FILE COPY

OCT 0 8 2015

DAVID Y. IGE
GOVERNOR
STATE OF HAWAII

SHAN S. TSUTSUI
LT GOVERNOR
STATE OF HAWAII

JOBIE M. K. MASAGATANI
CHAIRMAN
HAWAIIAN HOMES COMMISSION

WILLIAM J. AILA, JR.
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF HAWAIIAN HOME LANDS

P O BOX 1879
HONOLULU, HAWAII 96805

September 17, 2015

RECEIVED
'15 SEP 28 P3:46
OFC. OF ENVIRONMENTAL QUALITY CONTROL

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

Dear Ms. Wooley:

Subject: Draft Environmental Assessment for Honokaia Non-Potable Water System, TMK (3rd.) 2-6-001: 001-046; 4-7-007:005, Hāmākua, Island of Hawai'i

The Department of Hawaiian Home Lands has prepared the draft environmental assessment for the subject project and anticipates a Finding of No Significant Impact (FONSI) determination. Please publish notice of availability for this project in the next available edition of the Environmental Notice. We have enclosed the following:

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

Please contact Maryam R. Speidel at 808-620-9286 if you have any questions.

Sincerely,

Jobie M.K. Masagatani, Chairman
Hawaiian Homes Commission

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

AGENCY ACTIONS
SECTION 343-5(B), HRS
PUBLICATION FORM (FEBRUARY 2013 REVISION)

Project Name Honokaia Non-Potable Water System
Island: Hawai‘i
District: Hāmākua
TMK: (3rd) 4-6-001: 001-046; 4-7-007:005
Permits:
Hawai‘i State Department of Health
National Pollutant Discharge Elimination System Permit
Hawai‘i State Department of Land and Natural Resources
State Historic Preservation Division Chapter 6e Concurrence
Hawai‘i County Department of Public Works
Grubbing and Grading

Proposing/Determination Agency:
State of Hawai‘i
Department of Hawaiian Home Lands
91-5420 Kapolei Parkway, Room 124 I
Kapolei, Hawai‘i 96707
Contact: Maryam R. Speidel (808) 620-9274

Consultant:
Geometrician Associates
PO Box 396
Hilo HI 96721
Ron Terry Ph. (808) 969-7090 rterry@hawaii.rr.com

Status (check one only):

_**x**_DEA-AFNSI	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of DEA, a completed OEQC publication form, along with an electronic word processing summary and a PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov); a 30-day comment period ensues upon publication in the periodic bulletin.
___FEA-FONSI	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and a PDF copy (send both summary and PDF to oeqchawaii@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
__FEA-EISPN	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov); a 30-day consultation period ensues upon publication in the periodic bulletin.
__Act 172-12 EISPN	Submit the proposing agency notice of determination on agency letterhead, an OEQC publication form, and an electronic word processing summary (you may send the summary to oeqchawaii@doh.hawaii.gov). NO environmental assessment is required and a 30-day consultation period upon publication in the periodic bulletin.
__DEIS	The proposing agency simultaneously transmits to both the OEQC and the accepting authority, a hard copy of the DEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the DEIS (you may send both the summary and PDF to oeqchawaii@doh.hawaii.gov); a 45-day comment period ensues upon publication in the periodic bulletin.

__FEIS — The proposing agency simultaneously transmits to both the OEQC and the accepting authority, a hard copy of the FEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the FEIS (you may send both the summary and PDF to oeqchawaii@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.

__ Section 11-200-23 Determination — The accepting authority simultaneously transmits its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS to both OEQC and the proposing agency. No comment period ensues upon publication in the periodic bulletin.

__Section 11-200-27 Determination — The accepting authority simultaneously transmits its notice to both the proposing agency and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is not required. No EA is required and no comment period ensues upon publication in the periodic bulletin.

__Withdrawal (explain)

Summary DHHL is proposing a gravity fed non-potable water system consisting of a County DWS connection, a 104,600-gallon metal storage tank reservoir, 32,000 linear feet of transmission lines and laterals, submeters and appurtenant infrastructure. The benefitted properties are 46 leased pastoral lots within a DHHL pastoral subdivision near Honokaa. For ranching needs, the project would distribute 4,800 gallons a day to the lessees, sufficient for 320 head of cattle. Beneficial effects include facilitating the subdivision's intended land use and lifestyle. Very minor short-term impacts to water quality can be mitigated to negligible levels by proper adherence to construction permits and other mitigation. No significant archaeological sites are present, cultural uses will not be adversely affected, and no threatened or endangered species will be affected, given standard mitigation for timing of removal of tall woody vegetation. The very minor level of growth facilitated by the project occurs in an existing subdivision in keeping with State and County plans.

Honokāia Non-Potable Water System
Hāmākua, Island of Hawai‘i
State of Hawai‘i

DRAFT ENVIRONMENTAL ASSESSMENT AND ANTICIPATED FONSI

State of Hawai‘i, Department of Hawaiian Home Lands

October 2015

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

Honokāia Non-Potable Water System
Hāmākua, Island of Hawai‘i
State of Hawai‘i

DRAFT ENVIRONMENTAL ASSESSMENT AND ANTICIPATED FONSI

Tax Map Key Numbers: (3rd): 4-6-001: 001-046; 4-7-007:005

PROPOSING/APPROVING AGENCY:

State of Hawai‘i
Department of Hawaiian Home Lands
91-5420 Kapolei Pkwy
Kapolei HI 96707

CONSULTANT:

Geometrician Associates
P.O. Box 396
Hilo HI 96721

And

Akinaka & Associate, Ltd.
3375 Koapaka Street, Suite B-206
Honolulu HI 96819

CLASS OF ACTION:

Use of State Land and 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)

[This page intentionally left blank]

SUMMARY

The Hawai‘i State Department of Hawaiian Home Lands (DHHL) is proposing a gravity fed non-potable water system consisting of a County of Hawai‘i, Department of Water Supply (DWS) connection, one 104,600-gallon metal storage tank reservoir, approximately 32,000 linear feet of transmission lines and laterals, individual submeters and appurtenant infrastructure. The benefitted properties are 46 lots within a DHHL pastoral subdivision in Honokāia, on Old Mamalahoa Highway near Honokaa. These lots are owned by DHHL and leased by various lessees. All improvements would be located on portions of some of these lots or on the private DHHL roads that provide access to the lots, except for the DWS connection, which would occur on an adjacent DHHL lot.

The Honokāia Pastoral Lots were created in 2006 by DHHL and involve land that has been in continuous ranching use for almost two centuries. It was designed based on a planning process that included a series of community meetings, individual ranch plans, and independent panel reviews involving Pu‘ukapu and Honokāia pastoral lessees eligible for additional acreage for larger scale ranching. A key aspect of the project was a new road system, which was subsequently developed. Subdivision into 42 properties and leasing of the property to beneficiaries ensued. The Proposed Action to provide supplemental water for ranching fulfills aspects of DHHL’s Waimea Nui Plan that seek to improve the pastoral program and provide for the non-potable ranching water needs of lessees in order to achieve agricultural success. For ranching needs, the Proposed Action distributes 4,800 gallons a day to the lessees, sufficient to supply approximately 320 head of cattle.

Beneficial effects include facilitating the land use and lifestyle that was intended when the subdivision was created. Very minor short-term impacts to water quality can be mitigated to negligible levels by proper adherence to construction permits and other mitigation. No significant archaeological sites are present, cultural uses will not be adversely affected, and no threatened or endangered species will be affected, given standard mitigation for timing of removal of tall woody vegetation. The very minor level of growth facilitated by the Proposed Action would occur in an existing subdivision and is in keeping with State and County plans.

[This page intentionally left blank]

Table of Contents

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

BMP	Best Management Practice
CDP	Community Development Plan
DHHL	(Hawai‘i State) Department of Hawaiian Home Lands
DLNR	(Hawai‘i State) Department of Land and Natural Resources
DOH	(Hawai‘i State) Department of Health
DWS	(Hawai‘i County) Department of Water Supply
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Environmental Site Assessment
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
gpd	Gallons per day
HAR	Hawai‘i Administrative Rules
HELCO	Hawaii Electric Light Company
HEPA	Hawai‘i Environmental Policy Act
HCGP	Hawai‘i County General Plan
HRS	Hawai‘i Revised Statutes
msl	Mean sea level
OEQC	(Hawai‘i State) Office of Environmental Quality Control
SFHA	Special Flood Hazard Area
SHPD/O	State Historic Preservation Division/Officer
UH	University of Hawai‘i
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

1 PROJECT LOCATION, DESCRIPTION AND ALTERNATIVES

1.1 Project Location, Description and Purpose and Need

The Hawai‘i State Department of Hawaiian Home Lands (DHHL) is proposing a gravity fed non-potable water system consisting of a County of Hawai‘i, Department of Water Supply (DWS) connection, one 104,600-gallon metal storage tank reservoir, approximately 32,000 linear feet of transmission lines and laterals, individual submeters and appurtenant infrastructure. The benefitted lots are within a DHHL pastoral subdivision that consist of TMKs (3rd) 4-6-001: 001-046 in Honokāia, on Old Mamalahoa Highway near Honokaa (Figures 1-1 to 1-3). These lots are owned by DHHL and leased by various lessees. All improvements would be located on portions of some of these properties or on the private DHHL roads that provide access to the lots, except for the DWS connection, which would occur on an adjacent DHHL lot – TMK (3rd) 4-7-07:005.

The pastoral subdivision was created in 2006 by DHHL, as described in the Final Environmental Assessment (EA) for the project that was published in the *OEQC Environmental Notice* on May 8, 2006. The Honokāia pastoral subdivision involves land that has been in continuous ranching use for almost two centuries. It was designed based on a planning process that included a series of community meetings, individual ranch plans, and independent panel reviews involving Pu‘ukapu and Honokāia pastoral lessees eligible for additional acreage for larger scale ranching. A key aspect of the project was a new road system, which was subsequently developed. Subdivision into 42 properties and leasing of the property to beneficiaries ensued. The subdivision has 27 additional acreage pastoral lots for cattle ranching, as well as 15 primary pastoral lots, which will have single family residences as well as pastoral activities. The Proposed Action to provide supplemental water for ranching fulfills aspects of DHHL’s Waimea Nui Plan that seek to improve the pastoral program and improve the lessees’ ability to achieve agricultural success.

For supplemental ranching water needs, the 2006 plan noted that the DWS water allocation to the project site was only 4,800 gallons a day. This was sufficient to supply approximately 320 head of cattle. It was planned that the existing DWS 4-inch pipe could be extended to the project site to provide this allocation. However, the project plan at the time did not provide for any facilities for storage and distribution for this non-potable system. These facilities have now been designed and their locations specified, which is the reason for this EA. Domestic water needs for the 15 primary pastoral lots are being met through individual water tanks, wells and catchment basins, which are not part of the proposed project.

Figure 1-1a. Location Maps

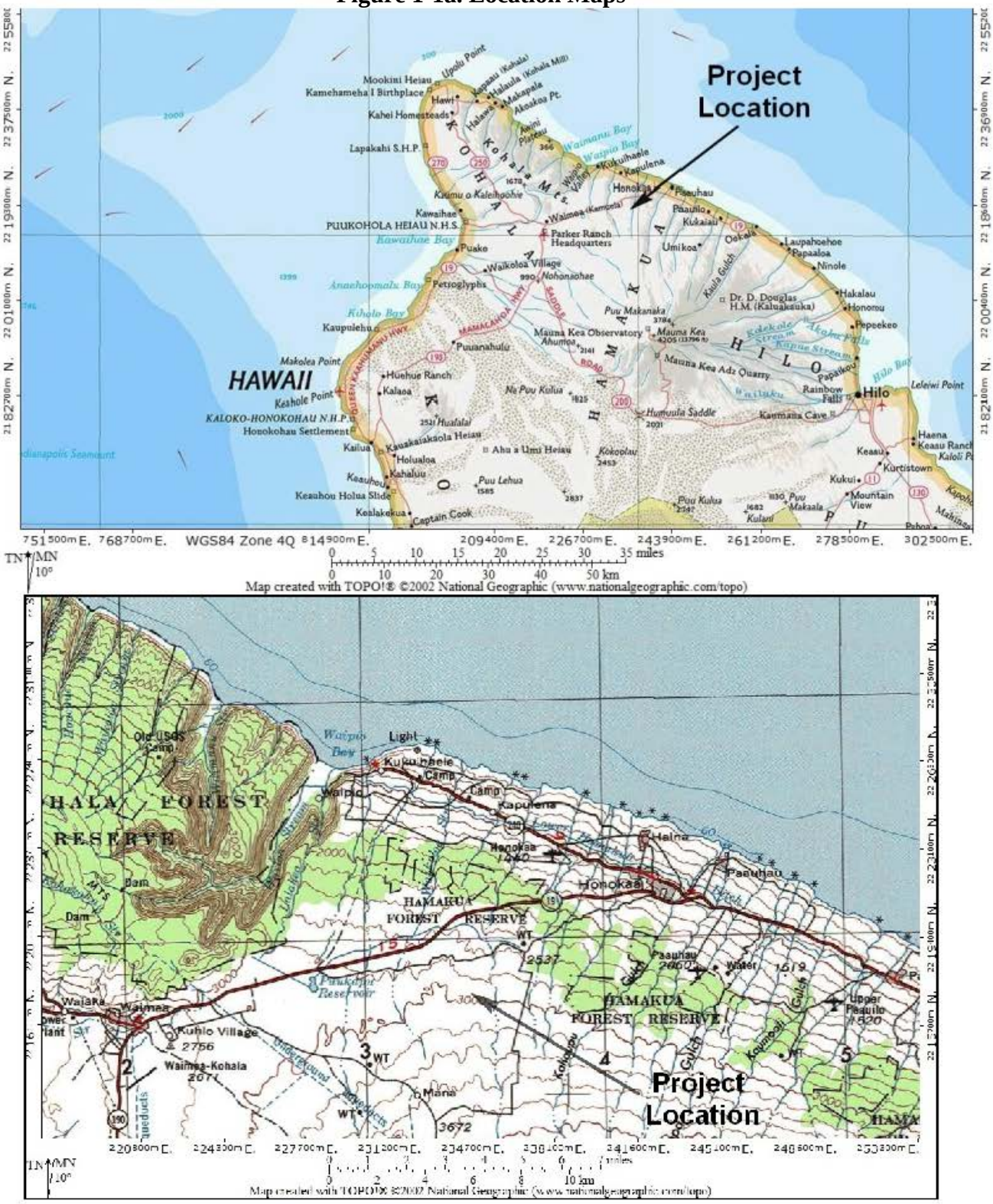


Figure 1-1b. Location Map Aerial Image

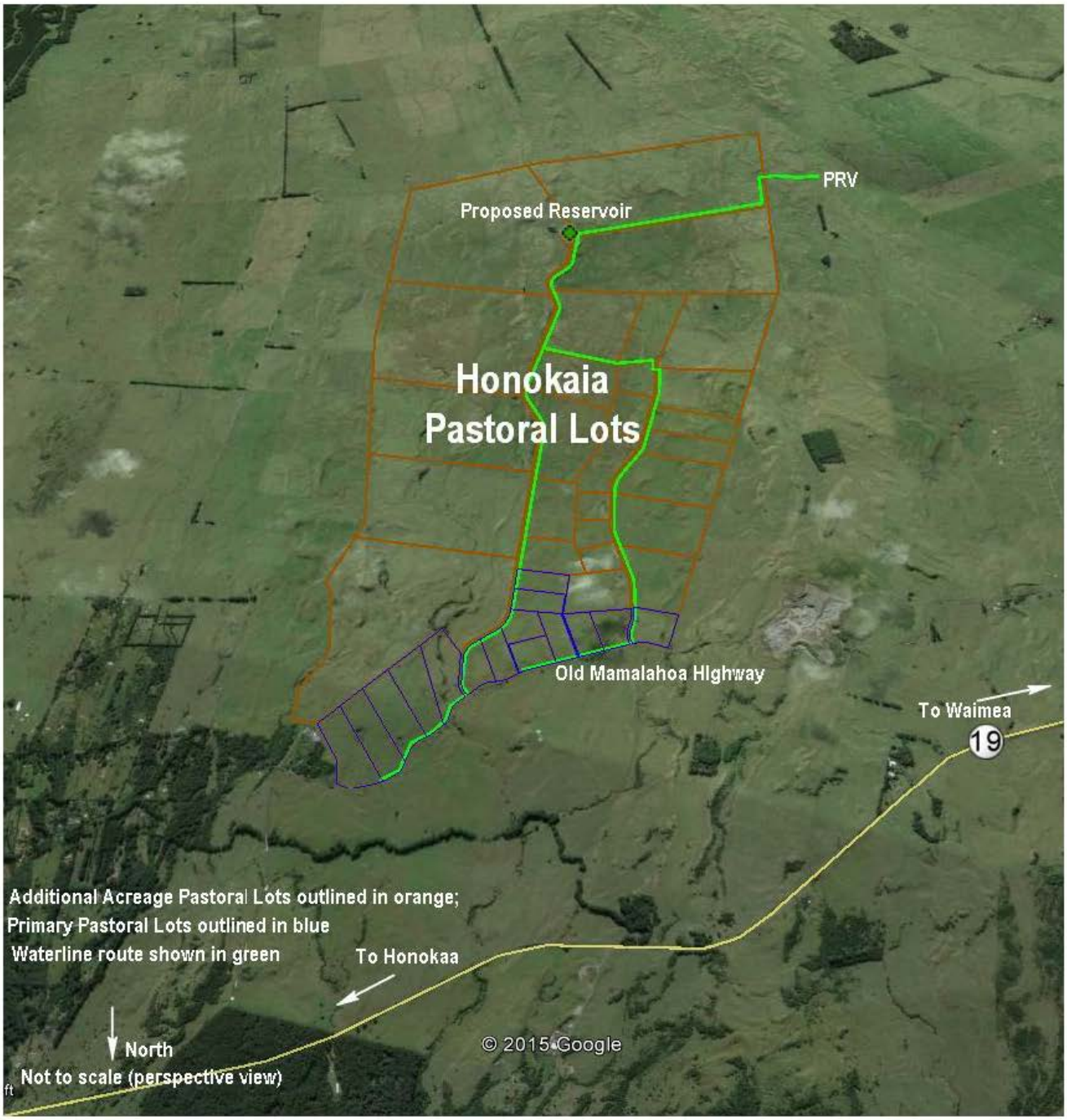


Figure 1-2 Project Site Photos

1-2a. Top of main road: waterline route follows left side of road, water tank site on right ▲

▼ 1-2b. Waterline route across a pasture lot, on left side of fence line

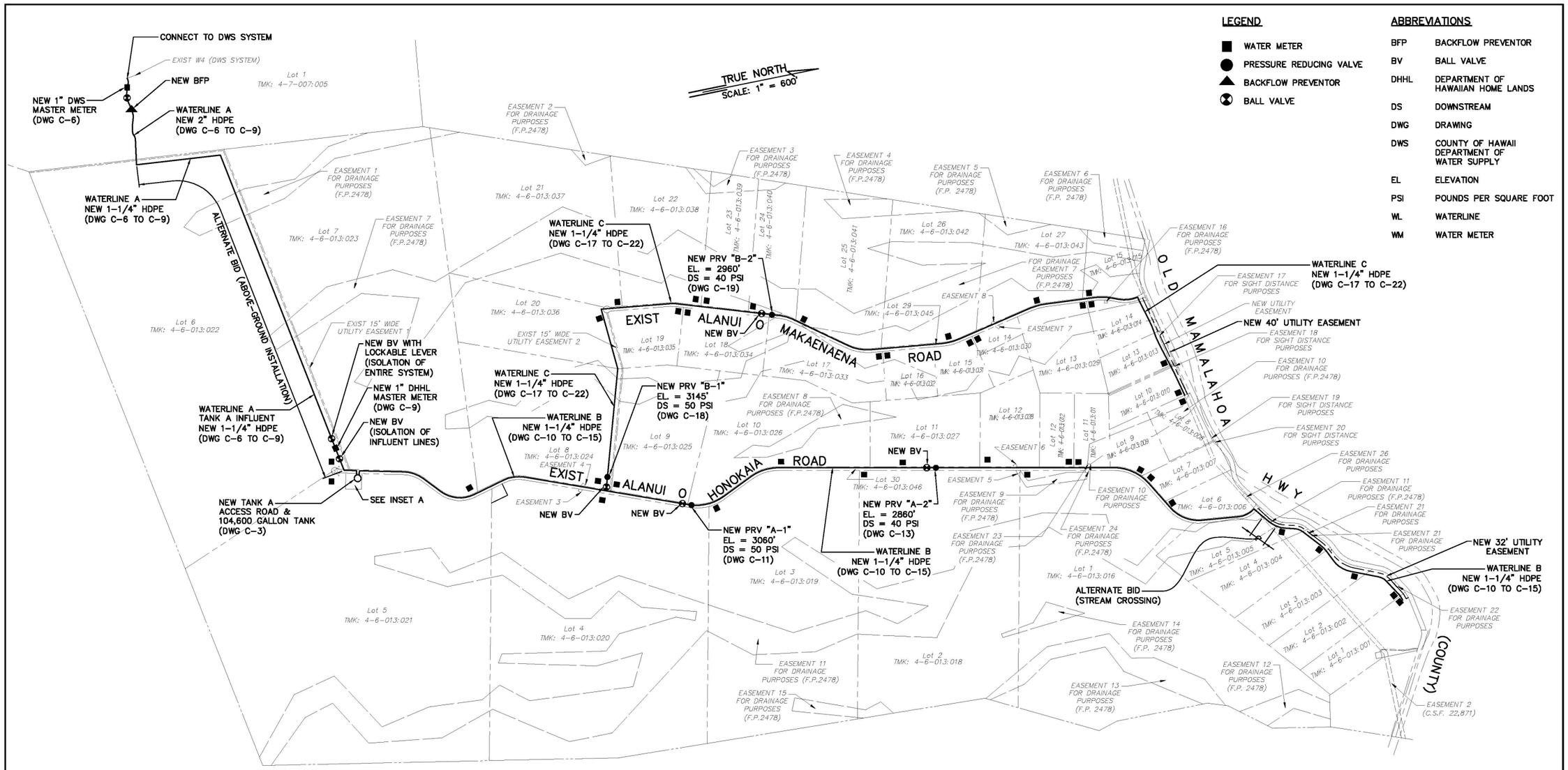
Figure 1-2 Project Site Photos

1-2c. Pressure relief valve in pasture at far southwest of project site ▲

▼ 1-2d. One of a few ʻohiʻa trees in *mauka* area, 100 yards south of waterline corridor

Figure 1-2 Project Site Photos

1-2e. Waterline will cross intermittent stream ▲ ▼ 1-2f. Typical Mamalahoa Highway frontage



Last Save by: SHU
Last Saved: 6/24/2015
Plotted on: 6/24/2015
G:\DHHL1401 Honokaia Non-Pot\300 DSGN\310 Plans\DHHL1401-General Layout.dwg

C-2 SHEET 3 OF 32 SHEETS

[this page intentionally left blank]

1.2 Alternatives Considered

As background, the Honokāia Pastoral Lots subdivision resulted from a lawsuit in 1990 against DHHL by a group of prospective Hawaiian homesteaders known as the Aged Hawaiians. They were concerned that the Honokāia DHHL lands had not been distributed to DHHL beneficiaries and still remained under lease to Parker Ranch for pasture. Several of the plaintiffs had originally applied for pasture leases in 1952 but had still not received leases. After more than a decade of litigation, the lawsuit was settled and the Honokāia Pastoral Lots were created in 2006. Among the stipulations in the agreement was that the source of water would be individual catchment, which would be the responsibility of that particular lessee. Some lessees believed that DHHL should provide a water system and they subsequently filed another lawsuit against DHHL. To settle this suit, it was stipulated that DHHL would be responsible for developing a non-potable water system with a maximum of 4 equivalent water units that would be designed and constructed for under $1.165 million.

Although water systems of different sizes and types could conceivably be constructed, DHHL has funding only to satisfy the requirements of the stipulation that settled the lawsuit. The Proposed Action has been designed to accomplish this, and DHHL does not envision any other substantially distinct systems that could do so and are worthy of advancement as an alternative to the Proposed Action.

The No Action Alternative provides a baseline for comparison of impacts from the Proposed Action. It would result in no on-ground impacts, but it has adverse implications for impacts to DHHL pastoral lot residents, who would continue to lack an adequate water supply. Unless explicitly mentioned, the discussion of impacts and mitigation in Chapter 3 relates to the Proposed Action Alternative only.

1.3 Consistency with Government Plans and Policies

An important consideration in evaluating the potential impacts of a proposed action on the environment is how it conforms or conflict with approved or proposed land use plans, policies and controls for the affected area. In general, the Proposed Action is highly consistent with government plans and policies. This EA addresses applicable State and County land use plans including the Hawai‘i State Plan, DHHL General Plan, DHHL Hawai‘i Island Plan, DHHL Waimea Nui Regional Plan, DHHL Water Policy Plan, County of Hawai‘i General Plan, and Hāmākua Community Development Plan. Hawai‘i State Land Use Law and County Zoning are discussed above in Section 3.3.1. The following sections discuss consistency with key plans.

1.3.1 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 Action 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. The sections of the Hawai'i State Plan most relevant to the Proposed Action are centered on the themes of water, agriculture, economy and environmental protection, as discussed below.

§226-6 Objectives and policies for the economy--in general. (a) Planning for the State's economy in general shall be directed toward achievement of the following objectives:

(1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people, while at the same time stimulating the development and expansion of economic activities capitalizing on defense, dual-use, and science and technology assets, particularly on the neighbor islands where employment opportunities may be limited.

(2) A steadily growing and diversified economic base that is not overly dependent on a few industries, and includes the development and expansion of industries on the neighbor islands.

§**226-7 Objectives and policies for the economy-- agriculture.** (a) Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives:

(1) Viability of Hawaii's sugar and pineapple industries.

(2) Growth and development of diversified agriculture throughout the State.

(3) An agriculture industry that continues to constitute a dynamic and essential component of Hawaii's strategic, economic, and social well-being.

(b) To achieve the agriculture objectives, it shall be the policy of this State to:

(1) Establish a clear direction for Hawaii's agriculture through stakeholder commitment and advocacy.

(2) Encourage agriculture by making best use of natural resources.

(3) Provide the governor and the legislature with information and options needed for prudent decision making for the development of agriculture.

(4) Establish strong relationships between the agricultural and visitor industries for mutual marketing benefits.

(5) Foster increased public awareness and understanding of the contributions and benefits of agriculture as a major sector of Hawaii's economy.

(6) Seek the enactment and retention of federal and state legislation that benefits Hawaii's agricultural industries.

(7) Strengthen diversified agriculture by developing an effective promotion, marketing, and distribution system between Hawaii's producers and consumer markets locally, on the continental United States, and internationally.

(8) Support research and development activities that provide greater efficiency and economic productivity in agriculture.

(9) Enhance agricultural growth by providing public incentives and encouraging private initiatives.
(10) Assure the availability of agriculturally suitable lands with adequate water to accommodate present and future needs.
(11) Increase the attractiveness and opportunities for an agricultural education and livelihood.
(12) Expand Hawaii's agricultural base by promoting growth and development of flowers, tropical fruits and plants, livestock, feed grains, forestry, food crops, aquaculture, and other potential enterprises.
(13) Promote economically competitive activities that increase Hawaii's agricultural self-sufficiency.
(14) Promote and assist in the establishment of sound financial programs for diversified agriculture.
(15) Institute and support programs and activities to assist the entry of displaced agricultural workers into alternative agricultural or other employment.

226-11 Objectives and policies for the physical environment--land-based, shoreline, and marine resources. (a) Planning for the State's physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of the following objectives:
(1) Prudent use of Hawaii's land-based, shoreline, and marine resources.
(2) Effective protection of Hawaii's unique and fragile environmental resources.

§226-12 Objective and policies for the physical environment--scenic, natural beauty, and historic resources. (a) Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawaii's scenic assets, natural beauty, and multi-cultural/historical resources.

§226-16 Objective and policies for facility systems--water. (a) Planning for the State's facility systems with regard to water shall be directed towards achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capacities.
(b) To achieve the facility systems water objective, it shall be the policy of this State to:
(1) Coordinate development of land use activities with existing and potential water supply.
(2) Support research and development of alternative methods to meet future water requirements well in advance of anticipated needs.
(3) Reclaim and encourage the productive use of runoff water and wastewater discharges.
(4) Assist in improving the quality, efficiency, service, and storage capabilities of water systems for domestic and agricultural use.
(5) Support water supply services to areas experiencing critical water problems.

> (6) Promote water conservation programs and practices in government, private industry, and the general public to help ensure adequate water to meet long-term needs. [L 1978, c 100, pt of §2; am L 1986, c 276, §15]

Discussion: The Proposed Action supports relevant objectives and policies of the Hawai‘i State Plan. In particular, it advances provision of water to adequately accommodate agricultural needs within resource capacities. It assists in improving the quality, efficiency, service, and storage capabilities of water systems for agricultural use, and assures the availability of agriculturally suitable lands with adequate water to accommodate present and future needs. It represents a prudent use of Hawaii's land-based marine resources, and assists in the goal to achieve full employment, increased income and job choice, and improved living standards for those among Hawai‘i's people who wish to pursue ranching.

1.3.2 DHHL General Plan and Hawai‘i Island Plan

The Hawai‘i State Department of Hawaiian Home Lands (DHHL) General Plan (2002a) has as its mission statement:

> Our mission is to manage the Hawaiian Home Lands trust effectively and to develop and deliver lands to native Hawaiians. We will partner with others towards developing self-sufficient and healthy communities.

Among its land use planning goals are utilizing Hawaiian Home Lands for uses most appropriate to meet the needs and desires of the beneficiary population. Objectives include providing space for and designating a mixture of appropriate land uses, economic opportunities and community services in a native Hawaiian-friendly environment. \The following are relevant goals and objectives for agricultural and pastoral uses.

GOALS

- Provide infrastructure, technical assistance and financial support commensurate with the intended uses of agricultural and pastoral lots.
- Provide agriculture and pastoral commercial leasing opportunities for beneficiaries.
- Conserve the most productive agriculture lands for intensive agriculture and pastoral use.
- Provide agriculture and pastoral homestead lots for subsistence and supplemental purposes.
- Provide access to quality water in the most cost-effective and efficient manner.
- Ensure the availability of sufficient water to carry out Hawaiian Home Lands' mission.
- Establish self-sufficient and healthy communities on Trust lands.

OBJECTIVES

- Establish water partnership arrangements.
- Identify and establish a clear understanding of existing water resources available to the Hawaiian Home Lands Trust.
- Build partnerships with public and private agencies to ensure reliable and adequate delivery of services to homesteaders.

DHHL's Hawai'i Island Plan (2002b) assesses the Department's 116,963 acres on Hawai'i Island. Under the DHHL Planning System, there are five components outlined in the island plans:

1. Baseline analysis of existing physical environmental conditions and beneficiary preferences;
2. Preliminary identification of appropriate land use based on those conditions and preferences;
3. Community input and participation on the draft land use plan;
4. Pre-final land use evaluation and public commentary on that evaluation by region; and
5. Final land use analysis and recommendations.

The Hawai'i Island Plan designated the Honokaia area *mauka* of Old Mamalahoa Highway for subsistence agricultural and pastoral uses under DHHL's Land Use Categories.

Discussion: The proposed non-potable water system to provide supplemental water to promote pastoral uses is consistent with the basic goals and objectives and land use categories of these plans. The land uses have been refined through continued consultation with the community.

1.3.3 Hawai'i County General Plan

The *General Plan* for the County of Hawai'i is the document expressing the broad goals and policies for the long-range development of the Island of Hawai'i. The latest plan was adopted by ordinance in 2005. The *General Plan* is organized into thirteen elements, with policies, objectives, standards, and principles for each. There are also discussions of the specific applicability of each element to the nine judicial districts comprising the County of Hawai'i. Below are pertinent Goals, Objectives, Policies and Standards sections related to relevant sections of the General Plan, followed by a discussion of conformance with each.

WATER SYSTEMS POLICIES

(a) Water system improvements shall correlate with the County's desired land use development pattern.
(b) All water systems shall be designed and built to Department of Water Supply standards.

(c) Improve and replace inadequate systems.
(d) Water sources shall be adequately protected to prevent depletion and contamination from natural and man-made occurrences or events.
(e) Water system improvements should be first installed in areas that have established needs and characteristics, such as occupied dwellings, agricultural operations and other uses, or in areas adjacent to them if there is need for urban expansion.
(f) A coordinated effort by County, State and private interests shall be developed to identify sources of additional water supply and be implemented to ensure the development of sufficient quantities of water for existing and future needs of high growth areas and agricultural production.
(g) The fire prevention systems shall be coordinated with water distribution systems in order to ensure water supplies for fire protection purposes.
(h) Develop and adopt standards for individual water catchment units.
(i) Cooperate with the State Department of Health to develop standards and/or guidelines for the construction and use of rainwater catchment systems to minimize the intrusion of any chemical and microbiological contaminants.
(j) Cooperate with appropriate State and Federal agencies and the private sector to develop, improve and expand agricultural water systems in appropriate areas on the island.
(k) Promote the use of ground water sources to meet State Department of Health water quality standards.
(l) Continue to participate in the United States Geological Survey's exploratory well drilling program.
(m) Seek State and Federal funds to assist in financing projects to bring the County into compliance with the Safe Drinking Water Act.
(n) Develop and adopt a water master plan that will consider water yield, present and future demand, alternative sources of water, guidelines and policies for the issuing of water commitments.
(o) Expand programs to provide for agricultural irrigation water.

WATER SYSTEM STANDARD

(a) Public and private water systems shall meet the requirements of the Department of Water Supply and the Subdivision Control Code.

ECONOMIC GOALS

(d) Provide an economic environment that allows new, expanded, or improved economic opportunities that are compatible with the County's cultural, natural and social environment.

ENVIRONMENTAL QUALITY POLICIES

(a) Take positive action to further maintain the quality of the environment for residents both in the present and in the future.

ENVIRONMENTAL QUALITY STANDARDS

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

HISTORIC SITES GOALS

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

HISTORIC SITES POLICIES

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

FLOOD CONTROL AND DRAINAGE GOALS

(c) Control pollution.
(d) Prevent damage from inundation.
(e) Reduce surface water and sediment runoff

FLOOD CONTROL AND DRAINAGE POLICIES

(g) Development-generated runoff shall be disposed of in a manner acceptable to the Department of Public Works and in compliance with all State and Federal laws.

FLOOD CONTROL AND DRAINAGE STANDARDS

(b) Applicable standards and regulations of Chapter 27, “Flood Control,” of the Hawaii County Code.
(c) Applicable standards and regulations of the Federal Emergency Management Agency (FEMA).

(d) Applicable standards and regulations of Chapter 10, "Erosion and Sedimentation Control," of the Hawaii County Code.

NATURAL RESOURCES AND SHORELINES GOALS

(a) Protect and conserve the natural resources of the County of Hawaii from undue exploitation, encroachment and damage.
(f) Ensure that alterations to existing land forms and vegetation, except crops, and construction of structures cause minimum adverse effect to water resources, and scenic and recreational amenities and minimum danger of floods, landslides, erosion, siltation, or failure in the event of earthquake.

Discussion: The Proposed Action is generally consistent with the goals, policies, objectives and standards of the General Plan. It is important to note that water system policies relate to potable water systems, not agricultural systems as the one proposed at Honokāia. Nevertheless, the water system improvements correlate with the County's desired land use development pattern, which includes ranching in this area. It fulfills a need of existing agricultural operations to ensure the development of sufficient quantities of water for existing and future needs of agricultural production. The system would not adversely affect drainage, streams, biota, viewplanes, historic sites, or other resources for which protection is specified by the General Plan. Although the Plan states that water systems shall be designed and built to DWS standards, this refers to potable systems. While the source is DWS potable water, the use is for cattle watering, and the system itself is non-potable. The project is thus not inconsistent with the standard. The quantity of water is sufficient for supplemental ranching water needs, and it is key component for successful ranching for the Hawaiian Home Land lessees.

1.3.4 Hāmākua Community Development Plan

The project site is located in the Hāmākua Community Development Plan (CDP) planning area. However, this CDP has not yet been adopted and is currently in the planning process. According to elements available for review (http://www.hawaiicountycdp.info/hamakua-cdp/draft-hamakua-cdp-documents) the Hāmākua CDP stresses the value of having a rural community of distinctive small towns and villages thriving on sustainable agriculture and ranching to provide itself and the rest of Hawai'i with healthy food and locally grown products. The DHHL's plans to provide water for pastoral purposes for Native Hawaiian lessees is highly consistent with goals of protecting the *'āina* and managing natural and cultural resources, preserving and strengthening community character, building a robust local economy, and building and strengthening community capacity, and it is not inconsistent with any aspect of the plan to date.

1.3.5 DHHL Water Policy and Waimea Nui Hawai‘i Regional Plan

The DHHL Water Policy Plan 2014 was developed with beneficiary input to formulate DHHL's vision and mission for water and supporting values, goals, and policies. The mission of the Water Policy Plan is to strive to ensure adequate, quality water by working to understand DHHL's trust water assets; planning for DHHL's water needs; understanding, exercising, and asserting DHHL's *kuleana* as stewards of water; developing and protecting water resources; and managing water systems. The project supports the DHHL Water Policy Plan through providing water that is critically needed for use on pastoral lots.

The Waimea Nui Hawai‘i Regional Plan is one of 20 regional plans that express the vision of the Department of Hawaiian Home Lands (DHHL):

> "…to build vibrant homestead communities that flourish from the solid foundation of the Hawaiian Home Lands Trust. A trust grounded in commitment to serving and partnering with beneficiaries, implementing sound policies and procedures, following a long-term sustainable financial plan, and practicing an organizational culture that honors the spirit of its founder, Prince Jonah Kūhiō Kalaniana‘ole. DHHL works in partnership with government agencies, private landowners, non-profit organizations, homestead associations, and other community groups. Regional plans provide the means to solidify visions and partnerships that are essential to effectively manage Hawaiian Home Lands trust lands for the betterment of native Hawaiian beneficiaries."

In these regional plans, DHHL takes a leadership role in the region, working to strengthen growth of the area, developing partnerships to leverage diverse resources and capital investment; and fostering beneficiary participation in determining the future direction of the homestead community.

A majority of the Waimea Nui lands in DHHL inventory today were part of the original lands included in the 1921 Hawaiian Homes Commission Act. Honokāia is a 3,243-acre parcel that was evaluated for homesteading opportunities and was recommended agricultural based development. A portion of Honokāia has been opened up for pastoral leases. Among issues and opportunities identified in the plan, it is stated that the DWS systems in Nienie and Honokāia should be evaluated.

The Waimea Nui Plan has a number of priorities and goals:

- Access to existing and potentially new water systems
- Roadways and access
- Drainage issues
- Economic and recreational opportunities
- Homesteader access to cinder from DHHL lands

- Price of leases and the ability of homesteaders to afford leases and homes
- Repair and rehabilitation of existing homes
- Re-leasing policies for agricultural lands
- Agricultural and pastoral ease rules
- County property taxes
- DHHL communication

Most relevant to the Proposed Actions are the priority projects to evaluate and revise the agriculture/pastoral program for Waimea Nui. According to the plan, although DHHL has awarded 110 farm and 275 pastoral leases in Waimea Nui, the number of successful, productive working farms is quite limited. Problems include (1) the lack of resources (i.e. water, equipment), (2) limits of lessees' technical capacity, (3) finances, (4) lack of hands-on training programs and (5) availability of appropriate product type. These issues have contributed to the lack of increase in farming and ranching activities by lessees.

The Proposed Action to provide water for ranching fulfills aspects of DHHL's Waimea Nui Plan that seek to improve the pastoral program and provide for the ranching water needs of lessees in order to achieve agricultural success.

2 ENVIRONMENTAL ASSESSMENT PROCESS

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

This EA process is being conducted in accordance with Chapter 343 HRS. This law, along with its implementing regulations, Title 11, Chapter 200, of the Hawai‘i Administrative Rules (HAR), is the basis for the environmental impact process in the State of Hawai‘i. According to Chapter 343, an EA is prepared to determine impacts associated with an action, to develop mitigation measures for adverse impacts, and to determine whether any of the impacts are significant according to thirteen specific criteria.

Part 4 of this document states the finding (anticipated in the Draft EA) that no significant impacts are expected to occur; Part 5 lists each criterion and presents the findings made by the DHHL. In the EA process, if the approving agency determines after considering comments to the Draft EA that no significant impacts would likely occur, then the agency issues a Finding of No Significant Impact (FONSI), and the action is permitted to proceed to any necessary permits and approvals. If the agency concludes that significant impacts are expected to occur as a result of the Proposed Action, then an Environmental Impact Statement (EIS) is prepared.

[this page intentionally left blank]

3 ENVIRONMENTAL SETTING AND IMPACTS

This section describes the existing social, economic, cultural, and environmental conditions associated with the Proposed Action, along with the probable impacts of the Proposed Action and mitigation measures designed to avoid, reduce or eliminate adverse environmental impacts. As discussed above in Section 1.2, the No Action Alternative would have certain disadvantages, but it would not result in any on-ground impacts to land or land uses. Therefore, unless explicitly mentioned, discussion of impacts and mitigation relates to the Proposed Action Alternative only.

The area upon which the Honokāia Non-Potable Water System facility elements would be built is referred to throughout this EA as the *project corridor* or *project site*. The term *project area* is more flexibly used to describe the general Ahualoa to Waimea area, including the various DHHL lots.

3.1 Physical Environment

3.1.1 Geology, Soils and Hazards

Existing Environment

Geologically, the project corridor is located on the flanks of Mauna Kea volcano on ash-covered lava flows that erupted from 14,000 to 250,000 years before the present (Wolfe and Morris 1996). The project area soils are classified by the U.S. Natural Resources Conservation Service (formerly Soil Conservation Service) as Honokaa silty clay loam in the lower elevations, Maile silt loam in upper elevations, and rough broken land in certain gulches. The Honokaa series consists of deep, well drained soils that formed in basic volcanic ash. It is found on mid-elevation, windward slopes of Mauna Kea with slopes ranging from 0 to 35 percent, and is potentially highly erodible. Maile silt loam is a very deep, well-drained soil that formed in basic volcanic ash over ʻaʻa lava flows. It is found at mid-elevations on the windward slopes of Mauna Kea and has slopes of 0 to 20 percent. It is not highly erodible. Both soils are used principally for pasture and timber plantations, although some areas of native forest remain (U.S. Soil Conservation Service 1973).

The project area has a very low risk of volcanic hazard – zone 8 on a scale of ascending risk 9 to 1 – because Mauna Kea is not an active volcano (Heliker 1990). In terms of seismic risk, the entire Island of Hawaiʻi is rated Zone 4 Seismic Hazard (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, as the 6.7-magnitude quake of October 15, 2006, demonstrated. The project corridor does not appear to be subject to subsidence, landslides or other forms of mass wasting. Certain areas within the pastoral lots may be subject to such conditions, but the Proposed Action does not increase the risk.

Impacts and Mitigation Measures

In general, geologic conditions impose no constraints on the project, which would promote pastoral use of the property in conformance with zoning, government plans and owner/lessee intentions, and the Proposed Action is not imprudent to implement. Appropriate seismic standards will be followed during construction, per building codes.

3.1.2 Floodplains, Drainage and Water Quality

Existing Environment:

The Federal Emergency Management Agency (FEMA) has prepared Flood Insurance Rate Maps (FIRM) for the area (Panel No. 155166 200C), and there are no mapped flood hazards on or near the project corridor or on the DHHL lots. The area is considered to be within Flood Zone X, outside of the 500-year floodplain.

No lakes or permanent streams are present. Several poorly defined, unnamed gullies with no channels are present, along with one intermittent stream, a tributary of Honokāia Stream (see Figures 1-1 to 1-3). Fieldwork and consultation of U.S. Geological Survey maps and U.S. Fish and Wildlife Service National Wetland Inventory maps indicate that there are no mapped wetlands in the project corridor.

Impacts and Mitigation Measures

Construction and use of the proposed water system would not involve any impacts to floodplains. In any construction 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.

In order to minimize the potential for sedimentation and erosion, the contractor shall perform all earthwork and grading in conformance with Chapter 10, Erosion and Sediment Control, Hawai‘i County Code. A County Grading Permit will be required. Also, because the Proposed Action will disturb more than one acre of surface, a National Pollutant Discharge Elimination System (NPDES) permit must be obtained before the Proposed Action commences. These permits require the completion of a Storm Water Pollution Prevention Plan (SWPPP). In order to properly manage storm water runoff, the SWPPP will describe the emplacement of a number of best management practices (BMPs) for the project. These BMPs may include, but will not be limited to, the following:

- Limiting the amount of surface area graded at any given time to reduce the area subject to potential erosion;
- Utilizing soil erosion protective materials such as mulch or geotextiles on areas where soils have a high potential for erosion until permanent vegetation is in place;

- Planting vegetation as soon as grading operations permit to minimize the amount of time soils are exposed to possible erosion; and
- Installing silt fences along the downhill perimeter of any disturbed areas to collect sediment from stormwater runoff.

The project plans will be regulated through review and approval by DPW and the Hawai‘i State Department of Health (DOH) to ensure compliance with standards related to storm runoff containment. It is not expected that the Proposed Action will have a long term negative impact on water quality in any area.

3.1.3 Hazardous Materials and Toxic Substances

Environmental Setting, Impacts and Mitigation Measures

The context of the project site coupled with the absence of any known use of the site for other than ranching purposes suggests a low probability for hazardous materials. Additionally, visual surveys of the site and its surroundings during surveying, botanical and archaeological investigations did not reveal any hazardous materials nor structures, equipment, or storage containers that might be indicative of hazardous material use. Therefore, based upon known prior and present use of the project site, no hazardous substances, toxic wastes, or hazardous conditions are expected to be present. If evidence of suspicious materials or conditions appears during additional survey, design, or construction, it is recommended that DHHL undertake a systematic assessment of the property.

3.1.4 Air Quality and Noise

Existing Environment

Air pollution in the Honokaa to Waimea is generally minimal, and is mainly derived from volcanic emissions of sulfur dioxide, which convert into particulate sulfate and produce a volcanic haze (vog) that occasionally blankets the district. Persistent trade winds keep the project area relatively free of vog for most of the year.

Noise is very low in the area, derived from occasional traffic on the gated roads and natural sources such as winds and birdsong. In the lowest elevations, traffic on Old Mamalahoa Highway is another minor source of noise. As the area has pastoral uses with no homes or other developed uses near the proposed facilities, sensitive receptors are not present.

Impacts and Mitigation Measures

Some short-term noise and air quality impacts associated with activities that excavate and emplace the waterline and construct the water tank will occur. Operationally, no air quality impacts would occur. Noise levels would be very limited and only noticeable near the water tank, which is adjacent to a road. No impacts are expected, and no mitigation measures are necessary.

3.2 Biological Environment

A biological report was prepared for the Proposed Action by Geometrician Associates. It is attached as Appendix 2, and summarized in the section below.

Methods

The survey involved a full assessment in October 2014 of flora and vegetation along a 30-foot wide corridor surrounding all waterlines, as well as an area of about one acre centered on the water tank. The objectives of the botanical survey were to: 1) describe the vegetation; 2) list all species encountered; and 3) identify threatened or endangered plant species. Special attention was given to the possible presence of any federally (USFWS 2014) listed threatened or endangered plant species.

The survey also included a limited faunal survey restricted to listing birds and introduced mammals, reptiles, or amphibians observed during the botanical survey and in one additional bird observation survey. Also considered was the general value of the habitat for native birds, the Hawaiian hoary bat (*Lasiurus cinereus semotus*) and the endangered Blackburn's sphinx moth (*Manduca blackburnii*).

Existing Environment: Vegetation and Flora

Average annual rainfall varies from about 83 inches on the *makai*, northern end of the area near the Old Mamalahoa Highway at about 2,600 feet in elevation, to about 56 inches at the *mauka*, southern end in the hills east of Puʻukapu and Manā Road at about 3,400 feet in elevation (Giambelluca et al 2014). It is difficult to speculate on the precise pre-human vegetation of the area, since the area has been completely transformed by removal of tree cover and introduction and promotion of pasture grasses maintained by heavy cattle grazing. Gagne and Cuddihy (1990) described the natural vegetation in fairly undisturbed areas with similar geology and climate in this part of Hāmākua as sub-montane rain forest dominated by ʻōhiʻa (*Metrosideros polymorpha*) and koa (*Acacia koa*) (Gagne and Cuddihy 1990). There are now only small areas of remnant forest that reflect the original vegetation, none of them near the Honokāia lots.

The current vegetation of the area is entirely managed pasture (see photos in Figure 2) or adjacent roadsides, consisting of various non-native species of grass, with kikuyu grass (*Cenchrus clandestinus*) and Pangola grass (*Digitaria eriantha*) most common. There are also a number of primarily non-native herbs, with noxious pasture weed fireweed (*Senecio madagascarensis*) especially prominent. A few ferns and low shrubs are also present. There are only a few trees, almost all of them near the Old Mamalahoa Highway right-of-way.

There is a crossing over an unnamed gulch at the far southwest end of the project site just *mauka* of Old Mamalahoa Highway, which joins with another unnamed gulch downstream to form Honokāia Stream (see Figure 1-2e). This intermittent stream is highly ephemeral and lacks any distinct

riparian vegetation, but the streambanks contain some ‘ohi‘a trees, which could be avoided by the waterline.

A full list of plant species found in the surveyed areas is contained in Table 1 of Appendix 3. Only a small proportion of the 62 plant species found are native, and they make up generally a very small part of the vegetative cover and biomass. The most numerous native plants are the fern pala‘a (*Sphenomeris chinensis*) and the sedge *Cyperus polystachyos.* Also present are a few ‘ohi‘a (*Metrosideros polymorpha*), ‘uhaloa (*Waltheria indica*), moa (*Psilotum nudum*), uluhe fern (*Dicranopteris linearis*), sword fern (*Nephrolepis exaltata*).and one planted koa tree (*Acacia koa*). The remainder of the plants are mainly grasses and weeds associated with pastures and roadsides. Non-native plants of some concern include the widespread *Senecio madagascarensis*, which sickens cattle, strawberry guava (*Psidium cattleianum*), and *Pterolepis glomerata*, a highly invasive melastome.

No listed or proposed threatened or endangered plant species were found. Given the current context, in an area completely devoted to regularly grazed pasture and adjacent roadsides, it is unlikely that one would be found. It should also be noted that no members of the Solanaceae family were found that could serve as hosts for the endangered Blackburn’s sphinx moth.

Existing Environment: Fauna

The only live mammals seen during the survey were domestic cattle (*Bos taurus*) and horses (*Equus caballus caballus*). It is likely that small Indian mongooses (*Herpestes a .auropunctatus*), mice (*Mus* spp.), rats (*Rattus* spp.), feral cats (*Felis catus*) and domestic dogs, (*Canis f. familiaris*) are occasionally present on the property. None of these wild alien mammals have conservation value and all are deleterious to native flora and fauna. There are no native terrestrial reptiles or amphibians in Hawai‘i. No reptiles and amphibians were detected during the survey.

Only a few species of birds were detected during the survey, all typical of those found in similar pasture and roadside habitat: the non-natives Skylark (*Alauda arvensis*), Ring-necked Pheasant (*Phasianus colchicus*), Erckel’s Francolin (*Francolinus erckelii*) and Mourning Dove (*Zenaida macroura*), and the native winter resident, Golden-Plover or Kolea (*Pluvialis fulva*), which was extremely abundant on the roadsides. The Golden-Plover is a protected migratory bird that is unlikely to be disturbed by the construction and operation of the system, as it commonly thrives in rural and even urban settings.

No native land birds were detected, and it would be unlikely to find any, except perhaps *Asio flammeus sandwichensis*, the Hawaiian endemic sub-species of the Short-eared Owl. Also called Pueo, this diurnal bird of prey is regularly seen within the grasslands of South Kohala but was not noticed during the survey. There is some possibility the construction of the waterlines and water tank could briefly displace Short-eared Owls. Any such disturbance will be of a highly temporary nature, as there is abundant additional suitable habitat within the area for any displaced owls to

move into. This species is currently widespread in South Kohala and does not have special protected status under either the State or federal endangered species statutes.

The elevation of the land at 2,600 to 3,400 feet above sea level is within the range of many native forest birds, including the Hawai‘i ‘Amakihi (*Hemignathus virens*) (which is sometimes found near sea level in Puna), ‘Elepaio (*Chasiempis sandwichensis*), ‘I‘iwi (*Vestiaria coccinea*), ‘Apapane (*Himatione sanguinea*), and ‘Oma‘o (*Myadestes obscurus*). However, the lack of forest cover means that such birds are unlikely to be found, and several bird observations at different times of the day did not detect them.

It is recognized that listed terrestrial vertebrates may be present in this part of Hāmākua and may overfly, roost, nest, or utilize resources here, including the endangered Hawaiian Hawk (*Buteo solitarius*), the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), the endangered Hawaiian Petrel (*Pterodroma sandwichensis*), and the threatened Newell’s Shearwater (*Puffinus auricularis newelli*).

No temporary or permanent lighting or erect structures such as poles are planned, and therefore no impacts to listed seabirds are anticipated. There are no tall trees in the area to be disturbed that could serve as nesting sites for Hawaiian Hawks. Given that the area in question is in active use as roads and pasture lots, and it appears unlikely that the project, which involves a narrow and relatively shallow trench and a water tank, would disturb Hawaiian Hawks.

Although not detected in the survey, which took place in daylight and did not utilize echolocation equipment, the Hawaiian Hoary Bat – Hawai‘i’s only native land mammal – may also be present in the general area, as it has been observed in many areas on the island of Hawai‘i and is known to favor eucalyptus forests, which are present about a mile away in Ahualoa. Bats may forage for flying insects over portions of the project area on a seasonal basis, although the lack of any forest cover on or adjacent to the project site precludes substantial food resources or roosting habitat.

Impacts and Mitigation Measures

No impacts to native ecosystems or rare, threatened or endangered flora are expected to occur. To minimize impacts to the endangered Hawaiian hoary bat, woody plants taller than 15 feet will not be removed or trimmed during the bat birthing and pup rearing season (June 1 through September 15). Very few such trees are present, most of them adjacent to the Mamalahoa Highway right-of-way.

3.3 Socioeconomic

3.3.1 Land Use and Land Use Designations

Existing Environment, Impacts and Mitigation Measures

Land use on the project site for the non-potable water system, in the enclosing or surrounding properties which it is designed to benefit, and in all adjacent properties, is grazing or roadways that support pastoral land use. All properties in the area are within the State Land Use Agricultural District. As the project is within DHHL lands, it is not subject to statutes controlling land use, per Section 204 of the Hawaiian Homes Commission Act, which stipulates, "The powers and duties of the governor and the board of land and natural resources, in respect to lands of the State, shall not extend to lands having the status of Hawaiian home lands, except as specifically provided in this title." Therefore, the Hawaiian Homes Commission is the authority that determines its land use designations and governs the allowable use and activities within the parcel. As the properties are within the control of DHHL, zoning will ultimately be determined according to the Memorandum of Agreement between DHHL and the County (see letter from Planning Department in Appendix 1a), but is expected to be Agricultural. The project site is not within the County's Special Management Area. As discussed in Section 1.3, above, the project is consistent with all relevant government plans and policies. No adverse effects to existing land uses would occur,.

3.3.2 Social Characteristics and Neighborhood Identity

The Proposed Action would occur within the Honokāia Pastoral Lots, which were primarily intended for pastoral use but also include 15 lots with the ability to construct a single-family residence in association with pastoral use.

Table 3-1 details some characteristics of the population of Waimea and Honokaa, the nearest and most related populated areas, along with those of the State of Hawai‘i for comparison. Waimea is famous as the location of Parker Ranch. It has a tradition of cattle ranching and is the home of the celebrated *paniolo* or Hawaiian cowboy. Honokaa's roots relate to a century of sugar cane plantations. The era ended in the 1990s but the legacy of architecture, town layout, multi-ethnic population and community spirit persist. Both communities are diverse, with "majority minority" populations, mainly Asian and Pacific Islander. Waimea has relatively more young persons and less elderly than the State as a whole, while Honokaa is opposite. Home values in Waimea are relatively high, but paradoxically, so are poverty rates, which may be explained by the relatively high proportion of Native Hawaiians who live on DHHL lands, which generally have higher poverty rates than the average for the State. Income, like many of Waimea's social characteristics, reflects a somewhat bimodal population, with many upper middle class, mainland Americans who have relocated to Waimea because of the lifestyle values of the area, superimposed on a population with local roots.

Impacts and Mitigation Measures

The Proposed Action to supply non-potable water to support pastoral uses within a subdivision designed for this purpose will have beneficial impacts to subdivision lessees and residents. It will have no adverse impacts to surrounding neighborhoods or communities, and will help perpetuate a lifestyle that is integral to the identity of the region.

Table 3-1. Selected Socioeconomic Characteristics

Characteristic	Waimea CDP	Honoka a CDP	State of Hawai‘i
Population, 2010	9,212	2,258	1,360,301
Persons under 5 years, percent, 2010	6.8%	6.6%	6.4%
Persons under 18 years, percent, 2010	27.5%	23.1%	22.3%
Persons 65 years and over, percent, 2010	12.3%	17.2%	14.3%
Female persons, percent, 2010	51.7%	51.2%	49.9%
White alone, percent, 2010 (a)	31.2%	24.2%	24.7%
Asian alone, percent, 2010 (a)	17.3%	35.9%	38.6%
Native Hawaiian and Other Pacific Islander alone, percent, 2010 (a)	15.8%	5.1%	10.0%
Two or More Races, percent, 2010	34.0%	33.7%	23.6%
Hispanic or Latino, percent, 2010 (b)	9.0%	10.9%	8. 9%
Foreign born persons, percent, 2008-2012	9.8%	23.0%	18.1%
Language other than English spoken at home, pct age 5+, 2008-2012	17.4%	n/a	25.7%
High school graduate or higher, percent of persons age 25+, 2008-2012	94.5%	88.3%	90.3%
Homeownership rate, 2008-2012	63.0%	60.8%	58.2%
Median value of owner-occupied housing units, 2008-2012	$425,200	$306,836	$517,000
Persons per household, 2008-2012	2. 88	2.92	2.95
Median household income, 2008-2012	$62,000	$52,019	$67,492
Persons with income below poverty level, percent, 2008-2012	10.4%	7.2%	10.8%

Source: U. S. Census Bureau: http://quickfacts. census.gov/qfd/states/15/1578500. html

3.3.3 Cultural and Historic Resources

The material in this section is drawn from historical research, consultation with homesteaders familiar with the area, and an archaeological inventory survey of the project site that conducted by ASM Affiliates. The survey is included as Appendix 3 and is summarized below. Most scholarly references have been removed for readability; interested readers may consult the appendix.

Cultural Background and Resources

The inhabiting of Hawai‘i took place in the context of settlement that resulted from voyages taken across the open ocean. For many years, researchers have proposed that early Polynesian settlement voyages between Kahiki (the ancestral homelands of the Hawaiian gods and people) and Hawai‘i were underway by A.D. 300, with long distance voyages occurring fairly regularly through at least

the thirteenth century. It has been generally reported that the sources of the early Hawaiian population – the Hawaiian Kahiki – were the Marquesas and Society Islands. Recent work indicates a later settlement date of about 1000 A.D.

For generations following initial settlement, communities were clustered along the watered, windward (*koʻolau*) shores of the Hawaiian Islands. Along the *koʻolau* shores, streams flowed and rainfall was abundant, and agricultural production became established. The *koʻolau* region also offered sheltered bays from which deep sea fisheries could be easily accessed, and nearshore fisheries, enriched by nutrients carried in the fresh water, could be maintained in fishponds and coastal waters. It was around these bays that clusters of houses where families lived could be found. In these early times, Hawaiʻi's inhabitants were primarily engaged in subsistence level agriculture and fishing.

Over a period of several centuries, areas with the richest natural resources became populated and sometimes even crowded, and the population began expanding to the *kona* (leeward side) and upland areas such as Waimea. Over the generations, the ancient Hawaiians developed a sophisticated system of land and resources management. By the time ʻUmi-a-Līloa rose to rule the island of Hawaiʻi in ca. 1525, the island (*mokupuni*) was divided into six districts or *moku-o-loko*. On Hawaiʻi, the district of Hāmākua is one of six major *moku-o-loko* within the island. Hāmākua, like other large districts on Hawaiʻi, was subdivided into *ʻokana* or *kalana* (regions of land smaller than the *moku-o-loko*, yet comprising a number of smaller units of land). The *moku-o-loko* and *ʻokana* or *kalana* were further divided into manageable units of land, and were tended to by the *makaʻāinana* (people of the land). Of all the land divisions, perhaps the most significant management unit was the *ahupuaʻa*. *Ahupuaʻa* are subdivisions of land that were usually marked by an altar with an image or representation of a pig placed upon it (thus the name *ahu-puaʻa* or pig altar). In their configuration, the *ahupuaʻa* may be compared to wedge-shaped pieces of land that radiate out from the center of the island, extending to the ocean fisheries fronting the land unit.

The *ahupuaʻa* were also divided into smaller individual parcels of land (such as the *ʻili*, *kōʻele*, *māla*, and *kīhāpai,* etc.), generally oriented in a *mauka-makai* direction, and often marked by stone alignments (*kuahiwi*). In these smaller land parcels the native tenants tended fields and cultivated crops necessary to sustain their families, and the chiefly communities with which they were associated. As long as sufficient tribute was offered and kapu (restrictions) were observed, the common people who lived in a given *ahupuaʻa* had access to most of the resources from mountain slopes to the ocean. These access rights were almost uniformly tied to residency on a particular land, and earned as a result of taking responsibility for stewardship of the natural environment, and supplying the needs of the *aliʻi*.

Entire *ahupuaʻa*, or portions of the land were generally under the jurisdiction of appointed *konohiki* or lesser chief-landlords, who answered to an *aliʻi-ʻai-ahupuaʻa* (chief who controlled the *ahupuaʻa* resources). The *aliʻi-ʻai-ahupuaʻa* in turn answered to an *aliʻi ʻai moku* (chief who claimed the abundance of the entire district). Thus, *ahupuaʻa* resources supported not only the *makaʻāinana* and *ʻohana* who lived on the land, but also contributed to the support of the royal community of regional

and/or island kingdoms. This form of district subdividing was integral to Hawaiian life and was the product of strictly adhered to resources management planning. In this system, the land provided fruits and vegetables and some meat in the diet, and the ocean provided a wealth of protein resources.

The project site is located on the Island of Hawai‘i within the District of Hāmākua in the *‘okana* of Kamoku and the *ahupua‘a* of Honokāia. The names of an *‘okana* and *ahupua‘a* sometimes indicate their importance, record their history, or reveal something about their resources or population.

It is not clear if Kamoku, the name of which literally translates as “the district *or* cut off portion” (Pukui et al. 1974), is an ancient land division or a more recent land division created from the upland portion of several *ahupua‘a* that terminate at its *makai* boundary as a result the *Māhele ‘Āina* of 1848 (the latter seems more likely; see the discussion of the *Māhele* and the subsequent Boundary Commission hearings below). While Kamoku is not an *ahupua‘a*, it along with Honokāia Ahupua‘a are two of eighty-seven land divisions located in East Hāmākua, a region that extends along the coast for roughly 21 miles from the upper slopes above Waipi‘o Valley to the North Hilo border (Cordy 1994). Each of the *ahupua‘a* of East Hāmākua cross-cut the major terrestrial resource zones so that the residents had access to agricultural lands and forest resources. They also included offshore fishing territories for the procurement of marine resources. The land divisions of this region were mostly small – less than a mile wide, extending several miles inland – but a few, such as Honokāia, were wider at the coast and extended further inland. Honokāia extends 7.5 miles inland to a point where it is cut off by Nienie Ahupua‘a at an elevation of about 3,600 feet above sea level. Kamoku, which is also a fairly wide land division, begins roughly 3.5 miles inland of the coast, and extends from an elevation of roughly 2,200 feet to 3,600 above sea level (a distance of about 6.5 miles) where it is cut off by Pā‘auhau Ahupua‘a at the Hāmākua/South Kohala District boundary. There were just two very large *ahupua‘a* in the Hāmākua District (Pā‘auhau and Ka‘ohe) that together made up nearly all of the upper mountain lands.

It was during the time of Kamehameha that Captain James Cook and his crew on board the ships the H.M.S. Resolution and Discovery first arrived in the Hawaiian Islands on January 18, 1778, drastically altering the course of Hawaiian history. Around 1790, in an effort to secure his rule, Kamehameha began building the *heiau* of Pu‘ukohola in Kawaihae, which was to be dedicated to the war god Kūka‘ilimoku. When Pu‘ukoholā Heiau (in Kohala) was completed in the summer of 1791, Kamehameha sent his two counselors, Keaweaheulu and Kamanawa, to Keōua to offer peace. Keōua was enticed to the dedication of the Pu‘ukoholā Heiau by this ruse, and when he arrived at Kawaihae, he and his party were sacrificed to complete the dedication. The assassination of Keōua gave Kamehameha undisputed control of Hawai‘i Island by A.D. 1792.

In 1790, two Western ships, the *Eleanora* and *Fair American*, were trading in Hawaiian waters. As retribution for the theft of a skiff and the murder of one of the sailors, the crew of the *Eleanora* massacred more than 100 natives at Olowalu [Maui]. The *Eleanora* then sailed to Hawai‘i Island, and one of its crew, John Young, went ashore where he was detained by Kamehameha. The other vessel, the *Fair American*, was captured by the forces of Kamehameha off the Kekaha coast and its

crew was killed except for one member, Isaac Davis. Guns, and a cannon later named "Lopaka," were recovered from the *Fair American*, which Kamehameha kept as part of his fleet. Kamehameha made Young and Davis his advisors, and aided by them and his newly acquired ships and foreign arms, succeeded in conquering all the island kingdoms except Kaua'i by 1796. It wasn't until 1810, when Kaumuali'i of Kaua'i gave his allegiance to Kamehameha, that the Hawaiian Islands were unified under one ruler.

Demographic trends during this period indicate population reduction in some areas due to war and disease, yet increases in others, with relatively little change in material culture. However, there was a continued trend toward craft and status specialization, intensification of agriculture, *ali'i* controlled aquaculture, upland residential sites, and the enhancement of traditional oral history. The Kū cult, *luakini heiau*, and the *kapu* system were at their peaks, although western influence was already altering the cultural fabric of the Islands.

Foreigners had introduced the concept of trade for profit, and by the time Kamehameha I had conquered O'ahu, Maui and Moloka'i in 1795, Hawai'i saw the beginnings of a market system economy. This marked the end of the Proto-Historic Period and the end of an era of uniquely Hawaiian culture. Hawai'i's culture and economy continued to change drastically as capitalism and industry established a firm foothold. The sandalwood (*Santalum spp.*) trade, established by Euro-Americans in 1790 and turned into a viable commercial enterprise by 1805, was flourishing by 1810. This added to the breakdown of the traditional subsistence system, as farmers and fishermen were ordered to spend most of their time logging, resulting in food shortages and famine that led to a population decline. Kamehameha, who resided on the Island of O'ahu at this time, did manage to maintain some control over the trade.

In October of 1819, seventeen Protestant missionaries set sail from Boston to Hawai'i. They arrived in Kailua-Kona on March 30, 1820 to a society with a religious void to fill. Many of the *ali'i*, who were already exposed to western material culture, welcomed the opportunity to become educated in a western style and adopted their dress and religion. Soon they were rewarding their teachers with land and positions in the Hawaiian government. During this period, the sandalwood trade was wreaking havoc on the commoners, who were weakening with the heavy work, exposure, and famine just to fill the coffers of the *ali'i* who were no longer under any traditional constraints. The lack of control of the sandalwood trade was to soon lead to the first Hawaiian national debt, as promissory notes and levies were initiated by American traders and enforced by American warships.

The Hawaiian culture was well on its way towards Western assimilation as commerce in Hawai'i shifted from the sandalwood trade, to a short-lived whaling industry, to the more lucrative, but environmentally destructive sugar industry. Soon after the arrival of foreigners, the landscape of Waimea and adjacent areas such as Honokāia began to change dramatically, initially through deforestation from the collection of sandalwood, followed by the introduction of cattle.

In 1823 the Reverend William Ellis, a visiting missionary from London but late of the South Seas, made a tour of the Island of Hawai'i. His journal provides invaluable insights into the early times of

Western contact and cultural transition. On this way from Hilo to Kawaihae, Ellis and his party (fellow missionaries Mr. Thurston, Mr. Bishop, and Mr. Goodrich) passed through the Hāmākua District. Ellis described the area near the Hilo/Hāmākua border:

> The high land over which we passed was generally woody, though the trees were not large. The places that were free from wood, were covered with long grass and luxuriant ferns. The houses mostly stood singly, and were scattered over the face of the country. A rich field of potatoes or taro, five or six acres sometimes in extent, or large plantations of sugar-cane and bananas, occasionally bordered our path. But though the soil was excellent, it was only partially cultivated. The population also appeared less than what we had seen inhabiting some of the most desolate parts of the island. (Ellis 2004:352)

At Kapulena (to the northwest of the current project area) Ellis' party split into two groups; Ellis and Thurston continued northwest following the coast to Waipi'o Valley, and Bishop and Goodrich proceed inland to Waimea, passing near the project site:

> On Monday morning Messers. Bishop and Goodrich commenced their journey to Waimea. Having procured a man to carry their baggage, they left Kapulena, and taking an inland direction, passed over a pleasent country, gently undulated with hill and dale. The soil was fertile, the vegetation flourishing, and there was considerable cultivation, though but few inhabitants. (Ellis 2004:357)

The cattle brought by Captain Vancouver in 1793 and 1794, protected by a *kapu* placed on them by Kamehameha, multiplied rapidly. By the time the *kapu* was lifted a few years later, wild cattle had become rampant throughout the island, disturbing native gardens and damaging streams, grasslands and forests. Foreign bullock hunters were then employed to keep the herds under control. Although the meat was eaten, the main economic products were the hides. Foraging cattle wreaked havoc on the agricultural fields and were responsible for a flurry of wall building as people tried to keep the feral cattle out of their fields and homes. John Parker worked for Governor Kuakini as a bullock hunter in 1831, and before long had founded the famous ranch that still bears his name.

In addition to taro, new crops such as Irish potatoes, watermelons, cabbage, onions, tomatoes, mulberries, figs, and beans were introduced in Historic times. For a while, agricultural products from the Waimea area and beyond replenished the cargo ships at Kawaihae Harbor, and in the late 1840s many of the potatoes grown in the area were shipped to California to help feed the gold rush. However, commercial ventures soon replaced traditional agricultural practices, and the landscape of these upper areas was substantially altered as a result of this post-contact change. The written history from the late 19th to the early 20th century largely reflects news of new settlers, religious endeavors, and commercial pursuits in the region. McEldowney (1983) discussed changes in land use and land ownership before and after the *Māhele*, with the eventual displacement of the Hawaiian community as cattle ranching became fully established in Waimea (Parker Ranch began operating in 1830). An 1848 description of the Waimea population is as follows: "it can scarcely be said that there is any native population at all" (McEldowney 1983:432). By this time, the native population of

Waimea (and adjacent areas such as Honokāia affected by cattle ranching) had been severely reduced by disease, displacement, and the ongoing changes in land tenure.

In 1848, the Hawaiian system of land tenure was radically altered by the *Māhele ʻĀina*. The *Māhele* (division) defined the land interests of Kamehameha III (the King), the high-ranking chiefs, and the *konohiki*. The *Māhele* placed all land in the Kingdom of Hawaiʻi into one of three categories: (a) Crown Lands (for the occupant of the throne); (b) Government Lands; and (c) Konohiki Lands. Laws in the period of the *Māhele* record that ownership rights to all lands in the kingdom were "subject to the rights of the native tenants;" those individuals who lived on the land and worked it for their subsistence and the welfare of the chiefs.

The Board of Commissioners oversaw the program and administered the *kuleana* as Land Commission Awards (LCAw.). Claims for *kuleana* had to be submitted during a two year period that expired on February 14, 1848 to be considered. All of the land claimants were required to provide proof of land use and occupation, which took the form of volumes of native registry and testimony. The claims and awards were numbered, and the LCAw. numbers, in conjunction with the volumes of documentation, remain in use today to identify the original owners and their use of the *kuleana* lands. The work of hearing, adjudicating, and surveying the claims required more time than was prescribed by the two year term, and the deadline was extended several times, not for new claims, but for the Land Commission to finish its work.

In 1862, the Commission of Boundaries (Boundary Commission) was established in the Kingdom of Hawaiʻi to legally set the boundaries of the *ahupuaʻa* that were awarded during the Māhele. Subsequently, in 1874, the Commissioners of Boundaries was authorized to certify the boundaries for lands brought before them. The primary informants for the boundary descriptions were old native residents of the lands, many of whom had also been claimants for *kuleana* during the Māhele. The boundary testimonies were collected primarily between 1873 and 1885 and were usually given in Hawaiian, but transcribed in English as they occurred. Boundary testimony for Honokāia Ahupuaʻa was provided to the Boundary Commission by Makaenaena on April 18, 1873. Makaenaena, who was "born before collecting of sandalwood by Boki" (ca. 1829; Kuykendall 1938), may have been about fifty years old at the time of his testimony. In his description Makaenaena not only names several places in the immediate vicinity of the project site, but provides insights regarding Precontact land use within the *ahupuaʻa*. Makaenaena had previously accompanied the Government Surveyor S. C. Wiltse in March of 1873 while he surveyed the boundary between Kawela and Honokāia Ahupuaʻa, as well as the boundary between Honokāia and Kamoku.

From Makaenaena's testimony (reproduced in Appendix 3) it is evident that the upper portion of Honokāia Ahupuaʻa was an ʻōhiʻa forest that once contained resources such as māmaki and birds. The bird catchers of Honokāia would stay in a cave in a *kahawai* (ravine) called Waiakahoi when they were in the uplands. An old trail/road called Honokāia also passed through the area. The route of this old transportation route is shown on an old map of the area. The Honokāia Pastoral Lots non-potable waterline crosses the boundary of Honokāia Ahupuaʻa (into Kamoku ʻOkana) between the

*māmak*i grounds of Nakikapio and the hill called Kalapaaki, somewhere in the vicinity of Makaleha ridge.

All lands awarded during the Māhele were subject to the rights of the native tenants therein; those individuals who lived on the land and worked it for their subsistence and the welfare of the chiefs (Sinoto and Kelly 1970). Native tenants could claim, and acquire title to, *kuleana* parcels that they actively lived on or farmed at the time of the Māhele. As the new owners of the lands on which the *kuleana* were located began selling parcels to foreigners, questions arose concerning the rights of the native tenants and their ability to access and collect the resources necessary for sustaining life. The "Enabling" or "*Kuleana* Act," passed by the King and Privy Council on December 21, 1849, clarified the native tenant's rights to the land and its resources, and also the process by which they could apply for, and be granted fee-simple interest in their *kuleana*. A review of the Waihona ʻAina Database indicates that in Honokāia Ahupuaʻa sixteen *kuleana* parcels were claimed, but only twelve were awarded. The awarded parcels ranged from 1.0 to 17.5 acres in size. All of the awarded LCAw. were located well *makai* of the project site, 2 to 3 miles of the coast. No *kuleana* claims are listed for Kamoku ʻOkana.

In 1848 John Palmer Parker, founder of the Parker Ranch, received two acres of land at Mānā (in Kamoku ʻOkana *mauka* of the project site) where he built a family house and the first ranch buildings. In 1850 he purchased 640 acres surrounding Mānā (Grant No. 358), and in 1851 he purchased another 1,000 acres. This land became the nucleus of Parker Ranch. The ranch slowly expanded from its center at Mānā by acquiring and leasing many of the lands of the Kohala and Hāmākua Districts. By the mid-1850s John Parker had turned most of the day to day operations of Parker Ranch over to his son, John Palmer Parker II. A map of a tract of Hāmākua Government land (Nienie Ahupuaʻa) prepared in 1859 by the surveyor S. C. Wiltse (Hawaiʻi Registered Map No. 52) shows the relationship between J. P. Parker's Mānā lands in Kamoku ʻOkana and Honokāia Ahupuaʻa. The Parker lands are located in the upper right hand portion of the map. A peach tree is shown marking the corner of that land. The *mauka* line of an "unbroken *ʻōhiʻa* and fern forest" is depicted just to the northeast of the Parker lands, passing by the southwestern corner of Honokāia Ahupuaʻa. Along the eastern edge of Honokāia a trail labeled "Honokāia Trail" is shown following the boundary of the *ahupuaʻa* to the *mauka* boundary of Kawela Ahupuaʻa, where it cuts across that land division.

Following the signing of a reciprocity treaty between the Kingdom of Hawaiʻi and the United States of America in 1876, sugar plantations developed rapidly throughout the islands. Between 1876 and 1888 twenty sugar plantations sprang up along the Hāmākua coast. In 1878 the first sugar mill was established in the Hāmākua District, and due to its rich soil and plentiful water supply the district soon became the premiere location for growing sugar on the Island of Hawaiʻi. The seaward portions of Honokāia Ahupuaʻa (up to 1,400 feet elevation) were included in the lands of the Honokaa Sugar Company (1876-1979). The fields were originally unirrigated and for twenty-five years rattoon crops were grown in many areas because reaching the fields to replant was difficult. Eventually harvesting was accomplished using a combination of hand labor, flumes, and railroad. The project site for the non-potable water system was never part of any sugar plantation and instead

became part of Parker Ranch. By the end of the nineteenth century a "new" road to Waimea (the Old Māmalahoa Highway) had been constructed across Honokāia Ahupua'a forming the *makai* boundary of the Honokāia Pastoral Lots. The Hāmākua Ditch Company had begun construction of the Upper Hāmākua Ditch to water the sugarcane fields *makai* of this area, finishing in 1907, and later built the Lower Hāmākua Ditch in 1910.

In 1921, the U.S. government passed the Hawaiian Homes Commission Act and set aside approximately 200,000 acres in the Territory of Hawai'i (including portions of Honokāia and Kamoku) as a land trust for homesteading by native Hawaiians, administered by the Hawaiian Homes Commission). The stated purpose of the act was returning native Hawaiians to the land in order to maintain traditional ties to the land. The distribution of these lands to Hawaiian homesteaders proceeded very slowly. The Parker Ranch leases of Honokāia (General Lease No. 823) and Kamoku (General Lease No. 593), which were set to expire in 1928, were renewed once again that year. It wasn't until 1952 that the Kamoku lease reverted back to the Hawaiian Homes Commission and was distributed amongst several Hawaiian lessees. The Honokāia lease area was divided into four lots around this time, all of which continued to be leased by Parker Ranch.

In 1960, the Hawai'i State Legislature created the Department of Hawaiian Home Lands (DHHL) for the purposes of administering the Hawaiian home lands program and managing the Hawaiian home lands trust. As discussed in Chapter 2, as of 1990 the Honokāia DHHL lands had still not been distributed to its beneficiaries and still remained Parker Ranch pasture. In that year a group of prospective Hawaiian homesteaders known as the Aged Hawaiians, several of whom had originally applied for pasture leases in 1952, sued DHHL for release of the Honokāia lands. After a fifteen year legal battle the lands were released and in 2006 the Honokāia Pastoral Lots Subdivision was created. Now divided among a number of different DHHL lessees, the lands encompassed by the project site continue to be used as pasture.

Cultural Resources

The entirety of the project site is utilized by Native Hawaiian lessees for grazing. The area is fenced off in order to protect cattle and rationalize grazing, and no public access is allowed. There is no indication that individuals other than the lessees and person they allow to utilize the lands gather or perform other cultural activities on the lands. Research in historic records, reconnaissance of the sites, and discussions with lessees did not reveal any caves, springs, *pu'u*, native forest groves, gathering resources or other culturally significant natural features in or near the area. The vegetation is almost entirely non-native and contains only a few common native species, lacking the quality and quantity or resources that would be important for native gathering. As discussed below, no archaeological remains reflecting cultural history or supporting cultural values appear to be present. Based on historical research, botanical reconnaissance and inquiries with potentially knowledgeable informants (including the Office of Hawaiian Affairs and *kama'aina*), it appears that no known valuable natural, cultural or historical resources are present on the project corridor. The project corridor does not support any traditional resource uses, nor are there any Hawaiian customary and traditional rights or practices known to be associated with the project corridor.

Cultural Resources: Impacts and Mitigation Measures

As it currently appears that no resources or practices of a potential traditional 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 use of the non-potable water system would not likely impact any culturally valued resources or cultural practices. In fact, furtherance of the economic use of the land would assist in perpetuating land use by Native Hawaiians. Although there are no indications to date from literature review or consultation with the State Historic Preservation Division, the Office of Hawaiian Affairs (OHA), or local residents knowledgeable about Hawaiian cultural practices that any traditional cultural properties or practices exist on the project corridor, various parties including OHA and the State Historic Preservation Division were supplied a copy of the Draft EA to help finalize this finding.

Archaeological Resources: Existing Environment

As noted previously, an archaeological survey of the project corridor was conducted by ASM Affiliates. The survey is included as Appendix 3 and is summarized below. The surface of the entire project site, which had been marked in the field by surveyors prior to the commencement of the fieldwork, was visually examined for archaeological resources during the survey. The 10-meter wide waterline survey corridors through open pasture were surveyed by two fieldworkers maintaining a 5-meter spacing interval, while the waterline corridors along the existing paved roads were surveyed by a single fieldworker maintaining a 5-meter spacing from the road edge. The 200-meter by 200-meter area for the water storage tank was surveyed by walking back and forth across the area with the two fieldworkers maintaining a 10-meter spacing interval. (It should be noted that at the time of the field survey, two water tanks were planned, and two equal-sized areas were surveyed). Ground surface visibility was excellent across the entire pasture project area.

All ranching related infrastructure (i.e. fence lines, corrals, etc.) encountered during the survey appeared modern. The pasture lands appeared to have been thoroughly grubbed in the past and are known to have been grazed for more than a century, and the ground surface along the edges of the two cul-de-sac roads has been recently disturbed. These findings support the findings of an earlier Fong et al. (2005) high level study that included most of the project site and the 2,500-acre Honokāia Pastoral Lots Subdivision in its entirety.

A single archaeological feature consisting of a few stacked stones (Temporary Site 1) located along the edge of a drainage near the Old Māmalahoa Highway right-of-way on TMK: (3) 4-6-13:005 was only potential archaeological site identified during the survey. The feature was cleared of vegetation, mapped to scale with a tape and compass, described using a standardized site record form, and photographed. No other archaeological resources were observed on the surface of the project area anywhere else within the survey area, and the likelihood of encountering subsurface archaeological resources is very low given the geology of the area, the history of ranching on the parcels, and the recent development of the Honokāia Pastoral Lots Subdivision infrastructure.

Like a similar feature previously recorded by Fong et al. (2005) within the Honokāia Pastoral Lots Subdivision, Temporary Site 1 lacks integrity of setting and design and does not meet any of the defined significance criteria in the Hawai‘i Administrative Rules 13§13-284-6. It is therefore not regarded as significant and is not a historic property. Temporary Site 1 was nevertheless fully documented during the assessment survey. As no significant archaeological resources were identified on the surface of the project area, and the likelihood of encountering subsurface archaeological resources is extremely remote given the geology of the area, the history of ranching on the parcels, and the lack of subsurface findings during the recent development of the cul-de-sac roads and related subdivision infrastructure, the archaeologist recommended no further historic preservation work for the construction of the non-potable water system within the Honokāia Pastoral Lots Subdivision.

Archaeological Resources: Impacts and Mitigation Measures

By letter of April 30, 2015, ASM Affiliates requested the State Historic Preservation Division (SHPD) for concurrence with the findings of the survey, including the finding that no historic properties are present and that that there will be no adverse effect from the undertaking. As a response had not yet been received by the time the Draft EA was published, the Final EA will report on the response of the SHPD.

As an additional precaution, in the unlikely event that archaeological resources or human remains are encountered during future development activities within the project corridor, work in the immediate area of the discovery will be halted and DLNR-SHPD contacted as outlined in Hawai‘i Administrative Rules 13§13-275-12.

3.3.4 Scenic Resources

Existing Environment, Impacts and Mitigation Measures

The Hawaii County General Plan identifies areas of natural beauty and exceptional trees in each district. None of the sites, viewpoints or trees identified within the Hāmākua District are associated with the project site or general project area. Nonetheless, the drive along the winding Old Mamalahoa Highway is highly scenic, with views of pasture, rock faces and individual trees or groves of trees.

Construction would produce short-term visual impacts along Old Mamalahoa Highway but there would be no permanent scenic impacts and no mitigation should be necessary. The water tank is located high up on the private DHHL road system away from Old Mamalahoa Highway and their appearance would be in keeping with typical pastoral infrastructure. In the long-term, the continuation of grazing made possible by the access and utility easement would perpetuate the rural scenic values of the area.

3.3.5 Public Facilities and Utilities

Existing Facilities and Services

The only relevant public facility is the County road adjacent to the Honokāia Pastoral Lots, which is the Old Mamalahoa Highway. This two-lane facility extends between the Lakeland Subdivision area of Waimea through Ahualoa to Honokaa (see Figures 1-1a and 1-1b) and has very low levels of traffic. The roadways within the Honokāia Pastoral Lots are private, gated lots owned and maintained by DHHL.

The water source for the non-potable water system will be a water connection within TMK (3rd) 4-7-007:005 that is part of the system operated and maintained by the County of Hawai‘i Department of Water Supply (DWS).

No electrical, telephone, cable TV, or wastewater utilities are available or would be affected in any way by the Proposed Action.

Impacts and Mitigation Measures

The Proposed Action will install an additional DHHL non-potable system consisting of water tanks, booster pumps and waterlines. Construction will involve trucks and excavators but no significant level of traffic, and no adverse effect to Old Mamalahoa Highway would occur.

Based on the pre-existing lots of records prior to the subdivision, the Honokāia Pastoral Lots are entitled to four water units, each one of which accounts for 400 gallons per day on the average. As the four preexisting lot TMKs no longer exist, DHHL has requested DWS to assign the four water units to TMK 4-6-013:044, which is the water tank site, owned by DHHL. A one-inch DWS meter will be installed and the four equivalent water units will be used by all lessees as supplemental for non-potable usage, with monitoring of the usage total. None of the water is for drinking. Given these conditions, there will be no adverse impact upon the DWS system or its users.

3.4 Growth-Inducing, Cumulative and Secondary Impacts

The Proposed Action would not involve any secondary impacts, such as population changes or effects on public facilities. The non-potable water system does not trigger growth, but rather allows productive economic use of lots that have already been subdivided and leased for pastoral purposes.

Cumulative impacts result when implementation of several projects that individually have limited impacts combine to produce more severe impacts or conflicts in mitigation measures. It is important to note that the adverse effects of the Proposed Action are very limited in severity, nature and geographic scale. These impacts are confined to very minor, short-term construction impacts to air quality, noise, and scenery. At the current time, there do not appear to be any roadway, utility, development or other projects being undertaken on the Old Mamalahoa Highway or in adjacent

DHHL lands that would combine with the Proposed Action in such a way as to produce adverse cumulative effects. The Proposed Action does not involve a commitment for larger actions that would have impacts that would accumulate with those of the Proposed Action to become significant.

3.5 Required Permits and Approvals

Several permits and approvals would be required to implement this project. They are listed here under their granting agencies.

Hawai‘i State Department of Health
National Pollutant Discharge Elimination System Permit
Hawai‘i State Department of Land and Natural Resources
State Historic Preservation Division Chapter 6e Concurrence
Hawai‘i County Department of Public Works
Grubbing and Grading

At the current time, DHHL does not anticipate the need for any other permits or approvals, a finding that will be revisited after review of agency comments on the Draft EA.

3.6 Summary of Mitigation Measures

Table 3-6 below summarizes mitigation measures. The DHHL will maintain a checklist of mitigation measures and ensure that each is implemented at the appropriate stage of the project.

Table 3-6. Summary of Mitigation Measures

Subject (Reference)	Mitigation	Enforcement Responsibility
Water Quality, Erosion and Sedimentation (3.1.2)	Grading permit, NPDES permit and development of Storm Water Pollution Prevention Plan to properly manage storm water runoff, with emplacement and monitoring of best management practices	DHHL COH-DPW DOH-CWB
Biology (3.2)	Prohibition on clearing of woody vegetation taller than 15 feet during the Hawaiian hoary bat pupping season, June 1-Sept. 15. Construction BMPs will also serve to protect the aquatic biota downstream.	DHHL
Archaeological and Cultural Resources (3.3.3)	If archaeological resources or human remains are encountered during future development activities within the project corridor, work in the immediate area of the discovery will be halted and DLNR-SHPD contacted	DHHL SHPD

Notes: COH-DPW: County of Hawai‘i, Department of Public Works. DOH-CWB: Department of Health, Clean Water Branch; SHPD: State Historic Preservation Division.

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 and/or had meetings with project staff.

County of Hawai‘i

- Planning Department
- County Council
- Water Supply Department
- Police Department
- Fire Department

State of Hawai‘i

- Department of Health
- Office of Hawaiian Affairs

Organizations and Individuals

- Various lessees
- Sierra Club
- Waimea Community Association
- Waimea Hawaiian Homesteaders’ Association Inc

Copies of correspondence from agencies with substantive comments during the preparation of the EA are included in Appendix 1a and are cited in appropriate sections of the text of this EA.

5 LIST OF DOCUMENT PREPARERS

This Environmental Assessment was prepared for the Hawai‘i State Department of Hawaiian Home Lands by Geometrician Associates and Akinaka & Associates Ltd. The following companies and individuals were involved:

Co-Consultant

Geometrician Associates LLC
Environmental Assessment

Ron Terry, Ph.D.
Principal Scientist

Co-Consultant

Akinaka & Associates Ltd.
Engineering

Joni Tanimoto, P.E.
Project Manager

Sub-Consultants

ASM Affiliates
Robert Rechtman, Ph.D.
Matt Clark, B.A.
Archaeology

6 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*. The project corridor is dominated by non-native, invasive species and contains only a few individuals of a limited number of common native species. No natural water bodies would be affected in any way and no significant natural resources will be irrevocably committed or lost. The State Historic Preservation Division is expected to concur with the archaeological finding submitted to their office that no adverse effect to historic properties will occur.

2. *The project will not curtail the range of beneficial uses of the environment*. Future beneficial uses of the environment will in general be maintained by the Proposed Action.

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. The project's goal of improving water service for DHLL pastoral uses satisfies all relevant elements of 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 improving water facilities for DHHL beneficiaries who have pastoral lots in Honokāia.

5. *The project does not substantially affect public health in any detrimental way*. No effects to public health are anticipated.

6. *The project will not involve substantial secondary impacts, such as population changes or effects on public facilities*. The Proposed Action will foster the orderly use of the Honokāia Pastoral Lots, as consistent with all relevant plans including the Hawai‘i County General Plan, the DHHL General Plan, Hawai‘i Island Plan and Waimea Nui Plan.

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 Proposed Action 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 are present. Impacts to Hawaiian hoary bats will be avoided through timing of tall woody vegetation removal.

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*. At the current time, there do not appear to be any roadway, utility, development or other projects being undertaken on the Old Mamalahoa Highway or in adjacent DHHL lands that would combine in such a way as to produce adverse cumulative effects. The Proposed Action does not involve a commitment for larger actions that would have impacts that would accumulate with those of the Proposed Action to become significant.

10. *The project will not detrimentally affect air or water quality or ambient noise levels.* Effects to water quality will be negligible with implementation of standard best management practices that will be required under permits. Construction may involve very brief periods of elevated noise levels, but very few sensitive noise receptors are present, and impacts will not be significant.

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 floodplain is present, no water resources or hazards are present, and there are no geologically hazardous conditions.

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*. Energy will be required for construction, but the provision of non-potable water will reduce the need for water hauling, and the net result should be a reduction in energy use.

Based on the findings above, the Hawai‘i State Department of Hawaiian Home Lands expects that the Proposed Action will not have any significant effect in the context of Chapter 343, Hawai‘i Revised Statues and section 11-200-12 of the State Administrative Rules, and intends to issue a Finding of No Significant Impact (FONSI). This conclusion will be finalized after review of comment letters on the Draft EA.

REFERENCES

Banko, W. E. 1980. "Population Histories – Species Accounts Seabirds: Newell's Shearwater ('A'o)." Cooperative National Park Resources Studies Unit, University of Hawai'i at Manoa, Department of Botany, Technical Report #5A.

Bergin B. 2004 and 2006. *Loyal to the Land: The Legendary Parker Ranch, 750-1950.* Vols. 1 and 2. Honolulu: University of Hawai'i Press.

Cordy, R. 1994. *A Regional Synthesis of Hāmākua District, Hawai'i Island*. Historic Preservation Division, DLNR, State of Hawai'i.

Day, R. H., B. Cooper, and T. C. Telfer. 2003. *Decline of Townsend's (Newell's Shearwaters (Puffinus auricularis newelli) on Kauai, Hawaii*. The Auk 120: 669-679.

Ellis, W. 2004. *Journal of William Ellis, A Narrative of an 1823 Tour Through Hawai'i*. Honolulu: Mutual Publishing.

Fong, J., Shideler, D., and Hammatt, H. 2005. *Literature Review, Field Check and Cultural Impact Evaluation For Approximately 2,500-Acres of DHHL Lands at Honokāia Ahupua'a, Hāmākua District, Hawaii Island, TMK: 4-6- 11: 3, 11, 12, and 13. Cultural Surveys Hawai'i Job Code: HONO 64.* Prepared for Oceanit, Honolulu, HI.

Fornander, W. 1916-1919. *Fornander Collection of Hawaiian Antiquities and Folklore*. (9 vols.) Honolulu: Bishop Museum Press.

Gagne, W., and L. Cuddihy. 1990. "Vegetation," pp. 45-114 in W.L. Wagner, D.R. Herbst, and S.H. Sohmer, eds., *Manual of the Flowering Plants of Hawai'i.* 2 vols. Honolulu: University of Hawai'i Press.

Giambelluca, T.W., Q. Chen, A.G. Frazier, J.P. Price, Y.-L. Chen, P.-S. Chu, J.K. Eischeid, and D.M. Delparte. 2013. "Online Rainfall Atlas of Hawai'i." *Bull. Amer. Meteor. Soc*. 94, 313-316, doi: 10.1175/BAMS-D-11-00228.1.

Handy, E.S.C., and E.G. Handy. 1972. Native Planters in Old Hawaii. *B.P. Bishop Museum Bulletin 233*. Honolulu: Bishop Museum Press.

Hawai'i County Planning Department. 2005. *The General Plan, County of Hawai'i*. Hilo. http://www.hawaii-county.com/la/gp/toc.html

Hawai'i State Department of Hawaiian Home Lands. (DHHL) 2002a. *General Plan*. Honolulu.

_____. 2002b. *Hawai'i Island Plan*. Honolulu.

____. 2012. *Waimea Nui Hawaii Region Plan.* Honolulu.

Hawai‘i State Department of Land and Natural Resources (DLNR). 1998. *Indigenous Wildlife, Endangered and Threatened Wildlife and Plants, and Introduced Wild Birds*. State of Hawai‘i. Administrative Rule §13-134-1 through §13-134-10.

Hawai‘i State Department of Land and Natural Resources-Division of Aquatic Resources (DLNR-DAR). 2008. *Atlas of Hawaiian Watershed & Their Aquatic Resources. Island of Hawai‘i, Hilo Region Watersheds, Wailoa River*. Available online at URL http://www.hawaiiwatershedatlas .com/watersheds/hawaii/82061.pdf. (Accessed June, 2012)

Heliker, C. 1990. *Volcanic and Seismic Hazards on the Island of Hawaii*. Washington: U.S. GPO.

Kamakau, S. 1961. *Ruling Chiefs of Hawai‘i*. Honolulu: The Kamehameha Schools Press.

Kuykendall, R. 1938. *The Hawaiian Kingdom 1778–1854. Foundation and Transformation*. Honolulu: University of Hawai‘i Press.

Kuykendall, R, and A. Day. 1976 *Hawaii: A History; From Polynesian Kingdom to American Statehood*. Englewood Cliffs: Prentice-Hall, Inc.

McEldowney, H. 1983. “A Description of Major Vegetation Patterns in the Waimea-Kawaihae Region During the Early Historic Period.” Report 16, in J.T. Clark and P.V. Kirch (eds.), *Archaeological Investigations of the Mudlane-Waimea-Kawaihae Road Corridor, Island of Hawai‘i,* pp.407-445. Department Report 83-1. Dept. of Anthropology, Bernice P. Bishop Museum, Honolulu.

Pukui, M.K., Elbert, S., and E. Mookini. 1974. *Place Names of Hawaii*. Honolulu: University of Hawai‘i Press.

U.S. Dept. of Commerce, Economics and Statistics Administration, Bureau of the Census, 2012, http://factfinder.census.gov/.

U.S. Fish and Wildlife Service (USFWS). 2014. *USFWS Threatened and Endangered Species System (TESS).* Washington: GPO. http://ecos.fws.gov/tess_public.

U.S. Soil Conservation Service. 1973. *Soil Survey of Island of Hawai‘i, State of Hawai‘i.* Washington: U.S.D.A. Soil Conservation Service.

University of Hawai‘i at Hilo, Dept. of Geography. 1998. *Atlas of Hawai‘i.* 3rd ed. Honolulu: University of Hawai‘i Press.

Wolfe, E.W., and J. Morris. 1996. *Geologic Map of the Island of Hawai‘i.* USGS Misc. Investigations Series Map i-2524-A. Washington, D.C.: U.S. Geological Survey.

Honokaia Non-Potable Water System
Hāmākua, Island of Hawai‘i
State of Hawai‘i

ENVIRONMENTAL ASSESSMENT

Appendix 1a
Comments in Response to Early Consultation

[This page intentionally left blank]

William P. Kenoi
Mayor

Harry S. Kubojiri
Police Chief

Paul K. Ferreira
Deputy Police Chief

County of Hawai`i

POLICE DEPARTMENT
349 Kapi'olani Street • Hilo, Hawai'i 96720-3998
(808) 935-3311 • Fax (808) 961-2389

April 20, 2015

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

Dear Mr. Terry:

SUBJECT: EARLY CONSULTATION FOR DEPARTMENT OF HAWAIIAN HOME LANDS HONOKAIA NON-POTABLE WATER SYSTEM, ISLAND OF HAWAII

Staff, upon reviewing the provided documents, does not anticipate any significant impact to traffic and/or other public safety concerns.

Thank you for allowing us the opportunity to comment.

If you have any questions, please contact Captain Andrew Burian, N. Hilo/Hamakua Patrol Commander, at 775-7533.

Sincerely,

HENRY J. TAVARES, JR.
ASSISTANT POLICE CHIEF
AREA I OPERATIONS BUREAU

AB:lli
150277

William P. Kenoi
Mayor

Duane Kanuha
Director

Bobby Command
Deputy Director

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

County of Hawai'i
PLANNING DEPARTMENT

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

May 1, 2015

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

Dear Mr. Terry:

Subject: **Pre-Consultation for Draft Environmental Assessment**
Project: Non-Potable Water System for Honokaia Pastoral Lots
TMK: (3) 4-6-:013: Various Parcels; Honokaia, Hāmākua, Hawai'i

Thank you for your letter dated April 15, 2015, requesting comments from this office regarding the preparation of a Draft Environmental Assessment (DEA) for the subject project.

The State of Hawai'i, Department of Hawaiian Home Lands (DHHL) is proposing a gravity fed non-potable water system consisting of a County of Hawai'i, Department of Water Supply connection, metal storage tank reservoirs, transmission lines, laterals, individual sub meters and appurtenant infrastructure.

The properties are situated within the Agricultural State Land Use district and designated as Extensive Agricultural and Important Agricultural Lands by the Hawai'i County General Plan Land Use Pattern Allocation Guide (LUPAG) Map. In addition, none of the properties are located within the Special Management Area (SMA).

The subject properties are under the control of the Department of Hawaiian Home Lands (DHHL). Zoning will ultimately be determined by DHHL per the 2002 Memorandum of Agreement (MOA) with Hawai'i County. In addition, the MOA provides that all normal land use controls will be applied by Hawai'i County to DHHL property according to the zoning district selected by DHHL.

Finally, the subject properties were created under the "farm subdivision" provisions of Hawai'i County Code, Chapter 23 (Subdivision). Section 23-114 (b) prohibits any structures for temporary, seasonal, or permanent residential occupancy or habitation.

We have no further comments to offer, at this time. However, please provide our department with a copy of the Draft Environmental Assessment for our review and comment.

If you have any questions, or if you need further assistance, please feel free to contact Bethany Morrison of this office at (808) 961-8138.

Sincerely,

DUANE KANUHA
Planning Director

BJM:cs
\\COH33\planning\public\wpwin60\Bethany\EA-EIS Review\preconsultdraftea DHHL Honokaia non-potable water system.doc

cc: SUB 06-000339

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAI'I
345 KEKŪANAŌ'A STREET, SUITE 20 • HILO, HAWAI'I 96720
TELEPHONE (808) 961-8050 • FAX (808) 961-8657

May 7, 2015

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

PRE-ENVIRONMENTAL ASSESSMENT CONSULTATION
DEPARTMENT OF HAWAIIAN HOME LANDS
HONOKAIA NON-POTABLE WATER SYSTEM
TAX MAP KEY 4-6-001:001-046

This is in response to your Pre-Environmental Assessment Consultation request dated April 15, 2015.

Please be informed that water is available up to an average of 1,600 gallons per day for the pre-existing lots of record which the subject parcels were created from. It is understood that these parcels are for pastoral use only and that the water use is for supplemental purposes.

The Department cannot provide any additional water at this time, extensive improvements and additions, which may include, but not limited to source, storage, booster pumps, transmission, and distribution facilities, would be required.

Lastly, as the proposed non-potable water system is a private water system, the Department cannot comment on whether it would meet the State of Hawai'i, Department of Health and/or Federal Environmental Protection Agency requirements.

Should there be any questions, please contact Ryan Quitoriano of our Water Resources and Planning Branch at 961-8070, extension 256.

Sincerely yours,

Quirino Antonio, Jr., P.E.
Manager-Chief Engineer

RQ:dfg

Honokaia Non-Potable Water System
Hāmākua, Island of Hawai‘i
State of Hawai‘i

ENVIRONMENTAL ASSESSMENT

Appendix 2
Biological Survey

[This page intentionally left blank]

Biological Survey
Honokaia DHHL Pasture Lots Water System
TMKs (3rd.) 4-6-013:001 through 046
Honokaia, Hāmākua, Island of Hawai'i

By Ron Terry, Ph.D.
Prepared for Akinaka & Associates and the Department of Hawaiian Home Lands
October 2014

Introduction

The Hawai'i State Department of Hawaiian Home Lands (DHHL) is proposing a gravity fed non-potable water system consisting of a County of Hawai'i, Department of Water Supply master meter connection starting at a pressure relief valve (PRV) 2,000 feet northwest of the Honokaia Pastoral Lots, one 104,600-gallon storage tank, approximately 32,000 linear feet of transmission lines and laterals, individual submeters, and other appurtenant infrastructure (see attached Google Earth © image in Figure 1 – note: all figures and tables are at end of report). The benefitted properties consist of TMKs (3rd) 4-6-013:001 through 046, which are owned by DHHL and leased by various lessees. This biological survey was prepared to provide an assessment of the overall biological environment and potential impacts of the project and to inform design in case there is a need for avoidance or other mitigation.

The survey involved a full assessment of flora and vegetation of a 30-foot wide corridor surrounding all waterlines and an areas of about one acre centered on the water tank. The objectives of the botanical survey were to: 1) describe the vegetation; 2) list all species encountered; and 3) identify threatened or endangered plant species. The area was surveyed by Ron Terry and Colin Hart in October 2014. Plant species were identified in the field and in later in the laboratory. Special attention was given to the possible presence of any federally (USFWS 2014) listed threatened or endangered plant species.

The survey also included a limited faunal survey restricted to providing a list of birds and introduced mammals, reptiles, or amphibians observed during the botanical survey. Also considered in this report is the general value of the habitat for native birds and the Hawaiian hoary bat. Not included are evaluation of impacts to aquatic life and invertebrates, although members of the Solanaceae plant family, many of which are hypothesized to be host plants for the endangered Blackburn's sphinx moth (*Manduca blackburnii*), were specifically searched for.

Vegetation Type and Influences

The geologic substrate in the surveyed areas consists of different-aged lava flows from Mauna Kea ranging from as young as 4,000 years to as old as 250,000 years (Wolfe and Morris 1996). Average annual rainfall varies from about 83 inches on the *makai*, northern end of the area near the Old Mamalahoa Highway at about 2,600 feet in elevation, to about 56 inches at the *mauka*, southern end in the hills east of Puukapu and Manā Road at about 3,400 feet in elevation (Giambelluca et al 2014). It is difficult to speculate on the precise pre-human vegetation of the area, since the area has

been completely transformed by removal of tree cover and introduction and promotion of pasture grasses maintained by heavy cattle grazing. Gagne and Cuddihy (1990) described the natural vegetation in fairly undisturbed areas with similar geology and climate in this part of Hāmākua as sub-montane rain forest dominated by ʻōhiʻa (*Metrosideros polymorpha*) and koa (*Acacia koa*) (Gagne and Cuddihy 1990). There are now only small areas of remnant forest that reflect the original vegetation, none of them near the Honokaia lots, as shown in Figure 1.

The current vegetation of the area is entirely managed pasture (see photos in Figure 2) or adjacent roadsides, consisting of various non-native species of grass, with kikuyu grass (*Cenchrus clandestinus*) and Pangola grass (*Digitaria eriantha*) most common. There are also a number of primarily non-native herbs, with noxious pasture weed fireweed (*Senecio madagascarensis*) especially prominent. A few ferns and low shrubs are also present. There are only a few trees, almost all of them near the Old Mamalahoa Highway right-of-way.

There is a crossing over an unnamed gulch at the far southwest end of the project site just *mauka* of Old Mamalahoa Highway, which joins with another unnamed gulch downstream to form Honokaia Stream (see Figure 2e). The stream is highly ephemeral and lacks any distinct riparian vegetation, but the streambanks contain some ʻohiʻa trees, which could be avoided by the waterline.

Flora

A full list of plant species found in the surveyed areas is contained in Table 1. Only a small proportion of the 62 plant species found are native, and they make up generally a very small part of the vegetative cover and biomass. The most numerous native plants are the fern palaʻa (*Sphenomeris chinensis*) and the sedge *Cyperus polystachyos.* Also present are a few ʻohiʻa (*Metrosideros polymorpha*), ʻuhaloa (*Waltheria indica*), moa (*Psilotum nudum*), uluhe fern (*Dicranopteris linearis*), sword fern (*Nephrolepis exaltata*).and one planted koa tree (*Acacia koa*). The remainder of the plants are mainly grasses and weeds associated with pastures and roadsides. Non-native plants of some concern include the widespread *Senecio madagascarensis*, which sickens cattle, strawberry guava (*Psidium cattleianum*), and *Pterolepis glomerata*, a highly invasive melastome.

Threatened and Endangered Plant Species

No listed or proposed threatened or endangered plant species were found. Given the current context, in an area completely devoted to regularly grazed pasture and adjacent roadsides, it is unlikely that one would be found. It should also be noted that no members of the Solanaceae family were found that could serve as hosts for the endangered Blackburn's sphinx moth.

Introduced Mammals, Reptiles, and Amphibians

The only live mammals seen during the survey were domestic cattle (*Bos taurus*) and horses (*Equus caballus caballus*). It is likely that small Indian mongooses (*Herpestes a .auropunctatus*), mice (*Mus* spp.), rats (*Rattus* spp.), feral cats (*Felis catus*) and domestic dogs, (*Canis f. familiaris*) are occasionally present on the property. None of these wild alien mammals have conservation value

and all are deleterious to native flora and fauna. There are no native terrestrial reptiles or amphibians in Hawai‘i. No reptiles and amphibians were detected during the survey.

Birds and the Hawaiian Hoary Bat

Only a few species of birds were detected during the survey, all typical of those found in similar pasture and roadside habitat: the non-natives Skylark (*Alauda arvensis*), Ring-necked Pheasant (*Phasianus colchicus*), Erckel's Francolin (*Francolinus erckelii*) and Mourning Dove (*Zenaida macroura*), and the native winter resident, Golden-Plover or kolea (*Pluvialis fulva*), which was extremely abundant on the roadsides. The Golden-Plover is a protected migratory bird that is unlikely to be disturbed by the construction and operation of the system, as it commonly thrives in rural and even urban settings.

No native land birds were detected, and it would be unlikely to find any, except perhaps *Asio flammeus sandwichensis*, the Hawaiian endemic sub-species of the Short-eared Owl. Also called Pueo, this diurnal bird of prey is regularly seen within the grasslands of South Kohala but was not noticed during the survey. There is some possibility that the construction of the waterlines and water tank could briefly displace Short-eared Owls. Any such disturbance will be of a highly temporary nature, as there is abundant additional suitable habitat within the area for any displaced owls to move into. This species is currently widespread in South Kohala and does not have special protected status under either the State or federal endangered species statutes.

The elevation of the land at 2,600 to 3,400 feet above sea level is within the range of many native forest birds, including the Hawai‘i ‘Amakihi (*Hemignathus virens*) (which is sometimes found near sea level in Puna), ‘Elepaio (*Chasiempis sandwichensis*), ‘I‘iwi (*Vestiaria coccinea*), ‘Apapane (*Himatione sanguinea*), and ‘Oma‘o (*Myadestes obscurus*). However, the lack of forest cover means that such birds are unlikely to be found, and several bird observations at different times of the day did not detect them.

It is recognized that listed terrestrial vertebrates may be present in this part of Hāmākua and may overfly, roost, nest, or utilize resources here, including the endangered Hawaiian Hawk (*Buteo solitarius*), the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), the endangered Hawaiian Petrel (*Pterodroma sandwichensis*), and the threatened Newell's Shearwater (*Puffinus auricularis newelli*).

No temporary or permanent lighting or erect structures such as poles are planned, and therefore no impacts to listed seabirds are anticipated. There are no tall trees in the area to be disturbed that could serve as nesting sites for Hawaiian Hawks. Given that the area in question is in active use as roads and pasture lots, and it appears unlikely that the project, which involves a narrow and relatively shallow trench and a water tank, would disturb Hawaiian Hawks.

Although not detected in the survey, which took place in daylight and did not utilize echolocation equipment, the Hawaiian Hoary Bat – Hawai‘i's only native land mammal – may also be present in the general area, as it has been observed in many areas on the island of Hawai‘i and is known to favor eucalyptus forests, which are present about a mile away in Ahualoa. Bats may forage for flying insects over portions of the project area on a seasonal basis, although the lack of any forest cover on or adjacent to the project site precludes substantial food resources or roosting habitat.

Impacts and Mitigation Measures

To minimize impacts to the endangered Hawaiian hoary bat, we recommend that woody plants taller than 15 feet not be removed or trimmed during the bat birthing and pup rearing season (June 1 through September 15). Very few such trees are present, most of them adjacent to the Mamalahoa Highway right-of-way.

Limitations

No biological survey of a large area can claim to have detected every species present. Some plant species are cryptic in juvenile or even mature stages of their life cycle. Thick brush can obscure even large, healthy specimens. Birds utilize different patches of habitat during different times of the day and seasons, and only long-term study can determine the exact species composition. The findings of this survey must therefore be interpreted with proper caution; in particular, there is no warranty as to the absence of any particular species.

REFERENCES

Banko, W. E. 1980. "Population Histories – Species Accounts Seabirds: Newell's Shearwater (ʻAʻo)." Cooperative National Park Resources Studies Unit, University of Hawaiʻi at Manoa, Department of Botany, Technical Report #5A.

Day, R. H., B. Cooper, and T. C. Telfer. 2003. *Decline of Townsend's (Newell's Shearwaters (Puffinus auricularis newelli) on Kauai, Hawaii*. The Auk 120: 669-679.

Gagne, W., and L. Cuddihy. 1990. "Vegetation," pp. 45-114 in W.L. Wagner, D.R. Herbst, and S.H. Sohmer, eds., *Manual of the Flowering Plants of Hawaiʻi*. 2 vols. Honolulu: University of Hawaiʻi Press.

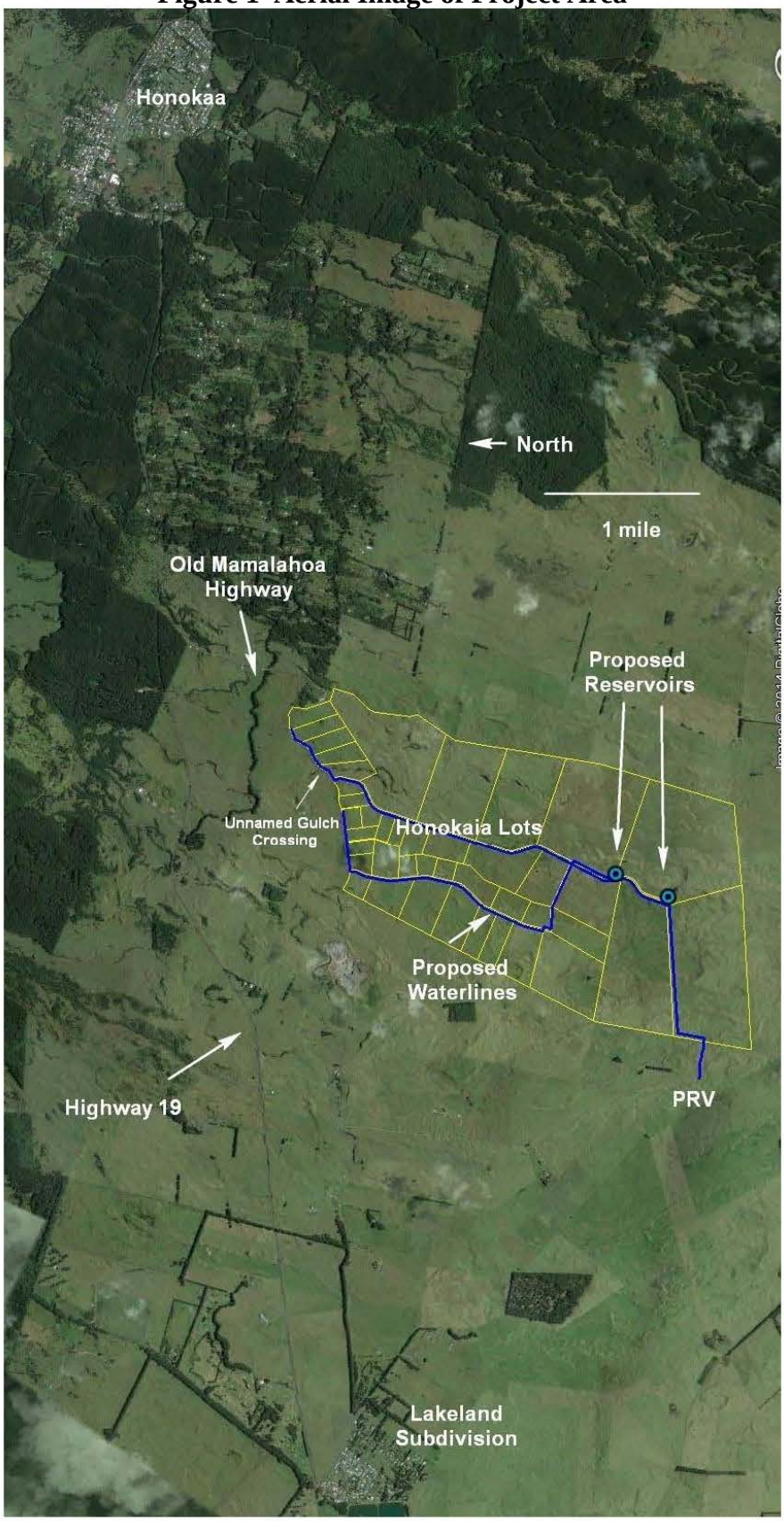
Giambelluca, T.W., Q. Chen, A.G. Frazier, J.P. Price, Y.-L. Chen, P.-S. Chu, J.K. Eischeid, and D.M. Delparte. 2013. "Online Rainfall Atlas of Hawai'i." *Bull. Amer. Meteor. Soc*. 94, 313-316, doi: 10.1175/BAMS-D-11-00228.1.

University of Hawaiʻi at Hilo, Dept. of Geography. 1998. *Atlas of Hawaiʻi.* 3rd ed. Honolulu: University of Hawaiʻi Press.

U.S. Fish and Wildlife Service (USFWS). 2014. *USFWS Threatened and Endangered Species System (TESS).* Washington: GPO. http://ecos.fws.gov/tess_public/.

Wolfe, E.W., and J. Morris. 1996. *Geologic Map of the Island of Hawaiʻi*. USGS Misc Investigations Series Map i-2524-A. Washington, D.C.: U.S. Geological Survey.

Figure 1 Aerial Image of Project Area



Source: Google Earth and Akinaka & Associates.

Figure 2 Project Site Photos

2a. Top of main road: waterline route follows left side of road, water tank site on right ▲

▼ 2b. Waterline route across a pasture lot, on left side of fenceline

Figure 2 Project Site Photos

2c. Pressure relieve valve in pasture at far southwest of project site ▲

▼ 2d. One of a few ʻohiʻa trees in *mauka* area, 100 yards south of waterline corridor

Figure 2 Project Site Photos

2e. Waterline will cross unnamed stream ▲ ▼ 2f. Typical Mamalahoa Highway frontage

Table 1
Plant Species Detected in Survey Area

Scientific Name	Family	Common Name	Life Form	Status*
Acacia koa	Fabaceae	Koa	Tree	E
Adiantum hispidulum	Pteridaceae	Rough maidenhair fern	Fern	A
Ageratina adenophora	Asteraceae	Maui pamakani	Herb	A
Anagallis arvensis	Primulaceae	Scarlet pimpernel	Herb	A
Andropogon virginicus	Poaceae	Broomsedge	Grass	A
Arundina graminifolia	Orchidaceae	Bamboo orchid	Herb	A
Axonopus sp.	Poaceae	Carpet grass	Grass	A
Bidens pilosa	Asteraceae	Spanish needle	Herb	A
Castilleja arvensis	Orobanchaceae	Indian paintbrush	Herb	A
Cenchrus clandestinus	Poaceae	Kikuyu grass	Grass	A
Chamaecrista nictitans	Fabaceae	Partridge Pea	Herb	A
Christella dentata	Thelypteridaceae	Christella	Fern	A
Cirsium vulgare	Asteraceae	Bull thistle	Herb	A
Commelina diffusa	Commelinaceae	Honohono grass	Herb	A
Crassocephalum crepidoides	Asteraceae	Crassocephalum	Herb	A
Cuphea carthagenensis	Lythraceae	Tarweed	Shrub	A
Cupressus sp.	Cupressaceae	Cypress	Tree	A
Cynodon dactylon	Poaceae	Bermuda grass	Grass	A
Cyperus haspan	Cyperaceae	Nut grass	Sedge	A
Cyperus polystachyos	Cyperaceae	Pycreus	Sedge	A
Dactylis glomerata	Poaceae	Orchard grass	Grass	A
Desmodium incanum	Fabaceae	Desmodium	Herb	A
Dicranopteris linearis	Gleicheniaceae	Uluhe	Fern	I
Digitaria eriantha	Poaceae	Pangola grass	Herb	A
Erechtites hieracifolia	Asteraceae	Fireweed	Herb	A
Geranium homeanum	Geraniaceae	Cranesbill	Herb	A
Hedychium sp.	Zingiberaceae	Ginger	Herb	A
Hypochoeris radicata	Asteraceae	Hairy cat's ear	Herb	A
Kyllinga breviifolia	Cyperaceae	Kili'o'opu	Sedge	A
Leucaena leucocephala	Fabaceae	Haole koa	Tree	A
Malva parviflora	Malvaceae	Cheese weed	Herb	A
Megathyrsus maximus	Poaceae	Guinea grass	Grass	A
Melinus minutiflora	Poaceae	Molasses grass	Grass	A
Melinus repens	Poaceae	Natal redtop grass	Grass	A
Metrosideros polymorpha	Myrtaceae	Ohia	Tree	E
Neonotonia wightii	Fabaceae	Glycine	Herb	A
Nephrolepis exaltata	Nephrolepidaceae	Sword Fern	Fern	I
Nephrolepis multiflora	Nephrolepidaceae	Sword fern	Fern	A
Paspalum conjugatum	Poaceae	Hilo grass	Grass	A
Paspalum urvillei	Poaceae	Vasey grass	Grass	A
Persea americana	Lauraceae	Avocado	Tree	A
Persicaria punctata	Water smartweed	Polygonaceae	Herb	A
Phymatosorus grossus	Polypodiaceae	Maile-scented fern	Herb	A
Pityrogramma calomelanos	Pteridaceae	Silver fern	Fern	A
Plantago lanceolata	Plantaginaceae	Narrow-leaved plantain	Herb	A

Table 1, continued				
Scientific Name	**Family**	**Common Name**	**Life Form**	**Status***
Pluchea symphytifolia	Asteraceae	Sourbush	Shrub	A
Psidium cattleianum	Myrtaceae	Strawberry guava	Tree	A
Psidium guajava	Myrtaceae	Guava	Tree	A
Psilotum nudum	Psilotaceae	Moa	Fern Ally	I
Polygala paniculata	Polygalaceae	Milkwort	Herb	A
Pterolepis glomerata	Melastomataceae	Pterolepis	Herb	A
Rubus rosifolius	Rosaceae	Thimble berry	Herb	A
Senecio madagascarensis	Asteraceae	Fireweed	Herb	A
Schizachyrium condensatum	Poaceae	Tufted beardgrass	Grass	A
Setaria parviflora	Poaceae	Yellow foxtail	Herb	A
Sida rhombifolia	Malvaceae	Cuba jute	Herb	A
Sphenomeris chinensis	Lindsaeaceae	Pala‘a	Fern	I
Sporobolus indicus	Poaceae	Dropseed	Grass	A
Trifolium repens	Fabaceae	White clover	Herb	A
Urochloa mutica	Poaceae	California grass	Grass	A
Verbena litoralis	Verbenaceae	‘Oiwi	Shrub	A
Waltheria indica	Malvaceae	Uhaloa	Herb	I

A = Alien, I = Indigenous, E = Endemic

Honokaia Non-Potable Water System
Hāmākua, Island of Hawai‘i
State of Hawai‘i

ENVIRONMENTAL ASSESSMENT

Appendix 3
Archaeological Assessment

[This page intentionally left blank]

An Archaeological Assessment Survey of the Proposed DHHL Honokaia Pastoral Lots Subdivision Non-Potable Water System

Portions of TMKs: (3) 4-6-13:001-005, 010, 013, 014, 020, 022, 024, 036, 044, 045, 046, and (3) 4-7-07:005

Honokaia Ahupua'a
Kamoku 'Okana
Hāmākua District
Island of Hawai'i

DRAFT VERSION

Prepared By:

Matthew R. Clark, B.A.,
Samuel (Kamuela) Plunkett, B.A.,
and
Robert B. Rechtman, Ph.D,

Prepared For:

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

April 2015

ASM affiliates
Archaeology • History • Ethnography • Architectural History
Office: (808) 969-6066 • Fax: (808) 443-0065

ASM Project Number 23360.00

An Archaeological Assessment Survey of the Proposed DHHL Honokaia Pastoral Lots Subdivision Non-Potable Water System

Portions of TMKs: (3) 4-6-13:001-005, 010, 013, 014, 020, 022, 024, 036, 044, 045, 046, and (3) 4-7-07:005

Honokaia Ahupua‘a
Kamoku ‘Okana
Hāmākua District
Island of Hawai‘i

ASM affiliates

EXECUTIVE SUMMARY

At the request of Ron Terry of Geometrician Associates, LLC, ASM Affiliates, conducted an Archaeological Assessment Survey of the Department of Hawaiian Homeland's (DHHL) proposed non-potable water system within the Honokaia Pastoral Lots Subdivision, Honokaia Ahupua'a and Kamoku 'Okana, Hāmākua District, Island of Hawai'i (Figures 1 and 2). The water system will be built as the result of the settlement of a 2009 lawsuit in which six of the Honokaia homesteaders sued DHHL for awarding pastoral homesteads without supporting water to maintain cattle ranching activities. Under the Hawaiian Homes Commission Act (HHCA), DHHL is required to provide support for homesteader ranching, including providing adequate amounts of water and supporting infrastructure. DHHL is proposing a gravity fed non-potable water system consisting of a County of Hawai'i, Department of Water Supply master meter connection, two 46,500-gallon storage tanks, approximately 40,000 linear feet (12,192 linear meters) of transmission lines and laterals, individual submeters and other appurtenant infrastructure. The benefitted properties include TMKs: (3) 4-6-13:001-046, which are owned by DHHL and ranched by various lessees.

A single archaeological feature consisting of a few stacked stones (Temporary Site 1) located along the edge of a drainage near the Old Māmalahoa Highway right-of-way on TMK: (3) 4-6-13:005 was only potential archaeological site identified during the current study. No other archaeological resources were observed on the surface of the project area anywhere else within the survey area, and the likelihood of encountering subsurface archaeological resources is extremely remote given the geology of the area, the history of ranching on the parcels, and the recent development of the Honokaia Pastoral Lots Subdivision infrastructure. All ranching related infrastructure (i.e. fence lines, corrals, etc.) encountered during the survey appeared modern, the pasture lands appeared to have been thoroughly grubbed in the past and are known to have been grazed for more than a century, and the ground surface along the edges of the two cul-de-sac roads has been recently disturbed. These findings support the findings of the earlier Fong et al. (2005) study that included most of the current project area and the 2,500-acre Honokaia Pastoral Lots Subdivision in its entirety.

Like a similar feature previously recorded by Fong et al. (2005) within the Honokaia Pastoral Lots Subdivision, Temporary Site 1 lacks integrity of setting and design and does not meet any of the defined significance criteria in the Hawai'i Administrative Rules 13§13-284-6, and is therefore not regarded as significant. Temporary Site 1 was nevertheless fully documented during the current study. As no significant archaeological resources were identified on the surface of the project area, and the likelihood of encountering subsurface archaeological resources is extremely remote given the geology of the area, the history of ranching on the parcels, and the lack of subsurface findings during the recent development of the cul-de-sac roads and related subdivision infrastructure, no further historic preservation work is recommend for the construction of the non-potable water system within the Honokaia Pastoral Lots Subdivision.

CHAPTERS

Page

FIGURES

Page

Page

1. INTRODUCTION

At the request of Ron Terry of Geometrician Associates, LLC, ASM Affiliates, Inc. conducted an Archaeological Assessment Survey of the Department of Hawaiian Homeland's (DHHL) proposed non-potable water system within the Honokaia Pastoral Lots Subdivision, Honokaia Ahupua'a and Kamoku 'Okana, Hāmākua District, Island of Hawai'i (Figures 1 and 2). The water system will be built as the result of the settlement of a 2009 lawsuit in which six of the Honokaia homesteaders sued DHHL for awarding pastoral homesteads without supporting water to maintain cattle ranching activities. Under the Hawaiian Homes Commission Act (HHCA), DHHL is required to provide support for homesteader ranching, including providing adequate amounts of water and supporting infrastructure. DHHL is proposing a gravity fed non-potable water system consisting of a County of Hawai'i, Department of Water Supply master meter connection, two 46,500-gallon storage tanks, approximately 40,000 linear feet (12,192 linear meters) of transmission lines and laterals, individual submeters and other appurtenant infrastructure. The benefitted properties include TMKs: (3) 4-6-13:001-046, which are owned by DHHL and leased by various lessees.

The roughly 2,500 acre Honokaia Pastoral Lots Subdivision was created in 2005 as the result of an earlier 1990 lawsuit that challenged the right of DHHL to lease the land to Parker Ranch rather than its beneficiaries. The subdivision includes forty-five homestead lots (ranging in size from 10 acres to 285 acres) that are currently accessed by two paved cul-de-sac roads. Fong et al. (2005) conducted a literature review, archaeological field check, and cultural impact evaluation of the DHHL Honokaia lands prior to the creation of the pastoral lots and roadways. The field inspection, which included only limited pedestrian survey and aerial survey, did not recorded any archaeological sites. The current study examines a portion of the Fong et al. (2005) study area including two proposed storage tank locations and several corridors for proposed water transmission lines and laterals. While most of the current project area is contained within the boundaries of Honokaia Ahupua'a, a short section of the proposed water transmission line will extend west from Honokaia Pastoral Lots Subdivision to tie in with an existing DHHL water system in the 'Okana of Kamoku ('*okana* is a land division term used only on certain islands that in the case of Kamoku describes an inland sub-district that may have once included the *mauka* portions of several *ahupua'a*; Lucas 1995:81).

This study was undertaken in accordance with Hawai'i Administrative Rules13§13–275, and was performed in compliance with the Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports as contained in Hawai'i Administrative Rules 13§13–276. According to 13§13-275-5(b)(5)(A) when no archaeological resources are discovered during an archaeological survey the production of an Archaeological Assessment report is appropriate. Compliance with the above standards is sufficient for meeting the initial historic preservation review process requirements of both the Department of Land and Natural Resources and the County of Hawai'i Planning Department. This report contains background information outlining the project area's physical and cultural contexts, a presentation of previous archaeological work in the vicinity of the project area, and current survey expectations based on that previous work. Also presented is an explanation of the project's methods, detailed descriptions of the archaeological features encountered, interpretation and evaluation of those resources, and treatment recommendations for the documented sites.

PROJECT AREA DESCRIPTION

The current project area consists of two proposed storage tank locations and several linear corridors for water transmission lines and laterals that will be used for the installation of a non-potable water system within the Honokaia Pastoral Lots Subdivision, Honokaia and Kamoku, Hāmākua District, Island of Hawai'i (see Figures 1 and 2). The study area extends from an existing DHHL water source in Kamoku 'Okana at an elevation of 3,346 feet (1,020 meters) above sea level to the Old Māmalahoa Highway at an elevation of 2,725-2,540 feet (830-775 meters) above sea level. The terrain is gently north-sloping, consisting of Pleistocene lavas of the Hāmākua Volcanic Series upper member (MacDonald and Abbot 1970) dissected by numerous drainage channels that create an up and down topography with steeper localized slopes along the drainage edges. Fong et al. (2005) classify the project area soils as predominately Honoka'a silty clay loam with some areas of rough broken land and pockets of Maile silt loam. The project area is exposed to the northeasterly trade winds and receives roughly 75-120 inches (1,900-3,050 millimeters) of rain annually, with most rain fall occurring during the winter months. Temperatures range from 50° to 80° F throughout the year (Armstrong 1973).

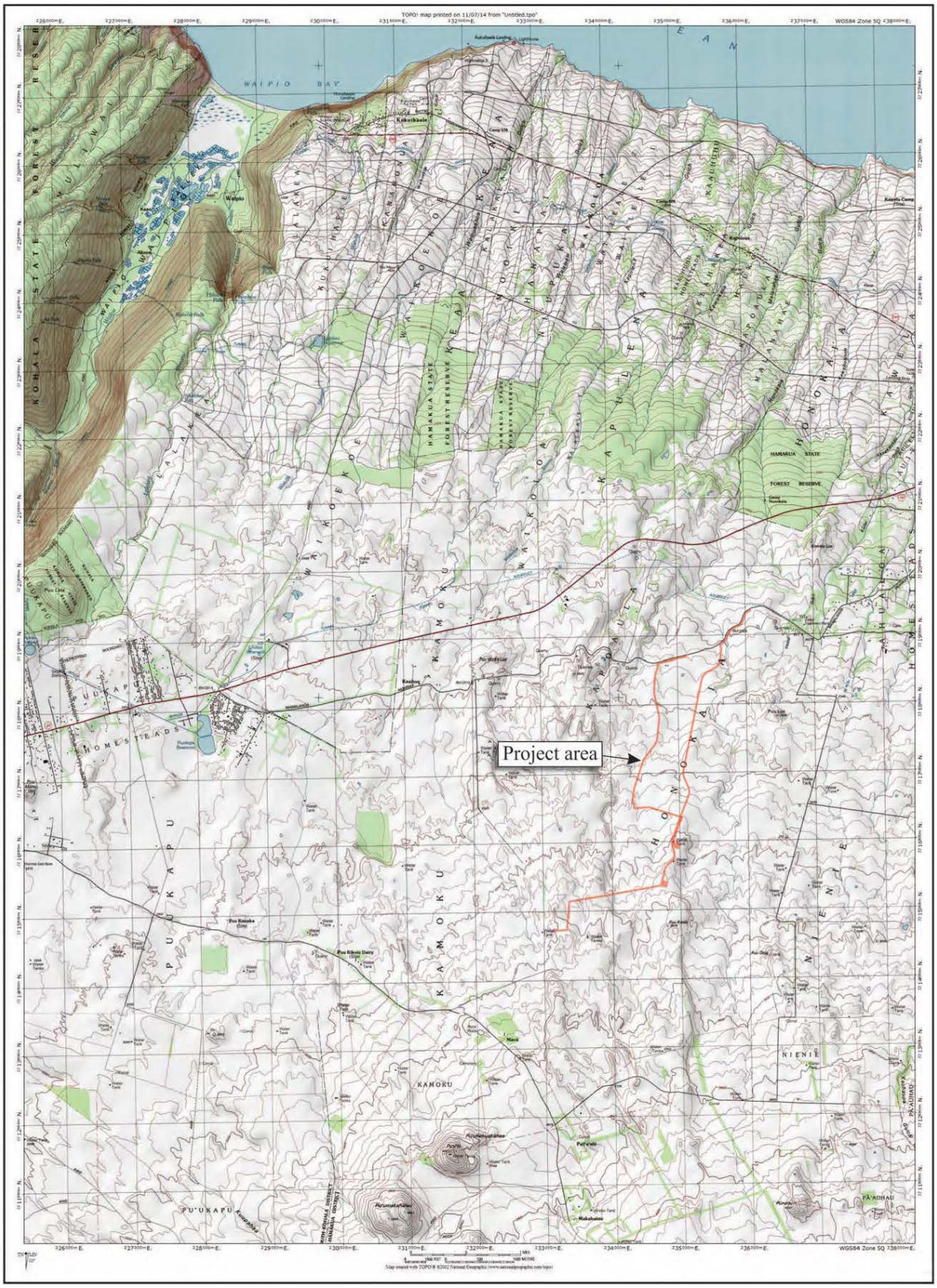


Figure 1. Project area location.

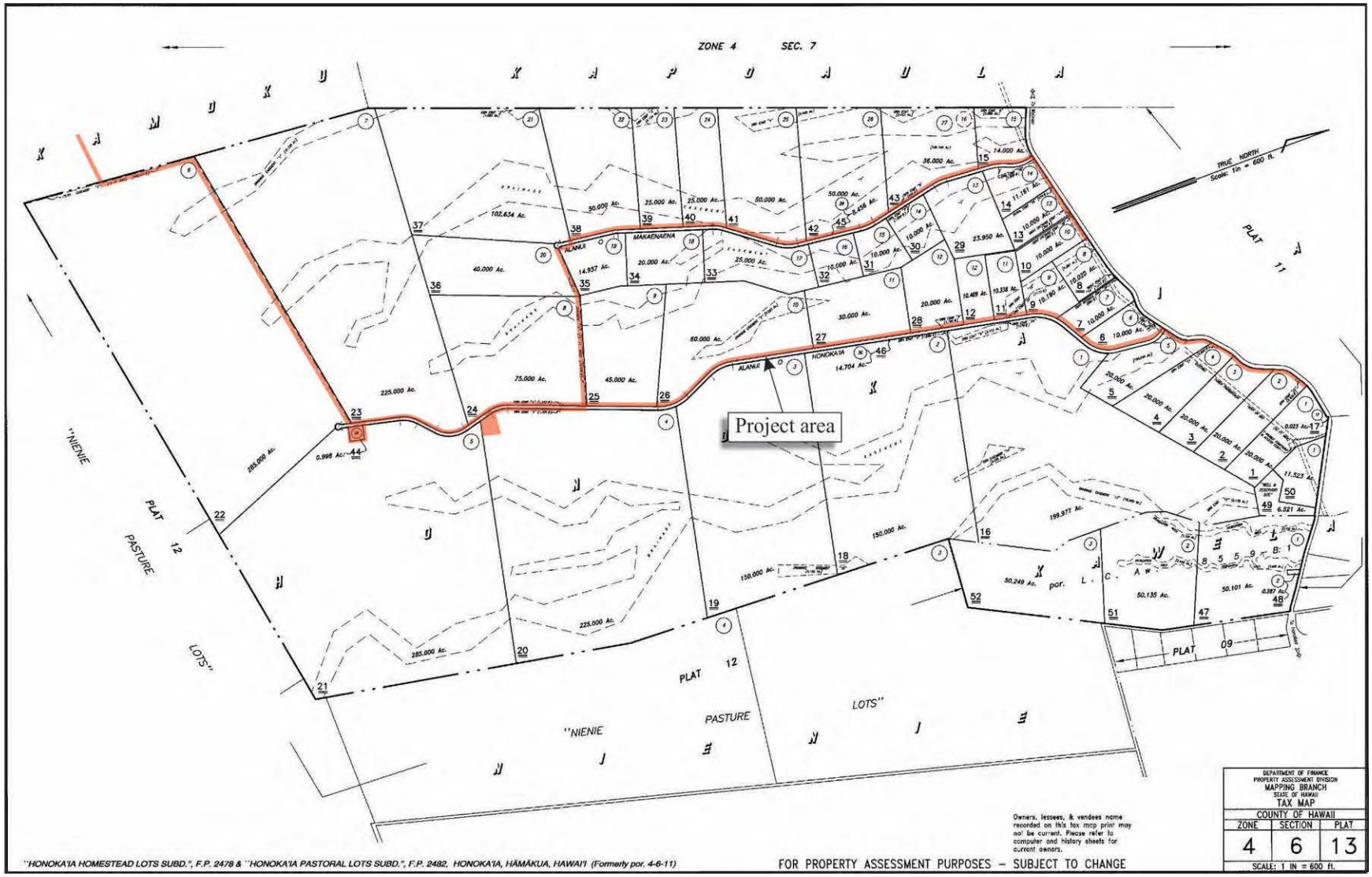


Figure 2. Tax Map Key (TMK): (3) 4-6-13 showing the current project area.

The Honokaia Pastoral Lots Subdivision, which is primarily used by the lessees for cattle ranching activities, is accessed by two recently constructed, gated, paved cul-de-sac roads – Alanui Honokaia at the eastern end of the subdivision and Alanui Makaenaena – that extend *mauka* (south) from the Old Māmalahoa Highway. Ranching related infrastructure is widespread across the project area in the form of fence lines, ranch roads, outbuildings, corrals, waterlines, catchment tanks, reservoirs, and troughs. Nearly all of the parcels within the subdivision are individually fenced along their boundaries, and the larger parcels are segmented into several paddocks. Gates in the fence lines allow for vehicular access to the individual parcels and paddocks. Much of the infrastructure appears modern, but the area has been used for cattle ranching for more than 100 years. Owing to the History of cattle ranching, vegetation within the project area consists almost exclusively of open grassland (Figure 3) composed of alien grasses, sedges, shrubs, herbs, ferns, and a few trees (the trees occur primarily along the Old Māmalahoa Highway right-of-way). A botanical survey of the study area indicates the a few species of indigenous ferns are also present. Prior to the widespread impacts of cattle ranching during the Historic Period, the project area would have occupied a zone of dense *ʻōhiʻa* rainforest with a much different and varied regime of vegetation (Clark and Kirch 1983).

The current archaeological survey area for the proposed DHHL non-potable water system within the Honokaia Pastoral Lots Subdivision includes several 10-meter (30-feet) wide corridors for the installation of roughly 11.25 kilometers (7 miles) of proposed transmission lines and two 200-meter by 200-meter (650-feet by 650-feet) areas for the construction of the water storage tanks. The proposed water system will extend eastward from an existing DHHL water source in Kamoku ʻOkana, located at an elevation of 1,020 meters (3,346 feet) above sea level (Figure 4), through pipelines for roughly 366 meters (1,200 feet) across TMK: (3) 4-7-07:005 to the western boundary of the Honokaia Pastoral Lots Subdivision in Honokaia Ahupuaʻa. It will then follow the boundary of TMK: (3) 4-6-13:022 north (Figure 5) for 305 meters (1,000 feet) and east (Figure 6) for 1,372 meters (4,500 feet) to the cul-de-sac end of Alanui Honokaia (TMK: (3) 4-6-13:046; Figure 7) and the 0.98 acre TMK: (3) 4-6-13:044 where one of the two proposed storage tanks will be erected at an elevation of 1,020 meters (3,346 feet) above sea level (Figure 8). From TMK: (3) 4-6-13:044 the waterline will follow the western edge of Alanui Honokaia north for 610 meters (2,000 feet) to a second proposed storage tank location in the southwest corner of TMK: (3) 4-6-13:020 at an elevation of 990 meters (3,248 feet) above sea level (Figure 9).

Two water transmission lines will extend *makai* (north) along the edge of the existing paved road (Figure 10) from the proposed storage tank location on TMK: (3) 4-6-13:020 within the Alanui Honokaia right-of-way (TMK: (3) 4-6-13:046). One transmission line will follow the western edge of the paved road for approximately 3.81 kilometers (2.37 miles) to the northern boundary of the Honokaia Pastoral Lots Subdivision adjacent to the Old Māmalahoa Highway (Figure 11). That transmission line will then extend east for 698 meters (2,291 feet) following the Old Māmalahoa Highway right-of-way across the northern boundaries of TMKs: (3) 4-6-13:002-005 to the western boundary of Parcel 001 (Figure 12). The other transmission line will follow the eastern edge of the paved road for 449 meters (1,472 feet) to the northern boundary of TMK: (3) 4-6-13:024 where it will turn east and follow the boundary of that parcel (Figure 13) and the northern boundary of TMK: (3) 4-6-13:036 for 750 meters (2,459 feet) to the cul-de-sac end of Alanui Makaenaena (TMK: (3) 4-6-13:045; Figure 14). From there the transmission line will follow the edge of the existing paved road (the eastern edge for a short distance, and then the western edge) for 2.23 kilometers (1.39 miles) to the northern boundary of the Honokaia Pastoral Lots Subdivision adjacent to the Old Māmalahoa Highway. That transmission line will then extend east for 634 meters (2,081 feet) following the Old Māmalahoa Highway right-of-way across the northern boundaries of TMKs: (3) 4-6-13:008, 010, 013, and 014 to the western boundary of Parcel 007 (Figure 15).

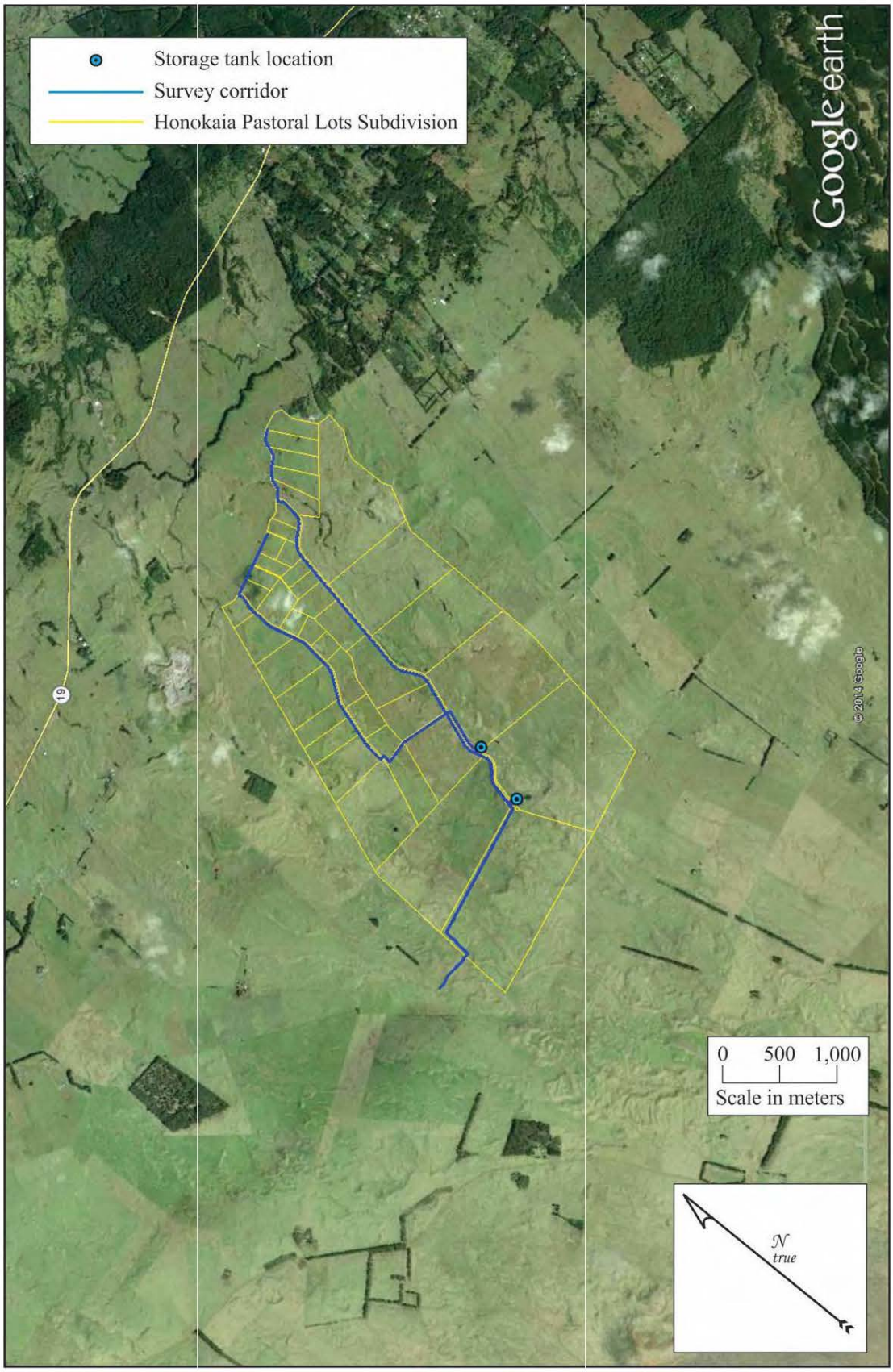


Figure 3. Google Earth image of the current project area.

Figure 4. Existing DHHL water source in Kamoku ʻOkana, view to the east.

Figure 5. Western boundary (fence line) of TMK: (3) 4-6-13:022, view to the north.

Figure 6. Northern boundary (fence line) of TMK: (3) 4-6-13:022, view to the east.

Figure 7. Cul-de-sac end of Alanui Honokaia, view to the north.

Figure 8. Storage tank location on TMK: (3) 4-6-13:044, view to the west.

Figure 9. Storage tank location in the southwest corner of TMK: (3) 4-6-13:020, view to the south.

Figure 10. Middle section of Alanui Honokaia, view to the north.

Figure 11. *Makai* end of Alanui Honokaia at the Old Māmalahoa Highway, view to the north.

Figure 12. Transmission line corridor across the northern boundaries of TMKs: (3) 4-6-13:002-005, view to the east.

Figure 13. Northern boundary (fence line) of TMK: (3) 4-6-13:024; view to the west.

Figure 14. Cul-de-sac end of Alanui Makaenaena, view to the north.

Figure 15. Transmission line corridor across the northern boundaries of TMKs: (3) 4-6-13:008, 010, 013, and 014, view to the east.

2. BACKGROUND

To generate a set of expectations regarding the nature of archaeological resources that might be encountered within the project area, and to establish an environment within which to access the significance of any such resources, a general culture-historical background for the region is presented and the results of previous archaeological studies conducted in the vicinity of the project area are summarized.

CULTURE-HISTORICAL CONTEXT

The current project area is in Honokaia Ahupua‘a and Kamoku ‘Okana, Hāmākua District, Island of Hawai‘i. These land divisions are located along the northeast facing shore of Hawai‘i Island in the district of Hāmākua, one of six traditional districts on the island. Although the boundaries of the Hāmākua District are strictly political, the lands encompassed by it possess a unique environment that played a large role in determining the boundaries and shaping its history from the time of Polynesian settlement to the modern day. Understanding this environment is important for understanding the history of the current project area:

> Hāmākua district is a windward district in the truest sense. It has ca. 29 miles of shoreline, primarily focused on Mauna Kea’s eastern slopes with exposed cliffs rough seas, and narrow reef formations. Above the sea cliffs, the gentle slopes have a thick soil cover and abundant rainfall, and lush vegetation, with the upper slopes from 1,000-6,000 feet in an ‘ōhi‘a-koa rain forest. The slopes are cut by deep (up to 300-foot), narrow stream gulches cloaked with kukui and pandanus. Yet Hāmākua is more than these slope and gulch lands. It also includes the extremely large, deep valleys of Waipi‘o and Waimanu which have cut over a millennia into the older Kohala Mountain, valleys which . . . dominated the history of the district and the island. Hāmākua also extended inland, encompassing the high elevation māmane-naio forests of Mauna Kea and the subalpine, oft snow-covered, summit itself. The district continued across the foggy and cold upland plateau or Saddle with its terrain a mixture of bare lava and soils, and with its vegetation a mixture of ‘ōhi‘a and māmane-naio forests. This plateau had important nesting grounds of ‘u‘ua and nēnē. And, Hāmākua virtually spanned the island-reaching to and looking down into the upper edges of Kona. (Cordy 2000:21).

It was to this general environmental setting that the first Polynesians in Hawai‘i arrived. Over generations they shaped and utilized the natural environment to provide all they needed for sustenance and survival. In the process they created a uniquely Hawaiian culture that was wholly adapted to the environment. The brief generalized cultural sequence that follows below provides a time frame for the peopling of Hawai‘i, the development of Hawaiian culture, the expansion and intensification of the Hawaiian population, and the resulting stresses on it from the earliest Precontact settlers to the time of European Contact. This cultural sequence is based largely on Kirch’s (1985) model amended to include recent revisions offered by Kirch (2011).

A Generalized Model of Hawaiian Prehistory

The conventional wisdom has been that first inhabitants of Hawai‘i Island probably arrived by at least A.D. 300, and focused habitation and subsistence activity on the windward side of the island (Burtchard 1995; Kirch 1985; Hommon 1986). However, there is no archaeological evidence for occupation of Hawai‘i Island (or perhaps anywhere in Hawai‘i) during this initial settlement, or colonization stage of island occupation (A.D. 300 to 600). More recently, Kirch (2011) has convincingly argued that Polynesians may not have arrived to the Hawaiian Islands until at least A.D. 1000, but expanded rapidly thereafter. The implications of this on the currently accepted chronology would alter the timing of the Settlement, Developmental, and Expansion Periods, possibly shifting the Settlement Period to A.D. 1000 to 1100, the Developmental Period to A.D. 1100 to 1350, and the Expansion Period to A.D. 1350 to 1650.

The initial settlement in Hawai‘i is believed to have occurred from the southern Marquesas Islands. This was a period of great exploitation and environmental modification, when early Hawaiian farmers developed new subsistence strategies by adapting their familiar patterns and traditional tools to their new environment (Kirch 1985; Pogue 1978). Their ancient and ingrained philosophy of life tied them to their environment and kept order. Order was further assured by the conical clan principle of genealogical seniority (Kirch 1984). According to Fornander (1969), the Hawaiians brought from their homeland certain universal Polynesian customs: the major gods Kāne, Kū, and Lono; the *kapu* system of law and order; cities of refuge; the *‘aumakua* concept; various epiphenomenal beliefs; and the concept of *mana*. Initial permanent settlements in the islands were established at sheltered bays with access to fresh water and marine resources. Communities shared extended familial relations and there was an occupational focus on the

collection of marine resources. Over a period of several centuries the areas with the richest natural resources became populated and perhaps even crowded, and there was an increasing separation of the chiefly class from the commoners. As the environment reached its maximum carrying capacity, the result was social stress, hostility, and war between neighboring groups (Kirch 1985).

The Development Period brought about a uniquely Hawaiian culture. The portable artifacts found in archaeological sites of this period reflect not only an evolution of the traditional tools, but some distinctly Hawaiian inventions. The adze (*koʻi*) evolved from the typical Polynesian variations of plano-convex, trapezoidal, and reverse-triangular cross-section to a very standard Hawaiian rectangular quadrangular tanged adze. A few areas in Hawaiʻi produced quality basalt for adze production. Mauna Kea on the island of Hawaiʻi in the Hāmākua District was a well-known adze quarry. The two-piece fishhook and the octopus-lure breadloaf sinker are Hawaiian inventions of this period, as are ʻ*ulu maika* stones and *lei niho palaoa*. The later was a status item worn by those of high rank, indicating a trend toward greater status differentiation (Kirch 1985).

The Expansion Period is characterized by the greatest social stratification, major socioeconomic changes, and intensive land modification. Most of the ecologically favorable zones of the windward and coastal regions of all major islands were settled and the more marginal leeward areas were being developed. The greatest population growth occurred during the Expansion Period. Subsistence patterns intensified as crop farming evolved into large irrigated field systems and expanded into the marginal dry land areas. The *loko* or fishpond aquaculture flourished during this period (Bellwood 1978; Kirch 1985).

It was during the Expansion Period that a second major migration settled in Hawaiʻi, this time from Tahiti in the Society Islands. According to Kamakau (1976) the *kahuna* Pāʻao settled in the islands during the 13th century. Pāʻao was the keeper of the god Kuʻkaʻilimoku, who had fought bitterly with his older brother, the high priest Lonopele. After much tragedy on both sides, Pāʻao was expelled from his homeland by Lonopele. He prepared for a long voyage, and set out across the ocean in search of a new land. On board Pāʻao's canoes were thirty-eight men (*kānaka*), two stewards (*kānaka ʻāʻīpuʻupuʻu*), the chief Pilikaʻaiea (Pili) and his wife Hinaʻaukekele, Nāmauʻu o Malaia, the sister of Pāʻao, and the prophet Makuakaʻūmana (Kamakau 1991). In 1866 Kamakau told the following story of their arrival in Hawaiʻi:

> Puna on Hawaiʻi Island was the first land reached by Pāʻao, and here in Puna he built his first heiau for his god Ahaʻula and named it Ahaʻula [Wahaʻula]. It was a luakini. From Puna, Pāʻao went on to land in Kohala, at Puʻuepa. He built a heiau there called Moʻokini, a luakini.
>
> It is thought that Pāʻao came to Hawaiʻi in the time of the aliʻi Laʻau because Pili ruled as moʻi after Laʻau. You will see Pili there in the line of succession, the moʻo kūʻauhau, of Hanalaʻanui. It was said that Hawaiʻi Island was without a chief, and so a chief was brought from Kahiki; this is according to chiefly genealogies. Hawaiʻi Island had been without a chief for a long time, and the chiefs of Hawaiʻi were aliʻi makaʻāinana or just commoners, makaʻāinana, during this time. (1991:100)
>
> . . . There were seventeen generations during which Hawaiʻi Island was without chiefs—some eight hundred years. . . . The lack of a high chief was the reason for seeking a chief in Kahiki, and that is perhaps how Pili became the chief of Hawaiʻi. He was a chief from Kahiki and became the ancestor of chiefs and people of Hawaiʻi Island. (1991:101–102)

The Pili line's initial ruling center was likely in Kohala, but Cartwright (1933) suggests that Pili later resided in and ruled from Waipiʻo Valley in the Hāmākua District. Ethnohistorical traditions (Fornander 1880) indicate that valley was associated with at least nine successive Pili line rulers of Hawaiʻi Island, from Kahaʻimoeleʻa to ʻUmi (from roughly AD 1460 to 1620). Prior to the establishment of these Pili rulers, Waipiʻo was the residential base for powerful local rulers dating back to at least the A.D. 1200s (Cartwright 1933).

The concept of the *ahupuaʻa* was established during the A.D. 1400s (Kirch 1985), adding another component to a then well-stratified society. This land unit became the equivalent of a local community, with its own social, economic, and political significance. *Ahupuaʻa* were ruled by *aliʻi ʻai ahupuaʻa* or lesser chiefs; who, for the most part, had complete autonomy over this generally economically self-supporting piece of land, which was managed by a *konohiki*. *Ahupuaʻa* (such as Honokaia) were usually wedge or pie-shaped, incorporating all of the eco-zones from the mountains to the sea and for several hundred yards beyond the shore, assuring a diverse subsistence resource base (Hommon 1986). Unlike Honokaia, Cordy (1994:13) describes the land locked, *mauka* land division of Kamoku as an *ʻokana*, which Lucas (1995:81) defines as (1) a district or subdistrict comprising several *ahupuaʻa*; (2) a section smaller in size than a *moku*; a term used only on certain islands; (3) a subdivision within either a *moku ʻāina* or *kalana*; (4) a division of country of several precincts; and (5) a portion. Dealing with the diversity of land division terms Handy

and Handy write of *ʻokana*, ". . . in Umi's day the island of Hawaii was divided first into large districts called ʻokana. ʻOkana is derived from the verb ʻoki, "to cut," with the participial suffix ana. Hence the island itself was "cut" into sections, as it had been "cut off" or detached in its formation, to become a moku" (1972:47).

It is not clear if Kamoku, the name of which literally translates as "the district *or* cut off portion" (Pukui et al. 1974), is an ancient land division or a more recent land division created from the upland portion of several *ahupuaʻa* that terminate at its *makai* boundary as a result the *Māhele ʻĀina* of 1848 (the latter seems more likely; see the discussion of the *Māhele* and the subsequent Boundary Commission hearings below). While Kamoku is not an *ahupuaʻa*, it along with Honokaia Ahupuaʻa, are two of eighty-seven land divisions located in East Hāmākua, a region that extends along the coast for roughly 21 miles from the upper slopes above Waipiʻo Valley to the North Hilo border (Cordy 1994). The *ahupuaʻa* of East Hāmākua cross-cut the major terrestrial resource zones so that the residents had access to agricultural lands and forest resources. They also included off-shore fishing territories for the procurement of marine resources (Cordy 1994). The land divisions of this region were mostly small – 0.1-0.4 miles wide, extending 2.5-4.0 miles inland – but a few, such as Honokaia, were wider at the coast and extended further inland. Honokaia extends 7.5 miles inland to a point where it is cut off by Nienie Ahupuaʻa at an elevation of about 3,600 feet above sea level. Kamoku, which is also a fairly wide land division, begins roughly 3.5 miles inland of the coast, and extends from an elevation of roughly 2,200 feet to 3,600 above sea level (a distance of about 6.5 miles) where it is cut off by Pāʻauhau Ahupuaʻa at the Hāmākua/South Kohala District boundary. There were only two very large *ahupuaʻa* in the Hāmākua District (Pāʻauhau and Kaʻohe *ahupuaʻa*) that included nearly all of the upper mountain lands.

The *aliʻi* and the *makaʻāinana* (commoners) were not confined to the boundaries of the *ahupuaʻa*; when there was a perceived need, they also shared with their neighbor *ahupuaʻa ohana* (Hono-ko-hau 1974). The *ahupuaʻa* were further divided into smaller sections such as the *ʻili, moʻoʻaina, paukuʻaina, kihapai, koele, hakuone*, and *kuakua* (Hommon 1986, Pogue 1978). The chiefs of these land units gave their allegiance to a territorial chief or *moʻi* (king). *Heiau* building flourished during the Expansion Period as religion became more complex and embedded in a sociopolitical climate of territorial competition. Monumental architecture, such as *heiau*, "played a key role as visual markers of chiefly dominance" (Kirch 1990:206). Waipiʻo was one of the most important religious and chiefly centers on the Island of Hawaiʻi, and a number of large *heiau* were maintained in the valley throughout the Precontact Period (Cordy 1994).

Līloa and his son ʻUmi were two of the most renowned rulers of the Pili line. Both were from Hāmākua and had their ruling centers in Waipiʻo (Cordy 1994). ʻUmi, who is often credited with uniting the island of Hawaiʻi under one rule, had a chiefly father (Līloa) and a mother (Akahi) who was a commoner (Kamakau 1992). Līloa met Akahi when he secretly left the valley to visit his other Hāmākua lands. As a young boy ʻUmi was raised in the countryside by his mother, but he soon moved to Waipiʻo to reside with his father and learn the chiefly ways (Kamakau 1992). Waipiʻo remained a leading chiefly center until the end of ʻUmi's reign around ca. 1620 (Cordy 1994).

The Proto-Historic Period (A.D. 1650–1795) is marked by both intensification and stress. Wars occurred between intra-island and inter-island polities. Sometime between A.D. 1736 and 1758, during the reign of Kalaniʻōpuʻu, Kamehameha I was born in the *ahupuaʻa* of Kokoiki, North Kohala near Moʻokini Heiau [there is some controversy about his birth year, see Kamakau 1992:66–68]. It has been related that at the time of his birth an army was encamped on the leeward Kohala shore preparing for an attack on Maui (Kamakau 1964; Tomonari-Tuggle 1988). The birth event is said to have occurred on a stormy night of rain, thunder, and lightning, signified the night before by a very bright, ominous star, thought by some to be Halley's comet [this is also controversial] (Kamakau 1992). Kamehameha's ancestral homeland was in Halawa, North Kohala (Williams 1919).

This period was one of continual conquest by the reigning *aliʻi*. In A.D. 1775 Kalaniʻōpuʻu and his forces, who had already conquered Hāna in eastern Maui, raided and destroyed the neighboring Kaupō district, then launched several more raids on Molokaʻi, Lānaʻi, Kahoʻolawe, and parts of West Maui. It was at the battle of Kalaeokaʻilio that Kamehameha, a favorite of Kalaniʻōpuʻu, was first recognized as a great warrior and given the name of Paiʻea (hard-shelled crab) by the Maui chiefs and warriors (Kamakau 1992).

History After Contact

Captain James Cook landed in the Hawaiian Islands on January 18, 1778, marking the end of the Precontact Period and the beginning of the Historic Period. The following January [1779], Cook and Kalaniʻōpuʻu met in Kealakekua Bay and exchanged gifts. In February, Cook set sail intending to leave the Hawaiian Islands; however, a severe storm off the Kohala coast damaged a mast and he was forced to return to Kealakekua. Cook's return occurred at an inopportune time, and this misfortune cost him his life (Kuykendall and Day 1976).

Around A.D. 1780 Kalani‘ōpu‘u proclaimed that his son Kiwalao would be his successor, and he gave the guardianship of the war god Kū‘kā‘ilimoku to Kamehameha. Many chiefs, concerned about their land claims, which Kiwalao did not seem to honor, preferred Kamehameha as the next ruler. Encouraged by these chiefs Kamehameha usurped Kiwalao’s authority during a sacrificial ritual in Ka‘ū. He then withdrew to his home district of Kohala where he farmed the land, growing taro and sweet potatoes (Handy and Handy 1972). After Kalani‘ōpu‘u died in A.D. 1782 civil war broke out, Kīwala‘ō was killed, and Kamehameha became the ruler of Hawai‘i Island. The wars between Maui and Hawai‘i continued until A.D. 1795 (Kuykendall and Day 1976; Handy and Handy 1972). Several battles were fought in the Hāmākua District during this period, and many of the religious structures in Waipi‘o Valley were destroyed (Hazlett et al. 2007).

In 1793-1794 Captain George Vancouver, who had previously visited Hawai‘i with Cook in 1778-1779, returned leading his own expedition. It was Vancouver who first introduced cattle to the Island of Hawai‘i, giving seventeen head to King Kamehameha as a gift (Barrére 1983). Kamehameha placed a *kapu* on the cattle, and they were driven to the upland plain of Waimea to increase and multiply (Vancouver in Kuykendall 1938). Archibald Menzies, a naturalist and surgeon with the Vancouver expedition, wrote the following description of the Hāmākua District in 1793 as he sailed off the coast:

> The land we passed in the forenoon rose in a steep bank from the water side and from thence the country stretched back with an easy acclivity for about four or five miles, and was laid out into little fields, apparently well cultivated and interspersed with the habitations of the natives. Beyond this the country became steeply rugged and woody, forming mountains of great elevation. (Menzies 1920:51)

Demographic trends during this period indicate population reduction in some areas, due to war and disease, yet increase in others, with relatively little change in material culture. There was a continued trend toward craft and status specialization, intensification of agriculture, *ali‘i* controlled aquaculture, upland residential sites, and the enhancement of traditional oral history. The Kū cult, *luakini heiau*, and the *kapu* system were at their peaks, although Western influence was already altering the cultural fabric of the Islands (Kirch 1985; Kent 1983). Foreigners had introduced the concept of trade for profit, and by the end of the 1700s, Hawai‘i saw the beginnings of a market system economy (Kent 1983). This marked the end of the Proto-Historic Period and the end of an era of uniquely Hawaiian culture.

Hawai‘i’s culture and economy continued to change drastically as capitalism and industry established a firm foothold during the Historic Period. The sandalwood (*Santalum ellipticum*) trade, established by Euro-Americans in 1790 and turned into a viable commercial enterprise by 1805 (Oliver 1961), was flourishing by 1810. This added to the breakdown of the traditional subsistence system, as farmers and fishermen were ordered to spend most of their time logging, resulting in food shortages and famine that led to population decline. Kamehameha did manage to maintain some control over the trade (Kuykendall and Day 1976; Kent 1983).

By 1796 Kamehameha, with the aid of foreign weapons and advisors, had conquered all of the island kingdoms except Kaua‘i. In 1810, when Kaumuali‘i of Kauai gave his allegiance to Kamehameha, the Hawaiian Islands were unified under a single rule (Kuykendall and Day 1976). Kamehameha would go on to rule the islands for another nine years. He and his high chiefs participated in foreign trade, but continued to enforce the rigid *kapu* system.

Kamehameha I died in 1819 at Kamakahonu in Kailua-Kona. With the passing of Kamehameha, his heir Liholiho was given the name of Kamehameha II. Ka‘ahumanu, the favorite wife of Kamehameha, announced the last commands of Kamehameha I:

> O heavenly one! I speak to you the commands of your grandfather. Here are the chiefs; here are the people of your ancestors; here are your guns; here are your lands. But we two shall share the rule over the land. Liholiho consented and became ruling chief over the government. (Kamakau 1992:220)

Following the death of a prominent chief, it was customary to remove all of the regular *kapu* that maintained social order and the separation of men and women and elite and commoner. Thus, following Kamehameha’s death a period of *‘ai noa* (free eating) was observed along with the relaxation of other traditional *kapu*. It was for the new ruler and *kahuna* to re-establish *kapu* and restore social order, but at this point in history traditional customs changed:

> The death of Kamehameha was the first step in the ending of the tabus; the second was the modifying of the mourning ceremonies; the third, the ending of the tabu of the chief; the fourth, the ending of carrying the tabu chiefs in the arms and feeding them; the fifth, the ruling chief’s decision to introduce free eating (‘*ainoa*) after the death of Kamehameha; the sixth, the cooperation of his aunts, Ka-ahu-manu and Ka-heihei-malie; the seventh, the joint action of the chiefs in eating together at the suggestion of the ruling chief, so that free eating became an established fact and the

> credit of establishing the custom went to the ruling chief. This custom was not so much of an innovation as might be supposed. In old days the period of mourning at the death of a ruling chief who had been greatly beloved was a time of license. The women were allowed to enter the heiau, to eat bananas, coconuts, and pork, and to climb over the sacred places. You will find record of this in the history of Ka-ula-hea-nui-o-ka-moku, in that of Ku-ali‘i, and in most of the histories of ancient rulers. Free eating followed the death of the ruling chief; after the period of mourning was over the new ruler placed the land under a new tabu following old lines. (Kamakau 1992: 222)

Immediately upon the death of Kamehameha I, Liholiho was sent away to Kawaihae to keep him safe from the impurities of Kamakahonu brought about by the death of Kamehameha. After purification ceremonies Liholiho returned to Kamakahonu:

> Then Liholiho on this first night of his arrival ate some of the tabu dog meat free only to the chiefesses; he entered the *lauhala* house free only to them; whatever he desired he reached out for; everything was supplied, even those things generally to be found only in a tabu house. The people saw the men drinking rum with the women *kahu* and smoking tobacco, and thought it was to mark the ending of the tabu of a chief. The chiefs saw with satisfaction the ending of the chief’s tabu and the freeing of the eating tabu. The *kahu* said to the chief, “Make eating free over the whole kingdom from Hawaii to Oahu and let it be extended to Kauai!” and Liholiho consented. Then pork to be eaten free was taken to the country districts and given to commoners, both men and women, and free eating was introduced all over the group. Messengers were sent to Maui, Molokai, Oahu and all the way to Kauai, Ka-umu-ali‘i consented to the free eating and it was accepted on Kauai. (Kamakau 1992: 225)

When Liholiho, Kamehameha II, ate the *kapu* dog meat, entered the *lauhala* house and did whatever he desired it was still during a time when he had not reinstituted the eating *kapu* but others appear to have thought otherwise. Kekuaokalani, caretaker of the war god Kū‘kā‘ilimoku, was dismayed by his cousin’s (Liholiho) actions and revolted against him, but was defeated.

With an indefinite period of free-eating and the lack of the reinstatement of other *kapu* extending from Hawai‘i to Kaua‘i, and the arrival of the Christian missionaries shortly thereafter, the traditional religion had been officially replaced by Christianity within a year following the death of Kamehameha I. By December of 1819 Kamehameha II had sent edicts throughout the kingdom renouncing the ancient state religion, ordering the destruction of the *heiau* images, and ordering that the *heiau* structures be destroyed or abandoned and left to deteriorate. He did, however, allow the personal family religion, the ‘*aumakua* worship, to continue (Oliver 1961; Kamakau 1992).

With the end of the *kapu* system changes in the social and economic patterns began to affect the lives of the common people. Liholiho moved his court to O‘ahu, lessening the burden of resource procurement for the chiefly class on the residents of Hawai‘i Island. Some of the work of the commoners shifted from subsistence agriculture to the production of foods and goods that they could trade with early Western visitors. Introduced foods often grown for trade included yams, coffee, melons, Irish potatoes, Indian corn, beans, figs, oranges, guavas, and grapes (Wilkes 1845).

In October of 1819, seventeen Protestant missionaries had set sail from Boston to Hawai‘i. They arrived in Kailua-Kona on March 30, 1820 to a society with a religious void to fill. Many of the *ali‘i*, who were already exposed to western material culture, welcomed the opportunity to become educated in a western style and adopt their dress and religion. Soon they were rewarding their teachers with land and positions in the Hawaiian government. During this period, the sandalwood trade was wreaking havoc on the commoners, who were weakening with the heavy production, exposure, and famine just to fill the coffers of the *ali‘i* who were no longer under any traditional constraints (Oliver 1961; Kuykendall and Day 1976). In 1823 the Reverend William Ellis, one of the early missionaries, wrote:

> About eleven at night we reached Towaihae [Kawaihae], where we were kindly received by Mr. Young. . . . Before daylight on the 22nd, we were roused by vast multitudes of people passing through the district from Waimea with sandal-wood, which had been cut in the adjacent mountains for Karaimoku, by the people of Waimea, and which the people of Kohala, as far as the north point, had been ordered to bring down to his storehouse on the beach, for the purpose of its being shipped to Oahu. There were between two and three thousand men, carrying each from one to six pieces of sandal-wood, according to their size and weight. It was generally tied on their backs by bands of ti leaves, passed over the shoulders and under the arms, and fastened across their breasts. (Ellis 2004:405-406)

Prior to the stop over in Kawaihae, Ellis and his party (fellow missionaries Mr. Thurston, Mr. Bishop, and Mr. Goodrich) had passed through the Hāmākua District. Ellis described the area near the Hilo/Hāmākua border thusly:

> The high land over which we passed was generally woody, though the trees were not large. The places that were free from wood, were covered with long grass and luxurient ferns. The houses mostly stood singly, and were scattered over the face of the country.
>
> A rich field of potatoes or taro, five or six acres sometimes in extent, or large plantations of sugar-cane and bananas, ocassionlly bordered our path. But though the soil was excellent, it was only partially cultivated. The population also appeared less than what we had seen inhabiting some of the most desolate parts of the island. (Ellis 2004:352)

While in Hāmākua, Ellis also elaborated on the Hawaiian methods of marking boundaries:

> The geographical divisions of Hawaii, and other islands of the group are sometimes artificial, and a stone image, a line of stones somewhat distant from each other, a path, or a stone wall, serves to seperate the different districts or larger divisions from each other. They are, however, more frequently natural, as in the present instance, where a water course, winding through the center of the valley, marked the boundary of these two divisions. The boundary of the smaller districts, and even the different farms, as well as the large divisons, are definitely marked, well understood, and permanent.
>
> Each division, district, village, and farm, and many of the sites of houses, have a distinct name, which is often significant of some object or quality distinguishing the place. (Ellis 2004: 352-353)

At Kapulena (to the northwest of the current project area) Ellis' party split into two groups; Ellis and Thurston continued northwest following the coast to Waipi‘o Valley, and Bishop and Goodrich proceed inland to Waimea, passing nearby the current project area:

> On Monday morning Messers. Bishop and Goodrich commenced their journey to Waimea. Having procured a man to carry their baggage, they left Kapulena, and taking an inland direction, passed over a pleasent country, gently undulated with hill and dale. The soil was fertile, the vegetation flourishing, and there was considerable cultivation, though but few inhabitants. (Ellis 2004:357)

By the mid-nineteenth century, the ever-growing population of Westerners in Hawai‘i forced socioeconomic and demographic changes that promoted the establishment of a Euro-American style of land ownership, and in 1848 the *Māhele ‘Āina* became the vehicle for determining ownership of native lands. This change in land tenure was promoted primarily by the missionaries and Western businessmen in the island kingdom. Generally these individuals were hesitant to enter business deals on leasehold land. The *Māhele* (division) defined the land interests of Kamehameha III (the King), the high-ranking chiefs, and the *konohiki*. During the *Māhele*, all lands in the Kingdom of Hawai‘i were placed in one of three categories: (1) Crown Lands (for the occupant of the throne); (2) Government Lands; and (3) *Konohiki* Lands (Chinen 1958:vii and Chinen 1961:13). The chiefs and *konohiki* were required to present their claims to the Land Commission to receive awards for lands provided to them by Kamehameha III. They were also required to provide commutations to the government in order to receive royal patents on their awards. The lands were identified by name only, with the understanding that the ancient boundaries would prevail until the land could be surveyed. This process expedited the work of the Land Commission. As a result of the *Māhele* Honakaia Ahupua‘a was retained as Crown Land and the ‘Okana of Kamoku became Government Land.

All lands awarded during the *Māhele* were subject to the rights of the native tenants therein; those individuals who lived on the land and worked it for their subsistence and the welfare of the chiefs (Sinoto and Kelly 1970). Native tenants could claim, and acquire title to, *kuleana* parcels that they actively lived on or farmed at the time of the *Māhele*. The Kuleana Act of December 21, 1849 provided the framework by which native tenants could apply for and receive fee-simple interest in their *kuleana* lands from the Land Commission. The Board of Commissioners over saw the program and administered the lands as Land Commission Awards (LCAw.). Not all lands that were claimed were awarded. A review of the Waihona ‘Aina Database indicates that in Honokaia Ahupua‘a sixteen *kuleana* parcels were claimed, but only twelve were awarded. The awarded parcels ranged from 1.0 to 17.5 acres in size. All of the awarded LCAw. were located well *makai* of the current project area within 3 or 4 kilometers of the coast (Fong et al. 2005). No *kuleana* claims are listed for Kamoku ‘Okana.

The proceedings of the Land Commission ushered in changes in the traditional Hawaiian land tenure system that enabled foreigners to purchase lands which had previously been unavailable to them. During the middle to late 1800s Western businessmen established a number of diverse industries throughout the Islands on these newly available lands.

In 1848 John Palmer Parker, founder of the Parker Ranch, received two acres of land at Mānā (in Kamoku ʻOkana *mauka* of the current project area) where he built a family house and the first ranch buildings (Bergin 2004). In 1850 he purchased 640 acres surrounding Mānā (Grant No. 358), and in 1851 he purchased another 1,000 acres. This land became the nucleus of Parker Ranch (Bergin 2004). The ranch slowly expanded from its center at Mānā by acquiring and leasing many of the lands of the Kohala and Hāmākua Districts. By the mid-1850's John Parker had turned most of the day to day operations of Parker Ranch over to his son, John Palmer Parker II.

A map of a tract of Hāmākua Government land (Nienie Ahupuaʻa) prepared in 1859 by the surveyor S. C. Wiltse (Hawaiʻi Registered Map No. 52) shows the relationship between J. P. Parker's Mānā lands (in Kamoku ʻOkana) and Honokaia Ahupuaʻa (Figure 16). The Parker lands are located in the upper right hand portion of the map. A peach tree is shown marking the corner of that land. The *mauka* line of an "unbroken *ʻōhiʻa* and fern forest" is depicted just to the northeast of the Parker lands, passing by the southwestern corner of Honokaia Ahupuaʻa. Along the eastern edge of Honokaia a trail labeled "Honokaia Trail" is shown following the boundary of the *ahupuaʻa* to the *mauka* boundary of Kawela Ahupuaʻa, where it cuts across that land division.

The written history from the late 19th to the early 20th century largely reflects news of new settlers, religious endeavors, and commercial pursuits in the region. McEldowney (1983) discusses changes in land use and land ownership before and after the *Māhele*, with the eventual displacement of the Hawaiian community as cattle ranching became fully established in the Waimea area. An 1848 description of the population is as follows: "it can scarcely be said that there is any native population at all" (McEldowney 1983:432). The change in land use and ownership was very deliberate and strategic. Once land became a monetary commodity, Hawaiians were often forced off their house lots (and livelihoods) simply because they lacked the cash with which to make the purchase (of land) or pay the property tax.

In 1862, the Commission of Boundaries (Boundary Commission) was established in the Kingdom of Hawaiʻi to legally set the boundaries of the *ahupuaʻa* that were awarded during the *Māhele*. Subsequently, in 1874, the Commissioners of Boundaries was authorized to certify the boundaries for lands brought before them. The primary informants for the boundary descriptions were old native residents of the lands, many of whom had also been claimants for *kuleana* during the *Māhele*. The boundary testimonies were collected primarily between 1873 and 1885 and were usually given in Hawaiian, but transcribed in English as they occurred. Boundary testimony for Honokaia Ahupuaʻa was provided to the Boundary Commission by Makaenaena on April 18, 1873. Makaenaena, who was "born before collecting of sandalwood by Boki" (ca. 1829; Kuykendall 1938), may have been about fifty years old at the time of his testimony. In his description Makaenaena not only names several places in the immediate vicinity of the current project area, but provides insights regarding Precontact land use within the *ahupuaʻa*. Makaenaena had previously accompanied the Government Surveyor S. C. Wiltse in March of 1873 while he surveyed the boundary between Kawela and Honokaia *ahupuaʻa*, as well as the boundary between Honokaia and Kamoku (Figure 17). Makaenaena's testimony is as follows:

> Makaenaena K. sworn, says:
>
> I was born at Kawela Hamakua, Island of Hawaii, before the time of collecting sandalwood on the mountains. Have always lived on Kawela and Honokaia. I am a kamaaina of these lands. My father Moopua (now dead) showed me these boundaries when I went with him to catch birds. If we caught birds on other lands, the Luna of those lands, would take the birds away from us, and so he pointed out the boundaries to me. Honokaia is bounded on the makai side by the Sea; on the South East side by Kawela and Au 1st, mauka by Kamoko [Kamoku], North West side by Kamoko, Kapoaula and Malanahae. There were always in old times fisheries belonging to Honokaia extending out to sea a short distance. The boundary at the shore between Honokaia and Kawela is a large rock in the Sea called Pohakulelehu: From this point the boundary between these two lands runs mauka to a grove of Puhala trees called Paihala, thence mauka to place at old road called Kuaiwahia: Thence mauka to grove of Puhala trees called Puanapouli: Thence to small hill called Kulanahae: Thence across Government road to hill called Puuainako: Thence to a small mound Wiliwilihalou: Thence to a grove of small ohia trees on the side of a pali at place called Kauluawaa: Thence to waterhole called Kauluawaa: Thence to grove of ohia trees Kuhewa: The place called Ohiakiihelele is on the land Honokaia a short distance from the boundary: From Kuhewa the boundary runs mauka to Kawelaloa: Thence to Kawahine: The boundary from the shore follows up the iwi aina: From Kawahine to to [sic] Inoino gulch, and mauka to a pali called Palinui: The brow of pali is boundary, level land is on Honokaia, and pali on Kawela: Thence along brow of pali and on to Pakeke: Thence to Pohokai: Thence up a ridge to Pohopuumaia, at this point cross the Inoino gulch: Thence to place called Puuloa at the old Kawela road: Thence follow up the old road to Nahaleopaa a puu pahoehoe

> in Inoino kahawai*:* the mauka corner of Kawela where it is cut off by Au 1st: The place where the boundary of Honokaia enters the woods is at the water hole Kaohiawaa mauka of the grove of ohia trees of the same name.
>
> From Nahaleopaa the boundary between Honokaia and Au 1st follows up the old road Honokaia one side of road and Au 1st on other, to place called Puuokane hekili (a small hill or mound): Thence along road to a hill Puupohaku: Thence to old mamake [*māmaki*] ground called Waiakekukai: Thence to Kalapahaaha: Thence to small hill Puulepo: Thence to Waiakahoi a Kahawai with a cave it where the bird catchers used to live: Thence Honokaia ends and Au is cut off by Kamoko: Thence boundary of Honokaia runs along Kamoko to old Mamake ground called Kumaweo: Thence to Mamake grounds called Nakikapio: Thence to a ridge called Makaleha: Thence makai to a hill Kalapaaki: Thence to Kalapa Hapu the mauka corner of land of Kapoaula The corner of Kamoku on boundary of Honokaia.
>
> I went with Wiltse when he surveyed the boundary between Honokaia and Kawela, marked trees and pointed out boundaries. Kaikauna went with us. I was born before the collecting of sandalwood by Boki. . . . (Boundary Commission, Hawaii, Vol. A, No. 1, pgs. 238-240)

From Makaenaena's testimony we learn that the upper portion of Honokaia Ahupua'a was an *'ōhi'a* forest that once contained resources such as *māmaki* and birds. The bird catchers of Honokaia would stay in a cave in a *kahawai* (ravine) called Waiakahoi when they were in the uplands. An old trail/road called Honokaia also passed through the area. The route of this old transportation route is shown on Hawai'i Registered Map No. 572 prepared by R. Covington in 1881 (Figure 18). The current project area crosses the boundary of Honokaia Ahupua'a (into Kamoku 'Okana) between the *māmaki* grounds of Nakikapio and the hill called Kalapaaki, somewhere in the vicinity of Makaleha ridge. No boundary testimony was collected for the Government Land of Kamoku during the Boundary Commission hearings of the late 1800s. However in an 1898 hearing for an *ahupua'a* in the District of Puna on the Island of Hawai'i, Rufus A. Lyman, Esquire, Commissioner of Boundaries, 3rd & 4th Judicial Circuits, related that Kamoku was a very unusual land division, which he suggests may have come about as a result of the boundaries of other land divisions being forgotten – as knowledgeable, older Hawaiians passed away during the mid-1800s, and the lands ceased to be used – rather than as an ancient division of *mauka* lands. Lyman relates:

> I commenced traveling around Island of Hawaii in 1866, and in 1871 commenced setting boundaries of lands on Hawaii, and from the middle of 1866, until I resigned as Commissioner of Boundaries in November 1878, I frequently went around Hawaii, and onto the three mountains, and during all that time had more or less to do with looking after lands belonging to the Kings and Chiefs, advising the different konohiki, and settling their disputes, and a Tract called Kamoku in Hamakua, was the only place on the whole Island of Hawaii, that I found, that appeared to have fallen to the Government as a sort of No man's land. And I found kamaaina ready to give evidence, as to land boundaries all through North Kohala hills, the Kona Mountains, and the old bird catchers too feeble to go into the woods, were ready to dispute with the younger men about boundaries. . . My experience is, that in olden times every portion of the land on Island of Hawaii, was included in some division of land, and the name of land and the boundaries were known to the kamaaina living there or in neighborhood, but as the people ceased to go to collect sandalwood, to catch birds for food, the uwau; and Oo, & mamo and other birds for lei hulu for the high chiefs, and for various other reasons, among them, the decrease in population, that the knowledge of boundaries, names of localities &c has been gradually passing away, especially in places where the traveling is difficult, and now no doubt, knowledge of localities is so limited among the young men of North Kohala, and upper Keauhou lands, that irregular shaped remnants are found now, where formerly none existed. (Boundary Commission Hawai'i, Vol. D, No. 5, Pgs. 176-177)

By the mid to late 1800s the Hawaiian culture was well on its way towards Western assimilation as industry in Hawai'i went from the sandalwood trade, to a short-lived whaling industry, to the more lucrative, but environmentally destructive sugar and cattle industries. Sugarcane was grown on all islands, and when Cook arrived he wrote of seeing sugarcane plantations. Sugarcane was a Polynesian introduction and served a variety of uses. The *kō kea* or white cane was the most common, usually planted near Hawaiian homes for medicinal purposes, and to counteract bad tastes (Handy and Handy 1972:185). Sugarcane was a snack, condiment, famine food; fed to nursing babies, and helped to strengthen children's teeth by chewing on it (Handy and Handy 1972:187). It was used to thatch houses when *pili* grass or *lau hala* were not abundant (Malo 1903). The Chinese on Lāna'i are credited with producing sugar first, as early as 1802. However, it was not until 1835 that sugar became established commercially, replacing the waning sandalwood industry (Oliver 1961, Kuykendall and Day 1976).

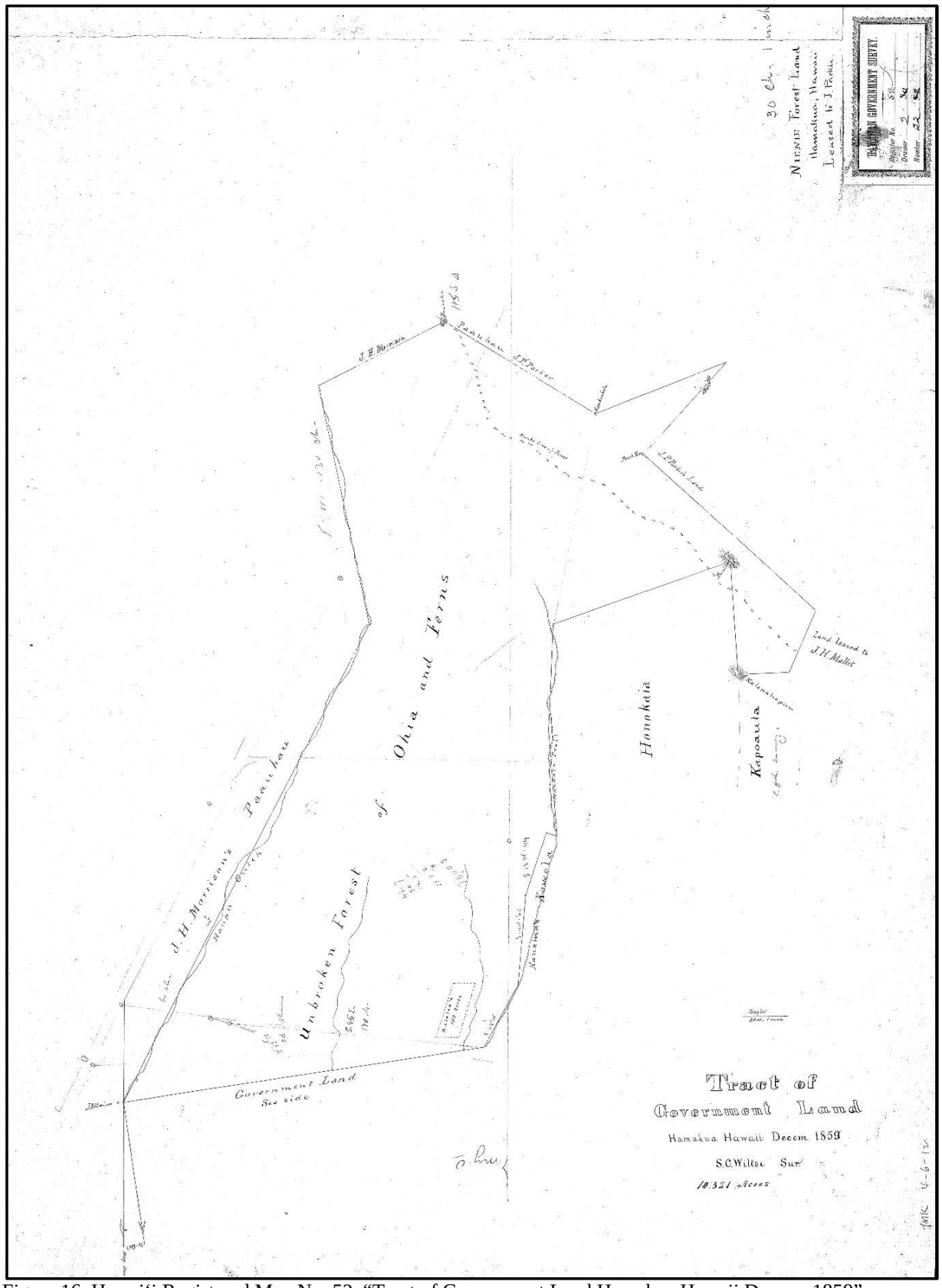


Figure 16. Hawai‘i Registered Map No. 52, “Tract of Government Land Hamakua Hawaii Decem. 1859”, surveyed by S. C. Wiltse.

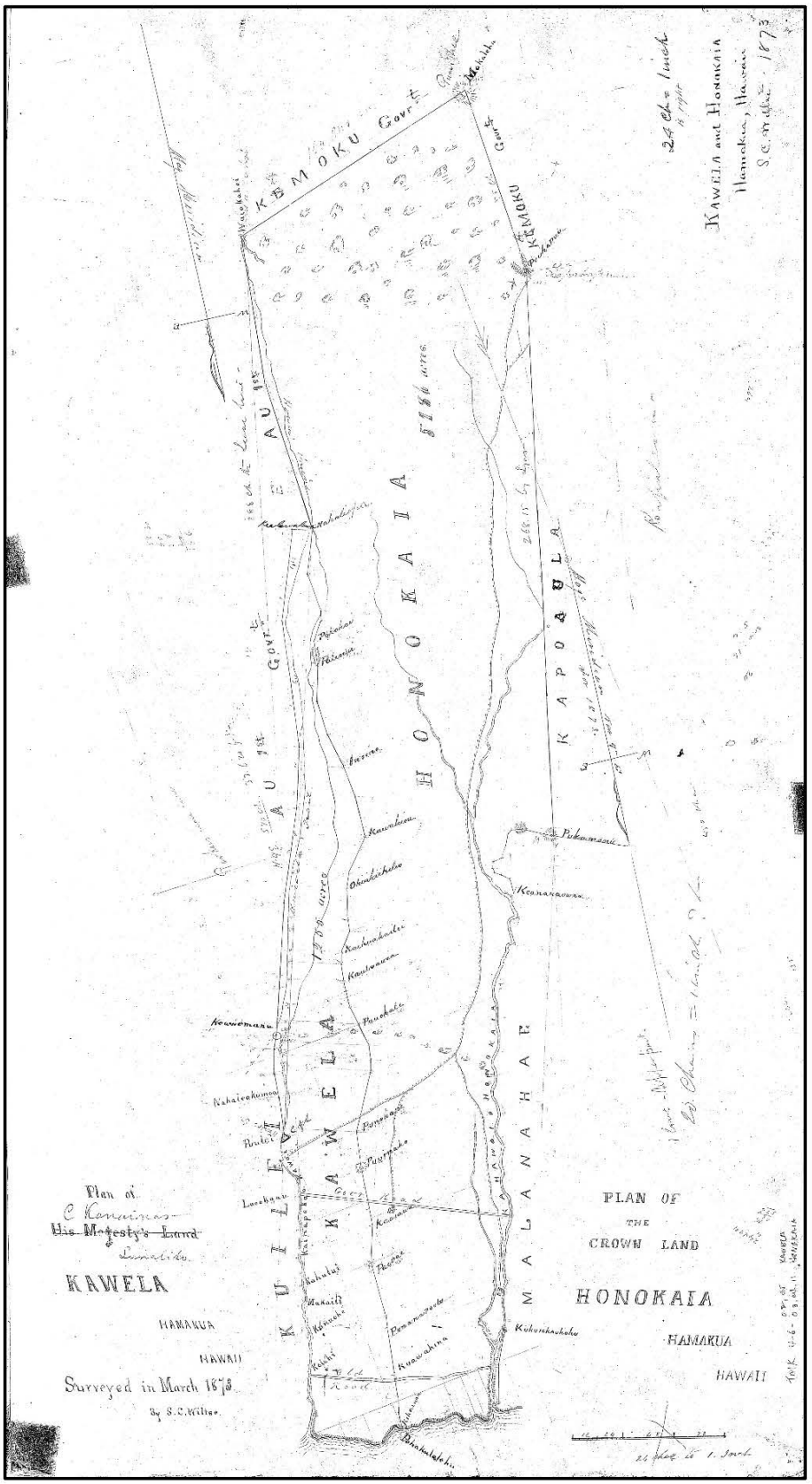


Figure 17. Hawai‘i Registered Map No. 59, “Kawela and Honokaia Hamakua, Hawai‘i” surveyed by S. C. Wiltse, March 1873.

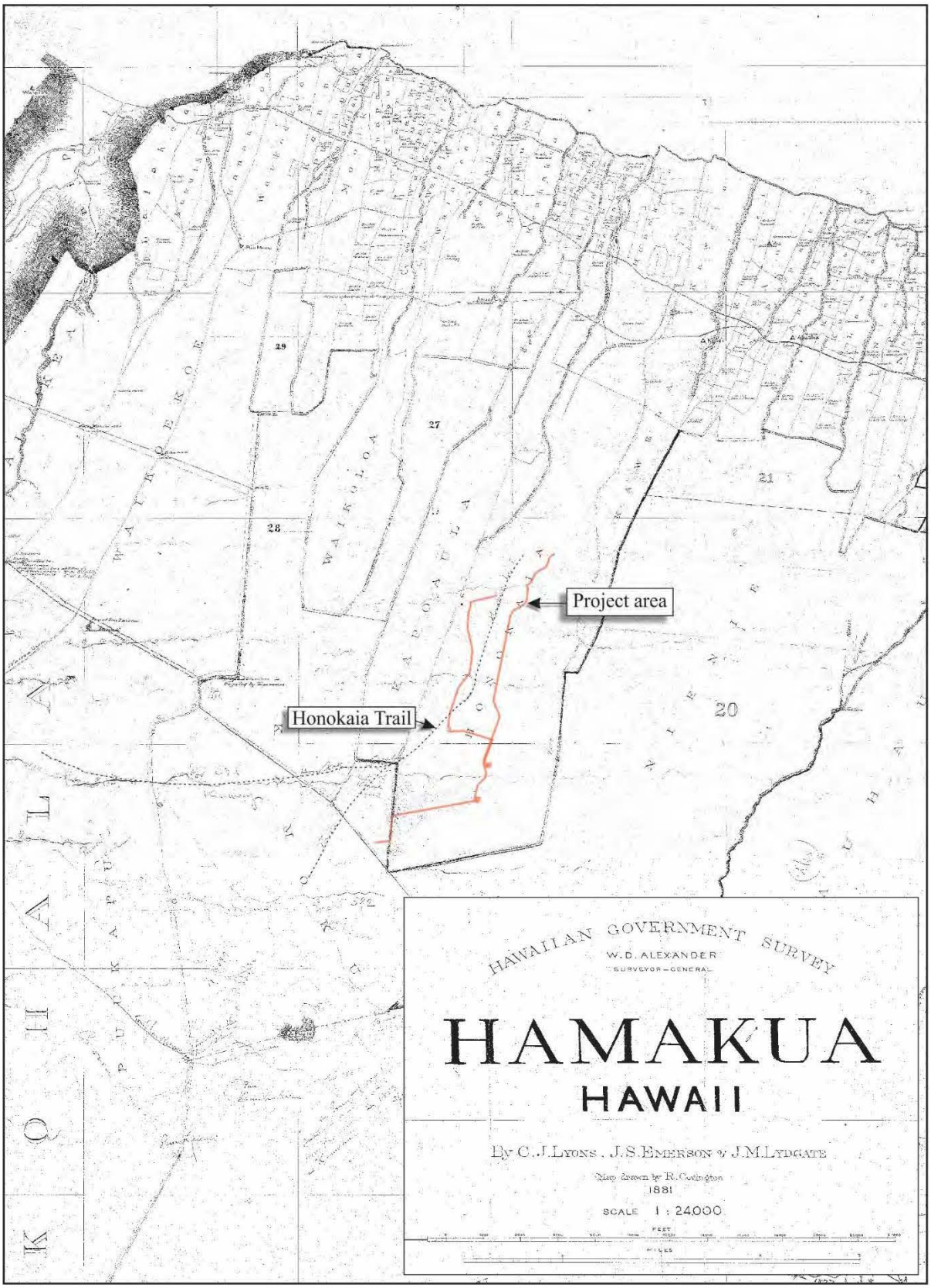


Figure 18. Portion of Hawai‘i Registered Map No. 572 (prepared by R. Covington in 1881) showing the current project area.

Following the signing of a reciprocity treaty between the Kingdom of Hawai‘i and the United States of America in 1876, sugar plantations developed rapidly throughout the islands (Fong et al. 2005). Between 1876 and 1888 twenty sugar plantations sprang up along the Hāmākua coast (Dorrance and Morgan 2000). In 1878 the first sugar mill was established in the Hāmākua District, and due to its rich soil and plentiful water supply the district soon became the premiere location for growing sugar on the Island of Hawai‘i (Hazlett et al. 2007). The seaward portions of Honokaia Ahupua‘a (up to 1,400 feet elevation) were included in the lands of the Honoka‘a Sugar Company (1876-1979). The fields were originally unirrigated and for twenty-five years ratoon crops were grown in many areas because reaching the fields to replant was difficult. Eventually harvesting was accomplished using a combination of hand labor, flumes, and railroad (Dorrance and Morgan 2000).

The current project area was not part of any sugar plantation, but instead became part of Parker Ranch. By the end of the nineteenth century a large portion of Honokaia Ahupua‘a and Kamoku ‘Okana, including the current project area, had been leased by the ranch for cattle grazing purposes. By this time a “new” road to Waimea (the Old Māmalahoa Highway) had been constructed across Honokaia Ahupua‘a forming the *makai* boundary of the current project area, and the Hamakua Ditch Company had begun construction of an Upper Hāmākua Ditch to water the sugarcane fields in the area. The ditch, which brought water from Kawainui Stream in the Kohala Mountains to the Honoka‘a Plantation and beyond (*makai* of the current project area) was completed in August of 1907 (Wilcox 1996). In 1909 the Hamakua Ditch Company became the Hawaiian Irrigation Company, and under that name work began on a second ditch, the Lower Hāmākua Ditch, which carried water from Waipi‘o Stream to the Honoka‘a Plantion and beyond. The Lower Hāmākua Ditch was completed in 1910 (Wilcox 1996).

Hawai‘i Registered Map No. 2460 (prepared by A. J. Williamson in 1909) shows the location of the “new” road to Waimea, the Upper and Lower Hamakua Ditches, and the relationship between the Honoka‘a Sugar Plantation lands and the Parker Ranch lands in Honokaia Ahupua‘a and Kamoku ‘Okana (Figure 19). A later map that shows only the *makai* boundary of the current project area (Hawai‘i Registered Map No. 2761 prepared by Chas. L. Murray in 1927), shows that the road to Waimea (labeled “Government Road”) was realigned during the first quarter of the twentieth century (Figure 20). Dates of construction for the bridges fronting the survey area along the current alignment of the Old Māmalahoa Highway indicate that the realignment occurred in 1924 (MKE and Fung 2013).

In 1921, the federal government of the United States passed the Hawaiian Homes Commission Act and set aside approximately 200,000-acres in the Territory of Hawai‘i (including portions of Honokaia and Kamoku) as a land trust for homesteading by native Hawaiians (administered by the Hawaiian Homes Commission). The stated purpose of the act was returning native Hawaiians to the land in order to maintain traditional ties to the land, but the distribution of these lands to Hawaiian homesteaders proceeded very slowly. The Parker Ranch leases of Honokaia (General Lease No. 823) and Kamoku (General Lease No. 593), which were set to expire in 1928 (Figure 21), were renewed once again that year, but by 1952 the Kamoku lease area had reverted back to the Hawaiian Homes Commission and was distributed amongst several Hawaiian lessees (Spitz 1964). The Honokaia lease area was divided into four lots around this time (Figure 22), all of which continued to be leased by Parker Ranch. A 1951 map of the Hawaiian Home Lands between Kamoku and Kapulena (Plat 6.2 HH; Figure 23) shows the distribution of waterholes, ranch trails, and fence lines within the Honokaia and Kamoku lease areas.

In 1960, the Hawai‘i State Legislature created the Department of Hawaiian Home Lands (DHHL) for the purposes of administering the Hawaiian home lands program and managing the Hawaiian home lands trust. Yet by 1990, the Honokaia DHHL lands had not been distributed to its beneficiaries and still remained Parker Ranch pasture. In that year a group of prospective Hawaiian homesteaders known as the Aged Hawaiians, several of whom had originally applied for pasture leases in 1952, sued DHHL for release of the Honokaia lands. After a fifteen year legal battle the lands were released and in ca. 2005 the Honokaia Pastoral Lots Subdivision was created. Now divided among a number of different DHHL lessees, the lands encompassed by the current project area continue to be used as pasture.

Figure 19. Hawai‘i Registered Map No. 2640 (prepared by A. J. Williamson in 1909) showing the current project area.

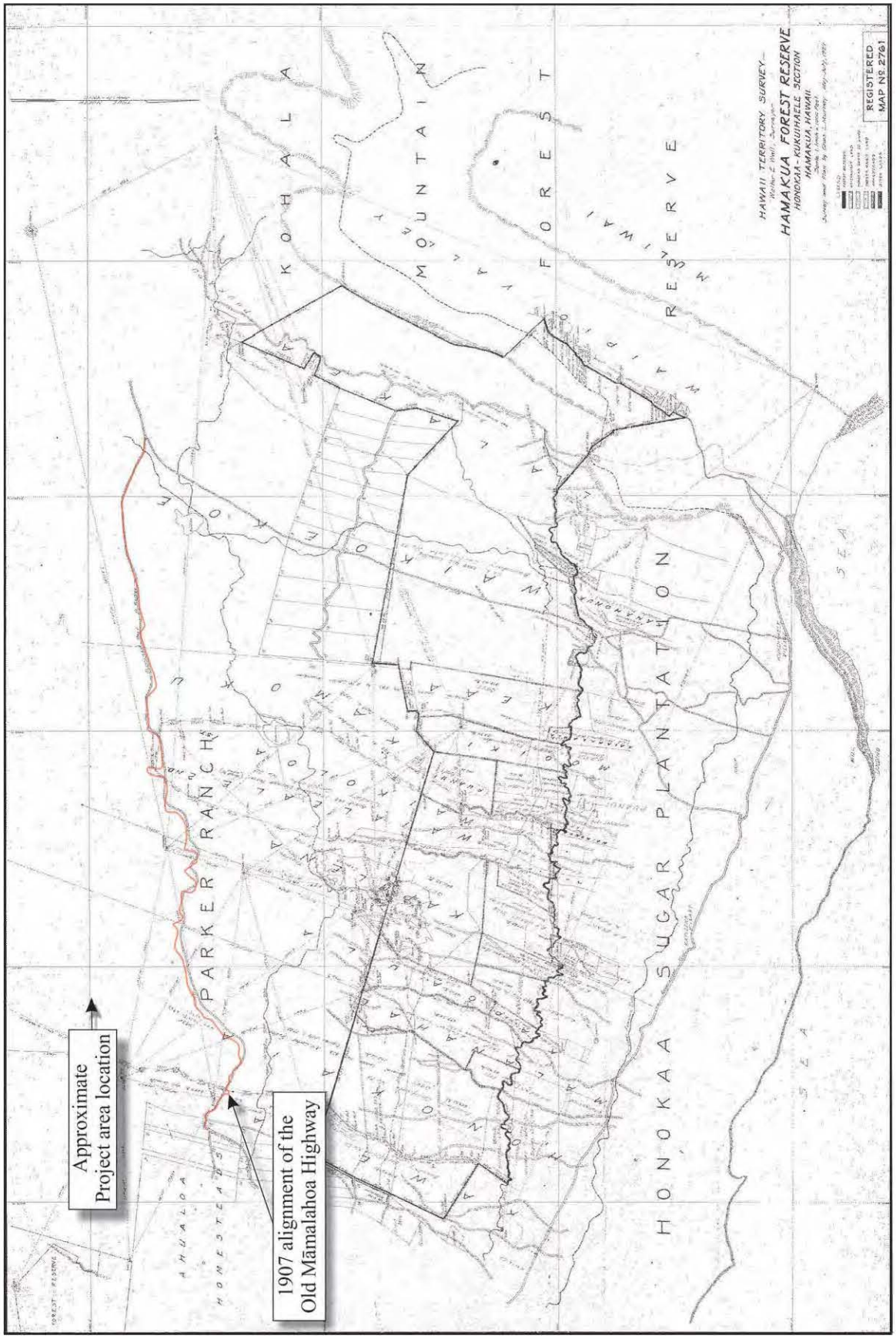


Figure 20. Hawai'i Registered Map No. 2761 (prepared by Chas. L Murray in 1927) showing the realigned Government Road

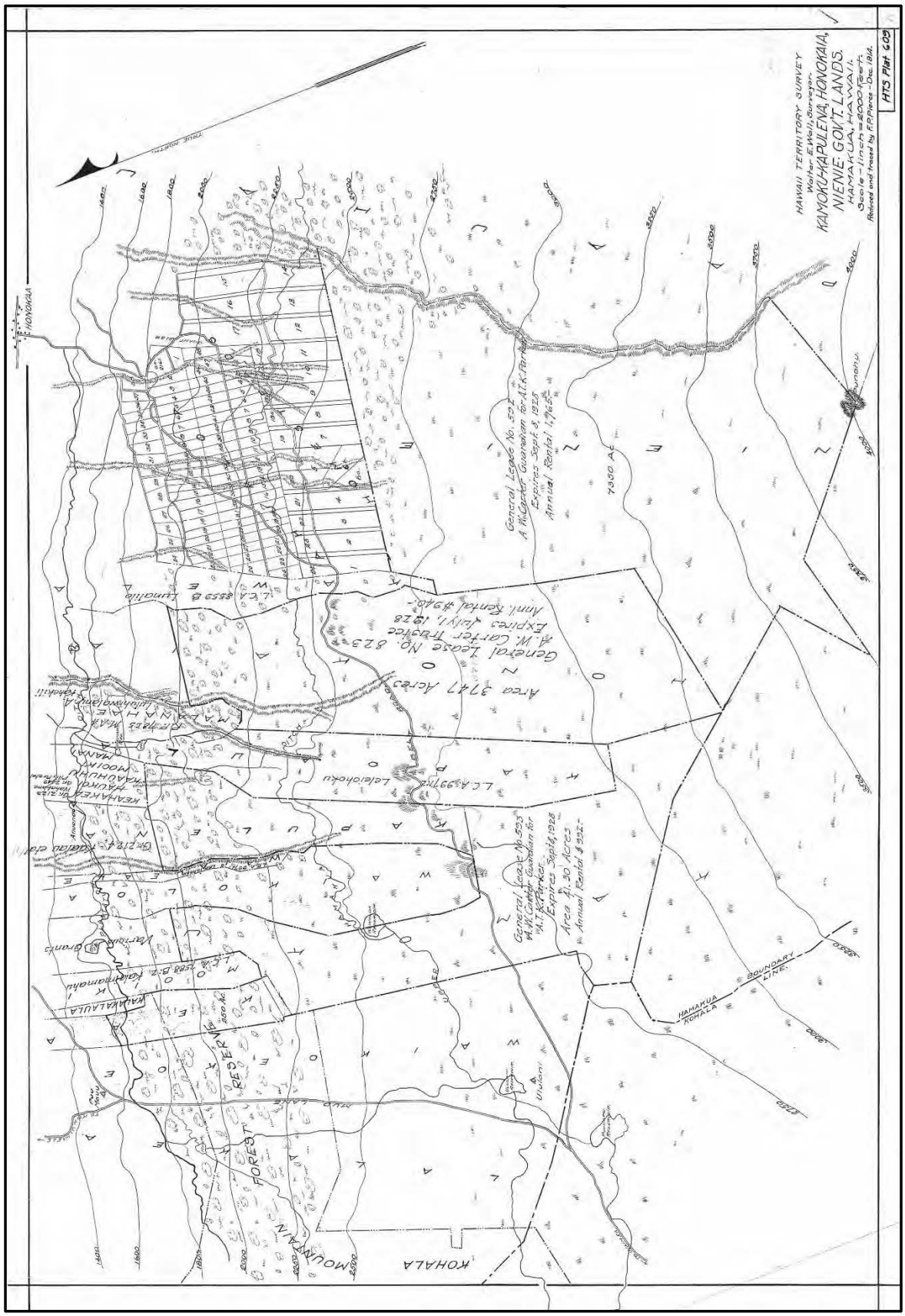


Figure 21. HTS Plat 609 (traced by F.P Pierce Dec. 1914) showing the Parker Ranch General Leases Nos. 593 and 823 in Honokaia and Kamoku.

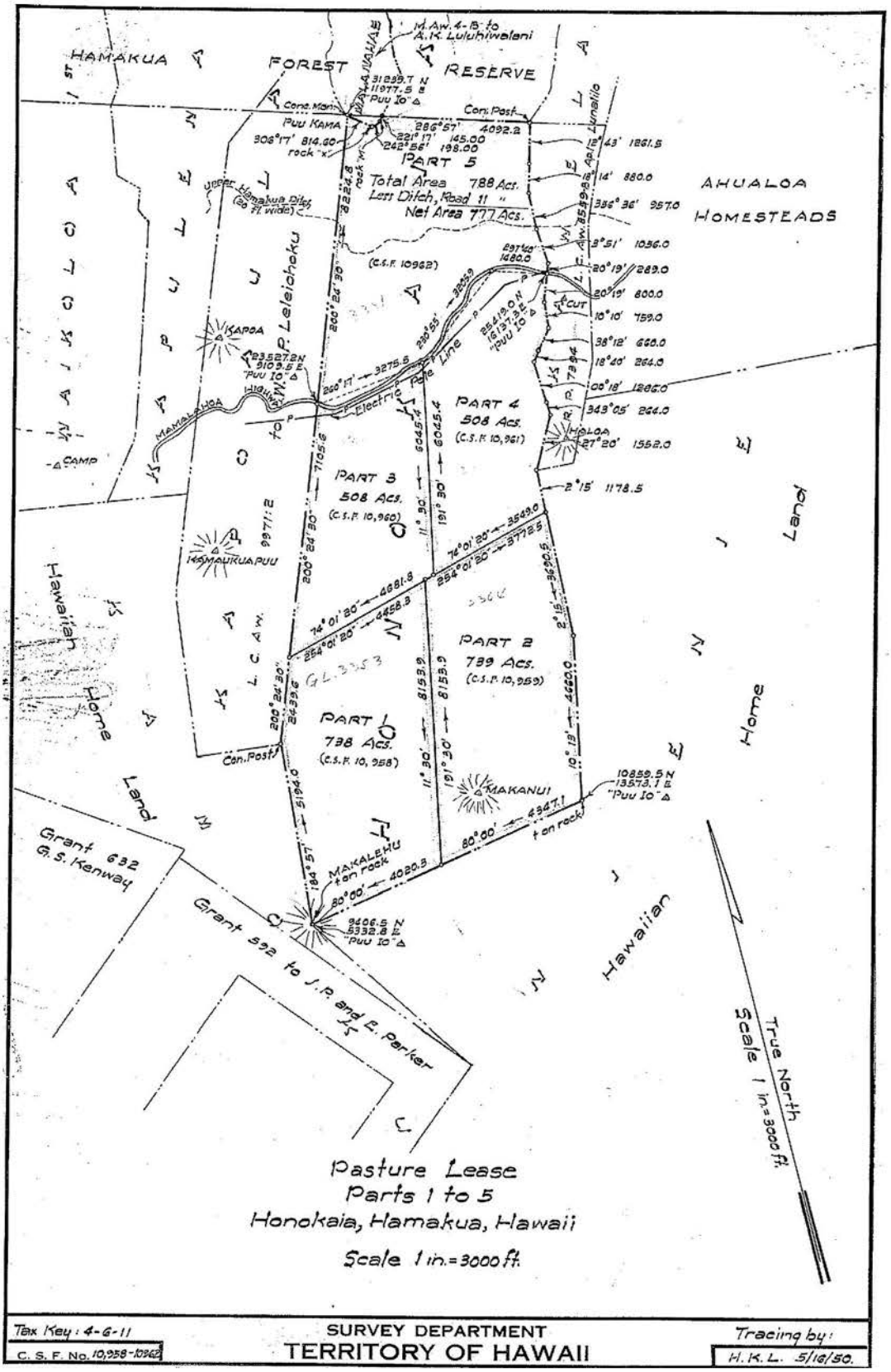


Figure 22. Pasture Lease in Honokaia, Hāmākua, Hawai‘i (C.S.F. 10958-10962; tracing by H.K.L. 5/16/50).

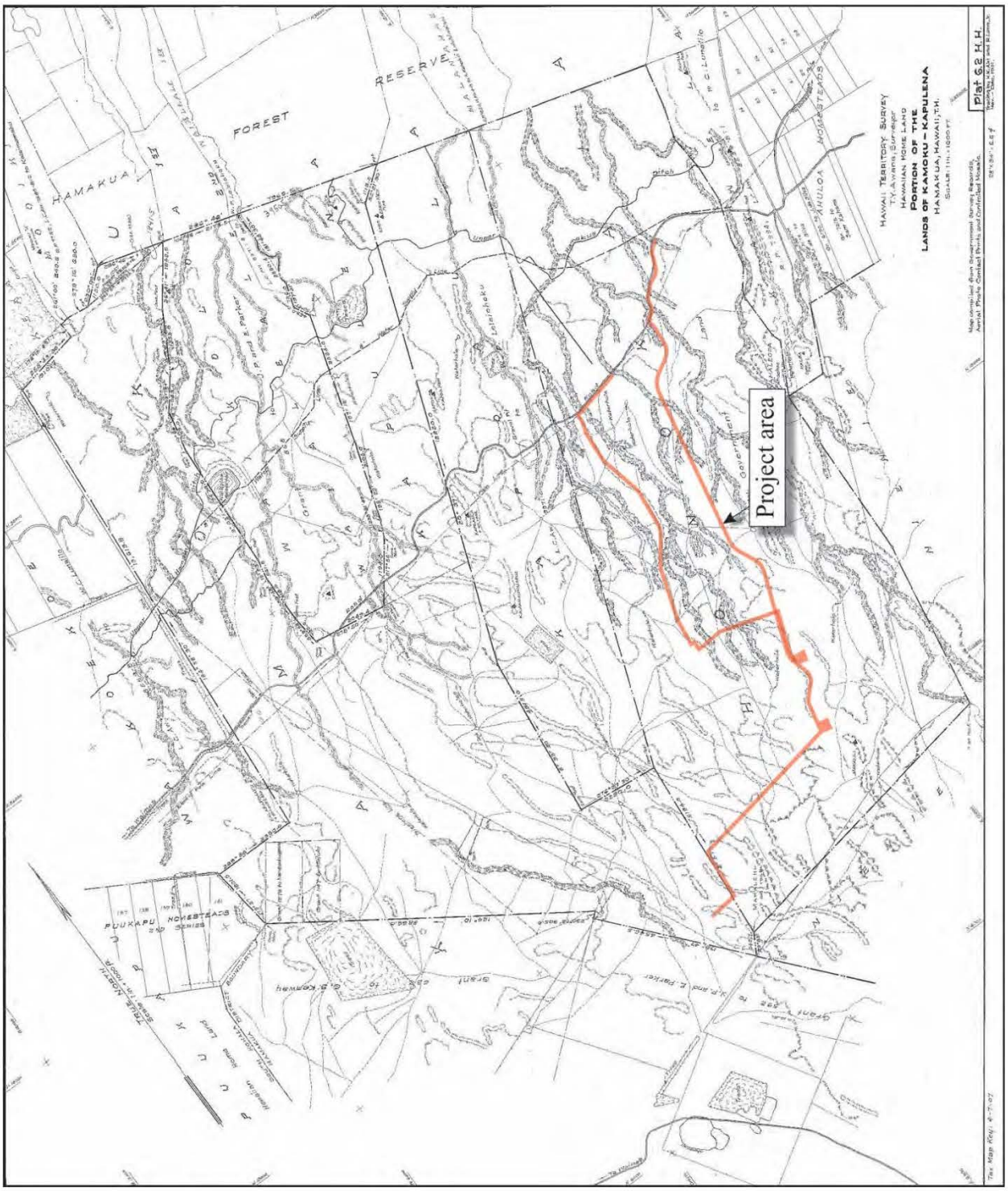


Figure 23. Portion of the Hawaiian Home Lands of Kamoku-Kapulena (PLAT 6.2 H.H.; tracing by H. K. Aki Dec. 1951) showing the current project area.

PREVIOUS ARCHAEOLOGICAL STUDIES

Very few formal archaeological studies have been conducted in the immediate vicinity of the current project area, although a literature review, field check and cultural impact evaluation for Honokaia Pasture Lots Subdivision was previously completed by Fong et al. (2005), and Cordy (1994) prepared *A Regional Synthesis of the Hāmākua District, Island of Hawai'i*, in which he summarizes the general Precontact and early Historic land use patterns of the region (including the lands of the current project area) in an effort to provide a predictive archaeological model for the district. *Makai* (northeast) of the current project area, Cleghorn (1999) conducted an archaeological inventory survey at Inoino bridge located along the Old Māmalahoa Highway, and Rechtman et al. (2009) prepared *An Archaeological and Limited Cultural Assessment of a Planned Access Road Route across TMKs: 3-4-6-11:004, 006, and 044*. The locations of the Fong et al. (2005), Cleghorn (1999), and Rechtman et al. (2009) studies relative to the current project area are shown in Figure 24, and the findings of each of the studies listed above are summarized below.

In *A Regional Synthesis of the Hāmākua District, Island of Hawai'i*, Dr. Ross Cordy (1994) summarizes the general Precontact and early Historic land use patterns for the subregion of East Hāmākua, which includes Honokaia Ahupua'a and Kamoku 'Okana (Cordy 1994). The summary is based on a review of *Māhele* records and a detailed examination of archival historical information. Cordy (1994) defines four general envirionmental zones within East Hāmākua: (1) the Sea-shore, (2) the Seaward Upland Slopes, (3) the 'Ōhi'a-Koa Forest Zone, and (4) The Gulches. The current project area is located just above the Seaward Upland Slopes within the 'Ōhi'a-Koa Forest Zone.

The Seaward Upland Slopes was the primary farming and residential zone of East Hāmākua. House sites in this zone were common between the sea cliffs and the cross-island trail (near the present day HWY 19). Garden plots (*mala*, *kihapai*, and *kula*), which were generally non-irrigated, tended to be located in close proximity to the houselots. In the *mauka* regions of this zone some scattered fields were present that were not associated with permanent residences. Dryland taro was the dominant crop of The Seaward Upland Slopes, but sweet potatoes and bananas were also commonly grown (Cordy 1994).

In the 'Ōhi'a-Koa Forest Zone, the Precontact and early Historic peoples of East Hāmākua utilized the natural resources of the forest. Activities in this zone included gathering bark to make fishing nets, collecting *māmaki* to make *kapa*, and catching birds for their feathers. At lower elevations within the 'Ōhi'a-Koa Forest Zone small plantings of supplemental crops such as bananas and taro were also present. Habitation in this zone occured at caves and campsites that were occupied for short durations of time (Cordy 1994).

Cleghorn (1999) conducted an archaeological inventory survey at Inoino Bridge located along the Old Māmalahoa Highway to the northeast of the current project area (see Figure 24). He identified four small caves (Caves 1, 2, 3, and 4) in the 'Ōhi'a-Koa Forest Zone during an archaeological inventory survey at Inoino Bridge along the Old Māmalahoa Highway (TMKs: (3) 4-6-11:037 and 038). The caves, which were all recorded under the SIHP designation Site 21405, are located in Kawela Ahupua'a along its boundary with Honokaia Ahupua'a. Each of caves contained stone constructions including platforms, walls, and alignments. Cleghorn (1999) suggests that the platforms within three of the caves, based on their formal attributes, could Precontact burial monuments. However, no excavations or structural dismantling was performed during the survey to determine if human remains were indeed present within the stone structures. Cleghorn (1999) also recorded the Historic Inoino Bridge across Inoino Gulch, which was replaced by a new Inoino Bridge subsequent to the completion of the study.

Fong et al. (2005) conducted a literature review, field check and cultural impact evaluation for approximately 2,500 acres of DHHL Lands at Honokaia Ahupua'a (TMKs: (3) 4-6-11: 003, 011, 012, and 013), including most of the lands encompassed by the current project area (see Figure 24). The literature review included a study of archival sources, historic maps, Land Commission Awards (LCAw.), and previous archaeological studies relative to Honokaia. These resources were used to construct a history of land use within the *ahupua'a*. The field inspection, which included limited pedestrian survey and aerial survey, was conducted by two archaeologists over a span of three days. The inspection was intended to identify any surface archaeological features present within the 2,500 acres and to assess the potential impacts to any such features so that sensitive areas that might require further investigation or mitigation prior to any development could be dealt with. As a result of the field check a single archaeological site – a Historic wall, possibly a dam or gulch crossing – was recorded, but was not considered significant and was not assigned an SIHP site number. Two other structures, a corral and a quarry, were noted within the survey area, but were determined to lack archaeological or historical significance, as both were less than fifty years old. Fong et al. (2005) did not provide a map showing the location of any of the potential archaeological features identified.

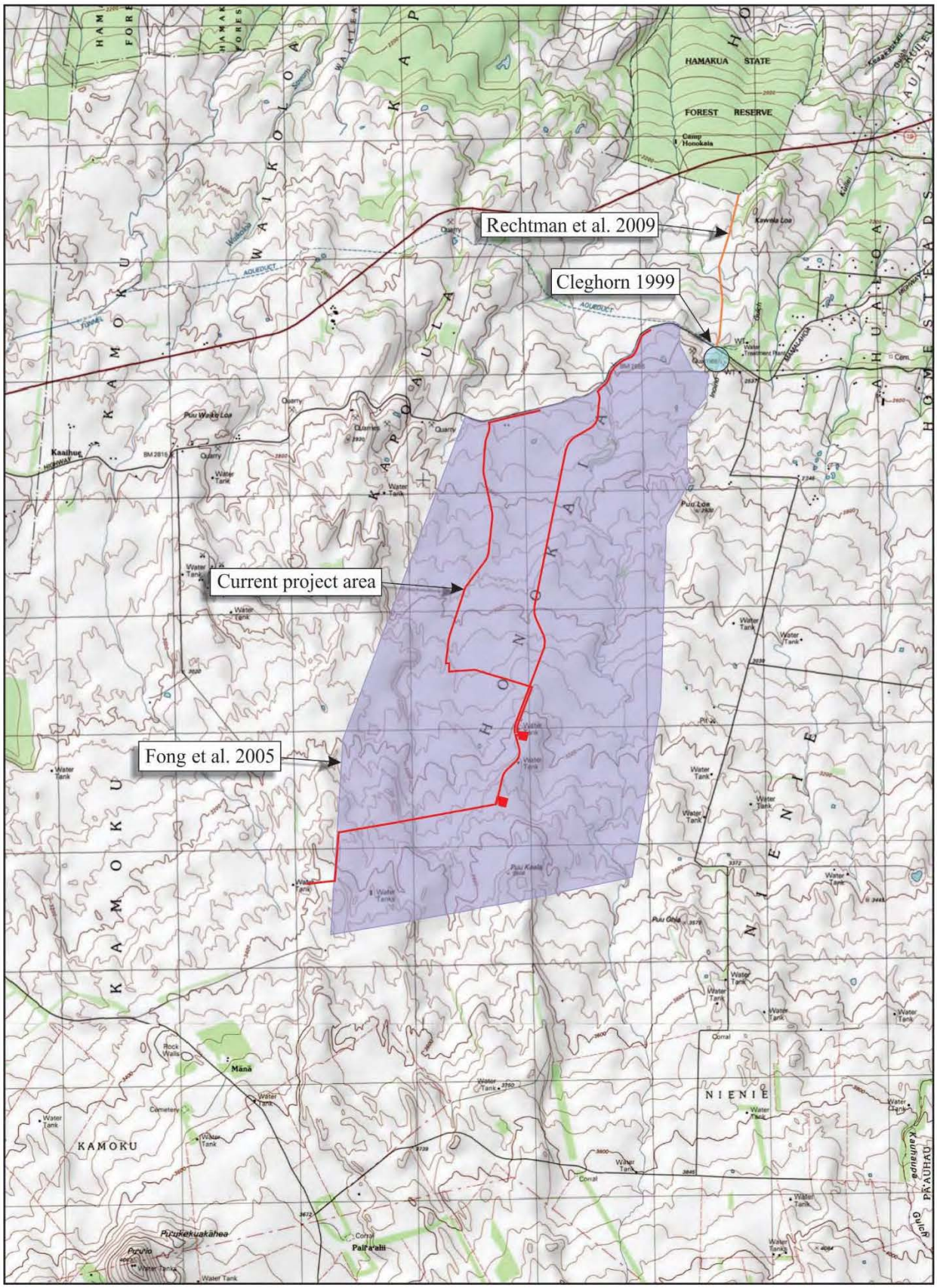


Figure 24. Previous archaeological studies conducted in the vicinity of the current project area.

Site 21405, previously recorded by Cleghorn (1999) within Inoino Gulch, was also relocated and inspected by Fong et al. (2005), and a fifth cave (Cave 5) containing two rough, mounded walls was identified at the site. As a result of the inspection it was determined that all five of the caves were located just beyond the boundaries of the study area. Given the absence of significant sites within the project area Fong et al. (2005) concluded that the development of the area would have no effect on historic resources.

As part of the study of the DHHL Honokaia Lands Fong et al. (2005) made an attempt to contact several individuals, organizations, and agencies by e-mail regarding traditional cultural properties in Honokaia. Only one organization, *Hui Mālama O Nā Kūpuna O Hawai'i Nei* headed by Mr. Halealoha Ayau, responded to the e-mail. Mr. Ayau indicated that the members of the organization primarily wanted to make sure that cultural monitors were present during excavations to assure that applicable burial treatment laws would be adhered to (see Fong et al. 2005:36). Fong et al. (2005) reviewed several areas of possible cultural concerns for properties that could by impacted by the proposed development of the DHHL lands including archaeological sites, burials, gathering rights, hunting rights, trails, and storied places, but no traditional cultural properties were identified within the area, so no impacts were expected.

Most recently in the vicinity of the current project area Rechtman et al. (2009) prepared *An Archaeological and Limited Cultural Assessment of a Planned Access Road Route across TMKs: 3-4-6-11:004, 006, and 044* (see Figure 24). This assessment involved a visual inspection of a roughly 1.3 kilometers (4,400-ft.) long access road corridor that followed the eastern boundary of Honokaia Ahupua'a from Highway 19 to the Old Māmalahoa Highway and phone interviews with five individuals from the Honokaia 'Ohana group. No archaeological resources of any kind were observed during the pedestrian survey, and no resources (landforms, vegetation, etc.) of a traditional cultural nature were present. The individuals interviewed for the study had no information regarding significant cultural places or practices that may have occurred within the project area. The only recollection of the area was that it was used for ranching. Given the negative findings of the study, Rechtman et al. (2009) concluded that development of the proposed access road route would not significantly impact any known historic properties or any cultural resources and practices of a traditional and customary nature. They therefore recommended that no further historic preservation work or mitigation was needed.

3. PROJECT AREA EXPECTATIONS

Based on the location and the specific history of the project area land use, the results of the background research, and a review of archaeological work previously conducted within the project area, the archaeological expectations for the current study are limited. It is remotely possible that Precontact sites, including trails, temporary habitations, caves, or resource procurement areas will be encountered within the formerly forested study area. However, the extensive land use for cattle ranching throughout the late nineteenth and twentieth centuries has significantly altered the landscape, and likely removed any evidence of these former site types (with the exception of caves). Given the long history of ranching, ranching related features such as corrals, walls, roads, fences, dams, or enclosures are much more likely to be present within the project area, but are also not widely expected, as no ranching related sites more than fifty years old were identified by Fong et al. (2005), who previously conducted an archaeological field check of the entire Honokaia Pastoral Lots Subdivision.

4. FIELDWORK

Fieldwork for the current assessment survey was conducted on October 14, 2014 by Matthew R. Clark, B.A and Samuel Plunket, B.A. under the direction of Robert B. Rechtman, Ph.D.

METHODS

The surface of the entire project area, which had been marked in the field by surveyors prior to the commencement of the current fieldwork, was visually examined for archaeological resources during the current survey. The 10-meter wide transmission line corridors through open pasture were surveyed by two fieldworkers maintaining a 5-meter spacing interval, while the transmission line corridors along the existing paved roads were surveyed by a single fieldworker maintaining a 5-meter spacing from the road edge. The two 200-meter by 200-meter areas for the proposed water storage tanks were surveyed by walking back and forth across the area with the two fieldworkers maintaining a 10-meter spacing interval. Given its use as active pasture, ground surface visibility was excellent across the entire project area. The UTM location of a single archaeological feature encountered during the pedestrian survey was recorded using a Garmin HCx handheld GPS device (set to the NAD 83 datum). The feature was cleared of vegetation, mapped to scale with a measuring tape and compass, described using a standardized site record form, and photographed (both with and without a meter stick and north arrow for scale and orientation). No subsurface testing was conducted during the current study.

FINDINGS

A single archaeological feature consisting of a few stacked stones located along the edge of a drainage near the Old Māmalahoa Highway right-of-way on TMK: (3) 4-6-13:005 was only potential archaeological site identified during the current study. This site (Temporary Site 1) is described in detail below, and its location relative to the highway and the rest of the survey area is shown in Figure 25. A significance evaluation and recommendations for the future treatment of the site are provided at the conclusion of this study.

No other archaeological resources were observed on the surface of the project area anywhere else within the survey area, and the likelihood of encountering subsurface archaeological resources is extremely remote given the geology of the area, the history of ranching on the parcels, and the recent development of the Honokaia Pastoral Lots Subdivision infrastructure. All ranching related infrastructure (i.e. fence lines, corrals, etc.) encountered during the survey appeared modern, the pasture lands appeared to have been thoroughly grubbed in the past and are known to have been grazed for more than a century, and the ground surface along the edges of the two cul-de-sac roads has been recently disturbed. These findings support the findings of the earlier Fong et al. (2005) study that included most of the current project area and the 2,500-acre Honokaia Pastoral Lots Subdivision in its entirety.

Temporary Site 1

Temporary Site 1 is a short alignment of stacked boulders and cobbles located within the proposed transmission line corridor near the *makai* boundary of TMK: (3) 4-6-13:005 (see Figure 25). The alignment is constructed on the northeastern slope of an intermittent drainage channel, approximately 10 meters southeast of an Old Māmalahoa Highway bridge that crosses the same drainage (Honokaia Gulch East Branch Bridge; Figure 26). The drainage itself consists of grass-covered, water-scoured bedrock with pools of standing water. A fence line, 6 meters to the southeast of the alignment, separates the study area from the highway right-of-way, and an old, bulldozed ranch road crosses the drainage roughly 12 meters to the southeast of Temporary Site 1. The alignment is situated on a relatively level bedrock surface between a vertical bedrock edge on the northeast side, and elevated bedrock within the drainage channel (Figure 27). The stacking measures 2.9 meters long by 0.7 to 0.3 meters wide (Figure 28). At the northeast end it stands 1 meter tall where it is constructed up against the bedrock drainage edge (Figure 29), and at the southwestern end it tapers to 0.3 meters tall, then terminates at the base of an elevated bedrock outcrop. The taller, northeastern end consists of small, angular boulders neatly stacked three high. The southwestern end is not stacked, but there are a couple large cobbles that are in line with the stacked portion. Cultural debris in the vicinity of the site consists of modern bottles and cans that appear to have been thrown off the bridge from the Old Māmalahoa Highway.

This alignment, although not previously identified, is very similar to a feature reported by Fong et al. (2005:27) at a small drainage somewhere in the northwestern corner of the Honokaia Pastoral Lots Subdivision. In that area Fong et al. (2005) describe stacked boulders aligned on both sides of the intermittent water course. They indicate that the stacking once completely crossed the drainage, but that a 4.9-meter long section in the center was removed by flood waters prior to their study. Fong et al. (2005) tentatively interpret the feature as a dam or foundation for a light bridge across the small gully that that they suggest was built by Parker Ranch during the early twentieth century.

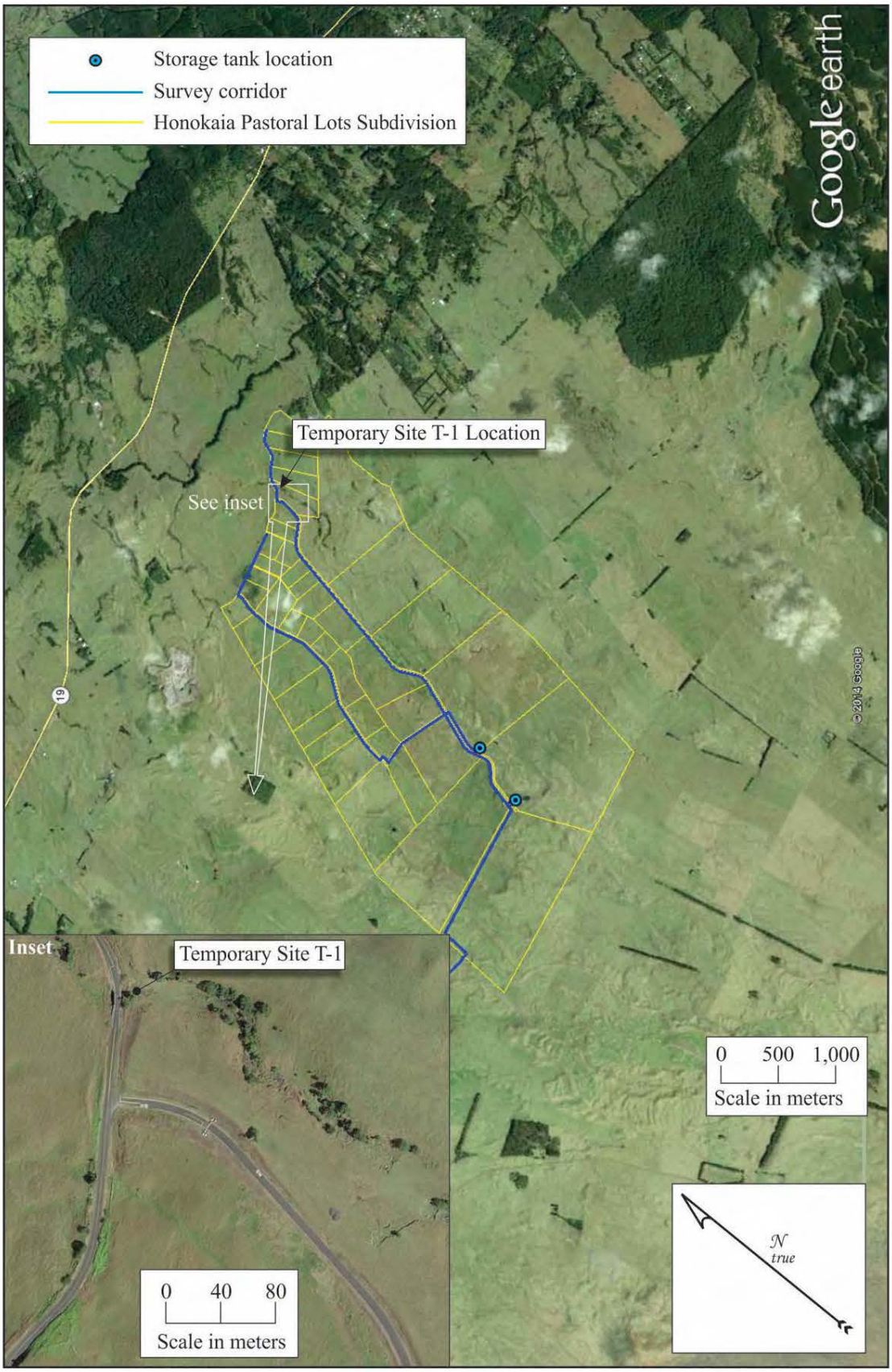


Figure 25. Location of Temporary Site 1.

Figure 26. Temporary Site 1 with Honokaia Gulch East Branch Bridge in the background, view to the northwest.

Figure 27. Temporary Site 1, view to the east across the drainage.

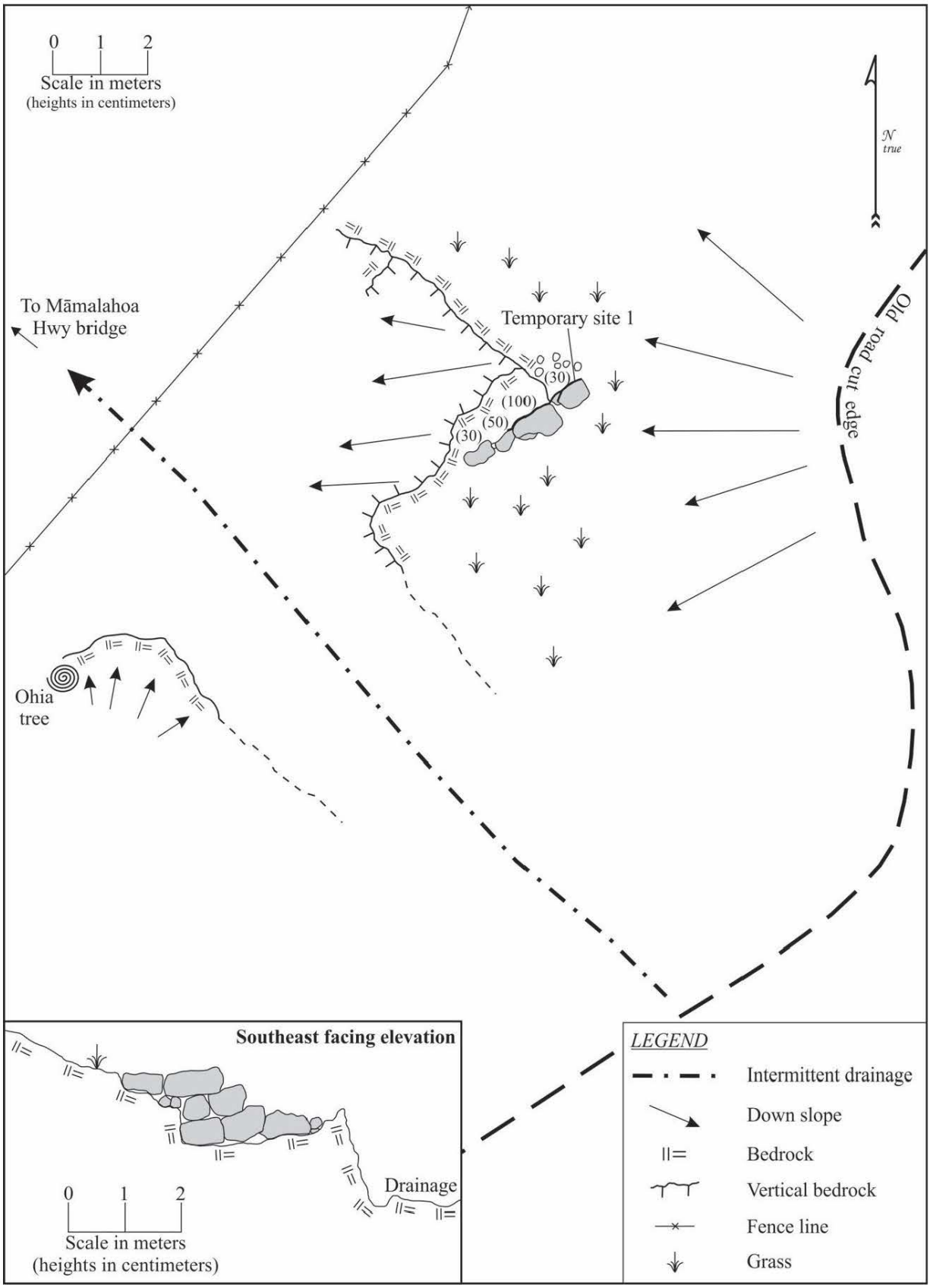


Figure 28. Temporary Site 1 plan view.

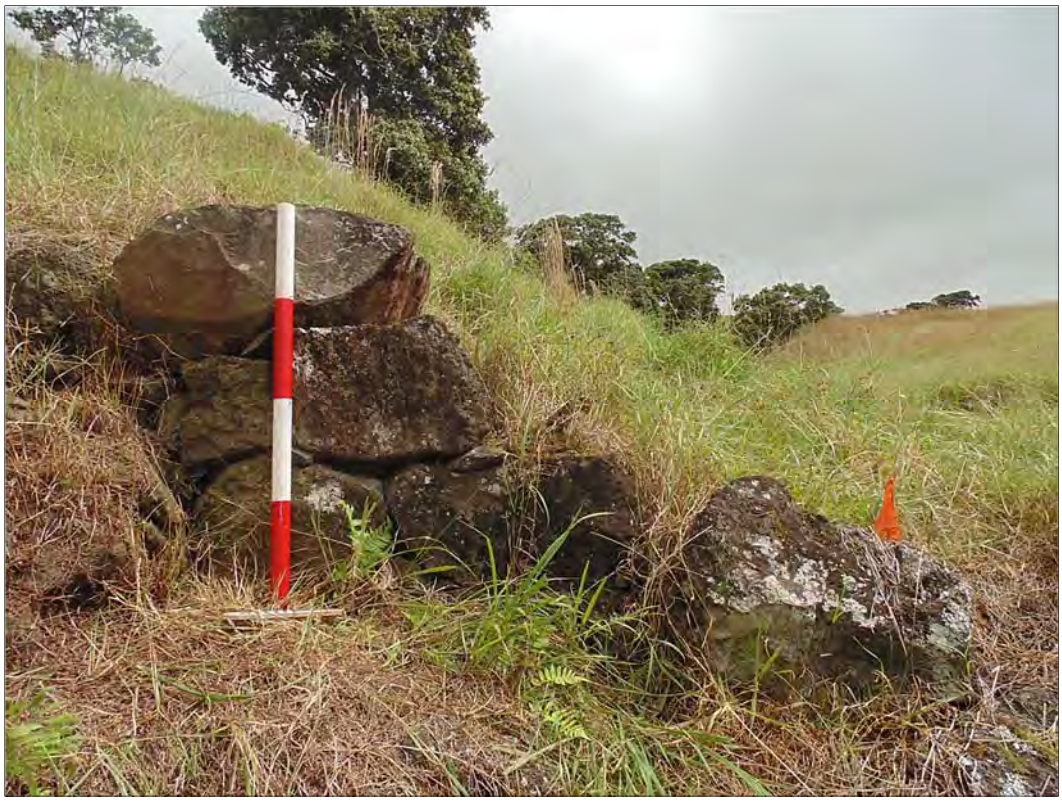


Figure 29. Close-up of Temporary Site 1, view to the east.

Temporary Site 1 lacks integrity of setting and design. This alignment, like the one reported by Fong et al. (2005), may have once completely crossed the adjacent drainage channel and perhaps functioned as a crude dam, light bridge foundation, or even a barrier under a wire fence line. Currently, no evidence of the alignment having extended further than 2.9 meters is present at the site, but the scoured bedrock within the drainage suggests that it is subject to periodic flooding which could have easily removed any western extension of the alignment. All of the above presented functional interpretations suggest Parker Ranch construction of the feature sometime during the twentieth century. Another possible interpretation, given the location of Temporary Site 1 adjacent to the current alignment Old Māmalahoa Highway, is that the stacking represents either a location of a former drainage crossing along an older alignment of the highway, or perhaps a construction element associated with the building of the nearby concrete bridge. Maps presented in the Culture-Historical Context section of this report seem to indicate that the earliest alignment of the highway (built around the turn of the twentieth century) was slightly *mauka* of the current alignment, and perhaps included within the current project area (see Figures 19 and 20). The nearby Honokaia Gulch East Branch Bridge, which crosses the drainage channel 10 meters *makai* of Temporary Site 1, is a concrete tee beam construction with concrete abutments that was built in 1924 when the highway was realigned (MKE and Fung 2013). It is possible that the stacking was created in ca. 1924 to aid in the construction of the bridge, or accommodate equipment used to build the bridge. Interpretation of Temporary Site 1 is extremely problematic without knowing the original design specifications of the feature and the temporal setting. The bedrock slope and drainage surrounding the stacked boulders makes it unlikely that subsurface testing will significantly aid in the determination of function.

5. CONCLUSION AND RECOMMENDATION

The one archaeological site identified during the current study is assessed for significance based on criteria established and promoted by the DLNR-SHPD and contained in the Hawai‘i Administrative Rules 13§13-284-6. For a resource to be considered significant it must possess integrity of location, design, setting, materials, workmanship, feeling, and association and meet one or more of the following criteria:

- **a** Be associated with events that have made an important contribution to the broad patterns of our history;
- **b** Be associated with the lives of persons important in our past;
- **c** Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value;
- **d** Have yielded, or is likely to yield, information important for research on prehistory or history;
- **e** Have an important traditional cultural value to the native Hawaiian people or to another ethnic group of the state due to associations with traditional cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity.

Like the similar feature previously recorded by Fong et al. (2005) within the Honokaia Pastoral Lots Subdivision, Temporary Site 1 lacks integrity of setting and design and does not meet any of the above defined significance criteria, and is therefore not regarded as significant. Temporary Site 1 was nevertheless fully documented during the current study. As no significant archaeological resources were identified on the surface of the project area, and the likelihood of encountering subsurface archaeological resources is extremely remote given the geology of the area, the history of ranching on the parcels, and the lack of subsurface findings during the recent development of the cul-de-sac roads and related subdivision infrastructure, no further historic preservation work is recommend for the construction of the non-potable water system within the Honokaia Pastoral Lots Subdivision.

REFERENCES CITED

Armstrong, R. (editor)
1973 *Atlas of Hawaii*. Honolulu: University of Hawaii Press.

Barrère, D.
1983 Report 2: Notes on the Lands of Waimea and Kawaihae. IN Clark and Kirch (editors) Archaeological Investigation of the Mudlane-Waimea-Kawaihae Road Corridor, Island of Hawaii. Prepared for State of Hawaii, Department of Transportation, B.P. Bishop Museum 1983:25–38.

Bellwood, P.
1978 *The Polynesians, Prehistory of an Island People*. London: Thames and Hudson, Ltd.

Bergin, B.
2004 *Loyal to the Land: The Legendary Parker Ranch, 750-1950. Aloha ʻĀina Paka*. University of Hawaiʻi Press, Honolulu.

Burtchard, G.
1995 Population and Land Use on the Keauhou Coast, the Mauka Land Inventory Survey, Keauhou, North Kona, Hawaiʻi Island. Part I: Narrative Volume. International Archaeological Research Institute, Inc. (IARII). Prepared for Belt Collins and Associates and Kamehameha Investment Corporation, Honolulu.

Cartwright, B.
1933 Some Aliis of the Migratory Period. *Bishop Museum Occasional Papers,* 10(7). Honolulu.

Chinen, J.
1958 *The Great Mahele: Hawaii's Land Division of 1848*. Honolulu: University of Hawaii Press.

1961 *Original Land Titles in Hawaii.* Honolulu: privately published.

Clark, J., and P. Kirch (editors)
1983 Archaeological Investigations of the Mudlane-Waimea-Kawaihae Road Corridor, Island of Hawaiʻi. An Interdisciplinary Study of an Environmental Transect. *Departmental Report Series* 83-1. Department of Anthropology, B.P. Bishop Museum, Honolulu. Prepared for Department of Transportation, State of Hawaii.

Cleghorn, P.
1999 The Results of an Archaeological Inventory Survey at Inoino Bridge, Kawela, Hāmākua, Hawaiʻi. Prepared by Pacific Legacy, Honolulu.

Cordy, R.
1994 A Regional Synthesis of Hāmākua District, Island of Hawaiʻi. Historic Preservation Division, Department of Land and Natural Resources, State of Hawaiʻi.

2000 *Exalted Sits the Chief: The Ancient History of Hawaiʻi Island*. Mutual Publishing, Honolulu.

Dorrance, W., and F. Morgan
2000 *Sugar Islands: The 165-Year Story of Sugar in Hawaii*. Mutual Publishing, Honolulu, Hawaii.

Ellis, W.
2004 *Journal of William Ellis, A Narrative of an 1823 Tour Through Hawaiʻi.* Mutual Publishing.

Fong, J., Shideler, D., and Hammatt, H.
2005 Literature Review, Field Check and Cultural Impact Evaluation For Approximately 2,500-Acres of DHHL Lands at Honokaia Ahupuaʻa, Hāmākua District, Hawaii Island, TMK: 4-6-11: 3, 11, 12, and 13. Cultural Surveys Hawaiʻi Job Code: HONO 64. Prepared for Oceanit, Honolulu, HI.

Fornander, A.
1880 *An Account of the Polynesian Race*. Trubner: London.

1969 *An Account of the Polynesian Race: Its Origins and Migrations*. Tokyo: Charles E. Tuttle Co., Inc.

Handy, E., and E. Handy
1972 *Native Planters in Old Hawaiʻi*. B.P. Bishop Museum Bulletin 233. Bishop Museum Press, Honolulu. (With M. Pukui).

Hazlett, A., Shideler, D., and Hammatt, H.
2007 Supplemental Archaeological Surveying, Recordation, Monitoring, Discovery, and Data Recovery Plan for the Hamakua Ditch System, Lālākea, Kukuihaele, Kanahonua, Waioʻekoʻe, Keaʻā, Puʻuʻōpaha, Kalakalaʻula, Moʻoiki 1, Hanapai, Niupuka, Kana, Paʻakō, Puanui, Papalapuka, Waikōloa, Waiʻaleʻale, Kapulena, Kaʻauhuhu, Keʻahakea, Haukoʻi, Moʻoiki 2, Manae, Kapoaʻula, Malanahae and Honokaiʻa Ahupuaʻa, Hāmākua District, Hawaiʻi Island, Portions of TMK: [3] 4-06, 4-07, and 4-08. Cultural Surveys Hawaiʻi Job Code: LALAKEA 1. Prepared for Belt Collins Hawaii, Ltd.

Hommon, R.
1986 Social Evolution in Ancient Hawai'i. IN Kirch, P.V. (ed.), *Island Societies: Archaeological Approaches to Evolution and Trans-formation*: 55-88. Cambridge: University Press.

Hono-ko-hau Study Advisory Commission
1974 The Spirit of Ka-Loko Hono-Ko-Hau. National Park Service, U.S. Department of the Interior.

Kamakau, S.
1964 Ka Poʻe Kahiko: The People of Old. B.P. *Bishop Museum Special Publication* 51. Bishop Museum Press.

1976 The Works of the People of Old: Na hana a ka Poʻe Kahiko. *B.P. Bishop Museum Special Publication 61*. Bishop Museum Press, Honolulu.

1991 *Tales and Traditions of the People of Old*. Honolulu: Bishop Museum Press.

1992 *Ruling Chiefs of Hawaii*. The Kamehameha Schools Press, Honolulu (revised edition).

Kent, N.
1983 *Hawaii: Islands Under Influence*. University of Hawai'i Press, Honolulu.

Kirch, P.
1984 *Evolution of the Polynesian Chiefdoms*. Cambridge University Press, New York.

1985 *Feathered Gods and Fishhooks: An Introduction to Hawaiian Archaeology and Prehistory*. Honolulu: University of Hawaii Press.

1990 Monumental Architecture and Power in Polynesian Chiefdoms: A Comparison of Tonga and Hawaii. *World Archaeology* 22(2).

2011 When did the Polynesians Settle Hawaiʻi? A Review of 150 Years of Scholarly Inquiry and a Tentative Answer. *Hawaiian Archaeology* Vol. 12:3-26.

Kuykendall, R.
1938 *The Hawaiian Kingdom 1778–1854. Foundation and Transformation*. Honolulu: University Press of Hawaii.

Kuykendall, R., and A. Day
1976 *Hawaii: A History From Polynesian Kingdom to American Statehood*. Prentice-Hall, Inc., Englewood Cliffs.

Lucas, P. (editor)
1995 *A Dictionary of Hawaiian Legal Land-Terms*. Native Hawaiian Legal Corporation. University of Hawai‘i Committee for the Preservation and Study of Hawaiian Language, Art and Culture: Honolulu.

MacDonald, and Abbot
1970 *Volcanoes in the Sea: the Geology of Hawaii.* Honolulu: University of Hawaii Press.

Malo, D.
1903 Hawaiian Antiquties. *B.P. Bishop Museum Special Publication 2*. Bishop Museum Press, Honolulu.

McEldowney, H.
1983 A Description of Major Vegetation Patterns in the Waimea-Kawaihae Region During the Early Historic Period. Report 16, in Jeffrey T. Clark and Patrick V. Kirch (eds.), Archaeological Investigations of the Mudlane-Waimea-Kawaihae Road Corridor, Island of Hawai‘i, pp.407-445. Department Report 83-1. Dept. of Anthropology, Bernice P. Bishop Museum, Honolulu.

Menzies, A.
1920 *Hawaii Nei, 128 Years Ago.* Edited by William F. Wilson. Honolulu: The New Freedom Press.

MKE Associates, LLC and Fung Associates, Inc.
2013 Hawai‘i State Bridge Inventory and Evaluation. Prepared for State of Hawai‘i Department of Transportation Highway Division.

Oliver, D.
1961 *The Pacific Islands*. University of Hawaii Press, Honolulu.

Pogue, J.
1978 Moolelo Hawaii. Hale Paipalapala Aupuni, Honolulu (Revised Edition).

Pukui, M., S. Elbert, and E. Mo‘okini
1974 *Place Names of Hawaii*. *Revised and Expanded Edition.* Honolulu: University of Hawaii Press, Honolulu.

Rechtman, R., M. Clark, and A. Dircks Ah Sam
2009 An Archaeological and Limited Cultural Assessment of a Planned Access Road Route across TMKs: 3-4-6-11:004, 006, and 044, Honokaia Ahupua‘a, Hāmākua District, Island of Hawai‘i. Rechtman Consulting report RC-0652. Prepared for Planning Solutions, Inc., Honolulu.

Sinoto, Y., and M. Kelly
1970 Archaeological and Historical Survey of Pakini-Nui and Pakini-Iki Coastal Sites, Waiahukini, Kailikii, and Hawea, Ka‘u, Hawaii. *Departmental Report Series* 75-1. Department of Anthropology, B.P. Bishop Museum, Honolulu.

Spitz, A.
1964 Land Aspects of the Hawaiian Homes Program. Report No. 1b, Legislative Reference Bureau. University of Hawai‘i, Honolulu.

Tomonari-Tuggle, M.
1988 North Kohala: Perception of a Changing Community. A Cultural Resource Management Study. Prepared for Division of State Parks, Outdoor Recreation, and Historic Sites, Department of Land and Natural Resources, State of Hawaii.

Williams, J.
1919 A little Known Engineering Work in Hawaii. In Thrum's *Hawaiian Almanac and Annual for 1919*. Thos. G. Thrum, Honolulu.

Wilcox, C.
1996 *Sugar Water: Hawaii's Plantation Ditches*. University of Hawai'i Press, Honolulu.

Wilkes, C.
1845 *Narrative of the United States Exploring Expedition During the Years 1838–1842, Under the Command of C. Wilkes, U.S.N.,* Volume 4. Philadelphia: Loa and Blanchard.