BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843
www.boardofwatersupply.com

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JAN - 8 2021

December 28, 2020

Mr. Keith Kawaoka, Acting Director
Office of Environmental Quality Control
State of Hawai'i
Department of Health
235 S. Beretania Street, Room 702
Honolulu, Hawai'i 96813

Dear Mr. Kawaoka:

Subject: Final Environmental Assessment and Finding of No Significant Impact for the Waihe'e Lo'i Restoration and Riparian Learning Center, Ko'olaupoko District on the Island of O'ahu, Tax Map Key: 4-7-006:010 (por.),4-7-006:018, 4-7-006-23 (por.), 4-7-008-002 (por.)

With this letter, the Board of Water Supply (BWS) hereby transmits the Final Environmental Assessment and Finding of No Significant Impact (FEA-FONSI) for the Waihe'e Lo'i Restoration and Riparian Learning Center project, situated at Tax Map Key: (TMK) 4-7-006: 010 (por.), 4-7-006: 018, 4-7-006-23 (por.), 4-7-008-002 (por.) in the Ko'olaupoko District on the Island of O'ahu, for publication in the next available edition of The Environmental Notice.

As set forth in the FEA, the Waihe'e Lo'i Restoration and Riparian Learning Center in Waihe'e, O'ahu will establish a farm centered around restoration of traditional lo'i kalo and the stream environment through community involvement and education that re-instills a sense of shared kuleana for watershed management in Waihe'e Valley. Proposed activities include restoring existing fallow lo'i; help maintain existing 'auwai system used by the taro farmers downstream; and restore riparian and forest areas with appropriate native and non-invasive plants. A program of this kind will assist with managed access to the area and protection of environmental resources, reminding visitors of their responsibility for achieving a sustainable Hawai'i.

BWS submitted the Draft Environmental Assessment and Anticipated Finding of No Significant Impact (DEA-AFONSI) document for the subject project to the Office of Environmental Quality Control (OEQC) for publication in the August 8, 2020 edition of The Environmental Notice.

21-100

BWS reviewed the comments and information received after the 30-day public comment period, and in light of the significance criteria in Hawaii Administrative Rules, Section 11-200.1-13, finds that the proposed action would not result in significant adverse effects on the natural or human environment. We understand that publication of the FEA-FONSI will initiate a final 30-day review and judicial challenge period for the applicant's proposed action.

An unlocked, searchable PDF file of the FEA/FONSI will be uploaded to the OEQC website along with this letter.

If you have any questions, please contact Barry Usagawa, Water Resources Division at 748-5900, or email at busagawa@hbws.org.

Very Truly Yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

Enclosures

From: webmaster@hawaii.gov
To: HI Office of Environmental Quality Control
Subject: New online submission for The Environmental Notice
Date: Tuesday, December 29, 2020 11:38:21 AM

Action Name

Waiheʻe Loʻi Restoration and Riparian Learning Center

Type of Document/Determination

Final environmental assessment and finding of no significant impact (FEA-FONSI)

HRS §343-5(a) Trigger(s)

- (1) Propose the use of state or county lands or the use of state or county funds
- (2) Propose any use within any land classified as a conservation district

Judicial district

Koʻolaupoko, Oʻahu

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

4-7-006:010 (por.); 4-7-006:018; 4-7-006:023 (por.); 4-7-008:002 (por.)

Action type

Agency

Other required permits and approvals

Numerous

Proposing/determining agency

Board of Water Supply, City and County of Honolulu

Agency contact name

Barry Usagawa

Agency contact email (for info about the action)

busagawa@hbws.org

Email address or URL for receiving comments

WaiheeRLC@g70.design

Agency contact phone

(808) 748-5900

Agency address

630 S. Beretania Street
Honolulu, HI 96843
United States
Map It

Was this submittal prepared by a consultant?

Yes

Consultant

G70

Consultant contact name

Kawika McKeague

Consultant contact email

kawikam@g70.design

Consultant contact phone

(808) 523-5866

Consultant address

111 South King Street
Suite 170
Honolulu, HI 96813
United States
Map It

Action summary

The Waiheʻe Loʻi Restoration and Riparian Learning Center in Waiheʻe, Oʻahu will establish a farm centered around restoration of traditional loʻi kalo and the stream environment through community involvement and education that re-instills a sense of shared kuleana for watershed management in Waiheʻe Valley. An open pavilion will be used as an outdoor classroom to demonstrate sustainable agricultural activities and provide education about Hawaiian culture, food security, and watershed management. Proposed activities include restoring existing fallow loʻi; help maintain existing ʻauwai system; and restore riparian and forest areas with appropriate native plants. A program of this kind will assist with managed access to the area and protection of environmental resources, reminding visitors of their responsibility for achieving a sustainable Hawaiʻi. Through a Request for Proposal, a qualified nonprofit community group will be selected to operate the project on a long-term agreement.

Reasons supporting determination

Please refer to Section 6.0 Findings Supporting the Anticipated Determination

Attached documents (signed agency letter & EA/EIS)

- Final-FEA_BWS_WLRRLC_01.08.21_reduced.pdf
- Ltr-to-K.-Kawaoka-FEA-Fonsi-Waihee-Loi-Restoration-and-Riparian-Learning-Center.pdf

Shapefile

- The location map for this Final EA is the same as the location map for the associated Draft EA.

Authorized individual

Barbara Natale

Authorization

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

WAIHE‘E LO‘I RESTORATION AND RIPARIAN LEARNING CENTER

FINAL ENVIRONMENTAL ASSESSMENT

WAIHE‘E, O‘AHU

APPLICANT:

Board of Water Supply

PREPARED BY:

G70

111 S. KING STREET, SUITE170
HONOLULU, HI 96813

JANUARY 2021

WAIHE‘E LO‘I RESTORATION AND RIPARIAN LEARNING CENTER

FINAL ENVIRONMENTAL ASSESSMENT

WAIHE‘E, O‘AHU

TMK: 4-7-006:010 (POR.), 4-7-006:018,
4-7-006:023 (POR.), 4-7-008:002 (POR.)

APPLICANT/APPROVING AGENCY:

BOARD OF WATER SUPPLY
630 SOUTH BERETANIA STREET
HONOLULU, HAWAI‘I 96843

PREPARED BY:

111 S. KING STREET, SUITE 170
HONOLULU, HI 96813

JANUARY 2021

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Chapter 1

Introduction

Chapter 1

Introduction

This Environmental Assessment (EA) has been prepared in accordance with the requirements of Chapter 343, Hawai'i Revised Statutes (HRS) and Hawai'i Administrative Rules (HAR), Title 11, Chapter 200.1, Department of Health, which set requirements for the preparation of environmental assessments.

1.1 Project Information Summary

Type of Document:	Environmental Assessment (EA)
Project Name:	Waihe'e Lo'i Restoration and Riparian Learning Center (WLRRLC)
Applicant:	Board of Water Supply (BWS), Hydrology/Geology Branch 630 South Beretania Street Honolulu, HI 96843 Contact: Barry Usagawa, Program Administrator Telephone: (808) 748-5900
Agent:	G70 111 S. King Street, Suite 170 Honolulu, HI 96813 Contact: Kawika McKeague, AICP, Principal Telephone: (808) 523-5866
Approving Agency:	Board of Water Supply 630 South Beretania Street Honolulu, HI 96843 Contact: Manger and Chief Engineer Telephone: (808) 748-5932
Recorded Fee Owners:	City and County of Honolulu Department of Parks and Recreation (DPR) 630 South Beretania Street Honolulu, HI 96843 Board of Water Supply 630 South Beretania Street Honolulu, HI 96843

Ch. 343, HRS Trigger:	Use of County land and funds; Use of lands within the State Land Use Conservation District
Project Location:	Waiheʻe Valley, mauka of residential development at 47-520 Waiheʻe Road, Kāneʻohe, HI 96744 *(Figure 1.1)*
Tax Map Key (TMK):	4-7-006:010 (por.),4-7-006:018, 4-7-006:023 (por.), 4-7-008:002 (por.) *(Figure 1.2)*
Existing Use:	Alien wet forest and various canopy and understory plant species, an existing stream diversion structure and ʻauwai serving two makai farms TMK: 4-7-06:04 & 13, and a gated gravel access road to mauka Waiheʻe.
Proposed Action:	Establishment of a farm to restore loʻi kalo and promote watershed protection, sustainable agriculture, and forest restoration, with a traditional meeting hale or open pavilion for agricultural activities and cultural and educational programs. Through a Request for Proposal, the BWS and DPR to select and award a land lease to a qualified non-profit community group to operate Waiheʻe Loʻi Restoration on a long-term agreement.
Project Area:	Total Property Area: Approx. 89 acres; Project Area: Approx. 27 acres
State Land Use District:	Urban, Conservation *(Figure 1.3)*
City & County of Honolulu Zoning:	AG-2 General Agricultural District, P-1 Restricted Preservation *(Figure 1.4)*
City Development Plan:	Koʻolau Poko Sustainable Communities Plan *(Figure 5.1)*
Flood Zone:	Zone D, X, and A *(Figure 1.5)*
Anticipated Determination:	Finding of No Significant Impact (FONSI)

1.2 Purpose of the Environmental Assessment

This EA will comply with Hawaiʻi's Environmental Review process, HRS Chapter 343. The ownership of the subject property by DPR and BWS, and therefore utilization of county land, provides the basis for the preparation of this document. Phase II B of this project is located within the State Land Use Conservation District, which also requires EA preparation.

The City and County of Honolulu Board of Water Supply is the approving agency. The EA examines the potential environmental impacts of the Project and seeks agency and public comment on subject areas that should be addressed.

1.3 Agencies, Organizations and Individuals Contacted in Early Consultation

Organizations and members of the community were consulted in the preparation of this Draft EA. The WLRRLC was discussed at meetings of the Kahaluʻu Neighborhood Board in June and July 2019. Issues discussed at the June 2019 meeting included disrespectful behavior of trespassing hikers and concern for how the project would affect loʻi downstream. At the July 2019 meeting, Councilmember Heidi Tsuneyoshi provided a summary regarding the steps that the Honolulu Police Department (HPD), DPR, and BWS will take to reduce the trespassing, such as additional signage, repairing and closing an inner gate, changing the gate codes at a higher frequency, and assigning an HPD special duty officer at the gate to issue warnings and citations. The Department of Parks and Recreation was also consulted as landowner.

An initial community meeting was held in July 2019. The backgrounds of the community members varied from those frustrated with hikers, taro farmers, stream specialists, church members, and residents who have lived here for a short time as well as those that grew up and played in the Project area. Immediate concerns about trespassing hikers were discussed, including blocked driveways, trash both in the neighborhood and into the Project site, water pollution, water quality, food safety for downstream taro, and protection of a valuable water source.

The longer-term aspects of the Project were also discussed, with interest in how the Project would create a presence and manage hiker access. The WLRRLC Project also has potential for additional opportunities, such as mapping, conditions assessment, water and structure testing, and other studies. Land ownership and liability concerns for any non-profit that manages this Project will need to be evaluated. Some community members were ready to get the project started now, however it was recognized that the Project will need to follow the EA process, a request for proposals by non-profits will need to occur, and appropriate permitting acquired in order to be successful. See *Appendix A* for Neighborhood Board and community meeting notes.

Additional parties contacted are listed below, and others that were invited to comment on the Draft EA are listed in *Chapter 7.*

Other Organizations and Individuals

State

- Department of Health, Wastewater Branch

City and County

- Councilmember Heidi Tsuneyoshi
- Department of Design and Construction
- Department of Parks and Recreation
- Department of Transportation Services
- Honolulu Police Department

Citizen Groups, Individuals, and Consulted Parties

- Kahaluʻu Neighborhood Board #29
- Amy Luersen
- John Reppun
- Rick Towill
- Waiheʻe Road residents
- Waiheʻe farmers
- KEY Project
- Additional community members

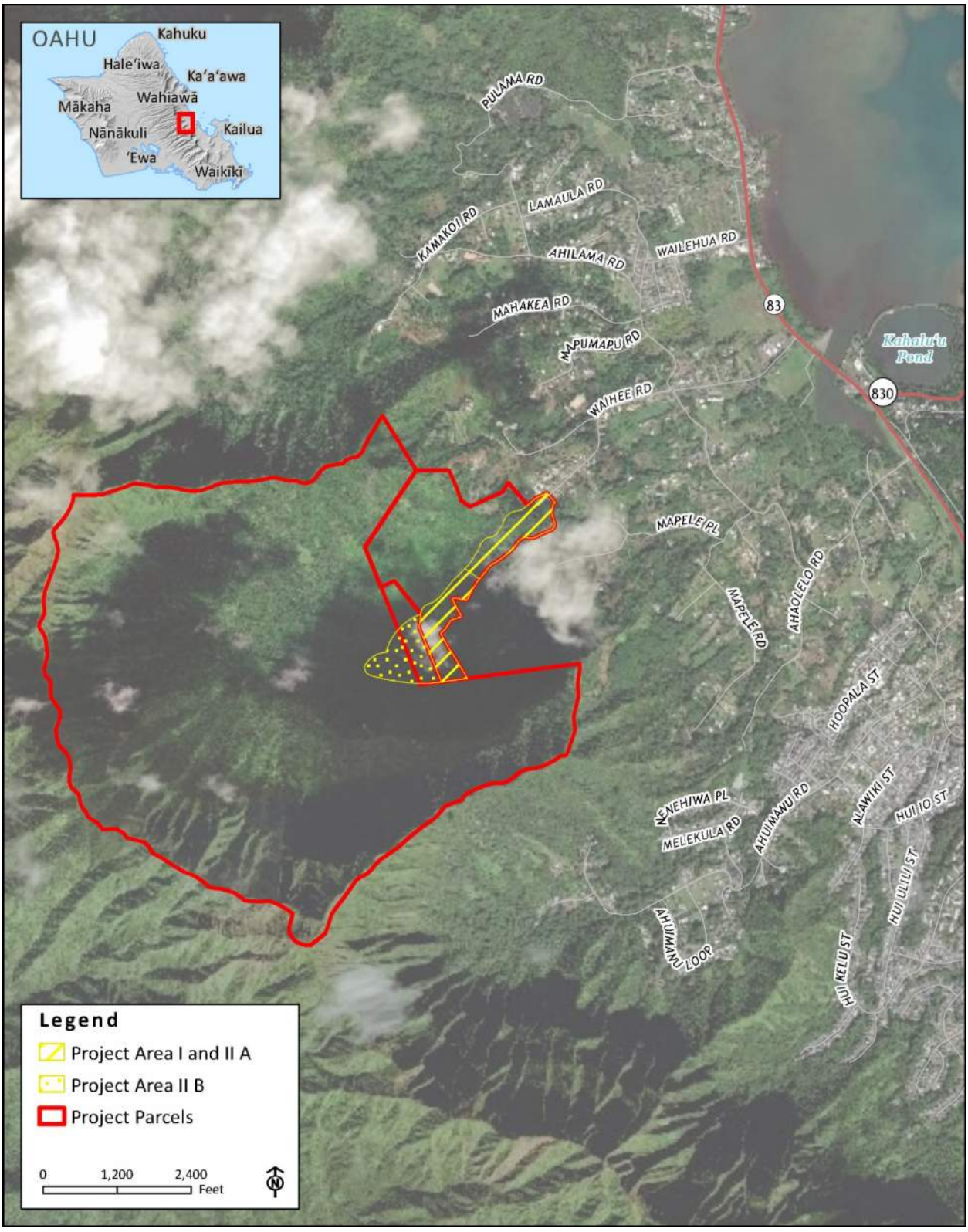

Figure 1.1 **Project Location**

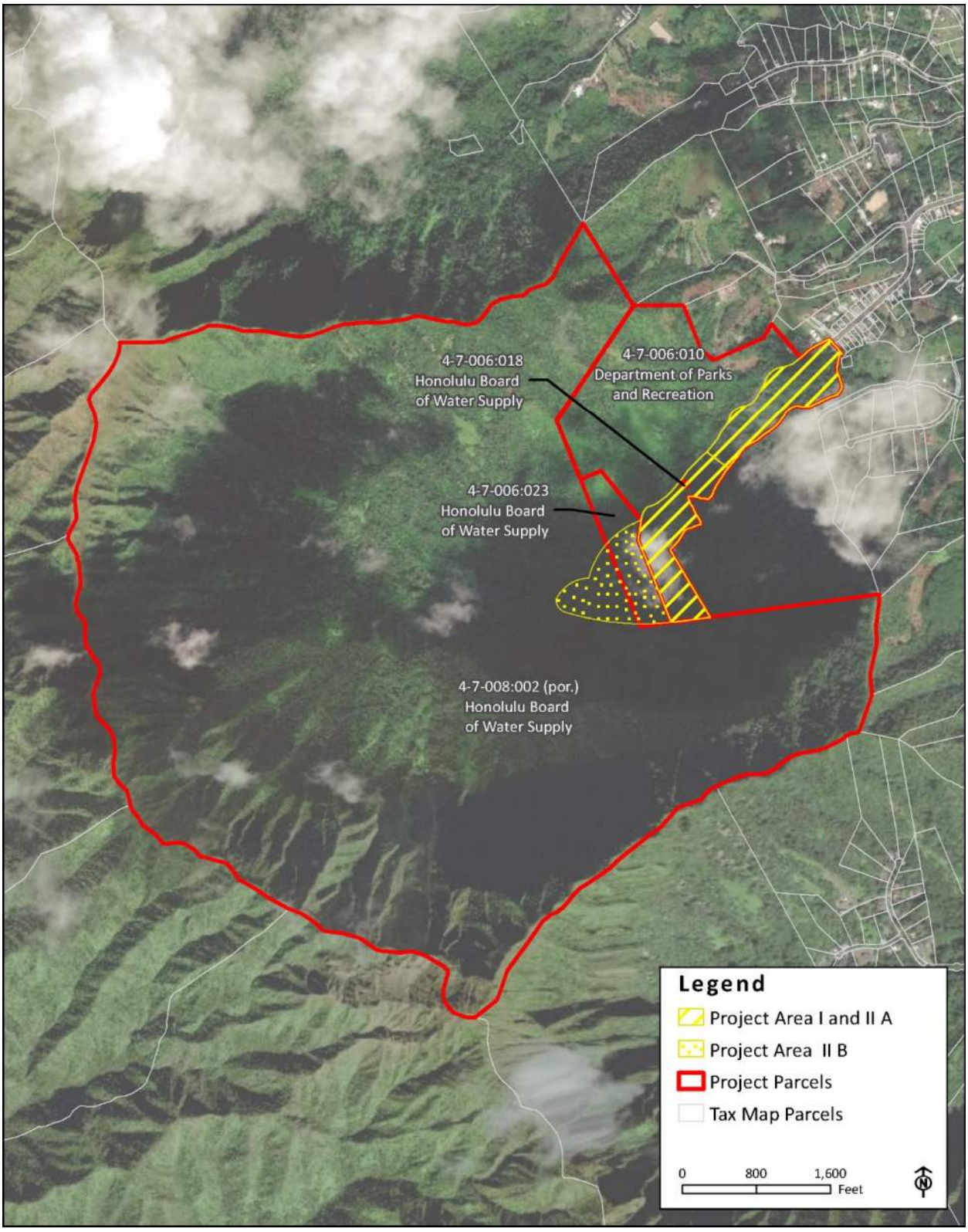

Figure 1.2 **Tax Map Key**

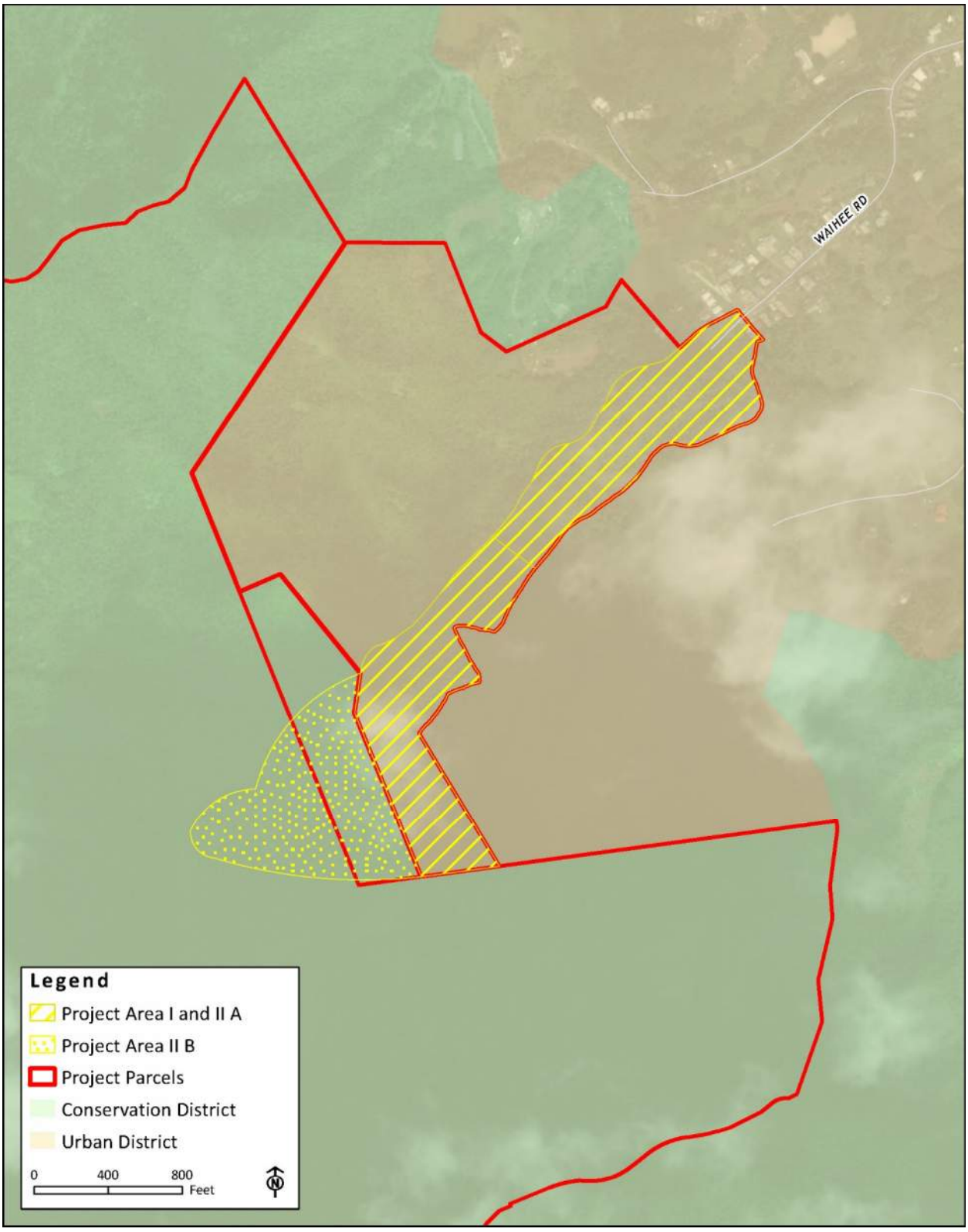

Figure 1.3 **State Land Use Classification**

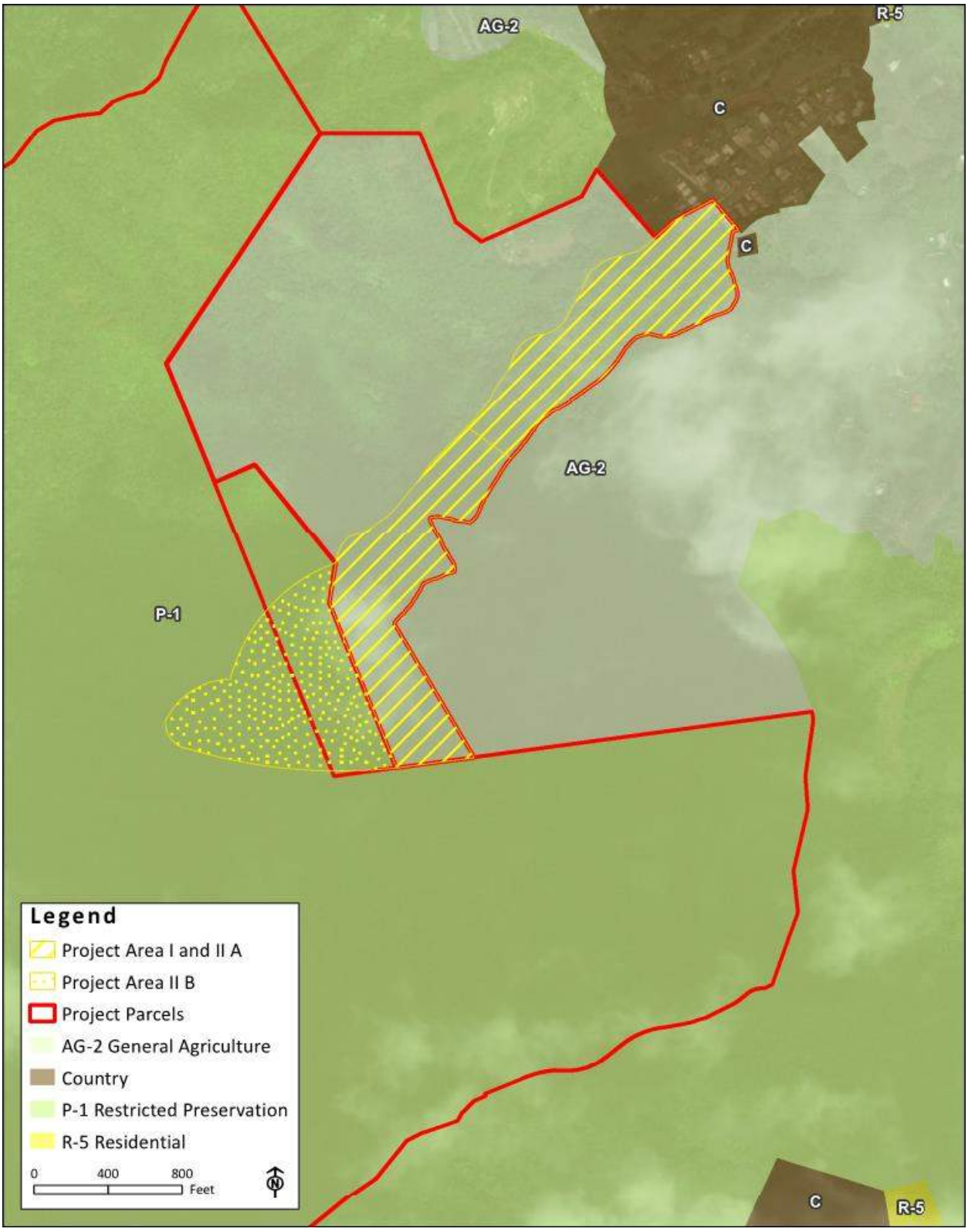

Figure 1.4 **City and County of Honolulu Zoning**

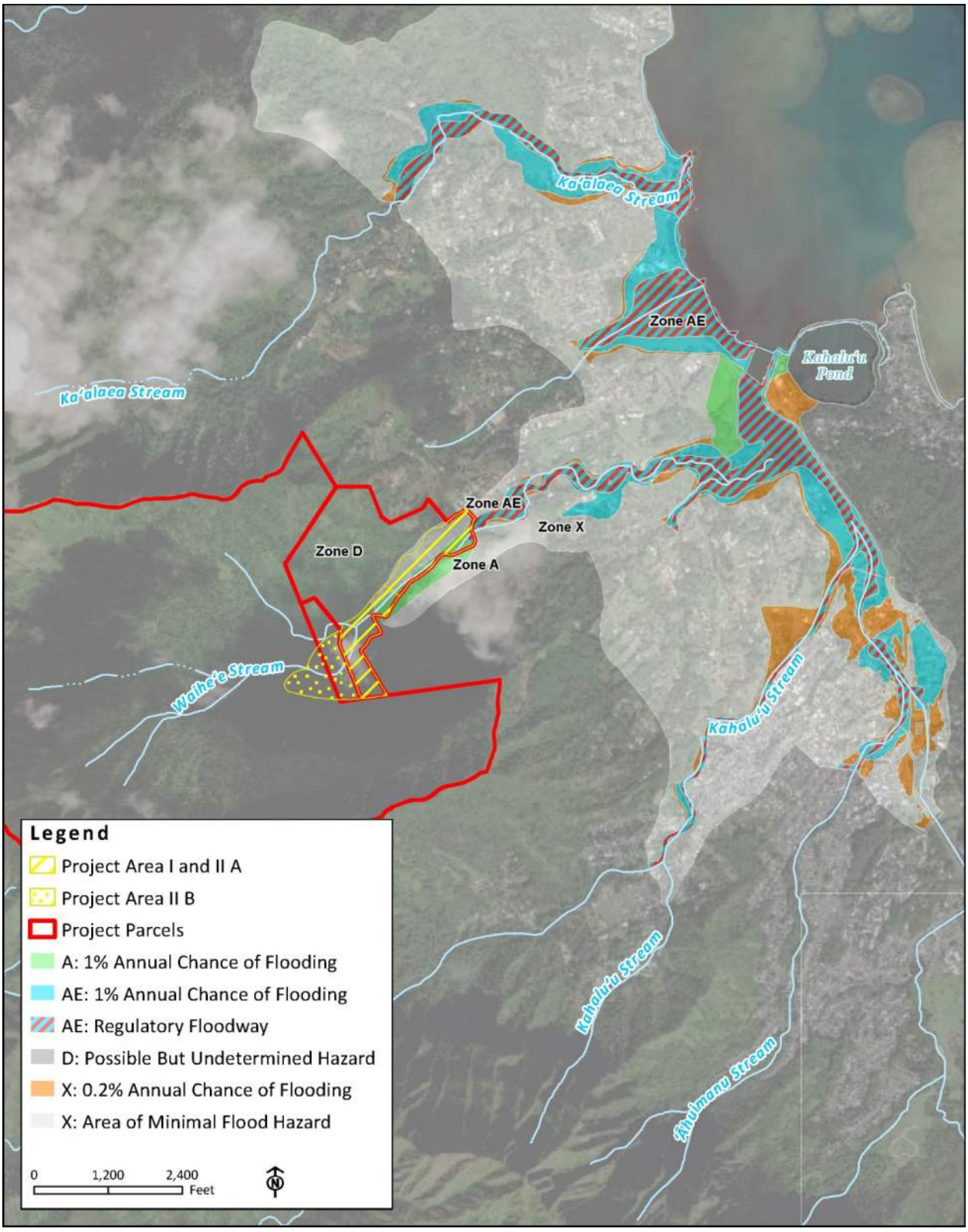

Figure 1.5 **Flood and Tsunami Evacuation Zones**

Chapter 2

Project Description

Chapter 2

Project Description

This chapter provides an overview of the project concepts for a farm centered around loʻi kalo restoration and cultural and environmental learning that carries forward the rich history of Waiheʻe Valley.

2.1 General Description of the Proposed Action

The goal for the proposed Waiheʻe Loʻi Restoration and Riparian Learning Center (WLRRLC) is to restore traditional loʻi kalo and the stream environment through community involvement and education that re-instills a sense of shared kuleana for watershed management in Waiheʻe Valley.

2.1.1 Project Concepts

Through a Request for Proposals (RFP) for a long-term land lease or service agreement, the City and County of Honolulu Board of Water Supply (BWS) and Department of Parks and Recreation (DPR) intend to select a qualified, financially viable and motivated non-profit community organization to restore and maintain the project site. The lease or service agreement will likely contain requirements for insurance and indemnification of liability. The key project concepts are:

- Farm and native plant nursery with small ancillary structures to demonstrate and promote the Waiheʻe Ahupuaʻa Initiative (WAI) partnership goals of stewardship, watershed management, water conservation, forest and loʻi restoration, and sustainable agriculture;
    - Clearing and grubbing of invasive vegetation under supervision of a qualified archaeologist. The parcel is currently overgrown with non-native grasses, brush, and trees that must be cleared before any work can be done on the site.
    - Protect and restore historic agricultural terraces, irrigation ditches, water control features, structural remnants, roads, and other culturally significant sites under supervision of a qualified archaeologist. Historic and significant sites and structures must be respected, protected from damage, and restored to ensure that the story of Waiheʻe can be shared with future generations.
    - Develop a soil and water conservation plan for the parcel consistent with Natural Resources Conservation Service (NRCS) soil and water conservation guidelines. The plan should define the types of native plants and crops, locations, water demands, irrigation systems, etc. that will be used.
    - Provide land and water resource management through restoration of fallow loʻi, removing invasive plants and replacing them with natives within the surrounding forest. Increase Hawaii's food self-sufficiency by increasing the amount of locally grown food consumed by local residents, which are components to Hawaiʻi's food security.
- Secure sufficient stream water for the two acres of restored loʻi kalo for Phase I. Waiheʻe Stream courses through Parcel 10 (an area of historic terrace complexes) and therefore the parcel should have riparian water rights to the Waiheʻe stream for loʻi restoration;

  - Repair and maintain the stream diversion and ‘auwai. Install PVC or HDPE irrigation pipe, as needed to reduce water loss in the ‘auwai to compensate for the use of ‘auwai water for new lo‘i kalo.
  - The objective is to provide additional water for new lo‘i first by improving water distribution efficiency and reducing water loss. If additional stream water is needed for lo‘i restoration, then strategies to secure permits to increase the amount of diverted water will be pursued as long as downstream users are not actually impacted.

- A community area with adequate parking spaces for place-based educational programs for schools (including Windward Community College) and other groups including a traditional meeting hale or open pavilion and composting toilets. It should be noted that this concept is NOT an institutional school with typical buildings, etc. This project is firmly intended as an agricultural activity with an educational component and not an institutional or commercial land use activity;

- An outdoor classroom concept for hands-on opportunities to learn about watershed protection, sustainable agriculture, food security and business plans for becoming viable production growers with revenue generation from the local sale of agricultural products. Provides a space and opportunity to extend community programs such as Kualoa-He‘eia Ecumenical Youth (KEY) Project’s youth programs into mauka Waihe‘e to focus and instill community, cultural and environmental values as an alternative to the social distractions that exist in the Kahalu‘u and Waihe‘e communities;

- Base for mauka Waihe‘e restoration and watershed partnership efforts for the removal of invasive species and ungulates, reforestation with site appropriate native species, erosion control and soil stabilization best management practices to reduce polluted runoff and sediment loading of the stream and conduct environmental management and climate change research;

- Provide a community presence to assist agencies reducing hiker impacts. Managing public access will need to consider transportation, parking, carrying capacity, comfort facilities, trash management, environmental mitigation, cultural education, safety, liability, maintenance, and security features such as gates and fencing to prevent chronic trespassing. Educating volunteers through activities and interpretive signage is important, with focus areas including watershed management, Hawaiian culture, lo‘i restoration, invasive species, defining KULEANA and KAPU in a forest reserve and source water protection area;

  - Create a cultural plan that outlines Hawaiian protocol, values and practices to be integrated into the actions and education at the site, which can then be carried forward with future generations.

- The community, cultural and environmental benefits of this project will be taken into consideration as a significant contribution to lower the rent. This project is not intended as revenue generation for the City, but rather to supplement resource management responsibilities and activities that the City does not have the resources to accomplish.

2.1.2 Project Plan Consistency

The Koʻolau Poko Watershed Management Plan (KPWMP) adopted in 2012 by the City Council and the State Commission on Water Resource Management provides a long-range 20-year plan for the preservation, restoration, and balanced management of groundwater, surface water, and related watershed resources in the Koʻolau Poko District of Oʻahu. The Waiheʻe Stream Watershed was selected as a critical watershed due to the following reasons:

- It is the largest single source of potable water for the Koʻolau Poko District (an average of 5 million gallons per day from two gravity dike sources, Waiheʻe Tunnel and Waiheʻe Inclined Wells, producing one-third of all drinking water for the Windward district);

- There is a critical need to protect water quantity and quality because of the important water uses within the watershed, and the importance of the riparian habitat along Waiheʻe Stream;

- Under court order Reppun vs BWS, which established riparian water rights in Hawaiʻi, 2.7 mgd of stream flow must be maintained at the United States Geological Survey (USGS) stream gage in Waiheʻe Stream for traditional, customary and riparian uses downstream;

- Stream water is used to sustain traditional and customary practices of loʻi kalo and cultural gathering practices;

- The potential to add new acres of loʻi kalo cultivation in addition to what exists in the valley;

- Because of the many opportunities for proactive management projects within the watershed.

The catalyst project in this watershed is called the Waiheʻe Ahupuaʻa Initiative (WAI) which has several projects to improve the watershed. This Environmental Assessment (EA) discloses the Riparian Zone Outdoor Learning Center (renamed Waiheʻe Loʻi Restoration and Riparian Learning Center) project in detail.

The WLRRLC addresses four objectives of the KPWMP:

1) Promote sustainable watersheds
2) Protect and enhance water quality and quantity
3) Protect Native Hawaiian rights and traditional customary practices
4) Facilitate public participation, education, and project implementation

BWS has embraced its dual role of being both a water purveyor as well as being a steward of the island's water resources. As one of its proactive measures, BWS entered into a Memorandum of Understanding (MOU) in 2003 with the Waiheʻe-based non-profit, Kualoa-Heʻeia Ecumenical Youth (KEY) Project. The WAI partnership was created through this MOU *(Appendix B),* in which BWS and KEY Project agreed to form relationships necessary to develop a community-based plan for the sustainable management of the Waiheʻe ahupuaʻa. Hui O Koʻolaupoko and Bishop Museum were subsequently added to the partnership. The WAI partnership also recognized the need to be inclusive of all parties that demonstrate a willingness to contribute positively to the goals of the WAI. Project goals in alignment with the Waiheʻe Ahupuaʻa Initiative include:

- Preserve, protect, restore, enhance, and interpret the unique natural and cultural heritage of Waiheʻe for future generations by fostering knowledge of relevant history, culture, local economy and science such that an understanding of the elements that are critical to ahupuaʻa restoration becomes widespread;

- Protect endangered tropical forest(s), wetlands, riparian, coastal, estuarine, and marine habitat through promotion of environmental policies and practices that address biological sustainability and human wellbeing. This will be accomplished, in part, by integrating current Western management strategies with traditional Hawaiian resource stewardship models – each of which is now better understood;

- Develop natural resource stewardship models that respect Native Hawaiian rights and those of an island community while helping to re-establish a corresponding acceptance of civic responsibilities attached to those rights; and

- Increase the number of partners that participate.

This project reflects other similar projects and programs already established within the Koʻolau Poko district and other areas of Hawaiʻi. These groups include: Papahana Kuaola, Paepae o Heʻeia, Kakoʻo ʻŌiwi, Hoʻokuaʻāina, Hoʻoulu ʻĀina, Hikaʻalani, Waikalua Loko Iʻa, Kuaʻāina Ulu ʻAuamo, Hui Mālama Loko Iʻa (Hui), Waimānalo Limu Hui, Koʻolau ʻĀina Aloha Network, ʻĀhuimanu Taro Complex, Punaluʻu Ahupuaʻa Farms, and planning for Waiahole-Waikane. Creating relationships with these and other similar groups will create a network of education and food security for the area.

2.1.3 Site Plan Elements and Programs

The proposed Waiheʻe Loʻi Restoration and Riparian Learning Center site on TMK:4-7-006:010 (por.), encompasses 27 acres of urban designated land at the end of Waiheʻe Road in Kahaluʻu, Oʻahu. The property is owned by the Department of Parks and Recreation (DPR), including the front entrance gate. BWS owns the mauka parcels in Waiheʻe Valley and has a road access easement through the DPR property. DPR agreed to allow BWS to evaluate and disclose the project in this EA in part, as a means to manage this parcel. DPR funding resources are stretched to their limits in maintaining current parks and is unable to adequately manage this property. A more feasible alternative would be to transfer the parcel through lease or service agreement to a non-profit community group that will implement the concept plan and assume maintenance responsibilities. To do this, an RFP process will be pursued after the Final EA is accepted.

The Project consists of several elements that are envisioned to be implemented in phases by area. It is important to note that the project area that was analyzed in detail (Phase I and II A), as shown in *Figure 2.1*, only includes the portion of TMK: 4-7-006:010 between the access roadway and Waiheʻe Stream. While the project area was surveyed for topographic, botanical, and archaeological features, the remaining areas were not surveyed due to limited available funding. All proposed activities outside the project area will need to undergo these surveys before ground disturbance is initiated. *Figure 2.1* is a draft concept plan, subject to adjustments provided by the implementing non-profit group.

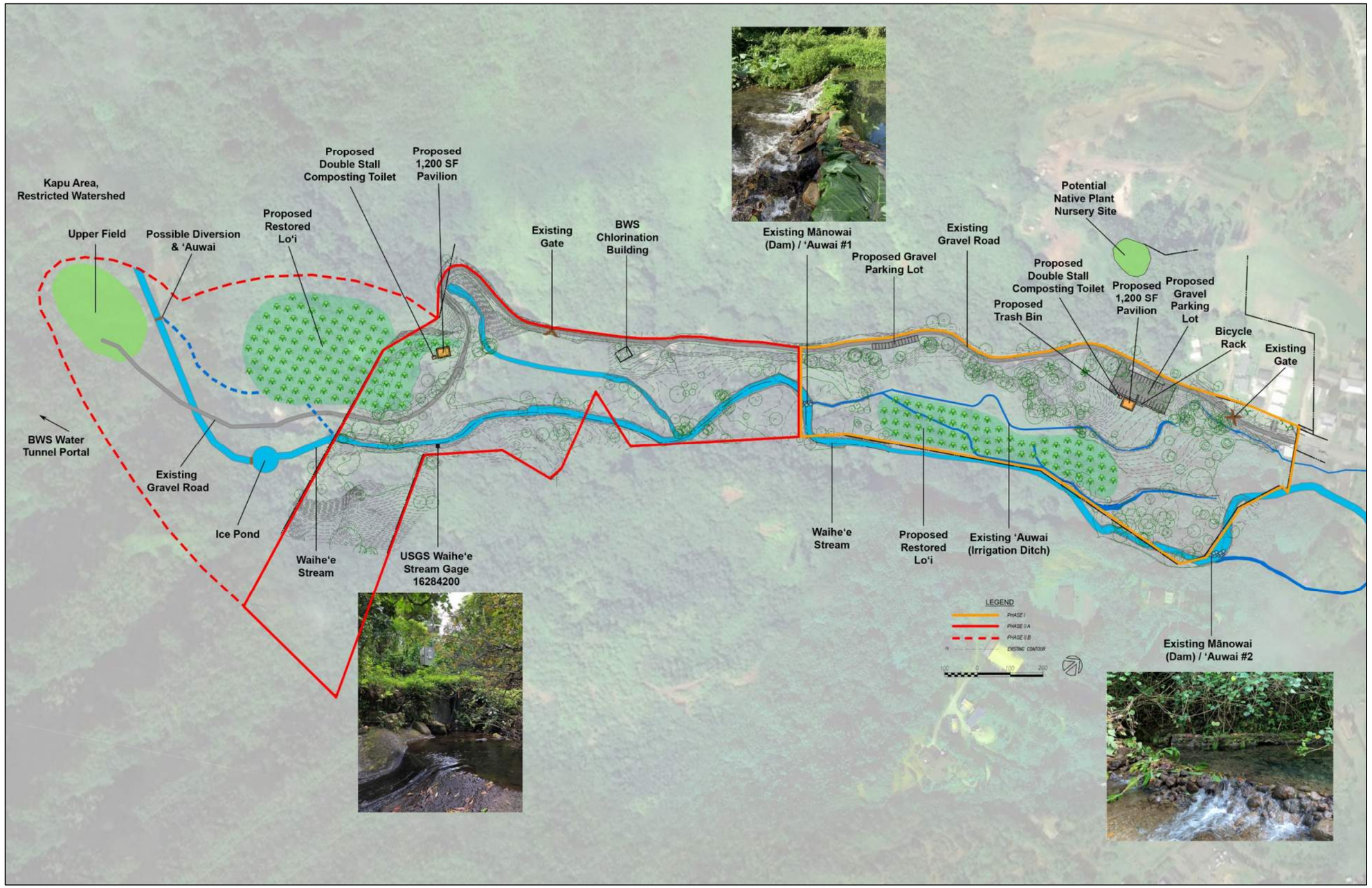

Figure 2.1 **Draft Concept Plan**

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The development of a successful project will have a primary focus on the restoration of indigenous agriculture, such as the cultivation of loʻi kalo and other native diversified crops, in areas currently overgrown with invasive vegetation. Restoration work will eventually be supplemented with educational and volunteer programs.

Construction of a 1,200 square foot pavilion/hale *(Figures 2.2, 2.3)* in Phase I will allow for a covered location to hold workshops, meetings and presentations. Initial infrastructure needs and feasibility for water, electrical, and composting toilet options *(Figure 2.4)* are based on assumed staff and volunteer numbers and analyzed in *Section 3.12* of this EA. A trash bin will be located adjacent to the composting toilets. Several areas will be designated as outdoor learning spaces. A nursery will provide native and other suitable plants for restoration and cultivation. Based on community consultation, a possible location for this nursery is outside the project area across the road on the Kahuku side of the parcel. The proposed nursery area will have to be surveyed for botanical or archaeology findings should the non-profit group that manages this area decide to locate it there instead of within the surveyed project area.

Two small parking areas ranging in size from 1,200 square feet to 5,000 square feet will be developed for staff, non-profit groups, students and volunteers that arrive for community workdays *(Figure 2.1).* The first gravel parking area will accommodate 25 cars, have an Americans with Disabilities Act (ADA) -compliant parking space, and will be large enough for a bus turn around. The second parking lot will accommodate 14 vehicles. A second existing gate installed past the second parking area will help to control vehicle access to the rest of the valley. Onsite parking spaces will decrease parked vehicles on Waiheʻe Road which presents a nuisance to residents.

Phase I, Lower Parcel

In addition to the facilities, it will be important to identify opportunities for the development of educational programs, interpretive resources, and additional research, analysis, and studies to support the long-term health of the Waiheʻe watershed. Programming for the WLRRLC will include scheduling service-learning workdays with groups and schools. These workdays will begin with reopening fallow loʻi and helping to maintain the ʻauwai system, as well as removing invasive plants and replanting with native species from the area. Students and volunteers will learn about invasive species (terrestrial and aquatic), watersheds, and regenerative agriculture.

Regenerative agriculture refers to a system of farming principles and practices that increases biodiversity, enriches soils, improves watersheds, and enhances ecosystem services. This type of farming aims to capture carbon in soil and aboveground biomass, reversing current global trends of atmospheric accumulation. It offers increased yields, resilience to climate instability, and higher health and vitality for farming communities, drawing from decades of scientific and applied research by the global communities of organic farming, agroecology, holistic management, and agroforestry.

Phase II A, Middle Parcel

Phase II A of the project for the remaining 14 acres of Parcel 10 extends from the mānowai mauka to the “ginger patch” bordering BWS lands *(Figure 2.1).* Phase II A will facilitate the future expansion of other traditional agricultural dryland crops, such as ʻuala (sweet potato), ʻulu (breadfruit), maiʻa (banana), olonā (shrub used for rope), māmaki (tree used for tapa), wauke (paper mulberry, used for tapa), ʻawa, hala (pandanus tree), ʻuhaloa (shrub that relieves sore throat), and kōkoʻolau (shrub used for medicinal tea). The cultivation and maintenance of loʻi kalo and dryland crops will aid in the perpetuation of Native Hawaiian agricultural systems and traditional knowledge while making efficient use of water, a treasured resource in this area.

Figure 2.2 **Example of a Traditional Thatched Pavilion/Hale**
(Source: Hale at Kamehameha Iki Park, http://mauiguidebook.com/beaches/kamehameha-iki-park-aka-armory-park)

Figure 2.3 **Example of a Modern Open-air Pavilion**
(Source: https://www.ahl.design/updates/hawai-i-nature-center-expands-facilities-with-new-rani-pavilion*)*

Figure 2.4 **Example of a Double Stall Composting Toilet**
(Source: https://clivusmultrum.com/newsletter/clivus_v11-01.html)

This aspect of the Project will entail the same attention to forest conservation and agriculture restoration practices as Phase I. Invasive plants will continue to be removed under the supervision of a qualified archaeologist. Another 1,200 square foot pavilion and double stall composting toilet will be constructed, and a second gate will be installed at the BWS property line.

Phase II B, Mauka Waiheʻe Valley

Phase II B is the remainder of the project that does not fall within the original project area of the DPR property TMK 4-7-006:010 and extends into BWS-owned lands (4-7-006:023 and 4-7-008:002). This area will need to be further evaluated with technical studies should the non-profit decide to pursue this phase of the project in the future. The BWS parcels are zoned conservation and any future uses may require a Conservation District Use Permit through the State Department of Land and Natural Resources. The Upper Field can be used to host educational programs. Phase II B will continue with conversion of the "ginger patch" into loʻi kalo. Considerations for the expansion of loʻi restoration efforts (including a new diversion and ʻauwai) in this area will need to be evaluated for stream water availability considering riparian rights and instream flow standards. It is important to note that the proposed stream diversion is located above the USGS Waiheʻe Stream gage where the Hawaiʻi Supreme Court in their ruling on the case of Reppun v. BWS in 1982, set a minimum instream flow of 2.71 million gallons per day (mgd). The ruling predated the Interim Instream Flow Standards established by the State Commission on Water Resource Management (CWRM) in 1992 after the Water Code was enacted in 1987.

The WLRRLC may present opportunities for additional projects such as Vegetative Cover Mapping. To better understand the resources of the ahupuaʻa, maps that illustrate the vegetative cover of the ahupuaʻa should be developed, especially in the riparian zone along Waiheʻe Stream. Vegetative cover mapping along with stream data could be used to better understand the relationship between stream flow/water temperature and vegetative cover. Other potential projects include a Watershed Conditions Assessment, Waiheʻe Ahupuaʻa Strategic Plan, testing and reporting of stream diversions, and future ʻauwai studies in the area through BWS funding and WAI management.

2.2 History of the Area

It is estimated that Hawaiians first settled on the windward coast of Oʻahu as early as 1,500 to 2,000 years ago. The favorable climate, rich soils, and the marine environment of Kāneʻohe Bay, along with the plentiful sources of fresh water that naturally existed in the many streams and springs of Koʻolau Poko lent naturally to its development into a major food production area. Loʻi dominated the landscape of the region while loko iʻa (fishponds) were common features along the district's coastlines. During pre-contact times Koʻolau Poko supported the largest concentration of Oʻahu's population, estimated between 20,000 to 25,000 people. As one of eleven ahupuaʻa in Koʻolau Poko, the Waiheʻe ahupuaʻa was part of this primary population center (Koʻolau Poko Watershed Management Plan, 2012).

The ahupuaʻa *(Figure 2.5)* takes its name from the largest loʻi terrace in Koʻolau Poko, presumed to have belonged to the aliʻi living at the back of Waiheʻe valley during the reign of Mailekukaki in the 15th or 16th century. The name Waiheʻe means "squid fluid" and originates from a moʻolelo about a young man named Keakaoku who was unable to talk. He was sent to Tahiti to seek his wife who would restore his speech upon their marriage. While on his journey, he was attacked by a large octopus, which he killed and threw toward Kahaluʻu, Oʻahu. The slime from its body flowed over the land. Another moʻolelo holds that the kūpua Pīkoiakaʻalalā speared a huge octopus while at sea and flung it ashore here, thus bestowing the name on the area.

The loʻi terraces that dominated the region during this time were described by Handy as being "continuous with those of Kaʻalaea to the north and Kahaluʻu to the south", forming the largest contiguous area of wetland taro cultivation on the coast. Most of the loʻi were restricted to coastal lowlands and flat areas adjacent to streams. In Waiheʻe, this claim is supported by the lack of archaeological evidence of irrigation ditches on elevated terraces, suggesting that they were not used for intensive farming, although dryland crops were likely grown there (Chun 1954). Handy & Handy (1972) speculate that, apart from the flatlands suitable for taro, "great quantities of sweet potato, yam, banana, upland taro, wauke, olona, and awa" were probably produced (Botanical Inventory of Board of Water Supply Lands, Waiheʻe and Kahaluʻu Valleys, Windward Oʻahu, 2007). However, a recently recovered Land Court map dated 1938 *(Figure 2.6)* delineates loʻi terraces, ditches and ʻauwai in the project area. Weavers and stoneworkers lived in the uplands where lauhala groves and hardened blue dike stone used to make tools and weapons could be found. These elements remain in the mauka areas and can still be found today.

During the mid-1800s the region's population plummeted by over 90 percent as native Hawaiians succumbed to foreign diseases contracted from western settlers. The Great Māhele of 1848 followed by the Kuleana Act of 1850 effectively dispossessed many Hawaiian commoners of their farmland (Botanical Inventory of Board of Water Supply Lands, Waiheʻe and Kahaluʻu Valleys, Windward Oʻahu, 2007). Western settlers capitalized on the land, transforming the traditional subsistence loʻi into successive commercial plantation operations for sugar cane, rice, pineapple and livestock grazing (Kahaluʻu Community Master Plan, 2007).

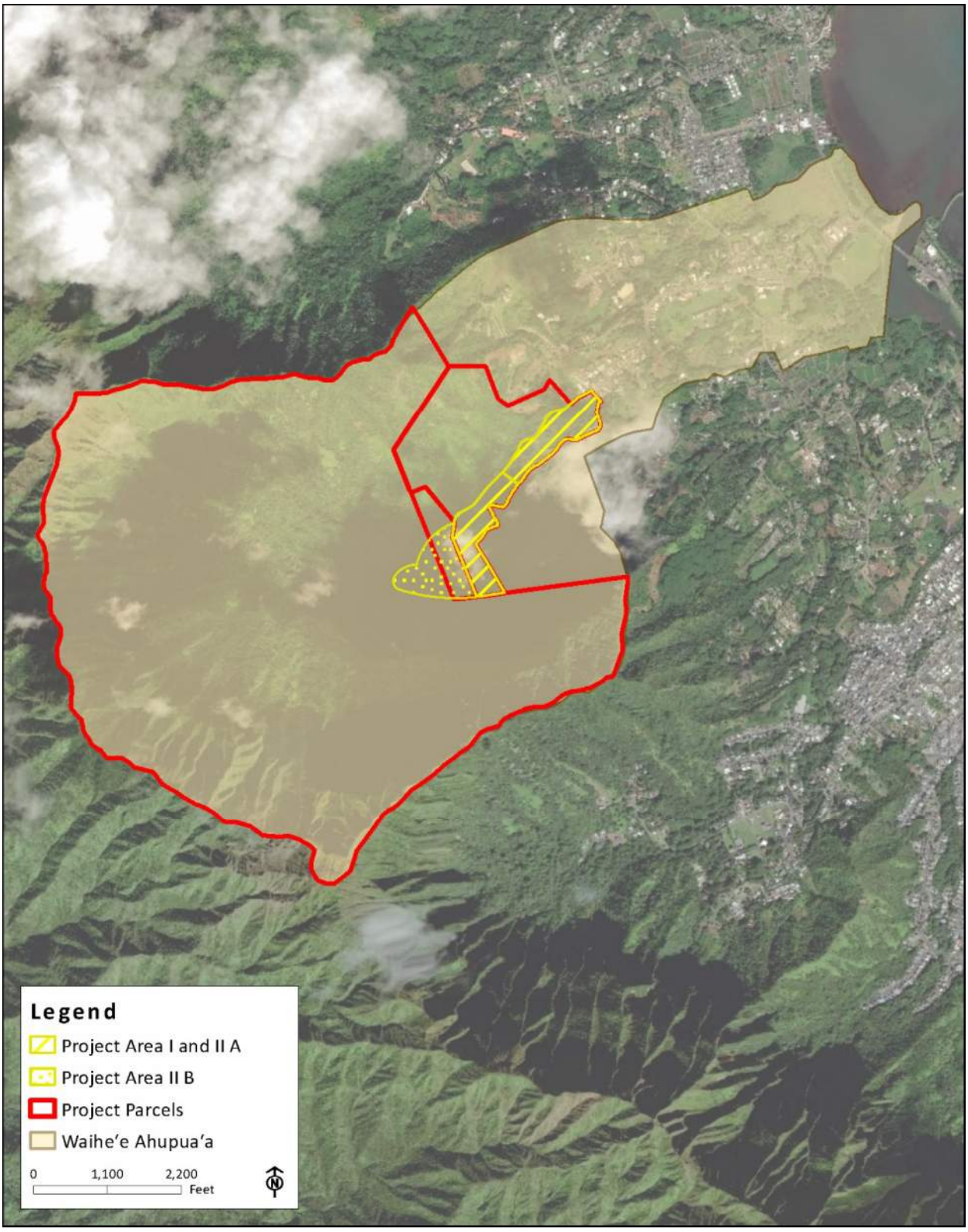

Figure 2.5 **Waiheʻe Ahupuaʻa**

The landscape continued to change with the onset of World War II, after Pearl Harbor was bombed in 1941. With World War II underway, an encampment supporting as many as 4,500 enlisted personnel and officers comprising up to four infantry battalions with attached units of the 98th Regimental Combat Team was constructed in October 1943 at Heʻeia Kea. The Heʻeia Combat Training Area consisted of approximately 200 acres in Heʻeia Kea and 2,254 acres in Waiheʻe and Kaʻalaea Valleys in Kahaluʻu *(Figure 2.7).* This area was utilized by the U.S. Army until 1945, as an encampment for troops, an ammunition storage facility, a firing range, and as a maneuver and artillery impact area for jungle and assault training. The Kahaluʻu training area was reportedly used for maneuver training and included impact areas for jungle and assault training. The Kaʻalaea Valley to the north of Waiheʻe Valley was the location of Mortar Fuze and Target location, which extended into the northern portion of Waiheʻe Valley.

Koʻolau Poko experienced another dramatic shift post-World War II as the decline of the agriculture industry prompted several of the region's large landowners to subdivide their landholdings in order to lease or sell the parcels for residential or commercial development. The construction of the Pali and Wilson Tunnels beginning in the 1950s improved access to the windward side from Honolulu, speeding the transformation from small rural community to suburban population center. A growing population created a demand for homes in the Kāneʻohe area and a majority of the existing subsistence fishponds were filled in to accommodate residential development. Today, a total of fourteen fishponds remain.

The completion of several municipal water supply projects also contributed to development and growth in the district during the same time period. The first public water works system in Koʻolau Poko began servicing Kāneʻohe in 1927. During the 1940s and 1950s three water tunnel systems were developed to service the windward municipal water system and future development, including the Waiheʻe Tunnel in 1955 (Koʻolau Poko Watershed Management Plan, 2012). BWS assumed ownership of the tunnel in 1959. In 1976, BWS installed the Waiheʻe inclined wells below Hāmama Falls above Waiheʻe Tunnel to further develop the water resources for public consumption. The Waiheʻe Wells constructed in 1974 were too close to Waiheʻe Stream and detrimentally impacted stream flows, and therefore were never operated. Under a court order Reppun vs BWS (which established riparian rights in Hawaiʻi), minimum instream flows in Waiheʻe Stream were required at 2.71 mgd at the USGS stream gage to ensure that riparian rights of makai loʻi kalo farms were not impacted.

The economic growth Oʻahu experienced during this time period led to the targeting of agricultural areas in ʻĀhuimanu and Kahaluʻu for urban expansion. The first Master Plan for the Kahaluʻu area in 1957 proposed the development of an industrial and manufacturing district supported by a deep draft harbor. The plan also proposed the development of a golf course and resort in Waiheʻe Valley. In 1965 Waiheʻe Road was subsequently widened to 60 feet, and sidewalks and curbs were added to accommodate this development.

These plans never came to fruition as the proposed oil refinery was relocated to Barber's Point, economic and environmental concerns prevented the pursuit of a deep draft harbor in the Kahaluʻu region, and a booming market for residential housing was underway due to the completion of the Pali and Wilson tunnels. Oʻahu's General Plan, adopted in 1964, included a Detailed Land Use Map (DLUM) setting the stage for urbanization and residential development in the region. Several subsequent development projects proposed for the greater Kahaluʻu region, including one for the construction of 1,067 apartment and townhome units at the end of Waiheʻe Road, were struck down by the community which opposed further urbanization, preferring to remain rural. The DLUM was replaced with a new Development Plan Land Use Map (DPLUM) in 1983 to better represent the community's wishes. The DPLUM favored the preservation of open spaces and agriculture, and the replacement of resort, industrial and commercial designations with residential.

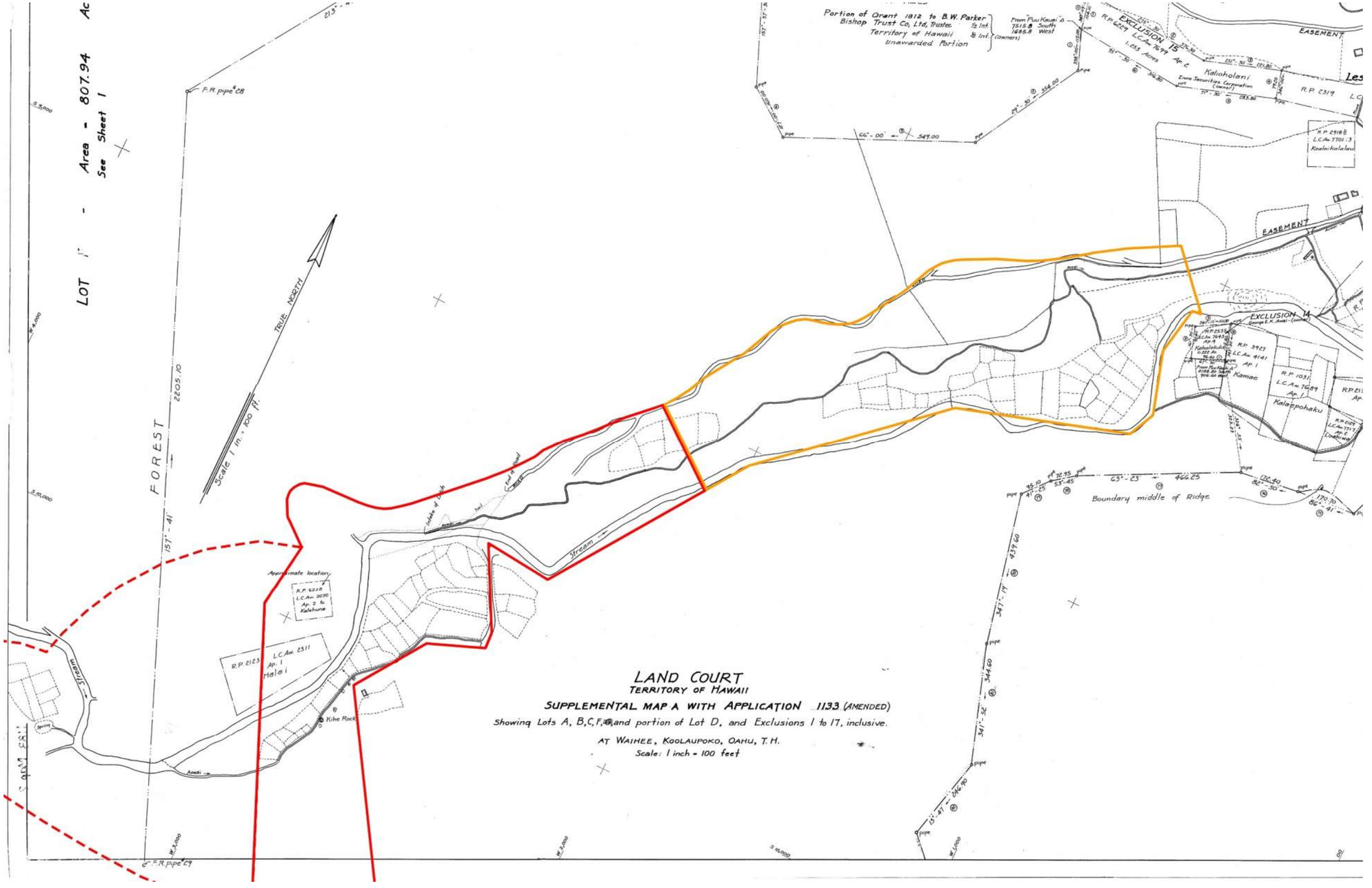

Figure 2.6 **1938 Land Court Map of Project Area**

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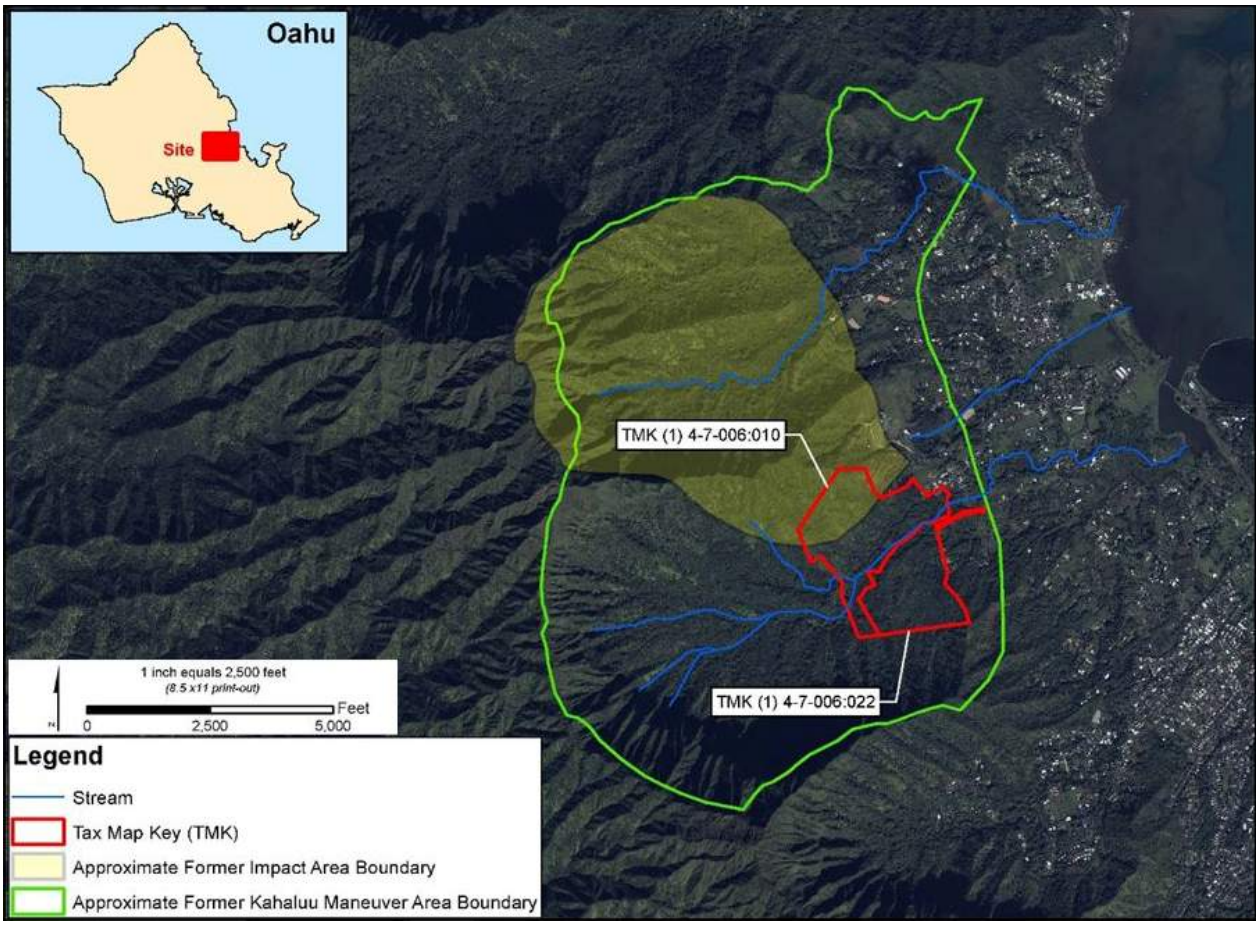

Figure 2.7 **Former Kahaluʻu Maneuver Area and Former Impact Area Boundaries**

During this time, Lewers & Cooke, Ltd. (who later merged with U.S. Plywood and then Champion Paper Co.) owned the property at the end of Waiheʻe Road. Prior to the DLUM rezoning, their property was zoned as resort. The property owners sued the City for the down designation of the land, which was settled out of court (J. Reppun, pers. comm. July 2019). DPR then acquired the property from Champion Property Corporation by way of deed, and BWS acquired control of the mauka lands surrounding the Waiheʻe Tunnel. When Frank Fasi became Mayor, he proposed a plan to create a golf course in the back of Waiheʻe Valley. The community and BWS banded together to stop this plan, and the land was ultimately designated as a nature park to prevent development of the golf course (J. Reppun, pers. comm. July 2019). DPR maintenance of the property is limited and no improvements to the property have been made since that time.

2.3 Primary Project Considerations

The community in Waiheʻe Valley is of rural-residential character with a mixture of private residences and farmland. Waiheʻe Road, a paved residential street, terminates in a cul-de-sac where the BWS access road into the valley begins. There are two predominant issues associated with this project: surface water availability for the loʻi restoration, and access into mauka Waiheʻe Valley.

2.3.1 The ʻAuwai System and Riparian Water Rights

Waiheʻe is a well-watered area that supported large fields of taro in the pre-contact era, with both wetland and dryland taro cultivated. At least two fishponds were maintained along the coast in nearby Kahaluʻu, adding to the abundant ocean resources of the region. An irrigation ditch more than one mile in length extended through the valley. Approximately 100 acres of Waiheʻe land were under cultivation of kalo in the pre-contact era. According to the Keala Pono Archaeological Inventory Survey (2019), the project site has two major loʻi terrace complexes, mānowai, ʻauwai, rock walls, berms, subsurface pondfield deposits and other historic features.

Phase I of the project will focus on the first 13 acres of the project area that spans from the end of Waiheʻe Road mauka to the mānowai (dam) which diverts approximately 0.2 mgd of water from Waiheʻe Stream to the Waiheʻe ʻAuwai #1 *(Figure 2.8).* The ʻauwai splits into two branches within the parcel. The main ʻauwai is approximately 0.5 miles long from the mānowai extending makai of the parcel to 5 acres of existing loʻi kalo.

The stream diversions and portions of the unlined ʻauwai system was surveyed by the BWS Hydrology-Geology Branch in 2009 *(Appendix C)* in consultation with Mr. Kaipo Faris and others. The USGS Waiheʻe Stream gage 16284200 located above the diversions had a discharge of 3.29 mgd and Waiheʻe ʻAuwai #1 was measured at 0.21 mgd, leaving 3.08 mgd of Waiheʻe Stream flow to supply the other three makai diversions further downstream. On the date of field survey, 6.4% of the Waiheʻe Stream or 0.2 mgd was diverted into ʻAuwai #1. ʻAuwai #1 currently provides irrigation water to two makai parcels, TMK: 4-7-006:004 & 13, about four to five acres owned by Marcus Rosehill and Clarence Young, respectively *(Figure 2.9).* See *Appendix D* for additional photos. The water flow rates at the point of entry into the two farms was not measured nor were the water losses in the ʻauwai system, which is approximately 0.5 miles long. The per-acre water demand is calculated at approximately 40,000 gallons per acre day (gpad) or 200,000 gpd/5 acres, not accounting for water loss.

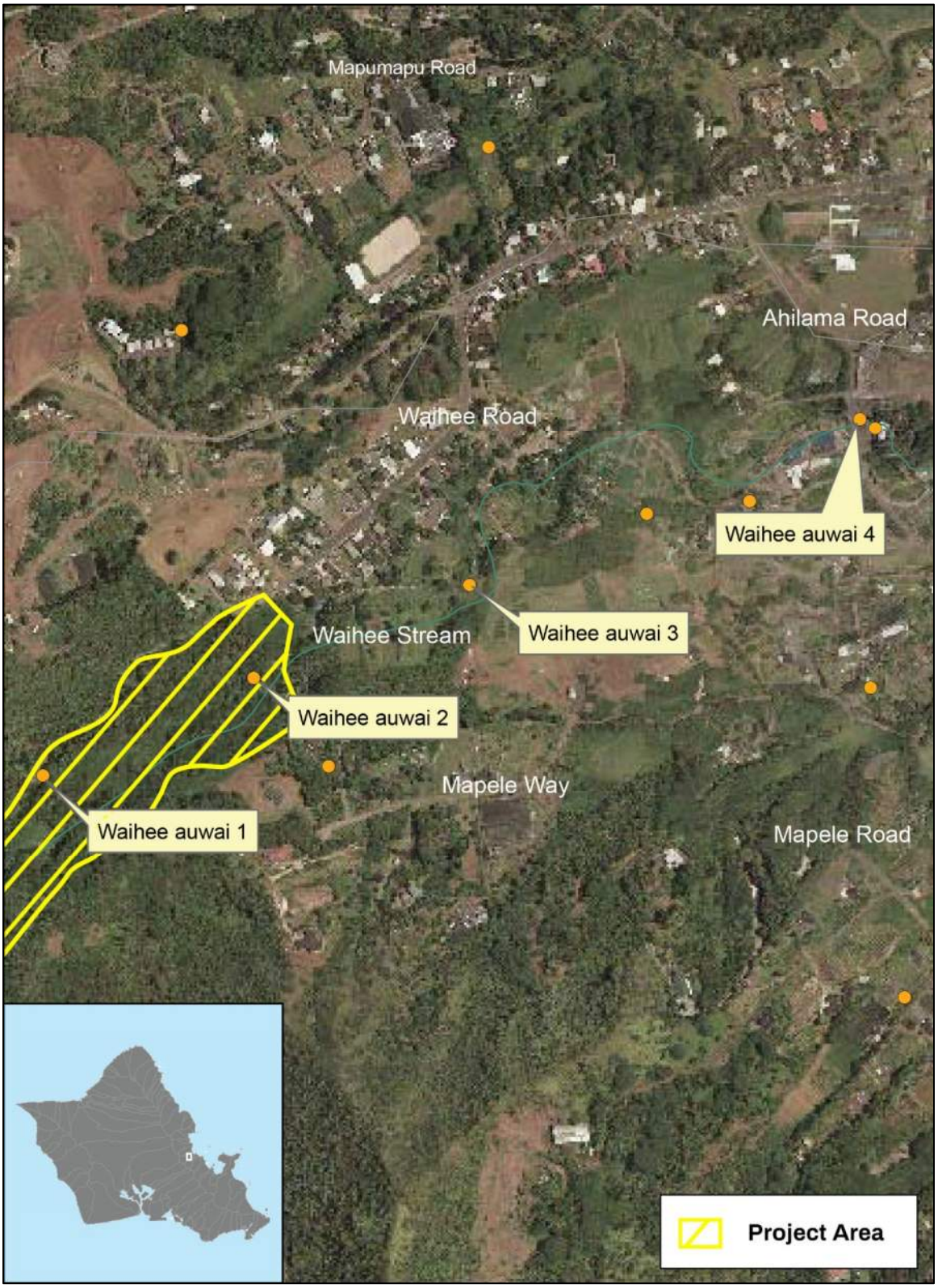

Figure 2.8 **Waiheʻe ʻAuwai**

(Source: Koʻolaupoko Stream Diversion Survey (2011) Board of Water Supply)

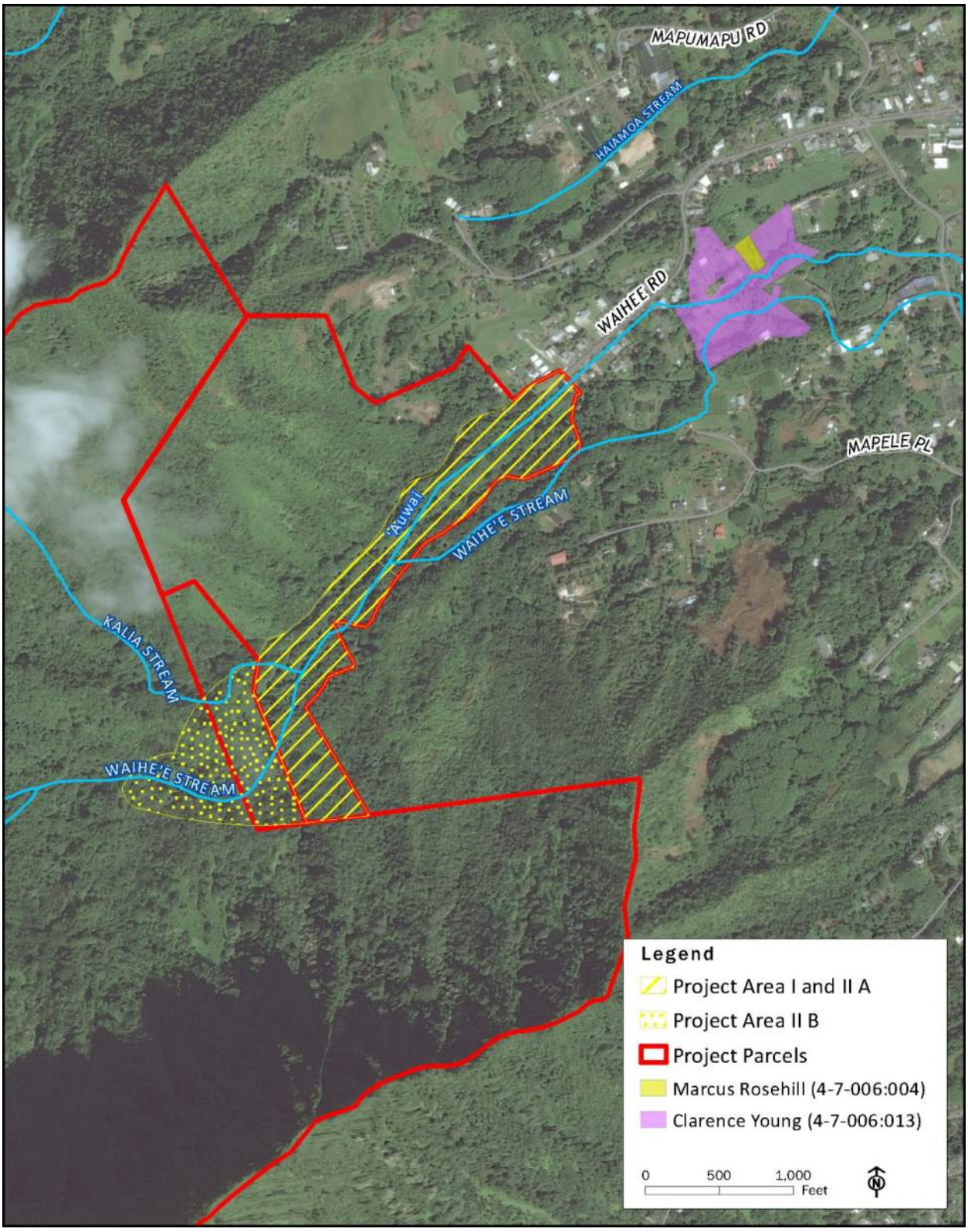

Figure 2.9 **Parcels Served by 'Auwai #1**

Figure 2.10 **Example Stream Diversion and Plastic Pipe in Ditch**
Note: This is a Punaluʻu stream diversion with a 7 mgd screen intake, fish ladders and HDPE plastic pipe in the ditch.

The proposed loʻi restoration area within Phase I is two acres, and if the same water demand per acre were applied, approximately 80,000 gpad would be required from Waiheʻe ʻAuwai #1. It is essential that water supply not be reduced to the existing farms. This can be accomplished by first installing approximately 2,000 feet of plastic distribution pipe within the two branches of ʻauwai in Parcel 10 to eliminate a portion of the water loss *(Figure 2.10).* The water saved can then be utilized in the project area. An ʻauwai seepage survey will need to be conducted to determine the water loss between the mānowai diversion to the makai property line by the entrance gate. If additional water is required for the loʻi restoration, strategies on increasing the diverted amount at the mānowai diversion will need to be investigated, designed and permitted through CWRM. It is important to note that loʻi kalo is a pass-through irrigation system where diverted water is then returned to Waiheʻe Stream from the terraces. The consumptive use of water for the kalo is relatively small but the water must remain relatively cold to prevent korm rot.

Waiheʻe Stream and ʻAuwai #1 courses through the project area of historic terrace complexes and therefore the parcel should have riparian water rights to Waiheʻe Stream. Riparian water rights are rights of land adjoining natural watercourses and are the surface water equivalent of correlative rights to groundwaters; i.e., owners of land adjoining the stream have the right to use stream water as long as the use is reasonable and the exercise of those rights cannot actually harm the reasonable use of those waters by other riparian landowners. A comprehensive summary of water rights in Hawaiʻi is included in *Appendix E.* Loʻi kalo is a traditional and customary use of water and is a Public Trust use having the highest protection under the State Water Code. If additional stream water is required for the restoration of the loʻi kalo for the project, CWRM is the governing authority to review and approve the exercise of additional riparian water rights for this public trust use. If additional stream water is diverted, a petition for an amendment to the interim instream flow standards may be required by CWRM if the amount of stream water requested is significant.

2.3.2 Access to Mauka Waiheʻe

The gated gravel access road at the end of Waiheʻe Road extends through the project property and provides BWS access to the Waiheʻe Tunnel and Inclined Wells. Access to Waiheʻe Valley is currently restricted to BWS staff and those who have obtained a BWS consent of entry permit to enter the area, such as Hawaiian Electric Company to maintain power lines and the United States Geological Survey to measure and maintain their Waiheʻe Stream gage. BWS regularly visits the area to maintain the chlorinator system, monitor the Waiheʻe Tunnel resources and give educational tours. They also have a current agreement with the Koʻolau Mountains Watershed Partnership to allow periodic access for the purpose of conducting forest conservation, fencing and restoration activities, including volunteer workdays, on a hillside near the entrance to the Waiheʻe tunnel. KEY Project, through the WAI watershed partnership agreement, coordinates community work groups that range from 50 to 70 people on a regular basis.

Despite the gate and "No Trespassing" signs, Waiheʻe Valley has become an increasingly popular recreational destination. It is frequently recommended to visitors on popular hiking and travel websites as a relatively easy hike with natural forested landscape, ice ponds, and Hāmama Falls. Trespassing issues on these websites are frequently downplayed and/or disclaimed, if they are mentioned at all. In June and July of 2015, an informal survey was administered over four days for three hours each day to approximately 475 visitors who had breached the fence to hike the trail. Survey results indicated that the trail is frequented by Oʻahu residents (87%) who learned of the area through friends and/or family (58%), or who had an existing connection to the Waiheʻe community (24%). A small portion of those surveyed had learned of the area via social media channels (13%), tour companies (2%), or BWS-led tours (1%). Other visitors included those from outer islands (0.4%), the continental U.S. (11%), and foreign countries (1%). Majority of those surveyed indicated that they were visiting the area to swim (25%), hike or exercise (44%), or see the waterfall (24%). At times there were groups of 30 to 40 people. The least number of visitors counted was 112 during a three-hour period, with a high count of 294 during another three-hour period. An approximation that can be derived from these survey counts is that there can be anywhere from approximately 300 to 1,000 hikers per day. These hikers have become a nuisance to the neighbors that live along Waiheʻe Road.

In 2018, BWS discovered *Escherichia coli (E. coli)* bacteria counts in water quality testing of Waiheʻe Tunnel and has since increased chlorine disinfection to address potential contamination in coordination with the State Department of Health (DOH), Safe Drinking Water Branch. The *E. coli* bacteria, which is typical in warm blooded animals, was not characterized and therefore it is unknown if the source was from feral animals or from human influences. Hikers trespassing in the area can cause environmental damage by trampling native plants, causing erosion leading to misdirected runoff, bringing in seeds and other foreign matter on their shoes, and leaving trash. The Waiheʻe sources are an essential water supply to the Windward communities and need to be protected from intermittent contamination. Ungulate control and managing access with education are viable mitigative measures.

Neighborhood frustration was vented at several Kahaluʻu Neighborhood Board meetings. In June 2019, issues discussed included hiker parking along Waiheʻe Road impacting residents, disrespectful behavior of trespassing hikers, blocking driveways, verbal altercations and other traffic concerns, trash and pet feces left on the trail and along Waiheʻe Road, and inconvenience and overall reduction in residents' quality of life. The neighborhood board approved a motion to call upon the relevant City and County of Honolulu entities to convene in a group and to enact immediate enforcement of No Trespassing signage at Waiheʻe Valley Nature Park to break the trespassing cycle, with proposals being returned to the Kahaluʻu Neighborhood Board by the next meeting in July, 2019. The group consisted of Councilmember

Heidi Tsuneyoshi, BWS, DPR, Honolulu Police Department (HPD) and the Department of Transportation Services (DTS). On June 19, 2019 HPD posted a vehicle and flashing road sign near the gate. The flashing illuminated messages read "NO TRESSPASSING" and "THIS IS NOT A PUBLIC TRAIL". At least a couple dozen hikers still trespassed within the few hours observed, however the number of cars parked on Waiheʻe Road and overall number of hikers on the trail were well below average. Police were present on other occasions to warn hikers about trespassing and issued citations.

In July 2019 DPR and BWS installed over 20 new No Trespassing signs at the gate and along the road, repaired the second cattle gate and locked it *(Appendix F).* The combination locks of both gates will be changed more often to prevent unauthorized vehicle entry. In addition, BWS has conducted outreach to the public through social media outlets stating that trespassing is not allowed on the trail. Initial internet searches show that the outreach has been successful, with public discussions noting police presence and discouragement from hiking this trail.

BWS has since agreed to use water rate funding to pay for special duty police officers to enforce the no trespassing ordinance, issuing warnings and citations. Hiker access has since been reduced as well as the associated parking issues along Waiheʻe Road. The redirection of HPD to enforce trespassing into Waiheʻe Valley unfortunately reduces the resources that HPD needs to enforce laws and fight crime in other areas to keep our community safe. BWS should not solely bear the cost of HPD security as it is not the only landowner. DPR should request funding from the City Council to contribute to HPD enforcement in future budget requests.

The below table lists the number of HPD warnings and citations issued since September 2019. Visitor counts may have increased in March 2020 due to the Coronavirus pandemic stay-at-home orders, with residents looking for an exercise alternative *(Figure 2.11).*

Table 2.1 Hiker Trespassing Counts for Hāmama Falls Trail in Waiheʻe

Month	Vehicles	Ride Share	Visitors	Warnings	Citations	Arrests
Sept 2019	64		811	811	3	
Oct 2019	164		894	896		
Nov 2019	206		797	788		
Dec 2019	134		586	576		
Jan 2020	125		579	575	5	
Feb 2020	44		192	201		
Mar 2020	156		704	684		
TOTAL	**893**	**0**	**4,563**	**4,531**	**8**	**0**

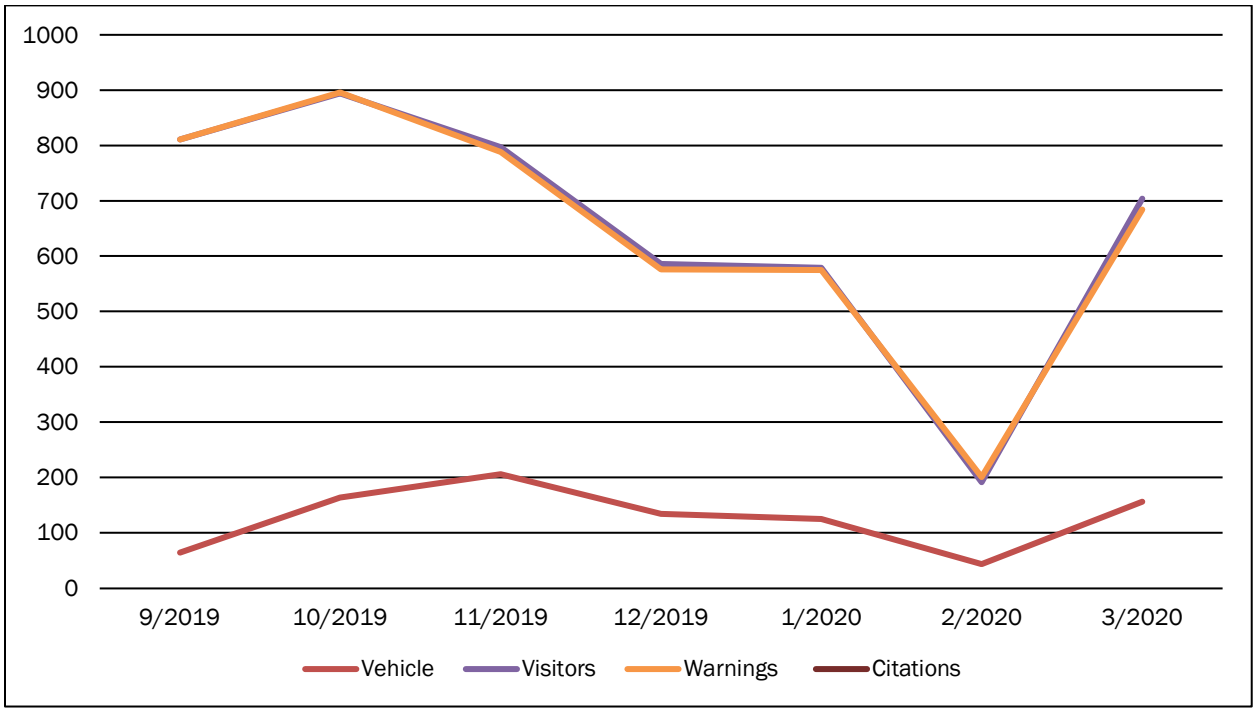

Figure 2.11 **Hiker Trespassing Counts for Hāmama Falls Trail in Waiheʻe**

2.3.2.1 Principles for Managing Access into Mauka Waiheʻe

In the long term, hiker impacts need to be reduced. The WLRRLC can be the vehicle to address both management of the natural resource as well as human impact. It is likely that the RFP will establish responsibilities for implementing aspects of managing public access to Waiheʻe Valley. As part of the WLRRLC project, managing public access will need to consider transportation, parking, carrying capacity, comfort facilities, trash management, environmental mitigation, cultural education, safety, liability, maintenance, and security features such as gates and fencing, to prevent chronic trespassing. The following principles and proposals for managing access into mauka Waiheʻe are offered to frame the situation and offer thoughts on possible solutions.

- Legal research is needed on public access to mountain watersheds. The Hawaiʻi Supreme Court ruling on Public Access to Shorelines in Hawaiʻi (PASH) may be applicable to mauka areas. Does the public have a right to access mauka public lands for cultural gathering, hunting and recreation? Do landowners have the right to restrict public access to mauka watershed lands?

- Mauka Waiheʻe has a rich cultural history and important natural resources and should be treated with the same respect and reverence as those that came before us.

- Mauka Waiheʻe is a major drinking water source for Windward communities. The DOH Source Water Protection Program guidelines recommend potential contaminating activities be mitigated or eliminated. The area mauka of Waiheʻe Tunnel and trail to Waiheʻe Inclined Wells and Hāmama Falls is within the recharge capture zone of the tunnel. Preventing source water contamination in this area is critical for protecting water supply quality. This area should be

designated as KAPU, Restricted Watershed and Forest Reserve with fencing and signage. Only those with a specific purpose such as water quality testing, research, work days, education, etc. should be allowed.

- Pig wallows and scat in the area could be a source of *Escherichia coli (E. coli)* bacteria, causing elevated bacteria counts in water quality tests. Pigs have also been known to cause damage to taro and eat the bark off ʻulu trees in the farms, killing them. Discussions with Department of Land and Natural Resources may be worth pursuing to designate the mauka area for pig hunting. Done safely, this would help to control the feral pig population.

- The ice pond is below the Waiheʻe Tunnel portal and since water flows downstream, swimming in ice pond will not detrimentally impact BWS drinking water sources. The public should realize that mitigating impacts to Waiheʻe Stream habitat is important and act accordingly.

- Those who enter mauka Waiheʻe should be knowledgeable about their KULEANA and what is KAPU. Education programs should be a prerequisite. Interpretive signage is required and would include information about the importance of the Waiheʻe ahupuaʻa and how users should interact with those resources in a non-detrimental way. The signage should explicitly state the activities that would be harmful to the watershed.

- Community presence at the WLRRLC near the gate should provide a deterrent to rampant trespassing. Here is a suggested metaphor: The entrance gate by the proposed loʻi restoration is like the front door to your home. It is a place where visitors put their slippers before entering and those who enter should act like they would want visitors to act in their own home. Visitors to mauka Waiheʻe should take off their slippers and tread lightly, with KULENA and know what is KAPU. Interpretive signage and proactive education programs at the WLRRLC are an important component for managing access.

- Should the proposed parking lots be larger to accommodate hikers to reduce parking pressures along Waiheʻe Road to avoid inconvenience to residents?

- Should comfort facilities be provided for hiker/volunteer use because no restrooms are currently available?

- Should access to mauka Waiheʻe be limited to educational and environmental work days for clean-ups, restoration and resource management? This concept is about access for environmental volunteers rather than recreational visitors/hikers. Or should access to mauka Waiheʻe be restricted to hikers who volunteer for clean-up days and work days for the removal of invasive species and scientific and climate change research?

- Periodic vegetation maintenance should be conducted to manage overgrowth along the access road. Removal of invasive species and restoration of native species could also be included in plans for vegetation management.

- The WLRRLC awardee should provide trash bins and maintain waste removal. Most people who litter do so because there are no convenient trash cans. It is a fallacy to assume that the presence of trash cans is encouraging hiking. Hiking will occur, even with intermittent HPD presence.

- The WLRRLC awardee will be required to assist agencies in managing hiker/volunteer access into the mauka valley. Managing access will include educating volunteers through activities and interpretive signage with focus areas including watershed management, Hawaiian culture, lo'i restoration, invasive species, defining KULEANA and KAPU in a forest reserve and source water protection area, and conducting environmental and climate change research to improve understanding and management of the Waihe'e watershed.
- The WLRRLC awardee will assist BWS in establishing and managing the carrying capacity of the WLRRLC including, for example, maximum visitors per day, perhaps by activity (hiking, education, school project, etc.); potential use of a reservation system for individuals and groups; and use of informational signage on Kamehameha Highway and lower Waihe'e Road to advise visitors when the WLRRLC is full.

Comments on the Draft EA will inform the conditions of the RFP.

2.4 Required Permits and Approvals

Permits and approvals required for this project will include:

- Final Environmental Assessment/Finding of No Significant Impact (FONSI), Chapter 343, Hawai'i Revised Statutes
- Conservation District Use Approval (for Phase II B, future)
- Request for Proposals for a land lease or service agreement to an appropriate community group
- Grading, Grubbing, Trenching and Stockpiling Permits
- Building Permits for a meeting hale/pavilion
- Approval of composting toilets
- Approval of a potable water meter
- National Pollutant Discharge Elimination System (NPDES) Permit, as necessary

Chapter 3

Environmental Setting, Potential Impacts, and Mitigation Measures

Chapter 3

Environmental Setting, Potential Impacts, and Mitigation Measures

The environmental setting, potential impacts, and mitigation measures for the proposed Waiheʻe Loʻi Restoration and Riparian Learning Center (WLRRLC) Project are addressed in the sections below.

3.1 Climate

Existing Conditions

Waiheʻe Valley, located in the central Kāneʻohe Bay area on the Windward Coast of Oʻahu, features a mild and semi-tropical climate with slight seasonal variations. Average annual temperatures in the region generally range from the low 70s to mid-80s (degrees Fahrenheit), depending upon the time of day and the season.

Annual rainfall for the larger Kāneʻohe region averages 76 inches, with monthly averages ranging from 3.65 inches in June to 9.45 inches in November. In the Project area, a mean annual rainfall ranging between 65 and 80 inches has been recorded by the United States Geological Society (USGS). Slightly more than 60% of the annual rainfall occurs during the wet season from November to April. One of the most common rains described from the entire moku of Koʻolau Poko and specifically known from Waiheʻe is ʻĀpuakea, a mist-like rain that resembles frost when it falls on leaves. Another is known as Ka Ua Poʻai Hale or Poʻai Hala, a rain that swirls around the hale or hala groves.

Winds from the northeast, known as trade winds, are the most predominant over the Hawaiian Islands. During the winter months the wind patterns shift with the arrival of the westerly and southerly winds. Westerly winds are typically characterized by strong gusts and high wave activity. The Waiheʻe area is known for the unusual winds and rain that blow in a swirling motion against the surrounding mountains. Annual wind speeds in the Project area typically range from 4.83 mph to 5.06 mph.

Anticipated Impacts and Proposed Mitigation

The proposed WLRRLC Project is not anticipated to have any negative effects on the local climate. The anticipated effects of climate change, such as decreased rainfall and increased storm intensity, may be mitigated by the efforts to restore the surrounding forest area with native species.

3.2 Topography and Soils

Existing Conditions

The topography of Waiheʻe Valley is defined by a gently sloping valley floor and steep upland mountains. The inland flats of Waiheʻe are contiguous with the flats of the adjacent areas. The flats of

Kahaluʻu, Waiheʻe, and Kaʻalaea created one of the largest landscapes of wetland kalo cultivation in Koʻolau Poko, prior to western contact. Although reduced in area, wetland kalo cultivation remains an important feature of the Waiheʻe watershed. The Project area itself ranges in elevation from approximately 80 feet to 350 feet *(Figure 3.1).* Adjacent to the loʻi planned for restoration in Phase I is a fairly level promontory that looks out over the loʻi. Both sites planned for pavilion construction are adjacent to the access road. Detailed boundary and topographic survey maps are located in *Appendix G,* which was surveyed by Control Point Surveying, Inc. in March and June, 2019.

Waiheʻe Valley contains the following soils classified by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS): Hanalei silty clays (HnB), Waikane silty clays (WpF, and WpE), Typic Endoquets (TR), and Lolekaa silty clays (LoB and LoE) (*Figure 3.1*). Soil types and characteristics identified from the Project area are described below:

- HnB (Hanalei silty clay, 2 to 6 percent slopes) – This soil type is somewhat poorly to poorly drained with gentle slopes of 2-6%. Due to the gentle slopes, land comprised of this soil type exhibit slow runoff rates and low erosion hazards. These soils are derived from alluvial deposits and are generally more than 60 inches deep. This type of land is suitable for taro, sugarcane, and pastureland.

- LoB (Lolekaa silty clay, 3 to 8 percent slopes) – This soil type is well-drained with gentle slopes of 3-8%. Lands that consist of this soil type exhibit low runoff due to the gentle slopes. These soils are derived from the alluvial deposits of igneous rock and are more than 80 inches deep. They are considered prime farmland.

- TR (Typic Endoquets mucky silt loam, 0 to 1 percent slopes) – This soil type is poorly drained, and lands comprised of this soil type are not prone to runoff due to the negligible slope. These soils originate from the alluvial deposits derived from basalt.

- WpF (Waikane silty clay, 40 to 70 percent slopes) – This soil type occurs on steep slopes of 40-70% and are not considered prime farmland. These soils are recommended for rangeland, woodland, or wildlife habitat.

- WpE (Waikane silty clay, 25 to 40 percent slopes) – The properties of this soil type are similar to the WpF soils with the notable difference that they occur on moderate slopes of 25-40% instead of steep slopes of 40-70%. The recommended use for this type of land is pastureland, rangeland, woodland, or wildlife habitat.

Anticipated Impacts and Proposed Mitigation

The construction of the proposed structures and restoration work is not anticipated to have extensive or significant impacts to the soils or overall topography of the Project area. Depending on the location, the construction of the proposed pavilions and parking areas will require grading to create a level foundation and allow for proper drainage. This will result in the disruption of the soil and slight alteration of the topography, particularly at the north end of the property where the BWS gravel access road is narrow and bordered by slopes and trenched areas to the east. Construction in this section of the Project area may require the enlargement of the road and grading or leveling of the area to accommodate the planned structures. Grading operations will be conducted in compliance with dust and erosion control requirements of the City Grading Ordinance. A grading permit will be obtained from the City in order to begin construction. No building will occur on steep slopes where WpF soils are located due to their rapid runoff and severe erosion potential.

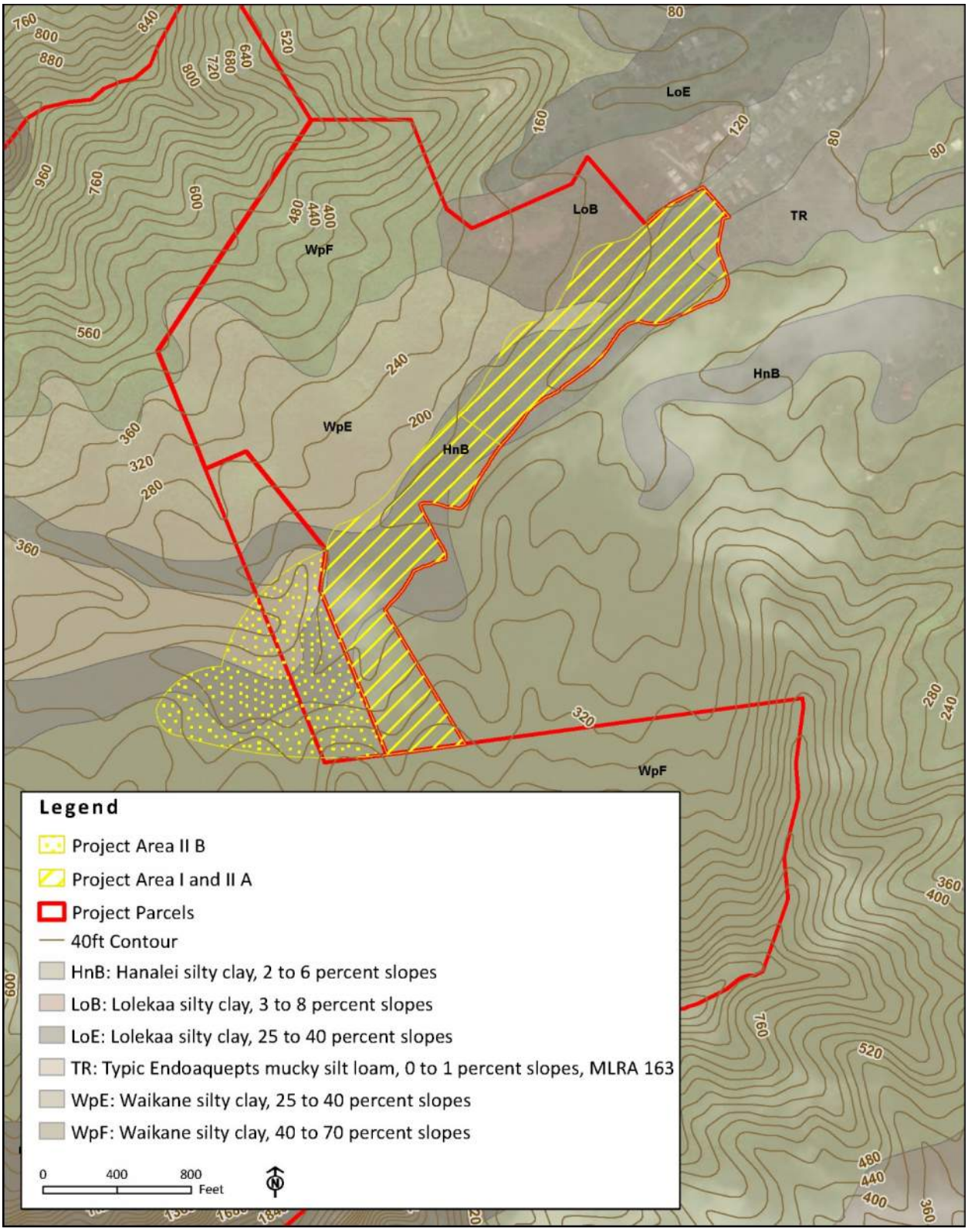

Figure 3.1 **USDA NRCS Soil Classifications**

The restoration activities, including the reestablishment of loʻi kalo and native riparian forest habitat, are the impetus of this Project. These activities will increase the agricultural productivity and improve the ecological integrity of Waiheʻe Valley. Former loʻi to be restored are located in areas composed of HnB soils which contain the nutrients ideal for successful taro production. Restoration work will consist of clearing invasive species from the area which may result in some soil erosion. The potential for erosion may be minimized by utilizing manual methods, rather than heavy equipment. Appropriate Best Management Practices (BMPs) will be followed to minimize any potential impacts from these activities.

3.3 Hydrology and Drainage

Existing Surface Water and Groundwater Conditions

The Project area in Waiheʻe Valley is situated within the approximately 6.7 square miles comprising the Kahaluʻu Watershed *(Figure 3.2).* The Kahaluʻu Watershed includes the ʻĀhuimanu, Kahaluʻu and Waiheʻe subwatersheds. The three major streams of the same names converge at the mouth of the Kahaluʻu Flood Control Lagoon and then enter Kāneʻohe Bay. Kāneʻohe Bay is designated under Hawaiʻi Department of Health (DOH) water quality standards as class "AA" waters. Class AA waters are those waters that must remain as close as possible to their natural pristine state. No discharge of effluent (any substance other than stormwater) is allowed within these waters. Other non-storm discharges as listed in Part B.2 of the City and County of Honolulu's National Pollutant Discharge Elimination System (NPDES) permit are also not considered effluent. Any other discharges must be approved under an NPDES permit per Revised Ordinances of Honolulu (ROH) §14-12.22.

The Department of Land and Natural Resources (DLNR) Commission on Water Resource Management (CWRM) identifies the Kahaluʻu Watershed as Surface Water Hydrologic Unit 3027. This watershed is described as medium-sized, with a steep upper watershed (maximum elevation of 2,762 feet) and containing an embayment, placing it in the DLNR Division of Aquatic Resources (DAR) cluster 4 watershed category. Watersheds with these characteristics tend to have a relatively high chance of experiencing flash floods when local rainfall is concentrated over a short period of time. Stormwater from Waiheʻe Valley generally overland flows east towards Kāneʻohe Bay via the Waiheʻe Stream.

Waiheʻe Stream is one of five major perennial, un-channelized streams within the Waiheʻe subwatershed, running for a length of 2.9 miles. It is the primary source of water for approximately 30 acres of kalo currently being cultivated in the watershed. Waiheʻe Stream originates in the Koʻolau Mountains in the southern half of the Waiheʻe ahupuaʻa, is joined by the Hāmama Stream and waterfall, and lower by Kalia Stream *(Figures 3.2, 3.3)*. A tributary, Kalohaka Stream, runs to the south through agricultural areas and along the periphery of residential areas. Here it joins Waiheʻe Stream and empties into the Kahaluʻu Flood Control Lagoon, which eventually terminates in Kāneʻohe Bay.

The Hawaiʻi Supreme Court order in Reppun vs BWS in 1982, established an instream flow standard of 2.71 mgd at the USGS Waiheʻe stream gage. The ruling recognized a direct relationship between groundwater and surface water. In this area, withdrawal of groundwater affects surface water flow. According to the BWS Hydrology-Geology Branch Koʻolaupoko Stream Diversion Survey (2011) (*Appendix C),* in consultation with Mr. Kaipo Faris and others, there are four diversions along Waiheʻe Stream each with a complex system of ʻauwai delivering surface water to approximately 30 acres of loʻi kalo. The recorded stream flow at the USGS Waiheʻe Stream gage 16284200 was 3.29 million gallons per day (mgd) on the date of the survey. A total of 2.18 mgd of diverted flow to ʻauwai was measured among the four diversion structures *(Figure 2.8).*

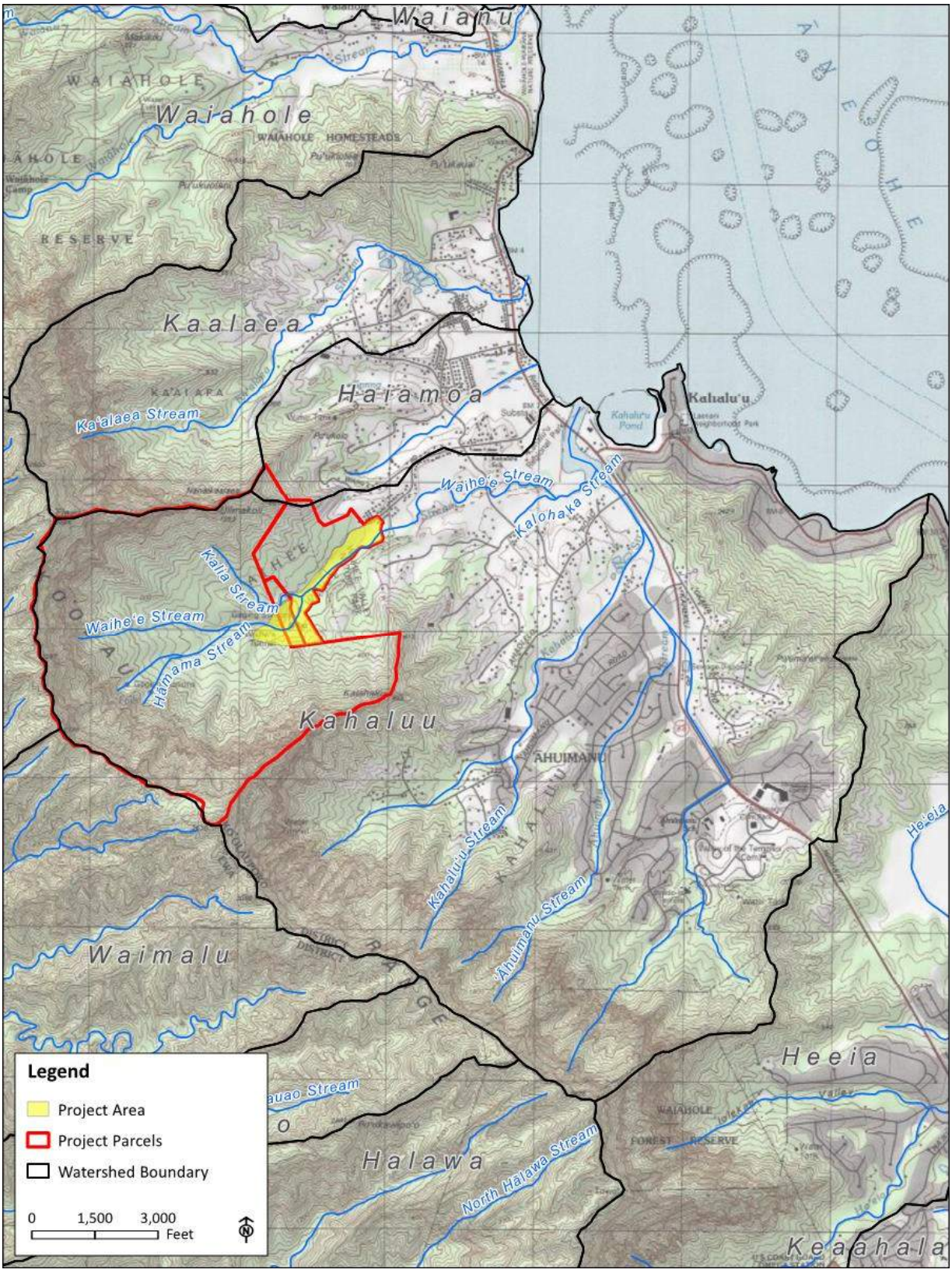

Figure 3.2 **Kahaluʻu Watershed**

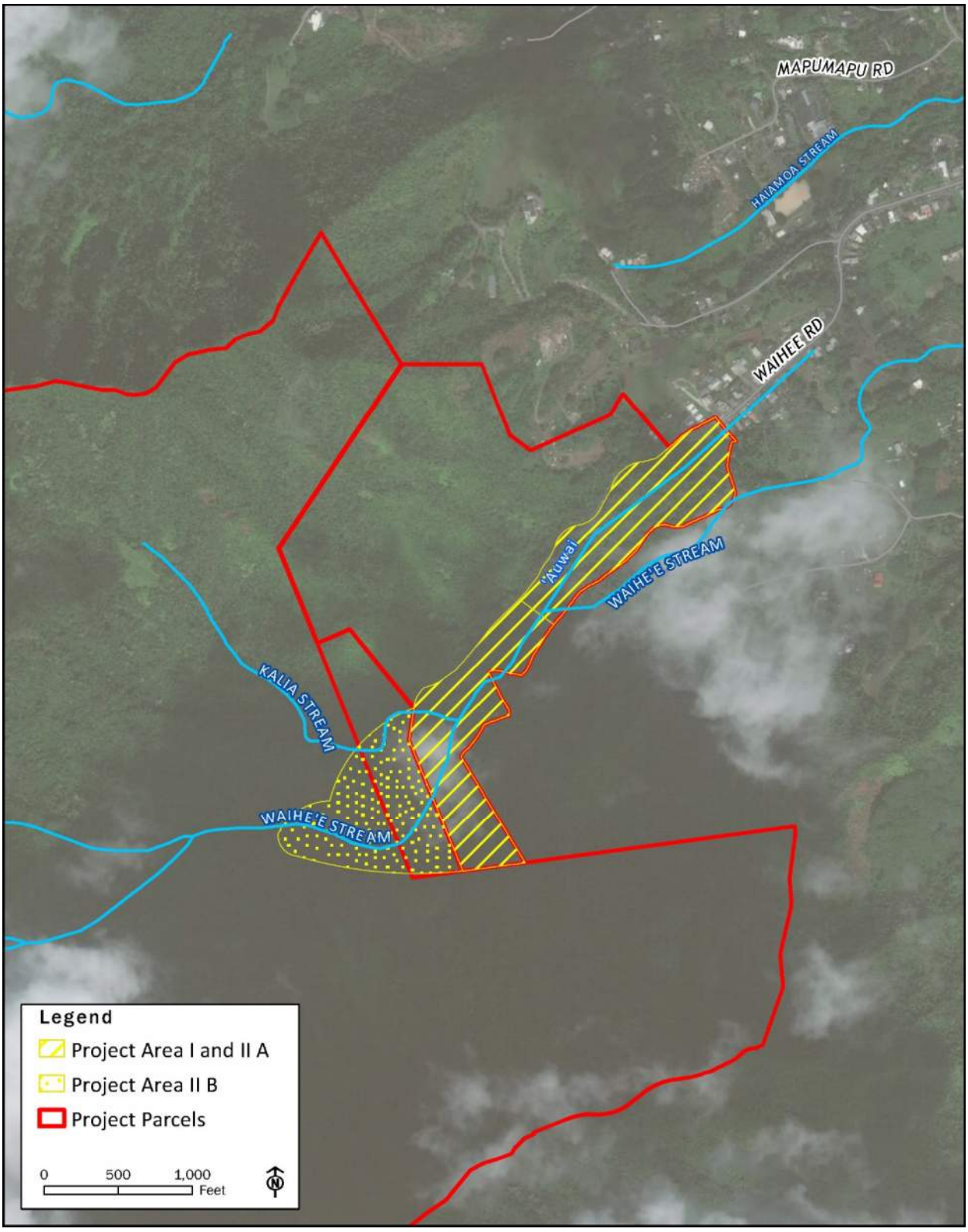

Figure 3.3 **Streams Intersecting with the Project Area**

Waiheʻe ʻAuwai #1, the furthest upstream diversion, flows through the project area and diverted ʻauwai flow was measured at 0.21 mgd or 6.4% of Waiheʻe stream flow. As loʻi kalo releases diverted water back into the stream for reuse downstream, the stream flow measured at ʻAuwai #4, the furthest downstream diversion was 2.97 mgd. Applicable excerpts of the BWS Koʻolaupoko Stream Diversion Study is in *Appendix C.* Waiheʻe ʻAuwai #2 is also located on the parcel diverting 0.19 mgd to lands located on the Kahaluʻu side of Waiheʻe Stream, outside the project area.

The Kahaluʻu Flood Control Lagoon was built due to major flooding experienced by the community in 1965. Although Waiheʻe and Kahaluʻu streams had flooded on many occasions prior, the worst of these floods occurred in February and May of 1965, resulting in thousands of dollars' worth of property damage, the loss of agricultural crops, five rescues in the May flood event, and one casualty during a storm in December. The 28-acre lagoon was constructed in two stages between 1976 and 1980 and involved the partial channelization of Kahaluʻu and ʻĀhuimanu streams and the eventual construction of the Kahaluʻu Regional Park from the dredged material. The residents of the surrounding Kahaluʻu community were involved in the planning of this project, which was funded primarily by federal appropriations (Kahaluu Watershed Plan, 1969).

The proposed WLRRLC is within the Koʻolau Poko aquifer system area which is dominated by high-level dike aquifers that extend to the coast. In dike aquifers, freshwater is not in contact with sea water. The unconfined dike aquifer has a water table that is at the surface of a saturated aquifer and occurs in dike compartments. Leakage from the dike compartments flows into the stream systems as base flow and is supplemented by stormwater runoff. Streams in Koʻolau Poko watersheds are typically gaining streams as high water tables discharge into the streams.

High level dike water flows by gravity through the Waiheʻe Tunnel bulkhead, and the Waiheʻe Inclined Wells tap directly into dike compartments below Hāmama Falls. The amount of freshwater from these two sources is regulated through valves to ensure the USGS stream gage 16284200 on Waiheʻe Stream does not drop below 2.71 mgd by court order.

Dike water is relatively young water, less than a few years old, compared with basal wells such as in Leeward Oʻahu that can be as old as 25 years. Dike water has a very low chloride content of less than 100 milligrams per liter and low total dissolved solids because of its young age and the short time it is in contact with minerals in rock. The water resources of Waiheʻe are some of the highest quality water and most significant on Oʻahu, providing 5 mgd or one third of the drinking water supply, for several communities from Kahaluʻu to Waimanalo.

There were many springs in Waiheʻe, some of which have dried up over time, according to a long-time Waiheʻe farmer (KPWMP, 2012). This started to occur once the Waiheʻe Tunnel was constructed in 1955 to serve the growing Windward communities. Urban development in the valley also disrupted ʻauwai flow of surface water throughout the lower Waiheʻe valley. There are two springs located in the Project area as identified by a long-time resident – one in the Ginger Patch and one in the proposed kalo restoration area (K. Faris, pers. comm. October 2019).

Relationship Between Ground and Surface Water

Waimānalo, Koʻolau Poko and Kahana aquifer system areas are generally considered to have a direct relationship between surface and groundwater conditions. In Koʻolau Loa, the upper elevations of these dike areas intersect with streams. At lower elevations, surface water may be hydraulically separated from the basal and dike basal aquifers by layers of thick sediments. Case by case test pumping is needed to verify localized site conditions.

The interactions between ground and surface water depend upon the location within a valley. *Figure 3.4* shows two locations in a windward valley. Location A is high in the back of the valley and Location B is in the lower reaches of the valley.

At Location A, there is a relationship between ground and surface water as illustrated in *Figure 3.5,* (Location A). This is a gaining stream reach, where the dike water supplies water to the stream, and therefore groundwater withdrawals affect streamflow. Also, where tunnels tap dikes for water supply, streams can be affected because dike water levels have been lowered.

At Location B *(Figure 3.5),* the stream water and groundwater are not hydraulically connected. This is a typical losing stream reach where streamflow is not directly supplied by the basal groundwater which occurs far below it. This is usually the case for the mouth of the valley in Windward Oʻahu and for most locations in Leeward Oʻahu. The groundwater and surface water relationship in the Koʻolau Poko Aquifer System Area will vary between different streams based on long-term well production experience. Therefore, significant effects of groundwater withdrawal on surface water should be evaluated on a case-by-case basis.

Figure 3.4 Typical Windward Valley with Upper (A) and Lower (B) Elevation Stream Locations

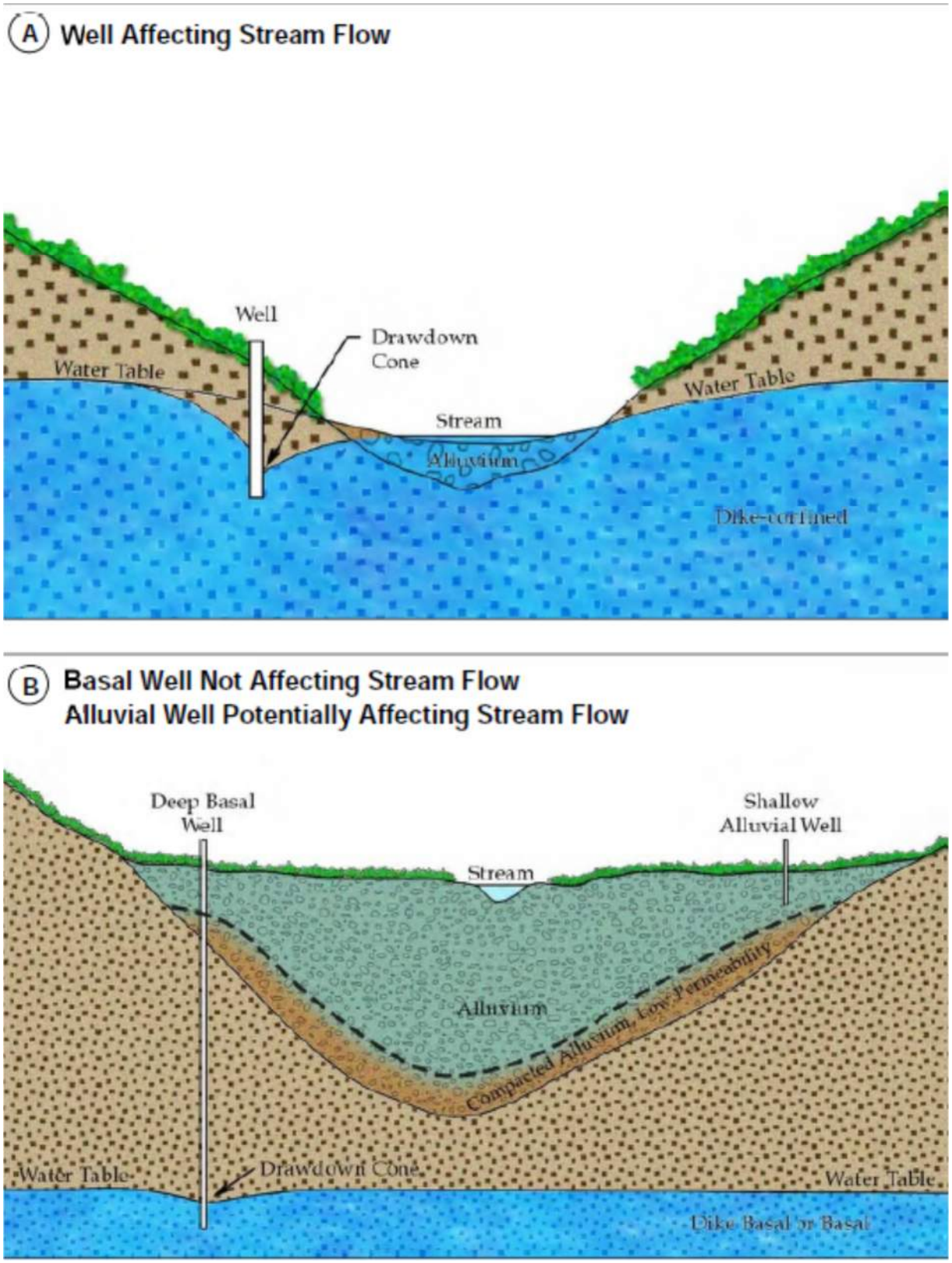

Figure 3.5 **Well/Groundwater Relationship**

Anticipated Impacts and Proposed Mitigation

The largest potential impact of the project is the need for additional stream water for the loʻi restoration of the historic terrace complexes. The proposed loʻi restoration area within Phase I is 2 acres requiring approximately 80,000 gallons per acre per day (gpad) from Waiheʻe ʻAuwai #1. A water demand of 40,000 gallons per acre day of kalo was measured in this ʻauwai by the BWS diversion survey and is much less than the USGS study Water Use in Wetland Kalo Cultivation in Hawaiʻi (2007) of approximately 260,000 gpad, or the demand identified in the BWS Koʻolau Poko Watershed Management Plan (2012) of 100,000 gpad for loʻi restoration planning purposes.

It is essential that water in the ʻauwai not be reduced to the existing downstream farms, TMKs: 4-7-006:004 and 013, which could result in actual harm. To mitigate this impact, approximately 2,000 feet of plastic distribution pipe will be installed within the two branches of the ʻauwai to eliminate the portion of water loss in the project parcel. The water saved can then be utilized in the project area. Native plants can be used to reduce the visual impact in locations where the pipe can be seen. The entire ʻauwai cannot be piped because it traverses through private residential property downstream of the entrance gate and provides cultural and aesthetic value. An ʻauwai seepage survey will need to be conducted to determine the water loss between the mānowai diversion to the makai property line by the entrance gate.

If additional water is required for the loʻi restoration of the existing terrace complexes, strategies on increasing the diverted amount at the mānowai diversion such as widening the ʻauwai at the diversion and installing a larger distribution pipe will need to be investigated, designed and permitted through CWRM. Diverting more water from Waiheʻe Stream will be discussed in the riparian water rights section of *Section 3.4 Water Quantity*. It is important to note that loʻi kalo is a pass-through irrigation system where diverted water is then returned to Waiheʻe Stream from the loʻi terraces. The consumptive use of water for the kalo is relatively small but the water must remain relatively cold to prevent korm rot. Since Waiheʻe Stream base flow is supplied by groundwater, USGS found little variation between maximum and minimum daily temperatures ranging between 20˚C and 22˚C. More discussion with Waiheʻe farmers will be needed to determine potential temperature impacts from additional loʻi return flow.

The proposed agricultural activities and meeting structures are not anticipated to significantly impact the existing hydrology and drainage around the Project area. The ʻauwai flow through the project area will be maintained and improved with a pipeline to reduce water loss. While the modest increase in total area covered by impervious surfaces will increase surface runoff, runoff and drainage problems are not anticipated. The overall drainage pattern will remain the same as existing, with runoff from the site flowing into the Waiheʻe Stream channel. The limited regrading in areas that are to be occupied by new structures and parking areas will be done in a manner that will retain the existing south-to-north flow of onsite surface runoff and preclude any runoff from flowing onto neighboring properties.

During the construction period, erosion will be minimized through compliance with the City and County's grading ordinance and the applicable provisions of the State of Hawaiʻi DOH Water Quality Standards (Title 11, Chapter 54, HAR) and Water Pollution Control requirements (Title 11, Chapter 55, HAR). Additionally, standard BMPs will be employed to minimize impacts, as detailed in subsequent construction plans. No significant storm drainage runoff to coastal waters is anticipated.

Since the project includes more than 5,000 sf of impervious area (pavilions, double stall composting toilets and gravel parking areas), this project is classified as a Priority B1 project (per City and County of Honolulu, Department of Planning and Permitting Rules Relating to Water Quality, December 2018) and must incorporate Post-Construction BMPs into the design to the Maximum Extent Practicable

(MEP). Low impact development measures and BMPs are planned within the design of WLRRLC. Proper landscaping, grading, and correct construction procedures will minimize drainage problems. Other potential methods to allow for stormwater infiltration and biofiltration include the use of rainwater catchment and pervious materials for any paved surfaces. Priority B1 projects must submit a Stormwater Quality Checklist prepared by a Certified Water Pollution Plan Preparer, which must be reviewed and approved by the Director prior to issuance of a grading permit.

Overall, there will be no material effect on ground or surface water quality downstream and in Kāneʻohe Bay. Long term drainage and water quality conditions following construction are expected to be similar to existing conditions or improved through loʻi restoration and forest recovery efforts.

Invasive species removal will be necessary throughout the life of the restoration project; however, this activity will not utilize any chemical treatments due the potential for effects on the water source and future agricultural operations in the immediate vicinity. Riparian forest recovery with appropriate native and introduced, non-invasive plants may contribute to the long-term watershed health of the area.

In addition to the activities described above, the WLRRLC Project will offer education to visitors and volunteers about the importance of streams, watersheds, and traditional agricultural practices.

3.4 Water Quantity

Existing Conditions

Waiheʻe Stream is unique in that it is court-mandated to maintain a minimum instream flow of 2.71 mgd at the USGS gage. As discussed in *Chapter 2.3,* this was part of the ruling in the Hawaiʻi Supreme Court 1982 case of Reppun vs BWS. The case was originally brought to court in 1976, when a group of taro farmers filed suit seeking to enjoin BWS from exporting water from Waiheʻe Valley. The farmers argued that the proposed BWS Waiheʻe Well Station constructed in 1974 reduced the amount of water from the stream to which they were entitled. The well was constructed too close to the Waiheʻe Stream and affected stream flow. The well station was subsequently taken out of service and over time has become inoperable and will remain so.

A USGS weir gage built in 1935 was situated on the Waiheʻe Stream at the 1.8-mile mark. This gage was abandoned in the 1970s and relocated further downstream. The original stream gage was creating a significant barrier for native ʻoʻopu trying to migrate to upstream habitat. In 2012 the U.S. Fish and Wildlife Service and the WAI partnership worked together to modify the weir into a fish ladder, creating passage for native stream species while excluding non-native fish that cannot climb the fish ladder.

A new, real-time USGS stream gage was installed approximately 170 feet upstream from the Project area. Waiheʻe Stream base flow is fed by groundwater and is characterized as a gaining stream because the stream intersects the high water table. Stormwater runoff contributes to the rest of the stream flow.

Data recorded from the USGS gage has shown steadily increasing rates of instream flow over the last decade. In 2009 the average discharge of the stream was 5.85 cubic feet per second (cfs); in 2018 it had nearly doubled to 11.3 cfs (*Figure 3.6)*. BWS regularly monitors the flow of the Waiheʻe Stream and varies the operation of valves from the Waiheʻe Tunnel and Inclined Wells pipelines to ensure the minimum stream flow of 2.71 mgd at the USGS stream gage. This operation protects stream users and water rights and sustains enough groundwater storage to mitigate drought impacts.

Since 1990, Windward source production has decreased by about 33% from 24 mgd in 1990 to 16 mgd in 2018 through proactive BWS water conservation and leak detection and repair programs. A reduction in water production results in defacto stream restoration and aquifer storage for drought mitigation. Reduced source production reduces BWS pumping costs and benefits water rate payers and the aquifers, allowing sources to recover in a shorter period of time post drought.

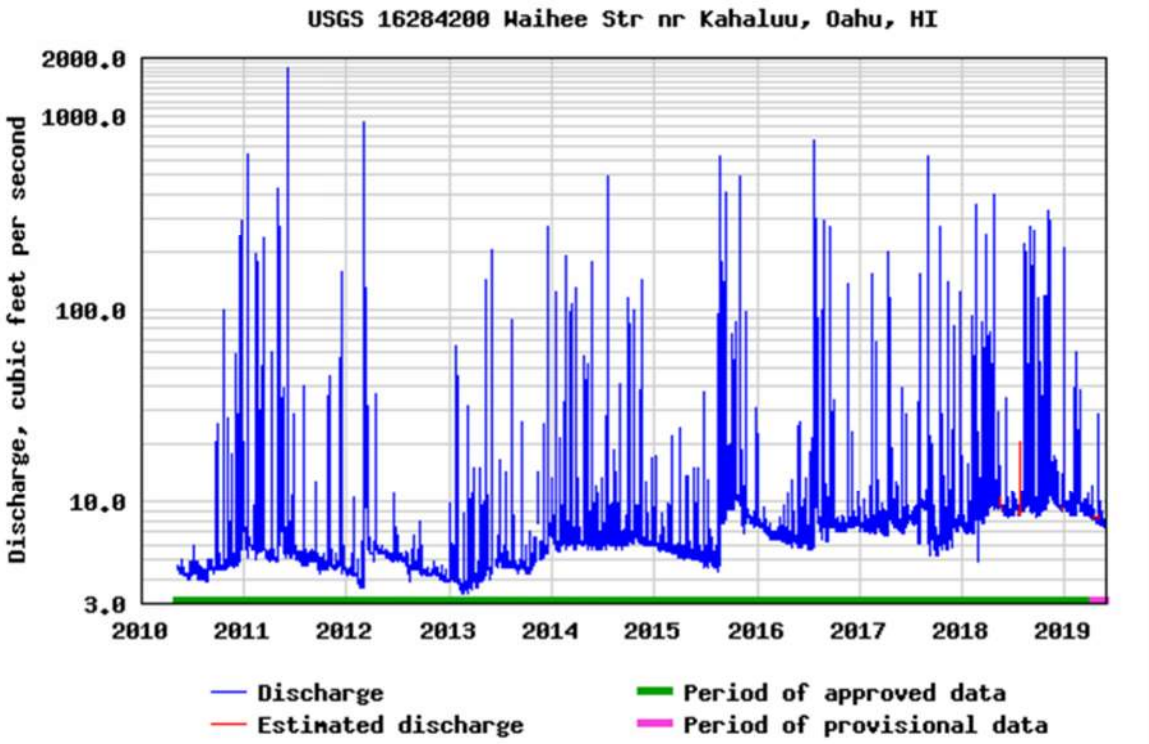

Figure 3.6 Discharge of Waiheʻe Stream from 2010-2019 at the USGS Weir Gage

A preliminary analysis of the potential availability of prime agricultural lands in Koʻolau Poko (KPWMP, 2012) found that there could be approximately 20 acres available for expansion of loʻi kalo activities in the district which largely depends on the availability of water and efficient water distribution systems. The Koʻolau Poko Watershed Management Plan (KPWMP) recommended that Interim Instream Flow Standards (IIFS) should be established to identify the availability of surface water for future agricultural activities in Koʻolau Poko. Loʻi kalo is a traditional and customary use of water and is a Public Trust use having the highest protection under the State Water Code. If additional stream water is required for the restoration of the loʻi kalo for the project, CWRM is the governing authority to review and approve the exercise of additional riparian water rights for this public trust use. If additional stream water is diverted, a petition for an amendment to the interim instream flow standards may be required by CWRM if the amount of stream water requested is significant.

While Koʻolau Poko is designated as a groundwater management area, it is not designated as a surface water management area. It is important to note that when a surface water management area is designated, existing riparian uses within Waiheʻe are eligible for water use permits as existing uses, but unexercised riparian rights are extinguished. It is therefore important to establish the loʻi restoration before any surface water management area designation.

A review of the parcel's land documents may be useful to determine if appurtenant water rights apply to the project parcel. Appurtenant water rights are rights to the use of surface water utilized by (non-riparian) parcels of land at the time of their original conversion into fee simple lands; i.e., when land allotted by the Māhele was confirmed to awardees by the Land Commission and/or when the Royal Patent was issued based on such award, the conveyance of the parcel of land carried with it the appurtenant right to water. According to the Keala Pono Archaeological Inventory Survey *(Appendix J),* two Land Commission Awards (LCA) were awarded within the study area, and several were located makai of the project. LCA 2070 ʻApana 2 was awarded to Kelehuna, and LCA 2311 ʻApana 1 was awarded to Halai. Māhele testimony for both LCA mention loʻi. LCA 2070 ʻApana 2 was also a house lot, while LCA 2311 ʻApana 1 noted five loʻi bordered by streams and cliffs.

Anticipated Impacts

There are three tests to determine impacts of diverting more stream water into the existing ʻAuwai #1; available stream water, reasonable use and no actual harm to other riparian landowners.

Available Stream Flow

The largest potential impact of the Project is the need for additional stream water for the loʻi restoration of the historic terrace complexes. The proposed loʻi restoration area in Phase I is two acres requiring 80,000 gpad, a portion of which can be captured from water loss in the existing unlined ʻauwai within the property. Approximately 2,000 feet of pipeline is proposed in the ʻauwai's two branches to eliminate water loss. Additional water can be provided by the existing diversion feeding Waiheʻe ʻAuwai #1 by widening the ʻauwai at the diversion and installing large pipelines.

Widening the ʻauwai will not generate a permit, however, if the stream diversion structure is proposed to be replaced, enlarged, or otherwise altered, a Diversion Works Permit and possibly a Stream Channel Alteration Permit will be required from CWRM. By utilizing water loss savings for a portion of the water supply for the loʻi restoration, the amount of additional stream water diverted is reduced. Water loss will be determined by seepage measurements along the ʻauwai that courses through the project parcel.

Discussions with Windward kalo farmers during the formulation of the Koʻolau Poko Watershed Management Plan provided a planning estimate for determining diversion quantity for loʻi kalo to not take more than half the stream flow. CWRM later defined the acceptable rate of diversion from the base stream flow as half of Q70, or the volume of daily mean stream flow present in the stream 70 percent of the time. ʻAuwai #1 currently diverts 0.21 mgd of 3.29 mgd, which amounts to only 6.4% of the Waiheʻe Stream flow, which is well below the planning estimate.

Reasonable Use

Loʻi kalo is a traditional and customary use of water and is a Public Trust use having the highest protection under the State Water Code *§174C Hawaiʻi Revised Statutes (HRS).* The project proposes to restore historic terrace complexes, not create new ones. CWRM is the governing authority to review and approve the exercise of riparian water rights for public trust use. If additional stream water is diverted, a petition for an amendment to the interim instream flow standards (IIFS) may be required by CWRM if the amount of stream water requested is significant.

No Actual Harm to Other Riparian Landowners

Waiheʻe Stream is a gaining stream because dikes extend to the coast and loʻi return flow does not significantly diminish stream flow. Consumptive use and evaporation are minor losses. Analysis of the BWS diversion survey show that approximately 3 mgd flows to all of the four existing diversions. The recorded stream flow at the USGS Waiheʻe Stream gage 16284200 was 3.29 mgd on the date of the survey. Among the four diversion structures along Waiheʻe Stream, a total of 2.18 mgd of diverted stream water flows to ʻauwai was measured. If the total diverted flow of 2.18 mgd were subtracted from the measured flow of 3.29 mgd, only 1 mgd would be left in the stream. This is not the case. Waiheʻe ʻAuwai #1, the furthest upstream diversion, flows through the project area and diverted ʻauwai flow was measured at 0.21 mgd or 6.4% of Waiheʻe stream flow. The stream flow measured at ʻAuwai #4, the furthest downstream diversion was 2.97 mgd. There is no significant change in stream flow because loʻi releases water back into the stream for reuse downstream, and the stream gains water flow from the high water tables.

Riparian water rights evolve in accordance with changing needs and circumstances. Thus, in order to maintain an action against a diversion which diminishes the quantity or flow of a natural watercourse, riparian owners must demonstrate actual harm to their own reasonable use of those waters. Subject to CWRM permit reviews and approvals, as long as flows in ʻAuwai #1 currently leaving the project parcel do not significantly decrease, there would be no harm to downstream existing riparian landowners with loʻi kalo on TMK: 4-7-06: 04 and 13.

Temperature impacts from insufficient flows resulting in korm rot are not expected to be significant. Since Waiheʻe Stream base flow is supplied by groundwater, USGS found little variation between maximum and minimum daily temperatures ranging between 20˚C and 22˚C. More discussion with Waiheʻe farmers will be needed to discuss potential temperature impacts from additional loʻi return flow.

Under Phase II of the project to restore the ginger patch to a fully functioning, traditional loʻi of approximately 3.5 acres, the development of a new stream diversion and ʻauwai along Kalia Stream will be required. Very little is known about the perennial stream flow in Kalia Stream because it is not gaged. Evaluation of this future phase is beyond the scope of this EA and will have to occur later, if pursued. Kalia Stream is a tributary of Waiheʻe Stream and is above the USGS stream gage. A diversion on Kalia Stream will impact BWS Waiheʻe water sources because the proposed diversion will have to be considered and balanced to maintain the 2.71 mgd flow at the USGS stream gage. This could mean that BWS would have to reduce production. Impacts could be mitigated if the return water re-enters Waiheʻe Stream above the USGS stream gage, but water losses and consumptive use would need to be accounted. It is noted that domestic use is also a public trust use, equal to traditional and customary uses of stream water, a resolution may have to be adjudicated by CWRM. Impacts to downstream kalo farmers will also have to be resolved using a similar approach to the analysis and mitigation used in Phase I.

A petition for an amendment to the Interim Instream Flow Standards (IIFS) will ultimately need to be approved by CWRM. Ideally, measurable Instream Flow Standards should be established prior to any major new diversions of stream water being permitted (except for users with appurtenant rights) in order to ensure that the surface water use is not detrimental to the ecosystems that are dependent upon an adequate level of stream flow. Surface water uses cannot practically be planned for until measurable IIFS are set. Measurable IIFS would help plan for the expansion of stream-irrigated agriculture on a holistic level.

3.5 Water Quality

Existing Conditions

Ko‘olau Poko groundwater quality is generally considered high. BWS and DOH regularly monitor drinking water quality for traces of more than 100 different types of natural and human-induced contaminants. All tests are performed at the water source. Monitoring of certain types of contaminants such as coliform bacteria is conducted throughout the distribution system. The *Hawai‘i Source Water Assessment and Protection Program (1999)* identifies Waihe‘e wells as one of the least susceptible drinking water sources with the potential for contamination.

Waihe‘e stream water quality measurements were taken by AECOS and documented in a natural resources survey dated May 2019 *(Appendix H).* On March 27, 2019, AECOS biologists took field measurements in Waihe‘e Stream for temperature, conductivity, dissolved oxygen, and pH and collected water samples for analysis of total suspended solids (TSS), turbidity, nitrate-nitrite nitrogen (NO3+NO2), total nitrogen (TN), and total phosphorus (TP) at three stations *(Figure 3.7).*

Additionally, stream velocity was measured and the average depth and width of the flowing portion of the stream or ‘auwai were measured in order to estimate stream discharge at each station during sampling.

The AECOS survey found the swift-flowing stream waters to be cool and clear. Temperature and conductivity varied little from station to station. Temperature readings ranged from 20.0 degrees Celsius at station USGS to 20.9 degrees Celsius at station Downstream *(Figure 3.7).* Stream waters were well oxygenated at all stations with saturation values of 102, 106, and 99% calculated based on ambient water temperature. Values for pH ranged from 6.75 to 7.34 standard units.

Turbidity and total suspended solids concentrations were low upstream, and somewhat higher downstream in the ‘auwai. The bulk of nitrogenous nutrient substances present in the sample waters were as soluble nitrate+nitrite, indicating the flow conditions during the sampling event were primarily groundwater driven rather than a result of surface water runoff. A surface water driven stream would have a lower proportion of nitrate+nitrite to total nitrogen.

Waihe‘e Stream is classified by the State of Hawai‘i as a perennial stream. The stream appears on the DOH 2018 list of impaired waters in Hawai‘i, prepared under Clean Water Act §303(d). The listing indicates that water quality within the stream may not meet all state water quality standards for streams. Specifically, Waihe‘e Stream is listed as impaired for enterococcus, total nitrogen, nitrate+nitrite, and turbidity during the dry season (May 1 to October 31) and listed as impaired for enterococcus, total nitrogen, nitrate+nitrite and total phosphorus in the wet season (November 1 to April 30), with the latter three parameters based solely on “visual” assessments.

Not all of the water quality measurements made by the AECOS survey can be compared directly with the state water quality criteria to establish compliance with these standards, because such a comparison requires representative geometric mean values, calculated from a minimum of three sampling events at each station in the stream. The AECOS one-time sampling event only reveals stream conditions at the time of their survey.

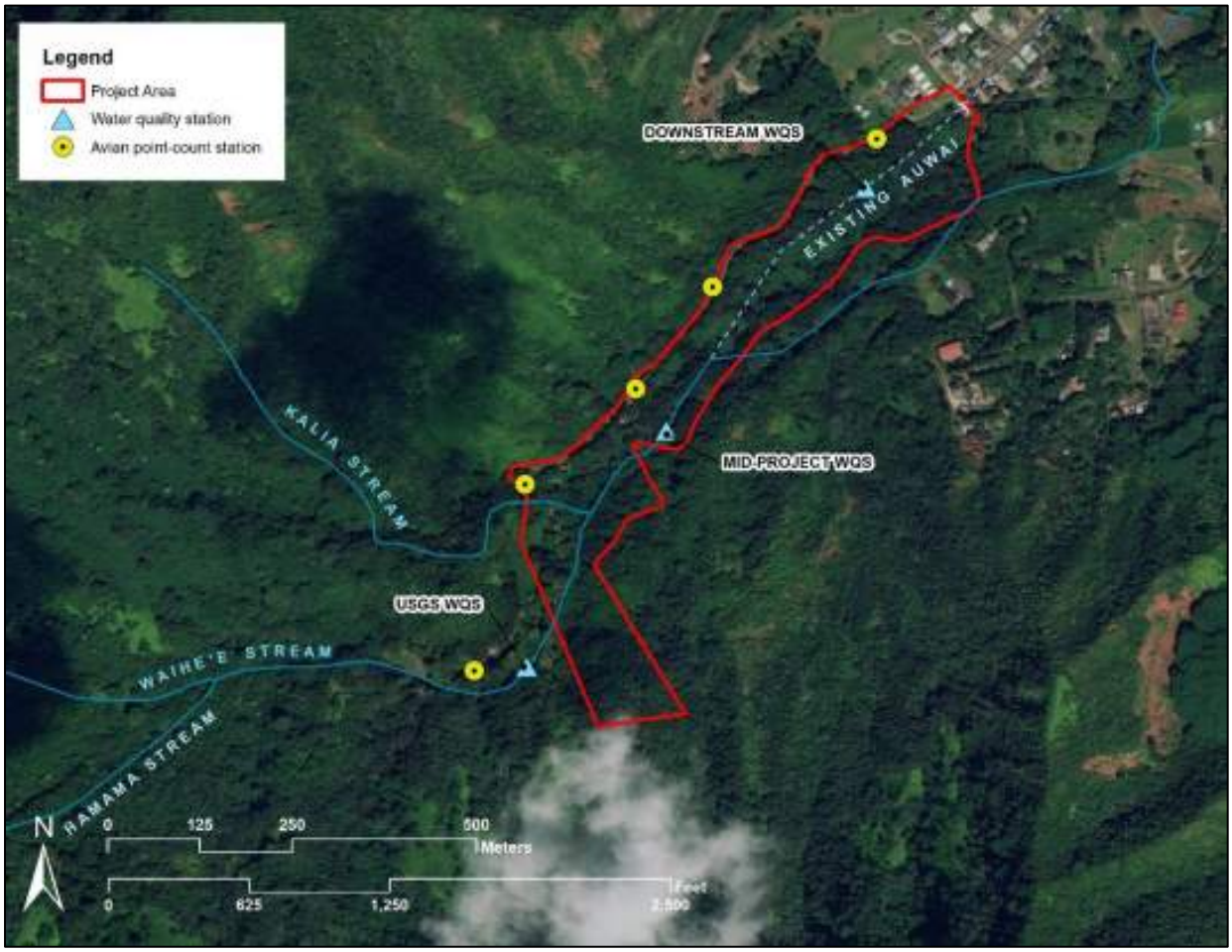

Figure 3.7 **Locations of Water Quality Stations and Avian Point-Count Stations**
(Source: AECOS Inc., 2019, Appendix H)

Stream discharge estimates, field measurements, and nutrient concentrations found during the survey are similar to long term historical data from the USGS station, indicating their survey likely encountered typical conditions for the Waihe'e Stream and the 'auwai. Consistent with the listing for impairedness, the AECOS survey found high levels of nitrate+nitrate in the stream and 'auwai, but very low turbidity in the stream (and only slightly elevated in the 'auwai). Flow in Waihe'e Stream is dominated by groundwater and therefore has little variation between maximum and minimum daily temperature, little groundwater seasonal variation, and cool temperatures relative to surface water-driven stream systems. Water quality in the Project area is relatively good compared to most streams on O'ahu, despite the 2018 DOH impairment listings for Waihe'e Stream.

Occasionally, drinking water samples from the Waihe'e Tunnel will test positive for the presence of *E. coli (Escherichia coli)* bacteria. *E. coli* is a coliform bacterium known as a fecal indicator because its presence indicates that water may be contaminated with human or animal feces. Pathogenic microorganisms in these wastes can cause diarrhea, headaches, or other symptoms, and may pose an elevated health risk for infants, young children, the elderly, and people with severely compromised immune systems. *E. coli* is also naturally found in high concentrations in tropical and sub-tropical soils and can transmit into nearby water sources. Using *E. coli* as a fecal indicator bacterium in tropical

watersheds is complex, and highlights the need to differentiate environmental sources of *E. coli* from fecal sources in water quality monitoring.

In 2009, Wil Chee Planning, Inc. conducted a site investigation in the area to (1) identify the nature and extent of impacts to soil, surface water, and sediment from munitions constituents from the He'eia Combat Training Area in 1943-1945 *(Figure 2.7),* and (2) collect sufficient samples to complete munitions response site prioritization protocol worksheets. Within Waihe'e Valley, two decision units (DUs) within the project area were identified based on "Areas of known or suspected munitions and explosives of concern (MEC) contamination and areas downgradient where MEC constituents may have migrated." One soil sample was collected from each of the two DUs. In addition, two surface water samples and two sediment samples were collected from Waihe'e Stream within the project area *(Figure 3.8).* Soil, sediment, and water samples were analyzed for explosives and total metals.

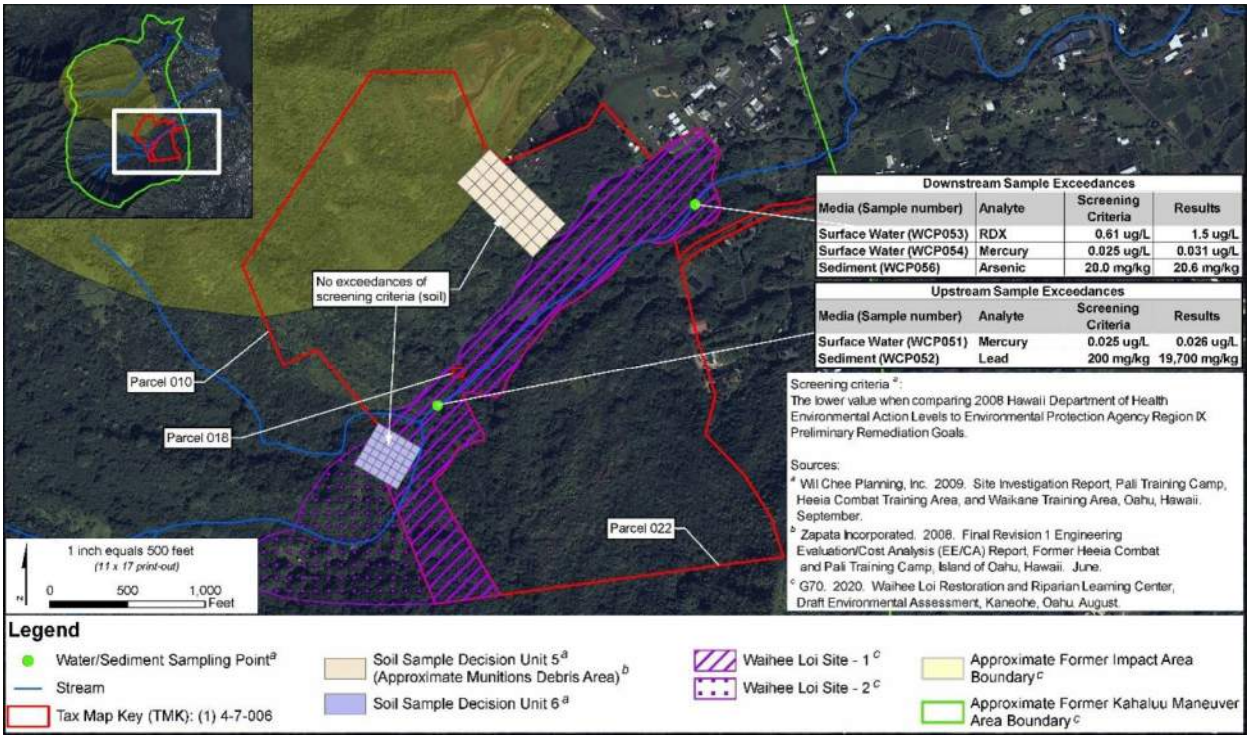

Figure 3.8 Map of Soil, Sediment and Stream Sample Locations for Explosives and Metals

The results from the soil samples indicated a detection of metals, but at concentrations below typical background concentrations on O'ahu. Therefore, no chemicals of potential concern (COPC) were identified for soil within the two decision units. Sediment samples within Waihe'e Stream indicated arsenic and lead were detected at concentrations exceeding project action levels and O'ahu background concentrations. Although lead is identified as COPC, the arsenic levels are far more likely attributed to previous agricultural practices in the area, in particular sugar cane production. One metal compound (mercury) and one explosive compound (RDX) were detected at concentrations exceeding their respective project action levels in the surface water samples collected from the Waihe'e Stream. Based on these results, mercury and RDX were identified as COPC for Waihe'e Stream.

The EA Engineering, Science and Technology report concluded the following:

- The northern portion of Parcel 10 may be impacted by unexploded ordnance (UXO)/MEC from the impact area in the neighboring Ka'alaea Valley to the north. The U.S. Army corps of Engineers (USACE) is planning to perform a Remedial Investigation of the Kahalu'u Maneuver Area in the future.
- The sediment in the Waihe'e Stream has been impacted by arsenic and lead. The arsenic impacts are likely related to former agricultural activities in the Waihe'e Valley and the lead impacts are likely related to UXO/MEC.
- The water in the Waihe'e Stream has been impacted by mercury and RDX, which are likely related to UXO/MEC.
- The soil within Waihe'e Valley may be impacted by pesticides and/or herbicides, which were commonly associated with commercial plantation operations for sugar cane, rice, and pineapple.

Anticipated Impacts and Proposed Mitigation

As contaminated sediments are often a significant source of surface water contamination, it is presumed that COPC identified in sediment samples collected from Waihe'e Stream (arsenic and lead) are also a COPC for the surface water. As such, further monitoring of the surface water from Waihe'e Stream should consider RDX, lead, and mercury. Future surface water monitoring should consider both upstream and downstream locations, as well as sampling during heavy rain events.

According to the U.S. Army Corps of Engineers, the Kahalu'u Maneuver Area is proposed for the completion of a Remedial Investigation. However, the date for the start of the Remedial Investigation has not been set and is likely several years to more than a decade away based on the backlog of formerly used defense sites (FUDS), requiring investigation.

For more information see the below links:

1. USACE Honolulu District FUDS website for Former He'eia Combat Training Area/Former Pali Training Camp (https://www.poh.usace.army.mil/Missions/Environmental/FUDS/HeeiaPali.aspx).
2. DOH Hazard Evaluation and Emergency Response (HEER) Office on-line information system (iHEER - https://eha-cloud.doh.hawaii.gov/iheer/#!/home).

Pursuant to Honolulu Department of Planning and Permitting Rules Relating to Water Quality, the Project will install and maintain appropriate BMPs during construction and may be required to implement post-construction BMPs.

Hikers, motorbikes and other unauthorized visitors are the primary concern for impacts to water quality. Given the high volume of people currently hiking and swimming in the vicinity of the Project area, human use is almost certainly affecting water quality due to the lack of restroom facilities. According to community members visitors to the area have also been known to leave trash in the stream, impacting kalo farms downstream. These issues may have affect water quality by introducing pathogens, viruses, plastics, and other pollutants into the ecosystem, as well as the media for growing crops. The installation of compostable toilets will presumably have indirect benefits to water quality as well as the farms using this water downstream.

Water quality will benefit with the removal of invasive plant species and the planting and maintenance of native riparian vegetation. Clearing existing loʻi and creating new patches may have limited adverse effects to water quality that will be temporary in nature. Maintaining good water quality in the stream and ʻauwai will be a priority, with specific attention paid to maintaining adequate temperature. In addition, the benefits of the education and outreach provided to the public will lead to a better understanding of water quality issues and aquatic environments.

3.6 Natural and Manmade Hazards

Existing Conditions

Hurricanes and Tropical Storms

Hurricanes and tropical storms are both categorized as tropical cyclones, which are warm-core storms which originate over tropical waters with well-defined centers of closed surface wind circulation. A hurricane is a tropical cyclone which sustains surface winds of 64 knots (74 mph) or more. Tropical storms are categorized as an organized system of strong thunderstorms with defined circulation and maximum sustained winds of 39 to 73 mph.

Hurricanes are considered relatively rare events in the Hawaiian Islands. Records show that strong windstorms have struck all major Hawaiian Islands. The first officially recognized hurricane in Hawaiian waters was Hurricane Hiki in August 1950. Since that time, five hurricanes have caused serious damage in Hawai'i: Nina (1957), Dot (1959), 'Iwa (1982), Estelle (1986), and 'Iniki (1992).

However, with rising global temperatures, Hawaiʻi is expected to experience a higher incidence of tropical storm events. In most recent history, Tropical Storm Olivia made landfall on Maui and Lānaʻi in 2018, causing considerable flooding, power outages, and road and school closures.

Earthquakes

Based on the 2015 USGS International Building Code (IBC) Seismic Design Map, the Project site could experience up to 0.15 earthquake ground motion accelerations (g-force). This represents the lower limits of probable force experienced by the island of Oʻahu during a seismic event.

Flooding and Tsunami Inundation

The Project site is in Flood Zone D (possible but undetermined flood hazard), X (minimal flood risk, outside of 0.2% Annual Chance Floodplain), and A (areas with a 1% chance of flooding) *(Figure 1.5*). According to the Kahaluʻu Community Master Plan (2007), drainage issues continue to the north of the Waiheʻe ahupuaʻa at the intersection of Wailehua Road and Kamehameha Highway. This is the only significant source of flooding that still occurs during rain events in the area. The cause of this issue has been identified as a design flaw in the drainage outlet, which discharges to the ocean under low tide conditions. Flooding typically occurs here at high tides when the ocean water flows upstream, blocking the outlet. Sea level rise will likely exacerbate this problem, however the effects are likely to remain in the coastal area.

The sudden displacement of the ocean floor (earthquakes), landslides, or volcanism can generate tsunamis, which are a series of waves that can reach speeds of up to 600 mph. Upon reaching a coastline, a tsunami can become a wall of water reaching heights of 30 ft or more and capable of moving inland several hundred feet. Known major tsunami events in Hawai'i include the areas of East Hawai'i (1946, 1960, 1975) and North Shore O'ahu (1952, 1957).

Climate Change and Sea Level Rise

Rapid anthropogenic climate change is a well-established fact within the scientific community. A 2013 study by a University of Hawai'i (UH) team of researchers predicts that tropical regions will experience drastically warmer climates by the year 2047. As a result of climate change, oceans are warming and acidifying, ice sheets and glaciers are melting, and sea levels are rising.

In addition to rising temperatures, sea level rise is a notable concern for coastal communities. Sea level rise has historically driven shoreline changes throughout the Hawaiian Islands. The global annual sea level rise averaged over the last century was roughly two millimeters, with previous studies indicating that this rate is now approaching three millimeters and may accelerate in the coming decades. According to the 2017 Hawai'i Sea Level Rise Vulnerability and Adaptation Report, the sea level in Hawai'i has increased at a rate of 0.6 inches or more each decade over the past century. While predicting future sea level rise is challenging because of unknown parameters, research shows that global mean sea level may rise approximately one foot by mid-century and 2.5 to 3.2 feet by 2100, with some studies showing a possible rise of up to 6 feet. According to recommendations provided in the report, an appropriate planning target to use in the design of future projects within the exposure area would be 3.2 feet. It is also practical to expect that a hurricane will make direct landfall in Hawai'i under conditions of higher sea levels and that tsunamis will continue to arrive at Hawaiian shores.

According to a 2014 UH Sea Grant College Program report titled, *Climate Change Impacts in Hawai'i – A Summary of Climate Change and its Impacts to Hawai'i's Ecosystem and Communities*, Hawai'i is experiencing climate change impacts in unique ways. It will be increasingly important to focus on the localized impacts of climate change and sea level rise to adequately understand and prepare for the changes to come.

Climate Change and Water Resources

Water resources are expected to be impacted by changing climate conditions. In Hawai'i, the average precipitation, streamflow, and stream discharge have been on a downward trend for nearly a century (USEPA 2014). Decreases in precipitation rates are linked to similar decreases in groundwater recharge and surface water flow, thereby reducing the supply of freshwater available for drinking as well as for crop irrigation.

The individual geography and topography of each island will determine how impacts to water resources are felt and translated across the landscape. Surface air temperatures are on the increase in Hawai'i and throughout the Pacific region by approximately 0.16 degrees Fahrenheit per decade. This temperature change is most pronounced in the higher elevations where cloud formation from orographic lift is critical to precipitation and recharge. Warming at high elevations could produce thinner cloud layers, changing condensation patterns and further impacting rainfall. This will also alter the distribution of many native species, as existing climate zones in the higher elevations are generally projected to shift upslope in response to climate change.

Temperature modeling projections for Hawaiʻi show the wet season will decrease between 5 to 10% and the dry season will increase by 5% by 2100. Annual rainfall projections based on similar models show either little change or up to a 5% increase in the main Hawaiian Islands. This combination of a prolonged dry season and a potentially rainier wet season may have consequences in the form of more severe droughts, increased erosion rates and decreased water capture rates due to the intensity of storm runoff, and severe flooding.

Sea level rise poses another concern, as rising sea levels may contribute to the contamination of freshwater resources and the prevention of freshwater recharge due to inundation of land with saltwater, coastal erosion, and saltwater intrusion into coastal aquifers.

Manmade Hazards

Within the Kahaluʻu parcel and specifically within Waiheʻe Valley where the Heʻeia Combat Training Area was located *(Figure 2.7),* Digital Geophysical Mapping (DGM) was performed in 2003 by Zapata Engineering over an area totaling 3.3 acres, which included 18 grids and 4 super-transects. An instrument-assisted visual reconnaissance was also conducted in the Kahaluʻu parcel covering approximately 5.1 acres. All munitions debris (MD) items found during the field investigation at Kahaluʻu were at the northeastern section of Waiheʻe Valley near the valley's entrance. The items were down slope of the former impact area as defined in historical documentation. During previous investigations, MD items were found within the former impact area.

Munitions and explosives of concern (MEC) exposure potential for the Kahaluʻu parcel were "High" based on the "presence of Practice Munitions Debris (MD) and Evidence of High Explosive (HE) Usage". A total of approximately 9 acres were investigated and 2 MD items were recovered including a 2.36-inch practice rocket and a 37 millimeter practice, M74, AP-T.

Anticipated Impacts and Proposed Mitigation

Hurricanes and Tropical Storms

The effects of past storm events have caused minimal to no damage in the Project area. The future threat of hurricanes at WLRRLC cannot be calculated, although the frequency of hurricane threats may increase with climate change and warming ocean waters. When a hurricane is approaching a coastal location, early evacuation is usually standard mitigation to address the possibility of accompanying storm surge with high winds. The National Weather Service provides guidance and when necessary during an event, issues a hurricane watch when a storm is expected to make landfall within 36 hours. A hurricane warning is issued when landfall is likely within 12 to 24 hours.

Earthquakes

All buildings for the Project will be constructed in compliance with regulatory controls to meet City and County of Honolulu Building Code requirements as appropriate to IBC seismic probabilities.

Flooding and Tsunami Inundation

The location of the planned loʻi is within Flood Zone A, which falls within a defined Special Flood Hazard Area, or General Floodplain. Development of the pavilion/hale, composting toilets, trash bin and parking area will be located outside of this Special Flood Hazard Area. Prior to the construction of any buildings or structures, and development activities such as grading work, a flood study that delineates the limits

of flooding and base flood elevations for Waihe'e Stream will be submitted and approved by the Honolulu Department of Planning and Permitting, pursuant to the provisions of ROH §21A.

The entire Project area is located outside of the extreme tsunami zone (*Figure 1.5*). The location's distance 0.9 miles inland and elevation at over 100 feet above sea level provide the Project area with protection from tsunami threats, and it is highly unlikely that a tsunami event could directly impact the Project.

Climate Change and Sea Level Rise

Using the potential for chronic flooding with 3.2 feet of sea level rise exposure area (SLR-XA) as the vulnerability zone for planning purposes, it is noted that no portion of the Project is located within areas potentially exposed to chronic flooding with sea level rise *(Figure 3.9).* Due to the property's elevation and distance away from the coastline, the Project is not anticipated to be substantially impacted by sea level rise, nor will the Project contribute to additional greenhouse gas emissions associated with long-term climate change. Therefore, no mitigation measures are needed.

Climate Change and Water Resources

The forecasted reduction in precipitation due to climate change will reduce the supply of freshwater for drinking as well as stream flow. In addition, native plant and animal distribution may change. It will be extremely important to reforest the area with native plants that are already adapted to this climate and remove those invasive species that are detrimental to their success. It has been proven that the groundwater recharge rates of invasive species are significantly lower than native species due to the invasive's low throughfall and high evapotranspiration rates (Mair, 2009).

BWS will need to continue their diligence in increasing the efficiency of water supply infrastructure to maintain drinking water needs as well as maintaining stream flow so that it is sufficient to support stream life as well as kalo and agricultural activities.

Restoration of lo'i in this area will be important on a watershed level. The lo'i system enhances environmental sustainability by maintaining aquatic and riparian habitat as well as the integrity of the hydrologic cycle (including coastal discharge, stormflow dissipation, and groundwater recharge), instream flow for other water uses, and integrity of the Hawaiian culture (Penn n.d.).

The Project is not anticipated to have any negative impact on climate change and water resources. Instead, it is anticipated to improve forest health and recharge the aquifer, which is vital in mitigating climate change.

Manmade Hazards

The Zapata Engineering report (2008) evaluated several remedial scenarios and recommended the alternative "Clearance to Detectable Depth with Institutional Controls". Clearance to Detectable Depth was recommended within an approximately 100-foot buffer at the base of where the slope changes to less than 33 percent along the perimeter of the former impact area boundary *(Figure 2.7).* In conjunction with Clearance to Depth, it was recommended that Institutional Controls including warning signs and literature be established. It was recommended that the warning signs should be placed at the perimeter of the former impact area every 1,000 feet (for three miles) totaling 15 signs and a bulletin board at the Kahalu'u gate (at Waihe'e Road).

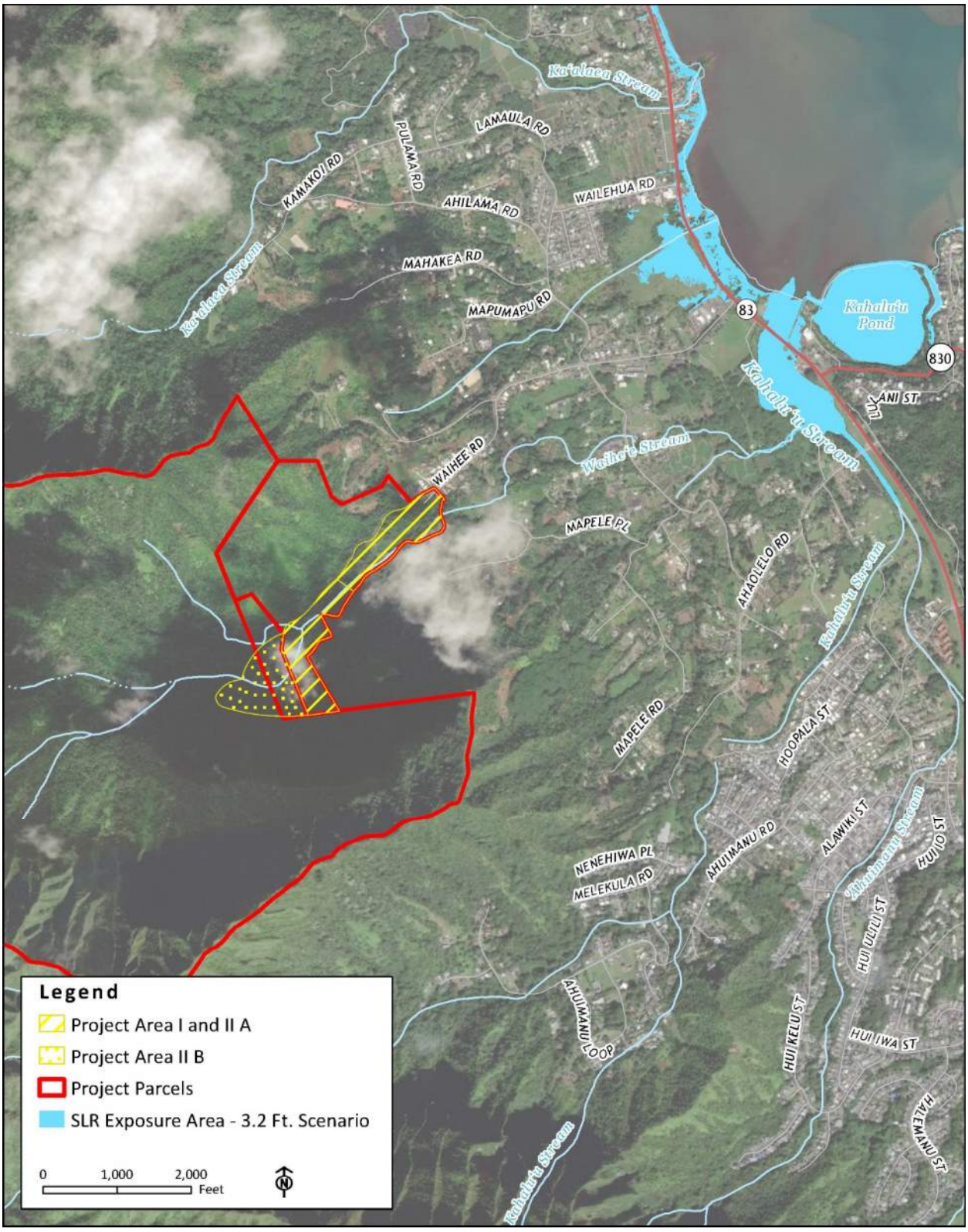

Figure 3.9 **Potential for Chronic Flooding with 3.2 Feet of Sea Level Rise (SLR-XA)**

3.7 Flora and Fauna

Existing Conditions

Flora

A 2019 botanical survey conducted by Hui Kū Maoli Ola, LLC and G70 *(Appendix I)* characterizes the vegetation within and immediately surrounding the Project area as Alien Wet forest. Of the 84 plant taxa identified during these surveys, approximately 19 (23%) may be considered native to the islands. A 2007 vegetation survey of Board of Water Supply lands in the Waiheʻe and Kahaluʻu Valleys conducted by the Hawaiʻi Biological Survey of Bishop Museum (BISH) identified fewer than one-third (31%) of the plants as being native in origin. This finding demonstrates the effects of significant past disturbance by activities such as agriculture and intensive ungulate grazing. Most of the native plant species identified in the BISH surveys were tucked away deep at the base of the valleys and gulches, or high up on steep slopes and rocky ridges.

The BISH survey suggests that the primary threat to native plant species and the ecological integrity of the valleys is the spread of invasive alien plant species. Most of the Project area is a dense mixture of alien tree and shrub species; only five indigenous species were identified during these surveys: ʻekaha (*Asplenium nidus*), moa or whisk fern (*Psilotum nudum*), uluhe (*Dicranopteris linearis*), palaʻa (*Sphenomeris chinensis*) and ʻakiohala (*Hibiscus furcellatus*).

Alien plants identified during recent botanical surveys within the Project area include those common to the Alien Wet forest plant community such as: shoebutton ardisia (*Ardisia elliptica*), juniperberry (*Cytharexylum caudatum*), fiddlewood (*Citharexylum spinosum*), octopus tree (*Schefflera actinophylla*), simpoh ayer (*Dillenia suffruticosa*), albizia (*Falcataria moluccana*), java plum (*Syzygium cuminii*) and strawberry guava (*Psidium cattleianum*), among others.

Much of the observable canopy along the road and in the interior of lower elevation areas of the Project site also host colonies of climbing vines. Commonly observed species include maunaloa (*Canavalia cathartica*), pothos (*Epipremnum pinnatum*), maile pilau (*Paederia foetida*), and bitter yam (*Dioscorea bulbifera*).

Dominant canopy and understory species varied throughout the Project area *(Figure 3.10).* A large portion of the central interior between the road and Waiheʻe Stream is overcome by extensive thickets of impenetrable hau (*Hibiscus tiliaceua*) shrubland. The northernmost portion of the Project area contains a mixed canopy, primarily made up of invasive species such as shoebutton ardisia, juniperberry, fiddlewood, African tulip, trumpet tree, and octopus tree and punctuated occasionally by hala (*Pandanus tectorius*). Higher elevation areas in the mauka direction of the Project area are contain sudden and distinct shifts in the dominant species composition with patches of monotypic forest alternating between shoebutton ardisia, simpoh ayer, strawberry guava, and fiddlewood. A grove of hala trees grows at the base of a gulch on the northwestern ridge face.

The plant communities established along the access road on the western boundary for the Project line consist of a diverse mixture of alien grasses, shrubs and trees. Species most commonly observed include the typical invasive grasses such as guinea grass (*Megathyrsus maximus*) and California grass (*Brachiaria mutica*), as well as tree species such as albizia (*Falcataria moluccana*), simpoh ayer, juniperberry, and fiddlewood. Native ferns uluhe (*Dicranopteris linearis*) and palaʻa (*Sphenomeris chinensis*) were occasionally sited along the roadway. A small grove of coffee (*Coffea arabica*) and mountain apple (*Syzygium malaccense*) grow between the road and a large field of white ginger (*Hedychium coronarium*) where a new loʻi has been proposed for construction.

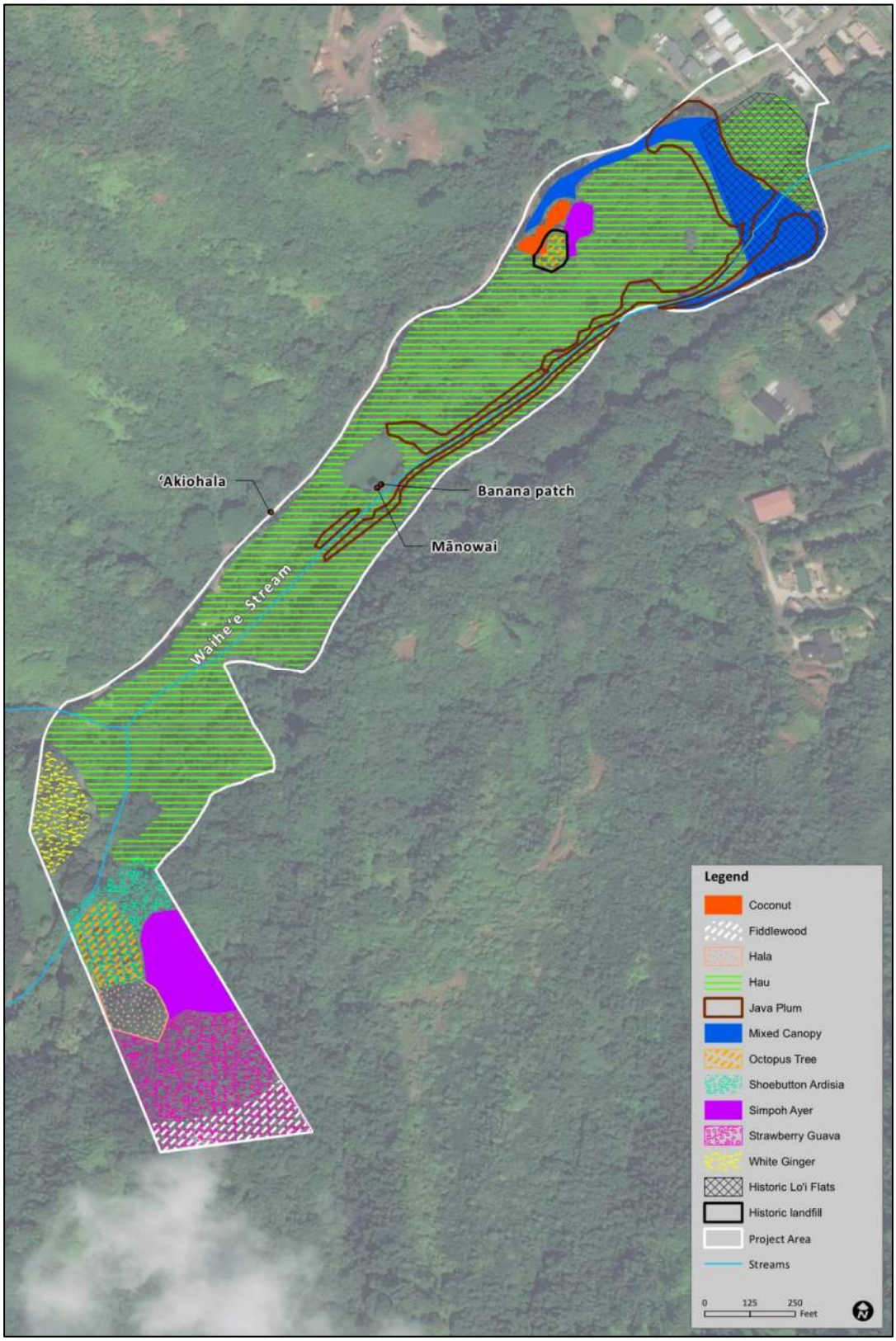

Figure 3.10 **Distribution of Plants Based on 2019 Botanical Survey**

No plants which are proposed or listed as threatened or endangered species under state or federal regulations were observed during these surveys and none have been previously documented in the proposed Project area. BWS lands in the upper mauka section of Waiheʻe are contained within Unit 20 of the U.S. Fish and Wildlife Service (USFWS) 36 Critical Habitat units for Oʻahu; however, the boundaries for this unit lie outside of the Project area.

Fauna

The 2019 avian survey by AECOS *(Appendix H)* observed 18 species of birds from 13 different families in the Waiheʻe Project area. Nearly all the avifauna observed were non-native species, with the exception of a single Pacific Golden-Plover or kōlea (*Pluvialis fulva*), an indigenous migratory species, and two ducks that are presumed to be hybrids of the native koloa and introduced Mallard species. A 2007 survey of nearby Kahaluʻu Valley recorded 15 different avian species representing 11 families. Only one of those species observed, an indigenous migratory shorebird called the wandering tattler (*Tringa incana*), is considered native to the Hawaiian Islands. Unlike the survey in 2007, no Oʻahu ʻelepaio (*Chasiempis ibidis*) were observed during recent avian surveys, though Critical Habitat for this species occurs just mauka of the Project area.

Avian diversity in the area during 2007 was reported as relatively low, though densities of several species were relatively high. The Japanese white-eye (*Zosterops japonicus*), red-vented bulbul (*Pycnonotus cafer*), and chestnut munia (*Lonchura atricapilla*) were among those species making up nearly half of the total recorded observations. The Japanese white-eye continued to make up a significant portion of avian sightings in the most recent survey, along with the spotted dove (*Streptopelia chinensis*) and the red-vented bulbul.

State listed waterbirds such as the Hawaiian Duck *(Anas wyvilliana),* Hawaiian Stilt *(Himantopus mexicanus knudseni),* Hawaiian Coot *(Fulica alsi),* and Hawaiian Common Gallinule *(Gallinula chhloropus sandvicensis)* have the potential to occur in the vicinity of the project area.

Protected seabirds may utilize cliff habitat in upper Waiheʻe Valley, and have some potential to overfly the Project area. Protected seabird species include threatened Newell's Shearwater or ʻaʻo *(Puffinus newelli),* endangered Hawaiian Petrel or ʻuaʻu *(Pterodroma sandwichensis),* and endangered Band-rumped Storm-Petrel or ʻakēʻakē *(Oceanodroma castro).*

Domestic dog (*Canis lupis familiaris*) was observed with hikers on the BWS access road throughout the survey period. Feral pig (*Sus scrofa*) wallows and scat were detected in the survey area near the stream. Distribution surveys for the ʻŌpeʻapeʻa or Hawaiian hoary bat (*Lasiurus cinereus semotus*) conducted across Oʻahu in 2018 included Waiheʻe Valley and nearby ʻĀhuimanu and Waikāne Valleys, however no bats were detected. No other mammalian species were detected during this survey.

AECOS also performed an aquatic biota survey in 2019 *(Appendix H) but* did not observe any aquatic species protected by state or federal endangered species statutes in Waiheʻe Stream or the ʻauwai in the Project area. The aquatic biota comprises both native and non-native species. The AECOS survey found hīhīwai (Neritina granosa), an endemic, amphidromous snail, tucked under boulders throughout the Project area. The native dragonfly or pinao *(Anax junius)* was observed, and previous studies reported at least three endemic species of pinao ʻula (Hawaiian damselflies) - Hawaiian upland damselfly *(Megalagrion hawaiiense),* blackline Hawaiian damselfly *(M. nigrohamatum nigrolineatum),* and Oceanic Hawaiian damselfly *(M. oceanicum).*

The introduced amphidromous Pacific prawn *(Macrobrachium lar)* resides in the deeper pools of Waiheʻe Stream, and bottom-dwelling ʻoʻopu nākea *(Awaous stamineus)* and bristle-nosed catfish *(Ancistrus c.f. temmincki)* are the most common fishes in Waiheʻe Stream within the Project area. External parasitic leeches (most likely *Myzobdella lugubris)* were conspicuous on the fins of several ʻoʻopu nākea. A single ʻoʻopu alamoʻo or ʻoʻopu hiʻu kole *(Lentipes concolor)* was observed a short distance upstream from the Project area.

Guppy *(Poecilia reticulata)* and swordtail *(Xiphophorus helleri)* inhabit the shallow side pools of the stream and are common in the slower-flowing waters of the ʻauwai through the Project area. Crayfish *(Procambarus clarkii)* and minute grass shrimp *(Neocaridina denticulata)* are also found in the silt bottom and grassed sides of the ʻauwai.

Anticipated Impacts and Proposed Mitigation

The WLRRLC Project is not expected to adversely impact the flora and fauna of Waiheʻe Valley. On the contrary, the loʻi and forest restoration activities will gradually improve the ecological integrity of this area as alien plants which pose a threat to the forested watershed are replaced with plants that help to capture and store water, prevent erosion and severe runoff, and produce food.

The movement of plant or soil material between worksites will be minimized to reduce the potential impacts that invasive fungal pathogens (e.g. Rapid 'Ohi'a Death), vertebrate and invertebrate pests (e.g. Little Fire Ants, Coconut Rhinoceros Beetles), or invasive plant parts could inflict onto native species and ecosystems. The Oʻahu Invasive Species Committee will be consulted in planning, design, and construction of the project to learn of any high-risk invasive species in the area and ways to mitigate spread. All equipment, materials, and personnel will be cleaned of excess soil and debris to minimize the risk of spreading invasive species. Gear that may contain soil, such as work boots and vehicles, will be thoroughly cleaned with water and sprayed with 70% alcohol solution to prevent the spread of Rapid 'Ohi'a Death and other harmful fungal pathogens.

Areas identified as former working loʻi have become heavily overgrown with non-native and invasive shrubs and trees in the intervening years and will likely require extensive vegetation removal as well as excavation to be put back into cultivation. Certain areas proposed for loʻi restoration may require the reestablishment of the ʻauwai connection to Waiheʻe Stream. Additional agricultural practices that are compatible with loʻi, and appropriate to the environment (i.e. growing ʻuala, or sweet potato, on the berms between terraces) may also be restored in the Project area. Water and soil management practices will be implemented to preserve the high quality of the natural environment. Any of these restoration activities should be coordinated with downstream loʻi farmers.

Waiheʻe Stream contains nearly all possible native amphidromous species (either observed and/or reported to exist in the area previously). Project activities will not impede migration of larvae and juveniles and therefore will not include drains or grates that may capture larva, or overhanging culverts that obstruct upstream movement. Adequate water temperature (not exceeding 35°C) will be maintained by leaving a sufficient number of trees overhanging the waterways to create shade.

The potential presence of the following species may require additional consideration and mitigation measures:

- *State listed waterbirds* – Waterbirds such as the Hawaiian Duck *(Anas wyvilliana),* Hawaiian Stilt *(Himantopus mexicanus knudseni),* Hawaiian Coot *(Fulica alsi),* and Hawaiian Common Gallinule *(Gallinula chhloropus sandvicensis)* have the potential to occur in the vicinity of the project area. It is against State law to harm or harass these species. If any of these species are present during construction activities, then all activities within 100 feet (30 meters) should cease, and the bird should not be approached. Work may continue after the bird leaves the area of its own accord. If a nest is discovered at any point, the 0‘ahu DLNR Division of Forestry and Wildlife (DOFAW) Office should be contacted.

- *Seabirds* – Hawaiian seabirds may traverse Waihe‘e Valley during the breeding, nesting, and fledging seasons (March 1 to December 15). Night lights can disorient seabirds, resulting in their potential downing and harm from collision with objects and/or predation by dogs and cats if downed. Exterior facility lighting will be fully shielded, with the light directed downward so the light bulb is only visible from below the light fixture, operating at a low wattage and at a correlated color temperature of no more than 3,000 degrees Kelvin, and turned off when human activity is not occurring in the illuminated area.

  Nighttime construction activity will be avoided during the seabird fledgling period of September 15 through December 15. Vulnerable birds and possibly additional trash at the project site may attract normative predators such as cats, rodents, and mongoose. To minimize predator presence both during and post-construction, cats will be removed, bait stations placed for rodents and mongoose, and trash receptacles will be covered.

- *O‘ahu ‘Elepaio* – A pair of endemic ‘elepaio (*Chasiempis ibidis*) have previously been recorded in Waihe‘e Valley and critical habitat occurs just beyond the boundary of the Project area. This proximity may mean that some USFWS endangered forest bird recommendations apply to certain Project activities. To ensure that potential ‘elepaio habitat is not impacted, actions will be taken to ensure that mosquito populations are not increased by the creation of stagnant water habitats. To avoid impacting ‘elepaio during breeding season, removal of tree cover between January 1 and June 30 will be avoided.

- *Hawaiian Hoary Bat* – The Hawaiian hoary bat, or ‘Ōpe‘ape‘a (*Lasiuris cinereus semotus*), potentially overfly the area and may roost in the tall trees. To avoid any potential negative impacts to roosting bats, site clearing will not be removed during bat birthing and pupping season (between June 1 and September 15). If this cannot be avoided, woody plants greater than 15 feet tall will not be disturbed, removed, or trimmed without first consulting with DOFAW.

3.8 Archaeological Resources

An Archaeological Inventory Survey was conducted by Keala Pono Archaeological Consulting, LLC (July 2020) for the Project site, and is included as *Appendix J.* Few archaeological studies have been conducted in the vicinity of the study area. However, because the current project area lies along a major stream, traditional agricultural remains were expected and found including terraces, ‘auwai, and subsurface pondfield deposits.

Existing Conditions

An initial Archaeological Reconnaissance Survey (ARS) was conducted to identify surface archaeological features in the Project area, describe them, and map their distribution on the landscape. Two archaeological sites consisting of 15 features were identified during pedestrian surveys covering approximately 90% of the Project area. Approximately 10% of the area was not walked due to dense vegetation. Subsequently, an Archaeological Inventory Survey (AIS) was conducted to gather more information on all sites within the Project area and determine their exact boundaries. Vegetation was cleared to allow access to areas that were not surveyed during the ARS.

The AIS included excavation that was minimally invasive to the archaeological sites (e.g., excavate at the base of lo‘i walls rather than dig through them) so that the integrity of the sites was maintained for possible future restoration. Excavation of eight test units yielded volcanic glass, charcoal, and modern or historic materials. Two charcoal samples were submitted for wood taxa identification but they were not suitable for radiocarbon dating.

State Inventory of Historic Places (SIHP) 08919 is comprised of the main access road and two culverts associated with the road. SIHP 08920 includes the other archaeological features found within the Project area. These consist of terraces, water drainage pipes, C-shaped structures, an old road, historic structural remnants, and a possible platform. They make up a network of ditches, agricultural features, a possible animal husbandry structure, possible habitation features, and a transportation feature (road).

The access road currently used by BWS is identified as part of SIHP 08919 and labeled as Feature 08919a in *Figure 3.11.* A portion of the road can be found on a Ka‘alaea Sugar Plantation map from 1880, and the upper portion is delineated in a 1937 map, indicating that the remainder of the road was built by this time *(See Appendix J).* It is possible that this portion of the road was built by the American military, who increased their land use around Waihe‘e and other areas throughout the islands after the overthrow of the Hawaiian monarchy and U.S. claim of annexation. Features 08919b and 08919c are culverts that extend beneath the road *(Figure 3.11).* These function as water control devices and are likely historic in age.

SIHP 08920 includes 12 features *(Figure 3.11* and *Table 3.1).* These consist of terraces, water control features, C-shaped structures, an old road, historic structural remnants, and a possible platform. The largest feature of the site is a wetland agricultural complex with two ‘auwai, multiple terraces, and a mound. Overall, the site is in poor to fair condition; many of the features are severely overgrown and suffer from erosion. Several of the Site 2 features may be historic in age, while the age of most features is undetermined. The site may represent use of the area from traditional times to the present.

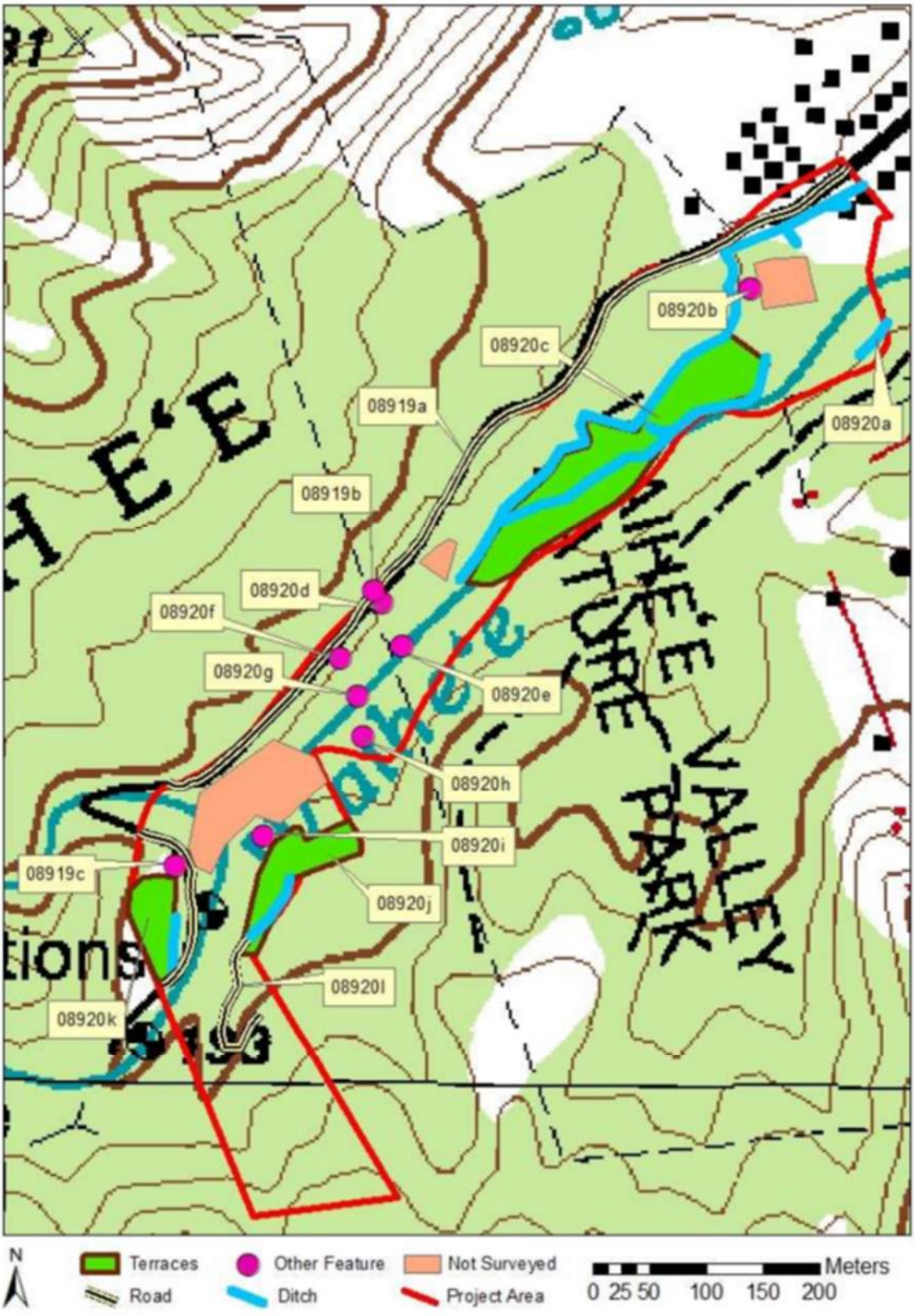

Figure 3.11 **Location of Archaeological Sites**

Table 3.1 Archaeological Features Located at the Project Site	
Feature	**Description**
08919a	main road
08919b	boulder culvert with concrete pipe
08919c	boulder culvert with concrete pipe
08920a	2nd manowai/'auwai with concrete in stream
08920b	Structural remnants including cement foundation, mortared rock, rusted metal posts, galvanized steel and cement troughs
08920c	eroded lo'i system, 1st manowai/'auwai, mound
08920d	rock wall segments
08920e	Terrace remnant with linear berm and retaining wall with drainageway
08920f	platform and alignment
08920g	possible C-shape structure single alignment of cobbles and stones
08920h	possible C-shape habitation area pile of cobbles and stones
08920i	USGS water control concrete in stream
08920j	lo'i terrace complex and 'auwai
08920k	terracing overgrown with ginger
08920l	old road

Anticipated Impacts and Proposed Mitigation

Based on the current design, the Project will impact some of these known archaeological sites, particularly 08919a, 08920d, and 08920l. The main road will continue to be used by pedestrians and vehicles. Lo'i restoration is planned for the features located at 08920d and 08920l.

SIHP 08919 and 08920 were determined to be significant under Hawai'i Administrative Rules (HAR) §13-284-6. As the road is still being utilized today, SIHP 08919 may be subjected to periodic maintenance as needed. No further archaeological work is recommended for SIHP 08919, other than archaeological monitoring, which is a project-wide recommendation. Selected features of SIHP 08920 are slated for rehabilitation. SIHP 08920 in general retains integrity of location, design, setting, materials, workmanship, feeling, and association. The features of the site are in their original location and setting, have not changed in feeling or association, and although several features are in poor condition, integrity of design and workmanship generally remain intact for the site as a whole. The site is significant under Criteria d and e of HAR §13-284-6 for its potential to yield further information on

the pre- and post-contact history of Waiheʻe Valley, and for its cultural importance. The loʻi systems are of particular cultural importance as the ditches are still utilized by farmers today, and the ancient loʻi may be rehabilitated to be functional again. A preservation plan should be prepared in accordance with HAR §13-277-3 to ensure proper treatment of this sites. The preservation plan should outline which features of the site will be rehabilitated, as well as short and long term preservation measures for these features and the site as a whole.

Additionally, archaeological monitoring is recommended for all parts of the project area 1) to ensure that none of the archaeological sites are impacted during construction; 2) to determine if archaeological features are located within the areas that could not be surveyed due to heavy vegetation; and 3) for the possibility of encountering buried archaeological features or deposits, even if none were found during subsurface testing. An archaeological monitoring plan should be prepared for the property in accordance with HAR §13-279-4. It is possible that human remains may be discovered during construction activities, even though no such evidence was found during the survey. Should the inadvertent discovery of significant cultural or historic materials and/or burials occur during site clearing and construction, all work in the immediate area of the find will cease and the State Historic Preservation Division (SHPD) will be notified, as outlined in HAR §13-275-12. No further mitigation measures are planned.

3.9 Historical and Cultural Resources

A Cultural Impact Assessment (CIA), which includes archival research and ethnographic surveys of area residents, was performed for the Project by Keala Pono Archaeological Consulting, LLC (December 2019). The findings of the assessment are included as *Appendix K.*

Existing Conditions

Waiheʻe is a well-watered area that supported large fields of taro in the pre-contact era, with both wetland and dryland taro cultivated. At least two fishponds were maintained along the coast in nearby Kahaluʻu, adding to the abundant ocean resources of the region. Moʻolelo of the area speak of competition for the marine resources, indicating the importance of ocean food sources.

Waiheʻe has a long and sustained history of cultivation, particularly with taro farming done by Hawaiian, Okinawan, Japanese, and Chinese families. The historic period brought about widespread changes to region, with sugar, rice, pineapple, military, and ranching enterprises making their mark on the landscape. Waiheʻe was put under development pressure throughout the 1900s but has largely retained its role as a rural watershed. Ongoing community concerns in the Koʻolau Poko region include water rights, flooding, and development.

The interviewees shared their extensive knowledge and experiences of Waiheʻe. Several place names and mele names were shared. It was noted that the name Hāmama Falls refers to a portal to a different realm. One mele of the area is titled Ka Ua Poʻai Hale or Poʻai Hala. The mele speaks of a rain that swirls around the hala groves that the region is known for. Traditional gathering practices were also identified for the area. These include mamaki and ginger gathering, as well as the collecting of other plant materials by hula hālau. Old koa, mango, and ʻulu trees were discussed as important natural resources in the valley, and the ʻauwai is an active resource that is still maintained today.

The project area was discussed as a critical piece of the Waiheʻe and Kahaluʻu watersheds, the waters from which flow makai, impacting kalo farmers and the community further down the valley. The streams were also mentioned as important resources for Hawaiian freshwater species including the hīhīwai and ʻoʻopu. Interviewees also identified several archaeological sites including loʻi, ʻauwai, walls, adze quarries, and burial sites that may lie within the Project area.

The area has seen many changes over the years, including shifts in water flow due to stream alterations, as well as increased foot traffic as the valley became identified as a popular hiking destination on social media. Consequently, restrictions to access were placed to reduce the hiking footprint of trash, defecation, and erosion. The increased bacteria levels in the stream were noted, due to the high levels of incoming traffic.

Anticipated Impacts and Proposed Mitigation

The interviewees were concerned about the large numbers of hikers in the valley and the negative effects this has had on the ʻāina and its residents. Managed access and invasive plant species removal were recommended. The idea of inviting hunters in to help control the feral pig population was put forth, as well as offering cultural residency to interns who could live and work in the valley for a period of time. Due to what happens in the mauka areas affecting those downstream, it was recommended that the residents and farmers downstream should be consulted on the proposed project.

Whereas the proposed project may affect the cultural resources and practices previously noted, the interviewees generally expressed that the effects would be positive, particularly since the Waiheʻe Riparian Learning Center is focused on reviving loʻi and ʻauwai systems and engaging the next generation with cultural watershed use. The project has the potential to provide a system for reciprocal-based access and aid in invasive plant species removal. The design of the gate and parking lot framework will have wider implications for parking, access, and neighborhood traffic and safety. In all, the Project is a product of community effort and the work of the KEY Project and was generally supported by all interviewees.

3.10 Socio-Economic Characteristics

Existing Conditions

The WLRRLC will be located in Kahaluʻu, between Heʻeia and Waikāne, just north of Kāneʻohe. The Project site is situated within the census tract 103.03 (Kahaluʻu-Waikāne). According to the Hawaiʻi 2012-2016 American Community Survey 5-year Estimates by census tracts, the Kahaluʻu-Waikāne Census Tract has a population of 4,755 and a median household income of $78,553 with 26.4 percent of residents having a bachelor's degree or higher. Adjacent tract 103.05 (ʻĀhuimanu) was also used in the socio-economic characteristics of the area. The ʻĀhuimanu Census Tract has a population of 4,631 and a median household income of $91,838 with 34.6 percent of residents having a bachelor's degree or higher.

Collectively, the population of Kahaluʻu-Waikāne and ʻĀhuimanu is 9,386, which is about 1% of Oʻahu's total population (988,650 (U.S. Census Bureau, Population Division, 2017)). Compared to Oʻahu as a whole, the population surrounding the Project area brings in a relatively higher income, and is composed of proportionately more persons of Caucasian, Native Hawaiian/Pacific Islander ethnic backgrounds, and a smaller percentage of persons of Asian ethnic background.

Anticipated Impacts and Proposed Mitigation

The proposed WLRRLC Project will have no foreseeable adverse impacts on the residential population or socioeconomic character of the area. While it is anticipated that the Project will slightly increase visitor activity, the marginal increase in visitor numbers should not significantly change the character or culture of the area. Visitors will mostly be student groups and work groups.

There are no permanent residential units being developed in conjunction with the WLRRLC Project; therefore, the Project will not affect land and housing speculation, property values of area homes, or affordable housing in the area.

The development of the WLRRLC improvements will have some short-term economic benefits resulting from the construction of facilities and labor-intensive work involved in clearing land, removing invasive species, restoring native plants, and restoring fallow loʻi. Construction costs are estimated to be between $500,000 and $1,000,000.

Long-term economic benefits will result from ongoing educational programs and the continuing need for labor to cultivate agriculture and maintain the high quality of the natural environment. The proposed action will support jobs for educators, researchers, natural resource and conservation specialists and managers, and farmers. Thus, the Project should increase diversified economic opportunities for residents, particularly those related to environmental work and education. The overall rate and pattern of economic growth in this portion of Oʻahu will not be significantly impacted by the Project. Public costs for construction and ongoing activities will be negligible.

3.11 Visual Resources

Existing Conditions

The Project site is located in the District of Koʻolau Poko near the community of Kahaluʻu on the island of Oʻahu. This area boasts unique scenery and outstanding natural beauty, which includes views of Kāneʻohe Bay, the steep cliffs of the Koʻolau mountain range, and lush valleys of dense forests and winding rivers.

The Project area is notable for its rural characteristics and for maintaining a rural environment at the urban periphery. Local planning guidelines and objectives uphold the importance of maintaining the rural character of the area, as well as protecting open space while supporting new development that reinforces the local culture and conforms to the natural landscape.

Anticipated Impacts and Proposed Mitigation

The natural environment of Waiheʻe Valley will be maintained and enhanced by the WLRRLC Project. The Project will improve visual characteristics at the property by removing alien invasive species, restoring fallow loʻi, and through continuous landscaping and property maintenance. Well-known (although restricted) hiking, swimming, and recreational areas in Waiheʻe Valley, such as Hāmama Falls, Waiheʻe Falls, and the Ice Pond, will be unaffected by the proposed Project, or even improved due to the education outreach by the WLRRLC.

Proposed facilities, uses, and activities for the Project are compatible with the natural landscape and the area's existing visual qualities. The proposed parking lots are small and will not drastically alter the rural characteristics of the area, nor will they further reduce the visual quality of the area. Scenic views of the land in and around Waiheʻe Valley will not be adversely altered by any of the proposed uses. The visual characteristics will be improved as the facility grounds will be properly maintained.

3.12 Utilities

A Preliminary Engineering Report (February 2020) was conducted by G70 to assess the existing infrastructure at the Project site and to determine the extent of infrastructure and utility improvements needed to support the WLRRLC. The following section provides key highlights and assesses potential impacts of infrastructure and utility needs for the planned improvements, with detailed information provided in *Appendix L.*

Water

Existing Conditions

There is an existing 24-inch BWS waterline that runs through the site and provides potable water service to Waiheʻe Road and downstream. It was observed that there are water spigots and valves along the BWS access road. The pipe is in a 20-foot road and pipeline easement.

Anticipated Impacts and Proposed Mitigation

A new lateral is anticipated to connect to the existing 24-inch BWS waterline. Access to water will be needed for the proposed pavilions and hose bibbs so that volunteers can wash their hands and tools can be cleaned. Extensive water use is not expected.

Fire Protection

Existing Conditions

There are currently no fire protection systems on the project property. The private gravel/dirt driveway throughout the property ranges from 9' to 12' wide, which does not provide the minimum 20' to allow for fire access. The closest BWS fire hydrant (W01673) is located along Waiheʻe Road approximately 560 linear feet away from the first gate. The static pressure provided by BWS for the fire hydrant is 68 pounds per square inch (psi) with a residual pressure of 52 psi and a flow of 1,000 gallons per minute (gpm).

Anticipated Impacts and Proposed Mitigation

There are no occupancy requirements available for open-air pavilions, and according to the 2012 International Building Code (IBC), an occupiable space is a room or enclosed space. Therefore, the pavilions are not occupiable, and there are no fire requirements. Unless a different occupancy type is determined, the need for fire access, water capable of supplying fire flow protection, and unobstructed width and unobstructed vertical clearance of a fire apparatus access road is not required.

Wastewater

Existing Conditions

There is no existing infrastructure for wastewater on or near the proposed site. Municipal wastewater infrastructure does extend any further than the Kahekili and Kamehameha Highway intersection.

Anticipated Impacts and Proposed Mitigation

To determine estimated wastewater usage, it was assumed that the Project site will be used year-round and accommodate 20 volunteers/staff, 100 visitors one weekend per month, 100 visitors one weekday per month, and 125 hikers per day. Based on these estimated counts, a Clivus Model M54 double stall composting toilet is recommended at each of the pavilions. Each stall has the capacity of 44,000 annual uses. Since this is a tank system, no significant impacts to the groundwater underlying the project site are anticipated. Humanure (human excreta and sawdust or other carbon source) will be pumped and removed from the composting toilets as needed.

Electrical Power

Existing Conditions

Electric poles follow the BWS utility road to the Waihe‘e Water Tunnel. Electricity is provided by Hawaiian Electric Co. (HECO) via 12 kilovolt (kV) distribution lines extending from Kamehameha Highway.

Anticipated Impacts and Proposed Mitigation

The existing electricity on site can be accessed for Project uses. Electricity may be needed to provide lighting for the pavilion, and for ventilation operation in the composting toilets. Ventilation requirements for power will need to come from an electrical source or an optional photo-voltaic system. No additional impacts are anticipated.

3.13 Roadways, Access and Traffic Conditions

Existing Conditions

The Project site is accessed by Waihe‘e Road via Kamehameha Highway in Kāne‘ohe. Waihe‘e Road, a paved residential street, terminates at a dead end where BWS access road into the valley begins. There is a gate at the entrance to this road owned by the Department of Parks and Recreation. Legal access to Waihe‘e Valley is currently restricted to BWS staff and those that have obtained a BWS permit to enter the area. However, thousands of hikers enter the mauka areas of Waihe‘e on a monthly basis, parking along Waihe‘e Road and negatively affecting neighbors with blocked driveways and trash.

The nearest bus access to the site is via Route 60, which stops on Kamehameha Highway at Waihe‘e Road. The intersection of Waihe‘e Road and Kamehameha Highway was identified by residents as a concern for both congestion and traffic safety due to activities at Kahalu‘u Regional Park and the beach park/canoe area opposite it, as well as sight distance limitations for travelers passing through Kahalu‘u in either direction. To address these concerns, the Department of Transportation suggested the construction of a traffic circle round-about in this intersection, which was later modified to include stacked turning and merging lanes.

Off-Street Parking and Loading

Adequate off-street parking will be provided to support the new pavilions, per the City and County of Honolulu Land Use Ordinance (LUO) Sec. 21-6.20. Due to the pavilion use as a public structure, actual parking will need to be determined by the Director of the City and County of Honolulu Department of Planning and Permitting. A bike rack to secure bikes and mopeds for the volunteers and visitors will be included adjacent to the pavilion *(Figure 2.1).*

The first gravel parking lot is planned for approximately 25 parking spaces, with room for a bus turnaround. The 2010 Americans with Disabilities Act (ADA) Standards for Accessible Design requires one accessible parking space per 1 to 25 total provided parking spaces. This will need to be a concrete ADA parking stall and access aisle with a 5-foot concrete sidewalk along the parking on the Pavilion side. The second gravel parking lot further upstream will accommodate approximately 14 parking spaces. The number of off-street loading required for places of public assembly at 1,200 is one loading space, as required under LUO Section 21-6.100 Off-street Loading Requirements.

Anticipated Impacts and Proposed Mitigation

The proposed Project is not anticipated to significantly affect traffic. In addition to residential use, hikers currently frequent the street to access the entrance that leads to the waterfalls. The main access road will continue to be used by pedestrians and vehicles to access the first parking area and pavilion. Volunteers to the Project site are anticipated to visit during non-peak traffic hours and will not significantly impact daily traffic. Visitors to the WLRRLC site will be informed to not park near homes to avoid negative impacts to the neighborhood. It is expected that presence of the WLRRLC will promote a managed control of the number and frequency of trespassing hikers. In the near-term, no more than 300 to 500 participants are anticipated annually to visit the Project area. In the long-term, visitors to the Project area are expected to double or triple in participation over time. Large groups will be asked to arrive by bus or carpool, or even park at the Kahaluʻu District Park and carpool up to the Project site.

Initial community outreach regarding the users of the first parking lot is unresolved. Most community members agree that the second parking lot further upstream should be used only by those working on the Project site. Some community members feel that the first parking lot should allow parking by hikers who are not necessarily going to participate in the Project activities. This could potentially free up parking on the street and reduce the hiker parking impact to the neighborhood. Other community members feel this parking lot should be closed off with a gate, and access only allowed for those that are participating in Project activities. By allowing hikers to park in this parking lot, it would essentially be “inviting” hikers to access an area that community members would like to otherwise protect and potentially close off to the masses.

Waiheʻe residents may be temporarily affected by a slight increase in truck traffic and construction-related activities, but these short-term impacts to Waiheʻe residents will be mitigated by restricting transfer of construction materials and equipment to off-peak hours to minimize any possible disruption to traffic on the local streets. The contractor will coordinate with the nearby school regarding student dismissal times. Deliveries will avoid the afternoon peak time for school-related traffic to ensure the safety of the students. All necessary signs, lights, barricades, and other safety equipment will be installed and maintained during the construction phase of the project. Notification and coordination with area representatives, neighborhood board, as well as the area residents, businesses, emergency personnel, Oʻahu Transit Services, Inc., etc., regarding the impacts of construction and operation on the adjoining local street area network will occur throughout the project.

3.14 Air Quality and Noise

Existing Conditions

Air Quality

The U.S. Environmental Protection Agency (EPA) established the National Ambient Air Quality Standards (NAAQS) per the requirements of the Clean Air Act (last amended in 1990) to protect public health and welfare and prevent the significant deterioration of air quality. These standards cover seven (7) major air pollutants: carbon monoxide (CO), nitrogen oxides (NO_X), ozone (O3), particulate matter smaller than 10 microns (PM_{10}), particulate matter smaller than 2.5 microns ($PM_{2.5}$), sulfur oxides (SO_X), and lead. The State DOH, Clean Air Branch (CAB) has also established State Ambient Air Quality Standards (SAAQS) for six (6) of these air pollutants to regulate air quality statewide. The SAAQS for carbon monoxide and nitrogen dioxide are more stringent than NAAQS. Hawai'i also has a stringent standard for hydrogen sulfide, which is a common odorous pollutant associated with wastewater treatment facilities.

DOH CAB regularly samples ambient air quality at monitoring stations throughout the State and annually publishes this information. On O'ahu, there are currently four (4) monitoring stations. The DOH Air Monitoring Station nearest Waihe'e is in located in Pearl City, on the other side of the Ko'olau Mountain Range. The air quality index for all three monitoring stations is currently good.

Air quality at the Project site is primarily affected by air pollutants from natural and/or vehicular sources. Natural sources of air pollution that may affect the air quality of the study area include aero-allergens from plants, and wind-blown dust from bare soil areas. Depending upon the prevailing wind direction, emissions from motor vehicles traveling in the adjacent neighborhoods or along Kamehameha Highway may be dispersed in the Project area.

Tradewinds that regularly blow from a northeasterly direction moving air pollutants on land to the southwest positively influence air quality at the Project site and throughout the State. In general, air quality in the State of Hawai'i continues to be one of the best in the Nation, and criteria pollutant levels remain well below NAAQS and SAAQS. According to the *Annual Summary 2016 Hawai'i Air Quality Data,* air quality monitoring data compiled by the DOH indicates that the established air quality standards for all monitored parameters are consistently met throughout the State and on the Island of O'ahu (excluding exceedances for fireworks and volcano emissions).

No regularly occurring odors are present at the site. Off-site odors are minimal, with potential for occasional exhaust or fuel odors from motor vehicle operations. Problems with poor air quality and elevated pollutant levels generally occur when tradewinds diminish or give way to southerly and southwesterly winds (known as Kona wind conditions). It is under stable conditions that the greatest potential for air pollutant buildup from ground level sources exists.

Noise

Hawai'i Administrative Rules (HAR) §11-46 defines maximum permissible sound levels which are intended to protect, control, and abate noise pollution from stationary sources and construction, industrial, and agricultural equipment. As detailed below, maximum permissible sound levels in various zoning districts are set for excessive noise sources during the day (7 a.m. to 10 p.m.) and night (10 p.m. to 7 a.m.) at the property line where the activity occurs.

- Class A – Residential, conservation, preservation, public space, open space, or similar type zones – 55 decibel (dBA) (day) and 45 dBA (night)
- Class B – Multi-family dwellings, apartment, business, commercial, hotel, resort, or similar type zones – 60 dBa (day) and 50 dBa (night)
- Class C – Agriculture, country, industrial, or similar type zones – 70 dBa (day) and 70 dBA (night)

Noise generated at the existing property is relatively minimal. The predominant noises in the area are associated with hikers who access Waiheʻe Stream and Valley via the local neighborhood.

Anticipated Impacts and Proposed Mitigation

Air Quality

Construction activities at the proposed WLRRLC are not expected to generate significant air quality impacts. New facilities such as parking lots and pavilions will be small with little impact to the environment, although such construction can be anticipated to produce some level of airborne pollutants. Construction activities will comply with the provisions of HAR §11-60.1-33 on Fugitive Dust. A dust control management plan can be developed which identifies and mitigates all activities that may generate airborne, visible fugitive dust. Reasonable measures will be implemented to control airborne, visible fugitive dust from the road areas and during the various phases of construction. These measures include, but are not limited to, the following:

- Planning the different phases of construction, focusing on minimizing the amount of airborne, visible fugitive dust-generating materials and activities, centralizing on-site vehicular traffic routes, and locating potential dust-generating equipment in areas of the least impact;
- Providing an adequate water source at the site prior to start-up of construction activities;
- Landscaping and providing rapid covering of bare areas, including slopes, starting from the initial grading phase;
- Minimizing airborne, visible fugitive dust from shoulders and access roads;
- Providing reasonable dust control measures during weekends, after hours, and prior to daily start-up of construction activities; and
- Controlling airborne, visible fugitive dust from debris being hauled away from the project site.

The proposed recreational and agricultural uses will not generate adverse air quality impacts. Vehicles traveling to and from WLRRLC will generate emissions; however, this traffic will be minimal.

Noise

The proposed activities for the Project include group educational activities, agriculture, clearing alien invasive species, and ongoing landscaping and site maintenance. While traffic coming into the Project area for group events will temporarily generate some noise, it is not anticipated to be significantly disruptive to residents. Project related activities will occur more than 400 feet away from the nearest residential property, and dense vegetation provides a natural barrier. Outdoor group activities will generate noise, but due to limited hours of operation during normal working hours, and due to distance away from nearby residential lots, such activities are not anticipated to produce significant adverse impact on the local neighborhood.

3.15 Public Services

Existing Conditions and Anticipated Impacts

Medical Facilities

The closest hospital to the property, the Hawaiʻi State Hospital in Kāneʻohe, is approximately six (6) miles away. Adventist Health Castle in Kailua, the next closest hospital, is approximately 11 miles away from the Project site. Several smaller medical offices exist in Kāneʻohe, about six (6) miles away from the Project area, such as the Kaiser Permanente Koʻolau Medical Office, the Straub Clinic at Kāneʻohe, and the Minute Clinic. Some visitors of the WLRRLC may infrequently require service from local medical facilities, although this will not affect the service capacity of these medical facilities.

Educational Facilities

There are three elementary schools and one intermediate school within five miles of the Project area. Kahaluʻu Elementary School is located 0.7 miles away; ʻĀhuimanu Elementary School is approximately three miles from the Project site; and Heʻeia Elementary School is 4.8 miles away. Samuel Wilder King Intermediate School is located approximately five miles away. James B. Castle High School in Kāneʻohe is the nearest high school to the proposed WLRRLC; it is just over seven miles away. The WLRRLC Project will have no adverse effect on existing educational facilities. It is expected to provide an opportunity for educational fieldtrips for nearby schools.

Recreational Facilities

Aside from the existing and unregulated recreational opportunity associated with the Waiheʻe Stream and Valley, the primary recreation area in the Project vicinity is the Kahaluʻu Community Park, located approximately 0.8 miles away. Additionally, Laenani Neighborhood Park is located 1.4 miles to the east of the Project area. These public recreational areas are not expected to be adversely affected by the WLRRLC Project.

Police and Fire Services

The Project falls within HPD's District 4, Sector 3. District 4 is the largest patrol area of the Honolulu Police Department, extending from Makapuʻu Point to Kawela Bay on the Windward side of Oʻahu. The main station for District 4 is located in Kāneʻohe, approximately six (6) miles away from the proposed WLRRLC. Fire stations 17 and 37 are the two fire stations for the Kāneʻohe area and the two closest fire stations to the Project area. Station 37, Kahaluʻu Fire Station, is located 0.6 miles from the WLRRLC Project, and Station 17 is 5.8 miles away.

The Project is not anticipated to affect police or fire services in the area. Fire protection access and firefighting support requirements for the facilities will be satisfied.

Refuse

There is currently no refuse collection service at the Project site. However, use of the area by trespassing hikers leaves intended and unintended trash that eventually litters the stream and spills out into the street and yards of neighbors located along Waiheʻe Road. Initially a garbage bag was left at the gate by a neighbor, however it could not be maintained. Trash cans or a roll-off and regular pick-up is needed to reduce litter and water pollution. One agency suggestion was to place trash cans just inside the front gate area only, with no other trash cans placed further up the trail. Opinion from community members is that if a garbage can is left out the gate entrance, it gives the appearance that hiking is allowed and encouraged.

DPR is unable to commit to the trash cans at this time as they don't have dedicated staff for this location. Park staff would need to be re-assigned to maintain trash cans with regular pick-up.

3.16 Unresolved Issues

The following issues will need to be addressed to move forward with this Project. This will entail further discussions with BWS and DPR, in partnership with the non-profit lessee and stakeholder feedback.

Phase I Project Logistics

In this early stage of the project, there may or may not be a need for a new ʻauwai to feed the new loʻi. It is uncertain as to whether it will be diverted from the existing ʻauwai, or if a new ʻauwai be created. The non-profit that oversees the restoration will need to work with downstream loʻi farmers to maintain stream flow and have minimal downstream impact.

Plans for the original location of the nursery are outside of the project area. The final location will need to be determined by the non-profit WLRRLC lessee, and parking may also need to be considered. Proper permitting will be necessary whether the nursery is on city or private lands. Any work outside the project area will need further study.

Phase II Project Vision

Early discussion with community members revealed that accessing the Phase II site first may allow for more rapid and highly visible results. The area of the current ginger patch is fairly open, and dryland taro could easily be planted and grown here. Not a lot of vegetation clearing would be necessary, and the spring that feeds the ginger patch may provide enough water that a new diversion and ʻauwai many not be immediately needed. It is uncertain at this time if this phase will occur before Phase I. While Phase I and Phase II A were surveyed for topographic, botanical, and archaeological features, Phase II B was not surveyed due to limited available funding. All proposed activities for Phase IIb will need to undergo these surveys before ground disturbance is initiated.

Vehicle Access and Parking

The number of proposed parking spaces have been allocated based on the size of the pavilions and are planned for location after the first gate. It does not include parking for hikers, although this could potentially take some of the cars off the road and reduce impact to residents. The non-profit could potentially charge a fee for parking to offset the impact created by the hikers. On the other hand, some residents felt this would encourage hikers to this location, and that is not what the community would like to see.

Managed Access and Protocol Development

The increase in hikers to the area has had a negative impact to both the environment and nearby residents. Although DPR is the landowner, there are no additional funds available for the department to enforce the "No Trespassing" signs or maintain the property. In an effort to empower the community to take charge of managing resources in the valley, a request for proposals (RFP) process will be pursued in order to lease the parcel to a non-profit community group that can implement the concept plan and provide managed access.

It will be up to the non-profit lessee to determine if access to the trail would be allowed based on involvement with activities at the WLRRLC, or if access would be allowed without this interaction. The intent of the WLRRLC is to provide education to everyone who comes to the location to have a better understanding of the proper protocol for accessing this area. Either way, managed access to the area will need to consider transportation, parking, carrying capacity, restrooms, waste management, environmental mitigation, cultural education, safety, liability insurance, maintenance, security features such as gates and fencing, and after-hours security detail to prevent chronic trespassing.

In 2019 the City Council introduced Bill 45, Relating to Watersheds and Water Reservoirs. This ordinance would amend Revised Ordinances of Honolulu, Article 3, §40-3.1, regarding trespassing in watershed and reservoir areas. The amendment would include the use of any accessway to a water reservoir site or watershed as trespassing. The legality for restricting access is unknown, especially as it pertains to Native Hawaiian gathering rights. Access to mauka watersheds may be subject to legal interpretation along guidelines presented in the Public Access Shoreline Hawaiʻi (PASH) v. Hawaiʻi County Planning Commission (1995) and Hawaiʻi Revised Statutes §§1-1 and 7-1. It is also unknown at this time as to whether mauka watersheds are considered public trust resources.

The community is concerned about protection of the significant water resources in Waiheʻe and would like to know how the capture zone above the falls will be restricted to protect the resource. According to HAR §13-105-2, a watershed can be designated as a "Restricted Watershed" where water supplies are vulnerable to contamination by public access and are therefore designated as restricted watersheds to public access. Although the nearby Waiāhole Watershed is designated Restricted, it is unknown as to whether Waiheʻe and therefore the Kahaluʻu watershed would qualify for a "Restricted Watershed" designation per Department of Land and Natural Resources. The Waiāhole Watershed may be Restricted due to its connection with State-owned Waiāhole Ditch and Trans-Koʻolau Tunnel.

Overall, a comprehensive managed access plan of some kind will be essential in order to educate the public in accordance with the new management system, protect the water source, deter residual trespassing, and prevent disturbance to Waiheʻe Valley residents.

Land Ownership

The parcel of land where the proposed project would take place is currently the property of DPR. BWS owns the mauka portion which is accessed via an easement with a gate and gravel road running through the DPR parcel. BWS' acquisition of the parcel would place the entire area, particularly the main access point, under a single jurisdiction. BWS would then have the authority to designate the area for watershed purposes as well as limiting or preventing access to the area (i.e. devising a managed access plan) and public recreational activities. However, due diligence within this regard has discovered previous unexploded ordnance (UXO) remediation, and any acquisition of the parcel will not be completed pending further remedial actions by the military.

3.17 Potential Cumulative and Secondary Impacts

Cumulative impacts are the result of incremental effects of an activity when combined with other past, present, and reasonably foreseeable future actions, regardless of what agency or person undertakes such other actions. Minor but collectively significant actions over a period of time can result in cumulative impacts to a place.

The cumulative impacts of the proposed loʻi and riparian forest education and restoration activities will be positive for the forest, the community, the public, and the watershed as a whole. Education programming and volunteers will help in the renewal and perpetuation of native forest areas and traditional agricultural practices. The reestablishment of native forest plants known to the area will create potential new habitat for native fauna, including birds and insects; assist with the capture and replenishment of groundwater resources while reducing erosion rates; provide visitors with a more authentic native riparian forest experience; and facilitate the return of Native Hawaiian cultural practices to the ahupuaʻa by eventually providing a new resource for plant materials. The taro produced from revived loʻi kalo will be a source of food and income for members of the community.

Secondary impacts are associated with an activity but do not result directly from the activity. The secondary impacts of the proposed Project are anticipated to have mitigating effects on the crowds of tourists and local visitors that come to hike and explore the area. While the number of hikers is not expected to be reduced by these improvements, the community presence in the area will be felt through the establishment of proposed facilities such as the pavilion and parking area. Similar to the Hawaiʻi Nature Center in Makīkī, the accompanying signage and the daily presence of Project staff and volunteers on site will discourage unlawful activity and help to promote pono practices that align with the overall Project vision. These things will serve to remind visitors that this place is special and cared for, setting the standard for their own behavior. Additionally, the provision of a small amount of public parking for trail access will provide a better alternative for visitors than parking in front of residences along Waiheʻe Road.

BMPs will be implemented to minimize the negative impacts of construction such as dust, erosion and noise. No chemicals will be utilized in the removal of invasive plants during the restoration process due to their proximity to important water resources, however BMPs to prevent excessive sedimentation in the stream and other potential negative impacts will be implemented when reshaping and constructing loʻi and ʻauwai.

Chapter 4

Alternatives to the Proposed Project

Chapter 4

Alternatives to the Proposed Project

The following presents an analysis of the alternatives to the proposed project.

4.1 Alternative A – No-Action Alternative

The No-Action Alternative is the baseline against which all other alternatives are measured. "No-action" refers to the future site conditions that would result should the project not proceed.

The No-Action Alternative would involve not proceeding with developing an active agricultural farm or restoring ancient loʻi, possibly losing cultural connections to place within the community, as well as losing opportunities for youth education. There would be no construction of the pavilion, parking lot, and composting toilets, thereby eliminating necessary support and functionality for any future potential of those working in the loʻi and riparian forest restoration capacities.

In the case of the No-Action Alternative, this area would continue to be posted as off-limits to the public. Recreational hikers will likely continue to trespass the gate and fence at the base of the access road to take advantage of this popularized waterfall trail. This would continue the issues identified by Waiheʻe Road residents such as parking and safety. The cost to maintain a special duty police officer at the trailhead to deter hikers would become insurmountable and detract from higher-priority police duties of public safety.

Restoration of traditional agricultural practices and of the greater forest area are the primary goals of this project. If this work is not undertaken, the natural environment in Waiheʻe Valley would continue to be dominated by introduced and invasive species, many of which pose a threat to the watershed, and no loʻi would be brought back into production. Moreover, the Koʻolau Poko Watershed Management Plan catalyst project would not be implemented, creating a loss not only of farming and educational opportunities for the community and the broader public, but for the health of the critical Waiheʻe Stream watershed. For these reasons, the No-Action Alternative was not considered a viable alternative.

4.2 Alternative B – Complete Closure

The consequences of the Complete Closure alternative would be similar to the No-Action Alternative, described above, as the area is already closed to the public. However, posted No Trespassing signs have not reduced the number of recreational users visiting the area, and the City cannot afford to continue to hire special duty police officers to monitor access at the gate. Access to the area would remain limited to BWS operations, maintenance and educational activities. Unchecked trespassing would remain a regular occurrence and visitors would continue to use Waiheʻe Road for parking, further angering residents who must continue to deal with parking and traffic issues in front of their homes.

However, since hiker counts have been reduced with the initial police presence, it is hoped that social media outlets will continue to note that this area is being enforced and that hiking is not allowed. Complete closure of the road to the waterfalls would help restrict public access to a protected watershed, most likely reducing *E. coli* counts and improve water quality.

Complete closure may be difficult to achieve. Hikers are able to go around the current gate to access the trail. It may be possible to extend this part of the gate so that it extends over the stream, but it may not be able to deter a determined hiker. Special duty police officer presences has been effective, however this is not a long-term solution for the City. The benefits of moving forward with this project outweigh those of complete trail closure. This project would enhance the natural environment in Waiheʻe and foster a community presence that reinforces good stewardship practices with visitors. The proposed facilities would serve as a volunteer base and provide spaces for hosting educational programming. Due to these reasons, the Complete Closure alternative is not considered a viable alternative.

4.3 Preferred Alternative - Proposed Action

The proposed action was determined to be the preferred alternative as it fulfills the need for a catalyst Project within a critical watershed. When implemented, this catalyst Project will provide energy, connectivity, information, and inspiration for other projects and programs within the watershed. This project also meets the needs of visitors, the community, and the natural environment. There is currently a high demand for increased access to mauka regions to experience Oʻahu's natural beauty. The Hawaiʻi State Plan promotes increased accessibility of inland areas for public recreational and educational purposes.

In this alternative, DPR would work in partnership with a nonprofit lessee through a management services contract. The construction of the proposed facilities will help to manage the volume of visitors to the area and encourage them to experience and take part in stewardship activities, while helping to mitigate environmental issues resulting from hikers. Loʻi restoration will offer an opportunity for cultural and agricultural education while providing groundwater replenishment and maintaining stream health. It is not anticipated to result in any significant adverse environmental, ecological, or social impacts.

Chapter 5

Plans and Policies

Chapter 5

Plans and Policies

In this chapter, the Project's consistency with applicable land use policies set forth in the Americans with Disabilities Act, Hawai'i State Plan, Hawai'i 2050 Sustainability Plan, Hawai'i State Land Use District Guidelines, Hawai'i Coastal Zone Management Program, Hawai'i Water Quality Standards, City and County of Honolulu General Plan, City and County of Honolulu Land Use Ordinance Guidelines, City and County of Honolulu Ko'olau Poko Sustainable Communities Plan, and City and County of Honolulu Special Management Area Guidelines are discussed.

5.1 Americans with Disabilities Act of 1991

In 1991, the Federal government enacted the Americans with Disabilities Act (ADA) to provide equal accessibility for persons with disabilities. Part of this statute requires building designs to consider and incorporate the needs of persons with disabilities. Chapter 103-50 of the Hawai'i Revised Statutes (HRS) states, "…all plans and specifications for the construction of public buildings, facilities, and sites shall be prepared so that the buildings, facilities, and sites are accessible to and usable to persons with disabilities." The Disability and Communication Access Board (DCAB) shall adopt rules for the design of buildings, facilities, and site, by or on behalf of the State and Counties.

An advisory issued by DCAB that became effective January 2, 2017 enacts outdoor recreational guidelines as required by the State of Hawai'i. The Hawai'i Outdoor Developed Areas Accessibility Guidelines apply to camping areas, picnic areas, trails and viewing areas by persons with disabilities, and are in addition to sections of the ADA Accessibility Guidelines, 36 CFR 1191.

Discussion: Site improvements, new facilities, and proposed activities at the Project area will comply with ADA and DCAB accessibility requirements.

5.2 Hawai'i State Plan

The Hawai'i State Plan establishes a statewide planning system that provides goals, objectives, and policies that detail priority directions and concerns of the State of Hawai'i; these will be discussed as they relate to the Project.

It is the goal of the State, under the Hawai'i State Planning Act (HRS §226), to achieve the following:

- A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawai'i present and future generations.
- A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people.
- Physical, social, and economic well-being, for individuals and families in Hawai'i, that nourishes a sense of community responsibility, of caring, and of participation in community life (HRS §226-4).

Specific objectives and policies of the State Plan that pertain to the Project are as follows:

Section 226-6 Objectives and policies for the economy–in general.

(b) To achieve the general economic objectives, it shall be the policy of this State to:
(10) Encourage the formation of cooperatives and other favorable marketing arrangements at the local or regional level to assist Hawai'i's small scale producers, manufacturers, and distributors.
(11) Encourage labor-intensive activities that are economically satisfying and which offer opportunities for upward mobility.
(19) Promote and protect intangible resources in Hawai'i, such as scenic beauty and the aloha spirit, which are vital to a healthy economy.

Discussion: The goals and proposed activities of the Waihe'e Lo'i Restoration and Riparian Learning Center (WLRRLC) Project are complementary to the State's objectives for the general economy. The proposed action will support jobs for educators, researchers, natural resource and conservation specialists and managers, and farmers. Thus, the Project should increase diversified economic opportunities for residents, particularly those related to environmental work and education.

Such activities as the recovery of riparian forest areas with appropriate native and non-invasive plants, and the restoration of fallow lo'i (taro patch) will renew the natural environment and enhance scenic beauty in the area. Moreover, proposed activities at the WLRRLC will communicate unique and sensitive elements of Hawai'i's culture and values, such as the importance of natural resource management and understanding the connection between ecological systems and human needs and activities.

Section 226-7 Objectives and Policies for the economy–agriculture.

(a) Planning for the State's economy with regard to agriculture shall be directed towards achievement of the following objectives:
(2) Growth and development of diversified agriculture throughout the State
(3) An agriculture industry that continues to constitute a dynamic and essential component of Hawai'i's strategic, economic, and social well-being.
(b) To achieve the agriculture objectives, it shall be the policy of this State to:
(2) Encourage agriculture by making the best use of natural resources.
(5) Foster increased public awareness and understanding of the contributions and benefits of agriculture as a major sector of Hawai'i's economy.
(11) Increase the attractiveness and opportunities for an agricultural education and livelihood.
(17) Perpetuate, promote, and increase use of traditional Hawaiian farming systems, such as the use of loko i'a, māla, and irrigated lo'i, and growth of traditional Hawaiian crops, such as kalo, 'uala, and 'ulu.

Discussion: The WLRRLC Project support's the State's policies and objectives for the economy with regard to agriculture. The Project will support the above agricultural objectives by providing educational opportunities to the community. Such activities and opportunities for education will foster increased public awareness and knowledge pertaining to the importance of streams, watersheds, and regenerative agriculture. Such engagement with the local community should also promote greater social well-being.

The proposed action will make the best use of natural resources. Planned activities in the Project area, including the maintenance of the existing ʻauwai (irrigation ditch) systems and the recovery of riparian forest areas with appropriate native and non-invasive plants, can be expected to support the social and economic goals of local farmers. Moreover, the Project's focus on maintaining irrigated loʻi and restoring native plants in the area promotes the State's objective to increase the use of traditional Hawaiian farming systems and crops.

Overall, the Project is anticipated to increase the attractiveness and opportunities for an agricultural education and livelihood in the region.

Section 226-8 Objectives and policies for the economy–visitor industry.

(b) To achieve the visitor industry objective, it shall be the policy of this State to:
(2) Ensure that visitor industry activities are in keeping with the social, economic, and physical needs and aspirations of Hawai'i's people.
(4) Encourage cooperation and coordination between the government and private sectors in developing and maintaining well-designed, adequately serviced visitor industry and related developments which are sensitive to neighboring communities and activities.
(8) Foster an understanding by visitors of the aloha spirit and of the unique and sensitive character of Hawai'i's cultures and values.

Discussion: The purpose of the Project is to educate the public about the importance of streams, watersheds, and regenerative agriculture. Proposed activities include the restoration of fallow loʻi (taro patch), proper maintenance of the existing ʻauwai (irrigation ditch) systems, and the recovery of riparian forest areas with appropriate native and non-invasive plants.

While the Project includes educational activities for visitors, it is not anticipated to become a tourist attraction or impact the State's visitor economy. It is meant instead to manage access of those that are currently trespassing in the area, and help visitors to have a deeper appreciation and respect for what they are coming to see. One strategy is to install interpretive signage to educate hikers and visitors about different focus areas, including watershed management, Hawaiian culture, loʻi restoration, invasive species, hiker kuleana and kapu in a forest reserve, and being sensitive to neighboring communities.

Section 226-11 Objectives and policies for the physical environment–land-based, shoreline, and marine resources.

(a) Planning for the State's physical environment with regard to land-based, shoreline, and marine resources shall be directed towards achievement of the following objectives:
(1) Prudent use of Hawai'i's land-based, shoreline, and marine resources.
(2) Effective protection of Hawai'i's unique and fragile environmental resources.
(b) To achieve the land-based, shoreline, and marine resources objectives, it shall be the policy of this State to:
(1) Exercise an overall conservation ethic in the use of Hawai'i's natural resources.
(2) Ensure compatibility between land-based and water-based activities and natural resources and ecological systems.
(3) Take into account the physical attributes of areas when planning and designing activities and facilities.
(4) Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.

(5) Consider multiple uses in watershed areas, provided such uses do not detrimentally affect water quality and recharge functions.
(6) Encourage the protection of rare or endangered plant and animal species and habitats native to Hawai'i.
(8) Pursue compatible relationships among activities, facilities, and natural resources.
(9) Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational, and scientific purposes.

Discussion: The Proposed Action is consistent with the State's objectives and policies regarding land based, shoreline, and marine resources. The WLRRLC Project will make the best use of natural resources. The Project aims to restore traditional agricultural practices and recover riparian forest areas with appropriate native and non-invasive species to ensure compatibility between land-based and water-based activities and natural resources and ecological systems. Educational and recreational opportunities planned for the Project will improve public awareness and knowledge pertaining to the importance of streams, watersheds, and regenerative agriculture.

Section 226-12 Objectives and policies for the physical environment—scenic, natural beauty, and historic resources.

(a) Planning for the State's physical environment shall be directed towards achievement of the objective of enhancement of Hawai'i's scenic assets, natural beauty, and multi-cultural/historical resources.
(b) To achieve the scenic, natural beauty, and historic resources objectives, it shall be the policy of this State to:
(1) Promote the preservation and restoration of significant natural and historic resources
(4) Protect those special areas, structures, and elements that are an integral and functional part of Hawai'i's ethnic and cultural heritage
(5) Encourage the design of developments and activities that complement the natural beauty of the islands.

Discussion: The WLRRLC Project supports the State's objectives and policies to preserve and restore natural and historic resources. The Project aims to restore traditional agricultural structures and practices and recover riparian forest areas with appropriate native and non-invasive species to preserve cultural and ecological elements integral to Hawai'i.

Section 226-13 Objectives and policies for the physical environment–land, air, and water quality.

(a) Planning for the State's physical environment with regard to land, air, and water quality shall be directed towards achievement of the following objectives:
(1) Maintenance and pursuit of improved quality in Hawai'i's land, air, and water resources.
(2) Greater public awareness and appreciation of Hawai'i's environmental resources.
(b) To achieve the land, air, and water quality objectives, it shall be the policy of this State to:
(1) Foster educational activities that promote a better understanding of Hawai'i's limited environmental resources.
(2) Promote the proper management of Hawai'i's land and water resources.
(3) Promote effective measures to achieve desired quality in Hawai'i's surface, ground, and coastal waters.
(8) Foster recognition of the importance and value of the land, air, and water resources to Hawai'i's people, their cultures and visitors.

Discussion: The WLRRLC Project supports the State's policies with regard to land, air, and water quality. It will maintain the high quality of the region's environmental resources, and new educational opportunities will promote greater public awareness and appreciation of Hawai'i's natural environment.

Section 226-21 Objectives and policies for socio-cultural advancement–education.

(a) Planning for the State's socio-cultural advancement with regard to education shall be directed towards achievement of the objective of the provision of a variety of educational opportunities to enable individuals to fulfill their needs, responsibilities, and aspirations.
(b) To achieve the education objective, it shall be the policy of this State to:
    (1) Support educational programs and activities that enhance personal development, physical fitness, recreation, and cultural pursuits of all groups.
    (4) Promote educational programs which enhance understanding of Hawai'i's cultural heritage.
    (9) Support research programs and activities that enhance the education programs of the State.

Discussion: The WLRRLC Project strongly supports the State's objective for socio-cultural advancement with regard to education. The purpose of the Project is to educate the public about the importance of streams, watersheds, and regenerative agriculture. The WLRRLC will provide opportunities for educational programs and activities suitable for a wide variety of guests, groups, and events, including school field trips, family outings, and individual pursuits of knowledge about Hawai'i's cultural heritage and environmental resources.

Section 226-23 Objectives and policies for socio-cultural advancement–leisure.

(a) Planning for the State's socio-cultural advancement with regard to leisure shall be directed towards the achievement of the objective of the adequate provision of resources to accommodate diverse cultural, artistic, and recreational needs for present and future generations.
(b) To achieve the leisure objective, it shall be the policy of this State to:
    (1) Foster and preserve Hawai'i's multi-cultural heritage through supportive cultural, artistic, recreational, and humanities-oriented programs and activities.
    (3) Enhance the enjoyment of recreational experiences through safety and security measures, educational opportunities, and improved facility design and maintenance.
    (4) Promote the recreational and educational potential of natural resources having scenic, open space, cultural, historical, geological, or biological values while ensuring that their inherent values are preserved.
    (5) Ensure opportunities for everyone to use and enjoy Hawai'i's recreational resources.

Discussion: The WLRRLC Project supports the State's objective for socio-cultural advancement with regard to leisure, as it will provide opportunities for visitors to engage in a traditional Hawaiian cultural experience and learn about Hawai'i's unique environmental resources.

Section 226-25 Objectives and policies for socio-cultural advancement–culture.

(a) Planning for the State's socio-cultural advancement with regard to culture shall be directed toward the achievement of the objective of enhancement of cultural identities, traditions, values, customs, and arts of Hawai'i's people.
(b) To achieve the culture objective, it shall be the policy of this State to:
    (1) Foster increased knowledge and understanding of Hawai'i's ethnic and cultural heritages and the history of Hawai'i.

(2) Support activities and conditions that promote cultural values, customs, and arts that enrich the lifestyles of Hawaiʻi's people and which are sensitive and responsive to family and community needs.
(3) Encourage increased awareness of the effects of proposed public and private actions on the integrity and quality of cultural and community lifestyles in Hawaiʻi.
(4) Encourage the essence of the aloha spirit in people's daily activities to promote harmonious relationships among Hawaiʻi's people and visitors.

Discussion: The WLRRLC Project supports the State's socio-cultural advancement objective to provide opportunities that enhance and promote Hawaiian cultural identities, traditions, values, customs, and arts. The Project will support programs and activities that enhance understanding of Hawaiʻi's cultural heritage and natural resources. The design of proposed facilities and activities are reflective of the natural environment and Hawaiian historical and cultural elements.

Section 226-27 Objectives and policies for socio-cultural advancement–government

(a) Planning for the State's socio-cultural advancement with regard to government shall be directed towards the achievement of the following objectives:
  (1) Efficient, effective, and responsive government services at all levels in the State.
  (2) Fiscal integrity, responsibility, and efficiency in the state government and county governments.
(b) To achieve the government objectives, it shall be the policy of this State to:
  (2) Pursue an openness and responsiveness in government that permits the flow of public information, interaction, and response.
  (5) Assure that government attitudes, actions, and services are sensitive to community needs and concerns.

Discussion: In operating its WLRRLC, Board of Water Supply (BWS) will adhere to its mission to provide safe, dependable and affordable drinking water to the people of Oʻahu. By moving forward with the WLRRLC Project, BWS has displayed integrity in being a responsive government to the needs and desires of the community as expressed in the Koʻolau Poko Watershed Management Plan. Presence at Neighborhood Board meetings and the willingness to continually meet with the community permits the flow of public information, interaction and response. A commitment of the Department of Parks and Recreation (DPR), the landowner in their attitude, action and service to this property will assure the community that they are sensitive to their needs and concerns.

Section 226-102 Overall Direction.

The State shall strive to improve the quality of life for Hawaiʻi's present and future population through the pursuit of desirable courses of action in seven major areas of statewide concern which merit priority attention: economic development, population growth and land resource management, affordable housing, crime and criminal justice, quality education, principles of sustainability, and climate change adaptation.

Discussion: The WLRRLC Project supports the overall direction of the State of Hawaiʻi in the areas of quality education, sustainability and climate change. The Project will provide a variety of quality cultural and educational programs that promote principles of sustainability for locals and visitors alike. The WLRRLC will provide land resource management through restoration of fallow loʻi, removing invasive plants and replacing them with natives within the surrounding forest.

Section 226-107 Quality education.

Priority guidelines to promote quality education:

(1) Pursue effective programs which reflect the varied district, school, and student needs to strengthen basic skills achievement.
(4) Promote increased opportunities for greater autonomy and flexibility of educational institutions in their decision-making responsibilities.

Discussion: WLRRLC supports the objectives and policies of the State as they relate to education by providing alternatives for delivery of educational programs to include environmental preservation, science, outdoor experiences, and service learning.

Section 226-108 Sustainability.

Priority guidelines and principles to promote sustainability shall include:

(4) Encouraging respect for the host culture.
(5) Promoting decisions based on meeting the needs of the present without compromising the needs of future generations.
(6) Considering the principles of the ahupuaʻa system.
(7) Emphasizing that everyone, including individuals, families, communities, businesses, and government, has the responsibility for achieving a sustainable Hawaiʻi.

Discussion: The WLRRLC supports the overall direction of the State in the area of sustainability. The Project is committed to environmental stewardship and sustainable practices by virtue of its programming and will incorporate environmental preservation concepts into its educational programs. The WLRRLC will allow for managed access to, awareness, and appreciation of the natural environment, reminding its visitors of their responsibility for achieving a sustainable Hawaiʻi.

Section 226-109 Climate change adaptation priority guidelines.

Priority guidelines to prepare the State to address the impacts of climate change, including impacts to the areas of agriculture; conservation lands; coastal and nearshore marine areas; natural and cultural resources; education; energy; higher education; health; historic preservation; water resources; the built environment, such as housing, recreation, transportation; and the economy shall:

(4) Consider native Hawaiian traditional knowledge and practices in planning for the impacts of climate change.
(5) Encourage the preservation and restoration of natural landscape features, such as coral reefs, beaches and dunes, forests, streams, floodplains, and wetlands, that have the inherent capacity to avoid, minimize, or mitigate the impacts of climate change.

Discussion: The WLRRLC Project will inherently prepare and mitigate impacts of climate change through the use of native Hawaiian traditional knowledge and practices to encourage the preservation and restoration of the Waiheʻe stream and surrounding forest, which has the inherent capacity to avoid, minimize, and mitigate the impacts of climate change.

5.3 Hawai'i 2050 Sustainability Plan

The long-term strategy of the Hawai'i 2050 Sustainability Plan is supported by its main goals and objectives of respect for culture, character, beauty, and history of the State's island communities; balance among economic, community, and environmental priorities; and an effort to meet the needs of the present without compromising the ability of future generations to meet their own needs.

The 2050 Plan delineates five goals toward a sustainable Hawai'i accompanied by strategic actions for implementation and indicators to measure success or failure. The goals and strategic actions that are pertinent to the Project are as follows:

Goal One: *Living sustainably is part of our daily practice in Hawai'i.* Strategic Actions: *Develop a sustainability ethic.*

Goal Two: *Our diversified and globally competitive economy enables us to meaningfully live, work, and play in Hawai'i.* Strategic Actions: *Develop a more diverse and resilient economy.*

Goal Three: *Our natural resources are responsibly and respectfully used, replenished, and preserved for future generations*. Strategic Actions: *Provide greater protection for air, and land-, fresh water- and ocean-based habitats; conserve agricultural, open space and conservation lands and resources.*

Goal Four: *Our community is strong, healthy, vibrant and nurturing, providing safety nets for those in need.* Strategic Actions: *Provide access to diverse recreational facilities and opportunities*.

Goal Five: *Our Kanaka Maoli and island cultures and values are thriving and perpetuated.* Strategic Actions: *Honor Kanaka Maoli culture and heritage; Celebrate our cultural diversity and island way of life; Enable Kanaka Maoli and others to pursue traditional Kanaka Maoli lifestyles and practices.*

Discussion: The WLRRLC Project will promote the goals of the Hawai'i 2050 Sustainability Plan and it is in alignment with the identified strategic actions listed above. Educational activities at WLRRLC will foster a strong sustainability ethic. Lo'i restoration will increase production and consumption of local foods and products, particularly agricultural products. Conservation and rehabilitation activities will improve management of the watershed area, incorporating the values and philosophy of the ahupua'a resource management system as appropriate, while protecting natural resources and restoring native and non-invasive plants in the Project area. The WLRRLC will be able to provide Kanaka Maoli cultural education for residents, visitors and the general public, protecting a place that is part of Hawai'i's unique character and cultural significance. It will also provide a place to perpetuate Kanaka Maoli food production associated with land traditions and practices, as well as provide opportunities to pass on Hawaiian culture and knowledge to the next generation of Kanaka Maoli and others. A secondary benefit of the WLRRLC Project is that will provide facilities, services and programs that meet the emotional, social and physical needs of those that are drawn to it.

5.4 Hawai'i State Land Use District Guidelines

Under the HRS §205, all lands of the State are to be classified in one of four categories: urban, rural, agricultural, and conservation lands. The State Land Use Commission (LUC), an agency of the State Department of Business, Economic Development, and Tourism (DBEDT), is responsible for each district's standards and for determining the boundaries of each district (HRS §205-2(a)). The LUC is also responsible for administering all requests for district reclassifications and/or amendments to district boundaries, pursuant to HRS §205-4, and the Hawai'i Administrative Rules (HAR), Title 15, Chapter 15 as amended. Under this Chapter, all lands in Hawai'i are classified into four land use districts: (1) Conservation, (2) Agricultural; (3) Urban, and (4) Rural.

Discussion: As classified by the State of Hawai'i LUC, the Project site is situated within the State Urban District. Urban districts are subject to activities or uses as provided by ordinances or regulations of the county within which the urban district is situated *(see Section 5.8).*

Phase II B of the Project is in the State Land Use Conservation District within two subzones, as described below. Jurisdiction of this district lies primarily with the State Department of Land and Natural Resources. Uses that are permissible within the State Conservation Land Use District are detailed in HAR §13-5. The permissible uses are dependent on the "subzone" designation(s) of the portion(s) of the property within the State Conservation Land Use District. Conservation lands are further classified into the following subzones: Protective; Limited; Resource; General; or Special. The Phase II B portion of the Project within TMK 4-7-006:023 is in the Resource Subzone, and the remainder is within the Protected Subzone. This Project will require the filing of a Conservation District Use Application (CDUA) and all required attachments such as this Environmental Assessment.

5.5 Hawai'i Coastal Zone Management Program

The Coastal Zone Management Program (CZMP) is a comprehensive nationwide program that establishes and enforces standards and policies to guide the development of public and private lands within the coastal areas. In the State of Hawai'i, the CZMP is articulated in the State Coastal Zone Management (CZM) Law in HRS §205A. The State CZM objectives and policies address ten subject areas. These subject areas include recreational resources, historic resources, scenic and open space resources, coastal ecosystems, economic uses, coastal hazards, managing development, public participation, beach protection, and marine resources.

Virtually all relate to potential development impacts on the shoreline, near shore, and ocean area environments. The Hawai'i CZM Law charges each County with designating and administering Special Management Areas (SMA) within the State's coastal areas. Any "development," as defined by the CZM Law, located within the SMA requires a SMA Use Permit.

Discussion: The Project area is not located within the coastal zone or SMA. However, HRS §205A requires all state and county agencies to enforce CZM objectives and policies as set forth in HRS §205A-2. The following table addresses the applicability of the objectives/policies to the WLRRLC in relation to the ten subject areas mentioned above.

Table 5.1 CZM Objectives/Policy Applicable to the Project	
Subject Area	**Objective/Policy**
Recreational resources	The WLRRLC will adopt water quality standards and regulate point and nonpoint sources of pollution to protect the recreational value of coastal waters.
Historic resources	Archaeological studies have been conducted for this Environmental Assessment (EA), where archaeological resources were identified and analyzed.
Scenic and open space resources	The WLRRLC will ensure that new facilities are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline.
Coastal ecosystems	The WLRRLC will promote water quantity and quality planning and management practices that maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.
Economic uses	Not applicable.
Coastal hazards	Restoration and maintenance efforts that occur in Waihe'e stream will potentially reduce stream flooding, erosion, and pollution.
Managing development	The Project site is in the State Agricultural Land Use District and is zoned Urban. All improvement activities will be conducted in compliance with State and County environmental rules and regulations. This EA identifies and, where necessary, proposes mitigation measures to address anticipated impacts from the construction and operation of the Project.
Public participation	Public notification of the proposed action will be provided with publication of the Draft EA. See *Chapter 7* of this EA for a list of agencies, organizations and individuals consulted in the preparation of the Project EA.
Beach protection	Not applicable.
Marine resources	Not applicable.

5.6 Hawaiʻi Water Quality Standards

The State of Hawaiʻi Department of Health, Clean Water Branch Hawaiʻi Water Quality Standards HAR §11-54 were most recently revised in 2014. The proposed Project is consistent with the applicable objectives and policies for state water quality standards as described below.

General Policy of Water Quality Antidegradation

(a) Existing uses and the level of water quality necessary to protect the existing uses shall be maintained and protected.

(b) Where the quality of the waters exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the director finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the state's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the director shall assure water quality adequate to protect existing uses fully. Further, the director shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control.

Discussion: Restoration of the loʻi and construction of the pavilions, composting toilets and parking areas may cause temporary elevated levels of suspended sediment. Environmental and construction BMPs will be implemented to control water quality fronting the Project area. After the Project is completed, long term water quality impacts are not anticipated.

5.7 City and County of Honolulu General Plan (2002 Amendment)

Adopted by resolution in 1977, the 1992 revised edition of the General Plan for the City and County of Honolulu sets forth the long-range objectives for the general welfare and prosperity of the people of Oʻahu and broad policies to attain those objectives. The Draft 2035 Oʻahu General Plan Update was published in November 2012, and the Revised General Plan was submitted to the City Council in April 2018 for approval. A Final Revised General Plan Update is still pending as of August 2019.

The General Plan Update provides objectives and policies intended to guide and coordinate City land use planning and regulation, and budgeting for operations and capital improvements. The Proposed Revised Plan includes continued focus on critical issues such as regional population, economic health, and affordable housing, while also addressing concerns such as climate change, sea level rise, and sustainability.

The City and County of Honolulu's objectives for population, housing, transportation and utilities, energy, public safety, and government operations and fiscal management are not applicable to the proposed Project.

The Project is consistent with the applicable objectives and policies of the current City and County of Honolulu General Plan as described below.

The Economy

Objective A: To promote employment opportunities that will enable all the people of O'ahu to attain a decent standard of living.

- Policy 1: Encourage the growth and diversification of O'ahu's economic base

Objective C: To maintain the viability of agriculture on O'ahu.

- Policy 2: Support agricultural diversification in all agricultural areas on O'ahu.
- Policy 3: Support the development of markets for local products, particularly those with the potential for economic growth
- Policy 5: Maintain agricultural land along the Windward, North Shore, and Waianae coasts for truck farming, flower growing, aquaculture, livestock production, and other types of diversified agriculture.
- Policy 7: Encourage the use of more efficient production practices by agriculture, including the efficient use of water.
- Policy 8: Encourage the more efficient use of non-potable water for agricultural use.

Natural Environment

Objective A: To protect and preserve the natural environment.

- Policy 2: Seek the restoration of environmentally damaged areas and natural resources.
- Policy 3: Retain the Island's streams as scenic, aquatic, and recreation resources.
- Policy 6: Design surface drainage and flood-control systems in a manner which will help preserve their natural settings.
- Policy 7: Protect the natural environment from damaging levels of air, water, and noise pollution.
- Policy 8: Protect plants, birds, and other animals that are unique to the State of Hawai'i and the Island of O'ahu.
- Policy 9: Protect mature trees on public and private lands and encourage their integration into new developments.
- Policy 10: Increase public awareness and appreciation of O'ahu's land, air, and water resources.

Objective B: To preserve and enhance natural landmarks and scenic views.

- Policy 1: Protect the Island's well-known resources: its mountains and craters; forests and watershed areas; marshes, rivers, and streams; shoreline, fishponds, and bays; and reefs and offshore islands.
- Policy 4: Provide opportunities for recreational and educational use and physical contact with O'ahu's natural environment.

Physical Development and Urban Design

Objective D: To maintain those development characteristics in the urban-fringe and rural areas which make them desirable places to live.

- Policy 4: Maintain rural areas as areas which are intended to provide environments supportive of lifestyle choices which are dependent on the availability of land suitable for small to moderate size agricultural pursuits, a relatively open and scenic setting, and/or a small town, country atmosphere consisting of communities which are small in size, very low density and low rise in character, and may contain a mixture of uses.

Health and Education

Objective B: To provide a wide range of educational opportunities for the people of Oʻahu.

- Policy 2: Encourage the provision of informal educational programs for people of all age groups.

Culture and Recreation

Objective A: To foster the multiethnic culture of Hawaiʻi.

- Policy 1: Encourage the preservation and enhancement of Hawaiʻi's diverse cultures.
- Policy 2: Encourage greater public awareness, understanding, and appreciation of cultural heritage and contributions to Hawaiʻi made by the City's various ethnic groups.
- Policy 3: opportunities for better interaction among people with different ethnic, social, and cultural backgrounds.

Objective D: To provide a wide range of recreational facilities and services that are readily available to all residents of Oʻahu and that balance access to natural areas with the protection of those areas.

- Policy 4: Encourage public and private botanic and zoological parks on Oʻahu to foster an awareness and appreciation of the natural environment.
- Policy 6: Provide convenient access to all beaches and inland recreation areas.
- Policy 7: Provide for recreation programs which serve a broad spectrum of the population.

Discussion: The WLRRLC Project is expected to create jobs in environmental work, education, and agriculture. Activities concentrated around restoring native vegetation and growing traditional agricultural crops using non-potable stream water will support the continued viability of agriculture along the Windward coast. The restoration of taro and native noninvasive vegetation, and proper maintenance of the existing ʻauwai system will support agricultural pursuits in the area. The WLRRLC and proposed activities are complementary to the rural nature and character of the Project location. Outreach and education will increase public awareness and appreciation for Oʻahu's land, air, and water resources. Improvements to the site will restore the natural beauty of the landscape and communicate a sense of the unique local culture and environment. The Project and proposed activities represent an opportunity for informal education appropriate for people of various age groups and educational backgrounds.

5.8 City and County of Honolulu Land Use Ordinance Guidelines

The purpose of the Land Use Ordinance (LUO) is to regulate land use in a manner that will encourage orderly development in accordance with adopted land use policies, including the County General Plan and development plans. The LUO is also intended to provide reasonable development and design standards. These standards are applicable to the location, height, bulk and size of structures, yard areas, off-street parking facilities, and open spaces, and the use of structures and land for agriculture, industry, business, residences or other purposes (Revised Ordinances of Honolulu (ROH), Chapter 21).

Discussion: The WLRRLC Project area is designated as AG-2 General Agricultural by the City and County of Honolulu's LUO. The intent of the AG-2 district is to conserve and protect agricultural activities on smaller parcels of land. Permitted uses relevant to the proposed Project include crop production, forestry, and open land. The Project includes the restoration of fallow loʻi (taro patch) and maintenance of the existing ʻauwai (irrigation) system. Moreover, educational activities will provide the public with information about streams, watersheds, and regenerative agriculture. These elements of the Project will support agricultural activities in the area and are compatible with the AG-2 district guidelines.

Phase II B of the Project is County designated P-1 Restricted Preservation, and State designated Conservation. Under HRS §205-12, the counties administer and enforce land uses in all districts other than the Conservation district. See Section 5.4 for further discussion.

5.9 City and County of Honolulu Koʻolau Poko Sustainable Communities Plan

The island of Oʻahu is divided into eight regional plan areas. Two areas are identified as "development plans," which provide guidance for future growth and development, while the other six areas are identified as "sustainable communities plans" (SCP), which aim to maintain the region's character and ensure modest development. Each regional plan implements the objectives and policies of the Oʻahu General Plan and provides direction on public policy, investment, and decision-making within each respective region. Together with the General Plan, they guide population and land use growth over a 20- to 25-year time span.

The Project site is located within the region encompassed by the Koʻolau Poko SCP (*Figure 5.1*). The Koʻolau Poko SCP was last revised in August 2017 by Ordinance No. 17-42, and it reflects the results of a community-based comprehensive review program to guide development in the region through 2035. The 2017 Plan's vision for Koʻolau Poko focuses on the long-term protection of community resources, the preservation of its residential character, and the adoption of public improvement programs and development regulations that reflect a stable population.

The Koʻolau Poko SCP establishes the region's role in Oʻahu's development pattern by defining policies in the following areas: Open Space Preservation; Parks and Recreation; Historic and Cultural Resources; Agricultural Use; Residential Use; Commercial and Industrial Uses; Institutional Uses; Military Uses, and Public Facilities and Infrastructure. The policies applicable to the Project area provided below:

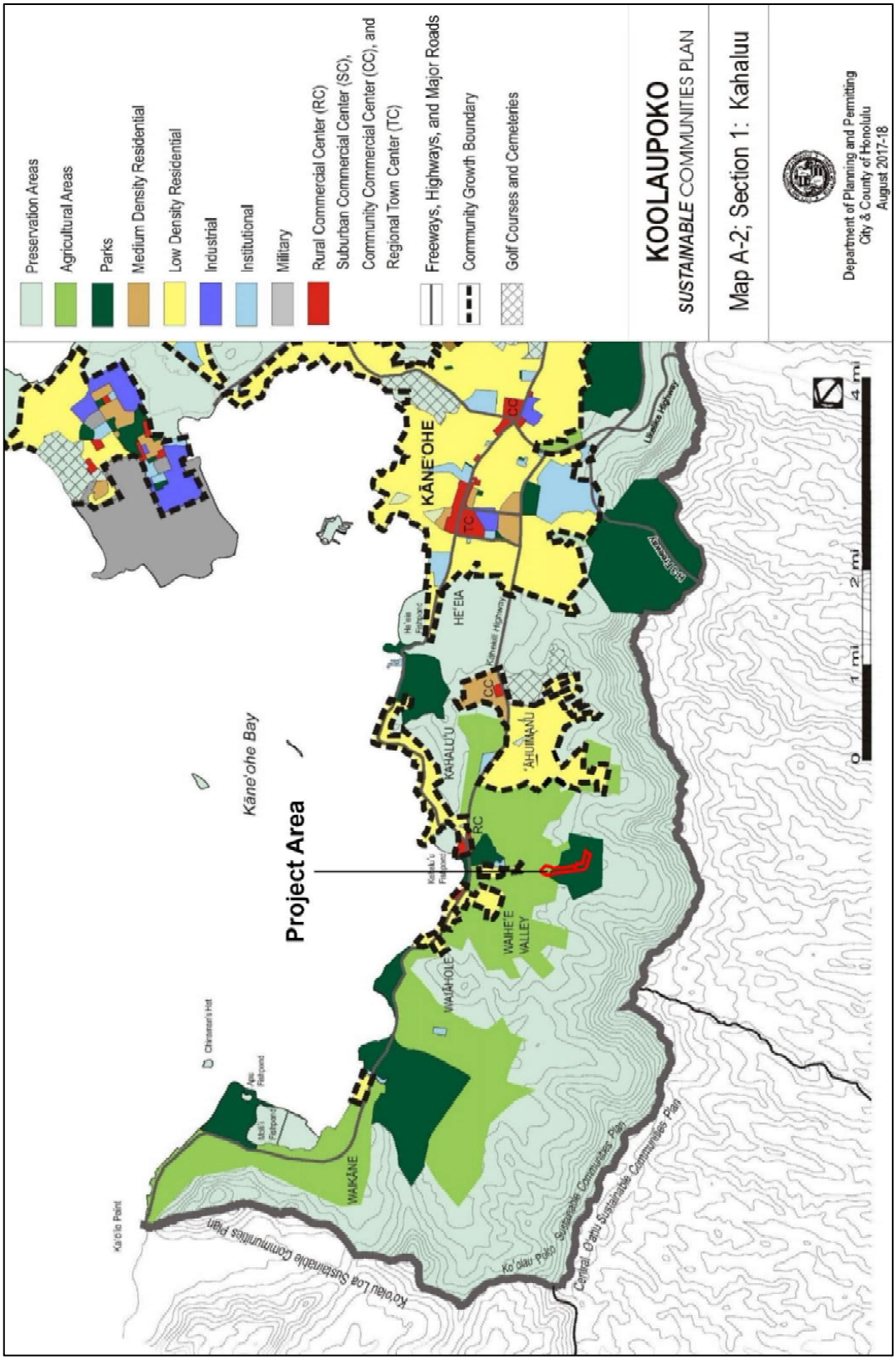

Figure 5.1 **City and County of Honolulu Koʻolau Poko Sustainable Communities Plan**

3.1 OPEN SPACE PRESERVATION

Policies

- Provide both active and passive open spaces. Active areas include community-based parks, golf courses, cemeteries and intensive agricultural uses. Passive areas include lands in the State Conservation District, drainage and utility corridors, nature parks, preserves and wetlands, and agricultural lands such as pastures, aquaculture ponds and fallow fields.
- Improve the accessibility of recreational open space for public recreational use, especially in shoreline and mountain areas (as required by City ordinance and State law). Address the need for parking and emergency vehicle access.
- Protect endangered species and their habitats.
- Protect scenic beauty and scenic views and provide recreation.

Guidelines for Preservation of Open Space and Natural Resources

- Require surveys to identify endangered species habitats and require appropriate mitigation measures to address impacts due to new developments.
- Allow outdoor lighting at the minimum level necessary for public safety, security, and community aesthetics consistent with the goals of energy conservation and environmental protection.
- Adopt outdoor night lighting standards that encourage efforts to minimize glare and stray light and reinforce the difference between urban and rural communities.

Guidelines for Mountain Areas

- Improve the sites that have been acquired for Waiheʻe Valley Nature Park and Waikāne Nature Preserve in a manner that preserves the area's natural scenic quality and provides educational and passive recreation opportunities.
- Prepare use and management plans for Heʻeia Marsh, Waiheʻe Valley Nature Park, Haʻikū Valley Cultural and Nature Preserve, and Waikāne Nature Preserve and develop those sites pursuant to those plans.
- Prepare wildlife preserve management plans emphasizing conservation and restoration of native plants, birds, fish and invertebrates.
- Minimize the adverse effects of artificial lighting on wildlife and human health by balancing the need of outdoor lighting for night utility, security, and desire for reasonable architectural expression with the need to conserve energy and protect the natural environment.

Guidelines for Natural Gulches, Stream and Drainageways

- Preserve the natural aesthetic and biological values of gulches, streams and drainageways as part of the open space system by implementing the stream classifications, design guidelines and actions contained in the Koʻolau Poko Watershed Management Plan for the protection of natural stream beds and habitat and the restoration of degraded streams.
- Alter natural drainageways only when necessary to provide flood protection for existing developed areas, and in a way that preserves aesthetic and biological values, and avoids degradation of stream, coastline and nearshore water quality. For example, impacts on biological conditions may be mitigated, as appropriate, by using v-shaped bottom channels for periods of low stream flow, rip-rap boulder lining of stream banks, streamside vegetation and

similar strategies to shade, cool and aerate the waters of the stream and provide riparian and stream bottom habitat.
- Incorporate erosion control measures and best management practices, as cited in the Hawaiʻi's Coastal Nonpoint Pollution Control Program Management Plan to prevent pollution of wetlands, streams, estuaries and nearshore waters.

Discussion: The upper regions of the Project area are in the State Conservation District and thus the State Board of Land and Natural Resources (BLNR) oversees uses in these areas. However, limited public access to upper reaches of Waiheʻe Valley and mountain areas is owned and/or managed by the County DPR and BWS. Issues regarding ownership, safety and liability must be further addressed before official access to trails can be assured. Planning and development of public access to the Project area, if pursued, will incorporate provisions for adequate parking and means for minimizing and addressing complaints from neighbors near trailheads.

All structures will avoid encroachment on upper slopes and ridgelines to preserve the visual integrity of the mountain headlands, as well as provide outdoor lighting at the minimum level necessary for safety while minimizing glare and stray light. Steps will be taken to control the number and range of feral animals and other alien species to prevent accelerated vegetation loss and soil erosion. Discussions with Department of Land and Natural Resources may be worth pursuing to designate the mauka area for pig hunting. Done safely, this would help to control the feral pig population. A 2019 vegetation survey of the Project area characterizes the vegetation within and immediately surrounding the Project area as Alien Wet forest. Alien species will be removed, and reforestation will occur with appropriate native species.

The WLRRLC will develop a soil and water conservation plan for the parcel consistent with Natural Resources Conservation Service (NRCS) soil and water conservation guidelines. The plan will define the types of native plants and crops, locations, water demands, irrigation systems, etc. that will be used. Erosion control measures and best management practices will be incorporated as specified in Hawaiʻi's Coastal Nonpoint Pollution Control Program Management Plan (1996). As discussed in *Section 2.1.2,* the WLRRLC Project will be consistent with the Koʻolau Poko Watershed Management Plan and in fact was specified as a catalyst project within the plan.

Certain areas proposed for loʻi restoration may require the reestablishment of the ʻauwai connection to Waiheʻe Stream. Although this could be considered an "alteration" to a natural drainageway, water and soil management practices will be implemented to preserve the high quality of the natural environment. Any loʻi restoration activities will be coordinated with downstream loʻi farmers. Waiheʻe Stream contains nearly all possible native amphidromous species (either observed and/or reported to exist in the area previously). Project activities will not impede migration of larvae and juveniles and therefore will not include drains or grates that may capture larva, or overhanging culverts that obstruct upstream movement. Adequate water temperature (not exceeding 35°C) will be maintained by leaving a sufficient number of trees overhanging the waterways to create shade.

The Project will provide recreation and promote access to mountain areas, ensuring environmental compatibility in the design and construction of WLRRLC facilities.

PARKS and RECREATION

Policies

- Maintain and enhance present island-wide parks by utilizing land area not fully developed for recreation use. Island-wide parks are part of the region's abundance of natural and scenic resources and contribute to the attractiveness of Koʻolau Poko to both residents and visitors.
- Construct park facilities in a manner that avoids adverse impacts on natural resources or processes in the coastal zone or any other environmentally sensitive area. In the design of recreation areas, incorporate natural features of the site and use landscape materials that are indigenous to the area in order to retain a sense of place.

Guidelines

- Improve the Waikāne Nature Preserve and Waiheʻe Valley Nature Park.

Discussion: The Project is located in an area that was designated as Waiheʻe Valley Nature Park in the 1980s. DPR acquired the property from Champion Property Corporation by way of deed, and BWS acquired control of the mauka lands surrounding the Waiheʻe Tunnel. When Frank Fasi became Mayor, he proposed a plan to create a golf course in the back of Waiheʻe Valley. The community and BWS banded together to stop this plan, and the land was ultimately designated as a nature park to prevent development of the golf course (J. Reppun, pers. comm. July 2019). DPR maintenance of the property is limited and no improvements to the property have been made since that time.

Despite the gate and "No Trespassing" signs, Waiheʻe Valley has become an increasingly popular recreational destination. Neighborhood frustration was vented at several Kahaluʻu Neighborhood Board meetings. In June 2019, issues discussed included hiker parking along Waiheʻe Road impacting residents, disrespectful behavior of trespassing hikers, blocking driveways, verbal altercations and other traffic concerns, trash and pet feces left on the trail and along Waiheʻe Road, and inconvenience and overall reduction in residents' quality of life. On June 19, 2019 HPD posted a vehicle and flashing road sign near the gate. The flashing illuminated messages read "NO TRESSPASSING" and "THIS IS NOT A PUBLIC TRAIL". BWS has since agreed to use water rate funding to pay for special duty police officers to enforce the no trespassing ordinance, issuing warnings and citations. Hiker access has since been reduced as well as the associated parking issues along Waiheʻe Road.

While the WLRRLC Project will not create a "park" in the traditional sense, it will establish a farm to restore loʻi kalo and promote watershed protection, sustainable agriculture, and forest restoration, with a traditional meeting hale or open pavilion for agricultural activities and cultural and educational programs. Overall, a comprehensive managed access plan of some kind will be essential in order to educate the public in accordance with the new management system, protect the water source, deter residual trespassing, and prevent disturbance to Waiheʻe Valley residents.

HISTORIC AND CULTURAL RESOURCES

Policies

- Emphasize physical references to Koʻolau Poko's history and cultural roots.
- Protect existing visual landmarks and support the creation of new, culturally appropriate landmarks.

- Preserve significant historic features from earlier periods.
- Implement in situ preservation and appropriate protection measures for sites that have high preservation value because of their good condition or unique features.
- Determine the appropriate treatment for a historic site by the particular qualities of the site and its relationship to its physical surroundings. Carefully plan and design adjacent uses to avoid conflicts or abrupt contrasts that detract from or destroy the physical integrity and historic or cultural value of the site since the context of a historic site is usually a significant part of its value.
- Establish the degree of public access and interpretation that would best promote the preservation of the historic, cultural and educational value of the site, recognizing that economic use is sometimes the only feasible way to preserve a site. Public access to a historic site can take many forms, from direct physical contact and use to limited visual contact. In some cases, however, it may be highly advisable to restrict access to protect the physical integrity or cultural value of the site.

Guidelines

- Promote the identification, survey and listing of sites that are eligible for the Hawaiʻi or National Registers of Historic Places.
- Preserve the architectural character, landscape setting and visual context of historic and cultural landmarks through appropriate zoning standards and development controls, as necessary, and public outreach programs such as design guidelines for the maintenance, renovation or expansion of older dwellings.
- Provide incentives for the preservation and maintenance of historic sites and buildings and allow for adaptive re-use of historic buildings through a permit review process.

Discussion: The WLRRLC Project is planning to restore loʻi kalo and ʻauwai that were previously in use in 1938 (see Figure 2.6), if not years before that. Loʻi dominated the landscape of the region, while the Waiheʻe ahupuaʻa takes its name from the largest loʻi terrace in Koʻolau Poko, presumed to have belonged to the aliʻi living at the back of Waiheʻe valley during the reign of Mailekukaki in the 15th or 16th century. The WLRRLC Project plants to protect and restore historic agricultural terraces, irrigation ditches, water control features, structural remnants, roads, and other culturally significant sites under supervision of a qualified archaeologist. Historic and significant sites and structures must be respected, protected from damage, and restored to ensure that the story of Waiheʻe can be shared with future generations.

WLRRLC will create a cultural plan that outlines Hawaiian protocol, values and practices to be integrated into the actions and education at the site, which can then be carried forward with future generations. A preservation plan should be prepared in accordance with HAR §13-277-3 to ensure proper treatment of this site. The preservation plan should outline which features of the site will be rehabilitated, as well as short and long term preservation measures for these features and the site as a whole. An archaeological monitoring plan should be prepared for the property in accordance with HAR §13-279-4. The WLRRLC Project will emphasize physical references to Koʻolau Poko's history and cultural roots while preserving significant historic features. The cultivation and maintenance of loʻi kalo and dryland crops will aid in the perpetuation of Native Hawaiian agricultural systems and traditional knowledge while making efficient use of water, a treasured resource in this area.

AGRICULTURAL USE

Policies

- Encourage agricultural use of small lots.
- Provide support infrastructure, services and facilities to foster and sustain agricultural operations.
- Encourage organic and sustainable agriculture.
- Encourage self-contained land-based aquaculture in appropriate locations.

Guidelines

- Focus performance standards for agricultural zoning districts on preventing degradation of the natural environment, maintaining the viability of agricultural uses, and protecting the health and safety of agricultural workers rather than on disturbance to residential uses.

Discussion: The WLRRLC Project is firmly intended as an agricultural activity with an educational component. The development of a successful project will have a primary focus on the restoration of indigenous agriculture, such as the cultivation of lo'i kalo and other native diversified crops, in areas currently overgrown with invasive vegetation. Restoration work will eventually be supplemented with educational and volunteer programs.

The WLRRLC will provide supporting infrastructure, services and facilities to foster and sustain agricultural operations and promote active, long-term agricultural uses. Students and volunteers will learn about regenerative agriculture, as well as invasive species (terrestrial and aquatic) and watersheds. Regenerative agriculture refers to a system of farming principles and practices that increases biodiversity, enriches soils, improves watersheds, and enhances ecosystem services. This type of farming aims to capture carbon in soil and aboveground biomass, reversing current global trends of atmospheric accumulation. It offers increased yields, resilience to climate instability, and higher health and vitality for farming communities, drawing from decades of scientific and applied research by the global communities of organic farming, agroecology, holistic management, and agroforestry.

WATER SYSTEMS

Policies

- Integrate management of all potable and non-potable water sources, including groundwater, stream water, storm water, and water recycling, following State and City legislative mandates.
- To protect watersheds, retain existing acreage that is designated as Preservation Area.

Guidelines

- Where new reservoirs and other above-ground infrastructure is necessary, avoid impacts to significant scenic resources; where such impacts are unavoidable, implement appropriate mitigation measures. Design and locate new water supply facilities to be compatible with the scenic environment.

Discussion: It is essential that water in the ʻauwai not be reduced to the existing downstream farms, TMKs: 4-7-006:004 and 013, which could result in actual harm. To mitigate this impact, approximately 2,000 feet of plastic distribution pipe will be installed within the two branches of the ʻauwai to eliminate the portion of water loss in the project parcel. The water saved can then be utilized in the project area. Native plants can be used to reduce the visual impact in locations where the pipe can be seen. If additional water is required for the loʻi restoration, strategies on increasing the diverted amount at the mānowai diversion will need to be investigated, designed and permitted through CWRM.

DRAINAGE SYSTEMS

Policies

- Promote drainage system design that emphasizes control and minimization of non-point source pollution and the retention of storm water on-site and in wetlands.
- Develop a comprehensive study of local flooding and drainage problems, including a phased plan for improvements.
- Design and construct modifications needed for flood protection in a manner that maintains habitat and aesthetic values, and avoids and/or mitigates degradation of stream, coastline and nearshore water quality.
- Select natural and man-made vegetated drainageways and retention basins as the preferred solution to drainage problems wherever they can promote water recharge, help control non-source pollutants, and provide passive recreation benefits.

Guidelines

- Emphasize retaining or detaining storm water for gradual release into the ground as the preferred strategy for management of storm water.
- Integrate planned improvements to the drainage system into the regional open space network by emphasizing the use of retention basins, creation of passive recreational areas, and recreational access for pedestrians and bicycles without jeopardizing public safety.
- Require periodic maintenance of stream channels and stormwater detention basins, including natural wetlands, to improve and retain their capacity for flood conditions while taking care to maintain their biological and aesthetic values.
- Designate a public agency to assume jurisdiction over abandoned irrigation ditches and reservoirs for the purpose of maintaining them as important elements of the flood control system.

Discussion: The location of the planned loʻi is within Flood Zone A, which falls within a defined Special Flood Hazard Area, or General Floodplain. Development of the pavilion/hale, composting toilets, trash bin and parking area will be located outside of this Special Flood Hazard Area. Prior to the construction of any buildings or structures, and development activities such as grading work, a flood study that delineates the limits of flooding and base flood elevations for Waiheʻe Stream will be submitted and approved by the Honolulu Department of Planning and Permitting, pursuant to the provisions of ROH §21A.

Proper landscaping, grading, and correct construction procedures will minimize drainage problems. No significant storm drainage runoff to coastal waters is anticipated. Periodic maintenance of the ʻauwai system and loʻi will improve and retain their capacity for flood conditions while taking care to maintain their biological and aesthetic values. BWS and DPR will select and award a land lease to a qualified non-profit community group to operate Waiheʻe Loʻi Restoration on a long-term agreement.

5.10 City and County of Honolulu Special Management Area Guidelines

The SMA is a designation established to preserve, protect, and where possible, to restore the natural resources of the coastal zone of Hawaiʻi. Special controls on developments within the SMA are necessary to avoid permanent loss of valuable resources and foreclosure of management options. The review guidelines of ROH §25-3.2 are used by Department of Planning and Permitting (DPP) and the City Council for the review of developments proposed in the SMA. These guidelines are derived from HRS §205A-26.

Discussion: The Project area at Waiheʻe Valley is not within the SMA as delineated by the County. In addition, the potential environmental impacts of the Project have been evaluated and determined to not pose a threat to the nearshore and coastal areas.

5.11 Koʻolau Poko Watershed Management Plan

The 2012 Koʻolau Poko Watershed Management Plan (KPWMP) provides a long-range 20-year plan for the preservation, restoration, and balanced management of ground water, surface water, and related watershed resources in the Koʻolau Poko District of Oʻahu. This plan was jointly prepared by BWS and DPP. The KPWMP is one of eight Watershed Management Plans that will form the updated Oʻahu Water Management Plan.

The KPWMP identifies "critical watersheds" within the Koʻolau Poko District. Critical watersheds are defined as: (1) providing various opportunities to promote sustainable watersheds, (2) needing protection or enhancement of water quality and quantity, (3) providing many opportunities to protect Native Hawaiian rights and traditional customary practices, (4) presenting special opportunities for organizing and implementing important watershed management actions, or (5) providing significant ground water or surface water supplies to meet current and future demand. The KPWMP also identifies high priority catalyst projects within each critical watershed. When implemented, these catalyst projects will provide energy, connectivity, information, and inspiration for other projects and programs within the watershed.

Discussion: The Waiheʻe Stream Watershed was selected as a critical watershed because it is the largest single source of potable water for the Koʻolau Poko District (about 5 million gallons per day, or one-third of all water produced by BWS in the district), and because of the many opportunities for proactive management projects within the watershed. The catalyst project in this watershed is the Waiheʻe Ahupuaʻa Initiative (WAI).

Of the many activities listed in the WAI catalyst project, this Environmental Assessment reviews the Riparian Zone Outdoor Learning Center. WAI partners have envisioned a Riparian Zone Outdoor Learning Center in the mauka area of Waiheʻe. The name of the project has evolved to the current WLRRLC Project. The goal of the Project is to restore traditional loʻi kalo and the stream environment through community education activities that re-instill a sense of shared kuleana for proper watershed management. Preliminary ideas for the WLRRLC include an ʻauwai that flows through the site to irrigate loʻi kalo as well as other diversified crops. Various other outdoor learning spaces and a greenhouse for native plants are also envisioned to restore riparian and forest areas with appropriate native and non-invasive plants.

The site chosen for the WLRRLC is on DPR land. An agreement with DPR will need to be defined for use of that site. By moving forward with the WLRRLC Project, BWS has displayed integrity in being a responsive government agency sensitive to the needs and desires of the community as expressed in the KPWMP. The intent of moving forward with this catalyst project is to provide energy, connectivity, information, and inspiration for other projects and programs within the watershed.

Chapter 6

Findings Supporting the Anticipated Determination

Chapter 6

Findings Supporting the Anticipated Determination

6.1 Anticipated Determination

Based on a review of the significance criteria outlined in Chapter 343, HRS, and Section 11-200.1-13, Hawai‘i Administrative Rules, the project has been determined to not result in significant adverse effects on the natural or human environment. A Finding of No Significant Impact (FONSI) is anticipated.

6.2 Reasons Supporting the Anticipated Determination

The potential impacts of the project have been fully examined and discussed in this EA. As stated earlier, there are no significant environmental impacts expected to result from the project. This determination is based on the assessments as presented below for criterion (1) to (13).

(1) Irrevocably commit a natural, cultural or historic resource.

The archaeological and cultural landscapes have been documented in studies conducted specifically for the project area. As detailed in *Section 3.8* of this report, the project does not involve any known loss or destruction of existing natural, cultural, archaeological or historical resources. Instead, a primary goal of this project is the restoration of historic lo‘i fields and ‘auwai segments that fell into disuse and have since been overtaken by the heavy growth of invasive vegetation.

There is the unknown potential for the inadvertent discovery of subsurface historical or cultural resources, including the unknown possibility of iwi kūpuna (ancestral remains). If any cultural or archaeological resources are unearthed or ancestral remains are inadvertently discovered, the DLNR, SHPD, the O‘ahu Island Burial Council representative and participating interests from lineal descendants and individuals will be notified. The treatment of these resources will be conducted in strict compliance with the applicable historic preservation and burial laws.

(2) Curtail the range of beneficial uses of the environment.

The project will not curtail the range of beneficial uses of the environment. Rather, the project will provide a beneficial effect by creating the infrastructure necessary to conduct restoration work and host educational programs and volunteers. Lo‘i restoration will assist with the capture and replenishment of groundwater resources while reducing erosion rates.

(3) Conflict with the State's environmental policies or long-term environmental goals established by law.

The project does not conflict with the State's long-term environmental policies or goals and guidelines as expressed in the State Environmental Policy, Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders. The very nature of the project will encourage productive and enjoyable harmony between people and their environment, promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, and enrich the understanding of the ecological systems and natural resources important to the people of Hawai'i.

(4) Have a substantial adverse effect on the economic welfare, social welfare, or cultural practices of the community and State.

The project will result in short-term economic benefits during construction that include direct, indirect, and induced employment opportunities and multiplier effects, but not at a level that would generate significant economic activity. Once construction is complete, the project will be a resource for cultural and environmental education, traditional agriculture, and possible employment opportunities within the community.

(5) Have a substantial adverse effect on public health.

The project is consistent with existing land uses and is not expected to affect public health. However, there will be temporary short-term impacts to air quality from possible dust emissions and temporary degradation of the acoustic environment in the immediate vicinity resulting from construction equipment operations. The project will comply with State and County regulations during the construction period and will implement best management practices to minimize temporary impacts.

(6) Involve adverse secondary impacts, such as population changes or effects on public facilities.

There will be no adverse secondary impacts such as population changes or effects on public facilities as a result of this project. The use of public facilities will be minimal. In addition, the project is likely to positively affect population as the number of people who are permitted to access the area will be managed and will largely be under the supervision of project staff.

(7) Involve a substantial degradation of environmental quality.

The project will not involve a substantial degradation of environmental quality and will in fact lead to improvements in environmental quality. Long-term impacts to air and water quality, noise, and natural resources are not anticipated. The use of standard construction and erosion control BMPs will minimize the anticipated construction-related short-term impacts.

(8) Be individually limited but cumulatively have substantial adverse effect upon the environment or involved a commitment for larger actions.

This project will not have substantial negative effects upon the environment and will in fact have a positive impact as restoration work is completed over time. Riparian forest restoration with native plants will uphold the integrity of the soil and water conditions and support the health of native stream animals as well as the lo'i downstream.

(9) Have a substantial adverse effect on a rare, threatened or endangered species, or its habitat.

The project site does not contain known identified rare, threatened, or endangered species or habitat. As outlined in *Section 3.6,* measures will be taken to prevent impacts to the Oʻahu ʻelepaio including timing tree disturbance and removal outside of the breeding season and avoiding the creation of stagnant water habitats to avert an increase of mosquito populations. In addition, to avoid potential impacts to Hawaiian hoary bats, tree disturbance will be limited during bat birthing and pup rearing season in the unlikely event that they may inhabit in trees within the project area. No impacts are anticipated.

(10) Have a substantial adverse effect on air or water quality or ambient noise levels.

General temporary impacts associated with construction are identified in *Section 3.0* of this EA. Mitigation measures which are outlined in this EA will be applied during the on-going construction activity. No detrimental long-term impacts to air, water, or acoustic quality are anticipated with the project improvements. The improvements are not anticipated to detrimentally affect air or water quality or ambient noise levels.

(11) Have a substantial adverse effect on or be likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, sea level rise exposure area, beach, erosion-prone area, geologically hazardous land, estuary, freshwater, or coastal waters.

The project site lies within Flood Zone D (possible but undetermined flood hazard), X (minimal flood risk outside of 0.2% Annual Chance Floodplain) and A (areas with a 1% chance of flooding). The project site is located in the upland area of Waiheʻe Valley along the Waiheʻe Stream corridor that consists primarily of somewhat poorly drained soils with low runoff rates. While Flood Zone A is noted as a General Floodplain or Special Flood Hazard area, it is also the location of the planned loʻi. Development of the pavilion/hale, composting toilets, trash bin and parking area will be located outside of this zone so that substantial adverse effects will not be suffered. The proposed agricultural and forest restoration activities will help to mitigate potential flooding lower in the watershed. The elevation of the project area is outside of the tsunami zone, sea level rise exposure area, and other coastal areas. No impact is anticipated.

(12) Have a substantial adverse effect on scenic vistas and viewplanes, during day or night, identified in county or state plans or studies.

The project will be located on the county-owned properties extending from the gate at the back of Waiheʻe Road into the forested mauka areas. The addition of the pavilions, parking areas, and composting toilets will fit into the natural surroundings and will not affect any scenic vistas and view-planes identified in City or State plans within the project vicinity. No significant adverse impacts are anticipated.

(13) Require substantial energy consumption or emit substantial greenhouse gases.

Construction of the project will not require substantial energy consumption or emit substantial greenhouse gases relative to other similar sized projects.

6.3 Summary

Based on the above findings, further evaluation of the project's impacts through the preparation of an Environmental Impact Statement is not warranted. The EA recommends mitigation measures to alleviate impacts when such impacts are identified. A Finding of No Significant Impact (FONSI) is anticipated for this project.

The project is consistent with the Hawai'i State Land Use District Boundaries; the Hawai'i State Plan; the 2050 Sustainable Plan, the Hawai'i Coastal Zone Management Plan, the Hawai'i Water Quality Standards, the City's General Plan; the City's Zoning Ordinance, Ko'olau Poko Sustainable Communities Plan, and the Special Management Area.

The project will have beneficial effects protecting and enhancing natural habitat for native plant and animal species, restoring and perpetuating traditional agricultural practices, establishing additional food resources, and educating students, volunteers and other visitors on the importance of protecting our island watersheds. Overall, the project will provide a public benefit while resulting in minimal impacts to the surrounding environment.

Chapter 7

List of Agencies, Organizations and Individuals Receiving Copies of the EA

Chapter 7

List of Agencies, Organizations and Individuals Receiving Copies of the EA

Early consultation on the project has been carried out with various agencies and stakeholder groups as part of the scoping process for this project. Parties contacted in preparation of the Draft Environmental Assessment (EA) process, comments received, those that were provided an opportunity to review the Draft EA, and Draft EA comments received are identified below. Comment letters received during these consultation processes are also provided following this list.

Table 7.1 Agencies, Organizations and Individuals Receiving Copies of the EA

Respondents and Distribution	Early Consultation	Receiving Draft EA	Draft EA Comments Received
Federal Agencies			
U.S. Department of the Interior, Fish and Wildlife Service		X	
U.S. National Marine Fisheries Service, Pacific Islands Regional Office		X	
U.S. National Oceanic Atmospheric Administration		X	
U.S. Department of the Interior, Geological Survey		X	
U.S. Department of Agriculture, Natural Resources Conservation Service		X	
State of Hawai'i Agencies			
Department of Accounting and General Services		X	X
Department of Business, Economic Development & Tourism (DBEDT)		X	
Department of Health (DOH)		X	
DOH, Clean Air Branch		X	X
DOH, Clean Water Branch		X	
DOH, Wastewater Branch		X	
Department of Land and Natural Resources (DLNR), Land Division		X	X
DLNR, Commission on Water Resource Management		X	
DLNR, Department of Forestry and Wildlife		X	X
DLNR, Division of Aquatic Resources		X	

Table 7.1 Agencies, Organizations and Individuals Receiving Copies of the EA			
Respondents and Distribution	**Early Consultation**	**Receiving Draft EA**	**Draft EA Comments Received**
State of Hawai'i Agencies			
DLNR, Engineering Division		X	X
DLNR, Land Division – O'ahu District		X	
DLNR, Office of Conservation and Coastal Lands		X	X
DLNR, State Historic Preservation Division		X	
Office of Planning		X	
City and County of Honolulu Agencies			
Board of Water Supply	X	X	
Department of Design and Construction		X	X
Department of Environmental Services		X	
Department of Facility Maintenance		X	X
Department of Parks and Recreation	X	X	X
Department of Planning and Permitting		X	X
Department of Transportation Services	X	X	X
Honolulu Fire Department		X	X
Honolulu Police Department	X	X	X
Elected Officials			
Senator Gil Riviere– State Senate District 23		X	
Representative Lisa Kitagawa – State House District 48		X	
Mayor Kirk Caldwell		X	
Council Member Heidi Tsuneyoshi – Honolulu City Council District 2	X	X	
Amy Luersen – Kahaluʻu Neighborhood Board No. 29	X	X	
Community Groups, Individuals, and Consulted Parties			
Carl Brown	X	X	
Daniel Salsedo	X	X	
Garnett J. Howard			X
Hui o Koʻolaupoko		X	
Ikaika Higa	X	X	

Table 7.1 Agencies, Organizations and Individuals Receiving Copies of the EA			
Respondents and Distribution	**Early Consultation**	**Receiving Draft EA**	**Draft EA Comments Received**
Community Groups, Individuals, and Consulted Parties			
John Reppun	X	X	
Kauaoa Fraiola	X	X	
Kaipo Faris	X	X	
Kent Yamaguchi	X	X	
KEY Project	X	X	X
Koʻolau Mountains Watershed Partnership	X	X	
Koʻolaupoko Hawaiian Civic Club		X	
Peter Field	X	X	
Robert Nakata	X	X	
Shae Cotteen	X	X	
Shelly Young	X	X	
Steve Springel	X	X	
Libraries			
Hawaiʻi State Library		X	
Kāneʻohe Public Library		X	
Other			
Honolulu Star Advertiser		X	

DAVID Y. IGE
GOVERNOR

CURT T. OTAGURO
COMPTROLLER

AUDREY HIDANO
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810-0119

(P) 20.142

AUG 18 2020

Mr. Kawika McKeague, AICP, Principal
Group 70 International, Inc., dba G70
111 South King Street, Suite 170
Honolulu, Hawaii 96813

Dear Mr. McKeague:

Subject: Draft Environmental Assessment (DEA)
Waihee Loi Restoration and Riparian Learning Center
Waihee, Island of Oahu, Hawaii
TMK: 4-7-006:010 (por.), 4-7-006:018, 4-7-006:023 (por.), 4-7-008:002 (por.)

Thank you for the opportunity to provide comments on the Draft Environmental Assessment (DEA) for the subject project. We have no comments to offer at this time, as the subject project does not appear to directly impact any of the Department of Accounting and General Services' managed facilities or properties.

If you have any questions, your staff may call Mr. Dennis Chen of the Planning Branch at 586-0491.

Sincerely,

CHRISTINE L. KINIMAKA
Public Works Administrator

DYKC:mo

111 S. King Street
Suite 170
Honolulu, HI 96813
808.523.5866
www.g70.design

January 8, 2021

Ms. Christine L. Kinimaka
Public Works Administrator
State of Hawai‘i
Department of Accounting and General Services
P.O. Box 119
Honolulu, HI 96810-0119

Subject: Chapter 343, Hawai‘i Revised Statutes Environmental Assessment
Response to Draft Environmental Assessment Comment Letter
Waihe‘e Lo‘i Restoration and Riparian Learning Center
Waihe‘e, Island of O‘ahu, Hawai‘i
TMK: 4-7-006:010 (por.), 4-7-006:018, 4-7-006:023 (por.), 4-7-008:002 (por.)

Dear Ms. Kinimaka,

Thank you for your comment letter dated August 18, 2020 concerning the Chapter 343, Hawai‘i Revised Statutes (HRS) Draft Environmental Assessment (EA) for the proposed Waihe‘e Lo‘i Restoration and Riparian Learning Center project, located in Waihe‘e, Island of O‘ahu, Hawai‘i.

We acknowledge that the Department of Accounting and General Services has no comments to offer at this time as the project does not impact any of your managed facilities or properties.

The Final EA will be published in the Office of Environmental Quality Control's *The Environmental Notice* which can be found online at: http://oeqc2.doh.hawaii.gov/_layouts/15/start.aspx#/Doc_Library/Forms/AllItems.aspx. Please enter *title* with a colon at the end, immediately followed by *Waihee* in the search box to locate the Final EA.

We appreciate your input and participation in this review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC., dba G70

Mark Kawika McKeague, AICP
Principal

Barbara Natale

Subject: RE: BWS WLRLC: FW: DOH Clean Air Branch Comments on Draft EA for the Waiheʻe Loʻi Restoration and Riparian Learning Center

---

From: Cab General <Cab.General@doh.hawaii.gov>
Sent: Tuesday, September 8, 2020 8:32 AM
To: busagawa@hbws.org; Kawika McKeague <kawikam@g70.design>
Subject: DOH Clean Air Branch Comments on Draft EA for the Waiheʻe Loʻi Restoration and Riparian Learning Center

Aloha

Thank you for the opportunity to provide comments on the subject project.
Please see our standard comments at:
https://health.hawaii.gov/cab/files/2019/04/Standard-Comments-Clean-Air-Branch-2019.pdf

Please let me know if you have any questions.

Barry Ching
Clean Air Branch
Hawaii Department of Health
(808) 586-4200

Standard Comments for Land Use Reviews
Clean Air Branch
Hawaii State Department of Health

If your proposed project:

Requires an Air Pollution Control Permit

You must obtain an air pollution control permit from the Clean Air Branch and comply with all applicable conditions and requirements. If you do not know if you need an air pollution control permit, please contact the Permitting Section of the Clean Air Branch.

s

Includes construction or demolition activities that involve asbestos

You must contact the Asbestos Abatement Office in the Indoor and Radiological Health Branch.

Has the potential to generate fugitive dust

You must control the generation of all airborne, visible fugitive dust. Note that construction activities that occur near to existing residences, business, public areas and major thoroughfares exacerbate potential dust concerns. It is recommended that a dust control management plan be developed which identifies and mitigates all activities that may generate airborne, visible fugitive dust. The plan, which does *not* require Department of Health approval, should help you recognize and minimize potential airborne, visible fugitive dust problems.

Construction activities must comply with the provisions of Hawaii Administrative Rules, §11-60.1-33 on Fugitive Dust. In addition, for cases involving mixed land use, we strongly recommend that buffer zones be established, wherever possible, in order to alleviate potential nuisance complaints.

You should provide reasonable measures to control airborne, visible fugitive dust from the road areas and during the various phases of construction. These measures include, but are not limited to, the following:

a) Planning the different phases of construction, focusing on minimizing the amount of airborne, visible fugitive dust-generating materials and activities, centralizing on-site vehicular traffic routes, and locating potential dust-generating equipment in areas of the least impact;
b) Providing an adequate water source at the site prior to start-up of construction activities;
c) Landscaping and providing rapid covering of bare areas, including slopes, starting from the initial grading phase;
d) Minimizing airborne, visible fugitive dust from shoulders and access roads;
e) Providing reasonable dust control measures during weekends, after hours, and prior to daily start-up of construction activities; and
f) Controlling airborne, visible fugitive dust from debris being hauled away from the project site.

If you have questions about fugitive dust, please contact the Enforcement Section of the Clean Air Branch

Clean Air Branch (808) 586-4200 cab@doh.hawaii.gov	Indoor Radiological Health Branch (808) 586-4700

April 1, 2019

111 S. King Street
Suite 170
Honolulu, HI 96813
808.523.5866
www.g70.design

January 8, 2021

Mr. Barry Ching
State of Hawai'i
Department of Health
Clean Air Branch
via email: cab@doh.hawaii.gov

Subject: Chapter 343, Hawai'i Revised Statutes Environmental Assessment
Response to Draft Environmental Assessment Comment Letter
Waihe'e Lo'i Restoration and Riparian Learning Center
Waihe'e, Island of O'ahu, Hawai'i
TMK: 4-7-006:010 (por.), 4-7-006:018, 4-7-006:023 (por.), 4-7-008:002 (por.)

Dear Mr. Ching,

Thank you for your comment letter dated September 8, 2020 concerning the Chapter 343, Hawai'i Revised Statutes (HRS) Draft Environmental Assessment (EA) for the proposed Waihe'e Lo'i Restoration and Riparian Learning Center project, located in Waihe'e, Island of O'ahu, Hawai'i. The following responses are offered to your comment.

The project will not require an air pollution control permit, nor does it include construction or demolition activities that involve asbestos. We acknowledge that effective air pollution control measures should be installed to prevent or minimize any fugitive dust emissions caused by construction work affecting the surrounding areas. *Chapter 3.14, Air Quality and Noise,* of the Final EA lists proposed mitigation measures to minimize the potential for impacts on the surrounding areas. We acknowledge the list of proposed air pollution control measures provided by your office, and will include them in *Chapter 3.14* of the Final EA.

The Final EA will be published in the Office of Environmental Quality Control's *The Environmental Notice* which can be found online at: http://oeqc2.doh.hawaii.gov/_layouts/15/start.aspx#/Doc_Library/Forms/AllItems.aspx. Please enter *title* with a colon at the end, immediately followed by *Waihee* in the search box to locate the Final EA.

We appreciate your input and participation in this review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC., dba G70

Mark Kawika McKeague, AICP
Principal

DAVID Y. IGE
GOVERNOR OF HAWAII

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 01, 2020

LD 822

MEMORANDUM

TO: **DLNR Agencies:**
_X_ Div. of Aquatic Resources
___ Div. of Boating & Ocean Recreation
_X_ Engineering Division *(via email: DLNR.Engr@hawaii.gov)*
_X_ Div. of Forestry & Wildlife *(via email: Rubyrosa.T.Terrago@hawaii.gov)*
___ Div. of State Parks
_X_ Commission on Water Resource Management *(via email: DLNR.CWRM@hawaii.gov)*
___ Office of Conservation & Coastal Lands
_X_ Land Division – Oahu District *(via email: DLNR.Land@hawaii.gov)*
_X_ Historic Preservation *(via email: DLNR.Intake.SHPD@hawaii.gov)*

FROM: Russell Y. Tsuji, Land Administrator *Russell Tsuji*
SUBJECT: **Draft Environmental Assessment (DEA)**
Waihe'e Lo'i Restoration and Riparian Learning Center
LOCATION: Waihe'e, Island of Oahu, Hawaii
TMK: (1) 4-7-006:010 (por.), -018, -023 (por.) and (1) 4-7-008:002 (por.)
APPLICANT: **G70 on behalf of the Board of Water Supply**

Transmitted for your review and comment is information on the above-referenced subject. The Draft EA/EIS was published on August 08, 2020 in the Office of Environmental Quality Control's periodic bulletin, The Environmental Notice, at the following link:

http://oeqc2.doh.hawaii.gov/The_Environmental_Notice/2020-08-08-TEN.pdf

Please submit any comments by **September 08, 2020** via email to DLNR.Land@hawaii.gov, and copied to barbara.j.lee@hawaii.gov. If no response is received by this date, we will assume your agency has no comments. Should you have any questions about this request, please contact Barbara Lee directly via email at barbara.j.lee@hawaii.gov. Thank you.

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

Signed: _____
Print Name: DAVID G. SMITH, Administrator
Division: Forestry and Wildlife
Date: Sep 11, 2020

Attachments
Cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 11, 2020

LD 822

ATTN: Kawika McKeague, AICP
GROUP 70 INTERNATIONAL, INC.
111 South King Street, Suite 170
Honolulu, HI 96813

Via email: WaiheeRLC@g70.design

Dear Sirs:

SUBJECT: **Draft Environmental Assessment, Waihe'e Lo'i Restoration and Riparian Learning Center, Waihe'e, Island of Oahu**
TMK: (1) 4-7-006:010 (por.), -018, -023 (por.), and (1) 4-7-008:002 (por.)

Thank you for the opportunity to review and comment on the subject project. In addition to previous comments sent to you from the Department of Land and Natural Resources (DLNR) dated September 08, 2020, enclosed are comments from DLNR's Division of Forestry and Wildlife.

Should you have any questions about the attached response, please feel free to contact Barbara Lee via email at barbara.j.lee@hawaii.gov. Thank you.

Sincerely,

Russell Tsuji

Russell Y. Tsuji
Land Administrator

Enclosure(s)
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

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

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

September 9, 2020

MEMORANDUM *Log no. 2789*

TO: RUSSELL Y. TSUJI, Administrator
Land Division

FROM: DAVID G. SMITH, Administrator DGS
Division of Forestry and Wildlife

SUBJECT: **Division of Forestry and Wildlife Comments for the Draft Environmental Assessment (DEA) for the Waiheʻe Loʻi Restoration and Riparian Learning Center**

The Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) has received your inquiry regarding the DEA for the Waiheʻe loʻi restoration and riparian learning center in Waiheʻe on Oʻahu, Hawaiʻi, TMKs: (1) 4-7-006:010 (por.), 018, 023 (por.), and (1) 4-7-008:002. The proposed project consists of: constructing a 1,200 square foot pavillion; two small parking areas; restoring existing fallow loʻi; maintain existing ʻauwai (irrigation) systems; and restoring riparian and forest areas with appropriate native plants.

State listed waterbirds such as the Hawaiian Duck (*Anas wyvilliana*), Hawaiian Stilt (*Himantopus mexicanus knudseni*), Hawaiian Coot (*Fulica alai*), and Hawaiian Common Gallinule (*Gallinula chloropus sandvicensis*) have the potential to occur 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 activities, then all activities within 100 feet (30 meters) should cease, and the bird should not be approached. Work may continue after the bird leaves the area of its own accord. If a nest is discovered at any point, please contact the Oʻahu DOFAW Office) at (808) 973-9778.

DOFAW is concerned about attracting vulnerable birds to areas that may host nonnative predators such as cats, rodents, and mongoose. Additionally, improvements to the area are likely to increase the human activity and may generate more trash and other predator attractants. We recommend taking action to minimize predator presence; remove cats, place bait stations for rodents and mongoose, and provide covered trash receptacles.

The State listed Hawaiian Hoary Bat or ʻŌpeʻapeʻa (*Lasiurus cinereus semotus*) has the potential to occur in the vicinity of the project area and may roost in nearby trees. If any site clearing is required this should be timed to avoid disturbance during the bat birthing and pup rearing season (June 1 through September 15). If this cannot be avoided, woody plants greater than 15 feet (4.6 meters) tall should not be disturbed, removed, or trimmed without consulting DOFAW.

DOFAW recommends minimizing the movement of plant or soil material between worksites, such as in fill. Soil and plant material may contain invasive fungal pathogens (e.g. Rapid ʻŌhiʻa Death), vertebrate and invertebrate pests (e.g. Little Fire Ants, Coconut Rhinoceros Beetles), or invasive plant parts that could harm our native species and ecosystems. We recommend consulting the Oʻahu Invasive Species Committee at (808) 266-7994 in planning, design, and construction of the project to learn of any high-risk invasive species in the area and ways to mitigate spread. All equipment, materials, and personnel should be cleaned of excess soil and debris to minimize the risk of spreading invasive species. Gear that may contain soil, such as work boots and vehicles, should be thoroughly cleaned with water and sprayed with 70% alcohol solution to prevent the spread of Rapid ʻŌhiʻa Death and other harmful fungal pathogens.

We note that artificial lighting can adversely impact seabirds that may pass through the area at night by causing disorientation. This disorientation can result in collision with manmade artifacts or grounding of birds. For nighttime lighting that might be required, DOFAW recommends that all lights be fully shielded to minimize impacts. Nighttime work that requires outdoor lighting should be avoided during the seabird fledging season from September 15 through December 15. This is the period when young seabirds take their maiden voyage to the open sea. For illustrations and guidance related to seabird-friendly light styles that also protect the dark, starry skies of Hawaiʻi please visit: https://dlnr.hawaii.gov/wildlife/files/2016/03/DOC439.pdf.

We appreciate your efforts to work with our office for the conservation of our native species. 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 Lauren Taylor, Protected Species Habitat Conservation Planning Coordinator at (808) 587-0010 or lauren.tavlor@hawaii.gov.

111 S. King Street
Suite 170
Honolulu, HI 96813
808.523.5866
www.g70.design

January 8, 2021

Mr. David G. Smith
Administrator
State of Hawai‘i
Department of Land and Natural Resources
Division of Forestry and Wildlife
1151 Punchbowl Street, Room 325
Honolulu, HI 96813

Subject: Chapter 343, Hawai‘i Revised Statutes Environmental Assessment
Response to Draft Environmental Assessment Comment Letter
Waihe‘e Lo‘i Restoration and Riparian Learning Center
Waihe‘e, Island of O‘ahu, Hawai‘i
TMK: 4-7-006:010 (por.), 4-7-006:018, 4-7-006:023 (por.), 4-7-008:002 (por.)

Dear Mr. Smith,

Thank you for your comment letter dated September 9, 2020 concerning the Chapter 343, Hawai‘i Revised Statutes (HRS) Draft Environmental Assessment (EA) for the proposed Waihe‘e Lo‘i Restoration and Riparian Learning Center project, located in Waihe‘e, Island of O‘ahu, Hawai‘i. The following responses are offered to your comment.

Potential state listed waterbirds include the Hawaiian Duck *(Anas wyvilliana),* Hawaiian Stilt *(Himantopus mexicanus knudseni),* Hawaiian Coot *(Fulica alsi),* and Hawaiian Common Gallinule *(Gallinula chhloropus sandvicensis).* We acknowledge that the state listed Hawaiian Hoary Bat or ‘Ōpe‘ape‘a *(Lasiurus cinereus semotus)* and seabirds have the potential to occur in the area. In addition, the movement of plant or soil material should be minimized as it could contain fungal pathogens, vertebrate and invertebrate pests, and invasive plant species.

Recommended avoidance and mitigation measures will be incorporated into the project. The contractor will be required to adhere to project plans and specifications which will incorporate measures to avoid or minimize impacts to listed species during construction. The project will implement the identified concerns to minimize impacts to listed animal species.

The Final EA will be published in the Office of Environmental Quality Control’s *The Environmental Notice* which can be found online at: http://oeqc2.doh.hawaii.gov/_layouts/15/start.aspx#/Doc_Library/Forms/AllItems.aspx. Please enter *title* with a colon at the end, immediately followed by *Waihee* in the search box to locate the Final EA.

We appreciate your input and participation in this review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC., dba G70

Mark Kawika McKeague, AICP
Principal

DAVID Y. IGE
GOVERNOR OF HAWAII

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 08, 2020

LD 822

ATTN: Kawika McKeague, AICP
GROUP 70 INTERNATIONAL, INC.
111 South King Street, Suite 170
Honolulu, HI 96813

Via email: WaiheeRLC@g70.design

Dear Sirs:

SUBJECT: **Draft Environmental Assessment, Waihe'e Lo'i Restoration and Riparian Learning Center, Waihe'e, Island of Oahu**
TMK: (1) 4-7-006:010 (por.), -018, -023 (por.), and (1) 4-7-008:002 (por.)

Thank you for the opportunity to review and comment on the subject project. The Land Division of the Department of Land and Natural Resources (DLNR) distributed copies of your request to DLNR's various divisions for their review and comment.

Enclosed are comments received from our Engineering Division on the subject project. Should you have any questions about the attached response, please feel free to contact Barbara Lee via email at barbara.j.lee@hawaii.gov. Thank you.

Sincerely,

Russell Tsuji

Russell Y. Tsuji
Land Administrator

Enclosure(s)
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

September 01, 2020

LD 822

MEMORANDUM

FROM:

~~TO:~~

TO:

DLNR Agencies:
_X_ Div. of Aquatic Resources
___ Div. of Boating & Ocean Recreation
_X_ Engineering Division *(via email: DLNR.Engr@hawaii.gov)*
_X_ Div. of Forestry & Wildlife *(via email: Rubyrosa.T.Terrago@hawaii.gov)*
___ Div. of State Parks
_X_ Commission on Water Resource Management *(via email: DLNR.CWRM@hawaii.gov)*
___ Office of Conservation & Coastal Lands
_X_ Land Division – Oahu District *(via email: DLNR.Land@hawaii.gov)*
_X_ Historic Preservation *(via email: DLNR.Intake.SHPD@hawaii.gov)*

~~FROM:~~ Russell Y. Tsuji, Land Administrator *Russell Tsuji*

SUBJECT: **Draft Environmental Assessment (DEA)**
Waihe'e Lo'i Restoration and Riparian Learning Center

LOCATION: Waihe'e, Island of Oahu, Hawaii
TMK: (1) 4-7-006:010 (por.), -018, -023 (por.) and (1) 4-7-008:002 (por.)

APPLICANT: **G70 on behalf of the Board of Water Supply**

Transmitted for your review and comment is information on the above-referenced subject. The Draft EA/EIS was published on August 08, 2020 in the Office of Environmental Quality Control's periodic bulletin, The Environmental Notice, at the following link:

http://oeqc2.doh.hawaii.gov/The_Environmental_Notice/2020-08-08-TEN.pdf

Please submit any comments by **September 08, 2020** via email to DLNR.Land@hawaii.gov, and copied to barbara.j.lee@hawaii.gov. If no response is received by this date, we will assume your agency has no comments. Should you have any questions about this request, please contact Barbara Lee directly via email at barbara.j.lee@hawaii.gov. Thank you.

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

Signed: _____
Print Name: Carty S. Chang, Chief Engineer
Division: Engineering Division
Date: Sep 3, 2020

Attachments
Cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji
Ref: Draft Environmental Assessment (DEA)
Waihe'e Lo'i Restoration and Riparian Learning Center
TMK(s): (1) 4-7-006:010 (por.), -018, -023 (por.) and (1) 4-7-008:002 (por.)
Location: Waihe'e, Island of Oahu, Hawaii
Applicant: G70 on behalf of the Board of Water Supply

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high risk areas). State projects are required to comply with 44CFR regulations as stipulated in Section 60.12. Be advised that 44CFR reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood Hazard Zones are designated on FEMA's Flood Insurance Rate Maps (FIRM), which can be viewed on our Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT).

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

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7253.
- Kauai: County of Kauai, Department of Public Works (808) 241-4896.

Signed: _____
CARTY S. CHANG, CHIEF ENGINEER

Date: Sep 3, 2020

111 S. King Street
Suite 170
Honolulu, HI 96813
808.523.5866
www.g70.design

January 8, 2021

Mr. Carty S. Chang
Chief Engineer
State of Hawaii
Department of Land and Natural Resources
Engineering Division
P.O. Box 621
Honolulu, HI 96809

Subject: Chapter 343, Hawai'i Revised Statutes Environmental Assessment
Response to Draft Environmental Assessment Comment Letter
Waihe'e Lo'i Restoration and Riparian Learning Center
Waihe'e, Island of O'ahu, Hawai'i
TMK: 4-7-006:010 (por.), 4-7-006:018, 4-7-006:023 (por.), 4-7-008:002 (por.)

Dear Mr. Chang,

Thank you for your comment letter dated September 3, 2020 concerning the Chapter 343, Hawai'i Revised Statutes (HRS) Draft Environmental Assessment (EA) for the proposed Waihe'e Lo'i Restoration and Riparian Learning Center project, located in Waihe'e, Island of O'ahu, Hawai'i. The following responses are offered to your comment.

We acknowledge that the rules and regulations of the National Flood Insurance Program, Title 44 of the Code of Federal Regulations (44 CFR), are in effect when development falls within a Special Flood Hazard Area (high risk areas). According to 44 CFR, the Special Flood Hazard Area is the land in the flood plain subject to a one percent or greater chance of flooding in any given year, usually designated as a variation of Zone A or V on the flood hazard boundary map.

The Waihe'e Lo'i Restoration and Riparian Learning Center falls within Zone D (an area of possible but undetermined hazard), X (minimal flood risk, outside of 0.2% Annual Chance Floodplain), and A (areas with a 1% chance of flooding). Zone A falls within a defined Special Flood Hazard Area and is also the location of the planned lo'i. Development of the pavilion/hale, composting toilets, trash bin and parking area will be located outside of this Zone A Special Flood Hazard Area.

The Final EA will be published in the Office of Environmental Quality Control's *The Environmental Notice* which can be found online at: http://oeqc2.doh.hawaii.gov/_layouts/15/start.aspx#/Doc_Library/Forms/AllItems.aspx. Please enter *title* with a colon at the end, immediately followed by *Waihee* in the search box to locate the Final EA.

We appreciate your input and participation in this review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC., dba G70

Mark Kawika McKeague, AICP
Principal

DAVID Y. IGE
GOVERNOR OF
HAWAII

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

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

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

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

REF: OCCL: TF

COR: OA 21-22

Kawika McKeague, AICP
G70
111 South King Street, Suite 170
Honolulu, HI 96813

SUBJECT: Draft Environmental Assessment (DEA)
Waihe'e Lo'i Restoration and Riparian Learning Center
Located at Waihe'e, Ko'olaupoko, O'ahu
Tax Map Key (TMK): (1) 4-7-006:010 (por.), (1) 4-7-006:018, (1) 4-7-006:023 (por.), (1) 4-7-008:002 (por.)

Dear Mr. McKeague:

The Office of Conservation and Coastal Lands (OCCL) is in receipt of your letter and attachments regarding the subject matter. According to the information you provided, G70 on behalf of the Board of Water Supply (BWS) is seeking agency comments on the DEA for the Waihe'e Lo'i Restoration and Riparian Learning Center project. The proposed Waihe'e Lo'i Restoration and Riparian Learning Center project will involve the establishment of a farm to restore lo'i kalo and promote watershed protection, sustainable agriculture, and forest restoration activities with support from structures such as a traditional meeting hale or open pavilion for agricultural activities and cultural and educational programs. A qualified non-profit community group will be selected through a Request for Proposal to operate the Waihe'e Lo'i Restoration and Riparian Learning Center on a long-term agreement. The proposed project will be carried out in two phases (Phase I and Phase II) for which Phase II still requires technical studies and will involve Conservation District lands. The goal for the proposed Waihe'e Lo'i Restoration and Riparian Learning Center is to restore traditional lo'i kalo and stream environment through community involvement and education that re-instills a sense of shared kuleana for watershed management in Waihe'e Valley.

The OCCL regulates land uses in the State Land Use Conservation District through the issuance of Conservation District Use Permits and Site Plan Approvals to help conserve, protect, and preserve important natural and cultural resources. We appreciate the opportunity to review and provide our comments on the subject matter. It appears that the parcels with the TMKs: (1) 4-7-006:018 and (1) 4-7-006:010 lie within the State Land Use Urban District and do not fall under OCCL's jurisdiction. The parcel with the TMK: (1) 4-7-006:023 appears to lie in the Resource

Subzone of the State Land Use Conservation District while the parcel with the TMK: (1) 4-7-008:002 appears to lie in the Protective and Resource Subzones of the State Land Use Conservation District. Based on the information you have provided; it is currently unclear whether land uses are being proposed by the BWS and its agent for the Waihe'e Lo'i Restoration and Riparian Learning Center project on Conservation District lands. Any proposed land uses in the Conservation District will require review by the OCCL. Additionally, should the BWS and its agent believe nonconforming agricultural uses may be present within the proposed project area, please provide evidence that such uses existed prior to 1964.

Should you have any questions, please feel free to contact Trevor Fitzpatrick of the Office of Conservation and Coastal Lands at 798-6660 or trevor.j.fitzpatrick@hawaii.gov .

Sincerely,

Sam Lemmo

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

CC: Chairperson
Oahu Land Division Office
City and County of Honolulu Department of Planning and Permitting
City and County of Honolulu Board of Water Supply

111 S. King Street
Suite 170
Honolulu, HI 96813
808.523.5866
www.g70.design

January 8, 2021

Mr. Samuel J. Lemmo, Administrator
State of Hawai'i
Department of Land and Natural Resources
Office of Conservation and Coastal Lands (OCCL)
P.O. Box 621
Honolulu, HI 96809

Subject: Chapter 343, Hawai'i Revised Statutes Environmental Assessment
Response to Draft Environmental Assessment Comment Letter
Waihe'e Lo'i Restoration and Riparian Learning Center
Waihe'e, Island of O'ahu, Hawai'i
TMK: 4-7-006:010 (por.), 4-7-006:018, 4-7-006:023 (por.), 4-7-008:002 (por.)

Dear Mr. Lemmo,

Thank you for your comment letter dated September 8, 2020 concerning the Chapter 343, Hawai'i Revised Statutes (HRS) Draft Environmental Assessment (EA) for the proposed Waihe'e Lo'i Restoration and Riparian Learning Center project, located in Waihe'e, Island of O'ahu, Hawai'i. The following responses are offered to your comment.

We acknowledge that TMK: (1) 4-7-008:002 lies within the Protected and Resource Subzones of the State Land Use Conservation District. The land uses being proposed on these Conservation District lands include the use of the upper field to host educational programs, and conversion of the "ginger patch" into lo'i kalo, with the potential for a new diversion and 'auwai. No other structures are planned for this parcel.

We acknowledge that any proposed land uses in the Conservation District will require review by the OCCL. We would like to bring to your attention to a potentially nonconforming agricultural use within the proposed project area. Please see attached Land Court map dated 1936. Two Land Commission Awards (LCA) were awarded within the project area, and several were located makai of the project. LCA 2070 'Apana 2 was awarded to Kelehuna, and LCA 2311 'Apana 1 was awarded to Halai. Māhele testimony for both LCA mention lo'i (Figures 1 and 2). LCA 2070 'Apana 2 was also a house lot, while LCA 2311 'Apana 1 noted five lo'i bordered by streams and cliffs. According to HRS §183C-5(a), "Any land identified as a kuleana may be put to those uses which were historically, customarily, and actually found on the particular lot including, if applicable, the construction of a single family residence."

The Final EA will be published in the Office of Environmental Quality Control's *The Environmental Notice* which can be found online at: http://oeqc2.doh.hawaii.gov/_layouts/15/start.aspx#/Doc_Library/Forms/AllItems.aspx. Please enter *title* with a colon at the end, immediately followed by *Waihee* in the search box to locate the Final EA. We appreciate your input and participation in this review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC., dba G70

Mark Kawika McKeague, AICP
Principal

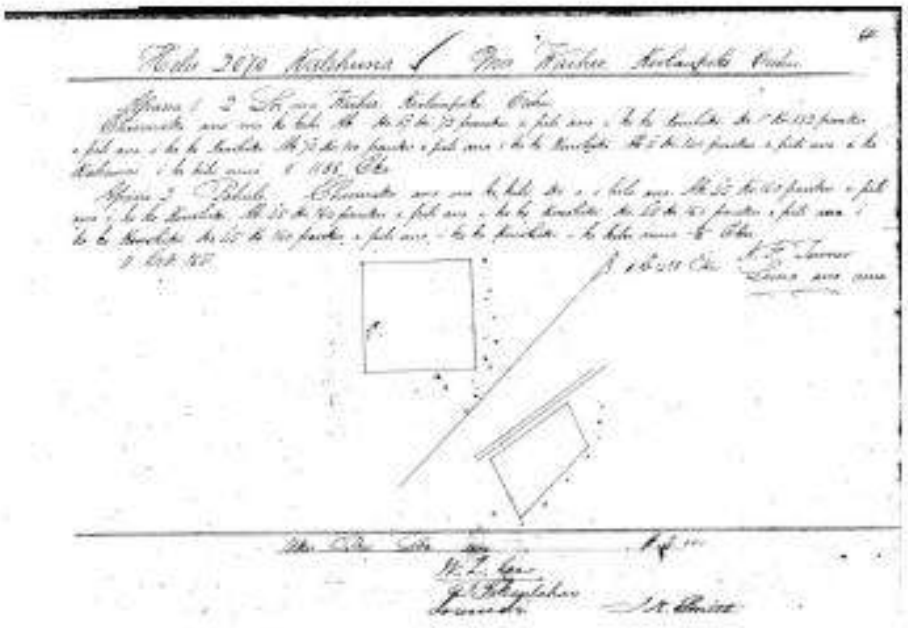

Figure 1. Māhele testimony for LCA 2070 (Māhele Book 6 Page 611).

Figure 2. Māhele testimony for LCA 2311 (Māhele Book 6 Page 610).

MAP 2

KAALAEA

KAALAEA

R.P. 7531, L.C.Aw. 8559-B, Apana 33 to William C. Lunalilo

Sing Chong & Company (owner)

WAIAHEE

GRANT 1812

EXCLUSION 16

10.51 Acres

Portion of Grant 1812 to B.W. Parker

Bishop Trust Co. Ltd. Trustee

Territory of Hawaii

Quitclaimed Portion

LOT D

Gross Area 467.372 Acres

Less Lot E and Exclusions 2 to 17 inclusive 17.175

Net Area 450.197 Acres

Portion of Deed of Kamehameha IV to James A. Steward, dated June 4, 1864 Liber 18, Page 106 (owner)

Sing Chong & Company (Owner)

Deed of Kamehameha IV to B.W. Parker dated July 11, 1851 Liber 8, Page 47

EXCLUSION 1

EXCLUSION 2

EXCLUSION 3

EXCLUSION 4

EXCLUSION 5

EXCLUSION 6

EXCLUSION 7

EXCLUSION 8

EXCLUSION 9

EXCLUSION 10

EXCLUSION 11

EXCLUSION 12

EXCLUSION 13

EXCLUSION 14

EXCLUSION 15

EXCLUSION 17

LOT A

LOT B

LOT C

LOT E

LOT F

LOT G

KANEOHE BAY

Lot G certificate by Order of the Land Court of Land Court dated Aug 14, 1931. Surveyor, Territory of Hawaii

LOT A - Area = 867.94 Acres See Sheet 1

RESERVE

FOREST

Phase I

Phase II A

Phase II B

LAND COURT
TERRITORY OF HAWAII

SUPPLEMENTAL MAP A WITH APPLICATION 1133 (AMENDED)

Showing Lots A, B, C, F, and portion of Lot D, and Exclusions 1 to 17, inclusive

AT WAIAHEE, KOOLAUPOKO, OAHU, T.H.

Scale: 1 inch = 100 feet

This map is from an actual survey on the ground made by, and under the direct supervision of the undersigned, between the dates July 11, 1933 and February 20, 1936, and may be checked with my field books numbered 512, 516, 518 and 664, calculation book number 298, and working sheets indexed under Waiahee.

Honolulu, T.H. February 20, 1936

WRIGHT, HARVEY & WRIGHT
By Lud G. Kenney
Surveyor, Territory of Hawaii
410 S.M. Damon Building

BISHOP TRUST COMPANY, LIMITED, Trustee for Kahalou Land Trust - Applicant

Note: Government Survey Triangulation Station "Puu Kaaiai" is the origin of all coordinates.

Owners shown on map are taken from records of Taxation Maps Bureau.

I hereby certify that the description of survey and map hereon have been examined and checked as to form and mathematical correctness, but not on the ground, and the same hereon been found to be in accord.
Honolulu, T.H. Jan. 18, 1937
Surveyor, Territory of Hawaii

Lot D amended by amendments to descriptions of Exclusions 2,5 and 17 by Order of the Judge of the Land Court dated August 3, 1931.
Honolulu, T.H. Aug. 10, 1931. Surveyor, Territory of Hawaii

I hereby certify that Decree of Registration dated January 4, 1938, and numbered 1237 has issued to Bishop Trust Company, Limited, Trustee for Kahalou Land Trust covering the land described hereon, and that Owner's Certificate of Title No. 17706 has been transcribed therefrom.
Honolulu, T.H. January 4, 1938
Registrar of the Land Court

Filed May 4, 1938
Chief Clerk

42"x 96"± RC Sy Pl.

SHEET 2 OF 2 SHEETS

DEPARTMENT OF DESIGN AND CONSTRUCTION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8480 • Fax: (808) 768-4567
Web site: www.honolulu.gov

KIRK CALDWELL
MAYOR

MARK YONAMINE, P.E.
DIRECTOR

HAKU MILLES, P.E.
DEPUTY DIRECTOR

September 21, 2020

RECEIVED
SEP 24 2020
Q70

G70
ATTN: Kawika McKeague
111 S. King Street, Suite 170
Honolulu, HI 96813

Dear Mr. McKeague,

Subject: Draft Environmental Assessment
Waihe'e Lo'i Restoration and Riparian Learning Center
Waihe'e, Oahu, Hawaii
TMK: 4-7-006:010, 4-7-006:018, 4-7-006:023 (por.), 4-7-008:002 (por.)

Thank you for the opportunity to review and comment. The Department of Design and Construction does not have any comments at this time.

Should you have any further questions, please contact me at 768-8480.

Sincerely,

FOR Mark Yonamine, P.E
Director

MY:ms (822107)

111 S. King Street
Suite 170
Honolulu, HI 96813
808.523.5866
www.g70.design

January 8, 2021

Mr. Mark Yonamine, P.E.
Director
City and County of Honolulu
Department of Design and Construction
650 S. King Street, 11th Floor
Honolulu, HI 96813

Subject: Chapter 343, Hawai'i Revised Statutes Environmental Assessment
Response to Draft Environmental Assessment Comment Letter
Waihe'e Lo'i Restoration and Riparian Learning Center
Waihe'e, Island of O'ahu, Hawai'i
TMK: 4-7-006:010 (por.), 4-7-006:018, 4-7-006:023 (por.), 4-7-008:002 (por.)

Dear Mr. Yonamine,

Thank you for your comment letter dated September 21, 2020 concerning the Chapter 343, Hawai'i Revised Statutes (HRS) Draft Environmental Assessment (EA) for the proposed Waihe'e Lo'i Restoration and Riparian Learning Center project, located in Waihe'e, Island of O'ahu, Hawai'i.

We acknowledge that the Department of Design and Construction has no comments to offer at this time.

The Final EA will be published in the Office of Environmental Quality Control's *The Environmental Notice* which can be found online at: http://oeqc2.doh.hawaii.gov/_layouts/15/start.aspx#/Doc_Library/Forms/AllItems.aspx. Please enter *title* with a colon at the end, immediately followed by *Waihee* in the search box to locate the Final EA.

We appreciate your input and participation in this review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC., dba G70

Mark Kawika McKeague, AICP
Principal

DEPARTMENT OF FACILITY MAINTENANCE

CITY AND COUNTY OF HONOLULU

1000 Ulu`ohia Street, Suite 215, Kapolei, Hawaii 96707
Phone: (808) 768-3343 • Fax: (808) 768-3381
Website: www.honolulu.gov

KIRK CALDWELL
MAYOR

ROSS S. SASAMURA, P.E.
DIRECTOR AND CHIEF ENGINEER

EDUARDO P. MANGLALLAN
DEPUTY DIRECTOR

IN REPLY REFER TO:
DRM 20-432

August 20, 2020

Mr. Kawika McKeague, AICP
G70
111 South King Street, Suite 170
Honolulu, Hawaii 96813

Dear Ms. McKeague:

Subject: Draft Environmental Assessment for
Waihe'e Lo'i Restoration and Riparian Learning Center
TMK: 4-7-006:010 (por.), 4-7-006:018, 4-7-006:023 (por.)
TMK: 4-7-008:002 (por.)

Thank you for the opportunity to review and comment on the subject project.

We have no comments at this time, as we do not have any facilities or easements on the subject property.

If you have any questions, please call Mr. Kyle Oyasato of the Division of Road Maintenance at 768-3697.

Sincerely,

for Ross S. Sasamura, P.E.
Director and Chief Engineer

111 S. King Street
Suite 170
Honolulu, HI 96813
808.523.5866
www.g70.design

January 8, 2021

Mr. Ross S. Sasamura, P.E.
Director and Chief Engineer
City and County of Honolulu
Department of Facility Maintenance
1000 Ulu‘ohia Street, Suite 215
Kapolei, HI 96707

Subject: Chapter 343, Hawai‘i Revised Statutes Environmental Assessment
Response to Draft Environmental Assessment Comment Letter
Waihe‘e Lo‘i Restoration and Riparian Learning Center
Waihe‘e, Island of O‘ahu, Hawai‘i
TMK: 4-7-006:010 (por.), 4-7-006:018, 4-7-006:023 (por.), 4-7-008:002 (por.)

Dear Mr. Sasamura,

Thank you for your comment letter dated August 20, 2020 concerning the Chapter 343, Hawai‘i Revised Statutes (HRS) Draft Environmental Assessment (EA) for the proposed Waihe‘e Lo‘i Restoration and Riparian Learning Center project, located in Waihe‘e, Island of O‘ahu, Hawai‘i.

We acknowledge that the Department of Facility Maintenance (DFM) has no comments to offer at this time as DFM does not have any facilities or easements on the subject property.

The Final EA will be published in the Office of Environmental Quality Control’s *The Environmental Notice* which can be found online at: http://oeqc2.doh.hawaii.gov/_layouts/15/start.aspx#/Doc_Library/Forms/AllItems.aspx. Please enter *title* with a colon at the end, immediately followed by *Waihee* in the search box to locate the Final EA.

We appreciate your input and participation in this review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC., dba G70

Mark Kawika McKeague, AICP
Principal

DEPARTMENT OF PARKS & RECREATION

CITY AND COUNTY OF HONOLULU

1000 Uluohia Street, Suite 309, Kapolei, Hawaii 96707
Phone: (808) 768-3003 • Fax: (808) 768-3053
Website: www.honolulu.gov

KIRK CALDWELL
MAYOR

MICHELE K. NEKOTA
DIRECTOR

JEANNE C. ISHIKAWA
DEPUTY DIRECTOR

September 9, 2020

Mr. Kawika McKeague, AICP
G70
111 South King Street, Suite 170
Honolulu, Hawaii 96813

Dear Mr. McKeague:

SUBJECT: Draft Environmental Assessment
Waihee Loi Restoration and Riparian Learning Center
Waihee, Island of Oahu, Hawaii
TMK: 407-006:010 (por.), 4-7-006:018, 4-7-006:023 (por.),
4-7-008:002 (por.)

Thank you for the opportunity to review and comment on the subject Draft Environmental Assessment.

The Department of Parks and Recreation supports this project.

All of the property that is currently under this jurisdiction will be transferred to the Board of Water Supply.

As this project will not impact any program or facility of the Department you are invited to remove us a consulted party to the balance of the EIS process.

Should you have any questions, please contact Mr. John Reid, Planner, at 768-3017.

Sincerely,

Michele K, Nekota
Director

MKN:jr
(822161)

cc: Miles Hazama, Department of Parks and Recreation

111 S. King Street
Suite 170
Honolulu, HI 96813
808.523.5866
www.g70.design

January 8, 2021

Ms. Michele K. Nekota
Director
City and County of Honolulu
Department of Parks & Recreation
1000 Ulu‘ohia Street, Suite 309
Kapolei, HI 96707

Subject: Chapter 343, Hawai‘i Revised Statutes Environmental Assessment
Response to Draft Environmental Assessment Comment Letter
Waihe‘e Lo‘i Restoration and Riparian Learning Center
Waihe‘e, Island of O‘ahu, Hawai‘i
TMK: 4-7-006:010 (por.), 4-7-006:018, 4-7-006:023 (por.), 4-7-008:002 (por.)

Dear Ms. Nekota,

Thank you for your comment letter dated September 9, 2020 concerning the Chapter 343, Hawai‘i Revised Statutes (HRS) Draft Environmental Assessment (EA) for the proposed Waihe‘e Lo‘i Restoration and Riparian Learning Center project, located in Waihe‘e, Island of O‘ahu, Hawai‘i.

We acknowledge that the Department of Parks and Recreation supports this project. The decision to transfer the property from Department of Parks and Recreation to the Board of Water Supply has not yet been made. Due diligence has discovered previous unexploded ordnance (UXO) remediation and is not complete pending further remedial actions by the military.

The Final EA will be published in the Office of Environmental Quality Control’s *The Environmental Notice* which can be found online at: http://oeqc2.doh.hawaii.gov/_layouts/15/start.aspx#/Doc_Library/Forms/AllItems.aspx. Please enter *title* with a colon at the end, immediately followed by *Waihee* in the search box to locate the Final EA.

We appreciate your input and participation in this review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC., dba G70

Mark Kawika McKeague, AICP
Principal

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
PHONE: (808) 768-8000 • FAX: (808) 768-6041
DEPT. WEB SITE: www.honoluludpp.org • CITY WEB SITE: www.honolulu.gov

KIRK CALDWELL
MAYOR

KATHY K. SOKUGAWA
ACTING DIRECTOR

TIMOTHY F. T. HIU
DEPUTY DIRECTOR

EUGENE H. TAKAHASHI
DEPUTY DIRECTOR

September 18, 2020 2020/ELOG-1544(ZS)

Mr. Kawika McKeague
G70
111 South King Street, Suite 170
Honolulu, Hawaii 96813

Dear Mr. McKeague:

SUBJECT: Draft Environmental Assessment (EA)
Waihee Loi Restoration and Riparian Learning Center
Waihee, Oahu
Tax Map Keys 4-7-006: 010 (por.), 018, 023 (por.), and
4-7-008: 002 (por.)

This is in response to your letter, received August 10, 2020, requesting written comments on a draft EA. The Project is intended to provide sustainable agriculture, watershed management, and cultural and educational programs. Conceptual plans for the proposed Project include the restoration of fallow taro fields, the cultivation of other native crops, reforestation, a native plant nursery, two 1,200-square-foot pavilions, composting toilets, and two gravel parking lots to accommodate a total of 39 cars. The site will be cleared of invasive vegetation. There may be lighting associated with the pavilions. An existing *auwai* (irrigation ditch) may be used, or a new *auwai* may be constructed. You state that the site will be used year-round and accommodate approximately 20 volunteers or staff, 100 visitors one weekend per month, 100 visitors one weekday per month, and 125 hikers per day.

The Project area is an approximately 27-acre portion of the 89-acre property and is within the AG-2 General Agricultural and P-1 Restricted Preservation Districts. The land is owned by the City and County of Honolulu Department of Parks and Recreation and the Board of Water Supply, but will be leased to a non-profit community group to implement the Project. The Project requires an environmental assessment because it uses County land and is partially within the State Conservation District. The location of the nursery is uncertain and may be on private lands. Our comments on the draft EA are as follows:

1. Within the P-1 Restricted Preservation District, all uses, structures, and development standards are governed by the appropriate State agencies.

2. Within the AG-2 General Agricultural District, public uses and structures are permitted by right. Plant nurseries are permitted, subject to the standards of Land Use Ordinance (LUO) Section 21-500A.

3. Parking lots, loading spaces, and trash enclosures must be landscaped or screened in accordance with LUO Section 21-4.70.

4. Pursuant to our Rules Relating to Water Quality, the proposed Project must install and maintain appropriate best management practices (BMP) during construction and may be required to implement post-construction BMP.

5. The final EA should describe the lighting to be used during and after construction, and assess its potential impacts on birds and bats. Outdoor lighting fixtures should be fully shielded with the light directed downward so that the light bulb is only visible from below the light fixture. Lighting should operate at a low wattage and at a correlated color temperature of no more than 3,000 degrees Kelvin. Outdoor lighting should be turned off when human activity is not occurring in the illuminated area.

6. The final EA should consider the use of rainwater catchment, as well as pervious materials for any paved surfaces, including the proposed pavilions and parking lots, in order to allow stormwater infiltration and biofiltration.

7. Prior to the construction of any buildings or structures, and development activities such as grading work, the Applicant shall submit and obtain our approval of a flood study that delineates the limits of flooding and base flood elevations for Waihee Stream, pursuant to the provisions of Revised Ordinances of Honolulu Chapter 21A.

8. The final EA should provide a more detailed discussion on how the Project adheres to guidelines and policies outlined in the Koolau Poko Sustainable Communities Plan (KPSCP). A substantive discussion on each relevant section should be included, rather than a brief discussion covering the whole KPSCP.

    a. Sections 3.1.3.1 and 3.1.3.3 provide guidance specific to Waihee Valley Nature Park. This language should be discussed in relation to the Project.

    b. Section 3.1.3.4, Natural Gulches, Stream and Drainageways, needs discussion.

c. Section 4.2, Irrigation Water, mentions, "...where new reservoirs and other above-ground infrastructure is necessary, avoid impacts to significant scenic resources; where such impacts are unavoidable, implement appropriate mitigation measures. Design and locate new water supply facilities to be compatible with the scenic environment." The proposed 2,000 foot plastic distribution pipe, with the purpose of avoiding water loss of *auwai* in Parcel 10, would not be compatible with the scenic environment and should be accompanied with mitigative efforts.

d. Section 4.6 Drainage Systems, needs discussion.

9. The final EA should include more analysis on how the proposed compostable toilets may affect water and air quality. Are these toilets usually set up in riparian areas? Will it leak into the groundwater? Is there potential for the toilet to be compromised if there is a flood event?

10. The final EA should be corrected to state that the municipal wastewater infrastructure does not extend past the Kahekili and Kamehameha Highway intersection.

11. Due to the potential increase in traffic within the Project site, we recommend providing adequate width for two-way traffic along the entry drive leading to the parking areas.

Should you have any questions, please contact Zack Stoddard, of our Land Use Approval Branch, at (808) 768-8019 or zachary.stoddard@honolulu.gov.

Very truly yours,

FOR Kathy K. Sokugawa
Acting Director

111 S. King Street
Suite 170
Honolulu, HI 96813
808.523.5866
www.g70.design

January 8, 2021

Ms. Kathy K. Sokugawa
Acting Director
City and County of Honolulu
Department of Planning and Permitting
650 S. King Street, 7th Floor
Honolulu, HI 96813

Subject: Chapter 343, Hawai'i Revised Statutes Environmental Assessment
Response to Draft Environmental Assessment Comment Letter
Waihe'e Lo'i Restoration and Riparian Learning Center
Waihe'e, Island of O'ahu, Hawai'i
TMK: 4-7-006:010 (por.), 4-7-006:018, 4-7-006:023 (por.), 4-7-008:002 (por.)

Dear Ms. Sokugawa,

Thank you for your comment letter dated September 18, 2020 concerning the Chapter 343, Hawai'i Revised Statutes (HRS) Draft Environmental Assessment (EA) for the proposed Waihe'e Lo'i Restoration and Riparian Learning Center project, located in Waihe'e, Island of O'ahu, Hawai'i. The following responses are offered to your comments.

1. We acknowledge that for those parcels located within the P-1 Restricted Preservation District, all uses, structures, and development standards are governed by the appropriate State agencies.

2. We acknowledge that for those parcels within the AG-2 General Agricultural District, public uses and structures are permitted by right. Plant nurseries are permitted, subject to the standards Revised Ordinances of Honolulu (ROH) Section 21-500A.

3. We acknowledge that parking lots, loading spaces, and trash enclosures must be landscaped or screened in accordance with ROH §21-4.70. However, the access road onto the property is a Board of Water Supply easement through the Department of Parks and Recreation property and should not be considered a street. Most likely landscaping will not occur adjacent to the parking lot and access road.

4. We acknowledge that pursuant to Department of Planning and Permitting (DPP) Administrative Rules Relating to Water Quality, §20-3, the Project must install and maintain appropriate best management practices (BMP) during construction and may be required to implement post-construction BMP. This is discussed in *Section 3.3 Water Quality.*

5. Lighting to be used during and after construction is described in the Final EA *Sections 3.7 Flora and Fauna* and *3.12 Utilities*, as well as steps to mitigate potential impacts on birds and bats.

6. The use of rainwater catchment, as well as pervious materials for any paved surfaces has been considered and added as additional methods to allow for stormwater infiltration and biofiltration in *Section 3.3 Hydrology and Drainage.*

7. We acknowledge that prior to the construction of any buildings or structures, and development activities such as grading work, the Applicant shall submit and obtain DPP approval of a flood study that delineates the limits of flooding and base flood elevations for Waiheʻe Stream, pursuant to the provisions of ROH §21A.

8. The Final EA further analyzes how the proposed action is consistent with the Policies and Guidelines of the Koʻolau Poko Sustainable Communities Plan (KPSCP), specifically: Sections 3.1.3.1 and 3.1.3.3 with regards to Waiheʻe Valley Nature Park; Section 3.1.3.4 - Natural Gulches, Stream and Drainageways; Section 4.2 - Irrigation Water; and Section 4.6 - Drainage Systems.

9. Additional information with regards to the safety of composting toilets to air and water quality has been included in the Final EA under *Section 3.5* Water Quality, *Section 3.12* Utilities, and *Section 3.14* Air Quality.

10. *Section 3.12* Utilities in the Final EA has been revised to state that the municipal wastewater infrastructure does not extend past the Kahekili and Kamehameha Highway intersection.

11. While there is the potential for increased traffic within the project site, traffic is expected to primarily flow in one direction with the timing of volunteer events. To reduce impact, turnouts will be placed at critical junctures.

The Final EA will be published in the Office of Environmental Quality Control's *The Environmental Notice* which can be found online at: http://oeqc2.doh.hawaii.gov/_layouts/15/start.aspx#/Doc_Library/Forms/AllItems.aspx. Please enter *title* with a colon at the end, immediately followed by *Waihee* in the search box to locate the Final EA.

We appreciate your input and participation in this review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC., dba G70

Mark Kawika McKeague, AICP
Principal

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 3RD FLOOR
HONOLULU, HAWAII 96813
Phone: (808) 768-8305 • Fax: (808) 768-4730 • web: www.honolulu.gov

KIRK CALDWELL
MAYOR

WES FRYSZTACKI
DIRECTOR

JON Y. NOUCHI
DEPUTY DIRECTOR

TP8/20-822471

September 17, 2020

Mr. Kawika McKeague, AICP
G70
111 South King Street, Suite 170
Honolulu, Hawaii 96813

Dear Mr. McKeague:

SUBJECT: Draft Environmental Assessment
Waihee Loi Restoration and Riparian Learning Center
TMK 4-7-006:010 (por.), 4-7-006:018, 4-7-006:023 (por.),
4-7-008:002 (por.)

Thank you for the opportunity to provide written comments on the Waihee Loi Restoration and Riparian Learning Center project description. In response to your letter dated August 8, 2020, we have the following comments.

1. **Complete Streets.** To the extent practicable, design of the project should be consistent with the City's Complete Streets ordinance and include features to encourage walking, bicycling, and public transit.

   a. The final EA should address the pedestrian connection between the entrance and the first parking area/pavilion.

   b. On site bike racks, secure bike storage, and secure moped parking for the volunteers and visitors should be included.

2. **Traffic Management Plan**. Particular emphasis should be made that construction materials and equipment should be transferred to and from the project site during off-peak hours to minimize any possible disruption to traffic on the local streets. In addition, deliveries should avoid the afternoon peak time for school-related traffic to ensure the safety of the students. Coordinate with the school regarding student dismissal times.

3. **Neighborhood Impacts**. The area representatives, neighborhood board, as well as the area residents, businesses, emergency personnel (fire, ambulance, and police), Oahu Transit Services, Inc. (TheBus and TheHandi-Van), etc., should be kept apprised of the details and status throughout the project and the impacts that the project may have on the adjoining local street area network.

4. **Disability and Communication Access Board (DCAB)**. Project plans (vehicular and pedestrian circulation, sidewalks, parking and pedestrian pathways, vehicular ingress/egress, etc.) should be reviewed and approved by DCAB to ensure full compliance with ADA requirements. Although the second parking area does not reach the threshold for requiring an accessible parking space, serious consideration should be given this addition.

Thank you for the opportunity to review this matter. Should you have any questions, please contact Scott Brady, of my staff, at 768-6693.

Very truly yours,

Wes Fryszтacki
Director

111 S. King Street
Suite 170
Honolulu, HI 96813
808.523.5866
www.g70.design

January 8, 2021

Mr. Wes Frysztacki
Director
City and County of Honolulu
Department of Transportation Services
650 S. King Street, 3rd Floor
Honolulu, HI 96813

Subject: Chapter 343, Hawai'i Revised Statutes Environmental Assessment
Response to Draft Environmental Assessment Comment Letter
Waihe'e Lo'i Restoration and Riparian Learning Center
Waihe'e, Island of O'ahu, Hawai'i
TMK: 4-7-006:010 (por.), 4-7-006:018, 4-7-006:023 (por.), 4-7-008:002 (por.)

Dear Mr. Frysztacki,

Thank you for your comment letter dated September 17, 2020 concerning the Chapter 343, Hawai'i Revised Statutes (HRS) Draft Environmental Assessment (EA) for the proposed Waihe'e Lo'i Restoration and Riparian Learning Center project, located in Waihe'e, Island of O'ahu, Hawai'i. The following responses are offered to your comments.

1. **Complete Streets.** We recognize that to the extent practicable; design of the project should be consistent with the City's Complete Streets ordinance and include features to encourage walking, bicycling, and public transit. The main access road will continue to be used by both pedestrians and vehicles to access the first parking lot and pavilion. A bike rack to secure bikes and mopeds for the volunteers and visitors will be included adjacent to the pavilion.

2. **Traffic Management Plan.** The suggested mitigation regarding construction traffic has been added in the Final EA to *Section 3.13* Roadways, Access and Traffic Conditions to minimize disruption to traffic on the local streets.

3. **Neighborhood impacts.** The Board of Water Supply has and will continue to provide reports at Neighborhood Board meetings each month. Notification and coordination with area representatives, neighborhood board, as well as the area residents, businesses, emergency personnel, O'ahu Transit Services, Inc., etc., regarding the impacts of construction and operation on the adjoining local street area network will occur throughout the project.

4. **Disability and Communication Access Board (DCAB).** We understand that DCAB will be reviewing the project during a more detailed design and building permit stage to ensure full compliance with ADA requirements.

The Final EA will be published in the Office of Environmental Quality Control's *The Environmental Notice* which can be found online at: http://oeqc2.doh.hawaii.gov/_layouts/15/start.aspx#/Doc_Library/Forms/AllItems.aspx. Please enter *title* with a colon at the end, immediately followed by *Waihee* in the search box to locate the Final EA.

We appreciate your input and participation in this review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC., dba G70

Mark Kawika McKeague, AICP
Principal

HONOLULU FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

636 South Street
Honolulu, Hawaii 96813-5007
Phone: 808-723-7139 Fax: 808-723-7111 Internet: www.honolulu.gov/hfd

KIRK CALDWELL
MAYOR

MANUEL P. NEVES
FIRE CHIEF

LIONEL CAMARA JR.
DEPUTY FIRE CHIEF

August 14, 2020

Mr. Kawika McKeague, AICP
G70
111 S. King Street, Suite 170
Honolulu, Hawaii 96813

Dear Mr. McKeague:

Subject: Draft Environmental Assessment
Waihee Loi Restoration and Riparian Learning Center
Tax Map Key: 4-7-006: 010, 018, and 023 (Portions)
4-7-008: 002 (Portion)

In response to your letter dated August 8, 2020, regarding the abovementioned subject, the Honolulu Fire Department (HFD) reviewed the submitted information and requires that the following be complied with:

1. Fire department access roads shall be provided such that any portion of the facility or any portion of an exterior wall of the first story of the building is located not more than 150 feet (46 meters) from fire department access roads as measured by an approved route around the exterior of the building or facility. (National Fire Protection Association [NFPA] 1; 2012 Edition, Sections 18.2.3.2.2 and 18.2.3.2.2.1.)

   A fire department access road shall extend to within 50 feet (15 meters) of at least one exterior door that can be opened from the outside and that provides access to the interior of the building. (NFPA 1; 2012 Edition, Section 18.2.3.2.1.)

2. A water supply approved by the county, capable of supplying the required fire flow for fire protection shall be provided to all premises upon which facilities or buildings, or portions thereof, are hereafter constructed, or moved into or within the county. When any portion of the facility or building is in excess of 150 feet (45,720 millimeters) from a

water supply on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building, on-site fire hydrants and mains capable of supplying the required fire flow shall be provided when required by the AHJ [Authority Having Jurisdiction]. (NFPA 1; 2012 Edition, Section 18.3.1, as amended.)

3. The unobstructed width and unobstructed vertical clearance of a fire apparatus access road shall meet county requirements. (NFPA 1; 2012 Edition, Sections 18.2.3.4.1.1 and 18.2.3.4.1.2, as amended.)

4. Submit civil drawings to the HFD for review and approval.

Should you have questions, please contact Acting Battalion Chief Ari Agpaoa of our Fire Prevention Bureau at 723-7152 or aagpaoa@honolulu.gov.

Sincerely,

WAYNE MASUDA
Acting Assistant Chief

WM/KC:bh

111 S. King Street
Suite 170
Honolulu, HI 96813
808.523.5866
www.g70.design

January 8, 2021

Mr. Wayne Masuda
Acting Assistant Chief
City and County of Honolulu
Honolulu Fire Department
636 South Street
Honolulu, HI 96813-5007

Subject: Chapter 343, Hawai'i Revised Statutes Environmental Assessment
Response to Draft Environmental Assessment Comment Letter
Waihe'e Lo'i Restoration and Riparian Learning Center
Waihe'e, Island of O'ahu, Hawai'i
TMK: 4-7-006:010 (por.), 4-7-006:018, 4-7-006:023 (por.), 4-7-008:002 (por.)

Dear Chief Masuda,

Thank you for your comment letter dated August 14, 2020 concerning the Chapter 343, Hawai'i Revised Statutes (HRS) Draft Environmental Assessment (EA) for the proposed Waihe'e Lo'i Restoration and Riparian Learning Center project, located in Waihe'e, Island of O'ahu, Hawai'i. The following responses are offered to your comments.

The structures planned for Phase I and Phase II A of this project each include a 1,200 square foot pavilion/hale to allow for a covered location to hold workshops, meetings and presentations. Initial infrastructure needs include water, electrical, and a double stall composting toilet.

There are no occupancy requirements available for open-air pavilions, and according to the 2012 International Building Code (IBC), an occupiable space is a room or enclosed space. Therefore, the pavilions are not occupiable, and there are no fire requirements. Unless a different occupancy type is determined, the need for fire access, water capable of supplying fire flow protection, and unobstructed width and unobstructed vertical clearance of a fire apparatus access road is not required.

Nonetheless, civil drawings for the improvements at the Waihe'e Lo'i Restoration and Riparian Learning Center will be provided to the Honolulu Fire Department for review and approval.

The Final EA will be published in the Office of Environmental Quality Control's *The Environmental Notice* which can be found online at: http://oeqc2.doh.hawaii.gov/_layouts/15/start.aspx#/Doc_Library/Forms/AllItems.aspx. Please enter *title* with a colon at the end, immediately followed by *Waihee* in the search box to locate the Final EA.

We appreciate your input and participation in this review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC., dba G70

Mark Kawika McKeague, AICP
Principal

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulupd.org

KIRK CALDWELL
MAYOR

SUSAN BALLARD
CHIEF

JOHN D. McCARTHY
CLYDE K. HO
DEPUTY CHIEFS

OUR REFERENCE EO-DK

August 27, 2020

Mr. Kawika McKeague, AICP
Principal
Group 70 International, Inc. (DBA G70)
111 South King Street, Suite 170
Honolulu, Hawaii 96813

Dear Mr. McKeague:

This is in response to your letter of August 8, 2020, requesting comments on the Draft Environmental Assessment for the Waihee Loi Restoration and Riparian Learning Center project located in Kahaluu.

The Honolulu Police Department recommends that all necessary signs, lights, barricades, and other safety equipment be installed and maintained by the contractor during the construction phase of the project, as well as adequate notification be made to any affected areas regarding pedestrian and vehicular traffic issues.

If there are any questions, please call Major Crizalmer Caraang of District 4 (Kaneohe, Kailua, Kahuku) at 723-8639.

Thank you for the opportunity to review this project.

Sincerely,

RADE K. VANIC
Acting Assistant Chief of Police
Support Services Bureau

Serving and Protecting With Aloha

111 S. King Street
Suite 170
Honolulu, HI 96813
808.523.5866
www.g70.design

January 8, 2021

Mr. Rade K. Vanic
Acting Assistant Chief of Police
Support Service Bureau
City and County of Honolulu
Honolulu Police Department
801 South Beretania Street
Honolulu, HI 96813

Subject: Chapter 343, Hawai'i Revised Statutes Environmental Assessment
Response to Draft Environmental Assessment Comment Letter
Waihe'e Lo'i Restoration and Riparian Learning Center
Waihe'e, Island of O'ahu, Hawai'i
TMK: 4-7-006:010 (por.), 4-7-006:018, 4-7-006:023 (por.), 4-7-008:002 (por.)

Dear Chief Vanic,

Thank you for your comment letter dated August 27, 2020 concerning the Chapter 343, Hawai'i Revised Statutes (HRS) Draft Environmental Assessment (EA) for the proposed Waihe'e Lo'i Restoration and Riparian Learning Center project, located in Waihe'e, Island of O'ahu, Hawai'i.

We will be sure that the contractor installs and maintains all necessary signs, lights, barricades, and other safety equipment during the construction phase of the project, as well as adequately notify those near any affected areas regarding pedestrian and vehicular traffic issues.

The Final EA will be published in the Office of Environmental Quality Control's *The Environmental Notice* which can be found online at: http://oeqc2.doh.hawaii.gov/_layouts/15/start.aspx#/Doc_Library/Forms/AllItems.aspx. Please enter *title* with a colon at the end, immediately followed by *Waihee* in the search box to locate the Final EA.

We appreciate your input and participation in this review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC., dba G70

Mark Kawika McKeague, AICP
Principal

Garnett J. Howard

91-1099 Kuanoo Street
Ewa Beach, HI 96706
Phone: 808-389-7448

September 1, 2020

Board of Water Supply
City and County of Honolulu
Barry Usagawa
630 S. Beretania Street, Honolulu, HI 96843
busagawa@hbws.org

G70
111 South King Street, Suite 170
Honolulu, HI 96813
Kawika McKeague
kawikam@g70.design

Re: Waihe'e Lo'i Restoration and Riparian Learning Center -- Draft EA (AFNSI)

Dear Mr. Usagawa

Thank you for the opportunity to comment on the Waihe'e Lo'i Restoration and Riparian Learning Center -- Draft EA (AFNSI). This project will be a tremendous benefit to the community. The BWS and G70 have done an excellent job in compiling this environmental analysis. I concur with the BWS determination that the project will not result in significant adverse effects on the natural or human environment and a finding of no significant impact.

As the BWS moves forward, please consider the following comments and recommendations:

Reference Section	Comment/Recommendation
2.1.3 Site Plan Elements and Programs	Recommendation: Given that DPR "funding resources are stretched to their limits in maintaining current parks and is unable to adequately manage this property", recommend that the City and County of Honolulu DPR transfer/sell/long-term lease/relinquish interest in and control of their TMKs to the BWS or the non-profit community group. This will streamline, simplify, and provide more efficient planning and management of the WLRRLC. The BWS, working with the community, is best suited to define the preservation, conservation, and educational vision and best management practices for the WLRRLC.
2.3.2.1 Principles for Managing Access into Mauka Waihe'e	Recommendations: - In the next to last bullet: Consistent with comments, above on Section 2.1.3, replace the reference to DPR with "The WLRRLC awardee will provide and manage trash bins and waste removal. - Add a bullet something like: The WLRRLC awardee will assist the BWS in establishing and managing the carrying capacity of the WLRRLC including, for example, maximum visitors per day, perhaps by activity (hiking, education, school project, etc.); potential use of a reservation system for individuals and groups; and use of informational signage on Kamehameha Highway and lower Waihe'e Road to advise visitors when the park is full.

Reference Section	Comment/Recommendation
3.16 Unresolved Issues	<u>Land Ownership</u> Unifying land ownership under the BWS is essential to the effective, efficient, and consistent management of the WLRRC. A single authority, leadership focus, and management structure will pay huge dividends in the long term success of the WLRRLC.

Please keep me informed of any community meetings or hearings concerning this project.

Very truly yours,

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Honolulu, HI 96813
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January 8, 2021

Mr. Garnett J. Howard
91-1099 Kuanoo Street
Ewa Beach, HI 96706

Subject: Chapter 343, Hawai'i Revised Statutes Environmental Assessment
Response to Draft Environmental Assessment Comment Letter
Waihe'e Lo'i Restoration and Riparian Learning Center
Waihe'e, Island of O'ahu, Hawai'i
TMK: 4-7-006:010 (por.), 4-7-006:018, 4-7-006:023 (por.), 4-7-008:002 (por.)

Dear Mr. Howard,

Thank you for your comment letter dated September 1, 2020 concerning the Chapter 343, Hawai'i Revised Statutes (HRS) Draft Environmental Assessment (EA) for the proposed Waihe'e Lo'i Restoration and Riparian Learning Center project, located in Waihe'e, Island of O'ahu, Hawai'i. The following responses are offered to your comment.

With regards to your comments affecting *Sections 2.1.3* and *3.16*, the decision to transfer the TMK 4-7-006:010 from Department of Parks and Recreation to the Board of Water Supply is currently being negotiated and has not yet been made. Due diligence has discovered previous unexploded ordnance (UXO) remediation and is not complete pending further remedial actions by the military.

We acknowledge your recommendation for *Section 2.3.2.1* that the reference to DPR should be replaced with the WLRRLC awardee with regard to managing trash bins and waste removal. This has been updated.

We acknowledge your additional recommendation for the same section with regards to assistance of the WLRRLC awardee BWS in establishing and managing the carrying capacity of the WLRRLC and will take into consideration your examples.

The Final EA will be published in the Office of Environmental Quality Control's *The Environmental Notice* which can be found online at: http://oeqc2.doh.hawaii.gov/_layouts/15/start.aspx#/Doc_Library/Forms/AllItems.aspx. Please enter *title* with a colon at the end, immediately followed by *Waihee* in the search box to locate the Final EA.

We appreciate your input and participation in this review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC., dba G70

Mark Kawika McKeague, AICP
Principal

KEY

Kualoa-He'eia Ecumenical Youth Project

September 7, 2020

Mr. Kawika McKeague
Group 70 International, Inc.
111 S. King Street, Suite 170
Honolulu, Hawaii 96813

Dear Mr. McKeague:

Subject: Kualoa-He`eia Ecumenical Youth (KEY) Project Comments to
Draft Environmental Assessment (DEA)
Waihe'e Lo'i Restoration and Riparian Learning Center
Waihe'e, Island of Oahu, Hawai'i
TMK: 4-7-006:010 (por.), 4-7-006:018, 4-7-006:023 (por.), 4-7-008:002 (por.)

On behalf of KEY Project's Board of Director's and Staff, we appreciate the opportunity to submit comments to the Draft DEA prepared by G70 on behalf of the City and County of Honolulu Board of Water Supply (BWS). First of all, we are in full support of the Waihe'e Lo'i Restoration and Riparian Learning Center (Proposed Project) and find the DEA to be culturally thoughtful, sensitive to our community, and consistent with Chapter 343 of the Hawai'i Revised Statutes. In addition, we concur with the DEA summary that, (1) an EIS is not warranted, and (2) based upon the DEA, support the Finding of No Significant Impact.

KEY Project is a 501(c)(3) non-profit organization whose location and mailing address is 47-200 Waihe'e Road, Kaneohe, Hawai'i 96744. The mission of KEY Project is the promotion of the "cultural, environmental, social, economic and recreational well-being" of the community it serves being the area from Kaneohe to Kahuku. KEY Project celebrated its 50th Anniversary in 2018. Many of our Board and staff members have lineal and cultural ties to the Ko'olaupoko Moku, including Ho'okano, McCabe, and Lau 'ohana members from the Waihe'e, Kahalu'u, and Kaneohe Ahupua'a and many have been stewards of the land and streams, including generations of the Towill, Mello, and Reppun families and others. Notwithstanding our individual connections to this land, we collectively as KEY Project have, for decades, consistently embraced a kuleana to mālama this Waihe'e Ahupua'a where our community center is located.

In addition, KEY Project has a long standing history of its stewardship of Waihe'e. In 2003, KEY Project entered into a Memorandum of Understanding (MOU) with BWS to form the Waihe'e

Watershed Initiative (WAI) to develop a community-based plan for the sustainable management of the Waihe'e Ahupua'a. Subsequently, Hui O Ko'olaupoko and Bishop Museum were added to the partnership. (See 2.1.2) KEY Project has been instrumental in forging effective partnerships throughout our service area – with educational entities (Kahalu'u Elementary School, Castle High School and others throughout the Castle Complex), government (the City and State) to offer supportive programs such as free Kupūna breakfasts, and private/non-profit collaborations such as hosting Tutu & Me Traveling Pre-School, a program of Partners in Development. As a community center complex, KEY also provides an outlet for local farmers to sell their produce, a gathering place for Neighborhood Board meetings, community forums, and family celebrations.

However, we provide the following specific comments:

1. Access.

The DEA notes in numerous sections, that the entrance gate to Waihe'e Valley up to the BWS watershed is through lands under the jurisdiction of the City and County Department of Parks and Recreation (DPR). Specifically, DPR has "agreed to allow BWS to evaluate and disclose the project in this EA in part, as a means to manage this access" and assume maintenance responsibilities. We would urge DPR and BWS to consider transferring jurisdiction of DPR lands to BWS. From a public perception and legal standpoint, it may be more defensible to limit access for watershed protection rather than limiting access to public park lands.

2. Parking

Although the proposed site plan provides two gravel parking lots that could accommodate 25 cars (first gravel parking area) and 14 cars (second gravel parking area) we would recommend caution. Currently, vehicle access is limited to authorized personnel who have a key to open the gate. Permitting grading and grubbing for even gravel parking lots could cause erosion or adverse impacts to the stream and surrounding environment. Parking should be very limited and parking for larger groups should be through shuttles to minimize impact on the environment and neighboring communities.

3. Archaeological Resources

The Draft EA recommends archaeological monitoring for all parts of the project area based upon an SHPD approved archaeological monitoring plan (AMP). The DEA proposes that a non-profit community based organization would enter into a lease for the Proposed Project. The expense of a State approved AMP and full time archaeological monitor can be a financial burden upon a community based non-profit with limited financial resources. The identified archaeological features include SIHP 08919 comprised of the main access road and two culverts, and SIHP 08920 which are terraces, water drainage pipes, C-shaped structures, an old road, historic structural remnants, and a possible platform. There was no evidence that any pre-contact habitation or potential burial sites were located. This is not a private for profit venture and the proposed mitigation could be unduly burdensome to a non-profit community based organization. Thus, we would recommend BWS reconsider the mitigation and require compliance with HAR §13-275-12 related to inadvertent discovery of significant cultural or historic materials and/or burials.

In conclusion, we concur in the BWS Finding of No Significant Impact and strongly believe that the Proposed Project will have a positive effect on the environment and community. The community efforts to preserve and protect Waihe'e Valley, watershed, and the entire Ahupua'a has been pa'a or firm from the first settlors and farmers. We support BWS's continued efforts to steward this land in partnership with a community based non-profit.

Should you have any questions or concerns, please do not hesitate to contact me or our Executive Director, 'Auli'i Dudoit at (808) 239-5777.

Mālama pono,

Dawn N.S. Chang
President
KEY Project Board of Directors

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January 8, 2021

Ms. Dawn N.S. Chang, President
Kualoa-He'eia Ecumenical Youth Project
47-200 Waihee Road
Kaneohe, HI 96744

Subject: Chapter 343, Hawai'i Revised Statutes Environmental Assessment
Response to Draft Environmental Assessment Comment Letter
Waihe'e Lo'i Restoration and Riparian Learning Center
Waihe'e, Island of O'ahu, Hawai'i
TMK: 4-7-006:010 (por.), 4-7-006:018, 4-7-006:023 (por.), 4-7-008:002 (por.)

Dear Ms. Chang,

Thank you for your comment letter dated September 7, 2020 concerning the Chapter 343, Hawai'i Revised Statutes (HRS) Draft Environmental Assessment (EA) for the proposed Waihe'e Lo'i Restoration and Riparian Learning Center project, located in Waihe'e, Island of O'ahu, Hawai'i. The following responses are offered to your comment.

Thank you for your support of the Waihe'e Lo'i Restoration and Riparian Learning Center Project.

1. **Access.** The decision to transfer the TMK 4-7-006:010 from Department of Parks and Recreation to the Board of Water Supply is currently being negotiated and has not yet been made. Due diligence has discovered previous unexploded ordnance (UXO) remediation and is not complete pending further remedial actions by the military.

2. **Parking**. We acknowledge your concern with causing erosion or adverse impacts to the stream and surrounding environment through grading and grubbing activities, including construction of the gravel parking lots. We agree that larger groups should park at the Kahalu'u District Park and carpool up to the Project site.

   A grading permit will be obtained from the City in order to begin construction. Building will occur primarily on soils that exhibit slow runoff rates and low erosion hazards. No building will occur on steep slopes where WpF soils are located due to their rapid runoff and severe erosion potential. During the construction period, erosion will be minimized through compliance with the City and County's grading ordinance and the applicable provisions of the State of Hawai'i DOH Water Quality Standards (Title 11, Chapter 54, HAR) and Water Pollution Control requirements (Title 11, Chapter 55, HAR). Proper landscaping, grading, and correct construction procedures will in fact minimize drainage problems. As a Priority B1 project, a Stormwater Quality Checklist must be prepared by a Certified Water Pollution Plan Preparer and reviewed and approved by the Director prior to issuance of a grading permit.

3. **Archaeological Resources.** We acknowledge your concern regarding the expense of employing a full time archaeological monitor for all parts of the project. However, pursuant to HRS §6E-8 and Hawai'i Administrative Rules §13-275, there is sufficient evidence in the presence of known sites to warrant archaeological monitoring as a mitigation measure. The necessity for having a monitor is for the protection and care of both known and unknown resources in the area. Due to the existing conditions, such as steep terrain and highly dense vegetation, there are most likely still-uncovered resources.

   The ability to ensure the protection of historical and cultural resources during project implementation will be based upon future coordination with the landowner and nonprofit group to find some reasonable means to find protection of the resources. There are also creative alternatives through partnerships that could result in community stewards being trained to serve in this capacity. These kinds of alternatives should also be explored for project implementation.

The Final EA will be published in the Office of Environmental Quality Control's *The Environmental Notice* which can be found online at: http://oeqc2.doh.hawaii.gov/_layouts/15/start.aspx#/Doc_Library/Forms/AllItems.aspx. Please enter *title* with a colon at the end, immediately followed by *Waihee* in the search box to locate the Final EA.

We appreciate your input and participation in this review process.

Sincerely,

GROUP 70 INTERNATIONAL, INC., dba G70

Mark Kawika McKeague, AICP
Principal

Chapter 8

List of References

Chapter 8

List of References

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Appendices

Appendix A

Neighborhood Board and Community Meeting Notes

KAHALU'U NEIGHBORHOOD BOARD NO. 29
(He'eia Kea, 'Āhuimanu, Kahalu'u, Waihe'e, Ka'alaea, Waiāhole, Waikāne, Hakipu'u, Kualoa)
c/o Neighborhood Commission Office • 925 Dillingham Boulevard, Suite 160 • Honolulu, Hawaii 96817
PHONE (808) 768-3710 • FAX (808) 768-3711 • INTERNET: http://www.honolulu.gov/nco

REGULAR MEETING MINUTES
WEDNESDAY, JUNE 12, 2019
KUALOA HE`EIA ECUMENICAL YOUTH (KEY) PROJECT

CALL TO ORDER: Chair Amy Luersen called the Kahalu'u Neighborhood Board No. 29 meeting to order at 7:05 p.m. **Quorum was established with ten (10) members present.** Note – This 15-member Board requires eight (8) members to establish quorum and to take official Board action.

Members Present: Daniel Bender, Cameron Deal, Lee Gomes, Ken LeVasseur, Clifford Loo, Amy Luersen, Art Machado, Flora Obayashi, John Reppun, Richard Vermeesch (arrived at 7:15 p.m.), Leialoha Kaluhiwa (arrived at 7:10 p.m.), and Rick Towill.

Members Absent: Yvonne Nelson.

Guests: Captain Mark Adams (Honolulu Fire Department); Lieutenant Michael Kuroda (Honolulu Police Department); Barry Usagawa (Board of Water Supply); Tiffany Patrick (Marine Corp Base Hawaii); Aulii Dudoit and Kalae Kukahiko (KEY Project); Councilmember Heidi Tsuneyoshi; Michael Sakata (Office of Councilmember Heidi Tsuneyoshi); Clifford Wong (Wong's Taro Farm); Evern Williams (Olelo Community Media); Barbara Natale (G70); Joseph Haili, Marie Samudio, Jackie Graessle, R. Miller, S. Miller, Shae Cotteen, Liz Aulsebrook, and Bill South (Residents); Casey Ishitani and Jackson Coley (Neighborhood Commission Office).

PUBLIC SAFETY REPORT
Honolulu Fire Department (HFD): HFD Captain Mark Adams reported the following: May 2019 Statistics: Captain Adams reported that HFD responded to 32 medical emergencies, three (3) motor vehicle collisions, one (1) mountain rescue, and one (1) ocean rescue.

Questions, comments, and concerns followed: Open Fires: The Board inquired if it is legal to have an open fire on private property and Captain Adams responded that it is not.

Honolulu Police Department (HPD): Lieutenant Michael Kuroda reported the following: May 2019 Statistics: There were three (3) motor vehicle thefts, five (5) burglaries, five (5) thefts, and five (5) unauthorized entries into motor vehicles (UEMV).

Questions, comments, and concerns followed: Likelike Highway Crash: Deal inquired about a multiple vehicle crash that occurred on Wednesday, June 12, 2019. Lieutenant Kuroda responded that allegedly a tow truck was unable to stop and impacted several other vehicles. The driver of the tow truck remained at the scene.

Kaluhiwa arrived at 7:10 p.m. 11 members present.

FILLING OF VACANCIES
Sub-District 1: As there were no nominations or volunteers, this item was deferred to the next meeting.

Sub-District 6: As there were no nominations or volunteers, this item was deferred to the next meeting.

Vermeesch arrived at 7:15 p.m. 12 members present.

RESIDENT/COMMUNITY CONCERNS
- Olelo: Olelo Community Relations Specialist Evern Williams reported that Olelo is hosting a Junior Academy for Media - a summer media camp that leads into yearlong student engagement through project-based learning and event engagements. Students participating in the camp will complete three (3) independent projects and participate in three (3) Olelo Community Media events prior to completion of the program in June 2020. The Summer Media Camp runs Monday, July 8, 2019 to Friday, July 26, 2019.
- Board Elections: Machado raised concerns regarding outreach by the Neighborhood Commission toward the senior members of Kahaluu. Machado cited senior residents at KEY Project not hearing about the Neighborhood Board elections.

CITY, STATE, AND FEDERAL AGENCY REPORTS
Marine Corps Base Hawaii (MCBH): MCBH Representative Tiffany Patrick reported the following:
- Bellows Base Japanese Cemetery: Descendants of Japanese Americans buried at the cemetery on Bellows Air Force Base were allowed to visit the culturally significant site.
- Belmont University: On Tuesday, May 14, 2019, students from Belmont University visited MCBH at Kaneohe Bay. The tour stops included the Marine Corps Air Station Kaneohe Bay terminal, Kaneohe Bay Range Training Facility, and the Pacific War Memorial. The visit informed students on the relations with the community and U.S. Marine Corps training on Oahu.
- Marina Fest 2019: On Friday, May 24, 2019, Marina Fest was held at the MCBH Marina. The public event featured live music and activities.
- Relocation: Ms. Patrick informed the Board that she was relocating to England. The board thanked her for her service and Member Obayashi recognized her with lei and song.

Board of Water Supply (BWS): BWS Programs Director Barry Usagawa reported the following:
- Water Main Break Report: There were no main breaks in May 2019.
- Water Levels: Potable production for May 2019 was 138.7 million gallons per day (MGD). The five (5) month moving average for rainfall is 72% of normal. Severe drought conditions exist for Leeward Oahu. The National Weather Service is predicting El Nino conditions through summer 2019, with 70% chance of five (5) to eight (8) tropical cycles through November 2019, increasing probabilities of above normal rainfall.

COMMUNITY PROJECTS PRESENTATIONS
Waihee Nature Park and Waihee Falls: BWS Programs Director Usagawa reported the following:
- Waihee Ahupuaa Initiative (WAI): BWS and KEY Project have partnered on WAI. Since 1959, BWS has assumed ownership of the Waihee Tunnel System, which is the largest source of water in Koolau Poko with a five (5) MGD production.
- Current WAI Activities: Since October 2007, WAI participants have been meeting regarding the construction of a fish passage in Waihee Stream near the "Ice Pond" and the old abandoned USGS gage. The fish passage would provide native aquatic species such as o`opu with passage of the upper reaches of the stream to lay and fertilize their eggs.
- Periodic Volunteer "Work Trips": KEY Project has coordinated several community volunteer "work trips" to remove large bulky items and invasive plant species along the access road to the upper valley.
- Vegetative Cover Mapping: Vegetative cover mapping is estimated to cost between 5,000 and 10,000 dollars. The projected mapping is to help better understand the resources of the Waihee ahupuaa.
- Waihee Loi Restoration and Riparian Learning Center: BWS is partnering with G70 for a proposed restoration of traditional loi kalo and the stream environment through community education activities. The 13 acre proposed region would extend from Waihee Road to the dam and evaluate access improvements into the watershed while mitigating adverse impacts to the ecosystem caused by hikers.

Questions, comments, and concerns followed:
1. Resident Concerns: Residents who live on Waihee Road raised that hikers have been trespassing on private property and into the Waihee Falls area. Trespassers have been bringing pets into the valley, causing concerns about fecal matter and pollution. Resident Clifford Wong raised concerns for the cleanliness of the water that flows downstream to his taro farm. Residents also raised concerns regarding trespassers harassing their pets and creating unsafe traffic conditions for their children. Several residents noted that social media posts seem to be encouraging trespassing.
2. Board Concerns: Kaluhiwa inquired if there were any ways that HPD could enforce the No Trespassing policy for Waihee Falls. Reppun inquired if the Board could call upon Department of Transportation Services (DTS) and HPD to enforce the No Parking policy at the end of the pedestrian streets. Reppun reiterated the concerns regarding pollution in the water table cascading from upstream hikers, in particular e. coli. Reppun also raised that social media can be used to deter trespassers, due to the sheer volume of thousands of individuals every weekend, pointing to the legal matters that trespassing individuals may face. LeVasseur inquired if trespassers are a Homeland Security risk.

Reppun Moved and Machado Seconded to call upon the relevant City and County of Honolulu entities to convene in a discussion group and to enact immediate enforcement of No Trespassing signage at Waihee Nature Park, with proposals being returned to the Kahaluu Neighborhood Board by Wednesday, July 10, 2019. The Motion was ADOPTED BY UNANIMOUS CONSENT, 12-0-0 (**Aye**: Bender, Deal, Gomes, LeVasseur, Loo, Luersen, Machado, Obayashi, Reppun, Vermeesch, Kaluhiwa, and Towill; **Nay**: None; **Abstain**: None).

At 8:26 p.m. Chair Luersen handed the gavel to Vice Chair Towill in order to present.
Dredging of Kahaluu Lagoon: Chair Luersen reported that there is a contract to dredge Kahaluu Lagoon from the City and County of Honolulu. The contract includes a Department of Parks and Recreation (DPR) agreement to dump waste spoils in the Heeia Kea area. Kahaluu Regional Park is designed to have an area to dispose of dredged spoils.

Questions, comments, and concerns followed:

1. Heeia Disposal Area: Kaluhiwa raised concerns regarding the disposal of wastes in the Heeia Kea area, especially in regard to wastes polluting the ocean.
2. Upstream Impacts: Resident Clifford Wong raised concerns about dredging causing increased water flows and bridges upstream from the lagoon and the culvert being unable to maintain the increased pressure. Vice Chair Towill responded that the invert appears to be degrading as well.
3. Kahaluu Watershed Work Plan: Reppun raised that in 1969, a work plan was developed to manage the Kahaluu watershed. He stated that no alternatives were sought by the City and County of Honolulu, raising concerns that sluiceways are outdated and that native fish upstream migration was not taken into account.
4. Board Approval: Obayashi raised concerns that the Board taking action against the dredging will run counter to past Board approval of dredging, namely from Reppun. Reppun responded that he has never insisted on approval of dredging, further elaborating that new findings about community outrage and environmental impacts are reason to put a stay on current dredging proposals.

Reppun Moved and Kaluhiwa Seconded a Motion to request that the City and County of Honolulu put a stay on both the dredging of Kahaluu Lagoon and disposal of dredged spoils at Heeia Kea while collaborating with the State of Hawaii to review and reevaluate the 1969 Kahaluu watershed work plan. The Motion PASSED BY UNANIMOUS CONSENT, 12-0-0 (**Aye**: Bender, Deal, Gomes, LeVasseur, Loo, Luersen, Machado, Obayashi, Reppun, Vermeesch, Kaluhiwa, and Towill; **Nay**: None; **Abstain**: None).

At 8:45 p.m. Chair Luersen reacquired the gavel.

Proposed Rezone from Agriculture (AG) 2 to Residential (R) 10 – 47-532 Ahuimanu Road: Dennis Silva reported that he is a planning consultant and will be seeking a zoning change for the property at 47-532 Ahuimanu Road. The property is proposed to be changed from an AG2 to R10 property with individual residential units as part of CRP, with shared access way. Silva informed the Board that this was an informational presentation prior to formally submitting the Environmental Assessment (EA).

Questions, comments, and concerns:

1. Access: Chair Luersen inquired about access to and from the property.
2. Proposed Property Size: Towill inquired about the property size after rezoning and Silva responded that there will be at least 10,000 square feet of land area for each residential unit. Reppun inquired if Silva was aware of the Community Growth Boundary location change. LeVasseur inquired if the property will result in spot-zoning since it is surrounded by AG 2. Resident Samudio raised concerns about affordability of lots on the property. Gomes raised concerns regarding total property area size and ability of neighboring residents to traverse around property. Silva responded that he will report back to the Board at a future Neighborhood Board meeting.
3. Environmental Assessment (EA): Towill inquired about an EA from BWS and Silva responded that BWS will conduct an EA when sewage lines are completed. Chair Luersen inquired if Silva will be submitting results under the new Environmental Impact Statement (EIS) rules and Silva responded that he will.
4. Proximity: Loo inquired about proximity to a community growth property. LeVasseur raised concerns regarding illegal activity in the change of the community growth property. Reppun inquired about the impact of the zoning change on schools in the area.

At 8:55 p.m. LeVasseur raised concerns regarding a member of the Kahaluu Neighborhood Board taking part in illegal activity regarding the change of the community growth property. Obayashi raised objection to LeVasseur's concerns. Chair Luersen gaveled to reestablish order.

Report on Windward Emergency Preparedness Fair: Obayashi reported that the Windward Emergency Preparedness Fair was held on Saturday, May 18, 2019. Handouts at the fair included emergency instructions, go-bags with emergency checklists, and Meals Ready to Eat (MRE's). Obayashi noted that 2019 is an El Nino year, meaning an increased likelihood of cyclone events.

REPORTS BY ELECTED OFFICIALS
Mayor Kirk Caldwell's Representative: Rebecca Soon was not in attendance. Chair Luersen requested that the following report be included in the minutes.

- Kahaluu Lagoon: The Department of Facility Maintenance (DFM) reported that dredging of the Kahaluu Lagoon would be performed by specialized contractor as part of a Capital Improvement Project to be administered by the Department of Design and Construction (DDC). Appropriate studies would be conducted as part of the project.
- Illegal Dumping: The Department of Environmental Services (ENV) reported that depending on the location, the State Department of Transportation (HDOT) has jurisdiction of the roadway and roadside along Kamehameha Highway. Previous attempts by ENV to utilize evidence from cameras were deemed by HPD and the City Prosecuting Attorney's office to be insufficient to prosecute. However, ENV will look into using camera evidence, under its existing authority, to enforce against illegal dumpers. If someone witnesses illegal dumping as it's occurring, they should immediately call 911 to notify the police. Illegally dumped materials or bulky items placed out for collection outside of the normal collection schedule can be reported directly to the City's Refuse Inspectors at (808) 768-5220.
- Refuse Transfer Station: Councilmember Heidi Tsuneyoshi has included Capital Improvement Program (CIP) monies in Fiscal Year 2020 (FY20) to begin the planning process for a Kahaluu Transfer Station. This is currently going through the budget approval process. However, the Kahaluu area is served by the Kapaa Transfer Station, located 20 minutes away, at 100 Kapaa Quarry Road.
- Waihee Falls: The DPR has extended the fence, placed "Government Property, No Trespassing" signs, and is working with BWS to resolve this issue. The entrance to the area, including the vehicle gate, is under the control of the Department of Parks and Recreation (DPR). BWS continues to work with DPR and area residents when large groups or unusual vehicular traffic is reported. Social media sites make the area very popular with both residents and visitors and due to the geography of the area, restricting access to the trail is challenging.
- Ahilama Road between Waihee Bridge and Kalohaku Bridge: DFM is not aware of an Administrative Order to turn over privately-owned bridges to the City and County of Honolulu.
- Oahu Society for the Prevention of Cruelty to Animals (OSPCA) Property Update: Notice of Order No. 2016/NOO-115 was issued on April 26, 2016. The current amount of civil fines is 110,500 dollars. DPP is requesting a Major Shoreline Management Area permit be obtained and an Environmental Impact Statement (EIS) be resubmitted to DPP's Land Use Approval Branch.
- Aloha Animal Sanctuary at 47-119 Pulama Road: The specified lot is vacant. No application has been submitted for a structure other than application for a six (6) foot high chain-link fence. Building Permit No. 823827 was issued for a fence on October 22, 2018. Proximity of the structure on the property to the ocean will be reviewed at the time of submittal for a building permit. The DFM requests that additional information be provided by the Neighborhood Board clarifying the specific concern with the Aloha Animal Sanctuary in order to determine the appropriate course of action to be taken.
- Ahuimanu Place between Kahekili and Ahuimanu Road Safety Concerns: The Department of Transportation Services (DTS) is still performing an investigation, which will include a site inspection, speed study, review of the traffic collision history, etc. The DTS will take appropriate action as warranted by the analysis. The DTS will contact the Mayor's representative should any additional information be required during the investigation.
- Stream Maintenance by the United States Army Corp of Engineers (USACE): The streams included in the stream maintenance permit that was applied to the USACE was developed through discussion with the USACE, State Department of Health and the City and County of Honolulu to address anticipated maintenance work performed on streams within five (5) years from the discussion date in 2017. Currently it is believed that the USACE is reviewing comments from the U.S. Fish and Wildlife Services (USFWS) that does not allow any permitted vegetation exceeding 15 feet to be cut between June and September, due to possible Hoary Bat rearing. USFWS is uncertain of the location of Hoary Bat habitat and understands that juvenile bats may be reared on unprotected vegetation branches. The City's application that proposes to perform stream maintenance during the low flow periods, typically in the summer months, may involve the removal of haole koa and mangroves in excess of 15 feet, which may conflict with USFWS comments and a Hoary Bat expert is being consulted by USFWS.

Councilmember Heidi Tsuneyoshi: Councilmember Tsuneyoshi reported the following:

- Councilmember Tommy Waters: Councilmember Waters has been sworn in and his appointment makes a full council.

- Kahalu`u Lagoon: Sakata reported that a project for the dredging of Kahalu`u Lagoon has been fully designed with the anticipated location for dredge spoils at He`eia Kea.
- Transient Vacation Rentals: Councilmember Tsuneyoshi's main issue was transient vacation rentals with Bill 85 and Bill 89 still in committee.
- Bridges: Councilmember Tsuneyoshi reported that City and County of Honolulu money is being requested to repair the Kalohaku Bridge.

Questions, comments, and concerns followed:

1. Bridges: Chair Luersen confirmed that the bridge being proposed for repair is Kalohaka, not Waihee Bridge. LeVasseur raised concerns regarding repairs needed at Waihee Bridge, as the spillway has been blown out. Machado inquired about repairs to the Kamehameha Highway from the bridge to Haiku Rd. and Councilmember Tsuneyoshi's representative Mike Sakata responded that a project has been scheduled for 2020.
2. Solar Panels: The Board raised concerns regarding solar panels containing cadmium, especially in instances of high wind or hurricanes. Sakata responded that he will get back to the Board.
3. Natural Resources and Conservation Service (NRCS): Reppun requested that Councilmember Tsuneyoshi invite NRCS to meetings.
4. Repaving Near the Canoe Club: Reppun inquired about repaving near the Canoe Club as the Board put a lot of work into the repaving. LeVasseur raised concerns regarding repaving promised by the Honolulu Film Office in the area around Heeia Kea Pier and Sakata responded that he would inquire about it.

Councilmember Ikaika Anderson: No representative was present; no report was given.

Governor David Ige's Representative: No representative was present; no report was given.

Senator Gil Riviere: No representative was present; no report was given.

Senator Jarrett Keohokalole: No representative was present; no report was given.

Representative Lisa Kitagawa: No representative was present; no report was given.

Representative Sean Quinlan: No representative was present; no report was given.

STANDING COMMITTEE REPORTS
Military Liaison Committee: Machado was not present; no report was given.

Planning and Zoning Committee: Chair Luersen reported the following

- New EIS Rules: Governor Ige is holding off on signing in order to ensure a smooth transition process. Hawaii Administrative Rules (HAR) 11-200 will be repealed. Information can be found at http://health.hawaii.gov/oeqc/.
- Heeia State Park: Chair Luersen reported that Kamaiana Kids commercial recreational activities at Heeia Kea Park technically should not be operating as they do not have a commercial recreation permit since March 2019.

Preservation of Hawaiian Heritage Committee: Kaluhiwa reported that a composers contest will be held at Haiku Gardens in September 2019.

Transportation and Safety Committee: LeVasseur had no report.

Water and Environment Committee: Vice Chair Towill raised concerns regarding snakes being flown into the islands, the sustainability of individual property septic systems. Reppun added further concern regarding waste disposal fees

Emergency Preparedness Committee: Obayashi inquired if Committees may retain a representatives even if they are not board members and Chair Luersen responded that they may.

At 9:20 Deal left. 11 members left.

BOARD BUSINESS

Treasurer's Report: Bender reported a remaining balance of $496.68.

Adoption of Regular Meeting Minutes of Wednesday, May 8, 2019: The Board raised that on Page 5 of 6, in the section Planning and Zoning Committee under "Questions, comments, and concerns followed", there should be an amendment reading "A resident raised concerns regarding the property being subdivided".

Bender Moved and Obayashi Seconded to Adopt the Regular Meeting Minutes of Wednesday, May 8, 2019 as amended. The Motion was ADOPTED BY MAJORITY VOTE, 11-0-1 (**Aye**: Bender, Deal, Gomes, LeVasseur, Loo, Luersen, Machado, Obayashi, Reppun, Kaluhiwa, and Towill; **Nay**: None; **Abstain**: Vermeesch)**.**

Adoption of Regular Meeting Minutes of Wednesday, April 10, 2019: Approval of Regular Meeting Minutes of Wednesday, April 10, 2019 was deferred until the next Neighborhood Board Meeting, Wednesday, July 10, 2019. Board members were asked to submit any significant changes to the Chair or Neighborhood Assistant prior to the Board meeting.

Adoption of Regular Meeting Minutes of Wednesday, May 9, 2018 and Special Meeting Memorandum for the Record of Wednesday, April 25, 2018 –: Chair Luersen submitted the Neighborhood Commission's original draft of the Wednesday, May 9, 2018 Regular Meeting Minutes, prior to any revisions, with the caveat that the Minutes be considered Draft Minutes pending results of LeVassuer's Appeal of the Findings of Fact Hearing held on Monday, October 22, 2018.

Bender Moved and Reppun Seconded to Adopt the Regular Meeting Minutes of Wednesday May 9, 2018 as Amended. The Motion FAILED TO MEET QUORUM, 6-4-1 (**Aye**: Bender, Luersen, Machado, Reppun, Towill, and Vermeesch; **Nay**: Gomes, LeVasseur, Loo, and Obayashi; **Abstain**: Kaluhiwa).

SUB-DISTRICT REPORTS: There were no sub-district reports.

ANNOUNCEMENTS
Next Meeting – The next meeting of the Kahalu'u Neighborhood Board No. 29 is tentatively scheduled for Wednesday, July 10, 2019 at the Key Project, 47-200 Waihee Road at 7:00 p.m.

ADJOURNMENT – The meeting adjourned at 10:25 p.m.

Submitted by: Casey Ishitani, Neighborhood Assistant
Reviewed by: Jackson Coley, Public Relations
Final approval by: Chair Amy Luersen

KAHALU'U NEIGHBORHOOD BOARD NO. 29
(He'eia Kea, 'Āhuimanu, Kahalu'u, Waihe'e, Ka'alaea, Waiāhole, Waikāne, Hakipu'u, Kualoa)
c/o Neighborhood Commission Office • 925 Dillingham Boulevard, Suite 160 • Honolulu, Hawaii 96817
PHONE (808) 768-3710 • FAX (808) 768-3711 • INTERNET: http://www.honolulu.gov/nco

"LET US NOT EVER HAVE AN UNHAPPY MINORITY; RATHER, LET US BUILD A COMMUNITY CONSENSUS."

INITIAL CONVENING MEETING MINUTES
WEDNESDAY, JULY 10, 2019
KUALOA HE`EIA ECUMENICAL YOUTH (KEY) PROJECT

CALL TO ORDER: Chair Pro Tem Amy Luersen called the Kahalu'u Neighborhood Board No. 29 meeting to order at 7:05 p.m. **Quorum was established with twelve (12) members present.** Note – This 15-member Board requires eight (8) members to establish quorum and to take official Board action.

Members Present: Daniel Bender, Kaanoi Walk, Lee Gomes (arrived at 7:24 p.m.), Leialoha Kaluhiwa (arrived at 7:34 p.m.), Ken LeVasseur, Joseph Haili, Amy Luersen, Art Machado, Yvonne Nelson, Flora Obayashi, John Reppun, Rick Towill, Richard Vermeesch, and Jean Tangaro.

Members Absent: None.

Guests: Major Crizalmer Caraang, Captain Shellie Paiva, Lieutenant Michael Kuroda (Honolulu Police Department); Danny Hayes (Marine Corps Base Hawaii); Captain Clayton Madrona (Honolulu Fire Department); Barry Usagawa (Board of Water Supply); Representative Lisa Kitagawa; Aulii Dudoit (KEY Project); Cliffor Wong (Wong Farm); Marie Samudio, Garrett Howard, Kai Kahele, Matthew Lee, Won-Seok Yuh, Lara Pangon, Bill South, Chuck Peason, Alan Texeira, Kalae Kukahiko, and Clifford Loo (Residents); Casey Ishitani (Neighborhood Assistant).

SWEARING IN OF NEW BOARD MEMBERS: The Neighborhood Assistant swore in the Kahaluu Neighborhood Board No. 29.

PUBLIC SAFETY REPORT
Honolulu Fire Department (HFD): Captain Clayton Madrona reported the following.

- June 2019 Statistics: There were no structure fires, one (1) wild-land fire, two (2) nuisance fires, no cooking fires, two (2) automobile fires, one (1) activated alarm, 39 medical emergencies, no motor vehicle collisions with pedestrians, three (3) motor vehicle crashes, no mountain rescues, two (2) ocean rescues, and one (1) hazardous materials incident.
- Safety Tip: Captain Madrona reported tips for grill safety. Each year, an average of 8,900 home fires are caused by grilling. Almost half of all injuries involving grills are due to thermal burns. HPD provided the following tips: propane and charcoal barbecue grills should only be used outdoors; grills should be placed well away from the home, deck railings, and out from under eaves and overhanging branches; keep children and pets at least three (3) feet away from the grill area; keep the grill clean by removing grease; never leave grills unattended; and ensure the gas grill lid is open before lighting it. Specific tips for charcoal grills include: charcoal chimney starters allow residents to light charcoal using newspaper as fuel; if using a starter fluid, only use charcoal starter fluid; keep charcoal fluid out of reach of children; and let coals cool completely before disposing of it in a metal container.

Questions, comments, and concerns followed: Beach Fire: Towill raised concerns regarding charcoal disposal at beaches. Towill referred to a Hawaii News Now story regarding a toddler being burned by hot coals that were buried. Captain Madrona responded that residents should properly dispose of coals.

Honolulu Police Department (HPD): Lieutenant Michael Kuroda reported the following.

- June 2019 Statistics: There was one (1) motor vehicle theft, 12 burglaries, six (6) thefts, and eight (8) unauthorized entries of motor vehicles.
- Safety Tips: Lieutenant Kuroda provided a handout regarding safety tips for children, including sections regarding internet safety and instructions on walking to and from school.

ORGANIZATION OF THE KAHALUU NEIGHBORHOOD BOARD
Chair: **Obayashi Moved and Machado Seconded to appoint Luersen as Chair. The Motion was ADOPTED BY UNANIMOUS CONSENT, 12-0-0** (**Aye**: Bender, Walk, LeVasseur, Haili, Luersen, Machado, Nelson, Obayashi, Reppun, Towill, Vermeesch, and Tangaro; **Nay**: None; **Abstain**: None).

Vice Chair: **Machado Moved to nominate Reppun. Reppun declined. There was no Second.**

Reppun Moved and Nelson Seconded to Appoint Towill as Vice Chair. The Motion was ADOPTED BY MAJORITY VOTE, 11-1-0 (**Aye**: Bender, Walk, LeVasseur, Haili, Luersen, Machado, Nelson, Reppun, Towill, Vermeesch, and Tangaro; **Nay**: Obayashi; **Abstain**: None).

Treasurer: **LeVasseur Moved and Machado Seconded to Appoint Bender as Treasurer. The Motion was ADOPTED BY UNANIMOUS CONSENT, 12-0-0** (**Aye**: Bender, Walk, LeVasseur, Haili, Luersen, Machado, Nelson, Obayashi, Reppun, Towill, Vermeesch, and Tangaro; **Nay**: None; **Abstain**: None).

Secretary: **Tangaro Moved and Reppun Seconded to Appoint Nelson as Secretary. The Motion was ADOPTED BY MAJORITY VOTE, 11-1-0** (**Aye**: Bender, Walk, LeVasseur, Haili, Luersen, Machado, Nelson, Reppun, Towill, Vermeesch, and Tangaro; **Nay**: Obayashi; **Abstain**: None).

Date, Time, and Location**: Reppun Moved and LeVasseur Seconded to retain the current date of the month, time, and location for the Kahaluu Neighborhood Board. The Motion was ADOPTED BY UNANIMOUS CONSENT, 12-0-0** (**Aye**: Bender, Walk, LeVasseur, Haili, Luersen, Machado, Nelson, Obayashi, Reppun, Towill, Vermeesch, and Tangaro; **Nay**: None; **Abstain**: None).

Recess Schedule: Chair Luersen suggested with no objection that the Kahaluu Neighborhood Board Recess in December 2019. Seeing no objection, the Board scheduled a Recess in December 2019.

Gomes arrived at 7:24 p.m. The Neighborhood Assistant swore her in. 13 members were present.

Olelo Broadcast Media: **Obayashi Moved and Machado Seconded to have Olelo Broadcast Media record Kahaluu Neighborhood Board meetings. The Motion was ADOPTED BY MAJORITY VOTE, 12-0-1** (**Aye**: Bender, Walk, Kaluhiwa, LeVasseur, Haili, Luersen, Machado, Nelson, Obayashi, Reppun, Towill, Vermeesch, and Tangaro; **Nay**: None; **Abstain**: Gomes).

Kaluhiwa arrived at 7:34 p.m. The Neighborhood Assistant swore her in. 14 members present.

Oral Testimony: LeVasseur raised issue regarding the rules of oral testimony, claiming that the Neighborhood Commission is not compliant with "the law". Obayashi raised that the Board may adopt their own rules. Bender responded that Robert's Rules allows civil discussion. Reppun raised that time limits to oral testimony during Board meetings should be at Chair Luersen's discretion.

FILLING OF VACANCIES ON THE BOARD: Sub-District Six (6): He'eia ahupua`a (Hui Iwa `ili): Chair Luersen inquired if there were any volunteers. Seeing none, this item was deferred to the August 2019 Meeting.

RESIDENT/COMMUNITY CONCERNS
57th Annual Hawaii State Farm Fair: Chair Luersen reported that the 57th Annual Hawaii State Farm Fair will take place at Kualoa Ranch from Saturday, July 13, 2019 to Monday, July 15, 2019.

Morning Glass Coffee: KEY Project Executive Director Aulii Dudoit reported that Morning Glass Coffee is now open at KEY Project, Monday to Friday from 7:00 a.m. to 1:00 p.m. More information can be found at http://www.morningglasscoffee.com/key-project.

Koolaupoko: Resident Marie Samudio reported that Hawaiian Electric Company (HECO) has been facilitating community conversations around Koolaupoko community resilience. Samudio stated that Kahaluu may require a separate power source. Chair Luersen responded that when the HECO report is finalized it will be shared with the Board.

CITY, STATE, AND FEDERAL AGENCY REPORTS
Marine Corps Base Hawaii (MCBH): Danny Hayes reported that MCBH will partner with Oahu Waterkeeper for an oyster deployment in Kaneohe Bay and at Mokapu Peninsula to aid in filtering pollutants and aiding biodiversity.

Questions, comments, and concerns followed: Fishponds: Kaluhiwa raised concerns regarding use of Nuupia ponds, stating that they could be developed as sustainable community fishponds.

Board of Water Supply (BWS): BWS Programs Director Barry Usagawa reported the following:

- Main Breaks: There were no main breaks.
- Usage: 140 Million Gallons per Day (MGD) were used in June 2019.
- 31st Annual Halawa Xeriscape Garden Open House and Unthirsty Plant Sale: BWS presents the 31st Annual Halawa Xeriscape Garden Open House and Unthirsty Plant Sale on Saturday, August 3, 2019 from 9:00 a.m. to 3:00 p.m. More information can be found at www.boardofwatersupply.com, visit www.facebook.com/bwshonolulu, follow @bwshonolulu on Twitter, or call the BWS Communications Office at (808) 748-5041.

COMMUNITY PROJECTS PRESENTATIONS

Update on Waihee Valley Nature Park: BWS Programs Director Usagawa reported that, with the E. coli reading in June 2019, drinking water contamination has become a priority. The drinking water is safe to drink but the area near Waihee Falls will need to be protected from contamination. BWS has activated a second gate within the trail, which remains closed and locked as a management access plan is needed to enter. BWS is also waiting for an Environmental Impact Statement for a proposed loi restoration project within Waihee Valley Nature Park. Special duty HPD officers have been effective at deterring trespassers but Department of Parks and Recreation (DPR) will need to hire security guards. BWS recorded 3,000 trespassers on a three (3) day weekend.

Questions, comments, and concerns followed:

1. Chlorine and Pollution: A resident raised concerns regarding chlorine in the water table near the Waihee Ice Ponds. The resident reported that shrimp were found dead in the pools on Sunday, June 30, 2019. Usagawa responded that chlorine is used to treat drinking water in reservoirs after the Ice Ponds and that if dead shrimp are found residents will need to report to HPD. Obayashi reported that Councilmember Heidi Tsuneyoshi has raised the issue of drinking water being at risk of pollution.
2. Trail Access: A resident raised concerns about trail access, stating that he is a former HPD officer and that he feels citations and court cases are needed to deter trespassers. HPD Captain Shellie Paiva responded that due to graffiti on the "No trespassing" signs, some citations may not be upheld in court. Reppun raised that trash cans being placed at the entrance of the access gate may appear to be an invitation to trespass.
3. Social Media and Tourism Outreach: Tangaro raised that social media posts within trail can be used as a means of citation. A resident reported that posts regarding Waihee Falls can be found on www.alltrails.com. Resident Samudio suggested contacting the Hawaii Tourism Authority.

Update on Dredging of Kahaluu Lagoon: Department of Community Services Deputy Director Rebecca Soon reported that Councilmember Tsuneyoshi has been attempting to meet with Department of Design and Construction Director Robert Kroning.

Questions, comments, and concerns followed:
Dredged Materials: Kaluhiwa raised concerns regarding the dredged materials being transferred to Heeia Kea area.
Water Flow: Resident Clifford Wong raised concerns regarding increased stream flow causing erosion damage to properties up Waihee Stream.
Environmental Impacts: A resident inquired if an Environmental Impact Statement (EIS) will be needed. Deputy Director Soon responded that an Environmental Assessment (EA) is being conducted and will be utilized to determine if an EIS will be needed.

At 9:01 p.m., Chair Luersen handed the gavel to Vice Chair Towill.

Update on Status of Holokai Tours: Chair Luersen reported that Holokai Tours does not have a commercial recreation permit to operate at Heeia State Park. The Department of Land and Natural Resources (DLNR) informed her that residents who witness Holokai Tours operating at the park are encouraged to contact DLNR at (808) 643-3567. An officer will require time and date of incident to write a citation. Chair Luersen also added that Holokai Tours has applied for a permit.

At 9:05 p.m., Chair Luersen received the gavel from Vice Chair Towill.

Questions, comments, and concerns followed: Senator Gil Riviere: Senator Gil Riviere responded that residents can report violations to The DLNRTip app and tip411. People without a smartphone will be able to send an anonymous text tip via their cell phone to DLNR Division of Conservation and Resources Enforcement (DOCARE) by texting keyword DLNRTIP and their message/tip to 847411 (tip411). Anonymous web tips can also be submitted through the DOCARE website https://dlnr.hawaii.gov/docare/.

REPORTS BY ELECTED OFFICIALS

Mayor Kirk Caldwell's Representative: Deputy Director Rebecca Soon of Mayor Caldwell's office reported the following.

- Oahu Society for the Prevention of Cruelty to Animals (OSPCA): Soon informed the Board that a permit will not be granted to OSPCA to build at a proposed location.
- Hui Koloa Place: Regarding a property on Hui Koloa Place, Soon reported that a grading permit was not granted as Department of Planning and Permitting (DPP) will need to inspect the property.

Councilmember Heidi Tsuneyoshi: Councilmember Tsuneyoshi and her Representative Mike Sakata reported the following:

- Kahaluu Lagoon Dredging: Councilmember Tsuneyoshi responded to earlier questions about EA and EIS that residents will be given a comments process.
- Waihee Valley Nature Park: Councilmember Tsuneyoshi reported that there is a permitting process to allow necessary access to City and County of Honolulu employees and cultural leaders. Social media platforms are also being monitored and citations are being explored for sites that encourage trespassing. Parking could be restricted at the end of Waihee Road with fees established if requested by residents and the Kahaluu Neighborhood Board.
- Resolution 1392: Repairs to the Kalohaku Bridge have been budgeted.
- Windward Coast Disaster Preparedness Fair: Councilmember Tsuneyoshi took a moment to honor the Windward Coast Disaster Preparedness Fair.

Questions, comments, and concerns: Waihee Marsh: Reppun inquired if DPP would support designating Waihee Marsh as a protected wetland.

Councilmember Ikaika Anderson: Councilmember Anderson reported the following.

- Bill 89: Councilmember Anderson reported that Bill 89, which will restrict vacation rentals, has been signed into law.
- Haiku Stairs: The comment period is active at the BWS website (https://www.boardofwatersupply.com/community/haiku-stairs), comments will be accepted no later than 11:59 PM HST, Wednesday, August 7, 2019

Senator Gil Riviere: Senator Riviere reported the following.

- Community Emergency Response Team (CERT): Senator Riviere reported that he graduated from the City and County of Honolulu's Department of Emergency Management (DEM) CERT training.
- Pali Lanes: Senator Riviere supports saving the Kailua bowling Pali Lanes.
- House Bill (HB) 1326: Senator Riviere reported that HB 1326 did not pass in spite of pressure to DLNR for water licenses from Alexander and Baldwin.
- HB 551: HB 551 passed and was forwarded to Governor Ige. HB 551 would extend various reporting deadlines and the sunset date of the cesspool conversion working group established pursuant to Act 132, Session Laws of Hawaii 2018.

Representative Lisa Kitagawa: Representative Kitagawa handed out a newsletter and reported the following.

- Windward Emergency Preparedness: Representative Kitagawa handed out a pamphlet for Emergency Preparedness. The pamphlet highlighted planning, emergency kits, and provided resources for further information. Residents can contact Kaneohe / Kahaluu CERT to get involved at kkcertsos@gmail.com.
- Windward Homelessness: Representative Kitagawa reported that the Joint Outreach Center at the Kaneohe Civic Center will be opening by the end of Summer 2019 with medical services for homeless Medicaid individuals. H4 Hawaii and The Institute for Human Services (IHS) will expand to include substance abuse treatment along with housing referrals.

Governor David Ige's Representative: Hawaii Department of Business Director Mike McCartney took questions.

Questions, comments, and concerns followed:

1. Emergency Shelters: Reppun raised concerns regarding the costs that Hurricane Lane caused in 2018. Reppun also inquired about which State department will take up liability for the Department of Education (DOE) and Waiahole Elementary School in the case of another storm event.

2. Solar Panels: Reppun and resident Samudio raised concerns regarding the cadmium toxicity in floatable solar panels in Kahaluu and Director McCartney responded that he would speak to the manufacturers of the panels and get back to the Board.
3. Pali Lanes: Machado raised concerns regarding Pali Lanes requiring assistance from the State of Hawaii. He stated that Pali Lanes regularly hosts Special Olympics events.

Senator Jarrett Keohokalole: No representative was present; no report was given.

Representative Sean Quinlan: No representative was present; no report was given.

ESTABLISH COMMITTEES, SUBCOMMITTEES, AND THEIR MEMBERSHIP
Committees: Chair Luersen stated that she recognized that there are many recurring issues that have faced the community for years and the KNB has positions for many. She proposed organizing these into a spreadsheet by geography, maybe in three a sections, as a means to better track the issues. Chair Luersen proposed modifying the committee structure aligned with some of the major issues. She proposed the establishment of three (3) committees – Land and Water Planning, Infrastructure, and Community Resilience.

Discussion followed:

- LeVasseur inquired and Chair Luersen confirm that Transportation would be imcluded under Infrastructure.
- Bender inquired if Agriculture could be a committee and Chair Luersen responded that it would be Included in Land and Water Planning.
- Obayashi raised objections as she felt that an Emergency Preparedness Committee is of immediate importance to the Kahaluu Neighborhood Board and warrants its own committee. she also stated that she felt we should use FEMA terms.
- Kaluhiwa inquired about where culture would be included.
- Walk stated that he felt Culture should be a separate committee
- Kaluhiwa inquires I f the making of committees and subcommittees can be added to the August 2019 Agenda.
- Reppun added that the process is a way of simplifying the language of committees and encourage proactivity and more communication within the Board.
- Obayashi objected without acknowledgement from Chair Luersen.

At 10:12 p.m. Chair Luersen gaveled to reestablish order.

At 10:15 Tangaro left. 13 Board members were present.

Kaluhiwa, LeVasseur, and Obayashi left the Board meeting as Gomes made a Motion and Towill Seconded to Adopt Committees. Neighborhood Assistant retrieved Kaluhiwa, LeVasseur, and Obayashi as a Motion was made and Sunshine Law issues were present with absent Board members.

Gomes Moved and Towill Seconded to Establish Three (3) Standing Committees (Land and Water Planning; Infrastructure; and Community Resilince) with time to develop subcommittees before the Wednesday, August 14, 2019 Kahaluu Neighborhood Board Meeting. The Motion was ADOPTED BY MAJORITY VOTE, 11-0-2 (**Aye**: Bender, Walk, Kaluhiwa, LeVasseur, Haili, Luersen, Nelson, Reppun, Towill, Vermeesch, and Tangaro; **Nay**: None; **Abstain**: Machado and Obayashi).

Chair Luersen stated that she will add further discussion of committee and subcommittee structure to the August agenda. She encouraged Board members to send her an email with additional thoughts on structure.

BOARD BUSINESS
Treasurer's Report: Bender reported a remaining balance of $495.24.

Approval of Regular Meeting Minutes of Wednesday, June 12, 2019: Neighborhood Assistant reiterated that residents who do not sign in or state their names will not be named in minutes. Obayashi raised that in "Report on Windward Emergency Preparedness Fair" references to "cyclones" should be changed to "hurricanes". Kaluhiwa raised that in "Preservation of Hawaiian Heritage Committee" the contest will be held at Windward Mall. LeVasseur raised that all instances of "Kalohaka" should be changed to "Kalohaku". Reppun raised that in "Solar Panels" the devices mentioned were water panels or floatable photovoltaic devices. Machado was mentioned as not being present, but was present at the time of the Military Liaison report.

Bender Moved and Gomes Seconded to Adopt the Wednesday, June 12, 2019 Regular Meeting Minutes as Amended. The Motion was ADOPTED BY UNANIMOUS CONSENT, 13-0-0 (**Aye**: Bender, Walk, Kaluhiwa, LeVasseur, Haili, Luersen, Nelson, Reppun, Towill, Vermeesch, Tangaro, Machado, and Obayashi; **Nay**: None; **Abstain**: None).

Approval of Regular Meeting Minutes of Wednesday, April 10, 2019: Approval of Regular Meeting Minutes of Wednesday, April 10, 2019 was deferred until the next Neighborhood Board Meeting, Wednesday, August 15, 2019. Board members were asked to submit any significant changes to the Chair or Neighborhood Assistant prior to the Board meeting.

Adoption of Regular Meeting Minutes of Wednesday, May 9, 2018 and Special Meeting Memorandum for the Record of Wednesday, April 25, 2018 – Deferred Pending Appeal Findings of Fact of Hearing held on Monday, October 22, 2018: Chair Luersen submitted the Neighborhood Commission's original draft of the Wednesday, May 9, 2018 Regular Meeting Minutes, with the Amendment that the Minutes be Draft Minutes pending results of LeVassuer's Appeal to Findings of Fact Hearing held on Monday, October 22, 2018.

SUB-DISTRICT REPORTS: There were no sub-district reports.

ANNOUNCEMENTS
Next Meeting – The next meeting of the Kahalu'u Neighborhood Board No. 29 is tentatively scheduled for Wednesday, August 14, 2019 at the Key Project, 47-200 Waihee Road at 7:00 p.m.

ADJOURNMENT – The meeting adjourned at 10:25 p.m.

Submitted by: Casey Ishitani, Neighborhood Assistant
Reviewed by: Jackson Coley, Public Relations
Final approval by: Chair Amy Luersen

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CONFERENCE REPORT

TO:	Files		
FROM:	G70 (BN)		
DATE:	7/31/2019	**LOCATION:**	KEY Project
PROJECT:	BWS Waihe'e Lo'i Restoration and Riparian Learning Center	**PROJECT NO:**	218043-01
SUBJECT:	Small Community Meeting, 7/31/2019	**NO. OF PAGES:**	4
THOSE PRESENT:	Community: John Reppun, Kaipo Faris, Shae Cotteen, Clifford Wong, Steven Springel, Kent Yamaguchi, Kauaoa Fraiola, Peter Field, Carl Brown, Ikaika Higa, Daniel Salsedo	BWS: Barry Usagawa, Kaimana Wong, Amy Tsuneyoshi G70: Kawika McKeague, Barbara Natale, Janice Jensen	

Summary: This was a community meeting to talk about the Waihe'e Lo'i Restoration and Riparian Learning Center (WLRRLC). The Kualoa He'eia Ecumenical Youth (KEY) Project is interested in working on this parcel to restore lo'i and create a Riparian Learning Center. Because of this, BWS is facilitating an Environmental Assessment (EA) to reach an informed decision for moving forward. Community members came together to talk about the issues related both to current trespassing issues in the area as well as concerns for the future WLRRLC.

History of the area

John R. - Lewers & Cooke owned the land at the back of Waihe'e Road. The land was originally zoned for a hotel/resort. Landowners in Waihe'e sued for the down designation of the land and the lawsuit was settled out of court. The result was that the City was assigned the land in the lower section. BWS maintained control of the mauka sections due to the tunnel. When Frank Fasi came on as Mayor, he floated a plan to create a golf course in the back of Waihe'e Valley. The community and BWS banded together to stop this plan and the land was ultimately designated as a nature park to prevent the development of a golf course.

There was a lot of flooding in the area in the 1960s and this spurred the development of the Kahalu'u Watershed Work Plan, a joint effort between City, State, and Federal entities. This plan may need revisiting and updating.

In 2003 BWS entered into a MOU with KEY Project granting KEY a ROE to access the valley for restoration work. The WAI Initiative originated from this work and the idea of a riparian learning center was born.

KEY Project and community members have excavated an old dump site along the road in preparation for the WRRLC (proposed bus turnaround area and parking).

Clifford W. - The area now owned by BWS at the back of the valley was once owned by the Kalahiki family. When Hawai'i went through statehood, the family lost their lands due to not having paid taxes on them. The Kalahiki family may have burials in the valley.

Clifford spent a lot of time in the valley as a child. They used to go back in the valley and pick mountain apples. There was also a lot of 'ilima and maile in the forest. A pig farm used to exist close to the current gate on Waihe'e Road. A large area was turned into cow pasture after the rice mills were closed. The rice mills were removed by DPR without SHPD consultation.

The creation of the tunnel drew the water away from the many large springs that used to be in the area. These springs supplied water to the lo'i that used to exist here. The entire lower area near Kahalu'u was swampy and the rice mills were able to run by water wheel. Clifford used to catch 'ōpae in the springs as a child.

The Higa family, who started the Waiāhole Poi Factory, has long been in the Kahalu'u area and may also have family burials on the land.

Issues and concerns regarding trespassing

- Kids can't play in the neighborhood because of cars
- Food safety standards (for taro production) and water quality
- Water safety: trespassers put the drinking water supply at risk for threats and acts of terrorism
- Pollution
  - Large amounts of rubbish left on the trail and in the stream by hikers, cleaned up by the community. Putting trash cans out gives the appearance that hiking is allowed/encouraged.
  - Aquatic organisms are extremely susceptible to the chemicals (e.g. sunblock, insect repellant). Some have noticed dead fish and prawns (most likely the invasive variety).
- Invasive species taking over the forest
- Hikers are extremely disrespectful to the forest and the neighborhood (driveways, fire hydrants, littering)
- Social media is an invitation that brings more people up to hike. The tourism industry is also a factor—tours drop people off to hike, some hikers said the front desk of their hotel told them of the hike.
  - Possible need for some communication/outreach to the military base and tour companies to get the no trespassing message across.
  - Tourism industry should be told there are places they should not go.

Actions taken to address trespassing

BWS - Police have been present on a few occasions to warn hikers about trespassing and have issued citations.

On 7/24 DPR and BWS put up 20+ new No Trespassing signs at the gate and along the road, repaired the second cattle gate and locked it with a different combination. The combinations of both gates will be changed more often to prevent unauthorized vehicle entry.

BWS is willing to fund 50% of the cost of private security but would need DPR to fund the other 50%.

BWS has put out communications and outreach to the public and social media outlets about not trespassing on the trail. Kaimana is not sure exactly what the messages have been or through what channels they were distributed.

Issues and concerns about the WLRRLC project

- Responsibility for land currently falls to DPR and BWS. DPR's presence gives the impression that it should be publicly accessible.
- The WLRRLC would require a land agreement or permit with DPR. DPR does not want to assume liability and has no resources to devote to the area. This may pose problems for a future MOU with KEY Project or another third-party nonprofit who is also not capable of taking on the liability.
- There is a spring in the lo'i that works with the stream to provide water.
- Don't move the gate further back from the road. People like to gather there and drink in the evenings and this may encourage them to go further up the valley where they are not visible to the neighbors.
- The tunnels under the garages of Waihe'e Road residents where the original 'auwai flows are beginning to crumble and sometimes become clogged. Kaipo (first house next to the gate) monitors his to make sure it continues to flow.
- Department of Health requires all cesspools to be upgraded or converted or the property must connect to a sewer system before January 1, 2050. The 'auwai should have precedence when making connections to the houses.
- The project is not currently scoped for a managed access plan in the EA, but Barry has a list of components for a management system. Access may need to be provided to hikers, as with shoreline access requirements to create public right-of-ways (same with mauka access as makai).
- How long will it take to get this project off the ground?

Possible solutions

- BWS taking over the land currently assigned to DPR down to the very first cattle gate at the road to create a single jurisdiction of land designated for watershed purposes. This would limit or prevent access to the area for recreational purposes.
- Involving a land trust in the purchase of the DPR land for conservation purposes and creating an MOU with them to address management.
- Creating a community presence near the first gate may alleviate some of the trespassing issues, instill some kuleana in visitors.
  - Is there a need for a caretaker's presence? Should there be an office space?
- Tunnels under resident garages for the 'auwai should have flow rates measured
- BWS Vision (Barry proposes including this list of possibilities in the EA): the WLRRLC may present opportunities for:
  - GIS mapping
  - conditions assessment
  - future 'auwai studies in the area through BWS funding and WAI management
  - testing divergent structures
  - removal of invasive species in the mauka sections of the forest to improve watershed health
  - long-term access issues with hikers— e.g. hikers would need to help with forest restoration work to go up the trail. They would need to follow a set of guidelines/obey kapu, etc.
- The EA should be completed in July 2020. The RFP process and permitting will occur soon after.

Potential contacts

- Kauaoa Fraiola
  - Stream monitoring and ecology
  - Did a project on o'opu in Ko'olaupoko streams, including a section of Waihe'e stream
- Vincent Mahoe - contact Kauaoa to get in touch
  - Long-time resident of the area; remembers exactly where things were located (e.g. springs)
- Roy Ryder – suggested by Clifford
- Bob Nakata – suggested by Steve

Appendix B

Memorandum of Understanding

MEMORANDUM OF UNDERSTANDING

Between
Kualoa He'eia Ecumenical Youth Project (KEY Project)
And the
Honolulu Board of Water Supply

Background:

Waihe'e Ahupua'a, Ko'olaupoko, O'ahu is one of nine ahupua'a that surround and include Kaneohe Bay and its contributing watershed(s).

Handy, Handy & Pukui *(Native Planters In Old Hawaii – Their Life, Lore and Environment)* describe the area as follows:

> "The main stream bearing this name has its headwaters in a waterfall against the mountain wall, and is joined by two others, *Hamama* and *Kalia*. Carefully terraced but abandoned taro *lo'i* follow the stream and its tributaries almost to their several sources. It is said that the ahupua'a took its name from a *kapu lo'i* belonging anciently to the *ali'i* of the place situated mauka of the *muliwai* (lagoon) called Pa'ele, into which the main stream empties."

In modern times, Waihe'e has gained recognition as a place of contest over water allocation and management issues. This ahupua'a has spawned or contributed to intense debate, litigation, constitutional and legislative deliberation...and most importantly, a keen interest in understanding our precious water resources and the task of stewardship that we all inherit.

Preamble:

The purpose of this document is one of providing fertile ground for, and the means to cultivate a new understanding of inherited public resources within this ahupua'a. By this document, these two parties – and others to join in – will restore and/or form anew the relationships that are necessary to the sustainable management of any watershed. From such a relationship, we hope to nurture development of a viable, community-based management plan for Waihe'e, Koolaupoko that will guide generations to come.

This agreement will assist the parties in identifying resources and opportunities towards achievement of agreed-upon goals including, but not limited to the following:

> *1) To preserve, protect, restore, enhance and interpret the unique natural and cultural inheritance of Waihe'e for future generations by fostering knowledge of relevant history, culture, local economy and science such that an understanding of the elements that are critical to ahupua'a restoration becomes widespread;*
>
> *2) To protect endangered tropical forest(s), wetlands, riparian, coastal, estuarine, and*

> *marine habitat through promotion of environmental policies and practices that address biological sustainability and human well being. This will be accomplished, in part, by integrating current Western management strategies with traditional Hawaiian resource stewardship models – each of which are now better understood;*
>
> *3) Develop natural resource stewardship models that respect the native Hawaiian rights and those of an island community while helping to re-establish a corresponding acceptance of civic responsibilities attached to said rights;*

Partnership Agreement:

The "Partners", as referred to in the agreement, fully support the need to include all parties who demonstrate a willingness to contribute positively to the expressed goals of the Waihe'e Ahupua'a Initiative [WAI].

This agreement is, therefore, but a <u>first</u> step towards development of a framework within which other individuals, organizations and resources can be added or assembled to accomplish common goals.

By this MEMORANDUM OF UNDERSTANDING, the Honolulu Board of Water Supply, hereinafter referred to as "BWS", and the Kualoa-He'eia Ecumenical Youth Project, hereinafter referred to as "KEY Project", agree to participate in cooperative management, and educational activities in Waihe'e Ahupua'a, hereinafter known as the WAI'HEE AHUPUA'A INITIATIVE ("WAI")

WHEREAS, KEY Project and **BWS**, hereinafter collectively referred to as "**PARTNERS**", wish to work cooperatively to foster appropriate management of and planning for all or portions of Waihe'e ahupua'a, from the summit of the Koolau range to the outer edge of Kane'ohe Bay; and

WHEREAS, Waihe'e Ahupua'a contains an abundance of publicly-owned lands and, therefore, offers a critical opportunity for cultural and environmental education, ahupua'a restoration and/or enhancement; and

WHEREAS, Waihe'e Stream and its system tributaries are a critical source of fresh water input supporting the estuary and fisheries of Kane'ohe Bay; and

WHEREAS, Waihe'e is historically an important source of water for both the **BWS** and adjacent farmers, including the cultivation of lo'i kalo; and

WHEREAS, proper management of this area would benefit Hawaii's watersheds, culture, native flora and fauna and provide valuable public benefit; and

WHEREAS, active and effective stewardship of the Waihe'e Ahupua'a is important to the programs of each of the **PARTNERS**; and

WHEREAS, effective management is best achieved through the coordinated actions of such partnerships; and.

NOW, THEREFORE, the **PARTNERS** hereby agree in principle as follows:

1. To jointly pursue the development of a strategic plan for the Waihe'e watershed that shall include, but not be limited to: a water resources and management plan; plans for the development/restoration of cultural, environmental and educational resources; opportunities for sustainable community-based economic development, and a plan for the development of additional partnerships that will support the goals of **WAI** as identified in a strategic plan; and

2. To determine costs to implement specific aspects of Waihe'e Ahupua'a Initiative agreed upon in #1 and join in cooperative efforts to raise funds for agreed-upon projects.

3. To develop and implement specific agreements and working plans for the individual projects considered by the parties hereto having mutual interest. Such agreements and working plans may be developed whenever appropriate.

4. To enter into specific agreements, as occasion demands, which may include the use of specialized equipment, hiring and supervision of personnel, transfer of funds, purchasing of supplies, and other matters pertaining to the general purposes of management agreed upon by the parties hereto. Limitation of expenditures under this MEMORANDUM OF UNDERSTANDING will be determined by specific working agreements, with consensus agreement of PARTNERS, entered into under authority of this instrument contingent upon compliance with applicable laws or policy guidelines which govern such expenditures.

5. That, in carrying out the terms of this understanding, each PARTNER will provide up to two, but not less than one, representatives for the purpose of resolving differences and determining the direction and flow of common work.

6. That other associates may enter into this partnership at any time by way of an addendum to this MEMORANDUM OF UNDERSTANDING.

7. The PARTNERS agree to a mediated conflict resolution process in the event of irreconcilable differences. Any PARTNER may elect to not participate in this MEMORANDUM OF UNDERSTANDING by providing 90 days written notice to the others.

IN WITNESS WHEREOF, the PARTNERS hereto have executed this MEMORANDUM OF UNDERSTANDING made and entered into on the 25th day of October 2003, at Waihe'e Ahupua'a, Koolaupoko, Oahu.

KEY Project

By: _____
Rick Towill, President,
Board of Directors

Date: 10/25/03

John L. Reppun

Honolulu Board of Water Supply

By: _____
Clifford Jamile,
Manager and Chief Engineer

Date: 10.25.03

Appendix C

Koʻolaupoko Stream Diversion Survey

Koʻolaupoko Stream Diversion Survey, 2008 to 2011
Stream Diversion Field Notes

Conducted for

State of Hawaiʻi
Department of Land and Natural Resources
Commission on Water Resource Management
Stream Protection and Management Branch

Prepared by

Honolulu Board of Water Supply
Water Resources Division
Hydrology-Geology Section

August 2011

Acknowledgments

The reconnaissance of stream diversions could not have been conducted without assistance from the following people and their area of expertise, in parentheses.
Kaipo Faris; (Waiheʻe Valley).
John Morgan, Brody Hartle; Kualoa Ranch Hawaiʻi (Hakipuʻu Valley).
Alfredo Lee, Vernon Pico, Joan Kawamoto, Gary Anguay, John Bautista; State of Hawaiʻi Agribusiness Development Corporation (Waiāhole Ditch System).
Gary Umeda; Hawaiʻi Housing Finance and Development Corporation (Waiāhole Valley Agricultural Park and Residential Lots Subdivision).
Randolph Teruya, Eddie Paulo, Shaun Wilcox; Hawaiʻi State Department of Agriculture (Maunawili Ditch – Waimānalo Irrigation System).
Jennifer Kobayashi (Student Aide III), Arthur Kham Sing (Poʻokela Program)

Product

Included in this submittal are the field notes, map, and summary of the Koʻolaupoko diversions. Reconnaissance was performed to the extent practicable. The field notes represent observations of Honolulu Board of Water Supply staff and make no representation of opinion regarding the utilization of any diversion.

Respectfully submitted by:

Barry Usagawa
Principal Executive
Water Resources Division

Glenn Oyama
Hydrologist-Geologist
Water Resources Division

Executive Summary

Staff of the Honolulu Board of Water Supply conducted field surveys of the stream diversions within the Koʻolaupoko district of Oʻahu during the period October 2008 to July 2011. The surveyed district encompassed Kaʻaʻawa Valley on the Northwestern boundary of the district, to Waimānalo on the Southeastern edge of the district. Included within the compilation of field notes are the Waiāhole Ditch System intakes 1 through 19, which are located within the Kahana hydrologic unit. Although these intakes are not within the Koʻolaupoko area, they are integral to the Waiāhole Ditch System. The Kaʻaʻawa Valley diversions, as listed in the Department of Land and Natural Resources inventory, were also included although that hydrologic unit is not within the Koʻolaupoko ahupuaʻa.

Discharge measurements were taken utilizing various methods. In many reaches of the streams or tributaries it was not possible to take measurements because of unsuitable site conditions. Due to staff time constraints, stream reconnaissance was pursued in reaches of the streams that were likely to have diversions. The existing Department of Land and Natural Resources inventory of stream diversions was used as the baseline for conducting these surveys.

In keeping with the previous stream surveys done on Maui by the R.M. Towill Corporation, the field sheets and stream measurement forms were kept to a similar format to maintain a degree of consistency.

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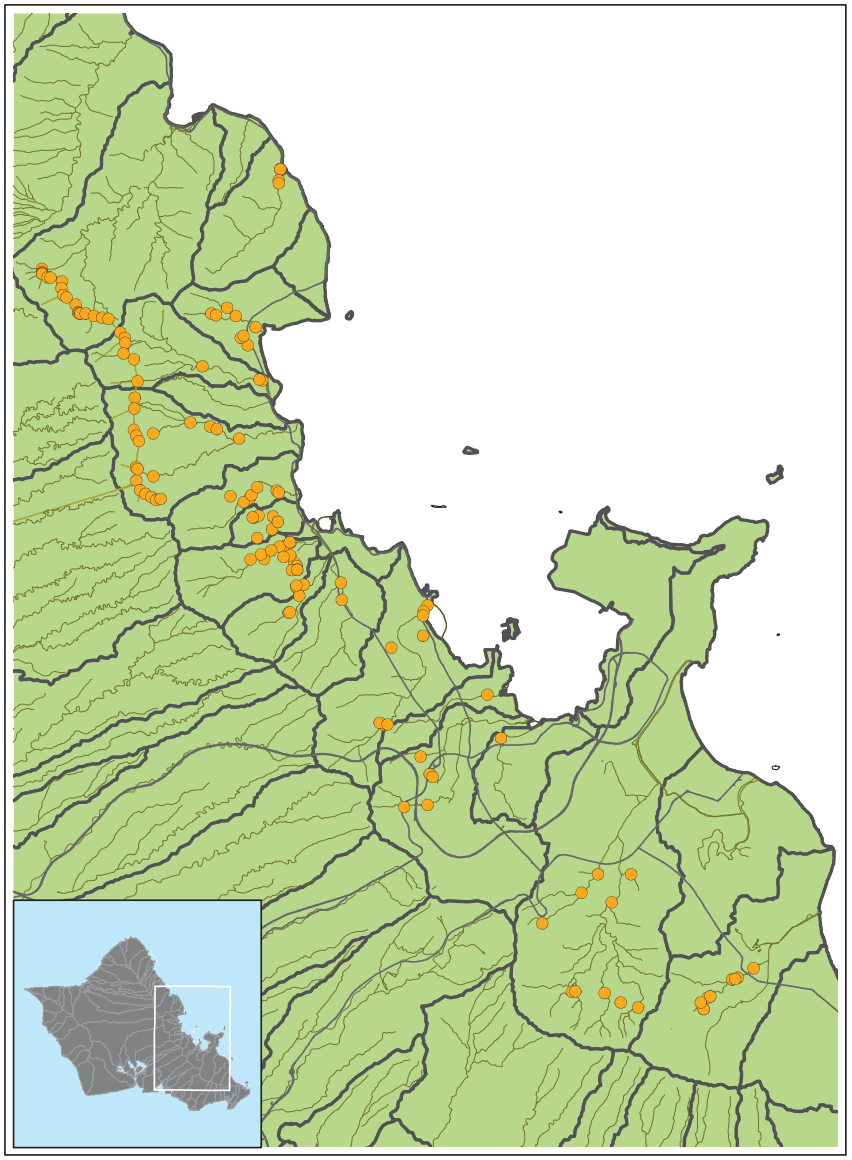


Koʻolaupoko Stream Diversion Survey, 2008 to 2011 (HBWS)

Diversion Name	Surface Hydrologic Units	TMK	Diversion	[a]Status	Stream	[b]Stream (mgd)	Diversion (mgd)	[b]Acreage	Crop
Fuller W&C	3035	4-1-010:048	—	I	Waimanalo	—	0.00	5.00	—
Fuller W&C	3035	4-1-010:048	—	I	Waimanalo	—	0.00		—
Lee (Green DW)	3035	4-1-025:042	pump	I	Waimanalo	—	0.00	1.00	—
Hashimoto Orchids	3035	4-1-018:015	pump	I	Waimanalo	—	0.00	1.00	diversified ag.
Hongs FF	3035	4-1-025:046	—	I	Waimanalo	—	0.00	2.00	other uses
Kamei ES	3035	4-1-013:003	—	I	Waimanalo	—	0.00	2.00	—
Lum AK	3035	4-1-025:040	gravity	I	Tributary to Waimanalo	—	0.00		kalo
Yamashita WM	3035	4-1-018:013	pump	I	Waimanalo	—	0.00	e0.86	diversified ag.
Yamashita Y	3035	4-1-018:014	pump	I	Waimanalo	—	0.00	e0.71	diversified ag.
Makalii Valley Farmers	3033	4-2-006:001	pump	I	Tributary to Maunawili	—	0.00	46.00	—
Maunawili Farmers Association	3033	4-2-008:001	gravity	I	Tributary to Maunawili	—	0.00	51.00	diversified ag.
St. Stephens Diocesan spring box 1	3033	4-2-010:001	gravity	A	Tributary to Kahanaiki				
St. Stephens Diocesan spring box 2	3033	4-2-010:001	gravity	A	Tributary to Kahanaiki	—	0.009	—	potable supply
St. Stephens Diocesan spring box 3	3033	4-2-010:001	gravity	A	Tributary to Kahanaiki				
Maunawili Ditch System Source 1	3033	4-2-010:001	gravity	A	Tributary to Maunawili	0.92	0.92		diversified ag.
Maunawili Ditch System Source 3	3033	4-2-010:001	gravity	A	Maunawili	0.29	0.29		diversified ag.
Maunawili Ditch System Source 10	3033	4-2-010:001	gravity	A	Ainoni	0.15	0.14	[c]750	diversified ag.
Maunawili Ditch System Source 16	3033	4-2-010:001	gravity	A	Tributary to Makawao	—	0.22		diversified ag.
Maunawili Ditch System Source 17	3033	4-2-010:001	gravity	I	Makawao	0.15	0.00		diversified ag.
Lew A	3033	4-2-012:001	pump	I	Kahanaiki	—	0.00	3.00	diversified ag.
Tanaka M	3033	4-2-011:002	pump	I	Kahanaiki	—	0.00		—
Atlas	3031	4-5-030:037	pump	I	Kawa	—	0.00	—	other uses
State Hospital	3030	4-5-023:002	gravity	A	Kapunahala	0.23	0.17	0.76	kalo
Yanagida	3030	4-5-025:005	—	U	Unnamed spring	—	--	—	—
Crocker	3030	4-5-025:025	—	U	Unnamed spring	—	--	—	—
Salas	3030	4-5-041:016	gravity	I	Luluku	0.78	0.14	e0.16	kalo
Stride	3030	4-5-041:017	gravity	A	Luluku	0.78	0.08	e5.00	diversified ag.
Burgher	3029	4-5-012:011	pump	I	Keaahala	—	0.00	—	other uses
Heeia Fishpond Wai 1	3028	4-6-005:001	gravity	A	Heeia	—	—	88.00	aquaculture
Heeia Fishpond Wai 2	3028	4-6-005:001	gravity	A	Heeia	—	—	88.00	aquaculture
Heeia Fishpond Wai 3	3028	4-6-005:001	gravity	I	Heeia	—	0.00	88.00	aquaculture
Hakipuu Learning Center	3028	4-6-014:001	gravity	A	Haiku	0.42	0.05	e0.39	kalo
Hui kū Maoli Ola	3028	4-6-014:002	gravity	A	Haiku	0.08	—	e0.46	kalo
Wing Wo Tai auwai	3028	4-6-016:001	gravity	A	Heeia	—	—	e0.04	kalo
Lee auwai	3028	4-6-016:002	gravity	A	Heeia	—	—	—	kalo
S Asato	3027	4-7-005:002	pump	A	Tributary to Waihee	0.31	—	e7.00	diversified ag.
Silverstein (McCord)	3027	4-7-005:009	gravity	A	Tributary to Waihee	0.45	0.23	e0.34	kalo
Field	3027	4-7-005:013	pump	A	Unnamed spring	e0.10	--	e0.02	diversified ag.
Akima	3027	4-7-005:017	pump	A	Waihee (auwai 3)	0.31	—	—	other uses
Chen	3027	4-7-005:070	pump	I	Tributary to Waihee	—	0.00	4.00	—
Silva	3027	4-7-005:073	pump	A	Tributary to Waihee	0.38	—	1.75	diversified ag.
Spencer	3027	4-7-005:074	pump	A	Tributary to Waihee	0.38	—	1.75	diversified ag.
Y Higa	3027	4-7-005:075	pump	A	Tributary to Waihee	0.29	—	e1.80	diversified ag.
Wainwright	3027	4-7-005:079	pump	A	Tributary to Waihee	0.24	—	e0.92	diversified ag.

[a] Status: A (active), I (inactive), U (unknown).
[b] Stream/Acreage: (e) estimation.
[c] Randolph Teruya, State DOA (personal communication).

Koʻolaupoko Stream Diversion Survey, 2008 to 2011 (HBWS)

Diversion Name	Surface Hydrologic Units	TMK	Diversion	[a]Status	Stream	[b]Stream (mgd)	Diversion (mgd)	[b]Acreage	Crop
Alvarado	3027	4-7-005:090	gravity	A	Waihee (auwai 3)	0.31	0.003	e0.04	other uses
B Young	3027	4-7-012:003	pump	A	Waihee	2.97	—	e0.25	diversified ag.
Anderson	3027	4-7-029:010	gravity	I	Kahaluu	—	0.00	—	—
C&C Hio Basin	3027	4-7-029:034	gravity	A	Kahaluu	3.62	3.62	—	—
C&C Hio Basin	3027	4-7-029:002			Kahaluu			e2.00	kalo, div. ag.
C&C Hio Basin	3027	4-7-029:003			Kahaluu				kalo, div. ag.
C&C Hio Basin	3027	4-7-029:004			Kahaluu			e3.00	kalo, div. ag.
C&C Hio Basin	3027	4-7-029:005			Kahaluu	3.62	3.62	e2.50	kalo, div. ag.
C&C Hio Basin	3027	4-7-029:017			Kahaluu			0.70	diversified ag.
C&C Hio Basin	3027	4-7-029:018			Kahaluu			1.00	diversified ag.
C&C Hio Basin	3027	4-7-029:033			Kahaluu			e5.00	diversified ag.
Hasegawa	3027	4-7-037:020	pump	I	Kahaluu	—	0.00	—	other uses
S Higa	3027	4-7-039:017	pump	I	Kahaluu	—	0.00	3.00	diversified ag.
Lesperance	3027	4-7-046:027	pump	I	Tributary to Kahaluu	—	0.00	e0.34	diversified ag.
Bowman	3027	4-7-046:028	pump	I	Tributary to Kahaluu	—	0.00	—	—
DT Chang	3027	4-7-049:002	gravity	A	Unnamed spring	e0.01	—	e0.01	kalo
Au	3027	4-7-049:003	gravity	I	Unnamed spring	0.01	0.00	—	diversified ag.
Waihee auwai 1	3027	4-7-006:010	gravity	A	Waihee	3.29	0.21	4.00	—
Waihee auwai 1	3027	4-7-006:004				3.29	0.21	1.00	kalo
Waihee auwai 1	3027	4-7-006:013						e4.00	kalo
Waihee auwai 2	3027	4-7-006:010	gravity	A	Waihee	3.08	0.19		
Waihee auwai 2	3027	4-7-064:001				3.08	0.21	0.50	diversified ag.
Waihee auwai 3	3027	4-7-064:014	gravity	A	Waihee	2.93	1.09	—	kalo
Waihee auwai 3	3027	4-7-005:017				—	0.31	—	diversified ag.
Waihee auwai 3	3027	4-7-005:090						e0.04	other uses
Waihee auwai 3	3027	4-7-006:002						e0.14	kalo
Waihee auwai 3	3027	4-7-006:003				2.93	0.78	e1.50	kalo, div. ag.
Waihee auwai 3	3027	4-7-006:013						e0.30	kalo, div. ag.
Waihee auwai 3	3027	4-7-026:002				—	0.31	e2.00	kalo
Waihee auwai 3	3027	4-7-026:005						e2.00	kalo
Waihee auwai 3	3027	4-7-026:024				—	0.31	e1.00	kalo
Waihee auwai 3	3027	4-7-027:006						e2.30	kalo
Waihee auwai 4	3027	4-7-012:021	gravity	A	Waihee	2.97	0.69	2.00	kalo
Waihee auwai 4	3027	4-7-026:004						e1.00	kalo
Waihee auwai 4	3027	4-7-026:024				2.97	0.69	e6.00	kalo
W. Chang	3026	4-7-033:010	pump	I	—	—	0.00	--	—
S Yogi	3026	4-7-033:016	pump	I	Unnamed spring	—	0.00	--	diversified ag.
R Yogi	3026	4-7-033:017	pump	I	Unnamed spring	—	0.00	1.00	diversified ag.
Saiki	3026	4-7-033:026	pump	I	Unnamed spring	—	0.00	—	diversified ag.
Serikaku	3026	4-7-047:015	pump	I	Unnamed spring	e0.02	0.00	0.67	diversified ag.
K Chang	3026	4-7-047:016	pump	A	Unnamed spring	e0.02	—	--	other uses
Higuchi	3026	4-7-047:020	gravity	I	Unnamed spring	—	0.00	—	diversified ag.

[a] Status: A (active), I (inactive), U (unknown).
[b] Stream/Acreage: (e) estimation

Koʻolaupoko Stream Diversion Survey, 2008 to 2011 (HBWS)

[d]Diversion Name	Surface Hydrologic Units	TMK	Diversion	[a]Status	Stream	Stream (mgd)	Diversion (mgd)	[b]Acreage	Crop
H Asato	3026	4-7-047:042	pump	A	Unnamed spring	—	—	0.01	diversified ag.
Fong	3025	4-7-007:010	gravity	I	Kaalaea	—	0.00	—	—
Magoon	3025	4-7-015:013	gravity	I	Kaalaea	1.48	0.00	—	—
Murakami (lower pump)	3025	4-7-015:014	pump	A	Kaalaea	1.48	—	e10.00	diversified ag.
Murakami (upper pump)	3025	4-7-015:014	pump	A	Kaalaea	1.48	—		
Wong's Taro Leaf Farm-auwai	3025	4-7-015:009	gravity	A	Kaalaea	1.48	0.52	e6.00	aquaculture
Wong's Taro Leaf Farm-pump 1	3025	4-7-015:009	pump	A	Kaalaea				kalo
Wong's Taro Leaf Farm-pump 2	3025	4-7-015:009	pump	A	Kaalaea				kalo
Wong's Taro Leaf Farm	3025	4-7-015:010							kalo
Wong's Taro Leaf Farm	3025	4-7-015:020				1.48	0.52	e6.00	kalo
Wong's Taro Leaf Farm	3025	4-7-014:026							kalo
Wong's Taro Leaf Farm	3025	4-7-014:006							kalo
Wong's Taro Leaf Farm	3025	4-7-014:013							kalo
Wong's Taro Leaf Farm	3025	4-7-016:007							kalo
Dan Bishop	3024	4-8-011:001	gravity	A	Waiahole	8.12	1.49	e3.49	kalo
Dan Bishop	3024	4-8-011:008			Waiahole		—	e0.21	kalo
Dan Bishop	3024	4-8-011:009			Waiahole		—	e0.12	kalo
Ota	3024	4-8-011:002	—	U	Waiahole	—	—	3.78	—
Lau	3024	4-8-012:001	—	U	Waiahole	—	—	51.55	—
Lam Ho	3024	4-8-012:002	—	I	Waiahole	—	0.00	3.80	—
Emelia L. H. Kailio	3024	4-8-012:003	—	I	Waiahole	—	0.00	1.34	—
McCandless	3024	4-8-013:013	gravity	A	Waianu	—	0.62	e32.05	kalo/diversified ag.
McCandless	3024	4-8-012:010			Waianu			e7.00	diversified ag.
McCandless	3024	4-8-012:022			Waianu			e6.00	diversified ag.
McCandless	3024	4-8-012:023			Waianu			e8.00	diversified ag.
McCandless	3024	4-8-012:027			Waianu			e0.75	diversified ag.
McCandless	3024	4-8-012:030			Waianu			e1.20	diversified ag.
McCandless	3024	4-8-012:034			Waianu			e1.50	kalo
McCandless	3024	4-8-012:035			Waianu			e5.90	diversified ag.
McCandless	3024	4-8-012:036			Waianu			e1.00	kalo/diversified ag.
McCandless	3024	4-8-012:043			Waianu			e0.70	diversified ag.
Chris Wilkinson	3024	4-8-012:014	gravity	A	Waianu	3.99	2.54	e0.36	other uses
Reppun-upper auwai	3024	4-8-012:021	gravity	A	Waianu	5.65	0.54	e1.50	kalo
Reppun-lower auwai	3024	4-8-012:021	gravity	A	Waianu	5.11	0.40	e0.75	kalo
Nguyen (Minakami)	3022	4-8-004:005	—	U	Waikane	—	--	2.74	—
Roman Catholic Church	3022	4-8-005:001	—	I	Waikane	—	0.00	3.97	—
Roberts	3022	4-8-006:009	—	U	Waikeekee	—	—	3.10	—
Waiahole Ditch System Intake 20	3022	4-8-014:005	gravity	A	Tributary to Waikane	—	—	[e]5644.00	diversified ag./other uses
Waiahole Ditch System Intake 21 (Kahana gage)	3022	4-8-014:005	gravity	A	Tributary to Waikane	—	—	[e]5644.00	diversified ag./other uses
Waiahole Ditch System Intake 22 (Development tunnel 1)	3022	4-8-014:005	gravity	A	Tributary to Waikane	—	—	[e]5644.00	diversified ag./other uses

[a] Status: A (active), I (inactive), U (unknown).
[b] Acreage: (e) estimation.
[d] Waiahole Ditch System intakes 1 through 19 are in Kahana,
[e] CWRM 2006, Waiahole Findings of Fact, Conclusions of Law; and Decision and Order. Table 2 and Table 3.

Koʻolaupoko Stream Diversion Survey, 2008 to 2011 (HBWS)

[a]Diversion Name	Surface Hydrologic Units	TMK	Diversion	[a]Status	Stream	Stream (mgd)	Diversion (mgd)	[b]Acreage	Crop
Waiahole Ditch System Intake 23 (release point)	3022	4-8-014:005	gravity	I	Tributary to Waikane	—	0.00	[c]5644.00	diversified ag./other uses
Waiahole Ditch System Intake 24	3022	4-8-014:005	gravity	A	Tributary to Waikane	—	—	[c]5644.00	diversified ag./other uses
Waiahole Ditch System Intake 25	3022	4-8-014:005	gravity	A	Waikeekee	—	—	[c]5644.00	diversified ag./other uses
Waiahole Ditch System Intake 26	3022	4-8-014:003	gravity	A	Tributary to Uwau	—	—	[c]5644.00	diversified ag./other uses
Waiahole Ditch System Intake 27	3022	4-8-014:003	gravity	A	Uwau	—	0.01	[c]5644.00	diversified ag./other uses
Waiahole Ditch System Intake 28	3022	4-8-013:014	gravity	A	Tributary to Waianu	—	—	[c]5644.00	diversified ag./other uses
Waiahole Ditch System Intake 29	3022	4-8-013:014	gravity	A	Tributary to Waianu	—	—	[c]5644.00	diversified ag./other uses
Waiahole Ditch System Intake 30 (release point to Waianu Stream)	3022	4-8-013:013	gravity	A	Tributary to Waianu	—	—	[c]5644.00	diversified ag./other uses
Waiahole Ditch System Intake 31 (release point to Waiahole Stream)	3022	4-8-013:001	gravity	A	Waiahole	—	—	[c]5644.00	diversified ag./other uses
Waiahole Ditch System Intake 32	3022	4-8-013:001	gravity	A	Waiahole	—	—	[c]5644.00	diversified ag./other uses
Waiahole Ditch System Intake 33	3022	4-8-013:001	gravity	A	Tributary to Waiahole	—	—	[c]5644.00	diversified ag./other uses
Waiahole Ditch System Intake 34	3022	4-8-013:001	gravity	A	Tributary to Halona	—	—	[c]5644.00	diversified ag./other uses
Waiahole Ditch System Intake 35	3022	4-8-013:001	gravity	A	Tributary to Halona	—	—	[c]5644.00	diversified ag./other uses
Waiahole Ditch System Intake 36	3022	4-8-013:001	gravity	A	Tributary to Halona	—	—	[c]5644.00	diversified ag./other uses
Waiahole Ditch System Intake 37	3022	4-8-013:001	gravity	A	Tributary to Halona	—	—	[c]5644.00	diversified ag./other uses
Waiahole Stream pumphouse	3022	4-8-013:001	gravity	I	Tributary to Waiahole	—	0.00	—	—
Waiahole baseyard	3022	4-8-013:001	gravity	A	Tributary to Waiahole	—	—	—	other uses
JUDD MS (Pahalona Spring)	3021	4-9-001:002	gravity	I	Pahalona Spring	—	0.00	2.40	—
K Johnson (Kealohiwai Spring)	3021	4-9-001.006	gravity	A	Kealohiwai Spring	—	—	—	kalo/other uses
K Johnson (Kealohiwai Spring)	3021	4-9-001:007				—	—	—	other uses
K Johnson (Kealohiwai Spring)	3021	4-9-001:014				—	—	e1.40	kalo
North Tributary to Hakipuu Stream	3021	4-9-002:001	gravity	I	Unnamed spring	0.08	0.00	—	—
Hakipuu Spring	3021	4-9-006:001	gravity	A	Hakipuu spring	0.12	0.06	e6.00	diversified ag./other uses
Hakipuu Loʻi	3021	4-9-006:001	gravity	A	Hakipuu spring	—	0.05	0.62	kalo
Sebastian JT	3021	4-9-002:005	gravity	I	Hakipuu	—	0.00	0.20	—
Kualoa Ranch ponds (UH4)	3021	4-9-001:014	pump	A	Hakipuu Stream	0.70	—	e4.00	aquaculture

[a] Status: A (active), I (inactive), U (unknown).
[b] Acreage: (e) estimation.
[d] Waiahole Ditch System intakes 1 through 19 are in Kahana.
[e] CWRM 2006, Waiahole Findings of Fact, Conclusions of Law; and Decision and Order. Table 2 and Table 3.

Field Check List

I. Diversion Information

Island: Oahu	Watershed code: 3027
Quad Name: Kaneohe	Attach Location Map: attached
Stream Name: Waihee	
auwai 1	Priority: 4
Tax Map Key: 4-7-006:010	Address: Department of Facility Maintenance
Land Owner: City and County of Honolulu	1000 Uluohia Street, Suite 215
Diversion User(s): see attached list	Kapolei, HI 96707
Location: Approximately .25 miles S-SW of the end of Waihee Road.	GPS recording: Latitude: d: 21N m: 27 s: 3.8 Longitude: d: 157W m: 51 s: 19.0

II. Stream Flow

a. Gage Data: USGS Gaging Station 16284200 (3.29 mgd on 3/30/10)						
b. Flow Character above:	High ☐		Average ☒		Low ☐	
c. Stream capture %: 6.4. calculation: 0.21mgd / 3.29 mgd						
d. Elevation (amsl): +132 feet, approximate. Taken from map.						
Diversion Character: Intake pipe to auwai			Dimensions/Size:			
a. Dam ☒	Dimensions:		Width: 30 feet		Height: 5 feet	
b. Ditch Flume	Dimensions:		Width:		Height:	
c. Pipe ☐	Dia.(in):	Type: steel ☐		aluminum ☐		concrete/clay ☐
Photographs		Upstream ☐		Site ☒		Downstream ☐

III. End User(s)

a. Number of Users 2				
b.Use/Purpose	Residence ☐	Farm ☒	Growing: Lo'i ☒	Crops ☐
c.Estimated volume:			Flowers ☐	Animals ☐
e. Area Irrigated:			Other ☐	

DLNR Notes:

Field Notes: Uppermost auwai that diverts Waihee Stream flow. USGS gage 16284200 had a discharge of 3.29 mgd prior to current meter measurements of auwai 1 and 2. Auwai 1 was measured at 0.21 mgd, leaving 3.08 mgd of Waihee Stream flow available to auwai 2 on the date of visit.

Notes By: GO Date: 10/8/2009, 3/30/10
Data Entry By: GO Date: 10/14/2009, 3/31/10

III. End User(s)

a. TMK: 4-7-006:013 Owner: Clarence Young		
b.Use/Purpose Residence ☐ Farm ☒	Growing: Lo'i ☒ Crops ☐	
c.Estimated volume na	Flowers ☐ Animals ☐	
e. Area Irrigated? 3.0 to 4.0 acres (per C. Young)	Other ☐ aquaculture	

a. TMK: 4-7-006:004 Owner: Marcus Rosehill		
b.Use/Purpose Residence ☐ Farm ☒	Growing: Lo'i ☒ Crops ☐	
c.Estimated volume na	Flowers ☐ Animals ☐	
e. Area Irrigated? 1.0 acre	Other ☐ aquaculture	

Meter Type: pygmy current meter Serial No.: 580066

ZERO ADJUSTMENT CHECK PERFORMED BEFORE: na AFTER: na

Stream/Diversion Interior Width: 3.5 Water Depth: 0.27

Measurement rating:	Excellent (2%) ☐	Good (5%) ☐	Fair (8%) ☒	Poor (>8%) ☐			
Flow State:	Steady ☐	Turbulent ☐	Laminar ☒				
X-Section Characteristics:	Ditch ☒	Boulders ☐	Gravel Bottom ☐	Steep Banks ☐			
Weather:	Clear/Sunny ☐	Partly Cloudy ☒	Light Rain ☐	Constant Rain ☐			

Measurement: JK, GO Date: 3/30/2010

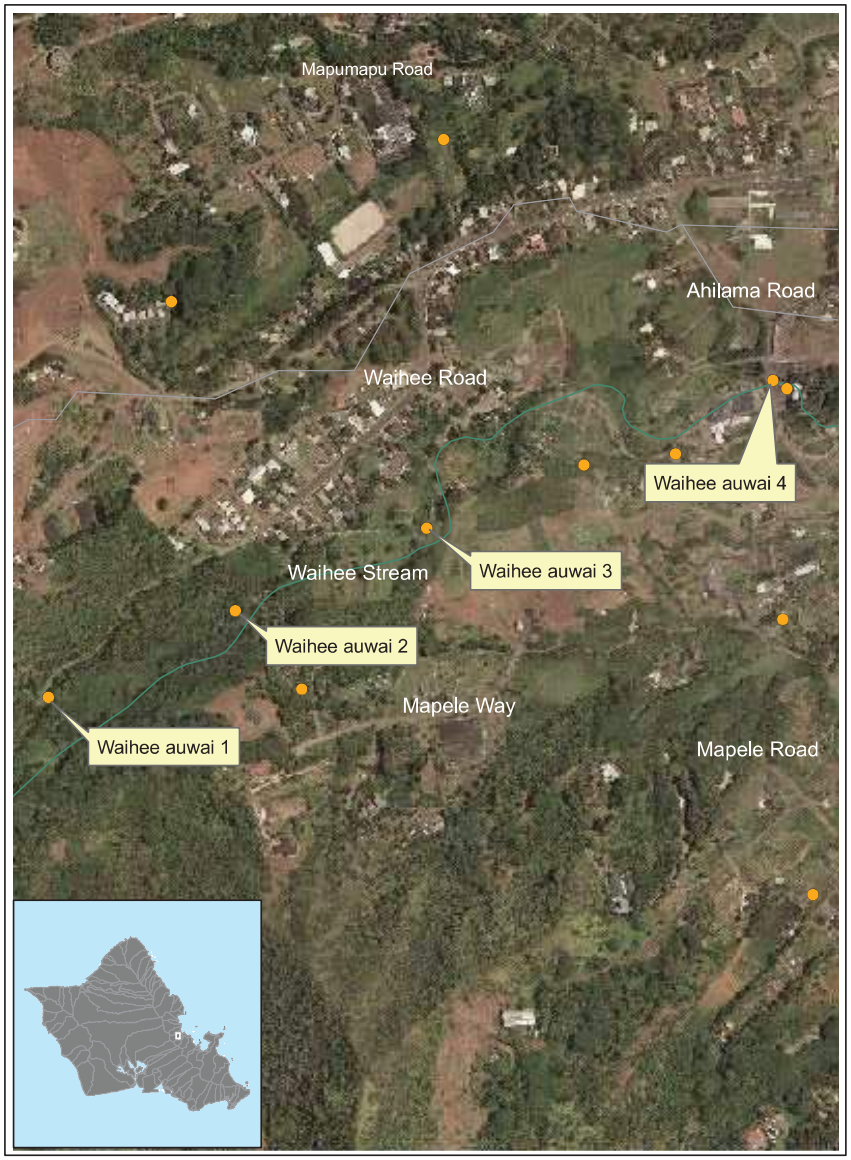
STREAM READINGS - CROSS SECTION

Tagline Station	Distance	Width	Depth	Obs. Depth	Vel. At Point	Vel. In Vertical	Adjusted	Area (ft^2)	Discharge (mgd)
0 RB		0.25	0.26		0.02		0.10	0.07	0.00
1	0.5	0.75	0.26	0.6	0.21			0.20	0.03
2	1.5	1.00	0.40	0.6	0.41			0.40	0.11
3	2.5	0.75	0.40	0.6	0.41			0.30	0.08
4	3.0	0.50	0.16	0.6	0.00			0.08	0.00
5 LB	3.5	0.25	0.16		0.00		0.10	0.04	0.00
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
TOTAL									0.21

Distance = distance from start
Width = distance 1/2 back + 1/2 forward
Depth = water depth
Observed depth = 0.2, 0.6, or 0.8
Velocity at Point = from meter
Velocity at Vertical = at 0.2 or 0.8
Area = width x depth
Discharge = area x velocity
Total = discharge of all stations

IF PIPE: formula K x D2 x U = flow
K = Level/Diameter ratio = from Table 1 (use cfs) =
D (diameter of pipe) = (x in./12)2 D=
U (flow from meter cfs) U=
Flow = total flow in cfs Flow:

Notes/Remarks: Laminar flow.



Waihee auwai 1

diversion dam

inlet of pipe

outlet of pipe to auwai

auwai

Waihee auwai 1

auwai

lo'i

distribution pipe

lo'i

Field Check List

I. Diversion Information

Island: Oahu	Watershed code: 3027
Quad Name: Kaneohe	Attach Location Map: attached
Stream Name: Waihee	
auwai 2	Priority: 4
Tax Map Key: 4-7-006:010	Address: Department of Facility Maintenance
Land Owner: City and County of Honolulu	1000 Uluohia Street
Diversion User(s): A. Ishida (4-7-064:001)	Kapolei, HI 96707
Location: 0.09 miles S-SE from end of Waihee Road	GPS recording: Latitude: d: 21 m: 27 s: 7.8 Longitude: d: 157 m: 51 s: 9.6

II. Stream Flow

a. Gage Data: na. 3.08 mgd available on date of auwai measurement (3/30/10)							
b. Flow Character above:	High ☐		Average ■		Low ☐		
c. Stream capture %: 6.2. calculation: 0.19 mgd / 3.08 mgd							
d. Elevation (amsl): + 125 feet, approximate. Taken from map.							
Diversion Character: open channel			Dimensions/Size: 1.5 feet (w) x 0.3 feet (d)				
a. Dam ■	Dimensions:		Width: 25 feet		Height: 3 feet		
b. Ditch Flume	Dimensions:		Width:		Height:		
c. Pipe ☐	Dia.(in):	Type: steel ☐		aluminum ☐		concrete/clay ☐	
Photographs		Upstream ☐		Site ☐		Downstream ☐	

III. End User(s)

a. Number of Users 1						
b.Use/Purpose	Residence ☐	Farm ■	Growing:	Lo'i ☐	Crops ■	
c.Estimated volume:				Flowers ☐	Animals ☐	
e. Area Irrigated: 0.5 acre (estimated from map)				Other ☐		
DLNR Notes:						
Field Notes: The diversion is located on the right bank of Waihee Stream. The available stream discharge of 3.08 mgd is the estimated stream discharge below the Waihee auwai 1 diversion (0.21 mgd). USGS Stream Gage 16284200 measured 3.29 mgd on 3/30/2010.						

Notes By: GO Date: 10/8/2009, 3/30/10
Data Entry By: GO Date: 10/16/2009, 3/31/10

Meter Type: pygmy current meter Serial No.: 580066

ZERO ADJUSTMENT CHECK PERFORMED BEFORE: na AFTER: na

Stream/Diversion Interior Width: 1.4 Water Depth: 0.26

Measurement rating:	Excellent (2%) ☒	Good (5%) ☐	Fair (8%) ☐	Poor (>8%) ☐			
Flow State:	Steady ☐	Turbulent ☐	Laminar ☒				
X-Section Characteristics:	Ditch ☒	Boulders ☐	Gravel Bottom ☐	Steep Banks ☐			
Weather:	Clear/Sunny ☐	Partly Cloudy ☒	Light Rain ☐	Constant Rain ☐			

Measurement: JK, GO Date: 3/30/2010

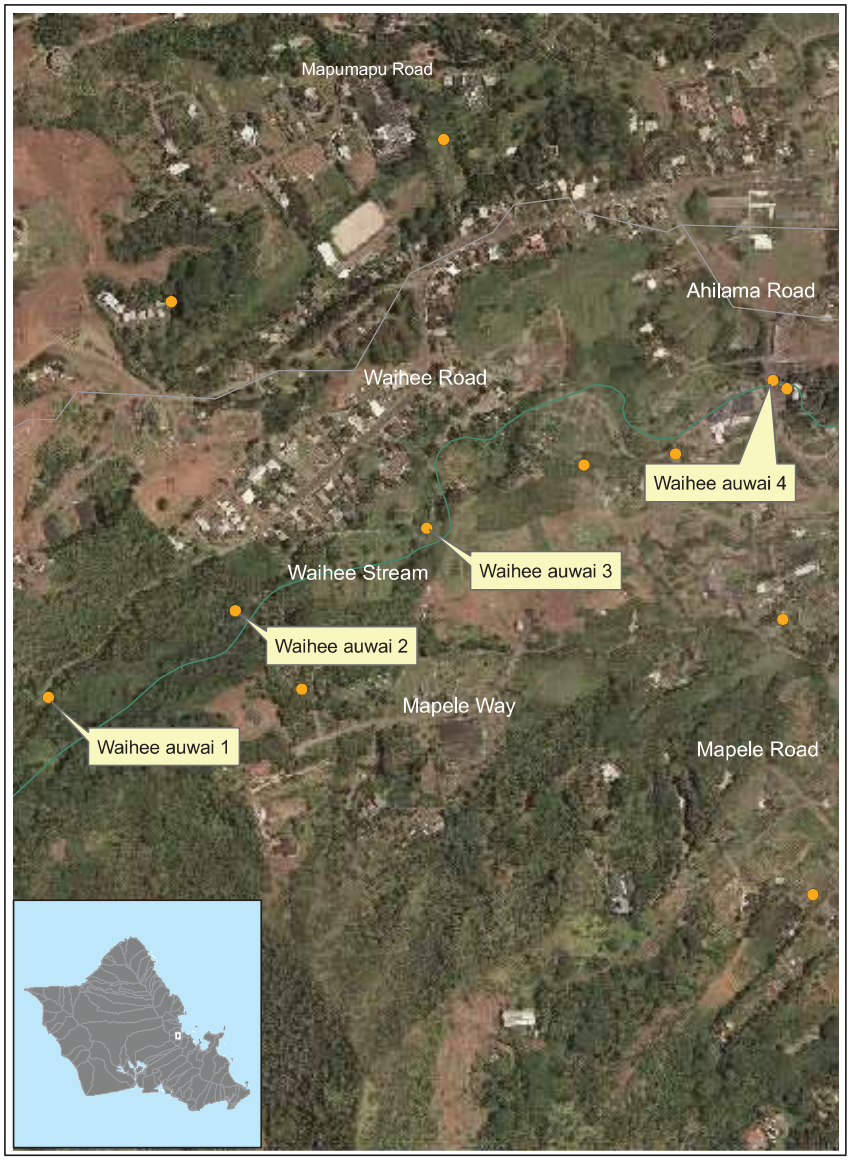
AUWAI READINGS - CROSS SECTION

Tagline Station	Distance	Width	Depth	Obs. Depth	Vel. At Point	Vel. In Vertical	Adjusted	Area (ft^2)	Discharge (mgd)
0 RB		0.20	0.27		0.04		0.10	0.05	0.00
1	0.4	0.40	0.37	0.6	0.41			0.15	0.04
2	0.8	0.40	0.42	0.6	1.06			0.17	0.11
3	1.2	0.30	0.16	0.6	1.01			0.05	0.03
4 LB	1.4	0.10	0.10		0.00			0.01	0.00
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
TOTAL									0.19

Distance = distance from start
Width = distance 1/2 back + 1/2 forward
Depth = water depth
Observed depth = 0.2, 0.6, or 0.8
Velocity at Point = from meter
Velocity at Vertical = at 0.2 or 0.8
Area = width x depth
Discharge = area x velocity
Total = discharge of all stations

IF PIPE: formula K x D2 x U = flow
K = Level/Diameter ratio = from Table 1 (use cfs) =
D (diameter of pipe) = (x in./12)2 D=
U (flow from meter cfs) U=
Flow = total flow in cfs Flow:

Notes/Remarks: Laminar flow. Former Nakata auwai.



Waihee auwai 2

Waihee Stream

diversion dam

pipeline protected by river rocks

auwai

Field Check List

I. Diversion Information

Island: Oahu	Watershed code: 3027
Quad Name: Kaneohe	Attach Location Map: attached
Stream Name: Waihee	
auwai 3	Priority: 4
Tax Map Key: 4-7-064:014	
Land Owner: K-4 Enterprises, Inc	Address: 514 Loring Avenue
Diversion User(s): attached list	Los Angeles, CA 90024
Location: Access off 47-252 Waihee Road	GPS recording: Latitude: d: 21 m: 27 s: 11.6 Longitude: d: 157 m: 51 s: 0.0

II. Stream Flow

a. Gage Data: na. 2.93 mgd (current meter measurement)							
b. Flow Character above:	High ☐		Average ☒		Low ☐		
c. Stream capture %: 37.2. calculation: 1.09 mgd/2.93 mgd							
d. Elevation (amsl): + 79 feet, approximate. Taken from map.							
Diversion Character: unlined channel			Dimensions/Size: 4-5 feet (w) x 2-5 feet (bank)				
a. Dam	Dimensions:		Width:		Height:		
b. Ditch Flume	Dimensions:		Width:		Height:		
c. Pipe ☐	Dia.(in):	Type: steel ☐		aluminum ☐		concrete/clay ☐	
Photographs		Upstream ☐		Site ☐		Downstream ☐	

III. End User(s)

a. Number of Users 5, utilizing 9 parcels.	
b.Use/Purpose Residence ☒ Farm ☒	Growing: Lo'i ☒ Crops ☐
c.Estimated volume:	Flowers ☐ Animals ☐
e. Area Irrigated: 9.28 acres	Other ☒ ti leaf
DLNR Notes:	
Field Notes: On the date of visit, 0.78 mgd of the auwai diversion was used for the upper section of lo'i and Ti leaf. The remaining 0.31 mgd of flow continued to the upper portion of the Alvarado property.	

Notes By: GO Date: 10/8/2009, 4/27/10
Data Entry By: GO Date: 10/14/2009, 5/01/10

III. End User(s)

a. TMK: 4-7-006:002 Owner: Clifford Wong							
b.Use/Purpose	Residence ☐	Farm ☒	Growing:	Lo'i ☒	Crops ☐		
c.Estimated volume na				Flowers ☐	Animals ☐		
e. Area Irrigated? 0.14 acre (estimate from map)				Other ☐	ti leaf		

a. TMK: 4-7-006:003 Owner: Clifford Wong							
b.Use/Purpose	Residence ☐	Farm ☒	Growing:	Lo'i ☒	Crops ☐		
c.Estimated volume na				Flowers ☐	Animals ☐		
e. Area Irrigated? 1.5 acres (estimate from map)				Other ☒	ti leaf		

a. TMK: 4-7-006:013 Owner: Clarence Young							
b.Use/Purpose	Residence ☐	Farm ☒	Growing:	Lo'i ☒	Crops ☐		
c.Estimated volume na				Flowers ☐	Animals ☐		
e. Area Irrigated? 0.3 acres (estimate from map)				Other ☒	ti leaf		

a. TMK: 4-7-005:090 Owner: Helen Alvarado							
b.Use/Purpose	Residence ☒	Farm ☐	Growing:	Lo'i ☐	Crops ☒		
c.Estimated volume na				Flowers ☐	Animals ☐		
e. Area Irrigated? 1560 ft^2 (approximate)				Other ☐			

a. TMK: 4-7-005:017 Owner: Joseph Akima							
b.Use/Purpose	Residence ☒	Farm ☐	Growing:	Lo'i ☐	Crops ☐		
c.Estimated volume na				Flowers ☐	Animals ☐		
e. Area Irrigated? na				Other ☒	yard		

a. TMK: 4-7-026:002 Owner: Reginald and Nadine Wong							
b.Use/Purpose	Residence ☐	Farm ☒	Growing:	Lo'i ☒	Crops ☐		
c.Estimated volume na				Flowers ☐	Animals ☐		
e. Area Irrigated? 2 acres (estimate from map)				Other ☐	aquaculture		

III. End User(s)

a. TMK: 4-7-026:005 Owner: Reginald and Nadine Wong							
b.Use/Purpose	Residence ☐	Farm ☒	Growing:	Lo'i ☒	Crops ☐		
c.Estimated volume na				Flowers ☐	Animals ☐		
e. Area Irrigated? 2 acres (estimate from map)				Other ☐	aquaculture		

a. TMK: 4-7-026:024 Owner: Clifford Wong							
b.Use/Purpose	Residence ☐	Farm ☒	Growing:	Lo'i ☒	Crops ☐		
c.Estimated volume na				Flowers ☐	Animals ☐		
e. Area Irrigated? 1 acre (estimate from map)				Other ☐	aquaculture		

a. TMK: 4-7-027:006 Owner: Clifford Wong							
b.Use/Purpose	Residence ☐	Farm ☒	Growing:	Lo'i ☒	Crops ☐		
c.Estimated volume na				Flowers ☐	Animals ☐		
e. Area Irrigated? 2.3 acres (estimate from map)				Other ☐	aquaculture		

Meter Type: pygmy current meter Serial No.: 580066

ZERO ADJUSTMENT CHECK PERFORMED BEFORE: na AFTER: na

Stream/Diversion Interior Width: 8.3 Water Depth: 0.57

Measurement rating:	Excellent (2%)	■	Good (5%)	☐	Fair (8%)	☐	Poor (>8%)	☐
Flow State:	Steady	☐	Turbulent	☐	Laminar	■		
X-Section Characteristics:	Ditch	☐	Boulders	☐	Gravel Bottom	■	Steep Banks	☐
Weather:	Clear/Sunny	☐	Partly Cloudy	■	Light Rain	☐	Constant Rain	☐

Measurement: JK, GO Date: 4/27/2010

STREAM READINGS - CROSS SECTION

Tagline Station	Distance	Width	Depth	Obs. Depth	Vel. At Point	Vel. In Vertical	Adjusted	Area (ft^2)	Discharge (mgd)
0 RB		0.50	0.40		0.07		0.25	0.20	0.01
1	1.0	1.00	0.50	0.6	0.27			0.50	0.09
2	2.0	1.00	0.50	0.6	0.61			0.50	0.20
3	3.0	1.00	0.51	0.6	1.03			0.51	0.34
4	4.0	1.00	0.61	0.6	1.26			0.61	0.50
5	5.0	1.00	0.69	0.6	1.26			0.69	0.56
6	6.0	1.00	0.75	0.6	1.14			0.75	0.55
7	7.0	1.00	0.72	0.6	1.24			0.72	0.58
8	8.0	1.00	0.48	0.6	0.31			0.48	0.10
9 LB	8.3	0.50	0.52		0.08		0.25	0.26	0.01
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
TOTAL									2.93

Distance = distance from start
Width = distance 1/2 back + 1/2 forward
Depth = water depth
Observed depth = 0.2, 0.6, or 0.8
Velocity at Point = from meter
Velocity at Vertical = at 0.2 or 0.8
Area = width x depth
Discharge = area x velocity
Total = discharge of all stations

IF PIPE: formula K x D2 x U = flow
K = Level/Diameter ratio = from Table 1 (use cfs) =
D (diameter of pipe) = (x in./12)2 D=
U (flow from meter cfs) U=
Flow = total flow in cfs Flow:

Notes/Remarks: Laminar flow. Banks of stream had recently been cleared of vegetation.

Meter Type: pygmy current meter Serial No.: 580066

ZERO ADJUSTMENT CHECK PERFORMED BEFORE: na AFTER: na

Stream/Diversion Interior Width: 2.9 Water Depth: 0.54

Measurement rating:	Excellent (2%)	■	Good (5%)	☐	Fair (8%)	☐	Poor (>8%)	☐
Flow State:	Steady	☐	Turbulent	☐	Laminar	■		
X-Section Characteristics:	Ditch	☐	Boulders	☐	Gravel Bottom	■	Steep Banks	☐
Weather:	Clear/Sunny	☐	Partly Cloudy	■	Light Rain	☐	Constant Rain	☐

Measurement: JK, GO Date: 4/27/2010

AUWAI READINGS - CROSS SECTION

Tagline Station	Distance	Width	Depth	Obs. Depth	Vel. At Point	Vel. In Vertical	Adjusted	Area (ft^2)	Discharge (mgd)
0 RB		0.25	0.47		0.59		0.75	0.12	0.05
1	0.5	0.50	0.51	0.6	0.79			0.26	0.13
2	1.0	0.50	0.55	0.6	1.18			0.28	0.21
3	1.5	0.50	0.60	0.6	1.09			0.30	0.21
4	2.0	0.50	0.61	0.6	1.46			0.31	0.29
5	2.5	0.45	0.51	0.6	1.26			0.23	0.19
6 LB	2.9	0.20	0.50		0.31		0.25	0.10	0.02
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
TOTAL									1.09

Distance = distance from start
Width = distance 1/2 back + 1/2 forward
Depth = water depth
Observed depth = 0.2, 0.6, or 0.8
Velocity at Point = from meter
Velocity at Vertical = at 0.2 or 0.8
Area = width x depth
Discharge = area x velocity
Total = discharge of all stations

IF PIPE: formula K x D2 x U = flow
K = Level/Diameter ratio = from Table 1 (use cfs) =
D (diameter of pipe) = (x in./12)2 D=
U (flow from meter cfs) U=
Flow = total flow in cfs Flow:

Notes/Remarks: Laminar flow.

Meter Type: pygmy current meter Serial No.: 580066

ZERO ADJUSTMENT CHECK PERFORMED BEFORE: na AFTER: na

Stream/Diversion Interior Width: 2.7 Water Depth: 0.35

Measurement rating:	Excellent (2%)	☐	Good (5%)	■	Fair (8%)	☐	Poor (>8%)	☐	
Flow State:	Steady	☐	Turbulent	☐	Laminar	■			
X-Section Characteristics:	Ditch	☐	Boulders	☐	Gravel Bottom	■	Steep Banks	☐	
Weather:	Clear/Sunny	☐	Partly Cloudy	■	Light Rain	☐	Constant Rain	☐	

Measurement: JK, GO Date: 4/27/2010

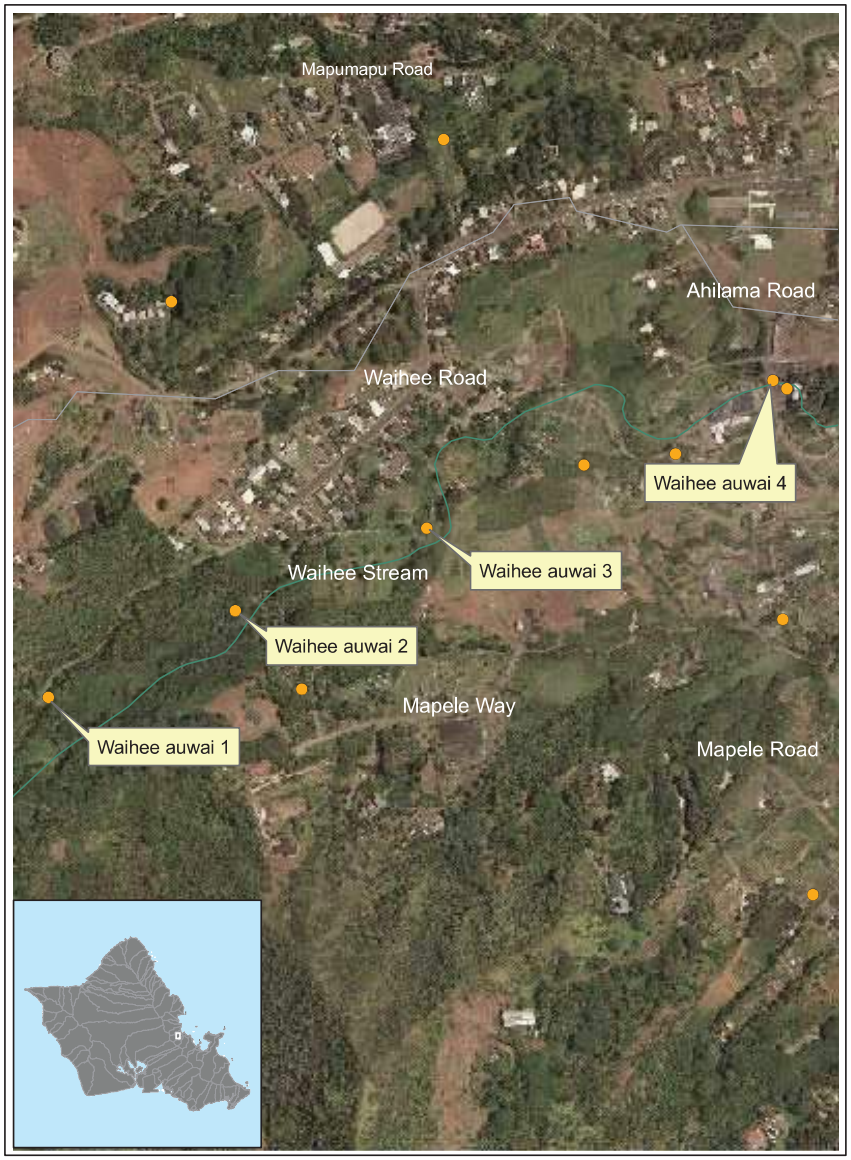
AUWAI READINGS - CROSS SECTION

Tagline Station	Distance	Width	Depth	Obs. Depth	Vel. At Point	Vel. In Vertical	Adjusted	Area (ft^2)	Discharge (mgd)
0 RB		0.25	0.32		0.05		0.25	0.08	0.00
1	0.5	0.50	0.35	0.6	0.21			0.18	0.02
2	1.0	0.50	0.32	0.6	0.59			0.16	0.06
3	1.5	0.50	0.32	0.6	0.89			0.16	0.09
4	2.0	0.50	0.39	0.6	0.79			0.20	0.10
5	2.5	0.35	0.39	0.6	0.37			0.14	0.03
6 LB	2.7	0.10	0.39		0.09		0.25	0.04	0.00
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
TOTAL									0.31

Distance = distance from start
Width = distance 1/2 back + 1/2 forward
Depth = water depth
Observed depth = 0.2, 0.6, or 0.8
Velocity at Point = from meter
Velocity at Vertical = at 0.2 or 0.8
Area = width x depth
Discharge = area x velocity
Total = discharge of all stations

IF PIPE: formula K x D2 x U = flow
K = Level/Diameter ratio = from Table 1 (use cfs) =
D (diameter of pipe) = (x in./12)2 D=
U (flow from meter cfs) U=
Flow = total flow in cfs Flow:

Notes/Remarks: Laminar flow. Flow measurement point is downstream of where water is taken to irrigate lo'i on parcels 4-7-006:003 and 4-7-006:013. The auwai continues from this point to the Alvarado and Akima properties before running parallel to Ahilama Road (mauka side). The auwai then crosses under Ahilama Road to feed the remaining 4 parcels.



Waihee auwai 3

diversion (left edge) on right bank of Waihee Stream

auwai

auwai

auwai flow to upper lo'i left bottom, auwai to Alvarado upper right

Waihee auwai 3

upper lo'i - looking down

Alvarado pipeline

Alvarado garden

auwai along Akima property

Waihee auwai 3

Akima pump

Akima yard

auwai 3 along Ahilama Road

lo'i

Field Check List

I. Diversion Information

Island: Oahu	Watershed code: 3027
Quad Name: Kaneohe	Attach Location Map: attached
Stream Name: Waihee auwai 4	Priority: 4
Tax Map Key: 4-7-012:021	Address: Department of Facility Maintenance
Land Owner: City and County of Honolulu	1000 Uluohia Street, Suite 215
Diversion User(s): see attached list	Kapolei, HI 96707
Location: Waihee stream, right bank, 15 feet downstream of Ahilama bridge	GPS recording: Latitude: d: 21 m: 27 s: 18.4 Longitude: d: 157 m: 50 s: 42.6

II. Stream Flow

a. Gage Data: na					
b. Flow Character above:	High ☐	Average ☒	Low ☐		
c. Stream capture %: 23.2. calculation: 0.69 mgd / 2.97 mgd					
d. Elevation (amsl): + 37 feet (approximate elevation taken from map)					
Diversion Character: Intake pipe to auwai		Dimensions/Size:			
a. Dam ☐	Dimensions:	Width:	Height:		
b. Ditch Flume	Dimensions:	Width:	Height:		
c. Pipe ☐	Dia.(in):	Type: steel ☐	aluminum ☐	concrete/clay ☐	
Photographs	Upstream ☐	Site ☒	Downstream ☐		

III. End User(s)

a. Number of Users 2, utilizing 2 parcels					
b.Use/Purpose	Residence ☐	Farm ☒	Growing: Lo'i ☒	Crops ☐	
c.Estimated volume:			Flowers ☐	Animals ☐	
e. Area Irrigated:			Other ☐		
DLNR Notes:					

Field Notes: The diversion for auwai 4 is located on the right bank of Waihee Stream, immediately downstream of the Ahilama Road bridge. The auwai runs parallel to Ahilama Road before turning east on to parcel 4-7-012:020 (not used on that parcel). It then continues on to parcels 4-7-026:024 and 4-7-026:004. The Waihee Stream measurement was taken on the eastern boundary of parcel 4-7-008:002.

Notes By: GO Date: 10/15/2009, 4/06/10
Data Entry By: GO Date: 10/16/2009, 5/01/10

III. End User(s)

a. TMK: 4-7-026:004 Owner: Hookano Trust		
b.Use/Purpose Residence ☐ Farm ☒	Growing: Lo'i ☒	Crops ☐
c.Estimated volume na	Flowers ☐	Animals ☐
e. Area Irrigated? 1 acre (estimate from map)	Other ☐	aquaculture

a. TMK: 4-7-026:024 Owner: Clifford Wong		
b.Use/Purpose Residence ☐ Farm ☒	Growing: Lo'i ☒	Crops ☐
c.Estimated volume na	Flowers ☐	Animals ☐
e. Area Irrigated? 6 acres (estimate from map)	Other ☐	aquaculture

Meter Type: AA current meter Serial No.: 271596

ZERO ADJUSTMENT CHECK PERFORMED BEFORE: na AFTER: na

Stream/Diversion Interior Width: 3.6 Water Depth: 0.73

Measurement rating:	Excellent (2%) ☒	Good (5%) ☐	Fair (8%) ☐	Poor (>8%) ☐
Flow State:	Steady ☐	Turbulent ☐	Laminar ☒	
X-Section Characteristics:	Ditch ☐	Boulders ☐	Gravel Bottom ☒	Steep Banks ☐
Weather:	Clear/Sunny ☐	Partly Cloudy ☒	Light Rain ☐	Constant Rain ☐

Measurement: JK, GO Date: 4/6/2010

STREAM READINGS - CROSS SECTION

Tagline Station	Distance	Width	Depth	Obs. Depth	Vel. At Point	Vel. In Vertical	Adjusted	Area (ft^2)	Discharge (mgd)
0 RB		0.25	0.73		1.50		0.95	0.18	0.18
1	0.5	0.50	0.85	0.6	1.58			0.43	0.43
2	1.0	0.50	0.86	0.6	1.47			0.43	0.41
3	1.5	0.50	0.79	0.6	1.80			0.40	0.46
4	2.0	0.50	0.75	0.6	2.74			0.38	0.66
5	2.5	0.50	0.70	0.6	1.98			0.35	0.45
6	3.0	0.55	0.69	0.6	1.18			0.38	0.29
7 LB	3.6	0.30	0.50		0.89		0.75	0.15	0.09
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
TOTAL									2.97

Distance = distance from start
Width = distance 1/2 back + 1/2 forward
Depth = water depth
Observed depth = 0.2, 0.6, or 0.8
Velocity at Point = from meter
Velocity at Vertical = at 0.2 or 0.8
Area = width x depth
Discharge = area x velocity
Total = discharge of all stations

IF PIPE: formula K x D2 x U = flow
K = Level/Diameter ratio = from Table 1 (use cfs) =
D (diameter of pipe) = (x in./12)2 D=
U (flow from meter cfs) U=
Flow = total flow in cfs Flow:

Notes/Remarks: Laminar flow.

Meter Type: pygmy current meter Serial No.: 580066

ZERO ADJUSTMENT CHECK PERFORMED BEFORE: na AFTER: na

Stream/Diversion Interior Width: 4.5 Water Depth: 0.29

Measurement rating:	Excellent (2%)	☐	Good (5%)	☐	Fair (8%)	☐	Poor (>8%) ☐
Flow State:	Steady	☐	Turbulent	☐	Laminar	☐	
X-Section Characteristics:	Ditch	☐	Boulders	☐	Gravel Bottom	☐	Steep Banks ☐
Weather:	Clear/Sunny	☐	Partly Cloudy	☐	Light Rain	☐	Constant Rain ☐

Measurement: JK, GO Date: 4/6/2010

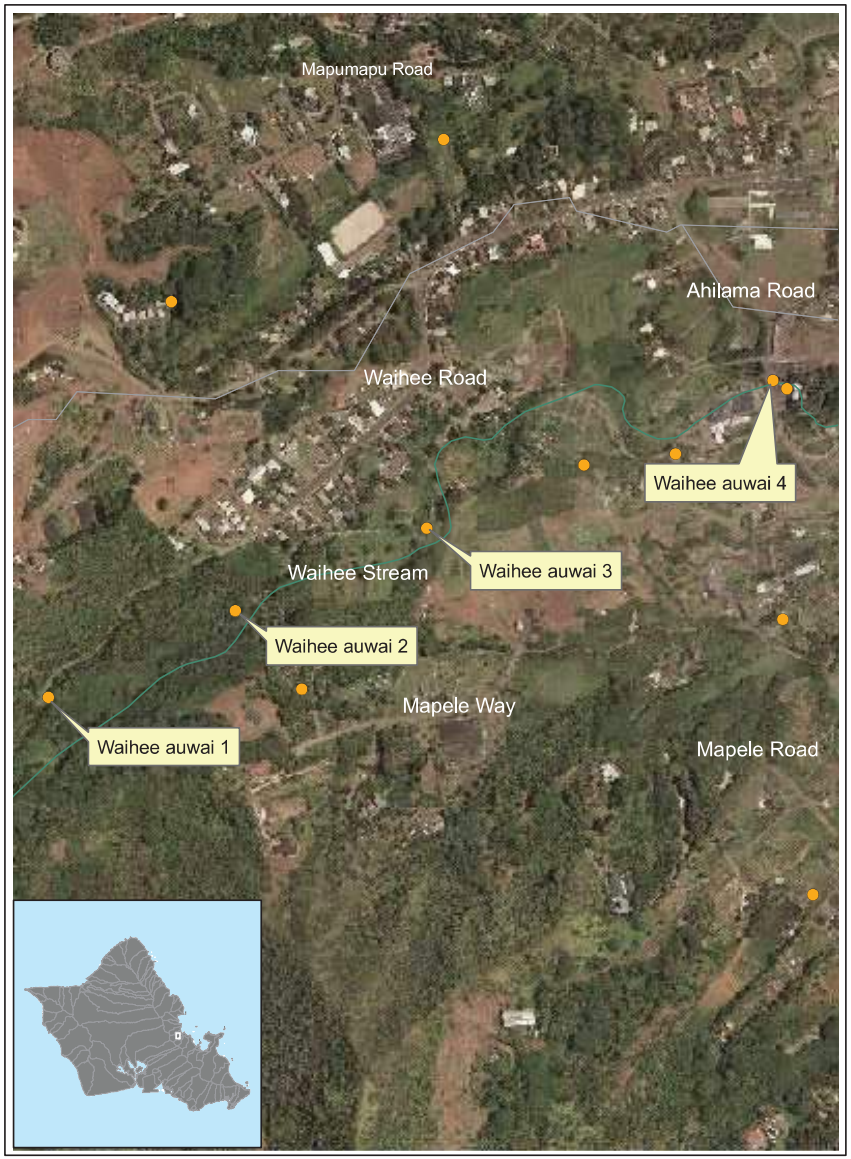
AUWAI READINGS - CROSS SECTION

Tagline Station	Distance	Width	Depth	Obs. Depth	Vel. At Point	Vel. In Vertical	Adjusted	Area (ft^2)	Discharge (mgd)
0 RB		0.50	0.20		0.13		0.25	0.10	0.01
1	1.0	1.00	0.30	0.6	0.52			0.30	0.10
2	2.0	1.00	0.37	0.6	1.53			0.37	0.36
3	3.0	1.00	0.33	0.6	0.84			0.33	0.18
4	4.0	0.75	0.30	0.6	0.26			0.23	0.04
5 LB	4.5	0.25	0.25		0.06		0.25	0.06	0.00
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
TOTAL									0.69

Distance = distance from start
Width = distance 1/2 back + 1/2 forward
Depth = water depth
Observed depth = 0.2, 0.6, or 0.8
Velocity at Point = from meter
Velocity at Vertical = at 0.2 or 0.8
Area = width x depth
Discharge = area x velocity
Total = discharge of all stations

IF PIPE: formula K x D2 x U = flow
K = Level/Diameter ratio = from Table 1 (use cfs) =
D (diameter of pipe) = (x in./12)2 D=
U (flow from meter cfs) U=
Flow = total flow in cfs Flow:

Notes/Remarks: Laminar flow. Auwai runs parallel to Ahilama Road (makai).



Waihee auwai 4

Waihee Stream upstream of Ahilama bridge

diversion on right bank

pipeline to auwai

pipeline running underground - auwai upper right

Waihee auwai 4

auwai parallel to Ahilama Road (makai)

auwai before entering Nona Wong property

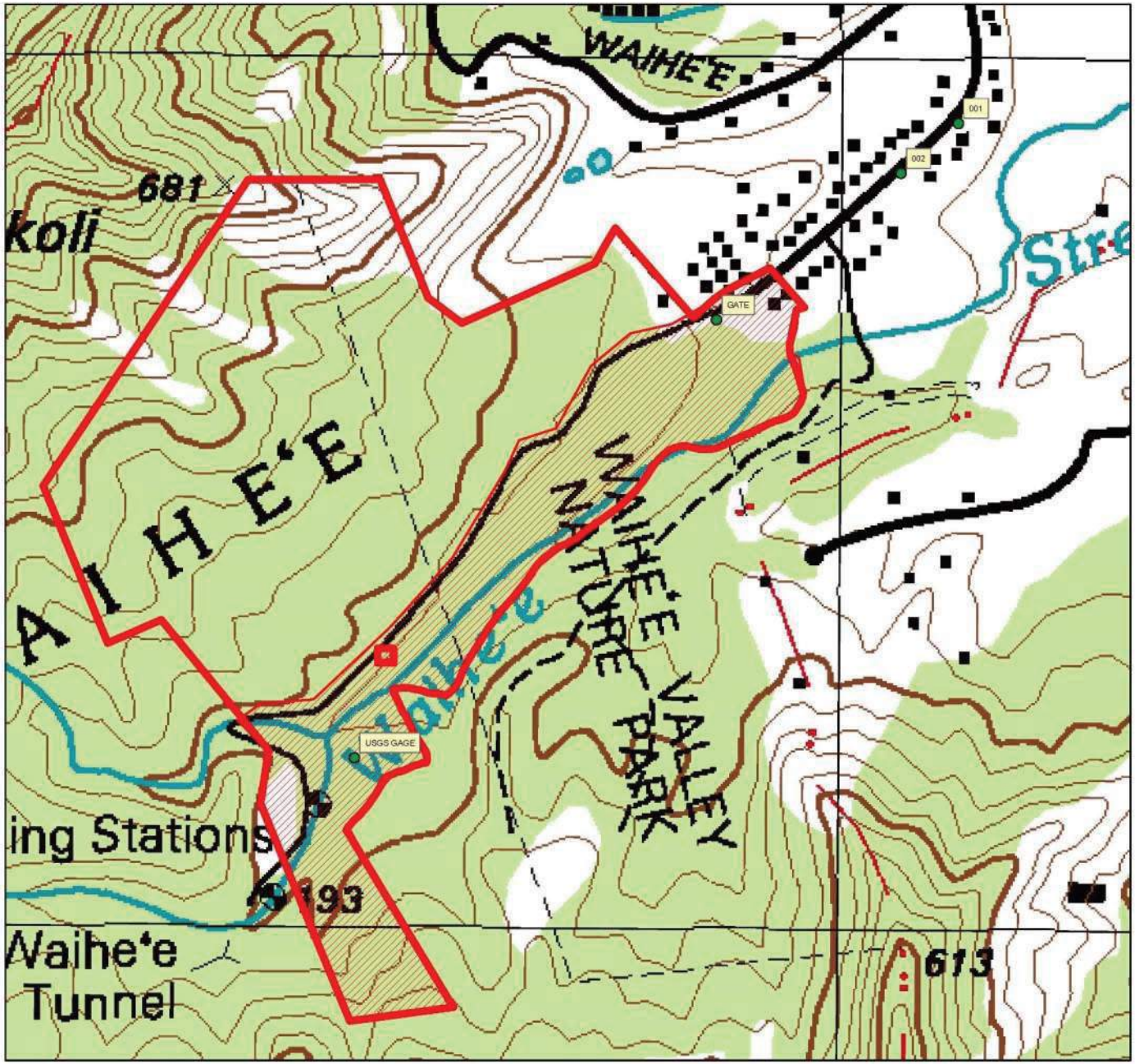
lo'i

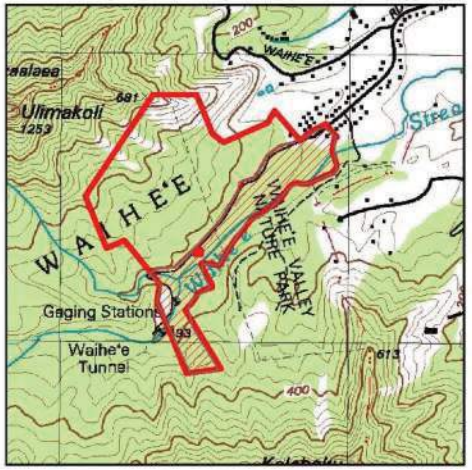
lo'i

Appendix D

Waiheʻe Stream USGS Gage and ʻAuwai Map and Pictures

Proposed Waihee Riparian Learning Center
Waihee Valley, Oahu, Hawaii





Legend

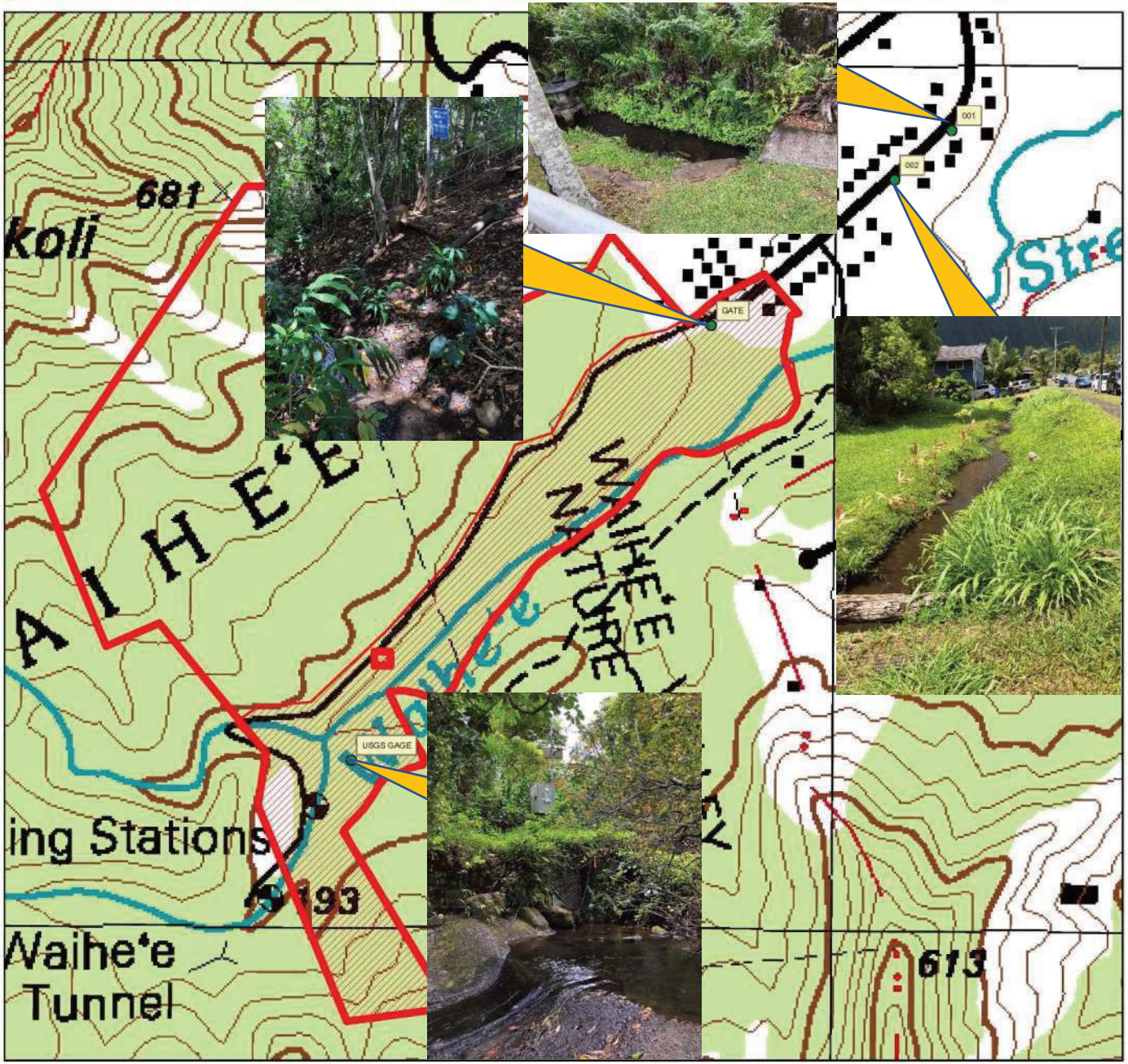
- auwai wpt_050720
- proposed Waihee Riparian Learning Center
- TMK 4-7-006:010 (DPR)

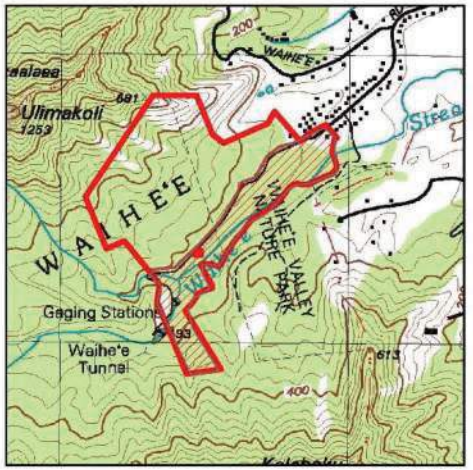
0 250 500 1,000 Feet

N

Honolulu Board of Water Supply 5/2020

Proposed Waihee Riparian Learning Center
Waihee Valley, Oahu, Hawaii





Legend

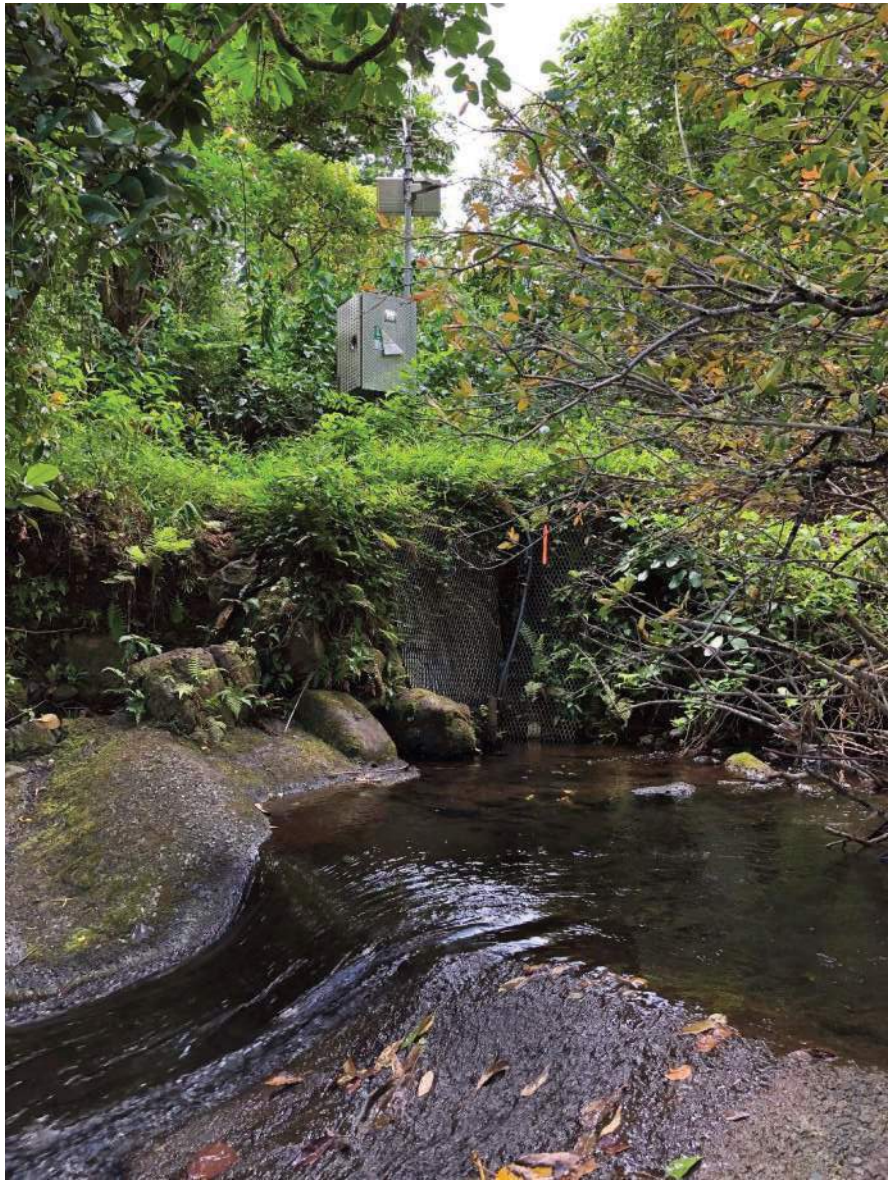
- auwai wpt_050720
- proposed Waihee Riparian Learning Center
- TMK 4-7-006:010 (DPR)

0 250 500 1,000 Feet

N

Honolulu Board of Water Supply 5/2020

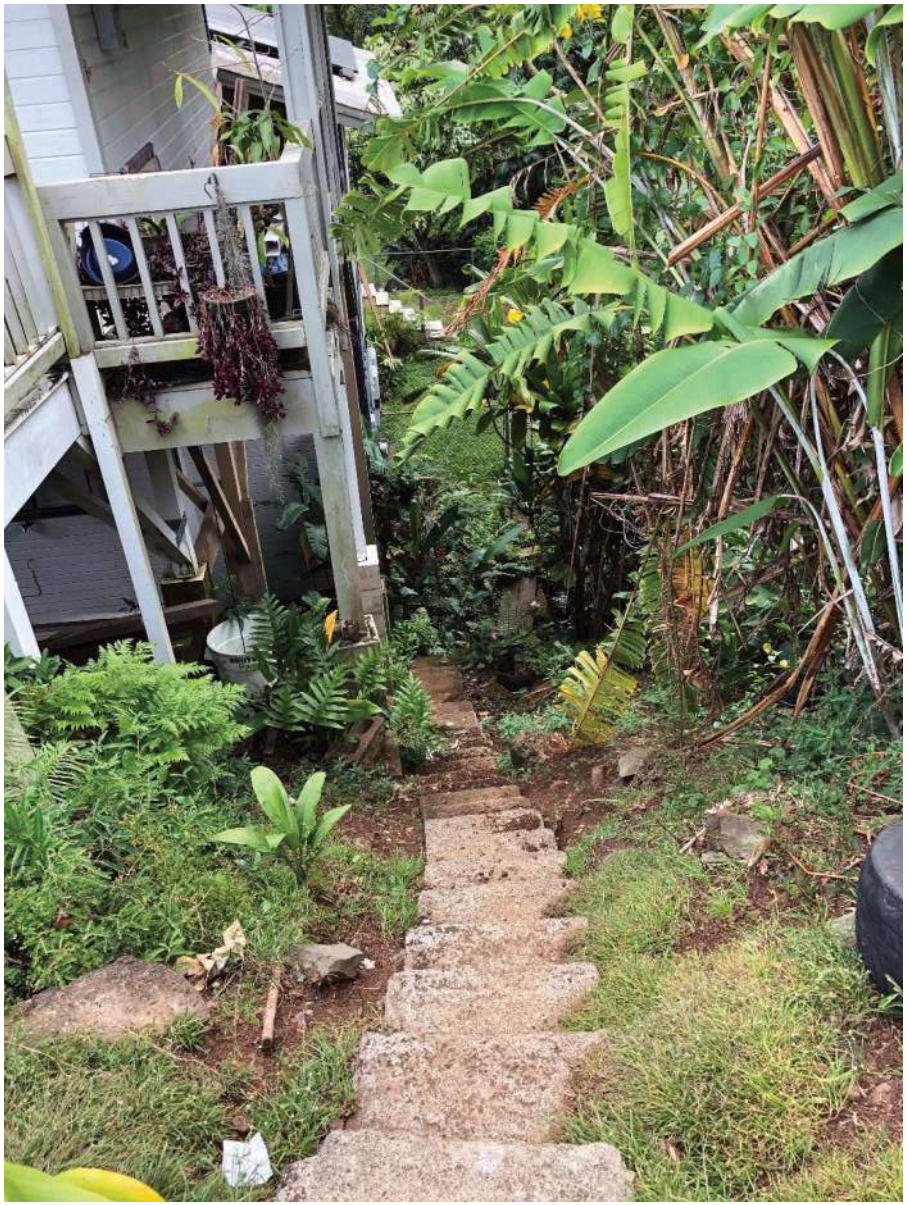
USGS stream gauge (5/7/2020)



Auwai (Gate) near front gate (5/7/2020)

Auwai downstream of Kaipo’s house (5/7/2020)

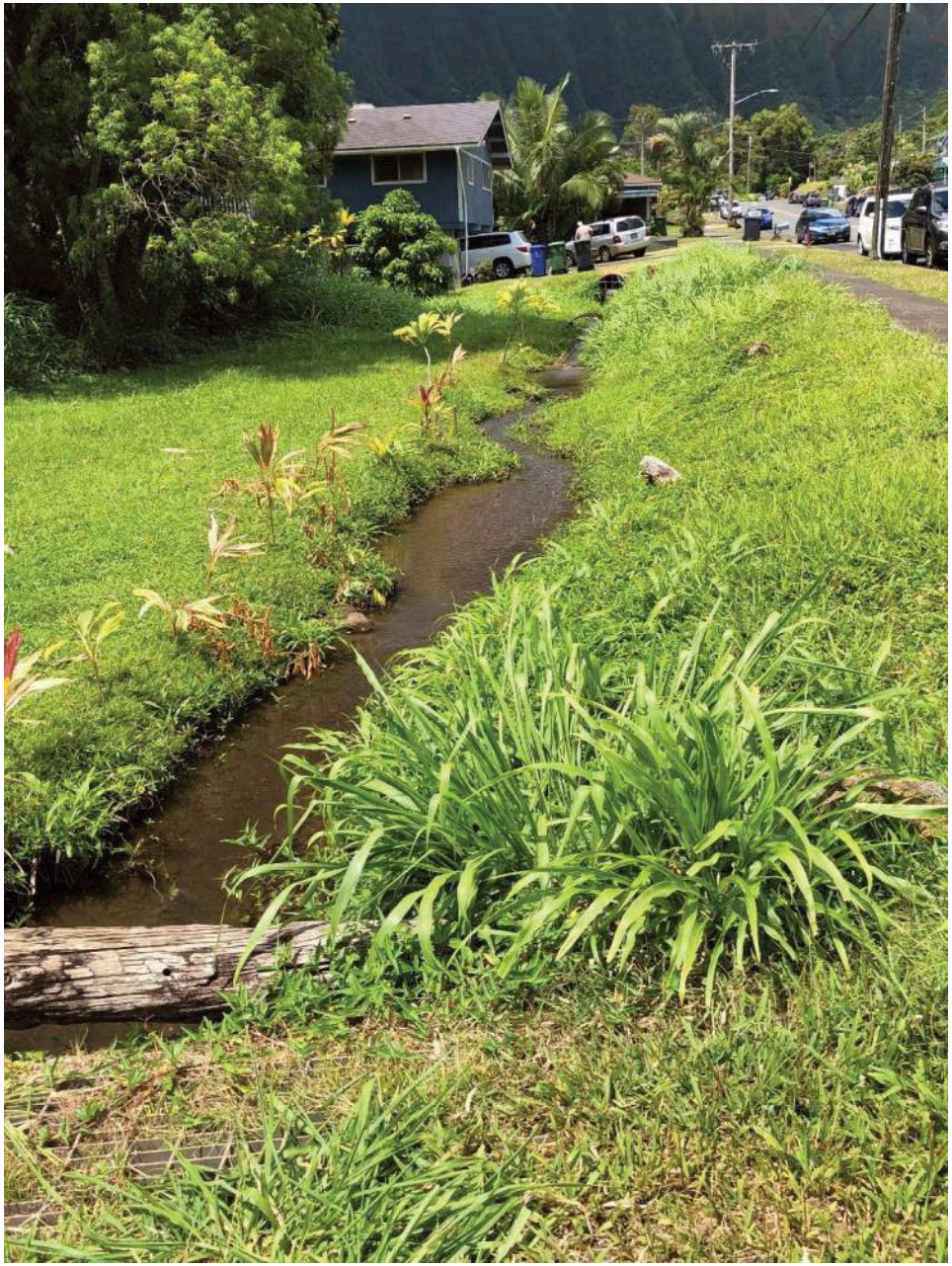
Auwai upstream of Kaipo’s house (5/7/2020)



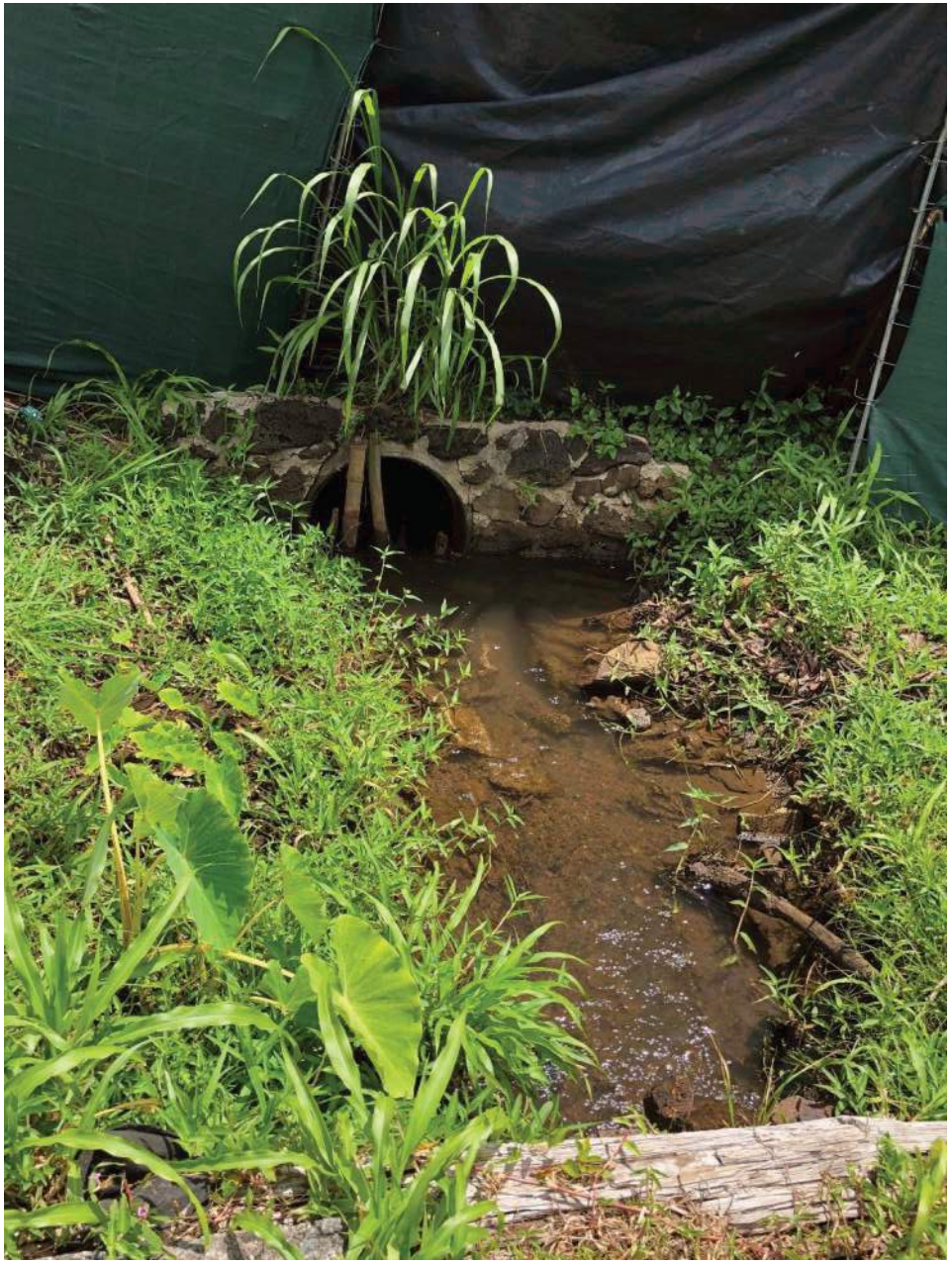
Auwai (001) near 47-358 Waihee Road

Auwai (001) near 47-358 Waihee Road going into 47-356 Waihee Road)

Auwai (002) near 47-410 Waihee Road



(looking downstream)



Appendix E

Water Rights in Hawai‘i, The Public Trust Doctrine and The Precautionary Principle

Appendix E

Water Rights in Hawai'i, The Public Trust Doctrine and The Precautionary Principle

E.1 Water Rights in Hawai'i

Water rights and uses in Hawai'i are governed by the State Water Code[1] and the common law. The Water Code preserved appurtenant rights but not correlative and riparian rights in designated water management areas. Thus, when a ground water management area is designated, existing correlative uses within that area can be issued water use permits under the existing use provisions of the Water Code, but unexercised correlative rights are extinguished.

Similarly, when a surface water management area is designated, existing riparian uses within that area are eligible for water use permits as existing uses, but unexercised riparian rights are extinguished. Furthermore, the Hawaii Supreme Court has ruled that when there is an undisputed direct interrelationship between the surface and ground waters, designation of a ground water management area subjects both ground and surface water diversions from the designated area to the statutory permit requirement.[2] Presumably, permits would also be required for ground and surface water diversions when the interrelationship occurs in a surface water management area.

While water use permits are required only in designated water management areas and the common law on water rights and uses continue to apply in non-designated areas, other provisions of the Water Code apply throughout the state. Thus, for example, well construction and pump installation permits are required for any new or modified ground water use and stream diversion, and stream alteration permits are required for any new or modified surface water diversions. If the proposed stream diversion will affect the existing instream flow standard, a successful petition to amend the interim instream flow standard is also required.

E.1.1 Correlative Rights

Under the common law, owners of land overlying a ground water source have the right to use that water on the overlying land as long as the use is reasonable and does not injure the rights of other overlying landholders.[3] When the amount of water is insufficient for all, each is limited to a reasonable share of the ground water. Overlying landowners who have not exercised their correlative rights cannot prevent other landowners from using the water on the theory that they are using more than their reasonable share. They must suffer actual, not potential, harm. Only when landowners try to exercise their correlative rights and the remaining water is insufficient to meet their needs, can they take action to require existing users to reduce their uses.

E.1.2 Riparian Rights

Riparian rights are rights of land adjoining natural watercourses and are the surface water equivalent of correlative rights to ground waters; i.e., the use has to be on the riparian lands, the use has to be reasonable, and the exercise of those rights cannot actually harm the reasonable use of those waters by other riparian landowners. The Court had originally stated that the right was to the natural flow of the stream without substantial diminution and in the shape and size given it by nature,[4] but later concluded that the right should evolve in accordance with changing needs and circumstances. Thus, in order to maintain an action against a diversion which diminishes the quantity or flow of a natural watercourse, riparian owners must demonstrate actual harm to their own reasonable use of those waters.[5]

E.1.3 Appurtenant Rights

Appurtenant water rights are rights to the use of surface water utilized by (non-riparian) parcels of land at the time of their original conversion into fee simple lands; i.e., when land allotted by the Mahele was confirmed to awardees by the Land Commission and/or when the Royal Patent was issued based on such award, the conveyance of the parcel of land carried with it the appurtenant right to water.[6] The amount of water under an appurtenant right is the amount that was being used at the time of the Land Commission award and is established by cultivation methods that approximate the methods utilized at the time of the Mahele; for example, growing wetland taro.[7] Once established, future uses are not limited to the cultivation of traditional products approximating those utilized at the time of the Mahele,[8] as long as those uses are reasonable, and if in a water management area, meets the Water Code's test of reasonable and beneficial use ("the use of water in such a quantity as is necessary for economic and efficient utilization, for a purpose, and in a manner which is both reasonable and consistent with the State and county land use plans and the public interest"). As mentioned earlier, appurtenant rights are preserved under the Water Code, so even in designated water management areas, an unexercised appurtenant right is not extinguished and must be issued a water use permit when applied for, as long as the water use permit requirements are met.

E.1.4 Extinguishing Riparian or Appurtenant Rights

Unlike appurtenant rights, which are based in the common law, the Court has interpreted riparian rights as originating in an 1850 statute.[9] This has led to a curious inconsistency in that, while unexercised appurtenant rights are preserved and unexercised riparian rights are extinguished in designated water management areas, actions by private individuals can extinguish appurtenant but not riparian rights. Both appurtenant and riparian rights cannot be severed from the lands they are attached to, and such rights pass with the title to the land whether or not the rights are expressly mentioned in the deed. If the transferor of the land attempts to reserve the riparian right in the deed, the reservation is not valid and the right nevertheless belongs to the transferee as the new owner of the land. The law with regards to appurtenant rights is not clear. The Court in Reppun held that where a landowner attempted to reserve an appurtenant right while selling the underlying land, the reservation is not valid and the attempt to reserve extinguishes the appurtenant right. In doing so, the Court reasoned that there is nothing to prevent a transferor from effectively providing that the benefit of the appurtenant right not be passed to the transferee.[10] This difference is due to the Court's interpretation that riparian rights had been created by the 1850 statute, so any attempt by the grantor to reserve riparian water rights in the deed when riparian lands are sold is invalid.

Presumably, the inconsistency could be cured by legislation providing a statutory basis for appurtenant rights. In fact, the Court in the Waiāhole Ditch Contested Case cited to the Water Code's recognition of appurtenant rights and legislative comment to the effect that "Appurtenant rights may not be lost."[11] However, the Court did not explicitly discuss its prior Reppun decision, so it is unclear whether its Waiāhole decision overruled Reppun.

E.1.5 Appropriated Uses

Appropriated uses are uses of surface or ground waters on non-riparian or non-overlying lands. In the case of ground water, "(p)arties transporting water to distant lands are deemed mere 'appropriators,' subordinate in right to overlying landowners ...(T)he correlative rights rule grants overlying landowners a right only to such water as necessary for reasonable use. Until overlying landowners develop an actual need to use ground water, non-overlying parties may use any available 'surplus' (citations omitted)."[12] For surface waters, "the effect of permitting riparian owners to enjoin diversions beneficial to others in the absence of a demonstration of actual harm may occasionally lead to wasteful or even absurd results...The continuing use of the waters of the stream by the wrongful diversion should be contingent upon a demonstration that such use will not harm the established rights of others."[13] Thus, appropriated uses are not based on water rights but are allowed as long as they are reasonable and do not actually impinge on correlative and riparian rights. Note that appurtenant uses would be a type of appropriated uses if they were not based on appurtenant rights, and that in fact, the history of appurtenant uses in the Kingdom of Hawai'i has led to their establishment as water rights superior to riparian rights. Also note that when a water management area is designated, appropriated uses become superior to unexercised water rights, because appropriated uses become existing uses and are eligible for water use permits, while unexercised correlative and riparian rights are extinguished.

E.1.6 Obsolete Rights: Prescriptive and Konohiki Rights

Until 1973, surface waters were treated as private property and could be owned. Prescriptive water rights were the water equivalent of "adverse possession" in land ownership, where open and hostile occupation of another's private property for a specified number of years entitled the occupier to take legal ownership, because it raised the legal presumption of a grant. Prescriptive rights to water were exercisable only against the ownership of other private parties and not against the government. Thus, under prescriptive rights, appropriated uses could ripen into a prescriptive right superior to riparian rights. (Some early Court cases viewed appurtenant rights as a type of prescriptive right.) In 1973, the Court voided private ownership of water resources and prescriptive rights because of public ownership of all surface waters.[14] As for ground water, two early cases (1884[15] and 1896[16]) reflected the then prevailing law on surface waters that water could be private property, but those cases also concluded that prescriptive rights cannot be exercised against subterranean waters that have no known or defined course; i.e., you could not adversely possess what you could not see. In 1929, the Court adopted the correlative rights rule,[17] in which the overlying landowners could not use the water as they pleased, because it was a shared resource.

Until 1973, "*konohiki* lands," or lands whose title had passed from persons documented as *iki*, owned the "normal daily surplus water" in excess of waters reserved by appurtenant and prescriptive rights. (Despite a number of earlier cases, in 1930 the Court had concluded that riparian rights had never been the law in Hawai'i.[18] The 1973 Court, instead of overturning that decision, found a statutory basis for riparian rights in the 1850 statute.) In 1973, in addition to voiding any private property interest in water, the Court ruled that there can be no "normal daily surplus water," because the recognition of

riparian rights entitled owners of riparian lands to have the flow of the watercourse in the shape and state given it by nature.[19]

E.1.7 Native Hawaiian Water Rights

The Water Code contains the following provisions on Native Hawaiian water rights (section 174C-101):

- Provisions of this chapter shall not be construed to amend or modify rights or entitlements to water as provided for by the Hawaiian Homes Commission Act, 1920, as amended, and by chapters 167 and 168, relating to the Molokai irrigation system. Decisions of the commission on water resource management relating to the planning for regulation, management, and conservation of water resources in the State shall, to the extent applicable and consistent with other legal requirements and authority, incorporate and protect adequate reserves of water for current and foreseeable development and use of Hawaiian home lands as set forth in section 221 of the Hawaiian Homes Commission Act.
- No provision of this chapter shall diminish or extinguish trust revenues derived from existing water licenses unless compensation is made.
- Traditional and customary rights of ahupua'a tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778 shall not be abridged or denied by this chapter. Such traditional and customary rights shall include, but not be limited to, the cultivation or propagation of taro on one's own kuleana and the gathering of hīhīwai, 'ōpae, 'o'opu, limu, thatch, ti leaf, aho cord, and medicinal plants for subsistence, cultural, and religious purposes.
- The appurtenant water rights of kuleana and taro lands, along with those traditional and customary rights assured by this section, shall not be diminished or extinguished by a failure to apply for or to receive a permit under this chapter. (The exercise of an appurtenant water right is still subject to the water use permit requirements of the Water Code, but there is no deadline to exercise that right without losing it, as is the case for correlative and riparian rights, which must have been exercised before designation of a water management area.

E.2 The Public Trust Doctrine and the Precautionary Principle

The Waiāhole Ditch Contested Case drew upon principles from the Public Trust Doctrine and Precautionary Principle in one of the landmark decisions in Hawai'i water law.

E.2.1 The Public Trust Doctrine

In its review of the Waiāhole Ditch Contested Case, the Hawai'i Supreme Court held that: 1) title to the water resources is held in trust by the state for the benefit of its people; 2) article XI, sections 1 and 7 of the Hawai'i Constitution adopted the public trust doctrine as a fundamental principle of constitutional law in Hawai'i; 3) the legislature incorporated public trust principles into the Water Code; and 4) nevertheless the Water Code did not supplant the protections of the public trust doctrine, which the Court would continue to use to inform the Court's interpretation of the Water Code, define its outer limits, and justify its existence.[20]

The Court has identified four trust purposes, three in the Waiāhole Ditch Contested Case, and a fourth in its 2004 decision, In the Matter of the Contested Case Hearing on Water Use, Well Construction, and Pump Installation Permit Applications, Filed by Wai'ola o Moloka'i, Inc. and Moloka'i Ranch, Limited:

- Maintenance of waters in their natural state;
- Domestic water use of the general public, particularly drinking water;
- The exercise of Native Hawaiian and traditional and customary rights, including appurtenant rights;[1] and
- Reservations of water for Hawaiian home lands.

The Court also identified the following principles for the water resources trust:[2]

- The state has both the authority and duty to preserve the rights of present and future generations in the waters of the state;
- This authority empowers the state to revisit prior diversions and allocations, even those made with due consideration of their effect on the public trust;
- The state also bears the affirmative duty to take the public trust into account in the planning and allocation of water resources and to protect public trust uses whenever feasible;
- Competing public and private water uses must be weighed on a case-by-case basis, and any balancing between public and private purposes begin with a presumption in favor of public use, access, and enjoyment;
- There is a higher level of scrutiny for private commercial uses, with the burden ultimately lying with those seeking or approving such uses to justify them in light of the purposes protected by the trust; and

[1] Although the Court has not ruled specifically on the issue, the exercise of an appurtenant right presumably would have to be done in a traditional and customary manner if it is to be considered a public trust purpose. Otherwise, commercial uses of appurtenant rights would be a protected public trust use. Note, however, that unexercised appurtenant rights cannot be extinguished, and this also applies to commercial uses of appurtenant rights as long as that use is reasonable and beneficial.

[2] While these principles are directed at surface water resources, they apply equally to ground water resources.

- Reason and necessity dictate that the public trust may have to accommodate uses inconsistent with the mandate of protection, to the unavoidable impairment of public instream uses and values; offstream use is not precluded but requires that all uses, offstream or instream, public or private, promote the best economic and social interests of the people of the state.

E.2.2 The Precautionary Principle

When scientific evidence is preliminary and not conclusive regarding the management of the water resources trust, it is prudent to adopt "precautionary principles." The Court's interpretation as explained in the Waiāhole Ditch Contested Case is as follows:

- As with any general principle, its meaning must vary according to the situation and can only develop over time. At a minimum, the absence of firm scientific proof should not tie the commission's hands in adopting reasonable measures designed to further the public interest.
- The precautionary principle simply restates the commission's duties under the Constitution and the Code. The lack of full scientific certainty does not extinguish the presumption in favor of public trust purposes or vitiates the commission's affirmative duty to protect such purposes wherever feasible. Nor does its present inability to fulfill the instream use protection framework render the statute's directives any less mandatory. In requiring the commission to establish instream flow standards at an early planning stage, the Water Code contemplates the designation of the standards based not only on scientifically proven facts, but also on future predictions, generalized assumptions, and policy judgments. Neither the Constitution nor the Water Code constrains the commission to wait for full scientific certainty in fulfilling its duty toward the public interest in minimum instream flows.

The Court's linking of the Public Trust Doctrine to the Precautionary Principle offers significant guidance to the Watershed Management Plans. The tenets of the Precautionary Principle state that:

- There is a duty to take anticipatory action to prevent harm to public resources;
- There is an obligation to examine the full range of alternatives before starting a new activity and in using new technologies, processes, and chemicals; and
- Decisions should be open, informed and democratic and include affected parties.

In this regard, "precautionary actions" may include:

- Anticipatory and preventive actions;
- Actions that increase rather than decrease options;
- Actions that can be monitored and reversed;
- Actions that increase resilience, health, and the integrity of the whole system; and
- Actions that enhance diversity.

The Public Trust Doctrine establishes a general duty to take precautionary actions and thus shifts the burden of proof to non-trust purposes and requires preventive action in the face of uncertainty.

Notes

[1] HRS 174C, §§ 174C-1 to 174C-101.
[2] In re Water Use Permit Applications, 94 Haw. 97, at 173; 9 P3d 409, at 485 (2000).
[3] City Mill Co. v Hon. S. & W. Com., 30 Haw. 912 (1929).
[4] McBryde v Robinson, 54 Haw. 174, at 198; 504 P.2d 1330, at 1344 (1973); aff'd on rehearing, 55 Haw. 260; 517 P.2d 26 (1973); appeal dismissed for want of jurisdiction and cert. denied, 417 U.S. 962 (1974).
[5] Reppun v Board of Water Supply, 65 Haw. 531, at 553; 656 P.2d 57, at 72 (1982).
[6] 54 Haw. 174, at 188; 504 .2d 1330, at 1339.
[7] 65 Haw. 531, at 554; 656 P.2d 57, at 72.
[8] Peck v Bailey, 8 Haw. 658, at 665 (1867).
[9] 54 Haw. 174; 504 P.2d 1330.
[10] 65 Haw. 531, at 552; 656 P.2d 57, at 71 (1982).
[11] 94 Haw. 97 at 179, 9 P.3d 409 at 491 (2000).
[12] 94 Haw. 97, at 178; 9 P3d 409, at 490 (2000).
[13] 65 Haw. 531, at 553-554; 656 P.2d 57, at 72 (1982).
[14] 54 Haw. 174; 504 P.2d 1330 (1973).
[15] Davis v Afong, 5 Haw. 216 (1884).
[16] Wong Leong v Irwin, 10 Haw. 265 (1896).
[17] City Mill Co. v Hon. S. & W. Com., 30 Haw. 912 (1929).
[18] Territory v Gay, 31 Haw. 376 (1930); aff'd 52 F.2d 356 (9th Cir. 1931); cert. denied 284 U.S. 677 (1931).
[19] 54 Haw. 174, at 198; 504 P.2d 1330, at 1344 (1973).
[20] 94 Haw. 97, at 130-133; 9 P3d 409, at 443-445.

Appendix F

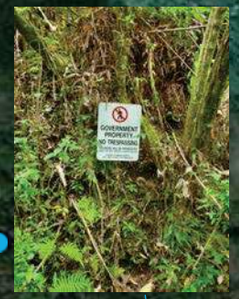
Waiheʻe Valley Signage Locations

Waihe’e Valley Signage Locations 07/24/19

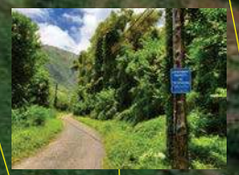
DPR

BWS

Hamama Falls



Ice Pond



Front Gate

Board of Water Supply

Department of Parks and Recreation

Front Gate

Fence Extension

Pole 27

Pole 28

Pole 30

Pole 32

BWS Chlorinator on left

BWS Cattle Gate – Combination Lock

Pole 37

Road turns as stream flows beneath

Sign Posted

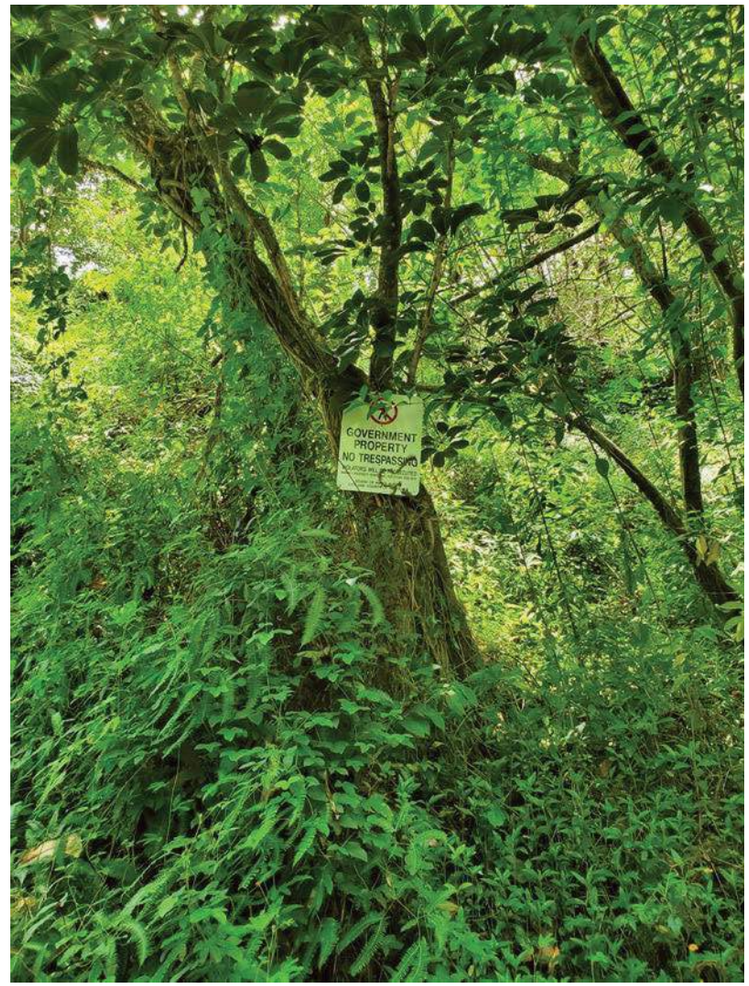
Sign on telephone pole

Signs posted on BWS fence before ice pond

BWS facility across ice pond

Signs posted at ice pond

Waihe’e Tunnel and Restoration Area



Along trail to Hamama Falls above Waihe’e Tunnel

Trail to falls

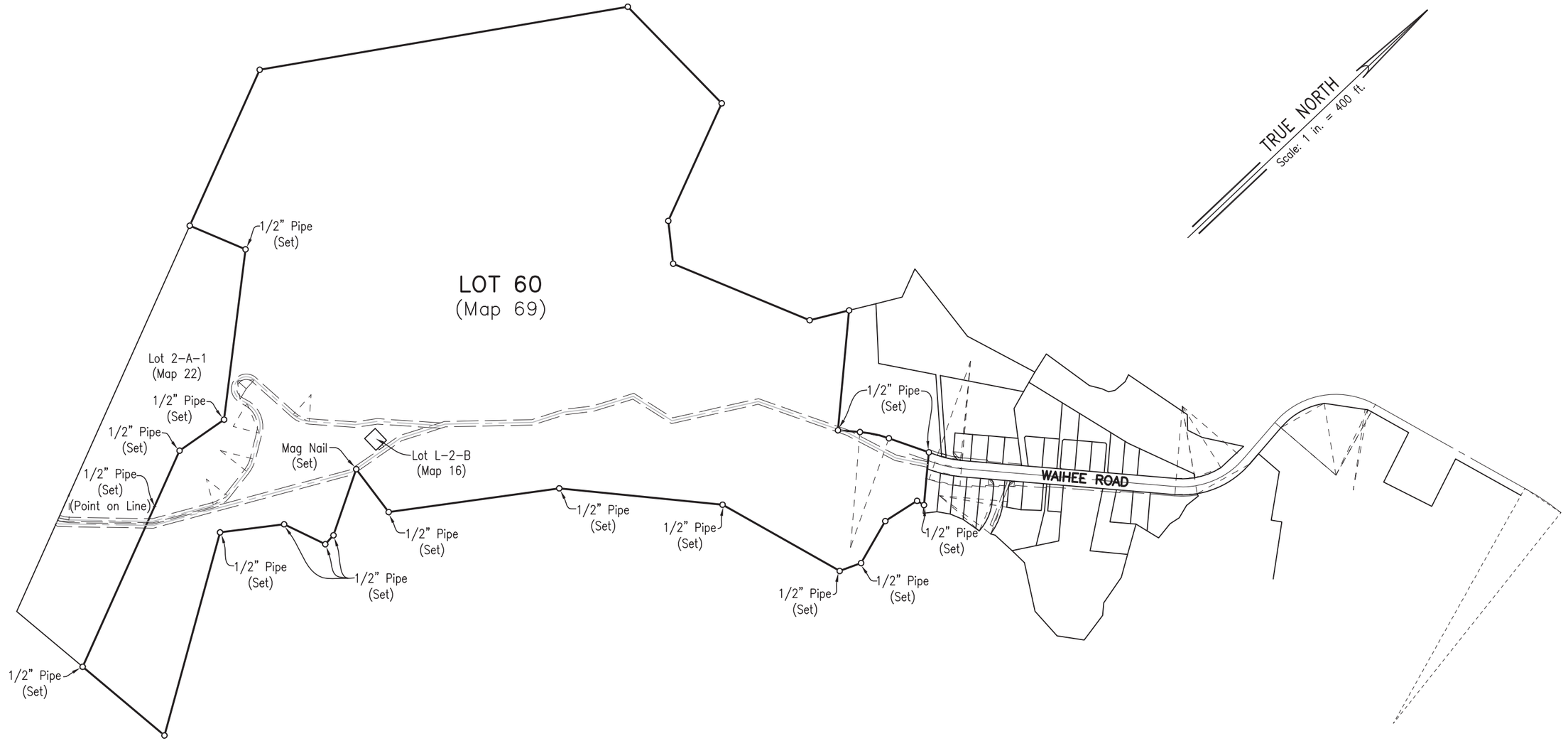
Hamama Falls

July 24, 2019

Honolulu Police Department
Board of Water Supply
Department of Parks and Recreation

Appendix G

Boundary and Topography Surveys



SKETCH

BOUNDARY STAKE OUT
LOT 60
LAND COURT APPLICATION 1133
(MAP 69)

At Waihee, Koolaupoko, Oahu, Hawaii

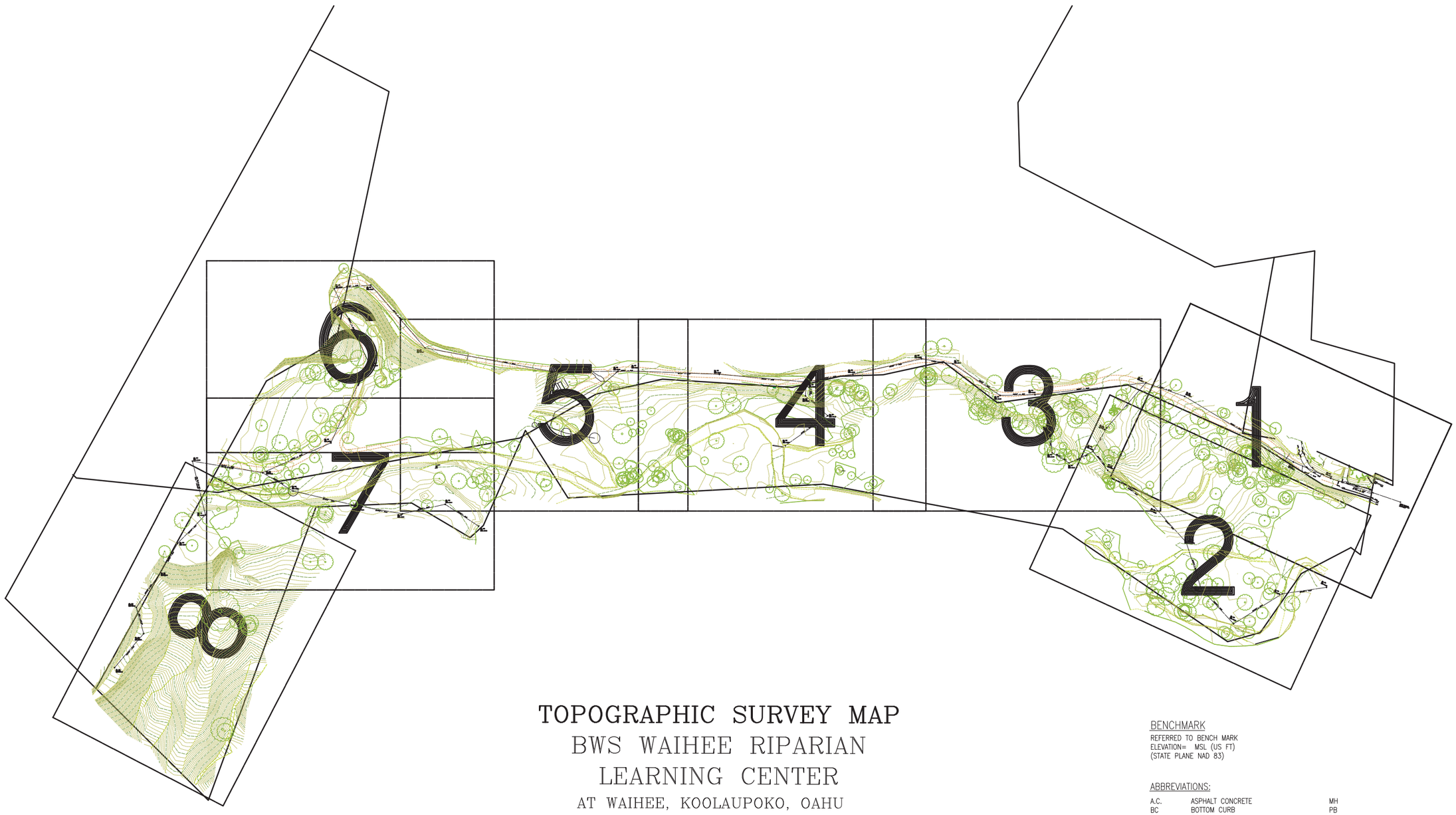
FN: N:\TOPOGRAPHIC SURVEY MAPS\2018\100\18113\dwg\18113 BDY-SO.dwg

TMK: 4-7-06: 10
Job No. 18113 BDY-SO

CONTROLPOINT SURVEYING, INC.
615 Piikoi Street, Suite 700
HONOLULU, HAWAII 96814

March 12, 2019

17" x 11"



TOPOGRAPHIC SURVEY MAP
BWS WAIHEE RIPARIAN LEARNING CENTER
AT WAIHEE, KOOLAUPOKO, OAHU

TMK: (1) 4-7-06

SCALE: 1 in. = 20 ft. JUNE 07, 2019

JOB NO. 18113 FIELD BOOK : 3213A: 07

DRN: MW FLD: WD,NL

CONTROLPOINT SURVEYING, INC.
615 Piikoi Street, Suite 700
HONOLULU, HAWAII 96814

BENCHMARK

REFERRED TO BENCH MARK
ELEVATION= MSL (US FT)
(STATE PLANE NAD 83)

ABBREVIATIONS:

A.C.	ASPHALT CONCRETE	MH	
BC	BOTTOM CURB	PB	
BW	BOTTOM WALL	S	
CONC.		SL	STREET LIGHT
CRM	CONCRETE ROCK MASONRY	TC	TOP CURB
D		TP	TOP PIPE
ELEC	ELECTRIC	TS	TOP STEM
FH	FIRE HYDRANT	TW	TOP WALL
G.W.		UB	UTILITY BOX
G.P.		UP	UTILITY POLE
H	HEIGHT	WM	WATER METER
INV	INVERT	WV	WATER VALVE BOX

NOTE

UNDERGROUND UTILITY LINES AND/OR STRUCTURES, IF SHOWN, ARE PROVIDED FOR INFORMATION ONLY AND ARE BASED ON INFORMATION SHOWN ON PLANS/MAPS PREPARED BY OTHERS. THE INFORMATION SHOWN, THEREFORE, MAY OR MAY NOT BE REPRESENTATIVE OF ACTUAL FIELD CONFDTIONS. THE UNDERGROUND UTILITY LINES AND/OR STRUCTURES MAY OR MAY NOT BE PRESENT AT THE LOCATIONS SHOWN OR OTHER UNDERGROUND UTILITY LINES AND/OR STRUCTURES NOT SHOWN MAY BE PRESENT.

UNLESS OTHERWISE NOTED, ALL LOCATIONS OF UNDERGROUND UTILITY LINES AND/OR STRUCTURES ARE APPROXIMATE. NO GUARANTEE IS MADE ON THE ACCURACY OR COMPLETENESS OF THE INFORMATION SHOWN. THE USER(S) OF THIS TOPOGRAPHIC SURVEY MAP SHALL VERIFY THE INFORMATION, AS NEEDED, DURING DESIGN AND CONSTRUCTION.

1

STA. 247
1/2 PIPE
ELEV.=142.91

57°53'42" — 102.72

69°47'21" — 317.75

STA. 246
IRON PIN
ELEV.=133.70

62°10'58" — 102.28

STA. 558
HUB
ELEV.=130.29

5°32'01" — 184.44
(ST. MON TO STA. 558)

STREET MONUMENT
TOP OF BRASS DISK
ELEV.=123.71

INV.=120.03(30")

INV.=120.62(30")

TRUE NORTH
SCALE: 1 IN. = 20 FT.

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

STA. 252
1/2" PIPE
ELEV.=158.06

STA. 302
HUB
ELEV.=136.54

STA. 303
MEG NAIL
ELEV.=133.51

STA. 305
HUB
ELEV.=124.55

STA. 310
HUB
ELEV.=110.06

STA. 336
HUB
ELEV.=108.14

STA. 337
HUB
ELEV.=106.94

STA. 338
HUB
ELEV.=102.15

STA. 339
HUB
ELEV.=100.25

270°59'07" — 59.80

256°34'52" — 146.33

266°40'01" — 121.36

280°47'10" — 122.43

265°50'26" — 112.08

210°19'57" — 111.84

INV.=120.03(30")

INV.=120.62(30")

TRUE NORTH
SCALE 1 IN = 20 FT

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

2

3

STA. 253
NAIL
ELEV.=158.95

STA. 254
NAIL
ELEV.=159.11

STA. 251
NAIL
ELEV.=160.92

STA. 250
NAIL
ELEV.=160.48

STA. 249
NAIL
ELEV.=152.35

STA. 299
MAG. NAIL
ELEV.=156.28

STA. 300
HUB
ELEV.=151.56

STA. 301
HUB
ELEV.=146.41

STA. 302
HUB
ELEV.=136.54

STA. 303
REC. MAG. NAIL
ELEV.=133.51

STA. 298
PIPE
ELEV.=150.06

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

TRUE NORTH
SCALE: 1 IN = 20 FT

4

STA. 258
NAIL
ELEV.=156.90

STA. 255
NAIL
ELEV.=159.95

STA. 256
NAIL
ELEV.=160.28

STA. 253
NAIL
ELEV.=158.95

STA. 296
MEG-NAIL
ELEV.=156.10

STA. 297
HUB
ELEV.=141.08

STA. 298
HUB
ELEV.=135.08

DIRT ROAD

TOP BANK

BOT. BANK

EDGE BUSH

EDGE HAU

BOT. BANK/EDGE WATER

TOP BANK/EDGE HAU

TOP BANK/EDGE WATER

BOT. BANK/EDGE HAU

CRM WALL

CHAIN LINK FENCE, H=5'

TREES

GRAPHIC SCALE
(IN FEET)
1 inch = 20 ft.

5

TRUE NORTH
SCALE 1 IN = 20 FT

STA. 263
IRON PIN
ELEV.=200.34

STA. 259
IRON PIN
ELEV.=175.62

STA. 260
HUB
ELEV.=162.73

STA. 257
NAIL
ELEV.=160.50'

STA. 288
HUB
ELEV.=170.11

GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.

TRUE NORTH
SCALE 1 IN = 20 FT

6

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

STA. 265
NAIL
ELEV.=182.86

STA. 264
NAIL
ELEV.=193.10

STA. 263
IRON PIN
ELEV.=200.34

STA. 266
NAIL
ELEV.=168.67

STA. 268
NAIL
ELEV.=168.54

TRUE NORTH
SCALE 1 IN = 20 FT

TRUE NORTH
SCALE: 1 IN = 20 FT

STA. 268
NAIL
ELEV.=168.54

STA. 269
IRON PIN
ELEV.=175.79

STA. 255
NAIL
ELEV.=159.95

STA. 287
HUB
ELEV.=173.71

STA. 288
HUB
ELEV.=170.11

STA. 290
HUB
ELEV.=164.00

45°01'40"
(STA. 269 TO STA. 270)
178.27

15°00'54"
186.45

231°40'14"
160.42

226°45'02"
119.43

206°08'23"
109.73

7

GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.

TRUE NORTH
SCALE: 1 IN = 20 FT

STA. 278 NAD 83 ELEV.=227.32

STA. 277 NAD 83 ELEV.=223.73

STA. 276 ELEV.=186.17

STA. 275 ELEV.=181.03

STA. 280 ELEV.=247.29

STA. 279 ELEV.=227.65

34°34'04" — 98.30

339°17'37" — 92.62

353°01'14" — 99.42

349°17'15" — 111.81

293°12'41" — 68.76

298°01'38" — 138.38
(STA. 270 TO STA. 275)

TREE D=3' H=50'

TREE D=4' H=60'

TREE D=4' H=40'

TREE D=3' H=50'

TREES D=3' H=40'

TREES D=3' H=30'

INTERMITTENT

EDGE WAT.

TOP BANK

BOT. BANK

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

Appendix H

Natural Resources Survey for the Waiheʻe Riparian Learning Center

AECOS No. 1559

Natural resources survey for the Waiheʻe Riparian Learning Center TMK: 4-7-006: 010 (por.) Kahuluʻu, Koʻolau Poko District, Oʻahu

Prepared by:

AECOS, Inc.
45-939 Kamehameha Hwy, Suite 104
Kāneʻohe, Hawaiʻi 96744-3221

May 7, 2019

Natural resources survey for the Waiheʻe Riparian Learning Center TMK: 4-7-006: 010 (por.) Kahuluʻu, Koʻolau Poko District, Oʻahu

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Introduction

The Board of Water Supply, City and County of Honolulu (BWS) proposes to create the "Waiheʻe Riparian Learning Center," to educate the public about the importance of streams, watersheds, and regenerative agriculture (the "Project"). *AECOS* Inc. was contracted by G70 to complete a natural resources survey of a portion of TMK: 4-7-006:100 and assess potential environmental impacts from the proposed Project[1].

Site Description

Waiheʻe Valley is located on the windward side of Koʻolau Mountain, Oʻahu (Figure 1). Stream erosion of Koʻolau Mountain formed the current distinctive half-circular valley shape with steep walls resembling an amphitheater. Waterfalls and intermittent stream tributaries near the top of the valley converge into the main course of Waiheʻe Stream at approximately 60 m (200 ft) above sea level (ASL). Waiheʻe Stream discharges into Kāneʻohe Bay through Kahaluʻu Lagoon, a dredged flood control channel located on the coastal plain. ʻĀhuimanu and Kahaluʻu streams also discharge into Kahaluʻu lagoon and the three streams make up the larger Kahaluʻu Watershed (State ID code: 32007). The proximity of Koʻolau Mountain to the shore in the project vicinity results in the longest length of Waiheʻe Stream being only 4.8 km (3.0 mi).

[1] This document will be incorporated into the Environmental Assessment (EA) for the Project and become part of the public record.

Figure 1. Location of the Project area and Kahaluʻu watershed in windward Oʻahu.

A real-time U.S. Geological Survey (USGS) stream gage located at 52 m (170 ft) ASL just upstream of the Project area has measured discharge and gage height of Waiheʻe Stream since 1974. Waiheʻe Stream has a median flow of 5.6 cubic feet per second (cfs) and an average flow of 7.1 cfs (USGS, 2019a) and is, therefore, considered a small stream (Hawaii Cooperative Park Service Unit, 1990). Just upslope from the USGS gage, Waiheʻe Tunnel, installed in 1955, captures and transports 5 million gallons per day (mgd) of dike-confined Koʻolau Range water for use as drinking water by Windward Oʻahu residents. Water withdrawn from the tunnel and wells is regulated to maintain an instream flow of 4.2 cfs (Charles F. Reppun vs. Board of Water Supply, City and County of Honolulu, 1982). Two waterfalls, Hāmama and Waiheʻe, are located just upstream of the tunnel.

At 50 m (160 ft) ASL, a diversion directs some flow from Waiheʻe Stream into an *ʻauwai* (irrigation ditch). This water was used to irrigate former *loʻi kalo* (terraced taro pondfields) in the Project area and is still being used for irrigation downstream of the Project area. Flow is directed back into the main channel upstream of Ahilama Road at 15 m (50 ft) ASL. *A r*iparian forest lines the banks of the stream and *ʻauwai*, creating a relatively closed canopy. The stream channel has a substratum of mainly boulders and large cobbles, with moderate water velocity and moderate siltation and embeddedness (Brasher, et al., 2003). The *ʻauwai* has a substratum of cobbles and silt, with moderate water velocity and high siltation and embeddedness.

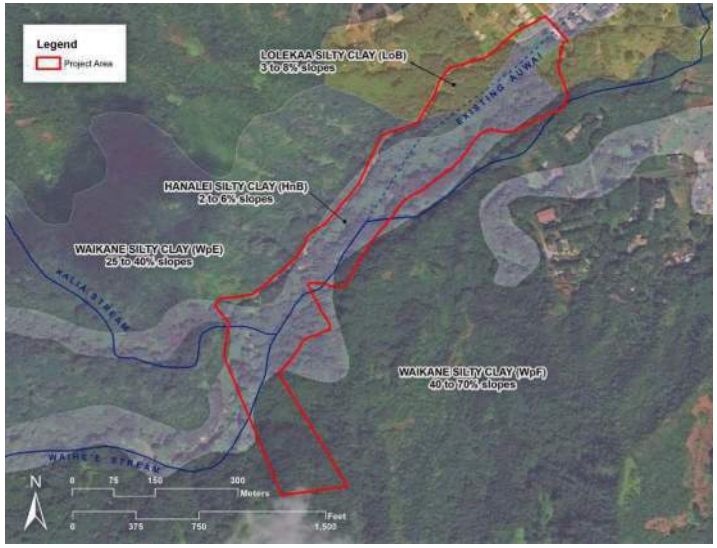

Figure 2. The Project area (outlined in red) is on the valley floor; most of the soils are mapped as Hanalei silty clay (HnB).

The U.S. Department of Agriculture – Natural Resources Conservation Service (USDA-NRCS) maps four soil types in the Project area (Figure 2, above). Hanalei silty clay (2 to 6 percent slopes [HnB]) occupies the majority of the Project area

on the valley floor and riparian flood zone of Waihe'e Stream. USDA-NRCS describes Hanalei silty clay as derived from alluvial deposits on bottomlands (USDA-NRCS, 2019), and classifies it as a Typic Endoaquept soil, a geologically-recently formed soil with a high water table. These soils are somewhat poorly drained to poorly drained and are susceptible to seasonal flooding (USDA-NRCS, 2019b).

Project Description

The Project area is located along Waihe'e Stream, from the end of Waihe'e Road to the BWS Waihe'e Tunnel. Elevation of the Project area ranges from approximately 35 m to 75 m (115 ft to 245 ft) ASL, and the total area of the is approximately 11 ha (27 ac). The land is currently unoccupied and, due to the ample rainfall, supports a lush vegetation. In 2007, the Hawai'i Biological Survey of Bishop Museum (BISH) mapped the vegetation in the Project area as Alien Wet Forest (Imada et al., 2007).

Proposed Project activities include the following: restore existing fallow *lo'i*, maintain existing *'auwai* system, and restore riparian and forest areas with appropriate native and non-invasive plants. Specific actions to implement these activities include: clear existing *lo'i*, develop parking areas, replace existing gate and install a new gate, remove invasive species, plant native species, create a *hale* (pavilion), evaluate toilet options, install signs, construct a plant nursery, and create a new *lo'i* from an existing ginger patch. Figure 3 depicts proposed Project activities.

Methods

Water Quality

On March 27, 2019, *AECOS* biologists took field measurements in Waihe'e Stream for temperature, conductivity, dissolved oxygen, and pH and collected water samples for analysis of total suspended solids (TSS), turbidity, nitrate-nitrite nitrogen (NO_3+NO_2), total nitrogen (TN), and total phosphorus (TP) at three stations (Figure 4).

Additionally, stream velocity was measured with a Swoffer Instruments® Model 3000 flow meter and the average depth and width of the flowing portion of the stream or *'auwai* were measured in order to estimate stream discharge at each station during sampling.

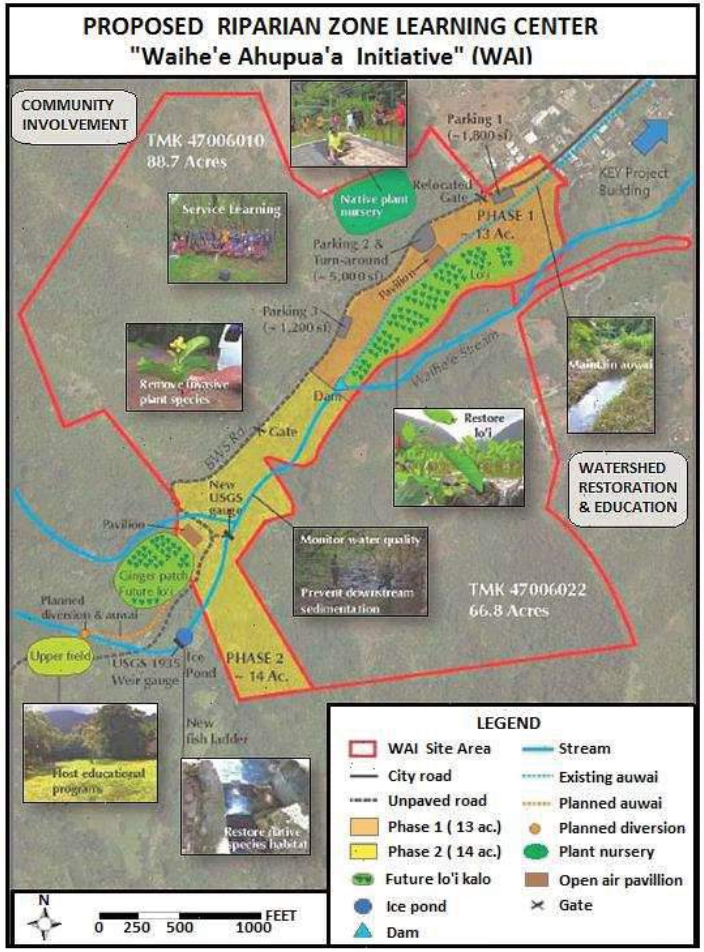

Figure 3. Proposed Project activities.

All water samples were collected into screw cap, polypropylene bottles from just below the surface and delivered to *AECOS* laboratory in Kāne'ohe, O'ahu for laboratory analyses (*AECOS* Log No. 37565). Table 1 lists analytical methods and instruments used in these measurements.

Table 1. Analytical methods and instruments used for water quality analyses.

Analysis	Method	Reference	Instrument†
Temperature	SM 2550 B	Standard Methods 20th Edition (1998)	YSI ProPlus multi-meter
Conductivity	SM 2510-B	Standard Methods, 20th Edition (1998)	YSI ProPlus multi-meter
pH	SM 4500 H+	Standard Methods 20th Edition (1998)	Hannah pocket pH meter
Dissolved Oxygen	SM 4500-O G	Standard Methods 20th Edition (1998)	YSI ProPlus multi-meter
Turbidity	EPA 180.1 Rev 2.0	EPA (1993)	HACH 2100Q Turbidimeter
Total Suspended Solids	Method 2540 D	Standard Methods 20th Edition (1998)	Mettler Toledo XS204 balance
Nitrate + Nitrite	EPA 353.2	USEPA (1993)	Lachat Quikchem 8500, FIA
Total Nitrogen	EPA 353.2	USEPA (1993)	Lachat Quikchem 8500, FIA
Total Phosphorus	EPA 365.3	USEPA (1993)	Lachat Quikchem 8500, FIA

† typical instruments listed, others may have been substituted

Station "Downstream" was located just upstream from a small bridge culvert in the *'auwai* about 165 m (540 ft) from the northeast end of the Project site. Sta. "Mid-Project" was located near the center of the Project site, approximately 150 m (500 ft) downstream from the Waihe'e-Kalia streams confluence. Sta. "USGS" was collected at the measuring weir in the former location of the USGS gage station, just upstream from a plunge pool locally referred to as "Ice Pond."

Aquatic Biota

AECOS biologists conducted an aquatic biota survey of streams and *'auwai* in the Project area on March 27, 2019. Our survey consisted of making visual observations of aquatic organisms while walking in or adjacent to the stream and snorkeling deeper segments. The biologists noted relative abundances (e.g., rare, common, abundant) of each species encountered as the survey progressed.

Hand nets were used to capture fishes for close inspection and discover more cryptic, bottom-dwelling species. Nomenclature for aquatic species follows *AlgaeBase* (Guiry and Guiry, 2019), *Integrated Taxonomic Information System* (ITIS, 2017), and *World Register of Marine Species* (WoRMS Editorial Board, 2019). A review of biological records from previous surveys within the watershed is included in the species list developed for the survey.

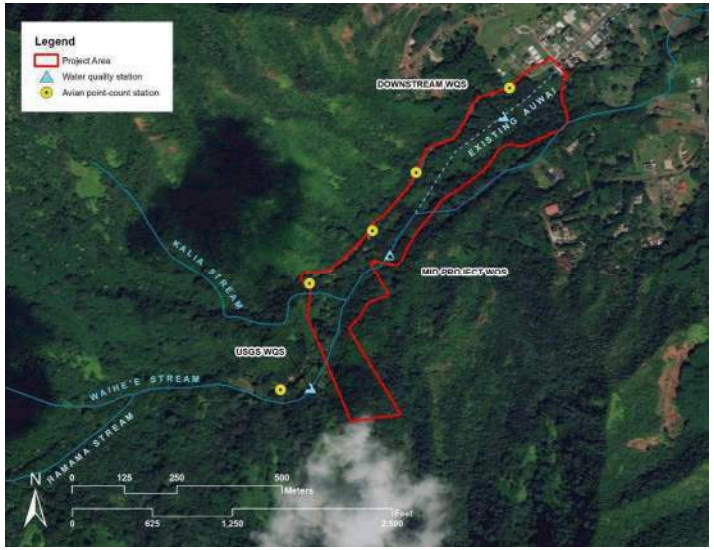

Figure 4. Locations of water quality stations (WQS) (blue triangles) and avian point-count stations (yellow circles) located in the Project vicinity.

Avian Survey

The avian survey was conducted during the morning hours when birds are most active. Five point-count stations (shown in Fig. 4, above) were selected in the Project area at equidistant positions, roughly 200 m (650 ft) apart. Weather conditions during the survey were ideal for avian observations, with no rain and light variable winds. At each point-count station, birds observed and/or heard

during an 8-minute period were identified to species and counted. Any additional avian species observed in the Project area beyond these point-count periods were noted as incidental observations. *AECOS* biologists spent additional time walking the the Project area, including the location of the planned diversion and *ʻauwai* and future *loʻi*..

The avian phylogenetic order and nomenclature used in this report follows the Hawaiian Island Birds Checklist 2017 (VanderWerf et al. 2018), which is based on the *Checklist* of *North and Middle America Birds* by American Ornithological Society (AOS; Chesser et al., 2018). Hawaiian common names are provided for indigenous and endemic species, as applicable.

Mammalian Survey

AECOS biologists compiled a list of terrestrial mammal species observed in the Project area. Visual observations of tracks, scat, and other sign indicating mammals using the survey area were noted. Mammalian scientific names follow *Mammal Species of the World* (Wilson and Reeder, 2005).

Results

Water Quality

Results from stream discharge calculations, *in situ* water quality measurements, and analyses of water samples collected are provided in Tables 2 and 3. Also included in these tables are data collected from Waiheʻe Stream in 1999 and 2012 at the former USGS Gage Station and 1 km (0.6 mi) downstream from the Project area at Ahilama Road (*AECOS*, 2012).

In the Project area, the swift-flowing stream waters are cool and clear. Temperature and conductivity varied little from station to station. Temperature readings ranged from 20.0°C at Sta. USGS to 20.9°C at Sta. Downstream. Stream waters were well oxygenated at all stations with saturation values of 102, 106, and 99% calculated based on ambient water temperature. Values for pH ranged from 6.75 to 7.34 standard units.

Turbidity and total suspended solids concentrations were low in Waiheʻe Stream represented by Sta. USGS and Sta. Mid-Project and somewhat higher at Sta. Downstream, in the *ʻauwai*. The bulk of nitrogenous nutrient substances present in the sample waters were as soluble nitrate+nitrite, indicating the flow conditions during the sampling event were primarily groundwater driven

Table 2. Results for *in situ* measurements on March 27, 2019 and historical data from June 1999 and July 2012 in Waiheʻe Stream.

Station	Time (hh:mm)	Discharge (cfs)	Temp. (°C)	Dissolved Oxygen (mg/l)	Dissolved Oxygen (% sat.)	pH --	Conductivity (µmhos/cm)
USGS (1999)†	1010	4.4	20.5	8.90	99	8.20	155
USGS (2012)‡	1046	--	20.7	9.02	100	7.99	152
USGS	1130	3.0	20.0	9.28	102	6.88	134
Mid-Project	1355	7.0	20.5	9.53	106	7.34	136
Downstream	1012	0.8	20.9	8.92	99	6.75	136
Ahilama Rd (2012)‡	0949	--	22.0	8.59	98	7.56	166

† (Brasher et al., 1999)
‡ (*AECOS*, 2012)

Table 3. Results for turbidity, suspended solids, and nutrients concentrations from samples collected on March 27, 2019 in the Project area and historical data from June 1999 and July 2012 in Waiheʻe Stream.

Station	TSS (mg/l)	Turbidity (ntu)	Nitrate+ Nitrite (µg N/l)	Total N (µg N/l)	Total P (µg P/l)
USGS(1999)†	2.0	--	120	170 (est.)	33
USGS(2012)‡	0.4	0.40	138	199	48
USGS	0.7	0.74	149	183	34
Mid-Project	0.7	0.82	174	219	58
Downstream	9.2	5.06	147	177	43
Ahilama Rd (2012)‡	2.4	2.36	51	64	98

† (Brasher et al., 1999)
‡ (*AECOS*, 2012)

rather than a result of surface water runoff. Total phosphorus concentrations ranged from 34 to 58 µgP/L.

Aquatic Biota

The aquatic biota in Waihe'e Stream and *'auwai* in the Project area comprises both native and non-native species (Table 4). The list in Table 4 presents qualitative abundances for species observed in the Project area during our present survey and includes, without abundance values, species previously reported from Waihe'e Stream (*AECOS*, 2012; Brasher et al., 2003) and Kahalu'u Watershed (Parham et al., 2008).

Table 4. List of aquatic species observed in or reported from Kahalu'u Watershed and Waihe'e Stream.

PHYLUM, CLASS, ORDER, FAMILY *Species*	Common name	Abundance	Status	Reach <ID Code>
ALGAE				
CHLORPHYTA, CHLOROPHYCEAE				
OEDOGONIALES				
OEDOGONIACEAE				
Oedogonium sp.		--	--	Low<2>
CHLORPHYTA, ULVOPHYCEAE				
ULVALES				
CLONIOPHORACEAE				
Cloniophora sp.		--	--	Low<2>
ULVACEAE				
Ulva flexuosa Wolfen		--	--	Est<2>
RHODOPHYTA, FLORIDEOPHYCEAE, HILDENBRANDIALES				
HILDENBRANDIACEAE				
Hildenbrandia angolensis Welw. ex W. West & G. S. West		A	**Ind**	Mid<1>
INVERTEBRATES				
PLATYHELMINTHES	flatworms			
undet. platyhelminthes		--	?	Mid<3>
MOLLUSCA, BIVALVIA, VENEROIDA, CORBICULOIDIDAE	clams			
Corbicula fluminea O.F. Müller	Asian clam	--†	Nat	Est<2> Low<4>
MOLLUSCA, GASTROPODA,	snails			
undet. Gastropoda		--	?	Mid<3>

Table 4 (continued).

PHYLUM, CLASS, ORDER, FAMILY Species	Common name	Abundance	Status	Reach <ID Code>
MOLLUSCA, GASTROPODA, ARCHITAENIOGLOSSA				
AMPULLARIIDAE				
Pila conica Gray	applesnail	--	Nat	<4>
Pomacea canaliculata Lam.	channeled applesnail	--	Nat	Est<2>, <4>
MOLLUSCA, GASTROPODA BASOMMATOPHORA				
LYMNAEIDAE				
indet.	pond snail	--	--	Low, Mid<4>
PHYSIDAE				
indet.		--	Nat	Mid<4>
Physa virgata Gould [syn: *Physella virgata* (Gould)]	pouch snail	--	Nat	<4>
MOLLUSCA, GASTROPODA CYCLONERITIDA				
NERITIDAE				
Neritina granosa (G. B. Sowerby)	*hihīwai*	O	**End**	Mid<4>
MOLLUSCA, GASTROPODA, NEOTAENIOGLOSSA				
THIARIDAE				
indet. Thiaridae	melania	--	--	Low, Mid<4> Mid<3>
Melanoides tuberculata Muller	red-rimmed melania	--	Nat	Mid<4>
Tarebia granifera Lamarck	quilted melania	C	Nat	Mid<1> Low, Mid<4>
ANNELIDA, CLITELLATA, HIRUDINIDAE	leaches			
indet. Hirudinidae		---	?	Mid<4>
ERPOBDELLIDAE				
indet. Erpobdellidae		---	?	Mid<5>
PISCICOLIDAE				
?*Myzobdella lugubris* Leidy	fish leech	R	Nat	Mid<4>
ANNELIDA, CLITELLATA ENCHYTRAEIDAE				
indet. Enchytraeidae		---	?	Mid<3>
NAIDIDAE				
indet. Naididae		---	?	Mid<3>
TUBIFICIDAE				
indet. Tubificidae		---	?	Mid<3>
ANNELIDA, OLIGOCHAETA,				
Megadrile sp.		--	?	Mid<3>

Table 4 (continued).

PHYLUM, CLASS, ORDER, FAMILY Species	Common name	Abundance	Status	Reach <ID Code>
ANNELIDA, POLYCHAETA, PHYLLODOCIDA	polychaete			
NEREIDIDAE				
Namalycastis sp.		--	**Ind**	Mid<4>
Namalycastis abiuma (Mueller, in Grube)		--	**Ind**	Mid<3>
ARTHROPODA, INSECTA, COLEOPTERA				
HYDROPHILIDAE	water scavenger beetles			
indet. Hydrophilidae		--	?	Mid<3>
ARTHROPODA, INSECTA, COLLEMBOLA				
indet. Collembola	springtails	--	?	Mid<3>
ARTHROPODA, INSECTA, DIPTERA				
EMPIDIDAE	dance flies			
Hemerodromia stellaris Melander		--	Nat?	Mid<3>
EPHYDRIDAE	brine flies			
indet.		--	Nat	Mid <3,4>
Discocerina mera Cresson		--	Nat	Est <4>
CHIRONOMIDAE	midges			
indet. Chironomidae		--	?	Mid<3>
Apedilum sp.		--	Nat?	Mid<3>
Cricotopus bicinctus (Meigen, 1818)		--	Nat	Est, Mid<4>
Paratanytarsus sp.		--	Nat?	Mid<3>
indet. Orthocladiinae		--	Nat	Mid<3>
Cricotopus/Orthocladius sp.		--	Nat	Mid<3>
Eukiefferiella sp.		--	Nat?	Mid<3>
CULICIDAE	mosquitos			
indet.		--	Nat	Mid<4>
Orthocladius sp.		--	**End**	Mid<4>
DIXIDAE				
Dixa longistyla Takahashi	dixid midges	--	Nat	Mid<3,4>
TETHINIDAE				
Dasyrhicnoessa insularis (Aldrich)	tethnid fly	--	**Ind**	Est<4>
TIPULIDAE				
Limonia sp.	crane fly	--	?	Mid<3,4>
ARTHROPODA, INSECTA HEMIPTERA				
MESOVELIIDAE				
Mesovelia amoena Mulsant and Rey	water treader	--	Nat	Mid<3,4>
VELIIDAE				
indet. Veliidae		--	Nat	Mid<4>
Microvelia vagans White	water strider	--	**End**	Mid<4,5>

Table 4 (continued).

PHYLUM, CLASS, ORDER, FAMILY Species	Common name	Abundance	Status	Reach <ID Code>
ARTHROPODA, INSECTA, LEPIDOPTERA				
indet. Lepidoptera		--	?	Mid<3>
ARTHROPODA, INSECTA, ODONATA	**dragonflies**			
AESHNIDAE				
Anax junius Drury	*pinao*, common green darner	R	**End**	Mid<1>
COENAGRIONIDAE	damselflies			
Ischnura ramburii Selys	fragile forktail	--	Nat	Est, Low<4>
Megalagrion sp.	*pinao 'ula*	--	**End**	Low, Mid<4>
Megalagrion hawaiiense McLachan	*pinao 'ula,* Hawaiian upland damselfly	--	**End**	Mid<4>
Megalagrion nigrohamatum nigrolineatum Blackburn	*pinao 'ula,* blackline Hawaiian damselfly	--	**End**	Mid, Head<4>
Megalagrion oceanicum McLachan	*pinao 'ula,* oceanic Hawaiian damselfly	--	**End**	Mid<4>
ARTHROPODA, INSECTA, TRICHOPTERA				
indet.				Mid<4>
HYDROPSYCHIDAE	net-spinning caddisflies			
indet.		--	Nat	Mid<4>
Cheumatopsyche analis (Banks)		--	Nat	Mid<4>
Cheumatopsyche pettiti Banks		--	**Ind**	Mid<3>
HYDROPTILIDAE	micro-caddisflies			
Hydroptilia sp.		--	Nat	Mid<3>
Hydroptilia icona Mosely		--	Nat?	Mid<3>
Oxyethira maya Denning		--	Nat	Mid<3,4>
ARTHROPODA, ARACHNIDA	arachnids			
indet. Oribatida		--	?	Mid<3>
ARTHROPODA, MAXILLAPODA SESSILIA				
BALANIDAE				
Balanus eburneus Gould	ivory barnacle	--†	**Ind**	Est<2>
ARTHROPODA, MALACOSTRACA, DECAPODA				
indet. Decapoda			?	Mid<3>
ATYIDAE				
Atyoida bisulcata J.W. Randall	*'ōpae kala'ole*	--	**End**	Low, Mid, Up<4> Mid<3>
Neocaridina denticulata sinensis Kemp	grass shrimp	U	Nat	Mid<1> Mid<3,4>
CAMBARIDAE				
Procambarus clarkii Girard	crayfish	U	Nat	Mid<1> Low<2> Low, Mid<4> Mid<3>

Table 4 (continued).

PHYLUM, CLASS, ORDER, FAMILY Species	Common name	Abundance	Status	Reach <ID Code>
GRAPSIDAE				
Metopograpsus thukuhar Owen	*kukuau*	--	**Ind**	Est<2>
PALAEMONIDAE				
Macrobrachium sp.	prawn	--	---	Low <4>
Macrobrachium grandimanus J.W. Randall	*ʻōpae ʻoehaʻa*	--	**End**	Low, Mid<4>
Macrobrachium lar J.C. Fabricus	Pacific river prawn	C	Nat	Mid<1> Low, Mid, Up<4> Mid<3>
PORTUNIDAE				
Thalamita crenata H. Milne Edwards	blue-pincer crab	--	Nat	Est<2>
	FISHES			
CHORDATA, ACTINOPTERYGII				
ACANTHURIDAE				
Acanthurus triostegus sandvicensis Streets	*manini*; convict tang	--	**End**	Est<2>
CALLICHTHYIDAE				
Corydoras aeneus Gill	bronze catfish	--	Nat	Low<4>
CICHLIDAE				
Archocentrus nigrofasciatus Gunther	convict cichlid	--	Nat	Low<2, 4>
Hemichromis elongatus Guichenot in Duméril	jeweled cichlid	--	Nat	<4>
Oreochromis mossambicus Peters	Mozambique tilapia	--	Nat	Est<2> <4>
Sarotherodon melanotheron Rupell	black-chin tilapia	--	Nat	Est<2> Low<4>
Tilapia sp.	unid. tilapia	--	Nat	Est, Low<4>
CHANIDAE				
Chanos chanos Forsskal	*awa*; milkfish	--	**Ind**	Est<2>
CLARIIDAE				
Clarias fuscus Lacepede	clarias; whitespotted catfish	--	Nat	Low<4>
COBITIDAE				
Misgurnus anguillicaudatus Cantor	dojo, loach, oriental weatherfish	--	Nat	Low, Mid<4>
ELEOTRIDAE				
Eleotris sandwicensis Vaillant and Sauvage	*ʻoʻopu ʻakupa*; Sandwich Isle sleeper	--	**End**	Est<2> Low<4>
ENGRAULIDAE				
Encrasicholina purpurea Fowler	*nehu*; Hawaiian anchovy	--	**End**	Est<2>
GOBIIDAE				
indet.	*ʻoʻopu*	--	--	Low, Mid<4>

Table 4 (continued).

PHYLUM, CLASS, ORDER, FAMILY Species	Common name	Abundance	Status	Reach <ID Code>
GOBIIDAE (cont.)				
Awaous staminensis (Eydoux & Souleyet	*ʻoʻopu nākea*	C	**End**	Mid<1> Low<2> Low, Mid<4>
Lentipes concolor Gill	*ʻoʻopu alamoʻo* or *ʻoʻopu hiʻu kole*	R	**End**	Mid<1> Mid<4>
Sicyopterus stimpsoni Gill	*ʻoʻopu nōpili*	--	**End**	Mid<4>
Stenogobius hawaiiensis Watson	*ʻoʻopu naniha*	--	**End**	Low<2, 4>
KUHLIDAE				
Kuhlia sp.	*ʻāholehole*; flagtail	--	**Ind**	Low<4>
Kuhlia xenura Jordan & Gilbert	*ʻāholehole*; Hawaiian flagtail	--	**Ind**	Est<2,4> Low<4>
LORICARIIDAE				
Ancistrus c.f. *temminckii* Valenciennes in Cuvier and Valenciennes	bristle-nose catfish	A	Nat	Mid<1> Low, Est<2> <4>
Hypostomus watawata Hancock	armored catfish	--	Nat	Low<4>
MUGILIDAE				
Mugil cephalus Linnaeus	striped mullet	--	**Ind**	Est<2, 4>
POECILIIDAE				
indet.		--	Nat	Est, Low, Mid<4>
Gambusia affinis Baird and Girard	mosquitofish	--	Nat	Est<4>, Low<2,4>, Mid<2>
Poecilia latipinna Lesueur	sailfin molly	--	Nat	Mid<4>
Poecilia reticulata Peters	guppy	A	Nat	Mid<1> Est<2> Low<2,4> Mid<4>
Poecilia sphenops Valenciennes	liberty/Mexican molly	--	Nat	Low, Mid<4>
Poecilia sp. hybrid complex (*salvatoris/mexicana* group)	hybrid molly	O	Nat	Mid<1>
Poecilia spp.	indet. molly	--	Nat	Est, Low, Mid<2> Low, Mid<4>
Xiphophorus sp.	swordtail	--	Nat	Mid<4>
Xiphophorus helleri Heckel	green swordtail	C	Nat	Mid<1> Est, Low<2> Low, Mid<4>
Xiphophorus maculatus Gunther	moonfish, platyfish	--	Nat	Mid<4>
SPHYRAENIDAE				
Sphyraena barracuda Edwards	barracuda	--	Nat	Est<4>

Table 4 (continued).

PHYLUM, CLASS, ORDER, FAMILY Species	Common name	Abundance	Status	Reach <ID Code>
	AMPHIBIANS			
VERTEBRATA, AMPHIBIA, ANURA				
BUFONIDAE				
Rhinella marina Linnaeus	cane toad	--	Nat	Low, Mid<4>
RANIDAE				
Lithobates catesbeianus (Shaw)	American bullfrog	O	Nat	Mid<1>

KEY TO SYMBOLS USED:
- Abundance categories:
  - R – Rare – only one or two individuals observed.
  - U – Uncommon – several to a dozen individuals observed.
  - O – Occasional – seen irregularly in small numbers
  - C – Common -observed everywhere, although generally not in large numbers.
  - A – Abundant – observed in large numbers and widely distributed.
- Status categories:
  - **End** – Endemic – species native only in Hawai'i
  - **Ind.** – Indigenous – species native in Hawai'i and elsewhere
  - Nat – Naturalized – species introduced to Hawai'i, intentionally or accidentally.
- Stream reach codes:
  - Est – Estuary – between the shore and 1 meter elevation
  - Low – Lower Reach – between 1 and 20 meter elevation
  - Mid – Middle Reach – between 20 and 200 meter elevation
  - Up – Upper Reach – between 200 and 750 meter elevation
  - Head – Headwaters – greater than 750 meter elevation
- ID codes:
  - <1> March 27, 2019
  - <2> *AECOS* (2012)
  - <3> Brasher et al. (2003)
  - <4> reported from the watershed, specific stream not identified (Parham et al, 2008)

† - Specimen identified from non-living material: shell, test, or carapace only.

Boulders In the Project stream are encrusted with a red alga that appears to be *Hildenbrandia* sp. (see Figure 5). In 2012, green algae (*Cloniophora* sp. and *Oedogonium* sp.) were conspicuous on boulders and bedrock of the stream bed downstream from the Project area at Ahilama Road. Our survey found *hīhīwai*(*Neritina granosa*), an endemic, amphidromous snail, tucked under boulders throughout the Project area (Figure 6). This population of *hīhīwai*, apparently thriving and reproducing (as evident by egg capsules adhered to boulders) in Waihe'e Stream, are likely transplants from Maui. In the early 2000s, *hīhīwai* stranded in the low flows of 'Īao Stream (now known as Wailuku Stream), which had been diverted for sugar cane irrigation for over 100 years, were transplanted to Waihe'e Stream (Hau, 2007; K. Faris, pers. comm.). These

Figure 5. Patches of a crustose red alga (probably *Hildenbrandia* sp.) covers boulders in shaded, fast-moving segments the stream within the Project area.

Figure 6. This (and others) *'o'opu nākea* has a fish leech adhered to its second dorsal fin. A nocturnal *hīhīwai* rests under a boulder in Waihe'e Stream during the day.

Figure 7. The amphidromous Pacific prawn is a common inhabitant of Waihe'e Stream in the Project area.

Figure 8. We observed a single *'o'opu alamo'o* in Waihe'e Stream just upstream of the Project area and fish ladder.

snails had not been previously reported from the streams of Kahaluʻu watershed (Parham et al., 2008; Brasher et al., 2003; *AECOS*, 2012), and prior to installation of the fish ladder at the USGS gage station in 2013, did not have access to the unaltered upper reach of the stream.

At least three endemic species of *pinao ʻula* (Hawaiian damselflies)—Hawaiian upland damselfly (*Megalagrion hawaiiense*), blackline Hawaiian damselfly (*M. nigrohamatum nigrolineatum*), and Oceanic Hawaiian damselfly (*M. oceanicum*)—have been reported from the middle reach (20 m to 200 m ASL) and headwaters (>750 m) of Waiheʻe Stream. Preferred habitats for these species include margins of streams and side pools along middle and upper stream reaches and seeps, wet banks, and waterfalls. The Hawaiian upland damselfly and blackline Hawaiian damselfly also inhabit upland forest pools and bogs and, as the name suggests, the Hawaiian upland damselfly can also be found on forest trails, ridges, and gulches (Polhemus and Asquith, 1996). We observed the native dragonfly or *pinao* (*Anax junius*), but not any damselflies in the Project area.

The introduced amphidromous Pacific prawn (*Macrobrachium lar*) resides in the deeper pools of Waiheʻe Stream (Figure 7). Bottom dwelling *ʻoʻopu nākea* (*Awaous stamineus*) and bristle-nosed catfish (*Ancistrus* c.f. *temmincki*) are the most common fishes in Waiheʻe Stream within the Project area. External parasitic leeches (most likely *Myzobdella lugubris*) were conspicuous on the fins of several *ʻoʻopu nākea* in the Project area (see Figure 5). These ectoparasites were introduced by either freshwater fishes or crabs from the Southeast USA and stream dwelling gobioids are often heavily infested (Font, 2007).

We observed a single *ʻoʻopu alamoʻo* or *ʻoʻopu hiʻu kole* (*Lentipes concolor*) in Waiheʻe Stream, a short distance upstream of the Project area (Figure 8). Installation of the fish ladder at the USGS gage station in 2013 made it possible for *ʻoʻopu nākea* and *ʻoʻopu alamoʻo* to inhabit an additional 1.5 km (1.0 mi) of stream above the gage station, including the reaches above Waiheʻe and Hāmama Falls. *ʻOʻopu alamoʻo* is a particularly adept climber—having been found above the 300-m vertically-dropping Hiʻilawe Falls in Lalakea Stream, a tributary to Waipio Stream on Hawaiʻi Island (Englund and Filbert, 1997).

Guppy (*Poecilia reticulata*) and swordtail (*Xiphophorus helleri*) inhabit the shallow side pools of the stream and are common in the slower-flowing waters of the *ʻauwai* through the Project area. Crayfish (*Procambarus clarkii*) and minute grass shrimp (*Neocaridina denticulata*) are also found in the silt bottom and grassed sides of the *ʻauwai*.

ʻOʻopu nākea, *ʻoʻopu naniha* (*Stenogobius hawaiiensis*), and *ʻoʻopu akupa* (*Eleotris sandwicensis*) were observed in the lower reach of Waiheʻe Stream and Kahaluʻu lagoon (*AECOS*, 2012) and these animals plus *ʻoʻopu nōpili* (*Sicyopterus stimpsoni*), *ʻōpae ʻoehaʻa* (*Macrobrachium grandimanus*), and *ʻopae kalaole* (*Atyoida bisulcata*) have been reported from the watershed (Parham et al., 2008).

Avian Survey

During five 8-minute avian point-count surveys, a total of 208 individual birds of 18 species representing 13 families was identified (Table 5). Nearly all of the avifauna observed is non-native species, with the exception of a solitary Pacific Golden-Plover or *kōlea* (*Pluvialis fulva*), an indigenous migratory species. A pair of Mallard-like ducks were observed in transit over the Project area and are likely to be Hawaiian Duck-Mallard hybrids. On Oʻahu, the endemic endangered Hawaiian Duck or *koloa* (*Anas wyvilliana*) population has interbred extensively with the non-native feral Mallard (*Anas platyrynchos*), such that hybrids of the two species are predominantly observed and are difficult to distinguish from pure *koloa* (Uyehara et al., 2007).

Table 5. Avian species detected during the March 27, 2019 survey.

ORDER FAMILY *Species*	Common Name	STATUS	RA
ANSERIFORMES			
ANATIDAE			
Anas wyvilliana x *platyrynchos*	Hawaiian Duck x Mallard hybrid	NN	0.4
GALLIFORMES			
PHASIANIDAE			
Gallus gallus	Domestic Chicken	**ND**	0.6
COLUMBIFORMES			
COLUMBIDAE			
Streptopelia chinensis	Spotted Dove	NN	4.8
Geopelia striata	Zebra Dove	NN	2.8
CHARADRIIFORMES			
CHARADRIIDAE			
*Pluvialis fulva**	Pacific Golden-Plover; *kōlea*	**IM**	0.2
PASSERIFORMES			
PYCNONOTIDAE			
Pycnonotus cafer	Red-vented Bulbul	NN	4.6
Pycnonotus jocosus	Red-whiskered Bulbul	NN	1.4

Table 5 (continued).

ORDER *FAMILY* *Species*	Common Name	STATUS	RA
ZOSTEROPIDAE			
Zosterops japonicus	Japanese White-eye	NN	5.4
TIMALIIDAE			
Garrulax canorus	Chinese Hwamei	NN	0.6
Leiothrix lutea	Red-billed Leiothrix	NN	2.6
MUSCICAPIDAE			
Copsychus malabaricus	White-rumped Shama	NN	3.2
STURNIDAE			
Acridotheres tristis	Common Myna	NN	2.4
CARDINALIDAE			
*Cardinalis cardinalis**	Northern Cardinal	NN	1.8
THRAUPIDAE			
Paroaria coronata	Red-crested Cardinal	NN	2.2
FRINGILLIDAE			
*Haemorhous mexicanus**	House Finch	NN	3.6
ESTRILDIDAE			
Estrilda astrild	Common Waxbill	NN	1.6
Lonchura oryzivora	Java Sparrow	NN	1.0
Lonchura atricapilla	Chestnut Munia	NN	2.4

Legend to Table 5.

Status – **I** = Indigenous
IM = Indigenous Migrant.
NN = Naturalized, non-native species (introduced).
ND = Naturalized, domestic
RA = Relative Abundance; the species count / number of stations (5).

O'ahu 'Elepaio (*Chasiempis ibidis*) was not observed during this survey. O'ahu 'Elepaio is an endemic species listed as endangered under federal and state endangered species statutes. Critical Habitat established for this native bird occurs just *mauka* of the Project area. HBS and Honolulu Board of Water Supply surveyed Waihe'e Valley in 2007 (Imada et al., 2007) and observed three O'ahu 'Elepaio and noted calls from two gulches in the valley, located above approximately 215 m (~700 ft) elevation.

Mammalian Survey

Domestic dog (*Canis lupis familiaris*) was observed with hikers on Waihe'e Road throughout the survey period. Feral pig (*Sus scrofa*) wallows and scat were observed near Waihe'e Stream in the survey area. No other mammalian species were detected during the survey.

Discussion

Water Quality

U.S. Geological Survey (USGS) gage station No. 16284200 at 52 m (170 ft) ASL measures real-time stream flow on Waihe'e Stream (USGS, 2019a). The average discharge measured between October 1, 1990 and March 19, 2019 was 0.2 cubic meter per second or cms (7.1 cfs) and the average gage height measured between October 1, 2007 and March 19, 2019 was 0.8 m (2.8 ft). The maximum discharge was 51.0 cms (1,800 cfs) and the maximum gage height was 2.9 m (9.4 ft).

Table 6. State of Hawai'i water quality criteria for streams for wet (Nov. 1-Apr. 30) and dry (May 1-Oct. 31) seasons from HAR §11-54-05.2(b) (HDOH, 2014).

Parameter	Total Nitrogen (µg N/l)	Nitrate + Nitrite (µg N/l)	Total Phosphorus (µg P/l)	Turbidity (NTU)	Total Suspended Solids (mg/l)
Geometric mean not to exceed given value (dry season) *(wet season)*	180.0 *250.0*	30.0 *70.0*	30.0 *50.0*	2.0 *5.0*	10.0 *20.0*
Not to exceed more than 10% of the time (dry season) *(wet season)*	380.0 *520.0*	90.0 *180.0*	60.0 *100.0*	5.5 *15.0*	30.0 *50.0*
Not to exceed more than 2% of the time (dry season) *(wet season)*	600.0 *800.0*	170.0 *300.0*	80.0 *150.0*	10.0 *25.0*	55.0 *80.0*

- pH – shall not deviate more than 0.5 units from ambient and not be lower than 5.5 nor higher than 8.0
- Dissolved oxygen – not less than 80% saturation
- Temperature – shall not vary more than 1 °C from ambient
- Conductivity – not more than 300 micromhos/cm

Waihe'e Stream is classified by the State of Hawai'i as a perennial stream. The stream appears on the Hawai'i Department of Health latest list of impaired waters in Hawai'i (HDOH, 2018), prepared under Clean Water Act §303(d). The listing indicates that water quality within the stream may not meet all state water quality standards for streams (Table 6, above). Specifically, Waihe'e

Stream is listed as impaired for *enterococcus*, total nitrogen, nitrate+nitrite, and turbidity during the dry season (May 1 - Oct. 31) and listed as impaired for *enterococcus*, total nitrogen, nitrate+nitrite and total phosphorus in the wet season (Nov. 1 - Apr. 30), with the latter three parameters based solely on "visual" assessments.

Not all of the water quality measurements made in our survey can be compared directly with the state water quality criteria to establish compliance with these standards because such a comparison requires representative geometric mean values, calculated from a minimum of three sampling events at each station in the stream. Our one time sampling event only reveals stream conditions at the time of our survey. Stream discharge estimates (7.0 cfs at Sta. Mid-Project), field measurements, and nutrient concentrations found at the Project site are similar to long term historical data from the USGS station near the Project site (Table 7) indicating our survey likely encountered typical conditions for the Waihe'e Stream and the *'auwai*. Consistent with the listing for impairedness, our survey found high levels of nitrate+nitrate in the stream and *'auwai*, but very low turbidity in the stream (and only slightly elevated in the *'auwai*).

Table 7. Water quality results from Waihe'e Stream alongside historical water quality data collected monthly from the USGS station in Waihe'e Stream near the Project site from 1999 to 2001 (USGS, 2019b).

	Temp (mg/l)	Cond (µs/cm)	pH (su)	DO (mg/l)	Nitrate + Nitrite (µg N/l)	Total N (µg N/l)	Total P (µg P/l)
Sta. Mid Project (3/27/19)	20.5	136	7.34	9.53	147	219	58
Sta. USGS (3/27/19)	20.0	134	6.88	9.28	149	183	34
USGS Station							
mean†	**20.5**	**139**	**7.66**	**8.73**	**105‡**	**214‡**	**60‡**
st dev	0.58	21.0	0.27	0.25	0.02	0.02	0.24
n=	*32*	*64*	*55*	*22*	*27*	*27*	*32*
min	19.5	74	6.9	8.10	50	75	32
max	22.0	160	7.9	9.30	150	5150	1230

† arithmetic mean values unless otherwise noted
‡ geometric mean values

Flow in Waihe'e Stream is dominated by ground water and therefore, has little variation between maximum and minimum daily temperature (Brasher et al., 2003), little seasonal variation (Figure 9), and cool temperatures relative to surface water driven stream systems. Water quality in the Project area is relatively good compared to most streams on O'ahu, despite the HDOH (2018) impairment listings for Waihe'e Stream.

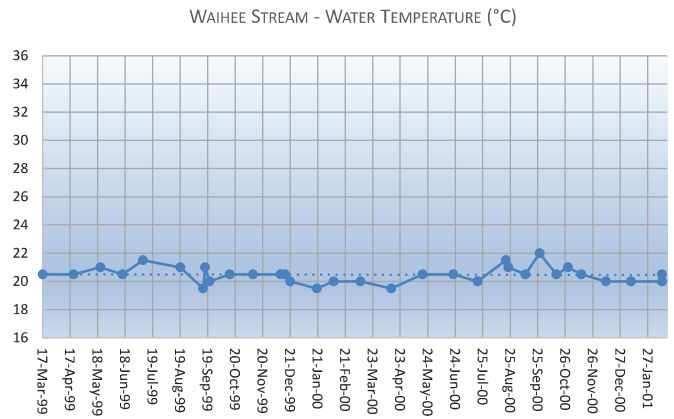

Figure 9. Water temperature readings in Waihe'e Stream from March 1999 to February 2001 (USGS, 2019b). Note - little seasonal variation exists.

Specific Project work to develop parking areas, replace existing gate and install a new gate, create a pavilion and plant nursery, and installation of signs can be completed without negative impacts to water quality if proper construction BMPs are implemented. The planned action to evaluate toilet options will presumably benefit water quality indirectly. The high volume of people currently using the Project area for hiking and swimming indicates human effects are certainly occurring to water quality due to the lack of restroom facilities.

Project work to construct a plant nursery, remove invasive species and plant native species will benefit water quality if riparian vegetation is maintained or improved. Clearing of existing and creation of new *lo'i* may have limited

adverse effects to water quality that will be temporary in nature. Certainly, the benefits of education and outreach provided by a facility such as proposed will lead to better understanding of water quality issues and aquatic environments by the public.

Aquatic Biota

We did not observe any aquatic species protected by state or federal endangered species statutes (HDLNR, 2015; USFWS, nd) in Waiheʻe Stream or the *ʻauwai* in the Project area; however, some animals previously reported from the Project area or vicinity are protected and some animals observed by us and reported from the stream are unique. The blackline Hawaiian damselfly (*Megalagrion nigrohamatum nigrolineatum*) and Oceanic Hawaiian damselfly (*M. oceanicum*) are listed as endangered on state and federal endangered species lists (HDLNR, 2015; USFWS, 2012). *Hīhīwai* (*Neritina granosa*) and the Oceanic Hawaiian damselfly are considered to be vulnerable to extinction and are on the International Union for Conservation of Nature (IUCN) Red List of Threatened Species (Corderio and Perez, 2012; Odonata Specialist Group, 1996). Hawaiʻi Department of Land and Natural Resources (HDLNR) administrative rules regulate fisheries in the state, including the taking of *ʻoʻopu* (HDLNR, 1989). *ʻOʻopu alamoʻo* (*Lentipes concolor*), previously considered for placement on the endangered species list and IUCN Red List, is sensitive to habitat degradation and rarely found on Oʻahu (Timbol et al., 1980; Fitzsimons et al., 1990; Higashi and Yamamota, 1993; G. Smith, USFWS, pers. comm., 2019; field notes of authors).

With the exception of the estuarine-dwelling snails, *hapawai* (*Neritina vespertina*) and *pipiwai* (*Theodoxus cariosus*), all possible native amphidromous animals that could be expected to be found in a stream in Hawaiʻi, were observed by us or have been reported to exist in Waiheʻe Stream. The amphidromous life cycle of native Hawaiian stream macrofauna entails eggs that are laid in the stream and larvae that hatch from the eggs moving downstream and out into the ocean where they develop for a time before migrating back into freshwater to grow to maturity (Ford and Kinzie, 1982; Kinzie, 1988). Project activities must not impede this life cycle, which will require maintenance of open migration pathways through a new and restored *ʻauwai*. New structures (e.g., new USGS gage) should not include drains or grates that may entrain drifting larvae or overhanging culverts that may obstruct upstream movement of recruiting juveniles. Maintaining good water quality in the stream and *ʻauwai* should be a priority, with specific attention paid to maintaining adequate temperature. Project plans should leave a sufficient number of trees overhanging the waterways, such that the channel and *ʻauwai* receive shade and water temperatures do not exceed 35°C. The upper-lethal

temperature limit for native aquatic species generally ranges from about 35 to 40°C (Hathaway, 1978).

Avian Resources

The avian assemblage surveyed in the Project area is consistent with the habitats available there, including disturbed lowland wet forest and streams. All birds counted during the survey are non-native species with the exception of a single Pacific Golden-Plover. The most abundant species were Japanese White-eye (*Zosterops japonicus*), Spotted Dove (*Streptopelia chinensis*), and Red-vented Bulbul (*Pycnonotus cafer*). Combined, these three species represent just over one third (36%) of the total birds observed during the survey. No federal- or state-listed endangered or threatened bird species were detected during the survey, but protected bird species may transit-through, overfly, or otherwise utilize the Project site on a part-time basis.

A small breeding population (less than 5 individuals) of Oʻahu ʻElepaio were recorded in Waiheʻe Valley in 2001 (VanderWerf et al., 2001), and three individuals and one call were noted from the valley in 2007 (Imada et al., 2007). From 2011 to 2012, only a single breeding pair was recorded in the valley (VanderWerf et al., 2013). The Koʻolau population of Oʻahu ʻElepaio is typically observed from an elevational range of 150 to 550 m (500 to 1,800 ft; Pyle and Pyle, 2017). Critical habitat for Oʻahu ʻElapaio, occurs just beyond the upper boundary of the Project (USFWS, nd. b, see Figure 10). Given the close proximity of the Project to critical habitat and lower elevational range of the species, USFWS endangered forest bird recommendations may apply for some Project activities (USFWS, nd. c).

- Actions such as road construction and development increase human access and result in increased invasive species threats. Avoid conducting activities within forest bird habitat that promote the spread or survival of invasive species.
- Avoid increasing mosquito populations by creating stagnant water habitat.
- Avoid removing tree cover during the peak breeding season, between January 1 and June 30.

Protected seabirds may utilize cliff habitat in upper Waiheʻe Valley, and have some potential to overfly the Project area. Protected seabird species include threatened Newell's Shearwater or *ʻaʻo* (*Puffinus newelli*), endangered Hawaiian Petrel or *ʻuaʻu* (*Pterodroma sandwichensis*), and endangered Band-rumped Storm-Petrel or *ʻakēʻakē (Oceanodroma castro)*. USFWS advises that Hawaiian seabirds may traverse projects during the breeding, nesting, and fledging

seasons (March 1 to December 15). Night lights can disorient seabirds, resulting in their potential downing and harm from collision with objects and/or predation by dogs and cats if downed (Reed et al., 1985; Telfer et al., 1987).

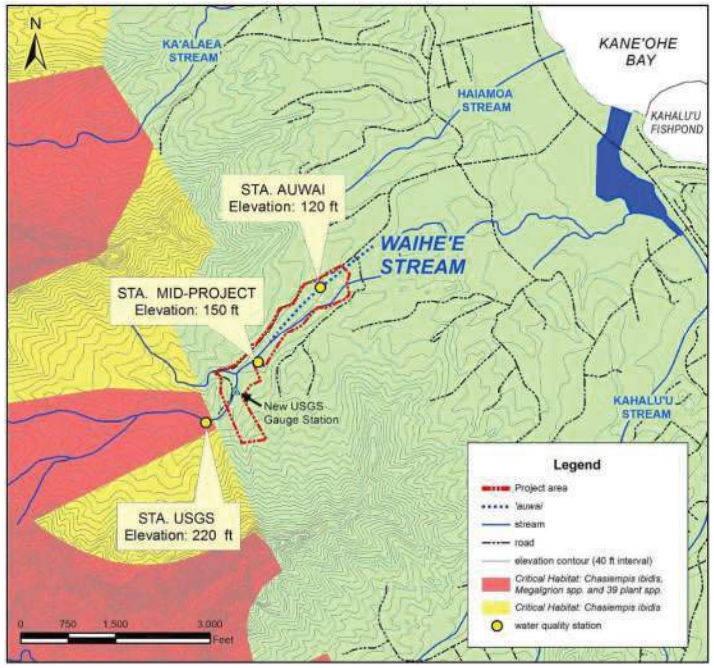

Figure 10. Federally-designated Critical Habitat near the Waihe'e Riparian Learning Center Project site.

- If the Project will result in additional night-time lighting sources, including lights from night-time construction, residential lighting, or street lights, then risk of incidentally downing nocturnally-flying seabirds will increase. To avoid and minimize potential Project impacts to seabirds, USFWS recommend the following applicable measures: Fully shield all outdoor lights so the bulb can only be seen from below bulb height and only use when necessary; install automatic motion sensor switches and timer controls on all outdoor lights or turn off lights when human activity is not occurring in the lighted area; and avoid night-time construction during the seabird fledging period from September 15 through December 15 (USFWS, nd (c)). All external lighting structures should be fully "dark sky compliant" (HDLNR-DOFAW, 2016).

White Tern (*Gygis alba*), or *manu o Kū*, is another indigenous seabird listed as threatened under the State of Hawai'i endangered species statute HRS 195D (HDLNR, 2015). White Tern occurs on O'ahu (USFWS, 2005), with the majority of the population found in the Honolulu area. White Tern was not observed (or expected to occur) in the Project area, and Project activities are not anticipated to have a deleterious impact to the species.

Mammalian Resources

Several hikers on Waihe'e Road were walking with domestic dog (*Canis lupis familiaris*). Residences surrounding the Project may support house cat (*Felis catus*) and domestic dog, which may utilize the Project area or vicinity. While not directly observed during the survey, sign (tracks, scat, wallows) of pig (*Sus scrofa*) was encountered during the survey. One or all of the four naturalized rodents (Family Muridae) in the Hawaiian Islands and Small Asian mongoose (*Herpestes javanicus*) are also likely to utilize the Project area to some extent. Mammals detected during the survey are not native to Hawai'i and offer little value from an ecological perspective.

The Hawaiian hoary bat is the only Endangered Species Act (ESA)-listed terrestrial mammal in Hawai'i. Potential Hawaiian hoary bat roosts (trees over 4.6 m [15 ft]) are abundant in the Project area. USFWS typically includes a standard BMP for areas with bat roosting habitat in permit conditions:

- To avoid potential deleterious impacts to roosting bats with pups, it is recommended that no woody vegetation taller than 4.6 m (15 ft) be removed during the bat pupping season between June 1 and September 15 (USFWS, 1998). The use of barbed wire to top fence lines may entangle flying bats and must be avoided (Zimpfer and Bonaccorso, 2010).

The Hawaiian Hoary Bat is known to forage for insects along waterways (USFWS, 1998), such as those found in the Project along Waihe'e Stream. Because Hawaiian Hoary Bat is noted habitat generalists that may forage several locations through a wide geographic home range (Bonaccorso, 2010),

and the proposed Project activities along Waihe'e Stream are not expected to reduce stream forage habitat, deleterious impacts to Hawaiian Hoary Bat are not anticipated so long as appropriate aforementioned BMPs are followed.

Critical Habitat

Federally delineated Critical Habitat is not present in the 27 ac included in Phases 1 and 2 of the Project (USFWS, 2019). Thus, the Project, as currently proposed, will not impinge on federally designated Critical Habitat. No equivalent habitat designation exists under state law.

However, Critical Habitat for native damselflies, O'ahu *'Elepaio*, and several endemic plant species begins just *mauka* from the Phase 1 and 2 work areas (Figure 8). The location of future planned stream diversion and work in the *'auwai* to convert the ginger patch to *lo'i* (as depicted in Project plans; see Figure 3) or any improvement near the upper field would be conducted within the Critical Habitat. Such work would likely not have adverse effects to Critical Habitat, and only improve the quality of habitat since "removing invasive plant species and planting natives" is part of the Project work. Species for which the adjacent Critical Habitat has been designated are listed in Table 8.

Table 8. Species for which land located upslope from (*mauka* of) the Project site has been federally-designated as Critical Habitat.

Species Group Common name	Scientific Name
Flowering plants	
hāhā	*Cyanea acuminate, Cyanea calycina, Cyanea crispa, Cyanea grimesiana* ssp. *obatae, Cyanea koolauensis, Cyanea lanceolate, Cyanea purpurellifolia, Cyanea st.-johnii, Cyanea truncata*
hāiwale	*Cyrtandra gracilis, Cyrtandra kaulantha, Cyrtandra polyantha, Cyrtandra sessilis, Cyrtandra subumbellata, Cyrtandra viridiflora, Cyrtandra waiolani*
'akoko	*Euphorbia rockii* var. *rockii*
nānū	*Gardenia mannii*
wāwae'iole	*Huperzia nutans*
aupaka	*Isodendrion longifolium*
kāmakahala	*Labordia cyrtandrae*

Table 8 (continued).

Species Group Common name	Scientific Name
--	*Lobelia gaudichaudii* ssp. *koolauensis*
--	*Lobelia oahuensis*
alani	*Melicope hiiakae, Melicope lydgatei*
kōlea	*Myrsine juddii*
--	*Phyllostegia hirsuta*
--	*Phyllostegia mollis*
--	*Phyllostegia parviflora* var. *parviflora*
--	*Platydesma cornuta* var. *cornuta*
'ohe'ohe	*Polyscias gymnocarpa*
kōpiko	*Psychotria hexandra* ssp. *oahuensis* var. *oahuensis*
kaulu	*Pteralyxia macrocarpa*
--	*Schiedea hookeri*
--	*Schiedea kaalae*
--	*Trematolobelia singularis*
ōpuhe	*Urera kaalae*
--	*Viola oahuensis*
a'e	*Zanthoxylum oahuense*
Insects	
Crimson Hawaiian damselfly; *pinao 'ula*	*Megalagrion leptodemas*
Blackline Hawaiian damselfly; *pinapinao ānuenue*	*Megalagrion nigrohamatum nigrolineatum*
Oceanic Hawaiian damselfly; *pinao 'ula*	*Megalagrion oceanicum*
Birds	
Oahu 'elepaio	*Chasiempis ibidis*

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Appendix I

Botanical Survey for the Waihe‘e Riparian Learning Center

FINAL DRAFT

Botanical Survey for the Waiheʻe Riparian Learning Center TMK: 4-7-006:010 (por.) Koʻolaupoko, Oʻahu

June 2019

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Contents

Executive Summary

This report was prepared for the Honolulu Board of Water Supply's (BWS) proposed Waiheʻe Loʻi Restoration and Riparian Learning Center project. A field survey was requested in order to identify any significant species and document the botanical composition of the area within the specified boundaries. This survey took place over two separate days in March and April 2019.

A total of 84 plant taxa were identified, approximately 23% of which may be considered native to the Hawaiian Islands. The highly disturbed nature of the vegetation may be attributed to the historical land use patterns in the area such as intensive agriculture and ungulate grazing. Large, flat sections were noted during surveys of the makai end of the specified project area and were presumed to have been historic loʻi.

The forest community within the survey area consists of variations of Alien Wet forest. Different canopy and understory species emerge as dominant with changes in topography (i.e. riparian zones vs. slopes and low ridges). Hau (*Hibiscus tiliacuea*) was particularly dominant throughout the project site, and often formed an impenetrable barrier to survey efforts. Other dominant alien vegetation included shoebutton ardisia (*Ardisia elliptica*), juniperberry (*Cytharexylum caudatum*), fiddlewood (*Citharexylum spinosum*), Java plum (*Syzygium cuminii*), octopus tree (*Schefflera actinophylla*) simpoh ayer (*Dillenia suffruticosa*) and strawberry guava (*Psidium cattleianum*). Hala (*Pandanus tectorius*) was the primary native (Polynesian introduction) species observed throughout the forested area.

No plants which are proposed or listed as threatened or endangered species under state or federal regulations were observed during these surveys.

Successful restoration of the historic loʻi and the forest community will require significant effort to remove invasive overgrowth and deplete the seedbank that is likely to exist in the soil, along with the reintroduction of agricultural and indigenous forest species, respectively. Consistent monitoring and management strategies will be necessary to keep invasive vegetation from encroaching on restored areas.

Introduction

Setting and Soil Types

Waiheʻe Valley is located on the windward side of Oʻahu in the district of Koʻolaupoko. The project area lies at the end of a residential area on Waiheʻe Road near the base of the Koʻolau Mountains. The elevation of the project area reflects the geographic features of the terrain it contains, including streambeds, trenches and flat areas at the makai (northernmost) end, and a low elevation ridgeline at the mauka (southeasternmost) portion of the boundary.

Soil types in the area were determined using the Natural Resources Conservation Service web soil survey platform. Profiles created for the character and properties of each soil type were used to describe those soils that were mapped within the project boundary.

The soils within the designated project area primarily consist of Hanalei silty clay (HnB). HnB soils are described as somewhat poorly drained to poorly drained soils on gentle slopes (2-6%) and prone to

flooding. This soil type originates from alluvial deposits and occurs largely along the banks of Waiheʻe Stream. It is known to be suitable for growing taro, sugarcane and pastureland.

The higher elevations of the project area are composed of Waikane silty clays (WpF). These well-drained soils result from alluvial deposits and occur on steep slopes (40-70%). Soils of this type are highly susceptible to runoff and erosion. Due to these properties, areas of WpF soils are most suitable for pasture or rangeland, or as woodland and wildlife habitat.

Small deposits of a less steeply-sloped (25-40%) Waikane silty clay (WpE) occur to the north of Waiheʻe Stream. WpE soils share many of the same characteristics as WpF, except for slope steepness, though they are still capable of severe runoff and erosion. Soils of this type are also recommended for use as pasture, rangeland, woodland and wildlife habitat.

Lolekaa silty clays on 3-8% slopes (LoB) is also found in a section of the northern project area. These well-drained soils originate from alluvial deposits of igneous rock and occur along old drainages at the base of the Koʻolau Mountains. LoB soils are considered prime farmland.

A small portion of the project area adjacent to the residences on Waiheʻe Road consists of Typic Endoaquepts mucky silt loam (TR). This soil type is derived from alluvial deposits of basalt and is typical of flood and coastal plains, valley floors depressions and alluvial fans. TR soils are poorly drained and are not suitable for agriculture.

Prehistorical and Historical Land Use Patterns

At least a small portion of the project area was likely to consist of terraced loʻi and traditional agricultural practices. Historical accounts of the area, pre-Western contact, describe the stretch of coast from Waiʻāhole to Heʻeia as a contiguous expanse of cultivated wetland taro loʻi that reached back toward the valleys for 1.5 miles.

In the years following the Great Māhele (1848) a succession of plantation crops occupied the fallow loʻi and dozens of acres in the uplands in Kahaluʻu and Waiheʻe when these areas fell into neglect after the dispossession of Hawaiian farmers. These crops included sugarcane (1860s-1880s), rice (1880-1920s), and pineapple (1910-1925).

The forested upper reaches of the valley that were not under cultivation prior to Western contact likely remained intact and used for traditional Hawaiian gathering. The native vegetation likely became heavily disturbed with the introduction of cattle and goats which were permitted to roam and grazed unchecked throughout the Kahluʻu region during the 1880s. These ungulates reportedly destroyed the crops being tended by the residents of that time and would have contributed to the drastic alteration of forest composition, particularly in the areas left uncultivated. The continued decline of native flora (excepting hala) and the spread of invasive species may today be attributed to the presence of wild pigs. Pig sign was noted in several places during this survey.

This survey also uncovered the presence of a potential landfill area. A small ravine near the access road was discovered to contain decomposed trash such as tires and glass bottles dating to the 1970s suggesting that the area was used for the disposal of unwanted items in relatively recent history.

The parcel containing the project area is currently owned by the City and County Department of Parks and Recreation. BWS currently uses the access road off Waiheʻe Road for the management of its land in the mauka sections of the valley and the Waiheʻe Tunnel.

Current Land Use Patterns

The survey area, and much of the area owned by BWS in the upper mauka portion of Waiheʻe Valley, is heavily forested. A BWS access road leads from Waiheʻe Road to the tunnel. The area has become a popular hiking trail for visitors and residents alike to reach the Hāmama and Waiheʻe waterfalls at the back of the valley. The surveyors encountered dozens of hikers over the course of the road survey on March 28, 2019.

In addition to recreational hiking, BWS frequently brings groups into the area for educational tours of the Waiheʻe Tunnel (a tour was also observed taking place during the March 28 survey). BWS has also partnered with a local conservation organization called the Koʻolau Mountains Watershed Partnership (KMWP) to adopt a site on the hillside next to the tunnel entrance for a forest restoration project. This project commenced in May 2018 and much of the dominant alien vegetation has since been thinned from the site and replace with natives. With permission from BWS, KMWP staff hold regular volunteer workdays to weed and install native plants.

Critical Habitat

There is no federally designated Critical Habitat for any species within the project area, therefore the proposed modifications to the site will not impact Critical Habitat.

Methods

A brief survey of the western edge of the project area (primarily along Waiheʻe Road) was conducted on March 28, 2019 by Rick Barboza, Kelvin McKeague (Hui Kū Maoli Ola, LLC) and Janice Jensen (G70). A Garmin 60CSx hand-held GPS was used to track the path taken by the surveyors and to mark sites of note for individual plants or plant communities (Figure 1). The second, final survey of the densely vegetated interior, as well as the eastern boundaries of the project area was completed by Rick Barboza and Janice Jensen on April 10, 2019.

Plants were identified and logged as they were encountered. GPS points and corresponding notes and pictures were taken as needed to document the general character of the vegetation. Any plants that could not be identified in the field were also documented with a GPS point and photographed for later identification.

Botanical Survey for the Waiheʻe Riparian Learning Center TMK: 4-7-006:010 (por.)

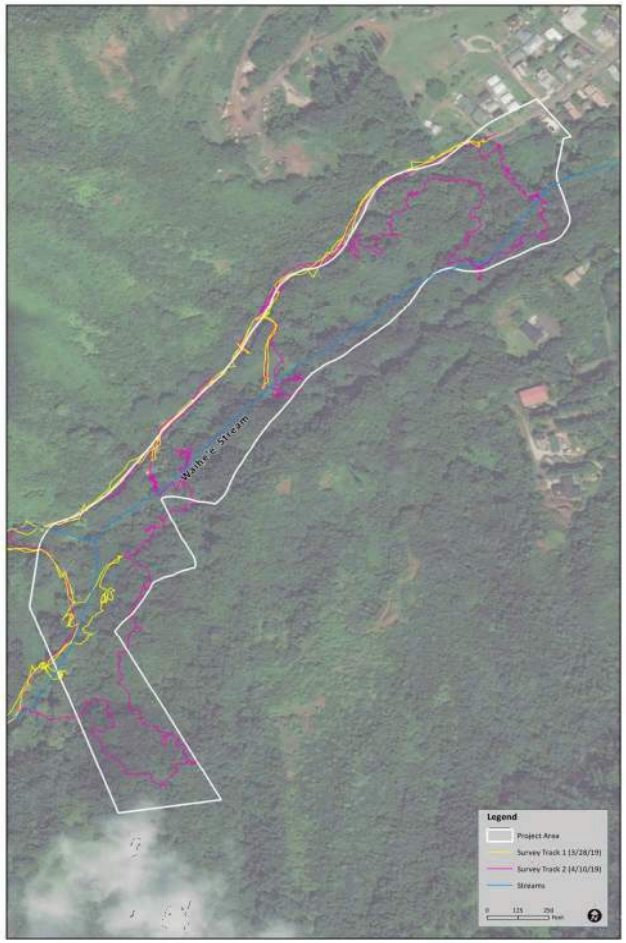

Figure 1 Department of Parks and Recreation land in upper Waiheʻe Valley with the project site outline in white. GPS tracks taken by the authors during the two botanical surveys are shown in yellow and magenta.

Results

Vegetation Zones and Plant Communities

The vegetation within and immediately surrounding the project area can generally be characterized as Alien Wet forest. Dominant canopy and understory species varied throughout the survey area (see Figure 2).

This survey identified 84 plant taxa, of which approximately 19 (23%) may be considered native (either indigenous to Hawai'i or of Polynesian introduction). A 2007 botanical survey of the Waihe'e and Kahalu'u valley regions (Hawaii Biological Survey) inventoried a total of 243 plant taxa, 31% of which were considered native to Hawai'i.

A complete inventory of plant species observed during both surveys is provided in Appendix I. This table is organized in alphabetical order by family name and lists each species by its scientific name, followed by the common and/or Hawaiian name. Species status in the islands and an estimation of abundance are also noted.

No plants which are proposed or listed as threatened or endangered species under state or federal regulations were observed during these surveys and none have been previously documented in the proposed project area.

Botanical Survey for the Waihe'e Riparian Learning Center TMK: 4-7-006:010 (por.)

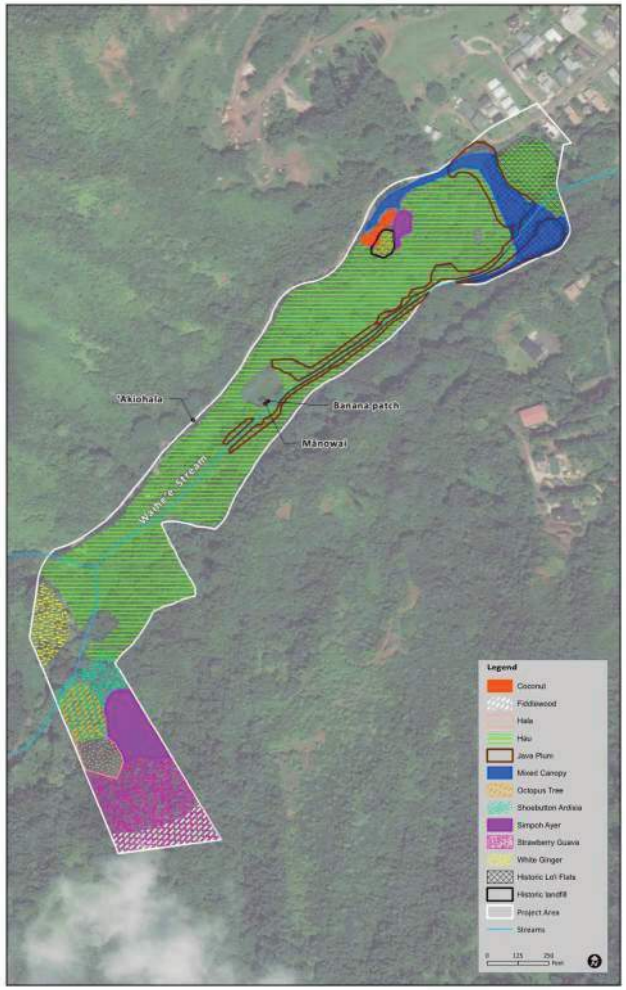

Figure 2 Dominant vegetation and sites of significance located within the project site boundaries during the botanical surveys. Area of coverage is approximated based on observations and collected GPS data.

The designated project site interior features flat areas and trenches presumed to be historical loʻi terraces (Figure A1) and ʻauwai found in the makai portion support a mixed canopy of invasive tree species such as shoebutton ardisia (*Ardisia elliptica*), juniperberry (*Cytharexylum caudatum*), fiddlewood (*Citharexylum spinosum*). These communities are occasionally punctuated by a few large established trees such as the African tulip (*Spathodea campanulata*), trumpet tree (*Cecropia obtusifolia*), kukui (*Aleurite moluccana*), hala (*Pandanus tectorius*) and a small grove of coconut trees (*Cocos nucifera*) located near the BWS access road. A large fallen octopus tree (*Schefflera actinophylla*) located along the streambank appeared to be alive and sprouting new roots and small offshoots (Figure A2). Java plum (*Syzygium cuminii*) was a noticeably significant part of the canopy along the lower portion of the stream, as well as the mixed canopy area.

Understory species varied according to canopy type. In areas identified as mixed or open canopy the understory consisted of grass and ferns. Basket grass (*Oplismenus hirtellus*) was commonly observed, sometimes intermixed with sword ferns (*Nephrolepis multiflora*) and white ginger (*Hedychium coronarium*) (Figure A3). In the overgrown loʻi flats elephant ear (*Xanthosoma rosea*) and patches of heliconia (Figure A4) were encountered fairly often. Dense stands of Indian head ginger (*Costus woodsonii*) growing at heights greater than 8 ft. appeared at intervals along the survey track. Honohono grass (*Commelina diffusa*) also appeared in patches throughout the survey area.

Extensive thickets of impenetrable hau (*Hibiscus tiliaceua*) shrubland encompass a significant portion of the project area between the BWS access road and Waihe'e Stream. It was often necessary to circumvent these thickets by wading into the stream. The twisting branches of the hau form a dense canopy (Figure A5) shading out most of the understory species that would grow there, though the occasional vine was detected.

Much of the observable canopy along the road and in the interior of lower elevation areas of the project site also host colonies of climbing vines (Figure A6). Commonly observed species include maunaloa (*Canavalia cathartica*), pothos (*Epipremnum pinnatum*), maile pilau (*Paederia foetida*), and bitter yam (*Dioscorea bulbifera*).

The trail to the mānowai passed through a dense area of Java plum, followed by an open field of honohono grass, California grass and vegetable ferns (*Diplazium esculentum*), commonly referred to as hōʻiʻo (Figure A7). A group of banana trees (*Musa x paradisiaca*) and cultivated taro (*Colocasia esculenta*) are established along an ʻauwai connecting to the stream below the mānowai (Figure 2 and Figure A8). These traditional agricultural features appear to be in use and are well-maintained.

Moving in the mauka direction, the project area gains in elevation culminating in a low ridgeline. Sudden and distinct shifts are observable in the dominant species composition for both forest canopy and understory with the change in terrain. These patches of nearly monotypic forest alternate between shoebutton ardisia, simpoh ayer (*Dillenia suffruticosa*), strawberry guava (*Psidium cattleianum*) and fiddlewood (*Citharexylum spinosum*) (Figure A9). A handful of enormous Chinese banyan trees (*Ficus macrocarpa*) were scattered throughout this portion of the landscape (Figure A10), including at the base of a gulch on the northwestern ridge face that contained many large hala trees (Figure A11).

The plant communities observed along the BWS access road on the western boundary were home to a diverse mixture of alien grasses, shrubs and trees (Figure A12). Species most commonly observed include the typical invasive grasses such as guinea grass (*Megathyrsus maximus*) and California grass

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(*Brachiaria mutica*), as well as tree species such as albizia (*Falcataria moluccana*), gunpowder tree (*Trema orientalis*), simpoh ayer, juniperberry, and fiddlewood. Native ferns uluhe (*Dicranopteris linearis*) and palaʻa (*Sphenomeris chinensis*) were occasionally sited along the roadway. A small grove of coffee (*Coffea arabica*) and mountain apple (*Syzygium malaccense*) (Figure A13) grow between the road and a large field of white ginger (*Hedychium coronarium*) where a new loʻi has been proposed for construction (Figure A14).

Endemic and indigenous species such as olonā (*Touchardia latifolia*) (encountered during the 2007 survey), *Carex wahuensis* (a native sedge whose Hawaiian name has been lost), and ʻōhiʻa lehua (*Metrosideros polymorpha*) were expected to be among the native species present, however none were observed. Only four indigenous fern species were identified during these surveys: ʻekaha (*Asplenium nidus*), moa or whisk fern (*Psilotum nudum*), uluhe, and palaʻa. ʻEkaha, moa, and whisk fern were found in the deeper forested areas, while uluhe and palaʻa, as previously mentioned, were mainly noted along the road. Occasionally, small patches of uluhe were observed during the survey of the ridgeline. One indigenous hibiscus, the ʻakiohala (*Hibiscus furcellatus*), was observed to be in bloom along the road (Figure 2).

Weedy Plants of Concern

Of the approximately 65 non-native taxa that were observed and recorded during these surveys, 15 species appear on the list below as "plants of concern". Three of these species—shoebutton ardisia, Koster's curse and tropical kudzu— are found on the List of Plant Species Designated as Noxious Weeds for Eradication or Control Purposes by the Hawaii Department of Agriculture (HAR, Title 4 Chap 68; last updated June 18, 1992). This list was developed to better regulate those species identified under the five designated criteria for traits such as reproduction, growth, detrimental effects, control, and distribution and spread.

Taxa that do not appear on the state's noxious weed list may still be considered invasive as their characteristics make them a threat to the watershed. The invasive qualities of each plant as well as their presence in the project site are discussed briefly, below.

African tulip tree (*Spathodea campanulata*)- This tree can reach heights up to 25 meters and is recognized by the large, orange horn-like flowers it produces. Its seeds are winged and wind-dispersed, but it can also be propagated from cuttings. The African tulip tree can spread rapidly in its favored climate of moist, wet areas. Its canopy of large leaves shades out other trees, reducing the species richness of the area. Its large limbs have a tendency to drop when the tree becomes old. The African tulip tree was relatively uncommon in the project site, though the few individuals that were observed were noted to be large and well-established. These trees were located primarily among the mixed forest canopy identified at the makai end of the site.

Albizia (*Falcataria moluccana*)- This deciduous tree is extremely fast-growing and can achieve heights of up to 40 meters. Previously used as both an ornamental and a forestry planting it is capable of growing on nutrient-poor soils in mesic to wet habitats and can form dense stands across a large area. Its wide-spreading branches create a canopy that can shade out native plants and present a danger during high winds as they easily break and drop. Albizia were observed regularly along the western border of the

BWS access road during the surveys, though none were observed in the dense interior of the project site.

Bingabing (*Macaranga mappa*)- This evergreen tree grows in mesic to wet forest environments and prefers disturbed areas. It can reach up to 10 meters in height and crowd out other forest trees. Its large leaves (2-3 ft. long) can shade out vegetation growing in its understory. This species was identified along the access road in only one area at the project site.

Cat's claw (*Caesalpinia decapetala*)- This shrub can grow between 2-4 meters tall and produces climbing vines that can grow to heights of over 10 meters. These thorny, sprawling vines form dense thickets that act as impenetrable barriers to animal passage. Cat's claw is generally found in mesic lowland habitats and its primary method of dispersal is likely by man. Only one individual plant was observed during these surveys. This plant is located along the western border of the access road, close to the gated entrance.

Hau (*Hibiscus tiliaceua*)- Though it exhibits many of the characteristics common to weedy plants, there is some controversy over whether hau should be considered invasive in the islands. Considered native and likely of Polynesian introduction, this evergreen shrub can spread rapidly over large areas of disturbed land. Its large crooked branches spread out to form extremely dense, impenetrable thickets. The shade created by this canopy impedes the growth of plants underneath. Surveys revealed hau to be a significant feature of the landscape, encompassing the greater part of the project area in the mid-low elevation sections.

Gunpowder Tree (*Trema orientalis*)- This evergreen tree can grow on poor soils and prefers disturbed mesic forest habitats. It can reach heights up to 36 meters and has been used for forest rehabilitation due to its extremely fast growth. It can also spread via birds which feed on its seeds. Gunpowder tree was found occasionally throughout the site, though mainly along the access road border.

Java plum (*Syzygium cuminii*)- This evergreen tree spreads rapidly and can achieve heights of 13 to 30 meters with a dense canopy. This canopy effectively shades out other young trees while the Java plum's shade-tolerant young grow to form monotypic stands. Its roots also create significant competition for surrounding plants. Surveys of the project area showed the greatest density of this species occurred along the trail leading to the mānowai on Waihe'e Stream.

Juniperberry/Fiddlewood (*Citharexylum spp.*)- Juniperberry (*C. caudatum*) and fiddlewood (*C. spinosum*) share many of the same characteristics. Both are evergreen shrubs/trees that may grow from 15 to 20 meters in height. They are prolific seeders, bearing fruit that is consumed and spread by birds. *C. caudatum* may also spread vegetatively. *C. spinosum* was extensively planted as an ornamental. These species can form thickets with dense canopies and their seedlings are capable of sprouting in low light conditions. Both species were noted in abundance during the survey where they made up a significant part of the mixed forest canopy in the makai portion of the project area. *C. spinosum* was also present in large stands on the low ridgeline, intermixed with stands of strawberry guava.

Koster's curse (*Clidemia hirta*)- This shrub is extremely fast-growing and may reach heights up to 3 meters. It is a pioneer shrub, growing aggressively in steep and disturbed areas in mesic and wet forests, sometimes forming impenetrable thickets. It is tolerant of both full sunlight and deep shade and its large leaves can shade out native vegetation. Koster's curse produces flowers and dark-colored berries

Botanical Survey for the Waihe'e Riparian Learning Center TMK: 4-7-006:010 (por.)

throughout the year; these fruits are consumed by birds which are the main method of dispersal. This plant was sited regularly over the course of the surveys, primarily in previously disturbed areas adjacent to the BWS access road.

Octopus tree (*Schefflera actinophylla*)- This tree grows rapidly and can reach 6-9 meters in height. It is shade-tolerant, thriving in moist environments, and forming dense thickets. Its seeds are bird-dispersed and can germinate in the nooks of larger, established trees where it may grow as an epiphyte. These traits enable it to easily invade undisturbed forests.

Shoebutton Ardisia (*Ardisia elliptica*)- This evergreen shrub/tree is an escaped ornamental that can reach 6 meters in height. Generally found in lowland wet forests, it is shade-tolerant and capable of forming dense monotypic stands. The fruits are appealing to birds, which consume them and contribute to their spread. This species was abundant in the project area and a particularly dense monotypic stand populated an area leading up the small ridgeline at the mauka end of the site.

Simpoh ayer (*Dillenia suffruticosa*)- According to the 2007 botanical survey, this tree was only noted in the Waihe'e valley. By contrast, it appeared to be absent in Kahulu'u. Indeed, this tree was abundant in Waihe'e, particularly along the BWS access road where it was observed in a mixed canopy, as well as the interior of the project site itself where two separate patches were present in monotypic stands.

Tropical kudzu (*Pueraria phaseoloides*)- This herbaceous vine prefers to colonize disturbed areas in moist environments. It is spread by seed and is also able to reproduce vegetatively if a vine touches the ground. It is extremely fast-growing and can colonize entire forests in a short amount of time. The vines form tangled mats that can fully cover other plants potentially smothering, strangling, breaking off limbs and even uprooting them. This plant was identified from one location during the surveys.

Trumpet tree (*Cecropia obtusifolia*)- This fast-growing tree reaches heights between 5-10 meters. Its seeds are bird-dispersed and, though it is short-lived, it can quickly invade gaps in the native forest to form dense stands and obstruct the growth of native plants. This species was observed occasionally around the project site, primarily as established trees within the mixed canopy of the makai section and along portions of the access road border.

Recommendations

Lo'i Restoration

Restoring a fallow lo'i is often the easiest option since they have already been prepared to meet the conditions for wet taro cultivation. Wet taro requires well-drained soil at a minimum depth of 10 inches, full sun exposure, open air circulation and proximity to a consistant source of fresh water. Water must also be able to drain from the lo'i when not in cultivation.

Several flat areas near the makai end of the project area were noted during the botanical survey. These areas may have previously been utilized for cultivating wet taro and other crops and became overgrown once they went out of production. The areas being proposed for future lo'i in this part of the site may also be former lo'i that have become unrecognizable with extensive overgrowth.

Successful restoration of these lo'i will require the removal of all vegetation from the areas intended for cultivation and the simultaneous reconstruction of surrounding walls so that these areas may be flooded to suppress weed growth. Flooding the newly-opened lo'i will prevent the germination of the dense seedbank that lies dormant in the soil and help rot any remaining roots for easy removal. Without flooding, digging out stumps and dense root systems would be an arduous process and would likely require earth-moving equipment that would create the potential for a large amount of runoff.

Several months of flooding may be necessary to ensure the seedbank is exhausted and enable the removal of large, rotted root systems. Once the flooding is concluded, the water should be cut off and the lo'i left to fallow for a time before being put back into production. Riparian zones that will not be restored to cultivated lo'i should be replanted with a dense vegetation buffer to help minimize runoff.

Another site proposed for the creation of a future lo'i is currently dominated by a large patch of white ginger. It is unknown whether this portion of the site was ever engaged in agricultural production. The area exhibits marsh-like qualities, however any connections between this area and a water source that may have existed were not visible during the botanical survey. Along with vegetation removal, a reliable connection to a continuous water source will need to be established to bring this area into wet taro production.

Forest Restoration and Management

Introduced and invasive species currently dominate the vegetation of the project site. A successful forest restoration effort will require a plan to strategically remove invasive plants from key areas and replace them with native species either previously known to Kahalu'u-Waihe'e or those best suited to the soil and climate conditions. Long-term management strategies and weed control will also be necessary to prevent the encroachment of non-native species on restored areas.

Past recommendations from the 2007 Hawaii Biological Survey report included the eradication of species known to be of "high weed threat," particularly those that were not yet common in the area. Species cited under the 2007 recommendation that were also observed during our surveys include fern tree, small shell ginger, albizia and tropical kudzu. Observations of their relative abundance suggest that these eradication efforts may still be worth undertaking as these species are not yet common. Albizia especially should be targeted as they are extremely fast-growing. Many young albizia trees observed along the access road were still at a manageable size for removal. Bingabing and cat's claw, both listed

above as "plants of concern," may also be candidates for eradication in this area due to their low abundance.

Endemic and indigenous plant species previously observed in and/or known to inhabit Waihe'e and adjacent valleys should be reintroduced to the area as part of any restoration effort. The following list of native plant species are suggested for forest restoration efforts in Waihe'e:

Species	Scientific Name
Trees	
hala*	*Pandanus tectorius*
koa*	*Acacia koa*
'ōhi'a lehua*	*Metrosideros polymorpha*
hame*	*Antidesma platyphyllum*
lama	*Diospyros sandwicensis*
maua	*Xylosma hawaiiense*
loulu	*Pritchardia martii*
papalakepau	*Pisonia umbellifera*
neneleau	*Rhus sandwicensis*
Shrubs & Vines	
olonā	*Touchardia latifolia*
'akoko	*Chamaesyce celastroides*
mamaki	*Pipterus albidius*
naupaka kuahiwi	*Scaevola gaudichaudiana*
hō'awa	*Pittosporum glabrum*
'ilima	*Sida fallax*
koki'o ke'oke'o	*Hibicus arnottianus*
'awikiwiki	*Canavalia galeata*
maile	*Alyxia stellata*
Groundcovers	
palapalai*	*Microlepia strigose*
hō'i'o*	*Diplazium sandwichianum* or *Diplazium arnottii*
carex sedge*	*Carex wahuensis*
'uki'uki	*Dianella sandwicense*
neke	*Cyclosorus interruptus*

**Primary forest restoration species for the Waihe'e area*

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Botanical Survey for the Waiheʻe Riparian Learning Center TMK: 4-7-006:010 (por.)

Appendix I: Photos

Figure A1 Flat areas overgrown with vegetation were presumed to be historical loʻi.

Figure A2 A large octopus tree (*Schefflera actinophylla*) continues to grow after falling, its roots holding onto stones that formed a low rock wall.

Figure A3 Basket grass (*Oplismenus hirtellus*) was abundant throughout the project area, particularly in the lower elevations where it tended to intermix with sword ferns (*Nephrolepis multiflora*) and white ginger (*Hedychium coronarium*).

Figure A4 Elephant ear (*Xanthosoma rosea*) and patches of heliconia (*Heliconia indica*) were common in the overgrown lo'i flats.

Figure A5 Thickets of dense, impenetrable hau (*Hibiscus tiliaceua*) dominated the forest canopy in the lower elevations of the project area.

Figure A6 Maunaloa (*Canavalia cathartica*) and bitter yam (*Dioscorea bulbifera*) were common among the many species of climbing vines encountered during the surveys.

Figure A7 Honohono grass (*Commelina diffusa*), California grass and ho'i'o/vegetable ferns (*Diplazium esculentum*) grow adjacent to the trail leading to the mānowai on Waihe'e Stream.

Figure A8 Banana trees (*Musa x paradisiaca*) grow along the connecting 'auwai along with cultivated taro (*Colocasia esculenta*).

Figure A9 Looking downslope at a section of monotypic strawberry guava (*Psidium cattleianum*) forest.

Figure A10 A handful of enormous Chinese banyan trees (*Ficus macrocarpa*) were scattered in the landscape.

Figure A11 A gulch off the northwest ridge contained many large hala (*Pandanus tectorius*) trees.

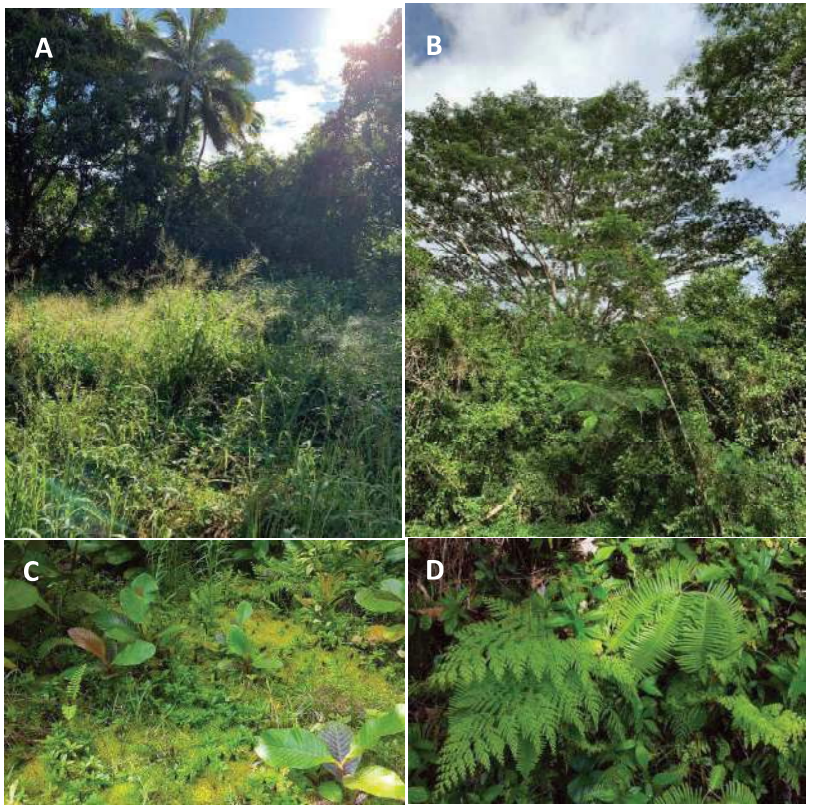

Figure A12 Examples of the mixed plant communities observed along the BWS access road. **A)** A mix of tall California grass (*Brachiaria mutica*) and guinea grass (*Megathyrsus maximus*). **B)** Albizia (*Falcataria moluccana*) towers over the lower canopy formed by juniperberry and fiddlewood (*Citharexylum* spp.) covered in vines. **C)** Simpoh ayer (*Dillenia suffruticosa*) springs up from a mossy bank. **D)** Native uluhe (*Dicranopteris linearis*) and pala'a (*Sphenomeris chinensis*) ferns were occasionally sited among herbaceous weeds such as Koster's curse (*Clidemia hirta*) and wedelia (*Sphaneticola trilobata*).

Figure A13 A small grove of coffee (*Coffea arabica*) and mountain apple (*Syzygium malaccense*) trees grow between the road and a field of white ginger where a new lo'i has been proposed for construction.

Figure A14 Field of white ginger (*Hedychium coronarium*).

Appendix II: Plant Checklist

The following checklist list was prepared after the conclusion of two surveys conducted in the proposed project area in Waihe'e Valley, Ko'olaupoko, O'ahu on March 28, 2019 and April 10, 2019. During these surveys as total of 84 taxa were identified including 10 indigenous (including Ind? species), 9 Polynesian-introduced (including Pol? species) and 65 naturalized.

The list is divided into three groups: pteridophytes, dicots, and monocots. Each group is organized alphabetically by family, then by scientific name (e.g. genus, species). The common and Hawaiian names are also included. A key with explanations of the abbreviations used in the checklist is provided below.

PLANT CHECKLIST KEY

Biogeographic Status

Nat	Naturalized: Introduced to Hawai'i by humans, either directly or indirectly, since Western contact. Includes ornamentals and plants that may have formerly been cultivated.
Pol	Polynesian introduction: Introduced to Hawai'i by the original Polynesian settlers.
Pol?	Possible Polynesian introduction: May have been introduced to Hawai'i by the original Polynesian settlers; or may have been introduced post-Western contact.
Ind	Indigenous species: Occurs naturally both within and outside of the Hawaiian Islands.
Ind?	Possible indigenous species: May occur naturally in Hawai'i; or may have been introduced post-Western contact.

Abundance

R	Rare: 1-3 individuals observed.
U	Uncommon: Several to a dozen individuals observed.
O	Occasional: Found regularly at the site.
C	Common: Observed numerous times; makes up a large portion of the vegetation.
A	Abundant: Large numbers of plants observed; likely a locally-dominant species.

Scientific Name	Common/Hawaiian Names	Status	Abundance
PTERIDOPHYTES - FERNS & FERN ALLIES			
AMARYLLIDACEAE			
Crinum pedunculatum	spider lily	Nat	R
ASPLENIACEAE			
Asplenium nidus	*'ekaha*	Ind	R
ATHYRIACEAE			
Diplazium esculentum	vegetable fern; *ho'i'o/pohole*	Nat	O
BLECHNACEAE			
Blechnum occidentale	hammock fern	Nat	O
CYATHEACEAE			
Sphaeropteris cooperi	Australian tree fern	Nat	R
DAVALLIACEAE			
Davallia tyermannii	rabbit's foot fern	Nat	R
GLEICHENIACEAE			
Dicranopteris linearis	*uluhe*	Ind	O
LINDSAEACEAE			
Sphenomeris chinensis	*pala'a*	Ind	O
MARATTIACEAE			
Angiopteris evecta	mule's foot fern	Nat	R
NEPHROLEPIDACEAE			
Nephrolepis multiflora	sword fern	Nat	U
PSILOTACEAE			
Psilotum nudum	*moa*, whisk fern	Ind	O
PTERIDACEAE			
Christella parasitica	maiden fern	Nat	C
Pteris cretica	*'ōali*, cretan brake	Ind	O
FLOWERING PLANTS - DICOTS			
ACANTHACEAE			
Hemigraphis reptans	red flame	Nat	U
ANACARDIACEAE			
Mangifera indica	mango	Nat	R
ARALIACEAE			
Schefflera actinophylla	octopus tree	Nat	C
ASTERACEAE			
Bidens pilosa	hairy beggartick	Nat	O
Sphaneticola trilobata	wedelia	Nat	O
BEGONIACEAE			
Begonia vitifolia	begonia	Nat	R
BIGONACEAE			
Spathodea campanulata	African tulip tree	Nat	U

Scientific Name	Common/Hawaiian Names	Status	Abundance
CECROPIACEAE			
Cecropia obtusifolia	trumpet tree	Nat	O
CONVOLVULACEAE			
Ipomea alba	moonflower	Nat	R
Ipomea indica	*Koali'awa*	Ind	R
Ipomea ochracea	fence morning glory	Nat	R
DILLENIACEAE			
Dillenia suffruticosa	simpoh ayer	Nat	A
EUPHORBIACEAE			
Aleurites moluccana	*kukui*	Nat	O
Macaranga mappa	bingabing	Nat	R
Macaranga tanarius	parasol leaf tree	Nat	R
FABACEAE			
Caesalpinia decapetala	cat's claw	Nat	R
Canavalia cathartica	*maunaloa*	Nat	C
Centrosema molle	butterfly pea	Nat	O
Falcataria moluccana	albizia	Nat	O
Leucaena leucocephala	*koa haole*	Nat	O
Mimosa pudica	sensitive plant	Nat	O
Mucuna gigantea sub. giantea	*ka'e'e'e*	Ind	R
Mucuna sloanei	sea bean	Ind	R
Pueraria phaseoloides	tropical kudzu	Nat	U
MELASTOMATACEAE			
Clidemia hirta	Koster's curse	Nat	O
Pterolepis glomerata	false meadowbeauty	Nat	U
MALVACEAE			
Hibiscus furcellatus	*'akiohala*	Ind	R
Hibiscus tiliaceua	*hau*	Pol?	A
Sida rhombifolia	Cuban jute	Nat	R
MORACEAE			
Ficus microcarpa	Chinese banyan tree	Nat	U
MYRSINACEAE			
Ardisia crenata	Hilo holly	Nat	R/U
Ardisia elliptica	shoebutton ardisia, inkberry	Nat	A
Syzygium malaccense	mountain apple; *'ohi'a 'ai*	Pol	C
MYRTACEAE			
Syzygium cuminii	Java plum	Nat	C
Psidium cattleianum	strawberry guava	Nat	A
Psidium guajava	common guava	Nat	C

Scientific Name	Common/Hawaiian Names	Status	Abundance
OCHNACEAE			
Ochna thomasiana	mickey mouse plant	Nat	R
ULMACEAE			
Trema orientalis	gunpowder tree	Nat	O
ONAGRACEAE			
Ludwigia octovalvis	kāmole	Pol?	U
ROSACEAE			
Rubus rosifolius	thimbleberry	Nat	O
RUBIACEAE			
Coffea arabica	coffee	Nat	O
Paederia foetida	*maile pilau*	Nat	O
SAPINDACEAE			
Dimocarpus longan	longan	Nat	U
Filicium decipiens	fern tree	Nat	U
VERBENACEAE			
Citharexylum caudatum	juniperberry	Nat	A
Citharexylum spinosum	fiddlewood	Nat	A
Stachytarpheta jamaicensis	Jamaica vervain	Nat	O
FLOWERING PLANTS - MONOCOTS			
ARACEAE			
Alocasia cucullata	Chinese taro	Nat	O
Colocasia esculenta	taro	Pol	U
Epipremnum pinnatum	pothos	Nat	A
Syngonium podophyllum	arrowhead plant	Nat	O
Xanthosoma sagittifolium	elephant ear	Nat	O
ARECACEAE			
Cocos nucifera	coconut tree	Ind?	U
Ptychosperma macarthurii	Macarthur palm	Nat	O
ASPARAGACEAE			
Cordyline fruticosa	*ti*, *la'i*	Pol	U
COMMELINACEAE			
Commelina diffusa	*honohono*	Nat	C
COSTACEAE			
Costus woodsonii	indian head ginger	Nat	A
DIOSCOREACEAE			
Dioscorea bulbifera	*hoi*, bitter yam	Pol	O
HELICONIACEAE			
Heliconia indica	heliconia	Nat	O
MUSACEAE			
Musa x paradisiaca	banana	Pol	U

Scientific Name	Common/Hawaiian Names	Status	Abundance
ORCHIDACEAE			
Phaius tankervilleae	nun's hood orchid	Nat	U
Spathoglottis plicata	Malayan ground orchid	Nat	R
PANDANACEAE			
Pandanus tectorius	hala	Pol	C
POACEAE			
Brachiaria mutica (*Urochloa mutica*)	California grass	Nat	C
Coix lachryma-jobi	Job's tears	Nat	U
Megathyrsus maximus	guinea grass	Nat	O
Oplismenus hirtellus	basketgrass	Nat	C
ZINGIBERACEAE			
Alpinia mutica	small shell ginger	Nat	R
Etlingera elatior	torch ginger	Nat	O
Hedychium coronarium	white ginger	Nat	A
Zingerber zerubet	shampoo ginger	Pol	C

Appendix J

Archaeological Inventory Survey

Draft—Archaeological Inventory Survey for TMK: (1) 4-7-006:010 (por.) and :018 in Waiheʻe Ahupuaʻa, Koʻolaupoko District, Island of Oʻahu, Hawaiʻi

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July 2020

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Draft— Archaeological Inventory Survey for TMK: (1) 4-7-006:010 (por.) and :018 in Waiheʻe Ahupuaʻa, Koʻolaupoko District, Island of Oʻahu, Hawaiʻi

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Management Summary

An archaeological inventory survey (AIS) was conducted for the proposed Waiheʻe Loʻi Restoration and Learning Center in Waiheʻe Ahupuaʻa, Koʻolaupoko District, on the island of Oʻahu on a portion of TMK: (1) 4-7-006:010 and all of TMK: (1) 4-7-006:018. Pedestrian survey of 11.51 ha (28.43 ac.) in Waiheʻe identified two archaeological sites consisting of 15 features. SIHP 08919 is the main access road and two culverts associated with the road. SIHP 08920 includes the other archaeological features found within the project area. These consist of terraces, water control features, C-shaped structures, an old road, historic structural remnants, and a possible platform. Excavation of eight test units yielded volcanic glass, charcoal, and modern or historic materials. Two charcoal samples were submitted for wood taxa identification but they were not suitable for radiocarbon dating.

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Introduction

At the request of G70, Keala Pono Archaeological Consulting conducted an archaeological inventory survey (AIS) for the proposed Waiheʻe Loʻi Restoration and Learning Center in Waiheʻe Ahupuaʻa, Koʻolaupoko District, on the island of Oʻahu on a portion of TMK: (1) 4-7-006:010 and all of TMK: (1) 4-7-006:018. This work was designed to identify, document, assess significance, and provide mitigation recommendations for any historic properties that may be located in the study area in anticipation of the proposed construction.

This report is drafted to meet the requirements and standards of state historic preservation law, as set out in Chapter 6e of the Hawaiʻi Revised Statutes and the State Historic Preservation Division's (SHPD's) draft *Rules Governing Standards for Archaeological Inventory Surveys and Reports*, Hawaii Administrative Rules (HAR) §13–276.

The report begins with a description of the study area and an historical overview of land use, Hawaiian traditions, and archaeology in the area. The next section presents methods used in the fieldwork, followed by results of the survey. Project results are summarized and recommendations are made in the final section. Hawaiian words and technical terms are defined in a glossary at the end of the document.

Project Location and Natural Environment

The study area consists of 11.51 ha (28.43 ac.) on a portion of TMK: (1) 4-7-006:010 and all of TMK: (1) 4-7-006:018, in Waiheʻe Ahupuaʻa, Koʻolaupoko District, on the island of Oʻahu (Figures 1 and 2). TMK: (1) 4-7-006:010 is a 36 ha (89 acre) parcel, while TMK: (1) 4-7-006:018 is a .036 ha (.08 ac.) plot. Both properties are owned by the City and County of Honolulu. The project area begins at the mauka end of Waiheʻe Road and extends along the south side of the Board of Water Supply access road for approximately 1 km (.62 mi.). The project area then veers south away from the access road for approximately 250 m (820 ft.) toward steeply sloping terrain on the valley's south side. The Board of Water Supply access road marks the northwest boundary of the project, while the southeast boundary is bordered by an undeveloped property.

Waiheʻe Valley includes 527.56 ha (1,303.67 ac.) of land, 326.96 ha (807.94 ac.) of which are forest reserve (Chun 1954:1). The area of study lies toward the middle of valley, along Waiheʻe Stream. Geologically speaking, this region sits in the giant caldera that formed the Koʻolau Mountain Range in ancient times. It is a place of consistent rain and trade winds:

> Carrying the burden of the trade wind rains, the windward side of Oʻahu is more weathered than the leeward areas of the island, and now this vast caldera wall is reduced to a line of sheer cliffs… The flat valley floors are extensively eroded, and are now mostly joined, studded here and there with isolated remnant peaks and ridges connected to the central massif. (Klieger et al. 2005:5)

The Koʻolau Mountain Range is 60 km (37 mi.) long and makes up the mauka boundary of Waiheʻe ahupuaʻa. In the Pleistocene, Waiheʻe Valley went through periods of submergence and emergence. It is believed that the valleys of Windward Oʻahu were under roughly 365 m (1,200 ft.) of water and filled with sediment as they gradually emerged (Stearns in Chun 1954:3). Today, Waiheʻe Valley has several main features: 1) the Koʻolau Mountains at the head of the valley, which are basalt with a complex of dikes; 2) a high terrace in the valley center, made up of old alluvium that built up between the streams; 3) a coastal plain composed of younger alluvium; and 4) a beach at the seashore made up of silt and other sediments washed downstream and reworked by wave action (Chun 1954:5–7). There are two perennial springs at the back of the valley that contribute to the

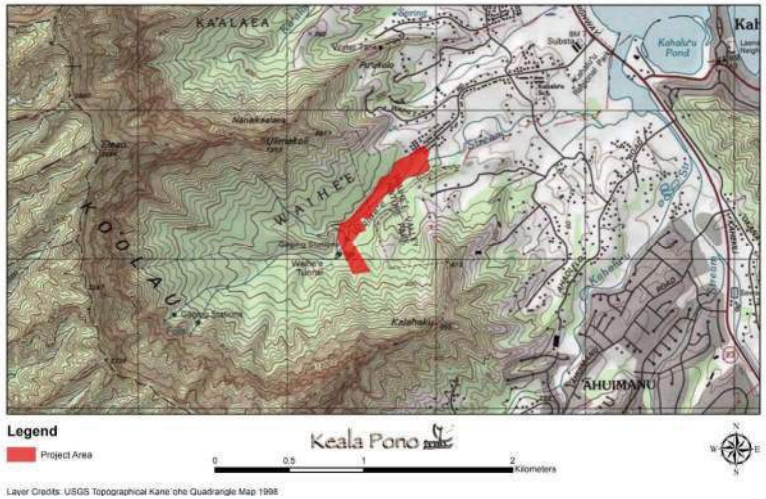

Figure 1. Project area on a 7.5 minute Kaneohe quadrangle map (USGS 1998).

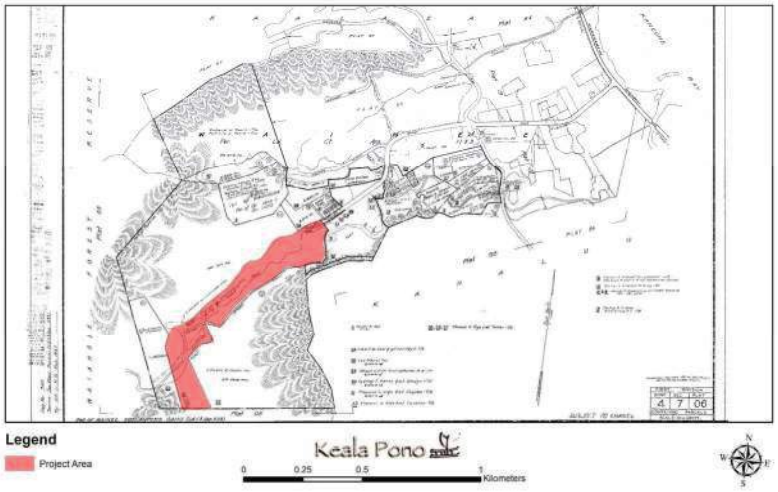

Figure 2. Project area on a TMK plat map (State of Hawai‘i 1937).

surface drainage of the ahupua‘a. The springs originate in dikes that are under pressure at the base of the Ko‘olau Mountains; they are responsible for much of the water flow in Waihe‘e Stream (Chun 1954:7).

Situated mostly in the valley center, topography of the study area is moderately to steeply sloping, and vegetation is generally very dense, with some places enveloped in thick tangles of hau and others covered in ginger. The project area lies between roughly 40–100 m (130–330 ft.) above mean sea level (amsl), approximately 2 km (1.2 mi.) from the coast at Kāne‘ohe Bay. Mean annual rainfall is 207 cm (82 in.) per year at the Waihe‘e gaging station that is situated toward the mauka end of the project (Giambelluca et al. 2013). Waihe‘e Stream, a perennial watercourse, runs through the project area.

Four soil types occur within the study area: Hanalei silty clay 2–6% slopes (HnB); Lolekaa silty clay, 3–8% slopes (LoB); Tropaquepts (TR); and Waikane silty clay, 25–40% slopes (WpE) (Figure 3). Hanalei series soils developed in alluvium and are often used for pasture, sugarcane, taro, and vegetable farming (Foote et al. 1972:38). Lolekaa soils developed in colluvium and alluvium that is old and gravelly. These soils are generally used for housing, sugarcane, wildlife habitat, and pasture (Foote et al. 1972:83). Tropaquepts are flooded soils that are utilized for wetland agriculture, such as the cultivation of rice, taro, or watercress (Foote et al. 1972:121). Waikane series soils developed in colluvium and alluvium, and are typically used for housing, pasture, and truck crops (Foote et al. 1972:130). Also in the vicinity are Hanalei silty clay 0–2% slopes (HnA); Lolekaa silty clay 8–15% slopes (LoC); Lolekaa silty clay 15–25% slopes (LoD); Lolekaa silty clay 25–40% slopes (LoE); Lolekaa silty clay 40–70% slopes (LoF); Pearl Harbor clay (Ph); rock outcrop (rRO); Waikane silty clay, 3–8% slopes (WpB); and Waikane silty clay, 40–70% slopes (WpF).

Project Description

The project will create a lo‘i restoration and learning center to educate the public about the importance of streams, watersheds, and regenerative agriculture. Proposed activities of the center include the following:

- restore existing fallow lo‘i
- help maintain an existing ‘auwai system used by the taro farmers downstream
- restore riparian and forest areas with appropriate native and non-invasive plants

Development of the learning center will occur in two phases. Phase I will take place on an approximately 5.3 ha (13 ac.) area from the end of Waihe‘e Road to the dam (Figure 4). Phase I will consist of the following:

- Service learning work days starting with reopening fallow lo‘i and helping maintain the ‘auwai system; learn about invasive species (terrestrial and aquatic), watersheds, and regenerative agriculture
- Scheduled service learning days with groups and schools
- Develop a parking area for scheduled groups and events to alleviate parking congestion in the neighborhood; the gravel parking area will be large enough for a bus turn around
- Replace the gate at the end of Waihe‘e Road with a more aesthetically pleasing gate
- Install a gate past the proposed parking area to prevent vehicle access to the rest of the valley

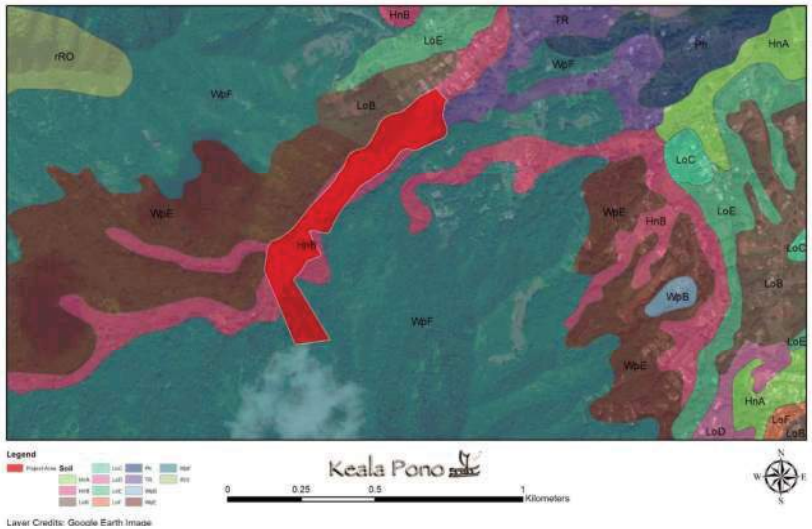

Figure 3. Soils in the vicinity of the project area.

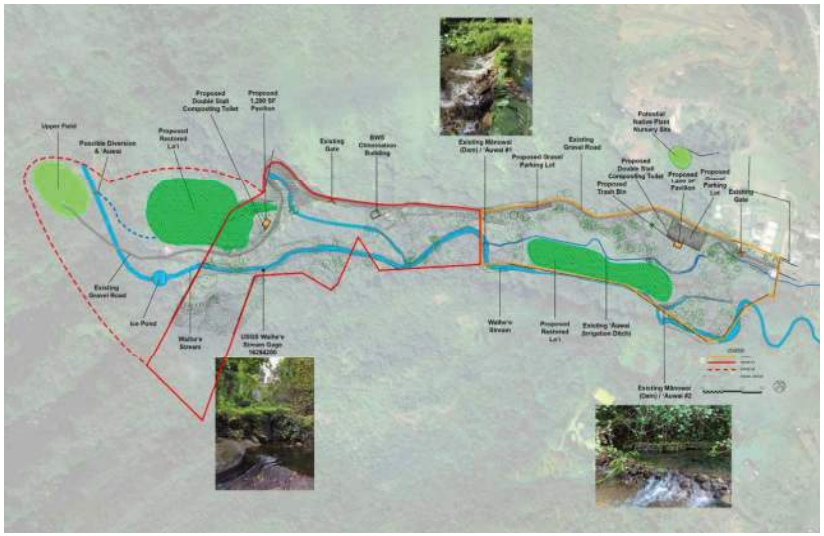

Figure 4. Conceptual design of the proposed Waihe'e Lo'i Restoration and Learning Center (courtesy of G70).

- Remove invasive plants in the project area and restore them with native species from the area
- Create a pavilion/hale to hold workshops, meetings, and presentations
- Identify comfort station/composting toilet options (identify infrastructure needs and feasibility)
- Install interpretive signage about the different focus areas (funding dependent)
- Construct and maintain an on-site nursery for native plants and other suitable plants for restoration and cultivation

Phase II will take place on an additional 5.7 ha (14 ac.) that extend from the dam to the "ginger patch" bordering Board of Water Supply (BWS) lands (see Figure 4). This phase will consist of the following:

- Clear the "ginger patch" area and convert it into another loʻi (identify ʻauwai and potential impact to taro farmers downstream)
- Remove invasive plants in the project area and restore the landscape with native species from the area

TRADITIONAL CULTURAL AND HISTORIC BACKGROUND

This section of the report presents background information as a means to provide a context through which one can examine the cultural and historical significance of the study area. In the attempt to record and preserve both the tangible (e.g., traditional and historic archaeological sites) and intangible (e.g., moʻolelo, mele, place names) culture, this research assists in the discussion of anticipated finds. Research was conducted at the Hawaiʻi State Library, the State Historic Preservation Division, as well as online at databases such as the Hawaiʻi Department of General Accounting map database, Ulukau, and Waihona ʻAina. Historical maps, archaeological reports, and historical reference books were among the materials examined.

Waiheʻe in the Pre-Contact Era

Information regarding traditional land use and occupation in Waiheʻe Ahupuaʻa is often intertwined with the moʻolelo of its neighboring ahupuaʻa, Kahaluʻu to the south and Kaʻalaea to the north. Information compiled for the pre-contact era includes data on place names, land use, and subsistence, as well as several moʻolelo, oli, and ʻōlelo noʻeau. Together, they give us an idea of what life may have been like in this storied place.

Place Names

One often overlooked source of history is the information embedded in the Hawaiian landscape. Hawaiian place names "usually have understandable meanings, and the stories illustrating many of the place names are well known and appreciated… The place names provide a living and largely intelligible history" (Pukui et al. 1974:xii).

Place names associated with the study area are listed in *Place Names of Hawaii* (Pukui et al. 1974), along with the meanings of the names and/or other comments about the specific locales:

> ʻĀhui-manu. Land division, stream… In 1845, Ka-mehameha III granted a tract of land in this area to the Catholic mission for the first Catholic school in the Islands. Each street name in the subdivision combines *Hui-* (flock) with the name of a bird… *Lit*., bird cluster (perhaps so called because the birds from nearby Moku-manu were caught here and tied together in bunches). (Pukui et al. 1974:6)
>
> ʻĀhuli-manu. Pool at ʻĀhuimanu, Oʻahu. *Lit*., birds looking [for water]. (Pukui et al. 1974:6)
>
> Ahu-o-Laka. Islet (3.1 acres, awash at high tide), off Kaha-luʻu… *Lit*., altar of Laka. (Pukui et al. 1974:6)
>
> Haia-moa. Stream, Wai-heʻe, Oʻahu. *Lit*., chicken chased. (Pukui et al. 1974:34)
>
> Hāmama. Stream, Wai-heʻe, Oʻahu. *Lit*., open. (Pukui et al. 1974:39)
>
> Kaha-luʻu… land division…stream, and fishpond…associated with the Ua-pōʻai-hale (house encircling rain…) perhaps named by fishermen who used to dive here for fish…A series of wet taro terraces here are said to be the largest on Oʻahu. See Ka-honua. *Lit*., diving place. (Pukui et al. 1974:62)
>
> Ka-honua. Old name for Kaha-luʻu fishpond… *Lit*., the earth. (Pukui et al. 1974:66)
>
> Kālia…Stream, Wai-heʻe, Oʻahu. *Lit*., waited for. (Pukui et al. 1974:77)
>
> Kāne-hoa-lani. Mountain ridge…named for a god ancestor of Pele; his female companion was said to be Ka-papa islet nearby…*Lit*., Kāne royal companion. (Pukui et al. 1974:84)

> Ka-papa. Offshore island (14 feet elevation)… A fishing shrine is here. See Kāne-hoa-lani. *Lit*., the flat surface. (Pukui et al. 1974:87)
>
> Koʻolau…Windward mountain range, Oʻahu…*Lit*., windward. (Pukui et al. 1974:117)
>
> Koʻolau Poko. District, southern windward Oʻahu. *Lit*., short Koʻolau. (Pukui et al. 1974:117)
>
> Wai-heʻe…Land section and stream…*Lit*., squid liquid (A mute, Ke-aka-o-Kū, the shadow of Kū, was told that his speech would be restored if he went to Kahiki to be married. On the way he was attacked by a huge squid which he killed and threw to Kaha-luʻu, Oʻahu. Slime flowed over the land; hence the name…). (Pukui et al. 1974:221–222)

Subsistence and Traditional Land Use

With its productive fishponds of Kāneʻohe Bay and extensive agricultural lands, Waiheʻe Ahupuaʻa was a thriving community in pre-contact times (Devaney et al. 1982). The ocean provided a variety of resources, such as limu, heʻe, crustaceans, and reef fish (Chun 1945:17). At least two fishponds were known to exist near Waiheʻe in Kahaluʻu. One was called Pokole (McAllister 1933), and the other was called Kahouna (McAllister 1933), which is also listed as Kahonua in *Place Names of Hawaii* (Pukui et al. 1974). This latter pond is also known as Kahaluʻu Fishpond today. Evidence of the community's traditional marine subsistence is further marked by its coastal fishing shrines, one of which was constructed on Kapapa Island and another situated in the sea there (McAllister 1933:172).

Although Waiheʻe was one of the smaller ahupuaʻa fronting Kāneʻohe Bay, the broad flats of Waiheʻe, together with Kaʻalaea on the north and Kahaluʻu on the south, formed a system of continuous agricultural terraces, comprising one of the largest areas of pondfield agriculture on the windward coast (Handy 1940:96). The terraces of Waiheʻe Ahupuaʻa were situated along Waiheʻe Stream and continued back into the valley for at least 1.5 miles (Handy 1940:96). While dryland kalo was also cultivated in the kula lands between Kahaluʻu and ʻĀhuimanu Streams (Handy 1940), it was the wetland loʻi that would have dominated the landscape:

> The *ahupuaʻa* [of Kahaluʻu], although practically continuous with Waiheʻe, is sheltered for most of its shore length behind low coastal hills, and its area contours are quite broken by the winding Kahaluʻu Stream and its tributaries, Waiola (Living-water), Ahulumanu (Discolored-and-broken), and Kalohaka (Hollow-taro). For this reason, despite the breadth of the stream valley, the *loʻi* sections of Kahaluʻu are tucked away in pockets of land watered from the several streams; there are few large continuous areas, but the total area under cultivation in ancient times must have been very considerable…
>
> The seaward flats of the three contiguous *ahupuaʻa* of Kaʻalaea, Waiheʻe, and Kahaluʻu together made up one of the largest single areas of wet-taro land on the Koʻolau coast. It is a region of ample rainfall… (Handy et al. 1991:454)

Approximately 40 ha (100 ac.) of Waiheʻe land were under cultivation of kalo in the pre-contact era (Devaney et al. 1982:36). They are described as continuing all the way to the back of the valley:

> The main stream bearing this name [Waiheʻe] has its headwaters in a waterfall against the mountain wall, and is joined by two others, Hamama and Kalia. Carefully terraced but abandoned taro *loʻi* follow the stream and its tributaries almost to their several sources. (Handy et al. 1991:453)

However, in a University of Hawaiʻi Master's thesis on Waiheʻe, Chun indicates that not all of the valley was used for loʻi:

> Judging from the lack of major irrigation works, the natives of Waihee apparently did not utilize most of the valley for agriculture. This was especially true in regards to wet-taro farming. Irrigation ditches were made only along the alluvial soils and coastal areas where water could easily be diverted from the stream due to the relative levelness of these areas. An absence of irrigation ditches on the elevated terraces of older alluvium indicates that no intensive farming occurred here, although it is quite likely that dry-land crops may have been cultivated sporadically in small cleared areas…
>
> According to Emory [noted archaeologist Kenneth P. Emory], prior to the decline in native population all of the potential taro lands, especially where water was accessible, was utilized and cultivated for taro. On the basis of irrigation ditches and kuleana awards, most of the areas suitable for taro agriculture were situated along the main stream of the valley and the coastal lowlands. (Chun 1954:27, 28)

An irrigation ditch more than one mile in length extends through the valley, although Chun (1954:44) believes that this ditch post-dates 1880. Dryland crops grown in the pre-contact period in Waiheʻe likely included olonā, ʻulu, wauke, and ʻawa.

Moʻolelo

As mentioned earlier, Hawaiian place names were connected to traditional stories through which the history of the places was preserved. These stories were referred to as "moʻolelo, a term embracing many kinds of recounted knowledge, including history, legend, and myth. It included stories of every kind, whether factual or fabulous, lyrical or prosaic. Moʻolelo were repositories of cultural insight and a foundation for understanding history and origins, often presented as allegories to interpret or illuminate contemporary life… Certainly many such [oral] accounts were lost in the sweep of time, especially with the decline of the Hawaiian population and native language" (Nogelmeier 2006:429–430).

There are different moʻolelo that speak of the naming of Waiheʻe. One account indicates that the name refers to a loʻi which belonged to aliʻi (Handy et al. 1991:453):

> It is said that the *ahupuaʻa* [Waiheʻe] took its name from a *kapu loʻi* belonging anciently to the *aliʻi* of the place situated *mauka* of the *muliwai* (lagoon) called Paʻele, into which the main stream empties. (Handy et al. 1991:453)

The name of Waiheʻe Ahupuaʻa literally translates to "squid liquid" (Pukui et al. 1974:221) or "squid water" (Handy and Handy 1972:453). Pukui et al. (1974) relate that this derived from a moʻolelo about a man that killed a large squid. The man, who was a mute, journeyed to Kahiki so that his voice would return. Along the way, he killed a large squid and threw it, splattering its slime across the land, and Waiheʻe was thus named (see Place Names section).

Waiheʻe is also mentioned in the epic saga of Hiʻiakaikapoliopele, as Hiʻiaka travels along the windward Oʻahu coast:

> They went on, passed Kahaluu, Waihee, and Kaalaea and on up to Auliilii. There they saw Pueo making ready to fight them and Hiiaka-i-ka-poli-o-Pele chanted thus:
>
> Pueo, the chief challenges to battle,
> He challenges on the day of his strength,
> He is strong, strong indeed.
>
> The two fought and she killed Pueo. They continued, passed Waiahole, Waikane, Hakipuu, Hiiaka said to Wahineomao, "There is our trail above Kai-kolu. The precipice is steep below." (Ka Leo o Ka Lahui in Sterling and Summers 1978:192)

Two other mo‘olelo, recounted in *Sites of Oahu* (Sterling and Summers 1978), are shared here. While both mo‘olelo do not mention Waihe‘e in particular, they speak of neighboring Kahalu‘u, and much of the history and land use of Waihe‘e is intertwined with Kahalu‘u. It is interesting that although these two mo‘olelo appear to be disconnected, they share a common theme, which is probably not coincidental. These two stories both speak of competition for the marine resources of Kāne‘ohe Bay. This reinforces the fact that the area was known to have prized resources in its sea since the earliest times.

The first mo‘olelo mentions the trickster hero Maui, and his rightful connection to Kahalu‘u. Due to his guile, Maui managed to secure the fishery rights to the waters off of Kahalu‘u’s coast. Here is that mo‘olelo as told in *Sites of Oahu*:

> The ahupua‘a of Kahalu‘u belonged to Maui-akalana. It was a land over which the sources of food were disputed, especially the low islands of Ahua and Kapapa where octopus were caught and the uhu fish of Kapuna caught in nets.
>
> The judges’ helper and high priest took Waiahole and Waikane as his boundaries, but the judges had a ruling against anything defiling. Should any of them be smeared with excretia, he ceased to handle sacred objects or participate in their work.
>
> Maui-akalana built a mound above Ha‘akolo, and made seven ridges and in the mound he secreted some excretia. He met his brothers and the two assistants of the supreme judges and told them that there was a precious treasure in the mound, diamonds and pearls and the first to dig rapidly into it might have them. They agreed to do it and when they began to dig and scrape away the earth, each of the judges’ assistants was anxious to get at the precious treasure. They observed no rules, restricted or otherwise in their eagerness to be the first to reach the heap of riches. Whose hands became dirty? This person’s --- that person’s. So Ahua-a-Laka, Kapapa and the uhu fish caught in the nets at the sea of Kapuna became the property of Kahalu‘u. The assistants of the supreme judges were ashamed and left their sacred offices and the name (of one), Ku, was given to kuapala (a kind of wooden bowl) and (of the other), Lono, to the Ipu-o-Lono container in the men’s eating house.
>
> Kohi-kohi-kupalale (Dig-in-haste, name of the mound), can still be found at Kahalu‘u, where Ahuli-manu faces the north, at the left side of the backs of Kaihu‘aha and Pakole, on the east side of the top of Ha‘akolo. Kupopolo is the resting place on the seaward side of Kakua-laui, facing the spring of Kameha‘ikana. (Sterling and Summers 1978:195)

The other story does not mention any person’s name in particular, as the gods of old are the central characters of this mo‘olelo. Specifically, the god of Kailua, characterized as the protagonist, and the god of Kualoa, characterized as the antagonist, met and fought for fishing rights. In the end, the god of Kailua prevailed, and an islet was placed in the sea of Kahalu‘u marking the boundary of the fishing grounds between the people of Kailua and the people of Kahalu‘u. The name of that islet was Ahu-o-Laka, meaning “Altar of Laka,” and it is still known today. Here is that mo‘olelo as told in *Sites of Oahu*:

> There were, and are, along this shore, various fish grounds, each with its god. And sometimes these gods of the fish disagree.
>
> This happened with two that controlled this shore. They quarreled on a matter of right and wrong. The men of Kualoa were coming to fish in Kailua bay, and fish grew scarce. The people died from want of food.
>
> The god of Kailua was justly enraged. He sent a challenge to the god of the poachers, proposing a battle for control of the shore.
>
> They met and fought, and the righteous god won. But he proved to be a kind-hearted god. He made a pact with the god of Kualoa; from thence forth forever, the men of Kualoa should fish in Kualoa and the men of Kailua would fish in Kailua.

> So it was settled, and this island was put into the sea, where the men can see it when they round the point. When the sand appears above the waves, it is time to turn the boat around. (Sterling and Summers 1978:196)

Oli and Mele

The noteworthiness of specific locales in Hawaiian culture is further bolstered by their appearances in traditional chants. An oli refers to a chant that is done without any accompaniment of dance, while a mele refers to a chant that may or may not be accompanied by a dance. These expressions of folklore have not lost their merit in society today. They continue to be referred to in contemporary discussions of Hawaiian history, identity, and values.

Appearing in perhaps one of the greatest known sagas of Hawaiian oral traditions, the epic journey of Hi‘iaka, is a chant Hi‘iaka uttered in Kahalu‘u in response to the inclement weather she encountered there. Perhaps she had come upon the famous Kahalu‘u rain, the Pō‘aihale, which was known to go in circles while pouring from above rather than just passing through the area like other showers do on the tradewinds. Here are the words to Hi‘iaka’s chant along with its translation and commentary by Emerson in his publication, *Pele and Hiiaka: A Myth from Hawaii*:

> Hiiaka found many things to try her patience and ruffle her temper in Pali-Koolau: Squalls, heavy with raindrops picked up by the wind in its passage across the broad Pacific, slatted against her and mired the path; but worse than any freak of the weather were her encounters with that outlaw thing, the mo‘o; not the bold robber creature of Hawaii which took to the wilds, as if in recognition of its own outlawry, but that meaner skulk, whose degenerate spirit had parted with its last atom of virtuous courage and clung to human society only as a vampire, unwilling to forego its parasitic hold on humanity. It was in the mood and spirit begotten of such experiences that she sang;
>
> *Ino Koolau, e, ino Koolau!* Vile, vile is this Koolau weather;
>
> *Ai kena i ka ua o Koolau;* One soaks in the rain till he’s full.
>
> *Ke ua mai la i Maelieli,* The rain, it pours at Maelieli;
>
> *Ke hoowa‘awa‘a mai la i Heeia.* It gutters the land at Heeia;
>
> *Ke kupa la ka ua i ke kai.* It lashes the sea with a whip.
>
> *Ha‘a hula le‘a ka ua* The rain, it dances in glee
>
> *I Ahuimanu, ka ua hooni,* At Ahuimanu, moving
>
> *Hoonaue i ka pu‘u ko‘a,* And piling the coral in heaps,
>
> *Ka ua poaihale o Kahalu‘u.* Shifting from side to side of the house, this whisking rain of Kahalu‘u.
>
> *Lu‘ulu‘u e, lu‘ulu‘u iho nei au* Heavy and sad, alas, am I
>
> *I ka puolo waimaka o ka onohi* ---Mine eyes, a bundle of tears,
>
> *Ke kulu iho nei, e.* Are full to o’erflowing. (Emerson 1997:90–91)

‘Ōlelo No‘eau

Like oli and mele, traditional proverbs and wise sayings, known as ‘ōlelo no‘eau, have been another means by which the history of Hawaiian places has been recorded. In 1983, Mary Kawena Pukui published a volume of close to 3,000 ‘ōlelo no‘eau that she collected throughout the islands. The introductory chapter of that book reminds us that if we could understand these proverbs and wise sayings well, then we would understand Hawai‘i well (Pukui 1983).

Approximately 500 places are listed in the ʻōlelo noʻeau book along with the proverbs and wise sayings that refer to these specific places. Of these 500 or so locales, Waiheʻe on Maui is noted, while Waiheʻe on Oʻahu is not. There is one ʻōlelo noʻeau that is specifically associated with Kahaluʻu, and it refers to the Kahaluʻu rain mentioned in the moʻolelo section above. The ʻōlelo noʻeau is as follows:

> Ka ua pōʻaihale o Kahaluʻu.
>
> *The rain that moves around the homes of Kahaluʻu.*
>
> Refers to Kahaluʻu of windward Oʻahu. (Pukui 1983:173)

There is another ʻōlelo noʻeau which refers to the Koʻolau region in general. This proverb suggests that Waiheʻe and other windward ahupuaʻa are lush and well-watered. Here is that ʻōlelo noʻeau as it appears in Pukui's book:

> Nā pali hāuliuli o ke Koʻolau.
>
> *The dark hills of Koʻolau.*
>
> The hills and cliffs of the windward side of Oʻahu are always dark and beautiful with trees and shrubs. (Pukui 1983:249)

Waiheʻe in the Early Historic Era

When the first Westerners arrived in the Hawaiian archipelago in 1778, the islands were not yet united under one ruler. At that time, the entire island of Oʻahu was under the rule of Chief Kahahana. In 1783, Chief Kahahana's reign was ended with the invasion and victory of Chief Kahekili of Maui. This would forever be the end of Oʻahu's independence as a sovereign entity. When Chief Kahekili died in 1794, control of O'ahu went to his son Kalanikūpule. The following year, Chief Kamehameha of Hawaiʻi Island invaded Oʻahu to engage Kalanikūpule in battle. Kamehameha overwhelmed Kalanikūpule's warriors, effectively gaining control of all the islands from Hawaiʻi to Oʻahu. Eventually, Kamehameha would make a peaceful agreement with Chief Kaumualiʻi of Kauaʻi, bringing that island and Niʻihau into the fold and thereby uniting the Hawaiian archipelago under one rule (Kamakau 1996, Kanahele 1995).

Under Kamehameha's rule, the island of Oʻahu was administered by High Chief Boki. After Kamehameha's death in 1819, Chief Boki continued to be the island's governor until he left on his South Seas voyage in 1829. After him, his wife, High Chiefess Liliha became the Oʻahu governor until 1831 when she was replaced by Kuakini (Devaney et al. 1982, Kamakau 1996).

The first foreigner's account of Waiheʻe comes from missionary Levi Chamberlain, who recorded memoirs of his 1826 trip through the area. He described wet, marshy conditions but did not mention wetland cultivation:

> We had a long walk over hills and streams of water between hills and along marshy tracts and reached Waihee at one-fourth before nine. We left Waihee at ten o'clock and walked towards the seashore where we used a muddy path most of the way and waded through a long tract of rushes through mud and water nearly knee deep. (Chamberlain 1826:5)

Despite the introduction of westerners and western ways into the islands, the first half of the 19th century did continue to see the cultivation of taro in Waiheʻe and other ahupuaʻa of the Koʻolaupoko district. However, population decline is evident in an 1835 census, which listed only 135 people in Waiheʻe, consisting of 65 men, 50 women, 11 boys, and 9 girls (Parker in Chun 1945:19–20). An account by missionary and businessman E.O. Hall in 1939 states that large expanses of taro land in the Kāneʻohe Bay area were lying in waste because they were not needed to feed the diminished

population (Chun 1954:53). Much of this decrease in population of Native Hawaiians is attributed to foreign-introduced diseases (Devaney et al. 1982).

Waiheʻe and the Changes in Land Tenure

During the reign of Kamehameha III, as the Hawaiian kingdom became increasingly exposed to outside influences, the Hawaiian monarchy faced a crossroads of major change. "The Constitution of 1840 confirmed that only two offices could convey allodial title. These were the mōʻī and the kuhina nui. The Māhele was an instrument that began to settle the constitutionally granted vested rights of three groups in the dominium of the kingdom—mōʻī, aliʻi, and the makaʻāinana" (Beamer 2014:143). However, the king felt the difficulty of governing a land where the influence of foreigners had been growing. Dr. David Keanu Sai describes this predicament:

> Kamehameha III's government stood upon the crumbling foundations of a feudal autocracy that could no longer handle the weight of geo-political and economic forces sweeping across the islands. Uniformity of law across the realm and the centralization of authority had become a necessity. Foreigners were the source of many of these difficulties. (Sai 2008:62)

"Several legislative acts during the period 1845–1855 codified a sweeping transformation from the centuries-old Hawaiian traditions of royal land tenure to the western practice of private land ownership" (Moffat and Fitzpatrick 1995:11). Most prominent of these enactments was the Māhele of 1848 which was immediately followed by the Kuleana Act of 1850.

> The Mahele was an instrument that began to settle the undefined rights of three groups with vested rights in the dominion of the Kingdom –- the government, the chiefs, and the hoaʻāina. These needed to be settled because it had been codified in law through the Declaration of Rights and laws of 1839 and the Constitution of 1840, that the lands of the Kingdom were owned by these three groups… Following the Mahele, the only group with an undefined interest in all the lands of the Kingdom were the native tenants, and this would be later addressed in the Kuleana Act of 1850. (Beamer 2008:194–195)

Although the Māhele had specifically set aside lands for the King, the government, and the chiefs, this did not necessarily alienate the makaʻāinana from their land. On the contrary, access to the land was fostered through the reciprocal relationships which continued to exist between the commoners and the chiefs. Perhaps the chiefs were expected to better care for the commoners' rights than the commoners themselves who arguably might have been less knowledgeable of foreign land tenure systems. Indeed, the ahupuaʻa rights of the makaʻāinana were not extinguished with the advent of the Māhele, and Beamer points out that there are "numerous examples of hoaʻāina living on Government and Crown Lands post-Māhele which indicate the government recognized their rights to do so" (Beamer 2008:274).

> Hoaʻāina who chose not to acquire allodial lands through the Kuleana Act continued to live on Government and Crown Lands as they had been doing as a class previously for generations. Since all titles were awarded, "subject to the rights of native tenants." The hoaʻāina possessed habitation and use rights over their lands. (Beamer 2008:274)

For those commoners who did seek their individual land titles, the process that they needed to follow consisted of filing a claim with the Land Commission; having their land claim surveyed; testifying in person on behalf of their claim; and submitting their final Land Commission Award (LCA) to get a binding royal patent. However, in actuality, the vast majority of the native population never received any LCAs recognizing their land holdings due to several reasons such as their unfamiliarity with the process, their distrust of the process, and/or their desire to cling to their traditional way of land tenure regardless of how they felt about the new system. In 1850, the king passed another law,

this one allowing foreigners to buy land. This further hindered the process of natives securing lands for their families.

After the Māhele, the fisheries of the region were divided into shares that were privately owned (Devaney et al. 1982). The konohiki and maka'āinana of each ahupua'a retained fishing rights and the konohiki would place a kapu on a given fish species within the fishery as necessary. By 1851, all fisheries were made public (Devaney et al. 1982).

There were 26 LCAs awarded in Waihe'e that include 59 kuleana plots (Chun 1954:24). Most were located mauka of Kamehameha Highway along the streams, with a few scattered on the makai side of the highway and along the coast. They consisted of lo'i, kula, and house sites (Chun 1954:24). Two LCAs were awarded within the study area, and several were located makai of the project (see Figure 11). LCA 2070 'Apana 2 was awarded to Kelehuna, and LCA 2311 'Apana 1 was awarded to Halai. Māhele testimony for both LCA mention lo'i (Figures 5 and 6). LCA 2070 'Apana 2 was also a house lot, while LCA 2311 'Apana 1 noted five lo'i bordered by streams and cliffs.

A total of 120 acres of Waihe'e land was awarded to konohiki, and the remainder was set aside as crown lands (Chun 1954:24). In 1855 Kamehameha V granted a large portion of Waihe'e Valley to missionary Benjamin W. Parker. By 1869, Parker had purchased all the land in the ahupua'a that was not awarded as kuleana plots (Chun 1954:25). In 1927, Parker's lands were transferred to the Bishop Trust Company, who subdivided and sold them, mostly to Japanese rice farmers (Chun 1954:25).

New Industries: Sugar, Rice, and Dairy

As noted above, large expanses of taro land lay abandoned in the Kāne'ohe region by 1839 (Devaney et al. 1982:36–37), thus it appears that taro agriculture came to an early decline in Waihe'e. By the 1860s, "sugar planting was considered to be at the commercial level in the Kaneohe Bay region" (Devaney et al. 1982:42). Chun describes a small sugar enterprise in the area:

> In 1865 two Englishmen Green and McKibbin, made an early attempt to establish a sugar plantation in Kaalaea to the north [of Waihe'e]. Ten acres of leased land in Waihee were a part of their plantation. The area leased was used mainly as a mill and dwelling site, with the small remaining acreage probably planted in sugar cane. (Chun 1954:29)

Rice agriculture began in windward O'ahu in the mid-19th century. At this time the contracts of Chinese sugar laborers were ending and they turned to rice farming, which was familiar to them. Specifically in 1857 a group of former rice farmers from southern China completed their sugar contracts and began farming rice in former taro lo'i (Chun 1954:55–56). By 1880 the Waihe'e sugarcane fields were also converted to rice paddies (Devaney et al. 1982:50). It has been speculated that the long irrigation ditch that runs for more than a mile in Waihe'e was built at this time (Chun 1954:44). The ditch is not believed to be older because: 1) archaeologist J.G. McAllister (1933) did not record it as a pre-contact site, while he did record a slightly longer ditch in Waialua; the Waihe'e ditch would have been the second longest pre-contact ditch on the island; 2) a flume is present in an area where Native Hawaiians would have chosen an alternate route for the ditch; and 3) there are no LCAs along most of the fields that the ditch feeds (Chun 1954:44–46).

In the second half of the 19th century, the Chinese population in the islands increased from 364 to a whopping 21,616 (Chun 1954:56). At the height of the rice era in Waihe'e in the mid-1890s the abandoned taro lo'i were converted to rice paddies, dikes were narrowed in width, additional irrigation channels were constructed, and livestock was brought in to compact the soils (Chun 1954, Devaney et al. 1982). Cattle ranching also took place after the late 1800s, with at least 150 acres of Waihe'e land devoted to pasturage (Chun 1954).

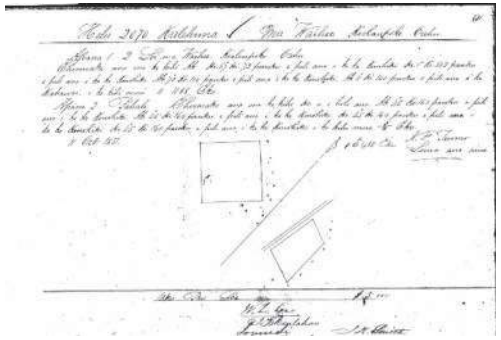

Figure 5. Māhele testimony for LCA 2070 (Māhele Book 6 Page 611).

Figure 6. Māhele testimony for LCA 2311 (Māhele Book 6 Page 610).

Three historic maps date to this period. The first map is from 1874 and it depicts the Kaalaea Sugar Plantation and Waihe'e Valley (Figure 7). A railroad is shown leading up to Waihe'e road, not far from the project area. What may be two streams or ditches run down the length of Waihe'e Valley,

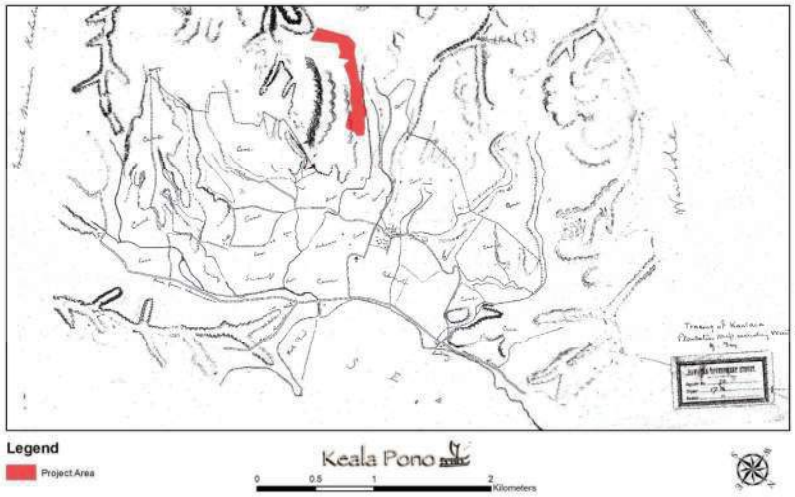

Figure 7. Portion of a map of Ka'alaea Sugar Plantation and Waihe'e (Gay 1874).

and several structures dot the area. One set of structures along the stream/ditch is labeled "Flag? MILL." Rice and sugarcane lands are identified, although they do not extend into the project area.

The second map dates to 1876, and although it shows the entire island of O'ahu, there are many details illustrated in the Waihe'e region (Figure 8). The project lands are labeled at "Gr. 1812" and Kahonua Fishpond is visible along the coast. There is a mill in Waihe'e, makai of the project area. Kamehameha Highway appears to be in its current position along the coastline, and the offshore islands, including Ahu o Laka, are illustrated.

The third map, from 1880, was drawn for the Kaalaea Sugar Plantation (Figure 9). This map shows individual land plots, with those of Kahale and Kamae partially overlapping with the east side of the project area. On the north side, a small portion of what is probably a fence line is within the project boundaries. Peaks to the northwest of the project are labeled Kapilioloka, Ulimakoli, Nanaikaalaea, and Kailio.

Approximately 160 acres were planted in rice between 1880 and 1927, including the vicinity of the project area (Devaney et al. 1982:50, 56). The peak of the rice industry in Waihe'e corresponds to the Sing Chong Company moving into the valley in 1894, with Sing Chong and the other rice farmers leasing the land from the Parker family (Chun 1954:58):

> On December 24, 1894, all of Parker's estate was leased to the company [Sing Chong] for a period of twenty years, at an annual rent of nine hundred dollars. The company apparently made good use of the land and also realized good profits, for at the termination of the lease in 1914 it re-leased Parker's lands again, this time for ten years at an annual rent of $1,500. Again, on January 1, 1924, Parker's estate was leased for another ten years to the same company for $1,800 a year
>
> As for the native kuleanas, most of them passed into the hands of the rising rice plantation or to individual farmers. Of the original fifty-four acres of native kuleanas, only about seventeen acres or about twenty-eight per cent remained in Hawaiian possession by 1936. (Chun 1954:59)

It is also believed that water buffalo, or carabao, were introduced to Waihe'e with the Sing Chong plantation in 1894 (Chun 1954:67). The water buffalo on O'ahu were described in a *Paradise of the Pacific* article from 1897:

> …Here's a rice field, Chinese almost invariably working them, and in the most primitive manner, dragging a quaint old forked stick plow through the rice fields with the Hongkong cow. I have never seen a poor or thin Chinese cow yet, and I have seen them everywhere on this island. All these Chinese cows are of a mouse color and fat as butter…(Baugn in Chun 1954:68)

The 19th century ended with the overthrow of the Hawaiian monarchy and the U.S. claim of annexation of the Hawaiian Islands. Throughout the islands, former government lands and crown lands were no longer under the oversight of the monarchy. After the overthrow, the U.S. federal government and the American military increased its land use around Waihe'e and Ko'olaupoko and throughout the islands.

Waihe'e in the 20th Century and Beyond

A 1902 O'ahu map shows the project area at the boundary of grazing lands (outlined in orange) and forest reserves (outlined in blue) (Figure 10). A large area toward the coast is striped in blue, which designates rice and taro wetlands. Two landings are also depicted at the coast.

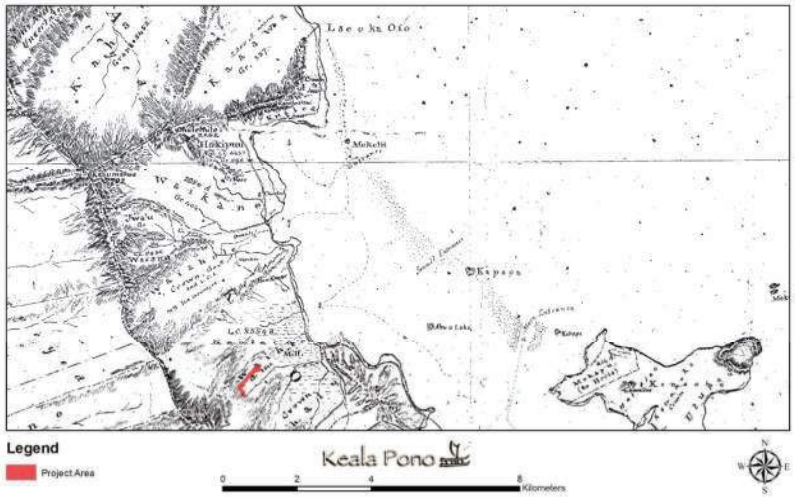

Figure 8. Portion of a map of O'ahu, showing the Waihe'e region (Alexander et al. 1876).

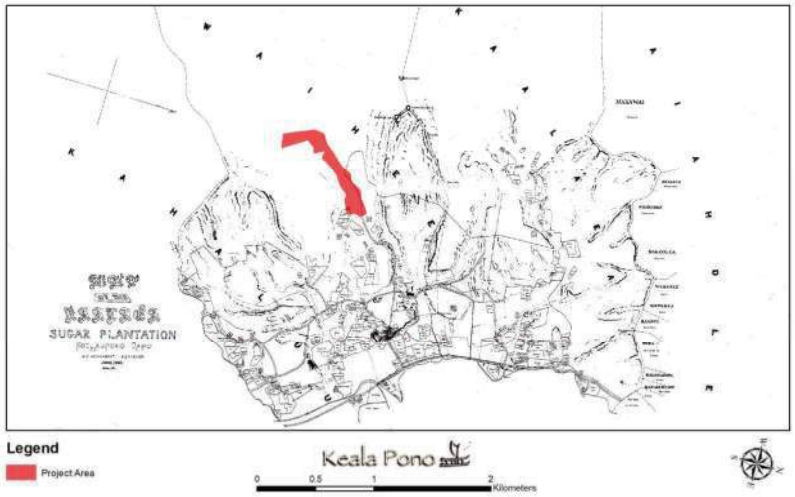

Figure 9. Portion of a Kaalaea Sugar Plantation map (Monsarrat 1880).

Kūpuna in Waiheʻe interviewed by Chun (1954:63) noted that "nearly every level area on the terraces, river plain and coastal plain were under rice cultivation as late as the 1920's." By the 1930s there were 25 irrigation ditches in Waiheʻe, extending a total of 4.39 km (2.73 mi.) (Chun 1954:64). In a ravine north of the alluvial terrace (see Natural Environment section), a tunnel was built through a narrow part of the terrace to feed the rice paddies of that drier area (Chun 1954:64–65). Rice began to decline in Hawaiʻi because of factors such as competition from California rice growers, changed immigration policies, as well as a stem borer outbreak, and the Sing Chong Company finally ended its lease in 1933.

While rice was on the decline in Waiheʻe, pineapple was taking hold in the Kāneʻohe Bay region, with a peak period of cultivation between 1910 and 1925 (Devaney et al. 1982:61). A Libby, McNeil & Libby pineapple cannery was built in Kahaluʻu, approximately one mile south of Waiheʻe Valley. The plan to build the large-scale cannery was realized in 1911 after they acquired the Ahuimanu Ranch, and the accompanying plantation workers' housing for the cannery gained the name of "Libbyville." Unfortunately, as a result of the Libby pineapple company's establishment, Kahaluʻu's Haluakaiamoana Heiau was destroyed. A second pineapple enterprise was established in 1910 on Castle lands in ʻĀhuimanu, under the name of the Koolau Fruit Company. It was later purchased by Dole's Hawaiian Pineapple Company. The pineapples were grown in fields in the uplands of windward Oʻahu, and Sing Chong subleased the higher areas of its lands to Japanese pineapple farmers. Between 1920 and 1926, approximately 16 ha (40 ac.) of Waiheʻe uplands were cultivated in pineapple (Chun 1954:80). However, the pineapple operations in Kahaluʻu could not compete with those on the leeward side of the island, and they shut down in the 1920s (Devaney et al. 1982).

In the 1930s Japanese farmers began moving into the valley, where they cultivated rice or pineapples. A map dating to 1936 shows what look like large loʻi systems within the project area (Figure 11). This map illustrates ʻauwai, terraces, and something labeled as "Kihe Rock" within the project. The current access road ends where it meets Waiheʻe Stream and continues as a trail that splits off in multiple directions. A Japanese school was built in Waiheʻe and it remained open until ca. 1941 and the beginning of World War II (Chun 1954:83). Large tracts of windward lands were used for military training during the war. One particular base was called the Heeia Combat Training Area (CTA), which included 912 ha (2,254 ac.) in Kahaluʻu, Kaʻalaea, and Waiheʻe and approximately 80 ha (200 ac.) in Heʻeia Kea (U.S. Army Corps of Engineers n.d.). Between 1943 and 1945, the CTA was utilized "as an encampment for troops, an ammunition storage facility, a firing range, and as a maneuver and artillery impact area for jungle and assault training" (U.S. Army Corps of Engineers n.d.). During World War II a pillbox at Puʻu Māʻeliʻeli was constructed, along with facilities that included roads, barracks, a mess hall, a theater, ammunition storage facilities, a motor pool, firing ranges, hand grenade ranges, as well as bayonet and obstacle courses (U.S. Army Corps of Engineers 2011).

By 1953, land ownership of Waiheʻe had shifted to mostly Japanese immigrants (Chun 1954:81). At that time, approximately 117 ha (290 ac.) of the 200 ha (496 ac.) of agricultural land in Waiheʻe was owned by Japanese. This consisted of 31 individual plots, with a 3.6 ha (9 ac.) average per family, aside from one large plot of 77 ha (190 ac.) owned by the Higa family (Chun 1954:81). By the mid-1900s taro farming returned to the valley, parts of the uplands were cleared for the farming of truck crops, and much of the valley slopes were cultivated in bananas (Chun 1954:95–97). In addition, large tracts of former rice lands were converted to pasture for cattle (Chun 1954:98).

Two maps show the project area at this time. The first map depicts land use of Waiheʻe (Figure 12). The quality of the map makes it difficult to distinguish between taro, truck crops, and papaya, but patches of these are depicted within the project area. On the east end of the project area, the map shows that bananas were grown. The second map illustrates ditches, and what is labeled as "main ditch" runs through most of the project area on the north side of Waiheʻe Stream (Figure 13).

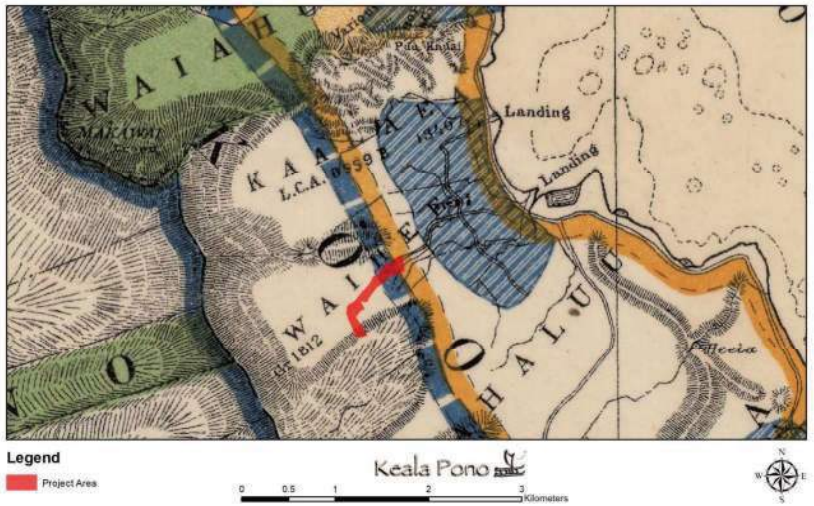

Figure 10. Portion of a map of Oʻahu, showing Kahaluʻu (Wall and Donn 1902).

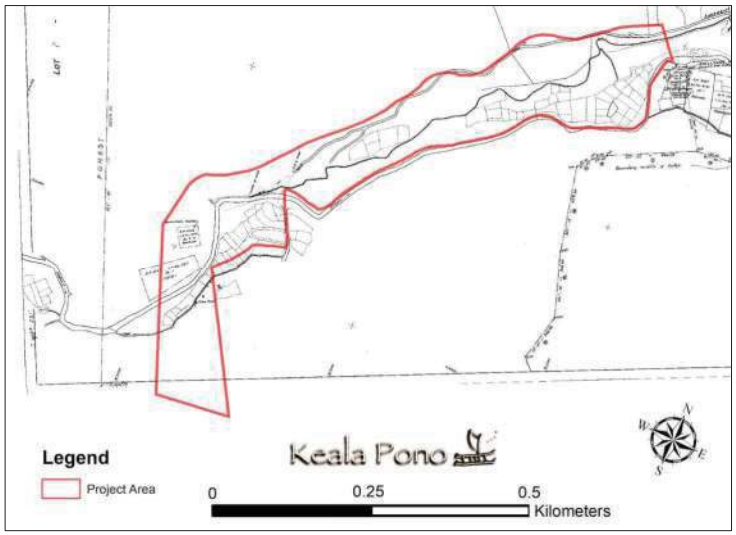

Figure 11. Portion of a map for a Land Court application (Harvey 1936).

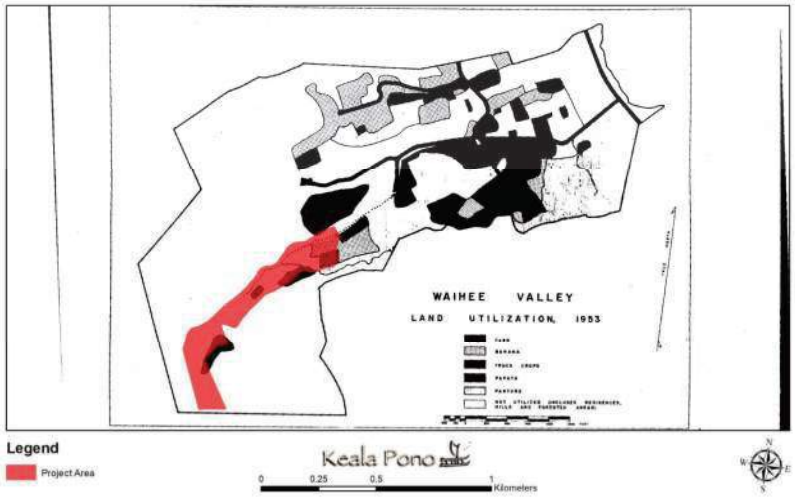

Figure 12. Portion of a map showing land use in Waiheʻe Valley (Chun 1954).

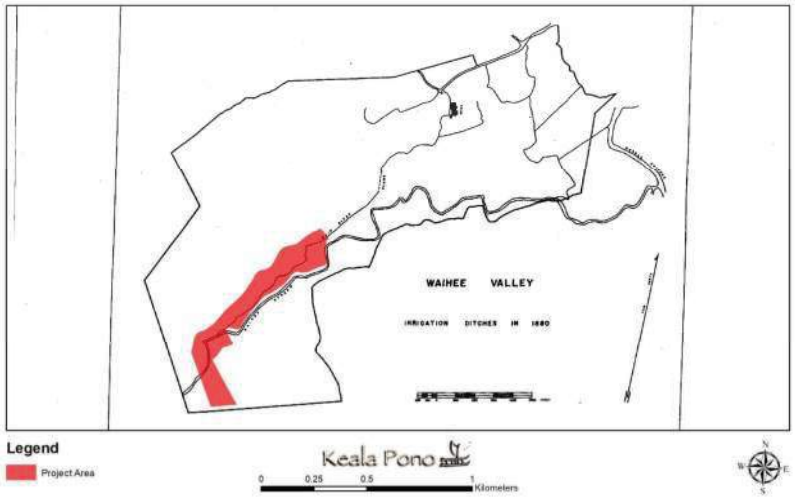

Figure 13. Portion of a map showing irrigation ditches in Waiheʻe Valley (Chun 1954).

The post-World War II era witnessed a rapid modernization of the Koʻolaupoko District, including Waiheʻe Ahupuaʻa. The Board of Water Supply's Waiheʻe Tunnel was constructed in 1955 at the head of Waiheʻe Valley (Devaney et al. 1982:82). It runs for approximately .5 km (1,500 ft.) to the dike zone deep in the Koʻolau Mountains (Kendrick 2000). A variety of developments were proposed for the area and Kahekili Highway was improved to support the future Valley of the Temples subdivision and other growth in the region in 1967. Further construction development continued into the following decades to include major infrastructure improvement projects (Helber, Hastert, and Fee 2007:1–22).

Previous Archaeology

Previous archaeological surveys offer significant information regarding traditional and historic land use. However, few studies have been conducted in the vicinity of the study area. The following discussion summarizes the findings of archaeological studies in Waiheʻe and at the Waiheʻe/Kahaluʻu border, based on reports found at the SHPD Kapolei library (Figure 14 and Table 1).

Although McAllister (1933) did not record any archaeological sites in Waiheʻe Ahupuaʻa, two were documented not far from Waiheʻe in Kahaluʻu: Kahonua (now called Kahaluʻu) Fishpond (Site 319) and Haluakaiamoana Heiau (Site 320). What is now known as Kahaluʻu Fishpond (Site 319) was formerly called Kahonua or Kahouna. This pond had a wall that was roughly 365 m (1,200 ft.) long, and it supported a watch house. There were two mākāhā (spaces in the sluice gates) along the wall of the fishpond (McAllister 1933:170). Haluakaiamoana Heiau was destroyed by the time of McAllister's (1933:170–171) survey—dismantled when the Libby, McNeill & Libby cannery was built on the site. It is said that the cannery was a failure because the heiau was desecrated.

No archaeological work took place in Waiheʻe until the 1980s, when an archaeological reconnaissance survey was conducted at coastal Waiheʻe (Kennedy 1981). No findings were reported from this study. Although loʻi were recorded on historic maps of the area, no evidence of these were identified on the surface.

An archaeological reconnaissance survey for the proposed Paradise Village Development, east of Kahaluʻu Stream also had no findings (Barrera 1982). The location was used as a modern dumping area, and the ground surface was not visible. Subsurface survey or archaeological monitoring during construction were recommended.

Human remains were encountered at a construction site east of Kahaluʻu Stream on the makai side of Kahekili Highway (Neller 1984). Fire-cracked rock and basalt flakes and tools were found at the base of the burial pit.

Archaeological monitoring at the wastewater pumping station at Laenani Beach Park, along Kāneʻohe Bay yielded no findings (Shun 1992). Eight depositional layers were recorded during excavations, all culturally sterile.

An archaeological inventory survey was conducted at a 2.5-acre property located roughly 1 km east of the current project area (McElroy 2006). The survey consisted of a surface inspection and archaeological trenching. No cultural remains were encountered during the excavations or the surface survey. The remnants of a piggery feature were noted, although they were thought to be less than 50 years old at the time of the survey.

An archaeological inventory survey at Kahaluʻu Regional Park consisted of a pedestrian survey and subsurface testing (Tulchin and Hammatt 2007). There were no findings.

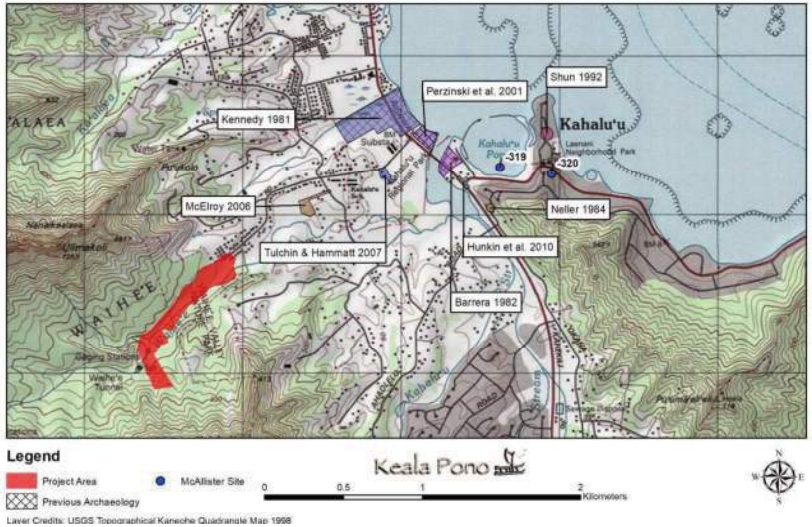

Figure 14. Location of previous archaeological studies and archaeological sites in the vicinity of the project area.

Table 1. Previous Archaeology Near the Study Area

Author and Year	Location	Type of Study	Findings
McAllister 1933	Island-Wide	Survey	Identified two sites on the coast near the Kahalu'u/Waihe'e Ahupua'a boundary: Haluakaiamoana Heiau (Site 320), Kahouna (also called Kahonua or Kahalu'u) Fishpond (Site 319).
Kennedy 1981	Coastal Waihe'e	Reconnaissance Survey	None.
Barrera 1982	West Side of Kahonua Fishpond	Reconnaissance Survey	None.
Neller 1984	East of Kahalu'u Stream	Burial Report	Documented human remains along with fire cracked rock and basalt flakes and tools (SIHP 50-80-10-2897).
Shun 1992	Laenani Beach Park	Archaeological Monitoring	None.
McElroy 2006	Waihe'e	Archaeological Inventory Survey	None.
Tulchin and Hammatt 2007	Kahalu'u Regional Park	Archaeological Inventory Survey	None.
Perzinski et al. 2001	Kahalu'u Beach Park	Archaeological Inventory Survey	Identified SIHP 50-80-08-5580, which consisted of 20th century subsurface foundations and an associated cesspool.
Hunkin et al. 2010	Kamehameha and Kahekili Hwy. Intersection	Archaeological Monitoring	None.

An archaeological inventory survey at Kahalu'u Beach Park identified one archaeological site (Perzinski et al. 2001). This consisted of two subsurface foundations and a cesspool dating to the early-20th century (SIHP 50-80-08-5580). The site lacked integrity however, and was determined to not be significant.

Archaeological monitoring at the intersection of Kamehameha and Kahekili Highways was conducted for improvements to the intersection (Hunkin et al. 2010). No archaeological resources were observed during the monitoring.

In sum, archaeological work in the project vicinity has been relatively limited, with most projects occurring closer to the coast. Many projects produced negative findings, although agricultural remains were noted in the uplands, and a human burial, a fishpond, a heiau, and 20th century structural remnants were found near the coast.

Summary of Background Information

Waihe'e is a well-watered area that supported large fields of taro in the pre-contact era, with both wetland and dryland taro cultivated. At least two fishponds were maintained along the coast in nearby Kahalu'u, adding to the abundant ocean resources of the region. Mo'olelo of the area speak of competition for the marine resources, indicating the importance of ocean food sources.

The historic period brought about widespread changes to region, with sugar, rice, pineapple, military, and ranching enterprises making their mark on the landscape. During the Māhele of 1848, there were two LCAs awarded within the subject property and Māhele testimony for both parcels mention loʻi.

Previous archaeology has identified a few sites in the area. These include agricultural remains in the uplands, and a human burial, a fishpond, a heiau, and 20th century structural remnants were found near the coast. Because the current project area lies along a major stream, traditional agricultural remains might be expected. These could include terraces, ʻauwai, and subsurface pondfield deposits. Remnants of historic era land use would likely be related to rice, sugarcane, or pineapple cultivation.

Anticipated Findings and Research Questions

As noted above, a variety of archaeological remains are known to occur in Waiheʻe. However, most of these are located on or near the coast. As the project area is located along a stream in the central part of the ahupuaʻa, traditional loʻi or remnants of historic rice, sugarcane, or pineapple agriculture are the most probable site types to be found.

Research questions will broadly address the identification of the above archaeological resources and may become more narrowly focused based on the kinds of resources that are found. Initial research questions are as follows:

1. Are there any vestiges of pre-contact land use within the survey area, particularly loʻi along Waiheʻe Stream? Where are they located and to what time period do they belong?
2. Are there remains of historic-era use of the study area, particularly sites related to rice, sugarcane or pineapple agriculture?

Once these basic questions are answered, additional research questions may be developed in consultation with SHPD, tailored to the specific kinds of archaeological resources that occur in the study area.

Methods

Pedestrian survey was conducted on March 28, March 29, May 7, and May 14–16, 2019. Two to five archaeologists were present per day for the survey, including Windy McElroy, PhD; Trisha Drennan, MA; Steven Eminger; Arleen Garcia-Herbst, CPhil; Jeffrey Lapinad; Max Pinsonneault, MA; and Danielle Shemesh, BA. Site documentation was carried out on October 22–24 and 28–31, 2019 and January 14–17 and 21–23, 2020 by Windy McElroy, Lapinad, Pinsonneault, Shemesh, Tiffany Brown, BA, and Robin Kapoi, BA. Subsurface testing was conducted on May 15, 16, and 18, 2020. Archaeologists participating in the subsurface testing included Windy McElroy, Pinsonneault, Lapinad, Daina Nicole Avila, BA; Ilikea McElroy, AA; and Kālenalani McElroy, MA, with 5–6 archaeologists present per day. Windy McElroy served as Principal Investigator, overseeing all aspects of the project.

Much of the project area was covered in dense vegetation, and visibility was poor. Approximately 9% of the project area was not walked due to vegetation conditions (see Figure 17). Vegetation consisted several dense patches of hau (Figure 15), as well as other areas covered in ginger, vines, or weeds (Figure 16). The upland portion of the project area (on the south) consisted of slopes forested in hala and ferns and had better visibility than the lowlands. Archaeological sites were identified visually and were marked with pink flagging tape and recorded with a 3 m-accurate Garmin GPSmap 62st.

Vegetation clearance to assist site documentation was conducted by Hui Kū Maoli Ola. Weed whackers, chain saws, and hand tools were used to cut the brush. At least one archaeologist was on site during the vegetation clearance to direct the clearing crew and assure that archaeological sites were not impacted. Sites were mapped using tape and compass. Digital photos were taken using iPhone and Android cameras.

Test units (TU) were excavated in eight locations across the project area. Excavation was conducted by hand with trowels and whisk brooms. Vertical provenience was measured from the surface, and trenches were excavated to sterile soil with saprolitic rock. Profiles were drawn and photographed, and soils were described to USDA standards using Munsell soil color charts (Munsell Color 2010), the USDA Soil Survey Manual (Soil Science Division Staff 2017), and a soil texture flowchart (Thien 1979). Excavated soil was screened through ¼-inch mesh at the discretion of the archaeologists. Trench locations were recorded with a 3 m-accurate Garmin GPSmap 62st, and all trenches were backfilled after excavation.

The scale in all field photographs is marked in 10 cm increments. The north arrow on all maps points to magnetic north. Throughout this report rock sizes follow the conventions outlined in *Field Book for Describing and Sampling Soils*: Gravel <7 cm; Cobble 7–25 cm; Stone 25–60 cm; Boulder >60 cm (Schoeneberger et al. 2002:2–35). Collected materials will be temporarily stored at the Keala Pono office in Kapolei, Hawaiʻi until the close of the project, when they will be turned over to the landowner.

Figure 15. Example of heavy vegetation, hau.

Figure 16. Example of heavy vegetation, weeds and vines.

RESULTS

Pedestrian survey was conducted in the 11.51 ha (28.43 ac.) project area. Two archaeological sites were identified, consisting of 15 features. SIHP 50-80-10-08919 is the main access road and two culverts associated with the road. SIHP 50-80-10-08920 includes the other archaeological features found within the project area. These consist of terraces, water control features, C-shaped structures, an old road, historic structural remnants, and a possible platform. Subsurface testing consisted of the excavation of eight test units. Traditional and historic artifacts, modern material, and charcoal were collected. Two charcoal samples were submitted for wood taxa identification but were not suitable for radiocarbon dating.

Community Consultation

A cultural impact assessment for the project covered the TMK: (1) 4-7-006:010 (por.) and :018 project area (McGuire et al. 2019). Four community members were interviewed. Interviewees identified hula hālau and lei-making as traditional gathering practices occurring in the project area. Interviewees also identified several archaeological sites including lo‘i, ‘auwai, walls, adze quarries, and burial sites that may lie within the project area. The interviewees were concerned about the large numbers of hikers in the valley and the negative effects this has had on the ‘āina and its residents. In all, the project was generally supported by the interviewees.

Pedestrian Survey

The surface survey included 91% of the 28.43 ac. study area (Figures 17–19). Much of the project area was covered in dense vegetation, and visibility was generally poor. Approximately 9% of the project area was not walked due to vegetation conditions, consisting of 1.7 ac. in the southwest, .15 ac. in the center, and .63 ac. in the northeast of the project (see Figure 17). The main vegetation in the lowlands consisted several dense patches of hau (see Figure 15), as well as other areas covered in ginger, vines, or weeds (see Figure 16). The upland portion of the project area (on the south) consisted of slopes forested in hala and ferns and had better visibility than the lowlands. Two archaeological sites were found: SIHP 08919, which includes the main road and two associated culverts; and SIHP 08920, a large complex of terraces, water control features, C-shaped structures, an old road, historic structural remnants, and a possible platform.

SIHP 50-80-10-08919

SIHP 08919, consists of the main access road and two culverts associated with the road. The road (Feature 08919a) extends through much of the northern edge of the project area, while one culvert (Feature 08919b) is located in the central western portion of the project, and the other (Feature 08919c) is on the far west side (see Figure 17).

The road (Feature 08919a) appears to be an extension of Waihe‘e Road that continues from the mauka (west) end of the current Waihe‘e Road southwest through almost the entire project area, and continuing outside the project boundary to the southwest. A portion of the road first shows up on an 1880 map (see Figure 9), where it ends roughly halfway up the project area and connects with a hatched line. There is no key on the map, but the hatched line may represent a fence or other boundary since the topography there would be too steep for a train track. A 1936 map shows a trail extending from the road’s end (see Figure 11). The entire road can be seen on a 1937 map (Figure 20; see Figure 2), indicating that the mauka portion of the road was constructed by this time.

The section of road within the project area consists of two segments, roughly 3.1 m wide each. One segment of the road runs for 850 m from the end of the current Waihe‘e Road on the east to where

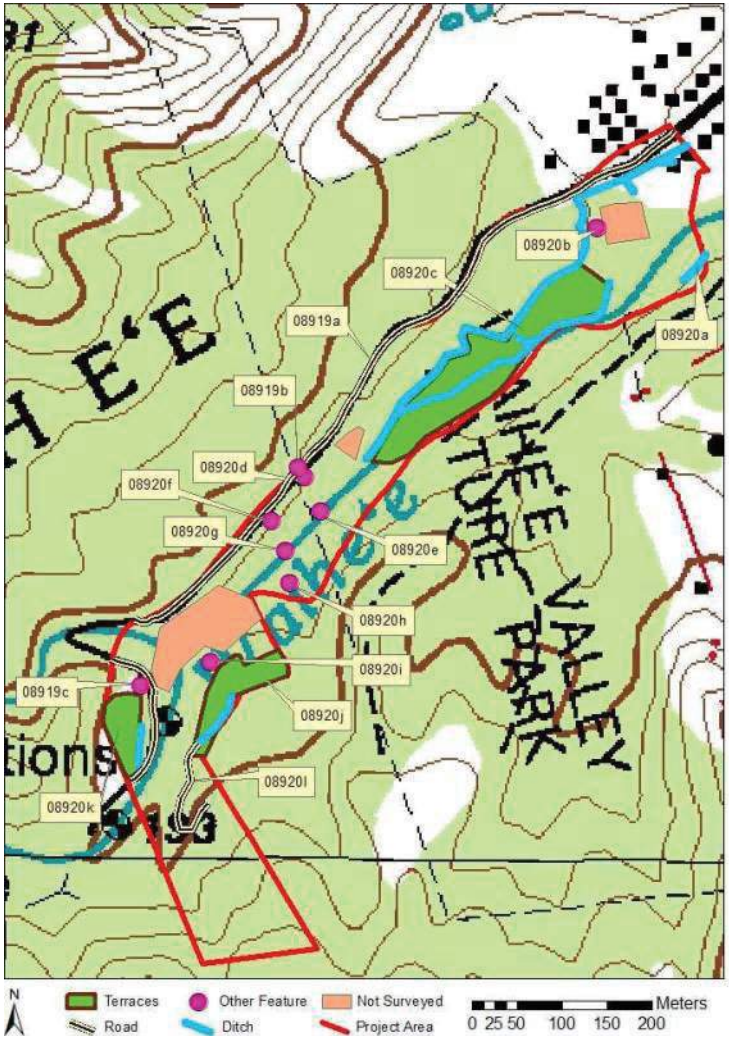

Figure 17. Location of archaeological features and areas that were not surveyed due to heavy vegetation (USGS 1998).

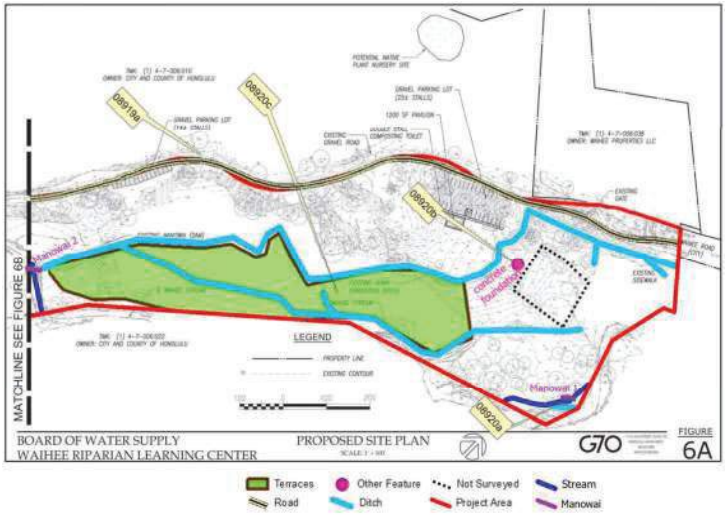

Figure 18. Location of archaeological features and areas that were not surveyed due to heavy vegetation, north side of project area (topographic map provided by G70).

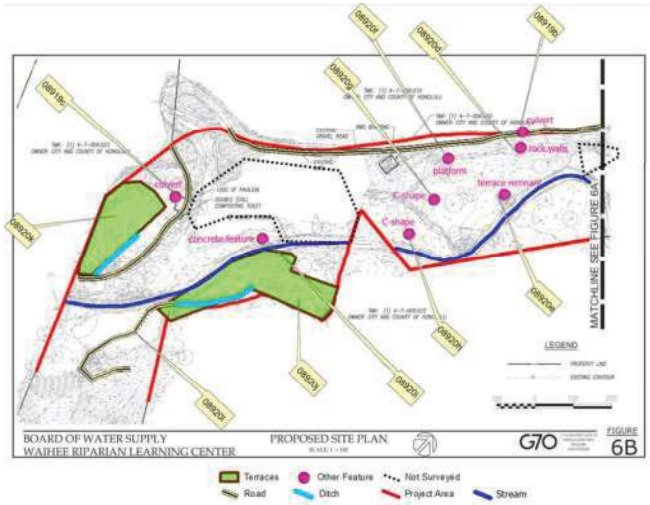

Figure 19. Location of archaeological features and areas that were not surveyed due to heavy vegetation, south side of project area (topographic map provided by G70).

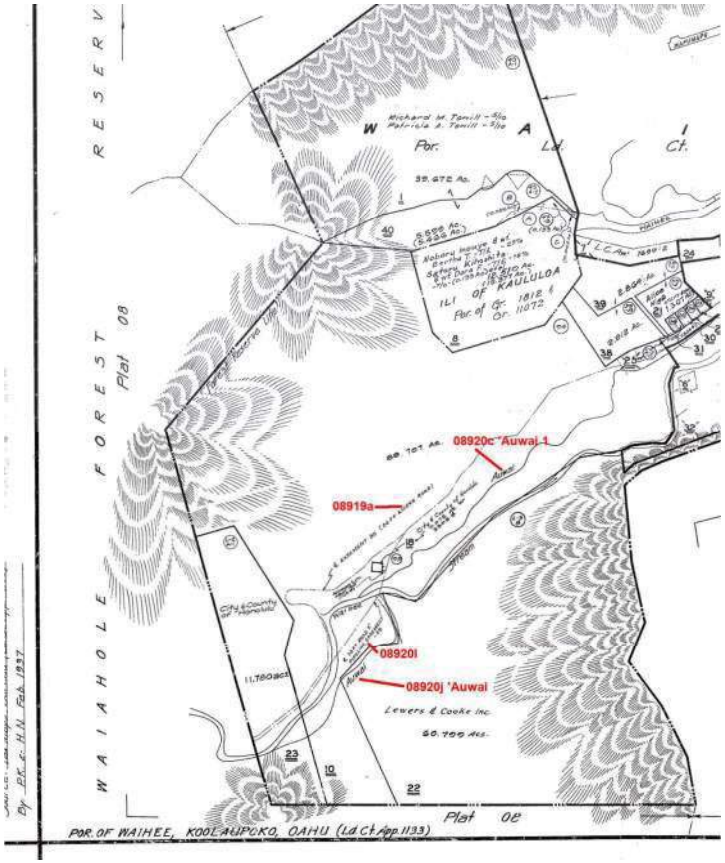

Figure 20. Portion of TMK plat (1) 4-7-006 (dated 1937) showing possible correlations to sites mentioned in the text.

it exits the project area on the west at a sharp bend. The other road segment enters the project area 55 m south of where it exited and continues in a moderate curve for 180 m where it again exits the project area and continues for an undetermined length beyond the project boundaries. The road is mostly asphalt and gravel paved but is not well maintained, with many potholes and areas where the asphalt has deteriorated (Figure 21). It is currently used as an access road for the Board of Water Supply.

Feature 08919b consists of two culverts that extend beneath the road in the west-central part of the project area (see Figure 17). The western culvert is built of mortared cobbles and stones that house a cement pipe which extends beneath the road to the other side (Figures 22 and 23). The culvert on the east side of the road is constructed of unmortared piled stones and boulders that retain the slope beneath the pipe (Figures 24 and 25). In total, the feature measures 10 m long by 1 m wide and up to 2 m tall. It functions as a water control device and is likely historic in age.

The Feature 08919c culvert is located on the west side of the road toward the west end of the project area (see Figure 17). It consists of a wall with a cement pipe embedded in it, and a rock alignment (Figure 26). The wall is made up of mortared basalt cobbles and stones with a cement cap (Figure 27). It measures 1.8 m long, 48 cm wide, and up to 90 cm tall. A large stone on the south side of the wall is set into the natural soil slope. A cement pipe juts out of the bottom of the wall at the center and continues beneath the road. There was no corresponding culvert visible on the opposite side of the road. Approximately 80 cm southwest of the pipe is a rock alignment made up of cobbles and stones set into the ground in a single alignment. The alignment is 150 cm long, 40 cm wide, and up to 50 cm tall. The Feature 08919c culvert functions as a water control device and is likely historic in age.

In sum, SIHP 08919 consists of a road and two culverts that are associated with the road. The road functions as transportation, while the culverts serve as a water control feature. The eastern portion of the road dates to at least 1880 when it is depicted on a historic map, while the western portion is not illustrated on historic maps until 1937. The culverts likely date to the time the adjacent segments of road were constructed. The site is in fair to good condition; the road is still intact and in use today, although it is in need of repair. The culverts are mostly intact, although there is damage on the northwest end of Feature 08919c, evidenced by missing rock and mortar. The culverts still function to divert water under the road.

Figure 21. Segment of Feature 08919a road. Orientation is to the northwest.

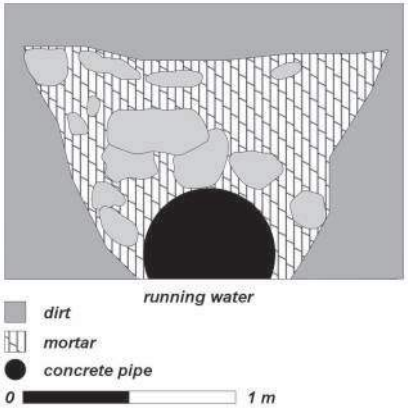

Figure 22. Feature 08919b western culvert, east face profile drawing.

Figure 23. Feature 08919b western culvert. Orientation is to the east.

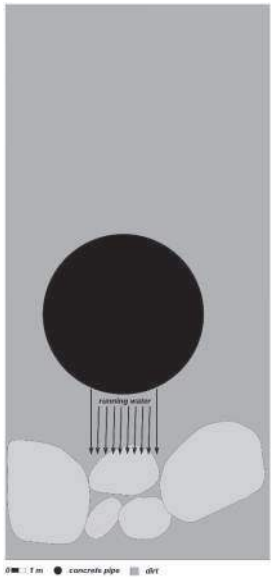

Figure 24. Feature 08919b eastern culvert, west face profile drawing.

Figure 25. Feature 08919b eastern culvert. Orientation is to the west.

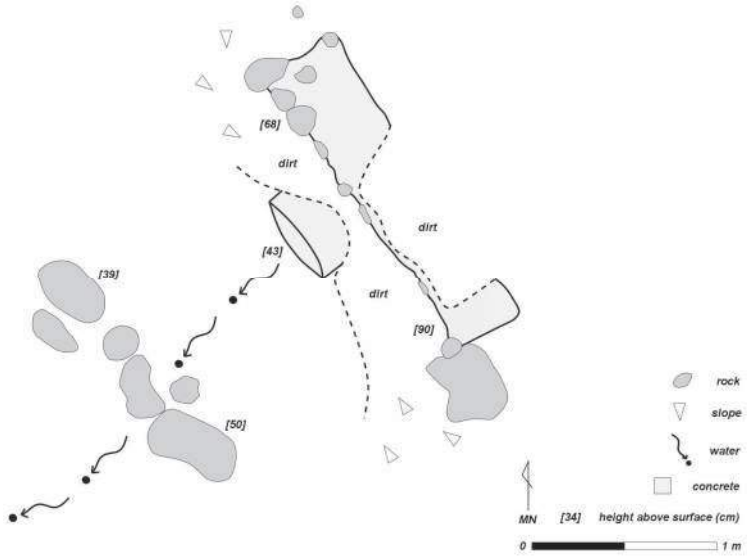

Figure 26. Feature 08919c culvert, plan view drawing.

Figure 27. Feature 08919c culvert. Orientation is to the northeast.

SIHP 50-80-10-08920

SIHP 08920 includes the other archaeological features found within the project area. They make up a network of ditches, agricultural features, a possible animal husbandry structure, and an old road. These were grouped into 12 features; each is described below. Together they likely represent use of the area from traditional times to the present.

Feature 08920a is a ditch located at the east corner of the project area (see Figure 17). This ditch is also known as Waiheʻe ʻAuwai 2 (BWS 2011). It measures 20 m long, 1 m wide, and the wall of the ditch is up to 85 cm tall (Figure 28). The ditch runs along the east side of the stream where it is made up of a wall of cobbles and stones set in cement on the west and a cliff on the east, which form a ditch between them (Figure 29). On the south end of the wall there is an opening to the stream for water flow. A stone dam (Mānowai 1) begins in this area and crosses the stream. The mānowai is built with river gravel, cobbles, and stones, and appears to be recently constructed or modified (Figure 30). The ditch continues out of the project boundary to the northeast where it consists of cut earth with no mortar or stonework. Within the ditch on the north end are two ceramic pipes that form a tunnel to the earthen ditch that continues outside the project area. This feature is likely historic in age and functioned as a water control feature.

Feature 08920b consists of structural remnants located in the northeastern portion of the project area, just east of Feature 08920c ʻAuwai 1 (see Figure 14). The structure is made up of broken cement troughs situated on a cement foundation (Figure 31), with parts of the cement foundation composed of mortared rock (Figure 32). Rusted metal posts are visible on the foundation (Figure 33), and sheets of galvanized steel remain on some of the troughs. Each trough exhibits a cement drain at the southeast end. In all, the structure measures 14 m long, 6 m wide, and up to 30 cm high. Historic material, including bottles and jars were collected from the surface of this feature (see Laboratory Analysis section). The cultural material and structural remains suggest that this feature is historic in age. It may have functioned as a pig pen or had some other animal husbandry use.

Feature 08920c is a large complex of terraces and ʻauwai situated along the central and south portion of the northern project area (see Figure 17). It consists of two ʻauwai, a mound, and three terraced areas that are severely overgrown in hau (Figure 34). Feature 08920c ʻAuwai 1 is a ditch that runs the entire length of the complex on the northwest side of the terraces and south of the access road. It is composed of an earthen ditch that extends for approximately 550 m (Figure 35). This ditch is also known as Waiheʻe ʻAuwai 1 (BWS 2011). ʻAuwai 1 is as deep as 2.2 m in places where the terrain is steeply sloping. Its northeastern end exhibits a portion that is lined on both sides with cement (Figure 36). This cement feature measures 16.5 m long, 3 m wide, and up to 70 cm deep. It is heavily overgrown, and modern trash litters both banks of the cement feature (Figure 37). On the northeastern end, the ditch continues to feed loʻi downstream while its southwestern end is near a modern dam (Mānowai 2). The mānowai is made up of stacked stones and cobbles and modern material such as cardboard and leaves that are constructed across Waiheʻe Stream (Figure 38).

Feature 08920c ʻAuwai 2 is a ditch that runs through the south and center portion of the Feature 08920c complex (see Figure 34). It is an earthen ditch that extends for roughly 300 m and is up to 80 cm deep. A perpendicular offshoot of this ʻauwai extends northwest between the terrace features of the complex. The two ʻauwai functioned as water control features; their age is undetermined, although ʻAuwai 1 is still in use and maintained today. Feature 08920c Mound 1 is a mound located at the northern end of Feature 08920c, between the two ʻauwai. It is made up of piled cobbles and stones that form a roughly square shape (Figure 39). The mound measures 2.5 m long, 1.2 m wide, and 23 cm tall (Figure 40). Excavation at this feature suggests that it is a natural rather than cultural feature (see Subsurface Testing section).

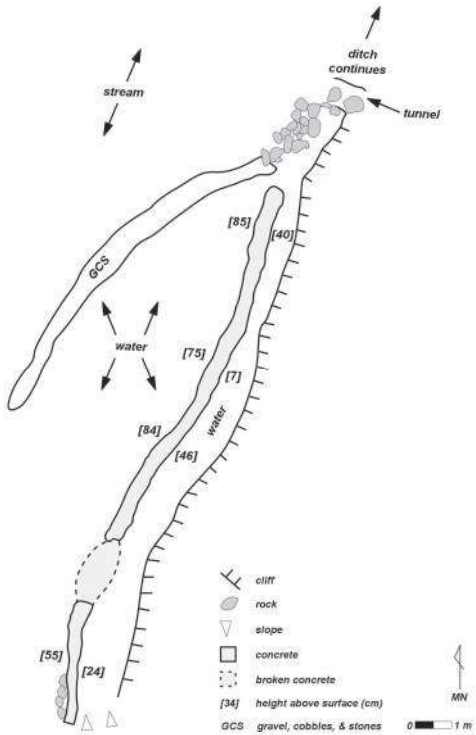

Figure 28. Feature 08920a ditch, plan view drawing (note that only the portions of the wall visible above the water are shown).

Figure 29. Feature 08920a ditch. Orientation is to the south.

Figure 30. Feature 08920a, mānowai (foreground) and ditch (background). Orientation is to the east.

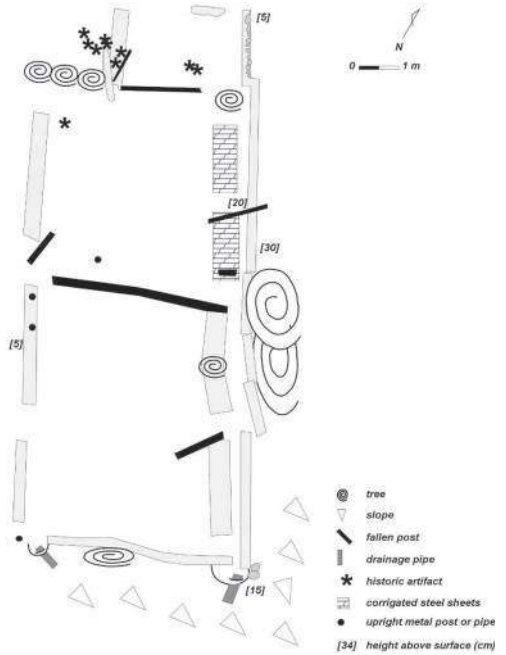

Figure 31. Feature 08920b structural remnants, plan view drawing.

Figure 32. Feature 08920b rock and mortar foundation. Orientation is to the west.

Figure 33. Feature 08920b cement trough with fallen metal posts. Orientation is to the west.

The terraced areas of the Feature 08920c complex consist of Features 08920c Terraces 1, 2, and 3 (see Figure 34). Terrace 1 is an expanse of terracing in the northern part of Feature 0892c. This area is characterized by earthen berms with a few segments that are reinforced with piled stones and cobbles (Figure 41).The longest berm is approximately 100 m long, and the berms are typically 1 m wide and 50 cm tall (e.g., Figure 42). Between the berms, the terrain is flat. Terrace 2 is an expanse of terracing in the central portion of Feature 08920c. This area is characterized by earthen berms with some segments that are reinforced with piled or stacked stones and cobbles. The most prominent section of stonework consists of an L-shaped berm at the northeast corner of the feature (Figure 43). This section exhibits a 35 m-long berm (Figure 44) with several remnants of perpendicular berms that extend into a flat area obscured by dense hau. The longest berm has a short segment of stacked stones and cobbles two courses high. This berm rises as much as 115 cm above ʻAuwai 2, which is to the south. The perpendicular berm remnants are less substantial, rising 40 cm tall at most. Excavation of Terrace 2 yielded charcoal found beneath stonework, although wood taxa identification was inconclusive and the sample was not submitted for radiocarbon dating (see Subsurface Testing and Laboratory Results sections). Terrace 3 appears to be one large terrace in the southern portion of Feature 0892c. ʻAuwai 2 is on the north of the terrace, while the ʻAuwai 1 is on the west, and Waiheʻe Stream is on the south and east. An earthen berm roughly parallels the stream for part of its length, then continues northeast to connect with ʻAuwai 2. While the berm exhibits sections of piled stones and cobbles (e.g., Figure 45), it is mostly earthen (Figure 46). The berm is approximately 200 m long and as tall as 150 cm where it transitions into the natural stream cut along Waiheʻe Stream. Terraces 1, 2, and 3 were likely used for wetland agriculture, although their age is undetermined. The complex is visible on a 1936 map, where 37 terraces and an ʻauwai are depicted (see Figure 11). It is likely that most of the terraces have eroded so badly that they are not identifiable in the heavy vegetation that has overtaken the area. In all, Feature 08920c probably functioned a wetland agricultural complex of undetermined age, but at least dating to 1936.

Feature 08920d consists of two rock wall segments located in the central part of the project area, just south of the access road (see Figure 17). The northern segment is composed of cobbles and stones in a 2.6 m-long alignment, approximately half of which is stacked and the other half is in a single alignment (Figure 47). This segment measures 20 cm wide and 35 cm tall (Figure 48). The southern segment lies 7.5 m to the south (see Figure 47). It is made up of piled cobbles and stones in a 4.2 m-long alignment. This segment measures 60 cm wide and 30 cm tall. On the north side of this wall segment is a depression that forms what may have once been a ditch (Figure 49). The ditch appears to channel a possible spring that trickles from the small slope above it, although it is unclear where the ditch once led to. This feature may have been used for water control. Its age is undetermined.

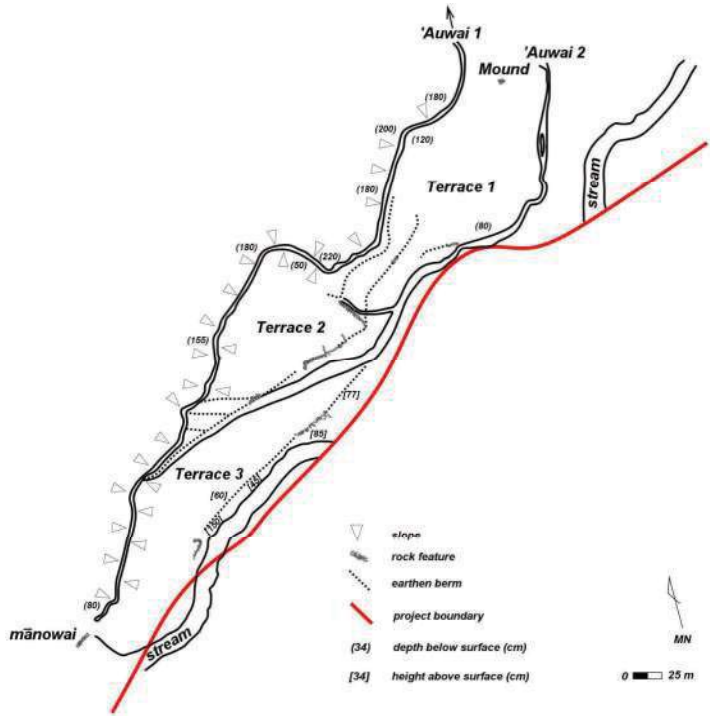

Figure 34. Feature 08920c agricultural system, plan view drawing.

Figure 35. Feature 08920c ‘Auwai 1, middle section. Orientation is to the southeast.

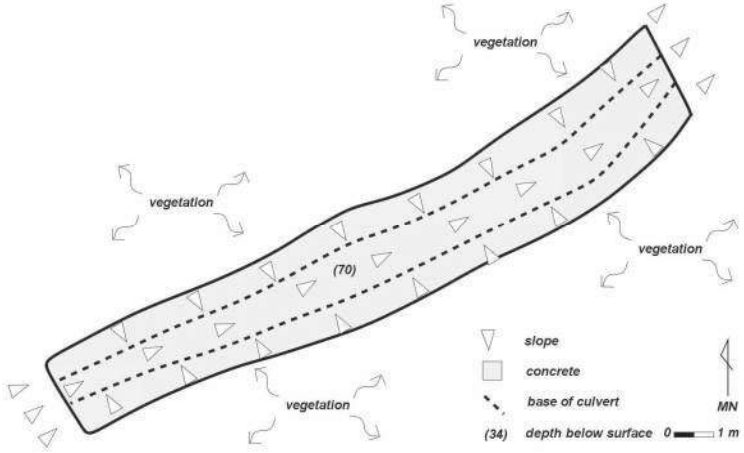

Figure 36. Feature 08920c ‘Auwai 1, plan view drawing of concrete culvert.

Figure 37. Feature 08920c ‘Auwai 1 concrete culvert after vegetation clearance. Orientation is to the northeast.

Figure 38. Feature 08920c modern mānowai. Orientation is to the south.

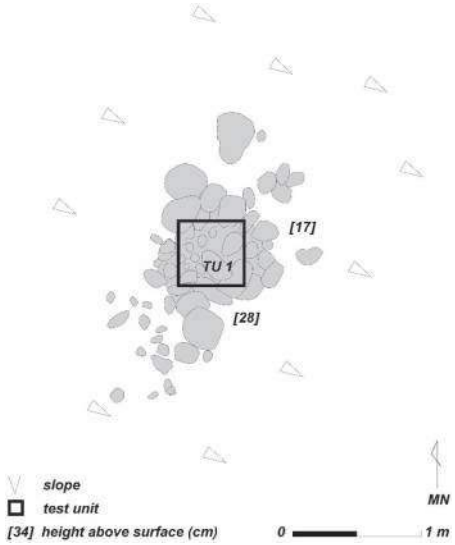

Figure 39. Feature 08920c Mound, plan view drawing.

Figure 40. Feature 08920c Mound. Orientation is to the south.

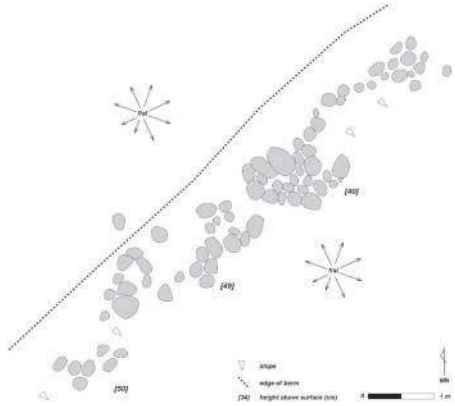

Figure 41. Feature 08920c Terrace 1, portion of central berm, plan view drawing.

Figure 42. Feature 08920c Terrace 1, portion of central berm. Orientation is to the northeast.

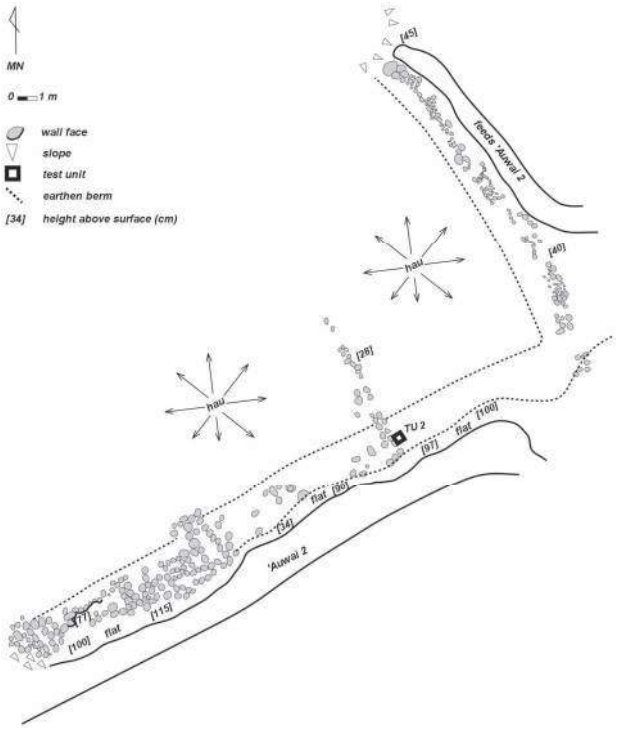

Figure 43. Feature 08920c Terrace 2, east corner, plan view drawing.

Figure 44. Feature 08920c Terrace 2. Orientation is to the northwest.

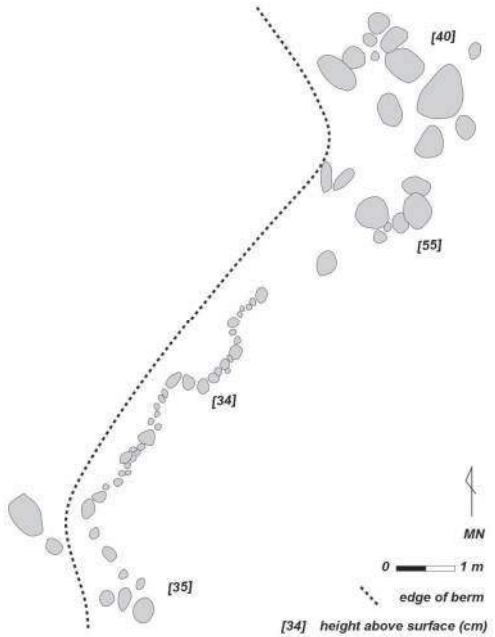

Figure 45. Feature 08920c Terrace 3, south end of the terrace berm, plan view drawing.

Figure 46. Feature 08920c Terrace 3, central portion of berm. Orientation is to the northeast.

Figure 47. Feature 08920d rock wall segments, plan view drawing.

Figure 48. Feature 08920d, northern wall segment. Orientation is to the north.

Figure 49. Feature 08920d, southern wall segment. Orientation is to the south.

Feature 08920e is a terrace remnant located in the central part of the project area along the west side of the stream (see Figure 17). The remnant consists of a linear berm on the south and a retaining wall and drainageway on the northeast (Figure 50). Both are heavily overgrown. The berm is composed of soil with piled cobbles and stones and measures 20 m long, 1.6 m wide, and up to 55 cm tall (Figure 51). The retaining wall is built of cobbles and stones that may have once been stacked but now appear piled and eroding into the stream (Figure 52). It measures 3 m long, 1 m wide, and 134 cm high. An opening that appears to be a drainage into the stream is on the northwest side of the wall. Excavation yielded isolated charcoal, however it was not found within or beneath feature rocks and is therefore not suitable for radiocarbon dating (see Subsurface Testing and Laboratory Results sections). Feature 08920e may be a remnant of an agricultural terrace. Its age is undetermined.

Feature 08920f consists of a possible platform and alignment located in the central part of the project area on the north side of the stream (see Figure 17). The platform is made up of piled cobbles and stones and has been disrupted by a large tree (Figures 53 and 54). Adjacent to the platform is a boulder alignment that forms an elongated C-shape with the platform. The feature measures 4.5 m long, 4.2 m wide, and 60 cm tall. A doll head was found within the rocks of the platform where it adjoins to the alignment (Figure 55). It was left in place. Historic or modern material and scattered charcoal were recovered from within the feature during excavation (see Subsurface Testing and Laboratory Results sections). Based on the collected materials, this feature is historic or modern in age, but its function is of yet undetermined.

Feature 08920g is a C-shaped structure located in the central part of the project area on the north side of the stream (see Figure 17). The feature is composed of a single alignment of cobbles and stones, measuring 2.3 m long, 2.2 m wide, and up to 30 cm high (Figure 56). It is not a very substantial feature (Figure 57) and did not likely function as a habitation structure. Excavations at this feature yielded no findings (see Subsurface Testing section). The age and function of this feature is undetermined.

Feature 08920h is a series of connected C-shaped structures located in the central part of the project area on the north side of the stream (see Figure 17). The feature is made of piled stones and boulders, some of which have fallen over. Several other piled rock walls radiate out from the C-shape to form a series of possibly habitable areas (Figure 58). The structure measures 9 m long, 6 m wide. Excavations yielded a modern glass shard found beneath the rocks of the feature, rendering the C-shape a modern construction (see Subsurface Testing and Laboratory Results sections). It may have functioned as a modern temporary shelter (Figure 59).

Feature 08920i is a cement structure that crosses Waihe‘e Stream near the Feature 08920j terrace complex (see Figure 17). The cement spans 9.2 m of the stream in an east to west orientation (Figure 60). It measures roughly 7 m at its widest point, and is up to 60 cm in height. Stones and boulders are cemented into both the east and west ends, and there is a cement slope in the center (Figure 61). A USGS stream gaging station lies 2 m to the southeast, on the east bank of the stream. Feature 08920i is a water control feature that may be historic in age.

Feature 08920j is a terrace complex located along the eastern boundary of the project area, east of the stream (see Figure 17). The system is made up of a large terrace, two small terraces, and an ‘auwai (Figures 62 and 63). The large terrace abuts the project boundary on the south and the complex continues farther south, outside the survey area. The large terrace is composed of an earthen berm with some areas reinforced with rock. The maximum height of this berm is 2 m, and its slope covers a width of approximately 5 m. The northern small terrace steps down from the large terrace on the north. It exhibits a much narrower earthen berm that has a maximum height of 1.90 m (Figure 64). The southern small terrace exhibits a wall made up of piled stones and cobbles up to 45 cm tall, with

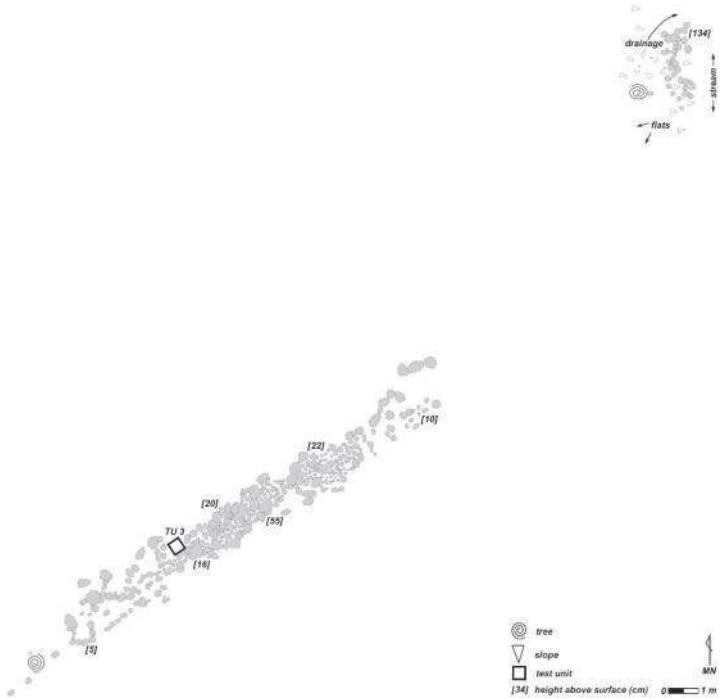

Figure 50. Feature 08920e terrace remnant, plan view drawing.

Figure 51. Feature 08920e terrace remnant (berm). Orientation is to the northeast.

Figure 52. Feature 08920e terrace remnant (retaining wall). Orientation is to the south.

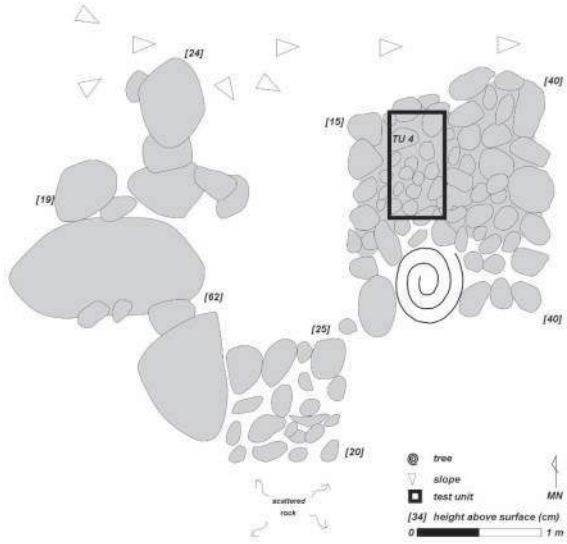

Figure 53. Feature 08920f platform (right) and alignment (left), plan view drawing.

Figure 54. Feature 08920f. Orientation is to the south.

Figure 55. Close up of doll head at Feature 08920f. The face was originally turned toward the interior of the structure and was returned to its original position after the photo was taken. Orientation is to the south.

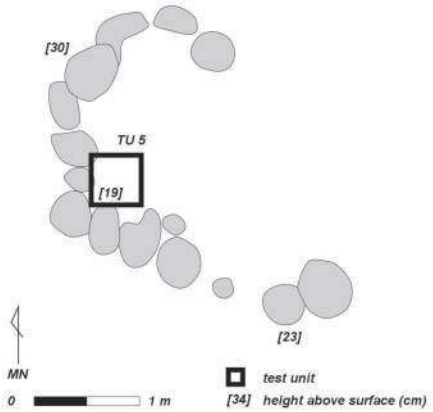

Figure 56. Feature 08920g C-shaped structure, plan view drawing.

Figure 57. Feature 08920g. Orientation is to the southeast.

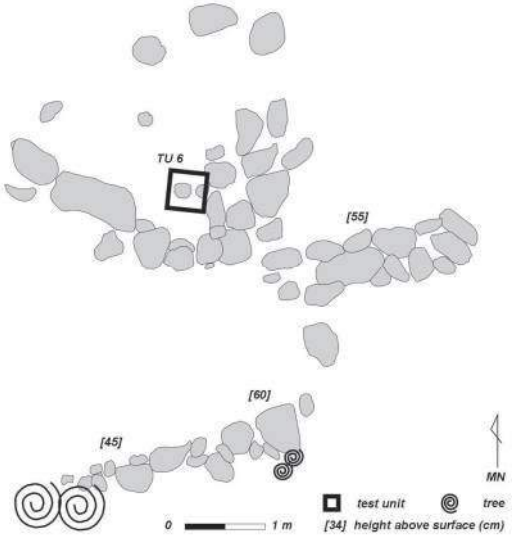

Figure 58. Feature 08920h C-shaped structures, plan view drawing.

Figure 59. Feature 08920h northern C-shaped structure. Orientation is to the east.

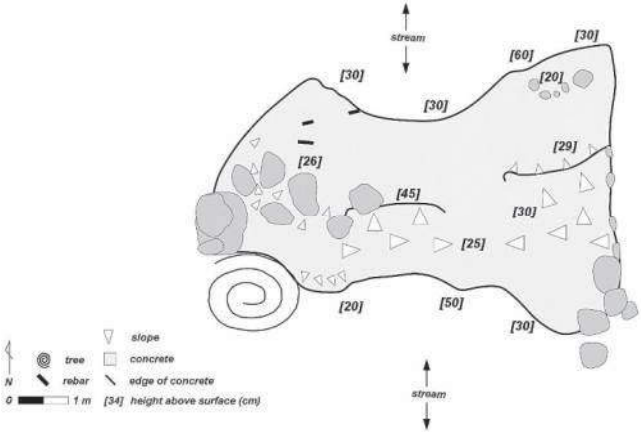

Figure 60. Feature 08920i cement feature, plan view drawing.

Figure 61. Feature 08920i. Orientation is to the east.

one section of two-course stacking. The ʻauwai segment runs along the east side of this terrace (Figure 65) and extends out of the project area to the northeast. The south end of the ʻauwai transitions into an old road (see Feature 08920l), although on a 1936 map it continues to the stream (see Figure 11). As a whole, the complex measures approximately 120 m long and 90 m wide. A 1937 TMK map shows the ʻauwai extending along the eastern project boundary and turning west to meet the stream (see Figure 17). Excavations at the feature yielded volcanic glass and scattered charcoal; wood taxa identification of the charcoal was inconclusive, rendering the sample not suitable for radiocarbon dating (see Subsurface Testing and Laboratory Results sections). The complex is visible on a 1936 map, where 31 terraces and an ʻauwai are depicted (see Figure 11). It is likely that most of the terraces have eroded so badly that they are not identifiable in the heavy vegetation that has overtaken the area. The Feature 08920j complex likely functioned as a wetland agricultural system of undetermined age, but at least dating to 1936.

Feature 08920k is a terrace complex located along the western boundary of the project area, just west of the access road (see Figure 17). A stone-faced retaining wall runs roughly north-south, and the area above the retaining wall is flat, suggesting a terrace (Figure 66). This wall is composed of cobbles and stones stacked 2–7 courses high. A perpendicular wall divides this terrace from another lower terrace to the north (see Figure 66). This perpendicular wall becomes less substantial toward the west, where only the tops of a few rocks are visible on the surface. It is likely that much of this wall is buried. An earthen ditch runs below the two terraces (Figure 67) but is cut off on the south by the access road, suggesting that the ditch pre-dates the road. The complex in total is approximately 40 m long by 30 m wide, with the tallest portion of wall measuring 110 cm. It is heavily overgrown with ginger, and although the entire ginger patch was walked and the identified walls were cleared of vegetation, it is possible that there are additional walls of the system that are low or buried that were not found during the survey. Excavations at this feature did not collect anything to determine age or function of the terrace complex (see Subsurface Testing section). A turn-mold glass bottle was wedged within the main wall of this terrace (see Laboratory Analysis section), although this would not necessarily point to a post-contact construction date for the wall. A 1936 map shows two LCAs in the Feature 08920k vicinity (see Figure 11). While loʻi systems are depicted in other areas of this map, none are shown at the Feature 08920k location, suggesting that the feature dates to a later time. This feature likely functioned as a wetland agricultural system, the age of which is undetermined, but possibly dating to the historic period.

Feature 08920l consists of a dirt road remnant located in the southern part of the project area, south of the stream (see Figure 17). The road is characterized by a flat swath that cuts through the natural slope (Figures 68 and 69). Stone facing was noted on the downslope side just outside the project area to the east, and several metal pipe remnants were found along the road (Figure 70). The road

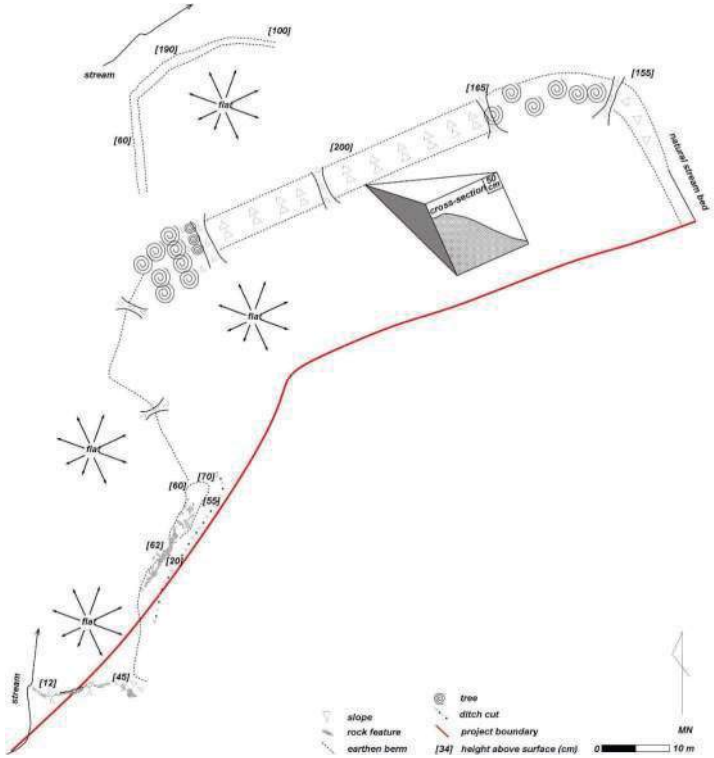

Figure 62. Feature 08920j terrace complex, plan view drawing.

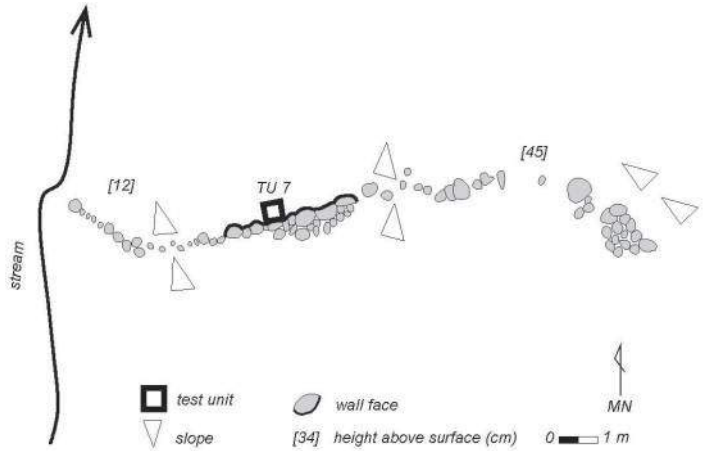

Figure 63. Portion of Feature 08920j, southernmost terrace, plan view drawing; closer view to show test unit location.

Figure 64. Feature 08920j berm of small terrace on the north. Orientation is to the east.

Figure 65. Feature 08920j ʻauwai. Orientation is to the southwest.

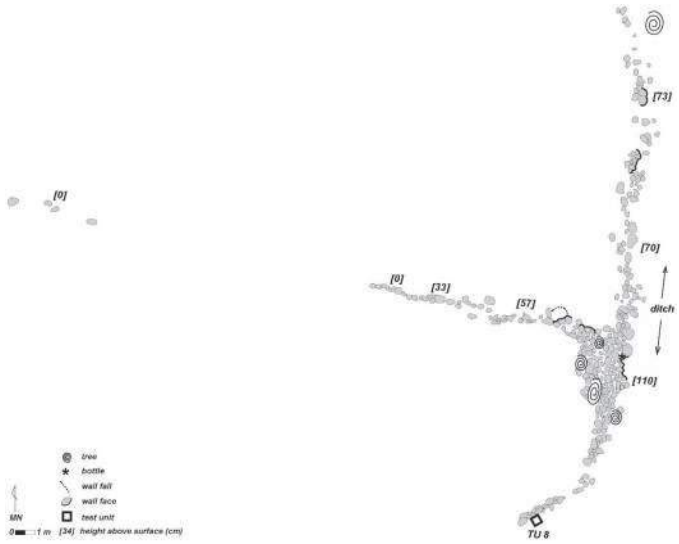

Figure 66. Feature 08920k terrace complex, plan view drawing.

Figure 67. Feature 08920k south end of wall and ditch. Orientation is to the north.

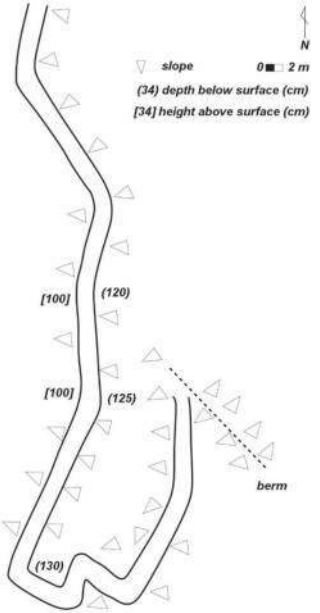

Figure 68. Feature 08920l old road, plan view drawing.

Figure 69. Feature 08920l. Orientation is to the southwest.

Figure 70. Feature 08920l, example of metal pipe along the old road. Orientation is to the south.

measures 2–3 m wide and approximately 150 m long. The north end begins at the ʻauwai of the Feature 08920j agricultural system, then the road continues, contouring the slope until it makes a U-turn and ends at a soil berm on the south. It is possible that this is the road illustrated in Figure 20 labeled as "20 ft. Road & Pipeline Easement," although the alignment depicted on the map does not exactly match what was followed on the ground, and the Feature 08920l road is not 20 ft. (6 m) wide. Feature 08920l is likely historic and may have been used to install and/or maintain the pipeline.

In summary, SIHP 08920 includes 12 features. These consist of terraces, water control features, C-shaped structures, an old road, historic structural remnants, and a possible platform. The largest feature of the site is a wetland agricultural complex with two ʻauwai, multiple terraces, and a mound.

Overall the site is in poor to fair condition; many of the features are severely overgrown and suffer from erosion. Several of the SIHP 08920 features may be historic in age, while the age of most features is undetermined. After subsurface testing, one of the features was determined to be modern (Feature 08920h), while another is thought to be natural (08920c Mound). The site may represent use of the area from traditional times to the present.

Subsurface Testing

The subsurface testing strategy was approved by SHPD before testing began. A total of eight test units were excavated to determine the presence or absence of subsurface archaeological deposits or material (Table 2; see individual feature plan view drawings for test unit locations). All units were excavated by hand and were terminated at a compact layer of sterile soil with saprolitic rock unless otherwise noted. No archaeological deposits were found; charcoal and cultural material were very sparse. Stratigraphy consisted entirely of natural alluvial deposits (Table 3).

Table 2. Test Unit Data

Test Unit	Feature #	Description	Function	Age	TU Size (cm) and Location	Data Recovered
TU 1	08920c	Mound	natural	N/A	50x50 over mound	none
TU 2	08920c	Terrace 2	wetland ag	undetermined	50x50 abutting terrace wall	charcoal found beneath wall; wood taxa identification inconclusive; not suitable for dating
TU 3	08920e	terrace remnant	agriculture	undetermined	50x50 abutting terrace wall	isolated charcoal found-not within or beneath feature rocks; not suitable for dating
TU 4	08920f	platform and alignment	undetermined	historic or modern	50x100 over platform	charcoal, rust fragments, and bullet casing found within feature rocks
TU 5	08920g	possible C-shape	undetermined	undetermined	50x50 inside C-shape	none
TU 6	08920h	possible C-shape	possible temporary shelter	modern	50x50 inside C-shape	modern glass beneath feature rocks
TU 7	08920j	Loʻi and ʻauwai	wetland ag	undetermined	50x50 abutting terrace wall	isolated charcoal and volcanic glass found-not beneath terrace wall; wood taxa identification inconclusive; not suitable for dating
TU 8	08920k	Loʻi	wetland ag	undetermined	50x50 abutting terrace wall	none

Table 3. Soil Descriptions

Test Unit	Layer	Depth (cmbs)	Color	Description	Interpretation
TU 1	I	0–30+	10YR 3/3 dark brown	Sandy clay loam; 6% roots, 60% rocks; saprolitic rock; base of excavation.	Natural Alluvium
TU 2	I	0–17+	10YR 2/2 very dark brown	Clay; 1% roots, 50% rocks; isolated, scattered charcoal at 14 cmbs, saprolitic rock; base of excavation.	Natural Alluvium
TU 3	I	0–48+	10YR 2/2 very dark brown	Clay loam; 10% roots, 7% rocks; isolated, scattered charcoal at 25 cmbs; saprolitic rock; base of excavation.	Natural Alluvium
TU 4	I	0–50+	10YR 3/4 dark yellowish brown	Clay; 15% roots, 15% rocks; modern or historic debris; isolated, scattered charcoal; base of excavation.	Natural Alluvium
TU 5	I	0–53+	10YR 3/2 very dark grayish brown	Sandy loam; 20% roots, 5% rocks; saprolitic rock; base of excavation.	Natural Alluvium
TU 6	I	0–40+	10YR 3/2 very dark grayish brown	Clay loam; 10% roots, 30% rocks; modern debris; saprolitic rock; base of excavation.	Natural Alluvium
TU 7	I	0–52+	10YR 2/2 very dark brown	Loamy clay; 6% roots, 5% rocks; isolated scattered charcoal and volcanic glass; base of excavation.	Natural Alluvium
TU 8	I	0–38+	10YR 3/2 very dark grayish brown	Clay loam; 30% roots, 30% rocks; base of excavation.	Natural Alluvium

TU 1 was excavated at Feature 08920c Mound, roughly in the center of the rock mound (see Figure 39). The unit measured 50 x 50 cm wide and was excavated to 30 cm below surface (cmbs). Stratigraphy consisted of a single deposit of natural alluvium (Figures 71 and 72). This deposit was a dark brown (10YR 3/3) sandy clay loam. No archaeological deposits or cultural material were identified. Excavation was stopped because the steep topography, culturally-sterile stratigraphy, and occurrence of saprolitic rock suggests a natural rock outcrop rather than a cultural feature.

TU 2 was placed at Feature 08920c Terrace 1, against a terrace wall (see Figure 43). The unit measured 50 x 50 cm and was excavated to 17 cmbs, where saprolitic rock was prevalent. Excavation proceeded beneath the rocks of the terrace wall to recover material suitable for dating. Isolated scattered charcoal was collected from beneath the rocks of the wall at 14 cmbs (see Laboratory Analysis). Stratigraphy consisted of a single deposit of natural alluvium (Figures 73 and 74). This deposit was a very dark brown (10YR 2/2) clay. No archaeological deposits or cultural material were identified, aside from the few small pieces of scattered charcoal.

TU 3 was placed at Feature 08920e, against a rock wall (see Figure 50). The unit measured 50 x 50 cm and was excavated to 48 cmbs, where saprolitic rock was prevalent. Isolated scattered charcoal was collected from the unit at 25 cmbs, not beneath the rocks of the wall (see Laboratory Analysis). Excavation proceeded beneath the rocks of the wall to recover material suitable for dating, although none was found. Stratigraphy consisted of a single deposit of natural alluvium (Figures 75 and 76). This deposit was a very dark brown (10YR 2/2) clay loam. No archaeological deposits or cultural material were identified, aside from the few small pieces of scattered charcoal.

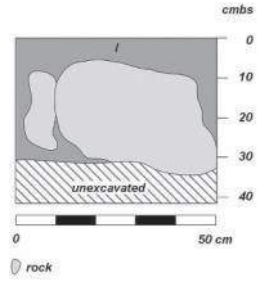

Figure 71. TU 1 at Feature 08920c Mound, east face profile drawing.

Figure 72. TU 1 east face profile photo.

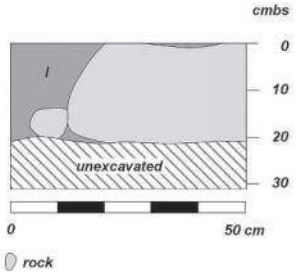

Figure 73. TU 2 at Feature 08920c Terrace 2, south face profile drawing.

Figure 74. TU 2 south face profile photo.

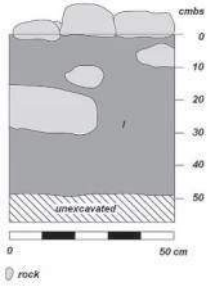

Figure 75. TU 3 at Feature 08920e, south face profile drawing.

Figure 76. TU 3 south face profile photo.

TU 4 was placed at Feature 08920f, on top of the rock platform (see Figure 53). The unit initially measured 50 x 50 cm and was extended to 50 x 100 cm to get farther into the interior of the platform. Three courses of rock were removed before the ground surface was exposed, and excavation extended to 50 cmbs, where saprolitic rock was prevalent. Stratigraphy consisted of a single deposit of natural alluvium (Figures 77 and 78). This deposit was a dark yellowish brown (10YR 3/4) clay. Isolated, scattered charcoal and materials that are possibly modern or historic were collected from beneath the rocks of the platform (see Laboratory Analysis). No archaeological deposits were identified.

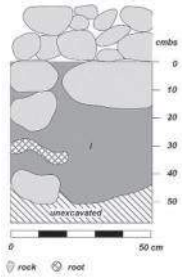

Figure 77. TU 4 at Feature 08920f, north face profile drawing.

Figure 78. TU 4 north face profile photo.

TU 5 was placed at Feature 08920g, within the interior of the C-shaped structure, abutting the rocks of the structure (see Figure 56). The unit measured 50 x 50 cm and was excavated to 53 cmbs, where saprolitic rock was prevalent and excavation was impeded by tightly packed cobbles and stones. Excavation proceeded beneath the rocks of the wall to recover material suitable for dating, although none was found. Stratigraphy consisted of a single deposit of natural alluvium (Figures 79 and 80). This deposit was a very dark grayish brown (10YR 3/2) sandy loam. No archaeological deposits or cultural material were identified.

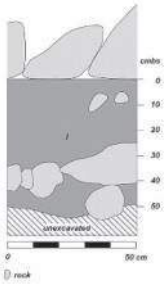

Figure 79. TU 5 at Feature 08920g, west face profile drawing.

Figure 80. TU 5 south face profile photo.

TU 6 was placed at Feature 08920h, within the interior of the most prominent C-shaped structure, abutting the rocks of the structure (see Figure 58). The unit measured 50 x 50 cm and was excavated to 40 cmbs, where saprolitic rock was prevalent. Excavation proceeded beneath the rocks of the wall to recover material suitable for dating, although none was found. A fragment of modern glass was recovered from 16 cmbs, beneath the rocks of the C-shape (see Laboratory Analysis). Stratigraphy consisted of a single deposit of natural alluvium (Figures 81 and 82). This deposit was a very dark grayish brown (10YR 3/2) clay loam. No archaeological deposits or cultural material were identified, aside from the piece of modern glass.

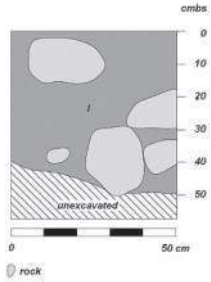

Figure 81. TU 6 at Feature 08920h, east face profile drawing.

Figure 82. TU 6 east face profile photo.

TU 7 was placed at Feature 08920j, against a terrace wall (see Figure 63). The unit measured 50 x 50 cm and was excavated to 52 cmbs, where saprolitic rock was prevalent. Scant isolated scattered charcoal and volcanic glass were collected from the unit between 30 and 52 cmbs, not beneath the rocks of the wall (see Laboratory Analysis). Excavation proceeded beneath the rocks of the wall to recover material suitable for dating, although none was found. Stratigraphy consisted of a single deposit of natural alluvium (Figures 83 and 84). This deposit was a very dark brown (10YR 2/2) loamy clay. No archaeological deposits were identified.

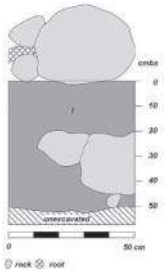

Figure 83. TU 7 at Feature 08920j, south face profile drawing.

Figure 84. TU 7 south face profile photo.

TU 8 was placed at Feature 08920k, against a terrace wall (see Figure 66). The unit measured 50 x 50 cm and was excavated to 38 cmbs, where the unit started flooding with water and further excavation was impeded by large, tightly packed rocks (Figure 85). There was no other suitable place to excavate this feature, as shallow standing or running water was visible on the surface at all other walls of the terrace. Stratigraphy consisted of a single deposit of natural alluvium (Figures 86 and 87). This deposit was a very dark grayish brown (10YR 3/2) clay loam. No archaeological deposits or cultural material were identified.

Figure 85. TU 8 at Feature 08920k, plan view, base of excavation.

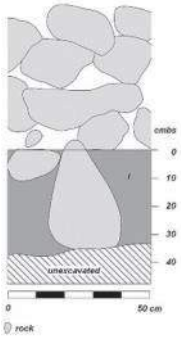

Figure 86. TU 8 at Feature 08920k, west face profile drawing.

Figure 87. TU 8 west face profile photo.

Laboratory Results

A small assemblage of traditional and historical material was collected during the archaeological inventory survey. Most of the assemblage consists of glass bottles, however a single ceramic artifact, several metal items, two fragments of volcanic glass, and scattered charcoal were also collected. A total of 27 items were collected and given accession (Acc.) numbers (Appendix A).

Traditional Artifacts

Two fragments of volcanic glass were recovered from 30–52 cmbs within TU 7 at Feature 08920j (Acc. 21a and 21b). They are small fragments (Figure 88), together weighing .8 g. Volcanic glass was used in food preparation, processing of plant materials, and in fine woodworking (Barrera and Kirch 1973). It is not uncommon to find volcanic glass in lo‘i sites; for example in a study of lo‘i in Wailau, Moloka‘i, McElroy (2007:195) recovered volcanic glass from seven of 13 lo‘i systems investigated.

Figure 88. Volcanic glass from TU 7 at Feature 08920j (Acc. 21a, left; and Acc. 21b, right).

Historic Artifacts

In total, 22 possible historic artifacts were collected (see Appendix A). Artifacts that were sufficiently old – produced or in use at least 50 years before present – and of a diagnostic nature will be discussed further in this section. These consist of 20 items: 15 glass items, one fragmented ceramic bowl, and four metal items. A modern glass shard recovered from TU 6 and a non-diagnostic rusted piece of metal from TU 4 will not be discussed further. Historic material was found on the surface and in within one test unit, with most of the artifacts concentrated on the surface around Feature 08920b (Table 4).

Glass

All terminology used here to describe glass artifacts and determine their dates has been taken from *The Parks Canada Glass Glossary* (Jones and Sullivan 1989), in tandem with the *IMACS User’s Guide* (1992a) maintained by the Department of Anthropology at the University of Utah, and the “Historic Glass Bottle Identification & Information Website” (Lindsey 2019a) maintained by Bill Lindsey. For bottles particular to Hawai‘i, *Hawaiian Bottles of Long Ago* (Elliot and Gould 1988) and *The Handbook of Hawaiian Machine Made Soda Bottles* (Millar 1986) were consulted. The 15 glass artifacts consisted entirely of containers (bottles and jars).

Glass Bottle Dating: Mold Seams, Finishes, and Manufacturer’s Marks

There have been three major technological innovations in the manufacture of container glass – which will hereafter be used interchangeably with the term “bottle” - that are key to dating such artifacts. The free-blowing of glass, using a blowpipe alone has a history that goes back into deep antiquity, making such vessels datable with great certainty. Its popularity greatly tapered off as newer methods provided more standardized bottle shapes and sizes. In the United States free-blown utilitarian bottles generally pre-date 1860. From ca. 1650, the mold-blowing of bottles was introduced to the industry. This method involved glass being blown into a square one-piece mold that gave the bottle its body shape, while its finish (lip and bore) was shaped by hand. Later datable developments in mold technology include: 1730s – the first use of dip molds in making cylindrical English ‘wine’ bottles (bulge seam around the shoulder, no embossed label); 1750 – introduction of a 2-piece hinged mold (seams down opposite sides/corner run below finish to cross the base on the diagonal, embossed labels on shoulder/base only); 1822 – invention of the 3-piece Rickets mold (seams down opposite sides of body from below finish to circular seam on base); ca. 1850 – 3-piece cup-bottom mold introduced (seams down opposite sides of body from below finish to seam encircling heel); 1870s - ‘turn-molds’ introduced for making ‘seamless’ cylindrical bottles (highly polished, perfectly circular in horizontal cross-section) [e.g., Acc. 1 (Figure 89)] (Jones and Sullivan 1989; Lindsey 2019b; IMACS 1992a).

Table 4. Number of Artifacts Recovered from each Feature by Material

Feature and Layer	Glass	Ceramics	Metal	Total
08919a Surface	3	0	0	3
08920b Surface	10	1	3	14
08920f, TU 4 Layer I	0	0	1	1
08920j Surface	1	0	0	1
08920k Surface, within Lo‘i Wall	1	0	0	1

Figure 89. Turn-mold bottle dating from 1880–1910 found within the wall of Feature 08920k (Acc. 1).

The glassmaking industry experienced profound change as automation was introduced. By 1904 the Owens fully automatic bottle machine had been patented (sometimes broken seams on opposite sides of the body run all the way up and over the finish, circular suction scar on base) [e.g., Acc. 2 (Figure 90)]. Automation got its start with the slightly earlier development of the semi-automatic press-and-blow machines, used from the 1910s onward to produce milk bottles and other wide-mouth food jars (smooth, circular mark on center of base). By 1920 the use of machines had entirely replaced older methods of glass bottle manufacture in North America. This advance removed the human glassblower from the bottle-making equation entirely (Jones and Sullivan 1989; Lindsey 2019a). Machine-made glass bottles dating from ca. 1920 onward are generally of a more uniform thickness, without the internal bubbling seen in the earliest products of automation (IMACS 1992a).

Automatic bottle machines formed bottles in their entirety, from base to finish (body seams run all the way up and over the finish). The standardizations made possible by machine-making saw the decline of the cork stopper, except for wine and liquor, in favor of screw caps and crown finishes from 1930 onward [e.g., Acc. 3 (Figure 91)] (Jones and Sullivan 1989; Lindsey 2019c).

Manufacturer marks located on the base and/or heel of mold-blown and machine-made bottles enable, when present, the pinpointing of a bottle's date of production. Variations in company names or logos, as well as plant and date codes, can narrow it down to the exact year a bottle rolled off the assembly line [e.g., Acc. 15 (Figure 92)] (Lindsey 2019d). The Ricketts & Co. Glassworks, the same that had patented the 3-piece mold, was among the first to emboss bottle bases with their company name in the 1820s. By the 1850s, these maker's marks could move from the resting point to the center of a mold-blown bottle's base. This was possible because the recently developed snap-case could hold a bottle for finishing without marring its base, as the previously used pontil rod inevitably had (Lindsey 2019b). While some glass bottle makers were including the rare date code on bottles in the latter half of the 19th century, date codes only became the norm on soda and milk bottles around 1930. By 1934, federal law in the U.S. required date codes on liquor bottles. Subtle changes in the glass company names and logos, as well as manufacturing date codes on bottle bases, further refine the dating of bottles from the 1940s onward (Lockhart and Hoenig 2018:15; Lindsey 2019d).

Innovations in bottle labeling technology are datable, as well: 1650s—individuals and taverns begin having their names/monograms/dates stamped into glass seals affixed to the bodies of 'wine' bottles (applied glass blob impressed with design from intaglio seal to create embossing while the glass is still hot); 1750−bottle bodies themselves became embossable with the introduction of the 2-piece

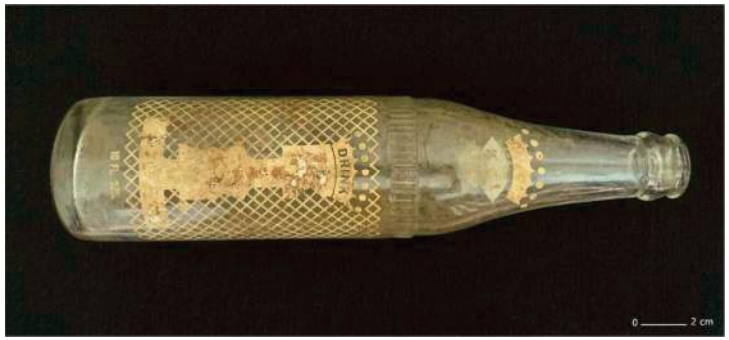

Figure 90. Honolulu Soda Water Co. Ltd. bottle dating to 1966, found on the surface near Feature 08919a (Acc. 2).

Figure 91. Coca-Cola bottle dating to 1967, found on the surface near Feature 08919a (Acc. 3).

Figure 92. Carboy dating to 1951, found on the surface at Feature 08920b (Acc. 15).

mold; 1822—the Ricketts mold allowed for the embossing of bottle shoulders; 1868—plate molds made it possible to emboss interchangeable labels, representing unique bottle contents, onto the bodies of standardized bottles (seam around the embossed label on the side of the body); 1934—applied color labels (ACL) were introduced in designs specific to given brand names (bottle contents labeled with baked-on enamel) [e.g. Acc. 2 (see Figure 90)] (Hume 1969; Jones and Sullivan 1989). The carefully researched evolutions in form and decoration (labeling) of bottles used by specific bottling companies for particular contents (household products, medicines, sodas, beers, milk bottles, etc.) can also be used to pin down a date range for the production of a bottle (Elliott and Gould 1988; Jones and Sullivan 1989; Lindsey 2019a, b, c, d; Lockhart and Hoenig 2016; Lockhart et al. 2013a, 2013b).

Other datable features that appear on bottles include: 1933–1964—the embossing of a statement to the effect that "Federal Law Prohibits the Sale or Reuse of this Bottle" on liquor bottles, as mandated by post-prohibition legislation in the U.S. (Lindsey 2017d); 1938—beer bottles marked as non-returnable/non-refillable; 1940—"No Deposit-No Return" appearing on soda bottles (e.g., Acc. 13) (Antiquities Section of the Utah Division of State History 2015). In Hawai'i, designation of the bottling location with certain abbreviations can also be used to date bottles: pre-1898—H.I. (Hawaiian Islands) or S.I. (Sandwich Islands); ca. 1898–1959—H.T. or T.H. (Territory of Hawaii). Particular colors of glass can be highly diagnostic as well, given known dates for the invention of the chemical for methods that produced them: 1880–1924—amethyst (purple) from the addition of manganese; 1914–1930s—honey/wheat (pale amber) from the addition of selenium. Other colors became more popular for particular bottle forms at given periods: 1890—milk (opaque white) glass became more popular for cosmetics bottles and jars; 1890—cobalt (blue) became more popular for medicine bottles (Jones and Sullivan 1989; IMACS 1992a).

These features were called on in determining the earliest possible date of production for each of the 15 glass bottles or fragments that were accessioned. All 15 glass artifacts were container glass (bottles) that were dated. These results were then sorted by quarter-century to determine the

chronological time frame of the assemblage (Table 5). Note that most of the bottles were not dated to a precise date, but instead to a range; in these cases, the earliest date for the item was used. Most items dated to 1925 or later (n=12), with only a few coming from earlier time periods (n=3) (see Table 5). All ten artifacts from Feature 08920b dated to 1934 or later. The oldest glass bottle was found wedged within the wall of Feature 08920k. This was a turn-mold bottle that dated from 1880–1910 [Acc. 1 (see Figure 89)].

Table 5. Earliest Production Dates for Glass Bottles (n=15)

Earliest Probable Date	Number of Items
1850–1874	1
1875–1899	0
1900–1924	2
1925–1949	8
1950–1974	4

Glass Bottle Use: Form, Function, Decoration

The technological changes in glassmaking outlined above were driven by a desire for greater standardization in the capacity and shape of glass bottles, to better reflect the nature and quantity of their contents, as well as increase efficiency in bottle production (Jones and Sullivan 1989:22). Such standardization reflected the growing commodification of the world, with goods increasingly flowing from producer to consumer through tightly regulated and taxed national and international markets (Johnson 1996:187–196). While the evolution of mouth-blown molds could ensure the ever-more consistent shaping and embellishing of bottle exteriors, it was not until the advent of machine manufacture that internal bottle capacities could be said to be truly uniform from one bottle to another (Jones 1986).

Patent medicines, sold as curatives on the basis of their unique and secretive compositions, were among the first contents for which uniquely shaped bottles were made, as marketing ploys in the 18th century (Griffenhagen and Bogard 1999:72). Undifferentiated olive green "wine" bottles were the standard container used to ship, store, and serve all sorts of alcoholic beverages (wine, beer, cider, spirits) wherever the English had a trade or colonial presence from the late-17th century. By the mid-18th century, English glassmakers were differentiating between squatter beer-style and taller wine-style cylindrical bottles (Jones 1986). As the 19th century progressed, and the use of multi-part molds expanded, bottle forms multiplied and were increasingly tied to specific contents, with both bottle and contents produced in relatively small batches. Bottle form, as well as glass color, was often dictated by the nature of the contents and their use: thicker-walled bottles were employed when intended for repeated reuse, like those filled with beer and soda water; cylindrical brown bottles could handle carbonation and keep damaging sunlight away from beer (e.g., Acc. 4); cylindrical glass bottles of a pale aqua color were capable of withstanding the carbonation while showcasing the healthful purity of soda water and were easier to make after 1863; flanged or patent lips were common to bottles with medicinal contents, as these containers were meant to be opened and resealed frequently with cork or glass stoppers. Trends in the association of glass color with content, including the use of cobalt glass for medicine bottles, continued through the transition to machine production, although the aqua glass of earlier soda water bottles gradually gave way to truly clear glass in many (though not all) soda bottles (Lindsey 2019e; Jones and Sullivan 1989; IMACS 1992a).

Given these historical trends, it was determined that glass color and vessel shape (including finish type) could be used to reliably identify container glass down to at least the general categories of bottle type, related to bottle content, outlined on the "Bottle Typing (Typology) & Diagnostic Shapes" page of the BLM/SHA website. Table 6 gives a typological breakdown of the 15 container glass artifacts by contents.

The 15 bottles include the following:

- 4 Soda / Mineral Water bottles:
  - 1 green turn-mold soda bottle likely produced between 1880 and 1910 [Acc. 1 (see Figure 89)]
  - 1 colorless Honolulu Soda Water Company bottle produced by Owens Illinois Bottling Company in Oakland California in 1966 [Acc. 2 (see Figure 90)] (Lockhart and Hoenig 2018)
  - 1 colorless Coca-Cola bottle produced by Owens Illinois Bottling Company in Oakland California in 1967 [Acc. 3 (see Figure 91)] (Lockhart and Hoenig 2018)
  - 1 colorless machine-made soda bottle produced as early as 1910 (Acc. 5)
- 2 Beer bottles:
  - 1 amber Dainippon Brewing Company bottle, filled between 1911 and 1949 (Acc. 4) (Ross 2009)
  - 1 green Anchor Hocking Glass Company beer bottle produced as early as 1938 (Acc. 13) (Lockhart et al. 2017)
- 7 Jars used for canning:
  - 6 colorless Anchor Hocking Glass Company jars produced as early as 1938 (Acc. 6–11) (Lockhart et al. 2017)
  - 1 colorless Glass Containers Corporation jar produced between 1934 and 1968 (Acc. 12) (Lockhart et al. 2015)
- 2 One-gallon carboys (large containers often used for transporting water or chemicals, or for at-home fermentation of beer/wine):
  - 1 colorless carboy produced in either 1965, 1975, or 1985 (Acc. 14) (Lockhart and Hoenig 2018)
  - 1 colorless carboy produced in 1951 [Acc. 15 (see Figure 92)] (Lockhart and Hoenig 2018)

Table 6. Contents/Use of Glass (n=15)

Glass Use/Contents	Number of Items
Soda/Mineral Water	4
Beer	2
Food	7
Water/Chemicals/Alcohol	2

When considering how bottles moved around in the past, two pieces of retrievable information need to be considered independently. The first is, where the bottle itself was produced. The second is, where the bottle was filled (i.e., its contents "bottled")? Whether or not these questions can be answered depends entirely on what information the bottle itself contains (Schulz and Allen 2016).

For some glass manufacturers (e.g., Owens-Illinois), more specific information on glass plant locations can be gleaned from plant codes included in the maker's marks embossed on bottle bases (Lockhart et al. 2018; Lockhart and Hoenig 2018). For other glass manufacturers, previous research can at least narrow down the location of bottle production to country, and possibly region within that country, based on just the maker's marks (Lockhart et al. 2016, Lockhart et al. 2017).

All of the glass artifacts that could be identified to origin came from either the mainland U.S. (n=12) or from Japan/Korea (n=1 bottle in three fragments) (Table 7). None originated in Hawai'i, a testament to the islands' continued reliance on imported glass (Elliot and Gould 1988:6). Interestingly, while none of the glass bottles were manufactured in Hawai'i, at least one was filled on the islands [Acc. 2 (see Figure 90)]. The only other item that bottling location could be identified was made in Japan or Korea and also bottled there.

Table 7. Origin of Bottle Glass

Origin of Bottle	Number of Artifacts
U.S. Mainland, General	8
Oakland, CA	3
Unidentified	2
Brockport, NY	1
Japan or Korea	1

Ceramics

The general terminology used here to describe the ceramic artifact was taken from *The Archaeologist's Fieldwork Companion* (Kipfer 2007), in tandem with the *IMACS User's Guide* (1992b) maintained by the Department of Anthropology at the University of Utah.

The assemblage contains only a single ceramic artifact, consisting of two fragments of a Japanese porcelain bowl, produced between 1854 and the present-day (Maryland Archaeological Conservation Laboratory 2012). The ceramic fragments were found on the surface within Feature 08920b.

- 2 fragments of a Japanese porcelain bowl of a style still constructed today but originating in the 1854 [Acc. 16 (Figure 93)] (Maryland Archaeological Conservation Laboratory 2012)

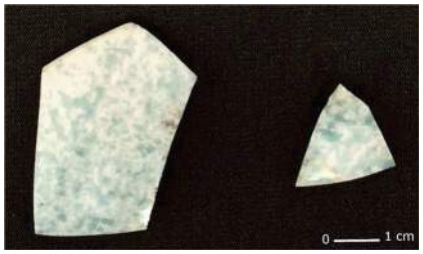

Figure 93. Japanese porcelain bowl fragments dating from 1854–present, found on the surface at Feature 08920b (Acc. 16).

Metal

Metal artifacts found throughout the survey area could have dated from as early as the mid-19th century to the present (Table 8). The metal items consisted of two pieces of stainless steel flatware, an industrial valve, and a .30 caliber carbine cartridge casing. The earliest probable production of the flatware can be placed in the 1920s when stainless steel became a common material for flatware (Britannica 2020). While the valve itself is difficult to date, the threading visible in its production places its earliest possible production in the mid-19th century (Hounshell 1978). The .30 caliber carbine cartridge was first put into production in 1942 as the standard ammunition for the M1 Carbine, a light personal defense weapon issued to infantry in World War II (Barnes 2009). Both pieces of flatware, along with the valve, were found on the surface in association with Feature 08920b. The .30 caliber cartridge casing was found 41 cmbs in TU4, beneath the rocks of Feature 08920f, indicating the 1940s as an earliest possible date for that feature.

Table 8. Metal Items Organized by Earliest Production Date (n=4)

Earliest Probable Date	Number of Items
1850–1874	1
1875–1899	0
1900–1924	2
1925–1949	1
1950–1974	0

In total there were four metal artifacts:

- 1 stainless steel spoon, produced with technology utilized since 1920 (Acc. 17) (Britannica 2020)
- 1 stainless steel butter-knife blade, produced with technology utilized since 1920 (Acc. 18) (Britannica 2020)
- 1 valve, produced with technology utilized since the mid-19th century, the valve itself is more modern in appearance however (Acc. 19) (Hounshell 1978)
- 1 .30 caliber carbine cartridge case, first put into production in 1942 (Acc. 20) (Barnes 2009)

Wood Charcoal

The main purpose of identifying the taxa of wood charcoal is to select short-lived species for radiocarbon dating. The heartwood of large trees can produce dates that are significantly older than the date in which the tree was burned. Selecting short-lived woods for dating reduces the effects of this problem, known as in-built age, or the old wood problem (e.g., Dye 2000). When selecting charcoal for dating, the context where the sample was collected is critical in establishing a relationship between the charcoal and the feature, in this case surface architecture. Charcoal found in excavation at a lower depth than the foundation of a feature provides a terminus post quem, or date before which the feature was not built. Academic literature has underscored the importance of responsible radiocarbon dating in Hawai‘i:

> For many years, Hawaiian archaeologists have labored under the false assumption that it is possible to estimate the age of surface architectural features by dating materials found on, within, or near them. This has resulted in a corpus of ^{14}C dates whose association with particular archaeological events is unclear; in the case of surface architecture this means that the archaeologist has not identified the stratigraphic relationship of the dated material to the base of the structure and so cannot be confident of the relationship between them. (Dye 2010:144)

Determining stratigraphic relationships at surface architecture was particularly difficult during the current excavations, as only one stratigraphic layer was identified in all test units and no subsurface features such as firepits were encountered. For this reason, test units were excavated into the side walls of the units as appropriate, beneath the foundations of the surface architecture, with the goal of recovering material suitable for dating that would provide a terminus post quem.

Four samples of wood charcoal were recovered from excavations (see Appendix A). They were all scattered, isolated fragments, not found within a firepit or other fire-related feature. At TU 2 of Feature 08920c Terrace 2, the charcoal (Acc. 24) was collected from beneath the rocks of the lo‘i wall, and could potentially provide a terminus post quem for the wall (i.e., the wall was not constructed before the charcoal was deposited). At TU 7 of Feature 08920j, charcoal (Acc. 25) was found in association with volcanic glass [Acc. 21a and 21b (see Figure 88)] and could potentially provide a date for use or deposition of the volcanic glass. These two charcoal samples were submitted for wood taxa identification, however results were inconclusive (Appendix B) and therefore they were not submitted for radiocarbon dating.

The other charcoal samples came from TU 3 at Feature 08920e (Acc. 27) and TU 4 at Feature 08920f (Acc. 26). At Feature 08920e, the isolated, scattered charcoal was found within the test unit at a position that was not beneath the wall of the feature. Because the relationship of the charcoal to the surface architecture could not be determined, this sample was not selected for wood taxa identification or radiocarbon dating. At Feature 08920f, modern or historic material was found beneath the rocks of the platform, confirming that the feature is not traditional in age and precluding the need for radiocarbon dating, which is less precise in later years because of increased carbon in the atmosphere.

Summary of Findings

Pedestrian survey of 11.51 ha (28.43 ac.) in Waihe‘e identified two archaeological sites consisting of 15 features. SIHP 08919 is the main access road and two culverts associated with the road. SIHP08920 includes the other archaeological features found within the project area. These consist of terraces, water control features, C-shaped structures, an old road, historic structural remnants, and a possible platform. Subsurface testing yielded volcanic glass, charcoal, historic material, and modern debris. Two charcoal samples were submitted for wood taxa identification but results were

inconclusive. No charcoal was submitted for radiocarbon dating because no samples suitable for dating were identified.

The only two in-situ historic artifacts encountered in the project area were a turn-mold bottle from the lo‘i wall at Feature 08920k and a .30 caliber bullet found 41 at cmbs in TU 4 of Feature 08920f. These artifacts date to as early as the 1880s and 1940s respectively. While context of the bullet indicates a historic to modern age for Feature 08920f, the bottle found within the wall at Feature 08920k may or may not have been placed there at the time it was built. The artifacts found scattered on the surface at Feature 08920b are consistent with early to mid-20th century use of the feature. A fragment of modern glass beneath the rocks of Feature 08920h indicates a modern age for that feature.

The glass collection dated from the late-19th century to the mid 20th-century and was concentrated in the early to mid-19th century. The turn-mold soda bottle found in a terrace wall at 2L was the only bottle made without an automatic bottle machine. Almost all of the glass bottles found were traced to manufacturers in the U.S. Mainland, with only one bottle being produced in Japan. At least one of the soda bottles was bottled locally.

Research questions for the survey can be answered as follows:

1. Are there any vestiges of pre-contact land use within the survey area, particularly lo‘i along Waihe‘e Stream? Where are they located and to what time period do they belong?

Several possibly pre-contact archaeological features, including lo‘i, were found within the survey area. The construction style of the three terrace complexes (Features 08920c, 08920j, and 08920k) is consistent with pre-contact lo‘i (dry-stacked rock walls; roughly rectangular shaped terraces that step down with elevation; ‘auwai to divert stream water). Volcanic glass was recovered from one of the lo‘i excavations (TU 7 at Feature 08920j). This would suggest a pre-contact time period for use of the area, as volcanic glass is not uncommon at pre-contact lo‘i (e.g., McElroy 2007). The context of the find does not definitively date Feature 08920j as a pre-contact structure, however. At Feature 08920k a historic bottle was found within a terrace wall, and the feature is not shown on a 1936 map where other lo‘i are depicted. However, these lines of evidence do not conclusively assign a post-contact age for the wall or the complex. As expected, lo‘i were found not far from Waihe‘e Stream. Feature 08920c is the largest and farthest downstream of the lo‘i complexes. Features 08920j and 08920k are situated on opposite sides of Waihe‘e Stream, at the bend in the project area (see Figure 17).

2. Are there remains of historic-era use of the study area, particularly sites related to rice, sugarcane or pineapple agriculture?

SIHP 08919 dates to the historic era, and it was used for transportation. It consists of a road and two culverts. SIHP 08920 contains six possible historic features. Two of these are water control features (Features 08920a and 08920i), one is a possible pig pen (Feature 08920b), and one is a road (Feature 08920l). These features all incorporate concrete in their construction except for the road, which exhibits rusted metal pipe in places. The Feature 08920f platform is either historic or modern in age, based on material found within the rocks of the feature. The function of Feature 08920f could not be determined. Whereas none of the historic features could be definitively linked to sugarcane or pineapple cultivation, it is likely that the SIHP 08919 road, and possibly the Feature 08920l road were used for transportation of these agricultural products that were known to be cultivated in the valley.

SUMMARY AND RECOMMENDATIONS

An archaeological inventory survey was conducted for the proposed Waihe‘e Lo‘i Restoration and Learning Center on a portion of TMK: (1) 4-7-006:010 and all of TMK: (1) 4-7-006:018, in Waihe‘e Ahupua‘a, Ko‘olaupoko District, on the island of O‘ahu. The archaeological work consisted of a pedestrian survey that covered 91% of the 11.51 ha (28.43 ac.) project area. The remaining 9% was not covered due to vegetation that severely impeded movement and visibility of the ground surface.

Two archaeological sites were identified during pedestrian survey. SIHP 08919 is the main access road and two culverts associated with the road. SIHP 08920 includes the other archaeological features found within the project area. These consist of terraces, water control features, C-shaped structures, an old road, historic structural remnants, and a possible platform. They make up a network of ditches, agricultural features, a possible animal husbandry structure, and a transportation feature (road). Table 9 provides data on the features of the two sites.

Traditional artifacts, historic artifacts, charcoal, and modern debris were collected (see Appendix A). Traditional artifacts consist of two fragments of volcanic glass; historic artifacts were comprised mostly of bottles, although ceramics and metal items were recovered as well. Historic artifacts dated from as early as 1880, although most of the assemblage dated from 1925 and later. Two samples of charcoal were submitted for wood taxa identification but the results were inconclusive, rendering the charcoal not suitable for radiocarbon dating.

Significance Evaluation

Significance assessments for SIHP 08919 and 08920 were conducted following the criteria established in HAR §13-284-6 and are summarized in Table 10.

The criteria of significance are as follows:

> 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:
>
> (1) Criterion “a”. Be associated with events that have made important contribution to the broad patterns of our history;
>
> (2) Criterion “b”. Be associated with the lives of persons important in our past;
>
> (3) Criterion “c”. Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value;
>
> (4) Criterion “d”. Have yielded, or is likely to yield, information important for research on prehistory or history;
>
> (5) 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 13-284-6(b)]

SIHP 08919 retains integrity of location, design, setting, materials, workmanship, feeling, and association. The road and culverts are in their original location and setting, have not changed in design, feeling, or association, and although the features of the site have deteriorated slightly over time, integrity of workmanship generally remains intact. The site is significant under Criterion d of

Table 9. Data for Archaeological Features

Feature #	Description	Function	Age
08919a	road	transportation	historic
08919b	culvert	water control	historic
08919c	culvert	water control	historic
08920a	ʻauwai	water control	historic
08920b	concrete structural remnants	possible animal husbandry	historic
08920c	loʻi	wetland ag	undetermined
08920d	rock wall segments	water control	undetermined
08920e	terrace remnant	agriculture	undetermined
08920f	platform and alignment	undetermined	historic or modern
08920g	possible C-shape	undetermined	undetermined
08920h	possible C-shape	possible temporary shelter	modern
08920i	concrete feature	water control	historic
08920j	loʻi and ʻauwai	wetland ag	undetermined
08920k	loʻi	wetland ag	undetermined, possibly historic
08920l	road remnant	transportation	historic

Table 10. Significance Assessments under HRS Chapter 6e

Site	Description	Function	Retains Integrity	Significance Criteria	Justification
08919	Road and Culverts	Transportation, Drainage	Yes	Not Eligible	Not associated with a significant event or person; does not have distinctive characteristics; not likely to yield important information; not culturally important.
08920	Multi-Function Complex	Agriculture, Water Control, Animal Husbandry, Transportation	Yes	d, e	Potential to yield further information, culturally important. Data gathered does not indicate eligibility under Criteria a, b, or c.

HAR §13-284-6 for its potential to yield further information on early roadways in Hawaiʻi and the post-contact history of Waiheʻe Valley.

Recommendations of Project Effects and Treatment

SIHP 08919 and 08920 are significant under HAR §13-284-6. Site-specific and project-wide recommendations are listed in Table 11.

As the road is still being utilized today, SIHP 08919 may be subjected to periodic maintenance as needed. No further archaeological work is recommended for SIHP 08919, other than archaeological monitoring, which is a project-wide recommendation (see below).

Selected features of SIHP 08920 are slated for rehabilitation. The Secretary of the Interior defines rehabilitation as follows:

> The act or process of making possible a compatible use for a property through repair, alteration, and additions while preserving those portions or features which convey its historical, cultural, or architectural values. (Secretary of the Interior 1995:60)

A preservation plan should be prepared in accordance with HAR §13-277-3 to ensure proper treatment of this sites. The preservation plan should outline which features of the site will be rehabilitated, as well as short and long term preservation measures for these features and the site as a whole.

Additionally, archaeological monitoring is recommended for all parts of the project area 1) to ensure that none of the archaeological sites are impacted during construction; 2) to determine if archaeological features are located within the areas that could not be surveyed due to heavy vegetation; and 3) for the possibility of encountering buried archaeological features or deposits, even if none were found during subsurface testing. An archaeological monitoring plan should be prepared for the property in accordance with HAR §13-279-4. It is possible that human remains may be discovered during construction activities, even though no such evidence was found during the survey. Should human burial remains be discovered during construction activities, work in the vicinity of the remains should cease and the SHPD should be contacted.

SIHP 08920 in general retains integrity of location, design, setting, materials, workmanship, feeling, and association. The features of the site are in their original location and setting, have not changed in feeling or association, and although several features are in poor condition, integrity of design and workmanship generally remain intact for the site as a whole. The site is significant under Criteria d and e of HAR §13-284-6 for its potential to yield further information on the pre- and post-contact history of Waiheʻe Valley, and for its cultural importance. The loʻi systems are of particular cultural importance as the ditches are still utilized by farmers today, and the ancient loʻi may be rehabilitated to be functional again.

Table 11. Recommended Current and Future Treatment Measures and Mitigation Commitments

Location	Recommended Treatment Measures and Mitigation Commitments
SIHP 08919	• Maintenance to road and culverts as needed • Archaeological monitoring
SIHP 08920	• Possible rehabilitation of selected features • Preservation plan • Archaeological monitoring
Entire Project	• Archaeological monitoring

GLOSSARY

ahupua‘a Traditional Hawaiian land division usually extending from the uplands to the sea.

‘āina Land.

ali‘i Chief, chiefess, monarch.

‘auwai Ditch, often for irrigated agriculture.

‘awa The shrub *Piper methysticum*, or kava, the root of which was used as a ceremonial drink throughout the Pacific.

hala The indigenous pandanus tree, or *Pandanus odoratissimus*, which had many uses in traditional Hawai‘i. Leaves were used in mats, house thatch, and basketry; flowers were used for their perfume; keys were utilized in lei and as brushes; roots and leaf buds were used medicinally; and wood was fashioned into bowls and other items.

hale House.

hau The indigenous tree *Hibiscus tiliaceous*, which had many uses in traditional Hawai‘i. Sandals were fashioned from the bark and cordage was made from fibers. Wood was shaped into net floats, canoe booms, and various sports equipment and flowers were used medicinally.

he‘e Octopus (*Polypus* sp.).

heiau Place of worship and ritual in traditional Hawai‘i.

hoa‘āina Native tenants that worked the land.

Kahiki A far away land, sometimes refers to Tahiti.

kalo The Polynesian-introduced *Colocasia esculenta*, or taro, the staple of the traditional Hawaiian diet.

kapu Taboo, prohibited, forbidden.

konohiki The overseer of an ahupua‘a ranked below a chief; land or fishing rights under control of the konohiki; such rights are sometimes called konohiki rights.

kuhina nui Prime minister or premier. Ka‘ahumanu was the first kuhina nui. The position was abolished in 1864.

kula Plain, field, open country, pasture, land with no water rights.

kuleana Right, title, property, portion, responsibility, jurisdiction, authority, interest, claim, ownership.

limu Refers to all sea plants, such as algae and edible seaweed.

lo‘i, lo‘i kalo An irrigated terrace or set of terraces for the cultivation of taro.

Māhele The 1848 division of land.

maka‘āinana Common people, or populace; translates to “people that attend the land.”

mākāhā A fishpond sluice gate.

makai Toward the sea.

mānowai Part of a loʻi system that is composed of a structure that slows water without damming it completely. The mānowai functions to channel water by breaking it up into smaller streams. Lit., the cardiovascular or circulatory system.

mauka Inland, upland, toward the mountain.

mele Song, chant, or poem.

mōʻī King.

moʻo Lizard, dragon, water spirit.

moʻolelo A story, myth, history, tradition, legend, or record.

muliwai River mouth, estuary, or pool near the mouth of a stream, enlarged by ocean water left there at high tide.

ʻōlelo noʻeau Proverb, wise saying, traditional saying.

oli Chant.

olonā The native plant *Touchardia latifolia*, traditionally used for making cordage.

pre-contact Prior to A.D. 1778 and the first written records of the Hawaiian Islands made by Captain James Cook and his crew.

terminus post quem A date earlier than an archaeological event of interest.

ʻulu The Polynesian-introduced tree *Artocarpus altilis*, or breadfruit.

wauke The paper mulberry, or *Broussonetia papyrifera*, which was made into tapa cloth in traditional Hawaiʻi.

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APPENDIX A: ARTIFACT INVENTORY

Glass

Acc.	Fe.	Depth (cmbs)	Description	L / W (cm)	Type	Contents	Brand	Bottling Location	Bottling Date	Color	Portion	Finishing Method / Shape	Label Type / Labeling	Embossed Base Markings	Glass Manufacturer	Origin of Bottle	Bottle Manufacture Date
1	089 20k	Surface	Green bottle found in the terrace wall	24 / 6.5	Soda / Mineral Water / Lager Beer	Mineral Water / Lager Beer	--	--	--	Green	Whole	Applied / Blob	--	--	--	--	1870 - 1910 (1880 -1910)
2	089 19a	Surface	Colorless soda bottle	24.7 / 5.8	Soda / Mineral Water	Soda	Honolulu Soda Water Co. Ltd	Honolulu, HI	--	Colorless	Whole	Machine / Crown	ACL / A stylized crown with "DRINK" written upon it superimposed on a cross-hatched background.	"20 Ⓒ 66" / "183 * 2 - 6"	Owens Illinois	Oakland, CA	1966
3	089 19a	Surface	Colorless Coca-Cola bottle	20 / 5.5	Soda / Mineral Water	Soda	Coca-Cola	--	--	Colorless	Whole	Machine / Crown	Embossed / Front: "COKE" / "TRADEMARK ®" superimposed on a coca-cola bottle superimposed on a diamond Back: "CocaCola" / "TRADEMARK ®" superimposed on a coca-cola bottle superimposed on a diamond	"NOT TO BE REFILLED" / "18941-OK 20 Ⓓ 67 10-AA"	Owens Illinois	Oakland, CA	1967
5	089 19a	Surface	Colorless soda bottle	24 / 5.5	Soda / Mineral Water	Soda	--	--	--	Colorless	Whole	Machine / Crown	--	"06 VIP 39"	--	--	1910 - present
6	089 20b	Surface	Colorless jar	12.4 / 6.5	Canning	Food	--	--	--	Colorless	Whole	Machine / Large mouth external thread	--	"H" overlapping "A" / "6742" / "31"	Anchor Hocking Glass Corp.	US Mainland	1938 - present
7	089 20b	Surface	Colorless jar	12.4 / 6.5	Canning	Food	--	--	--	Colorless	Whole	Machine / Large mouth external thread	--	"H" overlapping "A" / "6742" / "31"	Anchor Hocking Glass Corp.	US Mainland	1938 - present
8	089 20b	Surface	Colorless jar	12.4 / 6.5	Canning	Food	--	--	--	Colorless	Whole	Machine / Large mouth external thread	--	"H" overlapping "A" / "6742" / "31"	Anchor Hocking Glass Corp.	US Mainland	1938 - present
9	089 20b	Surface	Colorless jar	12.4 / 6.5	Canning	Food	--	--	--	Colorless	Whole	Machine / Large mouth external thread	--	"H" overlapping "A" / "6742" / "31"	Anchor Hocking Glass Corp.	US Mainland	1938 - present
10	089 20b	Surface	Colorless jar	12.4 / 6.5	Canning	Food	--	--	--	Colorless	Whole	Machine / Large mouth external thread	--	"H" overlapping "A" / "6742" / "31"	Anchor Hocking Glass Corp.	US Mainland	1938 - present
11	089 20b	Surface	Colorless jar	12.4 / 6.5	Canning	Food	--	--	--	Colorless	Whole	Machine / Large mouth external thread	--	"A S" / "H" overlapping "A" / "6742"	Anchor Hocking Glass Corp.	US Mainland	1938 - present
12	089 20b	Surface	Colorless jar	13.7 / 8.5	Canning	Food	--	--	--	Colorless	Whole	Machine / Large mouth external thread	--	"O" overlapping "C" / "3677" / "4"	Glass Containers Corp.	US Mainland	1934 - 1968
13	089 20b	Surface	Green Beer Bottle	20.4 / 7.8	Beer	Beer	--	--	--	Green	Whole	Machine / Crown	Embossed / "NO DEPOSIT NO RETURN" and "NOT TO BE REFILLED" wrap the shoulder	"63-38 A" / "5" anchor overlapping "H" "51" / "70"	Anchor Hocking Glass Corp.	US Mainland	1938 - present

Glass (Continued)

Acc.	Fe.	Depth (cmbs)	Description	L / W (cm)	Type	Contents	Brand	Bottling Location	Bottling Date	Color	Portion	Finishing Method / Shape	Label Type / Labeling	Embossed Base Markings	Glass Manufacturer	Origin of Bottle	Bottle Manufacture Date
14	089 20b	Surface	Colorless Carboy	28.5 17	Carboy	Alcohol	--	--	--	Colorless	Finish is partially broken	Machine / Small mouth external thread	Embossed / "ONE GALLON" on the shoulder, *Duraglas* (cursive) written on body above heel.	"4" "I" within a diamond superimposed on an "O" "5" / "16"	Owens Illinois	Brockport NY	1965, 1975, or 1985
15	089 20b	Surface	Colorless Carboy	28.5 / 17	Carboy	Alcohol	--	--	--	Colorless	Finish is partially broken	Machine / Small mouth external thread	Embossed / "ONE GALLON" on the shoulder, *Duraglas* (cursive) written on body above heel.	"20" "I" within a diamond superimposed on an "O" "51" / "20" / "1512 - W"	Owens Illinois	Oakland, CA	1951
22	089 20h	16	Amber glass fragment	1.4 / .8	--	--	--	--	--	Amber	--	--	--	--	--	--	<50 years old
4a	089 20j	Surface	Base of brown bottle	11.5 / 7	Beer	Beer	Dainippon Brewing Co LTD	Japan or Korea	1911 - 1949	Amber	Base and Body (portion)	--	Embossed / "DAINIPPON BREWING Co Ltd" is wrapped around the lower body crossing both 4a and 4b	A circle with a dot within a star (the sun)	--	Japan or Korea	--
4b	089 20j	Surface	Shoulder of brown bottle	12 / 4.5	Beer	Beer	Dainippon Brewing Co LTD	Japan or Korea	1911 - 1949	Amber	Body (portion)	--	Embossed / "DAINIPPON BREWING Co Ltd" is wrapped around the lower body crossing both 4a and 4b	--	--	Japan or Korea	--
4c	089 20j	Surface	Neck and finish of brown bottle	4-Oct	Beer	Beer	Dainippon Brewing Co LTD	Japan or Korea	1911 - 1949	Amber	Neck and Finish	Machine / Crown	--	--	--	Japan or Korea	--

Ceramics

Acc.	Fe.	Depth	L / W (cm)	Vessel Type	Form	Portion	Ceramic Type	Paste	Paste Color	Design Motif	Design Color	Manufacturer	Place of Manufacture	Date Range	Description Notes
16a	08920b	Surface	4.3 / 3.2	Tableware	Bowl	Rim edge	Porcelain	Hard Paste	White	Dimpled Exterior; Striped Interior	Grey Exterior; Blue Interior	--	Japan	1854 - present	Rim fragment of a small bowl with blue striping on the interior.
16b	08920b	Surface	2.1 / 2.1	Tableware	Bowl	Body	Porcelain	Hard Paste	White	Dimpled Exterior; Striped Interior	Grey Exterior; Blue Interior	--	Japan	1854 - present	Body fragment of a small bowl with blue striping on the interior.

Metal

Acc.	Fe.	Depth (cmbs)	Description	L x W (cm)	Material	Artifact Use	Date	Description Notes
17	08920b	Surface	Spoon	14.9 x 3.3	Stainless Steel	Tableware	1920 - present	
18	08920b	Surface	Butter Knife Blade	14 x 2	Stainless Steel	Tableware	1920 - present	
19	08920b	Surface	Gas Valve	5 x 4.3 x 2.5	Undetermined	Industrial	1850 - present	
20	08920f	41	Bullet Cartridge	4.2 x 1.2	Brass	Hunting / Warfare	1942 - present	.30 Carbine cartridge
23	08920f	27	Rusted Metal Fragments	Not Measured	Undetermined	Undetermined	Undetermined	

Traditional Artifacts

Acc.	Fe.	Depth (cmbs)	Material	Count	L / W (cm)	Weight (g)
21a	08920j	30-52	Volcanic Glass	1	1.4 x .9	0.5
21b	08920j	30-52	Volcanic Glass	1	1.3 x 1.0	0.3

Charcoal

Acc.	Fe.	Depth (cmbs)	Material	Count	Weight (g)
24	08920c Terrace 2	14	Charcoal	7	0.3
25	08920j	30-52	Charcoal	4	0.5
26	08920f	40	Charcoal	5	0.5
27	08920e	25	Charcoal	1	0.1

APPENDIX B: WOOD TAXA IDENTIFICATION

ANALYSIS OF CHARCOAL SAMPLES FROM WAIHE'E, O'AHU, KEALA PONO ARCHAEOLOGICAL CONSULTING PROJECT 119

By

Gail M. Murakami
Wood Identification Laboratory
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June 12, 2020

INTRODUCTION

Two charcoal samples from Keala Pono Archaeological Consulting Project 119 were submitted to the Wood Identification Laboratory at International Archaeological Research Institute, Inc. (IARII) for analysis. The samples, from a site in Waihe'e on the island of O'ahu, Hawai'i, were examined for the selection of short-lived taxa for radiocarbon dating. This service includes taxa identification of known short-lived woody plants or plant parts, such as nutshells or tubers, as well as a screening of the sample for the presence of known historically introduced woody plants or plant parts.

METHODS

The freshly fractured transverse, tangential, and radial facets of charcoal fragments were examined with the aid of a dissecting microscope at magnifications of up to 80X. Taxonomic identifications were made by comparing observed anatomical characteristics with those of woods in the IARII reference collection. Vouchers associated with this collection have been verified and archived at the Department of Botany, University of Hawai'i at Mānoa. Other published references, including books, journal articles, technical documents, and wood atlases, were also consulted.

RESULTS

This analysis resulted in no identifications of the three charcoal taxa found in the two samples examined. Some resemblance to native taxa was seen in the charcoal, however, no definitive identification, based on multiple features, could be made. Consequently, short-lived native taxa, such as wood shrubs or plant parts, appropriate for radiocarbon dating, were not identified. While no historically introduced plants in the reference collection matched with the charcoal taxa, the collection of recent plant introductions is not complete. The table below summarizes the results.

WIDL No.	Taxon	Plant Part	Comment
Sample 1: Feature 08920j, Layer I/5, 30-52 cmbs			
2010-1	Indeterminate	Wood charcoal	Soft wood
Sample 2: Feature 08920c Terrace 2, 14 cmbs			
2010-2	Indeterminate	Wood charcoal	
2010-3	Indeterminate	Wood charcoal	legume; aliform parenchyma

Sample 1 (Feature 08920j, Layer I/5, 30-52 cmbs) contained small pieces of charcoal whose cross section resembled that of *iliahi* (sandalwood, *Santalum*) or *ʻōhiʻa lehua* (*Metrosideros*) but the tangential face could not be seen well enough to definitively determine identification.

Sample 2 (Feature 08920c Terrace 2, 14 cmbs) contained two taxa but neither matched native or introduced taxa in the wood reference collection.

Appendix K

Cultural Impact Assessment

FINAL—Cultural Impact Assessment for TMK: (1) 4-7-006:010 (por.) and :018 in Waiheʻe Ahupuaʻa, Koʻolaupoko District, Island of Oʻahu, Hawaiʻi

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October 2020

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FINAL— Cultural Impact Assessment for TMK: (1) 4-7-006:010 (por.) and :018 in Waiheʻe Ahupuaʻa, Koʻolaupoko District, Island of Oʻahu, Hawaiʻi

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Management Summary

A Cultural Impact Assessment was conducted for TMK: (1) 4-7-006:010 (por.) and :018 in Waiheʻe Ahupuaʻa, Koʻolaupoko District on the island of Oʻahu. This was done in preparation for ground disturbance associated with construction and renovations for the Waiheʻe Riparian Learning Center. The current study took the form of background research and an ethnographic survey consisting of four interviews with five community members, all of which are included in this report.

The background research synthesizes traditional and historic accounts and land use history for the Waiheʻe area. Community consultations were performed to obtain information about the cultural significance of the subject properties and the surrounding area, as well as to address possible concerns of community members regarding the effects of the proposed project on places of cultural or traditional importance.

As a result of this work, the cultural significance of Waiheʻe Valley has been made clear. Waiheʻe has a long and sustained history of cultivation, particularly with taro farming done by Hawaiian, Okinawan, Japanese, and Chinese families. The area has seen many changes over the years, including shifts in water flow due to stream alterations, as well as increased foot traffic as the valley became identified as a popular hiking destination on social media.

Interviews with individuals knowledgeable about the project lands produced information on its rich cultural history. Interviewees identified hula hālau and lei-making as traditional gathering practices occurring in the project area. Interviewees also identified several archaeological sites including loʻi, ʻauwai, walls, adze quarries, and burial sites that may lie within the project area. Waiheʻe Road is also a historic property, as it was noted to have been constructed as a coral road during World War II. An archaeological inventory survey is recommended to determine if vestiges of these or other sites remain on the properties.

The interviewees were concerned about the large numbers of hikers in the valley and the negative effects this has had on the ʻāina and its residents. Managed access and invasive plant species removal were recommended. The idea of inviting hunters in to help control the feral pig population was put forth, as well as offering cultural residency to interns who could live and work in the valley for a period of time. The interviewees also remarked on the joint jurisdiction of the subject properties, between the Department of Parks & Recreation and the Board of Water Supply, and that it would be preferable to have stewardship under one entity. In all, the project is a product of community effort and the work of the KEY Project, and was generally supported by all interviewees.

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FIGURES

TABLES

INTRODUCTION

At the request of G70, Keala Pono Archaeological Consulting a Cultural Impact Assessment (CIA) for the proposed Waiheʻe Riparian Learning Center in Waiheʻe Ahupuaʻa, Koʻolaupoko District, on the island of Oʻahu on a portion of TMK: (1) 4-7-006:010 and all of TMK: (1) 4-7-006:018. This CIA was designed to identify any cultural resources or practices that may occur in the area and to gain an understanding of the community's perspectives on the proposed activity on the properties.

The report begins with a description of the study area and a historical overview of land use and archaeology in the ahupuaʻa. The next section presents methods and results of the ethnographic survey. Results are summarized and recommendations are made in the final section. Hawaiian words, flora and fauna, and technical terms are defined in a glossary. Also included are appendices with documents relevant to the ethnographic survey, including full transcripts of the interviews.

Project Location and Natural Environment

The study area consists of 11.51 ha (28.43 ac.) on a portion of TMK: (1) 4-7-006:010 and all of TMK: (1) 4-7-006:018, in Waiheʻe Ahupuaʻa, Koʻolaupoko District, on the island of Oʻahu (Figures 1 and 2). TMK: (1) 4-7-006:010 is a 36 ha (89 acre) parcel, while TMK: (1) 4-7-006:018 is a .036 ha (.08 ac.) plot. Both properties are owned by the City and County of Honolulu. The project area begins at the mauka end of Waiheʻe Road and extends along the south side of the Board of Water Supply access road for approximately 1 km (.62 mi.). The project area then veers south away from the access road for approximately 250 m (820 ft.) toward steeply sloping terrain on the valley's south side. The Board of Water Supply access road marks the northwest boundary of the project, while the southeast boundary is bordered by an undeveloped property.

Waiheʻe Valley includes 527.56 ha (1,303.67 ac.) of land, 326.96 ha (807.94 ac.) of which are forest reserve (Chun 1954:1). The area of study lies toward the middle of valley, along Waiheʻe Stream. Geologically speaking, this region sits in the giant caldera that formed the Koʻolau Mountain Range in ancient times. It is a place of consistent rain and trade winds:

> Carrying the burden of the trade wind rains, the windward side of Oʻahu is more weathered than the leeward areas of the island, and now this vast caldera wall is reduced to a line of sheer cliffs… The flat valley floors are extensively eroded, and are now mostly joined, studded here and there with isolated remnant peaks and ridges connected to the central massif. (Klieger et al. 2005:5)

The Koʻolau Mountain Range is 60 km (37 mi.) long and makes up the mauka boundary of Waiheʻe ahupuaʻa. In the Pleistocene, Waiheʻe Valley went through periods of submergence and emergence. It is believed that the valleys of Windward Oʻahu were under roughly 365 m (1,200 ft.) of water and filled with sediment as they gradually emerged (Stearns in Chun 1954:3). Today, Waiheʻe Valley has several main features: 1) the Koʻolau Mountains at the head of the valley, which are basalt with a complex of dikes; 2) a high terrace in the valley center, made up of old alluvium that built up between the streams; 3) a coastal plain composed of younger alluvium; and 4) a beach at the seashore made up of silt and other sediments washed downstream and reworked by wave action (Chun 1954:5–7). There are two perennial springs at the back of the valley that contribute to the surface drainage of the ahupuaʻa. The springs originate in dikes that are under pressure at the base of the Koʻolau Mountains; they are responsible for much of the water flow in Waiheʻe Stream (Chun 1954:7).

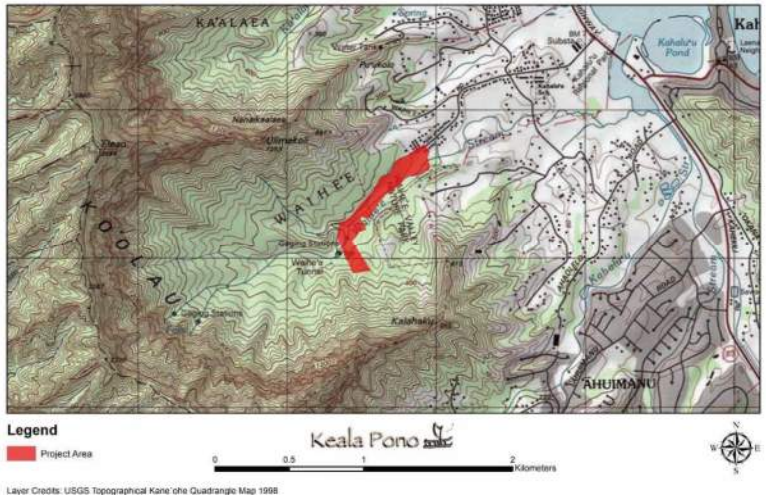

Figure 1. Project area on a 7.5 minute Kaneohe quadrangle map (USGS 1998).

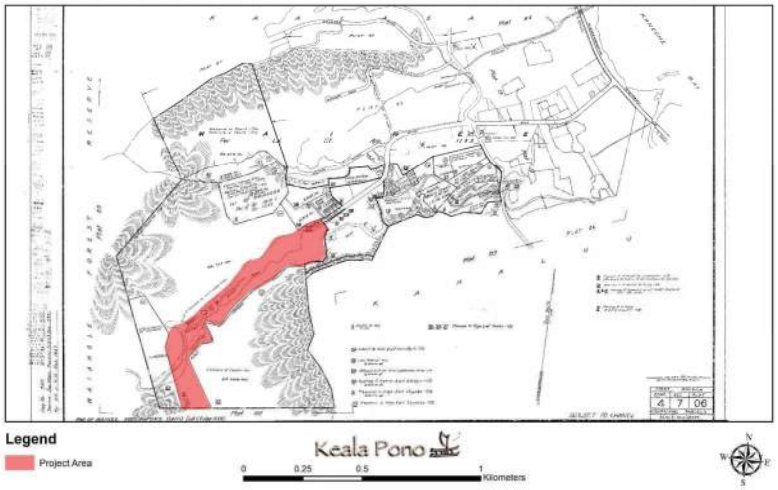

Figure 2. Project area on a TMK plat map (State of Hawai‘i 1937).

Situated mostly in the valley center, topography of the study area is moderately to steeply sloping, and vegetation is generally very dense, with some places enveloped in thick tangles of hau and others covered in ginger. The project area lies between roughly 40–100 m (130–330 ft.) above mean sea level (amsl), approximately 2 km (1.2 mi.) from the coast at Kāne‘ohe Bay. Mean annual rainfall is 207 cm (82 in.) per year at the Waihe‘e gaging station that is situated toward the mauka end of the project (Giambelluca et al. 2013). Waihe‘e Stream, a perennial watercourse, runs through the project area.

Four soil types occur within the study area: Hanalei silty clay 2–6% slopes (HnB); Lolekaa silty clay, 3–8% slopes (LoB); Tropaquepts (TR); and Waikane silty clay, 25–40% slopes (WpE) (Figure 3). Hanalei series soils developed in alluvium and are often used for pasture, sugarcane, taro, and vegetable farming (Foote et al. 1972:38). Lolekaa soils developed in colluvium and alluvium that is old and gravelly. These soils are generally used for housing, sugarcane, wildlife habitat, and pasture (Foote et al. 1972:83). Tropaquepts are flooded soils that are utilized for wetland agriculture, such as the cultivation of rice, taro, or watercress (Foote et al. 1972:121). Waikane series soils developed in colluvium and alluvium, and are typically used for housing, pasture, and truck crops (Foote et al. 1972:130). Also in the vicinity are Hanalei silty clay 0–2% slopes (HnA); Lolekaa silty clay 8–15% slopes (LoC); Lolekaa silty clay 15–25% slopes (LoD); Lolekaa silty clay 25–40% slopes (LoE); Lolekaa silty clay 40–70% slopes (LoF); Pearl Harbor clay (Ph); rock outcrop (rRO); Waikane silty clay, 3–8% slopes (WpB); and Waikane silty clay, 40–70% slopes (WpF).

Project Description

The project will create a riparian learning center to educate the public about the importance of streams, watersheds, and regenerative agriculture. Proposed activities of the center include the following:

- restore existing fallow lo‘i
- help maintain an existing ‘auwai system used by the taro farmers downstream
- restore riparian and forest areas with appropriate native and non-invasive plants

Development of the learning center will occur in two phases. Phase I will take place on an approximately 5.3 ha (13 ac.) area from the end of Waihe‘e Road to the dam (Figure 4). Phase I will consist of the following:

- Service learning work days starting with reopening fallow lo‘i and helping maintain the ‘auwai system; learn about invasive species (terrestrial and aquatic), watersheds, and regenerative agriculture
- Scheduled service learning days with groups and schools
- Develop a parking area for scheduled groups and events to alleviate parking congestion in the neighborhood; the gravel parking area will be large enough for a bus turn around
- Replace the gate at the end of Waihe‘e Road with a more aesthetically pleasing gate
- Install a gate past the proposed parking area to prevent vehicle access to the rest of the valley
- Remove invasive plants in the project area and restore them with native species from the area

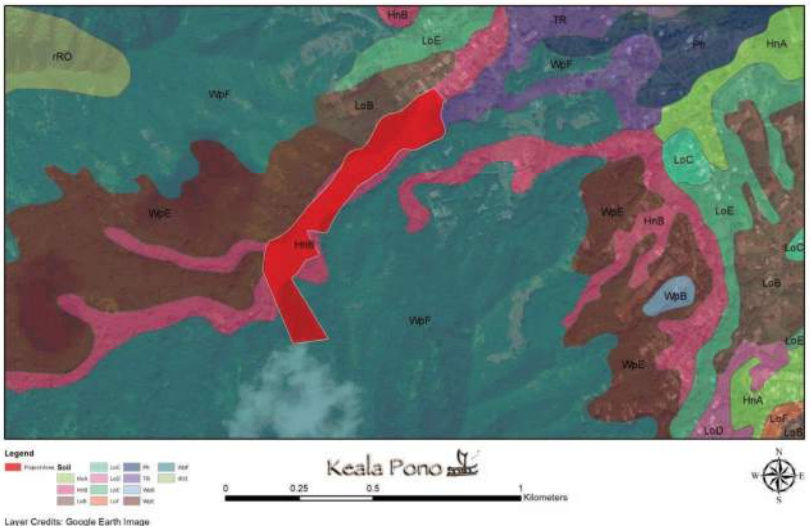

Figure 3. Soils in the vicinity of the project area.

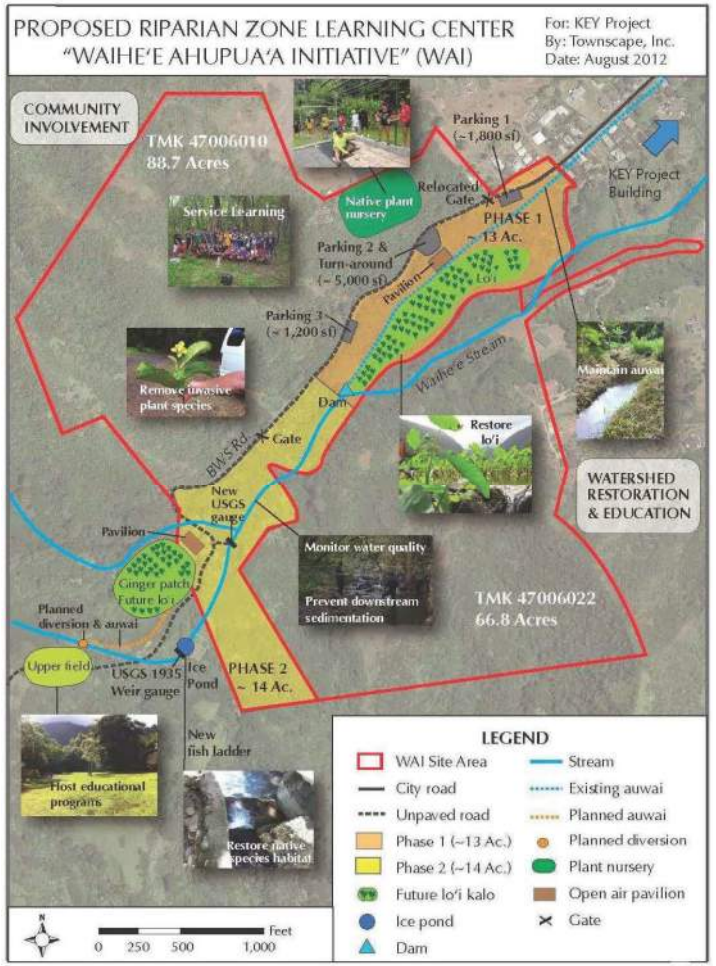

Figure 4. Conceptual design of the proposed Waiheʻe Riparian Learning Center (courtesy of G70).

- Create a pavilion/hale to hold workshops, meetings, and presentations
- Identify comfort station/composting toilet options (identify infrastructure needs and feasibility)
- Install interpretive signage about the different focus areas (funding dependent)
- Construct and maintain an on-site nursery for native plants and other suitable plants for restoration and cultivation

Phase II will take place on an additional 5.7 ha (14 ac.) that extend from the dam to the "ginger patch" bordering Board of Water Supply (BWS) lands (see Figure 4). This phase will consist of the following:

- Clear the "ginger patch" area and convert it into another lo'i (identify 'auwai and potential impact to taro farmers downstream)
- Remove invasive plants in the project area and restore the landscape with native species from the area

TRADITIONAL CULTURAL AND HISTORIC BACKGROUND

This section of the report presents background information as a means to provide a context through which one can examine the cultural and historical significance of the study area. In the attempt to record and preserve both the tangible (e.g., traditional and historic archaeological sites) and intangible (e.g., mo'olelo, mele, place names) culture, this research assists in the discussion of anticipated finds. Research was conducted at the Hawai'i State Library, the State Historic Preservation Division, as well as online at databases such as the Hawai'i Department of General Accounting map database, Ulukau, and Waihona 'Aina. Historical maps, archaeological reports, and historical reference books were among the materials examined.

Waihe'e in the Pre-Contact Era

Information regarding traditional land use and occupation in Waihe'e Ahupua'a is often intertwined with the mo'olelo of its neighboring ahupua'a, Kahalu'u to the south and Ka'alaea to the north. Information compiled for the pre-contact era includes data on place names, land use, and subsistence, as well as several mo'olelo, oli, and 'ōlelo no'eau. Together, they give us an idea of what life may have been like in this storied place.

Place Names

One often overlooked source of history is the information embedded in the Hawaiian landscape. Hawaiian place names "usually have understandable meanings, and the stories illustrating many of the place names are well known and appreciated… The place names provide a living and largely intelligible history" (Pukui et al. 1974:xii).

Place names associated with the study area are listed in *Place Names of Hawaii* (Pukui et al. 1974), along with the meanings of the names and/or other comments about the specific locales:

> 'Āhui-manu. Land division, stream… In 1845, Ka-mehameha III granted a tract of land in this area to the Catholic mission for the first Catholic school in the Islands. Each street name in the subdivision combines *Hui-* (flock) with the name of a bird… *Lit.*, bird cluster (perhaps so called because the birds from nearby Moku-manu were caught here and tied together in bunches). (Pukui et al. 1974:6)
>
> 'Āhuli-manu. Pool at 'Āhuimanu, O'ahu. *Lit.*, birds looking [for water]. (Pukui et al. 1974:6)
>
> Ahu-o-Laka. Islet (3.1 acres, awash at high tide), off Kaha-lu'u… *Lit.*, altar of Laka. (Pukui et al. 1974:6)
>
> Haia-moa. Stream, Wai-he'e, O'ahu. *Lit.*, chicken chased. (Pukui et al. 1974:34)
>
> Hāmama. Stream, Wai-he'e, O'ahu. *Lit.*, open. (Pukui et al. 1974:39)
>
> Kaha-lu'u… land division…stream, and fishpond…associated with the Ua-pō'ai-hale (house encircling rain…) perhaps named by fishermen who used to dive here for fish…A series of wet taro terraces here are said to be the largest on O'ahu. See Ka-honua. *Lit.*, diving place. (Pukui et al. 1974:62)
>
> Ka-honua. Old name for Kaha-lu'u fishpond… *Lit.*, the earth. (Pukui et al. 1974:66)
>
> Kālia…Stream, Wai-he'e, O'ahu. *Lit.*, waited for. (Pukui et al. 1974:77)
>
> Kāne-hoa-lani. Mountain ridge…named for a god ancestor of Pele; his female companion was said to be Ka-papa islet nearby…*Lit.*, Kāne royal companion. (Pukui et al. 1974:84)

> Ka-papa. Offshore island (14 feet elevation)… A fishing shrine is here. See Kāne-hoa-lani. *Lit*., the flat surface. (Pukui et al. 1974:87)
>
> Koʻolau…Windward mountain range, Oʻahu…*Lit*., windward. (Pukui et al. 1974:117)
>
> Koʻolau Poko. District, southern windward Oʻahu. *Lit*., short Koʻolau. (Pukui et al. 1974:117)
>
> Wai-heʻe…Land section and stream…*Lit*., squid liquid (A mute, Ke-aka-o-Kū, the shadow of Kū, was told that his speech would be restored if he went to Kahiki to be married. On the way he was attacked by a huge squid which he killed and threw to Kaha-luʻu, Oʻahu. Slime flowed over the land; hence the name…). (Pukui et al. 1974:221–222)

Subsistence and Traditional Land Use

With its productive fishponds of Kāneʻohe Bay and extensive agricultural lands, Waiheʻe Ahupuaʻa was a thriving community in pre-contact times (Devaney et al. 1982). The ocean provided a variety of resources, such as limu, heʻe, crustaceans, and reef fish (Chun 1945:17). At least two fishponds were known to exist near Waiheʻe in Kahaluʻu. One was called Pokole (McAllister 1933), and the other was called Kahouna (McAllister 1933), which is also listed as Kahonua in *Place Names of Hawaii* (Pukui et al. 1974). This latter pond is also known as Kahaluʻu Fishpond today. Evidence of the community's traditional marine subsistence is further marked by its coastal fishing shrines, one of which was constructed on Kapapa Island and another situated in the sea there (McAllister 1933:172).

Although Waiheʻe was one of the smaller ahupuaʻa fronting Kāneʻohe Bay, the broad flats of Waiheʻe, together with Kaʻalaea on the north and Kahaluʻu on the south, formed a system of continuous agricultural terraces, comprising one of the largest areas of pondfield agriculture on the windward coast (Handy 1940:96). The terraces of Waiheʻe Ahupuaʻa were situated along Waiheʻe Stream and continued back into the valley for at least 1.5 miles (Handy 1940:96). While dryland kalo was also cultivated in the kula lands between Kahaluʻu and ʻĀhuimanu Streams (Handy 1940), it was the wetland loʻi that would have dominated the landscape:

> The *ahupuaʻa* [of Kahaluʻu], although practically continuous with Waiheʻe, is sheltered for most of its shore length behind low coastal hills, and its area contours are quite broken by the winding Kahaluʻu Stream and its tributaries, Waiola (Living-water), Ahulumanu (Discolored-and-broken), and Kalohaka (Hollow-taro). For this reason, despite the breadth of the stream valley, the *loʻi* sections of Kahaluʻu are tucked away in pockets of land watered from the several streams; there are few large continuous areas, but the total area under cultivation in ancient times must have been very considerable…
>
> The seaward flats of the three contiguous *ahupuaʻa* of Kaʻalaea, Waiheʻe, and Kahaluʻu together made up one of the largest single areas of wet-taro land on the Koʻolau coast. It is a region of ample rainfall… (Handy et al. 1991:454)

Approximately 40 ha (100 ac.) of Waiheʻe land were under cultivation of kalo in the pre-contact era (Devaney et al. 1982:36). They are described as continuing all the way to the back of the valley:

> The main stream bearing this name [Waiheʻe] has its headwaters in a waterfall against the mountain wall, and is joined by two others, Hāmama and Kalia. Carefully terraced but abandoned taro *loʻi* follow the stream and its tributaries almost to their several sources. (Handy et al. 1991:453)

However, in a University of Hawaiʻi Master's thesis on Waiheʻe, Chun indicates that not all of the valley was used for loʻi:

> Judging from the lack of major irrigation works, the natives of Waihee apparently did not utilize most of the valley for agriculture. This was especially true in regards to wet-taro farming. Irrigation ditches were made only along the alluvial soils and coastal areas where water could easily be diverted from the stream due to the relative levelness of these areas. An absence of irrigation ditches on the elevated terraces of older alluvium indicates that no intensive farming occurred here, although it is quite likely that dry-land crops may have been cultivated sporadically in small cleared areas…
>
> According to Emory [noted archaeologist Kenneth P. Emory], prior to the decline in native population all of the potential taro lands, especially where water was accessible, was utilized and cultivated for taro. On the basis of irrigation ditches and kuleana awards, most of the areas suitable for taro agriculture were situated along the main stream of the valley and the coastal lowlands. (Chun 1954:27, 28)

An irrigation ditch more than one mile in length extends through the valley, although Chun (1954:44) believes that this ditch post-dates 1880. Dryland crops grown in the pre-contact period in Waiheʻe likely included olonā, ʻulu, wauke, and ʻawa.

Moʻolelo

As mentioned earlier, Hawaiian place names were connected to traditional stories through which the history of the places was preserved. These stories were referred to as "moʻolelo, a term embracing many kinds of recounted knowledge, including history, legend, and myth. It included stories of every kind, whether factual or fabulous, lyrical or prosaic. Moʻolelo were repositories of cultural insight and a foundation for understanding history and origins, often presented as allegories to interpret or illuminate contemporary life… Certainly many such [oral] accounts were lost in the sweep of time, especially with the decline of the Hawaiian population and native language" (Nogelmeier 2006:429–430).

There are different moʻolelo that speak of the naming of Waiheʻe. One account indicates that the name refers to a loʻi which belonged to aliʻi (Handy et al. 1991:453):

> It is said that the *ahupuaʻa* [Waiheʻe] took its name from a *kapu loʻi* belonging anciently to the *aliʻi* of the place situated *mauka* of the *muliwai* (lagoon) called Paʻele, into which the main stream empties. (Handy et al. 1991:453)

The name of Waiheʻe Ahupuaʻa literally translates to "squid liquid" (Pukui et al. 1974:221) or "squid water" (Handy et al. 1991:453). Pukui et al. (1974) relate that this derived from a moʻolelo about a man that killed a large squid. The man, who was a mute, journeyed to Kahiki so that his voice would return. Along the way, he killed a large squid and threw it, splattering its slime across the land, and Waiheʻe was thus named (see Place Names section).

Waiheʻe is also mentioned in the epic saga of Hiʻiakaikapoliopele, as Hiʻiaka travels along the windward Oʻahu coast:

> They went on, passed Kahaluu, Waihee, and Kaalaea and on up to Auliilii. There they saw Pueo making ready to fight them and Hiiaka-i-ka-poli-o-Pele chanted thus:
>
> Pueo, the chief challenges to battle,
> He challenges on the day of his strength,
> He is strong, strong indeed.
>
> The two fought and she killed Pueo. They continued, passed Waiahole, Waikane, Hakipuu, Hiiaka said to Wahineomao, "There is our trail above Kai-kolu. The precipice is steep below." (Ka Leo o Ka Lahui in Sterling and Summers 1978:192)

Two other mo‘olelo, recounted in *Sites of Oahu* (Sterling and Summers 1978), are shared here. While both mo‘olelo do not mention Waihe‘e in particular, they speak of neighboring Kahalu‘u, and much of the history and land use of Waihe‘e is intertwined with Kahalu‘u. It is interesting that although these two mo‘olelo appear to be disconnected, they share a common theme, which is probably not coincidental. These two stories both speak of competition for the marine resources of Kāne‘ohe Bay. This reinforces the fact that the area was known to have prized resources in its sea since the earliest times.

The first mo‘olelo mentions the trickster hero Maui, and his rightful connection to Kahalu‘u. Due to his guile, Maui managed to secure the fishery rights to the waters off of Kahalu‘u’s coast. Here is that mo‘olelo as told in *Sites of Oahu*:

> The ahupua‘a of Kahalu‘u belonged to Maui-akalana. It was a land over which the sources of food were disputed, especially the low islands of Ahua and Kapapa where octopus were caught and the uhu fish of Kapuna caught in nets.
>
> The judges’ helper and high priest took Waiahole and Waikane as his boundaries, but the judges had a ruling against anything defiling. Should any of them be smeared with excretia, he ceased to handle sacred objects or participate in their work.
>
> Maui-akalana built a mound above Ha‘akolo, and made seven ridges and in the mound he secreted some excretia. He met his brothers and the two assistants of the supreme judges and told them that there was a precious treasure in the mound, diamonds and pearls and the first to dig rapidly into it might have them. They agreed to do it and when they began to dig and scrape away the earth, each of the judges’ assistants was anxious to get at the precious treasure. They observed no rules, restricted or otherwise in their eagerness to be the first to reach the heap of riches. Whose hands became dirty? This person’s —- that person’s. So Ahua-a-Laka, Kapapa and the uhu fish caught in the nets at the sea of Kapuna became the property of Kahalu‘u. The assistants of the supreme judges were ashamed and left their sacred offices and the name (of one), Ku, was given to kuapala (a kind of wooden bowl) and (of the other), Lono, to the Ipu-o-Lono container in the men’s eating house.
>
> Kohi-kohi-kupalale (Dig-in-haste, name of the mound), can still be found at Kahalu‘u, where Ahuli-manu faces the north, at the left side of the backs of Kaihu‘aha and Pakole, on the east side of the top of Ha‘akolo. Kupopolo is the resting place on the seaward side of Kakua-laui, facing the spring of Kameha‘ikana. (Sterling and Summers 1978:195)

The other story does not mention any person’s name in particular, as the gods of old are the central characters of this mo‘olelo. Specifically, the god of Kailua, characterized as the protagonist, and the god of Kualoa, characterized as the antagonist, met and fought for fishing rights. In the end, the god of Kailua prevailed, and an islet was placed in the sea of Kahalu‘u marking the boundary of the fishing grounds between the people of Kailua and the people of Kahalu‘u. The name of that islet was Ahu-o-Laka, meaning “Altar of Laka,” and it is still known today. Here is that mo‘olelo as told in *Sites of Oahu*:

> There were, and are, along this shore, various fish grounds, each with its god. And sometimes these gods of the fish disagree.
>
> This happened with two that controlled this shore. They quarreled on a matter of right and wrong. The men of Kualoa were coming to fish in Kailua bay, and fish grew scarce. The people died from want of food.
>
> The god of Kailua was justly enraged. He sent a challenge to the god of the poachers, proposing a battle for control of the shore.
>
> They met and fought, and the righteous god won. But he proved to be a kind-hearted god. He made a pact with the god of Kualoa; from thence forth forever, the men of Kualoa should fish in Kualoa and the men of Kailua would fish in Kailua.

> So it was settled, and this island was put into the sea, where the men can see it when they round the point. When the sand appears above the waves, it is time to turn the boat around. (Sterling and Summers 1978:196)

Oli and Mele

The noteworthiness of specific locales in Hawaiian culture is further bolstered by their appearances in traditional chants. An oli refers to a chant that is done without any accompaniment of dance, while a mele refers to a chant that may or may not be accompanied by a dance. These expressions of folklore have not lost their merit in society today. They continue to be referred to in contemporary discussions of Hawaiian history, identity, and values.

Appearing in perhaps one of the greatest known sagas of Hawaiian oral traditions, the epic journey of Hi‘iaka, is a chant Hi‘iaka uttered in Kahalu‘u in response to the inclement weather she encountered there. Perhaps she had come upon the famous Kahalu‘u rain, the Pō‘aihale, which was known to go in circles while pouring from above rather than just passing through the area like other showers do on the tradewinds. Here are the words to Hi‘iaka’s chant along with its translation and commentary by Emerson in his publication, *Pele and Hiiaka: A Myth from Hawaii*:

> Hiiaka found many things to try her patience and ruffle her temper in Pali-Koolau: Squalls, heavy with raindrops picked up by the wind in its passage across the broad Pacific, slatted against her and mired the path; but worse than any freak of the weather were her encounters with that outlaw thing, the mo‘o; not the bold robber creature of Hawaii which took to the wilds, as if in recognition of its own outlawry, but that meaner skulk, whose degenerate spirit had parted with its last atom of virtuous courage and clung to human society only as a vampire, unwilling to forego its parasitic hold on humanity. It was in the mood and spirit begotten of such experiences that she sang;
>
> *Ino Koolau, e, ino Koolau!* Vile, vile is this Koolau weather;
>
> *Ai kena i ka ua o Koolau;* One soaks in the rain till he’s full.
>
> *Ke ua mai la i Maelieli,* The rain, it pours at Maelieli;
>
> *Ke hoowa‘awa‘a mai la i Heeia.* It gutters the land at Heeia;
>
> *Ke kupa la ka ua i ke kai.* It lashes the sea with a whip.
>
> *Ha‘a hula le‘a ka ua* The rain, it dances in glee
>
> *I Ahuimanu, ka ua hooni,* At Ahuimanu, moving
>
> *Hoonaue i ka pu‘u ko‘a,* And piling the coral in heaps,
>
> *Ka ua poaihale o Kahalu‘u.* Shifting from side to side of the house, this whisking rain of Kahalu‘u.
>
> *Lu‘ulu‘u e, lu‘ulu‘u iho nei au* Heavy and sad, alas, am I
>
> *I ka puolo waimaka o ka onohi* ---Mine eyes, a bundle of tears,
>
> *Ke kulu iho nei, e.* Are full to o’erflowing. (Emerson 1997:90–91)

‘Ōlelo No‘eau

Like oli and mele, traditional proverbs and wise sayings, known as ‘ōlelo no‘eau, have been another means by which the history of Hawaiian places has been recorded. In 1983, Mary Kawena Pukui published a volume of close to 3,000 ‘ōlelo no‘eau that she collected throughout the islands. The introductory chapter of that book reminds us that if we could understand these proverbs and wise sayings well, then we would understand Hawai‘i well (Pukui 1983).

Approximately 500 places are listed in the ʻōlelo noʻeau book along with the proverbs and wise sayings that refer to these specific places. Of these 500 or so locales, Waiheʻe on Maui is noted, while Waiheʻe on Oʻahu is not. There is one ʻōlelo noʻeau that is specifically associated with Kahaluʻu, and it refers to the Kahaluʻu rain mentioned in the moʻolelo section above. The ʻōlelo noʻeau is as follows:

> Ka ua pōʻaihale o Kahaluʻu.
>
> *The rain that moves around the homes of Kahaluʻu.*
>
> Refers to Kahaluʻu of windward Oʻahu. (Pukui 1983:173)

There is another ʻōlelo noʻeau which refers to the Koʻolau region in general. This proverb suggests that Waiheʻe and other windward ahupuaʻa are lush and well-watered. Here is that ʻōlelo noʻeau as it appears in Pukui's book:

> Nā pali hāuliuli o ke Koʻolau.
>
> *The dark hills of Koʻolau.*
>
> The hills and cliffs of the windward side of Oʻahu are always dark and beautiful with trees and shrubs. (Pukui 1983:249)

Waiheʻe in the Early Historic Era

When the first Westerners arrived in the Hawaiian archipelago in 1778, the islands were not yet united under one ruler. At that time, the entire island of Oʻahu was under the rule of Chief Kahahana. In 1783, Chief Kahahana's reign was ended with the invasion and victory of Chief Kahekili of Maui. This would forever be the end of Oʻahu's independence as a sovereign entity. When Chief Kahekili died in 1794, control of O'ahu went to his son Kalanikūpule. The following year, Chief Kamehameha of Hawaiʻi Island invaded Oʻahu to engage Kalanikūpule in battle. Kamehameha overwhelmed Kalanikūpule's warriors, effectively gaining control of all the islands from Hawaiʻi to Oʻahu. Eventually, Kamehameha would make a peaceful agreement with Chief Kaumualiʻi of Kauaʻi, bringing that island and Niʻihau into the fold and thereby uniting the Hawaiian archipelago under one rule (Kamakau 1996, Kanahele 1995).

Under Kamehameha's rule, the island of Oʻahu was administered by High Chief Boki. After Kamehameha's death in 1819, Chief Boki continued to be the island's governor until he left on his South Seas voyage in 1829. After him, his wife, High Chiefess Liliha became the Oʻahu governor until 1831 when she was replaced by Kuakini (Devaney et al. 1982, Kamakau 1996).

The first foreigner's account of Waiheʻe comes from missionary Levi Chamberlain, who recorded memoirs of his 1826 trip through the area. He described wet, marshy conditions but did not mention wetland cultivation:

> We had a long walk over hills and streams of water between hills and along marshy tracts and reached Waihee at one-fourth before nine. We left Waihee at ten o'clock and walked towards the seashore where we used a muddy path most of the way and waded through a long tract of rushes through mud and water nearly knee deep. (Chamberlain 1826:5)

Despite the introduction of westerners and western ways into the islands, the first half of the 19th century did continue to see the cultivation of taro in Waiheʻe and other ahupuaʻa of the Koʻolaupoko district. However, population decline is evident in an 1835 census, which listed only 135 people in Waiheʻe, consisting of 65 men, 50 women, 11 boys, and 9 girls (Parker in Chun 1945:19–20). An account by missionary and businessman E.O. Hall in 1939 states that large expanses of taro land in the Kāneʻohe Bay area were lying in waste because they were not needed to feed the diminished

population (Chun 1954:53). Much of this decrease in population of Native Hawaiians is attributed to foreign-introduced diseases (Devaney et al. 1982).

Waiheʻe and the Changes in Land Tenure

During the reign of Kamehameha III, as the Hawaiian kingdom became increasingly exposed to outside influences, the Hawaiian monarchy faced a crossroads of major change. "The Constitution of 1840 confirmed that only two offices could convey allodial title. These were the mōʻī and the kuhina nui. The Māhele was an instrument that began to settle the constitutionally granted vested rights of three groups in the dominium of the kingdom—mōʻī, aliʻi, and the makaʻāinana" (Beamer 2014:143). However, the king felt the difficulty of governing a land where the influence of foreigners had been growing. Dr. David Keanu Sai describes this predicament:

> Kamehameha III's government stood upon the crumbling foundations of a feudal autocracy that could no longer handle the weight of geo-political and economic forces sweeping across the islands. Uniformity of law across the realm and the centralization of authority had become a necessity. Foreigners were the source of many of these difficulties. (Sai 2008:62)

"Several legislative acts during the period 1845–1855 codified a sweeping transformation from the centuries-old Hawaiian traditions of royal land tenure to the western practice of private land ownership" (Moffat and Fitzpatrick 1995:11). Most prominent of these enactments was the Māhele of 1848 which was immediately followed by the Kuleana Act of 1850.

> The Mahele was an instrument that began to settle the undefined rights of three groups with vested rights in the dominion of the Kingdom –- the government, the chiefs, and the hoaʻāina. These needed to be settled because it had been codified in law through the Declaration of Rights and laws of 1839 and the Constitution of 1840, that the lands of the Kingdom were owned by these three groups… Following the Mahele, the only group with an undefined interest in all the lands of the Kingdom were the native tenants, and this would be later addressed in the Kuleana Act of 1850. (Beamer 2008:194–195)

Although the Māhele had specifically set aside lands for the King, the government, and the chiefs, this did not necessarily alienate the makaʻāinana from their land. On the contrary, access to the land was fostered through the reciprocal relationships which continued to exist between the commoners and the chiefs. Perhaps the chiefs were expected to better care for the commoners' rights than the commoners themselves who arguably might have been less knowledgeable of foreign land tenure systems. Indeed, the ahupuaʻa rights of the makaʻāinana were not extinguished with the advent of the Māhele, and Beamer points out that there are "numerous examples of hoaʻāina living on Government and Crown Lands post-Māhele which indicate the government recognized their rights to do so" (Beamer 2008:274).

> Hoaʻāina who chose not to acquire allodial lands through the Kuleana Act continued to live on Government and Crown Lands as they had been doing as a class previously for generations. Since all titles were awarded, "subject to the rights of native tenants." The hoaʻāina possessed habitation and use rights over their lands. (Beamer 2008:274)

For those commoners who did seek their individual land titles, the process that they needed to follow consisted of filing a claim with the Land Commission; having their land claim surveyed; testifying in person on behalf of their claim; and submitting their final Land Commission Award (LCA) to get a binding royal patent. However, in actuality, the vast majority of the native population never received any LCAs recognizing their land holdings due to several reasons such as their unfamiliarity with the process, their distrust of the process, and/or their desire to cling to their traditional way of land tenure regardless of how they felt about the new system. In 1850, the king passed another law,

this one allowing foreigners to buy land. This further hindered the process of natives securing lands for their families.

After the Māhele, the fisheries of the region were divided into shares that were privately owned (Devaney et al. 1982). The konohiki and maka'āinana of each ahupua'a retained fishing rights and the konohiki would place a kapu on a given fish species within the fishery as necessary. By 1851, all fisheries were made public (Devaney et al. 1982).

There were 26 LCAs awarded in Waihe'e that include 59 kuleana plots (Chun 1954:24). Most were located mauka of Kamehameha Highway along the streams, with a few scattered on the makai side of the highway and along the coast. They consisted of lo'i, kula, and house sites (Chun 1954:24). There were no LCAs awarded within the study area, but one LCA was located not far to the north. Kalioholani was awarded LCA 7699:2, and eight lo'i are noted in the Māhele testimony. A total of 120 acres of Waihe'e land was awarded to konohiki, and the remainder was set aside as crown lands (Chun 1954:24). In 1855 Kamehameha V granted a large portion of Waihe'e Valley to missionary Benjamin W. Parker. By 1869, Parker had purchased all the land in the ahupua'a that was not awarded as kuleana plots (Chun 1954:25). In 1927, Parker's lands were transferred to the Bishop Trust Company, who subdivided and sold them, mostly to Japanese rice farmers (Chun 1954:25).

New Industries: Sugar, Rice, and Dairy

As noted above, large expanses of taro land lay abandoned in the Kāne'ohe region by 1839 (Devaney et al. 1982:36–37), thus it appears that taro agriculture came to an early decline in Waihe'e. By the 1860s, "sugar planting was considered to be at the commercial level in the Kaneohe Bay region" (Devaney et al. 1982:42). Chun describes a small sugar enterprise in the area:

> In 1865 two Englishmen Green and McKibbin, made an early attempt to establish a sugar plantation in Kaalaea to the north [of Waihe'e]. Ten acres of leased land in Waihee were a part of their plantation. The area leased was used mainly as a mill and dwelling site, with the small remaining acreage probably planted in sugar cane. (Chun 1954:29)

Rice agriculture began in windward O'ahu in the mid-19th century. At this time the contracts of Chinese sugar laborers were ending and they turned to rice farming, which was familiar to them. Specifically in 1857 a group of former rice farmers from southern China completed their sugar contracts and began farming rice in former taro lo'i (Chun 1954:55–56). By 1880 the Waihe'e sugarcane fields were also converted to rice paddies (Devaney et al. 1982:50). It has been speculated that the long irrigation ditch that runs for more than a mile in Waihe'e was built at this time (Chun 1954:44). The ditch is not believed to be older because: 1) archaeologist J.G. McAllister (1933) did not record it as a pre-contact site, while he did record a slightly longer ditch in Waialua; the Waihe'e ditch would have been the second longest pre-contact ditch on the island; 2) a flume is present in an area where Native Hawaiians would have chosen an alternate route for the ditch; and 3) there are no LCAs along most of the fields that the ditch feeds (Chun 1954:44–46).

In the second half of the 19th century, the Chinese population in the islands increased from 364 to a whopping 21,616 (Chun 1954:56). At the height of the rice era in Waihe'e in the mid-1890s the abandoned taro lo'i were converted to rice paddies, dikes were narrowed in width, additional irrigation channels were constructed, and livestock was brought in to compact the soils (Chun 1954, Devaney et al. 1982). Cattle ranching also took place after the late 1800s, with at least 150 acres of Waihe'e land devoted to pasturage (Chun 1954).

Three historic maps date to this period. The first map is from 1874 and it depicts the Kaalaea Sugar Plantation and Waihe'e Valley (Figure 5). A railroad is shown leading up to Waihe'e road, not far from the project area. What may be two streams or ditches run down the length of Waihe'e Valley,

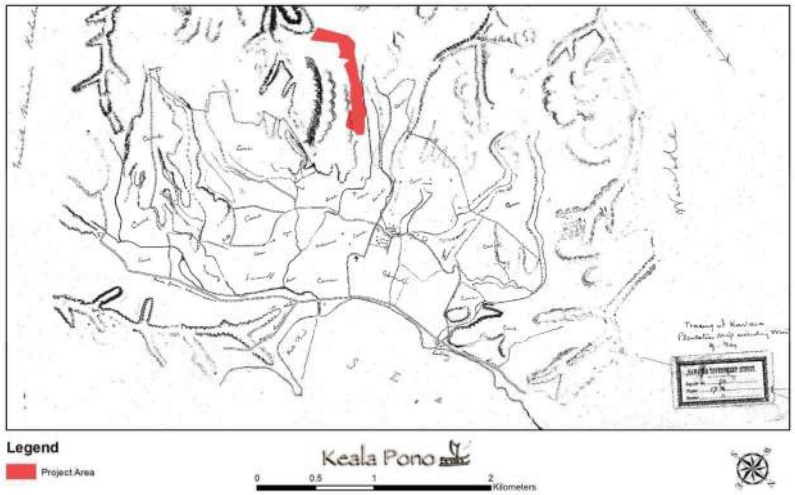

Figure 5. Portion of a map of Ka'alaea Sugar Plantation and Waihe'e (Gay 1874).

and several structures dot the area. One set of structures along the stream/ditch is labeled "Flag? MILL." Rice and sugarcane lands are identified, although they do not extend into the project area.

The second map dates to 1876, and although it shows the entire island of O'ahu, there are many details illustrated in the Waihe'e region (Figure 6). The project lands are labeled at "Gr. 1812" and Kahonua Fishpond is visible along the coast. There is a mill in Waihe'e, makai of the project area. Kamehameha Highway appears to be in its current position along the coastline, and the offshore islands, including Ahu o Laka, are illustrated.

The third map, from 1880, was drawn for the Kaalaea Sugar Plantation (Figure 7). This map shows individual land plots, with those of Kahale and Kamae partially overlapping with the east side of the project area. On the north side, a small portion of what is probably a fence line is within the project boundaries. Peaks to the northwest of the project are labeled Kapilioloka, Ulimakoli, Nanaikaalaea, and Kailio.

Approximately 160 acres were planted in rice between 1880 and 1927, including the vicinity of the project area (Devaney et al. 1982:50, 56). The peak of the rice industry in Waihe'e corresponds to the Sing Chong Company moving into the valley in 1894, with Sing Chong and the other rice farmers leasing the land from the Parker family (Chun 1954:58):

> On December 24, 1894, all of Parker's estate was leased to the company [Sing Chong] for a period of twenty years, at an annual rent of nine hundred dollars. The company apparently made good use of the land and also realized good profits, for at the termination of the lease in 1914 it re-leased Parker's lands again, this time for ten years at an annual rent of $1,500. Again, on January 1, 1924, Parker's estate was leased for another ten years to the same company for $1,800 a year
>
> As for the native kuleanas, most of them passed into the hands of the rising rice plantation or to individual farmers. Of the original fifty-four acres of native kuleanas, only about seventeen acres or about twenty-eight per cent remained in Hawaiian possession by 1936. (Chun 1954:59)

It is also believed that water buffalo, or carabao, were introduced to Waihe'e with the Sing Chong plantation in 1894 (Chun 1954:67). The water buffalo on O'ahu were described in a *Paradise of the Pacific* article from 1897:

> …Here's a rice field, Chinese almost invariably working them, and in the most primitive manner, dragging a quaint old forked stick plow through the rice fields with the Hongkong cow. I have never seen a poor or thin Chinese cow yet, and I have seen them everywhere on this island. All these Chinese cows are of a mouse color and fat as butter…(Baugn in Chun 1954:68)

The 19th century ended with the overthrow of the Hawaiian monarchy and the U.S. claim of annexation of the Hawaiian Islands. Throughout the islands, former government lands and crown lands were no longer under the oversight of the monarchy. After the overthrow, the U.S. federal government and the American military increased its land use around Waihe'e and Ko'olaupoko and throughout the islands.

Waihe'e in the 20th Century and Beyond

A 1902 O'ahu map shows the project area at the boundary of grazing lands (outlined in orange) and forest reserves (outlined in blue) (Figure 8). A large area toward the coast is striped in blue, which designates rice and taro wetlands. Two landings are also depicted at the coast.

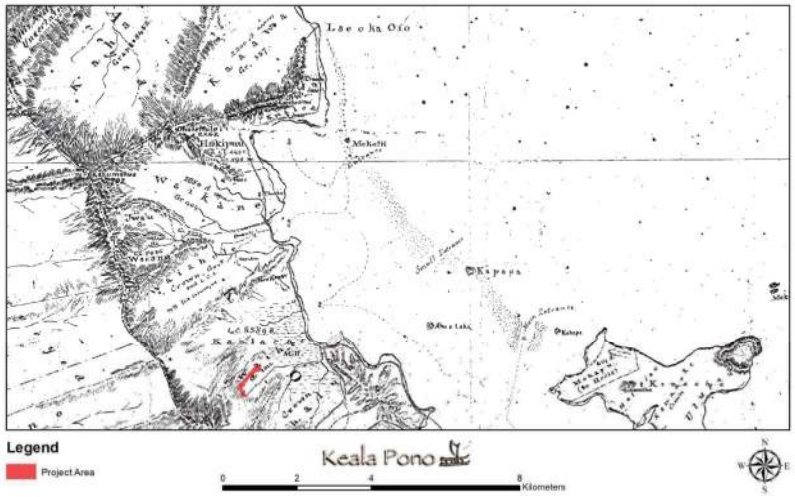

Figure 6. Portion of a map of O'ahu, showing the Waihe'e region (Alexander et al. 1876).

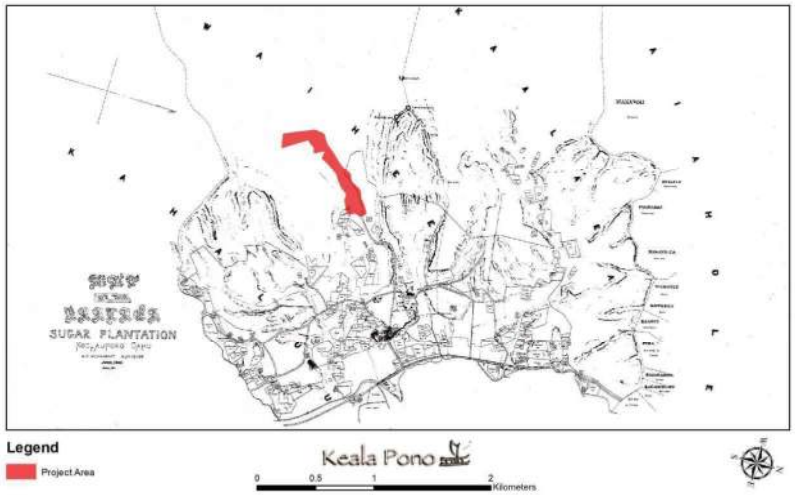

Figure 7. Portion of a Kaalaea Sugar Plantation map (Monsarrat 1880).

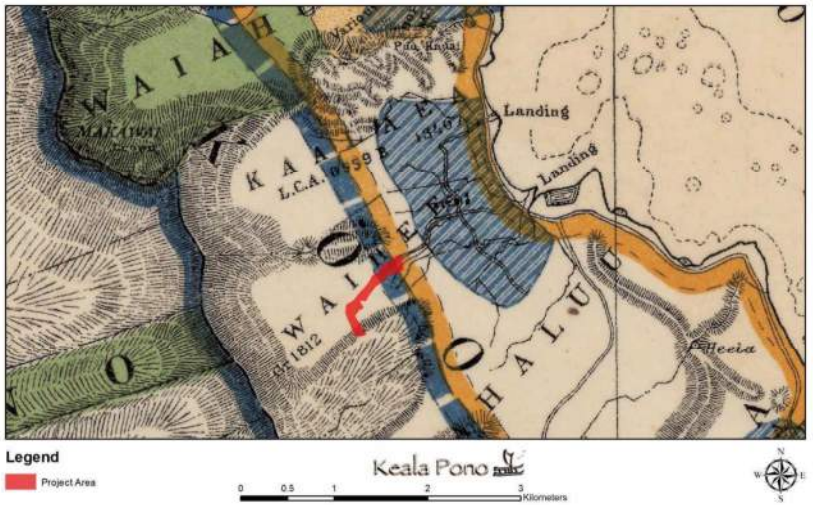

Figure 8. Portion of a map of O'ahu, showing Kahalu'u (Wall and Donn 1902).

Kūpuna in Waiheʻe interviewed by Chun (1954:63) noted that "nearly every level area on the terraces, river plain and coastal plain were under rice cultivation as late as the 1920's." By the 1930s there were 25 irrigation ditches in Waiheʻe, extending a total of 4.39 km (2.73 mi.) (Chun 1954:64). In a ravine north of the alluvial terrace (see Natural Environment section), a tunnel was built through a narrow part of the terrace to feed the rice paddies of that drier area (Chun 1954:64–65). Rice began to decline in Hawaiʻi because of factors such as competition from California rice growers, changed immigration policies, as well as a stem borer outbreak, and the Sing Chong Company finally ended its lease in 1933.

While rice was on the decline in Waiheʻe, pineapple was taking hold in the Kāneʻohe Bay region, with a peak period of cultivation between 1910 and 1925 (Devaney et al. 1982:61). A Libby, McNeil & Libby pineapple cannery was built in Kahaluʻu, approximately one mile south of Waiheʻe Valley. The plan to build the large-scale cannery was realized in 1911 after they acquired the Ahuimanu Ranch, and the accompanying plantation workers' housing for the cannery gained the name of "Libbyville." Unfortunately, as a result of the Libby pineapple company's establishment, Kahaluʻu's Haluakaiamoana Heiau was destroyed. A second pineapple enterprise was established in 1910 on Castle lands in ʻĀhuimanu, under the name of the Koolau Fruit Company. It was later purchased by Dole's Hawaiian Pineapple Company. The pineapples were grown in fields in the uplands of windward Oʻahu, and Sing Chong subleased the higher areas of its lands to Japanese pineapple farmers. Between 1920 and 1926, approximately 16 ha (40 ac.) of Waiheʻe uplands were cultivated in pineapple (Chun 1954:80). However, the pineapple operations in Kahaluʻu could not compete with those on the leeward side of the island, and they shut down in the 1920s (Devaney et al. 1982).

In the 1930s Japanese farmers began moving into the valley, where they cultivated rice or pineapples. A Japanese school was built in Waiheʻe and it remained open until ca. 1941 and the beginning of World War II (Chun 1954:83). Large tracts of windward lands were used for military training during the war. One particular base was called the Heeia Combat Training Area (CTA), which included 912 ha (2,254 ac.) in Kahaluʻu, Kaʻalaea, and Waiheʻe and approximately 80 ha (200 ac.) in Heʻeia Kea (U.S. Army Corps of Engineers n.d.). Between 1943 and 1945, the CTA was utilized "as an encampment for troops, an ammunition storage facility, a firing range, and as a maneuver and artillery impact area for jungle and assault training" (U.S. Army Corps of Engineers n.d.). During World War II a pillbox at Puʻu Māʻeliʻeli was constructed, along with facilities that included roads, barracks, a mess hall, a theater, ammunition storage facilities, a motor pool, firing ranges, hand grenade ranges, as well as bayonet and obstacle courses (U.S. Army Corps of Engineers 2011).

By 1953, land ownership of Waiheʻe had shifted to mostly Japanese immigrants (Chun 1954:81). At that time, approximately 117 ha (290 ac.) of the 200 ha (496 ac.) of agricultural land in Waiheʻe was owned by Japanese. This consisted of 31 individual plots, with a 3.6 ha (9 ac.) average per family, aside from one large plot of 77 ha (190 ac.) owned by the Higa family (Chun 1954:81). By the mid-1900s taro farming returned to the valley, parts of the uplands were cleared for the farming of truck crops, and much of the valley slopes were cultivated in bananas (Chun 1954:95–97). In addition, large tracts of former rice lands were converted to pasture for cattle (Chun 1954:98).

Two maps show the project area at this time. The first map depicts land use of Waiheʻe (Figure 9). The quality of the map makes it difficult to distinguish between taro, truck crops, and papaya, but patches of these are depicted within the project area. On the east end of the project area, the map shows that bananas were grown. The second map illustrates ditches, and what is labeled as "main ditch" runs through most of the project area on the north side of Waiheʻe Stream (Figure 10).

The post-World War II era witnessed a rapid modernization of the Koʻolaupoko District, including Waiheʻe Ahupuaʻa. The Board of Water Supply's Waiheʻe Tunnel was constructed in 1955 at the

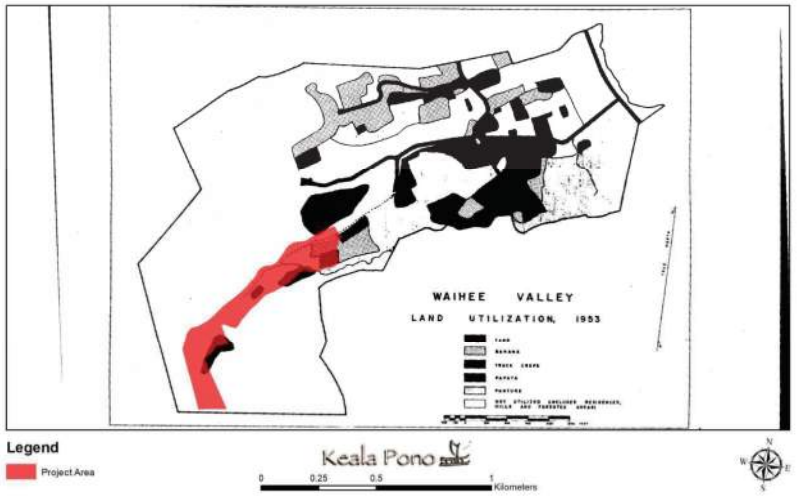

Figure 9. Portion of a map showing land use in Waiheʻe Valley (Chun 1954).

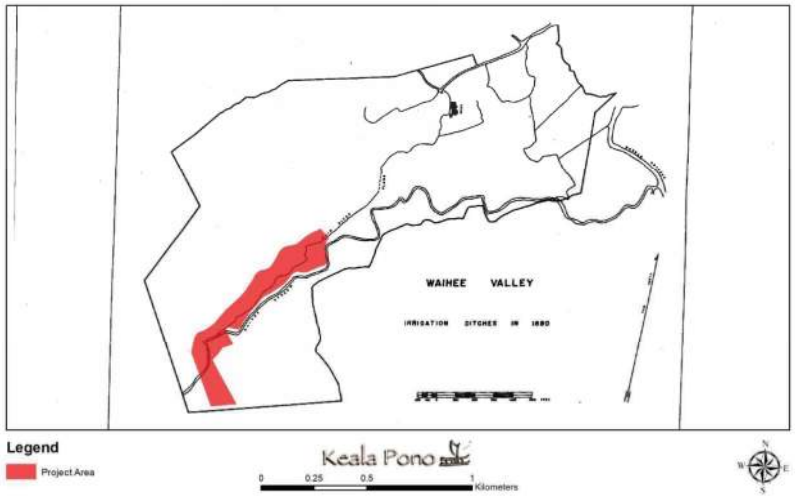

Figure 10. Portion of a map showing irrigation ditches in Waiheʻe Valley (Chun 1954).

head of Waiheʻe Valley (Devaney et al. 1982:82). It runs for approximately .5 km (1,500 ft.) to the dike zone deep in the Koʻolau Mountains (Kendrick 2000). A variety of developments were proposed for the area and Kahekili Highway was improved to support the future Valley of the Temples subdivision and other growth in the region in 1967. Further construction development continued into the following decades to include major infrastructure improvement projects (Helber, Hastert, and Fee 2007:1–22).

Previous Archaeology

Previous archaeological surveys offer significant information regarding traditional and historic land use. However, few studies have been conducted in the vicinity of the study area. The following discussion summarizes the findings of archaeological studies in Waiheʻe and at the Waiheʻe/Kahaluʻu border, based on reports found at the SHPD Kapolei library (Figure 11 and Table 1).

Although McAllister (1933) did not record any archaeological sites in Waiheʻe Ahupuaʻa, two were documented not far from Waiheʻe in Kahaluʻu: Kahonua (now called Kahaluʻu) Fishpond (Site 319) and Haluakaiamoana Heiau (Site 320). What is now known as Kahaluʻu Fishpond (Site 319) was formerly called Kahonua or Kahouna. This pond had a wall that was roughly 365 m (1,200 ft.) long, and it supported a watch house. There were two mākāhā (spaces in the sluice gates) along the wall of the fishpond (McAllister 1933:170). Haluakaiamoana Heiau was destroyed by the time of McAllister's (1933:170–171) survey—dismantled when the Libby, McNeill & Libby cannery was built on the site. It is said that the cannery was a failure because the heiau was desecrated.

No archaeological work took place in Waiheʻe until the 1980s, when an archaeological reconnaissance survey was conducted at coastal Waiheʻe (Kennedy 1981). No findings were reported from this study. Although loʻi were recorded on historic maps of the area, no evidence of these were identified on the surface.

An archaeological reconnaissance survey for the proposed Paradise Village Development, east of Kahaluʻu Stream also had no findings (Barrera 1982). The location was used as a modern dumping area, and the ground surface was not visible. Subsurface survey or archaeological monitoring during construction were recommended.

Human remains were encountered at a construction site east of Kahaluʻu Stream on the makai side of Kahekili Highway (Neller 1984). Fire-cracked rock and basalt flakes and tools were found at the base of the burial pit.

Archaeological monitoring at the wastewater pumping station at Laenani Beach Park, along Kāneʻohe Bay yielded no findings (Shun 1992). Eight depositional layers were recorded during excavations, all culturally sterile.

An archaeological inventory survey was conducted at a 2.5-acre property located roughly 1 km east of the current project area (McElroy 2006). The survey consisted of a surface inspection and archaeological trenching. No cultural remains were encountered during the excavations or the surface survey. The remnants of a piggery feature were noted, although they were thought to be less than 50 years old at the time of the survey.

An archaeological inventory survey at Kahaluʻu Regional Park consisted of a pedestrian survey and subsurface testing (Tulchin and Hammatt 2007). There were no findings.

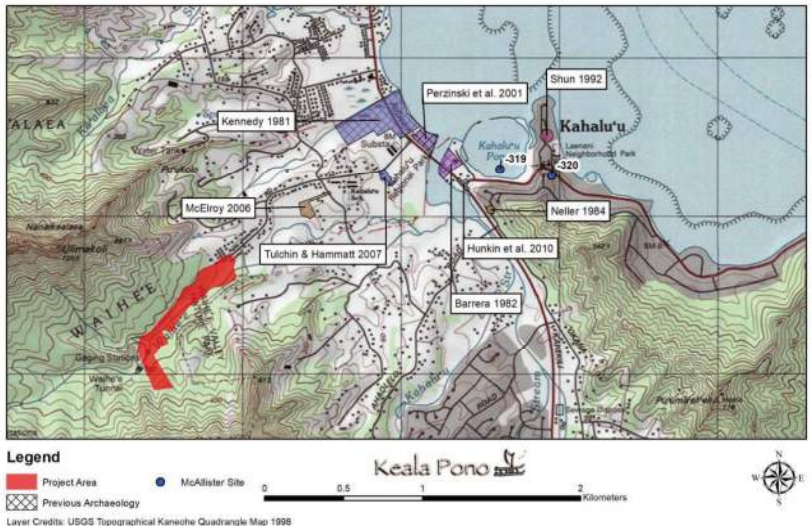

Figure 11. Location of previous archaeological studies and archaeological sites in the vicinity of the project area.

Table 1. Previous Archaeology Near the Study Area

Author and Year	Location	Type of Study	Findings
McAllister 1933	Island-Wide	Survey	Identified two sites on the coast near the Kahaluʻu/Waiheʻe Ahupuaʻa boundary: Haluakaiamoana Heiau (Site 320), Kahouna (also called Kahonua or Kahaluʻu) Fishpond (Site 319).
Kennedy 1981	Coastal Waiheʻe	Reconnaissance Survey	None.
Barrera 1982	West Side of Kahonua Fishpond	Reconnaissance Survey	None.
Neller 1984	East of Kahaluʻu Stream	Burial Report	Documented human remains along with fire cracked rock and basalt flakes and tools (SIHP 50-80-10-2897).
Shun 1992	Laenani Beach Park	Archaeological Monitoring	None.
McElroy 2006	Waiheʻe	Archaeological Inventory Survey	None.
Tulchin and Hammatt 2007	Kahaluʻu Regional Park	Archaeological Inventory Survey	None.
Perzinski et al. 2001	Kahaluʻu Beach Park	Archaeological Inventory Survey	Identified SIHP 50-80-08-5580, which consisted of 20th century subsurface foundations and an associated cesspool.
Hunkin et al. 2010	Kamehameha and Kahekili Hwy. Intersection	Archaeological Monitoring	None.

An archaeological inventory survey at Kahaluʻu Beach Park identified one archaeological site (Perzinski et al. 2001). This consisted of two subsurface foundations and a cesspool dating to the early-20th century (SIHP 50-80-08-5580). The site lacked integrity however, and was determined to not be significant.

Archaeological monitoring at the intersection of Kamehameha and Kahekili Highways was conducted for improvements to the intersection (Hunkin et al. 2010). No archaeological resources were observed during the monitoring.

In sum, archaeological work in the project vicinity has been relatively limited, with most projects occurring closer to the coast. Many projects produced negative findings, although agricultural remains were noted in the uplands, and a human burial, a fishpond, a heiau, and 20th century structural remnants were found near the coast.

Summary of Background Information

Waiheʻe is a well-watered area that supported large fields of taro in the pre-contact era, with both wetland and dryland taro cultivated. At least two fishponds were maintained along the coast in nearby Kahaluʻu, adding to the abundant ocean resources of the region. Moʻolelo of the area speak of competition for the marine resources, indicating the importance of ocean food sources.

The historic period brought about widespread changes to region, with sugar, rice, pineapple, military, and ranching enterprises making their mark on the landscape. During the Māhele of 1848, there were no LCAs awarded within the subject properties, although one located nearby supported eight lo‘i.

Previous archaeology has identified a few sites in the area. These include agricultural remains in the uplands, and a human burial, a fishpond, a heiau, and 20th century structural remnants were found near the coast. Because the current project area lies along a major stream, traditional agricultural remains might be expected. These could include terraces, ‘auwai, and subsurface pondfield deposits. Remnants of historic era land use would likely be related to rice, sugarcane, or pineapple cultivation.

ETHNOGRAPHIC SURVEY

There are some things that cannot be found in the archives, in textbooks, or at the library. It is here, through the stories, knowledge and experiences of our kama‘āina and kūpuna, that we are able to better understand the past and plan for our future. With the goal to identify and understand the importance of, and potential impacts to, traditional Hawaiian and historic cultural resources and traditional cultural practices of Waihe‘e, ethnographic interviews were conducted with community members who are knowledgeable about the project area.

Methods

This Cultural Impact Assessment was conducted through a multi-phase process between October and December, 2019. Guiding documents for this work include The Hawai‘i Environmental Council’s Guidelines for Assessing Cultural Impacts, A Bill for Environmental Impact Statements, and Act 50 (State of Hawai‘i). Personnel involved with this study are Windy McElroy, PhD, Principal Investigator of Kea la Pono Archaeological Consulting, and Gina McGuire, MS, Ethnographer.

Interviewees were selected because they met one or more of the following criteria: 1) was referred by Kea la Pono Archaeological Consulting or G70; 2) had/has ties to the project area or vicinity; 3) is a known Hawaiian cultural resource person; 4) is a known Hawaiian traditional practitioner; or 5) was referred by other cultural resource professionals. Five individuals participated in the current study. Mana‘o and ‘ike shared during these interviews are included in this report.

Interviews were taped using a digital MP3 recorder. During the interviews, each person was provided with a map or aerial photograph of the subject properties, the Agreement to Participate (Appendix A), and Consent Form (Appendix B), and briefed on the purpose of the Cultural Impact Assessment. Research categories were addressed in the form of open questions which allowed the interviewee to answer in the manner that he/she was most comfortable. Follow-up questions were asked based on the interviewee‘s responses or to clarify what was said.

Transcription was completed by listening to recordings and typing what was said. A copy of the edited transcript was sent to each interviewee for review, along with the Transcript Release Form. The Transcript Release Form provided space for clarifications, corrections, additions, or deletions to the transcript, as well as an opportunity to address any objections to the release of the document (Appendix C). When the forms were returned, transcripts were corrected to reflect any changes made by the interviewee.

Several potential interviewees were contacted, resulting in four interviews (Table 2). Note that during the interview with John Reppun, Kihei Nahale‘a was available to join the conversation and provided additional mana‘o, therefore five individuals participated in the four interviews. The ethnographic analysis process consisted of examining each transcript and organizing information into research themes, or categories. Research topics include: connections to the project lands, place names and mele, archaeological sites, gathering practices, change through time, and concerns and recommendations for the project. Edited transcripts are presented in Appendices D–G.

Interviewee Background

The following section includes background information for each interviewee, in their own words. This includes information on their ʻohana and where the interviewee was born and raised. The interviewees are Kaipo Faris, John Reppun, Steven Springel, and Rick Towill.

Table 2. List of Individuals Contacted

Name	Affiliation	Method of Contact	Result of Contact
Kaipo Faris	Kalo farming revival leader	Telephone, In Person	Interviewed
Steven Springel	Waiheʻe Ahupuaʻa Intiative member, knowledgable on archaeological sites in the valley	Telephone, In Person	Interviewed
Clifford Wong	Kalo farmer in Waiheʻe	Telephone	Declined
Mahealani Cypher	Koʻolaupoko Hawaiian Civic Club	Telephone, Email	No Response
Kepā Maly	Cultural specialist	Telephone, Email	Declined
Puakea Nogelmeier	Cultural specialist	Telephone, Email	No Response
Rick Towill	Longtime Waiheʻe resident, property neighbor	Telephone	Interviewed
John Reppun	Longtime Waiāhole resident, kalo farmer, past executive director of KEY Project, Kahaluʻu Neighborhood Board member	Telephone, Email, In Person	Interviewed
Kihei Nahaleʻa	Director of Huliamahi Education Alliance, KEY Project	In Person	Joined interview with John Reppun

Kaipo Faris

I was born on Molokaʻi, lived on Waiheʻe, Maui, and then moved to Oʻahu and went to Kamehameha Schools. Finished my high school in California, went to two different colleges in California. Did a little post work at Scripps Institute. And was a harbor master at Redondo Beach for many years. Then I retired from that and became a boat shop owner. I sold boats and motors. And trailers and did a lot of contract work for the government. And then my wife retired so we decided to sell out and come home. And we're back in Hawaiʻi and got involved with teaching the kids at KEY Project. And bettering the environment in our area. My dad came to Hawaiʻi because he got hurt playing football at Oregon State. He was in the hospital for two years. So he had to get well in a warm environment, they told him. So he moved to Hawaiʻi. He sold newspapers around the island at night driving a Jeep and then later he moved to Maui and he wrote for the Maui News and he also worked at the airport. Then he started flying his own plane and crop dusting. Then he started an airline and that's how he met my mom. She's one of 17 children all raised in Waiheʻe, Maui and he became very in-tune to Hawaiʻiana.

Steven Springel

I was born in the Territory of Hawaiʻi and grew up in Kailua. and I've lived in Waiheʻe since 1986. My parents moved to Hawaiʻi in 1951 shortly after the war. My father ran the Omega Communications station in Haiku Valley until his retirement. And my mother

received her doctorate from the University of Hawaiʻi, PhD in Psychology. And my father is passed away now. And my mother and my sister live in the UK now.

Rick Towill

I actually grew up on the adjacent property on the ridge on the Kahuku side of the property. My parents bought 45 acres back when St. Charles Company sold off all of the land that was once in rice, then was pineapple, then in the ʻ50s they sold it all. I was born in ʻ58 and my parents built the house up there in 1960 and lived there ever since. Then I attended Punahou School and went to Oregon State, studied ag-engineering after that. Then my folks sold the property but we had some remnant pieces of the property. We live below that property now on a two acre parcel that my wife and I built a home, and we raised our two boys there... I guess on my mom's side, go all the way to the Rice family, which were a missionary family from the East Coast of the United States. On my dad's side, my grandfather came from Virginia, came with the JD White Engineering Company in 1918, something like that, and was surveying for the fuel tanks that they were putting up on Kamehameha Highway adjacent to Pearl Harbor. And then my grandmother's side, my great-grandfather came over from New Zealand; biologist with Rothchild expedition, they were seeking flora and fauna for the collection in England. He ended up managing the ranch, well he worked for the Robinsons on Kauaʻi for many years and then my grandmother and her older brother were born and then they moved to Molokaʻi and he managed the ranch there for a time and took the family all the way back to New Zealand. Through the grapevine, scuttlebut, he found out about the management of the ranch out on Lanaʻi and took that on and came by himself for a year to make sure he secured the job before he brought the family over. And it all worked out, brought the family back.

John Reppun

I was born, actually, Hoʻolehua, Molokaʻi. My dad was a general practitioner, was a doctor on Molokaʻi for about 15 years. So several of us were born on Molokaʻi, others of us on Lanaʻi. One in Baltimore when he was in med-school. But my dad grew up in Kahaluʻu here. Immigrated from Russia. He was born in the Ural Mountains in Russia and my mom was from Pennsylvania. Dad grew up in Hawaiʻi, his father also was a doctor along the windward coast, so very familiar with many of the families. So my dad inherited patients who had been my grandfather's patients. There were not many doctors around, back in the day from Waimānalo to Kahuku. Kind of a range that he might follow. So we grew up in Kahaluʻu, near where my dad lived when he was a kid and you know my brothers and I, my sister, six boys, one girl, it was a wild ride. It was great growing up in a big family.

And I was born in 1952 so I'm kind of in the middle of the family. And it was an interesting time to grow up, born in the Territory of Hawaii and transitioning into the State of Hawaiʻi...In the course of growing up in this community, went to school at Benjamin Parker Elementary in Kāneʻohe, there was no Kahaluʻu Elementary at the time. There was a Waiāhole Elementary, I don't even know if ʻĀhuimanu had been built so, because my dad's office was in Kāneʻohe, we would catch a ride, go along the beach road, what we now call the beach road, there was no Kahekili Highway. And so we went to Benjamin Parker Elementary, most of us, and we were very lucky to go on to high school at Punahou. I'm very grateful for that.

Topical Breakouts

The following sections are extended quotations from the interviews, organized by topic. Interviewees provided information on connections to the project lands, place names and mele,

archaeological sites, gathering practices, change through time, and concerns and recommendations for the proposed Waiheʻe Riparian Learning Center.

Connections to the Project Area

I just did a lot of hiking in this area. And I saw this property for sale and the stream and I said to my wife, "We're moving." When I was young, I grew up with my Tutus on Maui, even after I went away for school, I would fly home for vacation, weekends, to stay with my Tutus. And they taught me the Hawaiian way of fishing and preserving our environment. I started looking into our streams and started noticing we have so many aquarium species and we're losing all our native species. And we're losing our water. We're losing everything. So I started getting involved in protecting the ʻoʻopu and the hīhīwai and all the native stream species. And that in turn, to protecting the water and water rights and why they have to keep taking water out of the streams? It's time to start recycling and do more recycling. [Kaipo Faris]

What I've been trying to do is to get the State to, as new construction starts, so many homes, thousand homes, five hundred homes, whatever it may be. That they're required to have recycling systems on site for their homes. And to start using recycling water for their lawns and toilets and so forth. And save the water, put the water back in the streams where it belongs. To protect the species. So the water leads to the land. And loss of water, and the land being torn up by a lot of hikers not paying attention to trails and so forth, four wheelers going where they don't belong in our watershed, every time it rains all that mud gets washed into the stream down into the opening of the mouth of the stream and that kills our nursery areas for our ocean fish. 'Cause that's where they come in, to protect themselves, in the freshwater, from the predators. And when it's all muddy and dirty, where do they end up? Farther out to sea. Too bad, get eaten. So I started working with the water department. [Kaipo Faris]

Personally, I've done a lot of hiking throughout the Valley. I've done a lot of photography throughout the valley. For a while I had a company called Pictures of Hawaiʻi where I would sell my photography and I used to do a lot of hiking with some friends of mine. We did a lot of little investigating and just learning the valley. It's always been a place for me to take my dogs and exercise. I tell people that I don't need to go to the gym, the valley is my gym. [Steven Springel]

When I was young in my 20s and 30s I spent a lot of time up there, my friend Glen and I camped up there by the second waterfall, which is actually Waiheʻe waterfall, the first waterfall is Hāmama Waterfall. And we camped at Waiheʻe waterfall for three, four days, and we built a polie square and retaining walls to make ponds. It was quite an interesting time to be in the valley. [Steven Springel]

John Reppun and I signed a memorandum of understanding with the Board of Water Supply back in in the '90s with the intent on creating such a riparian zone open, outside classroom that would be managed by KEY Project in Kahaluʻu. And so, it still is the dream. [Rick Towill]

... I got involved in farming with my brothers; kind of running away from the world, trying to hide from what we saw happening around us but instead finding ourselves jumping right into it. By getting involved with farming, in particular wanting to learn more about things like taro farming, discovering that streams were starting to dry up and the reasons why: water diversions by the Board of Water Supply, following on the heels of sugar and pineapple, with the know-how to tap and divert water from one watershed to another, from one side of the island to another. It was a grand awakening. And the whole time, discovering reference material, reading through descriptions of each ahupuaʻa, learning

what an ahupuaʻa is, the seasons: Makahiki, not just a football jamboree at the stadium, but an actual season and starting to learn the cycles of life that were surrounding us, it was fascinating. [John Reppun]

I started working at KEY Project in the early '80s, started in teaching at the alternative learning center, which got me medical coverage while farming part-time which was great, put me in direct contact with the students from the very families that I had grown up with, who were the product of pretty difficult times: development pressure, the war in Vietnam going on, and seeing the sons and daughters of guys I grew up with impacted by drug use, by disenfranchisement, separation from the land, lack of familiarity with their surroundings, so that was my introduction to KEY Project. One of the exercises I used to do with kids, I would give each of them a long piece of paper and ask them to draw Koʻolau Poko... [John Reppun]

Place Names and Mele

I understand terms like Hāmama Falls, the name of the falls in the back, my understanding of Hāmama is that it refers to a portal, into a different realm and I can understand that, I relate to that. The falls as we first knew it, was this wide expanse, and when the Board of Water Supply sunk its straws into the cup, that got narrowed drastically today, and we do, we go up to the falls, we take kids up, we use the impact of the Board of Water Supply's withdrawal of water as teachable moments. [John Reppun]

There's one mele that stands out. Ka Ua Poʻai Hale or Poʻai Hala, both are used. That has to do with a rain that swirls around the hale or the hala grove. And Waiheʻe, Kahaluʻu are known for its hala groves. I remember that because I heard that from one of the staff members here at KEY, who was involved in hula and we traced it back to Puakea who was very familiar with that particular mele. So there are names of winds and rains that come in certain ways around Waiheʻe and Kahaluʻu that are important to bring forward. [John Reppun]

I'd have to describe [to my students] what Koʻolau Poko was, the moku, right? They didn't know those terms, they didn't know those places .... Mokoliʻi, Chinaman's Hat, Kapapa, is a flat surface, is that island at the edge of the bay before it drops off to the deep beyond Kāneʻohe Bay. My brothers and I would camp out on those islands, watch the birds, go surfing, go diving. Mōkapu Peninsula, now part of the military industrial complex, every kid should be given an opportunity. The military should not be allowed to be on Mōkapu unless they have extensive programs to ensure that the citizens around it have access to see Nuʻupia Ponds, the isthmus between, understanding water used to circulate between the bays through those fishponds and saline, kind of wetland areas. Heʻeia fishponds... [John Reppun]

... a guy that you probably want to talk to is Kepā Maly. He actually was close with Hoʻohila Kawelo who actually wrote a chant, a song for this area. So he ′s quite familiar with some of the ʻōlelo from way back. He actually helped us on our property here. We wanted to name our property. And he went back and got for us, retrieved from early maps that have a whole bunch of place names and our particular property and the one where the landslide happened, of which we own currently, it was ʻIli of Kaʻululoa and was dated from Kamehameha the 5th to a man by the name of James Steward. I want to go and find more information about him because it ′s a name that's always on a lot of land deeds but don ′t know the background on him. But anyway, there's a whole bunch of, there's Nana Kaʻalaʻea, which is the spider on the ridge if you ′re facing the ridge of the Koʻolaus it's on the right hand side, sort of above the property I grew up on. I have the map I can share with

you on that. Anyway, with Kepā's help we named our property Ka'ululoa, sort of refresh life, kind of thing. [Rick Towill]

Archaeological Sites

In the valley there, I know that in our property, the 45 acre piece that I grew up on, there's a series of dikes. On the north side of Waihe'e Valley comes down and then it breaks off into two ridges that forms kind of a triangle and we had the middle triangle. And then between those two ridges there were quite a number of, I think there were two or three basaltic dike complexes, this is where the earth cracks open and the lava goes up and cools very slowly. And creates these rock, the lava cooling slowly, it turns into basalt. That's where adzes, stone adzes were quarried. We actually found quite a number of them. I still have some adze blanks from our property. Adze blanks are sort of in the general shape of an adze but they're kind of squared off and the Hawaiians would carry them down or transfer them to whomever near the shore and that's where they would sort of grind the ends down to create the point to be able to dig soil or whatever they were going to use the adze for. [Rick Towill]

The area was fed before that, by an 'auwai that was maintained by all of the farming communities. They would go once a month, Saturday once a month, and clear all the bushes and make sure the 'auwai was unobstructed. The 'auwai is actually recorded on the Land Court map, located on the original, what's known as the part on our properties, is called the Land Court Application 1133. Remnants of the 'auwai exist but it's no longer a functioning 'auwai, down Waihe'e Road because places in the road there was an elevated flume, passed through some piping going down Waihe'e Road. Waihe'e Road, so some of the issues that you probably know of this area, when I was a little kid, was all coral roads, all of the roads, the roads in the area were coraled with coral aggregate. I believe those roads were built during the war. You know, military operations. I think they used a portion of the ridge in Waihe'e Valley. It's kind of bare on one end, towards the front of the valley, I think they used that for target practice and that sort of thing. [Rick Towill]

I've not really found any 'ulu maikas or anything like that in Waihe'e Valley but Larry Higa, on his property, which is down across from Kahalu'u Elementary School, they farmed that property in sweet potato in the '40s, late '30s. He found some adzes that he has, a foot long, maybe 14 inches long. Appropriately shaped with the cutting edges and so forth... Not too many 'ulu maikas in the area. There were some of those, sort of sling shots. They look like a miniature, shrunken football kind of thing, like an inch or two long. I think I have one of those. [Rick Towill]

So the back part of Kahalu'u Regional Park is a long stretch where lo'i used to be. Used to be a rice mill, just at the top part of the lagoon. Used to have 'auwai where Kahalu'u Fire Station is, used to be lo'i. [John Reppun]

That used to be a traditional lo'i site and it had a wall at one time. Parts of the wall are still visible. They had water coming from the stream across the, now there's a road there, a gravel road, coming through that road into the ginger patch. The ginger had taken over because it's wet, lot of water there. It's still real wet. There's still a spring up above. It's got cold enough water, I've taken temperatures. I think if we pull the ginger we can get the water to flow. That's to be seen. That needs to be done. [Kaipo Faris]

Well, I've come across several ancient sites in the valley. The back right side of the valley there's a trail, a pig hunting trail that circles the valley for the most part, through the back of the valley. There's some terraced areas back there with some interesting wall structures for food storage and if you do the research and the history of the valley, one time the valley

was pretty clear and there was a lot of cattle grazing and now all the vegetation is overgrown in the valley again. [Steven Springel]

But there's a lot of historical sites in the valley that are overgrown, you don't even know are there until you stumble upon. What I wanted to bring up that's important, is that this whole valley at one point was Kalahiki land. Belonged to the Kalahiki family. I forgot when it was that it was taken from them because they didn't pay their taxes. But, there's burial sites, there's Kalahiki family burial sites up there. I've spoken with people, second hand, about it. There's also Ho'okano family members buried up there. [Steven Springel]

I would be most concerned where they want to do the development in the lower part of the valley here [pointing to location on project site map]. This is the gate, on both sides of the road here there were houses. And I'm not sure where the burials and all the family members are buried, I would assume close in this area here. This place right here, this is an ancient lo'i. You can tell by the way the land is laid and the way the river can be diverted and exit over here. It is an ancient lo'i. Guarantee. Over here, before the bridge on the right over here, there is an old wall site you need to be aware of. The other sites that I know about are way back in the valley. Not even near this area [points toward main development location]. Up in this area right here, there's old military remains up here. [Steven Springel]

I would think that of most importance is to find out where these people have their family members buried. I think you need to look into that and speak to them directly... I mean, if you realize back in the '20s and '30s that was Kalahiki land, Kalahiki family up in that area. Back in those days people didn't bury their family in grave yards like we do now, they buried them in the mountain. You know? So, it's only normal for there to be people buried there, guaranteed. [Steven Springel]

I think that, this site should be taken a look at [pointing to map]. Right before the bridge, the bridge is by the pond. Somewhere in this area. It's real overgrown. Just take a look at this area. I can't be sure if it's an ancient Hawaiian site or not, there's a lot of wall construction in that area. And how old it is, it could be within the last century for all I know. But the other site I know about is way in the back here [pointing to map]. It's old, I know it is real old. The other thing, to navigate this valley, what my friend and I found best, is follow the mango trees, 'cause birds don't drop mango seeds. They don't grow at random. People planted those mango trees. For instance, if you come up the Jeep trail, before you get to the ponds, maybe about right here [pointing to map] there's two mango trees like gates, like an entry gate into something. So people planted those mango trees for that purpose, yeah? And then if you get further back up into the, by the waterfall, you can look across to the other side of the valley you can see the path to the trail that goes along here [pointing to map] and it's all marked by mango trees. You just travel from mango tree to mango tree. If you go down here in this area [pointing to map] there's a line of 'ulu trees, six 'ulu trees planted across like this, in a perfect line. From here to here [pointing to map]. So it's like, somebody planted these trees like this for a purpose. The old trees can be like a map to the valley of old of how people lived in the valley. 'Cause like I said, birds don't carry those kinds of trees and plant them like other stuff. [Steven Springel]

The army used to come up in here and they used to practice maneuvers. Old Man Higa told me when he first moved to the valley back in the '40s that there's tanks coming up the road and doing military practice. And if you go up in this area here, there's an old concrete bunker. Near that concrete bunker we used to find hazardous waste in the dirt: a lot of old Jeeps that were abandoned up there and by hazardous waste I mean we would find medical vials, stuff like that. [Steven Springel]

Gathering Practices

So Board of Water Supply engaged the Bishop Museum in a study of the flora and fauna of the back of the valley. Really extensive study not too long ago. But all kinds of plants that, whether it's things like mamaki or things that hālau would use. I think that's important to bring forward. Jeff Preble, part-time staff here at KEY, he's very interested in this whole Waiheʻe Ahupuaʻa initiative that we have going, very knowledgeable about different plants we have mauka. [John Reppun]

Not really [the project won't affect cultural practices] that I know of other than the ʻauwai is active from I think probably halfway up the property that you're working and the Reppuns maintain that diversion from the stream through this ʻauwai that Rachel Hall. She was one of twelve kids from Kauaʻi. [Rick Towill]

There's a really good location, which we've sort of called the Ginger Patch, the road kind of goes up the hill from the gate and it drops down and goes across a small tributary, sort of an intermittent stream, and then you reach this place which has a whole bunch of white and yellow ginger, which we actually harvest the ginger blossoms for KEY Project's fundraiser and other things. [Rick Towill]

There have been a couple of hālaus that come in. And yes, I help them out, I've shown them to several areas where they can go and find what they need. And now they come on their own. They always stop in to say hi. [Kaipo Faris]

Change Through Time

There's a lot of invasive species in the valley, a lot of invasive species that I've seen change the flora of the whole valley over the last several decades. That's one of the things that really depresses me about the valley as well as the foot traffic as well. [Steven Springel]

Since the internet, social media, the foot traffic is off the charts. It's, I mean, for the most part people stick to the jeep trail, the main road, there are people that go off on other trails and create new trails. So, it's just, you know, most of the people there are conscientious, good people for the most part, but there's you know, people that have no regard, no respect for the valley. [Steven Springel]

I have some pictures of how it used to look with the koa trees. The koa trees were affected by a blight in the late ʻ90s and that's when the right hillside was overtaken by invasive species. Used to be maile. The very back corner, almost to the back corner, used to be a whole ravine of rosy apples. But the valley, you know, if you study the history, the valley originally had eight waterfalls until the Board of Water Supply came in there started taking the water. Now two remain. The third waterfall, it runs pretty prevalent when it rains hard. [Steven Springel]

You know, as far as the community's concerned, back in the old days, everybody grew up as kids. They would go up there as kids and swim. It would be the community playground. It would be, I'm sure it would be the same like you growing up Big Island, you guys go up to the pond, you go swim. It was that way for the community. And it got overrun and now it's restricted to everybody and so, this is one of the things that my neighbor, he mentioned, he cannot go up there to visit his relatives that are buried up there. Ken Higa. He mentioned that to me. And I feel the same way, you know. I've always raised dogs. I have two dogs buried up there on the hillside. I can't go, I can't take my dog I have right now running and exercise like I used to up there. It's taken away something precious from the community, from the people who live there. It's taken away from us. We cannot take our children and our grandchildren up there to go swimming in the pond like we used to. I have pictures of my daughters when they are just babies, two, three years old, and my father in law and I

carried them up there to the pond to swim. That's all gone. We can't do that now. [Steven Springel]

Not the fact that it's gated. I mean, it's always been gated. Now, it's, you get cited by the police. It's restricted area now. And I mean, it's always been No Trespassing signs, Board of Water Supply but still everybody would go. The social media and the masses have ruined it for everyone now. Especially the people of the community. It's been taken away from us. The parking on the street and everything, was a big concern and everyone was upset about that. But now, it's not too bad ʻcause a lot of people not coming now. So, the police have done their job and it's been working. But, nevertheless we cannot go up there either. I used to go up there two, three times a week. I get off, take my dog and can go for a run. I can't do that anymore. I kind of miss that. Hawaiʻi's changed a lot. [Steven Springel]

Mayor Fasi was going to put a golf course in the back of the valley. John Reppun saw to it that that didn't happen. And so, that actually sat with Parks Department and then they somehow named it the Waiheʻe Nature Preserve, which is to the detriment of the community around here. ʻCause when Facebook and all that kind of stuff came along, someone got the bright idea saying what a wonderful hike it is back there. And the community actually made enough fuss that there's been rubbish and stuff left up there, defecation, they've actually found for the second time bacteria in the water, so they've had to shut it down. [Rick Towill]

When you go in the back there, they actually put an inclined well, Board of Water Supply, at the base of Hāmama Falls back in the ʻ80s and the Reppuns and others had a contested case hearing because when that inclined well was put in at the time it drastically reduced the flow of water in Waiheʻe Stream, which limited the use of that water for taro patch purposes and so forth. [Rick Towill]

Luckily Waiheʻe Stream has very few obstructions in the stream. One of them is the fish ladder, that was a USGS gauging station and we considered taking it out and then thinking about what the real issue was, the aquatic life being able to get past that. So we did the fish ladder project. The other obstruction, manmade is the crossing of what used to be the Nakata's farm. A number of houses down from the gate there's a driveway that goes across Waiheʻe Stream. It goes to the farm that Bob Nakata's father, where Bob grew up on. The Nakata's farm, used to be absolutely beautiful loʻi, rock walls, terraces, all maintained with a sickle. He would do it all with a sickle. I think some of that's been bulldozed by the person who came in after. But that would be a really important site to go look at... There was a ford in the stream, the stream flowed over it. Then you get down to Ahilama Road, where Waiheʻe Stream comes under the bridge there, that's been altered but the water's still running through there. [John Reppun]

My brothers built their own loʻi right there, making the rock walls, running water in gutters that were hung through the hau bush from the stream to the loʻi, wonderful piping hot water that we would bathe before it would go back into the stream... and then the taro all rotted. And we were like, "wait a minute, what's going on here?" My brothers went consulting with Rachel Hall, who was from Hanapepe, Kauaʻi, married Joe Hall over here in Waiheʻe, was farming taro in Waiheʻe. And that was our introduction to Waiheʻe, to go and ask her. Her sage response: "You want to learn how to grow taro? Take over that loʻi," right next to her. So farming alongside this Hawaiian woman who really knew her taro. But she also had problems with rot and eventually that led to, something else is going on here. We looked at the water, something's happening with the water. Board of Water Supply had come into Waiheʻe and had started to tap water with wells and tunnels and eventually got to the point where they could turn a valve and pretty much dry up Waiheʻe Stream, turn off Hāmama Falls. [John Reppun]

Concerns and Recommendations

Actually, by having something that's, John and I envisioned through KEY project in the back of the valley, we could incorporate some invasives removal because there's albizia, there's this other thing, it's on the State noxious plant list, it has a yellow flower and it's somehow been isolated to this valley. It migrated from the Kahuku side of the valley and it's become a problem. By doing an outside classroom and some of those efforts we can eradicate some of those invasives which don't help the land. [Rick Towill]

No actually, the surrounding community is quite supportive of an effort like this because it would work towards limiting just the free for all access that 's been happening for the last five or six years. I think going forward, there needs to be an effort to make the visitors that visit Hawai'i understand that there 's a protocol and a respect that needs to happen. I think if something were added to the video that 's played on the incoming flight that talks about invasive species, declaring unwanted plants and animals. That if something like that were offered, that would be good. It 's gotten, I think we're just beginning to see the signs, the industry has too many people coming here now. The State and County doesn 't manage access to open areas very well. [Rick Towill]

The idea of moving the gate back and creating a parking lot, I'm totally against that. Because then you're going to have people coming up there at night to drink in that vacant parking lot. And that's going to create more problems for the neighborhood. [Steven Springel]

It's the gate. The gate has to keep people from even getting in there. Where the gate is located now, close to the homes, they can't really park there. If they do, people call the cops 'cause it's right by their house. But if they're further back in the valley, where they can manifest at midnight, making trouble, nobody's gonna know they back there. Then they come down the road at 50 miles an hour in the middle of the night, it's a problem. That's a concern. [Steven Springel]

The other thing that was brought up at the Neighborhood Board Meeting was that there's two entities, the Board of Water Supply and Parks & Recreation. It seems Parks & Recreation, they have a thousand and one things to do already so they're not really, you know, concerned about this area. And if it was put all under Board of Water Supply under one entity, then there would be better management. Right now, you have two entities that are trying to be consolidated, whereas if had just one entity it would be a lot easier and faster. [Steven Springel]

Because if we have one land owner, and honestly don't think of them as owners, I think of them as stewards, better to have one agency, better to turn this all into watershed, down to the gate. Because there's this portion of Waihe'e Nature Reserve that's under Parks & Recreation, there's this implication that there's this recreational resource up there. Thousands of people going up there, literally thousands. And they're going up there thinking it's a destination, it's a recreation area. I'm not against a lot of people going up, but if they're going up for a purpose, if it's managed access, and they're going to help with fighting invasives and restoring lo'i, and they're going in learning groups by permit or arrangement, which the Board of Water Supply does anyway. [John Reppun]

It's better for it to be a managed access watershed area, including inviting in hunting groups at certain times to quell the riot of feral pigs. Right now there's not hunting allowed, guys go anyway. Because there's so many pigs up there. That's been our pitch. This is a fairly recent conversation where we're trying to get BWS to take this all on, so then we don't have to be stuck with a phase one, phase two. Getting vehicles, small vans, 15 passenger vans. There's a parking area, it's adjacent to the land that Rick Towill owns, put like a gate-

area, kind of like what Ho'omaluhia has, so anybody going up there is passing by some kind of a facility. Have a checking point. Parking area up here, I'm generally in favor of that. There's a logical bus turn around area, and a bus coming up and dropping off kids in a program. And if they drive right in with parking there and a turn-around up there makes sense. The very first issue for me is, first of all they're doing an environmental assessment. Because the City is not there and probably shouldn't be there, down here is Kahalu'u Regional Park. They have so much on their plate down here, they can't possibly take this on, they don't have the ability or interest. [John Reppun]

We know how to restore a fishpond, we know how to restore lo'i, we know how to get the 'auwai flowing, we know how to plant, how to harvest. But we don't know how that konohiki-relationship works, how to interface with the community. The idea is to have a space with some cabins on it and we have interns, a business intern, a cultural intern, a poet, you know, kumu hula, those interns are cycling through, they work with you on your farms, with your kids, so we're constantly enriching ourselves, we're constantly learning... and maybe we talk about the pavilion, the parking area, but shouldn't we also talk about building in this opportunity to stay, work, live there even if it's for a period of time? Cultural residency... A day trip to me is like somebody diving with a snorkel and a mask as opposed to going with an Aqualung. So some way of being in these spaces, not only mauka, here, the wetland area. Creating those spaces where people go and stay for a longer moment... A pilot project just in order to scare up the questions we could be asking, would be really awesome. [John Reppun]

That's the struggle though with the uplands. The uplands historically is not meant for people to gather resources and bring down and not have a lot of that traffic in there. Because culturally speaking, you leave it in that state. The challenge is, about people going up into that space, even guys that say they're hunters and stuff, I think the perspective of what it's supposed to do for the people that live in these more habited areas, is a challenge of how you manage that. About who should have access and when and how. And I'm not trying to limit the access, but it's definitely a challenge on understanding what is its primary role to sustaining the water that we all need to survive and the secondary resources it provides: medicine, food. For me, recreation is very low on the list in some ways. But it still has its recreation value. It's a challenge.[Kihei Nahale'a]

That it is the whole community's responsibility: the viability of the ahupua'a, I'm one that thinks it's important for people to have access but there's levels of access. Also requires a sense of reciprocity. Traditionally, ahupua'a meant if you like eat, or you like water, then you goin' come help clean. And if that's happening, then there's opportunities for other to come and see that. You have to celebrate that kind of relationship that people have with their place. Which I think is a good thing to share. It requires an organization or a family, like John guys, they keep that responsibility of keeping it with integrity. It requires some type of management or konohikiship that allows the community to come and speak to their concerns and the community to enforce or mitigate those concerns. There has to be some kind of community-based residence that resides in that place. Like a KEY Project, like a family that understands the responsibility. They should be given the opportunity to subsidize themselves, be supported by... to model the relationship that is very Hawaiian. [Kihei Nahale'a]

Immerse. Re-cultivate. The thing about the cultural residency, there's a sense of immersing. You're going in to let go of whatever you have and accept what's there. That's kind of an important thing. So if we talk about infrastructure, or support systems that do that, I think that's very helpful. Having people that can stay there that can train people and accept people in in a way that spiritual, emotional management is happening. It's never about the physical. It's dependent upon your attitude and your emotions. People don't

realize those things aren't in check, people are going to get hurt. Physical infrastructure or support systems allow people to become calibrated into a space. [Kihei Nahale'a]

They have a program on protecting the environment. So we started looking into the plants up here. And there's so many invasive species up here, I would say it's probably impossible to get back to where we were. There's old, old Hawaiian trees, very rare. I know where they are up here in the valley but they're getting so encroached upon by Christmas berry. And thimble berry. And these trees take forever to grow. The wood is so hard that the Hawaiians used to use it as an anchor, that wood. And that's the tree, you know? There's a couple of them up here. They take forever, they're 70 years old and they're only six inches around. You know, they grow for years and those things need to be protected and they're just getting choked out. [Kaipo Faris]

We've been working with the police department to try and keep the 800-a-day hikers down to a very minimum and trying to stop it at all, stop all of it, 'cause the pollution in the water, the pollution on the land. And this is a watershed, you know? There's other waterfalls to go visit, this watershed, the water from these streams also goes into taro patches and farms down below here. And when you have 800 people a day hiking with no facilities, you know where all that's going. And that's why the stream now, has been considered, you know, to stay out of. Because it's polluted, has E. coli and so forth. So that's where we are, we're trying to teach the kids how to protect the 'āina. [Kaipo Faris]

We spent two days picking up trash, we filled two 35 foot bins with trash, I mean not just from that one spot, but all up and down. We've done many more cleanups and that's all from the hikers. Bottles, beer cans, you can't believe it. So anyway, we cleared an area, smoothed it out, bulldozer in there, made it all nice and level, made an area for parking and for buses to be able to turn around. So the buses and whatever traffic this pavilion may incur, keeps traffic out of the neighborhood. So we don't take the neighborhood's parking. You know, we don't want to upset the neighbors. They've been upset enough by all the tourists— 800 on weekends. That's why the policeman is up there now. Right at the gate there. They don't pay attention to the signs, they take pictures next to it with their kids. A 'No Trespassing' sign. And teaching their kids, it's ok to trespass, how's that? [Kaipo Faris]

We need to be sure that any work we do around the stream and the lo'is, that we do not affect the people downstream. And we should get their ok that this is our plan, and is it ok with you? And some of the kids that are working in the lo'i now are our kids. So, should go ok. [Kaipo Faris]

I think we could put it back to somewhat of what it used to be by teaching the kids about water and about native species and then we can have a nursery and put some of the plants back that belong in there. Take out invasives, find a way to take them out so they don't regrow. We have had many kids that we've worked with that are now back again here with master's degrees, working with us. [Kaipo Faris]

Summary of Ethnographic Survey

The interviewees shared their extensive knowledge and experiences of Waihe'e. Several place names and mele names were shared. It was noted that the name Hāmama Falls refers to a portal to a different realm. One mele of the area is titled Ka Ua Po'ai Hale or Po'ai Hala. The mele speaks of a rain that swirls around the hala groves that the region is known for. Traditional gathering practices were also identified for the area. These include mamaki and ginger gathering, as well as the collecting of other plant materials by hula hālau. Old koa, mango, and 'ulu trees were discussed as important natural resources in the valley, and the 'auwai is an active resource that is still maintained today. The project

area was discussed as a critical piece of the Waihe'e and Kahalu'u watersheds, the waters from which flow makai, impacting kalo farmers and the community further down the valley. The streams were also mentioned as important resources for Hawaiian freshwater species including the hīhīwai and 'o'opu.

Interviewees identified archaeological sites within the project area, such as lo'i, 'auwai, old walls, and basalt dike complexes that were quarried for making adzes. Waihe'e Road is also a historic property, as it was noted to have been constructed as a coral road during World War II. There may also be burials of the families Kalahiki and Ho'okano, although it is not known whether these are within the project area or not. Cultural resources noted outside the project area include lo'i, 'auwai, a rice mill, wall structures for food storage, and military remains such as a concrete bunker.

Interviewees remarked on recent changes in Waihe'e Valley including increased foot traffic and consequent restrictions to access to reduce the hiking footprint of trash, defecation, and erosion. The increased bacteria levels in the stream were noted, due to the high levels of incoming traffic. It was suggested that visitors to Hawai'i should be educated on protocol, respect, and the harmful effects of bringing invasive plants to the islands. The Waihe'e Riparian Learning Center was discussed as an opportunity to promote managed, reciprocal access to the valley. There were varying opinions on how this should be managed, with one interviewee remarking on the creation of a parking lot as a potential place for future trouble in the neighborhood and that the gate should be where the neighbors can see it. The idea of inviting hunters in to help control the feral pig population was put forth, as well as offering cultural residency to interns who could live and work in the valley for a period of time. Because what happens in the mauka areas affects the people downstream, it was recommended that the residents and farmers downstream should be consulted on the proposed project. The interviewees also remarked on the joint jurisdiction of the subject properties, between the Department of Parks & Recreation and the Board of Water Supply, and that it would be preferable to have stewardship under one entity. In all, the project is a product of community effort and the work of the KEY Project, and was generally supported by all interviewees. The overwhelming numbers of hikers and their effects were noted as a major problem, and the proposed project might help by managing access to the area.

Summary and Recommendations

Waiheʻe Valley has a long history of agriculture and as an abundant ahupuaʻa. These traditions continue today, with kalo farming revitalization as an integral part of recent history and ongoing community connection to place. Population levels and kalo farming declined in the 1820s and 1830s as a result of disease and changes in land tenure with the sugar, rice, and dairy industries. Waiheʻe was put under development pressure throughout the 1900s, but has largely retained its role as a rural watershed. Ongoing community concerns in the Koʻolaupoko region include water rights, flooding, and development.

This study highlights the unique history of Waiheʻe and demonstrates the importance of this place to the community. Four interviews of community members were conducted so that they could share their manaʻo and help to identify any potential cultural resources or practices that might be affected by the proposed Waiheʻe Riparian Learning Center.

Cultural Resources, Practices, and Beliefs Identified

Archival research and ethnographic interviews compiled for the current study revealed that Waiheʻe was a culturally significant area with many of the natural resources which supported traditional subsistence activities. In the project area, this would have centered on kalo farming.

The interviewees identified several traditional cultural practices that are carried out in the project area today including gathering of mamaki and ginger, as well as the collecting of other plant materials by hula hālau, and maintenance of the ʻauwai. Interviewees identified many important natural resources including wai, old koa, mango, and ʻulu trees, puaʻa, as well as freshwater fauna.

Archaeological sites were identified within the project area by the interviewees. These include loʻi, ʻauwai, old walls, and basalt dike complexes that were quarried for making adzes. Waiheʻe Road was noted to have been constructed as a coral road during World War II, and there may also be burials of the families Kalahiki and Hoʻokano within the project area or nearby.

Previous archaeological research in Waiheʻe has been focused in the makai portion of the valley and along the coast. Although no previous archaeological studies have been conducted within the project area, archival research tells us that there were 26 LCAs awarded in Waiheʻe, including 59 kuleana plots, most of which were situated along the stream (Chun 1954:24). There were no LCAs awarded within the study area, although one LCA was located not far to the north, where eight loʻi were recorded in Māhele testimony.

Potential Effects of the Proposed Project

Whereas the proposed project may affect the cultural resources and practices noted above, the interviewees generally expressed that the effects would be positive, particularly since the Waiheʻe Riparian Learning Center is focused on reviving loʻi and ʻauwai systems and engaging the next generation with cultural watershed use. The project has the potential to provide a system for reciprocal-based access and aid in invasive plant species removal. The design of the gate and parking lot framework will have wider implications for parking, access, and neighborhood traffic and safety.

Confidential Information Withheld

During the course of researching the present report and conducting the ethnographic survey program, no sensitive or confidential information was revealed. No confidential information was withheld from the current report.

Conflicting Information

No conflicting information was obvious in analyzing the gathered sources. On the contrary, a number of themes were repeated and information was generally confirmed by independent sources.

Recommendations/Mitigations

In general, the interviewees were concerned about the overwhelming numbers of hikers in the valley and the negative effects this has had on the ʻāina and its residents. Managed access was an important theme that recurred across the interviews. In addition, invasive plant species removal was discussed by all interviewees as an important mitigation tool. All interviewees talked about the role of the project area as a mauka site that needs to be managed with the cascade effect of water to more makai-located farmers and communities. Because what happens in the mauka areas affects the people downstream, it was recommended that the residents and farmers downstream should be consulted on the proposed project. The idea of inviting hunters in to help control the feral pig population was put forth, as well as offering cultural residency to interns who could live and work in the valley for a period of time. Several of the interviewees expressed a desire that jurisdiction of the project area be consolidated with the Board of Water Supply in efforts to streamline administration and put management in the best possible hands. One interviewee identified the Hoʻokano, and Kalahiki families as having family members possibly buried on the project properties. Further work may need to be done with these ʻohana to determine if the project will affect any burial sites.

Summary and Conclusion

In conclusion, background research and oral history interviews identified several archaeological resources within and outside the project area that will be affected by the proposed project. An archaeological inventory survey is recommended to gather more information on the surface and possibly subsurface cultural resources within the study area. The community should be kept informed and their concerns and recommendations should be considered during all phases of the proposed work. Waiheʻe Valley is clearly valued, both for its traditional uses and history as well as contemporary role in agricultural and cultural revitalization and as a critical source of fresh water.

Glossary

ahupua‘a Traditional Hawaiian land division usually extending from the uplands to the sea.

‘āina Land.

albizia A genus of trees invasive to Hawai‘i, particularly *Falcataria moluccana*.

ali‘i Chief, chiefess, monarch.

‘auwai Ditch, often for irrigated agriculture.

‘awa The shrub *Piper methysticum*, or kava, the root of which was used as a ceremonial drink throughout the Pacific.

hala The indigenous pandanus tree, or *Pandanus odoratissimus*, which had many uses in traditional Hawai‘i. Leaves were used in mats, house thatch, and basketry; flowers were used for their perfume; keys were utilized in lei and as brushes; roots and leaf buds were used medicinally; and wood was fashioned into bowls and other items.

hālau Meeting house for hula instruction or long house for canoes.

hale House.

hānai Foster child, adopted child; to raise, feed, or sustain; a provider or caretaker.

Haole White person, American, Englishman, Caucasian; formerly any foreigner.

hau Native tree *Hibiscus tiliaceus*

he‘e Octopus (*Polypus* sp.).

heiau Place of worship and ritual in traditional Hawai‘i.

hīhīwai The endemic freshwater gastropod, *Neritina granosa*, which is eaten raw or cooked.

hoa‘āina Native tenants that worked the land.

‘ike To see, know, feel; knowledge, awareness, understanding.

imu Underground pit or oven used for cooking.

Kahiki A far away land, sometimes refers to Tahiti.

kalo The Polynesian-introduced *Colocasia esculenta*, or taro, the staple of the traditional Hawaiian diet.

kapu Taboo, prohibited, forbidden.

koa Native tree, *Acasia koa*, hardwood tree used for canoe construction

kolohe Mischievous, unethical, naughty; rascal, prankster, vandal; to misbehave or cheat.

konohiki The overseer of an ahupua‘a ranked below a chief; land or fishing rights under control of the konohiki; such rights are sometimes called konohiki rights.

kuhina nui Prime minister or premier. Ka‘ahumanu was the first kuhina nui. The position was abolished in 1864.

kula Plain, field, open country, pasture, land with no water rights.

kuleana Right, title, property, portion, responsibility, jurisdiction, authority, interest, claim, ownership.

kumu hula Hula teacher/master.

kupuna Grandparent, ancestor; kūpuna is the plural form.

limu Refers to all sea plants, such as algae and edible seaweed.

lo‘i, lo‘i kalo An irrigated terrace or set of terraces for the cultivation of taro.

Lono The Hawaiian god associated with such things as agriculture, rain, and the makahiki, a time of peace.

Māhele The 1848 division of land.

maile *Alyxia olivaeformis*, a fragrant native shrub used for twining.

maka‘āinana Common people, or populace; translates to “people that attend the land.”

mākāhā A fish pond sluice gate.

makai Toward the sea.

māmaki *Piptarus* spp., a small native tree. Fiber from its bark was used to make a kind of coarse tapa. Sometimes spelled mamake in old texts.

mana‘o Thoughts, opinions, ideas.

mango Trees of the genus *Mangifera*, introduced to Hawai‘i in the 19th Century and well known for their edible fruit.

mauka Inland, upland, toward the mountain.

mele Song, chant, or poem.

mō‘ī King.

moku District, island.

mo‘o Lizard, dragon, water spirit.

mo‘olelo A story, myth, history, tradition, legend, or record.

muliwai River mouth, estuary, or pool near the mouth of a stream, enlarged by ocean water left there at high tide.

‘ohana Family.

‘ōlelo no‘eau Proverb, wise saying, traditional saying.

oli Chant.

olonā The native plant *Touchardia latifolia*, traditionally used for making cordage.

‘o‘opu Fish of the families *Eleotridae*, *Gobiidae*, and *Bleniidae*.

polie Gleaming, shining, a flash of light.

pre-contact Prior to A.D. 1778 and the first written records of the Hawaiian Islands made by Captain James Cook and his crew.

pua‘a Pig.

uhu An adult parrotfish, one of two genera of the *Scaridae* family known to occur in Hawai‘i.

‘ulu The Polynesian-introduced tree *Artocarpus altilis*, or breadfruit.

‘ulu maika Stone used in the maika game, similar to bowling.

wai	Water or liquid other than salt water.
waiawī	*Psidium cattleianum f. lucidum*, the yellow strawberry guava.
wauke	The paper mulberry, or *Broussonetia papyrifera*, which was made into tapa cloth in traditional Hawai‘i.

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Appendix A: Agreement to Participate

Agreement to Participate in the Cultural Impact Assessment for the Waihe'e Riparian Learning Center
Gina McGuire, Ethnographer, Keala Pono Archaeological Consulting

You are invited to participate in a Cultural Impact Assessment (CIA) for the Waihe'e Riparian Learning Center in Kahalu'u, on the island of O'ahu (herein referred to as "the Project"). The Assessment is being conducted by Keala Pono Archaeological Consulting (Keala Pono), a cultural resource management firm, on behalf of G70. The ethnographer will explain the purpose of the Assessment, the procedures that will be followed, and the potential benefits and risks of participating. A brief description of the Assessment is written below. Feel free to ask the ethnographer questions if the procedures need further clarification. If you decide to participate, please sign the attached Consent Form. A copy of this form will be provided for you to keep.

Description of the Project

This CIA is being conducted to collect information about the Project in the Kahalu'u area in Ko'olaupoko on O'ahu Island through interviews with individuals who are knowledgeable about this area, and/or about information including (but not limited to) cultural practices and beliefs, mo'olelo, mele, or oli associated with this area. The goal of this Assessment is to identify and understand the importance of any traditional Hawaiian and/or historic cultural resources, or traditional cultural practices within the Project. This Assessment will also attempt to identify any effects that the proposed development may have on cultural resources present, or once present within the Project area.

Procedures

After agreeing to participate in the Assessment and signing the Consent Form, the ethnographer will digitally record your interview and it may be transcribed in part or in full. The transcript may be sent to you for editing and final approval. Data from the interview will be used as part of the ethno-historical report for this project and transcripts may be included in part or in full as an appendix to the report. The ethnographer may take notes and photographs and ask you to spell out names or unfamiliar words.

Discomforts and Risks

Possible risks and/or discomforts resulting from participation in this Assessment may include, but are not limited to the following: being interviewed and recorded; having to speak loudly for the recorder; providing information for reports which may be used in the future as a public reference; your uncompensated dedication of time; possible misunderstanding in the transcribing of information; loss of privacy; and worry that your comments may not be understood in the same way you understand them. It is not possible to identify all potential risks, although reasonable safeguards have been taken to minimize them.

Benefits

This Assessment will give you the opportunity to express your thoughts and opinions and share your knowledge, which will be considered, shared, and documented for future generations. Your sharing of knowledge may be instrumental in the preservation of cultural resources, practices, and information.

Confidentiality

Your rights of privacy, confidentiality and/or anonymity will be protected upon request. You may request, for example, that your name and/or sex not be mentioned in the Assessment material, such as in written notes, on tape, and in reports; or you may request that some of the information you provide remain off-the-record and not be recorded in any way. To ensure protection of your privacy, confidentiality and/or anonymity, you should immediately inform the ethnographer of your requests. The ethnographer will ask you to specify the method of protection and note it on the attached Consent Form.

Refusal/Withdrawal

At any time during the interview process, you may choose to not participate any further and ask the ethnographer for the tape and/or notes. If the transcription of your interview is to be included in the report, you will be given an opportunity to review your transcript, and to revise or delete any part of the interview.

Appendix B: Consent Form

Consent Form

I, _____, am a participant in the Cultural Impact Assessment for the Waiheʻe Riparian Project (herein referred to as "the Project"). I understand that the purpose of the Assessment is to conduct oral history interviews with individuals knowledgeable about the Project and the surrounding area of Waiheʻe on Oʻahu Island. I understand that Keala Pono Archaeological Consulting and/or G70 will retain the product of my participation (digital recording, transcripts of interviews, etc.) as part of their permanent collection and that the materials may be used for scholarly, educational, land management, and other purposes.

_____ I hereby grant to Keala Pono and G70 ownership of the physical property delivered to the institution and the right to use the property that is the product of my participation (e.g., my interview, photographs, and written materials) as stated above. By giving permission, I understand that I do not give up any copyright or performance rights that I may hold.

_____ I also grant to Keala Pono and G70 my consent for any photographs provided by me or taken of me in the course of my participation in the Assessment to be used, published, and copied by Keala Pono and G70 and its assignees in any medium for purposes of the Assessment.

_____ I agree that Keala Pono and G70 may use my name, photographic image, biographical information, statements, and voice reproduction for this Assessment without further approval on my part.

_____ If transcriptions are to be included in the report, I understand that I will have the opportunity to review my transcripts to ensure that they accurately depict what I meant to convey. I also understand that if I do not return the revised transcripts after two weeks from the date of receipt, my signature below will indicate my release of information for the draft report, although I will still have the opportunity to make revisions during the draft review process.

By signing this permission form, I am acknowledging that I have been informed about the purpose of this Assessment, the procedure, how the data will be gathered, and how the data will be analyzed. I understand that my participation is strictly voluntary, and that I may withdraw from participation at any time without consequence.

Consultant Signature **Date**

Print Name **Phone**

Address

Thank you for participating in this valuable study.

APPENDIX C: TRANSCRIPT RELEASE

Transcript Release

I, _____, am a participant in the Cultural Impact Assessment for the Waiheʻe Riparian Project (herein referred to as "the Project") and was interviewed for the Assessment. I have reviewed the transcripts of the interview and agree that the transcript is complete and accurate except for those matters delineated below under the heading "CLARIFICATION, CORRECTIONS, ADDITIONS, DELETIONS."

I agree that Keala Pono Archaeological Consulting and/or G70 may use and release my identity, biographical information, and other interview information, for the purpose of including such information in a report to be made public, subject to my specific objections, to release as set forth below under the heading "OBJECTIONS TO RELEASE OF INTERVIEW MATERIALS."

CLARIFICATION, CORRECTIONS, ADDITIONS, DELETIONS:

OBJECTIONS TO RELEASE OF INTERVIEW MATERIALS:

Participant Signature **Date**

Print Name **Phone**

Address

Appendix D: Interview with Kaipo Farris

TALKING STORY WITH

KAIPO FARIS (KF)

October 19, 2019 / 3:00 PM / Uncle Kaipo's House, Waiheʻe, Oʻahu
Interview by Gina McGuire (GM)

GM: I'm here at the top of Waiheʻe Road with Uncle Kaipo Farris. We're talking story about the Waiheʻe Riparian Learning Center. Today is October 19, 2019. To start off, Uncle could you please tell me a little bit about yourself?

KF: Kaipo Farris. I was born on Molokaʻi, lived on Waiheʻe, Maui, and then moved to Oʻahu and went to Kamehameha Schools. Finished my high school in California, went to two different colleges in California. Did a little post work at Scripps Institute. And was a harbor master at Redondo Beach for many years. Then I retired from that and became a boat shop owner. I sold boats and motors. And trailers and did a lot of contract work for the government. And then my wife retired so we decided to sell out and come home. And we're back in Hawaiʻi and got involved with teaching the kids at KEY Project. And bettering the environment in our area.

GM: Do you want to talk a little bit about your family background, your parents?

KF: Sure. My dad came to Hawaiʻi because he got hurt playing football at Oregon State. He was in the hospital for two years. So he had to get well in a warm environment, they told him. So he moved to Hawaiʻi. He sold newspapers around the island at night driving a Jeep and then later he moved to Maui and he wrote for the Maui News and he also worked at the airport. Then he started flying his own plane and crop dusting. Then he started an airline and that's how he met my mom. She's one of 17 children all raised in Waiheʻe, Maui and he became very in-tune to Hawaiʻiana.

GM: Your dad sounds like a really cool guy! Could you talk about your experience with the Waiheʻe Valley and how you came to know this area?

KF: I just did a lot of hiking in this area. And I saw this property for sale and the stream and I said to my wife, "We're moving." When I was young, I grew up with my Tutus on Maui, even after I went away for school, I would fly home for vacation, weekends, to stay with my Tutus. And they taught me the Hawaiian way of fishing and preserving our environment. I started looking into our streams and started noticing we have so many aquarium species and we're losing all our native species. And we're losing our water. We're losing everything. So I started getting involved in protecting the ʻoʻopu and the hīhīwai and all the native stream species. And that in turn, to protecting the water and water rights and why they have to keep taking water out of the streams? It's time to start recycling and do more recycling. A recycling plant can do more. We talked to them, they said "yeah, all we need the State to do is tell us go ahead. Bring some more water." But no, it's big money. What I've been trying to do is to get the State to, as new construction starts, so many homes, thousand homes, five hundred homes, whatever it may be. That they're required to have recycling systems on site for their homes. And to start using recycling water for their lawns and toilets and so forth. And save the water, put the water back in the streams where it belongs. To protect the species. So the water leads to the land. And loss of water, and the land being torn up by a lot of hikers not paying attention to trails and so forth, four wheelers going where they don't belong in our watershed, every time it rains all that mud gets washed into the stream down into the opening of the mouth of the stream and that kills our nursery areas for our ocean fish. 'Cause that's where they come in, to protect themselves, in the freshwater, from the predators. And when it's all muddy and dirty, where do they end up? Farther out to sea. Too bad, get eaten. So I started working with the water department. They have a program on protecting the environment. So we started looking into the plants up here. And there's so many invasive species up here, I would say it's probably impossible to get back to where

we were. There's old, old Hawaiian trees, very rare. I know where they are up here in the valley but they're getting so encroached upon by Christmas berry. And thimble berry. And these trees take forever to grow. The wood is so hard that the Hawaiians used to use it as an anchor, that wood. And that's the tree, you know? There's a couple of them up here. They take forever, they're 70 years old and they're only six inches around. You know, they grow for years and those things need to be protected and they're just getting choked out. We've been working with the police department to try and keep the 800-a-day hikers down to a very minimum and trying to stop it at all, stop all of it, 'cause the pollution in the water, the pollution on the land. And this is a watershed, you know? There's other waterfalls to go visit, this watershed, the water from these streams also goes into taro patches and farms down below here. And when you have 800 people a day hiking with no facilities, you know where all that's going. And that's why the stream now, has been considered, you know, to stay out of. Because it's polluted, has E. coli and so forth. So that's where we are, we're trying to teach the kids how to protect the ʻāina.

GM: Could you expand on how you've seen the area change? Is there anything you'd like to add?

KF: I think we could put it back to somewhat of what it used to be by teaching the kids about water and about native species and then we can have a nursery and put some of the plants back that belong in there. Take out invasives, find a way to take them out so they don't regrow. We have had many kids that we've worked with that are now back again here with master's degrees, working with us.

GM: That's awesome!

KF: It is.

GM: Could you share any knowledge about any moʻolelo, oli, important place names for the area?

KF: No, I'm not the one for that.

GM: That's totally ok.

KF: As I said, I'm a newcomer here, myself. I've only been here ten, twelve years I think. My home is Molokaʻi and Waiheʻe, Maui.

GM: You were talking a little bit earlier (before interview started) about the ʻauwai and a spring over here [pointing to map]. Do you want to talk a little bit more about traditional sites you know of in this area?

KF: That used to be a traditional loʻi site and it had a wall at one time. Parts of the wall are still visible. They had water coming from the stream across the, now there's a road there, a gravel road, coming through that road into the ginger patch. The ginger had taken over because it's wet, lot of water there. It's still real wet. There's still a spring up above. It's got cold enough water, I've taken temperatures. I think if we pull the ginger we can get the water to flow. That's to be seen. That needs to be done. We figure if we don't have enough we can run a pipe from the upper, where the bridge is, the first bridge past the ice pond, everyone calls it, right by that first bridge, just around the corner, we can take water from that stream down. We have a hundred yards, just a little over a hundred yards run. And then the water can come into here. We originally went up here, we spent several days cleaning the area. We had a lot of help from the school kids came. We spent two days picking up trash, we filled two 35 foot bins with trash, I mean not just from that one spot, but all up and down. We've done many more cleanups and that's all from the hikers. Bottles, beer cans, you can't believe it. So anyway, we cleared an area, smoothed it out, bulldozer in there, made it all nice and level, made an area for parking and for buses to be able to turn around. So the buses and whatever traffic

this pavilion may incur, keeps traffic out of the neighborhood. So we don't take the neighborhood's parking. You know, we don't want to upset the neighbors. They've been upset enough by all the tourists— 800 on weekends. That's why the policeman is up there now. Right at the gate there. They don't pay attention to the signs, they take pictures next to it with their kids. A 'No Trespassing' sign. And teaching their kids, it's ok to trespass, how's that?

GM: Laughs. Are you aware of any traditional gathering or cultural practices within the area?

KF: There have been a couple of hālaus that come in. And yes, I help them out, I've shown them to several areas where they can go and find what they need. And now they come on their own. They always stop in to say hi.

GM: We've talked about hiking and community concerns with that, but are there any other cultural concerns the community might have regarding the area that we should be aware of?

KF: We need to be sure that any work we do around the stream and the lo'is, that we do not affect the people downstream. And we should get their ok that this is our plan, and is it ok with you? And some of the kids that are working in the lo'i now are our kids. So, should go ok.

GM: My last question is, do you have any other recommendations for other kūpuna or any other locals who might be good to talk story with from the area?

KF: I'm sure you talked to John.

GM: Reppun?

KF: Yeah. He knows all the ins and outs. He's got it all upstairs, he knows the people and places and dates. I'm more of an on-hands dude. Is Amy Shinoshi involved? She's the Board of Water Supply liaison. She'd be a good one to talk to. She's very nice, very smart.

GM: Right on, I will check on that. Thank you so much for your time, Uncle Kaipo.

Appendix E: Interview with John Reppun (Additional Mana‘o Provided by Kihei Nahale‘a)

TALKING STORY WITH

JOHN REPPUN (JR)

December 5, 2019 / 9:00 AM / KEY Project, Waiheʻe Ahupuaʻa
Interview by Gina McGuire (GM)

GM: I'm here with Uncle John Reppun outside the KEY Project in Waiheʻe. It's December 5th, we're talking about the proposed Waiheʻe Riparian Learning Center. Just to start us off Uncle, can you tell us a little bit about yourself, where you were born, grew up...

JR: Okay. So, I'm John Reppun. I was born, actually, Hoʻolehua, Molokaʻi. My dad was a general practitioner, was a doctor on Molokaʻi for about 15 years. So several of us were born on Molokaʻi, others of us on Lanaʻi and one, my sister, the eldest, in Baltimore when he was in med-school. But my dad grew up in Kahaluʻu here. Immigrated from Russia. He was born in the Ural Mountains in Russia and my mom was from Pennsylvania. Dad grew up in Hawaiʻi, his father also was a doctor along the windward coast, so very familiar with many of the families. So my dad inherited patients who had been my grandfather's patients. There were not many doctors around, back in the day from Waimānalo to Kahuku. Kind of a range that he might follow. So we grew up in Kahaluʻu, near where my dad lived when he was a kid and you know my brothers and I, my sister, six boys, one girl, it was a wild ride. It was great growing up in a big family.

And I was born in 1952 so I'm kind of in the middle of the family. And it was an interesting time to grow up, born in the Territory of Hawaii and transitioning into the State of Hawaiʻi and I remember when I was in elementary school all of us probably what, kindergarteners or first graders, being trotted out to the road with American flags in our hands to go wave American flags. I would definitely question that today. I might fly that flag a little bit upside down. I would question why are we doing this? Because in the course of my lifetime, very aware of the pressures, the movements that have been pushed onto Hawaiʻi that have, in many respects, wiped out or really heavily impacted what used to be in Hawaiʻi. And why that's so important, it's not just a cultural thing, here we are 2019, I was born in 1952. In 2019 we are probably much more dependent on outside sources of food, families that are from Hawaiʻi that grew up in Hawaiʻi, whether they are Hawaiian or haole or whatever, struggle a lot harder now to stay in place, medically people are struggling far more than they used to, they are living far less healthy lives. To top it all off, sea levels are rising. We were scolded for fighting progress when we first started to buck up against the political machine, whether it was a neighborhood or a County, or a State, or a Federal level. I still grimace when I hear that phrase, "you can't stop progress." But you can, if you can name it as what it really is. It wasn't progress. Oceans are full of plastic, we've got dump sites that we don't know what to do with, chemicals... you know, hanging over our water systems from Red Hill to Kāneʻohe Marine Base, so where are we? So, that's a background in a nut shell.

In the course of growing up in this community, I went to school at Benjamin Parker Elementary in Kāneʻohe, there was no Kahaluʻu or ʻĀhuimanu Elementary at the time. There was a Waiāhole Elementary so, because my dad's office was in Kāneʻohe, we would catch a ride, go along the beach road (Kamehameha Highway), what we now call the "beach road," there was no Kahekili Highway. And so we went to Benjamin Parker Elementary, most of us, and we were very lucky to go on to high school at Punahou. I'm very grateful for that just to start with, for being able to juxtapose the value of private education, the reality of public education, the importance of public education, and beyond that, most importantly, that we're all still in the same canoe when we get out on the other end. Whether you come through public or private school you end up as citizens of these islands, under whatever jurisdiction you want to recognize, and you still have the same responsibility for stewardship. That's my short answer to your first question.

GM: No, that's all good! Did you want to talk a little bit about how you came to know the project area?

JR: Sure, so I'll start before my time at KEY Project. I went away to college. I had the opportunity to go away, to upstate New York, Hamilton College. Each summer before and during, I would come back and work, usually a construction job. I worked with Young Brothers one summer. It was fascinating to watch what was coming and going, the commerce between islands: herding pipi off the barge in the docks of downtown Honolulu or pigs from Kawaihae or driving 100 Toyotas into the bowels of the barge. I worked also construction, Alber's Feedmill, places like State Tile, where we were just all day long muscle work, just loading conveyer belts with tile, you know these machines that bevel the edges and then stack them to a pallet. During those college years, summertime jobs, I was becoming more and more aware of the impacts of post-statehood development that were sweeping across the state and here at home in Kahaluʻu, even from high school times, watching the major flooding that happened in the ʻ60s. And I mean major flooding and watching the development that came with Kahekili Highway, breaking through the back of ʻĀhuimanu Valley, obliterating streams, ʻauwai systems. Even though I didn't really know exactly how those systems worked at the time, we didn't grow up around loʻi, we grew up in a big family house, sibling rivalry was probably the most important thing to us, going to school every day. But slowly becoming more and more aware of the rural landscape, of the agrarian lifestyle that surrounded us, that the kids I grew up playing football and baseball with, this is where they came from, the Hawaiian, Okinawan families, all of their values and so on came from that lifestyle.

The flooding in the ʻ60s was something to behold. I remember riding my bike down to the end of Lulani Street, out onto the point overlooking the intersection by Hygienic Store and it had been raining and raining, and in the course of those days of the flooding, I remember watching, going down to Ahaʻolelo Road across the river, and marveling at how the river was raging under the bridge, then a couple of hours later, coming back down and, "oh you can't go to the bridge, the bridge is over-topped", and then in the course of that day watching an eight-bedroom house coming down the river with people in it, watching cars, cows, floating in Kāneʻohe Bay, people being rescued out of their cars right in the intersection by Hygienic Store, the wall of Kahaluʻu fishpond busted open. This was what I later came to understand what the Army Corps might call a 500-year flood. Today those kind of events are happening more and more frequently. They don't even use the term 500-year because of things like climate change and increasing frequency and intensity of weather events. So, witnessing that, plus my upbringing... my civic awareness that I took with me beyond my early years, my parents getting very involved in community planning... just as they spent time fighting and clawing their way with their pens and correspondence, getting to the planning tables, the rest of us grew up with that same drive.

So today, when I finally came back from college on the mainland I got involved in farming with my brothers; kind of running away from the world, trying to hide from what we saw happening around us but instead finding ourselves jumping right into it. By getting involved with farming, in particular wanting to learn more about things like taro farming, discovering that streams were starting to dry up and the reasons why: water diversions by the Board of Water Supply, following on the heels of sugar and pineapple, with the know-how to tap and divert water from one watershed to another, from one side of the island to another. It was a grand awakening. And the whole time, discovering reference material, reading through descriptions of each ahupuaʻa, learning what an ahupuaʻa is, the seasons: Makahiki, not just a football jamboree at the stadium, but an actual season and starting to learn the cycles of life that were surrounding us, it was fascinating.

I started working at KEY Project in the early ʻ80s, started in teaching at the alternative learning center, which got me medical coverage while farming part-time which was great, put me in direct contact with the students from the very families that I had grown up with, who were the product of

pretty difficult times: development pressure, the war in Vietnam going on, and seeing the sons and daughters of guys I grew up with impacted by drug use, by disenfranchisement, separation from the land, lack of familiarity with their surroundings, so that was my introduction to KEY Project. One of the exercises I used to do with kids, I would give each of them a long piece of paper and ask them to draw Koʻolau Poko, inevitably out of 15–18 kids, 15–18 years of age, all of them who had grown up in this area, Kahaluʻu, the surrounding ahupuaʻa, I would never ever see the Mōkapu Peninsula, I never saw a fishpond, I never saw Mokoliʻi, Kapapa Islands, and they wouldn't know where Koʻolau Poko was, I'd have to describe what Koʻolau Poko was, the "moku", right? They didn't know those terms, they didn't know those places, and these are all kids, regular kids. I'd ask them, how many of you have been into Kāneʻohe Bay, maybe 3 out of 15 or 18 kids had even been into Kāneʻohe Bay. And you know, coming from a big family, where we had a row boat, we rowed everywhere. We figured out how to sail, row out and sail back, 'cause the wind's coming onshore. At first it was almost laughable and then it was tragic to realize that we were a whole generation into people who were completely separated from their surroundings. The major feature that showed up on every single map that they drew was, guess?

GM: I don't know.

JR: The Windward Mall. So, that's what these kids were growing up with. The major archaeological feature was the Windward Mall. On Bishop Estate land, mind you. So that kind of fed the conversations that we had at KEY and have continuously had at KEY Project, which is a pretty important community center. That informed the conversations, what they needed to be, I think. If we're raising a generation that doesn't have the terminology, the lexicon of its own cultural background, geographical background, are we just out there slapping Band-Aids on gaping wounds? And so ever since, that revelation informed my community involvement. I went from teaching at KEY, part time, part time while I was also trying to farm and doing community development work, serving on the Kahaluʻu Neighborhood Board, which my dad was the first chair of and rabble rousing, getting involved in all the different battles: fighting off zoning that promoted intense development and displacement for our area. The zoning that came out of the '60s was zoning that was in place for deep draft harbor, a second city in Kāneʻohe Bay area, an oil refinery in Temple Valley/ʻĀhuimanu, plans for a nuclear power plant in Heʻeia, H-3 coming at us. You know? We were at the other end of these really big gun barrels that were fueled by post-statehood corporate interests.

The push, with plan laid for our area around corporate tables downtown, far from the community started off with Alexander & Baldwin, the Big Five, Dillingham and Standard Oil, that had caused industrial/commercial zoning, plans for dredging the bay and so on. Eventually, probably after they saw the writing on the wall that they were not going to be able to force our community into that scenario, then came in the smaller land owners, who still had development dreams and schemes for and light industry, taking advantage of existing zoning that had not been seen by or approved by community that would displace agriculture and impact rural/agrarian lifestyles and resources. We spent decades of battling off what we did not want to see as our future, fighting our way to the planning tables, dealing with City officials who would say things like, and I won't give names to those officials, "Communities don't belong in planning." We inherited from early community organizers, parents and mentors, the drive to question authority and a belief that the community had the right to be "at the table" a part of the planning process that would determine the future of our area. There was a lot of community organizing going on back then, growing through the late '60s, '70s and early '90s because there was a lot of families that still had kuleana lands or who were renting lands to farm. They were not going to give up easily, they were going to fight for lands that had been productive agriculture for centuries, niche farming that was happening: loʻi, banana patches, areas where the plantations' early efforts had not touched or were no longer in use. 'Cause plantations came sweeping through windward Oʻahu, not touching, but still impacting the lowlands

in each valley, from vast areas being cultivated in taro, flood plains, and then rice where water was a critical resource. Plantations swept through the higher ground until they could figure out how to take water from the windward side to the drier, more economically viable broad expanse areas on the leeward side.

But the niches and the kuleana properties in-between, held us together to a considerable extent. So the community organizing that happened, brought all these different ethnicities together. That was how we held on. We managed to hold together, Hui Malama ʻĀina o Koʻolau was one example of a hui of organizations, farmers, fishermen that continued to meet and fight back. Amazing history to grow up around. I finished college around 1975, then for a time worked in Wyoming, finally found my way home, got involved in farming with my brothers. I remember consorting with Calvin Hoe and others, who farmed in Waiāhole, learning about things like Makahiki. I remember around '75 or so, my parents, my mom especially was involved in the community with the Ka Lama Newspaper we used to communicate with the community about the issues we were facing. My brothers, we had use of some land that my dad lined up for us. He was the doctor for an Okinawan family and whose own sons weren't interested in farming at that time. We ended up working that land. My brothers built their own loʻi right there, making the rock walls, running water in gutters that were hung through the hau bush from the stream to the loʻi, wonderful piping hot water that we would bathe before it would go back into the stream... and then the taro all rotted. And we were like, "wait a minute, what's going on here?" My brothers went consulting with Rachel Hall, who was from Hanapepe, Kauaʻi, married Joe Hall over here in Waiheʻe, was farming taro in Waiheʻe. And that was our introduction to Waiheʻe, to go and ask her. Her sage response: "You want to learn how to grow taro? Take over that loʻi," right next to her. So farming alongside this Hawaiian woman who really knew her taro. But she also had problems with rot and eventually that led to, something else is going on here. We looked at the water, something's happening with the water. Board of Water Supply had come into Waiheʻe and had started to tap water with wells and tunnels and eventually got to the point where they could turn a valve and pretty much dry up Waiheʻe Stream, turn off Hāmama Falls. We landed at KEY Project where, Ron Albue was a legal aid lawyer and he had come out of a background of working with southwestern United States with Native American tribes struggling over water. And we took the Board of Water Supply to court.

GM: Was it the quality of the water?

JR: Not enough water means the quality goes down. Not enough water means temperatures are higher. That court case started to bring that science forward, and the culture. Those that were involved in that court case, my brothers, haole hippy guys who wanted to farm taro, Clifford Wong, taro was grown in China, Seiyu Nakata, Bob Nakata's father, Okinawan, and Rachel Hall, Hawaiian. So it was kind of a classic court case: Hawaiian, Okinawan, Japanese, Chinese, and haole all coming together, bringing together the information, the drive to the table to push back on behalf of the needs for loʻi. The focus was on that, on what the needs are for taro and I would say it probably wasn't until later, building off of that case, the water code, water commission being set up, and cases like Waiāhole started to evolve when we eventually started farming in Waiāhole in the '70s where stream ecosystems, riparian zones, estuarine, nearshore meets water quality starts to come into play. And again, during all of this time we're learning civics, we're learning about things like Class AA Waters, over which Department of Health has jurisdiction and responsibility. No such thing as rights without responsibilities. And in the water code, the commission, automatically the Department of Health sits on the water commission. For good reason, because they have this responsibility mauka to makai water quality, which is directly correlated to water quantity, right?

Let me jump back a step. After the major flooding in the '60s, the response was this massive, federally funded, congressionally-authorized Kahaluʻu Watershed Workplan, which was a "watershed restoration" project but for so many of the years that I was involved, we always referred

to it as the "Flood Control Project." But you know, that really, when you look at the congressional authorization, it's important to look at. Kahaluʻu referring to ʻĀhuimanu, Kahaluʻu, Waiheʻe. The importance of that watershed workplan was that it was supposed to be looking at the entire watershed. Primarily it ended up being shanghaied into flood control, channelization of streams, so even while we were learning about the importance of quantity and quality in streams, and Kahekili busting through the back of ʻĀhuimanu at that time and streams being channelized, so. When you come into the greater Kahaluʻu, the ahupuaʻa that the Kahaluʻu Neighborhood Board touches is from Heʻeia, portions of ʻĀhuimanu, Kahaluʻu, Waiheʻe, Kaʻalaea, Waiāhole, Waikāne, Kualoa, right? The north end of the bay and all of the receiving waters, you have to look at the whole ecosystem. And so, when streams got channelized in our area, we destroyed ecosystems. You've spoken to Kaipo Faris. Kaipo is the first one to tell you, yeah, if an oʻopu makes the major mistake of making a left turn instead of going up to Waiheʻe Stream, they go left and up Kahaluʻu or ʻĀhuimanu channels, by noon they're cooked, by super-heated temperatures no shade: sun heating water on concrete. We managed to hold off channelization of Waiheʻe Stream.

There's still some huge issues about Waiheʻe Stream, when it jumps its banks and makes trouble left and right, "threatening" to adjacent landowners. For me, the solution to those issues should never have been channelizing; it should have been about pushing development away from streams, including the meander that streams need to be allowed. Stream ecosystems need a much broader area than just a particular stream channel. I think that with the right mechanisms, buy backs, conservation easements, working with land trusts and so on, human beings need to get out of the way of nature instead of forcing nature to a ditch, a channel, that inevitably becomes a detrimental link in ecosystems. So, in the Waiāhole battles, in the battles of water in Waiheʻe, if the water commission thinks for a second its jurisdiction is only on the land, they're missing the point. No, these are ecosystems that feed into the ocean, into estuaries, into bays, into fisheries, that which needs to and used to sustain us. So ultimately our goal is things like food security and environmental integrity. The magic of Hawaiian culture has nothing to do with simple adzes and artifacts, it has to do with a total understanding of ecosystems. Thank goodness the Board of Water Supply is now headed by some pretty brilliant and devoted people. We sued them back in the day, in the ʻ70s and I think we helped. Our goal was not to hammer anybody.

With the Riparian Zone Learning Center, I think what we're trying to achieve is a site where we can start to understand and envision a healthier ecosystem. We think of riparian zones as being a certain distance from streams. Actually, we kind of think a riparian zone is the entire island, it's the entire ahupuaʻa. Everything that feeds down towards... the wetlands, the filters, at the bottom, the sponges at the top, amazing understanding that existed in ancient Hawaiian times. Hawaiians, it probably took them a thousand years to understand how everything works, and that's what we need to go back and do. To help us do smart development. The learning we need to do needs to take place more out of doors. So why is it important to do a Waiheʻe Riparian Learning Center? Because it's going to be a little bit different, composed a little bit differently than Papahana's doing, what's happening in Heʻeia, what's happening in Waimānalo, in a different moku with different circumstances. But we still need those classrooms. When I was teaching at the KEY Alternative Learning Center, the kids that I was working with were totally unfamiliar with their surroundings. We realized, let's get these kids out of the classroom. We can do it differently than Castle High School can do it. We did our level best to get these kids out. We did things that we would have done when we were growing up, we got familiar with our surroundings. That's what's needed. I look forward to a time where, we need to get to the point where every kid growing up in Hawaiʻi sees the classroom as being out there, out-of-doors, and the briefing, de-briefing space as the formal classroom setting. In doing so, the campus gets much bigger, the campus includes the world. If kids don't grow up observing sea level rise, it's happening, if they don't understand the riparian zones and the infrastructure, then we're not producing citizens that will help save the world.

GM: Can I pause you there?

JR: Sorry, I gotta keep going.

GM: No, I love it. I was really interested when you were talking about asking the kids to draw and the place names. I was wondering if you could talk more about the surrounding place names?

JR: Sure. Mokoliʻi Island, or "Chinaman's Hat" as we used to call it, was one: "Kapapa", refers to a flat surface, is that island at the edge of the bay before it drops off to the deep beyond Kāneʻohe Bay. My brothers and I would camp out on those islands, watch the birds, go surfing, go diving. Mōkapu Peninsula, now part of the military industrial complex, every kid should be given an opportunity to access. The military should not be allowed to be on Mōkapu unless they have extensive programs to ensure that the citizens around it have access to see Nuʻupia Ponds, the isthmus between, understanding water used to circulate between the bays through those fishponds and saline, kind of wetland areas. Heʻeia fishponds, I never saw fishponds show up on these maps. That informed me as a teacher that we were failing.

GM: Could you share any knowledge about Waiheʻe in particular, about any moʻolelo, oli, mele, or personal stories about the area?

JR: There is a next generation that is gonna do a much better job of answering that question than I can. I know in my heart that it's all there. I understand terms like Hāmama Falls, the name of the falls in the back, my understanding of Hāmama is that it refers to a portal, into a different realm and I can understand that, I relate to that. The falls as we first knew it, was this wide expanse, and when the Board of Water Supply sunk its straws into the cup, that got narrowed drastically today, and we do, we go up to the falls, we take kids up, we use the impact of the Board of Water Supply's withdrawal of water as teachable moments. You go up today, what you see is huge cast iron straws in the cup and we use that to teach. We understand more than ever before the value of an island-wide water system. As far as moʻolelo and so on, I would defer to people that are gone: Richard Paglinawan, Likeke Paglinawan would have been a great sense, Puakea Nogelmeier I think would be really valuable to speak to, and Kepā Maly would be great to talk to. I think that's really important. The names, the winds, the rains, the mele and oli are really important. I think with the way that Hawaiian language has taken a leap forward with those that are now studying the connections between language and sites, I think I would probably send you back to Center for Hawaiian Studies. My niece Kealohi is fluent in Hawaiian, she is now teaching at Punahou, she has a vested interest in helping to bring that information forward since she grew up in Waiāhole. Her dad and her uncles are involved in Waiheʻe and now she's teaching and learning. I think it would be great to talk story with her. We really, in this project, need to involve the next generation, ʻcause they're the ones that are already carrying the torch. And they're going to design the curriculum that includes that close cultural connection. I'm trying to think who else.

GM: That's a good starting point for me.

JR: And as far as who was farming where, or what kind of farming was taking place up into the valley behind the gate, I would encourage you to talk to Larry Higa.

GM: I haven't been able to find his contact info!

JR: Here's his number and if you can't get a hold of him, he frequents here, he comes down for coffee. But Larry's a little older than I am, a part of that Okinawan community, he could tell you who was where. He remembers, ʻcause the military used the backs of all these valleys and Larry he talks about, they wanted to come in and deal with unexploded ordinance, what they did was set it on

fire. Literally, just burned the whole hillsides to set off the ordinance. Yeah, Larry would be interesting to talk to. He's very kolohe, has a crazy sense of humor. He's gonna bend your ear but he knows the history and the families. He grew up in Waikāne, and here, be worth talking to. Just him remembering that there was taro being farmed. Harder to find that knowledge in the Hawaiian families. People like Randy Kalahiki and others have gone, they're no longer with us. Have you folks spoken to Shelly Young?

GM: No.

JR: So Shelly is Rachel's granddaughter. And she continues to farm where my brothers farm, up here in Waiheʻe, in the wetland just beyond Kahaluʻu Fire Station. Shelly's next generation but she would at least be able to speak to what her grandmother remembers and has some of that history. She, with my brothers, they continue to access mauka Waiheʻe and make sure water is flowing in the ʻauwai. The ʻauwai that Paul Chun documented is important. There are still, we're not just looking at mauka. With that Riparian Learning Center, it's just one station on a stream ecosystem. There are other stations, those have to relate. Those can't exist alone, has to be connected to where loʻi is still being cultivated. Also Kahaluʻu Regional Park goes up against Waiheʻe Stream. The back part of Kahaluʻu Regional Park probably, maybe one day, the City and County of Honolulu will have a department of a different form of recreation. There's baseball fields and soccer fields and football and all that. There's also re-creation. Loʻi, places where whole families go. That's a different form of recreation that's probably far more important. Every football player should be in the loʻi but not everybody in the loʻi needs to go play football. So the back part of Kahaluʻu Regional Park is a long stretch where loʻi used to be. Used to be a rice mill, just at the top part of the lagoon. Used to have ʻauwai where Kahaluʻu Fire Station is, used to be loʻi. And all along that stretch above it, that ʻauwai used to go across and feed other wetland areas. So there's Waiheʻe wetland down here, where Waiheʻe and Kaʻalaea start to come together. The center up mauka might be somewhere we convene to have certain types of discussions, but whoever comes there will inevitably come here by the stream, down here in the wetland, in the nearshore, and same thing, anyone who convenes here is going to go mauka. The Riparian Learning Center is just going to be one touch point, I think. They're a network of outdoor learning sites. And then KEY Project, which I see as being a part of a whole network.

There's one mele that stands out. Ka Ua Poʻai Hale or Poʻai Hala, both are used. That has to do with a rain that swirls around the hale or the hala grove. And Waiheʻe, Kahaluʻu are known for its hala groves. I remember that because I heard that from one of the staff members here at KEY, who was involved in hula and we traced it back to Puakea who was very familiar with that particular mele. So there are names of winds and rains that come in certain ways around Waiheʻe and Kahaluʻu that are important to bring forward.

GM: So, other than kalo farming, especially in this valley, are there any other cultural harvesting, gathering, and practices around the project area?

JR: Absolutely. So Board of Water Supply engaged the Bishop Museum in a study of the flora and fauna of the back of the valley. Really extensive study not too long ago. But all kinds of plants that, whether it's things like mamaki or things that hālau would use. I think that's important to bring forward. Jeff Preble, part-time staff here at KEY, he's very interested in this whole Waiheʻe Ahupuaʻa initiative that we have going, very knowledgeable about different plants we have mauka. Rick Barboza with Papahana is aware of what we're trying to push here, he'd probably be a good person to talk to. But it's a huge battle to deal with the invasives. So much else that's going on up there. There were all kinds of sites where loʻi used to exist that really need to be mapped out, that's where we need you guys. We need archaeologists, we need people to literally comb through the bushes and look where loʻi used to be. Some of that can be recreated, some of that has to be done by

instinct. The ʻauwai systems that still exist, the one going up past the gate, is the one that my brothers and Shelly and others continue to maintain.

GM: You mentioned changes in the stream levels and quality and invasive species, are there any other changes that you've seen in the project area you could talk to?

JR: Luckily Waiheʻe Stream has very few obstructions in the stream. One of them is the fish ladder, that was a USGS gauging station and we considered taking it out and then thinking about what the real issue was, the aquatic life being able to get past that. So we did the fish ladder project. The other obstruction, manmade is the crossing of what used to be the Nakata's farm. A number of houses down from the gate there's a driveway that goes across Waiheʻe Stream. It goes to the farm that Bob Nakata's father, where Bob grew up on. The Nakata's farm, used to be absolutely beautiful loʻi, rock walls, terraces, all maintained with a sickle. He would do it all with a sickle. I think some of that's been bulldozed by the person who came in after. But that would be a really important site to go look at. I think it was briefly on the State Register of Historic Sites and then got taken off because it hadn't gone through the proper procedures. That would be worth looking at, to go back through State Registers to see which sites were on, were taken off, and re-identify sites. That would be important. There was a ford in the stream, the access to the Nakata site, the stream flowed over it. Then you get down to Ahilama Road, where Waiheʻe Stream comes under the bridge there, that's been altered but the water's still running through there.

I would be very concerned if we did things to channelize the stream. But there may need to be some kind of shoring up of certain banks as you come down into the flood control lagoon. There is a major project that the City, back to the Kahaluʻu Watershed Work Plan, it's maybe the most important project for us to be talking about. That project went on for quite a long time. It involved State, County, and Federal levels. The State helped to acquire lands with the County around the project area including where KEY is located and the County was left having to maintain the stream channels and dredge the lagoon, which, in my mind, is a big mistake. The really important thing is that's still an open project, it was never closed. And so maybe we go to Congress and we get funding to look at this 30, 40 year-old project to look at mitigation we can do and also look mauka to makai. Get the church and the development out of the heart of the lowlands here, leave it as a park, gathering place. When it floods it floods, to keep dredging the lagoon. Crazy to keep dredging. The dredged material would fill up 14 acres 12 feet high with material. That's what a Learning Center will help: where is all that material coming from? And well, we know where it's coming from. Is it coming too fast? I'm pretty sure that the majority of that material is coming down the channelized streams. It comes from mauka, hits the channelized streams, hits the bottom at a high speed, instead of spilling out and over into wetlands and meandering and so on. So there's all this hydrology involved. It would become a delta. Right? Why are we trying to stop nature from building a delta? That's why these areas were so rich with loʻi in the past, this area is so rich with nutrient rich soil, coming down, spreading out. If anything those loʻi should be thriving. The ʻauwai that took water to those areas and then back into the stream should still be intact.

GM: Two questions, kind of tied together. Talking about this project area, would this development impact access to any cultural sites or practices? And the flip side of that, is there anything the project can do to minimize their impact?

JR: So we had some conversation with some folks at G70. There's this Ginger Patch, which kind of bridges between County and Board of Water Supply jurisdiction. Rick and I now and I in agreement... so I'm going to go back a little bit. This area controlled by Parks & Recreation, they don't have the foggiest idea what they're doing there. They probably don't even know how to get through the gate. And the only reason why they're there is when the City settled with Lewers & Cook out of court, they sued the City for recommended for down-zoning and the City settled out of

court and immediately Frank Fasi proposed building a golf course in Waiheʻe. And suddenly the community and the Board of Water Supply, which had been fighting each other, found themselves down at the planning commission united, saying no golf course. Lands, City acquired these lands. Board of Water Supply wanted the mauka areas for their systems up there, they didn't want all of this because it wasn't above their water sources. We've been pushing very hard, Ernie Lau, head of Water Supply, Bryan Andaya, is the chair of the Board of directors of Board of Water Supply. We're trying to pitch to BWS, take it all the way down to the gate. At one point under former Mayor Peter Carlisle, they were going to divest themselves of a lot of property. The City was trying to dump property that they owned. Probably trying to raise money for rail. But they did go around all the different agencies first: "are you interested in this property?". And I remember seeing the letter that Ernie Lau wrote, saying that BWS was not not interested. We're trying to convince them otherwise; they should be interested all the way down to the gate.

Because if we have one land owner, and honestly don't think of them as owners, I think of them as stewards, better to have one agency, better to turn this all into watershed, down to the gate. Because there's this portion of Waiheʻe Nature Reserve that's under Parks & Recreation, there's this implication that there's this recreational resource up there. Thousands of people going up there, literally thousands. And they're going up there thinking it's a destination, it's a recreation area. I'm not against a lot of people going up, but if they're going up for a purpose, if it's managed access, and they're going to help with fighting invasives and restoring loʻi, and they're going in learning groups by permit or arrangement, which the Board of Water Supply does anyway. It's better for it to be a managed access watershed area, including inviting in hunting groups at certain times to quell the riot of feral pigs. Right now there's not hunting allowed, guys go anyway. Because there's so many pigs up there. That's been our pitch. This is a fairly recent conversation where we're trying to get BWS to take this all on, so then we don't have to be stuck with a phase one, phase two. Getting vehicles, small vans, 15 passenger vans. There's a parking area, it's adjacent to the land that Rick Towill owns, put like a gate-area, kind of like what Hoʻomaluhia has, so anybody going up there is passing by some kind of a facility. Have a checking point. Parking area up here, I'm generally in favor of that. There's a logical bus turn around area, and a bus coming up and dropping off kids in a program. And if they drive right in with parking there and a turn-around up there makes sense. The very first issue for me is, first of all they're doing an environmental assessment. Because the City is not there and probably shouldn't be there, down here is Kahaluʻu Regional Park. They have so much on their plate down here, they can't possibly take this on, they don't have the ability or interest.

GM: The Parks & Rec side?

JR: Yeah. So if we start looking at this as what it is, a watershed, cultural restoration area, let's call it what it should be. As opposed to a recreation area. So we have to wrestle with that issue because even when they do that environmental assessment, they still don't know who the accepting authority would be. Because this is Board of Water Supply up mauka, talking about City parks lands. So it's like we're only going to be able to go so far in this discussion before we run into that problem. Like why is BWS doing an EA for City parks? 'Cause City's busy picking up rubbish in the parks. Trying to accommodate soccer teams. They don't want to be up mauka. And we don't really want them up mauka. I don't. They can barely keep up with the park. If we invite them to go mauka, we're going to lose it.

***Joined by KIHEI NAHALEʻA (KN)**

KN: That's the struggle though with the uplands. The uplands historically is not meant for people to gather resources and bring down and not have a lot of that traffic in there. Because culturally speaking, you leave it in that state. The challenge is, about people going up into that space, even guys that say they're hunters and stuff, I think the perspective of what it's supposed to do for the

people that live in these more habited areas, is a challenge of how you manage that. About who should have access and when and how. And I'm not trying to limit the access, but it's definitely a challenge on understanding what is its primary role to sustaining the water that we all need to survive and the secondary resources it provides: medicine, food. For me, recreation is very low on the list in some ways. But it still has its recreation value. It's a challenge.

JR: I mean, that is the problem.

GM: Something that's been talked about is the limit to the community going up to the valley in the effort to exclude hikers...

JR: By bringing this all under one jurisdiction. BWS also acknowledging that they are guests in this. We are all guests in this. They have their straw in the cup, we have our straw in the stream ecosystem. But there's so much to do just in terms of restoration and management, that there are tons of opportunity for community. There's work for this community to do. Ideally nobody in this ahupuaʻa misses out on that opportunity. It's not just an opportunity or a right. It's a responsibility. Every family, everyone in this ahupuaʻa should be cognizant of the work to do in this area. If we do it right, then we create opportunities for other people to come in.

KN: I was going to say to that, it is important. That it is the whole community's responsibility: the viability of the ahupuaʻa, I'm one that thinks it's important for people to have access but there's levels of access. Also requires a sense of reciprocity. Traditionally, ahupuaʻa meant if you like eat, or you like water, then you goin' come help clean. And if that's happening, then there's opportunities for other to come and see that. You have to celebrate that kind of relationship that people have with their place. Which I think is a good thing to share. It requires an organization or a family, like John guys, they keep that responsibility of keeping it with integrity. It requires some type of management or konohikiship that allows the community to come and speak to their concerns and the community to enforce or mitigate those concerns. There has to be some kind of community-based residence that resides in that place. Like a KEY Project, like a family that understands the responsibility. They should be given the opportunity to subsidize themselves, be supported by... to model the relationship that is very Hawaiian.

JR: You leave it all alone, it gets totally overgrown and you lose it. You allow anybody to go, you lose it. We've talked a lot about that. We know how to restore a fishpond, we know how to restore loʻi, we know how to get the ʻauwai flowing, we know how to plant, how to harvest. But we don't know how that konohiki-relationship works, how to interface with the community. The idea is to have a space with some cabins on it and we have interns, a business intern, a cultural intern, a poet, you know, kumu hula, those interns are cycling through, they work with you on your farms, with your kids, so we're constantly enriching ourselves, we're constantly learning. The land that KEY is sitting on, we have a certain footprint, but there's a line that goes from the kukui trees up there, right up there, above which is a parcel of land that belongs to the City, they don't know what to do with. That's where our imu is. Up to the fence, is an area we pushed the City to acquire. Same over here, between us and Kahaluʻu Regional Park. What if we have the ability to have a poet of residence, what if we're building into the system.

KN: That's an interesting point you make. That's definitely a model that should be adopted here, before we lose a lot of the connections that have been here for a long time.

JR: Your question started with what else G70 could do, like in terms of facilities... and maybe we talk about the pavilion, the parking area, but shouldn't we also talk about building in this opportunity to stay, work, live there even if it's for a period of time?

KN: Cultural residency.

JR: Cultural residency. Yeah. It will take some work to design that in, but it's doable. And the great thing is, in this ahupua'a, or any one. He'eia has all kinds of opportunities. But you can do some of that mauka, you can do some of that here. Every time I go up in our attic here, I see 30 potential cots that could be laid out. Let's create a window in the attic and somebody could stay here. So we've gotta build that in. Getting beyond the day trip. A day trip to me is like somebody diving with a snorkel and a mask as opposed to going with an Aqualung. So some way of being in these spaces, not only mauka, here, the wetland area. Creating those spaces where people go and stay for a longer moment.

KN: Immerse. Re-cultivate. The thing about the cultural residency, there's a sense of immersing. You're going in to let go of whatever you have and accept what's there. That's kind of an important thing. So if we talk about infrastructure, or support systems that do that, I think that's very helpful. Having people that can stay there that can train people and accept people in in a way that spiritual, emotional management is happening. It's never about the physical. It's dependent upon your attitude and your emotions. People don't realize those things aren't in check, people are going to get hurt. Physical infrastructure or support systems allow people to become calibrated into a space.

JR: Before Thanksgiving there was a watershed group up mauka, they were getting ready to do a project right by the tunnel. Had maybe 20 people. Volunteers, people from the watershed partnership. So I went up, because I thought, captive audience. I got them in the stream to help collect imu rocks. And it was a really nice break from what they had been doing, a shift. Now they're in a line, they're passing rocks, they're identifying porous ones from the non-porous ones. And then they were paying attention to the imu they were getting ready down here. So suddenly they were connected to the community in a different way. The opportunity to have those kinds of experiences is enhanced if we have the facility that can engage them. We can propose that early on and try to assess the environmental impact of that and go through the whole process, which could be pretty laborious.

KN: K, you guys, I gotta run.

GM: Mahalo nui Uncle!

JR: We could try to take this idea of a cultural residency through an environmental assessment process, which could be pretty challenging, 'cause you gotta answer so many... But if our approach, and this is where G70 could be very helpful, because G70's been around a really long time, if we don't try some pilot projects, being something we could back off from. A pilot project just in order to scare up the questions we could be asking, would be really awesome. This property, mauka, being adjacent to the property that Rick Towill owns is kind of a unique opportunity for a variety of reasons. One, Rick is passionate about doing the right thing by mauka Waihe'e, he has a deep background having grown up under the guidance of Richard Towill Corporation, all of what he's learned having his own engineering background, his passion about culture and connections to folks, his wife now being a Bishop Estate trustee, there are all kinds of resources that we could gather together pretty quickly, the watershed partnership... we could pilot some things here to learn. We need to learn quickly. And we need to be able to share that learning among ahupua'a at a higher rate than we have before. Which would in turn allow us to connect to the regular, charter, and private schools. That's what this is, it's one piece of a larger puzzle. We're not trying to invent something new, we're trying to put together the pieces.

GM: Yeah, for sure. Well, thank you so much for your time, Uncle, I really appreciate it.

Appendix F: Interview with Steven Springel

TALKING STORY WITH

STEVEN SPRINGEL (SS)

October 3, 2019 / 6:00 PM / Starbucks, Kāneʻohe
Interview by Gina McGuire (GM)

GM: Today is Thursday, October 3rd, I'm here with Uncle Steven Springel talking story about Waiheʻe in Kahaluʻu on the Island of Oʻahu. We're talking about the Waiheʻe Riparian Learning Center project. Can we start with your name, where you were born, where you grew up, and where you went to school?

SS: My name is Steven Springel. I was born in the Territory of Hawaiʻi and grew up in Kailua. and I've lived in Waiheʻe since 1986.

GM: And you went to school in Kailua?

SS: Kailua.

GM: Could you share a little bit about your family background?

SS: My parents moved to Hawaiʻi in 1951 shortly after the war. My father ran the Omega Communications station in Haiku Valley until his retirement. And my mother received her doctorate from the University of Hawaiʻi, PhD in Psychology. And my father is passed away now. And my mother and my sister live in the UK now.

GM: You've lived in Waiheʻe for a long time, would you be able to talk a little bit about your experience with the project area?

SS: Personally, I've done a lot of hiking throughout the Valley. I've done a lot of photography throughout the valley. For a while I had a company called Pictures of Hawaiʻi where I would sell my photography and I used to do a lot of hiking with some friends of mine. We did a lot of little investigating and just learning the valley. It's always been a place for me to take my dogs and exercise. I tell people that I don't need to go to the gym, the valley is my gym.

GM: Do you have any personal anecdotes about the Project's specific area or nearby? This can include your personal stories but also any moʻolelo, oli, or mele you know of surrounding the area

SS: Well, I've come across several ancient sites in the valley. The back right side of the valley there's a trail, a pig hunting trail that circles the valley for the most part, through the back of the valley. There's some terraced areas back there with some interesting wall structures for food storage and if you do the research and the history of the valley, one time the valley was pretty clear and there was a lot of cattle grazing and now all the vegetation is overgrown in the valley again. There's a lot of invasive species in the valley, a lot of invasive species that I've seen change the flora of the whole valley over the last several decades. That's one of the things that really depresses me about the valley as well as the foot traffic as well.

GM: The foot traffic has been increasing?

SS: Since the internet, social media, the foot traffic is off the charts. It's, I mean, for the most part people stick to the jeep trail, the main road, there are people that go off on other trails and create new trails. So, it's just, you know, most of the people there are conscientious, good people for the most

part, but there's you know, people that have no regard, no respect for the valley. When I was young in my 20s and 30s I spent a lot of time up there, my friend Glen and I camped up there by the second waterfall, which is actually Waiheʻe waterfall, the first waterfall is Hāmama Waterfall. And we camped at Waiheʻe waterfall for three, four days, and we built a polie square and retaining walls to make ponds. It was quite an interesting time to be in the valley.

GM: Around when was this?

SS: It was back, in the ‘80s. Late ‘80s I would say, maybe early ‘90s. But there's a lot of historical sites in the valley that are overgrown, you don't even know are there until you stumble upon. What I wanted to bring up that's important, is that this whole valley at one point was Kalahiki land. Belonged to the Kalahiki family. I forgot when it was that it was taken from them because they didn't pay their taxes. But, there's burial sites, there's Kalahiki family burial sites up there. I've spoken with people, second hand, about it. There's also Hoʻokano family members buried up there.

When I first moved to the Valley, my first experience was riding on horseback up there with the Estacado family. Dennis took me and my girlfriend up there horseback-riding. There was a squatter up there. There used to be houses up there on both sides of the entrance to the valley after the gate. There were probably about five or six houses and they were all run-down and derelict and abandoned by the time I moved there but there was a squatter up there with a shotgun and he used to chase people out. That was my first experience in the valley. I have some pictures of how it used to look with the koa trees. The koa trees were affected by a blight in the late ‘90s and that's when the right hillside was overtaken by invasive species. Used to be maile. The very back corner, almost to the back corner, used to be a whole ravine of rosy apples. But the valley, you know, if you study the history, the valley originally had eight waterfalls until the Board of Water Supply came in there started taking the water. Now two remain. The third waterfall, it runs pretty prevalent when it rains hard. I've been caught up there in flash floods on a couple of occasions, it's the real deal. You don't really want to be stuck up there in a flash flood because you cannot really get back out, just trapped up there, you gotta find high ground. Everything turns into a river everywhere. Centipedes come out of the woodworks.

GM: [Laughs]

SS: It's really crazy.

GM: Yeah.

SS: I would be most concerned where they want to do the development in the lower part of the valley here [pointing to location on project site map]. This is the gate, on both sides of the road here there were houses. And I'm not sure where the burials and all the family members are buried, I would assume close in this area here. This place right here, this is an ancient loʻi. You can tell by the way the land is laid and the way the river can be diverted and exit over here. It is an ancient loʻi. Guarantee. Over here, before the bridge on the right over here, there is an old wall site you need to be aware of. The other sites that I know about are way back in the valley. Not even near this area [points toward main development location]. Up in this area right here, there's old military remains up here. The army used to come up in here and they used to practice maneuvers. Old Man Higa told me when he first moved to the valley back in the ‘40s that there's tanks coming up the road and doing military practice. And if you go up in this area here, there's an old concrete bunker. Near that concrete bunker we used to find hazardous waste in the dirt: a lot of old Jeeps that were abandoned up there and by hazardous waste I mean we would find medical vials, stuff like that. And all kind of different things. That's the right side of the valley here, there's old military history up there. I would

think that of most importance is to find out where these people have their family members buried. I think you need to look into that and speak to them directly.

GM: Is there anyone you would recommend talking to from those families?

SS: I would say talk to someone like John Reppun who grew up, born and raised in the area who knows the families, Bob Nakata. He's born and raised in the area and he's been in the valley with me on a few occasions hiking. And he knows the families better than I do. Keith Ryder would be the most knowledgeable about the family history and the valley in general.

GM: Thank you so much for that, that's good to know about.

SS: I mean, if you realize back in the '20s and '30s that was Kalahiki land, Kalahiki family up in that area. Back in those days people didn't bury their family in grave yards like we do now, they buried them in the mountain. You know? So, it's only normal for there to be people buried there, guaranteed.

GM: You talked a little bit about how you've seen the valley change over time with invasive species and more foot traffic. Is there anything you'd like add to that change that you've seen?

SS: You know, as far as the community's concerned, back in the old days, everybody grew up as kids. They would go up there as kids and swim. It would be the community playground. It would be, I'm sure it would be the same like you growing up Big Island, you guys go up to the pond, you go swim. It was that way for the community. And it got overrun and now it's restricted to everybody and so, this is one of the things that my neighbor, he mentioned, he cannot go up there to visit his relatives that are buried up there. Ken Higa. He mentioned that to me. And I feel the same way, you know. I've always raised dogs. I have two dogs buried up there on the hillside. I can't go, I can't take my dog I have right now running and exercise like I used to up there. It's taken away something precious from the community, from the people who live there. It's taken away from us. We cannot take our children and our grandchildren up there to go swimming in the pond like we used to. I have pictures of my daughters when they are just babies, two, three years old, and my father in law and I carried them up there to the pond to swim. That's all gone. We can't do that now.

GM: It's gated?

SS: Not the fact that it's gated. I mean, it's always been gated. Now, it's, you get cited by the police. It's restricted area now. And I mean, it's always been No Trespassing signs, Board of Water Supply but still everybody would go. The social media and the masses have ruined it for everyone now. Especially the people of the community. It's been taken away from us. The parking on the street and everything, was a big concern and everyone was upset about that. But now, it's not too bad 'cause a lot of people not coming now. So, the police have done their job and it's been working. But, nevertheless we cannot go up there either. I used to go up there two, three times a week. I get off, take my dog and can go for a run. I can't do that anymore. I kind of miss that. Hawai'i's changed a lot. And it's not just the valley. I don't know how the Big Island is, but this island's changed a lot.

GM: Big Island's changed a lot too.

SS: Yeah.

GM: Could you talk about how the project would affect cultural significance or access to the sites you've discussed?

SS: Personally, I feel this is the prime spot, right here [pointing to map]. This is the secondary right now, this is the primary [pointing to upper and lower proposed lo'i restoration sites]. I understand why, because they have the diversion ditch which makes it easier.

GM: But traditionally this [pointing at lower lo'i] would have been the main field?

SS: Yeah. If you look at the lay of the land and how it is and you survey it, you can see it right off the bat. It used to be, well they have it marked "Ginger Patch", so it's still here. But to me, that's the perfect spot. I would concentrate here first. This area up in here [pointing to upper lo'i restoration site]. This is where the houses were. So, I would tread lightly in this area over here [pointing to areas surrounding upper lo'i restoration site]. I mean John Reppun and Bob Nakata, they would remember when there was houses up there. Especially Bob Nakata, he grew up right here. His family's home was right here. He spent a lot of time up there in his youth. The idea of moving the gate back and creating a parking lot, I'm totally against that. Because then you're going to have people coming up there at night to drink in that vacant parking lot. And that's going to create more problems for the neighborhood.

GM: Can you think of a better spot for that parking lot?

SS: The parking lot would be, it's not the location of the parking lot that's the matter. It's the gate. The gate has to keep people from even getting in there. Where the gate is located now, close to the homes, they can't really park there. If they do, people call the cops 'cause it's right by their house. But if they're further back in the valley, where they can manifest at midnight, making trouble, nobody's gonna know they back there. Then they come down the road at 50 miles an hour in the middle of the night, it's a problem. That's a concern.

GM: Could you think of anything the project could give back to lessen adverse effects on the community and cultural practices?

SS: I understand the proposal perfectly, it's all geared around the youth. And it's partnered with Waihe'e Elementary. I think that's a great idea. I think that the people, the families that have taro ponds, the Wongs and the other families, they should be involved more. They should be given the opportunity to be involved more. I know that Peter, Peter, I forget his last name. He grew up in the valley as well. He's all onboard to go ahead and start already without the impact statement or any of that, he just wants to start bulldozing and get it going already, 'cause he's all for building a lo'i right at the school for the kids, you know? Which there used to be. But I don't know if they want to do that or keep on doing it up here. The other thing that was brought up at the Neighborhood Board Meeting was that there's two entities, the Board of Water Supply and Parks & Recreation. It seems Parks & Recreation, they have a thousand and one things to do already so they're not really, you know, concerned about this area. And if it was put all under Board of Water Supply under one entity, then there would be better management. Right now, you have two entities that are trying to be consolidated, whereas if had just one entity it would be a lot easier and faster.

GM: I think we've covered it, unless there's anything you want to add about the area.

SS: [Looking at map again]. I think that, this site should be taken a look at [pointing to map]. Right before the bridge, the bridge is by the pond. Somewhere in this area. It's real overgrown. Just take a look at this area. I can't be sure if it's an ancient Hawaiian site or not, there's a lot of wall construction in that area. And how old it is, it could be within the last century for all I know. But the other site I

know about is way in the back here [pointing to map]. It's old, I know it is real old. The other thing, to navigate this valley, what my friend and I found best, is follow the mango trees, 'cause birds don't drop mango seeds. They don't grow at random. People planted those mango trees. For instance, if you come up the Jeep trail, before you get to the ponds, maybe about right here [pointing to map] there's two mango trees like gates, like an entry gate into something. So people planted those mango trees for that purpose, yeah? And then if you get further back up into the, by the waterfall, you can look across to the other side of the valley you can see the path to the trail that goes along here [pointing to map] and it's all marked by mango trees. You just travel from mango tree to mango tree. If you go down here in this area [pointing to map] there's a line of 'ulu trees, six 'ulu trees planted across like this, in a perfect line. From here to here [pointing to map]. So it's like, somebody planted these trees like this for a purpose. The old trees can be like a map to the valley of old of how people lived in the valley. 'Cause like I said, birds don't carry those kinds of trees and plant them like other stuff. I'm kind of, I don't know. I can't really get into a description of the invasive species.

GM: That's ok.

SS: I know that Albizia hasn't come into the valley yet like it is in Waiāhole. Waiāhole the Albizia took over already. Not so much, it's just starting in this valley. There is a tree that grows very tall and has silver leaves and it has been growing since the late '90s and it's all over. We used to cut 'em down, my friend and I. There's what's called fiddle wood? And the fiddle wood used to be all invading on this side [pointing to map] but it's gotten taken over by another invasive species. It's kind of like a big leaf plant. And at one time, this was all strawberry guava, waiawī.

GM: But no more?

SS: There is a lot at the top. Not as much, the whole hillside used to be waiawī. Then this plant came in and took over, then another. The only hardy plant that survives is the hau bush. The hau bush, there's nothing stopping that. I don't know that trying to eradicate invasive species in this valley is monumental task. It's not going to be that easy. This border outline here covers a lot of the hillside. I would be careful up in this area [pointing to map] 'cause like I say, there used to be roads up in this area, there used to be Jeep trails in here. You can tell, one of them is pretty obvious when you go by the bamboo, then you get lost, can't really follow it. But there's several others up there as well. And that's where the Jeeps used to be and stuff too. This area, I would watch up in here [pointing to map].

GM: That's good to know.

SS: Other than that, there's not too much more that I can think of.

GM: We really appreciate your time.

SS: No problem.

GM: Thank you so much Uncle Steven.

Appendix G: Interview with Rick Towill

TALKING STORY WITH

RICK TOWILL (RT)

December 20, 2019 / 4:30 PM / Telephone
Interview by Gina McGuire (GM)

GM: I'm here with Uncle Rick Towill. It's December 20th we're talking about the Waiheʻe Riparian Learning Center. Uncle, can you start by telling us a little bit about yourself, your name, where you're from and grew up?

RT: Okay so, I actually grew up on the adjacent property on the ridge on the Kahuku side of the property. My parents bought 45 acres back when St. Charles Company sold off all of the land that was once in rice, then was pineapple, then in the ʻ50s they sold it all. I was born in ʻ58 and my parents built the house up there in 1960 and lived there ever since. Then I attended Punahou School and went to Oregon State, studied ag-engineering after that. Then my folks sold the property but we had some remnant pieces of the property. There was a bad landslide that happened on the property between us and the ridge on the Waiheʻe side. A significant portion of the ridge came down. Roy Kinoshita was the eldest of two sons of Satoro and Dora Kinoshita. They had a farm up here, chicken farm, so this landslide happened at three in the morning and the boy lost his life. The material up here sticks to and by the time they dug him out. It just hit the corner of the house where he was sleeping. The whole side of the hill came down. Anyway, that's neither here nor there. Then, we live below that property now on a two acre parcel that my wife and I built a home and we raised our two boys there.

GM: Wow. Do you want to talk a little bit more about your family background?

RT: So, my, I guess on my mom's side, go all the way to the Rice family, which were a missionary family from the East Coast of the United States. On my dad's side, my grandfather came from Virginia, came with the JD White Engineering Company in 1918, something like that, and was surveying for the fuel tanks that they were putting up on Kamehameha Highway adjacent to Pearl Harbor. And then my grandmother's side, my great-grandfather came over from New Zealand; biologist with Rothchild expedition, they were seeking flora and fauna for the collection in England. He ended up managing the ranch, well he worked for the Robinsons on Kauaʻi for many years and then my grandmother and her older brother were born and then they moved to Molokaʻi and he managed the ranch there for a time and took the family all the way back to New Zealand. Through the grapevine, scuttlebut, he found out about the management of the ranch out on Lanaʻi and took that on and came by himself for a year to make sure he secured the job before he brought the family over. And it all worked out, brought the family back. And if you know anything about that island, there's a great big, one of two Norfolk pine trees in Hawaiʻi. And that one is in Kauweli, and the ranch house, used to be a U-shaped house around that. And at night the fog would condense in the area and the water droplets would condense on the needles and drip, what he coined the term fog drip, which is a widely accepted term for the purpose for recharging. So later he planted a whole bunch of Cook Island pines on the top of the hale and restored the water table there quite significantly. They actually measured a 40-foot tree, they put tin roofing underneath the tree, and one 40-foot tree at the top of the hale will generate 100 gallons of water in 24 hours through fog drip.

GM: Wow.

RT: Anyway, that's kind of the family background.

GM: Thank you for that. You have one of the longest backgrounds with this area that I've talked to. Could you share any personal anecdotes or any moʻolelo, oli, or place names that you know of for the area?

RT: When it was, a guy that you probably want to talk to is Kepā Maly. He actually was close with Hoʻohila Kawelo who actually wrote a chant, a song for this area. So he's quite familiar with some of the ʻōlelo from way back. He actually helped us on our property here. We wanted to name our property. And he went back and got

for us, retrieved from early maps that have a whole bunch of place names and our particular property and the one where the landslide happened, of which we own currently, it was ʻIli of Kaʻululoa and was dated from Kamehameha the 5th to a man by the name of James Steward. I want to go and find more information about him because it's a name that's always on a lot of land deeds but don't know the background on him. But anyway, there's a whole bunch of, there's Nana Kaʻalaʻea, which is the spider on the ridge if you're facing the ridge of the Koʻolaus it's on the right hand side, sort of above the property I grew up on. I have the map I can share with you on that. Anyway, with Kepā's help we named our property Kaʻululoa, sort of refresh life, kind of thing.

We used to go up there, I went up there as a kid, you couldn't, the road only went up to the water tunnel, the Suburban Water Supply put in. The Suburban Water Supply was a company that handled all of the rural water systems around Oʻahu except for the City and County of Honolulu, which of course the Board of Water Supply. If you look at some of the water pumps in the area they still have Suburban Water Supply on them. Suburban Water Supply dug what is known as the Waiheʻe Tunnel, and it's quite a ways down, just mauka of the place where everybody goes, it's called the Ice Pond. There's a ford across the stream and then there's a deep water place in the stream where people kind of like to go cool off. But at any rate this water tunnel was put in in the late ʻ50s and then they ran a water line down the road and across the gulch on the Kahuku side and pumped it up to a water tank, I can't remember how many million gallons.

The area was fed before that, by an ʻauwai that was maintained by all of the farming communities. They would go once a month, Saturday once a month, and clear all the bushes and make sure the ʻauwai was unobstructed. The ʻauwai is actually recorded on the Land Court map, located on the original, what's known as the part on our properties, is called the Land Court Application 1133. Remnants of the ʻauwai exist but it's no longer a functioning ʻauwai, down Waiheʻe Road because places in the road there was an elevated flume, passed through some piping going down Waiheʻe Road. Waiheʻe Road, so some of the issues that you probably know of this area, when I was a little kid, was all coral roads, all of the roads, the roads in the area were coraled with coral aggregate. I believe those roads were built during the war. You know, military operations. I think they used a portion of the ridge in Waiheʻe Valley. It's kind of bare on one end, towards the front of the valley, I think they used that for target practice and that sort of thing.

But then, a portion of the property in ʻĀhuimanu that I believe was part of the Hygienic Dairy. It was a big dairy operation after the pineapple ceased operations. I think the Hygienic store got its name from that somehow, as the supplier of milk for the community. I'm not quite sure about that. But Wendell Carlsmith, who was the main founder of the Carlsmith law firm in Honolulu, purchased the property and he got some financers in the early ʻ60s and actually the back of ʻĀhuimanu Valley was going to be, it was chosen as one of two sites... the second site was in Campbell Industrial Park, to put the Chevron refinery. So, in the ʻ60s a lot of other companies purchased portions of the _____ company, particularly on Wailehua Road. It was all in an effort, or with the thought that, there would be accessory businesses for the refinery so at any rate... And how it impacts Waiheʻe Valley is, one of the, the big five investors in the property and a lot of this back property, the 200 acres that the Parks Department has now, was purchased way back when Lewers & Cook. Waiheʻe Road coming up was, when it was put in, was built 60 feet wide with the intention that there was going to be hotels, big sewage treatment plant, I think even a golf course at the back of Waiheʻe Valley. Fortunately that didn't happen. The refinery was placed in Campbell Industrial Park where it should be and so the rest is sort of history. The City ended up downzoning lots of the land in the area from what would have been maybe some residential, downzoned it into ag. And so, that lessened the value of the Lewers & Cook portion and I think the property was purchased by the City in the mid-ʻ70s.

Mayor Fasi was going to put a golf course in the back of the valley. John Reppun saw to it that that didn't happen. And so, that actually sat with Parks Department and then they somehow named it the Waiheʻe Nature Preserve, which is to the detriment of the community around here. ʻCause when Facebook and all that kind of stuff came along, someone got the bright idea saying what a wonderful hike it is back there. And the community actually made enough fuss that there's been rubbish and stuff left up there, defecation, they've actually found for the second time bacteria in the water, so they've had to shut it down. So, this riparian zone, that is to happen that

you're working towards, on this 200 acre parcel, which goes up to, and I don't think it includes that ice pond area, which is the former Lewers & Cook property, I think it's better served-- John Reppun and I signed a memorandum of understanding with the Board of Water Supply back in in the '90s with the intent on creating such a riparian zone open, outside classroom that would be managed by KEY Project in Kahaluʻu. And so, it still is the dream. But any rate, that's sort of where we are with the community involvement with that property in the back. It's one of the last, really, beautiful valleys. When you go in the back there, they actually put an inclined well, Board of Water Supply, at the base of Hāmama Falls back in the '80s and the Reppuns and others had a contested case hearing because when that inclined well was put in at the time it drastically reduced the flow of water in Waiheʻe Stream, which limited the use of that water for taro patch purposes and so forth. Anyway, I don't know what else I can tell you history-wise.

GM: No, that was super helpful.

RT: It's really a beautiful valley. It reminds me, when you get up in the back of the valley there where the Ice Pond is, you can see the rim of the sort of the amphitheater, and it reminds me a lot of Kalalau Valley on Kauaʻi. I'll tell you who might, the Higa family, Brian Higa, who's probably in his late 70s, early 80s. He's my neighbor right down here. His family owned a lot of that property up there before Lewers & Cook bought it. He could shed a lot of the early history from when they purchased the property in the early '50s, maybe even late '40s. I can give you his contact information. He might have some snippets of information I wasn't able to fill in.

GM: Yeah, that'd be great! You talked a little about the ʻauwai system and I was wondering if you knew of any other cultural sites or structures, burials, or artifacts on the property.

RT: Not really. In the valley there, I know that in our property, the 45 acre piece that I grew up on, there's a series of dikes. On the north side of Waiheʻe Valley comes down and then it breaks off into two ridges that forms kind of a triangle and we had the middle triangle. And then between those two ridges there were quite a number of, I think there were two or three basaltic dike complexes, this is where the earth cracks open and the lava goes up and cools very slowly. And creates these rock, the lava cooling slowly, it turns into basalt. That's where adzes, stone adzes were quarried. We actually found quite a number of them. I still have some adze blanks from our property. Adze blanks are sort of in the general shape of an adze but they're kind of squared off and the Hawaiians would carry them down or transfer them to whomever near the shore and that's where they would sort of grind the ends down to create the point to be able to dig soil or whatever they were going to use the adze for.

GM: Cool. How do you think this project is going to affect places of cultural significance or access for the community for gathering or cultural practices in the area?

RT: Not really that I know of other than the ʻauwai is active from I think probably halfway up the property that you're working and the Reppuns maintain that diversion from the stream through this ʻauwai that Rachel Hall. She was one of twelve kids from Kauaʻi. My wife's classmate was Rachel's sister, I believe. It was a huge family. I've not really found any ʻulu maikas or anything like that in Waiheʻe Valley but Larry Higa, on his property, which is down across from Kahaluʻu Elementary School, they farmed that property in sweet potato in the '40s, late '30s. He found some adzes that he has, a foot long, maybe 14 inches long. Appropriately shaped with the cutting edges and so forth.

GM: Right on.

RT: Not too many ʻulu maikas in the area.There were some of those, sort of sling shots. They look like a miniature, shrunken football kind of thing, like an inch or two long. I think I have one of those

GM: Are there any hula hālau that are harvesting in the valley?

RT: Not that I know of. There's a hālau that practices down at KEY Project every Monday night, I'm not sure that they go up in the valley that much.

GM: Okay, no worries. Is there anything the project can do to lessen the effects on cultural practices and the community?

RT: Actually, by having something that's, John and I envisioned through KEY project in the back of the valley, we could incorporate some invasives removal because there's albizia, there's this other thing, it's on the State noxious plant list, it has a yellow flower and it's somehow been isolated to this valley. It migrated from the Kahuku side of the valley and it's become a problem. By doing an outside classroom and some of those efforts we can eradicate some of those invasives which don't help the land.

GM: That would be great.

RT: There's actually a place, if you come up to visit. There's a really good location, which we've sort of called the Ginger Patch, the road kind of goes up the hill from the gate and it drops down and goes across a small tributary, sort of an intermittent stream, and then you reach this place which has a whole bunch of white and yellow ginger, which we actually harvest the ginger blossoms for KEY Project's fundraiser and other things. It would be a really great location for a loʻi and there's a place above it which could support a kind of like a big open pavilion, would really give people a sense of what the place is all about.

GM: Next question is if you're aware of any cultural concerns the community might have about the project happening in the valley?

RT: No actually, the surrounding community is quite supportive of an effort like this because it would work towards limiting just the free for all access that's been happening for the last five or six years. I think going forward, there needs to be an effort to make the visitors that visit Hawaiʻi understand that there's a protocol and a respect that needs to happen. I think if something were added to the video that's played on the incoming flight that talks about invasive species, declaring unwanted plants and animals. That if something like that were offered, that would be good. It's gotten, I think we're just beginning to see the signs, the industry has too many people coming here now. The State and County doesn't manage access to open areas very well.

GM: My last question unless there's anything else you wanted to add, other than Brian Higa and Kepā Maly, who you recommended earlier, is there anyone else you would recommend we talk to?

RT: I would also reach out to, there's a man by the name of Richard Paglinawan, who was quite knowledgeable about the area but he's since passed away. I think Brian might be able to help you. Certainly Kepā Maly would be a good resources. He's as haole as I am but he was hanaied by the Daniel Kaopuiki family on Lanaʻi and was raised real traditional way, learned to speak Hawaiian the real traditional way and is quite knowledgeable about land matters and deeds, that kind of thing. And as I said, he knew Hoʻohila Kawelo and knows about some of the moʻolelo of the area. He would certainly be one to reach out.

GM: Alright! Thank you so much for your time Uncle.

Appendix L

Preliminary Engineering Report

Preliminary Engineering Report

FOR

Waiheʻe Loʻi Restoration and Riparian Learning Center

Prepared for:

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February 2020

G70 Project No. 218043-01

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I.INTRODUCTION

The proposed project, Waihe'e Lo'i Restoration and Riparian Learning Center (WLRRLC)is approximately 30 acres and is located within the larger 88 acre Waihe'e Valley Nature Park in Kaneohe, Oahu, Hawaii. There is also a small parcel located within the Waihe'e Valley Nature Park that in less than one acre and is owned by the Honolulu Board of Water Supply that is also included in the WLRRLC.

Waihe'e Valley Nature Park is owned by the City and County of Honolulu (CCH) Department of Parks and Recreation. A gated gravel road that runs through the property provides the Honolulu Board of Water Supply (BWS) access to the Waihe'e Tunnel and BWS building.

BWS's vision for the proposed WLRRLC is to restore the traditional lo'i systems that likely once existed on site and foster a sense of kuleana through educational and stewardship programming. The property will be leased to private groups that will be responsible to restore and maintain the area. This Preliminary Engineering Report (PER) has been prepared to provide recommendations for the improvements referred hereinafter as WLRRLC. This report evaluates the existing site conditions and defines requirements for roadway, drainage, water, and wastewater utilities.

II.EXISTING USE

The project property is zoned as General Agriculture and is located on TMKs: (1) 4-7-006:010 (por.) and (1) 4-7-006:018 as indicated in **Figure 1** Location Map. BWS regularly visits the area to monitor the Waihe'e Tunnel resource and give educational tours. They also have a current agreement with the Ko'olau Mountains Watershed Partnership to allow periodic access for the purpose of conducting forest conservation and restoration activities, including volunteer workdays on a hill side near the entrance to the dike tunnel.

The community adjacent to Waihe'e Valley is of rural-residential in character and with a mixture of private residences and farmland. The access to WLRRLC is through a gate at the end of the City and County owned Waihe'e Road.

Although there is a gate at the entrance, and "No Trespassing" signs, the area has become an increasingly popular recreational destination. It is frequently recommended to visitors on popular hiking and travel websites as a relatively easy hike with natural forested landscape, ice ponds, and waterfalls.

III.EXISTING INFRASTRUCTURE

Existing Roadways and Vehicular Site Access

The project site is accessed by Waihe'e Road via Kamehameha Highway in Kaneohe, Oahu. Waihe'e Road, owned and maintained by the City and County of Honolulu, terminates at a dead end where the BWS access road into the valley begins. There is a gate at the entrance to this road owned by the Department of Parks and Recreation. Legal access to Waihe'e Valley is currently restricted to BWS staff and those who have obtained a BWS permit to enter the area. The access road is a gravel/dirt road which varies from 9' to 12' wide. BWS maintains the road by adding gravel as needed.

Existing Pedestrian Access

The nearest bus access to the site is via Route 60, which stops on Kamehameha Highway at Waihe'e Road. Pedestrian access is only provided to the end of the Waihe'e road via a 4' concrete sidewalk. Visitors can walk along the gravel/dirt road to visit the BWS Waihe'e Tunnel, but it is not compliant with the *American with Disabilities Act (ADA)*.

Existing Topography and Drainage Systems

The existing topography of the project area is defined by a gently sloping valley floor and steep upland mountains. The project area ranges in elevation from about 80 feet to 350 feet. The Waihe'e Stream bisects the parcel running for a length of 2.9 miles. Waihe'e Stream originates in the Ko'olau Mountains in the southern half of the Waihe'e ahupua'a, is joined first by the Hāmama Stream and waterfall, and then by the Kalia Stream and eventually terminates in Kāneohe Bay.

The project area in Waihe'e Valley is situated within approximately 6.7 square miles comprising the Kahalu'u Watershed. Kahalu'u Watershed is described as medium-sized, with a steep upper watershed (maximum elevation of 2,762 feet). These watersheds tend to have relatively high chance of experiencing flash floods when local rainfall is concentrated over a short period of time. Stormwater from Waihe'e Valley generally overland flows east towards Kāneohe Bay.

It was observed that there is an existing mānowai (dam) which diverts water from Waihe'e Stream to the 'auwai (irrigation ditch) within the project site which may have been used for traditional lo'i farming.

Drainage infrastructure was also observed within the project area as roadway culverts associated with the Waihe'e Stream. Storm runoff comes down from the upland mountains and crosses the gravel road at various locations, through culverts, concrete swales, or by sheet flow until it enters the Waihe'e Stream. See **Figure 3** Existing Drainage and Topography. Detailed boundary and topographic survey maps were completed by Control Point Surveying, Inc. in June 2019.

The project area generally lies within Flood Zone D, which is identified as a possible flood risk but undetermined hazard and Zone X, which is outside of the 0.2% annual chance floodplain. Around the Waihe'e Stream is Flood Zone A, which is an area subject to inundation with no base flood elevation determined. Near the entrance of the property around the Waihe'e Stream is Flood Zone AEF, which is a regulatory floodway. See **Figure 4** Flood Designation Map.

Existing Soils

Waihe'e Valley contains the following soils classified by the *USDA Natural Resourses Conservation Service Soils*: Hanalei silty clays (HnB), Waikane silty clays (WpF, and WpE), Typic Endoquets (TR), and Lolekaa silty clays (LoB and LoE). See **Figure 5** Soils Map. Soil types and characteristics identified from the project area are described below:

- HnB (Hanalei silty clay, 2 to 6 percent slopes) – This soil type is poorly drained with gentle slopes of 2-6%. Due to the gentle slopes, land comprised of this soil type exhibit slow runoff rates and low erosion hazards. These soils are derived from alluvial deposits and are generally more than 60 inches deep. This type of land is suitable for taro, sugarcane, and pastureland.

- LoB (Lolekaa silty clay, 3 to 8 percent slopes) – This soil type is well-drained with gentle slopes of 3-8%. Lands that consist of this soil type exhibit low runoff due to the gentle slopes. These soils are derived from the alluvial deposits of igneous rock and are more than 80 inches deep. They are considered prime farmland.

- TR (Typic Endoquets mucky silt loam, 0 to 1 percent slopes) – This soil type is poorly drained, and lands comprised of this soil type are not prone to runoff due to the negligible slope. These soils originate from the alluvial deposits derived from basalt.

- WpF (Waikane silty clay, 40 to 70 percent slopes) – This soil type occurs on steep slopes of 40-70% and are not considered prime farmland. Soil type is characterized by rapid to very rapid runoff rates and severe erosion hazard. These soils are recommended for rangeland, woodland, or wildlife habitat.

- WpE (Waikane silty clay, 25 to 40 percent slopes) – The properties of this soil type are similar to the WpF soils with the notable difference that they occur on moderate slopes of 25-40% instead of steep slopes of 40-70%. Soil type is characterized by medium runoff rates and is moderate to severe erosion hazard. The recommended use for this type of land is pastureland, rangeland, woodland, or wildlife habitat.

Existing Water Systems

There is an existing 24-inch BWS waterline that runs through the site, and provides potable water service to Waihe'e Road and downstream. It was observed that there are water spigots and valves along the BWS access Road. The pipe is in a 20' road and pipeline easement.

Existing Fire Protection Systems

There are currently no fire protection systems on the project property.

The private gravel/dirt driveway throughout the property ranges from 9' to 12' wide, which does not provide the minimum 20' to allow for fire access.

The closest BWS fire hydrant (W01673) is located along Waihe'e Road approximately 560 linear feet away from the first gate. The static pressure provided by BWS for the fire hydrant is 68 pounds per square inch (psi) with a residual pressure of 52 psi and a flow of 1,000 gallons per minute (gpm).

Existing Wastewater Systems

There are no existing sewer connections on or near the project property. The closest City and County of Honolulu wastewater system is located makai on Kamehameha Highway.

IV. PROPOSED IMPROVEMENTS

Phase I of the project will focus on the first 13 acres of the project area that spans from the gate at the end of Waihe'e Road to the existing mānowai (dam). The development of a successful concept plan will have a primary focus on the restoration of indigenous agriculture, such as the cultivation of lo'i kalo and other native crops, to areas currently overgrown with invasive vegetation. Restoration work will eventually be supplemented with educational and volunteer programming.

Construction of a 1,200 square foot pavilion and a double stall composting toilet in Phase I will allow for a covered location to hold workshops, meetings and presentations. A plant nursery may be built near the project area and will provide native and other suitable plants for restoration and cultivation. Several areas will be designated as outdoor learning spaces. Two small parking areas ranging in size from 1,200 square feet to 5,000 square feet will be developed for staff, non-profit groups, students and volunteers that arrive for community workdays. The first parking area will be large enough for a school bus turn around. A second gate installed past the proposed parking areas will help to prevent vehicle access to the rest of the valley. See **Figure 5A** Proposed Site Plan.

Phase II of the project will facilitate the future expansion of lo'i and other agricultural crops to the remaining 14 acres extending from the mānowai to the "ginger patch" bordering BWS lands. This aspect of the Project will entail the same attention to forest conservation and agriculture restoration practices as Phase I. Invasive plants will continue to be removed and the areas replanted with appropriate native species. Another 1,200 square foot pavilion and a double stall composting toilet will be constructed, and a third gate will be installed at the BWS property line. See **Figure 5B** Proposed Site Plan.

Proposed Roadways and Vehicular Site Access

The existing access to the project site at Waihe'e Road via Kamehameha Highway will generally remain in its exiting condition. The private gravel/dirt roads will remain with potholes to be filled when requested.

The first gravel parking lot is planned for approximately 25 parking spaces, with room for a school bus turnaround. It will have a concrete ADA parking stall and access aisle with a 5' concrete sidewalk along the parking on the Pavilion side. The second gravel parking lot further upstream will accommodate approximately 14 parking spaces.

Proposed Pedestrian Access

Access to the site will be limited to driving into the site or arriving on a bus or with a permit. There will be no pedestrian access. Visitors to the WLRRLC site will be informed to not park near homes to avoid negative impacts to the neighborhood. It is expected that the presence of the WLRRLC will decrease the number and frequency of trespassing hikers. Large groups will be asked to arrive by bus or carpool, or even park at the Kahalu'u District Park and carpool up to the project site.

Proposed Grading and Drainage Systems

The proposed activities and facilities are not anticipated to significantly impact the existing hydrology and drainage around the project area. Impervious areas are limited to the pavilions, double stall composting toilets and gravel parking areas. While the slight increase in total area covered by impervious surfaces will increase surface runoff, impact to the overall and regional drainage areas are not anticipated. The overall drainage pattern will remain the same as existing, with runoff from the site flowing into the Waihe'e Stream. The limited regrading in areas that are to be occupied by new structures and parking areas will be done in a manner that will retain the existing south-to-north flow of onsite surface runoff and preclude any runoff from flowing onto neighboring properties. Proposed drainage improvements shall conform and designed in

compliance with the *CCH Department of Planning and Permitting (DPP) Storm Drainage Standards, August 2017*.

During the construction period, erosion will be minimized through compliance with the *CCH's Grading Ordinance* and the applicable provisions of the *DOH's Water Quality Standards (Title 11, Chapter 54, HAR)* and *Water Pollution Control requirements (Title 11, Chapter 55, HAR)*. Additionally, standard Best Management Practices (BMPs) will be employed to minimize impacts, as detailed in subsequent construction plans. No direct storm drainage runoff from the project to coastal waters is anticipated.

Stormwater Quality

CCH DPP Rules Relating to Water Quality, December 2018 will require the implementation of Low Impact Development (LID) features and permanent BMPs. Since the project includes more than 5,000 sf of impervious area (pavilions, double stall composting toilets and gravel parking areas), this project is classified as a Priority B1 project and must incorporate Post-Construction BMPs into the design to the Maximum Extent Practicable (MEP). These BMPs include LID Site Design Strategies (i.e. identifying buildable areas and minimizing impervious surfaces based on a site's natural drainage features), and Source Control BMPs (i.e. limit runoff from landscaped areas to impervious areas). Priority B1 projects require Treatment Control BMPs. Priority B1 projects must submit a Stormwater Quality Checklist (SWQC) prepared by a Certified Water Pollution Plan Preparer (CWPPP), which must be reviewed and approved by the Director prior to issuance of a grading permit. It may be possible to classify the project as a Priority B2 if the gravel parking areas are considered pervious.

Managing stormwater quality through LID features minimizes downstream stormwater impacts. Particularly, LID works to reduce runoff entering downstream systems which may already be at or above capacity, treat pollutants from frequent storm events, reduce erosion, protect habitats, recharge groundwater, and also, designed correctly, may reduce infrastructure costs with reduced installation of large traditional stormwater utility systems.

Site specific LID BMPs include the following which may be used in the parking areas or by buildings for polluted runoff. These potential LID techniques may also be used in conjunction or combination with other techniques to enhance the overall system and should be selected based on the different parameters and constraints at each specific site:

- **Landscaped Areas**
  Limit runoff from landscaped areas to impervious areas and protect slopes and channels

- **Parking Areas**
  Parking areas that have impermeable material must be graded to direct runoff towards vegetated/landscaped areas.

Proposed Water Systems

A new lateral is anticipated to connect to the existing 24-inch BWS waterline. Access to water will be needed for the proposed pavilions, double stall composting toilets and hose bibbs so that volunteers can wash their hands and tools can be cleaned. Extensive water use is not expected.

Proposed Fire Water Systems

We assume that the pavilion use is similar to a Community Hall, which would make the pavilion an occupancy type A-3. According to the 2006 International Building Code (IBC), since the pavilions are less than 12,000 sf and have an occupancy load of less than 300, an automatic sprinkler system is not required.

Once the Occupancy type is determined the need for fire access and fire hydrants can be determined.

Proposed Wastewater Systems

Estimated usage:

Year round operation
20 volunteers/staff per week
100 visitors one weekend per month
100 visitors one weekday per month
125 hikers per day

Based on the above estimated counts, we recommend using a Clivus Model M54 double stall composting toilet at each of the pavilions. Each stall has the capacity of 44,000 annual uses. Since this is a tank system no significant impacts to the groundwater underlying the project site are anticipated. Humanure (human excreta and sawdust or other carbon source) will have to be pumped and removed from the composting toilets as needed. Ventilation requirements for power can come from an electrical source or an optional photo-voltaic system.

Additional Development Considerations

It was observed that there are existing overhead electrical lines along the BWS access road. There is a potential to connect to the overhead system.

There is no existing trash service. Trash will have to be collected and removed from the site.

V.CONCLUSION

Phase I of the project will focus on the first 13 acres of the project area which will consist of constructing a 1,200 square foot pavilion and a double stall composting toilet to hold workshops, meetings and presentations. A plant nursery may be built near the project site will provide native and other suitable plants for restoration and cultivation. Several areas will be designated as outdoor learning spaces. Two small parking areas will be developed ranging in size from 1,200 square feet to 5,000 square feet with the larger parking lot with a school bus turn around. A second gate installed past the proposed parking areas will help to prevent vehicle access to the rest of the valley.

Phase II of the project will facilitate the future expansion of lo'i and other agricultural crops to the remaining 14 acres extending from the mānowai to the "ginger patch" bordering BWS lands. In addition, another 1,200 square foot pavilion and double stall composting toilet will be constructed. A third gate will be installed to prevent further access into the property.

The existing access to the project site at Waihe'e Road via Kamehameha Highway will generally remain in its existing condition. The private gravel/dirt roads will remain with potholes to be filled when requested. Pedestrian access from the proposed parking lot will be provided to support the new pavilions and native plant nursery. The larger parking lot will have a concrete ADA parking stall and access aisle with a 5' concrete sidewalk along the parking on the Pavilion side.

The proposed activities and facilities are not anticipated to significantly impact the existing hydrology and drainage around the project area. Impervious areas are limited to the pavilions, double stall composting toilets and gravel parking areas. The limited regrading in areas that are to be occupied by new structures and parking areas will be done in a manner that will retain the existing south-to-north flow of onsite surface runoff and preclude any runoff from flowing onto neighboring properties.

This project is classified as a Priority B1 project and must incorporate Post-Construction BMPs into the design to the Maximum Extent Practicable (MEP). These BMPs include LID Site Design Strategies (i.e. identifying buildable areas and minimizing impervious surfaces based on a site's natural drainage features), and Source Control BMPs (i.e. limit runoff from landscaped areas to impervious areas). Priority B1 projects require Treatment Control BMPs. Priority B1 projects must submit a Stormwater Quality Checklist (SWQC) prepared by a Certified Water Pollution Plan Preparer (CWPPP), which must be reviewed and approved by the Director prior to issuance of a grading permit.

As discussed with BWS, a new lateral is anticipated to connect to the existing 24-inch BWS waterline. Access to water will be needed for the proposed pavilion, double stall composting toilets and hose bibbs. Extensive water use is not expected. There are no proposed fire protection systems on the project site.

Double stall composting toilets have been recommended and since this is a tank system, no significant impacts to the groundwater underlying the project site are anticipated. Humanure (human excreta and sawdust or other carbon source) will have to be pumped and removed from the composting toilets as needed.

VI.REFERENCES

Topographic survey prepared in June 2019 by Control Point Surveying, Inc.

City and County of Honolulu Department of Planning and Permitting Storm Drainage Standards, August 2017

City and County of Honolulu Department of Planning and Permitting Rules Relating to Water Quality, December 2018

City and County of Honolulu Department of Planning and Permitting Storm Water BMP Guide for New and Redevelopment, July 2017

United States Department of Agriculture Natural Resources Conservation Services Web Soil Survey

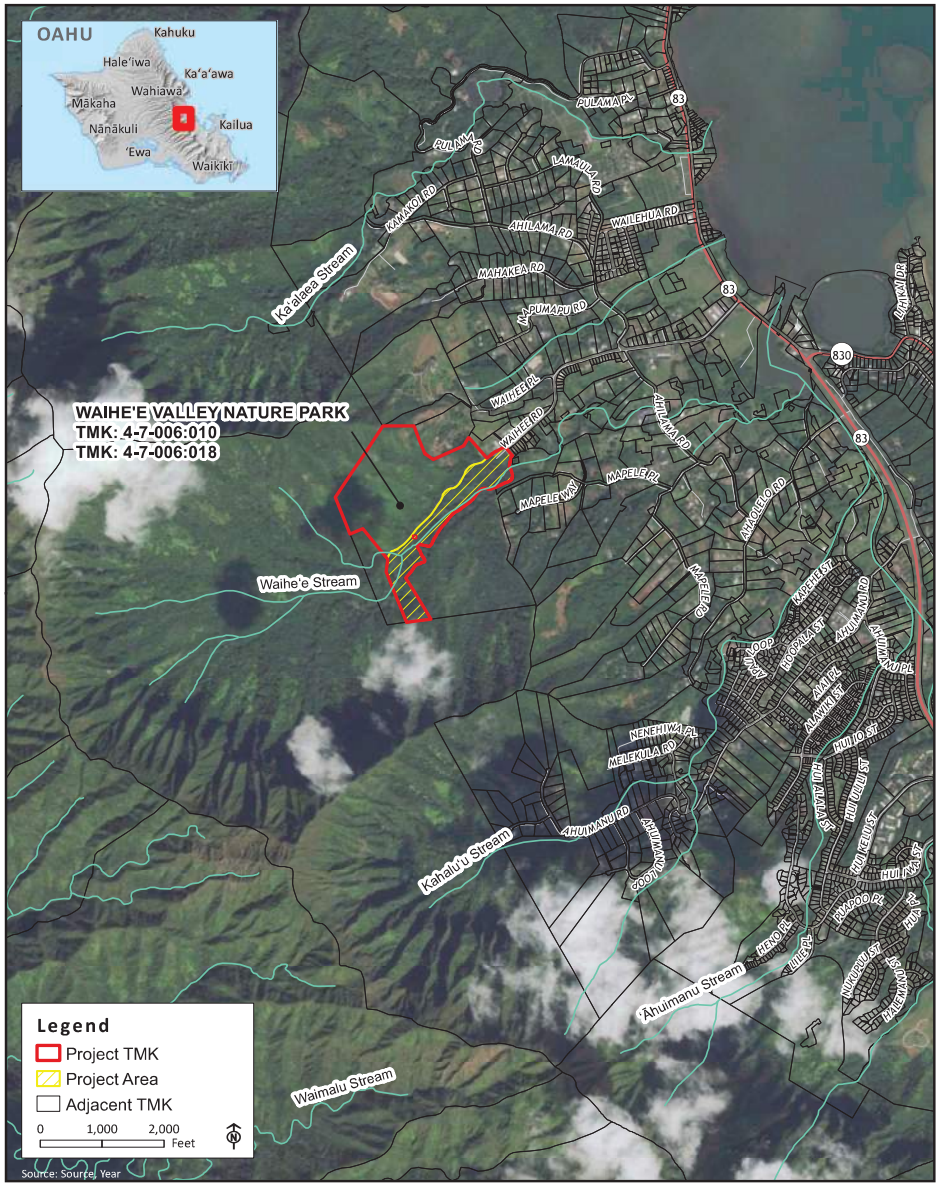
2010 ADA Standards for Accessible Design

LUO Section 21-6.100 Off-street Loading Requirements

City and County of Honolulu's Grading Ordinance

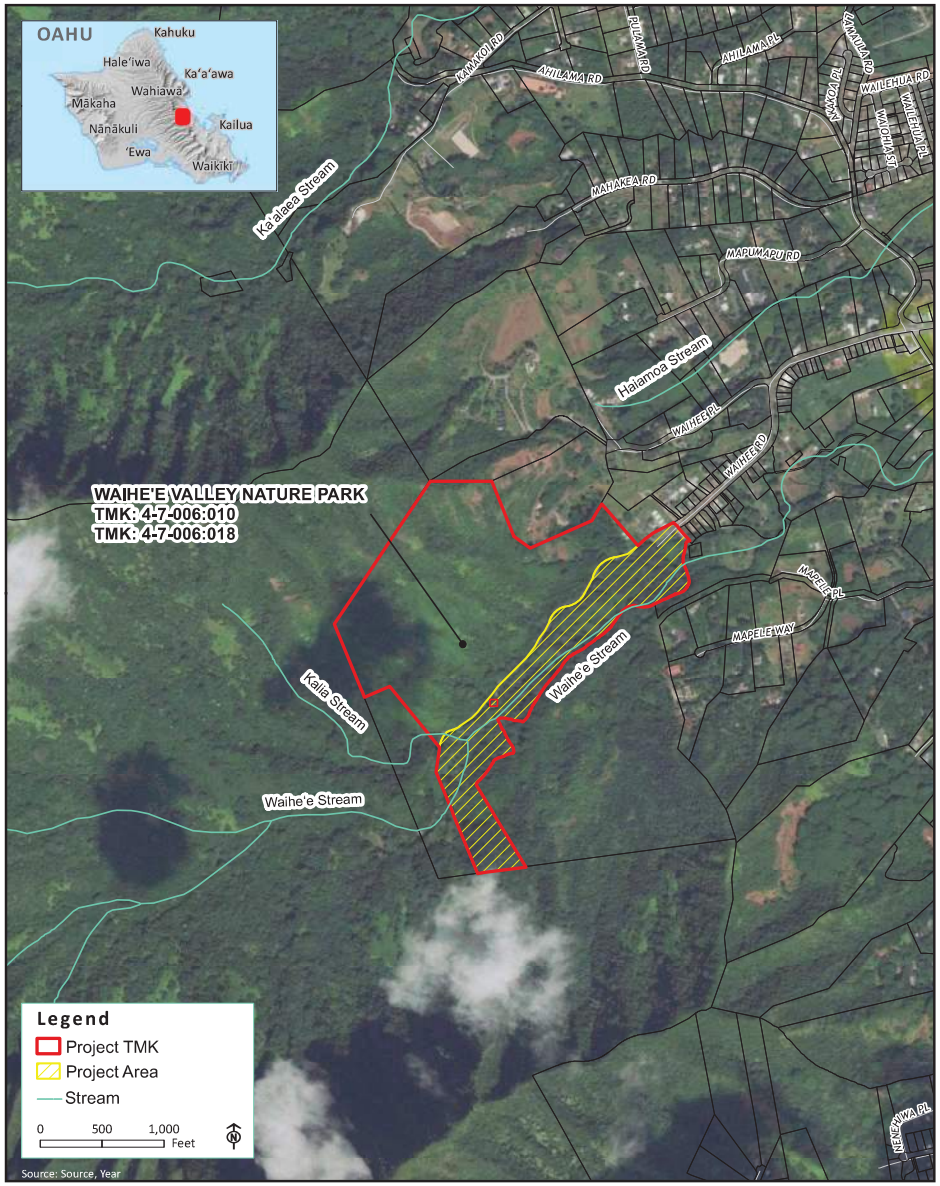
State of Hawaii Department of Health Water Quality Standards (Title 11, Chapter 54, HAR)

State of Hawaii Department of Health Water Pollution Control (Title 11, Chapter 55, HAR)



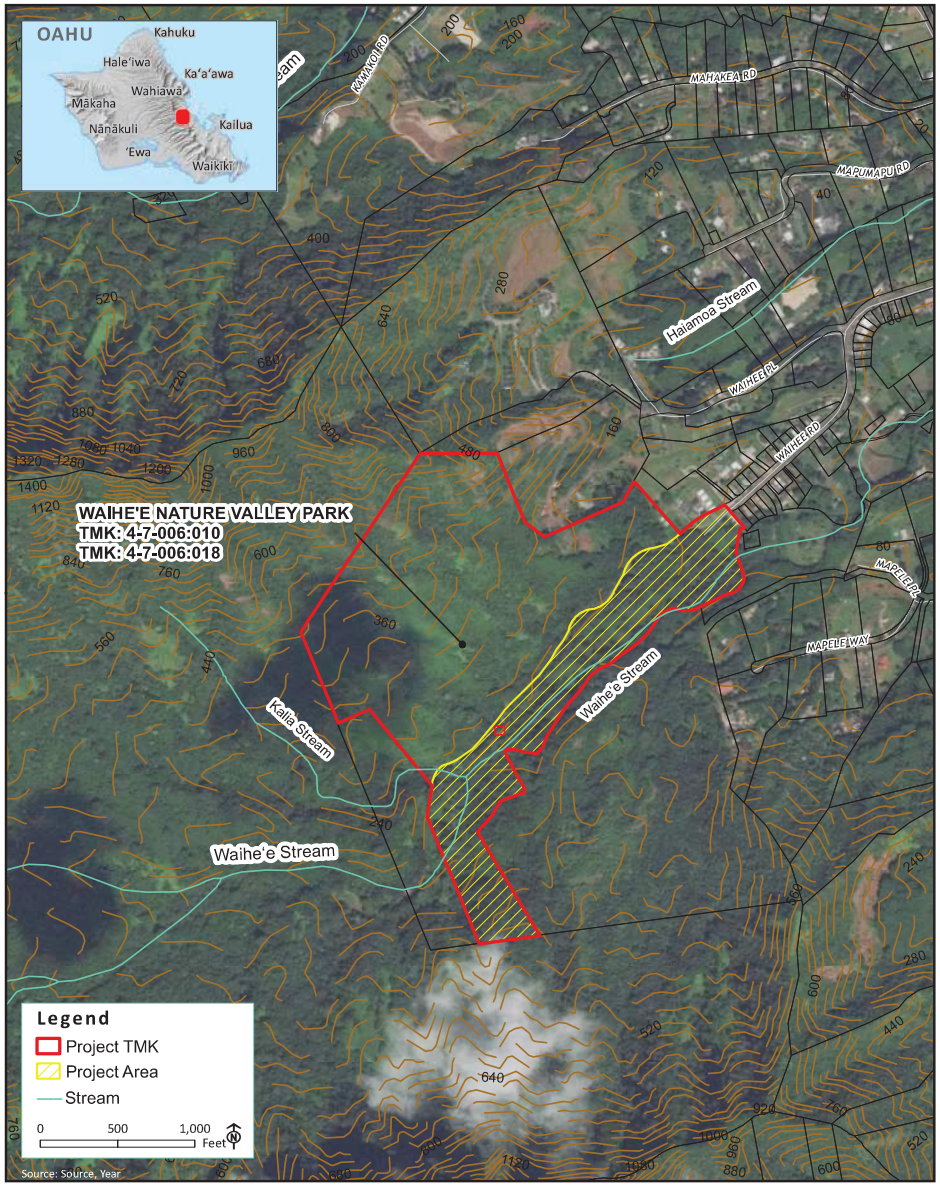
Board of Water Supply
Waihe'e Riperian Learning Center

Figure 01 - Vicinity Map



Board of Water Supply
Waihe'e Riperian Learning Center

Figure 02 - Location Map



Board of Water Supply
Waihe'e Riperian Learning Center

Figure 03 - Existing Drainage Map

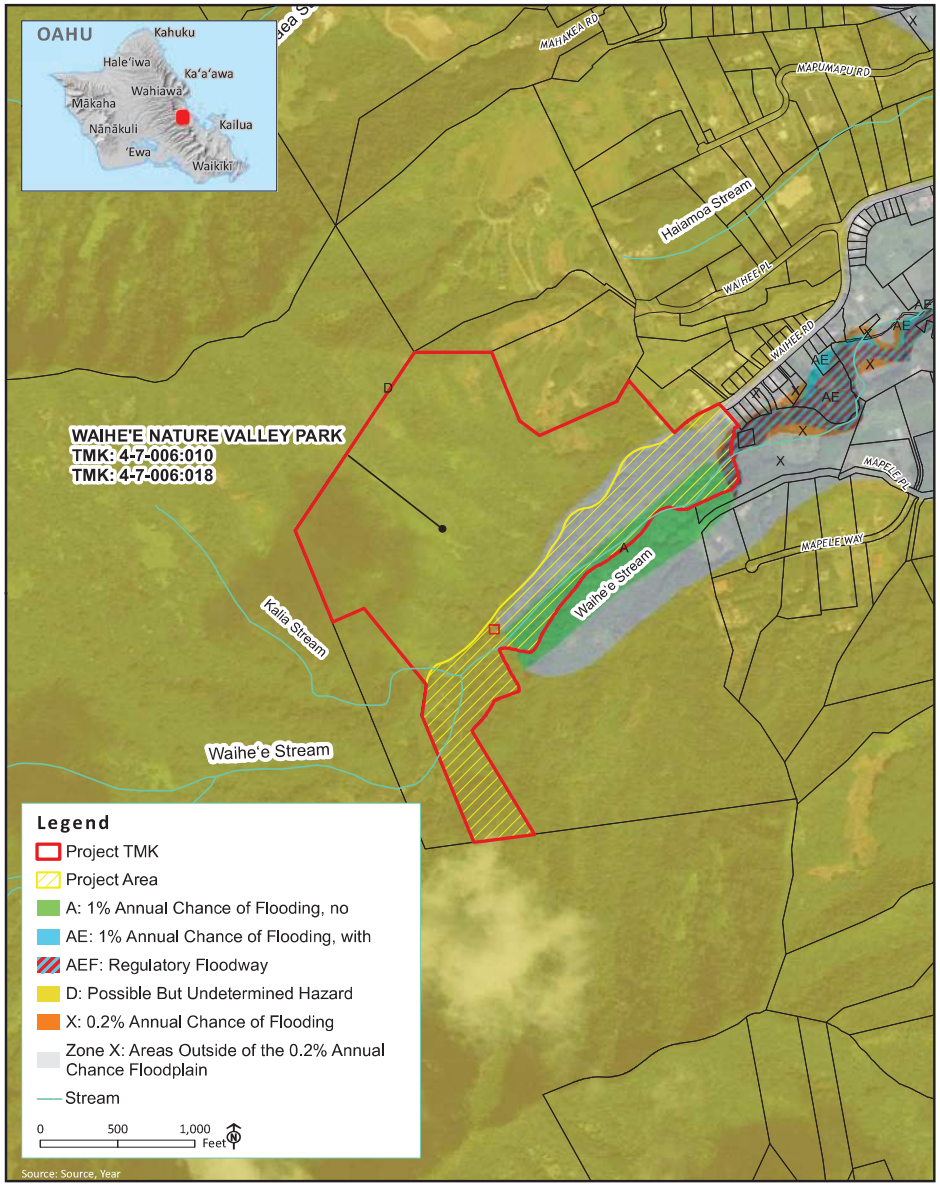


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Figure 04 - Flood Designation Map

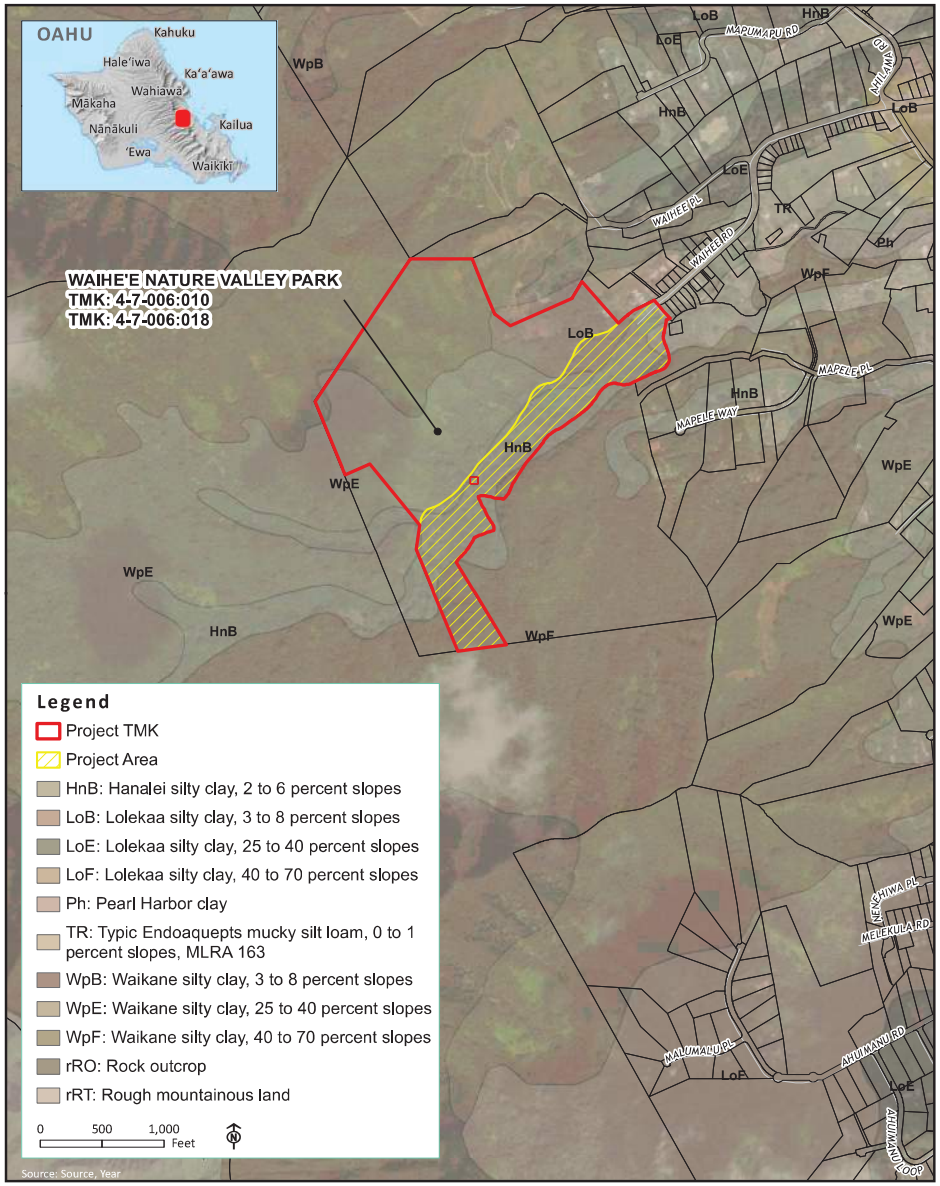

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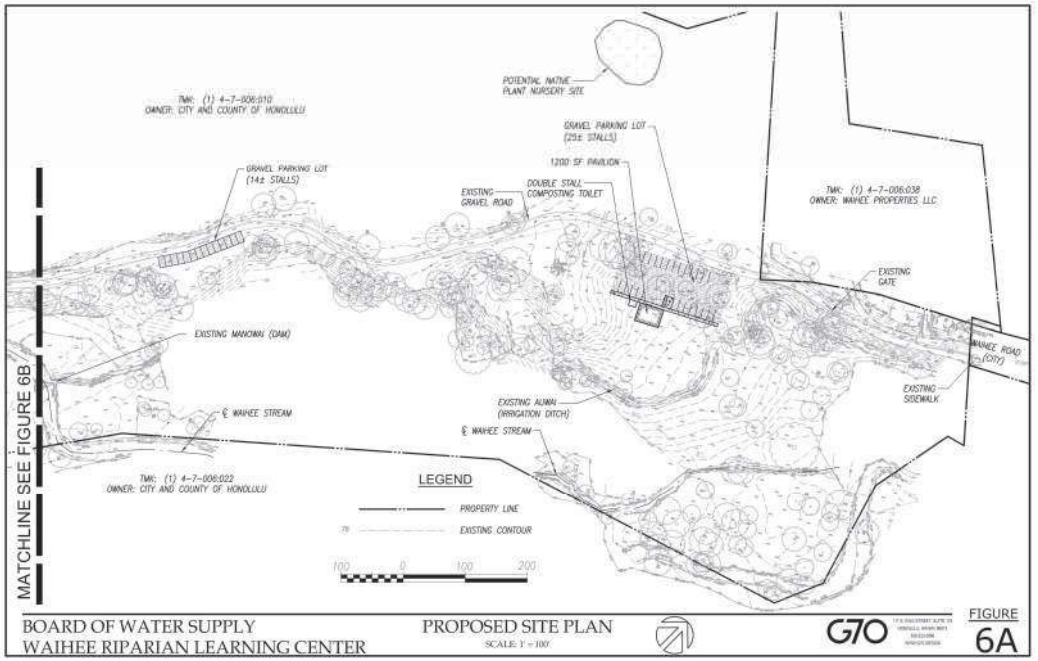
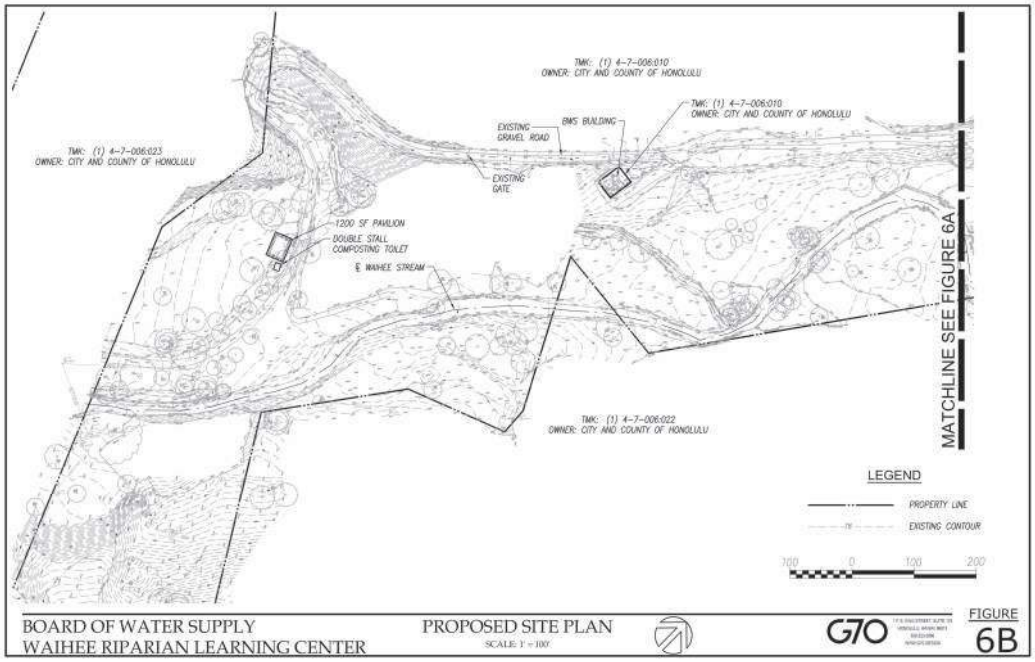
Figure 05 - Soils Map





BOARD OF WATER SUPPLY
WAIHEE RIPARIAN LEARNING CENTER

PROPOSED SITE PLAN
SCALE: 1" = 100'

GZO

FIGURE
6B