Appendix 1

Early Consultation Letters

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Mitchell D. Roth
Mayor

Lee Lord
Managing Director

Ramzi I. Mansour
Director

Brenda Iokepa-Moses
Deputy Director

County of Hawai'i

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

345 Kekūanāo'a Street, Suite 41 · Hilo, Hawai'i 96720 · cohdem@hawaiicounty.gov
Ph: (808) 961-8083 · Fax: (808) 961-8086

MEMORANDUM

TO: Michele Lefebvre, Ph.D.
Senior Project Manager, Environmental Scientist
Stantec GS, Inc.
Via email: michele.lefebvre@stantecgs.com

FROM: Ramzi I. Mansour, Director
Department of Environmental Management

DATE: December 19, 2023

SUBJECT: Early Consultation for Environmental Assessment for 'Āinakō Affordable Housing Project, TMK (3) 2-3-030:004 and Pors. 2-3-030:001 and 2-3-034:001, South Hilo District, Island of Hawai'i

The Solid Waste Division has reviewed the subject application and provides the following comments (contact the Solid Waste Division for details):

- Commercial operations, State and Federal agencies, religious entities and non-profit organizations may not use transfer stations for disposal.
- Aggregates and any other construction/demolition waste should be responsibly reused to its fullest extent.
- Ample room should be provided for rubbish and recycling.
- Green waste may be transported to the green waste sites located at the West Hawai'i Organics Facility and East Hawai'i Organics Facility, or other suitable diversion programs.
- Construction and demolition waste is prohibited at all County Transfer Stations.
- Submit Solid Waste Management Plan in accordance with attached guidelines.

The Wastewater Division has reviewed the subject application and provides the following comments (contact the Wastewater Division for details):

- Recommend an extension of the County's existing 15-inch sewer line residing within the adjoining parcels south of the subject property. The subject parcel is located approximately 600 feet from the County sewer system.

Mitchell D. Roth
Mayor

Lee Lord
Managing Director

Ramzi I. Mansour
Director

Brenda Iokepa-Moses
Deputy Director

County of Hawai'i

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

345 Kekūanāo'a Street, Suite 41 · Hilo, Hawai'i 96720 · cohdem@hawaiicounty.gov
Ph: (808) 961-8083 · Fax: (808) 961-8086

May 5, 2023

SOLID WASTE MANAGEMENT PLAN
Guidelines

INTENT AND PURPOSE

This is to establish guidelines for reviewing Solid Waste Management Plans, for which special conditions are placed on developments. The Solid Waste Management Plan will be used to (1) promote and implement recycling and recycling programs; (2) predict the waste generated by the proposed development to anticipate the impacts on County Solid Waste Management Facilities; and (3) predict the additional vehicular traffic being generated because of waste and recycling transfers. A State of Hawai'i licensed engineer or architect shall prepare a suitable Solid Waste Management Plan for review by the Department of Environmental Management.

REPORT

The Solid Waste Management Plan will contain the following:

1. Description of the project and the potential waste that may be generated: e.g., analysis of anticipated waste volume and composition. This includes waste generated during the construction and operation or maintenance phases. Waste types shall include (but not be limited to):
   A. Organics (including food waste and green wastes);
   B. Construction and Demolition materials;
   C. Paper (including cardboard);
   D. Metal (including ferrous and non-ferrous metals);
   E. Plastic;
   F. Special (including ash, sludge, treated medical waste, bulky items, tires);
   G. Hazardous (including paint, vehicle fluids, oil, batteries); and
   H. Glass.

2. Indicate onsite source separation by waste type, e.g., source separation bins for glass, metal, plastic, cardboard, aluminum, et cetera. Provide ample space for rubbish and recycling.

3. Identification and location of the proposed waste reduction, waste re-use, recycling facility or disposal site and associated transportation methods for the various components of the development's waste management system, including the number of vehicle

movements and associated routes that will be used to transport the waste and recycled materials.

4. The report will include identification of any impacts to County-operated waste management facilities, and the appropriate mitigation measures that will be implemented by the development to minimize these impacts.

5. Analysis will be based on the highest potential use or zoning of the development.

REQUIREMENTS AND CONDITIONS

1. A Solid Waste Management Plan will be prepared for all developments including but not limited to projects that are required to perform an EA, EIS, or Special Use Permit, as defined under the policies of the Department of Environmental Management.

2. The Department of Environmental Management will require the developer to provide or resolve all recommendations and mitigation measures as outlined in the solid waste management plan, besides any conditions placed on the applicant herein.

3. A State of Hawai'i licensed engineer or architect will draft and certify in writing the Solid Waste Management Plan as complying with applicable Federal, State, and County of Hawai'i Solid Waste laws, regulations, and administrative rules.

Should you require additional information, please contact the Solid Waste Division at swd@hawaiicounty.gov or at (808) 961-8270.

CONCUR:

Brenda Iokepa-Moses
DEPUTY DIRECTOR

(For Ramzi I. Mansour, DIRECTOR)

1/05/24

JOSH GREEN, M.D.
GOVERNOR | KE KIA'ĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIA'ĀINA

DAWN N. S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAI'I | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA 'OIHANA KUMUWAIWAI 'ĀINA
LAND DIVISION

P.O. BOX 621
HONOLULU, HAWAII 96809

December 19, 2023

MEMORANDUM

TO: **DLNR Agencies:**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_ Engineering Division (DLNR.ENGR@hawaii.gov)
_X_ Div. of Forestry & Wildlife (rubyrosa.t.terrago@hawaii.gov)
___Div. of State Parks
_X_ Commission on Water Resource Management (DLNR.CWRM@hawaii.gov)
___Office of Conservation & Coastal Lands
_X_ Land Division – Hawaii District (gordon.c.heit@hawaii.gov)
_X_ Aha Moku Advisory Committee (leimana.k.damate@hawaii.gov)

FROM: Russell Y. Tsuji, Land Administrator Russell Tsuji
SUBJECT: Early Consultation for Environmental Assessment for **Ainako Affordable Housing Project**
LOCATION: South Hilo, Island of Hawaii;
TMKs: (3) 2-3-030:004; and Portions of (3) 2-3-030:001 and (3) 2-3-031:001
APPLICANT: Geometrician Associates on behalf of Stantec GS Inc.

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **January 12, 2024.**

If no response is received by the above date, we will assume your agency has no comments. Should you have any questions about this request, please contact Darlene Nakamura at darlene.k.nakamura@hawaii.gov. Thank you.

BRIEF COMMENTS:

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(✓) Comments are included/attached.

Signed: [signature]
Print Name: GORDON C. HEIT
Division: Land Division
Date: 1/05/24

Attachments
cc: Central Files

JOSH GREEN, M.D.
GOVERNOR | KE KIA'ĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIA'ĀINA

DAWN N. S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAI'I | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA 'OIHANA KUMUWAIWAI 'ĀINA
LAND DIVISION

75 Aupuni Street, Room 204
Hilo, Hawaii 96720
PHONE: (808) 961-9590
FAX: (808) 961-9599

January 5, 2024

MEMORANDUM

TO: Russell Y. Tsuji, Administrator

FROM: Gordon C. Heit, Hawaii District Land Agent

SUBJECT: Early Consultation for Environmental Assessment for Ainako Affordable Housing Project

LOCATION: Piihonua, South Hilo, Island of Hawaii,
TMK: (3) 2-2-030:001, 004, and 2-3-031:001

APPLICANT: Geometrician Associates on behalf oof Stantec GS Inc.

Pursuant to your request for comments on the above matter, we offer the following:

The properties identified by TMK: (3) 2-3-030:001 and 2-3-031:001 are currently encumbered under Revocable Permit No. S-7959 to the Spencer Nagata for Pasture Purposes. The project describes a road access corridor through the above State parcels. The Hawaii District Land Office will provide further comment when the Environmental Assessment for the proposed project is published, and the access route is defined.

Please contact me should you have any questions.

Stantec GS Inc.
P.O. Box 191
Hilo, HI 96721

December 15, 2023

Dear Neighbor or Agency/Organization Official:

Subject: Early Consultation for Environmental Assessment for Ainako Affordable Housing Project, TMK (3) 2-3-030: 004 and pors. 2-3-030:001 and ~~2-3-034:001~~ 2-3-031:001, South Hilo District, Island of Hawai'i

Our firm is in the process of preparing an Environmental Assessment (EA) for a proposed activity proposing use of government land and funds, in compliance with Chapter 343, Hawai'i Revised Statues (HAR), and Title 11, Chapter 200.1, Hawai'i Administrative Rules (HAR).

As shown in the attached map figure, the subject area is a County-owned, residentially zoned property in Hilo on TMK (3) 2-3-030:004, a 60.59-acre parcel, which currently has access from Kilikina Street. The project would also include a road access corridor easement from Waianuenue Avenue to the property over two State properties (TMKs (3) 2-3-030:001 and 2-3-031:001), the former of which is currently encumbered with a pasture lease.

The project would develop the property for affordable housing according to a conceptual plan that is currently in preparation and which will be presented in the Draft EA. The concept envisions increments of single-family and/or multi-family housing occupying the portions of the property that would be most readily developable considering topography, hydrology, access, and other considerations. Road access will be determined and included in the EA after the completion of environmental and engineering investigations but would preferably be primarily from Waianuenue Avenue, and possibly also from Kilikina Street.

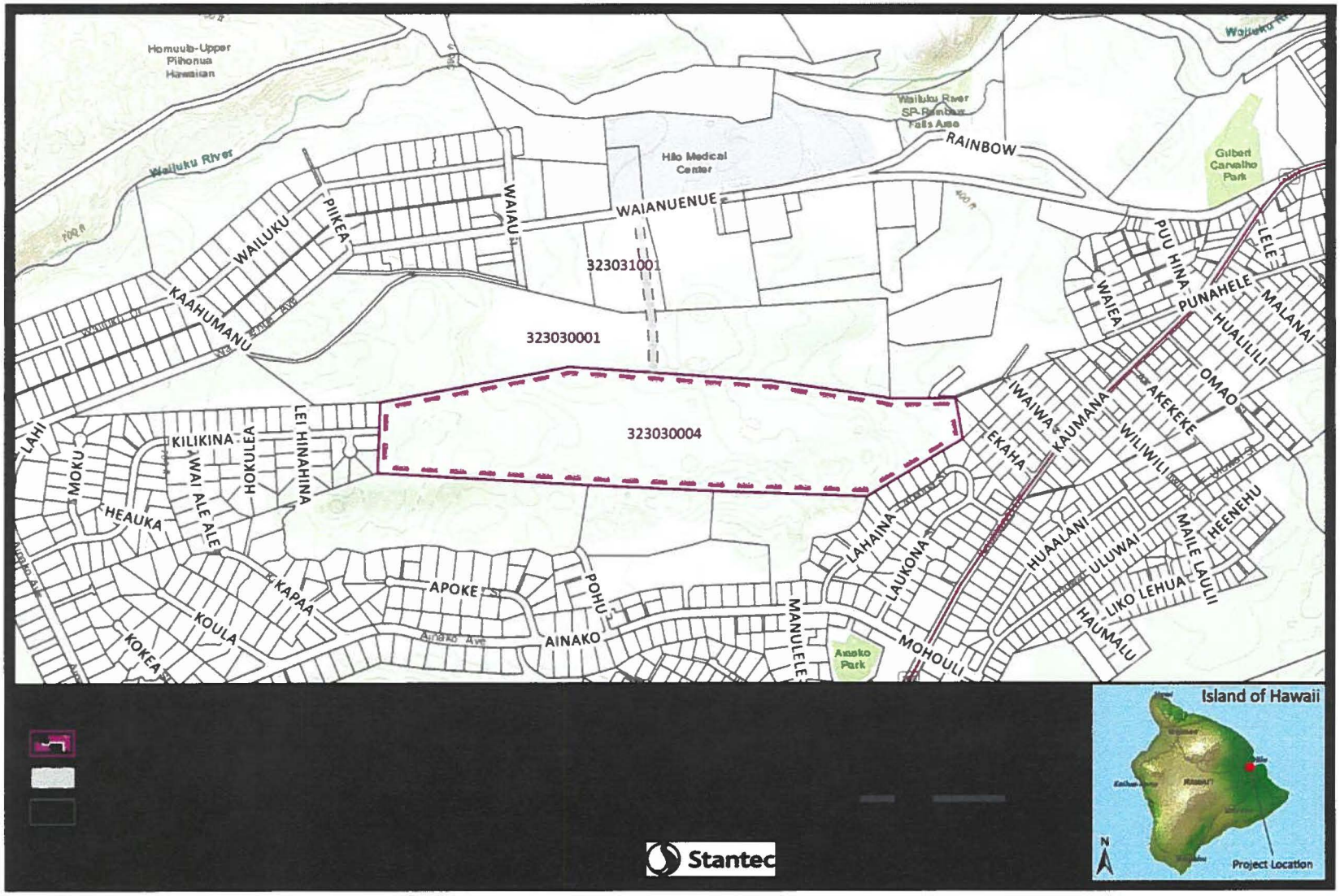
The property is situated adjacent to established neighborhoods of Hilo near major medical facilities, less than two miles from downtown, to which it is connected by major roads and transit routes. The EA will include a biological survey, an archaeological survey, a traffic impact assessment report, an analysis on the effects to adjacent neighborhoods and various other evaluations. We would appreciate your comments on any special environmental conditions or impacts related to the project. Please contact me at (808) 791-9872 or email to michele.lefebvre@stantecgs.com if you have any questions or require clarification. Kindly indicate whether you wish to receive notice of EA availability when it has been completed.

Sincerely,

Stantec GS Inc.

Michele Lefebvre Ph.D.
Senior Project Manager, Environmental Scientist
Stantec GS, Inc.
Michele.Lefebvre@stantecgs.com

Location Map



JOSH GREEN, M.D.
GOVERNOR | KE KIA'ĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIA'ĀINA

DAWN N. S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAI'I | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA 'OIHANA KUMUWAIWAI 'ĀINA
LAND DIVISION

P.O. BOX 621
HONOLULU, HAWAII 96809

December 19, 2023

MEMORANDUM

FROM: ~~TO:~~ **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division (DLNR.ENGR@hawaii.gov)
X Div. of Forestry & Wildlife (rubyrosa.t.terrago@hawaii.gov)
__Div. of State Parks
X Commission on Water Resource Management (DLNR.CWRM@hawaii.gov)
__Office of Conservation & Coastal Lands
X Land Division – Hawaii District (gordon.c.heit@hawaii.gov)
X Aha Moku Advisory Committee (leimana.k.damate@hawaii.gov)

TO: ~~FROM:~~ Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: Early Consultation for Environmental Assessment for **Ainako Affordable Housing Project**
LOCATION: South Hilo, Island of Hawaii;
TMKs: (3) 2-3-030:004; and Portions of (3) 2-3-030:001 and (3) 2-3-031:001
APPLICANT: Geometrician Associates on behalf of Stantec GS Inc.

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **January 12, 2024.**

If no response is received by the above date, we will assume your agency has no comments. Should you have any questions about this request, please contact Darlene Nakamura at darlene.k.nakamura@hawaii.gov. Thank you.

BRIEF COMMENTS:

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(✓) Comments are included/attached.

Signed: *CSC*
Print Name: Carty S. Chang, Chief Engineer
Division: Engineering Division
Date: Dec 28, 2023

Attachments
cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji
Ref: Early Consultation for Environmental Assessment for Ainako Affordable Housing Project
Location: South Hilo, Island of Hawaii
TMK(s): (3) 2-3-030:004; and Portions of (3) 2-3-030:001 and (3) 2-3-031:001
Applicant: Geometrician Associates on behalf of Stantec GS Inc.

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high-risk areas). Be advised that 44CFR, Chapter 1, Subchapter B, Part 60 reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood zones subject to NFIP requirements are identified on FEMA's Flood Insurance Rate Maps (FIRM). The official FIRMs can be accessed through FEMA's Map Service Center (msc.fema.gov). Our Flood Hazard Assessment Tool (FHAT) (fhat.hawaii.gov) could also be used to research flood hazard information.

If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7139.
- Kauai: County of Kauai, Department of Public Works (808) 241-4849.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: Dec 28, 2023

JOSH GREEN, M.D.
GOVERNOR | KE KIA'ĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIA'ĀINA

DAWN N. S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAI'I | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA 'OIHANA KUMU'WAIWAI 'ĀINA
LAND DIVISION

P.O. BOX 621
HONOLULU, HAWAII 96809

December 19, 2023

MEMORANDUM

FROM: **DLNR Agencies:**
___Div. of Aquatic Resources
___Div. of Boating & Ocean Recreation
_X_ Engineering Division (DLNR.ENGR@hawaii.gov)
_X_ Div. of Forestry & Wildlife (rubyrosa.t.terrago@hawaii.gov)
___Div. of State Parks
_X_ Commission on Water Resource Management (DLNR.CWRM@hawaii.gov)
___Office of Conservation & Coastal Lands
_X_ Land Division – Hawaii District (gordon.c.heit@hawaii.gov)
_X_ Aha Moku Advisory Committee (leimana.k.damate@hawaii.gov)

TO: Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: Early Consultation for Environmental Assessment for **Ainako Affordable Housing Project**
LOCATION: South Hilo, Island of Hawaii;
TMKs: (3) 2-3-030:004; and Portions of (3) 2-3-030:001 and (3) 2-3-031:001
APPLICANT: Geometrician Associates on behalf of Stantec GS Inc.

Transmitted for your review and comment is information on the above-referenced subject matter. Please submit comments by **January 12, 2024.**

If no response is received by the above date, we will assume your agency has no comments. Should you have any questions about this request, please contact Darlene Nakamura at darlene.k.nakamura@hawaii.gov. Thank you.

BRIEF COMMENTS:

( ) We have no objections.
( ) We have no comments.
( ) We have no additional comments.
(☑) Comments are included/attached.

Signed: *Afsheen Siddiqi*
Print Name: AFSHEEN A. SIDDIQI, Acting Wildlife Prog Mgr.
Division: Forestry and Wildlife
Date: Jan 16, 2024

Attachments
cc: Central Files

JOSH GREEN, M.D.
GOVERNOR | KE KIA'ĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIA'ĀINA

STATE OF HAWAI'I | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA 'OIHANA KUMUWAIWAI 'ĀINA

DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

DAWN N.S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

LAURA H.E. KAAKUA
FIRST DEPUTY

DEAN D. UYENO
ACTING DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

January 12, 2024

Log no. 4372

MEMORANDUM

TO: RUSSELL Y. TSUJI, Administrator
Land Division

FROM: AFSHEEN A. SIDDIQI, Acting Wildlife Program Manager
Division of Forestry and Wildlife

SUBJECT: **Early Consultation for Environmental Assessment for Ainako Affordable Housing Project**

The Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) has received your request for comments for the Early Consultation for Environmental Assessment (EA) for Ainako Affordable Housing Project on the Hawai'i Island; TMKs: (3) 2-3-030:004; and Portions of (3) 2-3-030:001 and (3) 2-3-031:001. The proposed project area is in South Hilo, on County-owned land and is residentially zoned. The goal of the proposed project would be to develop the property for affordable housing which would include increments of single-family and/or multi-family housing. Access to the property would be through Kilikina Street, as well as a road access corridor easement from Waianuenue Avenue to the property over two State properties: TMKs (3) 2-3-030:001 and (3) 2-3-031:001, the former of which is currently encumbered with a pasture lease. Adjacent to the property are established neighborhoods which are near major medical facilities. The EA will include a biological survey, an archeological survey, a traffic impact assessment report, an analysis on the effects to adjacent neighborhoods, and various other evaluations.

The State listed 'ōpe'ape'a or Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) could potentially occur at or in the vicinity of the project and may roost in nearby trees. Any required site clearing should be timed to avoid disturbance to bats during their birthing and pup rearing season (June 1 through September 15). During this period woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed. Barbed wire should also be avoided for any construction because bats can become ensnared and killed by such fencing material during flight.

Artificial lighting can adversely impact seabirds that may pass through the area at night by causing them to become disoriented. This disorientation can result in their collision with manmade structures or the grounding of birds. For nighttime work that might be required, DOFAW recommends that all lights used be fully shielded to minimize the attraction of seabirds. Nighttime work that requires outdoor lighting should be avoided during the seabird fledging season, from September 15 through December 15, when young seabirds make their maiden voyage to sea.

If nighttime construction is required during the seabird fledgling season (September 15 to December 15), we recommend that a qualified biologist be present at the project site to monitor and assess the risk of seabirds being attracted or grounded due to the lighting. If seabirds are seen circling around the area, lights should then be turned off. If a downed seabird is detected, please follow DOFAW's recommended response protocol by visiting https://dlnr.hawaii.gov/wildlife/seabird-fallout-season/#response.

Permanent lighting also poses a risk of seabird attraction, and as such should be minimized or eliminated to protect seabird flyways and preserve the night sky. For illustrations and guidance related to seabird-friendly light styles that also protect seabirds and the dark starry skies of Hawai'i please visit https://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf.

State-listed waterbirds such as ae'o or Hawaiian stilt (*Himantopus mexicanus knudseni*), 'alae ke'oke'o or Hawaiian coot (*Fulica alai*), and nēnē or Hawaiian Goose (*Branta sandvicensis*) could potentially occur at or in the vicinity of the proposed project site. It is against State law to harm or harass these species. If any of these species are present during construction, all activities within 100 feet (30 meters) should cease and the bird or birds should not be approached. Work may continue after the bird or birds leave the area of their own accord. If a nest is discovered at any point, please contact the Hawai'i Branch DOFAW Office at (808) 974-4221 and establish a buffer zone around the nest.

The State listed 'io or Hawaiian Hawk (*Buteo solitarius*) may occur in the project vicinity. Prior to undertaking vegetation clearing, DOFAW recommends that pre-construction surveys of the area be conducted by a qualified biologist following appropriate survey methods[1] (Gorressen et al., 2008) to ensure no Hawaiian Hawk nests are present, which may occur during the breeding season from March to September. The survey should be conducted at least 10 days prior to the start of construction. If an 'io nest is detected, a buffer zone of 100 meters (330 feet) should be established around it where no construction shall occur until the chick or chicks have fledged, or the nest is abandoned and. DOFAW staff should be immediately notified. If adult individuals are detected in the area during construction, all activities within 30 meters (100 feet) of the bird should cease. Work may continue when the bird has left the area on its own.

The endemic pueo or Hawaiian Short-Eared Owl (*Asio flammeus sandwichensis)* could potentially nest in the project area. Before any potential vegetative alteration, especially ground-based disturbance, we recommend that line transect surveys are conducted during crepuscular hours through the project area. If a pueo nest is discovered, a minimum buffer distance of 100 meters from the nest should be established until chicks are capable of flight.

[1] Gorresen, P. M., R. J. Camp, J. L. Klavitter, and T. K. Pratt. 2008. Abundance, distribution and population trend of the Hawaiian Hawk: 1998-2007. Hawai'i Cooperative Studies Unit Technical Report HCSU-009. University of Hawai'i at Hilo. 53 pp., incl. 8 figures, 3 tables & 1 appendix.

DOFAW recommends using native plant species for landscaping that are appropriate for the area; i.e., plants for which climate conditions are suitable for them to thrive, plants that historically occurred there, etc. Please do not plant invasive species. DOFAW also recommends referring to www.plantpono.org for guidance on the selection and evaluation of landscaping plants and to determine the potential invasiveness of plants proposed for use in the project.

DOFAW recommends minimizing the movement of plant or soil material between worksites. Soil and plant material may contain detrimental fungal pathogens (e.g., Rapid 'Ōhi'a Death), vertebrate and invertebrate pests (e.g., Little Fire Ants, Coqui Frogs, etc.), or invasive plant parts (e.g., African Tulip, Octopus Tree, Trumpet Tree, etc.) that could harm our native species and ecosystems. We recommend consulting the Big Island Invasive Species Committee (BIISC) at (808) 933-3340 to help plan, design, and construct the project, learn of any high-risk invasive species in the area, and ways to mitigate their spread. All equipment, materials, and personnel should be cleaned of excess soil and debris to minimize the risk of spreading invasive species.

To prevent the spread of Rapid 'Ōhi'a Death (ROD), DOFAW requests that the information and guidance at the following website be reviewed and followed if 'ōhi'a trees are present at the project site that will be removed, trimmed, or potentially injured: https://cms.ctahr.hawaii.edu/rod.

The invasive Coconut Rhinoceros Beetle (CRB) or *Oryctes rhinoceros* has now been found on the islands of O'ahu, Hawai'i Island, Maui, and Kaua'i. On July 1, 2022, the Hawai'i Department of Agriculture (HDOA) approved Plant Quarantine Interim Rule 22-1. This rule restricts the movement of CRB-host material within or to and from the island of O'ahu, which is defined as the Quarantine Area. Regulated material (host material or host plants) is considered a risk for potential CRB infestation. Host material for the beetle specifically includes a) entire dead trees, b) mulch, compost, trimmings, fruit and vegetative scraps, and c) decaying stumps. CRB host plants include the live palm plants in the following genera: Washingtonia, Livistona, and Pritchardia (all commonly known as fan palms), Cocos (coconut palms), Phoenix (date palms), and Roystonea (royal palms). When such material or these specific plants are moved there is a risk of spreading CRB because they may contain CRB in any life stage. For more information regarding CRB, please visit https://dlnr.hawaii.gov/hisc/info/invasive-species-profiles/coconut-rhinoceros-beetle/.

Cats prey on native birds, including State-listed endangered waterbirds, seabirds, and forest birds. Predation is instinctive and means that even well-fed cats will hunt and kill wildlife. Therefore, DOFAW recommends that homeowner associations request that residents with pet cats be kept indoors or safely contained. In addition, no feeding of feral cats should occur on the premises.

We recommend that Best Management Practices are employed during and after construction to contain any soils and sediment with the purpose of preventing damage to near-shore waters and marine ecosystems.

We appreciate your efforts to work with our office for the conservation of our native species. These comments are general guidelines and should not be considered comprehensive for this site or project. It is the responsibility of the applicant to do their own due diligence to avoid any negative environmental impacts. Should the scope of the project change significantly, or should it become apparent that threatened or endangered species may be impacted, please contact our staff as soon as possible. If you have any questions, please contact Myrna N. Girald Pérez, Protected Species Habitat Conservation Planning Coordinator at (808) 265-3276 or myrna.girald-perez@hawaii.gov.

Sincerely,

Afsheen Siddiqi

AFSHEEN A. SIDDIQI
Acting Wildlife Program Manager

JOSH GREEN, M.D.
GOVERNOR | KE KIA'ĀINA

SYLVIA LUKE
LIEUTENANT GOVERNOR | KA HOPE KIA'ĀINA

DAWN N. S. CHANG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAI'I | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF LAND AND NATURAL RESOURCES
KA 'OIHANA KUMUWAIWAI 'ĀINA
LAND DIVISION

P.O. BOX 621
HONOLULU, HAWAII 96809

January 17, 2024

Geometrician Associates, LLC
Attention: Mr. Ron Terry
P.O. Box 396
Hilo, Hawaii 96721

via email: rterry@hawaii.rr.com

Dear Mr. Terry:

SUBJECT: Early Consultation for Environmental Assessment for **Ainako Affordable Housing Project** located at South Hilo, Island of Hawaii; TMKs: (3) 2-3-030:004; and Portions of (3) 2-3-030:001 and (3) 2-3-031:001 on behalf of Stantec GS Inc.

Thank you for the opportunity to review and comment on the subject matter. The Land Division of the Department of Land and Natural Resources (DLNR) distributed or made available a copy of your request pertaining to the subject matter to DLNR's Divisions for their review and comments.

At this time, enclosed are comments from the (a) Engineering Division and (b) Land Division-Hawaii District on the subject matter. Should you have any questions, please feel free to contact Darlene Nakamura at (808) 587-0417 or email: darlene.k.nakamura@hawaii.gov. Thank you.

Sincerely,

Russell Tsuji

Russell Y. Tsuji
Land Administrator

Enclosures
cc: Central Files

Mitchell D. Roth
Mayor

Benjamin T. Moszkowicz
Police Chief

Reed K. Mahuna
Acting Deputy Police Chief

County of Hawai`i

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

January 2, 2024

Ms. Michele Lefebvre, Ph.D.
Senior Project Manager, Environmental Scientist
Stantec GS Inc.
P.O. Box 191
Hilo, Hawaii 96721

Dear Ms. Lefebvre:

SUBJECT: EARLY CONSULTATION FOR ENVIRONMENTAL ASSESSMENT FOR AINAKO AFFORDABLE HOUSING PROJECT, TMK (3) 2-3-030:04 AND PROS. 2-3-030:001 AND 2-3-034:001, SOUTH HILO DISTRICT, ISLAND OF HAWAII

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

Thank you for allowing us the opportunity to comment.

If you have any questions, please contact our South Hilo District Commander, Captain Brian Prudencio, at (808) 961-2316 or via email at Brian.Prudencio@hawaiicounty.gov.

Sincerely,

SCOTT P. AMARAL
ACTING ASSISTANT POLICE CHIEF

BP:ws/23HQ1537

From:	M & C johnson
To:	Michele Lefebvre
Subject:	EA for Ainako Affordable Housing Project, TMK (3) 2-3-030:004 Hilo
Date:	Wednesday, March 27, 2024 9:52:45 AM

Dear Michele Lefebvre PhD,

As residents on Ainako Street, Hilo we are interested in the Early Consultation for EA for Ainako Affordable Housing Project, TMK (3) 2-3-030:004 and pors. 2-3-030:001 and 2-3-034:001, South Hilo being prepared by Stantec GS Inc.

Please send us notice of EA availability and any other public information about the project.
mjohnson@hevanet.com

Ainako Stream is a named stream recognized by Commission on Water Resource Management. Some maps do not show the entire course of Ainako Stream or its tributaries especially between Ainako and Akolea Streets. The Ainako stream is spring fed, originating just makai of Akolea Street. It gathers water from a large surrounding area. There are numerous bog areas along the stream that are filled with sheet flows of water during rainy periods. It and other waterways are on or near these properties and they eventually enter the Wailuku River at Carvalho Park on Waianuenue Avenue and has caused flooding.

Many of our neighbors on the Ainako, Kilikina and Akolea Streets have lived here for generations. They have played and explored these areas. We are all very aware of water issues, archeology and topography of this and the surrounding lands. Several of us are pleased to be on the Hilo sewer system. Any housing based on this EA should plan to connect to the sewer system near the Hilo Medical Center. The roads are already heavy with traffic near the hospital and DeSilva Elementary School. The EA must address congestion issues and traffic flow into town.
Thank you for the work being done fulfilling the request from Hawaii County.

Carol Johnson
Mark Johnson
969 Ainako Street
Hilo

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Appendix 2

Wetland Surveys

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AECOS No. 1734B

Aquatic features within a new road alignment on TMKs: (3)2-3-031:001 (por.) and (3)2-3-030:001 (por.), Ainako, South Hilo, Hawai‘i

AECOS Inc.
45-939 Kamehameha Highway
Suite 104
Kāne‘ohe, Hawai’i 96744

July 16, 2024

Aquatic features within a new road alignment on TMKs: (3)2-3-031: 001 (por.) and (3)2-3-030: 001 (por.), Ainako, South Hilo, Hawai‘i

July 16, 2024 **DRAFT** *AECOS* No. 1734B

Susan Burr and Kamryn Yoneshige
AECOS Inc.
45-939 Kamehameha Highway Suite 104
Kāne‘ohe, Hawai’i 96744
Phone: (808) 234-7770 ~ Email: sburr@aecos.com

Introduction

The County of Hawai‘i is conducting a housing feasibility study that includes making a schematic subdivision layout for housing units (“Project”) on Tax Map Keys (TMKs) (3)2-3-030:004 and (3)2-3-030:001 (por.) in Ainako, Hawai‘i Island (Figure 1). In 2022, *AECOS* scientists conducted a preliminary jurisdictional waters and wetlands survey within the approximate 24-ha (60-ac) Project area, including an approximation of the boundaries of aquatic features and an assessment of whether the features are likely to be considered jurisdictional (Attachment A; *AECOS*, 2022). That survey found the proposed access road alignment crossed through a wetland associated with “Tributary B” of Ainako Stream. *AECOS* was recently contracted by Okahara and Associates to conduct further jurisdictional waters and wetlands surveys for a new road alignment to the Project through TMKs (3)2-3-031:001 (por.) and (3)2-3-030: 001 (por.); see polygon outlined in orange in Fig. 1 for the expanded survey area. This report depicts boundaries of aquatic features within the new road alignment and an assessment of whether the features are likely to be considered jurisdictional under the Clean Water Act (federal jurisdiction) and State Water Code and Water Pollution Chapter (state jurisdiction).[1]

[1] This report is intended to become part of the public record and incorporated into an EA for the subject Project.

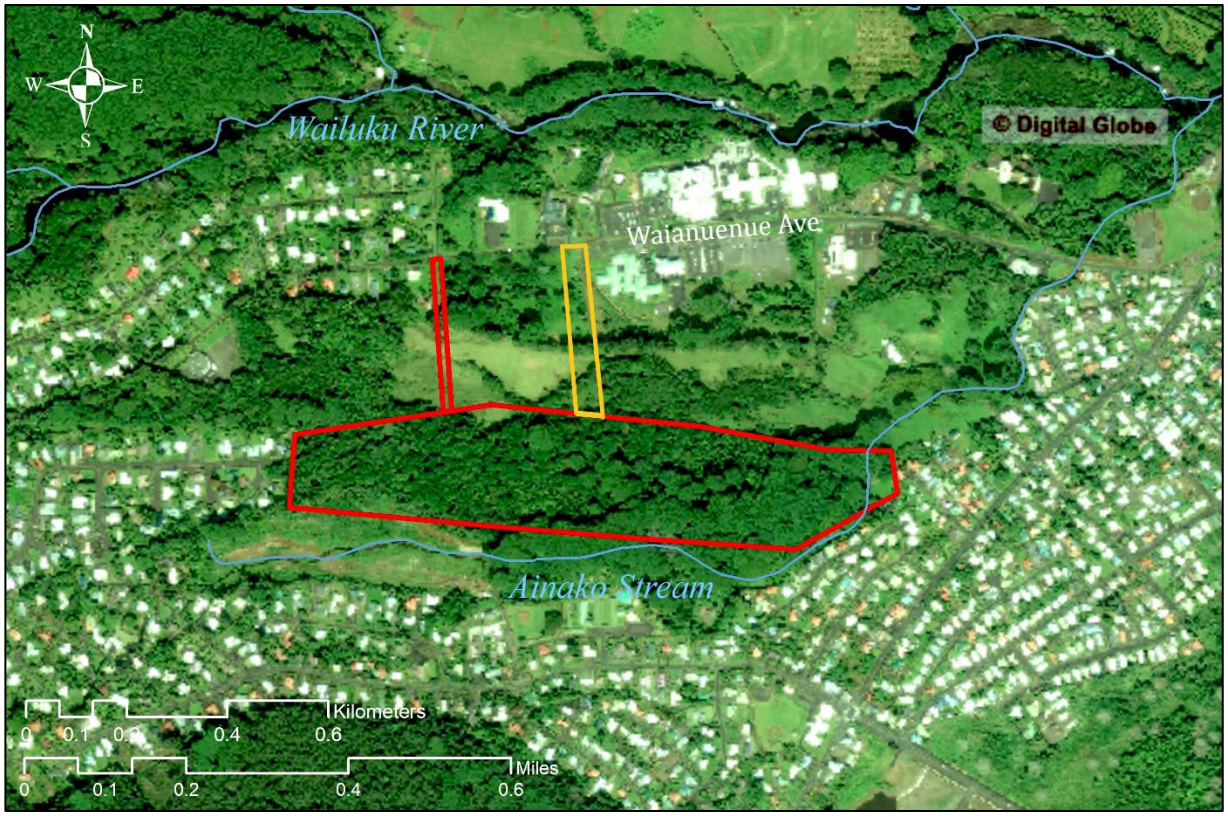

Figure 1. Housing project area (red outline) and new road alignment survey area (orange outline) in Ainako, Hawai'i Island.

Site Description

The housing project and new road alignment are in the Ainako Stream sub-basin of the larger Wailuku Watershed (DAR Watershed Code 82060; Parham et al., 2008). Wailuku Watershed occupies 65,300 ha (161,350 ac)—very nearly the size of the island of Moloka'i—on the east side of the saddle between Mauna Loa and Mauna Kea. Wailuku River is the longest and largest surface water feature in the state (National Park Service, 2021) with a length of 45 km (28 mi). Wailuku River flows west to east on the approximate boundary between lava flows from Mauna Kea and flows from Mauna Loa before emptying into the Pacific Ocean on the west side of Hilo Bay. Owing to the porous nature of young lava flows on the flank of Mauna Loa, tributary streams of the Wailuku River are mostly limited to the southeast slope of Mauna Kea, where soils have formed from older and less-permeable volcanic ash deposits. Rainfall on Mauna Loa infiltrates into the groundwater system to charge aquifers, flowing underground to streams and the coast. Numerous springs emerge on the slopes of both mountains above Hilo to feed into the Wailuku River.

Ainako Stream is one of only a few streams on the slopes of the Mauna Loa, but it is not listed as a perennial stream in the Hawai'i Watershed Atlas (Parham et al., 2008) and is not on the list of perennial streams in the Hawai'i Stream Assessment (Hawai'i Cooperative Service Unit, 1990). Ainako Stream and two tributaries are visible in the Hawai'i layers of the US Geological Survey (USGS) StreamStats map-based web application (USGS, 2019); streamflow statistics computed for the stream at the confluence with Wailuku River include a 50-percent annual exceedance probablility (AEP) flood of 682 cubic feet per second (cfs) and a 100-year peak flow of 2,710 cfs.

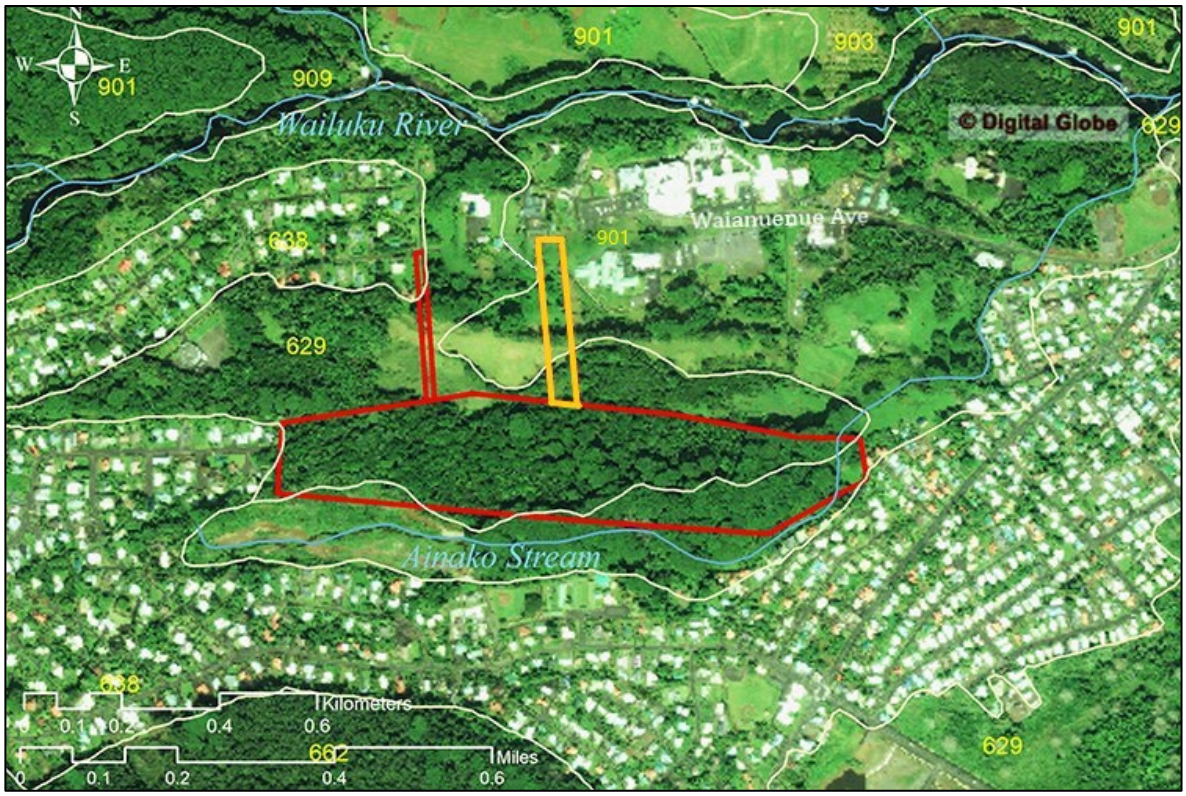

Figure 2. USDA-NRCS soil types in housing project area (red outline) and new road alignment survey area (orange outline). Relevant soil codes referred to in the text.

The majority of the the new road alignment is mapped as the soil type Hilo hydrous silty clay loam, 0-10% slopes (901) and the southern end is mapped as Panaewa very cobbly hydrous loam, 2-10% slopes (629; USDA-NRCS, 2021; Figure 2, above). Panaewa very cobbly hydrous loam, 2-10% slopes (629) is listed as a hydric soil with a component representative percentage of 10 on the U.S. Dept. of Agriculture-Natural Resources Conservation Service (USDA-NRCS), National List of Hydric Soils for Hawai'i (USDA-NRCS, 2020). A 10% rating

indicates that 10% of all areas mapped as Panaewa very cobbly hydrous loam, 2-10% slopes (629) meet the criteria for hydric soils.

Precipitation in South Hilo is high. The National Oceanographic and Atmospheric Administration–National Centers for Environmental Information (NOAA-NCEI) climate normals for Sta. "HILO 5 S, HI US" includes an average annual rainfall of 3,840 mm (151 in; NOAA-NCEI, 2024). USGS StreamStats calculates mean annual precipitation for the Ainako sub-basin at 4,343 mm (171 in; USGS, 2019). Most rainfall occurs during the rainy season from November through April, although the area can remain relatively wet throughout the year. These precipitation statistics are based on a 30-year average.

The U.S. Geological Survey (USGS) topographic map (USGS, 2017) and U.S. Fish and Wildlife Service (USFWS) *National Wetlands Inventory* (NWI; USFWS, nd) map Ainako Stream (unnamed) traversing in and near the Project area from west to east (Figure 3). The USGS topo map also marks the three locations of Kaūmana Springs at the eastern edge of the Project area at the base of Kupapaʻu Hill—east of the new road alignment survey area. The USGS map indicates Ainako Stream is intermittent flowing and the NWI describes the stream channel as a temporarily flooded, forested wetland (PSS3A). Ainako Stream and three tributaries are situated in FEMA Flood Zone AE, meaning these areas are subject to inundation by the 1% annual chance (100-year) flood (hatched polygons in Fig. 3; FEMA, 2018; FEMA, nd). The remainder of the Project area is in a non-special flood hazard area determined to be outside the 0.2% annual chance floodplain.

USGS StreamStats shows that the Ainako sub-basin extends upslope to Akolea Road where streams that likely used to flow into Ainako Stream are diverted in a man-made ditch to the north and directed into Wailuku River at Wailuku River State Park. Despite the diversion and porous nature of the substratum, streams, ponds, and wetlands have been identified in the Akolea subdivision upslope of the Project area and in the undeveloped land between the subdivision and Akolea Road (Clayton, 2007; *AECOS*, 2008; HDLNR-CWRM, 2013). The Project area has been described as a "boggy area" (HDLNR-CWRM, 2013), although a desktop study by the U.S. Army Corps of Engineers–Honolulu District (USACE–HD) Regulatory Program determined uplands comprise the entirety of an unspecified area of review in the Project area (USACE-HD, 2021).

The environmental conditions of the Project area and new road alignment survey area are conducive to the formation of seeps, springs, streams, and wetlands. The high rainfall; substratum composed of a thin layer of soil over young and porous lava flows; previous land use and manipulation of water flows for sugar cane fields and pastures; and current overgrowth of vegetation make the

determination and delineation of aquatic features in the constructional landscape of the Project area difficult.

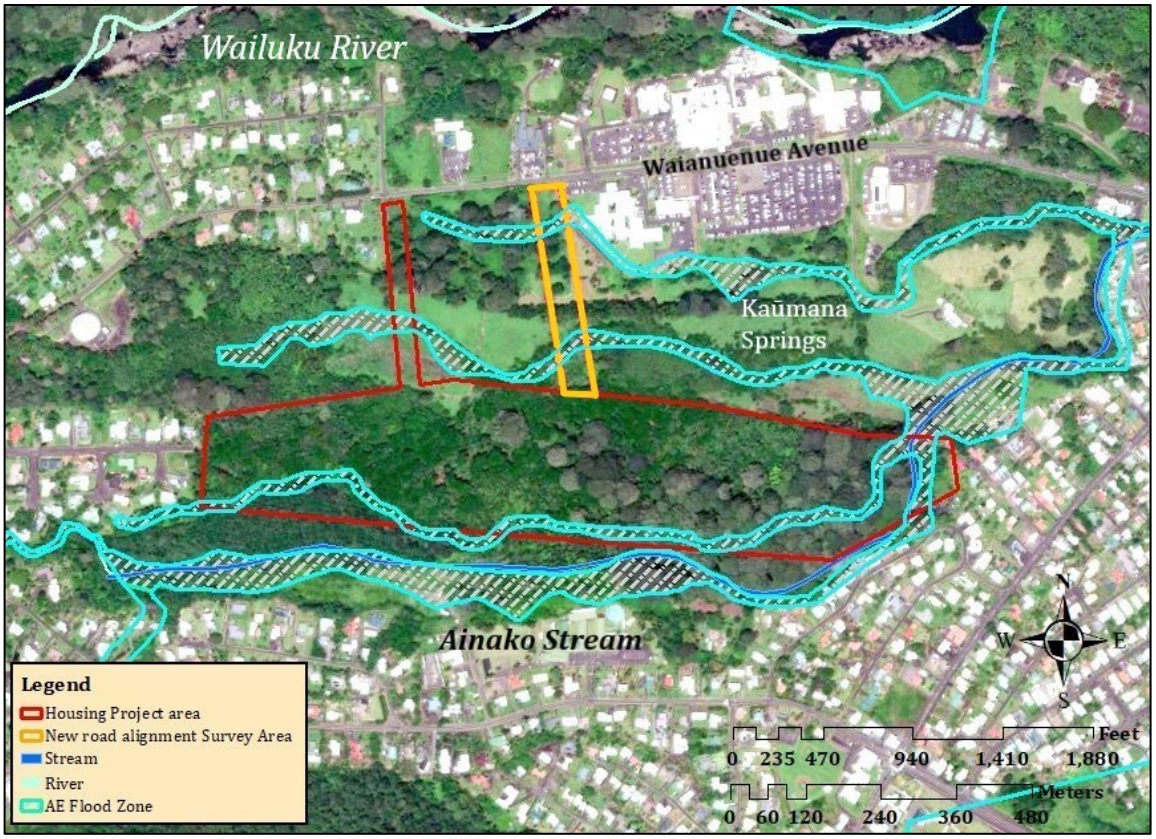

Figure 3. Surface waters and wetlands as depicted in the National Wetlands Inventory or NWI (USFWS, nd), springs indicated on the USGS topographic map (USGS, 2017), and AE flood zones (FEMA, nd). Project area (red outline) and new road alignment survey area (orange outline).

Jurisdictional Waters

Waters of the U.S.

Waters of the U.S. (also called "jurisdictional waters" or "federally jurisdictional waters") are surface waters that come under federal jurisdiction as authorized by the Clean Water Act (CWA) and the Rivers and Harbors Act (RHA). Authority over these waters is granted to various federal agencies, including the U.S. Environmental Protection Agency (USEPA), with the U.S. Army Corps of Engineers (USACE) having permit authority for some actions that impact jurisdictional waters. Jurisdictional waters include all tidal waters and a subset of streams, lakes, reservoirs, and wetlands.

Revised Definition of Waters of the US - On March 20, 2023, the final "Revised Definition of 'Waters of the United States" ("2023 rule") took effect (USACE and USEPA, 2023a). Jurisdictional waters identified in the rule include:

- tidal waters, also known as traditionally navigable waters (TNWs) [(a)(1)(i)] [2];
- impoundments of jurisdictional waters [(a)(2)];
- tributaries of TNWs that have relatively permanent water (RPW) [(a)(3)(i)] or tributaries of TNWs that have a significant effect on the chemical, physical, or biological integrity of a TNW [(a)(3)(ii)];
- wetlands adjacent to TNWs [(a)(4)(i)] or wetlands adjacent to and with a continuous surface connection to RPW tributaries [(a)(4)(ii)], or wetlands adjacent to tributaries, provided the wetlands significantly affect the chemical, physical, or biological integrity of a TNW [(a)(4)(iii)];
- other waters not identified above that have RPW and a surface connection to a TNW or RPW tributary [(a)(5)(i)] or other waters not identified above that significantly affect the chemical, physical, or biological integrity of a TNW [(a)(5)(ii)];

Non-jurisdictional waters identified in the rule include:

- prior converted cropland (PCC) [(b)(2)];
- ditches excavated wholly in and draining only dry land that do not carry RPW [(b)(3)]; and
- artificial lakes or ponds created by excavating or diking dry land to collect and retain water and are used exclusively for irrigation [(b)(5)].

Although a definition of a tributary is not included in the rule, "tributary for the purposes of this rule includes rivers, streams, lakes, ponds, and impoundments, regardless of their flow regime, that flow directly or indirectly through another water or waters to a traditional navigable water, the territorial seas, or an interstate water. Waters through which a tributary may flow indirectly include, for example, impoundments, wetlands, lakes, ponds, and streams. A tributary may flow through a number of downstream waters, including a non-jurisdictional tributary or non-jurisdictional features, such as [an excluded ditch,] excluded waste treatment system, and jurisdictional waters that are not tributaries, such as an adjacent wetland" (USACE and USEPA, 2023a; pg. 3080).

US Supreme Court Ruling – On May 25, 2023, a Supreme Court of the US (SCOTUS) ruling, *Sackett v. Environmental Protection Agency* (SCOTUS, 2023), rejected the *significant nexus* standard, effectively eliminating jurisdiction over

[2] Numbers and letters given in brackets are from the final rule (USACE and USEPA, 2023a). Waterbody types are often referred to by these designations.

(a)(3)(ii), (a)(4)(iii), and (a)(5)(ii) waters as listed above; revising the "adjacent wetlands" definition; and eliminating jurisdiction over intrastate wetlands.

Revised Definition of Waters of the US; Conforming Rule – On September 8, 2023, the agencies published a conforming rule for the Revised Definition of 'Waters of the United States' ("Conforming Rule"; USACE and USEPA, 2023b) to comply with the SCOTUS opinion. According to the Conforming Rule, (a)(3)(ii), (a)(4)(iii), and (a)(5)(ii) waters are no longer jurisdictional and the only jurisdictional wetlands, including intrastate wetlands, are ones that are adjacent (meaning they have a continuous surface connection) to bodies that qualify as waters of the US in their own right.

To be consistent with the 2023 SCOTUS ruling (which unanimously agreed with the plurality decision of the Supreme Court in the 2006 *Rapanos* case, and, therefore, we can assume the guidance memorandum directing implementation of that decision [USEPA and DA, 2006] is applicable), a RPW stream might dry up in extraordinary circumstances, such as drought, but is not an ephemeral stream that flows or contains water only immediately after rain events and does not receive groundwater input for at least a season or longer.

The extent of federal jurisdiction for tributaries (and impoundments) is drawn at the Ordinary High Water Mark (OHWM). OHWM is defined as "…that line on the shore established by the fluctuations of water and indicated by physical characteristics such as a clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas" (USACE and USEPA, 2023a).

Wetlands are defined as those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar features characterized by wet ground (USACE, 1987; USACE and USEPA, 2023a). As described, not all wetlands are waters of the US. That is, the term wetland applies to a defined landscape feature; a jurisdictional (regulatory) wetland is one that falls under the authority of the CWA.

State Waters

Unlike many states, Hawai'i does not have an independent permitting program for state waters that are not regulated as waters of the US. Due to recently frequent changes in the definition of waters of the US (e.g., the Clean Water Rule of 2015, the Navigable Waters Protection Rule of 2018, the Revised Definition of

Waters of the US of March 2023, the US Supreme Court decision of May 2023, and the conforming rule of 2023), Hawai‘i State agencies have begun to evaluate whether certain waterbodies are state waters, independent of whether they are waters of the US.

State waters fall under jurisdiction authorized under Hawai‘i Revised Statutes (HRS), State Water Code (HRS § 174C-3, 2021), and Water Pollution Chapter (HRS § 342D-1, 2022). The State Water Code defines a “stream” as “any river, creek, slough, or natural watercourse in which water usually flows in a defined bed or channel. It is not essential that the flowing be uniform or uninterrupted. The fact that some parts of the bed or channel have been dredged or improved does not prevent the watercourse from being a stream.” A “watercourse… means a stream or any canal, ditch, or other artificial watercourse in which water usually flows in a defined bed or channel. It is not essential that the flowing be uniform or uninterrupted.” State waters are defined in the Water Pollution Chapter as “all waters, fresh, brackish, or salt, around and within the State, including, but not limited to, coastal waters, streams, rivers, drainage ditches, ponds, reservoirs, canals, ground waters, and lakes; provided that drainage ditches, ponds, and reservoirs required as part of a water pollution control system are excluded.”

Wetlands are defined in the Hawai‘i water quality standards (HDOH, 2021, pg. 54-11 and 12) as, “land that is transitional between terrestrial and aquatic ecosystems where the water table is usually at or near the surface or the land is covered by shallow water” and “the delineation of wetland boundaries shall be done following the procedures described in the U.S. Army Corps of Engineers’ Wetlands Delineation Manual” (i.e., USACE, 1987). “Delineation” is defined as the process of determining a geospatial line that separates wetlands and other waters from upland areas.

Methods

AECOS scientists conducted field work on December 18, 2023, during the rainy season. Prior to our field surveys, we reviewed literature and GIS data, including results of previous surveys conducted by *AECOS* for projects in Wailuku Watershed (*AECOS*, 2008; 2021; 2022); climate data, including recent rainfall (NOAA-NWS, 2023); mapped soil types (USDA-NRCS, 2021); surface waters and wetlands identified in the NWI (USFWS, nd); and mapped flood zones (HDLNR, nd).

Stream Survey

We delineated the OHWM of streams in the new road alignment survey area by walking the course of the channels and investigating downstream connections. We identified points that exhibit physical characteristics of OHWM, including shelving and destruction of terrestrial vegetation. We recorded the geospatial locations using a Trimble Geo7X, capable of sub-meter accuracy in position. The resulting shapefiles were processed with GPS Pathfinder, including differential correction, and exported as ArcMap shapefiles using a projected coordinate system of NAD 1983 UTM Zone 5N.

Wetland Survey

Wetland identification follows the methods described in the *Corps of Engineers Wetland Delineation Manual* ("Manual"; USACE, 1987) and *Regional Supplement for Hawai'i and Pacific Islands* (USACE, 2012)[3]. Wetland determination sampling points (SPs) are used to evaluate the presence of either wetland or upland characteristics at selected points in the landscape. The approach for wetland delineation for CWA purposes requires finding positive evidence of hydric soil, wetland hydrology, and hydrophytic vegetation at a SP. All three indicators must be present for a positive wetland determination. The boundary between wetland and upland (non-wetland) is established as a line outside of which at least one of the three wetland indicators is absent.

The National Wetland Plant List (NWPL), administered by the USACE, assigns a wetland indicator status to each species of vascular plant on a regional basis (Lichvar, 2012; USACE, 2020). Table 1 provides wetland status indicators and their definitions. The wetland indicator status of each species in the plant assemblage at a SP is used to determine if a site has a "prevalence of vegetation typically adapted for life in saturated soil conditions." We identified plant assemblages in the Project area (grassland and forest) and made visual estimates at each SP of percent cover of plant species in sample plots of appropriate size and shape, based on the type of vegetation.

Hydric soils are soils that are sufficiently wet in the upper layers to develop anaerobic conditions; that is, soils that could be associated with wetlands. Soil saturation with water is what differentiates wetland soils from upland soils, as saturation greatly reduces the oxygen present between soil particles. In determining whether a soil is hydric, we look for evidence of this saturation (i.e., reducing conditions); the soil need not be water saturated at the time of

[3] As described above, the same method is used to define wetlands that are considered to be both waters of the U.S. and State Waters.

Table 1. Wetland status indicators and their definitions (after Lichvar and Gillrich, 2011).

Status indicator (CODE)	Qualitative Description
Obligate (OBL)	Almost always occurs in wetlands
Facultative wetland (FACW)	Usually occurs in wetlands, but may occur in non-wetlands
Facultative (FAC)	Occurs in wetlands and non-wetlands
Facultative upland (FACU)	Usually occurs in non-wetlands, but may occur in wetlands
Upland (UPL)	Almost never occurs in wetlands

inspection, and indeed may be dry. Even though one of the soil types, Panaewa very cobbly hydrous loam, 2-10% slopes (629), mapped in the survey area is listed as a hydric soil on Hawai'i (USDA-NRCS, 2020; 2021), inspection by soil pits is a necessary part of the wetland determination process. Local conditions can deviate from a mapped soil type, and saturation or inundation of sufficient duration can render any soil, even fill material, hydric.

During our December 2023 survey of the new road alignment area, we established four wetland determination sampling points (SPs) in low areas (i.e., geomorphological positions conducive to wetland formation) and/or areas with hydrophytic vegetation present and completed a wetland data determination sheet at each SP. We recorded the geospatial positions of the four SPs, identified potential boundaries between wetland and uplands, and marked the boundaries with our GNSS instrument. These data were used to prepare the updated jurisdictional waters and wetlands figure presented in this report that includes data from our 2022 survey of the Project area (*AECOS*, 2022). Wetland data determination sheets for the seven SPs are provided in Attachment B and photographs to document conditions at each SP are provided in Attachment C.

For wetland features, we identified approximate boundaries based primarily on a change in plant assemblages and elevation. We recorded the geospatial position of the boundaries using a Trimble Geo7X. The resulting shapefiles were processed as described above.

Jurisdictional Determination

To characterize wetlands and tributaries in the new road alignment survey area, we determined how the aquatic features are classified under the Conforming

Rule (USACE and USEPA, 2023b). As applicable to the survey area, federal agencies (USACE, EPA) will assert jurisdiction over tributaries to navigable waters with relatively permanent waters (RPW; tributaries that typically flow year-round or have continuous flow at least seasonally) and wetlands adjacent to and with a continuous surface connection to RPW tributaries. Features that are generally not jurisdictional are swales or similar erosional features and ditches excavated wholly in and draining only uplands and not carrying a relatively permanent flow of water. Tributaries that are excluded from state jurisdiction are drainage ditches, ponds, and reservoirs required as part of a water pollution control system.

Results

Tributaries

Ainako Stream and three tributaries (designated herein "Tributary A", "Tributary B", and "Tributary C") flow in or near the housing project area and new road alignment survey area (Figure 4). Our July 2022 survey (*AECOS*, 2022) confirmed that Ainako Stream follows the channel mapped on the USGS topographic map (USGS, 2017) and the USFWS NWI (USFWS, nd) and Ainako Stream and the three tributaries generally flow within the boundaries indicated by Flood Zone AE (FEMA, nd). Tributary A and Tributary B converge with Ainako Stream at the eastern edge of the Project area. The confluence with Tributary C is located to the northeast, near Waianuenue Avenue. The higher order stream crosses under Waianuenue Road and discharges into the Wailuku River. Wailuku River discharges into Hilo Bay at Mokupane Point. Ainako Stream and Tributary A do not cross the new road alignment and are not discussed further in this report.

Tributary B

Tributary B is not identified as a stream on the USGS topo map, nor is it indicated as a stream or wetland on the NWI. Tributary B emerges from a mixed forest at the west end of TMK (3)2-3-030: 001. The stream is largely channelized between the origin and confluence with Ainako Stream, although it crosses two wide areas of grassland where the channel is less deeply incised, sinuous, and sometimes indistinct from the landscape (*AECOS*, 2022). Within the survey area, Tributary B flows through a forest in an incised channel (Figure 5). Physical indicators of flow include presence of a bed and banks, shelving, and a change in plant community. We observed fishes and macroinvertebrates in the stream, including Pacific prawn (*Macrobrachium lar*). The presence of Pacific prawn in Tributary B indicates both that stream flow is perennial and the stream has a surface

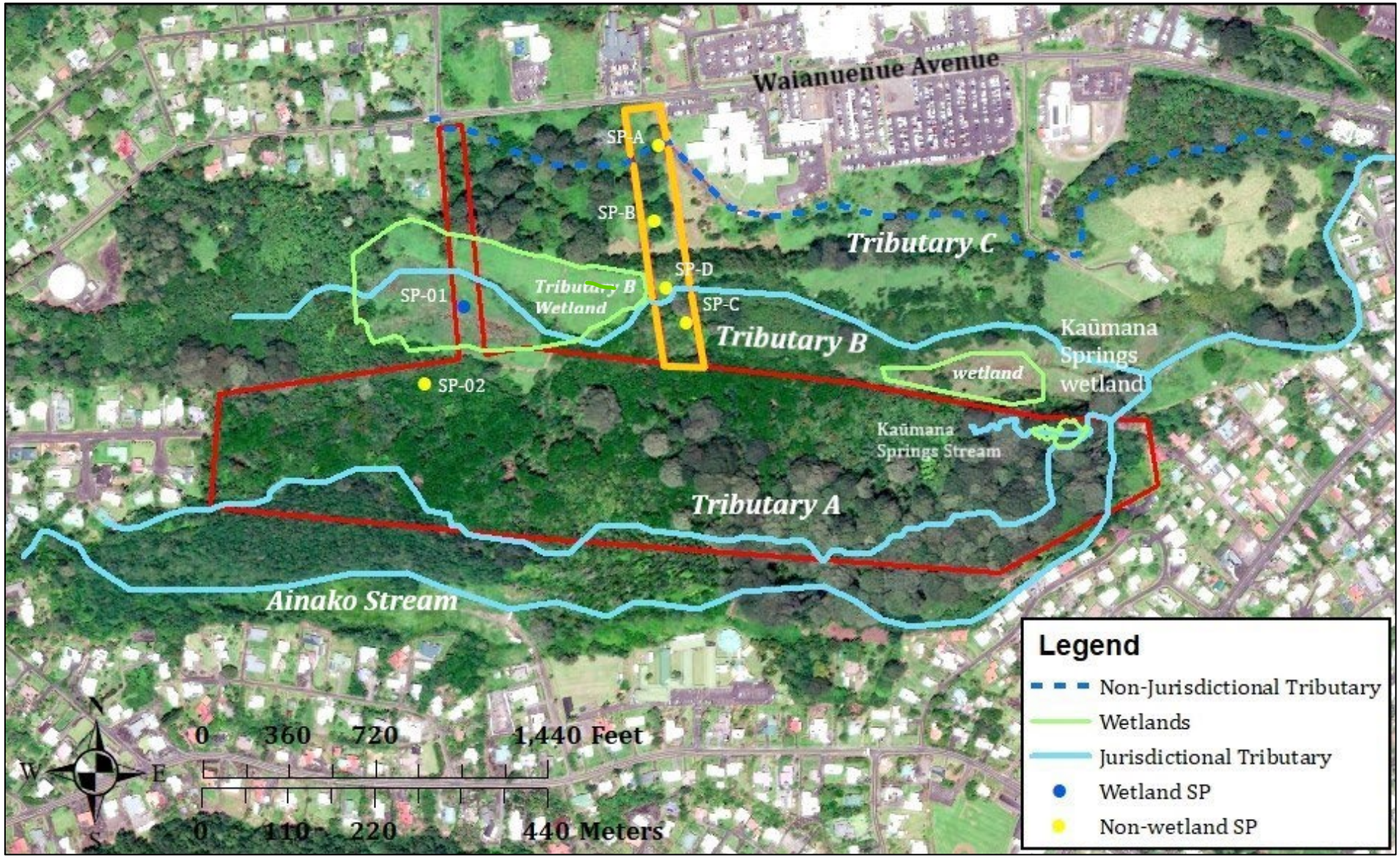

Figure 4. Wetland boundaries (in green) updated from 2022 report and stream flowpaths (in blue) updated from 2022 report within the new road alignment survey area as marked in the field by *AECOS* on December 18, 2023.

Figure 5. Within the new road alignment survey area, Tributary B flows in an incised channel through a forested area.

connection to the ocean because the prawn is an amphidromous animal that migrates to and from the ocean. As described above, Tributary B converges with Ainako Stream to the north of the Project area, downstream of the confluence with the spring stream and Tributary A.

We delineated approximately 66 m (216 ft) of the left and right banks of Tributary B within the new road alignment survey area (Figure 6). The channel measures approximately 6 m (20 ft) in width throughout the survey area. The OHWM points reflect the sinuous path of the tributary as it curves northwest to northeast then turns to the east.

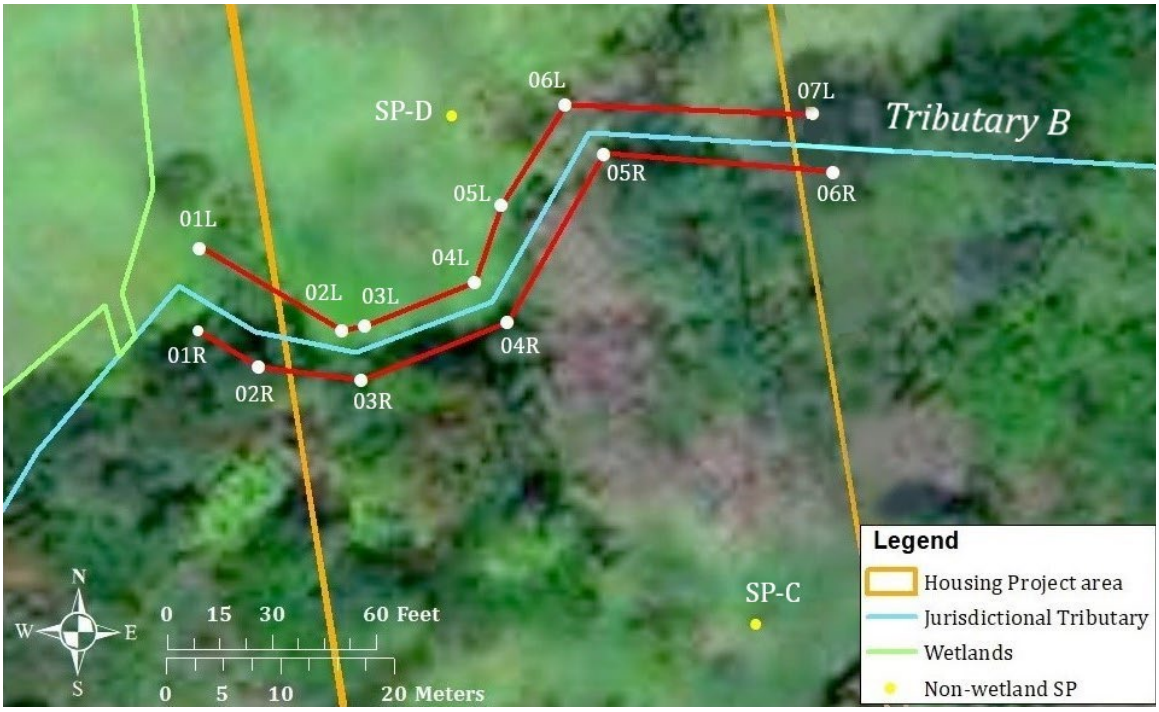

Figure 6. Delineated OHWM (red lines) of Tributary B relative to new road alignment survey area (orange outline).

Tributary C

Tributary C is not identified as a stream on the USGS topo map, nor is it indicated as a stream or wetland on the NWI. Tributary C receives flow from a roadside ditch on Waianuenue Avenue that is directed through a culvert under Waiau Street. Within the Project area surveyed in July 2022 (*AECOS*, 2022), Tributary C contained water and exhibited physical indicators of flow. Within the new road alignment survey area, surveyed in December 2023, Tributary C did not contain water, but exhibited physical indicators of flow such as shelving, presence of bed and banks, and destruction of terrestrial vegetation. Flow from Tributary C is directed into a concrete-lined drainage channel (Figure 7). The confluence of Tributary C with Ainako Stream is downslope near Waianuenue Avenue.

We delineated approximately 56 m (184 ft) of the left and right banks of Tributary C with six paired points (Figure 8). The channel measures approximately 15 m (49 ft) wide near the west side of the survey area, then narrows to 5 m (16 ft) near the start of the drainage channel. Physical characteristics of flow used to delineate OHWM include presence of natural bed and banks, scour, shelving, and vegetative debris.

Figure 7. Tributary C flows into a fenced drainage ditch on the east side of the new road alignment survey area.

We established a single SP in Tributary C (SP-A) to determine if a wetland occupies the bottom of the channel. Job's tears (*Coix lacryma-jobi*; FACW) is dominant in the herb stratum and Moluccan albizia *(Falcataria moluccana*; FACU) is dominant in the tree stratum. The non-hydric soil at SP-A is a very dark brown (10YR 2/2) mucky silty clay loam atop a brown (7.5YR 4/3) sandy clay loam with very few redox concentrations. Other than geomorphic position (a secondary indicator of wetland hydrology), no indicators of wetland hydrology were present. Because SP-A meets only one of the three indicators, it is not a wetland. We established SP-B in an area dominated by California grass located between Tributary C and Tributary B. The vegetation is hydrophytic here, but the soil is non-hydric and indicators of wetland hydrology are absent. Because SP-B meets only one of the three indicators, it is not a wetland.

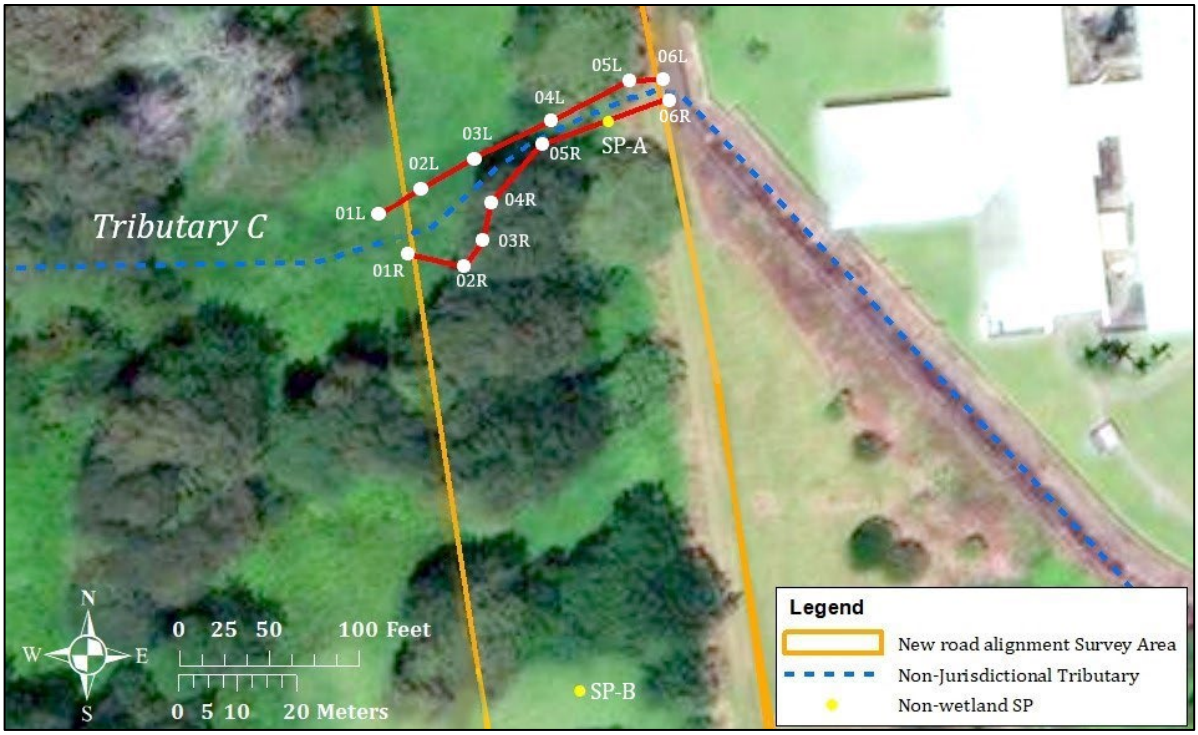

Figure 8. Delineated OHWM (red lines) of Tributary C within the new road alignment survey area (orange outline).

Wetlands

As shown above in Fig. 4, wetlands are associated with and adjacent to Tributary B.

Tributary B wetland

Tributary B flows through a large wetland adjacent to the Project area (Figure 9); the original road alignment bisected this wetland. Figure 4 shows the locations and status (wetland or upland) of the two SPs established in July 2022 and the two established in the December 2023 survey that were used to define the boundaries of the wetland. SP-01 is in the wetland and SP-02, SP-C, and SP-D are in upland. We drew the wetland boundaries primarily by a change in vegetation and a change in elevation.

Hydrology – The source of water for Tributary B wetland is a high groundwater table, coupled with a smaller proportion of surface runoff from the relatively small watershed of Tributary B. Indicators of wetland hydrology observed at SP-01 and elsewhere within the wetland include standing and flowing water during

Figure 9. Looking west toward Tributary B wetland located upslope from the left bank of Tributary B.

the dry season, visible iron-rich floc and bacterial sheens, saturated soil, aquatic fauna, hydrogen sulfide odor, geomorphic position, and a positive FAC-neutral test. The forested areas between Tributary B and Tributary A (e.g., SP-02 and SP-C) do not have any primary or secondary indicators of wetland hydrology (*AECOS*, 2022). The grassed slope north of Tributary B (e.g., SP-D) has only geomorphic position as a secondary indicator of wetland hydrology.

Vegetation – The two dominant grasses in Tributary B wetland are wainaku grass (*Panicum repens* – FAC) and California grass (*Urochloa mutica* – FACW). Wainaku grass dominates the lower elevation and seemingly wetter areas of the wetland and California grass is more abundant to the south of Tributary B (e.g., SP-01) and on the grassed slope north of Tributary B (e.g., SP-D), which is not wetland. Attachment D is a list of plant species observed in and near Tributary B wetland; most of the species observed are hydrophytic. Conspicuous plants observed throughout the wetland include paca fern (*Diplazium esculentum* –

FACW), Hilo grass (*Paspalum conjugatum* - FAC), primrose willow (*Ludwigia octovalvis* - OBL), *Cyperus halpan* (FACW), *honohono* (*Commelina diffusa* - FACW), Glenwood grass (*Sacciolepis indica* – FAC), Job's tears (*Coix lacryma-jobi* - FACW), and umbrella sedge (*Cyperus involucratus* - FACW). SP-02 is in a strawberry guava (*Psidium cattleianum* – FACU) scrub forest, but a common plant throughout the forest is Alexander palm (*Archontophoenix alexandrae* – UPL). SP-D is on a slope dominated by California grass and SP-C is in a low area dominated by fox-tongued melastoma (*Melastoma septemnervium* – FAC).

Soils - The soil at SP-01 in Tributary B wetland is a histosol—a thin (3-in) layer of saturated, very dark brown (10YR 2/2) muck atop a restrictive layer of pahoehoe lava. The soil has a hydrogen sulfide odor, indicating the soil is anaerobic. The non-hydric soil at SP-D largely confirms the mapped soil type Hilo hydrous silty clay loam, 0-10% slopes (901); it is a thick (16-in) layer of brown (7.5YR 4/3) clay with very few redox concentrations. The soil in the upland areas at SP-02 and SP-C largely confirm the mapped soil type of Panaewa very cobbly hydrous loam, 2-10% slopes (629). The non-hydric soil at SP-02 consists of a thin (5-in) layer of dark brown (10YR 3/3) clay loam atop a colorful (2.5YR 3/6 and 7.5YR 2.5/3) layer of loam (Figure 10) and the non-hydric soil at SP-C is a thick (11-in) layer of dark brown (10YR 3/3) clay loam atop a dark yellowish brown (10YR ¾) layer with redox concretions and depletions.

Figure 10. The non-hydric soil at SP-02 largely confirms the mapped soil type of Panaewa very cobbly hydrous loam ("629").

Conclusions

Our determination is that, within the new road alignment survey area, Tributary B is jurisdictional under both federal and state statutes. The boundary of Tributary B wetland is outside to the west of the survey area. Tributary C is jurisdictional under state statutes, but not federal[4]. Federal jurisdiction is solely determined by the U.S. Army Corps of Engineers (USACE) and is based upon the USACE accepting our conclusions. Acceptance may require a field visit by a USACE representative from the Regulatory Branch. Our preliminary jurisdictional determinations of the tributaries and wetlands described above and in *AECOS* (2022—but updated to reflect the new survey area and revised definintion of waters of the US [USACE and USEPA, 2023b])— can be summarized as follows:

Stream	Federal Status	Reasoning	State Status	Reasoning
Ainako Stream	Jurisdictional	Tributary to navigable water, contains relatively permanent water (RPW)	Jurisdictional under State Water Code and Water Pollution Chapter	Stream that flows in a defined bed or channel
Tributary A	Jurisdictional	Tributary to navigable water, does not contain RPW throughout entire length, but has bed, banks, and OHWM; therefore, has significant nexus on a "jurisdictional by rule water"	Jurisdictional under State Water Code and Water Pollution Chapter	Stream that flows in a defined bed or channel
Kaūmana Springs Stream	Jurisdictional	Tributary to navigable water, contains RPW	Jurisdictional under State Water Code and Water Pollution Chapter	Stream that flows in a defined bed or channel
Tributary B	Jurisdictional	Tributary to navigable water, contains RPW	Jurisdictional under State Water Code and Water Pollution Chapter	Stream that flows in a defined bed or channel
Tributary C	Non-Jurisdictional	Tributary to navigable water, but does not contain RPW	Jurisdictional under State Water Code and Water Pollution Chapter	Stream that flows in a defined bed or channel

[4] *AECOS* (2022) concluded Tributary C was jurisdictional under federal statutes that were applicable at that time. A new definition of waters of the U.S. (USACE and USEPA, 2023b) was published in 2023 (as described above in the Introduction) and, based upon the lack of RPW, the determination is revised.

Tributary B wetland	Jurisdictional (but not in new road alignment survey area or Project area)	Adjacent to Tributary B, which is tributary to navigable water and contains RPW	Jurisdictional under Water Pollution Chapter	Wetland that meets USACE Manual definition
Kaūmana Springs wetland	Jurisdictional	Adjacent to Kaūmana Springs Stream, which is tributary to navigable water and contains RPW	Jurisdictional under Water Pollution Chapter	Wetland that meets USACE Manual definition

Our delineation is not official until an acceptance letter from the USACE is received by the applicant. Any work requiring fill or modifications within the OHWM and wetland boundaries may require a permit from the USACE. Streams and wetlands determined to be jurisdictional by the USACE will be considered by the state to be jurisdictional under state regulations. If the USACE determines a feature is not jurisdictional, confirmation on the state status should be sought from the Hawai'i Department of Land and Natural Resources–Commission on Water Resources (HDLNR-CWRM) and Hawai'i Department of Health–Clean Water Branch (HDOH-CWB).

References Cited

AECOS, Inc. 2008. Draft biological and water quality reconnaissance survey of streams and wetlands in the Akolea area, Island of Hawai'i. Prep. for Belt Collins. *AECOS* No. 1166: 26 pp. + attachments.

AECOS, Inc. 2021. A natural resources assessment for the Pi'ihonua Bridge Emergency Repair Project, South Hilo Hawai'i Island. Prep. for Okahara and Associates. *AECOS* No. 1689: 42 pp. + attachments.

AECOS, Inc. 2022. Jurisdictional waters and wetlands survey of TMKs (3)2-3-030:004 and (3)2-3-030:001 (por.), Ainako, South Hilo, Hawai'i. Prep. for Inaba Engineering. *AECOS* No. 1734: 22 pp. + attachments.

Clayton Group Services, Inc. (Clayton). 2007. Phase I Environmental Site Assessment; Akolea Road Agricultural Parcels; Tax Map Key Numbers: (3) 2-5-8: Parcels 3 and 24; Hilo, Hawaii. Project No: 17006-006521.00. Prep. for Central Pacific Bank.

Federal Emergency Management Agency (FEMA). No Date (nd). Digital Flood Insurance Rate Maps (DFIRMs).

Federal Emergency Management Agency (FEMA). 2018. FEMA Flood Maps and Zones Explained. Available online at https://www.fema.gov/blog/fema-flood-maps-and-zones-explained; last retrieved December 14, 2023.

Hawai'i Cooperative Park Service Unit. 1990. Hawaii stream assessment. A preliminary appraisal of Hawaii's stream resources. Prep. for State of Hawaii, Commission on Water Resource Management. National Park Service, Hawaii Cooperative Park Service Unit, Rept. No. R84: 294 pp.

Hawai'i Department of Land and Natural Resources – Commission on Water Resource Management (HDLNR - CWRM). 2013. Findings of fact, conclusions of law, and decision and order for contested case hearing CCH-HA11-1. 31 pp + attachments. Online at URL: https://files.hawaii.gov/dlnr/cwrm/cch/cchha1101/CCHHA1101-2.pdf; last retrieved December 15, 2023.

Hawai'i Revised Statutes (HRS). 2021. Volume 3 § 174C-3. State Water Code: Definitions. *Hawaii Revised Statutes* (December 29, 2021).

Hawai'i Revised Statutes (HRS). 2022. Volume 6 § 342D. Water Pollution. *Hawaii Revised Statutes* (January 6, 2022).

Lichvar, R. W. 2012. The National Wetland Plant List. ERDC/CRREL TR-12-11. Hanover, NH: U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory.

Lichvar, R. W. and J. J. Gillrich. 2011. Final protocol for assigning wetland indicator status ratings during National Wetland Plant List Update. Prep. for: US Army Corps of Engineers. ERDC/CRREL TN-11-1. 19 pp.

National Oceanographic and Atmospheric Administration–National Centers for Environmental Information (NOAA–NCEI). 2021. Data Tools: 1991-2020 Normals. Online at URL: https://www.ncei.noaa.gov/access/us-climate-normals/; last retrieved June 28, 2024.

National Oceanographic and Atmospheric Administration–National Weather Service (NOAA–NWS). 2023. November 2023 Monthly Precipitation Summary. Online at URL: https://www.hawaii.edu/climate-data-portal/publications-search/; last retrieved July 3, 2024.

National Park Service. 2021. Nationwide Rivers Inventory. Online at URL: https://www.nps.gov/subjects/rivers/nationwide-rivers-inventory.htm; last retrieved January 2, 2024.

Parham, J. E., G. R. Higashi, E. K. Lapp, D. G. K. Kuamoʻo, R. T. Nishimoto, S. Hau, J. M. Fitzsimmons, D. A. Polhemus and W. S. Devick. 2008. Atlas of Hawaiian Watersheds and their Aquatic Resources. Island of Oʻahu. Bishop Museum and Division of Aquatic Resources. 614 pp.

Supreme Court of the United States (SCOTUS) 2023. *Sackett v. Environmental Protection Agency*. 21 U.S. 454 Available online at: https://www.supremecourt.gov/opinions/22pdf/21-454_4g15.pdf; last retrieved December 20, 2023.

U.S. Army Corps of Engineers (USACE). 1987. *Corps of Engineers Wetlands Delineation Manual*. Tech. Rept. Y-87-1. Environmental Laboratory, Dept. of the Army, Waterways Experiment Station, Vicksberg.

U.S. Army Corps of Engineers (USACE). 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Hawai'i and Pacific Islands Region Version 2.0,* ed. J. F. Berkowitz, J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-12-5. U.S. Army Engineer Research and Development Center. Vicksberg, MS. 130 pp.

U.S. Army Corps of Engineers (USACE). 2020. National Wetland Plant List, version 3.5. Online at URL: https://cwbi-app.sec.usace.army.mil/nwpl_static/v34/home/home.html; last retrieved on December 14, 2023.

U.S. Army Corps of Engineers–Honolulu District (USACE-HD). 2021. Approved jurisdictional determination form for POH-2021-00083. 3 pp.

U.S. Army Corps of Engineers and U.S. Environmental Protection Agency (USACE and USEPA). 2015. Department of Defense, Department of the Army, Corps of Engineers, 33 CFR Part 328, Environmental Protection Agency, 40 CFR Parts 110, 112, 116, 117, 122, 230, 232, 300, 302, and 401, Clean Water Rule: Definition of "Waters of the United States". *Federal Register*, 80 (124; Monday, June 29, 2020): 37054-37127.

U.S. Army Corps of Engineers and U.S. Environmental Protection Agency (USACE and USEPA). 2020. Department of Defense, Department of the Army, Corps of Engineers, 33 CFR Part 328, Environmental Protection Agency, 40 CFR Parts 110, 112, 116, 117, 122, 230, 232, 300, 302, and 401, The Navigable Waters Protection Rule: Definition of "Waters of the United States". *Federal Register*, 85 (77; Tuesday, April 21, 2020): 22250-22342.

U.S. Army Corps of Engineers and U.S. Environmental Protection Agency (USACE and USEPA). 2021. Department of Defense, Department of the Army,

Corps of Engineers, 33 CFR Part 328, Environmental Protection Agency, 40 CFR Part 120, revised definition of "Waters of the United States". *Federal Register*, 86 (232; Tuesday, December 7, 2021): 69372-69450.

U.S. Army Corps of Engineers and U.S. Environmental Protection Agency (USACE and USEPA). 2023a. 33 CFR Part 328 and 40 CFR Part 120. Revised Definition of "Waters of the United States; Final Rule. Online at URL: https://www.federalregister.gov/documents/2023/01/18/2022-28595/revised-definition-of-waters-of-the-united-states; last retrieved December 20, 2023.

U.S. Army Corps of Engineers and U.S. Environmental Protection Agency (USACE and USEPA). 2023b. 33 CFR Part 328 and 40 CFR Part 120. Revised Definition of "Waters of the United States; Conforming. Online at URL: https://www.govinfo.gov/content/pkg/FR-2023-09-08/pdf/2023-18929.pdf; last retrieved December 20, 2023.

U.S. Department of Agriculture–Natural Resources Conservation Service (USDA-NRCS). 2020. National Hydric Soils List by State. Online at URL: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcseprd1316619.html; last retrieved December 14, 2023.

U.S. Department of Agriculture–Natural Resources Conservation Service (USDA-NRCS). 2021. Web Soil Survey, Soil Map—Island Of Hawai'i Area, Hawai'i. Online at URL: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx; last retrieved December 14, 2023.

U.S. District Court for the District of Arizona (US District Court for AZ). 2021. Order No. CV-20-00266-TUC-RM regarding *Pasqua Yaqui Tribe, et al v. USEPA et al*. 11 pp.

U.S. Environmental Protection Agency and Department of Army (USEPA and DA). 2008. Clean Water Act jurisdiction following the U.S. Supreme Court's decision in *Rapanos v. United States & Carabell v. United States.* December 2, 2008. 13 pp.

U.S. Environmental Protection Agency and Department of the Army (USEPA and DA). 2006. Clean Water Act jurisdiction following the U.S. Supreme Court's decision in *Rapanos v. United States & Carabell v. United States*. 13 pp.

U.S. Fish and Wildlife Service (USFWS). no date (nd). National Wetlands Inventory website. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Online at URL: https://fwsprimary.wim.usgs.gov/

wetlands/apps/wetlands-mapper/; last retrieved December 14, 2023; relevant polygons date from 1977.

U.S. Geological Survey (USGS). 2019. The StreamStats program v4.20.1. Online at URL: http://streamstats.usgs.gov; last retrieved June 27, 2024.

U.S. Geological Survey (USGS). 2017. Hilo Quadrangle, Hawai‘i – Hawai‘i County, 7.5-minute series.

Attachment A (1734B)

Jurisdictional waters and wetlands survey of Housing Project area (*AECOS*, 2022)

AECOS No. 1734

Jurisdictional waters and wetlands survey of TMKs: (3)2-3-030: 004 and (3)2-3-030: 001 (por.) Ainako, South Hilo, Hawai‘i

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November 12, 2022

Jurisdictional waters and wetlands survey of TMKs: (3)2-3-030: 004 and (3)2-3-030: 001 (por.) Ainako, South Hilo, Hawai‘i

November 12, 2022 *AECOS* No. 1734

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Introduction

The County of Hawai‘i is conducting a housing feasibility study that includes making a schematic subdivision layout for housing units (“Project”) on Tax Map Key (TMK) (3)2-3-030: 004 and (3)2-3-030: 001 (por.) in Ainako, Hawai‘i Island (Figure 1). *AECOS* was contracted by Inaba Engineering to conduct a preliminary jurisdictional waters and wetlands survey within the approximate 24-ha (60-ac) Project area, including an approximation of the boundaries of aquatic features and an assessment of whether the features are likely to be considered jurisdictional under the Clean Water Act (federal jurisdiction) and State Water Code and Water Pollution Chapter (state jurisdiction).[1]

Site Description

The Project is in the Ainako Stream sub-basin of the larger Wailuku Watershed (DAR Watershed Code 82060; Parham et al., 2008). Wailuku Watershed occupies 65,300 ha (161,350 ac)—very nearly the size of the island of Moloka‘i—on the east end of the saddle between Mauna Loa and Mauna Kea . Wailuku River is the longest and largest surface water feature in the state (NPS, 2021) with a length of 45 km (28 mi). Wailuku River flows west to east on the approximate boundary between lava flows from Mauna Kea and flows from Mauna Loa before emptying into the Pacific Ocean on the west side of Hilo Bay. Owing to the porous nature of young lava flows on the flank of Mauna Loa, tributary streams of the Wailuku

[1] This report is intended to become part of the public record and incorporated into an EA for the subject Project.

River are mostly limited to the southeast slope of Mauna Kea, where soils have formed from older and less-permeable volcanic ash deposits. Rainfall on Mauna Loa infiltrates into the groundwater system to charge aquifers, flowing underground to streams and the coast. Numerous springs emerge on the slopes of both mountains above Hilo to feed into the Wailuku River.

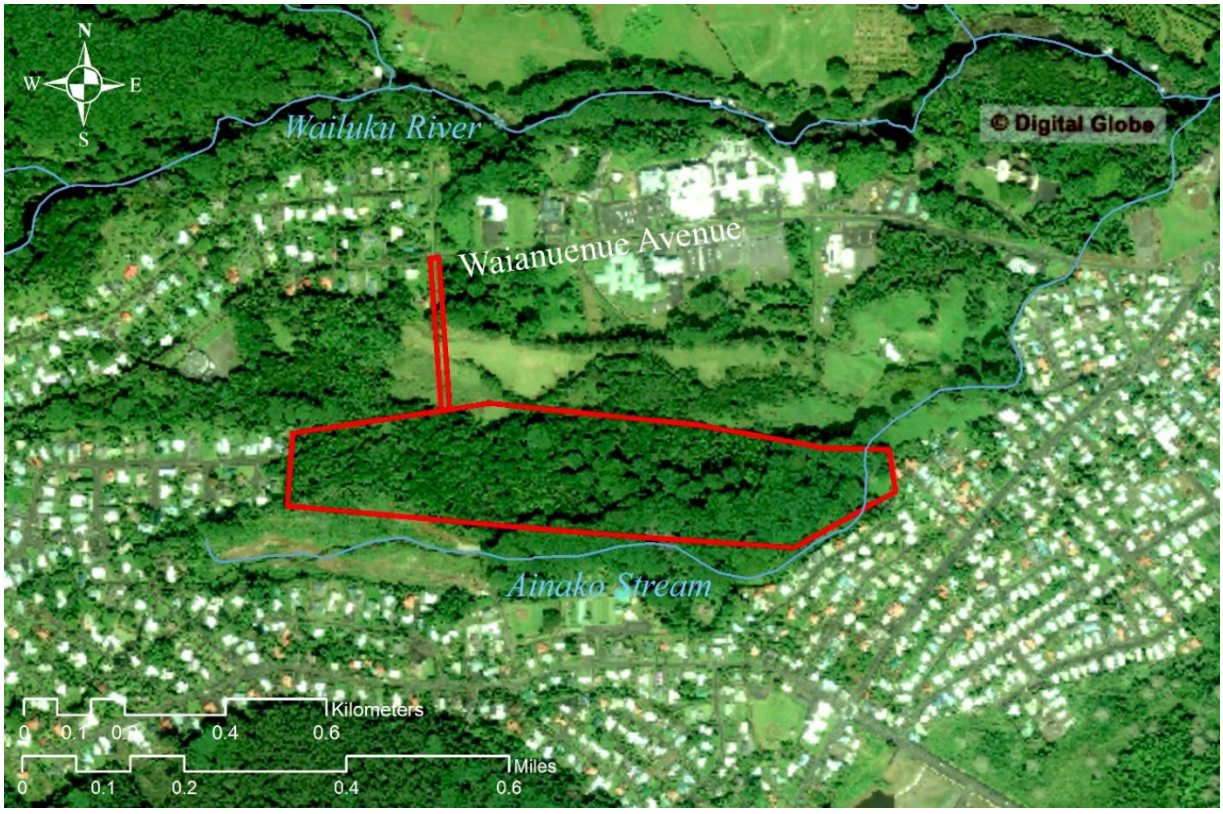

Figure 1. Project area (red outline) in Ainako, Hawai‘i Island.

Ainako Stream is one of only a few streams on the slopes of the Mauna Loa lava flows, but it is not listed as a perennial stream in the Hawai‘i Watershed Atlas (Parham et al., 2008) and is not on the list of perennial streams in the Hawai‘i Stream Assessment (Hawai‘i Cooperative Service Unit, 1990). Ainako Stream and two tributaries are visible in the Hawai‘i layers of the US Geological Survey (USGS) StreamStats map-based web application (USGS, 2016); streamflow statistics computed for the stream at the confluence with Wailuku River include a 2-year peak flood of 857 cubic feet per second (cfs) and a 100-year peak flow of 3,210 cfs.

The majority of the Project area is mapped as the soil type Panaewa very cobbly hydrous loam, 2-10% slopes (629; USDA-NRCS, 2021a). The soil type to the south is Hilo hydrous silty clay loam, 0-10% slopes (901). Panaewa very cobbly

hydrous loam, 2-10% slopes (629) is listed as a hydric soil with a component representative percentage of 10 on the U.S. Dept. of Agriculture-Natural Resources Conservation Service (USDA-NRCS), National List of Hydric Soils for Hawai'i (USDA-NRCS, 2020). A 10% rating indicates that 10% of all areas mapped as Panaewa very cobbly hydrous loam, 2-10% slopes (629) meet the criteria for hydric soils.

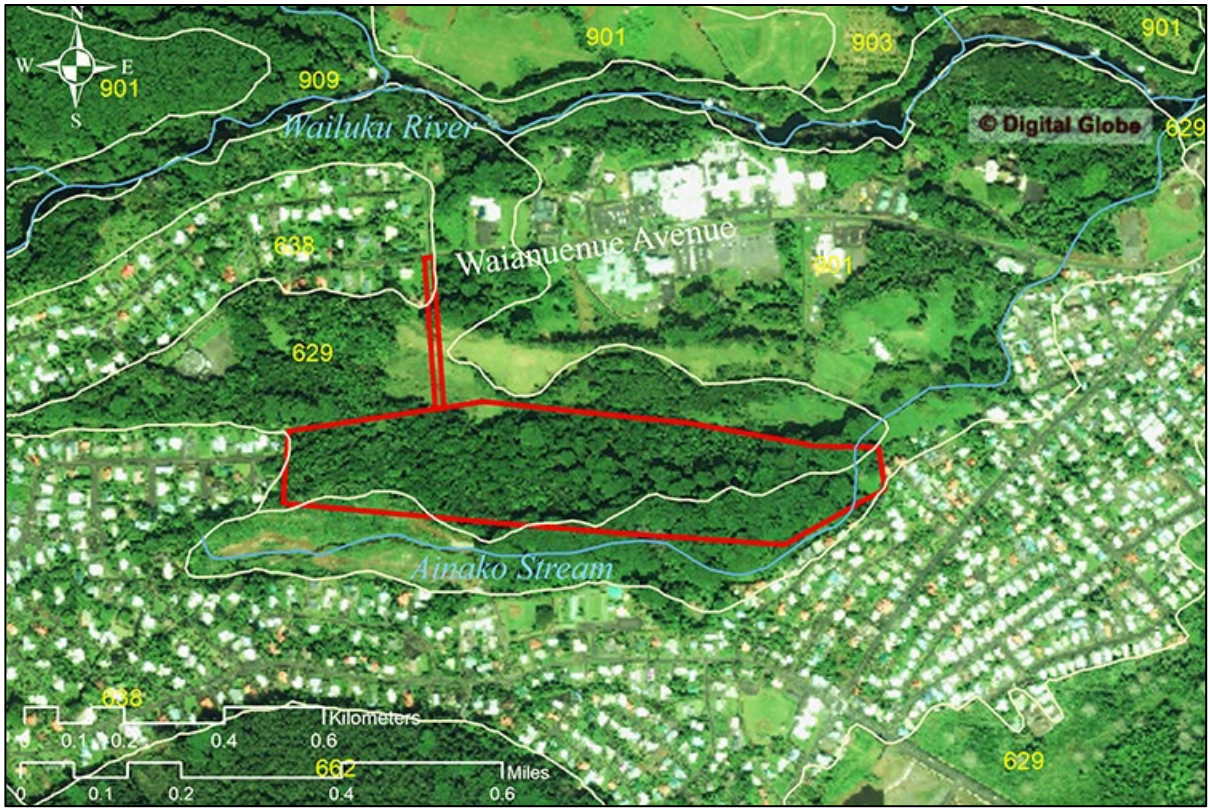

Figure 2. USDA-NRCS soil types in the Project area (Project site in red).

Precipitation in South Hilo is high. The National Oceanographic and Atmospheric Administration–National Centers for Environmental Information (NOAA-NCEI) climate normals (three-decade averages of climatological variables) for Sta. "HILO 5 S, HI US" includes an average annual rainfall of 3,840 mm (151 in; NOAA-NCEI, 2022). USGS StreamStats calculates mean annual precipitation for the Ainako sub-basin at 4,216 mm (166 in; USGS, 2016). Most rainfall occurs during the rainy season from November through March, although the area can remain relatively wet throughout the year. These precipitation statistics are based on a 30-year average.

The U.S. Geological Survey (USGS) topographic map (USGS, 2017) and U.S. Fish and Wildlife Service (USFWS) *National Wetlands Inventory* (NWI; USFWS, nd)

map Ainako Stream (unnamed) traversing in and near the Project area from west to east (Figure 3). The USGS topo map also marks the three locations of Kaūmana Springs at the eastern edge of the Project area at the base of Kupapa'u Hill. The USGS map indicates Ainako Stream is intermittent flowing and the NWI describes the stream channel as a temporarily flooded, forested wetland (PSS3A). Ainako Stream and three tributaries are situated in FEMA Flood Zone AE, meaning these areas are subject to inundation by the 1% annual chance (100-year) flood (Figure 3; FEMA, 2018; FEMA, nd). The remainder of the Project area is in a non-special flood hazard area determined to be outside the 0.2% annual chance floodplain.

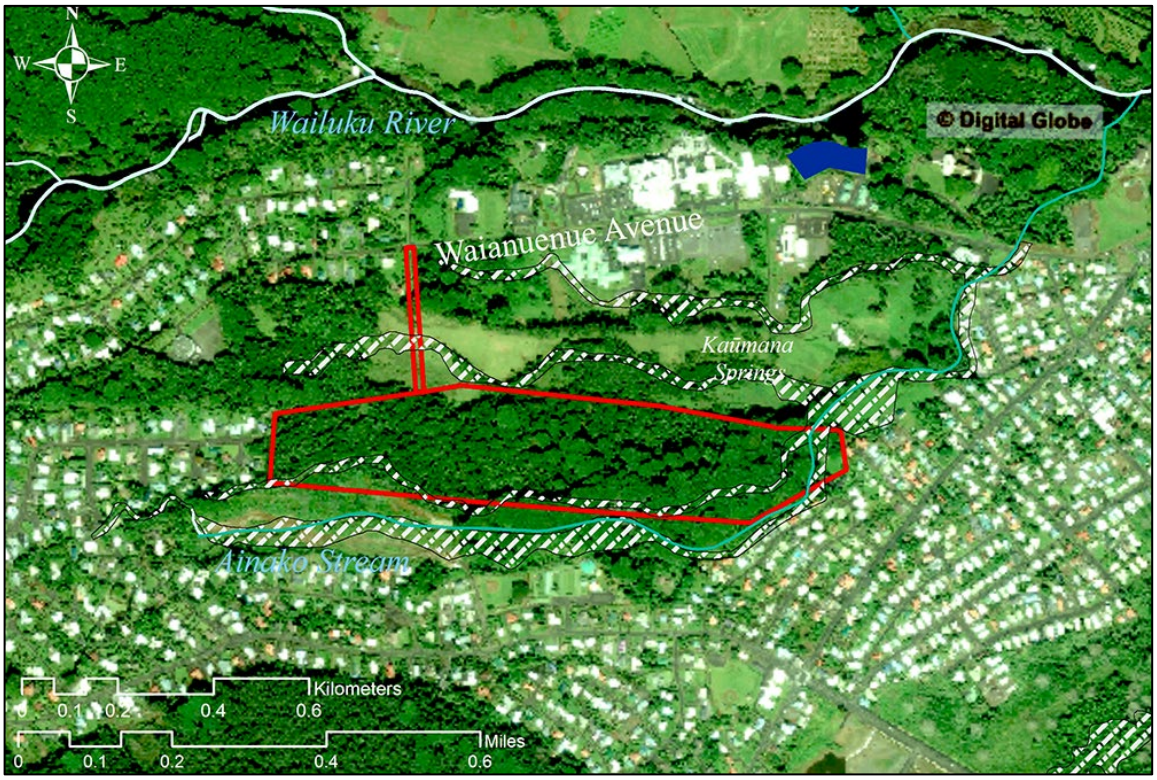

Figure 3. Surface waters and wetlands as depicted in the National Wetlands Inventory or NWI (USFWS, nd), springs indicated on the USGS topographic map (USGS, 2017), and AE flood zones (FEMA, nd). Survey area (outlined in red).

USGS StreamStats shows that the Ainako sub-basin extends upslope to Akolea Road where streams that likely used to flow into Ainako Stream are diverted in a man-made ditch to the north and directed into Wailuku River at Wailuku River State Park. Despite the diversion and porous nature of the substratum, streams, ponds, and wetlands have been identified in the Akolea subdivision upslope of the Project area and in the undeveloped land between the subdivision and Akolea Road (Clayton, 2007; *AECOS*, 2008; HDLNR-CWRM, 2013). The Project area has

been described as a "boggy area" (HDLNR-CWRM, 2013), although a desktop study by the U.S. Army Corps of Engineers – Honolulu District (USACE – HD) Regulatory Program determined uplands comprise the entirety of an unspecified area of review in the Project area (USACE-HD, 2021).

The environmental conditions of the Project area described above are conducive to the formation of seeps, springs, streams, and wetlands. The high rainfall; substratum composed of a thin layer of soil over young and porous lava flows; previous land use and manipulation of water flows for sugar cane fields and pastures; and current overgrowth of vegetation make the determination and delineation of aquatic features in the constructional landscape of Project area difficult.

Jurisdictional Waters

Waters of the U.S.

Waters of the U.S. (also called "jurisdictional waters" or "federally jurisdictional waters) are surface waters that come under federal jurisdiction as authorized by the Clean Water Act (CWA) and the Rivers and Harbors Act (RHA). Jurisdictional waters include all tidal waters and a subset of streams, lakes, reservoirs, and wetlands.

Because ecosystem boundaries tend to be gradients in nature, defining the limits of jurisdiction is somewhat of a political decision. Supreme Court cases (including *Rapanos v. United States*, *SWANCC v. USACE*, and *Carabell v. United States*), a guidance memorandum (USEPA and DA, 2008), and recent published rules (USACE and USEPA, 2015; 2020) have variously defined waters of the U.S. On August 20, 2021, a District Court Order (US District Court for AZ, 2021) remanded and vacated the most recent definition of waters of the U.S. and, until a new rule is published, the definition reverts to the pre-2015 regulatory language, decided upon by the Supreme Court and described in the guidance memorandum (USEPA and DA, 2008). The U.S. Army Corps of Engineers (USACE) and U.S. Environmental Protection Agency (USEPA) initiated another round of rulemaking by publishing a proposed new rule to revise the definition of waters of the U.S. (USACE and USEPA, 2021). Additionally, a new case regarding the definition of waters of the U.S. (*Sackett v. EPA*) is coming before the U.S. Supreme Court in October 2022, so the definition is likely to continue to remain in flux for a while. Our preliminary jurisdictional assessment presented herein is based on best professional judgement, but the USACE must concur for our findings to become official determinations of federal jurisdiction.

State Waters

State waters fall under jurisdiction authorized under Hawai'i Revised Statutes (HRS), State Water Code (HRS § 174C-3, 2021) and Water Pollution Chapter (HRS § 342D-1, 2022). The State Water Code defines a "stream" as "any river, creek, slough, or natural watercourse in which water usually flows in a defined bed or channel. It is not essential that the flowing be uniform or uninterrupted. The fact that some parts of the bed or channel have been dredged or improved does not prevent the watercourse from being a stream." A "watercourse… means a stream or any canal, ditch, or other artificial watercourse in which water usually flows in a defined bed or channel. It is not essential that the flowing be uniform or uninterrupted." State waters are defined in the Water Pollution Chapter as "all waters, fresh, brackish, or salt, around and within the State, including, but not limited to, coastal waters, streams, rivers, drainage ditches, ponds, reservoirs, canals, ground waters, and lakes; provided that drainage ditches, ponds, and reservoirs required as part of a water pollution control system are excluded."

Wetlands are defined in the Hawai'i water quality standards (HDOH, 2021, pg. 54-11 and 12) as, "land that is transitional between terrestrial and aquatic ecosystems where the water table is usually at or near the surface or the land is covered by shallow water" and "the delineation of wetland boundaries shall be done following the procedures described in the U.S. Army Corps of Engineers' Wetlands Delineation Manual" (i.e., USACE, 1987). "Delineation" is defined as the process of determining a geospatial line that separates wetlands and other waters from upland areas.

Methods

AECOS scientists conducted field work on July 27 - 28, 2022, during the dry season. Prior to our field surveys, we reviewed literature and GIS data, including results of previous surveys conducted by *AECOS* for projects in Wailuku Watershed (*AECOS*, 2008; 2021); climate data, including recent rainfall (NOAA-NWS, 2022); mapped soil types (USDA-NRCS, 2021); surface waters and wetlands identified in the NWI (USFWS, nd); and mapped flood zones (HDLNR, nd).

Wetland Survey

Wetland identification follows the methods described in the *Corps of Engineers Wetland Delineation Manual* ("Manual"; USACE, 1987) and *Regional Supplement*

for Hawai'i and Pacific Islands (USACE, 2012)[2]. The wetland status of plant species derives from the 2012 National Wetland Plant List (Lichvar, 2012) and a 2020 update (USACE, 2020). Surface waters and wetlands are categorized using the *Classification of Wetlands and Deepwater Habitats of the United States* (FGDC, 2013), which is the classification system adapted from Cowardin et al. (1979).

Wetland determination sampling points (SPs) are used to evaluate the presence of either wetland or upland characteristics at selected points in the landscape. The approach for wetland delineation for CWA purposes requires finding positive evidence of hydric soil, wetland hydrology, and hydrophytic vegetation at a SP. All three indicators must be present for a positive wetland determination. The boundary between wetland and upland (non-wetland) is established as a line outside of which at least one of the three wetland indicators is absent.

The National Wetland Plant List (NWPL), administered by the USACE, assigns a wetland indicator status to each species of vascular plant on a regional basis (Lichvar, 2012; USACE, 2020). Table 1 provides wetland status indicators and their definitions. The wetland indicator status of each species in the plant assemblage at a SP is used to determine if a site has a "prevalence of vegetation typically adapted for life in saturated soil conditions." We identified plant assemblages in the Project area (grassland and forest) and made visual estimates at each SP of percent cover of plant species in sample plots of appropriate size and shape, based on the type of vegetation.

Table 1. Wetland status indicators and their definitions (after Lichvar and Gillrich, 2011).

Status indicator (CODE)	Qualitative Description
Obligate (OBL)	Almost always occurs in wetlands
Facultative wetland (FACW)	Usually occurs in wetlands, but may occur in non-wetlands
Facultative (FAC)	Occurs in wetlands and non-wetlands
Facultative upland (FACU)	Usually occurs in non-wetlands, but may occur in wetlands
Upland (UPL)	Almost never occurs in wetlands

Hydric soils are soils that are sufficiently wet in the upper layers to develop anaerobic conditions; that is, soils that could be associated with wetlands. Soil saturation with water is what differentiates wetland soils from upland soils, as

[2] As described above, the same method is used to define wetlands that are considered to be both waters of the U.S. and State Waters.

saturation greatly reduces the oxygen present between soil particles. In determining whether a soil is hydric, we look for evidence of this saturation (i.e., reducing conditions); the soil need not be water saturated at the time of inspection, and indeed may be dry. Even though one of the soil types, Panaewa very cobbly hydrous loam, 2-10% slopes (629), mapped in the survey area is listed as a hydric soil on Hawai'i (USDA-NRCS, 2020; 2021), inspection by soil pits is a necessary part of the wetland determination process. Local conditions can deviate from a mapped soil type, and sufficient saturation or inundation can render any soil, even fill material, hydric.

Our wetland survey was not a delineation for regulatory purposes, so we did not strictly follow the procedures in the Manual to delineate wetlands (USACE, 1987). We identified two plant assemblages in the Project area (grassland and forest), established a wetland determination sampling point (SP) in each plant assemblage, and completed a wetland data determination sheet at each SP. We recorded the geospatial positions of the two SPs, identified potential boundaries between wetland and uplands, and marked the boundaries with our GNSS instrument. These data were used to prepare the preliminary jurisdictional waters and wetlands figure presented in this report.

For wetland features in the Project area, we identified approximate boundaries based primarily on a change in plant assemblages. We recorded the geospatial position of the boundaries using a Trimble Geo7X, capable of sub-meter accuracy. The resulting shapefile was processed with GPS Pathfinder, including differential correction, and exported as ArcMap shapefiles using a projected coordinate system of NAD 1983 UTM Zone 5N.

Stream Survey

The purpose of our stream survey was to identify landscape features created by flowing water (rivers, streams, gulches) to an extent such that physical characteristics of flow are present and identifiable. These physical characteristics include a bed and banks and other physical characteristics of an ordinary high water mark (OHWM) from the following list, as defined in the Corps *Regulatory Guidance Letter 05-05*: *Ordinary High Water Mark Identification* (USACE, 2005):

Natural line impressed on the bank	Sediment sorting
Shelving	Leaf litter disturbed or washed away
Changes in the character of soil	Scour
Destruction of terrestrial vegetation	Deposition
Presence of litter and debris	Multiple observed flow events
Wracking	Water staining
Vegetation matted down, bent, or absent	Change in plant community

For identified streams in the Project area, we marked the flow path by recording the geospatial position of the several points within the stream using a Trimble Geo7X. The shapefile was processed as described above.

Preliminary Jurisdictional Determination

To characterize wetlands and tributaries in the Project area, we determined how the aquatic features are classified under pre-2015 federal regulatory language. Per 2008 guidance memorandum following *Rapanos v. United States*, *SWANCC v. USACE*, and *Carabell v. United States* (USEPA and DA, 2008), the federal agencies (USACE, EPA) will assert jurisdiction over (1) all traditional navigable waters (such as the Pacific Ocean) and (2) tributaries to navigable waters with relatively permanent waters (tributaries that typically flow year-round or have continuous flow at least seasonally), and adjacent wetlands. The agencies may also assert jurisdiction to (3) non-navigable, not relatively permanent tributaries where such tributaries (and any adjacent wetlands) have a significant nexus to a traditional navigable water. Features that are generally not jurisdictional are (4) swales or similar erosional features and (5) ditches excavated wholly in and draining only uplands and not carrying a relatively permanent flow of water. Tributaries that are excluded from State jurisdiction are drainage ditches, ponds, and reservoirs required as part of a water pollution control system.

Results

Tributaries

Ainako Stream and three tributaries (herein, "Tributary A", "Tributary B", and "Tributary C") flow in or near the Project area (Figure 4). Our survey confirmed that Ainako Stream follows in the channel mapped on the USGS topographic map (USGS, 2017), the USFWS NWI (USFWS, nd), and generally flows within the boundary indicated by Flood Zone AE (FEMA, nd). Ainako Stream flows from the west to the east beyond the southern edge of the Project area and then makes a sharp turn to the north at the eastern edge of the Project area where it connects with Tributary A and Tributary B. The confluence with Tributary C is northeast outside of the Project area. The higher order stream crosses under Waianuenue Road and discharges into Wailuku River. Wailuku River discharges into Hilo Bay at Mokupane Point.

Figure 4. Preliminary wetland boundaries (in green) and stream flowpaths (in blue) as marked in the field by *AECOS* on July 27 - 28, 2022.

Ainako Stream

Ainako Stream is identified as an intermittent stream on the USGS topo map and a temporarily flooded wetland on the NWI. The Commission on Water Resource Management (CWRM) determined that, within the Akolea subdivision sub-basin between the west end of the Project area and Ainako Avenue, Ainako Stream is a stream as defined in the State Water Code. During our survey at the beginning of the dry season, the segment of Ainako Stream in and near the Project area contained flowing water and physical indicators of flow, such as presence of a bed and banks, shelving, destruction of terrestrial vegetation, vegetation absent on the stream bed, and a change in plant community (Figure 5). We observed fishes and macroinvertebrates in the stream, indicating that stream flow is perennial.

Figure 5. Within the Project area, flow in Ainako Stream is relatively permanent.

Tributary A

Tributary A is not identified as a stream on the USGS topo map, nor is it indicated as a stream or wetland on the NWI. Tributary A is likely one of the branches of Ainakoa Stream within the Akolea subdivision that CWRM determined is a stream as defined in the State Water Code. During our survey in the middle of

the dry season, Tributary A was dry from the west end of the property (see cover photo) to the confluence with a "spring stream" near the confluence with Ainako Stream. Tributary A is contained in a deep gulch (incised some 8 m or 26 ft) with steep side slopes. Physical indicators of flow include presence of a bed and banks, shelving, destruction of terrestrial vegetation, and a change in plant community. Plants are largely absent on the stream bed and upland trees, such as Alexander palm (*Archontophoenix alexandrae* - UPL) are rooted on the banks above the OHWM.

Tributary A converges with Ainako Stream and the spring stream in a flat area at the northeastern end of the Project area (see Fig. 3). A Job's tears (*Coix lachrymal-jobi*) wetland occupies the area near the confluence of the three streams. From the wetland on, in the downstream direction, Tributary A contained flowing water and we observed fishes and macroinvertebrates in the stream, indicating that stream flow of this segment is perennial.

Kaūmana Springs Stream

The origin of Kaūmana Springs Stream is indicated on the USGS topo map as Kaūmana Springs, located at the base of Kupapaʻu Hill, but neither the springs nor stream are identified as stream or wetland on the NWI. The spring is surrounded by a low concrete wall (Figure 6), and we observed clear water bubbling to the surface. Water seeps over the walls and the stream is additionally fed by groundwater emerging throughout the length of a channel that extends from the spring to the confluence with Tributary A and Ainako Stream. Kaūmana Springs Stream channel is approximately 2 m (7 ft) wide and the water depth is approximately 10 cm (4 in). Organic matter dominates the stream bed and we observed fishes and macroinvertebrates in the stream. As described above, a wetland occupies the land between the three streams.

Tributary B

Like Tributary A, Tributary B is not identified as a stream on the USGS topo map, nor is it indicated as a stream or wetland on the NWI. Tributary B emerges from a mixed forest at the west end of TMK (3)2-3-030: 001. The stream is largely channelized between the origin and confluence with Ainako Stream, although it crosses two wide areas of grassland (Figure 7) where the channel is less deeply incised, sinuous, and sometimes indistinct from the landscape. During our survey at the beginning of the dry season, Tributary B contained water throughout the length of the channel. Physical indicators of flow include presence of a bed and banks, shelving, and a change in plant community. We observed fishes and macroinvertebrates in the stream, including Pacific prawn (*Macrobrachium lar*). The presence of Pacific prawn in Tributary B indicates both that stream flow is

Figure 6. The origin of Kaūmana Springs Stream is an artesian spring surrounded by low concrete walls.

perennial and has a surface connection to the ocean because the prawn is an amphidromous animal that migrates to and from the ocean. Tributary B converges with Ainako Stream to the north of the Project area, downslope of the confluence with the spring stream and Tributary A.

Figure 7. Tributary B flows in a shallow channel through a Wainaku grass (FAC) and California grass (FACW) grassland in TMK (3)2-3-030:001.

Tributary C

Like Tributary A and B, Tributary C is not identified as a stream on the USGS topo map, nor is it indicated as a stream or wetland on the NWI. Tributary C receives flow from a roadside ditch on Waianuenue Avenue that is directed through a culvert under Waiau Street. During our survey in July, Tributary C contained water and exhibited physical indicators of flow. The confluence of Tributary C with Ainako Stream is downslope of the Project area near Waianueue Avenue. Other than potentially the culvert on Waiau Street, Tributary C is largely outside of the Project area

Wetlands

Wetlands are associated with and adjacent to Tributary B and Kaūmana Springs Stream (see Fig. 4)

Tributary B wetland

Tributary B flows through a large wetland in the vicinity of the proposed extension of Waiau Street (see Fig. 7). Fig. 4 shows the locations and status (wetland or upland) of the two SPs (SP-01 in the wetland and SP-02 in upland)

and the reconnaissance-level boundaries of Tributary B wetland, as delineated by us in the field in July 2022. We established the wetland boundary primarily by a change in vegetation and a change in elevation. Wetland data determination sheets for two SPs are provided in Attachment A. Photographs to document conditions at each SP are provided in Attachment B. Another wetland to the east of Waiau Street is associated with Tributary B, but this wetland is entirely outside of the Project area.

Hydrology – The source of water for Tributary B wetland is a high groundwater table, coupled with a smaller proportion of surface runoff from the relatively small watershed of Tributary B. Indicators of wetland hydrology observed at SP-01 and elsewhere within the wetland include standing and flowing water during the dry season, visible iron-rich floc and bacterial sheens, saturated soil, aquatic fauna, hydrogen sulfide odor, geomorphic position, and a positive FAC-neutral test. The forested areas between Tributary B and Tributary A do not have any primary or secondary indicators of wetland hydrology.

Vegetation – The two dominant grasses in Tributary B wetland are wainaku grass (*Panicum repens* – FAC) and California grass (*Urochloa mutica* – FACW). Wainaku grass dominates the lower elevation and seemingly wetter areas of the wetland and California grass is more abundant to the south of Tributary B. Attachment C is a list of plant species observed in and near Tributary B wetland; most of the species observed are hydrophytic. Conspicuous plants observed throughout the wetland include paca fern (*Diplazium esculentum* – FACW), Hilo grass (*Paspalum conjugatum* - FAC), primrose willow (*Ludwigia octovalvis* - OBL), *Cyperus halpan* (FACW), *honohono* (*Commelina diffusa* - FACW), glenwood grass (*Sacciolepis indica* – FAC), Job's tears (*Coix lacryma-jobi* - FACW), and umbrella sedge (*Cyperus involucratus* - FACW). SP-02 is in a strawberry guava (*Psidium* cattleianum – FACU) forest, but a dominant plant throughout the forest is Alexander palm (*Archontophoenix alexandrae* – UPL).

Soils - The soil at SP-01 in Tributary B wetland is a histosol—a thin (3-in) layer of saturated, very dark brown (10YR 2/2) muck atop a restrictive layer of pahoehoe lava. The soil has a hydrogen sulfide odor, indicating the soil is anaerobic.

The soil in the upland area at SP-02 largely confirms the mapped soil type of Panaewa very cobbly hydrous loam, 2-10% slopes (629). The soil here consists of a thin (5-in) layer of dark brown (10YR 3/3) clay loam atop a colorful (2.5YR 3/6 and 7.5YR 2.5/3) layer of loam (Figure 8).

Figure 8. The non-hydric soil outside of the wetland largely confirms the mapped soil type of Panaewa very cobbly hydrous loam, 2-10% slopes (629).

Kaūmana Springs wetland

Kaūmana Springs wetland (Figure 9) extends between the Kaūmana Springs Stream, Tributary A, and Ainako Stream. We did not complete a wetland data determination form in the wetland or prepare a plant species list, but did delineate a reconnaissance-level boundary in the field in July 2022. We established the wetland boundary primarily by a change in vegetation and presence/absence of surface water.

Hydrology – The primary source of water for Kaūmana Springs wetland is Kaūmana Springs. The wetland likely also receives floodwater from Tributary A and Ainako Stream after heavy rains. Indicators of wetland hydrology observed within the wetland include standing and flowing water during the dry season, visible iron-rich floc and bacterial sheens, soil saturation, aquatic fauna, hydrogen sulfide odor, geomorphic position, and a positive FAC-neutral test.

Vegetation – Job's tears (FACW) is the dominant plant in Kaūmana Springs wetland.

Soils - The soil at Kaūmana Springs wetland is a histosol consisting of a thin layer of saturated muck atop a restrictive layer of pahoehoe lava.

Figure 9. Kaūmana Springs Stream delivers water from Kaūmana Springs to Kaūmana Springs wetland.

Conclusions

Our determination is that all aquatic features identified in the Project area and depicted in Figure 3 are jurisdictional under both federal and state statutes. Federal jurisdiction is solely determined by the U.S. Army Corps of Engineers (USACE) and is based upon the USACE accepting our conclusions. Acceptance may require a field visit by a USACE representative from the Regulatory Branch. Our preliminary jurisdictional determinations of the tributaries and wetlands, described above, can be summarized as follows:

Stream	Federal Status	Reasoning	State Status	Reasoning
Ainako Stream	Jurisdictional	Tributary to navigable water, contains relatively permanent water (RPW)	Jurisdictional under State Water Code and Water Pollution Chapter	Stream that flows in a defined bed or channel
Tributary A	Jurisdictional	Tributary to navigable water, does not contain RPW throughout entire length, but has bed, banks, and OHWM; therefore, has significant nexus on a "jurisdictional by rule water"	Jurisdictional under State Water Code and Water Pollution Chapter	Stream that flows in a defined bed or channel
Kaūmana Springs Stream	Jurisdictional	Tributary to navigable water, contains RPW	Jurisdictional under State Water Code and Water Pollution Chapter	Stream that flows in a defined bed or channel
Tributary B	Jurisdictional	Tributary to navigable water, contains RPW	Jurisdictional under State Water Code and Water Pollution Chapter	Stream that flows in a defined bed or channel
Tributary C	Jurisdictional	Tributary to navigable water, contains RPW	Jurisdictional under State Water Code and Water Pollution Chapter	Stream that flows in a defined bed or channel
Tributary B wetland	Jurisdictional	Adjacent to Tributary B, which is tributary to navigable water and contains RPW	Jurisdictional under Water Pollution Chapter	Wetland that meets USACE Manual definition
Kaūmana Springs wetland	Jurisdictional	Adjacent to Kaūmana Springs Stream, which is tributary to navigable water and contains RPW	Jurisdictional under Water Pollution Chapter	Wetland that meets USACE Manual definition

Our delineation is not official until an acceptance letter from the USACE is received by the applicant. Any work requiring fill or modifications within the

OHWM and wetland boundaries may require a permit from the USACE. Streams and wetlands determined to be jurisdictional by the USACE will be considered by the state to be jurisdictional under state regulations. If the USACE determines a feature is not jurisdictional, confirmation on the state status should be sought from the Hawai'i Department of Land and Natural Resources–Commission on Water Resources (HDLNR-CWRM) and Hawai'i Department of Health–Clean Water Branch (HDOH-CWB).

References Cited

AECOS, Inc. 2008. Draft biological and water quality reconnaissance survey of streams and wetlands in the Akolea area, Island of Hawai'i. Prep. for Belt Collins. *AECOS* No. 1166: 26 pp. + attachments.

_____. 2021. A natural resources assessment for the Pi'ihonua Bridge Emergency Repair Project, South Hilo Hawai'i Island. Prep. for Okahara and Associates. *AECOS* No. 1689: 42 pp. + attachments.

Clayton Group Services, Inc. (Clayton). 2007. Phase I Environmental Site Assessment; Akolea Road Agricultural Parcels; Tax Map Key Numbers: (3) 2-5-8: Parcels 3 and 24; Hilo, Hawaii. Project No: 17006-006521.00. Prep. for Central Pacific Bank.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of Wetlands and Deepwater Habitats of the United States. Prep. for USFWS. FWS/OBS-79/31. 131 pp.

Federal Geographic Data Committee. 2013. Classification of wetlands and deepwater habitats of the United States. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, DC. 86 pp.

Federal Emergency Management Agency (FEMA). No Date (nd). Digital Flood Insurance Rate Maps (DFIRMs).

_____. 2018. FEMA Flood Maps and Zones Explained. Available online at https://www.fema.gov/blog/fema-flood-maps-and-zones-explained; last retrieved September 22, 2022.

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. Online at URL: http://rainfall.geography.hawaii.edu/; last retrieved September 1, 2022.

Hawaii Cooperative Park Service Unit. 1990. Hawaii stream assessment. A preliminary appraisal of Hawaii's stream resources. Prep. for State of Hawaii, Commission on Water Resource Management. National Park Service, Hawaii Cooperative Park Service Unit, Rept. No. R84: 294 pp.

Hawai'i Department of Health (HDOH). 2021. Hawai'i Administrative Rules, Title 11, Department of Health, Chapter 11-54, Water Quality Standards. October 22, 2021. 82 pp + appendices.

Hawai'i Department of Land and Natural Resources – Commission on Water Resource Management (HDLNR - CWRM). 2013. Findings of fact, conclusions of law, and decision and order for contested case hearing CCH-HA11-1. 31 pp + attachments. Online at URL: https://files.hawaii.gov/dlnr/cwrm/cch/cchha1101/CCHHA1101-2.pdf; last retrieved September 1, 2022.

Hawai'i Revised Statutes (HRS). 2021. Volume 3 § 174C-3. State Water Code: Definitions. *Hawaii Revised Statutes* (December 29, 2021).

_____. 2022. Volume 6 § 342D. Water Pollution. *Hawaii Revised Statutes* (January 6, 2022).

Lichvar, R. W. 2012. The National Wetland Plant List. ERDC/CRREL TR-12-11. Hanover, NH: U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory.

_____ and J. J. Gillrich. 2011. Final protocol for assigning wetland indicator status ratings during National Wetland Plant List Update. Prep. for: US Army Corps of Engineers. ERDC/CRREL TN-11-1. 19 pp.

National Oceanographic and Atmospheric Administration–National Centers for Environmental Information (NOAA–NCEI). 2021. Data Tools: 1991-2020 Normals. Online at URL: https://www.ncdc.noaa.gov/cdo-web/datatools/normals; last retrieved September 1, 2022.

National Oceanographic and Atmospheric Administration–National Weather Service (NOAA–NWS). 2022a. Precipitation Summaries. Online at URL: https://www.weather.gov/hfo/hydro_summary; last retrieved September 2, 2022.

National Park Service. 2021. Nationwide Rivers Inventory. Online at URL: https://www.nps.gov/subjects/rivers/nationwide-rivers-inventory.htm; last retrieved September 1, 2022.

Parham, J. E., G. R. Higashi, E. K. Lapp, D. G. K. Kuamoʻo, R. T. Nishimoto, S. Hau, J. M. Fitzsimmons, D. A. Polhemus and W. S. Devick. 2008. Atlas of Hawaiian Watersheds and their Aquatic Resources. Island of Oʻahu. Bishop Museum and Division of Aquatic Resources. 614 pp.

U.S. Army Corps of Engineers (USACE). 1987. *Corps of Engineers Wetlands Delineation Manual*. Tech. Rept. Y-87-1. Environmental Laboratory, Dept. of the Army, Waterways Experiment Station, Vicksberg.

_____. 2005. Regulatory Guidance Letter 05-05: Ordinary High Water Mark Identification.

_____. 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Hawai'i and Pacific Islands Region Version 2.0,* ed. J. F. Berkowitz, J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-12-5. U.S. Army Engineer Research and Development Center. Vicksberg, MS. 130 pp.

_____. 2020. National Wetland Plant List, version 3.5. Online at URL: https://cwbi-app.sec.usace.army.mil/nwpl_static/v34/home/home.html; last retrieved on September 2, 2022.

U.S. Army Corps of Engineers–Honolulu District (USACE-HD). 2021. Approved jurisdictional determination form for POH-2021-00083. 3 pp.

U.S. Army Corps of Engineers and U.S. Environmental Protection Agency (USACE and USEPA). 2015. Department of Defense, Department of the Army, Corps of Engineers, 33 CFR Part 328, Environmental Protection Agency, 40 CFR Parts 110, 112, 116, 117, 122, 230, 232, 300, 302, and 401, Clean Water Rule: Definition of "Waters of the United States". *Federal Register*, 80 (124; Monday, June 29, 2020): 37054-37127.

U.S. Army Corps of Engineers and U.S. Environmental Protection Agency (USACE and USEPA). 2020. Department of Defense, Department of the Army, Corps of Engineers, 33 CFR Part 328, Environmental Protection Agency, 40 CFR Parts 110, 112, 116, 117, 122, 230, 232, 300, 302, and 401, The Navigable Waters Protection Rule: Definition of "Waters of the United States". *Federal Register*, 85 (77; Tuesday, April 21, 2020): 22250-22342.

U.S. Army Corps of Engineers and U.S. Environmental Protection Agency (USACE and USEPA). 2021. Department of Defense, Department of the Army, Corps of Engineers, 33 CFR Part 328, Environmental Protection Agency, 40 CFR Part 120, revised definition of "Waters of the United States". *Federal Register*, 86 (232; Tuesday, December 7, 2021): 69372-69450.

U.S. Department of Agriculture–Natural Resources Conservation Service (USDA-NRCS). 2020. National Hydric Soils List by State. Online at URL: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcseprd1316619.html; last retrieved September 1, 2022.

_____. 2021. Web Soil Survey, Soil Map—Island Of Oʻahu Area, Hawaiʻi. Online at URL: http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx; last retrieved September 1, 2022.

U.S. District Court for the District of Arizona (US District Court for AZ). 2021. Order No. CV-20-00266-TUC-RM regarding *Pasqua Yaqui Tribe, et al v. USEPA et al*. 11 pp.

U.S. Environmental Protection Agency and Department of Army (USEPA and DA). 2008. Clean Water Act jurisdiction following the U.S. Supreme Court's decision in *Rapanos v. United States & Carabell v. United States.* December 2, 2008. 13 pp.

U.S. Fish and Wildlife Service (USFWS). no date (nd). National Wetlands Inventory website. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Online at URL: http://www.fws.gov/wetlands/Data/Mapper.html; last retrieved September 1, 2022; relevant polygons date from 1977.

U.S. Geological Survey (USGS). 2016. The StreamStats program v4.8.1. Online at URL: http://streamstats.usgs.gov; last retrieved September 1, 2022.

_____. 2017. Hilo Quadrangle, Hawaiʻi – Hawaiʻi County, 7.5-minute series.

Attachment A

Wetland determination data forms

Reset Form

WETLAND DETERMINATION DATA FORM—Hawai'i and Pacific Islands

Project/Site: Ainako | City: Hilo | Sampling Date: 07/28/2022 | Time: 1:09 pm

Applicant/Owner: County of Hawaii | State/Terr./Comm.: Hawaii | Island: Hawaii | Sampling Point: SP-01

Investigator 1: Susan Burr | Investigator 2: Bryson Luke | TMK/Parcel: 2-3-030: 001

Landform: lower hillslope | Local relief: concave

Lat: 19.714837 deg N | Long: 155.11746 deg W | Datum: NAD 1983 (HI) | Slope (%): 1

Soil Map Unit Name: 629 | NWI classification: PEM1F

Are climactic/hydrologic conditions on the site typical for this time of year: Yes ☑ No ☐ (If no, explain in Remarks)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS—Attach a site map showing sampling point locations transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Hydric Soil Present? Yes ☑ No ☐

Wetland Hydrology Present? Yes ☑ No ☐

Is the Sampled Area within a Wetland? Yes ☐ No ☐

Remarks: PEM1F - Persistent emergent palustrine wetland that is semipermanently flooded

629 - Panaewa very cobbly hydrous loam, 2-10% slopes

VEGETATION—Use scientific names of plants.

Tree Stratum (Plot size: 10-m radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. None		No	Select
2.		No	Select
3.		No	Select
4.		No	Select
5.		No	Select
	0	=Total Cover (sum)	

Sapling/Shrub Stratum (Plot size: 1-m radius)			
1. None		No	Select
2.		No	Select
3.		No	Select
4.		No	Select
5.		No	Select
	0	=Total Cover (sum)	

Herb Stratum (Plot size: 1-m radius)			
1. Panicum repens	60	Yes	FAC
2. Urochloa mutica	18	Yes	FACW
3. Scleria testacea	8	No	FAC
4. Dissotis rotundifolia	1	No	UPL
5. Cyperus halpan	12	Yes	FACW
6.		No	Select
7.		No	Select
8.		No	Select
	99	=Total Cover	

Woody Vine Stratum (Plot size: 10-m radius)			
1. None		No	Select
2.		No	Select
	0	=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 **(B)**

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	0
FACW species	x 2 =	0
FAC species	x 3 =	0
FACU species	x 4 =	0
UPL species	x 5 =	0
Column Totals: 0 (A)		0 (B)

Prevalence Index = B/A=

Hydrophytic Vegetation Indicators:

☐ 1 - Rapid Test for Hydrophytic Vegetation

☑ 2 - Dominance Test is >50%

☐ 3 - Prevalence Index is ≤3.0[1]

☐ Problematic Hydrophytic Vegetation [1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☑ No ☐

Remarks: Urochloa mutica is more dominant in the wetland to the south of SP-01.

SOIL

Sampling Point: SP-01

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type [1]	Loc[2]	Texture	Remarks
0 - 3	10YR 2/2	100	None		Select	Select	Muck	H2S odor
					Select	Select	Select	
					Select	Select	Select	
					Select	Select	Select	
					Select	Select	Select	
					Select	Select	Select	
					Select	Select	Select	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains

[2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- select
- Histisols (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Muck Presence (A8)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Gleyed Matrix (S4)

- select
- Sandy Redox (S5)
- Dark-Surface (S7)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- select
- Stratified Layers (A5)
- Sandy Mucky Mineral (S1)
- Red Parent Material (TF2)
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: pahoehoe

Depth (inches): 3

Hydric Soil Present: Yes ☑ No ☐

Remarks:

Hole was dug at 1:00 pm

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required: check all that apply)

- select
- Surface Water (A1
- High Water Table (A2)
- Saturation (A3)
- Water Marks (B1)
- Sediment Deposits (B2)
- Drift Deposits (B3)
- Algal Mat or Crust (B4)
- Iron Deposits (B5)
- Inundation Visible on Aerial Imagery (B7)
- Water Stained Leaves (B9)

- select
- Aquatic Fauna (B13)
- Tilapia Nests (B17)
- Hydrogen Sulfide Odor (C1)
- Oxidized Rhizospheres on Living Roots (C3)
- Presence of Reduced Iron (C4)
- Recent Iron Reduction in Tiled Soils (C6)
- Thin Muck Surface (C7)
- Fiddler Crab Burrows (C10) (Guam, CNMI, a
- Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- select
- Surface Soil Cracks (B6)
- Sparsely Vegetated Concave Surface (B8)
- Drainage Patterns (B10)
- Dry-Season Water Table (C2)
- Salt Deposits (C5)
- Stunted or Stressed Plants (D1)
- Geomorphic Position (D2)
- Shallow Aquitard (D3)
- FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☑	No ☐	Depth (inches):	2
Water Table Present?	Yes ☑	No ☐	Depth (inches):	surface
Saturation Present? (includes capillary fringe)	Yes ☑	No ☐	Depth (inches):	surface

Wetland Hydrology Present? Yes ☑ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Rainfall at Piihonua (PIIH1) for July 2022 was 12.29 in, 73% of average. 2022 rainfall through July 31 was 81.10 in, 76% of average

Remarks:

Time of field observations 1:20 pm
Iron bacteria sheen on surface of water
Poeciliids present

Reset Form

WETLAND DETERMINATION DATA FORM—Hawai'i and Pacific Islands

Project/Site: Ainako | City: Hilo | Sampling Date: 07/28/2022 | Time: 1:30 pm

Applicant/Owner: County of Hawaii | State/Terr./Comm.: Hawaii | Island: Hawaii | Sampling Point: SP-02

Investigator 1: Susan Burr | Investigator 2: Bryson Luke | TMK/Parcel: 2-3-030: 004

Landform: lower hillslope | Local relief: convex

Lat: 19.71395 deg N | Long: 155.11793 deg W | Datum: NAD 1983 (HI) | Slope (%): 10

Soil Map Unit Name: 629 | NWI classification: upland

Are climactic/hydrologic conditions on the site typical for this time of year: Yes ☑ No ☐ (If no, explain in Remarks)

Are Vegetation ☐, Soil ☐, or Hydrology ☐ significantly disturbed? Are "Normal Circumstances" present? Yes ☑ No ☐

Are Vegetation ☐, Soil ☐, or Hydrology ☐ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS—Attach a site map showing sampling point locations transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ☐	No ☑	
Hydric Soil Present?	Yes ☐	No ☑	**Is the Sampled Area**
Wetland Hydrology Present?	Yes ☐	No ☑	**within a Wetland? Yes ☐ No ☐**

Remarks: 629 - Panaewa very cobbly hydrous loam, 2-10% slopes

VEGETATION—Use scientific names of plants.

Tree Stratum (Plot size: 10-m radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Psidium cattleianum	90	Yes	FACU
2.		No	Select
3.		No	Select
4.		No	Select
5.		No	Select
	90	=Total Cover (sum)	
Sapling/Shrub Stratum (Plot size: 1-m radius)			
1. None		No	Select
2.		No	Select
3.		No	Select
4.		No	Select
5.		No	Select
	0	=Total Cover (sum)	
Herb Stratum (Plot size: 1-m radius)			
1. None		No	Select
2.		No	Select
3.		No	Select
4.		No	Select
5.		No	FACW
6.		No	Select
7.		No	Select
8.		No	Select
	0	=Total Cover	
Woody Vine Stratum (Plot size: 10-m radius)			
1. None		No	Select
2.		No	Select
	0	=Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ **(B)**

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	90	x 4 =	360
UPL species	0	x 5 =	0
Column Totals:	90 (A)		360 (B)

Prevalence Index = B/A= 4.00

Hydrophytic Vegetation Indicators:

☐ 1 - Rapid Test for Hydrophytic Vegetation

☐ 2 - Dominance Test is >50%

☐ 3 - Prevalence Index is ≤3.0[1]

☐ Problematic Hydrophytic Vegetation [1] (Explain in Remarks or in the delineation report)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☐ No ☑

Remarks: Understory is bare due to closed canopy of Psidium cattleianum.

SOIL **Sampling Point:** SP-02

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type [1]	Loc[2]	Texture	Remarks
0 - 5	10YR 3/3	100	None		Select	Select	Clay Loam	
5 - 18	2.5YR 3/6	90	7.5YR 2.5/3	10	D	M	Loam	
					Select	Select	Select	
					Select	Select	Select	
					Select	Select	Select	
					Select	Select	Select	
					Select	Select	Select	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains [2]Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

select
Histisols (A1)
Histic Epipedon (A2)
Black Histic (A3)
Hydrogen Sulfide (A4)
Muck Presence (A8)
Depleted Below Dark Surface (A11)
Thick Dark Surface (A12)
Sandy Gleyed Matrix (S4)

select
Sandy Redox (S5)
Dark-Surface (S7)
Loamy Gleyed Matrix (F2)
Depleted Matrix (F3)
Redox Dark Surface (F6)
Depleted Dark Surface (F7)
Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

select
Stratified Layers (A5)
Sandy Mucky Mineral (S1)
Red Parent Material (TF2)
Very Shallow Dark Surface (TF12)
Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: pahoehoe

Depth (inches): 3

Hydric Soil Present: **Yes** ☐ **No** ☑

Remarks:

Hole was dug at 1:30 pm

HYDROLOGY

Wetland Hydrology Indicators: (Explain observations in Remarks, if needed.)

Primary Indicators (minimum of one required: check all that apply)

select
Surface Water (A1
High Water Table (A2)
Saturation (A3)
Water Marks (B1)
Sediment Deposits (B2)
Drift Deposits (B3)
Algal Mat or Crust (B4)
Iron Deposits (B5)
Inundation Visible on Aerial Imagery (B7)
Water Stained Leaves (B9)

select
Aquatic Fauna (B13)
Tilapia Nests (B17)
Hydrogen Sulfide Odor (C1)
Oxidized Rhizospheres on Living Roots (C3)
Presence of Reduced Iron (C4)
Recent Iron Reduction in Tiled Soils (C6)
Thin Muck Surface (C7)
Fiddler Crab Burrows (C10) (Guam, CNMI, a
Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

select
Surface Soil Cracks (B6)
Sparsely Vegetated Concave Surface (B8)
Drainage Patterns (B10)
Dry-Season Water Table (C2)
Salt Deposits (C5)
Stunted or Stressed Plants (D1)
Geomorphic Position (D2)
Shallow Aquitard (D3)
FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ☐	No ☑	Depth (inches): none
Water Table Present?	Yes ☐	No ☑	Depth (inches): >18
Saturation Present? (includes capillary fringe)	Yes ☐	No ☑	Depth (inches): >18

Wetland Hydrology Present? **Yes** ☐ **No** ☑

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Rainfall at Piihonua (PIIH1) for July 2022 was 12.29 in, 73% of average. 2022 rainfall through July 31 was 81.10 in, 76% of average

Remarks:

Time of field observations 1:45 pm

Attachment B

Photos of Sampling Points (SPs)

SP-01 Wetland

View from SP-01 looking to the south into strawberry guava upland forest.	View from SP-01 looking upslope to the west.
View from SP-01 looking downslope to the east.	Surface water at SP-01 has an oily sheen, indicitive of iron bacteria in groundwater exposed to the air.

SP-02 Non Wetland

View from SP-02 looking south.	View from SP-02 looking west.
View from SP-02 looking north towards the wetland.	Soil pedon at SP-02 has a dark brown clay loam layer atop a dark red layer of loam. No evidence of wetland hydrology.

Attachment C

Plant species observed in and near Tributary B wetland

Species listed by family	Common name	Status	Abundance	Wetland Status Code
PTERIDOPHYTES - FERNS & FERN ALLIES				
ATHYRIACEAE				
Diplazium esculentum (Retz.) Sw.	paca fern	Nat	C	FACW
NEPHROLEPIDACEAE				
Nephrolepis brownii (Desv.) Hovenkasmp & Miyam.	Asian sword fern	Nat	C	FAC
FLOWERING PLANTS				
MONOCOTS				
COMMELINACEAE				
Commelina diffusa Burm. f.	dayflower, *honohono*	**Pol**	C	FACW
CYPERACEAE				
Cyperus gracilis R. Br.	McCoy grass	Nat	O	FACU
Cyperus halpan L.	---	Nat	O	FACW
Cyperus involucratus Roxb.	umbrella sedge	Nat	O	FACW
Cyperus polystachyos Rottb.	---	Nat	C	FACW
Scleria testacea Nees	---	**Ind**	U	FAC
Rhynchospora caduca Elliot	anglestem beakrush	Nat	A	FACW
POACEAE				
Coix lachrymal-jobi L.	Job's tears	Nat	C	FACW
Panicum repens L.	torpedo grass, wainaku grass	Nat	AA	FAC
Paspalum conjugatum Bergius	Hilo grass	Nat	C	FAC
Paspalum urvillei Steud.	Vassey grass	Nat	C	FAC
Sacciolepis indica (L.) Chase	Glenwood grass	Nat	C	FAC
Setaria palmifolia (J. Konig) Stapf.	palm grass	Nat	C	FAC
Urochloa mutica (Forssk.) Nguyen	California grass	Nat	A	FACW
FLOWERING PLANTS				
EUDICOTS				
APIACEAE				
Centella asiatica (L.) Urb.	Asiatic pennywort	Nat	C	FAC
ASTERACEAE				
Ageratum conyzoides L.	*maile honohono*	Nat	C	FAC
Crassocephalum crepidioides (Benth.) S. Moore	---	Nat	O	FACU
Elephantosus spicatus Juss. Ex Aubl.	---	Nat	R	UPL
Erechtites valerianifolia (Wolf) DC.	---	Nat	C	UPL
Sphagneticola triloba (L.) Pruski	wedelia	Nat	U	FAC
BEGONIACEAE				
Begonia hirtella Link	wild begonia	Nat	U	FACU
BIGNONIACEAE				
Spathodea campanulata P. Beauv.	African tulip	Nat	C	FACU

CONVOLVULACEAE				
Ipomoea sp.	---	Nat	R	---
LAMIACEAE				
Hyptis pectinata (L.) Poit.	comb hyptis	Nat	O	UPL
LYTHRACEAE				
Cuphea carthegenensis (Jacq.) Macbr.	tarweed	Nat	O	FAC
MALVACEAE				
Sida rhombifolia L.	Cuba jute	Nat	O	FACU
MELASTOMATACEAE				
Dissotis rotundifolia (Sm.) Triana	---	Nat	C	UPL
MYRTACEAE				
Psidium cattleianum Sabine	strawberry guava	Nat	C	FACU
Psidium guajava L.	common guava	Nat	C	FACU
ONAGRACEAE				
Ludwigia octovalvis (Jacq.) P.H. Raven	primrose willow, *kamole*	**Pol**	C	OBL
ROSACEAE				
Rubus rosifolius Sm.	thimbleberry	Nat	O	FACU
RUBIACEAE				
Spermacoce assurgens Ruiz & Pav.	buttonweed	Nat	O	UPL

Attachment B (1774B)

Wetland determination data forms

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Hawai'i and Pacific Islands Region
See ERDC/EL TR-12-5; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Ainako | City: Hilo | Sampling Date: 12/18/2023 | Time: 10:05
Applicant/Owner: County of Hawai'i | State/Terr/Comlth.: Hawai'i | Island: Hawai'i | Sampling Point: SP-A
Investigator(s): Susan Burr, Kamryn Yoneshige | TMK/Parcel: 2-3-030: 004
Landform (hillside, coastal plain, etc.): lower hillslope | Local relief (concave, convex, none): concave
Lat: 19.716723 N | Long: 155.115119W | Datum: NAD 1983 (HI) | Slope (%): 5
Soil Map Unit Name: Hilo hydrous silty clay loam, 0-10% slopes (901) | NWI classification: upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No ____	**Is the Sampled Area within a Wetland?** Yes ____ No X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	

Remarks:
Within Tributary C channel.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10-m radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Falcataria moluccana*	25	Yes	FACU
2. *Macaranga tanarius*	3	No	UPL
3. *Trema orientalis*	2	No	FACU
4.			
5.			
	30	=Total Cover	
Sapling/Shrub Stratum (Plot size: 1-m radius)			
1. None	0		
2.			
3.			
4.			
5.			
		=Total Cover	
Herb Stratum (Plot size: 1-m radius)			
1. *Coix lacryma-jobi*	100	Yes	FACW
2. *Commelina diffusa*	10	No	FACW
3. *Hyptis pectinata*	2	No	UPL
4. *Paederia foetida*	2	No	UPL
5.			
6.			
7.			
8.			
	114	=Total Cover	
Woody Vine Stratum (Plot size: 10-m radius)			
1. *Moved to herb stratum*			
2.			
		=Total Cover	

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	110	x 2 =	220
FAC species	0	x 3 =	0
FACU species	27	x 4 =	108
UPL species	7	x 5 =	35
Column Totals:	144 (A)		363 (B)
Prevalence Index = B/A =			2.52

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:
Paederia foetida is a woody vine, but was moved to herb stratum because absolute cover of woody vine is < 5%.

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Hawai'i and Pacific Islands Region
See ERDC/EL TR-12-5; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Ainako | City: Hilo | Sampling Date: 12/18/2023 | Time: 11:20
Applicant/Owner: County of Hawai'i | State/Terr/Comlth.: Hawai'i | Island: Hawai'i | Sampling Point: SP-B
Investigator(s): Susan Burr, Kamryn Yoneshige | TMK/Parcel: 2-3-030: 004
Landform (hillside, coastal plain, etc.): top of hill | Local relief (concave, convex, none): convex
Lat: 19.715822 degrees N | Long: 155.115120 degrees W | Datum: NAD 1983 (HI) | Slope (%): 2
Soil Map Unit Name: Hilo hydrous silty clay loam, 0-10% slopes (901) | NWI classification: upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____
Hydric Soil Present? Yes ____ No ____
Wetland Hydrology Present? Yes ____ No X
Is the Sampled Area within a Wetland? **Yes** ____ **No** X

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10-m radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Albizia ?*	25	Yes	FACU
2. *Macaranga tanarius*	2	No	UPL
3. *Cecropia obtusifolia*	1	No	UPL
4.			
5.			
	28	=Total Cover	
Sapling/Shrub Stratum (Plot size: 1-m radius)			
1. None	0		
2.			
3.			
4.			
5.			
		=Total Cover	
Herb Stratum (Plot size: 1-m radius)			
1. *Urochloa mutica*	100	Yes	FACW
2. *Commelina diffusa*	25	No	FACW
3. *Rubus rosifolius*	5	No	FACU
4. *Dissotis rotundifolia*	2	No	UPL
5. *Paederia foetida*	3	No	UPL
6.			
7.			
8.			
	135	=Total Cover	
Woody Vine Stratum (Plot size: 10-m radius)			
1. *Moved to herb stratum*			
2.			
		=Total Cover	

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	125	x 2 =	250
FAC species	0	x 3 =	0
FACU species	30	x 4 =	120
UPL species	8	x 5 =	40
Column Totals:	163 (A)		410 (B)

Prevalence Index = B/A = 2.52

Hydrophytic Vegetation Indicators:
____ 1 - Rapid Test for Hydrophytic Vegetation
____ 2 - Dominance Test is >50%
X 3 - Prevalence Index is ≤3.0[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Hawai'i and Pacific Islands Region
See ERDC/EL TR-12-5; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Ainako | City: Hilo | Sampling Date: 12/18/2023 | Time: 13:20
Applicant/Owner: County of Hawai'i | State/Terr/Comlth.: Hawai'i | Island: Hawai'i | Sampling Point: SP-C
Investigator(s): Susan Burr, Kamryn Yoneshige | TMK/Parcel: 2-3-030: 004
Landform (hillside, coastal plain, etc.): floodplain | Local relief (concave, convex, none): none
Lat: 19.71469 degrees N | Long: 155.11475 degrees W | Datum: NAD 1983 (HI) | Slope (%): 0
Soil Map Unit Name: Panaewa very cobbly hydrous loam, 2-10% slopes (629) | NWI classification: upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ____ No X
Hydric Soil Present? Yes ____ No X
Wetland Hydrology Present? Yes ____ No X

Is the Sampled Area within a Wetland? **Yes** ____ **No** X

Remarks:

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10-m radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Mangifera indica*	20	Yes	FACU
2. *Psidium cattleianum*	5	No	FACU
3. *Melastoma sanguineum*	4	No	UPL
4. *Clusia rosea*	2	No	FACU
5.			
	31	=Total Cover	
Sapling/Shrub Stratum (Plot size: 1-m radius)			
1. None	0		
2.			
3.			
4.			
5.			
		=Total Cover	
Herb Stratum (Plot size: 1-m radius)			
1. *Melastoma septemnervium*	90	Yes	FAC
2. *Mimosa pudica*	25	No	FACU
3. *Commelina diffusa*	3	No	FACW
4. *Sacciolepis indica*	20	No	FAC
5.			
6.			
7.			
8.			
	138	=Total Cover	
Woody Vine Stratum (Plot size: 10-m radius)			
1. None	0		
2.			
		=Total Cover	

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 2 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 50.0% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	3	x 2 =	6
FAC species	110	x 3 =	330
FACU species	52	x 4 =	208
UPL species	4	x 5 =	20
Column Totals:	169 (A)		564 (B)
Prevalence Index = B/A =			3.34

Hydrophytic Vegetation Indicators:
____ 1 - Rapid Test for Hydrophytic Vegetation
____ 2 - Dominance Test is >50%
____ 3 - Prevalence Index is ≤3.0[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ____ **No** X

Remarks:

U.S. Army Corps of Engineers
WETLAND DETERMINATION DATA SHEET – Hawai'i and Pacific Islands Region
See ERDC/EL TR-12-5; the proponent agency is CECW-CO-R

OMB Control #: 0710-0024, Exp: 11/30/2024
Requirement Control Symbol EXEMPT:
(Authority: AR 335-15, paragraph 5-2a)

Project/Site: Ainako | City: Hilo | Sampling Date: 12/18/2023 | Time: 13:45
Applicant/Owner: County of Hawai'i | State/Terr/Comlth.: Hawai'i | Island: Hawai'i | Sampling Point: SP-D
Investigator(s): Susan Burr, Kamryn Yoneshige | TMK/Parcel: 2-3-030: 004
Landform (hillside, coastal plain, etc.): gulch wall | Local relief (concave, convex, none): concave
Lat: 19.71509 degrees N | Long: 155.11501 degrees W | Datum: NAD 1983 (HI) | Slope (%): 40
Soil Map Unit Name: Panaewa very cobbly hydrous loam, 2-10% slopes (629) | NWI classification: upland
Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)
Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____
Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes X No ____
Hydric Soil Present? Yes ____ No X
Wetland Hydrology Present? Yes ____ No X

Is the Sampled Area within a Wetland? **Yes** ____ **No** X

Remarks:
On steep slope of left bank of Tributary B

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10-m radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Spathodea campanulata*	7	Yes	FACU
2. *Psidium cattleianum*	2	No	FACU
3. *Citharexylum caudatum*	2	No	UPL
4. *Clusia rosea*	5	Yes	FACU
5. *Psidium guajava*	1	No	FACU
	17	=Total Cover	
Sapling/Shrub Stratum (Plot size: 1-m radius)			
1. None	0		
2.			
3.			
4.			
5.			
		=Total Cover	
Herb Stratum (Plot size: 1-m radius)			
1. *Urochloa mutica*	100	Yes	FACW
2. *Melastoma septemnervium*	15	No	FAC
3. *Commelina diffusa*	5	No	FACW
4. *Ludwigia octovalvis*	5	No	OBL
5. *Sphagneticola trilobata*	2	No	FAC
6. *Mimosa pudica*	2	No	FACU
7.			
8.			
	129	=Total Cover	
Woody Vine Stratum (Plot size: 10-m radius)			
1. None	0		
2.			
		=Total Cover	

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
Total Number of Dominant Species Across All Strata: 3 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 33.3% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	5	x 1 =	5
FACW species	105	x 2 =	210
FAC species	17	x 3 =	51
FACU species	17	x 4 =	68
UPL species	2	x 5 =	10
Column Totals:	146 (A)		344 (B)
Prevalence Index = B/A =			2.36

Hydrophytic Vegetation Indicators:
___ 1 - Rapid Test for Hydrophytic Vegetation
___ 2 - Dominance Test is >50%
___ 3 - Prevalence Index is ≤3.0[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)
[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** X **No** ____

Remarks:
Most trees are adjacent to the stream and out of plot.

Attachment C (1734B)

Photos of Sampling Points (SPs)

SP-01 Wetland

View from SP-01 looking to the south into strawberry guava upland forest.	View from SP-01 looking upslope to the west.
View from SP-01 looking downslope to the east.	Surface water at SP-01 has an oily sheen, indicitive of iron bacteria in groundwater exposed to the air.

SP-02 Non Wetland

View from SP-02 looking south.	View from SP-02 looking west.
View from SP-02 looking north towards the wetland.	Soil pedon at SP-02 has a dark brown clay loam layer atop a dark red layer of loam. No evidence of wetland hydrology.

SP-A Non Wetland

View from SP-A looking to the north toward Waianuenue Avenue.	View from SP-A looking upslope to the south.
View from SP-A looking west.	SP-A soil pit.

SP-B Non Wetland

View from SP-B looking to the north toward Waianuenue Avenue.	View from SP-B looking east toward Hale Anuenue Restorative Health Center.
View from SP-B looking west.	SP-B soil pit.

SP-C Non Wetland

SP-C soil pit.	Asian melastome (*Melastoma septemnervium*) shrubs dominating the area.

SP-D Non Wetland

SP-D soil pit.	View from SP-D looking south towards Tributary B.

Attachment D (1734B)

Plant species observed in and near Tributary B wetland

Species listed by family	Common name	Status	Abundance	Wetland Status Code
PTERIDOPHYTES - FERNS & FERN ALLIES				
ATHYRIACEAE				
Diplazium esculentum (Retz.) Sw.	paca fern	Nat	C	FACW
NEPHROLEPIDACEAE				
Nephrolepis brownii (Desv.) Hovenkasmp & Miyam.	Asian sword fern	Nat	C	FAC
FLOWERING PLANTS				
MONOCOTS				
ARECACEAE				
Archontophoenix alexandrae (F. Muell.) H. Wendl. & Drude	Alexander palm	Nat	O	UPL
COMMELINACEAE				
Commelina diffusa Burm. f.	dayflower, *honohono*	**Pol**	C	FACW
CYPERACEAE				
Cyperus gracilis R. Br.	McCoy grass	Nat	O	FACU
Cyperus halpan L.	---	Nat	O	FACW
Cyperus involucratus Roxb.	umbrella sedge	Nat	O	FACW
Cyperus polystachyos Rottb.	---	Nat	C	FACW
Scleria testacea Nees	---	**Ind**	U	FAC
Rhynchospora caduca Elliot	anglestem beakrush	Nat	A	FACW
POACEAE				
Coix lachrymal-jobi L.	Job's tears	Nat	C	FACW
Panicum repens L.	torpedo grass, *wainaku* grass	Nat	AA	FAC
Paspalum conjugatum Bergius	Hilo grass	Nat	C	FAC
Paspalum urvillei Steud.	Vassey grass	Nat	C	FAC
Sacciolepis indica (L.) Chase	Glenwood grass	Nat	C	FAC
Setaria palmifolia (J. Konig) Stapf.	palm grass	Nat	C	FAC
Urochloa mutica (Forssk.) Nguyen	California grass	Nat	A	FACW
FLOWERING PLANTS				
EUDICOTS				
ANACARDIACEAE				
Mangifera indica L.	mango	Nat	R	FACU
APIACEAE				
Centella asiatica (L.) Urb.	Asiatic pennywort	Nat	C	FAC
ASTERACEAE				
Ageratum conyzoides L.	*maile honohono*	Nat	C	FAC
Crassocephalum crepidioides (Benth.) S. Moore	---	Nat	O	FACU
Elephantosus spicatus Juss. Ex Aubl.	---	Nat	R	UPL
Erechtites valerianifolia (Wolf) DC.	---	Nat	C	UPL
Sphagneticola triloba (L.) Pruski	wedelia	Nat	U	FAC

BEGONIACEAE				
Begonia hirtella Link	wild begonia	Nat	U	FACU
BIGNONIACEAE				
Spathodea campanulata P. Beauv.	African tulip	Nat	C	FACU
CLUSIACEAE				
Clusia rosea Jacq.	autograph tree	Nat	R	FACU
CONVOLVULACEAE				
Ipomoea sp.	---	Nat	R	---
FABACEAE				
Mimosa pudica L.	sensitive plant	Nat	R	FACU
LAMIACEAE				
Mesosphaerium pectinatum (L.) Kuntze	comb hyptis	Nat	O	UPL
LYTHRACEAE				
Cuphea carthegenensis (Jacq.) Macbr.	tarweed	Nat	O	FAC
MALVACEAE				
Sida rhombifolia L.	Cuba jute	Nat	O	FACU
MELASTOMATACEAE				
Dissotis rotundifolia (Sm.) Triana	---	Nat	C	UPL
Melastoma sanguineum Sims	fox-tongued melastoma	Nat	R	UPL
Melastoma septemnervium Lour.	Asian melastome	Nat	O	FAC
MYRTACEAE				
Psidium cattleianum Sabine	strawberry guava	Nat	C	FACU
Psidium guajava L.	common guava	Nat	C	FACU
ONAGRACEAE				
Ludwigia octovalvis (Jacq.) P.H. Raven	primrose willow, *kamole*	**Pol**	C	OBL
ROSACEAE				
Rubus rosifolius Sm.	thimbleberry	Nat	O	FACU
RUBIACEAE				
Spermacoce assurgens Ruiz & Pav.	buttonweed	Nat	O	UPL
VERBENACEAE				
Citharexylum caudatum L.	fiddlewood	Nat	R	UPL

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Appendix 3

Biological Survey Results

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Biological Survey
TMKs: (3) 2-3-030: 004 & Portions of 2-3-030:001 and 2-3-031:001
Hilo, Island of Hawai‘i

By Ron Terry, Ph.D. and Patrick J. Hart, Ph.D.
Geometrician Associates, LLC
March 2024

Introduction

As shown on Figure 1, this biological survey concerns portions of mostly forested land in upper Hilo centered on TMK (3) 2-3-030:004, a 60.59-acre parcel with access on Kilikina Street. The project would also include a preferred road access corridor easement from Waianuenue Avenue just mauka of Hale Anuenue to this parcel over two State parcels (TMKs (3) 2-3-030:001 and 2-3-031:001), the former of which is currently encumbered with a pasture lease. We also explored a secondary access route extending from the terminus of Waiau Street across TMKs (3) 2-3-030:001. The entire area is referred to as "the property" within this report.

The objectives of the survey were:

- Conduct a literature search for information regarding potential rare, threatened and endangered (RTE) plant and animal species and valuable native habitat.
- Conduct a physical biological reconnaissance survey by walking the perimeter and transects within the property spaced at intervals adequate to inventory the flora and fauna.
- If applicable, produce general maps and/or geographic descriptions of sensitive areas.
- Document all plant species, birds, mammals, reptiles, and amphibians encountered.
- List typical mitigation measures for any RTE species found or potentially present.
- Prepare a report that includes all findings.

This survey has certain limitations. No highly specialized studies such as radar bat detection or seabird passage surveys were included. Although invertebrates and aquatic species in general were not included within the scope of work, the goal was to assess whether endangered RTE aquatic species had the potential to be present, indicating the need for professional entomological or aquatic survey. A separate study by the consulting firm AECOS focused on the biological and wetlands values of the stream environment found in the access areas associated with Ainako Stream and its tributaries, which are covered only briefly here.

Vegetation Type and Influences

Geologically, the project site is located on the lower flank of Mauna Loa (Wolfe and Morris 1996). The elevation of the property ranges from approximately 400 to 700 feet above sea level. The hyper-wet property receives an average annual rainfall of about 160

to 170 inches (Giambelluca et al 2013). The surface consists of weathered soils derived from regional Pahala Ash deposits and alkalic basalt lava flows on Pleistocene-era (greater than 10,000 years old) lava flows from Mauna Loa. The project site soils are classified by the U.S. Natural Resources Conservation Service (formerly Soil Conservation Service) as Panaewa very cobbly hydrous loam, 2 to 10 percent slopes and Hilo silty clay loam, These soils were often used for sugar cane agriculture in the past and now support diversified agriculture, secondary forest or pasture (U.S. Soil Conservation Service 1973).

In the *Manual of the Flowering Plants of the Hawaiian Islands*, Gagne and Cuddihy (1990) classified the natural, pre-human vegetation in areas with similar geology, elevation and rainfall as Lowland Wet Forest. Dominant species were likely ʻōhiʻa trees (*Metrosideros polymorpha*), uluhe (*Dicranopteris linearis*) and hapuʻu ferns (*Cibotium* spp.), as well as a large variety of trees, shrubs, ferns, sedges, grasses and herbs. This original community in the general area was long ago mostly eradicated or heavily degraded by sugar cane cultivation, cattle grazing, and clearing for small farms and residences. The vegetation outside towns in the area is now either managed (i.e., farms, pasture or landscaped grounds) or adventive "communities" of various alien weeds. Small remnants of native forest still remain in places.

An undated State of Hawaiʻi environmental assessment (EA) prepared for the proposed Kaumana Springs County Park (Hawaiʻi County P&R n.d.) that would have occupied this property and several others noted concerning the general area:

> Years ago, this area was used for agriculture, and even the casual hiker can see evidence of this use demonstrated by the furrowed land and the rock mounds and walls which were created when the land was cleared for cultivation. Agricultural use also eliminated most of the area's large trees. Today, most of the remaining significant trees are located in linear bands which designate property boundaries or water courses. The agricultural land now consists primarily of pastureland and scrub growth which invaded the area as the fields were abandoned. There are also a few residences along the periphery of the pasture land Except for the windrows of trees defining the park boundaries, most of the vegetation within the proposed park site is of recent origin, and virtually none is more than 25 years old.

An archaeological reconnaissance survey associated with the EA stated:

> … the preliminary results of the survey indicate the presence of a prehistoric-type agricultural complex in the interior portions of the proposed Kaumana Springs Wilderness Park, with some historic-period remains in the peripheral areas.

Examination of the U.S. Geological Survey maps from various dates along with airphotos from 1954, 1965 and 1977 indicates that during this period the property supported either (or both) sugar cane cultivation and cattle pasture and only became reforested in the last 50 years. Google Earth © images from the last 20 years indicate very little change except on the southwest margin, where clearing of albizia and grading occurring on an adjacent property appears to encroach onto a few acres of the property (see Figure 2).

Results: Vegetation and Flora

Several forays into the dense property were made in August and September 2022, and again in January 2024. As shown in Figure 2, a Google Earth© image of the property from 2015, and in the ground photos in Figure 3, the property is heavily forested, with a few clearings and a small area of pasture in the north. Prominent tree species in the upper canopy include very tall albizia trees (*Falcataria moluccana*) – especially dominant in the makai half of the property – along with autograph tree (*Clusia rosea*), African tulip (*Spathodea campanulata*) and large stands of Alexandra palm (*Archontophoenix alexandrae*), with some kukui (*Aleurites moluccana*) and Chinese banyan (*Ficus microcarpa*). The understory is composed of seedlings of the trees above, especially Alexandra palm, along with thickets of strawberry guava (*Psidium cattleianum*), palmgrass (*Setaria palmifolia*), Australian tree fern (*Sphaeropteris cooperi*), warabi fern (*Diplazium esculentum*), shoebutton ardisia (*Ardisia elliptica*) and hare's foot fern (*Phlebodium aureum*). Herbs and grasses are uncommon except near the steeper stream banks, in limited clearings, and at the mauka margin of the property with Kilikina Street, where a wide variety of weedy species are present. Ainako Stream cuts through the makai tip of the property, leaving an isolated remnant that is adjacent to the backyards of homes on Ekaha and Lahaina Street.

The primary access begins just mauka of Hale Anuenue and extends across two state properties. The first 400 feet has been modified heavily by grazing and landclearing for an unpaved road and other uses. The final 300 feet is heavily wooded with non-native trees including *Eucalyptus* sp., strawberry guava, deviltree (*Alstonia macrophylla*), and mule's foot fern (*Angiopteris evecta*), among many others. Topographically it consists of an unnamed (and not mapped on USGS 1:24,000 topographic sheets), apparently permanent spring-fed stream and its steep, wooded banks. The secondary Waiau Street access (currently not expected to be utilized) is 1,000 feet in total length and begins at the south end of Waiau Street in a grove of non-native trees and various ornamental gingers. Once into the State property, the vegetation rapidly becomes a wetlands marsh of California grass (*Urochloa mutica*), Wainaku grass (*Panicum repens*), kamole (*Ludwigia octovalvis*) and umbrella sedge (*Cyperus involucratus*) associated springs and streams.

All plant species found on the property during the surveys are listed in Table 1. Of the 96 species detected, only two were native, the indigenous (native to the Hawaiian Islands and elsewhere) and very widespread sedges *Cyperus polystachyos* and *Scleria testacea*. No endemic (found only in the Hawaiian Islands) plants were seen. No rare or unusual native plant species were present. Several common Polynesian introductions were also present: kukui (*Aleurites moluccana*), ti (*Cordyline fruticosa*), taro (*Colocasia esculenta*), ʻape (*Alocasia macrorrhizos*) and banana (*Musa* sp.). It should be noted that we were not able to identify several species because they were sterile, juvenile and/or in poor condition. It is highly unlikely that any of these unidentified species would be rare.

Results: Threatened and Endangered Plant Species and Critical Habitat

No threatened or endangered plant species as listed by the U.S. Fish and Wildlife Service appear to be present on the property, nor are there uniquely valuable habitats. No existing or proposed federally designated critical habitat is present on or near the property.

Botanical Impacts and Recommended Mitigation Measures

The history of continuous disturbance coupled with a location in the lowlands has resulted in a flora and vegetation on the property that has little to no value in terms of conserving native vegetation or threatened or endangered plant species. No adverse botanical impacts are expected as a result of future development. Impacts to wetlands at the access crossing areas are covered in a separate report by AECOS.

Background and Results: Birds

Dozens of alien bird species that were often intentionally brought to Hawai‘i found it suitable habitat and now make the islands their home. Lowland, non-shoreline properties on the windward side of Hawai‘i island covered in alien forest are likely to have an almost exclusively non-native bird fauna. None of the forest birds for which Hawai‘i is famous as a showcase of evolution are likely to be present. Most of these native birds are found primarily or exclusively in the montane forests outside the mosquito belt (generally above 4,000 feet in elevation), where native plant resources are still present and *Culex* mosquitos are absent or scarce.

The only forest bird that is likely to utilize this low-elevation property is the Hawaiian hawk or ‘io (*Buteo solitarius*). The Hawaiian hawk generally prefers ‘ōhi‘a forest habitat but is known to breed successfully in both native and non-native forests. It occurs throughout the island of Hawai‘i from sea level to 8,530 feet in elevation. Hawks often forage in forests near agricultural tracts and nest in tall trees of a variety of species. Most nesting occurs in native ‘ōhi‘a trees, although hawks may also nest in non-native trees, including eucalyptus, ironwood, mango, coconut palm and macadamia.

Since the property is adjacent to streams and wetlands and contained some springs and small streams, several Hawaiian waterbirds merit consideration. Almost certainly present at times would be the common, indigenous black-crowned night heron, or ‘auku‘u (*Nycticorax nycticorax hoactli*), especially in the wetlands on the property margins. Less likely are various other threatened and endangered waterbirds, which tend to prefer more open habitat and larger ponds and have not been reported from this area. These include the listed endangered Hawaiian duck or koloa maoli (*Anas wyvilliana*), Hawaiian stilt or ae‘o (*Himantopus mexicanus knudseni*), and the Hawaiian coot or ‘alae ke‘oke‘o (*Fulica alai)*. Koloa maoli are almost never seen in streams in this area and prefer open upland ponds further west in the Hamakua District. Ae‘o have occasionally been spotted in certain coastal and inland ponds, but generally in areas of shallow water with mudflats, which are lacking on the property. The ‘alae ke‘oke‘o is frequently observed in calm open waters, including only four miles east in the large, brackish Loko‘aka Ponds and similar waters. The threatened Hawaiian goose or nēnē (*Branta sandwicensis*) is a wide-ranging bird that is frequently seen in a variety of environments and elevations throughout the island, including ponds and streams. Historically, flocks moved between high-elevation feeding habitats and lowland nesting areas. A preliminary search of records found no sightings of any of the listed waterbirds nearby, with the exception of nēnē, which has been noted in the parking lots of the tourist attractions Rainbow Falls,

Boiling Pots and Kaumana Caves, where tourists unfortunately feed and imperil them (Hawai‘i DLNR 2013, 2015; 2019).

Finally, although seabirds and shorebirds were not normally be expected on the property, the grassy area and particularly the marsh project margins could attract the migratory resident Pacific golden-plover (*Pluvialis fulva*). This bird frequently rests and forages not only on the shoreline but in pastures and open fields throughout the State of Hawai‘i during its residence here from August to April. As with all of the island of Hawai‘i, several listed seabirds may overfly the island's interior between the months of May and November, including the endangered Hawaiian petrel (*Pterodroma sandwichensis*), the endangered band-rumped storm petrel (*Oceanodroma castro*), and the threatened Newell's shearwater (*Puffinus auricularis newelli*). These seabirds hunt over the ocean during the day and fly to higher elevations at night to nest. Although each of these seabirds may fly over the property on their way to and from mountain nesting areas and the open ocean, no suitable nesting habitat for any of them is present on the property.

We conducted five separate reconnaissances on the property, all during mid-day, which provided only a snapshots of the bird fauna. We observed a total of twelve bird species, all common non-natives (see Table 2). Multiple long-term observations made at all times of the day and in different seasons would undoubtedly reveal additional species, most of them also likely non-native.

Results: Mammals, Reptiles and Amphibians

It is highly likely that Hawaiian hoary bats (*Lasiurus cinereus semotus*), the only native Hawaiian land mammals, are sometimes present on the property, especially on the margins with less densely forested properties. They have been found throughout the island of Hawai‘i. Bats may forage for flying insects on or near the property on a seasonal basis and may also roost in trees and large shrubs. Bats are often visible while they are feeding on flying insects near dusk and dawn at various locations around the island of Hawai‘i. The presence of these bats can also be verified by echolocation detectors. If a bat is detected during a night's study, this merely indicates that they were present in the area. Determination of bat populations or usage patterns requires much more sophisticated, long term studies. Conversely, the absence of bat detections does not indicate an absence of bats, which may have been absent for only a night, a week, or a season, or may have simply gone undetected. No bats were observed in our survey, which took place in daylight and did not use any detection equipment. For the purposes of this assessment, it is assumed that Hawaiian hoary bats are present at least some of the time. Hawaiian hoary bats are vulnerable to disturbance during the summer pupping season and require special mitigation measures.

We observed numerous individuals and abundant sign of feral or semi-feral pigs (*Sus scrofa*). Domestic cattle (*Bos taurus*) graze nearby. It is highly probably that small Indian mongooses (*Herpestes a. auropunctatus*), mice (*Mus* spp.), rats (*Rattus* spp.), cats (*Felis catus*) and domestic dogs (*Canis f. familiaris*) are present. None of these 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 were observed on the property, but various species of skink (Family: Scincidae), gecko (Gekkonidae) and anoles (Dactyloidae) could be present. Two species of amphibians were detected, the highly invasive coqui frogs (*Eleutherodactylus coqui*) and the American bullfrog (*Rana catesbeiana*). It is likely that bufo toads (*Bufo marinus*) and perhaps several other species are present as well. As with non-native mammals, these species lack conservation value and harm native flora and fauna.

No invertebrate survey was undertaken as part of the survey, but in general, rare, threatened or endangered invertebrates on the Island of Hawai‘i tend to be associated with either higher-elevation, older substrate rainforests (e.g., various *Drosophila*); coastal dry shrubland (e.g., various *Hylaeus*); the summit of Mauna Kea (*Nysius wekiuicola*); extremely dry, disturbed ‘a‘a flows (*Manduca blackburnii*); or aquatic settings in estuaries or at high elevations (various *Megalagrion*). The project site does not contain suitable habitat for any threatened or endangered invertebrates.

Faunal Impacts and Mitigation Measures

As part of project approvals, particularly if federal funding is involved, various mitigation measures would likely be imposed in compliance with State and federal laws to avoid and minimize impacts to threatened and endangered native birds and the Hawaiian hoary bat.

Hawaiian hawks

These birds were delisted by the federal government in 2019, but they are still listed as endangered by the State of Hawai‘i. The primary concern for housing projects is disturbance of nesting hawks during construction. Hawaiian hawk nest building is protracted, beginning up to two months before the first egg is laid and continuing into the nestling period. Egg-laying generally occurs from March to June, and fledging from July to September. Both adults feed fledglings, which are dependent on adults for up nine months. Given the vegetation context and the isolation of the property from nearby homes and farms, there is a small possibility that hawk nesting occurs on or near the property. If nests were near enough, grading, tree removal and other construction activities might disturb nesting. To minimize impacts to Hawaiian hawks:

- Avoid earthmoving within 100 meters of tall trees or tree cutting during the breeding season for Hawaiian hawks (March through the end of September). If this time period cannot be avoided, arrange for a hawk nest search to be conducted by a qualified biologist. If hawk nests are present in or near the project site, all land clearing activity should cease until the expiration of the breeding season.

Hawaiian waterbirds

Hawaiian waterbirds are primarily vulnerable to disturbance from nearby construction during nesting. To avoid and minimize potential impacts to Hawaiian waterbirds:

- If water resources are located within or adjacent to the project site, incorporate the applicable U.S. Fish and Wildlife Service Pacific Island Fish and Wildlife Service Office (PIFWO) BMPs regarding work in aquatic environments into the project design.
- Have a biological monitor that is familiar with the species' biology conduct Hawaiian waterbird nest surveys where appropriate habitat occurs within the vicinity of the proposed project site prior to project initiation. Repeat surveys again within 3 days of project initiation and after any subsequent delay of work of or more days (during which the birds may attempt to nest).
- In areas where waterbirds are found to be present, post and implement reduced speed limits, and inform project personnel and contractors about the presence of endangered species on-site or nearby.

If a Hawaiian waterbird nest or active brood is found in the action area:

- Contact the PIFWO within 24 hours for further guidance.
- Establish and maintain a 100-foot buffer around all active nests and/or broods until the chicks/ducklings have fledged. Do not conduct potentially disruptive activities or habitat alteration within this buffer.
- Have a biological monitor that is familiar with the species' biology present on the project site during all construction or earth moving activities until the chicks/ducklings fledge to ensure that Hawaiian waterbirds and nests are not adversely impacted.

Hawaiian geese are vulnerable during nesting and their unafraid behavior makes them particularly at risk. To avoid and minimize potential impacts to the Hawaiian goose:

- Do not approach, feed, or disturb Hawaiian geese if they fly over or land at the project site.
- If Hawaiian geese are observed loafing or foraging within the project area during the breeding season (September through April), halt work and have a biologist familiar with the nesting behavior of Hawaiian geese survey for nests in and around the project area prior to the resumption of any work. Repeat surveys after any subsequent delay of work of 3 or more days (during which the birds may attempt to nest).
- Cease all work immediately and contact PIFWO for further guidance if a nest is discovered within a radius of 150 feet of proposed work, or a previously undiscovered nest is found within said radius after work begins.
- In areas where Hawaiian geese are known to be present, post and implement reduced speed limits, and inform project personnel and contractors about the presence of endangered species on-site.

<u>Hawaiian seabirds</u>

The primary cause of mortality in these seabird species in Hawai‘i is thought to be predation by alien mammals species at the nesting colonies. Collision with man-made structures is another significant cause. Nocturnally flying seabirds, especially fledglings

on their way to sea in the summer and fall, can become disoriented by exterior lighting. Disoriented seabirds may collide with manmade structures and, if not killed outright, become easy targets of predatory mammals including cats and mongooses. If development activities incorporate outdoor lighting, they may attract endangered seabirds. To avoid or minimize impacts to threatened or endangered seabirds:

- No construction or unshielded equipment lighting should be used after dark between the months of April and October. All permanent lighting should be shielded in strict conformance with the Hawai‘i County Outdoor Lighting Ordinance (Hawai‘i County Code Chapter 9, Article 14), which requires shielding of exterior lights so as to lower the ambient glare caused by unshielded lighting. Furthermore, all lighting should be low-blue spectra and utilize the minimum necessary number of fixtures, with timers or cutoff switches as practical.

Hawaiian hoary bats

These bats are vulnerable to disturbance during the bat birthing and pup rearing season, when roosting mother bats may not be able to successfully move pups when their tree roosting sites are disturbed. Hawaiian hoary bats are also in danger of being entangled and killed by top strands of barbed wire on fences. Therefore, to minimize impacts to the endangered Hawaiian hoary bat:

- Shrubs and trees taller than 15 feet should not be removed or trimmed between June 1 through September 15, and no top-strand barbed wire should be used.

Aquatic Species

No formal aquatic survey was done for any of the marshes or small waterways crossing the property, but species were casually noted. We observed mosquito fish (*Gambusia affinis*), crayfish (*Procambarus clarkii*), and American bullfrogs (*Rana catesbeiana*). A number of observation periods did not result in any sightings of damselflies or dragonflies, although they are undoubtedly occasionally present, including possibly several common native species. The habitat indicates a low likelihood of threatened or endangered aquatic organisms. Regardless, it would be appropriate to incorporate applicable the PIFWO BMPs regarding work in aquatic environments mentioned above.

Report Limitations

No biological survey of a large area can claim to have detected every species present. Some plant species are cryptic in juvenile or even mature stages of their life cycle. This is particularly true for a reconnaissance survey that examines representative areas of a property. Dry conditions can render almost undetectable plants that extended rainfall may later invigorate and make obvious. Thick brush can obscure even large, healthy specimens. Birds utilize different patches of habitat during different times of the day and seasons, and only long-term study can determine the exact species composition. The findings of this survey must therefore be interpreted with proper caution; in particular, there is no warranty as to the absence of any particular species.

Literature Cited or Consulted

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 Hawai'i*. 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 Hawaiʻi. Bull. Amer. Meteor. Soc. 94, 313-316, doi: 10.1175/BAMS-D-11-00228.1.

Hawaiʻi County Department of Parks and Recreation (P&R). n.d. *Environmental Assessment And Negative Declaration For Kaumana Springs Wilderness Park South Hilo, Hawaii. TMK: 2-3-30: 1, 4, 6, 7*. Prep. for P&R by Walters, Kimura and Associates, Inc. Honolulu.

Spiegel, C.S., and P.J. Hart, B.L. Woodworth, E.J. Tweed and J.J. Lebrun. 2006. "Distribution and abundance of forest birds in low-altitude habitat on Hawaiʻi Island: evidence for range expansion of native species." *Bird Conservation International* 16:175–185.

U.S. Fish and Wildlife Service (USFWS). 2022. *ECOS Environmental Conservation Online System.* https://ecos.fws.gov/ecp/species-reports.

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

Figure 1. Location Map

Aerial Image Base Map © Google Earth

Figure 2. Property Map with Walking Transects

Aerial Image Base Map © Google Earth

Figure 3. Property Photos

3a. Giant albizia log ▲ ▼ 3b. Large pig wallow

Figure 3. Property Photos

3c. Stone enclosure ▲ ▼ 3d. Grove of leaning strawberry guava

Figure 3. Property Vegetation Photos

3e. Aerial roots of autograph trees ▲ ▼ 3f. Concrete wall-ringed spring

Figure 3. Property Vegetation Photos

3g. Albizia regrowing after 2014 cut in southwest corner ▲

▼ 3h. Stream habitat on access mauka of Hale Anuenue

Table 1. Plant Species List on Project Site

Scientific Name	Family	Common Name	Life Form	Status
Adiantum raddianum	Pteridaceae	Maidenhair Fern	Fern	A
Ageratum conyzoides	Asteraceae	Ageratum	Herb	A
Aleurites moluccana	Euphorbiaceae	Kukui	Tree	A
Alocasia macrorrhizos	Araceae	‘Ape	Shrub	PI
Alstonia macrophylla	Apocynaceae	Deviltree	Tree	A
Angiopteris evecta	Marraticeae	Mule’s Foot Fern	Fern	A
Ardisia elliptica	Myrsinaceae	Shoebutton Ardisia	Tree	A
Archontophoenix alexandrae	Arecaceae	Alexandra Palm	Tree	A
Bambusa vulgaris	Poaceae	Yellow Clumping Bamboo	Grass	A
Begonia reniformis	Begoniaceae	Grape-Leaf Begonia	Herb	A
Blechnum appendiculatum	Blechnaceae	Blechnum	Fern	A
Caladium lindenii	Araceae	Indian Kale	Shrub	A
Catharanthus roseus	Apocynaceae	Madagascar Periwinkle	Shrub	A
Cecropia obtusifolia	Cecropiaceae	Cecropia	Tree	A
Cenchrus purpureus	Poaceae	Napier Grass	Herb	A
Centella asiatica	Apiaceae	Asiatic Pennywort	Herb	A
Cestrum nocturnum	Solanaceae	Night Blooming Jasmine	Shrub	A
Chamaecrista nictitans	Fabaceae	Partridge Pea	Herb	A
Chloris sp.	Poaceae	Chloris	Herb	A
Christella parasitica	Thelypteridaceae	Downy Wood Fern	Fern	A
Clidemia hirta	Melastomataceae	Koster’s Curse	Shrub	A
Clusia rosea	Clusiaceae	Autograph Tree	Tree	A
Coffea arabica	Rubiaceae	Coffee	Shrub	A
Coix lacryma-jobi	Poaceae	Job’s Tears	Grass	A
Cordyline fruticosa	Asparagaceae	Ti	Shrub	PI
Colocasia esculenta	Araceae	Taro	Shrub	PI
Commelina diffusa	Commelinaceae	Honohono	Herb	A
Crassocephalum crepidioides	Asteraceae	Crassocephalum	Herb	A
Crotalaria pallida	Fabaceae	Rattlepod	Herb	A
Cuphea carthegenensis	Lythraceae	Tarweed	Herb	A
Cyperus gracilis	Cyperaceae	McCoy Grass	Herb	A
Cyperus halpan	Cyperaceae	Cyperus	Herb	A
Cyperus involucratus	Cyperaceae	Umbrella Sedge	Herb	A
Cyperus polystachyos	Cyperaceae	Pycreus	Sedge	I
Desmodium triflorum	Fabaceae	Desmodium	Herb	A
Dichorisandra thyrsiflroa	Commelinaceae	Blue Ginger	Herb	A
Dieffenbachia sp.	Araceae	Dumb Cane	Herb	A
Digitaria sp.	Poaceae	Digitaria	Herb	A
Diplazium esculentum	Athyriaceae	Warabi	Fern	A
Dracaena marginata	Asparagaceae	Money Tree	Tree	A
Elephantopus spicatus	Asteraceae	Elephantopus	Herb	A
Epipremnum aureum	Araceae	Pothos	Vine	A
Eucalyptus sp.	Myrtaceae	Eucalyptus	Tree	A
Erechtites valerianifolia	Asteraceae	Fireweed	Herb	A
Etlingera elatior	Zingiberaceae	Torch Ginger	Shrub	A
Falcataria moluccana	Fabaceae	Albizia	Tree	A

Table 1, continued				
Scientific Name	**Family**	**Common Name**	**Life Form**	**Status**
Ficus microcarpa	Moraceae	Banyan	Tree	A
Fraxinus uhdei	Oleacea	Tropical Ash	Tree	A
Hedychium coronarium	Zingiberaceae	White Ginger	Herb	A
Hedychium flavescens	Zingiberaceae	Yellow Ginger	Herb	A
Heliconia spp.	Heliconiaceae	Heliconia	Herb	A
Hyptis pectinata	Lamiaceae	Comb Hyptis	Shrub	A
Ipomoea triloba	Convolvulaceae	Little Bell	Vine	A
Justicia betonica	Acanthaceae	White Shrimp Plant	Shrub	A
Litchi chinensis	Sapindaceae	Lychee	Tree	A
Ludwigia octovalvis	Onagraceae	Kamole	Herb	A
Macaranga mappa	Euphorbiaceae	Bingabing	Shrub	A
Mangifera indica	Anacardiaceae	Mango	Tree	A
Medinilla cumingii	Melastomataceae	Medinilla	Shrub	A
Megathyrsus maximus	Poaceae	Guinea Grass	Herb	A
Melastoma candidum	Melastomataceae	Melastoma	Shrub	A
Melinis minutiflora	Poaceae	Molasses Grass	Herb	A
Melochia umbellata	Sterculiaceae	Melochia	Tree	A
Musa sp.	Musaceae	Banana	Herb	PI
Nephrolepis multiflora	Nephrolepidaceae	Sword Fern	Fern	A
Oplismenus hirtellus	Poaceae	Basket Grass	Herb	A
Oxalis corniculata	Oxalidaceae	Creeping Wood Sorrel	Herb	A
Paederia foetida	Rubiaceae	Maile Pilau	Vine	A
Panicum repens	Poaceae	Wainaku Grass	Grass	A
Paspalum conjugatum	Poaceae	Hilo Grass	Herb	A
Paspalum urvellei	Poaceae	Vasey Grass	Herb	A
Passiflora edulis	Passifloraceae	Lilikoi	Vine	A
Persea americana	Lauraceae	Avocado	Tree	A
Phlebodium aureum	Polypodiaceae	Hare's Foot Fern	Fern	A
Pseudoelephantopis spicatus	Asteraceae	Elephant's Foot	Herb	A
Psidium cattleianum	Myrtaceae	Strawberry Guava	Tree	A
Psidium guajavum	Myrtaceae	Common Guava	Tree	A
Rhynchospora caduca	Poaceae	Beakrush	Grass	A
Ricinus communis	Euphorbiaceae	Castor Bean	Shrub	A
Rubus rosifolius	Rosaceae	West Indian Raspberry	Shrub	A
Sacciolepis indica	Poaceae	Glenwood Grass	Herb	A
Schefflera actinophylla	Araliaceae	Octopus Tree	Tree	A
Scleria testacea	Cyperaceae	Nutgrass	Sedge	I
Setaria palmifolia	Poaceae	Palmgrass	Herb	A
Sida rhombifolia	Malvaceae	Broomweed	Herb	A
Spathodea campanulata	Bignoniaceae	Africa Tulip	Tree	A
Spermacoce assurgens	Rubiaceae	Buttonweed	Herb	A
Sphaeropteris cooperi	Cyatheaceae	Australian Tree Fern	Fern	A
Sphagneticola trilobata	Asteraceae	Wedelia	Herb	A
Sporobolus indicus	Poaceae	Smutgrass	Herb	A
Stachytarpheta jamaicensis	Verbenaceae	Jamaican Vervain	Shrub	A
Syngonium sp.	Araceae	Syngonium	Vine	A
Tibouchina herbacea	Melastomataceae	Cane Tibouchina	Shrub	A

Table 1, continued				
Scientific Name	**Family**	**Common Name**	**Life Form**	**Status**
Trema orientalis	Ulmaceae	Gunpowder Tree	Tree	A
Urochloa mutica	Poaceae	California Grass	Herb	A
Zingiber zerumbet	Zingiberaceae	‘Awapuhi	Herb	PI

A = alien, E = endemic, I = indigenous, PI = Polynesian introduction

Table 2. Bird Species Observed on Property

Scientific name	Common name	Status
Acridotheres tristis	Common Myna	Alien Resident
Cardinalis cardinalis	Northern Cardinal	Alien Resident
Estrilda astrild	Common Waxbill	Alien Resident
Geopelia striata	Zebra Dove	Alien Resident
Leiothrix lutea	Red-billed Leiothrix	Alien Resident
Paroaria capitata	Yellow-Billed Cardinal	Alien Resident
Serinus mozambicus	Yellow-Fronted Canary	Alien Resident
Sicalis flaveola	Saffron Finch	Alien Resident
Spilopelia chinensis	Spotted Dove	Alien Resident
Zosterops japonicus	Japanese White-Eye	Alien Resident

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Appendix 4

Cultural Impact Assessment

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Stantec

CULTURAL IMPACT ASSESSMENT FOR THE PROPOSED AINAKO AFFORDABLE HOUSING DEVELOPMENT PROJECT

Tax Map Key (3) 2-3-030 :001(por.),004, and (3) 2-3-031:001-

September 29, 2025

Prepared for:
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Hilo, HI 96720

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Project Number:
093046

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Executive Summary

At the request of Okahara and Associates, on behalf of the Hawai‘i County Office of Housing and Community Development (“the Agency”), Stantec GS Inc. (“Stantec”) conducted a Cultural Impact Assessment (CIA) for a proposed workforce housing development (“the Project”) within an approximately 72 acre area (“the Project Area”) located in the two ahupua‘a of Punahoa 2nd and Pi‘ihonua, South Hilo District, Island of Hawai‘i. The Project Area includes Tax Map Key (TMK) (3) 2-3-030:004, which is owned by Hawai‘i County, and a proposed road corridor easement that extends from Waianuenue Avenue across two State-owned parcels (TMKs: (3) 2-3-030:001 and 2-3-031:001) onto the County-owned parcel. The Agency proposes to develop a portion of the Project Area for a workforce housing project, and to construct a new road in the proposed road corridor. The proposed project would consist of infrastructure development of single-family and multi-family housing with phased construction to accommodate timing of funding and housing demand.

This CIA was undertaken to provide information to facilitate the Chapter 343, Hawai‘i Revised Statutes (HRS) review of the Project in accordance with Hawai‘i Administrative Rules (HAR) Chapter 11-200.1 It is also intended to provide information that can be used by the County in its fulfilment of its Article XII Section 7 obligations to protect all rights, customarily and traditionally exercised for subsistence, cultural, and religious purposes and possessed by ahupua‘a tenants who are descendants of native Hawaiians (kānaka ‘ōiwi) who inhabited the Hawaiian Islands prior to 1778, subject to the right of the State to regulate such rights.

Preparation of this CIA involved archival research and interviews with knowledgeable community members, following guidance presented in the State of Hawai‘i, Office of Planning and Sustainable Development’s *Guidelines For Assessing Cultural Impacts* adopted in 1997. The research included review of archival sources to identify an appropriate study area and potential cultural resources and practices, as well as individuals and organizations who may have expertise concerning the types of cultural resources, practices, and beliefs found within the broad geographical area. Results of biological and archaeological surveys conducted for the proposed project were also reviewed. Following this background research, a list of potential interviewees was created and contacted with an invitation to consult. Interviews were conducted with everyone who requested to talk.

Cultural practices and beliefs (including important natural, cultural, and historic resources and practices associated with them) were identified based on direct testimony of resources and practices, observation of resources in the Project Area that are known from other sources to have cultural value, and reference to known cultural resources or practices in archival sources. The study identified:

- **Wahi Kūpuna (Places Significant to Kānaka ‘Ōiwi)** that include natural landforms and archaeological sites.
    - Pu‘u Mohihi / Pu‘u Moohihi / Kupapau Hill, a cinder cone located outside the development footprint but within the Project Area that may be associated with sweet-potato cultivation or possibly traditional burials.

  - The Hilo Boarding School Ditch (SIHP 50-10-35-14947), which was developed and managed as part of the traditional Hawaiian water management system before it was improved for use by the Hilo Boarding School.
  - An agricultural site complex (SIHP 50-10-35-18969) used until the early twentieth century, likely beginning earlier than the 19th century.

- **Wai (Fresh water)** flowing in Ainako Stream and its tributaries, Kaūmana Springs Stream, and other springs in the eastern end of the Project Area. Consultation did not indicate that any particular person or group is using the wai within the project area, but nevertheless this resource is considered critical for the life of the ʻāina, the Hawaiian people, and everyone else dependent on it.
- **Lāʻau (Plants) with traditional Hawaiian cultural uses.** These include ʻape, awapuhi, digitaria, hōʻiʻo, kamole, and kukui. A very small number of plants that represent "feral" or possibly remnant crops of kalo, kī, and maiʻa were also found, as were edible introduction like avocado, guava, lilikoʻi, lychee, mango, strawberry guava, and West Indian raspberry. One interviewee reported gathering hōʻiʻo near the Project Area. No specific practices in the Project Area involving the plants named above were identified.
- **Holoholonā (Animals) with traditional Hawaiian cultural value**. ʻIo (Hawaiian hawks) and ʻōpeʻapeʻa (Hawaiian hoary bats) are presumed to be present in the Project Area at least some of the time, but were not directly observed. They are considered to be resources with traditional Hawaiian cultural importance that are occasionally present in the Project area.
- **No specific traditional Hawaiian cultural practices** were identified that occur within the Project Area. No specific traditional Hawaiian cultural practices were identified that require access to the Project Area.

Impacts to identified cultural resources and practices were determined by physically altering cultural resources, practices, or beliefs; by isolating cultural resources, practices, or beliefs from their setting; and by introducing elements which may alter the setting in which cultural practices take place. Development of the Project would require vegetation clearance throughout the development footprint. Construction of the proposed housing development would involve grading to create buildable lots, roadways, utilities, and recreational space. Once the development is occupied, there will be a substantial increase in the number of people, likely both Kānaka ʻŌiwi and otherwise, accessing the area. Impacts could include:

- Destruction of features of the archaeological site complex (SIHP 50-10-35-18969), primarily agricultural clearing mounds and wall remnants.
- The removal of groups of plants or individual plants with traditional Hawaiian cultural significance.
- Removal for the development of the Project could remove habitat that is suitable for ʻōpeʻapeʻa (Hawaiian hoary bat) and ʻio (Hawaiian hawks)

- Resources, practices, and beliefs in surrounding area (e.g., Wailuku River corridor and Hāla‘i Hills) **would not** be isolated by the development of the Project. Resources available in the undeveloped portions of the Project Area and nearby would become easier to access from within the development due to the addition of sidewalks and streets.
- The proposed action would not introduce elements which may alter the setting in which cultural practices take place because no active cultural practices were identified within the Project Area.

Mitigation of these impacts would include:

- The removal of these plants could be mitigated by the creation of community cultural gardens in the planned community center and green spaces within the development.
- To minimize impacts to ‘io, the Project would avoid earthmoving within 100 meters of tall trees or tree cutting during the breeding season for Hawaiian hawks (March through the end of September).
- To minimize impacts to ‘ōpe‘ape‘a, shrubs and trees taller than 15 feet would not be removed or trimmed between June 1 through September 15, and no top-strand barbed wire should be used.
- The design of the Project minimizes potential contamination of the wai by the Project by connecting to the County sewer to treat wastewater. The Project would be required to follow county regulations and policies related to flood control and drainage.
- Effects to wahi kupuna such as the archaeological sites, could be mitigated through a combination of preservation, public interpretation, historical data recovery, and archaeological data recovery.
- Archaeological monitoring would be used to help clearance crews avoid damaging preservation and data recovery features, as well as identify features that had been obscured by vegetation during the current field work. Monitoring would also be a safeguard against inadvertent discoveries of archaeological deposits or human burials.
- Potential effects of introducing more people to the vicinity of Kupapau Hill and the punawai nearby could be mitigated by public interpretation. The Project could incorporate information about the entire water cycle and its physical and cultural connections to the Project Area

Acronyms/Abbreviations

A.D.	Anno Domini
ABCFM	American Board of Commissioners for Foreign Missions
AIS	Archaeological Inventory Survey
CIA	Cultural Impact Assessment
HAR	Hawai‘i Administrative Rules
the Agency	Hawai‘i County Office of Housing and Community Development
HEA	Hawai‘i Evangelical Association
HRS	Hawai‘i Revised Statutes
LCAw	Land Commission Award
OHA	Office of Hawaiian Affairs
Stantec GS Inc.	Stantec
SIHP	State Inventory of Historic Places
TMK	Tax Map Key

Glossary

ʻaumakua	ancestral guardians or family deities
ahi	fire
ʻāhua	heap, mound, hillock, knoll, pile; in surveying large cairns to mark boundaries
ahupuaʻa	land division smaller than a moku (district) and made up of several ʻili (smaller divisions) and under care of a konohiki (chief having charge of the land on behalf of the king of chief to whom the land was assigned or awarded.) (Lucas 1995)
ʻāina	"that which feeds," the land
ʻāina momona	the "sweet land" where intensive agricultural was practiced
akua	god, goddess, spirit, ghost, devil, image, idol, divine, corpse. The four major akua are Kū, Kāne, Kanaloa, and Lono
ʻalae	mudhen or Hawaiian gallinule (*Gallinula chloropus sandvicensis*)
aliʻi	chief
aliʻi ʻai moku	literally, the chief who eats/consumes the land
ʻamaʻu	genus of ferns (*Sadleria*)
Anake	"Aunty"
ʻapana	literally, a piece, slice, portion, fragment, section, segment, installment, part, land parcel
ʻape	*Alocasia macrorrhizos*
ʻauwai	irrigation ditch
ʻawa	kava, Piper methysticum
ʻea	a general term for infections and infectious diseases; coated tongue, sometimes accompanied by sore throat, the thrush disease of children
hānau ʻia	born
hāpuʻu	a native tree fern *Cibotium* spp.
honua ola	living environment
iaku o ka ihu	nasal growth
ʻili kūpono	politically independent subdivision within an ahupuaʻa
ʻiliahi	sandalwood, *Santalum ellipticum*
imu	traditional Hawaiian earth oven
ipu	gourd
ka poʻina nalu	the fringing reefs at the coast
kaʻao	legendary stories
kahakō	symbol used in modern written Hawaiian to symbolize an elongated vowel sound
kahuli	chaos
kalo	taro, Colocasia esculenta

kamaʻāina	literally, “child of the land”; native-born or one well-acquainted with an area
Kānaka ʻŌiwi	Native Hawaiians
kanu	To plant or bury
kapu	“taboo,” restricted or restrictions
kauhale	group of houses comprising a Hawaiian home
keʻokeʻo	white or clear
kī	ti plant, *Cordyline fruticosa*
kīhāpai	a cultivated patch, garden, orchard, field, small farm
Kino lau	“many bodies”; manifestation of an akua
kipi	mounds for growing kalo in certain areas of Hilo
Kō	sugarcane , *Saccharum officinarum*
kohe popo	an ancient sickness characterized by ill-smelling vagina discharge
koʻihonua	a cosmogonic genealogical chant
konohiki	chief having charge of the land on behalf of the king of chief to whom the land was assigned or awarded
kuahu	hula altars
kūʻauhau	individuals trained in the discipline of remembering genealogies and associated ancestral stories
kukui	candlenut, *Aleurites moluccana*
kula	plain, field, open country, pasture.
kuleana	right, privilege, concern, responsibility.
kupapaʻu	corpse
kūpapau	deeply engaged, as in an activity; finished; engrossed, absorbed, united; all, all together
kupua	person of extraordinary powers of mind of body, “demigod”
lāʻau lapaʻau	traditional Hawaiian healing using plants
lei	garland
limu kala	a brown seaweed (*Sargassum echinocarpum*)
loʻi	wetland kalo (taro) patch
luna wai	overseer of water
Māhele	division of lands; the Māhele of 1848 established the current land tenure system in Hawaiʻi
maiʻa	banana, Musa sp.
makaʻāinana	people of the land, or commoners
makai	toward the ocean
makani	wind
mana	divine power
mauka	toward the mountains

mauna	mountain
mele	songs or poetry or chants
mōhihi	a type of sweet potato
Mōʻī	king, sovereign, monarch, majesty, ruler, queen
moku	a social-ecological region, or "district" subdivided into ahupuaʻa and other land divisions
moʻo	has several meanings rooted in the concept of linear things, such as lizards or serpents including water spirits and dragons, but also lines of succession and genealogies, narrow strips of land, narrow fragments of things, narrow paths, or ridges on mountains
moʻolelo	historical stories
nā	article before a noun making it plural, as in "the rains" for nā ua
ʻōhiʻa	a native tree *Metrosideros polymorpha*
ʻokina	consonant in the Hawaiian language pronounced as a glottal stop between valves
ʻolelo	language, talk, speech
ʻōlelo noʻeau	a proverbial saying
pāʻaoʻao	latent childhood disease, with physical weakening; a general term for ailment
paeʻāina	archipelago
palai	a native fern (*Microlepia setosa*)
paopao	scooped out
pauku	section, link, piece; stanza
pō	eternal darkness , the primordial time before light
puʻuhonua	places of refuge
pūʻao pehu	swollen womb
pūhō ʻaʻai	abscess, burst sore, ulcer, that is spreading, festering, increasing, as a sore; ulcerous, cancerous, malignant
puna wai	freshwater springs
puʻu	cinder cone
ua	rain
ʻulaʻula	red
uluhe	a native fern *Dicranopteris linearis*
waʻa kaulua	double-hulled canoes
Wahi kūpuna	a physical site, area, or landscape that is significant to Kānaka ʻŌiwi, past and present
Wahi pana	storied/legendary place
wai	fresh water
waiwai	wealth
wao	general term for inland region usually forested but not precipitous and often uninhabited

1 Introduction

At the request of Okahara and Associates, on behalf of the Hawai‘i County Office of Housing and Community Development (“the Agency”), Stantec GS Inc. (“Stantec”) conducted a Cultural Impact Assessment (CIA) for a proposed workforce housing development (“the Project”) within an approximately 72 acre area (“the Project Area”) located in the two ahupua‘a of Punahoa 2nd and Pi‘ihonua, South Hilo District, Island of Hawai‘i (Figure 1). The Project Area includes Tax Map Key (TMK) (3) 2-3-030:004, which is owned by Hawai‘i County, and a proposed road corridor easement that extends from Waianuenue Avenue across two State-owned parcels (TMKs: (3) 2-3-030:001 and 2-3-031:001) onto the County-owned parcel (Figure 2). The Agency proposes to develop a portion of the Project Area for a workforce housing project, and to construct a new road in the proposed road corridor. The proposed project would consist of infrastructure development of single-family and multi-family housing with phased construction to accommodate timing of funding and housing demand. Phase 1 (pictured at right in Figure 3) would include construction of up to 82 townhomes and 28 flats (110 residential units) in about the middle third of the Project Area mauka of Kupapa‘u Hill. Phase 2 (pictured at left in Figure 3) would include up to 34 single-family units. The total number of units would be up to 144 at final build-out.

The current CIA was undertaken to provide information to facilitate the Chapter 343, Hawai‘i Revised Statutes (HRS) review of the Project in accordance with Hawai‘i Administrative Rules (HAR) Chapter 11-200.1 It is also intended to provide information that can be used by the County in its fulfilment of its Article XII Section 7 obligations to protect all rights, customarily and traditionally exercised for subsistence, cultural, and religious purposes and possessed by ahupua‘a tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778, subject to the right of the State to regulate such rights.

Throughout this report, ‘ōlelo Hawaii (Hawaiian language) words and passages are included in the mostly English text. Because Hawaiian is both the native language of the pae‘āina (archipelago) of Hawai‘i and an official language of the State of Hawai‘i, these passages are not distinguished from English by italics unless they are a direct quotation from an author who did. Spellings of Hawaiian words in the report text use kahakō and ‘okina following spellings in the *Hawaiian Dictionary* (Pukui and Elbert 1986) and the place name database compiled by the Hawai‘i Board on Geographic Names (Office of Planning and Sustainable Development 2025). Words in languages other than Hawaiian or English are italicized to distinguish them from these two languages.

Regarding the place name “Ainako,” the research conducted for this study indicates that the name originated in 1946 when the Hilo Sugar Company subdivided sugarcane fields in Punahoa 2 located to the south and west of the Project Area, creating Ainako Street and the five side streets in the neighborhood. The subdivision was named “Ainako” after the “cane land” (the modern spelling would be ’āina kō) that the company was converting to residential use (Hawaii Tribune-Herald 1946; Towill 1947). No earlier examples of this place name were found during the research, and this is discussed in more detail in Section 6.2. For this reason, the place name is spelled “Ainako” throughout this report except in quotations that spell it otherwise.

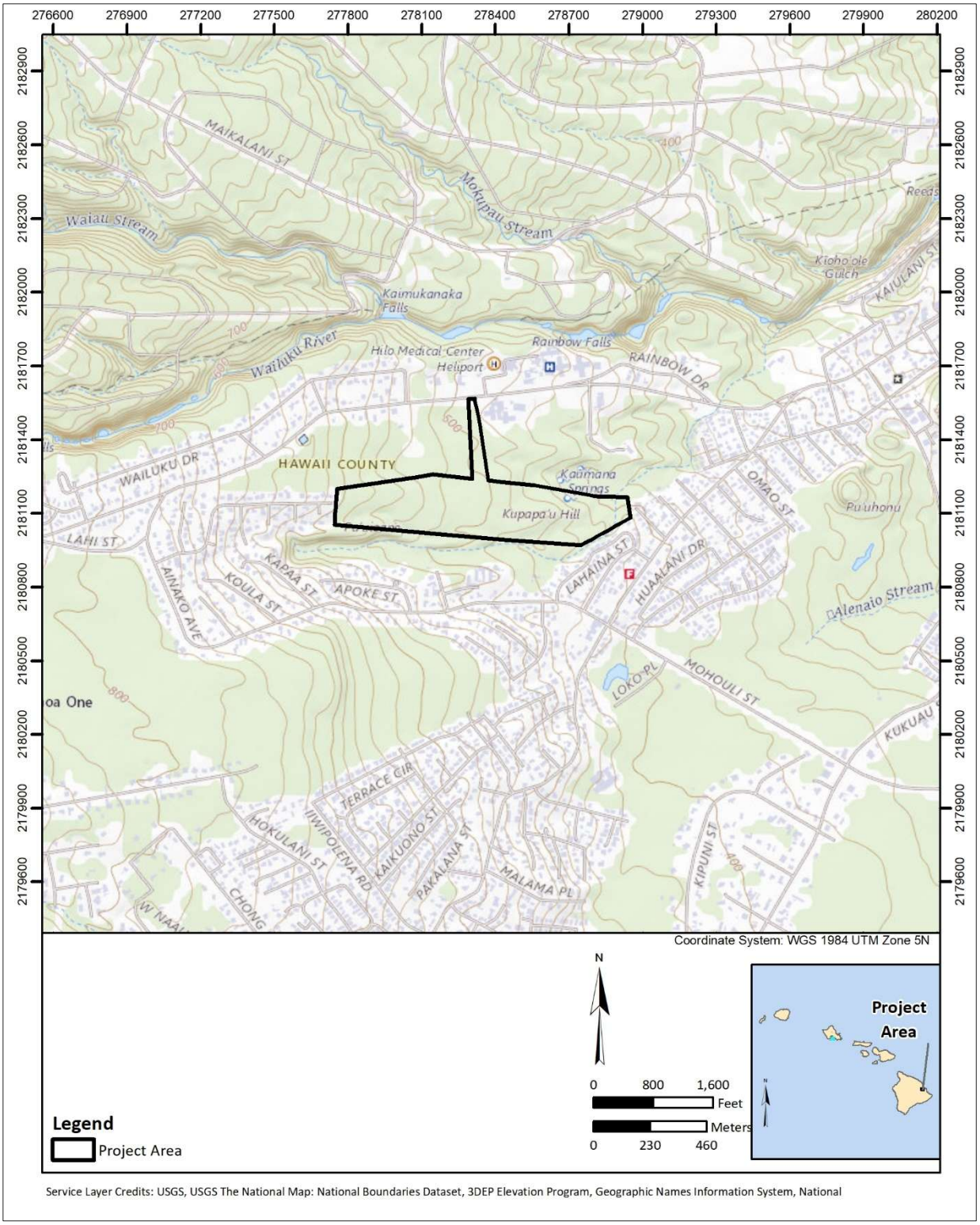


Figure 1. Project Area Location

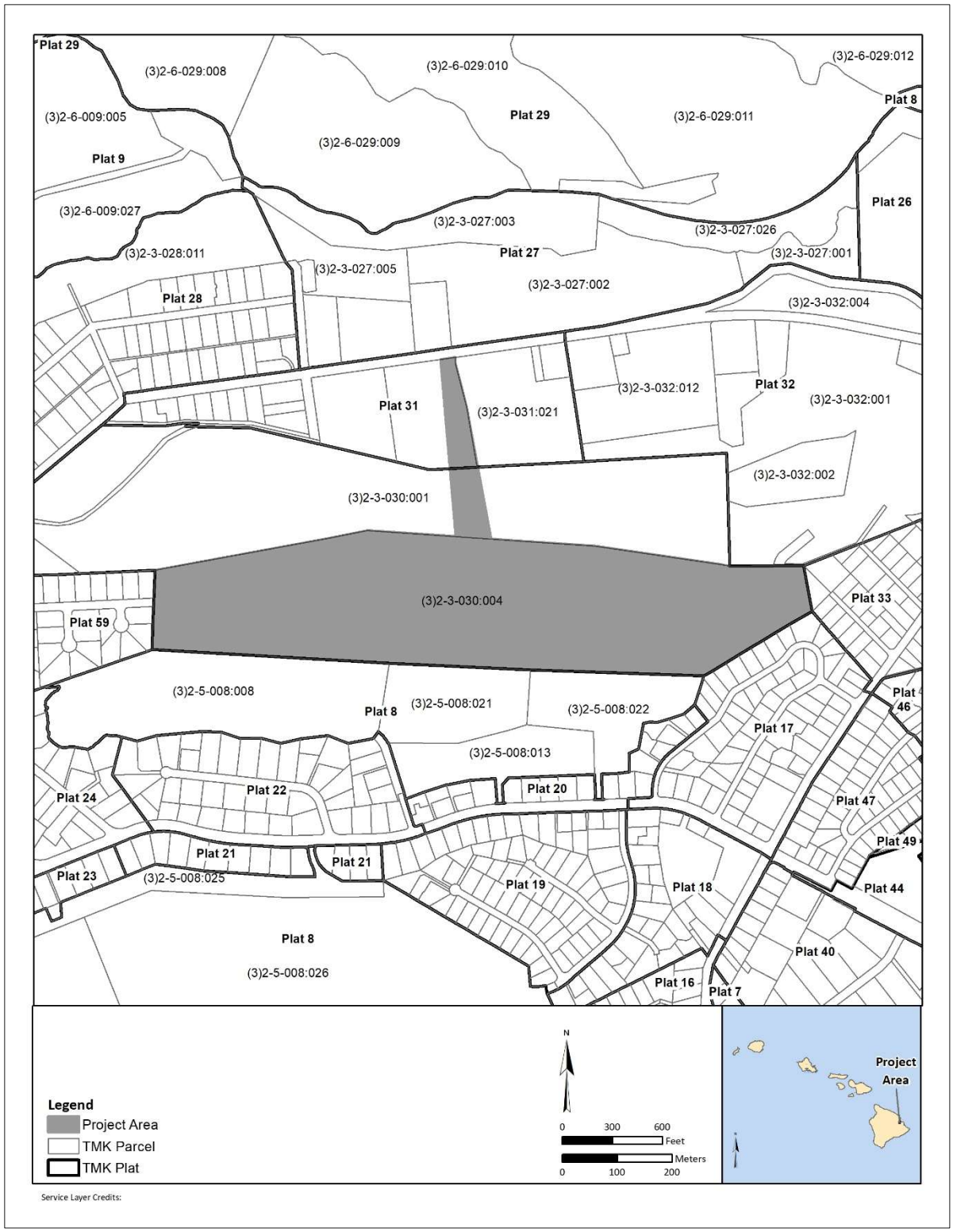


Figure 2. Tax Map Key

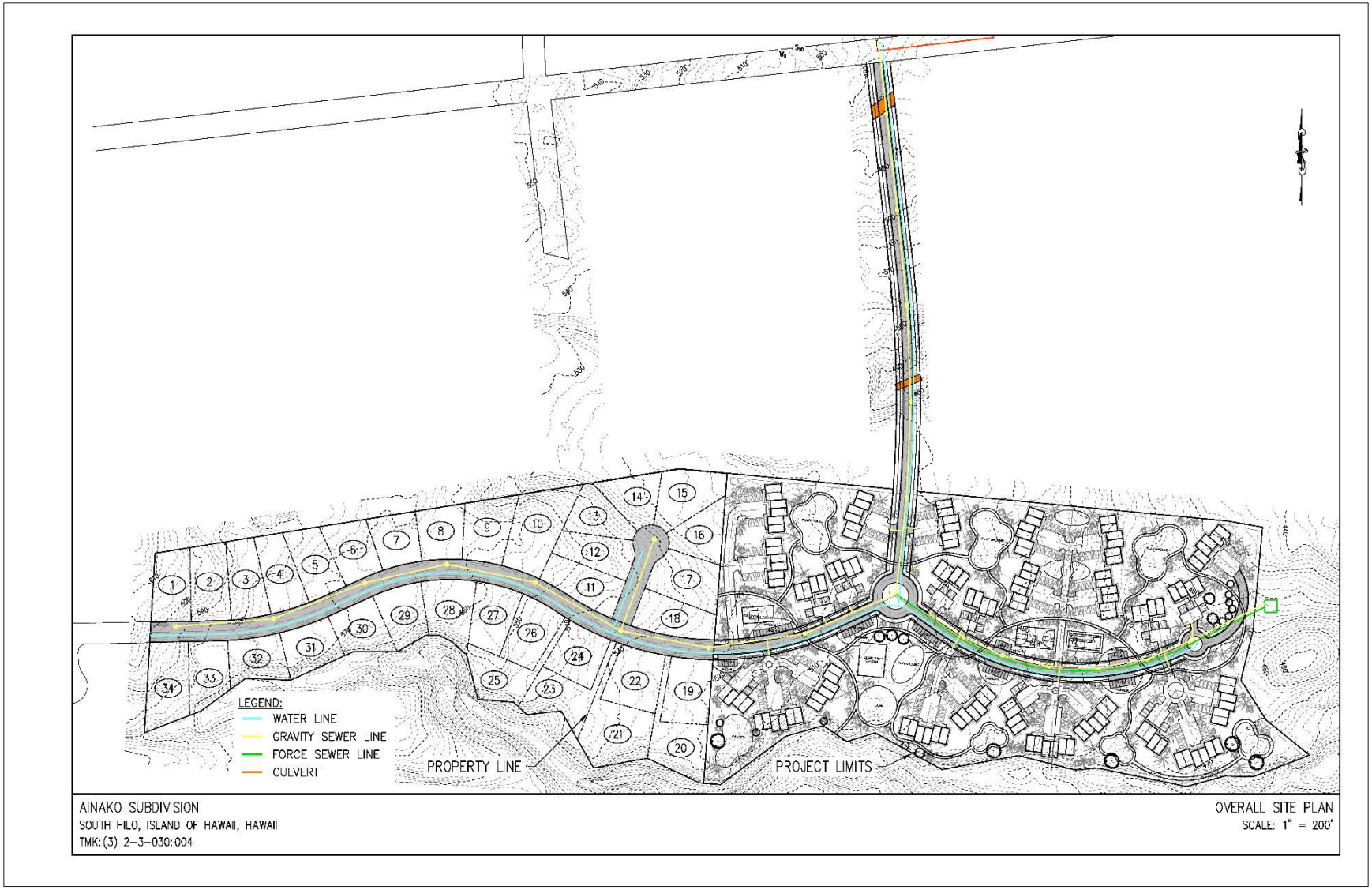


Figure 3. Conceptual Project Design

2 Regulatory Background

HRS 343 and HAR 11-200.1 require an environmental review of a proposed action to include consideration of effects on the cultural practices of the community and State. The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs.

This CIA is also intended to provide information for the County of Hawai‘i Agencies to use to meet its responsibility for protecting traditional and customary Native Hawaiian rights. In *Ka Pa‘akai O Ka ‘Aina v. Land Use Commission*, the Hawai‘i Supreme Court articulated an analytical framework to assist state agencies in balancing the State’s obligation to protect traditional and customary practices against private property (as well as competing public) interests, by requiring specific findings and conclusions about:

- the identity and scope of “valued cultural, historical, or natural resources” in the relevant area, including the extent to which traditional and customary native Hawaiian rights are exercised in the relevant area;
- the extent to which those resources—including traditional and customary native Hawaiian rights—will be affected or impaired by the proposed action; and
- the feasible action, if any, to be taken by the [agency] to reasonably protect native Hawaiian rights if they are found to exist.

Resources and practice outside the area at issue (including both the immediate vicinity as well as other areas), must also be identified and considered. Sections 11, 12, and 13 present information to be used by the County in their analysis.

3 Proposed Action

The Project would consist of infrastructure development of single-family and multi-family housing with phased construction to accommodate timing of funding and housing demand. Phase 1 would include construction of up to 82 townhomes and 28 flats (110 residential units), and Phase 2 would include up to 34 single-family units. The total number of units would be up to 144 at final build-out.

A conceptual plan of the layout of the buildings is illustrated in Figure 3. The layout optimizes the ability to develop the property, factoring in topography, hydrology, access, archaeological sites, existing vegetation, and other considerations. The Project would construct the infrastructure necessary for the development of up to 144 units in the price range from approximately $363,100 to $635,500. The target population for the Project is Hilo's work-force population (typically teachers, nurses, fire and/or police department employees or staff, and county employees), professional services (scientists, engineers, health care, and information technology employees), and skilled trades personnel (construction, utilities, and manufacturing employees).

3.1 Phase 1: Townhomes and Flats

3.1.1 PHASE 1 HOUSING UNITS

As shown in the conceptual layout, Phase 1 would include construction of up to 110 units and associated infrastructure would occur in clusters of flats and two-story townhouses on approximately 18.82 acres on TMK: (3) 2-3-030:004. Although the numbers may be adjusted during final design and permitting, this study analyzes the maximum building height of 82 townhomes and 28 single-story flats in this area. It is anticipated that the entire area would be graded at once including installation of buried lateral utility connections.

Townhomes could be constructed with 2- or 3-bedroom options and the flats would be constructed with 2 bedrooms, for an expected occupancy of 164 to 246 residents in Phase 1. The multi-family townhouses and flats would likely be lightweight wood-framed construction. The subdivision would be organized in clusters of townhomes and flats, with covered parking available at each cluster and on-street parking available for guests.

Common areas in the subdivision would include a community center, playgrounds, a volleyball court, a tennis court, gardens, and open lawn areas. Phase 1 would likely be developed by a developer in a housing agreement with the Agency for sale or rent. The developer would be required to provide management for rentals and property maintenance.

3.1.2 PHASE 1 ACCESS AND INFRASTRUCTURE

Access to the multi-family units will be primarily from a new road to be constructed during Phase 1 across state land (TMKs: (3) 2-3-030:001 and 2-3-031:001) mauka of the Hale ʻĀnuenue Restorative Care Center on Waiānuenue Avenue.

Phase 1 infrastructure will include construction of access and interior two-lane roads with wide shoulders for pedestrian and bicycle travel; clearing and grubbing of the site, which is heavily forested with invasive trees; a 10-inch gravity sewer line, a 6-inch force main, a pump station, and other sewer infrastructure; a 6-inch waterline and miscellaneous water infrastructure; drainage improvements including an estimated 14 drywells, drain pipes, and two culverts; a water line; overhead electrical, telephone, and cable lines; and site improvements to include landscape and possible trails throughout.

A traffic circle is currently proposed to provide traffic calming within the development, but other solutions may be considered during final design.

The current cost estimate for Phase 1 infrastructure construction and installation is $8.538 million.

3.2 Phase 2: Single-Family Development

3.2.1 PHASE 2: SINGLE-FAMILY HOMES

Following completion of Phase 1, construction of a maximum of 32 single-family homes on approximately 15 acres would commence. Grading would occur as individual lots are purchased, rather than all at once. Lots would be sized at 15,000 square-feet.

3.2.2 PHASE 2: ACCESS AND INFRASTRUCTURE

Phase 2 infrastructure includes a road connection to Kilikina Street, infrastructure similar to that of Phase 1 totaling $6.648 million, and subdivision into 34 lots for single-family homes.

4 Project Area and Area of Analysis

The Agency proposes to construct the Project on approximately 40 acres of a 60.59-acre County-owned, residentially zoned property in Hilo on TMK: (3) 2-3-030:004 (see Figure 1). The Project would include construction within a road access corridor easement from Waiānuenue Avenue to the property, over two State properties (TMKs (3) 2-3-030:001 and 2-3-031:001), as well as an extension of an existing road (Kilikina Street), to include two points of access. The Project Area is located approximately 2 miles west of downtown Hilo on Hawai‘i Island on the south side of Waiānuenue Avenue near Hilo Medical Center. The Project Area consists of the entire development TMK parcel and the road access corridor easement. The area of analysis for the current CIA focuses on the Project Area but also extends beyond it to include the Ahupua‘a of Punahoa 2 and portions of South Hilo between the Wailuku and the Wailoa Rivers (Figure 4). This larger area allows for cultural resources and practices within the Project Area to be understood in the context of the larger cultural landscape that surrounds it.

4.1 Physical Environment

The Project Area is located on the lower flank of Mauna Loa (Sherrod et al. 2021) at elevations ranging between approximately 400 and 700 feet above sea level, approximately 2.0 miles from the coast at Hilo

Bay. The Project Area is located within the Ainako Stream drainage basin, and multiple springs are present, especially at its northeastern end. Tributaries of ʻĀiinakō Stream flank the main portion of the project area on its north and south sides, and there are several swales within the project area that can contain standing or flowing water.

4.1.1 GEOGRAPHY AND SOILS

The terrain in the Project Area slopes gently to moderately toward the east, rising slightly as it approaches Puʻu Kupapaʻu, a cinder cone located on the eastern portion of the Project Area. The moderate eastward slope is occasionally broken by steep declines and fault scarps, and also by several areas of relatively low slope where soil and water accumulate. The project area soils are classified as Panaewa very cobbly hydrous loam, 2 to 10 percent slopes and Hilo hydrous silty clay loam, 0–10 percent slopes (Soil Survey Staff 2023). These weathered soils derived from regional Pahala Ash deposits where they were deep enough were often used for sugar cane agriculture in the late nineteenth and early twentieth centuries. Soil deposits in the Project Area, however, are patchy and found within swales and basins in the rolling and faulted exposed pāhoehoe ground surface. At this elevation, the climate is mild and moist, with weather patterns dependent on the presence or absence of trade winds. Generally, the trades are relatively light from the east-northeast and shift to downslope at night. Average annual rainfall in the project area is about 160 to 170 inches (Giambelluca et al. 2013).

4.1.2 VEGETATION

The project area is currently heavily forested (Figure 5), with a few clearings (Figure 6) and a small area of pasture in the north through which the proposed road corridor extends (Figure 7) (Terry and Hart 2024). Prominent tree species in the upper canopy are mainly introduced and include very tall albizia trees (*Falcataria moluccana*), autograph tree (*Clusia rosea*), African tulip (*Spathodea campanulata*), and large stands of Alexandra palm (*Archontophoenix alexandrae*), with some kukui (*Aleurites moluccana*) and Chinese banyan (*Ficus microcarpa*). The understory is composed of seedlings of the trees listed above, especially Alexandra palm, along with thickets of strawberry guava (*Psidium cattleianum*), palmgrass (*Setaria palmifolia*), Australian tree fern (*Sphaeropteris cooperi*), warabi fern (*Diplazium esculentum*), shoebutton ardisia (*Ardisia elliptica*), and hares foot fern (*Phlebodium aureum*). Herbs and grasses are uncommon except near the steeper stream banks, in limited clearings, and at the mauka margin of the property with Kilikina Street, where a wide variety of weedy species are present. Ainako Stream cuts through the makai tip of the property, leaving an isolated remnant that is adjacent to the backyards of homes on Ekaha Street and Lahaina Street. Only two plants identified were native: the indigenous (native to the Hawaiian Islands and elsewhere) and very widespread sedges *Cyperus polystachyos* and *Scleria testacea*.

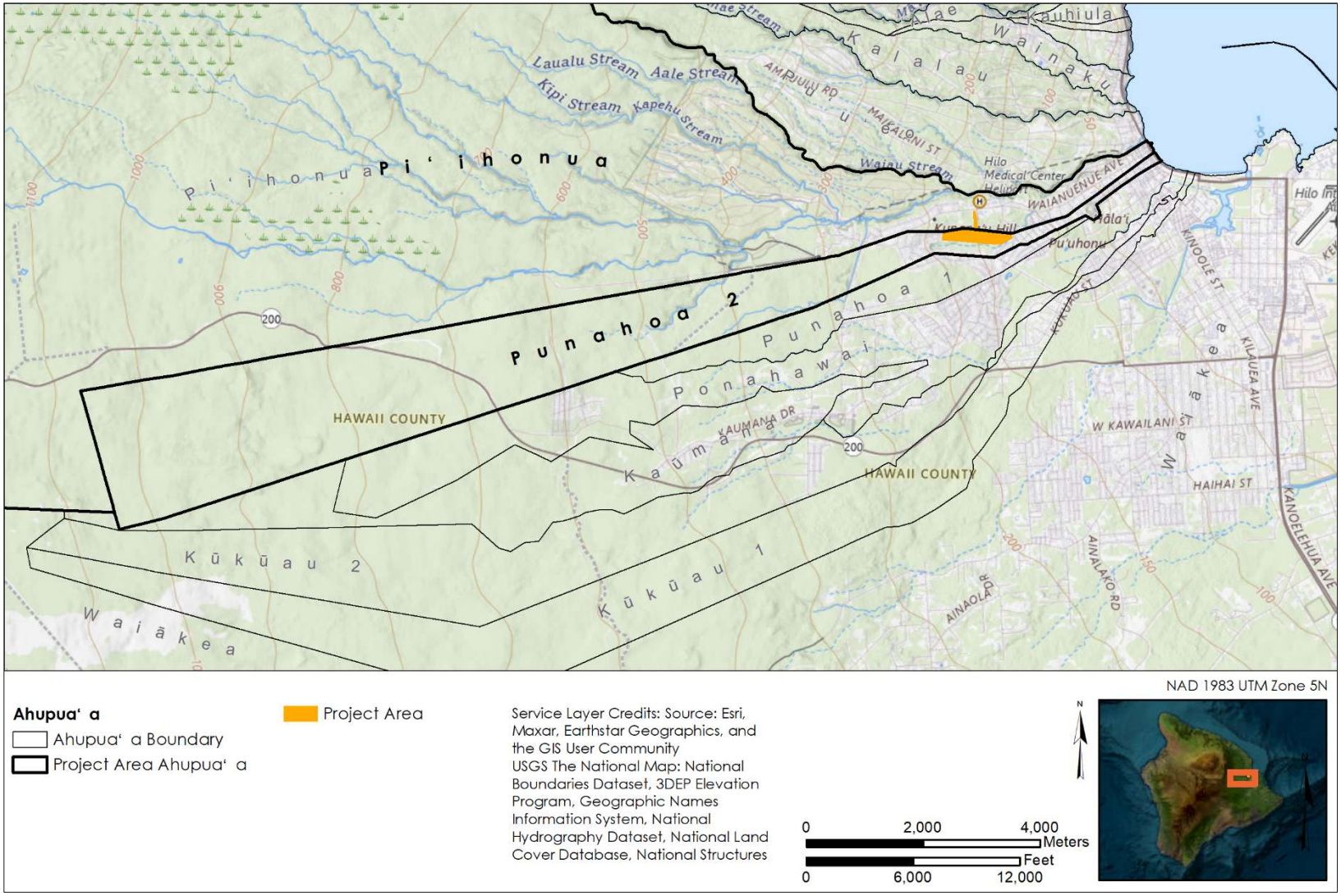


Figure 4. Ahupua'a Boundaries

Figure 5. Typical dense forest and pāhoehoe outcrops in the Project Area

Figure 6. Project area overview typical open ground under albiza and guava canopy

Figure 7. Project area overview photo in the road corridor

No endemic (found only in the Hawaiian Islands) plants were seen. No rare or unusual native plant species are present. Several common Polynesian introductions were also present in small numbers: kukui (candlenut, *Aleurites moluccana*), kī (*Cordyline fruticosa*), kalo (taro, *Colocasia esculenta*), ʻape (*Alocasia macrorrhizos*), and maiʻa (banana, *Musa* sp.).

Within the proposed road corridor extending from Waiānueue Avenue, the first 400 feet has been modified heavily by grazing and other land clearing. The final 300 feet is heavily wooded with non-native trees including *Eucalyptus* sp., strawberry guava, deviltree (*Alstonia macrophylla*), and mules foot fern (*Angiopteris evecta*). Only two native plant species were identified in the project area (Terry and Hart 2024), the indigenous (native to the Hawaiian Islands and elsewhere) and very widespread sedges *Cyperus polystachyos* and *Scleria testacea*. No endemic (found only in the Hawaiian Islands) plants were seen. Several common Polynesian introductions were also present in small numbers, namely kukui, kī, kalo, ʻape, and maiʻa.

Evidence of prior ground disturbance is relatively limited. In addition to the grazing and land clearing in the proposed road corridor, the relatively flat terrain adjacent to the backyards of homes on Ekaha and Lahaina Street indicates past clearing.

4.1.3 SURFACE WATERS

The Project Area is approximately 2,000 feet south of Wailuku Stream (commonly known as the Wailuku River), the major drainage of this part of Hilo. The Wailuku River is the longest and largest surface water feature in the state with a length of 28 miles (National Park Service 2021). The property is within the drainage basin of Wailuku Stream. The slopes of Hilo in the 400 to 800 foot elevation exhibit a number of springs that emerge from abundant near surface groundwater derived from precipitation in the forests above, which are situated on highly permeable recent lava flows. Ainako Stream and three tributaries flow through the Project area Figure 8. Ainako Stream originates from springs located just west of the Project and then flows near the Project Areas southern margin before cutting through the eastern tip of the Project Area at low elevations. Flow from springs within the eastern end of the Project Area and the lands just to the north join Ainako Stream before it connects with Wailuku Stream at an elevation of about 200 feet above sea level. Marshy wetlands flank the springs found north of the Project Area. No ponds, lakes, or other water features are present in or near the Project Area. A second stream, Kaūmana Springs Stream, originates at a now developed spring located at base of the north side of Kupapau Hill.

Figure 8. Streams in the Project Area (Burr 2022, 10)

5 Research Methods

Preparation of this CIA involved archival research and interviews with knowledgeable community members, following guidance presented in the State of Hawai‘i, Office of Planning and Sustainable Development’s *Guidelines For Assessing Cultural Impacts* adopted in 1997. The general steps recommended for conducting a CIA include:

A. Identify and consult with individuals and organizations with expertise concerning the types of cultural resources, practices and beliefs found within the broad geographical area, e.g., district or ahupua‘a;

B. Identify and consult with individuals and organizations with knowledge of the area potentially affected by the proposed action;

C. Receive information from or conduct ethnographic interviews and oral histories with persons having knowledge of the potentially affected area;

D. Conduct ethnographic, historical, anthropological, sociological, and other culturally related documentary research;

E. Identify and describe the cultural resources, practices, and beliefs located within the potentially affected area; and

F. Assess the impact of the proposed action, alternatives to the proposed action, and mitigation measures, on the cultural resources, practices, and beliefs identified.

The research process began by reviewing archival sources to identify an appropriate study area and potential cultural resources and practices, as well as individuals and organizations who may have expertise concerning the types of cultural resources, practices, and beliefs found within the broad geographical area. Results of biological and archaeological surveys conducted for the proposed project were also reviewed. Following this background research, a list of potential interviewees was created and contacted with an invitation to consult. Interviews were conducted with everyone who requested to talk.

5.1 Archival Sources

Archival sources were sought from various physical and digital repositories. Primary English language and Hawaiian language resources were found at state agencies including the State Historic Preservation Division, Hawai‘i State Archives, and the Department of Accounting and General Services Land Survey Division. Records were also sought from the County of Hawai‘i Planning Department, the Lyman Museum and Mission House in Hilo, the Plantation Museum Archives (John Cross), the Hawai‘i Conference/United Church of Christ, and the Hawaiian Mission Houses Historic Site and Archives. Digital collections provided through the Office of Hawaiian Affairs (OHA) Papakilo (www.papakilodatabase.com) and Kīpuka (www.kipukadatabase.com) databases, the Ulukau Hawaiian Electronic Library (www.ulukau.org), Newspapers.com (www.newspapers.com), and the Library of Congress *Chronicling America* database

(https://www.loc.gov/collections/chronicling-america/). Secondary resources in Stantec's library were consulted for general information regarding the history of land use, politics, and culture change in Hawai'i. Additional information was obtained during interviews conducted for this CIA.

5.2 Interviews

5.2.1 SELECTION

Initial outreach to identify interview participants included contacting known Native Hawaiian organizations and individuals and organizations that had been invited to participate in recently completed CIAs for other projects located near the current project area. These individuals were identified as persons who were long-time residents of the area and were believed to have knowledge of past land use, history, or cultural information. Each of the persons contacted was provided with a consultation packet that contained maps of the project area, a description of the proposed project, and the proposed plans. Interview participants were asked for recommendations for other people who might have knowledge of the Project Area.

5.2.2 METHODS

All interviews were conducted in an informal "talk-story" style. Interview participants were given a consultation packet containing topics to discuss, maps, and photographs. During the interviews, the topics were discussed in an open-ended way. The conversation was allowed to follow the participants' train of thought and brought back to the pre-determined topics as the rhythm of the conversation allowed. Visual aids were used to orient the conversation, and these included historic maps, photographs, and interactive media available on a laptop computer.

5.3 Analysis

Cultural practices and beliefs (including important natural, cultural, and historic resources and practices associated with them) were identified based on the following criteria:

1. Direct testimony of resources and practices. For example, a consulted individual or organization names a culturally important resource or practice and states that it occurs or occurred within the Project Area. This kind of testimony is considered confirmation of the presence of cultural resources or practices within the Project Area.

2. Observation of resources in the Project Area that are known from other sources to have cultural value. For example, during the biological survey, a plant used in traditional lā'au lapa'au (traditional Hawaiian healing using plants) is observed in the Project Area. This is considered to be confirmation of a cultural resource in the Project Area, but not necessarily any practices associated with that resource.

3. Reference to known cultural resources or practices in archival sources. For example, in a ka'ao or mo'olelo, the Project Area is visited by a kupua (person of extraordinary powers of mind of body, "demigod"). This would be considered an example of a traditional cultural belief associated with the Project Area.

For ease of discussion, the results of the current study are presented in five sections below. Section 0 presents the results of archival research and includes a broad range of topics as found during the literature review. Section 7 presents summaries of the consultation and includes the range of topics discussed by each consultation participant. Section 8 presents a summary of the archaeological survey. Section 9 presents information about potential ethnobotanical resources. Section 10 presents information about animal resources observed during the biological survey.

Impacts to identified cultural resources and practices were determined by physically altering cultural resources, practices, or beliefs; by isolating cultural resources, practices, or beliefs from their setting; and by introducing elements which may alter the setting in which cultural practices take place. During consultation, these kinds of potential effects from building the proposed housing development were discussed with interviewees.

6 Results of Archival Research

This background section develops a context for identifying and evaluating potentially significant historic properties within the project area. It presents a culture-historical context and summary of previously conducted archaeological research.

The Project Area is located in the ahupuaʻa of Punahoa 2nd within the district of South Hilo. The current judicial district of South Hilo was created in 1909 (State of Hawaii 1909, 109), the most recent subdividing of the traditional moku of Hilo into smaller land units. While the current division of Hilo splits it between north and south, older poetic descriptions of Hilo in ʻolelo Hawaiʻi refer to three traditional divisions: Hilo Palikū, Hilo One, and Hilo Hanakahi (Edith Kanakaʻole Foundation 2012). Hilo Palikū extends from the Wailuku River north to Kaʻula Gulch and is named for its upright cliffs (pali kū) that line the coast. Hilo One includes the sandy area of Hilo bay between the Wailuku and Wailoa rivers. Hilo Hanakahi extends south and inland from the Wailoa toward Keaukaha. The project area is located mauka of Hilo One, which was the most populated portion of the moku. Handy et al. (2020, 538) note that:

> *The population of Hilo was anciently as now concentrated mostly around and out from Hilo Bay, which is still the island's principal port. The Hilo Bay region is one of lush tropical verdure and beauty, owing to the prevalence of nightly showers and moist warmth which prevail under the northeasterly trade winds into which it faces.*

The area between the Wailuku and the Wailoa is divided, from north to south, into the seven ahupuaʻa of Piʻihonua, Punahoa 2, Punahoa 1, Ponahawai, Kukuau 2, Kukuau 1, and Waiākea. Punahoa 2 begins at the sea where it includes nearshore fishing grounds and comes ashore between present-day Kalākaua Street and Hāili Street. From there it climbs toward the three Hālaʻi Hills at about 300 feet elevation. Today it includes all three hills, but before the 19th century shared Halai with Punahoa 1. The ahupuaʻa continues mauka into the forest, gradually spreading out to nearly a mile and a half wide at an elevation of about 3,400 feet above sea level. Here, Punahoa 2 is "cut off" by the ahupuaʻa of Piʻihonua, the neighboring ahupuaʻa to the north. To the south, Punahoa 1 has also climbed beside it, originally taking in a portion of Hālaʻi Hill (which was later given to Punahoa 2) and becoming cut off by Ponahawai around 1,700 feet elevation or just below Kaumana City.

This area of Hilo served as one of Hawaiʻi Island's royal seats with chiefly residences that lasted up through the time of Princess Ruth Keʻelikōlani in the 1870s (Brandt 2017; Cordy 2000; Kelly et al. 1981; Maly 2003). Coastal settlement Kamakau (1992) writes of the Hilo chief Keawe-hano, whose houses in the year 1773 were "situated on the beach at Punahoa, close to Piihonua and facing the waves of Huia and Kihanui."

6.1 A Brief Cultural Context

Hawaiian scholars and scholars working in Hawaiʻi, both past and present, have argued for a pluralistic outlook on ancestral Hawaiian origins from Kahiki (Case 2015; Fornander 1916a; Kamakau 1866; Kikiloi 2010; Nakaa 1893; Poepoe 1906; Kapuni-Reynolds and Brandt 2023). In the fields of archaeology, folklore, Hawaiian studies, and linguistics, researchers have argued that Polynesians arrived in the

Hawaiian Islands sometime between Anno Domini (A.D.) 1000 and A.D. 1200 (Kirch 2011; Wilmshurst et al. 2011; Rieth et al. 2011; Athens et al. 2014). This initial migration on intricately crafted waʻa kaulua (double-hulled canoes) to Hawaiʻi from Kahiki, the ancestral homelands of Hawaiian deities and peoples from southern Pacific islands, occurred at least from initial settlement to the 13th century. Knowledgeable and skilled kūʻauhau (individuals trained in the discipline of remembering genealogies and associated ancestral stories) published accounts of episodic migrations in the Hawaiian language (Kapuni-Reynolds and Brandt 2023). Kānaka ʻŌiwi (Native Hawaiians) brought from their homelands certain Polynesian customs and beliefs: the major gods Kāne, Kū, Lono, and Kanaloa (who have cognates in other Pacific cultures); the kapu system of political and religious governance; and the concepts of puʻuhonua (places of refuge), ʻaumakua (ancestral deity), and mana (divine power) (see, for example, Fornander 1878). They also brought the cultural belief that living organisms were hānau ʻia (born) out of a time of eternal darkness (pō) and chaos (kahuli) and adapted these beliefs to reflect their deep connection to their environment (Kapuni-Reynolds and Brandt 2023). For example, the Kumulipo, Hawaiʻi's most famed koʻihonua (a cosmogonic genealogical chant), establishes a birthrank genealogical order for all living beings (M. W. Beckwith 1951; Liliuokalani 1978). One such genealogical relationship that remains widely accepted in Hawaiʻi is the belief that kalo (taro) plants—as well as other plants, land animals, and sea creatures—are elder siblings to humans (M. W. Beckwith 1951). This concept of hierarchical creation underpins the belief that all life forms are intimately connected, and that in the Hawaiian world view, "natural" and the "cultural" are one and the same.

6.2 Wahi Kūpuna (Places Significant to Kānaka ʻŌiwi)

The ʻāina ("that which feeds," the land), is also genealogically related to Hawaiians in this belief system, and was perhaps most revered (Kapuni-Reynolds and Brandt 2023). An ʻōlelo noʻeau (a proverbial saying) expresses the relationship and importance of the ʻāina:

He aliʻi ka ʻāina; he kauwā ke kanaka
The land is a chief; man is its servant.

Land has no need for man, but man needs the land and works it for a livelihood.
(Pukui 1983, 531)[1]

Wahi kūpuna, much like the term wahi pana (storied/legendary place), refers to a physical site, area, or landscape that is significant to Kānaka ʻŌiwi, past and present (Kaliʻuokapaʻakai Collective 2021, 5). These places are significant for Kānaka ʻŌiwi because of the longstanding relationships and interconnections Native Hawaiians have with these places. The names of places on the ʻāina can often provide information about history and cultural meanings. Within the Project Area, two named places appear on historic maps, and there are several named places makai of the Project Area.

The prominent hill in the eastern end of the Project Area appears on maps from the 20th century as "Kupapau Hill." Although this is the name of the puʻu (cinder cone) used on maps beginning in the 20th century, older maps give it a different name. A map made for the American Board of Commissioners for Foreign Missions (ABCFM) use a different name for this puʻu. The earliest map to include the Project

[1] The citations from this book refer to the numbered ʻōlelo noʻeau instead of the page number.

Area in detail (Figure 9) was made in 1849 from a survey conducted in support of the claim that the ABCFM made before the Board of Commissioners to Quiet Land Titles (more commonly known as the Land Commission) for most of the land in Punahoa 2 (see Section 6.4.1). Although the precision of the map is not very good, it depicts a pu‘u mauka of a kukui tree marked with a “B.” A point on the pu‘u is labeled “Large Rock on Puu Mohihi.” There are sweet potatoes named “mōhihi” that is quick growing but dependent on good rain (Handy et al. 2020, 169). Mōhihi ke‘oke‘o have white or yellowish flesh and a red skin; mōhihi ‘ula‘ula has a reddish or purple flesh (Kagawa-Viviani 2016, 10). This variety has a high sugar content and was the most popular for making ‘uala ‘awa‘awa, a type of fermented drink (Handy et al. 2020, 178). Given the historically abundant rain in the Project Area, mōhihi could be an appropriate crop for the environmental conditions in the Project Area.

The pu‘u is labeled “Moohihi” on a map produced from a survey conducted in 1895 by A. B. Loebenstein (Figure 10). Loebenstein’s map indicates that he used the top of the pu‘u as a triangulation station while making his measurements for the survey. Loebenstein labeled the triangulation station “Moohihi or spring.” It is possible that the double “o” written by Loebenstein is his attempt to show the long “o” sound indicated by the kahakō (macron or bar over the “o”) in “mōhihi.” If, however, Loebenstein was trying to write “mo‘ohihi” pronounced with an ‘okina signifying a glottal stop consonant between two “o” sounds, then the significance of the pu‘u could be something else. “Mo‘o” has several meanings rooted in the concept of linear things, such as lizards or serpents including water spirits and dragons, but also lines of succession and genealogies, narrow strips of land, narrow fragments of things, narrow paths, or ridges on mountains (Pukui and Elbert 1986). The word “hihi” can refer to “entanglement” as in vines or grass, and also webs and snares (Andrews 1865; Pukui and Elbert 1986). The word “hīhī,” which would have been spelled this way before kahakō and ‘okina were adopted, is a reduplication of “hī,” meaning “to hiss.” During consultation for the current study, Punahoa 2 resident Leilehua Yuen (personal communication, 2025) surmised that the place name “Mo‘ohihi” could be related to entangling of genealogies—entangling mo‘o—or the intermarriage of chiefly families.

The earliest documentation of the pu‘u being referred to as “Kupapau” is from survey notes and a map created by Erdmann D. Baldwin (who later founded Baldwin and Alexander). The survey was conducted for water head reservation that was proposed for the Project Area and surrounding land in 1901 (see Section 6.4.2.2). The survey notes (Baldwin 1901b) indicate that Baldwin set a corner of the proposed water head reservation parcel at a “stone marked +, on top of old kupapau known as Kupapau Hill Trig. Sta.” What this statement means is that he set the corner at a known surveyor’s trigonometry station, which today is a steel pipe set in concrete (Figure 11). This appears to be the same station used by Loebenstein 6 years earlier, except in 1901 the Territorial Survey called it “Kupapau Hill.” Hawai‘i Two other places named “Kupapau” are compiled by Soehren (2019), one on Kaua‘i and one in the ahupua‘a of Poupou, Puna, Hawai‘i Island. Two meanings of “Kupapau” are provided by Soehren: as “kupapa‘u” it means “corpse” (Pukui and Elbert 1986, 185) and as “kūpapau” it means “deeply engaged, as in an activity; finished; engrossed, absorbed, united; all, all together” (Pukui and Elbert 1986, 319). Why Baldwin referred to the location of the station as an “old kupapau” is unclear. One possibility may be based on the appearance of the summit of the pu‘u. There are several places in Hawai‘i called “paopao,” meaning “scooped out,” that are sometimes spelled “papau” (for example, Paopao Point on Lāna‘i, see Coulter 1935, 107). The top of the pu‘u in the Project Area appears “scooped out” with two large depressions at its summit (Figure 12), and the trigonometry station is located at the edge of this “scooped

out" area at the location shown on Registered Map 2508 (Figure 13). Every map that includes the project area produced after 1901 uses the name "Kupapau Hill" name for the puʻu. This hill does not appear in *Place Names of Hawaii* (Pukui et al. 1974) or older gazetteers. The Hawaiʻi Board on Geographic Names 2018 list of place names on Hawaiʻi Island uses the spelling "Kupapaʻu" but notes that more research is needed about the name (Office of Planning and Sustainable Development 2025). The United States Geological Survey also uses this name (United States Geological Survey 2025).

Another named puʻu is located near the southwest corner of the Project Area (Figure 14). This puʻu, "Puʻu Ioane" also does not appear *Place Names of Hawaii* (Pukui et al. 1974) or older gazetteers. No references were found to it during the review of archival materials conducted for the Project Area.

Ainako Stream extends near the southern boundary of the Project Area and turns north to cross it below Kupapau Hill. Smaller tributaries of the stream also extend through the Project Area. The stream originates at about the 820-foot elevation about 0.6 mile mauka of the Project Area in roughly a half-mile of boggy scrub forest and grasslands immediately below what is now Akolea Road. The stream and its branches wind through the Ainako Terrace subdivision before reaching the project area. The tributaries of the stream converge toward the northeast corner of the Project Area and then flow toward the Wailuku. The stream appears to be named after the Ainako Subdivision, which was created in 1946 by the Hilo Sugar Company on abandoned sugarcane land south and west of the Project Area. The subdivision which includes Ainako Street and five side streets, and some of the lots were initially set aside for World War II veterans. In the Hilo Sugar Company's announcement of the subdivision's opening, they stated that the new neighborhood was named "Ainako (ai-na-ko') meaning cane land" (Hawaii Tribune-Herald 1946), after the sugarcane fields that were repurposed for housing. Early advertisements for the subdivision featured this translation of the name (Figure 15). The name of the stream is not mentioned by Solomon P. Kaleoholani in the testimony he gave in 1917 regarding the ditches in Piʻihonua, Punahoa, and Ponahawai. No other earlier references to the stream by name could be found. The plat that was drawn for the subdivision (Towill 1947) does not name the stream. The stream is referred to as "Ainako Stream" in a 1958 newspaper article describing plans to create flood controls on the stream to address concerns about flooding the Ainako neighborhood (Hilo Tribune-Herald 1958), but no earlier references to the stream's name could be found.

Other named places that appear in Punahoa 2 in kaʻao (legendary stories) and moʻolelo (historical stories) are shown in Figure 14 and listed in Table 1.

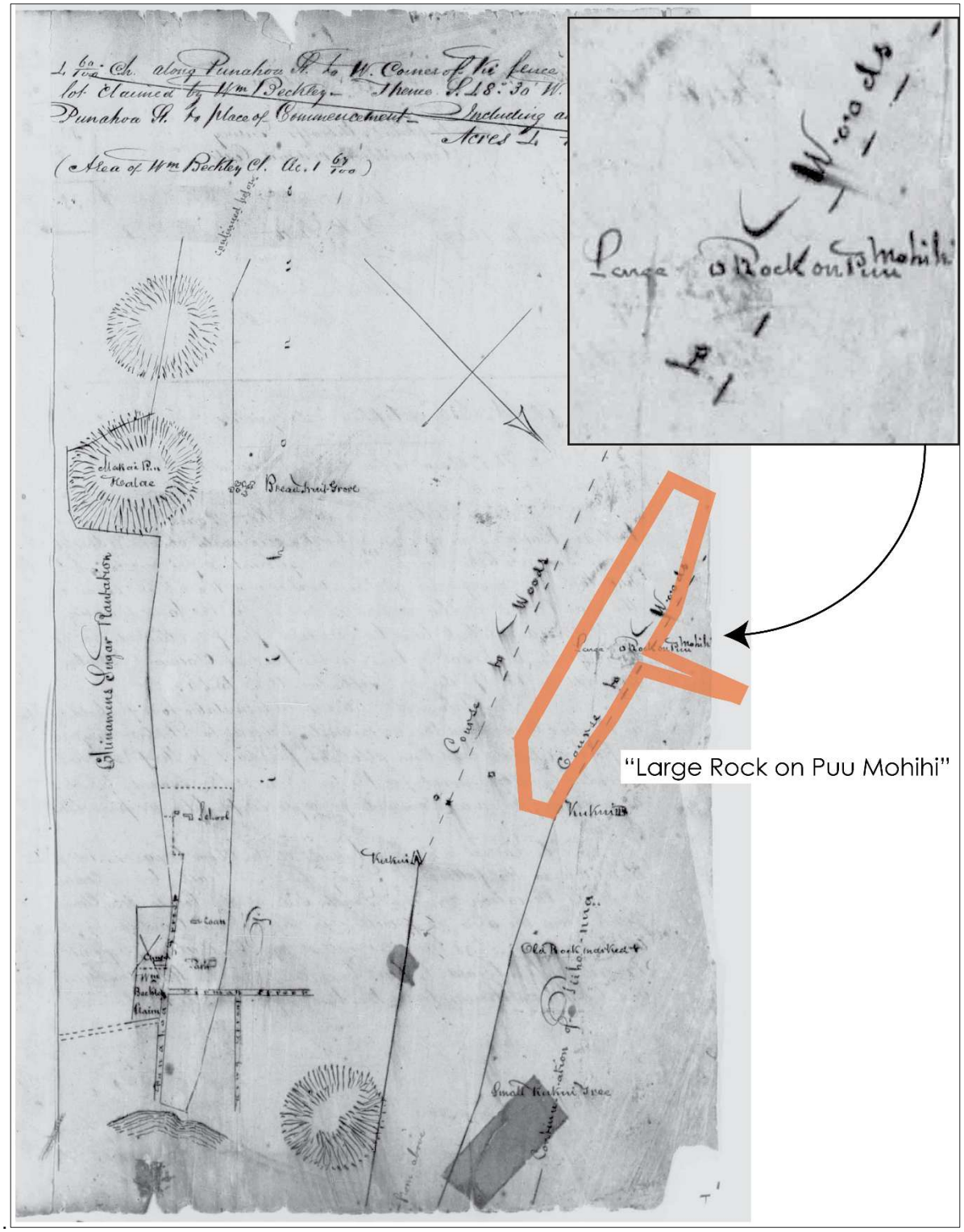


Figure 9. Map submitted in 1849 with Land Commission Award 387, Part 4, ʻĀpana 1 with the approximate location of the Project Area outlined in orange

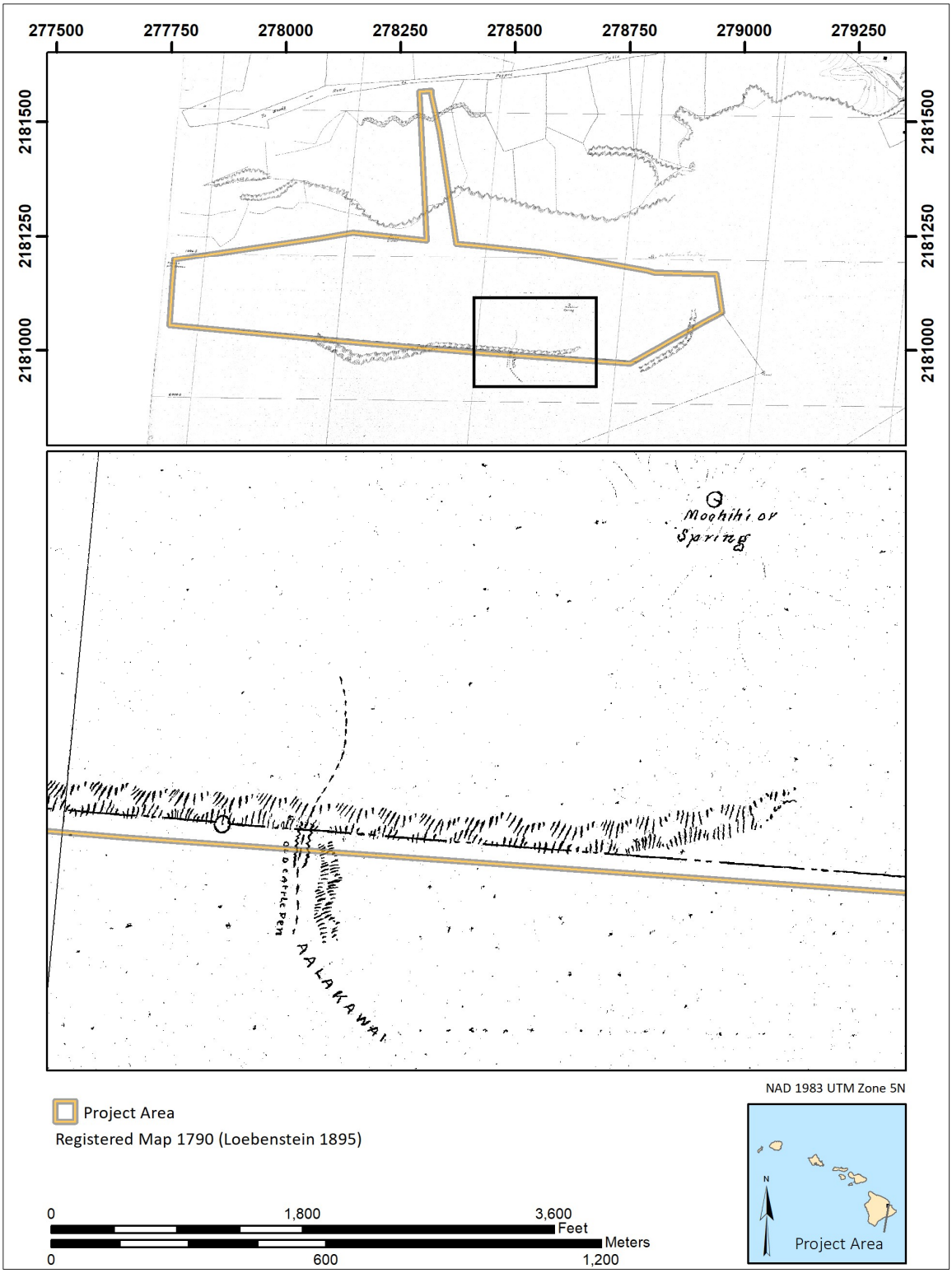


Figure 10. Detail of Registered Map 1790 (Loebenstein 1895) with the place name "Moohihi"

Figure 11. Kupapau Hill Trigonometry Station at the edge of the "scooped out" portion on the summit of the pu'u

Figure 12. "Scooped out" ground on summit of Kupapau Hill, photo scale is 1 meter (39 inches) long

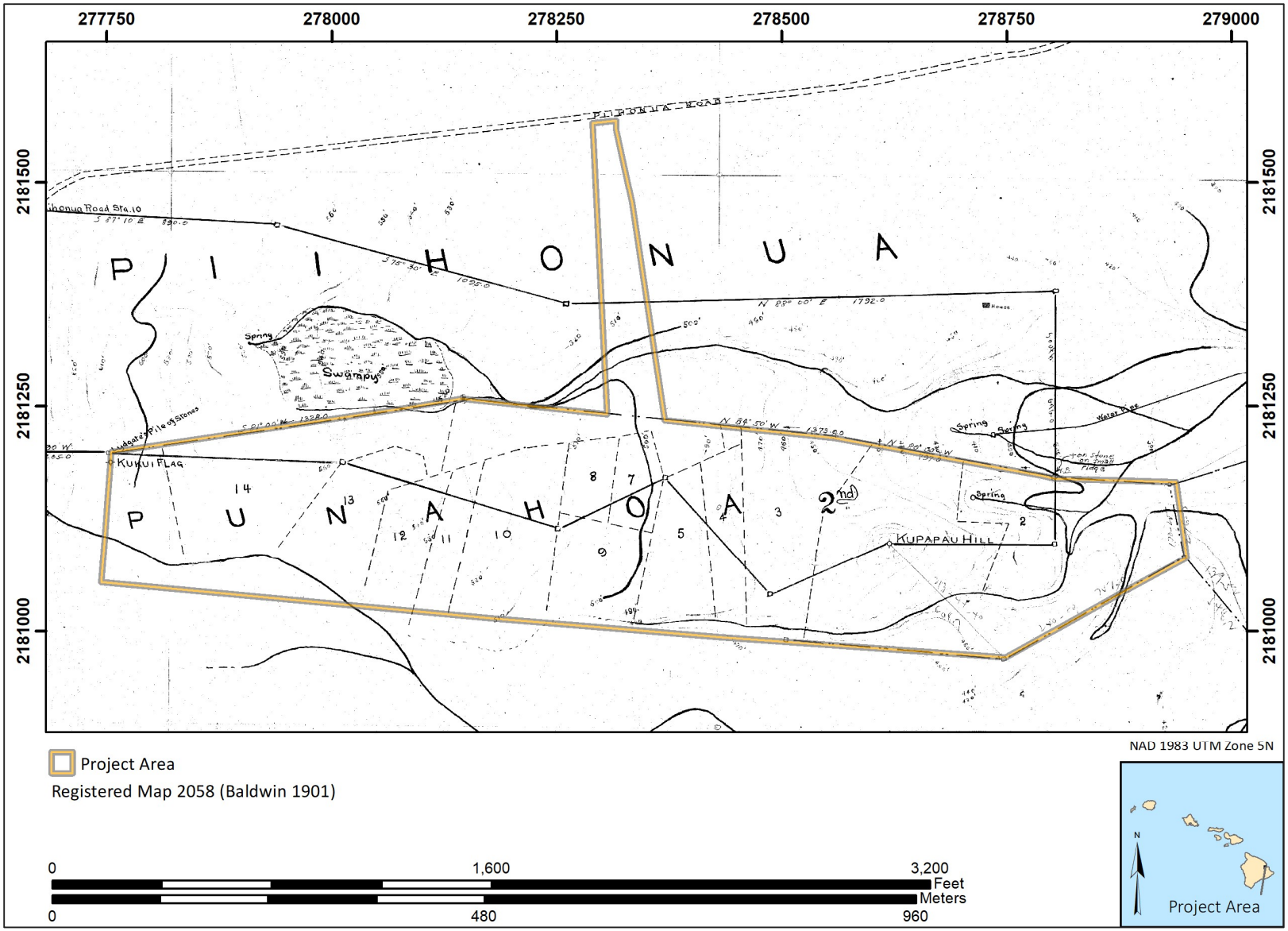


Figure 13. Detail of Registered Map 2058 (Baldwin 1901a)

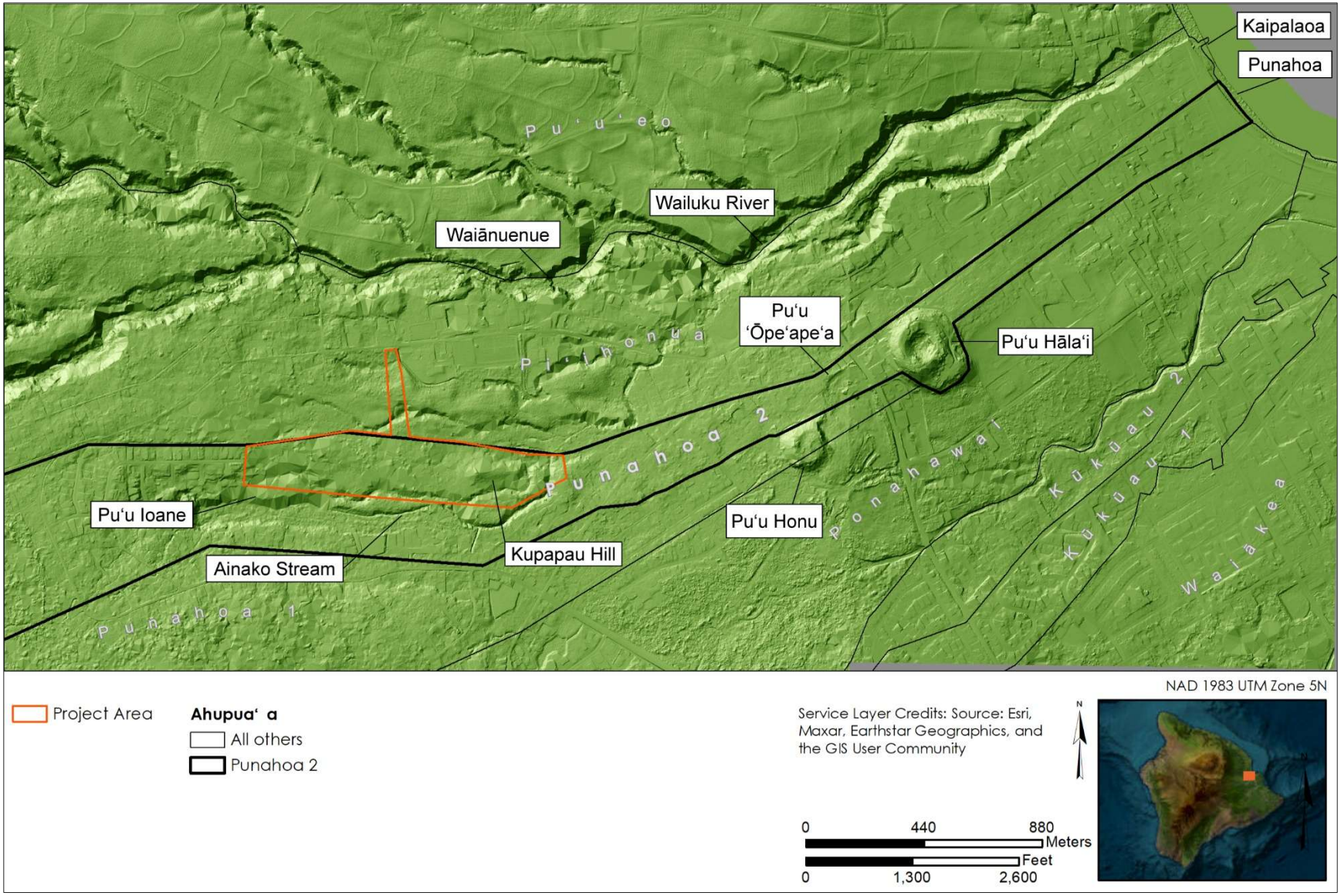
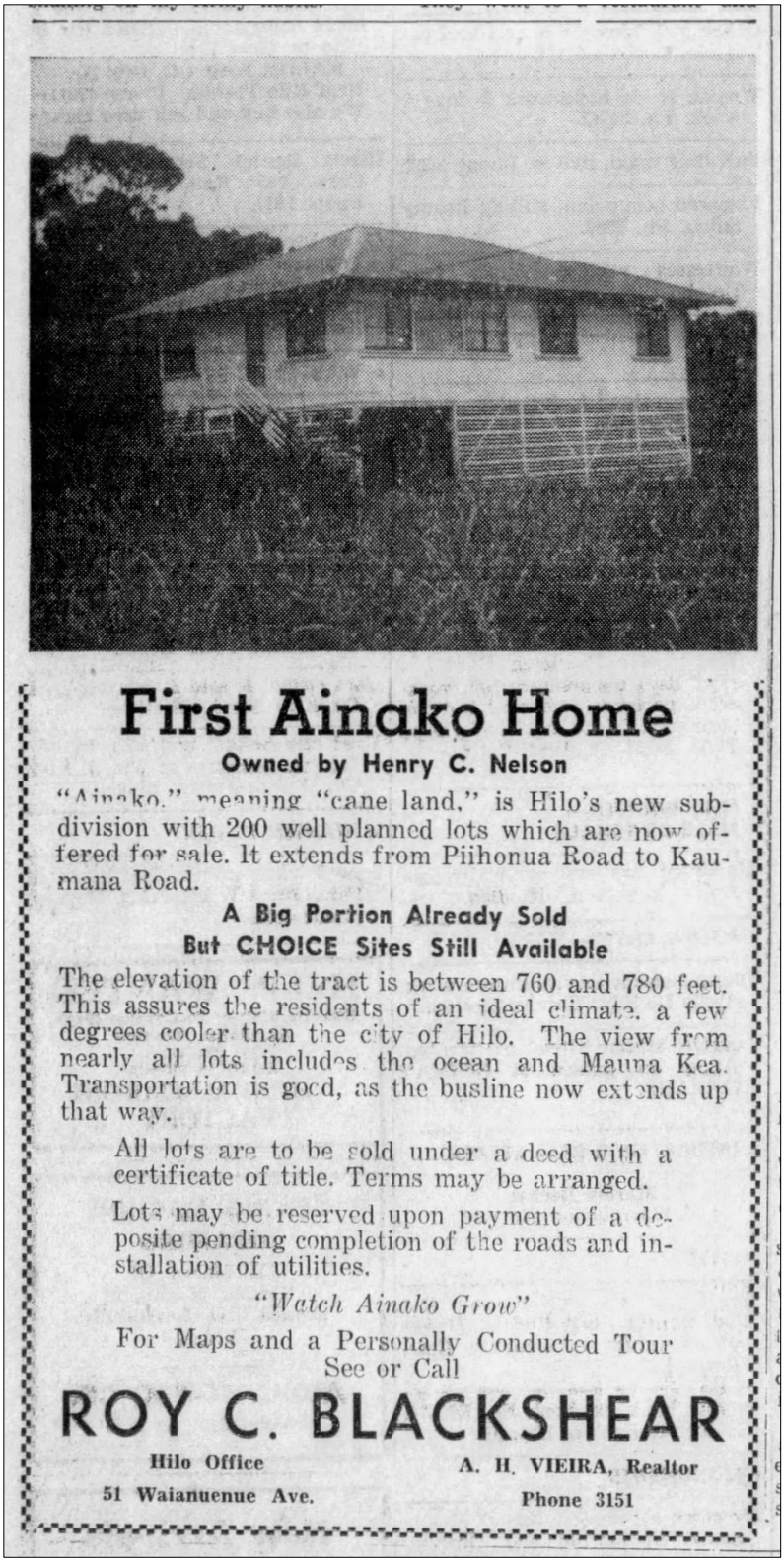


Figure 14. Named places in the Project Area vicinity



First Ainako Home

Owned by Henry C. Nelson

"Ainako," meaning "cane land," is Hilo's new subdivision with 200 well planned lots which are now offered for sale. It extends from Piihonua Road to Kaumana Road.

A Big Portion Already Sold
But CHOICE Sites Still Available

The elevation of the tract is between 760 and 780 feet. This assures the residents of an ideal climate, a few degrees cooler than the city of Hilo. The view from nearly all lots includes the ocean and Mauna Kea. Transportation is good, as the busline now extends up that way.

All lots are to be sold under a deed with a certificate of title. Terms may be arranged.

Lots may be reserved upon payment of a deposite pending completion of the roads and installation of utilities.

"Watch Ainako Grow"

For Maps and a Personally Conducted Tour
See or Call

ROY C. BLACKSHEAR

Hilo Office
51 Waianuenue Ave.

A. H. VIEIRA, Realtor
Phone 3151

Figure 15. Advertisement for houses in the Ainako Subdivision (Blackshear 1947)

Table 1 Placenames associated with Punahoa 2

Placename	Feature	Location	Meaning	Significance	References
Ainako	Stream, Subdivision	South and east ends of Project Area	"Cane Land" using spelling without kahakō or ʻokina.	Refers to Hilo Sugar Company cane fields converted to the Ainako Subdivision	(Hawaii Tribune-Herald 1946)
Haili	Forest	About 7.5 km mauka of Project Area, or near Hālaʻi Hills	"Loving memory" "Sudden remembrance" "Ghost of spirit"	Named ōhiʻa forest used for catching birds in an oli chanted by Ka-pohu in the story of Ka-hahana Timber was brought from Haili to build a church of the same name, said to have been built by Kuakini. Haili was logged and eventually converted to sugarcane lands.	(Kamakau 1867) (Pukui and Elbert 1986, 48)
Kaipalaoa			"whale sea"	Former location of *heiau.* Liholihos piko was cut here. Kamehameha I visited and surfed there. Site of battle between Kamehameha I and Namakeha of Maui.	(Stokes and Dye 1991, 154)
Mohihi/ Moohihi/ Kupapau Hill	Puʻu	East end of Project Area	Mōhihi is a type of sweet potato Moohihi could be "entwined roots, genealogies Kupapaʻu = "corpse" Kūpapau = "Deeply engaged, as in an activity; finished; engrossed, absorbed, united; all, all together" "Papau" could be a misspelling of "paopao" meaning "scooped out"	Mōhihi could indicated sweet potato cultivation Moʻohihi might refer to intertwined chiefly genealogies Kūpapau significance is unclear Kupapaʻu could indicate burials nearby (Office of Hawaiian Affairs, pers. comm. 2025) "Papau" as "paopao" could refer to summit of puʻu	Land Commission Award 387:4-1 Loebenstein (1895) Baldwin (1901a; 1901b) Soehren (2019) Pukui and Elbert (1986, 185, 319) Leileihua Yuen, (pers. comm. 2025) OHA consultation
Punahoa	Ahupuaʻa	Ahupuaʻa, also the sandy beach	Companion spring	Likely refers to the many water springs in the ahupuaʻa	Pukui et al (1974)
Puʻu Hālaʻi also Puʻu o Hālaʻi	Puʻu	1.5 km east of Project area	"hill of tranquility"	Where Hina Ke Ahi sacrificed herself during a drought in Punahoa	Pukui et al (1974) Soehren (2019) Westervelt (1910, 155–64)

Placename	Feature	Location	Meaning	Significance	References
Puʻu Honu	Puʻu	1 km east of Project area		Where Hina-Kuluʻua attempted to copy her sisters sacrifice during a drought in Punahoa	Westervelt (1910, 155–64)
Puu Ioane	Puʻu	Southwest corner of Project Area	Not known, could be transliteration of "John"	Not known	1917 United States Geological Survey quadrangle
Puʻu ʻOpeʻapeʻa also Puʻu Peʻapeʻa Puʻu Peʻa Puʻu Pōhakunui Puʻu o Kamaliʻi Puʻu Aliʻi	Puʻu	1.2 km east of Project area	Bat Hill Entangled Hill, Perplexity Large stone Hill of the Aliʻi children Hill of the Aliʻi	Where (in one version) Māui confronts the ʻalae birds to take fire	Pukui et al (1974) Pukui and Elbert (1986) Pukui et al (1974) Pukui and Elbert (1986) Westervelt (1910, 64–66) Nupepa Kuokoa (1863).

6.3 Kaʻao and Moʻolelo (Legendary and Historical Stories)

Hawaiian oral tradition includes several types of stories through which cultural values and history are expressed. Two forms that can tell stories about places are kaʻao and moʻolelo. As Martha Beckwith (1976, 1–2) explains, kaʻao are entertaining stories or stories in which "fancy plays an important role" or are "consciously composed to tickle the fancy rather than to inform the mind." In contrast, moʻolelo typically are about historical figures, including nā akua, told to teach or explain. Moʻolelo, literally "a succession of talk" (Pukui and Elbert 1986), are better thought of as historical stories, even if to outsiders elements of a moʻolelo involve what they might think are supernatural or fantastic when such elements are firmly grounded in a Hawaiian cultural world view.

Punahoa appears in only a few stories that have been collected in print. A few well-known stories involve natural features in the ahupuaʻa and members of the family of Hina. In others, the protagonists of the story live there, or visit during the course of the story's events. Moʻolelo featuring Punahoa in general, and Punahoa 2 specifically, are summarized below.

6.3.1 HINA-I-KA-AHI A ME HINA-I-KA-WAI (THE WOMAN IN THE FIRE AND THE WOMAN IN THE WATER)[2]

Makai of the Project Area near the boundary of Punahoa 2 and Punahoa 1 are three cinder cones bearing the names Puu Hālai, Puu ʻŌpeʻapeʻa, Puʻu Honu. These hills play an important role in a story featuring two kupua ("demi-goddesses") who are daughters of Hina, the woman who lives in a cave at Waiānuenue on the Wailuku River. There are several versions of the story recorded (e.g., Green 1926; Pukui and Curtis 1996; Westervelt 1910; M. Beckwith 1976, 96; Hapai 1920, 39,44), each a little different. The version published by Green (1923) includes text in ʻolelo Hawaiʻi which is attributed to Mary Pukui, who learned it during her childhood from a woman named Kanui Kaikaina in Hilo. Most of the text in the following summary comes from Anake (Aunty) Kaikainas version. The versions published by Westervelt (1910) and Pukui and Curtis (1996) clearly state that the story takes place at the Hālaʻi Hills. The Kaikaina version does not, but it is understood that this is the setting. This story illustrates moral lessons about generosity, jealousy, and sacrifice. It also explains, in the version published by Westervelt, the appearance of water cycles, springs, and the large pit found atop Puʻu Hālai.

The two daughters are Hinaikeahi and Hiniakawai in the olelo Hawaiʻi version published by Green (also Hina Ke Ahi and Hina Kuluʻua in other versions). Their mother had given each of them powers. Hinaikeahi's was the power to control ke ahi (fire). Hinaikawai's was the power over ka wai (water)[3]. The story begins on Puʻu Honu in a time of drought and famine:

> *I ka hiki ana mai o kekahi wi weliweli maluna o ka aina, ua nui ka uwe o kanaka i a pololi. Ua nui no hoi na keiki liilii I make I ka nele or ka makuahine i ka waiu.*
>
> *Nana mai nei o Hinaikeahi i kona poe kanaka, a ua hu anei ke aloha ia lakou, nolaila oia i hea mai ai ia lakou e akoakoa aku i kona alo. Kauoha aku nei oia i na kane e*

[2] This title is taken from a version published by Green (1926, 57).
[3] In versions calling her Hina Kuluʻua, she has power over rain (Westervelt 1910).

> *ahonui a e hele i ke kuahiwi i ka lapulapu wahie, a i ka muliwai i pohaku imu. A i ka ahua ana o keia mau mea, e hana i imu enaena nui. Kahaha ka naau o kanaka i ke kauoha ia i imu, oiai aohe mea ai e hoomoa aku ai. No ke aloha no i ke alii,·hana kunukunu ole no. (Green 1926, 56)*
>
> *Once famine came and great was the lamentation of the people because of hunger, and very many infants died because their mothers could not provide them with milk.*
>
> *As Woman-of-the-fire [Hina Keahi] saw her peoples distress, her compassion Bowed out to them and she called them all to gather before her. Then she commanded the men to be strong and to climb the mountain after fuel and bring stones from the river in order to prepare an underground oven or imu, and, when everything was brought, to prepare a very hot oven. Amazement filled the mens hearts at the command to prepare an oven when there was no food to be cooked, but out of love for their chiefess they did it all without a murmur. (Green 1926, 57)*

When the imu was ready, Hina Keahi then circled the imu, chanting an incantation naming the food that would be inside: “Maanei ka uwala, ke kalo, ka uhi, ilio, puaa, ia, hapuu, a me ka moa”—sweet potato, taro, yam, dog, pig, fish, tree fern, and chicken (Green 1926, 56). Then she went into the middle of the imu and called to the men to cover her with earth and close the imu. The men cried out “No! No!” but Hinaikeahi promised that she would go visit their divine ancestors so that they might live. She told them to keep the imu closed for 3 days until they see a cloud in the form of a woman with a radiant face, “I ku he wahine me kea no olioli ke nana aku, hu‘e ia ka imu” (Green 1926, 56).

They did, reluctantly, and watched for 3 days until a cloud in the shape of a woman appeared over the imu. When they opened the imu,

> *Aohe i loaa aku o Hinaikeahi e moe mai ana, aka o na mea ai wale no ana i helu ai, o ka uhi, ke kalo, ka ia, a pela wale aku (Green 1926, 58)*
>
> *There was no body lying there, but the foods she had enumerated were there-yam,* taro*, fish, and all the rest. (Green 1926, 59)*

After they did this, Hina Keahi appeared, approaching from the coast “ua ohuohu i ka lei limu kala”—wearing a lei of limu kala or *Sargassum echinocarpum*, a brown seaweed (Green 1926, 58). As they all ate, she told them the story of her visit with their divine ancestors who had shown their love for her. Westervelt (1910, 160–61) includes more detail about the path Hina Keahi took down from Pu‘u Halai‘i and the sources of wai (fresh water) she created along the way:

> *The legend says that Hina made her appearance in the form of a gushing stream of water which would always supply the want of her adherents. The second day passed. Hina was still journeying underground, but this time she came to the surface as a pool named Moe Waa (canoe sleep) much nearer the sea. The third day came and Hina caused a great spring of sweet water to burst forth from the sea shore in the very path of the ocean surf. This received the name Auauwai. Here Hina washed away all traces of her journey through the depths. This was the last of the series of earthquakes and the appearance of new water springs.*

He also adds that the food from the imu lasted until the famine ended. In the Pukui and Curtis version, this part of the story ends with the gardens growing well on Hāla‘i Hill.

On Puʻu Honu, news of what had happened reached the ears of Hinaikawai, and:

> *Komo iho nei ka manao lili iloko o Hinaikawai. Kauoha aku nei oia i na kanaka e hana i imu nui, a i ka makaukau ana, ua hoohalike oia me ka kona kaikuaana i ka helupapa i na mea ai; a pau ia, hea aku nei i na kanaka e uhi iaia i ka lepo. (Green 1926, 58)*.
>
> *Thus the spirit of jealousy entered into Woman-of-the-water, and she commanded her retainers also to prepare a great oven, and when this was done she imitated her older sister by repeating the names of various foods and then calling upon her retainers to cover her with earth. (Green 1926, 59)*

They do as she asks.[4] On the third day, the sky was overcast, and a dark cloud in the form of a woman ("ua ike ia he ao uliuli, me he wahine la") appeared over the imu. The men quickly opened the imu but instead of finding food, they found only Hinaikawai's burned body or ashes—"o ke kino papaa wale no o Hinaikawai" (Green 1926, 58). In the Kaikaina version rain falls after the imu is opened, "o na waimaka ia mai ka lani mai no Hinaikawai"—tears of heaven for Hinaikawai (Green 1926, 58), but this is not mentioned in the versions by Pukui and Curtis or Westervelt. The people then rebury the imu.

All versions conclude by moralizing about the jealousy of Hinaikawai, whose excessive pride led her death and the suffering of her people because she tried to use her sisters power over fire instead of her own power, which could have brought rain to end the drought. The Pukui and Curtis version includes a coda in which Hinaikeahi speaks this lesson, then tells her people to bring the people of Puʻu Honu to Hālaʻi and share their food. The crater at the top of Puʻu Hālaʻi is said to be the imu of Hinaikeahi, left open. The round top of Puʻu Honu is the filled-in imu where Hinaikawai perished.

The lei of limu kala worn by Hinaikeahi as she ascends from the coast is also significant to the story. Isabella Abbott and Eleanor Williamson (1974, 6) note that the name of the limu, "kala," means to forgive, and it is used in ʻohana rituals to hoʻoponopono (to set things right) and by kahuna in a ritual to purify (huikala) family members who have watched over the burial of a relative.

6.3.2 MĀUI FINDING FIRE

This moʻolelo tells the story of how Māui learned the secret of making fire from ʻalae (mudhen or Hawaiian gallinule, *Gallinula chloropus sandvicensis*) who lived at the Hālaʻi Hills located makai of the Project Area. Most versions of the story either do not specify where it takes place (e.g., Fornander 1918, 560; Pūkuʻi and Curtis 1985, 26; Hapai 1920, 25) or locate it entirely on a different island (Kamakau 1870; Westervelt 1910, 61). One version, published by Westervelt (1910, 64), however, begins in Hilo in the Hālaʻi Hills:

> *Another Hawaiian legend places the scene of Mauis contest with the mud-hens a little inland of the town of Hilo on the Island of Hawaii. There are three small extinct craters*

[4] Westervelt adds that some versions of the story include Māui at this point, who comes to make the imu very hot but Hina Kuluʻua (as she is called in this version) escapes and hangs over the imu as a cloud. Māui tries to catch her several times but she finds refuge in some kukui trees on the mountain.

> *very near each other known as The Halae Hills. One, the southern or Puna side of the hills, is a place called Pohaku-nui. Here dwelt two brother birds of the Alae family. They were gods. One had the power of fire making. Here at Pohaku-nui they were accustomed to kindle a fire and bake their dearly loved food—baked bananas. Here Maui planned to learn the secret of fire.*

The mud-hens are ʻAlae ʻula (*Gallinula galeata sandvicensis*, the Hawaiian Common Gallinule), a bird associated with sorcery (M. Beckwith 1976, 115). Upon seeing Maui, the older of the two ʻalae calls to the younger, “Be quick, here comes the swift son of Hina.” The birds scratch out the fire and run away. Māui chases them, eventually catching them at Waianae on Oʻahu (where other versions of the story take place). After they ʻalae try to trick him by telling him to rub pieces of banana stump together, then taro stems. Finally, after Māui twists the ʻalae birds neck and rubs its head, it tells him the truth: ʻiliahi (sandalwood, *Santalum ellipticum*), whose bark (ʻili) hides the fire (ahi) within.

6.3.3 KAAO NO KANA A ME NIHEU (LEGEND OF KANA AND NIHEU)

A portion of the moʻolelo “Kaao No Kana a Me Niheu” or the “Legend of Kana and Niheu” (Fornander 1916b, 444) takes place at Punahoa harbor. In this story, Punahoa is mentioned as a place where aliʻi (chiefs) were living and could launch canoes. Kana was born in Hamakualoa, Maui, in the form of a piece of rope and raised by his grandmother Uli in Piʻihonua on Hawaiʻi Island. Niheu was his brother, an aliʻi and ancestor of Kualiʻi, who was remarkable for his small size but great strength. As young adults, the two learn that their mother has been taken to Molokai by Kapepeekauila, the aliʻi of the hill of Haupu (actually named Kahonunuimaeleka, the very large turtle at Aleka). As they prepare to sail to rescue her, Kapepeekauilas kahuna, Moi, dreams a warning that a long man and a short man would conquer them. Then,

> *A lohe ke lii o Kapepeekauila i keia olelo a Moi, hoouna aku la ia i kana mau kukini mama loa, o Kolea, o Ulili, e lele e nana ia Kana a me Niheu. A hiki laua i ke kai o Hilo, Punahoa, e pili ana me Kaipalaoa kahi o Kana e noho ana, i aku o Kolea ia Ulili: "E, e lele kana i luna loa, o make kaua ia Kana, alaila, kahea iho kaua." Lele ae la laua a hala i luna loa, kau pono iho la i luna o kahi o Kana e moe ana, kahea iho la ; ia lohe ana o Kana, lalau ae la o Kana me kona man lima i luna, me kona moe i lalo ke kino, aole nae i loaa, aka, ua opeapea ka lele ana a na wahi manu, a Kolea a me Ulili, a haule laua i Molokai, i luna o Haupu, no ka ikaika loa o ka makani o na lima o Hana.*
> *(Fornander 1916b, 445)*

> *When the chief Kapepeekauila heard the words of Moi, he sent his swiftest messengers, Kolea and Ulili, to fly and look for Kana and Niheu. When the two came to the harbor of Punahoa, in Hilo, a place adjoining Kaipalaoa, where Kana was then living, Kolea said to Ulili : "Say, let us fly away up high so as to be out of the reach of Kana, and from up there, call out to him." The two then flew away up high and at a point directly over the place where Kana was sleeping, they called out to Kana. When Kana heard the call he reached up with his hands, while still lying down, but did not catch them, though the effects of the wind caused by the hands of Kana made them swing away in haste, and in doing this they fell down on the hill of Haupu in Molokai.*
> *(Fornander 1916b, 444)*

Kana and Niheu finish their preparations and depart from Punahoa to Molokai to confront Kapepeekaiuila. The story does not mention Punahoa after this episode.

6.3.4 KAAO NO KAPUAOKAOHELOAI (LEGEND OF KAPUAOKAOHELOAI)

Legend of Kapuaokaoheloai (Fornander 1916b, 540) is a story about two children of Ku and Hina who, brought up under a very strict kapu an not knowing they are siblings, have a forbidden love and are separated by their parents. After a series of trials, Kapuaokaoheloai returns to Punahoa to be reunited with her brother. The story takes place in part in Punahoa, and symbolic natural phenomena (rainbows and clouds) that can occur there play a role in resolving the story.

At the beginning of the story, the siblings live in Waiākea, but their attendants go daily to the uplands of Kaūmana, directly above Punahoa[5] to do farm work. The daughter, Kapuaokaoheloai, is banished to Kauaihelani on Kaua'i, while the son Hookaakaaikapakaakaua wastes away in a house in the upland of Punahoa. While banished, Kapuaokaoheloai is accused of violating the sanctity of a very sacred part of a heiau ("ka aanuu kapu loa") but is spared because of her high rank as daughter of Ku and Hina. One night the daughter of the king of Kauaihelani, who has befriended Kapuaokaoheloai, asks her why she weeps. She explains about her brother and her banishment, and the king's daughter tells her that she wants to see him. Kapuaokaoheloai says that if she wishes to see him, she shall. That night in their sleep, Kapuaokaoheloai finds the spirit of her brother and makes it sleep with the king's daughter. She falls in love with him and decides to go to him. She asks Kapuaokaoheloai where her home is, and is told:

> *"Aia ma ka hikina o ka la; ina oe e holo, o ka aina mua e loaa ia oe o Kauai, Oahu aku, o Molokai, o o Maui, o Hawaii, aia nae ma kahi a ka la e hiki mai, oia o Kumukahi, o Punahoa ke awa, o Waianuenue ka maka o uka e nana ai. Ka hale nui e ku ana i uka, o ko maua hale ia, aia no kuu kaiknnane ilaila me kona kahu."*
>
> *A pau ka olelo ana, haalele ke aikane ia Kuaihelani a holo mai la me kona mau waa a hiki i Hilo a pae ma Punahoa, nana aku la ia i keia hale e ku ana i uka. (Fornander 1916b, 547)*
>
> *It is where the sun rises. If you should go, the first land you come to is Kauai, then Oahu, then Molokai, then Maui and then Hawaii. It is, however, at the first point where the sun comes up, called Kumukahi. The harbor Punahoa and Waianuenue is the first object to be seen upon landing. The large house which you will see in the upland is our home; my brother is still there with his attendant." Soon after these instructions were given, her friend left Kuaihelani and set sail in her canoes until she arrived at Hilo and landed at Punahoa, where she saw a house standing in the uplands. (Fornander 1916b, 546)*

She finds Hookaakaaikapakaakaua, but he has wasted away in his sorrow from refusing to eat since his sister left. The king's daughter keeps visiting him. Inspired by this, he is quickly nursed back to health by his attendant. On her next trip up to see him, the kings daughter sees a rainbow and thick red raincloud ("e pio ana ke anuenue, e nee ana ka ua koko") signifying that she was approaching her intended husband. (Fornander 1916b, 547). She goes to lie with him, but he tells her that his sister had forbidden him from lying with anyone else—but because they had already done so in her dreams, the ban was lifted ("Ma ka uhane moe laua, a noa ae la. Pela laua i moe ai") (Fornander 1916b, 547).

[5] "…i uka o Kaumaua, aia ia wahi i uka pono o Punahoa…" (Fornander 1916b, 540).

6.3.5 MELE

Mele, typically translated as “songs” or poetry or chants, are another oral tradition through which cultural values and history are expressed. Hilo features in several mele, as the subject and setting. Many of these invoke the rains, flora, beauty, and other qualities of Hilo. One older mele that speaks of the rain and freshwater in Hilo is “Hula Alaʻa-papa,” presented here as transcribed and translated by Emerson (1909, 57). The mele tells the story of Hiʻiaka on her journey to Kauaʻi to bring Lohiau to her sister Pele. In the third paukū (stanza), the action moves to Hilo, where violent rain in the mauka regions of Piʻihonua and Punahoa swells the Wailuku river, making the landing at Punahoa dangerous from the surf crashing on the shoal. The same rains that would make the Wailuku run swollen and red would also fill the streams that pass through the project area.

Pauku 3
(Koi-honua)

Pakū Kea-au, lulu Wai-akea;
Noho i ka lai loa Hana-kahi,
O Hilo, i olokea ia, i au la, e, i kai.
o Lele-iwi, o Maha-hana-loa.
Me he kaele-papa la Hilo, i lalo ka noho.
Kaele wale Hilo i ke alai ia e ka ua.
Oi ka niho o ka ua o Hilo i ka lani;
Kua-waa-waa Hilo i eli a e ka wai;
Kao-koo, haki ua nalu, ka ua o Hilo;
Hai lau-wili mai ka nahele.
Nanalu, kahe waikahe o Wai-lku;
Hohonu Waiau, nalo ke poo o ka lae o Moku-pane;
Wai ulaula o Wai-anuenue;
Ka-wowo nui i ka wai o Kolo-pulu-pule;
Halulu I ha-kui, ke me ka uahi la
Ka puā o ka wai ua o-aka i ka lani.
Eleele Hilo e, pano e, i ka ua;
Okakala ka kulu o Hilo i ke anu;
Pili-kau mai Hilo ia ua loa.
Pali-ku laau ka uka o Haili.
Ka lae ohia e kope-kope,
Me he aha moa la, ka pale pa laau,
Ka nahele o Pa-ie-ie,
Kuu poe lehua iwaena konu o Mo-kau-lele;
Me ka hai laau i pu-kaula halai i ka ua.
Ke nana ia la e lai i Hanakahi.
Oni aku Hilo, oni kuu kai lipo-lipo,
A Lele-iwi, kuu kai abu mimiki a ka Malua
Lei kahiko, lei nalu ka poai.
Nana Puu-eo, e! makai ka iwi-honua, e !
Puna-hoa la, ino, ku, ku wau a Wai-akea la.
(Emerson 1909, 60–61)

Stanza 3
(With distinct utterance)

Kea-au shelters, Waiakea lies in the calm,
The deep peace of King Hana-kahi.
Hilo, of many diversions, swims in the ocean,
Tween Point Lele-iwi and Maka-hana-loa;
And the village rests in the bowl,
Its border surrounded with rain—
Sharp from the sky the tooth of Hilos rain.
Trenched is the land, scooped out by the downpour- Tossed and like gnawing surf is Hilos rain— Beach strewn with a tangle of thicket growth;
A billowy freshet pours in Wailuku;
Swolln is Wai-au, flooding the point Moku-pane; And red leaps the water of Anue-nue.
A roar to heaven sends up Kolo-pule,
Shaking like thunder, mist rising like smoke.
The rain-cloud unfolds in the heavens;
Dark grows Hilo, black with the rain.
The skin of Hilo grows rough from the cold;
The storm-cloud hangs low oer the land.
A rampart stand the woods of Haili;
Ohias thick-set must be brushed aside,
To tear ones way, like a covey of fowl,
In the wilds of Pa-ie-ie—
Lehua growths mine—heart of Mokau-lele.
A breaking, a weaving of boughs, to shield from rain; A look enraptured on Hana-kahi,
Sees Hilo astir, the blue ocean tossing
Wind-thrown-spray—dear sea—against Point Lele-iwi—
A time-worn foam-wreath to encircle its brow.
Look, Puu-eo! guard gainst the earth-rib!
It’s Puna-hoa reef; halt!
At Waiakea halt! (Emerson 1909, 61–62)

6.3.6 ʻŌLELO NOʻEAU

In Mary Kawena Pukui's collection of ʻōlelo noʻeau, there are only a few sayings that invoke the place name Punahoa (Pukui 1983). The area surrounding the Hilo Hills was a place renowned for its bounty. The naturally fertile soil and ample rainfall provided the area residents with the ideal conditions to develop unique horticultural practices and helped to establish Hilo as a place renowned its fondness of cooked greens and proud farmers. Pukui elaborates on these two traditions in the following ʻōlelo noʻeau:

Hilo ʻai lūʻau.
Hilo, eater of taro greens.

The people of Hilo were said to be fond of cooked taro greens. When storms came to Hilo, it was impossible to obtain fish from the streams or the sea. The people had to be content with taro greens. (Pukui 1983, 997)[6]

Hilo mahi haʻaheo.
Hilo of the proud farmers.

The climate makes the soil of Hilo very easy to till, so the farmers used to make a game of planting. They used long digging sticks to make the holes and wore lei to work. Working in unison, they made a handsome picture. (Pukui 1983, 1003)

Another saying is taken from the moʻolelo of Māui taking fire from the ʻalae. The version published by Westervelt (1910, 64) that begins at Pohakunui in the Hālaʻi Hills includes this saying in its English translation:

Ua moʻa ka maiʻa, he keiki māmā ka Hina.
The bananas are cooked, [and remember that] Hina has a swift son.

Lets finish this before we are caught. This saying comes from the legend of Māui and the mudhens. For a long time he tried to catch them in order to learn the secret of making fire. One day he overheard one of them saying these words. He caught them before they could hide and forced them to yield the secret of fire. (Pukui 1983, 2830)

Three of the sayings published by Pukui (1983) refer to Punahoa, but do not specify which of the many places named "Punahoa" around the islands:

Aohe lihi ike aku i ka nani o Punahoa.
Hasnt known the beauty of Punahoa.

Used when the charms of a person or place are unknown. Punahoa is an unusually attractive place. (Pukui 1983, 171)

Nee aku, nee mai ke one o Punahoa.
That way and this way shifts the sand of Punahoa.

Said of a group that divides, or of an undecided person who shifts one way and then another. (Pukui 1983, 2305)

[6] The citations from this book refer to the numbered ʻōlelo noʻeau instead of the page number.

Nee papa ka helu a ka lā i Punahoa.
The sun continued to scorch at Punahoa.

The fight didn't end quickly. (Pukui 1983, 2306)

Located as it is on the windward side of Hawai'i Island, Hilo normally receives ample rain brought on the trade winds. Several 'ōlelo no'eau published by Mary Kawena Pukui refer to rain of Hilo:

The rains of Hilo
'Ele'ele Hilo, panopano i ka ua.
Dark is Hilo, clouded with the rain (Pukui 1983:40)

Halulu me he kapua'i kanaka la ka ua o Hilo.
The rain of Hilo makes a rumbling sound like the treading of feet.(Pukui 1983:53)

Hana Hilo i ka po'i a ka ua.
Hilo works on the lid of the rain. Refers to the constant showers
typical of Hilo district on Hawai'i. (Pukui 1983:54)

Hilo 'āina ua lokuloku.
Hilo of the pouring rain. (Pukui 1983:107)

Hilo i ka ua kinakinai, ka ua mao 'ole.
Hilo of the constant rain, where it never clears up. (Pukui 1983:107)

Ka ua Hehi'ulu o Pi'ihonua.
The rain that treads on the breadfruit leaves of Pi'ihonua. (Pukui 1983:167)

Ka ua lei mā'ohu o Waiānuenue.
The rain of Waiānuenue that is like a wreath of mist. Refers to the rising vapors of Waiānuenue Falls during heavy rain. (Pukui 1983:170)

The significance of nā ua (the rains) in Hawaiian culture is described by Collette Akana and Kiele Gonzalez:

> *Our kūpuna [ancestors] had an intimate relationship with the elements. They were keen observers of their environment, with all of its life-giving and life-taking forces. They had a nuanced understanding of the rains of their home. They knew that one place could have several different rains, and that each rain was distinguishable from another. They knew when a particular rain would fall, its color, duration, intensity, the path it would take, the sound it made on the trees, the scent it carried, and the effect it had on people. (Akana and Gonzalez 2015, xv)*

Like the rains, nā makani (the winds) are distinguished by their characteristics and given names. A description of winds found in the District of Hilo was published in the newspaper *Ke Ao Okoa* by S. W. Nailiili (1865). Each wind is introduced by name and given a brief description. The wind names, transcribed with kahakō and 'okina added to the original text, and descriptions are summarized by Kapuni-Reynolds and Brandt (2023, 20–21). These winds include Kēhau, a calm misty or dewy wind that originates in the uplands and descends in the middle of the night; Kēwai, a moisture-laden wind associated with the mists of low-lying rainbows during daylight; Pu'ulena, a rainless, calm wind that blows

in from Puna and brings the scent of the hala (Pandanus tectorum) trees from ʻŪpēlo and Mōkaulele. One of the wind descriptions given by Nailiili (1865) explicitly refers to Punahoa:

> *He Malua. He makani kii wai keia ma ka moana loa mai keia makani, na keia makani e houluulu I na ao e kau wale ana i ka lewa, a hui i kahi hookahi, e hoohuli ia ana ka lau o ke amau, a me ka [Palai], alaila e hiele mai ka ua me he muliwai ia i hookio ia, a hele ana ka wai i ka moana,* ***e ku ana ka wahie a me a opala i kai, pania iho o Kaipalaoa a me Punahoa, like me he lae pohaku la****.*

In this passage, the wind named Malua is described as a stormy wind coming from the ocean with clouds and rain and turning the leaves of the ʻamaʻu (*Sadleria*) and palai (*Microlepia setosa*) ferns. The bolded portion of the description refers to the downed tree limbs and rubbish caught in the sea, blocking the shore at Kaipalaoa and Punahoa "as if with a rocky point."

6.4 Traditional Hawaiian Land Management Strategies

Before the arrival of humans, the natural, pre-human vegetation in the Project Area vicinity was mostly likely what Cuddihy and Stone (1990) describe as Lowland Wet Forest. Dominant species were likely ʻōhiʻa trees (*Metrosideros polymorpha*), uluhe (*Dicranopteris linearis*), and hāpuʻu ferns (*Cibotium* spp.), as well as a large variety of trees, shrubs, ferns, sedges, grasses and herbs. The current archaeological consensus on when Hawaiʻi was first settled by Polynesians derives from several sources, including archaeological, genealogical, mythological, oral-historical, radiometric data. With data from advances in palynology and radiocarbon dating techniques, Kirch (2011) and others (Athens et al. 2014; Rieth et al. 2011; Wilmshurst et al. 2011) have argued that Polynesians arrived in the Hawaiian Islands, sometime between A.D. 1000 and A.D. 1200 and expanded rapidly thereafter.

Other versions of the peopling of the islands, including various native Hawaiian traditions, place the event earlier in time—and as early as the creation of the world (e.g., M. W. Beckwith 1917; Liliuokalani 1978; Malo 1951). After initial migration to Hawaiʻi from Kahiki, the ancestral homelands of Hawaiian akua and people—most likely the Marquesas Islands (Kirch 2011; Tatar 1982), subsistence agriculture and fishing sustained the initial populations. Widespread environmental modification followed with the adaptation of traditional practices and tools to the new environment (Kirch and McCoy 2023; Pogue 1978). According to Fornander (1969), traditional practices included Polynesian customs and beliefs such as the major gods Kāne, Kū, Lono, and Kanaloa; the kapu system of law and order; and the concepts of puʻuhonua (places of refuge), ʻaumakua (ancestral deity), and mana (divine power).

Voyaging between western and southern Polynesia and Hawaiʻi is attested to in traditional kaʻao and moʻolelo such as the stories of Hawaiʻiloa (Fornander 1919, 278–81; M. W. Beckwith 1932, 74–77), Moʻikeha (Fornander 1917, 112–28; Kamakau 1991, 105–10; Kalākaua 1888, 117–35), and Paʻao (Kamakau 1991, 97–100; Thrum 1923, 46–52; Emerson 1893; Green 1926, 120–24). Voyaging lasted until sometime around the end of the 14th century, which led to a consistent pattern of social and political changes throughout the islands (Kirch 2010). Hommon (1976) argues that kinship links among coastal settlements became less important than those with the mauka-makai (upland to coastal) settlements. This shift is believed to have resulted in the establishment of the hierarchical land tenure system organized by moku ("social-ecological regions") and ahupuaʻa (social-ecological community) and other land divisions

sometime during the A.D. 1400s (Kirch and McCoy 2023; Winter et al. 2020). On Hawai‘i Island, the implementation of the system is attributed to Kalaunuiohua, an ali‘i (chief) descended from Pilika‘aiea who was brought from Kahiki by the kahuna Pā‘ao.

This system divided of the moku of Hilo into the major land units of moku, ahupua‘a and smaller subdivisions that were tended by the maka‘āinana (people of the land, or commoners) for the ali‘i who stewarded the āina (land, “that which feeds”) and its people. Within the large moku, resource management was done in a decentralized way by ali‘i ‘ai moku (literally, the chief who eats/consumes the land) using the smaller social-ecological communities (ahupua‘a) (Winter et al. 2018), Punahoa 2, possibly originally part of a larger “Punahoa” ahupua‘a at first, is part of this land tenure system. Boundaries of ahupua‘a were generally defined by topography and natural resources, and extended from the nearshore fishing grounds toward the mountains to provide access to the range of available resources in a given place (Gonschor and Beamer 2014; Kamakau 1992, 372–77; Malo 1951, 63–67). The resource zones that were distributed through this system were not simply defined in ecological terms but were part of the Hawaiian world view. Beginning from mountain peaks, Samuel Kamakau recorded a list of them in *Ke Au Okoa* in November, 1869:

> *5. Eia kekahi kapa ana i na inoa o ka mauna a me ke kuahiwi. O ka mauna ka inoa nui o ke kuahiwi i kapa aia aku as, aka, na nui no ka inoa ma ke ano e pili ana i ka mauna, eia kekahi mau inoa e pili ana i ka mauna. O kahi ma ke kua, a ma ke alo o ka mauna ma ka piko pono o ka mauna, ua kapaia ke kuamauna, a o kahi malalo mai o ke kuamauna, he kuahea, a makai mai o ke kuahea, ke kuahiwi, aia malaila e hoomaka mai ai ka ulu ana o na laau liilii, he waonahele ia, a makai mai, na loloa ae ka laau, o ka wailipo ia, a makai mai o ka waoeiwa, o ka waomaukele ia, a makai o ka waokaukele, o ka waoakua, a makai mai o ka waoaku, he waokanaka ia, oia hai a na kanaka e maihai ai, a makai o ka waokanaka, ka amau, a makai o ka amau, he apaa, a maka [sic[o ka apaa, he pahee, he lilima, a makai olaila he kula, he apoho, a pili i hauhale, a makai o kauhale, he kahakai, he kahaone, a he kalawa, a hiki i ka aekai, a pela ka poe kahiko i kapa aku ai i aka inoa. (Kamakau 1869)*

An English version of this passage (Kamakau 1976, 8–9), translated by Mary Kawena Pukui, reads:

> *Here are some names for [the zones of] the mountains—the mauna or kuahiwi. A mountain is called a kuahiwi, but mauna is the overall term for the whole mountain, and there are many names applied to one, according to its delineations (ano). The part directly in back and in front of the summit proper is called the kuamauna, mountaintop; below the kuamauna is the kuahea, and makai of the kuahea is the kuahiwi proper. This is where small trees begin to grow; it is the wao nahele. Makai of this region the trees are tall, and this is the wao lipo. Makai of the wao lipo is the wao eiwa, and makai of that the wao maukele. Makai of the wao maukele is the wao akua, and makai of there is the wao kanaka, the area that people cultivate. Makai of the wao kanaka is the amau, fern belt, and makai of the amau the apaa, grasslands.*
>
> *A solitary group of trees is a moku laau (a “stand” of trees) or an ulu laau, grove. Thickets that extend to the kuahiwi are ulunahele, wild growth. An area where koa trees suitable for canoes (koa waa) grow is a wao koa and mauka of there is a wao laau, timber land. These are dry forest growths from the apaa up to the kuahiwi. The places that are “spongy” (naele) are found in the wao maukele, the wet forest.*

> *Makai of the apaa are the pahee [pili grass] and ilima growths and makai of them the kula, open country, and the apoho hollows near to the habitations of men. Then comes the kahakai, coast, the kahaone, sandy beach, and the kalawa, the curve of the seashore—right down to the ae kai, the waters edge.*
>
> *That is the way ka poe kahiko named the land from mountain peak to sea.*

The social ecological zones within an ahupuaʻa extended beyond the water's edge to ka poʻina nalu (the fringing reefs) (Maly and Maly 2003; Winter et al. 2018). Although Punahoa 2 begins at ka poʻina nalu, it does not extend beyond the forest and into higher-elevation wao (a general term for inland region usually forested but not precipitous and often uninhabited) such as the wao nahele. The Project Area itself, located at about 500 feet above sea level, appears to have been located in the wao kanaka or possibly in grasslands located makai (e.g., the ʻapaʻa).

Some of this ambiguity stems from the evolution of models of traditional Hawaiian settlement patterns. One model proposed by Archaeologist Holly McEldowney (1979, 18–25) places the Project Area in what she calls the "Upland Agricultural Zone" which consisted of open kula (plains or grasslands) land gently sloping up to the base of the woods, about 4 to 6 miles inland from the coastal village at Hilo Bay. Additional research by Sam Ohu Gon et al. (2018) have refined estimates of where intensively used lands were, that is the lands that were chronically occupied, directly manipulated, and significantly changed from the pre-existing native ecosystem types into traditional Hawaiian uses. Gon et al. (2018) used updated ecological and historical data to develop an overall "Hawaiian Footprint" representing the ʻāina momona or the "sweet land" where intensive agricultural was practiced on the island circa 1770 (Figure 16). The Project Area appears very near the margins of the 1770 footprint, on or just outside of the southern edge of an intensively used area indicated in pink. The modeled footprint shows āina momona extending mauka in Piʻihonua to elevations of nearly 1,000 feet. The pink "footprint" ends abruptly at the Punahoa 2 boundary, however.

Regardless of the precision of the model by Gon et al. (2018), land near (or in) the Project Area might have been used for gardens and tree crops, where dryland taro and bananas were grown along with crops that were also found in the village (McEldowney 1979, 18–25): kō (sugarcane, *Saccarum officianum*), wauke (paper mulberry, *Boussonetia papyifera*), irrigated and dryland kalo (taro, *Colocasia esculenta*), along with ʻuala (sweet potatoes, *Ipomoea batatas*), and minor vegetable crops. Tree crops, such as ʻulu (breadfruit, *Atocarpus alitilis*) and niu (coconut, *Cocos nucifera*), ōhiʻa ʻai (mountain apple, *Eugenia malccensis*), milo (Pacific rosewood, *Thespesia populnea*), and kukui (candle nut, *Aleruites moluccana*) were also maintained. Along streams, irrigated kalo varieties were grown. Early descriptions of "neatly laid out fields" among what appeared to be largely uncultivated land (e.g, Malden 1841; Menzies 1920, 141) suggests swidden agriculture was practiced, at least early on, consistent with what Kamakau (1976, 31–32) and Handy et al. (2020, 103–10) describe.

Several traditional planting methods used in South Hilo are described by Handy, Handy, and Pukui (2020) 1991). For example, dry taro was planted "wherever there was enough soil" (Handy et al. 2020, 726). Another innovation, kanu kipi, involved creating mounds of soil in marshy land for planting:

> *In lava-strewn South Hilo there were no streams whose valleys or banks were capable of being developed in terraces, but cuttings were stuck into the ground on the*

> *shores and islets for many miles along the course of the Wailuku River far up into the forest zone. In the marshes surrounding Waiakea Bay, east of Hilo, taro was planted in a unique way known as kanu kipi. Long mounds were built on the marshy bottom with their surface two or three feet above water level. Upon the top and along the sides of these mounds taro was planted. This swampy land is now* [in the 1930s] *abandoned to rank grass. Kipi (mounds) were also formerly made along Alenaio Stream above Hilo.* (Handy et al. 2020, 747–48)

Although Handy, Handy, and Pukui specify locations in the two ahupua‘a of Waiākea and Kukuau, similar marshy terrain exists just north of the Project Area on the State parcel in Pi‘ihonua.

In sum, the upland kula of Punahoa where the Project Area can be found was integrated into the moku- and ahupua‘a-based social, political, and ecological system practiced during the Precontact era. Current modeling of the extent of cultivated lands by Gon et al. (2018) suggest that the Project Area is located near, but outside of, the southern edge of intensive land use at this elevation. Abundant freshwater, though, may have made the Project Area available for cultivation of both irrigated and rain-fed crops.

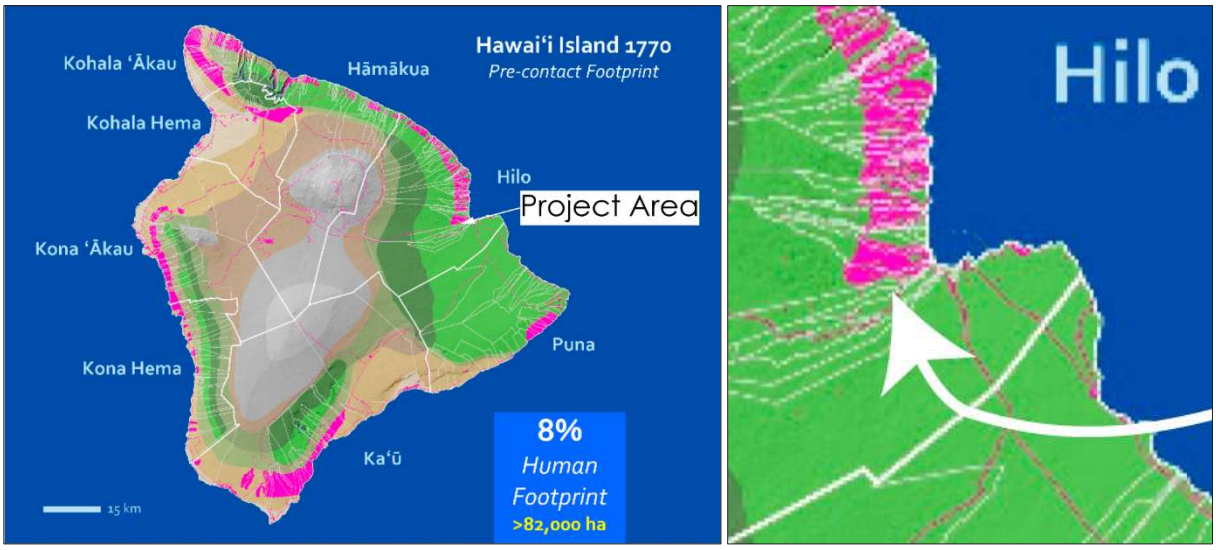


Figure 16. Modeled Āīna Momona Shown in Pink, with project area indicated by the white arrow (Gon et al. 2018, fig. 7)

6.4.1 LAND TENANCY AT THE TIME OF THE 1848 MĀHELE

During the 1830s and 1840s, the Hawaiian Kingdom was an established center of commerce and trade in the Pacific, recognized internationally as a sovereign national by the United States and other nations in the Pacific and Europe (Sai 2011). Hawaiian political elites sought ways to integrate the kingdom into the family of nations, and the influence of an increasing population of Western settlers led to major socioeconomic and political changes. These changes included the formal adoption of a Hawaiian constitution by 1840, the change in governance from an absolute monarchy to a constitutional monarchy, and the shift towards a Euro-American model of private land ownership. The change in land governance was partially informed by ex-missionaries and Euro-American businessmen in the islands who were

generally hesitant to enter business deals on leasehold lands that they feared could be revoked from them at any time.

Following the Declaration of Rights and Laws of 1839 and the Constitution of 1840, the vested rights in the ʻāina held by the Mōʻī (King), the aliʻi, and the makaʻāinina needed to be settled, as these new documents codified the concept that these three groups jointly owned the lands of the kingdom, but with differing degrees of interest (Beamer and Tong 2016). The change in land tenure was further endorsed by missionaries and Western businessmen in the islands who were generally hesitant to enter business deals on leasehold lands. It was decided that the three classes of people had one-third vested rights to the lands of Hawaii (Chinen 1958). In 1845, the legislature created the Board of Commissioners to Quiet Land Titles (more commonly known as the Land Commission), to develop procedures for dividing the lands and to grant or reject claims to land titles brought before them. Land claims could be made by chiefs, often for entire ahupuaʻa, or by tenants for their house lots and gardens, with an initial deadline of February 14, 1848. This deadline was extended several times for the aliʻi and konohiki, but not for commoners (Alexander 1920; Soehren 2005). The Mōī and some 245 aliʻi spent nearly 2 years trying unsuccessfully to divide all the lands of Hawaiʻi amongst themselves before the whole matter was referred to the Privy Council on December 18, 1847 (Kameʻeleihiwa 1992; King n.d.; Kuykendall 1938). Once the Mōī and his aliʻi accepted the principles of the Privy Council, the Māhele ʻĀina (Division of Land) was completed on March 7, 1848. The names of all of the ahupuaʻa and ʻili kūpono (politically independent subdivision within an ahupuaʻa) of the Hawaiian Islands and the chiefs who claimed them, were recorded in the Buke Mahele (1848; see also Soehren 2005). To set aside public lands that could be sold to raise money for the government or purchased by his subjects to live on, the Mōʻī commuted about two-thirds of the lands awarded to him to the government (King n.d.). The chiefs who participated in the Māhele were also required to provide commutations of a portion of their lands to the government to receive a Royal Patent that gave them clear title to their remaining lands. The lands surrendered to the government by the Mōī and aliʻi and konohiki became known as “Government Land,” while the lands that were personally retained by the Mōī became known as “Crown Land” and the lands received by the aliʻi and konohiki became known as “Konohiki Land” (Chinen 1958, vii; 1961, 13). Most importantly, all lands (whether Crown, Government, or Konohiki lands) identified and claimed during the Māhele were “subject to the rights of the native tenants” residing therein (Garavoy 2005, 524). All lands awarded during the Māhele were identified by name only, with the understanding that the ancient boundaries would prevail until the land could be formally surveyed. This process expedited the work of the Land Commission. Unlike the Mōʻī, the aliʻi and konohiki were required to present their claims to the Land Commission to receive title—less than allodial—to their lands via a document known as a Land Commission Award (LCAw).

6.4.1.1 Distribution of Land During the Māhele

Punahoa 2 does not appear in the Māhele Book, although a land division called only “Punahoa” does (1848, 42). The Punahoa in the Māhele Book is the ahupuaʻa of Punahoa 1, which was given to Enoka Kahakumakaliua after some controversy when Asa Keao claimed it (see Land Commission Claim 463, Native Register 2:183, Foreign Testimony 2:226). Punahoa 2 is probably not in the Māhele Book because the land had already been given to the ABCFM by the King and Kaʻahumanu in about 1827.

In 1848, Piʻihonua was held by Kalaeokekoi, who is thought to have received it from Kaeuikeaouli or Boki in 1828, and who had in turn received it from Liholiho and Kamehameha I (Kapuni-Reynolds and Brandt 2023; Kelly et al. 1981).

6.4.1.2 Claims Under the Kuleana Act of 1850

As the Mōī and aliʻi made claims to large tracts of land during the Māhele, questions arose regarding the protection of rights for the native tenants. To address this matter, on August 6, 1850, the Kuleana Act or Enabling Act was passed, allowing native tenants to claim a fee simple title to any portion of lands that they physically occupied, actively cultivated, or had improved (Garavoy 2005). Additionally, the Kuleana Act clarified rights (kuleana) to gather natural resources, as well as access rights to their parcels, which were typically landlocked. Lands awarded through the Kuleana Act were and still are, referred to as kuleana awards or kuleana lands. The Land Commission oversaw the program and administered the kuleana as LCAw (Chinen 1958). Native tenants wishing to claim land were required to register their claim for ʻapana (the equivalent of a land parcel) in writing with the Land Commission. The Land Commission then assigned the claimant a number, and that number was used to track the claimant through the entire claims process. Subsequently, the claimant had to provide supporting testimony from two individuals (typically neighbors) to confirm their claim to the land. The document generated as part of this process was known as a Native Testimony (if the testimony was given in ʻolelo Hawaiʻi) or Foreign Testimony (if given in English). Upon successful submittal of the required documents, the Land Commission rendered their decision. If the commission decided in their favor, the tenant was issued a LCAw and title less-than-allodial for all or some of the ʻapana that were claimed. Allodial title to the kuleana parcel could be obtained by paying a fee to acquire a Royal Land Patent.

The ABCFM submitted a claim to the Land Commission for all of the lands it held throughout the islands. Punahoa 2 was filed under claim 387 Part 4 Section 1, and was submitted by Titus Coan. It included nearly the entire ahupuaʻa. The description of the land in the claim provides few details about the Project Area. Coan's testimony, given on May 4, 1849, notes that the land was given to missionary Joseph Goodrich by the King and Kaʻahumanu in about 1827. He added, "There are some Natives living on the land of Punahoa, some of them are Kamaainas or descendants of them, and others have leases or permission to live there from the Mission" (Foreign Testimony 1964, 3:136), The testimonies also describe dwellings at the mission station, the school for boys and the school for girls, the school farm, all makai of Hālaʻi Hill.

In the initial registration of their claim to the Land Commission for the missionary lands in Punahoa under Claim No. 387 (Foreign Register, 45–46), the ABCFM noted:

> *The boundaries of this land are well understood by natives of the vicinity. All the dwelling houses at the station, belonging to the Mission are on this land; also the buildings & yards of the two boarding schools together with all the cultivation connected with the school for boys, & a considerable portion of that belonging to the school for girls. A portion of this land is worthless, except for pasturage & is used for that purpose. A small portion is occupied by natives; another & probably the largest portion is still a forest.*

This does not specify where the Hawaiian tenants were living at the time, but based on the claims made for house lots, it appears that most, if not all, were near the coast (Maly 2003).

Six claims for native tenant kuleana parcels were filed for lands in Punahoa 2, in addition to the ahupuaʻa-wide claim by the ABCFM (Table 2). These claims are listed specifically as occurring in Punahoa 2 in the Native Register, Native Testimony, Foreign Testimony, or Land Commission Award documentation. Only three of the Punahoa 2 kuleana claims were awarded, and their locations are shown in Figure 17. These awards went to Apiki for two house lots, one to Aipinepine for one house lot, and one to Puali for an enclosed lot with three houses. One claim for a lot in Punahoa 2 by "John Nomore" was not awarded (it is shaded green in Figure 17.) There appears to have been some confusion over where the ahupuaʻa boundaries were by the time the claims for these lands were made. One lot awarded to Kahalelepo under Claim 3996, was described by him as being located in Punahoa 2, just mauka of "John Nomores" lot. The lot was awarded to Kahalelepo, but under LCAw 4002 and documented as being in Ponahawai.

In Piʻihonua, the situation was similar, with all claims (Table 3) made in the makai portion of the ahupuaʻa. No claims were made in the vicinity of the Project Area in Piʻihonua. In Figure 17, the location of kuleana parcels in Piʻihonua are shaded blue, as well as adjacent Punahoa 1 kuleana awards shaded gray. The map indicates that as late as the 1880s, several traditional ʻili and other smaller land divisions were still intact in downtown Hilo.

While kuleana claims and awards in other ahupuaʻa included ʻapana in mauka agricultural areas, the only kuleana claims in Punahoa 2 and Piʻihonua were for lands makai of Hālaʻi Hill, in what was becoming downtown Hilo. All are house lots, although some lots included kīhāpai (cultivated patches or gardens). This does not necessarily mean that no Hawaiian tenants were using the Project Area before or after the Māhele, but it complicates the search for information about how the Project Area may have been used and by whom.

Table 2 Land Commission Awards and Claims in Punahoa 2

Claim	Claimant	Awarded	Location	Uses	Acres
387-4 part 1	Titus Coan	1849	Ahupuaʻa of Punahoa 2	Ahupuaʻa of Punahoa 2 (note it is called "Punahoa 1" in their claim).	585 makai of woods
2228 & 8629	Kaapa	1851	Punahoa and Ponahawai	2 kīhāpai, 2 dwelling houses	3.9
3769	Apiki k. (for Kahuhu w.)	1851	1. Punahoa 2 at Church Street and beach 2. Punahoa 2 at Church Street and Main Road.	1. House lot, 4 houses, enclosed. 2. 1 house enclosed with a wall	1. 0.68 2. 0.34
3779	Aipinepine	1851	Punahoa 2 makai	1 kīhāpai, 1 house	0.86
3867	Puali	1851	Punahoa 2, on Church Street	3 houses, enclosed	0.70
3996 (awarded as 4002)	Nahalelepo	1851	Punahoa 2 makai in Claim 3996, Award 4002 places it in Ponhawai	1 house	0.875
5320	Asa Kaeo	Not awarded	1. Punahoa 1 2. Punahoa 2 Church Street and the Beach 3. Punahoa 2 Church Street and main Road	1. House lot “for the Chinese” 2. House lot “for the Chinese” 3. House lot	not surveyed
11298	John Nomore	Not awarded	Punahoa 2, at the beach makai of Nahalelepos lot	House lot	not surveyed

Table 3 Land Commission Awards and Claims in Piʻihonua

Claim	Claimant	Awarded	Location	Uses	Acres
11046B	Akina (Ansin)	1852	Makai of Kapiʻolani Street	Contained three buildings; 1 wooden house and a retail store, 1 warehouse, and 1 cook house. Lot was fenced	0.96
4539	Ewaliko	1858	Makai of Kapiʻolani Street	Fenced in and contained four dwellings	0.40
4598:1	Halaki	1856	Makai of Kapiʻolani Street	Fenced lot containing two dwellings	1.81
4598	Hanamaikai	1859	Makai of Kapiʻolani Street		0.37
3994	Haumu	1867	Makai of Kapiʻolani Street	1 large field planted with *kalo* a portion of which was planted by D.B. Lyman for the school. No house or fence.	0.2
571	Cornelius Hoyer	1864	Makai of Kapiʻolani Street	Lot enclosed and containing 1 house	0.75
4894	Kalaeloa	1853	Makai of Kapiʻolani Street	One house and 1 canoe house	2.16
2276	Kuhio	1882	Makai of Kapiʻolani Street	Partly enclosed lot containing 2 dwellings	4.38
1783	Mikaele	1858	Makai of Kapiʻolani Street		4.30
1178	George M. Moore	1849	Makai of Kapiʻolani Street		0.96
2604	Paulo	1853	Makai of Kapiʻolani Street	3 houses	4.49
67	Benjamin Pitman	1849	Makai of Kapiʻolani Street	Merchandise store, dwellinghouse, and other houses used for domestic purposes. Formerly kīhāpai.	1.92
2630	Pohano	1853	Makai of Kapiʻolani Street	Partly enclosed lot, 2 dwellings, 1 field	0.97
3758B	Ulu	1858	Makai of Kapiʻolani Street		1.63

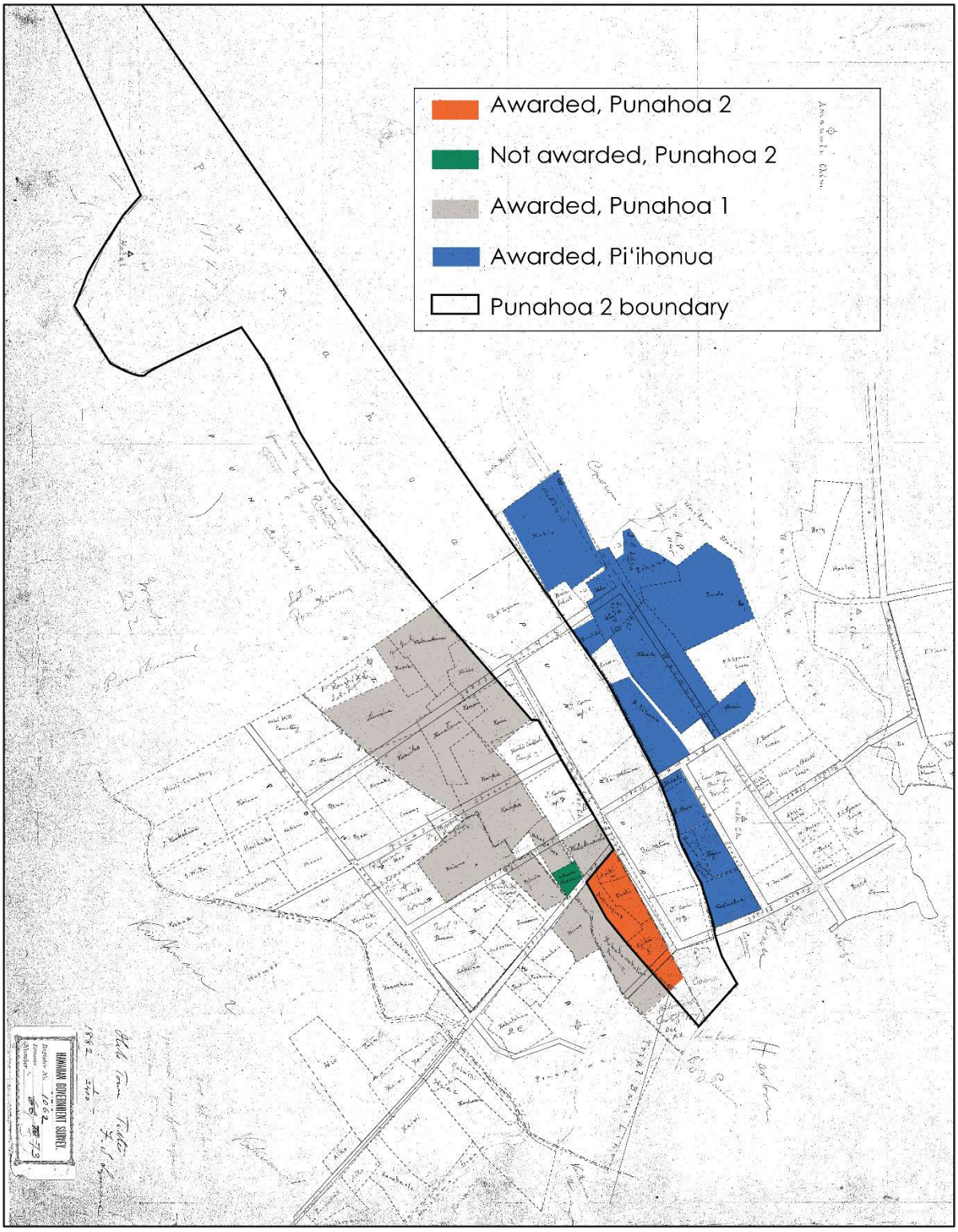


Figure 17. Map of Hilo Town Titles (F. S. Lyman 1882) with kuleana parcels indicated

In 1862, the Commission of Boundaries (Boundary Commission) was established in the Kingdom of Hawaii to legally set the boundaries of all the ahupuaʻa that had been given by name only without surveys during the Māhele. Later, in 1874, the Boundary Commission was authorized to certify the boundaries for lands brought before them, including smaller claims. As a part of this process, the Boundary Commission gathered testimony from informants, who were typically elder kamaʻāina (native-born or one well-acquainted with an area) residents who learned of the boundaries from their ancestors, relatives, or neighbors. The boundary information was collected primarily between 1873 and 1885 and was usually given in Hawaiian and simultaneously transcribed into English. Many of the Boundary Commission hearings held on Hawaiʻi island by Commissioner Rufus Lyman produced detailed descriptions of not only the ahupuaʻa boundaries but also the ways people were using the land. Hearings for most ahupuaʻa boundaries were brought before the Boundary Commission and later surveyed by Government employed surveyors. In some cases, testimonies were not taken, and boundaries were established through a combination of other methods. These methods included using surveys that were conducted on adjacent ahupuaʻa or adjoining smaller parcel that were awarded as LCAw or sold as Royal Patent Grants. Although these small-scale surveys aided in establishing the boundaries, they lack the detailed knowledge of the land that is often found in the Boundary Commission hearings.

Commissioner Lyman conducted hearings for establishing the boundaries of Piʻihonua, in particular to establish its extent in the mauka regions above the current project area. Five native residents, named Kamalo, Manuia, Kamoku, Pilimoku, and Hoikaikaeleele, testified. The descriptions given by them for the portions of the ahupuaʻa near the Project Area, however, do not include many details. For example, testimony given by Koikaikaeleele (k.), a native of Punahoa born at the time of the ʻAinoa (1819), is typical. It states simply that "Punahoa 2nd bounds Piihonua from the shore to a place in the woods called Puuiki," which is located at about 1,000 feet in elevation above the Project Area (Boundary Commission 1874, 26).

Because they had already surveyed the boundaries of Punahoa 2 when they patented their title in 1853, the ABCFM did not submit testimony to the Boundary Commission. A little information about the landscape can be found in the notes to the 1853 survey that are written on a map made from the survey (Figure 18). For example, the survey uses several kukui trees to mark corners of the property. After passing the Hālaʻi Hills, the boundary ascends "to Kukui marked B [on Registered Map 1744]" then to a "stone marked x" and a "stone by stream" and finally to a "pile of stones" located near a kukui grove depicted on the map. On the Punahoa 2 side, at the time of the survey, a road ascended near this boundary, marked with ʻāhua (large cairns) that were also used to demarcate the boundary. The survey also shows that in 1853, the forest boundary was about a mile and half mauka of the project area. Several springs appear on the map made to accompany the survey, along with a small square on the road at the eastern foot of Kupapau Hill. This may be a residence, but it is not labeled on the map. The map, focused as it is on boundaries, also leaves out details about the streams in the area. For example, Ainako Stream is not shown, so it is difficult to understand where the house on the road east of Kupapau Hill really was located.

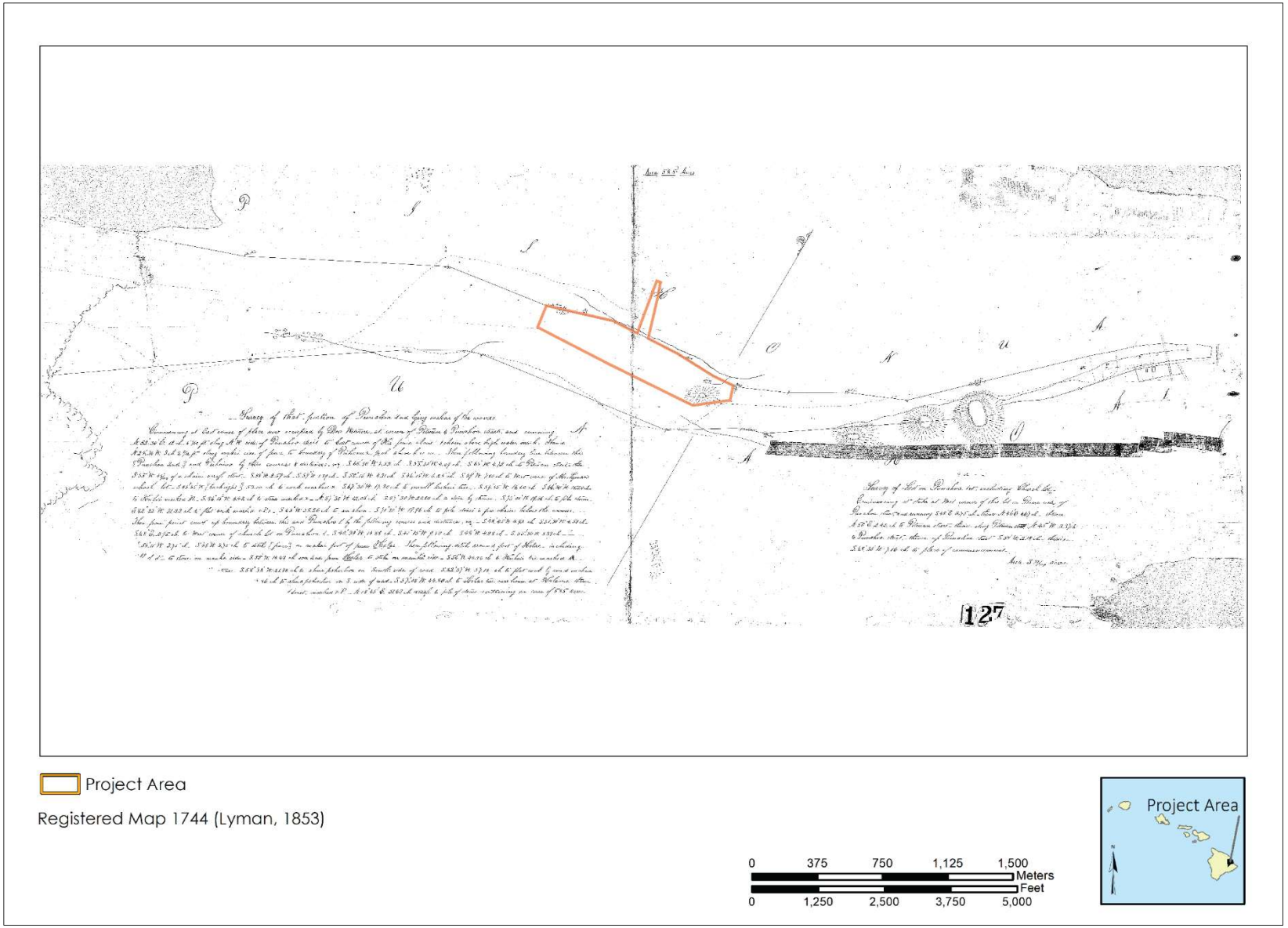


Figure 18. Registered Map 1744 (H. M. Lyman 1853) with the Project Area indicated

6.4.2 WAI AND WATER RIGHTS

The Project Area contains several puna wai (freshwater springs) and tributaries of Ainako Stream. The abundance of wai in Hilo is expressed in several ‘olelo no‘eau published by Mary Kawena Pukui (1983). The sayings quoted below[7] use the abundance of water and streams in Hilo, and the difficulties of crossing them, as a metaphor for challenging situations (Kapuni-Reynolds and Brandt 2023, 22).

> ***‘Au umauma o Hilo i ka wai.***
> *Hilo has breasted the water.*
>
> *To weather the storm. The district of Hilo had many gulches and streams and was difficult to cross. (Pukui 1983, 242)*
>
> ***“Māmā Hilo?” “Ae, māmā Hilo i ka wai ole.”***
> *“Is Hilo light?” “Yes, Hilo is light for lack of water.”*
>
> *A question asked of a runner, and his reply. It means that the way is clear, with no robbers or unpleasant experiences, and no rains to swell the streams and make traveling difficult. (Pukui 1983, 2132)*
>
> ***Pau ke aho i ke kahawai lau o Hilo.***
> *Ones strength is exhausted in crossing the many streams of Hilo.*
>
> *Said of or by one who is weary with effort. First uttered by Hi‘iaka in a chant when she found herself weary after a battle with the lizard god Pana‘ewa. (Pukui 1983, 2609)*

Beyond this metaphorical meaning, the wai within the project area—and in general—is valued for its life-giving and purifying properties (Kapuni-Reynolds and Brandt 2023, 24). The continuous mauka to makai flow of wai provided fresh drinking water, supplied water to irrigated fields and fishponds, recharged groundwater supplies, and sustained productive estuaries and fisheries by transporting nutrients from the uplands to the sea (Sproat 2009). Water is revered as a physical manifestation of Kāne, the procreator akua who was addressed as Kāne-of-the-water-of-life (Kane-ka-wai-ola) (Handy et al. 2020, 24). It is important to remember that:

> *Fresh water as a life-giver was not to the Hawaiians merely a physical element; it had a spiritual connotation. In prayers of thanks and invocations used in offering fruits of the land, and in prayers chanted when planting, and in prayers for rain, the “Water of Life of Kane” is referred to over and over again. Kane—the word means “male” and “husband”—was the embodiment of male procreative energy in fresh water, flowing on or under the earth in springs, in streams and rivers, and falling as rain (and also as sunshine), which gives life to plants. (Handy et al. 2020, 87)*

Fresh water was also associated with Kanaloa, Lono, Ku, and Hi‘iaka, but regardless of all such distinctions, life-giving waters were sacred. Ka‘ao and mo‘olelo explain the presence of puna wai, the springs where freshwater emerges from the ground, as locations where Kāne and Kanaloa stopped to brew their ‘awa (kava, *Piper methysticum*) as they traveled about the islands. These locations, Handy et al. (2020, 87) note, are typically at places where there was no water, and so they needed to open new

[7] Citations refer to the numbered saying in Pukui (1983).

springs. No kaʻao or moʻolelo researched for this study specifically mentioned the origins of the springs in Punahoa, but they produce the water of Kāne, which also flows through the tributaries of Ainako Stream that cross the Project Area.

6.4.2.1 Traditional Water Management

Wai furnishes and satisfies life's needs and is an inalienable public trust resource intimately tied to the traditional Hawaiian world view and nā akua. Handy et al. (2020, 24) state, "Water (wai) was so associated with the idea of bounty that the word for wealth was waiwai. And water rights were the basic form of law, the Hawaiian word for which was ka-na-wai, meaning relative to water." The wealth and value of water was managed through the cultural and social hierarchy that began with nā akua and flowed down to the makaʻāinana. As Handy et al. (2020, 85–86) explain,

> *Inalienable title to water rights in relation to land use is a conception that has no place in old Hawaiian thinking… Water, whether for irrigation, for drinking, or other domestic purposes, was something that "belonged" to Kane-i-ka-wai-ola (Procreator-in-the-water-of-life) and came through the meteorological agency of Lono-makua the Rain-provider…*
>
> *Water, then, like sunlight, as a source of life to land and man, was the possession of no man, even the alii nui or moi. The right to use it depended entirely upon the use of it. So long as a family lived upon and cultivated land, using a given water source, and continued to contribute its share of the labor required to maintain that water source, just so long did it maintain its "right" to that water. If the family did not use it, it no longer had a right to claim it.*

The lower lands of Punahoa, makai of Halaiʻi hill, in particular, lack permanent streams such as Alenaio and Wailoa. At higher elevations, including the Project Area, surface and underground springs feed permanent and intermittent streams that wind their way into the Wailuku. The water in these streams and springs was eventually tapped by the various konohiki of Piʻihonua, Punahoa, and Ponahawai to feed agricultural fields in the lands under their care (Wolforth 1999). A system of branching ʻauwai is said to have been begun by the powerful 17th century Hilo aliʻi named ʻĪ. Before this ditch system, inhabitants of Hilo would come to the Wailuku River, north of the Project Area, to gather water (Kaleioholani quoted in Kelly 1982, 27). The ʻĪ ʻauwai, named after the aliʻi who had it built, brought water from the mauka springs located in the two ahupuaʻa of Punahoa and Piʻihonua down to the coast and fed the many irrigated fields located along its length. It began from a source near Waiale Falls in Punahoa 2, mauka of the Project Area. The creation of this ditch system likely improved agricultural production and household subsistence. Even recently, Piʻihonua residents would keep mullet farms and build loʻi (irrigated kalo patches) off of ʻauwai such as the Piʻihonua Ditch, or natural streams such as those on the state-owned lands north of the Project Area (Leilehua Yuen, quoted in Barna and Rechtman 2015; Ronald Kodani and Doreen Kodani, "Interview with Ronald and Doreen Kodani," July 22, 2025).

Typical irrigation ditches were simply trenches dug in the soil, from the dam in the stream to the area where its water was used (Handy et al. 2020, 83). Where the terrain required it, other engineering techniques were used. For example, when water had to be carried around or along a hillside, typically on terraces if the hillside was steep, the embankment beneath the ditch was often faced with stone part or all the way up. Flumes called "ha-wai" were built to carry water over a depression (Handy et al. 2020, 85).

Versions of these included large bamboos split in half, with the inside node walls cut out to allow for water flow, and long wooden troughs carved like an open-ended canoe hull. The ways in which ‘auwai were constructed, maintained, and managed are described by Nakuina (1893):

> *Auwais, were generally dug from makai—seaward or below—upwards. The konohiki who had the supervision of the work having previously marked out where it would probably enter the stream, the diggers worked up to that point. The different ahupuaas, ilis or kus taking part in the work, furnished men according to the number of cultivators on each land. There was no limit though to the number of laborers any land might furnish, and it often happened that a small ku or ili was sometimes represented in the auwai making by more men than a much larger land or ahupuaa, and would thus become entitled to as much or more water, at the distribution of the water privileges, than were assigned larger tracts.*
>
> *The dams were always a low loose wall of stones with a few clods here and there, high enough only to raise water sufficiently to flow into the auwai, which should enter it at almost a level. No auwai was permitted to take more water than continued to flow in the stream below the dam. It was generally less, for there were those living makai or below the same stream, and drawing water from it, whose rights had to be regarded… Nakuina (1893, 79)*
>
> *Bordering on the upper portions of most auwais are small lois limited in size and number, generally on a hillside, or on the borders of a gulch. These lois are generally awarded kulu or drops; that is, they are entitled to continual driblets of water, and no one having a water share may turn the water entirely away from them unless, in times of scarcity, it should be seen that these lois or loi were full to overflowing. Nakuina (1893, 81)*

Management of the water within an ‘auwai was the kuleana of the konohiki:

> *The konohiki of each independent land subdivided his water time among the holders of mooainas (now kuleanas) on his ahupuaa, ili or ku. (80)*
>
> *Water rights were primarily for lois, that is, for kalo culture. potato patches, bananas or sugar cane had no recognized claim on a water right in the rotation. The cultivation of these, regarded as dry land crops, were invariably during the rainy season except in the Koolau or wet districts. Sugar cane and bananas were almost always planted on loi banks (kuaunas) so as to ensure a sufficiency of moisture from the seepage or ooze between them. (83)*

As for the water that specifically passes through the Project Area, some information about its management was recorded in 1917 during a court hearing over the disposition of water rights in the Hilo Boarding School Ditch, a portion of which passes through the northwestern corner of the Project Area (Figure 19). Solomon P. Kaleoholani, who was born in 1845, began overseeing the distribution of water in the Hilo ditches in 1852, a responsibility he took over from his grandmother. His testimony is reproduced in *Archaeological and Historical Studies for the Alenaio Stream Flood Damage Reduction Study, Hilo, Hawai‘i* by Marion Kelly (1982, 27–28). Kaleioholani was part of a distinguished family. His grandmother was the daughter of George Adams Kuakini V and niece of Governor Kuakini. His mother, Piikea, was the daughter of Kaaikunoku and brother of Charles Kanaina, the father of King Lunalilo. Kaleioholani testified, “My grandmother gave the missionaries the right to dig the ditch for household purposes and my grandmothers people dug this ditch for them, during the time of Goodrich,-this was the time the ditch got

its name of Haalilili" (Kelly 1982, 28). Not only was his grandmother the luna wai (overseer of water), she was also in charge of the land at the time of the Māhele of 1848 and gave the kuleana to different people which they brought before the Land Commissioner. Kaleioholani testified that he inherited charge of the lands and water from her in 1852. In his capacity as luna wai, he would manage the flow of water in the ditch system, sending a person up to the dam at its intake on the Wailuku to ensure the people had their equal rights to the water.

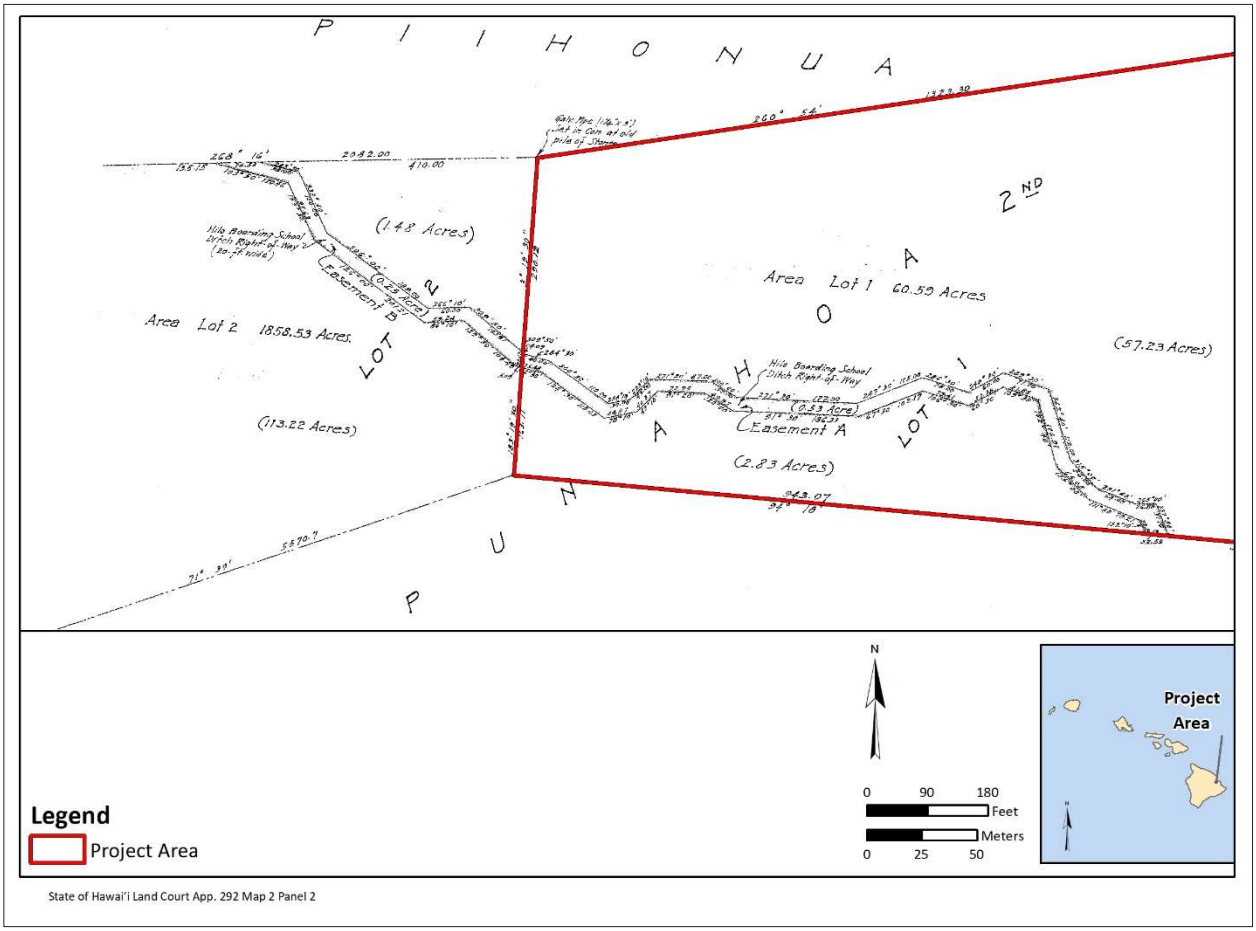


Figure 19. Map of Hilo Boarding School Ditch right of way (Newton 1937)

6.4.2.2 Historical Alterations to Puna Wai (Freshwater Springs)

During the first half of the 20th century, the Project Area became embroiled in a protracted fight over ownership and use of the water from the springs. By that time, the Project Area was owned by the Hawai'i Evangelical Association (HEA), which was the name the ABCFM had reorganized under in 1854. As the sugar industry and the town of Hilo grew, so did the need for clean, fresh water. At the time, the Portuguese Mill flume in Pi'ihonua provided some of the town's water from a source located at about 284 feet above mean sea level. The springs in Pi'ihonua and Punahoa 2 were identified as potential sources, both cleaner and capable of providing more water pressure to the system. In August 1897, a water line

was installed from the spring in Piʻihonua and connected to the city water main under the supervision of Hilo Water Works superintendent Wiliam Vannata (Hawaii Herald 1897). With the spring in Piʻihonua tapped, the County sought to protect it by creating a water reservation around the town's water source at the springs near and in the Project Area, including the springs it owned in Piʻihonua, the springs in Punahoa 2, and the surrounding watershed. In 1905, the boilers on the engines of the Hilo Railroad began to have constant problems with rust (Hilo Tribune 1905). The railroad was using water from the public water mains, which were fed in part by water from these springs. The source of the contamination was found to be a 5-acre field surrounding the Piʻihonua spring where stable manure was being used to fertilize sugarcane. In August of 1910, the County Board of Supervisors passed a resolution to acquire 22.8 acres of land in the Project Area that the Hilo Sugar Company was leasing from the HEA in order to take water out of the spring (Warshauer 2003). The County and the HEA fought over the purchase until 1917, when a condemnation suit brought by the County was settled. The County wound up acquiring about 60 acres instead of the originally intended 22.8, which is the entire County-owned portion of the current Project Area. It should be noted that he earliest reference to these springs as the "Kaumana Springs" appears to be from the 1950s, and that it refers to the springs' location near the junction of the Piʻihonua and Kaūmana Roads (Hawaii Tribune-Herald 1953). All earlier references to the spring call them the Piʻihonua or Punahoa springs.

Having acquired the land and the spring, the County installed a new intake for the water system. An undated map provided by Hawaiʻi County Public Works Department (Figure 20) shows the location of both the "old intake" for the Hilo City Water Works in Piʻihonua just north of the Project Area, and a "new intake" located at the spring in Project Area. A small building is shown at the intake, which is about 100 yards downstream from the spring itself. During the archaeological survey for the current project (Barna 2025), a concrete foundation for a spring building and a water pipe extending from the foundation were found at the spot on the map where the spring is indicated. The spring supplied water into the County system until 1973, when the Piʻihonua Well at Gilbert Carvalho Park was completed and brought online.

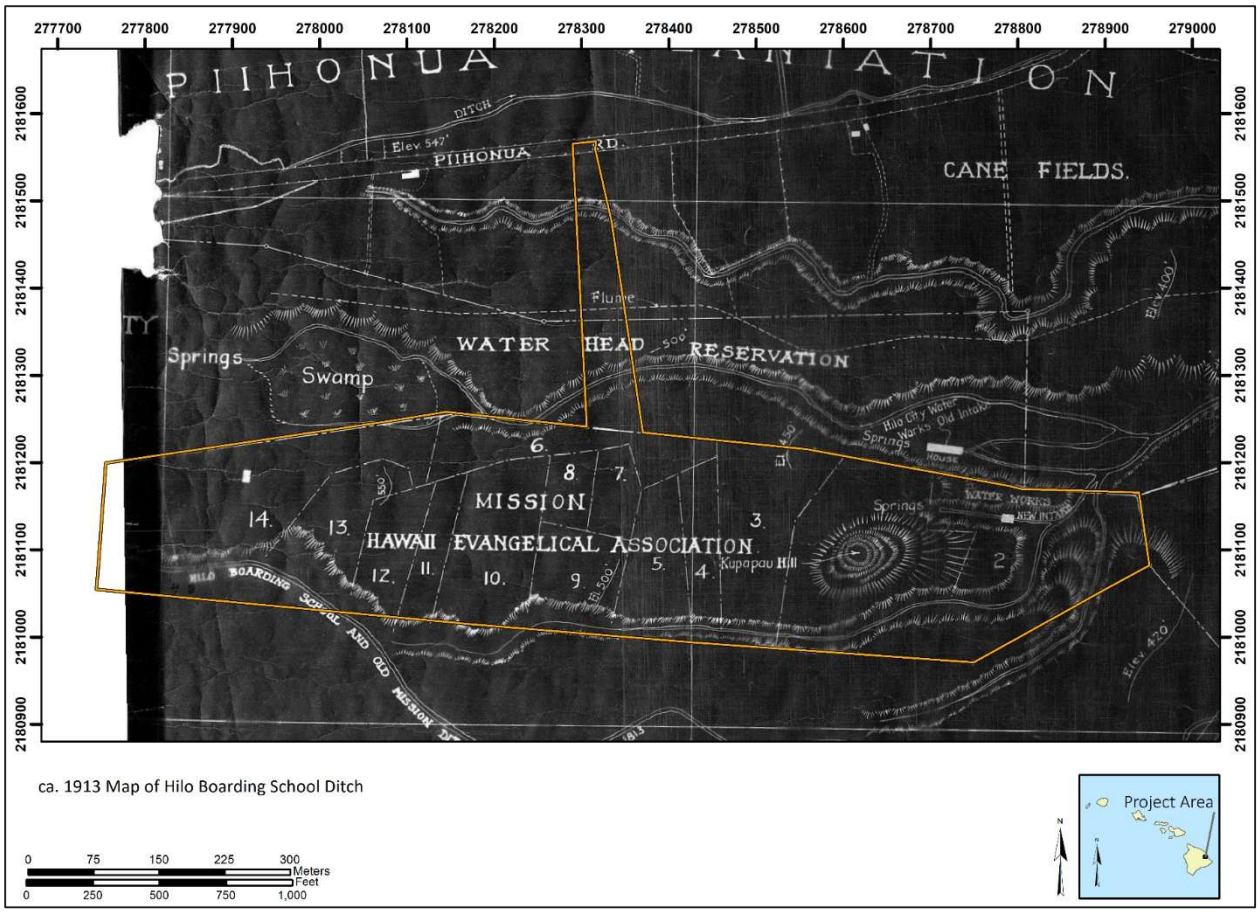


Figure 20. Map of project area circa 1920 with county waterworks and lots indicated. map provided by Hawai‘i County Public Works)

7 Consultation

Consultation included written and in-person communication with knowledgeable individuals and organizations. Table 4 lists the groups and individuals contacted for consultation and the results of the invitations to consult. Responses that were received are summarized below. Information obtained through consultation is incorporated into the text of the CIA report, including background, findings, and analysis.

Table 4 Groups and Individuals Contacted for Consultation

Name	Organization	Contacted	Notes
Kaweni Ibarra	Office of Hawaiian Affairs	March 25, 2025	Received email response
Kevin Sullivan, Kim Tanaka	County of Hawai‘i Planning Department-Cultural Resources Commission	March 25, 2025	Requested a presentation for the commission
Terri Napeahi	Aha Moku Council	March 25, 2025, June 15, 2025	No response
Pi‘ilani Ka‘awaloa	Mokupuni Po‘o, Moku O Keawe, Aha Moku Advisory Committee	June 25, 2025	No response
Jordan Calpito, Christian Omerod	Department of Land and Natural Resources-State Historic Preservation Division, History and Culture Branch	March 25, 2025	Requested submittal via Hawai‘i Cultural Resources Information System, March 27, 2025
Sean Nāleimaile, Nicole Mello	Department of Land and Natural Resources-State Historic Preservation Division, Archaeology Branch	March 25, 2025	Requested submittal via Hawai‘i Cultural Resources Information System, March 27, 2025
Kiersten Faulkner	Historic Hawai‘i Foundation	March 25, 2025, June 15, 2025	No response
Ronald and Doreen Kodani	Pi‘ihonua Hawaiian Homestead Community residents	March 25, 2025, June 15, 2025	Interviewed 7/23/2025
Leileihua Yuen	Punahoa 2 Resident	March 25, 2025	Interviewed 6/17/2025

7.1 Office of Hawaiian Affairs

The OHA was contacted via email on May 16, 2025, and provided with preliminary results of the archaeological survey and background cultural research. A response was received on June 3, 2025, from compliance officer Kaweni Ibarra. In the response, OHA thanked Stantec for providing the documents and commented:

> *In regards to your inquiry about Puu Kupapau, the name does imply that the area is associated with burials. In addition to the association of the nearby boarding school with alii, it is common for chiefly and high ranking burials to be placed in elevated areas, such as this pu‘u. On account of these factors, we recommend consideration of archaeological monitoring at a minimum for all ground disturbing work on this project.*

7.2 State Historic Preservation Division

Informal consultation was conducted with the State Historic Preservation Division via email in March 2025 and consisted of a request for information from the Archaeology Branch and the Burial Sites Specialists in the Hilo Office. SHPD responded by acknowledging the request and asking that the county make a formal submittal in HICRIS. Additional informal consultation in August 2025 was conducted with SHPD Ethnographer Noah Gomes, again by email. Mr. Gomes provided information obtained from a typescript of Theodore Kelsey's notes in the private collection of June Gutmanis. The notes include information from ethnographic interviews that Kelsey conducted around 1918 with Lameka Ahalau, a resident of Piʻihonua Ahupuaʻa who lived were the Hilo High School campus now is. Kelsey and Ahulau took a series of trips in which Ahulau pointed out various places in upper Piʻihonua and especially the Wailuku river. Mr. Gomes shared the following information:

- Ahulau told Kelsey that the inclusive name for the foothills" near "Molo-kioi" is "Ka-lama."
- Mōhihi or Moʻohihi seems to be a name of either the northernmost or middle spring that originates in the "Kaʻūmana Springs" area, as depicted on maps and mentioned in old newspaper articles. Looking at various other sources, it seems that the main stream that currently flows through the ʻĀinakō Subdivision is named either Malokioi or Molokioi, and that its course may have been altered at some point to join with Mōhihi spring and another spring named Waipāhoehoe, whose name dominates the waterflow as the stream continues on through what is now Carvalho Park, and into the Wailuku. There is at least one more spring in the area that converges with these three, whose name I have not found. These springs also seem to have contributed to the ʻIʻauwai system in Piʻihonua and Punahoa.
- Mr. Gomes was unable to find the names Puʻu Kūpapaʻu or Puʻu Ioane in older sources, but he has heard from Kale Langlas that Puʻu Ioane may have been named for Ioane Haʻa, a famous paniolo.
- Kelsey also recorded that there was a place called "Piʻihau" that was a hill on the Puna side of the road to Piʻihonua around the area of Waiānuenue, but Mr. Gomes is not sure exactly where that is or if it refers to Puʻu Kūpapaʻu .

7.3 Leilehua Yuen

Leilehua Yuen is a multigenerational resident of Punahoa 2 and a Hawaiian artisan with a background in hula, music, and storytelling. Dr. Barna met with Ms. Yuen at her home in Punahoa 2 on June 16, 2025, to discuss potential cultural impacts in the project area.

On June 17, 2025, Leileihua Yuen spoke with the author about the project and potential cultural impacts. The interview took place at her house in Punahoa 2.

Topics that were discussed included:

- The area is too wet for sugar, but not too wet for growing taro and ʻuala with mounds.

- Looking at 1931 map, Leilehua noted that the area mauka was mostly used for cattle because it was too wet for other agriculture.
- “Moohihi or Spring.” Could be related to entangling of genealogies—entangling mo’o—or the intermarriage of chiefly families. Or “the moʻo grabs.”
- Thinking about Hinakeahi, could Kupapau Hill maybe have been used for cremating criminals? Maybe cremated with pukiawe wood to destroy the bones? Or maybe removing flesh the pono way?
- Related three stories of how Hilo was named.
- Puʻu Opeʻapeʻa—she said Puupeʻa—and said that luʻau was Lohiau’s favorite dish. To make it, you harvest the young tip of the taro leaves. When they are young and thin, they are like bat’s wings. Taro was grown for that purpose on the puʻu.
- Also mentioned that there used to be many bats at that puʻu, but not as many when she was young. Hilo High School’s lights for the football field attracted insects and especially termite, and that helped increase the number of bats.

Recommendations included:

- Keep development out of ditches and streams.
- She stated a preference or hope that community could care for open space.
- Interpretation at the spring would be a good opportunity to tell the story of the whole aquifer, from Polihale to Hina i ke ahi—story of wai from top to bottom.
- She suggested checking mounds for burials.

7.4 Ronald and Doreen Kodani

Ronald and Doreen Kodani are residents of the Piʻihonua Hawaiian Homestead Community. Both are active in the native Hawaiian community. Ronald has been a director of Hui Mālama Ola Nā ʻŌiwi and a community leader with the Sovereign Council of Hawaiian Homestead Associations and the Piʻihonua Hawaiian Homestead Community Association, among others. Doreen provided childcare as owner and operator of Hilo Keiki Cares for over a decade. They live makai of State-owned parcel.

On July 23, 2025, Ronald and Doreen Kodani spoke with the author about the project and potential cultural impacts. The interview took place at their home in the Piʻihonua Hawaiian Homestead Community.

Topics that were discussed included:

- The history of the Kaumana Springs Wilderness Park and the archaeology survey that was done in 1978.

- Connections between the neighborhood (Puʻu Hina street), Hina, the Wailuku, and the Hina stories.
- History of water in the area, including springs, pipelines, and streams. People used to take water from the area and take it home for drinking.
- Norman Kalima brought loʻi back to grow taro and other crops in the land behind Henderson's. Kalima would tell him about "people who guard the place."
- The name Puʻu Kupapau or Kupapau Hill was not familiar to them, but moʻolelo or mele might have more information.
- Has gathered bamboo and hōʻiʻo from across Ainako Stream near the Project Area. Does not know of others who gather in the Project Area.
- Main concern for the area is gentrification.

Recommendations included:

- Make an effort to notifying neighbors about public meetings and the project, for example, mailing or stopping by in person.
- Reach out to halaus in area, and people living in older neighborhood across Kuamana Drive.

8 Archaeological Resources

A new Archaeological Inventory Survey (AIS) was conducted of the Project Area between March 4 and March 7, 2024, and September 16 through September 20, 2024. The AIS identified portions of two previously recorded archaeological sites and two newly identified archaeological sites.

State Inventory of Historic Places (SIHP) 50-10-35-14947 is the Hilo Boarding School Ditch. A portion of the ditch crosses the northwest corner of the Project Area. The ditch no longer carries water due to grading during the creation of the Ainako Terrace subdivision. Based on portions of the site recorded elsewhere, it was previously determined to be significant (Jensen 1991). Because of its association with the traditional water management system described by Solomon P. Kaleoholani, it is considered to be a traditional Hawaiian cultural resource.

SIHP 50-10-35-18969 is an agricultural site complex previously identified by Sinoto (1978). In the Project Area, 181 individual archaeological features, including 5 complexes with a total of 29 subfeatures, were identified as part of the site. Features included 5 complexes, 2 ditches, 2 enclosures, 23 freestanding walls, 5 modified outcrops, 2 modified springs, 111 mounds, 8 mound/platforms, 2 platforms, 3 retaining wall, 4 rock piles, and 15 terraces. Functions represented by the features included agriculture (n=135), indeterminate (n=20), boundary (n=15), water infrastructure (n=4), habitation (n=3), clearing (n=2), animal pen (n=1), and habitation/agriculture (n=1). Age determinations of most features were hindered by a lack of temporally diagnostic features, and as a result the features were assessed to date to be a mix of Historic (n=70) and Precontact/Historic (n=108) aged features, with three of indeterminate age. Based on correlations with features shown on historic maps and an absence of unequivocally Precontact material culture, SIHP 50-10-35-18696 is interpreted to represent an agricultural landscape last used during the early 20th century for small-scale agriculture and livestock husbandry by at least four different tenants of the HEA. Although the only artifacts found dated to the late 19th and early 20th centuries, the multiple springs in the makai portion of the Project Area almost certainly made it a “persistent place” on the landscape and brought Hawaiians to the area in Precontact times. For example, the earliest known name used for the puʻu in the project area, “Mohihi,” suggests the possibility of sweet potato cultivation as early as the 1840s. Nearly all individual features are damaged by tree roots that have grown into the dry-stacked rock constructions and shallow surrounding soils. Because the site was likely used for traditional Hawaiian cultivation up to and possibly during the early 20th century, it is considered a traditional Hawaiian cultural resource.

SIHP 50-10-35-T1 is a portion of the Hilo City Water Works Kaūmana Springs Intake, including the concrete foundation of a 20th century spring house and a buried water line connected the spring to the town water supply. This site is an example of a developed surface spring used to provide water to Hilo Town during the early 20th century. The spring, as a source of wai, is considered to be a traditional Hawaiian cultural resource, but the 20th-century improvements made to it are not.

SIHP 50-10-35-T2 is the Kupapaʻu Hill Hawaii Triangulation Station and is located at the summit of Kupapaʻu Hill. It was created as part of the effort to use Western land survey techniques, and is not considered to be a traditional Hawaiian cultural resource.

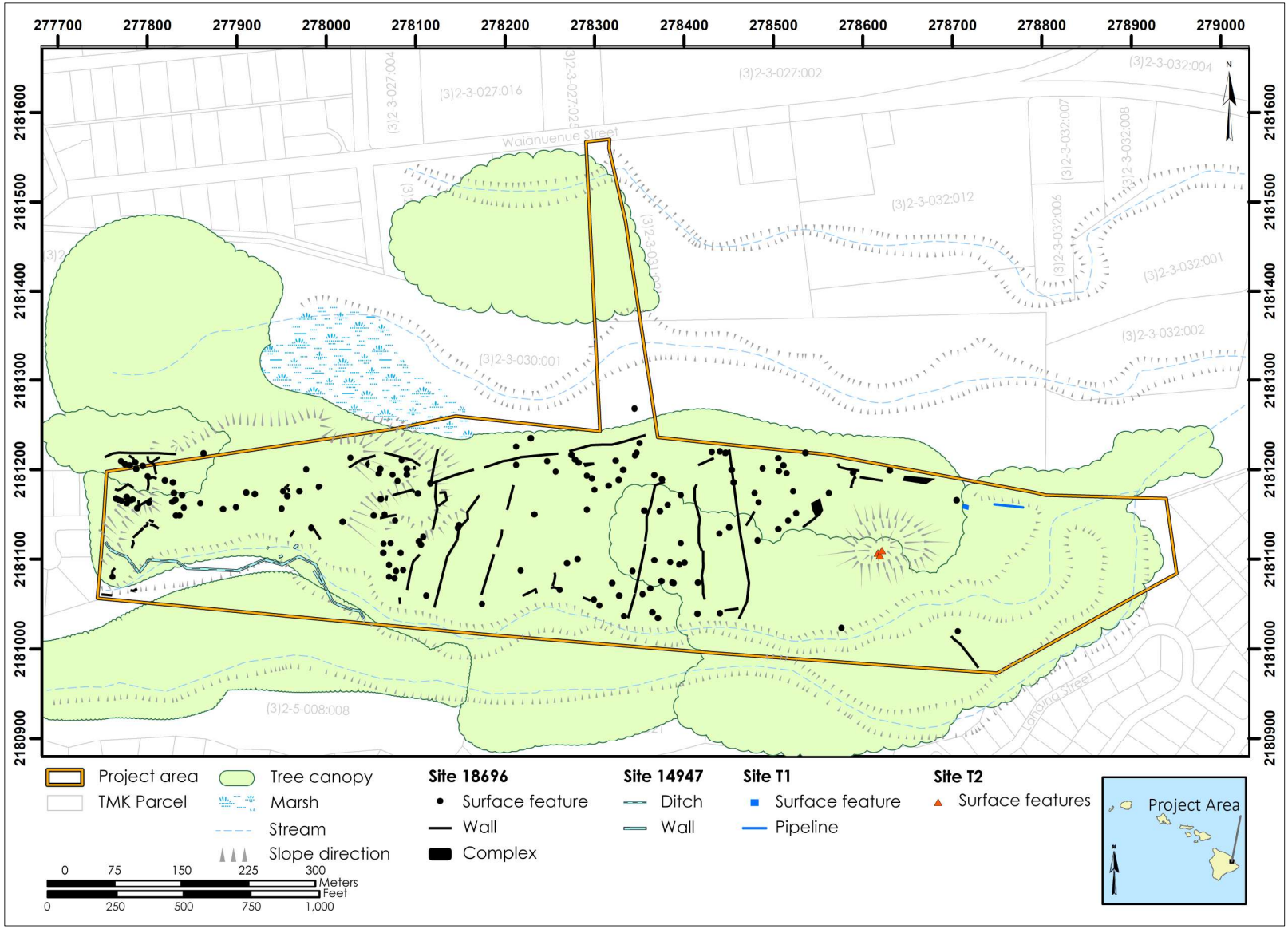


Figure 21. Location of identified archaeological features

9 Ethnobotanical Resources

Ethnobotany is the study of relationships between people and plants. The current study focuses on relationships that are based in traditional Hawaiian cultural knowledge, values, and practices. These relationships between Hawaiians and plants is not simply one of resource-user and resource, but is grounded in their genealogical kinship with their honua ola (living environment) (Maly et al. 2023, 145). Plant species that were found in the Project Area are listed in Table 5 with their known traditional Hawaiian cultural uses. The table was created by checking the plants observed during the botanical survey checked against the Hawaiian Ethnobotany Online Database published by the Bishop Museum (Bishop Museum 2021) and other sources cited in the table. Uncited text in the usage column of the table quotes directly from the database. For English translations of illness or symptoms, see the glossary. The uses included in the table are not necessarily exhaustive. Edible plants that are not endemic, indigenous, or Polynesian introductions are also included because they may be more recently introduced resources that have been incorporated into existing traditional Hawaiian practices.

Table 5 Ethnobotanical Resources in Project Area

Common Name	Scientific Name	Status	Ethnobotanical information
Kukui	*Aleurites moluccana*	PI	**Kino lau** of Kamapuaʻu and symbol of Lono (Handy et al. 2020, 306) **Medicine:** For kuahu, the flowers and endosperm (nut) of the kukui are combined with alaalawainui pehu stems (*Peperomia* spp.), ohia ai bark (*Syzygium malaccense*), akaakai oliana (onion, *Allium cepa*) bulb, noni fruit (*Morinda citrifolia*), kō kea (white sugarcane, *Saccharum officinarum*), and possibly kikania (*Desmodium sandwicense*). Ingredients are mashed and strained, and liquid ingested. For infected sores, including pūhū ʻaʻai, the green flesh of the kukui fruit is cooked in kī leaves (ti, *Cordyline fruticosa*) and combined with ulu sap (*Artocarpus altilis*), powdered ahuawa (*Cyperus javanicus*), and powdered lama (*Diospyros* spp.); the mixture is applied as a salve. For forms of kohepopo, kukui bark is combined with the bark of ohia ai and koa (*Acacia koa*), the leaf buds and stems of alaalawainui pehu (*Peperomia* spp.), the leaves, flowers, and leaf buds of koʻokoʻolau, kohekohe (*Eleocharis* spp.), noni fruits, root bark of the uhaloa (*Waltheria indica*), root bark of the pōpolo (*Solanum americanum*), and kō kea (white sugarcane, *Saccharum officinarum*). For pūʻao pehu, the “shell” (endocarp) is burned and the smoke is used from inside an ipu (gourd). To build strength after an illness, the endocarps (nut meat) are ground, along with cooked kalo (taro, *Colocasia esculenta*), the flesh of kikawaioa (fern, *Christella cyatheoides*); these are eaten with fish and uala poi (sweet potato, *Ipomoea batatas*) with a kookoolau infusion.

Common Name	Scientific Name	Status	Ethnobotanical information
			As a purge, the oil of the kukui endocarp is used, and followed by poi and pia (*Tacca leontopetaloides*) (Chun 1994:170–174). **Non-Medicine**: the light-weight wood can be used for canoes (Abbott 1992, 81; Malo 1951, 21), and house timbers (Handy et al. 2020, 310). The bark for dye and fruits and oil for light (Hillebrand 1888, 400). "Nuts" (oily endosperm) placed inside bamboo as torch (kali kukui) or oil burned in lamps (Abbott 1992:77), fish floats from wood (Degener 1930:197), oil for fishing, polishing. Soot collected on smooth, clean pebbles under which kukui nuts had been burned for tattooing (Abbott 1992, 128; Handy et al. 2020, 310). Dye also from the fleshy part of the green part of fruit also for tattooing (not as good). The "meat" of the seed (endosperm) roasted and eaten as inamona relish (Handy et al. 2020, 309). Endosperm also used in fish bait (Abbott 1992, 85; Krauss 1993, 45) Sap as adhesive (Abbott 1992, 120; Degener 1930, 77), the oil as a polish ((Krauss 1993, 22), oil used to clean birdlime from birds feet (Degener 1930, 290), sticks burned in divining ceremony (Degener 1930, 199). Used for hula altars (Pukui 1942). "Nuts" for lei (Krauss 1993, 79). In the Ethnology Collection at Bishop Museum there are examples of kukui oil used to make kapa waterproof and there is a post-contact example of the wood made into a bowl.
ʻApe	*Alocasia macrorrhizos*	PI	**Medicines**: The meat of the corm used to treat burns and broken skin. A liquid is made from the peeled stem that is used as a purgative for stomachaches. ʻApe leaves used as a wrap to induce sweating for fever reduction (Abbott 1992, 98). Specifically for ʻape eleele, a treatment for ako o ka puka okole i ka maneo i ka naio (from pinworms), the flesh is combined with leaves of the uhaloa (*Waltheria indica*), and green kukui nut flesh (*Aleurites moluccana*), and used as an ointment (Chun 1994, 46). **Non Medicinal Uses**: Corm used as a famine food (Abbott 1992, 43).
Kī, ti	*Cordyline fruticosa*	PI	**Medicines**: Kī has many medicinal uses. For treatment of iaku o ka ihu (nasal growth), kī flowers are combined with rhizomes (underground stems) of ōlena (*Cucurma longa*), ʻawapuhi kuahiwi (*Zingiber zerumbet*), and ʻawapuhi lei (Hedychium coronarium), as well as powdered ʻiliahi (*Santalum* spp.) and naio (*Myoporum sandwicense*). For hano (ho) makau i ke kanaka, kī flowers are added to pith of the amaumau fern (*Sadleria cyatheoides*) and ōkaha (birdsnest fern, *Asplenium nidus*), and taken internally with poi and other foods. Treatment for shortness of

Common Name	Scientific Name	Status	Ethnobotanical information
			breath/asthma (nae, naeoiku, nae hokale ano ōhaohao), kī flowers and leaf buds are mixed with uhaloa root bark (*Waltheria indica*), ʻalaʻala wai nui pehu (*Peperomia* spp.), noni fruit (*Morinda citrifolia*), ʻuala huamoa (sweet potato, *Ipomoea batatas*), possibly pū (squash, Cucurbita spp.), and kō kea (white sugarcane, *Saccharum officinarum*). For phlegm in the chest, umauma hihia paʻakikī i ka male, leaves and leaf buds of the kī is mixed with uala, to cause vomiting. For the illness wela hou ʻole o ke kino (absence of perspiration), kī leaves are wrapped about the head and chest. For illnesses such as hinanawe, hopilo, waiopua, (classes of kohepopo?), the leaves are stripped and worn as a lei. The treatment for naeoiku and waiopua and similar classes of kohepopo illnesses, the leaf buds of the kī are combined with ʻalaʻala wai nui pehu, the aerial roots of the hala (*Pandanus tectorius*), leaf buds from pōpolo (*Solanum americanum*), noni fruit, and kō kea. **Non Medicinal Uses**: Many uses, including leaves as food wrappers in imu and for footwear; the sweet roots baked as a "treat or famine food". Abbott suggests that the term "famine food" for kī may be inappropriate, and says perhaps it was more commonly consumed (1992:41–42). In historic period, distilled into alcoholic beverage, okolehao (Handy *et al.* 1972:222–225). It is of note that Portlock made beer from the boiled roots for curing scurvy; it is possible that this was a forerunner of okolehao, which is distilled in iron pots, hence the name "iron bottom." Degener says that the Hawaiians brewed beverages of low alcoholic content from kī, uala, and kō prior to haole arrival, and that before 1800, they were taught to distill kī by some convicts from Botany Bay, Australia (1930:97). Hillebrand (1888:442) may be the source of this idea—he notes that the natives understood how to make a kind of beer, and later learned to distill it. The leaves are used as thatch, rain capes, symbols of status, plates, instruments, and cups. The stem is used in divining (Handy *et al.* 1972:222–225). Used on hula altars (kuahu) (Emerson 1909:20). Leaves used as healing apparatus, not as medicines themselves: they were wrapped around warm stones to serve as hot packs, used in poultices, and applied to fevered brows (Abbott 1992:101). **Ka Hoʻohana ʻAna** (Look et al. 2013): Leaves are used to thatch shelter. In cooking, the leaves are used to cover food placed in an imu (underground oven), wrap food, and serve food from as platters. Clothing articles such as hula skirts, sandals, and rain capes are made by bundling leaves together. The leaves are also used in lei-making and lashed together to make lava sleds. Kī is used as an important part of religious ceremonies, and when denoting a kapu (forbidden/sacred), it was called kānāwai (law). When

Common Name	Scientific Name	Status	Ethnobotanical information
			raised like a kāhili (feather standard), stalks represented a truce in battle. The plant is used to designate protected persons or places. Only kahuna (high priests) and aliʻi (chiefs) are able to wear leaves around their necks during certain ritual activities. Plants outline borders between properties and are planted at the corners of the home to keep spirits from entering the home or property.
Kalo, taro	*Colocasia esculenta*	PI	Kin relationship between kānaka and kalo (Hāloa) with roots in creation described in the Kumulipo (Bremer et al. 2018). **Medicines**: There are numerous varieties of kalo, some of which are favored over others in medicinal treatments. These include kalo lauloa, kalo apii, kalo mana, kalo hāpuu keokeo, kalo uahiapele, kalo manini, kalo apuwaikeokeo, kalo haokea mana, and kalo piialii (Chun 1994:134). Abbott notes that the cut end of a petiole used to stop wounds from bleeding; stem leaf rubbed on insect bites to prevent swelling & pain; juice consumed to reduce fever. Only uncooked flesh of corm was used in medicines. Raw scrapings from kalo corms were mixed with the juices of kō (sugarcane, *Saccharum officinarum*) and other plants, the mixture then pounded, and the juices squeezed out for ingestion (Abbott 1992:101). **Non Medicinal Uses**: Single most important food plant to Polynesians, early Hawaiians grew 300 varieties, mainly grown for poi production. Poi is produced by steaming (in an underground oven or imu), then mashing and adding water. Also used in religious rituals, as medicine, as bait for opelu fishing, for gluing kapa pieces together, and as a red dye for kapa (Handy et al. 2020, 153).
Hōʻiʻo, Warabi	*Diplazium esculentum*	A	Edible-introduced fern (Palmer 2008). Collected near the Project Area by Ronald Kodani (Ronald Kodani and Doreen Kodani, “Interview with Ronald and Doreen Kodani,” July 22, 2025).
Lychee	*Litchi chinensis*	A	Edible-introduced fruit.
Kamole	*Ludwigia octovalvis*	A	Not in database. Some evening primrose used medicinally or for tea, others for black or yellow dye.
Mango	*Mangifera indica*	A	Edible-introduced fruit.
Maiʻa, Banana	*Musa* sp.	PI	The variety in the Project Area was not confirmed. **Kino lau:** Understood as a kinolau or bodyform of the god Kanaloa, thus a set of kapu surrounded maiʻa plants (see Abbott 1992:37–39, Handy *et al.* 1972:155–167). **Medicines**: There are numerous varieties of maiʻa (banana, *Musa* spp.) that have medicinal uses. These include the use of dried leaves, which are burnt and eaten with poi for intense heart burn. Also, this and hou nui o ke kino (profuse sweating) are treated with palaholo maiʻa, hau keakea bark, Palolo and ʻalaea clays, kō kea, kikawaioa leaf shoots (*Christella*

Common Name	Scientific Name	Status	Ethnobotanical information
			cyatheoidea); this medicine is used in conjunction with koʻokoʻolau and moa nahele tea. Forms of ʻea, pāʻaoʻao, pala, and ʻūkihi are treated with a medicine made of the sap of the flowers and pohuli (root sucker), mixed with sap from green kukui fruits (*Aleurites moluccana*) and hei (papaya, *Carica papaya*). Another variety of maiʻa is used to treat ʻea and pāʻaoʻao, this medicine uses the immature flowers and sheath, with ʻalaea clay, ana (sponge, *Leiodermatium* spp.), and green kukui fruit. For treatment of lepo paʻa (constipation), the fruit is combined with the fruits, flowers, and flower leaf buds of kukui, the sap of hau keakea (*Hibiscus tiliaceus*), ohia ai bark (*Syzygium malaccense*), and kō kea (white sugarcane, *Saccharum officinarum*). This is cooked, strained, and drunk in conjunction with koʻokoʻolau tea (*Bidens* spp.) and broiled koali leaf buds (*Ipomoea* spp.). For some types of kohepopo, ripe buds are combined with ʻuala huamoa (sweet potato variety, *Ipomoea batatas*), noni fruit (*Morinda citrifolia*), niu (coconut, *Cocos nucifera*), ko, and ʻalaea clay. Koali and koʻokoolau tea with moa (*Psilotum nudum*) follow the treatment. Another variation for the treatment of kohepopo uses the sucker roots of the maiʻa with the bark of ʻuhaloa roots (*Waltheria indica*), ʻōhiʻa ʻai and kukui bark, kohekohe (*Eleocharis* spp.), pōpolo (*Solanum americanum*), and kō kea. For bruises linked to ancestors, immature flowers are mixed with pōpolo, squid ink sack, and ʻalaea clay; again, followed with koali and koʻokoʻolau tea with moa. For anal itching associated with pinworms, maiʻa fruit, koali vines, ʻuala mohihi, noni fruit, hau keakea and ʻōhiʻa ʻai bark, and ʻalaea clay and combined, strained and drunk. For forms of nae (shortness of breath), dried leaf ash and sap are used in conjunction with ihi makole buds (*Oxalis* spp.), noni fruit, ʻōhiʻa ʻai bark, kukui endosperm and flowers, niu fruit, ʻalaʻalawainui pehu stems (*Peperomia* spp.), ʻalaea clay, and kō kea. The medicine is taken in combination with luau, poi, and fish and a purgative tea of koʻokoʻolau and moa nahele (Chun 1994:200–210). **Non Medicinal Uses**: Nearly 20 varieties exist today falling into three major groups: maoli, popoulu, and iholena. Maiʻa were not cultivated on a large scale. They were offered in the heiau and other houses of the gods. Three specific varieties were available for women to eat (popoulu, iholena, and kaualau), the rest were forbidden (kapu). Certain varieties (polapola) steamed in an imu and pounded to make a type of poi. Used on hula altars (kuahu), the stalk symbolized a man.

Common Name	Scientific Name	Status	Ethnobotanical information
			Stalks used to line the imu, as canoe rollers or used as a poultice. Fibers of leaves used in lei making. Sap used as a dye, and nectar from flowers used to feed babies. Leaf sheath beaten for kapa or used for sandals but both of poor quality (Lucas 1982: 18).
Lilikoi	*Passiflora edulis*	A	Edible-introduced fruit.
Avocado	*Persea americana*	A	Edible-introduced fruit.
Strawberry Guava	*Psidium cattleianum*	A	Edible-introduced fruit.
Common Guava	*Psidium guajavum*	A	Edible-introduced fruit.
West Indian Raspberry	*Rubus rosifolius*	A	Edible-introduced fruit.
ʻAwapuhi	*Zingiber zerumbet*	PI	**Medicines**: ʻAwapuhi is used as a compress to apply to sore spots, bruises, and cuts; also, for headaches, toothache, ringworm/other skin disease, achy joints/sprains, stomachache (it is said to have anti-inflammatory properties). Ashes from burnt leaves, combined with a mixture of ashes of ʻohe lau liʻi (small-leaved bamboo, *Schizostachyum glaucifolium*) kukui nut sap (*Aleurites moluccana*), and ʻawapuhi tuber sap, provided a remedy for cuts and bruised skin. Underground stems were mashed with salt and rubbed on the head to treat headaches (Abbott 1992, 102; Chun 1994, 61–64). **Non Medicinal Uses**: Sometimes used on kuahu (hula altars) (Pukui 1942). Fragrant, sudsy fluid squeezed out of plant for use as shampoo, the powdered rhizome for scenting kapa, and leaves used to flavor meat (Wagner et al. 1990, 1624).

Note: A = alien, E = endemic, I = indigenous, PI = Polynesian introduction

10 Animal Resources

During the biological survey conducted for the Project, no birds with traditional Hawaiian cultural significance were observed. The only forest bird that is likely to utilize this low-elevation property is the ʻio (Hawaiian hawk, *Buteo solitarius*), but none were observed.

10.1 ʻŌpeʻapeʻa (Hawaiian Hoary Bats)

ʻŌpeʻapeʻa (Hawaiian hoary bats, *Aeorestes semotus*), the only native Hawaiian land mammal, are considered to be manu or "flying creatures" in the Hawaiian world view (Malo 1951; Gomes 2020). Malo (1951) refers to them as nā manu ʻai ʻole or birds that are not eaten. Bats are known to be considered ʻaumakua (ancestral guardians or family deities) by some Hawaiians.

Although none were observed during botanical surveys conducted for the Project (Terry and Hart 2024), it is highly likely that ʻōpeʻapeʻa are sometimes present in the Project Area, especially on the margins with less densely forested properties. They have been found throughout the Island of Hawaiʻi. ʻŌpeʻapeʻa may forage for flying insects on or near the property on a seasonal basis and may also roost in trees and large shrubs. They are often visible while they are feeding on flying insects near dusk and dawn at various locations around the Island of Hawaiʻi. For the purposes of this assessment, it is assumed that ʻōpeʻapeʻa are present in the Project Area at least some of the time.

10.2 Puaʻa (Pigs)

Traditions regarding puaʻa are extensive within Hawaiian culture (Maly et al. n.d.). A very brief discussion of some aspects of these traditions is presented here. Traditional beliefs and practices concerning puaʻa integrated them into the subsistence economy as well as ritual life (Handy et al. 2020, 339). Even the feral pigs, however, were mainly reliant on food and shelter provided by the kauhale (group of houses comprising a Hawaiian home), as native Hawaiian forests did not have large introduced fruits such as mangos and guavas or protein sources such as earthworms to support them as they do today (Maly et al. n.d.). The cultural importance of pigs extended beyond their caloric value. Pork was kapu (forbidden) to women, except during the ʻahaʻaina māwaewae ("clearing the way feast") held 24 hours after childbirth (Pukui et al. 1972, 19). Pigs are kinolau of Lono, akua of agriculture (M. Beckwith 1976). They are also associated with Kamapuaʻa, a kupua (person of extraordinary powers of mind of body) most often seen in either his form as a handsome young man or a pig (sometimes large and sometimes small), is famous for his mischievous adventures (Kameʻeleihiwa 1996; Fornander 1916b, 112–59; 1918, 314–63; Haleole 1863).

Numerous individuals and abundant sign of feral or semi-feral puaʻa (pigs, *Sus scrofa*) were present in the Project Area. Although they are present, and traditionally have a valued place in Hawaiian culture, no consultation participants or archival sources indicate that the puaʻa observed in the Project Area are part of any active cultural practices. For this reason, the feral pigs observed in the Project Area *are not* considered traditional Hawaiian cultural resources for the purposes of this analysis.

11 Summary of Findings

11.1 Resources

11.1.1 WAHI KŪPUNA (PLACES SIGNIFICANT TO KĀNAKA ʻŌIWI)

Within the Project Area, two named places could be considered cultural resources based on references in archival sources. These are the puʻu in the makai portion of the project area and Ainako Stream.

11.1.1.1 Mohihi/Moohihi/Kupapau Hill

The puʻu located in the makai portion of the Project Area has been referred to as "Kupapau Hill" on Hawaiʻi Territorial and other government maps since at least 1901 (most recently as "Kupapaʻu Hill"). On maps made before 1901, the puʻu is referred to as "Mohihi" (in 1849) and "Moohihi" (in 1895). No other recorded references to the puʻu have been found. The significance of the puʻu, based on these place names, could be:

1. As Puʻu Mohihi, a place where mōhihi, a kind of sweet potato that prefers a rainy environment (Handy et al. 2020, 169), was grown. This is based on the 1849 map accompanying the ABCFM's claim for LCAw 387, Part 4, ʻApana 1.

2. As Moohihi, possibly a metaphor of entangled genealogies as in the intermarriage of chiefly families, as suggested by Leilehua Yuen (personal communication, 2025). This name is based on the 1895 map for water head reservation, interpreting the word "Moohihi" as "moʻohihi."

3. As Kupapau Hill, it could mean that the area is associated with burials, as suggested by the OHA during consultation for this CIA. This is based on interpreting "Kupapau" as "kupapaʻu" meaning "corpse" (Pukui and Elbert 1986, 185). Alternately, when pronounced "kūpapau" the name would mean "deeply engaged, as in an activity; finished; engrossed, absorbed, united; all, all together" (Pukui and Elbert 1986, 319). The name is derived from a reference to a surveyor's trigonometry station located "on top of old kupapau" by Erdmann Baldwin (1901b).

The research conducted for this CIA indicates that the puʻu was known as "Mohihi" as early as 1849, but that name stopped being used around 1901 when Erdmann Baldwin referred to the puʻu as an "old kupapau." The current research did not find any other sources that directly name or refer to the puʻu. The significance of the puʻu, based on its name, appears unclear, however, as a part of the natural landscape and ʻāina, the puʻu is considered to have traditional Hawaiian cultural significance.

11.1.1.2 Archaeological Sites

Two of the archaeological sites identified in the Project Area are considered to have traditional Hawaiian cultural significance. SIHP 50-10-35-14947 is the Hilo Boarding School Ditch, which was created as part of a larger network of ʻauwai in Piʻihonua, Punahoa, and Ponahway. From testimony given by Solomon P. Kaleoholani in 1917, it is clear that the ʻauwai was an important part of water distribution that was

maintained through traditional practices into the Territorial period. The Hilo Boarding School Ditch no longer carries water in the Project Area due to alterations made upstream within the Ainako Terrace subdivision. Based on portions of the site recorded elsewhere, it was previously determined to be significant under the State Historic Preservation Division's Criterion "e" for having an important value to the native Hawaiian people due to cultural practices once carried out at the property (Jensen 1991).

SIHP 50-10-35-18969 is an agricultural site complex previously identified by Sinoto (1978). In the Project Area, 181 individual archaeological features were identified as part of the site. As it appears today, the site is interpreted to represent the agricultural landscape left behind during the early 20th century for small-scale agriculture and livestock husbandry by tenants of the HEA. The evidence at the site also indicates that people were maintaining freshwater springs. Although the only artifacts found dated to the late 19th and early 20th centuries, the multiple springs in the makai portion of the Project Area almost certainly made it a "persistent place" on the landscape and brought Hawaiians to the area in Precontact times. For example, the earliest known name used for the puʻu in the project area, "Mohihi," suggests the possibility of sweet potato cultivation as early as the 1840s. Based on their understanding of the name of Kupapau Hill, the OHA has expressed the idea that traditional Hawaiian burials might be possible within the site.

11.1.2 KA WAI (WATER)

Consultation for the current study, along with archival sources and archaeological results, indicates that a major traditional Hawaiian cultural resource in the Project Area is wai, in the form of the freshwater springs and the flow within Ainako Stream and Kaūmana Springs Stream.

Ainako Stream and three of its tributaries flow through the Project Area. The name of this stream appears to derive from the Ainako Subdivision created in 1947 by Hilo Sugar Company. Advertising materials for the subdivision indicate that the subdivision (and therefore the stream) were named after the sugarcane land (the "ainako") cultivated commercially by the plantation. The name of the stream is not mentioned by Solomon P. Kaleoholani in the testimony he gave in 1917 regarding the ditches in Piʻihonua, Punahoa, and Ponahawai. Although the stream's current name does not seem to be a traditional one, the stream as a source of wai or freshwater is considered to have traditional Hawaiian cultural significance. The name of Kaūmana Springs Stream also appears to have originated during the mid-20th century as a reference to the springsʻ location near the junction of the Piʻihonua and Kaūmana roads.

Consultation did not indicate that any particular person or group is using the wai within the project area, but nevertheless this resource is considered critical for the life of the ʻāina, the Hawaiian people, and everyone else dependent on it. The importance of wai is evident from the moʻolelo, mele, and sophisticated water management techniques and wisdom described in Sections 6.1, 6.3, 6.4, 7.2, and 7.3 of this report.

11.1.3 NĀ LĀʻAU (PLANTS)

Within the Project Area, botanical surveys found a few examples of plants with traditional Hawaiian cultural uses. These include ʻape, awapuhi, digitaria, hōʻiʻo, kamole, and kukui. A very small number of plants that represent "feral" or remnant crops were also found. These include, kalo, kī, and maiʻa. Recent

introductions that are edible and candidates for incorporation into gathering practices grounded in traditional gathering rights: avocado, guava, liliko‘i, lychee, mango, strawberry guava, and West Indian raspberry. One interviewee reported gathering hō‘i‘o near the Project Area, but no specific practices in the Project Area involving the plants named above were identified. These particular plants in the project area are considered to be natural resources with traditional Hawaiian cultural importance.

11.1.4 NĀ HOLOHOLONA (ANIMALS)

‘Io (Hawaiian hawks) and ‘ōpe‘ape‘a (Hawaiian hoary bats) are presumed to be present in the Project Area at least some of the time, but were not directly observed. They are considered to be resources with traditional Hawaiian cultural importance that are occasionally present in the Project area.

Feral or semi-feral pua‘a (pigs) were seen in the Project Area, but because no specific practices in the Project Area involving these animals were identified, they are not considered to be resources with traditional Hawaiian cultural importance that are occasionally present in the Project area for the purposes of this analysis.

11.2 Practices

No specific traditional Hawaiian cultural practices were identified that occur within the Project Area. No specific traditional Hawaiian cultural practices were identified that require access to the Project Area.

11.3 Confidential Information That Has Been Withheld from Public Disclosure

No confidential information shared during interviews has been withheld from public disclosure.

11.4 Conflicting Information in Regard to Identified Cultural Resources, Practices, and Beliefs

No conflicting information regarding identified cultural resources, practices, or beliefs was related during the current study.

12 Analysis of Potential Effects

12.1 Proposed physical alteration on cultural resources, practices or beliefs

Development of the Project would require vegetation clearance throughout the development footprint. Construction of the proposed housing development would involve grading to create buildable lots, roadways, utilities, and recreational space. Once the development is occupied, there will be a substantial increase in the number of people, likely both Kānaka ʻŌiwi and otherwise, accessing the area.

The proposed development would not physically alter Mohihi/Moohihi/Kupapau Hill or the area makai of it. The development footprint is designed to incorporate that area as undeveloped open space. No construction-related activities would occur on the puʻu or makai of it. This design also preserves the puna wai (freshwater springs) that are located in the Project Area. The development would tie into the County sewer system for wastewater disposal, which would not result in impacts from wastewater to the puna wai or streams.

Similarly, the development footprint stops before it reaches the tributary of Ainako Stream located along the southern boundary of the Project Area. No alterations to that portion of the stream are proposed. Within the road corridor accessing Waiānuenue Street, the stream tributaries would be crossed with culverts that would allow them to continue to flow. Other surface water flows could be altered by the grading and build out.

Development of the Project would require grading of a substantial portion of the features of the archaeological site complex (SIHP 50-10-35-18969). This would result in the destruction of those features, primarily agricultural clearing mounds and wall remnants.

No rare or protected plants are located in the Project Area, but vegetation clearance could result in the removal of groups of plants or individual plants with traditional Hawaiian cultural significance. Plants located outside of the development footprint would not be altered.

Vegetation removal for the development of the Project could remove habitat that is suitable for ʻōpeʻapeʻa (Hawaiian hoary bat) and ʻio (Hawaiian hawks).

12.2 Potential of the Proposed Action to Isolate Cultural Resources, Practices, or Beliefs From Their Setting

Resources, practices, and beliefs in surrounding area (e.g., Wailuku River corridor and Hālaʻi Hills) would not be isolated by the development of the Project. It is likely that residents of the development, including Hawaiian cultural practitioners, would have increased access to culturally important locations nearby, such as Waiānuenue, Peʻepeʻe Falls, and other places associated with the Hina traditions and the Wailuku River. Resources available in the undeveloped portions of the Project Area would become easier to access from within the development due to the addition of sidewalks and streets.

12.3 Potential of the Proposed Action to Introduce Elements Which May Alter the Setting in Which Cultural Practices Take Place

No active cultural practices were identified within the Project Area.

13 Mitigation Measures

Effects from vegetation clearance would include the removal of plants with traditional Hawaiian cultural uses. The removal of these plants could be mitigated by the creation of community cultural gardens in the planned community center and green spaces within the development. These community cultural gardens could not only replace any specimens of traditionally used plants but could make them available to more people who wish to perpetuate cultural practices with them.

Vegetation clearance could also displace ʻio or ʻōpeʻapeʻa that may frequent the Project Area. To minimize impacts to ʻio, the Project would avoid earthmoving within 100 meters of tall trees or tree cutting during the breeding season for Hawaiian hawks (March through the end of September). If this time period cannot be avoided, the Project would arrange for a hawk nest search to be conducted by a qualified biologist. If hawk nests are present in or near the Project Area, all land clearing activity should cease until the expiration of the breeding and fledging season. To minimize impacts to ʻōpeʻapeʻa, shrubs and trees taller than 15 feet would not be removed or trimmed between June 1 through September 15, and no top-strand barbed wire should be used.

The design of the Project minimizes potential contamination of the wai by the Project by connecting to the County sewer to treat wastewater. The Project would be required to follow county regulations and policies related to flood control and drainage. A drainage study would be prepared prior to the implementation of the Project, with the approval from the Department of Public Works, ensuring that runoff from the Project Area would not be directed toward adjacent properties. Potential impacts to water quality would also be prevented through best management practices during construction and through requirements of the grading plan prepared for the Project.

Effects to wahi kupuna such as the archaeological sites, could be mitigated through a combination of preservation and data recovery. The focus of preservation for the archaeological site would be to integrate examples of the archaeological features that can tell the story of the landscape as it was used during the early 20th century and before. Preservation is recommended for the Hilo Boarding School Ditch (SIHP 50-10-35-14947), which would be located within an undeveloped portion of the Project. Preservation is recommended for select features of the agricultural site complex (SHIP 50-10-35-19686) to convey the history of the Project Area within the context of the proposed subdivision and development. Five archaeological preservation areas with potential for public interpretation are recommended. A proposed “Historic Agricultural Feature Preserve” at the mauka end of the Project Area would focus on the agricultural history of the Project Area. This area would preserve 16 agricultural features representative of the types of features found throughout the site, along with the setting of the portion of the Hilo Boarding School Ditch located in the Project Area. A proposed “Kaūmana Springs Historic Preserve” would be located immediately east of the proposed development area, north of Kupapau Hill. It would focus on preserving and interpreting the modified springs identified in the Project Area. Nine features would be included in this preservation area, including modified springs, as well as surrounding constructed features. Preservation areas focused on historic habitation would be created around Features 03-09 and 05-08. Limited data recovery at these sites could be used to collect more information to aid in public interpretation. In addition to formal preservation of the above named features, the design of open

spaces and parks within the subdivision could incorporate features for passive or informal preservation as well.

Another mitigation measure for effects to the archaeological site would be to conduct Historical Data Recovery. Information gaps remain concerning how the Project Area was managed by the ABCFM, HEA, and County, including the timing of the creation of the 15 historic lots and names of people or families that may have been tenants on the land, and whether those tenants have long-standing genealogical ties to the ʻāina. Additional archival research at the archives consulted for the current study and others may yield this and other information. Results of the research could be made available to the residents and the general public, and could also be incorporated into the final project design, for example, to name public spaces such as parks and the community center.

Archaeological data recovery is also recommended as mitigation to learn more about some of the archaeological features that only have limited interpretation potential. Recovery of archaeological data related to their age and internal structure may add to the discussion of correlations between mound form and age (Clark and Rechtman 2016; Hunt and McDermott 1993).Three of the habitation features in poor condition are recommended for data recovery to focus on research questions related to confirming or refining the age and duration of their occupation. Data recovery is also recommended for an enclosure that is interpreted to be an animal pen, to analyze the soil within and outside of the feature to try to determine what types of animals, if any, were kept in the enclosure.

Archaeological monitoring is also recommended during vegetation clearance prior to development activities. The monitor would be used to help clearance crews avoid damaging preservation and data recovery features, as well as identify features that had been obscured by vegetation during the current field work. Monitoring would also be a safeguard against inadvertent discoveries of archaeological deposits or human burials.

Potential effects of introducing more people to the vicinity of Kupapau Hill and the punawai nearby could be mitigated by public interpretation. The open space planned into the Project is ideal for informing about wai and its cultural importance. The Project could incorporate information about the entire water cycle and its physical and cultural connections to the Project Area. Appropriate signage located in open spaces could tell the story of Hawaiʻi's wai and the waters of Kāne from its origins in the rains and Poliʻahu on Mauna Loa and Mauna Kea, to the streams, springs, and ʻauwai in the Project Area, down to the Wailuku River and Hilo Bay. Local history could also be incorporated at the springs, including the foundation of the spring house located makai of the development footprint.

14 References Cited

Abbott, Isabella Aiona. 1992. *Lāʻau Hawaiʻi, Traditional Hawaiian Uses of Plants*. Bishop Museum Press.

Abbott, Isabella Aiona, and Eleanor Horswill Williamson. 1974. *Limu: An Ethnobotanical Study of Some Edible Hawaiian Seaweeds*. Pacific Tropical Botanical Garden.

Akana, Collette Leimomi, and Kiele Gonzalez. 2015. *Hānau Ka Ua: Hawaiian Rain Names*. Kamehameha Publishing.

Alexander, Arthur C. 1920. "Land Titles and Surveys in Hawaii." *The Hawaiian Planters' Record* XXIII: 67–78.

Andrews, Lorrin. 1865. *A Dictionary of the Hawaiian Language, to Which Is Appended an English-Hawaiian Vocabulary and a Chronological Table of Remarkable Events*. Henry M. Whitney.

Athens, J. Stephen, Timothy Rieth, and Thomas S. Dye. 2014. "A Paleoenvironmental and Archaeological Model-Based Age Estimate for the Colonization of Hawaiʻi." *American Antiquity* 79 (1): 144–55.

Baldwin, E. D. 1901a. *Plan of Proposed Hilo City Waterhead Reservation*. Hawaiʻi Registered Map No. 2058. 1:2,400. http://ags.hawaii.gov/survey/map-search.

Baldwin, E. D. 1901b. *Hilo City Water Head Reservation. Notes of Survey of the Part on Punahoa 2nd*. C.S.F. 1112. Department of Accounting and General Services Survey Division, November 12. http://ags.hawaii.gov/survey/map-search.

Barna, Benjamin. 2025. *Draft Archaeological Inventory Survey for the Ainako Affordable Housing Development Project*. Stantec Project Number 093046. Okahara & Associates, Inc. for.

Barna, Benjamin, and Robert B. Rechtman. 2015. *An Archaeological Inventory Survey of a State-Owned Drainage Easement Across TMK: (3) 2-3-023:006*. ASM Affiliates. Engineering Partners, Inc., Hilo, Hawaii. F:\ASM PROJECTS\24000-25000\24450 - Hilo Boarding School Ditch AIS\Report\Formatted\24450AIS_ben.pdf.

Beamer, Kamanakaikalani, and N. Wahineʻaipohaku Tong. 2016. "The Mahele Did What? Native Interest Remains." Sec. 125. *Hulili: Multidisciplinary Research on Hawaiian Well-Being* 10: 20.

Beckwith, Martha. 1976. *Hawaiian Mythology*. University of Hawaii Press.

Beckwith, Martha Warren. 1917. "Hawaiian Shark Aumakua." *American Anthropologist* N.S. 19: 503–17.

Beckwith, Martha Warren. 1932. *Kepelino's Traditions of Hawaii*. Bernice P. Bishop Museum Bulletin 95. Bishop Museum Press.

Beckwith, Martha Warren. 1951. *The Kumulipo A Hawaiian Creation Chant*. University of Hawaii Press.

Bishop Museum. 2021. "Hawaiian Ethnobotany Online Database." Bishop Museum. http://data.bishopmuseum.org/ethnobotanydb/ethnobotany.php?b=list&o=1.

Blackshear, Roy C. 1947. "First Ainako Home." *Hawaii Tribune-Herald* (Hilo), April 27.

Boundary Commission. 1874. "Boundary Commission Book Vol. B." Microfilm. Reel #1. Hawaiian Reference Collection.

Brandt, Lokelani M. P. 2017. "Through the Lens of the ʻIli Kūpono: Re-Establishing Connections to Piʻopiʻo, Waiākea, Hilo, Hawaiʻi through Ethnohistory, Archaeology, and Community." M.A. Thesis, University of Hawaiʻi at Hilo, Heritage Management.

Bremer, Leah, Kim Falinski, Casey Ching, et al. 2018. "Biocultural Restoration of Traditional Agriculture: Cultural, Environmental, and Economic Outcomes of Loʻi Kalo Restoration in Heʻeia, Oʻahu." *Sustainability* 10 (12): 4502. https://doi.org/10.3390/su10124502.

Buke Māhele. 1848. *Buke Kakau Paa No Ka Mahele Aina i Hooholoia Iwaena o Kamehameha III a Me Na Lii a Me Na Konohiki Ana*. Hale Alii, Honolulu.

Burr, Susan. 2022. *Jurisdictional Waters and Wetlands Survey of TMKs: (3)2-3-030: 004 and (3)2-3-030: 001 (Por.) Ainako, South Hilo, Hawaiʻi*. AECOS Inc. No. 1734.

Case, Emalani M. K. 2015. "I Kahiki Ke Ola: In Kahiki There Is Life Ancestral Memories and Migrations in the New Pacific." Ph.D. Thesis, Victoria University of Wellingtom.

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

Chinen, J. J. 1961. *Original Land Titles in Hawaii*. Privately published.

Chun, Malcolm N. 1994. *Native Hawaiian Medicines*. First People's Productions.

Clark, Matthew R., and Robert B. Rechtman. 2016. *Archaeological Inventory Survey of a Roughly 26-Acre Parcel Located at the Corner of Haihai Street and Ainaola Drive, TMK: (3) 2-4-039:025, Waiākea Ahupuaʻa, South Hilo District, Island of Hawaiʻi*. ASM Affiliates. Roy Sonomura, Hilo, HI.

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

Coulter, John Wesley. 1935. *A Gazetteer of the Territory of Hawaii*. University of Hawaii Research Publications, Number 11. University of Hawaii.

Cuddihy, Linda W., and Charles P. Stone. 1990. *Alteration of Native Hawaiian Vegetation: Effects of Humans, Their Activities, and Introductions.* Cooperative National Park Resources Studies Unit, University of Hawaii, Manoa.

Degener, Otto. 1930. *Illustrated Guide to the More Common or Noteworthy Ferns and Flowering Plants of Hawaii National Park*. Honolulu Star-Bulletin, Ltd. https://hdl.handle.net/2027/uiug.30112009958924.

Edith Kanakaʻole Foundation. 2012. *Ethnohistorical Study of Honohononui, Hilo, Hawaii Island*. Honohononui Kalaninuiʻīamamao. Kamehameha Schools, Land Assets Division, Honolulu.

Emerson, Nathaniel B. 1893. "The Long Voyages of the Ancient Hawaiians." *Papers of the Hawaiian Historical Society Number Five*.

Emerson, Nathaniel B. 1909. *Unwritten Literature of Hawaii*. Smithsonian Institution Bureau of American Ethnology Bulletin 38. Government Printing Office.

Foreign Register. "Register of Claims to Land." Digital Archives of Hawaiʻi. Hawaii State Archives. https://digitalarchives.hawaii.gov/browse/parent/ark:70111/0jD6.

Foreign Testimony. 1964. *Dept. of Land and Natural Res. Foreign Testimony Microfilmed 1964 Originals in State Archives*. Vols. 3, 4, 5, 6, 7, 8, 9. MFL 91–2. Hawaii State Archives. https://digitalarchives.hawaii.gov:8443/documents/3910/663-2.pdf.

Fornander, Abraham. 1878. *An Account of the Polynesian Race: Its Origin and Migrations and the Ancient History of Hte Hawaiian People to the Times of Kamehameha I*. I. Trübner & Co.

Fornander, Abraham. 1916a. *Fornander Collection of Hawaiian Antiquities and Folk-Lore*. IV. Memoirs of the Bernice Pauahi Bishop Museum. Bishop Museum Press.

Fornander, Abraham. 1916b. *Fornander Collection of Hawaiian Antiquities and Folk-Lore*. 9. Bishop Museum Press.

Fornander, Abraham. 1917. *Fornander Collection of Hawaiian Antiquities and Folk-Lore*. Vol. 4. Bishop Museum Press.

Fornander, Abraham. 1918. *Fornander Collection of Hawaiian Antiquities and Folk-Lore*. Memoirs of the Bernice Pauahi Bishop Museum, Volume V. Bishop Museum Press.

Fornander, Abraham. 1919. *Fornander Collection of Hawaiian Antiquities and Folk-Lore*. VI. Memoirs of the Bernice Pauahi Bishop Museum. Bishop Museum Press.

Fornander, Abraham. 1969. *An Account of the Polynesian Race: Its Origins and Migrations, and the Ancient History of the Hawaiian People to the Times of Kamehameha I*. Edited by John F. G. Stokes. Charles Tuttle & Co., Inc.

Garavoy, J. 2005. "'Ua Koe Ke Kuleana o Na Kanaka' (Reserving the Rights of Native Tenants): Integrating Kuleana Rights And Land Trust Priorities in Hawaii." *Harvard Environmental Law Review* 29.

Giambelluca, Thomas W., Qi Chen, Abby G. Frazier, et al. 2013. "Online Rainfall Atlas of Hawaiʻi." *Bulletin of the American Meteorological Society* 94 (3): 313–16. https://doi.org/10.1175/BAMS-D-11-00228.1.

Gomes, Noah. 2020. "Reclaiming Native Hawaiian Knowledge Represented in Bird Taxonomies." *Ethnobiology Letters* 11 (2): 30–43. https://doi.org/10.14237/ebl.11.2.2020.1682.

Gon, Samuel, Stephanie Tom, and Ulalia Woodside. 2018. "'Āina Momona, Honua Au Loli—Productive Lands, Changing World: Using the Hawaiian Footprint to Inform Biocultural Restoration and Future Sustainability in Hawaiʻi." *Sustainability* 10 (10): 3420. https://doi.org/10.3390/su10103420.

Gonschor, Lorenz, and Kamanamaikalani Beamer. 2014. "Toward an Inventory of Ahupuaʻa in the Hawaiian Kingdom: A Survey of Nineteenth- and Early Twentieth-Century Cartographic and Archival Records of the Island of Hawaiʻi." *The Hawaiian Journal of History* 48: 53–87.

Green, Laura. 1926. *Folk-Tales from Hawaii*. Second Series. Edited by Martha Warren Beckwith. Vassar College.

Haleole, S. N. 1863. *Ke Kaao o Laieikawai: Ka Hiwahiwa O Paliuli, Kawahineokaliula*. Henry M. Whitney. http://www.ulukau.org/elib/collect/laiekawai/index/assoc/D0.dir/book.pdf.

Handy, E. S. Craighill, Elizabeth Green Handy, and Mary Kawena Pukui. 2020. *Native Planters in Old Hawaii: Their Life, Lore, and Environment*. Digital. Bernice P. Bishop Museum Bulletin 233. Bishop Museum Press.

Hapai, Charlotte. 1920. *Legends of the Wailuku*. The Charles R. Frazier Company.

Hawaii Herald. 1897. "Local Brevities." *Hawaii Herald* (Hilo, Hawaii), September 2.

Hawaii Tribune-Herald. 1946. "Veterans Village Lots Are Ready; Selections Tonight." *Hawaii Tribune-Herald* (Hilo), November 15.

Hawaii Tribune-Herald. 1953. "Hilo's Water Supply Adequate For Time Being." *Hawaii Tribune-Herald* (Hilo, HI), February 4.

Hillebrand, William. 1888. *Flora of the Hawaiian Islands: A Description of Their Phanerogams and Vascular Cryptogams*. Williams & Norgate.

Hilo Tribune. 1905. "Hilo's Polluted Water." *Hilo Tribune* (Hilo, HI), February 28.

Hilo Tribune-Herald. 1958. "Army to Study Ainako Stream Flood Project." *Hawaii Tribune-Herald* (Hilo), September 26.

Hommon, Robert. 1976. "The Formation of Primitive States in Pre-Contact Hawaii." Ph.D. Dissertation, University of Arizona, Department of Anthropology.

Hunt, Terry, and Matthew J. McDermott. 1993. *Archaeological Inventory Survey Pu'ainako Street Extension Project, Lands of Waiakea, Kukuau 1 and 2, and Ponahawai, South Hilo District, Island of Hawai'i*. Scientific Consultant Services, Inc. Okahara and Associates.

Jensen, Peter. 1991. *Archaeological Inventory Survey Komohana Golf Course, Lands of Ponahawai and Punahoa 1-2, South Hilo District, Island of Hawaii (TMK: 3-2-44:09)*. Paul H. Rosendahl, Ph.D., Inc. 998–021091. KTA Consulting Group c/o The Keith Companies-Hawaii.

Ka Nupepa Kuokoa. 1863. "Moluhi, He Kaao No Hawaii Nei." *Ka Nupepa Kuokoa* (Honolulu), August 29.

Kagawa-Viviani, Aurora. 2016. *Untangling 'Uala: Toward Re-Diversifying and Re-Placing Sweet Potato in the Hawaiian Landscape*. E Kūpaku Ka 'Āina – The Hawai'i Land Restoration Institute.

Kalākaua, L. D. 1888. *The Legends and Myths of Hawaii. The Fables and Folk-Lore of a Strange People*. Charles L. Webster & Company. https://archive.org/details/legendsmythsofha00kala/page/n9.

Kali'uokapa'akai Collective. 2021. *The Kali'uokapa'akai Collective Report: Re-Envisioning Wahi Kūpuna Stewardshipt in Hawai'i*. Kali'uokapa'akai Collective.

Kamakau, S. M. 1866. "Ka moolelo o Kamehameha I: Mokuna III." Sec. 51. *Ka Nupepa Kuokoa* (Honolulu), December 22. V Edition.

Kamakau, S. M. 1867. "Ka Moolelo o Na Ka-Hahana." *Ka Nupepa Kuokoa* (Honolulu), March 16.

Kamakau, S. M. 1869. "Ka Moolelo Hawaii: Helu 3." *Ke Au Okoa* (Honolulu), November 11. Volume V Number 30 Edition.

Kamakau, Samuel M. 1870. "Ka Moolelo Hawaii, Helu 16: No ka loaa ana o ke ahi." *Ke Au Okoa* (Honolulu), February 3. Buke V Helu 42 Edition.

Kamakau, Samuel M. 1976. *The Works of the People of Old, Na Hana a Ka Po'e Kahiko*. B.P. Bishop Museum Special Publication 61. Bishop Museum Press.

Kamakau, Samuel M. 1991. *Tales and Traditions of the People of Old, Nā Mo'olelo a Ka Po'e Kahiko*. Bishop Museum Press.

Kamakau, Samuel M. 1992. *Ruling Chiefs of Hawaii*. Revised. Kamehameha Schools Press.

Kame'eleihiwa, Lilikalā. 1992. *Native Land and Foreign Desires: Ko Hawaii 'Āina a Me Nā Koi Pu'umake a Ka Po'e Haole, Pehea Lā e Pono Ai? How Shall We Live in Harmony?* Bishop Museum Press.

Kame'eleihiwa, Lilikalā. 1996. *He Mo'olelo Ka'ao O Kamapua'a An Annotated Translation of a Hawaiian Epic from Ka Leo O Ka Lāhui June 22, 1891-July 23, 1891*. Bishop Museum Press.

Kapuni-Reynolds, Halena, and Lokelani Brandt. 2023. *Cultural Impact Assessment for the 34 Rainbow Drive Rehabilitation and Master Plan TMK: (3) 2-3-026:008 Pi'ihonua Ahupua'a South Hilo District Island of Hawai'i*. ASM Affiliates 42060.00. Office of Housing and Community Development.

Kelly, Marion. 1982. “Report 1. Background History.” *Archaeological and Historical Studies for the Alenaio Stream Flood Damage Reduction Study, Hilo, Hawai‘i*.

Kelly, Marion, Barry Nakamura, and Dorothy Barrere. 1981. *Hilo Bay: A Chronological History, Land and Water Use In The Hilo Bay Area, Island of Hawai‘i*. Department of Anthropology, Bernice P. Bishop Museum. U.S. Army Engineer District, Honolulu.

Kikiloi, S. Kekuewa. 2010. “Rebirth of an Archipelago: Sustaining a Hawaiian Cultural Identity for People and Homeland.” *Hūlili: Multidisciplinary Research on Hawaiian Well-Being* 6: 73–115.

King, Robert. n.d. “Hawaiian Land Titles.” Manuscript. https://ags.hawaii.gov/wp-content/uploads.

Kirch, Patrick Vinton. 2010. *How Chiefs Became Kings: Divine Kingship and the Rise of Archaic States in Ancient Hawai‘i*. University of California Press.

Kirch, Patrick Vinton. 2011. “When Did the Polynesians Settle Hawai‘i? A Review of 150 Years of Scholarly Inquiry and a Tentative Answer.” *Hawaiian Archaeology* 12: 3–26.

Kirch, Patrick Vinton, and Mark D. McCoy. 2023. *Feathered Gods and Fishhooks: The Archaeology of Ancient Hawai’i*. 2nd revised edition. University of Hawaii Press.

Krauss, Beatrice H. 1993. *Plants in Hawaiian Culture*. A Kolowalu Book. University of Hawaii Press.

Kuykendall, Ralph. 1938. *The Hawaiian Kingdom 1778–1854. Foundation and Transformation*. Vol. 1. University Press of Hawaii.

Liliuokalani, ed. 1978. *The Kumulipo: An Hawaiian Creation Myth*. Pueo Press. https://hdl.handle.net/2027/mdp.39015019965071.

Loebenstein, Alexander B. 1895. *Piihonua Road*. 1:2,400. Registered Map No. 1790. Hawai‘i Land Survey Division.

Look, M. A., K. B. Yamauchi, M. K. Trask-Batti, K. K. Werner, and W. K. Lee. 2013. *Guide to Selected Plants of the Māla Lā‘au Lapa‘au at JABSOM*. Department of Native Hawaiian Health, John A. Burns School of Medicine, University of Hawai‘i at Mānoa.

Lyman, F. S. 1882. *Hilo Town Titles*. Hawai‘i Land Survey Division, Registered Map No. 1062. http://ags.hawaii.gov/survey/map-search.

Lyman, H. M. 1853. *Survey of That Portion of Punahoa 2nd Lying Makai of the Woods*. Registered Map No. 1744. Hawaii Land Survey Division. 1:6336. http://ags.hawaii.gov/survey/map-search.

Malden, C. R. 1841. *Sandwich Islands, Waiakia or Byron Bay on the North-East Side of Owyhee Survyed By Lieut C. R. Malden R.N. 1825*. Hydrographic Office of the Admiralty. https://uwm.edu/libraries/digital-collections/copyright-digcoll/.

Malo, David. 1951. *Hawaiian Antiquities*. Second. Translated by Nathaniel B. Emerson. B. P. Bishop Museum Special Publication 2. B. P. Bishop Museum Press.

Maly, Kepā. 2003. *He Wai Mo‘olelo No Ponahawai A Me Punahoa Ma Hilo: A Collection of Traditions and Historical Accounts for Ponahawai and Punahoa, District of HIlo, Island of Hawai‘i*. Kumu Pono Associates HiPonaha78-051203. Kimura International, Honolulu.

Maly, Kepā, and Onaona Maly. 2003. *Volume I: Ka Hana Lawai‘a A Me Nā Ko‘a O Na Kai ‘Ewalu, A History Of Fishing Practices of the Hawaiian Islands, Compiled From: Native Hawaiian Traditions, Historical Accounts, Government Communications, Kama‘āina Testimony And Ethnography*. Kumu Pono Associates, LLC. The Nature Conservancy.

Maly, Kepā, Onaona Maly, and Trisha Kehaulani Watson. 2023. *Cultural Impact Assessment for the Proposed Facility for Bayfront Highway and Waiānuenue Avenue Intersection Improvements TMKs (3) 2-3-002:022 (Portion); (3) 2-3-002-999 (Portion); (3) 2-3-003:003; (3) 2-3- 003:999 (Portion); and (3) 2-3-005:999 (Portion) Pi’ihonua and Punahoa 2 Ahupua‘a, South Hilo District, Island of Hawai‘i*. Honua Consulting and Kumu Pono Associates. With Julie Au, Matthew Kawaiola Sproat, Christopher Monahan, and Frederick LaChance. State of Hawaii Department of Transportation.

Maly, Kepā, Benton K. Pang, and Charles P.M. Burrows. n.d. *Pigs in Hawai‘i, from Traditional to Modern*. East Maui Watershed Coalition. https://www.eastmauiwatershed.org/wp-content/uploads/2013/01/Puaa-cultural-fact-sheet-04.03.pdf.

McEldowney, Holly. 1979. *Archaeological and Historical Literature Search and Research Design: Lava Flow Control Study, Hilo, Hawai‘i*. Department of Anthropology, B.P. Bishop Museum. The U.S. Army Engineer Division, Pacific Ocean.

Menzies, Archibald. 1920. *Hawaii Nei, 128 Years Ago*. Honolulu, T.H.

Nailiili, S. W. 1865. “Na Ino o Na Makai o Hilo.” *Ke Au Okoa* (Honolulu), July 10.

Nakaa, G. W. 1893. “He moolelo Hawaii: Mokuna II: Ke kumu mua o ko Hawaii nei kanaka.” Sec. 5. *Ka Nupepa Kuokoa* (Honolulu), February 4. XXXII Edition.

Nakuina, Emma. 1893. “Ancient Hawaiian Water Rights and Some of the Customs Pertaining to Them.” In *The Hawaiian Annual 1894*. Press Publishing Company Steam Print. file:///E:/Barna%20Refs/endnote/Barna_Refs.Data/PDF/1360415227/Thrum-%201894%20Hawaiian_Almanac_and_Annual_for.pdf.

National Park Service. 2021. “Nationwide Rivers Inventory.” https://www.nps.gov/subjects/rivers/nationwide-rivers-inventory.htm.

Newton, H. E. 1937. *Land Court, Territory of Hawaii, Subdivision of Land Court Application 292, as Shown on Map 1 Field in the Office of the Assistant Registrar of the Land Court into Lots 1, 2, 3, and 4.* Land Court Application 292 Map 2. Hawai‘i Land Survey Division.

Office of Planning and Sustainable Development. 2025. “Hawai‘i Board on Geographic Names.” Hawaii Statewide GIS Program. https://planning.hawaii.gov/gis/hbgn/.

Palmer, Daniel D. 2008. *Hawai’i’s Ferns and Fern Allies*. Paperback ed. Univ. of Hawai’i Press.

Poepoe, Joseph. 1906. “He Moolelo No Kamehameha I, Ka Na-i Aupuni O Hawaii, Ka Liona, A I Ole, O Ke Pukonakona O Ka Moana Pakipika.” Number 144. *Ka Nai Aupuni* (Honolulu), May 14. Volume I Edition.

Pogue, John F. 1978. *Moolelo of Ancient Hawaii*. Translated by Charles W. Kenn. Topgallant Press.

Pūku‘i, Mary Kawena, and Caroline Curtis. 1985. *Tales of the Menehune*. Rev. ed. Kamehameha Schools Press.

Pukui, Mary Kawena. 1942. *Hawaiian Beliefs and Customs During Birth, Infancy, and Childhood*. Occasional Papers XVI. Bernice P. Bishop Museum.

Pukui, Mary Kawena, ed. 1983. *‘Ōlelo No‘eau: Hawaiian Proverbs & Poetical Sayings*. B. P. Bishop Museum Special Publication 71. Bishop Museum Press.

Pukui, Mary Kawena, and Caroline Curtis. 1996. *Hawai‘i Island Legends: Pīkoi, Pele and Others*. Kamehameha Schools Press.

Pukui, Mary Kawena, and Samuel H. Elbert. 1986. *Hawaiian Dictionary: Hawaiian-English, English-Hawaiian*. Revised and English. University of Hawaii Press.

Pukui, Mary Kawena, Samuel H. Elbert, and Edwin Mo‘okini. 1974. *Place Names of Hawaii*. Revised and Expanded. University of Hawaii Press.

Pukui, Mary Kawena, E. W. Haertig, and Catharine A. Lee. 1972. *Nānā I Ke Kumu (Look to the Source)*. Vol. 2. Hui Hānai.

Rieth, Timothy M., Terry L. Hunt, Carl Lipo, and Janet M. Wilmshurst. 2011. “The 13th Century Polynesian Colonization of Hawai’i Island.” *Journal of Archaeological Science* 38 (10): 2740–49. https://doi.org/10.1016/j.jas.2011.06.017.

Sai, David Keanu. 2011. *Ua Mau Ke Ea Sovereignty Endures: An Overview of the Political and Legal History of the Hawaiian Islands*. Pū‘ā Foundation.

Sherrod, David R., John M. Sinton, Sarah E. Watkins, and Kelly M. Brunt. 2021. *Geologic Map of the State of Hawai‘i*. USGS Numbered Series. Scientific Investigations Map 3143. U.S. Department of the Interior, U.S. Geological Survey. 1:100,000 and 1:250,000. https://doi.org/10.3133/sim3143.

Sinoto, Aki. 1978. *Archaeological Reconnaissance Survey of Proposed Kaumana Springs Wilderness Park. Hilo, Island of Hawaii*. Dept. of Anthropology, B.P. Bishop Museum, Honolulu Ms. 080478. Division of Parks and Recreation County of Hawaii, Hilo, HI.

Soehren, Lloyd. 2005. “A Catalog of Hawai‘i Place Names Compiled from the Records of the Boundary Commission and the Board of Commissioners to Quiet Land Title of the Kingdom of Hawaii. Part 1: Puna and Hilo.” http://ulukau.org/cgi-bin/hpn?

Soehren, Lloyd. 2019. “Hawaiian Place Names.” Ulukau: The Hawaiian Electronic Library. http://ulukau.org/cgi-bin/hpn?

Soil Survey Staff. 2023. “Web Soil Survey.” http://websoilsurvey.nrcs.usda.gov.

Sproat, D. Kapua‘ala. 2009. *Ola I Ka Wai: A Legal Primer for Water Use and Management in Hawai’i*. Ka Huli Ao Center for Excellence in Native Hawaiian Law.

State of Hawaii. 1909. *Laws of the Territory of Hawaii Passed by the Legislature at Its Regular Session*. Hawaiian Gazette Co., LTD.

Stokes, John, and Thomas S. Dye. 1991. *Heiau of the Island of Hawai'i: A Historic Survey of Native Hawaiian Temple Sites*. Bishop Museum Bulletin in Anthropology 2. Bishop Museum Press.

Tatar, E. 1982. *Nineteenth Century Hawaiian Chant*. Pacific Anthropological Records. Department of Anthropology, B.P. Bishop Museum.

Terry, Ron, and Patrick J. Hart. 2024. *Biological Survey TMKs: (3) 2-3-030: 004 & Portions of 2-3-030:001 and 2-3-031:001 Hilo, Island of Hawai'i*. Geometrician Associates, LLC.

Thrum, Thomas G., ed. 1923. *More Hawaiian Folk Tales A Collection of Native Legends and Traditions*. A. C. McClurg & Co.

Towill, R. M. 1947. *Ainako Subdivision Series 2*. File Plan 427. Department of Accounting and General Services Survey Division.

United States Geological Survey. 2025. "USGS TNM Topo Base Map." https://basemap.nationalmap.gov/arcgis/rest/services/USGSTopo/MapServer.

Wagner, Warren Lambert, Derral R. Herbst, and S. H. Sohmer. 1990. *Manual of the Flowering Plants of Hawaii*. Bishop Museum Special Publication 83. University of Hawaii Press : Bishop Museum Press.

Warshauer, Kent. 2003. "Kaumana Springs Once Supplied Hilo with Water." *Hawaii Tribune-Herald* (Hilo, HI), July 3.

Westervelt, William Drake. 1910. *Legends of Ma-Ui--A Demi God of Polynesia and of His Mother Hina*. The Hawaiian Gazette Co., Ltd.

Wilmshurst, Janet, Terry Hunt, Carl Lipo, and Atholl Anderson. 2011. "High-Precision Radiocarbon Dating Shows Recent and Rapid Colonization of East Polynesia." *Proceedings of the National Academy of Sciences* 108: 1815–20.

Winter, Kawika B., Kamanamaikalani Beamer, Mehana Blaich Vaughan, et al. 2018. "The Moku System: Managing Biocultural Resources for Abundance within Social-Ecological Regions in Hawai'i." *Sustainability* 10 (10): 3554. https://doi.org/10.3390/su10103554.

Winter, Kawika B., Noa Kekuewa Lincoln, Fikret Berkes, et al. 2020. "Ecomimicry in Indigenous Resource Management: Optimizing Ecosystem Services to Achieve Resource Abundance, with Examples from Hawai'i." *Ecology and Society* 25 (2): art26. https://doi.org/10.5751/ES-11539-250226.

Wolforth, Thomas R. 1999. *Data Recovery for the Housing Facility at the Hawai'i Community Correctional Center: Investigation into the Network of Ditches in the Hāla'i Region of Hilo. Land of Pi'ihonua, South Hilo District, Island of Hawai'i (TMK:3-2-3-23:Por.5)*. Paul H. Rosendahl, Ph.D., Inc. Architects Hawaii Ltd., Hilo, HI.

APPENDIX A

Appendix A Interview Summaries

A.1 Leilehua Yuen

Notes from talk story with Leilehua Yuen, June 17, 2025
Location: Leilehua Yuen's house in Punahoa 2
Format: Informal talk story. Not recorded.
Interviewed by Benjamin Barna

Interview Summary

The interview began with a brief catching up. Aunty Leilehua and I had met once before in 2017 during a project involving Hilo Intermediate School and ditches in Piʻihonua. We looked at a map of the project area location, and she indicated that she knew the parcel and how overgrown it is. We looked at a current version of the development plan, and I explained the proposed layout of townhomes and flats in lower section, single family homes in upper section, and no development other than sewer pump in makai third of parcel.

Her initial reaction was for the project to "Stay out of ditches and streams." I showed how the development stops above ʻĀinakō Stream. She asked about green spaces and the small park areas in the design. I pointed out the open spaces between units and the community center. She discussed her volunteer work at Lilluokalani Park helping to maintain a fern garden before Parks and Rec had cut the ferns. The ferns were meant to be an example of native ferns. She stated a hope that the community could care for open space in the development in a similar way.

We looked at historic maps, starting with the 1931 Hilo Sugar Co. map. I pointed out pockets of sugar cane fields outside of the water head reservation. She stated that the area is too wet for sugar, but not too wet for growing taro and ʻuala with mounds. She pointed out Puʻu ʻŌpeʻapeʻa (makai of the Project Area) on the map—she used the name Puʻupeʻa—and said that lūʻau (young taro leaves) was Lohiauʼs (the unsuccessful suitor of Pele and Hiʻiaka) favorite dish. She explained that to make lūʻau, you harvest the young tip of the taro leaves. When they are young and thin, they are like batʼs (ʻōpeʻapeʻa) wings. Taro was grown for that purpose on the puʻu, and that is where the name comes from. She also mentioned that there used to be many bats at that puʻu, but not as many when she was young. Hilo High Schoolʼs lights for the football field attracted insects and especially termite, and that helped increase the number of bats. She also mentioned a book titled *Lei and the Fire Goddess* by Malia Maunakea, saying that the book is good but has bats living in caves instead of trees.

Looking at the 1931 map, she noted that the area mauka of the Project Area was mostly used for cattle. Sugar was grown down near the Halaiʻi Hills by people who would sell to the plantations.

She discussed how the house we were in was built in 1932 as a spec house. The builder and family would live in partially completed houses until they were finished and sold, then move on to next. Five generations of her family had lived in the house.

Returning to discussing the land mauka of the Project Area, she said that it was used mostly for cattle, because it was too wet for other agriculture. She recommended contacting two people who might know more about the mauka lands: Kaleo Johnston Kitagawa and Christine Reed.

Talking about the project area, generally, she said that the area is not wet enough for wetland taro, like below at Wailoa. You also couldn't just plant straight in the ground, but would use mounds for taro and sweet potatoes. If the ground was too soggy, you could still grow peʻa (bat taro). To do this, you pile mulch to make mounds, or you could also bundle taro in leaves with mulch inside. You would do this just before the rainy season. It was important to provide drainage. As her grandfather said, a farmer growing these crops needed "to keep their feet dry."

Looking at the project area map, we discussed the west end of the property and the plan to preserve the two lots closest to Kilikina subdivision. I showed maps and photographs of the concentration of rock mounds, and also where the Hilo Boarding Schol ditch crosses the project area.

We then looked at the 1901 map with lot boundaries. We talked about the Hawaii Evangelical Association and how they had the land since about 1827. I said I had seen list of people leasing land from HEA but cannot connect them to specific lots because the property was bigger and included the sugarcane patches on the 1931 map. She suggested looking into the collection at the American Antiquarian Society in Worchester, Massachusetts and showed me a promotional video about their Hawaiʻi collection.

We discussed the water head and springs. I told the story of the County trying to get the spring water from the HEA. I mentioned that the county was thinking about doing historical interpretation at the springhouse foundation and the Hilo Boarding School Ditch. Leilehua said that the interpretation at the spring would be a good opportunity to tell the story of the whole aquifer, from Polihale to Hina i ke ahi, to tell the story of wai from top to bottom.

We discussed how rock mounds and other archaeological features are covered with guava, autograph tree, and alibiza, and that the parcel would need to be cleared of vegetation. Leilehua suggested offering mulch from clearing to community. Tarp it to raise heat to kill pathogens and make it available to truck away.

Discussing rock mounds she suggested checking mounds for burials. This turned the conversation to Kupapau Hill. I showed the 1895 map of the Project Area and the survey station labeled "Moohihi or Spring" on top of the hill. She said that she had not heard that name, and looked up the name in the Hawaiian Place Names collection on Ulukau and found Mookini in Kohala. She thought about the name and suggested that it could be related to entangling of genealogies—hihi meaning entangling and moʻo referring to genealogy—or the intermarriage of chiefly families.

She searched on the Ulukau Nupepa page for Moohihi, and found an instance of it in *Ke Alaula* 2(11):42 1868. [*Author's note: Looking closer at the newspaper scan, it looks like the sentence is actually "Hoohihi maoli ka puu I ka ono; ai me nap ahi, o ki me ka waiu," in an article about Kawaihae, South Kohala*.]

She said the name reminded her of “Koloiki,” the name for Reed’s Island. It was named Koloiki because the chiefly residents there were of sufficient rank to receive the kapu kolo. Lesser ranking people had to bend down (kolo) in their presence, and anyone going to the island had to observe that kapu.

This brought up stories of how Hilo was named. She told three stories:

Kamehameha I lands at Kaipalaoa with canoe to go inland. He has his men watch the canoe. Kamehameha is late returning, so his men go looking for him. They use ti leaves to tie up the canoe by making a rope with hilo (twisted) braiding. They find him, and he asks where canoe is. They explain that they made rope to tie it up using tie leaves. Kamehameha was surprised to hear it because the skill was one from Waipiʻo and did not expect his men to have known it. To remember this, the place was renamed “Hilo.”

The name comes from the panopano—the ao panopano or the thick cloud just above the horizon that can be seen when looking out past Hilo harbor. At sunrise, a thin band of sunlight between the horizon and the ao panopano would shimmer and look like the twists of a hilo-braided cord.

Hilo was a navigator with the kanuna and navigator Paʻao, and harbor and land (district) around it was given to him after he found the way to it.

Looking at Registered Map 1744 from 1853. Noted that it was made to show boundaries, but it does include the puʻu. Leileihua noticed in the written survey notes reference to Punahoa Street. We looked for it on maps of downtown and found it as the alley behind the shops on Kamehameha Avenue between Ponahawai Street and Furneaux Lane. She remembered it as an old path to cut through downtown.

Thinking about Kupapau Hill and the name “moohihi” that was used on the 1859 map again, Leilehua thought maybe the name could mean “the moʻo grabs” and maybe there might be some story about that. Leilehua said she had not heard why it is called Kupapau Hill. We looked at photos of the top of the hill. I pointed out the trig station and the excavated areas. She said she thought she saw a lot of erosion, maybe caused by the trees replacing ground. I mentioned the idea of the hill being used as a lookout during World War II. She said that was done on Halaiʻi Hill and up north at Kapua Heuer’s place where there was a gun emplacement. Thinking about Hina i ke ahi, she wondered if maybe people were burned on Kupapaʻu Hill? For example, maybe cremating criminals with pukiawe wood to destroy the bones. This would be the ultimate form of ostracism to reduce a person to ash and have it blown away, so that not even the mana is left. Or, maybe it was used for removing flesh the pono way?

Wrapping up, she asked that the county do what it can to make the housing and the land available to local people, not people who buy houses but do not live here. Always mālama the land.

A.2 Ronald and Doreen Kodani

Notes from talk story with Ronald and Doreen Kodani, July 23, 2025
Location: Ronald and Doreen's home in Piʻihonua Hawaiian Homesteads
Format: Informal talk story. Not recorded.
Interviewed by Benjamin Barna
Summary of conversation.

Uncle Ronald and Aunty Doreen met me at their house around 9 a.m. on July 23, 2025. I introduced myself and explained that the county of Hawaiʻi is proposing to develop workforce housing on the 60 acres that the county owns in Punahoa 2. I showed them a printout of the topographic map of the Project Area and pointed out where their house is on the map, where Henderson's place is, and then where the project area is back under the albizia.

Uncle Ronald said that we also want to talk to Mathias Kusch, since he was fire chief, lives nearby, and had plans for trails through the wilderness park. Uncle Ronald reminded me that the area was/is the Kaūmana Springs Wilderness Park, and showed me his copy of the 1979 environmental assessment.

Uncle Ronald pointed out the street is called Puʻu Hina, and that the neighborhood was an old Portugese neighborhood. He recommended talking to the woman who lives the second house in on Puʻu Hina (Meg?).

He recommended contacting Timo Sullivan for drone work of the property. Said it really helps show the area.

We talked a little about the Old Hospital [34 Rainbow Drive] project. Doreen and Ronald both said that one thing that could have been done better was notifying neighbors about the meeting and the project. There were neighbors who learned about it by word of mouth. It would be better, the old Hawaiian way, to go door to door with aloha to let them know. Even better if someone from the neighborhood could do this, or someone they already know.

Ronald said he would support the idea of hospital staff housing, blended with senior living. [something about interns] And have a clinic built or visits.

Ronald talked about having lived in Puna for 25 years, and about rising prices and gentrification.

He recommended talking to Donald Ikeda to get support.

Doreen and Ronald recommended talking to Kanoe Lee-Loy (with NRCS).

Ronald said his main concern is gentrification of the neighborhood. He is concerned that with permanent housing, prices will go up and increase tax burden. Temporary housing for hospital staff would be OK. He suggested leasehold as a way to control housing price and prevent gentrification.

We talked a little about water in the area. Ronald showed photos of pipes near Henderson's. We talked a little about water history and how the pipes supplied Hilo and the boilers were corroding from construction. I showed Ronald the Hilo City Watershed Map (Map 4) and told about the case when they traced the polluted water to the Japanese farmer on the state land in the 1890s. He asked if there was cattle in the area and I said there was. The Hilo Sugar Company did not want the land for sugar.

I asked about loʻi in the area, which Ronald had mentioned on the phone when we spoke yesterday. He and Doreen said that the Kalima family would know. Norman Kalima (now deceased) was in charge of the water department. He brought loʻi back to grow taro and other crops behind Henderson's. [Sounds like it is on state land, not county]. Doreen said that Kalima would tell about "people who would guard the place."

Ernest Pang used the lands on the stae side also.

We talked a little about albizia mitigation by Azevedo.

The conversation came back around to history, cultural use, and archaeology. I showed them the 2901 map of the Hilo City Watershed. Said I had two mysteries I have not been able to answer yet. First mystery is Kupapau Hill. I said name could be "corpse hill" and that OHA agreed that it could mean burials nearby. I said the oldest thing I could find using it was the map from 1910. They were not familiar with the name of the puʻu. I said that in my research I have not found anything that seems to refer to it. They suggested I try old Hawaiian documents, since they wrote so much. They suggested using charter school students to translate them.

We talked about the Hālaʻi Hills and the Hina stories. Ronald mentioned again the street is named Puʻu Hina for her and how it the area is very important because of the connection with her and the Wailuku.

We looked at the lot lines on the 1910 map and said that I did not know how old the lots were, or who was leasing. I talked about how the ABCFM had the land beginning in 1827 from Kaʻahumanu and Kamehameha III, and that there are few kuleana claims only at the coast. But the problem is that I do not know who was on the land, but I know some Japanese names were leasing from HEA later on.

He suggested contacting Donovan Preza about translating documents in Hawaiian.

He suggested maybe that the Titus Coan estate had papers about who used the land, and offered to call Kalaniakea Wilson, who might have information or points of contact through his research. Ronald called him, and we talked on speaker phone. I told him I was looking for information about the ABCFM (and HEA) leasing land. He suggested I try the Hawaii Conference, and I said I had talked to them. He offered to help and gave me his email address.

We talked again about Kupapau Hill. Ronald suggested I look into mele and moʻolelo.

We discussed the walls again, and Ronald said he thought they looked like border walls. I agreed, but said my main question is do they match old kīhapai, or were they made by the ABCFM? Ronald said that they could be, the church would need to make money too.

I showed photos of archaeology sites. Doreen asked if they were heiau. I said they are rock mounds and that we thought they look like part of agricultural field—moving rocks to clear the ground to plant. Doreen said that the ones on the "platforms" slide were pretty. Ronald suggested talking to someone who knew more about agriculture. He mentioned some heiau that were stepped on the sides.

Doreen talked about an aunty who came from Tahiti. We talked about how some people say Kamehameha was from there and his name was originally with a "T."

He talked about heiau that were built not with ʻāʻā but with sea rocks. That he knew about two in Hawaiʻi and one in Peru. We talked about South America and Kon Tiki, that people came from both ways. I said that archaeology research on chickens and ʻuala show that those came from South America and probably because Polynesians sailed all the way over. Ronald talked about an idea of his to have Pacific Rim canoe races, all of the Pacific Rim because they all have sailing traditions.

I compared Sinoto map with ours and explained how they had only been out there 2 days and had trouble getting through the uluhe in a lot of places. That we found more things and knew where we were better than they did.

I said I know people were there at the turn of the century, 125 years ago, maybe 140, but at this point I cannot tell. With more budget I would like to do radiocarbon dating to see if we can tell about the house foundations and some of the other mounds.

We talked about the springs. Ronald showed photographs of water pipes near Henderson's. I said those were on the state land, not the county, but the county did have pipes. I showed them Registered Map 2058 and told about the foundation from the spring house. He said he would like to have the right to tap into the water in the springs. He told how the Kalima family would have a pipe straight out of the stream, and that the water was the sweetest water he ever tasted. The Kalimas had the water piped straight to their house, even though they also had catchment. Doreen said that people would take water from the area and take it home for drinking. Ronald talked about an idea to bottle water from the springs to sell to vacation rentals, like Fiji water, the most expensive brand.

I brought the idea of Hawaiian cultural resources and practices, and asked about any related to water. They said let it do its regular course. He said again that there used to be loʻi behind Henderson's, and took me outside to show me where.

Ronald and I went into his backyard and pointed out the invasive species and a fallen tree in the stream (his property backs up to ʻĀinakō Stream). He pointed to an albizia on the Punahoa side of his lot that he is concerned will fall. He said he used to go back into the area to cut bamboo, but also to get hōʻiʻo.

Back inside, we talked a little more about what Doreen and Ronald would support—senior living for the project because there is not enough.

I asked one more time if they knew of anyone who goes into the county land or behind Henderson's for cultural practices or to gather. Doreen talked about neighbors swimming near the small waterfall on ʻĀinakō Stream.

Doreen and Robert also suggested talking to a woman who was a nursing professor living near the 7-11. Doreen suggested getting in touch with the halaus around the area. They also suggested asking at Haili Church, where there could be old timers who know the stories up there, and at the Haili Senior Living.

As the interview ended, Robert stressed that the thing they most want is to not gentrify the area.

Appendix 5

Archaeological Inventory Survey

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Stantec

ARCHAEOLOGICAL INVENTORY SURVEY FOR THE AINAKO AFFORDABLE HOUSING DEVELOPMENT PROJECT

Tax Map Key (3) 2-3-030 :001(por.), 004, and (3) 2-3-031:001 (por.)

October 1, 2025

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A.SIHP 50-10-35-18696 Features in the Project Area 231

Executive Summary

At the request of Okahara and Associates, on behalf of the Hawai‘i County Office of Housing and Community Development (“OHCD”), Stantec GS Inc. (“Stantec”) conducted an Archaeological Inventory Survey (“AIS”) for the proposed Ainako Development Project (“the Project”) of an approximately 72 acre project area located in the two ahupua‘a of Punahoa 2nd and Pi‘ihonua, South Hilo District, Island of Hawai‘i. The Project Area includes Tax Map Key (“TMK”) (3) 2-3-030:004, which is owned by Hawai‘i County, and a proposed road corridor easement that extends from Waianuenue Avenue across two State-owned parcels (TMKs: (3) 2-3-030:001 and 2-3-031:001) onto the County-owned parcel. The OHCD proposes to develop a portion of the Project Area for a workforce housing project, and to construct a new road in the proposed road corridor.

Background research included archival research conducted using sources from various physical and digital repositories, and through consultation with groups and individuals with knowledge of the Project Area and its history. This research indicated a history of agricultural use in the Project Area and historical incidents related to the protection and expansion of the Hilo town water supply in the early 20th century.

The Project Area was included in a prior archaeological reconnaissance survey conducted by the Bishop Museum in 1978 as part of a larger study area associated with the County of Hawai‘i, Department of Parks and Recreation proposed development of the Kaumana Springs Wilderness Park. The survey identified six clusters of archaeological features that were interpreted as exhibiting characteristics that are “more typical of prehistoric construction than of historic construction.”

Archaeological fieldwork for the current AIS consisted of a 100% coverage pedestrian survey. No systematic subsurface testing was conducted due to generally shallow, but variable sediment and soil accumulations throughout the Project Area and the presence of numerous surface features suggestive of agricultural clearing. The current archaeological fieldwork identified portions of two previously recorded archaeological sites (SIHP 50-10-35-14047 and SIHP 50-10-35-18696) and two newly identified archaeological sites. A total of 212 archaeological features were identified.

SIHP 50-10-35-14947 is the Hilo Boarding School Ditch. Within the current Project Area, five features associated with the Hilo Boarding School Ditch were identified. Based on portions of the site recorded elsewhere, it was previously determined to be significant under Criteria “a”, “b”, “c”, “d”, and “e” (Jensen 1991). The portion of site in the Project Area retains sufficient integrity in all relevant categories to contribute to the site’s significance under Criteria "a”, “b”, “c”, and “e”. It is recommended for preservation.

SIHP 50-10-35-18696 is an agricultural site complex previously identified by Sinoto (1978). In the Project Area, 181 individual archaeological features, including 5 complexes with a total of 29 subfeatures, were identified as part of the site. Features included 5 complexes, 2 ditches, 2 enclosures, 23 freestanding walls, 5 modified outcrops, 2 modified springs, 111 mounds, 8 mound/platforms, 2 platforms, 3 retaining wall, 4 rock piles, and 15 terraces. Functions represented by the features included agriculture (n=135), indeterminate (n=20), boundary (n=15), water infrastructure (n=4), habitation (n=3), clearing (n=2), animal pen (n=1), and habitation/agriculture (n=1). Age determinations of most features were hindered by a lack

of temporally diagnostic features, and as a result the ages of the features were assessed to be a mix of Historic (n=70) and Precontact/Historic (n=108) aged features, with 3 of indeterminate age. Based on correlations with features shown on historic maps and an absence of unequivocally Precontact material culture, SIHP 50-10-35-18696 is interpreted to represent an agricultural landscape last used during the early 20th century for small-scale agricuture and livestock husbandry by at least four different tenants of the Hawai‘i Evangelical Association (HEA). Although no clear archaeological evidence of Precontact use of the site was identified, the multiple springs in the makai portion of the Project Area area almost certainly made it a “persistent place” on the landscape and brought Hawaiians to the area. Nearly all individual features have some amount of damage from tree roots growing in the dry-stacked rock constructions and shallow surrounding soils. The portion of site in the Project Area retains sufficient integrity in all relevant categories to contribute to the site’s significance. The site is recommended significant under Criteria “a” and “d.” A mix of preservation and data recovery is recommended for selected features of this site.

SIHP 50-10-35-T1 is a portion of the Hilo City Water Works Kaūmana Springs Intake, including the concrete foundation of a 20th century spring house and a buried water line connected the spring to the town water supply. The site is in generally fair condition. It is significant under Criterion “a”. It is recommended for preservation.

SIHP 50-10-35-T2 is the Kupapau Hill Hawaii Triangulation Station is located at the summit of Kupapau Hill. It is not recommended significant under any criterion.

The current AIS was undertaken to provide information to facilitate the Hawai‘i Revised Statutes (“HRS”) section 6E-8, review of the Project by the Department of Land and Natural Resources-State Historic Preservation Division (“DLNR-SHPD”) in accordance with Hawai‘i Administrative Rules (“HAR”) section 13-275, as well as to inform the HRS chapter 343, environmental impact assessment of the project. The AIS was conducted in accordance with the *Rules Governing Standards for Archaeological Inventory Surveys and Reports* as contained in HAR section 13-276.

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Acronyms / Abbreviations

AIS	Archaeological Inventory Survey
amsl	above mean sea level
cm	centimeters
DLNR-SHPD	Department of Land and Natural Resources-State Historic Preservation Division
GPS	Global Positioning System
HAR	Hawai‘i Administrative Rules
HEA	Hawai‘i Evangelical Association
HRS	Hawai‘i Revised Statutes
LCAw	Land Commission Award
LiDAR	Light Direction and Ranging
m	meters
OHCD	Hawai‘i County Office of Housing and Development
SIHP	State Inventory of Historic Places
Stantec	Stantec GS, Inc.
TMK	Tax Map Key

Glossary

Meanings of terms in ʻolelo Hawaiʻi listed below are generally derived from Pukui and Elbert's (1986) *Hawaiian Dictionary*. Sources used to elaborate on more specialized terms are cited in the list.

ʻauwai	The artificial diversion of "a flow" of fresh water by means of a ditch or channel, for purposes of domestic use and irrigation, is ʻauwai (au meaning a flow or current) (Handy et al. 2020:77)
ahupuaʻa	Land division smaller than a moku (district) and made up of several ʻili (smaller divisions) and under care of a konohiki (chief having charge of the land on behalf of the king of chief to whom the land was assigned or awarded) (Lucas 1995)
ʻāina	Land, earth, "that which feeds"
aliʻi	Chief, chiefess
ʻaumakua (ancestral deity),	Family or personal gods, deified ancestors who might assume the shape of animals or plants
hale	House or building
hānai holoholona	Animal husbandry
ha-wai	Flume (Handy et al. 2020:85)
ʻili ʻili	Pebble
ʻili kūpono	Politically independent subdivision within an ahupuaʻa (Lucas 1995)
imu	Underground oven
kamaʻāina	"Child of the land"; someone native born or one well-acquainted with an area
kanu kipi	Creating mounds of soil in marshy land for planting (Handy et al. 2020:747)
kapu	Taboo, restriction; the "kapu system" refers to the social-religious-political structures of traditional Hawaiian culture
kauhale	Group of houses comprising a Hawaiian home, formerly consisting of men's eating house, women's eating house, sleeping house, cook-house, canoe house, etc.
kīhāpai	Small land division, cultivated patch, garden, orchard, field, small farm
konohiki	Chief having charge of the land on behalf of the king of chief to whom the land was assigned or awarded (Lucas 1995)
kū	Standing upright
kula	Plains or sloping land, generally grassland a few stunted trees and shrubs (Handy et al. 2020:74)
kuleana	Generally, rights and responsibilities; kuleana parcels are those claimed after the Enabling Act of 1850 by tenants asserting rights to them (Garavoy 2005)
loʻi	Irrigated taro patch
māhele	A portion, division, section, etc. The division of lands in 1848 among the mōʻī, aliʻi, and government is referred to as the māhele of 1848, previously as "the great māhele"
makaʻāinana	Commoners in traditional Hawaiian culture
makai	Toward the sea
mana	Divine power
mauka	Toward the mountains
Mōʻī	King, sovereign, monarch, majesty, ruler, queen
moku	Land division larger than an ahupuaʻa, a "social-ecological region" roughly equivalent to a modern "district", stewarded by an aliʻi ʻai moku (Beamer and Tong 2016)

moʻolelo	Native traditions and historical accounts
ʻolelo Hawaiʻi	Hawaiian language
oli	Traditional Hawaiian language chant that was not danced to
one	Sand, sandy
pāhoehoe	Basaltic lava that has a smooth, hummocky, or ropy surface. A pahoehoe flow typically advances as a series of small lobes and toes that continually break out from a cooled crust.
pali	Cliff
puʻuhonua	Places of refuge
puna wai	Freshwater spring
puʻu	Geographically, a hill, peak, or cinder cone
wai	Fresh water

1 Introduction

At the request of Okahara and Associates, on behalf of the Hawai‘i County Office of Housing and Community Development (“OHCD”), Stantec GS Inc. (“Stantec”) conducted an Archaeological Inventory Survey (“AIS”) for a proposed workforce housing development (“the Project”) within an approximately 72 acre area (“the Project Area”) located in the two ahupua‘a of Punahoa 2nd and Pi‘ihonua, South Hilo District, Island of Hawai‘i (Figure 1). The Project Area includesTax Map Key (“TMK”) (3) 2-3-030:004, which is owned by Hawai‘i County, and a proposed road corridor easement that extends from Waianuenue Avenue across two State-owned parcels (TMKs: (3) 2-3-030:001 and 2-3-031:001) onto the County-owned parcel (Figure 2). The OHCD proposes to develop a portion of the Project Area for a workforce housing project, and to construct a new road in the proposed road corridor. The proposed project would consist of infrastructure development of single-family and multi-family housing with phased construction to accommodate timing of funding and housing demand. Phase 1 (pictured at right in Figure 3) would include construction of up to 82 townhomes and 28 flats (110 residential units) in about the middle third of the Project Area mauka of Kupapau Hill. Phase 2 (pictured at left in in Figure 3) would include up to 34 single-family units. The total number of units would be up to 144 at final build-out.

The current AIS was undertaken to provide information to facilitate the §6E-8, Hawai‘i Revised Statutes (“HRS”) review of the Project by the Department of Land and Natural Resources-State Historic Preservation Division (“DLNR-SHPD”) in accordance with Hawai‘i Administrative Rules (“HAR”) §13-275, as well as to inform the §343, HRS environmental impact assessment of the project. The AIS was conducted in accordance with the *Rules Governing Standards for Archaeological Inventory Surveys and Reports* as contained in HAR §13-276. This report presents information regarding the proposed project and the scope of work for the current AIS, a description of the project area environment, the results of background research including historic and archaeological contexts, consultation, and the current survey expectations based on that prior work, followed by an explanation of the archaeological field survey methods, a description of the field findings, the presentation of significance assessments and treatment recommendations for the documented historic properties, and recommendations including project effect and mitigation commitments.

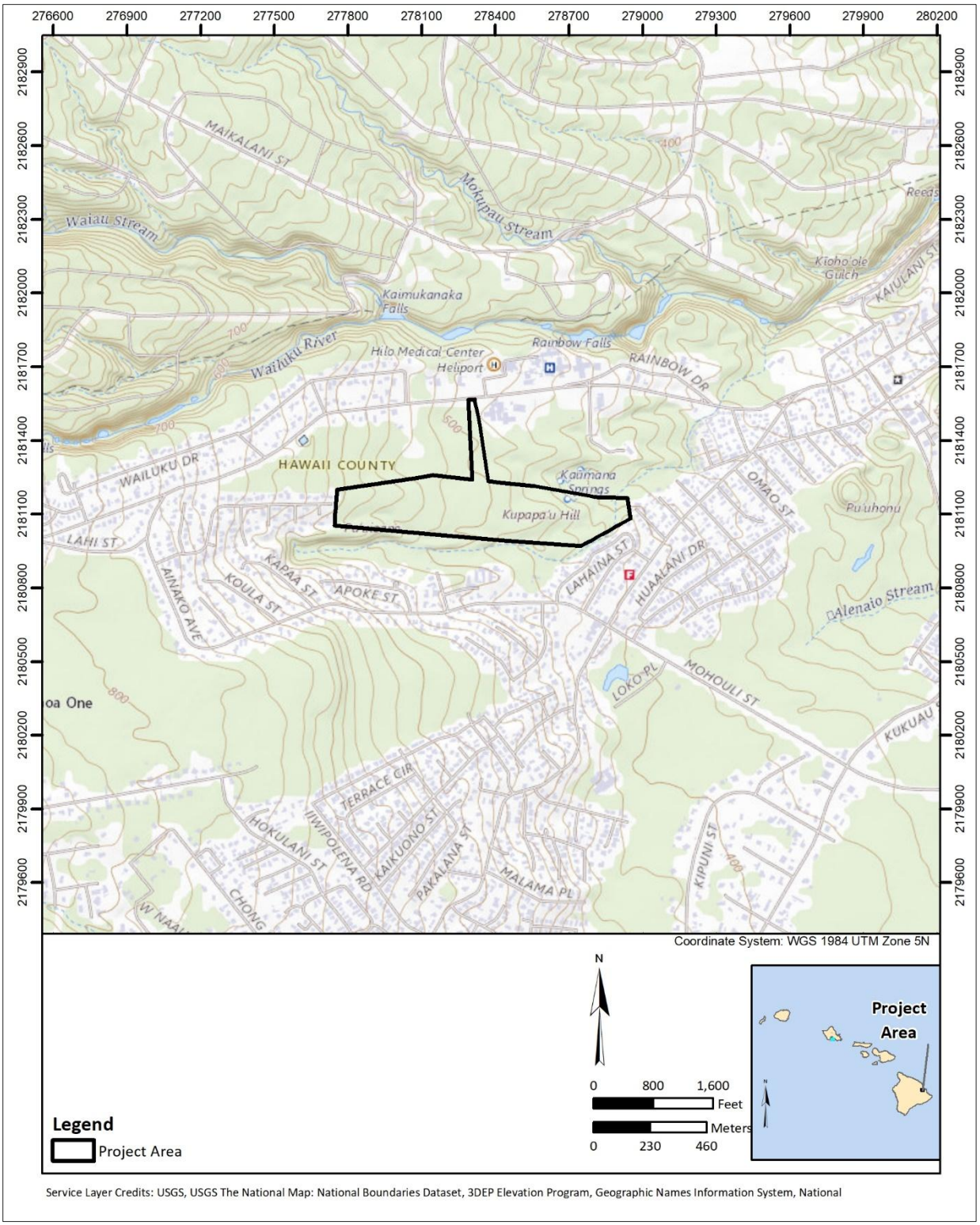

Figure 1. Project area location.

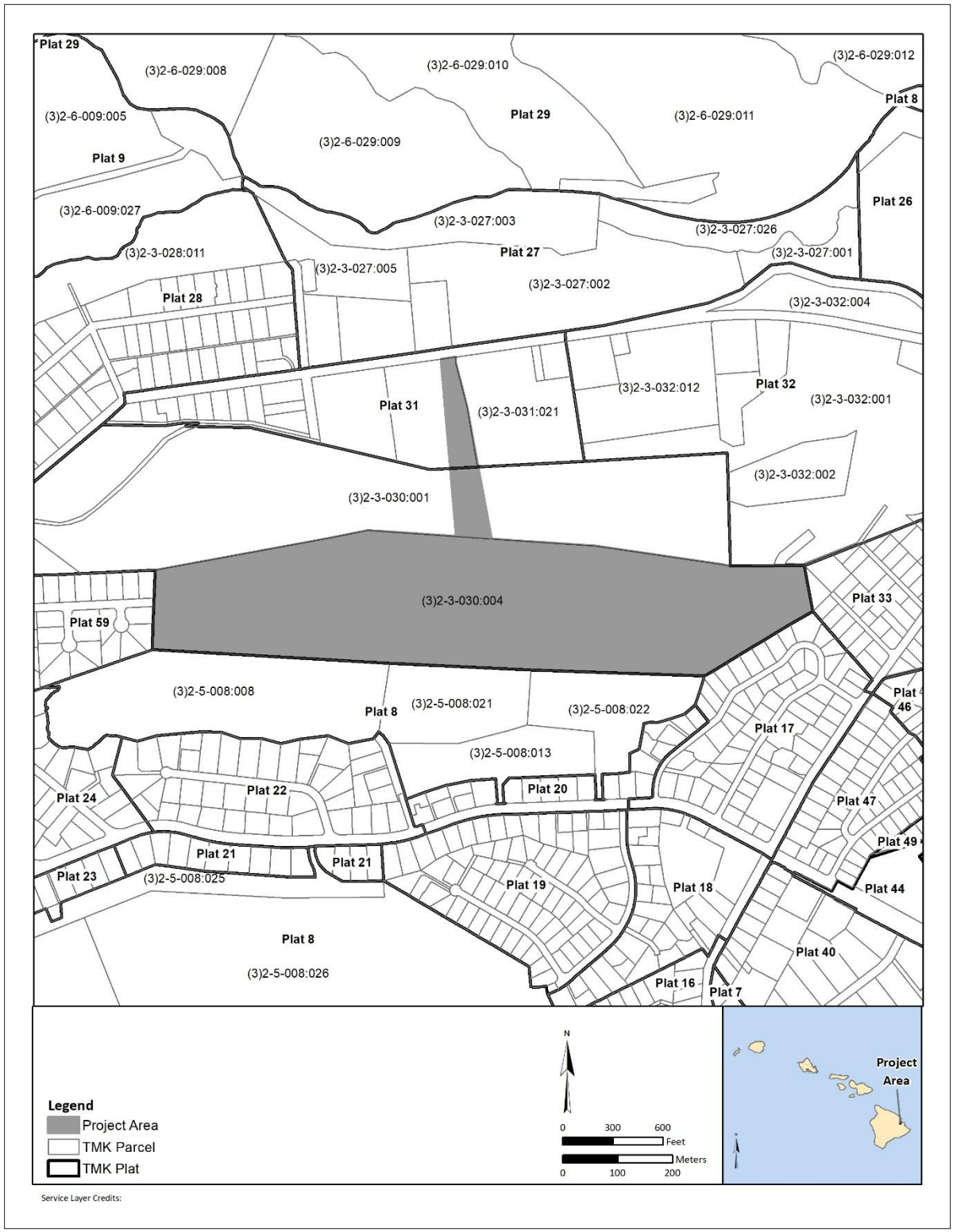

Figure 2. Tax Map Key

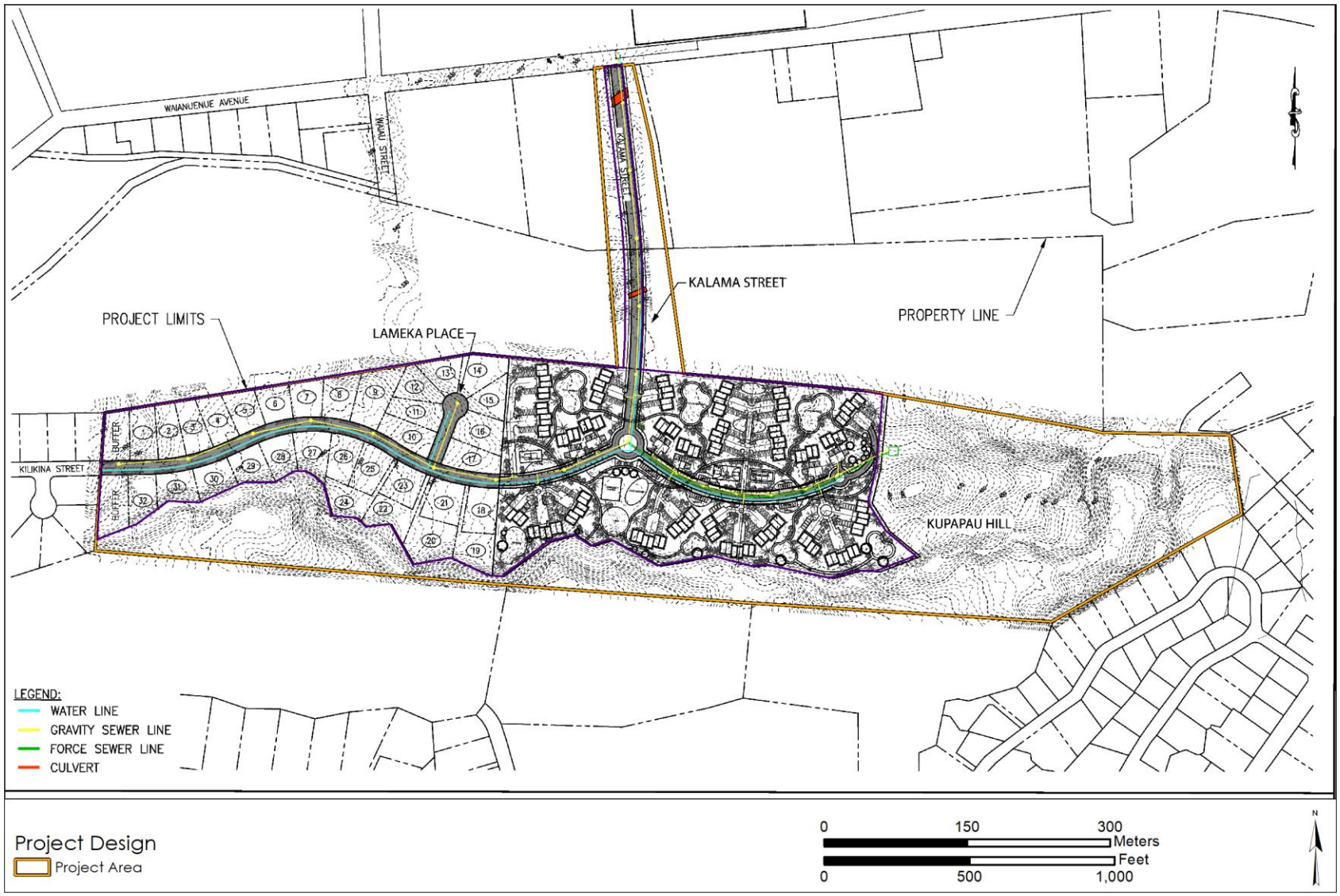

Figure 3. Conceptual Project Design

1.1 Project Area Description

The project area is located on the lower flank of Mauna Loa (Sherrod et al. 2021) at elevations ranging between approximately 400 and 700 feet above mean sea level (amsl), approximately 2.0 miles from the coast at Hilo Bay. The terrain in the project area slopes gently to moderately toward the east, rising slightly around Kupapau Hill. The moderate eastward slope is occasionally broken by steep declines and fault scarps, and also by several areas of relatively low slope where soil and water accumulate. Deeply incised stream channels extend through the project area.

Surface geology (Figure 5) consists of a patchwork tholeiitic basalt lava flows and tephra deposits on Pleistocene-era (greater than 10,000 years old) lava flows from Mauna Loa (Sherrod et al. 2021). The majority of the project area is underlain by 11,000- to 30,000-year-old tephra deposits originating from two pu‘u: Kupapa‘u at the eastern end of the project area and Ioane located near the southwest corner. The basalt flows are pāhoehoe of a similar age. The main channel of the unnamed stream extending near the southern project area boundary exposes much older (64,000 to 300,000 year old) Hamakua Volcanics produced by Mauna Kea during its post-shield phase.

Two soil types are present in the Project Area (Figure 6). In the majority of the Project Area (approximately 47 acres) north of the tributary of ‘Āinakō Stream the soils are classified as Panaewa very cobbly hydrous loam, 2 to 10 percent slopes. The remainder of the Project Area, south of the stream and in the northern half of the road corridor, contains Hilo hydrous silty clay loam, 0-10 percent slopes (Soil Survey Staff 2023). Both of these weathered soil types are derived from regional Pahala Ash deposits and were often used for sugar cane agriculture in the past and now support diversified agriculture, secondary forest, or pasture. Based on field observations, soil deposits in the Project Area are localized within swales and basins among the rolling and faulted exposed pāhoehoe ground surface. Siltation appears to be occurring on the upslope side of rock walls and outcrops.

The climate at the elevation of the current project area is mild and moist, with weather patterns dependent on the presence or absence of trade winds. Generally, the trades are relatively light from the east-northeast and shift to downslope at night. Average annual rainfall in the project area is about 160 to 170 inches (Giambelluca et al. 2013).

The project area is located within the Ainako Stream drainage basin, which feeds into the Wailuku River. Groundwater flows in the basin alternates from surface to groundwater due to a complex geology consisting of basaltic lava tubes and intrusive dikes (Paquay et al. 2007). Multiple springs, especially in the northeastern end of the project area, are present in the project area. The ahupua‘a name, Punahoa, evokes these and the many other springs near the project area. Tributaries of Ainako Stream flank the main portion of the project area on its north and south sides. During the rainy season, the ground is often saturated and there are several swales within the project area that can contain standing or flowing water.

The project area is heavily forested, with a few clearings and a small area of pasture in the north through which the proposed road corridor extends (Terry and Hart 2024). Prominent tree species in the upper canopy are mainly introduced and include very tall albizia trees (*Falcataria moluccana*), autograph tree (*Clusia rosea*), African tulip (*Spathodea campanulata*) and large stands of Alexandra palm (*Archontophoenix alexandrae*), with some kukui (*Aleurites moluccana*) and Chinese banyan (*Ficus microcarpa*). The understory is composed of seedlings of the trees listed above, especially Alexandra

palm, along with thickets of strawberry guava (*Psidium cattleianum*), palmgrass (*Setaria palmifolia*), Australian tree fern (*Sphaeropteris cooperi*), warabi fern (*Diplazium esculentum*), shoebutton ardisia (*Ardisia elliptica*) and hare's foot fern (*Phlebodium aureum*). Herbs and grasses are uncommon except near the steeper stream banks, in limited clearings, and at the mauka margin of the property with Kilikina Street, where a wide variety of weedy species are present. Ainako Stream cuts through the makai tip of the property, leaving an isolated area that is adjacent to the backyards of homes on Ekaha and Lahaina Street. Within the proposed road corridor extending from Waiānueue Avenue, the first 400 feet has been modified heavily by grazing and land clearing for an unpaved road and other uses. The final 300 feet is heavily wooded with non-native trees including *Eucalyptus* sp., strawberry guava, deviltree (*Alstonia macrophylla*), and mule's foot fern (*Angiopteris evecta*). Only two native plant species were identified in the project area (Terry and Hart 2024), the indigenous (native to the Hawaiian Islands and elsewhere) and very widespread sedges *Cyperus polystachyos* and *Scleria testacea*. No endemic (found only in the Hawaiian Islands) plants were seen. Several common Polynesian introductions were also present, namely kukui (*Aleurites moluccana*), kī (ti, *Cordyline fruticosa*), kalo (taro, *Colocasia esculenta*), ʻape (*Alocasia macrorrhizos*) and maiʻa (banana, *Musa* sp.).

Evidence of prior mechanical ground disturbance is relatively limited; however, observations made during the current study suggest that there may have been some near the outer fringes of the proposed development parcel, particularly in the north and west. The road corridor crosses areas formerly planted in cane and currently used for grazing. Plowing and clearing have occurred in this part of the project area. The relatively flat terrain in the southeastern corner of the project area (south of Ainako Stream) also suggests past clearing for agriculture use.

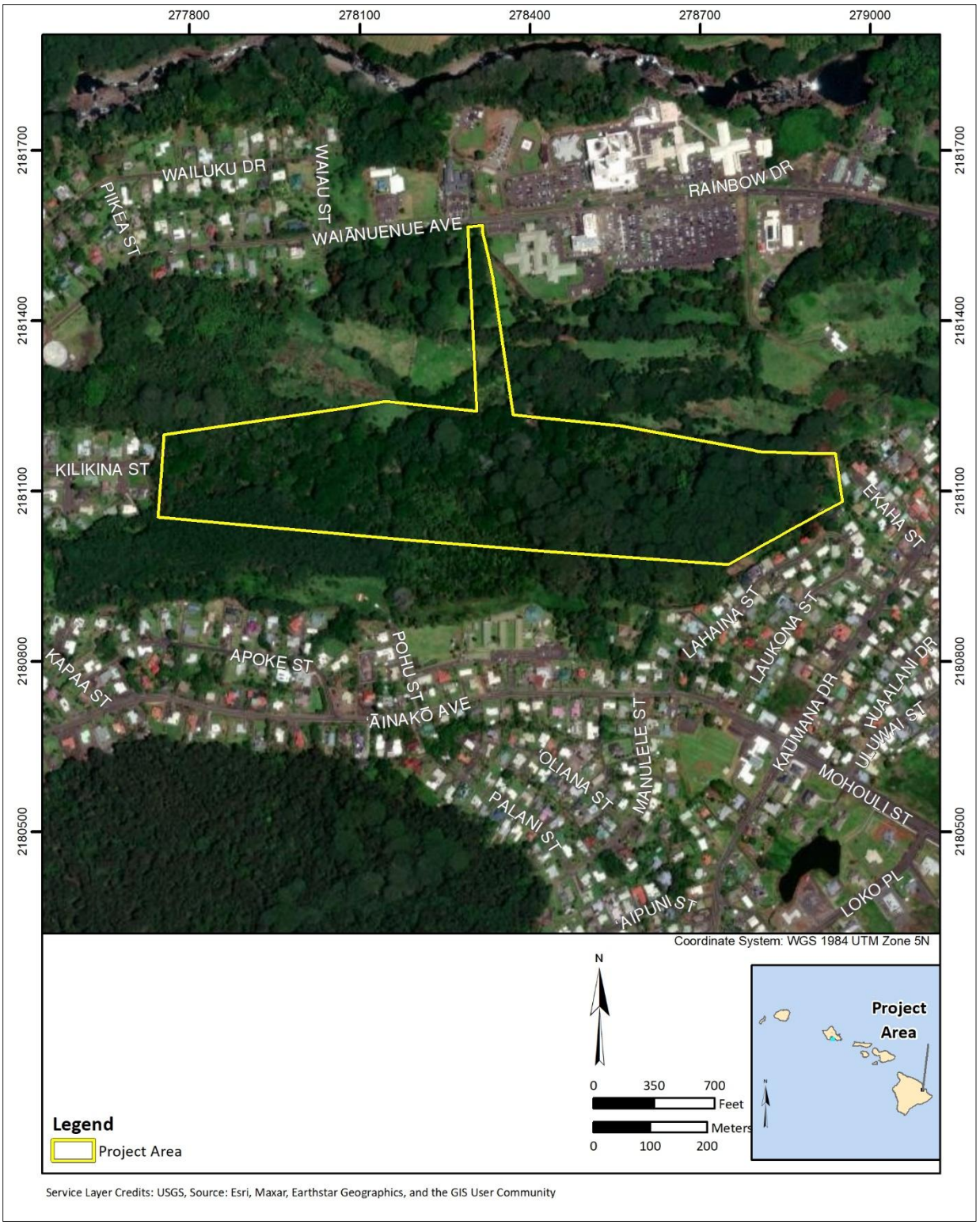

Figure 4. Project area location

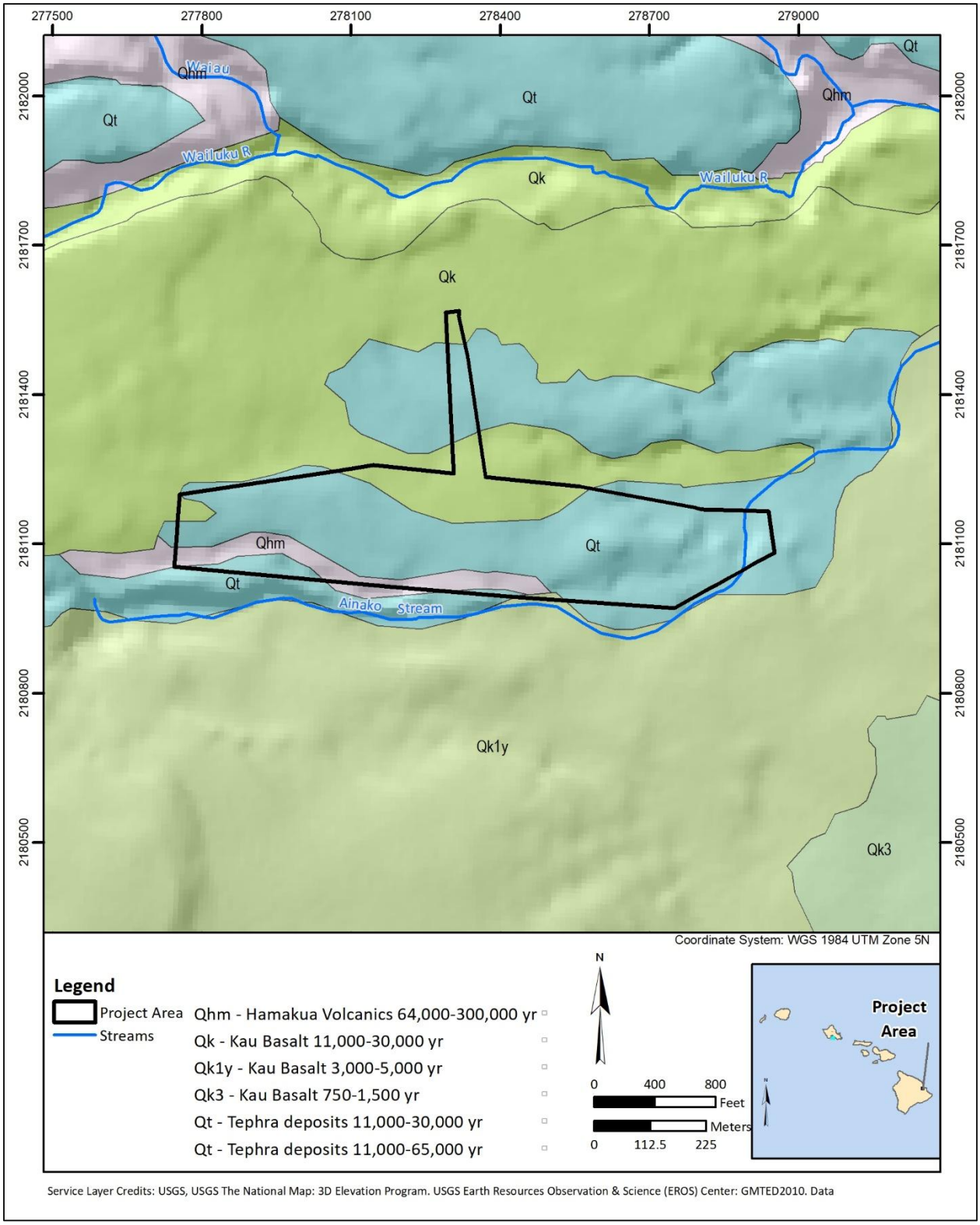

Figure 5. Surface geology in the project area vicinity.

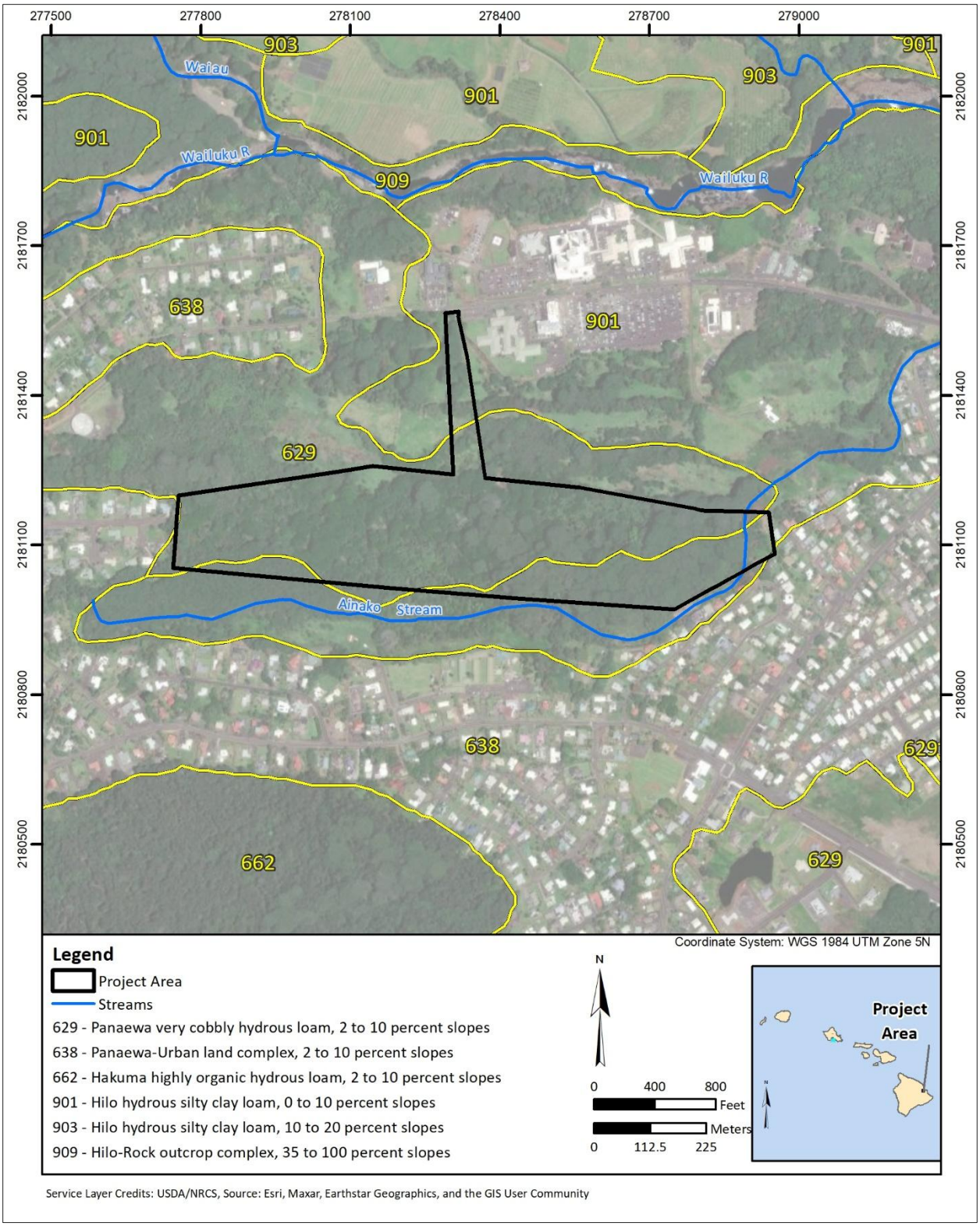

Figure 6. Soils in the project area vicinity.

Figure 7. Ainako Stream at the east end of the Project area, view to the northeast.

Figure 8. Gently sloped area in the western end of the Project Area, view to the south.

Figure 9. Project area overview, road corridor, view to the south.

2 Methods

The current project was conducted under the direction of Principal Investigator Benjamin Barna, Ph.D. (DLNR-SHPD Permit 25-03). Fieldwork was conducted by ASM Affiliates under subcontract to Stantec. ASM Affiliates' field archaeologists were led by Field Director David King, M.Sc. Archaeological fieldwork. Fieldwork was conducted between March 4 and March 7, 2024, and September 16 through September 20, 2024. The total duration of the fieldwork was 456 person-hours.

Archival Research

Archival research was conducted using sources from various physical and digital repositories. Primary English language and Hawaiian language resources were found at various state agencies, including the State Historic Preservation Division, Hawai'i State Archives, the Department of Accounting and General Services Land Survey Division, and the County of Hawai'i Planning Department, the Lyman Museum and Mission House, the Hawaiian Mission Houses Historic Site and Archives, and the Plantation Museum Archives. In many cases, Hawaiian language texts were previously interpreted into English by other scholars. Digital collections provided through the Office of Hawaiian Affairs Papakilo and Kīpuka databases, the Ulukau Hawaiian Electronic Library, and Newspapers.com. Secondary resources in Stantec's library were consulted for general information regarding the history of land use, politics, and culture change in Hawai'i.

2.1 Consultation

Consultation with Native Hawaiians and the Office of Hawaiian Affairs concerning historic properties that might be significant under Criterion "e" was and other potential consulting parties was initiated by email in late March, 2025. Interviews with consulting parties was conducted in person in an informal "talk-story" format. During the conversations, visual aids including historic maps, archaeological site maps and photographs, and other media available on the internet were used to discuss the Project Area and surrounding locations. The conversations were not recorded, but handwritten notes were taken. Then notes were transcribed and a summary of the conversation was prepared for the participants' review. A copy of the summary was sent to the participants, who were asked to correct, add, or delete any information they felt was necessary. Copies of the approved summaries were sent to the participants.

2.2 Fieldwork

Archaeological fieldwork consisted of a 100% coverage pedestrian survey. No systematic subsurface testing was conducted due to generally shallow, but variable sediment and soil accumulations throughout the Project Area and the presence of surface features suggestive of agricultural clearing. Numerous shallow roots were present throughout the Project Area, including on and within constructed features, which also precluded partially dismantling features to inspect their interior.

2.2.1 PEDESTRIAN SURVEY

During the archaeological field survey, the entire (100%) ground surface of study area was visually inspected by field archaeologists walking transects oriented north-south, spaced at no more than 10

meters apart, reducing transect spacing to 5 meters when visibility was hindered by thick brush. In addition to the transects, the interior and sides of gulches project area were investigated by walking parallel to the gulch.

When archaeological features were encountered, their positions were plotted on a map of the current study area using Global Positioning System (GPS) equipment that consisted of EOS Arrow 100 Global Navigation Satellite System receivers connected to handheld tablet computers running ESRI's FieldMaps Application set to the North American Datum 83 Zone 5 North. Areas of previous disturbance, conspicuous landforms, and vegetation patterns were also mapped. Archaeological features were assigned temporary field numbers. It should be noted that good GPS satellite coverage was difficult to maintain beneath the thick canopy of guava and albizia. Every effort was made to obtain a <1 meter accuracy on recorded positions taken; however, this was not always possible.

2.2.2 SITE AND FEATURE RECORDATION

Identified features were then cleared of vegetation, photographed (both with and without a metric scale), and described using standardized feature record forms. A measuring tape was used to collect metric feature dimensions (length, width, and height). Canopy and understory trees in the Project Area exceed 15-30 feet in height. During the survey, the size of these standing trees made fully clearing features difficult, and only trees that could be removed safely without a professional arborist were cut. In some cases, clusters of autograph trees and guava trees are growing directly from rock mounds and other features. There are numerous fallen trees, both large individual trees and clusters of smaller trees, throughout the Project Area. Where these fallen trees lie on top of archaeological features, essentially burying them beneath hundreds of pounds of dead wood. In these situations, an attempt was made to observe and document the obscured features as much as possible. Wherever feature descriptions note that features were obscured by fallen trees, autograph tree roots, and guava stands, removal of those trees to clear the feature would have required mechanical equipment or the services of arborists, neither of which were within the scope of work for the current survey. The field archaeologists attempted to accurately document each identified feature within the limitations of the heavy vegetation overgrowth.

All features that were identifiable as agricultural features, such as clearing mounds, were recorded solely with GPS, notes, and photographs. Formal features and distinctive feature complexes were recorded with GPS, notes, photographs, and scaled drafted plan maps.

2.2.3 SUBSURFACE TESTING

No subsurface testing was conducted during the current fieldwork. Although areas within the Project Area exhibit accumulations of soil and sediment, extensive tree roots.

2.2.4 CULTURAL MATERIAL RECORDATION

Artifacts were documented in the field with written descriptions and photographs. Locations of isolated artifacts and artifact concentrations were recorded using the GPS equipment. No cultural material was collected.

2.2.5 POST-FIELDWORK ANALYSIS

All identified features were compared to site and feature descriptions from prior archaeological studies, (e.g., Jensen 1991; Sinoto 1978) and assigned to a previously recorded State Inventory of Historic Places (SIHP) number if they were consistent with the site description. Features that did not match the age, type, or function were assigned temporary Site numbers. Within each identified site, individual features were assigned alphabetical designations, as in “Site T1 Feature A.”

Features assigned to SIHP 50-10-35-18696 were designated using a different system designed to aid in locating each feature relative to the 15 historic lots shown on Registered Map 2508. These feature designations use a prefix corresponding to the lot number and a sequential feature number, such as “15-01.” Areas outside of the numbered lots were assigned to Lot 0 in the GIS data. The new feature numbers were appended to the GIS data as a separate attribute field.

Some features within SIHP 50-10-35-18696 were grouped into complexes based on proximity and formal and functional relationships. These features are given subfeature letters, as in Feature 01-04A, which is one of three features grouped into the complex represented by 01-04. As a result of post-field analysis, some combinations of historic lot and feature numbers are not used in the final data; this is due to grouping some features into complexes or reassigning features to a different site.

Isolated artifacts were designated similarly to the archaeological features but have the letter “A” as a prefix, as in A10-01, a shovel head identified within historic lot 10. Artifact descriptions and photographs were compared with standard references for Traditional Hawaiian and historical artifacts to confirm their identification, when possible. These references are cited in the descriptions of the artifacts in Section 5 of this report.

An attempt was made to analyze the distribution of features in SIHP 50-10-35-18696 in the context of topography and elevation using the available Geographic Information System data from the State of Hawai‘i GIS portal (Hawai‘i State Office of Planning 2024) and elevation data from the United States Geological Survey (United States Geological Survey 2023). Light Direction and Ranging (LiDAR) data from 2020 was used to derive topographic data for the Project Area (e.g., slope and aspect), but the heavy tree canopy covering the project area during the LiDAR data collection resulted in elevation data of insufficient resolution to make conclusions.

3 Background

3.1 Culture-Historical Context

The Project Area is located primarily in the ahupuaʻa of Punahoa 2nd with a road corridor that extend through the ahupuaʻa of Piʻihonua, both of which are within the district of South Hilo (Figure 10). The current judicial district of South Hilo was created in 1909 (State of Hawaii 1909:109), the most recent subdivision of the traditional moku of Hilo. While the current division of Hilo splits it between north and south, older poetic descriptions of Hilo in ʻolelo Hawaiʻi refer to three traditional divisions: Hilo Palikū, Hilo One, and Hilo Hanakahi (Edith Kanakaʻole Foundation 2012). Hilo Palikū extended from the Wailuku River north to Kaʻula Gulch and is named for its upright cliffs (pali kū) that line the coast. Hilo One includes the sandy area of Hilo bay between the Wailuku and Wailoa rivers. Hilo Hanakahi extends south and inland from the Wailoa toward Keaukaha. The project area is located mauka of Hilo One, which was the most populated portion of the moku. Handy et al. (2020:538) note that:

> *The population of Hilo was anciently as now concentrated mostly around and out from Hilo Bay, which is still the island's principal port. The Hilo Bay region is one of lush tropical verdure and beauty, owing to the prevalence of nightly showers and moist warmth which prevail under the northeasterly trade winds into which it faces.*

The area between the Wailuku and the Wailoa is divided, from north to south, into the seven ahupuaʻa of Piʻihonua, Punahoa 2, Punahoa 1, Ponahawai, Kukuau 2, Kukuau 1, and Waiākea. Punahoa 2 begins at the sea in this way, coming ashore approximately between present-day Kalākaua Street and Hāili Street and ascending to encompass all or portions of the three Hālaʻi Hills at about 300 feet amsl, and then continuing mauka into the forest, gradually expanding in width to about 1.5 miles wide at an elevation of about 3,400 feet amsl. At this point, it is "cut off" by the ahupuaʻa of Piʻihonua.

The ahupuaʻa of Punahoa 2 carries a name which translates literally as "companion spring" (Pukui et al. 1974:194). This place name evokes the many fresh water sources (puna wai) found throughout the ahupuaʻa. These springs and streams that run through Punahoa once provided water for irrigated agriculture and supplied fresh water supply for the town of Hilo. Some of these springs are located in and adjacent to the Project Area and have played an important role in its history.

This area of Hilo also served as one of Hawaiʻi Island's royal seats with chiefly residences that lasted up through the time of Princess Ruth Keʻelikōlani in the 1870s (Brandt 2017; Cordy 2000; Kelly et al. 1981). Coastal settlement Kamakau (1992) writes of the Hilo chief Keawe-hano, whose houses in the year 1773 were "situated on the beach at Punahoa, close to Piʻihonua and facing the waves of Huia and Kihanui."

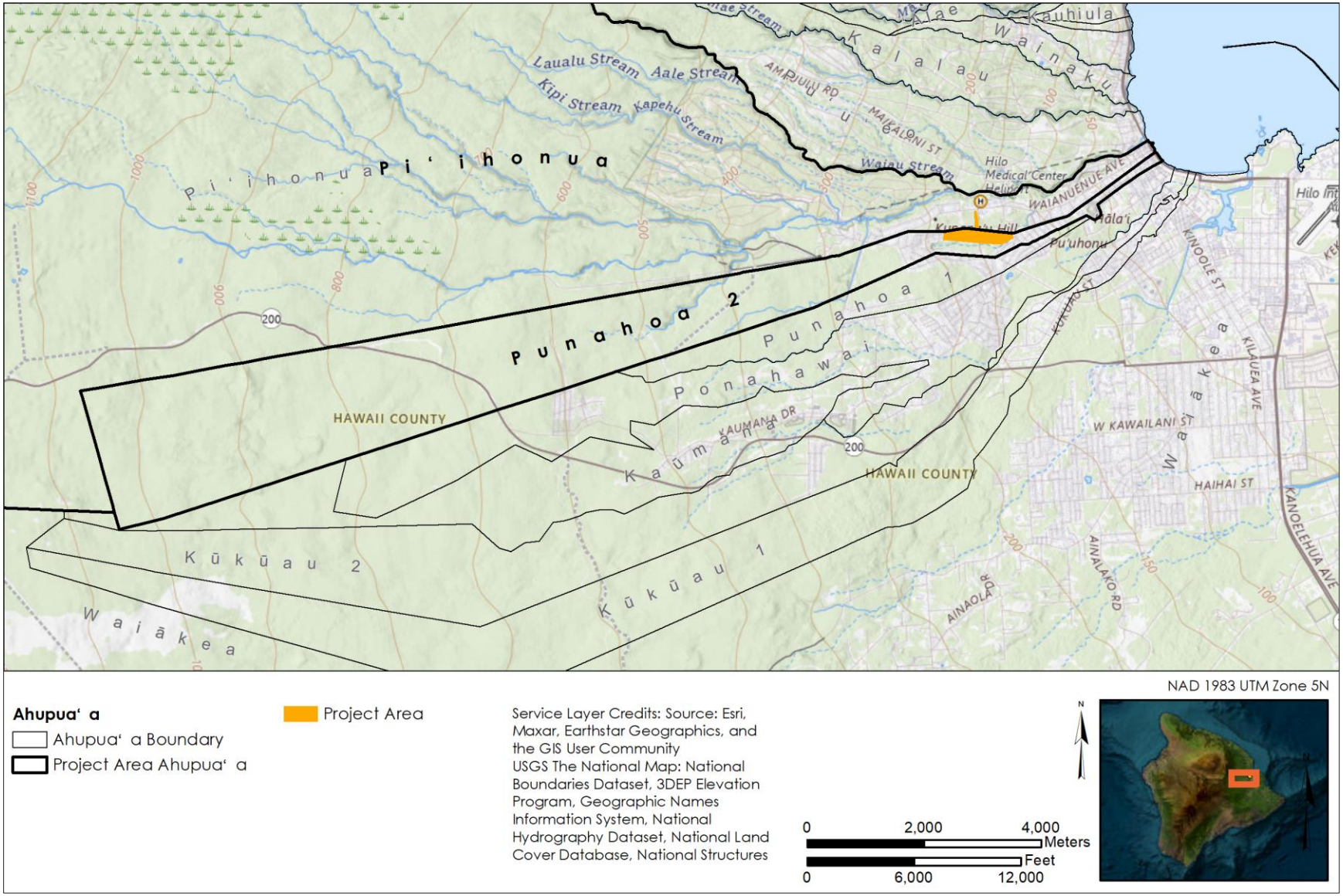

Figure 10. Punahoa 2, Piʻihonua, and other nearby ahupuaʻa

3.1.1 PUNAHOA IN THE PRECONTACT PERIOD

The current archaeological consensus on when Hawai‘i was first settled by Polynesians derives from several sources, including archaeological, genealogical, mythological, oral-historical, radiometric data. Other versions of the peopling of the islands, including various native Hawaiian traditions, place the event earlier in time—and as early as the creation of the world (e.g., Beckwith 1917; Liliuokalani 1978; Malo 1951). With data from advances in palynology and radiocarbon dating techniques, Kirch (2011) and others (Athens et al. 2014; Rieth et al. 2011; Wilmshurst et al. 2011) have argued that Polynesians arrived in the Hawaiian Islands, sometime between A.D. 1000 and A.D. 1200 and expanded rapidly thereafter. After initial migration to Hawai‘i from Kahiki, the ancestral homelands of Hawaiian akua and people—most likely the Marquesas Islands (Kirch 2011; Tatar 1982), subsistence agriculture and fishing sustained the initial populations. Widespread environmental modification followed with the adaptation of traditional practices and tools to the new environment (Kirch and McCoy 2023; Pogue 1978). According to Fornander (1969), traditional practices included Polynesian customs and beliefs such as the major gods Kāne, Kū, Lono, and Kanaloa; the kapu system of law and order; and the concepts of pu‘uhonua (places of refuge), ‘aumakua (ancestral deity), and mana (divine power). An increasing reliance on agricultural products may have caused a shift in social networks as well, which increasingly supported the exchange of upland agricultural products for marine resources.

Voyaging between western and southern Polynesia and Hawai‘i continued until sometime around the end of the fourteenth century, which led to a consistent pattern of social and political changes throughout the islands (Kirch 2010). Hommon (1976) argues that kinship links among coastal settlements became less important than those with the mauka-makai (upland-coastal) settlements. This shift is believed to have resulted in the establishment of the hierarchical land tenure system organized by moku (“social-ecological regions) and ahupua‘a (social-ecological community) and other land divisions sometime during the A.D. 1400s (Kirch and McCoy 2023; Winter et al. 2020), which added another component to an already well-stratified society. On Hawai‘i Island, the implementation of the system is attributed to Kalaunuiohua, an ali‘i descended from Pilika‘aiea who was brought from Kahiki by the kahuna Pā‘ao (Fornander 1996:67; Kamakau 1991:56). This system divided of the moku of Hilo into the major land units of ahupua‘a and smaller subdivisions that were tended by the maka‘āinana (people of the land, or commoners) for the ali‘i (chiefs) who stewarded the ‘āina (land, “that which feeds”) and its people. Boundaries of ahupua‘a were generally defined by topography and natural resources, and extended from the nearshore fishing grounds toward the mountains to provide access to the range of available resources in a given place (Gonschor and Beamer 2014; Kamakau 1992:372–377; Malo 1951:63–67).

3.1.1.1 Settlement Patterns and Agricultural Practices

Once established on the land, Hawaiians created an agricultural landscape that extended inland from the shore. The elevation of the Project Area is located in a part of that landscape that McEldowney (1979a:18–25) describes as the “Upland Agricultural Zone.” The characteristics she ascribes to the Upland Agricultural Zone are based on early written accounts of settlement patterns and land use. This zone consisted of open kula land gently sloping up to the base of the woods, about four to six miles inland from the coastal village at Hilo Bay. Additional research and modeling since McEldowney’s study have refined estimates of the extent of the upland kula of Hilo, whether as a natural phenomenon or a

landscape created through swidden agriculture as the area's population grew. Gon et al (2018) created a model of the ʻāina momona ("sweet land" where intensive agricultural was practiced) using updated ecological and historical data, and devleoped an overall "Hawaiian Footprint" on the island circa 1770 (Figure 10). In this model, the "Hawaiian Footprint" represents the extent of ʻāina that was chronically occupied, directly manipulated, and significantly changed from pre-existing native ecosystem types into traditional Hawaiian uses. The Project Area appears very near the margins of the 1770 footprint, on or just outside of the southern edge of an intensively used area indicated in pink. The modeled footprint shows ʻāina momona extending mauka in Piʻihonua to elevations of nearly 1,000 feet. The pink "footprint" ends abruptly at the Punahoa 2 boundary, however. The e and this could be due to a number of factors. On the one hand, gaps in historic land use descriptions of Punahoa may have left it out of the footprint; on the other, it may be that the environment of upland Punahoa, particularly the underlying volcanic substrate, was not suitable for intensive traditional agriculture.

In the Upland Agricultural Zone, gardens and tree crops could be found in the uplands, where dryland taro and bananas were grown along with crops that were also found in the village: kō (sugarcane, *Saccarum officianum*), wauke (paper mulberry, *Boussonetia papyifera*), irrigated and dryland kalo (taro, *Colocasia esculenta*), along with ʻuala (sweet potatoes, *Ipomoea batatas*) and minor vegetable crops. Tree crops, such as ʻulu (breadfruit, *Atocarpus alitilis*) and niu (coconut, *Cocos nucifera*), ōhiʻa ʻai (mountain apple, *Eugenia malccensis*), milo (Pacific rosewood, *Thespesia populnea*), and kukui (candle nut, *Aleruites moluccana*) were also maintained. Along streams, irrigated kalo varieties were grown. Early descriptions of "neatly laid out fields" among what appeared to be largely uncultivated land (e.g, Malden 1841; Menzies 1920:141) suggests swidden agriculture was practiced, at least early on, consistent with what Kamakau (1976:31–32) and Handy et al. (2020:103–110) describe.

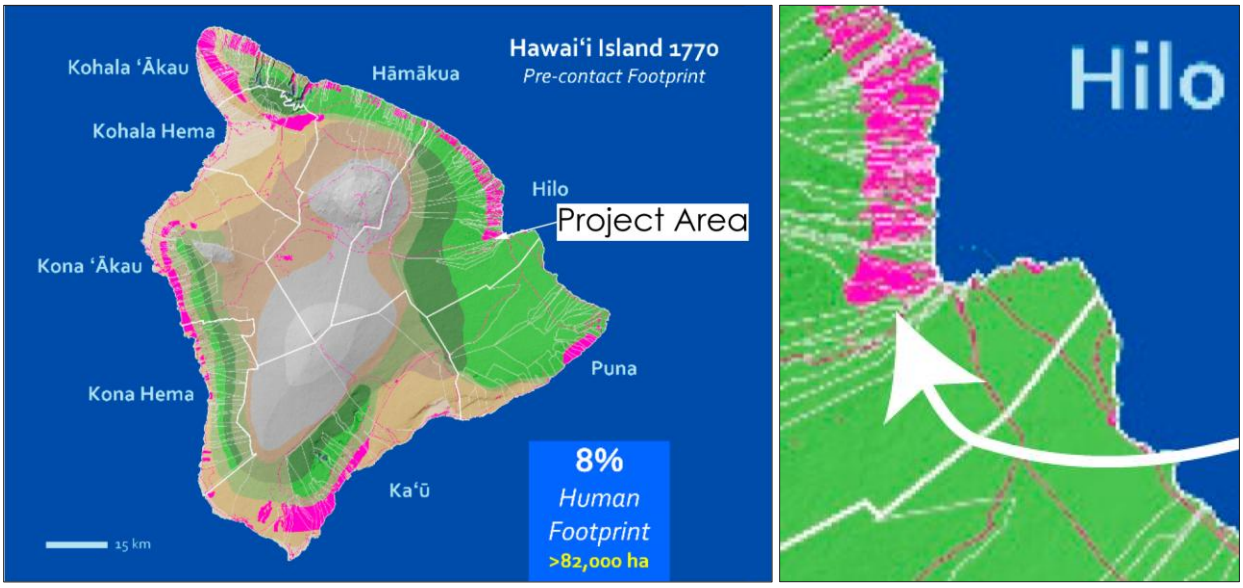

Figure 11. Modeled ʻĀīna Momona Shown in Pink (Gon et al. 2018:Figure 7)

Several traditional planting methods used in South Hilo are described by Handy, Handy, and Pukui (2020) 1991). For example, dry taro was planted “wherever there was enough soil” (Handy et al. 2020:726). Another innovation, kanu kipi, involved creating mounds of soil in marshy land for planting:

> *In lava-strewn South Hilo there were no streams whose valleys or banks were capable of being developed in terraces, but cuttings were stuck into the ground on the shores and islets for many miles along the course of the Wailuku River far up into the forest zone. In the marshes surrounding Waiakea Bay, east of Hilo, taro was planted in a unique way known as kanu kipi. Long mounds were built on the marshy bottom with their surface two or three feet above water level. Upon the top and along the sides of these mounds taro was planted. This swampy land is now* [in the 1930s] *abandoned to rank grass. Kipi (mounds) were also formerly made along Alenaio Stream above Hilo. (Handy et al. 2020:747–748).*

Although Handy, Handy, and Pukui specify locations in the two ahupua‘a of Waiākea and Kukuau, similar marshy terrain exists just north of the Project Area on the State parcel in Pi‘ihonua.

The lower lands of Punahoa, makai of Halai‘i hill, in particluar, lack permanent streams such as Alenaio and Wailoa. At higher elevations, including the Project Area, surface and underground springs feed permanent and intermittent streams that wind their way into the Wailuku. The water in these streams and springs was eventually tapped by the various konohiki of Pi‘ihonua, Punahoa, and Ponahawai to feed agricultural fields in the lands under their care (Wolforth 1999). A system of branching ‘auwai is said to have been begun by the powerful 17th century Hilo ali‘i named ‘Ī. Before this ditch system, inhabitants of Hilo would come to the Wailuku River, north of the Project Area, to gather water (Kaleioholani quoted in Kelly 1982:27). The ‘Ī ‘auwai, named after the ali‘i who had it built, brought water from the mauka springs located in the two ahupua‘a of Punahoa and Pi‘ihonua down to the coast and fed the many irrigated fields located along its length. It began from a source near Waiale Falls in Punahoa 2, mauka of the Project Area. The creation of this ditch system likely improved agricultural production and household subsistence. Even recently, Pi‘ihonua residents would keep mullet farms and build lo‘i off of ‘auwai such as the Pi‘ihonua Ditch, or natural streams such as those on the state-owned lands north of the Project Area (Leilehua Yuen, quoted in Barna and Rechtman 2015; Kodani and Kodani 2025).

Typical irrigation ditches were simply trenches dug in the soil, from the dam in the stream to the area where its water was used (Handy et al. 2020:83). Where the terrain required it, other engineering techniques were used. For example, when water had to be carried around or along a hillside, typically on terraces if the hillside was steep, the embankment beneath the ditch was often faced with stone part or all the way up. Flumes called “ha-wai” were built to carry water over a depression (Handy et al. 2020:85). Versions of these included large bamboos split in half, with the inside node walls cut out to allow for water flow, and long wooden troughs carved like an open-ended canoe hull. The ways in which ‘auwai were constructed, maintained, and managed are described by Nakuina (1893):

> *Auwais, were generally dug from makai—seaward or below—upwards. The konohiki who had the supervision of the work having previously marked out where it would probably enter the stream, the diggers worked up to that point. The different ahupuaa's, ili's or ku's taking part in the work, furnished men according to the number of cultivators on each land. There was no limit though to the number of laborers any land might furnish, and it often happened that a small ku or ili was sometimes represented in the auwai making by more men than a much larger land or ahupuaa,*

> *and would thus become entitled to as much or more water, at the distribution of the water privileges, than were assigned larger tracts.*
>
> *The dams were always a low loose wall of stones with a few clods here and there, high enough only to raise water sufficiently to flow into the auwai, which should enter it at almost a level. No auwai was permitted to take more water than continued to flow in the stream below the dam. It was generally less, for there were those living makai or below the same stream, and drawing water from it, whose rights had to be regarded…. (79)*
>
> *Bordering on the upper portions of most auwais are small lois limited in size and number, generally on a hillside, or on the borders of a gulch. These lois are generally awarded kulu or drops; that is, they are entitled to continual driblets of water, and no one having a water share may turn the water entirely away from them unless, in times of scarcity, it should be seen that these lois or loi were full to overflowing. (81)*

Management of the water within an ʻauwai was the kuleana of the konohiki:

> *The konohiki of each independent land subdivided his water time among the holders of mooainas (now kuleanas) on his ahupuaa, ili or ku. (80)*
>
> *Water rights were primarily for lois, that is, for kalo culture. potato patches, bananas or sugar cane had no recognized claim on a water right in the rotation. The cultivation of these, regarded as dry land crops, were invariably during the rainy season except in the Koolau or wet districts. Sugar cane and bananas were almost always planted on loi banks (kuauna's) so as to ensure a sufficiency of moisture from the seepage or ooze between them. (83)*

In sum, the upland kula of Punahoa where the Project Area can be found was integrated into the moku- and ahupuaʻa-based social, political, and ecological system practiced during the Precontact era. Current modeling of the extent of cultivated lands by Gon et al. (2018) suggest that the Project Area is located near, but outside of, the southern edge of intensive land use at this elevation. Abundant freshwater, though, may have made the Project Area available for cultivation of both irrigated and rain-fed crops.

3.1.1.2 Kɑʻao and Moʻolelo of Punahoa

Unlike neighboring Piʻihonua and the Wailuku River, the ahupuaʻa of Punahoa does not feature in many of the moʻolelo (native traditions and historical accounts) that have been recorded to date. Perhaps the most familar of these are the traditions of Hina-a-ke-ahi and her self-sacrifice on Hālaʻi Hill, where, buried in an imu (earth oven) during a time of famine and draught, she traveled underground toward the shore and caused springs (puna wai) named Hina ʻAuʻauwai to emerge (Westervelt 1910:155). Maly (2003:6) suggests that this event may be the source of the place name, as Hina, the origin of the springs, was a friend and companion of the people of the land. The Hālaʻi Hills are also the setting, in one version of the story (Westervelt 1910:64) in which Māui wrestles with an ʻalae (Hawaiian Gallinule) bird on the middle hill known variously as ʻŌpeʻapeʻa, Peʻa, Pōhakunui, Puʻu o Kamaliʻi, or Puʻu Aliʻi (Maly 2003:22).

Other moʻolelo briefly mention the harbor at Punahoa. Kamakau (1991:19, 34) tells of a hunch-backed aliʻi named Kawau who lived in Hilo and would look out at the surf off Piʻihonua and Punahoa, at a surfing spot called Huia. The fishing ground for nehu (Hawaiian anchovy, *Encrasicholina purpurea*) at the shore of Punahoa is mentined in an oli (chant) of the six moku of the island of Hawaiʻi that appears in the

Legend of Kuapakaa (Fornander 1918:118–119). In Fornander‘s (1916:444) version of the story of Kana and Niheu, the harbor at Punahoa adjoining Kaipalaoa is briefly mentioned, but no other parts of the ahupua‘a. Lastly, the Story of Laieikawai, in versions told by Haleole (1863, 1918) and by Kalālaua (1888) also features action set at the harbor in Punahoa. In “Kaao Hooniua Puuwai no Ka-Miki” (“The Heart Stirring Story of Ka-Miki”), Punahoa is not named, but events in the story occur nearby (Maly 2003:9). A search of digitzed nupepa (Hawaiian language newspapers) available on the Ulukau website (Hale Kuamo‘o 2025) did not find legendary references to Punahoa in Hilo.

The uplands of Punahoa are briefly mentioned in the Legend of Kapuaokaoheloai, a Ku and Hina story (Fornander 1916:540). In the story, Kū and Hina are said to be living in Waiakea in Hilo with a son and a daughter. Being of high rank, they raise the two children under a very strict kapu (taboo, restriction) that kept them separated and secluded indoors for twenty years. The major events of the story begin the breaking of that kapu by the children when their attendants go to “the uplands of Kaumana, directly above Punahoa to do farm work” (Fornander 1916:540). No further details about the uplands or the farms are included in Fornander‘s version of the story, but the story corroborates the settlement and agricultural patterns inferred in McEldowney‘s (1979a) Upland Agricultural Zone. The ahupua‘a of Kaūmana is located south and about 360 feet higher in elevation than the Project Area. A portion of that land was formerly used for sugarcane cultivation. So while the farms in “Kaumana, directly above Punahoa” would not have been in the immediate vicinity of the Project Area, the Legend of Kapuaokaoheloai suggests that the Project Area could still have been located at a suitable elevation for agriculture, depending on soil and terrain conditions.

3.1.1.3 Placenames in the Project Area

The names of places on the ‘āina can often provide information about history and cultural meanings. Within the Project Area, two place names appear on historic maps, and there are several named places makai of the Project Area.

The pu‘u in the eastern end of the Project Area appears on maps from the twentieth century as “Kupapau Hill.” Although this is the name of the pu‘u used on maps beginning in the twentieth century, older maps give it a different name. The earliest map to include the Project Area in detail (Figure 12) was made in 1849 from a survey conducted in support of the claim that the ABCFM made before the Board of Commissioners to Quiet Land Titles (more commonly known as the Land Commission) for most of the land in Punahoa 2 (see Section 3.1.3). The precision of the map is not very good, but it depicts the pu‘u located in the Project Area. The pu’u is drawn mauka of a kukui tree marked with a “B” and was used during the survey as a triangulation station. The station used is indicated by a circle on the pu‘u that is labeled “Large Rock on Puu Mohihi.” The name given to the pu’u, may refer to a sweet potato variety named “mōhihi.” Mōhihi is quick growing but dependent on good rain (Handy et al. 2020:169). Mōhihi ke‘oke‘o have white or yellowish flesh and a red skin; mōhihi ‘ula‘ula has a reddish or purple flesh (Kagawa-Viviani 2016:10). This variety has a high sugar content and was the most popular for making ‘uala ‘awa‘awa, a type of fermented drink (Handy et al. 2020:178). The pu‘u’s name suggests that sweet potatoes, in particular mōhihi, could have been grown on it or nearby, but no explanation for the name was found during research for this study.

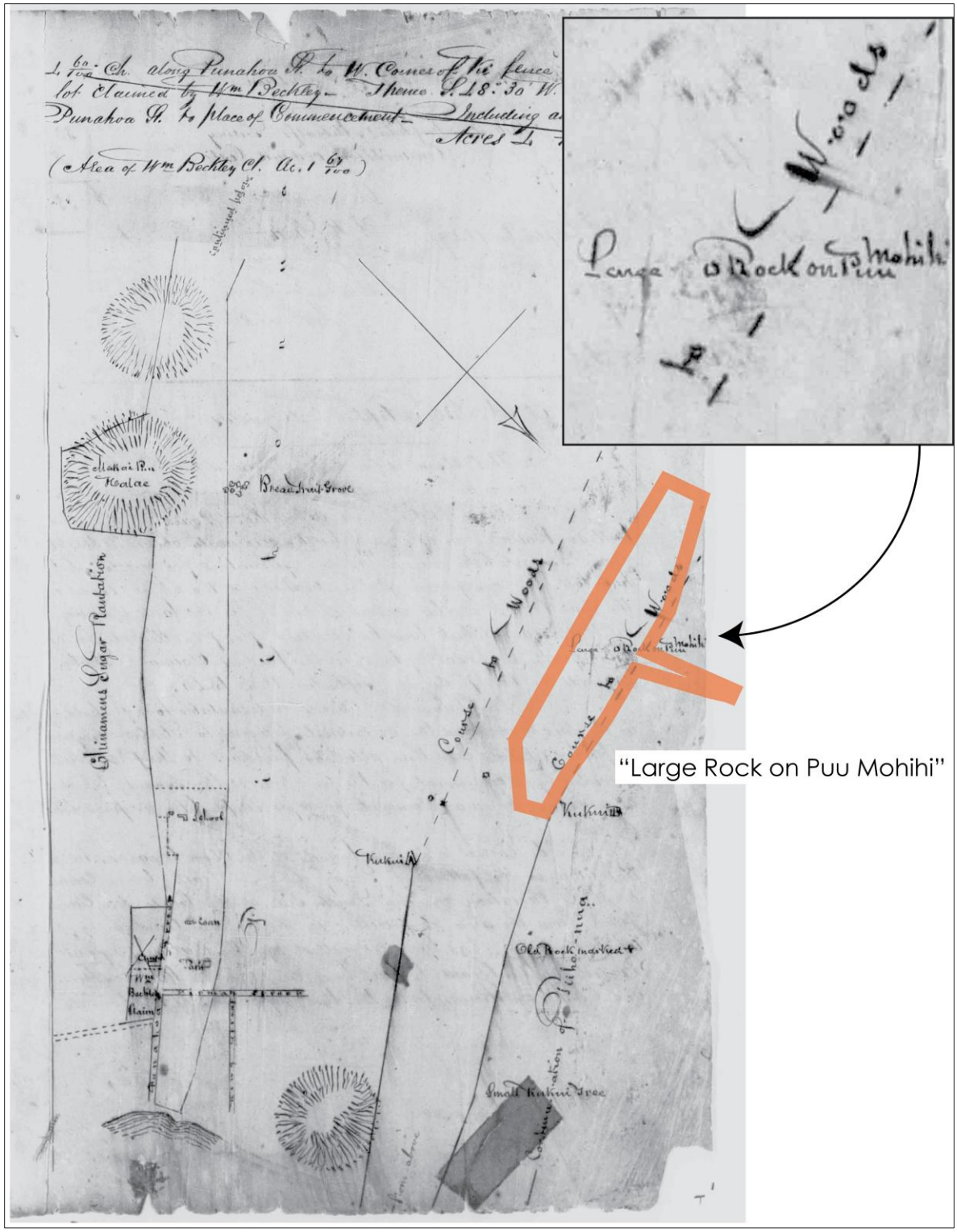

Figure 12. Map submitted in 1849 with Land Commission Award 387, Part 4, ʻĀpana 1 with the approximate location of the Project Area outlined in orange.

The puʻu, or at least the trigonometry station, appears with the same name on a map produced in 1895 by A. B. Loebenstein (Figure 13). The trigonometry station is indicated with a circle (see inset of Figure 13) and labeled "Moohihi or spring." It is likely that the double "o" written by Loebenstein is his attempt to convey the long "o" sound now indicated by the kahakō in "mōhihi." This method of indicating the long "ō" sound was sometimes used until macrons (i.e., kahakō) became more prevalent beginning in the late 1980s (Schütz 1994:146–147). Loebenstein may also have tried to write "moʻohihi" as pronounced with an ʻokina, which was also written with two adjacent vowels at that time. If he intended "moʻohihi", then the puʻu' name could mean something other than sweet potatoes. "Moʻo" has several meanings rooted in the concept of linear things, such as lizards or serpents including water spirits and dragons, but also lines of succession and genealogies, narrow strips of land, narrow fragments of things, narrow paths, or ridges on mountains (Pukui and Elbert 1986). The word "hihi" can refer to "entanglement" as in vines or grass, and also webs and snares (Andrews 1865; Pukui and Elbert 1986). The word "hīhī" is a reduplication of "hī," meaning "to hiss." During consultation for the current study, one Punahoa 2 resident surmised that a place name "Moʻohihi" with the ʻokina could be related to entangling of genealogies—moʻo—as in the intermarriage of chiefly families (Leilehua Yuen, personal communication, 2025).

The earliest documentation of the puʻu as "Kupapau Hill" is from survey notes and a map created six years later by Erdmann D. Baldwin. The survey was conducted in 1901 to map out a proposed reservation parcel around several fresh water springs, including one in the Project Area (see Section 3.1.5). The typed survey description shows that Baldwin made one corner of the parcel at a "stone marked +, on top of old kupapau known as Kupapau Hill Trig. Sta." (Baldwin 1901b). What this statement means is that he set the corner at a survey trigonometry station on top of the hill. Based on his map (Figure 22), this is the same station used in 1849 and 1895. The reason that Baldwin did not use the older name for the trigonometry station is not known, but it may be that the rock used during the earlier surveys was not there anymore, or he did not find it, or he may not have known about it. Whatever the reason, Baldwin's survey established a trigonometry station on the hill and named it "Kupupau Hill." Every map that includes the project area produced after 1901 uses the name "Kupapau Hill" name for the puʻu. This hill does not appear in *Place Names of Hawaii* (Pukui et al. 1974) or older gazetteers. The Hawaiʻi Board on Geographic Names 2018 list of place names on Hawaiʻi Island uses the spelling "Kupapaʻu" but notes that more research is needed about the name (Office of Planning and Sustainable Development 2025).

Why Baldwin named the station "Kupapau" is not known, nor why he wrote that the station was on top of an "old kupapau." There are two other places called "Kupapau" in Soehren's (2019) compilation of place names: one on Kauaʻi and one in Puna on Hawaiʻi Island. Soehren offers two translations for the word "Kupapau" but does not suggest any direct link between the places or meanings. One meaning is "corpse" (Pukui and Elbert 1986:185), and the other is "deeply engaged, as in an activity; finished; engrossed, absorbed, united; all, all together" (Pukui and Elbert 1986:319). It is possible that the puʻu or surrounding area was known to Baldwin to be the location of Hawaiian burials (this was also suggested by OHA during consultation for this study). Baldwin may have referred to the puʻu itself as a "corpse," perhaps meaning an extinct crater. It may also be that the spelling of the Hawaiian language at the turn of the century obscures the meaning, and that "kupapau" refers to something else entirely. For example, the top of the puʻu appears "scooped out" with two large depressions at its summit. There are several places in Hawaiʻi called "paopao," meaning "scooped out," that are sometimes spelled "papau" (for example, Paopao Point on Lānaʻi, see Coulter 1935:107).

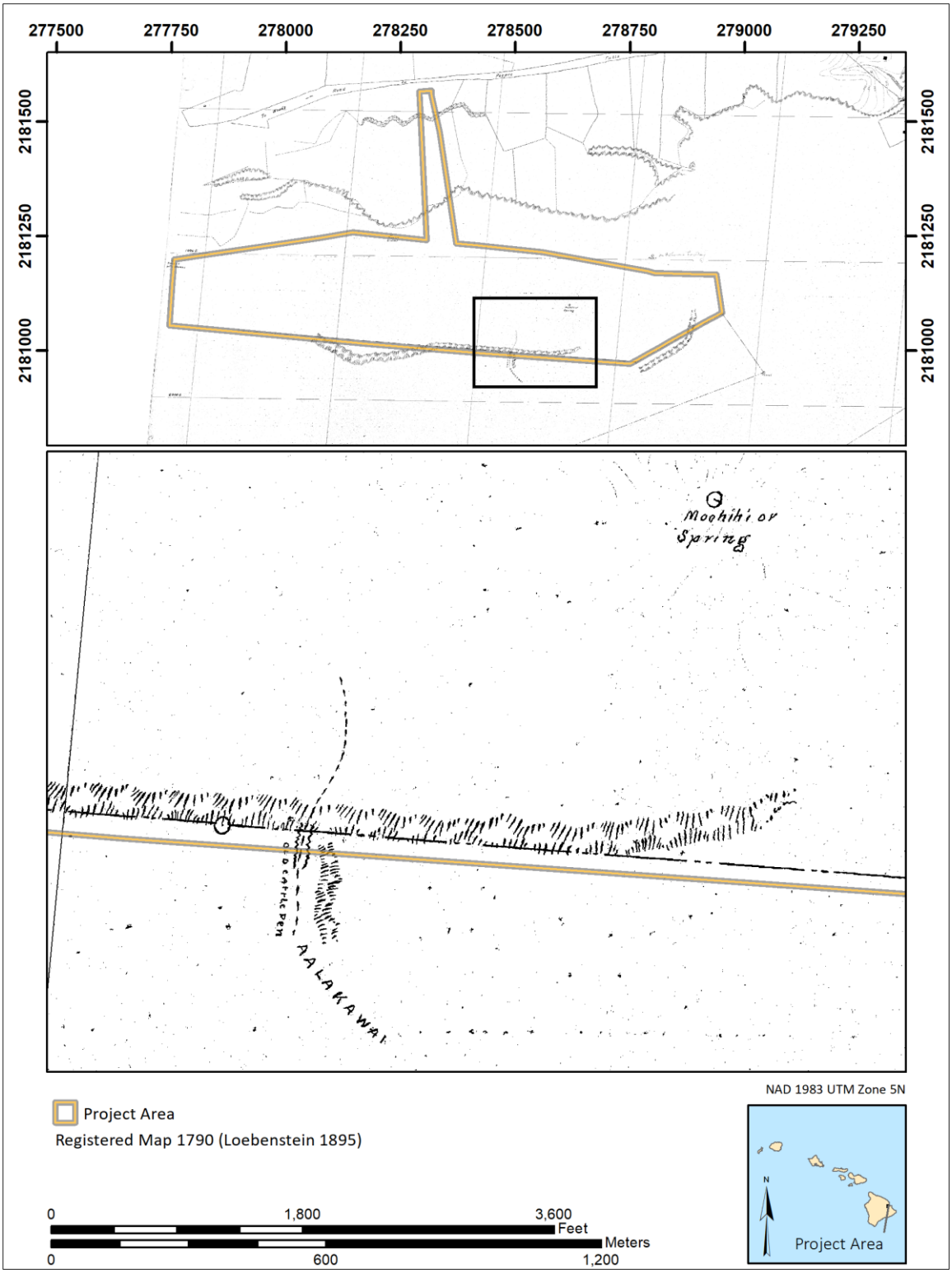

Figure 13. Detail of named places on Registered Map 1790 (Loebenstein 1895)

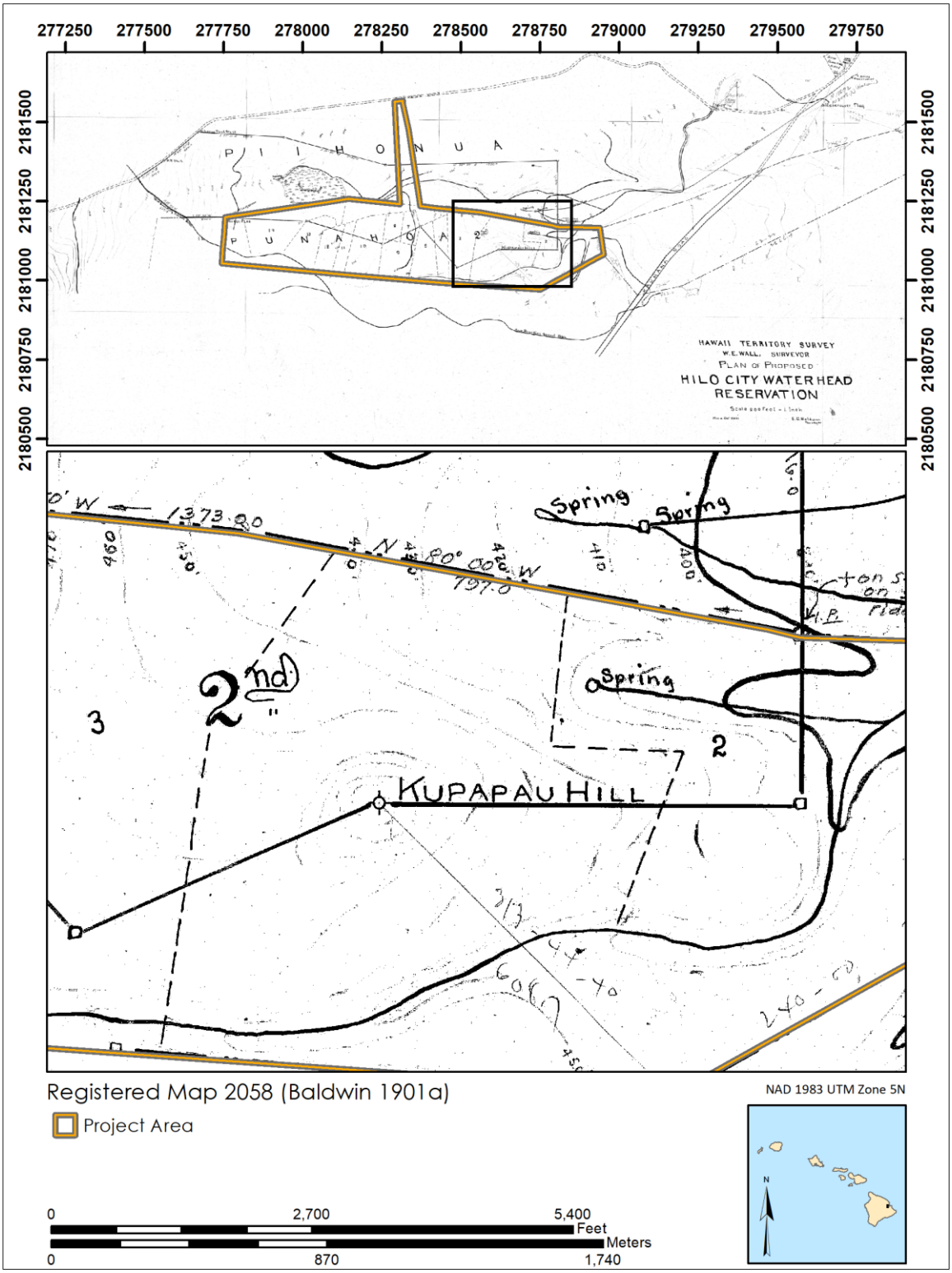

Figure 14. Detail of Registered Map 2058 (Baldwin 1901a)

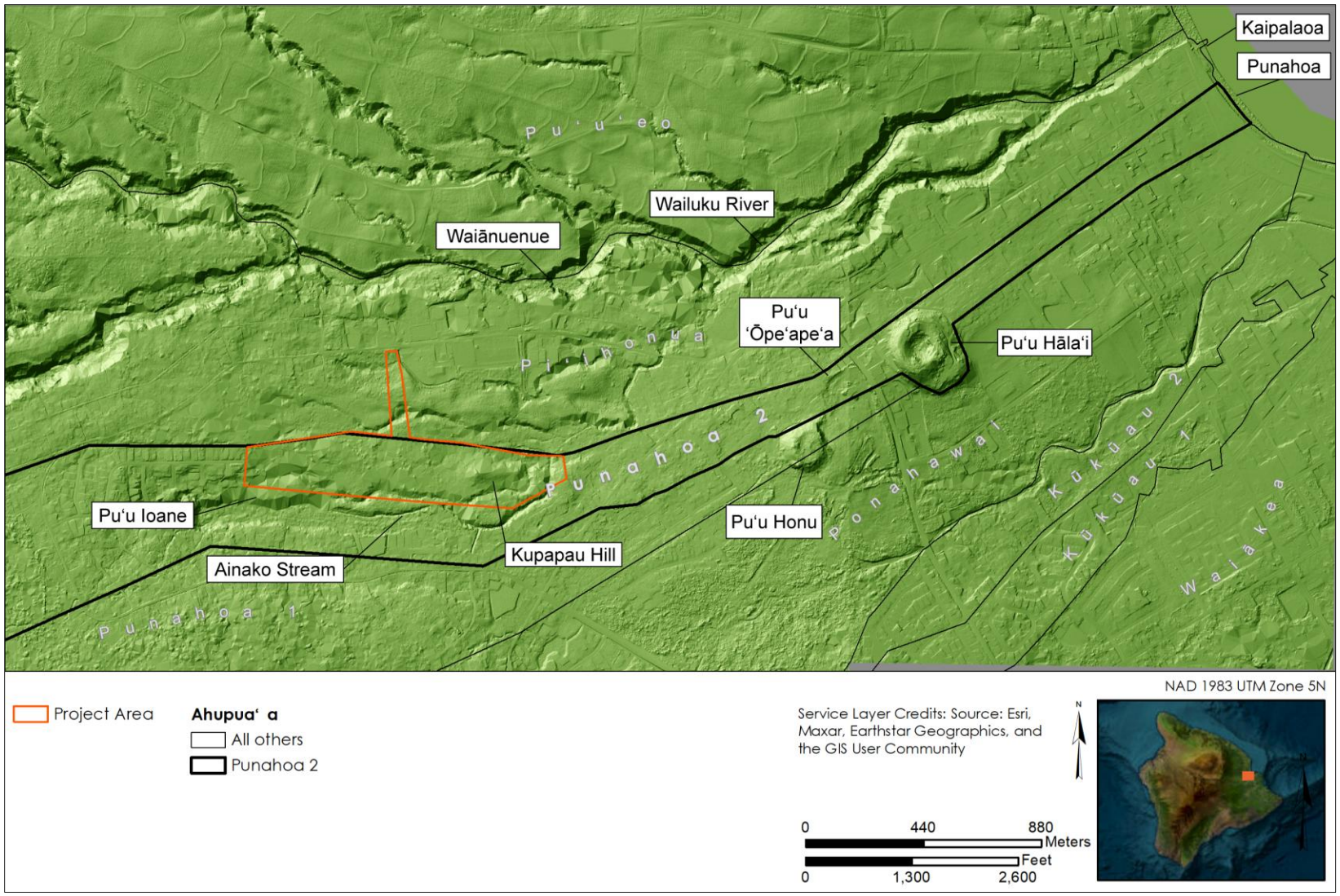

Figure 15. Named places in the Project Area vicinity

Another named pu‘u is located near the southwest corner of the Project Area (Figure 15). This pu‘u, “Pu‘u Ioane” also does not appear *Place Names of Hawaii* (Pukui et al. 1974) or older gazetteers. No references were found to it in during the review of archival materials conducted for the Project Area.

Ainako Stream extends near the southern boundary of the Project Area and turns north to cross it below Kupapau Hill. Smaller tributaries of the stream also extend through the Project Area. The stream originates at about the 820-foot elevation about 0.6 mile mauka of the Project Area in roughly a half-mile of boggy scrub forest and grasslands immediately below what is now Akolea Road. The stream and its branches wind through the Ainako Terrace subdivision before reaching the project area. The tributaries of the stream converge toward the northeast corner of the Project Area and then flow toward the Wailuku. The stream appears to be named after the Ainako Subdivision, which was created in 1946 by the Hilo Sugar Company on abandoned sugarcane land south and west of the Project Area. The subdivision which includes Ainako Street and five side streets, and some of the lots were initially set aside for World War II veterans. In the Hilo Sugar Company’s announcement of the subdivision’s opening, they stated that the new neighborhood was named “Ainako (ai-na-ko’) meaning cane land” (Hawaii Tribune-Herald 1946), after the sugarcane fields that were repurposed for housing. The name of the stream is not mentioned by Solomon P. Kaleoholani in the testimony he gave in 1917 regarding the ditches in Pi‘ihonua, Punahoa, and Ponahawai. No other earlier references to the stream by name could be found. The plat that was drawn for the subdivision (Towill 1947) does not name the stream. The stream is referred to as “Ainako Stream” in a 1958 newspaper article describing plans to create flood controls on the stream to address concerns about flooding the Ainako neighborhood (Hilo Tribune-Herald 1958), but no earlier references to the stream’s name could be found.

3.1.2 1779-1848: EARLY CONTACT AND CULTURAL EXCHANGE

Sustained interaction between Hawaiians and foreigners, which appears to have paused after the arrival of the various ali‘i associated with the moku and ahupua‘a system in the 15th century, resumed with the arrival of HMS Discovery and HMS Resolution, commanded by Captain James Cook, to Kaua‘i in 1778, and their return the next year to Hawai‘i Island. Earliest recorded descriptions of the area by foreign visitors include John Ledyard (1783) and David Samwell (1786), Archibald Menzies (1920), William Ellis (1825, 1827), Joseph Goodrich (1826, 1833), Titus Coan (1852), and several other. It is from these descriptions that McEldowney (1979a) and Gon et al. (2018) derive some of their models for Precontact settlement and land use patterns.

Beginning about 1822, missionaries associated with the American Board of Commissioners for Foreign Missions (ABCFM) arrived in Hilo to begin converting Hawaiians to their Congregationalist Christian faith and way of life. In 1823, Reverend William Ellis, one of the first Christian missionaries to arrive in Hilo, estimated about 2,000 people and 400 dwellings along the coastline at Hilo Bay (Ellis 1825). He arrived in Hilo by way of Puna and came through Waiākea to Pi‘ihonua. He describes the river and the coastal village, along with a description of settled and farmed land in Waiākea and Kūkuau (Ellis 1825:186). He notes frequent rainfall, light and fertile soil formed from decomposed lava and plant material, and plantations of “plaintains,” bananas, sugarcane, taro, potatoes and melons along with coconut and ‘ulu (breadfruit) groves. In less soil-prone areas he describes potatoes being grown in mounds built from small

pieces of lava. Within two years, the ABCFM had established a meeting house and missionary school under the direction of Joseph Goodrich, had arrived the previous year (Wolforth 1999:11).

The patterns of settlement and agriculture at Hilo shortly after the arrival of missionaries were roughly captured in on a British chart of Hilo Bay (Figure 12) surveyed in 1825 by C.R. Malden (1841) during the visit of HMS Bonde commanded by Lord George Anson Byron (Byron 1826). Although the chart's main focus is depth soundings of the bay and useful navigational landmarks, it also includes some details as far as a mile inland. Several small groups of Hawaiian hale (houses) are arranged near the coast, a few in what appears to be Punahoa, but the majority of land between the shore and Pu'u Hāla'i (labeled "Green Hill") is occupied by agricultural plots, including one on the lower slope of the pu'u. The area depicted on the chart does not extend far enough mauka to include the Project Area. It does, however, provide an illustration of the early first-hand descriptions of land by Ellis (1825, 1827), Goodrich (1826, 1833), and Coan (1852).

Families associated with the Kamehameha line resided near the shore in Punahoa and Pi'ihonua as they were establishing the kingdom in the late 1700s (Maly 2003:180). One major 'auwai in Pi'ihonua is attributed to Kamehameha's court requiring a supply of water, near Kaipalaoa. After Kamehameha's death, Punahoa 2 was among the earliest lands on Hawai'i Island to be given to foreigners. According to testimony given to the Board of Commissioners to Quiet Land Titles (the "Land Commission") by members of the ABCFM, the king Kauikeaouli (Kamehameha III) and the kuhina nui Ka'ahumanu gave nearly the entire ahupua'a of Punahoa 2 to Joseph Goodrich, on behalf of the ABCFM 1827.

During this period, the ABCFM grew its presence in Punahoa, building meeting houses, establishing farms and plantations, and after the arrival of the Lyman missionary family in 1832, the Hilo Boarding school. The school was founded in 1835 by David Lyman and his wife Sarah on the southeast side of the present-day intersection of Hāili Street and Laimana Street. The Hilo Boarding School obtained its water through an 'auwai (the Hilo Boarding School Ditch, SIHP Site 50-10-34-14947) that transported water from mauka Punahoa. Multiple accounts of the origin of the 'auwai were included in testimony given during a legal battle over the water rights in the early 20th century (Kelly 1982; Wolforth 1999). Solomon P. Kaeloholani testified that it was dug in 1813 under the purview of the konohiki of Punahoa, named Aki. Another version, provided by Fredrick Lyman and other Hawaiian Evangelical Association leaders, attributes the construction of the ditch to the Rev. Joseph Goodrich in 1824. Wolforth's (1999) interpretation places its origins even earlier in the 17th century as the 'auwai built under the orders of the ali'i 'Ī, from which the other ditches in Pi'ihonua, Punahoa, and Ponahawai branch. Multiple historic maps, discussed below, show the route of the Hilo Boarding School Ditch passing through the Project Area.

Meanwhile, beginning in the 1830s, the kula lands in Ponahawai were planted in sugar cane under direction of Benjamim Pitman (Maly 2003:181). To the north of Punahoa, as early as 1843, a Chinese immigrant by the name of Chee In, called A'ina in Hawaiian, claimed to own a 4-acre sugar operation, including a mill in Pi'ihonua on the southern bank of the Wailuku (Tam Sing et al. 2017:52). Another Chinese immigrant, Tang Hun Sin, or Akina, acquired an acre of land in Pi'ihonua and partnered with Pitman to operate the Amau'ulu Plantation (founded by Akina) in Pu'u'eo across the Wailuku River in about 1851. These sugar plantations would grow into the dominant agricultural endeavor in Hilo, ultimately surrounding the Project Area with cane fields and tapping the waters that flow through it.

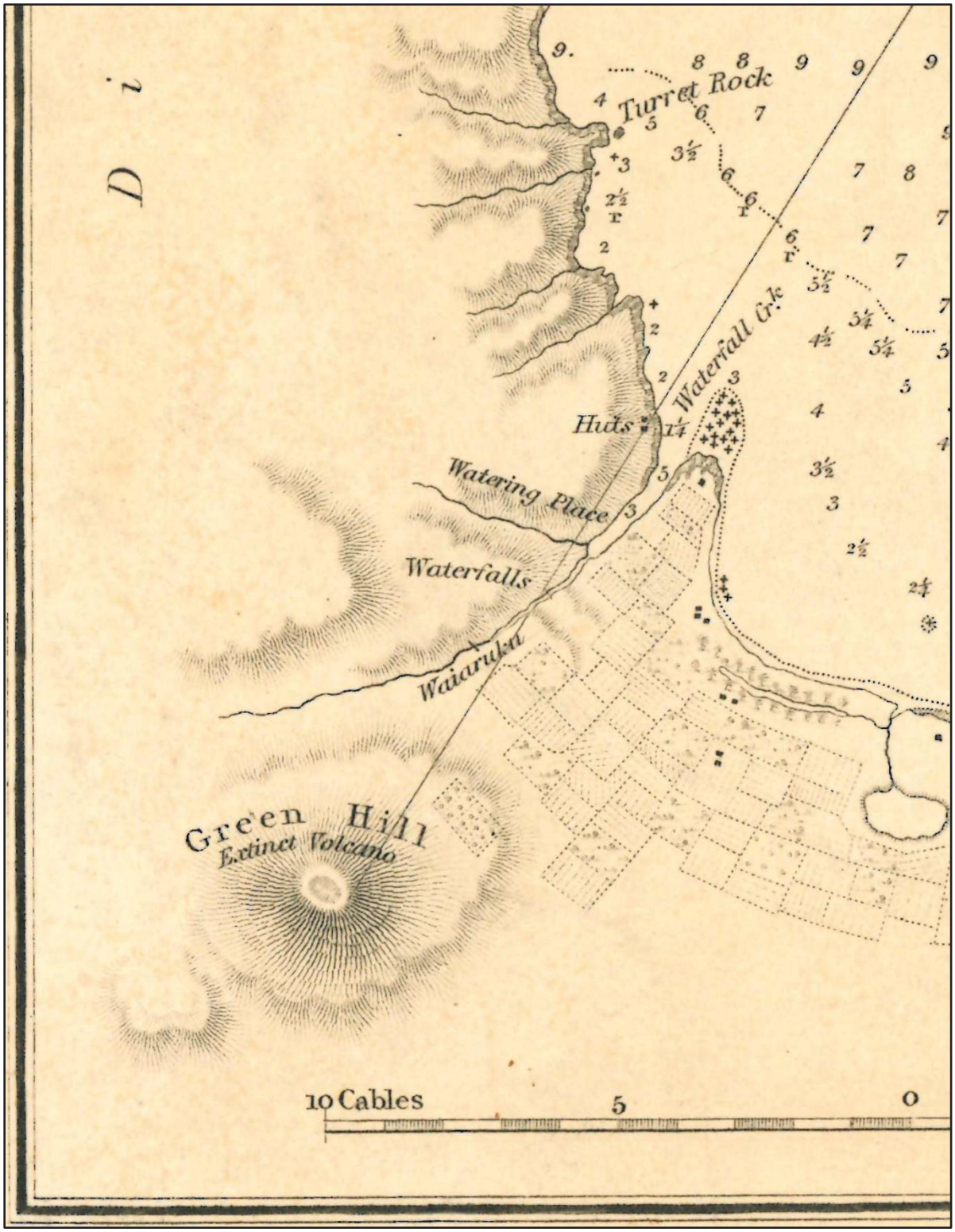

Figure 16. Detail of Malden's (1841) chart of Waiakea or Byron Bay surveyed in 1825

3.1.3 1848-1851: THE MĀHELE AND THE ABCFM

During the 1830s and 1840s, the Hawaiian Kingdom was an established center of commerce and trade in the Pacific, recognized internationally as a sovereign national by the United States and other nations in the Pacific and Europe (Sai 2011). Hawaiian political elites sought ways to integrate the kingdom into the family of nations, and the influence of an increasing population of Western settlers led to major socioeconomic and political changes. These changes included the formal adoption of a Hawaiian constitution by 1840, the change in governance from an absolute monarchy to a constitutional monarchy, and the shift towards a Euro-American model of private land ownership. The change in land governance was partially informed by ex-missionaries and Euro-American businessmen in the islands who were generally hesitant to enter business deals on leasehold lands that they feared could be revoked from them at any time.

Following the Declaration of Rights and Laws of 1839 and the Constitution of 1840, the vested rights of the Mōʻī (King), aliʻi, and makaʻāinina in the ʻāina needed to be settled, as these documents codified the concept that these three groups jointly owned the lands of the kingdom, though with differing degrees of interest (Beamer and Tong 2016). The change in land tenure was further endorsed by missionaries and Western businessmen in the islands who were generally hesitant to enter business deals on leasehold lands. It was decided that three classes of people had one-third vested rights to the lands of Hawaiʻi: the Mōʻī, the aliʻi (chiefs), and konohiki (land agents), and the makaʻāinana (common people or native tenants) (Chinen 1958). In 1845 the legislature created the Board of Commissioners to Quiet Land Titles (more commonly known as the Land Commission), to develop procedures for dividing the lands and to grant or reject claims to land titles brought before them. Land claims could be made by chiefs, often for entire ahupuaʻa, or by tenants for their house lots and gardens, with an initial deadline of February 14, 1848. This deadline was extended several times for the aliʻi and konohiki, but not for commoners (Alexander 1920; Soehren 2005). The Mōʻī and some 245 aliʻi spent nearly two years trying unsuccessfully to divide all the lands of Hawaiʻi amongst themselves before the whole matter was referred to the Privy Council on December 18, 1847 (Kameʻeleihiwa 1992; King n.d.; Kuykendall 1938). Once the Mōʻī and his aliʻi accepted the principles of the Privy Council, the Māhele ʻĀina (Division of Land) was completed on March 7, 1848. The names of all of the ahupuaʻa and ʻili kūpono (politically independent subdivision within an ahupuaʻa) of the Hawaiian Islands and the chiefs who claimed them, were recorded in the Buke Mahele (Buke Māhele 1848; Soehren 2005). To set aside public lands that could be sold to raise money for the government or purchased by his subjects to live on, the Mōʻī commuted about two-thirds of the lands awarded to him to the government (King n.d.). The chiefs who participated in the Māhele were also required to provide commutations of a portion of their lands to the government to receive a Royal Patent that gave them clear title to their remaining lands. The lands surrendered to the government by the Mōʻī and aliʻi and konohiki became known as “Government Land,” while the lands that were personally retained by the Mōʻī became known as “Crown Land” and the lands received by the aliʻi and konohiki became known as “Konohiki Land” (Chinen 1958:vii, 1961:13). Most importantly, all lands (whether Crown, Government, or Konohiki lands) identified and claimed during the Māhele were “subject to the rights of the native tenants” residing therein (Garavoy 2005:524). All lands awarded during the Māhele were identified by name only, with the understanding that the ancient boundaries would prevail until the land could be formally surveyed. This process expedited the work of the Land Commission. Unlike the Mōʻī, the aliʻi and konohiki were required to present their claims to the

Land Commission to receive title—less than allodial—to their lands via a document known as a Land Commission Award (LCAw). Punahoa 2 does not appear in the Māhele Book, although a land division called only “Punahoa” does. The Punahoa in the Māhele Book is the ahupuaʻa of Punahoa 1, which was given to Enoka Kahakumakaliua (despite also being claimed by Asa Keao). The absence of Punahoa 2 in the Māhele Book is likely because the land had already been given to the ABCFM by the King and Kaʻahumanu in about 1827.

As the Mōʻī and aliʻi made claims to large tracts of land during the Māhele, questions arose regarding the protection of rights for the native tenants. To address this matter, on August 6, 1850, the Kuleana Act or Enabling Act was passed, allowing native tenants to claim a fee simple title to any portion of lands that they physically occupied, actively cultivated, or had improved (Garavoy 2005). Additionally, the Kuleana Act clarified rights to gather natural resources, as well as access rights to kuleana parcels, which were typically landlocked. Lands awarded through the Kuleana Act were and still are, referred to as kuleana awards or kuleana lands. The Land Commission oversaw the program and administered the kuleana as Land Commission Awards (Chinen 1958). Native tenants wishing to claim land were required to register their claim in writing (either in the Hawaiian or English language) by submitting a register to the Land Commission who assigned the claimant a number, and that number was used to track the claimant through the entire claims process. Subsequently, the claimant had to get supporting testimony from two individuals (typically neighbors) to confirm their claim to the land. The document generated as part of this process was known as a Native or Foreign Testimony depending upon the language used by the claimant. Upon successful submittal of the required documents, the Land Commission rendered their decision, and if the commission decided in their favor, the tenant was issued the LCAw.

The ABCFM submitted a claim for all of the lands it held throughout the islands. The claim for Punahoa 2, LCA 387 Part 4 Section 1, was submitted by Titus Coan. It included nearly the entire ahupuaʻa. The description of the land in the claim provides few details about the Project Area. Coan’s testimony, given on May 4, 1849, notes that the land was given to Joseph Goodrich by King and Kaʻahumanu in about 1827. He added, “There are some Natives living on the land of Punahoa, some of them are Kamaainas or descendants of them, and others have leases or permission to live there from the Mission” (Foreign Testimony 1964:3:136), The testimonies also describe dwellings at the mission station, the school for boys and the school for girls, the school farm, all makai of Hālaʻi Hill.

In the initial registration of their claim to the Land Commission for the missionary lands in Punahoa under Claim No. 387 (Foreign Register:45–46), the ABCFM noted:

> *The boundaries of this land are well understood by natives of the vicinity. All the dwelling houses at the station, belonging to the Mission are on this land; also the buildings & yards of the two boarding schools together with all the cultivation connected with the school for boys, & a considerable portion of that belonging to the school for girls. A portion of this land is worthless, except for pasturage & is used for that purpose. A small portion is occupied by natives; another & probably the largest portion is still a forest.*

This does not specify where the Hawaiian tenants were living at the time, but based on the claims made for house lots, it appears that most if not all were near the coast.

Six claims for native tenant kuleana parcels were filed for lands in Punahoa 2, in addition to the ahupua‘a-wide claim by the ABCFM (Table 1). These claims are listed specifically as occurring in Punahoa 2 in the Native Register, Native Testimony, Foreign Testimony, or Land Commission Award documentation. All kuleana claims were for lands makai of Hāla‘i Hill, in what was becoming an important part of Hilo Town. All are more than 7/8 of a mile from the Project Area. This does not necessarily mean that no Hawaiian tenants were using the Project Area before or after the Māhele, but it complicates the search for information about how the Project Area may have been used and by whom.

Only two of the Punahoa 2 kuleana claims were awarded, and their locations are shown in Figure 17. These awards went to Apiki, for two house lots, and to Aipinepine for one.. One claims for a lot in Punahoa 2 claimed by “John Nomore” was not awarded (it is shaded green in Figure 17.) There appears to have been some confusion over where the ahupua‘a boundaries were by the time the claims for these lands were made. Another lot was initially claimed under claim 3996 by Kahalelepo as being in Punahoa 2, just mauka of “John Nomore’s” lot. The lot was awarded to Kahalelepo, but under LCAw. 4002 and documented as being in Ponahawai on the award paperwork and Royal Patent Grant 5604. In Pi‘ihonua, the situation was similar, with all claims made in the makai portion of the ahupua‘a. No claims were made in the vicinity of the Project Area in Pi‘ihonua. In Figure 17, the location of kuleana parcels in Pi‘ihonua are shaded blue, as well as adjacent Punahoa 1 kuleana awards shaded gray. The map indicates that as late as the 1880s, several traditional ‘ili and other smaller land divisions were still intact in downtown Hilo.

Table 1. Land Commission Awards and Claims in Punahoa 2.

Claim	Claimant	Awarded	Location	Uses	Acres
387-4 part 1	Titus Coan	1849	Ahupua‘a of Punahoa 2	Ahupua‘a of Punahoa 2 (note it is called "Punahoa 1" in LCA claim).	585 makai of woods
2228 & 8629	Kaapa	1851	Punahoa* and Ponahawai	2 kīhāpai, 2 dwelling houses	3.9
3769	Apiki k. (for Kahuhu w.)	1851	1. Punahoa 2 at Church Street and beach 2. Punahoa 2 at Church Street and Main Road.	1. House lot, 4 houses, enclosed. 2. 1 house enclosed with a wall	1. 0.68 2. 0.34
3779	Aipinepine	1851	Punahoa 2 makai	1 kīhāpai, 1 house	0.86
3867	Puali	not awarded	Punahoa 2, on Church Street	3 houses, enclosed	not surveyed
3996 (awarded as 4002)	Nahalelepo	1851	Punahoa 2 makai in Claim 3996, Award 4002 places it in Ponhawai	1 house	0.875
5320	Asa Kaeo	Not awarded	1. Punahoa 1 2. Punahoa 2 Church Street and the Beach 3. Punahoa 2 Church Street and main Road	1. House lot “for the Chinese” 2. House lot “for the Chinese” 3. House lot	not surveyed
11298	John Nomore	Not awarded	Punahoa 2, at the beach makai of Nahalelepo’s lot	House lot	not surveyed

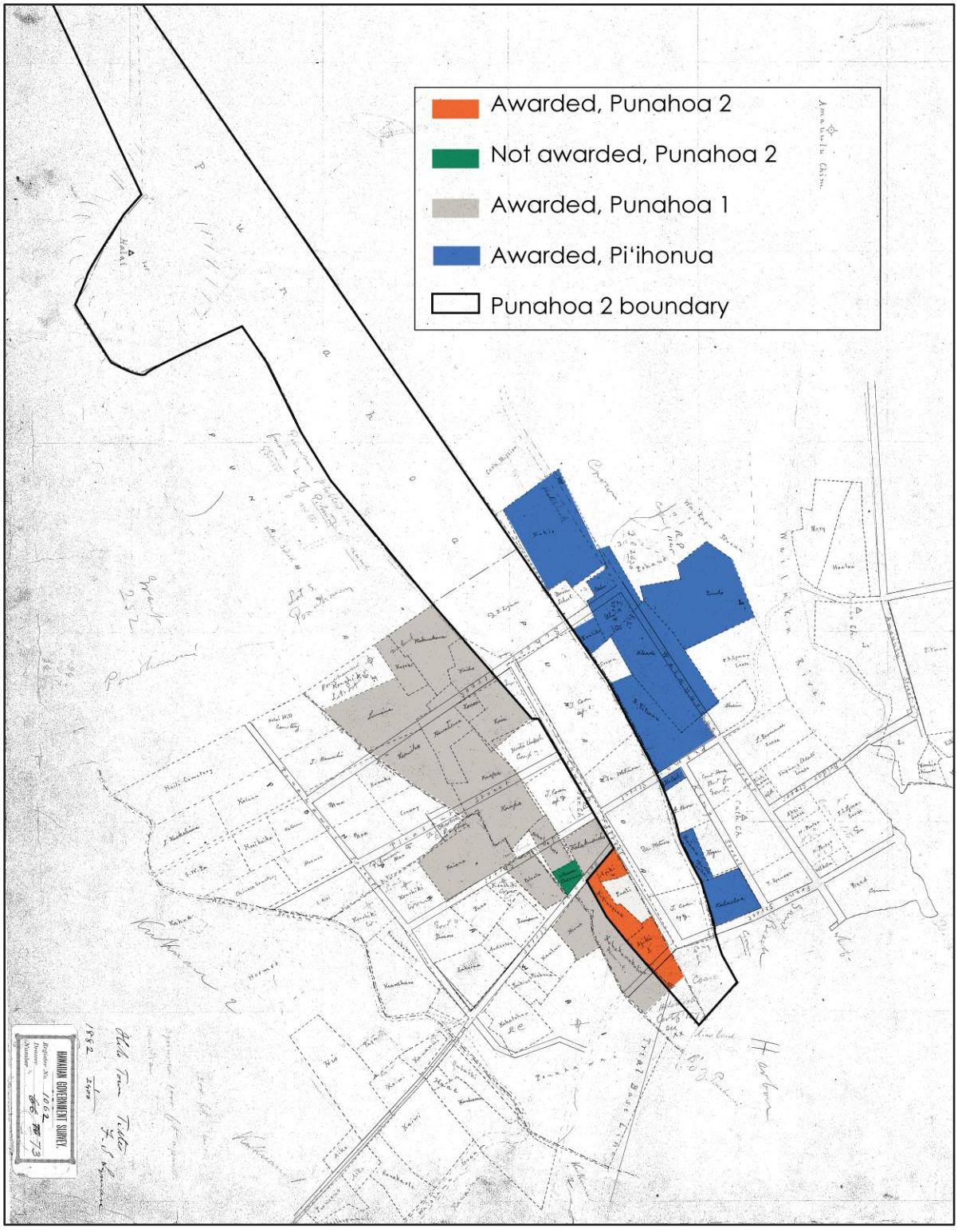

Figure 17. Map of Hilo Town Titles (Lyman 1882) with kuleana parcels indicated

3.1.4 THE LATE 19TH CENTURY: SURROUNDED BY SUGAR

Available late 19th century historical documentation of the Project Area is relatively scarce, in part due to record-keeping priorities of the ABCFM and its successor organization, the Hawai‘i Evangelical Assocation. Based on what is known about the surrounding public and private lands, it is likely that the major agricultural innovation of the late 19th century, commercial sugarcane, influenced how the land was used during this period. The Project Area does not appear to have been a good place to grow sugar cane, although a few early 20th century sources allude to at least some of the land potentially being used in that way.

Over the next half century, the Project Area came to be surrounded by sugarcane fields that provided cane for a series of plantations and milling companies that became the Hilo Sugar Company (Dorrance and Morgan 2000; Kelly et al. 1981; Tam Sing et al. 2017). As mentioned above, experimental sugar production began in the Hilo area as early as Joseph Goodrich’s small plot of cane and wooden mill in the 1820s, but really began in earnest in the late 1840s when Akina, partnered with Pitman, started growing cane on Pitman’s lands at Amau‘ula with a small mill on the Wailuku River. The Aumau‘ula sugar operation was sold by Pitman to Thomas Spencer in 1860 and renamed as the Amauulu Plantation. Spencer then purchased the purchased the 4,000 acre Hoon Sing plantation and its mill in 1867, and 1884 Amauulu and Wainaku plantations merged by W. G. Irwin and Clause Spreckels, creating Hilo Sugar Company. A competitor, the Hilo Mill Company, was formed in 1880 to grow and process cane grown in Pi‘ihonua along the Alenaio Stream. Through this time, land suitable for sugarcane was purchased or leased to the growing sugar companies as well as to farmers working “outside” the plantations.

In 1853, the members of the ABCFM’s Sandwich Island’s Mission, including Titus Coan and David Lyman in Hilo, voted to change their organization’s name to the Hawaii Evangelical Association (HEA) (Hawaiian Evangelical Association 1854), in part to better reflect their integration into Hawaiian society. The Project Area is depicted on an map (Lyman 1853) prepared from a survey conducted that year documenting the boundaries of Punahoa 2 makai of the forest. Although the map is generally focused on boundaries, a fee details of the interior of the Project Area are included. Landmarks shown include Kupapau Hill, which due to survey error is drawn southeast of its actual position. A spring is shown on the north side of the hill with a watercourse extending to the north. A trail approaches from Hāla‘i hills and what appears to be a small building is shown on the trail at the eastern toe of Kupapau Hill. Ainako Stream is shown crossing into the project area from the south. Prominent kukui trees were used to represent corners on the ahupua‘a boundary.

The general vicinity of the Project Area was probably visited briefly during a journey across uplands from the Kīlauea to Hilo taken by a traveler named Samuel Hill (1856:290). Hill’s ride across he uplands ends with his emergence into “a piece of meadow land, on which were feeding several head of cattle, with letters marked upon their skins, which as plainly revealed the fact of their captivity as it assured us of the near termination of our journey” which was another half-hour by horse down to Bejamin Pitman’s home in Ponahawai. This suggests that by this time, upland kula lands were being used for pasturage.

In 1862, the Commission of Boundaries (Boundary Commission) was established in the Kingdom of Hawai‘i to legally set the boundaries of all the ahupua‘a that had been awarded, by name only, as a part of the Māhele. In 1874, the Boundary Commission was authorized to certify the boundaries for lands brought before them. As a part of this process, the Boundary Commission gathered testimony from informants, who were typically elder kama‘āina (native born or one well-acquainted with an area) residents who learned of the boundaries from their ancestors, relatives, or neighbors. The boundary information was collected primarily between 1873 and 1885 and was usually given in Hawaiian and simultaneously transcribed into English. No boundary commission hearing was conducted for Punahoa 2, as the boundaries of the ABCFM's Land Commission Award already included a survey and the boundaries had been accepted.

The HEA, in possession of over 1,900 acres in Punahoa 2, did not sit idly on their land. At various times, it was leased to tenants. By the last decade of the nineteenth century, the growth of sugar as an industry had become a consideration for the HEA as it offered its lands for lease. In January 1891, it auctioned off a lease of its entire Punahoa 2 holdings mauka of Halai Hill, including the Project Area (The Pacific Commercial Advertiser 1890). In the advertisement for this auction (Figure 18), the land is offered for a lease term of 10 or 15 years to begin, presumably, in January of 1891. The entire property was offered at an upset price of $300 per year. Of the more than 1,900 acres, only 60 to 80 of them were advertised as good agricultural land, suitable for "cane, bananas, etc." The Hilo Sugar Company successfully bid on the land, most likely for its water resources more than its potential for sugarcane cultivation (John Cross, personal communication, March 21, 2004).

Another glimpse at the Project Area toward the end of this period is provided by Registered Map 1790 (Figure 19) was prepared in 1895 for the layout of the Pi‘ihonua Road between Hāla‘i Hill and an elevation of about 600 feet. Although the map is focused on terrain and property boundaries in Pi‘ihonua, a few landmarks were surveyed in the Project Area (Figure 20). These include Kupapau Hill, where Loebenstein set a survey point he called "Moohihi or spring," portions of Ainako Stream along the southern boundary of the Project Area, and a few rock piles marking the Pi‘ihonua-Punahoa 2 boundary. On the southern boundary of the Project Area southwest of Kupapa‘u, he indicates a dashed line extending across the boundary and Ainako Stream, labels "Aalakawai". Next to this he labels "Old Cattle Pen." Both labels are outside of the Project Area. Aalakawai could be "the water is fragrant" and could be a small stream.

Lease at Auction!

By Order of the Board of the Hawaiian Evangelical Association, I shall sell at Public Auction on

Saturday, January 3, 1891,

at 12 o'clock noon,

At Hilo Court House, Hilo, Hawaii, the Lease of that Tract of Land, situate in the land of Punahoa 2d, District of Hilo, formerly belonging to Rev. T. Coan, containing an area of about 1,900 acres, and being the land described as Lot 4 in Royal Patent No. 1,949.

Lease for 10 or 15 years.

From 60 to 80 acres of this land is suitable for cane, bananas, etc.

Upset rent of $300 per year in advance. Lessee to pay taxes.

For further particulars inquire of Hon. F. S. Lyman, Hilo, Hawaii, or W. W. Hall, Honolulu.

L. SEVERANCE.
Auctioneer.

Hilo, Hawaii,
Dec. 16, 1890.

150 3-t 1355 1-t

Figure 18. Advertisement for a lease auction of the HEA's Punahoa 2 lands, including the Project Area (The Pacific Commercial Advertiser 1890).

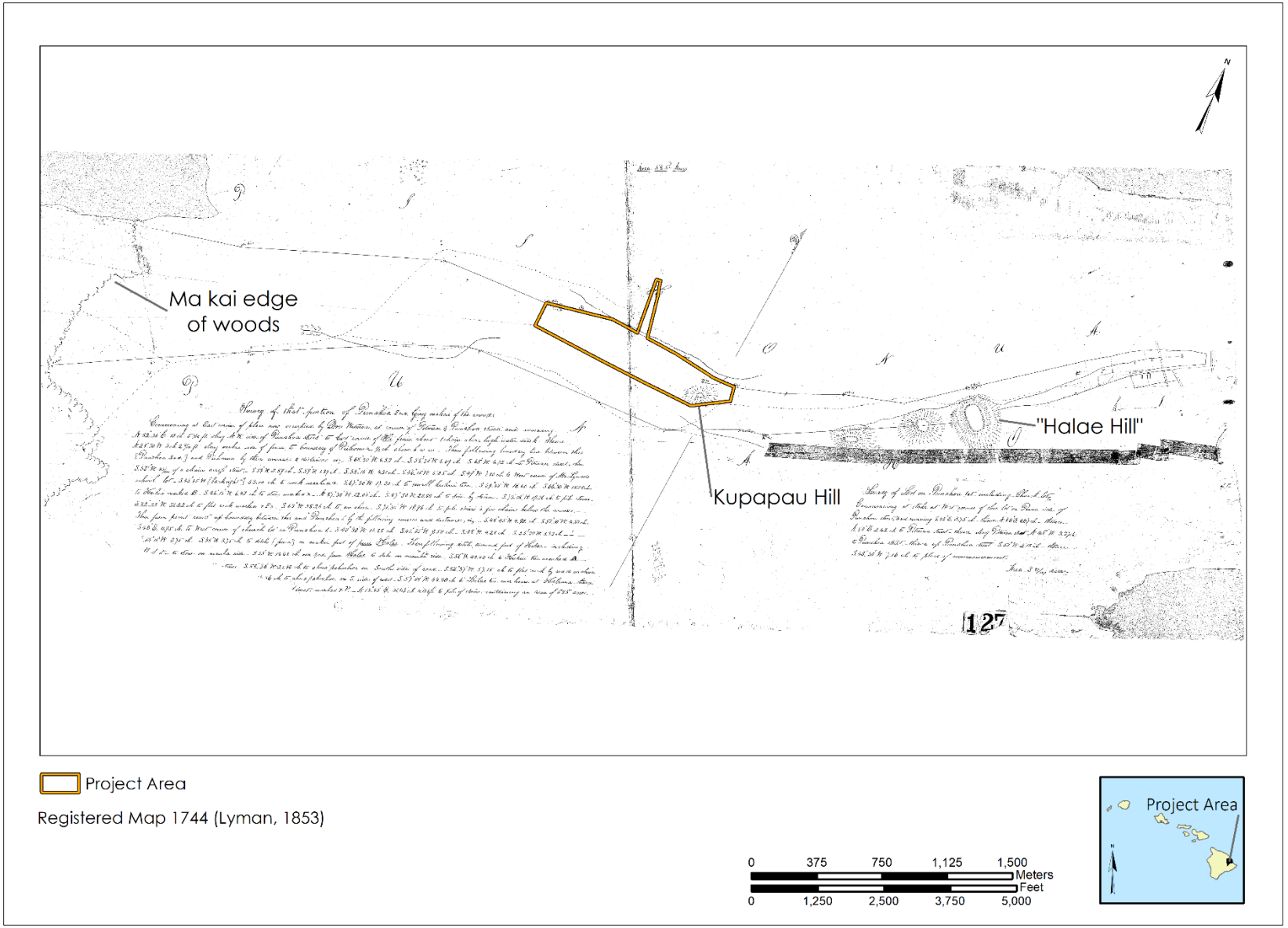

Figure 19. Registered Map 1744 (Lyman 1853) with the Project Area indicated.

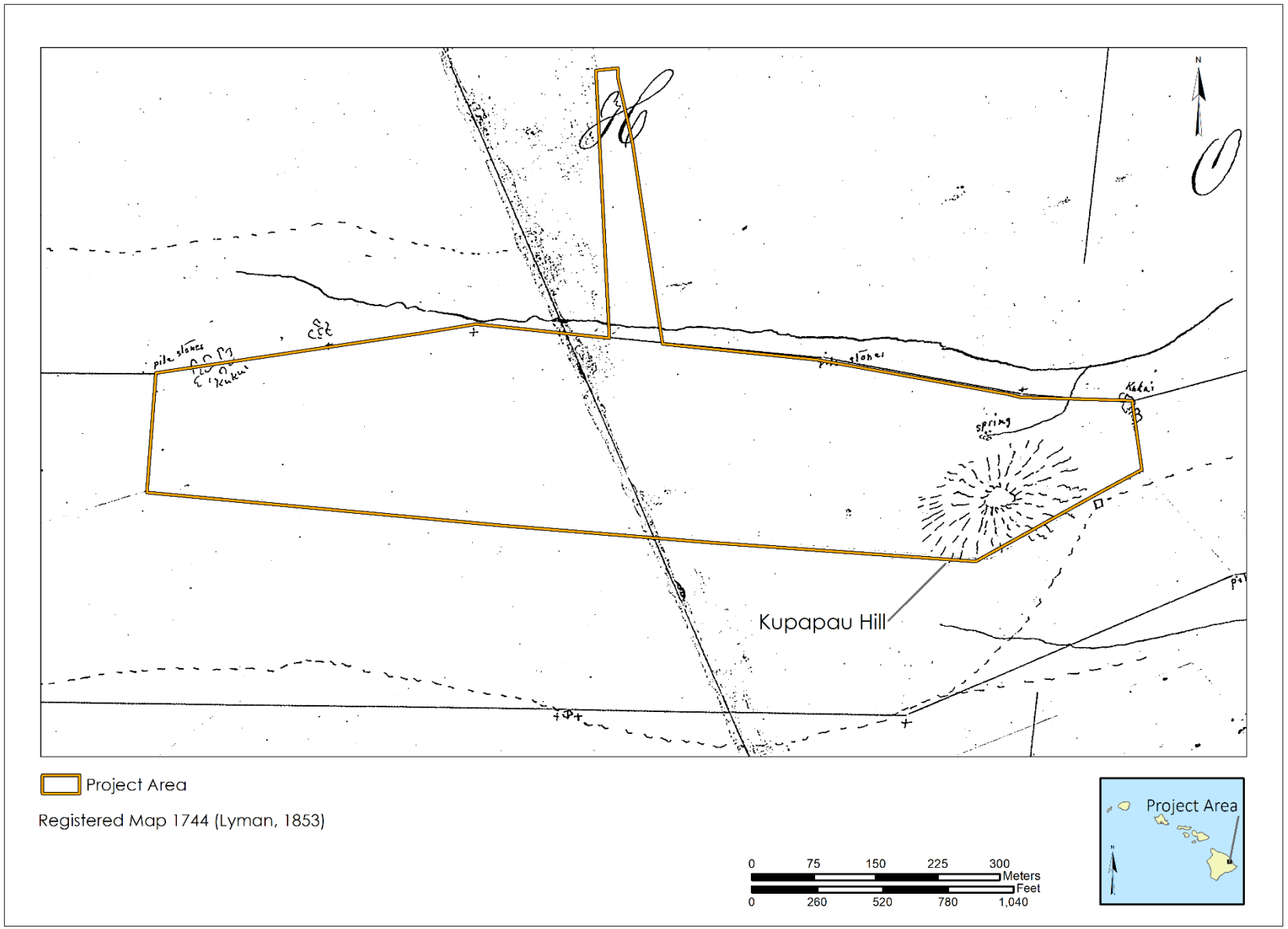

Figure 20. Portion of Hawaii Registered Map 1744 (Lyman 1853) containing the project area.

3.1.5 THE EARLY 20TH CENTURY: WATER RIGHTS AND WATER FIGHTS

During the first half of the 20th century, the Project Area became embroiled in a protracted fight over ownership and use of the water from the springs located in the makai portion of the parcel. This clash occurred between the HEA and the County of Hawai‘i, dragging the Project Area into public view through a series of newspaper articles, county commission meetings, and eventually legal proceedings. As the sugar industry and the town of Hilo grew, so did the need for clean, fresh water. At the time, the Portuguese Mill flume in Pi‘ihonua was providing a portion of the town’s water supply from a source located at about 284 ft amsl. The springs in Pi‘ihonua and Punahoa 2, 123 feet higher in elevation, were identified as potential sources, both cleaner and capable of providing more water pressure to the system. On July 22, 1897, Hilo Water Works superintendent Wiliam Vannata began installation of a 8-inch pipeline to the Pi‘ihonua springs (Hawaii Herald 1897a). The next week, the county reported that the entire route for new pipeline had been surveyed (Hawaii Herald 1897b), and at the end of August the entire line had been installed and connected to the city main (Hawaii Herald 1897c).

With the spring in Pi‘ihonua tapped, the County sought to protect it by creating a water reservation around the town’s water source at the Kaūmana Springs, to include the springs it owned in Pi‘ihonua, the springs in Punahoa 2, and the surrounding watershed. The proposed extent of the reservation was plotted by E. D. Baldwin on Hawai‘i Registered Map 2058 (Figure 15). The proposed reservation included 22.5 acres of the HEA’s land within the northern portion of the Project Area.

This map depicts several key features of the project area and its surroundings. The Hilo Boarding School Ditch can be seen entering the project area from the west and exiting through the southern boundary. The ditch remains outside of the project area and does not join Ainako Stream. A large swamp is shown just north of the project area with a stream running from it into Ainako Stream. Three springs appear north of the project area and one within it, just to the northeast of Kupaau Hill. No improvements area drawn at the springs, other than one waterpipe fed by the two northeasternmost springs.

What is most interesting about this map is that beneath the propsed water reserve boundary, it shows the HEA’s land subdivided into 15 smaller lots of irregular shape and size. The boundaries of these “historic lots” are indicatd with a dashed line. Most of them are numbered, but not all. Kupapau Hill appears to be in a large, unnumbered lot (which will be referred to as “Lot 1” or “historic Lot 1”). The spring located on the HEA’s land is on historic Lot 2. The lot boundaries extend down to the Hilo Boarding School Ditch or to ‘Āinakō Stream. Most of the lots are about five acres or less, but the two most mauka historic lots, 14 and 15, are substantially larger than the rest.

Because this map was created to define the proposed watershed boundary and clarify the locations of waterways and springs, some information about the HEA’s land was not included. For example, the southern boundary of Lot 15 is not shown, nor is it clear whether more lots extended mauka. There are no details about land use within the project area other than the delination of the lot boundaries and the spring in Lot 2. No buildings are shown within the Project Area.

Table 2. Numbered lots depicted in the project area on Registered Map 2058.

Lot	Approximate acres	Elevation (feet amsl)
1 (Kupapau Hill)	7.8	430-500
2	3.75	400-430
3	5.0	440-480
4	2.0	480-490
5	2.7	490-500
6	3.5	480-540
7	1.3	490-505
8	1.15	505-510
9	2.7	490-510
10	5.4	510-525
11	1.8	525-530
12	3.6	530-550
13	3.4	550-560
14	7.0	540-590
15	>12.0	590-655

In 1905, contamination of Hilo's water supply from the Kaūmana Springs area led to the acquisition of the Project Area by the County, but only after several decades of protracted disagreement with the ABCFM and its successor, the Hawai‘i Evangelical Association. In the spring of that year, the boilers on the engines of the Hilo Railroad began to have constant problems with rust (Hilo Tribune 1905). The railroad was using water from the public water mains, which were fed in part by water from the Kaūmana Springs. The water in the mains was analyzed and it was found that after heavy rains the water containes a large proportion of impurities traceable to fertilizer. The source of the contamination was found to be a 5-acre field surrounding the springs where stable manure was being used to fertilize sugarcane. The culprit was identified only as a Japanese cane farmer who was subleasing the land from a man named Manuel Aranjo, who in turn was leasing the 5 acres from John Tamatoa Baker, the last governor of Hawai‘i under the monarchy and founder of Pu‘u O‘o ranch in Pi‘ihonua. Although Baker had surrendered 57.5 acres of leased lands at the headwaters of the water supply back to the government in 1902—in exchange for the right to clear 300 acres of mauka lands in Pi‘ihonua (Hilo Tribune 1903)—he apparently had leased some of these lands to Aranjo without the government's knowledge.

Meanwhile, across the parcel boundary in Punahoa 2, the Hilo Sugar Company was leasing land from the ABCFM around the springs. These lands were among 1,932 ½ acres leased by the HEA to the Hilo Sugar Company beginning in 1891 (Territory of Hawaii 1903:Book 1, page 123). The total value of this land, as assessed by the Territorial government, was $2,500. By this time, the Hilo Sugar Company owned land south of the Project Area in Punahoa 1 and was growing sugarcane on portions of it.

The contamination of the water in the Pi‘ihonua Springs led some County commissioners to propose that land around the springs be set aside as a water reservation, where restrictions on land use would prevent

similar problems in the future. In addition to the land in Piʻihonua surrounding the springs, they also proposed including a portion of the Project Area that was under lease to the Hilo Sugar Company:

> *These [Punahoa] lands have an area of 22.8 acres belonging to the American Board of Missions and now under lease to the Hilo Sugar Company. This tract is now under cultivation and in the opinion of experts should be set aside as government reserve to preserve the purity of the water supply. (Hilo Tribune 1905)*

The 22.8 acres mentioned in the article are the lands included within the proposed reservation are indicated with a thick black line in Figure 15. The land described as being under cultivation was probably the where sugar cane was being grown on adjacent parcels. The lands within the Project Area were too rough and wet to make sugar cane cultivation viable there (John Cross, personal communication, March 21, 2004).

In August of 1910, the County Board of Supervisors passed a resolution to acquire the 22.8 acres that were under lease to Hilo Sugar Company (Warshauer 2003). This effort would last for several decades. The first attempt was made the next year, when the Legislature appropriated $7,500 to purchase the land from the HEA (Hawaii Herald 1911a). The legislature offered to buy the land at $125 per acre and allow the Hilo Sugar Company to continue using the land for another two years with all rents during that time paid to the HEA (Hawaii Herald 1911b). The HEA rejected the appraisal of the land's value and threatened to take the matter to court. (Hawaii Herald 1911b). This disagreement was documented in the tax register for 1911 (Territory of Hawaii 1912:Book 1, page 177) as a penciled-in note above the HEA's tax assessment reading "Spring offered to County + 56 acre for $20,000 but the would only to sell @ 15,000" (Figure 21).At a meeting of the Board of Commissioners, Commissioner Marston Campbell stated that it appeared as though the HEA's response would force the County to condemn the land (Hawaii Herald 1911c). Providing testimony at the meeting, John Scott, the manager of Hilo Sugar Company, said he was willing to exchange the lease at the spring for ownership of the government-owned house lot at Reed's Bay where he lived. The county balked at this offer, and this led to a lively back-and-forth between the commissioners and Scott, who got the last word in by insisting that the government, if it gave him the Reed's Bay property, could always get it back by condemnation.

The County attempted to condemn the water shed property, scheduling a hearing in August of 1912 (Hawaii Herald 1912). HEA countered with a valuation of $20,000 and an asking price of $15,000 (Hilo Daily Tribune 1914b). The County, of course, disputed this valuation, noting that the HEA was paying taxes based on a $4,000 valuation of the entire 1,908.98 acre property. Unable to secure a deal with the HEA, the County arranged with Hilo Sugar Company to use all the water they desired that was not required by the company (Hawaii Herald 1914). This created peace between the County and the HEA, but a peace that was short-lived.

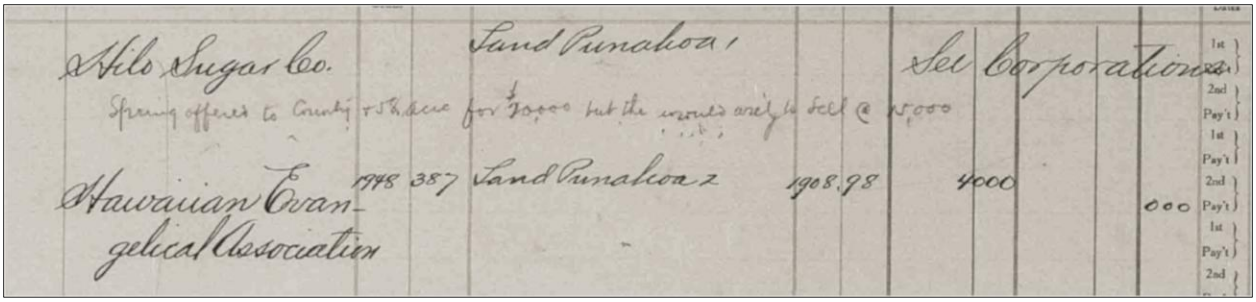

Figure 21. Detail of 1911-1912 Territorial Real Property Tax Ledger with note about the attempted purchase of the spring and 58 acres (Territory of Hawaii 1912:Book 1, page 177)

The County commissioners still wanted to acquire the spring in fee-simple, and appear to have tried applying financial pressure on the HEA to make that happen. They called the HEA's bluff on the value of the spring and raised the taxable value of the HEA's Punahoa 2 lands, not quite to the entire amount that the HEA wanted in exchange for the spring, but exactly the price, $15,000, that the county was willing to pay for it (Territory of Hawaii 1914:Book 1, page 195). The remaining 1,850 acres of agricultural land, which the county did not want, were taxed the same as before. Meanwhile, in May of 1913, the Hilo Sugar Company's lease on the HEA's 1,908.98 acres ended, and with it the county's right to buy the spring's water from Hilo Sugar Company. This did not stop the County from continuing to draw water from the spring. Seven months passed before, apparently without warning, the HEA sent the County a bill for $2,578.80 to cover the 486,000 gallons of water taken between May 1913 and January 1914 (Hawaii Herald 1914)—the equivalent of roughly $81,388 today (United States Bureau of Labor Statistics 2024). The County, of course, balked at the price tag (Hilo Daily Tribune 1914a). The HEA justified their position by noting two facts: that their spring supplied Hilo with one-fourth of its water supply, and that they were asking for less per gallon than the price the County paid for rest of its water supply. A month later, the HEA sent a second bill to cover the water taken by the County the month of February 1914.

The county dug in its heels. In response to this second bill, the Deputy County Attorney William Haehae Heen made a statement that the County did not need the water, but only the land surrounding the spring to protect the quality of the water taken out at the Piʻihonua springs. Heen added that:

> *…it will be the cheapest thing to condemn the land about the springs, as it is generally agreed that it is of no great value, as the Association [the HEA] having in its correspondence admitted that in arriving at the $15,000 valuation it considered the springs and not the land as the valuable asset.* (Hilo Daily Tribune 1914a)

The next week, the HEA published a letter in response to Heen in the newspaper, asking what value the County would put on the water from the spring so they could arrive at a price that would be fair to the consumers of the water in Hilo. The County's response was also published, and noted that the County had the HEA at an advantage, pointing out:

> *…the fact that the owners of the water cannot sell it to any one else, and that they cannot pipe it to any one across public streets unless they have a franchise, which they have not. In Hilo [Heen] adds, water is worth practically nothing. What consumers pay for is not the water but the service and use and maintenance of reservoirs and pipes.* (Hilo Daily Tribune 1914b)

Unsurprisingly, this response did not facilitate a deal between the HEA and the County. The discovery of additional springs on the Pi‘ihonua parcel further slowed progress (Hilo Daily Tribune 1914c).

In 1917, the County’s acquisition of the parcel began in earnest after a final judgement was rendered in the condemnation suit (Hawaii Tribune-Herald 1917). The presiding judge, Clem K. Quinn, ordered the County to pay $11,500 for a 60.59-acre parcel that comprises the portion of the Project Area in Punahoa 2, not just the 22.5 acres around the springs that it had originally desired for the watershed reservation. This version of the transfer to the county is described in a note on Map 1 for Land Court Application 292 (Newton 1937), which documents the subdivision of the HEA’s lands above Kaumana Road.

As the County worked to obtain the Punahoa springs, the Territorial government was locked in a court battle against the Trustees of the Hilo Boarding School over the quantity of water the school was authorized to take from the Wailuku. The government sought to reduce the amount taken out of the Wailuku River through the Hilo Boarding School Ditch, a portion of which passes through the southwest corner of the current project area. The water rights case (Hilo Boarding School v. Territory, 23 Haw. 595) and the testimony provided during it is summarized and analyzed by (Wolforth 1999). Ultimately, the Hilo Boarding School’s rights to 5,590,000 gallons per day were affirmed by the court. The court case, however, included the testimony of Solomon P. Kaleioholani, whose grandmother was the daughter of George Adams Kuakini 5th and was in charge of land and waters in Pi‘ihonuna. Kaleioholani’s testimony describes three large ‘auwai and how they were interrelated. The Hilo Boarding School Ditch, he noted, was a branch of a ditch attributed to Aki, konohiki in about 1841.

The condition of the Project Area during this time is depicted on a map created in 1913 showoing the Hilo Boarding School Ditch and surrounding lands (Figure 16). The map is a reproduction of a blueprint copy on file with the Hawai‘i County Department of Public Works (see discussion in Kelly 1982:Appendix 2). The underlying cartography of the map appears to be traced from Registered Map 2058 (see Figure 15) and includes the 15 lots shown on that earlier map. It also includes updated information about the Hilo Water Works on both sides of Punahoa 2 boundary. Just outside the northeast corner of the Project Area, the map shows the “Hilo City Water Works Old Intake” as a spring house. The natural springs inside the Project Area near the northern flank of Kupapau Hill is shown, along with a spring house labeled “Water Works New Intake” east of the springs is shown inside the Project Area. Other details are similar to the earlier map. The swamp still appears near the northwest end of the project area, and the Hilo Boarding School Ditch appears to be in the same alignment. The gulch banks around the streams are drawn on this map, which makes the boundaries of the numbered fields more understandable. The layout and numbering of the fields has not changed from the 1901 map, with the exception of labeling Field 6 (which had not been labeled before). Another new addition is a building, shown as a solid rectangle in Field 14. Current Public Works staff did not know the age of the map. Because it shows the Hilo Water Works “New Intake” but still labels the Project Area as under HEA ownership, it is likely that the map was drawn before the former HEA parcel was acquired in 1917, but possibly after 1913, when the County began taking water from the spring through their arrangement with Hilo Sugar Company.

The research conducted by Warshauer (2003) indicates that despite the publicized Judge Clem’s final order in 1917, full conveyance of the land did not happen right away. He notes that the land was released on February 25, 1937. This date coincides with the filing of Land Court Application 292, which

documented the subdivision of the County's parcel from the HEA's fee-simple lands. Warshauer (2003:35) also notes two other transactions, without elaborating. One on November 10, 1947, when the parcel was transferred to the Territory of Hawai‘i, and another on January 26, 1951, when the Kaumana Springs was transferred to the County of Hawaii by Executive Order 1418, signed by Gov. Ingram M. Stainback.

Other records slightly contradict this timeline. The 1917 tax register (Hawaii Tribune-Herald 1917:Book 1, page 212) shows the waterhead land (55.8 acres) itemized separately from the HEA's lands, and 18.50 acres leased to the Hilo Sugar Company. The 1919 the tax register notes "County Hawaii let 58.9 [acres] for Water Head" (Territory of Hawaii 1919:Book 3, page 50). In 1922, there is no mention in the tax register of the waterhead land (Territory of Hawaii 1921:Book 2, page 143). Additionally, a 1934 map of the Hilo Sugar Company's fields (Figure 17) labels the Project Area parcel "Hilo Water Supply." These pieces of evidence suggest that the paperwork on the County's acquisition was slow to be filed, but before the 1937 Land Court Application was filed, the transfer of the land was completed. The filing under Land Court Application 292 also recorded easements for the Hilo Boarding School Ditch across the County's parcel (Lot 1) and the HEA's (Lot 2) (Figure 25).

The 1934 map (see Figure 17) provides some useful context for the agricultural use of the lands surrounding the Project Area. It suggests that once the water reservation was made official, agricultural production likely ceased throughout the parcel. One reason to assume this is the County's rationale for acquiring the land in the first place—to prevent pollution of the spring water feeding Hilo's water supply. Another is the absence of sugarcane fields within the reservation, while suitable lands surrounding it are indicated to be cultivated in cane. To the north in Pi‘ihonua, the Hilo Sugar Company's Field 2 extends between the Pi‘ihonua Road and the northern boundary of the water reservation. To the south, there is a patchwork of small fields near Ainako Stream. Most telling, however, is an 8-acre field just mauka of the Project Area on land owned by the HEA. This patch of land, now occupied by the Ainako Terrace subdivision, is near the mauka boundary of Lot 15 as depicted on Registered Map 2058. This suggests that the Project Area was considered marginal land for cultivation, at least by the sugarcane industry.

In 1940, drought conditions were so bad that at one point water from the Hilo Boarding School Ditch was diverted into the Kaumana Springs intakes (Hawaii Tribune-Herald 1940). The seriousness of the drought prompted the county to begin contemplating development of wells mauka of the watershed. Other droughts in 1941 and the 1950s led to the eventual development of the current water system and abandonment of the Kaumana Springs.

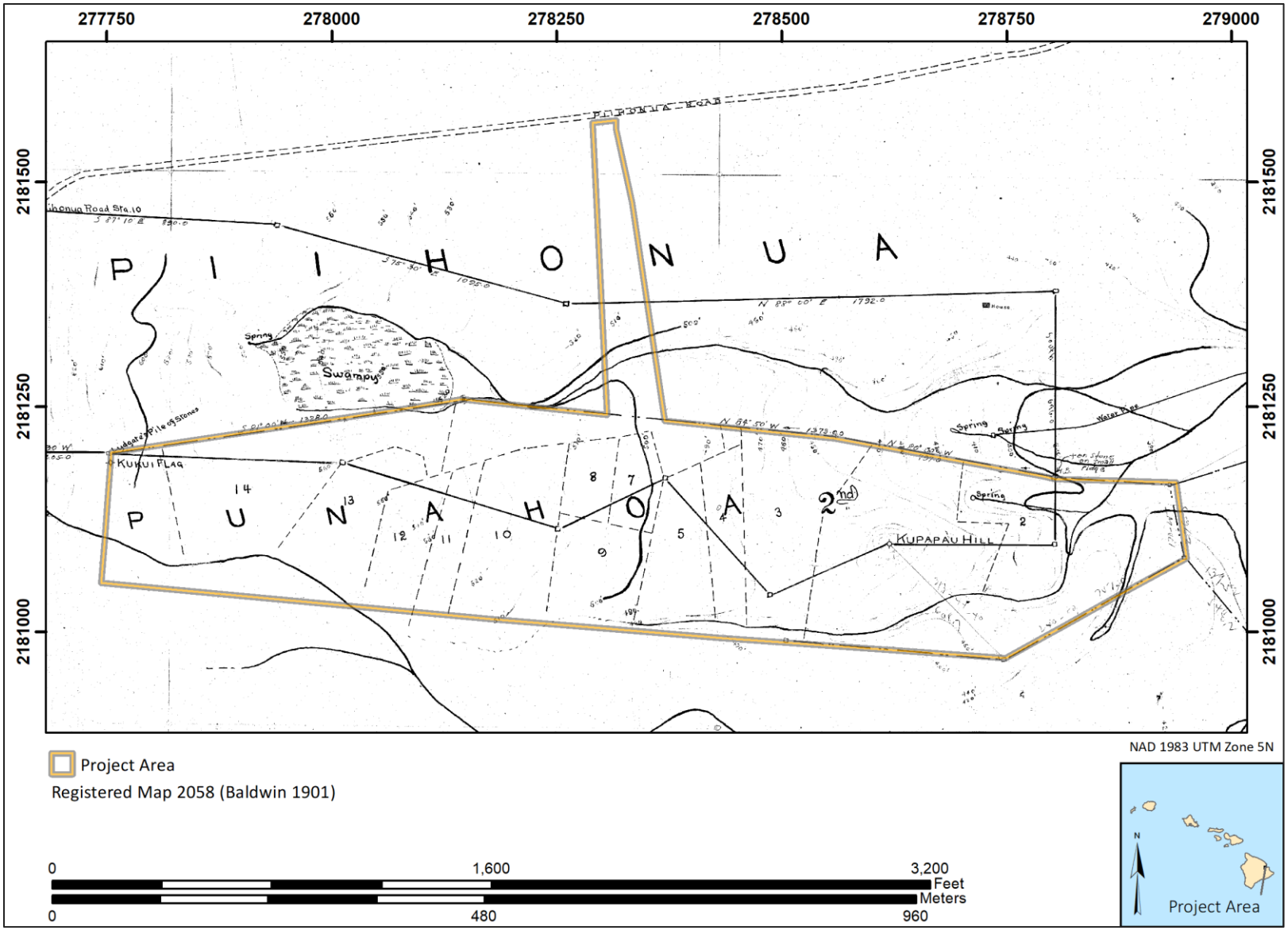

Figure 22. Detail of Registered Map 2058 (Baldwin 1901a)

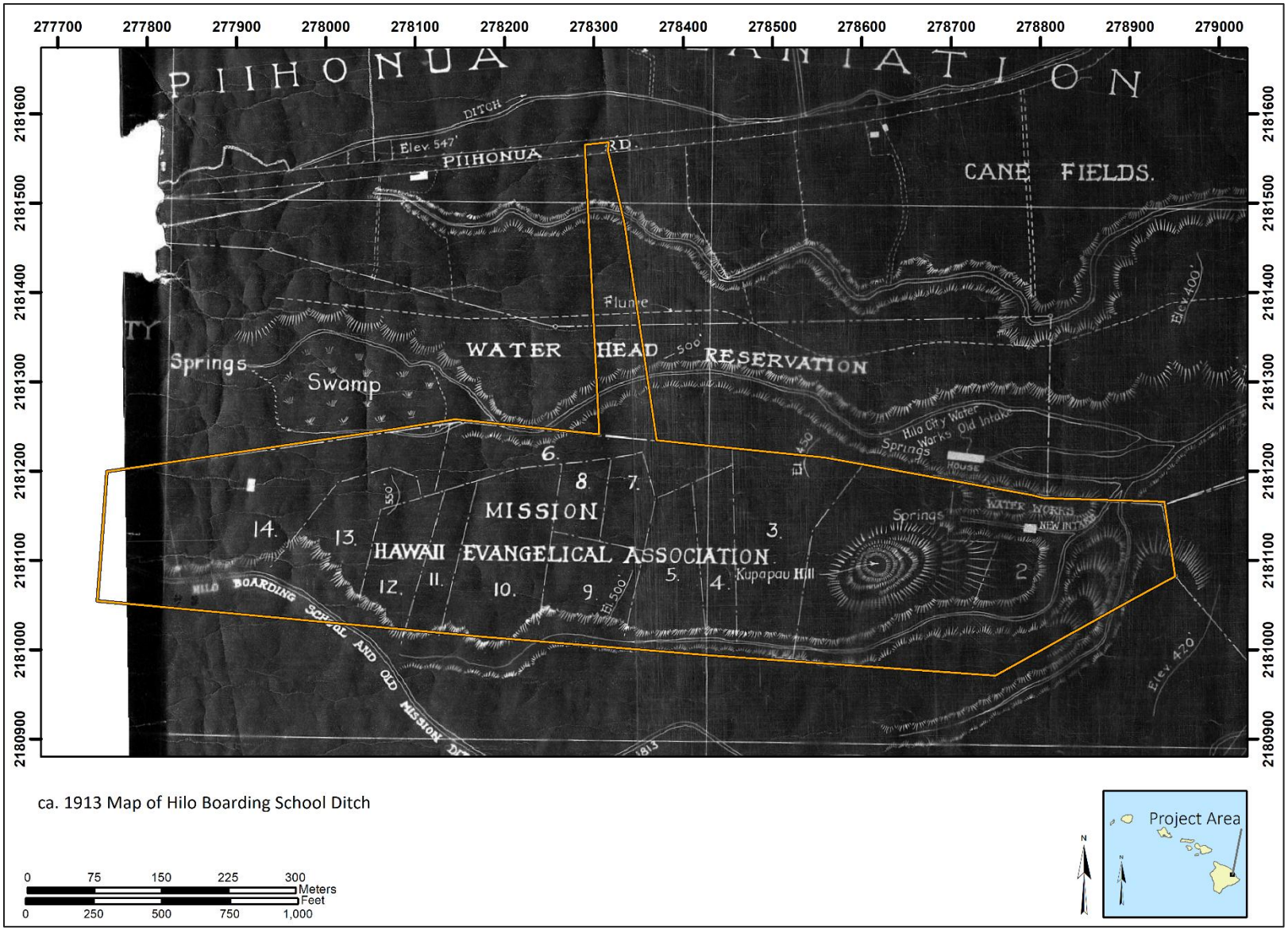

Figure 23. Map of project area circa 1913 with county waterworks and lots indicated (Southworth 1913)

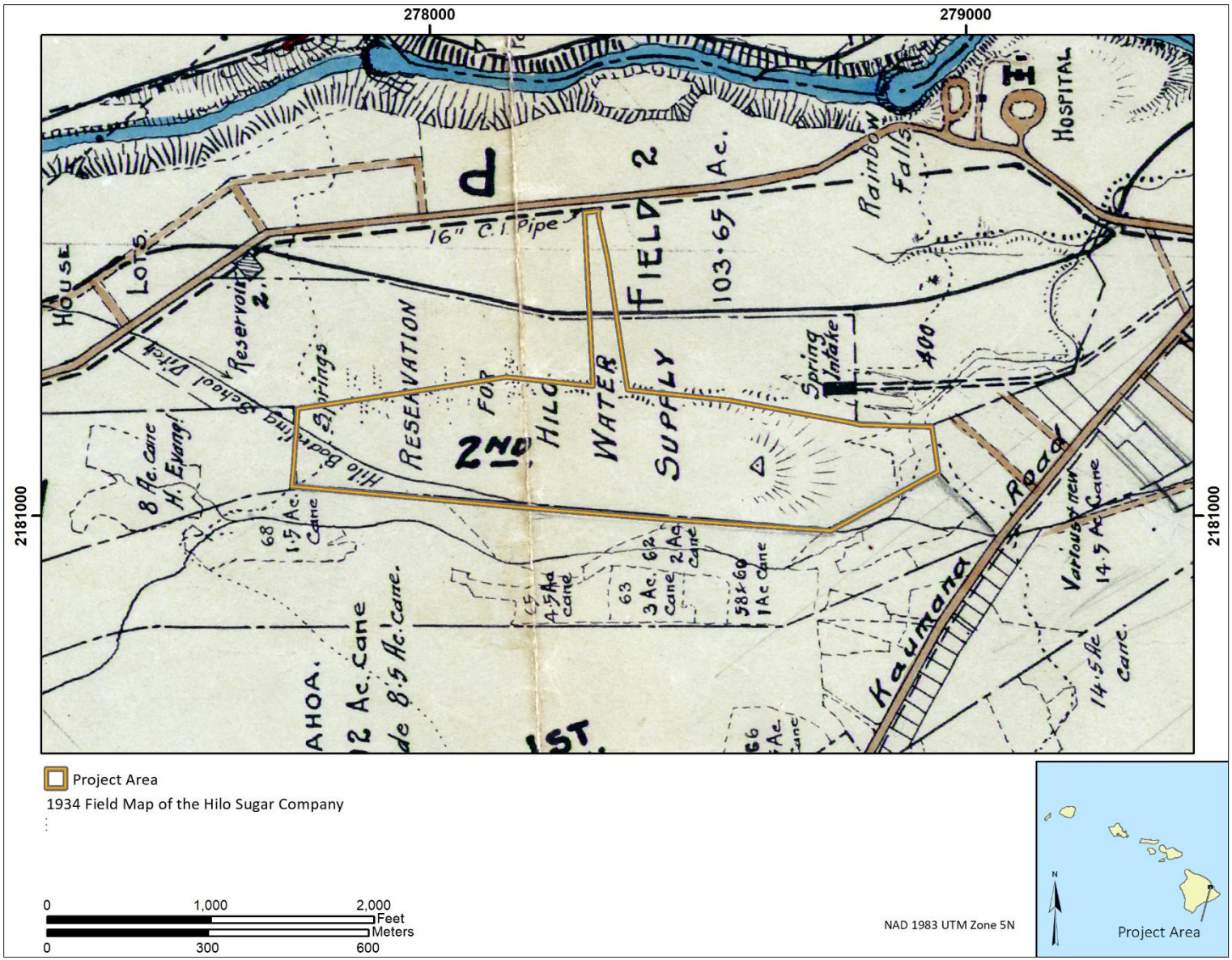

Figure 24. Portion of 1934 Map of the Hilo Sugar Company (courtesy of John Cross).

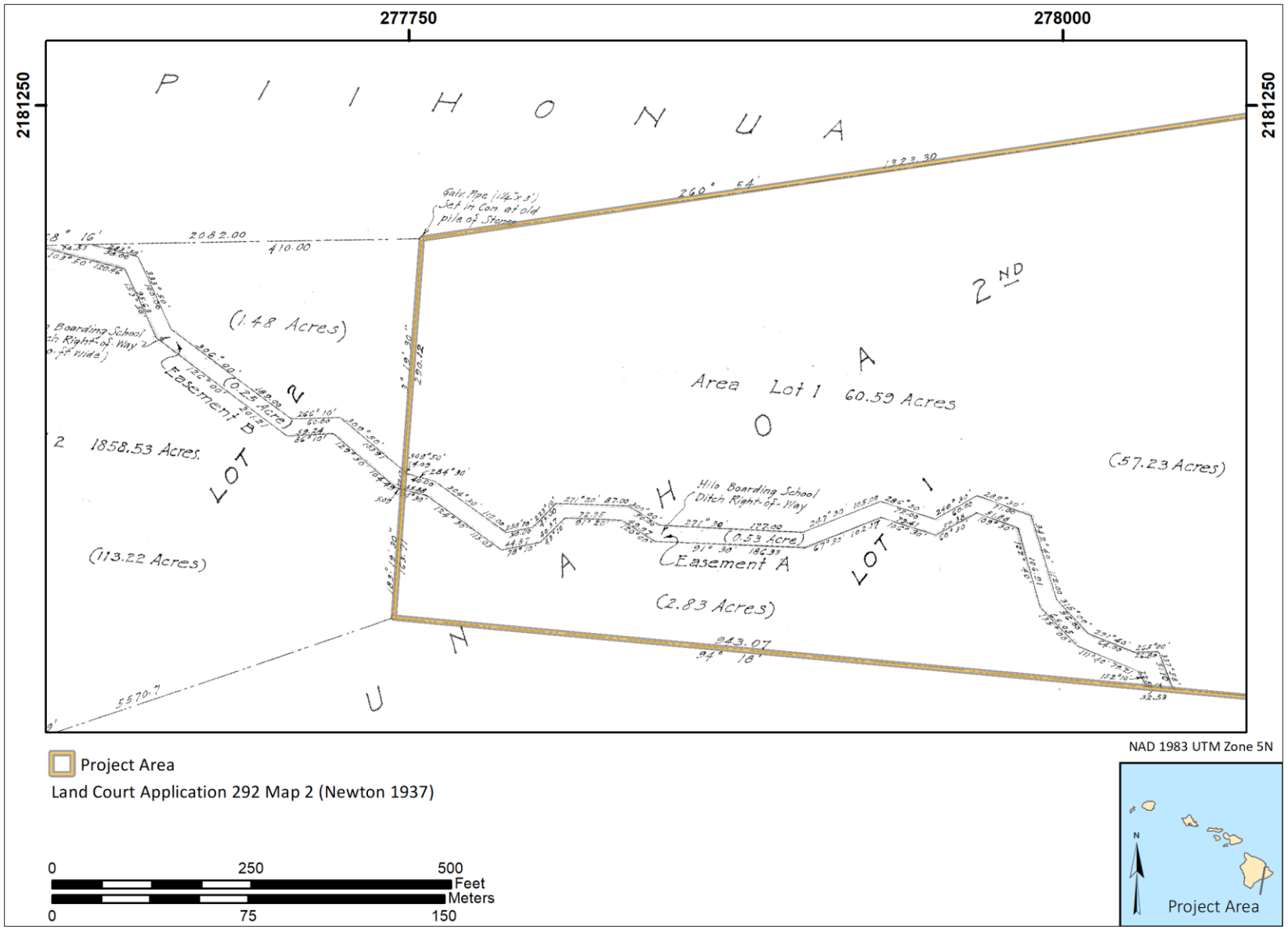

Figure 25. Survey of Hilo Boarding School Ditch right of way through the Project Area (Newton 1937).

3.1.6 LATE 20TH CENTURY: THE END OF SURFACE SPRING FED WATER AND A PROPOSAL FOR A "WILDERNESS PARK"

During the 1950s, new subdivisions in Waiakea Homesteads and Kaūmana, combined with a series of drought years, placed new stress on Hilo's water system. New sources, reservoirs, and transmission pipelines were planned an constructed to meet the increased demand (Hawaii Tribune-Herald 1950, 1951, 1953). The main sources of water at this time were river intakes at Pukamaui on the Wailuku, Kahoama and Lyman Springs intakes on Kaumana Stream, but Kaumana Springs were an important if smaller source. In spring of 1973, a new Piʻihonua Well located at the Department of Water Supply's Reservoir No. 3 site below Gilbert Carvalho Park, proved producing 3.5 million gallons per day. With the well brought online, the Kaūmana Springs were no longer needed to supply the water system. The county water head designation for the Project Area and neighboring parcels was cancelled in 1973 via Executive Order No. 02682.

Any cultivated fields that had been used while the ABCFM and HEA owned the Project Area were clearly abandoned by the 1950s. Aerial photographs from October 1954 (Figure 19), January 1965 (Figure 20), and January 1977 (Figure 21) show the Project Area increasingly overgrown. With the land no longer needed as a water source, the County of Hawaii Department of Parks and Recreation began developing a master plan for the Project Area that would convert the property into a park. Initial discussions about the park occurred as early as 1967 (Hawaii Tribune-Herald 1974a). In 1970, the idea was presented to the County Council, and funds were sought from the State two years later (Smith 2005). The proposal, announced in 1974, was based on recommendations in the Hilo Community Development Plan and the Hawaii County Recreation Plan for more recreation facilities located inland (Hawaii Tribune-Herald 1974b). A master plan for the "Kaumana Springs Wilderness Park" was developed (Figure 29), and an environmental assessment for the development of the park was conducted under HRS Chapter 343 (Walters, Kimura, and Associates, Inc. 1976). This effort also included an archaeological reconnaissance of the property.

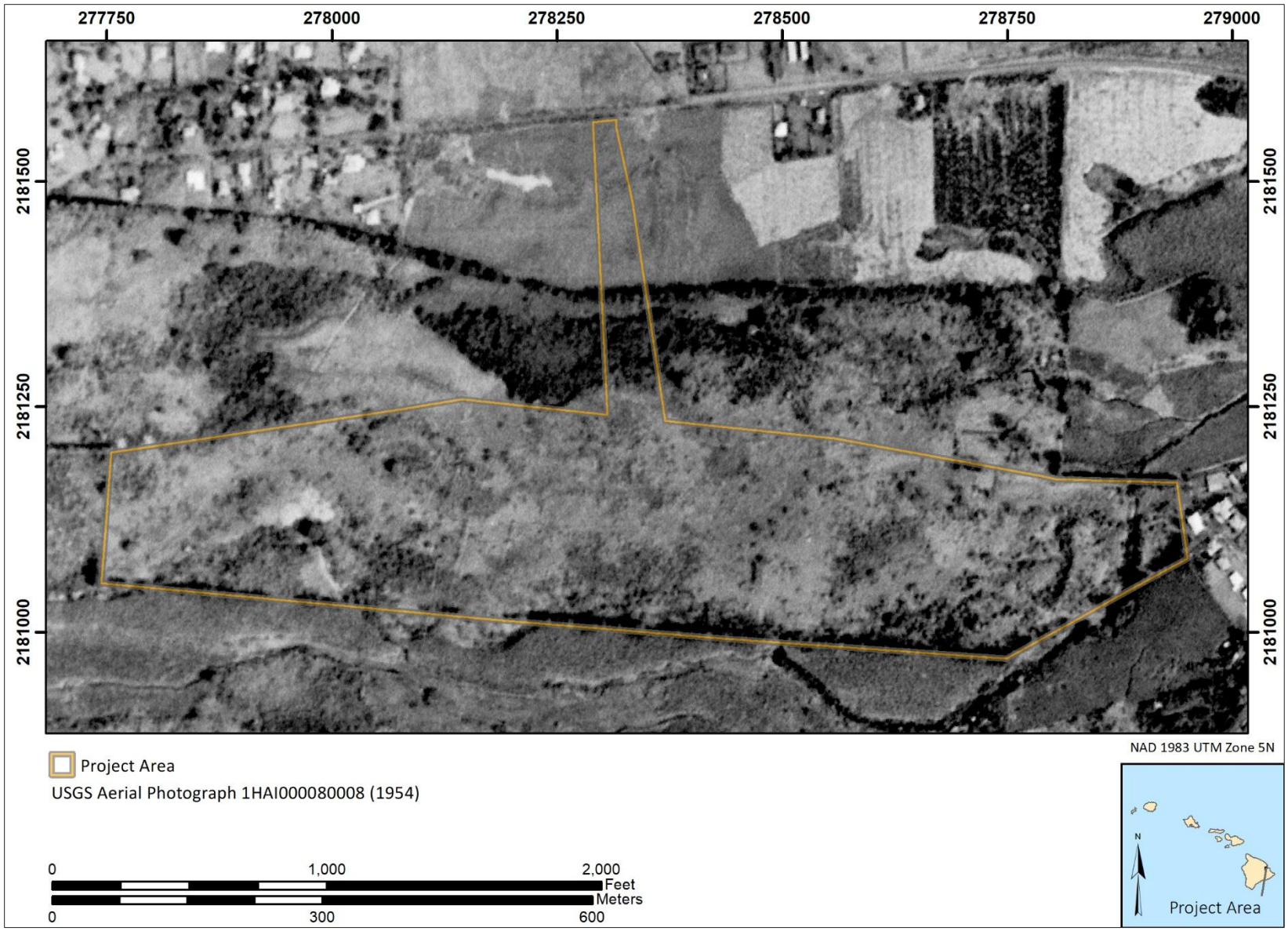

Figure 26. Aerial photograph of project area in 1954 (United States Geological Survey 1954)

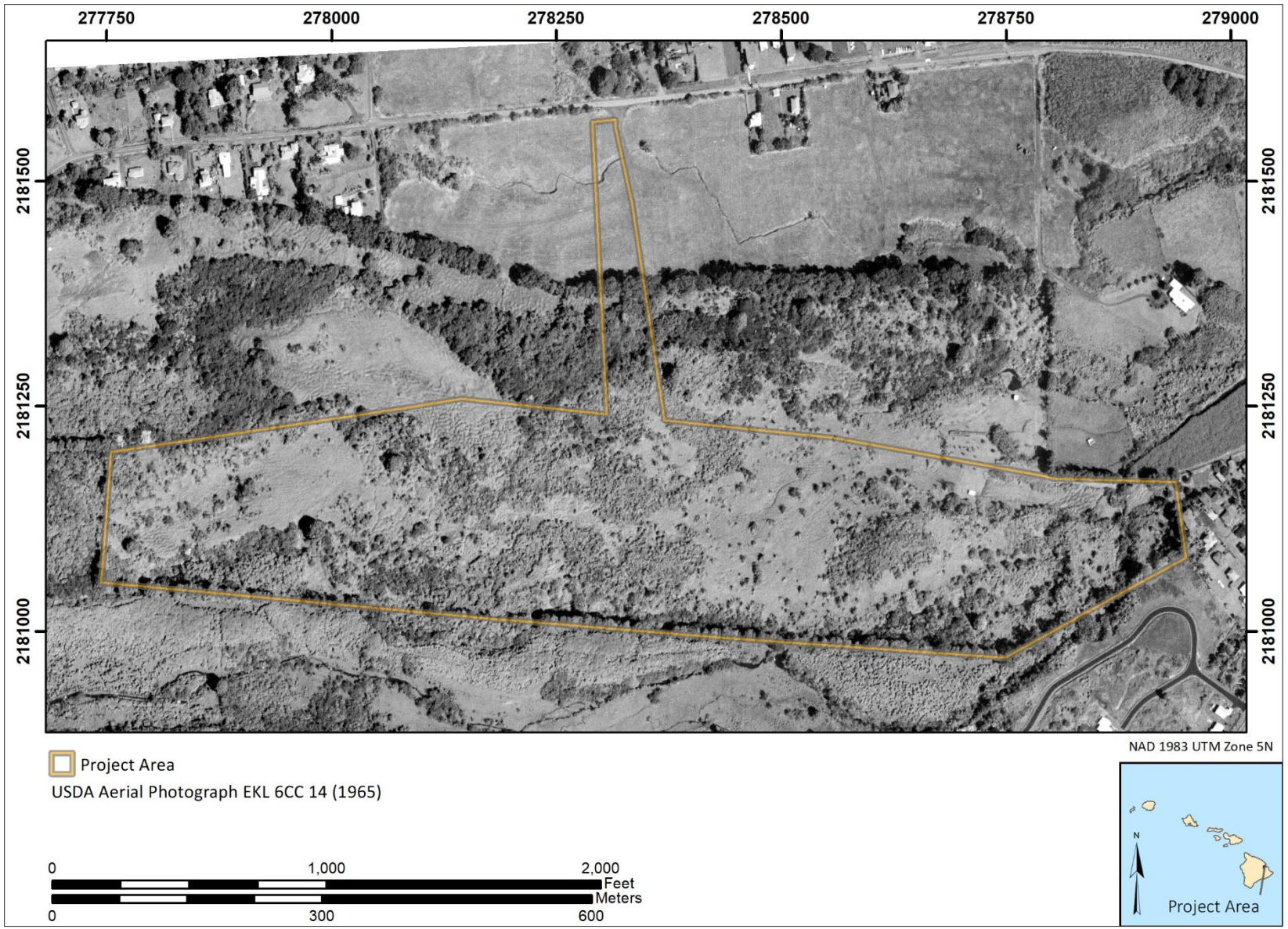

Figure 27. Aerial photograph of project area in 1965 (United States Department of Agriculture 1964)

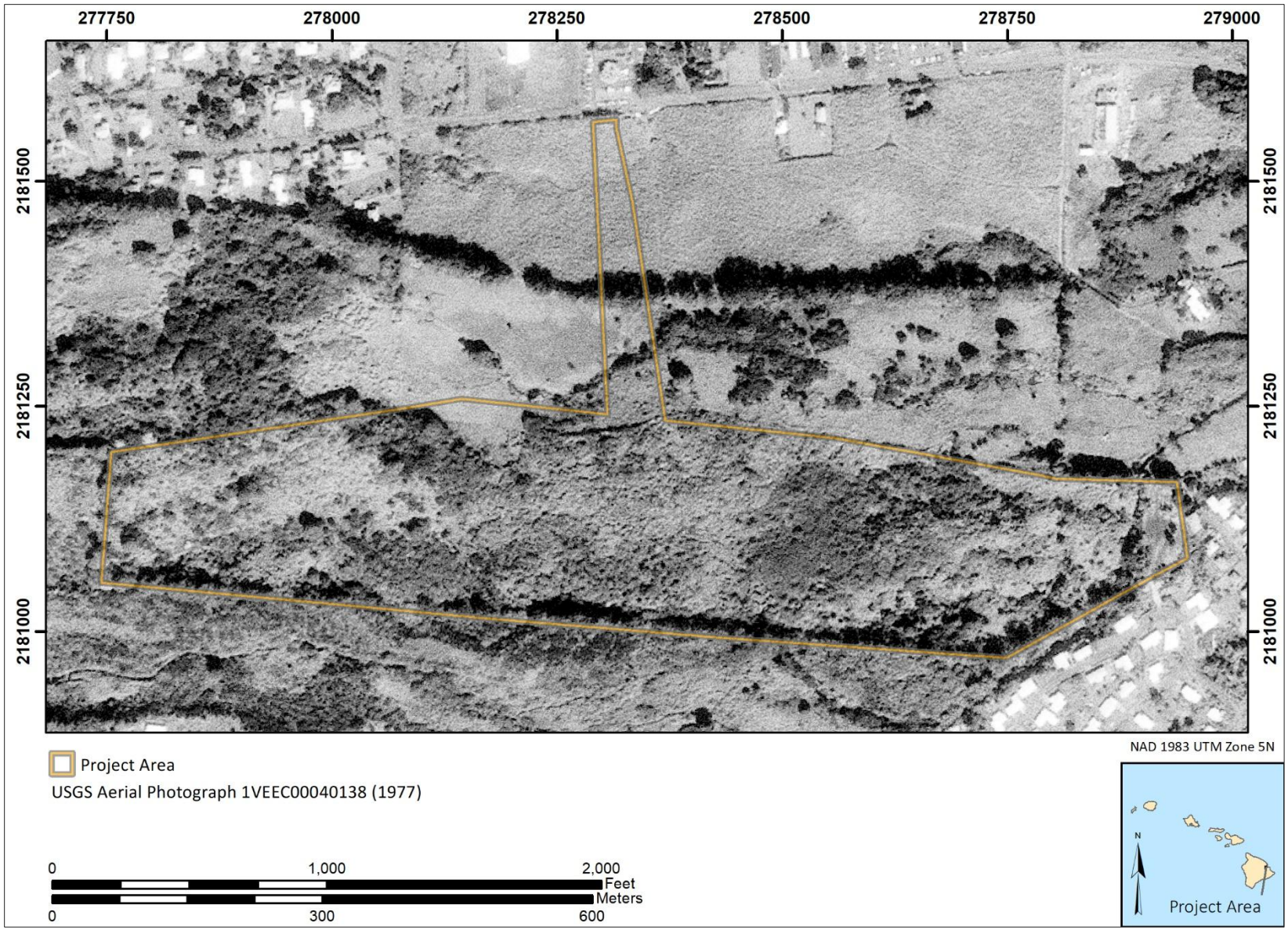

Figure 28. 1977 USGS aerial photograph of the Project Area (United States Geological Survey 1977)

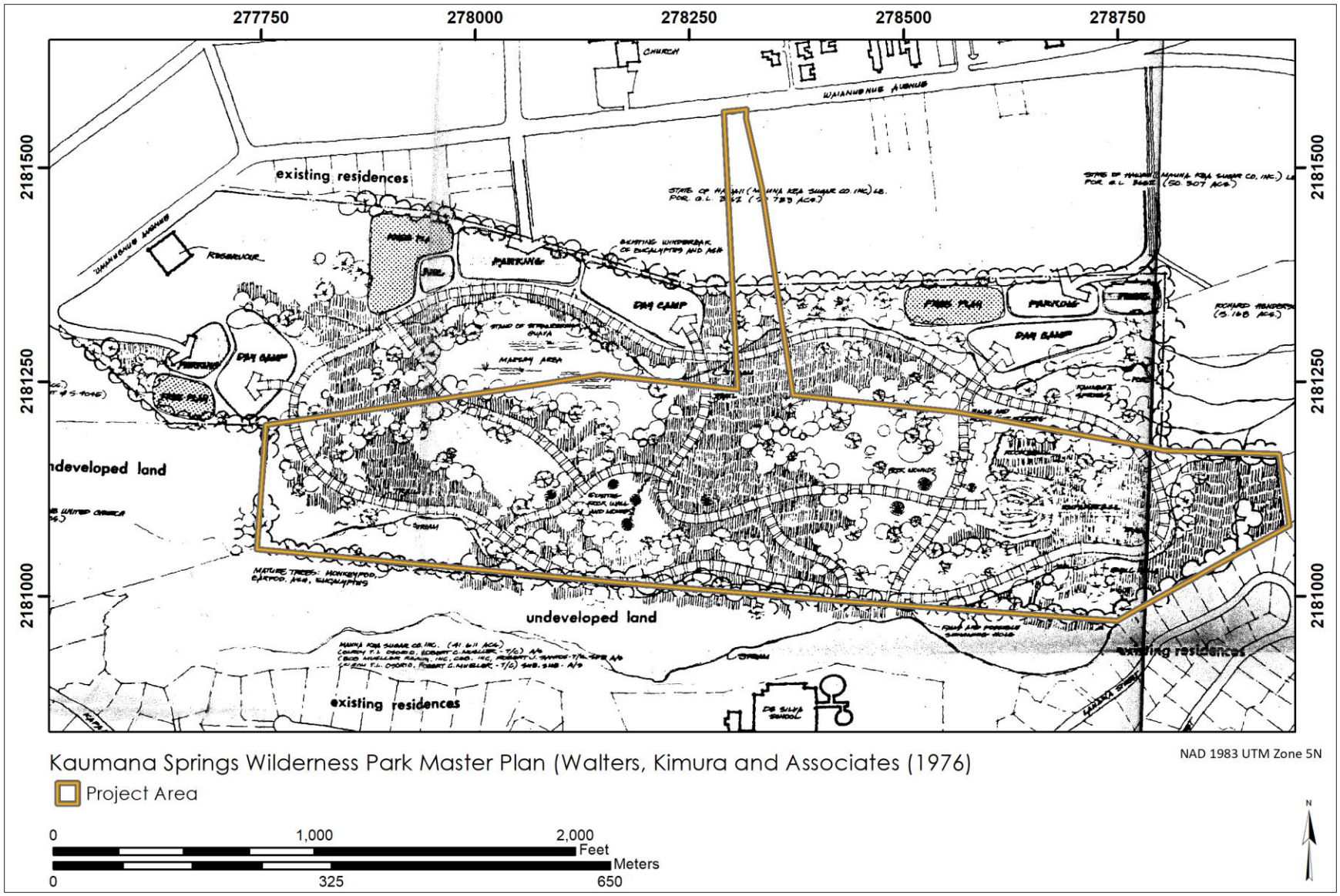

Figure 29. 1977 USGS aerial photograph of the Project Area (Walters, Kimura, and Associates, Inc. 1976)

The environmental assessment includes the following brief description of the land and history, which simultaneously acknowledges past land use while reframing the Project Area as a wild place.

> *The Kaumana Springs Wilderness area consists of 111 acres of undeveloped land located in the lower Kaumana-Piihonua area, directly above the urban center. In reality, it is neither a wilderness nor a natural area. Years ago, this area was used for agriculture and even the casual hiker can see evidence of this use demonstrated by the furrowed land and the rock mounds and walls which were created when the land was cleared for cultivation. Today, most of the remaining significant trees are located in linear bands which designate property boundaries or water courses. The agricultural land now consists primarily of pastureland and scrub growth which invaded the area as the fields were abandoned. There are also a few residences along the periphery of the pasture land. Except for the windrows of trees defining the park boundaries, most of the vegetation within the proposed park site is of recent origin, and virtually none is older than 25 years.*
>
> *The proposed park site already functions in many ways as a "wilderness" park. Neighborhood children "explore" the gullies and stream beds, and make their own trails to their favorite haunts. At certain times of the year, other* residents *venture into the area to harvest strawberry guavas and bananas. In general, however, utilization of the area by the greater community is limited because access points are not clearly defined, and trails appear to the uninitiated as either overgrown or non-existent. (Walters, Kimura, and Associates, Inc. 1976)*

The park facilities that were proposed in the master plan were never constructed, however, apparently due to lack of funds.

Meanwhile, the former HEA lands immediately mauka of the Project Area were subdivided in the late 1970s to create the Ainako Terrace subdivision. The subdivision created two development increments of residential view lots extending from Ainako Street down to the mauka boundary of the Project Area. Lots in the lower portion of the subdivision were sold as Increment II, beginning in the fall of 1977 (Figure 22). By the mid-1980s, grading for the lower end of Kilikina Street and the subdivision lots destroyed the Hilo Boarding School Ditch within the subdivision (Figure 23). Although the proposed wilderness park had not been constructed, it found its way into the local phone book (Smith 2005).

Figure 30. Advertisement for Ainako Terrace Subdivision Unit II (RSM, Inc. 1977)

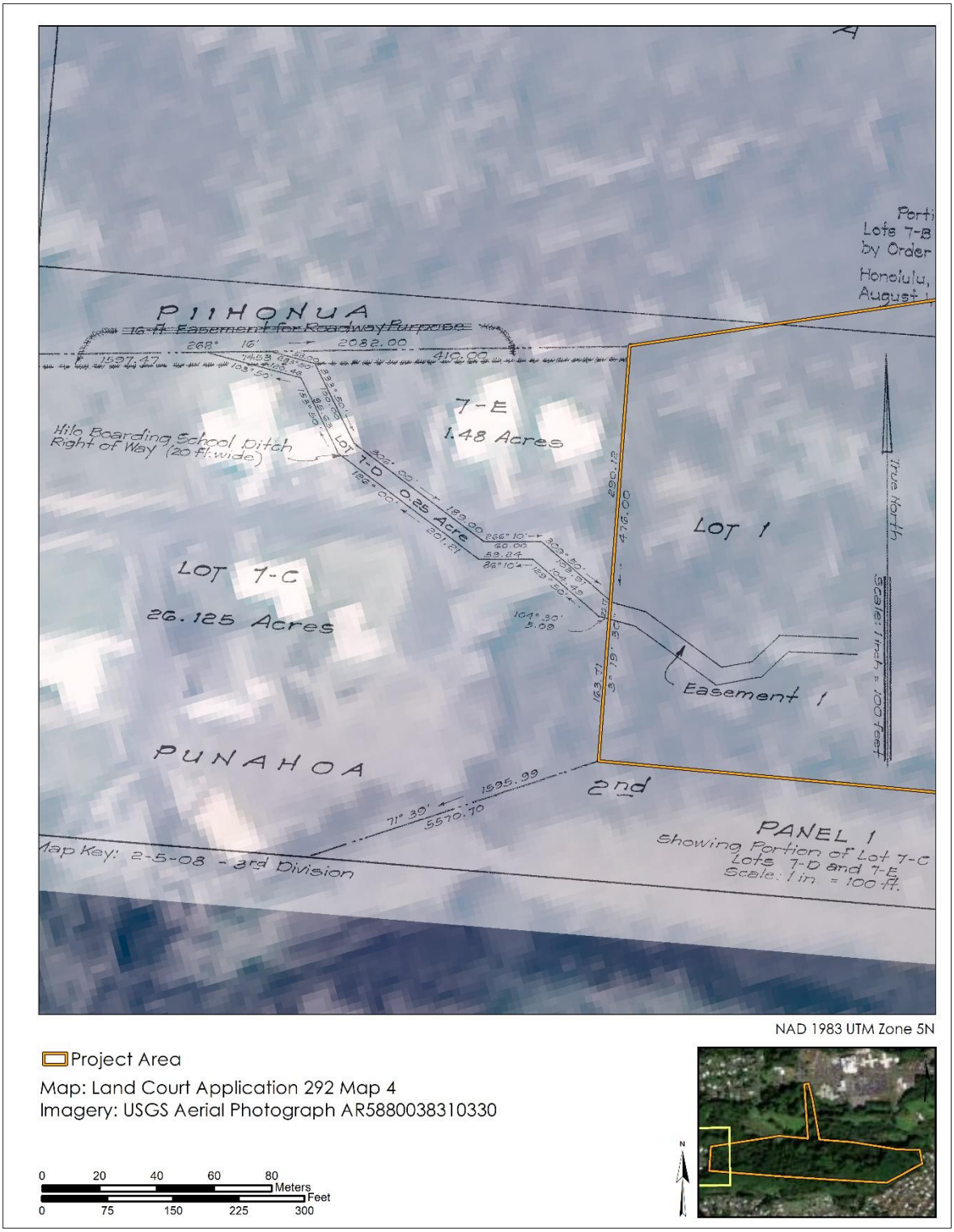

Figure 31. Hilo Boarding School Ditch easement overlain on 1985 aerial imagery of developed lots in the Ainako Terrace subdivision (Newton 1937; United States Geological Survey 1985)

3.2 Prior Archaeological Studies

The majority of Punahoa 2 makai of the current project area was developed before the advent of historic preservation laws, and very few archaeological investigations have taken place within the ahupua‘a. The Project Area, however, was included in a reconnaissance survey (Sinoto 1978) that identified archaeological features thought to represent a portion of a Precontact agriculture area. Elsewhere in Punahoa 2, remants of historically documented ditches (possibly reused portions of older ‘auwai) have been recorded, along with Historic features associated with sugarcane cultivation. In the neighboring ahupua‘a of Pi‘ihonua, a few archaeological studies have occured at similar elevations or slightly lower. These studies also provide information about possible land uses in the Project Area. Table 3 lists relevant prior archaeological studies, and the locations of those studies are shown in Figure 24.

Table 3. Prior archaeological studies in Punahoa 2 and in the project area vicinity.

Author	Year	Type	Elevation	Ahupua‘a	Relevant findings (SIHP 50-10-35-)
Barna	2018	Inventory	2200-2560	Punahoa 2	No historic properties
Barna et al.	2023	Inventory	290-380	Pi‘ihonua	Sugarcane complex (T1) Historic foundation (T2) Rubbish dump (T3)
Bautista and Hammatt	2021	Field Inspection		Pi‘ihonua	
Clark and Rechtman	2005	Inventory	400-440	Pi‘ihonua	No historic properties
Corbin	2006	Field Inspection	525-900	Punahoa1 & 2	AF-1: spring, ditch, mound AF-2: wall AF-3: stone enclosure, C-shape, terrace, mounds
Jensen and Rosendahl	1991	Inventory	240-410	Punahoa 2 Punahoa 1 Ponahawai	Hilo Boarding School Ditch (14947)
Rechtman	2004a	Reconnaissance	440-480	Pi‘ihonua	No historic properties
Rechtman	2004b	Inventory	580-670	Pi‘ihonua	Wall (24267) Wall (24269)
Sinoto	1978	Reconnaissance	400-700	Pi‘ihonua Punahoa 2	Six clusters of features
Spear	1992	Inventory	325-415	Pi‘ihonua	Retaining wall (18444) Wall (18443)
Spear	1993a	Inventory	335-445	Pi‘ihonua	Rubbish dump (19037) Portuguese bread oven (19036)
Spear	1993b	Inventory			
Walker and Rosendahl	1996	Inventory	370-385	Pi‘ihonua	None in Site F near project area

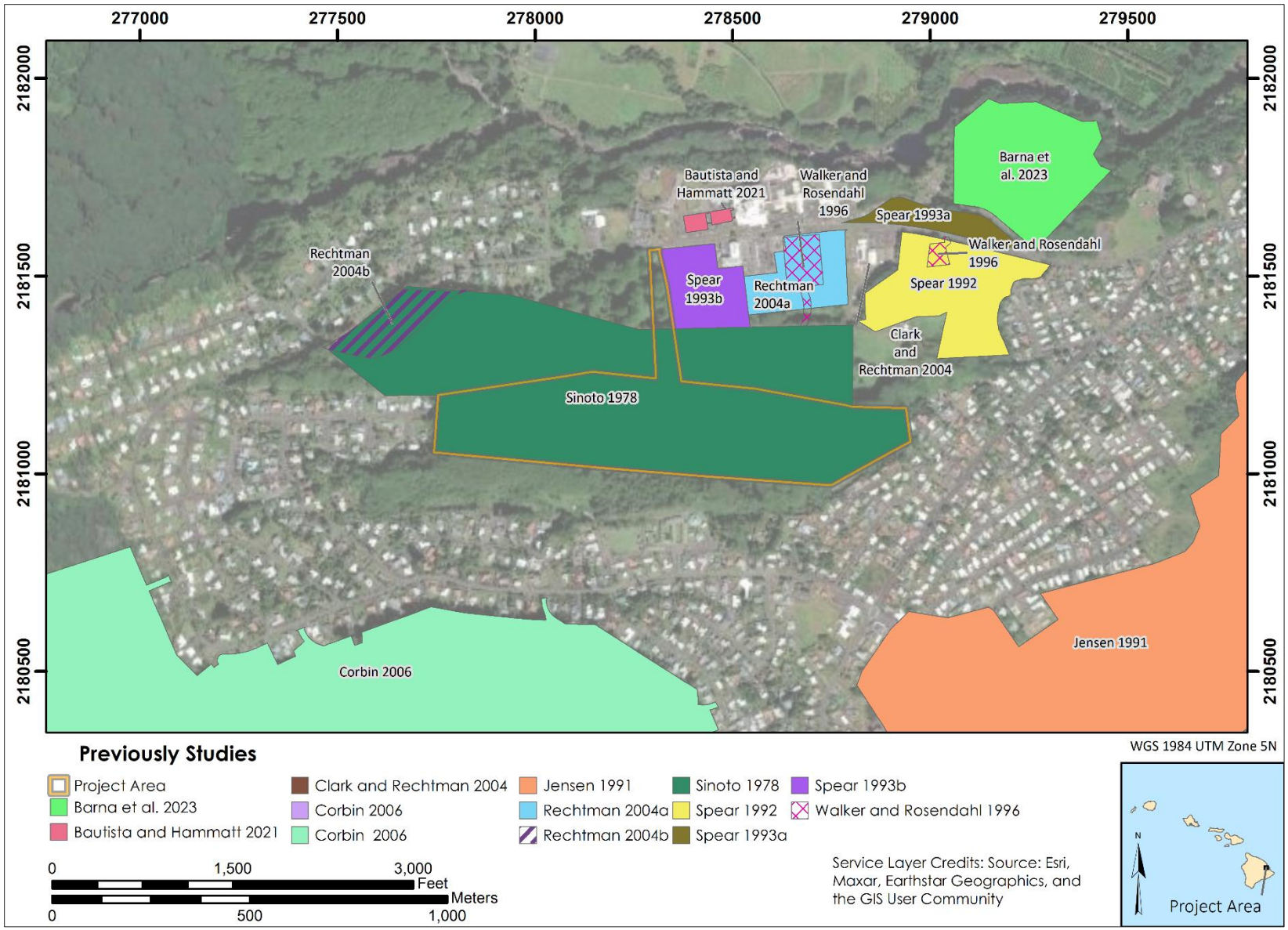

Figure 32. Location of prior archaeological studies in the project area vicinity.

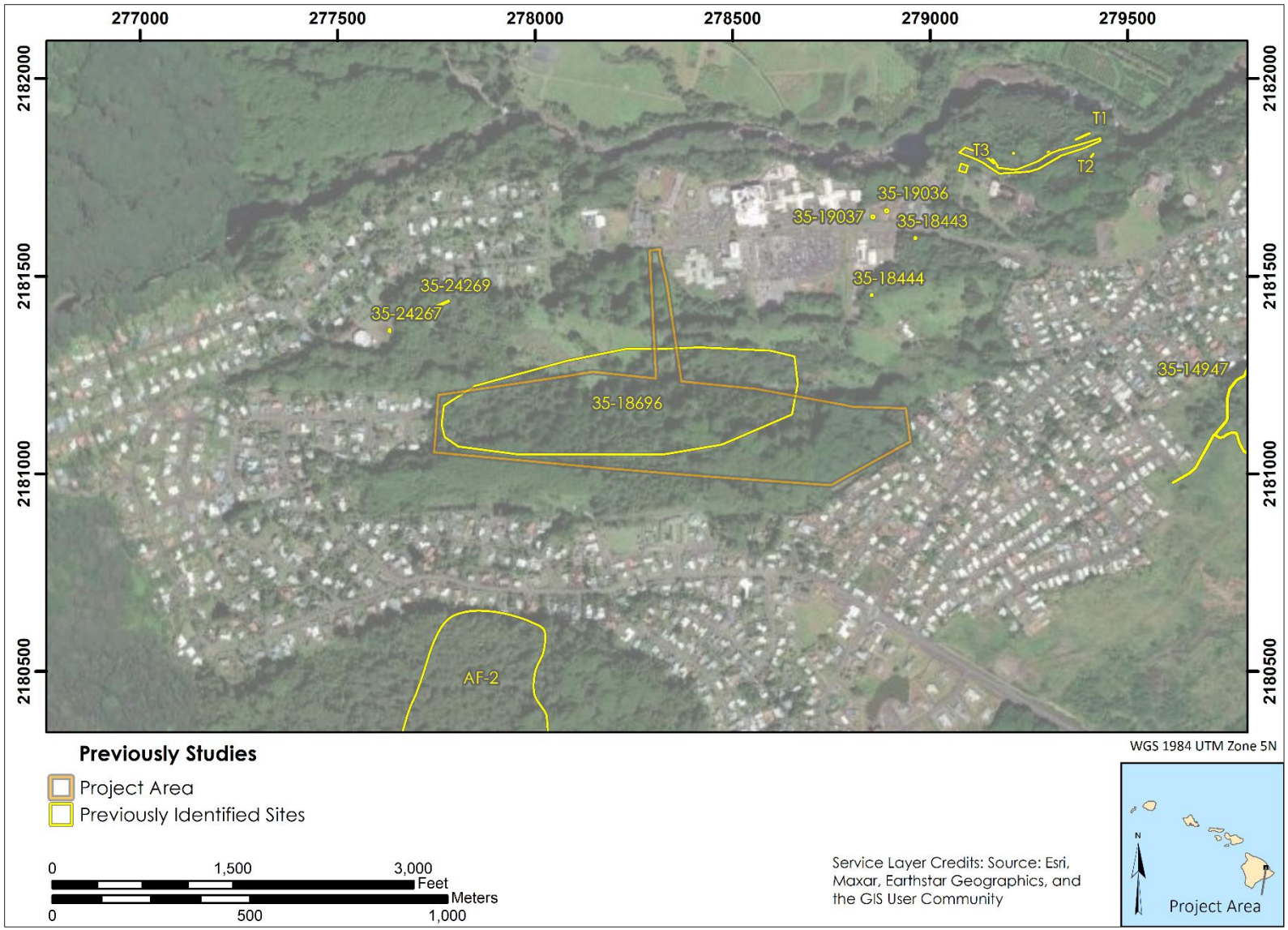

Figure 33. Location of previously recorded archaeological sites in the project area vicinity

3.2.1 STUDIES IN THE PROJECT AREA

The Project Area was included in an archaeological reconnaissance survey conducted by the Bishop Museum (Sinoto 1978) as part of a larger study area associated with the County of Hawai‘i, Department of Parks and Recreation proposed development of the Kaumana Springs Wilderness Park. The survey identified six clusters of archaeological features that were interpreted as exhibiting characteristics that are “more typical of prehistoric construction than of historic construction.” He briefly described the six clusters, noting that no portable artifacts were recovered during the survey:

> Cluster 1. Near the western end of the survey area, adjacent to the swamp, are several disturbed terraces and small segments of stone alignments.
>
> Cluster 2. Near the southwestern corner of the survey area are more remnants of terraces and intact portions of a stone-reinforced *‘awuai* (irrigation ditch).
>
> Cluster 3. Centrally located in the southern half of the survey area are several stone mounds and cairns…, a large elongate platform…, and a low stone wall that parallels the present fence line along the southern boundary (included int the Preliminary Master Plan map, Jan. 1974, by George S. Walters and Assoc., Inc.)
>
> Cluster 4. Near the northern boundary of the survey area, immediately south of the existing residential lots, are several walls, enclosures, terrace and stone reinforced stream banks.
>
> Cluster 5. Centrally located in the survey area and NE of Cluster 3 are terraces, platforms, mounds, cairns, and *‘auwai*.
>
> Cluster 6. Near the northeastern corner of the survey area, adjacent to the Kaumana Springs aqueduct and pastureland, are several circular and oblong cairns…and a small, high-walled enclosure.

The fieldwork involved systematic pedestrian transects walked by Sinoto and Eric Komori. The features that they observed included ‘auwai, terraces, rock mounds, cairns, and modified stream banks. He also noted what he described as wild stands of wetland kalo (taro, Colocasia esculenta) and ‘ape (Alocasia macrorhiza). Sinoto uses the term *mound* to mean “crude amorphous piles”—in other words, rock piles—and *cairn* to refer to mounds with “some structural form”—that is, mounds with varying degrees of structure and stacking. He noted that “cairns” or mounds with structure and stacking, have been used for boundary marking *and* burials. Sinoto interpreted the stone walls were to be cattle or boundary walls, and he considered the rock mounds to be ambiguous in terms of age and function. Sinoto commented on the dense vegetation that covered portions of the project area, in particular uluhe (false staghorn, Dicranopteris linearis) and Christmasberry (wilelaiki, Schinus terbinthifolius), that prevented full coverage of his study area. Sinoto felt that the clusters he observed were probably parts of a continuous distribution of features, many of which were likely hidden in the areas he was unable to access. He also noted evidence of past land alterations from plowing on the periphery of his study area and acknowledged that if there had been associated sites nearby, they were likely destroyed.

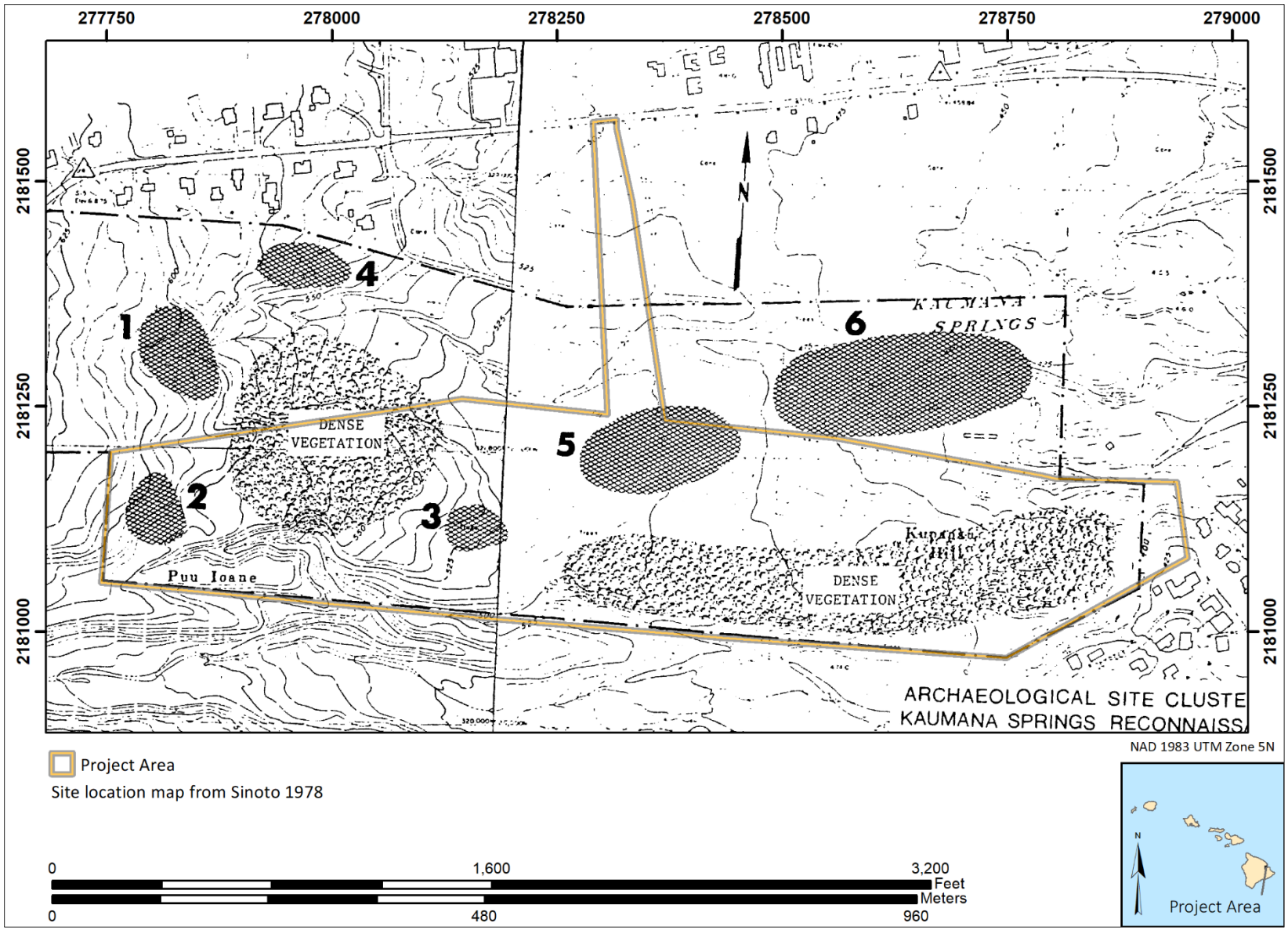

Figure 34. Site location map from Sinoto (1978) with the current project area indicated

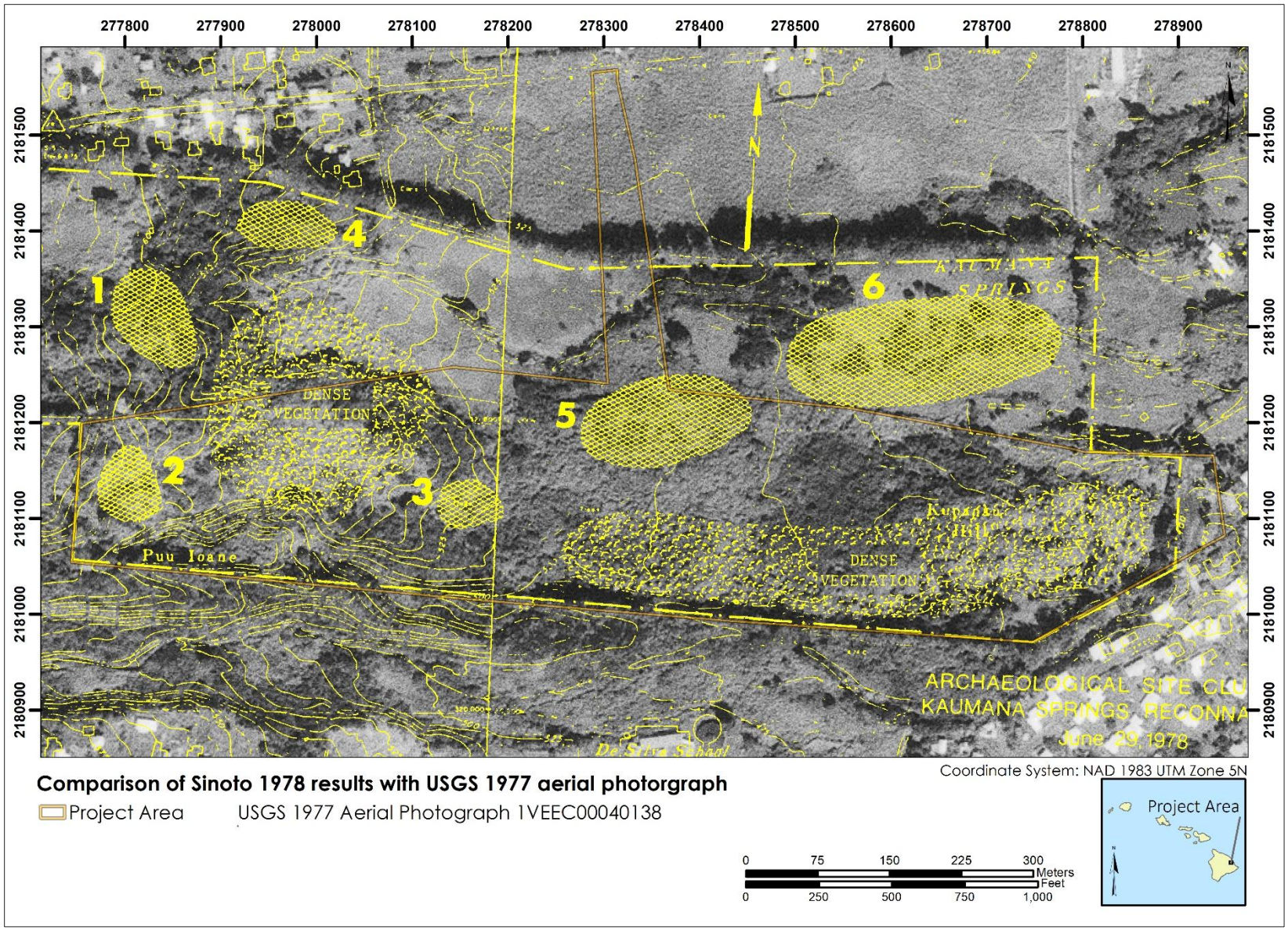

Figure 35. Site location map from Sinoto (1978) overlain on 1977 USGS aerial photograph

3.2.2 STUDIES MAKAI OF THE PROJECT AREA

In 1990, Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted an archaeological inventory survey (Jensen 1991) of an approximately 222-acre parcel located about 600 yards makai of the Project Area (see Figure 24). The majority of the survey area included former sugarcane fields and was scarred by numerous haul roads or bulldozer cuts. During the survey, two a portion of the Hilo Boarding School Ditch (SIHP 50-10-35-14947) was identified, along with a shed identified as a “cane house” (SIHP 50-10-35-14946). The Hilo Boarding School Ditch was recommended for preservation with interpretation was recommended. The cane house was determined to have been adequately documented, and no further work was recommended for it.

3.2.3 STUDIES MAUKA OF THE PROJECT AREA

Other than the Sinoto (1978) reconnaissance of the current Project Area, the most pertinent archaeological project for the current study was field inspection and assessment of a 333-acre project area (see Figure 24) at the in Punahoa 1 and 2 by Paul H. Rosendahl, Ph.D., Inc. (Corbin 2006). During that survey, three “areas of features” found by topographic surveyors were investigated by two archaeologists. AF-1 was located in Punahoa 2 and contained a spring, a partially rock-lined ditch, and a 7.0 meter long rock mound. AF-2 consisted of a historic rock wall, likely built on a parcel boundary. AF-3 was an area reported to measure 1.0 by 0.75 kilometers containing a stone enclosure, a C-shape, a terrace, and numerous mounds. It was also reported that at least 100 to 200 more mounds were scattered on lands surrounding these “areas of features.” The features were identified as likely historic sugar cane cultivation or ranching features, although it is considered possible that the C-shape and the terrace at AF-3 could be traditional Hawaiian features. The numerous mounds were probably sugar-cane clearing mounds or sugarcane loading mounds.

About 6 miles mauka of the current project area, ASM Affiliates conducted an Archaeological Inventory Survey (Barna 2018) for the Hawai‘i Electric Light 6200 Transmission Line Replacement project. This project area is not depicted in Figure 24. The survey corridor paralleled Highway 200 and crossed Punahoa 2 for roughly 0.5 miles between 2,200 and 2,560 feet amsl. Within four corridors ranging between 50 and 100 feet wide, the pedestrian survey identified no historic properties within Punahoa 2.

3.2.4 RELEVANT STUDIES IN PI‘IHONUA

A series of small surveys have been conducted near the Hilo Medical Center campus north and west of the Project Area.

In 1992, Scientific Consulting Services (SCS) conducted an inventory survey (Spear 1992) of a 12-acre parcel located on the south side of Waiānuenue Avenue. Vegetation reported closely resembles that of the current study property. Spear identified two Historic era stacked stone walls associated with a stream channel.

In 1993, SCS conducted and archaeological inventory survey (Spear 1993a) of 9.5 acres between Wāianuenue Avenue and the Hilo Watershed Reservation. No historic properties were identified.

Also in 1993, SCS conducted an archaeological inventory survey (Spear 1993b) of approximately 5 acres located between Wāianuenue Avenue and Rainbow Road. Two historic properties were identified. SIHP

50-10-35-19036 consisted of the remains of a Portuguese oven. SIHP 50-10-35-19037 consisted of a historic refuse dump containing material from the 1880s and later. Both sites were considered significant under Criterion D because of their informational content and no further work was recommended for either.

In 1996, Paul H. Rosendahl Ph.D., Inc. (PHRI) (Walker and Rosendahl 1996) conducted an archaeological inventory survey of a parcel on Waiānuenue Avenue across from the Hilo Hospital (TMK:2-3-32:1), which included the parcel earlier studied by SCS. After concluding that the 42.3 acres had likely been impacted by historic sugarcane cultivation, PHRI surveyed only 11% (approximately 4.6 acres) of the property. As a result, they missed the two walls previously documented by Spear (1992) and neglected to include Spear's study in their review of previous archaeology. PHRI recorded no sites within the 4.6 acres they surveyed, concluding that areas outside the streambed were modified by sugarcane cultivation, whereas areas within the streambed may not have been affected by historic land use and may therefore contain archaeological remains (Walker and Rosendahl 1996:13)

In 2004, Rechtman Consulting conducted an archaeological inventory survey and limited cultural assessment (Rechtman 2004a) of a parcel located along the southern edge of Waiānuenue Avenue (TMK:[3] 2-3-030:005 por.; see Figure 35) which had been previously surveyed by (Sinoto 1978). Rechtman recorded two Historic stone wall remnants (Sites 50-10-35-24267 and -24268). The sites appeared to have been previously disturbed and were interpreted as agricultural and residential features dating to a time before the development of commercial sugarcane cultivation.

Also in 2004, Rechtman Consulting conducted an archaeological and limited cultural assessment (Clark and Rechtman 2004b) of a 5.4-acre parcel for the expansion of the Arc of Hilo facility (TMKs: (3) 2-3-032:006-008), located to the southwest of the current project area. (see Figure 35). Their survey resulted in no historic properties.

Also in 2004, Rechtman Consulting conducted an archaeological and limited cultural assessment (Clark and Rechtman 2004) of 5.4-acres for the expansion of the Arc of Hilo facility (TMKs: [3] 2-3-032:006-008), located to the south of the current study area within Piʻihonua Ahupuaʻa. (see Figure 27). As a result of their fieldwork, RC found no historic properties in the project area, which had been previously bulldozed.

In 2021, Cultural Surveys Hawaiʻi conducted a literature review and field inspection (Bautista and Hammatt 2021) of a 1.1-acre area located at 1190 Waiānuenue Avenue. No archaeological features were observed on the ground surface within the project area.

In 2023, ASM Affiliates conducted an archaeological inventory survey (Barna et al. 2023) of a 24.9 acre parcel located at the historic Hilo Memorial Hospital site. Three historic properties were identified. Site T1 is an agricultural complex created by the late nineteenth and early twentieth century cultivation of sugarcane. Site T2 is a large refuse concentration associated with the operation of the hospital and later tenants of the site. Site T3 is the remnant foundations of four buildings formerly located on the hospital campus. Site T1 was recommended significant under Criterion d for the information provided about sugarcane cultivation, with no further work recommended. Sites T2 and T3 were not recommended significant.

4 Consultation

Consultation included written and in-person communication with knowledgeable individuals and organizations. Table 4 lists the groups and individuals contacted for consultation and the results of the invitations to consult. Responses that were received are summarized below. Information obtained through consultation is incorporated into the text of the CIA report, including background, findings, and analysis.

Table 4 Groups and Individuals Contacted for Consultation

Name	Organization	Contacted	Notes
Kaweni Ibarra	Office of Hawaiian Affairs	March 25, 2025	Received email response
Kevin Sullivan, Kim Tanaka	County of Hawai‘i Planning Department-Cultural Resources Commission	March 25, 2025	Requested a presentation for the commission
Terri Napeahi	Aha Moku Council	March 25, 2025, June 15, 2025	No response
Pi‘ilani Ka‘awaloa	Mokupuni Po‘o, Moku O Keawe, Aha Moku Advisory Committee	June 25, 2025	No response
Jordan Calpito, Christian Omerod	Department of Land and Natural Resources-State Historic Preservation Division, History and Culture Branch	March 25, 2025	Requested submittal via Hawai‘i Cultural Resources Information System, March 27, 2025
Noah Gomes	Department of Land and Natural Resources-State Historic Preservation Division, History and Culture Branch	August 14, 2025	Email conversation about place names.
Sean Nāleimaile, Nicole Mello	Department of Land and Natural Resources-State Historic Preservation Division, Archaeology Branch	March 25, 2025	Requested submittal via Hawai‘i Cultural Resources Information System, March 27, 2025
Kiersten Faulkner	Historic Hawai‘i Foundation	March 25, 2025, June 15, 2025	No response
Ronald and Doreen Kodani	Pi‘ihonua Hawaiian Homestead Community residents	March 25, 2025, June 15, 2025	Interviewed 7/23/2025
Leileihua Yuen	Punahoa 2 Resident	March 25, 2025	Interviewed 6/17/2025

4.1 Office of Hawaiian Affairs

The OHA was contacted via email on May 16, 2025, and provided with preliminary results of the archaeological survey and background cultural research. A response was received on June 3, 2025, from compliance officer Kaweni Ibarra. In the response, OHA thanked Stantec for providing the documents and commented:

> *In regards to your inquiry about Puu Kupapau, the name does imply that the area is associated with burials. In addition to the association of the nearby boarding school with alii, it is common for chiefly and high ranking burials to be placed in elevated areas, such as this pu‘u. On account of these factors, we recommend consideration of archaeological monitoring at a minimum for all ground disturbing work on this project.*

4.2 State Historic Preservation Division

Informal consultation was conducted with the State Historic Preservation Division via email in March 2025 and consisted of a request for information from the Archaeology Branch and the Burial Sites Specialists in the Hilo Office. SHPD responded by acknowledging the request and asking that the county make a formal submittal in HICRIS. Additional informal consultation in August 2025 was conducted with SHPD Ethnographer Noah Gomes, again by email. Mr. Gomes provided information obtained from a typescript of Theodore Kelsey's notes in the private collection of June Gutmanis. The notes include information from ethnographic interviews that Kelsey conducted around 1918 with Lameka Ahalau, a resident of Piʻihonua Ahupuaʻa who lived were the Hilo High School campus now is. Kelsey and Ahulau took a series of trips in which Ahulau pointed out various places in upper Piʻihonua and especially the Wailuku river. Mr. Gomes shared the following information:

- Ahulau told Kelsey that the inclusive name for the foothills" near "Molo-kioi" is "Ka-lama."
- Mōhihi or Moʻohihi seems to be a name of either the northernmost or middle spring that originates in the "Kaʻūmana Springs" area, as depicted on maps and mentioned in old newspaper articles. Looking at various other sources, it seems that the main stream that currently flows through the ʻĀinakō Subdivision is named either Malokioi or Molokioi, and that its course may have been altered at some point to join with Mōhihi spring and another spring named Waipāhoehoe, whose name dominates the waterflow as the stream continues on through what is now Carvalho Park, and into the Wailuku. There is at least one more spring in the area that converges with these three, whose name I have not found. These springs also seem to have contributed to the ʻĪʻauwai system in Piʻihonua and Punahoa.
- Mr. Gomes was unable to find the names Puʻu Kūpapaʻu or Puʻu Ioane in older sources, but he has heard from Kale Langlas that Puʻu Ioane may have been named for Ioane Haʻa, a famous paniolo.
- Kelsey also recorded that there was a place called "Piʻihau" that was a hill on the Puna side of the road to Piʻihonua around the area of Waiānuenue, but Mr. Gomes is not sure exactly where that is or if it refers to Puʻu Kūpapaʻu .

4.3 Leilehua Yuen

Leilehua Yuen is a multigenerational resident of Punahoa 2 and a Hawaiian artisan with a background in hula, music, and storytelling. Dr. Barna met with Ms. Yuen at her home in Punahoa 2 on June 16, 2025, to discuss potential cultural impacts in the project area.

On June 17, 2025, Leileihua Yuen spoke with the author about the project and potential cultural impacts. The interview took place at her house in Punahoa 2.

Topics that were discussed included:

- The area is too wet for sugar, but not too wet for growing taro and ʻuala with mounds.
- Looking at 1931 map, Leilehua noted that the area mauka was mostly used for cattle because it was too wet for other agriculture.

- “Moohihi or Spring.” Could be related to entangling of genealogies—entangling mo’o—or the intermarriage of chiefly families. Or “the moʻo grabs.”
- Thinking about Hinakeahi, could Kupapau Hill maybe have been used for cremating criminals? Maybe cremated with pukiawe wood to destroy the bones? Or maybe removing flesh the pono way?
- Related three stories of how Hilo was named.
- Puʻu Opeʻapeʻa—she said Puupeʻa—and said that luʻau was Lohiau’s favorite dish. To make it, you harvest the young tip of the taro leaves. When they are young and thin, they are like bat’s wings. Taro was grown for that purpose on the puʻu.
- Also mentioned that there used to be many bats at that puʻu, but not as many when she was young. Hilo High School’s lights for the football field attracted insects and especially termite, and that helped increase the number of bats.

Recommendations included:

- Keep development out of ditches and streams.
- She stated a preference or hope that community could care for open space.
- Interpretation at the spring would be a good opportunity to tell the story of the whole aquifer, from Polihale to Hina i ke ahi—story of wai from top to bottom.
- She suggested checking mounds for burials.

4.4 Ronald and Doreen Kodani

Ronald and Doreen Kodani are residents of the Piʻihonua Hawaiian Homestead Community. Both are active in the native Hawaiian community. Ronald has been a director of Hui Mālama Ola Nā ʻŌiwi and a community leader with the Sovereign Council of Hawaiian Homestead Associations and the Piʻihonua Hawaiian Homestead Community Association, among others. Doreen provided childcare as owner and operator of Hilo Keiki Cares for over a decade. They live makai of State-owned parcel.

On July 23, 2025, Ronald and Doreen Kodani spoke with the author about the project and potential cultural impacts. The interview took place at their home in the Piʻihonua Hawaiian Homestead Community.

Topics that were discussed included:

- The history of the Kaumana Springs Wilderness Park and the archaeology survey that was done in 1978.
- Connections between the neighborhood (Puʻu Hina street), Hina, the Wailuku, and the Hina stories.
- History of water in the area, including springs, pipelines, and streams. People used to take water from the area and take it home for drinking.

- Norman Kalima brought loʻi back to grow taro and other crops in the land behind Henderson's. Kalima would tell him about "people who guard the place."
- The name Puʻu Kupapau or Kupapau Hill was not familiar to them, but moʻolelo or mele might have more information.
- Has gathered bamboo and hōʻiʻo from across Ainako Stream near the Project Area. Does not know of others who gather in the Project Area.
- Main concern for the area is gentrification.

Recommendations included:

- Make an effort to notifying neighbors about public meetings and the project, for example, mailing or stopping by in person.
- Reach out to halaus in area, and people living in older neighborhood across Kuamana Drive.

5 Project Area Expectations

The current Project Area is located at an elevation of elevation of 400 and 700 feet amsl, about 2 miles inland from Hilo Bay in the ahupua‘a of Punahoa 2. Some models of Precontact settlement and land use place the Project Area in the Upland Agricultural Zone, where scattered garden and agroforestry plots could be found, with some temporary habitations, in the upper kula. More recent modelling suggests that Punahoa was near the southern edge of a band of intensively utilized lands that extended inland along the Hilo kula toward Hāmākua. The Project Area in particular, however, has a relative abundance of freshwater springs and streams, making it possible for rainfed and limited irrigated agriculture. Little documentary evidence in the form of recorded mo‘olelo or 19th century written accounts has been found to elaborate on land use in the Project Area. The Hilo Boarding School Ditch (SIHP 50-10-35-14947) or its predecessor, the ‘Ī ‘auwai (or the Kanuha ‘auwai or Aki ‘auwai) is known to pass through the Project Area. Early 20th century maps indicate the land was divided into 15 historic lots, and that it was unlikely that the land was used extensively for sugarcane cultivation. The springs in the northeast corner were hotly contested by the HEA and the County in the early 20th century. Ultimately, at least one spring was developed to provide water for the Hilo municipal supply.

A reconnaissance survey conducted by the Bishop Museum (Sinoto 1978) identified three clusters of features he described as resembling traditional Hawaiian construction, along with ranching walls. These clusters were assigned to SIHP 50-10-35-18696 but were never inventoried.

5.1 Anticipated Feature Types

Archaeological features are quantifiable forms constructed or modified by humans that make up the archaeological landscape and provide a material record of human activities in a given place. After their initial construction, various site formation processes related to their use, reuse, abandonment, and naturally occurring preservation or decay can alter features such that a level of interpretation is necessary to categorize and explain what they are. Numerous formal feature types have been identified (but not agreed upon) during the past 100 or so years of archaeological research (augmented by historical documentation and oral historical accounts) on the island of Hawai‘i. Indeed, as Kirch (1985:36–38) points out, “given the bewildering variety of forms and permutations that Hawaiian structures take…no single classification has yet been found to be entirely satisfactory. In fact, Hawaiian archaeologists commonly use ad hoc combinations of functional and formal types in their survey work, applying functional terms to sites whose past use seems relatively unambiguous, and using formal, descriptive terms for sites that might have been used for several alternative purposes.” By nature, this lack of agreement on feature terminology hinders comparisons between sites and projects, and the “ad hoc” combination of formal and functional terms used in describing features in the field can preclude innovative interpretation. As has been documented, similar formal feature types can have diverse functional and temporal associations.

A set of formal feature definitions is presented below based on prior studies by Cordy (Cordy et al. 1991), Kirch (Kirch 1985; Kirch and McCoy 2023), and adapted by Rechtman and Clark (e.g., Clark and Rechtman 2016; Gastilo and Clark 2018). The definitions are purposely devoid of function, and present only the common attributes that allow for sorting the diverse formal feature types into easily quantifiable groups. Features, which typically comprise spatially bounded individual deposits or constructions, may

may stand alone on the landscape or be combined to form compound structures. According to Kirch (1985:39), “groupings or aggregations of architectural components, features, and compound structures over the landscape are termed complexes (such as all of the features and structures that make up a residential unit).”

5.1.1 FEATURE TYPES

Formal feature types expected in the project area are described below. A definition of each feature type, based on convention, is presented below. In addition to these feature types, complexes composed of multiple associated features and isolated artifacts were also expected.

Alignment

An alignment is a low-lying, linear or curvilinear arrangement of stones that is considerably longer than it is wide. Alignments are informally constructed using stones of various type and size depending upon the source material. Alignments, unlike the walls encountered within the study area, are rarely stacked. In some cases, alignments may consist of single stones placed end to end in a row. Alignments may form adjoining or shaped segments (i.e., L-shaped, T-shaped, U-shaped, etc.).

Artifact concentration

An artifact concentration is an accumulation of multiple portable artifacts in reasonable proximity to each other to be associated with use or depositional events. They may be exposed on the ground surface or buried. They consist of discarded or abandoned artifacts in primary or secondary depositional contexts. Unlike a midden, an artifact concentration may not necessarily be the result of intentional dumping or discard.

Ditch

A long, narrow excavation that provides a channel for moving water. They may be lined (e.g., with rock; concrete/gunite lining, mortared rock, concrete), but may also be unlined. Ditches may connect in networks that are dentritic or heiarchical to distribute water. Component features of ditches may include diversion structures (e.g., weirs dams), conduits (e.g. flumes, tunnels, pipelines), and flow control devices (e.g., gates). The English term “ditch” is used to avoid functional interpretations, reserving the term “‘auwai” for the artificial diversion of “a flow” of fresh water by means of a ditch or channel, for purposes of domestic use and irrigation (Handy et al. 2020:77).

Enclosure

An enclosure is a collection of walls or alignments that surround an interior space on at least 75% of its perimeter. The construction may incorporate natural formations (i.e., bedrock outcrops, boulders, etc.) or other formal feature types into its length. Construction materials are of varying type and size depending on the source. The shape of an enclosure (i.e. square, rectangular, three sided, many sided, circular, oval, irregular, etc.) varies considerably depending on the topography, its intended function, and the amount of land disturbance that has occurred in the vicinity of the feature. Some enclosures completely surround an interior space with no openings; others have an open side or have an intentionally created small opening in one or more of the perimeter constructions. The interior of the enclosure may contain rubble, cleared space, soil, or other feature types depending on the individual purpose of construction.

Freestanding Wall

A wall is a linear or curvilinear alignment of stones (at least two courses high) that is considerably longer than it is wide. Walls are constructed using stones of various type and size depending upon the source material. They generally have sloped sides, although in neatly stacked walls the slope approaches vertical. Walls encountered within the study area take on three general forms; collapsed (no formal placement of stones evident), stacked (stones placed on top of one another), and core-filled (stacked along the edges with a fill of smaller, piled stones). Walls may also form adjoining or shaped segments (i.e., L-shaped, T-shaped, U-shaped, etc.).

Modified outcrop

A modified outcrop is an elevated tumulus (outcrop) of pāhoehoe that has been altered from its natural form by the addition of a collection (or collections) of stones placed on or against it. The collection of stones may take the form of any of the other architectural feature types, but the collection must be significantly smaller than the size of the tumulus, and the outcrop must be integral to the feature's architecture and location. Typically, the outcrop itself defines the limits of the feature, rather than the extent of the modifications.

Modified Spring

A spring is a water resource formed when the ground surface intersects groundwater at or below the local water table, at a depth where the subsurface material is saturated with water. A modified spring has been altered from its natural form. Some examples of modifications include excavation of the spring to improve access to the water source, the addition of constructed features to protect the spring (e.g., lining the spring with rock, wood, or concrete, enclosing the spring in a wall or fence), or constructing features to improve access (e.g., leveling the surrounding ground surface, building steps down or up to the spring).

Mound

A mound is a collection of stones with an irregular surface. Mounds can range in size, shape, method of construction, and type of stone used. They can be constructed from as few as four stones or as many as the topography and the effort of the individual(s) constructing them allow. The shape of a mound (e.g., oval, round, linear, curvilinear, square, crescent, rectangular, or irregular) can vary depending on the terrain and the needs and preferences of the individual(s) constructing it. Mounds generally have sloped sides. Mounds are either piled or stacked, or a combination of both. Stacked mounds usually contain a fill of piled stones contained by an outside layer that is stacked around the edges. The type of stone used in mound construction reflects the immediately available source material. The size of stone used is also a function of material availability.

Platform

A platform is a stone construction with a relatively flat upper surface that is elevated above the surrounding ground surface on all sides. Platforms are usually quadrangular (but may also be rounded or irregular) with neatly stacked or collapsed edges (stacked edges are generally vertical, while collapsed edges were formerly stacked, but are now sloped and resemble piled edges). The upper surface of a platform often consists of smaller stones than are used to construct the rest of the feature.

Retaining wall

A retaining wall is a linear or curvilinear alignment of stones (at least two courses high) that is considerably longer than it is wide. Unlike a freestanding wall, a retaining wall is constructed to support nearly vertical slopes of earth or rock and prevent erosion and collapse of the material. Retaining walls are constructed using stones of various types and size depending upon the source material. They generally have sloped sides, although in neatly stacked retaining walls the slope can approach vertical.

Rock pile

A rock pile is a collection of stones with an irregular surface. Rock piles may be intentionally constructed by heaping or stacking stones at a specific location or could be incidentally created by mechanical disturbance to another feature type that deposited the stones in a pile, rendering any previous formal traits unrecognizable. Rock piles range considerably in size and shape depending on the number of stones they contain. The type and size of stone found in a rock pile reflects the immediately available source material. Incidentally created rock piles are always loose collections of stones that lack any formal architectural traits. Intentionally created rock piles are either piled or stacked, or a combination of both. All rock piles, as dictated by gravity, have sloped sides, although rock piles with stacked sides may have edges that approach vertical. Stacked rock piles usually contain a fill of piled stones with an outside layer of stacked stones around the edges.

Rock ring

A rock ring is an arrangement of rocks around the perimeter of a circular or roughly circular area. Unlike an enclosure, the arrangement does not form a wall but is generally built as an alignment of single rocks or exposed on the ground surface.

Terrace

A terrace is a stone surfaced area, level with the surrounding ground surface on at least one side. Typically, a terrace consists of a linear or curvilinear stone construction built perpendicular to the natural slope of the terrain that retains a fill of stones behind it with an artificially leveled surface. The stones of the retaining edge may be piled, stacked, or collapsed (piled edges are sloped, stacked edges are nearly vertical, while collapsed edges were formerly stacked, but now resemble piled edges). The retaining edge is generally constructed of larger cobbles, while the fill (behind the retaining edge against the slope) is made up of variously sized source material, but often has a paving of small (cobble to gravel size) stones on the surface. Terraces vary in size and shape depending on the terrain and the individual purpose of construction.

5.1.2 COMPLEXES

Multiple features that appear to be associated spatially, functionally, and temporally can be interpreted to comprise a “complex” that could have been used in a coordinated and interdependent manner. Within a complex, the individual features that comprise it are considered to be “subfeatures.” A complex could be considered a “site” or a “feature” depending on the larger archaeological context. A classic example of a complex as a site might be a kauhale (Ladefoged 1991; Vacca 2019) that includes several features and activity areas (e.g., enclosures or platforms) that were used by a household as their residence. Within the context of a larger site, an example of a complex could be multiple connected platforms and terraces used as a foundation of a building.

5.2 Temporal Affiliations (Age) of Features

Individual features identified in the field were examined for indicators of their temporal affiliation or age. Ideally, these indicators would provide information about the entire history of the feature, from its initial creation to its ultimate abandonment and any episodes of use, reuse, or modification in between. More often than not, this level of detail is not possible, but a general idea of a feature's age may be determined. Using a diverse set of criteria, an attempt was made to assign each feature to one or more generic periods commonly used to describe sites in Hawaiian archaeology. The earliest period, "Precontact," describes the years between the arrival of the first Polynesian voyagers to the Hawaiian Islands and the arrival of the first European explorers in C.E. 1778. The second period, "Historic," describes the years after the arrival of the first European explorers until the "Modern" period, which begins fifty years before the preparation of this report. If more specific temporal information is available, other designations may be made, such as "nineteenth century." Some isolated and remnant features may lack clear evidence of temporal affiliation. The age of these features is considered "Indeterminate."

Due to current scope and budget limitations, no radiometric dating was conducted during the current survey, and so other lines of evidence were used to assign temporal affiliation. These included the accumulated archaeological data, historical documentary research, the *Māhele* and grant records, and oral historical information. One common indicator of Historic period utilization of a feature is the presence of artifacts known to be manufactured during that period. The presence (or absence) of Historic artifacts is often used as a relative dating technique in Hawaiian archaeology. The identification of such artifacts in association of a feature suggests that the feature was used when those artifacts were available to its occupants. Precontact use can be suggested by the presence of traditional Hawaiian artifacts with or without accompanying Historic period artifacts. Artifacts alone, however, cannot definitively rule out the use of a feature during either the Precontact or Historic periods, as several studies have demonstrated (e.g., Bayman 2009; Kirch 1992). Features that lack Historic Period artifact types and construction styles may still be assigned to the Historic Period based on their associations with, or locations relative to, places or features known to have been used during the Historic Period.

Some architectural attributes and construction materials can also be indicative of temporal affiliation. In general, Historic walls may be distinguished from Precontact walls by construction technique. Evidence of core-filled construction outside of the special contexts cited by Cordy et al. (1991) is a strong indicator that the wall was built during the Historic Period. As Cordy et al. (1991:460) state, "It has long been realized in Hawaiian archaeology that high (1.0+ meter), vertically faced, and core-filled walls are common architectural features of the late 1800s—seen in the form of kuleana house lot walls, house walls themselves, and in ranch and ahupua'a border walls." These types of walls are occasionally found in Precontact sites, but were not common and seem to be restricted to certain site types such as heiau (Cordy et al. 1991). Often, the materials used to construct the Historic walls were pirated from older Precontact features. Occasionally, the Historic walls even follow the alignments of older walls. Features built using mortar, concrete, metal, or milled lumber are also easy to distinguish as Historic (or Modern) Period constructions.

Absent chronometric data or documentary evidence of their creation, it can be difficult to assess the age of rock mounds. Techniques for clearing agricultural fields of stone during both the Precontact and Historic periods often create rock mounds. Based on interviews with former sugarcane field workers, Hunt and McDermott (1993:31) suggest that the edges of rock mounds found in South Hilo in former sugarcane fields were stacked "to increase the efficiency and holding capacities of the piles, thereby

allowing more cleared space for sugarcane." The rock mounds were dismantled and rebuilt each planting season to reduce weeds and pests. They go on to relate that the rock mounds known to have been built by plantation workers tended to lack the stable, weight-bearing vertical faces and top surfaces paved with stones that are more commonly associated traditional Hawaiian architecture (Hunt and McDermott 1993:90). Additionally, they noted an absence of traditional Hawaiian artifacts and activity area features such as paving stones, ʻili ʻili (pebble) pavements, or imu (earth ovens), but the presence of Historic Period artifacts. Their findings create a model for assessing the age rock mounds in agricultural contexts that has been useful in South Hilo (e.g., Clark and Rechtman 2016).

A feature containing evidence of Historic Period use may also be older than this. Some features may have been used, continually, periodically, or episodically, from Precontact times into Historic times. Evidence of continued use, or reuse, of a feature through time can be identified by absolute dating techniques, or by examining the cultural material remains, architectural elements, and associations with known loci of human occupation. Features with indicators of use or the potential for use during both Precontact times and Historic times are assigned to both relative time periods. Some isolated and remnant features with forms that permeate the span of human settlement in the islands, or which have been so badly disturbed by Historic/Modern land clearing activities that they are only small remnants of what once existed, often lack clear evidence of temporal affiliation. The age of these features is considered "indeterminate." Likely scenarios for the construction of features with indeterminate ages are discussed in the text, but they are not assigned to a particular time period. The remaining features, with forms and associated cultural deposits indicative solely of use prior to the Historic Period, are considered the vestiges of the Precontact archaeological landscape, and they too are grouped into sites (see Defining Site Boundaries below).

"Modern" features that are less than 50 years old are not considered to be historic properties (HRS Chapter 6E-2) by DLNR-SHPD. Features of this age, as determined in the field, were noted but not recorded in detail. The criteria used to assign features to a particular time period include architectural style, construction materials, location, proximity and similarity to other features, associated cultural material, the accumulated knowledge of Hawaiian archaeological forms, and when possible historical documentary research and oral historical information.

5.3 Functional Interpretations

Functional interpretations are derived by considering a features form, likely age, and the historical and environmental context in which it is identified. Expected functions are listed below.

Agriculture

Features are assigned an agricultural function when they are recognizable as a component of an agricultural system known or likely to have been used in the Project Area. Agricultural systems used in Precontact and early Historic Periods, including their component features and technologies used within them are described by Handy et al. (2020), and details of Historic agricultural systems are found in various oral histories, historical documents, and archaeological, cultural, and reports. In Hilo, and in South Hilo in particular, agricultural features would be associated with the garden and tree crops in the Upland Agricultural Zone (see McEldowney 1979a:18–25) and the planting methods described by Handy et al. (2020) that included planting dry taro wherever soil was available (which would have entailed clearing stones from the soil), kanu kipi or planting taro in soil mounded above marsh bottoms. Historic farming

methods included manual or mechanized clearing of stone from soil and plowing using hand tools, draft animals, or machinery. Thus, an agriculture feature is any feature that, based on the presence of soil is interpreted as having been used primarily in the service of cultivating plant crops. These could include clearing mounds and rock piles, terraces, loʻi, and fields, as well as features constructed to facilitate harvesting such as loading ramps.

Animal Husbandry

Animal husbandry or hānai holoholona (Pukui and Elbert 1986:56) entails the care of animals, a practice that Hawaiians did since they arrived in the islands with pigs, chickens, and dogs. An archaeological feature commonly associated with animal husbandry is an animal pen—a walled construction that was used for containing livestock. Animal pens are known to have been used in both Precontact and Historic periods. In Precontact times, for example, pigs were maintained in pens, except when they were let loose to root in fields (Cordy 1972; Kirch 1992; Lockwood 2009; Newman 1970:130, 219; Sahlins 1992). The introduction of other livestock species during and after the eighteenth century necessitated the construction of other types of animal enclosures (Barna 2013; Langlas 2022). Constructions used as pens could include enclosures, modified outcrops, modified overhangs, modified sinks, walls, or combinations of any of these. They may or may not have an entrance. Animal pens can usually be associated with a nearby Historic residence. Animals kept in pens may have included pigs, cows, horses, goats, sheep, donkeys, chickens, etc., but typically not more than a few to a pen, and the benefits obtained from the animals directly supported the people caring for them. Larger scale features used for livestock ranching such as paddocks and catch pens, and rock walls that comprise them would also be categorized as animal husbandry.

Boundary

Walls or alignments that based on their locations and associations appear to mark or define the edge of a utilized space are assigned a boundary function. Boundary walls, when core-filled, are typically Historic Period constructions that follow known land (parcel or ahupuaʻa) boundaries, while boundary alignments, or in some cases low, stacked walls, are thought to be Precontact constructions that define the space around sites or features used by individuals for a specific functional purpose such as an alignment or wall marking the boundary of a habitation area. Some historic walls served additional functions, such as animal husbandry when used to contain livestock along property boundaries.

Clearing

Clearing features are those that are the result of attempts to clear land of vegetation or stones to make the land fit for some purpose other than agriculture. For example, a push pile of rocks created while mechanically grading or grubbing land intended for residential or commercial development would be associated with clearing.

Habitation

Habitation features are those that, based on their formal attributes, associated cultural material, or their associations with known locations of habitation, appear as though they were once occupied by humans as dwelling places. Complexes of multiple features often comprise a habitation site or a locus of habitation within a larger site. Habitations can date to both the Precontact and Historic Periods. In addition to constructed surface features, lava tubes, modified sinks, modified overhangs, and modified outcrops can also be habitation sites. A specific type of habitation, “refuge,” can occur within lava tubes.

Habitation sites, with the exception of lava tubes and modified overhangs, typically contain one or more features that served as the foundation for a roofed structure. Sites interpreted as having been used for habitation purposes can include other functional feature types, as well, but the primary use must have been as a dwelling location, with the other features serving ancillary functions. The duration and type of occupation at a habitation site can vary widely depending on its location, associations, and intended purpose of construction. In the Hawaiian archaeological literature there is a significant amount of attention devoted to qualifying habitation sites into permanent and temporary categories, using variables such as structure size, substantiveness, and other contextual information, but with differing results (Cordy 1981, 1995; e.g., Haun et al. 2006; Kirch 1985; Ladefoged 1991, 1998; Vacca 2019; Van Gilder and Kirch 1997). While aspects of these approaches were used to assess and discuss the permanence of habitation that occurred at sites and feature recorded within the Project Area, separate categories of temporary and permanent habitation were not used in this report.

Indeterminate

The function of a site for which the use cannot be accurately determined through Direct Informant Information, Direct Ethnographic Analogy, General Analogy, or Logical Supposition, or for which numerous possible uses exist, is considered “indeterminate.” Likely scenarios for the use of indeterminate sites are discussed in the text, but they are not assigned to a particular functional category. In most cases, remnant features in poor condition or features for which multiple possible functions could exist are assigned to this category.

Water Infrastructure

Water infrastructure refers to systems used to manage the supply and flow of water. This functional category is used regardless of the ultimate use of the water (e.g., agricultural, domestic, hydroelectric generation, etc.). Feature types that are likely to be associated with a water infrastructure function include diversion structures such as weirs, dams, or pumping stations; conduits such as ditches or ‘auwai, flumes, tunnels, or pipelines; flow control devices such as gates, gauges, valves, head boxes, forebays and intakes, outlets and spillways, and drops and chutes; and cleaning devices such as trash gates (JRP Historical Consulting Services and California Department of Transportation 2000; Wilcox 1996). In Hilo, the incorporation of natural drainage channels into ‘auwai and ditch systems has been documented archaeologically (Barna 2017; Barna and Rechtman 2015; Kelly and Athens 1982; Wolforth 1999).

6 Results

The current archaeological fieldwork identified portions of two previously recorded archaeological sites and two newly identified archaeological sites. A total of 212 archaeological features were identified. Table 4 lists the identified sites. Figure 36 depicts the locations of these features relative to the entire Project Area. On the map, the locations of individual features are shown, generalized to “discrete features” (e.g., mounds, terraces), walls, and complexes. More detailed maps of the locations of the identified features are shown as Figure 16 through Figure 32. The four sites are described below.

Table 4 Identified Sites

SIHP No.	Type	Function	Age	No. of Features
50-10-35-14947	Hilo Boarding School Ditch	Water infrastructure	Precontact/Historic	5
50-10-35-18696	Kaūmana Springs Archaeological Site Complex	Agriculture, Habitation	Precontact/Historic	202
50-10-35-T1	Kaūmana Springs Hilo City Water Works	Water infrastructure	Historic	2
50-10-35-T2	Kupapau Hill Hawaii Triangulation Station	Land Survey	Historic	3

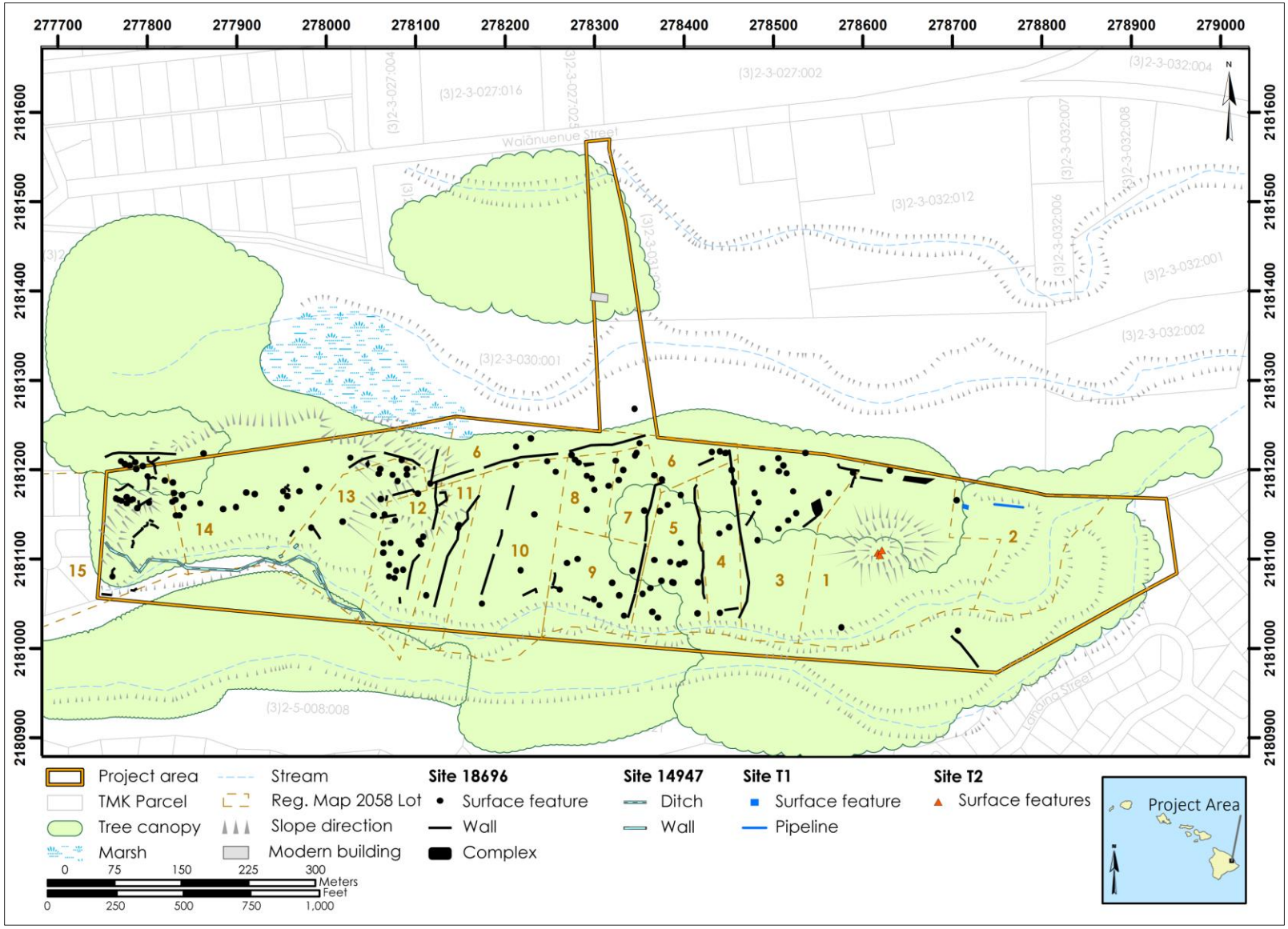

Figure 36. Site location map

6.1 Survey Results

The results of the field survey are presented below. Field data also includes six features or isolated artifacts determined to be younger than 50 years. These modern features and artifacts are not considered components of any of the historic properties that were identified. The identified sites are described below. Details about individual features are presented in the Appendix, where they are organized by site.

6.1.1 SIHP 50-10-35-14947 (HILO BOARDING SCHOOL DITCH

SIHP 50-10-35-14947 is the Hilo Boarding School Ditch. Portions of this ditch have been recorded archaeologically makai of the project area (Athens 1982; Jensen 1991; Wolforth 1999). The portion of the site located in the current Project Area is newly recorded.

Within the current Project Area, five features associated with the Hilo Boarding School Ditch (Site 50-10-35-14947) were identified (Figure 38, Table 2). These features are located near the southwestern end of the Project Area and consist of the ditch itself (Feature A, consisting of one artificial segment that has been dug into the ground and one segment of the ditch that uses the natural channel of a tributary of Ainako Stream) and four rock retaining walls (Features B, C, D, and E) located on the banks of tributary of Ainako Stream. The total length of the site within the project area is approximately 354 meters. Its width varies between 2 meters and the width of the stream banks, approximately 10 meters at its maximum.

The artificial segment of the ditch extends in a northwest-southeast direction, then empties into the tributary of Ainako Stream. This segment begins approximately 2 meters makai of TMK: (3) 2-5-059:014. This portion of the ditch is excavated into the surrounding soil and exposed pāhoehoe Figure 37). It extends 49 meters and varies in width from 2 to 4 meters, and in depth between 0.8 and 2 meters. In some places, the banks of the ditch are lined with cobbles and boulders, sometimes with stacked cobble riprap to mitigate erosion. The ditch bottom is exposed pāhoehoe with some accumulations of decomposing leaves and soil. The excavated portion of the ditch enters the tributary of Ainako Stream near the southern end of the Project Area at the end of the documented segment. There is no constructed spillway or other reinforcement; the ditch simply merges into the stream.

Inside the tributary of Ainako Stream, the Hilo Boarding School Ditch is assumed to follow the bottom of the stream within the historically documented right of way (see Figure 18). The stream has cut a deep gulch through the silty clay loam soils in this part of the Project Area. The stream varies considerably in width and depth. The majority of the stream banks appear to be unmodified. Four locations where the bank has been reinforced were observed (Table 2, see Figure 10). These locations were designated Features 13-12, 13-13, 13-14, and 14-06. All are constructed of stacked small boulders and large cobbles and generally extend from the top to the bottom of the stream bank. Feature 14-06 was obscured by a large fallen stand of guava trees. Site 50-10-35-14947 extends within the stream for approximately 305 meters and then exits the southern boundary of the Project Area. Historic maps depict the Hilo Boarding School Ditch continuing to the southeast, then east, across what is now Kaūmana Drive, never re-entering the Project Area.

There is substantial disturbance at the mauka end of the ditch. The artificially excavated portion of the ditch abruptly ends at rubble that appears to have been deposited during the grading for the house lots in the Kilikina Estates subdivision, which borders the Project Area a few meters to the west of this location.

Overall, the condition of Site 14947 within the Project Area is good. The site has previously been determined to be significant under Criteria “a”, “b”, “c”, “d”, and “e” (Jensen 1991). The portion of site in the Project Area retains sufficient integrity in all relevant categories to contribute to the site’s significance under Criteria a,” “b,” “c,” and “e.”

Table 5 SIHP 50-10-35-14947 Stream Bank Reinforcement in the Project Area

Feature	Type	Construction	Bank	Length (meters)	Photograph
B	Retaining wall	Stacked boulders and cobbles	North	3.2	Figure 39
C	Retaining wall	Stacked boulders and cobbles	South	18.0	Figure 40
D	Retaining wall	Stacked boulders and cobbles	North	4.5	Figure 41
E	Retaining wall	Stacked boulders and cobbles	North	5.4	Figure 42

Figure 37. SIHP 50-10-35-14947 Hilo Boarding School Ditch, artificial segment, view southeast

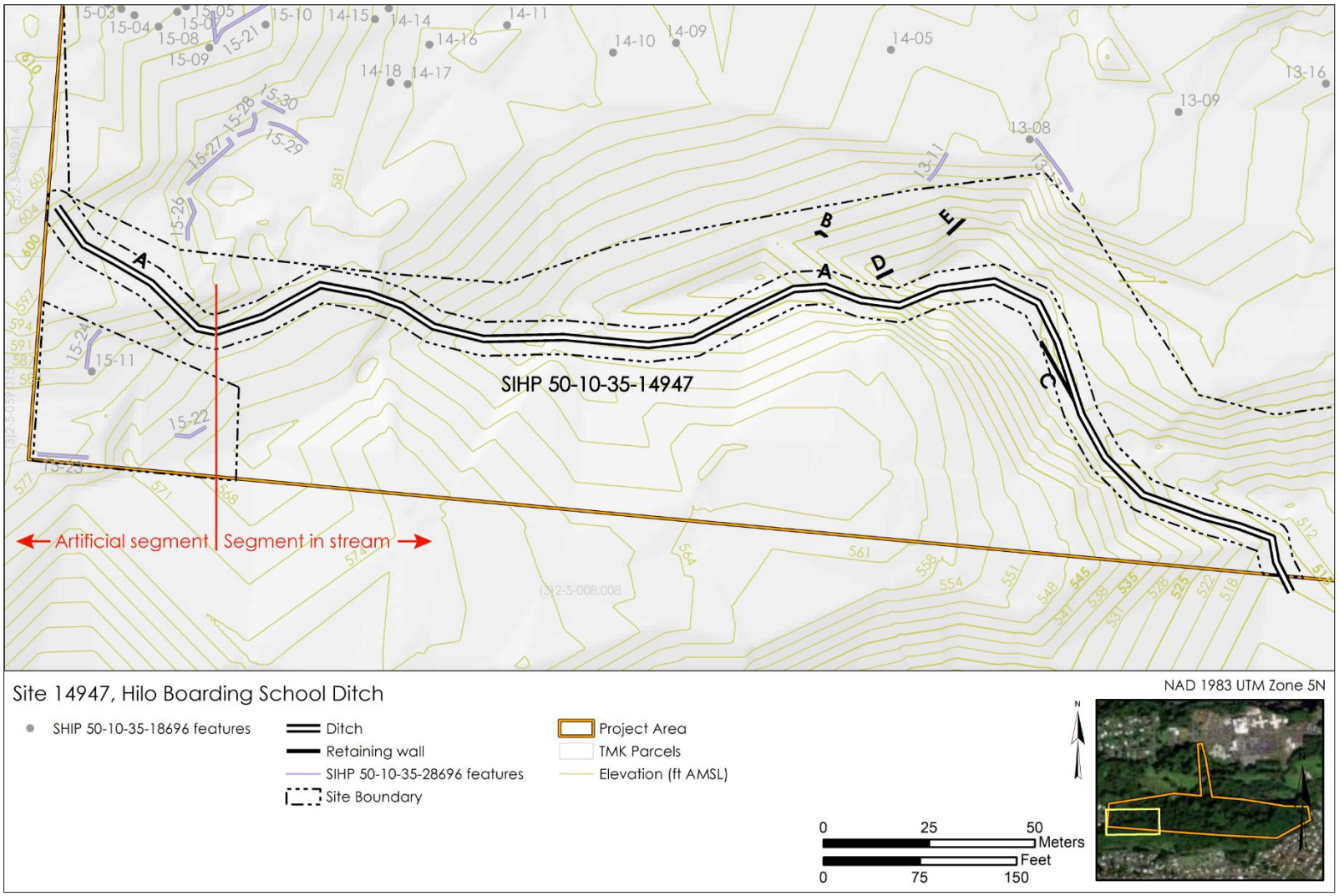

Figure 38. Plan view of Site 50-10-35-14947 Hilo Boarding School Ditch

Figure 39. SIHP 50-10-35-14947 Feature B stream bank reinforcement, view to the northwest

Figure 40. SIHP 50-10-35-14947 Feature C stream bank reinforcement, view to the west

Figure 41. SIHP 50-10-35-14947 Feature D stream bank reinforcement, view to the west

Figure 42. Detail of SIHP 50-10-35-14947 Feature E stream bank reinforcement, view to the west

6.1.2 SIHP 50-10-35-18696 (AGRICULTURAL SITE COMPLEX)

SIHP 50-10-35-18696, an agricultural site complex, was identified by Sinoto (1978) during a reconnaissance survey of the Project Area and adjacent land. The site was recorded as six clusters of archaeological features that he described as “more typical of prehistoric construction than of historic construction” (Sinoto 1978) The SIHP number was assigned to an area enclosing the six clusters of archaeological features as they were mapped by Sinoto (compare [REPLACE] and [REPLACE]) As a result of the current study, 181 individual archaeological features, including 5 complexes with a total of 29 subfeatures, were identified as part of the site within the Project Area (Table 3). It should be noted that the area inspected by Sinoto extended beyond the Project Area, and not all of the clusters he reported were visited during the current survey. The revised site boundary presented in this report was derived from the extent of features identified during the current fieldwork and the extent of feature clusters noted by Sinoto (1978) outside of the current Project Area.

Within the current Project Area, the site boundary begins at the northwestern corner of TMK (3) 2-3-030:004 and follows the western parcel boundary south to the Hilo Boarding School Ditch. It follows northern bank of the ditch until the ditch enters the tributary of Ainako Stream located near the southern parcel boundary. At this point, the site boundary extends along the top of the stream bank generally toward the east. After reaching Feature 01-02 (a mound), the boundary turns toward the north and then follows the western foot of Kupapau Hill around to the northern side of the hill. From there, it extends northeasterly to enclose Feature 02-03 (a mound), and then extends north across the parcel boundary, where it joins the boundary of Sinoto’s (1978) Cluster 6 on TMK (3) 2-3-030:001. The boundary then follows the boundary of Cluster 6 and connects to Cluster 5. It follows the northern boundary of Cluster 5 until it intersects the northern boundary of TMK (3) 2-3-030:004, which it follows to the area of “Dense Vegetation” not surveyed by Sinoto (1978). From this point, it extends northwesterly to encompass Sinoto’s Clusters 4 and 1, and then to the northwest corner of TMK (3) 2-3-030:004. In addition to this area (roughly 57.4 acres), there is a group of features located in the southwest corner of the Project Area.

Soils and sediments observed throughout the portion of the site in the Project Area are a patchy distribution of Panaewa very cobbly hydrous loam, which is developing and accumulating in swales and low spots on the landscape. The potential for buried archaeological deposits is highly variable throughout the site due to this distribution of soils and sediments.

In the site description below, individual archaeological features have been assigned feature numbers that consist of two parts. The first part of the feature number refers to the historic lots depicted on Registered Map 2058 (see Figure 15). The second part is a sequential number for each feature. Thus, the first feature recorded in historic Lot 1 is designated “01-01.” The locations of the identified features are depicted on the maps shown in Figure 45 through Figure 59. Individual features are listed in Table 3. Twenty-eight of these features were grouped into complexes. The component features of these complex are given letters, as in Features 01-04A, 01-04B, 01-04C, and 01-04D. Features located outside of the historic lots shown on Registered Map 2058 are prefixed with “00-.” Four isolated artifacts were identified (see Section 5.1.2.12).

Overall, the condition of Site 18696 within the Project Area is good. The portion of site in the Project Area retains sufficient integrity in all relevant categories to contribute to the site's significance. The site is recommended significant under Criteria "a" and "d."

The identified archaeological features are summarized below, organized by feature type (see Table 3). Features that are included in complexes are discussed as elements of those complexes. Notable examples of features are described in more detail. All individual features are described in Appendix A.

Table 6 SIHP 50-10-35-18696 Summary of Archaeological Feature Types by Age

Feature Type	Precontact/ Historic	Historic	Indeterminate	Total
Complex	1	4	0	5
Ditch	0	1	1	2
Enclosure	1	1	0	2
Freestanding Wall	8	15	0	23
Modified outcrop	3	2	0	5
Modified spring	1	0	0	1
Mound	75	35	1	111
Mound/platform	8	0	0	8
Platform	0	0	2	2
Retaining wall	3	0	0	3
Rock pile	2	2	0	4
Terrace	2	13	0	15
Total	**104**	**73**	**4**	**181**

Table 7 Individual Features of SIHP 50-10-35-18696 Identified in the Project Area

Feature	Type	Function	Age	Location map
00-01	Mound	Agriculture	P/H	Figure 59
00-04	Ditch	Water infrastructure	H	Figure 59
01-01	Wall	Water infrastructure	P/H	Figure 43
01-02	Mound	Agriculture	P/H	Figure 8
01-04	Complex	Agriculture	P/H	Figure 8
01-05	Mound	Agriculture	P/H	Figure 8
01-09	Complex	Agriculture	I	Figure 8
02-03	Mound	Agriculture	H	Figure 44
03-01	Mound	Agriculture	P/H	Figure 45
03-02	Mound	Agriculture	P/H	Figure 45
03-03	Mound	Agriculture	P/H	Figure 45
03-04	Mound	Agriculture	P/H	Figure 45
03-05	Mound	Agriculture	P/H	Figure 45
03-06	Mound	Agriculture	P/H	Figure 45
03-07	Mound	Agriculture	P/H	Figure 45
03-08	Mound	Agriculture	P/H	Figure 45
03-09	Complex	Habitation	H	Figure 45
03-11	Mound	Agriculture	P/H	Figure 45
03-12	Mound/platform	Agriculture	P/H	Figure 45
03-13	Mound	Agriculture	P/H	Figure 45
03-14	Mound	Agriculture	P/H	Figure 45
03-15	Mound	Agriculture	P/H	Figure 45
03-16	Wall	Water infrastructure	H	Figure 45
03-17	Mound	Agriculture	P/H	Figure 45
03-18	Modified spring	Water infrastructure	P/H	Figure 45
03-19	Retaining Wall	Agriculture	P/H	Figure 45
03-21	Wall	Boundary	H	Figure 45
04-01	Mound	Agriculture	P/H	Figure 46
04-02	Mound	Agriculture	P/H	Figure 46
04-03	Mound	Agriculture	P/H	Figure 46
04-04	Mound	Agriculture	P/H	Figure 46
04-05	Wall	Agriculture	P/H	Figure 46
04-06	Wall	Agriculture	P/H	Figure 46
04-07	Wall	Boundary	P/H	Figure 46
05-01	Enclosure	Habitation	H	Figure 47
05-02	Mound	Agriculture	P/H	Figure 47
05-03	Mound	Agriculture	P/H	Figure 47

Feature	Type	Function	Age	Location map
05-04	Mound	Agriculture	H	Figure 47
05-05	Mound	Agriculture	H	Figure 47
05-06	Mound	Agriculture	H	Figure 47
05-07	Mound	Agriculture	H	Figure 47
05-08	Mound	Agriculture	H	Figure 47
05-09	Mound	Agriculture	P/H	Figure 47
05-10	Mound	Agriculture	P/H	Figure 47
05-11	Mound	Agriculture	H	Figure 47
05-12	Mound	Agriculture	P/H	Figure 47
05-13	Mound	Agriculture	P/H	Figure 47
05-14	Mound	Agriculture	H	Figure 47
05-15	Mound	Agriculture	H	Figure 47
05-16	Mound	Agriculture	H	Figure 47
05-17	Mound	Agriculture	P/H	Figure 47
05-18	Wall	Boundary	H	Figure 47
06-01	Wall	Boundary	H	Figure 48
06-03	Mound	Agriculture	P/H	Figure 48
06-04	Mound	Agriculture	P/H	Figure 48
06-05	Mound	Agriculture	P/H	Figure 48
06-06	Rock pile	Clearing	H	Figure 48
06-07	Mound	Agriculture	P/H	Figure 48
06-08	Mound	Agriculture	P/H	Figure 48
06-09	Mound	Agriculture	P/H	Figure 48
07-01	Mound	Agriculture	H	Figure 49
07-02	Platform	Agriculture	P/H	Figure 49
07-03	Mound	Agriculture	P/H	Figure 49
07-04	Wall	Boundary	H	Figure 49
07-05	Mound	Agriculture	P/H	Figure 49
07-06	Mound	Agriculture	P/H	Figure 49
07-07	Mound	Agriculture	P/H	Figure 49
07-08	Mound	Agriculture	P/H	Figure 49
08-01	Mound	Agriculture	P/H	Figure 50
08-02	Mound	Agriculture	P/H	Figure 50
08-03	Mound	Indeterminate	P/H	Figure 50
08-04	Terrace	Agriculture	H	Figure 50
08-05	Complex	Habitation/Agriculture	H	Figure 50
08-06	Wall	Indeterminate	P/H	Figure 50
08-07	Mound	Agriculture	P/H	Figure 50

Feature	Type	Function	Age	Location map
08-08	Mound	Agriculture	P/H	Figure 50
09-01	Wall	Agriculture	H	Figure 51
09-02	Mound	Agriculture	H	Figure 51
09-03	Mound	Agriculture	P/H	Figure 51
09-04	Mound	Agriculture	H	Figure 51
09-05	Mound	Agriculture	H	Figure 51
09-06	Terrace	Water infrastructure	H	Figure 51
09-07	Terrace	Water infrastructure	H	Figure 51
09-08	Terrace	Water infrastructure	H	Figure 51
09-09	Mound	Agriculture	P/H	Figure 51
09-10	Terrace	Water infrastructure	H	Figure 51
09-11	Mound	Agriculture	H	Figure 51
09-12	Mound	Agriculture	H	Figure 51
09-13	Wall	Boundary	H	Figure 51
10-01	Wall	Boundary	H	Figure 52
10-02	Mound	Indeterminate	P/H	Figure 52
10-03	Wall	Habitation	P/H	Figure 52
10-04	Mound	Indeterminate	H	Figure 52
10-05	Mound	Indeterminate	P/H	Figure 52
10-06	Terrace	Habitation	P/H	Figure 52
10-07	Wall	Boundary	H	Figure 52
11-01	Wall	Boundary	H	Figure 53
11-02	Mound	Agriculture	H	Figure 53
11-03	Mound	Agriculture	P/H	Figure 53
11-04	Enclosure	Animal husbandry	H	Figure 53
11-05	Mound	Agriculture	H	Figure 53
12-01	Mound	Agriculture	H	Figure 54
12-02	Wall	Water infrastructure	P/H	Figure 54
12-03	Mound	Agriculture	P/H	Figure 54
12-04	Mound	Agriculture	P/H	Figure 54
12-05	Mound	Agriculture	P/H	Figure 54
12-07	Mound	Agriculture	P/H	Figure 54
12-08	Mound	Agriculture	P/H	Figure 54
12-06	Mound	Agriculture	P/H	Figure 54
12-09	Mound	Agriculture	P/H	Figure 54
12-10	Mound	Agriculture	P/H	Figure 54
12-11	Mound	Agriculture	P/H	Figure 54
12-12	Mound	Agriculture	P/H	Figure 54

Feature	Type	Function	Age	Location map
12-13	Mound/platform	Agriculture	P/H	Figure 54
12-14	Mound	Agriculture	P/H	Figure 54
12-15	Mound	Agriculture	P/H	Figure 54
12-16	Mound	Agriculture	P/H	Figure 54
13-01	Mound	Agriculture	H	Figure 55
13-02	Mound	Agriculture	H	Figure 55
13-03	Mound	Agriculture	H	Figure 55
13-04	Mound	Agriculture	H	Figure 55
13-05	Mound	Water infrastructure	P/H	Figure 55
13-06	Mound	Agriculture	H	Figure 55
13-07	Mound	Agriculture	H	Figure 55
13-08	Rock pile	Clearing	P/H	Figure 55
13-09	Mound	Agriculture	P/H	Figure 55
13-10	Modified outcrop	Agriculture/Habitation	H	Figure 55
13-11	Wall	Boundary	P/H	Figure 55
13-15	Mound/platform	Indeterminate	P/H	Figure 55
13-16	Mound	Agriculture	P/H	Figure 55
13-17	Terrace	Agriculture	P/H	Figure 55
14-01	Mound	Agriculture	P/H	Figure 56
14-02	Platform	Habitation	H	Figure 56
14-03	Complex	Habitation	H	Figure 56
14-04	Platform	Habitation	P/H	Figure 56
14-05	Artifact concentration	Habitation/Agriculture	H	Figure 56
14-07	Mound/platform	Agriculture	P/H	Figure 56
14-08	Mound/platform	Indeterminate	P/H	Figure 56
14-09	Mound/platform	Indeterminate	P/H	Figure 56
14-10	Mound	Indeterminate	P/H	Figure 56
14-11	Mound	Indeterminate	H	Figure 56
14-12	Mound/platform	Agriculture	P/H	Figure 56
14-13	Mound	Indeterminate	I	Figure 56
14-14	Mound	Agriculture	P/H	Figure 56
14-15	Mound	Agriculture	P/H	Figure 56
14-16	Mound	Agriculture	P/H	Figure 56
14-17	Modified outcrop	Agriculture	P/H	Figure 56
14-18	Mound	Agriculture	P/H	Figure 56
14-19	Wall	Boundary	H	Figure 56
14-20	Mound/platform	Agriculture	P/H	Figure 56
14-21	Mound	Boundary	H	Figure 56

Feature	Type	Function	Age	Location map
14-22	Wall	Boundary	H	Figure 56
14-23	Rock pile	Clearing	P/H	Figure 56
15-01	Wall	Boundary	H	Figure 57
15-02	Mound	Agriculture	P/H	Figure 57
15-03	Mound	Agriculture	P/H	Figure 57
15-04	Mound	Agriculture	P/H	Figure 57
15-05	Mound	Agriculture	P/H	Figure 57
15-06	Mound	Agriculture	P/H	Figure 57
15-07	Modified outcrop	Agriculture	P/H	Figure 57
15-08	Mound	Agriculture	P/H	Figure 57
15-09	Mound	Agriculture	P/H	Figure 57
15-10	Mound	Agriculture	P/H	Figure 57
15-11	Terrace	Agriculture	H	Figure 57
15-12	Modified outcrop	Agriculture	P/H	Figure 57
15-13	Mound	Agriculture	H	Figure 57
15-14	Mound	Agriculture	H	Figure 57
15-15	Mound	Agriculture	H	Figure 57
15-16	Mound	Agriculture	H	Figure 57
15-17	Mound	Agriculture	H	Figure 57
15-18	Mound	Agriculture	H	Figure 57
15-19	Wall	Agriculture	P/H	Figure 57
15-20	Wall	Agriculture	P/H	Figure 57
15-21	Rock pile	Indeterminate	H	Figure 57
15-26	Retaining wall	Agriculture	P/H	Figure 57
15-28	Retaining wall	Agriculture	P/H	Figure 57

Age: P = Precontact, H = Historic, I = Indeterminate

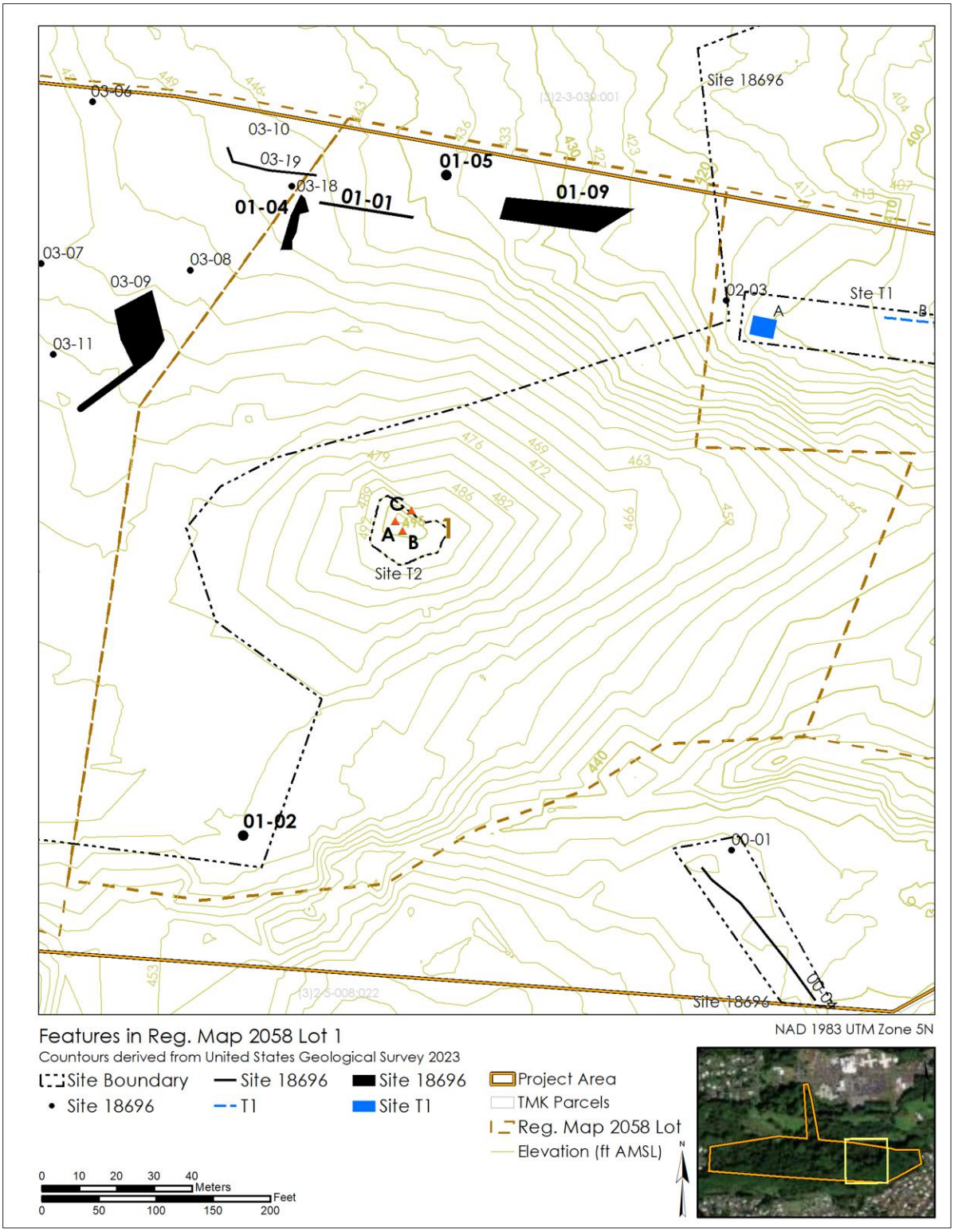

Figure 43. Identified features in Lot 1 as depicted on Registered Map 2058 (Baldwin 1901a)

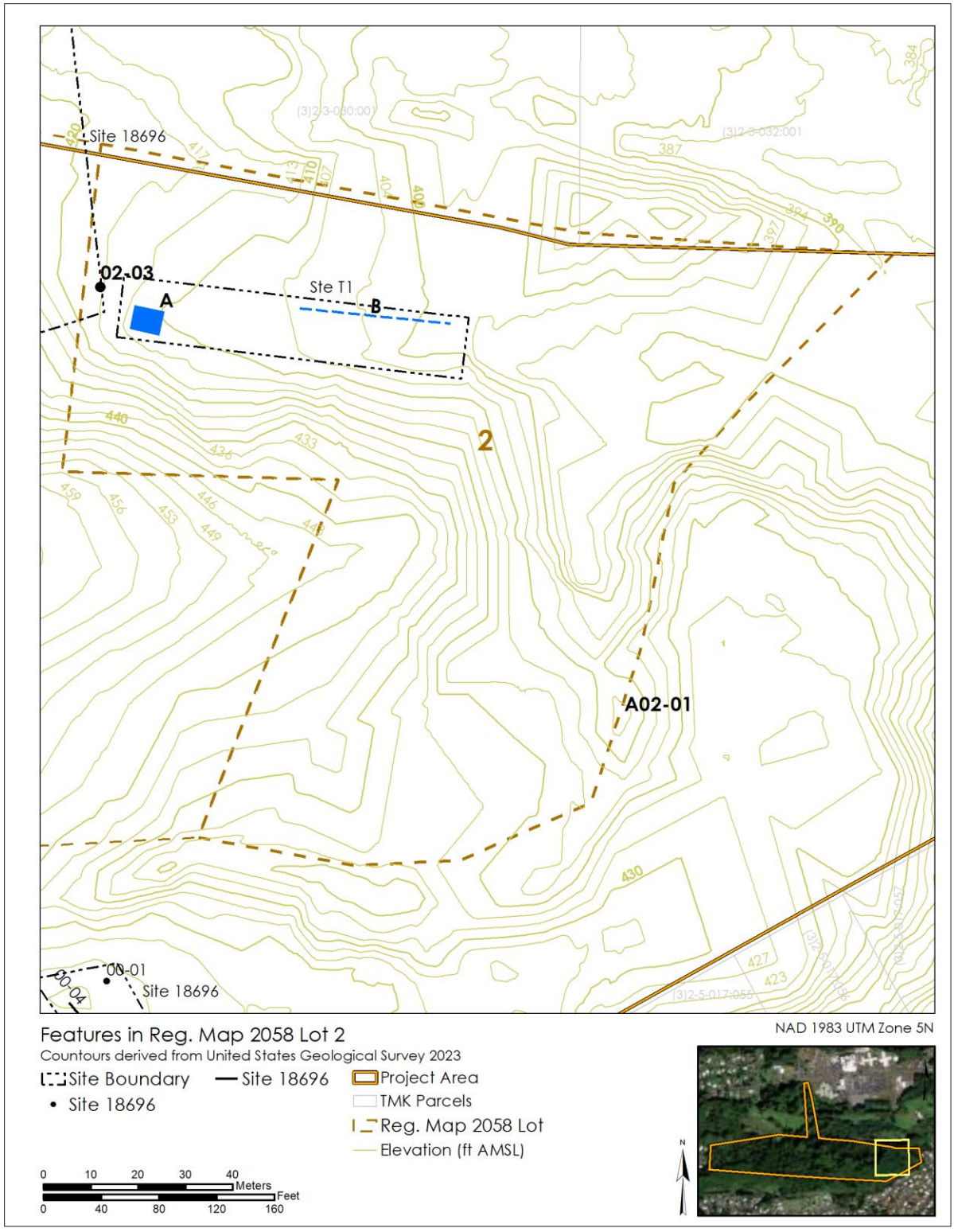

Figure 44. Features identified in Lot 2 as depicted on Registered Map 2058 (Baldwin 1901a)

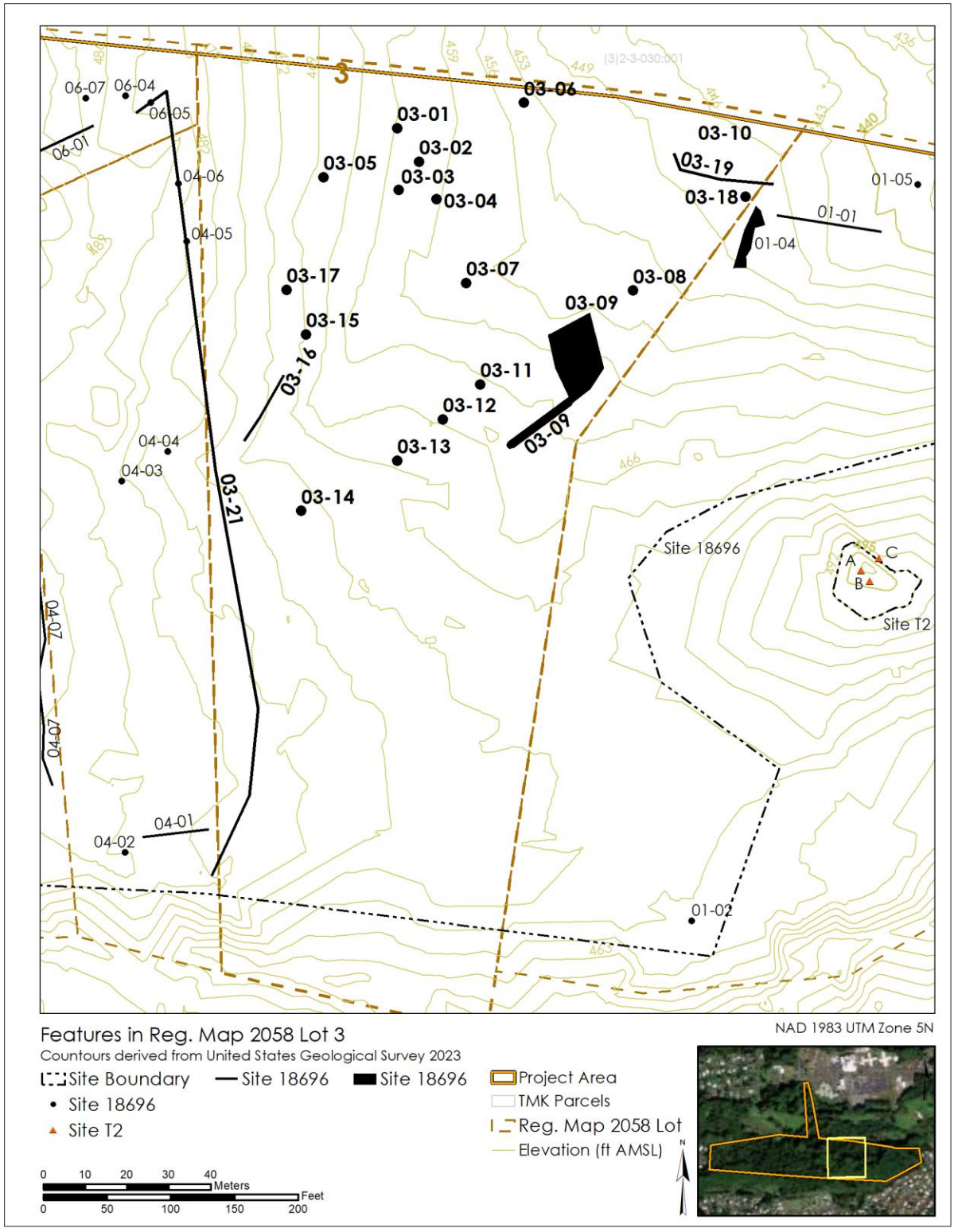

Figure 45. Features identified in Lot 3 as depicted on Registered Map 2058 (Baldwin 1901a)

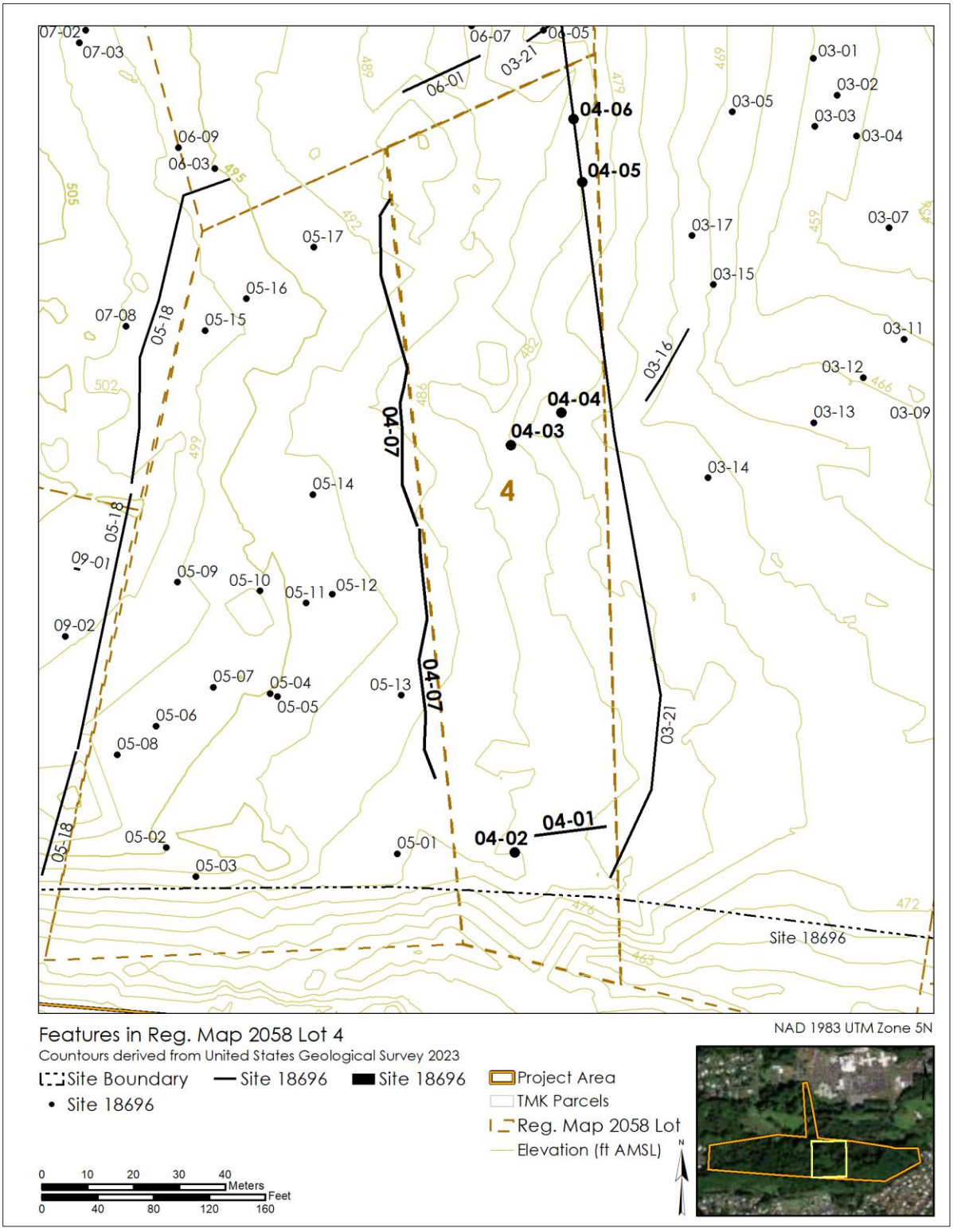

Figure 46. Features identified in Lot 4 as depicted on Registered Map 2058 (Baldwin 1901a)

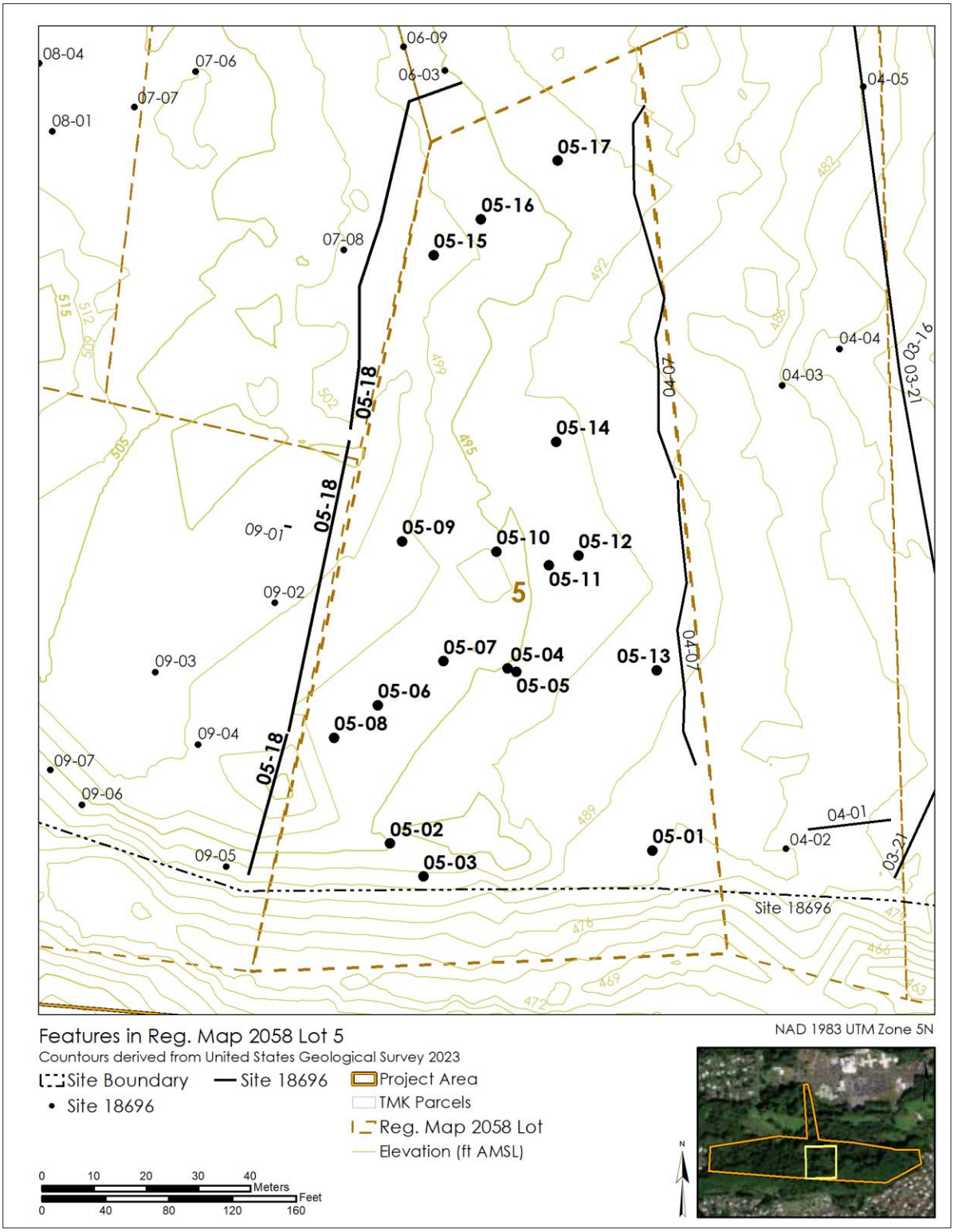

Figure 47. Features identified in Lot 5 as depicted on Registered Map 2058 (Baldwin 1901a)

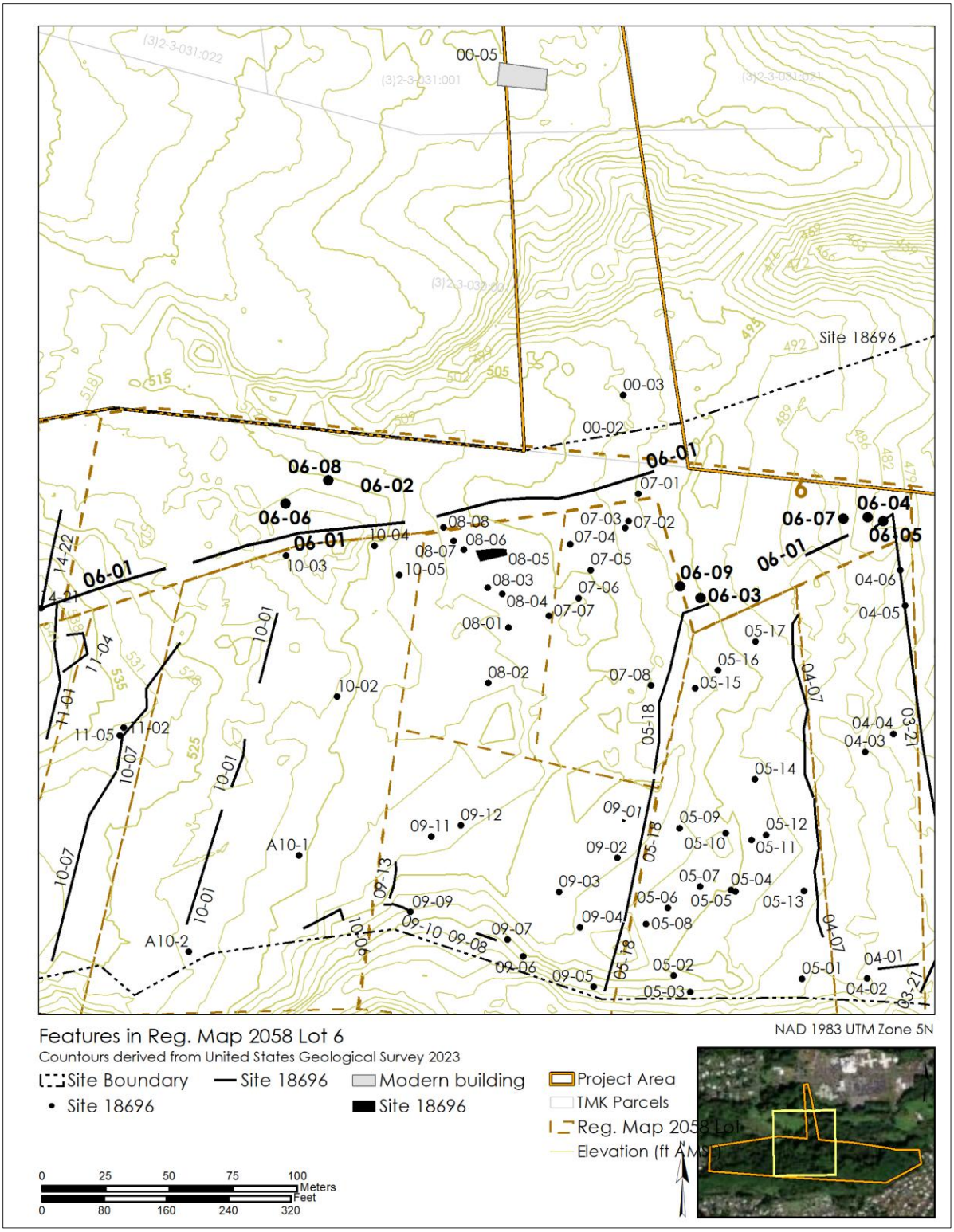

Figure 48. Features identified in Lot 6 as depicted on Registered Map 2058 (Baldwin 1901a)

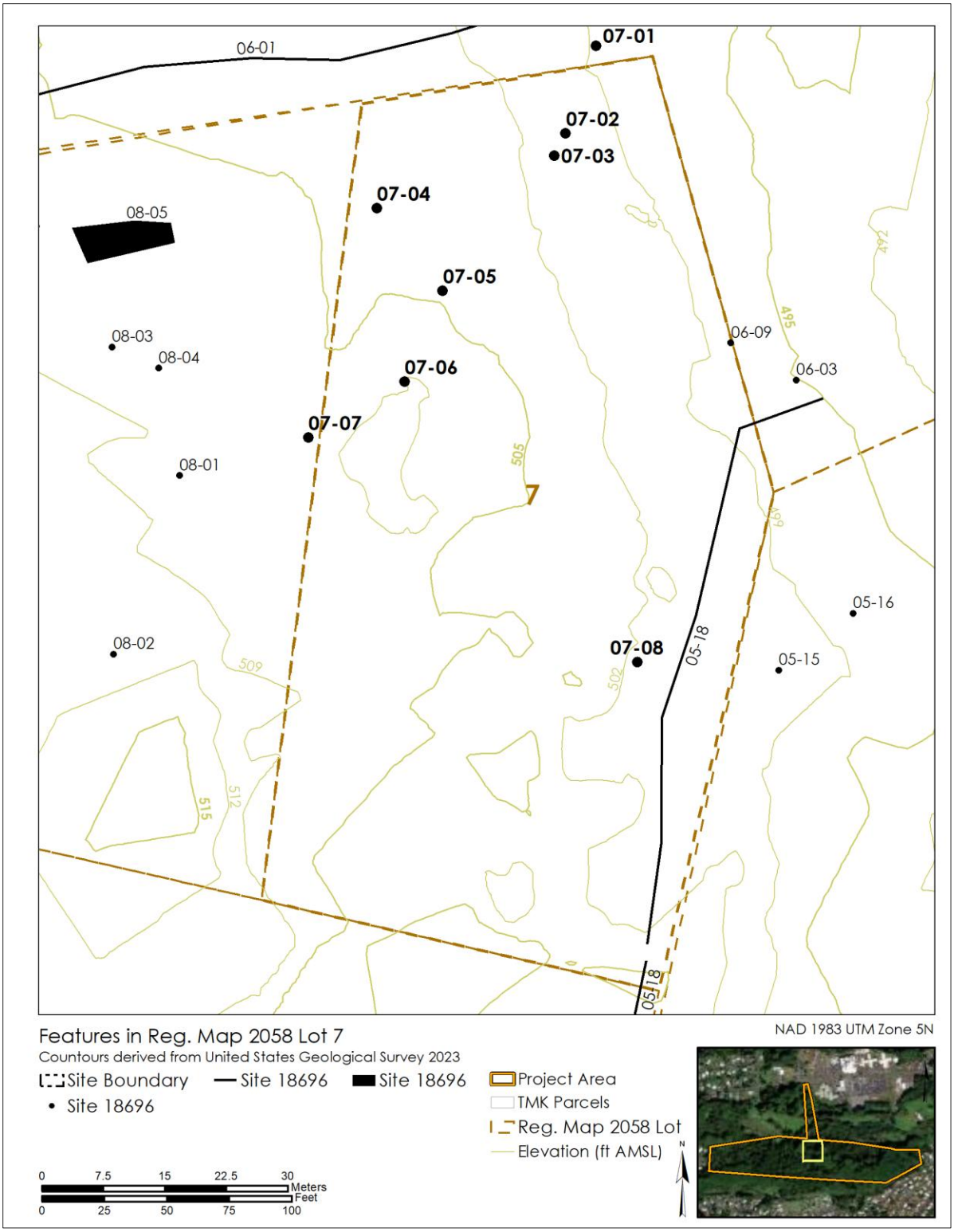

Figure 49. Features identified in Lot 7 as depicted on Registered Map 2058 (Baldwin 1901a)

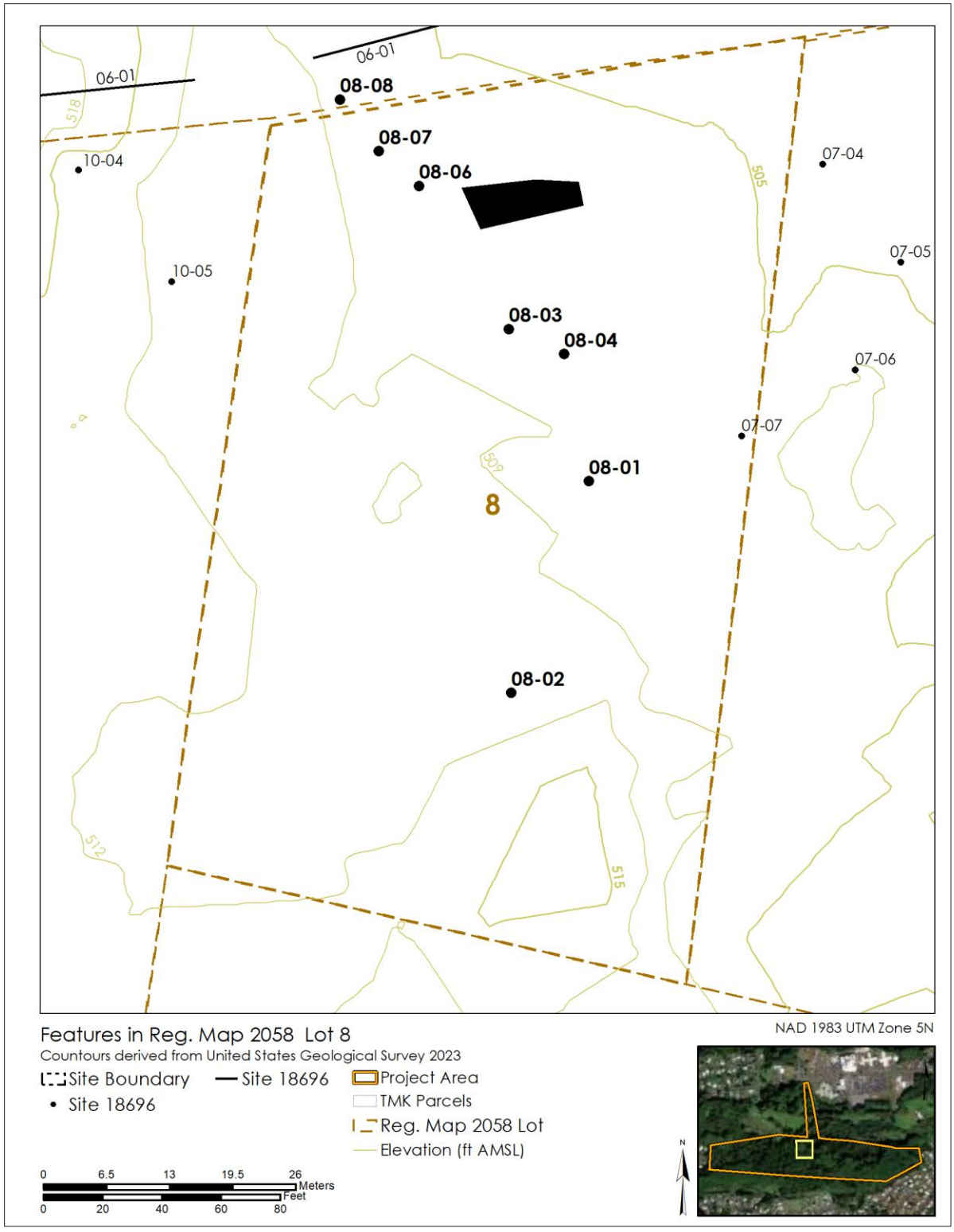

Figure 50. Features identified in Lot 8 as depicted on Registered Map 2058 (Baldwin 1901a)

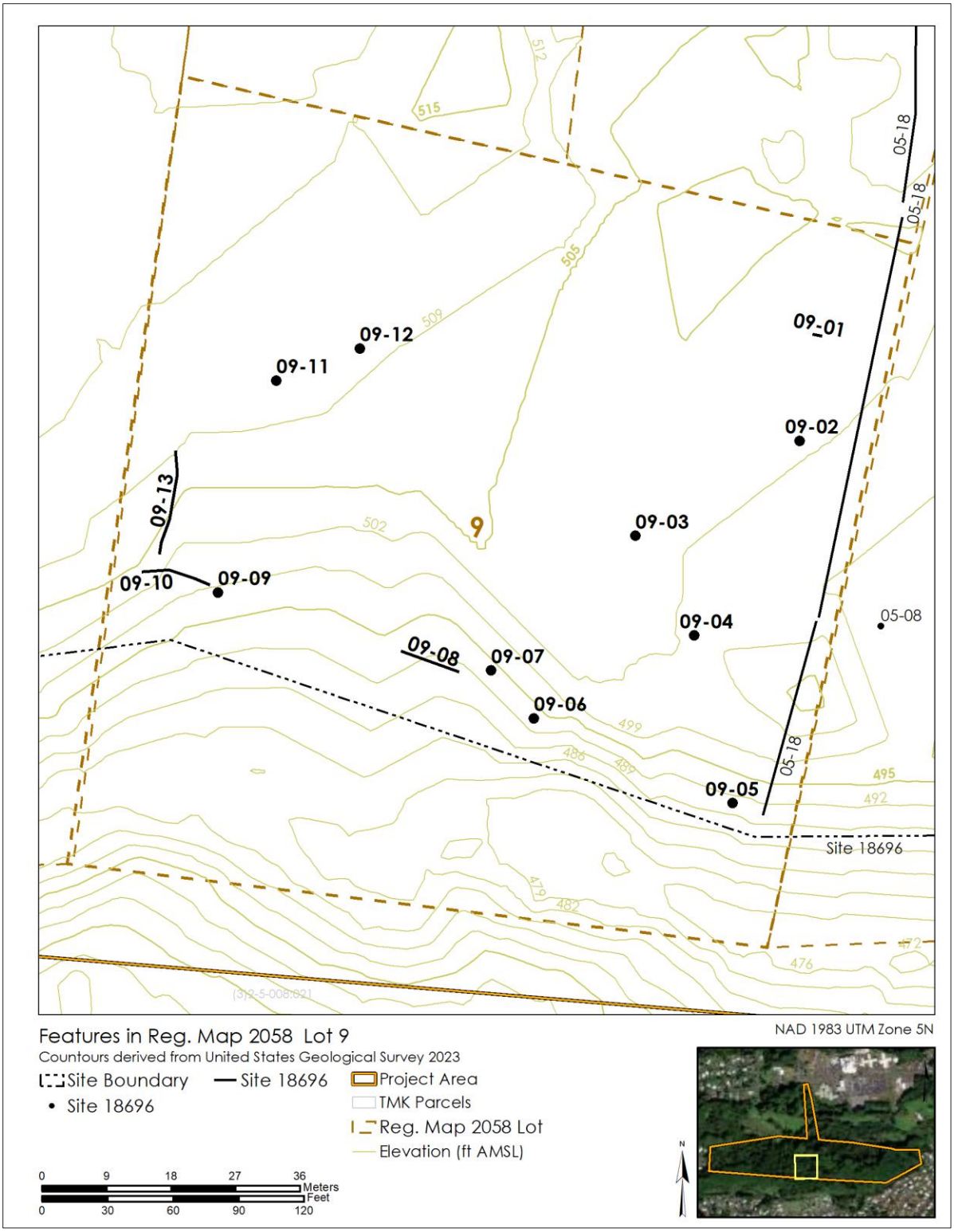

Figure 51. Features identified in Lot 9 as depicted on Registered Map 2058 (Baldwin 1901a)

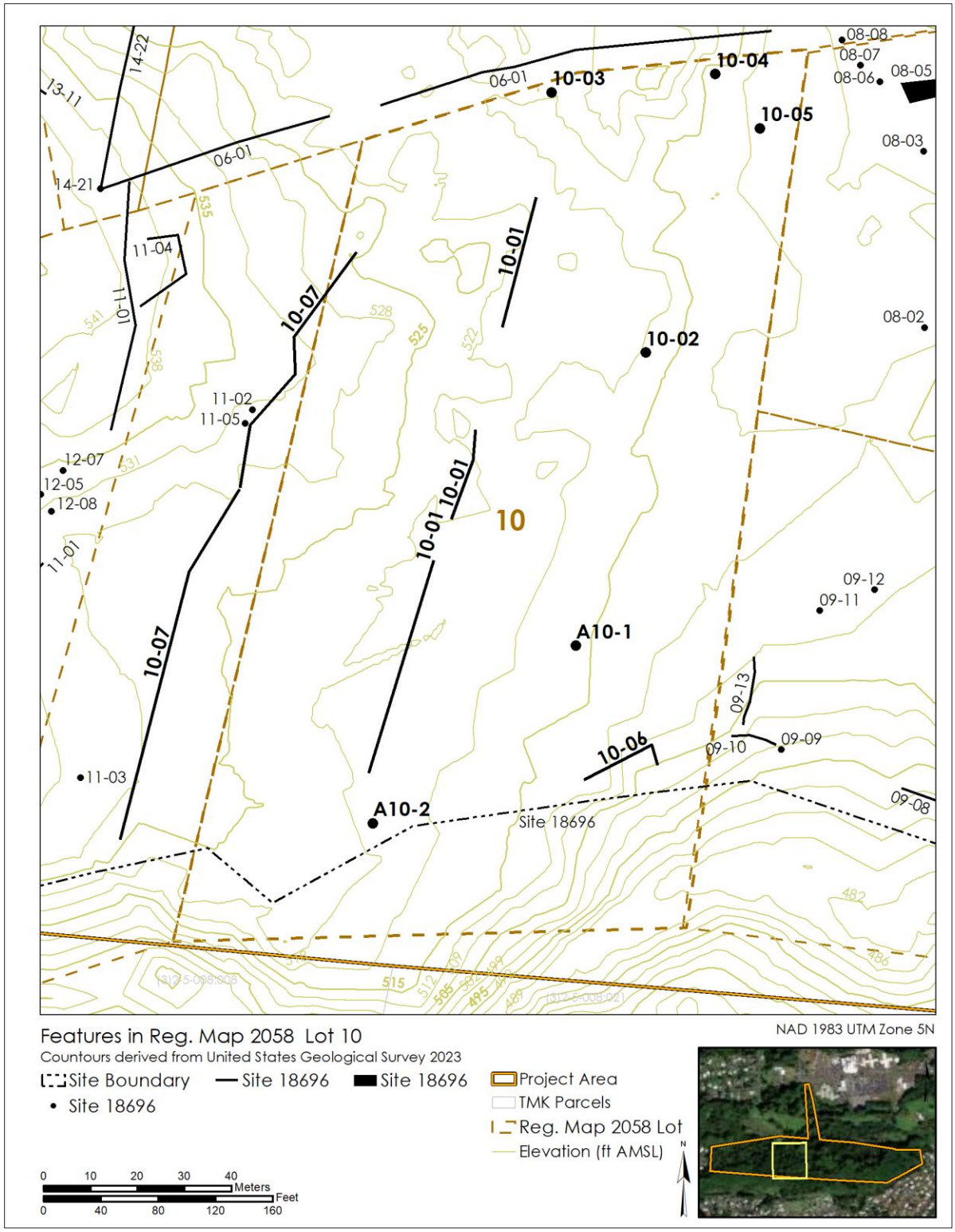

Figure 52. Features identified in Lot 10 as depicted on Registered Map 2058 (Baldwin 1901a)

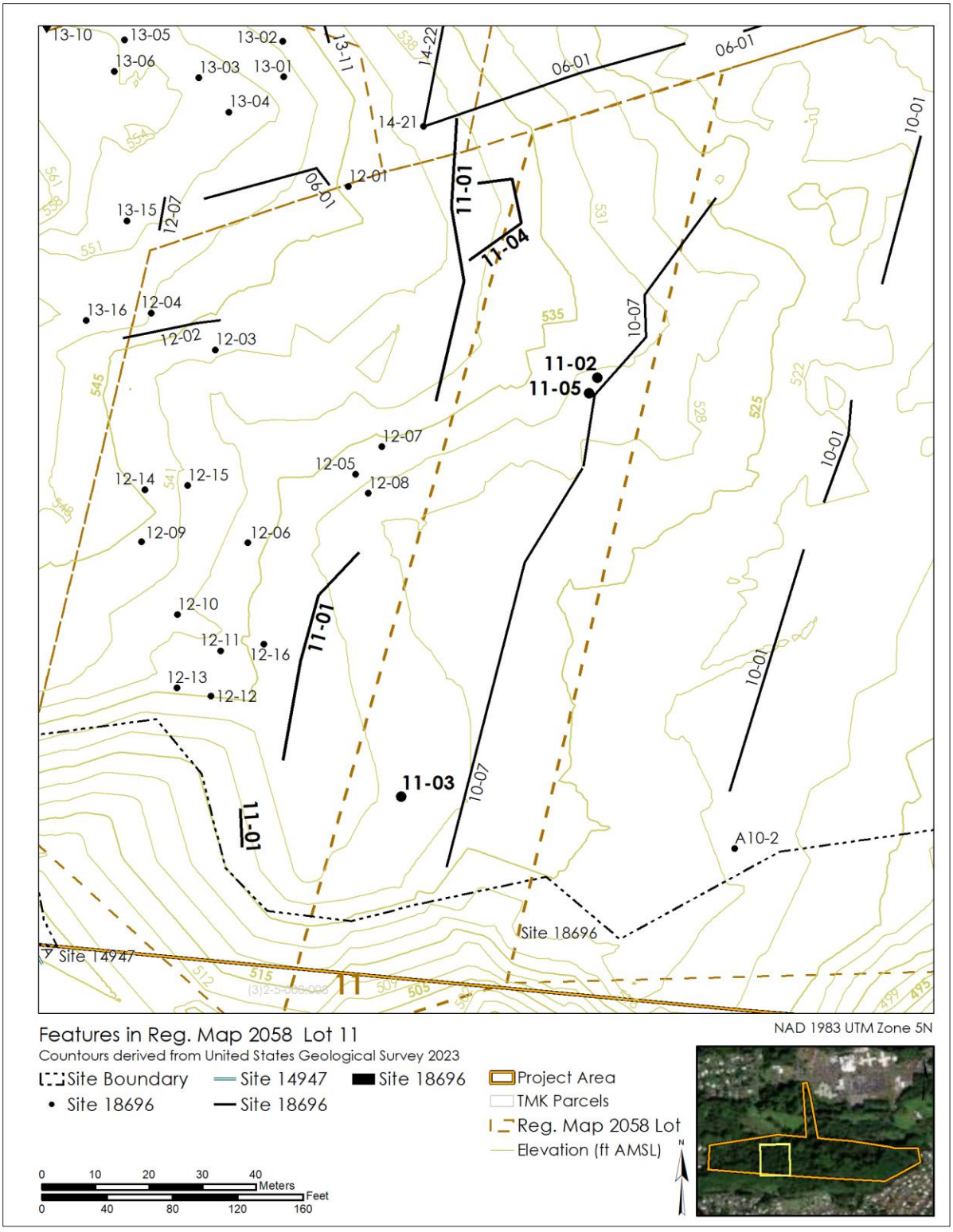

Figure 53. Features identified in Lot 11 as depicted on Registered Map 2058 (Baldwin 1901a)

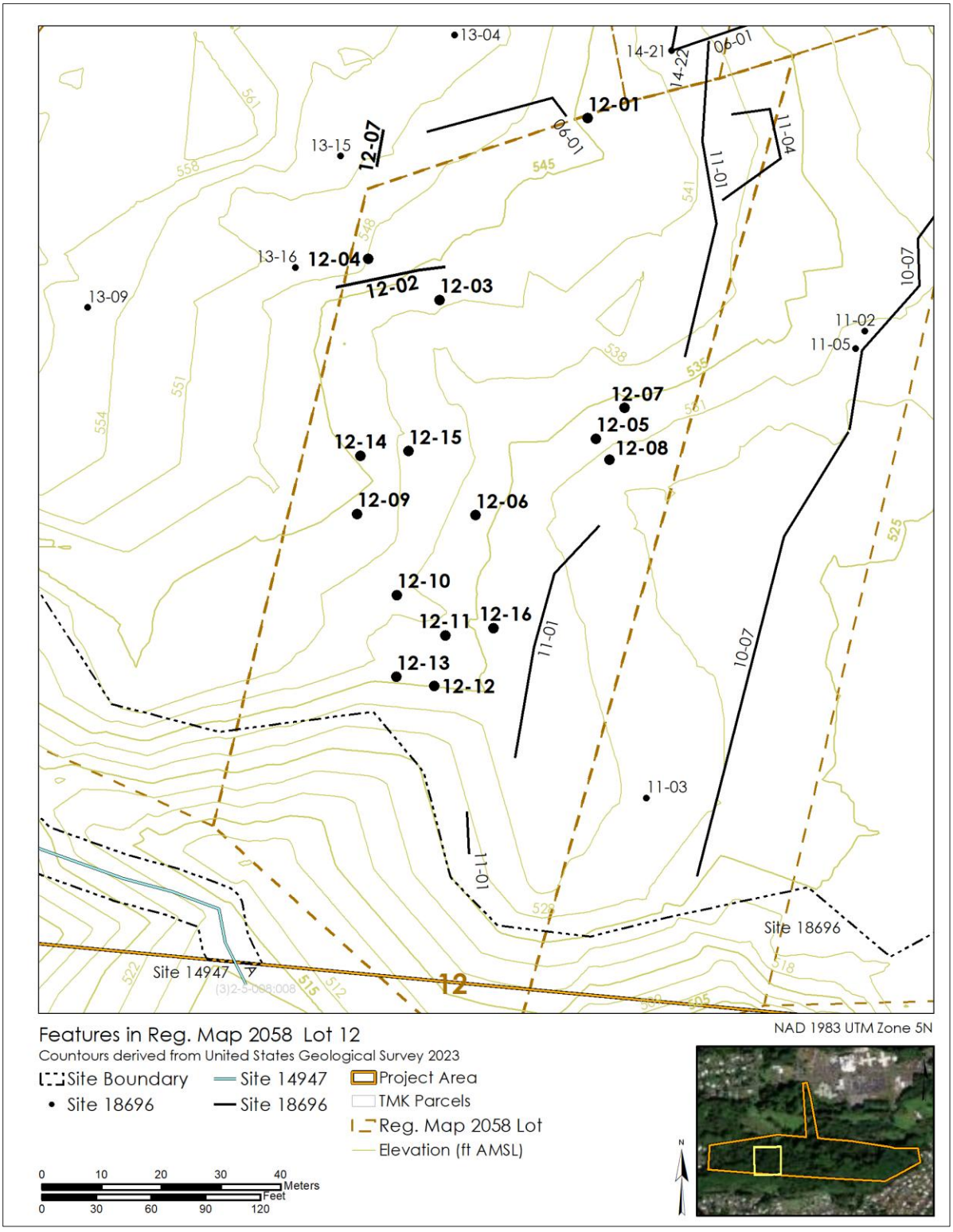

Figure 54. Features identified in Lot 12 as depicted on Registered Map 2058 (Baldwin 1901a)

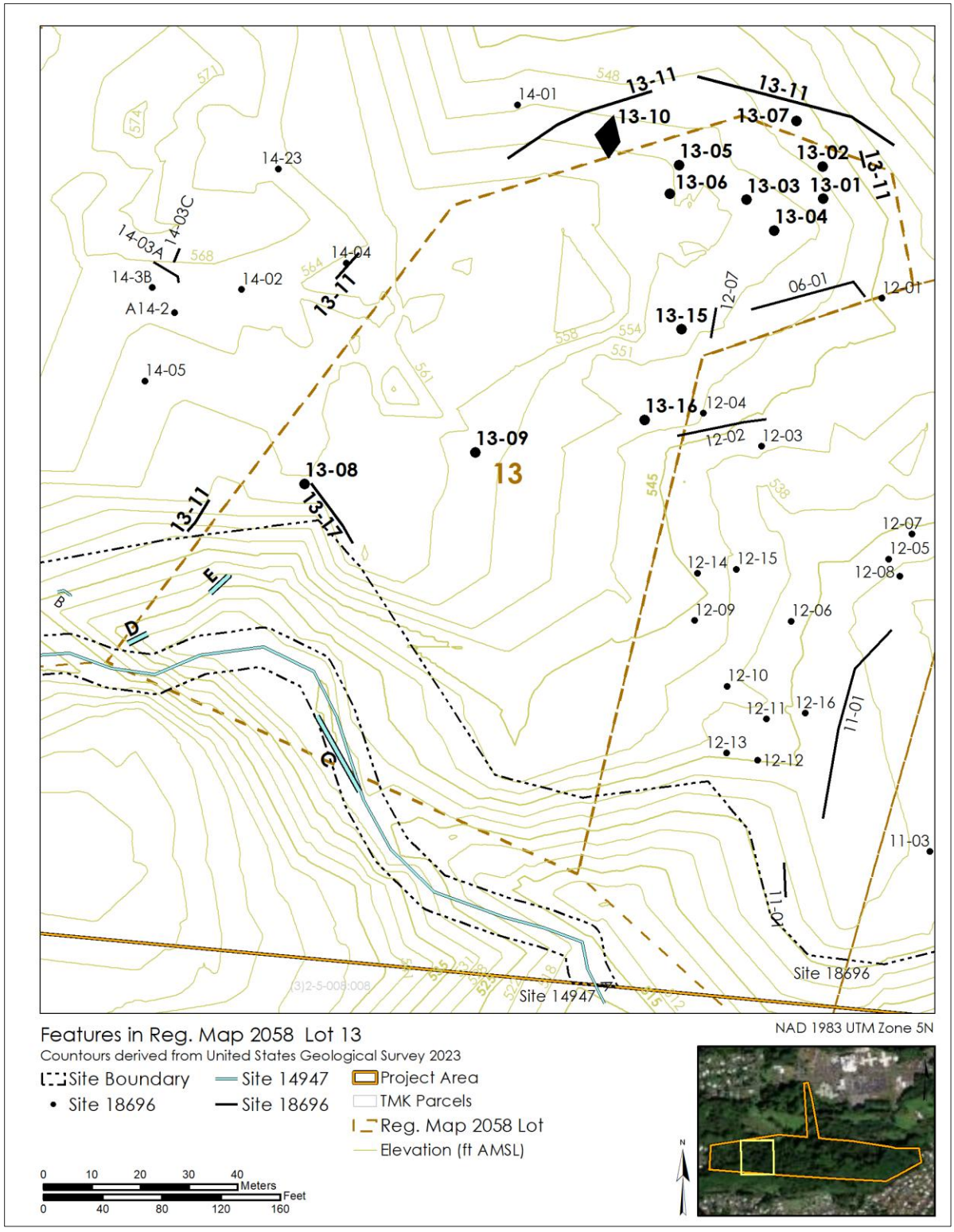

Figure 55. Features identified in Lot 13 as depicted on Registered Map 2058 (Baldwin 1901a)

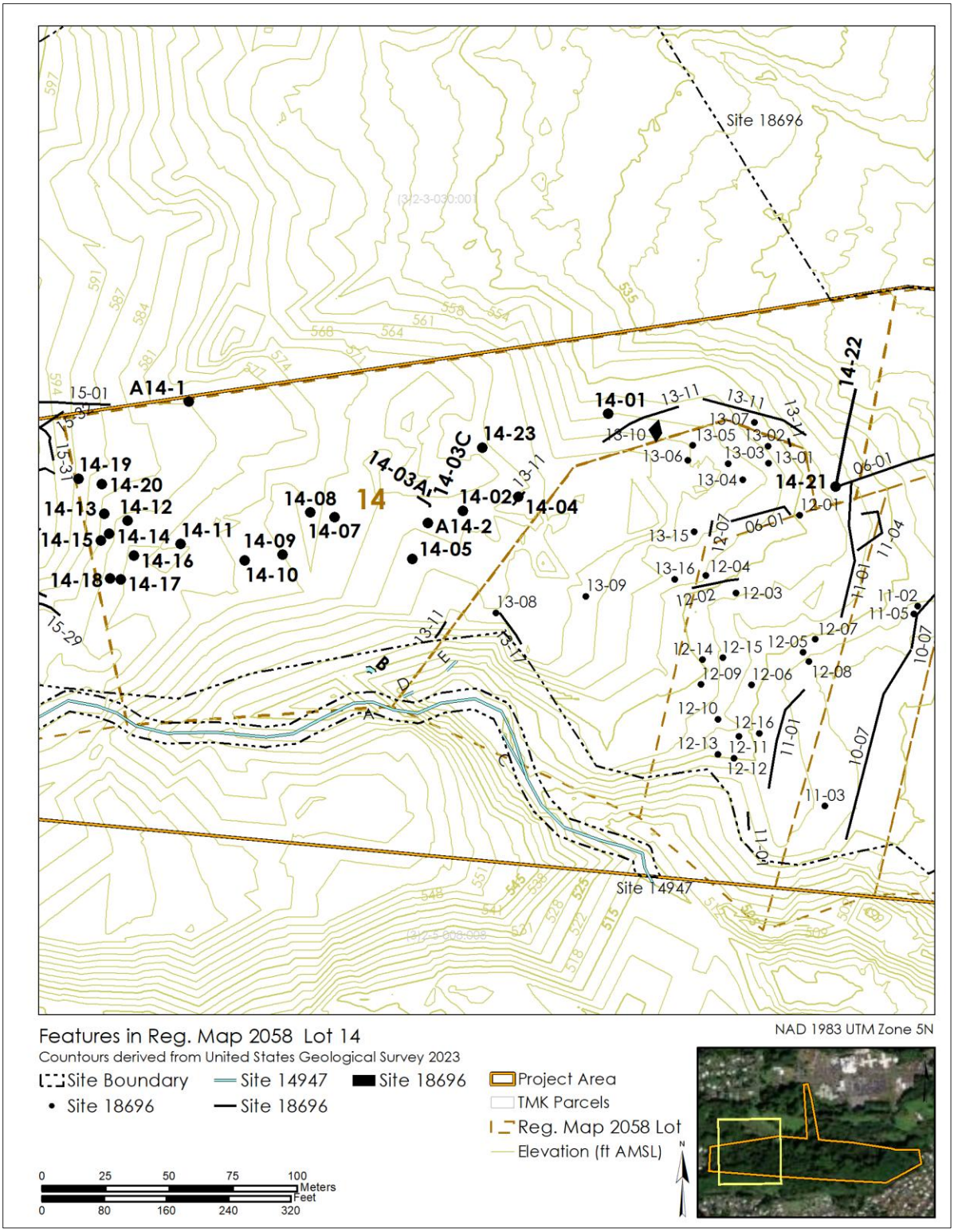

Figure 56. Features identified in Lot 14 as depicted on Registered Map 2058 (Baldwin 1901a)

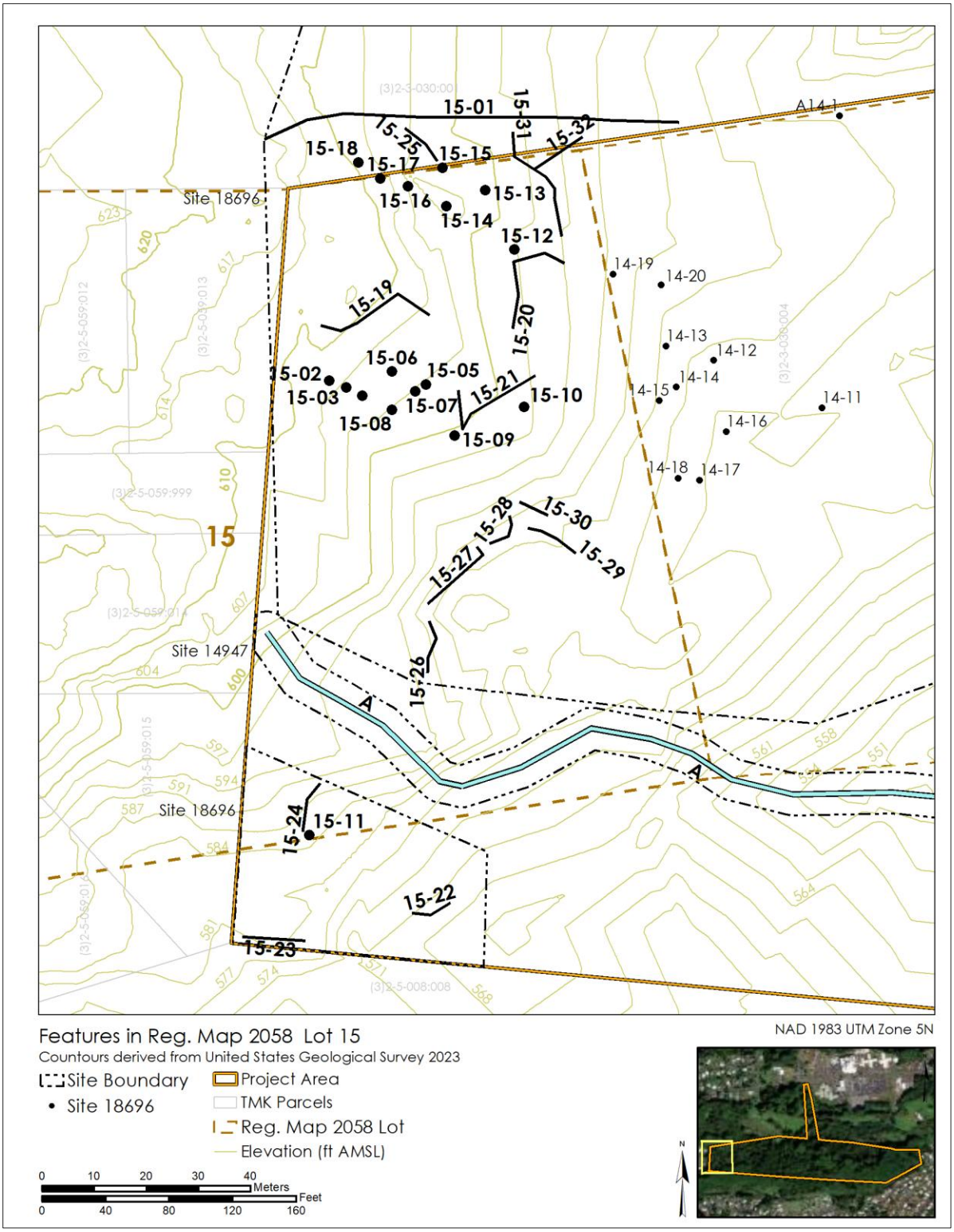

Figure 57. Features identified in Lot 15 as depicted on Registered Map 2058 (Baldwin 1901a)

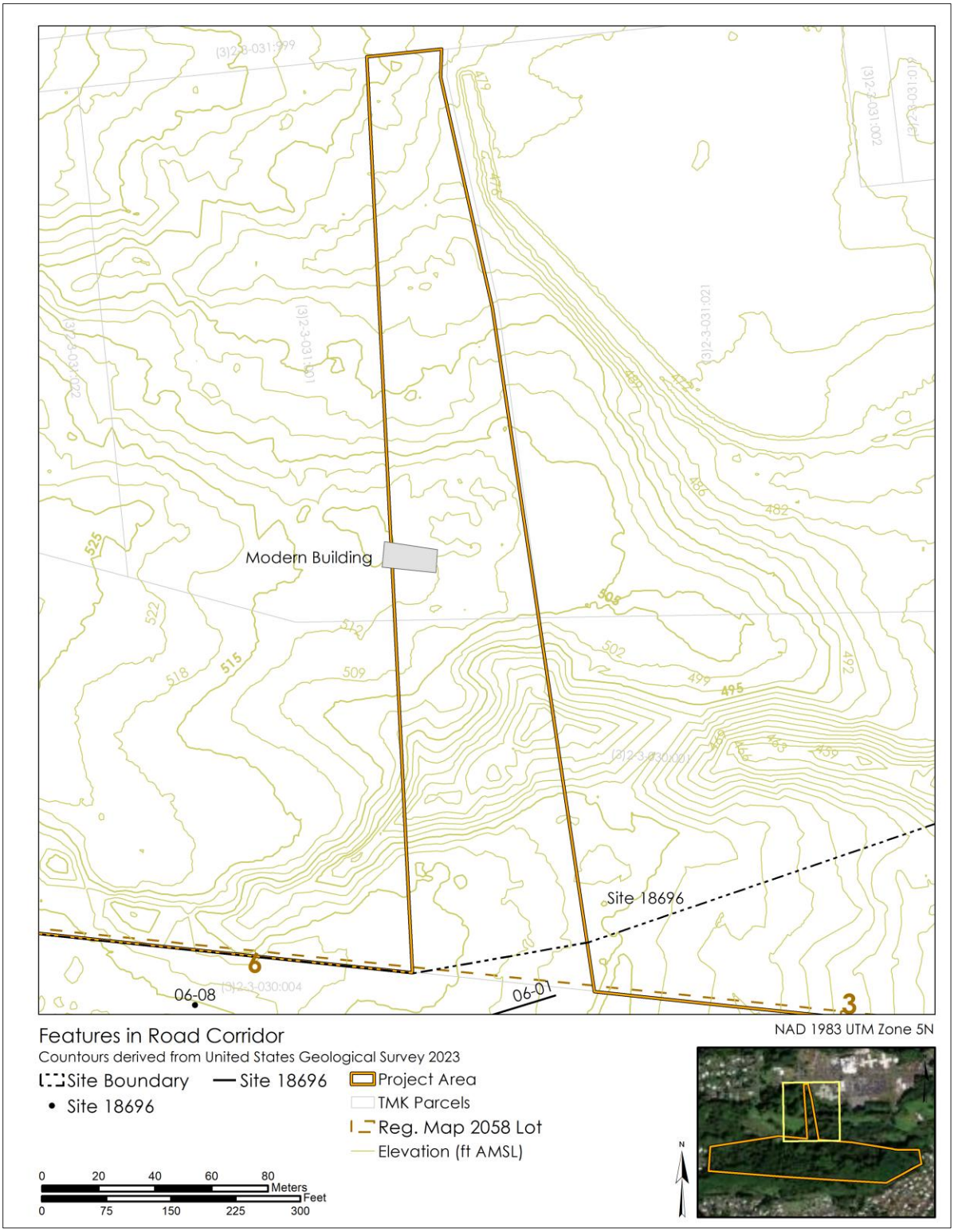

Figure 58. Identified features in the Road Corridor

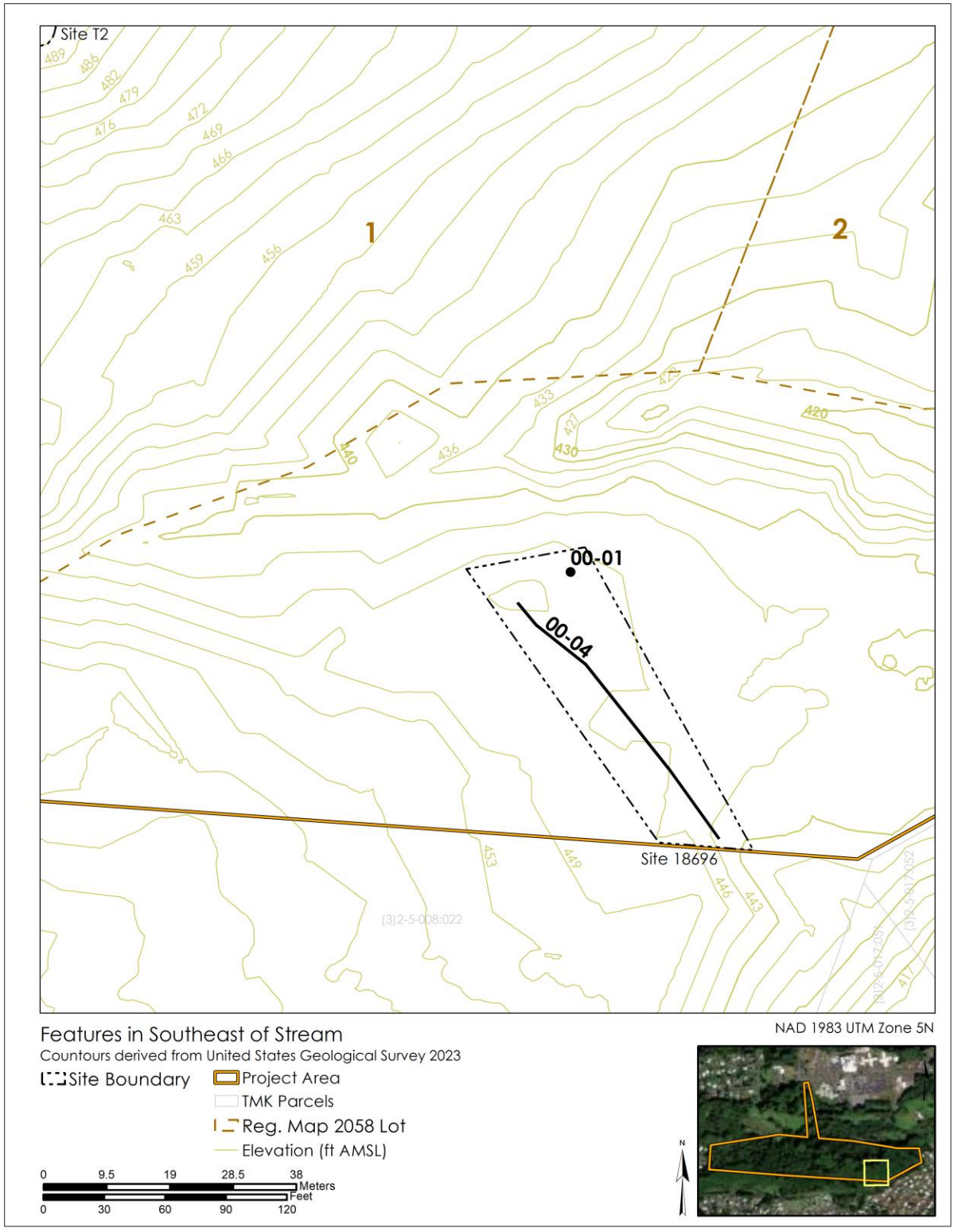

Figure 59. Features identified southeast of the ʻAinakō Stream tributary

6.1.2.1 Complexes

Five feature complexes were recorded in the Project Area. These complexes are composed of multiple features that appear to be associated spatially, functionally, and temporally. These complexes are listed in Table 5 and described below. Four of the complexes were designated by a single Feature Number. In the case of Features 14-02, -03, -04, and -05, post-fieldwork analysis indicated that they are more appropriately considered a single feature complex rather than separate features.

Table 8 Features grouped into complexes within SIHP 50-10-35-18696 in the Project Area

Feature	Complex Type	Number of Subfeatures	Age	Location Map
01-04	Agricultural	4	P/H	Figure 43
01-09	Agricultural	9	P/H	Figure 43
03-08 and 03-09	Habitation	2	H	Figure 45
08-05	Habitation/Agriculture	3	H	Figure 50
14-02, -03, -04, and -05	Habitation	5	H	Figure 56

6.1.2.1.1 Feature 01-04

Feature 01-04 is a complex consisting of four agricultural features in close proximity, oriented roughly north-south, located near the northwestern corner of Lot 1 depicted on Registered Map 2058, immediately south of Feature 03-18. It measures 14 m north-south by 4 m east to west. Feature 01-04A (Figure 60) is a terrace measuring 3.1m by 4m and standing 15cm above the surrounding ground surface. It is constructed with small to large subangular cobbles. Glass bottles and ceramic fragments were observed on the north side of the terrace. Feature 01-04B (Figure 61) is a terrace measuring 2.6 m by 2.9 m and standing 30 cm above the surrounding ground surface. It is constructed with a low retaining wall of small to large subangular cobbles stacked 2 courses high. Feature 01-04C (Figure 62) is a mound measuring 2.7 m by 0.7 m and standing 60 cm above the surrounding ground surface. It is constructed with a low retaining wall built with piled small to large subangular cobbles. Feature 01-04D (Figure 63) is a mound that measures 1.7 m by 1.7 m and stands 50 cm above the surrounding ground surface. It is constructed with piled small to large subangular cobbles. Based on the presence of historic artifacts and construction techniques, it is interpreted to be historic in age and associated with agricultural use of the Project Area. All four features are in generally poor condition, exhibiting collapse. There may be some potential for buried deposits within the two terraces, Features A and B. The mounds, Features C and D, resemble clearing mounds.

Figure 60. SIHP 50 10-35-18696 Features 01-04A, view to the west

Figure 61. SIHP 50 10-35-18696 Feature 01-04B, view to the west

Figure 62. SIHP 50 10-35-18696 Feature 01-04C, view to the west

Figure 63. SIHP 50 10-35-18696 Feature 01-04D, view to the west

6.1.2.1.2 Feature 01-09

Feature 01-09 is a complex consisting of 9 subfeatures (A-I, see Table 6) located near the northern edge of Lot 1 (see Figure 43). The complex includes four mounds, a short wall segment, and a modified spring that is flanked by two terraces (Figure 64). The features are arranged in a roughly linear configuration, oriented east-west. The surrounding terrain slopes upward to the north away from a natural drainage near the northern toe of Kupapau Hill. Autograph tree, guava, and palms grow within the feature, and all features are impacted by root growth. It is interpreted to be a collection of agricultural features associated with a modified spring (Feature 01-09E). Although there are no datable artifacts or deposits directly associated with this complex, the presence of the modified spring suggests that it could have been used during the Precontact period and was almost certainly used during the Historic period.

The focal point of the complex appears to be the modified spring (Feature E; Figure 65). It is a roughly circular excavation into the sloping ground, apparently over a natura spring. At various times during the survey, water was observed collecting inside the well, but on dry days it was not. The interior walls of the excavation are lined with rough-stacked small to large cobbles. Sediment has collected in the bottom of the well. The well is accessible from two level soil covered terraces (Features F and I) on its downhill and uphill sides (see Figure 65). The remaining features are dry-stacked surface rock features. Feature A (Figure 66), Feature C (Figure 67), and Feature D (Figure 68) are mounds built of neatly stacked and faced small to large subangular cobbles, all located on exposed pāhoehoe. These are roughly in an east-west oriented line with the modified spring. On the north side of the modified spring, Feature G (Figure 69) and Feature H (Figure 70) are linear rock mounds flanking the level terrace (Feature F). They are also roughly oriented east-west. Feature G is in better condition than Feature H and exhibits some stacking along its edges. Feature B (Figure 71) appears to be a remnant wall segment.

Table 9 SIHP 50-10-35-18696 Feature 01-04 Agricultural Complex subfeatures

Subfeature	Type	Function_	Age	L	W	H	Notes
A	Mound	Agriculture	P/H	2.8	1.8	130	Neatly stacked and faced small to large subangular pāhoehoe cobbles, 6 stones tall on exposed bedrock.
B	Wall	Agriculture	P/H	4.1	1.2	75	Stacked small to large subangular pāhoehoe cobbles, two medium boulders at west end. East end is slightly collapsed. Stacked 3 courses tall.
C	Mound	Agriculture	P/H	2.9	2.7	110	Neatly stacked and faced small to large subangular pāhoehoe cobbles, 6 stones tall on exposed bedrock.
D	Mound	Agriculture	P/H	3.2	3.1	135	Neatly stacked and faced small to large subangular pāhoehoe cobbles, 6 stones tall on exposed bedrock.
E	Modified spring	Water infrastructure	P/H	3.0	2.7	100	Western (uphill) edge of depression is reinforced with stacked small to large subangular pāhoehoe cobbles and a few small boulders.
F	Terrace	Agriculture	P/H	6.2	2.5	30	Northeast end is defined by a single course of stones exposed above the ground surface.
G	Mound	Agriculture	P/H	9.5	2.6	75	Linear mound constructed with piled small to large subangular pāhoehoe cobbles. Some collapsed areas.
H	Mound	Agriculture	P/H	6.1	3.5	61	Linear mound constructed with piled small to large subangular pāhoehoe cobbles. Some collapsed areas.
I	Terrace	Agriculture	P/H	4.7	4.0	25	End is lined with small to large subangular pāhoehoe cobbles and a few small boulders. This retaining wall has collapsed due to tree fall.

Legend: L = Length (m), W = Width (m), H = Height above ground surface (cm)

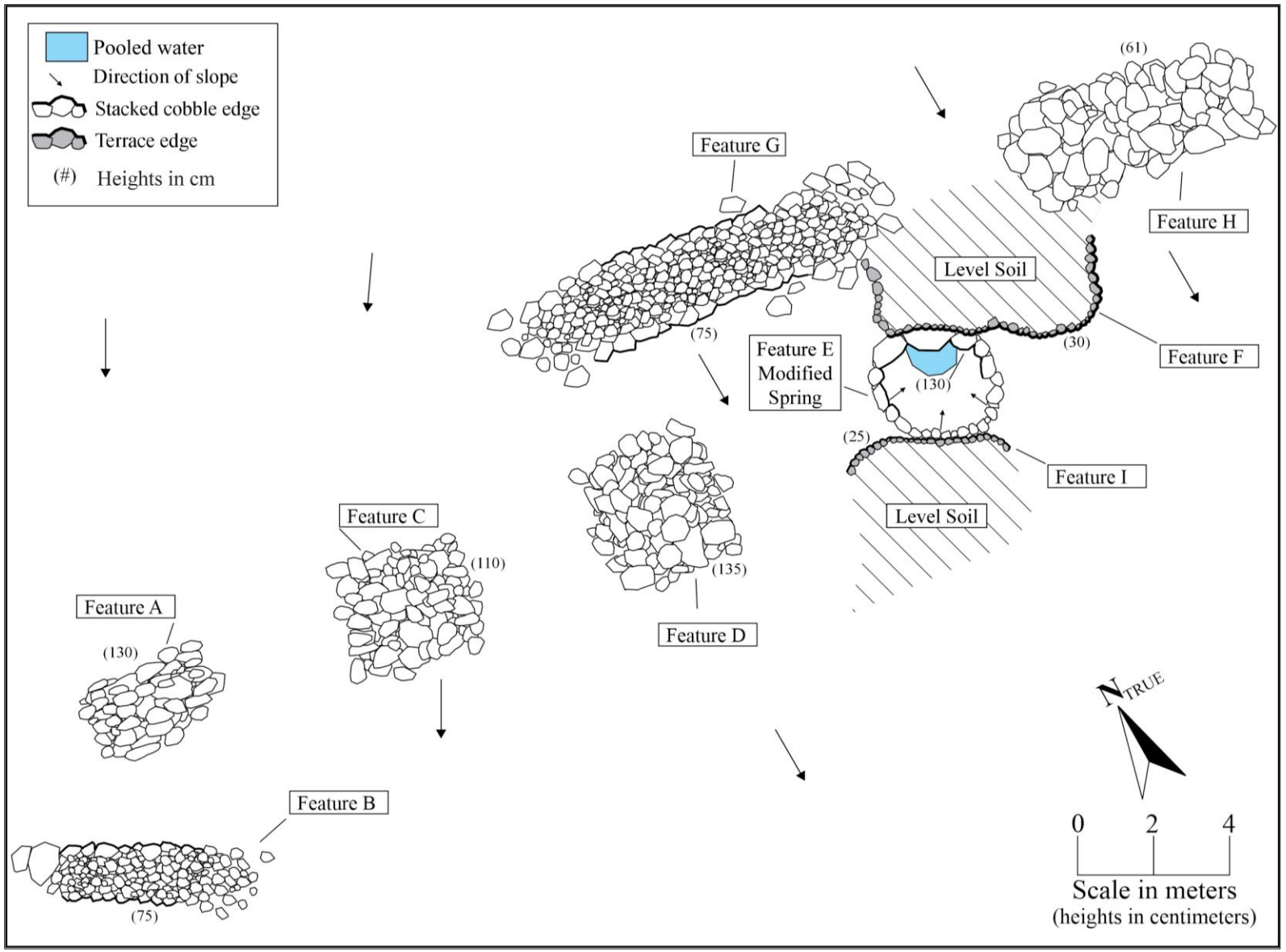

Figure 64. SIHP 50 10-35-18696 Feature 01-09 plan view

Figure 65. SIHP 50 10-35-18696 Features 01-09E, F, and I, view to the west

Figure 66. SIHP 50 10-35-18696 Features 01-09A, mound, view to the north

Figure 67. SIHP 50 10-35-18696 Features 01-09C, mound, view to the north

Figure 68. SIHP 50 10-35-18696 Features 01-09D, mound, view to the north.

Figure 69. SIHP 50 10-35-18696 Features 01-09G, mound, view to the northeast.

Figure 70. SIHP 50 10-35-18696 Features 01-09H, mound, view to the north.

Figure 71. SIHP 50 10-35-18696 Features 01-09B remnant wall, view to the southwest.

6.1.2.1.3 Features 03-08 and 03-09

Features 03-08 and 03-09 comprise a complex (Figure 72) located on gently sloping ground approximately 45 m west-northwest of the base of Kupapau Hill. Feature 03-09 appears to be the main feature of the complex and consists of multiple connected platforms, terraces, and a wall. Feature 03-08 is a mound and based on its form and proximity to Feature 03-09 appears to be the foundation of an ancillary structure. The two features together are interpreted to be the remains of a Historic Period habitation. The extent is approximately 50 m north-south by 15 m east-west. It is situated in undulating, swampy flats on slightly raised ground between tributaries of Ainako Stream. Vegetation in the immediate vicinity includes autograph trees, palms, guava, and ferns. Because it is the main feature in the complex, Feature 03-09 is described below, followed by Feature 03-08.

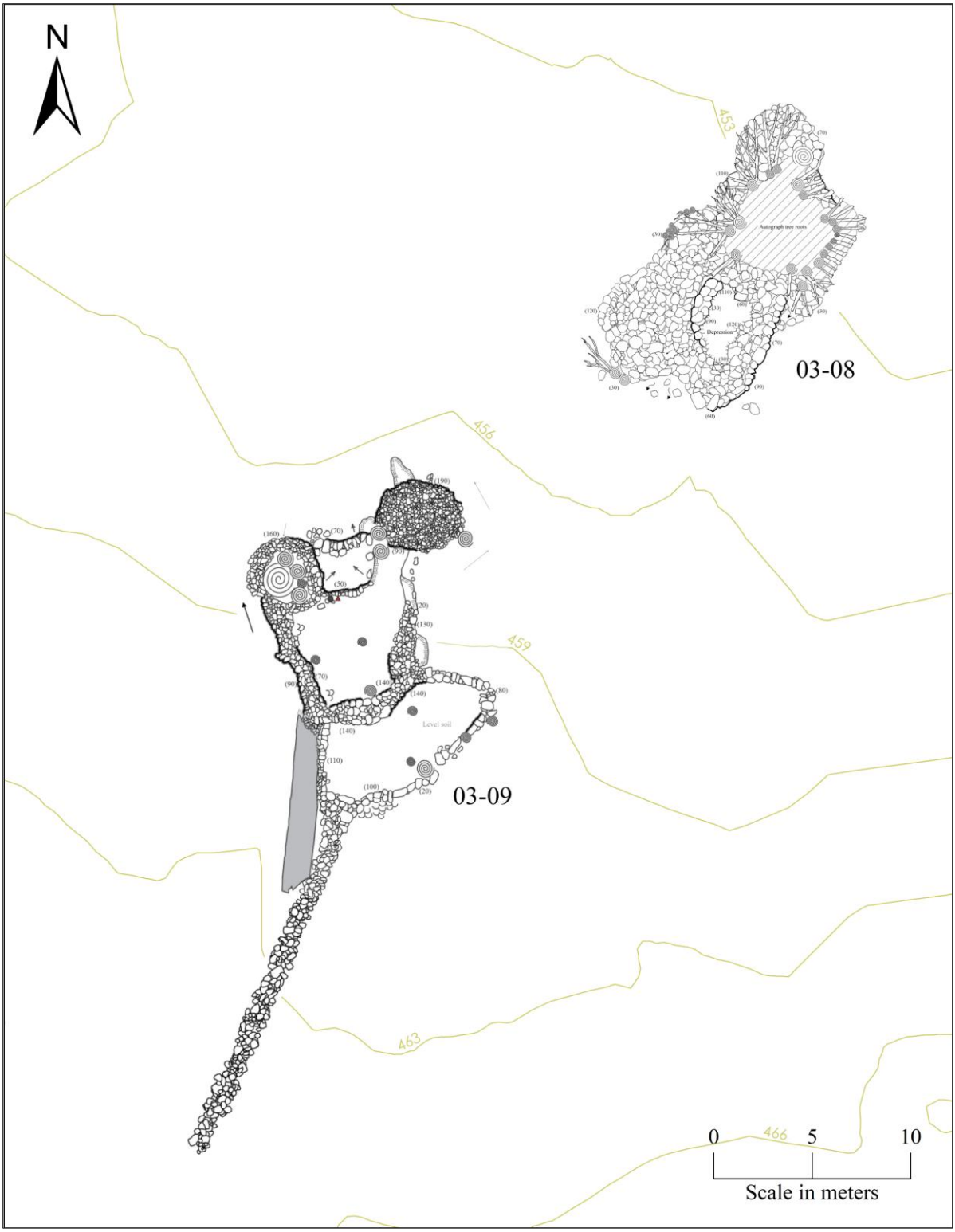

Figure 72. SIHP 50 10-35-18696 Feature 03-09, habitation complex

Feature 03-09 (Figure 73) consists of five component subfeatures (Figure 74): two platforms (Subfeatures A and D) on its northern end that flank two connected terraces (Features B and C), a rock wall (Subfeature E) that encloses Subfeature C, and a low wall (Subfeature F) that extends from the southern end of Subfeature E. Only one artifact, a historic glass bottle, was observed. Based on its form, Feature 03-09 is interpreted to be the foundation of a habitation likely associated with agricultural use of the Lot 3 depicted on Registered Map 2058 (Baldwin 1901a).

Figure 73. SIHP 50 10-35-18696 Feature 03-09, habitation complex, view to the southwest with Subfeature A at left

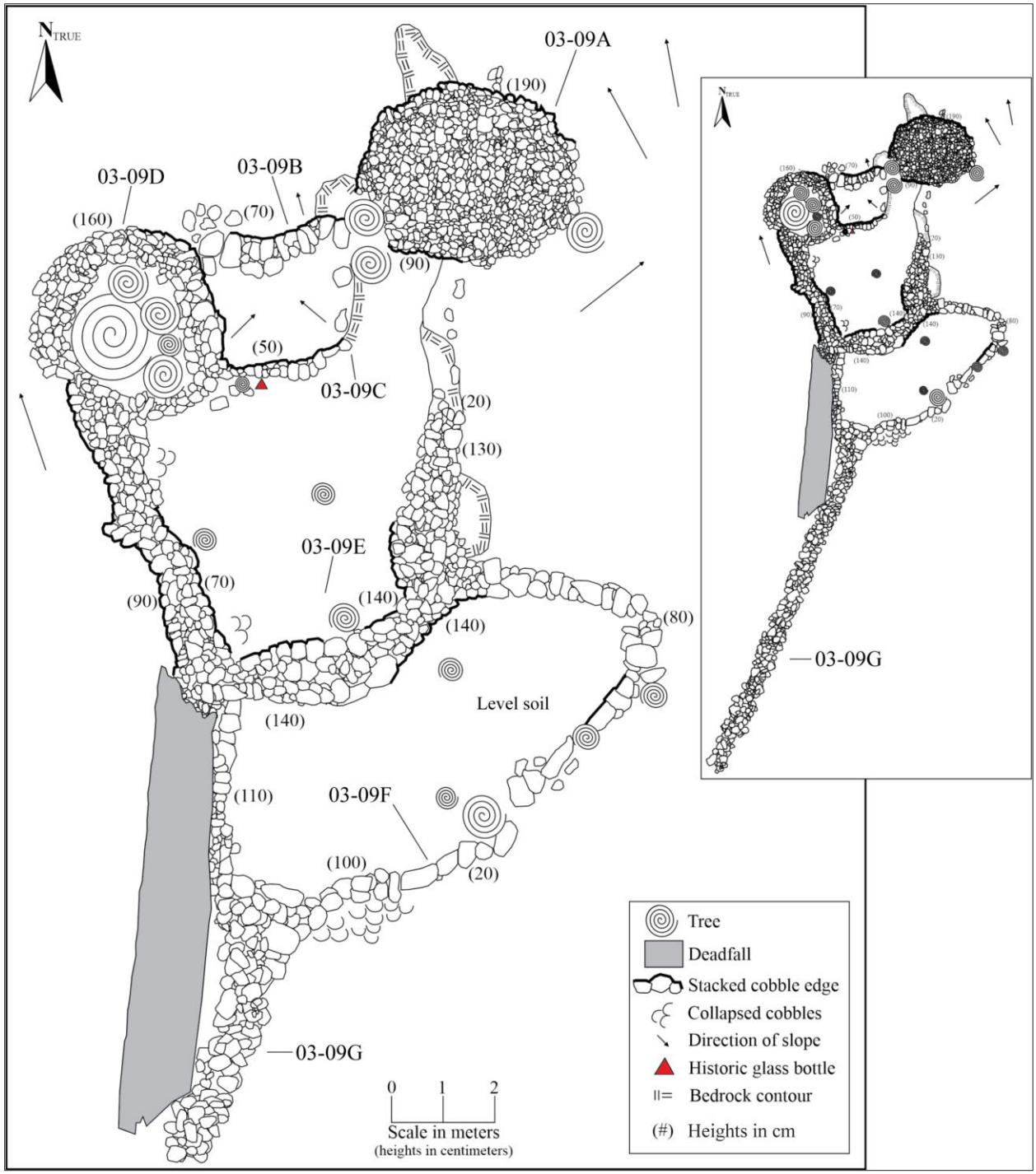

Figure 74. SIHP 50 10-35-18696 Feature 03-09, habitation complex plan view

Subfeature A is a platform located on the northeast side of the complex. It is a semi-circular raised platform constructed of stacked subangular cobbles and small boulders standing 4-8 courses tall. It measures 5.5 meters by 4.7 meters and stands 190 centimeters tall. All sides of the platform are faced, and the top is slightly mounded. The northeast side of the platform has slightly collapsed. Based on its structure, Subfeature A is interpreted to be the foundation for a water catchment tank that would have been used at the residence.

Subfeature B is a low terrace located between Features A and D. It is defined by a low retaining wall of stacked subangular cobbles extending 2.7 meters from Feature A and connecting to Feature D. The wall is faced and stands 70 centimeters tall. Behind the retaining wall the terrace measures roughly 2.7 meters by 3.5 meters and is roughly rectangular in plan. The surface of the terrace is covered with soil. The southern end of the terrace is defined by the retaining wall that creates the northern end of Feature C.

Subfeature C is a retaining wall located at the southern end of Subfeature B, creating a step-up to Subfeature E, the large central enclosed terrace. It is defined on its northern end by a retaining wall constructed of stacked subangular cobbles and small boulders. The wall extends between Subfeatures A and D for a distance of 2.7 meters, incorporating exposed *pahoehoe* adjacent to Subfeature A. It stands 2-3 courses high, 50 centimeters tall.

Subfeature D is a nearly circular platform constructed of stacked subangular cobbles and small boulders located at the northwest end of Feature 03-09. It measures 3.65 meters by 3.6 and stands 160 centimeters tall on the northern side and 20 centimeters tall on the southern side. The top of the platform slopes toward the northwest. Subfeature C extends off its northeast side, and one enclosure wall of Subfeature E extends from its southwestern side. An autograph tree is growing out of the platform.

Subfeature E is a relatively large terrace centrally located within Feature 03-09. The terrace extends toward the south from the Subfeature C retaining wall. It measures 8 m north-south by 6 m east-west. The surface of the terrace is composed of soil. The terrace is enclosed by a rock wall that measures between 1.2 and 1.7 meters wide and 70 to 140 centimeters tall. The wall is constructed of stacked and faced subangular cobbles and small boulders. It extends along the southwestern side of the terrace from Subfeature D for 8 m and then curves sharply to the northeast and wraps around to connect to Subfeature A. The wall construction is fairly uniform for most of its length, with the exception of a segment measuring approximately 3.9 meters that incorporates exposed *pāhoehoe* near Subfeature A. A historic glass bottle was observed resting on the surface of this terrace next to Subfeature C.

Subfeature F is an enclosed area created by a rock wall 0.4 meters wide by 20 to 100 centimeters tall, 2 to 4 courses high. The wall's condition varies along its length; some portions are faced but others appear mounded and have likely collapsed. The enclosed space measures 5.5 m north-south by 11.5 m east-west, and the surface of its interior includes accumulated soil. Trees are growing in the enclosed area.

Subfeature G is a rock wall (Figure 75) extending toward the southeast from Subfeature E. The wall is constructed of stacked subangular cobbles and small boulders. It measures 1.4 meters wide by 27 meters long and stands between 20 and 100 centimeters tall. It is in fair to poor condition, partially collapsed along most of its length and disturbed by autograph trees and guava. The space on either side of the wall does not appear to have been modified other than by clearing rock.

Figure 75. SIHP 50 10-35-18696 Feature 03-09 Subfeature G, rock wall, view to the northwest

Feature 03-08 (Figure 76) is a mound located 12 meters northeast of Feature 03-09. It is a large rectangular mound with a large depression in the center. It is oriented northeast-southwest and measures 7.6 m long by 4.4 m wide and stands 280 cm tall (Figure 77). Its east wall is face and stacked, but its south and west faces are mounded and partially collapsed. The stacked walls are built with 4-10 courses of subangular cobbles and small boulders. On the top surface there is a roughly square-shaped depression in the cobble surface. The depression measures 1.8m by 1.4 and extends 40-100 cm below the top surface of the mound. An autograph tree is growing out of the north end of the feature and its roots have caused substantial damage to that end. No cultural material was observed at the feature. Based on its proximity to the habitation Feature 03-09, Feature 03-08 is interpreted to be an ancillary structure to the habitation, possibly the foundation for a water catchment tank.

Feature 03-09 is interpreted to have been a foundation for a habitation, likely used in a permanent fashion. It is possible that Feature 03-08, located 13 meters to the northeast, is associated with this habitation, and could have been a foundation for a cistern or water tank. It is in relatively good condition, and soil accumulations in and around the feature may have potential for buried archaeological deposits. No cultural material diagnostic of age was observed. Its size and form suggest that it is historic in age. The complex containing Feature 03-09 and Feature 03-08 is interpreted to be a Historic period habitation. The reason this is interpreted to be a Historic period feature is that with the possible exception of Feature

03-08 (which may be a cistern or outbuilding), there do not appear to be any other features resembling habitation or activity areas typical of multi-feature kauhale associated with traditional residences built to be compatible with traditional gender restrictions (see discussions in Handy and Pukui 1998; Ladefoged 1991; Malo 1951), and the presence of a historic glass bottle . This does not by itself rule out possible Precontact use; however, there are a few early maps that do not include it but do show other features nearby. These include Registered Map 1744 (Lyman 1853), Registered Map 1790 (Loebenstein 1895) prepared in 1895, and Registered Map 2058 (Baldwin 1901a) prepared in 1901.

Figure 76. SIHP 50 10-35-18696 Feature 03-08, mound, view to the northwest

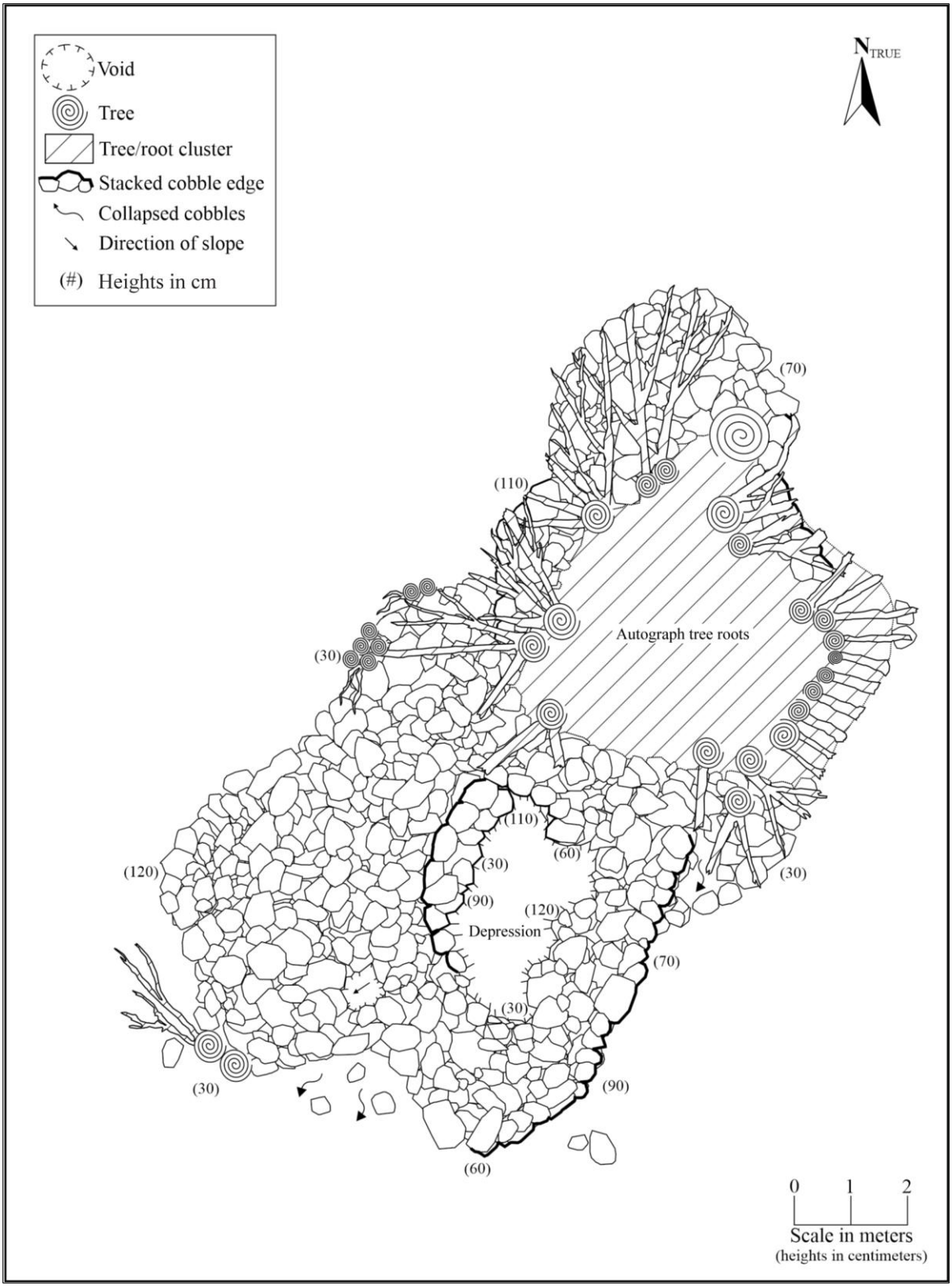

Figure 77. SIHP 50 10-35-18696 Feature 03-08, mound, planview

6.1.2.1.4 Feature 08-05

Feature 08-05 is a complex composed of two terraces built against a pāhoehoe outcrop and an L-shaped wall that appears to be a remnant of a structure (Figure 78; Table 7). It is located in the northern portion of Lot 8 (see Figure 50) and is in poor condition. It is interpreted to be a Historic period habitation.

Subfeature A is a terrace (Figure 79) that extends the east side of a natural pāhoehoe outcrop. It is constructed of subangular cobbles and small boulders, which are stacked and faced on the outer edge of the terrace. The stacked edge is approximately 8 m long. The terrace wall stands 120 to 130 cm above the ground surface. Behind the stacked and faced wall, the terrace is filled with this same material, creating a roughly level surface that connects to the natural outcrop behind it. On its southeast side, the construction ends abruptly and appears to have been deliberate, possibly creating an entry route onto the leveled area on the outcrop from below. No cultural material was observed on this terrace.

Subfeature B is a terrace (Figure 80) that extends the northwest side of the pāhoehoe outcrop. It is constructed with stacked and faced subangular cobbles and small boulders and stands 95 cm above the ground surface. The constructed edge is approximately 4 m in total length. Behind the stacked and faced wall, the terrace is filled with this same material, creating a roughly level surface that connects to the natural outcrop behind it. The north side of terrace wall is in good condition, but the west side is collapsing. No cultural material was observed on this terrace.

Subfeature C is an L-shaped wall (Figure 81) located on the pāhoehoe outcrop about 10 m southwest of Subfeature A. It is constructed of subangular cobbles and small boulders and appears to be core-filled. It is oriented with what is assumed to be the interior space facing north, which could make this the southeast corner of the structure. The wall remnant that is oriented north-south measures 2.5 m long and the east-west oriented remnant measures 2.0 m long. Both are roughly 0.8 m wide and stand 80 cm above the ground surface. The interior space is cleared, and 2 historic bottles were observed.

The surface of the pāhoehoe outcrop is roughly level and covered in soil. It is heavily disturbed by guava trees. Subfeature C appears to be the remnant of a structure, potentially a habitation site based on the presence of glass bottles. The terraces formed by Subfeatures A and B appear to have been constructed to expand the living surface of the outcrop to accommodate its use. The presence of the historic bottles and artifacts of a similar age suggests that this feature was occupied during the early twentieth century but could have been used earlier. Although soil accumulation may be shallow, there could be potential for additional archaeological deposits associated with the structure and its use. Feature 08-05 is interpreted to have been used for habitation during the twentieth century.

Table 10 SIHP 50-10-35-18696 Feature 08-05 Habitation Complex subfeatures

Subfeature	Type	Function_	Age
A	Terrace	Living surface	H
B	Modified outcrop	Terracing	H
C	L-shaped wall	Corner of structure or enclosure	H

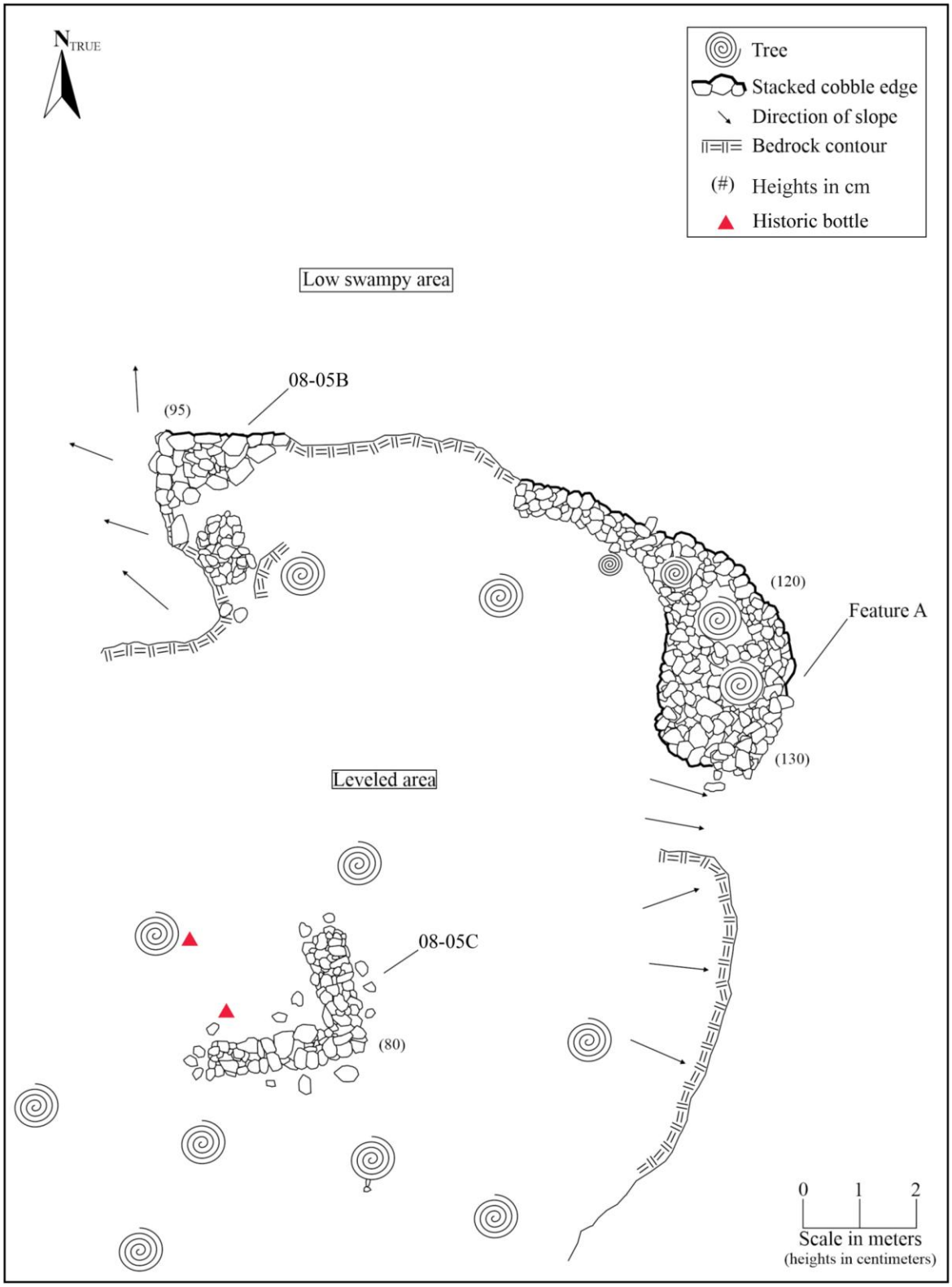

Figure 78. SIHP 50 10-35-18696 Feature 08-05, Habitation Complex, plan view

Figure 79. SIHP 50 10-35-18696 Feature 08-05A, terrace, view to the southwest

Figure 80. SIHP 50 10-35-18696 Feature 08-05B, terrace, view to the north

Figure 81. SIHP 50 10-35-18696 Feature 08-05C, L-shaped wall, view to the south

6.1.2.1.5 Features 14-02, 14-03, 14-04, and 14-05

Features 14-02, 14-03, and 14-04 comprise a complex (Figure 82) located in the northern portion of Lot 14 (see Figure 56). The complex is situated on flat, soil-covered ground. It consists of two low platforms (Features 14-02 and 14-04), a terrace complex (Feature 14-03), and an artifact accumulation (Feature 15-05). The overall dimensions of the complex are 28 m north-south by 8 m east-west. Cultural material observed is limited to historic period artifacts dating to the early twentieth century or later. It is interpreted to be the remnants of a Historic period habitation associated with Lot 14 depicted on Registered Map 2058. It is in good to fair condition.

Feature 14-02

Feature 14-02 (Figure 83) is a platform located between Features 14-03 and 14-04. It is a constructed on exposed pāhoehoe of stacked small-large subangular pāhoehoe cobbles. It measures 4.9 m by 4.1 meters and stands 70 cm tall, or 2-5 courses high. The surface of the platform is level and covered in leaf litter. A possible entryway is located on the east side of the platform, where two short walls measuring 1.5 m long by 0.7 m wide and standing 70cm tall create a 1 m wide corridor. Some collapse is noted throughout, especially along its north edge. Its south edge has more intact stacking. A tree has uprooted the northeast edge.

Feature 14-03 is located to the west of Feature 14-02. Its overall dimensions are approximately 6 m north-south by 9 m east-west. It consists of five subfeatures (A – D, see Table 11) as shown in Figure 84.

It is located in close proximity to Features 14-2, 14-4, and 14-5, which could be functionally associated with the habitation.

Table 11 SIHP 50-10-35-18696 Feature 14-03 Habitation Complex subfeatures

Subfeature	Type	Function_	Age
A	Terrace	Habitation, temporary	H
B	Rock ring	Cooking/fire pit	H
C	Wall	Indeterminate	P/H
D	Retaining wall	Indeterminate	H
E	Retaining wall	Indeterminate	H

Subfeature A (Figure 85) is a terrace defined by retaining walls on two sides. The terrace is oriented with its long edge facing north. The retaining wall on the north side measures 2.4 meters long and stands 36 centimeters above the ground surface. The other retaining wall is located on the east side of the terrace. It measures 1.9 meters long and stands 23 centimeters above the ground surface. Both retaining walls are built of angular small to large cobbles and extend 1 to 2 courses above the ground surface. The space behind the retaining walls is filled with cobbles and built up to be level with the ground level to the southwest. At the west end of the northern retaining wall there is a small circular depression in the cobbles. Feature A is interpreted to have been constructed to extend the level ground surface to the south to accommodate a habitation structure.

Subfeature B (Figure 86) is a rock ring located about 2 m south-southwest of Feature A. It is built with small to large angular cobbles and measures 1.1 m north-south by 1.2 m east-west, standing 24 cm above the ground surface. Its interior space measures 60 cm north-south by 30 cm east-west. This space is defined by an alignment of upright basalt blocks, which are braced on the outside of the ring with cobbles, some of which are laid flat. The ring opens to the north. Inside the ring is one broken aqua glass bottle that is missing its finish, has a round body and cup-mold scars, and has a base mark that reads “[AB ligature]/HI 14”. Based on its size and form, Feature B is interpreted as a hearth or a fire ring.

Subfeature C (Figure 87) is a rock wall abutting the north end of Feature A. The wall is built of small to medium cobbles on intermittently exposed pāhoehoe. It measures up to 1.0 m wide and stands up to 20 cm above the ground surface. It extends roughy toward the north for 3.1 m. Its condition degrades increasingly toward the north. Feature C is interpreted to be a remnant of a boundary wall associated with the habitation complex, similar to the wall at Feature 03-09.

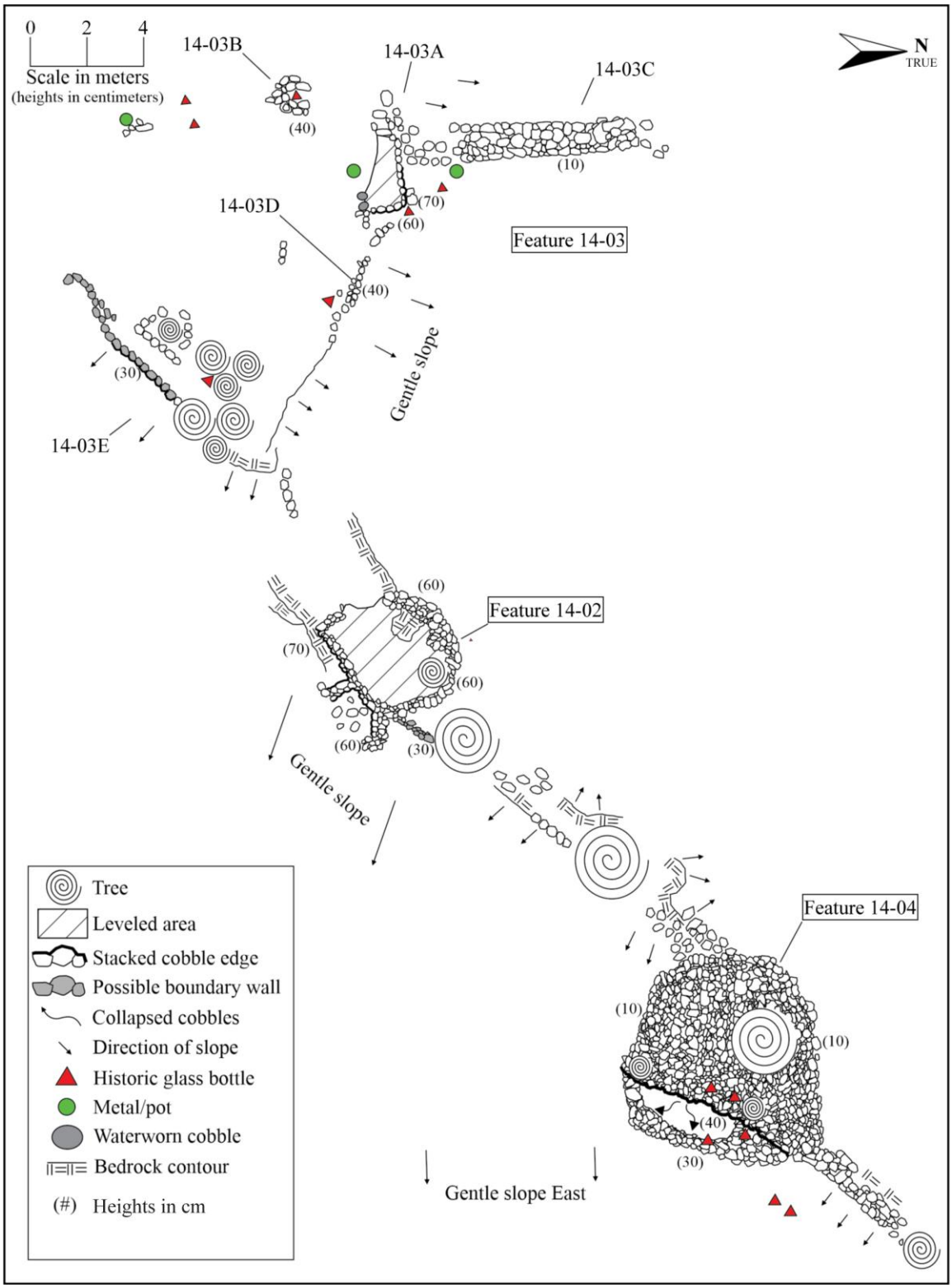

Figure 82. SIHP 50 10-35-18696 Feature 14-02, 14-04, and 14-04, habitation complex, plan view

Figure 83. SIHP 50 10-35-18696 Feature 14-02, platform, view to the northwest

Subfeature D (Figure 88) is a retaining wall that abuts the east side of Feature A, opposite Feature C. It is composed of roughly piled small and medium angular cobbles. It extends roughly east to west, and measures 0.3 m wide and stands 40 cm above ground surface. Soil is retained behind the wall. This feature, along with Feature E, helps to define the leveled surface that makes up the habitation site.

Subfeature E (Figure 89) is a retaining wall located about 5 to 6 m south-southeast of Feature D. It is built of nicely stacked and faced small angular cobbles with some medium cobbles as well. It measures 0.2 m wide and 35 cm above the ground surface, extending 3.2 m toward the southwest away from a pahoehoe outcrop. There is a faint rock ring built into the soil about 1 m northwest of this retaining wall. There are several guava trees growing from the northeast end of the retaining wall. This feature, along with Feature D, helps to define the leveled surface that makes up the habitation site.

Cultural material observed at Feature 14-03 includes historic glass bottles (e.g., aqua crown finish beverage bottles with AB ligature base marks, brown crown finish beverage bottles, green case gin bottle), metal pots, a fragment of sheet metal, and a few scattered cobbles. The AB ligature base mark was used by the American Bottle Co. between 1905 and 1909 in their Belleville, Illinois factory (Lockhart et al. 2021). Along with the age of the glass bottle, the presence of sheet metal suggests that Feature 14-03 was the location of a habitation occupied during the late 19th or early 20th century.

Figure 84. SIHP 50 10-35-18696 Feature 14-03 overview to the southeast

Figure 85. SIHP 50 10-35-18696 Feature 14-03A, view to the southwest

Figure 86. SIHP 50 10-35-18696 Feature 14-03B rock ring, view to the southwest

Figure 87. SIHP 50 10-35-18696 Feature 14-03C, view to the northwest

Figure 88. SIHP 50 10-35-18696 Feature 14-03D, view to the southwest

Figure 89. SIHP 50 10-35-18696 Feature 14-03E, view to the northwest

Feature 14-04

Feature 14-01 is a platform (Figure 90) located to the east of Feature 14-02, adjacent to a remnant segment of Feature 13-11 (the boundary wall between Lots 13 and 14). It is built with subangular cobbles to small boulders. It measures 5. 1 m by 4.0 m and stands between 10 and 50 cm above the ground surface. The feature is heavily obscured by deadfall, autograph tree, and albizia, but appears to be level on top. There is extensive root growth within the feature. Tumbled cobbles have accumulated next to the east side of the platform. Historic bottles were observed on the southeast side of platform.

Figure 90. SIHP 50 10-35-18696 Feature 14-04, platform, view to the west

Feature 14-05 is an artifact concentration (Figure 91) located16 meters south of Feature 14-03 (a habitation complex). The artifact concentration measures approximately 2 meters by 2 meters. It is composed of a low-density accumulation of historic artifacts. Artifacts observed include those listed in Table 9. These artifacts appear to date to the early twentieth century or later and are consistent with those observed at Feature 14-03.

Table 12 Artifacts identified in Feature 14-05

Material	Type	Age	Function	Notes	Reference
Glass	Bottle	Early 20th century	Pharmaceutical	Konishi & Co/ Apothecary/ Doshumachi	(Konishi Co., Ltd. 2021)
Steel	Hoe	20th century	Tool	Head only	
Steel	Hook	20th century	Tool		
Steel	Hook	20th century	Tool		
Iron	Pipe fitting	20th century	Water infrastructure?	Embedded in ground	
Steel	Chain	20th century	Tool		

Figure 91. Feature 14-05 Artifact Concentration

6.1.2.2 Ditches

Two ditches were identified as part of Site 50-10-35-18696.

6.1.2.2.1 Feature 00-04

Feature 00-04 (Figure 92) is a ditch that extends between tributaries of Ainako Stream in the southeast portion of the Project Area (see Figure 59). The ditch is excavated into the surrounding soil and extends roughly southeasterly direction before exiting the Project Area. Within the Project Area it measures approximately 47.0 m long by 2.0 meters wide along its bottom. The ditch is roughly 60 centimeters deep below the surrounding ground surface. Subangular pahoehoe cobbles irregularly line the banks of the ditch and ditch bottom. The banks are eroded, and the occasional palm tree is growing within the ditch. This ditch does not appear on any historic maps that were consulted for the current study, and so its age is indeterminate but assumed to be older than 50 years given the history of land use in the Project Area.

Figure 92. Feature 00-04, ditch, view to the southeast

6.1.2.2.2 Feature 03-16

Natural drainages in the Project Area may have been used as ‘auwai to transport water for agricultural or other purposes. Feature 03-16 (Figure 93) may represent a feature built to enhance a natural drainage’s ability to function as an ‘auwai or irrigation ditch. The feature is a low stacked and faced wall built along the western bank of a drainage near the western end of Lot 3 (see Figure 37). The drainage extends in a north-northeasterly direction. The wall is constructed of 3-4 courses of subangular cobbles and exhibits only some facing but is clearly stacked. The wall extends for at least 8.5 m but becomes obscured beneath a fallen tree on its southwestern end. It measures 3.7 m wide and stands 70 cm tall above the top of the drainage bank. The drainage bottom is 1.0 m below the top of the bank. On the north side of wall it descends into streambed, creating a paved bank. The addition of this wall to the drainage bank suggests the drainage was used as an ‘auwai. This feature does not appear on historic maps that were consulted for the current study. Its age is assumed to be older than 50 years given the history of land use in the Project Area.

Figure 93. Feature 03-16, wall along bank of drainage, view to the west

6.1.2.3 Enclosures

Two enclosures (Features 05-01 and 11-04) were identified within the Project Area.

6.1.2.3.1 Feature 05-01

Feature 05-01 (Figure 94) is a remnant enclosure located on relatively flat ground just above the north bank of the tributary of Ainako Stream that extends near the southern Project Area boundary (see Figure 47). The remnant enclosure is defined by a low rock wall of piled subangular cobbles surrounding a roughly level cleared area. It measures 5.4 m north-south by 4.15 m east-west (Figure 95). The low rock wall on the northwest side of the feature stands 35 cm tall and is constructed of 2-3 courses of subangular pahoehoe. In the southern corner, a small segment of the wall stands 110 cm tall. The walls on the northeast and southwest sides of the feature are primarily mounded soil with 1 course of cobbles exposed. There is no wall on the southeast side, which is directly above the stream bank and is eroding into the stream. The interior of the feature is roughly level with a thin deposit of organic soil and exposed subangular pāhoehoe cobbles and small boulders. In the southern corner, 2 historic glass bottles are partially buried and a third bottle is embedded in the in structure (Figure 96). All three are colorless round beverage bottles with crown finishes and automated bottle machine scars up the neck to the finish. In the west corner of the feature, a flat cobble is exposed on the ground surface. It has possible abrasions on the exposed surface (Figure 97), suggesting mechanical disturbance. Based on its form and the presence of historic artifacts, Feature 05-01 is interpreted to be the remnants of a habitation feature used during the Historic period, specifically the early twentieth century. It was likely used in association with agricultural use of the Lot 5 depicted on Registered Map 2058 (Baldwin 1901a). It is in relatively poor condition, but the presence of partially buried artifacts suggests that it may have potential to yield additional archaeological evidence of its use and age.

Figure 94. SIHP 50 10-35-18696 Feature 05-01, habitation terrace, view to the southwest

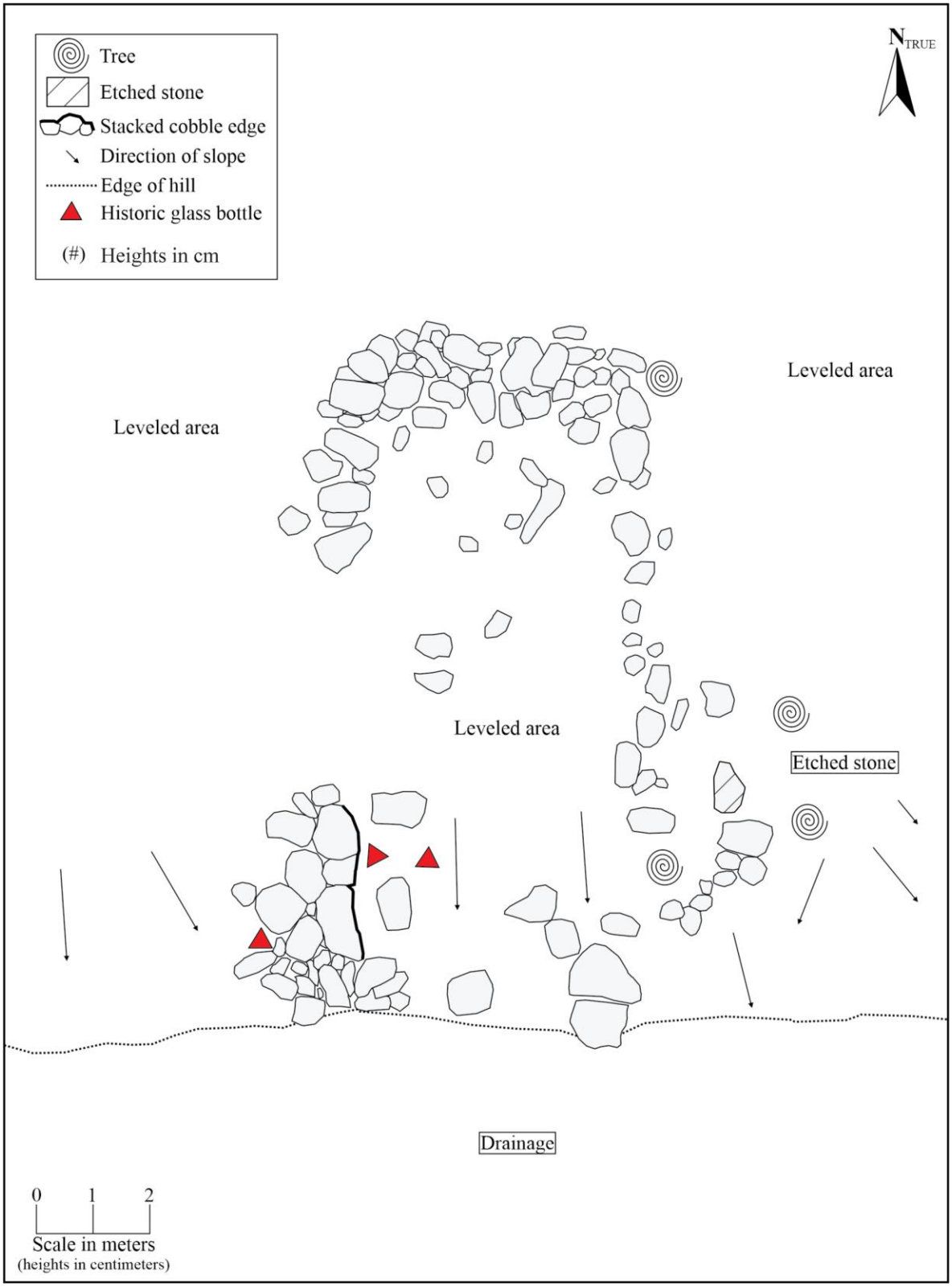

Figure 95. SIHP 50 10-35-18696 Feature 05-01, enclosure, plan view

Figure 96. SIHP 50 10-35-18696 Feature 05-01, historic bottles buried in southern corner of feature

Figure 97. SIHP 50 10-35-18696 Feature 05-01, exposed cobble with abrasions on surface

6.1.2.3.2 Feature 11-04

Feature 11-04 (Figure 98) is an enclosure located at the western end of Lot 11 (see Figure 53). The enclosure is situated near the junction of three historic lot boundary walls (Features 06-01, 11-01, and 14-22), with several features in Lots 6 and 13 nearby (Figure 99). The enclosure is defined by a roughly-U-shaped wall built off of the east side of Feature 11-01 (the boundary wall between Lots 11 and 12). It is constructed of dry-stacked small to large subangular pāhoehoe cobbles. The wall measures 1m wide by 130cm tall and has a total length of 27 meters. The interior of the enclosure is roughly 12 m by 12 m, with a cleared and roughly level surface covered with leaf litter and soil. There are no deliberately constructed openings in the enclosure wall. Guava and autograph trees are growing inside the enclosure and adjacent to the enclosure wall, causing root damage. Because the ends of the wall forming this enclosure about Feature 11-01, it is interpreted to be Historic in age, contemporaneous if not younger than that the adjacent historic lot boundary wall. The absence of entrances suggests that the enclosure was used as an animal pen, possibly for pigs based on the height of the walls. The enclosure is in fair shape. No cultural material was observed at this feature. The interior of the enclosure may have potential for buried archaeological, paleoenvironmental, or soil chemistry information related to its use.

Figure 98. Feature 11-04, enclosure interior, view to the south

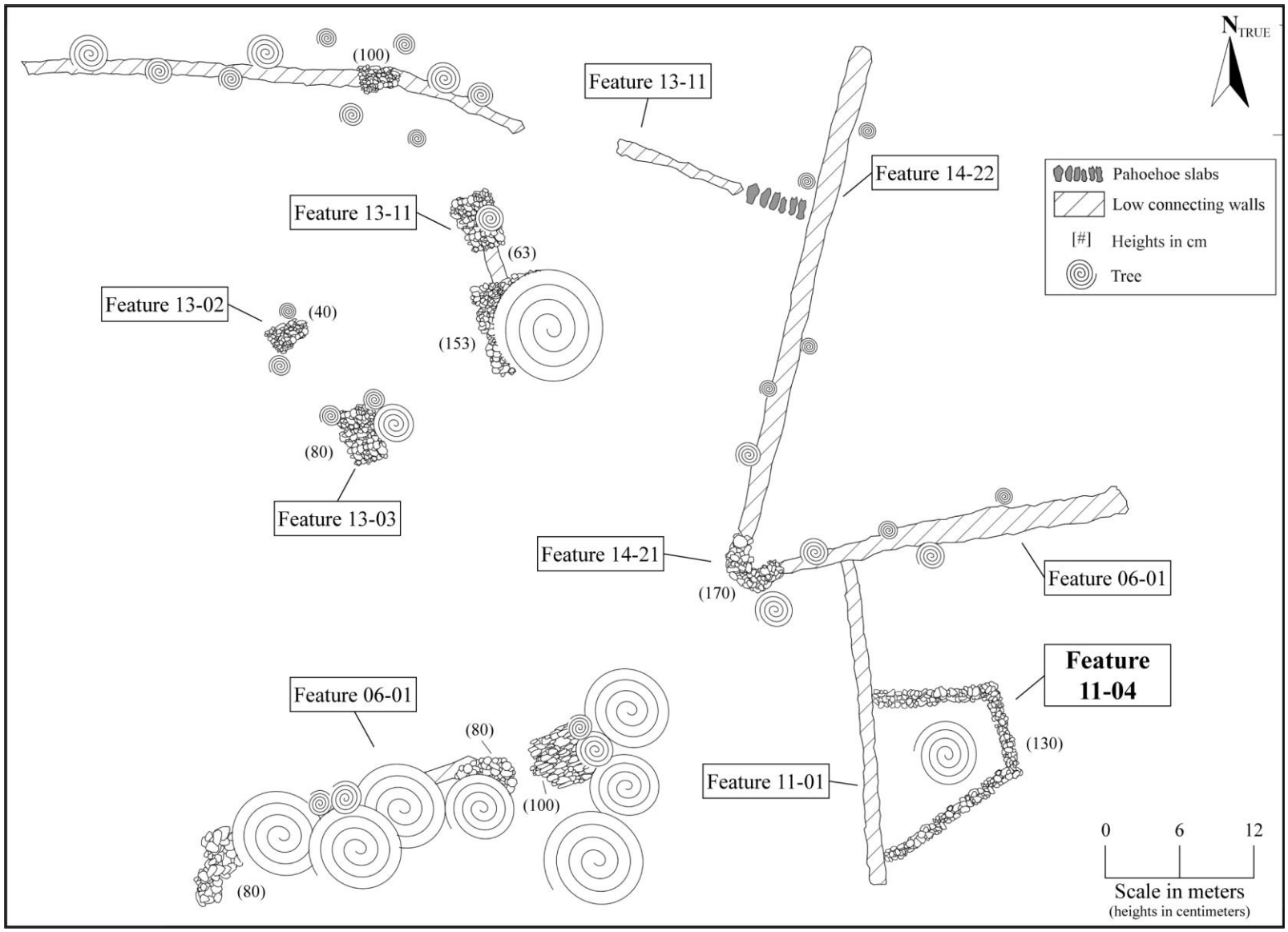

Figure 99. Plan view of Feature 11-04 and nearby features

6.1.2.4 Free-standing Walls

A free-standing wall is a linear or curvilinear alignment of stones (at least two courses high) that is considerably longer than it is wide, and the majority of both long sides are not attached to another artificial or natural feature, nor is it designed to retain material on any side. Twenty-three features (Table 10) in the Project Area were identified as free-standing rock walls that are not part of a feature complex. Descriptions of individual wall features are provided in Appendix A.

Construction techniques observed included core-filled (Figure 100), stacked (Figure 101), and piled (Figure 102). Intact segments of wall features sometimes included a mix of these construction techniques, and this appeared to be a result of the available material. The material used in the walls appears to have been obtained from the immediate vicinity. Thus, when rocks of comparable size were available nearby, the wall appears to be stacked. When a mix of large and small material was nearby, the wall construction appears core-filled. In several cases, surviving wall segments consist of a single row of cobbles exposed above the ground surface, and construction techniques could not be determined.

The condition of most wall segments was relatively poor, and accurate measurement of wall segments was often hindered by fallen trees (Figure 103) and extensive autograph tree root growth (Figure 104). The walls themselves are intermittent—the solid lines shown in the GPS maps prepared for this report represent the alignments marked by intermittent segments. The mean width of the rock walls is 1.7 m, with individual wall segments measuring between 0.4 m and 7.1 m. Note that widths greater than about 1 m include the rubble that fallen from the walls. Mean wall height was 73 cm and varied from 20.0 cm to 210.0 cm above the ground surface. This tallest, most intact wall is Feature 15-01, which is located north of the Project Area boundary according to the GPS data collected in the field (see Figure 57). Walls oriented across the prevailing slope retained sediments on their uphill sides. In some cases, such as Feature 09-13, the remnant wall stands only a few stones above the ground surface on its downslope side, and the trapped sediments on the upslope side make it appear that the wall is a very low terrace (Figure 105).

A comparison of the identified rock walls with Registered Map 2058 demonstrates that most of the historically documented lots had walls on at least a portion of their boundaries (Table 11). In Figure 106, walls that were identified on or near historic lot boundaries are represented by solid red lines, with the historic lot boundaries indicated on the map by gray dashed lines. Partial boundary walls were identified on at least one boundary of all historic lots except for Lot 2 and the unnumbered historic lot containing Kupapau Hill. The intact segments of Feature 15-01 (Figure 107) approximate the northern boundary of TMK (3) 2-3-030:004 (the County parcel comprising most of the project area), but only in historic lot 15. No other wall segments were observed separating the County parcel from the State parcel. Feature 10-01 (Figure 108) is interesting because it is located inside Lot 10 and extends parallel to that lot's mauka and makai boundary walls but is not depicted on Registered Map 2058.

Table 13 SIHP 50-10-35-18696 Free Standing Walls

Feature	Function_	Age	Construction	Total Lenth (m)	Mean Width (m)	Mean height (cm)	Notes	Location map
01-01	Indeterminate	P/H	Piled	25.5	0.7	20	Remnant	Figure 35
03-21	Boundary	H	Mixed	201.0	1.0	150	Intermittent	Figure 37
04-05	Boundary	P/H	Piled	1.8	1.6	50	Remnant of 03-21 wall	Figure 38
04-06	Boundary	P/H	Piled	2.8	1.4	70	Remnant of 03-21 wall	Figure 38
04-07	Boundary	P/H	Core-filled	129.6	1.1	60	Intermittent	Figure 38
05-18	Boundary	H	Core-filled	160.8	0.6	80	Intermittent	Figure 39
06-01	Boundary	H	Stacked	270.0	3.3	60	Intermittent	Figure 40
07-04	Boundary	H	Piled	4.0	0.6	50	Remnant	Figure 41
08-06	Indeterminate	P/H	Core-filled	5.0	2.8	85	Remnant	Figure 42
09-01	Agriculture	H	Stacked	5.1	1.7	120	Remnant	Figure 43
09-13	Boundary	H	Stacked?	14.9	0.4	25	Remnant	Figure 43
10-01	Boundary	H	Stacked	96.3	1.7	45	Intermittent	Figure 44
10-03	Indeterminate	P/H	Stacked	3.1	2.9	90	Remnant L-shaped	Figure 44
10-07	Boundary	H	Stacked	138.1	1.1	70	Intermittent	Figure 44
11-01	Boundary	H	Stacked	104.0	1.1	110	Intermittent	Figure 45
12-02	Indeterminate	P/H	Core-filled	18.7	1.5	110	Remnant above drainage	Figure 46
12-07	Boundary	H	Core-filled	95.7	2.3	100	Remnant	
13-11	Boundary	P/H	Core-filled	5.9	5.4	190	Intermittent	Figure 47
14-15	Boundary	H	Indeterminate	4.5	3.7	80	Remnant	Figure 48
14-19	Boundary	H	Stacked	39.5	1.0	50	Remnant	Figure 48
14-22	Boundary	H	Stacked	80.7	3.2	210	Intermittent	Figure 48
15-01	Boundary	H	Core-filled	24.5	3.6	80	Intermittent	Figure 49
15-19	Agriculture	P/H	Core-filled	23.6	7.1	120	Low wall extending roughly east-west	Figure 49
15-20	Agriculture	P/H	Core-filled	10.3	2.0	70	Low, wide wall above change in slope	Figure 49
15-24	Boundary	H	Piled	6.4	1.5	70	Very rough	Figure 49

Notes: m = meters, cm = centimeters

Table 14. Numbered historic lots depicted in the project area on Registered Map 2058.

Lot	Approximate acres	Associated Walls
Unnumbered, with Kupapau Hill	7.8	None identified
2	3.75	None identified
3	5.0	03-21, 04-05, 04-06
4	2.0	04-05, 04-06, 04-07, 06-01
5	2.7	04-07, 05-18
6	3.5	05-18, 06-01, 14-22
7	1.3	06-18. 07-04
8	1.15	06-01, 08-06
9	2.7	05-18, 09-13
10	5.4	06-01, 09-13, 10-07
11	1.8	6-01, 10-07, 11-01
12	3.6	06-01, 11-01, 12-07, 13-11
13	3.4	06-01, 12-07, 13-11
14	7.0	13-11, 14-19, 14-22, 15-01
15	>12.0	14-19, 15-01

Figure 100. Feature 05-18, core-filled wall segment, view to the west

Figure 101. Feature 11-01, stacked wall segment, view to the west

Figure 102. Feature 12-01, piled wall segment, view to the north

Figure 103. Feature 15-01, wall segment damaged by fallen tree, view to the north

Figure 104. Feature 10-06, wall segment damaged by autograph tree roots, view to the west

Figure 105. Feature 09-13, wall, view to the northwest

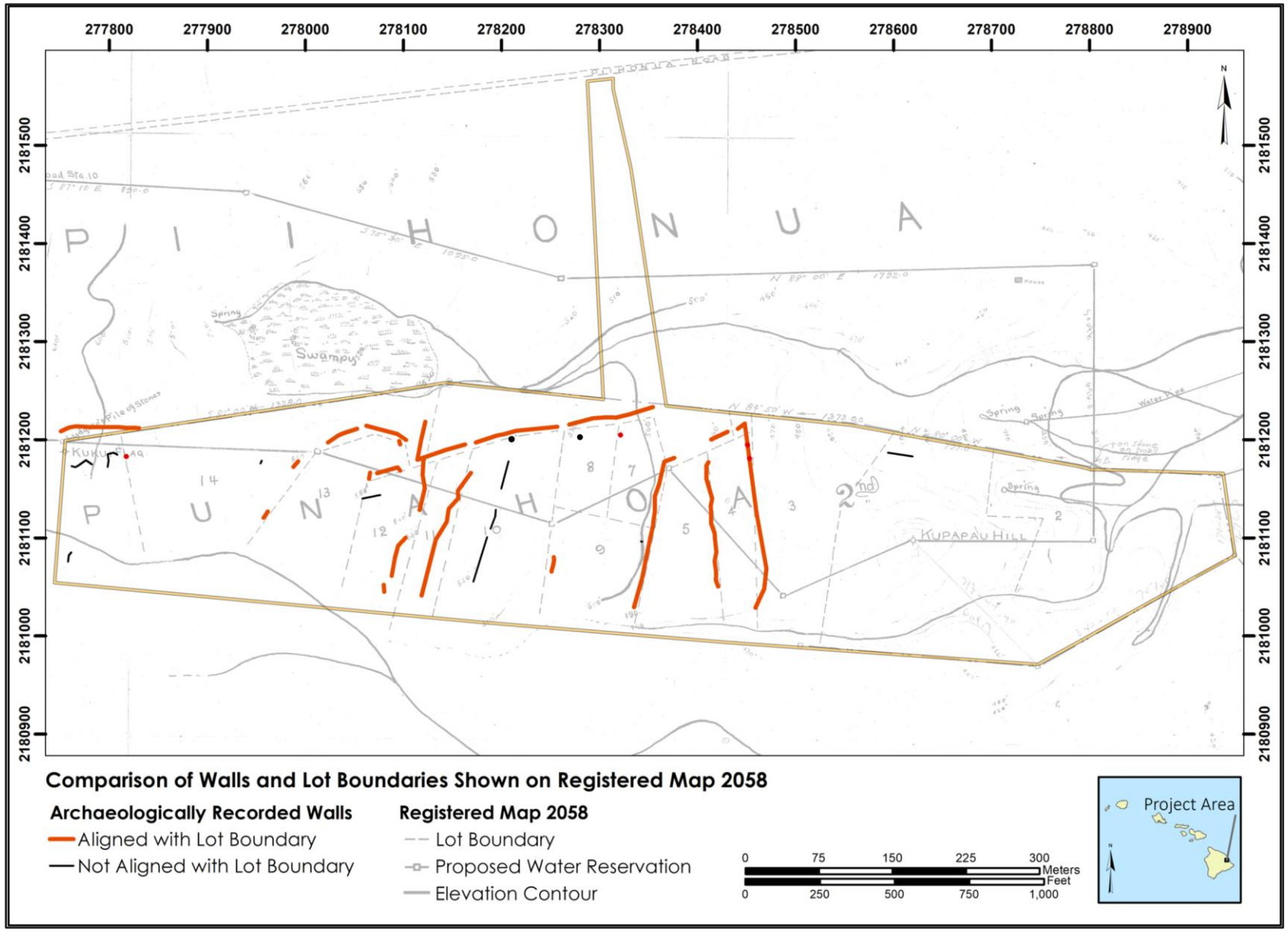

Figure 106. Comparison of walls with Registered Map 2058 historic lot boundaries

Figure 107. Feature 15-01, wall, view to the west

Figure 108. Feature 10-01, wall, view to the west

6.1.2.5 Modified outcrops

Five modified outcrops were identified in the Project Area. Full descriptions are presented in Appendix A. In general, these features consisted of either stacked or piled cobbles on exposed pāhoehoe outcrops. All are heavily disturbed by autograph trees, guava, or alibizia roots. No cultural material was observed at these features. They are interpreted to be clearing piles created during agricultural use of the Project Area during the late nineteenth and early twentieth century but could be older. An example of a modified outcrops observed in the Project Area is shown in Figure 109 See Appendix A for full descriptions. All five are interpreted to have been created during agricultural clearing, moving rocks from nearby areas with soil to pāhoehoe outcrops.

Table 15 SIHP 50-10-35-18696 Modified Outcrops in the Project Area

Feature	Function	Age	Notes	Location Map
13-10	Agriculture	H		Figure 55
14-17	Agriculture	P/ H		Figure 56
15-07	Agriculture	P/ H	Linear construction suggests this could be a remnant of a wall.	Figure 57
15-12	Agriculture	P/H		Figure 57
15-29	Agriculture	H	Potentially connects to Feature 15-28.	Figure 57

Figure 109. Feature 13-10, modified outcrop, view to the southeast

6.1.2.6 Modified Spring

One modified spring (independent of complexes) was identified in the Project Area. Feature 03-18 (Figure 110) is a spring set near the southern end of Feature 03-19, a low retaining wall, just west of Feature 02-04A (Figure 111, see Figure 45). The spring appears to have been excavated and modified by the addition of a lining build with subangular cobbles on the east, south, and west sides of the excavation. The lining is a cleanly faced wall, stacked 3 courses above the ground surface. The feature measures 0.7m in diameter and extends 54 cm below the ground surface. The age of the spring is indeterminate.

Figure 110. Feature 03-18, modified spring wall, view to the south

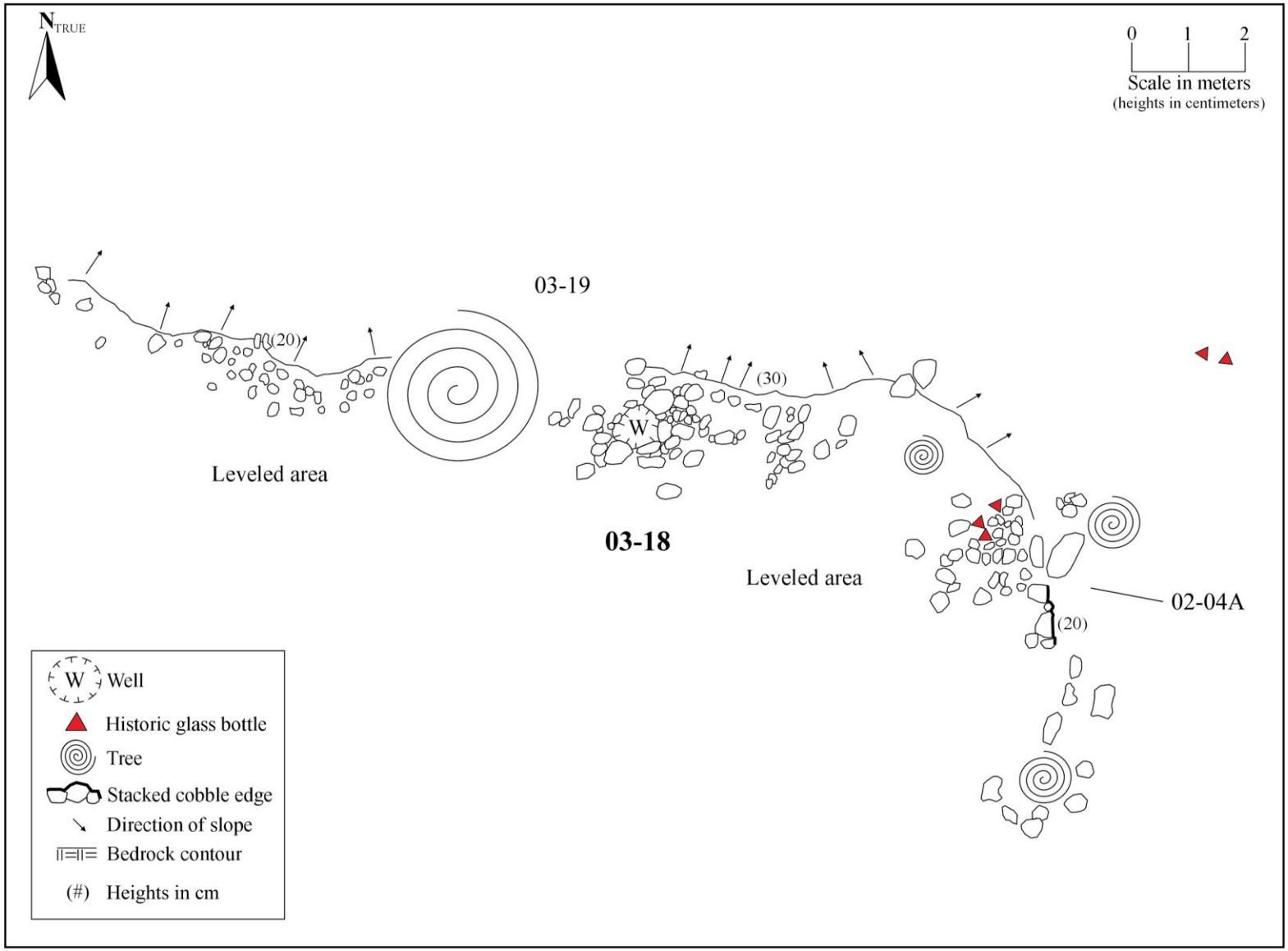

Figure 111. Feature 03-18, modified spring plan view with surrounding features

6.1.2.7 Mounds and "Mound/platforms"

A mound is a collection of stones with an irregular surface. A platform is a stone construction with a relatively flat upper surface that is elevated above the surrounding ground surface on all sides. Although a mound in good condition may be easily distinguishable from a platform in good condition based on the diagnostic characteristics discussed in Chapter 4, site formation processes and similarities in construction can also make it difficult to tell one from another in the field. Within the Project Area, the extensive root disturbance observed on nearly all of the identified features has altered mounds and platforms. Because of this disturbance, several features are ambiguous in form, exhibiting some characteristics of mounds but also some typical of platforms. These features are identified as "mound/platforms." Only mounds and mound/platforms identified as individual features are discussed below. Those that are included as subfeatures within complexes are discussed with those complexes. A total of 111 mounds and 8 "mound/platforms (Table 13). The discussion below summarizes the mounds, mound/platforms, and platform identified. More detailed descriptions of individual features are presented in Appendix A.

Table 16 SIHP 50-10-35-18696 Mounds, Mound/Platforms, and Platforms in the Project Area

Type	Function	Precontact/ Historic	Historic	Indeterminate	Total
Mound	Agriculture	71	32	0	102
Mound	Boundary	0	1	0	1
Mound	Indeterminate	4	2	1	7
Total Mounds					*111*
Mound/platform	Agriculture	5	0	0	5
Mound/platform	Indeterminate	3	0	0	3
Total Mound/platform					*8*
Total		**84**	**35**	**1**	**119**

Mounds were the most common feature type within SIHP 50-10-35-18696 in the Project Area. The mounds vary in shape (circular, oval, rectilinear, linear, and irregular) and exhibit two methods of construction: piling and stacking. The lengths of the mounds varied from 1.0 m to 15.0 m, with a median length of 3.9 m. Widths varied from 0.7 m to 8.5 m, with the median 2.8 m. Mound heights varied from 26 cm to 280 cm above the ground surface, with a median height of 105.0 cm). Footprints of the mounds varied between 1.0 m^2 and 90.9 m^2 with a median area of 10.3 m^2. Volumes were similarly variable, ranging from 0.3 m^3 to 181.7 m^3 with a median of 23.8 m^3. The construction method of the majority of the mounds (n= 76) was piling in which the rocks used to construct them were simply heaped together in an informal pile, like the mound shown in Figure 112. These mounds typically have sloped edges and mounded, sloped, or irregular top surfaces. Another 36 mounds exhibited stacking on one or more sides. The stacked mounds, like those shown in Figure 113, have top surfaces that range from irregular to sloped to almost level. The condition of the top surfaces of stacked mounds could have been a result of root disturbance. Some of the stacked mounds may have begun as piled mounds, but at some point the stones were stacked along the exterior edges of the piles, creating nearly vertical edges (see Clark and

Rechtman 2016:42). Based on their locations relative to cleared soil areas and pāhoehoe outcrops, the mounds in the Project Area are interpreted to have been constructed as a result of agricultural clearing.

The 8 features categorized as “mound/platform” all exhibit stacking on one or more edges and tend to have smaller material filling their interior. Their shapes vary in shape (circular, oval, rectilinear, and linear). Top surfaces are not quite flat, nor are they deflated, and they tended to have a more formal appearance than the stacked mounds (for example, Figure 114 and Figure 115). They measure from 2.3 m to 9.8 m long, with a median length of 5.0 m. Widths vary between 2.2 m and 5.7 m, with a median length of 3.4 m. Heights of these features ranged from 90.0 m to 200.0 m, with a median height of 110.0 m. Footprints of the mounds varied between 5.1 m^2 and 55.9 m^2 with a median area of 19.5 m^2. Volumes were similarly variable, ranging from 6.1 m^3 to 111.7 m^3 with a median of 18.0 m^3. As with mounds, extensive root disturbance has caused these features to partially collapse or to distort their shape. In most cases, no cultural material was observed at the mound/platform features to assist with interpretation. In general, the function of these features is considered indeterminate.

Cultural material was not observed at most of these features. A single glass bottle was present at Features 05-08, 05-10, and 13-05—all mounds—and at 03-12, a mound/platform. At Feature 09-09, a steel field hoe head was resting on the side of the mound (Figure 116).

Figure 112. Feature 15-04, piled mound, view to the east

Figure 113. Feature 03-07, mound with well-stacked sides, view to the west

Figure 114. Feature 03-12, mound/platform, view to the northeast

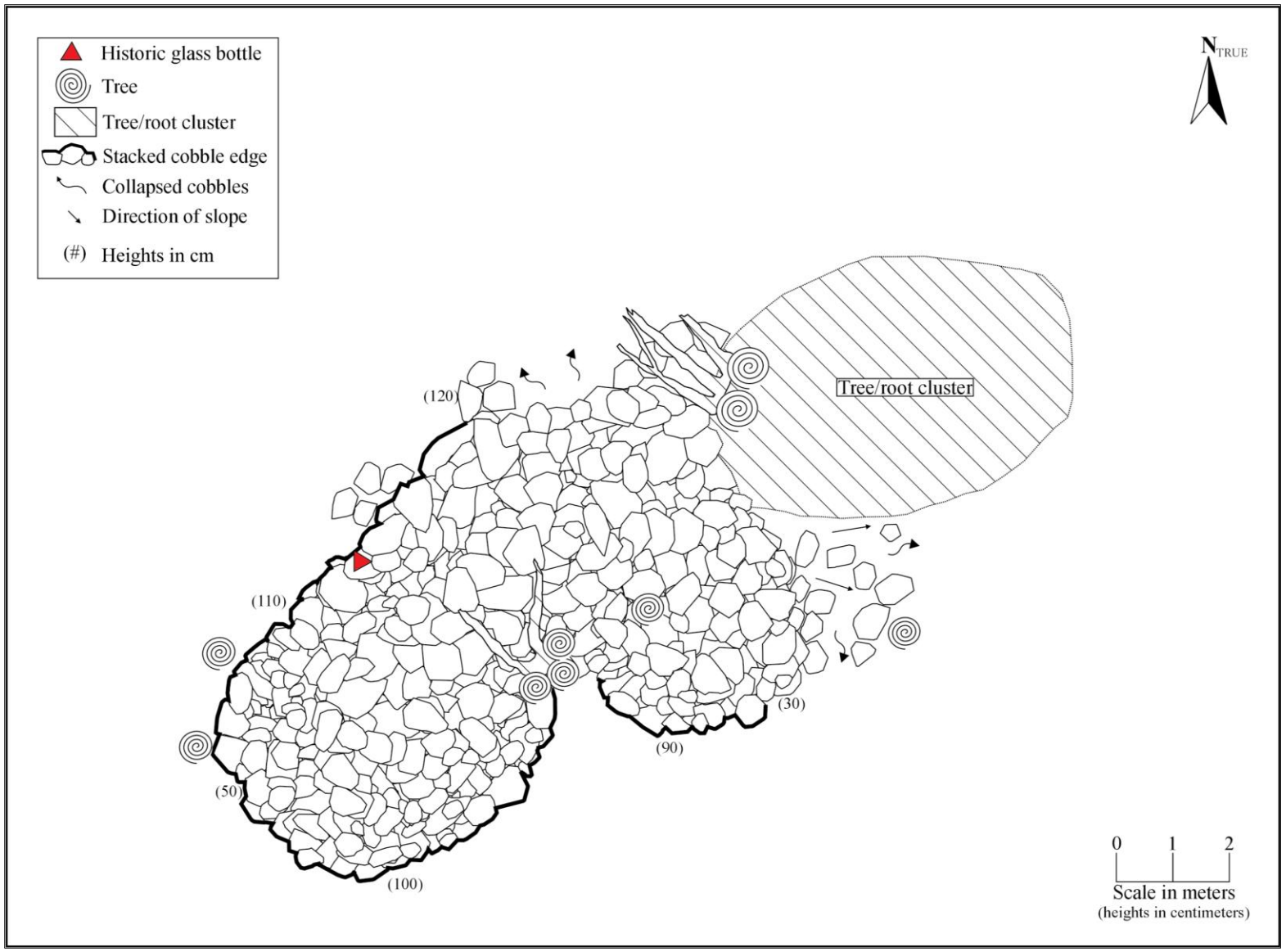

Figure 115. Feature 03-12 plan view

Figure 116. Hoe head resting on Feature 09-09

Platforms

Two features (Features 07-02 and 15-13) were identified as platforms based on their form.

Feature 07-02 (Figure 117) is a small platform located in the northern end of Lot 7 shown on Registered Map 2058, near the proposed road corridor (see Figure 49). It is low and oval in plan, faced and stacked walls and a flat top. It measures 2.0 m by 1.3 m and stands 60 cm tall. The stacked sides consist of 2-3 courses of subangular cobbles and are neatly stacked compared to the sides of the surrounding mounds. The top surface consists of small cobbles, while walls are built with larger cobbles. No cultural material was observed at this feature. Its age and function are considered to be indeterminate.

Feature 15-13 (Figure 118) is a large, somewhat rectangular platform located near the northwestern corner of the Project Area (see Figure 57), surrounded by multiple smaller mounds, rock piles, terraces, and walls (Figure 119). It is built of small subangular cobbles and small boulders. It measures 6.2 m by 4.7 m and stands 190 cm tall. The platform is neatly stacked on the north side, but its structure becomes rougher as the feature extends to the south. The top of the platform is slightly mounded but clearly flattened off. It has been disturbed by an albizia growing out of the south side and a guava out of north. No cultural material was observed at this feature. Although its form resembles stacked clearing mounds found elsewhere in Hilo, its age and function are considered indeterminate because it appears so different from the surrounding rock mounds.

Figure 117. Feature 07-02, platform, view to the west

Figure 118. Feature 15-13, platform, view to the south

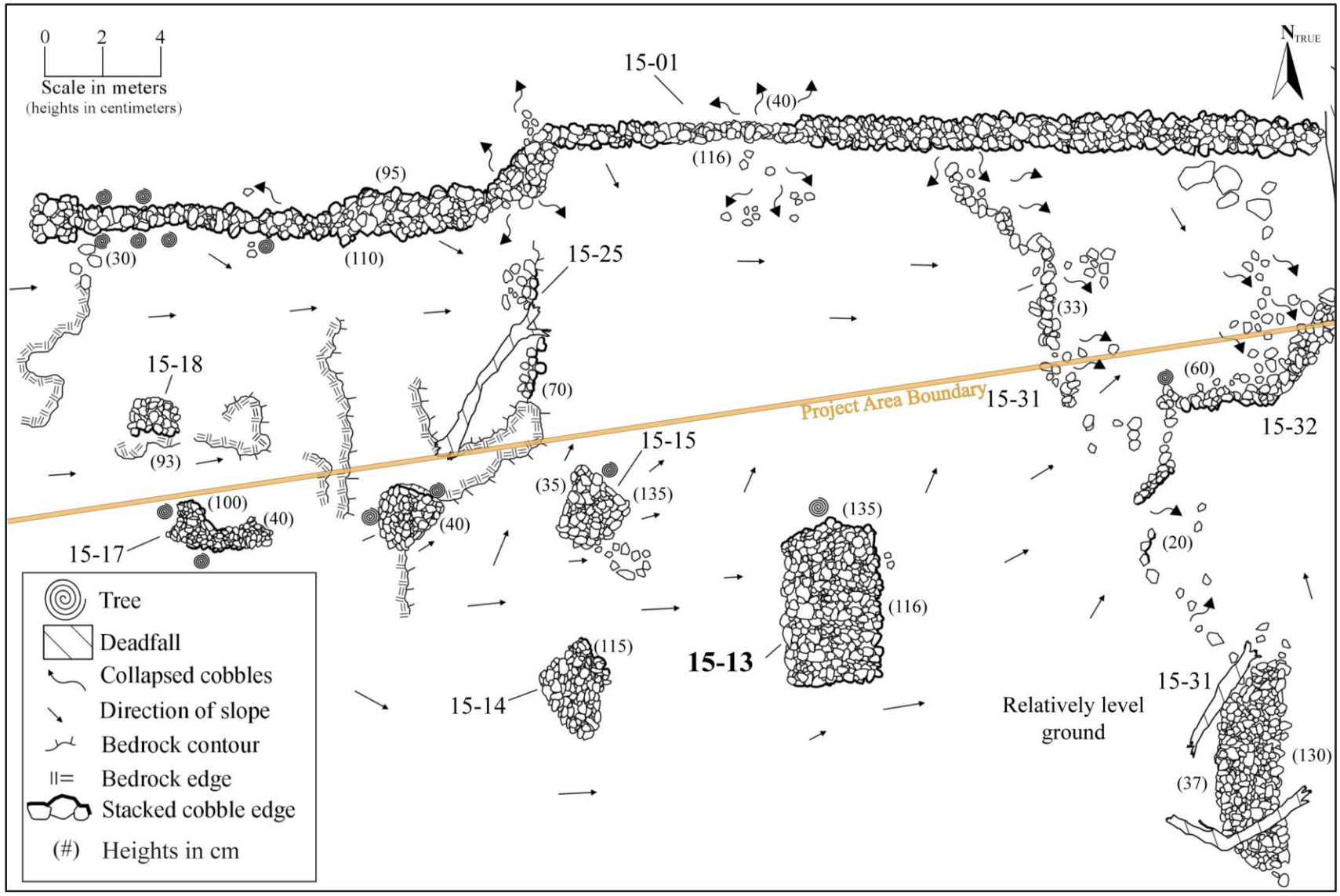

Figure 119. Feature 15-13, platform in context with surrounding features, plan view

6.1.2.8 Retaining walls

Three retaining walls were identified in the Project Area, two on slopes in the western portion of the Project Area and one near a modified spring.

Feature 03-19 (Figure 120) is a very low retaining wall located immediately uphill from Feature 03-18, a modified spring (see Section 5.1.2.4). It is constructed with subangular cobbles and small boulders; 1-3 courses are exposed, some stacked and some piled. It measures 1.8 m wide by 30 cm tall. It is likely Precontact to Historic in age and associated with agricultural production.

Feature 15-26 is a retaining wall (Figure 121) located in the western end of the Project Area (see Figure 57). It is built of roughly piled subangular cobbles and boulders along the edge of a drainage, following a slope contour. It measures 10.6 m by 1.7 m and stands 100 cm above the ground surface on the downhill side. It is in poor condition. It is interpreted to have been built to mitigate erosion along the contour into the drainage. It is likely Precontact to Historic in age and associated with agricultural production.

Feature 15-28 is a retaining wall (Figure 122) located in the western end of the Project Area see Figure 57). It is built of subangular cobbles and small boulders, set at the base of hill and wrapping around the hill. It measures 8.1 m by 0.9 m and stands 70 cm above the ground surface, with 2-4 courses of stacked rock visible. This feature is heavily obscured by vegetation and deadfall and may be an extension of the retaining wall that supports the terrace Feature 10-27. It is in fair condition. It is likely Precontact to Historic in age and associated with agricultural production.

Figure 120. Feature 13-19, retaining wall, view to the southeast

Figure 121. Feature 15-26, retaining wall, view to the northwest

Figure 122. Feature 15-28, retaining wall, view to the west

6.1.2.9 Rock piles

Rock piles are accumulations of rock that have even less formal appearance than mounds (for example, Figure 123). They are presumed to have been constructed in this informal manner. Four rock piles were identified in the Project Area. Descriptions are presented in Appendix A. Two of the rock piles (Features 13-08 and 14-23) are interpreted to be associated with agricultural clearing. Features 06-06 and 15-21 are interpreted as push piles from mechanical clearing.

Table 17 SIHP 50-10-35-18696 Rock Piles

Feature	Function_	Age	Notes	Location map
06-06	Clearing	H	Dozer push.	Figure 48
13-08	Clearing	P/H	Close to edge of drainage	Figure 55
14-23	Clearing	P/H		Figure 56
15-21	Unknown	H	Pushed up on bedrock lobe.	Figure 57

Figure 123. Feature 14-02, rock pile, view to the southeast

6.1.2.10 Terraces

A terrace is a stone surfaced area, level with the surrounding ground surface on at least one side and supported by at least one retaining wall. Fifteen terraces were identified in the Project Area. Only terraces identified as individual features are discussed below. Those that are included as subfeatures within complexes are discussed with those complexes. Descriptions of individual terraces are presented in Appendix A. A total of 14 terraces (Table 15) were identified in the Project Area. The length of each terrace varied from 3.1 m to 24.3 m, with a median length of 8.9 m. Widths of the terraces ranged from 0.9 m to 4.0 meters, with a median width of 2.8 m. The surface area of the terraces varied from 3.4 m^2 to 80.2 m^2 with a median area of 21.8 m^2. All were constructed with stacked or piled cobble retaining walls, with the terraced surface generally covered with sediment or soil. Eight of the terraces are located near western end of Project area, where terrain is generally steeper than most of the Project Area (with the exception of Kupapau Hill). Some of these terraces, like Feature 15-27 (Figure 124 and Figure 125) are built along a moderate to steep slope. Five terraces are built along tributary of ʻĀinakō Stream, where they extend relaltively flat ground all the way to the top of the stream bank (for example, Figure 126). Unlike the retaining walls associated with the Hilo Boarding School Ditch (SIHP 50-10-35-14947), the retaining walls of these features are located high on the stream bank and generally do not extend down to the level of running water. These are reminiscent of terraced features observed in former sugarcane fields near the Wailuku (Barna et al. 2023:50), and although no record of sugarcane production has been found for the Project Area, this technique of reinforcing the top of the stream bank against erosion to enhance planting could have been used for other kinds of agriculture. The terraces are likely associated with Historic Period agriculture conducted within the historic lots shown on Registered Map 2058, although it is possible that they could be older.

Table 18 SIHP 50-10-35-18696 Terraces

Feature	Function	Age	Notes	Location map
08-04	Agriculture	H		Figure 50
09-06	Agriculture	H	Above of the north bank of the tributary of Ainako Stream.	Figure 51
09-07	Agriculture	H	Along north edge of the tributary of Ainako Stream.	Figure 51
09-08	Agriculture	H	Along north edge of the tributary of Ainako Stream.	Figure 51
09-10	Agriculture	H	Along north edge of the tributary of Ainako Stream.	Figure 51
13-17	Agriculture	P/H		Figure 51
15-11	Agriculture	H	Above Hilo Boarding School Ditch (SIHP 50-10-34-14947).	Figure 57
15-22	Agriculture	H	Along south bank of tributary of Ainako Stream.	Figure 57
15-23	Agriculture	P/H		Figure 57
15-25	Agriculture	H	Remnant.	Figure 57
15-27	Agriculture	H		Figure 57
15-30	Agriculture	H		Figure 57
15-31	Agriculture	H		Figure 57
15-32	Agriculture	H	Heavily disturbed by fallen trees and tree roots.	Figure 57

Figure 124. Feature 15-27, terrace, view to the south

Figure 125. Feature 15-27, northern corner of terrace, view to the southwest

Figure 126. Feature 09-10, terrace overlooking Ainako Stream tributary (at left), view to the south

6.1.2.11 Isolated Artifacts

Four isolated artifacts were identified. A10-01 is a steel shovel head found resting on the ground surface in Lot 10. Artifact A10-02 is a brown glass bottle with a tooled ring finish, round body, and cup-bottom base. It has an embossed logo for the Buffalo Brewing Company of Sacramento, California on its side. It resembles bottles sold between 1890 and ca. 1910, when automatic bottle machines became widespread (Sacramento Public Library n.d.). A14-01 is a rounded basalt small cobble found near the northern boundary of the Project Area parcel. It was found outside of a stream context and may have been intentionally moved to its current location. A14-02 is an olive-green glass bottle. It is missing its finish, has a round body, and appears to be turn-molded in a cup mold. It likely dates to the mid to late 1880s and late 1910s, after which automatic bottle machines dominated the market (Lindsey 2016).

Table 19 Isolated Artifacts Associated with SIHP 50-10-35-18696 in the Project Area

Field Number	Material	Type	Age	Function	Location map
A10-01	Steel	Shovel head	Historic	Tool	Figure 52
A10-02	Glass	Bottle	1890-ca.1910	Beverage	Figure 52
A14-01	Basalt	Waterworn (possible)	Precontact/historic?	Tool	Figure 56
A14-02	Glass	Bottle	>1906	Beverage	Figure 56

6.1.2.12 Summary

Within the current Project Area, SIHP 50-10-65-18696 consists of 181 individual archaeological features, including 5 complexes (which have a total of 29 subfeatures). Together, these features are interpreted to be the remnants of agricultural activities conducted in the Project Area during the early twentieth century, and almost certainly before.

6.1.2.12.1 Summary by Type

The majority of Site 18696 features (62.2%, n= 112) in the Project Area are rock mounds (Table 17). The next most common type of feature (13.3%) is a freestanding rock wall. Agricultural terraces comprise 7.8% of features, and all other feature types account for less than 5% each of the total feature count. The spatial distribution of feature types is shown in Figure 127.

Table 20 SIHP 50-10-35-18696 Summary of features by type in the Project Area

Feature Type	Number of Features
Mound	112
Wall	24
Terrace	16
Mound/platform	8
Modified outcrop	5
Rock pile	3
Retaining wall	3
Platform	3
Enclosure	2
Ditch	2
Complex	2
Modified spring	1
Grand Total	**181**

6.1.2.12.2 Summary by Function

Of the 181 features (including complexes), the majority of features (74.4%, n= 135) are agricultural in function (Table 18). These features include mounds, terraces, free-standing walls, modified outcrops, retaining walls, and platforms. Another 11.1% of features (8 mound/platforms, 7 mounds, 4 walls, and a rock pile) were assigned an indeterminate function. Features assigned to a boundary function, primarily walls but also one rock mound that appeared to be a stockpile of wall material, comprised 7.8% (n=15) of identified features. The remaining features each comprised 2% or less of the totals, and were assigned functions of water infrastructure, habitation, clearing, and animal pen. Four habitation features were identified. The spatial distribution of features by function is shown in Figure 128.

Table 21 SIHP 50-10-35-18696 Summary of features by function in the Project Area

Function	Number of Features
Agriculture	135
Indeterminate	20
Boundary	15
Water infrastructure	4
Habitation	3
Clearing	2
Animal pen	1
Habitation/Agriculture	1
Grand Total	**181**

6.1.2.12.3 Summary by Age

Determining the age of most features was made difficult by a paucity of diagnostic characteristics and associated material culture. The appearance of features on historic maps and the few associated late nineteenth and early twentieth century artifacts were used to assign features to the Historic period, especially boundary walls that are depicted on Registered Map 2058 (Baldwin 1901a). Additionally, information developed by Hunt and McDermott (1993) and Clark and Rechtman (2016) regarding agricultural clearing mounds was used to assess the potential age of rock mounds and platforms. Of the 181 features (including complexes) identified within SIHP 50-10-35-18696 in the Project Area (Table 19), 70 are assessed to date to the Historic period, in particular to the period when the Project Area had been divided into the 15 historic lots shown on Registered Map 2058 (Baldwin 1901a). Based on their appearance on that map, the historic lots are thought to date to before the turn of the twentieth century but after the 1850s due to their absence from earlier maps. Another 108 features, again mostly mounds, have been assessed to possibly date to the Precontact era, but could also be younger. In most cases, these mounds are in poor shape and badly damaged by tree roots or fallen trees. Another 3 features were designated “indeterminate” due to extremely poor condition and possibility that they are either modern or natural formations too obscured by fallen vegetation to accurately assess. The distribution of features by age is shown in Figure 129.

Table 22 SIHP 50-10-35-18696 Summary of features by age in the Project Area

Age	Number of Features
Historic	70
Indeterminate	3
Precontact/Historic	108
Grand Total	**181**

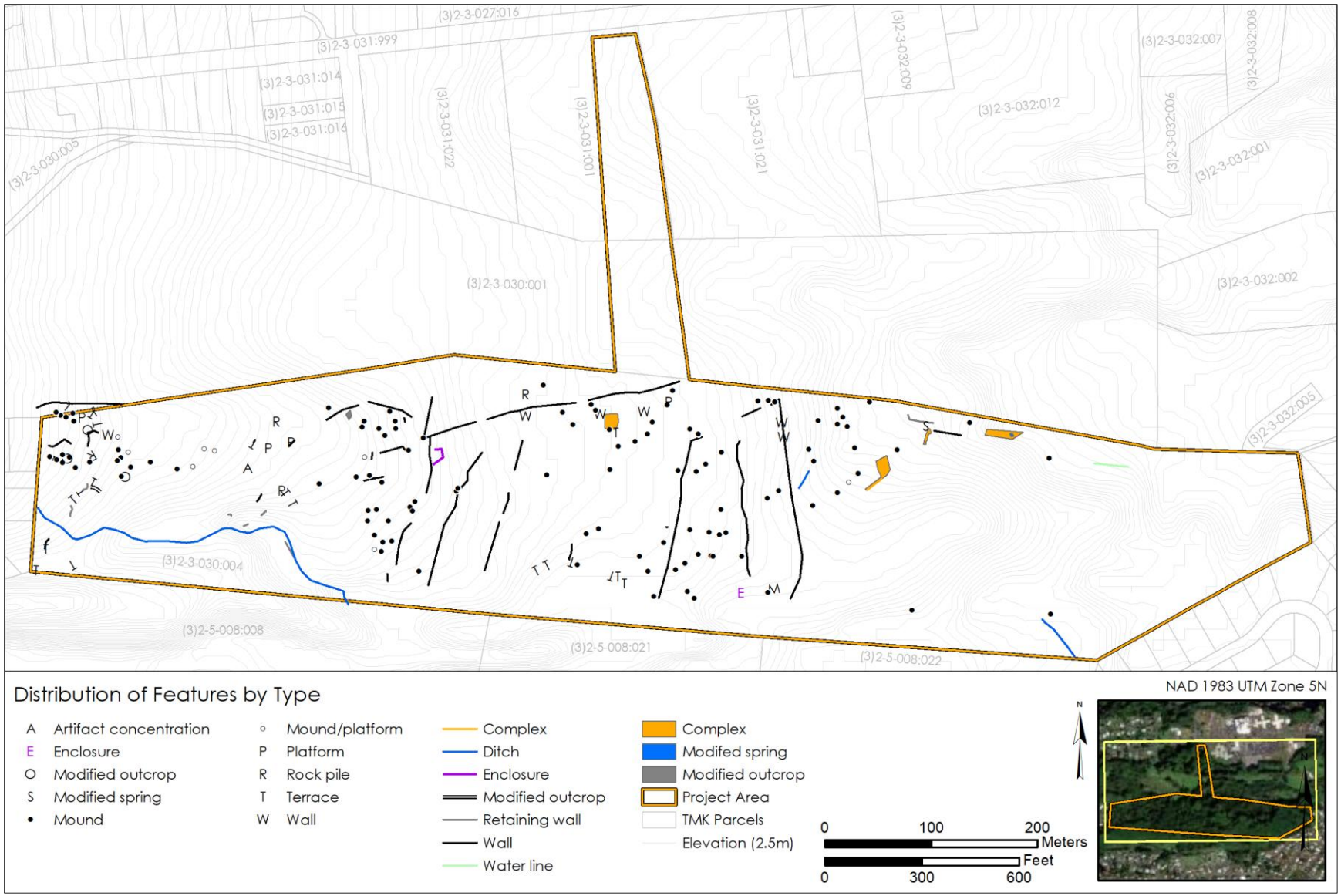

Figure 127. SIHP 50-10-35-18696 Distribution of Features by Type

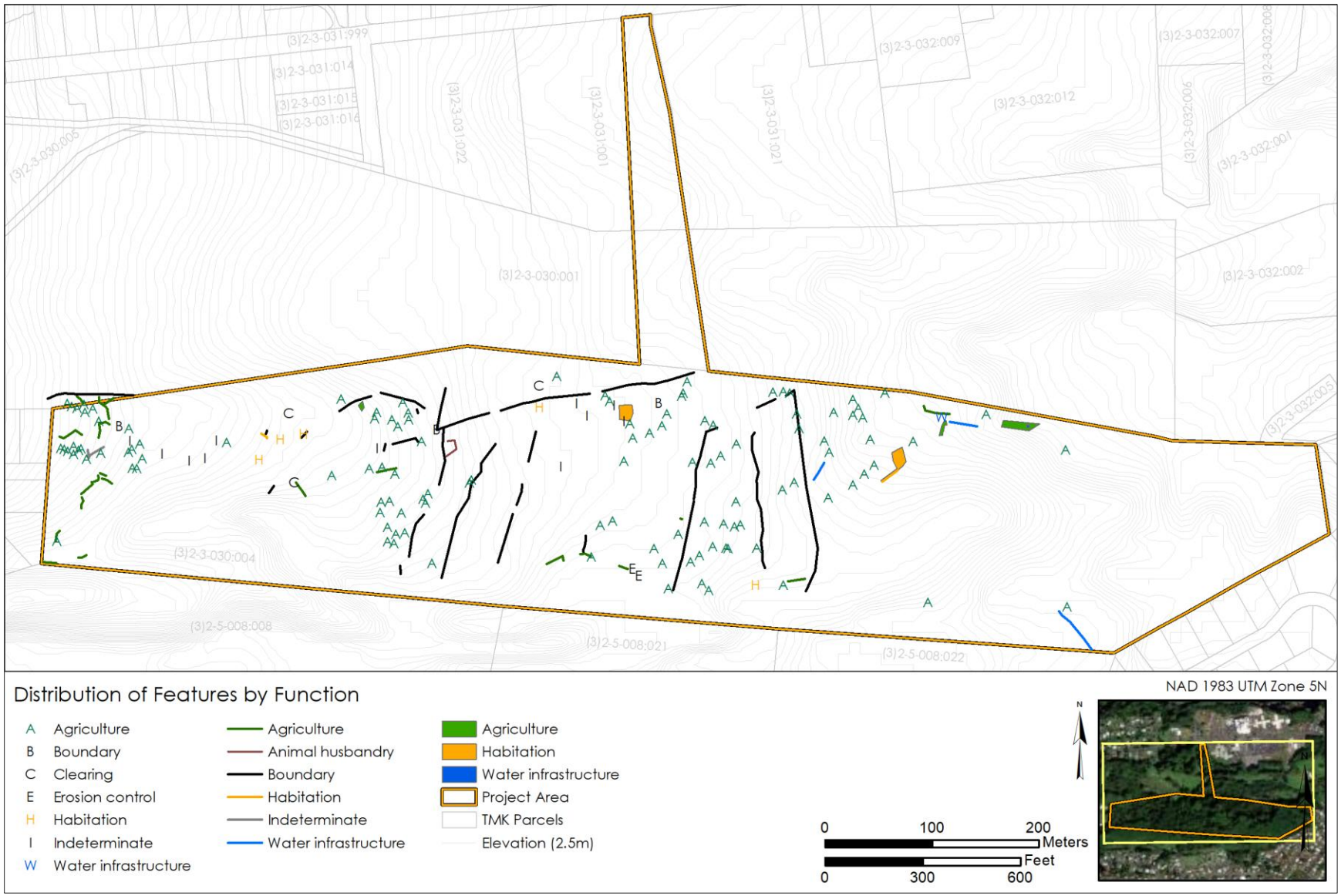

Figure 128. SIHP 50-10-35-18696 Distribution of Features by Function

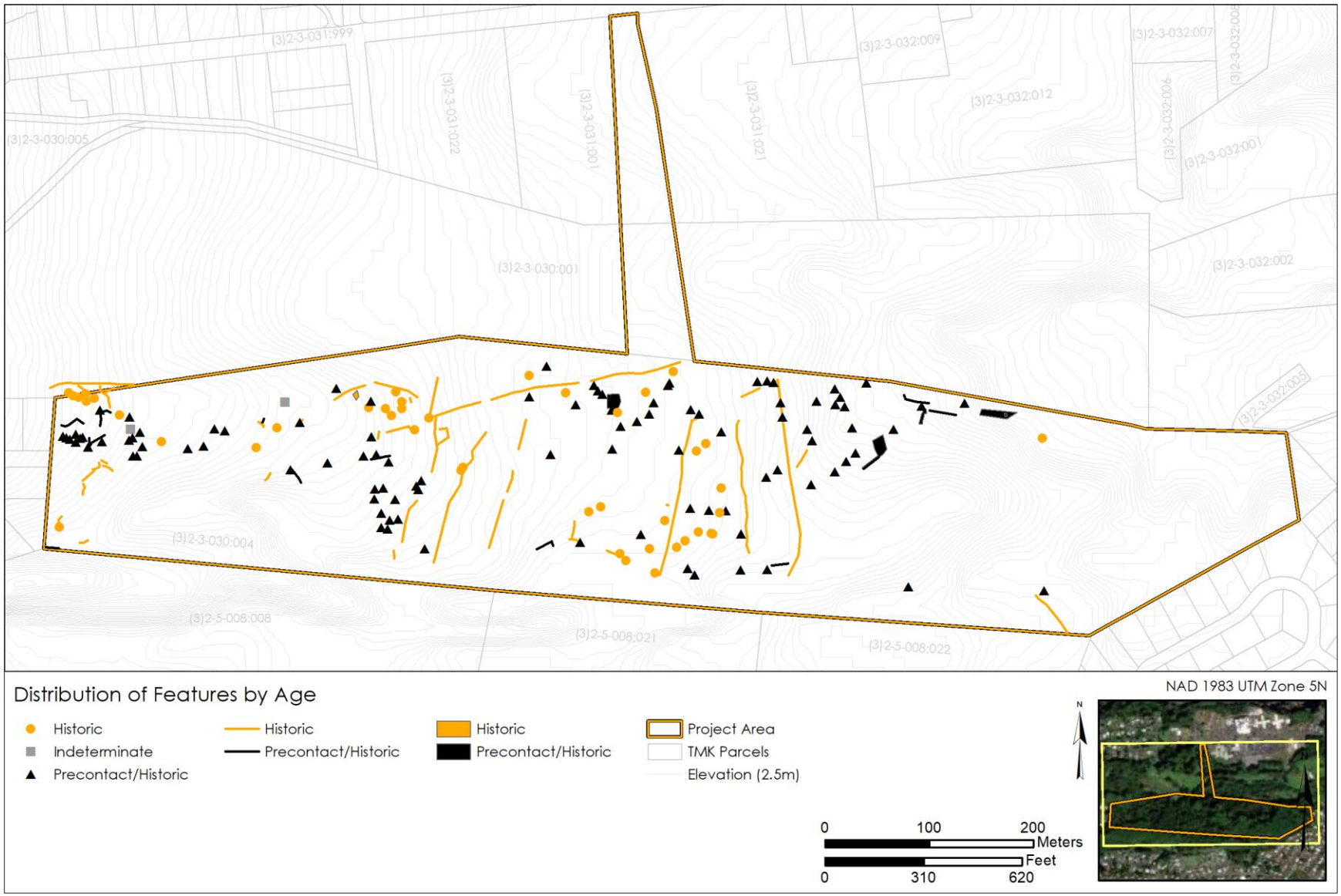

Figure 129. SIHP 50-10-35-18696 Distribution of Features by Age

6.1.3 SIHP 50-10-35-T1 (KAŪMANA SPRINGS HILO CITY WATER WORKS)

SIHP 50-10-35-T1 is a portion of the Kaūmana Springs Hilo City Water Works that is shown on historic maps (e.g., Figure 16). It is located in the northeast end of the Project Area (Figure 130) and consists of two features (Table 20). The site, as observed during the current survey, measures approximately 15 m north-south by 85 m east-west. These dimensions are based on the portions of a partially buried water pipeline that are visible on the ground surface. The buried pipeline extends farther to the east, but because it was buried its exact location was not determined. The site is situated on the gentle northeast slope of Kupapau Hill, surrounded by palm and guava trees.

Feature A is a concrete foundation (Figure 131) that encloses the developed spring and supported a superstructure (the spring house). The spring house was a watertight structure built to protect the spring and its intake from contaminated surface runoff. The foundation measures 6.6 meters by 3.4 meters. It has three standing formed concrete walls. The eastern wall, the most complete of the three, measures about 75 centimeters above the ground surface. The southern wall has partially collapsed. The interior of the foundation is flooded with water and partially filled with silty clay. Historic aerial photographs (e.g., see Figure 20) show that this structure previously had a roof; however, no remnants of the superstructure were observed. Feature B is a buried cast-iron water pipe (Figure 132), intermittently exposed by erosion. It is 12 inches in diameter, and the intermittently exposed portion extends 32 meters roughly eastward between Feature A (the spring house foundation) and Ainako Stream. The current site boundary includes the concrete foundation and the exposed pipe segments. The spring house and pipe were installed ca. 1917 and operated as part of the Hilo water system until 1973 when the Pi‘ihonua Well near Gilbert Carvalho Park replaced it.

The site is in generally fair condition. It is significant under Criterion “a” for its association with the development and operation of the Hilo water system during the period ca. 1912 to 1973, a period when surface springs were used as the town’s water source.

Table 23 SIHP 50-10-35-T1 Kaūmana Springs Hilo City Water Works Features

Feature	Type	Function	Age
A	Concrete foundation	Water infrastructure	Historic
B	Cast-iron water pipe	Water infrastructure	Historic

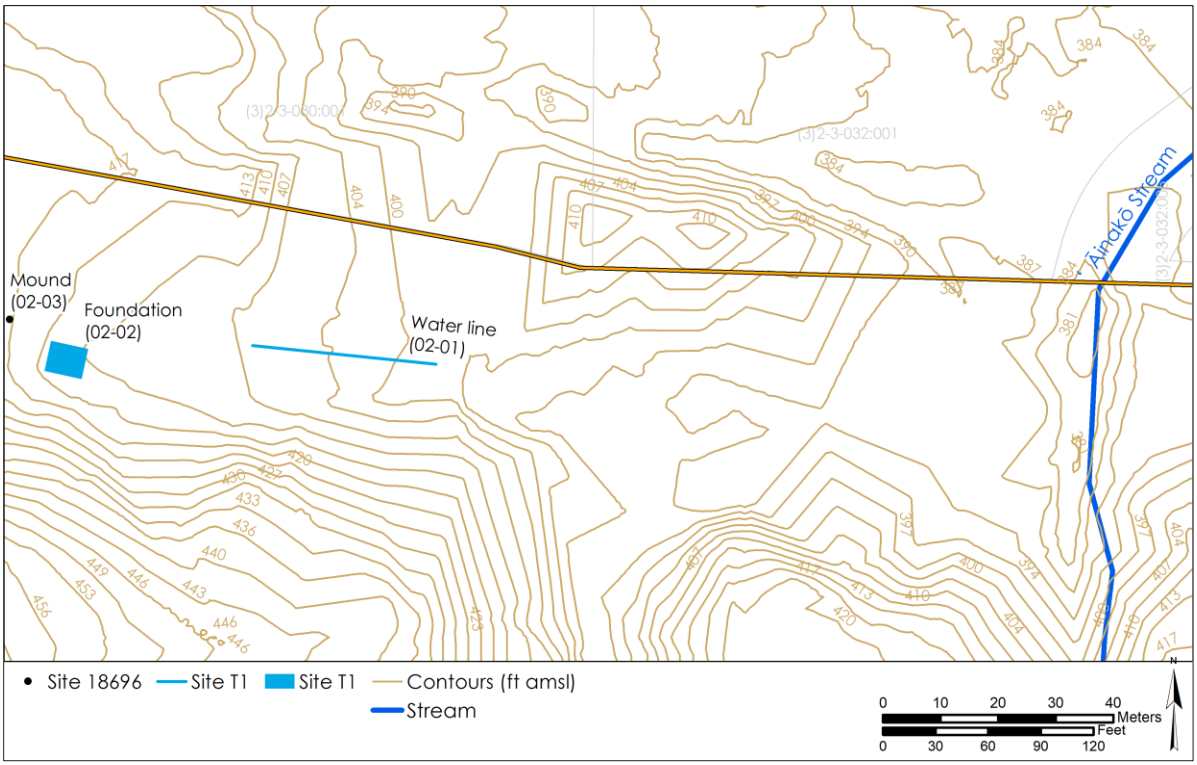

Figure 130. SIHP 50 10-35-T1 Plan View

Figure 131. SIHP 50 10-35-T1 Feature A, spring house foundation, view to the northeast

Figure 132. SIHP 50 10-35-T1 Feature B, cast-iron water pipe connecting the spring house (Feature B) to the Hilo town water system, view to the northeast

6.1.4 SIHP 50-10-35-T2 (KUPAPAU HILL HAWAIʻI TRANGULATION STATION)

Site T2 is the Kupapau Hill Hawaii Triangulation Station[1]. The site is located at the summit of Kupapau Hill at an elevation of 499 feet amsl. The site measures approximately 8 meters by 8 meters. The summit of Kupapau Hill moderately vegetated with guava and palms, with a few large albizia trees. The site consists of three features (Table 21). All three features appear to date to the Historic period. No artifacts or other cultural material were observed at this site.

Table 24 SIHP 50-10-35-T2 Kupapau Hill Trig. Station Features

Feature	Type	Function	Age
A	Hawaii Triangulation Station	Land Survey	Historic
B	Excavated area	Indeterminate	Historic
C	Excavated area	Indeterminate	Historic

Feature A (Figure 133) is a triangulation station used for land surveys. It consists of a 4-inch diameter galvanized pipe embedded in a formed concrete foundation. The feature is located at the summit of Kupapau Hill. The foundation measures 1.4 m by 1.4 m and stands 30 cm above the ground surface. The pipe is centered within the foundation and extends 15 cm (6 inches) centimeters above the foundation. The ground surface surrounding the feature consists of clay loam heavily infiltrated by guava roots. Subangular to subrounded basaltic cobbles and small boulders lie on the ground surface and are embedded in the surrounding soil. The foundation is being undercut by erosion where it abuts Feature B, an excavated area.

Features B and C are irregularly shaped excavated areas located on the summit of Kupapau Hill. Feature B (Figure 134) measures 3.5 m by 3.5 m and is excavated approximately 100 centimeters below the surrounding ground surface. Feature C (Figure 135) measures 2.5 m by 25 m and is excavated approximately 70 cm below the surrounding ground surface.

Triangulation stations like this one are used to mark known points on the geodetic system for land survey. Although the puʻu is indicated in the 1849 map prepared for the ABCFM's Land Commission claim (and named "Puu Mohihi" on that map), the earliest reference to a triangulation station on Kupapau Hill was found on Registered Map 1790 (Loebenstein 1895). That map, which was prepared for improvements to Piʻihonua Road, names the station "Moohihi or Spring" and appears to refer to name given in the Land Commission claim. The current name appears to date to a survey conducted in 1901 (Baldwin 1901b), for the Hilo City Water Head Reservation, which refers to the station as:

…a stone marked +. on top of old kupapau known as Kupapau Hill Trig. Sta…

The map derived from that survey, Registered Map 2058 (Baldwin 1901a), labels the station "Kupapau Hill." The station was also used during the survey for Land Court Application 292 Map 1 (Baldwin 1914), which was prepared for a petition by the Hawaii Evangelical Association's that year to record their title to

[1] This triangulation station should not be confused with the Kupapau 1914 horizontal control, which is located on Kupapau Point, 3 miles southwest along the coast from the village of Kalapana (Mitchell 1930:212–213).

the land. The survey notes on that map indicate that the station was marked with a galvanized pipe. Based on these maps, Feature A appears to have been installed between 1901 and 1914, before which time the station was marked with a "+" carved into a rock. , although the location was used as early as 1895. The station does not appear in the United States Coast and Geodetic Survey's 1930 publication *Triangulation in Hawaii* (Mitchell 1930). This suggests that it was only used for local surveys within the surrounding area.

Although Site T2 is a triangulation station used by land surveyors during the late nineteenth and early twentieth century, research conducted for the current study does not suggest that it was used during the critical period between the Māhele of 1848 and the Boundary Commission hearings of the 1870s, when the Hawaiian government transitioned from the traditional Hawaiian land tenure system to modern land tenure system that uses cadastral surveys to define land parcel boundaries. It is not recommended significant under any criteria.

Figure 133. SIHP 50 10-35-T2 Feature A, Hawaii Triangulation Station, view to the south

Figure 134. SIHP 50 10-35-T2 Feature B, excavated area, view to the north

Figure 135. SIHP 50 10-35-T2 Feature C, excavated area, view to the north

7 Discussion

Two previously identified sites and two newly identified sites were identified in the Project Area. Together, they document the connection of the Project Area to three historic themes: augmentation of water resources in Punahoa makai, agricultural use of the upper kula in Hilo, and changes in land tenure.

7.1 Supplying Water to Punahoa Makai

The people who lived in Hilo One were able to depend on rain-fed agriculture to support themselves for centuries. The organized system of kalo and other fields depicted on Malden's (1841) chart of Hilo were likely watered naturally by rainfall, but by the 1820s may have been augmented by irrigation. Augmentation of the rainfed agriculture in Punahoa may have happened in response to a variety of factors, including population growth in the late Precontact period as well as the increasing urbanization of Hilo Town in the 19th and 20th centuries. The testimony provided by Kaleioholani in the 1917 Hilo Boarding School Ditch water rights case suggests that by 1825, when Malden surveyed for the chart, two major ʻauwai were already in place. These were the 17th century ʻĪ ʻauwai, which furnished water to the village of Hilo, and the early 19th century Kamehameha ʻauwai, which suppled the Mōʻīʻs court near the mouth of the Wailuku. At this time, according to William Ellis (1825), some 2,000 people lived along Hilo Bay. The springs and streams in the project area were a part of the larger ʻauwai network (Noah Gomes, personal communication, August 19, 2025). The stream now known as Ainako Stream was known as either "Malokioi" or "Molokioi," and that its course may have been altered to join with Mōhihi spring and another spring named Waipāhoehoe, and flow north through what is now Carvalho Park towards the Wailuku River. In doing so, these springs also seem to have contributed to the ʻĪʻauwai system in Piʻihonua and Punahoa. A different history of water development, however, was given by Frederick Lyman in the 1917 Hilo Boarding School Ditch water rights case. Lyman claimed that the Hilo Boarding School Ditch was created in 1813 when Joseph Goodrich improved an ʻauwai built by the konohiki named Aki.

The testimonies by Kaleioholani testimonies, though conflicting in their history and details, illustrate a shift in water needs in Hilo Town by the early nineteenth century. For example, Kaleioholani states that when the ABCFM approached his grandmother for the right to dig the Hilo Boarding School Ditch, it was for household purposes, a need beyond traditional irrigation for agriculture. The water from the ditch was eventually used for a variety of industrial purposes as well, for example to power a sugar mill and hydroelectric generators. The timing of the construction of the ʻauwai built by Aki coincides with Hilo's growth as an emerging commercial port. This shift, from ʻauwai for irrigation to ditches for domestic and industrial use, occurred as part of a long-term process changing motivations, and technological evolution from open traditional ʻauwai to spring-fed buried water mains, and ultimately to the system of wells that provide to the system today. Two sites identified in the Project Area, the Hilo Boarding School Ditch (SIHP 50-10-35-14947) and the Kaūmana Springs Hilo City Water Works (SIHP 50-10-35-T1) illustrate this long-term process.

7.1.1 THE HILO BOARDING SCHOOL DITCH (SIHP 50-10-35-14947)

The Hilo Boarding School ditch (SIHP 50-10-35-14947) is a long, linear historic property that extended both mauka and makai of the Project Area. Only a relatively short portion of the ditch is present in the

Project Area, but this portion demonstrates some engineering techniques typical of ʻauwai in Hilo. Additionally, the testimony of Kaleioholani in the 1917 water rights case strongly suggests that this portion of the ditch, located above the Hālaʻi Hills, could be a part of the ʻĪ ʻauwai originally dug in the 17th century. The ditch, based on historic maps, the ditch was approximately 4 miles long, extending from Waiele Falls to the Hilo Boarding School makai of Hālaʻi Hill. Some portions of the ditch outside the Project Area have been documented archaeologically. A portion of the ditch at the base of Hālaʻi Hill documented by Athens (1982:8) during a reconnaissance survey about 1 kilometer makai of the current project area:

> *… still visible running along the base of Hala'i Hill. In this remnant section it measures approximately 1 meter wide at the top and is 40 cm deep.*

Another portion of this ditch was identified approximately 700 meters makai of the project area, by (Jensen 1991). That portion of the ditch was described as:

> *Site 14947 is a ditch system with one primary channel which remains partially intact. The primary channel is the Hilo Boarding School and Old Mission Ditch previously documented by Kelly and Athens during their study of the proposed Alenaio Stream Flood Damage Control Project Area (Kelly and Athens 1982 Figures 11-12). The ditch is early historic and probably also prehistoric.*
>
> *The intact ditch segment enters the project area immediately west of the uppermost of the three Hala'i Hills (Puuhonu) (see Figure 1). The ditch, which averages 1 to 1.25 m in width and from 0.40 to 0.75 cm in depth, follows the approximate 304 contour line around the base of Puuhonu cinder cone, and then proceeds easterly around the base of Ope'ape'a, the second of the three Hala'i Hills. Portions of the ditch within Ope'ape'a area have been stone- and concrete lined in order to prevent down-cutting and erosion adjacent to existing residential subdivisions. No features of any kind and no artifact concentrations were observed along this segment of ditch, which terminates within the northeastern comer of the project area at a point just south of the intersection of Komohana and Waianuenue Streets. (Jensen 1991:5)*

Wolforth (1999:29) inspected a portion of the Hilo Boarding School between Hālaʻi Hill and Puʻu Honu (the farthest mauka of the three Hālaʻi hills, which he called Pōhakunui):

> *The HBS Ditch is clearly present along the northern one-quarter of Hala'i Hill starting near the intersection of Hala'i and Haili Streets, and ending at the medical center parking lot facing Komohana Street. This roughly 200 meter segment of the HBS Ditch is not at the base ofHala'i Hill Rather, it is at a contour of the hill where the steep upper slope changes to a more gentle lower slope. The flat terrain at the base ofHala'i Hill is about 3.5 meters lower than, and 10 meters beyond, the HBS Ditch. Due to its location tangent to the sloping terrain, the lower bank of the roughly 2-meter-wide channel is about 50 centimeters high, and the upper bank is about two meters high. An alignment of rocks along the lower bank is occasionally visible above the silts in the channel. It is likely that the channel was deeper prior to abandonment and siltation, and that in situ rock linings occur elsewhere along the ditch.*

The portion of the ditch documented in the Project Area helps to archaeologically confirm the physical extent of the ditch. Most historic maps generalize and simplify the ditch's course, and a full representation of the ditch based on metes and bounds does not appear to be available. The current fieldwork confirms that the ditch exits the County-owned parcel by joining the tributary of Ainako Stream that flows south of the Project Area. It also the mapped extent of the ditch right of way documented in Land Court Application 292. Furthermore, the current fieldwork demonstrates the integration of natural watercourses into the ditch design. This is similar to the Piʻihonua Ditch, which similarly takes advantage of a natural drainage

channel above Hilo Intermediate School (Barna 2017; Barna and Rechtman 2015; Wolforth 1999). Lastly, the current fieldwork documents the fate of the ditch after it was no longer needed to supply water to the Hilo Boarding School in the mid-20th century. The portion in the Project Area was isolated from its source and any surviving upstream segments by the construction of the Ainako Terrace subdivision, which graded and filled over the ditch while creating residential lots and the bottom end of Kilikina Street. Similarly, development downstream in the Kaumana Gardens, Crescent City Heights, adjoining subdivisions, and the neighborhood makai of Hāla'i Hill likely altered or destroyed portions of the ditch.

7.1.2 HILO CITY WATER WORKS KAŪMANA SPRINGS INTAKE (SIHP 50-10-35-T1)

This unassuming concrete foundation and buried water pipe are located at the focal point of decades-long tension between a large landowner, the Hawaii Evangelical Association, and the local government over the needs of the growing town and fair compensation. Local scholars have given some attention to the 1913 lawsuit between the Hilo Boarding School and the Territorial government over the amount of water taken out of the Wailuku through the Hilo Boarding School Ditch (Canevali 1977; Wolforth 1999), but the related conflict between the County and the Hawaii Evangelical Association over the spring water at Site T1 remains something of a footnote to this history. The most recent attention given to the incident was Warshauer's (2003, 2005a, 2005b) brief newspaper pieces from two decades ago.

The conflict had its roots in the discovery of contaminated spring water used by the Hilo Railroad in 1905, which prompted the County to consider acquiring the land surrounding the springs to prevent future contamination of the water supply. Increased needs over the following decade led County officials to attempt an end-run around the Hawaii Evangelical Association first by purchasing the spring's water from the association's tenant, the Hilo Sugar Company, and then continuing to take the water after the Hilo Sugar Company's lease had ended. The conflict grew to a decades-long legal fight, ultimately resolving in the County's favor with the acquisition of the 60 acres that make up most of the Project Area. The site was ultimately abandoned in the early 1970s when the County water system brought the Pi'ihonua Well on line to replace the surface waters sources at Kaūmana Springs.

The results of the current study at Site T1 clarify one detail on the circa 1913 map provided by the County of Hawai'i Department of Public Works (Figure 130), which has been used by several researchers (Barna 2017; Barna and Rechtman 2015; Jensen 1991; Kelly and Athens 1982; Wolforth 1999). Who produced the map and why remains unknown. Inquiries at the Hawai'i County Department of Public Works were unsuccessful in answering this question. Three different age estimates have been given for the map by archaeological researchers. Marion Kelly thought the undated map was prepared in the early 1900s (Kelly and Athens 1982). Peter Jensen (1991) estimated that it was produced circa 1913. Tom Wolforth (1999) understood the map to have been produced around 1920. Assuming that the new intake for the Hilo Water Works was drawn on the map at the time it was produced (not added later), it is likely that the map was drawn between 1913 and 1917, when the County began taking water from Hilo Sugar Company's lease of the spring, but before the County acquired the parcel. The archaeological evidence, however, is related to the way the map depicts the "New Intake" for the Hilo Water Works. As recorded during the current study, Feature A (the spring house foundation) is located about 80 meters to the west of the building that is depicted on the map (Figure 136) as the "New Intake." No archaeological or architectural remains were found in that location. By contrast, Registered Map 2058 (Figure 137) (and the Public Works map) both show the spring to be in the location where Feature A was identified, allowing for some variance due to GPS and surveying accuracy. It is possible that the map pre-dates the creation of the

water shed at Site T1 and shows a proposed location for the new intake. Despite its current condition, the spring house foundation and piping that are visible in Project Area offer a unique opportunity for public storytelling about wai, the public trust, and early 20th century politics in Hilo. Although one wall of the foundation is partially collapsed and the superstructure is missing, its location makes it a good candidate for preservation and interpretation. Public interpretation of an interpreted or restored spring house could be included in a recreational trail. Additional archival research may reveal more details about the conflict and negotiations between the HEA and the County over the springs.

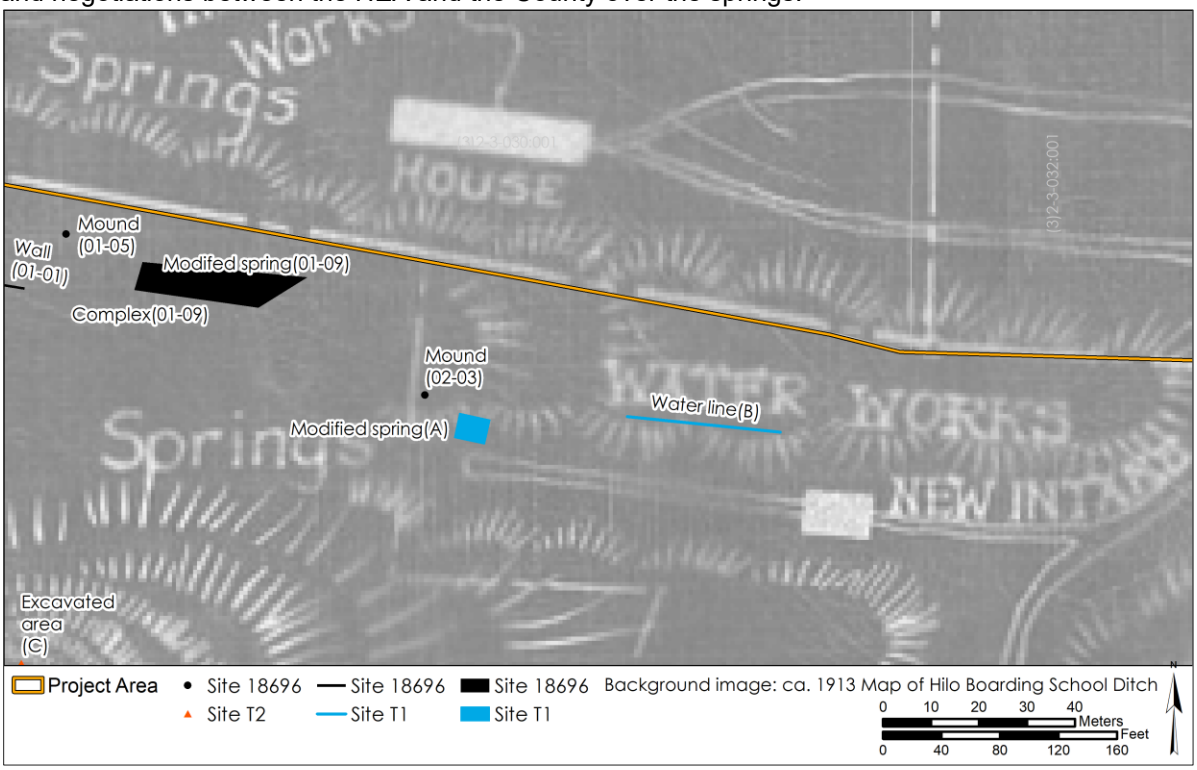

Figure 136. Circa 1913 map with identified features of SIHP 50 10-35-T1

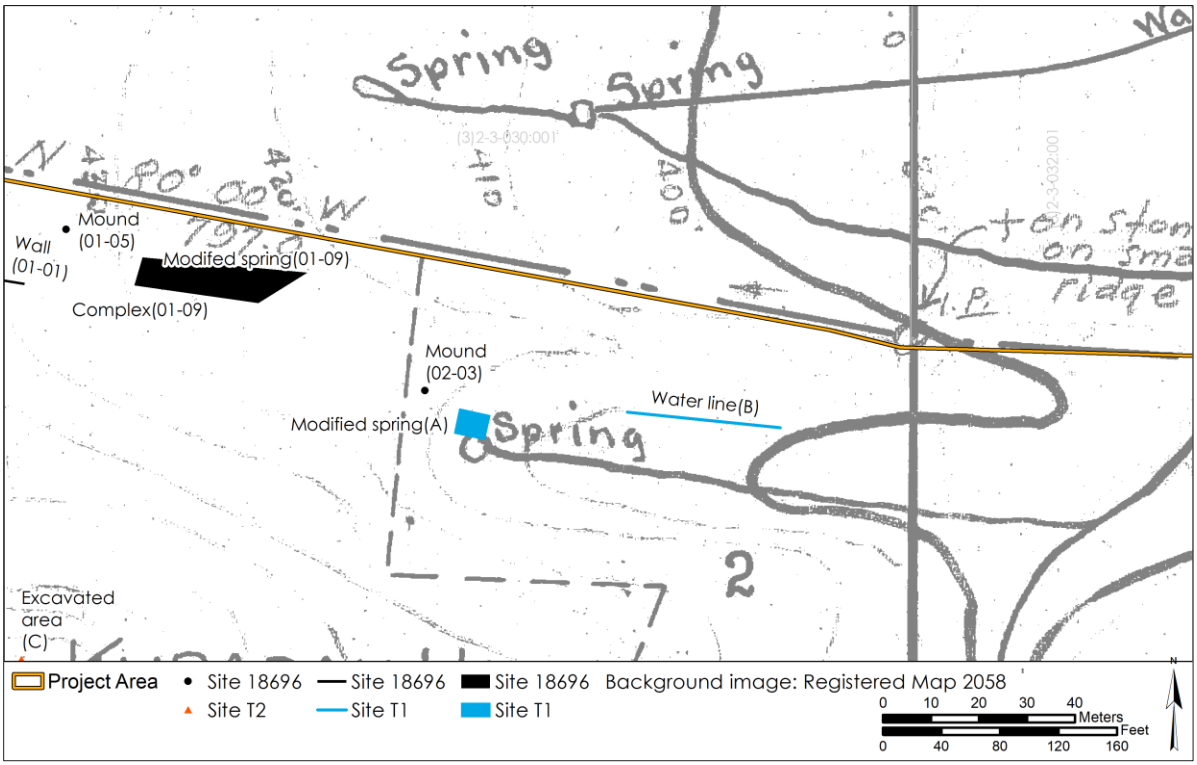

Figure 137. Comparison of identified feature of SIHP 50 10-35-T1 with Registered Map 2058 (Baldwin 1901a)

7.2 Agricultural Use of the Upper Kula in Hilo

McEldowney's (1979b) model of settlement patterns and land use in Precontact Hilo places the Project Area in the "Upland Agricultural Zone," where scattered huts with adjacent garden plots and small groves economically beneficial trees ascended to the edge of the forest. Her model is based on the earliest descriptions of the area from 1820. More recent modeling by Gon et al. (2018) suggests that Project Area was on the margins of intensive traditional land use. Estimates of how far inland the forest edge was in the past vary slightly. In 1826, Joseph Goodrich (1826:4), writing generally of the Hilo area, placed it at 5 or 6 miles inland, while Titus Coan (1882:46) recounted a distance of 3 to 5 in 1837 or 1838, likely in Punahoa. It should be noted that these estimates were made in the latter years of Hawai'i's sandalwood trade, and after the introduction of ungulates—note the account by Samuel Hill of meeting branded cattle near the Project Area elevation in 1848 (Hill 1856:290), almost two decades after the depredations of wild cattle had led to the introduction of ranching on Hawai'i Island (Barna 2013; Bergin 2004; Wellmon 1973). The distances to the forest edge that were noted by Goodrich and Coan are consistent with the Māhele era survey of Punahoa prepared for the ABCFM on Registered Map 1790 (Lyman 1853). Thus, it is unknown whether this forest edge was the same as before the 1790s, but the potential existed for traditional agricultural use in the Project Area.

7.2.1 DETERMINING THE AGE AND INTENSITY OF AGRICULTURE

Only one archaeological study has been conducted near the Project Area in a location with comparable elevation, soils, and terrain to the Project Area. A reconnaissance survey of a property below 'Ākōlea Road by Corbin (2006). found similar features to those in the current Project Area: numerous mounds, a

stone enclosure, a C-shape, and a terrace, along with 100 to 200 more mounds in the surrounding area. While Sinoto (1978:3) proposed that the most of the features he observed in the current project area were "characteristic of an aboriginal (prehistoric) agricultural complex", Corbin (2006) interpreted features that were not mounds as potentially be left over from Precontact use of the area, but the mounds were interpreted to be more recent, likely created by clearing sugarcane fields. Because the surrounding lands in Piʻihonua, Punahoa 2, and Punahoa 1 that had sufficient arable soil were used for sugarcane cultivation there are no comparative studies to rule out, or to confirm, that Precontact archaeological sites have survived in this part of Hilo.

The majority of the identified features in the Project Area, being rock mounds, provide limited diagnostic characteristics that can be used to determine age of SIHP 50-10-35-18696. The age of a mound is difficult to determine based on form alone, despite some attempts to correlate the quality stacked edges with different agricultural contexts such as Historic sugarcane fields or Precontact agriculture (Clark and Rechtman 2016; Hunt and McDermott 1993). Multi-generational Punahoa resident Leilehua Yuen (personal communication, June 17, 2025) noted that in a relatively wet location like the Project Area, taro and sweet potato could be grown in rock mounds as long as proper drainage could be maintained around the plants, to "keep their feet dry." Radiocarbon dating of appropriate organic material recovered from the right kinds of stratigraphic contexts associated with the construction of the mounds may provide a range of years in which they may have been built (Rieth and Athens 2013) —the best chance of this would be to find organic deposits created during a vegetation-clearing event just prior to mound's construction. Budget limitations for the current study did not permit this type of data collection, but future data recovery could potentially provide information to address this question.

Whenever the native forest in the Project Area was opened up into the upland kula, agricultural practices would have had to been adapted to the wet conditions typical of the area. Planting methods for dryland kalo and ʻuala would have needed to provide adequate drainage to prevent damage to corms and tubers. Rock planting mounds and earthen mounds are a documented method for planting in such conditions (Handy et al. 2020:141, 173, 726). Tenant farmers might also have taken advantage of the springs and streams to grow irrigated kalo and other crops as part of the larger integrated agricultural system within Punahoa. Small ʻauwai would have been built to distribute the water from these sources. It is likely that the people tending these crops would have built small hale or shelters in these fields. Meanwhile, from the 17th century on, the ʻĪ Ditch (i.e., the Hilo Boarding School Ditch) would have augmented the flow of the stretch of the Ainako Stream tributary at the southern end of the Project Area.

At some point, possibly during the tenure of the ABCFM/HEA, the Project Area was divided into lots for tenant farmers. The lots depicted on the turn-of-the-century maps might use boundaries of traditional kīhāpai that went unclaimed in the 1850s. The rock walls that were used to define the lots, however, seem to be more recently constructed and suggestive of Western conceptions of property boundaries. It is interesting to note the presence of an "extra" wall not shown on historic maps extending through Lot 10. In building these walls, it is possible that older archaeological features were robbed of stone. Planting and maintenance of the fields may have involved dismantling and rebuilding clearing mounds, as described by (Hunt and McDermott 1993). Another piece of information suggesting a more recent origin of the walled lots is that they are numbered on the historic maps, not named as a traditional kīhāpai or other planting area would have been.

The results of the current field work support a scenario in which the features observed reflect late nineteenth century and early twentieth century tenant farming on lots leased out by the HEA. The artifacts

found throughout the site only provide evidence of use during the end of the nineteenth century and the decade or so before the parcel was made part of the Hilo Water Reservation in 1917. The presence of metal farming tools (Isolated artifact A10-1 and the hoe head found at Feature 09-09) clearly indicate Historic period farming was conducted here, which undoubtedly required field clearing and maintenance. The features built of stacked rock—the mounds, platforms, modified outcrops, etc.—are all consistent in their construction and placement on the landscape to be evidence of clearing for agriculture, but not in any way that distinguishes itself from Historic period agricultural practices. The terraces constructed near the edges of the Ainako Stream tributary (Features, 05-03, 09-06 through 09-10, 10-06, 13-14, 13-08, 14-06, 15-22, and 15-23) resemble erosion control modifications observed at the edges of sugarcane fields elsewhere in Hilo, for example, on former cane fields behind the old Hilo Hospital site (Barna et al. 2023). This does not rule out the possibility that they are older.

There is more concrete evidence of when the Project Area was inhabited than when agricultural use began. Of the habitation features (Features 03-09, 08-05, the 14-03 complex, and possibly 05-01) none were associated with typical Precontact cultural material (at least on the surface).Again, artifacts associated with habitation features indicate that they were occupied during the late nineteen and early twentieth century. At least one building or structure appears on the circa 1913 map of the Project Area. While no archaeological feature was found in the exact location indicated by the map, the habitation complex composed of Features 14-02, 14-03, 14-04, and 14-05 is situated nearby, about 35 meters to the east. Given some of the other apparent inaccuracies on this map (e.g., the location of the water works intake, see Section 6.1.2 above), it is reasonable to infer that the building shown on the map is this habitation.

7.2.2 RE-EVALUATION OF LAND USE HISTORY IN THE PROJECT AREA

Sinoto's (1978) reconnaissance survey was an important first step toward reconstructing the history of the Project Area. The writers of the environmental assessment for the Kaumana Springs Wilderness Park (Walters, Kimura, and Associates, Inc. 1976) described the area as extensively altered by historic-period agricultural activities, which they posited had destroyed any archaeological or historical sites in the area. This flawed conclusion was based on a lack of actual archaeological fieldwork, as well as an assumptioni that only "ancient" archaeological sites had any value. On the basis of a one-day reconnaissance conducted with Eric Komori, Sinoto (1978:2) came to the opposite conclusion:

> *… much of the interior area is unaltered, and that some of the remains, such as walls and mounds, exhibit characteristics that are more typical of prehistoric construction than of historic construction.*

Sinoto's survey was essential to debunking the idea that there were no archaeological remains, but the conditions on the ground made it difficult for him and Komori to survey all 117 acres of the proposed park area. Many portions were covered with impassable thickets of uluhe and Christmasberry (wilelaiki), which hindered their ability to walk the entire area, let alone identify and document features:

> *Although the clusters of sites appear as discrete, spatially isolated units, the sited areas are probably continuous and could be considered as components of a single extensive complex. The apparent discontinuity of sites as described in this report is primarily the result of the physical limitations imposed on the survey by dense vegetation cover. The false staghorn fern (Dicnanopteris linearis) and wilelaiki (Schinus terebinthifolius Raddi), in particular, were often impenetrable and prevented*

> *continuous transects. Thus, more sites may be present within those areas that are densely vegetated.(Sinoto 1978:3)*

Without the benefit of relatively open ground beneath today's alibiza and guava canopy, Sinoto and Komori were only able to obseve a small portion of the features present in the Project Area (Figure 138). The poor visibility also made it difficult for them to accurately map the locations of the features they were able to find. Their difficulties appear to have been substantial. Only 30 of the features identified during the current study are contained with the cluster areas that they mapped. Another 58 features are located in the areas marked "dense vegetation" by Sinoto; that they would go undetected is no surprise. What was unexpected were the 93 additional features identified by the current study outside of Sinoto's clusters and vegetated areas. Sinoto's report alludes to the possiblity of undetected features, but is phrased in such a way to imply that they would primarily be expected in the vegetated area. Perhaps he simply understated how poor the visibility was outside of the six clusters he identified.

Despite the difficulty in moving through their survey area, Sinoto and Komori were able to identify a fairly good representative sample of the features in the Project Area. In Sinoto's Cluster 2, for example, the remnants of terraces and intact portions of a stone-reinforced 'auwai are a decent description of some of the features identified in Lots 14 and 15. Based on the current results, the stone-reinforced 'auwai may have been the Hilo Boarding School Ditch (SIHP 50-10-35-18696).

The location of Cluster 3 does not match very well with the major grouping of mound features in Lot 12, but the description of "several stone mounds and cairns" aptly summarizes this grouping, and the large elongate platform he lists could be Feature 12-13, but the feature is too covered in ferns in his photograph to make a positive identification. Sinoto also mentions a low stone wall that parallels the present fenceline along the southern boundary; the current survey did not encounter such a wall in that location.

The large Cluster 5, simply summarized by Sinoto as terraces, platforms, mounds, cairns, and 'auwai, maps onto the locations of 29 features identified in Lots 4, 5, 6, 7, and 8. Eight other features are within a few meters of the cluster as it appears on the site location map. With the exception of 'auwai, which were not observed in this area, the current study and Sinoto's generally match up in terms of what was observed in Cluster 5.

What is interesting, and perhaps telling of the difficulties of the 1978 reconnaissance survey, is the amount of features encountered outside of the clusters. Most notably, the relatively dense collection of features in Lot 3 and the northern edge of Lot 1 were not reported. These include the distinctive habitation feature 03-09 and the modified springs Features 03-08 and 01-09E. It is also notable, but not surprising given the ground cover, that no portable artifacts were recovered. It is likely that none were observed. Another element of the built landscape in the Project Area that is absent from Sinoto's site map are the rock wall segments identified during the current study. At least some of these were observed and noted as historic cattle or boundary walls.

The preliminary conclusions of Sinoto's reconnaissance reflect his goals to reassess the initial representation of the proposed Wilderness Park parcel's lack of archaeological potential. By identifying mounds, plaforms, terraces, and 'auwai, he established a hypothesis that, contrary to the environmental assessment's conclusion, it was possible that evidence of a deeper past in the Project Area had survived in the archaeological record than had been assumed. He encouraged additional documentation and study of the features in the Project Area, but ultimately concluded that the mounds, terraces, and platforms are fairly common features with little additional research potential. He did, however, recognize their potential

for public interpretation, given the opportunity to incorporate the features into a minimally-developed public park.

The current study builds on the results of Sinoto's (1978) reconnaissance to present a more nuanced interpretation of the archaeological features of SIHP 50-10-35-18696. There are several reasons for this. One of them is that the current study benefits from a more complete survey coverage than Sinoto and Komori could accomplish in the dense uluhu and Christmasberry. Another is that over the past 45 years, cultural resource management professionals have researched sugarcane and other historic period agricultural clearing features from an archaeological perspective (Clark and Rechtman 2016; Hunt and McDermott 1993). Much of Sinoto's limited observations remain valid. Considered holistically, however, the features in the project area more closely resemble the material of expressions of late-19th and early 20th century agricultural practices and livestock management, with a few features serving to contribute to make this a "persistent places" (Schlanger 1992).

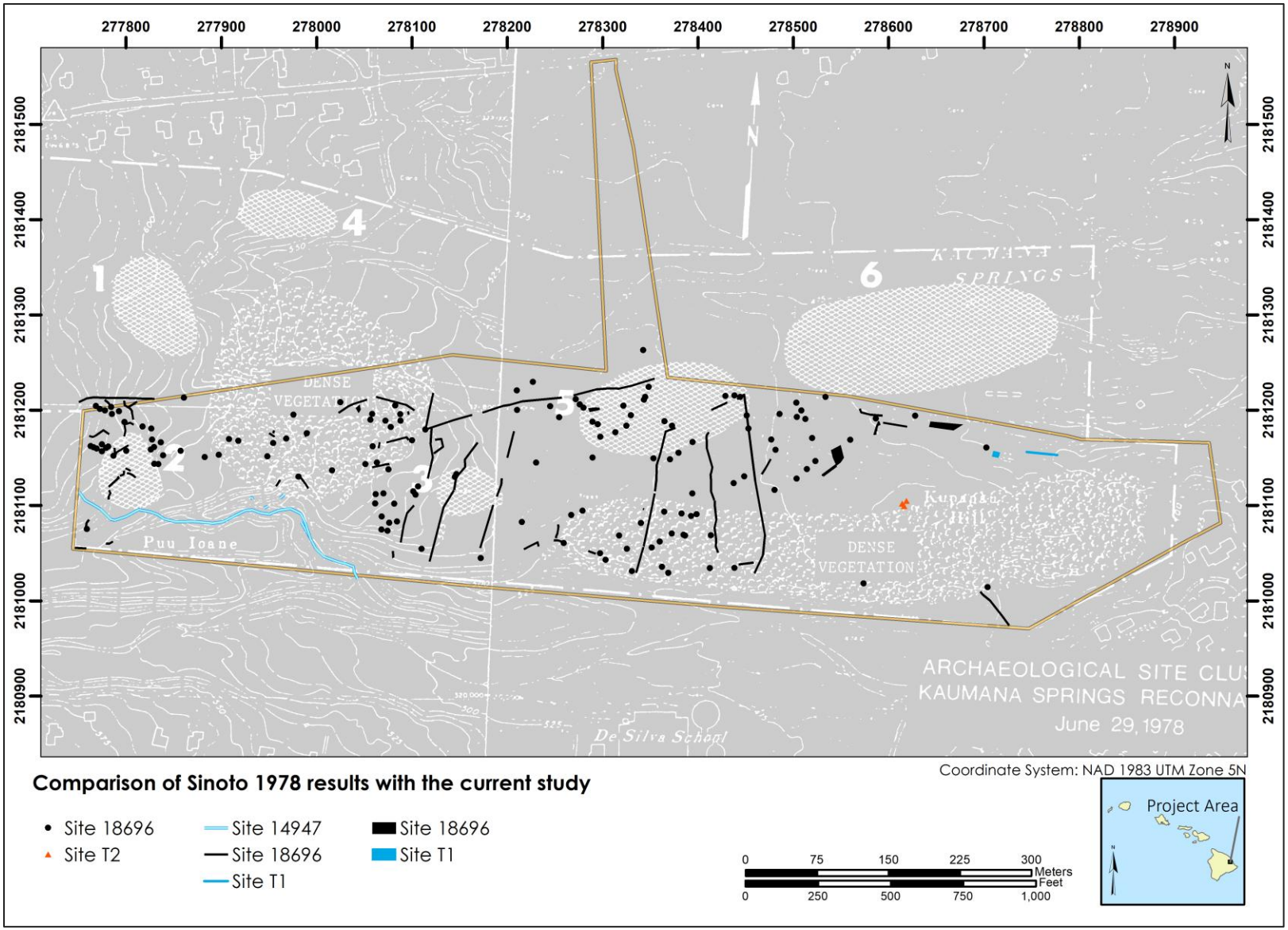

Figure 138. Comparison of Sinoto's (1978) results with the current study

At the heart of this interpretation is the combination of the archaeological evidence of rock walls and the documentary evidence of the division of the Project Area into lots, first depicted around the turn of the 20th century on Registered Map 2058. This alone does not mean that all features withint he project area must date to the same period as the walls; the islands are criss-crossed with rock walls built around, over, and with rocks taken from older archaeological features. If there were older built features in the project area, it is almost certain that the rock walls in the current Project Area were built in part from material robbed from them. Additionally, any existing features inside the lots that were useful or at least not in the way might be retained. If, on the other hand, the older constructed features were incompatible with the tenant's plans, those features would likely be dismantled and the rocks either reused or disposed of.

The differential distribution of rock mounds and other features within the walled historic lots suggests that it is ths latter scenario that occurred. Some historic lots, like the southern half of 3, 4, 6, 7, 8, 9, 10, and 11, are almost are fully cleared, while others such as 12, 14, and 15 are relatively packed with mounds and other agricultural feaures. The flattest land appears to be the most cleared. It could be that these historic lots were the ground under cultivation described by the *Hilo Tribune* in 1905, possibly for sugarane if the soil depths and quality were adequate then. Other historic lots, with less soil, may have been cleared for pasture, as suggested by the mid-19th century observations of Samuel Hill (1856), the statements made by the Deputy County Attorney William Heen that the land was of "no great value" (Hilo Daily Tribune 1914a), and recollections of Leileihua Yuen (personal communication, July 17, 2025). Another line of reasoning in support of a more recent age for some of the mounds comes from Hunt and McDermott's (1993) documentation of rock mound maintenance by plantation workers. Their conversations with plantation works found that healthy field maintenance involved dismantling and rebuilding clearing mounds to rid them of vermin and rubbish. Thus, it is likely that the arrangement of mounds in the Project Area observed today was created during the early 20th century by the tenants of the 15 historic lots.

Another line of evidence about the relatively recent occupation of the Project Area are the habitation features. At least one (the complex containing Features 14-02, 14-03, 14-04, and 14-05) is close to a building that is drawn on an early 20th century map (Figure 139), but no other early map. In the case of that feature, it can be confidently asserted that the habitation was used at that time. At all the other habitation features, no Precontact artifacts were observed, nor were surface expressions of middens. Only late 19th and early 20th century artifacts were found in assocaition with habitation features. This indicates that these features were also occupied during that period. Other evidence would be needed to determine how much older the habitation features might be.

Water features, though, seem to hint at older past. The puna wai in the Project Area could very well have made for a persistent place here. In this case, the spatial relationship between the springs and other features suggests the possibility that they have a deeper history of use than the Historic agricultural lots. This is because the historic lot boundaries do not appear to structure the distribution of the features near the springs. The features near the modified springs 01-09E and 03-18 appear to be built without regard for the historic lot boundary between Lots 1 and 3. They effectively form their own cluster that extends across the artificial lines that create each historic lot. These features may predate the division of the Project Area into lots, and that features in Lots 1 and 3 may be associated with an older occupation related to the springs. The material evidence at the habitation feature 03-09 only demontstrates Historic period use of the site, but additional investigation of that feature or others in this part of the Project Area could be useful to clarify this question.

Based on the evidence and this line of reasoning, SIHP 50-10-35-18696 is interpreted to represent an agricultural landscape last used during the early 20th century for small-scale agricuture and livestock husbandry by at least four different tenants of the Hawai‘i Evangelical Association. These small-scale agrictultural operations occurred on fifteen historic lots that had been used to divide up the HEA’s land on the located between ‘Āinakō Stream and the Government land in Pi‘ihonua. This land was not optimal for growing sugarcane, and the mauka boundary of Lot 15 likely coincided with the beginning of more suitable lands. The Historic period agricultural practices, however, do not preclude earlier use of the land. The multiple springs in the makai portion of the project area almost certainly made it a “persistent place” on the landscape with its readily available fresh water. It stands to reason that there would have been a human presence at the springs, and it is possible that one or more of the habitation sites could also have been used much earlier than the surface archaeological expressions suggest. A more complete understanding of the time depth of Hawaiian use of the Project Area would require additional archaeological investigation, as well as additional archival and possibly oral history research as well.

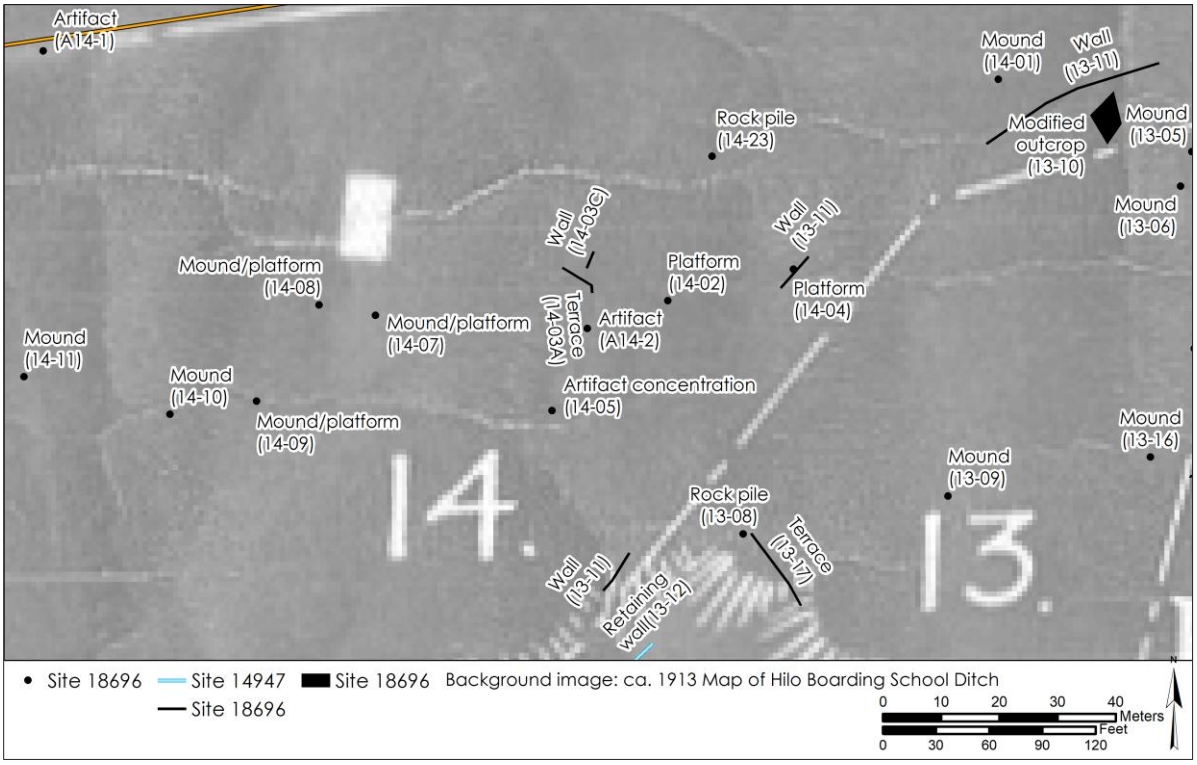

Figure 139. Features Identified Near Building on ca. 1913 County of Hawai‘i Public Works Map.

7.3 Land Tenure and Land Survey

The Kupapau Hill Triangulation Station (50-10-35-T2) is clearly documented by 19th and early 20th century maps as a local survey control point. It does not appear in lists of survey controls managed by the Coast and Geodetic Survey or its successor the National Geodetic Survey. The station is apparently not used anymore. The station represents a small part of the geodetic system established to measure land after the Māhele of the history of land use, ownership, and geodesy.

Nothing observed archaeologically seemed to indicate why the hill is known as Kupapau Hill. If burials are present, they are well concealed and only consultation or systematic archaeological testing would seem to be capable of locating them. The two excavated areas at the summit of the hill are not readily explained, either, although one would hope they are not related to the name of the hill.

8 Significance Evaluations and Recommendations

8.1 Significance Evaluations

Hawai‘i Administrative Rules Chapter 13 Section 13-275-6 requires that once a historic property is identified, an assessment of significance shall occur. To be significant, a historic property shall possess integrity of location, design, setting, materials, workmanship, feeling, and association and shall meet one or more of the following criteria:

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

HAR 13-275 does not provide guidance for how to apply the criteria and assess integrity; however, National Register Bulletin No. 15 (National Park Service 1997) recommends determining the following things when conducing a similar evaluation for National Register eligibility:

- The facet of prehistory or history of the local area, State, or the nation that the property represents;
- Whether that facet of prehistory or history is significant;
- Whether it is a type of property that has relevance and importance in illustrating the historic context;
- How the property illustrates that history; and finally
- Whether the property possesses the physical features necessary to convey the aspect of prehistory or history with which it is associated.

In other words, the significance evaluation considers these two questions: does the property represent an important aspect of the area's history or prehistory and does it possess the requisite quality of integrity to convey that history? If so, the property is significant. Significance evaluations for the identified historic properties are listed in Table 25 and discussed below.

Table 25 Site Signficance Recommendations

Site	Type	Function	Age	Significance*	Recommendation
14947	Hilo Boarding School Ditch	Water infrastructure	Historic	a, b, c, e	Preservation
18696	Kaumana Springs Agricultural Site	Agriculture, Habitation	Precontact/Historic	a, d	Limited Preservation and Data Recovery
T1	Kaumana Springs Hilo Water Head	Water Infrastructure	Historic	a, c	Preservation
T2	Kupapau Hill Trig Station	Land Survey	Historic	Not Significant	No Further Work

Legend: * = Significance to which the elements in the Project Area contribute.

8.1.1 SIHP 50-10-35-14947 (HILO BOARDING SCHOOL DITCH)

The Hilo Boarding School Ditch (SIHP 50-10-35-14947) was inventoried makai of the Project Area by Jensen (1991) and was assessed for significance before the adoption of the current HAR 13-275 rules, which occurred in 2002. Jensen's (1991:8) assessment was "based on the National Register criteria for evaluation, as outlined in the Code of Federal Regulations (36 CFR Part 60)," which at the were the criteria used by the DLNR Historic Preservation Program, the predecessor to DLNR-SHPD. Jensen also elaborated on the assessment by including PHRI's in-house "Cultural Resource management value modes" to assign a research-, interpretive-, and cultural value to the property. Although he did not explicitly state which criteria apply to the site or discuss aspects of integrity as they relate to the site's significance, Jensen (1991:8) assessed the Hilo Boarding School Ditch to be significant "as an excellent example of a site type", for "information content", and for "cultural value." Jensen (1991:8) also notes:

> *The background information suggests this site was initially built during prehistoric/protohistoric times by an important Hilo chief, I. Further, the same background information suggests that this feature was subsequently associated with persons who were important in local and regional history, as well as events and organizations which were significant in the social and political evolution of Hilo. This latter conclusion is based on the discovery that this ditch may represent the single most important initial capital asset of the Hilo Electric Light Company, Ltd.*

Applying the current significance criteria to Jensen's assessment, it appears that Jensen intended to determine the site significant under Criterion "a" for association with significant events related to early electrification of the Hilo Boarding School and the founding of Hilo Electric Light company; under Criterion "b" for its association with the Hilo ali'i named 'Ī; under Criterion "c" as an excellent example of a site type; under Criterion "d" for unspecified research value; and under Criterion "e" for unspecified for unspecified cultural value. In the HICRIS database, SIHP 50-10-35-14947 is listed as significant under Criteria "c", "d", and "e." Within the current Project Area, the site is considered significant under Criteria "a," "b," "c," and "e."

Under Criterion "a" the Hilo Boarding School Ditch significant for its role in the growth and development of the town of Hilo during the late nineteenth and early twentieth centuries, and possibly even earlier.

Historically documented accounts of its origins, primarily from the 1917 water rights dispute, disagree about when and by whom it was created. Regardless of its origins, once under control of the ABCFM the ditch's role in Hilo evolved. Beginning as a source of water for domestic uses and farming at the Hilo Boarding School, in 1895 it provided water to an early hydroelectric generator for what became Hilo Electric and Light Company, Ltd. The ditch, with the Hilo Boarding School holding rights to its water until 1943, was not a primary source of water for the Hilo municipal water supply during the 20th century, but on several occasions *was* used to supplement water from the Kaūmana Springs during drought years.

Under Criterion "b" the site is significant for its association with at least four historically important people. Based on Solomon P. Kaleioholani's testimony, as interpreted by Wolforth (1999), suggests that ditch in the Project Area may be part of the ʻĪ ditch ordered built by that aliʻi in the 1600s or the Kanuha ʻauwai built in the in the 1830s or 1840s built at that aliʻi's command (Kelly 1982:25; Wolforth 1999:10). Fredrick Lyman's testimony states that the Konohiki of Punahoa named Aki commissioned the ditch during the time of Kamehameha I, but Joseph Goodrich improved it after 1822.

Under Criterion "c", the site is significant for its design and construction, which is similar to portions of the Piʻihonua Ditch (SIHP 50-10-35- 21228), which was documented to the north and east of the Project Area. The upper portions of this ditch consists of artificially-dug segments that connect with natural drainages, taking advantage of the topography and surface hydrology to deliver water from the Wailuku in an efficient way (Wolforth 1999). Lower portions of the ditch, on more developed parcels tend to rely on concrete and rock masonry rather than dry stack, as documented by Barna and Rechtman (2015), Barna (2017), and Wilkinson and Hammatt (2009). The designers and maintainers of the Hilo Boarding School Ditch improved the natural drainages where necessary to counteract erosion using dry-stack masonry, a technique that was also used on several larger ditches on Hawaiʻi Island, such as the Upper Hamakua Ditch (Barna 2020)) and the Lower Hamakua Ditch (Haun and Henry 2013). The portion of the ditch that is present in the Project Area provides an example of these design and construction techniques that could readily be interpreted to the public.

This portion of the ditch is not considered to be significant under Criterion "d." No additional historically important information not already known from historical documents was yielded during the archaeological fieldwork. Based on the findings of the current fieldwork, the portion of the site in the project area does not possess the potential to yield additional historically important information.

Under Criterion "e", the ditch is considered significant for its association with traditional Hawaiian cultural practices related to irrigation and the conveyance of wai once carried out with the property. The testimony of Solomon P. Kaleioholani in 1917 clearly establishes this cultural use through his description of how rights to the water in the ditch were allocated under his grandmother's, and later his own, authority.

With respect to the property's overall integrity, the Hilo Boarding School Ditch has experienced major alterations along its entire length that leave it only partially intact. The ditch is fragmentary and portions of it have been destroyed by development above and below the Project Area. Immediately above the Project Area, grading for house lots and roads in the Ainako Terrace subdivision demolished a 165 meter-long portion of the ditch. Another 175 meters have been rechannelized downstream from the Department of Water Supply reservoir on Waiānuenue Avenue (Rechtman 2004). To date, no archaeological survey has documented the ditch upstream of this reservoir. Downstream from the Project Area, LIDAR data (United States Geological Survey 2023) suggests that some of the ditch is still present between Lahaina Street

and Kaūmana Drive, and some is present on Hālaʻi Hill. Makai of Hālaʻi Hill, the ditch appears to no longer exist.

Within the current Project Area, the ditch retains sufficient integrity to convey the aspects of history with which it is associated. As a water conveyance feature, aspects of integrity that are important to convey significance include design, materials, workmanship, and setting. Overall, the portion of the property in the Project Area retains sufficient integrity in all of these categories, with its integrity of design and setting diminished.

Integrity of design within the Project Area appears to be relatively unchanged. The upper 56 meters extending makai from the parcel boundary still appears to hand-dug with occasional stone reinforced embankments. The lower portion, assumed to have flowed directly within the branch of Ainako Stream (i.e., not in a flume), remains relatively natural-looking but with some of its distinctive stream bank reinforcement of stacked stonework still intact (Features B, C, D, and E). One degradation of design occurs at the mauka parcel boundary, where grading for the development of the lowest parcels in the Ainako Terrace development (Lots, 192, 193, 194, and 197, plus Kilikina Street) destroyed the ditch. This diminishment of integrity of design negatively affects its significance under Criterion “c” because the ditch no longer carries water from upstream and, visually, it ends abruptly near the parcel boundary.

The site’s integrity of materials appears to be relatively unchanged from the time when the ditch was used. The ditch bottom and banks have not been lined with modern materials, and the stacked rock reinforcement of the ditch banks all appear to be built with dry-stacked locally-sourced uncut stone.

Integrity of workmanship is also consistent with the period of significance for the site, as evidenced by the intact sections of stacked rock reinforcement on the ditch banks.

Overall, the integrity of setting has been altered from the upland kula and agricultural landscape that surrounded the ditch during its period of significance. The Project Area is overgrown with introduced vegetation and currently appears as a forested landscape. It should be noted as well that the current vegetation community is different than the one encountered by Sinoto (1989).

Based on the analysis presented above, SIHP 50-10-35-14947 is considered significant per HAR 13-275-6 under Criteria “a,” “b,” “c,” and “e”.

8.1.2 SIHP 50-10-35-18696 (AGRICULTURAL SITE COMPLEX)

SIHP 50-10-35-18696 was identified in 1978 during a reconnaissance level survey (Sinoto 1978) that preliminarily interpreted the site to contain features resembling traditional Hawaiian stacked rock architecture. No formal site significance evaluation was conducted at the time, as the study pre-dated such requirements. The current study has found that the site appears to be more complex temporally and structurally than what Sinoto (1978) was able to observe. It is assessed to be significant under Criteria “a” and “d.”

The site is associated with the historic theme of the development and evolution of agricultural systems beginning in the Precontact period and extending through the 20th century (Criterion “a”). The modified springs contained within the site were likely used during the Precontact and Historic periods to provide fresh water for agricultural use and domestic use by those who were farming and inhabiting the site. The various agricultural features, such as mounds, terraces, platforms, and rock piles, are likely the final

expression of changing agricultural practices in the Project Area, which unlike much of the surrounding landscape, appear to have not been part of large-scale sugarcane production. The Project Area's limited capacity for growing sugarcane resulted in the land being divided into the 15 historic lots that are depicted on Registered Map 2058 and delineated on the ground by Features 03-10, 03-21, 04-07, 05-18, 06-01, 07-04, 09-13, 10-01, 10-07, 11-01, 12-7, 13-11, 14-19, 14-21, 14-22, and, 15-01. Within these historic lots, smaller scale agriculture was conducted into the early 20th century, until the land was set aside as a reservation to protect Hilo's water supply. It represents a pocket of smaller scale, possibly subsistence tenant farming surrounded by commercial sugarcane cultivation.

The site also has the potential to yield information important for research in history (Criterion "d"). There are multiple habitation features within the site, of which only one (the complex containing Features 14-02, 14-03, 14-04, and 14-05) appears on a historic map. Additional information about their age and household composition may be available in subsurface deposits at these sites. This information would be useful for evaluating models of the "Hawaiian Footprint" (Gon et al. 2018) and Precontact settlement patterns (McEldowney 1979b) of the upper kula in Hilo. Among the agricultural sites are numerous mounds and similar features. While most of these, especially the clearing mounds, are unlikely to contain additional information, the outward appearance of some differs enough from typical clearing mounds to suggest other possible functions or motivations for their construction. Additionally, subsurface deposits beneath agricultural clearing mounds may contain datable material that might be associated with the initial vegetation clearing event(s) that transformed the Project Area into an agricultural landscape. Such material could be used to determine, in absolute terms, when farming was brought into the Project Area. Additionally, accumulated sediments in the animal pen (Feature 11-04) identified in the Project Area may contain chemical residues capable of indicating what kinds of animals were kept there, and when.

As an agricultural complex, aspects of integrity that are important to convey the site's significance include design, materials, workmanship, and setting. Of these, design and materials are most important. Overall, the portion of the property in the Project Area retains sufficient integrity in all of these categories. Component features of the property, however, vary widely in their integrity due to widespread damage to individual features from tree roots and fallen trees.

The site's overall integrity of design appears to be relatively intact, primarily due to the survival of portions of the rock walls that were used to divide the Project Area into 15 historic lots. These walls still express the spatial organization behind the agricultural activities on the land. Within the historic lots, agricultural clearing features are distributed unevenly, primarily on exposed pāhoehoe in a way that stores the cleared rock away from arable soil deposits. The organization of these features can be contrasted with clearing pile organization in more soil-prone areas, which tends to be more regular and influenced by the distance it is practical to carry rock (see, for example, the site location map in Clark and Rechtman, 2006).

The site's integrity of materials appears to be relatively intact, with the exception of missing superstructures at habitation sites or other structures. The agricultural features, including rock-lined springs, terrace retaining walls, free-standing boundary walls, and mounds and platforms, retain their original materials with no added modern materials other than the occasional discarded beverage can or bottle.

Integrity of workmanship varies widely among the individual features, and on the whole is fairly diminished due to the widespread damage caused by the incursion of albizia, guava, and autograph tree

roots into nearly every feature. This has resulted in partial collapse of many features as roots grow within the spaces between rocks. A number of features were also impacted by trunks and branches of trees, which have dislodged rocks from them, or by roots that pulled rocks from the features as the trees fell over. Any preservation of features within the Project Area will need to address the problems of stopping further damage from living roots and the degree to which the feature might be further damaged by removing roots and fallen trees.

Overall, the integrity of setting has been altered from the upland kula and agricultural landscape that surrounded the ditch during its period of significance. The Project Area is overgrown with introduced vegetation and currently appears as a forested landscape. The land immediately to the north and south is now in pasture, which somewhat resembles the rural setting of the period of significance. The land mauka and makai are now residential subdivisions.

Based on the analysis presented above, SIHP 50-10-35-18696 is considered significant per HAR 13-275-6 under Criteria “a” and “d.”.

8.1.3 SIHP 50-10-35-T1 (HILO CITY WATER WORKS KAŪMANA SPRINGS)

SIHP 50-10-35-T1 (Hilo City Water Works Kaūmana Springs Intake) was used to supply water to the town of Hilo between 1912 and 1973. It consists of a buried cast iron water pipe (Feature B) and the concrete foundation of the spring house (Feature A) that covered the water works intake. The site is assessed to be significant under Criterion “a” for its association with the development and operation of the Hilo water system during the period ca. 1912 to 1973, a period when surface springs were used as the town’s water source.

The site is associated with the historical development of public water supply for Hilo Town in the early 20th century (Criterion “a”). Hilo’s growth as a town, along with the growth of the sugar industry, relied on adequate sanitary fresh water being brought into residences and businesses. Although the site is nether the first nor the last surface spring water source to be used in the old Hilo water system, this particular spring was at the center of a decades-long legal battle over the spring between the County of Hawai‘i and the Hawai‘i Evangelical Association. In the opening decades of the twentieth century, the spring was desired by the County as a source of fresh water to meet the growing demands of the town. The HEA, knowing that the County could only acquire it through condemnation procedures, sought to maximize their returns. The County ultimately acquired the spring and a 60-acre parcel containing it. In this conflict between the public interest (the County) and private rights to the spring (the HEA), both sides attempted to use their advantages against the other party. The County, for example, helped itself to the spring’s water without the HEA’s permission for eight months in 1912. Once the condmenation negotiations began, the County Commissioners played hardbal with the HEA, using the HEA’s own low opinion of the land’s value as the basis for their low-ball price. The HEA, on the other hand, was not afraid demand a higher price, using the publicly known rates paid that the County was paying for water from other sources as leverage. Nor were they shy about hitting the County with a punishingly high bill for the water taken without their permission in 1912. The negotiations required intervention of the courts, but in the end the spring became a part of the Hilo water system, and supplied water to the town until it was rendered obsolete in 1973 by the Pi‘ihonua Well installed near Gilbert Carvalho Park. The incident is especially interesting when compared with testimonies of historically known wai luna such as Solomon P. Kaleioholani (Kelly 1982) and Emma Nakuina (1893).

To convey its significance under Criterion "a," the site's integrity of design, materials, and workmanship should be adequate to convey that the site is the developed Kaūmana Spring. Although missing its superstructure, the extant concrete foundation and cast-iron pipe the site retains integrity of design and materials, but its integrity of workmanship is noticeably diminished. It also retains integrity of location, feeling, and setting, and its integrity of association is excellent as this site is the spring that was at the heart of the legal standoff between the County and the HEA.

Based on the analysis presented above, SIHP 50-10-35-T1 (Kaūmana Springs Hilo City Water Works) is considered to be significant under Criterion "a".

8.2 SIHP 50-10-35-T2 (Kupapau Hill Triangulation Station)

Triangulation stations set by the government survey and independent surveyors were used to establish old and new boundaries within the allodial land tenure system created by the Māhele ʻĀina of 1848. Stations that can be associated with very early land surveys, or played a prominent role in land surveys that made important changes to land divisions could be considered significant under Criterion "a" within the historic context of the transition from traditional Hawaiian land tenure system to modern land tenure system. To be considered significant under Criterion "b" the site would need a strong and important association with a historically important surveyor. To be considered significant under Criterion "c" the station would need to exhibit distinctive design and construction characteristics that are unique to the location or importance of the station.

The site is not considered significant under Criterion "a." Some triangulation stations have been more important than others in the process of formalizing boundaries within the allodial land tenure system created by the Māhele ʻĀina of 1848. The station on Hālaʻi Hill, for example, is a centrally located station that is the basis for much of the platting of properties in Hilo town. Kupapau Hill Triangulation Station played a much smaller role, providing a spatial reference for lands mauka of Hālaʻi. The station, in the form of a rock on "Puʻu Mohihi," was used in 1849 to survey the ABCFM's holdings in Punahoa 2, but apparently not for the survey shown on Registered Map 1744 (Lyman 1853). It was used during the 1895 survey that produced Registered Map 1790 (Loebenstein 1895)—again called "Moohihi or spring" instead of "Kupapau." It was used more regularly in the earliest part of the 20th century, as seen on Registered Map 2508 (Baldwin 1901a) where it was given the name Kupapau, the ca. 1913 Hilo Boarding School Ditch map, and maps prepared for Land Court Application 292 (Baldwin 1914). By the 1930s, it appears to have fallen out of use and was not incorporated into the United States Coast and Geodetic Survey's network of triangulation stations. Although the triangulation station was used as early as 1849 to further the transition from traditional Hawaiian land tenure system to modern land tenure system, its use appears to be limited to local surveys, and as such, its association under Criterion "a" is not significant.

The site is not considered significant under Criterion "b." Even though it was used by at least two well-known surveyors, namely Alexander B. Loebenstein and Erdmann D. Baldwin, it was one of many such trangulation stations used by them during their careers as surveyors. This association with either of the two surveyors is not considered an important historical association.

The site is not considered significant under Criterion "c." It is simply constructed in a common and fairly rudimentary manner. The concrete base appears to have been formed on-site, and the pipe lacks any additional embellishments. There is no plaque, engraving, or other marking on the concrete or pipe.

Because it lacks distinctive characteristics of design or construction, it is not considered significant under Criterion “c.”

The sites is not considered significant under Criterion “d.” The information yielded by the site is limited to its current condition, which indicates that at some point in the twentieth century the existing triangulation station monument replaced the marked stones described in older survey documents. The site also has no potential to yield additional information from archaeological study.

Based on the analysis presented above, Site 50-10-35-T2 is not considered significant under any criterion.

9 Determination of Effect and Mitigation Recommendations

9.1 Project Effects

The proposed project will require grading and will create a modern residential neighborhood on what historically was an agricultural landscape. This would occur in both the Phase 1 development area (Figure 140) and the Phase 2 development area (Figure 141).

The proposed action would result in physical damage to features of SIHP 50-10-35-18696. This physical damage will adversely affect aspects of integrity of design, workmanship, and setting that are important for conveying the site's significant association under Criterion "a" to the history of agricultural development and under Criterion "d" for the information potential related to the timing and nature of agricultural development and habitation at this site.

Effects to SIHP 50-10-35-14847, and T1 would be limited to effects to the setting of these sites, in which additional residential development would be imposed on a formerly rural setting. This by itself, however, would not be enough to be considered adverse, as the integrity of design, workmanship, and materials of the portion of the sites within the Project Area would still be sufficient to convey its significance.

The recommended effect determination for the proposed project is "Effect, with proposed mitigation commitments."

9.2 Recommended Project Mitigation

A combination of Preservation, Historical Data Recovery, Archaeological Data Recovery, and Archaeological Monitoring are recommended as mitigation for the proposed project effects to the three significant historic properties in the Project Area. Specific mitigation recommendations are listed in Table 4. Recommended preservation areas are outlined in orange in Figure 142, and recommended data recovery sites are outlined in purple. A preservation plan in compliance with HAR Section 13-277, a Data Recovery Plan in compliance with HAR Section 13-178, and an Archaeological Monitoring Plan in compliance with HAR Sectin 13-279 should be prepared and submitted to SHPD for review and acceptance.

9.2.1 PRESERVATION RECOMMENDATIONS

9.2.1.1 Hilo Boarding School Ditch (SIHP 50-10-35-14947)

Preservation is recommended for the Hilo Boarding School Ditch (SIHP 50-10-35-14947). Within the Project Area, this would include both parts of Feature A (the artificially excavated portion and the portion within the ʻĀinakō Stream tributary) and Features B, C, D, and E.

9.2.1.2 Agricultural Complex (SIHP 50-10-35-18696)

Preservation is recommended for select features of the agricultural site complex (SIHP 50-10-35-19686) to convey the history of the Project Area within the context of the proposed subdivision and development. Five archaeological preservation areas with potential for public interpretation are recommended.

A proposed "Historic Agricultural Feature Preserve" at the mauka end of the Project Area would focus on the agricultural history of the Project Area. This area would preserve 16 agricultural features representative of the types of features found throughout the site, along with the setting of the portion of the Hilo Boarding School Ditch located in the Project Area.

A proposed "Kaūmana Springs Historic Preserve" would be located immediately east of the proposed development area, north of Kupapau Hill. It would focus on preserving and interpreting the modified springs identified in the Project Area. Nine features would be included in this presrvation area, including modified springs (Features 01-09E and 03-18), as well as surrounding constructed features. This preservation area would also include features of Site T1 (see below).

Preservation areas focused on historic habitation would be created around Features 03-09 and 05-08.

In addition to formal preservation of the above named features, the design of open spaces and parks within the subdivision could incorporate features for passive or informal preservation as well.

9.2.1.3 Hilo City Water Works Kaūmana Springs Intake Site T1

Site T1 is recommended for preservation, in particular the spring house foundation (Feature A) and if possible, the exposed portions of the water line (Feature B). Preservation and interpretation of Site T1 could be integrated with the proposed "Kaūmana Springs Historic Preserve" described above, which would create an opportunity to present the history of puna wai in a context that extends from the Precontact period to the 1970s, and possibly incorporating information about local hydrology and geology as well.

9.2.2 DATA RECOVERY RECOMMENDATIONS

9.2.2.1 Historical Data Recovery

Historical Data Recovery is recommended to mitigate effects that would occur site-wide. Information gaps remain concerning how the Project Area was managed by the ABCFM, HEA, and County, including the timing of the creation of the 15 historic lots and names of people or families that may have been tenants on the land. Additional archival research at the archives consulted for the current study and others may yield this and other information. Results of the research could be made available to the residents and the general public, and could also be incorporated into the final project design, for example, to name public spaces such as parks and the community center.

9.2.2.2 Archaeological Data Recovery

Archaeological data recovery is recommended for select formal features with indeterminate functions and habitation features with limited interpretation potential. The indeterminate features recommended for data recovery are Features 07-02, a platform; 14-11, a circular mound; 14-08, a mound; and 14-09, also a

mound. These features resemble other agricultural clearing features but exhibit more formal construction methods. Recovery of data related to their age and internal structure may add to the discussion of correlations between mound form and age (Clark and Rechtman 2016; Hunt and McDermott 1993).Habitation features that are recommended for data recovery are Features 03-08, 05-01, and the complex comprised of 14-02, 14-03, 14-04, and 14-05. Data recovery could focus on research questions related to confirming or refining the age and duration of their occupation.

Data recovery is recommended for Feature 11-04, an enclosure that is interpreted to be an animal pen. Investigations could focus on research questions related to the timing and nature of animal husbandry practices in the Project Area (Lockwood 2009). Analysis of the soil chemistry within and outside of the feature could potentially yield evidence of its use, including what types of animals, if any, were kept in the enclosure. Datable material could also potentially provide information on the age of the feature and periods when it was used.

9.2.3 ARCHAEOLOGICAL MONITORING RECOMMENDATIONS

9.2.3.1 Topographic Survey

The thick tree canopy in the Project Area hindered the ability of the field archaeologists to obtain high-precision GPS signals during portions of the survey. It is recommended that an archaeologist work with surveyors during on-the-ground topographic surveying for during additional design or pre-construction phases of the project to ensure that project engineering drawings accurately include archaeological features designated for preservation or data recovery. The survey-grade locational information for the archaeological features could be used to update SHPD's records.

9.2.3.2 Vegetation Clearance

Due to the heavy overgrowth in some portions of the Project Area, archaeological monitoring is recommended during vegetation clearance prior to development activities. The monitor would be used to help clearance crews avoid damaging preservation and data recovery features, as well as identify features that had been obscured by vegetation during the current field work.

9.2.3.3 Ground Disturbing Activities During Project Implementation

The Ground disturbance during project implementation. The monitor would be used to help construction crews avoid damaging preservation and data recovery features.

Table 26 Mitigation Recommendations

SIHP No.	Features	Mitigation Commitment	Notes	Area in Figure 142
50-10-35-14947	All features in Project Area	Preservation	Hilo Boarding School Ditch. Good candidate for interpretation	2
50-10-35-18696	15-2, 15-3 15-4, 15-5 15-7, 15-8 15-11, 15-13 15-14, 15-15 15-16, 15-17 15-19, 15-11 15-22, 15-23 15-24	Preservation	Historic Agriculture Preserve. Good candidate for preservation.	1
50-10-35-18696	01-01, 01-04 01-05, 01-09, 02-03, 03-18 03-19	Preservation	Kaumana Springs Historic Preserve. Good candidates for interpretation with Site T-1.	13
50-10-35-18696	03-09	Preservation	Example of Historic Habitation. Good candidate for interpretation.	11
50-10-35-18696	08-05	Preservation	Example of Historic Habitation. Good candidate for interpretation.	8
50-10-35-18696	11-04	Data Recovery	Timing and nature of animal husbandry. Preservation could depend on data recovered.	7
50-10-35-18696	All features in Project Area	Historical Data Recovery	Additional research into ABCFM, HEA, and County uses to aid interpretation.	n/a
50-10-35-18696	Habitation Features: 03-08, 05-01 14-02, 14-03, 14-04, 14-05	Archaeological Data Recovery	Potential to learn about timing and nature of habitation.	5, 10, 12
50-10-35-18696	07-02, Platform 14-08, Mound 14-09, Mound 14-11, Circular Mound	Archaeological Data Recovery	Potential to learn about timing and nature of agricultural activities.	2, 3, 4, 9
50-10-35-T1	All Features in Project Area	Preservation	Kaumana Springs Historic Preserve. Good candidates for interpretation.	13

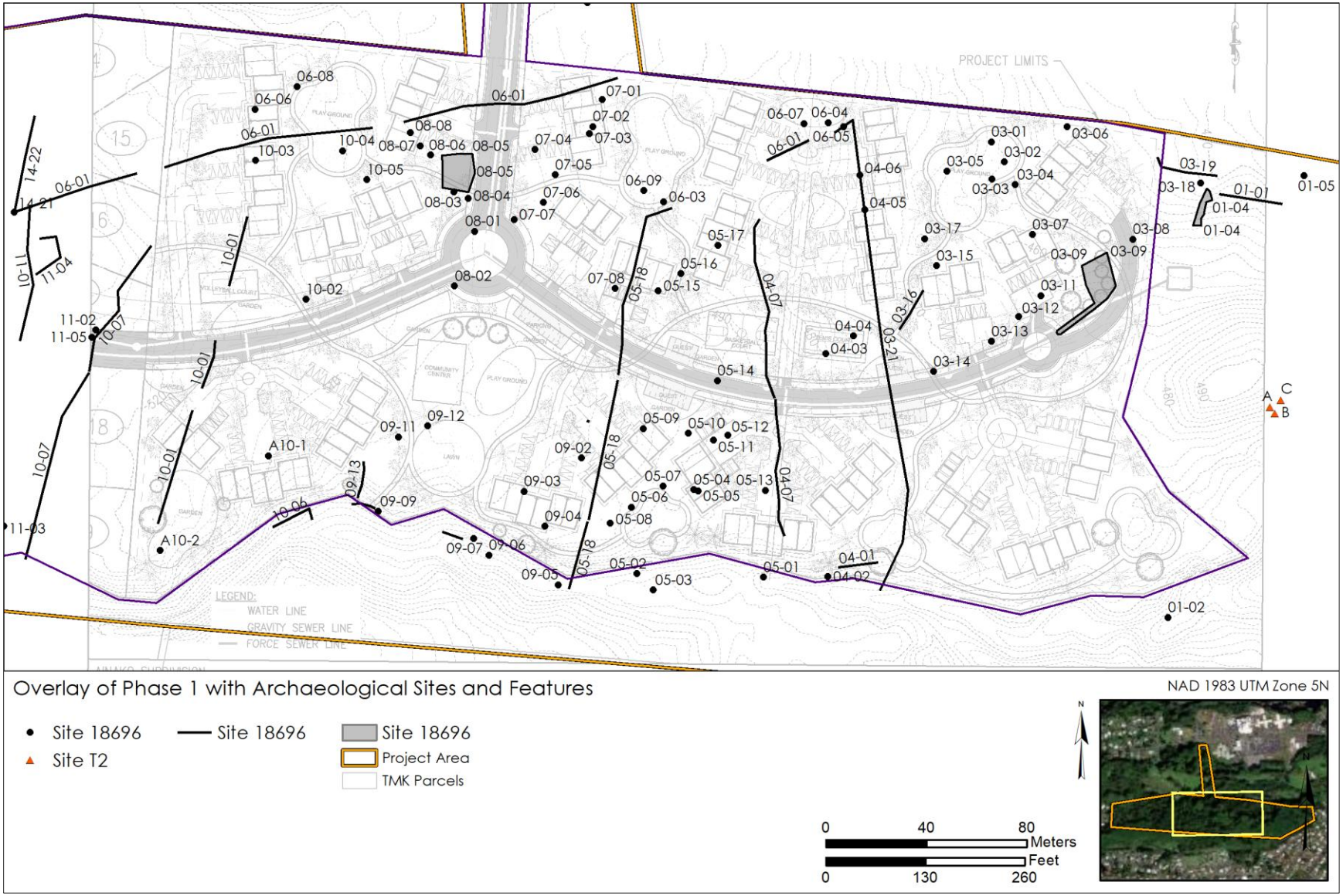

Figure 140. Overlay of Proposed Project and Archaeological Sites and Features, Phase 1

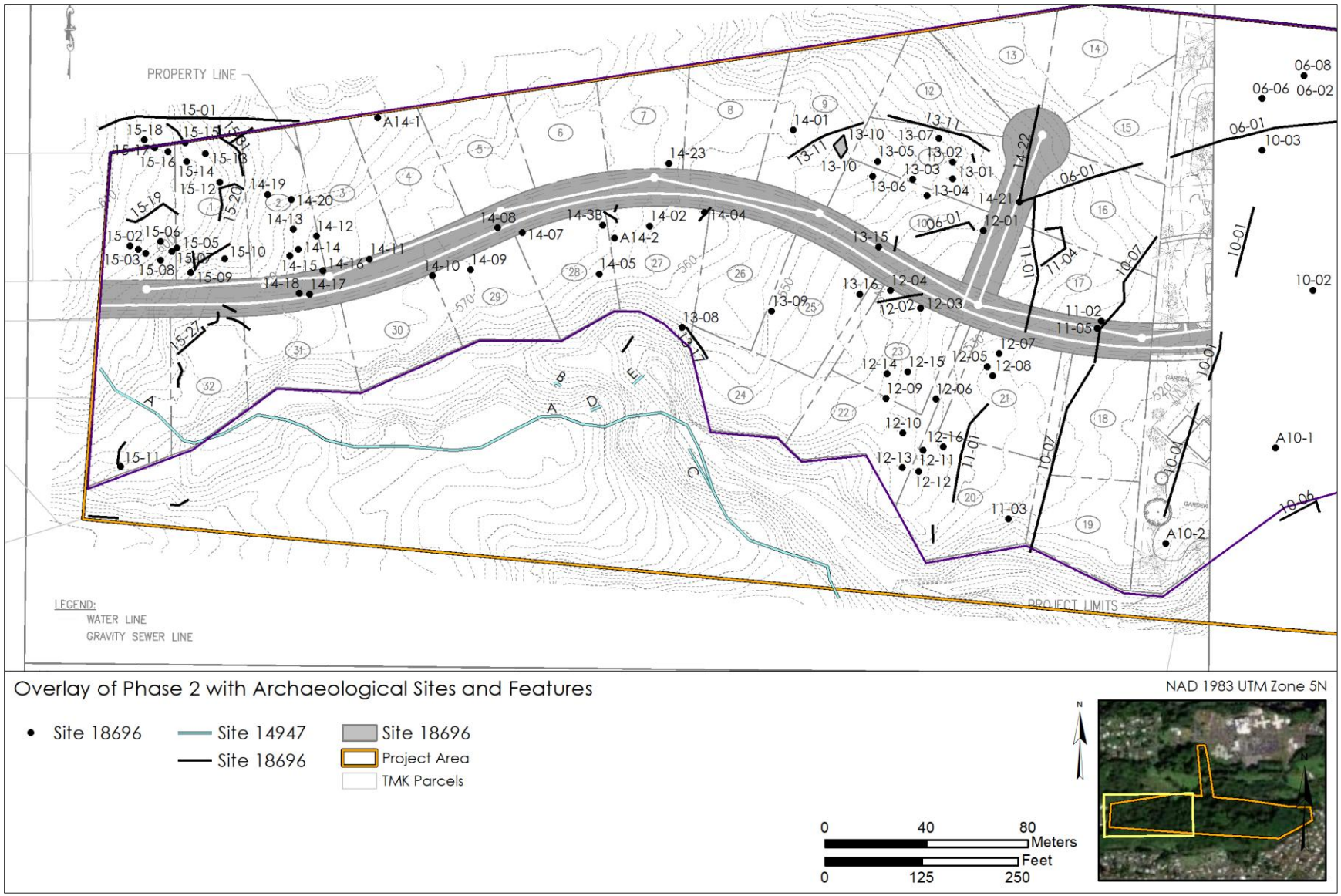

Figure 141. Overlay of Proposed Project and Archaeological Sites and Features, Phase 2

Figure 142. Recommended Mitigation Treatments

10 References Cited

Alexander, Arthur C. 1920. Land Titles and Surveys in Hawaii. *The Hawaiian Planters' Record* XXIII:67–78.

Andrews, Lorrin. 1865. *A Dictionary of the Hawaiian Language, to Which Is Appended an English-Hawaiian Vocabulary and a Chronological Table of Remarkable Events*. Henry M. Whitney, Honolulu.

Athens, J. Stephen. 1982. Report 2. Cultural Resources Reconnaissance. Edited by Marion Kelly and J. Stephen Athens. *Archaeological and Historical Studies for the Alenaio Stream Flood Damage Reduction Study, Hilo, Hawai'i*.

Athens, J. Stephen, Timothy Rieth, and Thomas S. Dye. 2014. A Paleoenvironmental and Archaeological Model-Based Age Estimate for the Colonization of Hawai'i. *American Antiquity* 79(1):144–155.

Baldwin, E. D. 1901a. *Plan of Proposed Hilo City Waterhead Reservation*. Hawai'i Registered Map No. 2058, 1:2,400.

Baldwin, E. D. (Department of Accounting and General Services Survey Division). 1901b. *Hilo City Water Head Reservation. Notes of Survey of the Part on Punahoa 2nd*. C.S.F. 1112. Department of Accounting and General Services Survey Division.

Baldwin, E. D. (Hawai'i Land Survey Division). 1914. *Land Court, Territory of Hawaii, Map and Description with Petition No. 292. Petitioner: Board of Hawaiian Evangelical Association*. Hawai'i Land Survey Division.

Barna, Benjamin. 2013. Ethnogenesis of the Hawaiian Ranching Community: An Historical Archaeology of Tradition, Transnationalism, and Pili. Ph.D. Dissertation, University of Nevada, Reno. ProQuest LLC, Ann Arbor, MI.

Barna, Benjamin. 2017. *An Archaeological Inventory Survey for the Hilo Intermediate School Repair/Replace Building A (Phase 1), DOE Project No. Q11000-16, TMK: (3) 2-3-021:058 (Por.), Pi'ihonua Ahupua'a, South Hilo District, Island of Hawai'i*. Fung Associates Inc., Honolulu.

Barna, Benjamin. 2018. *An Archaeological Inventory Survey for the Hawai'i Electric Light 6200 Transmission Line Replacement, Portions of TMKs: (3)2-4-006, -008; (3)2-5-001, -002, -003, -004, -005, 038, -041, -044, -046, -053, -054, -055, -057, -061, -062; (3)2-6-018; (3)3-8-001; (3)4-4-015, -016; (3)6-7-001, -004, -005, -006; and (3)6-8-002, Waikōloa, Ka'ohe, Humu'ula, Pi'ihonua, Punahoa 2nd, Kaūmana, and Waiākea Ahupua'a, South Kohala, Hāmākua, North Hilo, and South Hilo Districts, Island of Hawai'i*. Stantec, Hilo, HI.

Barna, Benjamin. 2020. *Archaeological Inventory Survey of a Roughly 4,700-Acre Harvest Area TMK: (3) 4-4-014:005 (Por.) and (3) 4-4-015:003 (Por.) Pā'auhau and Pā'auhau Mauka Ahupua'a Hāmākua District Island of Hawai'i*. CN Renewable Resources LLC, Hilo, HI.

Barna, Benjamin, Candace Gonzales, and Amy Ketner. 2023. *Archaeological Inventory Survey for the 34 Rainbow Drive Rehabilitation and Master Plan, TMK: (3) 2-3-026:008, Pi'ihonua Ahupua'a, South Hilo District, Island of Hawai'i*. Fung Associates Inc., Honolulu.

Barna, Benjamin, and Robert B. Rechtman. 2015. *An Archaeological Inventory Survey of a State-Owned Drainage Easement Across TMK: (3) 2-3-023:006*. Engineering Partners, Inc., Hilo, Hawaii.

Bautista, Olivier, and Hallett H. Hammatt. 2021. *Archaeological Literature Review and Field Inspection for the Hilo Medical Center Hospital Expansion Project, Piʻihonua Ahupuaʻa, South Hilo District, Hawaiʻi Island TMK: [3] 2-3-027:002 Por.* Final. Munekiyo and Hiraga on behalf of Hawaii Health Systems Corporation.

Bayman, James M. 2009. Technical Change and the Archaeology of Emergent Colonialism in the Kingdom of Hawaiʻi. *International Journal of Historical Archaeology* 13(2):127–157.

Beamer, Kamanakaikalani, and N. Wahineʻaipohaku Tong. 2016. The Mahele Did What? Native Interest Remains. *Hulili: Multidisciplinary Research on Hawaiian Well-Being* 10:20.

Beckwith, Martha Warren. 1917. Hawaiian Shark Aumakua. *American Anthropologist* N.S. 19:503–517.

Bergin, Billy. 2004. *Loyal to the Land: The Legendary Parker Ranch, 750-1950*. University of Hawaii Press, Honolulu.

Brandt, Lokelani M. P. 2017. Through the Lens of the ʻIli Kūpono: Re-Establishing Connections to Piʻopiʻo, Waiākea, Hilo, Hawaiʻi through Ethnohistory, Archaeology, and Community. M.A. Thesis, University of Hawaiʻi at Hilo, Heritage Management, Hilo.

Buke Māhele. 1848. *Buke Kakau Paa No Ka Mahele Aina i Hooholoia Iwaena o Kamehameha III a Me Na Lii a Me Na Konohiki Ana*. Hale Alii, Honolulu.

Byron, G. 1826. *Voyage of the H.M.S. Blonde to the Sandwich Islands, in the Years 1824-1825*. John Murray, London.

Canevali, Ralph C. 1977. *Hilo Boarding School - Hawaii's Experiment in Vocational Education*, Vol. 11. Hawaiian Journal of History.

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

Chinen, J. J. 1961. *Original Land Titles in Hawaii*. Privately published.

Clark, Matthew R., and Robert B. Rechtman. 2004. *An Archaeological and Limited Cultural Assessment for the Arc of Hilo Property (TMKs:3-2-3-32:6, 7, and 8), Piʻihonua Ahupuaʻa, South Hilo District, Island of Hawaiʻi*. Geometrician, LLC, Keaʻau, HI.

Clark, Matthew R., and Robert B. Rechtman. 2016. *Archaeological Inventory Survey of a Roughly 26-Acre Parcel Located at the Corner of Haihai Street and Ainaola Drive, TMK: (3) 2-4-039:025, Waiākea Ahupuaʻa, South Hilo District, Island of Hawaiʻi*. Roy Sonomura, Hilo, HI.

Coan, Titus. 1852. Eruption from the Summit of Mauna Loa, Hawaii. *American Journal of Science* Series 2-14(40–52):219–224.

Coan, Titus. 1882. *Life in Hawaii: An Autobiographic Sketch of Mission Life and Labors 1835-1881*. Electronic edition. Randolph, New York.

Corbin, Alan B. 2006. *Archaeological Field Inspection and Assessment of Previously Identified Features, Punahoa Mauka Parcel, Lands of Punahoa 1-2, South Hilo District, Island of Hawai'i (TMK:3-2-5-08:3,24)*.

Cordy, Ross. 1972. The Effects of European Contact on Hawaiian Agricultural Systems - 1778-1819. *Ethnohistory* 19(4):393–418. https://doi.org/10.2307/481442.

Cordy, Ross. 1981. *A Study of Prehistoric Social Change: The Development of Complex Societies in the Hawaiian Islands*. Academic Press, New York.

Cordy, Ross. 1995. *Central Kona Archaeological Settlement Patterns*. Planning Department, County of Hawaii.

Cordy, Ross. 2000. *Exalted Sits the Chief, The Ancient History of Hawai'i Island*. Mutual Publishing, Honolulu.

Cordy, Ross, Joseph Tainter, Robert Renger, and Robert Hitchcock. 1991. *An Ahupua'a Study: The 1971 Archaeological Work at Kaloko Ahupua'a, North Kona, Island of Hawai'i*. Western Archaeological and Conservation Center Publications in Anthropology 8. U.S. Department of the Interior, National Park Service, Tucson, AZ.

Coulter, John Wesley. 1935. *A Gazetteer of the Territory of Hawaii*. University of Hawaii Research Publications Number 11. University of Hawaii, Honolulu.

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

Edith Kanaka'ole Foundation. 2012. *Ethnohistorical Study of Honohononui, Hilo, Hawaii Island*. Kamehameha Schools, Land Assets Division, Honolulu.

Ellis, William. 1825. *Journal of William Ellis, Narrative of a Tour of Hawaii, or Owhyee; with Remarks on the History, Traditions, Manners, Customs and Language of the Inhabitants of the Sandwich Islands*. Cocker and Brewster, Boston.

Ellis, William. 1827. *Narrative of a Tour of Hawaii, or Owhyee; with Observations on the Natural History of the Sandwich Islands, and Remarks on the Manners, Customs, Traditions, History, and Language of Their Inhabitants*. Second. H. Fisher, Son, and P. Jackson, London.

Foreign Register. Register of Claims to Land. Hawaii State Archives (Digital Archives of Hawai'i).

Foreign Testimony. 1964. *Dept. of Land and Natural Res. Foreign Testimony Microfilmed 1964 Originals in State Archives*, Vol. 3, 4, 5, 6, 7, 8, 9. MFL 91–2. Hawaii State Archives.

Fornander, Abraham. 1916. *Fornander Collection of Hawaiian Antiquities and Folk-Lore*. 9 vols. Bishop Museum Press, Honolulu.

Fornander, Abraham. 1918. *Fornander Collection of Hawaiian Antiquities and Folk-Lore*. Memoirs of the Bernice Pauahi Bishop Museum Volume V. Bishop Museum Press, Honolulu.

Fornander, Abraham. 1969. *An Account of the Polynesian Race: Its Origins and Migrations, and the Ancient History of the Hawaiian People to the Times of Kamehameha I*. Edited by John F. G. Stokes. Charles Tuttle & Co., Inc., Tokyo.

Fornander, Abraham. 1996. *Ancient History of the Hawaiian People*, Vol. II. Mutual Publishing, Australia.

Garavoy, J. 2005. "Ua Koe Ke Kuleana o Na Kanaka" (Reserving the Rights of Native Tenants): Integrating Kuleana Rights And Land Trust Priorities in Hawaii. *Harvard Environmental Law Review* 29.

Gastilo, Joshua, and Matthew R. Clark. 2018. *An Archaeological Inventory Survey of the 2,296-Acre Waikapuna Property, TMK: (3) 9-5-007:016, Kāhilipali Nui, Kāhilipali Iki, and Kahaea Ahupua'a, Ka'ū District, Island of Hawai'i*. Ka'ū Mahi, LLC, Denver, CO.

Giambelluca, Thomas W., Qi Chen, Abby G. Frazier, Jonathan P. Price, Yi-Leng Chen, Pao-Shin Chu, Jon K. Eischeid, and Donna M. Delparte. 2013. Online Rainfall Atlas of Hawai'i. *Bulletin of the American Meteorological Society* 94(3):313–316. https://doi.org/10.1175/BAMS-D-11-00228.1.

Gon, Samuel, Stephanie Tom, and Ulalia Woodside. 2018. 'Āina Momona, Honua Au Loli—Productive Lands, Changing World: Using the Hawaiian Footprint to Inform Biocultural Restoration and Future Sustainability in Hawai'i. *Sustainability* 10(10):3420. https://doi.org/10.3390/su10103420.

Gonschor, Lorenz, and Kamanamaikalani Beamer. 2014. Toward an Inventory of Ahupua'a in the Hawaiian Kingdom: A Survey of Nineteenth- and Early Twentieth-Century Cartographic and Archival Records of the Island of Hawai'i. *The Hawaiian Journal of History* 48:53–87.

Goodrich, Joseph. 1826. Notice of the Volcanic Character of the Island of Hawaii. *American Journal of Science and Arts* 11:2–7.

Goodrich, Joseph. 1833. Notices of Some of the Volcanos and Volcanic Phenomena of Hawaii, (Owyhee,) and Other Islands in That Group, in a Letter from Mr. Joseph Goodrich, Missionary, Dated Nov. 17, 1832. *American Journal of Science and Arts* 25:199–203.

Hale Kuamo'o. 2025. Ka 'Ohina Nūpepa 'Ōlelo Hawai'i | Hawaiian Newspaper Collection. *Ulukau*. https://nupepa.org/, accessed March 20, 2025.

Haleole, S. N. 1863. *Ke Kaao o Laieikawai: Ka Hiwahiwa O Paliuli, Kawahineokaliula*. Henry M. Whitney, Honolulu.

Haleole, S. N. 1918. *The Hawaiian Romance of Laieikawai with Introduction and Translation by Martha Beckwith*. Translated by Martha Beckwith. Reprinted from the Thrity-Third Annual Report of the Bureau of American Ethnology. Government Printing Office, Washington, D.C.

Handy, E. S. Craighill, Elizabeth Green Handy, and Mary Kawena Pukui. 2020. *Native Planters in Old Hawaii: Their Life, Lore, and Environment*. Digital. Bernice P. Bishop Museum Bulletin 233. Bishop Museum Press, Honolulu.

Handy, E. S. Craighill, and Mary Kawena Pukui. 1998. *The Polynesian Family System in Ka'u, Hawai'i*. Mutual Publishing, Honolulu.

Haun, Alan E., and Dave Henry. 2013. *Archaeological Inventory Survey, TMK: (3) 4-7-07:108, Waiko'eko'e Ahupua'a Hamakua, District, Island of Hawaii (TMK: 3-4-8-06:8, 9, 11, 13, 43, and 44)*. Gault's Gulch, LLC, c/o Edmund W.K. Haitsuka, Carlsmith Ball LLP, Kailua-Kona, HI.

Haun, Alan E., Dave Henry, and Dianne Berrigan. 2006. *Volume I: Archaeological Inventory Survey TMK: (3) 9-5-11:01, 04-06; 9-5-12:01 Land of Kaunamano, Ka'u District, Island of Hawai'i*, Vol. I. Sunrise Oceanfront Farms, LLC, Farmington Hills, MI.

Hawai'i State Office of Planning. 2024. Hawai'i Statewide GIS Program Geospatial Data Portal. https://geoportal.hawaii.gov/.

Hawaii Herald. 1897a. *Increased Water Supply*. *Hawaii Herald*, July 22.

Hawaii Herald. 1897b. *Local Brevities*. *Hawaii Herald*, July 29.

Hawaii Herald. 1897c. *Local Brevities*. *Hawaii Herald*, September 2.

Hawaii Herald. 1911a. *What Hawaii Will Get During Coming Year*. *Hawaii Herald*, May 11.

Hawaii Herald. 1911b. *To Refuse Good Price*. *Hawaii Herald*, October 5.

Hawaii Herald. 1911c. *Large Contracts In General Favor*. *Hawaii Herald*, October 12.

Hawaii Herald. 1912. *The County of Hawaii vs. The Board of the Hawaiian Evangelical Association, a Corporation; John Doe, May Doe, and Richard Roe, Unknown Owners and Claimants*. *Hawaii Herald*, July 12.

Hawaii Herald. 1914. *County Gets Water Bill for $2,578.80*. *Hawaii Herald*, February 6.

Hawaii Tribune-Herald. 1917. *Decision Is Given On Watershed Land Suit*. *Hawaii Tribune-Herald*, February 1.

Hawaii Tribune-Herald. 1940. *Water Supply Is Very Low*. *Hawaii Tribune-Herald*, March 1.

Hawaii Tribune-Herald. 1946. *Veterans Village Lots Are Ready; Selections Tonight*. *Hawaii Tribune-Herald*, November 15.

Hawaii Tribune-Herald. 1950. *Isemoto Awarded Kaumana Water System Contract*. *Hawaii Tribune-Herald*, September 16.

Hawaii Tribune-Herald. 1951. *Water Improvements Keynote Fire Prevention Week*. *Hawaii Tribune-Herald*, October 7.

Hawaii Tribune-Herald. 1953. *Hilo's Water Supply Adequate For Time Being*. *Hawaii Tribune-Herald*, February 4.

Hawaii Tribune-Herald. 1974a. *Unique Hilo Park Proposed*. *Hawaii Tribune-Herald*, February 27.

Hawaii Tribune-Herald. 1974b. *Planning Under Way For Wilderness Park*. *Hawaii Tribune-Herald*, March 10.

Hawaiian Evangelical Association. 1854. *Minutes of the Meeting of the Hawaiian Evangelical Association, Held at Honolulu, May and June 1854*. Mission Press, Honolulu.

Hill, Samuel S. 1856. *Travels in the Sandwich and Society Islands*. Chapman and Hall, London.

Hilo Daily Tribune. 1914a. *May Soon Settle Spring Question*. *Hilo Daily Tribune*, March 17.

Hilo Daily Tribune. 1914b. *Water Controversy Gets Interesting*. *Hilo Daily Tribune*, March 24.

Hilo Daily Tribune. 1914c. *Vannatta Makes Fine Discovery*. *Hilo Daily Tribune*, April 21.

Hilo Tribune. 1903. *Reservoir Site*. *Hilo Tribune*, January 16.

Hilo Tribune. 1905. *Hilo's Polluted Water*. *Hilo Tribune*, February 28.

Hilo Tribune-Herald. 1958. *Army to Study Ainako Stream Flood Project*. *Hawaii Tribune-Herald*, September 26.

Hommon, Robert. 1976. The Formation of Primitive States in Pre-Contact Hawaii. Ph.D. Dissertation, University of Arizona, Department of Anthropology, Tucson, AZ.

Hunt, Terry, and Matthew J. McDermott. 1993. *Archaeological Inventory Survey Pu'ainako Street Extension Project, Lands of Waiakea, Kukuau 1 and 2, and Ponahawai, South Hilo District, Island of Hawai'i*. Okahara and Associates.

Jensen, Peter. 1991. *Archaeological Inventory Survey Komohana Golf Course, Lands of Ponahawai and Punahoa 1-2, South Hilo District, Island of Hawaii (TMK: 3-2-44:09)*. KTA Consulting Group c/o The Keith Companies-Hawaii.

JRP Historical Consulting Services and California Department of Transportation. 2000. *Water Conveyance Systems in California: Historic Context Development and Evaluation Procedures*. Caltrans Environmental Program, Sacramento, CA.

Kagawa-Viviani, Aurora. 2016. *Untangling 'Uala: Toward Re-Diversifying and Re-Placing Sweet Potato in the Hawaiian Landscape*. E Kūpaku Ka 'Āina – The Hawai'i Land Restoration Institute, Wailuku, HI.

Kalākaua, L. D. 1888. *The Legends and Myths of Hawaii. The Fables and Folk-Lore of a Strange People*. Charles L. Webster & Company, New York.

Kamakau, Samuel M. 1976. *The Works of the People of Old, Na Hana a Ka Po'e Kahiko*. B.P. Bishop Museum Special Publication 61. Bishop Museum Press, Honolulu.

Kamakau, Samuel M. 1991. *Tales and Traditions of the People of Old, Nā Mo'olelo a Ka Po'e Kahiko*. Bishop Museum Press, Honolulu.

Kamakau, Samuel M. 1992. *Ruling Chiefs of Hawaii*. Revised. Kamehameha Schools Press, Honolulu.

Kame'eleihiwa, Lilikalā. 1992. *Native Land and Foreign Desires: Ko Hawaii 'Āina a Me Nā Koi Pu'umake a Ka Po'e Haole, Pehea Lā e Pono Ai? How Shall We Live in Harmony?* Bishop Museum Press, Honolulu.

Kelly, Marion. 1982. Report 1. Background History. *Archaeological and Historical Studies for the Alenaio Stream Flood Damage Reduction Study, Hilo, Hawai'i*.

Kelly, Marion, and J. Stephen Athens. 1982. *Archaeological and Historical Studies for the Alenaio Stream Flood Damage Reduction Study, Hilo, Hawai'i*. U.S. Army Engineer Division, Pacific Ocean District.

Kelly, Marion, Barry Nakamura, and Dorothy Barrere. 1981. *Hilo Bay: A Chronological History, Land and Water Use In The Hilo Bay Area, Island of Hawai'i*. U.S. Army Engineer District, Honolulu.

King, Robert. n.d. Hawaiian Land Titles.

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

Kirch, Patrick Vinton. 1992. *Anahulu: The Anthropology of History in the Kingdom of Hawaii, Volume II: The Archaeology of History*. The University of Chicago Press, Chicago.

Kirch, Patrick Vinton. 2010. *How Chiefs Became Kings: Divine Kingship and the Rise of Archaic States in Ancient Hawai'i*. University of California Press, Berkeley.

Kirch, Patrick Vinton. 2011. When Did the Polynesians Settle Hawai'i? A Review of 150 Years of Scholarly Inquiry and a Tentative Answer. *Hawaiian Archaeology* 12:3–26.

Kirch, Patrick Vinton, and Mark D. McCoy. 2023. *Feathered Gods and Fishhooks: The Archaeology of Ancient Hawai'i*. 2nd revised edition. University of Hawaii Press, Honolulu.

Kodani, Ronald, and Doreen Kodani. 2025. Interview with Ronald and Doreen Kodani Interview by Benjamin Barna, July 22.

Konishi Co., Ltd. 2021. Company Profile. Konishi Co., Ltd.

Kuykendall, Ralph. 1938. *The Hawaiian Kingdom 1778–1854. Foundation and Transformation*, Vol. 1. 3 vols. University Press of Hawaii, Honolulu.

Ladefoged, Thegn. 1991. Hawaiian Architectural Transformations during the Early Historic Era. *Asian Perspectives* 30(1):55–70.

Ladefoged, Thegn. 1998. Spatial Similarities and Change in Hawaiian Architecture: The Expression of Ritual Offering and Kapu in Luakini Heiau, Residential Complexes, and Houses. *Asian Perspectives* 37(1):59–73.

Langlas, Charles M. 2022. A History of Ranching Operations in the Saddle Region of Hawai'i Island. *Hawaiian Journal of History* 56(1):113–141. https://doi.org/10.1353/hjh.2022.a907634.

Ledyard, John. 1783. *A Journal of Captain Cook's Last Voyage to the Pacific Ocean, and in Quest of a North-West Passage, Between Asian & America*. Nathanial Patten, Hartford.

Liliuokalani (editor). 1978. *The Kumulipo: An Hawaiian Creation Myth*. Pueo Press, Kentfield, Calif.

Lindsey, Bill. 2016. Bottle Bases. *Historic Glass Bottle Identification & Information Website*.

Lockhart, Bill, Pete Schulz, Bill Lindsey, Carol Serr, David Whitten, and Beau Schriever. 2021. The American Bottle Co.: A Study in Contrasts and Contradictions. In *Encyclopedia of Manufacturer's Marks on Glass Containers*, edited by The Bottle Research Group, pp. 333–380.

Lockwood, Christopher. 2009. Pigs, Dryland Agriculture and Social Complexity in Precontact Hawai'i: Assessing Surplus Production through Landscape Geochemistry. Ph.D. Dissertation, University of Washington, Seattle.

Loebenstein, Alexander B. (Hawai'i Land Survey Division). 1895. *Piihonua Road*. 1:2,400. Hawai'i Land Survey Division.

Lucas, Paul. 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.

Lyman, F. S. (Hawai'i Land Survey Division, Registered Map No. 1062). 1882. *Hilo Town Titles*. Hawai'i Land Survey Division, Registered Map No. 1062.

Lyman, H. M. (Hawaii Land Survey Division). 1853. *Survey of That Portion of Punahoa 2nd Lying Makai of the Woods*. Registered Map No. 1744, 1:6336. Hawaii Land Survey Division.

Malden, C. R. (Hydrographic Office of the Admiralty). 1841. *Sandwich Islands, Waiakia or Byron Bay on the North-East Side of Owyhee Survyed By Lieut C. R. Malden R.N. 1825*. Hydrographic Office of the Admiralty.

Malo, David. 1951. *Hawaiian Antiquities*. Translated by Nathaniel B. Emerson. Second. B. P. Bishop Museum Special Publication 2. B. P. Bishop Museum Press, Honolulu.

Maly, Kepā. 2003. *He Wai Moʻolelo No Ponahawai A Me Punahoa Ma Hilo: A Collection of Traditions and Historical Accounts for Ponahawai and Punahoa, District of HIlo, Island of Hawaiʻi*. Kimura International, Honolulu.

McEldowney, Holly. 1979a. *Archaeological and Historical Literature Search and Research Design: Lava Flow Control Study, Hilo, Hawaiʻi*. the U.S. Army Engineer Division, Pacific Ocean.

McEldowney, Holly. 1979b. *Inventory of Archaeological and Historical Resources, Lava Flow Control Study, Hilo, Hawaiʻi*. U.S. Army Engineer Division, Pacific Ocean Honolulu.

Menzies, Archibald. 1920. *Hawaii Nei, 128 Years Ago*. Honolulu, T.H., Honolulu.

Mitchell, H. 1930. *Triangulation in Hawaii*. Special Publication No. 156. U.S. Department of Commerce, Coast and Geodetic Survey, Washington, D.C.

Nakuina, Emma. 1893. Ancient Hawaiian Water Rights and Some of the Customs Pertaining to Them. In *The Hawaiian Annual 1894*, pp. 79–84. Press Publishing Company Steam Print, Honolulu.

National Park Service. 1997. *How to Apply the National Register Criteria for Evaluation*. National Register Bulletin 15. U.S. Department of the Interior, National Park Service, Washington, D.C.

Newman, T. Stell. 1970. *Hawaiian Fishing and Farming on the Island of Hawaii in A.D. 1778*. Department of Land and Natural Resources, Division of State Parks, State of Hawaii, Honolulu.

Newton, H. E. (Hawaiʻi Land Survey Division). 1937. *Land Court, Territory of Hawaii, Subdivision of Land Court Application 292, as Shown on Map 1 Field in the Office of the Assistant Registrar of the Land Court into Lots 1, 2, 3, and 4.* Hawaiʻi Land Survey Division.

Office of Planning and Sustainable Development. 2025. Hawaiʻi Board on Geographic Names. *Hawaii Statewide GIS Program*. https://planning.hawaii.gov/gis/hbgn/.

Paquay, François S., Fred T. Mackenzie, and Alberto V. Borges. 2007. Carbon Dioxide Dynamics in Rivers and Coastal Waters of the “Big Island” of Hawaii, USA, during Baseline and Heavy Rain Conditions. *Aquatic Geochemistry* 13(1):1–18. https://doi.org/10.1007/s10498-006-9005-5.

Pogue, John F. 1978. *Moolelo of Ancient Hawaii*. Translated by Charles W. Kenn. Topgallant Press, Honolulu.

Pukui, Mary Kawena, and Samuel H. Elbert. 1986. *Hawaiian Dictionary: Hawaiian-English, English-Hawaiian*. Revised and english. University of Hawaii Press, Honolulu.

Pukui, Mary Kawena, Samuel H. Elbert, and Edwin Moʻokini. 1974. *Place Names of Hawaii*. Revised and Expanded. University of Hawaii Press, Honolulu.

Rechtman, Robert B. 2004. *Archaeological Inventory Survey and Limited Cultural Assessment for a Proposed Department of Water Supply Reservoir, TMK:3-2-3-30:5 (Por.), Piʻihonua Ahupuaʻa, South Hilo District, Island of Hawaiʻi*. Ron Terry, Geometrician, Keaʻau, HI.

Rieth, Timothy, and J. Stephen Athens. 2013. Suggested Best Practices for the Application of Radiocarbon Dating to Hawaiian Archaeology. *Hawaiian Archaeology* 13:3–29.

Rieth, Timothy M., Terry L. Hunt, Carl Lipo, and Janet M. Wilmshurst. 2011. The 13th Century Polynesian Colonization of Hawai’i Island. *Journal of Archaeological Science* 38(10):2740–2749. https://doi.org/10.1016/j.jas.2011.06.017.

RSM, Inc. 1977. *Open House: Ainako Terrace Subdivision Unit II*. *Hawaii Tribune-Herald*, September 9.

Sacramento Public Library. n.d. Buffalo Brewing Co. *Sacramento Room Digital*. https://sacroom.contentdm.oclc.org/digital/collection/p15248coll1/id/4112, accessed March 3, 2025.

Sahlins, Marshall. 1992. Historical Ethnography. In *Anahulu, The Anthropology of History in the Kingdom of Hawai'i*, edited by Patrick Kirch and Marshall Sahlins, 1:. University of Chicago Press, Chicago.

Sai, David Keanu. 2011. *Ua Mau Ke Ea Sovereignty Endures: An Overview of the Political and Legal History of the Hawaiian Islands*. Pū'ā Foundation, Honolulu.

Samwell, David. 1786. *A Narrative of the Death of Captain James Cook, to Which Are Added Some Particulars, Concerning His Life and Character, and Observations Respecting the Introduction of the Venereal Disease into the Sandwich Islands*. G.G. J. and J. Robinson, London.

Schlanger, Sarah H. 1992. Recognizing Persistent Places in Anasazi Settlement Patterns. In *Space, Time, and Archaeological Landscapes*, edited by Jacqueline Rossignol and LuAnn Wandsnider, pp. 91–112. Plenum Press, New York.

Schütz, Albert J. 1994. *The Voices of Eden: A History of Hawaiian Language Studies*. University of Hawai'i Press, Honolulu.

Sherrod, David R., John M. Sinton, Sarah E. Watkins, and Kelly M. Brunt (U.S. Department of the Interior, U.S. Geological Survey). 2021. *Geologic Map of the State of Hawai'i*. USGS Numbered Series, 1:100,000 and 1:250,000. U.S. Department of the Interior, U.S. Geological Survey. Reston, VA.

Sinoto, Aki. 1978. *Archaeological Reconnaissance Survey of Proposed Kaumana Springs Wilderness Park. Hilo, Island of Hawaii*. Division of Parks and Recreation County of Hawaii, Hilo, HI.

Smith, Dave. 2005. *County Land Not for Sale*. *Hawaii Tribune-Herald*, November 9.

Soehren, Lloyd. 2005. A Catalog of Hawai'i Place Names Compiled from the Records of the Boundary Commission and the Board of Commissioners to Quiet Land Title of the Kingdom of Hawaii. Part 1: Puna and Hilo.

Soehren, Lloyd. 2019. Hawaiian Place Names. *Ulukau: The Hawaiian Electronic Library*. http://ulukau.org/cgi-bin/hpn?, accessed September 15, 2016.

Soil Survey Staff. 2023. Web Soil Survey. http://websoilsurvey.nrcs.usda.gov.

Southworth, E. A. (Hawai'i County Department of Public Works). 1913. *Hilo Boarding School Ditch from the Wailuku Water Head to the Hilo Boarding School, Showing the Wailuku Drainage Basin and the Plantation Land, Hilo, Hawaii*. 1:2400. Hawai'i County Department of Public Works. Hilo, HI.

Spear, Robert L. 1992. *An Archaeological Inventory Survey for the H.C.E.O.C. Project, Hilo. Island of Hawai'i (TMK: 2-3-32:1B)*. Neil Erickson, AIA, Kaneohe, HI.

Spear, Robert L. 1993a. *An Archaeological Inventory Survey for the Hilo Health Care Center, Island of Hawai'i (TMK: 2-3-31:1)*. Mr. Roy Takemoto.

Spear, Robert L. 1993b. *An Inventory Survey of the H.C.E.O.C (Option II) Parcel, Piihonua Ahupua'a, South Hilo District, Hilo, Hawai'i [TMK:2-3-32:4]*. Stuart/Erickson and Associates.

State of Hawaii. 1909. *Laws of the Territory of Hawaii Passed by the Legislature at Its Regular Session*. Hawaiian Gazette Co., LTD., Honolulu.

Tam Sing, Lauren M. U. K., Teresa Gotay, Lokelani Brandt, and Robert Rechtman. 2017. *A Cultural Impact Assessment for the Renewal of Hawai'i Electric Light's Wailuku River Water Lease, TMK: (3) 2-6-009 (Por.), Pi'ihonua and Pu'u'eo Ahupua'a, South Hilo District, Island of Hawai'i*. SSFM International, Honolulu.

Tatar, E. 1982. *Nineteenth Century Hawaiian Chant*. Department of Anthropology, B.P. Bishop Museum.

Territory of Hawaii. 1903. Dept. of Taxation (3rd Div.) Real Property Tax Ledgers South Hilo (1902-1903). Digital Archives of Hawai'i.

Territory of Hawaii. 1912. Dept. of Taxation (3rd Div.) Real Property Tax Ledgers South Hilo (1911-1912). Digital Archives of Hawai'i.

Territory of Hawaii. 1914. Dept. of Taxation (3rd Div.) Real Property Tax Ledgers South Hilo (1913-1914). Digital Archives of Hawai'i.

Territory of Hawaii. 1919. Dept. of Taxation (3rd Div.) Real Property Tax Ledgers South Hilo (1919). Digital Archives of Hawai'i.

Territory of Hawaii. 1921. Dept. of Taxation (3rd Div.) Real Property Tax Ledgers South Hilo (1921). Digital Archives of Hawai'i.

Terry, Ron, and Patrick J. Hart. 2024. *Biological Survey TMKs: (3) 2-3-030: 004 & Portions of 2-3-030:001 and 2-3-031:001 Hilo, Island of Hawai'i*.

The Pacific Commercial Advertiser. 1890. *Lease at Auction! The Pacific Commercial Advertiser*, December 23.

Towill, R. M. (Department of Accounting and General Services Survey Division). 1947. *Ainako Subdivision Series 2*. File Plan 427. Department of Accounting and General Services Survey Division. Honolulu.

United States Bureau of Labor Statistics. 2024. CPI Inflation Calculator. *U.S. Bureau of Labor Staistics*. https://www.bls.gov/data/inflation_calculator.htm.

United States Department of Agriculture (United States Department of Agriculture). 1964. *Aerial Photograph EKL-6CC-14*. Aerial Photograph. United States Department of Agriculture.

United States Geological Survey. 2023. USGS 1 Meter 5 X27y219 HI_Hawaii_Island_Lidar_NOAA_2017_B17. https://prd-tnm.s3.amazonaws.com/StagedProducts/Elevation/1m/Projects/HI_Hawaii_Island_Lidar_NOAA_2017_B17/TIFF/USGS_1M_5_x27y219_HI_Hawaii_Island_Lidar_NOAA_2017_B17.tif.

United States Geological Survey (Department of the Interior, United States Geological Survey). 1954. *Aerial Photograph 1HAI000080008*. Aerial Photograph. Department of the Interior, United States Geological Survey.

United States Geological Survey (Department of the Interior, United States Geological Survey). 1977. *Aerial Photograph 1VEEC00040138*. Aerial Photograph. Department of the Interior, United States Geological Survey.

United States Geological Survey (Department of the Interior, United States Geological Survey). 1985. *Aerial Photograph AR5880038310330*. Aerial Photograph. Department of the Interior, United States Geological Survey.

Vacca, Kirsten Marquise Garwood. 2019. A Question of Design: The Investigation of Space and Structure in Hawaiian Kauhale. Ph.D. Thesis, University of California, Berkeley, Berkeley, CA.

Van Gilder, Cindy, and Patrick Vinton Kirch. 1997. Household Archaeology in the Ahupua'a of Kipapa and Naka'ohu. In *Na Mea Kahiko o Kahikinui: Studies in the Archaeology of Kahikinui, Maui*. Oceanic Archaeology Laboratory Special Publication 1. Archaeological Research Facility, University of California, Berkeley.

Walker, Alan, and Paul H. Rosendahl. 1996. *Archaeological Assessment Study Hilo Judiciary Complex Project, Lands of Wainaku, Pōnohawai, Pi'ihonua, and Waiākea, South Hilo District, Island of Hawai'i (TMK: 2-6-15:1,2; 2-6-16:2; 2-4-49:18,19; 2-2-15:33; 2-4-1:12)*. State of Hawai'i, Honolulu.

Walters, Kimura, and Associates, Inc. 1976. *Environmental Assessment for Kaumana Springs Wilderness Park (Oct. 19, 1976)*. the County of Hawaii.

Warshauer, Kent. 2003. *Kaumana Springs Once Supplied Hilo with Water*. *Hawaii Tribune-Herald*, July 3.

Warshauer, Kent. 2005a. *Water: From Buckets and Pumps to Turning the Tap*. *Hawaii Tribune-Herald*, August 14.

Warshauer, Kent. 2005b. *Hilo's Sanitary Water System Was a Long Time Coming*. *Hawaii Tribune-Herald*, August 21.

Wellmon, Bernard. 1973. Frontier Traders and Pioneer Cattlemen: A Hawaiian Perspective. *Hawaiian Journal of History* 7:48–54.

Westervelt, William Drake. 1910. *Legends of Ma-Ui--A Demi God of Polynesia and of His Mother Hina*. The Hawaiian Gazette Co., Ltd., Honolulu.

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

Wilkinson, Sarah, and Hallett H. Hammatt. 2009. *Archaeological Field Inspection and Literature Review Report for the DOE Hilo High School Gymnasium Project Pi'ihonua Ahupua'a, South Hilo District, Island of Hawai'i TMK [3] 2-3-015:001*. Kober/Hanssen/Mitchell Architects.

Wilmshurst, Janet, Terry Hunt, Carl Lipo, and Atholl Anderson. 2011. High-Precision Radiocarbon Dating Shows Recent and Rapid Colonization of East Polynesia. *Proceedings of the National Academy of Sciences* 108:1815–1820.

Winter, Kawika B., Noa Kekuewa Lincoln, Fikret Berkes, Rosanna A. Alegado, Natalie Kurashima, Kiana L. Frank, Pua'ala Pascua, et al. 2020. Ecomimicry in Indigenous Resource Management: Optimizing Ecosystem Services to Achieve Resource Abundance, with Examples from Hawai'i. *Ecology and Society* 25(2):art26. https://doi.org/10.5751/ES-11539-250226.

Wolforth, Thomas R. 1999. *Data Recovery for the Housing Facility at the Hawai'i Community Correctional Center: Investigation into the Network of Ditches in the Hāla'i Region of Hilo. Land of Pi'ihonua, South Hilo District, Island of Hawai'i (TMK:3-2-3-23:Por.5)*. Architects Hawaii Ltd., Hilo, HI.

APPENDIX A

Appendix A: SIHP 05-10-35-18696 Features in the Project Area

Feature	Type	Age	Function	Photo
18696 00-01	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.5 m	1.5 m	40 cm	Fair	

Description: Small linear mound of roughly piled small to large sized subangular pahoehoe cobbles. Located close to ditch (Feature 00-04).
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 00-04	Ditch	H	Water infrastructure	
Length	**Width**	**Height**	**Condition**	
47.0 m	2.0 m	-60 cm	Fair	

Description: Ditch extending between tributaries of ʻĀinakō Stream. Measures approximately 47.0m x 2.0m x 0.6m depth. Subangular pahoehoe cobbles irregularly line the banks of the ditch and ditch bottom. Banks are eroded. Length was measured only in project area.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** None.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 01-01	Wall	P/H	Indeterminate	
Length	**Width**	**Height**	**Condition**	
25.5 m	0.7 m	20 cm	Poor	

Description: Remnant of wall extending roughly east-west near improved springs. Potentially connected to terrace just west of wall. Only the base is left, but it could be retaining wall. About .7m wide and .2m tall. Constructed with sm to lrg subang phh cobbles roughly piled.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** d s w f.
Recommendation: P

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

Appendix A: SIHP 05-10-35-18696 Features in the Project Area

Feature	Type	Age	Function	Photo
18696 01-02	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
1.5 m	1.5 m	50 cm	Fair	

Description: Mound constructed with small to large sub angular pāhoehoe cobbles and a few small boulders that have been roughly piled up to at least 2-3 stones high.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 01-04A	Terrace	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.0 m	3.1 m	15 cm	Poor	

Description: Terrace constructed with small to large subangular cobbles. Surface is relatively level with few jumbled cobbles. On north side of terrace glass bottle fragments and ceramic fragments were observed.
Cultural Material: Glass bottle fragments, ceramic fragments
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** d s w f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 01-04B	Terrace	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.9 m	2.6 m	30 cm		

Description: Small terrace behind a retaining wall built with faced, stacked small to large subangular pahoehoe cobbles. The wall measures 2.6 meters long by 0.9 meters wide and stands 30 centimeters (2 courses) above the ground surface
Cultural Material: None
Data Potential: Interpretation
Contributes to: a c d. **Integrity issues:** d s w f.
Recommendation: P

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

Appendix A: SIHP 05-10-35-18696 Features in the Project Area

Feature	Type	Age	Function	Photo
18696 01-04C	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.7 m	2.7 m	60 cm		

Description: Mound constructed with piled small to large subangular pāhoehoe cobbles
Cultural Material: None
Data Potential: Interpretation
Contributes to: a c d. **Integrity issues:** d s w f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 01-04D	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
1.7 m	1.7 m	50 cm		

Description: Mound constructed with piled small to large subangular pāhoehoe cobbles
Cultural Material: None
Data Potential: Interpretation
Contributes to: a c d. **Integrity issues:** d s w f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 01-05	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.7 m	2.0 m	65 cm	Poor	

Description: Small mound constructed with small to large subangular pāhoehoe cobbles. Possibly stacked, some facing visible. Disturbed and obscured by fallen tree.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: P

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

Appendix A: SIHP 05-10-35-18696 Features in the Project Area

Feature	Type	Age	Function	Photo
18696 01-09A	Mound	I	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.8 m	1.8 m	130 cm	Fair	

Description: Neatly stacked and faced small to large subangular pāhoehoe cobbles, 6 stones tall on exposed bedrock.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 01-09B	Wall	I	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.1 m	1.2 m	75 cm	Fair	

Description: Stacked small to large subangular pāhoehoe cobbles, two medium boulders at west end. East end is slighltly collapsed. Stacked 3 courses tall.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 01-09C	Mound	I	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.9 m	2.7 m	110 cm	Fair	

Description: Neatly stacked and faced small to large subangular pāhoehoe cobbles, 6 stones tall on exposed bedrock.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Appendix A: SIHP 05-10-35-18696 Features in the Project Area

Feature	Type	Age	Function	Photo
18696 01-09D	Mound	I	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.2 m	3.1 m	135 cm	Fair	

Description: Neatly stacked and faced small to large subangular pāhoehoe cobbles, 6 stones tall on exposed bedrock.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 01-09E	Modified spring	I	Water infrastructure	
Length	**Width**	**Height**	**Condition**	
3.0 m	2.7 m	100 cm	Fair	

Description: Appears to be a natural depression exposing a spring. Western (uphill) edge of depression is reinforced with stacked small to large subangular pāhoehoe cobbles and a few small boulders.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 01-09F	Terrace	I	Agriculture	
Length	**Width**	**Height**	**Condition**	
0.0 m	0.0 m	cm		

Description: Northeast end is defined by a single course of stones exposed above the ground surface.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

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m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 01-09G	Mound	I	Agriculture	
Length	**Width**	**Height**	**Condition**	
9.5 m	2.6 m	75 cm	Fair	

Description: Linear mound constructed with piled small to large subangular pāhoehoe cobbles. Some collapsed areas.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 01-09H	Mound	I	Agriculture	
Length	**Width**	**Height**	**Condition**	
6.1 m	3.5 m	61 cm	Fair	

Description: Linear mound constructed with piled small to large subangular pāhoehoe cobbles. Some collapsed areas.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 01-09I	Terrace	I	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.7 m	4.0 m	25 cm	Fair	

Description: End is lined with small to large subangular pāhoehoe cobbles and a few small boulders. This retaining wall has collapsed due to tree fall.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 02-03	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
1.0 m	1.0 m	50 cm	Poor	

Description: Located on slope west of spring house foundation (02-02). Constructed with small to large subangular sub angular pāhoehoe cobbles. Northeast edge collapsed. May have been a small terrace but has collapsed.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 03-01	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.7 m	2.3 m	110 cm	Fair	

Description: Small oval rough mound, with stacked facing on south side, 4-5 courses subangular cobbles. Tumbled on north, east, and west. Sitting on slight pāhoehoe outcrop.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 03-02	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.1 m	1.7 m	110 cm	Poor	

Description: Irregular/rectangular mound with stacked facing 4-5 courses of subangular cobbles on southeast side, all other sides tumbled.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 03-03	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
1.3 m	1.1 m	50 cm	Poor	

Description: Small rough mound, stacked facing on east side. 3-4 courses subangular cobbles. Under fallen tree.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 03-04	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.6 m	1.9 m	40 cm	Poor	

Description: Small, low rough mound. Tumbled subangular cobbles, about 4-5 courses. Looked to have facing at one point as bottom edge on E is aligned. Sitting on pāhoehoe outcrop.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 03-05	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
5.0 m	3.5 m	180 cm	Poor	

Description: Rough disturbed mound on high rise. Minimal facing remnant on east side, but heavily disturbed by collapsed trees and uprooting
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s w f.
Recommendation: NFW

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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 03-06	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.9 m	1.9 m	90 cm	Fair	

Description: Rough oval mound, set on edge of drainage on pāhoehoe outcrop. Waiwi trees growing out of it. 3-4 courses subangular cobbles.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 03-07	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.7 m	3.1 m	100 cm	Fair	

Description: Large, stacked mound built with subangular cobbles to small boulders. Walls are slightly angled outwards at bottom, while top of mound is slightly mounded but generally flat. West and south walls are most faced, east is slightly collapsed and north has banyan growing .out of it. West wall has slight rim on top
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 03-08	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
7.6 m	4.4 m	280 cm	Fair	

Description: Large rectangular mound with large depression in center. East wall is face and stacked, but south and west are mounded/tumbled and are higher. North has autograph tree growing out of it and is mounded, extending to north. 4-10 courses of subangular cobbles and small boulders. Depression is square and offset to W, and interior walls seem to be faced and stacked. Depression measures 1.8m n/s, 1.4 e/w, 40-100cm deep.
Cultural Material: None
Data Potential: Timing and nature of habitation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: DR

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Feature	Type	Age	Function	Photo
18696 03-09	Complex	H	Habitation	

Length	Width	Height	Condition
15.0 m	10.0 m	100 cm	Good

Description: Large irregular shaped habitation complex. 2 high stacked faced platforms on N side with a double terrace between them. To SW L-shaped wall extends from W platform to create semi enclosure to south of terraces, level with second terrace, cleared interior. Small low enclosure wall extends from S of L-shape to create a soiled 'garden' area. All walls except enclosure are stacked and faced. Enclosure wall is core-filled, faced and stacked. 2-4 courses of subangular cobbles and small boulders. 1.9m wide, .8m tall. Bottle found in void in wall, early 20th century.
Cultural Material: Glass bottle
Data Potential: Information on household and timing of occupation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 03-11	Mound	P/H	Agriculture	

Length	Width	Height	Condition
2.0 m	1.0 m	40 cm	Poor

Description: Small linear mound, roughly piled but disturbed by vegetation as well. 1-4 courses of subangular cobbles.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s w f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 03-12	Mound/platform	P/H	Indeterminate	

Length	Width	Height	Condition
6.5 m	3.4 m	110 cm	Fair

Description: Linear mound or platform built on outcrop. Slightly mounded on top but clearly flattened, with rounded corners. 4-8 courses subangular cobbles and small boulders, stacked and faced walls. Distinct round bulge at south end which cuts inwards on SE side. Guava growing near center has caused some collapse. Autograph tree growing out of NE end.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

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Feature	Type	Age	Function	Photo
18696 03-13	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
1.4 m	0.9 m	50 cm	Poor	

Description: Small rough oval mound, subangular cobbles and small boulders. 2-3 courses, no stacking or facing. Set on exposed pāhoehoe outcrop.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 03-14	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
6.0 m	1.2 m	110 cm	Fair	

Description: Linear mound with clear facing on south side but tumbled and disturbed on north, stacked. Curved edges, rounded on south. 4-8 courses of subangular cobbles and small boulders, most clean on SE side.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s w f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 03-15	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
10.5 m	4.4 m	90 cm	Fair	

Description: Triangular mound set on NW edge of drainage, with stacked facing on NW side. SE side collapsed and tumbled towards stream. Mound was originally linear along stream but seems tumbled. Autograph trees and palms growing out of mound. 3-6 courses subangular cobbles and boulders.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 03-16	Ditch	H	Water infrastructure	
Length	**Width**	**Height**	**Condition**	
18.5 m	3.7 m	70 cm	Fair	

Description: Stacked and faced wall along south edge of a drainage. P 3-4 courses subangular cobbles, some facing but clearly stacked. At least 8.5m long but more is hidden under a fallen tree, 3.7 wide, .7m tall at top of bank but 1.7m from bottom of bank to top. The addition of this wall to the drainage bank suggests the drainage was an 'auwai. Wall extends along drainage until it disappears under collapsed trees. On north side of wall it descends into streambed, creating a paved bank.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 03-17	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
1.9 m	1.7 m	30 cm	Fair	

Description: Small mound, roughly piled. Subangular cobbles, 2-4 courses.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 03-18	Modified spring	P/H	Water infrastructure	
Length	**Width**	**Height**	**Condition**	
0.7 m	0.7 m	-54 cm	Fair	

Description: Spring set within the southern edge of Feature 03-19, a low retaining wall. The spring is lined with a cleanly faced wall of subangular cobbles stacked 3 courses above the ground surface. The wall opens to the north. Spring is .7m diameter, .54m deep.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a c. **Integrity issues:** s f.
Recommendation: P

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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 03-19	Retaining wall	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
27.0 m	1.8 m	30 cm	Fair	

Description: Retaining wall, very low and only visible as a risen mound with 1 course of cobbles at times. Some parts are more piled. Subangular cobbles and small boulders, 1-3 courses. 1.8 wide, .3 tall. Feature 03-18, a spring, is located on the southern edge of this feature.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 03-21	Wall	H	Boundary	
Length	**Width**	**Height**	**Condition**	
201.0 m	1.0 m	150 cm	Fair	

Description: Wall extending roughly north-south between the tributary of Ainako Stream at the southern end of the parcel to a junction with Feature 06-01, another wall. Varies between 3-8 courses, from .5-1.5m tall and .4m-1m wide. Form varies along its, length, at times appearing as a retaining wall with soil accumulated behind it and others standing free. Condition varies between fair and poor due to collapse and root disturbance. This wall matches the boundary between Lots 3 and 4 on Registered Map 2508, and despite its condition problems clearly defines the boundary on the ground.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s w f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 04-01	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
9.7 m	2.6 m	100 cm	Fair	

Description: Linear mound of roughly piled subangular cobbles and small boulders, 4-8 courses. Mound is oriented parallel to the edge of an east-west trending drainage. Slightly larger and higher on east end
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

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Feature	Type	Age	Function	Photo
18696 04-02	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.4 m	3.3 m	120 cm	Fair	

Description: Mound built of roughly piled subangular cobbles to small boulders, 6-9 courses high. Possibly stacking and facing on west side but very tumbled on most sides.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 04-03	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.5 m	1.0 m	60 cm	Poor	

Description: Mound built of roughly piled subangular cobbles to small boulders, heavily distrubed by fallen trees and root disturbance. Two smaller mounds to north. Possibly a disturbed wall or terrace.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s w f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 04-04	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
1.0 m	1.0 m	30 cm	Fair	

Description: Mound built of roughly piled subangular cobbles to small boulders. Root disturbance.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s w f.
Recommendation: NFW

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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 04-05	Wall	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
1.8 m	1.6 m	50 cm	Poor	

Description: Remnant of 03-21 wall. Appears as small rough mound, piled subangular cobbles. 3-4 courses, under fallen trees.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 04-06	Wall	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.8 m	1.4 m	70 cm	Fair	

Description: Remant of 03-21 wall. Appears as mound built of roughly piled of subangular cobbles and small boulders. Oval shaped, stands 3-6 courses.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 04-07	Wall	P/H	Boundary	
Length	**Width**	**Height**	**Condition**	
129.6 m	1.1 m	60 cm	Poor	

Description: Discontinuous wall extending roughly north-south. Some sections are clearly stacked and faced walls with 3-4 courses of subangular cobbles and some sections are low mounded soil with only a few inset cobbles visible. Dimensions range between .2m and .6m in height, .3m wide and 1.1m wide. This correlates to boundary between Lots 4 and 5 on Registered Map 2508.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 05-01	Enclosure	P/H	Habitation	
Length	**Width**	**Height**	**Condition**	
5.4 m	4.2 m	110 cm	Poor	

Description: Possible remnant enclosure, roughly rectangular, located just above north bank of ʻĀinakō Stream tributary. But located near pipeline on 1930 TMK map. Interior is roughly level and cleared. Exterior is defined by a rock wall of piled subangular cobbles 2-3 courses tall on NW side, the NE and SW sides are mounded soils with 1 course of cobbles exposed, the SE side is eroded into drainage. S corner 4 courses is built up with 2 historic glass bottles partially exposed in ground and 1 in structure. In the W corner a flat cobble exposed with possible abrasions on face. 5.4 n/s, e/w 4.15, .35m n wall, S corner 1.1m.
Cultural Material: Three glass bottles.
Data Potential: Timing and nature of habitation
Contributes to: a d. **Integrity issues:** s w f.
Recommendation: DR

Feature	Type	Age	Function	Photo
18696 05-02	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.5 m	2.2 m	70 cm	Fair	

Description: Rough oval mound of piled subangular cobbles, 4-6 courses high, located on north edge of drainage.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 05-03	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
5.5 m	1.3 m	70 cm	Fair	

Description: Disturbed mound built on the edge of the north bank of 'Ainako Stream tributary. Built of piled subangular cobbles and small boulders 2-3 courses high with larger material on perimeter and smaller inside. Erosion of bank has undermined part of the mound, which has collapsed down the bank wall a distance 5.1 meters.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s w f.
Recommendation: NFW

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Feature	Type	Age	Function	Photo
18696 05-04	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
8.1 m	2.1 m	93 cm	Fair	

Description: Linear mound of piled subangular cobbles and small boulders.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 05-05	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
8.0 m	3.7 m	170 cm	Fair	

Description: Large oval mound, roughly piled subangular cobbles to small boulders, 10-12 courses. Autograph trees growing in mound.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 05-06	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.0 m	2.9 m	110 cm	Fair	

Description: Rough oblong mound, some stacking and slight facing on south side but tumbled on other sides. 4-8 courses, subangular cobbles to small boulders. Autograph tree and guava growing out of it
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

Appendix A: SIHP 05-10-35-18696 Features in the Project Area

Feature	Type	Age	Function	Photo
18696 05-07	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
6.1 m	3.8 m	175 cm	Fair	

Description: Rough oval mound, piled subangular cobbles and small boulders 4-8 courses. Autograph tree growing out of mound.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 05-08	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
6.6 m	4.8 m	210 cm	Fair	

Description: Rough oblong mound, tumbled on all sides. 8-12 courses, subangular cobbles to small boulders. Autograph and waiwai growing out of it, particularly on e/w sides
Cultural Material: Glass bottle.
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 05-09	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
1.9 m	1.8 m	110 cm	Fair	

Description: Small mound, stacked and faced on north side, stacked on south side. Set on pāhoehoe outcrop, 2-6 courses subangular cobbles
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 05-10	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.4 m	2.3 m	120 cm	Poor	

Description: Rough piled mound with trees and roots covering it. Very disturbed on southwest side, probably due to tree fall. 4-8 courses of subangular cobbles and boulders, historic bottle in voids.
Cultural Material: Glass bottle.
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s w f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 05-11	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.7 m	2.7 m	130 cm	Fair	

Description: Small mound, roughly piled subangular cobbles and small boulders. 6-8 courses, oval.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 05-12	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
7.9 m	5.5 m	210 cm	Fair	

Description: Large, very overgrown mound, with some stacking on NE side. 10-15 courses of subangular cobbles and small boulders, tumbled on most sides. Mounded on top, large autograph tree growing out of most of mound.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 05-13	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
5.6 m	4.6 m	75 cm	Fair	

Description: Large mound, overgrown with autograph trees. Almost square in shape with stacked and faced walls where visible. 4-6 courses, subangular cobbles to small boulders.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 05-14	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.2 m	1.8 m	30 cm	Fair	

Description: Small roughly piled mound, sitting on pāhoehoe outcrop. Small subangular cobbles to medium, 3-5 courses
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 05-15	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.4 m	2.8 m	90 cm	Poor-fair	

Description: Mound set on edge of pāhoehoe outcrop. Roughly piled but with some facing on south side, heavily overgrown with autograph trees. 4-5 courses subangular cobbles and small boulders.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 05-16	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.9 m	2.0 m	85 cm	Poor	

Description: Rough mound set on pāhoehoe outcrop. Piled and stacked along east side, but tumbled down on west side. 3-5 courses, subangular cobbles and small boulder
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 05-17	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.2 m	2.2 m	110 cm	Fair	

Description: Roughly piled rounded mound, 6-8 courses of subangular cobbles
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 05-18	Wall	H	Boundary	
Length	**Width**	**Height**	**Condition**	
160.8 m	0.6 m	80 cm	Fair	

Description: Discontinuous wall of varying construction extending roughly north - south, turns east at northern end. Varies between freestanding and retaining. Some stacked and faced sections and some mounded, appears core filled in parts. Varies in height from 0.3m to 0.8m, width 0.3m to 0.6m. 1-5 courses. Some sections well preserved, other smashed by fallen trees. Located on boundary between Lot 5 and Lots 7 and 9 on Registered Map 2508.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 06-01	Wall	H	Boundary	
Length	**Width**	**Height**	**Condition**	
270.0 m	3.3 m	60 cm	Poor	

Description: Discontinuous rock wall extending roughly west-southwest from the northern parcel boundary, then turning north after 247 meters and extending another 39 meters before ending. Construction varies along length but material is small to large subangular pāhoehoe cobbles. Where stacked, up to 3 courses are extant. Some segments of the wall are mounded, some faced, and there are occasional gaps between segments and there is a high degree of disturbance from fallen trees and tree roots. Wall width varies between 1.14m and 3.3m wide by 20cm to 60cm tall. Located on boundary between Lot 6 and Lots 7, 8, 10, 11, 13, and 14 depicted on Registered Map 2508.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s w f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 06-03	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
5.7 m	3.2 m	160 cm	Poor-fair	

Description: Large rectangular mound at the end of rock wall, constructed with sm-lrg sub angular pāhoehoe cobbles and a few small boulders that have been piled between 6-8 courses high. N face neatly faced
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 06-04	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
1.0 m	1.0 m	55 cm	Poor	

Description: Square mound constructed with small and medium subangular pāhoehoe cobbles along the W edge of a drainage/stream.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 06-05	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.2 m	2.2 m	110 cm	Fair	

Description: Small rough mound constructed with small-large subangular pāhoehoe cobbles that have been neatly stacked to at least 6 courses high. Situated at the S edge of stream/drainage.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 06-06	Rock pile	H	Clearing	
Length	**Width**	**Height**	**Condition**	
4.8 m	4.2 m	175 cm	Poor	

Description: Looks like dozer push. Linear pile of small-large subangular pāhoehoe cobbles jumbled on top.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 06-07	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
6.2 m	2.6 m	100 cm	Fair	

Description: Linear mound constructed with small-large subangular pāhoehoe cobbles that have been neatly stacked at least 4-5 courses high. N face is neatly faced.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 06-08	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.6 m	2.1 m	80 cm	Fair	

Description: Piled mound with potential facing on south side, long and rounded. Constructed with rougly piled small-large subangular pāhoehoe cobbles and small boulders. Another push pile direct SE of it.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 06-09	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
8.2 m	2.8 m	100 cm	Poor	

Description: Large rectangular rock mound almost completely covered by fallen trees, with new trees growing from it. Constructed with small to large sub angular pāhoehoe cobbles that have been piled up to 5-6 courses high.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 07-01	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.0 m	2.1 m	80 cm	Poor	

Description: Roughly piled mound, very moss covered. 4-8 courses subangular cobbles, irregular shape but appears stacked in small sections
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 07-02	Platform	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.0 m	1.3 m	60 cm	Good	

Description: Low oval platform, faced and stacked walls and flat top. 2-3 courses, subangular cobbles, noticeably cleanly stacked and built compared to surrounding mounds. Surface is small cobbles, while walls are larger cobbles. Slightly sloped on north end.
Cultural Material: None
Data Potential: Timing and nature of agricultural use
Contributes to: a d. **Integrity issues:** s f.
Recommendation: DR

Feature	Type	Age	Function	Photo
18696 07-03	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
11.8 m	7.7 m	200 cm	Fair	

Description: Two tiered mound, built on pāhoehoe outcrop. Smaller tier to east is very rough, small subangular cobbles to small boulders, 3-5 courses.. Split by multiple small guava trees growing from center. Larger tier is to west, very large and rough with autograph trees growing out of it. 10-12 courses, 10.2m e/w, 5.6 n/s, 2m tall.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 07-04	Wall	H	Boundary	
Length	**Width**	**Height**	**Condition**	
4.0 m	0.6 m	50 cm	Poor	

Description: Wall remnant consisting of roughly piled subangular cobbles, 3-6 courses high. Located on boundary between Lots 7 and 8 on Registered Map 2508.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 07-05	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
10.0 m	8.5 m	180 cm	Poor	

Description: Mound constructed of subangular cobbles and small boulders, 6-10 courses. Sloping tumbled sides, flattened top. Obscured by fallen trees and disturbed by tree roots.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s w f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 07-06	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
11.7 m	3.5 m	200 cm	Fair	

Description: Remnant of a linear mound constructed of subangular cobbles to small boulders. Some stacking and facing on north and east sides, very degraded on west and south sides. Fallen trees obscure much of south and west side.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 07-07	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
1.7 m	1.7 m	80 cm	Fair	

Description: Circular mound constructed with stacked and faced subangular cobbles. Covered by a fallen tree with other trees growing out of it.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

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Feature	Type	Age	Function	Photo
18696 07-08	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.2 m	3.1 m	140 cm	Poor	

Description: Mound constructed of subangular cobbles and small boulders, aligned cobbles are visible at base, suggesting that at one point maybe had facing and stacking. Heavily disturbed by fallen tree. South side pulled apart by fallen tree, north side more intact.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s w f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 08-01	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
7.0 m	3.5 m	130 cm	Poor	

Description: Large rough clearing mound constructed of subangular cobbles to medium boulders on pāhoehoe outcrop. Irregular shape, disturbed by vegetation and treefall uprooting.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s w f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 08-02	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
1.9 m	1.8 m	50 cm	Poor	

Description: Small roughly square mound constructed of subangular cobbles, possible remnants of facing on south side. Fallen trees have impacted.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

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m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 08-03	Mound	P/H	Indeterminate	
Length	**Width**	**Height**	**Condition**	
1.9 m	1.7 m	120 cm	Good	

Description: Well stacked and faced circular mound with larger subangular cobbles and small boulders around perimeter and smaller material inside. Upper surface slopes to southeast, almost like a truncated cone. Sloping to SE, core filled.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 08-04	Terrace	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.6 m	1.9 m	120 cm	Fair	

Description: Terrace built up on east side of outcrop with roughly piled subangular cobbles along edge, 3-4 courses
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 08-05	Complex	H	Habitatation/Agriculture	
Length	**Width**	**Height**	**Condition**	
11.5 m	4.0 m	120 cm	Fair	

Description: Large terrace, set around natural pāhoehoe rise and with two separate wall sections and a L shaped wall built on rise. See feature form for map and details.
Cultural Material: None
Data Potential: Information on animal husbandry and timing of occupation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 08-06	Wall	P/H	Indeterminate	
Length	**Width**	**Height**	**Condition**	
5.0 m	2.8 m	85 cm	Poor	

Description: Constructed with small to large subangular pāhoehoe cobbles that have been stacked been 4 courses high. Oriented east-west.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 08-07	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.3 m	2.4 m	100 cm	Fair	

Description: Constructed with piled small to large subangular pāhoehoe cobbles and small boulders.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 08-08	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
6.0 m	3.1 m	120 cm	Constructed with piled small to large subangular pāhoehoe cobbles and small boulders	

Description: Constructed of roughly piled small to large subangular pāhoehoe cobbles and small boulder on exposed bedrock. Large autograph tree growing out of the center of feature.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

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m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 09-01	Wall	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
5.1 m	1.7 m	120 cm	Poor-fair	

Description: Wall constructed of subangular cobbles and small boulders, 1-8 courses high perpendicular to Feature 06-18 (Lot boundary wall). North side is tumbled and south side is stacked and faced, but heavily obscured by treefall. Could be linear mound. Slight turn to north at eastern end. Wall is 4.1m e/w, 1.7m n/s, 1.2 tall. L hook is 1m long n/s, .7m e/w, .3m tall.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 09-02	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
8.2 m	2.6 m	200 cm	Fair	

Description: Large mound covered by autograph tree except for squared off north end. Near pipeline on 1930 TMK map. North end is constructed of stacked and faced subangular cobbles and small boulders, 3-4 courses high. Remainder is obscured by fall trees. Roughly parallel to Feature 09-01 (Lot boundary wall) with a narrow band of raised soil between them. Visible north side is 2.6 e/w, 1.2 n/s, .5m tall. Under autograph tree 7m n/s, 2m tall.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 09-03	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.2 m	1.4 m	45 cm	Fair	

Description: Small mound of roughly piled mound subangular cobbles, 3-4 courses tall, very tumbled.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 09-04	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
5.3 m	2.0 m	75 cm	Poor	

Description: Rough oblong mound of roughly piled subangular cobbles and small boulders, 6-8 courses high, tumbled on all sides and disturbed on south side by guava growth.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s w f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 09-05	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
5.0 m	3.5 m	60 cm	Fair	

Description: Mound built of roughly piled subangular cobbles and small boulders, 3-4 courses high. Low and tumbled but wide, Located just to the west of south end of Feature 05-18 (Lot boundary wall), on north edge of drainage. South side of mound is undermined and collapsing into the drainage.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 09-06	Terrace	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
7.0 m	3.1 m	120 cm	Fair	

Description: Large pile of subangular and angular cobbles and small boulders, 4-6 courses high, along the top of the north bank of the tributary of 'Ainako Stream near the southern Project Area boundary. Autograph trees obscure a portion of it, but a portion measuring 3.1 m wide n/s and .2m tall is exposed at its western end. This end is stacked and faced. Appears to be a clearing pile built at edge of stream.
Cultural Material: None
Data Potential: Low
Contributes to: a c. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

Appendix A: SIHP 05-10-35-18696 Features in the Project Area

Feature	Type	Age	Function	Photo
18696 09-07	Terrace	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.1 m	1.1 m	120 cm	Fair	

Description: Section of terracing along north edge of the tributary of 'Ainako Stream. Retaining wall above stream bank is stacked and faced subangular cobbles and small boulders, 4-6 courses vertically. Pocket of soil between natural pāhoehoe edge and built terrace. Dimensions are retaining wall.
Cultural Material: None
Data Potential: Low
Contributes to: a c. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 09-08	Terrace	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
8.7 m	2.0 m	120 cm	Poor	

Description: Remnant terracing along north edge of the tributary of 'Ainako Stream. Retaining wall on stream bank is very degraded but a few areas of intact stacked and faced subangular cobbles to small boulders are present. Collapsed rocks extend at least 5m down stream bank.
Cultural Material: None
Data Potential: Low
Contributes to: a c. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 09-09	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
5.0 m	3.8 m	170 cm	Fair	

Description: Large oval mound constructed of subangular cobbles and boulders, 10-12 courses highg. Located above north bank of tributary of 'Ainako Stream. Iron hoe head embedded in mound.
Cultural Material: Field hoe head
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 09-10	Terrace	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
9.9 m	3.0 m	110 cm	Fair	

Description: Terracing along north edge of the tributary of 'Ainako Stream. Retaining wall on stream bank is constructed of 1-2 courses of stacked subangular cobbles.
Cultural Material: None
Data Potential: Low
Contributes to: a c. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 09-11	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.4 m	2.3 m	90 cm	Fair	

Description: Rough oval mound built of piled subangular cobbles and small boulders, 4-6 courses high.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 09-12	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.0 m	3.5 m	185 cm	Fair	

Description: Large rough circular mound of piled subangular cobbles and small boulders. Very tumbled on all sides, maybe some remnant facing on N side.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 09-13	Wall	H	Boundary	
Length	**Width**	**Height**	**Condition**	
14.9 m	0.4 m	25 cm	Poor	

Description: Cobble alignment exposed above ground surface, 1-3 cobbles wide and 1-2 cobbles tall. Location correlates with boundary between Lots 9 and 10 on Registered Map 2508.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 10-01	Wall	H	Boundary	
Length	**Width**	**Height**	**Condition**	
96.3 m	1.7 m	45 cm	Fair	

Description: Low discontinuous wall extending roughly north - south within Lot 10. Constructed with piled small to large subangular pāhoehoe cobbles. Mounded top surface on wall. Does not correlate with lot boundaries on Registered Map 2508.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 10-02	Mound	P/H	Indeterminate	
Length	**Width**	**Height**	**Condition**	
15.0 m	2.9 m	170 cm	Fair	

Description: Linear mound constructed of stacked small to large subangular pāhoehoe cobbles and small boulders, up to 7 courses high. Obscured by fallen trees, overgrown and impacted by roots. Possibly a wall segment. Does not correlate well with lot boundaries on Registered Map 2508.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

Appendix A: SIHP 05-10-35-18696 Features in the Project Area

Feature	Type	Age	Function	Photo
18696 10-03	Wall	P/H	Indeterminate	
Length	**Width**	**Height**	**Condition**	
3.1 m	2.9 m	90 cm	Fair	

Description: Small L-shaped wall constructed with small to large sub angular pāhoehoe cobbles stacked courses high. Curvature at each end fo wall suggests it could be a remnant of an enclosure. Majority of feature is obscured by autograph tree roots.
Cultural Material: None
Data Potential: Timing and nature of habitation
Contributes to: a d. **Integrity issues:** s w f.
Recommendation: DR

Feature	Type	Age	Function	Photo
18696 10-04	Mound	H	Indeterminate	
Length	**Width**	**Height**	**Condition**	
9.0 m	4.0 m	230 cm	Poor	

Description: Large mound constructed with small to large subangular pāhoehoe cobbles and medium to large boulders. Stacking visible on NW and NE side up to 6 courses high. Partially obscured by large fallen trees, autograph tree roots.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 10-05	Mound	P/H	Indeterminate	
Length	**Width**	**Height**	**Condition**	
5.0 m	4.0 m	130 cm	Poor	

Description: Mound constructed with small to large subangular pāhoehoe cobbles and medium and large boulders.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 10-06	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
20.9 m	4.0 m	250 cm	Fair	

Description: Linear mound located above north bank of the tributary of 'Ainako Stream at southern end of Project Area. Constructed with small to large subangular pāhoehoe cobbles and small boulders. Some segments are stacked between 3 to 4 courses high, others are either collapsed or piled
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 10-07	Wall	H	Boundary	
Length	**Width**	**Height**	**Condition**	
138.1 m	1.1 m	70 cm	Poor	

Description: Discontinuous wall extending roughly north-south. Constructed of small to large subangular pāhoehoe cobbles, stacked 4-5 courses high. Significantly collapsed throughout its length due to large fallen trees and overgrowth. Correlates with boundary between Lots 10 and 11 on Registered Map 2508.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 11-01	Wall	H	Boundary	
Length	**Width**	**Height**	**Condition**	
104.0 m	1.1 m	110 cm	Fair	

Description: Discontinuous wall extending roughly north-south. Constructed with small to large subangular pāhoehoe cobbles and small boulders. Portions are neatly stacked up to 6 courses high, especially northern segments, and portions are only roughly stacked, up to 4 courses high. Feature 11-04 is built off of the east side of this wall. Correlates with boundary between Lot 11 and 12 on Registered Map 2508.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 11-02	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
#VALUE! m	#VALUE! m	0 cm	Poor	

Description: Feature number changed
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 11-03	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.0 m	2.5 m	120 cm	Fair	

Description: Large rough mound of piled small to large pāhoehoe cobbles and small boulders. Located on an exposed pāhoehoe flat. Guava and autograph tree growing from it.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 11-04	Enclosure	P/H	Animal pen	
Length	**Width**	**Height**	**Condition**	
5.5 m	5.1 m	115 cm	Fair	

Description: Enclosure constructed with small to large sub angular pāhoehoe cobbles that have been stacked up 5 courses high. Roughly U-shaped, it is built off the east side of Feature 11-01 (Boundary wall between Lots 11 and 12). No deliberately constructed openings. Field notes describe this as 11-1, T-9.
Cultural Material: None
Data Potential: Information on household and timing of occupation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: DR

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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 11-05	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
1.3 m	1.3 m	150 cm	Poor	

Description: Mound constructed of piled small to large subangular pāhoehoe cobbles. In thick vegetation east of Feature 10-07 (Boundary wall between Lots 10 and 11).
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 12-01	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
6.0 m	4.0 m	100 cm	Poor	

Description: Large low mound constructed of roughly stacked small to large subangular pāhoehoe cobbles and small boulders, at least 8 courses high. Obscured by roots of large autograph tree. It is difficult to discern the extent of this mound.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 12-02	Wall	P/H	Indeterminate	
Length	**Width**	**Height**	**Condition**	
18.7 m	1.5 m	110 cm	Poor	

Description: Wall remnant constructed along the NW edge of a small drainage. Built of roughly stacked small to large subangular pāhoehoe cobbles and small boulders, 2-5 courses high. Southeast side of wall appears faced. A large tree has uprooted the southwest end of wall. Ground surface directly above wall is relatively level and consists of soil and leaf debris and duff. There is an 0.8m-wide gap in the wall, appears to be pig damage.
Cultural Material: None
Data Potential: Low
Contributes to: a c. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 12-03	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
1.8 m	0.7 m	100 cm	Poor	

Description: Mound built of piled small to large subangular pāhoehoe cobbles and small boulders. Located on small east-west trending ridge. Damaged by large fallen guava tree.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 12-04	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.4 m	2.1 m	70 cm	Fair	

Description: Mound constructed of roughly piled small to large subangular pāhoehoe cobbles and small boulders.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 12-05	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.2 m	3.1 m	50 cm	Fair	

Description: Mound of roughly piled small to large sub angular pāhoehoe cobbles.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

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m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 12-06	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.3 m	3.2 m	110 cm	Fair	

Description: Mound of roughly piled small to large subangular cobbles and small to medium boulders, at least 5 courses high .
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 12-07	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
1.4 m	1.3 m	70 cm	Good	

Description: Circular mound of stacked small to large subangular cobbles and small boulders top of exposed pāhoehoe bedrock. Faced on east, west, and south sides. The surface of the mound is covered with small cobbles and few pebbles; not paved, slightly mounded.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 12-08	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.3 m	2.5 m	150 cm	Fair	

Description: Mound of roughly piled small to large subangular pāhoehoe cobbles and small boulders on exposed bedrock. Some collapse evident.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

Feature	Type	Age	Function	Photo
18696 12-09	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
5.8 m	4.8 m	240 cm	Fair	

Description: Mound of roughly piled small to large subangular cobbles and small boulders.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 12-10	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
5.7 m	4.9 m	260 cm	Fair	

Description: Mound of roughly piled small to large subangular cobbles and small boulders.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 12-11	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.4 m	4.0 m	100 cm	Fair	

Description: Mound of roughly piled small to large subangular cobbles and small boulders, at least 5 courses high .
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 12-12	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
5.5 m	5.5 m	220 cm	Fair	

Description: Mound of roughly piled small to large subangular cobbles and small boulders.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 12-13	Mound/platform	P/H	Indeterminate	
Length	**Width**	**Height**	**Condition**	
5.0 m	3.9 m	90 cm	Fair	

Description: Oval mound, just outside of group of 7 mounds (Features 12-06 A-E and G-H). Constructed with small to large subangular pāhoehoe cobbles and small boulders that have been roughly piled. Somewhat faced on N side. Distinct in shape and construction from other mounds in group in that it is not as deflated and perimeter is largely small boulders
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 12-14	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
5.9 m	4.4 m	180 cm	Poor	

Description: Mound of roughly piled small to large subangular cobbles and small boulders. Uprooted by autograph tree.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 12-15	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.0 m	2.2 m	85 cm	Fair to poor	

Description: Mound of roughly piled small to large subangular cobbles and small boulders. Uprooted by autograph tree
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 12-16	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.1 m	3.0 m	110 cm	Fair	

Description: Mound of roughly piled small to large subangular cobbles and small boulders.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 12-7	Wall	H	Boundary	
Length	**Width**	**Height**	**Condition**	
6.4 m	1.5 m	70 cm	Poort	

Description: Remnant core-filled wall of small to large cobbles and small boulders. Located on boundary between Lots 12 and 13 on Registered Map 2058.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** d w f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 13-01	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
6.6 m	5.8 m	153 cm	Fair	

Description: Oblong mound of piled subangular cobbles, 5-10 courses high. Section on southeast side appears stacked and maybe faced but tumbled. Very disturbed buy autograph trees and guava.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s w f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 13-02	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.4 m	2.0 m	63 cm	Poor	

Description: Mound of roughly piled subangular cobbles on pāhoehoe outcrop, 2-3 courses. Very tumbled and deflated.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 13-03	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.9 m	1.1 m	40 cm	Poor	

Description: Small linear mound of roughly piled subangular cobbles and small boulders, 2-3 courses. Disturbed by guava growth.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s w f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 13-04	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.1 m	2.1 m	80 cm	Poor	

Description: Slightly curved linear rock mound of roughly piled angular to subangular cobbles, with stacking in southeast corner. Sits on pāhoehoe outcrop. Disturbed and covered by guava.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s w f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 13-05	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
7.5 m	4.5 m	120 cm	Fair	

Description: Large linear mound of stacked subangular cobbles to small boulders located above the tributary of ʻĀinakō Stream. Disturbed by autograph tree roots on south end. Historic bottle observed in void in mound.
Cultural Material: Glass bottle.
Data Potential: Low
Contributes to: a c. **Integrity issues:** s w f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 13-06	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
8.9 m	6.0 m	130 cm	Poor	

Description: Roughly rectangular mound of subangular and angular cobbles and small boulders, deflated. The north and middle of mound appear the most disturbed and tumbled. Mango tree on south side disturbing corner with roots and growth, palm growing out of middle most likely doing same.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s w f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

Appendix A: SIHP 05-10-35-18696 Features in the Project Area

Feature	Type	Age	Function	Photo
18696 13-07	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.6 m	2.9 m	100 cm	Fair	

Description: Oval mound of roughly piled subangular cobbles and small boulders on a pāhoehoe outcrop. Extends off Feature 13-11 (Boundary wall between Lots 13 and 14).
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 13-08	Rock pile	P/H	Clearing	
Length	**Width**	**Height**	**Condition**	
2.0 m	1.7 m	50 cm	Poor	

Description: Small mound of piled small to medium subangular cobbles. Close to edge of drainage. Guava trees growing around perimeter.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 13-09	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.6 m	3.5 m	80 cm	Poor	

Description: Mound of piled small to medium subangular cobbles piled together. Heavily disturbed by guava and autograph tree.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s w f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

Appendix A: SIHP 05-10-35-18696 Features in the Project Area

Feature	Type	Age	Function	Photo
18696 13-10	Modified outcrop	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.0 m	1.5 m	110 cm	Poor-fair	

Description: Piled cobbles along ege of pāhoehoe outcrop, with aPāhoehoe outcrop with piled cobbles along wedges and a small low wall extending north-south. Ground surface on outcrop is generally cleared with some scattered cobbles. small low wall extending from south ending in mound. Guava trees growing around perimeter.
Cultural Material: None
Data Potential: Low
Contributes to: a d e. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 13-11	Wall	P/H	Boundary	
Length	**Width**	**Height**	**Condition**	
95.7 m	2.3 m	100 cm	Fair	

Description: Discontinous wall constructed with stacked small-large subangular pāhoehoe cobbles, 4-6 courses high. Faced on downslope side. Location correlates to boundary between Lots 13 and 14 on Registered Map 2508.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 13-15	Mound/platform	P/H	Indeterminate	
Length	**Width**	**Height**	**Condition**	
n/a m	n/a m	0 cm	Poor	

Description: Large mound/platform with tree growing out of it, possible facing on south side.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 13-16	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.5 m	1.9 m	100 cm	Fair	

Description: Mound constructed of stacked small to large subangular pāhoehoe cobbles and small boulders, t least 5 courses high.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 13-17	Terrace	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
15.2 m	3.3 m	160 cm	Poor-fair	

Description: Terrace built of piled angular small to large cobbles. Retains slope at top of ridge. Piled angular small to large cobbles. 330 cm wide, 160 cm high from bottom of descent to top of ridge.
Cultural Material: None
Data Potential: Poor
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 14-01	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.8 m	1.8 m	26 cm	Poor	

Description: Linear mound of small and medium angular cobbles.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 14-02	Platform	H	Habitation	
Length	**Width**	**Height**	**Condition**	
4.9 m	4.1 m	70 cm	Fair to good	

Description: Rectangular platform constructed of stacked small-large subangular Rectangular platform constructed of stacked small-large subangular pāhoehoe cobbles that have been, 2-5 courses high on exposed bedrock. A possible entryway (1m at its widest) @ E side two short walls, semi-parallel (1.5m longX0.7m wideX70cm tall). Surface area is level. Some collapse is noted throughout. A tree has uprooted the northeast edge. The north edge is more piled/jumbled than south edge, where stacking is more intact. May be functionally related to Feature 14-03 habitation complex
Cultural Material: None
Data Potential: Timing and nature of habitation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: DR

Feature	Type	Age	Function	Photo
18696 14-03A	Terrace	H	Habitation	
Length	**Width**	**Height**	**Condition**	
2.4 m	1.9 m	23 cm	Good	

Description: See Feature 14-3 site description.
Cultural Material: Bottles, steel pot fragment.
Data Potential: Timing and nature of habitation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: DR

Feature	Type	Age	Function	Photo
18696 14-03B	Rock ring	H	Cooking/Fire pit	
Length	**Width**	**Height**	**Condition**	
1.2 m	1.1 m	24 cm	Fair	

Description: See Feature 14-3 site description.
Cultural Material: None
Data Potential: Timing and nature of habitation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: DR

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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 14-03C	Wall	P/H	Indeterminate	
Length	**Width**	**Height**	**Condition**	
3.1 m	2.0 m	20 cm	Fair to poor	

Description: See Feature 14-3 site description.
Cultural Material: Glass bottles and metal pot .
Data Potential: Timing and nature of habitation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: DR

Feature	Type	Age	Function	Photo
18696 14-04	Platform	P/H	Habitation	
Length	**Width**	**Height**	**Condition**	
5.1 m	4.0 m	50 cm	Fair	

Description: Large, generally square platform. Set along remnants of Feature 13-11 (Boundary wall between Lots 13 and 14). Platform is heavily obscured by deadfall, autograph tree, and albizia, but appears to be level on top and consists of subangular cobbles to small boulders, with sharp defined edges. Only 1-2 courses, no facing. Almost a second small lower terrace on E side, but could be tumbled cobbles. Historic bottles observed on southeast side of platform.
Cultural Material: Glass bottles.
Data Potential: Timing and nature of habitation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: DR

Feature	Type	Age	Function	Photo
18696 14-05	Artifact concentration	H	Habitation/Agriculture	
Length	**Width**	**Height**	**Condition**	
2.0 m	2.0 m	0 cm	Fair	

Description: Concentration of historic artifacts. Includes 1 green bottle, 'konishi & co apothecary' with Japanese writing on bottom. Metal hoe head, metal hook. To south of that group, large pipe fitting halfway exposed out of ground, oxidized chain, another hook and one unidentified piece. All within 2m zone.
Cultural Material: Glass bottle, iron farmign hoe head, chain, pipe fitting
Data Potential: Timing and nature of habitation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: DR

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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 14-07	Mound/platform	P/H	Indeterminate	

Length	Width	Height	Condition
5.7 m	5.6 m	140 cm	Fair

Description: Round mound constructed of piled small to large subangular pāhoehoe cobbles and medium and large boulders, roughly stacked in places.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 14-08	Mound/platform	P/H	Indeterminate	

Length	Width	Height	Condition
4.6 m	3.3 m	90 cm	Good

Description: Mound constructed of small to large subangular pāhoehoe cobbles and medium and large boulders. Perimester is neatly stacked, up to 5 courses high. Interior is filled with piled small cobbles. Surface is mounded. A ti plant is growing out of surface.
Cultural Material: None
Data Potential: Timing and nature of agricultural use
Contributes to: a d. **Integrity issues:** s f.
Recommendation: DR

Feature	Type	Age	Function	Photo
18696 14-09	Mound/platform	P/H	Indeterminate	

Length	Width	Height	Condition
9.8 m	5.7 m	200 cm	Fair

Description: Mound constructed of small to large subangular pāhoehoe cobbles and medium and large boulders. Perimeter is stacked at least 8-10 courses high, interior is filled with smaller material. Partially collapsed. Autograph trees growing at south end of feature.
Cultural Material: None
Data Potential: Timing and nature of agricultural use
Contributes to: a d. **Integrity issues:** s f.
Recommendation: DR

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 14-10	Mound	P/H	Indeterminate	
Length	**Width**	**Height**	**Condition**	
4.4 m	4.2 m	155 cm	Fair	

Description: Mound constructed of roughly piled small to large subangular pāhoehoe cobbles and medium and large boulders. Partially collapsed throughout.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 14-11	Mound	H	Indeterminate	
Length	**Width**	**Height**	**Condition**	
6.7 m	6.2 m	210 cm	Fair	

Description: Large circular mound constructed of small to large subangular pāhoehoe cobbles and medium and large boulders. . Heavily disturbed by autograph tree roots and fallen trees
Cultural Material: None
Data Potential: Timing and nature of agricultural use
Contributes to: a d. **Integrity issues:** s f.
Recommendation: DR

Feature	Type	Age	Function	Photo
18696 14-12	Mound/platform	P/H	Indeterminate	
Length	**Width**	**Height**	**Condition**	
4.3 m	3.0 m	110 cm	Fair	

Description: Oblong shaped mound. Perimeter of stacked small boulders and medium cobbles, filled with small and medium cobble, flat top surface.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 14-13	Mound	I	Indeterminate	
Length	**Width**	**Height**	**Condition**	
5.7 m	4.3 m	170 cm	Poor	

Description: Large circular mound, heavily disturbed by autograph tree roots. Composed of primarily large cobbles and small boulders
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s w f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 14-14	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
9.4 m	4.5 m	220 cm	Fair to poor	

Description: Linear mound of piled large boulders near base and cobbles progressively smaller toward the top of construction. Oriented roughly east-west. Has appearance of roughly leveled transect down length of mound where smaller material is flanked by boulder-sized material.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 14-15	Wall	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
5.9 m	5.4 m	190 cm	Poor	

Description: Somewhat circular accumulation of large boulders and small to large cobbles piled together. Almost entirely disturbed by autograph tree and aerial roots. Aligned with boundary between Fields 14 and 15 on Registered Map 2508.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s w f.
Recommendation: NFW

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m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

Feature	Type	Age	Function	Photo
18696 14-16	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.7 m	3.8 m	160 cm	Fair	

Description: Mound of roughly piled small to large subangular pāhoehoe cobbles and medium and large boulders. Partially obscured by thicket of fallen guava trees.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 14-17	Modified outcrop	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
9.0 m	5.0 m	140 cm	Fair	

Description: Outcrop modified with stacked small to large subangular pāhoehoe cobbles and medium and large boulders. South end of construction is collapsed.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 14-18	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.5 m	4.0 m	135 cm	Fair	

Description: Mound constructed of stacked subangular pāhoehoe cobbles and medium and large boulders. Heavily disturbed by autograph tree roots and guava trees.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s w f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 14-19	Wall	H	Boundary	
Length	**Width**	**Height**	**Condition**	
4.5 m	3.7 m	80 cm	Good nice stacked edges. Platform?	

Description: Two remnant segments of wall separated by approximately 5 meters. Constructed of small to large subangular pāhoehoe cobbles and a few small boulders, roughly stacked. Located near boundary of Lots 14 and 15 on Registered Map 2508. Heavily disturbed by uprooting and fallen guava trees.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s w f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 14-20	Mound/platform	P/H	Indeterminate	
Length	**Width**	**Height**	**Condition**	
2.3 m	2.2 m	120 cm	Fair	

Description: Roughly circular mound of boulders and small to large cobbles. Perimeter is stacked and faced. Filled with smaller cobbles. Top is mounded.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 14-21	Mound	H	Boundary	
Length	**Width**	**Height**	**Condition**	
3.6 m	3.2 m	170 cm	Fair	

Description: Large mound of roughly piled subangular cobbles and small boulder. Located at junction of the alignments of Features 14-22 and 06-01, both boundary walls of lots depicted on Registered Map 2508. Possibly stockpile of rock from walls or for repair of walls.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

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Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Feature	Type	Age	Function	Photo
18696 14-22	Wall	H	Boundary	
Length	**Width**	**Height**	**Condition**	
39.5 m	1.0 m	50 cm	Fair	

Description: Wall built of stacked subangular cobbles and boulders. Stacked and faced near junction with Feature 06-10 wall, but condition degrades toward north. Wall is catching soil on west side. Separates Lots 6 and 14 on Registered Map 2058.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 14-23	Rock pile	I	Clearing	
Length	**Width**	**Height**	**Condition**	
2.5 m	2.5 m	40 cm	Poor	

Description: Small rough pile of small to large subangular pāhoehoe cobbles.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 15-01	Wall	H	Boundary	
Length	**Width**	**Height**	**Condition**	
80.7 m	3.2 m	210 cm	Poor-fair	

Description: Wall approximating northern boundary of parcel. Very roughly piled and mounded subangular cobbles and boulders. North side shows more evidence of stacking and facing, and north side ground is set higher than south side ground as well. As well reaches eastern extent, it ends at natural drainage where the same line of wall turns into modified north bank of drainage which continues onward out of project area. As tall as .7-2.1m, wide as 1.1m-3.15m, 2-20 courses.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

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Feature	Type	Age	Function	Photo
18696 15-02	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.4 m	4.1 m	80 cm	Poor, poss dozed	

Description: Mound of piled small boulders, medium to large angular cobbles. Heavily disturbed by albizia and guava, and possibly bulldozing on the west side.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 15-03	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
5.1 m	3.3 m	130 cm	Fair	

Description: Mound of roughly piled small to large subangular pāhoehoe cobbles and medium and large boulders. Disturbed by albizia and guava.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 15-04	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.2 m	3.3 m	120 cm	Fair	

Description: Round mound of roughly piled small to medium subangular pāhoehoe cobbles and medium and large boulders. Disturbed by albizia and guava
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

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Feature	Type	Age	Function	Photo
18696 15-05	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
6.9 m	6.0 m	130 cm	Fair	

Description: roughly piled small to large subangular pāhoehoe cobbles and medium and large boulders. Disturbed by guava.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 15-06	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.2 m	3.0 m	90 cm	Poor	

Description: Somewhat oval mound of piled large and medium subangular cobbles, filled with small cobbles. Disturbed by fallen guava trees. Ti plants observed nearby.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s w f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 15-07	Modified outcrop	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
8.0 m	5.8 m	130 cm	Poor	

Description: Mound of small to large subangular pāhoehoe cobbles and medium and large boulders on exposed bedrock. Roughly piled, with some stacked edges. Disturbed by albizia and guava.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
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Appendix A: SIHP 05-10-35-18696 Features in the Project Area

Feature	Type	Age	Function	Photo
18696 15-08	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
7.4 m	4.2 m	70 cm	Poor	

Description: Mound of small to large subangular pāhoehoe cobbles and medium and large boulders on exposed bedrock. Piled, with some stacked edges. Disturbed by autograph tree.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 15-09	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.2 m	3.1 m	80 cm	Fair	

Description: Mound of piled small to large subangular pāhoehoe cobbles and medium and large boulders on exposed bedrock. Disturbed by uprooted guava tree.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s w f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 15-10	Mound	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.1 m	2.6 m	110 cm	Fair	

Description: Oval mound of piled small to large subangular pāhoehoe cobbles on exposed bedrock. Northeast end stacked and minimally faced.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

Appendix A: SIHP 05-10-35-18696 Features in the Project Area

Feature	Type	Age	Function	Photo
18696 15-11	Terrace	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
5.9 m	3.3 m	140 cm	Fair	

Description: Terrace formed behind stacked and faced retaining wall of 5-8 courses subangular cobbles. Both ends are collapsed. Overlooks Hilo Boarding School Ditch (SIHP 50-10-34-14947).
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 15-12	Modified outcrop	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.4 m	130.0 m	80 cm	Fair to poor	

Description: Outcrop modified with linear construction oriented east-west, possibly a wall segment. Composed of medium and large angular cobbles.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 15-13	Platform	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
6.2 m	4.7 m	190 cm	Good	

Description: Large, somewhat rectangular platform built of small subangular cobbles to small boulders. Platform is neatly stacked on the north side, with clean facing but becomes rougher as the feature extends to the south. Slightly mounded on top but clearly flattened off. Disturbed by albizia growing out of south side, guava out of north.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

Appendix A: SIHP 05-10-35-18696 Features in the Project Area

Feature	Type	Age	Function	Photo
18696 15-14	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.7 m	3.5 m	140 cm	Fair	

Description: Oval mound of roughly piled subangular and angular cobbles and small boulders. Obscured by fallen trees.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 15-15	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
4.3 m	4.1 m	170 cm	Poor	

Description: Mound of roughly piled subangular cobbles and angular small boulders. Oblong with no defined shape, very disturbed by albizia and guava.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 15-16	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.2 m	2.1 m	50 cm	Poor	

Description: Mound of subangular cobbles set on pāhoehoe outcrop. Very degraded, particularly on south and east edges. North and west edges are more intact but covered by trees
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

Appendix A: SIHP 05-10-35-18696 Features in the Project Area

Feature	Type	Age	Function	Photo
18696 15-17	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
3.1 m	1.3 m	110 cm	Fair	

Description: Linear mound of stacked subangular cobbles and small boulders. Possible facing on north and west sides. East end is collapsed. Disturbed and covered by fallen and uprooted trees.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 15-18	Mound	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
2.2 m	1.2 m	110 cm	Fair	

Description: Mound of stacked and faced subangular cobbles. Heavily disturbed by fallen trees. South wall is stacked and faced, bowed inwards to north, aperture to south, almost c shaped. North side is disturbed and covered by uprooted tree and deadfall. Tumbled on west, east and north sides.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s w f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 15-19	Wall	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
24.5 m	3.6 m	80 cm	Poor	

Description: Low wall extending roughly east-west in northwest corner of Project Area. Constructed of small boulders to small angular cobbles. Heavily impacted by autograph tree roots. West end impacted by bulldozer disturbance, push pile observered to the west.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

Feature	Type	Age	Function	Photo
18696 15-20	Wall	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
23.6 m	7.1 m	120 cm	Poor	

Description: Low, wide piled wall of angular boulders and small to large cobbles above change in slope. Somewhat c shaped with opening to the east. Heavily disturbed by vegetation.
Cultural Material: None
Data Potential: Low
Contributes to: a c d. **Integrity issues:** s w f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 15-21	Rock pile	P/H	Indeterminate	
Length	**Width**	**Height**	**Condition**	
25.4 m	0.0 m	cm	Poor, remnant	

Description: Jumbled linear arrangement of scattered boulders and cobbles on edge of cleared area. Pushed up on bedrock lobe.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 15-22	Terrace	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
8.1 m	3.5 m	290 cm	Fair	

Description: Terracing along south bank of tributary of 'Ainako Stream. Built with subangular cobbles to small boulders. One portion of retaining wall is faced and stacked, remainder is collapsed. Roughly piled on top of bank. From bottom of drainage to top is 2.9m height, width 3.5m
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

Feature	Type	Age	Function	Photo
18696 15-23	Terrace	P/H	Agriculture	
Length	**Width**	**Height**	**Condition**	
12.2 m	1.8 m	120 cm	Fair	

Description: Terrace built into side of drainage with stacked and faced subangular cobbles and small boulders, 4-6 courses. Heavily disturbed by trees. Generally even on top but sloping east as if creating walkway into drainage. Located near southern boundary of parcel.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 15-24	Wall	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
10.3 m	2.0 m	70 cm	Poor	

Description: Very rough wall of piled subangular cobbles to small boulders extending north from west side of terrace (Feature 15-11). Construction style is very different than 15-11, suggesting they are not contemporary. Obscured by dense mat of fallen guava. Tumbled and mounded, 3-5 courses.
Cultural Material: None
Data Potential: Interpretation
Contributes to: a d. **Integrity issues:** s f.
Recommendation: P

Feature	Type	Age	Function	Photo
18696 15-25	Terrace	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
9.0 m	0.9 m	80 cm		

Description: Remnant of a small terrace feature built of stacked angular and subangular cobbles to small boulders. Extends to southeast from Feature 15-01
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

Feature	Type	Age	Function	Photo
18696 15-26	Retaining wall	H	Water infrastructure	
Length	**Width**	**Height**	**Condition**	
10.6 m	1.7 m	110 cm	Poor	

Description: Roughly piled subangular cobbles and boulders lining edge of a drainage, following contour.
Cultural Material: None
Data Potential: Low
Contributes to: a c. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 15-27	Terrace	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
16.2 m	4.0 m	250 cm	Fair	

Description: Extremely large faced terrace extending along slope. 5-15 courses subangular cobbles to small boulders. As wide as 4m in sections, no narrower than 3. 2.5m tall from bottom of structure to top, .4 on top of ridge. On south end, tumbled and collapsed and looks like lined drainage extends south. On north, distinct end with gap before another modified edge begins.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 15-28	Retaining wall	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
8.1 m	0.9 m	70 cm	Fair	

Description: Low retaining wall, possible remnant edge of terrace, extending at slope change. Possibly extension of Feature 10-27. surrounding terraces. 2-4 courses subangular cobbles and small boulders, set at base of hill and wraps around hill. Heavily obscured by vegetation and deadfall.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

Appendix A: SIHP 05-10-35-18696 Features in the Project Area

Feature	Type	Age	Function	Photo
18696 15-29	Modified outcrop	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
10.7 m	2.8 m	150 cm	Fair	

Description: Roughly piled terrace or retaining wall sitting on top of natural pāhoehoe ridge, potentially connecting to Feature 15-28. Roughly piled and mounded, no facing or stacking appears like in nearby features. 4-6 courses of subangular cobbles and boulders, soil is retained on north side. South side is 1.5 tall, north side is .3m tall. 2.8m wide n/s. Gradually ends on west side, drops off on east.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 15-30	Terrace	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
6.1 m	2.5 m	130 cm	Fair	

Description: Roughly piled and somewhat tumbled, subangular and angular cobbles and small boulders. 1.3m tall, 2.5m wide.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s f.
Recommendation: NFW

Feature	Type	Age	Function	Photo
18696 15-31	Terrace	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
24.3 m	3.3 m	170 cm	Poor-fair	

Description: Terrace stretching across hill and intersecting Feature 15-01 (Boundary wall on north end of Project Area). Appears as line of subangular and angular cobbles and boulders set into soil. Roughly built, a few sections of facing remain but the majority of the feature is disturbed. Varies in height and width, on south end 3.3m e/w, 1.7m tall, north end 1.8m wide, 1m tall.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s w f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

Appendix A: SIHP 05-10-35-18696 Features in the Project Area

Feature	Type	Age	Function	Photo
18696 15-32	Terrace	H	Agriculture	
Length	**Width**	**Height**	**Condition**	
11.3 m	2.1 m	130 cm	Poor	

Description: Small terrace wall built of subangular and angular cobbles to medium boulders. Extends northeast from Feature 15-31 toward Feature 15-01 (Boundary wall). Terrace is disturbed, with a few small sections of stacking and facing remaining. Boulders from Feature 15-01 have fallen onto terrace. Heavily disturbed by fallen trees and tree roots.
Cultural Material: None
Data Potential: Low
Contributes to: a d. **Integrity issues:** s w f.
Recommendation: NFW

Age: P = Precontact, H = Historic, M = Modern, I = Indeterminate.
m = meters, cm = centimeters. Negative heights are depth below ground surface. n/a = not applicable
Significance: A, B, C, D, E. Integrity issues: l = location, d = design, s = setting, m = materials, w = workmanship, f = feeling, a = association
Recommendations: BTP = Burial Treatment Planning, P = Preservation, DR = Data Recovery, NFW = No Further Work.

Appendix 6

Traffic Impact Analysis Report

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DRAFT TRAFFIC IMPACT ANALYSIS REPORT

FOR THE PROPOSED

AINAKO SUBDIVISION

SOUTH HILO, HAWAI`I ISLAND

TAX MAP KEY: 2-3-030:004

I. Introduction

A. Project Description

The County of Hawai`i Office of Housing & Community Development is proposing to develop the Ainako Subdivision in South Hilo, Hawai`i Island. The 60.59-acre property is located to the east of Ainako Terrace, between Waianuenue Avenue and Kaumana Drive. The project site is identified as Tax Map Key: 2-3-030:004.

The proposed Ainako Subdivision will include 82 townhouses, 28 flats, and 32 single-family detached dwelling units for a total of 142 dwelling units. Phase 1 site access will be provided by a new north-south roadway (hereinafter referred to as Kalama Street) from the Kilikina Street Extension to Waianuenue Avenue, opposite the Kaiser Clinic Entry Driveway. Phase 2 site access will be provided by the extension of Kilikina Street from Ainako Terrace to the east through the project site. Phase 1 of the Ainako Subdivision is expected to be completed by the Year 2035. The full build-out and occupancy of the proposed project is expected by the Year 2040. Table 1 summarizes the Ainako Subdivision development plan.

Table 1. Ainako Subdivision Development Plan

Phase	Year	Land Use (ITE Code)	Dwelling Units
1	2035	Townhouses and Flats (215)	110
2	2040	Single-Family Detached Housing (210)	32
		Total	**142**

Figure 1 depicts the project location and study area. The proposed site plan is depicted in Figure 2.

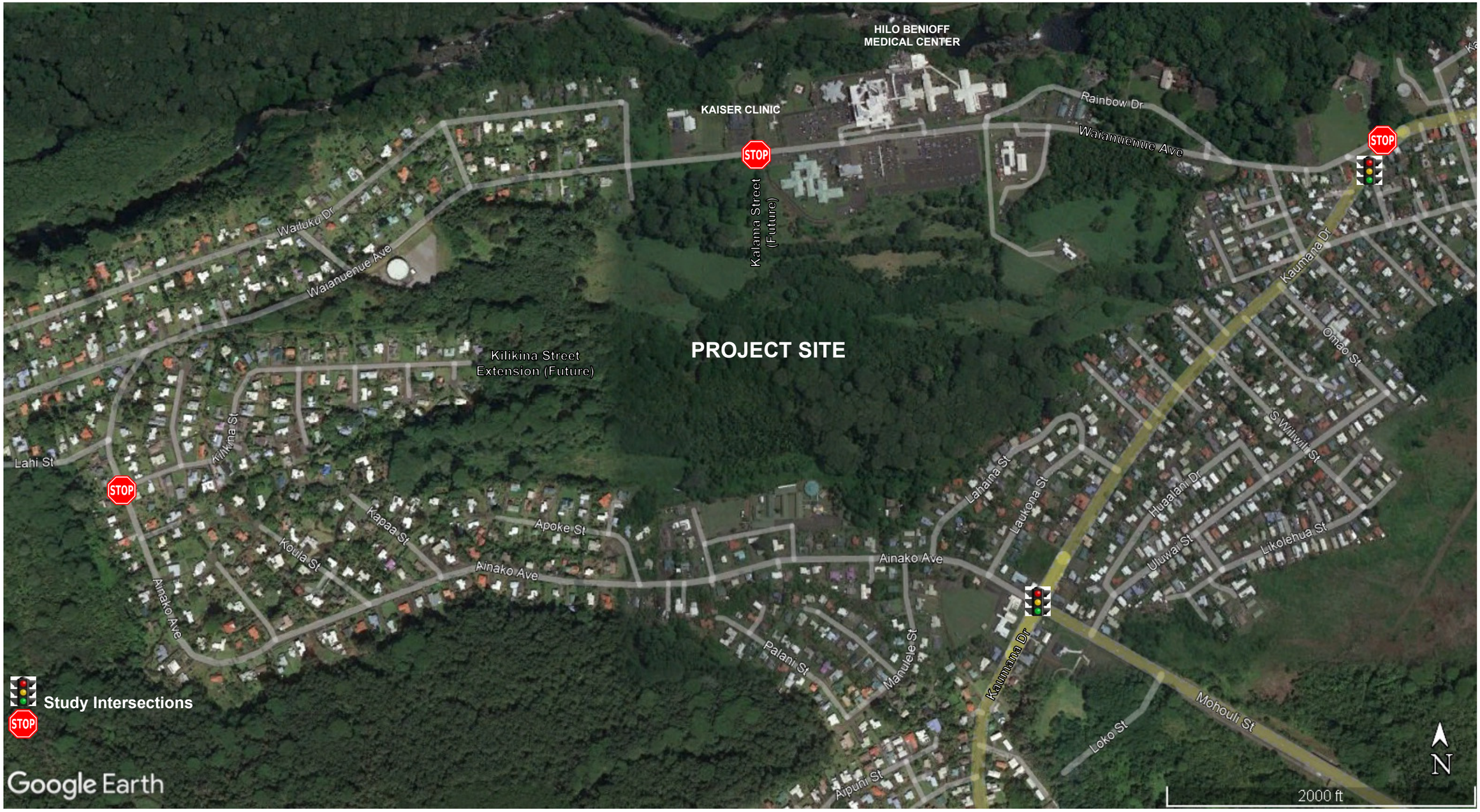

Figure 1. Project Location and Study Area

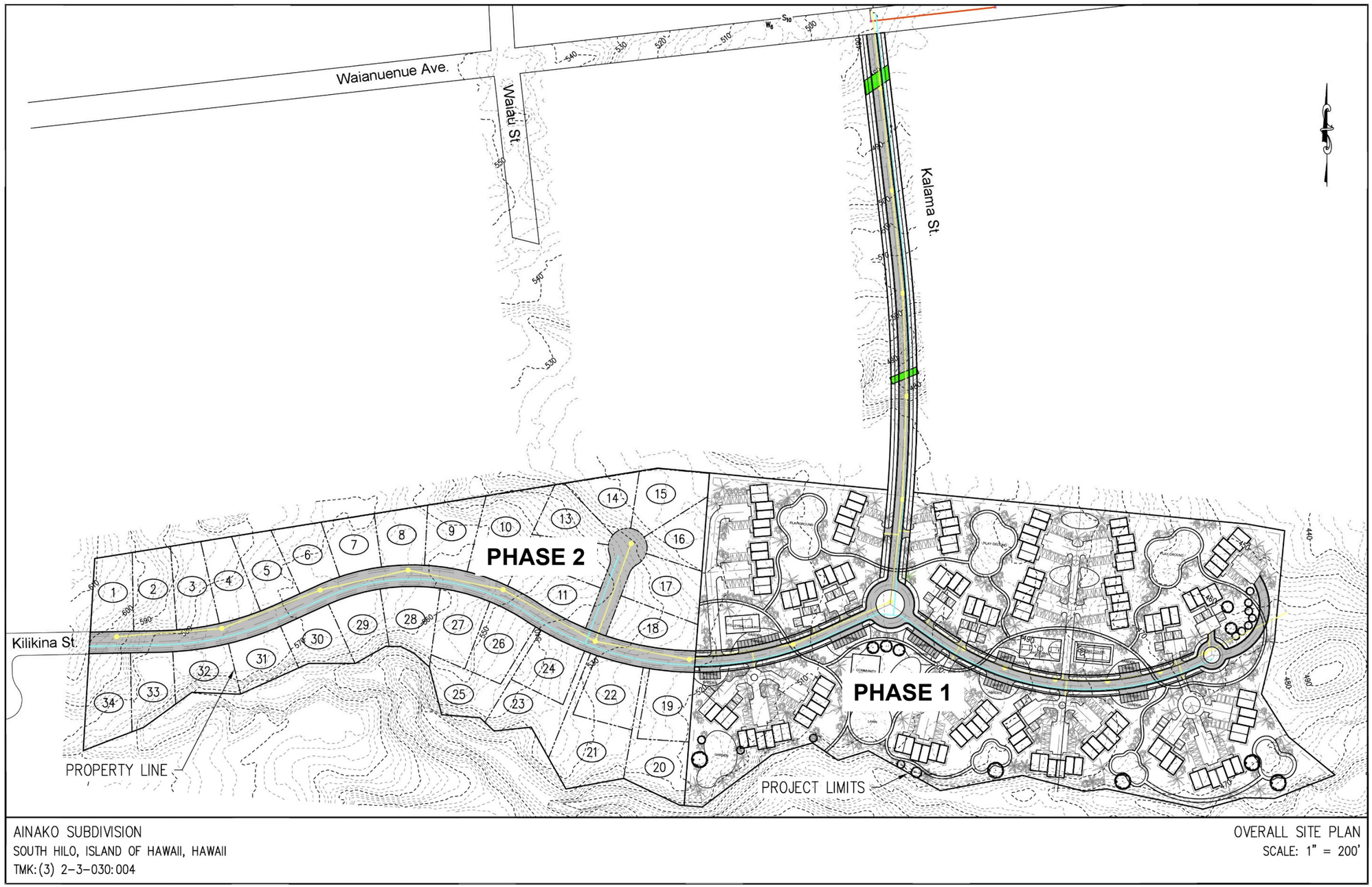

Figure 2. Ainako Subdivision Site Plan

B. Purpose and Scope of the Study

The purpose of this study is to analyze the traffic impacts resulting from the development of the proposed Ainako Subdivision. The scope of this traffic study includes the following:

1. A description of the Ainako Subdivision.
2. An evaluation of the existing roadways and the peak hour traffic conditions.
3. An analysis of the future traffic conditions without the proposed project.
4. The development of the trip generation characteristics of the proposed project.
5. The identification and analysis of the traffic impacts resulting from the development of the proposed project.
6. The recommendation of roadway improvements, which would mitigate the traffic impacts identified in this study.

C. Methodologies

1. Capacity Analysis

The highway capacity analysis, performed in this study, is based upon procedures presented in the Highway Capacity Manual, 7th Edition (HCM), published by the Transportation Research Board. HCM defines the Level of Service (LOS) as "a quantitative stratification of a performance measure or measures representing quality of service." HCM defines the six (6) Levels of Service from the traveler's perspective, ranging from the best LOS "A" to the worst LOS "F". LOS translates the complex mathematical results of the highway capacity analysis into an A through F grading system for the purpose of simplifying the roadway performance for decision-makers.

LOS's "A", "B", and "C" are generally considered to be satisfactory Levels of Service. The Hawai`i County Code Chapter 25, Section 25-2-46 "Concurrency Requirements" defines LOS "D" as the minimum acceptable Level of Service. The Concurrency Requirements go on to define LOS's "E" and "F" as worse than acceptable Levels of Service. The intersection LOS is primarily based upon average delay (d) in seconds per vehicle. The delays at unsignalized intersections, which include stop-controlled intersections and roundabouts, are generally shorter than signalized intersections, due to the drivers' expectation and acceptance of longer delays at higher-volume signalized intersections. Table 2 summarizes the HCM LOS criteria.

Table 2. Intersection Level of Service Criteria (HCM)			
LOS	**Signalized Control**	**Unsignalized Control**	**Description**
A	d≤10	d≤10	Control delay is minimal.
B	10<d ≤20	10<d≤15	Control delay is not significant.
C	20<d≤35	15<d≤25	Stable operation. Queuing begins to occur.
D	35<d≤55	25<d≤35	Less stable condition. Increase in delays, decrease in travel speeds.
E	55<d≤80	35<d≤50	Unstable operation, significant delays.
F	d>80	d>50	High delays, extensive queuing.

Synchro is a traffic analysis software that was developed by Trafficware. Synchro is an intersection analysis program that is based upon the HCM methodology. Synchro is used to calculate the Levels of Service for the intersections in the study area. Worksheets for the capacity analysis, performed throughout this report, are compiled in the Appendix.

2. Trip Generation

The trip generation methodology is based upon generally accepted techniques developed by the Institute of Transportation Engineers (ITE) and published in the Trip Generation Manual, 11th Edition. The ITE trip rates were developed by correlating the total vehicle trip generation data with various land use activities/characteristics, such as the vehicle trips per hour (vph) per dwelling unit (DU). The ITE trip generation methodology is cited in the Hawai`i County Code "Concurrency Requirements" for use in traffic impact analysis studies.

II. Existing Conditions

A. Roadways

Ainako Avenue is a two-way, two-lane collector roadway between Kaumana Drive and Waianuenue Avenue. To the north, Ainako Avenue continues as Lahi Street to Waianuenue Avenue. The posted speed on Ainako Avenue varies from 20 miles per hour (mph) to 35 mph. To the south, Ainako Avenue continues as Mohouli Street from Kaumana Drive to Kilauea Avenue. Ainako Avenue is signalized at its intersection with Kaumana Drive, opposite Mohouli Street. The posted speed on Mohouli Street is 45 mph.

Kaumana Drive is a two-way, two-lane collector roadway between the Daniel K. Inouye Highway (Saddle Road) and Waianuenue Avenue. The posted speed on Kaumana Drive is 35 mph. Kaumana Drive is also signalized at its intersection with eastbound Waianuenue Avenue/Lele Street. To the east, Kaumana Drive continues as Waianuenue Avenue.

Waianuenue Avenue is a two-way, two-lane collector roadway from Kamehameha Avenue to the east to Piihonua Road to the west. Waianuenue Avenue provides primary access to Hilo Benioff Medical Center. The posted speed on Waianuenue Avenue is 35 mph.

Kilikina Street is a two-way, two-lane, no-outlet roadway in Ainako Terrace. Kilikina Street is stop-controlled at its Tee-intersection with Ainako Avenue. The posted speed on Kilikina Street is 25 mph.

B. Existing Peak Hour Traffic Volumes and Operating Conditions

1. Field Investigation and Data Collection

Turning movement traffic count surveys were conducted during the week of August 28, 2023, during the AM and PM peak periods of traffic, at the following intersections in the study area:

- Ainako Avenue and Kilikina Street
- Waianuenue Avenue and Kaiser Clinic Entry Driveway
- Kaumana Drive and Waianuenue Avenue/Lele Street
- Waianuenue Avenue and Carvalho Park Driveway
- Kaumana Drive and Carvalho Park Driveway
- Kaumana Drive and Mohouli Street/Ainako Avenue

2. Existing AM Peak Hour Traffic

The existing AM peak hour of traffic in the study area occurred from 7:15 AM to 8:15 AM. During the existing AM peak hour of traffic, Waianuenue Avenue carried between 200 vehicles per hour (vph), west of Hilo Benioff Medical Center and 700 vph, east of Hilo Benioff Medical Center, total for both directions. Ainako Avenue carried between 200 vph at Kilikina Street and 750 vph at Kaumana Drive, total for both directions. Kaumana Drive carried between 500 vph at Waianuenue Avenue and 900 vph at Ainako Avenue/Mohouli Street, total for both directions. The pedestrian volumes crossing the Kaumana Drive intersections at Ainako Avenue/Mohouli Street and at Waianuenue Avenue/Lele Street were low, which resulted in shorter cycle lengths.

During the existing AM peak hour of traffic, Kilikina Street operated at LOS "A" at Ainako Avenue. The intersection of Waianuenue Drive and the Kaiser Entry Driveway also operated at LOS "A".

The intersection of Kaumana Drive and Waianuenue Avenue/Lele Street operated at satisfactory Levels of Service, i.e., LOS "C" or better, during the existing AM peak hour of traffic. The Carvalho Park Driveway operated at LOS "B" at Waianuenue Avenue and at Kaumana Drive.

The intersection of Kaumana Drive and Mohouli Street/Ainako Avenue operated at an overall LOS "C", during the existing AM peak hour of traffic. The shared through/ right-turn movement on eastbound Ainako Avenue operated at LOS "D". The through movement on westbound Mohouli Street also operated at LOS "D". The other traffic movements at the intersection operated at satisfactory Levels of Service, during the existing AM peak hour of traffic. Figure 3 depicts the existing AM peak hour traffic volumes.

3. Existing PM peak Hour Traffic

The existing PM peak hour of traffic in the study area occurred from 3:45 PM to 4:45 PM. During the existing PM peak hour of traffic, Waianuenue Avenue carried between 300 vph and 800 vph, total for both directions. Ainako Avenue carried between 100 vph and 400 vph, total for both directions, while Kaumana Drive carried about 500 vph, total for both directions.

Kilikina Street operated at LOS "A" at Ainako Avenue, during the existing PM peak hour of traffic. The intersection of Waianuenue Drive and the Kaiser Entry Driveway operated at LOS "A".

During the existing PM peak hour of traffic, the signalized intersection of Kaumana Drive and Waianuenue Avenue/Lele Street operated at an overall LOS "C". The left-turn movement from Waianuenue Avenue onto Kaumana Drive operated at LOS "D". The other traffic movements at the intersection operated at satisfactory Levels of Service. The Carvalho Park Driveway operated at LOS "B" at Waianuenue Avenue and at Kaumana Drive.

The intersection of Kaumana Drive and Mohouli Street/Ainako Avenue operated at satisfactory Levels of Service, during the existing PM peak hour of traffic. The existing PM peak hour traffic volumes are depicted in Figure 4.

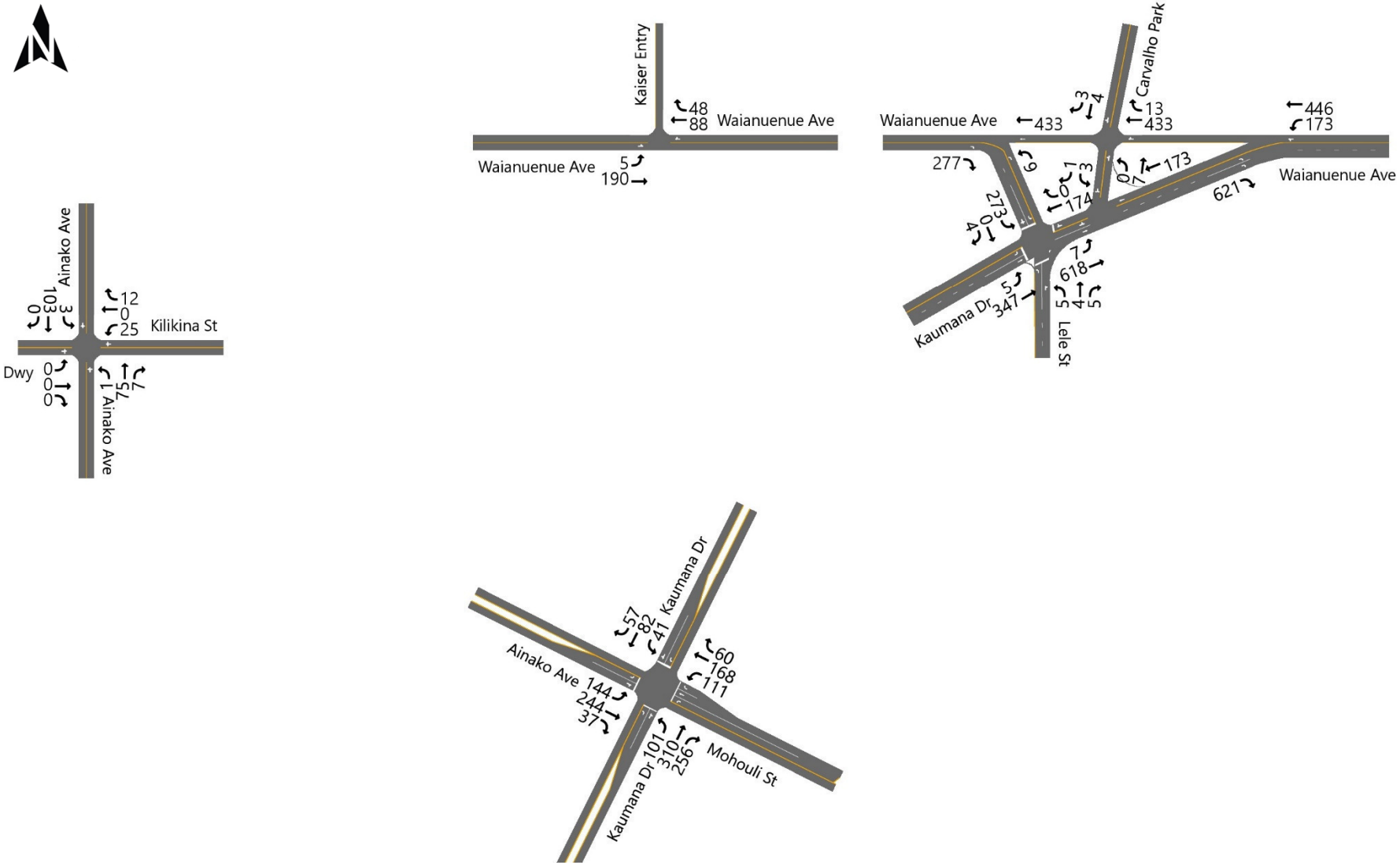

Figure 3. Existing AM Peak Hour Traffic

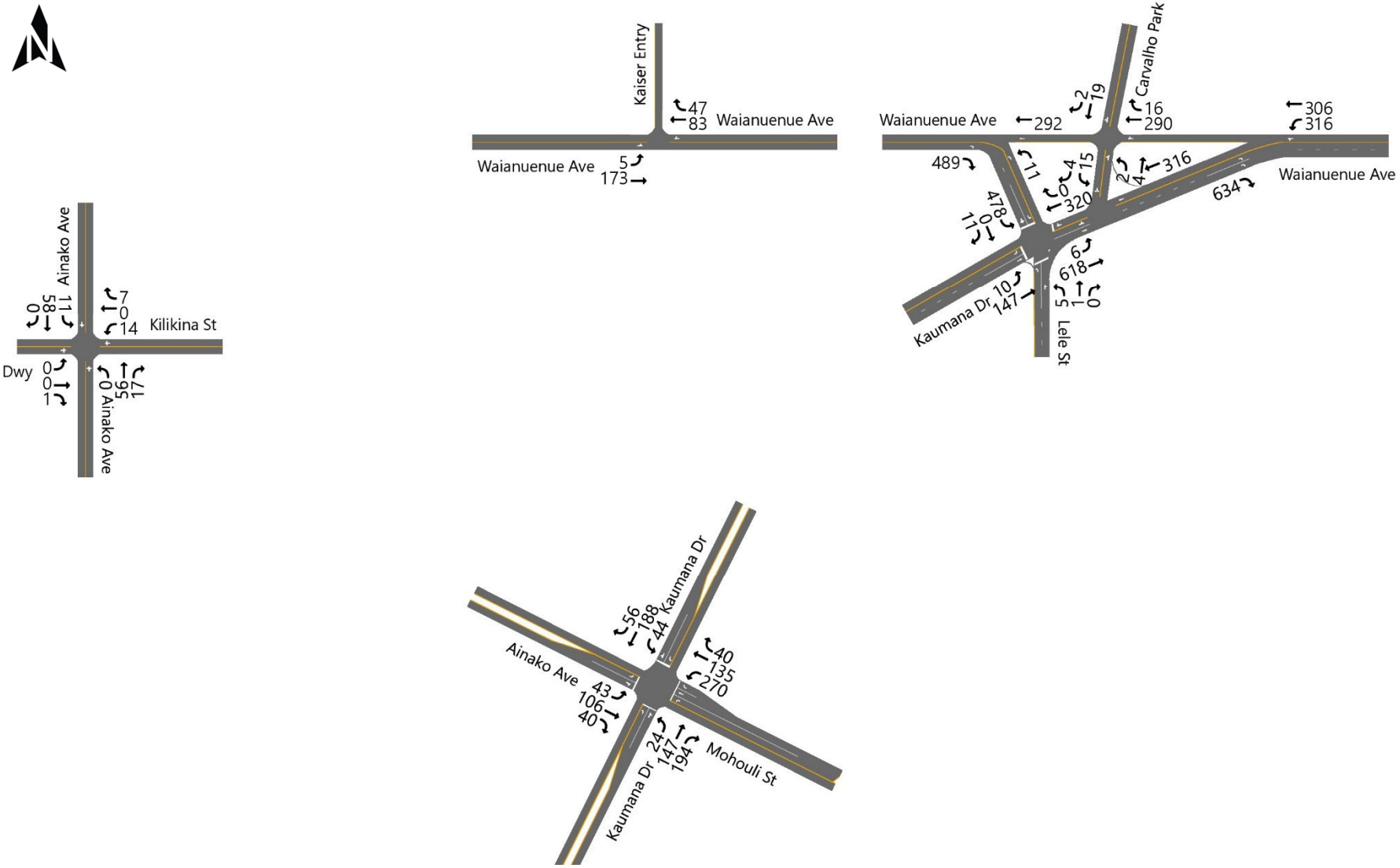

Figure 4. Existing PM Peak Hour Traffics

III. Future Traffic Conditions

A. Background Growth Regional Traffic

The Federal-Aid Highways 2035 Transportation Plan for the District of Hawai`i (TPDH) was prepared for the State of Hawai`i Department of Transportation (DOT), in cooperation with the County of Hawai`i Department of Public Works and Planning Department. The TPDH developed long-range travel forecasts for Hawai`i Island based upon future socio-economic conditions. TPDH projected an annual average growth rate of about 1.14 percent in vehicle trips in South Hilo. The annual average growth rate of 1.14 percent was uniformly applied to the existing (2023) traffic conditions to estimate future (2040) traffic demands in the region.

B. Hilo Benioff Medical Center

The expansion and redesign of the Hilo Benioff Medical Center (HBMC) is under construction at this writing. The HBMC expansion will add over 93,000 square feet of gross floor area (SFGFA) and 67 beds. The HBMC Cancer Center is also being expanded by about 17,000 SFGFA. A new 19,000 SFGFA medical office building will be constructed next to the HBMC Cancer Center. The Final Environmental Assessment Proposed Hilo Medical Center Expansion (FEA) was prepared for the Hawai`i Health Systems Corporation by Munekiyo & Hiraga, Inc., dated April 2023. The FEA traffic study trip generation and traffic assignment were included in the future traffic conditions without the proposed project.

C. Wailani Master Plan

The Draft Traffic Impact Analysis Report for the Proposed Wailani Master Plan was prepared by The Traffic Management Consultant, dated May 8, 2025. The Wailani Master Plan is a proposed mixed-use development in South Hilo. The Wailani Master Plan properties are located generally along the mauka (west) side of Komohana Street near its intersection with Ponahawai Street and extends up to the makai (east) side of the Mohouli Street.

Wailani Master Plan will be developed in six (6) phases, which will include a total of 613 single-family and multi-family dwelling units, a 250-room hotel, and a total of 260,000 square feet of commercial floor area. Phase 1 will begin development along Mohouli Street. Phases 2 and 3 will continue in the makai (east) direction. Phase 4 will include the extension of Ponahawai Street from Mohouli Street to Komohana Street. Phases 1 through 4 are expected to be developed within the timeframe of the development of the proposed Ainako Subdivision. Phases 1 through 4 of the Wailani Master Plan traffic assignment is included in the Year 2040 peak hour traffic without the proposed Ainako Subdivision. The development of Phases 5 and 6 are beyond the timeframe of the traffic impact analysis and are not included in this traffic study.

D. Traffic Analysis Without Project

1. Year 2040 AM Peak Hour Traffic Analysis Without Project

Kilikina Street is expected to operate at LOS "B" at Ainako Avenue, during the Year 2040 AM peak hour of traffic without the proposed project. Waianuenue Drive is expected to operate at LOS "A" at Kaiser Clinic Entry Driveway,

During the Year 2040 AM peak hour of traffic without the proposed project, the intersection of Kaumana Drive and Mohouli Street/Ainako Avenue is expected to operate at an overall LOS "D". The shared through/right-turn movement on eastbound Ainako Avenue and the left-turn movement on westbound Mohouli Street are expected to operate at LOS "F" and LOS "E", respectively. The through movement on westbound Mohouli Street and the shared through/right-turn movement on northbound Kaumana Drive are expected to operate at LOS "D".

The other intersections in the study area are expected to operate at satisfactory Levels of Service, during the Year 2040 AM peak hour of traffic without the proposed project. Figure 5 depicts the Year 2040 AM peak hour traffic volumes without the proposed project.

2. Year 2040 PM Peak Hour Traffic Analysis Without Project

During the Year 2040 PM peak hour of traffic without the proposed project, Kilikina Street is expected to continue to operate at LOS "A" at Ainako Avenue. Waianuenue Drive is expected to continue to operate at LOS "A" at Kaiser Clinic Entry Driveway,

The intersection of Kaumana Drive and Mohouli Street/Ainako Avenue is expected to operate at an overall LOS "C", during the Year 2040 PM peak hour of traffic without the proposed project. The shared through/right-turn movement on eastbound Ainako Avenue and the through movement on westbound Mohouli Street are expected to operate at LOS "D". The other traffic movements at the intersection are expected to operate at satisfactory Levels of Service.

The other intersections in the study area are expected to operate at satisfactory Levels of Service, during the Year 2040 PM peak hour of traffic without the proposed project. The Year 2040 PM peak hour traffic without the proposed project is depicted in Figure 6.

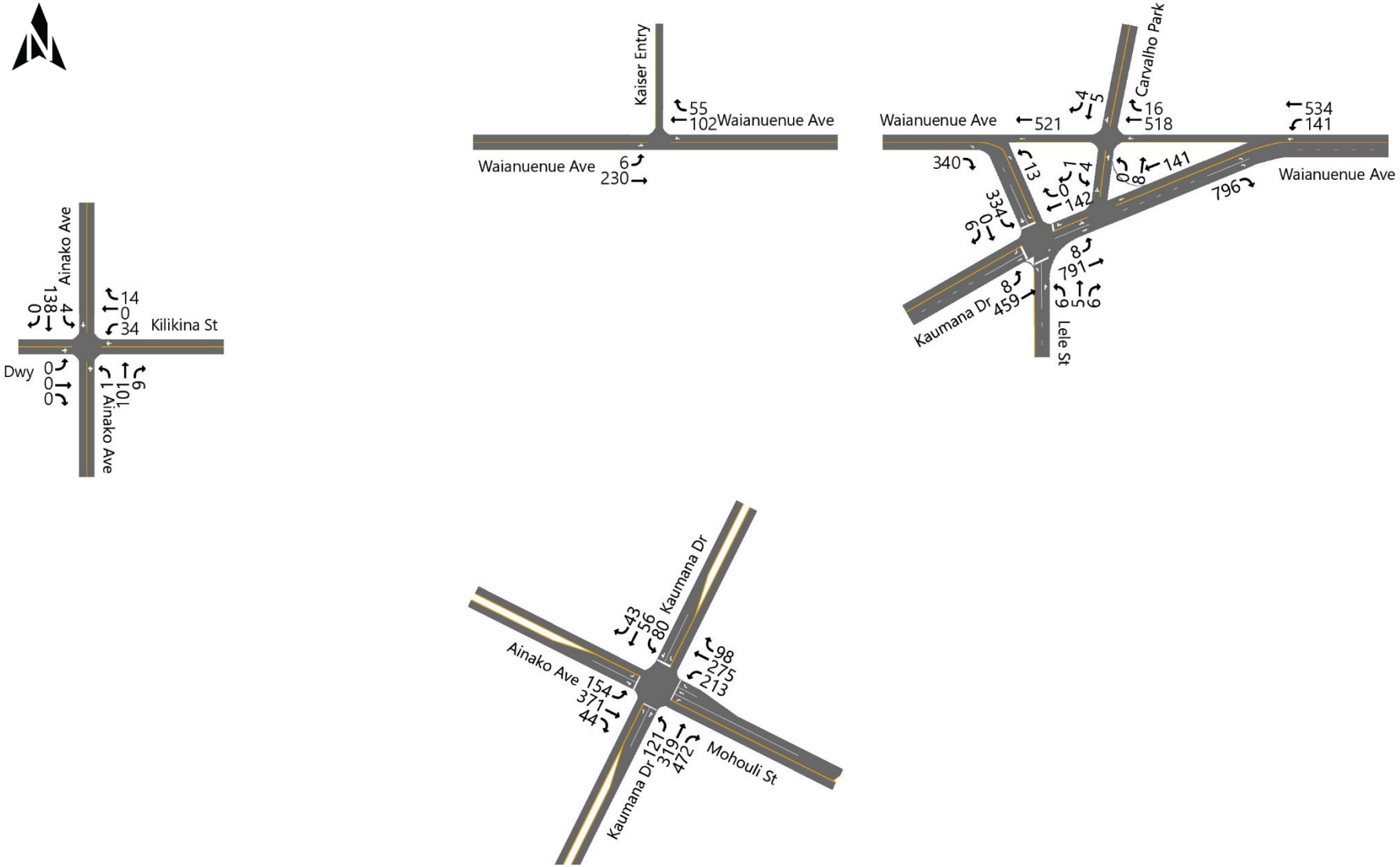

Figure 5. Year 2040 AM Peak Hour Traffic Without Project

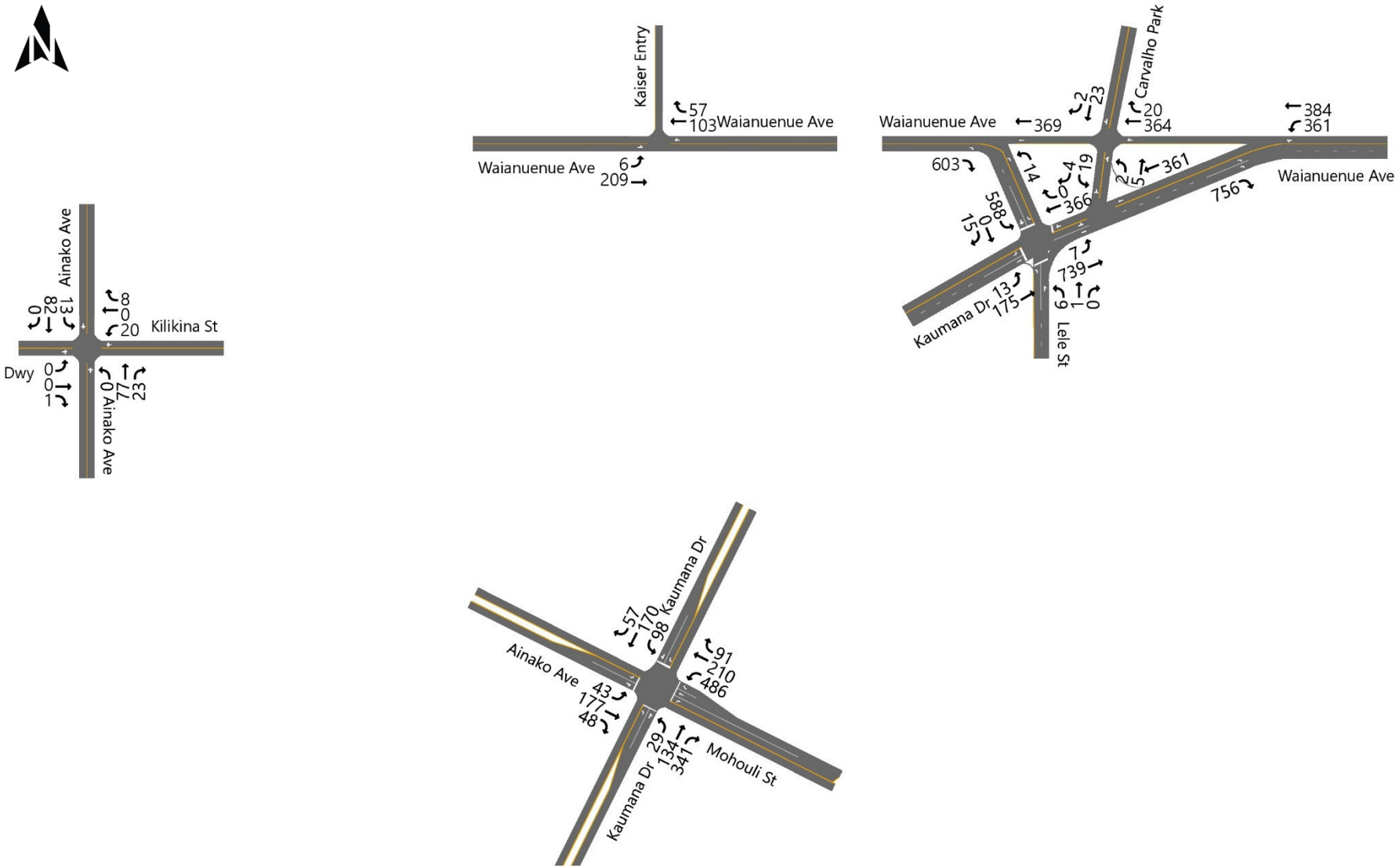

Figure 6. Year 2040 PM Peak Hour Traffic Without Project

IV. Traffic Impact Analysis

A. Trip Generation and Traffic Assignment

The Phase 1 townhouses and flats are analyzed as single family attached housing, while Phase 2 is analyzed as single family detached housing. The proposed Ainako Subdivision is expected to generate totals of 79 vph and 96 vph during the AM and PM peak hours of traffic, respectively. The trip generation characteristics for the proposed project are summarized in Table 3.

Table 3. Trip Generation Characteristics

Phase	Land Use (ITE Code)	Dwelling Units	AM Peak Hour (vph)			PM Peak Hour (vph)		
			Enter	Exit	Total	Enter	Exit	Total
1	**Single Family Attached Housing (215)**	110	13	39	52	37	25	62
2	**Single Family Detached Housing (210)**	32	7	20	27	21	13	34
	Totals	142	20	59	79	58	38	96

The AM and PM peak hour traffic assignments were based upon the future traffic circulation patterns created by the development of the Wailani Master Plan. Figures 7 and 8 depict the AM and PM peak hour traffic assignments, respectively.

B. Traffic Analysis With Project

1. AM Peak Hour Traffic Analysis With Project

Kilikina Street is expected to continue to operate at LOS "B" at Ainako Avenue, during the Year 2040 AM peak hour of traffic with the proposed project. Kalama Street is expected to operate at LOS "C" at Waianuenue Drive.

During the Year 2040 AM peak hour of traffic with the proposed project, the intersection of Kaumana Drive and Mohouli Street/Ainako Avenue is expected to operate at an overall LOS "D". The shared through/right-turn movement on eastbound Ainako Avenue, the left-turn movement on westbound Mohouli Street, and the shared through/right-turn movement on northbound Kaumana Drive are expected to operate at LOS "E", during the Year 2040 AM peak hour of traffic with the proposed project. The other intersections in the study area are expected to operate at satisfactory Levels of Service. Figure 9 depicts the Year 2040 AM peak hour traffic volumes with the proposed project.

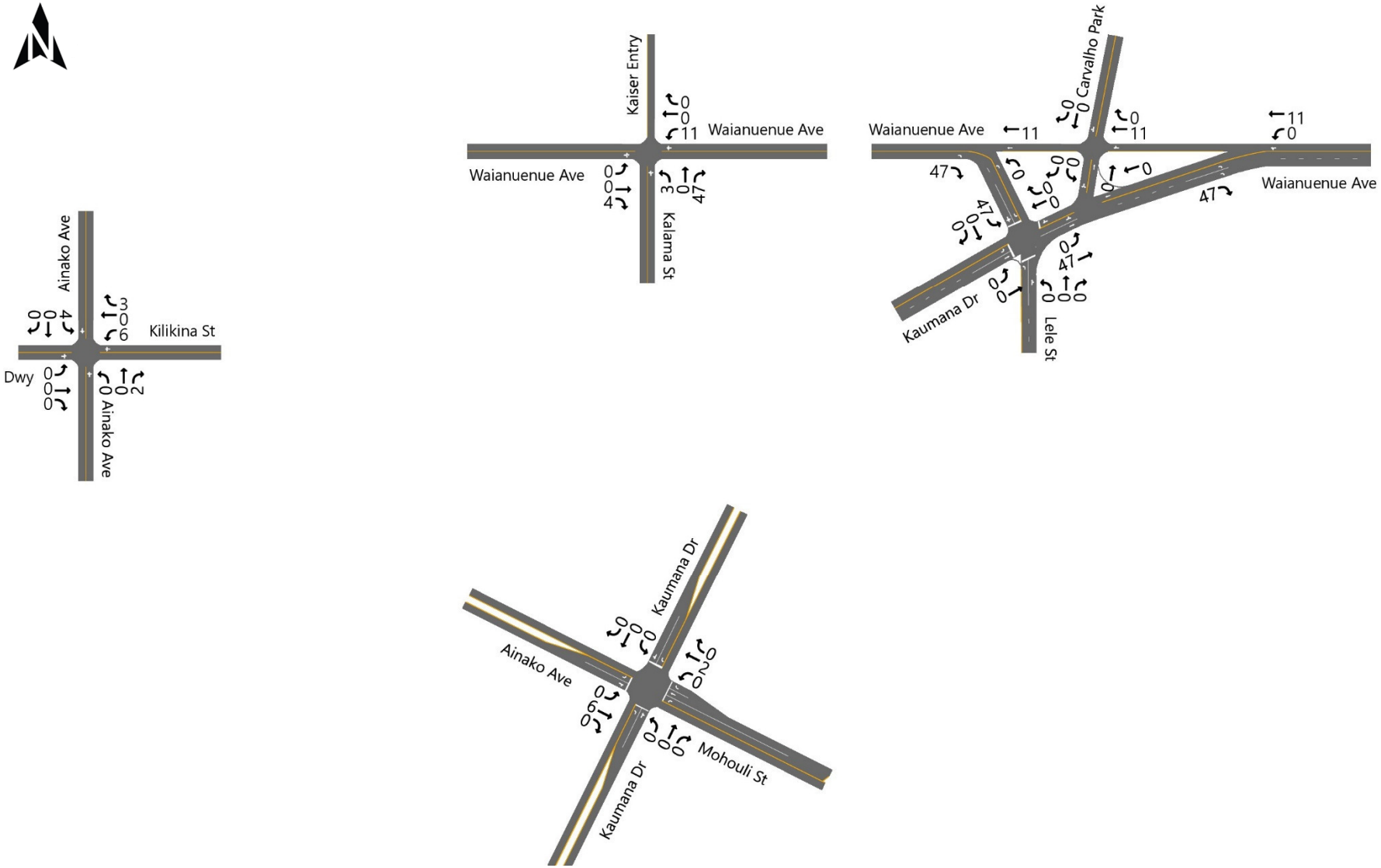

Figure 7. AM Peak Hour Site Traffic Assignment

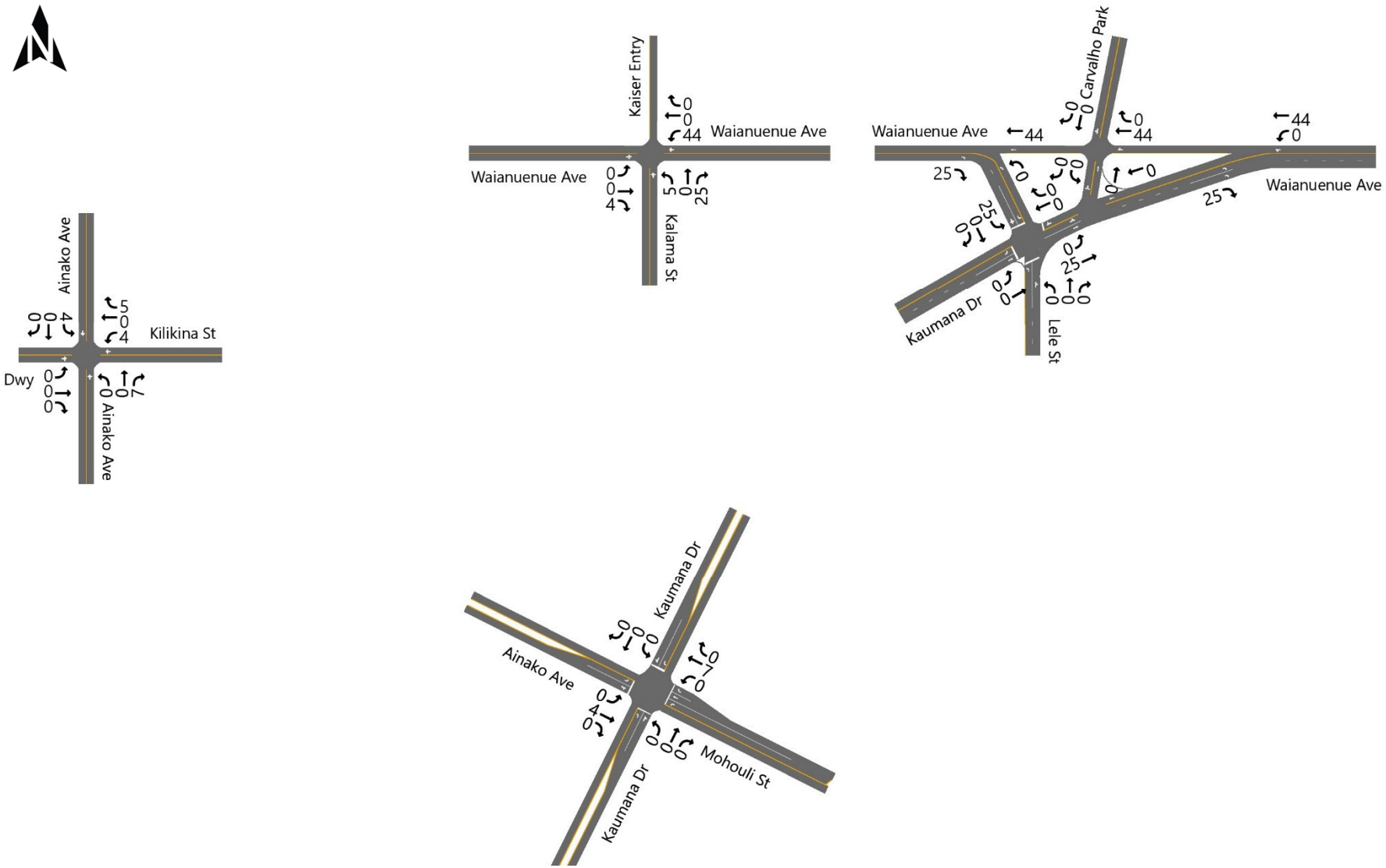

Figure 8. PM Peak Hour Site Traffic Assignment

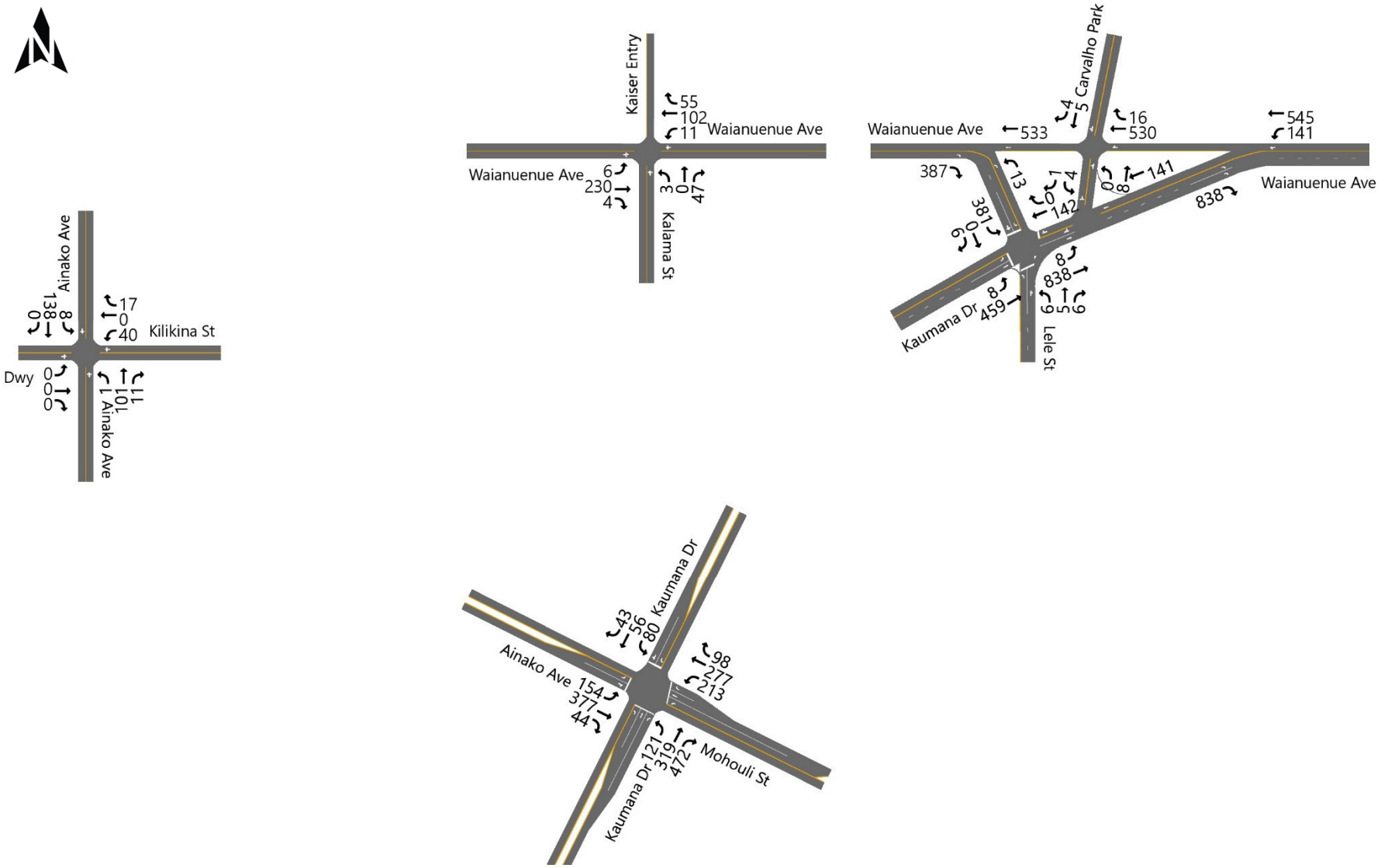

Figure 9. Year 2040 AM Peak Hour Traffic With Project

2. PM Peak Hour Traffic Analysis With Project

During the Year 2040 PM peak hour of traffic with the proposed project, Kilikina Street is expected to operate at LOS "A" at Ainako Avenue. Kalama Street is expected to operate at LOS "B" at Waianuenue Drive.

The intersection of Kaumana Drive and Mohouli Street/Ainako Avenue is expected to operate at the acceptable Levels of Service, i.e., LOS "D" or better, during the Year 2040 PM peak hour of traffic with the proposed project. The other intersections in the study area are expected to operate at satisfactory Levels of Service. The Year 2040 PM peak hour traffic with the proposed project is depicted in Figure 10.

V. Recommendation and Conclusions

A. Recommendation

Northbound Kaumana Drive should be widened at Mohouli Street/Ainako Avenue to provide a minimum 300-foot long exclusive right turn lane to Mohouli Street to mitigate the unacceptable Levels of Service, which are expected to occur during the Year 2040 AM peak hour of traffic without the proposed project.

B. Conclusions

The improved intersection of Kaumana Drive and Ainako Avenue/Mohouli Street is expected to operate at acceptable Levels of Service, during the Year 2040 AM and PM peak hours of traffic with the proposed Ainako Subdivision. The other intersections in the study area are expected to operate at satisfactory Levels of Service and are not expected to be significantly impacted by the development of the proposed Ainako Subdivision. Table 4 summarizes the measures of effectiveness (MOE) for the traffic impact analysis of the Ainako Subdivision.

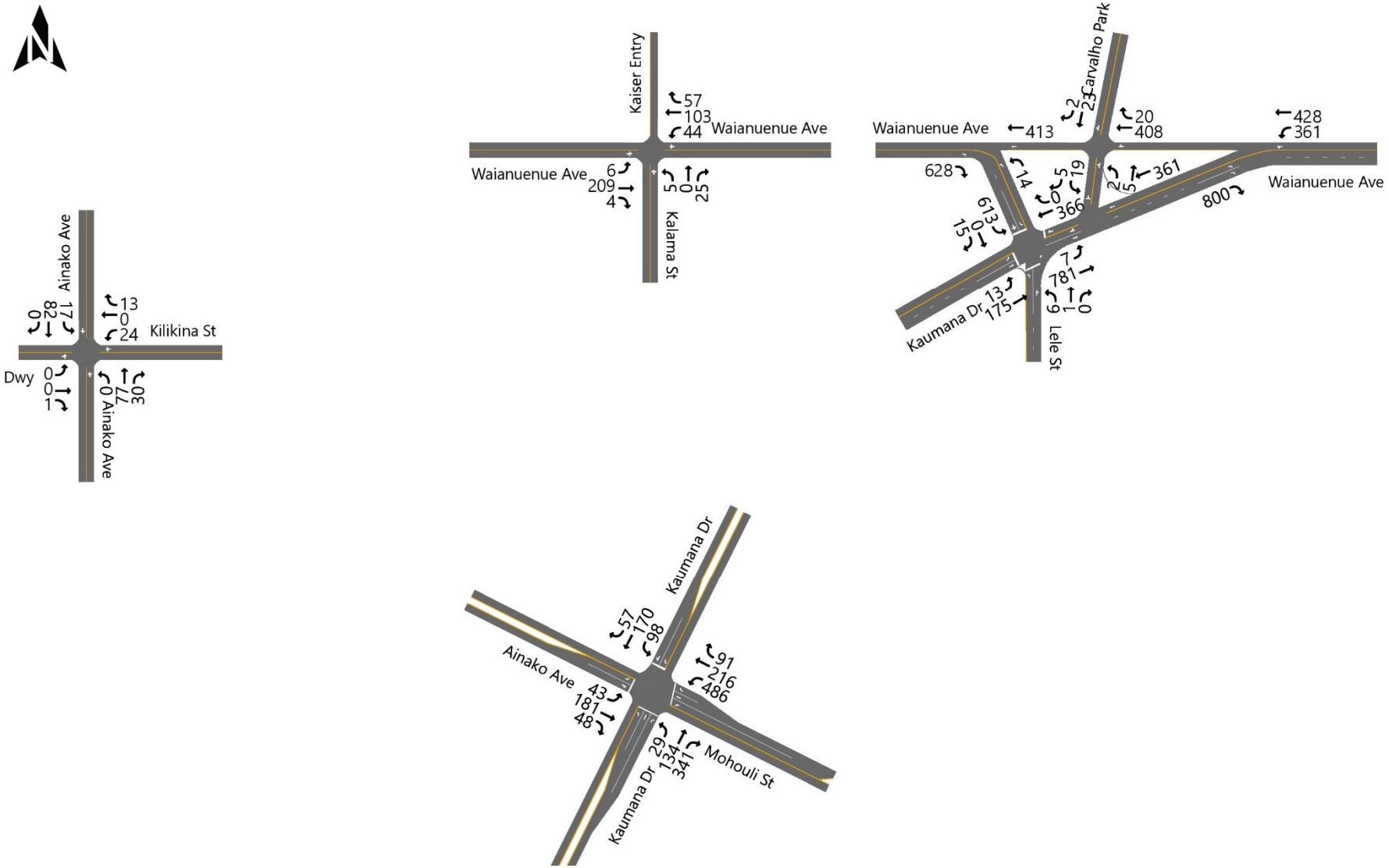

Figure 10. Year 2040 PM Peak Hour Traffic With Project

Table 4. Summary of Capacity Analysis

Peak Hour	Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
Existing AM Peak Hour	Ainako Avenue & Driveway/Kilikina Street	LOS	A			A			A	A	-	A	A	-	A
		Delay	0.0			9.9			7.4	0.0	-	7.4	0.0	-	1.8
		v/c	-			0.06			0.00	-	-	0.00	-	-	N/A
	Waianuenue Avenue & Kaiser Entry Driveway	LOS	A	A	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A	A
		Delay	7.5	0.0	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A	0.1
		v/c	0.00	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Waianuenue Avenue & Carvalho Park	LOS	N/A	N/A	N/A	-			B		N/A	N/A	B		A
		Delay	N/A	N/A	N/A	-			13.5		N/A	N/A	12.7		0.4
		v/c	N/A	N/A	N/A	-			0.02		N/A	N/A	0.02		N/A
	Kaumana Drive & Carvalho Park	LOS	A	A	N/A	N/A	-		N/A	N/A	N/A	B	N/A	B	A
		Delay	7.7	0.0	N/A	N/A	-		N/A	N/A	N/A	12.5	N/A	12.5	0.2
		v/c	0.01	-	N/A	N/A	-		N/A	N/A	N/A	0.01	N/A	0.01	N/A
	Kaumana Drive & Waianuenue Avenue/Lele Street	LOS	A	C	N/A	N/A	B		B	B		C	N/A	A	B
		Delay	8.4	20.4	N/A	N/A	15.5		19.0	15.4		22.1	N/A	2.4	16.5
		v/c	0.02	0.72	N/A	N/A	0.40		0.02	0.05		0.51	N/A	0.31	0.72 (maximum)
	Kaumana Drive & Ainako Avenue/Mohouli Street	LOS	C	D		C	D	A	B	C		B	B		C
		Delay	29.0	54.1		30.6	40.3	2.9	11.3	21.4		11.5	12.0		28.0
		v/c	0.45	0.80		0.48	0.48	0.16	0.15	0.64		0.13	0.17		0.80 (maximum)
Existing PM Peak Hour	Ainako Avenue & Driveway/Kilikina Street	LOS	A			A			A	-	-	A	A	-	A
		Delay	8.6			9.3			0.0	-	-	7.4	0.0	-	1.7
		v/c	0.00			0.03			-	-	-	0.01	-	-	N/A
	Waianuenue Avenue & Kaiser Entry Driveway	LOS	A	A	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A	A
		Delay	7.5	0.0	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A	0.1
		v/c	0.00	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Waianuenue Avenue & Carvalho Park	LOS	N/A	N/A	N/A	-			B		N/A	N/A	B		A
		Delay	N/A	N/A	N/A	-			11.2		N/A	N/A	11.3		0.9
		v/c	N/A	N/A	N/A	-			0.01		N/A	N/A	0.04		N/A
	Kaumana Drive & Carvalho Park	LOS	A	A	N/A	N/A	-		N/A	N/A	N/A	B	N/A	B	A
		Delay	8.0	0.1	N/A	N/A	-		N/A	N/A	N/A	14.1	N/A	14.1	0.4
		v/c	0.01	-	N/A	N/A	-		N/A	N/A	N/A	0.05	N/A	0.05	N/A
	Kaumana Drive & Waianuenue Avenue/Lele Street	LOS	A	B	N/A	N/A	C		B	B		D	N/A	A	C
		Delay	8.9	12.2	N/A	N/A	24.7		18.6	18.0		39.1	N/A	6.5	21.6
		v/c	0.04	0.28	N/A	N/A	0.67		0.02	0.00		0.80	N/A	0.49	0.80 (maximum)
	Kaumana Drive & Ainako Avenue/Mohouli Street	LOS	B	C		B	B	A	B	B		B	B		B
		Delay	13.0	28.6		17.2	16.8	0.2	10.6	14.3		11.0	14.7		16.2
		v/c	0.18	0.55		0.56	0.25	0.07	0.04	0.47		0.10	0.31		0.56 (maximum)

Table 4. Summary of Capacity Analysis (Cont'd.)

Peak Hour	Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
2040 AM Peak Hour Without Project	Ainako Avenue & Driveway/Kilikina Street	LOS	A			B			A	A	-	A	A	-	A
		Delay	0.0			10.7			7.5	0.0	-	7.5	0.0	-	1.8
		v/c	-			0.08			0.00	-	-	0.00	-	-	N/A
	Waianuenue Avenue & Kaiser Entry Driveway	LOS	A	A	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A	A
		Delay	7.6	0.0	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A	0.3
		v/c	0.01	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Waianuenue Avenue & Carvalho Park	LOS	N/A	N/A	N/A	-			B		N/A	N/A	B		A
		Delay	N/A	N/A	N/A	-			14.9		N/A	N/A	14.0		0.4
		v/c	N/A	N/A	N/A	-			0.03		N/A	N/A	0.03		N/A
	Kaumana Drive & Carvalho Park	LOS	A	A	N/A	N/A	-		N/A	N/A	N/A	B			A
		Delay	7.6	0.1	N/A	N/A	-		N/A	N/A	N/A	13.4			0.2
		v/c	0.01	-	N/A	N/A	-		N/A	N/A	N/A	0.01			N/A
	Kaumana Drive & Waianuenue Avenue/Lele Street	LOS	A	C	N/A	N/A	B		C	B		C	N/A	A	B
		Delay	8.0	22.9	N/A	N/A	13.2		23.8	18.9		29.7	N/A	5.9	19.5
		v/c	0.02	0.79	N/A	N/A	0.26		0.03	0.06		0.62	N/A	0.41	0.79 (maximum)
	Kaumana Drive & Ainako Avenue/Mohouli Street	LOS	C	F		E	D	A	B	D		C	A		D
		Delay	30.2	99.9		70.7	37.7	5.4	11.6	50.1		30.0	9.0		51.8
		v/c	0.57	1.07		0.94	0.64	0.22	0.20	0.98		0.60	0.13		1.07 (maximum)
2040 PM Peak Hour Without Project	Ainako Avenue & Driveway/Kilikina Street	LOS	A			A			A	-	-	A	A	-	A
		Delay	8.7			9.8			0.0	-	-	7.4	0.0	-	1.7
		v/c	0.00			0.04			-	-	-	0.01	-	-	N/A
	Waianuenue Avenue & Kaiser Entry Driveway	LOS	A	A	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A	A
		Delay	7.6	0.0	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A	0.1
		v/c	0.01	-	N/A	N/A	-	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Waianuenue Avenue & Carvalho Park	LOS	N/A	N/A	N/A	-			B		N/A	N/A	B		A
		Delay	N/A	N/A	N/A	-			12.1		N/A	N/A	12.1		0.9
		v/c	N/A	N/A	N/A	-			0.02		N/A	N/A	0.05		N/A
	Kaumana Drive & Carvalho Park	LOS	A	A	N/A	N/A	-		N/A	N/A	N/A	C	N/A	C	A
		Delay	8.1	0.1	N/A	N/A	-		N/A	N/A	N/A	16.1	N/A	16.1	0.4
		v/c	0.01	-	N/A	N/A	-		N/A	N/A	N/A	0.07	N/A	0.07	N/A
	Kaumana Drive & Waianuenue Avenue/Lele Street	LOS	B	B	N/A	N/A	C		B	C		C	N/A	B	C
		Delay	12.2	16.8	N/A	N/A	30.9		18.5	25.0		28.5	N/A	11.3	22.8
		v/c	0.07	0.34	N/A	N/A	0.77		0.02	0.00		0.69	N/A	0.54	0.77 (maximum)
	Kaumana Drive & Ainako Avenue/Mohouli Street	LOS	B	D		D	B	A	A	C		B	B		C
		Delay	10.6	48.2		41.9	14.4	0.4	9.8	22.4		13.1	14.8		26.7
		v/c	0.15	0.83		0.93	0.31	0.13	0.07	0.80		0.32	0.38		0.93 (maximum)

Table 4. Summary of Capacity Analysis (Cont'd.)

Peak Hour	Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
2040 AM Peak Hour With Project	Ainako Avenue & Driveway/Kilikina Street	LOS	A			B			A	A	-	A	A	-	A
		Delay	0.0			10.8			7.5	0	-	7.5	0.0	-	2.2
		v/c	-			0.10			0.00	-	-	0.00	-	-	N/A
	Waianuenue Avenue & Kalama Street/Kaiser Entry Driveway	LOS	A	A	-	A	A	-	B			N/A	N/A	N/A	A
		Delay	7.6	0.0	-	7.8	0.0	-	10.1			N/A	N/A	N/A	1.3
		v/c	0.01	-	-	0.01	-	-	0.07			N/A	N/A	N/A	N/A
	Waianuenue Avenue & Carvalho Park	LOS	N/A	N/A	N/A	-			C		N/A	N/A	B		A
		Delay	N/A	N/A	N/A	-			15.1		N/A	N/A	14.2		0.4
		v/c	N/A	N/A	N/A	-			0.03		N/A	N/A	0.03		N/A
	Kaumana Drive & Carvalho Park	LOS	A	A	N/A	N/A	-		N/A	N/A	N/A	B			A
		Delay	7.6	0.1	N/A	N/A	-		N/A	N/A	N/A	13.8			0.2
		v/c	0.01	-	N/A	N/A	-		N/A	N/A	N/A	0.02			N/A
	Kaumana Drive & Waianuenue Avenue/Lele Street	LOS	B	C	N/A	N/A	B		C	C		B	N/A	A	C
		Delay	10.6	27.8	N/A	N/A	16.2		32.7	30.1		19.8	N/A	7.9	20.8
		v/c	0.02	0.80	N/A	N/A	0.26		0.06	0.18		0.38	N/A	0.31	0.80 (maximum)
	Kaumana Drive & Ainako Avenue/Mohouli Street	LOS	C	E		E	C	A	B	E		D	B		D
		Delay	33.9	71.9		77.8	31.9	5.6	13.2	58.2		40.4	10.4		50.3
		v/c	0.55	0.97		0.97	0.51	0.19	0.20	1.01		0.67	0.13		1.01 (maximum)
2040 PM Peak Hour With Project	Ainako Avenue & Driveway/Kilikina Street	LOS	A			A			A	-	-	A	A	-	A
		Delay	8.7			9.9			0.0	-	-	7.5	0.0	-	2.1
		v/c	0.00			0.05			-	-	-	0.01	-	-	N/A
	Waianuenue Avenue & Kalama Street/Kaiser Entry Driveway	LOS	A	A	-	A	A	-	B			N/A	N/A	N/A	A
		Delay	7.6	0.0	-	7.8	0.0	-	10.1			N/A	N/A	N/A	1.5
		v/c	0.01	-	-	0.04	-	-	0.05			N/A	N/A	N/A	N/A
	Waianuenue Avenue & Carvalho Park	LOS	N/A	N/A	N/A	-			B		N/A	N/A	B		A
		Delay	N/A	N/A	N/A	-			12.5		N/A	N/A	12.7		0.9
		v/c	N/A	N/A	N/A	-			0.01		N/A	N/A	0.06		N/A
	Kaumana Drive & Carvalho Park	LOS	A	A	N/A	N/A	-		N/A	N/A	N/A	C			A
		Delay	8.1	0.1	N/A	N/A	-		N/A	N/A	N/A	16.3			0.4
		v/c	0.01	-	N/A	N/A	-		N/A	N/A	N/A	0.08			N/A
	Kaumana Drive & Waianuenue Avenue/Lele Street	LOS	B	B	N/A	N/A	C		C	C		B	N/A	A	C
		Delay	14.5	19.9	N/A	N/A	34.4		32.0	31.0		18.6	N/A	9.9	21.4
		v/c	0.08	0.35	N/A	N/A	0.78		0.05	0.01		0.47	N/A	0.42	0.78 (maximum)
	Kaumana Drive & Ainako Avenue/Mohouli Street	LOS	B	D		D	B	A	A	C		B	B		C
		Delay	10.6	51.3		43.0	14.5	0.4	9.8	22.4		13.1	14.8		27.3
		v/c	0.15	0.86		0.94	0.32	0.13	0.07	0.80		0.32	0.38		0.94 (maximum)

Table 4. Summary of Capacity Analysis (Cont'd.)

Peak Hour	Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
2040 AM Peak Hour Without Project-Improved	**Kaumana Drive & Ainako Avenue/Mohouli Street**	**LOS**	B	D		C	C	A	B	C	A	B	B		C
		Delay	11.5	40.2		23.4	20.3	1.3	14.1	27.5	9.7	15.8	13.8		20.9
		v/c	0.35	0.87		0.69	0.48	0.17	0.27	0.64	0.67	0.29	0.22		0.87 (maximum)
2040 PM Peak Hour Without Project-Improved	**Kaumana Drive & Ainako Avenue/Mohouli Street**	**LOS**	B	D		C	B	A	B	C	A	B	B		B
		Delay	10.7	45.8		23.6	12.8	0.3	12.1	20.1	6.3	14.0	17.7		18.8
		v/c	0.15	0.81		0.81	0.27	0.12	0.08	0.29	0.54	0.24	0.41		0.81 (maximum)
2040 AM Peak Hour With Project-Improved	**Kaumana Drive & Ainako Avenue/Mohouli Street**	**LOS**	B	D		C	C	A	B	C	B	B	B		C
		Delay	19.6	42.7		32.0	21.3	2.4	16.8	25.6	10.9	16.9	13.1		23.0
		v/c	0.43	0.85		0.76	0.44	0.16	0.24	0.52	0.64	0.24	0.16		0.85 (maximum)
2040 PM Peak Hour With Project-Improved	**Kaumana Drive & Ainako Avenue/Mohouli Street**	**LOS**	B	D		C	B	A	B	C	A	B	B		B
		Delay	10.7	47.7		23.8	12.9	0.3	12.1	20.1	6.3	14.0	17.7		19.2
		v/c	0.15	0.82		0.82	0.28	0.12	0.08	0.29	0.54	0.24	0.41		0.82 (maximum)

Legend

MOE – Measure of Effectiveness
LOS – Level of Service
Delay – Average Delay (seconds/vehicle)
v/c – Volume-to-Capacity Ratio

EBL – Eastbound Left-Turn Movement
EBT – Eastbound Through Movement
EBR – Eastbound Right–Turn Movement
WBL – Westbound Left-Turn Movement
WBT – Westbound Through Movement
WBR – Westbound Right-Turn Movement

NBL – Northbound Left-Turn Movement
NBT – Northbound Through Movement
NBR – Northbound Right-Turn Movement
SBL – Southbound Left-Turn Movement
SBT – Southbound Through Movement
SBR – Southbound Right-Turn Movement