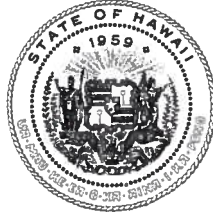


NEIL ABERCROMBIE  
GOVERNOR OF HAWAII



FEB 23 2011

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LAND  
STATE PARKS

STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES

POST OFFICE BOX 621  
HONOLULU, HAWAII 96809

February 7, 2011

Director  
Office of Environmental Quality Control  
235 South Beretania Street, Suite 702  
Honolulu, Hawaii 96813

Dear Director:

Subject: Draft Environmental Assessment for the Hilo Forest Reserve Fencing Project,  
TMK (3) 2-6-018:013, Piihonua, South Hilo, Hawaii.

The Department of Land and Natural Resources has reviewed the Draft Environmental Assessment for the subject project, and anticipates a Finding of No Significant Impact. Please publish notice in the next issue of The Environmental Notice. Enclosed are the following items:

- One (1) copy in pdf format and One (1) completed OEQC Publication Form on a CD
- One (1) hardcopy of the Draft EA
- DEIS Distribution List

If you have any questions, please contact Michael Constantinides at 587-4187 or michael.constantinides@hawaii.gov

Sincerely,

A handwritten signature in blue ink that reads "Paul J. Conry".

Paul J. Conry, Administrator  
Division of Forestry and Wildlife

---

**DRAFT ENVIRONMENTAL ASSESSMENT**

**HILO FOREST RESERVE FENCING PROJECT**

**TMK: (3<sup>rd</sup>) 2-6-018:013  
Pi'ihonua, Hawai'i Island  
State of Hawai'i**

**February 2011**

**Submitted Pursuant to Chapter 343, Hawai'i Revised Statutes (HRS)**

**State of Hawai'i  
Department of Land and Natural Resources  
Division of Forestry and Wildlife  
1151 Punchbowl St., Room 325  
Honolulu, Hawai'i 96813**

---

# **DRAFT ENVIRONMENTAL ASSESSMENT**

## **Hilo Forest Reserve Fencing Project**

**TMK: Portion (3<sup>rd</sup>) 2-6-018:013  
Pi'ihonua, Hawai'i Island, State of Hawai'i**

**PROPOSING/ACCEPTING  
AGENCY:**

State of Hawai'i  
Department of Land and Natural Resources  
1151 Punchbowl Street #325  
Honolulu, Hawai'i 96813

**CONSULTANT:**

GK Environmental LLC  
PO Box 1363  
Honoka'a, Hawai'i 96727

**CLASS OF ACTION:**

Use of State Land  
Use of State Funds

This document is prepared pursuant to:

The Hawai'i Environmental Policy Act,  
Chapter 343, Hawai'i Revised Statutes (HRS), and  
Title 11, Chapter 200, Hawai'i Department of Health Administrative Rules (HAR).

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## SUMMARY

The Hawai‘i State Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DOFAW) has identified the need to construct a cattle fence and access road within a proposed State Forest Reserve. This project would prevent cattle encroachment into the proposed Forest Reserve and would reduce consequent adverse impacts. The cattle-proof fence would extend along an approximately 5-mile alignment bordering a portion of the western perimeter of the Hilo Forest Reserve and a portion of the northern perimeter of the Upper Waiakea Forest Reserve. The fence corridor has already been subdivided from its parent parcel and is currently being processed for addition to the Hilo Forest Reserve by DLNR. The access road would allow for fence construction and maintenance, DLNR resource management efforts, and future public access for hunting and other activities.

The Forest Reserve System (FRS) is managed under the guidance of the Hawai‘i State Constitution, Hawai‘i Revised Statutes (Chapter 183) and associated Hawai‘i Administrative Rules (Chapter 104). Through these directives DOFAW focuses its resources to protect, manage, restore, and monitor the natural resources of the FRS. Keeping with the original intention of the FRS, DOFAW provides recreational and hunting opportunities; aesthetic benefits; watershed restoration; native, threatened, and endangered species habitat protection and management; cultural resources; and fire protection among many other resources. The FRS accounts for over 640,000 acres of state-managed land, and without continued management these natural resources that provide a suite of ecosystem services to Hawai‘i residents and visitors to the islands, these resources would be impaired in both quality and quantity.

This assessment examines alternatives considered to the proposed action and describes anticipated impacts to the physical and biological environment, socioeconomic factors, and growth-inducing, cumulative, and secondary impacts. An archaeological survey and cultural assessment have determined that no significant historic sites or cultural resources are present; if archaeological resources are encountered during land-altering activities associated with construction, work in the immediate area of the discovery will be halted and the State Historic Preservation Division will be contacted. A number of small holes are located near the fence corridor and are possibly indicative of lava tubes; these will be avoided when feasible and implementation of a mitigation plan will minimize the potential for damage to historic, cultural and biological resources. Potential water quality impacts due to erosion and sedimentation are mitigable through implementation of a soil conservation plan. In general, other impacts are expected to be negligible or beneficial to the environment.

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## **LIST OF ABBREVIATIONS**

ALISH	Agricultural Lands of Importance to the State of Hawai‘i
BMP	Best Management Practice
DLNR	Hawai‘i State Department of Land and Natural Resources
DOFAW	Division of Fish and Wildlife
EA	Environmental Assessment
EIS	Environmental Impact Statement
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
FRS	Forest Reserve System
HDOH	Hawai‘i State Department of Health
HAR	Hawai‘i Administrative Rules
HEPA	Hawai‘i Environmental Policy Act
HRS	Hawai‘i Revised Statutes
OEQC	Hawai‘i State Office of Environmental Quality Control
SHPD/O	State Historic Preservation Division/Officer
SMA	Special Management Area
UH	University of Hawai‘i
USF&WS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
NRCS	Natural Resources Conservation Service



# **1 PROJECT LOCATION, DESCRIPTION, PURPOSE AND NEED**

## **1.1 Project Background, Purpose and Need**

The Hawai‘i State Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DOFAW) has identified the need to construct a cattle fence and access road within a proposed State Forest Reserve. This project would prevent cattle encroachment into the proposed Forest Reserve and would avoid consequent adverse impacts.

The Forest Reserve System (FRS) is managed under the guidance of the Hawai‘i State Constitution, Hawai‘i Revised Statutes (Chapter 183) and associated Hawai‘i Administrative Rules (Chapter 104). Through these directives DOFAW focuses its resources to protect, manage, restore, and monitor the natural resources of the FRS. Through the FRS DOFAW provides recreational and hunting opportunities; watershed restoration; native, threatened, and endangered species habitat protection and management; cultural resources; aesthetical benefits; and fire protection among many other opportunities and resources. The FRS accounts for over 640,000 acres of state managed land, and without continued management these natural resources that provide a suite of ecosystem services to Hawai‘i residents and visitors to the islands, these resources would be damaged in both quality and quantity.

Hawaiian forest ecosystems are among the world’s most spectacular examples of ecological and evolutionary speciation and adaptation. These biological resources are key elements of the cultural heritage of the native culture of the Hawaiian Islands. Unfortunately many of these native forest ecosystems have been degraded and destroyed. The Hilo Forest Reserve is a primary water resource for windward Hawai‘i Island, and provides exceptional habitat for a great amount of diversity of plant and animal species.

Cattle pose a significant threat to watershed integrity and native species habitat in the State Forest Reserve System. Cattle consume and trample native plants, create conditions favorable for invasive weed infestation and establishment, prevent the establishment of native plant seedlings, serve as vectors for the dispersal of non-native plants, disrupt soil nutrient cycling, and accelerate soil erosion. The long-term impact of cattle is the decline of intact native ecosystems, including the destruction of suitable habitat for threatened and endangered forest birds, plants, and invertebrates. Forest left unprotected from cattle encroachment is gradually destroyed and is eventually replaced by open grassland. The absence of cattle helps create an environment that promotes natural forest regeneration which in turn improves habitat for native wildlife.

## **1.2 Project Location and Description**

The cattle-proof fence would extend along a 4.97-mile alignment (Figure 1,2 &3) near the border of a portion of the western perimeter of the Hilo Forest Reserve and a portion of the northern perimeter of the Upper Waiakea Forest Reserve. The fence would serve to protect a 1,460.6-acre parcel that has already been subdivided from its parent parcel and is currently being processed for addition to the Hilo Forest Reserve by DLNR. The access road would allow for fence construction and maintenance, DLNR resource management efforts, and future public access for

hunting and other activities. The budget for the project is approximately \$300,000 million and construction is expected to begin after the environmental review process and permitting are completed.

The fence would be 4-foot tall hogwire 12.5-gauge mesh fence with a barbed-wire strand six inches above the mesh. The fence would be constructed in a manner conformant with NRCS Conservation Practice Standard Fencing Code 382 (NRCS 2011). Fence T-posts would be spaced every 10 feet with line posts every 100 feet. The roadway would be constructed with a maximum width of 14 feet, and would follow the immediately surrounding terrain, thereby requiring a minimum of excavation and fill. The access road would not be surfaced except as needed by gravel in boggy areas.

## **1.3 Alternatives Considered**

### **1.3.1 The Preferred Alternative**

This refers to the proposed project, which is described in Section 1.2, above.

### **1.3.2 Alternative Fence Corridors Considered**

As the fence and roadway must be constructed within the proposed State Forest Reserve the most sensible route for the fence to take, barring other concerns, is at the exterior of the forest reserve. Inasmuch as the specific fence corridor may be slightly modified for the purpose of avoiding direct physical damage to resources, no alternative fence corridors meet this requirement.

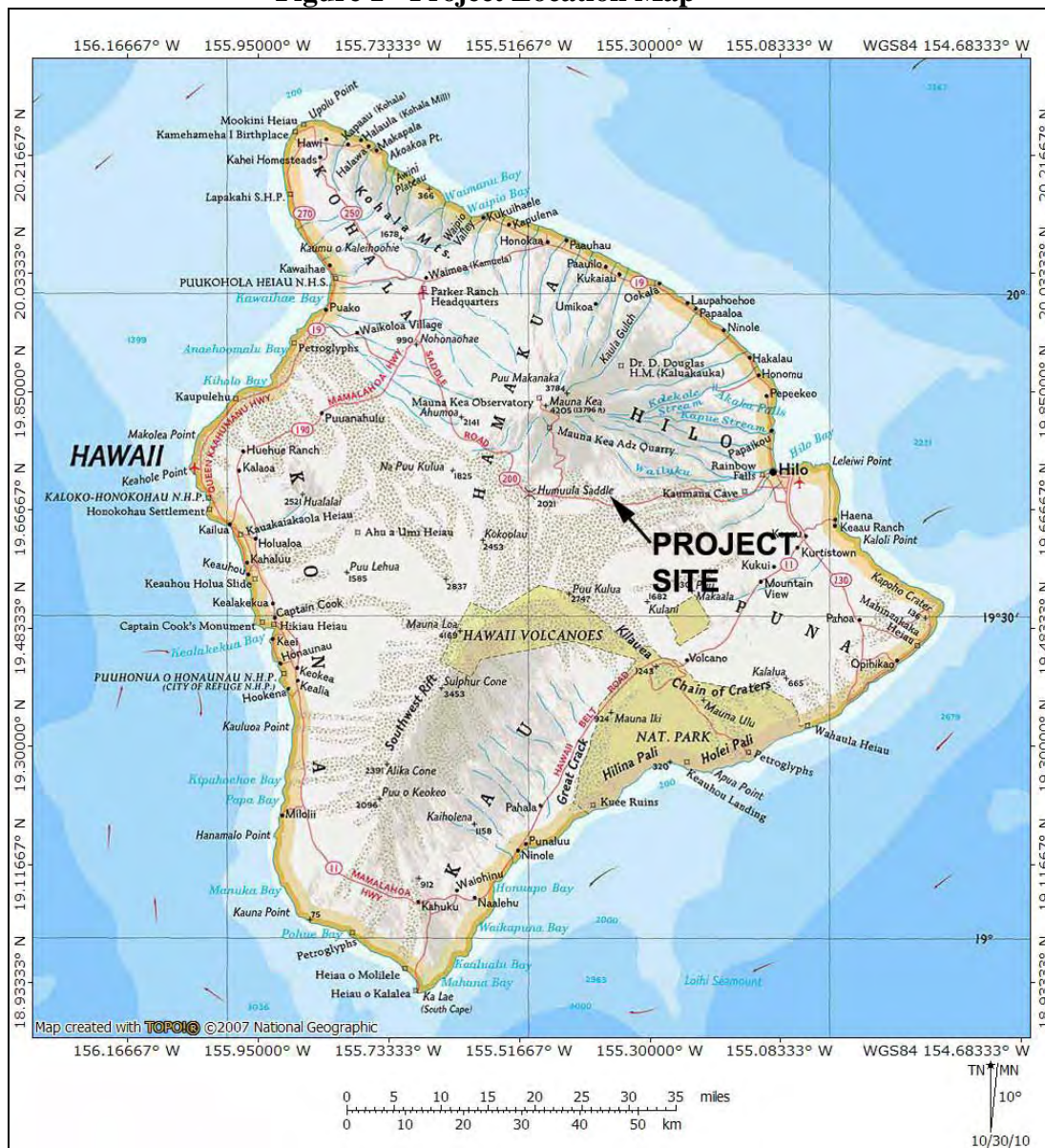
### **1.3.3 Alternative Strategies Considered**

There appear to be no other alternatives that would achieve the purpose of the project.

### **1.3.4 No-Action Alternative**

The No Action Alternative is a baseline alternative to which we compare all action alternatives and their impacts. In this case the No Action Alternative means that the proposed State Forest Reserve would not be protected from encroachment by cattle and would essentially remain in pasture. Particular impacts would not take place in the No Action Alternative, including the expenditure of funds and the direct impacts of construction of the fence and access road. However, the No Action Alternative fails to take advantage of existing funding opportunities and would result in the long-term impairment of the quality of the State Forest Reserve. As such, the applicant considers the No Action Alternative to be highly undesirable.

**Figure 1 - Project Location Map**



### 1.3.5 Selection of Project Alternative

DOFAW has determined that the most rational and efficient strategy for dealing with the need to restrict encroachment by cattle into the proposed State Forest Reserve is to construct the proposed fence. DOFAW considers construction and maintenance costs to be acceptable viewed against the long-term benefit to the FRS.

### 1.4 Consistency with Government Plans and Policies

The project is highly consistent with government plans, laws and policies regarding protection and management of the State FRS, which in general call for maintenance of public resources for

long-term economic and social benefits. The following sections discuss consistency with key plans.

#### **1.4.1 Hawai'i State Plan**

The Hawai'i State Plan was adopted in 1978. It was revised in 1986 and again in 1991 (Hawai'i Revised Statutes, Chapter 226, as amended). The Plan establishes a set of goals, objectives and policies that are meant to guide the State's long-run growth and development activities. The proposed project is consistent with State goals and objectives that call for increases in employment, income and job choices, and a growing, diversified economic base extending to the neighbor islands.

#### **1.4.2 Hawai'i County General Plan**

The Hawai'i County General Plan does not directly discuss the State FRS or the project area, but discussion in several sections does indirectly relate to the project by stating that soil conservation in areas mauka of urban areas is important for flood control (Hawai'i County Planning Department 2005).

Land Use, Section 14 classifies State Forest Reserves within the Open Space designation. Pertinent sections of the Hawai'i County General Plan from the Open Space and Public Lands sections (14.8 and 14.9, respectively) are as follows:

Pertinent Goals of Section 14.8, Open Space, are as follows:

##### 14.8.2 Goals

- (a)** Provide and protect open space for the social, environmental, and economic well being of the County of Hawaii and its residents.
- (b)** Protect designated natural areas.

Pertinent Goals, Policies, and Standards of Section 14.9, Public Lands, are as follows:

##### 14.9.2 Goals

- (a)** Utilize publicly owned lands in the best public interest and to the maximum benefit for the greatest number of people.

##### 14.9.3 Policies

- (a)** Encourage uses of public lands that will satisfy specific public needs, such as housing, recreation, open space and education.

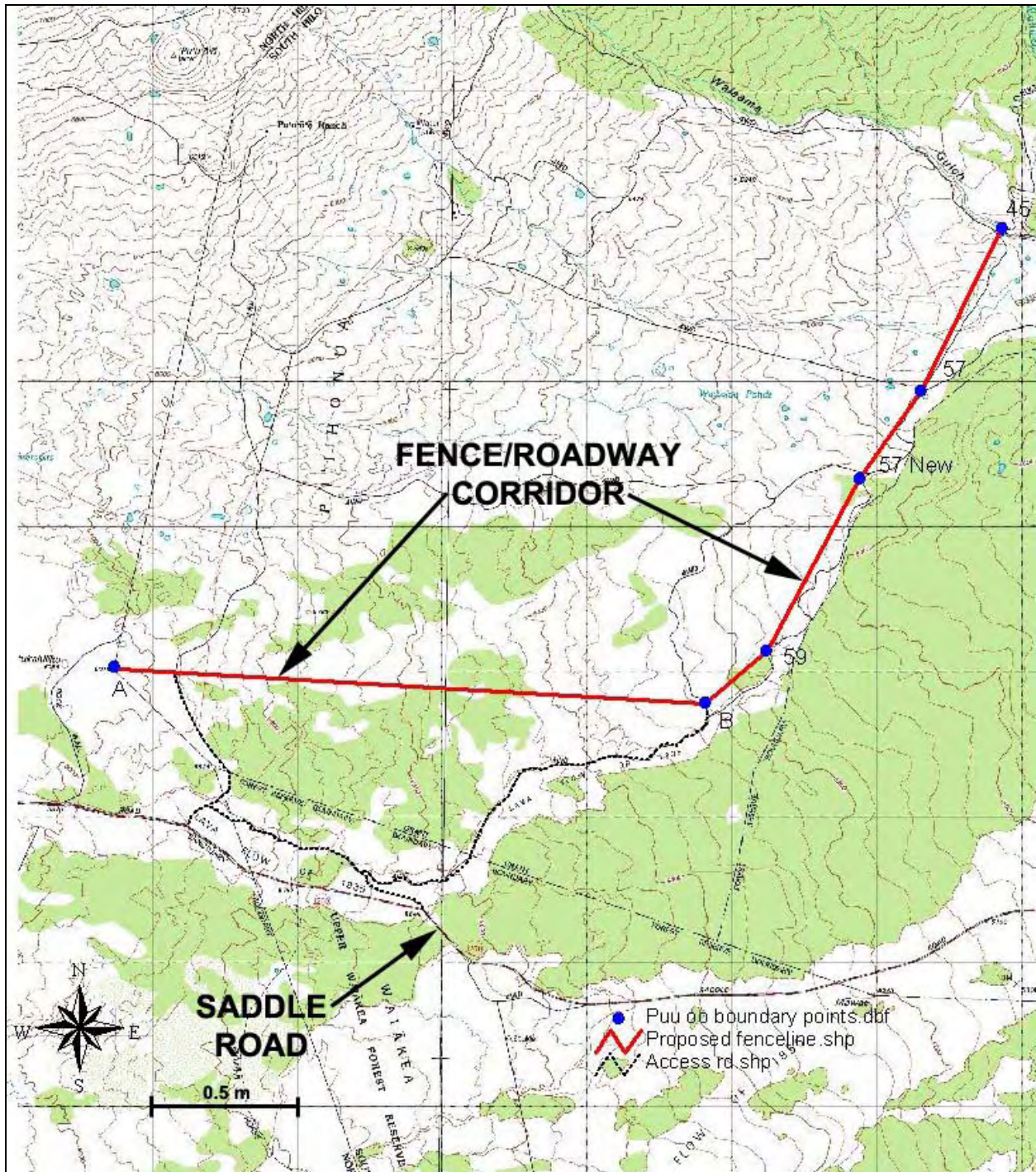
##### 14.9.4 Standards

- (a)** Public lands with unique recreational and natural resources shall be maintained for public use.

The proposed project is consistent with applicable sections of the Hawai'i County General Plan, which, in general, call for protection of Forest Reserves for the benefit of the people of Hawai'i.

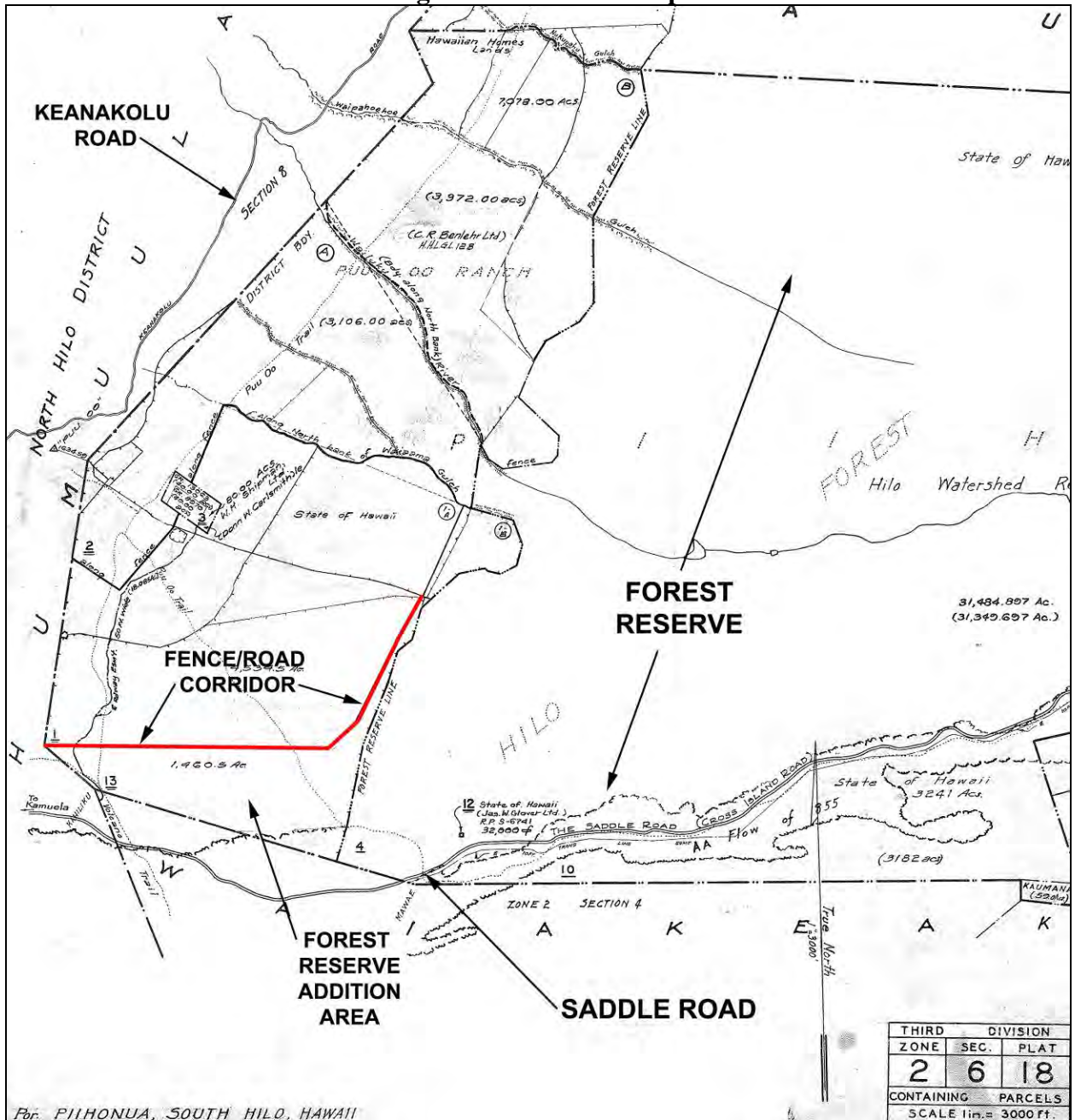


Figure 2 – Site Topographic Map





**Figure 3- Site TMK Map**



**Figure 4a - Representative view of the western portion of the proposed fence corridor.  
Fence corridor traverses grassland and scattered forest in this area.**



**Figure 4b - Representative view of the northern portion of the proposed fence corridor.  
Fence corridor traverses open grassland in this area.**





## 2

## ENVIRONMENTAL ASSESSMENT PROCESS

The project involves the use of State of Hawai‘i funds and land and therefore requires compliance with Chapter 343, Hawai‘i Revised Statutes (HRS), the Hawai‘i Environmental Policy Act (HEPA). DLNR is the proposing and approving agency for this Environmental Assessment (EA).

HEPA was enacted by the Hawai‘i State Legislature to require State and County agencies to consider the environmental impacts of various actions as part of the decision-making process. Agencies are required to conduct an investigation and evaluation of alternatives as part of the environmental impact analysis process, prior to making decisions that may impact the environment. The implementing regulations for HEPA are contained in Title 11, Chapter 200, Hawai‘i Administrative Rules (HAR).

This Environmental Assessment (EA) process was conducted in accordance with HEPA. According to HEPA and its implementing regulations, a Draft EA is prepared to document environmental conditions and impacts, to develop mitigation measures that avoid, minimize or compensate for adverse environmental impacts, and determine whether or not an action has significant impacts upon the environment. Impacts are evaluated for significance according to thirteen specific criteria as presented in HAR 11-200-12. If no significant impacts are expected, then a Final EA with a Finding of No Significant Impact (FONSI) may be issued. When the Draft EA determines that significant impacts are present, then a Notice of Intent is prepared and the Final EA facilitates preparation of an Environmental Impact Statement (EIS).

### 3

## ENVIRONMENTAL SETTING AND IMPACTS

This section describes the existing cultural, historic, environmental, social, and economic conditions surrounding the proposed project along with the probable impacts of the proposed action and mitigation measures designed to reduce or eliminate adverse environmental impacts. For many categories, the No Action Alternative would result in no impacts. Therefore, unless explicitly mentioned, discussion of impacts and mitigation relates to the preferred alternative only.

### *Basic Geographic Setting*

The fence corridor traverses a roughly L-shaped, 4.97-mile route on the eastern flank of Mauna Kea between approximately 4,800 and 6,000 feet of elevation (MSL, above Mean Sea Level) in the ahupua‘a of Pi‘ihonua. The corridor is underlain by weathered lava flows from Mauna Loa Volcano and surfaced by open grasslands dominated by common non-native grasses with scattered Ohi‘a (*metrosideros polymorpha*) and occasional naio (*Myoporum sandwicense*), koa (*acacia koa*) and native shrubs including ohelo (*Vaccinium calycinum*), and pukiawe (*Styphelia tamieamieae*). Densely forested sections of the State Forest Reserve, Hilo Watershed and Upper Waiakea units, are located immediately to the south and east of the fence corridor, respectively. The northeastern terminus of the corridor is located near the ephemeral water feature of Waiama Gulch, a tributary of the Wailuku River. In general, the more mauka (i.e., upslope) areas in the project vicinity are used for ranching, and include Pu‘u O‘o Ranch.

The fence corridor is located completely within the State Agricultural Land Use District. It is not located in the County of Hawaii’s Special Management Area. The property is zoned Agricultural (A-40a). The Hawai‘i County General Plan classifies the area as Extensive Agriculture, which is defined as lands not classified as Important Agricultural Land and not capable of producing sustained, high agricultural yields (Hawai‘i County Planning Department 2005).

### **3.1 Physical Environment**

#### **3.1.1 Surface Geology, Hazards, and Soils**

##### *Existing Environment*

The surface geology consists of Ka‘u basalt pahoehoe and a‘a lava flows erupted from Mauna Loa volcano. These flows are interwoven flows of varying ages including young flows of 200-750 years of age and somewhat older flows of 1,500 to 5,000 years of age (Wolfe and Morris 1996).

The U.S. Natural Resource Conservation Service (NRCS, formerly the Soil Conservation Service) classifies the soils in the fence corridor as raw pahoehoe lava flows near the western terminus of the corridor, Kekake extremely rocky muck with 6 to 20% slopes along the majority of the midsection of the corridor, and Mawae extremely stony muck with 6 to 20% slopes in the north-eastern section of the corridor (SCS 1972).

The entire Big Island is subject to geologic hazards, especially lava flows and earthquakes. The project site is located in Lava Flow Hazard Zone 2 (on a scale of ascending risk 9 to 1; with 1 being highest risk). In Zone 2, approximately 15-25 percent of the land area has been covered by lava flows since 1800 and 25-75 percent of the land area has been covered in the last 750 years. This risk is due to the proximity of the project site to the summit and rift zones of Mauna Loa where vents have been repeatedly active in historic time. As such, there is a risk of lava inundation over short time scales in the project area (USGS 2010).

In terms of seismic risk, the entire Island of Hawai‘i is rated Zone 4 Seismic Probability Rating (Uniform Building Code, Appendix Chapter 25, Section 2518). Zone 4 areas are at risk from major earthquake damage, especially to structures that are poorly designed or built.

Visual surveys of the fence corridor revealed the presence of a number of holes that may be indicative of lava tubes.

### *Impacts and Mitigation Measures*

In order to minimize risks to resources DOFAW will implement a contingency plan:

1. All construction personnel will be trained in this contingency plan;
2. If a previously undetected lava tube cave is encountered, all construction with the potential to impact the lava tube will immediately cease;
3. The appropriate personnel at DOFAW will be contacted;
4. These personnel will contact SHPD and will mobilize appropriate personnel qualified to assess whether historic sites or burials are present and whether the lava tube cave has special geological, biological or other value that merits investigation and data collection; and

Depending on the context and resources associated with the cave, several alternative courses of action may be pursued:

1. If burials or historic sites are present, the mitigation directed by the State Historic Preservation Division and Hawai‘i Island Burial Council will be followed, in accordance with Chapter 6E, HRS, Section 106 of the National Historic Preservation Act, P.L. 101-85, and P.L. 101-601.
2. If no historic sites are present, the disposition of the cave will be as follows:
  - a. If appropriate and feasible, the cave will be disturbed as little as possible and left as-is.
  - b. If the cave poses a structural or safety hazard to the fence or access road the alignment of either the fence, roadway or both will be modified adequately to avoid the cave.

Geologic conditions impose only minimal constraints on the project. However, it is recognized the most of the surface of the Big Island is subject to eventual lava inundation, and that all projects in this area would face such risk.

### **3.1.2 Hydrology, Floodplains and Surface Water Quality**

#### *Existing Environment, Impacts and Mitigation Measures*

Floodplain status for the project site is unmapped (i.e., no FIRM exists for the area), indicating that the area is designated Zone X, located outside of the 100- or 500-year flood plain (FEMA 2010). The area is mostly recent lava and is generally well drained, although small boggy pockets dot the landscape. The lack of surface water features and erosion features in the project area is indicative of the lack of surface runoff in the project area due to a combination of high hydraulic permeability and general absence of significant soils.

The project will not add to the area of impermeable surface as the access road will not be paved and will not adversely affect drainage. In any project, uncontrolled excess sediment from soil erosion during and after excavation and construction has the potential to impact natural watercourses, water quality and flooding potential. Contaminants associated with heavy equipment and other sources during construction have the potential to impact ground water if not mitigated effectively. However, due to the lack of impermeable surfaces and the general hydraulic characteristics of the site, it is highly unlikely that water quality impacts would occur as a result of construction. In spite of this a Soil Conservation Plan has been prepared and approved by the NRCS and will be implemented during construction. This plan specifies, among other requirements, that water bars be constructed crossing the roadway at regular intervals in order to reduce the velocity of runoff and the potential for sediment laden storm water runoff. The project will also require the acquisition of a National Pollutant Discharge Elimination System Individual Permit, which may carry with it further mitigation requirements.

The project site contains Waiama Gulch, an ephemeral water feature located near the northern terminus of the fence corridor. Site visits to this area reveal that a 4WD track already crosses Waiama Gulch. If possible, this existing 4WD track should be utilized for construction access to the site and also as a portion of the proposed access roadway in order to minimize soil disturbance and the potential for sediment laden storm water runoff.

Minimizing cattle encroachment into the Forest Reserve will reduce soil erosion and consequent adverse water quality impacts. Therefore the project would have a long-term positive impact to water quality.

### **3.1.3 Climate and Air Quality**

#### *Existing Environment, Impacts and Mitigation Measures*

The climate of the project area can be described as moist and cool due to its location on the Mauna Kea highlands and on the windward and wet side of the island. Average annual rainfall

in the area is between approximately 78 and 118 inches. Winds are generally trades from the east-northeast, which are occasionally replaced by light and variable southerly “kona” winds, most often in winter (UH-Manoa, Dept. of Geography 1998).

Air pollution in the area is minimal, and is mainly derived from occasional periods of volcanic emissions of sulfur dioxide, which convert into particulate sulfate and produce a volcanic haze (vog) that infrequently affects the area. The persistent tradewinds keep this area relatively free of vog for most of the year.

The proposed project would not produce any permanent substantial air quality impacts. Construction has the potential to produce very localized and temporary fugitive dust emissions, although construction disturbance of the moist and vegetated landscape is unlikely to produce significant dust. There are no dust-sensitive land uses in the area.

### **3.1.4 Noise and Scenic Value**

#### *Existing Environment, Impacts and Mitigation Measures*

Noise levels on the site are very low and are derived mainly from aircraft and wind. No sensitive noise receptors exist within the project area as the area is uninhabited.

The project corridor is not visible from any public roadways. The project will produce negligible short-term and no long-term noise impacts. Due to the lack of proximity to public roadways and the nature of the project visual impacts would be negligible. Artificial lighting would not be required as all construction activities would be performed during daylight hours.

### **3.1.5 Hazardous Substances**

#### *Existing Environment, Impacts and Mitigation Measures*

Due to the history of use of the site it is unlikely that any hazardous substances are present in or near the project site. Given the nature of the project no impacts due to hazardous substances are anticipated.

## **3.2 Biological Environment**

#### *Existing Flora, Impacts and Mitigation Measures*

A botanical survey of the fence corridor was conducted by qualified botanists on January 28, 2010. Plant species were identified in the field and, as necessary, keyed out in the lab. Special attention was given to the possible presence of any federally listed endangered or threatened plant species (USFWS 2010).

The fence corridor crosses mostly open grasslands dominated by common non-native grasses such as *Anthoxanthum odoratum*, *Axonopus fissifolius*, and Kikuyu grass (*Pennisetum*

*clandestinum*) with pockets of the native bunch grass (*Deschampsia nubigena*) and the scattered native fern *Dryopteris wallichiana*. The native shrubs ohelo (*Vaccinium calycinum*) and pukiawe (*Styphelia tameiameiae*) are also common in places. The project area is located within the Montane Wet Forest ecoregion with the upper portion extending into the Montane Mesic Forest and Shrubland ecoregion (Wagner et. al 1999).

Other natural communities that the proposed fenceline passes through include scattered ohia (*Metrosideros polymorpha*) trees in grasslands dominated by non-native pasture grasses (see above description) with occasional naio (*Myoporum sandwicense*), koa (*Acacia koa*), and native shrubs such as ohelo, pilo (*Coprosma montana*) and the native bunch grass *Deschampsia nubigena*, often growing in holes where grazing animals can't reach. This community type grades into an open koa/ohia forest with a canopy of 30-40 feet or a shorter-statured ohia-dominated forest type with constituents such as kolea (*Myrsine lessertiana*) over an understory dominated by ohelo, the native shuttlecock fern, *Dryopteris wallichiana*, and scattered hapu'u (*Cibotium glaucum*) tree ferns. There were 30 endemic or indigenous Hawaiian plant species out of 58 total species identified from the project area (Table 3-1). No USFWS endangered or threatened plant species were observed during the course of the survey.

Some minor direct impacts to floral resources from fence and access road construction are unavoidable but may be minimized by careful selection of precise fence post location and access road route. Construction may affect some common native plants, although the final fence and access road route would be selected to occupy existing non-native grassland whenever possible.

The project would also create the potential for the introduction of novel alien species to the project area. Construction equipment, materials, and personnel provide opportunities for the introduction of destructive non-native plants and insects, such as ants. In the long-term, the provision of access for fence maintenance also produces this potential as maintenance personnel and equipment, as well as other visitors, may bring non-native plant seeds and insects into the area. Disturbance to the ground surface and vegetation may create conditions facilitating colonization of weedy plants. Thus the following practices will be implemented to minimize the introduction of alien plants and insects and to reduce the possibility of establishment. First, boots, clothes, equipment and materials will be inspected for seeds, insects, eggs, larvae, etc., prior to delivery and/or entry into the project area, and these items will be cleaned as necessary. All construction workers will be instructed on specific procedures to prevent the spread or introduction of noxious alien plants or insects in the project area. In addition, precautions will be taken to prevent spreading alien plants already found in the project area, and all refuse, tools, gear, and construction waste will be removed upon completion of the work. Periodic weed assessment and treatment are recommended as part of other long-term conservation activities in the proposed Forest Reserve.

The project would result in long-term protection of floral resources in the FRS through removal of encroachment by cattle and would thus, in conjunction with the above mitigation measure, result in positive impacts for the habitat. The No Action Alternative would result in immediate degradation of habitat within the proposed State Forest Reserve and would not prevent future encroachment by cattle into the existing FRS.

**Table 3-1  
Plant Species on Project Site**

<b>Scientific Name</b>	<b>Family</b>	<b>Common Name</b>	<b>Life Form</b>	<b>Status*</b>
<i>Acacia koa</i>	Fabaceae	Koa	Tree	E
<i>Ageratina riparia</i>	Asteraceae	Mistflower	Shrub	A
<i>Andropogon virginicus</i>	Poaceae	Broom Sedge	Grass	A
<i>Anthoxanthum odoratum</i>	Poaceae	Sweet Vernal Grass	Grass	A
<i>Axonopus fissifolius</i>	Poaceae	Common carpetgrass	Grass	A
<i>Asplenium adiantum-nigrum</i>	Polypodiaceae	Iwaiwa	Fern	I
<i>Asplenium trichomanes</i>	Polypodiaceae	'oali'i	Fern	A
<i>Astelia menziesiana</i>	Liliaceae	Pa'iniu	Herb	E
<i>Athyrium sandwichianum</i>	Athyriaceae		Fern	E
<i>Bambusa sp.</i>	Poaceae	Bamboo	Tree	A
<i>Carex wahuensis</i>	Carex	Carex	Grass	E
<i>Cheirodenron trigynum</i>	Araliaceae	Olapa	Tree	E
<i>Cibotium glaucum</i>	Dicksoniaceae	Hauptu Pulu	Fern	E
<i>Cirsium vulgare</i>	Asteraceae	Bull thistle, pua kala	Herb	A
<i>Coprosma ernodeiodes</i>	Rubiaceae	Kukaenene	Shrub	E
<i>Coprosma Montana</i>	Rubiaceae	Pilo	Shrub	E
<i>Coprosma rhynchophora</i>	Rubiaceae	Pilo	Shrub	E
<i>Cuphea carthagensis</i>	Lythraceae	Tarweed	Herb	A
<i>Deschampsia nubigena</i>	Poaceae	Hairgrass	Grass	E
<i>Dicranopteris linearis</i>	Gleicheniaceae	Uluhe	Fern	I
<i>Diplazium sandwichianum</i>	Athyriaceae	Pohole	Fern	E
<i>Dryopteris fusco-atra</i>	Dryopteridaceae	Li, Dryopteris	Fern	E
<i>Dryopteris glabra</i>	Dryopteridaceae	Kilau	Fern	E
<i>Dryopteris wallichiana</i>	Dryopteridaceae	Laukahi	Fern	I
<i>Ehrharta stipoides</i>	Poaceae	Meadow Rice Grass	Grass	A
<i>Eragrostis browneii</i>	Poaceae	Sheepgrass	Grass	A
<i>Fragaria chiloensis</i>	Rosaceae	Ohelo papa	Herbs	E
<i>Fraxinus uhdei</i>	Oleaceae	Tropical Ash	Tree	A
<i>Gnaphalium japonicum</i>	Asteraceae	Japanese Cudweed	Herb	A
<i>Gnaphalium sandwicense</i>	Asteraceae	Enaena	Herb	E
<i>Holcus lanatus</i>	Poaceae	Yorkshire Fog	Grass	A
<i>Hypochoeris radicata</i>	Asteraceae	Cat's ear	Herb	A

<i>Juncus effusus</i>	Juncaceae	Soft Rush	Herb	A
<i>Luzula hawaiiensis</i>	Juncaceae	Wood rush	Herb	E
<i>Metrosideros polymorpha</i>	Myrtaceae	Ohia	Tree	E
<i>Myoporum sandwicense</i>	Myoporaceae	Naio	Tree	E
<i>Myrsine lessertiana</i>	Myrsinaceae	Kolea lau nui	Tree	E
<i>Pellaea ternifolia</i>	Pteridaceae	Kalamoho	Fern	I
<i>Pennisetum clandestinum</i>	Poaceae	Kikuyu Grass	Grass	A
<i>Prunella vulgaris</i>	Lamiaceae	Selfheal	Herb	A
<i>Pteris cretica</i>	Pteridaceae	Cretan brake	Fern	I
<i>Reichardia tingitiana</i>	Asteraceae	Reichardia	Herb	A
<i>Rubus argutus</i>	Rosaceae	Blackberry	Herb	A
<i>Rubus hawaiiensis</i>	Rosaceae	Akala	Shrub	E
<i>Rubus rosifolius</i>	Rosaceae	Thimbleberry	Herb	A
<i>Rumex acetosella</i>	Polygonaceae	Sheep sorrel	Herb	A
<i>Sadleria pallida</i>	Blechnaceae	Amau	Fern	E
<i>Schizachryium condensatum</i>	Poaceae	Tufted beardgrass	Grass	A
<i>Setaria gracilis</i>	Poaceae	Yellow Foxtail	Grass	A
<i>Senecio madagascariensis</i>	Asteraceae	Fireweed	Shrub	A
<i>Sporobolus africanus</i>	Poaceae	Dropseed	Grass	A
<i>Stereocaulon vulcani</i>	Polypodiaceae		Lichen	I
<i>Styphelia tameiameia</i>	Ericaceae	Pukiawe	Shrub	I
<i>Trifolium repens</i>	Fabaceae	White clover	Herb	A
<i>Uncinia uncinata</i>	Cyperaceae	Hook sedge	Grass	I
<i>Ulex europaeus</i>	Fabaceae	Gorse	Shrub	A
<i>Vaccinium calycinum</i>	Ericaceae	Ohelo	Shrub	E
<i>Youngia japonica</i>	Asteraceae	Oriental hawksbeard	Herb	A

E = Endemic species, I = Indigenous species, A = Alien species

Nomenclature used for plants follows *Manual of the Flowering Plants of Hawai'i* (Wagner et al. 1999). Nomenclature for ferns and fern allies follows Palmer (2003).

### *Existing Terrestrial Fauna, Impacts and Mitigation Measures*

A faunal survey of the fence corridor was conducted by qualified biologists on March 9, 2010 and the results of this survey are attached in Appendix 1. The following four native bird species were observed: Amakihi (*Hemignathus virens*), Apapane (*Himatione sanguinea*), I'o (*Buteo solitarius*), and Kolea (*Pluvialis fulva*). No-native mammals observed include feral pig (*sus scrofa*) and domestic cattle (*Bos Taurus*). No USFWS listed threatened or endangered bird species were observed during the survey (USFWS 2010). Non-native bird species observed include the Japanese White Eye (*Zosterops japonicus*), Skylark (*Alauda arvensis*), Turkey (*Meleagris gallopavo*) and Kalij Pheasant (*Lophura leucomelanos*).



The survey noted that a set of native birds were not observed but are known to occupy the project area and include the following species: I'iwi (*Vestiaria coccinea*), Oma'ō (*Myadestes obscurus*), Pūeo (*Asio flammeus sandwichensis*), Nēne (*Branta sandvicensis*), and Kōloa (*Anas wyviallana*).

Direct physical impacts to native fauna are likely to be negligible; a very small amount of habitat would be directly affected by fence and access road construction. Noise associated with construction may temporarily disrupt the activities of native birds within the project area. It is possible that the 'ōpe'ape'a, or Hawaiian Hoary Bat, could fly into the fencing and become entangled, leading to injury or possibly death. The overall impact on native bats is not anticipated to be significant, however, since none has been sighted in the project area. The significant benefits to native habitat as a result of the project would outweigh any adverse impacts to bats or other wildlife species.

#### *Existing Aquatic Environment, Impacts and Mitigation Measures*

No perennial streams, lakes or wetlands are present or would be affected in any way by surface activities.

### **3.3 Socioeconomic**

#### **3.3.1 Social Factors and Community Identity**

##### *Existing Environment, Impacts and Mitigation Measures*

The project site is located a large distance from any residence or population center. The site is not within the Special Management Area or Conservation District. No relocation of residences, businesses, community facilities, farms or other activities would occur because of the project. Over the long term, all direct impacts to the social environment may be regarded as beneficial, because it will indirectly improve watershed and water quality, as well as access to a public resource. Therefore the project would have negligible or no impacts on social factors and community identity.

#### **3.3.2 Public Services, Facilities and Utilities**

##### *Existing Environment, Impacts and Mitigation Measures*

The project would not require electrical power or other utilities and would produce no demand upon public facilities or services. No such facilities or services would be affected in any adverse way.

#### **3.3.3 Cultural, Archaeological and Historic Resources**

##### *3.3.3.1 Archaeological Resources*

An archaeological inventory survey report of the proposed fence and roadway corridor was

performed by the National Park Service in 2008 (National Park Service 2008). It is attached as Appendix 2 and is summarized in this and the next section.

Inventory work performed in association with developments at the Hakalau NWR include Haun 1986; Carter 1999; Rosendahl 1989 and 1990; Raymond 1991 and 1993; Speulda 1996, Tomonari-Tuggle 1996; and Williams and O'Hare (2001). Information from these site studies is supplemented by broader regional investigations (McEldowney; Cordy 1994; Tomonar-Tuggle 1996; Maly 1997, 1999 & 2005; U.S. Department of Transportation 1997; Williams et al. 2000).

Archaeological sites identified as a result of these works are summarized in Table 1 of the archaeological inventory survey report (Appendix 2). Apart from historic roadways and structures relating to ranching, identified sites included a platform, enclosure and complex relating to a habitation, historic petroglyphs and cairns serving as boundary markers, a shelter, and a shrine.

A Historic Properties Identification and Field Report was prepared by the Division of State Parks (Carpenter et al. 2006) for portions of the Hilo Forest Reserve including the Upper Laupahoehoe and Humu'ula Sections. This work selected study areas between 4,800 and 5,920 feet above sea level and identified no historic properties on a total of five pedestrian transects. The study for this work was located approximately five miles north of the proposed fence corridor.

A Draft Environmental Impact Statement (DEIS) was prepared for the Saddle Road (US DOT 1997) that details archaeological, historic, and traditional cultural resources for the area. A total of 16 archaeological sites were identified during survey efforts comprised of 13 newly identified sites and 3 previously known sites. Two of these resources, the Pu'u O'o – Volcano and the Hilo – Pu'u O'o Trails may intersect the fence corridor. These trails were both constructed in the 20<sup>th</sup> century for transporting sheep and cattle and are eligible for inclusion to the National Register of Historic Places as they are both eligible under criteria A, C & D as described below.

To be considered for the National Register, resources must possess particular criteria relating to integrity of location, design, setting, materials, workmanship, feeling, and association, and: A) Are associated with events that have made a significant contribution to the broad patterns of our history; or B) Are associated with the lives of persons significant in our past; or C) Embody the distinctive characteristics of a type, period, or method of construction, or that represents the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or D) Have yielded or may be likely to yield information important in prehistory or history.

The archaeological inventory survey for this project revealed a number of historic features and no traditional Hawaiian features. Two historic features observed were a wire fence alignment and a historic corral (T2). The wire fence alignment appeared to coincide with the location of the Volcano – Pu'u O'o Trail on maps, however, no visible trail route was identified in this area. The historic corral, named the "Pinto Corral", although in poor condition, is currently in use.

These sites were evaluated for site significance based on the National Register Criteria

established in the National Historic Preservation Act of 1966. Neither of the two historic features observed are eligible for listing on the National Register of Historic Places based on these criteria.

As no archaeological resources appear to be present in the fence corridor there would be no adverse impacts to archaeological resources due to the fence and roadway construction. However, mitigation recommended for inadvertent discovery of resources within caves described in Section 3.1.1 above would ensure protection of archaeological resources.

Concurrence with our finding of no adverse impact was requested of DLNR-SHPD in a letter dated November 20, 2010. As of February 4,, 2011 no response has been received. However, telephone conversations with DLNR-SHPD staff indicate that that this finding of concurrence will be forthcoming and will be published in the Final Environmental Assessment.

In conclusion, no significant archaeological features are present and none are likely to be impacted by the proposed project. The Draft EA has been distributed to groups knowledgeable in the area's resources to ensure that this conclusion is valid. None of the groups consulted contributed any information concerning cultural resources in the project area.

### *3.3.3.2 Cultural Impact Assessment*

This section assesses cultural impacts of the proposed action. The significance of environmental impact can, in part, be determined by impacts upon cultural resources, as determined by HRS 343. Significant cultural impacts exist when a proposed action adversely affects traditional cultural practices and beliefs in the area of the proposed action. This cultural impact assessment presents information relating to the cultural practices, traditions and beliefs of the project area, provided in the form of narratives provided by cultural practitioners, and by historic accounts of the area. This assessment is not limited to the project site, but examines cultural practices and beliefs of the project area.

The work of Kumu Pono Associates collected historical and oral accounts concerning Native Hawaiian experiences with Mauna Kea, the Humu'ula Saddle, and the Mauna Kea mountain lands, or '*aina mauna* (Kumu Pono Associates LLC 2005). We summarize this document and others, including information presented in the Saddle Road Improvements Final Environmental Impact Statement (US Dept. of Transportation 1999), here as they relate to the project area.

Mauna Kea, known traditionally as Mauna a Wākea, figures prominently in Native Hawaiian traditions as the first-born mountain son of Wākea and Papa, who were also progenitors of the Hawaiian race. Mauna Kea symbolizes the *piko*, or umbilical cord or the island-child, Hawai'i, and that which connects the land to the heavens. Regarded as the residence of Hawaiian deities, the mountain was utilized for ceremonial activities in traditional, pre-contact, times.

Pi'ihonua is but one of 158 total ahupua'a, or land divisions, that generally extend downward from the summit regions of Mauna Kea. These traditional land divisions represent part of an

ocean to mountain land management system that divided the rights of access individuals had to particular resources. These ahupua‘a were traditionally part of larger districts (*moku-o-loko*) and sub-regions (*‘okana* and *kalana*), and were often further subdivided into smaller manageable parcels of land. Access to the entire ahupua‘a was generally tied to residency, and while within the constraints of the *kapu* system, a resident would have access to the entire land division. As such, land stewardship was a natural part of the traditional land management system. Only the largest of the ahupua‘a extend all the way to the summit area of Mauna Kea, and Pi‘ihonua itself extends to the boundary between the North and South Hilo Judicial Districts. Pi‘ihonua is representative of this, rising from the shoreline in present-day urban Hilo, bounded on the north side by the Wailuku river, widening until it terminates at its boundary with Humu‘ula (on the Humu‘ula Saddle).

Early voyages to the Hawaiian archipelago from were frequent by AD 300. These voyages are traditionally recognized as originating from Kahiki, generally regarded as being the Marquesas and Society Islands. In the early period of settlement communities were concentrated in the windward shores of the Hawaiian Islands, where water was plentiful. Over a number of centuries the areas with more natural resources became increasingly populated and possible even crowded, and by ca. 900 to 1100 AD, the population expanded into previously uninhabited areas including Kona, with settlements still concentrating in shoreline areas, with some limited settlement of upland areas. By the 1400s, a diverse system of cultivation was developed in upland areas to elevations of around 3,000 feet of elevation. Into the 1500s and 1600s upland settlement had become more permanent, accompanied by an increasing separation of royalty from commoners and implementation of a system of land management.

A marked distinction between lowland and upland land use was seen in lowlands below around 3,000 foot being used for residential, agricultural, and subsistence activities, while the upper mountain lands being frequented by travelers, collectors of natural resources, and a wide range of cultural practices. Taken literally, the ahupua‘a name of Pi‘ihonua indicates the mountainous context, as it translates as “rising land” or “ascending Earth” (Soehren 2010, Maly 1996). The origin of the name Pi‘ihonua is described in Maly (1996) as from the Hawaiian Legend of Ka‘ao Ho‘oniua Pu‘wai no Ka-Miki, named for Pi‘ihonua-a-ka-lani, the brother of Waiākea and Pana‘ewa, and the father of chiefesses ‘Ohele and Waiānuenue (Maly 1996:A-4).

Prior to the introduction of cattle and sheep a set of major vegetation zones may have existed in the project area including the following: (1) Open *koa* forest (above about 4,400 feet of elevation) with *koa*, *māmane*, *ohi‘a*, and other plants and (2) closed *ohi‘a* rain forest (above about 1600 feet of elevation) of *ohia*, *hapu‘u* and *ama‘u* tree ferns, and *‘olapa* (Lamoreux in Armstrong 1983:70-71).

In traditional times the project vicinity was forested with several footpaths, or *ala hele*, traversing the area, allowing access between coastal areas and upland areas, as well as from the major districts of the Island. Several of these are known from tradition, including an ancient trail between Kalai‘eha, a prominent pu‘u near the Pu‘u O‘o Sheep Station and about 2.5 miles west of the fence corridor, and the summit of Mauna Kea and Lake Waiau. This route was improved into a horse trail by the Spencers, lessees of the Mauna Kea mountain lands. Other trails include

a Hilo-Kalai‘eha/Pu‘u O‘o Trails and a spur to the north of the project area, and a Kalai‘eha/Pu‘u O‘o – Keanakolu Trail (PHRI in UDSOT 1999). Maly’s work indicates that several other footpaths approaching the summit of Mauna Kea were used by *maka‘āinana* into the 1920s including the ‘Umikoa-Ka‘ula Trail (approaching from Hamakua) and the Kemole-Pu‘u Nanahu Trail.

Native Hawaiian traditions and accounts describe the upland forest regions (i.e., up to about 6,000 feet of elevation) as being utilized by native practitioners who gathered forest resources, birds, and food. Individuals traveling to the higher mountain regions to worship, gather stones, bury family members, or deposit *piko* in special areas, would have passed through the project area. Bird catching, or *ahele manu*, was performed in order to catch feathers and as delicacies, and accounts of bird catching methods are described into the 19<sup>th</sup> century (Ibid, pp. 32 -36). In about 1870 Kamehameha V placed a *kapu* on the birds of Pi‘ihonua, perhaps because of scarcity due to the use of shotguns. Bird catching for their feathers probably ceased as a traditional activity in the late 1800’s to early 1900’s as desirable species became extinct or scarce.

Maly relates the Heart Stirring Story of Kam-Miki (*Kaao Hooniua Puuwai no Ka-Miki*), set in the 1300s and published over the period of several years in the Hawaiian language newspaper *Hoku o Hawaii* between 1914 and 1917, relating the adventures of two supernatural brothers who travel Hawaii Island. This tale specifically mentions one site within Pi‘ihonua, *Kipuka-‘āhina*, which bears the name of an *‘ōlohe*, or expert of lua fighting, who was resident of the area (Maly, p. 49). *Kipuka-‘āhina* is now located near the boundary of Pi‘ihonua and Waiākea on Pāhoehoe flats.

Historical accounts record that by the 1820s introduced cattle and wild dogs had made their way up to the Mauna Kea mountain lands and the Humu‘ula Saddle. As cattle increasingly reshaped the terrain, increasing the range of the grasslands, ranching activities became increasingly organized, with portions of Pi‘ihonua Uka being worked by Daniel Castle and later by the Castle and Hitchcock brothers for lumber milling and bullock hunting operations. In 1887 the entire *ahupua‘a* of Pi‘ihonua (from above Hilo town to the Humu‘ula Saddle) was leased to John Timoteo Baker for ranching activities. Prior to this the Pu‘u O‘o Ranch Station was established, and was maintained as part of the W.H. Shipman Estate until the 1970s.

The 1840-1841 account of Charles Wilkes, Commander of the United States Exploring Expedition, describes their party’s ascent of Mauna Kea, passing through Pi‘ihonua. The observed bullock hunting ongoing, in spite of this activity being *kapu*, in the upper forest and grasslands and camped near the Waikoloa Ponds near the northern portion of the fence corridor, and emerged from the forest at about 6,000 feet of elevation. They observed *koa* as the dominant tree, also with many false sandalwood trees and *mamane*, but the grasses were described as few, scattered, and so poor that cattle would not eat it.

Pi‘ihonua was held by Kamehameha I until his death in 1819, at which time his holdings, including Pi‘ihonua, were passed down to his son Liholiho (Kelly 1981). Pi‘ihonua was surrendered at the time of the *Māhele* and classified as Crown Land (Kelly 1981).

The account of Kingdom Surveyor E.D. Baldwin 1889 similarly describes an ascent starting from Hilo that paused at *Kipuka-‘āhina* and described the vicinity being of “open fields of fine pasture land.”

By the 1850s, the Kingdom of Hawai‘i issued formal leases to ranchers on the mountain lands. These cattle had originally been introduced by Vancouver 1793, and by the 1820s, accounts describe them as having increased in population to the point that they were altering the landscape (ibid, p. 265). Land tenure records state that Pi‘ihonua was “relinquished by Kalaeokekoi to Kamehameha III on January 28, 1848” and retained as Crown Lands. No kuleana land claims were recorded in the mountain lands. Neighboring Humu‘ula was also retained as Crown Lands.

Testimony to the Boundary Commission in 1873 states that the mauka boundary of the ahupua‘a of Pi‘ihonua was demarcated by the upper reach of the forests (Ibid., p. 284).

Ongoing recreational activities undertaken within the project area, recognized as the saddle area and areas upland of the State Forest Reserves include hunting, hiking, birding, camping, bicycling, running, gathering, and scientific research.

As part of the current study an effort was made to obtain information about any potential traditional cultural properties and associated practices that might be present, or have taken place in upper Pi‘ihonua Ahupua‘a. The Office of Hawaiian Affairs, and Hawaiian Civic Clubs of Hilo, Kona, Waimea, and South Kohala were contacted but had no information relative to the existence of traditional cultural properties in the immediate vicinity of the project area; nor did they provide any information indicating current use of the area for traditional and customary practices.

Visits to the project area show that gathering occurs at locations along Saddle Road and areas readily accessed from Saddle Road. Given that these activities occur in or on the periphery of forested areas we do not expect the fence corridor and project area to contain resources that would be desirable for gathering.

DOFAW has long-term plans to allow controlled public access to the project area for the purpose of gathering, bird watching, hunting and similar activities.

As no resources or practices of a potential cultural nature (i.e., landform, vegetation, etc.) appear to be present on or near the project site, and there is no evidence of any traditional gathering uses or other cultural practices, the proposed construction and maintenance would not appear to impact any culturally valued resources or cultural practices. Furthermore, the proposed designation of new FRS lands, with the intended protection by the proposed fence and road alignments, would likely serve to increase the potential for contemporary cultural uses of the area.

### **3.3.4 Agricultural Land**

#### *Existing Farming Operations and Value of Agricultural Land*

Consultation of maps of important farmland from the U.S. Natural Resources Conservation Service (USNRCS) (as displayed in the Hawai‘i State Geographic Information System) determined that approximately the eastern two-thirds of the fence corridor is classified as important agricultural lands in *Agricultural Lands of Importance to the State of Hawai‘i* (ALISH) map series. This region is designated as “Other” in this classification system, meaning that these lands are inferior to the “Prime” and “Unique” designated lands because they have limiting characteristics require certain investments - such as added fertilizer or other soil amendments, drainage improvements, erosion control practices and flood control - to increase their productivity. Apart from grazing of cattle, no farming is occurring near the project area.

#### *Impacts and Mitigation Measures*

The project effectively reduces the size of an area leased for cattle pasturing of 1,460.6-acres. This area will be removed from extensive agricultural productivity for the foreseeable future, and therefore the action will have a small adverse impact on the availability of ranching land in the project area and in the County of Hawai‘i.

However, the project is related to an ongoing effort to increase the size of the FRS. One of the key purposes of the FRS is to provide for silviculture and thus the action is of potentially positive benefit for this activity, and is consistent with the Agricultural zoning of the proposed addition to Hilo Forest Reserve.

### **3.4 Growth-Inducing, Cumulative and Secondary Impacts**

#### *Growth-Inducing Impacts*

Analysis of growth-inducing impacts examines the potential for a project to induce unplanned development, substantially accelerate planned development, encourage shifts in growth from other areas in the region, or intensify growth beyond the levels anticipated and planned for without the project. This project, by its nature, cannot be seen as growth-inducing as it aims to maintain and improve the quality of an existing public resource. The financial expenditure for construction will have a minor positive impact to the economy of the County of Hawai‘i.

#### *Cumulative Impacts*

Cumulative impacts result when implementation of several projects that individually have minor impacts combine to produce more severe impacts or conflicts among mitigation measures.

All adverse impacts of the current project related to most categories of effect, including hydrology, native species/habitat, wetlands, water quality, erosion, historic sites, and other areas of concern, are either non-existent or extremely restricted in geographic scale, negligible, and capable of mitigation through proper enforcement of permit conditions. No appreciable adverse impacts relating to the proposed project that might accumulate with those of other past, present and future actions to produce more severe impacts are anticipated.

### *Secondary Impacts*

Construction projects sometimes have the potential to induce secondary physical and social impacts that are only indirectly related to project. For example, construction of a new recreation facility can lead to changes in traffic patterns that produce impacts to noise and air quality for a previously unimpacted neighborhood. In this case, the proposed project's impacts are limited to direct impacts at the site itself or are positive in nature, and there does not appear to be any potential for secondary impacts.

### **3.5 Required Permits and Approvals**

The action would require a National Pollution Discharge Elimination System Individual Permit from the State of Hawai'i Department of Health as it involves a construction activity that may disturb a total area of more than one acre. A grubbing and grading permit from the County of Hawai'i Department of Public Works has already been obtained.



## 4

## COMMENTS AND COORDINATION

### 4.1 Agencies and Organizations Contacted

The following agencies received a letter inviting their participation in the preparation of the Environmental Assessment.

#### *County of Hawai‘i*

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

#### *State of Hawai‘i*

- Department of Land and Natural Resources, Historic Preservation Division
- Office of Hawaiian Affairs
- Department of Agriculture
- Department of Hawaiian Homelands

#### *United States*

- Fish and Wildlife Service

The following organizations/individuals received a letter and/or personal invitation soliciting its participation in the preparation of the Environmental Assessment:

- Sierra Club
- Pig Hunters of Hawai‘i
- Hawaiian Civic Club of Hilo
- Kona Hawaiian Civic Club
- Waimea Hawaiian Civic Club
- South Kohala Hawaiian Civic Club
- Hawaii Cattlemen’s Council
- Mr. Freddie Nobriga
- Nature Conservancy
- ‘Ōiwi Lōkahi o ka Moku o Keawe

**DETERMINATION**

The State of Hawai‘i Department of Land and Natural Resources has made a preliminary determination that the project does not significantly alter the environment, as impacts will be minimal, and intends to issue a Finding of No Significant Impact (FONSI). This determination will be reviewed based on comments to the Draft EA, and the Final EA will present the final determination.

## 6 STATE OF HAWAI‘I ENVIRONMENTAL ASSESSMENT FINDINGS

Section 11-200-12 of the State Administrative Rules sets forth the criteria by which the significance of environmental impacts shall be evaluated. The following discussion paraphrases these criteria individually and evaluates the project’s relation to each.

1. *The project will not involve an irrevocable commitment or loss or destruction of any natural or cultural resources.* No significant natural or cultural resources will be irrevocably committed or lost. The State Historic Preservation Division is expected to concur with the determination that no effect to historic properties will occur.
2. *The project will not curtail the range of beneficial uses of the environment.* No future beneficial use of the environment will be affected in any way by the proposed project. The project will enhance the long-term quality of the State Forest Reserve System, a significant public resource.
3. *The project will not conflict with the State’s long-term environmental policies.* The State’s long-term environmental policies are set forth in Chapter 344, HRS. The broad goals of this policy are to conserve natural resources and enhance the quality of life. A number of specific guidelines support these goals. No aspect of the proposed project conflicts with these guidelines. The project’s goal of protecting an important public resource satisfies the State’s environmental policies.
4. *The project will not substantially affect the economic or social welfare of the community or State.* The improvements will benefit the social and economic welfare of Hawai‘i by protecting and improving the quality of the State Forest Reserve System.
5. *The project does not substantially affect public health in any detrimental way.* No adverse effects to public health are anticipated. Public health will be benefited by protection of watershed areas.
6. *The project will not involve substantial secondary impacts, such as population changes or effects on public facilities.* No adverse secondary effects are expected. The project will not enable development or effects on public facilities.
7. *The project will not involve a substantial degradation of environmental quality.* The implementation of best management practices for all construction will ensure that the project will not degrade environmental quality in any substantial way.
8. *The project will not substantially affect any rare, threatened or endangered species of flora or fauna or habitat.* No rare, threatened or endangered species of flora or fauna are known to exist on the project site or would be affected in any way by the project.
9. *The project is not one which is individually limited but cumulatively may have considerable effect upon the environment or involves a commitment for larger actions.*

Cumulative impacts result when implementation of several projects that individually have minor impacts combine to produce more severe impacts or conflicts among mitigation measures. All adverse impacts will either not occur or will be reduced to negligible levels through mitigation measures, and will therefore not tend to accumulate in relation to this or other projects.

10. *The project will not detrimentally affect air or water quality or ambient noise levels.* The project will have negligible effects in terms of water quality, air quality and noise.

11. *The project will not affect or will likely be damaged as a result of being located within an environmentally sensitive area such as flood plains, tsunami zones, erosion-prone areas, geologically hazardous lands, estuaries, fresh waters or coastal waters.* No floodplains, tsunami zones, geologically hazardous areas, or other such sensitive land is involved in the area planned for development.

12. *The project will not substantially affect scenic vistas and viewplanes identified in county or state plans or studies.* No protected viewplanes will be impacted by the project, which will have no adverse scenic effects.

13. *The project will not require substantial energy consumption.* Some, but not substantial, input of energy is required for the construction of the fence and access roadway.

**LIST OF DOCUMENT PREPARERS**

This Environmental Assessment was prepared for the State of Hawai‘i, Department of Land and Natural Resources Division of Forestry and Wildlife by Graham Paul Knopp, Ph.D., of GK Environmental LLC.

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## **APPENDIX 1 – FLORA AND FAUNA SURVEY REPORTS**

## **A survey of fauna was conducted in the withdrawal lands at Pu'u O'o on March 9, 2010**

The new boundary line running approximately 5 miles along the south and east of the Pu'u O'o ranch was surveyed by Joey Mello and Steve Bergfeld on March 9, 2010. All wildlife detected during the survey is listed below.

### native birds

Amakihi (*Hemignathus virens*)

Apapane (*Himatione sanguinea*)

I'o, Hawaiian Hawk (*Buteo solitarus*)

### non-native birds

Japanese White Eye (*Zosterops japonicus*)

skylark (*Alauda arvensis*)

Turkey (*Meleagris gallopavo*)

Kalij (*Lophura leucomelanos*)

Kolea, Pacific Golden Plover (*Pluvialis fulva*)

### mammals

feral pig (*sus scrofa*) (minimal sign near eastern boundary with Hilo Forest Reserve)

domestic cattle (*Bos taurus*)

Other fauna that was not detected on this survey, but known to occupy the area from recent visits include

### native birds

Iiwi (*Vestiaria coccinea*)

Omao (*Myadestes obscurus*)

Pu'ueo (*Asio flammeus sandwichensis*)

### non-native birds

Northern cardinal (*Cardinalis cardinalis*)

Common mynah (*Acridotheres tristis*)

Erckel's francolin (*Francolinus erckelli*)

House Finch (*Carpodacus mexicanus*)

Nene, Hawaiian Goose (*Branta sandvicensis*)

Koloa, Hawaiian Duck (*Anus wyviallana*)

### migratory birds\*

barn owl (*Tyto alba*)

\*various migratory ducks and a few Canada geese are occasional winter visitors to the ponds and reservoirs in the lower Puu Oo pastures.

### mammals

mongoose (*Herpestes auropunctatus*)

feral dog (*Canus familiaris*)

## **Puu O'o Fenceline Botanical Survey**

January 28<sup>th</sup>, 2010

Lyman Perry, Steve Bergfeld, Chris Graper

Vegetation types traversed by the proposed fenceline corridor:

The fenceline corridor primarily traverses open grasslands dominated by common non-native pasture grasses such as *Anthoxanthum odoratum*, *Axonopus fissifolius*, and Kikuyu grass (*Pennisetum clandestinum*) with pockets of the native grass (*Deschampsia nubigena*) and scattered native fern *Dryopteris wallichiana*. The native shrubs ohelo (*Vaccinium calycinum*) and pukiaawe (*Styphelia tamieamieae*) are also common in places.

Other natural communities that the proposed fenceline passes through include scattered ohia (*Metrosideros polymorpha*) trees in grasslands dominated by non-native pasture grasses (see above description) with occasional naio (*Myoporum sandwicense*), koa (*Acacia koa*), and native shrubs such as ohelo, pilo (*Coprosma montana*) and the native bunch grass *Deschampsia nubigena*, often growing in holes where grazing animals can't reach. This community type grades into an open Koa/Ohia forest with a canopy of 30-40 feet or a shorter-statured Ohia-dominated forest type with constituents such as kolea (*Myrsine lessertiana*) over an understory dominated by ohelo, the native shuttlecock fern, *Dryopteris wallichiana*, and scattered hapu`u (*Cibotium glaucum*) tree ferns.

Generally the proposed fenceline corridor is degraded and minimal disturbance to native vegetation is anticipated. No endangered or threatened plant species were observed during the course of the survey and no negative impact to endangered or threatened plant species will occur as a result of building a fence and corresponding maintenance road along this alignment.

Plant Species Observed:

Frequency Codes: C = Common, O = Occasional, S = Scattered, U = Uncommon

### **Native Trees:**

*Acacia koa* O

*Cheirodendron trigynum* U

*Metrosideros polymorpha* C

*Myoporum sandwicense* O

*Myrsine lessertiana* U

### **Non-Native Trees:**

*Bambusa* sp. U

*Fraxinus uhdei* U

**Native Shrubs:**

*Coprosma ernodeioides* C  
*Coprosma montana* U  
*Coprosma rhynchocarpa* U  
*Styphelia tamieamieae* C  
*Rubus hawaiiensis* S  
*Vaccinium calycinum* C

**Non-Native Shrubs:**

*Ageratina riparia* S  
*Senecio madagascariensis* S  
*Ulex europaeus* S

**Native Grasses and Sedges:**

*Carex wahuensis* O  
*Deschampsia nubigena* C  
*Uncinia uncinata* C

**Non-Native Grasses and Sedges:**

*Andropogon virginicus* O  
*Anthoxanthum odoratum* C  
*Axonopus fissifolius* C  
*Ehrharta stipoides* O  
*Eragrostis browneii* U  
*Holcus lanatus* O  
*Pennisetum clandestinum* C  
*Schizachryium condensatum* O  
*Setaria gracilis* O  
*Sporobolus africanus* O

**Native Ferns:**

*Athyrium sandwichianum* U  
*Cibotium glaucum* O  
*Dicranopteris linearis* O  
*Diplazium hawaiiensis* U  
*Dryopteris fusco-atra* U  
*Dryopteris glabra* U  
*Dryopteris wallichiana* C  
*Pteris cretica* S  
*Sadleria pallida* S

**Non-Native Ferns:**

*Asplenium adiantum-nigrum* O  
*Asplenium trichomanes* O

*Pellaea ternifolia* O

**Native Herbs:**

*Astelia menziesii* U

*Fragaria chiloensis* U

*Gnaphalium sandwicense* U

*Luzula hawaiiensis* U

**Non-Native Herbs:**

*Cirsium vulgare* O

*Cuphea carthaginensis* O

*Gnaphalium japonicum* U

*Hypchoeris radicata* O

*Juncus effusus* O

*Prunella vulgaris* S

*Reichardia tingitiana* O

*Rubus argutus* S

*Rubus rosifolius* O

*Rumex acetosella* C

*Trifolium repens* C

*Youngia japonica* S

**Native Lichen:**

*Stereocaulon vulcani* C

**APPENDIX 2 – ARCHAEOLOGICAL INVENTORY SURVEY REPORT**

# Archaeological Inventory Survey Report for Proposed Boundary Fence Corridor, Pi‘ihonua Ahupua‘a, South Hilo, Hawaii. (TMK 3-2-6-018:001)

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Prepared for the Division of Forestry and Wildlife,  
Department of Land and Natural Resources,  
State of Hawaii.



Prepared by  
Dennis Dougherty, B.A.,  
Project Supervisor

Project Director  
Jadelyn Moniz-Nakamura, Ph.D.,



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Pacific Island Cluster  
National Park Service  
Department of the Interior

Publications in Anthropology #12  
Hawai‘i Volcanoes National Park  
2008





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May 2008

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# 1. Report Overview

At the request of the Division of Forestry and Wildlife, the National Park Service has been contracted to prepare an archaeological inventory survey report for a proposed boundary fence within Pi‘ihonua Ahupua‘a (TMK 3-2-6-018:001) (Figures 1 and 2). The inventory survey was conducted in advance of lease withdraw procedures for portions of State leased land to Puu Oo Ranch. The objectives of the current archaeological inventory are 1) to review archival material including previous archaeological reports and historical maps, 2) conduct a 100% pedestrian survey of the proposed fence corridor, and 3) provide significance evaluations and treatment recommendations for identified archaeological resources.

## 1.1. Survey Area and Environment

The project area is located on the southeastern flank of Mauna Kea (13,796 ft) and is positioned north of the Upper Waiakea Forest Reserve and west of the Hilo Watershed Forest Reserve. Few developed roads are located along this remote section of Mauna Kea and include the Saddle Road (Highway 200) located to the south and Keanakolu Road located northwest of the project area. Elevation within the project area ranges from 4,840-6,018 ft (1,475-1,834 meters) and topography consists of rolling hills with a general southeastern aspect (see Figures 3, 4, and 5) multiple seasonal water courses are present in the northern section of the project area and serve as tributaries of the Wailuku River. Vegetation consists of native *koa* (*Acacia koa*) and ‘*ōhi‘a* (*Metrosideros polymorpha*) interspersed with *kolea lau nui* (*Myrsine lessertiana*), and the ground cover consists of pasture grasses including *kikuyu* (*Pennisetum clandestinum*). A total of five soil types are present within the project area and consist of: rLW – Lava Flows Pahoehoe; rKHD – Kekake Extremely Rocky Muck; rMWD – Mawae Extremely Stony Muck; PUC – Puu Oo Silt Loam, and; PND – Piuhonua Silty Clay Loam. The project area is primarily situated in the Montane Mesic Forest & Shrubland ecoregion with the upper, western portion slightly extending into the Montane Dry Forest & Shrubland region. Rainfall in the project area ranges from 188-157 inches (300-400 cm) in the lower, eastern elevations to 79-118 inches (200-300 cm) in the western portion of the area.

## 1.2. Report Outline

The current report is divided into three Sections: Section One provides project and report overviews; Section Two provide descriptions of the cultural setting of the project area and is divided into five parts: 2.1) previous archaeology of the area, 2.2) comparative studies, 2.3) archaeological sets of expectations, 2.4) known site locations within the project area, and 2.5) historic ranching at Pu‘u O‘o. The information provided in Section Two establishes the necessary background for evaluating the identified cultural resources in the area. Section Three discusses the field survey methods and survey findings, and includes site determinations, evaluations, and treatment recommendations for each identified site. The current report is intended to be used as a management tool and supplies the necessary background to better enable managers to direct future planning projects and to be integrated into analysis documents.

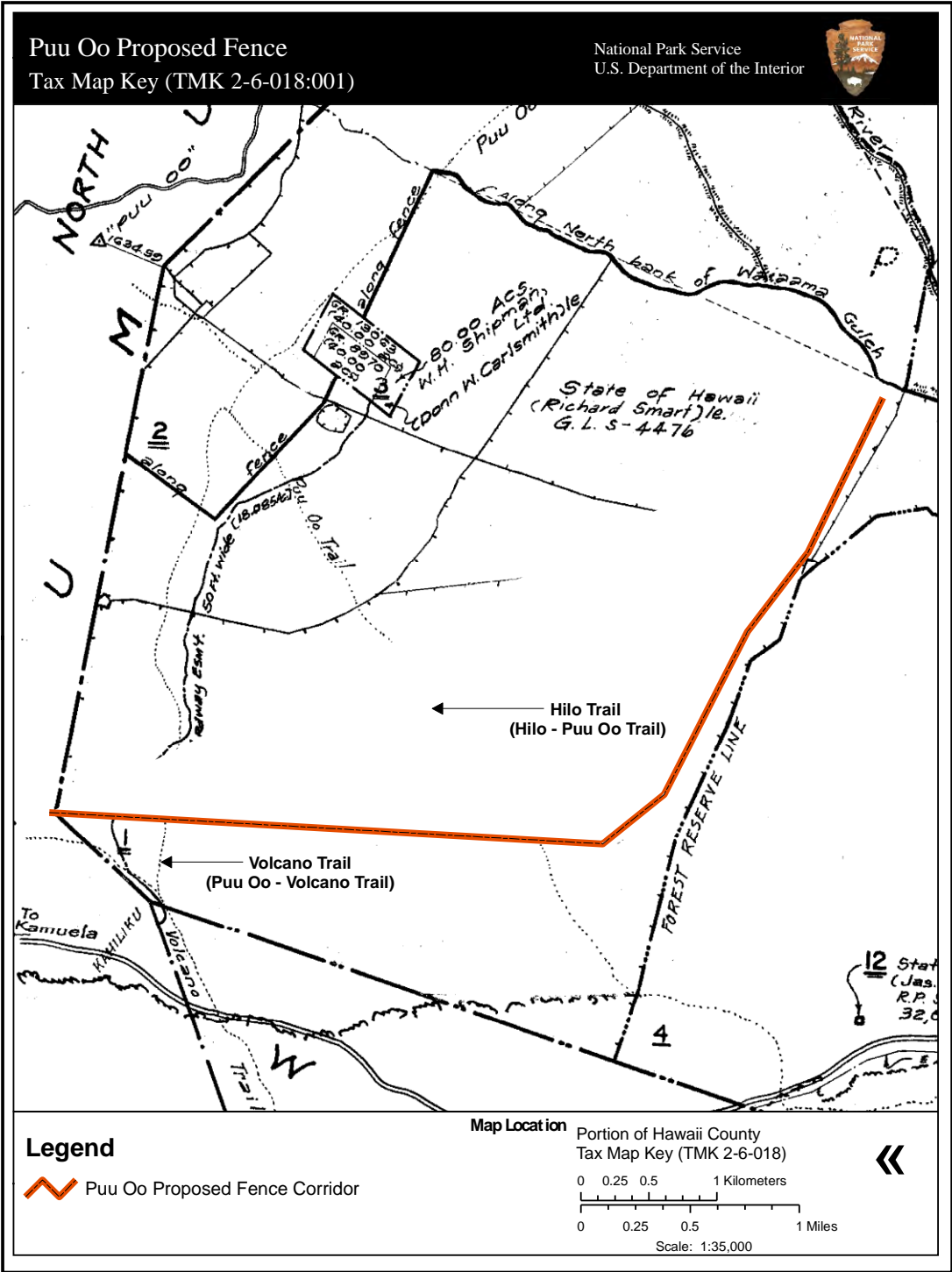
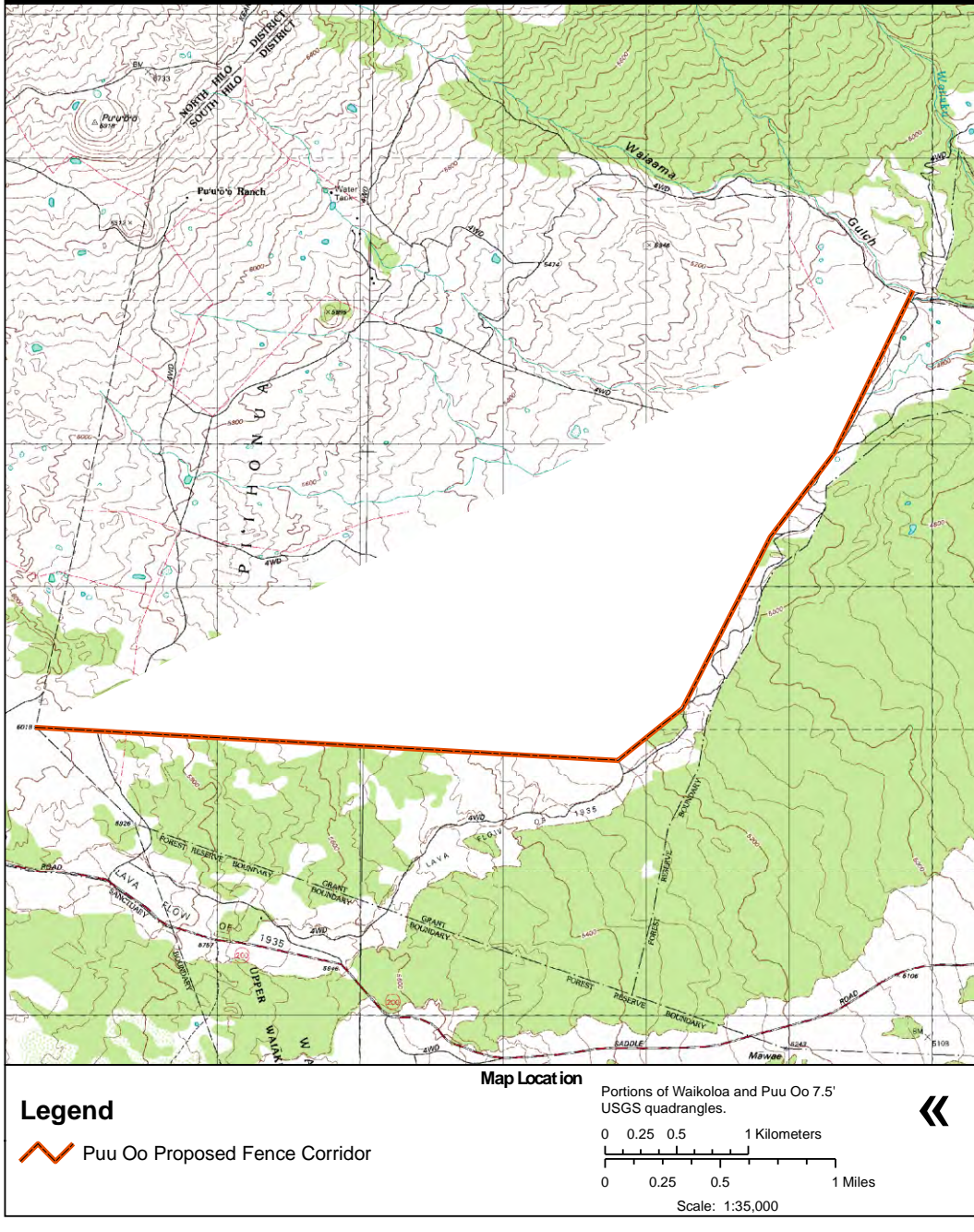


Figure 1. Enlarged portion of Tax Map Key 3-2-6-018:001 showing general project area.

Puu Oo Proposed Fence  
Project Area Location

National Park Service  
U.S. Department of the Interior



**Figure 2.** Project area location depicted on 7.5' U.S.G.S. quadrangle maps (portions of Waikoloa and Puu Oo quadrangles).





**Figure 3.** Project location overview showing low pasture grass and rolling topography.



**Figure 4.** Project location overview showing low pasture grass and rolling topography along western portion of proposed fence corridor.



**Figure 5.** Project area overview along northeastern section of proposed fence corridor; forested section on left of photo is the Hilo Forest Reserve.



## 2. Cultural Setting and Context

The following section provides a review of previous archaeological surveys and regional studies conducted in the area that are used to generate current project expectations. Additional sections discuss known site locations within the project area and present a brief overview of the historic ranching activities at Pu‘u O‘o Ranch.

### 2.1. Previous Archaeology

No previous archaeological inventories have been conducted within the current project area. Several archaeological investigations have been conducted north of the project area within the Hakalau Forest National Wildlife Refuge (NWR) and along the Keanakolu Road. Inventory efforts were conducted in association with developments at the Hakalau Forest NWR (Haun 1986; Carter 1999; Rosendahl 1989, 1990; Raymond 1991, 1993; Speulda 1996; Tomonari\_Tuggle 1996) and for proposed improvements to Keanakolu Road (Williams and O’Hare 2001). In addition to these site specific studies, multiple regional studies have been conducted for the upper elevations of the eastern flank of Mauna Kea (McEldowney 1979; Cordy 1994; Tomonari\_Tuggle 1996; Maly 1997, 1999, 2005; U.S. Dept. of Transportation 1997; Williams et al. 2000) and provide for a broad and comprehensive overview of the historical-cultural context of the inland, mountainous region of east Hawaii.

Archaeological inventory surveys within the Hakalau NWR have been conducted for multiple projects that include: boundary fence installation, fence line corridors, gravel quarrying, road corridors, road improvements, tent-shed construction, administration site and U.H. Field Station locations, restoration efforts, and also include a sampling of upland pasture zones within the refuge. Only one pedestrian survey has occurred in the lower forest zones prior to the establishment of the refuge (Tomonari-Tuggle 1996) and was integrated with biological inventory efforts (native bird counts, vegetation inventory). Archaeological sites identified as a result of these survey efforts are presented below in Table 1.

**Table 1.** Archaeological sites recorded in Hakalau NWR and Keanakolu Road corridor.

<i>SIHP No.</i>	<i>Site Type</i>	<i>Site Function</i>	<i>Reference:</i>
15071	Cairn ( <i>ahu</i> )	Survey boundary marker	Raymond 1991
15072	Platform	Habitation	Raymond 1991
15073	Enclosure	Habitation	Raymond 1991
15074	Complex (enclosure, cairn, c-shape)	Habitation	Raymond 1991, 1993
18666	Petroglyphs (historic)	Survey boundary marker	Raymond 1993
21137	Petroglyphs (historic)	Survey boundary marker	Tomonari-Tuggle 1996
21138	Possible Laumai‘a road segment	Transportation	Tomonari-Tuggle 1996
Nauhi Cabin	Historic Building	Experiment station	Tomonari-Tuggle 1996
Pua Akala Ranch	Historic Building	Ranch headquarters	Tomonari-Tuggle 1996
20693	Telephone line poles	Communication	Speulda 1996
20694 (Same as SIHP site 211137)	Petroglyphs (historic)	Survey boundary marker	Speulda 1996
20695	Wall	Ranching	Speulda 1996
20751	Cairn	Ahupua‘a boundary marker	Williams and O’Hare 2001

**Table 1.** Archaeological sites recorded in Hakalau NWR and Keanakolu Road corridor (continued).

<i>SIHP No.</i>	<i>Site Type</i>	<i>Site Function</i>	<i>Reference:</i>
22939	Keanakolu Road	Transportation	Williams and O’Hare 2001
22940	Shelter Complex	Shelter	Williams and O’Hare 2001
22942 and 22943	Roadbed	Transportation	Williams and O’Hare 2001
22944	Upright Shrine	Ceremonial	Williams and O’Hare 2001
22945	Cairn	Marker	Williams and O’Hare 2001

## 2.2. Comparative Studies

A number of archeological survey reports and cultural assessment overviews have been prepared for project locations situated in similar high elevation landscapes (Maly and Maly 2005; Tomonari-Tuggle 1996, Williams et al. 2000, Carpenter et al. 2006). These reports include findings associated with cultural remains located in mountainous environments on the Island of Hawai‘i, and a selection of the report findings are presented below.

A cultural resource study conducted by Kumo Pono Associates LLC (Maly and Maly 2005) was prepared for the Office of Mauna Kea Management (University of Hawaii-Hilo) for the mountain lands and summit region of Mauna Kea. Their extensive research reveals the numerous oral and traditional practices associated with the mountain; the legends attesting to the gods and goddesses of Mauna Kea; and the historical usage of the vast mountainous upland regions. The site types typically associated with the high elevation areas included: *heiau*, *ahu*, *ilina* (burial interment locations), trail routes, habitation and shelter caves, and resource collection sites. Historic-era remains include ranch paddocks, walls, and fence lines, stone and wooden houses, water collection sites, bird hunting blinds, and other associated ranch infrastructure remains. The remains of cattle hunting and later cattle and sheep ranching activities represent the predominate historic-era usage of the mountainous upland area.

A cultural resource overview was prepared by International Archaeological Research Institute, Inc (Tomonari-Tuggle 1996) for the U.S. Fish and Wildlife Service. The study area consisted of the Hakalau Forest National Wildlife Refuge situated along the eastern slopes of Mauna Kea at roughly the 6,000-7,000 ft. elevation. Five sites were previously know on the refuge and include 1) a cairn site, 2) a square shaped platform, 3) a rectangular shaped enclosure, 4) a site complex consisting of one cairn (Feature A), a basalt cobble and boulder scatter (possible C-shape remnants) (Feature B), a square enclosure (Feature C), and a basalt boulder and cobble concentration (Feature D), and 5) an historic-era petroglyph site consisting of Hawaiian inscriptions. Two additional sites were recorded during the brief reconnaissance level survey of the refuge and consist of a boundary marker site comprised of a possible collapsed cairn and surveyor’s inscription, and a road segment tentatively associated with Laumai‘a Road, a late nineteenth century road alignment.

An archaeological inventory survey of portions of Pohakuloa Training Area (PTA) was conducted by Ogden Environmental and Energy Services Co., Inc. (Williams et al. 2000). Their study area is located within the high elevation saddle area situated between Mauna Loa and Mauna Kea. The comprehensive report presents field survey findings as well as results for paleo-environmental studies of archeological faunal material and remote sensing data results. Features identified during the survey include lava tube shelters, cairns, petroglyphs, surface work areas, shrines, paved structures, C-shapes, walls, basalt outcrops, and a total of 1,822 excavated pits, the most abundant feature type noted during survey efforts. Of the total 34 sites recorded, 14 sites (41%) were interpreted as habitation sites. The high incidence of habitation sites at this location may result from a larger population exploiting both the high elevation faunal resources (petrels) as well as other highly valued resources such as the Mauna Kea adze quarries. In addition, a cross-island travel route most

likely increased the number of individuals and groups passing through the area requiring temporary shelter during their travels.

The Division of State Parks (Carpenter et al. 2006) prepared a Historic Properties Identification and Field Report for portions of the Hilo Forest Reserve including the Upper Laupahoepahoe and Humu'ula Sections. The selected project areas are situated on the northeast flank of Mauna Kea and range in elevation from 4,800 to 5,920 feet above sea level. No historic properties were identified on a total of five pedestrian transects, findings that are consistent with survey findings of other archaeological surveys conducted in similar areas of the Hilo Forest Reserve (ibid). One historic complex was identified within the Humu'ula section that consists of a Koa Log Cabin (SIHP 50-10-15-7642), forestry worker cabins constructed next to the cabin in 1927, and landscape features including an experimental fruit orchard and arboretum and multiple fence lines that define pasture, corral, orchard, and planting plot areas.

The discussion of studies presented above reveal that upland mountainous regions contain a broad range of archeological site types and are distributed throughout the landscape, from the lower forested zones to the summit areas of the peaks that dominate the island interior. Pre-Contact, traditional usage occurred throughout these forested zones, taking advantage of trail routes and trail networks that connected coastal habitation zones to the upland plantations and forest resources. Historic-era developments centered on cattle hunting and cattle and sheep ranching efforts, and utilized the vast upland regions for grazing herds and for upper ranch core/complexes that provided a base of operations for processing hides, beef, wool, and dairy products. These combined activities represent a continuum of land usage spanning centuries, leaving a legacy on the landscape.

### 2.3. Current Project Expectations

Archaeological investigations have helped correlate the observed archaeological record with previous summaries and regional syntheses for eastern Hawaii and the uplands of Mauna Kea. Previous regional studies have provided possible site types likely found at the upper elevations: Pre-contact site types are typically associated with resource extraction activities including harvesting valued hardwoods such as *koa* for canoe construction in addition to *mamane*, *kolea lau nui*, and sandalwood; and bird catcher activities centered on capturing *mamo* and high elevation insectivores including the *amakihi* and *elepaio*. Site distributions for these activities would be located in the lower forest elevations where "Bone and shell remains from food preparation and consumption might remain as midden in these sites (Tomonari-Tuggle 1996:67). Other Pre-contact activity centered on the multiple trails routes that course through the inland high elevations, and the temporary shelters (lava tubes, overhangs, platforms, enclosures, C-shapes) were likely situated near trail routes and near established or constructed water sources. Trails were used to access these remote resources and to cross the island, and during the early Historic Period native Hawaiians often served as guides, helping surveyors and bullock hunters to navigate the immense upland wilderness. The upper elevations of Mauna Kea are also noted for interment. Burials are usually located near prominent cinder cone formations (*pu'u*), and may be marked by cairn (*ahu*) structures or platforms.

Historic Period activities in the upper elevation were limited primarily to early land surveying efforts, wild bullock hunting, road construction activities, and eventually widespread cattle and sheep ranching activities. Site types generally associated with this period include survey marks (cairns and inscribed survey marks), bullock-hunting traps (examples of this activity have yet to be identified in the archaeological record), improved trails, paths, and roadways, and numerous cabins and ranch complexes distributed throughout the eastern flanks of Mauna Kea.

Based on current archival research and on the available reports that discuss cultural history of upland regions on Hawai‘i Island, it is posited that the forested upland regions of Pi‘ihonua were most commonly used for specialized resource procurement activities. These activities were most likely centralized in specific areas that contained important resources and include bird catching/collecting and harvesting hardwoods for traditional uses. Archival material collected for similar mountainous *ahupua‘a* reveal extensive resource procurement activities taking place in the high elevation plateau between Mauna Loa and Mauna Kea. Native testimony collected during the Mahele proceedings and Boundary Commission Testimony both provide insights into native land tenure practices and upland resource collection practices. Additional archival material penned by early western explorers supplement these data sources with their own observations concerning the natural environment and cultural traditions, legends, and practices associated with the high elevation, forested inland areas.

Historic-era developments were extensively documented through government records and by those associated with the burgeoning cattle and sheep ranching industries and plantation activities. From these combined records (government records, ethnographic accounts, historical observations), a general overview of cultural resource site types can be elicited. A list of archeological sites types likely to be found within the current project area and the in the general region should only serve as a general outline and not as a definitive catalog of site types and is presented below in Table 2. The site types represent both pre-Contact and historic era usage, and these sites and their associated remains may or may not be readily identifiable.

**Table 2.** Archeological site types potentially located within current project area.

<i>Site Type</i>	<i>Site Function</i>
Temporary habitation sites (e.g. C-shapes, overhang and rock shelters)	Habitation
Caves	Temporary habitation Water collection Burial/interment
Ponds/water holes	Resource Procurement
Ahu	Marker
Trails	Transportation
Excavated Pits	Resource Procurement
Shrines/heiau	Ceremonial
Ranch structures	Habitation
Walls	Boundary
Paddocks	Animal Pens
Enclosures	Habitation, Animal Pens
Temporary (historic) Camps	Habitation
Water tanks	Resource Management
Irrigation systems	Resource Management
Logging/milling stations	Resource Collection/Processing
Roads/trails	Transportation

As previously noted, pre-Contact use of the upland forest areas appeared to be limited primarily to bird catching and forest resource collection. Remains associated with these activities are difficult to identify and result from traditional practices that appear to be transitory in nature and required short-term excursions into these resource areas. Tomonari-Tuggle (1996), in discussing shelters in the forested slopes of Mauna Kea at Hakalau Forest National Wildlife Refuge, cite Emerson as

describing the habitation of bird catchers as being modest and that the catcher “erects the necessary huts for himself and his family” (1894:105). These structures were most likely temporary in nature, and when abandoned, they rapidly deteriorated and were overgrown, becoming unrecognizable within the surrounding forest. Food remains, and later historic era artifacts, may remain at the sites, but identification of these sites is reduced by dense vegetation that reduces ground surface visibility and promotes site degradation and deterioration.

## 2.4. Known Site Locations

A Draft Environmental Impact Statement (DEIS) was prepared for the Saddle Road (State Route 200) and Mamalahoa Highway (State Route 190) (U.S. Dept. of Transportation 1997) that details archaeological, historic, and traditional cultural resources for the area. A total of 16 archaeological sites were identified during survey efforts comprised of 13 newly identified sites and 3 previously known sites. Two site locations identified during the highway survey may intersect the current project area and include two linear trail routes, the Pu‘u Oo – Volcano Trail (SIHP 50-10-33-10309) and the Hilo – Pu‘u Oo Trail (SIHP 50-10-33-20878). Each trail was recorded during the highway survey and significance evaluations and mitigation treatments were prepared for each. Site discussions for each trail are presented below (U.S. Department of Transportation 1997:3-189 through 3-190):

The Pu‘u ‘O‘o – Volcano Trail is eligible under Criterion A because it was used by Shipman to drive cattle from Pu‘u Ranch down to Volcano, from the early 1900s until after Saddle Road was built in 1943. The Trail was also used by Parker Ranch to drive cattle between Humu‘ula and Kahuku Ranch in Ka‘u from perhaps 1915 to the 1940s. Parker Ranch bought Kahuku Ranch in 1912 and Humu‘ula in 1914. Calves were brought back to Humu‘ula/Waimea to be fattened for market. Before 1930 replacement heifers were also driven down to Kahuku for breeding, but in later years the heifers were trucked down from Waimea. The trail is associated with the cattle drives in the early twentieth century, by Shipman and Parker Ranch. It contributed to development and travel on the island. The trail provided a vital economic link between Parker’s Waimea and Ka‘u ranches and between Shipman’s Pu‘u ‘O‘o Ranch and its Hilo market. The trail is eligible under Criterion C because it is an excellent example of a historic trail in eastern Hawai‘i. It is also eligible under Criterion D because it contains information on trail morphology and transportation routing during historic and, potentially, prehistoric periods. It is a strong probability that the trail is in large part prehistoric. If the prehistoric status of the trail were confirmed, it would establish an association with historic events further back in time, including use for the movement of Hawaiian armies. The part of the trail just south of Saddle Road, including the small portion of the trail that lies in the project corridor, was built more recently, after the 1935 flow.

The documented portion of the Hilo – Pu‘u ‘O‘o Trail is an outstanding example of a historic trail, with a variety of construction techniques employed and is therefore eligible under Criterion C. The lower part of the trail in this area passes over pahoehoe, appearing as a worn passage, built up in the low spots with rocks. The upper part of the trail in this area passes over ‘a‘a, appearing as a cleared and smoothed trough in the lava. The trail is still used by hikers, hunters, and gatherers. The part of the trail between MP 20 and 18 appears to be part of the trail in the best condition today. This part of the trail is associated with the Hitchcock family’s use of Puakala and with the Pu‘u ‘O‘o Ranch. The Hitchcock

house at Puakala was a site used for nineteenth-century cattle hunting in upper Pi‘ihonua and a vacation spot for the white elite of Hilo, who often ascended Mauna Kea from there. Pu‘u ‘O‘o Ranch was the first ranching operation in *mauka* (towards the sea) Pi‘ihonua above Hilo. It was established sometime between 1887 and 1896. It was established about the same time as Kuka‘iau Ranch farther north, which was started in 1887. The trail is thus associated with the shift in exploitation of the eastern side of Mauna Kea in the nineteenth century, from bird catching by native Hawaiian to feral cattle hunting and cattle ranching, primarily by whites, and is eligible under Criterion A. The trail embodies the distinctive characteristics of a type of construction and is a good example of a historic trail and is eligible under Criterion D. It contains information of the location of pathways taken during historic times, and on trail construction techniques relative to changes in terrain.

Table 3.19.1 presented within the DEIS discusses the impacts and recommended mitigation for each National Register of Historic Places-eligible archaeological site. A condensed version of the table is present below (Table 3) that presents the findings for each trail route.

**Table 3.** Impacts and recommended mitigation for archaeological sites within Saddle Road DEIS (from U.S. Dept. of Transportation 1997: 3-195)

Section	Site	Criteria	Effects and Analysis	Mitigation
EX-3	Pu‘u ‘O‘o-Volcano Trail (50-10-33-10309)	A, C, & D	35,000-m linear feature already interrupted in numerous locations by roads. Portion affected by project not significant for preservation in place. No alteration of significance criteria features. Adverse effect, but can be mitigated.	Data recovery and signage with pullout
EX-3	Hilo-Pu‘u ‘O‘o- Trail (50-10-33-20878)	A, C, & D	2,600-m linear feature already interrupted in numerous locations by roads. Portion affected by project not significant for preservation in place. No alteration of significance criteria features. Adverse effect, but can be mitigated.	Data recovery and signage with pullout

## 2.5. Historic Ranching at Pu‘u O‘o

As discussed above in Previous Archaeology (Section 2.1), Kumo Pono Associates LLC (Maly and Maly 2005) prepared a cultural resource study for the Office of Mauna Kea Management (University of Hawaii-Hilo) for the mountain lands and summit region of Mauna Kea. In their Executive Summary, early ranching developments on Hawaii Island are examined and include a brief history of Pu‘ O‘o Ranch. The section below is abstracted from this study (Maly and Maly 2005: vii-viii):

By 1850, the natural-cultural landscape of the *‘āina mauna* was being significantly altered by the roving herds of wild bullocks, sheep and other ungulates, and ranching interests were being formalized in the region. In 1857, the Crown and Government mountain lands of Humu‘ula and Ka‘ohe—including the summit of Mauna Kea—were leased to Francis Spencer and the Waimea Grazing and Agricultural Company, which established ranching stations and operations around the mountain lands. Portions of the land of Pi‘ihonua were leased to native bird hunters in the middle 1860s, and subsequently to native and foreign bullock hunters. As a result, Humu‘ula and the larger *‘āina mauna* have been intensively ranched for more than 150 years.

...As early as 1831, portions of the land of Pi'ihonua Uka and neighboring forest lands were being worked by Daniel Castle, and later, by the Castle and Hitchcock brothers for lumber milling and bullock hunting operations. Subsequently by the 1860s, native lessees were granted the right of hunting in the Pi'ihonua uplands. Then in 1887, the *ahupua'a* of Pi'ihonua (everything above Hilo Town to the upland boundary with Humu'ula) was leased to John Timoteo Baker, who undertook ranching operations in Pi'ihonua in the 1890s.

Prior to Bakers lease, the Puu Oo Ranch Station had been established, with its buildings developed as a part of the Humuula Sheep Station Company; this due to an error in locating the boundary between Humu'ula and Pi'ihonua. In 1896, the boundary matter was settled, and Baker maintained cattle and livestock ranching operations in the area. Baker sold his lease to W.H. Shipman in 1899, which was followed by the sale of a 40 acre parcel—the Pu'u Oo Ranch headquarters—in Patent Grant No. 8970, to W.H. Shipman. In 1902, Shipman secured leases on the lands of Pāpa'ikou, Makahanaloa and other Hilo District lands, which were incorporated into the Pu'u Oo ranching operation. W.H. Shipman, Limited, sold its interest in the Pu'u 'O'ō parcel in the 1970s, and it remains in private ownership to the present day.

Additional reports prepared on the ranching efforts in the islands were prepared by L.A. Henke (1929) and discusses the composition of Pu'u Oo ranch:

Puu Oo Ranch, largely on the slopes of Mauna Kea on a line between Hilo and the top of the mountain, has an area of 23,000 acres, 40 of which are held in fee simple, 13,000 are leased from the government and the balance from private parties. The ranch is located at an elevation ranging between 5,000 and 6,500 feet, and can be reached by an auto trail through Waikii and by horse trail from Hilo. The soil is good except for about 3,000 acres of rocky land between Mauna Kea and Mauna Loa. It is mostly an open forest country with Ohia lehua, *koa* (*Acacia koa*) and *mamani* (*Sophora chrysophylla*) trees.

This region has an annual rainfall of 92.48 inches based on eighteen years' records and the temperature has been observed to drop as low as 19°F. Water is secured from springs which lead to tanks and this ordinarily is an ample supply for the cattle. It is estimated that an average bullock drinks about 15 gallons per day. Puu Oo Ranch has about 75 miles of fence. This ranch carries about 4,000 high grade Herefords, 100 of the Hereford cows being registered animals. Forty-five bulls, all registered, are in service. All of the herd bulls except three from the Parker Ranch are Puu Oo raised. A total of about 1200 head are marketed annually from Keaau and Puu Oo Ranches, cattle from Keaau, the lower ranch, often being brought to Puu Oo for a year or more before marketing them.

Kentucky Blue Grass (*Poa pratensis*) with white clover (*Trifolium repens*) mixed in predominates as a forage grass in this section, and mesquite (*Holcus lanatus*) is considered very good. A wide variety of forae grasses are found, including cocks foot (*Dactylis glomerata*), *Paspalum dilatatum*, carpet grass (*Paspalum compressum*), redtop of Herd's grass (*Agrostis alba*), perennial rye (*Lolium perenne*), sweet vernal grass (*Anthoxanthum odoratum*), *Phalaris bulbosa*,

Beffiluda grass (*Cynodon dactylon*), tall meadow oat grass (*Arrhenatherum elantins*), brome grass (*Bromus unioloides*), *Panicum pruriens*, native sedges, creeping bent grass (*Agrostis alba var. maritime*), birds' foot trefoil clover (*Lotus corniculatus*), sheep sorrel (*Rumex acetosella*) and hop vine clover (*trifolium agrarium*), ect.

The lease on Puu Oo Ranch was purchased in 1899 by W. H. Shipman from John Baker, who started the ranch about 1896. He had built some fences, and about 600 head of mixed cattle, including some Longhorns, were found on the ranch at that time. Hereford bulls have been used on this ranch since 1900 and the cattle are well bred.

The ranch is still owned by W. H. Shipman, Ltd., and managed by W.H. Shipman and his son, H.C. Shipman. [Henke 1929:43].

### **3. Field Survey Methods and Findings**

The project area was surveyed on May 9, 2008 by the author, with the assistance of Steve Bergfeld, DOFAW Forester, who provided GPS coordinates of the proposed fence corridor. The entire survey area is comprised of low pasture grass resulting in excellent visibility. The single pedestrian transect began from the western edge of the project area and extended 8.0 km. (5.0 miles) to the east, following the proposed corridor, and provided for 100% coverage of the proposed fence line with sufficient intensity to identify all potential cultural resource features that may be located with the project area. Digital photographs were taken to document the project area and the conditions during survey efforts.

#### **3.1. Results**

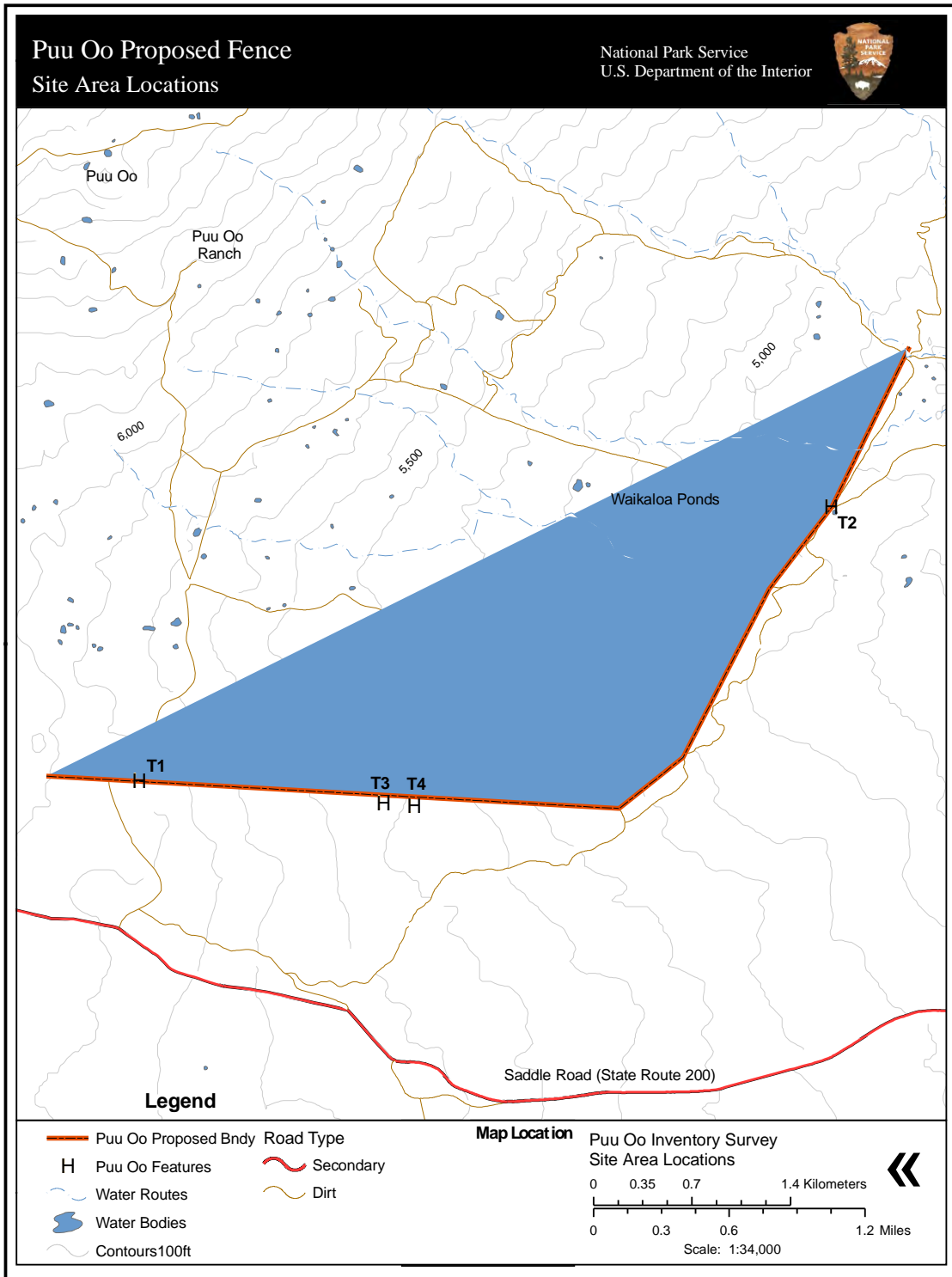
The pedestrian survey revealed the absence of traditional Hawaiian features. Two historic-era features were noted during the survey and consist of a wire fence alignment (Temporary Feature 1, T1) and a historic corral (Temporary Feature 2, T2) (Figure 3). The fence alignment noted in the western portion of the survey area (T1) aligns with the location of Volcano – Puu Oo Trail based on GIS analysis. A digital copy of the 1930 Humuula map was geo-referenced to determine the approximate location of the both the Volcano – Puu Oo Trail and the Hilo – Puu Oo Trail (Figure 4). Based on the analysis, the observed fence remnant aligns with the approximate trail location; however no visible trail route was identified in the area surrounding the deteriorated fence (see Figures 5, 6, and 7). A historic corral (T2) named the Pinto Corral (pers. comm. Bergfeld) is located along the proposed fence route (see Figure 3). The corral is in poor condition and consists of multiple stalls, gates, a feeding trough, and are all covered with a corrugated metal roofing structure. A metal water tank is situated in the central portion of the corral complex and miscellaneous metal fragments are strewn throughout the area (see Figures 8, 9, 10, and 11).

Of the two features noted during the survey, both appear to be intersected by the proposed fence corridor. Communications with DOFAW personnel coordinating the fence construction indicate that the fence project will not impact the identified features; any potential impacts will be eliminated through avoidance.

Two additional road locations (Temporary Features 3 and 4, T3 and T4) were identified in the central portion of the project area that appears to intersect with the proposed fence alignment. GPS locations were collected for each road and were geo-referenced with respect to the above mentioned 1930 Humuula map. The resulting analysis shows their location being situated



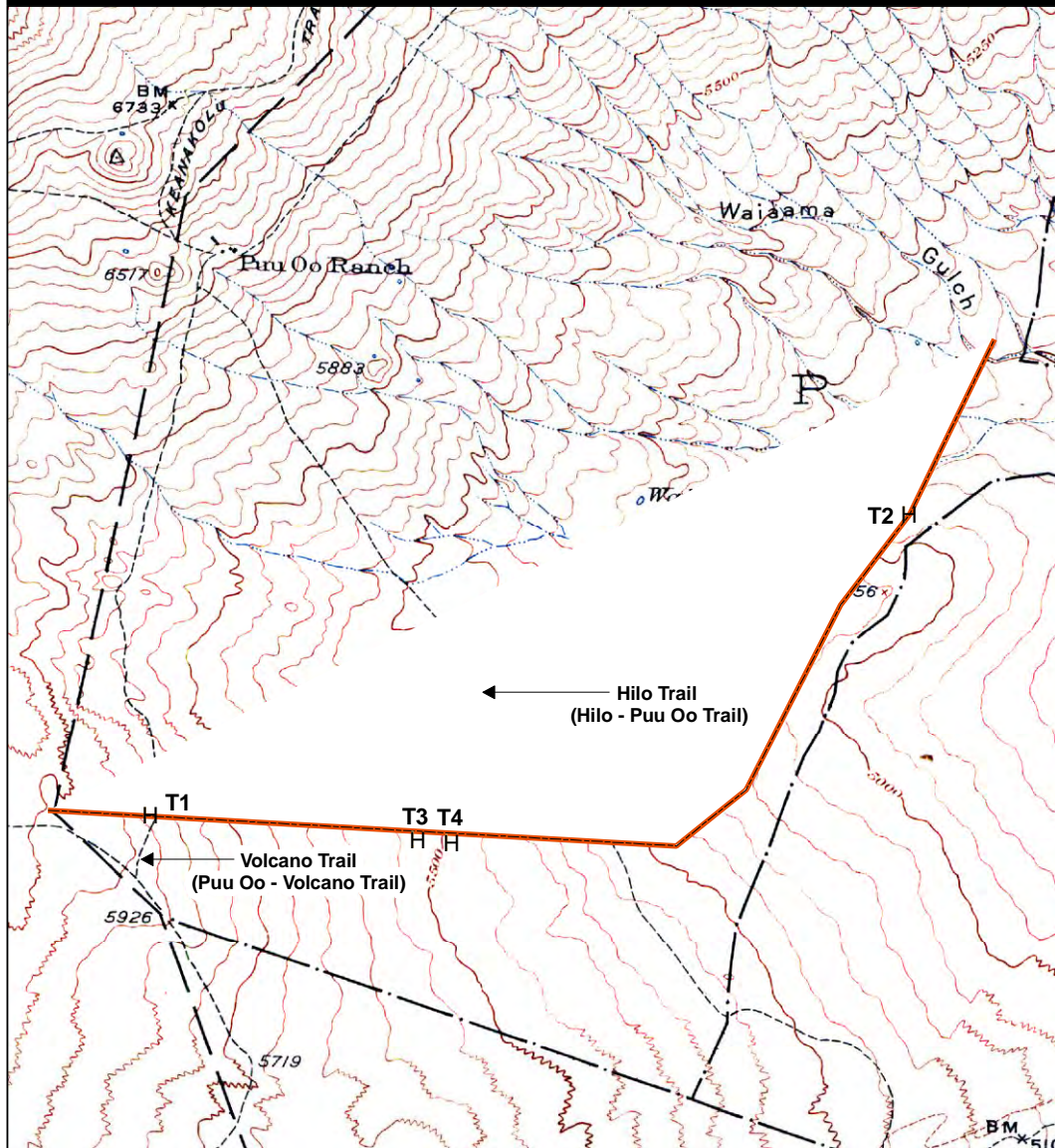
approximately 1,035-1,245 meters (0.6 to 0.7 miles) west of the Hilo – Puu Oo Trail (see Figure 4). Based on this analysis, the road locations most likely do not represent an alignment of this historic trail route and probably represent minimally developed ranch access roads.



**Figure 6.** Site locations within proposed fence corridor.

Puu Oo Proposed Fence  
Trail Route Locations

National Park Service  
U.S. Department of the Interior

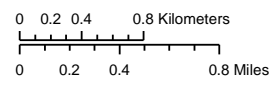


**Legend**

- Puu Oo Proposed Boundary
- Puu Oo Features

Map Location

Portion of Humu'ula 1:62,500  
1930 Edition



Scale: 1:35,000

**Figure 7.** Project area and site locations projected on a geo-referenced 1930 Edition of the Humu'ula, Territory of Hawaii, United States Department of the Interior Geological Survey quadrangle map.





**Figure 8.** T1 fence line and fence post within depression/sink along proposed boundary, view to the east.



**Figure 9.** T1 Fenceline and surrounding area; note the absence of discernable trail tread or road features that would correspond to the Puu Oo – Volcano Trail, view to the south.





**Figure 10.** Feature T2 corral, northern portion of structure, view to the west/northwest.



**Figure 11.** Feature T2 corral, southern portion of structure, view to the south/southwest.



**Figure 12.** Feature T2 corral, southern portion of structure, view to the east.

**Figure 13.** Feature T2 corral, central portion of corral complex with metal water tank situated within the corral interior, view to the southeast.



## 3.2. Site Determinations

The resources recorded during the current reconnaissance were each evaluated for site significance based on the National Register Criteria established in the National Historic Preservation Act of 1966. To be considered eligible for the National Register, resources must possess integrity of location, design, setting, materials, workmanship, feeling, and association, and: A) Are associated with events that have made a significant contribution to the broad patterns of our history; or B) Are associated with the lives of persons significant in our past; or C) Embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or D) Have yielded or may be likely to yield, information important in prehistory or history.

The sites identified during the archaeological inventory survey are not eligible for listing on the National Register of National Places based on the criteria stated above, and site evaluations for each identified feature are provided below.

The historic fence line (T1) located in the western portion of the project area is not eligible to the NRHP. Although the fence line is most likely more than 50 years old, it represents a common and ubiquitous ranching element used throughout the islands and is not a distinctive feature nor does it represent a significant contribution to the broad patterns of history. In addition, the fence line is severely deteriorated and does not maintain integrity of workmanship, materials, setting, or association.

The “Pinto Corral” (Feature T2) situated in the eastern portion of the project area is also not eligible to the NRHP. The feature’s age is uncertain (most likely older than 50 years old), and also represents a common ranching element used throughout upland ranches in Hawaii. The feature does not maintain integrity of workmanship or materials that reduces the overall feeling, setting, and association.

Finally, the identified features are located either outside of or adjacent to the Area of Potential Effect (APE). The fence project is designed to avoid adverse effects to the observed historic era ranch elements identified during the survey. As none of the features located within or adjacent to the APE are eligible to the NRHP, we determine that the current undertaking will have a “no effect” determination on significant historical properties.

The historic resources recorded during the current inventory are clearly identifiable in the field, and with appropriate direction from DOFAW personnel, the resources will be easily avoided during project implementation. The proposed undertaking will not directly or indirectly alter the physical characteristics of the historical properties and will not further impact the sites’ already diminished setting or feeling of the ranch elements.

The pedestrian survey of the proposed project area successfully identified two historic features. In the unlikely event that additional archaeological resources are located during project implementation, all construction activity will stop and the appropriate agency personnel (DLNR-SHPD, NPS Cultural Resource Staff) should be notified.

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