0	0	10	172	0	0	182	1	0	16	0	17	0	161	1	0	162	361
% App. Total	0	0	0	0	0	5.5	94.5	0	0		5.9	0	94.1	0		0	99.4	0.6	0		
PHF	.000	.000	.000	.000	.000	.313	.860	.000	.000	.875	.250	.000	.444	.000	.472	.000	.774	.250	.000	.764	.940





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File Name : WE\_MD\_Dillingham Ranch West Dwy - Farrington Hwy  
Site Code : 00000000  
Start Date : 9/4/2016  
Page No : 1

Groups Printed- Unshifted

Start Time	Southbound				FARRINGTON HWY Westbound				DILLINGHAM RANCH WEST DWY Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
11:00 AM	0	0	0	0	3	50	0	0	1	0	1	0	0	48	2	0	105
11:15 AM	0	0	0	0	0	63	0	0	0	0	2	0	0	53	0	0	118
11:30 AM	0	0	0	0	0	57	0	0	2	0	3	0	0	41	1	0	104
11:45 AM	0	0	0	0	3	54	0	0	0	0	4	0	0	52	1	0	114
Total	0	0	0	0	6	224	0	0	3	0	10	0	0	194	4	0	441
12:00 PM	0	0	0	0	0	39	0	0	0	0	4	0	0	52	1	0	96
12:15 PM	0	0	0	0	8	41	0	0	0	0	9	0	0	38	0	0	96
12:30 PM	0	0	0	0	0	42	0	0	0	0	2	0	0	43	0	0	87
12:45 PM	0	0	0	0	2	50	0	0	1	0	1	0	0	28	0	0	82
Total	0	0	0	0	10	172	0	0	1	0	16	0	0	161	1	0	361
01:00 PM	0	0	0	0	2	49	0	0	0	0	5	0	0	42	0	0	98
01:15 PM	0	0	0	0	3	42	0	0	0	0	1	0	0	55	0	0	101
01:30 PM	0	0	0	0	1	52	0	0	0	0	2	0	0	37	1	0	93
01:45 PM	0	0	0	0	4	54	0	0	0	0	0	0	0	44	0	0	102
Total	0	0	0	0	10	197	0	0	0	0	8	0	0	178	1	0	394
02:00 PM	0	0	0	0	5	30	0	0	0	0	0	0	0	57	1	0	93
02:15 PM	0	0	0	0	1	35	0	0	0	0	0	0	0	54	0	0	90
Grand Total	0	0	0	0	32	658	0	0	4	0	34	0	0	644	7	0	1379
Apprch %	0	0	0	0	4.6	95.4	0	0	10.5	0	89.5	0	0	98.9	1.1	0	
Total %	0	0	0	0	2.3	47.7	0	0	0.3	0	2.5	0	0	46.7	0.5	0	

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Site Code : 00000000

Start Date : 9/4/2016

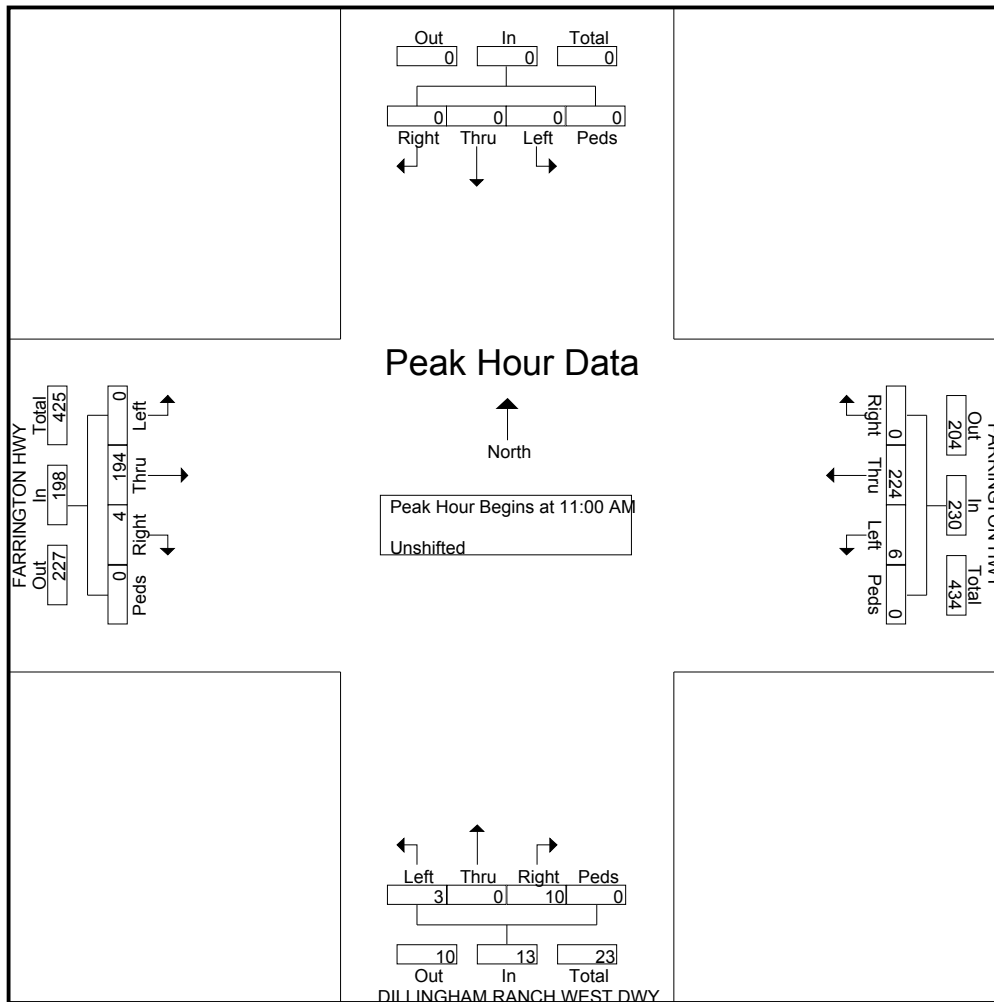
Page No : 2

Start Time	Southbound					FARRINGTON HWY Westbound					DILLINGHAM RANCH WEST DWY Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	

Peak Hour Analysis From 11:00 AM to 02:15 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 11:00 AM

11:00 AM	0	0	0	0	0	3	50	0	0	53	1	0	1	0	2	0	48	2	0	50	105
11:15 AM	0	0	0	0	0	0	63	0	0	63	0	0	2	0	2	0	53	0	0	53	118
11:30 AM	0	0	0	0	0	0	57	0	0	57	2	0	3	0	5	0	41	1	0	42	104
11:45 AM	0	0	0	0	0	3	54	0	0	57	0	0	4	0	4	0	52	1	0	53	114
Total Volume	0	0	0	0	0	6	224	0	0	230	3	0	10	0	13	0	194	4	0	198	441
% App. Total	0	0	0	0	0	2.6	97.4	0	0		23.1	0	76.9	0		0	98	2	0		
PHF	.000	.000	.000	.000	.000	.500	.889	.000	.000	.913	.375	.000	.625	.000	.650	.000	.915	.500	.000	.934	.934



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Site Code : 00000000

Start Date : 9/4/2016

Page No : 1

Groups Printed- Unshifted

Start Time	Southbound				FARRINGTON HWY Westbound				DILLINGHAM RANCH EAST DWY Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
10:45 AM	1	0	0	0	3	48	0	0	0	0	0	0	0	20	1	0	73
Total	1	0	0	0	3	48	0	0	0	0	0	0	0	20	1	0	73
11:00 AM	0	0	0	0	1	64	0	0	1	0	4	0	0	49	1	0	120
11:15 AM	0	0	0	0	4	78	0	0	0	0	2	1	0	56	0	0	141
11:30 AM	0	0	0	0	0	69	0	0	1	0	0	0	1	44	0	0	115
11:45 AM	0	0	0	0	0	59	1	0	0	0	1	0	0	55	0	0	116
Total	0	0	0	0	5	270	1	0	2	0	7	1	1	204	1	0	492
12:00 PM	0	0	1	0	0	47	0	0	1	0	0	0	1	57	0	0	107
12:15 PM	0	0	1	0	2	67	0	0	0	0	1	0	0	56	0	0	127
12:30 PM	0	0	0	0	1	60	0	0	0	0	0	0	0	58	0	0	119
12:45 PM	0	0	0	0	1	54	0	0	0	0	0	0	0	32	0	0	87
Total	0	0	2	0	4	228	0	0	1	0	1	0	1	203	0	0	440
01:00 PM	0	0	0	0	1	60	0	0	0	0	1	0	0	42	1	0	105
01:15 PM	0	0	0	0	1	61	0	0	0	0	1	0	0	50	1	0	114
01:30 PM	0	0	0	0	2	80	0	0	1	0	2	0	0	42	3	0	130
01:45 PM	0	0	0	0	1	88	0	0	1	0	0	0	0	42	1	0	133
Total	0	0	0	0	5	289	0	0	2	0	4	0	0	176	6	0	482
02:00 PM	0	0	0	0	1	63	0	0	0	0	3	0	1	51	1	0	120
02:15 PM	0	0	0	0	2	53	0	0	0	0	1	0	0	54	3	0	113
Grand Total	1	0	2	0	20	951	1	0	5	0	16	1	3	708	12	0	1720
Apprch %	33.3	0	66.7	0	2.1	97.8	0.1	0	22.7	0	72.7	4.5	0.4	97.9	1.7	0	
Total %	0.1	0	0.1	0	1.2	55.3	0.1	0	0.3	0	0.9	0.1	0.2	41.2	0.7	0	

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File Name : WE\_MD\_Dillingham Ranch East Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

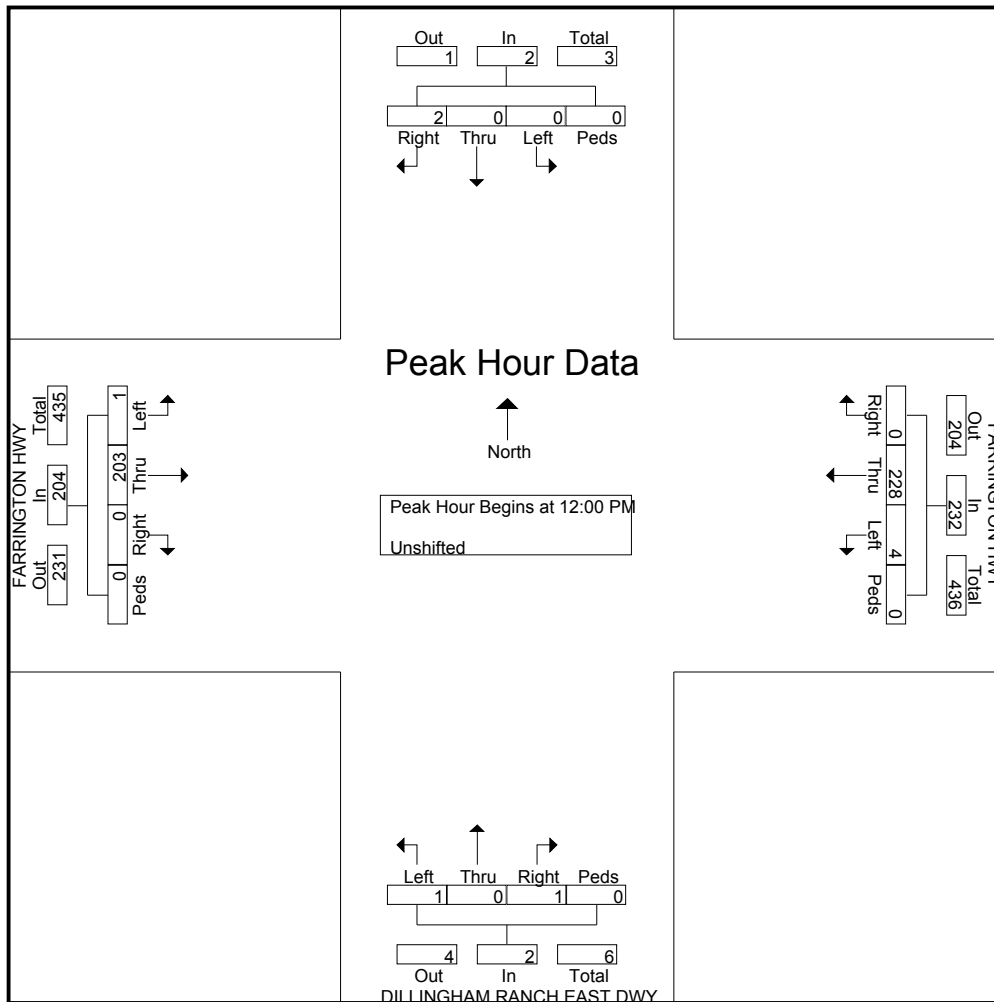
Page No : 2

Start Time	Southbound					FARRINGTON HWY Westbound					DILLINGHAM RANCH EAST DWY Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	

Peak Hour Analysis From 12:00 PM to 12:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 12:00 PM

12:00 PM	0	0	1	0	1	0	47	0	0	47	1	0	0	0	1	1	57	0	0	58	107
12:15 PM	0	0	1	0	1	2	67	0	0	69	0	0	1	0	1	0	56	0	0	56	127
12:30 PM	0	0	0	0	0	1	60	0	0	61	0	0	0	0	0	0	58	0	0	58	119
12:45 PM	0	0	0	0	0	1	54	0	0	55	0	0	0	0	0	0	32	0	0	32	87
Total Volume	0	0	2	0	2	4	228	0	0	232	1	0	1	0	2	1	203	0	0	204	440
% App. Total	0	0	100	0		1.7	98.3	0	0		50	0	50	0		0.5	99.5	0	0		
PHF	.000	.000	.500	.000	.500	.500	.851	.000	.000	.841	.250	.000	.250	.000	.500	.250	.875	.000	.000	.879	.866



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File Name : WE\_MD\_Dillingham Ranch East Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 1

Groups Printed- Unshifted

Start Time	Southbound				FARRINGTON HWY Westbound				DILLINGHAM RANCH EAST DWY Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
10:45 AM	1	0	0	0	3	48	0	0	0	0	0	0	0	20	1	0	73
Total	1	0	0	0	3	48	0	0	0	0	0	0	0	20	1	0	73
11:00 AM	0	0	0	0	1	64	0	0	1	0	4	0	0	49	1	0	120
11:15 AM	0	0	0	0	4	78	0	0	0	0	2	1	0	56	0	0	141
11:30 AM	0	0	0	0	0	69	0	0	1	0	0	0	1	44	0	0	115
11:45 AM	0	0	0	0	0	59	1	0	0	0	1	0	0	55	0	0	116
Total	0	0	0	0	5	270	1	0	2	0	7	1	1	204	1	0	492
12:00 PM	0	0	1	0	0	47	0	0	1	0	0	0	1	57	0	0	107
12:15 PM	0	0	1	0	2	67	0	0	0	0	1	0	0	56	0	0	127
12:30 PM	0	0	0	0	1	60	0	0	0	0	0	0	0	58	0	0	119
12:45 PM	0	0	0	0	1	54	0	0	0	0	0	0	0	32	0	0	87
Total	0	0	2	0	4	228	0	0	1	0	1	0	1	203	0	0	440
01:00 PM	0	0	0	0	1	60	0	0	0	0	1	0	0	42	1	0	105
01:15 PM	0	0	0	0	1	61	0	0	0	0	1	0	0	50	1	0	114
01:30 PM	0	0	0	0	2	80	0	0	1	0	2	0	0	42	3	0	130
01:45 PM	0	0	0	0	1	88	0	0	1	0	0	0	0	42	1	0	133
Total	0	0	0	0	5	289	0	0	2	0	4	0	0	176	6	0	482
02:00 PM	0	0	0	0	1	63	0	0	0	0	3	0	1	51	1	0	120
02:15 PM	0	0	0	0	2	53	0	0	0	0	1	0	0	54	3	0	113
Grand Total	1	0	2	0	20	951	1	0	5	0	16	1	3	708	12	0	1720
Apprch %	33.3	0	66.7	0	2.1	97.8	0.1	0	22.7	0	72.7	4.5	0.4	97.9	1.7	0	
Total %	0.1	0	0.1	0	1.2	55.3	0.1	0	0.3	0	0.9	0.1	0.2	41.2	0.7	0	

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Site Code : 00000000

Start Date : 9/4/2016

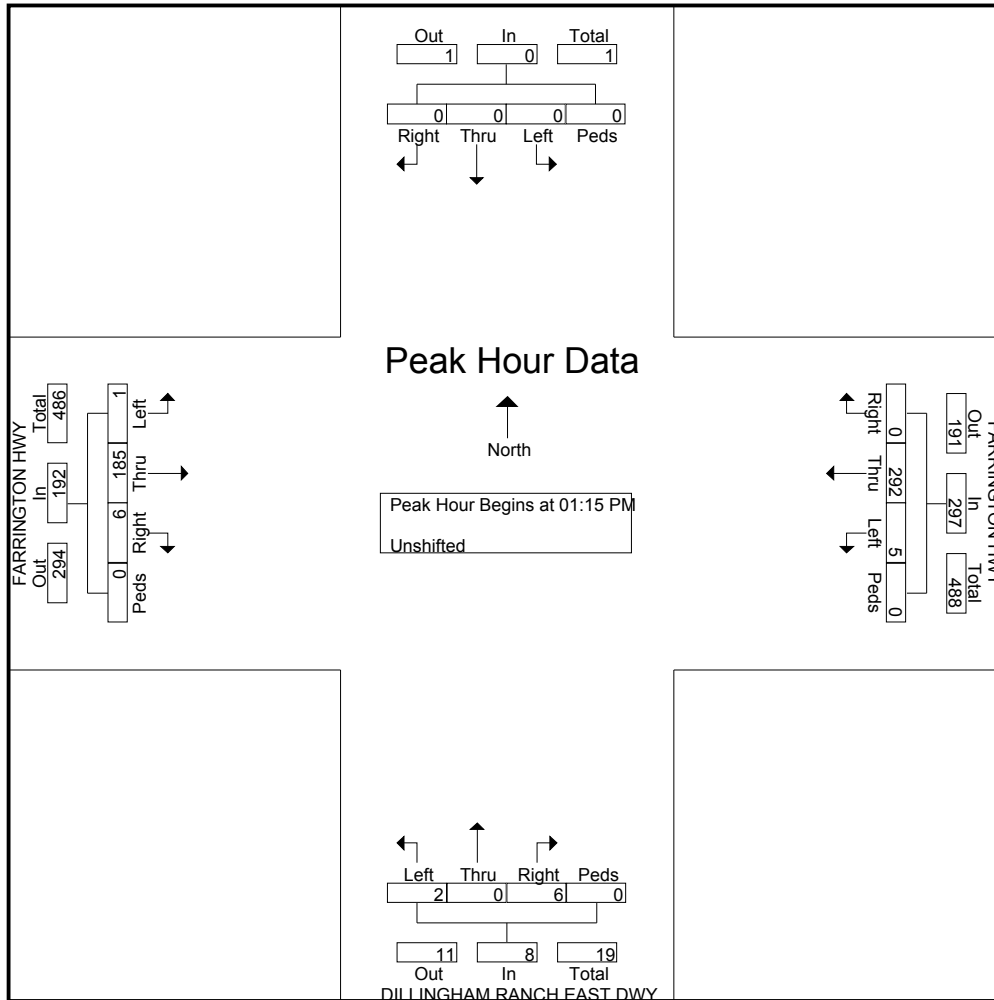
Page No : 2

Start Time	Southbound					FARRINGTON HWY Westbound					DILLINGHAM RANCH EAST DWY Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	

Peak Hour Analysis From 10:45 AM to 02:15 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 01:15 PM

01:15 PM	0	0	0	0	0	1	61	0	0	62	0	0	1	0	1	0	50	1	0	51	114
01:30 PM	0	0	0	0	0	2	80	0	0	82	1	0	2	0	3	0	42	3	0	45	130
01:45 PM	0	0	0	0	0	1	88	0	0	89	1	0	0	0	1	0	42	1	0	43	133
02:00 PM	0	0	0	0	0	1	63	0	0	64	0	0	3	0	3	1	51	1	0	53	120
Total Volume	0	0	0	0	0	5	292	0	0	297	2	0	6	0	8	1	185	6	0	192	497
% App. Total	0	0	0	0	0	1.7	98.3	0	0		25	0	75	0		0.5	96.4	3.1	0		
PHF	.000	.000	.000	.000	.000	.625	.830	.000	.000	.834	.500	.000	.500	.000	.667	.250	.907	.500	.000	.906	.934



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Phone: (808) 533-3646 Fax: (808) 526-1267

File Name : PM\_Polo Field West Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/8/2016

Page No : 1

## Groups Printed- Unshifted

Start Time	POLO FIELD WEST DWY Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
03:00 PM	0	0	0	0	0	23	0	0	0	0	0	0	0	28	0	0	51
03:15 PM	0	0	0	0	0	17	0	0	0	0	0	0	0	33	0	0	50
03:30 PM	0	0	0	0	0	17	0	0	0	0	0	0	0	20	0	0	37
03:45 PM	0	0	0	0	0	10	0	0	0	0	0	0	0	15	0	0	25
Total	0	0	0	0	0	67	0	0	0	0	0	0	0	96	0	0	163
04:00 PM	0	0	0	0	0	20	0	0	0	0	0	0	0	20	0	0	40
04:15 PM	0	0	0	0	0	20	1	0	0	0	0	0	0	26	0	0	47
04:30 PM	1	0	0	0	0	21	0	0	0	0	0	0	0	10	0	0	32
04:45 PM	1	0	0	0	0	20	0	0	0	0	0	0	0	19	0	0	40
Total	2	0	0	0	0	81	1	0	0	0	0	0	0	75	0	0	159
Grand Total	2	0	0	0	0	148	1	0	0	0	0	0	0	171	0	0	322
Apprch %	100	0	0	0	0	99.3	0.7	0	0	0	0	0	0	100	0	0	
Total %	0.6	0	0	0	0	46	0.3	0	0	0	0	0	0	53.1	0	0	

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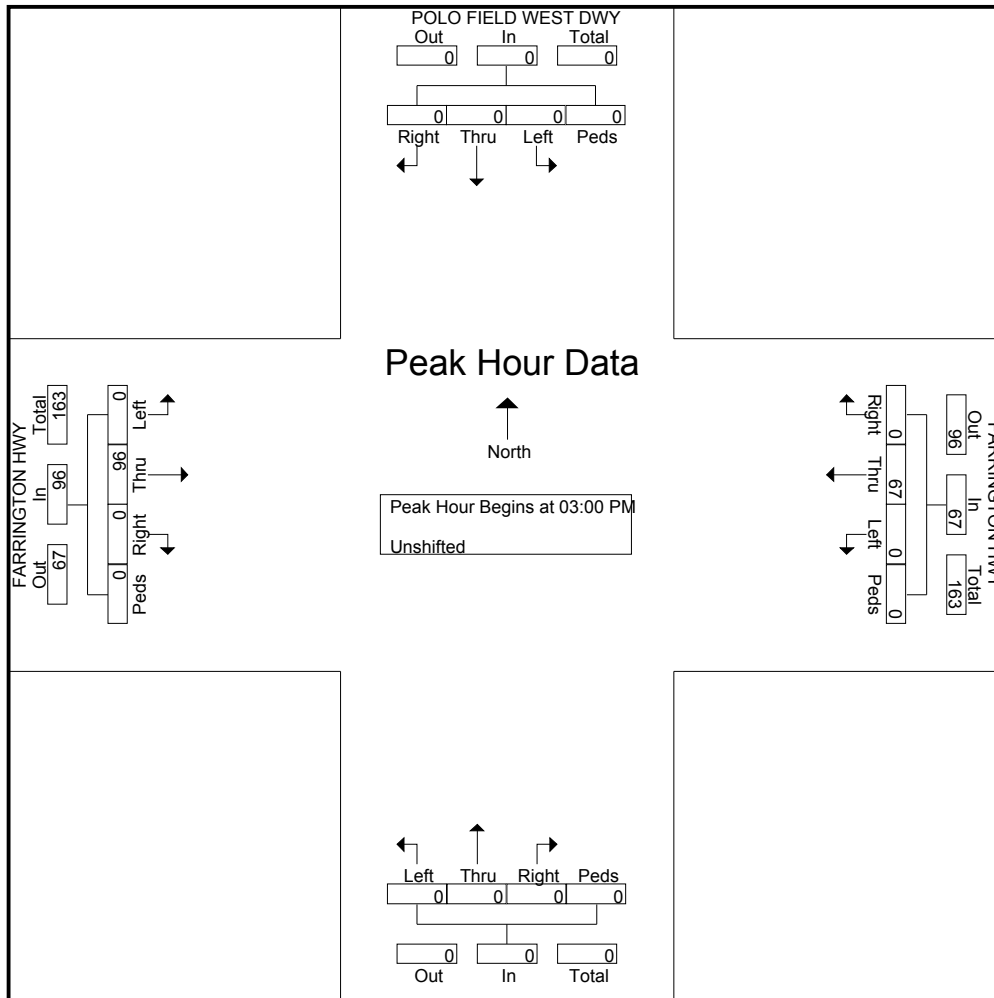
File Name : PM\_Polo Field West Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/8/2016

Page No : 2

Start Time	POLO FIELD WEST DWY Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:00 PM to 04:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:00 PM																					
03:00 PM	0	0	0	0	0	0	23	0	0	23	0	0	0	0	0	0	28	0	0	28	51
03:15 PM	0	0	0	0	0	0	17	0	0	17	0	0	0	0	0	0	33	0	0	33	50
03:30 PM	0	0	0	0	0	0	17	0	0	17	0	0	0	0	0	0	20	0	0	20	37
03:45 PM	0	0	0	0	0	0	10	0	0	10	0	0	0	0	0	0	15	0	0	15	25
Total Volume	0	0	0	0	0	0	67	0	0	67	0	0	0	0	0	0	96	0	0	96	163
% App. Total	0	0	0	0	0	0	100	0	0	100	0	0	0	0	0	0	100	0	0	100	
PHF	.000	.000	.000	.000	.000	.000	.728	.000	.000	.728	.000	.000	.000	.000	.000	.000	.727	.000	.000	.727	.799





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Page No : 1

## Groups Printed- Unshifted

Start Time	POLO FIELD EAST DWY Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
03:00 PM	0	0	0	0	0	25	0	0	0	0	0	0	0	29	0	0	54
03:15 PM	2	0	0	0	0	19	0	0	0	0	0	0	0	33	0	0	54
03:30 PM	5	0	0	0	0	17	0	0	0	0	0	0	0	22	0	0	44
03:45 PM	0	0	0	0	0	13	0	0	0	0	0	0	0	16	0	0	29
Total	7	0	0	0	0	74	0	0	0	0	0	0	0	100	0	0	181
04:00 PM	0	0	0	0	0	23	1	0	0	0	0	0	0	20	0	0	44
04:15 PM	0	0	0	0	0	24	0	0	0	0	0	0	0	26	0	0	50
04:30 PM	0	0	0	0	0	24	0	0	0	0	0	0	0	12	0	0	36
04:45 PM	0	0	0	0	0	21	0	0	0	0	0	0	0	21	0	0	42
Total	0	0	0	0	0	92	1	0	0	0	0	0	0	79	0	0	172
Grand Total	7	0	0	0	0	166	1	0	0	0	0	0	0	179	0	0	353
Apprch %	100	0	0	0	0	99.4	0.6	0	0	0	0	0	0	100	0	0	
Total %	2	0	0	0	0	47	0.3	0	0	0	0	0	0	50.7	0	0	

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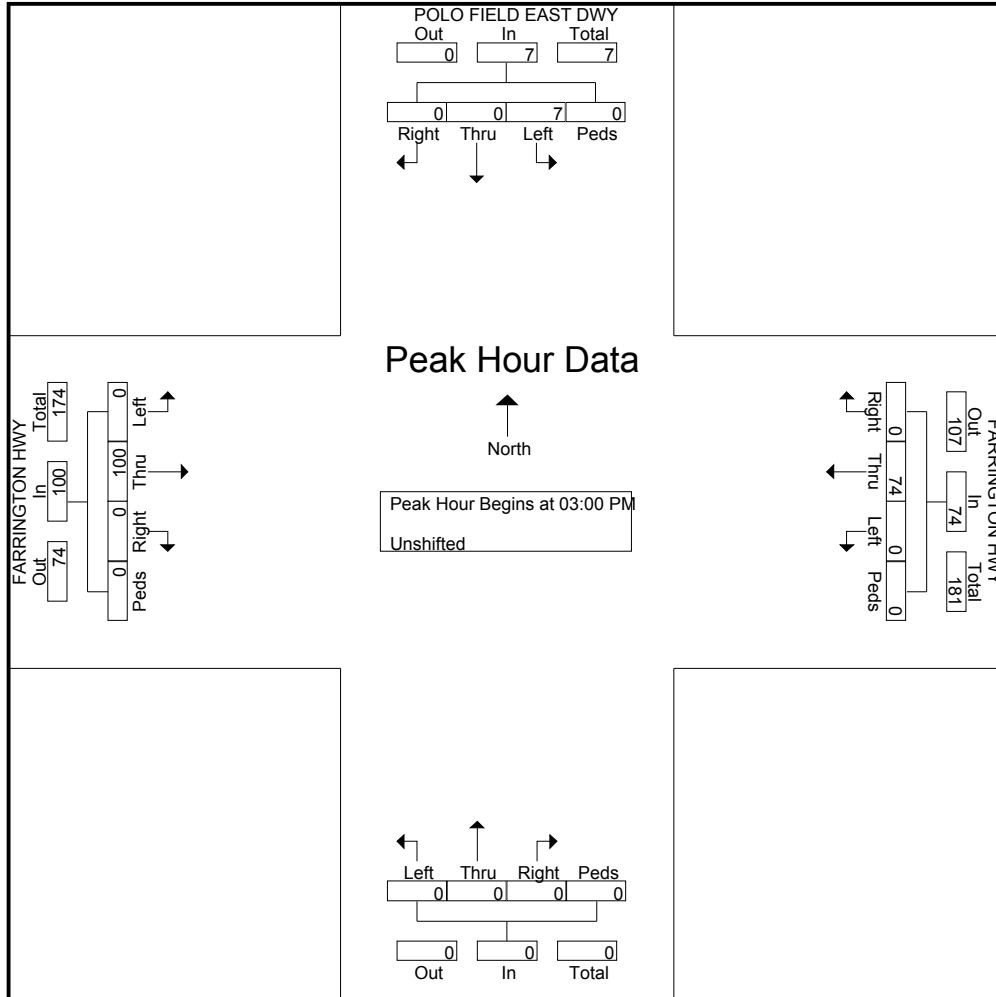
File Name : PM\_Polo Field East Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/8/2016

Page No : 2

Start Time	POLO FIELD EAST DWY Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:00 PM to 04:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:00 PM																					
03:00 PM	0	0	0	0	0	0	25	0	0	25	0	0	0	0	0	0	29	0	0	29	54
03:15 PM	2	0	0	0	2	0	19	0	0	19	0	0	0	0	0	0	33	0	0	33	54
03:30 PM	5	0	0	0	5	0	17	0	0	17	0	0	0	0	0	0	22	0	0	22	44
03:45 PM	0	0	0	0	0	0	13	0	0	13	0	0	0	0	0	0	16	0	0	16	29
Total Volume	7	0	0	0	7	0	74	0	0	74	0	0	0	0	0	0	100	0	0	100	181
% App. Total	100	0	0	0		0	100	0	0		0	0	0	0		0	100	0	0		
PHF	.350	.000	.000	.000	.350	.000	.740	.000	.000	.740	.000	.000	.000	.000	.000	.000	.758	.000	.000	.758	.838



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Site Code : 00000000

Start Date : 9/8/2016

Page No : 1

## Groups Printed- Unshifted

Start Time	GOODALE AVE Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
03:00 PM	50	0	33	0	0	44	47	0	0	0	0	0	23	41	0	0	238
03:15 PM	20	0	29	0	0	47	37	0	0	0	0	0	31	57	0	0	221
03:30 PM	21	0	23	0	0	39	49	0	0	0	0	0	33	70	0	0	235
03:45 PM	29	0	26	0	0	54	49	0	0	0	0	0	29	43	0	0	230
Total	120	0	111	0	0	184	182	0	0	0	0	0	116	211	0	0	924
04:00 PM	34	0	26	0	0	57	60	0	0	0	0	0	15	48	0	0	240
04:15 PM	27	0	21	0	0	68	56	0	0	0	0	0	22	45	0	0	239
04:30 PM	22	0	23	0	0	47	50	0	0	0	0	0	11	49	0	0	202
04:45 PM	23	0	19	0	0	61	48	0	0	0	0	0	23	25	0	0	199
Total	106	0	89	0	0	233	214	0	0	0	0	0	71	167	0	0	880
Grand Total	226	0	200	0	0	417	396	0	0	0	0	0	187	378	0	0	1804
Apprch %	53.1	0	46.9	0	0	51.3	48.7	0	0	0	0	0	33.1	66.9	0	0	
Total %	12.5	0	11.1	0	0	23.1	22	0	0	0	0	0	10.4	21	0	0	

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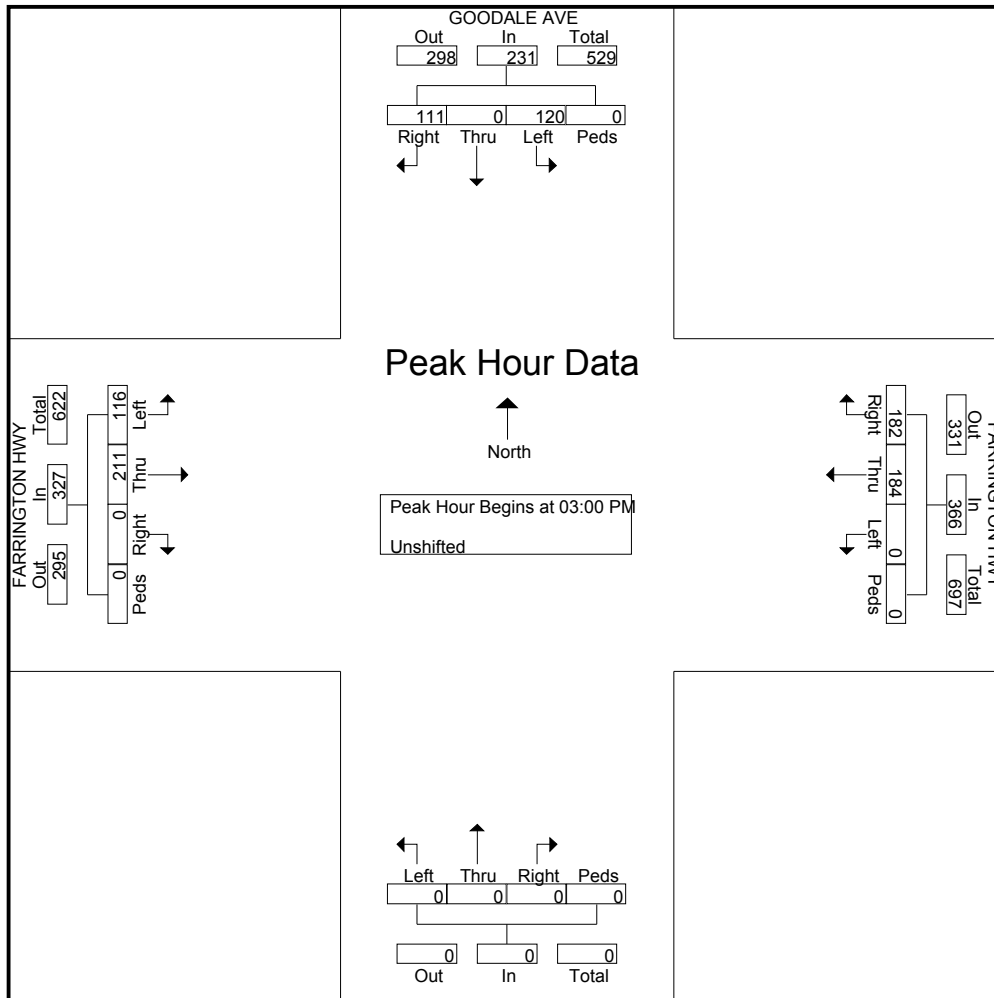
File Name : PM\_Goodale Ave - Farrington Hwy

Site Code : 00000000

Start Date : 9/8/2016

Page No : 2

Start Time	GOODALE AVE Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:00 PM to 03:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:00 PM																					
03:00 PM	50	0	33	0	83	0	44	47	0	91	0	0	0	0	0	23	41	0	0	64	238
03:15 PM	20	0	29	0	49	0	47	37	0	84	0	0	0	0	0	31	57	0	0	88	221
03:30 PM	21	0	23	0	44	0	39	49	0	88	0	0	0	0	0	33	70	0	0	103	235
03:45 PM	29	0	26	0	55	0	54	49	0	103	0	0	0	0	0	29	43	0	0	72	230
Total Volume	120	0	111	0	231	0	184	182	0	366	0	0	0	0	0	116	211	0	0	327	924
% App. Total	51.9	0	48.1	0		0	50.3	49.7	0		0	0	0	0		35.5	64.5	0	0		
PHF	.600	.000	.841	.000	.696	.000	.852	.929	.000	.888	.000	.000	.000	.000	.000	.879	.754	.000	.000	.794	.971



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Site Code : 00000000

Start Date : 9/8/2016

Page No : 1

## Groups Printed- Unshifted

Start Time	GOODALE AVE Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
03:00 PM	50	0	33	0	0	44	47	0	0	0	0	0	23	41	0	0	238
03:15 PM	20	0	29	0	0	47	37	0	0	0	0	0	31	57	0	0	221
03:30 PM	21	0	23	0	0	39	49	0	0	0	0	0	33	70	0	0	235
03:45 PM	29	0	26	0	0	54	49	0	0	0	0	0	29	43	0	0	230
Total	120	0	111	0	0	184	182	0	0	0	0	0	116	211	0	0	924
04:00 PM	34	0	26	0	0	57	60	0	0	0	0	0	15	48	0	0	240
04:15 PM	27	0	21	0	0	68	56	0	0	0	0	0	22	45	0	0	239
04:30 PM	22	0	23	0	0	47	50	0	0	0	0	0	11	49	0	0	202
04:45 PM	23	0	19	0	0	61	48	0	0	0	0	0	23	25	0	0	199
Total	106	0	89	0	0	233	214	0	0	0	0	0	71	167	0	0	880
Grand Total	226	0	200	0	0	417	396	0	0	0	0	0	187	378	0	0	1804
Apprch %	53.1	0	46.9	0	0	51.3	48.7	0	0	0	0	0	33.1	66.9	0	0	
Total %	12.5	0	11.1	0	0	23.1	22	0	0	0	0	0	10.4	21	0	0	

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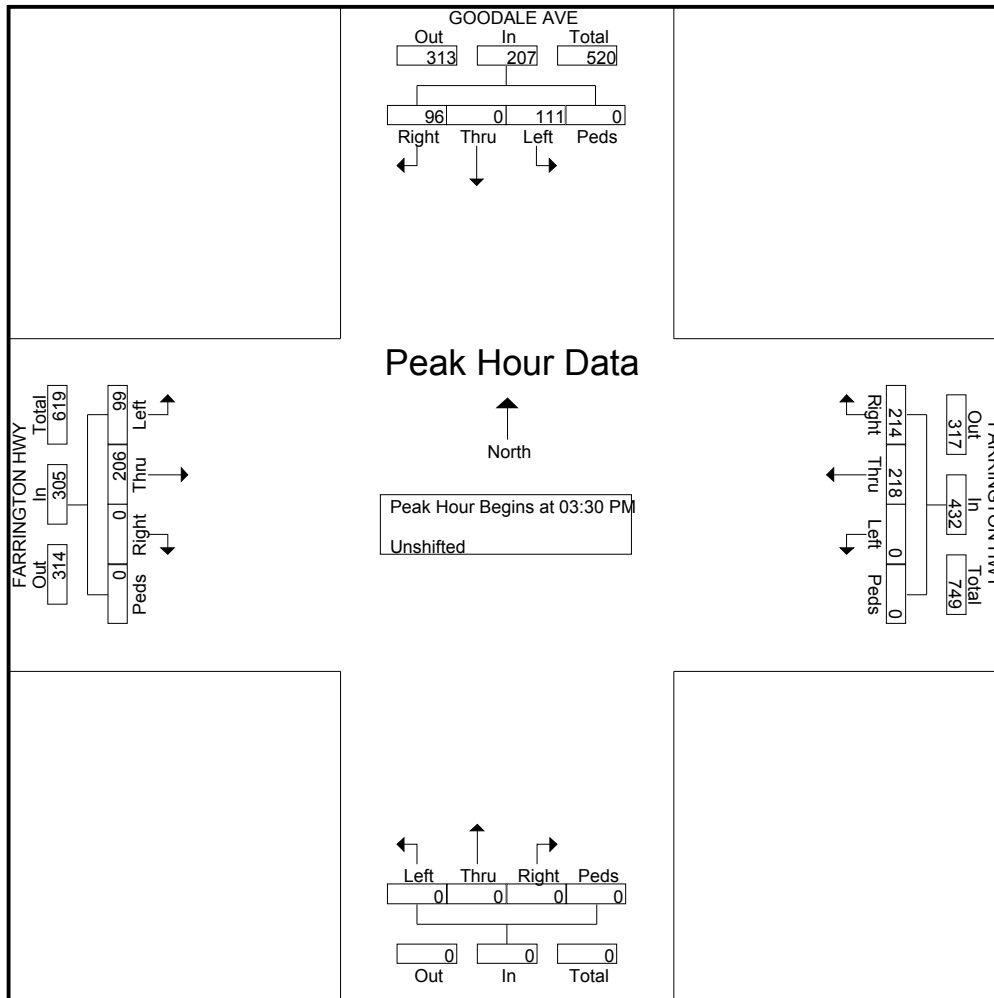
File Name : PM\_Goodale Ave - Farrington Hwy

Site Code : 00000000

Start Date : 9/8/2016

Page No : 2

Start Time	GOODALE AVE Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:00 PM to 04:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:30 PM																					
03:30 PM	21	0	23	0	44	0	39	49	0	88	0	0	0	0	0	33	70	0	0	103	235
03:45 PM	29	0	26	0	55	0	54	49	0	103	0	0	0	0	0	29	43	0	0	72	230
04:00 PM	34	0	26	0	60	0	57	60	0	117	0	0	0	0	0	15	48	0	0	63	240
04:15 PM	27	0	21	0	48	0	68	56	0	124	0	0	0	0	0	22	45	0	0	67	239
Total Volume	111	0	96	0	207	0	218	214	0	432	0	0	0	0	0	99	206	0	0	305	944
% App. Total	53.6	0	46.4	0		0	50.5	49.5	0		0	0	0	0		32.5	67.5	0	0		
PHF	.816	.000	.923	.000	.863	.000	.801	.892	.000	.871	.000	.000	.000	.000	.000	.750	.736	.000	.000	.740	.983



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File Name : PM\_Dillingham Ranch West Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/8/2016

Page No : 1

Groups Printed- Unshifted - Bank 1

Start Time	Southbound				FARRINGTON HWY Westbound				DILLINGHAM RANCH WEST DWY Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
03:00 PM	0	0	0	0	2	23	0	0	0	0	1	0	0	28	0	0	54
03:15 PM	0	0	0	0	2	17	0	0	0	0	0	0	0	33	0	0	52
03:30 PM	0	0	0	0	0	17	0	0	0	0	3	0	0	19	1	0	40
03:45 PM	0	0	0	0	3	10	0	0	0	0	1	0	0	15	0	0	29
Total	0	0	0	0	7	67	0	0	0	0	5	0	0	95	1	0	175
04:00 PM	0	0	0	0	3	20	0	0	0	0	0	0	0	20	0	0	43
04:15 PM	0	0	0	0	3	21	0	0	0	0	0	0	0	26	0	0	50
04:30 PM	0	0	0	0	4	20	0	0	1	0	1	0	0	11	0	0	37
04:45 PM	0	0	0	0	1	20	0	0	0	0	1	0	0	20	0	0	42
Total	0	0	0	0	11	81	0	0	1	0	2	0	0	77	0	0	172
Grand Total	0	0	0	0	18	148	0	0	1	0	7	0	0	172	1	0	347
Apprch %	0	0	0	0	10.8	89.2	0	0	12.5	0	87.5	0	0	99.4	0.6	0	
Total %	0	0	0	0	5.2	42.7	0	0	0.3	0	2	0	0	49.6	0.3	0	
Unshifted	0	0	0	0	18	148	0	0	1	0	7	0	0	172	1	0	347
% Unshifted	0	0	0	0	100	100	0	0	100	0	100	0	0	100	100	0	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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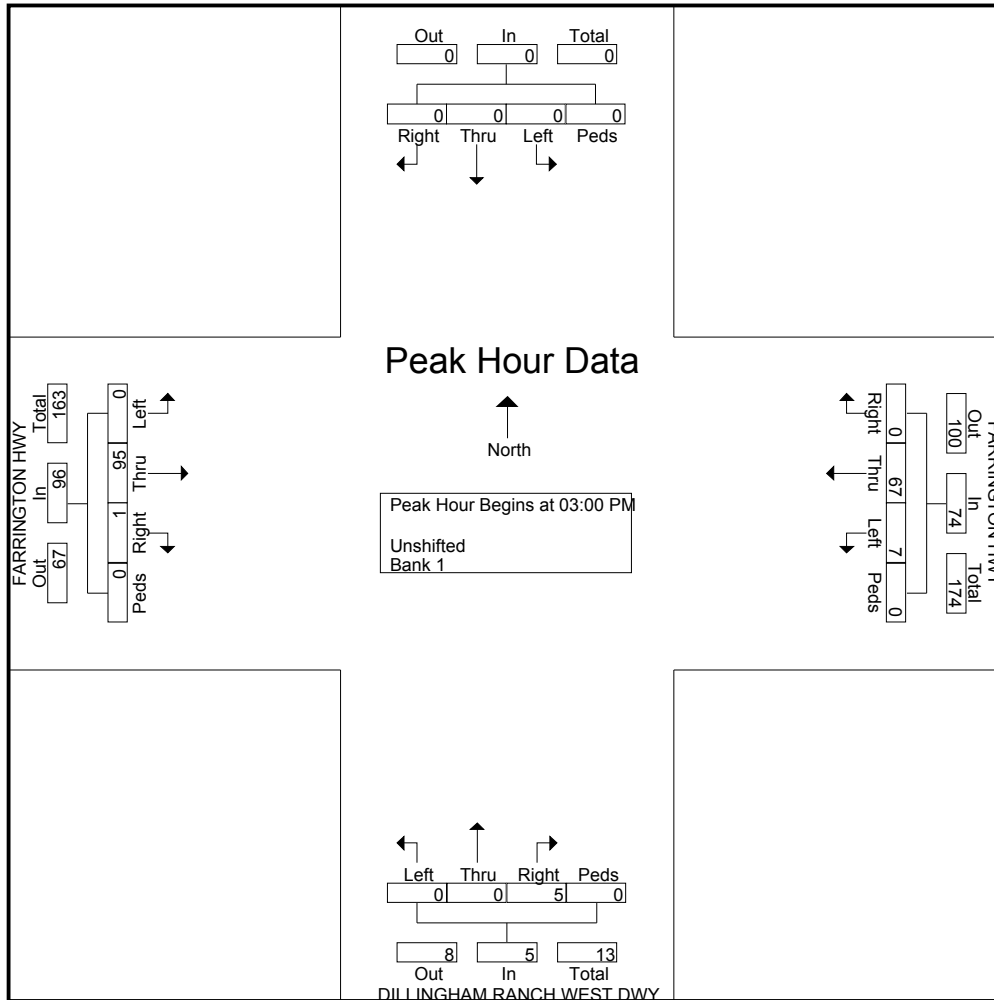
File Name : PM\_Dillingham Ranch West Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/8/2016

Page No : 2

Start Time	Southbound					FARRINGTON HWY Westbound					DILLINGHAM RANCH WEST DWY Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 03:00 PM to 04:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 03:00 PM																					
03:00 PM	0	0	0	0	0	2	23	0	0	25	0	0	1	0	1	0	28	0	0	28	54
03:15 PM	0	0	0	0	0	2	17	0	0	19	0	0	0	0	0	0	33	0	0	33	52
03:30 PM	0	0	0	0	0	0	17	0	0	17	0	0	3	0	3	0	19	1	0	20	40
03:45 PM	0	0	0	0	0	3	10	0	0	13	0	0	1	0	1	0	15	0	0	15	29
Total Volume	0	0	0	0	0	7	67	0	0	74	0	0	5	0	5	0	95	1	0	96	175
% App. Total	0	0	0	0	0	9.5	90.5	0	0		0	0	100	0		0	99	1	0		
PHF	.000	.000	.000	.000	.000	.583	.728	.000	.000	.740	.000	.000	.417	.000	.417	.000	.720	.250	.000	.727	.810







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Start Date : 9/8/2016

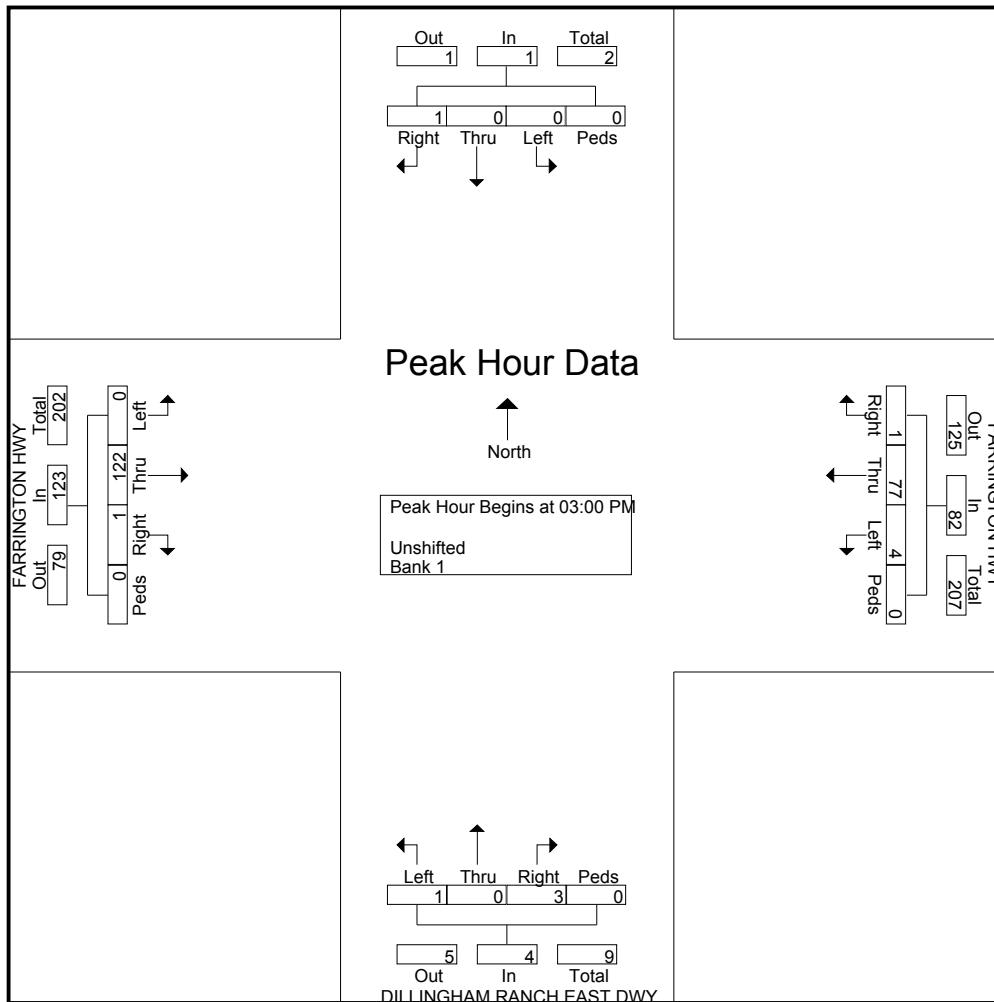
Page No : 2

Start Time	Southbound					FARRINGTON HWY Westbound					DILLINGHAM RANCH EAST DWY Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	

Peak Hour Analysis From 03:00 PM to 04:45 PM - Peak 1 of 1

Peak Hour for Entire Intersection Begins at 03:00 PM

03:00 PM	0	0	1	0	1	2	25	0	0	27	0	0	1	0	1	0	25	0	0	25	54
03:15 PM	0	0	0	0	0	0	17	1	0	18	0	0	0	0	0	0	44	0	0	44	62
03:30 PM	0	0	0	0	0	1	19	0	0	20	0	0	2	0	2	0	33	0	0	33	55
03:45 PM	0	0	0	0	0	1	16	0	0	17	1	0	0	0	1	0	20	1	0	21	39
Total Volume	0	0	1	0	1	4	77	1	0	82	1	0	3	0	4	0	122	1	0	123	210
% App. Total	0	0	100	0		4.9	93.9	1.2	0		25	0	75	0		0	99.2	0.8	0		
PHF	.000	.000	.250	.000	.250	.500	.770	.250	.000	.759	.250	.000	.375	.000	.500	.000	.693	.250	.000	.699	.847



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File Name : AM\_Polo Field West Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/8/2016

Page No : 1

Groups Printed- Unshifted

Start Time	POLO FIELD WEST DWY Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
07:00 AM	0	0	0	0	0	13	0	0	0	0	0	0	0	11	0	0	24
07:15 AM	0	0	0	0	0	9	0	0	0	0	0	0	0	10	0	0	19
07:30 AM	0	0	0	0	0	13	0	0	0	0	0	0	0	16	0	0	29
07:45 AM	0	0	0	0	0	17	0	0	0	0	0	0	0	20	0	0	37
Total	0	0	0	0	0	52	0	0	0	0	0	0	0	57	0	0	109
08:00 AM	1	0	0	0	0	31	0	0	0	0	0	0	0	6	0	0	38
08:15 AM	1	0	0	0	0	28	1	0	0	0	0	0	0	27	0	0	57
08:30 AM	0	0	0	0	0	19	0	0	0	0	0	0	0	12	0	0	31
08:45 AM	0	0	0	0	0	22	0	0	0	0	0	0	0	15	0	0	37
Total	2	0	0	0	0	100	1	0	0	0	0	0	0	60	0	0	163
09:00 AM	0	0	0	0	0	20	0	0	0	0	0	0	0	14	0	0	34
Grand Total	2	0	0	0	0	172	1	0	0	0	0	0	0	131	0	0	306
Apprch %	100	0	0	0	0	99.4	0.6	0	0	0	0	0	0	100	0	0	
Total %	0.7	0	0	0	0	56.2	0.3	0	0	0	0	0	0	42.8	0	0	

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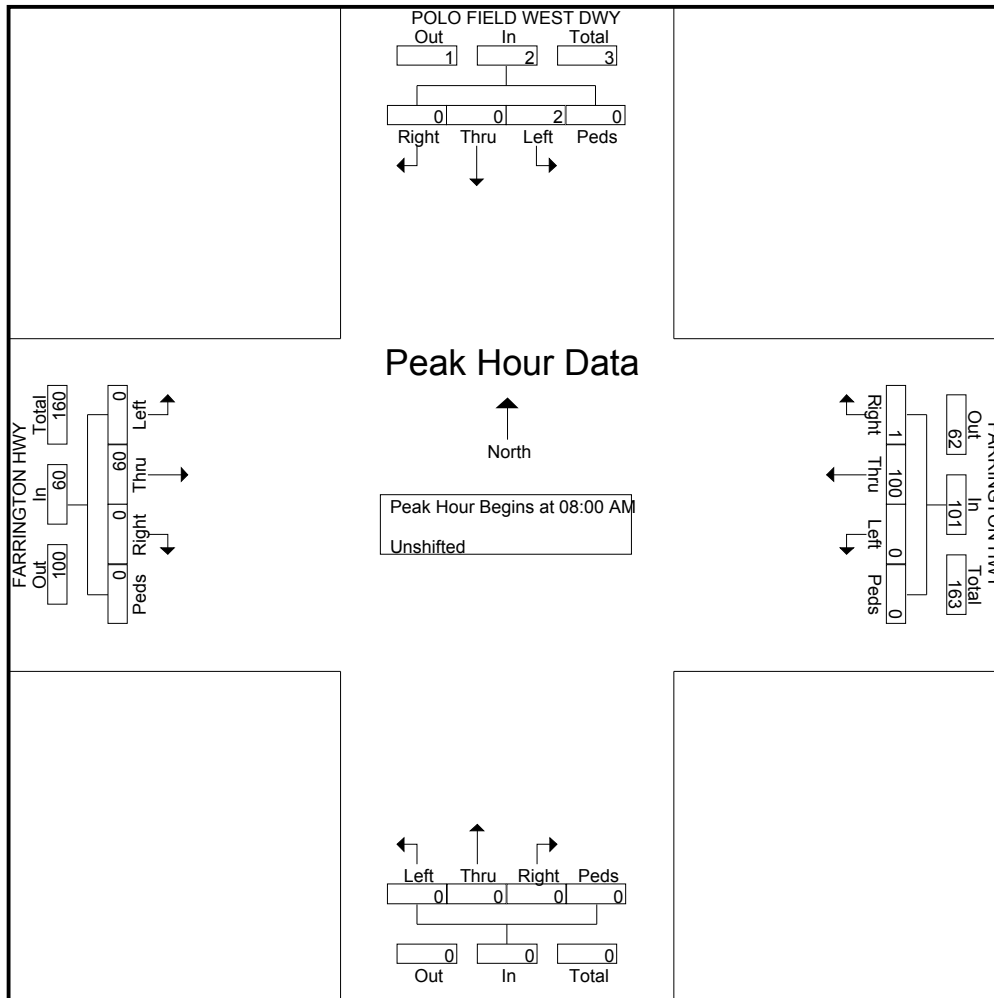
File Name : AM\_Polo Field West Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/8/2016

Page No : 2

Start Time	POLO FIELD WEST DWY Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 08:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	1	0	0	0	1	0	31	0	0	31	0	0	0	0	0	0	6	0	0	6	38
08:15 AM	1	0	0	0	1	0	28	1	0	29	0	0	0	0	0	0	27	0	0	27	57
08:30 AM	0	0	0	0	0	0	19	0	0	19	0	0	0	0	0	0	12	0	0	12	31
08:45 AM	0	0	0	0	0	0	22	0	0	22	0	0	0	0	0	0	15	0	0	15	37
Total Volume	2	0	0	0	2	0	100	1	0	101	0	0	0	0	0	0	60	0	0	60	163
% App. Total	100	0	0	0	0	0	99	1	0	0	0	0	0	0	0	0	100	0	0	0	0
PHF	.500	.000	.000	.000	.500	.000	.806	.250	.000	.815	.000	.000	.000	.000	.000	.000	.556	.000	.000	.556	.715



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Site Code : 00000000

Start Date : 9/8/2016

Page No : 1

Groups Printed- Unshifted

Start Time	POLO FIELD WEST DWY Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
07:00 AM	0	0	0	0	0	13	0	0	0	0	0	0	0	11	0	0	24
07:15 AM	0	0	0	0	0	9	0	0	0	0	0	0	0	10	0	0	19
07:30 AM	0	0	0	0	0	13	0	0	0	0	0	0	0	16	0	0	29
07:45 AM	0	0	0	0	0	17	0	0	0	0	0	0	0	20	0	0	37
Total	0	0	0	0	0	52	0	0	0	0	0	0	0	57	0	0	109
08:00 AM	1	0	0	0	0	31	0	0	0	0	0	0	0	6	0	0	38
08:15 AM	1	0	0	0	0	28	1	0	0	0	0	0	0	27	0	0	57
08:30 AM	0	0	0	0	0	19	0	0	0	0	0	0	0	12	0	0	31
08:45 AM	0	0	0	0	0	22	0	0	0	0	0	0	0	15	0	0	37
Total	2	0	0	0	0	100	1	0	0	0	0	0	0	60	0	0	163
09:00 AM	0	0	0	0	0	20	0	0	0	0	0	0	0	14	0	0	34
Grand Total	2	0	0	0	0	172	1	0	0	0	0	0	0	131	0	0	306
Apprch %	100	0	0	0	0	99.4	0.6	0	0	0	0	0	0	100	0	0	
Total %	0.7	0	0	0	0	56.2	0.3	0	0	0	0	0	0	42.8	0	0	

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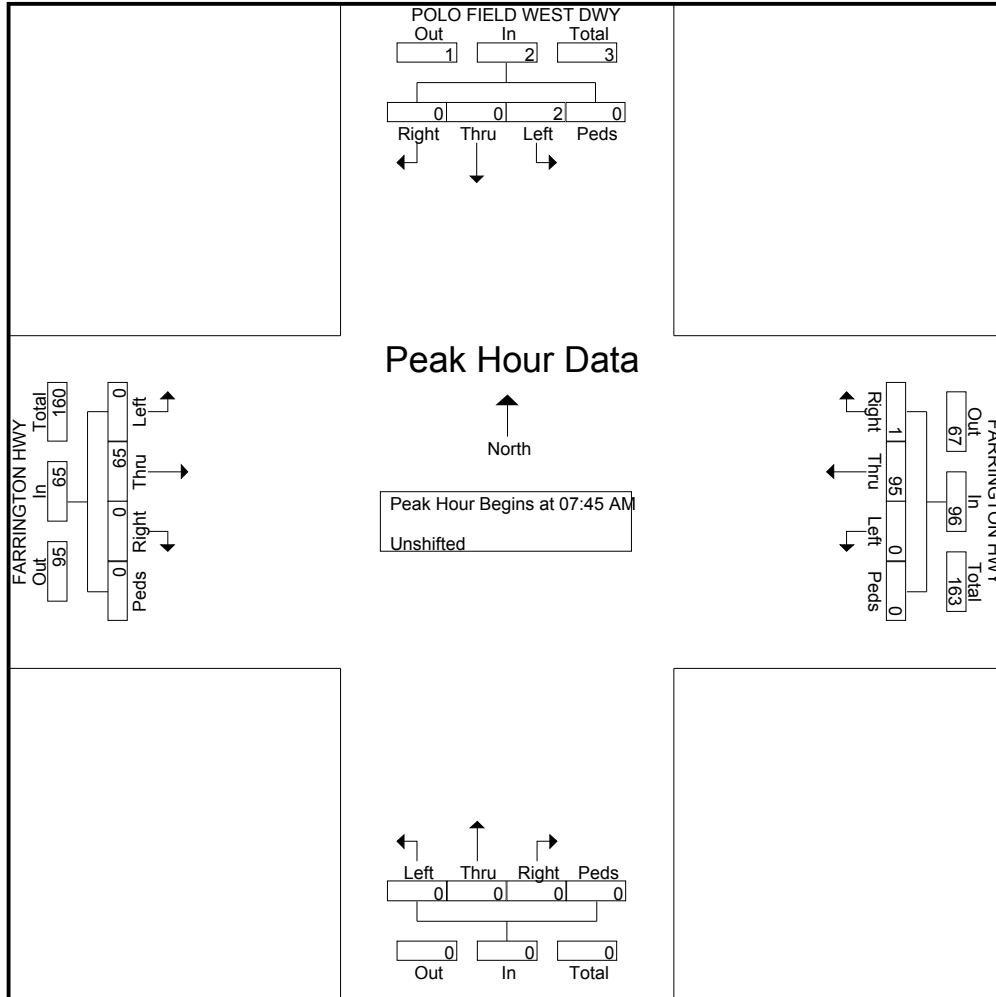
File Name : AM\_Polo Field West Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/8/2016

Page No : 2

Start Time	POLO FIELD WEST DWY Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	0	0	0	0	0	0	17	0	0	17	0	0	0	0	0	0	20	0	0	20	37
08:00 AM	1	0	0	0	1	0	31	0	0	31	0	0	0	0	0	0	6	0	0	6	38
08:15 AM	1	0	0	0	1	0	28	1	0	29	0	0	0	0	0	0	27	0	0	27	57
08:30 AM	0	0	0	0	0	0	19	0	0	19	0	0	0	0	0	0	12	0	0	12	31
Total Volume	2	0	0	0	2	0	95	1	0	96	0	0	0	0	0	0	65	0	0	65	163
% App. Total	100	0	0	0	0	0	99	1	0	0	0	0	0	0	0	0	100	0	0	0	
PHF	.500	.000	.000	.000	.500	.000	.766	.250	.000	.774	.000	.000	.000	.000	.000	.000	.602	.000	.000	.602	.715





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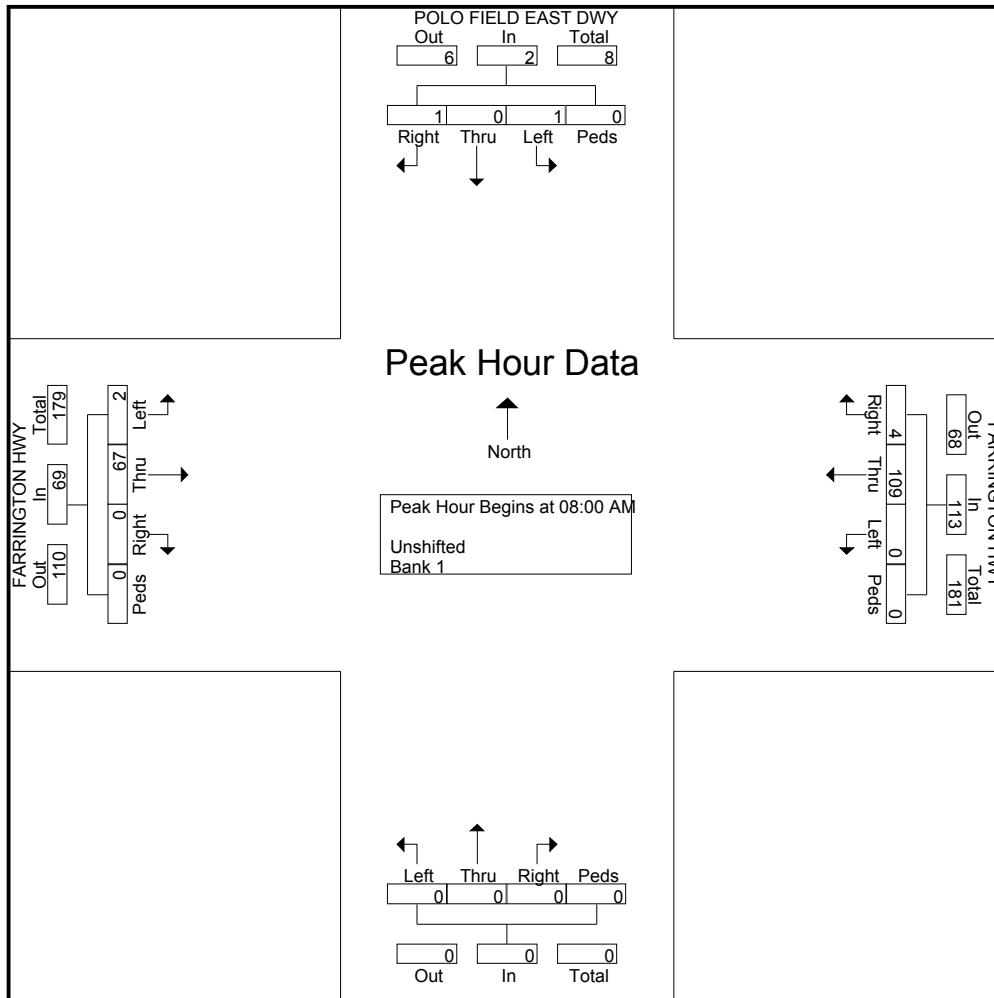
File Name : AM\_Polo Field East Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/8/2016

Page No : 2

Start Time	POLO FIELD EAST DWY Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 08:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	0	0	0	0	0	32	0	0	32	0	0	0	0	0	0	8	0	0	8	40
08:15 AM	0	0	0	0	0	0	35	0	0	35	0	0	0	0	0	1	30	0	0	31	66
08:30 AM	0	0	0	0	0	0	19	1	0	20	0	0	0	0	0	1	14	0	0	15	35
08:45 AM	1	0	1	0	2	0	23	3	0	26	0	0	0	0	0	0	15	0	0	15	43
Total Volume	1	0	1	0	2	0	109	4	0	113	0	0	0	0	0	2	67	0	0	69	184
% App. Total	50	0	50	0		0	96.5	3.5	0		0	0	0	0		2.9	97.1	0	0		
PHF	.250	.000	.250	.000	.250	.000	.779	.333	.000	.807	.000	.000	.000	.000	.000	.500	.558	.000	.000	.556	.697







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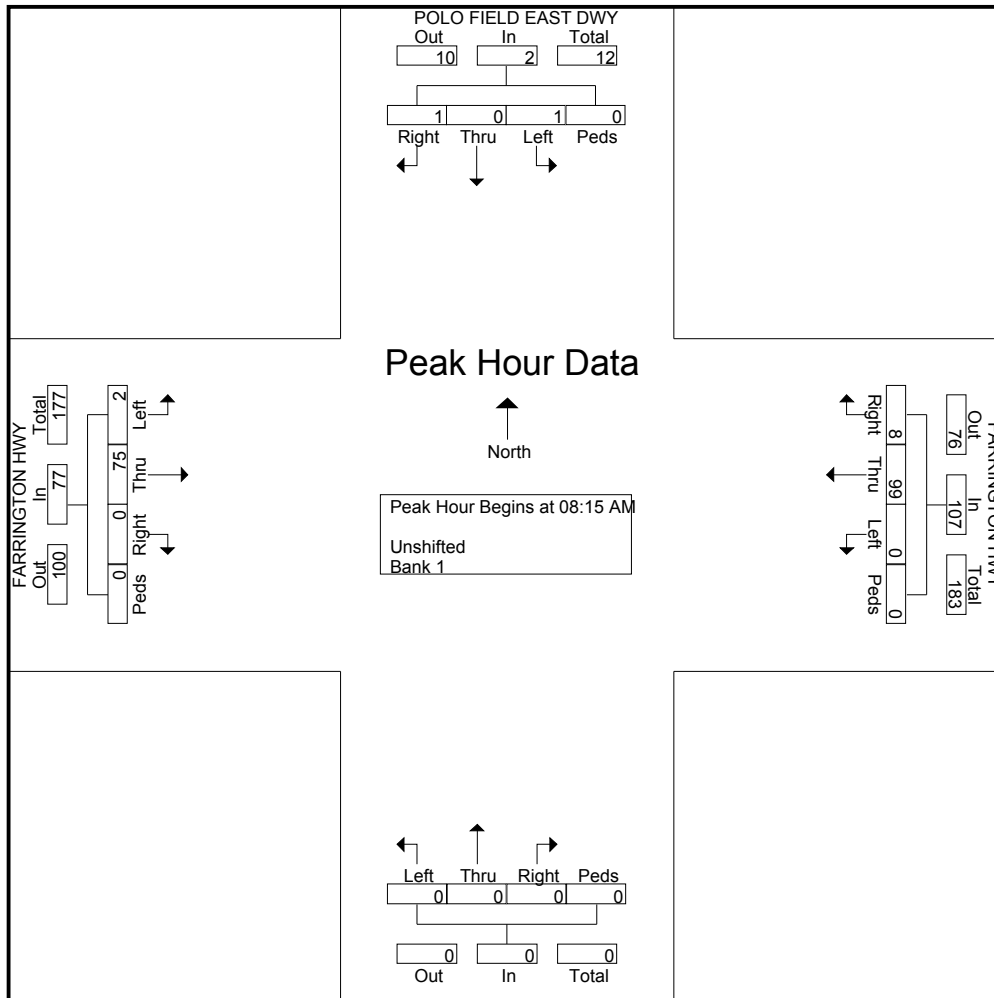
File Name : AM\_Polo Field East Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/8/2016

Page No : 2

Start Time	POLO FIELD EAST DWY Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:15 AM																					
08:15 AM	0	0	0	0	0	0	35	0	0	35	0	0	0	0	0	1	30	0	0	31	66
08:30 AM	0	0	0	0	0	0	19	1	0	20	0	0	0	0	0	1	14	0	0	15	35
08:45 AM	1	0	1	0	2	0	23	3	0	26	0	0	0	0	0	0	15	0	0	15	43
09:00 AM	0	0	0	0	0	0	22	4	0	26	0	0	0	0	0	0	16	0	0	16	42
Total Volume	1	0	1	0	2	0	99	8	0	107	0	0	0	0	0	2	75	0	0	77	186
% App. Total	50	0	50	0		0	92.5	7.5	0		0	0	0	0		2.6	97.4	0	0		
PHF	.250	.000	.250	.000	.250	.000	.707	.500	.000	.764	.000	.000	.000	.000	.000	.500	.625	.000	.000	.621	.705





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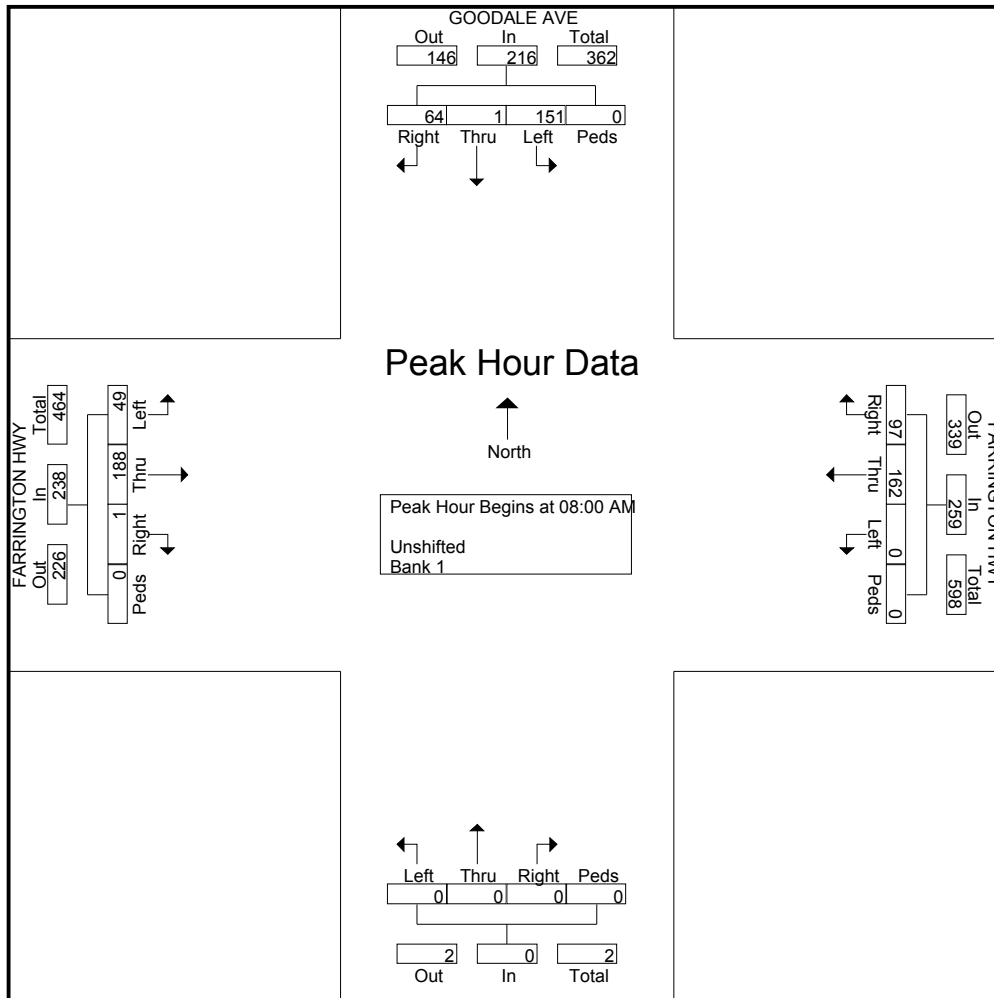
File Name : AM\_Goodale Ave - Farrington Hwy

Site Code : 00000000

Start Date : 9/8/2016

Page No : 2

Start Time	GOODALE AVE Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 08:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	42	1	20	0	63	0	42	19	0	61	0	0	0	0	0	15	52	0	0	67	191
08:15 AM	28	0	17	0	45	0	41	15	0	56	0	0	0	0	0	11	64	0	0	75	176
08:30 AM	42	0	15	0	57	0	40	33	0	73	0	0	0	0	0	14	40	0	0	54	184
08:45 AM	39	0	12	0	51	0	39	30	0	69	0	0	0	0	0	9	32	1	0	42	162
Total Volume	151	1	64	0	216	0	162	97	0	259	0	0	0	0	0	49	188	1	0	238	713
% App. Total	69.9	0.5	29.6	0		0	62.5	37.5	0		0	0	0	0		20.6	79	0.4	0		
PHF	.899	.250	.800	.000	.857	.000	.964	.735	.000	.887	.000	.000	.000	.000	.000	.817	.734	.250	.000	.793	.933





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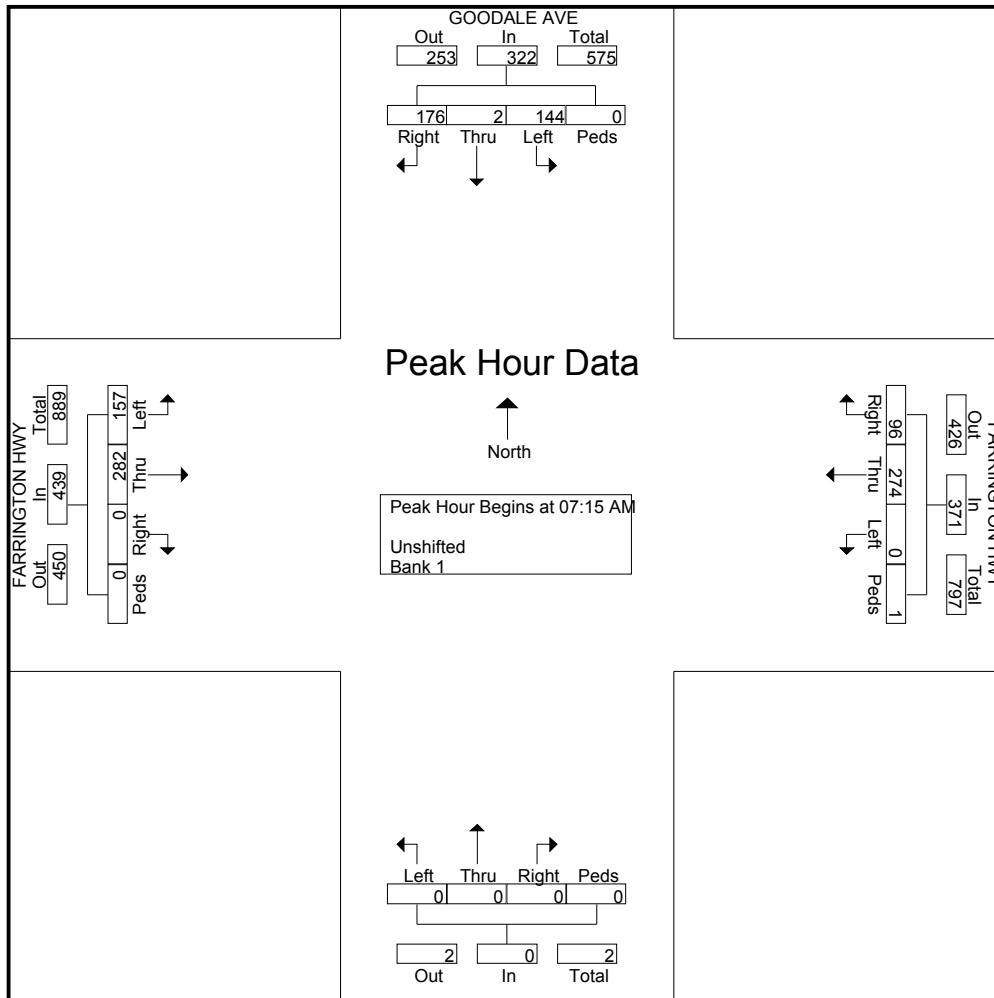
File Name : AM\_Goodale Ave - Farrington Hwy

Site Code : 00000000

Start Date : 9/8/2016

Page No : 2

Start Time	GOODALE AVE Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:15 AM																					
07:15 AM	35	0	24	0	59	0	52	23	0	75	0	0	0	0	0	28	47	0	0	75	209
07:30 AM	30	1	65	0	96	0	80	32	1	113	0	0	0	0	0	56	80	0	0	136	345
07:45 AM	37	0	67	0	104	0	100	22	0	122	0	0	0	0	0	58	103	0	0	161	387
08:00 AM	42	1	20	0	63	0	42	19	0	61	0	0	0	0	0	15	52	0	0	67	191
Total Volume	144	2	176	0	322	0	274	96	1	371	0	0	0	0	0	157	282	0	0	439	1132
% App. Total	44.7	0.6	54.7	0		0	73.9	25.9	0.3		0	0	0	0		35.8	64.2	0	0		
PHF	.857	.500	.657	.000	.774	.000	.685	.750	.250	.760	.000	.000	.000	.000	.000	.677	.684	.000	.000	.682	.731



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Site Code : 00000000

Start Date : 9/8/2016

Page No : 1

Groups Printed- Unshifted - Bank 1

Start Time	Southbound				FARRINGTON HWY Westbound				DILLINGHAM RANCH WEST DWY Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
07:00 AM	0	0	0	0	0	13	0	0	0	0	1	0	0	10	1	0	25
07:15 AM	0	0	0	0	2	9	0	0	0	0	0	0	0	10	0	0	21
07:30 AM	0	0	0	0	0	13	0	0	0	0	0	0	0	16	0	0	29
07:45 AM	0	0	0	0	2	17	0	0	0	0	0	0	0	20	0	0	39
Total	0	0	0	0	4	52	0	0	0	0	1	0	0	56	1	0	114
08:00 AM	0	0	0	0	1	31	0	0	0	0	1	0	0	7	0	0	40
08:15 AM	0	0	0	0	6	29	0	0	0	0	4	0	0	27	1	0	67
08:30 AM	0	0	0	0	0	19	0	0	0	0	3	0	0	12	0	0	34
08:45 AM	0	0	0	0	2	22	0	0	0	0	1	0	0	14	1	0	40
Total	0	0	0	0	9	101	0	0	0	0	9	0	0	60	2	0	181
09:00 AM	0	0	0	0	2	20	0	0	0	0	2	0	0	14	0	0	38
Grand Total	0	0	0	0	15	173	0	0	0	0	12	0	0	130	3	0	333
Approch %	0	0	0	0	8	92	0	0	0	0	100	0	0	97.7	2.3	0	
Total %	0	0	0	0	4.5	52	0	0	0	0	3.6	0	0	39	0.9	0	
Unshifted	0	0	0	0	15	173	0	0	0	0	12	0	0	130	3	0	333
% Unshifted	0	0	0	0	100	100	0	0	0	0	100	0	0	100	100	0	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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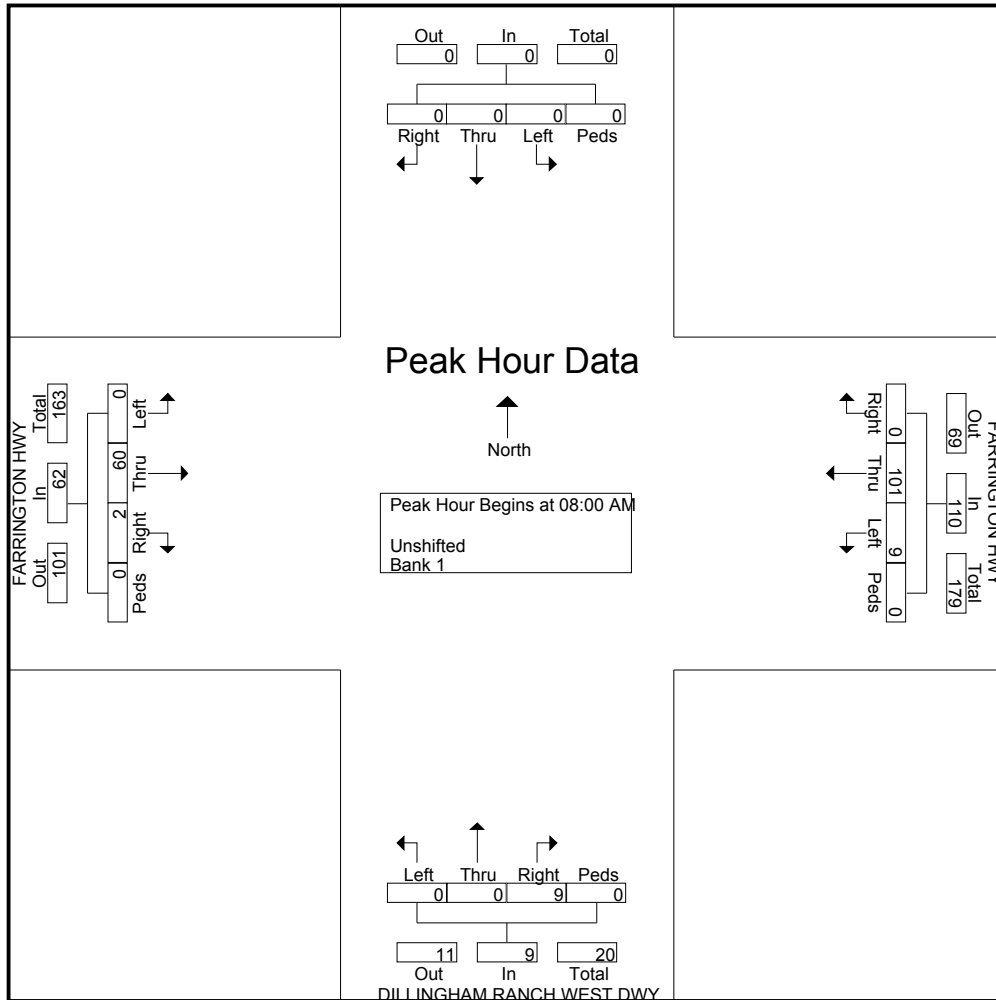
File Name : AM\_Dillingham Ranch West Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/8/2016

Page No : 2

Start Time	Southbound					FARRINGTON HWY Westbound					DILLINGHAM RANCH WEST DWY Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 09:00 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	0	0	0	0	1	31	0	0	32	0	0	1	0	1	0	7	0	0	7	40
08:15 AM	0	0	0	0	0	6	29	0	0	35	0	0	4	0	4	0	27	1	0	28	67
08:30 AM	0	0	0	0	0	0	19	0	0	19	0	0	3	0	3	0	12	0	0	12	34
08:45 AM	0	0	0	0	0	2	22	0	0	24	0	0	1	0	1	0	14	1	0	15	40
Total Volume	0	0	0	0	0	9	101	0	0	110	0	0	9	0	9	0	60	2	0	62	181
% App. Total	0	0	0	0	0	8.2	91.8	0	0		0	0	100	0		0	96.8	3.2	0		
PHF	.000	.000	.000	.000	.000	.375	.815	.000	.000	.786	.000	.000	.563	.000	.563	.000	.556	.500	.000	.554	.675





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Site Code : 00000000

Start Date : 9/8/2016

Page No : 1

Groups Printed- Unshifted - Bank 1

Start Time	Southbound				FARRINGTON HWY Westbound				DILLINGHAM RANCH EAST DWY Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
07:00 AM	0	0	0	0	1	13	0	0	0	0	2	0	0	10	0	0	26
07:15 AM	0	0	0	1	0	11	0	0	0	0	0	0	0	11	0	0	23
07:30 AM	0	0	1	0	0	13	0	0	0	0	1	0	0	15	0	0	30
07:45 AM	0	0	1	0	0	20	0	0	0	0	1	0	0	22	0	0	44
Total	0	0	2	1	1	57	0	0	0	0	4	0	0	58	0	0	123
08:00 AM	0	0	0	0	1	30	0	0	0	0	0	0	0	6	0	0	37
08:15 AM	0	0	0	0	0	34	0	0	0	0	0	0	1	32	0	0	67
08:30 AM	0	0	0	0	0	21	0	0	0	0	0	0	0	14	0	0	35
08:45 AM	0	0	1	0	0	26	0	0	0	0	1	0	0	19	0	0	47
Total	0	0	1	0	1	111	0	0	0	0	1	0	1	71	0	0	186
09:00 AM	0	0	0	0	0	32	0	0	0	0	0	0	0	15	0	0	47
Grand Total	0	0	3	1	2	200	0	0	0	0	5	0	1	144	0	0	356
Apprch %	0	0	75	25	1	99	0	0	0	0	100	0	0.7	99.3	0	0	
Total %	0	0	0.8	0.3	0.6	56.2	0	0	0	0	1.4	0	0.3	40.4	0	0	
Unshifted	0	0	3	1	2	200	0	0	0	0	5	0	1	144	0	0	356
% Unshifted	0	0	100	100	100	100	0	0	0	0	100	0	100	100	0	0	100
Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Bank 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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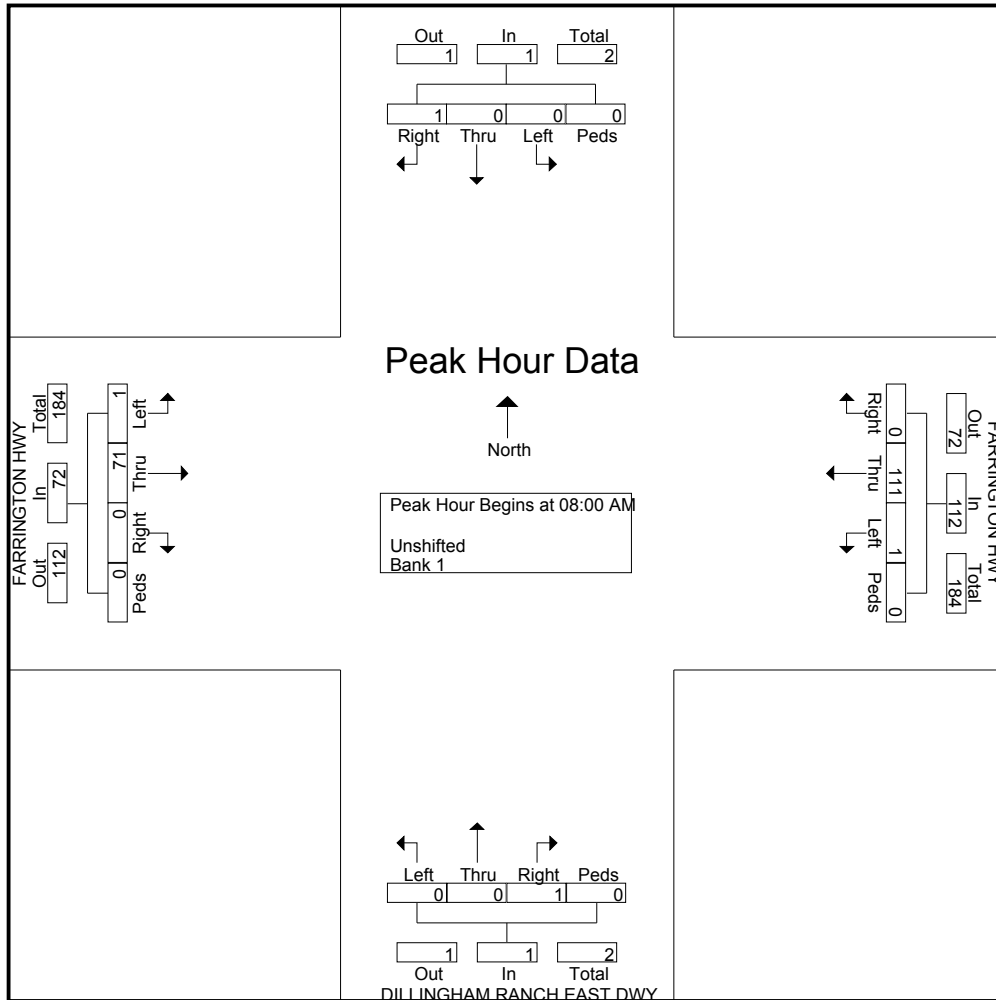
File Name : AM\_Dillingham Ranch East Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/8/2016

Page No : 2

Start Time	Southbound					FARRINGTON HWY Westbound					DILLINGHAM RANCH EAST DWY Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 08:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	0	0	0	0	0	1	30	0	0	31	0	0	0	0	0	0	6	0	0	6	37
08:15 AM	0	0	0	0	0	0	34	0	0	34	0	0	0	0	0	1	32	0	0	33	67
08:30 AM	0	0	0	0	0	0	21	0	0	21	0	0	0	0	0	0	14	0	0	14	35
08:45 AM	0	0	1	0	1	0	26	0	0	26	0	0	1	0	1	0	19	0	0	19	47
Total Volume	0	0	1	0	1	1	111	0	0	112	0	0	1	0	1	1	71	0	0	72	186
% App. Total	0	0	100	0		0.9	99.1	0	0		0	0	100	0		1.4	98.6	0	0		
PHF	.000	.000	.250	.000	.250	.250	.816	.000	.000	.824	.000	.000	.250	.000	.250	.250	.555	.000	.000	.545	.694



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File Name : WE\_PM\_Polo Field West Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 1

Groups Printed- Unshifted

Start Time	POLO FIELD WEST DWY Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
04:30 PM	0	0	0	0	0	19	0	0	0	0	0	0	0	35	0	0	54
04:45 PM	0	0	0	0	0	15	0	0	0	0	0	0	0	50	0	0	65
Total	0	0	0	0	0	34	0	0	0	0	0	0	0	85	0	0	119
05:00 PM	11	0	1	0	0	28	0	0	0	0	0	0	0	40	0	0	80
05:15 PM	6	0	0	0	0	24	0	0	0	0	0	0	0	54	0	0	84
05:30 PM	5	0	0	0	0	22	0	0	0	0	0	0	0	39	0	0	66
05:45 PM	4	0	0	0	0	31	0	0	0	0	0	0	1	32	0	0	68
Total	26	0	1	0	0	105	0	0	0	0	0	0	1	165	0	0	298
06:00 PM	3	0	1	0	0	19	0	0	0	0	0	0	0	22	0	0	45
06:15 PM	8	0	0	0	0	29	0	0	0	0	0	0	0	20	0	0	57
06:30 PM	1	0	0	0	0	20	0	0	0	0	0	0	0	26	0	0	47
06:45 PM	0	0	0	0	0	19	0	0	0	0	0	0	0	22	0	0	41
Total	12	0	1	0	0	87	0	0	0	0	0	0	0	90	0	0	190
07:00 PM	13	0	1	0	0	18	2	0	0	0	0	0	0	22	0	0	56
Grand Total	51	0	3	0	0	244	2	0	0	0	0	0	1	362	0	0	663
Apprch %	94.4	0	5.6	0	0	99.2	0.8	0	0	0	0	0	0.3	99.7	0	0	
Total %	7.7	0	0.5	0	0	36.8	0.3	0	0	0	0	0	0.2	54.6	0	0	

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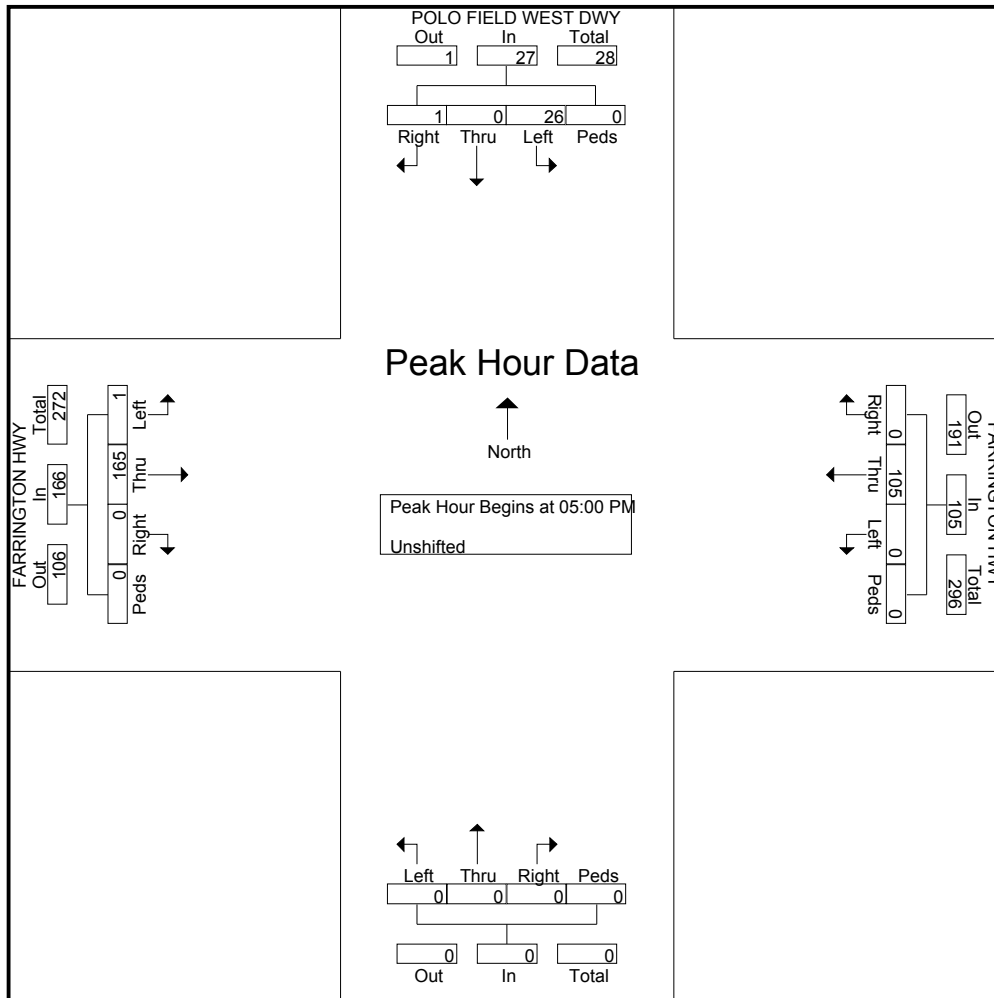
File Name : WE\_PM\_Polo Field West Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 2

Start Time	POLO FIELD WEST DWY Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 05:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	11	0	1	0	12	0	28	0	0	28	0	0	0	0	0	0	40	0	0	40	80
05:15 PM	6	0	0	0	6	0	24	0	0	24	0	0	0	0	0	0	54	0	0	54	84
05:30 PM	5	0	0	0	5	0	22	0	0	22	0	0	0	0	0	0	39	0	0	39	66
05:45 PM	4	0	0	0	4	0	31	0	0	31	0	0	0	0	0	1	32	0	0	33	68
Total Volume	26	0	1	0	27	0	105	0	0	105	0	0	0	0	0	1	165	0	0	166	298
% App. Total	96.3	0	3.7	0		0	100	0	0		0	0	0	0		0.6	99.4	0	0		
PHF	.591	.000	.250	.000	.563	.000	.847	.000	.000	.847	.000	.000	.000	.000	.000	.250	.764	.000	.000	.769	.887



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Site Code : 00000000

Start Date : 9/4/2016

Page No : 1

Groups Printed- Unshifted

Start Time	POLO FIELD WEST DWY Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
04:30 PM	0	0	0	0	0	19	0	0	0	0	0	0	0	35	0	0	54
04:45 PM	0	0	0	0	0	15	0	0	0	0	0	0	0	50	0	0	65
Total	0	0	0	0	0	34	0	0	0	0	0	0	0	85	0	0	119
05:00 PM	11	0	1	0	0	28	0	0	0	0	0	0	0	40	0	0	80
05:15 PM	6	0	0	0	0	24	0	0	0	0	0	0	0	54	0	0	84
05:30 PM	5	0	0	0	0	22	0	0	0	0	0	0	0	39	0	0	66
05:45 PM	4	0	0	0	0	31	0	0	0	0	0	0	1	32	0	0	68
Total	26	0	1	0	0	105	0	0	0	0	0	0	1	165	0	0	298
06:00 PM	3	0	1	0	0	19	0	0	0	0	0	0	0	22	0	0	45
06:15 PM	8	0	0	0	0	29	0	0	0	0	0	0	0	20	0	0	57
06:30 PM	1	0	0	0	0	20	0	0	0	0	0	0	0	26	0	0	47
06:45 PM	0	0	0	0	0	19	0	0	0	0	0	0	0	22	0	0	41
Total	12	0	1	0	0	87	0	0	0	0	0	0	0	90	0	0	190
07:00 PM	13	0	1	0	0	18	2	0	0	0	0	0	0	22	0	0	56
Grand Total	51	0	3	0	0	244	2	0	0	0	0	0	1	362	0	0	663
Apprch %	94.4	0	5.6	0	0	99.2	0.8	0	0	0	0	0	0.3	99.7	0	0	
Total %	7.7	0	0.5	0	0	36.8	0.3	0	0	0	0	0	0.2	54.6	0	0	

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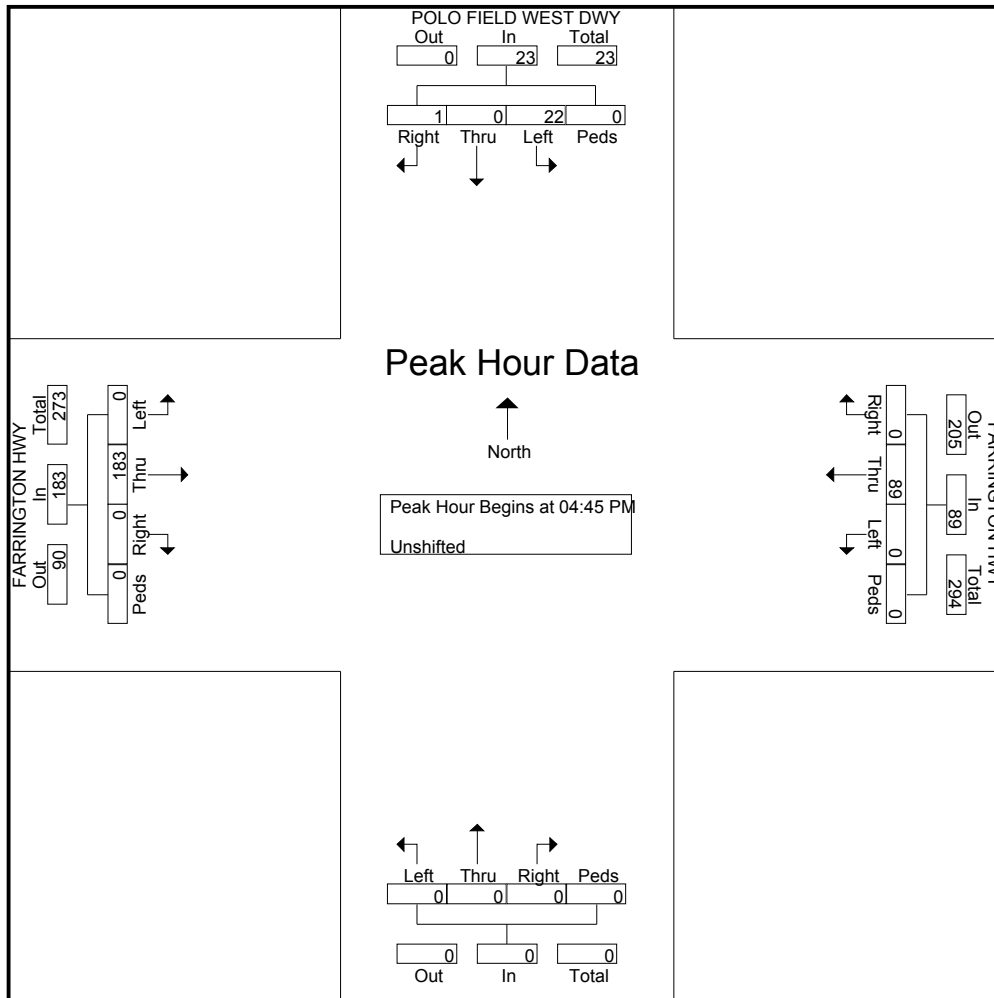
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Start Date : 9/4/2016

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Start Time	POLO FIELD WEST DWY Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 04:45 PM to 05:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	0	0	0	0	0	0	15	0	0	15	0	0	0	0	0	0	50	0	0	50	65
05:00 PM	11	0	1	0	12	0	28	0	0	28	0	0	0	0	0	0	40	0	0	40	80
05:15 PM	6	0	0	0	6	0	24	0	0	24	0	0	0	0	0	0	54	0	0	54	84
05:30 PM	5	0	0	0	5	0	22	0	0	22	0	0	0	0	0	0	39	0	0	39	66
Total Volume	22	0	1	0	23	0	89	0	0	89	0	0	0	0	0	0	183	0	0	183	295
% App. Total	95.7	0	4.3	0		0	100	0	0		0	0	0	0		0	100	0	0		
PHF	.500	.000	.250	.000	.479	.000	.795	.000	.000	.795	.000	.000	.000	.000	.000	.000	.847	.000	.000	.847	.878



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Site Code : 00000000

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Groups Printed- Unshifted

Start Time	POLO FIELD WEST DWY Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
04:30 PM	0	0	0	0	0	19	0	0	0	0	0	0	0	35	0	0	54
04:45 PM	0	0	0	0	0	15	0	0	0	0	0	0	0	50	0	0	65
Total	0	0	0	0	0	34	0	0	0	0	0	0	0	85	0	0	119
05:00 PM	11	0	1	0	0	28	0	0	0	0	0	0	0	40	0	0	80
05:15 PM	6	0	0	0	0	24	0	0	0	0	0	0	0	54	0	0	84
05:30 PM	5	0	0	0	0	22	0	0	0	0	0	0	0	39	0	0	66
05:45 PM	4	0	0	0	0	31	0	0	0	0	0	0	1	32	0	0	68
Total	26	0	1	0	0	105	0	0	0	0	0	0	1	165	0	0	298
06:00 PM	3	0	1	0	0	19	0	0	0	0	0	0	0	22	0	0	45
06:15 PM	8	0	0	0	0	29	0	0	0	0	0	0	0	20	0	0	57
06:30 PM	1	0	0	0	0	20	0	0	0	0	0	0	0	26	0	0	47
06:45 PM	0	0	0	0	0	19	0	0	0	0	0	0	0	22	0	0	41
Total	12	0	1	0	0	87	0	0	0	0	0	0	0	90	0	0	190
07:00 PM	13	0	1	0	0	18	2	0	0	0	0	0	0	22	0	0	56
Grand Total	51	0	3	0	0	244	2	0	0	0	0	0	1	362	0	0	663
Apprch %	94.4	0	5.6	0	0	99.2	0.8	0	0	0	0	0	0.3	99.7	0	0	
Total %	7.7	0	0.5	0	0	36.8	0.3	0	0	0	0	0	0.2	54.6	0	0	

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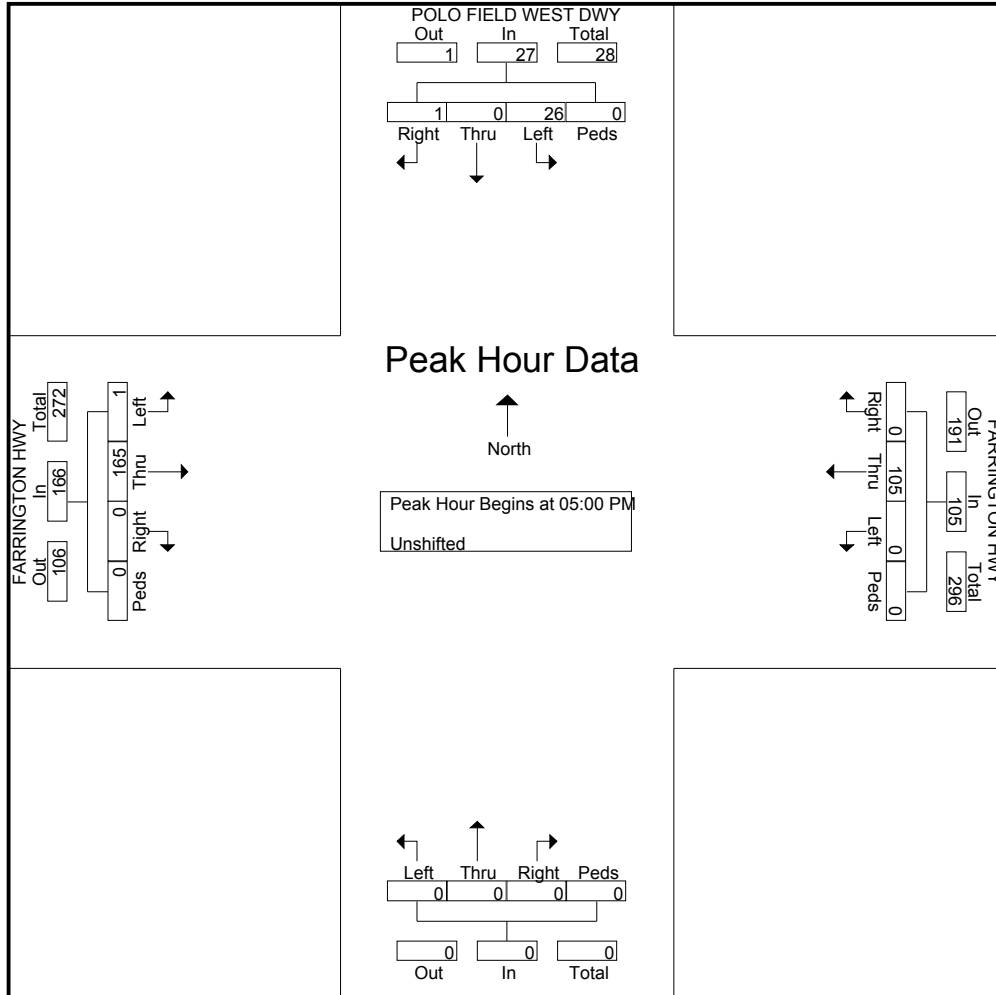
File Name : WE\_PM\_Polo Field West Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 2

Start Time	POLO FIELD WEST DWY Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 04:30 PM to 07:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	11	0	1	0	12	0	28	0	0	28	0	0	0	0	0	0	40	0	0	40	80
05:15 PM	6	0	0	0	6	0	24	0	0	24	0	0	0	0	0	0	54	0	0	54	84
05:30 PM	5	0	0	0	5	0	22	0	0	22	0	0	0	0	0	0	39	0	0	39	66
05:45 PM	4	0	0	0	4	0	31	0	0	31	0	0	0	0	0	1	32	0	0	33	68
Total Volume	26	0	1	0	27	0	105	0	0	105	0	0	0	0	0	1	165	0	0	166	298
% App. Total	96.3	0	3.7	0		0	100	0	0		0	0	0	0		0.6	99.4	0	0		
PHF	.591	.000	.250	.000	.563	.000	.847	.000	.000	.847	.000	.000	.000	.000	.000	.250	.764	.000	.000	.769	.887





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Start Date : 9/4/2016

Page No : 1

Groups Printed- Unshifted

Start Time	POLO FIELD EAST DWY Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
04:30 PM	11	0	0	0	0	19	5	0	0	0	0	0	3	34	0	0	72
04:45 PM	5	0	0	0	0	22	4	0	0	0	0	0	0	54	0	0	85
Total	16	0	0	0	0	41	9	0	0	0	0	0	3	88	0	0	157
05:00 PM	9	0	2	0	0	30	3	0	0	0	0	0	1	53	0	0	98
05:15 PM	12	0	3	0	0	22	8	0	0	0	0	0	3	63	0	0	111
05:30 PM	13	0	1	0	0	22	5	0	0	0	0	0	1	42	0	0	84
05:45 PM	12	0	2	0	0	28	6	0	0	0	0	0	0	37	0	0	85
Total	46	0	8	0	0	102	22	0	0	0	0	0	5	195	0	0	378
06:00 PM	17	0	2	0	0	20	0	0	0	0	0	0	1	26	0	0	66
06:15 PM	13	0	1	0	0	28	3	0	0	0	0	0	1	26	0	0	72
06:30 PM	10	0	2	0	0	19	2	0	0	0	0	0	1	29	0	0	63
06:45 PM	14	0	1	0	0	18	1	0	0	0	0	0	3	25	0	0	62
Total	54	0	6	0	0	85	6	0	0	0	0	0	6	106	0	0	263
07:00 PM	18	0	1	0	0	19	1	0	0	0	0	0	1	37	0	0	77
Grand Total	134	0	15	0	0	247	38	0	0	0	0	0	15	426	0	0	875
Apprch %	89.9	0	10.1	0	0	86.7	13.3	0	0	0	0	0	3.4	96.6	0	0	
Total %	15.3	0	1.7	0	0	28.2	4.3	0	0	0	0	0	1.7	48.7	0	0	

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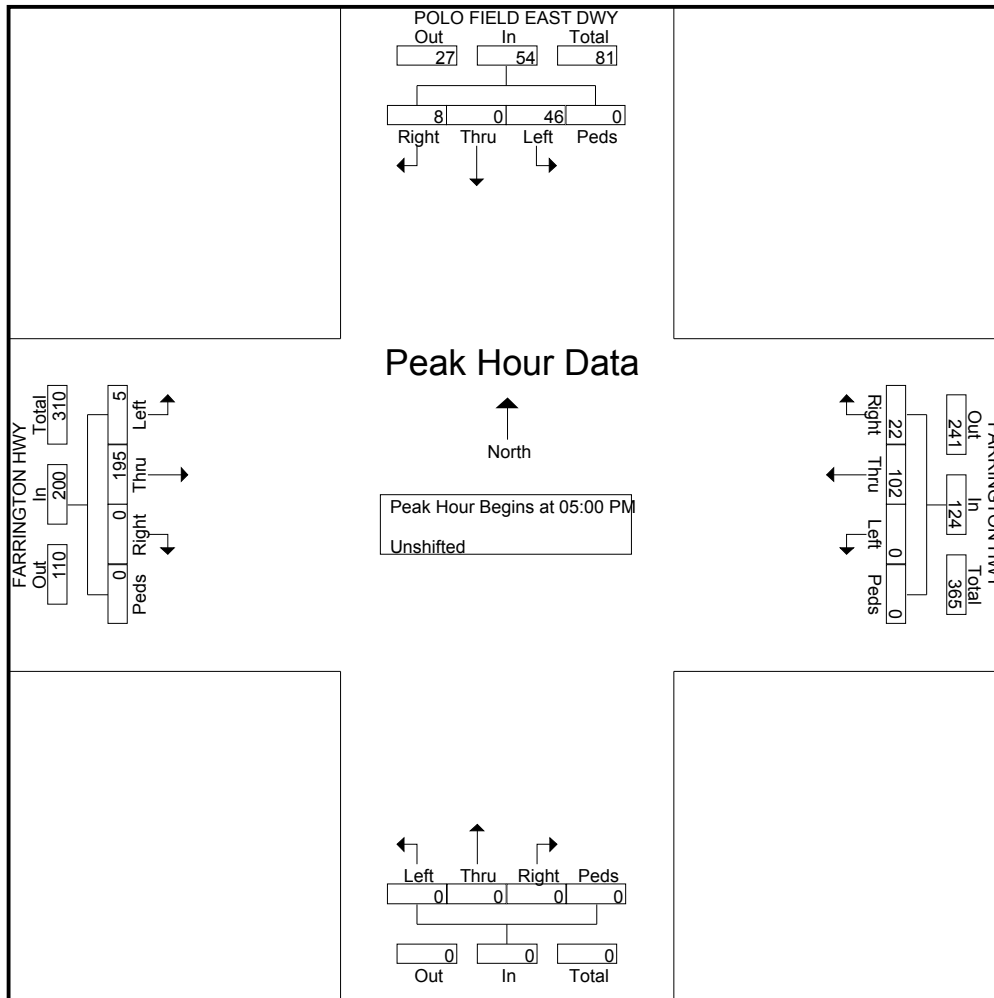
File Name : WE\_PM\_Polo Field East Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 2

Start Time	POLO FIELD EAST DWY Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 05:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 05:00 PM																					
05:00 PM	9	0	2	0	11	0	30	3	0	33	0	0	0	0	0	1	53	0	0	54	98
05:15 PM	12	0	3	0	15	0	22	8	0	30	0	0	0	0	0	3	63	0	0	66	111
05:30 PM	13	0	1	0	14	0	22	5	0	27	0	0	0	0	0	1	42	0	0	43	84
05:45 PM	12	0	2	0	14	0	28	6	0	34	0	0	0	0	0	0	37	0	0	37	85
Total Volume	46	0	8	0	54	0	102	22	0	124	0	0	0	0	0	5	195	0	0	200	378
% App. Total	85.2	0	14.8	0		0	82.3	17.7	0		0	0	0	0		2.5	97.5	0	0		
PHF	.885	.000	.667	.000	.900	.000	.850	.688	.000	.912	.000	.000	.000	.000	.000	.417	.774	.000	.000	.758	.851



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Start Date : 9/4/2016

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Groups Printed- Unshifted

Start Time	POLO FIELD EAST DWY Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
04:30 PM	11	0	0	0	0	19	5	0	0	0	0	0	3	34	0	0	72
04:45 PM	5	0	0	0	0	22	4	0	0	0	0	0	0	54	0	0	85
Total	16	0	0	0	0	41	9	0	0	0	0	0	3	88	0	0	157
05:00 PM	9	0	2	0	0	30	3	0	0	0	0	0	1	53	0	0	98
05:15 PM	12	0	3	0	0	22	8	0	0	0	0	0	3	63	0	0	111
05:30 PM	13	0	1	0	0	22	5	0	0	0	0	0	1	42	0	0	84
05:45 PM	12	0	2	0	0	28	6	0	0	0	0	0	0	37	0	0	85
Total	46	0	8	0	0	102	22	0	0	0	0	0	5	195	0	0	378
06:00 PM	17	0	2	0	0	20	0	0	0	0	0	0	1	26	0	0	66
06:15 PM	13	0	1	0	0	28	3	0	0	0	0	0	1	26	0	0	72
06:30 PM	10	0	2	0	0	19	2	0	0	0	0	0	1	29	0	0	63
06:45 PM	14	0	1	0	0	18	1	0	0	0	0	0	3	25	0	0	62
Total	54	0	6	0	0	85	6	0	0	0	0	0	6	106	0	0	263
07:00 PM	18	0	1	0	0	19	1	0	0	0	0	0	1	37	0	0	77
Grand Total	134	0	15	0	0	247	38	0	0	0	0	0	15	426	0	0	875
Apprch %	89.9	0	10.1	0	0	86.7	13.3	0	0	0	0	0	3.4	96.6	0	0	
Total %	15.3	0	1.7	0	0	28.2	4.3	0	0	0	0	0	1.7	48.7	0	0	

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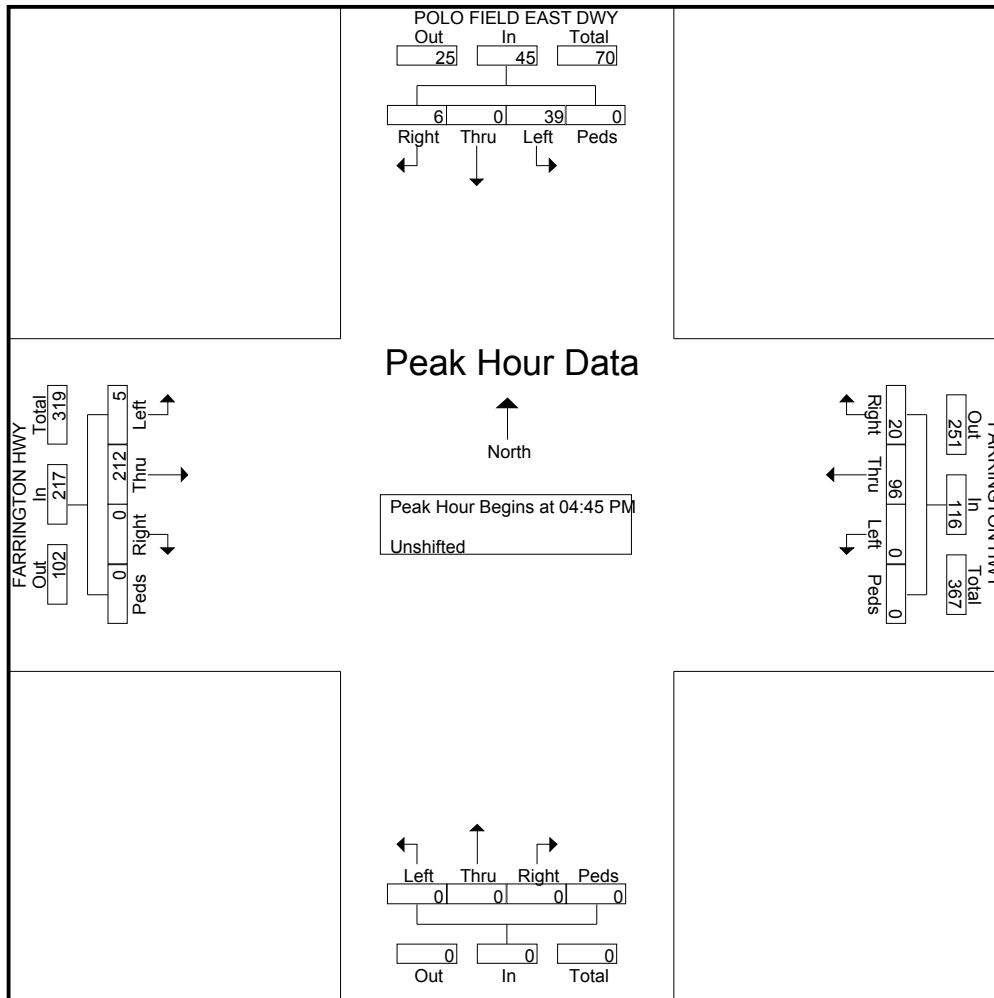
File Name : WE\_PM\_Polo Field East Dwy - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 2

Start Time	POLO FIELD EAST DWY Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 04:30 PM to 07:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	5	0	0	0	5	0	22	4	0	26	0	0	0	0	0	0	54	0	0	54	85
05:00 PM	9	0	2	0	11	0	30	3	0	33	0	0	0	0	0	1	53	0	0	54	98
05:15 PM	12	0	3	0	15	0	22	8	0	30	0	0	0	0	0	3	63	0	0	66	111
05:30 PM	13	0	1	0	14	0	22	5	0	27	0	0	0	0	0	1	42	0	0	43	84
Total Volume	39	0	6	0	45	0	96	20	0	116	0	0	0	0	0	5	212	0	0	217	378
% App. Total	86.7	0	13.3	0		0	82.8	17.2	0		0	0	0	0		2.3	97.7	0	0		
PHF	.750	.000	.500	.000	.750	.000	.800	.625	.000	.879	.000	.000	.000	.000	.000	.417	.841	.000	.000	.822	.851



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Site Code : 00000000

Start Date : 9/4/2016

Page No : 1

Groups Printed- Unshifted

Start Time	GOODALE AVE Southbound				FARRINGTON HWY Westbound				Northbound				FARRINGTON HWY Eastbound				Int. Total
	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	Left	Thru	Right	Peds	
04:30 PM	21	0	20	0	0	31	23	0	0	0	0	0	24	41	0	0	160
04:45 PM	30	0	9	0	0	34	37	0	0	0	0	0	18	57	0	0	185
Total	51	0	29	0	0	65	60	0	0	0	0	0	42	98	0	0	345
05:00 PM	12	0	10	0	0	15	15	0	0	0	0	0	23	59	0	0	134
05:15 PM	21	0	8	0	0	37	24	0	0	0	0	0	29	72	0	0	191
05:30 PM	24	0	19	0	0	36	25	0	0	0	0	0	28	59	0	0	191
05:45 PM	13	0	16	0	0	35	34	0	0	0	0	0	21	54	0	0	173
Total	70	0	53	0	0	123	98	0	0	0	0	0	101	244	0	0	689
06:00 PM	22	0	13	0	0	36	26	0	0	0	0	0	14	53	0	0	164
06:15 PM	24	0	22	0	0	43	21	0	0	0	0	0	17	49	0	0	176
06:30 PM	14	0	10	0	0	28	23	0	0	0	0	0	16	57	0	0	148
06:45 PM	17	0	13	0	0	27	16	0	0	0	0	0	21	46	0	0	140
Total	77	0	58	0	0	134	86	0	0	0	0	0	68	205	0	0	628
07:00 PM	18	0	14	0	0	24	14	0	0	0	0	0	17	57	0	0	144
Grand Total	216	0	154	0	0	346	258	0	0	0	0	0	228	604	0	0	1806
Apprch %	58.4	0	41.6	0	0	57.3	42.7	0	0	0	0	0	27.4	72.6	0	0	
Total %	12	0	8.5	0	0	19.2	14.3	0	0	0	0	0	12.6	33.4	0	0	

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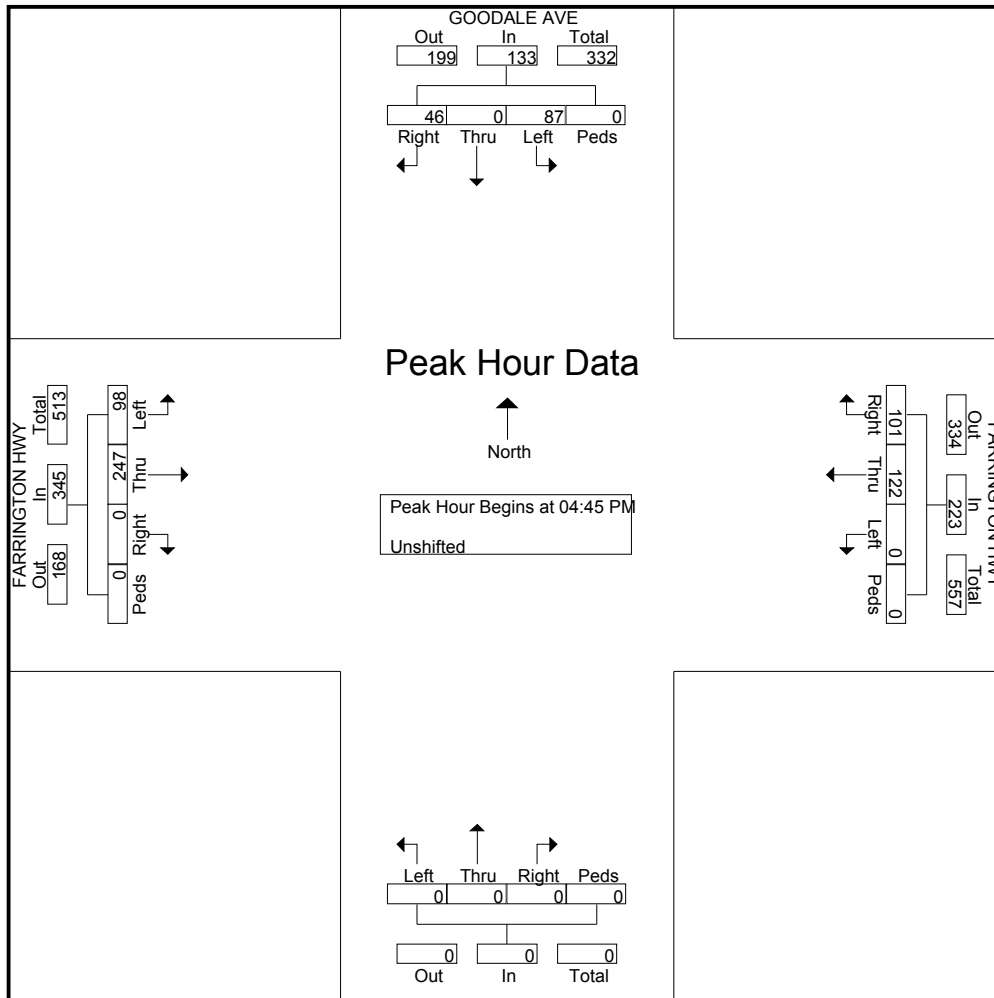
File Name : WE\_PM\_Goodale Ave - Farrington Hwy

Site Code : 00000000

Start Date : 9/4/2016

Page No : 2

Start Time	GOODALE AVE Southbound					FARRINGTON HWY Westbound					Northbound					FARRINGTON HWY Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
Peak Hour Analysis From 04:45 PM to 05:30 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	30	0	9	0	39	0	34	37	0	71	0	0	0	0	0	18	57	0	0	75	185
05:00 PM	12	0	10	0	22	0	15	15	0	30	0	0	0	0	0	23	59	0	0	82	134
05:15 PM	21	0	8	0	29	0	37	24	0	61	0	0	0	0	0	29	72	0	0	101	191
05:30 PM	24	0	19	0	43	0	36	25	0	61	0	0	0	0	0	28	59	0	0	87	191
Total Volume	87	0	46	0	133	0	122	101	0	223	0	0	0	0	0	98	247	0	0	345	701
% App. Total	65.4	0	34.6	0		0	54.7	45.3	0		0	0	0	0		28.4	71.6	0	0		
PHF	.725	.000	.605	.000	.773	.000	.824	.682	.000	.785	.000	.000	.000	.000	.000	.845	.858	.000	.000	.854	.918





# **APPENDIX B**

## LEVEL OF SERVICE CRITERIA

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## APPENDIX B – LEVEL OF SERVICE (LOS) CRITERIA

### LEVEL OF SERVICE FOR SIGNALIZED INTERSECTIONS (HCM 2000)

Level of service for signalized intersections is directly related to delay values and is assigned on that basis. Level of Service is a measure of the acceptability of delay values to motorists at a given intersection. The criteria are given in table below.

Level-of Service Criteria for Signalized Intersections

Level of Service	Control Delay per Vehicle (sec./veh.)
A	< 10.0
B	>10.0 and ≤ 20.0
C	>20.0 and ≤ 35.0
D	>35.0 and ≤ 55.0
E	>55.0 and ≤ 80.0
F	> 80.0

Delay is a complex measure, and is dependent on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group or approach in question.

### LEVEL OF SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS (HCM 2000)

The level of service criteria for unsignalized intersections is defined as the average control delay, in seconds per vehicle.

LOS delay threshold values are lower for two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections than those of signalized intersections. This is because more vehicles pass through signalized intersections, and therefore, drivers expect and tolerate greater delays. While the criteria for level of service for TWSC and AWSC intersections are the same, procedures to calculate the average total delay may differ.

Level of Service Criteria for Two-Way Stop-Controlled Intersections

Level of Service	Average Control Delay (sec/veh)
A	≤ 10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	> 50





# **APPENDIX C**

## LEVEL OF SERVICE CALCULATIONS

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**Intersection**

Int Delay, s/veh 0.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	0	60	100	1	2	0
Future Vol, veh/h	0	60	100	1	2	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	65	109	1	2	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	110	0	174
Stage 1	-	-	109
Stage 2	-	-	65
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1480	-	816
Stage 1	-	-	916
Stage 2	-	-	958
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1480	-	816
Mov Cap-2 Maneuver	-	-	816
Stage 1	-	-	916
Stage 2	-	-	958

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1480	-	-	-	816
HCM Lane V/C Ratio	-	-	-	-	0.003
HCM Control Delay (s)	0	-	-	-	9.4
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

**Intersection**

Int Delay, s/veh 0.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	60	2	9	101	0	9
Future Vol, veh/h	60	2	9	101	0	9
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	65	2	10	110	0	10

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	67
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1535
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1535
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.6	8.6
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	998	-	-	1535	-
HCM Lane V/C Ratio	0.01	-	-	0.006	-
HCM Control Delay (s)	8.6	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

**Intersection**

Int Delay, s/veh 0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	2	67	109	4	1	1
Future Vol, veh/h	2	67	109	4	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	73	118	4	1	1

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	123	0	198
Stage 1	-	-	121
Stage 2	-	-	77
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1464	-	791
Stage 1	-	-	904
Stage 2	-	-	946
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1464	-	790
Mov Cap-2 Maneuver	-	-	790
Stage 1	-	-	904
Stage 2	-	-	945

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	9.2
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1464	-	-	-	854
HCM Lane V/C Ratio	0.001	-	-	-	0.003
HCM Control Delay (s)	7.5	0	-	-	9.2
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

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**Intersection**

Int Delay, s/veh 0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	1	71	0	1	111	0	0	0	1	0	0	1
Future Vol, veh/h	1	71	0	1	111	0	0	0	1	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	77	0	1	121	0	0	0	1	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	121	0	0	77	0	0	202	202	77	203	202	121
Stage 1	-	-	-	-	-	-	79	79	-	123	123	-
Stage 2	-	-	-	-	-	-	123	123	-	80	79	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1467	-	-	1522	-	-	756	694	984	755	694	930
Stage 1	-	-	-	-	-	-	930	829	-	881	794	-
Stage 2	-	-	-	-	-	-	881	794	-	929	829	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1467	-	-	1522	-	-	754	693	984	753	693	930
Mov Cap-2 Maneuver	-	-	-	-	-	-	754	693	-	753	693	-
Stage 1	-	-	-	-	-	-	929	828	-	880	793	-
Stage 2	-	-	-	-	-	-	879	793	-	927	828	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	0.1	8.7	8.9
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	984	1467	-	-	1522	-	-	930
HCM Lane V/C Ratio	0.001	0.001	-	-	0.001	-	-	0.001
HCM Control Delay (s)	8.7	7.5	0	-	7.4	0	-	8.9
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

**Intersection**

Int Delay, s/veh 4.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	0	237	0	0	151	226
Future Vol, veh/h	0	237	0	0	151	226
Conflicting Peds, #/hr	250	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	258	0	0	164	246

**Major/Minor**

	Major1	Minor2
Conflicting Flow All	0	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

**Approach**

HCM Control Delay, s 0 11.3  
HCM LOS B

**Minor Lane/Major Mvmt**

	EBL	EBT	SBLn1
Capacity (veh/h)	-	-	731
HCM Lane V/C Ratio	-	-	0.225
HCM Control Delay (s)	0	-	11.3
HCM Lane LOS	A	-	B
HCM 95th %tile Q(veh)	-	-	0.9

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HCM research expects at least one 'Stop' controlled approach at the intersection.

**Intersection**

Int Delay, s/veh 0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	0	0	0	259	49	0
Future Vol, veh/h	0	0	0	259	49	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	282	53	0

**Major/Minor**

	Major2	Minor1
Conflicting Flow All	0	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

**Approach**

HCM Control Delay, s 0  
HCM LOS -

**Minor Lane/Major Mvmt**

	NBLn1	WBL	WBT
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	-	0	-
HCM Lane LOS	-	A	-
HCM 95th %tile Q(veh)	-	-	-



**Intersection**

Int Delay, s/veh 5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	162	146	0	0	0	215
Future Vol, veh/h	162	146	0	0	0	215
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	176	159	0	0	0	234

**Major/Minor**

	Minor1	Major2
Conflicting Flow All	234	0
Stage 1	0	-
Stage 2	234	-
Critical Hdwy	7.12	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	6.12	-
Follow-up Hdwy	3.518	-
Pot Cap-1 Maneuver	721	0
Stage 1	-	0
Stage 2	769	0
Platoon blocked, %		-
Mov Cap-1 Maneuver	721	-
Mov Cap-2 Maneuver	721	-
Stage 1	-	-
Stage 2	769	-

**Approach**

HCM Control Delay, s 11.6 0  
 HCM LOS B

**Minor Lane/Major Mvmt**

	WBLn1	SBL	SBT
Capacity (veh/h)	721	-	-
HCM Lane V/C Ratio	0.244	-	-
HCM Control Delay (s)	11.6	0	-
HCM Lane LOS	B	A	-
HCM 95th %tile Q(veh)	1	-	-

**Intersection**

Int Delay, s/veh 0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	0	96	67	0	0	0
Future Vol, veh/h	0	96	67	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	104	73	0	0	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	73	0	177
Stage 1	-	-	73
Stage 2	-	-	104
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1527	-	813
Stage 1	-	-	950
Stage 2	-	-	920
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1527	-	813
Mov Cap-2 Maneuver	-	-	813
Stage 1	-	-	950
Stage 2	-	-	920

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1527	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

**Intersection**

Int Delay, s/veh 0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	95	1	7	67	0	5
Future Vol, veh/h	95	1	7	67	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	103	1	8	73	0	5

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	104
Stage 1	-	-	104
Stage 2	-	-	88
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1488
Stage 1	-	-	920
Stage 2	-	-	935
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1488
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	920
Stage 2	-	-	929

Approach	EB	WB	NB
HCM Control Delay, s	0	0.7	8.8
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	951	-	-	1488	-
HCM Lane V/C Ratio	0.006	-	-	0.005	-
HCM Control Delay (s)	8.8	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

**Intersection**

Int Delay, s/veh 0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	0	100	0	74	7	0
Future Vol, veh/h	0	100	0	74	7	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	109	0	80	8	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	80	0	149
Stage 1	-	-	40
Stage 2	-	-	109
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1518	-	843
Stage 1	-	-	982
Stage 2	-	-	916
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1518	-	843
Mov Cap-2 Maneuver	-	-	843
Stage 1	-	-	982
Stage 2	-	-	916

Approach	EB	WB	SB
HCM Control Delay, s	0	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1518	-	-	-	843
HCM Lane V/C Ratio	-	-	-	-	0.009
HCM Control Delay (s)	0	-	-	-	9.3
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

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**Intersection**

Int Delay, s/veh 0.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	0	122	1	4	77	1	1	0	3	0	0	1
Future Vol, veh/h	0	122	1	4	77	1	1	0	3	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	133	1	4	84	1	1	0	3	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	85	0	0	134	0	0	226	226	133	228	227	84
Stage 1	-	-	-	-	-	-	133	133	-	93	93	-
Stage 2	-	-	-	-	-	-	93	93	-	135	134	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1512	-	-	1451	-	-	729	673	916	727	672	975
Stage 1	-	-	-	-	-	-	870	786	-	914	818	-
Stage 2	-	-	-	-	-	-	914	818	-	868	785	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1512	-	-	1451	-	-	727	671	916	723	670	975
Mov Cap-2 Maneuver	-	-	-	-	-	-	727	671	-	723	670	-
Stage 1	-	-	-	-	-	-	870	786	-	914	816	-
Stage 2	-	-	-	-	-	-	910	816	-	865	785	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.4	9.2	8.7
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	860	1512	-	-	1451	-	-	975
HCM Lane V/C Ratio	0.005	-	-	-	0.003	-	-	0.001
HCM Control Delay (s)	9.2	0	-	-	7.5	0	-	8.7
HCM Lane LOS	A	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

**Intersection**

Int Delay, s/veh 3.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	0	327	0	0	120	295
Future Vol, veh/h	0	327	0	0	120	295
Conflicting Peds, #/hr	250	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	355	0	0	130	321

**Major/Minor**

	Major1	Minor2
Conflicting Flow All	0	355
Stage 1	-	0
Stage 2	-	355
Critical Hdwy	-	6.42
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	5.42
Follow-up Hdwy	-	3.518
Pot Cap-1 Maneuver	-	643
Stage 1	-	-
Stage 2	-	710
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	643
Mov Cap-2 Maneuver	-	643
Stage 1	-	-
Stage 2	-	710

**Approach**

	EB	SB
HCM Control Delay, s	0	12
HCM LOS		B

**Minor Lane/Major Mvmt**

	EBL	EBT	SBLn1
Capacity (veh/h)	-	-	643
HCM Lane V/C Ratio	-	-	0.203
HCM Control Delay (s)	0	-	12
HCM Lane LOS	A	-	B
HCM 95th %tile Q(veh)	-	-	0.8

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HCM research expects at least one 'Stop' controlled approach at the intersection.

**Intersection**

Int Delay, s/veh 0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	0	0	0	366	116	0
Future Vol, veh/h	0	0	0	366	116	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	398	126	0

**Major/Minor**

	Major2	Minor1
Conflicting Flow All	0	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

**Approach**

HCM Control Delay, s 0  
HCM LOS -

**Minor Lane/Major Mvmt**

	NBLn1	WBL	WBT
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	-	0	-
HCM Lane LOS	-	A	-
HCM 95th %tile Q(veh)	-	-	-



**Intersection**

Int Delay, s/veh 5.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	184	298	0	0	0	231
Future Vol, veh/h	184	298	0	0	0	231
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	200	324	0	0	0	251

**Major/Minor**

	Minor1		Major2	
Conflicting Flow All	251	-	0	0
Stage 1	0	-	-	-
Stage 2	251	-	-	-
Critical Hdwy	7.12	-	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	6.12	-	-	-
Follow-up Hdwy	3.518	-	-	-
Pot Cap-1 Maneuver	702	0	-	-
Stage 1	-	0	-	-
Stage 2	753	0	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	702	-	-	-
Mov Cap-2 Maneuver	702	-	-	-
Stage 1	-	-	-	-
Stage 2	753	-	-	-

**Approach**

	WB	SB
HCM Control Delay, s	12.2	0
HCM LOS	B	

**Minor Lane/Major Mvmt**

	WBLn1	SBL	SBT
Capacity (veh/h)	702	-	-
HCM Lane V/C Ratio	0.285	-	-
HCM Control Delay (s)	12.2	0	-
HCM Lane LOS	B	A	-
HCM 95th %tile Q(veh)	1.2	-	-

**Intersection**

Int Delay, s/veh 0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	0	195	178	0	0	0
Future Vol, veh/h	0	195	178	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	212	193	0	0	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	193	0	405
Stage 1	-	-	193
Stage 2	-	-	212
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1380	-	602
Stage 1	-	-	840
Stage 2	-	-	823
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1380	-	602
Mov Cap-2 Maneuver	-	-	602
Stage 1	-	-	840
Stage 2	-	-	823

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1380	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

**Intersection**

Int Delay, s/veh 0.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	193	2	13	178	0	3
Future Vol, veh/h	193	2	13	178	0	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	210	2	14	193	0	3

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	212
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1358
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1358
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	9.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	829	-	-	1358	-
HCM Lane V/C Ratio	0.004	-	-	0.01	-
HCM Control Delay (s)	9.4	-	-	7.7	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

**Intersection**

Int Delay, s/veh 0.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	11	185	188	86	0	3
Future Vol, veh/h	11	185	188	86	0	3
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	12	201	204	93	0	3

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	298	0	476
Stage 1	-	-	251
Stage 2	-	-	225
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1263	-	788
Stage 1	-	-	791
Stage 2	-	-	812
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1263	-	788
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	791
Stage 2	-	-	803

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	9.6
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1263	-	-	-	788
HCM Lane V/C Ratio	0.009	-	-	-	0.004
HCM Control Delay (s)	7.9	0	-	-	9.6
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

HCM 2010 TWSC  
 4: Dillingham Ranch East Dwy & Farrington Hwy

10/28/2016

**Intersection**

Int Delay, s/veh 0.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	1	185	6	5	292	0	2	0	6	0	0	0
Future Vol, veh/h	1	185	6	5	292	0	2	0	6	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	201	7	5	317	0	2	0	7	0	0	0

Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	317	0	0	208	0	0	535	535	204	538	538	317
Stage 1	-	-	-	-	-	-	207	207	-	328	328	-
Stage 2	-	-	-	-	-	-	328	328	-	210	210	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1243	-	-	1363	-	-	456	452	837	454	450	724
Stage 1	-	-	-	-	-	-	795	731	-	685	647	-
Stage 2	-	-	-	-	-	-	685	647	-	792	728	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1243	-	-	1363	-	-	454	450	837	449	448	724
Mov Cap-2 Maneuver	-	-	-	-	-	-	454	450	-	449	448	-
Stage 1	-	-	-	-	-	-	794	730	-	684	644	-
Stage 2	-	-	-	-	-	-	682	644	-	785	727	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	0.1	10.3	0
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	691	1243	-	-	1363	-	-	-
HCM Lane V/C Ratio	0.013	0.001	-	-	0.004	-	-	-
HCM Control Delay (s)	10.3	7.9	0	-	7.7	0	-	0
HCM Lane LOS	B	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	-

**Intersection**

Int Delay, s/veh 3.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	0	276	0	0	106	376
Future Vol, veh/h	0	276	0	0	106	376
Conflicting Peds, #/hr	250	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	300	0	0	115	409

**Major/Minor**

	Major1	Minor2
Conflicting Flow All	0	300
Stage 1	-	0
Stage 2	-	300
Critical Hdwy	-	6.42
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	5.42
Follow-up Hdwy	-	3.518
Pot Cap-1 Maneuver	-	691
Stage 1	-	-
Stage 2	-	752
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	691
Mov Cap-2 Maneuver	-	691
Stage 1	-	-
Stage 2	-	752

**Approach**

HCM Control Delay, s 0 11.2  
HCM LOS B

**Minor Lane/Major Mvmt**

	EBL	EBT	SBLn1
Capacity (veh/h)	-	-	691
HCM Lane V/C Ratio	-	-	0.167
HCM Control Delay (s)	0	-	11.2
HCM Lane LOS	A	-	B
HCM 95th %tile Q(veh)	-	-	0.6

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HCM research expects at least one 'Stop' controlled approach at the intersection.

**Intersection**

Int Delay, s/veh 0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	0	0	0	418	83	0
Future Vol, veh/h	0	0	0	418	83	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	454	90	0

**Major/Minor**

	Major2	Minor1
Conflicting Flow All	0	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

**Approach**

HCM Control Delay, s 0  
HCM LOS -

**Minor Lane/Major Mvmt**

	NBLn1	WBL	WBT
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	-	0	-
HCM Lane LOS	-	A	-
HCM 95th %tile Q(veh)	-	-	-



**Intersection**

Int Delay, s/veh 7.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	284	217	0	0	0	198
Future Vol, veh/h	284	217	0	0	0	198
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	309	236	0	0	0	215

**Major/Minor**

	Minor1	Major2
Conflicting Flow All	215	0
Stage 1	0	-
Stage 2	215	-
Critical Hdwy	7.12	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	6.12	-
Follow-up Hdwy	3.518	-
Pot Cap-1 Maneuver	742	0
Stage 1	-	0
Stage 2	787	0
Platoon blocked, %		-
Mov Cap-1 Maneuver	742	-
Mov Cap-2 Maneuver	742	-
Stage 1	-	-
Stage 2	787	-

**Approach**

	WB	SB
HCM Control Delay, s	13.3	0
HCM LOS	B	

**Minor Lane/Major Mvmt**

	WBLn1	SBL	SBT
Capacity (veh/h)	742	-	-
HCM Lane V/C Ratio	0.416	-	-
HCM Control Delay (s)	13.3	0	-
HCM Lane LOS	B	A	-
HCM 95th %tile Q(veh)	2.1	-	-

HCM 2010 TWSC  
 1: Farrington Hwy & Polo Field West Dwy

10/28/2016

**Intersection**

Int Delay, s/veh	0.6
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Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	5	75	125	5	5	5
Future Vol, veh/h	5	75	125	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	82	136	5	5	5

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	141	0	231
Stage 1	-	-	139
Stage 2	-	-	92
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1442	-	909
Stage 1	-	-	888
Stage 2	-	-	932
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1442	-	909
Mov Cap-2 Maneuver	-	-	754
Stage 1	-	-	888
Stage 2	-	-	928

Approach	EB	WB	SB
HCM Control Delay, s	0.5	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1442	-	-	-	824
HCM Lane V/C Ratio	0.004	-	-	-	0.013
HCM Control Delay (s)	7.5	0	-	-	9.4
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

**Intersection**

Int Delay, s/veh 1.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	75	5	15	130	5	15
Future Vol, veh/h	75	5	15	130	5	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	82	5	16	141	5	16

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	87
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1509
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1509
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	9.1
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	896	-	-	1509	-
HCM Lane V/C Ratio	0.024	-	-	0.011	-
HCM Control Delay (s)	9.1	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

**Intersection**

Int Delay, s/veh	0.5
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Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	5	85	140	5	5	5
Future Vol, veh/h	5	85	140	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	92	152	5	5	5

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	158	0	155
Stage 1	-	-	155
Stage 2	-	-	103
Critical Hdwy	4.12	-	6.22
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.318
Pot Cap-1 Maneuver	1422	-	891
Stage 1	-	-	873
Stage 2	-	-	921
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1422	-	891
Mov Cap-2 Maneuver	-	-	728
Stage 1	-	-	873
Stage 2	-	-	917

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	9.6
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1422	-	-	-	801
HCM Lane V/C Ratio	0.004	-	-	-	0.014
HCM Control Delay (s)	7.5	0	-	-	9.6
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

HCM 2010 TWSC  
 4: Dillingham Ranch East Dwy & Farrington Hwy

10/28/2016

Intersection

Int Delay, s/veh 1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	5	90	5	5	140	5	5	0	5	5	0	5
Future Vol, veh/h	5	90	5	5	140	5	5	0	5	5	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	98	5	5	152	5	5	0	5	5	0	5

Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	158	0	0	103	0	0	279	279	101	280	280	155
Stage 1	-	-	-	-	-	-	111	111	-	166	166	-
Stage 2	-	-	-	-	-	-	168	168	-	114	114	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1422	-	-	1489	-	-	673	629	954	672	628	891
Stage 1	-	-	-	-	-	-	894	804	-	836	761	-
Stage 2	-	-	-	-	-	-	834	759	-	891	801	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1422	-	-	1489	-	-	665	624	954	664	623	891
Mov Cap-2 Maneuver	-	-	-	-	-	-	665	624	-	664	623	-
Stage 1	-	-	-	-	-	-	890	801	-	833	758	-
Stage 2	-	-	-	-	-	-	826	756	-	882	798	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.4	0.2	9.7	9.8
HCM LOS			A	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	784	1422	-	-	1489	-	-	761
HCM Lane V/C Ratio	0.014	0.004	-	-	0.004	-	-	0.014
HCM Control Delay (s)	9.7	7.5	0	-	7.4	0	-	9.8
HCM Lane LOS	A	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

**Intersection**

Int Delay, s/veh 5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	0	300	0	0	190	285
Future Vol, veh/h	0	300	0	0	190	285
Conflicting Peds, #/hr	250	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	326	0	0	207	310

**Major/Minor**

	Major1	Minor2
Conflicting Flow All	0	326
Stage 1	-	0
Stage 2	-	326
Critical Hdwy	-	6.42
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	5.42
Follow-up Hdwy	-	3.518
Pot Cap-1 Maneuver	-	668
Stage 1	-	-
Stage 2	-	731
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	668
Mov Cap-2 Maneuver	-	668
Stage 1	-	-
Stage 2	-	731

**Approach**

	EB	SB
HCM Control Delay, s	0	12.8
HCM LOS		B

**Minor Lane/Major Mvmt**

	EBL	EBT	SBLn1
Capacity (veh/h)	-	-	668
HCM Lane V/C Ratio	-	-	0.309
HCM Control Delay (s)	0	-	12.8
HCM Lane LOS	A	-	B
HCM 95th %tile Q(veh)	-	-	1.3

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HCM research expects at least one 'Stop' controlled approach at the intersection.

**Intersection**

Int Delay, s/veh 0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	0	0	0	330	65	0
Future Vol, veh/h	0	0	0	330	65	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	359	71	0

**Major/Minor**

	Major2	Minor1
Conflicting Flow All	0	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

**Approach**

HCM Control Delay, s 0  
HCM LOS -

**Minor Lane/Major Mvmt**

	NBLn1	WBL	WBT
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	-	0	-
HCM Lane LOS	-	A	-
HCM 95th %tile Q(veh)	-	-	-



**Intersection**

Int Delay, s/veh 5.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	205	190	0	0	0	270
Future Vol, veh/h	205	190	0	0	0	270
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	223	207	0	0	0	293

**Major/Minor**

	Minor1	Major2
Conflicting Flow All	293	0
Stage 1	0	-
Stage 2	293	-
Critical Hdwy	7.12	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	6.12	-
Follow-up Hdwy	3.518	-
Pot Cap-1 Maneuver	659	0
Stage 1	-	0
Stage 2	715	0
Platoon blocked, %		-
Mov Cap-1 Maneuver	659	-
Mov Cap-2 Maneuver	659	-
Stage 1	-	-
Stage 2	715	-

**Approach**

HCM Control Delay, s 13.2 0  
 HCM LOS B

**Minor Lane/Major Mvmt**

	WBLn1	SBL	SBT
Capacity (veh/h)	659	-	-
HCM Lane V/C Ratio	0.338	-	-
HCM Control Delay (s)	13.2	0	-
HCM Lane LOS	B	A	-
HCM 95th %tile Q(veh)	1.5	-	-

**Intersection**

Int Delay, s/veh	0.6					
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Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	5	120	85	5	5	5
Future Vol, veh/h	5	120	85	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	130	92	5	5	5

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	98	0	236
Stage 1	-	-	95
Stage 2	-	-	141
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1495	-	752
Stage 1	-	-	929
Stage 2	-	-	886
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1495	-	749
Mov Cap-2 Maneuver	-	-	749
Stage 1	-	-	929
Stage 2	-	-	882

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	9.3
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1495	-	-	-	842
HCM Lane V/C Ratio	0.004	-	-	-	0.013
HCM Control Delay (s)	7.4	0	-	-	9.3
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

**Intersection**

Int Delay, s/veh 1.1

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	120	5	10	85	5	15
Future Vol, veh/h	120	5	10	85	5	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	130	5	11	92	5	16

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	136
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1448
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1448
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.8	9.3
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	863	-	-	1448	-
HCM Lane V/C Ratio	0.025	-	-	0.008	-
HCM Control Delay (s)	9.3	-	-	7.5	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

**Intersection**

Int Delay, s/veh 0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	5	125	95	5	10	5
Future Vol, veh/h	5	125	95	5	10	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	136	103	5	11	5

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	109	0	253
Stage 1	-	-	106
Stage 2	-	-	147
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1481	-	736
Stage 1	-	-	918
Stage 2	-	-	880
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1481	-	733
Mov Cap-2 Maneuver	-	-	733
Stage 1	-	-	918
Stage 2	-	-	876

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	9.6
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1481	-	-	-	793
HCM Lane V/C Ratio	0.004	-	-	-	0.021
HCM Control Delay (s)	7.4	0	-	-	9.6
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

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**Intersection**

Int Delay, s/veh 0.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	5	155	5	5	100	5	5	0	5	5	0	5
Future Vol, veh/h	5	155	5	5	100	5	5	0	5	5	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	168	5	5	109	5	5	0	5	5	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	114	0	0	174	0	0	307	307	171	307	307	111
Stage 1	-	-	-	-	-	-	182	182	-	122	122	-
Stage 2	-	-	-	-	-	-	125	125	-	185	185	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1475	-	-	1403	-	-	645	607	873	645	607	942
Stage 1	-	-	-	-	-	-	820	749	-	882	795	-
Stage 2	-	-	-	-	-	-	879	792	-	817	747	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1475	-	-	1403	-	-	637	602	873	637	602	942
Mov Cap-2 Maneuver	-	-	-	-	-	-	637	602	-	637	602	-
Stage 1	-	-	-	-	-	-	817	746	-	878	792	-
Stage 2	-	-	-	-	-	-	870	789	-	809	744	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.3	10	9.8
HCM LOS			B	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	737	1475	-	-	1403	-	-	760
HCM Lane V/C Ratio	0.015	0.004	-	-	0.004	-	-	0.014
HCM Control Delay (s)	10	7.5	0	-	7.6	0	-	9.8
HCM Lane LOS	B	A	A	-	A	A	-	A
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

**Intersection**

Int Delay, s/veh 3.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	0	410	0	0	150	370
Future Vol, veh/h	0	410	0	0	150	370
Conflicting Peds, #/hr	250	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	446	0	0	163	402

**Major/Minor**

	Major1	Minor2
Conflicting Flow All	0	446
Stage 1	-	0
Stage 2	-	446
Critical Hdwy	-	6.42
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	5.42
Follow-up Hdwy	-	3.518
Pot Cap-1 Maneuver	-	570
Stage 1	-	-
Stage 2	-	645
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	570
Mov Cap-2 Maneuver	-	570
Stage 1	-	-
Stage 2	-	645

**Approach**

HCM Control Delay, s 0 13.8  
HCM LOS B

**Minor Lane/Major Mvmt**

	EBL	EBT	SBLn1
Capacity (veh/h)	-	-	570
HCM Lane V/C Ratio	-	-	0.286
HCM Control Delay (s)	0	-	13.8
HCM Lane LOS	A	-	B
HCM 95th %tile Q(veh)	-	-	1.2

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HCM research expects at least one 'Stop' controlled approach at the intersection.

**Intersection**

Int Delay, s/veh 0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	0	0	0	460	145	0
Future Vol, veh/h	0	0	0	460	145	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	500	158	0

**Major/Minor**

	Major2	Minor1
Conflicting Flow All	0	500
Stage 1	-	0
Stage 2	-	500
Critical Hdwy	-	7.12
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	6.12
Follow-up Hdwy	-	3.518
Pot Cap-1 Maneuver	-	481
Stage 1	-	-
Stage 2	-	553
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	481
Mov Cap-2 Maneuver	-	481
Stage 1	-	-
Stage 2	-	553

**Approach**

HCM Control Delay, s 0  
HCM LOS -

**Minor Lane/Major Mvmt**

	NBLn1	WBL	WBT
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	-	0	-
HCM Lane LOS	-	A	-
HCM 95th %tile Q(veh)	-	-	-



**Intersection**

Int Delay, s/veh 6.3

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	230	375	0	0	0	290
Future Vol, veh/h	230	375	0	0	0	290
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	250	408	0	0	0	315

**Major/Minor**

	Minor1	Major2
Conflicting Flow All	315	0
Stage 1	0	-
Stage 2	315	-
Critical Hdwy	7.12	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	6.12	-
Follow-up Hdwy	3.518	-
Pot Cap-1 Maneuver	638	0
Stage 1	-	0
Stage 2	696	0
Platoon blocked, %		-
Mov Cap-1 Maneuver	638	-
Mov Cap-2 Maneuver	638	-
Stage 1	-	-
Stage 2	696	-

**Approach**

HCM Control Delay, s 14.2 0  
 HCM LOS B

**Minor Lane/Major Mvmt**

	WBLn1	SBL	SBT
Capacity (veh/h)	638	-	-
HCM Lane V/C Ratio	0.392	-	-
HCM Control Delay (s)	14.2	0	-
HCM Lane LOS	B	A	-
HCM 95th %tile Q(veh)	1.9	-	-

**Intersection**

Int Delay, s/veh 0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	5	245	225	5	5	5
Future Vol, veh/h	5	245	225	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	266	245	5	5	5

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	250	0	524
Stage 1	-	-	247
Stage 2	-	-	277
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1316	-	792
Stage 1	-	-	794
Stage 2	-	-	770
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1316	-	792
Mov Cap-2 Maneuver	-	-	512
Stage 1	-	-	794
Stage 2	-	-	767

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	10.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1316	-	-	-	622
HCM Lane V/C Ratio	0.004	-	-	-	0.017
HCM Control Delay (s)	7.7	0	-	-	10.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

**Intersection**

Int Delay, s/veh            0.5

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	245	5	15	225	5	5
Future Vol, veh/h	245	5	15	225	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	266	5	16	245	5	5

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	272
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1291
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1291
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.5	11.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	600	-	-	1291	-
HCM Lane V/C Ratio	0.018	-	-	0.013	-
HCM Control Delay (s)	11.1	-	-	7.8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0	-

**Intersection**

Int Delay, s/veh 0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	15	235	235	90	5	5
Future Vol, veh/h	15	235	235	90	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	255	255	98	5	5

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	353	0	592
Stage 1	-	-	304
Stage 2	-	-	288
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1206	-	469
Stage 1	-	-	748
Stage 2	-	-	761
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1206	-	462
Mov Cap-2 Maneuver	-	-	462
Stage 1	-	-	748
Stage 2	-	-	750

Approach	EB	WB	SB
HCM Control Delay, s	0.5	0	11.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1206	-	-	-	568
HCM Lane V/C Ratio	0.014	-	-	-	0.019
HCM Control Delay (s)	8	0	-	-	11.5
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

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**Intersection**

Int Delay, s/veh 0.6

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	5	235	10	5	355	5	5	0	10	5	0	5
Future Vol, veh/h	5	235	10	5	355	5	5	0	10	5	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	255	11	5	386	5	5	0	11	5	0	5

Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	391	0	0	266	0	0	674	674	261	676	676	389
Stage 1	-	-	-	-	-	-	272	272	-	399	399	-
Stage 2	-	-	-	-	-	-	402	402	-	277	277	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1168	-	-	1298	-	-	368	376	778	367	375	659
Stage 1	-	-	-	-	-	-	734	685	-	627	602	-
Stage 2	-	-	-	-	-	-	625	600	-	729	681	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1168	-	-	1298	-	-	362	372	778	359	371	659
Mov Cap-2 Maneuver	-	-	-	-	-	-	362	372	-	359	371	-
Stage 1	-	-	-	-	-	-	730	682	-	624	599	-
Stage 2	-	-	-	-	-	-	617	597	-	715	678	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.1	11.6	12.9
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	563	1168	-	-	1298	-	-	465
HCM Lane V/C Ratio	0.029	0.005	-	-	0.004	-	-	0.023
HCM Control Delay (s)	11.6	8.1	0	-	7.8	0	-	12.9
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1

**Intersection**

Int Delay, s/veh 3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	0	330	0	0	110	450
Future Vol, veh/h	0	330	0	0	110	450
Conflicting Peds, #/hr	250	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	359	0	0	120	489

**Major/Minor**

	Major1	Minor2
Conflicting Flow All	0	359
Stage 1	-	0
Stage 2	-	359
Critical Hdwy	-	6.42
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	5.42
Follow-up Hdwy	-	3.518
Pot Cap-1 Maneuver	-	640
Stage 1	-	-
Stage 2	-	707
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	640
Mov Cap-2 Maneuver	-	640
Stage 1	-	-
Stage 2	-	707

**Approach**

HCM Control Delay, s 0 11.9  
HCM LOS B

**Minor Lane/Major Mvmt**

	EBL	EBT	SBLn1
Capacity (veh/h)	-	-	640
HCM Lane V/C Ratio	-	-	0.187
HCM Control Delay (s)	0	-	11.9
HCM Lane LOS	A	-	B
HCM 95th %tile Q(veh)	-	-	0.7

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HCM research expects at least one 'Stop' controlled approach at the intersection.

**Intersection**

Int Delay, s/veh 0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	0	0	0	490	85	0
Future Vol, veh/h	0	0	0	490	85	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	533	92	0

**Major/Minor**

	Major2	Minor1
Conflicting Flow All	0	533
Stage 1	-	0
Stage 2	-	533
Critical Hdwy	-	7.12
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	6.12
Follow-up Hdwy	-	3.518
Pot Cap-1 Maneuver	-	458
Stage 1	-	-
Stage 2	-	531
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	458
Mov Cap-2 Maneuver	-	458
Stage 1	-	-
Stage 2	-	531

**Approach**

HCM Control Delay, s 0  
HCM LOS -

**Minor Lane/Major Mvmt**

	NBLn1	WBL	WBT
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	-	0	-
HCM Lane LOS	-	A	-
HCM 95th %tile Q(veh)	-	-	-



**Intersection**

Int Delay, s/veh 9.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	355	220	0	0	0	205
Future Vol, veh/h	355	220	0	0	0	205
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	386	239	0	0	0	223

**Major/Minor**

	Minor1	Major2
Conflicting Flow All	223	0
Stage 1	0	-
Stage 2	223	-
Critical Hdwy	7.12	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	6.12	-
Follow-up Hdwy	3.518	-
Pot Cap-1 Maneuver	733	0
Stage 1	-	0
Stage 2	780	0
Platoon blocked, %		-
Mov Cap-1 Maneuver	733	-
Mov Cap-2 Maneuver	733	-
Stage 1	-	-
Stage 2	780	-

**Approach**

	WB	SB
HCM Control Delay, s	15.2	0
HCM LOS	C	

**Minor Lane/Major Mvmt**

	WBLn1	SBL	SBT
Capacity (veh/h)	733	-	-
HCM Lane V/C Ratio	0.526	-	-
HCM Control Delay (s)	15.2	0	-
HCM Lane LOS	C	A	-
HCM 95th %tile Q(veh)	3.1	-	-

**Intersection**

Int Delay, s/veh 0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	5	80	125	5	5	5
Future Vol, veh/h	5	80	125	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	87	136	5	5	5

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	141	0	237
Stage 1	-	-	139
Stage 2	-	-	98
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1442	-	909
Stage 1	-	-	888
Stage 2	-	-	926
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1442	-	909
Mov Cap-2 Maneuver	-	-	748
Stage 1	-	-	888
Stage 2	-	-	922

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1442	-	-	-	821
HCM Lane V/C Ratio	0.004	-	-	-	0.013
HCM Control Delay (s)	7.5	0	-	-	9.4
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

**Intersection**

Int Delay, s/veh 2.4

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	75	5	25	130	5	50
Future Vol, veh/h	75	5	25	130	5	50
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	82	5	27	141	5	54

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	87
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1509
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1509
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.2	9.1
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	941	-	-	1509	-
HCM Lane V/C Ratio	0.064	-	-	0.018	-
HCM Control Delay (s)	9.1	-	-	7.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0.1	-

**Intersection**

Int Delay, s/veh 0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	5	120	150	5	5	5
Future Vol, veh/h	5	120	150	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	130	163	5	5	5

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	168	0	307
Stage 1	-	-	166
Stage 2	-	-	141
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1410	-	685
Stage 1	-	-	863
Stage 2	-	-	886
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1410	-	682
Mov Cap-2 Maneuver	-	-	682
Stage 1	-	-	863
Stage 2	-	-	882

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	9.8
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1410	-	-	-	768
HCM Lane V/C Ratio	0.004	-	-	-	0.014
HCM Control Delay (s)	7.6	0	-	-	9.8
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

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**Intersection**

Int Delay, s/veh 1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	5	125	5	5	150	5	5	0	10	5	0	5
Future Vol, veh/h	5	125	5	5	150	5	5	0	10	5	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	136	5	5	163	5	5	0	11	5	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	168	0	0	141	0	0	328	328	139	332	329	166
Stage 1	-	-	-	-	-	-	149	149	-	177	177	-
Stage 2	-	-	-	-	-	-	179	179	-	155	152	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1410	-	-	1442	-	-	625	591	909	621	590	878
Stage 1	-	-	-	-	-	-	854	774	-	825	753	-
Stage 2	-	-	-	-	-	-	823	751	-	847	772	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1410	-	-	1442	-	-	617	586	909	610	585	878
Mov Cap-2 Maneuver	-	-	-	-	-	-	617	586	-	610	585	-
Stage 1	-	-	-	-	-	-	851	771	-	822	750	-
Stage 2	-	-	-	-	-	-	815	748	-	834	769	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	0.2	9.7	10.1
HCM LOS			A	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	785	1410	-	-	1442	-	-	720
HCM Lane V/C Ratio	0.021	0.004	-	-	0.004	-	-	0.015
HCM Control Delay (s)	9.7	7.6	0	-	7.5	0	-	10.1
HCM Lane LOS	A	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

**Intersection**

Int Delay, s/veh 4.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	0	340	0	0	190	300
Future Vol, veh/h	0	340	0	0	190	300
Conflicting Peds, #/hr	250	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	370	0	0	207	326

**Major/Minor**

	Major1	Minor2
Conflicting Flow All	0	370
Stage 1	-	0
Stage 2	-	370
Critical Hdwy	-	6.42
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	5.42
Follow-up Hdwy	-	3.518
Pot Cap-1 Maneuver	-	630
Stage 1	-	-
Stage 2	-	699
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	630
Mov Cap-2 Maneuver	-	630
Stage 1	-	-
Stage 2	-	699

**Approach**

HCM Control Delay, s 0 13.5  
 HCM LOS B

**Minor Lane/Major Mvmt**

	EBL	EBT	SBLn1
Capacity (veh/h)	-	-	630
HCM Lane V/C Ratio	-	-	0.328
HCM Control Delay (s)	0	-	13.5
HCM Lane LOS	A	-	B
HCM 95th %tile Q(veh)	-	-	1.4

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HCM research expects at least one 'Stop' controlled approach at the intersection.

**Intersection**

Int Delay, s/veh 0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	0	0	0	340	70	0
Future Vol, veh/h	0	0	0	340	70	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	370	76	0

**Major/Minor**

	Major2	Minor1
Conflicting Flow All	0	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

**Approach**

HCM Control Delay, s 0  
HCM LOS -

**Minor Lane/Major Mvmt**

	NBLn1	WBL	WBT
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	-	0	-
HCM Lane LOS	-	A	-
HCM 95th %tile Q(veh)	-	-	-



**Intersection**

Int Delay, s/veh 12.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	215	195	0	0	0	275
Future Vol, veh/h	215	195	0	0	0	275
Conflicting Peds, #/hr	215	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	234	212	0	0	0	299

**Major/Minor**

	Minor1	Major2
Conflicting Flow All	514	215
Stage 1	215	-
Stage 2	299	-
Critical Hdwy	7.12	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	6.12	-
Follow-up Hdwy	3.518	-
Pot Cap-1 Maneuver	471	0
Stage 1	-	0
Stage 2	710	0
Platoon blocked, %		-
Mov Cap-1 Maneuver	375	-
Mov Cap-2 Maneuver	375	-
Stage 1	-	-
Stage 2	710	-

**Approach**

	WB	SB
HCM Control Delay, s	29.2	0
HCM LOS	D	

**Minor Lane/Major Mvmt**

	WBLn1	SBL	SBT
Capacity (veh/h)	375	-	-
HCM Lane V/C Ratio	0.623	-	-
HCM Control Delay (s)	29.2	0	-
HCM Lane LOS	D	A	-
HCM 95th %tile Q(veh)	4	-	-

**Intersection**

Int Delay, s/veh            0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	5	130	85	5	5	5
Future Vol, veh/h	5	130	85	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	141	92	5	5	5

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	98	0	247
Stage 1	-	-	95
Stage 2	-	-	152
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1495	-	741
Stage 1	-	-	929
Stage 2	-	-	876
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1495	-	738
Mov Cap-2 Maneuver	-	-	738
Stage 1	-	-	929
Stage 2	-	-	872

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1495	-	-	-	835
HCM Lane V/C Ratio	0.004	-	-	-	0.013
HCM Control Delay (s)	7.4	0	-	-	9.4
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0

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**Intersection**

Int Delay, s/veh 2.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	125	10	45	85	5	30
Future Vol, veh/h	125	10	45	85	5	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	136	11	49	92	5	33

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	147
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1435
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1435
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	2.6	9.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	856	-	-	1435	-
HCM Lane V/C Ratio	0.044	-	-	0.034	-
HCM Control Delay (s)	9.4	-	-	7.6	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

**Intersection**

Int Delay, s/veh	0.6
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Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	5	150	130	5	10	5
Future Vol, veh/h	5	150	130	5	10	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	163	141	5	11	5

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	147	0	318
Stage 1	-	-	144
Stage 2	-	-	174
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1435	-	675
Stage 1	-	-	883
Stage 2	-	-	856
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1435	-	672
Mov Cap-2 Maneuver	-	-	672
Stage 1	-	-	883
Stage 2	-	-	853

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	10
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1435	-	-	-	735
HCM Lane V/C Ratio	0.004	-	-	-	0.022
HCM Control Delay (s)	7.5	0	-	-	10
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

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**Intersection**

Int Delay, s/veh 1.1

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	5	175	5	15	130	5	5	0	10	5	0	5
Future Vol, veh/h	5	175	5	15	130	5	5	0	10	5	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	190	5	16	141	5	5	0	11	5	0	5

Major/Minor	Major1	Major2	Minor1	Minor2								
Conflicting Flow All	147	0	0	196	0	0	383	383	193	386	384	144
Stage 1	-	-	-	-	-	-	204	204	-	177	177	-
Stage 2	-	-	-	-	-	-	179	179	-	209	207	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1435	-	-	1377	-	-	575	550	849	573	550	903
Stage 1	-	-	-	-	-	-	798	733	-	825	753	-
Stage 2	-	-	-	-	-	-	823	751	-	793	731	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1435	-	-	1377	-	-	564	541	849	558	541	903
Mov Cap-2 Maneuver	-	-	-	-	-	-	564	541	-	558	541	-
Stage 1	-	-	-	-	-	-	795	730	-	822	743	-
Stage 2	-	-	-	-	-	-	807	741	-	780	728	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.8	10.1	10.3
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	727	1435	-	-	1377	-	-	690
HCM Lane V/C Ratio	0.022	0.004	-	-	0.012	-	-	0.016
HCM Control Delay (s)	10.1	7.5	0	-	7.6	0	-	10.3
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0

**Intersection**

Int Delay, s/veh 3.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	0	440	0	0	150	415
Future Vol, veh/h	0	440	0	0	150	415
Conflicting Peds, #/hr	250	0	0	0	0	0
Sign Control	Free	Free	Stop	Stop	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	478	0	0	163	451

**Major/Minor**

	Major1	Minor2
Conflicting Flow All	0	478
Stage 1	-	0
Stage 2	-	478
Critical Hdwy	-	6.42
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	5.42
Follow-up Hdwy	-	3.518
Pot Cap-1 Maneuver	-	546
Stage 1	-	-
Stage 2	-	624
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	546
Mov Cap-2 Maneuver	-	546
Stage 1	-	-
Stage 2	-	624

**Approach**

HCM Control Delay, s 0 14.4  
HCM LOS B

**Minor Lane/Major Mvmt**

	EBL	EBT	SBLn1
Capacity (veh/h)	-	-	546
HCM Lane V/C Ratio	-	-	0.299
HCM Control Delay (s)	0	-	14.4
HCM Lane LOS	A	-	B
HCM 95th %tile Q(veh)	-	-	1.2

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HCM research expects at least one 'Stop' controlled approach at the intersection.

**Intersection**

Int Delay, s/veh 0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	0	0	0	490	150	0
Future Vol, veh/h	0	0	0	490	150	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	533	163	0

**Major/Minor**

	Major2	Minor1
Conflicting Flow All	0	0
Stage 1	-	-
Stage 2	-	-
Critical Hdwy	-	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	-
Follow-up Hdwy	-	-
Pot Cap-1 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	-
Mov Cap-2 Maneuver	-	-
Stage 1	-	-
Stage 2	-	-

**Approach**

HCM Control Delay, s 0  
HCM LOS -

**Minor Lane/Major Mvmt**

	NBLn1	WBL	WBT
Capacity (veh/h)	-	-	-
HCM Lane V/C Ratio	-	-	-
HCM Control Delay (s)	-	0	-
HCM Lane LOS	-	A	-
HCM 95th %tile Q(veh)	-	-	-



**Intersection**

Int Delay, s/veh 20.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Traffic Vol, veh/h	260	380	0	0	0	305
Future Vol, veh/h	260	380	0	0	0	305
Conflicting Peds, #/hr	215	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	283	413	0	0	0	332

**Major/Minor**

	Minor1		Major2	
Conflicting Flow All	547	-	215	0
Stage 1	215	-	-	-
Stage 2	332	-	-	-
Critical Hdwy	7.12	-	-	-
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	6.12	-	-	-
Follow-up Hdwy	3.518	-	-	-
Pot Cap-1 Maneuver	448	0	-	-
Stage 1	-	0	-	-
Stage 2	681	0	-	-
Platoon blocked, %				-
Mov Cap-1 Maneuver	356	-	-	-
Mov Cap-2 Maneuver	356	-	-	-
Stage 1	-	-	-	-
Stage 2	681	-	-	-

**Approach**

	WB	SB
HCM Control Delay, s	44.6	0
HCM LOS	E	

**Minor Lane/Major Mvmt**

	WBLn1	SBL	SBT
Capacity (veh/h)	356	-	-
HCM Lane V/C Ratio	0.794	-	-
HCM Control Delay (s)	44.6	0	-
HCM Lane LOS	E	A	-
HCM 95th %tile Q(veh)	6.7	-	-

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**Intersection**

Int Delay, s/veh 0.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↗		↘	
Traffic Vol, veh/h	5	250	230	5	5	5
Future Vol, veh/h	5	250	230	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	5	272	250	5	5	5

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	255	0	536
Stage 1	-	-	253
Stage 2	-	-	283
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1310	-	505
Stage 1	-	-	789
Stage 2	-	-	765
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1310	-	503
Mov Cap-2 Maneuver	-	-	503
Stage 1	-	-	789
Stage 2	-	-	762

Approach	EB	WB	SB
HCM Control Delay, s	0.2	0	11
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1310	-	-	-	613
HCM Lane V/C Ratio	0.004	-	-	-	0.018
HCM Control Delay (s)	7.8	0	-	-	11
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

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**Intersection**

Int Delay, s/veh 1.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔		↔		↔	
Traffic Vol, veh/h	245	10	40	225	5	25
Future Vol, veh/h	245	10	40	225	5	25
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	266	11	43	245	5	27

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	277
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.12
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.218
Pot Cap-1 Maneuver	-	-	1286
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1286
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.2	10.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	684	-	-	1286	-
HCM Lane V/C Ratio	0.048	-	-	0.034	-
HCM Control Delay (s)	10.5	-	-	7.9	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.1	-	-	0.1	-

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**Intersection**

Int Delay, s/veh 0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	
Traffic Vol, veh/h	15	255	260	110	5	5
Future Vol, veh/h	15	255	260	110	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	16	277	283	120	5	5

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	402	0	652
Stage 1	-	-	342
Stage 2	-	-	310
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1157	-	433
Stage 1	-	-	719
Stage 2	-	-	744
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1157	-	426
Mov Cap-2 Maneuver	-	-	426
Stage 1	-	-	719
Stage 2	-	-	732

Approach	EB	WB	SB
HCM Control Delay, s	0.5	0	11.9
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1157	-	-	-	530
HCM Lane V/C Ratio	0.014	-	-	-	0.021
HCM Control Delay (s)	8.2	0	-	-	11.9
HCM Lane LOS	A	A	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

HCM 2010 TWSC  
 4: Dillingham Ranch East Dwy & Farrington Hwy

1/19/2017

Intersection

Int Delay, s/veh 0.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	255	10	15	390	5	5	0	15	5	0	5
Future Vol, veh/h	5	255	10	15	390	5	5	0	15	5	0	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	60	92	92	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	5	277	11	25	424	5	5	0	16	5	0	5

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	429	0	0	288	0	0	772	772	283	779	776	427
Stage 1	-	-	-	-	-	-	293	293	-	477	477	-
Stage 2	-	-	-	-	-	-	479	479	-	302	299	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1130	-	-	1274	-	-	317	330	756	313	328	628
Stage 1	-	-	-	-	-	-	715	670	-	569	556	-
Stage 2	-	-	-	-	-	-	568	555	-	707	666	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1130	-	-	1274	-	-	307	320	756	299	318	628
Mov Cap-2 Maneuver	-	-	-	-	-	-	307	320	-	299	318	-
Stage 1	-	-	-	-	-	-	711	667	-	566	542	-
Stage 2	-	-	-	-	-	-	548	541	-	688	663	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	0.4	11.8	14.1
HCM LOS			B	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	554	1130	-	-	1274	-	-	405
HCM Lane V/C Ratio	0.039	0.005	-	-	0.02	-	-	0.027
HCM Control Delay (s)	11.8	8.2	0	-	7.9	0	-	14.1
HCM Lane LOS	B	A	A	-	A	A	-	B
HCM 95th %tile Q(veh)	0.1	0	-	-	0.1	-	-	0.1

**Intersection**

Int Delay, s/veh 3.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↑	↑		↑	
Traffic Vol, veh/h	0	375	0	0	135	505
Future Vol, veh/h	0	375	0	0	135	505
Conflicting Peds, #/hr	250	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	Free
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	408	0	0	147	549

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	- 0	- 0	409 -
Stage 1	- -	- -	1 -
Stage 2	- -	- -	408 -
Critical Hdwy	- -	- -	6.42 -
Critical Hdwy Stg 1	- -	- -	5.42 -
Critical Hdwy Stg 2	- -	- -	5.42 -
Follow-up Hdwy	- -	- -	3.518 -
Pot Cap-1 Maneuver	0 -	- 0	599 0
Stage 1	0 -	- 0	1022 0
Stage 2	0 -	- 0	671 0
Platoon blocked, %	- -	- -	- -
Mov Cap-1 Maneuver	- -	- -	599 -
Mov Cap-2 Maneuver	- -	- -	599 -
Stage 1	- -	- -	1022 -
Stage 2	- -	- -	671 -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	12.9
HCM LOS			B

Minor Lane/Major Mvmt	EBT	WBT	SBLn1
Capacity (veh/h)	-	-	599
HCM Lane V/C Ratio	-	-	0.245
HCM Control Delay (s)	-	-	12.9
HCM Lane LOS	-	-	B
HCM 95th %tile Q(veh)	-	-	1

**Intersection**

Int Delay, s/veh 2.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑	↓	
Traffic Vol, veh/h	0	0	0	550	115	0
Future Vol, veh/h	0	0	0	550	115	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	598	125	0

Major/Minor	Major2	Minor1
Conflicting Flow All	-	598
Stage 1	-	0
Stage 2	-	598
Critical Hdwy	-	6.42
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	-	5.42
Follow-up Hdwy	-	3.518
Pot Cap-1 Maneuver	0	465
Stage 1	0	-
Stage 2	0	549
Platoon blocked, %	-	-
Mov Cap-1 Maneuver	-	465
Mov Cap-2 Maneuver	-	465
Stage 1	-	-
Stage 2	-	549

Approach	WB	NB
HCM Control Delay, s	0	15.6
HCM LOS		C

Minor Lane/Major Mvmt	NBLn1	WBT
Capacity (veh/h)	465	-
HCM Lane V/C Ratio	0.269	-
HCM Control Delay (s)	15.6	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	1.1	-

HCM 2010 TWSC  
 8: Goodale Ave & Farrington Hwy

1/19/2017

**Intersection**

Int Delay, s/veh 10.1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↕					↑
Traffic Vol, veh/h	380	285	0	0	0	260
Future Vol, veh/h	380	285	0	0	0	260
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Free	Free
RT Channelized	-	Free	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	16974	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	413	310	0	0	0	283

**Major/Minor**

	Minor1	Major2
Conflicting Flow All	283	-
Stage 1	0	-
Stage 2	283	-
Critical Hdwy	6.42	-
Critical Hdwy Stg 1	-	-
Critical Hdwy Stg 2	5.42	-
Follow-up Hdwy	3.518	-
Pot Cap-1 Maneuver	707	0
Stage 1	-	0
Stage 2	765	0
Platoon blocked, %		-
Mov Cap-1 Maneuver	707	-
Mov Cap-2 Maneuver	707	-
Stage 1	-	-
Stage 2	765	-

**Approach**

	WB	SB
HCM Control Delay, s	17	0
HCM LOS	C	

**Minor Lane/Major Mvmt**

	WBLn1	SBT
Capacity (veh/h)	707	-
HCM Lane V/C Ratio	0.584	-
HCM Control Delay (s)	17	-
HCM Lane LOS	C	-
HCM 95th %tile Q(veh)	3.8	-



**J**  
**—**

*Archaeological Inventory Survey Report  
for a Portion of the Dillingham Ranch  
Agricultural Subdivision Project and  
State Historic Preservation Correspondence*

(Cultural Surveys Hawai'i, Inc.)

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**Final**  
**Archaeological Inventory Survey Report**  
**for a Portion of the**  
**Dillingham Ranch Agricultural Subdivision Project**  
**Mokulē‘ia Ahupua‘a, Waialua District, O‘ahu**  
**TMK: [1] 6-8-003:005 (por.)**

**Prepared for**  
**Dillingham Ranch Aina, LLC**

**Prepared by**  
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**Cultural Surveys Hawai‘i, Inc.**  
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**(Job Code: MOKULEIA 6)**

**November 2017**

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## Management Summary

<b>Reference</b>	Archaeological Inventory Survey Report for a Portion of the Dillingham Ranch Agricultural Subdivision Project, Mokulē'ia Ahupua'a, Waialua District, O'ahu, TMK: [1] 6-8-003:005 (por.) (Belluomini et al. 2017)
<b>Date</b>	November 2017
<b>Project Number(s)</b>	Cultural Surveys Hawai'i, Inc. (CSH) Job Code: MOKULEIA 6
<b>Investigation Permit Number</b>	CSH completed the archaeological inventory survey (AIS) fieldwork under archaeological fieldwork permit number 16-26, issued by the Hawai'i State Historic Preservation Division (SHPD) per Hawai'i Administrative Rules (HAR) §13-282.
<b>Agencies</b>	SHPD
<b>Project Proponent, Land Jurisdiction, and Funding</b>	Dillingham Ranch Aina, LLC Contact: David Eadie, Vice President 3200 Bristol Street, Suite 640 Costa Mesa, CA 92626 (714) 619-7877 deadie@kennedywilson.com
<b>Project Location</b>	The approximately 878.3-acre Dillingham Ranch Agricultural Subdivision project area is located on the Dillingham Ranch property. The Dillingham Ranch Agricultural Subdivision project area is south of Farrington Highway between the Mokulē'ia residential community to the east and the Dillingham Airfield to the west and extends into the foothills of the Wai'anae Mountain Range. The 113.5-acre AIS study area is located within TMK: [1] 6-8-003:005 on the Dillingham Ranch property east of the Mokuleia Access Road. The Dillingham Ranch property, Dillingham Ranch Agricultural Subdivision project area, and AIS study area are depicted on a 1998 Kaena U.S. Geological Survey (USGS) topographic quadrangle.
<b>Project Description</b>	Dillingham Ranch currently operates as a coconut plantation, equestrian boarding and recreational facility (utilized by recreational riders and polo participants), and pasture for limited cattle grazing. The Dillingham Ranch Lodge is also rented for weddings and other celebrations or events. The proposed Dillingham Ranch Agricultural Subdivision project is owned by Dillingham Ranch Aina, LLC, based in California. The proposed Dillingham Ranch Agricultural Subdivision project will continue with the existing ranch operations described above (excluding cattle grazing) with the addition of four primary development components consistent with the current equestrian and agricultural use including a subdivision of 70 agricultural lots with farm dwellings, farm-to-table agricultural activities, expansion of the equestrian facility, employee dwellings, offices, polo fields, barns and trails, and a road network.

<b>Project Acreage</b>	The AIS study area includes approximately 113.5 acres (46 hectares) of the 878.3-acre (355.4-hectare) Dillingham Ranch Agricultural Subdivision project area.
<b>Historic Preservation Regulatory Context</b>	<p>Four project-specific AISs were conducted for Dillingham Ranch (Drolet and Schilz 1992a and 1992b; Lauer and Rieth 2015; Tulchin and Hammatt 2007) in various portions of the Dillingham Ranch Agricultural Subdivision project area. The combination of these four AIS studies covers the entire Dillingham Ranch Agricultural Subdivision project area, with the exception of approximately 60 acres on the southeast portion of the Dillingham Ranch Agricultural Subdivision project area. This previously unsurveyed area is primarily on the steep slopes bordering a tableland area covered by Drolet and Schilz 1992b.</p> <p>Tulchin and Hammatt (2008a) completed a long-term preservation plan for all historic properties identified and recommended for preservation by Drolet and Schilz (1992a and 1992b) and Tulchin and Hammatt (2007). Lauer and Rieth (2015) also identified and recommended two historic properties for preservation. No preservation plan for the two sites has been completed. An archaeological monitoring plan (Tulchin and Hammatt 2008b) was also prepared and accepted by the SHPD. All of the previously mentioned reports have been reviewed and accepted by the SHPD (see Appendix A).</p> <p>CSH conducted archaeological monitoring for a brief period in 2008 for the clearance of access pathways for geotechnical boring equipment. The fieldwork was primarily conducted in the steep hillsides, to the southwest and outside the Dillingham Ranch Agricultural Subdivision project area. However, some of the fieldwork was conducted within the Dillingham Ranch Agricultural Subdivision project area. The project that required archaeological monitoring has been on hold and no formal documentation of the results of monitoring has been provided to the SHPD to date.</p> <p>This AIS investigation fulfills the requirements of HAR §13-276 and was conducted to identify, document, and assess significance of any historic properties. This document is intended to support the proposed project's historic preservation and environmental review under Hawai'i Revised Statutes (HRS) §6E-42 and HAR §13-284 and HAR §343, respectively, as a "private" project with no federal involvement. It is also intended to support any project-related historic preservation consultation with stakeholders such as state and county agencies and interested Native Hawaiian Organizations (NHOs) and community groups.</p> <p>This AIS is intended to cover areas not included in a previously conducted AIS, as well provide additional information regarding any insufficiently documented historic properties within the Dillingham Ranch Agricultural Subdivision project area.</p>

<b>Fieldwork Effort</b>	Fieldwork was accomplished between 22 November and 2 December 2016 by Scott Belluomini, B.A., Si-Si Hensley, M.A., and Jason Kline, B.S., under the general supervision of principal investigator David W. Shideler, M.A. This work required approximately 18 person-days to complete.
<b>Historic Properties Identified and Historic Property Significance</b>	<p>Five historic properties were identified and documented in this AIS report. Two are newly identified (SIHP # 50-80-03-7976, and 50-80-03-7977), one was previously observed, but not formally documented (SIHP # 50-80-03-7978), and two were previously identified and further documented during this AIS (SIHP # 50-80-03-4777 and SIHP # 50-80-03-7653).</p> <p>Three of the five historic properties were identified during this AIS within the AIS project area:</p> <p>State Inventory of Historic Places (SIHP) # 50-80-03-7653, walls, was previously identified by Lauer and Rieth (2015). During the AIS, it was determined that SIHP # 50-80-03-4439 (wall) previously identified and not fully documented by Drolet and Schilz (1992b) is connected with SIHP # -7653 Feature 1. Therefore, SIHP # -4439 has been redesignated as a portion of SIHP # -7653 Feature 1. SIHP # -4439 was previously assessed as significant by Drolet and Schilz (1992b) under Criterion d. SIHP # -7653 was evaluated by Lauer and Rieth (2015:47) as significant pursuant to HAR §13-284-6 under Criterion d (have yielded, or is likely to yield, information important for research on prehistory or history) and was evaluated as eligible for listing on the Hawai'i Register of Historic Places per HAR §13-198-8 under Criterion D. This report concurs with the Lauer and Rieth (2015) and Drolet and Schilz (1992b) assessment of significance.</p> <p>SIHP # 50-80-03-7976, wall, was assessed as significant pursuant to HAR §13-284-6 under Criterion d (have yielded, or is likely to yield, information important for research on prehistory or history).</p> <p>SIHP # 50-80-03-7977, agricultural feature complex, was assessed as significant pursuant to HAR §13-284-6 under Criterion d (have yielded, or is likely to yield, information important for research on prehistory or history) and Criterion 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).</p> <p>Two additional historic properties (SIHP # 50-80-03-4777 Feature C and SIHP # 50-80-03-7978) were encountered during a brief period of archaeological monitoring in 2008 that has since been on hiatus. Therefore, this newly identified feature and newly identified historic property were not formally previously documented in a formal report. The</p>

	<p>two historic properties are within the Dillingham Ranch Agricultural Subdivision project area, but not within this AIS project area. During the fieldwork for the current AIS, these historic properties were located and documented:</p> <p>SIHP # 50-80-03-4777, U-shaped wall, was previously documented by Drolet and Schilz (1992a) and Tulchin and Hammatt (2008a). SIHP # -4777, was previously assessed as significant by Drolet and Schilz (1992b) under Criteria “C” and “D”. Tulchin and Hammatt (2008a) evaluated SIHP # -4777 as eligible for listing on the Hawai‘i Register of Historic Places under Criteria C and D. Based on the findings of this report, SIHP # -4777 is in poor to intact condition and is assessed as significant under Criterion c (embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, or possess high artistic value) and Criterion d (have yielded, or is likely to yield, information important for research on prehistory or history) pursuant to HAR §13-284-6. The historic property is also evaluated as eligible for listing on the Hawai‘i Register of Historic Places per HAR §13-198-8 under Criteria C and D. This report concurs with this assessment due to the historic property providing information regarding ranching activities and land divisions and may provide additional information regarding the land use of the land grant for which it borders. The historic property, which borders the <i>mauka</i> portion of Land Grant 452 Lot 2 is significant under Criterion c/C due to its being representative of post-Contact boundary walls that incorporate traditional techniques. This assessment of significance is for the overall site and applies to all features of the historic property. The historic property retains integrity of location, design, setting, materials, and workmanship.</p> <p>SIHP # 50-80-03-7978, platform, is newly documented and is assessed as significant pursuant to HAR §13-284-6 under Criterion d (have yielded, or is likely to yield, information important for research on prehistory or history) and Criterion 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).</p>
<p><b>Effect Recommendation</b></p>	<p>The project specific effect recommendation is “effect, with agreed upon mitigation commitments” pursuant to HAR §13-284-7. The recommended mitigation measures will reduce the project’s effect on the potentially affected historic properties identified within the project area.</p>
<p><b>Mitigation Recommendations</b></p>	<p>Based on the many cattle walls present within the Dillingham Ranch property, as well as several cattle walls being preserved as representative examples of a portion of Dillingham Ranch’s history as part of the Dillingham Ranch Agricultural Subdivision project, no further work is recommended for SIHP # 50-80-03-7976 (cattle wall). The wall is in fair to poor condition and is unlikely to provide any additional information.</p>

	<p>This site will not be adversely affected by the proposed project. No further work is recommended. However, archaeological monitoring is recommended for all ground disturbing activities.</p> <p>Based on the findings of previously conducted AIS studies, preservation is agreed to for SIHP # 50-80-03-4777 and SIHP # 50-80-03-7653 Features 1 and 2 (cattle wall). SIHP # 50-80-03-7653 Features 2 through 4 were not further documented during this AIS. Preservation is already a mitigation commitment for SIHP # 50-80-03-4777 and SIHP # 50-80-03-7653 within the Dillingham Ranch Agricultural Subdivision project area. As previously agreed to by the SHPD, portions of SIHP -4777 will be breached to allow for access roads to various portions of the property (see Appendix B). SIHP # 50-80-03-7653 Features 3 and 4 are located outside the Dillingham Ranch Agricultural Subdivision project area and therefore will not be adversely affected by this project.</p> <p>Based on the findings of the current AIS, preservation is recommended for SIHP # 50-80-03-7977 (agricultural/ranching terraces) and SIHP # 50-80-03-7978 (possible habitational/ceremonial platform). A preservation plan meeting the requirements of HAR §13-277-3 will be submitted for review and acceptance by the SHPD. Consultation with NHOs and individuals knowledgeable about the project area's history will be conducted during the development of the preservation plan.</p> <p>This report concurs with the previous requirement that archaeological monitoring be conducted for the project. This includes any construction activity within the immediate vicinity of any of the significant historic properties. An archaeological monitoring plan for the Dillingham Ranch Agricultural Subdivision project (Tulchin and Hammatt 2008b) has been reviewed and accepted by the SHPD.</p>
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## Section 1 Introduction

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### 1.1 Project Background

At the request of Dillingham Ranch Aina, LLC (landowner), Cultural Surveys Hawai‘i, Inc. (CSH) has prepared this archaeological inventory survey report (AISR) for a portion of the Dillingham Ranch Agricultural Subdivision project, Mokulē‘ia Ahupua‘a, Waialua District, O‘ahu, Tax Map Key (TMK): [1] 6-8-003:005 (por.).

The approximately 878.3-acre Dillingham Ranch Agricultural Subdivision project area is located on the 2,721-acre (1,101-hectare) Dillingham Ranch property. The Dillingham Ranch Agricultural Subdivision project area is south of Farrington Highway between the Mokulē‘ia residential community to the east and the Dillingham Airfield to the west and extends into the foothills of the Wai‘anae Mountain Range. The AIS study area is located within TMK: [1] 6-8-003:005 on Dillingham Ranch property east of the Mokuleia Access Road. The AIS study area includes approximately 113.5 acres (46 hectares) of the 878.3-acre (355.4-hectare) Dillingham Ranch Agricultural Subdivision project area. The Dillingham Ranch property, Dillingham Ranch Agricultural Subdivision project area, and AIS study area are depicted on a portion of the 1998 Kaena U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Figure 1), a tax map plat (Figure 2), and a 2013 aerial photograph (Figure 3).

Dillingham Ranch currently operates as a coconut plantation, equestrian boarding and recreational facility (utilized by recreational riders and polo participants), and pasture for limited cattle grazing. The Dillingham Ranch Lodge is also rented for weddings and other celebrations or events. The proposed Dillingham Ranch Agricultural Subdivision project is owned by Dillingham Ranch Aina, LLC based in California. The proposed Dillingham Ranch Agricultural Subdivision project will continue with the existing ranch operations described above (excluding cattle grazing) with the addition of four primary development components consistent with the current equestrian and agricultural use including a subdivision of 70 agricultural lots with farm dwellings, farm-to-table agricultural activities, expansion of the equestrian facility, employee dwellings, offices, polo fields, barns and trails, and a road network. The Dillingham Ranch Agricultural Subdivision project area includes only property owned by Dillingham Ranch Aina, LLC. The DLNR road and various parcels owned by other private entities are outside the Dillingham Ranch property.

### 1.2 Historic Preservation Regulatory Context and Document Purpose

Four project-specific AISs were conducted for Dillingham Ranch (Drolet and Schilz 1992a and 1992b; Lauer and Rieth 2015; Tulchin and Hammatt 2007) in various portions of the Dillingham Ranch Agricultural Subdivision project area. The combination of these four AIS studies covers the entire Dillingham Ranch Agricultural Subdivision project area, with the exception of approximately 60 acres on the southeast portion of the Dillingham Ranch Agricultural Subdivision project area. This area is primarily on the steep slopes bordering a tableland area covered by Drolet and Schilz 1992b.

Tulchin and Hammatt (2008a) completed a long-term preservation plan for all historic properties identified and recommended for preservation by Drolet and Schilz (1992a and 1992b) and Tulchin and Hammatt (2007). Lauer and Rieth (2015) also identified and recommended two

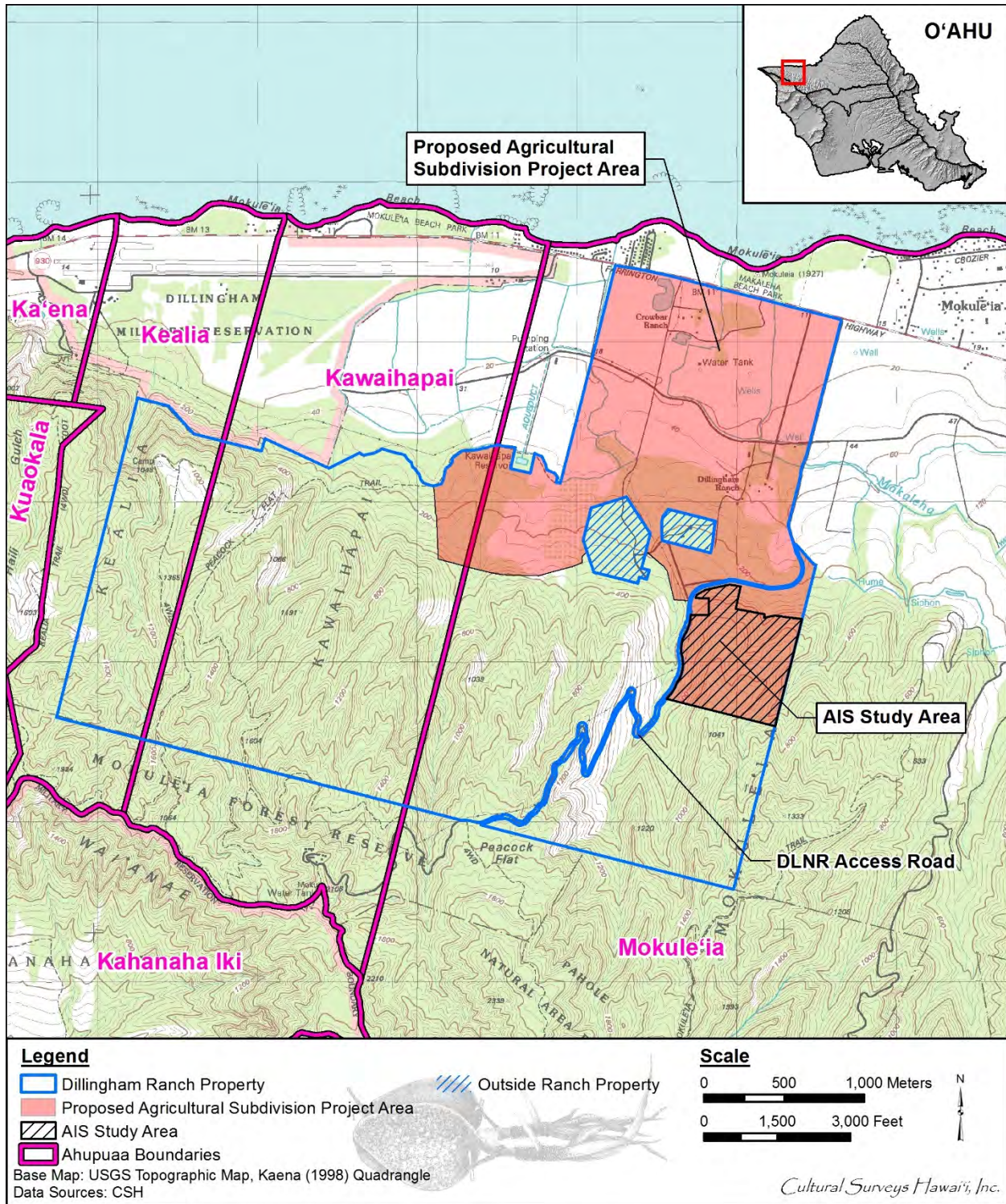


Figure 1. Portion of the 1998 Kaena USGS 7.5-minute topographic quadrangle showing the location of the AIS study area

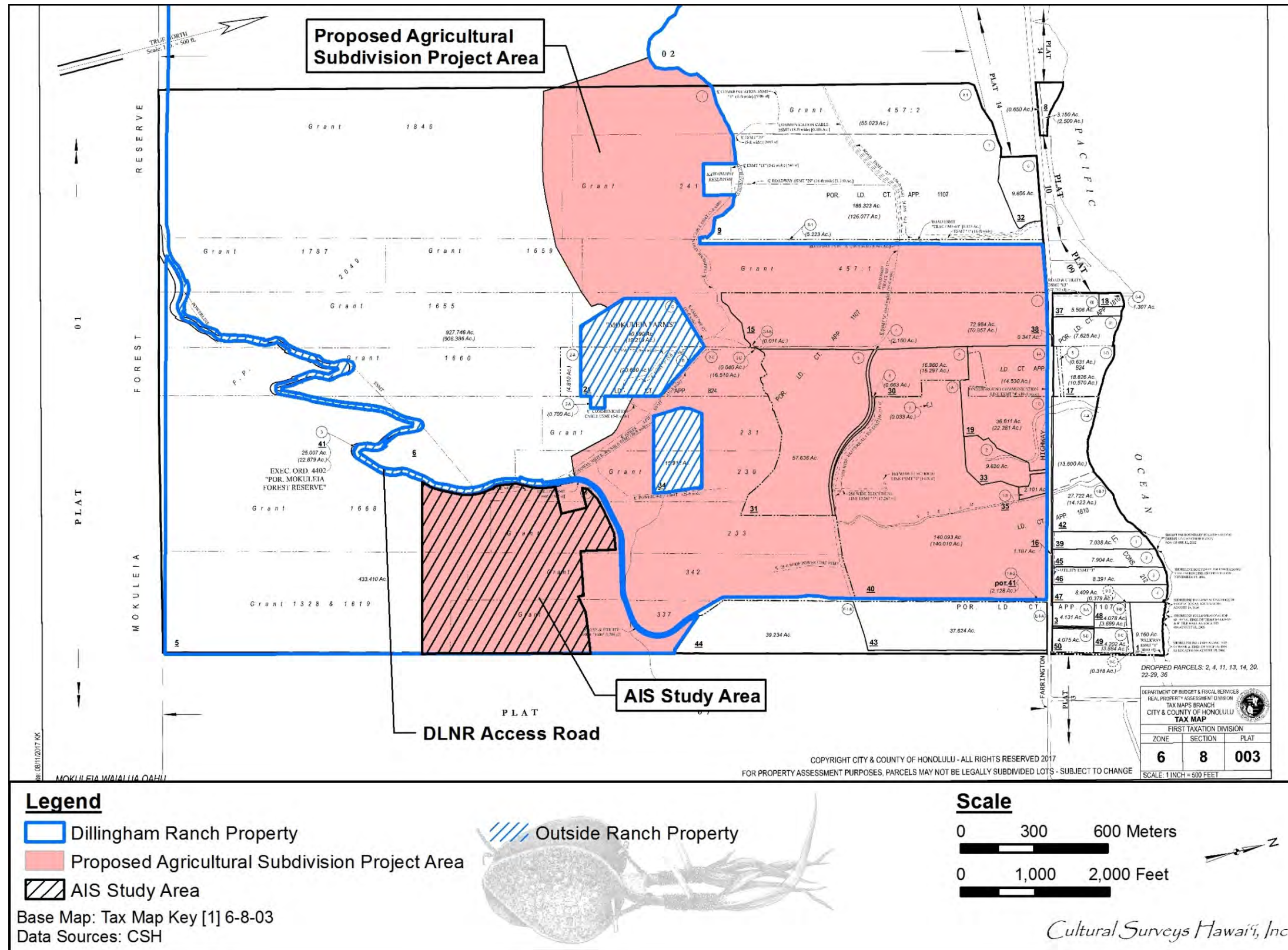


Figure 2. TMK: [1] 6-8-003 showing the location of the AIS study area (Hawai'i TMK Service 2017)



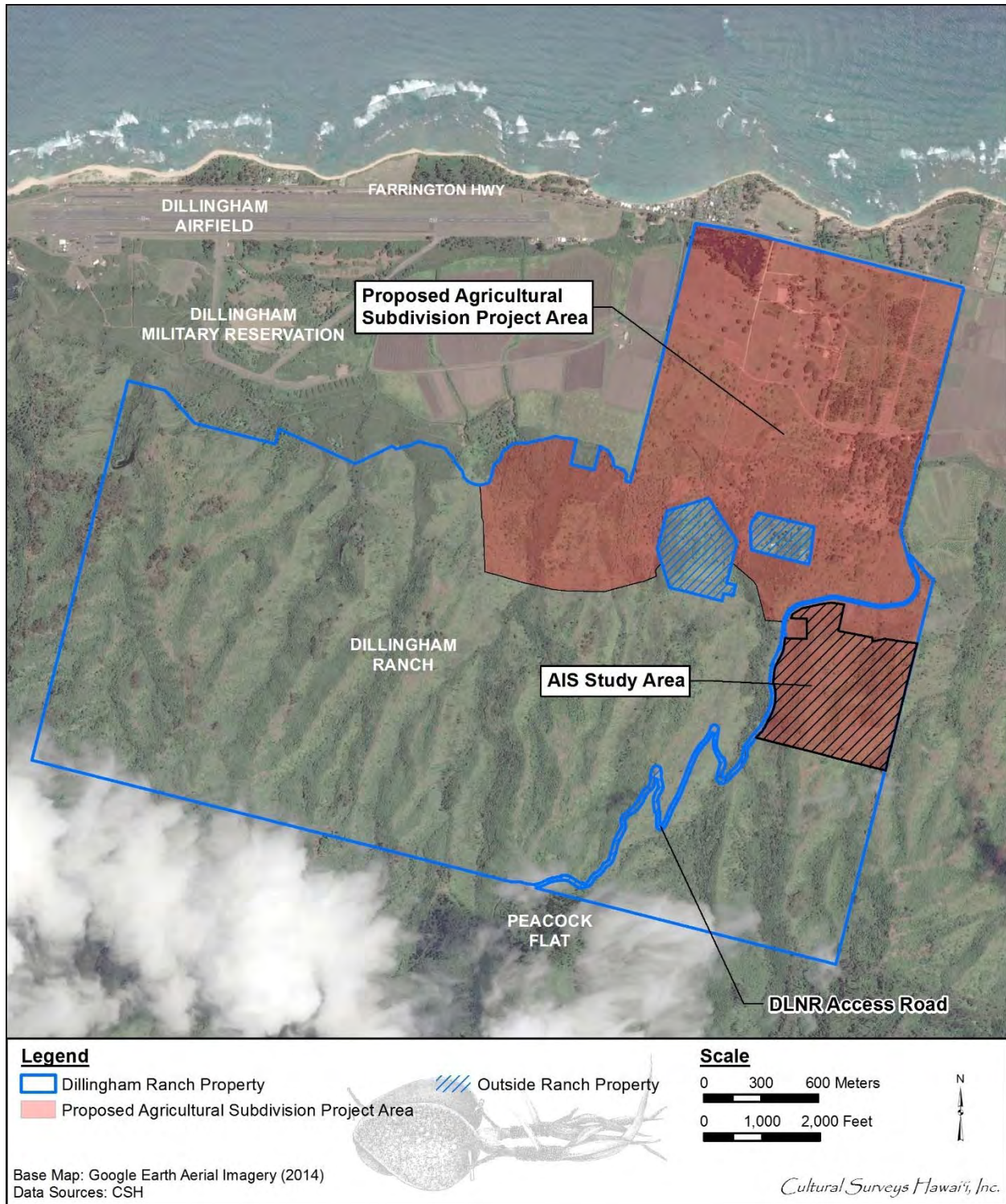


Figure 3. Aerial photograph of the AIS study area (Google Earth 2013)

historic properties for preservation. No preservation plan for the two sites has been completed. An archaeological monitoring plan (Tulchin and Hammatt 2008b) was also prepared and accepted by the State Historic Preservation Division (SHPD). All of the previously mentioned reports have been reviewed and accepted by the SHPD (see Appendix A).

CSH conducted archaeological monitoring for a brief period in 2008 for the clearance of access pathways for geotechnical boring equipment. The fieldwork was primarily conducted in the steep hillsides, to the southwest and outside the Dillingham Ranch Agricultural Subdivision project area. However, some of the fieldwork was conducted within the Dillingham Ranch Agricultural Subdivision project area. The project that required archaeological monitoring has been on hold and no formal documentation of the results of monitoring has been provided to the SHPD to date.

This AIS investigation fulfills the requirements of Hawai'i Administrative Rules (HAR) §13-276 and was conducted to identify, document, and assess significance of any historic properties. This document is intended to support the proposed project's historic preservation and environmental review under Hawai'i Revised Statutes (HRS) §6E-42 and HAR §13-284 and HAR §343, respectively, as a "private" project with no federal involvement. It is also intended to support any project-related historic preservation consultation with stakeholders such as state and county agencies and interested Native Hawaiian Organizations (NHOs) and community groups.

This AIS is intended to cover areas not included in a previously conducted AIS, as well as provide additional information regarding any insufficiently documented historic properties within the Dillingham Ranch Agricultural Subdivision project area, including those observed during the brief 2008 monitoring.

## 1.3 Environmental Setting

### 1.3.1 Natural Environment

The Dillingham Ranch Agricultural Subdivision project area includes lands within the level coastal plain of Mokulē'ia and the lower foothills of the Wai'anae Range. The foothills consist of gently to moderately sloping lands dissected by multiple seasonal drainage gullies. Vertical exposed basalt cliffs are also common on the *mauka* (toward the mountains) or southern boundary of the Dillingham Ranch Agricultural Subdivision project area. Elevations within the Dillingham Ranch Agricultural Subdivision project area range from approximately 1-297 m (3-975 feet [ft]) above mean sea level. The annual average air temperature is between 23.2°C (73.8°F) and 23.6°C (74.5°F) (Giambelluca et al. 2014).

The Dillingham Ranch Agricultural Subdivision project area receives on average 904.5 mm (35 inches) of annual rainfall (Giambelluca et al. 2013). Vegetation in the Dillingham Ranch Agricultural Subdivision project area generally consists of exotic grasses, ironwood (*Casuarina* spp.), monkeypod (*Samanea saman*), coconut (*niu*, *Cocos nucifera*), koa haole (*Leucaena leucocephala*), kiawe (*Prosopis pallida*), Java plum (*Syzygium cumini*), and klu (*Acacia farnesiana*). Additional species include wiliwili (*Erythrina sandwicensis*), 'a'ali'i (*Dodonaea viscosa*), 'ilie'e (*Plumbago zeylanica*), naio (*Myoporum sandwicense*), silk oak (*Grevillea robusta*), guava (*Psidium guajava*), strawberry guava (*Psidium cattleianum*), Christmas berry (*Schinus terebinthifolius*), and kukui (*Aleurites moluccana*).

According to Foote et al (1972) and the U.S. Department of Agriculture (USDA) Soils Survey Geographic Database (SSURGO) (2001), soils within the *makai* (toward the sea) or northern portion of the Dillingham Ranch Agricultural Subdivision project area consist of Pulehu Clay Loam, 0 to 3 percent slopes (PsA), Pearl Harbor Clay (Ph), and Mokuleia Clay Loam (Mt).

Soils within the *mauka* portion of the Dillingham Ranch Agricultural Subdivision project area include Ewa Silty Clay Loam, 6 to 12 percent slopes (EaC), Ewa Stony Silty Clay, 6 to 12 percent slopes (EwC), Helemano Silty Clay, 30 to 90 percent slopes (HLMG), Kaena Clay, 2 to 6 percent slopes (KaB), Kaena Stony Clay, 2 to 6 percent slopes (KaeB), Kaena Stony Clay, 6 to 12 percent slopes (KaeC), Kaena Stony Clay, 12 to 20 percent slopes (KaeD), Kaena Very Stony Clay, 10 to 35 percent slopes (KanE), Kawaihapai Clay Loam, 0 to 2 percent slopes (KIA), Kawaihapai Stony Clay Loam, 0 to 2 percent slopes (KIaA), Kawaihapai Stony Clay Loam, 0 to 2 percent slopes (KIaB), Kemoo Silty Clay, 35 to 70 percent slopes (KpF), Pulehu Stony Clay Loam, 2 to 6 percent slopes (PuB), Rock Land (rRK), and Stony Steep land (rSY) (Figure 4).

Soils of the Pulehu Series consist of “well-drained soils on alluvial fans and stream terraces and in basins . . . developed in alluvium washed from basic igneous rock” (Foote et al. 1972).

Soils of the Pearl Harbor Series consist of “very poorly drained soils on nearly level coastal plains. . . developed in alluvium overlying organic material” (Foote et al. 1972).

Soils of the Mokuleia Series consist of “well-drained soils along the coastal plains . . . formed in recent alluvium deposited over coral sand” (Foote et al. 1972).

Soils of the Ewa Series consist of “well-drained soils in basins and on alluvial fans . . . developed in alluvium derived from basic igneous rock” (Foote et al. 1972).

Soils of the Helemano Series consist of “well-drained soils on alluvial fans and colluvial slopes on the sides of gulches . . . developed in alluvium and colluvium derived from basic igneous rock” (Foote et al. 1972).

Soils of the Kaena Series consist of “very deep, poorly drained soils on alluvial fans and talus slopes . . . developed in alluvium and colluvium from basic igneous material” (Foote et al. 1972).

Soils of the Kawaihapai Series consist of “well-drained soils in drainage ways and on alluvial fans on the coastal plains . . . formed in alluvium derived from basic igneous rock in humid uplands” (Foote et al. 1972).

Soils of the Kemoo Series consist of “well-drained soils on uplands . . . developed in material weathered from basic igneous rock” (Foote et al. 1972).

The AIS study area spans across a high Y-shaped ridge ranging between 83 m (272 ft) and 297 m (975 ft) in elevation, part of the Waianae Mountain Range. The AIS study area is approximately 2.0-3.0 km from the coastline. The north, east, and west flanks of the ridge are densely vegetated with tall grasses such as California grass (*Brachiaria mutica*) and Guinea grass (*Panicum maximum*), and various trees and bushes such as *koa haole* (*Leucaena leucocephala*), Christmasberry (*Schinus terebinthifolius*), silver oak (*Grevillea robusta*), *klu* (*Acacia farnesiana*), guava (*Psidium guajava*), strawberry guava (*Psidium cattleianum*), *wiliwili* (*Erythrina sandwicensis*), and *niu* (*Cocos nucifera*). The slopes are heavily eroded, with basalt scarps between areas of soil and rock fall.

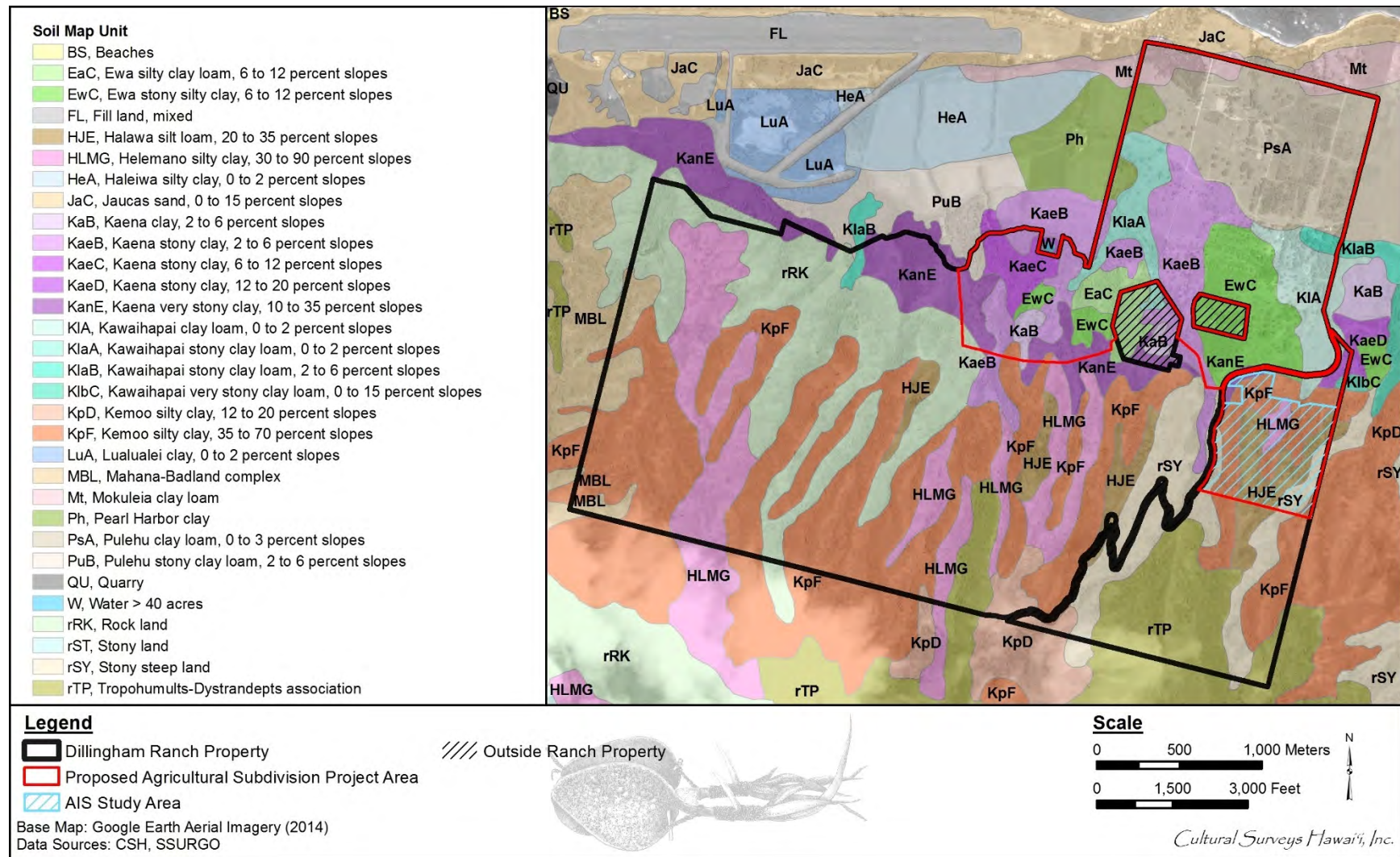


Figure 4. Overlay of *Soil Survey of the State of Hawaii* (Foote et al. 1972) on a 2014 Google Earth aerial photograph, indicating soil types within and surrounding the Dillingham Ranch Agricultural Subdivision project area (USDA SSURGO 2001)

A small dry stream valley extends through much of the middle of the AIS study area, gently sloping to the tablelands atop the ridge. The valley contains trees such as octopus tree (*Schefflera actinophylla*), koa haole (*Leucaena leucocephala*), Christmasberry (*Schinus terebinthifolius*), Java plum (*Syzygium cumini*), and less dense ground vegetation along the stream bed and the eastern slopes of the valley. The western slope of the dry stream valley is similar to the other flanks of the ridge. The tablelands contain many of the same grasses and trees that are located on the north, east, and west flanks of the ridge as well as an ironwood (*Casuarina* sp.) forest. Large swaths of the tablelands are experiencing heavy erosion. Makaleha Stream extends diagonally through the southernmost corner of the AIS study area. Vegetation is less dense near the stream, with scarce patches of grasses, large trees including Indian banyan (*Ficus benghalensis*) and candlenut (*kukui*; *Aleurites moluccana*), and various ferns such as 'oali'i (*Asplenium trichomanes*), moss, and lichen.

### 1.3.2 Built Environment

The *makai* portion of the Dillingham Ranch Agricultural Subdivision project area, along the level coastal plain, is currently used for equestrian activities. Existing ranch components include stables, fenced activity areas, ranch office structures, ranch employee residences, and the Dillingham Ranch Lodge. A commercial plant nursery for palm trees is also located in the *makai* portion of the Dillingham Ranch Agricultural Subdivision project area. The *mauka* portion of the Dillingham Ranch Agricultural Subdivision project area is largely undeveloped, with limited ranch-related infrastructure including fences, walls, water troughs, and a corral.

The surrounding area is rural, primarily consisting of cultivated diversified agricultural lands. The Dillingham Airfield and Gliderport is approximately 1 km (0.6 miles) west of the Dillingham Ranch Agricultural Subdivision project area. The residential community of Mokulē'ia is approximately 0.25 km (0.15 miles) east of the Dillingham Ranch Agricultural Subdivision project area. *Mauka* of the Dillingham Ranch Agricultural Subdivision project area is the undeveloped Mokulē'ia Forest Reserve. *Makai* of the Dillingham Ranch Agricultural Subdivision project area are Farrington Highway, the Mokulē'ia Polo Field, and the shoreline. The AIS study area is entirely in undeveloped ranch lands with limited ranch-related infrastructure including fences and walls.

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## Section 2 Methods

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### 2.1 Field Methods

CSH completed the fieldwork component of this AIS under archaeological fieldwork permit number 16-26, issued by the SHPD pursuant to HAR §13-282. Fieldwork was accomplished between 22 November and 2 December 2016 by Scott Belluomini, B.A., Si-Si Hensley, M.A., and Jason Kline, B.S., under the general supervision of principal investigator David W. Shideler, M.A. This work required approximately 18 person-days to complete.

In general, fieldwork included 100% pedestrian inspection of the AIS study area and GPS data collection. The two sites observed during the brief 2008 archaeological monitoring were also located and formally and sufficiently documented during this AIS, in order to bring the documentation of all sites within the Dillingham Ranch Agricultural Subdivision project area into compliance with documentation standards.

#### 2.1.1 Pedestrian Survey

A pedestrian inspection of the project area was undertaken for the purpose of historic property identification and documentation. This was accomplished by systematic sweeps of three CSH archaeologists spaced approximately 5-10 m apart based on ground visibility. The general characteristics of the project area, including vegetation, were documented and general photographs of the project area were taken.

When potential historic properties were identified, their locations were documented. This included GPS data collection of the horizontal extent of the potential historic property and associated features. The features were photographed with a scale and generally described, which often included descriptions of shape, materials, method of construction, integrity, and evidence of age and function of the feature. The dimensions of all features and the general condition were often recorded. A representative portion of linear archaeological features was illustrated on plan maps. All other archaeological features were illustrated in full on plan maps. The historic properties' boundaries are defined by their previously documented extents (if applicable) and the extent that was documented as part of this AIS.

#### 2.1.2 GPS Data Collection

The location of each of the historic properties was recorded using a Trimble Pro XH mapping grade GPS unit with real-time differential correction. This unit provides sub-meter horizontal accuracy in the field. Hand-held Garmin GPSMAP 64s were used to guide the field crew through the project area and to assist in identifying the boundaries of the project area in the field. These handheld units provide horizontal accuracy between 3 and 5 m. GPS field data was post-processed, yielding horizontal accuracy between 0.5 and 0.3 m. GPS location information was converted into GIS shape files using Trimble's Pathfinder Office software, version 2.80, and graphically displayed using ESRI's ArcGIS 10.3. CSH utilizes the NAD 83 HARN datum and UTM Zone 4N coordinate system.

For linear features, such as walls, etc., GPS points were taken from various points along the historic property, including, but not limited to, its most extreme extents. Datum points were also taken and recorded on illustrated plan maps. For feature complexes, GPS points were taken in

various datum points, which were recorded on field maps and plan maps to assist in the accurate mapping of the horizontal extent of the historic property. The datum points were used to georeference the historic properties' location using scaled illustrated maps and field notes.

### **2.1.3 Disposition of Materials**

No materials were collected during the current AIS. All data generated during the course of the AIS are stored at the CSH offices.

Materials collected during the current AIS (excluding human remains and grave goods) will remain temporarily curated at the CSH office in Waimānalo, O'ahu. CSH will make arrangements with the landowner regarding the disposition of this material. Should the landowner request different archiving of material, an archive location will be determined in consultation with the SHPD.

### **2.1.4 Research Methods**

Background research included a review of previous archaeological studies on file at the SHPD; review of documents at Hamilton Library of the University of Hawai'i at Mānoa, the Hawai'i State Archives, the Mission Houses Museum Library, the Hawai'i Public Library, and the Bishop Museum Archives; study of historic photographs at the Hawai'i State Archives and the Bishop Museum Archives; and study of historic maps at the Survey Office of the Department of Land and Natural Resources. Historic maps and photographs from the CSH library were also consulted. In addition, Māhele records were examined from the Waihona 'Aina database (Waihona 'Aina 2000).

This research provided the environmental, cultural, historic, and archaeological background for the project area. The sources studied were used to formulate a predictive model regarding the expected types and locations of historic properties in the project area.

## Section 3 Background Research

### 3.1 Traditional and Historical Background

The district of Waialua is rich in legends, stories, proverbs, and myths. Waialua, literally translated as “two waters” (Clark 2002) may refer to the two large stream drainages (Anahulu and Helemano-Poamoho-Kaukonahua) once used to irrigate extensive taro fields in the *ahupua'a* (traditional land division) of Kamananui, Pa'ala'a, and Kawailoa, the more populous *ahupua'a* on the eastern side of the district. The *ahupua'a* of Keālia, Kawaihāpai, and Mokulē'ia, on the western side of the district, were not as well-watered as the three eastern *ahupua'a*. However, these western lands were famed for their warm climate, cooling breezes, plant resources, and especially marine resources.

#### 3.1.1 References to the Environment

Kūali'i was a legendary eighteenth century chief of O'ahu (Cordy 2002:32). A *mele* (chant) of his genealogy includes a description of his lands on O'ahu and Kaua'i:

Kaena is a point,	<i>He lae Kaena,</i>
Kahuku is hala-wreathed, covered with dew Is the back of Kaala;	<i>He hala o Kahuku He kuamauna hono i kehau Kaala</i>
There below doth Waialua sit, That is Waialua.	<i>Noho mai ana Waialua i lalo-e– O Waialua ia.</i>
Mokuleia with its dish of Kahala; A fish-pond, like cooked shark,	<i>O Mokuleia, Kahala ka ipu Ka loko ia mano lalawalu,</i>
The tail of the hammer-headed shark is Kaena, The shark that travels at the bottom of Kauai,	<i>Hiu lalakea o Kaena, Mano hele lalo o Kauai-e–</i>
At the bottom of Kauai my land . . .	<i>Olalo o Kauai, kuu aina . . .</i>

[Fornander 1986:4(2):374]

In this chant, the general aspect of the land in Waialua and the vicinity is illustrated. Ka'ala is the tallest peak in the Wai'anae Range, and its sharp ridgeline resembles the tail of a shark, running down to the sea. The sloping tablelands at the foothills of the mountains in Mokulē'ia resemble a bowl or pond.

In the legend of Pele and Hi'iaka, the sister of the volcano goddess Pele, Hi'iaka travels around the islands (Emerson 1993). In one instance, Hi'iaka's canoe is beached on the sands of Mokulē'ia. Hi'iaka leaves her companions to pay her respects to her ancestor, Pōhaku-o-Kaua'i, and to her ancestral divinity Ka'ena. She passes Ka'ena Point on O'ahu and enters the hot and arid region of Waialua. As she climbs up into the Wai'anae Mountains above the lands of Keālia and Kawaihāpai, she offers the following chant:

Ka'ena's profile fleets through the calm,	<i>Kunihi Kaena, holo i ka malie:</i>
With flanks ablaze in the sunlight –	<i>Wela i ka La ke alo o ka pali;</i>



A furnace heat like Kilauea;	<i>Auamo mai i ka La o Kilauea;</i>
Ke-awa-ula shelters in heat;	<i>Ikiiki i ka La na Ke-awa-ula,</i>
Kohala-lele revives in the breeze,	<i>Ola i ka makani Kai-a-ulu Kohola-lele–</i>
That breath from the sea, Kai-a-ulu.	<i>He makani ia no lalo.</i>

[Emerson 1993:157–158]

The offshore winds of Mokulē‘ia are also mentioned in the legend “The Wind Gourd of La‘amaomao” (Nakuina 1992). In this story, a special gourd contained all the winds of Hawai‘i, which could be summoned by calling their names. This gourd was an embodiment of Lono, the Hawaiian god of fertility and agriculture who was also associated with winds, clouds, and rain. The gourd was passed down from La‘amaomao, the Hawaiian wind goddess, to her granddaughter, who then passed it down through their line to Pāka‘a and his son Kā‘a Pāka‘a, attendants to the high chief, Keawenuiaumi. On windless days, one could open the gourd, call the name of the wind, and cause this wind to blow. The winds of Waialua were named thus:

The wind of Ka‘ena turns in two directions,  
 Hinakokea is of Mokule‘ia,  
 The winds of Waialua blow,  
 Moving silently at the cape of Ka‘ena [Nakuina 1992:51]

### 3.1.2 References to Plant Resources

Although not as extensively cultivated as the more populous eastern portion of the district, Kawaihāpai and Mokulē‘ia had several smaller streams and springs that could be used to irrigate crops. Kawaihāpai literally translates as “the carried water” (Pukui et al. 1974:99), with the origin of the place name described by the following passage:

Life on this land in the olden days was a life of plenty until trouble came, for plants died because of the lack of water. Everybody thought of going and leaving the land.

There were two old men who belonged to the priestly class of old, and they remained, setting up the kapu with prayers and after praying they saw a hog shaped cloud coming directly from Kahuku point and they guessed that it was going to rain, that their prayers were heard. They were waiting for rain and heard the splashing of raindrops on the cliff. When they went to look they saw water pouring from the cliff and they told everybody to stay for water was found.

This place where this strange water created by God is on the hill facing the length and breadth of the district of land called Kawaihāpai that lies between Waianae and Waialua, Oahu.

Because God created this water on the cliff, the name of the land from old was called Ka-wai-hapai (Lifted-water) because this water was lifted up and placed above and because no one knew the source of this water it is called Ka-wai-kumu-ole-i-ka-pa-i (Water–without-source-on-the-cliff) to this day. [Liokakele 1911 in Sterling and Summers 1978:99]

Research on the meaning of Mokulē'ia produced two different translations concerning cultivation. According to *Place Names of Hawaii*, Mokulē'ia means “isle [of] abundance” (Pukui et al. 1974:155). The second translation, which may be of relatively modern origin, has the name as *moku-leia*, from the saying “*Moena pāwehe o Mokulē'ia*”—the patterned map of Mokulē'ia. This refers to the pattern of agricultural fields on the lowlands of Mokulē'ia in the early post-Contact period (Pukui 1983:161).

Although wetland cultivation in Keālia is not mentioned, several legends refer to specific plants in the area. Keālia means “the salt bed” (Clark 1977:105). There is no known salt pond at Keālia, but an association with salt is mentioned in a legend concerning Pele and another of her sisters, Ka'ōhelo. Ka'ōhelo told her son that when she died, she wanted him to take her body to the top of Kīlauea, the home of her sister Pele. When he took her body to Kīlauea, her flesh became the creeping vine portion of the 'ōhelo plant (*Vaccinium reticulatum*), and the bones became the bush-plant portion of the 'ōhelo. Pele “retained Ka'ōhelo's head, which became the smoldering fire in the volcano; the rest of the body was thrown over to Haleakalā, Maui and to salty Keālia, O'ahu; some of it was thrown on Kaua'i, and some of it was left on Hawaii” (Fornander 1985:576). The 'ōhelo plant grows at high elevations and was considered a sacred offering to Pele.

In the legend of Kalelealuaka (Thrum 1998:94–100), the hero uses his miraculous powers to fly to different parts of the island of O'ahu and wreathes himself in plants particular to those regions. At the start of one battle, he flies to Wai'anae and covers himself with the fine-leaved *maile* (*Maile lauli'i*). Before the second battle, he flies to Waialua to array himself “in the rough and shaggy wreaths of *uki* (native sedges) from the lagoons of 'U'koa (a fishpond in eastern Waialua) and of *hinahina* (*Heliotropium anomalam*) from Keālia” (Thrum 1998:98). Before the third battle, he flies to Kahuku and adorns himself in a wreath of the pandanus fruit and flowers of the sugarcane. The heliotrope from Keālia is a low, spreading beach plant with small, white fragrant flowers.

### 3.1.3 References to Marine Resources

Several legends about Mokulē'ia concern marine resources, fishing practices, and ceremonial rites related to fishing. In an archaeological survey of the Mokulē'ia area conducted in the 1920s and 1930s, four surviving *ko'a* (shrine) were recorded (McAllister 1933). *Ko'a* are usually natural boulders or rock mounds used as shrines where fishermen could beseech the gods for a good catch or place offerings to thank the gods. One of the gods honored by the Hawaiians was Kāne'aukai, who first revealed himself to the people in Waialua. The following passage describes the appearance of Kāne'aukai to two fisherman, who were tasked with praying to him for a plentiful supply of fish:

One morning on going out upon the seashore they found a log of wood, somewhat resembling the human form, which they took home and set in a corner of their lowly hut, and continued their habit of praying to Kaneaukai. One evening, after having prepared a scanty supper of poi and salt, with perhaps a few roasted kukui-nuts, as a relish, and a couple of cocoanut cups of awa as their usual drink, they saw a handsome young man approaching, who entered their hut and saluted them. He introduced himself by saying, 'I am Kaneaukai to whom you have been praying, and that which you have set up is my image; you have done well in caring for it.'

He sat down, after the Hawaiian custom, as if to share their evening meal, which the two old men invited him to partake of with them, but regretted the scanty supply of awa. He said: 'Pour the awa back into the bowl and divide into three.' This they did and at once shared their meal with their guest.

After supper Kaneaukai said to the two old men, 'Go to Keawanui and you will get fish enough for the present.' He then disappeared, and the fishermen went as instructed and obtained three fishes; one they gave to an old sorceress who lived nearby, and the other two they kept for themselves.

Soon after this there was a large school of fish secured by the fishermen of Mokuleia. So abundant were the fish that after salting all they could, there was enough to give away to the neighbors; and even the dogs had more than they desired. [Thrum 1998:251]

The two fishermen also described the variety of marine resources found at Mokulē'ia:

The fish that frequented the waters of Mokuleia are the aweoweo [bigeyes; *Priacanthus* sp.], kala [surgeonfish; *Naso* sp.], manini, [surgeonfish; *Acanthurus* sp.] and many other varieties that find their habitat inside the coral reefs. Crabs of the white variety burrowed in the sand near the seashore and were dug out by the people, young and old. The squid also were speared by the skillful fishermen, and were eaten stewed, or salted and sun-dried and roasted on the coals. [Thrum 1998:250]

The wooden idol was eventually moved to Waimea Valley, O'ahu and placed next to a stone idol also representing the god Kāne'aukai. The stone idol was still in place when Thrum recorded this tale in 1907, but the wooden idol had disappeared. Thrum speculated that it may have been destroyed on one of Ka'ahumanu's trips around the island, when she spread the word of Christianity and ordered all idols of the Hawaiian gods to be burned (Thrum 1998:253).

In the legend of Māikoha, the types of fish resources associated with certain *ahupua'a* are mentioned (Fornander 1974:5[2]). This legend concerns a man named Māikoha and his four sisters. Māikoha was sent away by his father for breaking several *kapu* (taboos). He left his family and settled in Kaupō, Maui. His four sisters later went in search of him, and found he had changed into a *wauke* (paper mulberry; *Broussonetia papyrifera*) plant. After they had found him, they left again on a journey to O'ahu. The first sister, Kaihuopala'āina, met a man named Kapapa'apuhi in Honouliuli, 'Ewa. She married him, settled down, and eventually changed into a fishpond still present in the area. As the remaining three sisters traveled on, the second sister, Kaihukoa, met a man named Ka'ena in Wai'anae, and decided to marry him. She settled in the area and changed into a fishing ground directly out from Ka'ena Point, famous for its *ulua* (trevally or jack), *kahala* (amberjack, *Seriola* sp.), and the *mahimahi* (dolphin fish; *Coryphaena hippurus*). The remaining two sisters traveled on to Waialua, where Ihukoko met a man named Kawaihoa. They married and settled in the area, and Ihukoko was accompanied to the area by the fish *āholehole* (Hawaiian flagtail; *Kuhlia malo*). The final sister traveled to Lā'ie where she married a man named Laniloa. She brought with her the *'ama'ama* (mullet; Mugilidae) (Fornander 1974:5[2]:270–272).

A continuation of the legend of Māikoha contains another variation on the legend of the fishing god, Kāne'aukai:

After the sisters were all married and had been living with their husbands on Oahu for some time, Kaneaukai their oldest brother came in search of them. This man's body was in the shape of a log of wood, and after he had floated on the surface of the ocean for several days, it drifted to the seashore at Kealia in Mokuleia, Kawaihapai, Waialua, where it was carried in and out by the tide. After being in this form for some time it changed into a human being and journeyed to Kapaeloa, where two old men were living.

When he approached the home of the two old men, he saw them watching an imu (oven), and after it was covered up they set out to the beach to do some fishing. After fishing for some time without success Kaneaukai called out to them: 'Say, you old men, which god do you worship and keep?' The old men replied: 'We are worshipping a god, but we do not know his name.' Kaneaukai then said: 'You will now hear and know his name. When you let down your net again, call out, 'Here is the food and fish, Kaneaukai, that is the name of the god.' The old men assented to this, saying: 'Yes, this is the first time that we have learned his name.' Because of this fact, Kaneaukai is the fish god worshiped by many to this day, for Kaneaukai became their fish god, and from them others, if they so desired. [Fornander 1974:5(2):272]

The *kahala* (amberjack; *Seriola* sp.) of Mokulē'ia are mentioned often in stories, such as the Legend of Kūali'i and the Legend of Māikoha, presented above. According to the *Hawaiian Dictionary*, the word *mokulē'ia* itself is a rarely used alternate name for this fish (Pukui and Elbert 1986:252). This species, the amberjack, is a deep water species that was caught on a hooked line at depths of 400-500 ft. It is a large, meaty fish that can reach a length of 6 ft (Tinker 1978:256–257). *Kahala* were commonly cooked in the *imu* (earth oven) or cubed and eaten raw with salt by Native Hawaiians (Titcomb 1972:83).

The legend of the Hinalea Fish Basket also takes place in Mokulē'ia, which attests to the abundance of marine resources in the area (Kamakau 1870 in Sterling and Summers 1978:101–103). In this legend, Kalamainu'u, a *mo'o* or goddess, resides in a cave in the Waile'a valley, west of the valley of Makaleha in Mokulē'ia. Kalamainu'u, in search of a husband, lures Puna'aikoa'e, a chief of Kapa'a, Kaua'i, out to sea while he is surfing. Puna'aikoa'e is taken by Kalamainu'u from Kaua'i to her cave in Mokulē'ia. The following passage describes the abundance of both land and marine resources at Makaleha:

They went to her home in Makaleha where sweet potatoes and both the kiki and lapa varieties of taro grew abundantly and there was plenty of poi, 'awa and bananas. The woman supplied the fish of that land that was usually caught by torching, the kumu, the uhu (lobster), and all kinds of fish. [Kamakau 1870 in Sterling and Summers 1978:101]

The legend continues with Puna'aikoa'e observing the breaking surf along the Waialua shoreline. Longing for the surf of his homeland, Puna'aikoa'e asks the permission of Kalamainu'u to surf. Kalamainu'u granted him permission, as long as he did not speak to anyone on the way to the shoreline. Puna'aikoa'e is then caught speaking to two farmers, which leads Kalamainu'u to attempt to kill the two men. The men escape to a crack in the sea floor, where Kalamainu'u is unable to reach them.

Kalamainu'u, exhausted and lying on the beach, is approached by two women who teach her how to trap the two men:

' . . . They like the sand crabs on this beach to eat with the sweet potatoes which they cultivate in Kanoa, Keone'ae, and the uplands of Makaloha, but they are unskilled in torch fishing. This how you can catch them. Go gather some 'inalua vines under tapu and on your return weave (them into a trap), beginning at the opening. When the part that goes inward is formed, bend (the 'inalua) back to shape the basket. Add some 'inalua to increase the size of the basket as you work downward, and when you see that it is large enough then decrease the 'inalua that are standing upright and keep on decreasing. In that way the bottom of the basket is shaped and finished. When the weaving of the basket is finished the tapu is freed. Then dig sand crabs; carry the basket into the sea, weighted down with pebbles from the sea pools, and set it up in a favorable place where there is a depression so that the sea runs in and out, and remove the stones until it is properly balanced. Then go to a rock in the sea and chew the sand crabs, dive into the sea and place them in the basket, then return to some distance. After an interval, dive again. Hinale and Akilolo will have come to eat their favorite food, and when you come you will find your enemies in the basket.' Kalamainu'u heard and heeded these words. All went as they had said. She killed her enemies and tore them into pieces, and the pieces into which she tore them became hinalea fish. From that time down to the overthrow of the tapus those who wove baskets to trap hinalea fish observed these tapu rules; and there were always plenty of hinalea caught in the baskets during that period, so many that a stench arose from the frames where they were drying, from the water of Kumalaekawa to the cape of Ka'ena. Kalamainu'u became an 'aumakua for basket fishing in these places. [Kamakau 1870 in Sterling and Summers 1978:102–103]

### 3.1.4 Other Legendary References

The plains of Mokulē'ia were said to have once been inhabited by cannibal chiefs, as told in *The Legend of Oahunui* (Thrum 1998). These cannibal chiefs from the South Seas were

. . . driven from the plains of Mokuleia and Waialua by the inhabitants of those districts; for the people had been exasperated by the frequent requisitions on the *kama'ainas* (original inhabitants) by the stranger chiefs to furnish material for their cannibal feasts. [Thrum 1998:140]

Kawaihāpai was also known to be one of the places that the lights of the *menehune* (legendary little people) could be seen. These lights have been described as follows:

Here in the arm of Haleiwa Bay, strange things can be seen at night. Looking over toward the point to the right, when the night is dark, rows of twinkling light show upon the water. It is the menehunes at their fishing, working fast against the coming of the dawn. [Raphaelson 1925 in Sterling and Summers 1978:100]

### 3.1.5 Early Descriptions

A picture of pre-Contact Hawai'i is painted by the recorded accounts of early foreign explorers. After the death of Captain James Cook on the island of Hawai'i, the crew of the *Resolution*

continued to sail toward O'ahu under the leadership of Captain Charles Clerke. Clerke, after anchoring in Waimea Bay, describes the highly populated and lush northwest coast of O'ahu:

I stood into a Bay just to the Wtward [Westward] of this point the Eastern Shore of which was by far the most beautifull Country we have yet seen among these Isles, here was a fine expanse of Low Land bounteously cloath'd with Verdure, on which were situate many large Villages and extensive plantations; at the Water side it terminated in a fine sloping, sand Beach . . . This Bay, its Geographical situation consider'd is by no means a bad Roadsted, being sheltered from the NEbN [Northeast by North] SEterly [Southeasterly] to SWbW [Southwest by West] with a good depth of Water and a fine firm sandy Bottom; it lays on the NW [Northwest] side of this Island of Wouahoo [O'ahu] . . . surrounded by a fine pleasant fertile Country. [Beaglehole 1967:569]

In 1813, Waialua was described by John Whitman, an early missionary visitor, as follows:

. . . a large district on the N.E. extremity of the island, embracing a large quantity of taro land, many excellent fishing grounds and several large fish ponds one of which deserves particular notice for its size and the labour bestowed in building the wall which encloses it. [Holt 1979:78]

Another missionary, Levi Chamberlain, described the vicinity of Kawaihāpai in 1826:

At 11 o'ck [*sic*] we set out and walked along a path leading over an extended plain covered with high grass. After walking about 3 miles we took a path leading over a marshy tract to the mountains which we were designing to cross in order that we might avoid a bad piece of traveling along the western shore. The mountains here run in nearly a N.W. and N.E. direction being somewhat circular. We ascended by a rough & difficult path, shrubs, long grass, wild plants and bushes sprung up grew luxuriantly among the rocks being plentifully moistened by little streams which trickled down the steep sides of the mountains. After ascending several hundred feet, we came to a beautiful little run of water conducted by sprouts [*sic*] furnishing sufficient moisture for a number of taro patches below. I was told that the water never failed and the district into which it passes is called Kawaihāpai (Water lifted Up) on account of the water's being conducted from such an elevation.

The prospect from the acclivity is very fine. The whole district of Waialua is spread out before the eye with its cluster of settlements, stragglng houses, scattering trees, cultivated plats & growing in broad perspectives the wide extending ocean tossing its restless waves and throwing in its white foaming billows fringing the shores all along the whole extent of the district. [Chamberlain 1823-1827 in Alameida 1993:14-15]

### 3.1.6 Economic Changes

About AD 1720-1740, the island of O'ahu was united under the high chief Kūali'i after a series of battles with the chiefs of Kona and 'Ewa. Kūali'i continued his wars of conquest by carrying out raids on the islands of Moloka'i and Hawai'i. This began a period of intra-island and inter-island wars referred to as the Conquest Period that culminated in the conquest of O'ahu by the Hawai'i Island chief, Kamehameha, in AD 1795 (Sahlins 1992:36). In 1804, the Hawai'i chiefs

who supported Kamehameha occupied O'ahu, taking control of the lands of the former ruling chiefs. In 1806, Kamehameha traveled around the island of O'ahu to encourage people to rebuild their war-ravaged agricultural fields and fishponds by his own example.

Kamehameha stayed for only one day to farm at Wai'anae, then went to Waialua. He stayed at least 3 or 4 days with the chiefs and people of Waialua working in the lo'i [irrigated fields] which extended from the famous pawehe (geometric patterns) mats [of Mokule'ia] to the waters of Waimea. From Waialua he went to Laie and farmed there. [*Ka Nai Aupini*, newspaper article in Alameida 1993:39]

Kamehameha not only encouraged his people to rebuild areas devastated by the wars, but also to expand into new areas. "He cleared the land at Waikiki, Honolulu, Kapalama, Kapa'aiki, Keone'ula, Kapa'eli, and all the other places, and when all the lands were under cultivation he cultivated mauka in Nu'uaniu as far as Keawewawapu'ahanui" (Kamakau 1961:192). This passage indicates there may have been an intensification of agriculture after 1804, which included expanding the irrigation system into new lands upland (*mauka*) of the former pre-Contact fields (Sahlins 1992:52). Some of these agricultural endeavors may be connected to the new trade that developed with visiting foreign ships. During the Conquest Period, food and other provisions were sold to visiting ships involved in the Canton trade. Ships would travel to the Northwest Coast for furs, stop in Hawai'i for provisions, and journey on to Canton, China to trade the furs for luxury goods such as fine ceramics and silk (Sahlins 1992).

Kamehameha died in 1819, and his son Liholiho and wife Ka'ahumanu shared the duties of ruling the new kingdom. In 1823, Liholiho addressed a gathering of chiefs at Maui and told them that he wished to visit England. He selected his younger brother Kauikeaouli to be his chief during his absence and heir in the event that he did not return. Both Liholiho and his wife died in 1824 while in England, and Kauikeaouli, later known as Kamehameha III, became king at the age of nine, with a guardian Kahalai'a as his *kahu* (personal attendant). This took place during the Sandalwood Period (AD 1812-1830), when the *ali'i* (high chiefs) made enormous demands upon the common people to gather sandalwood in the upland forests. The wood was sold to foreigners in trade for western luxury goods (Sahlins 1992:82).

Kau-i-ke-aouli's assumption of control was marked by the selection of a group of young chiefs and children of important persons, of resident foreigners, and of commoners, to become his favorites, friends, members of his household, and soldiers and sailors to form his bodyguard. After Kahala'ia's death all repaired to the uplands of Waialua adjoining Waimea, to upper Kolokini, Wao'ala, 'Aikanaka, Kaloka in upper Makaleha, and to upper Mokule'ia to cut sandalwood. Kau-i-ke-aouli was but a boy in his thirteenth year while cutting at upper Wao'ala and lower Maeaea, but he attended to the work himself and when he sailed in his two-masted boat to Mokule'ia or other places after sugarcane, sweet potatoes, melons, pigs, and fowl, he handled the boat in true sailor fashion, dressed in his sailor blouse and cap. [Kamakau 1992:278-279]

This period ended in the exhaustion of sandalwood on the Islands. Trade continued with visiting whaling ships during the Whaling Period (AD 1830-1848) for provisions, but this did not generate the same profits for the *ali'i* as did the early sandalwood trade. The *ali'i* became greatly indebted

to western merchants, and made increasing demands upon the common people for goods and work to pay off these debts and to buy yet more goods (Sahlins 1992:108).

Between 1830 and 1850, the demands of the *ali'i* on the *maka'āinana* (common people) were severe. The missionary John Emerson, commenting on the burdensome taxes on the people, wrote that the ruling chiefs “get hungry often and send a vessel to Waialua for food quite as often as it is welcomed by the people” (MsL: 10 Feb 1834 in Sahlins 1992:145). The chiefs also demanded food be brought to them:

Last Sat some 2 or 300 men went from this place to H[onolulu] to carry food for the chiefs and this [is] often done . . . Each man carried enough food to maintain 4 persons one week & will cost each man beside the time spent in [indecipherable] and cooking it 4 days time and 70 miles travel to get it to H[onolulu], and yet each man's load would only bring 50 cts. [Locke, journal, 26 June 1837; cf. MsL: Emerson, 11 Jan 1835 in Sahlins 1992:145]

John Emerson also began growing sugarcane on his land in Waialua as early as 1836. He “made his own molasses, grinding a few bundles of cane in a little wooden mill turned by oxen, and boiling down the juice in an old whaler trypot” (*The Friend* in Condé and Best 1973:340). This early sugarcane plantation later passed through several hands, including the Levi and Warren Chamberlain Sugar Company, established 1865, Halstead & Gordon, and the Halstead Brothers.

### 3.1.7 Population Decline

In the pre-Contact period, villages in the Waialua District were concentrated along the coast and the well-watered valleys of the *ahupua'a* on the eastern side of the district. The population of these *ahupua'a* has been estimated at 6,000 to 8,000 people before Western Contact (Sahlins 1992:20).

In 1832, the missionary Ephraim Walter Clark reported that

Waialua on the eastern part of the island is a populous region. A mission can be located at a central point in this vicinity, [and] by preaching at different places that are within 5 or 6 miles of each other & of easy access, [we] would probably have 3,000 or 4,000 bearers [followers]. [Letter from E.W. Clark 1832 in Alameida 1993:4]

A small school was also established at Kawaihāpai in 1839, near Kawaihāpai Stream.

The first missionary census of the district in 1831-1832 recorded 2,640 people in Waialua, probably down 20-30% from the first decade of the century. The population continued to decline in the first part of the nineteenth century and by 1848, the population was down to 1,616 persons. Much of this decline was due to a high death rate from newly introduced diseases such as smallpox, typhus, and venereal diseases.

In 1850, the missionary Emerson wrote the following:

I went to Kawaihapai, distant about 6 miles to preach to a small congregation. Found many sick on the road calling for medicine; & when [I] arrived at the place of meeting I found two unburned corpses, but a few steps from the schoolhouse & other sick-apparently nigh unto death . . . The past epidemic has been of a very



strange character. Many were taken with violent pains in the head or stomach, which would soon spread over the whole system; & some times in one or two days the patient would die, but more frequently he would linger along six or ten days. [Emerson 1850 in Alameida 1993:84; Letter, Emerson to Anderson, 22 May 1850, Hawaiian Mission Children's Society Library]

The adult to child ratio in 1831–1832 was three to one (Schmitt 1977:9). This is not only a reflection of the low birth rate during these years, but also indicates many young people were moving out of the district. They left to escape the increasing demands of the *ali'i* during the Sandalwood Period and to seek a better life in the new urban centers of the Islands. This trend in population decline continued until 1866, when the population reached a low of 851 persons (Schmitt 1977:13–14).

### 3.1.8 Mid- to Late 1800s

Following the death of Ka'ahumanu's father, Ke'eaumoku, in 1804, Ka'ahumanu's brother Kahekili Ke'eaumoku, also known as George Cox, became the *ali'i ai moku* (governing high chief) of Waialua. In 1824, Kahekili Ke'eaumoku died and his sister, Lydia Kekuapi'ia Nāmāhana, also known as Pi'ia, inherited the entire *moku* (district) of Waialua. When she died, her husband La'anui was confirmed as the *luna* (landlord or supervisor) by Ka'ahumanu, who was again considered the owner. Ka'ahumanu, who died in 1832, willed all of her lands to her niece, Kīna'u. After Kīna'u's death in 1839, the *kalana* (land division smaller than a *moku*) within Waialua was inherited by her daughter, Victoria Kamāmalu, along with many other lands in the Islands (Kame'eleihiwa 1992:106, 120–124).

In 1845, the Board of Commissioners to Quiet Land Titles, also called the Land Commission, was established “for the investigation and final ascertainment or rejection of all claims of private individuals, whether natives or foreigners, to any landed property” (Chinen 1958:8). This led to the Māhele, the division of lands among the king of Hawai'i, the *ali'i*, and the common people, which introduced the concept of private property into Hawaiian society. In 1848, Kamehameha III divided the land into four divisions: Crown Lands to be reserved for himself and the royal house; Government Lands set aside to generate revenue for the government; Konohiki Lands claimed by *ali'i* and their *konohiki* (supervisors); and *kuleana*, habitation and agricultural plots claimed by the common people (Chinen 1958:8–15).

Upon the confirmation of a land claim, the *ali'i* were required to pay a commutation to the government. This commutation (meaning a substitution of one form of payment or charge for another) could be satisfied with a cash payment or the return of land of equal value. This payment was usually one-third of the value of the unimproved land at the date of the award (Chinen 1958:9–12). Victoria Kamāmalu gave up all of her lands in Kamananui, Mokolē'ia, Kawaihāpai, Keālia, and Ka'ena, all within the Waialua District, to the Government to satisfy the one-third-commutation requirement in order to claim all of her other extensive land titles. These *ahupua'a* then became Government Lands. In 1848, Government Lands became available for purchase, “in lots of from one to fifty acres in fee simple, to residents only, at a minimum price of fifty cents per acre” (Chamberlain n.d.). These costs did not include the survey fee, which was to be paid by the interested buyer.

Many of the Native Hawaiians living in the area bought the lands they lived and worked on through the Waialua land agent, the missionary John Emerson. Emerson had encouraged the

natives of these five *ahupua'a* in western Waialua to withdraw from the Māhele and not prosecute their claims through the Kuleana Act of 1850. Instead, he encouraged them to buy the lands they worked. In this way they could not only obtain house and agricultural lots, but also pasturage and upper forest lands, which were usually not awarded as *kuleana* claims (Sahlins 1992:168).

A total of 27 land grants were purchased in the *ahupua'a* of Mokulē'ia and 16 in the *ahupua'a* of Kawaihāpai (Figure 5). Portions of 17 land grant lots awarded from 1850 to 1855 are located within the Dillingham Ranch Agricultural Subdivision project area and six of those land grant lots extend into the AIS study area (Figure 6 and Table 1). The land grants in the vicinity generally consisted of long, narrow rectangular pieces of land with the long axis running *mauka-makai*. There were also two rows of land grants extending from the shoreline to the forest reserve line. The *makai* row included the coastal plains and lower foothills. The *mauka* row consisted of the upper mountainous areas. No land use information was provided in the land grant documentation.

In 1850, a law passed that allowed foreigners to buy land fee-simple. Two descendants of missionaries, William Emerson and John T. Gulick, were the first foreigners to buy land in Mokulē'ia and Kawaihāpai. Over the next few years, Emerson continued to buy land from the original grantees or later owners until he owned a total of 2,605 acres in Waialua (Alameida 1993:xii).

In 1852, the first Chinese were brought to the Islands to work in the sugarcane fields. Some of these Chinese later moved to Waialua to begin rice cultivation. A market for rice in California had developed as increasing numbers of Chinese laborers immigrated there since the mid-nineteenth century. Similarly, as Chinese immigration to the Islands also accelerated, a domestic market for rice developed:

By 1876 there was still a considerable amount of former taro land available for rice farming. The great demand for rice land brought disused taro patches into requisition—especially because water rights attached to them . . .

As the demand for rice continued, it became profitable to bring into use land hitherto unused. The land most easily rendered fit for rice cultivation was swamp or marsh land of which there was a large amount in the islands. At Waialua on Oahu, about three hundred acres of swamp land were reclaimed for rice farming. [Coulter and Chun 1937:11]

In 1892, there were 180 acres of land under cultivation for rice in the Waialua District; these rice fields were located in the *ahupua'a* of Mokulē'ia, Kamanui, and Kawaihoa (Coulter and Chun 1937:12, 21). The immigrant Chinese may account for the rise in the Waialua District population during the last quarter of the nineteenth century. In 1866, the population of Waialua had reached a low of 851 persons. This trend reversed in 1878, with a small increase to 939 people and a count of 1,349 in 1886 (Schmitt 1977:13–14).

### 3.1.9 1900s

By the early 1900s, sugarcane plantations and large ranches came to dominate the lands of western Waialua. Cattle were known to have grazed on the lowlands of Waialua as early as the 1840s (Sahlins 1992:148). In 1897, B.F. Dillingham purchased the Kawaihoa Ranch in Mokulē'ia. The ranch included over 2,000 head of cattle and over 100 horses and mules on 10,000 acres of land (Yardley 1981:193). Dillingham also leased additional property in Mokulē'ia, including the

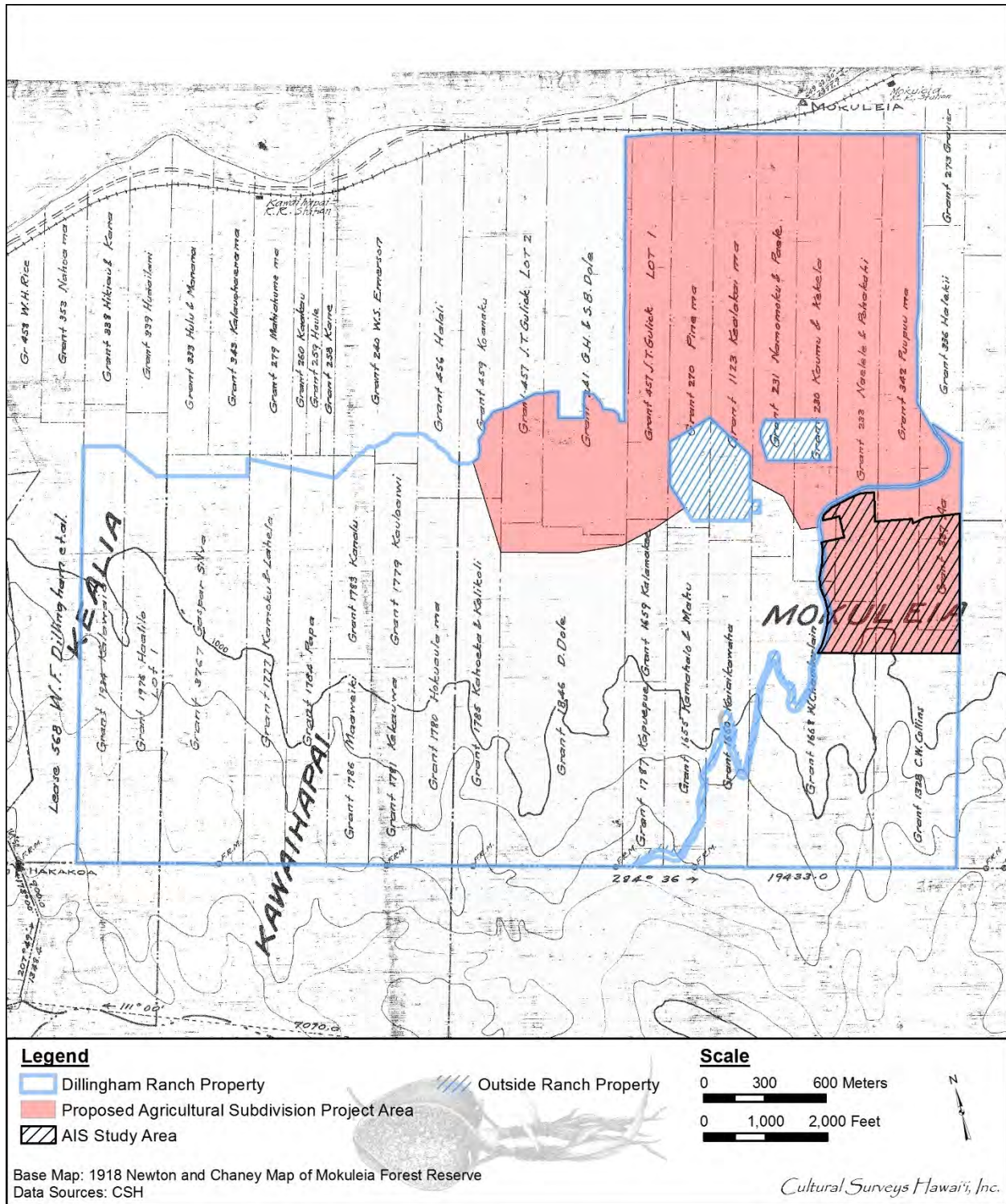


Figure 5. Portion of the 1918 Newton and Chaney map of the Mokuleia Forest Reserve, showing the distribution of land grants in the vicinity of the Dillingham Ranch Agricultural Subdivision project area

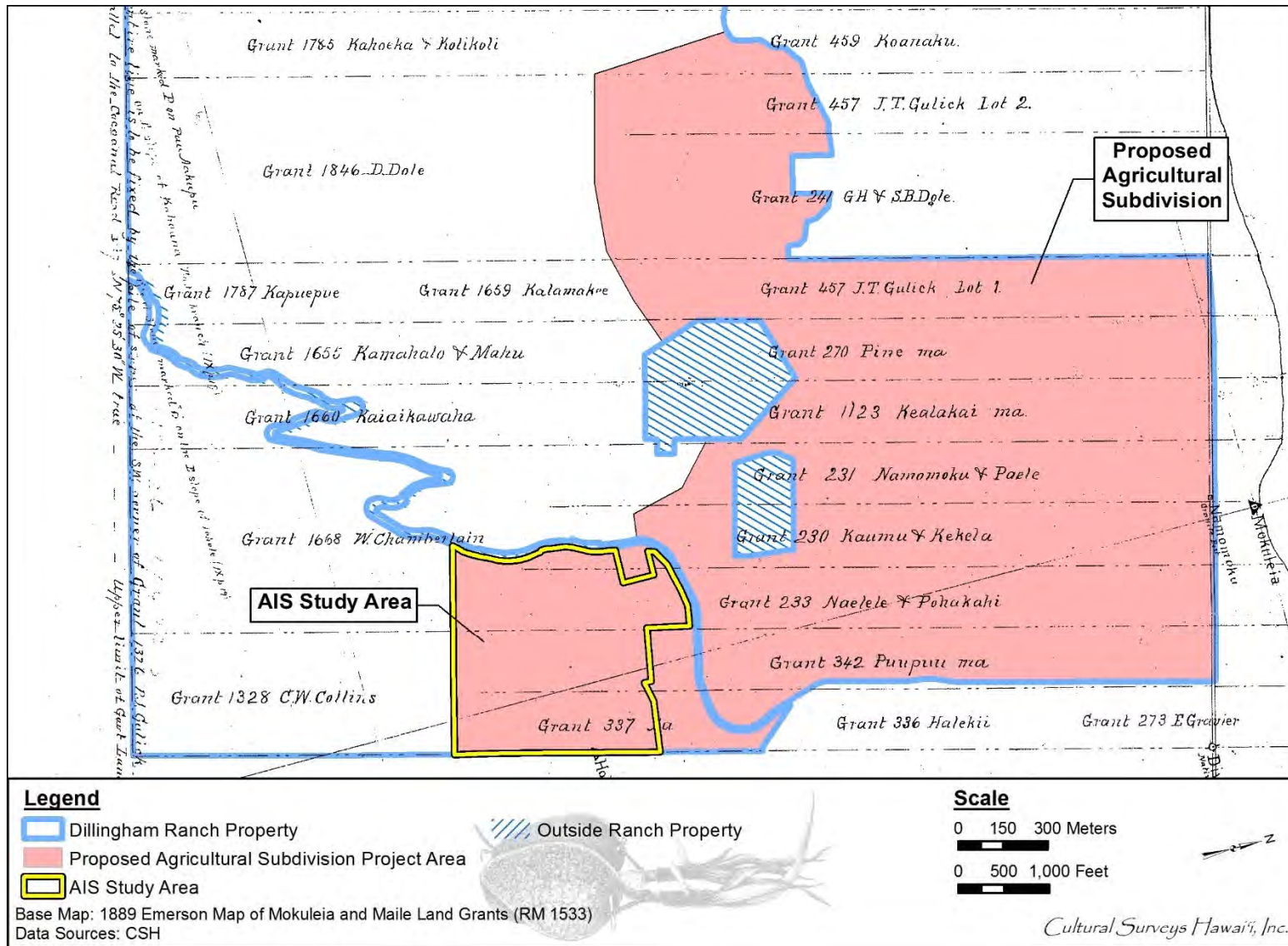


Figure 6. Portion of the 1889 Emerson map of Mokuleia and Maile Land Grants map showing in detail land grants in the AIS study area

Table 1. Land Grants within the Dillingham Ranch Agricultural Subdivision project area

<b>Grant #</b>	<b>Grantee</b>	<b>Year</b>	<b>Acreage</b>	<b>Location</b>
230*	Kaumu and Kekela	1850	120	Mokulē'ia
231	Namomoku and Paele	1850	114	Mokulē'ia
233*	Pohakahi and Naelele	1850	130	Mokulē'ia
241	George H. Dole and Sanford B. Dole	1850	195	Mokulē'ia
270	Pine Pao and Mahiai	1850	108	Mokulē'ia
336	Haleki	1850	50	Mokulē'ia
337*	Aa	1850	49	Mokulē'ia
342*	Puupuu, Ao, Kalaikao, and Malehine	1850	141	Mokulē'ia
457 (2 lots)	John T. Gulick	1850	197	Mokulē'ia and Kawaihapai
459	Koanaku, Palau, and Kaweawea	1850	90	Kawaihapai
1123	Makahi, Kealakai, Poli and Keoahu	1853	112	Mokulē'ia
1328*	Charles W. Collins	1854	136	Mokulē'ia
1659	Kalamaku (Kalamakee)	1855	40	Mokulē'ia
1668*	Warren Chamberlain	1855	211	Mokulē'ia
1785	Kahoeka C. and Kolikoli	1855	90	Kawaihapai
1846	Daniel Dole	1855	248	Mokulē'ia and Kawaihapai

\*Land grants that extend into the AIS study area

Gaspar Silva Ranch, the James Gay Estate, and other lands in the area that he could secure. Dillingham's plan was to later sublease or sell the land at a profit as the lands had potential for being developed into large-scale sugar plantations. He anticipated the land would become valuable once extensive irrigation systems were in place, and when the Oahu Railway and Land Company (OR&L) railroad was constructed around Ka'ena Point and along the north shore to Kahuku.

By 1898, the OR&L railroad was constructed through Waialua District, with stations in both Kawaihāpai and Mokulē'ia. Soon thereafter, Dillingham began selling off or subleasing much of his lands in western Waialua. However, Dillingham retained as his personal ranch, "a great strip of mountainside and beaches with flat land in between and a homestead in the middle" (Yardley 1981:206). This land would remain ranch land, with sugar plantations located to the east and west. The Dillingham Ranch was developed into a horse ranch including stables, pastures, equestrian areas, and a polo field along with a large, wood-framed house for the Dillingham family (Yardley 1981:193–194).

Also in 1898, the Halstead Brothers had a small sugarcane plantation and mill at Waialua town. B.F. Dillingham believed the Halstead Brothers' land could be turned into a profitable sugar plantation, especially since there was now a rail line to Honolulu. The Waialua Agricultural Company was established in 1898 by J.B. Atherton, E.D. Tenney, B.F. Dillingham, W.A. Bowen, H. Waterhouse, and M.R. Robinson (Moblo 1991:4), and was incorporated by the company Castle & Cooke (Dorrance and Morgan 2000:47). They bought the Halstead Brothers' land and mill and began to buy or lease the adjacent lands, many owned by Native Hawaiians. They acquired many of the former irrigated taro lands in order to control the water rights of the region.

Ditches to control water flow began to be built around 1902 in Waialua. The Ito Ditch, built after 1911, diverted water from Kaukonahua Stream to the Mokulē'ia sugarcane fields. The Waialua Agricultural Company was famous for its system of flume irrigation. The portable concrete flumes were set around the fields in a herringbone pattern and water was released to the field by small tin gates (Wilcox 1996:110). In addition, various artesian wells, pumping stations, reservoirs, and associated water control infrastructure were constructed to support the growing sugar plantations.

Land for a new railroad that would carry cane from the fields to the mill began to be surveyed in 1898 and by 1908 the new railroad connected the plantation lands in Waialua, Helemano, and Kawailoa. In 1910, it was reported in the *Louisiana Planter*:

Waialua is reached either by railroad, a distance from Honolulu of 58 miles, or wagon road, 28 miles. The plantation lands extend along the seacoast 15 miles and 10 miles back toward the mountains. The plantation has a good railway system.

There are nearly 600 cane cars and five locomotives: with 30 miles of permanent track and eight of portable track. One stretch of road is nine miles long. [Condé and Best 1973:341]

A 1919 U.S. Army War Department fire control map (Figure 7) illustrates the extent of plantation development in the vicinity of the Dillingham Ranch Agricultural Subdivision project area. In general, cane lands extend from the OR&L/Government Road that parallels the shoreline, to the base of the foothills of the Wai'anae Range. The *mauka* extent of plantation cultivation appears to be the Ito Ditch, indicated crossing east-west through the *mauka* portion of the

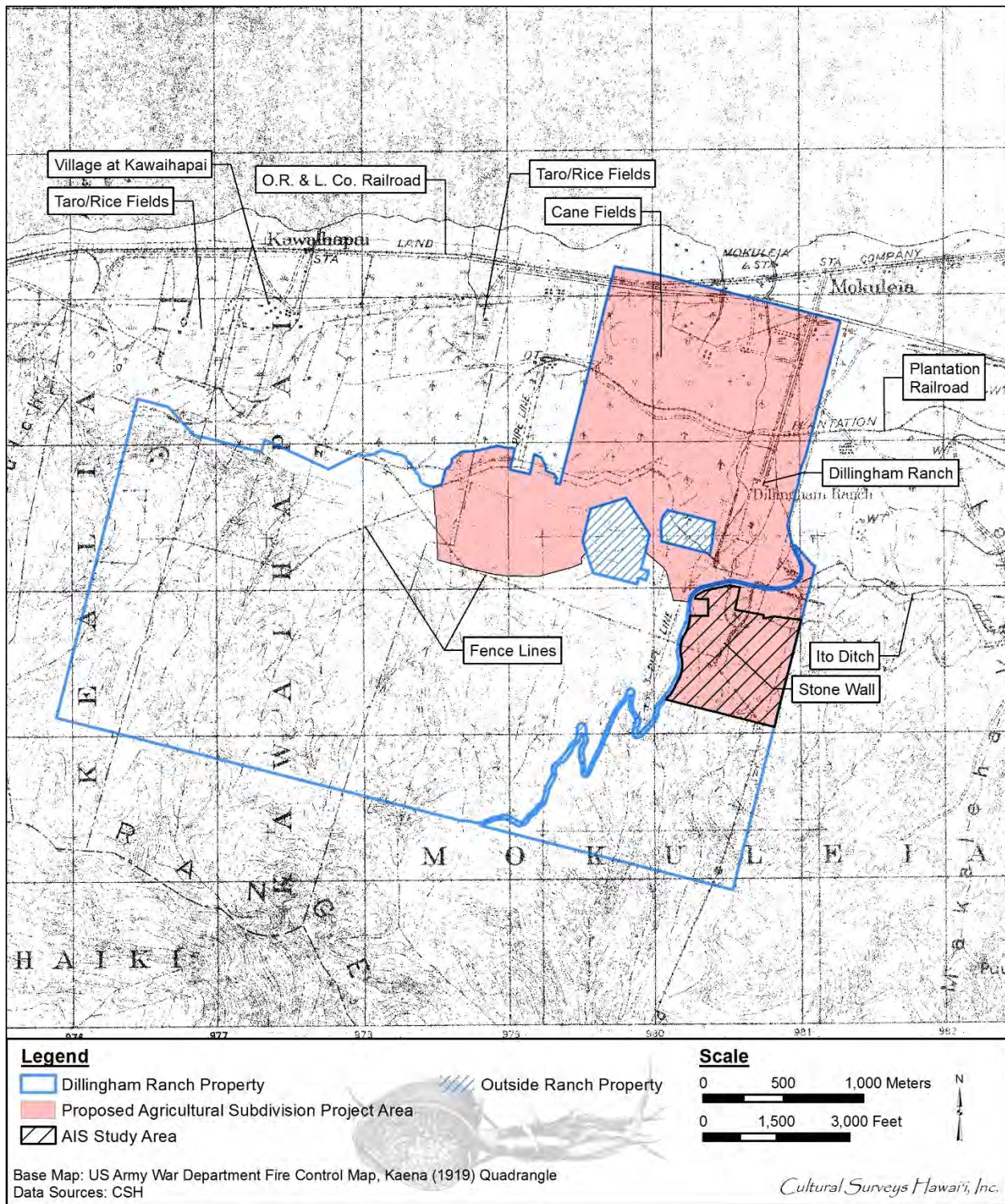


Figure 7. Portion of the 1919 U.S. Army War Department fire control map, Kaena Quadrangle, showing the extent of plantation development in the vicinity of the Dillingham Ranch Agricultural Subdivision project area

Dillingham Ranch Agricultural Subdivision project area, along the base of the foothills. Various fence lines are indicated *mauka* of the ditch, as these areas remained pasture for grazing livestock.

There are several structures indicated on the 1919 map, most of which are regularly spaced around the railroad tracks. These may be worker's houses and camps, or other structures associated with the sugar plantation. Structures are also clustered near the coast at Kawaihāpai. These possible houses and walls are adjacent to three delineated areas of marsh, bounded by stone walls and fencing. These may be fields used to grow taro or rice, which may have been irrigated. The 1919 map also indicates the extent of Dillingham's personal ranch (labeled "Dillingham Ranch"), which was not cultivated in cane. The narrow strip of land extends from the Government Road up into the foothills and is bordered by fence lines. Cattle walls are also indicated near the *mauka* end of the Dillingham Ranch.

In 1918, the Waialua plantation railroad lines were connected to the main OR&L lines. In 1927, the rail line was extended to the upper levels of the cane fields. Water flumes had been used to transport the cane in these upper fields to the lower tracks, but the use of these flumes caused a serious depletion of the water supply and it was considered more economical to build more tracks.

The 1929 series USGS map (Figure 8) continues to show the various plantation ditches, railroad lines, and various other plantation-related structures in the vicinity of the Dillingham Ranch Agricultural Subdivision project area. The Kawaihāpai Reservoir is now indicated, suggesting a need for additional irrigation infrastructure for the expanding sugar plantation lands. Also of note are two large cattle paddocks located in the western portion of the Dillingham Ranch Agricultural Subdivision project area. These rectangular paddocks are indicated to be bordered on three sides by stone walls—which must have been fairly large structures to be indicated on the topographic map—that extend from the foothills down to the plantation ditch fed by the Kawaihāpai Reservoir. The locations of these paddocks correspond to the *mauka* boundaries of Land Grant 457, Lots 1 and 2 to J.T. Gulick (see Figure 5). At this time, Dillingham's personal ranch lands appear to remain confined to the strip of land along the eastern end of the Dillingham Ranch Agricultural Subdivision project area, bordered by cattle walls and fence lines.

Major land use changes occurred in western Waialua when the U.S. military began development in the area. Kawaihāpai Military Reservation was established ca. 1927 at the site of the present Dillingham Airfield. Following the entrance of the U.S. into World War II, Kawaihāpai Military Reservation was expanded and became known as Mokuleia Airfield (Payette 2003). A small sand and grass runway was built and in use within a week after the attack on Pearl Harbor. The airfield was a training base for fighter planes, P-38s, and later, P-51s. The continuation of the war required the expansion of the airfield and by April 1942, the airfield had become an 8,000-ft runway, later expanded to 9,500 ft. It was the longest runway in the Hawaiian Islands at that time (Allen 1971:226–227). Also located at Mokuleia Airfield was Battery Dillingham, in use from 1942–1944. Battery Dillingham included a series of naval gun emplacements located both along the beach and further inland, and served as a field artillery training range (Payette 2003). Mokuleia Airfield was renamed Dillingham Air Force Base when the U.S. Air Force was formed in 1947. In 1948, the base was deactivated but continued to be used for training activities by the U.S. Army. The site was also used as a Nike missile base during the 1950s (Payette 2003).

Mokuleia Military Reservation, including Battery Mokuleia, was also established in 1942 and consisted of four gun emplacements located 2 miles inland (Payette 2003). The extent of military



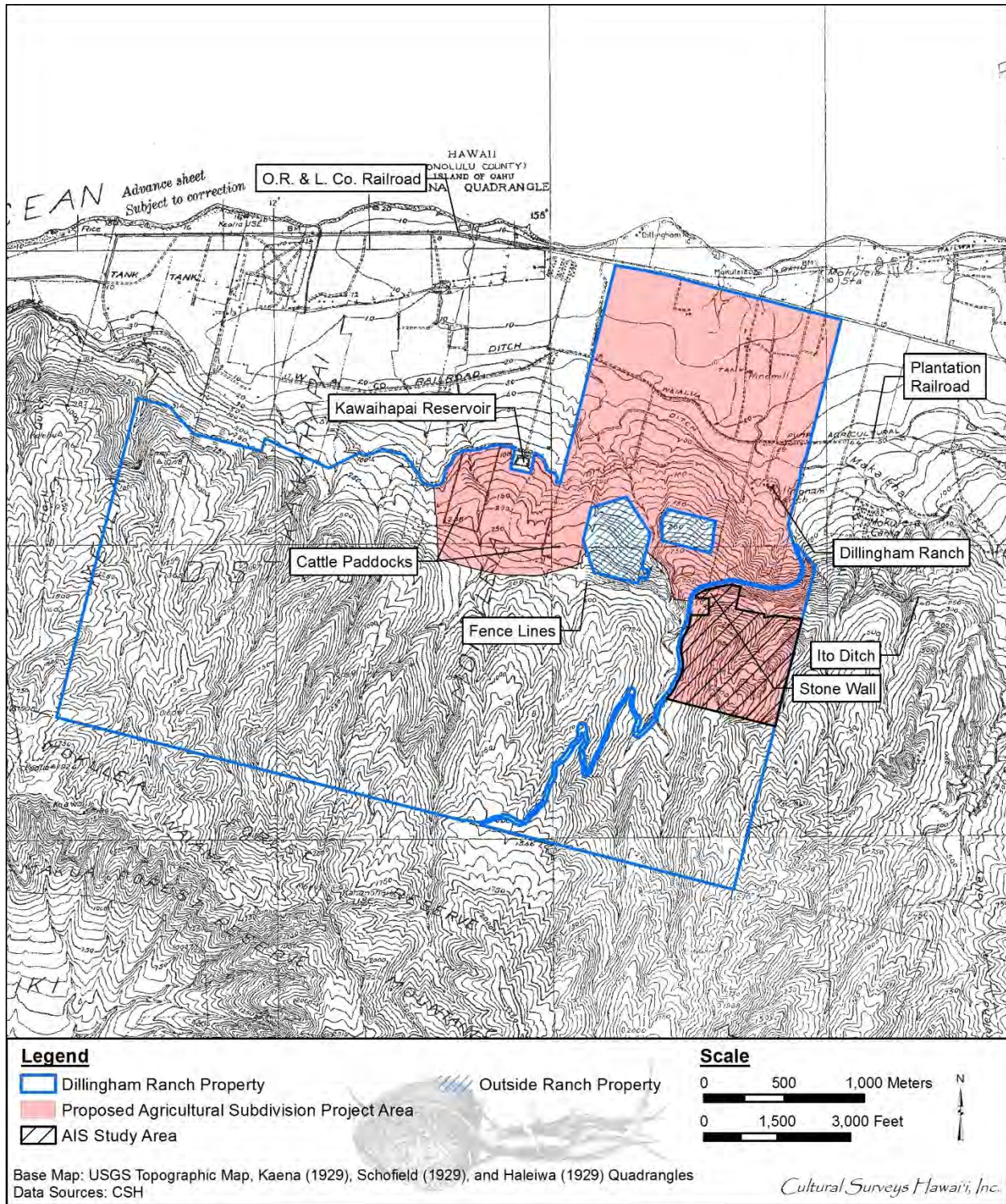


Figure 8. Portion of the 1929 Kaena, Schofield, and Haleiwa USGS topographic quadrangles map, showing development in the vicinity of the Dillingham Ranch Agricultural Subdivision project area

development in the vicinity of the Dillingham Ranch Agricultural Subdivision project area is shown on the 1943 U.S. Army War Department map (Figure 9). Dillingham Airfield is shown to dominate the landscape of coastal Kawaihāpai, though ranching and plantation agriculture remain throughout the vicinity of the Dillingham Ranch Agricultural Subdivision project area.

In 1946, Robert P. Patterson, Secretary of War of the United States, executed a “Declaration of Taking,” which stated that the land of Mokulē‘ia, Auku‘u, Kawaihāpai, Keālia, and Ka‘ena, Waialua, O‘ahu, Territory of Hawaii; Mokuleia Ranch and Land Company, Limited, et al.

is taken . . . to provide for a military airfield, an ordnance storage area, and related military purposes incident thereto. The said land has been selected by me for acquisition by the United States for use in connection with such purposes, and for such other uses as may be authorized by Congress or by Executive Order, and is [r]equired for immediate use. [Alameida 1993:113]

Several of the Native Hawaiian families who had retained their small plots of land through the nineteenth and early twentieth centuries now lost the lands through this confiscation (Alameida 1993:113).

### 3.1.10 Modern Land Use

With the announcement of the OR&L’s decision to discontinue service in 1947, the Waialua Agricultural Company began to switch to truck transportation. The change was made slowly, until the last railroad line was closed in 1952. Subsequent historic maps and aerial photographs indicate a general lack of development in the area through the 1970s. The 1964 USGS map (Figure 10) indicates the Crowbar and Campbell ranches in the coastal portion of the Dillingham Ranch Agricultural Subdivision project area north of the Dillingham Ranch. The railroad lines have been replaced by roads, though much of the plantation infrastructure remains in use. A 1977 aerial photograph (Figure 11) clearly depicts the various land use areas within and in the vicinity of the Dillingham Ranch Agricultural Subdivision project area. Lands in the *makai* portion of the Dillingham Ranch Agricultural Subdivision project area consist of improved pasture and ranch activity areas, including the Dillingham family residence and other smaller residences. Lands in the *mauka* foothills portion of the Dillingham Ranch Agricultural Subdivision project area generally appear to be unimproved pasture areas. To the east and west of the Dillingham Ranch Agricultural Subdivision project area are extensive sugar plantation fields.

The lands occupied by the Crowbar Ranch, Campbell Ranch, and Dillingham Ranch were later consolidated under the control of the Mokuleia Land Company. At present, the Dillingham Ranch Agricultural Subdivision project area, again known as the Dillingham Ranch, is an active horse and cattle ranch. Much of the level coastal plain portion of the Dillingham Ranch Agricultural Subdivision project area is used for equestrian stables and activity areas. The sloping foothills of the Dillingham Ranch Agricultural Subdivision project area are used as pasture for grazing cattle. The Dillingham residence remains on the property, as well as a coconut and palm tree farm.

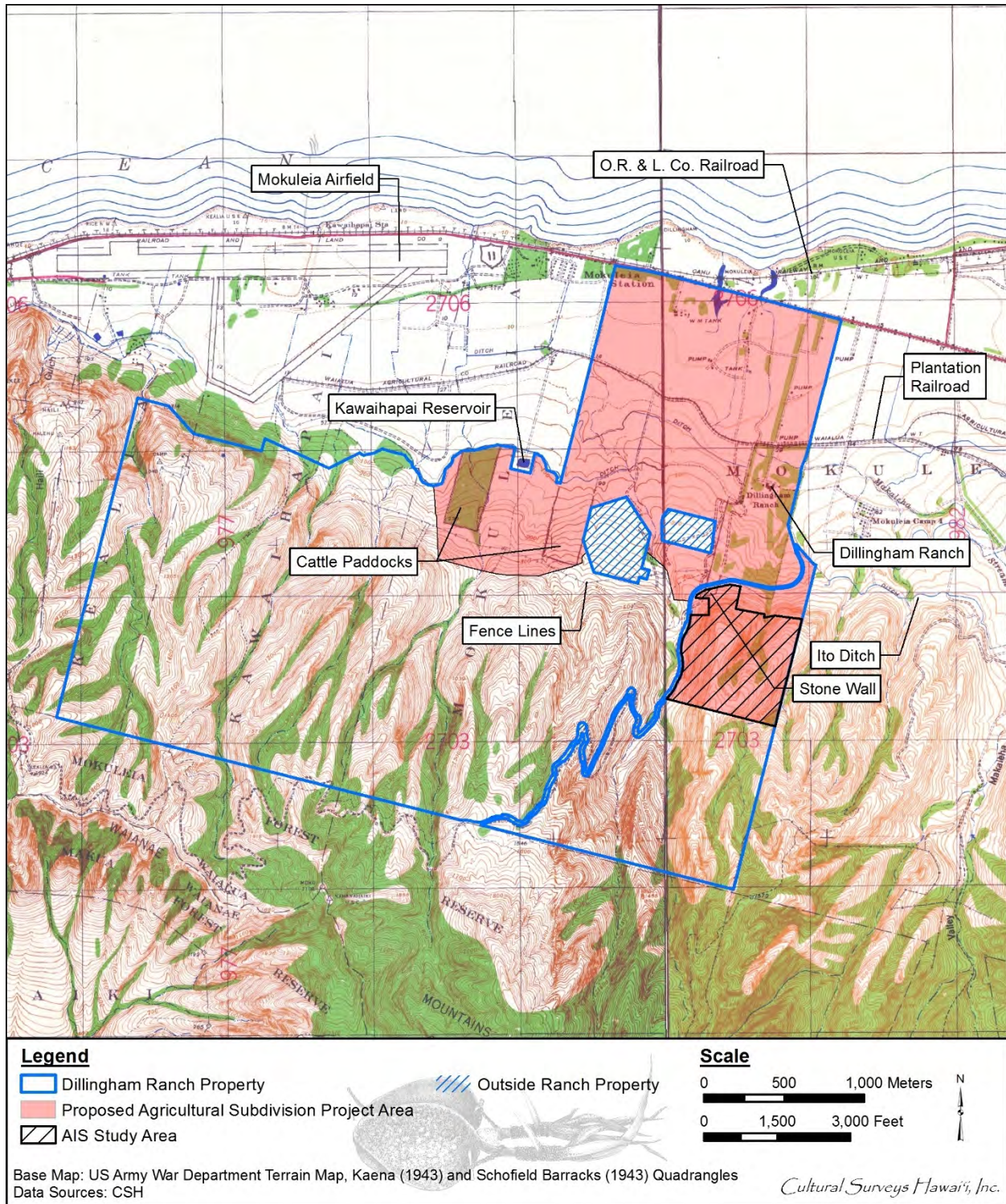


Figure 9. Portions of the 1943 U.S. Army War Department terrain map, Kaena and Schofield Barracks Quadrangles, showing development in the vicinity of the Dillingham Ranch Agricultural Subdivision project area

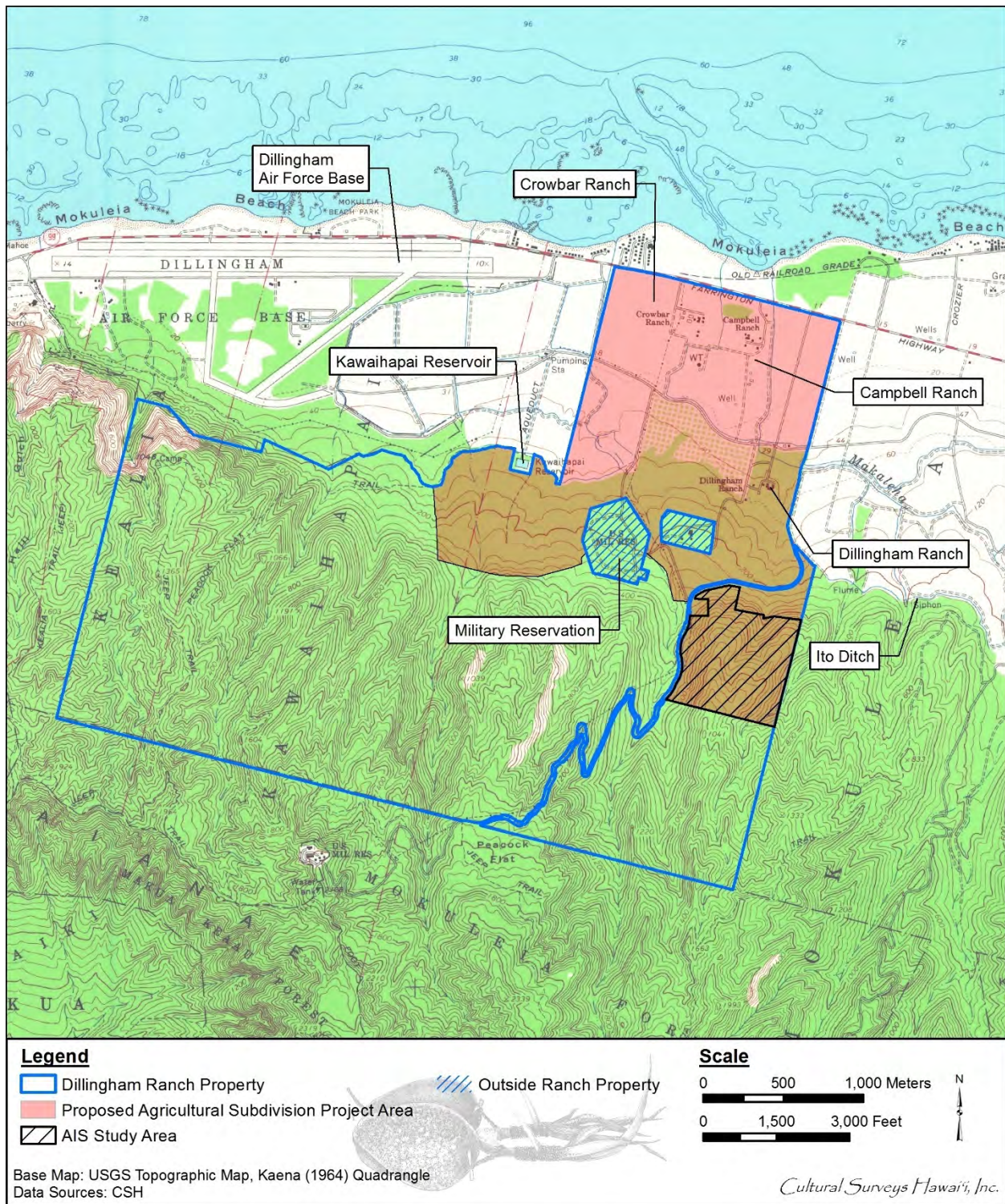


Figure 10. Portion of the 1964 Kaena USGS topographic quadrangle map, showing development in the vicinity of the Dillingham Ranch Agricultural Subdivision project area

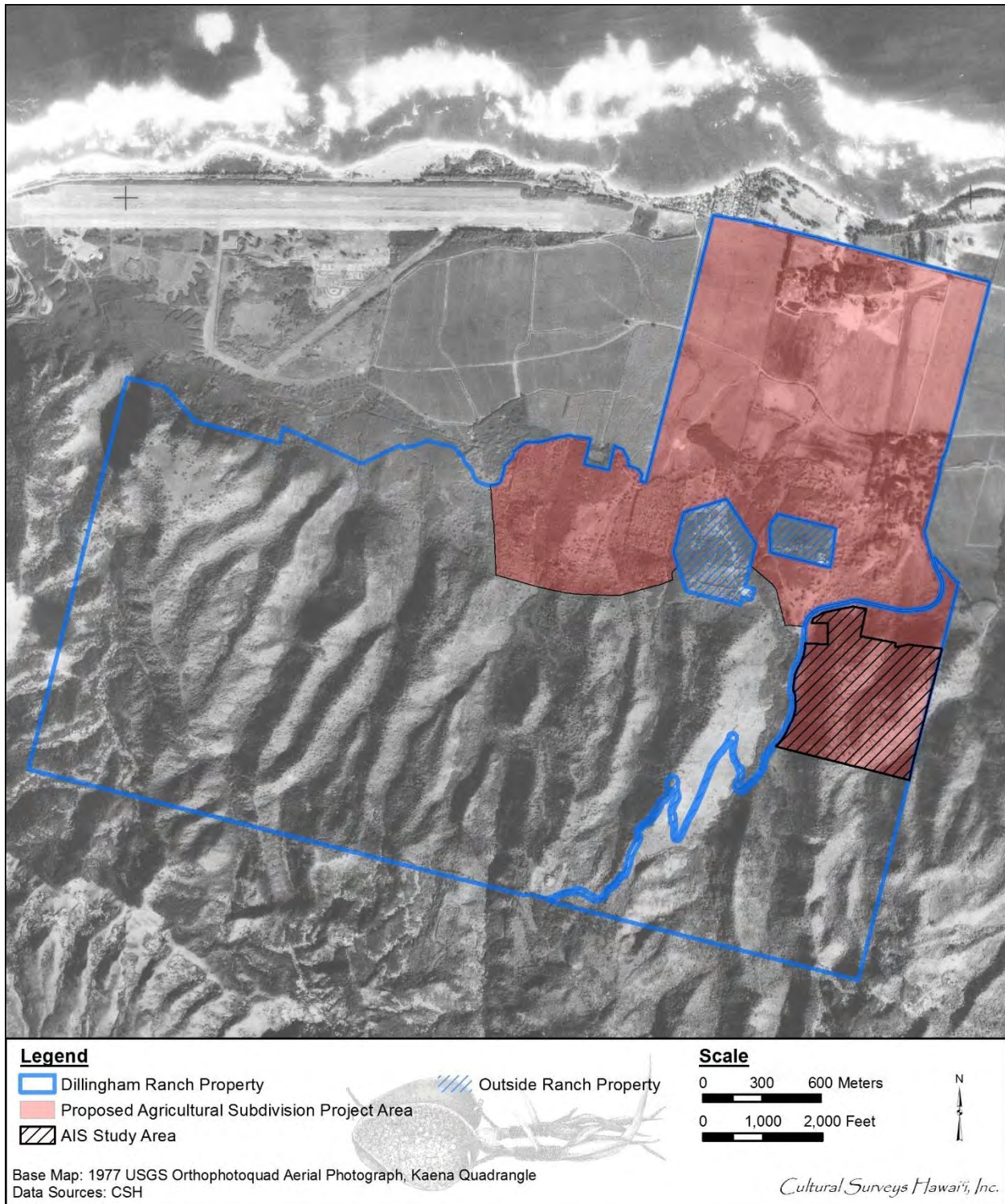


Figure 11. 1977 USGS Orthophotoquad, Kaena Quadrangle, showing development in the vicinity of the Dillingham Ranch Agricultural Subdivision project area

## 3.2 Archaeological Background

Archaeological studies in the vicinity of the Dillingham Ranch Agricultural Subdivision project area have largely been limited to the inadvertent finds of burial remains along the beach and short, one or two-day reconnaissance surveys in the inland areas. Figure 12 illustrates the locations of previously conducted archaeological studies. Table 2 presents the findings of the archaeological studies in the vicinity of the Dillingham Ranch Agricultural Subdivision project area. Several of these studies have focused on locating archaeological sites first identified in early archaeological studies. Historic properties located within and near the Dillingham Ranch Agricultural Subdivision project area are illustrated on Figure 13 and summarized in Table 3.

### 3.2.1 Early Archaeological Studies

Two early archaeological studies were conducted in the vicinity of the Dillingham Ranch Agricultural Subdivision project area. These consist of Gilbert McAllister in his island-wide survey conducted in 1930 (McAllister 1933) and Handy's ethnographic survey of Hawaiian farming (Handy 1940).

McAllister (1933) identified eight sites within Mokulē'ia and Kawaihāpai Ahupua'a, in the vicinity of the Dillingham Ranch Agricultural Subdivision project area. Four sites were located along the coast and consisted of *ko'a*, or fishing shrines. Sites 190, 193, 195, and 201 are described as follows:

#### Site 190 Pu'u o Hekili Ko'a

Pu'u o Hekili, an ahua which was once located on the beach below the Kawaihāpai [railroad] station. According to Hookala, an ahua is 'bent instead of angular in construction' and was evidently a type of fishing shrine (*ko'a*). Unfortunately nothing remains of the site. [McAllister 1933 in Sterling and Summers 1978:99]

#### Site 193. Fishing Shrine (destroyed)

Kuakea fishing shrine (*ko'a*), Kawaihapai, was formerly located on the beach in a direct line with Kawailoa heiau. Nothing marks the site. [McAllister 1933 in Sterling and Summers 1978:100]

#### Site 195. Kolea fishing shrine (*ko'a*), Mokuleia, Fishing Shrine (destroyed)

The shrine is located on the beach in a direct line with the Dillingham stables. The stones have been removed and only an indistinct line of stones 15 by 30 feet remains to mark the foundation. A stone in the water in front of Kolea was known as Mokupaoa. [McAllister 1933 in Sterling and Summers 1978:101]

#### Site 201. Fishing Shrine

Keauau fishing shrine was once located on the beach at Puuiki, at the Kaena end of a long row of ironwood trees. Nothing remains of the site. [McAllister 1933 in Sterling and Summers 1978:105]

The presence of four *ko'a* in the immediate area attests to the abundance of marine resources, as described in traditional and historic accounts (see Section 2.1). McAllister (1933) also identified

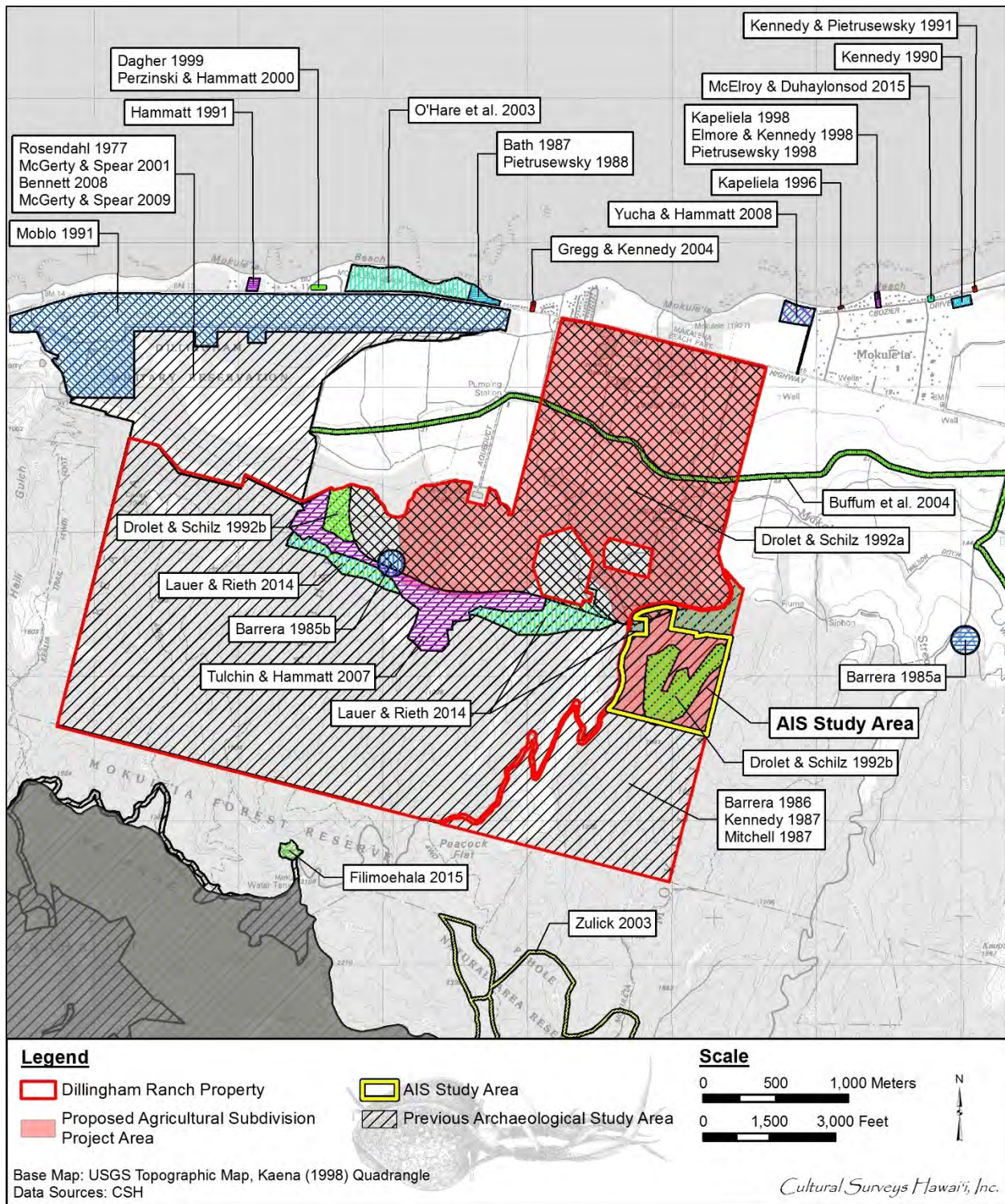


Figure 12. Portion of the 1998 Kaena USGS topographic quadrangle map showing the locations of previous archaeological studies in the vicinity of the Dillingham Ranch Agricultural Subdivision project area. The individual screens (e.g., cross-hatching for Drolet and Schilz area) are not keyed, each screen or symbol is identified in the map.

Table 2. Previous archaeological studies in the vicinity of the Dillingham Ranch Agricultural Subdivision project area

Reference	Type	Location	SIHP # 50-80-03-	Description
Rosendahl 1977	Archaeological survey and inventory of sites	Dillingham Military Reservation (DMR); Keālia and Kawaihāpai	416	Confirmed Keālia- Kawaihāpai Complex of agricultural terraces, designated State Inventory of Historic Places (SIHP) # 50-80-03-416
Barrera 1985a	Archaeological survey	Mokulē'ia I (II) well location; Mokulē'ia	—	No historic properties or cultural materials identified
Barrera 1985b	Archaeological survey	Kawaihāpai well location; Kawaihāpai	—	No historic properties or cultural materials identified
Barrera 1986	Archaeological reconnaissance survey	Dillingham Ranch property; Kawaihāpai and Mokulē'ia	4439*; 4785*	Identified two sites, no SIHP number assigned; see Drolet and Schilz (1992a and 1992b)
Bath 1987 Pietruszewsky 1988	Inadvertent find of human remains	Camp Mokulē'ia; Kawaihāpai	3747	Identified 13 adults and eight sub-adults; location of burials designated SIHP # 50-80-03-3747
Kennedy 1987	Archaeological literature review and reconnaissance survey	Dillingham Ranch property; Kawaihāpai and Mokulē'ia	190 through 196	Confirmed previously identified historic properties, no new historic properties identified
Mitchell 1987	Archaeological reconnaissance survey	Dillingham Ranch property; Kawaihāpai and Mokulē'ia	416; 4439*; 4472 through 4777*; 4785*; 4786*	Identified five sites, no SIHP site number assigned; see Drolet and Schilz (1992a and 1992b)
Kennedy 1990	Subsurface testing	Lot 2C, Crozier Dr; Mokulē'ia	—	No historic properties or cultural materials identified

\*Not designated with number until Drolet and Schilz 1992a and 1992b



Table 2. Previous archaeological studies in the vicinity of the Dillingham Ranch Agricultural Subdivision project area (cont.)

Reference	Type	Location	SIHP # 50-80-03-	Description
Hammatt 1991	Subsurface testing	Keālia Coastal Subdivision	–	No historic properties or cultural materials identified
Kennedy and Pietrusewsky 1991	Inadvertent find of human remains	Crozier Dr. TMK [1] 6-8-005:001	4451	Two sets of human skeletal remains (SIHP # 50-80-03-4451) scattered over an area of a septic pit
Moblo 1991	Literature review and archaeological reconnaissance survey	Dillingham Airfield; Ka'ena, Keālia, Kawaihāpai, and Mokulē'ia	–	No historic properties or cultural materials identified
Drolet and Schilz 1992a	Archaeological inventory survey	Dillingham Ranch property; Kawaihāpai and Mokulē'ia	4772 through 4786	Identified 15 pre- and post-Contact sites with 40 component features, primarily religious, habitation or agricultural sites, designated SIHP #s 50-80-03-4772 through 50-80-03-4786
Drolet and Schilz 1992b	Addendum archaeological inventory survey	Dillingham Ranch property; Kawaihāpai and Mokulē'ia	4439 through 4442	Identified four sites; SIHP # 50-80-03-4439, a 300 m stone wall; SIHP # 50-80-03-4440, a remnant stone wall, disturbed by stream cuts; SIHP # 50-80-03-4441, an approximately 200m long stone wall and associated barbed wire fence, interpreted to be a historic cattle wall; SIHP # 50-80-03-4442, a terrace with damage due to erosion and stream cuts
Kapeliela 1996	Inadvertent find of human remains	68-711 Crozier Dr, Mokulē'ia	5467	Two human cranium fragments recovered from the water's edge in the beach area fronting 68-711 Crozier Drive, at the east end of Mokulē'ia Ahupua'a; no other bones recovered, though additional remains believed to have been washed away by heavy surf; burial location designated SIHP # 50-80-03-5467

Table 2. Previous archaeological studies in the vicinity of the Dillingham Ranch Agricultural Subdivision project area (cont.)

Reference	Type	Location	SIHP # 50-80-03-	Description
Kapeliela 1998 Elmore and Kennedy 1998 Pietruszewsky 1998	Inadvertent find of human remains	63-639 Crozier Dr; Mokulē'ia 2	5599	Identified seven individuals, all of probable Hawaiian ancestry; glass trade beads found with one burial, suggesting an early post-Contact date; remaining six burials probably pre-Contact; area designated SIHP # 50-80-03-5599
Dagher 1999 Perzinski and Hammatt 2000	Inadvertent find of human remains	Mokulē'ia Beach Park; Kawaihāpai	5766	Documented adult skeletal remains of probable Hawaiian ancestry, designated SIHP # 50-80-03-5766
McGerty and Spear 2001	Archaeological inventory survey	DMR	191; 416; 5479 through 5492	Recorded 16 pre- and post-Contact sites; seven traditional Hawaiian sites associated with agriculture, settlement, and ceremonial/religious activities; remaining nine sites attributed to post-Contact ranching and U.S. military activities and training; Site 416 agricultural complex, originally identified or recorded by Handy (1940) and recorded by Rosendahl (1977) subdivided into five specific site areas: SIHP #s 50-80-03-416 and 50-80-03-5483 through 50-80-03-5486. Radiocarbon dates for SIHP # 50-80-03-5485 yielded the date range of "AD 1673 to AD 1753 (0.32%)" and "AD 1979 to AD 1955 (0.68%)"
O'Hare et al. 2003	Archaeological inventory survey	Mokulē'ia Beach Park; Kawaihāpai	6638	Identified one historic property: SIHP # 50-80-03-6638, subsurface cultural layer, containing both pre- and post-Contact archaeological features. Radiocarbon dating yielded the date range of AD 1280-1440 (95.4%) for 1 sample and AD 1670-1960 for the other two.

Table 2. Previous archaeological studies in the vicinity of the Dillingham Ranch Agricultural Subdivision project area (cont.)

Reference	Type	Location	SIHP # 50-80-03-	Description
Zulick 2003	Environmental assessment Kapuna Watershed Project	Pahole Natural Area Reserve and Mokulē'ia Forest Reserve	–	No historic properties identified
Buffum et al. 2004	Archaeological inventory survey	Schofield Barracks Military Reservation (SBMR) Dillingham Trail between Schofield Barracks and DMR	–	Concrete bridge spans identified on west boundary of current Dillingham Ranch project; site evaluated as not National Register of Historic Places (NRHP) eligible and no SIHP number assigned; recorded plantation-era ditch (Wilson Ditch) and Halstead Mill smokestack and three ca. 1952 concrete span bridges; bridge spans on western boundary of current Dillingham project evaluated as not NRHP eligible
Gregg and Kennedy 2004	Inadvertent find of human remains	68-681 Farrington Hwy; Mokulē'ia	6708	Partial remains of one individual consistent with Hawaiian/Polynesian ancestry, designated SIHP # 50-80-03-6708
Tulchin and Hammatt 2007	Archaeological inventory survey	Dillingham Ranch property; Kawaihāpai, Kikahi, Auku'u, and Mokulē'ia 2	6884 through 6888	Identified five historic properties consisting of five agricultural complexes designated: SIHP #s 50-80-03-6884, 50-80-03-6885, 50-80-03-6886, 50-80-03-6687, and 50-80-03-6888
Bennett 2008	Site visit report	Mokuleia Military Reservation	–	Identified features of the Mokuleia Military Reservation (no SIHP # designated in report)
Yucha and Hammatt 2008	Archaeological literature review and field inspection	Crozier Dr, Mokulē'ia		Remnants of OR&L railway (SIHP # 50-80-12-9714) and location of an inadvertent human burial find and reburial location identified

Table 2. Previous archaeological studies in the vicinity of the Dillingham Ranch Agricultural Subdivision project area (cont.)

Reference	Type	Location	SIHP # 50-80-03-	Description
McGerty and Spear 2009	Archaeological inventory survey	Dillingham Military Reservation; TMK [1] 6-8-002 and 014	419; 5479 through 5486; 5488 through 5492	Fourteen historic properties identified consisting of rock alignments, rock-faced/rock surfaced terraces, rock-faced/soil-surfaced terraces, rock mounds, rock platforms, rock lined channels, water diversion features, wells, cement foundations, buildings, and bunkers.
Lauer and Rieth 2015	Archaeological inventory survey	Dillingham Ranch property; Kawaihāpai, Kikahi, Auku'u, and Mokulē'ia 2	7653 and unmodified seeps	Identified one historic property and two unmodified seeps; SIHP # 50-80-03-7653 consists of four discontinuous rock walls once used as ranch-era paddocks and enclosures
Filimoehala 2015	Archaeological inventory survey	Information and Communication Services Division (ICSD) Pahole Radio Facility at Pahole Rare Plant Facility, Kawaihāpai		No historic properties or cultural materials identified
McElroy and Duhaylonsod 2015	Archaeological inventory survey	TMKs: [1] 6-8-004:017 and 030 in Mokule'ia 2		No historic properties or cultural materials identified
Belluomini et al. 2017-draft	Archaeological inventory survey	TMK: [1] 6-8-003:005	4777, 7653; 7976, 7977, 7978	Identified five historic properties consisting of wall alignments (SIHP #s 50-80-03-4777, 50-80-03-7653, and 50-80-03-7976), a terrace complex (SIHP # 50-80-03-7977), and a platform (SIHP # 50-80-03-7978)

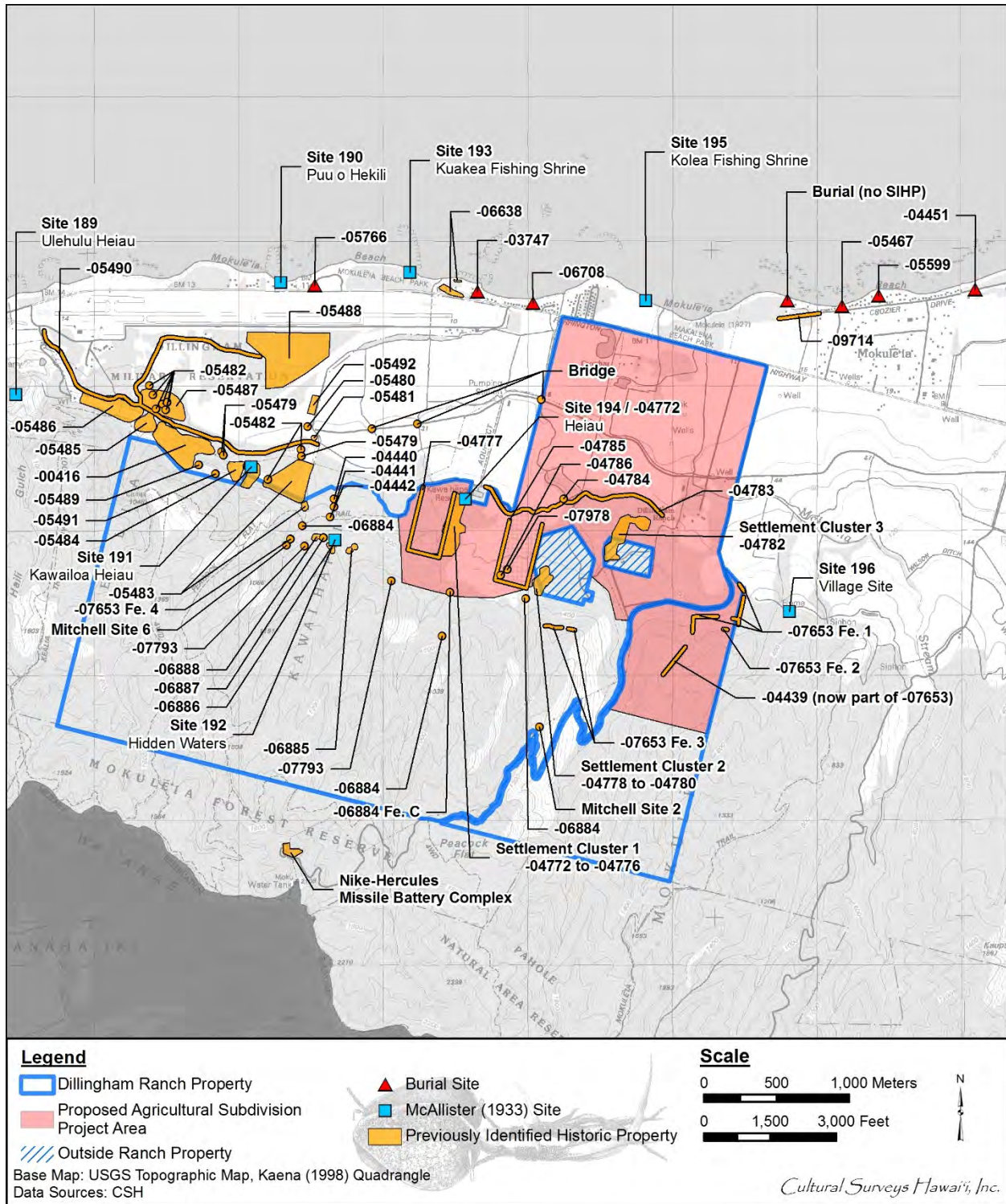


Figure 13. Portion of the 1998 Kaena USGS topographic quadrangle map showing the locations of historic properties in the vicinity of the Dillingham Ranch Agricultural Subdivision project area

Table 3. Historic properties previously identified within the Dillingham Ranch Agricultural Subdivision project area

SIHP # 50-80-03-	Site Type	Source	Comment
4439 (now 7653 Feature 1)	Wall	Barrera (1986); Mitchell (1987); Drolet and Schilz (1992b)	Possible pre-Contact wall of undetermined function, located in <i>mauka</i> portion of Dillingham Ranch Agricultural Subdivision project area
4772 (formerly 4424) (Site 194)	<i>Heiau</i>	McAllister (1933); Mitchell (1987); Drolet and Schilz (1992a); Tulchin and Hammatt (2008)	25 m square enclosure with internal wall section; possibly <i>Poloaiae Heiau</i> , originally designated a house site (Site 194) by McAllister (1933)
4773 (formerly 4425)	Complex (habitation/ agriculture)	Mitchell (1987); Drolet and Schilz (1992a); Tulchin and Hammatt (2008)	Feature cluster that covers an area of 80 m by 40 m in size and is composed of five units, consisting of a platform (Fea. A) and enclosures (Fea. B-C)
4774 (formerly 4426)	Platform (habitation)	Mitchell (1987); Drolet and Schilz (1992a); Tulchin and Hammatt (2008)	Platform measures 2.0 m by 3.5 m in size
4775 (formerly 4427)	Enclosure (habitation)	Mitchell (1987); Drolet and Schilz (1992a); Tulchin and Hammatt (2008)	Enclosure with a wall segment, measures 18 m by 9 m in size
4776 (formerly 4428)	Habitation-religious/ ceremonial- agricultural complex	Mitchell (1987); Drolet and Schilz (1992a); Tulchin and Hammatt (2008)	Enclosures (3), terraces (3), walls (2), alignment, mound, and clearing
4777 (formerly 4429)	Wall	Drolet and Schilz (1992a); Tulchin and Hammatt (2008)	Two wall segments (Features A and B) identified
4782 (formerly 4434)	Agricultural- habitation complex	Drolet and Schilz (1992a); Tulchin and Hammatt (2008)	Walled field complex with habitation features covering 8 hectares; large enclosures, terraces, and mound
4783 (formerly 4435)	Historic agricultural complex	Drolet and Schilz (1992a)	Plantation-era irrigation ditch with associated rock wall and clearing mounds
4784 (formerly 4436)	Agricultural ditch	Drolet and Schilz (1992a)	Possible remnant ' <i>auwai</i> (ditch)

Table 3. Historic properties previously identified within the Dillingham Ranch Agricultural Subdivision project area (cont.)

<b>SIHP #</b> <b>50-80-03-</b>	<b>Site Type</b>	<b>Source</b>	<b>Comment</b>
4785 (formerly 4437)	Ranch enclosure- paddock	Barrera (1986); Mitchell (1987); Kennedy (1987); Drolet and Schilz (1992a)	Large paddock disturbed by subsequent development
4786 (formerly 4438)	Platform-terrace complex with religious/ceremonial function	Barrera (1986); Mitchell (1987); Kennedy (1987); Drolet and Schilz (1992a); Tulchin and Hammatt (2008)	In southwest corner of SIHP # -4785; site includes undocumented and unrecorded terrace identified during CSH 2008 monitoring
6884	Ranch-related walls in gully features	Tulchin and Hammatt (2007); Tulchin and Hammatt (2008)	Three areas of rock wall sections (Features A–D) located in Dillingham Ranch Agricultural Subdivision project area
7653	Ranch enclosure- paddock complex	Lauer and Rieth (2015)	Rock wall section in eastern and central survey areas (Features 1–3)

four sites in the foothills above the coastal plain. Site 191 is Kawailoa Heiau, indicated to be located in the area *mauka* of the present Dillingham Airfield, west of the Dillingham Ranch Agricultural Subdivision project area:

Only a portion of two terraces remains. The upper terrace is 66 feet long and 4 feet high, and is excellently paved with small stones a few inches in size. The southwest limits can not be discerned. On the east end is a wall 1.5 feet high which can be followed for about 10 feet. The lower terrace was 25 feet wide with a facing 2 feet high, which can only be traced a short distance. The houses (kahua hale) in which the kahunas lived were known as 'Paweo', according to Hookala. This is undoubtedly the site referred to by Thrum [1909] as Paweu, 'A small heiau 58 by 65 feet at the base of the hill: badly damaged by freshets.' [McAllister 1933 in Sterling and Summers 1978:99–100]

Site 196 was identified by McAllister (1933) as a village site, indicated to be located east of the Dillingham Ranch Agricultural Subdivision project area. The following description was provided:

In the valley near the mountain side of the Greenfield house was once evidently a large Hawaiian settlement. Old coconut palms and the dead trunks of others, portions of house sites, isolated sections of terracing, can still be found, despite the inroads of roaming cattle. Water freshets have also obliterated many remains. These sites are thought to have furnished the stones for the numerous walls, probably of later construction, on the hillside and in the valley. [McAllister 1933 in Sterling and Summers 1978:101]

Two of McAllister's sites were indicated to be located within the Dillingham Ranch property. Site 192 consists of "hidden waters," or natural freshwater springs, located in the hills of Kawaihāpai. The following description was provided:

These are the four hidden waters upon which Hiiaka called when she was refused water by the old inhabitants. Their names, as given by Hookala, are Ulunui, Koheiki, Ulehulu, and Waiakaaiea. Farther toward Kaena Point is another water known as Kawaikumuole, which is a conjunction of Kanaloa and Waihuna a Kaalai. Another hidden water, which Hookala says is mentioned in the Hiiaka chant is Kuilaau o Kealia, but he does not know its location. [McAllister 1933 in Sterling and Summers 1978:100]

The general location of Site 192 was provided by Sterling and Summers (1978: Waialua District Map) based on notes taken by McAllister (1933), placing it in the southwestern portion of the Dillingham Ranch property. This location is consistent with traditional accounts that describe the springs of Kawaihāpai up in the hills at the base of cliffs (see Section 2.1).

Also indicated to be located within the Dillingham Ranch Property and within the Dillingham Agricultural Subdivision project area is McAllister's (1933) Site 194, Poloai Heiau. The site, which was noted by McAllister to have been destroyed, was described as follows:

On the Kaena side of Dillingham's ranch, near the plantation reservoir in the western part of Mokuleia, is said to be an old heiau site. The straggling stone wall near a group of rather large rocks is covered with a dense growth of lantana. It is doubtful that this site was ever of importance, as it suggests a house site rather than



the location of a heiau. Poloaiāe is the name given me of a former Mokuleia heiau about which nothing else is known. [McAllister 1933 in Sterling and Summers 1978:101]

In an ethnographic survey of Hawaiian farming, Handy noted in 1940 that there were agricultural terraces, possibly for taro, in the lowlands of Kawaihāpai extending into Keālia. Handy describes the features:

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

The large area of lowland terraces between the cliff and the elevated coral, though mostly in Kawaihāpai, extends a short way into Keālia. Otherwise this small ahupua'a offered little opportunity for cultivation, unless for sweet potatoes. [Handy 1940]

The site was confirmed during a 1977 survey of the Dillingham Military Reservation by the Bishop Museum (Rosendahl 1977) and the extent of these terraces was mapped. These terraces were given the designation of SIHP # 50-80-03-416, and later listed as destroyed (Rosendahl 1977). The terraces are located 2,250-4,500 ft inland, on the *mauka* edge of the military reservation, at elevations of 80-140 ft AMSL. The site was described as an "extensive complex of agricultural and associated occupation features spread over virtually entire rocky sloping area between flat land of airfield and sheer cliffs" (Rosendahl 1977:1-25). In 1987, during a day-long survey on horseback of portions of the Dillingham Ranch property, Mitchell (1987) was informed that there was "a great deal of rock terracing" in the area along the western end of the Dillingham Ranch property, which he designated as Site 6. Mitchell did not locate the site but, based on informant information, placed it in the vicinity of SIHP # -416 as the informant was likely referring to components of SIHP # -416. Additional portions of SIHP # -416 were again identified in later archaeological surveys of the Dillingham Airfield (Moblo 1991), Dillingham Military Reservation (McGerty and Spear 2001), and the Dillingham Ranch lands (Tulchin and Hammatt 2007).

### **3.2.2 Archaeological Studies in Vicinity of the Dillingham Ranch Agricultural Subdivision Project Area**

The following is a summary of previously conducted archaeological studies and identified historic properties within the vicinity of the Dillingham Ranch Agricultural Subdivision project area. Previously conducted archaeological studies within the Dillingham Ranch Agricultural Subdivision project area per se are discussed in Section 3.3.

In 1985, an archaeological survey was conducted for numerous proposed Board of Water Supply well sites, including the proposed wells at Kawaihāpai near Dillingham Airfield and Mokulē'ia I, east of Makaleha Stream (Barrera 1985a and 1985b). No historic properties were identified.

In 1987, human remains were inadvertently uncovered during the excavation of a boathouse at Camp Mokulē'ia, east of Mokulē'ia Beach Park in Kawaihāpai Ahupua'a (Bath 1987). Osteological analysis by Michael Pietrusewsky identified 13 adults and eight sub-adults from the recovered remains. The location of the remains was designated SIHP # 50-80-03-3747 (Pietrusewsky 1988).

In 1990, Archaeological Consultants of Hawaii (ACH) conducted subsurface testing at Lot 2C Crozier Drive in Mokulē'ia Ahupua'a (Kennedy 1990). Nine backhoe trenches were excavated through various sandy topsoil, calcareous sand, and coarse sand layers. No historic properties were identified.

In 1991, CSH conducted subsurface testing with hand and backhoe trenches to investigate archaeological impacts on a proposed subdivision at a beach front lot located at 68-999 Farrington Highway near Dillingham Airfield (Hammatt 1991). Nine backhoe trenches and three shovel test trenches were excavated within that project area. No subsurface archaeological features or cultural materials were identified.

In 1991, the International Archaeological Research Institute (IARII) conducted a literature review and archaeological reconnaissance survey for the Dillingham Airfield Master Plan. Dillingham Airfield is located inland of Farrington Highway at the base of the Waianae Mountains (Moblo 1991). During the survey, Moblo (1991) attempted to confirm SIHP # 50-80-03-416, the cultivation terraces associated with the Keālia-Kawaihāpai Complex documented in Rosendahl (1977) and Handy (1940). Unfortunately, the probable site was located outside that project area; this combined with dense vegetation made it too difficult to determine if it was the Keālia-Kawaihāpai Complex site. Moblo also noted a few rock features on the southwest corner of their project area could be an extension of Site 416. No other historic properties were identified.

In 1991, an inadvertent burial discovery consisting of two sets of human skeletal remains at 68-421 Crozier Drive at the east end of Mokulē'ia Ahupua'a (Kennedy and Pietrusewsky 1991). The skeletal remains were scattered across a septic pit. Analysis of the skeletal remains determined the remains were previously disturbed and represents a secondary burial.

In 1996, an inadvertent burial discovery consisting of two human cranium fragments was recovered from the water's edge in the beach area fronting 68-711 Crozier Drive, at the east end of Mokulē'ia Ahupua'a. No other bones were recovered, though additional remains were believed to have been washed away by heavy surf. The burial location was designated SIHP # 50-80-03-5467 (Kapeliela 1996).

In 1998, seven inadvertent burial finds were encountered at 68-637 Crozier Drive in Mokulē'ia Ahupua'a by a construction crew during excavations for a house foundation (Elmore and Kennedy 1998; Kapeliela 1998; Pietrusewsky 1998). The burials were found at a depth of approximately 4.5 to 5 ft. Based on osteological features and the burial location, the remains were determined to be of Hawaiian ethnicity. Six of the burials were deemed pre-Contact, while the seventh burial was more likely to be from the early post-Contact period based on the presence of western trade items. The burial site was designated SIHP # 50-80-03-5599.

In 1999, human remains were inadvertently discovered during excavations associated with the installation of a leach field at Mokulē'ia Beach Park, Kawaihāpai Ahupua'a (Dagher 1999; Perzinski and Hammatt 2000). The remains were determined to be from a single individual, likely

Native Hawaiian. Following the recovery of the remains, archaeological monitoring was conducted for the remaining leach field excavations. A possible posthole was also noted in the excavations. The burial location was designated SIHP # 50-80-03-5766.

In 2001, Scientific Consultant Services (SCS) completed an archaeological inventory survey (AIS) comprising 504 acres of the Dillingham Military Reservation (DMR). A pedestrian survey was conducted in the southwest portion of the DMR project area and previously identified sites were tested to determine association with the Kealia-Kawaihlipai Complex, a portion of which was determined to be within their project area (McGerty and Spear 2001). Sixteen sites of various functions were re-identified or recorded during the SCS AIS. Features identified during the AIS included rock alignments, rock-surfaced terraces, modified outcrops, enclosures, stacked rock rolls, core-filled rock walls, rock mounds, rock platforms, and water diversion features (McGerty and Spear 2001). The recorded sites were designated SIHP #s 50-80-03-5479 through 50-80-03-5492. These sites are located within the Dillingham Ranch Agricultural Subdivision project area.

In 2003, CSH conducted an archaeological inventory survey, including a program of subsurface testing, for the proposed expansion of Mokulē'ia Beach Park (O'Hare et al. 2003). No surface archaeological features were identified. Seventeen shovel tests were excavated along the beach bank and 32 backhoe trenches were excavated within the Mokulē'ia Beach Park project area. A grayish cultural layer (SIHP # 50-80-04-6638) exposed on the beach bank was also found in five trenches on the east side of the Mokulē'ia Beach Park project area. In two trenches, the cultural layer was also associated with five subsurface features including two fire pits, two possible postholes, and a feature of undetermined function. Charcoal from one fire pit was dated to AD 1280-1440.

In 2003, the Department of Land and Natural Resources conducted an Environmental Assessment of the Pahole Natural Area Reserve and the Mokulē'ia Forest Reserve as part of a proposal to construct new fences within the Pahole Natural Area Reserve extending to the Mokulē'ia Forest Reserve (Zulick 2003). A pedestrian survey was completed and no historic properties were observed or encountered along the fence line route.

In 2004, human remains were inadvertently encountered during excavations associated with the repair of a seawall at 68-681 Farrington Highway, in Mokulē'ia Ahupua'a (Gregg and Kennedy 2004). The partial set of fragmented human remains was determined to likely have been previously disturbed. Based on the location of the remains, it was suggested to be of pre-Contact, Native Hawaiian origin. The burial site was designated SIHP # 50-80-03-6708.

Over the course of several years of site inspections, John D. Bennett provided a site visit report for the Mokuleia Military Reservation. Only areas open to the public were observed and features of the reservation were located and documented. Sites include World War II-era structures, including former coast artillery batteries (Bennett 2008).

In 2003, SCS conducted a survey to evaluate and test sites previously identified by McGerty and Spear (2001) (SIHP #s 50-80-03-416, 50-80-03-5479 through 50-80-03-5486, and 50-80-03-5488 and 50-80-03-5492). The sites are associated with World War II-era military buildings and complexes as well as pre-Contact and post-Contact agricultural and habitation sites and sites related to historic sugar cane production and ranching activities (McGerty and Spear 2009).

### 3.2.3 Archaeological Studies within the Dillingham Ranch Agricultural Subdivision Project Area

With the exception of McAllister's (1933) island-wide survey that possibly identified one historic property in the Dillingham Ranch Agricultural Subdivision project area (Site 194, Poloiaie Heiau), most of the Dillingham Ranch Agricultural Subdivision project area's previous archaeological studies were triggered by development plans for portions of the Dillingham Ranch property (Barrera 1986; Drolet and Schilz 1992a; Drolet and Schilz 1992b; Kennedy 1987; Lauer and Rieth 2015; Mitchell 1987; Tulchin and Hammatt 2007). These project-specific studies are discussed below. Some features of the historic properties are located outside the Dillingham Ranch Agricultural Subdivision project area; the features located within the project area are presented in Table 4.

Barrera conducted the first archaeological reconnaissance survey of the approximately 2,800-acre Dillingham Ranch property in 1986. The report was not available; however, it was referenced in Drolet and Schilz 1992a. The brief two-day reconnaissance identified two archaeological sites within the property. These included a stone wall on the end of the ridge south of the Dillingham Ranch, and another stone wall southeast of the Kawaihāpai Reservoir, described to be a portion of a historic paddock (Barrera 1986). Barrera did not provide a site location map. However, based on the general location information and brief site descriptions, it is believed these two sites were later confirmed and later designated SIHP # -4783 and -4785 in subsequent archaeological studies within the Dillingham Ranch property (see below).

The following year, Kennedy (1987) reviewed previous archaeological studies within and in the vicinity of the Dillingham Ranch, and conducted another brief two-day reconnaissance of the Dillingham Ranch property. The study was conducted to assess the archaeological potential within the property and generate recommendations for future archaeological work. The reconnaissance survey confirmed the stone wall southeast of the Kawaihāpai Reservoir previously identified by Barrera (1986). In the vicinity of the wall, Kennedy (1987) noted the presence of two platforms he thought might be *heiau* structures. The wall and platforms were later confirmed by subsequent archaeological studies within the Dillingham Ranch property and are discussed further below. Based on the preliminary archaeological investigation, Kennedy (1987) indicated the archaeological potential of the Dillingham Ranch property was high and recommended intensive survey and documentation of sites, a program of subsurface testing, and historic background research be conducted prior to any development of the property.

In 1987, Mitchell (1987) conducted an additional archaeological reconnaissance of portions of the Dillingham Ranch property that were then proposed for golf course and residential development. The reconnaissance was made on horseback and was led by local informants who directed Mitchell to archaeological sites they knew of within the Dillingham Ranch property. A total of six site areas were documented. Site 1 consisted of a stone wall situated along a ridge south of the Dillingham Ranch. Site 2 consisted of a large wall structure, indicated to be a possible World War II military construction, located at approximately 1,100 ft elevation. Site 2 is indicated to be *mauka* of subsequent proposed development areas and has not been confirmed. Site 3 included a large, rectangular wall structure and platform structures within the enclosure, located southeast of the Kawaihāpai Reservoir. Site 4 refers to McAllister (1933) Site 192, the hidden waters springs that Mitchell indicates "were still producing water for the reservoir" (Mitchell 1987:3). Site 5,

Table 4. Historic property features\* located within the Dillingham Ranch Agricultural Subdivision project area

<b>SIHP #</b> <b>50-80-03-</b>	<b>Feature #s</b>	<b>Source</b>
4439 (now included in 7653)	See SIHP # -7653	Barrera (1986); Mitchell (1987); Drolet and Schilz (1992b)
4772 (Site 194)	–	Mitchell (1987); Drolet and Schilz (1992a); Tulchin and Hammatt (2008)
4773	A through C only	Mitchell (1987); Drolet and Schilz (1992a); Tulchin and Hammatt (2008)
4774	–	Mitchell (1987); Drolet and Schilz (1992a); Tulchin and Hammatt (2008)
4775	–	Mitchell (1987); Drolet and Schilz (1992a); Tulchin and Hammatt (2008)
4776	A through K	Mitchell (1987); Drolet and Schilz (1992a); Tulchin and Hammatt (2008)
4777	A through C	Drolet and Schilz (1992a); Tulchin and Hammatt (2008)
4782	A, C, E, and F (B and D “outside” project area”)	Drolet and Schilz (1992a); Tulchin and Hammatt (2008)
4783	–	Drolet and Schilz (1992a)
4784	–	Drolet and Schilz (1992a)
4785	–	Barrera (1986); Mitchell (1987); Kennedy (1987); Drolet and Schilz (1992a)
4786	–	Barrera (1986); Mitchell (1987); Kennedy (1987); Drolet and Schilz (1992a); Tulchin and Hammatt (2008)
6884	C	Tulchin and Hammatt (2007); Tulchin and Hammatt (2008)
7653	1 and 2	Lauer and Rieth (2015)
7976	–	Belluomini et al. (2017-draft)
7977	A-I	Belluomini et al. (2017-draft)
7978	–	Belluomini et al. (2017-draft)

\*Feature #s marked “–” do not have individual features designations. The entire historic property is located within the Dillingham Ranch Agricultural Subdivision project area.

based solely on informant information, included a large wall and many rock structures located south of the Kawaihāpai Reservoir. Site 5 was later confirmed by subsequent archaeological studies. Site 6, also based solely on informant information, included “a great deal of rock terracing” located near the base of the cliffs at the western end of the Dillingham Ranch property (Mitchell 1987:4). The informants were likely referring to the terracing located *mauka* of the Dillingham Airfield, originally described by Handy (1940) later designated SIHP # 50-80-03-416 by Rosendahl (1977).

In 1992, Drolet and Schilz (1992a) conducted an AIS of an approximately 840-acre portion of the Dillingham Ranch property proposed for golf course and residential development. The inventory survey consisted of a systematic pedestrian survey of the entire Dillingham Ranch Agricultural Subdivision project area and a program of subsurface testing with a backhoe within the coastal plain portion of the Dillingham Ranch Agricultural Subdivision project area. A total of 28 trenches were excavated throughout the testing area. No cultural material was recovered from the test excavations.

A total of 15 archaeological sites with 40 component features were identified through the pedestrian survey. Eleven of the 15 sites were located within three site complexes described by Drolet and Schilz (1992a) as “settlement clusters.” These settlement clusters are generally located in the foothills above the coastal plain to the base of the coastal cliffs. The sites are situated along gently sloping upland terraces adjacent to natural stream drainages and consist of agricultural field systems with associated habitation structures constructed during the pre-Contact or early post-Contact period. It was also noted that the settlement clusters were likely much more extensive than what was documented, as significant land alteration by ranching and military activities was observed in the vicinity of the sites. Drolet and Schilz (1992a) suggested the principal villages were located along the coastal plain, though ranching and plantation agriculture had removed any evidence of this. No archaeological sites were identified in the coastal plain portion of the Dillingham Ranch Agricultural Subdivision project area.

As explained below, two settlement clusters (Settlement Cluster 1 and Settlement Cluster 3) and four additional sites are located (at least in part) within the subdivision project area; none of the clusters or the four additional sites are located within the current AIS project area.

Settlement Cluster 1—located outside the AIS project area but within the subdivision project area—located southeast of the Kawaihāpai Reservoir, includes six historic properties (SIHP #s 50-80-03-4772 through 50-80-03-4777) comprised of 19 individual features. Settlement Cluster 1 measures approximately 470 m north/south by 150 m east/west, covering approximately 13 acres. Settlement Cluster 1 was previously referred to by Mitchell (1987) as Site 5. The primary feature of Settlement Cluster 1 is SIHP # -4772, is an enclosure “rectangular in shape” located near the southwest corner of the Kawaihāpai Reservoir property (Drolet and Schilz 1992a:24). “The overall size is 25 m by 25 m” (Drolet and Schilz 1992a:24) which suggests it is likely square. This enclosure was interpreted to be *Poloiaie Heiau*, documented by McAllister (1933) as Site 194. The enclosure is also Mitchell’s (1987) Site 5. SIHP #s -4773 through -4776 consist of enclosures, platforms, terraces, walls, alignments, and mounds located *mauka* of the *heiau*. SIHP # -4777 is a long north-south (*makai-mauka*) oriented stone wall. The wall was interpreted to represent an *ahupua‘a* boundary marker dividing Mokulē‘ia and Kawaihāpai Ahupua‘a. However, recent archaeological investigations, as well as a preservation plan for sites within the Dillingham Ranch

Agricultural Subdivision project area (Tulchin and Hammatt 2008), have determined the wall is actually the eastern portion of a historic paddock, similar to SIHP # 50-80-03-4785 identified by Drolet and Schilz (1992a) and described below. The two historic paddocks are also indicated on historic maps of the area (see Figure 8 and Figure 9). The existence and location of the southern and western walls of the paddock were confirmed during CSH inventory survey fieldwork in October 2006 (Tulchin and Hammatt 2007). Drolet and Schilz (1992a) did not locate the southern and western walls of the paddock or note the location of the paddock on historic maps.

Settlement Cluster 2—located partially on a property outside the ranch (see Figure 13) and partially within the Dillingham Ranch property but entirely outside the subdivision project area.—located approximately 600 m southeast of Settlement Cluster 1, includes three historic properties (SIHP #s 50-80-03-4778 through 50-80-03-4780) and 17+ individual features. Settlement Cluster 2 measures approximately 190 m north/south by 135 m east/west, covering approximately 4 acres. SIHP #s -4778 through -4780 consist of rectangular enclosures, terraces, and platforms. Damage to the sites due to military road construction was noted.

Settlement Cluster 3—located partially on a property outside the ranch (see Figure 13) and partially within the subdivision project area—located approximately 500 m northeast of Settlement Cluster 2, includes one historic property (SIHP # 50-80-03-4782) comprised of six individual features. Settlement Cluster 3 measures approximately 300 m north/south by 290 m east/west, covering approximately 9 acres. SIHP # -4782 consists of a network of large rectangular enclosures bordered by field walls, mounds, terraces, and paved areas.

Drolet and Schilz (1992a) also identified four sites—all within the subdivision project area—located outside the boundaries of the three designated settlement clusters. SIHP # 50-80-03-4783 consists of a plantation-era irrigation ditch and associated stone wall and clearing mounds. SIHP # -4783 was originally discussed by Barrera (1986). SIHP # 50-80-03-4784 is an earthen ditch, possibly an *'auwai*, a traditional Hawaiian ditch used to irrigate crops like taro. SIHP # 50-80-03-4785 is a large stone walled enclosure marking the boundary of J.T. Gulick's Grant 457 Lot 1 and was presumably built for that purpose (see Figure 6 and Figure 13 ) and is interpreted to be a historic paddock. The paddock, along with a second located approximately 450 m to the west, is indicated on historic maps of the area (see Figure 11 and Figure 12). SIHP # -4785 was originally discussed by Barrera (1986). SIHP # 50-80-03-4786, located within the SIHP # -4785 paddock, is a large, well-constructed stone platform, interpreted to be a *heiau* structure. SIHP #s -4785 and -4786 were referred to by Kennedy (1987), and later designated Site 3 by Mitchell (1987). Kennedy (1987) and Mitchell (1987) indicated the presence of at least two platforms within the enclosure, which was confirmed during recent archaeological investigations associated with the current AIS study, as well as a preservation plan for sites within that project area (Tulchin and Hammatt 2008). Drolet and Schilz (1992a) did not locate the second platform, nor did they note the existence of two platforms based on the previous archaeological work within that project area.

Subsequent to the AIS of the approximately 840-acre portion of the Dillingham Ranch property, Drolet and Schilz (1992b) surveyed an additional approximately 53 acres, documented in an addendum AISR. The additional lands consisted of an approximately 42-acre parcel located south of the Dillingham house, *mauka* of the coastal cliffs, and an approximately 11-acre parcel located west of the western extent of the original survey area. One site, SIHP # 50-80-03-4439, was identified in the *mauka* parcel. SIHP # -4439 is an approximately 300-m long stone wall oriented

in a north-south direction along a ridge. This wall was designated Site 1 by Mitchell (1987). Three additional sites were located in the western parcel. SIHP # 50-80-03-4440 consisted of a remnant stone wall, disturbed by stream cuts. SIHP # 50-80-03-4441 consisted of an approximately 200-m long stone wall and associated barbed wire fence, interpreted as an historic cattle wall. SIHP # 50-80-03-4442 consisted of a terrace, with damage due to erosion and stream cuts.

In 2004, an AIS was conducted for a number of proposed military training areas at Schofield Barracks Military Reservation, Kahuku Training Area, Wheeler Army Airfield, and military vehicle trails running from Schofield Barracks to the Dillingham Training Area, a portion of which crosses through the present Dillingham Ranch Agricultural Subdivision project area (Buffum et al. 2004). Survey methods included pedestrian survey that included transects set at 15 m intervals to ensure area coverage. No historic properties were identified.

In 2006, Tulchin and Hammatt (2007) conducted an AIS investigation that extends into a portion of the Dillingham Ranch Agricultural Subdivision project area on adjacent *mauka* lands not covered by the Drolet and Schilz (1992a and 1992b) inventory survey. The survey areas were added as part of the current Dillingham Ranch Agricultural Subdivision development plan. Six historic properties comprising 28 individual archaeological features were identified within the approximately 78-acre study area.

SIHP # 50-80-03-6884 contains four historic, ranch-related stone wall features located within gully areas in the eastern, central, and western portions of Dillingham Ranch; Feature C is within the current (subdivision) project area. SIHP # 50-80-03-6885 is an agricultural complex located within a gully area in the western portion of the study area. The complex consists of three terraces and a retaining wall. SIHP #s 50-80-03-6886 and 50-80-03-6888 consist of agricultural complexes composed mostly of crudely constructed mounds and terraces situated along or immediately downslope of exposed cliff faces. SIHP #s -6885–6888 are all outside the current (subdivision) project area. Although no natural springs or seeps were identified in the area, the last two historic properties were located along a prominent hillside indicated by McAllister (1933) as the location of Site 192 (SIHP # 50-80-03-192) referred to as “hidden waters.” SIHP # 50-80-03-6887 is a modified overhang shelter, also located on the prominent hillside in the vicinity of Site 192. The overhang shelter was modified with the construction of a retaining wall and level terrace across the entrance of the overhang.

An eastern extension of the previously identified SIHP # 50-80-03-416 agricultural and habitation complex was identified in the northwestern corner of the study area. Six features including walls, terraces, and a mound were located within the study area, though numerous associated archaeological features were observed to continue to the northwest, as previously identified or documented in previous archaeological studies by Handy (1940), Rosendahl (1977), and Moblo (1991).

Historic properties identified by Tulchin and Hammatt (2007) represent two distinct periods of land use within the Dillingham Ranch property. SIHP #s 50-80-03-416, 50-80-03-6885, 50-80-03-6886, and 50-80-03-6888 are late pre-Contact to early post-Contact traditional Hawaiian agricultural complexes. The agricultural complexes were built to utilize limited water resources on the inland coastal terrace, particularly along stream drainages and at the base of exposed cliff faces near the *mauka* or southern boundary of the Dillingham Ranch Agricultural Subdivision project area. The location, feature types, and pattern of relatively dense site clustering are similar



to the “settlement clusters” identified by Drolet and Schilz (1992a) within adjacent stream drainages of the Dillingham Ranch Agricultural Subdivision project area.

The four ranch-related rock walls (SIHP # 50-80-03-6884 Features A–D) are affiliated with the post-Contact ranching period. The ranching period has a long history in the Waialua District, with large ranches developing ca. the mid- to late 1800s.

In 2008, CSH completed a preservation plan for sites located within an earlier design plan of the Dillingham Ranch Agricultural Subdivision project (Tulchin and Hammatt 2008a). The plan addressed all historic properties in the earlier 820-acre project area, including properties identified by Drolet and Schilz (1992a and 1992b) and Tulchin and Hammatt (2007). In accordance with the previous inventory surveys’ Hawai’i Register of Historic Places significance evaluations and treatment recommendations, and following consultation among CSH, SHPD, and the property owner, the preservation plan provided proposed interim and long-term preservation measures for 16 traditional Hawaiian sites: SIHP #s 50-80-03-416, 50-80-03-4772 through 50-80-03-4780, 50-80-03-4782, 50-80-03-4786, and 50-80-03-6885 through 50-80-03-6888.

In 2008, CSH completed a monitoring plan for the Dillingham Ranch Agricultural Subdivision project (Tulchin and Hammatt 2008b). The plan covers ranch improvement projects and the initial subdivision infrastructure construction activities undertaken by Dillingham Ranch Aina, LLC. This includes initial grubbing, grading, and excavation work. Subsequent construction within the subdivision development lots by individual lot owners is not covered by the monitoring plan.

In 2008, CSH conducted a brief period of archaeological monitoring under the Tulchin and Hammatt (2008b) monitoring plan for the creation of access pathways for geotechnical boring equipment. Some of the fieldwork was conducted within the Dillingham Ranch Agricultural Subdivision project area. The monitoring was very brief and the project that required archaeological monitoring has been on hold and no formal documentation of the results of monitoring has been provided to the SHPD to date. During the course of the brief period of archaeological monitoring, two additional components of previously identified sites were encountered. These consist of a platform near a previously identified platform (SIHP # 50-80-03-4786), and a continuation of a cattle wall (SIHP # 50-80-03-4777). In order to provide an accurate understanding of the historic properties within the Dillingham Ranch Agricultural Subdivision project area, the findings are discussed as necessary in this report. All information gathered during the monitoring is presented below in the historic property descriptions.

In 2014, IARII conducted an AIS of approximately 85.3 acres along the southern or *mauka* portion of the Dillingham Ranch Agricultural Subdivision project area (Lauer and Rieth 2015). The survey area represented additional, unsurveyed property in the proposed subdivision. The AIS covered three separate parcels. Lauer and Rieth (2015) identified one historic property (SIHP # 50-80-03-7653) with four discontinuous rock wall sections (Features 1–4). SIHP # -7653 was interpreted as nineteenth or early twentieth century ranch walls that were enclosures and exclosures used for grazing cattle in the upper and steeper slopes of the Dillingham Ranch Agricultural Subdivision project area. Two unmodified springs or seeps were also identified in the southwestern portion of the Dillingham Ranch Agricultural Subdivision project area (their westernmost survey parcel), on the prominent hillside indicated by McAllister (1933) as the location of freshwater springs referred to as “hidden waters” (SIHP # 50-80-03-192).

Four shovel test probes were excavated at SIHP # 50-80-03-7653 Feature 3 wall and an adjoining unmodified rock shelter (Lauer and Rieth 2015). No cultural deposits were identified in the floor of the rock shelter nor among the colluvial deposits retained upslope by the Feature 3 wall.

Because the site had been fully documented during the inventory survey, Lauer and Rieth (2015:47) recommended no further fieldwork at SIHP # 50-80-03-7653. However, to ensure the preservation of representative examples of this portion of Dillingham Ranch's history, preservation was recommended. Protection of the two unmodified springs (outside the Dillingham Ranch Agricultural Subdivision project area), was also recommended because of their potential associations with the "hidden waters" (SIHP # 50-80-03-192), natural water springs, as documented in oral history and by McAllister (1933).

Based on the findings of previous AIS reports and the background research compiled about the area, it is likely historic properties associated with ranching activities such as walls, corrals, and irrigation infrastructure may be present in the AIS study area. This may include additional features of SIHP #s -7653 and -4439. In addition, pre-Contact to early post-Contact agricultural terracing, as suggested by McAllister 1933, may also be present along the banks of Makaleha Stream. With the large pre-Contact to early post-Contact settlement clusters previously identified within the Dillingham Ranch Agricultural Subdivision project area, additional habitational and/or religious/ceremonial features and trails may be present. Steep slopes with exposed cliff faces dominate the previously unsurveyed areas of the AIS study area, therefore, it is possible pre-Contact to early post-Contact cupboards, rock shelters, and/or petroglyphs may also be present.

## Section 4 Results of Fieldwork

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Fieldwork was conducted between 22 November and 2 December 2016 by Scott Belluomini, B.A., Si-Si Hensley, M.A., and Jason Kline, B.S., under the general supervision of principal investigator David W. Shideler, M.A. In general, fieldwork included 100% pedestrian inspection of the AIS study area and GPS data collection. The two sites observed during the brief 2008 archaeological monitoring were also located and documented during this AIS, in order to bring the documentation of all sites within the Dillingham Ranch Agricultural Subdivision project area into compliance with documentation standards.

The AIS study area spans across a high Y-shaped ridge, part of the Waianae Mountain Range (Figure 14). The north, east, and west flanks of the ridge are densely vegetated with tall grasses such as California grass (*Brachiara mutica*) and Guinea grass (*Panicum maximum*), and various trees and bushes such as *koa haole* (*Leucaena leucocephala*), Christmasberry (*Schinus terebinthifolius*), silver oak (*Grevillea robusta*), *klu* (*Acacia farnesiana*), guava (*Psidium guajava*), strawberry guava (*Psidium cattleianum*), *wiliwili* (*Erythrina sandwicensis*), and *niu* (*Cocos nucifera*). The slopes are heavily eroded, with basalt scarps between areas of soil and rock fall (Figure 15).

A small dry stream valley extends through much of the middle of the AIS study area, gently sloping to the tablelands atop the ridge. The valley contains trees such as octopus tree (*Schefflera actinophylla*), *koa haole* (*Leucaena leucocephala*), Christmasberry (*Schinus terebinthifolius*), Java plum (*Syzygium cumini*), and less dense ground vegetation along the stream bed and the eastern slopes of the valley (Figure 16). The western slope of the dry stream valley is similar to the other flanks of the ridge. The tablelands contain many of the same grasses and trees that are located on the north, east, and west flanks of the ridge as well as an ironwood (*Causarina* sp.) forest. Large swaths of the tablelands are experiencing heavy erosion (Figure 17).

Makaleha Stream extends diagonally through the southernmost corner of the AIS study area. Vegetation is less dense near the stream, with scarce patches of grasses, large trees including Indian banyan (*Ficus benghalensis*) and candlenut (*kukui*; *Aleurites moluccanus*), and various ferns such as *'oali'i* (*Asplenium trichomanes*), moss, and lichen (Figure 18 and Figure 19).

Three historic properties were located within the AIS study area (Figure 20 and Figure 21). These include two cattle walls (SIHP # 50-80-03-7653 Feature 1 and SIHP # 50-80-03-7976), and a terrace complex along Makaleha Stream (SIHP # 50-80-03-7977) (Figure 24). As discussed previously, two additional historic properties outside the AIS study area but within the Dillingham Ranch Agricultural Subdivision project area were documented (Figure 22 and Figure 23). These consist of a wall (SIHP # 50-80-03-4777 Feature C) and a platform (SIHP # 50-80-03-7978).

A wall (SIHP # 50-80-03-4439) previously identified by Drolet and Schilz (1992b) was located extending through the center of the AIS study area, extending approximately north-south from near the edge of the tablelands, into the dry stream bed, and continuing to the previously identified extent of SIHP # 50-80-03-7653 Feature 1, identified by Lauer and Rieth (2015). Based on these findings, it was determined that SIHP # -4439 and SIHP # -7653 Feature 1 are the same structure. Therefore, SIHP # -4439 is to be considered a part of SIHP # -7653 Feature 1 and not a separate historic property.



Figure 14. 2016 Google Earth image showing the Y-Shaped ridge, view to south



Figure 15. Western portion of AIS study area with steep slopes, view to northwest



Figure 16. Vegetation along dry stream valley in middle of the AIS study area, view to northeast



Figure 17. Tablelands showing areas of erosion and vegetation and showing dry stream valley between tablelands, view to northeast



Figure 18. Makaleha Valley in southeast corner of AIS study area, view to south



Figure 19. Makaleha Stream, view to southwest

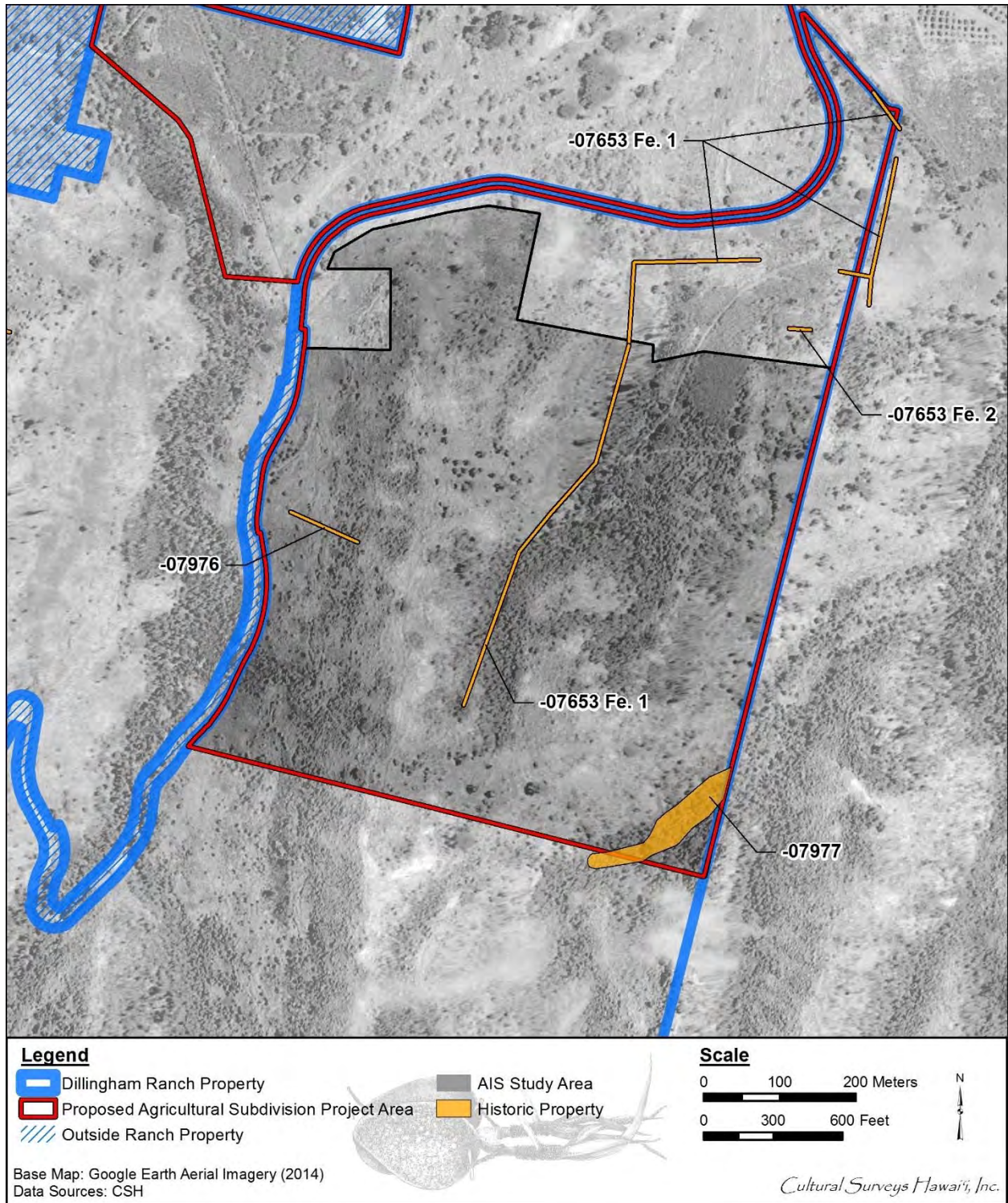


Figure 20. 2014 Google Earth aerial photograph showing historic properties identified within the AIS study area



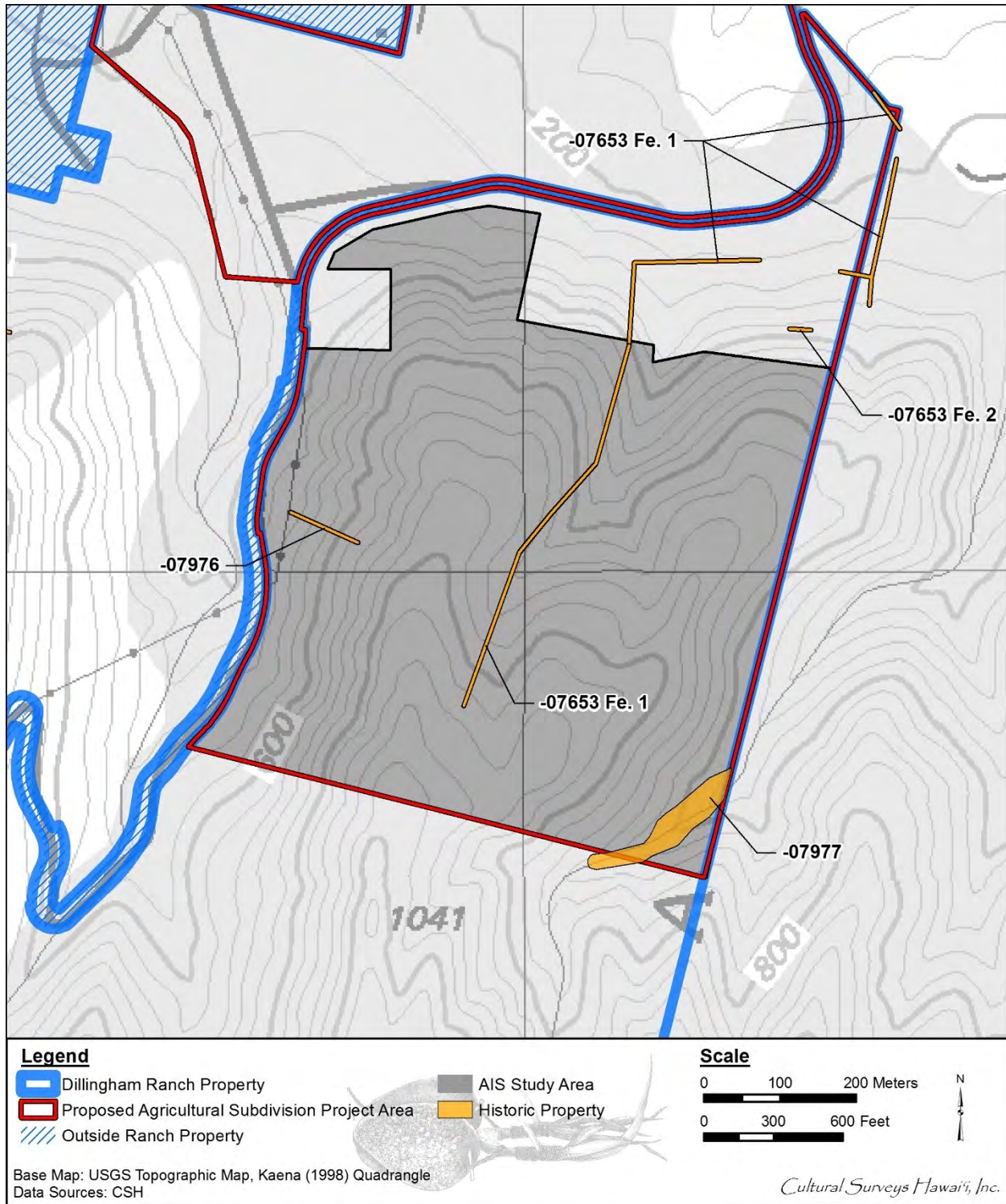


Figure 21. Portion of a 1998 Kaena USGS topographic quadrangle, showing the locations of historic properties within the AIS study area

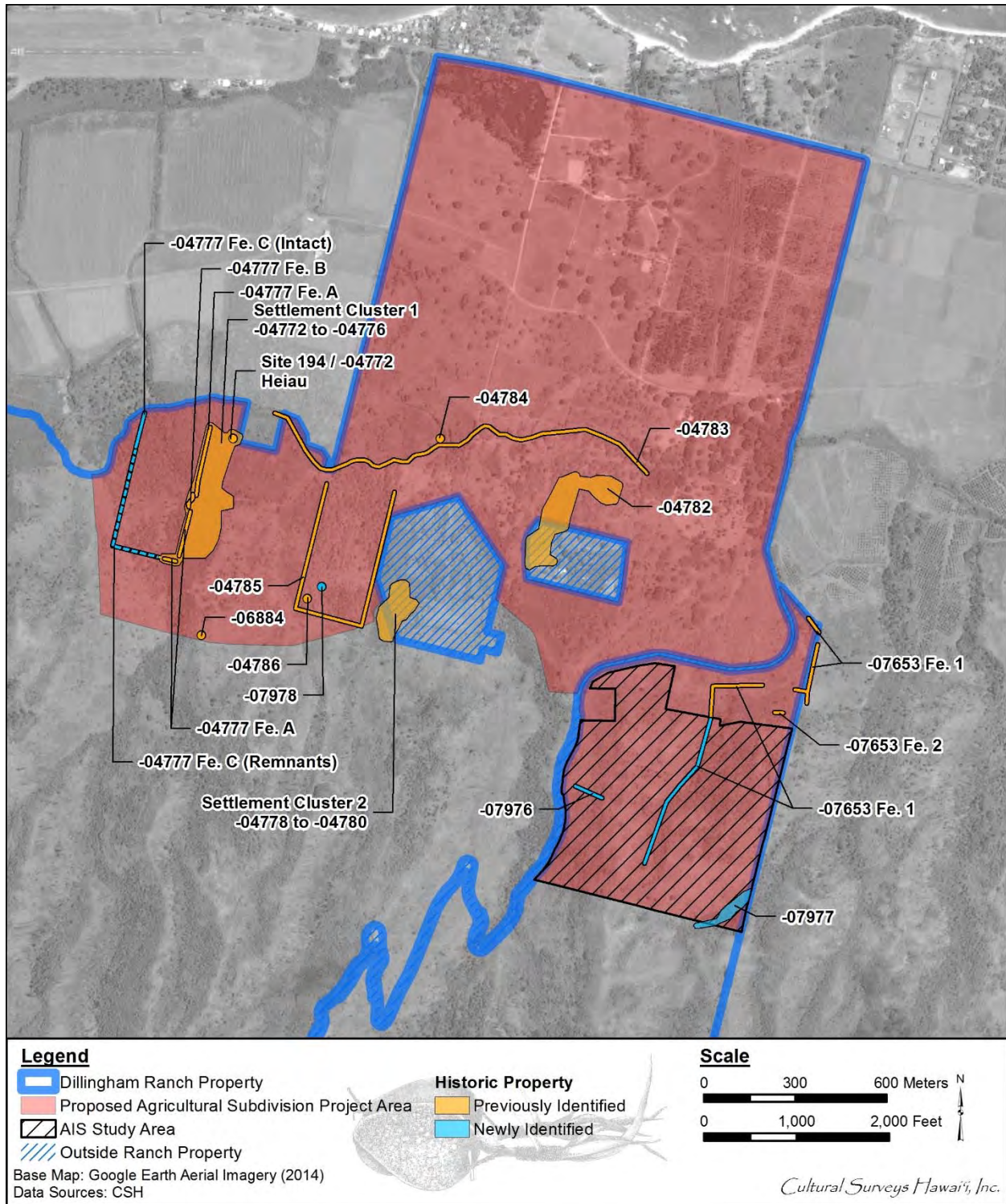


Figure 22. 2014 Google Earth aerial photograph showing historic properties identified within the Dillingham Ranch Agricultural Subdivision project area

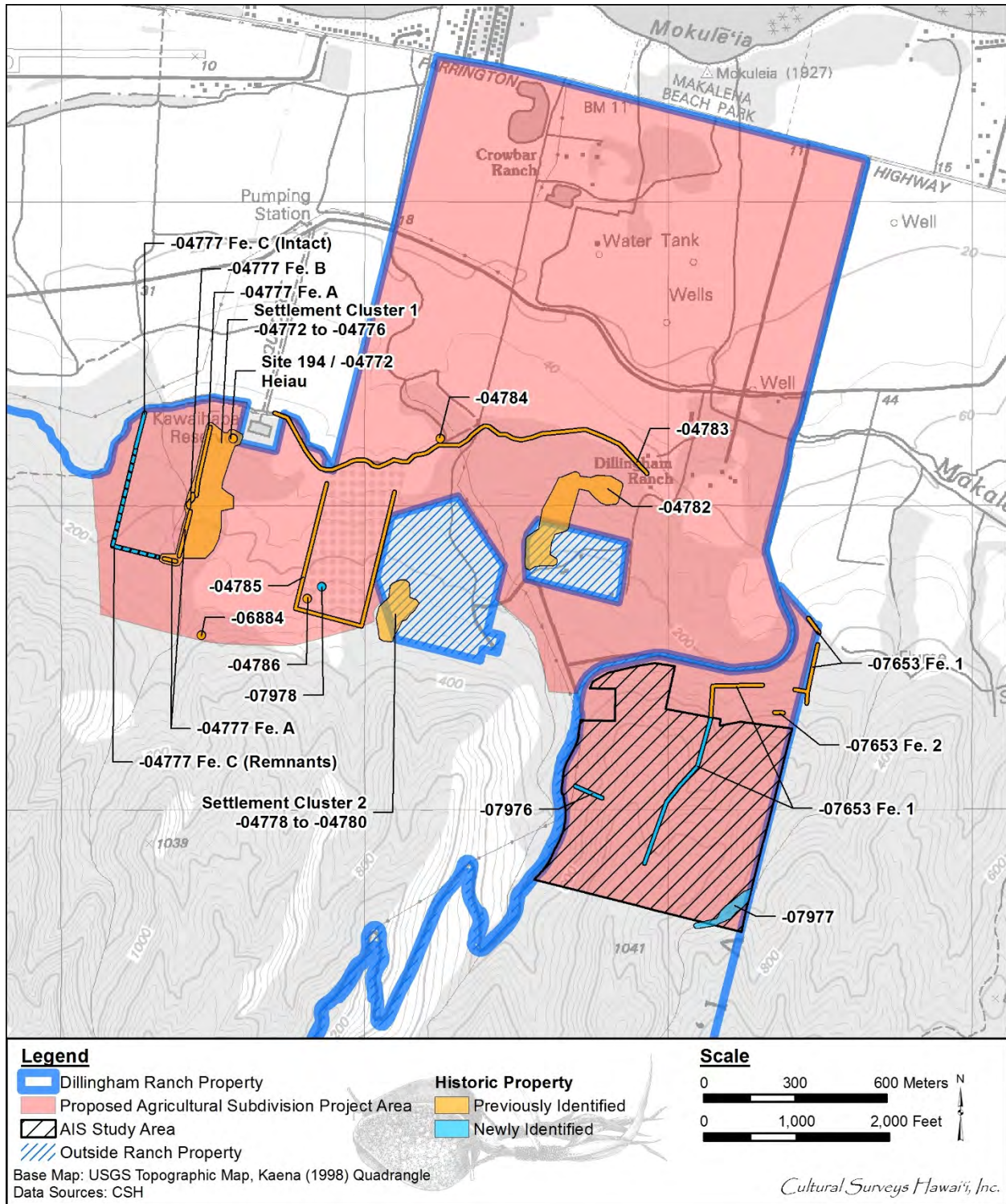


Figure 23. Portion of a 1998 Kaena USGS topographic quadrangle, showing the locations of historic properties within the Dillingham Ranch Agricultural Subdivision project area

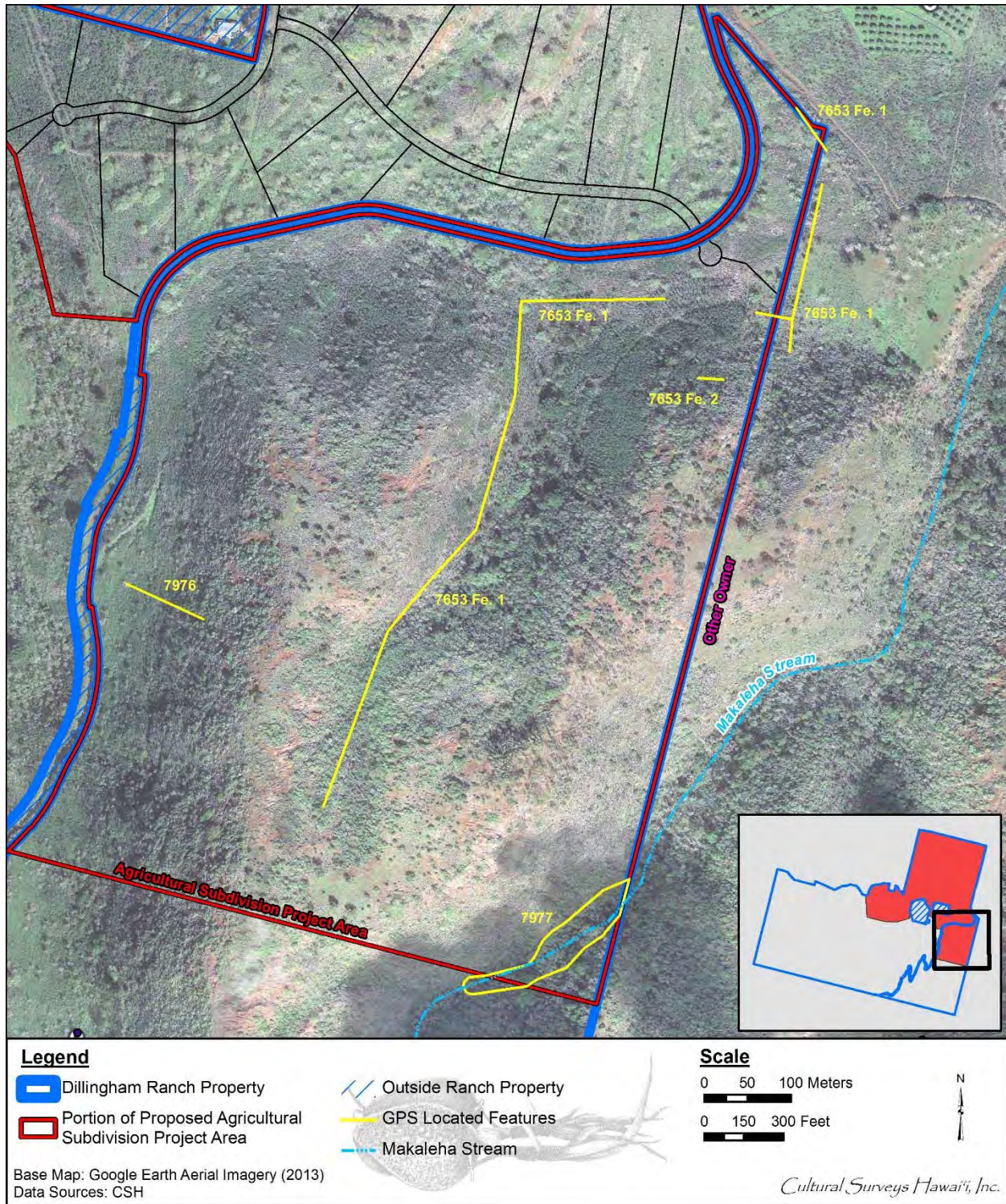


Figure 24. 2013 Google Earth aerial photograph showing distribution of historic properties in southeast corner of the proposed Dillingham Ranch Agricultural Subdivision project area and Makaleha Stream

SIHP # 50-80-03-7976 is a cattle wall that extends up the western slope of the ridge from near the Mokuleia Access Road, to near the edge of the tablelands upslope. The historic cattle wall is constructed of dry-stacked cobbles and is in fair condition.

SIHP # 50-80-03-7977 is a terrace complex on the western and eastern banks of Makaleha Stream. The terraces are constructed of dry-stacked basalt cobbles/boulders and are likely related to traditional Hawaiian agricultural practices, portions of which were likely modified for use in ranching activities. It is likely the complex continues both upstream and downstream of the AIS study area.

SIHP # 50-80-03-4777 Feature C was encountered during the brief archaeological monitoring in 2008 and was located during the course of AIS fieldwork to provide proper documentation of the historic property. Feature C extends from the southwesternmost extent of Feature A and extends east/west approximately 162 m. The wall then extends north/south approximately 331 m and disappears at a small wash. The wall continues for an additional 119 m on the northern end of the wash, where the wall ultimately ends at a dirt road. Feature C is in poor condition and is almost entirely collapsed except for the 119 m portion north of the wash that is in good condition. The three features of the wall (Features A, B, and C) form a U-shape that follows the boundary of Land Grant 457 Lot 2 granted to J.T. Gulick.

SIHP # 50-80-03-7978 was also encountered during the brief archaeological monitoring in 2008 and was located during the course of AIS fieldwork to provide proper documentation of the historic property. SIHP # -7978 is a platform located 50 m northwest of SIHP # 50-80-03-4786, a platform with a possible religious/ ceremonial function. SIHP # -7978 is constructed of dry-stacked cobbles and boulders and faced on three sides. The upslope side is lined with basalt cobbles and boulders. The platform is basalt cobble filled and is in fair condition.

## Section 5 Historic Property Descriptions

Five historic properties were documented during AIS fieldwork (see Table 5). Two newly identified historic properties (SIHP #s 50-80-03-7976 and -7977) and one previously identified historic property (SIHP # 50-80-03-7653) were identified within the current AIS study area. One new feature of a previously identified feature (SIHP # 50-80-03-4777 Feature C) and a newly identified platform (SIHP # 50-80-03-7978) previously observed during the brief 2008 archaeological monitoring are also fully described and documented in this section. A map showing the distribution of historic properties in relation to the proposed project plans are depicted on Figure 25.

Table 5. Historic properties documented during the current AIS fieldwork

SIHP #	Formal Type	Function	Age
50-80-03-4777	U-shaped wall	Property boundary	Historic (ranching)
50-80-03-7653	Walls	Animal husbandry	Historic (ranching)
50-80-03-7976	Wall	Animal husbandry	Historic (ranching)
50-80-03-7977	Terrace complex	Agricultural and ranching	Pre-Contact to early post-Contact
50-80-03-7978	Platform	Possibly habitational or ceremonial	Pre-Contact to early post-Contact

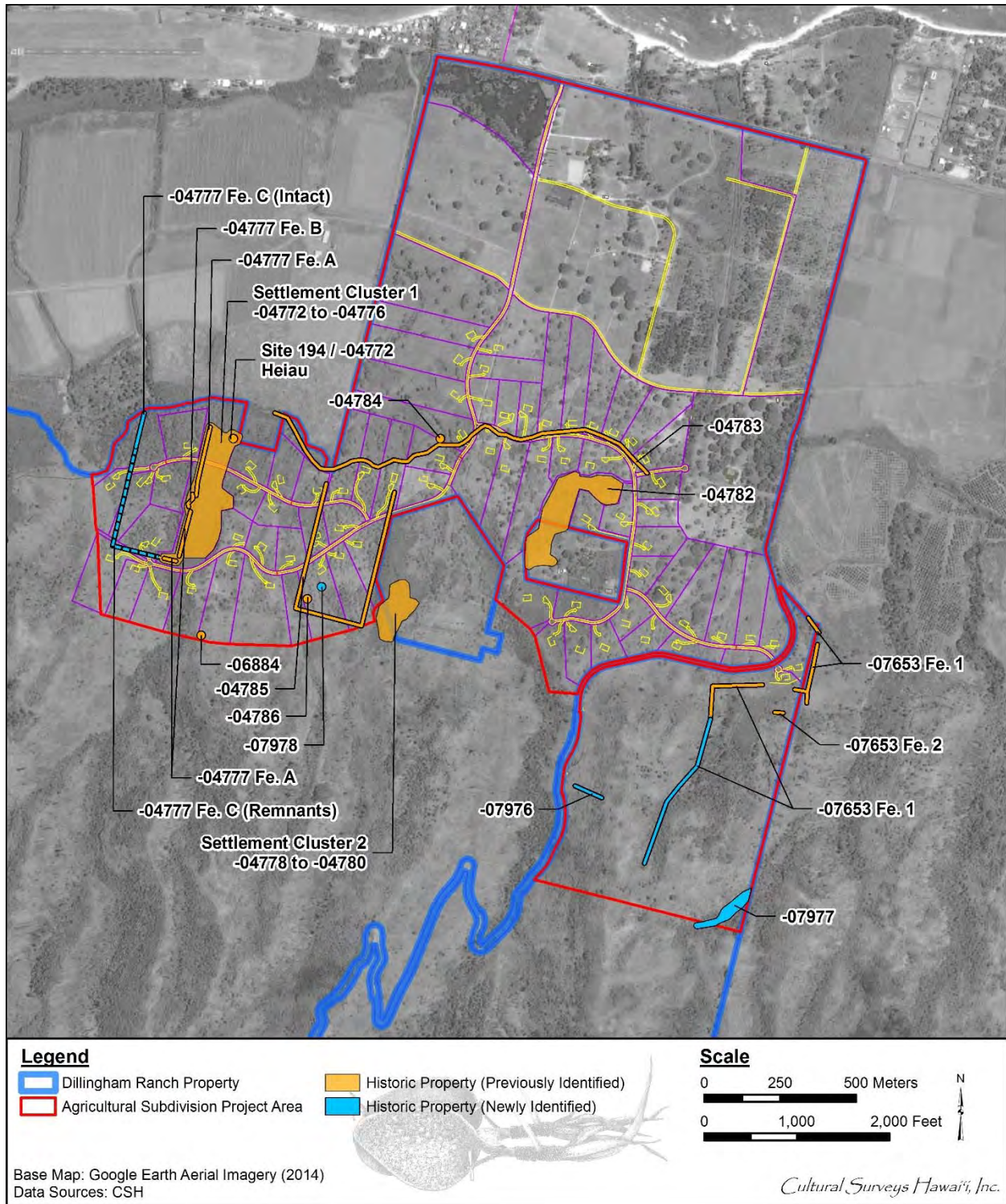


Figure 25. 2014 Google Earth aerial photograph showing the distribution of historic properties within the Dillingham Ranch Agricultural Subdivision project area with overlay of house lot boundaries and road alignments

### 5.1 SIHP # 50-80-03-4777 (Formerly SIHP # 50-80-03-4429)

<b>FORMAL TYPE:</b>	U-shaped wall
<b>FUNCTION:</b>	Property boundary
<b>NUMBER OF FEATURES:</b>	3 wall segments
<b>SIZE:</b>	Total area is approximately 475 m by 225 m
<b>AGE:</b>	Post-Contact
<b>LAND JURISDICTION:</b>	Dillingham Ranch
<b>PREVIOUS DOCUMENTATION:</b>	Drolet and Schilz (1992a); Tulchin and Hammatt (2008a)

SIHP # 50-80-03-4777 consists of a property boundary U-shaped wall related to Land Grant 457 Lot 2 awarded to J.T. Gulick located in the west portion of the Dillingham Ranch Agricultural Subdivision project area (see Figure 22 and Figure 23). The location is west of the main Settlement Cluster 1 feature concentration and west of the formal AIS project area (see Figure 23). Portions of the wall were identified in three different studies. Features A and B were initially identified by Drolet and Schilz (1992a). An additional extent of Feature A was identified by Tulchin and Hammatt 2008a. The newly identified Feature C is a continuation of the wall to the west and north extending from the portion identified by Tulchin and Hammatt (2008a).

The following description of SIHP # 50-80-03-4777 was provided by Drolet and Schilz (1992a:28) (Figure 27):

Site 4429 [4777] (Field Site 05): Wall. Feature A is a principal feature of this settlement cluster and probably a major regional landmark of this north shore area. It consists of a faced wall that stretches approximately 280m in a north/south direction, situated along the margin of the stream bed that borders the western portion of Settlement Cluster 1. The well-built wall corresponds to the location of the Mokuleia ahupua'a western division limits [see Figure 1] and thus appears to have been constructed as a landmark feature during early historic occupation here. The faced wall ranges between 1-2m in height and between 0.7-1.2m in width. It is constructed with a boulder base and stacked with smaller cobbles placed vertically 4-7 courses high. Just west of the Site 4776 complex of features, the wall contains a 39m gap. The presence of numerous features in this area, the high terrace bank, and the gap in the ahupua'a wall may indicate a principal point along the terrace for water diversion to aid in both water run off and field irrigation. Also noteworthy is the presence of a faced wall (Feature B) constructed along the opposite side of the stream. Presumably, this construction also functioned to aid in water channeling along the stream where an array of residential and field system constructions are evident [Figure 27].

Feature B: Wall. As noted in the description of Feature A, this feature is a wall segment, placed on the western bank margin of the stream where there is a 39m gap in the principal ahupua'a wall construction. It measures 1m in height and 50cm in width and runs approximately 40m in length. The wall is S-shaped from north to south, presumably formed this way to facilitated water channeling at this point



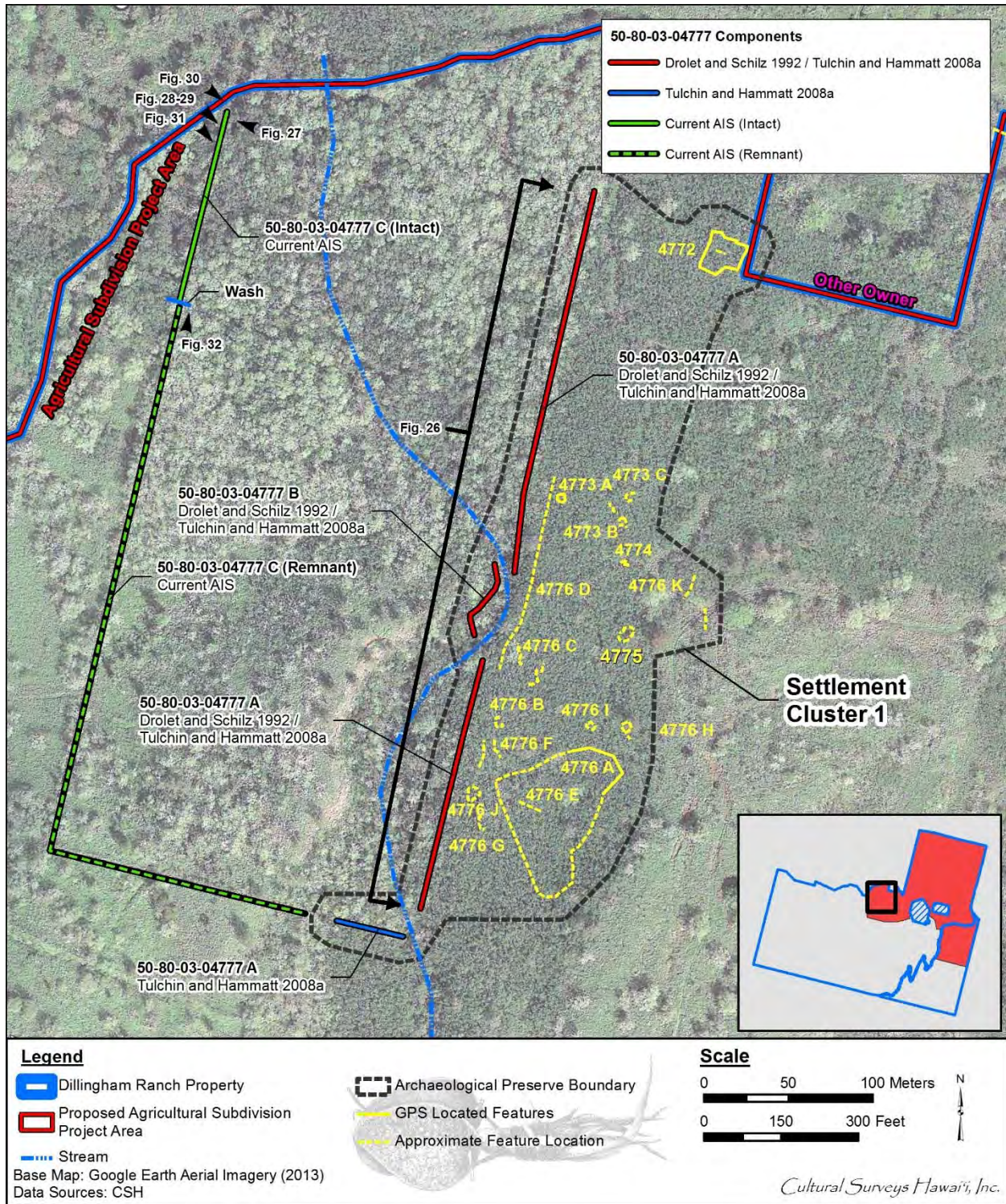


Figure 26. Detailed map of SIHP # -4777 showing the features, references, and photograph views (Figure 39's exact photograph location is unknown), note that the stream and wash locations are based on field observations



Figure 27. Photograph of SIHP # 50-80-03-4777 Feature A wall, view to north (Tulchin and Hammatt 2008a)

along the stream. It is situated much lower than the wall on the opposite side of the stream. [Drolet and Schilz 1992a:28]

The complete extent of the SIHP # 50-80-03-4777 Features A and B walls was located and traversed during the field inspection associated with the preparation of the preservation plan (Tulchin and Hammatt 2008a). The walls were observed to be in good to excellent condition, with very little collapse observed. In addition to the *mauka/makai* (north/south) running walls (i.e., Features A and B) described by the original Drolet and Schilz (1992a) inventory survey, an approximately 40-m long east/west trending wall was observed near the *mauka* (southern) end of the Feature A wall. The Feature A wall section identified by Tulchin and Hammatt (2008a) is located on the western side of the unnamed gulch, opposite the Drolet and Schilz (1992a) Feature A wall, and runs perpendicular to the Feature A wall. Tulchin and Hammatt (2008a) evaluated SIHP # -4777 as eligible for listing on the Hawai'i Register of Historic Places under Criteria C and D.

According to Tulchin and Hammatt 2008a, this historic property was assessed as significant under Criterion C as part of Settlement Cluster 1 which was determined to be significant beyond Criterion D based on the following:

Given these sites' excellent integrity, the fact that they represent a related group of sites characteristic of the type that was built on the coastal terrace of Mokule'ia during prehistoric times, and because other site groups of this type in the region might have less integrity, we believe that these sites are also significant because they embody the distinctive characteristics of a type (criterion C). [SHPD review letter LOG NO. 5155, DOC. NO. 0682t; see Appendix A]

During the course of the brief period of archaeological monitoring in 2008, a continuation of the wall was observed. This portion of the wall was not formally documented. During the course of AIS fieldwork, the full extent of the undocumented wall was surveyed and designated SIHP # 50-80-03-4777 Feature C (Figure 28 through Figure 33). Feature C is of similar construction and size to the previously identified Feature A and follows the boundaries of Land Grant 457 Lot 2 awarded to J.T. Gulick. The wall construction is made of stacked basalt cobbles approximately three to four courses wide and five to seven courses tall. The wall measures approximately 1 m in thickness and 1.1 m in height. A short barbed wire fence was observed at the northwest end of Feature C and a barbed wire fence also follows along the remnant portion of Feature C in the southwest corner.

Feature C extends from the southwesternmost extent of Feature A and extends east/west approximately 162 m. The wall then extends north/south approximately 331 m and disappears at a small wash. The wall continues for an additional 119 m on the northern end of the wash, where the wall ultimately ends at an existing road that leads from the cattle and horse paddocks toward the west side of the property. Feature C is in poor condition and is almost entirely collapsed except for the 119 m portion north of the wash that is in good condition.

The three features of the wall (Features A, B, and C) form a U-shape that follows the boundary of Land Grant 457 Lot 2 granted to J.T. Gulick. SIHP # 50-80-03-4777 is similar in construction, size, and function as a cattle wall (SIHP # 50-80-03-4785). It is likely that SIHP # -4785 is a grant boundary wall. Both walls follow the *mauka* boundaries of two lots of the same land grant (457) to J.T. Gulick. They are likely related to the clearing of the property and the enclosing of the

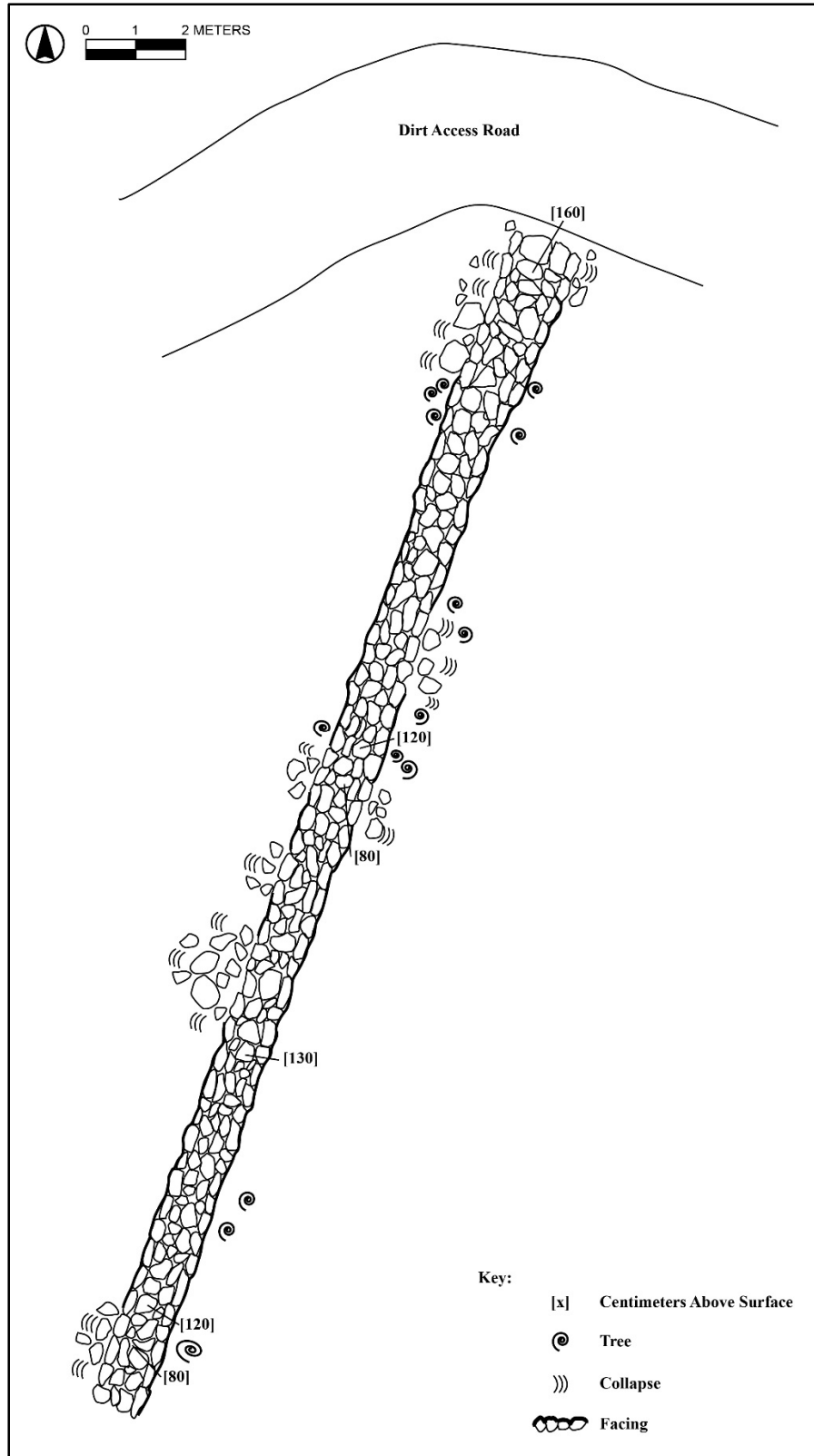


Figure 28. Representative plan map of intact portion of SIHP # 50-80-03-4777 Feature C



Figure 29. Northern portion of SIHP # 50-80-03-4777 Feature C (intact portion), view to south



Figure 30. Oblique view showing top of SIHP # 50-80-03-4777 Feature C (intact portion), view to southwest



Figure 31. Northern terminus of SIHP # 50-80-03-4777 Feature C (intact portion) wall adjacent to existing road from cattle paddocks, view to east



Figure 32. Northern portion of SIHP # 50-80-03-4777 Feature C (intact portion) with periodic areas of collapse about 1 m apart, view to south



Figure 33. SIHP # 50-80-03-4777 Feature C (remnant portion) at the wash, showing the portion of the wall completely destroyed by water runoff, view to north



property for use as a grazing pasture. The wall is not an *ahupua'a* boundary wall, but an historic land grant boundary wall. Based on these findings, SIHP # -4777 is no longer considered to be part of the pre-Contact to early post-Contact Settlement Cluster 1 as it is a historic feature that is not associated with pre-Contact to early post-Contact habitation in the area. The wall is not significant under Criterion C as an excellent type of feature that was built on the coastal terrace of Mokule'ia during prehistoric times, as discussed above, but rather significant under Criteria C as a type of dry-stacked wall that was constructed during the ranching period and represents the westernization of land ownership (land grants) and land use in the area. The lack of mortar also suggests a continuation of traditional Hawaiian wall building techniques in the post-Contact period. Feature A and B are in good condition, while Feature C ranges from poor condition (remnant portion [approximately 500 m]) to good condition (intact portion [approximately 119 m]).

SIHP # 50-80-03-4777, U-shaped wall, was previously documented by Drolet and Schilz (1992a) and Tulchin and Hammatt (2008a). SIHP # -4777, was previously assessed as significant by Drolet and Schilz (1992b) under Criteria "C" and "D". Tulchin and Hammatt (2008a) evaluated SIHP # -4777 as eligible for listing on the Hawai'i Register of Historic Places under Criteria C and D. Based on the findings of this report, SIHP # -4777 is in poor to intact condition and is assessed as significant under Criterion c (embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, or possess high artistic value) and Criterion d (have yielded, or is likely to yield, information important for research on prehistory or history) pursuant to HAR §13-284-6. The historic property is also evaluated as eligible for listing on the Hawai'i Register of Historic Places per HAR §13-198-8 under Criteria C and D. This report concurs with this assessment due to the historic property providing information regarding ranching activities and land divisions and may provide additional information regarding the land use of the land grant for which it borders. The historic property, which borders the *mauka* portion of Land Grant 452 Lot 2 is significant under Criterion c/C due to its being representative of post-Contact boundary walls that incorporate traditional techniques. This assessment of significance is for the overall site and applies to all features of the historic property. The historic property retains integrity of location, design, setting, materials, and workmanship.

Site preservation measures are required for SIHP # 50-80-03-4777 Features A and B and are included in Tulchin and Hammatt (2008a). SIHP # -4777 Features A and B are located within the Settlement Cluster 1 preservation boundary, although not considered associated with the settlement cluster. Preservation is recommended for the features of SIHP # 50-80-03-4777 that are located within the Dillingham Ranch Agricultural Subdivision project area. SIHP # -4777 preservation measures for SIHP # -4777 Feature C are not currently addressed in a preservation plan.

## 5.2 SIHP # 50-80-03-7653 (Formerly SIHP # 50-80-03-4439)

<b>FORMAL TYPE:</b>	Walls
<b>FUNCTION:</b>	Animal husbandry
<b>NUMBER OF FEATURES:</b>	4
<b>SIZE:</b>	Total length (discontinuous) is approximately 1,500 m
<b>AGE:</b>	Post-Contact
<b>LAND JURISDICTION:</b>	Dillingham Ranch
<b>PREVIOUS DOCUMENTATION:</b>	Drolet and Schilz (1992b); Lauer and Rieth (2015)

SIHP # 50-80-03-7653 consists of five areas of rock wall segments (Features 1–4) located along the southern boundary of the proposed Dillingham Ranch Agricultural Subdivision project area and on the western edge of the AIS study area (see Figure 20 through Figure 23). The walls were previously identified by Lauer and Rieth (2015):

Site 7653 consists of dry-stacked stone walls that in places incorporate large colluvial boulders and outcrops. Wall segments may parallel the slope contours (generally east-west) or run cross contour (generally north-south). Slope erosion and collapse has affected numerous portions of these walls, but the remaining segments are consistent with the extensive 19th/early 20th century ranching infrastructure in this area. These walls, and the components of Site 6884, likely once formed an integrated enclosure/exclosure system for the ranch. [Lauer and Rieth 2015:29]

Four features (Features 1–4) were identified by Lauer and Rieth (2015). Feature 1 was the only feature encountered within the AIS study area. Feature 1 (Figure 35 through Figure 42) is described by Lauer and Rieth (2015) as follows:

Feature 1 is a series of adjoining, or once continuous, dry-stacked stone walls located within the eastern survey parcel. The longest segment is oriented east-west and extends 312 m with an 80 m wide break where a single track dirt road breaches the wall. At the western end of this segment the wall makes a nearly 90-degree turn south and continues for at least 106 m intersecting the southern boundary of the survey parcel. The wall appears to have originally continued further to the south but it is now completely collapsed in this area. At the eastern end of the east-west segment there is another right angle intersection with a north-south oriented wall segment. This component is largely beyond the survey parcel, although a 50 m portion of it falls within the survey parcel along its northeast edge. The north-south wall segment extends across at least 295 m and is parallel to the current TMK boundary, although offset by approximately 20 m. These core filled wall segments are constructed with multiple courses of basalt cobbles and small boulders. The maximum wall height is 1.2 m and the average width is 0.7 m. There are several sections where the wall has collapsed or has been breached. [Lauer and Rieth 2015:31]

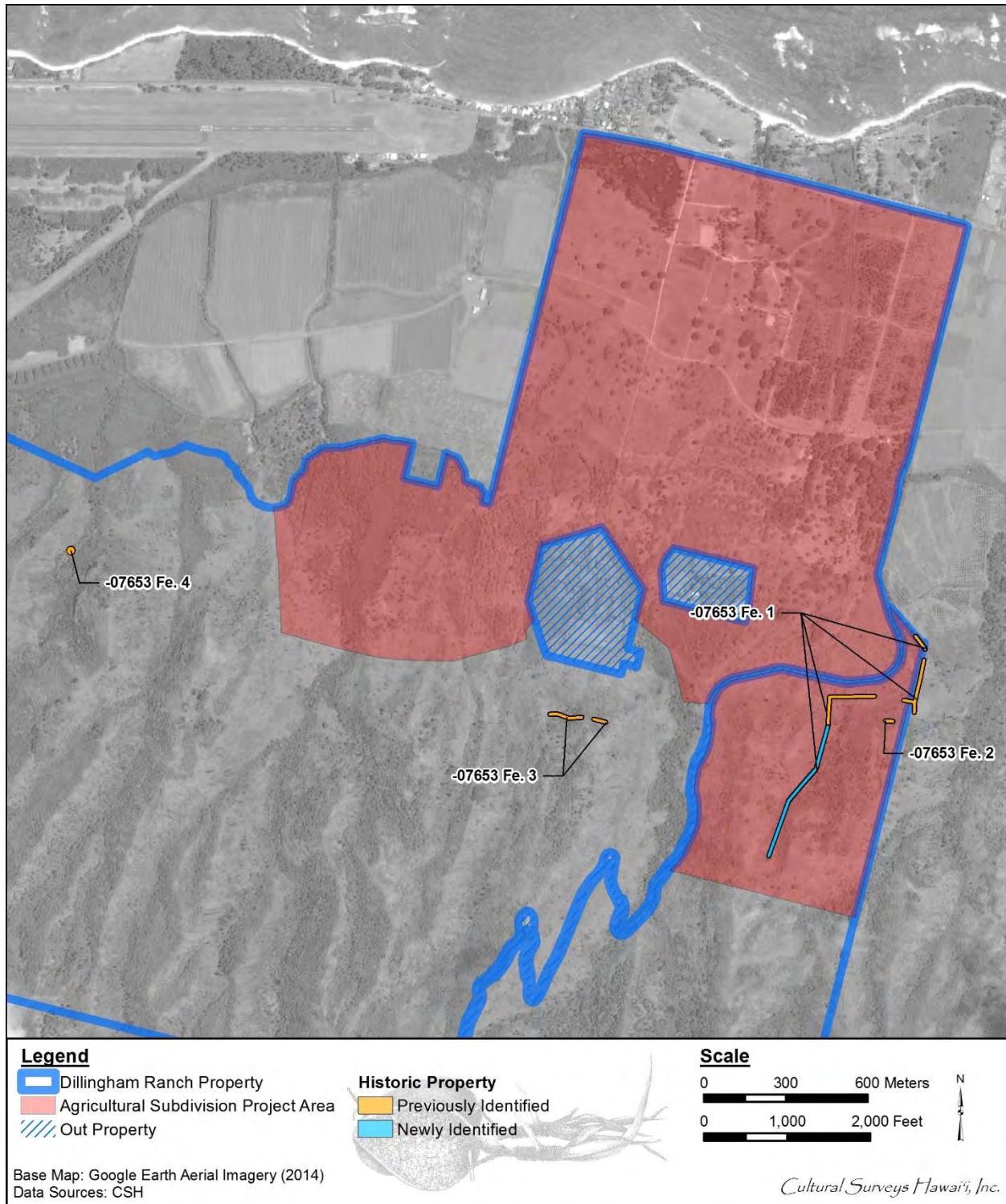


Figure 34. 2014 Google Earth aerial photograph showing the locations of SIHP # -7653 Features

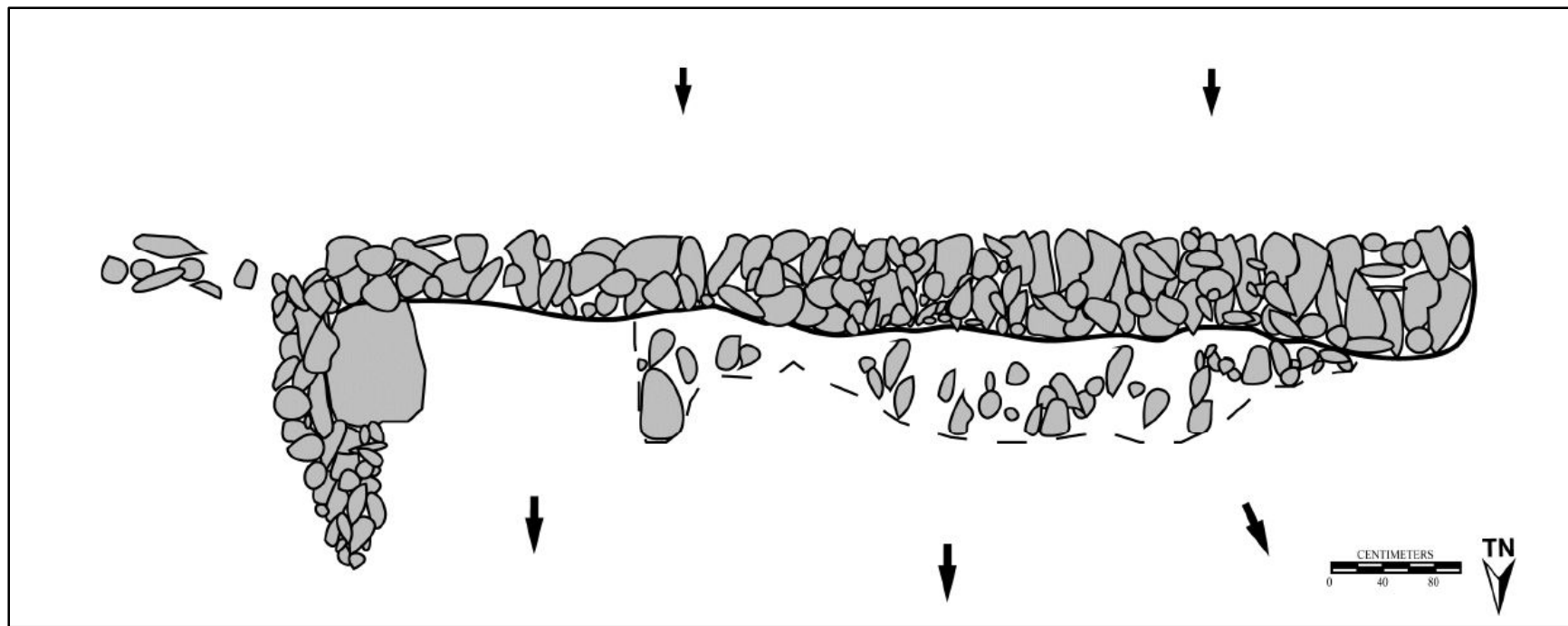


Figure 35. SIHP # 50-80-03-7653 Feature 1 plan map of portion of east-west segment (Lauer and Rieth 2015:33)



Figure 36. SIHP # 50-80-03-7653 Feature 1, view to southwest (Lauer and Rieth 2015:34)



Figure 37. SIHP # 50-80-03-7653 Feature 1, view to south (Lauer and Rieth 2015:34)

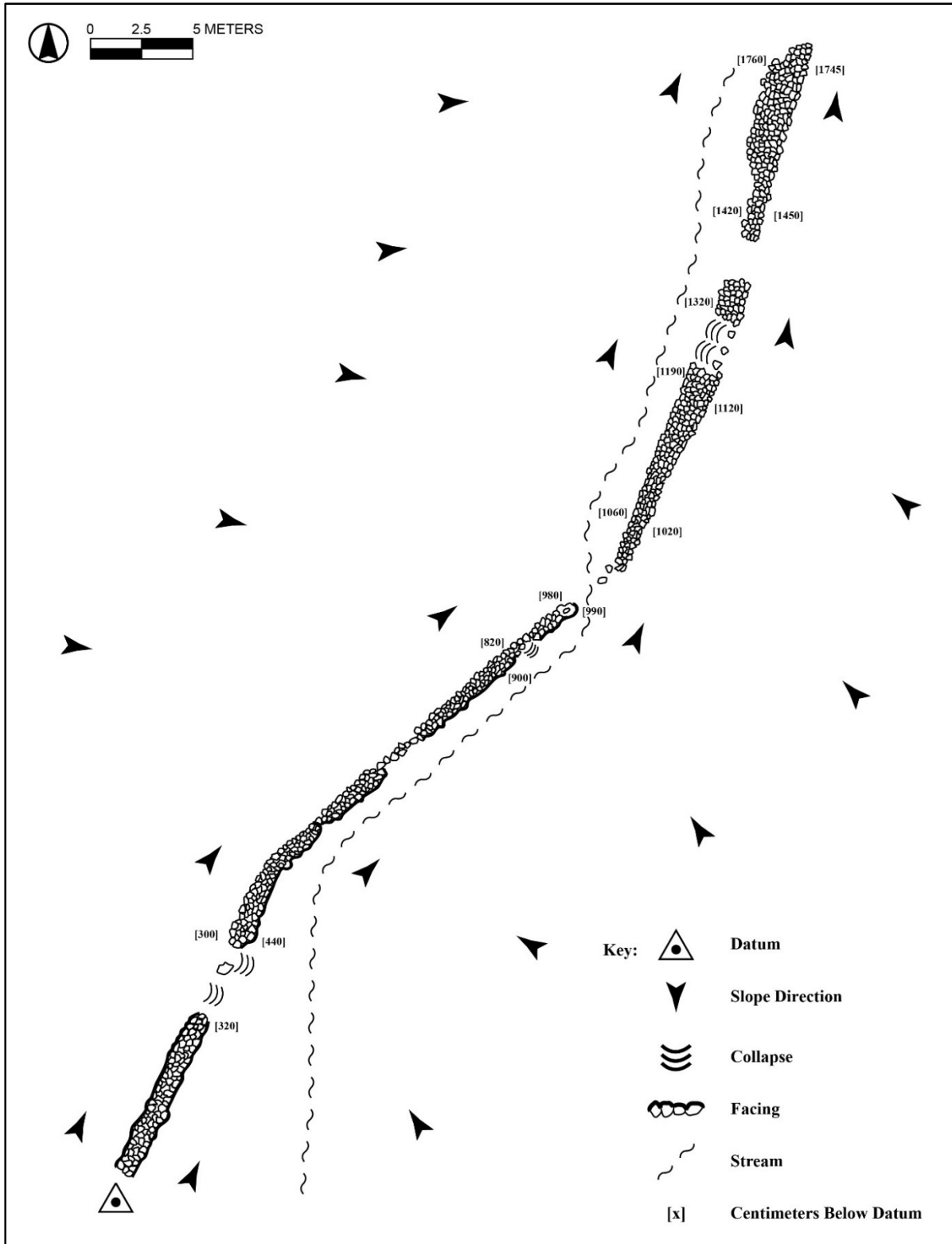


Figure 38. SIHP # 50-80-03-7653 Feature 1 (formerly SIHP # 50-80-03-4439) plan map of a portion of the south segment within the AIS study area



Figure 39. SIHP # 50-80-03-7653 Feature 1 (formerly SIHP # 50-80-03-4439) showing facing, view to southwest



Figure 40. SIHP # 50-80-03-7653 Feature 1 (formerly SIHP # 50-80-03-4439) disturbed portion, view to south



Figure 41. Intact portion SIHP # 50-80-03-7653 Feature 1 (formerly SIHP # 50-80-03-4439) with facing on both sides, view to northwest





Figure 42. Portion of SIHP # 50-80-03-7653 (formerly SIHP # 50-80-03-4439) showing wall built into hillside, view to northwest

During the current AIS, SIHP # 50-80-03-7653 Feature 1 was encountered extending into the AIS study area beyond the southern edge of the Lauer and Rieth (2015) study area. The wall was determined to be the same wall as the wall designated SIHP # 50-80-03-4439 and documented by Drolet and Schilz (1992b). The Feature 1 wall extends an additional 515 m south from the previously documented extent and is mostly intact and of similar construction. The Drolet and Schilz (1992b) description of SIHP # -4439 is as follows:

It is situated along the western bank of an unnamed stream channel that separates the two high ridges in this parcel. The wall extends 300 meters in a north-south direction, parallel to the stream channel, and runs from the low terraces to the top of the ridge. It measures one meter wide and 90cm in height, and is made of boulder and cobble construction. The feature appears to be prehistoric although no other cultural associations could be found in the area inspected. Only a few sections of the stone construction are damaged from cattle crossings; its location in the stream channel gully has protected it from further alterations. [Drolet and Schilz 1992b:3]

Features 2 through 4 were not encountered within the AIS study area (Figure 43 through Figure 48). Feature 2 is located within the Dillingham Ranch Agricultural Subdivision project area. The features described by Lauer and Rieth (2015) are as follows:

Feature 2 is a shorter dry-stacked stone wall located in the eastern survey parcel (see Fig. 8; Photo 7). This wall is 28 m long and is parallel to the east-west segment of Feature E. The core filled wall is constructed with multiple courses of basalt cobbles and small boulders. The maximum height of the wall is 0.6 m and the average width is 0.7 m [see Figure 13].

Feature 3 is a stacked stone wall located in the central survey parcel (see Fig 9; Photo 8-9). The dry stacked wall runs east-west in three sections across ridge tops and a shallow hanging valley. The total length of the wall is 210 m, including two breaches of 6 m and 45 m. Portions of the wall have been heavily damaged by erosion and have collapsed. A segment of the wall extends outside the project area on the bluff top running south from the project area for a minimum of 30 m. The maximum wall height is 1.6 m, the maximum width is 1 m with an average width of 0.7 m [see Figure 13].

Feature 4 is a stacked stone wall located in a steeply sided gully at the western edge of the western survey parcel (see Fig. 8, Fig. 10; Photo 10). The small L-shaped feature was built by infilling the gaps between large colluvial boulders with stacked stone courses. The northeastern portion of the wall is 7.9 m long and 0.7-0.9 m high, while the western portion of the wall, which runs parallel to the main stream bed, is 7.8 m long and 1.35-1.85 m high [see Figure 13]. [Lauer and Rieth 2015:31]

Drolet and Schilz (1992b) suggest SIHP # 50-80-03-4439 marks a remnant *mauka* edge of a pre-Contact agricultural complex previously destroyed by development or represents the *makai* boundary of an agricultural complex that expands outside the Dillingham Ranch Agricultural Subdivision project area. No evidence of this interpretation was observed during the current AIS. This AIS concurs with the interpretation by Lauer and Rieth (2015) that the walls are part of an integrated enclosure/exclosure system for the Dillingham Ranch.



Figure 43. Portion of SIHP # 50-80-03-7653 Feature 2, view to southwest (Lauer and Rieth 2015:35)

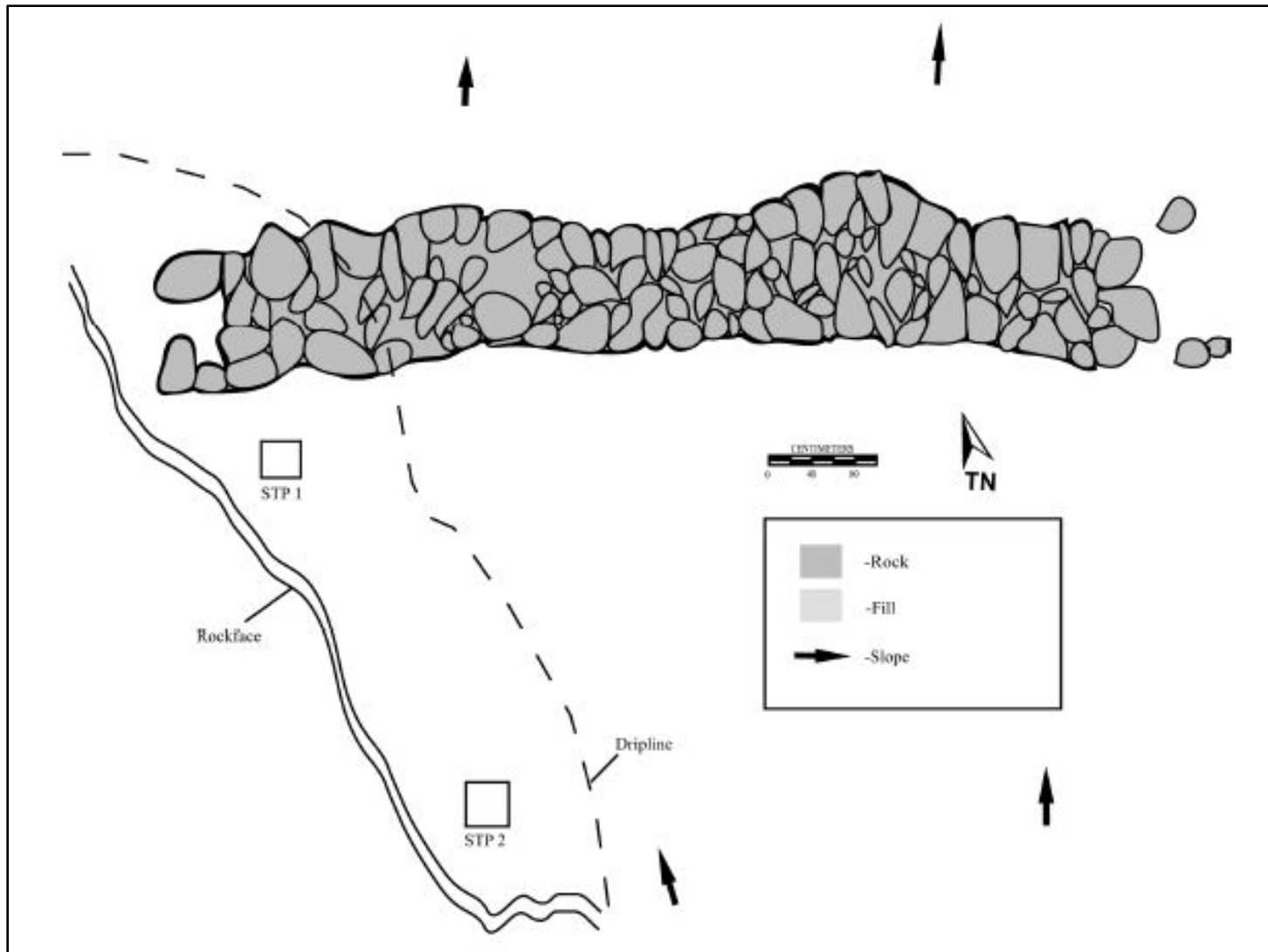


Figure 44. Plan map of a portion of SIHP # 50-80-03-7653 Feature 3 with rock shelter and dripline shown on left (Lauer and Rieth 2015:42) (note arrows point downslope)



Figure 45. SIHP # 50-80-03-7653 Feature 3, view to west (Lauer and Rieth 2015:37)



Figure 46. SIHP # 50-80-03-7653 Feature 3 and rock shelter, view to west (Lauer and Rieth 2015:36)

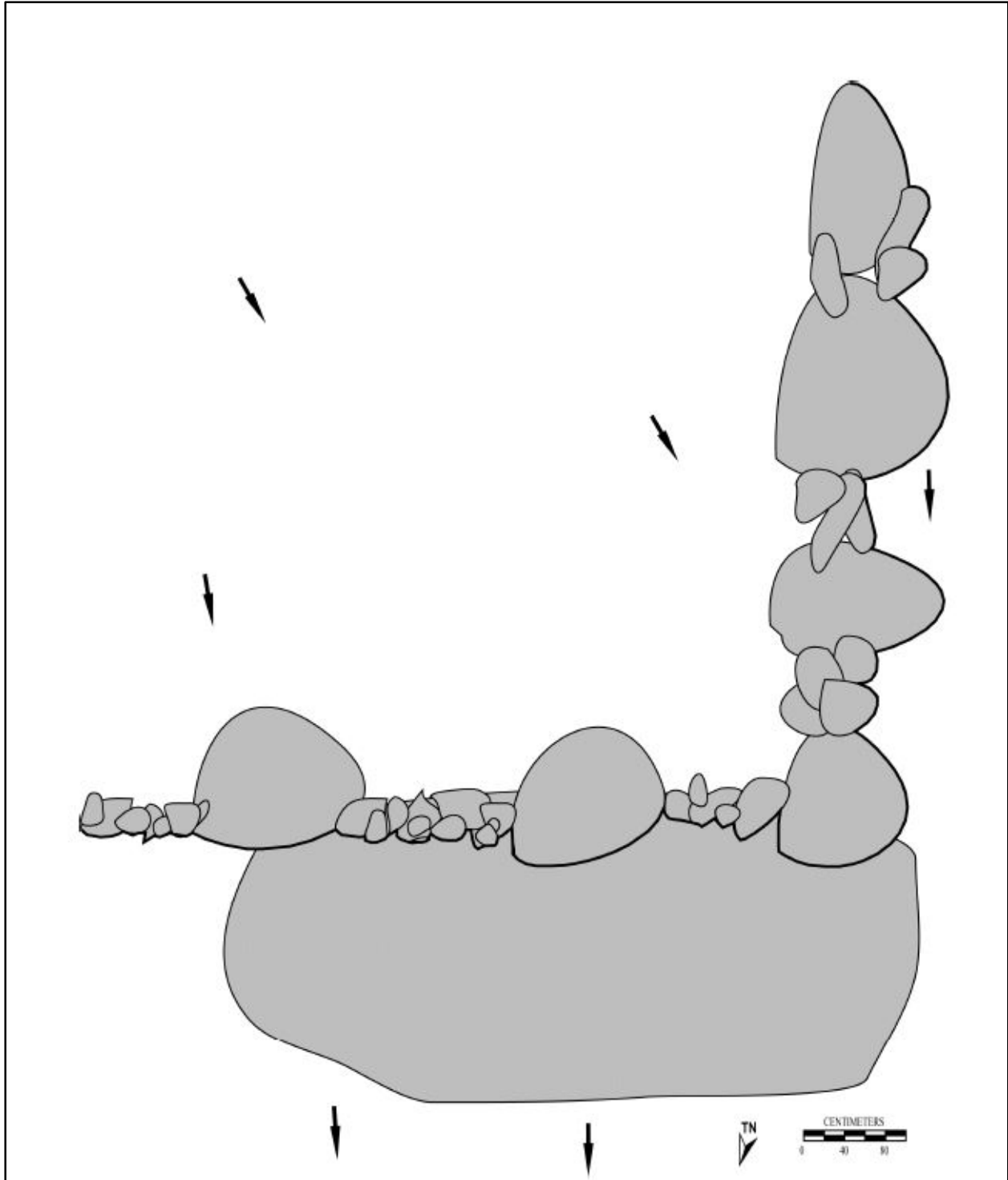


Figure 47. Plan map of SIHP # 50-80-03-7653 Feature 4 (Lauer and Rieth 2015:38) (note arrows point downslope, gray shading represent boulders/cobbles, and dark lining represents facing)



Figure 48. Portion of SIHP # 50-80-03-7653: Feature 4, view to southwest



SIHP # 50-80-03-7653, walls, was previously identified by Lauer and Rieth (2015). SIHP # 50-80-03-4439 (now SIHP # -7653 Feature 1) was previously assessed as significant by Drolet and Schilz (1992b) under Criterion d. This assessment of significance is for the overall site and applies to all features of the historic property. SIHP # -7653 was evaluated by Lauer and Rieth (2015:47) as significant pursuant to HAR §13-284-6 under Criterion d (have yielded, or is likely to yield, information important for research on prehistory or history) and was evaluated as eligible for listing on the Hawai'i Register of Historic Places per HAR §13-198-8 under Criterion D. This assessment was based on the historic property's distribution and characteristics providing information regarding ranching activities and land divisions (Lauer and Rieth 2015:iii,49). This historic property has provided information regarding ranching practices in the area; there is a potential that additional features of the historic property may be present in areas not yet surveyed. This report concurs with the Lauer and Rieth (2015) and Drolet and Schilz (1992b) assessment of significance. The historic property retains integrity of location, design, setting, materials, and workmanship.

Preservation is already a mitigation commitment for the previously identified features of SIHP # 50-80-03-7653 that are located within the Dillingham Ranch Agricultural Subdivision project area. Preservation is recommended for the newly identified and previously identified features of SIHP # -7653. SIHP # -7653 preservation measures are not current addressed in a preservation plan.

### 5.3 SIHP # 50-80-03-7976

<b>FORMAL TYPE:</b>	Wall
<b>FUNCTION:</b>	Animal husbandry
<b>NUMBER OF FEATURES:</b>	1
<b>SIZE:</b>	Total length is approximately 115 m
<b>AGE:</b>	Post-Contact
<b>LAND JURISDICTION:</b>	Dillingham Ranch
<b>PREVIOUS DOCUMENTATION:</b>	N/A

SIHP # 50-80-03-7976 consists of a basalt rock wall construction measuring approximately 1 m wide and extending approximately 115 m in an east/west orientation terminating at the edge of the tablelands in the west portion of the AIS study area (see Figure 20 through Figure 23).

The wall is constructed of dry-stacked basalt with a boulder base and smaller cobbles placed vertically about three to five courses high and three to four stacks wide (Figure 49 through Figure 52). Approximate height of the wall varies from 80 to 120 cm from the ground surface. The wall is faced on both sides with periodic areas of collapse throughout. The wall does not extend to the previously identified historic property SIHP # 50-80-03-7653 Feature 1, a large cattle wall documented by Lauer and Rieth (2015) and formerly designated SIHP # 50-80-03-4439 by Drolet and Schilz 1992b. It is unclear if the two walls are associated with each other. However, SIHP # -7976 is similar to SIHP # -7653 and many other cattle walls throughout the Dillingham Ranch property.

SIHP # 50-80-03-7976, wall, is assessed for significance pursuant to HAR §13-284-6 under Criterion d (have yielded, or is likely to yield, information important for research on prehistory or history). This is based on the historic property's yielding information regarding ranching activities on the Dillingham Ranch property. Additional features of the historic property may be present outside the previously surveyed areas, and there is a potential that additional information on the age of the wall may be acquired. The historic property retains integrity of location, design, setting, materials, and workmanship.

No further work is recommended for this historic property. However, archaeological monitoring is required for the proposed project for all ground disturbing activities.

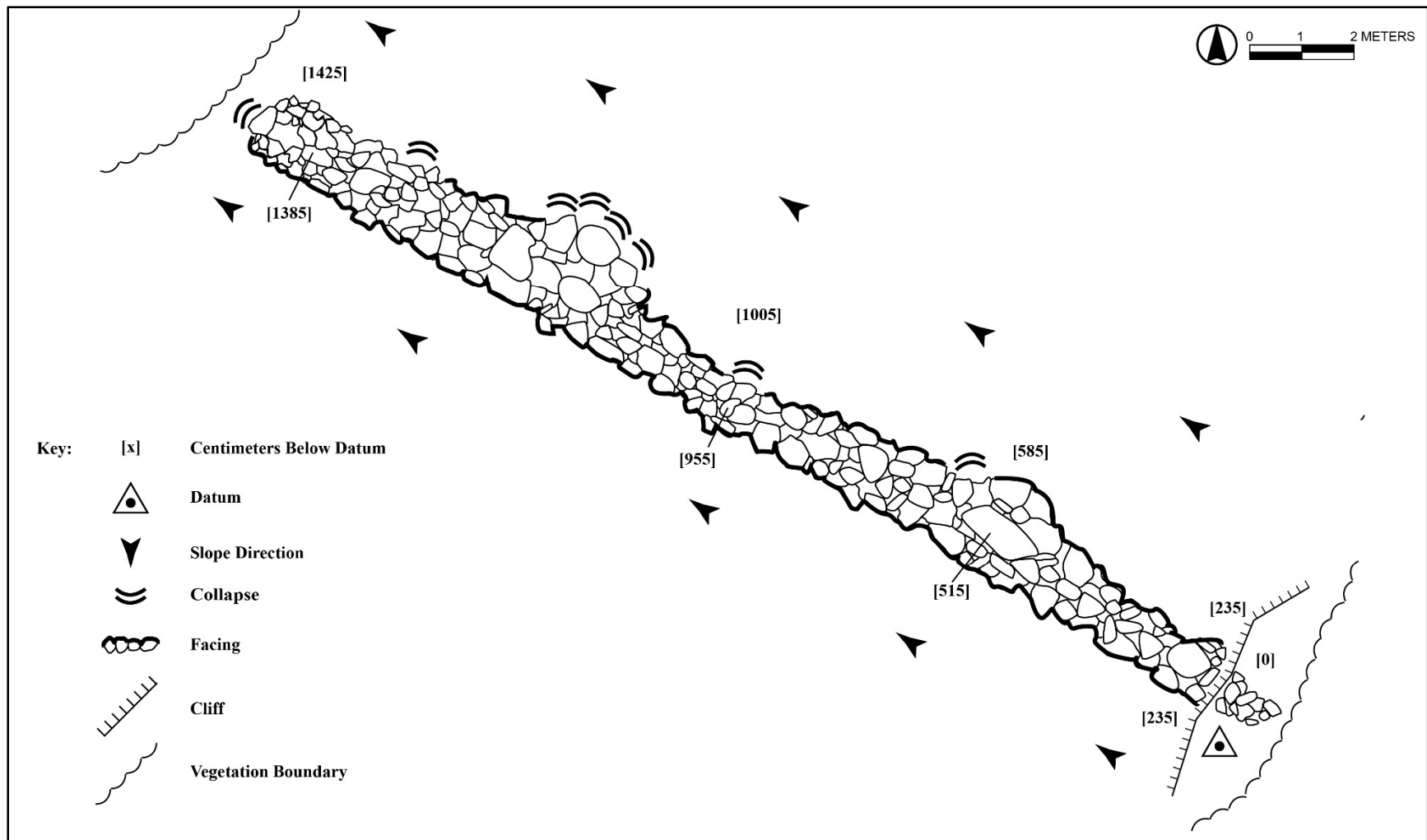


Figure 49. Plan map of a representative portion of SIHP # 50-80-03-7976



Figure 50. Faced portion of SIHP # 50-80-03-7976, view to south



Figure 51. Plan view of SIHP # 50-80-03-7976



Figure 52. SIHP # 50-80-03-7976 extending over cliff face, view to southeast

## 5.4 SIHP # 50-80-03-7977

<b>FORMAL TYPE:</b>	Terraces
<b>FUNCTION:</b>	Agricultural and ranching
<b>NUMBER OF FEATURES:</b>	9
<b>SIZE:</b>	Approximately 650 sq m
<b>AGE:</b>	Pre-Contact to early post-Contact
<b>LAND JURISDICTION:</b>	Dillingham Ranch
<b>PREVIOUS DOCUMENTATION:</b>	None

SIHP # 50-80-03-7977, located in the southeast corner of the project area along Makaleha Streambed, consists of a system of terraces on both the west and east side of the stream extending to the western extent of the Dillingham Ranch Agricultural Subdivision project area and AIS study area (see Figure 20 through Figure 23). SIHP # -7977 consists of nine features: a square-shaped terrace (Feature A), three terraces on the east side of the project area (Features B through D), a terrace cutting across the stream (Feature E), a terrace on the west side of the stream (Feature F), a U-shaped terrace (Feature G), and two upstream terraces on the west side of the stream (Features H and I) (Figure 53 and Figure 54).

The terrace complex is within the valley *mauka* of a former large Hawaiian settlement (Site 196) identified by McAllister (1933). The village site is indicated to be located east of the Dillingham Ranch Agricultural Subdivision project area downstream of SIHP # -7977. It is likely these terraces were once agricultural terraces associated with this large settlement that is no longer extant. The following description was provided by McAllister (1933):

In the valley near the mountain side of the Greenfield house was once evidently a large Hawaiian settlement. Old coconut palms and the dead trunks of others, portions of house sites, isolated sections of terracing, can still be found, despite the inroads of roaming cattle. Water freshets have also obliterated many remains. These sites are thought to have furnished the stones for the numerous walls, probably of later construction, on the hillside and in the valley. [McAllister 1933 in Sterling and Summers 1978:101]

SIHP # 50-80-03-7977 Feature A is at the north end of the stream adjacent to the east project area boundary (see Figure 53 and Figure 55). It consists of a triangle-shaped terrace with a flattened area on top on the east side of the stream bed. Portions of terrace walls are clear and intact and the site feature is in fair to good condition. The northwest wall adjacent to the orientation of the stream is a stacked wall construction approximately 90 cm in height. Along the northeast wall of the terrace there are small stacked stones approximately 1 m long, 60 cm in height, and approximately 20 cm wide. The northwest wall of the terrace is in good condition, while the northeast wall is in poor to fair condition. Both walls of the terrace are approximately one course wide (50 cm). The southernmost portion of the wall is much wider than the northern portions at approximately 2 m wide and is made of a larger boulder pile than smaller stacked stones. The upper surface of the terrace is flat and may be evidence of pre-Contact or early post-Contact agricultural terracing.

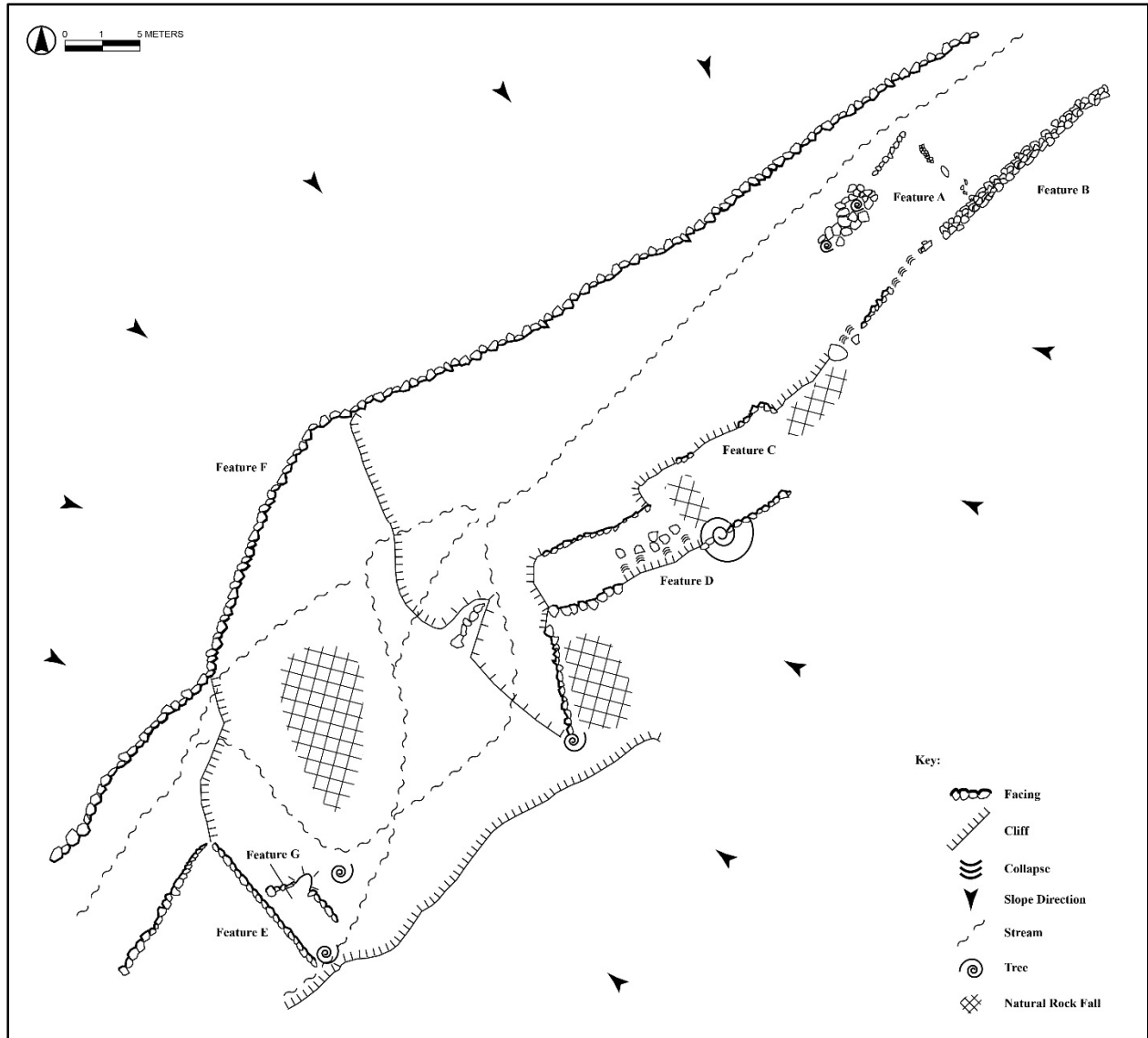


Figure 53. Plan map of SIHP # 50-80-03-7977 Features A–G



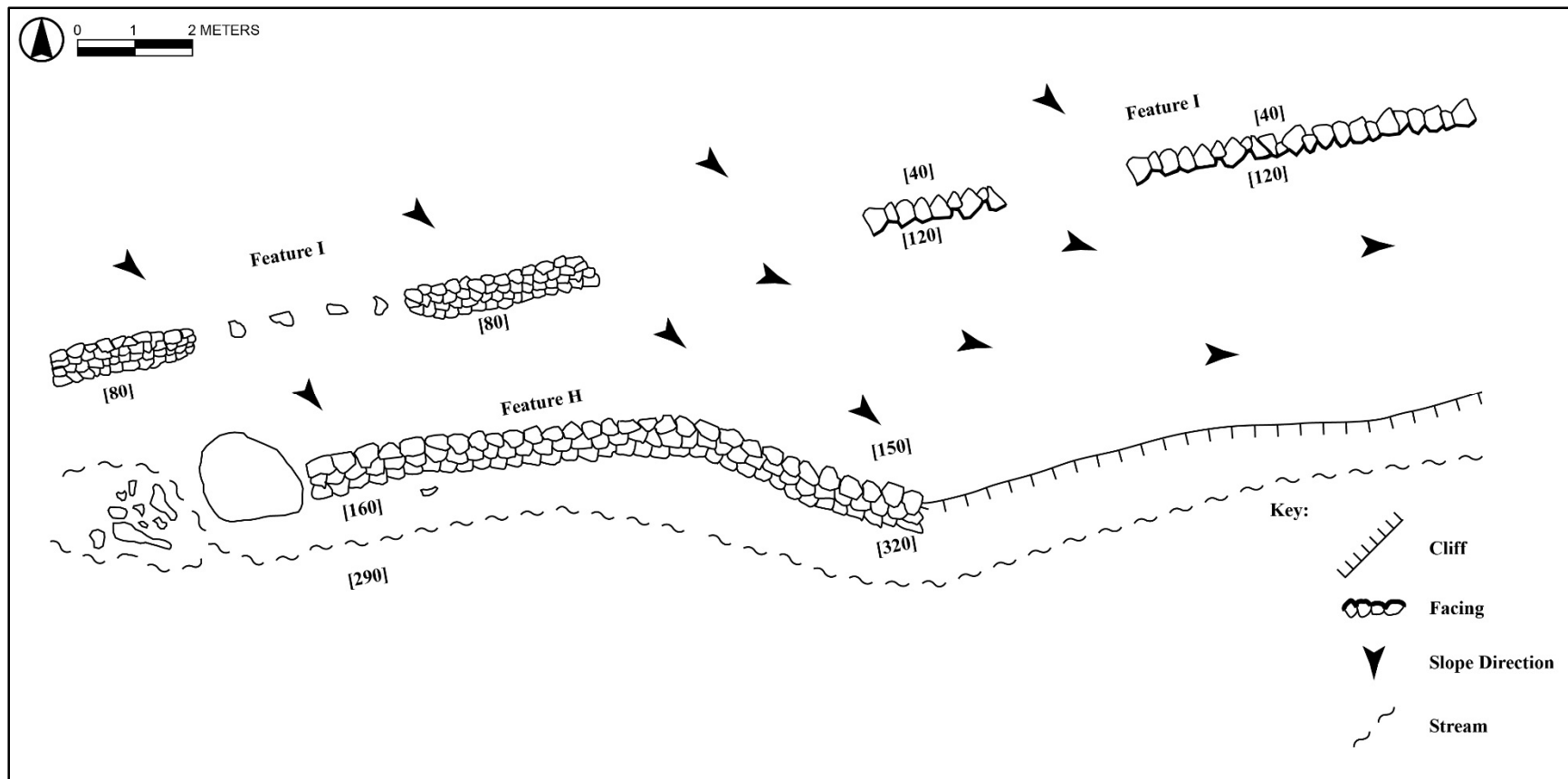


Figure 54. Plan map of SIHP # 50-80-03-7977 Features H and I



Figure 55. Northwest wall of SIHP # 50-80-03-7977 Feature A terrace showing the stacked basalt construction approximately five to six courses tall, view to east

SIHP # 50-80-03-7977 Feature B is a terrace wall that abuts the property boundary and extends south back into the valley approximately 15 m long (see Figure 53 and Figure 56). The terrace wall is a basalt stacked stone construction in fair condition. Areas of extensive water runoff and grass growth have disturbed portions of the wall. The intact portions of the wall measure three courses high (measuring 120 cm in height), with the bottom course being larger boulders with smaller stones stacked atop, and one course wide (50-80 cm). This portion of terracing may have also been associated with pre-Contact or early post-Contact agricultural practices.

SIHP # 50-80-03-7977 Feature C is the lower terrace wall further south from Feature A and Feature B adjacent to the stream bed (see Figure 53 and Figure 57). The feature wall measures approximately 30 m in length, 1.8 m at maximum height, and is 50 cm to 1 m wide. The wall is in good condition with only a few minor areas of collapse where the top stacked stones have fallen. The wall is constructed of stacked stones, intermittent cliff facing with stacked stones on top, and natural boulders with rock to fill in areas that are not as high. In areas where rock is stacked, the terrace wall is four to six courses tall with the bottom course being larger boulders. The terrace wall extends into SIHP # 50-80-03-7977 Feature D at the southern extent of the feature. The terrace platform is a flattened area and extends to Feature D and is associated with pre-Contact or early post-Contact agricultural practices and early historic ranching activities.

SIHP # 50-80-03-7977 Feature D is a terrace located upslope of Feature C (see Figure 53 and Figure 58 through Figure 60). The terrace is approximately 30 m in length with a maximum height of 1.5 m and an average width of 1 m. The terrace facing is comprised of dry-stacked basalt cobbles and boulders that lie atop a basalt outcrop cliff face approximately 1 m in height. The northern end of the basalt facing is primarily cobbles four to five courses high. Soil is present atop the terrace in this portion. A large banyan tree is growing over the majority of these cobbles. In the center of the feature (south of the banyan tree), the feature has been disturbed. Boulders and cobbles (likely the former terrace facing in this portion) were observed at the base of the outcrop, likely the result of natural forces or the grazing cattle observed in the area. South of the collapsed area, the construction is different and there is a lack of soil atop the terrace. This portion is constructed of boulders two to three courses high and loosely stacked. Atop the terrace are many large boulders and cobbles, likely fallen from the large cliff faces and outcrops upslope of the terrace. The terrace extends east at the stream and extends into a large cliff face. The feature is in fair condition, with the continual rock fall from upslope, and the vegetation overtaking the feature causing the majority of the damage. The terrace platform is not as flat as the other terraces in the area and is more rocky. Feature D is likely associated with pre-Contact or early post-Contact agricultural practices and was likely modified during historic ranching activities.

SIHP # 50-80-03-7977 Feature E is a large terrace located approximately 26 m southwest of Feature D (see Figure 53, Figure 61, and Figure 62). The terrace extends from the cliff face of a large outcrop in a northeast direction approximately 10 m to Makaleha Stream. The dry-stacked basalt cobble facing in this portion is six to seven courses high with a maximum height of 1.4 m. The facing extends perpendicular to the stream bed and follows the direction of a basalt outcrop cliff face in which the stream extends down. The terrace facing turns southwest and follows the edge of the stream approximately 8 m. This portion is less intact, likely due to natural stream erosion, however, in portions that were intact, the dry-stacked basalt cobble terrace facing was approximately two to three courses high with a maximum height of 50 cm. The terrace platform consisted of soil and was entirely flat with only a few small boulders observed on the surface,



Figure 56. Southern portion of SIHP # 50-80-03-7977 Feature B terrace wall showing the larger boulders on the bottom with smaller stacked stones on top, view to south



Figure 57. Northern portion of SIHP # 50-80-03-7977 Feature C showing the terrace wall and Feature D in the background, view to south



Figure 58. Southern portion of terrace facing of SIHP # 50-80-03-7977 Feature D, showing the banyan tree overtaking most of the structure, view to east



Figure 59. Northern portion of terrace wall of SIHP # 50-80-03-7977 Feature D, showing growth of banyan tree on wall face, view to east



Figure 60. Southern portion of SIHP # 50-80-03-7977 Feature D wall showing stacked stone atop boulder construction, view to south



Figure 61. SIHP # 50-80-03-7977 Feature E terrace wall that runs in an east-west orientation across the river valley, view to west



Figure 62. Flattened area of SIHP # 50-80-03-7977 Feature E terrace, view to west

likely the result of falling from the steep slope to the south. The terrace was in good condition and is likely associated with pre-Contact or early post-Contact agricultural practices.

SIHP # 50-80-03-7977 Feature F is a terrace facing that extends along the west side of Makaleha Stream (see Figure 53, Figure 63, and Figure 64). The terrace is approximately 96 m in length. The terrace facing consists of dry-stacked basalt cobbles two to three courses high with a maximum height of 60 cm. Where the stream extends down the face of a basalt outcrop, the terrace face makes a nearly right-angled turn to the northwest and follows the outcrop before turning northeast again following the contour of the slope. Feature F extends to the northeast beyond the study area. The feature ends approximately 15 m southwest of the turn at the cliff face roughly parallel to Feature E's facing along the edge of the stream. The feature is in good condition and is continuous only throughout the documented section. It does not appear the feature was disturbed at its southernmost extent, however, it is likely associated with Feature H and/or Feature I as the features have similar construction, design, and function and additional features may also be extant between Features E and H, however, dense vegetation likely has obscured them from view. Feature F is likely associated with pre-Contact or early post-Contact agricultural practices and was likely modified during historic ranching activities.

SIHP # 50-80-03-7977 Feature G is a small square-shaped terrace downslope of Feature E (see Figure 53 and Figure 65). The terrace extends 4 m northeast from approximately the mid-point of Feature E's northeast terrace facing. The terrace facing turns southeast at a small basalt outcrop and extends approximately 5 m. A natural spring extending from just above Feature E runs between the features and the basalt outcrop cliff face. The upper surface of the terrace is flat and comprised of soil which may be evidence of pre-Contact or early post-Contact agricultural terracing.

SIHP # 50-80-03-7977 Feature H is similar to Feature F. The feature is approximately 12 m in length and extends along the northwestern edge of Makaleha Stream approximately 70 m southwest of Feature F (see Figure 54, Figure 66, and Figure 67). The dry-stacked basalt boulder and cobble terrace facing is five courses tall with a maximum height of 1.7 m. It extends from a large boulder to a basalt outcrop cliff face. The upper surface of the terrace is relatively flat and comprised of soil which may be evidence of pre-Contact or early post-Contact agricultural terracing.

SIHP # 50-80-03-7977 Feature I is similar to Feature A in construction and design. Feature I is located approximately 2 m upslope of Feature H and consists of three to four courses of dry-stacked basalt cobbles (see Figure 54, Figure 67, and Figure 68). The terrace is discontinuous and was observed in four sections. The southernmost two sections were not vertically faced, but angled slightly. The two northernmost sections were vertically faced. The feature extends a total of 29 m. It could not be established if the gaps in the terrace facing were by design or due to erosion or disturbance. The upper surface of the terrace is relatively flat and comprised of soil which may be evidence of pre-Contact or early post-Contact agricultural terracing.

SIHP # 50-80-03-7977, agricultural feature complex, is assessed for significance pursuant to HAR §13-284-6 under Criteria d (have yielded, or is likely to yield, information important for research on prehistory or history) and 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). This is





Figure 63. Stacked basalt wall of SIHP # 50-80-03-7977 Feature F located on west bank of stream, view to west



Figure 64. Southern portion of SIHP # 50-80-03-7977 Feature F, view to northwest



Figure 65. SIHP # 50-80-03-7977 Feature G extending from Feature E, view to west



Figure 66. Portion of SIHP # 50-80-03-7977 Feature H along Makaleha Stream, view to north



Figure 67. SIHP # 50-80-03-7977 Feature H (in foreground) and SIHP # 50-80-03-7977 Feature I (in background), view to northwest



Figure 68. Southernmost terrace facing of SIHP # 50-80-03-7977 Feature I, view to northwest

based on the historic property's potential to provide information regarding traditional Hawaiian cultural and agricultural practices. The terrace complex likely extends along the stream well beyond the survey area. In addition, there is a potential for additional information regarding agricultural use to be acquired. This may include types of crops that may have been cultivated within the complex, soil suitability studies, crop yield analysis, and the modification of the terraces for ranching use. The assessment of significance is for the overall site, applies to all features of the historic property and this report agrees with this assessment. The historic property retains integrity of location, design, setting, materials, and workmanship.

Based on the findings of this AIS, preservation is recommended for SIHP # 50-80-03-7977. SIHP # -7977 preservation measures are not current addressed in a preservation plan. Consultation with NHOs and individuals knowledgeable about the project area's history should be conducted during the development of the preservation plan.

## 5.5 SIHP # 50-80-03-7978

<b>FORMAL TYPE:</b>	Platform
<b>FUNCTION:</b>	Possible habitational/ceremonial
<b>NUMBER OF FEATURES:</b>	1
<b>SIZE:</b>	7.8 m by 6.8 m (approximately 53 sq m)
<b>AGE:</b>	Pre-Contact to early post-Contact
<b>LAND JURISDICTION:</b>	Dillingham Ranch
<b>PREVIOUS DOCUMENTATION:</b>	N/A

During a brief period of archaeological monitoring associated with Dillingham Ranch improvements in 2008, a platform was located by CSH archaeologists. The feature was undocumented except for a photograph and GPS location.

The platform was located, photographed, and documented during the current AIS (see Figure 22 and Figure 23). The platform consisted of a rock-filled rectangular structure of dry-stacked basalt stone walls of varying heights composed of varying stone sizes (Figure 69 through Figure 75). The platform is in fair condition. The overall dimensions of the platform are approximately 6.7 m in width and 7.8 m in length. The maximum height of the northwest wall stands at 150 cm and the height of the constructed alignment at the southeast wall is at 40 cm.

The platform walls are constructed of large basalt boulders and smaller cobble walls, with a smaller cobble interior. The walls are faced on the northeast, northwest, and southwest sides. The walls are approximately five to six courses tall (at the tallest point) and one to two courses wide, with the larger boulders at the base and the smaller cobbles resting on top. There are no areas of collapse in the constructed walls, however, the northeast and southeast walls are not as well preserved and have gaps in their construction. It is unclear if these gaps are by design or if the stones were removed, as there has been documented collecting of stones from the area (Mitchell 1987).

SIHP # 50-80-03-7978 is located approximately 50 m northeast of SIHP # 50-80-03-4786 (platform) (see Figure 22 and Figure 23) documented by Drolet and Schilz (1992) and Tulchin and Hammatt (2008) as having a possible religious/ceremonial function. It is also possible the platform is a remnant house platform or some other structure related to habitational use. The two platforms (SIHP #s -4786 and -7978) share similar construction methods and may be associated with each other, however, a direct association could not be definitively established.

SIHP # 50-80-03-7978, platform, is newly identified and assessed as significant pursuant to HAR §13-284-6 under Criteria d (have yielded, or is likely to yield, information important for research on prehistory or history) and 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). This is based on the historic property's potential to provide information regarding traditional Hawaiian cultural practices. Additional information regarding the construction, age, and function of the

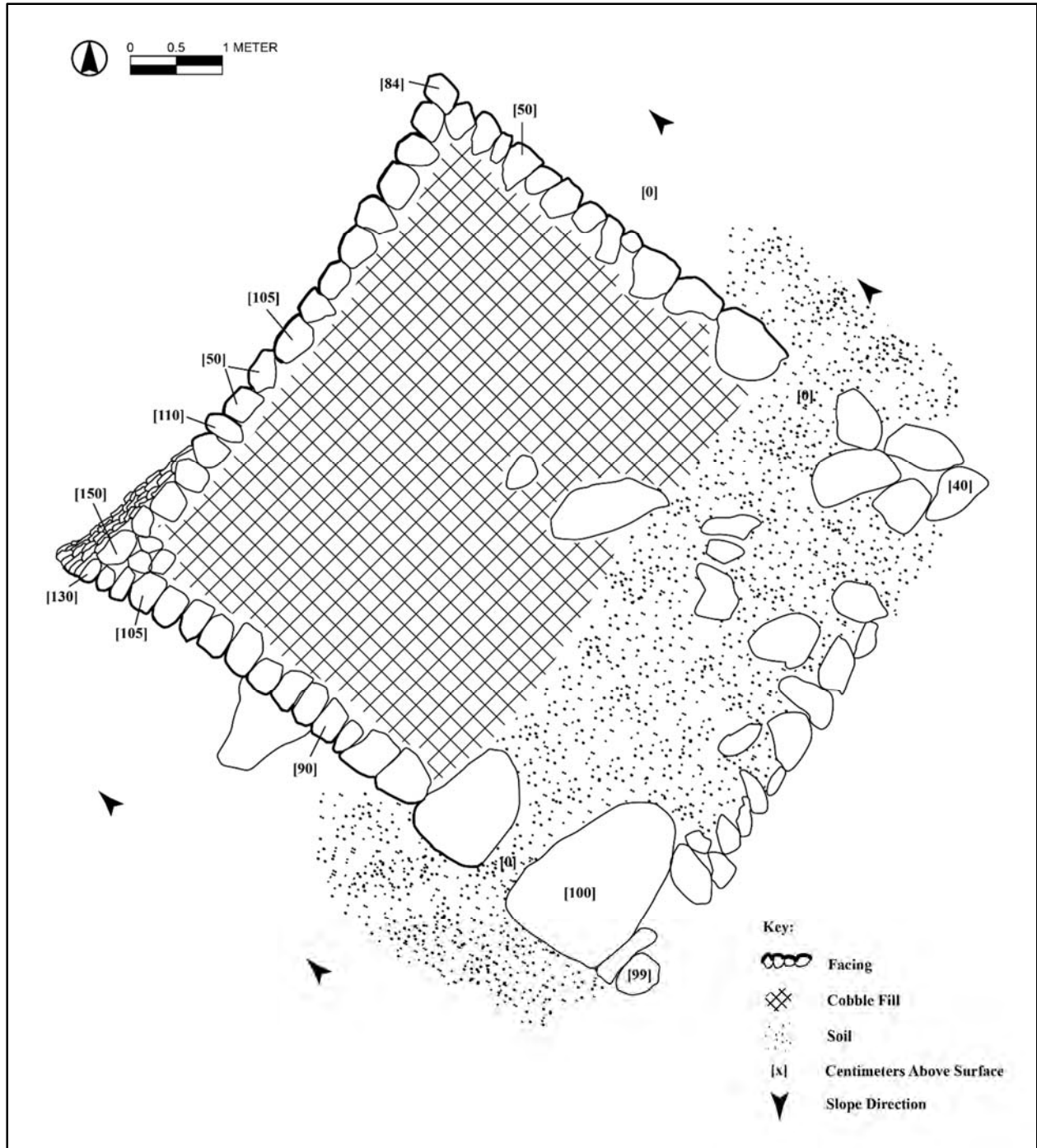


Figure 69. Plan map of SIHP # 50-80-03-7978



Figure 70. Photograph of SIHP # 50-80-03-7978 platform observed ca. 2008, view to east (from CSH project files associated with 2008 brief archaeological monitoring)



Figure 71. Photograph of northwest and southwest walls of SIHP # 50-80-03-7978, view to south



Figure 72. Photograph of faced southwest wall of SIHP # 50-80-03-7978, view to west





Figure 73. Plan view of northeast wall of platform and small boulder rock fill (SIHP # 50-80-03-7978), view to southwest



Figure 74. Northwest wall of SIHP # 50-80-03-7978 platform, view to east (north arrow marked incorrectly)



Figure 75. Large boulders along the southwest wall of SIHP # 50-80-03-7978 with a gap in the wall construction, view to east

historic property can potentially be collected. The historic property has a possible religious or ceremonial function based on its construction and therefore has an important value to the Native Hawaiian people with its association with their traditional beliefs and cultural practices. This assessment of significance is for the overall site and applies to all features of the historic property. The historic property retains integrity of location, design, setting, materials, and workmanship. This report agrees with this assessment.

Based on the findings of this AIS, preservation is recommended for SIHP # 50-80-03-7978. SIHP # -7978 preservation measures are not current addressed in a preservation plan. Consultation with NHOs and individuals knowledgeable about the project area's history should be conducted during the development of the preservation plan.

## Section 6 Summary and Interpretation

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At the request of Dillingham Ranch Aina, LLC, CSH has prepared this AISR for a portion of the Dillingham Ranch Agricultural Subdivision project, Mokulē'ia Ahupua'a, Waialua District, O'ahu, TMK: [1] 6-8-003:005 (por.). The approximately 878.3-acre Dillingham Ranch Agricultural Subdivision project area is located on the 2,721-acre (1,101-hectare) Dillingham Ranch property. The 113.5-acre AIS study area is located within TMK: [1] 6-8-003:005 on Dillingham Ranch property east of the Mokuleia Access Road. This report was "prepared to record and synthesize the data gathered from background research, field survey and consultation process with knowledgeable individuals" in accordance with HAR §13-276-5(a).

Four project-specific AISs were conducted for Dillingham Ranch (Drolet and Schilz 1992a and 1992b; Lauer and Rieth 2015; Tulchin and Hammatt 2007) in various portions of the Dillingham Ranch Agricultural Subdivision project area. The combination of these four AIS studies covers the entire Dillingham Ranch Agricultural Subdivision project area, with the exception of approximately 60 acres on the southeast portion of the Dillingham Ranch Agricultural Subdivision project area. This AIS report is intended to cover the areas not previously surveyed.

Waialua District contained a set of centrally located productive lands and peripheral areas that were ecologically marginal but that had access to abundant ocean resources. Large swaths of *lo'i kalo* were located on the floodplains of four major streams that flowed from gorges within the Wai'anae Mountains, and two large fishponds were located around Waialua Bay. Small fishing communities were also located at the western and eastern edges of Waialua Moku. The small fishing communities had access to very rich deep-sea fishing grounds (Sahlins 1992:20).

Prior to Western Contact, the population for the whole of Waialua (including the *ahupua'a* of Mokulē'ia and Kawaihāpai) had been estimated at 6,000 to 8,000 people (Sahlins 1992:20). Following Western Contact, there was a steep population decline that has been attributed to a high death rate from newly introduced diseases such as smallpox, typhus, and venereal diseases.

Following the initiation of the Māhele and Kuleana Act in 1845, many of the Native Hawaiians living within Waialua Moku and notable foreigners bought lands through the Waialua land agent and missionary John Emerson. A total of 27 land grants were purchased in the *ahupua'a* of Mokulē'ia and 16 in the *ahupua'a* of Kawaihāpai. Portions of 17 land grant lots are located within the Dillingham Ranch Agricultural Subdivision project area, granted from 1850 to 1855. Two descendants of missionaries, William Emerson and John T. Gulick, were the first foreigners to buy land in Mokulē'ia and Kawaihāpai.

By the early 1900s, sugarcane plantations and large ranches came to dominate the lands of western Waialua. In 1897, B.F. Dillingham purchased the Kawailoa Ranch in Mokulē'ia, including over 2,000 head of cattle and over 100 horses and mules (Yardley 1981:193). Dillingham also leased additional property in Mokulē'ia, including the Gaspar Silva Ranch, the James Gay Estate, and other lands in the area that he could secure. Following the construction of the OR&L railroad in 1898, Dillingham began selling off or subleasing much of his lands in western Waialua. However, Dillingham retained as his personal ranch "a great strip of mountainside and beaches with flat land in between and a homestead in the middle" (Yardley 1981:206). By the mid- to late twentieth century, lands within Mokulē'ia and Kawaihāpai were occupied by the Crowbar Ranch,

Campbell Ranch, and Dillingham Ranch. These land holdings were later consolidated under the control of the Mokuleia Land Company.

The AIS study area likely was not heavily used prior to Contact, with the exception of the Makaleha Stream area. The “large Hawaiian settlement” (McAllister’s [1933] Site 196) was located northeast of the AIS study area. This suggests there could be some pre-Contact use of the Y-shaped ridge. The AIS study area has been heavily used for ranching in the post-Contact period with cattle ranching dominating the area. Land grants in this area do not provide any additional information regarding land use in the AIS study area.

Fieldwork, consisting of a pedestrian inspection was conducted between 22 November and 2 December 2016 by CSH archaeologists under the general supervision of David W. Shideler, M.A. The two sites observed during the brief 2008 archaeological monitoring were also located and documented during this AIS. Three historic properties were located within the AIS study area. These include two cattle walls (SIHP # 50-80-03-7653 Feature 1 and SIHP # 50-80-03-7976) and a terrace complex along Makaleha Stream (SIHP # 50-80-03-7977). As discussed previously, two additional historic properties outside the AIS study area but within the Dillingham Ranch Agricultural Subdivision project area were documented. These consist of a wall (SIHP # 50-80-03-4777 Feature C) understood as a Grant 457 Lot 2 boundary wall and a platform (SIHP # 50-80-03-7978).

These historic properties represent both pre-Contact and post-Contact land use of the area. Pre-Contact agricultural, habitational, and ceremonial features have been identified within the AIS study area and throughout the Dillingham Ranch Agricultural Subdivision project area. Throughout the Dillingham Ranch Agricultural Subdivision project area these features are intermixed with land grant boundary walls, cattle walls, and other historic agricultural and ranching infrastructure. The dominance of cattle walls within the AIS study area further solidifies the vast network of ranching-related infrastructure in the area. While no evidence of McAllister’s (1933) Site 196 has been documented northeast of the AIS study area, evidence of pre-Contact to early post-Contact agricultural use of the Makaleha Stream valley may be evidence that the “large Hawaiian settlement” was previously extant *makai* of the AIS study area. While no definitive evidence exists that at least portions of the AIS study area were in use prior to Contact, the findings of this AIS and the results of previously conducted AISs in the area suggest a high probability of pre-Contact use.

## Section 7 Significance Assessments

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Five historic properties were documented during the course of AIS fieldwork. Table 6 lists the historic properties along with their significance assessments and mitigation recommendations. These significance recommendations are included in this AISR for the review and concurrence of the SHPD. Historic property significance is assessed based on the five State of Hawai'i historic property significance criteria. To be considered significant, a historic property must possess integrity of location, design, setting, materials, workmanship, feeling, and/or association and meet one or more of the following broad cultural/historic significance criteria (in accordance with HAR § 13-284-6):

- 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; or
- 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.

Pursuant to HAR §13-198-8, two historic properties were previously evaluated for eligibility for listing on the Hawai'i Register of Historic Places. To be considered eligible for listing on the Hawai'i Register of Historic Places, a historic property should possess integrity as described above, and meet one or more of the following broad significance criteria:

- A. Associated with events that have made a significant contribution to the broad patterns of our history;
- B. Associated with the lives of persons significant in our past;
- C. Embody the distinctive characteristics of a type, period, or method of construction, or that represent that work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction;
- D. Have yielded, or may be likely to yield, information important in 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 history accounts—these associations being important to the group's history and cultural identity.

Table 6. Historic property integrity, significance, and mitigation recommendations

SIHP #	Formal Type	Function	Condition	Integrity							Eligibility/ Significance	Mitigation Recommendation
				Location	Design	Setting	Materials	Workmanship	Feeling	Association		
50-80-03-4777	U-shaped wall	Property boundary	Poor to intact	Y	Y	Y	Y	Y	N	N	C and D/ c and d	Preservation
50-80-03-7653	Walls	Animal husbandry	Fair	Y	Y	Y	Y	Y	N	N	D/ d	Preservation
50-80-03-7976	Wall	Animal husbandry	Poor to fair	Y	Y	Y	Y	Y	N	N	d	Monitoring
50-80-03-7977	Terrace complex	Agriculture	Fair to good	Y	Y	Y	Y	Y	N	N	D/ d and e	Preservation
50-80-03-7978	Platform	Possibly habitational or ceremonial	Fair	Y	Y	Y	Y	Y	N	N	D/ d and e	Preservation



SIHP # 50-80-03-4777, U-shaped wall, was previously documented by Drolet and Schilz (1992a) and Tulchin and Hammatt (2008a). The two studies only identified Features A and B. SIHP # -4777, was previously assessed as significant by Drolet and Schilz (1992b) under Criteria "C" and "D". Tulchin and Hammatt (2008a) evaluated SIHP # -4777 as eligible for listing on the Hawai'i Register of Historic Places under Criteria C and D. During the current study, Feature C was identified. Based on the findings of this report, SIHP # -4777 is in poor to intact condition and is assessed as significant under Criterion c (embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, or possess high artistic value) and Criterion d (have yielded, or is likely to yield, information important for research on prehistory or history) pursuant to HAR §13-284-6. The historic property is also evaluated as eligible for listing on the Hawai'i Register of Historic Places per HAR §13-198-8 under Criteria C and D. This report concurs with this assessment due to the historic property providing information regarding ranching activities and land divisions and may provide additional information regarding the land use of the land grant for which it borders. The historic property, which borders the *mauka* portion of Land Grant 452 Lot 2 is significant under Criterion c/C due to its being representative of post-Contact boundary walls that incorporate traditional techniques. This assessment of significance is for the overall site and applies to all features of the historic property. The historic property retains integrity of location, design, setting, materials, and workmanship.

SIHP # 50-80-03-7653, walls, was previously identified by Lauer and Rieth (2015). During the AIS, it was determined that SIHP # 50-80-03-4439 (wall) previously identified and not fully documented by Drolet and Schilz (1992b) is connected with SIHP # -7653 Feature 1. Therefore, SIHP # -4439 has been redesignated as a portion of SIHP # -7653 Feature 1. SIHP # -4439, was previously assessed as significant by Drolet and Schilz (1992b) under Criterion d. SIHP # -7653 was evaluated by Lauer and Rieth (2015:47) as significant pursuant to HAR §13-284-6 under Criterion d (have yielded, or is likely to yield, information important for research on prehistory or history) and was evaluated as eligible for listing on the Hawai'i Register of Historic Places per HAR §13-198-8 under Criterion D. This assessment was based on the historic property's distribution and characteristics providing information regarding ranching activities and land divisions (Lauer and Rieth 2015:iii,49). This site has provided information regarding ranching practices in the area and there is a potential that additional features of the historic property may be present in areas not yet surveyed. This report concurs with the Lauer and Rieth (2015) and Drolet and Schilz (1992b) assessment of significance. This assessment of significance is for the overall site and applies to all features of the historic property. The historic property retains integrity of location, design, setting, materials, and workmanship.

SIHP # 50-80-03-7976, wall, is assessed for significance pursuant to HAR §13-284-6 under Criterion d (have yielded, or is likely to yield, information important for research on prehistory or history). This is based on the historic property's yielding of information regarding ranching activities on the Dillingham Ranch property. Additional features of the historic property may be present outside the previously surveyed areas, and there is a potential that additional information on the age of the wall may be acquired. The historic property retains integrity of location, design, setting, materials, and workmanship.

SIHP # 50-80-03-7977, agricultural feature complex, is assessed for significance pursuant to HAR §13-284-6 under Criteria d (have yielded, or is likely to yield, information important for research on prehistory or history) and 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). The terrace complex likely extends along the stream well beyond the survey area. In addition, there is a potential that additional information regarding agricultural use may be acquired. This may include types of crops that may have been cultivated within the complex, soil suitability studies, crop yield analysis, and the modification of the terraces for ranching use. The assessment of significance is intended for the overall site and applies to all features of the historic property. The historic property retains integrity of location, design, setting, materials, and workmanship.

SIHP # 50-80-03-7978, platform, is newly documented and is assessed as significant pursuant to HAR §13-284-6 under Criteria d (have yielded, or is likely to yield, information important for research on prehistory or history) and 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). This is based on the historic property's potential to provide information regarding traditional Hawaiian cultural practices. Additional information regarding the construction, age, and function of the historic property can potentially be collected. The historic property has a possible religious or ceremonial function, based on its construction, and therefore has an important value to the Native Hawaiian people through its association with their traditional beliefs and cultural practices. This assessment of significance is for the overall site and applies to all features of the historic property. The historic property retains integrity of location, design, setting, materials, and workmanship.

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## Section 8 Project Effect and Mitigation Recommendations

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### 8.1 Project Effect

The project specific effect recommendation is “effect, with agreed upon mitigation commitments” pursuant to HAR §13-284-7.

### 8.2 Mitigation Recommendations

Based on the many cattle walls present within the Dillingham Ranch property, as well as several cattle walls being preserved as representative examples of a portion of Dillingham Ranch’s history as part of the Dillingham Ranch Agricultural Subdivision project, no further work is recommended for SIHP # 50-80-03-7976 (cattle wall). The wall is in fair to poor condition and is unlikely to provide any additional information. This site will not be adversely affected by the proposed project. No further work is recommended. However, archaeological monitoring is recommended for all ground disturbing activities.

Based on the findings of previously conducted AIS studies, preservation is agreed to for SIHP # 50-80-03-4777 and SIHP # 50-80-03-7653 Features 1 and 2 (cattle wall). SIHP # 50-80-03-7653 Features 2 through 4 were not further documented during this AIS. Preservation is already a mitigation commitment for SIHP # 50-80-03-4777 and SIHP # 50-80-03-7653 within the Dillingham Ranch Agricultural Subdivision project area. As previously agreed to by the SHPD, portions of SIHP -4777 will be breached to allow for access roads to various portions of the property (see Appendix B). SIHP # 50-80-03-7653 Features 3 and 4 are located outside the Dillingham Ranch Agricultural Subdivision project area and therefore will not be adversely affected by this project.

Based on the findings of the current AIS, preservation is recommended for SIHP # 50-80-03-7977 (agricultural/ranching terraces) and SIHP # 50-80-03-7978 (possible habitational/ceremonial platform). A preservation plan meeting the requirements of HAR §13-277-3 will be submitted for review and acceptance by the SHPD. Consultation with NHOs and individuals knowledgeable about the project area’s history will be conducted during the development of the preservation plan.

This report concurs with the previous requirement that archaeological monitoring be conducted for the project. This includes any construction activity within the immediate vicinity of any of the significant historic properties. An archaeological monitoring plan for the Dillingham Ranch Agricultural Subdivision project (Tulchin and Hammatt 2008b) has been reviewed and accepted by the SHPD.

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- 1996 *Sugar Water: Hawaii's Plantation Ditches.* University of Hawai'i Press, Honolulu.

#### **Yardley, Paul**

- 1981 *Millstones and Milestones: The Career of B.F. Dillingham 1844-1918.* University of Hawaii Press, Honolulu.

#### **Yucha, Trevor and Hallett H. Hammatt**


- 2008 *Archaeological Literature Review and Field Inspection for the Castle & Cooke Corporate Retreat Kaiahulu Project Mokulē'ia Ahupua'a, Waialua District, Island of O'ahu TMK: [1] 6-8-003:001.* Cultural Surveys Hawai'i, Inc., Kailua, Hawai'i.

#### **Zulick, Loren**

- 2003 *Trip Report Archaeological Reconnaissance of Multiple Fence Line Routes for Proposed Exclosures within the Pahole Nature Area Reserve (NAR), Waianae Mountain Range, O'ahu Island, Hawaii.* Department of the Army, O'ahu, Hawai'i.

# Appendix A SHPD Acceptance Letters

## SHPD Acceptance for the Drolet and Schilz (1992) AIS

<p>JOHN WAHNEE GOVERNOR OF HAWAII</p>	 <p>STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES STATE HISTORIC PRESERVATION DIVISION 33 SOUTH KING STREET, 8TH FLOOR HONOLULU, HAWAII 96813</p>	<p>WILLIAM W. FATY, CHAIRPERSON BOARD OF LAND AND NATURAL RESOURCES</p> <p>DEPUTIES JOHN P. KEPPELER, II DONA L. MANAHE</p> <p>AQUACULTURE DEVELOPMENT PROGRAM</p> <p>AQUATIC RESOURCES CONSERVATION AND ENVIRONMENTAL AFFAIRS</p> <p>CONSERVATION AND RESOURCES ENFORCEMENT CONVEYANCES</p> <p>FORESTRY AND WILDLIFE HISTORIC PRESERVATION DIVISION LAND MANAGEMENT STATE PARKS WATER AND LAND DEVELOPMENT</p>
<p>April 24, 1992</p>		
<p>Mr. Allan J. Schilz Ogden Environmental &amp; Energy Services 680 Iwilei Rd., Suite 660 Honolulu, HI 96817</p>		<p>LOG NO. 5155 DOC NO. 0682t</p>
<p>Dear Mr. Schilz:</p>		
<p>SUBJECT: Chapter 6E Review -- Archaeological Inventory Survey and Evaluation Prepared for Mokuleia Land Company (February 1992) Mokule'ia and Kawaihapai, Waialua, O'ahu <u>TMK: 6-8-02 and -03 various</u></p>		
<p>Thank you for the copy of this report which adequately addresses concerns with an earlier draft noted in our letter of October 7, 1991 and in a subsequent meeting and telephone conversations. We now believe that this is an acceptable inventory survey report.</p>		
<p>A total of 840 acres was inventoried through a combination of pedestrian survey and backhoe test excavation. These survey techniques were adequate to locate all extant historic sites. Fifteen historic sites (comprising 40 features) were found and have been assigned state numbers 50-80-03-4424 through -4438. Table 2 on p.41 offers a preliminary significance assessment for each of the 40 features; technically, the site is the unit of analysis for significance determinations. Abstracting from this table, three sites (-4424, -4428, and -4438) are assessed as significant for their information content (criterion D) and for their historical value to the Hawaiian ethnic group (criterion E); eight sites (-4425, -4426, -4427, -4429, -4430, -4431, -4432, and -4434) for criterion D alone; and four sites (-4433, -4435, -4436, and -4437) are no longer significant because their location and description exhaust the information about Hawaiian history and pre-history that they contain. Based on the information presented in this report we disagree with the significance assessments for the six sites (-4424, -4425, -4426, -4427, -4428, and -4429) comprising Settlement Cluster 1. Given these sites' excellent integrity, the fact that they represent a related group of sites characteristic of the type that was built on the coastal terrace of Mokule'ia during prehistoric times, and because other site groups of this type in the region might have less</p>		

Mr. Allan Schilz  
April 24, 1992  
Page 2

integrity, we believe that these sites are also significant because they embody the distinctive characteristics of a type (criterion C). Our disagreement on this point does not affect the acceptability of the inventory survey report. It does require that consultation to resolve the differences take place; this could be a letter from Mokuleia Land Company, or you as their agent, agreeing to our assessment. If you do not agree, then we will need to schedule a meeting.

Once concurrence on significance assessments is reached, the next step will be to determine the effect of Mokuleia Land Company's proposed development on significant historic sites, and once these effects have been agreed upon, to develop a mitigation plan. It is at this stage that recommendations for excavation and/or preservation are appropriate.

If you have any questions please call Tom Dye at 587-0014.

Sincerely,





DON HIBBARD, Administrator  
State Historic Preservation Division

TD:amk

APR 28 1992

## SHPD Acceptance for the Tulchin and Hammatt (2007) AIS

 <p>LINDA LINGLE GOVERNOR OF HAWAII</p>		<p>LAURA H. THELEN CHAIRPERSON BOARD OF LAND AND NATURAL RESOURCES COMMISSION ON WATER RESEARCH/ MANAGEMENT</p> <p>RUSSELL Y. TSUJI FOREST DEPUTY</p> <p>KEN C. KAWAHARA DEPUTY DIRECTOR, WATER</p> <p>AQUATIC RESOURCES BOATING AND FISHING RECREATION BUREAU OF CONSERVATION COMMISSION ON WATER RESOURCE MANAGEMENT CONSERVATION AND COASTAL LANDS CONSERVATION AND RESOURCES ENFORCEMENT ENGINEERING FORESTRY AND WILDLIFE HISTORIC PRESERVATION KAMOHAKU ISLAND RESERVE COMMISSION LAND STATE PARKS</p>
<p>STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES STATE HISTORIC PRESERVATION DIVISION 601 KAMOKILA BOULEVARD, ROOM 555 KAPOLEI, HAWAII 96707</p>		
<p>December 19, 2007</p>		
<p>Todd Tulchin Cultural Surveys Hawai'i P.O. Box 114 Kailua, Hawai'i 96734</p>	<p>LOG NO: 2007.2421 DOC NO: 0712LM03 Archaeology</p>	
<p>Dear Mr. Tulchin:</p>		
<p><b>SUBJECT: Chapter 6E-42 Historic Preservation Review – Archaeological Inventory Survey of an Approximate 75-Acre Portion of the Proposed 861-Acre Dillingham Ranch Development Project, Auku'u, Kikahi, and Kawaihāpai Ahupua'a, Wailua District, Island of O'ahu TMK: (1) 6-8-002:006 por.; 6-8-003:006 por.</b></p>		
<p>Thank you for the opportunity to review the aforementioned report, which we received on July 11, 2007. We apologize for the delay in reviewing this project. The archaeological inventory survey, of approximately 75 acres of the mauka portion within the overall 861 acre Dillingham Ranch Development Project, identified six historically significant properties. Approximately 787 acres of the 861 acre Dillingham Ranch project area were covered by a previous archaeological inventory survey in 1992 (Drolet and Schilt:1992). This survey was reviewed and accepted by SHPD in 1992 (Log No. 5155, Doc No. 0682t).</p>		
<p>Two of the identified significant historic properties, sites 50-80-03-6884 and -6885 are located within the 75 acre survey area. The four other sites, -416, -6886, -6887, and -6888 are located outside of the 75 acre survey area. These sites were originally a part of a 78 acre survey area but the property boundaries were adjusted to exclude the approximately three acres where these four sites are located thus reducing the project area to 75 acres. This approximately 3 acre area will not be affected by the current development and should be classified as a preservation easement. Portions of Site -416 were previously identified in an adjacent property (Rosendahl 1977; Moblo 1991). The four historically significant properties are located on the boundaries of the overall 861 acre project area or the Area of Potential Effect (APE) and will not be affected by the proposed development project. Site -6884 consists of four historic, ranch related stone walls and is eligible for the Hawai'i Register under Criterion D, informational content relevant to research of historic era ranching in the Waialua area. Site -6885 consists of a pre-contact/early historic agricultural complex including terraces and a retaining wall which is eligible for the Hawai'i Register of Historic Places under Criteria C and D. Site -416, an agricultural complex, is eligible for the Hawai'i Register under Criteria C and D. Site -6886, an agricultural complex, is eligible for the Hawai'i Register under Criteria D and E due to its possible association with the legendary springs of Kawaihāpai. Site -6887, modified overhang, is eligible for the Hawai'i Register under Criteria D. Site -6888, an agricultural complex, is eligible for the Hawai'i Register under Criteria D and E due to its possible association with the legendary springs of Kawaihāpai. The following proposed mitigation recommendations were developed in consultation with community members knowledgeable of the history and culture of the area and with the Office of Hawaiian Affairs (OHA). We concur with the proposed mitigation.</p>		

Mr. Tulchin

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The proposed mitigation recommendation for Site -6884, the four ranching era stone walls, is no further work recommended. Sufficient information regarding the location, function, age, and construction methods was compiled by the current survey investigation to mitigate any adverse effect. We concur with this recommendation, but we recommend that these stone walls be incorporated into the design of the project. Breaching of the walls for access and other needs can be accomplished without the destruction of the entire site. The stone walls will add character and increased value to the community and reflect its post-contact land use for ranching.

The proposed mitigation for Site -6885, an agricultural complex which includes distinctive remnants of Mokulē'ia and Kawaihāpai's pre-contact/early historic land use and is a future resource for both the Hawaiian community and further archaeological research, is preservation, in the form of avoidance and protection. We concur with this recommendation, but we would suggest that an ongoing maintenance program be established to take care of the site in perpetuity ie; periodic hand clearing of invasive alien vegetation.

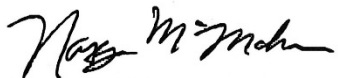
Sites -416, -6886, -6887, and -6888 which are located outside of the project area but in close proximity to the project areas boundary. Due to the sites proximity to the project area mitigation recommendations for these sites were included in the current study. The proposed mitigation for the sites located outside of the project area is preservation, in the form of avoidance and protection. Again we suggest that an ongoing maintenance program be established to take care of the site(s) in perpetuity ie; periodic hand clearing of invasive alien vegetation.

The introduction, methods, background research and previous archaeology sections are excellent and effectively provide a logical context for the inventory survey work.

This archaeological inventory survey is accepted as fulfilling the requirements of Hawai'i Administrative Rules (HAR) Chapter 13-276. We look forward to reviewing the Preservation Plan and we suggest that you interview Mr. Thomas Shirai a recognized lineal descendent of the Kawaihāpai area and any other knowledgeable persons that he might recommend for this plan.

Please contact Lauren Morawski (O'ahu Archaeologist) at (808) 692-8015 if you have any questions or concerns regarding this letter.



Aloha,



Nancy McMahon  
Acting Archaeology Branch Chief and Kaua'i Archaeologist  
State Historic Preservation Division

LM

# SHPD Acceptance for the Tulchin and Hammatt (2008a) Preservation Plan

 <p>LINDA LINGLE GOVERNOR OF HAWAII</p>		<p>LAURA H. THEILEN CHAIRPERSON BOARD OF LAND AND NATURAL RESOURCES COMMISSION ON WATER RESOURCE MANAGEMENT</p> <p>RUSSELL Y. TSUJI FIRST DEPUTY</p> <p>KEN C. KAWAHARA DEPUTY DIRECTOR - WATER</p> <p>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 KAOHOLAWE ISLAND RESERVE COMMISSION LAND STATE PARKS</p>
<p>STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES STATE HISTORIC PRESERVATION DIVISION 601 KAMOKILA BOULEVARD, ROOM 555 KAPOLEI, HAWAII 96707</p>		
<p>September 29, 2008</p>		
<p>Todd Tulchin Cultural Surveys Hawai'i, Inc. P.O. Box 1114 Kailua Hawai'i 96734</p>	<p>LOG NO: 2008.2963 DOC NO: 0809LM07 Archaeology</p>	
<p>Dear Mr. Tulchin:</p>		
<p><b>SUBJECT: Chapter 6E-42 Historic Preservation Review – Revised Archaeological Preservation Plan For SIHP #'s 50-80-03-416, -4772 to -4780, -4780, -4782, -4786, and -6885 to -6888 in the Proposed 820 Acre Dillingham Ranch Development Project Mokulē'ia 2, Auku`u, Kikahi, and Kawaihāpai Ahupua`a, Waialua District, Island of O`ahu <u>TMK: (1) 6-8-002; 006 por.; 6-8-003 por.; 015, 019, 030, 031, 033, 035, 040</u></b></p>		
<p>Thank you for the opportunity to review the aforementioned revised preservation plan (Tulchin and Hammatt 2008), which we received on July 18, 2008. The plan details both the interim and long term preservation measures that will be established before construction activities commence on the subject parcel.</p>		
<p>Interim preservation measures include the identification and marking, with brightly colored flagging tape all archaeological features to be preserved. Following the marking of all identified archaeological features orange web event fencing or some similar highly visible continuous fencing will be erected around an area 15.0 meters (50 feet) in radius from the perimeter of all historic properties designated for preservation. These continuous barriers will act as heavy machinery exclusion zones during all construction activities in the vicinity and will be re-established as needed. The erection of this continuous barrier will be supervised by qualified archaeologists prior to the commencement of construction activities. No land disturbing activities or stockpiling of construction materials will be permitted within these interim buffer zones. The boundaries of the designated heavy machinery exclusion zones will be accurately located by licensed land surveyor and indicated on all construction plans. A preconstruction meeting will be held for all project construction personnel to inform them of the conditions of the preservation plan and the location and significance of each of the archaeological preserve areas. Any construction activities in the immediately vicinity of the designated preserve areas will be supervised by qualified archaeologists. Specific archaeological monitoring measures will be outlined in the Archaeological Monitoring Plan (Tulchin and Hammatt 2008 currently under review).</p>		
<p>Long term preservation methods for the archaeological preserves will include permanent buffer zones of 15.0 meters (50 feet). These permanent buffers zones will be drawn from the perimeters of all features designated within the archaeological preserves. All long-term preservation buffer zones will be demarcated with permanent land survey markers and by using permanent fencing and/or boulder barriers. Any construction activity within these buffer zones is prohibited. The style of permanent fencing will be</p>		

Mr. Tulchin  
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determined in consultation with community members with familial ties to the area, in particular those who were consulted during the preparation of this preservation plan.

Access to historic properties shall be provided for those community members with familial ties to the area and those individuals and groups that desire to conduct cultural activities at these sites. Access agreements between the landowner or representatives and individuals and groups who desire access for cultural practices and or educational/research purposes will be granted with prior written consent of the landowner or representatives. Currently any requests for access can be obtained by contacting Dillingham Ranch Aina, LLC 68-540 Farrington Highway Waiialua HI 96791. After the implementation of the preservation plan access requests should be directed to the Dillingham Ranch Community Association.

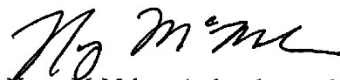
An Archaeological Monitoring Plan is currently under review by our office and pending acceptance will be carried out to insure that sites identified within the project area are not impacted during construction activities and that any subsurface cultural deposits and/or 'iwi kūpuna (human burials) receive appropriate treatment and or mitigation pursuant to compliance with procedures outlined in Hawai'i Revised Statutes (HRS) Chapter 6E-43.

Given the above information, we believe that any effect on the known historic properties by the proposed undertaking will be mitigated through adherence to the conditions of the accepted preservation plan and the archaeological monitoring plan. Via this letter the applicant is notified that the conditions in the preservation plan shall be adhered to pursuant to Section 6E-42, HRS. This includes notifying the State Historic Preservation Division, Lauren Morawski (O'ahu Archaeologist) at (808) 692-8015 or by email at Lauren.M.Morawski@hawaii.gov, that the interim protection measures are in place prior to the commencement of construction activities. The Division shall then verify in writing the County that these measures are in place prior to the commencement of any ground altering activities.

The requested revisions, SHPD Log No. 2008.0202 Doc No. 0806LM06, have been incorporated into the preservation plan. This Revised Preservation Plan is accepted as satisfying the requirements of Hawai'i Administrative Rules (HAR) Chapter 13-277.

Please contact Lauren Morawski (O'ahu Archaeologist) at (808) 692-8015 if you have any questions or concerns regarding this letter.

Aloha,





Nancy McMahon, Archaeology and Historic Preservation Manager  
State Historic Preservation Division

LM

Cc: ✓ Cliff Smith-Dillingham Ranch LLC



## SHPD Acceptance for the Tulchin and Hammatt (2008b) Archaeological Monitoring Plan

 <p>LINDA LINGLE GOVERNOR OF HAWAII</p>		<p>LAURA H. THIELEN CHAIRPERSON BOARD OF LAND AND NATURAL RESOURCES COMMISSION ON WATER RESOURCE MANAGEMENT</p> <p>RUSSELL Y. TSUJI FIRST DEPUTY</p> <p>KEN C. KAWAHARA DEPUTY DIRECTOR - WATER</p> <p>AQUATIC RESOURCES BOATING AND OCEAN RECREATION BUREAU OF CONVEYANCES COMMISSION ON WATER RESOURCE MANAGEMENT CONSERVATION AND COASTAL LANDS CONSERVATION AND RESOURCES ENFORCEMENT ENGINEERING</p> <p>FORESTRY AND WILDLIFE HISTORIC PRESERVATION KAHOLAWE ISLAND RESERVE COMMISSION LAND STATE PARKS</p>
<p>STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES STATE HISTORIC PRESERVATION DIVISION 601 KAMOKILA BOULEVARD, ROOM 555 KAPOLEI, HAWAII 96707</p>		
<p>October 30, 2008</p>		
<p>Todd Tulchin Cultural Surveys Hawai'i, Inc. P.O. Box 1114 Kailua Hawai'i 96734</p>	<p>LOG NO: 2008.4774 DOC NO: 0810LM42 Archaeology</p>	
<p>Dear Mr. Tulchin:</p>		
<p><b>SUBJECT: Chapter 6E-42 Historic Preservation Review – Revised-Archaeological Monitoring Plan for the 820 Acre Dillingham Ranch Development Project; Mokulē'ia 2, Auku'u, Kikahi and Kawaihāpai Ahupua'a, Waialua District, Island of O'ahu TMK: (1) 6-8-002:006 por.; 6-8-003:006 por., 015, 019, 030, 031, 033, 035 and 040</b></p>		
<p>Thank you for the opportunity to review the aforementioned revised archaeological monitoring plan (Tulchin and Hammatt 2008), which we received on October 27, 2008. The monitoring plan details the program of archaeological monitoring to be conducted during ranch improvement projects and initial subdivision infrastructure construction activities undertaken by Dillingham Ranch Aina LLC. Planned land-disturbing activities include: grubbing, grading and excavations associated with ranch drainage improvements; grubbing and grading associated with subdivision road construction; grubbing and grading associated with water well, water tank and access road construction; excavations for subsurface utilities; and rockfall remediation work, including grubbing and grading associated with access road construction, excavations for geotechnical testing, boulder removal and stabilization work, and excavations for rockfall catchment ditches and/or fencing. Subsequent construction activities within subdivision development lots by individual lot owners and are not covered by this plan. Subsequent construction activities on individual lots will be subject to permit approval by the Honolulu City and County Department of Planning and Permitting and the State Historic Preservation Division will provide comments and recommendation for individual lot owners at that time to the City and County Department of Planning and Permitting.</p>		
<p>The aforementioned plan (Tulchin and Hammatt 2008) recommends on-site monitoring of all initial grubbing and grading activities within the project area, including; subdivision road construction; water well; water tank; and access road construction; utility corridor construction; geotechnical testing; and rockfall mediation work. Grubbing, grading and excavation associated with ranch drainage improvement activities, including work in the vicinity of the old Dillingham Ranch house and maintenance of the Makaleha Stream channel will require full time on-site monitoring. Additionally full time on-site archaeological monitoring of any construction activities occurring within 30 meters (100 ft.) of designated archaeological preserve areas will occur throughout the duration of the proposed construction of the subdivision and its associated infrastructure. The remaining construction activities will be monitored on an on-call basis with weekly site visits to document the progress of construction activities and to coordinate with project contractors on upcoming and future construction activities.</p>		

Mr. Tulchin  
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The archaeological monitoring program implemented under the plan includes provisions that ensure that historic properties previously identified within the project area, SIHP 50-80-03-416, -4772 to -4780, -4782, -4786 and -6885 to 6888, are not adversely affected by construction activities. Additionally the program of archaeological monitoring will ensure the proper documentation of any additional historic properties identified during construction activities. Also if `iwi kūpuna (human remains) are identified during the program of archaeological monitoring compliance with procedures outlined in Hawai'i Revised Statutes (HRS) Chapter 6E-43 will be followed.

We accept this archaeological monitoring plan as fulfilling the requirements of Hawai'i Administrative Rules (HAR) Chapter 13-279. Please submit a copy of this acceptance letter and an electronic (pdf) copy of the report on a CD to the Kapolei SHPD office.

Please contact Lauren Morawski (O'ahu Archaeologist) at (808) 692-8015 if you have any questions or concerns regarding this letter.



Aloha,



Nancy McMahon, Archaeology and Historic Preservation Manager  
State Historic Preservation Division

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# SHPD Acceptance for the Lauer and Rieth (2015) Archaeological Inventory Survey

 <p>DAVID Y. IGE GOVERNOR OF HAWAII</p>	 <p>STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES STATE HISTORIC PRESERVATION DIVISION KAKUHIHEWA BUILDING 601 KAMOKILA BLVD, STE 555 KAPOLEI, HAWAII 96707</p>	<p>SUZANNE D. CASE CHAIRPERSON BOARD OF LAND AND NATURAL RESOURCES COMMISSION ON WATER RESOURCE MANAGEMENT</p> <p>KEKO A. KALUHIWA FIRST DEPUTY</p> <p>W. ROY HARDY ACTING DEPUTY DIRECTOR - WATER</p> <p>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</p>
<p>July 17, 2015</p> <p>Mr. George I. Atta, FAICP, Director Department of Planning and Permitting City and County of Honolulu</p> <p>Mr. Clifford R. Smith, Sr. Vice President Kennedy Wilson Commercial Investment Group 9701 Wilshire Boulevard, Suite 700 Beverly Hills, CA 90212</p> <p>Dear Mr. Smith:</p> <p>SUBJECT: <b>Chapter 6E-42 Historic Preservation Review – Archaeological Inventory Survey of the Mauka Lands, Dillingham Ranch Agricultural Subdivision Kawaihāpai, Kīkahī, Aukū'u, and Mokulē'ia 2 Ahupua'a, Waialua District, Island of O'ahu TMK: (1) 6-8-002:006 por., 6-8-003:005 por., 006 por.</b></p> <p>Thank you for the opportunity to review the draft report titled <i>Archaeological Inventory Survey of the Mauka Lands, Dillingham Ranch Agricultural Subdivision, Kawaihāpai, Kīkahī, Aukū'u, and Mokulē'ia 2 Ahupua'a, Waialua District, O'ahu, Hawai'i, Tax Map Key (1) 6-8-002:006 (portion), 6-8-003:005 (portion), 006 (portion)</i>. We received the initial draft (Lauer and Rieth, June 2014) on June 25, 2014, and the revised draft (Lauer and Rieth, July 2015) via email on July 15, 2015.</p> <p>Related reports and plans reviewed and accepted for portions of the Dillingham Ranch Agricultural Subdivision property are summarized below:</p> <p>1987 - Reconnaissance survey by horseback. Sites identified but not assigned site numbers [no information on SHPD review located];</p> <p>1992 - AIS for 840-acre portion [783 acres (1992a) and 55 acres (1992b)], TMK: (1) 6-8-002:006 por., 015, 019, 021, 030, 031, 033, 034, 035, 040 (Drolet and Schilz 1992 [a,b]), accepted in 1992 (Log No. 5155, Doc. No. 0682t);</p> <p>2007 - AIS for 75-acre portion, TMK: (1) 6-8-002:006 por., 6-8-003:006 por. (Tulchin and Hammatt 2007), accepted December 21, 2007 (Log No. 2007.2421, Doc. No. 0712LM03);</p> <p>2008 - PP for SIHP #s 50-80-03-416, 4772 to 4780, 4782, 4786 and 6885 to 6888, TMK: (1) 6-8-002:006 por., 6-8-003:006 por., 015, 019, 030, 031, 033, 035, 040 (Tulchin and Hammatt 2008), accepted on September 29, 2008 (Log No. 2008.2963, Doc. No. 0809LM07); and</p> <p>2008 - AMP for 820-acre portion, TMK: (1) 6-8-002:006 por., 6-8-003:006 por., 015, 019, 030, 031, 033, 035, 040 (Tulchin and Hammatt 2008), accepted October 30, 2008 (Log No. 2008.4774, Doc. No. 0810LM42)</p>		
<p>Log No. 2014.02945 Doc. No. 1507SL07 Archaeology</p>		

Mr. Smith  
July 15, 2015  
Page 2

International Archaeology, LLC (IA) completed an archaeological inventory survey (AIS) of approximately 85.3 acres for the landowner, Dillingham Ranch Aina, LLC. The landowner initiated the project in support of their proposed Dillingham Ranch Agricultural Subdivision (Subdivision Application No. 2014/SUB-149). The project acreage consists of three areas that will largely be used for pasturage but also residential development—an eastern parcel (30.1 acres), a central parcel (38.2 acres), and a western parcel (17 acres). The roughly 400-acre portion immediately south of the eastern survey parcel will continue to be used to graze cattle, and will not be subject to development.

Earlier archaeological inventory survey (AIS) studies were completed for portions of the subdivision area (Drolet and Schilz 1992a, 1992b; Tulchin and Hammatt 2007). The current AIS fieldwork included a pedestrian survey involving transects spaced 5-10 m apart, and excavation of three shovel test pits at two features. Sites and features were recorded using a Global Positioning System (GPS) unit, tape-and-compass mapping, photography, and detailed descriptions.

One archaeological site and one cultural property were recorded. The archaeological site (Site 50-80-03-7653) consists of four discontinuous historical ranching walls. In places, the dry-stacked stone walls incorporate large colluvial boulders and bedrock exposures. Wall segments either parallel the slope contours (generally east-west) or run cross contour (generally north-south). Slope erosion and collapse has affected numerous portions of these walls. The remaining segments are consistent with the extensive 19th/early 20th century ranching infrastructure in this area. These walls, and the components of previously recorded Site 50-80-03-6884 (walls recorded by Tulchin and Hammatt 2007), likely once formed an integrated enclosure/exclosure system for the ranch. Two unmodified fresh water seeps (Site 50-80-03-7793) were noted within the western survey parcel. They are located along the colluvial slopes, are in the general location of Site 192, "Hidden Waters" springs, recorded by McAllister (1933), and are considered a significant cultural property by some community members.

Site 50-80-03-7653 is assessed as significant per Hawaii Administrative Rules (HAR) §13-284-6 under Criterion d and is evaluated as eligible for listing on the Hawai'i Register of Historic Places per HAR §13-198-8 under Criterion D. Specifically, the distribution and characteristics of the various historical walls provide information about ranching activities and land divisions. The site features have been recorded in detail and no further work is recommended prior to the initiation of development activities. The site is recommended for preservation.

Site 50-80-03-7793 is assessed as significant per HAR §13-284-6 under Criterion e and is evaluated as eligible for listing on the Hawai'i Register of Historic Places per HAR §13-198-8 under Criterion D. Although the springs noted during the survey are not culturally modified features, their potential correlation with the "Hidden Waters" recorded in oral history and by McAllister (1933) and their importance to certain native Hawaiian community members warrants this evaluation. The site will be preserved.

In addition, the report indicates that if future development is considered for any previously un-surveyed portions of the ranch (e.g., the southern extension of Lots 90 and 91), the SHPD must be consulted for potential historic properties review requirements (e.g., archaeological inventory survey) prior to initiating development in these areas.

The AIS report adequately describes the project area, environment, cultural and historical background, previous investigations, anticipated findings, research objectives, field and laboratory methods, cultural consultation, and findings. SHPD concurs with the site significance assessments and mitigation recommendations for the current project area, and the stipulation that SHPD will be consulted regarding historic properties review requirements prior to initiating any future development in un-surveyed areas.

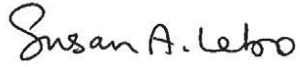
The report meets the standards set forth in HAR §13-276-5. It is accepted by SHPD. Please send one hardcopy of the document, clearly marked **FINAL**, along with a copy of this review letter and a text-searchable PDF version on CD to the Kapolei SHPD office, attention SHPD Library.

SHPD looks forward to receiving for review a preservation plan for Sites 50-80-03-7653 and 50-80-03-7793 that meets the requirements specified in HAR §13-277.

Please contact me at [Susan.A.Lebo@hawaii.gov](mailto:Susan.A.Lebo@hawaii.gov) or at (808) 692-8019 if you have any questions or concerns regarding archaeological resources or this letter.

Aloha,

Mr. Smith  
July 15, 2015  
Page 3



Susan A. Lebo, PhD  
Archaeology Branch Chief

cc: Timothy Rieth, International Archaeology, LLC ([trieth@iarii.org](mailto:trieth@iarii.org))



# *Invertebrate Resources Survey*

(Steven Lee Montgomery, Ph.D.)

Survey of Native Invertebrate Resources in proposed  
Dillingham Ranch Agricultural Subdivision  
Mokulē'ia, O'ahu

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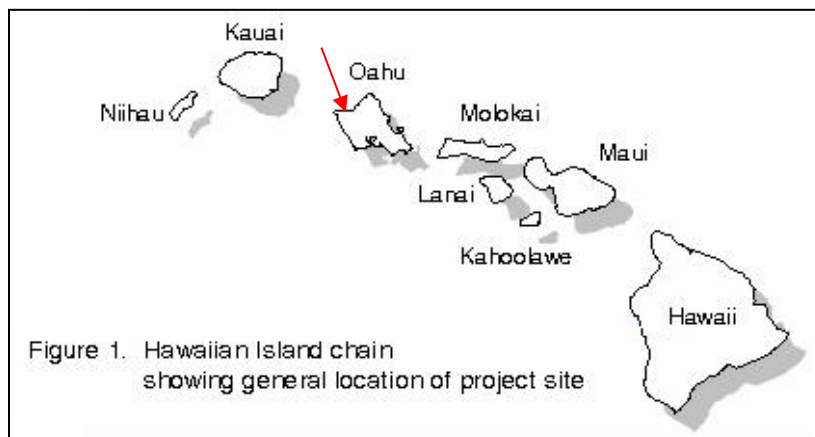
## SUMMARY

The Dillingham Ranch, O’ahu, project site sampled in a 2018 survey yielded predominantly adventive invertebrate species, and 31 native arthropods, and 4 native mollusks. No threatened and endangered species were found.

## INTRODUCTION

This report summarizes the findings of a 2018 invertebrate<sup>1</sup> survey conducted within Dillingham Ranch lands, O’ahu (Figure 1, 3). This survey was conducted by Steven Lee Montgomery, Ph.D., for HHF Planners, Honolulu, Hawai’i.

The primary purpose of this survey was to determine the presence or absence on the property of any endemic or indigenous terrestrial invertebrates, especially any species with legal status under federal or state threatened and endangered species statutes (DLNR 1998, USFWS 2017). Invertebrates are often the dominant fauna in natural Hawaiian environments. Native Hawaiian plant, vertebrate, and invertebrate populations are interdependent. Invertebrates are the food of some birds and the pollinators of plants. Certain insects are obligatorily attached to specific host plants and are able to use only that plant as their food. Those insect - host relationships are ancient and intertwined. Some native invertebrates have proven inventive in adapting to opportunities in changed ecosystems. A surprising number of native arthropod species survive even in degraded habitats. Nevertheless, the overall health of native Hawaiian invertebrate populations depends upon habitat quality and absence or low levels of predators introduced from the continents. Sufficient food sources, host plant availability, and the absence or low levels of introduced, continental predators and parasites comprise a classic native, healthy ecosystem. Consequently, where appropriate in the survey discussion, host plants, and some introduced arthropods are also noted.



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<sup>1</sup> Animals without backbones: insects, spiders, snails, shrimp, etc.

## **GENERAL SITE DESCRIPTION**

The Dillingham Ranch is located along the mauka side of Farrington Highway in the Mokulē'ia area of the Waialua district on the northwest coast of O'ahu. (Figure 1). The entire property is made up of ten TMK parcels totaling 2,721.023 acres. The surveyed area ranges in elevation from approximately 15 feet above mean sea level (amsl) along the Highway to about 1,600 feet amsl along its mauka extent. The terrain rises from gently sloping land to steeply sloping mountainous land offering a variety of habitats. The Ranch lands have been used for agriculture since the late 19th century. The current uses include equestrian activity, cattle grazing, horse pasturing, and palm tree propagation. The project area includes the current Dillingham Ranch Properties mauka of Farrington Highway from an elevation of a few feet above sea level up to approximately the 1200-foot elevation. The lower portion of the property is characterized by flat alluvial plains rising into sloping lands and continuing up through ridges and gulches at the upper elevations. The majority of the planned subdivision area is located in the areas of the property mauka of the managed land or areas that are currently utilized for coconut plantation and ranching activities. At least four intermittent streams run through the project area. All have dry rocky streambeds and several have constructed channels for either flood control or road crossings. Emphasis of this survey was on the lower portions where agricultural activity will be intensified.

## **INVERTEBRATE SURVEY METHODS**

### **Previous Surveys**

Prior to the field survey, a search was made for publications relating to invertebrates associated with this particular site or with nearby sites. A search was made for other projects in the general area that generated an Environmental Assessment or Environmental Impact Statement filed at the web site of the State's Office of Environmental Quality Control (2018). The results of prior and recent botanical and zoological surveys of the project area by Guinther (2008), Bruner (2014), and LeGrande (2017) were helpful in preparing for this study, but show no reference to previous invertebrate surveys. Searches were made in the University of Hawai'i and Bishop Museum library catalogs and in the University of Hawai'i, Hamilton Library's Hawai'i-Pacific Journal Index (2018). Searches were made for publicly available articles mounted on the web through Google Scholar. This review did not show any previous invertebrate surveys in the area.

### **Field Schedule:**

April 10, 2018	day field survey
April 16, 2018	day field survey
April 17, 2018	day field survey / night survey
April 18, 2018	day field survey
April 23, 2018	day field survey / night survey
April 27, 2018	day field survey / night survey
May 11, 2018	day field survey / night survey
May 12, 2018	day field survey
May 19, 2018	day field survey

## SURVEY METHODS

The following survey methods for terrestrial invertebrates were used as appropriate to the terrain, botanical resources, and target species.

**Host plant searches:** Host plants, both native and introduced, were sampled for arthropods that feed or rest on plants. Searches included visual inspection of resting sites and searching known feeding or breeding sites such as under dead bark or rocks.

**Sweep nets:** This is a general method of censusing most flying and perching insects. A fine mesh net is swept across plants, leaf litter, etc. to sample any flying or perching insects. Transfer from the net is either by aspiration, or by placing the net contents into a holding container.

**Visual observation:** I was vigilant for any visual evidence of arthropod presence or activity. Visual observations provide valuable evidence and are a cross check that extends the reach of sampling techniques. Visual observation also included turning over rocks, dead wood, and other debris.

**Light sampling:** A survey of insects active at night is vital to a complete faunal record. Many insects are active only at night to evade birds, avoid desiccation and high temperatures, or to use night food sources, such as night opening flowers. Light sampling uses a bright light in front of a white cloth sheet. (Figure 2) Night active insects are thought to mistake the collecting light for the light of the moon, which they use to orient themselves. In attempting to navigate by the entomologist's light, confused insects are drawn to circle the light and land on the cloth in confusion. This type of collecting is most successful during the dark phase of the moon, or under clouds blocking starlight. On level sites, vegetation usually blocks the light from being seen over long distances, and moths and other night fliers are not drawn from distant locations outside the survey area.



Figure 2: An aspirator allows undamaged collection of smaller insects for accurate identification.

The locations for my light were chosen based on experience, potential native host plant proximity, and to obtain a variety of terrain types (Figure 3). The absence of any nearby street lighting or on-site lights meant there was no competition to my collecting light. The light source was a battery powered florescent lantern and/ or generator powered UV and MV bulbs depending on the location. The sheet was monitored and visiting species observed/collected.

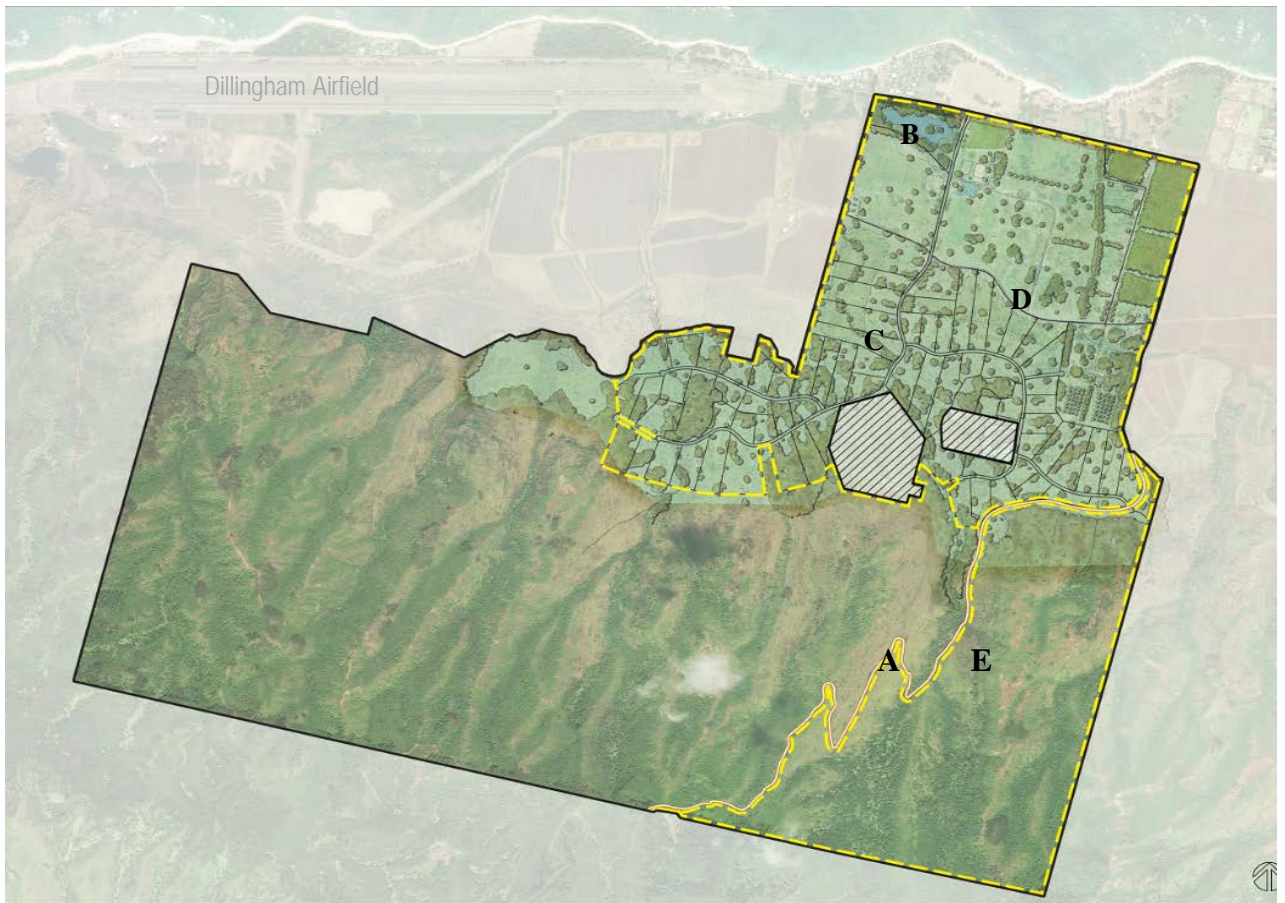


Figure 3: Map of subject area at Dillingham Ranch outlined in yellow dashed lines. Striped areas are not part of the subject project

area of light survey locations:

- A** = site of night light monitoring 2018 April 17
- B** = site of night light monitoring 2018 April 23
- C** = site of night light monitoring 2018 April 27
- D** = site of night light monitoring 2018 April 27
- E** = site of night light monitoring 2018 May 11

### **Survey Limitations / Conditions**

My ability to form advisory opinions is limited or influenced in the following ways:

#### **Collecting conditions**

Weather was favorable for surveying during the fieldwork and during night light monitoring. The moon presented no competition to the collecting light as either the moon was "dark" on the nights used or the moon set early in the evening. Other nights the moon was covered with patchy clouds. On April 17 for example, moonset was at 8:45PM, with only 4% visible<sup>2</sup>. On April 27<sup>th</sup> although the moon was 95% illuminated, the area had heavy cloud cover blocking all moonlight. On May 11, only 15% of the moon was visible, the moon set at 3:44PM and did not rise until 4:08AM the next day, giving a dark night. (USNO) Only light breezes were present if any.

**Seasons:** Monitoring at a different time of year might produce a different arthropod list. Weather and seasonal vegetation changes play a role in any survey of invertebrates. Many arthropods time their emergence and breeding to overlap or follow seasonal weather or to coincide with growth spurts of an important plant food. Host plant presence/absence, and seasonal changes, especially plant growth after heavy rains, affect the species collected. For example, if a survey were done during the fruiting of alahe'e (*Psydrax odorata*), found on site by the botanical survey (LeGrande 2017), I predict *Carposina graminicolor* would be reared from *Canthium* fruit as reported by Swezey 1954 at Keawa'ula, near Ka'ena Point (Haines 2004). Overall, vegetation was in good condition due to recent rains in months prior to the survey. Some species do have seasonal variation (Swezey 1935). However, the low level of native plants found at the site is the strongest factor in determining the few native invertebrates encountered. Given the short native plant inventory, seasonal factors are less important here.

**Duration:** Surveying for a longer time might change the species list; however, I believe the survey provides an adequate review of the property's resident native invertebrates as the visits were spread over several weeks and at varying times of day. (See: INVERTEBRATES NOT PRESENT)

**Physical limitations:** The size of the property as a whole meant the survey could not cover the entire area intensively. The overall study strategy and light survey site selections were designed to compensate. The resulting survey was representative and targeted in favor of locating and examining the few native host plants. The lower reaches of the property were relatively similar botanically and did not provide appropriate habitat for native species. At the same time, it is our understanding the highest portions of the property will continue in their present use and not undergo extensive change. Consequently, most time was spent in the lower areas.

**Selectivity:** My survey focused on finding endemic and indigenous Hawaiian species. Although some species of agricultural importance are noted, I did not attempt to completely document the common alien or agricultural / animal husbandry arthropod species likely present. Several alien invertebrates of human health concern are noted later in this report. See MEDICALLY IMPORTANT SPECIES.

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<sup>2</sup> all moon data from U.S. Naval Observatory [USNO]

## INVERTEBRATE SURVEY RESULTS:

This discussion<sup>3</sup> focuses on native species encountered, on species that affect native invertebrate survival, and on adventive species of concern in human health or commonly feared.

### **MOLLUSCA: PULMONATA – overview**

A special effort was made to find native snails, since West Oahu has many unique species mostly on the higher elevations. The snail fauna of Dillingham Ranch is now dominated by populations of adventive species, with only very small numbers of native *Succinea* and patches of micro-snails grazing upon native ferns perched on very large boulders, or in trees.

The largest native snail found was 1 *Succinea* sp. (probably *caduca*) shell in a stream bed. The species ranges over six islands, having effectively dispersed to all of the high islands, with an assumed dispersal mechanism of passively hitchhiking on birds. (Holland & Cowie 2007)

Sampling for the cryptic *Succinea* at low population levels is quite difficult, some specialists not seeing them for years in the field. Holland (2018) notes that finding living snails is most likely when searching during wetter periods as they are actively about feeding. The writer has found *Succinea* in many other O'ahu lowland sites under stones and logs, even in dry seasons, so my inability to locate live snails in addition to the stream deposited shell was unexpected.

On the road side below where the stream passes under Nike Road, heavy rains carried down stream and deposited many alien shells. On foliage in the upper gulch slope at 800', I found many small molluscs at rest on two large Bird's nest ferns (*Asplenium nidus*). Two empty shells were tied down by silk in the manner used by the caterpillar of *Hyposmocoma molluscivora* (Rubinoff & Haines 2006). On these same leaves near them were scale insects tended by glaber ants and at the base on dead leaves were casebearer caterpillars different from those on lichen covered stones.

### **Cannibal or Rosy Wolf snail**

*Euglandina rosea* (Férussac)

### **Giant African Snail**

*Lissachatina fulica* (Bowdich)

Both Rosy Wolf snail and their prey the alien common garden and agricultural pest Giant African Snail (Figure 4) were observed. Rosy Wolf snail has done great damage to populations of native land snails. (CABI) Of note for incoming agricultural operations is the link between Giant African Snail and the Rat-Lung Worm disease recently active in Hawai'i. (DOH 2018)



Figure 4: Rosy Wolf snail (R) approaching Giant African Snail (L)

<sup>3</sup> Organization of this section and Table 1 follow that of "Hawaiian Terrestrial Arthropod Checklist"

**ARTHROPODA: Arachnida**

**ARANEAE (spiders) Araneidae**

**Orb Weaver Spiders**

*Argiope appensa* (Walckenaer 1841)

Orb Weaver spiders (Figure 5) were seen on site. They are easily spotted by the distinctive white X in their web where they rest ready to rush out and wrap up the next item snagged in their web. These spiders pose no threat to people or livestock and are a good control on pest alien species. They should be allowed to scramble off to find a new home if they cannot be left undisturbed.



Figure 5: Orb Weaver spiders are common in home gardens throughout the island chain.



Figure 6: Adult cane spiders are on site.

**Heteropodidae**

*Heteropoda venatoria* (Linnaeus, 1767)

**Large Brown Spider or Cane Spider**

Although this fast running spider (Figure 6) is often startling to people, they are not known to bite or harm humans. They are helpful in controlling pests. They hunt mostly at night. Work crews may encounter them in moving rocks, piles of dry brush or discarded wood or cardboard. They should be allowed to run away.

As proof these two spiders are harmless, I have used them in direct contact with actors in filming on LOST and Hawaii 5-0.

ARTHROPODA: Arachnida cont.

**PSEUDOSCORPIONIDA**

**Geogarypidae**

*Geogarypus longidigitatus* (Rainbow, 1897)

Nine pseudoscorpions (Figure 7) were found in leaf litter beneath an *Asplenium nidus*, Bird's nest fern. They are less than 1/8 inch, not threatening to humans. They eat ants, mites, and small flies and so are of assistance pest control.

(Harvey 2000)



Figure 7: Pseudoscorpions are named for their physical resemblance to scorpions.

**INSECTA**

**COLEOPTERA:** beetles

**Coccinellidea**

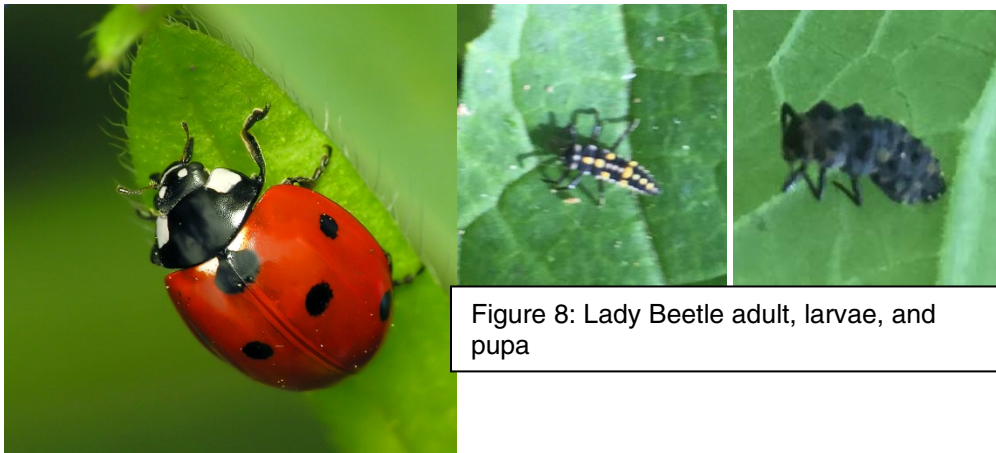


Figure 8: Lady Beetle adult, larvae, and pupa

*Coccinella septempunctata* Linnaeus, 1758

Seven-spotted lady beetle

Lady beetles (Figure 8) are a positive in the control of agricultural pests and should be protected at all life stages. They feed on plant-lice and scale insects both common agricultural pests. They were introduced specifically for control of pest species.



INSECTA COLEOPTERA cont.

**Scarabaeidae**

Dung beetles (Figure 9), adults and larvae, reduce cattle and horse manure. They destroy manure by both physically tunneling into it, using it as food for their larvae, and by burying it. Breaking up the manure also makes the dung more accessible to other controlling species. For example, opening up the piles makes it easier for birds to find and eat the larvae of flies. Burying of manure aids soil fertility. Their presence on site is very positive. Both species came readily to light (Figure 10).

*Aphodius lividus* (Olivier, 1789)

Considered a very early introduction with first cattle (Funasaki et al. 1988).

*Onthophagus gazella* (Fabricius, 1787)

In Hawai'i since 1957; re-released in 1959 and 1973 for control of pest species associated with cattle dung (Funasaki et al. 1988).



Figure 9: Adult dung beetles



Figure 10: Dung beetles responded in large numbers to the light survey when located near grazing areas.

## INSECTA

### DIPTERA (Flies and Mosquitoes)

#### **Culicidae** (Mosquitoes)

*Aedes albopictus* Skuse Forest Day Mosquito

*Culex quinquefasciatus* Say, 1823 Southern House Mosquito, Day Biter

*Aedes* and *Culex* mosquitoes are present on site. Only a very small amount of water is needed for them to breed. Even a discarded bottle or the 'pond' created by a horse hoof print is sufficient. They do not breed as well in ponds with fish, which eat many mosquito wrigglers. (DuPonte & Larish 2003)

#### **Dolichopodidae**

*Dolichopus exsul* Aldrich, 1922

This metallic, greenish water-loving fly is a common, energetic predator of mosquitoes, midges as adult and larva both, now statewide and listed as purposefully introduced.

#### **Ephydriidae**

*Brachydeutera hebes* Cresson, 1926



Figure 11: Shore flies rested on top of duckweed and algae mats in ponded rain water

These endemic silver and brown shore flies are usually scavengers. They are commonly encountered on still waters statewide, and feed on algae in the fresh water (Figure 11) ponded along roadsides and in drying pools of intermittent stream beds. (Williams 1938, Hardy 1983).

## INSECTA

### HOMOPTERA (leaf and plant hoppers)

#### Cixiidae

*Oliarus* sp.

Fifteen nymphs were found on *Sapindus* roots under stones at 100m off the Nike road. Adults are needed for identification as to which endemic species and none were encountered, but none of the species are listed as endangered or threatened.

### HYMENOPTERA (wasps, bees, ants)

#### Formicidae (ants):

Several species of ants were present on site, all alien, and many known to prey on other insects (Zimmerman 1948-80) and are well documented as a cause of low levels of native arthropods, especially in elevations below 2000 ft. (Perkins 1913).

#### Glaber ant

*Ochetellus glaber*, the small black adventive glaber ant, (Figure 12) was seen most frequently throughout the property. It exhibited a tree trail forming behavior. It may be nesting in dry hollow wood stems and especially in old termite holes. It is known from all major islands (HBS 2002a). Both sweet and protein (i.e., native insects) are attractive foods. One authority states the ant "bites fiercely" (Tenorio and Nishida 1995). Use caution around nests in hollow stems and when near active ant trails.



Figure 12: Glaber ants were seen running trails on tree trunks

Big-headed Ants (*Pheidole megacephala*) colonies are easily found under sun-lit warmed stones tending young, which they feed with insect parts dismembered by their soldiers. This species and the Long-legged Ant were surprisingly less common than Glaber ants in the forest at 800.'

**INSECTA**

**LEPIDOPTERA** (butterflies and moths)

**Carposinidae**

*Heterocrossa* sp.

This endemic Alahe'e fruit borer was taken by entomologist Otto H. Swezey in 1954 in N. Waianae (Swezey 1954), but no fruits were present now on plants at this site.

**Nymphalidae**

*Agraulis vanillae* Passion butterflies

The passion vine butterfly was seen on the property. In quick flight, its bright orange wings might be mistaken by members of the public for the Kamehameha butterfly (*Vanessa tameamea*). At rest, the silver markings on the underside of the Passion butterfly wings easily distinguish it from the Kamehameha butterfly at rest with cryptic coloring to hide. (Figure 13)



Figure 13: Passion butterfly top; Kamehameha butterfly bottom

INSECTA LEPIDOPTERA cont.

**Cosmopterigidae**

*Hyposmocoma* sp.



Figure 14: *Hyposmocoma* sp.

Photo# starr-030724-0089

credit: "Forest & Kim Starr" (HEAR)

Adult *Hyposmocoma* (Figure 14) or case bearer moths responded to the light. *Hyposmocoma* are called “case bearers” because after an early beginning inside a leaf curl or similar hiding place, caterpillars create protection in intricately constructed portable shells of silk. For camouflage, they add bits of their surroundings to the case: snips of dry grass / leaves, flakes of bark, maybe a little dirt. The case is then easily mistaken by a predator as another part of the inedible landscape. These bunkers are fitted with a hinged lid (operculum), pulled shut by mandibles to defend them from enemies. They are dependent on their case, and die if removed – even if protected from predators and given food. They don't move far, feed while partly emerged from the case, dragging along the protective armor by six true legs. Cases are sometimes attached to rocks or tree trunks and foliage. (Manning/Montgomery in Liittschwager & Middleton 2001) With over 500 kinds, *Hyposmocoma* micromoths are the greatest assemblage of Hawaiian Island moths, showing

astonishing diversity. After writing 630 pages on them, Dr. Zimmerman lamented the inadequacy of his study. He noted an enormous cluster of species with explosive speciation and diverging radiation (Zimmerman 1978). Much remains to be learned about them by University of Hawaii's Daniel Rubinoff and his graduate students (Rubinoff & Haines 2006).

**Crambidae**

*Eudonia* sp. (Moss moths)

There are 15 *Eudonia* species known from O'ahu, all Hawaiian endemics. Several O'ahu species are also known from other islands. None are considered rare, endangered, or threatened. Some species have been reared from moss, where they build silken tunnels for protection in which to feed (Swezey 1910), but for many species the host plant is not recorded yet. (HBS 2002a, HOSTS, Zimmerman 1958)

INSECTA LEPIDOPTERA cont.

**Geometridae**

*Macaria abydata*

The koa haole moth (Figure 15) was seen throughout the property in day flight as one walks nearby and also responded to the light survey. It is a very common species dependent on the host plant *Leucaena leucocephala* for the caterpillar.



Figure 15: koa haole moth

**Pyralidae**

*Thyrocopa sapindiella*

Signs of caterpillar feeding on leaves of O'ahu soapberry (*Sapindus*) were noted occasionally at 900-1000' elevation, but no larvae were seen. (Zimmerman 1958)

**ODONATA** (Dragonflies, Damselflies)

**Coenagrionidae**

*Ischnura ramburii* (Selys-Longchamps, 1850)



Figure 16: Rambur's damselfly seen on site day and night

The introduced Rambur's damselfly (Figure 16) was seen day and night. They treated the night collecting light as a 'fly-in' dining area. Although small they are frequently seen. They are predators on many of the smaller pest insects.

INSECTA ODONATA cont.

**Libellulidae**

*Pantala flavescens* (Fabricius, 1798) (Globe Skimmer)

An indigenous dragonfly (*Pantala flavescens*) (Figure 17) was observed on the property. Among the most readily observed native insects, Globe Skimmers are large, easily approached by people, and graceful in flight. Any small amount of fresh water will attract them and they often colonize human maintained water sources such as stock tanks. Globe skimmers are widely distributed throughout the Hawaiian Islands, from Kure to Hawai'i Island (HBS 2002a, Nishida 2002) and have even been found flying at sea (Howarth & Mull 1992). They will adapt to changes in water sources.



Figure 17: Globe skimmers are found through the Pacific.

*Anax strenuus* Hagen, 1867 Pinao

This endemic dragonfly (Figure 18) was seen in flight at 900' over a stream. It is known from the entire island chain (Nishida 2002), and is the largest dragonfly outside of Africa. The adult is a predator, catching insects on the wing. Easily seen at mid and upper Mokulē'ia and while hawking for prey, they help control pest insects. Eggs are laid in upland waterways, where young (called naiads) grow to adulthood eating anything smaller.



Figure 18: Native Dragonfly *Anax strenuus*

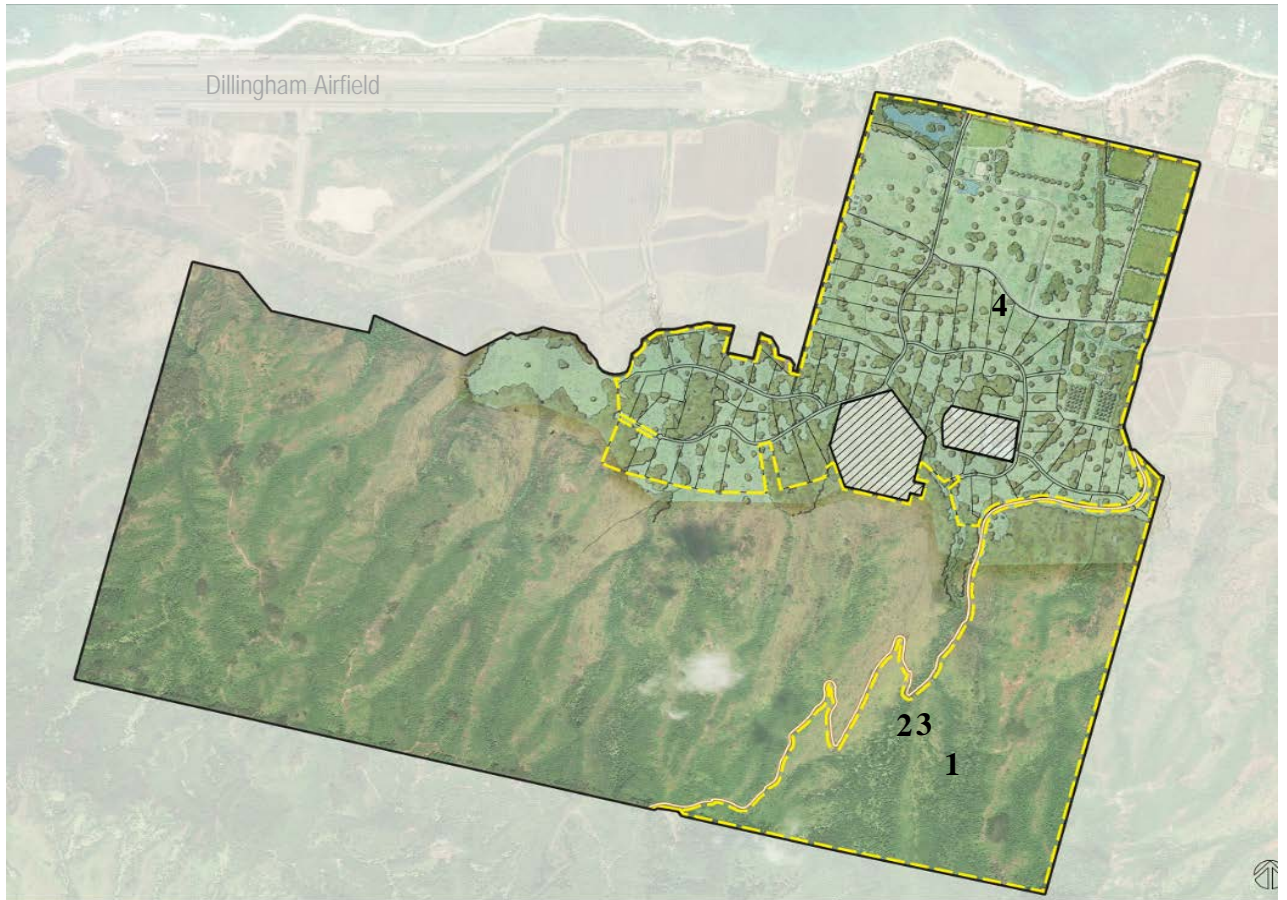


Figure 19: Map of subject area at Dillingham Ranch showing location of some species

**1** = Bird's Nest Fern hosting snails

**2** = *Succinea* sp. (probably *caduca*) shell in stream bed

**3** = Dripping cliff seep hosting long-legged flies; soapberry trees hosting planthoppers

**4** = Shore fly habitat



**Table 1:** List of Invertebrates:

Species	Common Name	Status	Comments
<b>MOLLUSCA</b>			
<b>GASTROPODA</b>			
Achatinellidae			
<i>Lamellidea</i> sp.		End	
<i>Tornatellides</i> sp.		End	
Achatinidae			
<i>Lissachatina fulica</i> (Bowdich) [previously <i>Achatina fulica</i> (Bowdich 1822)]	Giant African Snail	Pur	Since 1936
Amastridae			
<i>Leptachatina</i> sp.		End	Very diverse group; 150 species
Bradybaenidae			
<i>Bradybaena similaris</i> (Ferussac, 1821)		Adv	Known from Hawai'i and O'ahu; several Pacific islands, South America; in islands since at least 1948
<i>Eulota similaris</i> [Cooke]		Adv	On O'ahu since at least 1912; All major Hawaiian islands; Also in Samoa, Fiji
Hydrobiidae			
<i>Oxychilus alliarius</i>	Garlic Snail	Adv	
Spiraxidae			
<i>Euglandina</i> sp.	Rosy Wolf Snail	Pur	Since 1955
Subulinidae			
<i>Subulina octona</i> Bruguière		Adv	On O'ahu since at least 1912; Known from many Pacific islands; South America, other locations.
Succinidae			
<i>Succinea caduca</i> Mighels	Amber Snail	End	1 shell, upper stream channel; known from all major Hawaiian islands
Thiaridae			
<i>Melanoides tuberculata</i> (Mueller, 1774)	Melania	Adv	
Euconulidae			
<i>Liardetia</i> cf. <i>doliolum</i>		End	
<b>ARTHROPODA</b>			
<b>CRUSTACEA</b>			
Amphipoda			
Talitridae			
<i>Platorchestia platensis</i> (Kroyer, 1845)		Ind	
<i>Talitroides topitotum</i> Burt, 1934	Sow Bugs, Pill Bugs	Adv	
Isopoda			
<i>Porcellio laevis</i> Latreille, 1804.	Sow Bug	Adv	
Ostracoda			
Cypridae			
<i>Heterocypris makua</i> (Tressler), 1937		End	Aquatic in 1 liter rock hole at 800' elev. 1mm species also on Big I.
<b>ARACHNIDA</b>			
<b>ARANEAE</b>			
Spiders			
Oxyopidae			
<i>Oxyopes</i> sp.	Lynx Spider	Adv	
Salticidae			
<i>Phidippus regius</i> C.L. Koch, 1846	Jumping Spider	Adv	
Araneidae			
<i>Argiope appensa</i> (Walckenaer 1841)	Orb Weaver Spiders	Adv	
Heteropodidae			
<i>Heteropoda venatoria</i> (Linnaeus), 1767	Large Brown Spider / Cane Spider	Adv	
Pholcidae			
<i>Pholcus phalangoides</i> (Fuesslins, 1775)	Longbodied Cellar Spider	Adv	

Invertebrate Survey, Dillingham Ranch, O'ahu

Species	Common Name	Status	Comments
<b>ARACHNIDA</b>			
PSEUDOSCORPIONIDA			
Geogarypidae			
<i>Geogarypus longidigitatus</i> (Rainbow, 1897)	False Scorpion	Adv	
SCORPIONIDA			
Scorpiones			
<i>Isometrus maculatus</i> (De Geer)	Lesser Brown Scorpion	Adv	
<b>INSECTA</b>			
BLATTODEA			
Blatellidae			
<i>Balta</i> sp.	Forest roach	Adv	On <i>A. niodus</i>
COLEOPTERA			
Beetles			
Nitidulidae			
<i>Carpophilus humeralis</i> (Fabr)	Souring Beetle	Adv	
Coccinellidae			
<i>Coccinella septempunctata</i> Linnaeus, 1758	Seven-Spotted Lady Beetle	Pur	Agriculturally positive
Cerambycidae			
<i>Plagithmysus albertisi</i> Sharp, 1897		End	Not found in 2018
<i>Plagithmysus sapindi</i> Perkins		End	
Scarabaeidae			
<i>Aphodius lividus</i> (Olivier, 1789)		Adv	
<i>Onthophagus gazella</i> (Fabricius, 1787)	Brown Dung Beetle	Pur	
DERMAPTERA			
Earwigs			
Chelisochidae			
<i>Chelisoches morio</i> (Fabricius), 1775	Black Earwig	Adv	
<i>Rhantus pacificus</i> Bvd.			
DIPTERA			
Flies / Mosquitoes			
Sciaridae			
<i>Sciara</i> sp.	Fungus Gnat	Adv	Comes to rotting vegetation, not crops
<i>Allograpta obliqua</i> (Say)	Hover Fly	Adv	Agricultural positive Eats pest aphids
Chironomidae			
<i>Chironomus hawaiiensis</i> Grims.	Midge	End	Larva a reddish bloodworm; eats algae
Calliphoridae			
<i>Lucilia sericata</i> (Meigen, 1826)	Greenbottle Fly	Adv	
Ceratopogonidae			
<i>Dasyhelea hawaiiensis</i> Macfie, 1934		End	
<i>Forcipomyia howarthi</i> Wirth & Howarth, 1982		End	
Chironomidae			
<i>Chironomus hawaiiensis</i> Grimshaw, 1901		End	
Culicidae			
<i>Aedes albopictus</i> Skuse	Asian Tiger Mosquito	Adv	Day biting disease vector
<i>Culex quinquefasciatus</i> Say, 1823	Southern House Mosquito	Adv	Night biting disease vector
<i>Toxorhynchites amboinensis</i> (Doleschall, 1857)	Cannibal Mosquito	Pur	Preys on pest mosquitoes; does not bite humans
Dolichopodidae			
<i>Dolichopus exsul</i> Aldrich, 1922		Adv	
<i>Hydrophorus pacificus</i> Van Duzee, 1933		Adv	Pale Long-legged fly; ranges from coast marshes up to Laysan
Ephydriidae			
<i>Brachydeutera hebes</i> Cresson, 1926	Shore Fly	End	Feeds on algae, fresh water pools
Pipunculidae			
<i>Cephalops</i> sp.	Big-Headed Fly	Adv	Dark wings; leafhopper parasite
Tipulidae			
<i>Limonia perkinsi</i> Grimshaw, 1901	Crane Fly	Adv	
HEMIPTERA: HETEROPTERA			
True Bugs			
Lygaeidae			
<i>Nysius terrestris</i> Usinger, 1942	Seed Bug	End	on Portulaca
<i>Pseudopachybrachius vinctus</i> (Say, 1832)		Adv	
Mesoveliidae			
<i>Mesovelia mulsanti</i> White		Adv	

Invertebrate Survey, Dillingham Ranch, O'ahu

Species	Common Name	Status	Comments
INSECTA			
HEMIPTERA: HETEROPTERA			
Miridae	Leaf Bugs		
<i>Lygus elisus</i> Van Duzee, 1914		Adv	
<i>Orthotylus iolani</i> Kirkaldy, 1902		End	
<i>Trigonotylus hawaiiensis</i> (Kirkaldy), 1902	Grass Bug	End	
Nabidae			
<i>Nabis blackburni</i> White, 1878		End	
<i>Nabis capsiformis</i> Germar, 1837		Adv	
Pentatomidae			
<i>Nezara viridula</i> (L.)	Southern Green Stink Bug	Adv	Agricultural pest on Macadamia nut
Veliidae			
<i>Microvelia vagans</i> White	Velvet Water Bug	Adv	On surface of water
HOMOPTERA			
Cixiidae			
<i>Oliarus</i> sp.		End	new host record
HYMENOPTERA			
Anthophoridae			
<i>Xylocopa sonorina</i> F. Smith, 1874	Sonoran Carpenter Bee	Adv	
Apidae			
<i>Apis mellifera</i> Linnaeus, 1758	Honey Bee	Pur	
Formicidae			
<i>Anoplolepis gracilipes</i>	Long-Legged Ant	Adv	
<i>Camponotus variegatus</i> (F. Smith, 1858)	Carpenter Ant	Adv	
<i>Ochetellus glaber</i> (Mayr), 1862	Glaber Ant	Adv	
<i>Pheidole megacephala</i> (Fabricius), 1793	Big-Headed Ant	Adv	
Megachilidae			
<i>Megachile</i> sp.	Leaf Cutter Bee	Adv	
Vespidae			
<i>Polistes exclamans</i> Viereck, 1906	Common Paper Wasp	Adv	
ISOPTERA			
Kalotermitidae			
<i>Incisitermes immigrans</i> (Snyder), 1922	Drywood Termites	Adv	Came to lights in uplands
LEPIDOPTERA			
Alucitidae			
<i>Alucita objurgatella</i> (Walsm., 1907)	Alahee Fruit Borer	Adv?	Moth at lights
Carposinidae			
<i>Carposina graminicolor</i> (Walsingham), 1907	(Unseen; predicted seasonally)	End	reared ex <i>Canthium</i> fruit by Swezey 1954 at Keawaula
Cosmopterigidae			
<i>Hyposmocoma ekaha</i> Swezey, 1910	Borer on fern <i>A. Nidus</i>	End	Sought but Not seen
<i>Hyposmocoma</i> sp. 1	Cases on fern <i>A. Nidus</i>	End	
<i>Hyposmocoma</i> sp. 2	Cases on stone lichens	End	
<i>Hyposmocoma</i> sp. 3		End	At light
<i>Hyposmocoma</i> sp. 4		End	At light
Crambidae			
<i>Eudonia</i> sp. near <i>balanopsis</i> Meyrick	Moss Moth	End	
<i>Eudonia</i> sp. near <i>rhombias</i> Meyrick		End	
<i>Eudonia</i> sp. brown		End	
<i>Mestolobes</i> sp. (likely <i>minuscula</i> )		End	Grass feeder in web
<i>Omiodes localis</i> (Butler, 1879)		End	
Geometridae			
<i>Euacidalia brownsvillea</i> Cassino, 1931		Adv	
<i>Macaria abydata</i> Guenee, 1857	Koa Haole Moth	Adv	
Lycaenidae			
<i>Lampides boeticus</i> (Linnaeus)	Bean Butterfly	Adv	Agricultural pest of beans, Legumes
<i>Udara blackburni</i> (Tuely, 1878)		End	larvae on Kakalaioa leaves, <i>C. bonduc</i>
Noctuidae			
<i>Achaea janata</i> (Linnaeus), 1758	Croton Caterpillar	Adv	On root
<i>Schranksia simplex</i> (Butler), 1881		End	
Nymphalidae			
<i>Agraulis vanillae</i> (Linnaeus, 1758)	Passion Vine Butterfly	Adv	Agricultural pest on passion fruit vine
<i>Danaus plexippus</i> (Linnaeus, 1758)	Monarch Butterfly	Adv	

Invertebrate Survey, Dillingham Ranch, O'ahu

Species	Common Name	Status	Comments
INSECTA			
LEPIDOPTERA			
Pieridae			
<i>Pieris rapae</i> (Linnaeus, 1758)	Cabbage White Butterfly		Agricultural pest on cabbage family
<i>Abaeis nicippe</i> (Cramer, 1779)	Sulfur Butterfly	Adv	
Phycitidae			
<i>Ectomyeloides ceratoniae</i> (Zeller)1839		Adv	<i>Erythrina sandwicensis</i> seed feeder Reared ex pods
Pyrilidae			
<i>Omiodes localis</i> (Butler), 1879		End	
<i>Thyrocopa sapindiella</i> Swezey, 1913	sought but not seen	End	Leaf feeding common at 1000'elev.
ODONATA			
Dragonflies Damselflies			
Aeshnidae			
<i>Anax junius</i> (Drury), 1770	Green Darner	Adv	
<i>Anax strenuus</i> Hagen, 1867	Pinao	Ind	Seen in flight at 900'
Coenagrionidae			
<i>Ischnura ramburii</i> (Selys-Longchamps, 1850)	Rambur's Damselfly	Adv	
Libellulidae			
<i>Orthemis ferruginea</i> (Fabricius, 1775)	Roseate Skimmer	Adv	
<i>Pantala flavescens</i> (Fabricius, 1798)	Globe Skimmer	Ind	
ORTHOPTERA			
Grasshoppers, Crickets			
Acrididae			
<i>Oxya japonica</i> (Thunberg)	Japanese Grasshopper	Adv	
Gryllidae			
<i>Acheta domesticus</i> (Linnaeus), 1758	Field Cricket	Adv	By voice
Tettigoniidae			
<i>Elimaea punctifera</i> (Walker, 1869)	Katydid	Adv	At lights
<i>Euconocephalus nasutus</i> (Thunberg), 1815	Aggravating Grasshopper	Adv	In tall grass; noise annoyance
PSOCOPTERA:			
Psocidae			
<i>Ptycta</i> sp.	Bark Lice	Adv	
CHILOPODA			
Scolopendromorpha			
Centipedes			
Scolopendridae			
<i>Scolopendra subspinipes</i> Leach 1815	Large Centipede	Adv	
DIPLOPODA			
Millipedes			
Paradoxosomatidae			
<i>Oxidus gracilis</i> (C.L. Koch), 1847	Garden Millipede	Adv	

Status:

End endemic to Hawaiian Islands

Ind indigenous to Hawaiian Islands

Adv adventive

Pur purposefully introduced

Names authority: Hawaii Biological Survey 2002a, b; Nishida 2002; Zimmerman 1948-80; Zimmerman 2001

## SPECIES NOT FOUND BUT LIKELY PRESENT

### INSECTA COLEOPTERA **Cerambycidae**

*Plagithmysus* or long-horned woodborers

No evidence was found of native cerambycid beetles although they historically were collected on *Sapindus* nearby. They are termed “long-horned” because most species have extraordinarily long antennae (for sniffing out just the right egg laying location). Females lay eggs by boring into wood with a specially adapted ovipositor, putting eggs into solid wood or just under the bark depending on the species. For protection, the larvae feed below the bark, leaving long flat grooves or tunnels under bark or in sapwood. Grubs seldom go deep into a living tree, and do little damage to harvestable timber. Adults feed little, using stored fat from the larval stage. They are the mulching machines of the forest. The grubs reduce dead or dying trees to small bits of frass that eventually land on the forest floor to rot, releasing stored nitrogen to nourish existing plants and new growth.

The native genus *Plagithmysus*, a puzzle of evolution as the 140 *Plagithmysus* species are each island specific, all descended from a single arrival. Eggs are laid only in damaged or dying tree wood that gives off just the right scent (those long antennae smell their way to the right location).

They do not come to lights or baits and are well known as difficult to locate. Dr. J. L. Gressitt (1978) wrote: “Scarcity of adults has been noted by all field workers. Many entomologists long in Hawaii have never observed a plagithmysine beetle in the field. Sharp [1900] and Perkins [1896, 1921] have remarked at length on this.” Consequently, not encountering them in this short survey period may be due to their reclusive behavior.

### LEPIDOPTERA

#### **Crambidae**

*Omiodes monogona* Meyrick, 1888

I could not find any larvae of the Wiliwili Leaf Roller in webbed *Erythrina* leaves, as Otto Swezey did at Keālia in 1954 (Haines 2004). It may well be in there area.

#### **Noctuidae**

*Ascalapha odorata* (Linnaeus, 1758)

Black witch moth

Despite the presence of several large Monkeypod trees, the Black Witch moth (Figure 20) associated with that host plant did not come to our light. It may well be in the area. The black witch moth is widely distributed in the islands since first sightings were noted at Honaunau in 1928 (Bryan 1929). It is most frequently seen at dawn or dusk and is sometimes mistaken for a bat.



Figure 20: Black witch moth resting on tree trunk

### Incidental Sightings

Although no exhaustive search was made, any invertebrate surveyor incidentally observes wildlife that may be intertwined with that community – as insects are often food for birds, for example. Consequently, in addition to the invertebrate results above, I noted at various locations on the property most of the introduced birds recorded by Bruner (2014, Table 1). Of the native waterbirds Bruner listed in 2014, the following were seen on the property in 2018

Hawaiian Coot or `Alae Ke'oke'o (*Fulica alai*)

Common Moorhen or `Alae `ula (*Gallinula chloropus sanvicensis*)

Hawaiian Duck or Koloa (*Anas wyvilliana*)

Black-necked Stilt or Ae'o (*Himantopus mexicanus knudseni*)

Seen by Bruner in 2008 and seen by this surveyor in 2018

Pacific Golden-Plover or Kolea (*Pluvialis fulva*)

Wandering Tattler or 'Ulili (*Heteroscelus incanus*).

A small group of young feral pigs (*Sus scrofa*) was also sighted once in the coconut grove area.

*Bufo marinus* or cane toads were present.



Figure 21: *Indotyphlops braminus* or Blind snake

One 'blind snake' (Figure 21) *Indotyphlops braminus* [previously known as *Ramphotyphlops braminus*] was encountered under a stone. They resemble an earth worm as they quickly slither away when disturbed. They have been on O'ahu for 80 years and are commonly found under rocks or in the bottom of potted plants. They could be encountered by those beginning agricultural activity by bringing in flats or pots of sprouted seeds. Although truly a snake, these 4 inch insect eating reptiles are not a threat to humans or livestock. (Hunsaker and Breese 1967)

### INVERTEBRATES NOT PRESENT

Plant and invertebrate populations are interdependent; consequently, host plant availability is one way to review invertebrate health. This site had relatively few host plants for native invertebrates.

### SPECIES NOT FOUND

Any survey for federally protected species should include consideration of all native invertebrates (snails, spiders, and insects).

### Lava tube dependent native species

A review of the archaeological survey of the area (Belluomini 2018) indicated no lava tubes at the project site which could support cave-adapted native invertebrate species. Nor did this surveyor see any indication of lava tubes during time on site.

SPECIES NOT FOUND cont.

**ARTHROPODA: ARANEAE** (spiders)

Theridiidae: *Theridion grallator* (Happyface spider)

No examples of this foliar spider (Figure 22) were noted in searches. I am especially aware of this species and do not believe it is present on site.



Figure 22: Happyface spider, Mt. Kaala (2002)

**INSECTA**

**DIPTERA**

**Drosophilidae: *Drosophila***

No native *Drosophila*, the pomace flies, were observed on the property, but the alien fly *Leucophenga* was reared from mushrooms. The property is now unsuitable habitat for endemic *Drosophila*, especially those listed as endangered. These native Hawaiian picture wing flies require a much more intact environment and host flora is severely depleted on this property. (*Federal Register* 2006a, b). In the 1970s, above 1600' *Drosophila* species were recorded to lay eggs only in *Sapindus* sap fluxes where sweet, fermenting plant sap slowly leaks from a wound. Fermented by yeasts, the sap becomes a rich food for larval flies. Some introduced tree sap "tastes" enough like the native sap to entice some native flies to lay eggs at this resource when populations of the fly remain (Montgomery 1975). Without success, 15 large *Sapindus* trees were examined for sap exudates as a possible breeding site of 3 dry forest *Drosophila* species.

SPECIES NOT FOUND: INSECTA cont.

**LEPIDOPTERA**

**Sphingidae**

*Agrius cingulata* Sweet potato hornworm

Although it did not respond to my light survey, the sweet potato hornworm moth may be present or may come to the area when agricultural efforts expand. It feeds on sweet potato, morning glory,



Figure 23: Sweet potato hornworm showing pink markings.

and related plants. It is widely distributed around the Hawaiian Islands. (HBS 2002a, Nishida 2002) This large and easily seen moth is sometimes confused by the public with the endangered Blackburn's sphinx moth (*Manduca blackburni*) described below. The adult sweet potato hornworm moth has PINK markings (Figure 23) along both sides where *Manduca* has ORANGE (Figure 24). When the moth is at rest with wings folded, these color markings are hidden, leading to possible misidentifications.

***Manduca blackburni***

The Blackburn's sphinx moth<sup>4</sup> (*Manduca blackburni*), an endangered species (USFWS 2000) was not found in this survey, nor anywhere on O'ahu since 1932. Although the botany survey did find solanaceous plants which could serve as host to the caterpillar (LeGrande 2017), the plants "were seen infrequently within the survey area." (LeGrande 2018) During the botanical survey, LeGrande was alert to the possible presence of *Manduca* caterpillars on the host plants, but did not see any (LeGrande 2018). The only designated O'ahu habitat is at Honouliuli (USFWS 2005).



Figure 24: Blackburn's sphinx moth is distinguished from other hawk moths by orange markings.

<sup>4</sup> Blackburn hawk moth is the official common name recognized by the HES Committee on Common Names of Insects (1990). Blackburn's sphinx moth has come into popular usage.



## MEDICALLY IMPORTANT SPECIES

### Centipedes, scorpions, black or brown widow spiders:

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

### COLEOPTERA: Oedemeridae

*Ananca bicolor* (Fairmaire) 1849, or red-black false blister beetles was seen on site (Figure 25). The species is known from several major islands, including O'ahu and as far as Ni'ihau and Midway. The beetles are attracted to lights, but also feed on flower pollen by day. When irritated or pressed (between clothing and skin, for example) they ooze a defensive irritating chemical causing blistering of skin. Individual's susceptibility to blistering is reported to vary as do healing rates. Although irritating, uncomfortable, and very unpleasant, the blisters are not life threatening. Seek medical attention if blistering is widespread or does not heal promptly. See "*What's Bugging Me?*" (Tenorio and Nishida 1995) or for detailed discussion see University of Florida / Florida Dept. of Agriculture web site



Figure 25: Red-black false blister beetle

[http://entomology.ifas.ufl.edu/creatures/urban/medical/blister\\_beetles.htm](http://entomology.ifas.ufl.edu/creatures/urban/medical/blister_beetles.htm). (Arnett 2008)

MEDICALLY IMPORTANT SPECIES cont.

**HYMENOPTERA: Anthophoridae**

**Carpenter bees** (*Xylocopa sonorina*) were observed and are likely present in dry, dead wood on site. The black carpenter bee females and golden males are easily seen. Carpenter bees carve out a short tube tunnel in soft wood (fence post, dry branches) as their home (Figure 26). They do not form colonies, but live individually. Carpenter bees are not a danger to people under normal circumstances, but if cornered can sting.



Figure 26: Carpenter bee: black female, golden male; tunnel housing.

**Apidae**

As in many locations in the islands, there are hidden **honey bee** (*Apis mellifera*) colonies on the property. Dead trees with hollows are a favored location for a hive. If in clearing areas bees are encountered, a beekeeper should be contacted to remove the colony safely. Employees with an allergy to stings should inform their supervisor and carry their response kit at all times.

**Vespidae**

Common **paper wasps** (*Polistes* sp.) are on the property. This wasp favors dry, sheltered sites. These wasps, common throughout the lowlands, and especially like to build their 'paper' nests under overhangs. (Figure 27). They are a danger to humans. They sting repeatedly, unlike honey bees which die after one sting. Nests are best destroyed at night when all wasps are on the paper nest. Destroying the nest during daylight hours will result in rebuilding when the wasps return later in the day. If nests are found, ask for advice on removal. Protective clothing, gloves, covered shoes are required.



Figure 27: Typical paper wasp nest

## **POTENTIAL IMPACTS**

### **Potential Impacts on Native, Rare, Federally or State Listed Species**

No federally or state listed endangered species was found in this survey. No native species found in the lowland surveyed locations for the proposed project activity are known to be found only on this property.

## **RECOMMENDATIONS**

### **General Recommendations for promotion and protection of native invertebrates**

#### **Landscape with native plants:**

The 2017 botanical survey recommended landscaping with native plants during the project (LeGrande 2017). In addition to their beauty and the positive cultural and social values communicated by the use of native plants, these plants would provide habitat and refuge for native arthropods while creating a lower upkeep perimeter. Native plants will remain green and thus more fire resistant throughout the summer. Native plantings have lower maintenance costs when chosen to match area climate. As native plants tend to reach a predictable height and foliage spread, well-chosen plantings usually mean less hedge trimming and weed whacking. In the areas to be left undeveloped or used to screen the crops, native plants in a mixture of ground cover, shrub, and tree heights will slow run off, and retain moisture while holding soil at low cost. Native insects and other creatures may use this refuge over time.

Native plants can be convenient for mass re-vegetation plantings. A list of suppliers of native plants is available at <http://nativeplants.hawaii.edu/nursery/>

### **Control pests for health of livestock and people**

Control is recommended for the Giant African Snail and the Day and Night biting mosquitoes in the agricultural areas. Agricultural extension agents and Department of Health can advise.

### **Continue monitoring for Coconut Rhinoceros Beetle**

The coconut rhinoceros beetle (*Oryctes rhinoceros*) did **not** respond to our light or day searches. BUT the presence of a large number of Coconut trees in the Palm Plantation plantings makes the area classic beetle habitat. Ranch management is in contact with Hawaii Department of Agriculture pest monitoring staff. Periodic visits to the Department's web page on this pest is recommended. <http://hdoa.hawaii.gov/pi/main/crb/> All Ranch field workers should be familiarized with the classic signs of infestation to continue vigilance.

## ACKNOWLEDGMENTS

Steven Lee Montgomery conducted all surveying and is responsible for all conclusions. Anita Manning assisted with database searches, in the field, and contributed to preparation of this report. Brenden Holland and Norine W. Yeung assisted with malacological identifications. Thanks goes to Maya LeGrande for field information and Leilani Alquiza of Dillingham Ranch for assistance in property access.

Photos are by Anita Manning or Steven Montgomery unless otherwise attributed.

## STANDARD NOMENCLATURE

**Invertebrate** names follow

*Freshwater & Terrestrial Mollusk Checklist* (HBS 2002b)

*Common Names of Insects & Related Organisms* (HES 1990)

*Hawaiian Terrestrial Arthropod Checklist* (HBS2002a; Nishida 2002)

**Plant** names follow

*Manual of the Flowering Plants of Hawai'i* (Wagner et al. 1999)

*A Tropical Garden Flora* (Staples and Herbst 2005)

**Mammal** names follow *Mammals in Hawai'i* (Tomich 1986).

**Place name** spelling follows *Place Names of Hawaii* (Pukui et al. 1976).

## ABBREVIATIONS

**DLNR** Department of Land and Natural Resources, State of Hawai'i

**DOH** Department of Health, State of Hawai'i

**HBS** Hawai'i Biological Survey

**n.** new

**sp.** species

**spp.** more than one species

**TMK** Tax Map Key

**USFWS** United States Fish and Wildlife Service

## GLOSSARY<sup>5</sup>

**Adventive:** organisms introduced to an area but not purposefully.

**Alien:** occurring in the locality it occupies ONLY with human assistance, accidental or purposeful; not native. Both Polynesian introductions (e.g., coconut) and post-1778 introductions (e.g., guava, goats, and sheep) are aliens.

**Arthropod:** insects and related invertebrates (e.g., spiders) having an external skeleton and jointed legs.

**Endangered:** A species listed and protected under the Endangered Species Act of 1973, as amended.

**Endemic:** naturally occurring, without human transport, ONLY in the locality occupied. Hawaii has a high percentage of endemic plants and animals, some in very small microenvironments.

**Indigenous:** naturally occurring without human assistance in the locality it occupies; may also occur elsewhere, including outside the Hawaiian Islands. (e.g., Naupaka kahakai (*Scaevola sericea*) is the same plant in Hawai'i and throughout the Pacific).

**Insects:** arthropods with six legs, and bodies in 3 sections

**Invertebrates:** animals without backbones (insects, spiders, snails / slugs, shrimp)

**Larva/larval:** an immature stage of development in offspring of many types of animals.

**Mollusk:** invertebrates in the phylum Mollusca. Common representatives are snails, slugs, mussels, clams, oysters, squids, and octopuses.

**Native:** organism that originated in area where it lives without human assistance. May be indigenous or endemic.

**Naturalized:** an alien organism that, with time, yet without further human assisted releases or plantings, has become established in an area to which it is not native.

**Nocturnal:** active or most apparent at night.

**Pupa:** the stage between larva and adult in insects with complete metamorphosis, a non-feeding and inactive stage often inside a case

**Purposefully introduced:** an organism brought into an area for a specific purpose, for example, as a biological control agent.

**Rare:** threatened by extinction and low numbers.

**Species:** all individuals and populations of a particular type of organism, maintained by biological mechanisms that result in their breeding mostly with their kind.

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5 Glossary based largely on definitions in *Biological Science: An Ecological Approach*, 7<sup>th</sup> ed., Kendall/Hunt Publishing Co., Dubuque, a high school text; on the glossary in *Manual of Flowering Plants of Hawai'i*, Vol.2, Wagner, et al., 1999, Bishop Museum Press, and other sources.

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