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**CITY AND COUNTY OF HONOLULU**

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**FILE COPY**

**MAR 08 2016**

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ROBERT J. KRONING, P.E.  
DIRECTOR

MARK YONAMINE, P.E.  
DEPUTY DIRECTOR

CDD-A 16-643766

February 26, 2016

Mr. Scott Glenn, Interim Director  
Office of Environmental Quality Control  
235 South Beretania Street, Suite 702  
Honolulu, Hawaii 96813

Dear Mr. Glenn:

**SUBJECT:** HRS Chapter 343 Final Environmental Assessment (FEA) for the City and County of Honolulu, Department of Design and Construction, Civil Division, for a Kawa Stream and Ditch Improvements project located in Kaneohe on the windward side of the island of Oahu, Koolaupoko District. The Kawa Stream portion of this project begins near Kaneohe Bay Drive and extends upstream for approximately 4,000 linear feet near the end of Koa Kahiko Street. Kawa Ditch is a tributary of Kawa Stream that branches off the stream in an easterly direction for about 980 feet. TMK: (1) 4-05-066: 063, 4-5-067: 065, 4-5-070: 049, 4-5-084: 059

The City and County of Honolulu, Department of Design and Construction, has reviewed the Final Environmental Assessment (FEA) for the proposed project and hereby transmits the FEA and Finding of No Significant Impact (FEA-FONSI) determination. Please publish notice of availability for this project in the next available issue of the Environmental Notice. We have enclosed the OEQC Bulletin publication form, a CD with a copy of the FEA (pdf) and Publication Form (MS Word), and one hard copy of the FEA. Simultaneous with this memo, we have submitted the summary of the action in a text file by electronic mail to your office.

Mr. Scott Glenn  
February 26, 2016  
Page 2

Please contact Scott Nakamatsu, Project Manager, at 768-8812, Department of Design and Construction, Civil Division, or by email at [snakamatsu@honolulu.gov](mailto:snakamatsu@honolulu.gov) should you have any questions.

Very truly yours,

  
Robert J. Kroning, P.E.  
Director

SN:DT:pto

Enclosures: One (1) CD with a copy of the OEQC publication form, FEA  
DDC Acceptance letter (hard copy)  
OEQC Bulletin Publication Form (hard copy)  
One (1) FEA (Hard Copy)

OFFICE OF ENVIRONMENTAL  
QUALITY CONTROL

16 FEB 26 AM 10:07

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**AGENCY**  
**PUBLICATION FORM**

MAR 06 2016

Project Name:	Kawa Stream and Ditch Improvements - Final Environmental Assessment
Project Short Name:	Kawa Stream and Ditch Improvements
HRS §343-5 Trigger(s):	Use of state or county lands or funds
Island(s):	Oahu
Judicial District(s):	Ko'olaupoko
TMK(s):	(1) 4-05-066:063, 4-5-067:065, 4-5-070:049, 4-5-084:059
Permit(s)/Approval(s):	Section 401 Water Quality Certification, Pre-construction Notification, Stream Channel Alteration, Coastal Zone Management Federal Consistency Review
Proposing/Determining Agency:	Department of Design and Construction
Contact Name, Email, Telephone, Address	Scott Nakamatsu, P.E, <a href="mailto:snakamatsu@honolulu.gov">snakamatsu@honolulu.gov</a> , 808-527-6247, 650 South King Street, 15 <sup>th</sup> floor Honolulu, Hawai'i 96813
Accepting Authority:	(for EIS submittals only)
Contact Name, Email, Telephone, Address	
Consultant:	Oceanit
Contact Name, Email, Telephone, Address	Cris Takushi, <a href="mailto:ctakushi@oceanit.com">ctakushi@oceanit.com</a> , 808 – 531-3017, 828 Fort Street Mall, Suite 600 Honolulu, Hawaii 96813

**Status (select one)** DEA-AFNSI**Submittal Requirements**

Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEA, and 4) a searchable PDF of the DEA; a 30-day comment period follows from the date of publication in the Notice.

 FEA-FONSI

Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; no comment period follows from publication in the Notice.

 FEA-EISPN

Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; a 30-day comment period follows from the date of publication in the Notice.

 Act 172-12 EISPN  
("Direct to EIS")

Submit 1) the proposing agency notice of determination letter on agency letterhead and 2) this completed OEQC publication form as a Word file; no EA is required and a 30-day comment period follows from the date of publication in the Notice.

 DEIS

Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEIS, 4) a searchable PDF of the DEIS, and 5) a searchable PDF of the distribution list; a 45-day comment period follows from the date of publication in the Notice.

 FEIS

Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEIS, 4) a searchable PDF of the FEIS, and 5) a searchable PDF of the distribution list; no comment period follows from publication in the Notice.

 FEIS Acceptance  
Determination

The accepting authority simultaneously transmits to both the OEQC and the proposing agency a letter of its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS; no comment period ensues upon publication in the Notice.

FEIS Statutory  
Acceptance

Timely statutory acceptance of the FEIS under Section 343-5(c), HRS, is not applicable to agency actions.

 Supplemental EIS  
Determination

The accepting authority simultaneously transmits its notice to both the proposing agency and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and

determines that a supplemental EIS is or is not required; no EA is required and no comment period ensues upon publication in the Notice.

- Withdrawal Identify the specific document(s) to withdraw and explain in the project summary section.
- Other Contact the OEQC if your action is not one of the above items.

**Project Summary**

Provide a description of the proposed action and purpose and need in 200 words or less.

The City and County of Honolulu Department of Design and Construction is proposing this improvement project to Kawa Stream and Ditch. The project is located in Kāneʻohe on the Island of Oʻahu. The stream flows through an urbanized watershed and is comprised of natural and man-made stream features; including stream bank and streambed hard linings, concrete drop structures and drain outlet structures. Land development within the watershed has dramatically altered the natural hydrologic and hydraulic features of the original stream. The proposed project involves stabilizing areas where embankments have steepened and erosive forces have damaged existing structures within the stream. Proposed project improvements fall into three categories: 1) bank protection in areas where the bank is failing and a structural solution is required, 2) stream stabilization in areas where erosive forces can be controlled by non-structural or bioengineering practices and 3) grade control in areas where there is an existing drop structure that has failed. The magnitude of the improvements necessary to complete the stream rehabilitation is significant. In order to wisely use available funds multiple phases are proposed to stabilize specific areas within the site to provide an implementable and manageable approach to addressing the stream's problems.

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# KAWA STREAM AND DITCH IMPROVEMENTS PROJECT

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KĀNE‘OHE, O‘AHU

FINAL ENVIRONMENTAL  
ASSESSMENT

JANUARY 2016



*Prepared for:*

**Department of Design and Construction (DDC)  
City and County of Honolulu**

*Prepared by:*

**Oceanit Laboratories Inc.**

***oceanit***

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**FINAL ENVIRONMENTAL ASSESSMENT**

**KAWA STREAM AND DITCH IMPROVEMENTS PROJECT**  
**Kāneʻohe, Island of Oʻahu, Hawaiʻi**

Submitted Pursuant to the  
Hawaiʻi Environmental Policy Act,  
Chapter 343 Hawaiʻi Revised Statutes, and  
Title 11, Chapter 200, Hawaiʻi Department of Health Administration Rules

by the

City and County of Honolulu, Department of Design and Construction (DDC),  
State of Hawaiʻi

The following person may be contacted for additional information concerning this document:

Scott Nakamatsu, P.E.  
Civil Division  
Department of Design and Construction  
City and County of Honolulu  
650 South King Street, 15<sup>th</sup> floor  
Honolulu, Hawaiʻi 96813

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## ACRONYMS AND ABBREVIATIONS

AIS	Archaeological Inventory Survey
AFONSI	Anticipated Finding of No Significant Impact
BMP	Best Management Practice(s)
BWS	Board of Water Supply
CDP	Census-designated place
CEQ	Council on Environmental Quality
CIA	Cultural Impact Assessment
CWA	Clean Water Act
CZM	Coastal Zone Management
BMP	Best Management Practice
DDC	Department of Design and Construction
DLNR	Department of Land and Natural Resources
EA	Environmental Assessment
EFH	Essential Fish Habitat
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ft	foot/feet
FWS	Fish and Wildlife Service
GCS	Grade Control Structure
GRP	Grouted Rubble Pave
HEPA	Hawai‘i Environmental Protection Agency
HDOH	Hawai‘i Department of Health
HRS	Hawai‘i Revised Statutes
MBTA	Migratory Bird Treaty Act
MSL	Mean Sea Level
OEQC	Office of Environmental Quality Council
OHA	Office of Hawai‘ian Affairs
NPDES	National Pollution Discharge Elimination System
NRHP	National Register of Historic Places
PIRO	Pacific Island Resources Office
PM2.5	Suspended particulate matter $\leq$ microns aerodynamic diameter
PM10	Suspended particulate matter $\leq$ 10 microns aerodynamic diameter
PVT	PVT Integrated Solid Waste Management Facility
SHPD	State Historic Preservation Division
TMDL	Total Maximum Daily Loads
TRM	Turf Reinforced Matting
$\mu\text{g}/\text{m}^3$	Micrograms per cubic meter
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOG	Volcanic Gaseous Emissions
WQC	Water Quality Certification

## GENERAL INFORMATION SUMMARY

Applicant:	ParEn Inc., dba Park Engineering 711 Kapi'olani Blvd., Suite 1500 Honolulu, Hawai'i 96813
Owner:	City and County of Honolulu Department of Design and Construction 650 South King Street Honolulu, Hawai'i 96813
Consultant/Preparer:	Oceanit Laboratories Inc. 828 Fort Street Mall Suite 600 Honolulu, Hawai'i 96813
Approving Agency:	City and County of Honolulu Department of Design and Construction 650 South King Street Honolulu, Hawai'i 96813
Project Description:	<p>Kawa Stream and one of its tributaries (herein referred to as Kawa Ditch) is located in Kāne'ōhe on the Island of O'ahu. The stream flows through an urbanized watershed and is comprised of natural and man-made stream features; including stream bank and streambed hard linings, concrete drop structures and drain outlet structures. Land development within the watershed has dramatically altered the natural hydrologic and hydraulic features of the original stream. The proposed project involves improving and stabilizing areas where embankments have steepened and erosive forces have damaged existing structures within the stream. Proposed project improvements generally fall into three categories: 1) bank protection in areas where the bank is failing and a structural solution is required, 2) stream stabilization in areas where erosive forces can be controlled by non-structural or bioengineering practices and 3) grade control in areas where there is an existing drop structure that has failed. The magnitude of the improvements necessary to complete the stream rehabilitation is significant. In order to wisely use available funds a priority/phasing scheme to improve or stabilize specific areas within the project site would provide an implementable and manageable approach to addressing this enormous task. All of these phases would be included in this document.</p>
Anticipated Final Determination:	Finding of No Significant Impact (FONSI)

Agencies Consulted:

**Federal**

U.S. Army Corps of Engineers  
U.S. Coast Guard  
U.S.D.A. – Natural Resources Conservation Service  
U.S. EPA-Pacific Islands Office  
U.S. Fish & Wildlife  
U.S. Geological Service  
National Oceanic and Atmospheric Administration

**State of Hawai‘i**

Department of Accounting and General Services  
Department of Agriculture  
Department of Business, Economic Development,  
Tourism and Management - Office of Planning  
Department of Education  
Department of Hawaiian Home Lands  
Department of Health, Environmental Planning Office  
Department of Land and Natural Resources  
    Commission on Water Resource Management  
    Division of Aquatic Resources  
    Division of Boating and Oceanic Recreation  
    Division of Forestry and Wildlife  
    Land Division  
    Office of Conservation and Coastal Lands  
    State Historic Preservation Division  
Department of Transportation, Highways Division  
Office of Hawaiian Affairs

**City and County of Honolulu**

Board of Water Supply  
Department of Community Services  
Department of Design and Construction  
Department of Environmental Services  
Department of Facility Maintenance  
Department of Parks and Recreation  
Department of Planning and Permitting  
Department of Transportation Services  
Honolulu Fire Department  
Honolulu Police Department

**Other Individuals**

Ikaika Anderson, Councilmember  
Ken Ito, Representative

Tax Map Key: (1) 4-5-066:063; 4-5-067:065, 4-5-070:049, 4-5-084:059  
State Land Use: Urban  
County General Plan: State Conservation District  
County Zoning: R-7.5 Residential

## **1 INTRODUCTION**

The City and County of Honolulu, Department of Design and Construction (DDC) is proposing a stream rehabilitation/erosion protection plan for Kawa Stream and its tributary known as Kawa Ditch located in Kāneʻohe on the Island of Oʻahu, Hawaiʻi (**Figure 1-1**). The proposed project involves improving and stabilizing areas where embankments have steepened and where erosive forces have damaged previously installed erosion control structures. The plan would be comprised of three types of practices: 1) bank protection in areas where the bank is failing and a structural solution is required, 2) stream stabilization in areas where erosive forces can be controlled by non-structural or bioengineering practices and 3) grade control in areas where there is an existing drop structure that has failed. The magnitude of improvements necessary to complete the stream rehabilitation is significant.

Kawa Stream and Kawa Ditch flow through an urbanized watershed and are comprised of a mix of natural and man-made stream features. Land development within the watershed has dramatically altered the natural hydrologic and hydraulic features of the original stream. The result is a stream bank which self-adjusted to the urbanization with stream bank widening and streambed down cutting.

This document is being prepared to evaluate and document the possible environmental, social and economic consequences associated with the Proposed Action.

The Proposed Action is consistent with the following plans: Hawaiʻi 2050 Sustainability Plan (2008); Koʻolaupoko Watershed Restoration Action Strategy (2007) ; Koʻolaupoko Sustainable Communities Plan (2000); HDOT Highways Oʻahu Storm Water Management Program Plan (2007); and Kāneʻohe Bay Master Plan (1992).

Photos showing the existing stream conditions are shown in **Figure 1-3** through **Figure 1-8**. The tax map key numbers for this proposed project are 4-5-066, -067, -070, and -084. Refer to **Figure 1-2**.

Special environmental studies conducted for this EA include: 1) Archaeological Inventory Survey; 2) Cultural Impact Assessment; 3) Biological Surveys (Flora/Fauna). A summary of these studies are provided in this EA and a copy of the detailed reports are included in the Appendices.

Government agencies, nearby landowners, and community organizations would be invited to attend a Public Informational Meeting held by the applicant to review the alternatives considered for this proposed project. The feedback received at this meeting including questions, concerns and responses would be documented in the Final Environmental Assessment.

## **1.1 Purpose of this Document**

The purpose of the proposed project is to improve and stabilize areas where embankments have steepened and erosive forces have damaged Kawa Stream's existing erosion control features.

The use of State of Hawai'i funds and land require that an Environmental Assessment (EA) be conducted in accordance with Chapter 343 of the Hawai'i Revised Statutes (HRS). This law along with its implementing regulations, Title 11, Chapter 200, Hawai'i Administrative Rules (HAR), is the basis for the environmental impact process in the State of Hawai'i. According to Chapter 343, an EA is prepared to determine impacts associated with an action, to develop mitigation measures for adverse impacts, and to determine whether any of the impacts are significant according to 13 specific criteria. If after considering comments made regarding the Draft EA, the proposing agency confirms that no significant impacts are expected, then the agency would issue a Finding of No Significant Impact (FONSI), and the action would be permitted to occur. However, if the agency concludes that significant impacts are expected to occur, then an Environmental Impact Statement (EIS) would be prepared.

This Final EA discloses the foreseeable environmental impacts that could result from the proposed project's implementation and recommends employment of specific measures to avoid, minimize, or mitigate impacts to the environment. Additionally, this Final EA contains a record of the consultation activities that have been conducted to date as part of project planning.

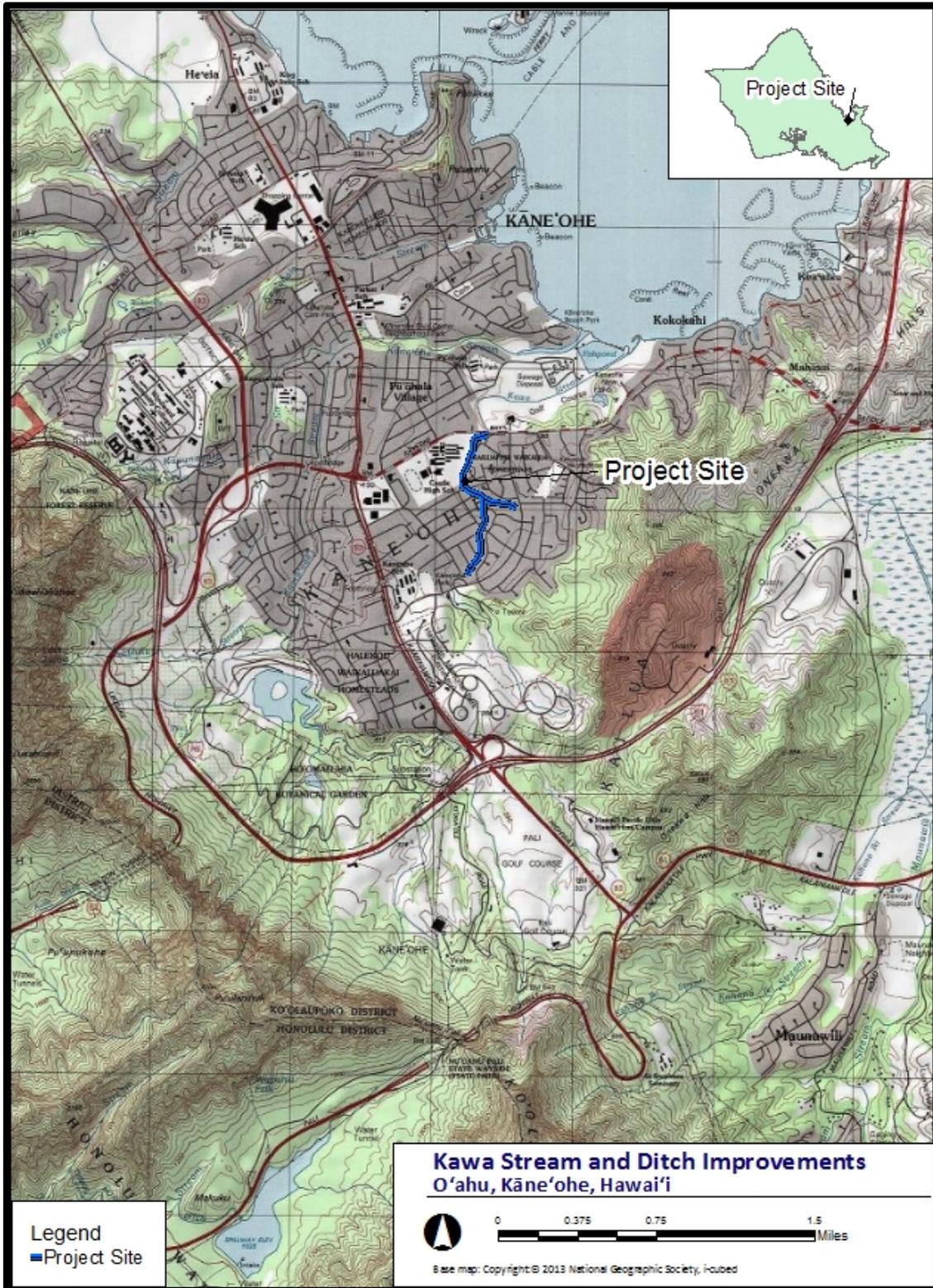


Figure 1-1. Location of Kawa Stream and Ditch Improvements Project





**Figure 1-3. Stream reach where GRP lining is proposed for both banks.**



**Figure 1-4. Concrete stream bank lining to be repaired.**



**Figure 1-5. Steep and unstable stream bank where gabions are proposed.**



**Figure 1-6. Area where A-Jacks, Vetiver grass, TRM are proposed.**



**Figure 1-7. Undermined areas at drop structure toe. Cut-off wall at toe is proposed.**



**Figure 1-8. Undermined areas at drop structure toe. Cut-off wall at toe is proposed.**

## **1.2 Historical Erosion and Degradation**

Urbanization of the watershed has dramatically altered the stream's natural hydrologic and hydraulic features. Concrete drop structures constructed within the stream have reduced stream slopes and concrete channel linings have stabilized the stream banks. However, these changes resulted in higher stream flow velocities which altered the stream's cross section by increasing the occurrence of erosional downcutting and scouring of the stream banks. Erosive forces within the stream continue to remove material supporting the concrete structures and these erosion protection structures are becoming more and more vulnerable to failure.

Development of the surrounding residential subdivisions increased erosion and degradation of natural and manmade stream features. Additionally, the residential subdivisions and schools have increased the amount of stormwater discharge into Kawa Stream. The stream's geometry has been altered by the following factors: channelization; straightening of the stream reach; reduction of the floodplain area; and a decrease in the sediment load in the stream. Kawa Stream was also altered by the addition of concrete drop structures constructed within the stream which reduced the stream slopes. Concrete channel linings were also installed to reinforce and armor earthen stream banks.

The straightening and partial hardening of Kawa Stream during development of the urbanized community was a standard practice for flood threat reduction in the mid 20<sup>th</sup> Century. The corresponding increase of impervious surfaces and efficient storm drain systems used throughout the watershed led to heightened peak storm flows in the stream. These flows traveled at greater speeds through the straightened and hardened channel sections. As predicted, the heightened energy in these flows, combined with a loss of erosion material from the stabilized watershed, led to down-cutting of the stream bed and undermining of the constructed stabilizing structures.

## **2 PROJECT DESCRIPTION**

### **2.1 Project Location and Description**

Kawa Stream is located on the windward side of the Island of O‘ahu, in the Ko‘olaupoko District. A low ridge of hills separate the proposed project area from the Ko‘olau Mountain Range, called Mahinui, surrounds the drainage basin and forms the eastern ridge of O‘ahu. Kawa Stream’s headwaters originate from three perennial branches, each of which is fed year-round by small groundwater seeps, and springs found at elevations from 100 to 150 feet.

The proposed Kawa Stream project area begins at the Kāne‘ohe Bay Drive crossing at the north end and extends upstream for approximately 4,000 linear feet to the end of a concrete lined ditch near the end of Koa Kahiko. The downstream section of Kawa Stream runs entirely along the eastern perimeter of the Castle High School campus. The upstream section of Kawa Stream runs through the surrounding Pikoiloa residential neighborhood, and includes a culvert crossing at the Namoku Street Bridge.

Kawa Ditch, a tributary of Kawa Stream, begins at the point of confluence near the end of Kanela Street. It extends approximately 1,000 linear feet upstream to the culvert crossing at Mokulele Drive. Similar to Kawa Stream, Kawa Ditch is entirely located within the Pikoiloa residential neighborhood. Refer to **Figure 2-1**.

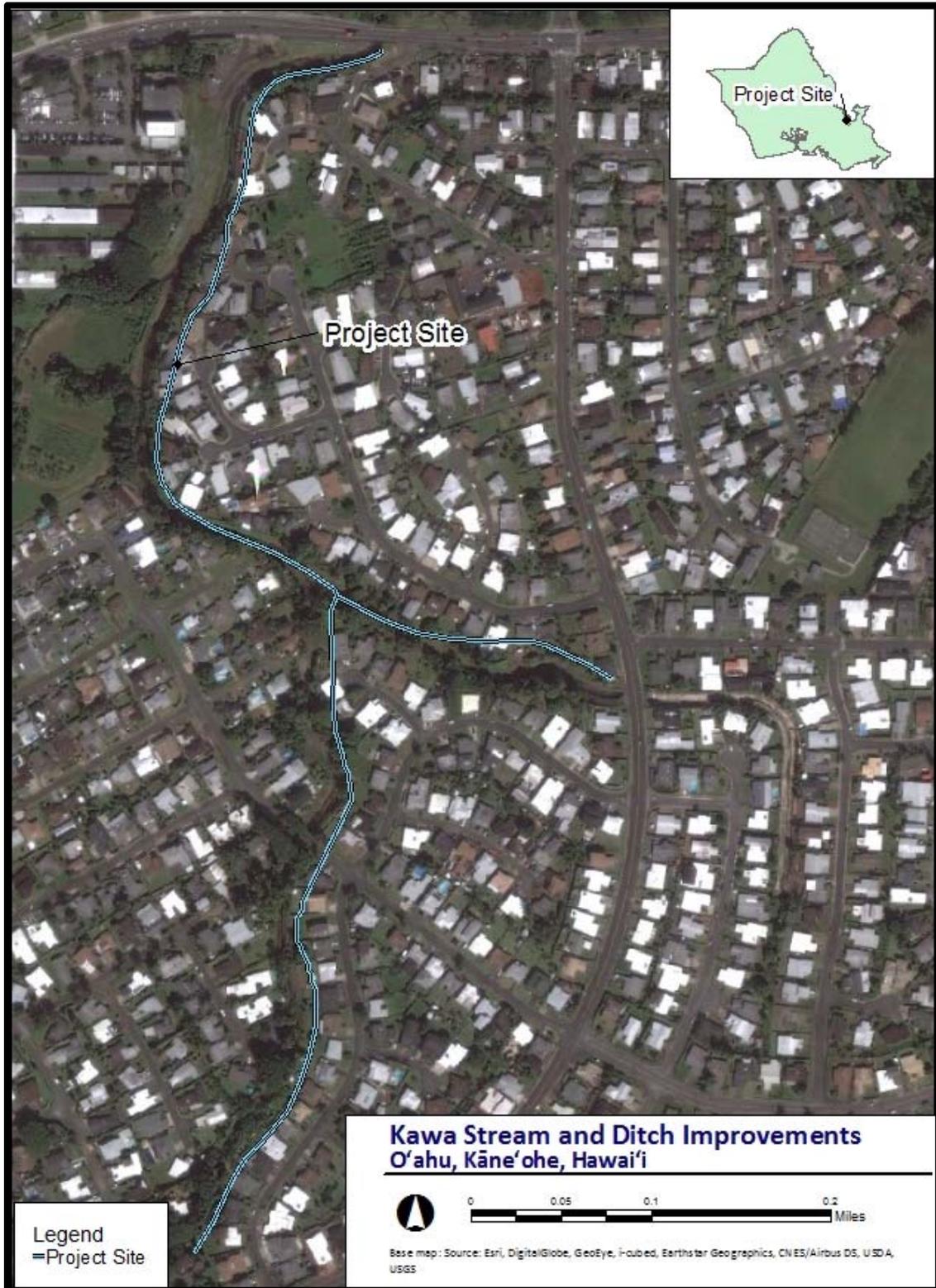


Figure 2-1. Aerial photo of Kāwā Stream and Ditch Improvement Project, O'ahu

## **2.2 Existing Land Use Classifications**

The proposed project site is located entirely within the Urban (U) State Land Use District. According to the Revised Ordinances of Honolulu the zoning of the proposed project and immediately surrounding areas are zoned R-7.5 Residential District by the City and County of Honolulu. According to the Land Use Ordinance (Chapter 21, ROH), the city's zoning code, the purpose of a residential district is to allow for a range of residential densities, primarily detached residences. The proposed Kawa Stream and Ditch Improvements Project is an action that is allowed under the existing zoning and is compatible with designated residential uses. The improvements would protect the existing residences that are located along the stream bank from threat of ongoing erosion. Refer to **Figure 2-2**.

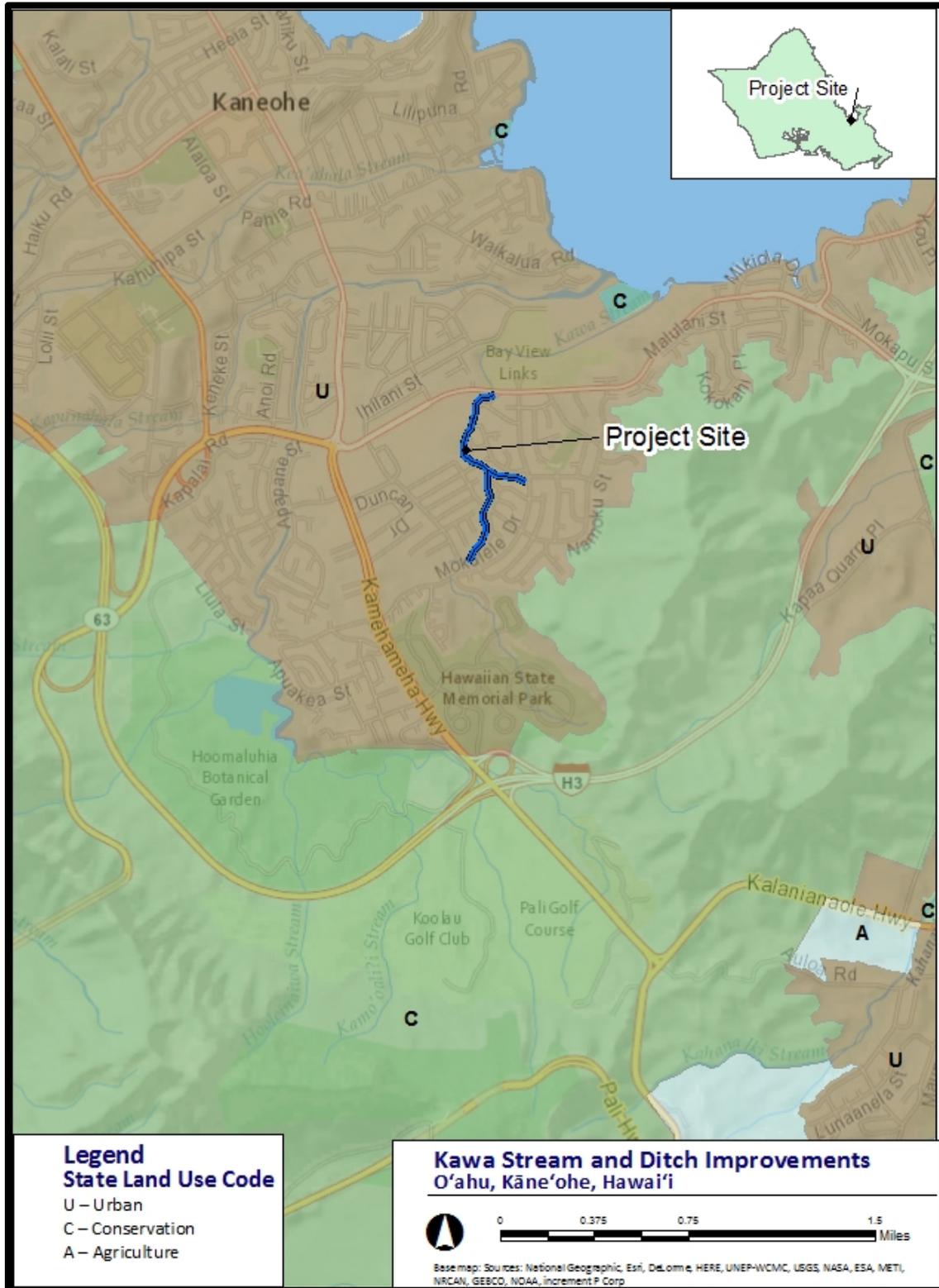


Figure 2-2. State Land Use Map

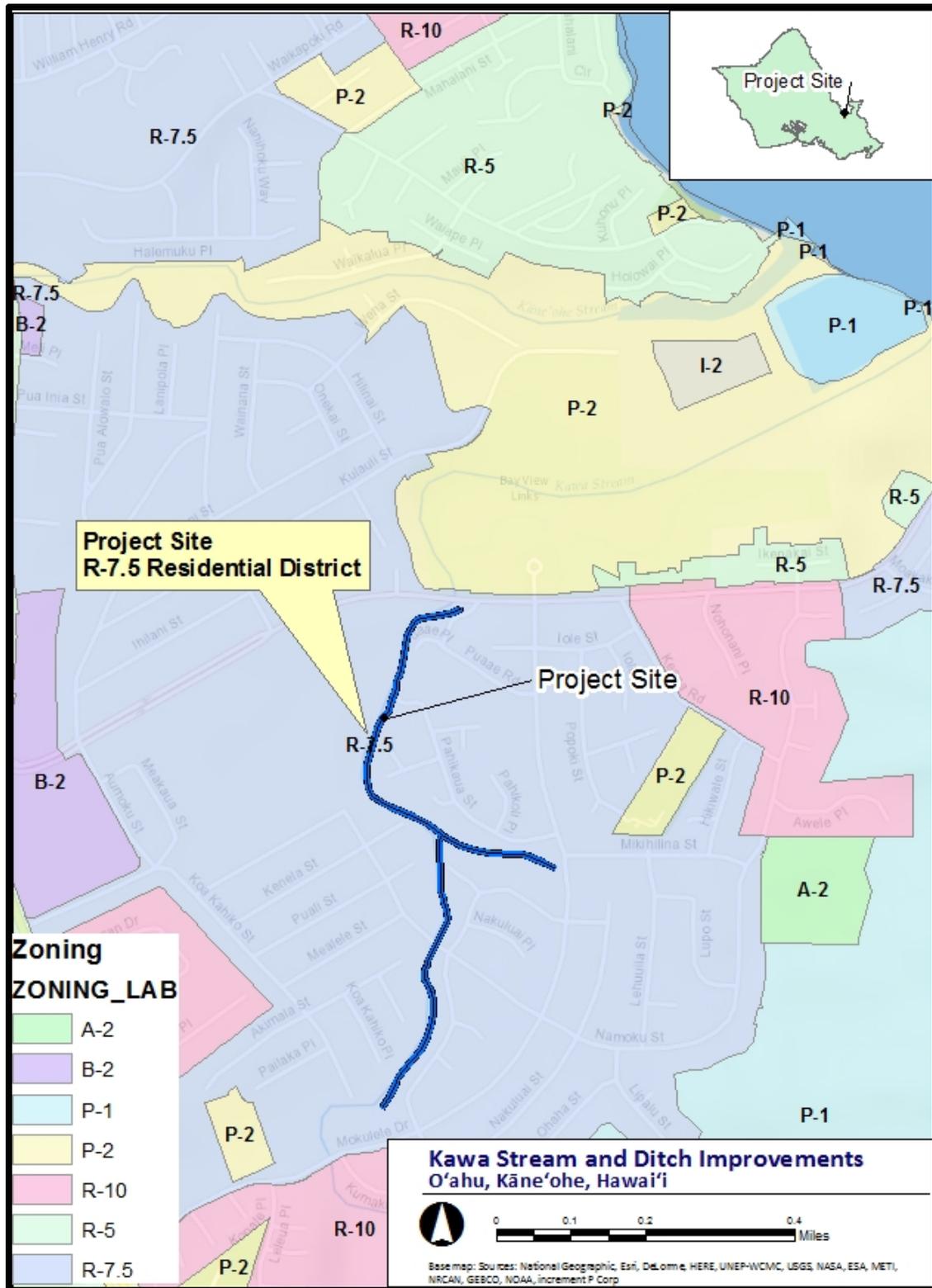


Figure 2-3. Zoning Map – Residential District

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### **3 ALTERNATIVES CONSIDERED**

#### **3.1 No Action Alternative**

Urbanization of the watershed has altered the stream's natural hydrologic and hydraulic features. Concrete drop structures constructed within the stream have reduced stream slopes and concrete channel linings have stabilized the stream banks. However, these changes resulted in higher stream flow velocities which altered the stream's cross sections by increasing the occurrence of erosional downcutting and scouring of the stream banks. Erosive forces within the stream continue to remove material supporting the concrete structures making these erosion protection structures more and more vulnerable to failure.

The No Action Alternative would mean that nothing is done to mitigate erosion of Kawa Stream and Ditch. Erosion would continue to occur, meaning damage to the stream's natural and manmade elements would escalate, eventually leading to failure of these erosion protection structures. Given the project's close proximity to residential lots and schools this alternative is not considered feasible.

#### **3.2 Alternative A: Selective Structural and Non-Structural Erosion Control**

This is the Proposed Action and consists of utilizing a combination of several erosion control features of various designs. The features recommended for implementation are described in the following sections and involve improving and stabilizing areas where embankments have steepened and erosive forces have damaged the stream's manmade erosion control structures. Proposed project improvements generally fall into three categories: 1) bank protection in areas where the bank is failing and a structural solution is required; 2) stream stabilization in areas where erosive forces can be controlled by non-structural or bioengineering practices; and 3) grade control in areas where there is an existing drop structure that has failed.

##### **3.2.1 Concrete Stream Bank Lining**

Erosive forces have altered the stream's cross section, lowered the streambed elevation and widened the stream banks causing scouring and removal of material supporting the existing lining, and undermining. The new concrete lining would provide a hard surface that has strong retaining capabilities that would channelize flows in the stream. The lining would have a smooth finish with a relatively low roughness coefficient. The downside of the proposed concrete lining include increased velocities, decreased sediment load, unaesthetic visual appeal and reduced natural habitat for wildlife. However, the strength of a concrete lined channel provides a greater degree of protection for nearby homes and schools along the upper stream banks. **Figure 1-4** shows an area where the existing concrete stream bank lining is damaged. **Figure 3-1** shows a section of the proposed repaired concrete stream bank lining.

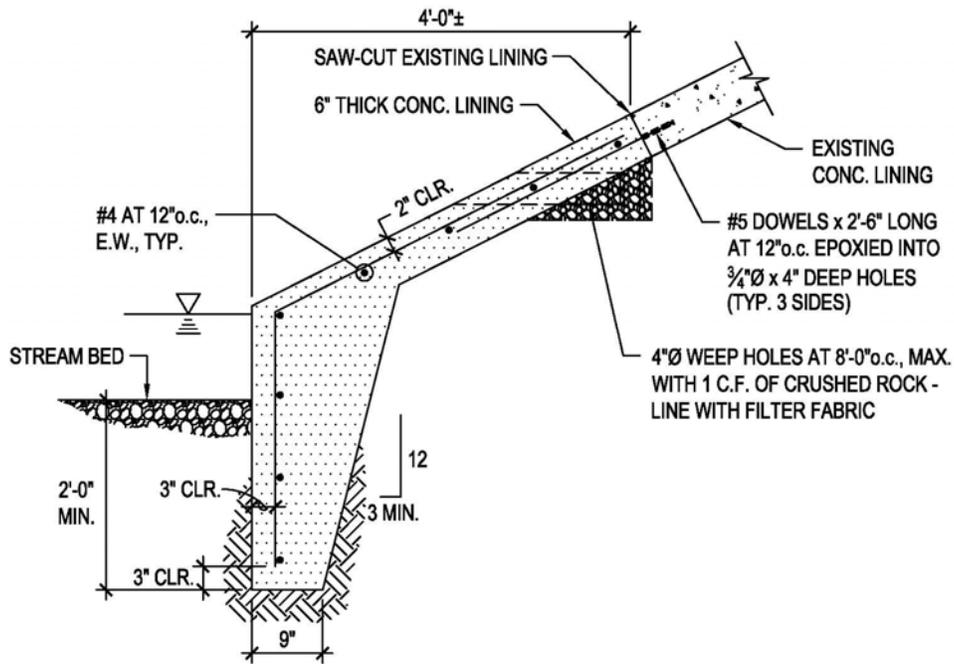


Figure 3-1. Schematic of concrete stream bank lining

### 3.2.2 Grouted Rubble Paving (GRP) Stream Bank Lining

GRP stream bank lining can be used to protect stream banks from erosion. GRP is constructed by preparing the subgrade, laying grout and placing stones to create a well-packed surface to protect the bank. GRP strengthens the stream bank by protecting natural soils from being eroded or undermined, resulting in a more rigid surface to hold the bank in place. In addition, GRP lining allows for the use of locally available rock that may not be able to withstand higher velocity flows unless it is grouted. Disadvantages associated with this alternative include; a less natural look and a possible reduction in the natural habitat area for fauna and flora.

Figure 1-3 shows an area where stream banks are deteriorating. Figure 3-2 is a schematic of GRP stream bank linings proposed for stabilizing these deteriorated slopes.

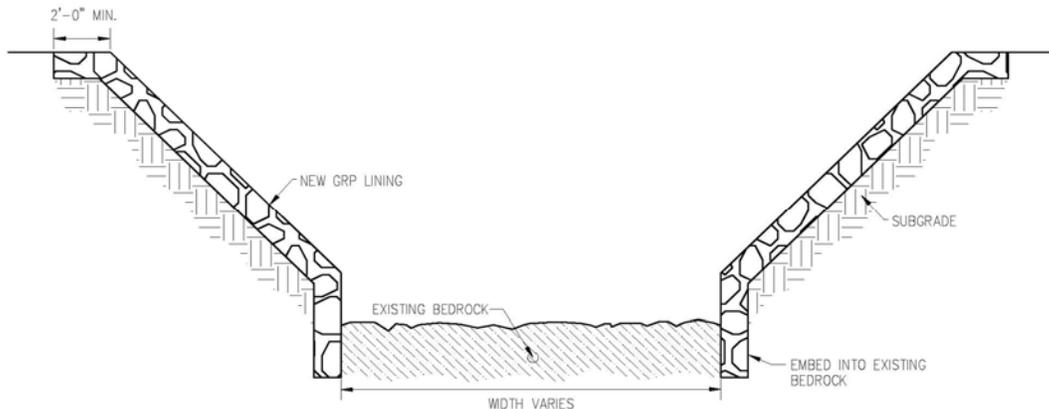


Figure 3-2. Schematic of GRP stream bank lining

### 3.2.3 Concrete Armor Units (A-Jacks)

A system of interlocking concrete armor units known as A-Jacks can be used to protect the toe of stream banks. A-Jacks are manufactured, high strength armor units designed to dissipate energy and protect areas from scouring damage. The unique structure and installed orientation of A-Jacks units can provide a design roughness coefficient (n) of 0.1 that has been proven to be effective along stream banks. The units are uniformly designed and manufactured, placed in an interlocking manner and held together with additional steel cables. A-Jacks are often used with bioengineering systems. Disadvantages of this alternative include: their availability, cost, slope stability, and stream conditions when sizing, and choosing the best type of concrete armor unit. Monitoring of the installed system would reveal site-specific long-term maintenance requirements. Studies show that the main failures of the A-Jacks system normally occur with the loss of contact between the units and the subgrade. Refer to **Figure 3-3**.

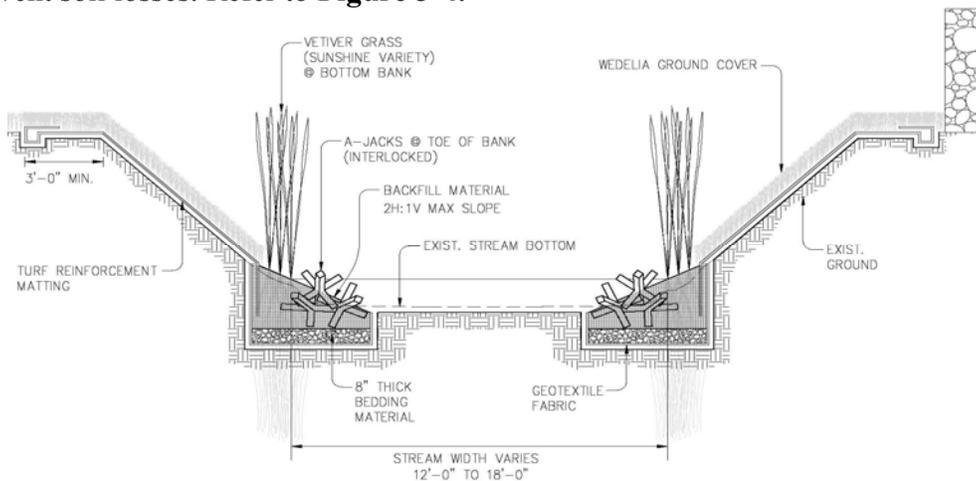


**Figure 3-3. A-Jacks in Waimānalo**

### 3.2.4 Sunshine Vetiver Grassing

“Sunshine” Vetiver grass or *Chrysopgon zizanioides* is a low cost bioengineered soil stabilization alternative to hard structures. This grass creates a natural barrier to protect steep slopes from failure and promotes erosion control. The dense and rigid stalks of the Vetiver grass impedes the transport of sediment and stormwater runoff when planted in close continuous rows along contours. The rows of grass act as a living “filter strip” capable of resisting high flow velocities, subsequently depositing sediment behind the

barrier. The grass also has a compact and complex root system that penetrates deep into the soil (up to 12 feet) which increases the average shear strength of the earthen slope. This specific type of Vetiver grass is infertile so it would not spread by seed to other areas. It provides a “soft” alternative to rigid and hard-engineered structures while maintaining a good aesthetic appeal. Vetiver grass is not appropriate for all locations. Strong sunlight is required for healthy and effective erosion control grass. Approximately 1-year, with care and watering, is required for the grass to become established and effective. To be effective the grass strip should be dense and continuous to prevent soil losses. Refer to **Figure 3-4**.



**Figure 3-4. A-Jacks and Vetiver Grass**

### 3.2.5 Turf Reinforced Matting (TRM)

TRM is a bioengineered, “soft” method that integrates woven geosynthetic mats with natural vegetation and can be used to reduce the erosion potential of exposed slopes and drainage channels. TRM protects the root system of the imbedded vegetation and prevents surrounding soil from eroding. The vegetation protected by the TRM reduces flow velocities, while removing particle pollutants from stormwater runoff. The TRM should be designed to resist ultraviolet light, be unreactive to chemicals in the surrounding soil, and strong enough to increase soil shear strength. Disadvantages of this method include: TRM is not designed to prevent deep slope failure, nor mitigate strong and constant flow conditions. TRM is a permanent solution to stabilize banks, unlike other temporary erosion control methods. TRMs provide a medium-strength erosion control alternative with great aesthetic value at a price less than most “hard” engineered methods. Refer to **Figure 3-5**.



Figure 3-5. Stream bank stabilized with TRM (Kolea Reservoir, Maui)

### 3.2.6 Rock Riffle

A rock riffle is a reach of over which the water velocity is slowed and made more turbulent by the addition of coarse grained material. Under these conditions, flow is often turbulent and effective at dispersing energy within that section of the stream. An engineered rock riffle is designed to be a permanent grade control structure to stabilize the natural channel. Rock riffles typically require more long-term maintenance than rigid structures. While not particularly aesthetic in all environments, riffles are naturally occurring and more acceptable when compared to concrete structures. Factors to consider when designing a rock riffle are maximum flow velocity, rock exposure to direct flow, and extent of turbulence within the stream flow. The engineered rock riffle should be stable and resist migration downstream during high and low flow conditions. Failure can occur when rocks migrate and the stream erodes upstream, when the stream flanks and erodes the bank walls or when the toe of the riffle degrades and creates a scour pool. When combined with a bank stabilizing/protecting method, an engineered rock riffle can provide a good alternative to the existing rigid concrete structures within Kawa Stream. Refer to **Figure 3-6**.



Figure 3-6. Example of an engineered rock riffle (ABC Rural, 2015).

### 3.2.7 Grouted Sloping Boulder Drop

This type of structure is designed to dissipate energy within a channel while protecting the streambed from degradation. It has been successfully installed in high-energy streams, providing compatible design aesthetics to natural riparian environments. These structures are generally more durable than grouted riprap due to the continuity of grout reaching down to the subgrade versus a thin cap of grout covering the loose riprap. Typically, the drop structure is designed with a basin at the toe to dissipate energy from the turbulent flow. The cutoff walls installed at the upstream and downstream ends of the structure reduces erosion downstream and protects the structure from being undermined. Although initial construction costs of the structure are higher than dumped riprap, the maintenance costs of the grouted sloping boulder drop are lower. In addition, the construction of this type of drop is more flexible than straight concrete drop structures. Considerations for its design include existing hydraulic conditions, transition area protection, subgrade preparation, boulder sizing/spacing, grout contact area, and scour protection. The grouted structure is recommended over the rock riffle alternative, because it is less vulnerable to damage during major flood events. Refer to **Figure 3-7**.



**Figure 3-7. Example of a grouted sloping boulder drop (Kolea Reservoir).**

### **3.2.8 Concrete Drop Structure**

Concrete drop structures (**Figure 3-8**) are rigid grade control measures designed to stabilize steep streambeds and to reduce stream flow velocities. Generally, these structures extend the entire width of the channel and dissipate energy of the stream flow within a non-erodible area. This allows the channel slope away from the structure to become milder and reduces erosion potential.

Concrete drop structures are effective in handling large drops in grade, high flow velocities, tight construction space conditions, and deep head cutting erosion. Disadvantages of this method include: high cost, creation of barriers to wildlife, cause sedimentation upstream and erosion downstream. These concrete structures also hold little aesthetic value. The concrete drop structure should be accompanied with a stream bank protection method to prevent the drop structure from being flanked. Failure can occur when the structure is undermined, thus a basin and cutoff walls should be incorporated into the design.

Vertical hard basin drop structures are not recommended for this area due to the safety and maintenance issues associated with this method. However, the sloped concrete drop structure's abilities to handle large drops in grade and high flow velocities make it an effective option to stabilize parts of Kawa Stream.



**Figure 3-8. Sloped concrete drop structure**

### **3.3 Alternative B: All Hard Structure**

The concrete drop structure and concrete lined channel are the primary features of this alternative design. This alternative involves lining the entire project area, including channel and banks, with reinforced concrete. The new concrete lining would provide a hard surface that has strong retaining capabilities that would channelize flows in the stream. The lining would have a smooth finish with a relatively low roughness coefficient. Although applicable in some reaches, this alternative as a complete solution was rejected because it would substantially disturb and change the stream channel and banks. It would also accelerate flow through the project area and increase erosion in the stream reach downstream of the project area. Furthermore, it would be more expensive and take longer to construct.

### **3.4 Alternative C: All Non-Structural**

This alternative involves lining the entire channel with Vetiver grass and other vegetation. The primary features of this alternative are “Sunshine” Vetiver grassing, turf reinforced matting and mechanically stabilized earth vegetated wall systems (MSE). This vegetation creates a natural barrier to protect steep slopes from failure and promotes erosion control. The condensed and rigid stalks of the Vetiver grass impede the transport of sediment and stormwater runoff when planted in close contiguous rows along contours. Again, Vetiver Grass is applicable in some reaches of the stream but it would

not adequately address all of the erosion problems associated with Kāwā Stream. Therefore this alternative was rejected as a complete solution to the erosion problems.

#### **3.4.1 Mechanically Stabilized Earth Vegetated Wall System (MSE)**

MSE vegetated wall systems are erosion control features that use compost and structural filled textile tubes in a stacked and anchored fashion to create a sloping structure capable of anchoring soil behind it and absorbing runoff. The tubes can be designed with additional textile grids that are buried and compacted in the backfill material to anchor the product in place. The tubes are installed along the stream banks, parallel to flow. These products are effective solutions for steep contours and stream banks but are not applicable in water environments or high flow applications with large amounts of debris. Installations to date have been found to be relatively short lived as the lifetime is dependent upon the structural integrity of each textile tube.

#### **3.5 Cost of Alternatives**

The cost of each alternative was estimated based on the approximate dimensions of the conceptual designs and the size of erosion control treatment. Refer to **Table 3-1, Table 3-2 and Table 3-4.**

**Table 3-1. Selected Structural and Non-structural Cost Estimate**

Alternative A Selected Structural and Non-Structural Erosion Controls		
Item	Subtotal (\$)	Total (\$)
Mobilization & Demobilization	\$1,679,000	\$30,350,000
Permit Compliance/BMPs	\$2,900,600	
Drainage Bypass Measures	\$985,100	
Concrete Repairs (1)	\$630,350	
Site Preparation & Restoration	\$1,538,450	
Traffic Control	\$191,900	
Demolition & Removal	\$547,400	
Stream Channel Excavation	\$1,214,400	
Settlement Monitoring for Dwellings	\$502,000	
Construct Concrete Channel Linings	\$632,500	
Construct Concrete Grade Control Structures	\$655,500	
Construct Concrete Retaining Walls	\$1,887,600	
Construct CRM Linings	\$59,800	
Construct Gabion Retaining Walls	\$6,727,500	
Install Dumped Riprap Channel Bottom	\$1,665,200	
Install Dumped Riprap Basins	\$736,000	
Backfill behind Retaining Walls	\$2,530,800	
Install Turf Reinforcement Matting	\$319,000	
Vegetation, Landscaping, Temp Irrigation	\$227,500	
Construct GRP Apron and Linings	\$1,907,400	
Install A-Jack Streambank Toe Protection	\$319,600	
Site Grading	\$2,325,000	
Install Maintenance Access Roads	\$167,400	

**Table 3-2. Hard Structure Cost Estimate**

Alternative B Hard Structures		
Item	Subtotal (\$)	Total (\$)
Mobilization & Demobilization	\$1,300,000	\$38,162,900
Permit Compliance/BMPs	\$2,990,000	
Drainage Bypass Measures	\$1,015,450	
Concrete Repairs (1)	\$650,000	
Site Preparation & Restoration	\$1,585,850	
Traffic Control	\$180,000	
Demolition & Removal	\$601,800	
Stream Channel Excavation	\$1,276,500	
Settlement Monitoring for Dwellings	\$605,000	
Construct Concrete Channel Linings	\$3,634,000	
Construct Concrete Grade Control Structures	\$655,500	
Construct Concrete Retaining Wall	\$1,887,600	
Install Concrete on Exposed Slopes	\$16,525,500	
Backfill behind Retaining Walls	\$2,530,800	
Site Grading	\$2,557,500	
Install Maintenance Access Roads	\$167,400	

**Table 3-3. Non-structural Cost Estimate**

Alternative C Non-Structural Solutions		
Item	Subtotal (\$)	Total (\$)
Mobilization & Demobilization	\$1,124,988	\$19,671,623
Permit Compliance/BMPs	\$2,392,000	
Drainage Bypass Measures	\$1,015,450	
Concrete Repairs (1)	\$650,000	
Site Preparation & Restoration	\$1,843,795	
Demolition & Removal	\$547,400	
Stream Channel Excavation	\$1,335,840	
Settlement Monitoring for Dwellings	\$336,375	
Install BioSock	\$3,312,000	
Backfill on Slopes and Channel	\$3,163,500	
Install Turf Reinforced Matting	\$478,500	
Vegetation, Landscaping, Temp Irrigation	\$398,125	
Site Grading	\$2,906,250	
Install Maintenance Access Roads	\$167,400	

(1) Includes repairs or reconstruction of cut-off walls, side edges, sloped linings, CRM lining and drainage outlets.

### 3.6 Evaluation of Alternatives

Four alternatives were considered for this project: No Action, Selected Structural and Non-Structural Erosion Control, Hard Structures and Non-structural Solutions. The No Action Alternative was not considered feasible because damage to existing stream slopes and structures would jeopardize adjacent properties.

All of the alternatives were evaluated using a weighted factor system. The factors represent the six main areas of importance. Each alternative receives a score comparing the importance of each factor. Each factor would receive an importance score based on the following criteria:

- “1” - factor A is more important than factor B
- “0” -factor A is equally important as factor B
- “-1” -factor A is less important than factor B.

The sum of the importance factors was normalized by adding 6 to the Weighted Score so no factor had a negative or zero weighted score. **Table 3-4** gives the weighted factor for the six main areas of importance.

**Table 3-4. Weight Matrix**

		Factor B						Total	Weight	
		1	2	3	4	5	6			
		Erosion Protection	Total Cost	Constructability	Neighborhood Impact	Environment	Flood Protection			
Factor A	1	Erosion Protection	0	1	1	1	1	1	5	11
	2	Total Cost	-1	0	1	1	0	1	2	8
	3	Constructability	-1	-1	0	1	-1	1	-1	5
	4	Neighborhood Impact	-1	-1	-1	0	-1	-1	-5	1
	5	Environment	-1	0	1	1	0	-1	0	6
	6	Flood Protection	-1	-1	-1	1	1	0	-1	5

The weighted score for each factor was used to evaluate each alternative on a scale of one to three, with three being the most desirable. Multiplying the weighted score with the alternative score provides the final score. The alternative with the highest score would be the most desirable according to all factors considered.

**Table 3-5. Evaluation Matrix**

Factor	Weighted Score	Alternative Score			Final Weighted Score Per Alternative & Factor		
		A	B	C	A	B	C
Erosion Protection	11	3	2	1	33	22	11
Total Cost	8	2	1	3	16	8	24
Constructability	5	2	1	3	10	5	15
Neighborhood Impact	1	2	1	3	2	1	3
Environment	6	3	1	2	18	6	12
Flood Protection	5	2	3	1	10	15	5
<b>Total Score</b>					<b>89</b>	<b>57</b>	<b>70</b>

The results show that Alternative A (Selected Structural and Non-Structural Erosion Controls) is the most desirable, followed by Alternative C (Non-Structural). The third option is Alternative B (Hard Structure). The top two alternatives would both provide durable structures with little maintenance considerations. As a result the life-cycle cost analysis among all the alternatives was not evaluated.

Although effective in reducing erosion in the protected reaches, installing only hard structures (concrete channels and drop structures) would be the most expensive and would cause excessive damage to the natural environment and erosion downstream. Based on these considerations, the Hard Structure option was also rejected. Non-Structural solutions installed exclusively throughout affected portions of the stream would be attractive in terms of natural appearance and cost, but may not stand up to high flow velocities during extreme storm events.

The Proposed Action involves applying appropriate erosion control methods, both hard structure and non-structural to selected reaches of the stream and ditch in the project area. This would minimize damage to the environment and effectively protect the stream and adjacent properties, while making the most of limited funds.

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## **4 PHYSICAL, BIOLOGICAL AND CULTURAL ENVIRONMENT**

### **4.1 Climate, Topography, and Soils**

O‘ahu, like the other Hawaiian Islands, has a mild semi-tropical climate that varies across the terrain. The proposed project site is located within a climate region known as the windward lowlands. Average temperatures range from 77.4 degrees Fahrenheit (°F) (22 degrees Celsius [°C]) in the warmer months to 71.6°F (22°C) in the cooler months. This region lies more or less perpendicular to the prevailing flow of the trade winds, and is moderately rainy with frequent trade wind showers. In the proposed project area, average rainfall varies between 4 inches per month during the summer, to 8 inches per month during the winter. Mean annual rainfall at the site is approximately 58 inches (Giambelluca and others 2013).

The topography of the Kawa Stream project area slopes downward from approximately 110 feet MSL near Mokulele Drive at the south end of the proposed project to 40 feet MSL at Kāne‘ohe Bay Drive at the north end of the project. The topography slopes gradually towards Kāne‘ohe Bay. The average gradient of the stream in the project area is about 85 feet per mile.

The soils underlying the project are Lolekaa, Kāne‘ohe and Hanalei (**Figure 4-1**). The Lolekaa Series is a well-drained forest soil of windward and Honolulu areas of O‘ahu. It has moderate water holding capacity and fast permeability. The Kāne‘ohe Series is a deep red soil found on windward slopes of the Ko‘olau Range on O‘ahu. It has moderate water holding capacity and fast permeability. The Hanalei Series is found on valley floors of east O‘ahu and Kaua‘i. It has high water holding capacity. The soil is saturated with water for parts of the year and has slow to moderate permeability (CTAHR, 2015).

#### **4.1.1 Impacts & Mitigation**

It is anticipated that the Proposed Action would result in negligible to minor adverse impacts on climate, topography, or soils. On the contrary, it is anticipated that the Proposed Action would improve and stabilize Kawa Stream’s embankments. Maintenance would extend the life of the structure and would reduce the stream’s level of siltation, thereby decreasing the amount of runoff and erosion within the Kawa Stream drainage system. No other means of mitigation would be required.

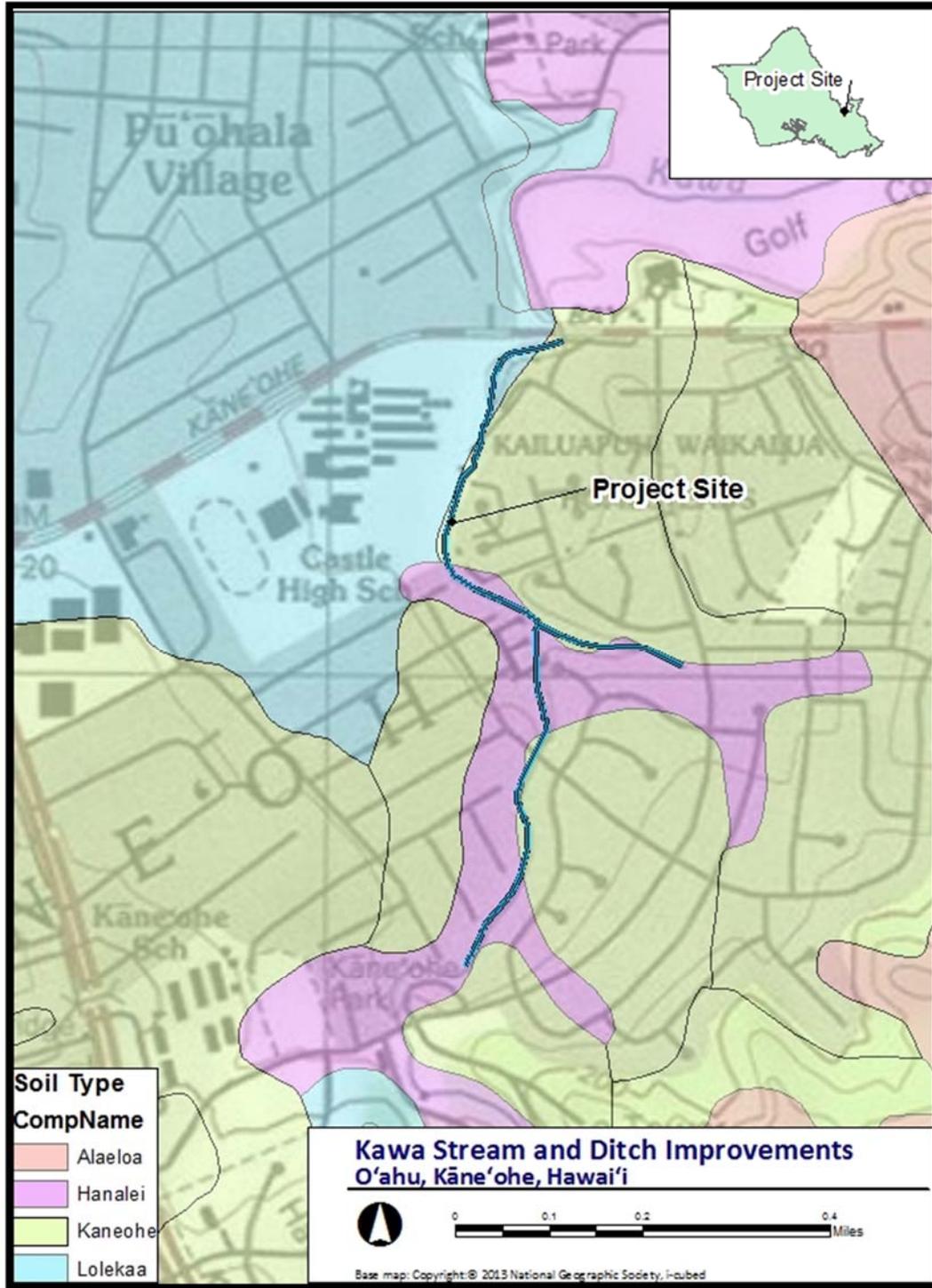


Figure 4-1. Soil Map

## 4.2 Natural Hazards

According to the City and County of Honolulu Multi-hazard Mitigation Plan (C&C 2012), potential natural hazards at the proposed project site could include strong winds, tropical cyclones (including hurricanes), landslides, earthquakes, floods, droughts VOG (volcanic gaseous emissions) and wildfire.

### 4.2.1 Impacts and Mitigation

It is anticipated that the Proposed Action would result in negligible to minor adverse impacts on the severity of most natural hazards. Although not listed as a natural hazard, stream erosion is hazardous to property. The Proposed Action would decrease stream channel erosion, increase the capacity of the stream channel and may slightly decrease the probability of flooding. There would be no mitigation is necessary.

## 4.3 Geology, Geomorphology and Hydrogeology

Kawa Stream is located on the windward coastal area of the Ko‘olau Volcano. The study area is directly underlain by the Honolulu Volcanics and by Older Alluvium (**Figure 4-2**). The Ko‘olau lavas are divided into the Ko‘olau Basalt and the Honolulu Volcanics. Both of these formations play an important role in the Kawa watershed. The Ko‘olau Basalt primarily consists of Pliocene aged shield stage tholeiitic basalt. The Honolulu Volcanics are composed of Quaternary and Pleistocene aged alkalic basalt, basanite, and nephelinite (Lagenheim and Clague, 1987). Quaternary alluvium, called Older Alluvium in Hawai‘i, is found in parts of the study area.

The rocks of the Ko‘olau Basalt can be divided into three groups: lava flows (a‘a and pahoehoe), pyroclastic deposits, and dikes. The lava flows of the Ko‘olau basalt are usually thin bedded with an average thickness of about ten feet (Wentworth and MacDonald, 1953). These beds are composed of a‘a, pahoehoe flows and pyroclastic deposits. A‘a contains a solid central core between two gravely clinker layers. Pahoehoe flows are usually characterized by a smooth ropy texture. Pyroclastic deposits originate from explosive volcanism. They are composed of friable sand-like ash and indurated tuff deposits. Dikes are thin near vertical sheets of rock that intruded or squeezed into existing lava flows or pyroclastic deposits.

The Honolulu Volcanics erupted much later than the Ko‘olau Basalt and overlay the deeply eroded Ko‘olau Volcano and its associated alluvial deposits. In the Kawa Stream area, they are composed mostly of lava flows of approximately 0.5 million years old (Sherrod and others, 2007). The lava flows have flow structures similar to the Ko‘olau Basalt.

The Older Alluvium is composed of consolidated sand and gravel that can be considered a conglomerate. It is mostly composed of well-rounded and moderately sorted sand and gravel. The Older Alluvium commonly forms terrace deposits along streams and valley fill deposits.

The current geomorphology of Kawa Stream and Ditch show the effects of urbanization. Historic records show that the geomorphologies of Kawa Stream with a meandering variable width channel, with sections diverting and rejoining the main stream. The streambed composition is a mixture of sediment ranging from boulder size to silt and sand size. In some areas the streambed is composed of Honolulu Volcanics lava rock. Kawa Stream can be classified as slightly sinuous with small bends and straight reaches. Channel width is variable because of heterogeneous channel material (ParEn 2013).

The largest and most reliable source of groundwater in the Kawa Stream watershed is the high level dike-impounded basaltic lava flows of the Ko‘olau Basalt (Takasaki and others 1969). High level groundwater maintains the base flow of Kāne‘ohe streams. Dikes can be found in the Ko‘olau Basalt in the upper parts of the Kawa watershed (**Figure 4-2**). The project site is underlain by Honolulu Volcanics. This formation is generally less permeable than the Ko‘olau Basalt and it generally retards upward groundwater flow thus reducing the seepage and spring flow into streams. Stearns and Vaksvic (1935) documented few springs in the Kāne‘ohe area Honolulu Volcanics.

#### **4.3.1 Impacts & Mitigation**

The Proposed Action is not anticipated to adversely impact the geological conditions of the proposed project site and therefore no mitigation is required.

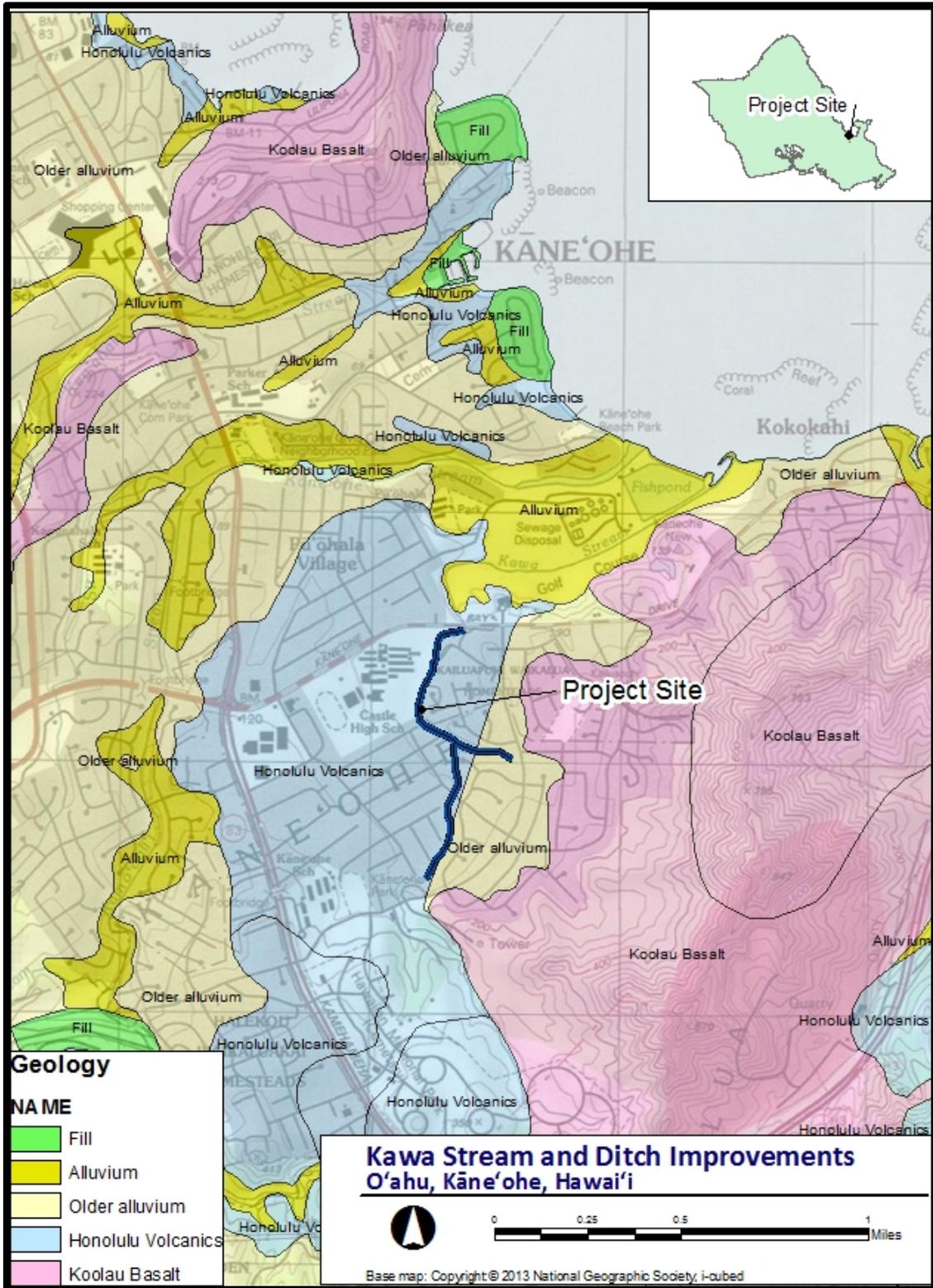


Figure 4-2. Geologic Map

#### 4.4 Surface Water

Kawa Stream is approximately two miles long. The total tributary watershed area is approximately 717 acres (Park Engineering 2013). The headwaters of the stream are located within the western slopes of the Oneawa Hills that separate the towns, Kāneʻohe and Kailua. The headwaters are composed of three perennial streams, each of which is supplied by a set of small springs situated between elevations of 100 and 150 feet (Oceanit 2002). There are no continuous U.S. Geological Survey streamflow records for Kawa Stream. The United States Geological Survey (U.S.G.S.) maintains a flood stage gage at the Kāneʻohe Bay Drive Bridge and has kept records from the early 1960's. **Table 4-1** shows the flood stage data at the bridge (USGS 2015).

**Table 4-1. Flood discharge (flow) data from USGS gage 16265000, Kawa Stream at Kāneʻohe Bay Drive**

Date	Stage height (feet)	Discharge (cubic feet per second)
2/4/1965	16.4	4,510
8/9/1967	6.84	739
12/18/1967	8.27	1,180
1/29/2002	5.3	507
3/12/2012	19.59	5,000

The Kawa Stream and Ditch project area is located within three flood zones: 0.2% Annual Chance Flood Zone, AE and X (**Figure 4-3**). 0.2% Annual Chance Flood Zone is the flood insurance rate zone that corresponds to areas of 500-year flooding. Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Federal Insurance Survey (FIS) by detailed methods. In most instances, whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone. X Zone: Zone X is an area determined to be outside of the 0.2% annual chance floodplain. No base flood elevations or depths are shown within these zones (DLNR 2011). The project shall comply with City Council Ordinance 14-9 relating to Flood Hazard Areas.

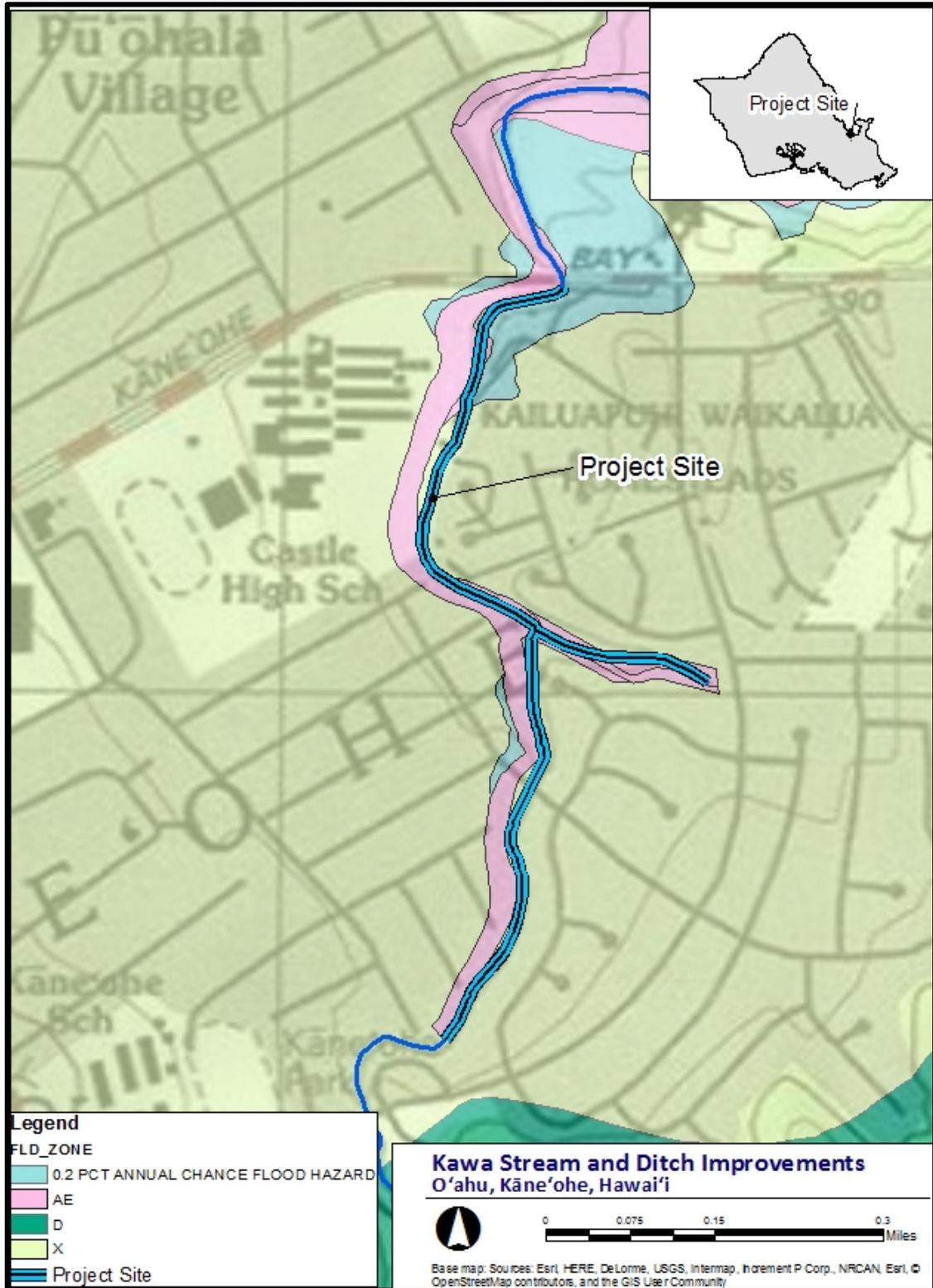


Figure 4-3. Flood Hazard Zones Map

#### 4.4.1 Impacts and Mitigation

The Proposed Action is anticipated to result in the following benefits: less stream bank erosion; more stream habitat; less sediment transported into Kāneʻohe Bay; and better long-term compliance with Total Maximum Daily Loads (TMDL) requirements. It is anticipated that the Proposed Action may result in a short-term, temporary increase in erosion during construction.

BMPs, such as sand bags or berms around construction areas in the water would be implemented to minimize the sediment and pollution caused during construction. The Contractor should consider the weather while performing construction in the stream. Work should be performed during low rain conditions. All construction should be halted during storm conditions.

#### 4.5 Aquatic Resources

A Terrestrial Biological Resources Survey was performed by Koehler Enterprises in 2014 which described vegetation in the riparian zone in the middle reach of Kawa Stream encompassing the project sites. Aquatic biological surveys of Kawa Stream were conducted in 1991 in association with the development of a golf course (Smith), in 2001 in association with the State DOH TMDL study of the watershed (Burr), and in 2003 (Englund, et al.) as part of a Bishop Museum survey of Kāneʻohe stream mouth ecosystems. The study by Burr which accompanied a TMDL study by Oceanit in 2001 was the only study which survey area encompassed the lower, middle, and upper branches of the stream. Between the surveys conducted in 2003 and 2014, the City discontinued its practice of broad herbicide use to control plant growth on the banks of Kawa Stream. This has primarily impacted the middle reach (project site) of the stream where large stands of grasses now cover what a decade ago were bare banks and open water stream beds.

Of the one hundred sixty nine plant species observed during the Terrestrial Biological Resources Survey, seven were identified as indigenous and four as endemic. Nine avian species were observed with one identified as indigenous. All other species observed were identified as invasive or introduced. Evidence or observation of three terrestrial animal species was found, all introduced. No endangered species were observed and limited suitable habitat was observed.

Plants within the riparian zone are important because their presence is in direct correlation with the health of the habitat for aquatic fish and invertebrate species. Plant life in the middle reach of the stream within the project area is dominated by invasive and introduced species with limited presence of endemic and indigenous plant species. In the middle reach of the stream, where Kawa Ditch enters the stream (**Figure 1-1**), California grass (*Brachiaria mutica*) and elephant grass (*Pennisetum purpureum*) dominate the banks and completely cover the stream bed in some locations. While this vegetation cover likely inhibits the up-stream and down-stream mobility of fish, it also likely

inhibits day-time overheating of the water and provides fish sanctuary from predators. Above the Kawa Ditch junction, shading from tall trees dominates and little vegetation exists within the stream channel.

Although the flow in Kawa Stream is perennial, the mean flow rate is usually quite low (less than 1 cubic feet per second) and large pools are absent, thereby providing limited aquatic habitat. Within the freshwater reaches (i.e. dismissing the lower estuarine areas) fishes most commonly observed include tilapia (*Tilapia* sp), mosquito fish (*Gambusia affinis*), guppies (*Poecilia reticulata*), hybrid mollies (*Poecilia* sp.), swordtail (*Xiphophorus helleri*), algae-eater catfish (*Hypostomus watwata*) and other miscellaneous escapees from residential aquariums. Although uncommon, o'opu, native gobies (*Gobiid* sp. *Eleotris sandwicensis*) have occasionally been seen in Kawa Stream and Kawa Ditch. Non-native invertebrates in the middle reach of the stream include abundant apple snails (*Lymnaeid* sp), frogs (*Rana* sp), crayfish (*Procambarus clarkia*) and Tahitian prawns (*Macribrachium lars*).

Below the project site (downstream of Kāne'ōhe Drive) the stream descends through a hau jungle and into a reach through the golf course, much of which is tidally influenced. In this estuarine reach, barracuda (*Spyhraena barracuda*); jacks (*Caranx me/ampygus*); tilapia (*Oreochromis mossambicus*); juvenile manini (*Acanthwus triostegus*); flagtail (*kuhlia sandwicensis*) and ama' ama (*Mugil cephalus*) are all present with tilapia being the dominant species, although native gobies (*Eleotris sandwicensis*, *Stenogobius hawaiiensis*, *Psilogobius mainland* and *Awaous guamensis*) are also known to be present. Rock oyster (*Ostrea sandvichensis*), barnacles (*Balanus* sp.), several crab species (including *Grapsus tenuicrustatus* and *Metopograpsus messor*), and small populations of blue-green algae (*Cyanobacteria* sp.) were also observed (Pacific Atlas, 1990). In this reach, a wider range of species are present, likely feeding on small fish and other material swept downstream during occasional freshets. Burr (2001) concluded that the habitat quality of Kawa Stream is impaired with lower habitat diversity and that it supports a lower diversity of fish, particularly native species, as compared to natural streams.

The most diverse area of the stream is the estuarine reach below the project area. The stream is not associated with any wetlands as defined by the combination of indicators required for a U.S. Army Corps of Engineers jurisdictional determination. The combination of appropriate wetland vegetation, hydrology, and soils were absent from the survey area" (Koehler, 2014).

#### 4.5.1 Impacts and Mitigation

Temporary disruptions to the stream channel flow in short sections of the stream would be necessary in order to complete the Proposed Action. Because of the narrow nature of the stream, it is not feasible to close half of the stream bed to flows, so a by-pass system would be used at each subsequent construction site. There would be a temporary, short-

term acute adverse impact on the fish and aquatic invertebrates in the stream reaches where flow is diverted. Many of these aquatic invertebrates would not survive the disruption of flow. No mitigation is proposed because a large majority of these are common invasive species that would rapidly repopulate the stream channel when flow is restored.

During construction there would also be short-term adverse impacts from increased turbidity. It is anticipated that the construction levels of turbidity would be lower than what a natural rainfall event from without construction would produce.

BMPs would be implemented to minimize turbidity by controlling and preventing construction related runoff resulting from the construction of the Proposed Action. BMPs may include the use of sandbags, bulk bags, drain by-pass pipe, pumped geotubes, grassing, geotextiles, and silt fences. Additionally, the Contractor would consider the weather while performing construction in the stream. Work would be performed during low rain conditions. All of the construction would be ceased during heavy storm conditions or when storm conditions threaten the watershed. For the purpose of this watershed, “storm conditions” consists of any storm anticipated of delivering more than 0.5 inches of rain in 12 hours.

There are no long-term adverse impacts anticipated to the aquatic environment. However, it is anticipated that there would be long-term, permanent, beneficial impacts to the aquatic environment resulting from stream and erosion control and an increase in the complexity of the habitat.

As mentioned in **Section 4.5**, native o`opu have been seen on rare occasions in Kawa Ditch and Kawa Stream. No adverse impact is anticipated affecting the o`opu because of their low population density in this stream.

#### **4.6 Botanical Resources**

One hundred and sixty nine plant species were observed during the plant survey on October 17, 2014 by Koehler Enterprises. Seven of these species were indigenous and four were endemic leaving about 98% of the flora as non-indigenous introduced species. The vegetation in the survey area forms a relatively homogeneous assemblage and cannot easily be divided into vegetation zones. Overall the botanical community is dominated by introduced plant species. Immediately adjacent to the stream, the grasses Job’s Tears (*Coix lachrymal-jobi*), Guinea grass (*Megathyrsus maximus*) and California grass (*Urochloa mutica*) dominate. The groundcover, *Wedelia trilobata*, was common on open banks. Trees such as Kukui (*Aleurites moluccanus*), Mango (*Mangifera indica*), Avacado (*Persea americana*), Albezia (*Amanea saman*), Octopus tree (*Schefflera actinophylla*), African tulip (*Spathodea campanulata*) and Java plum (*Syzygium cumini*) dominate the stream banks.

Given that the proposed project area is in a residential area, many of the plants likely either escaped from nearby residential lots or were planted and cultivated along the

stream. Plant species that had most likely naturalized from gardens included species such as: red ginger (*Alpinia purpurata*), noni (*Morinda citrifolia*), banana (*Musa x paradisiaca*) and fountainbush (*Russelia equisetiformis*). Plant species that were clearly being cultivated by property owners along the stream banks include several native plant species: Koki'o ke'oke'o (*Hibiscus arnottianus*), Ohia (*Metrosideros polymorpha*), and alahe'e (*Psyrdrax odorata*).

#### 4.6.1 Impacts and Mitigation

The botanical survey did not reveal any botanical resources of notable value or worthy of consideration for conservation or protective measures.

No mitigation is proposed. However, consideration should be given to erosion control, which the current vegetation cover presently provides. The Proposed Action would, at a minimum, replace the vegetation cover to provide erosion control.

#### 4.7 Avian, Terrestrial Fauna and Feral Mammals

Included in the Terrestrial Biological Survey conducted by Koehler Enterprises, LLC was a bird (avian) and animal survey (Refer to Appendix A). During the survey, 207 individual birds of 13 different species were encountered. In addition, during 8-minute point counts at four discrete locations along the stream, 77 individual birds representing 9 species were encountered. Zebra Doves (*Geopelia striata*) and Rock Pigeons (*Columba livia*) were the most common species observed on site. The only indigenous species observed was two Black Crowned Night Herons (*Nycticorax nycticorax*).

No endangered or endemic species were observed on site. Although the Hawaiian short-eared owl, pueo (*Asio flammeus sandwichensis*) does exist in small numbers on the Island of O'ahu, pueo was not observed during the survey and it is considered unlikely that they would occur at or near the project area due to the abundance of predators and lack of open habitat. Similarly, The Newell's Shearwater (*Puffins auricularis newelli*) was also not observed on site, nor was suitable nesting habitat observed.

Koehler Enterprises also conducted a survey for terrestrial fauna. Evidence of rat (*Rattus sp.*) activity was detected but no rats were observed. In addition, Brown Anole (*Anolis sagrei*) and cane toads (*Rhinella marina*) were observed in the area. Both are introduced species. Although project's site is suitable habitat for the Hawaiian hoary bat (*Lasiurus cenerus semotus*) none were observed during the survey.

#### 4.7.1 Impacts and Mitigation

The Newell's Shearwater is listed as Threatened under the Endangered Species Act (ESA). Since no construction would be allowed during nighttime hours, the potential for causing disorientation of Shearwater birds due to lighting would be eliminated. Nighttime work restrictions would also minimize construction impacts on nocturnal species.

Species observed on site including the Mallard Duck, Cattle Egret, House Finch and Black Crowned Night Heron are protected by the Migratory Bird Treaty Act (MBTA). It is possible that there would be adverse impacts to these species' habitats during construction. To avoid any adverse impacts to MBTA species, efforts shall be made to minimize or entirely avoid actions that may harass or injure these birds. Special permits would be acquired if take or possession is necessary.

As previously stated, the project site is a suitable habitat for Hawaiian Hoary Bats, therefore the Contractor would be required to maintain certain protocol to protect the bats. During the period between June 1 and September 15 the Contractor shall not clear trees above 15-feet in height to avoid impacts to the Hawaiian Hoary Bat. This is the period juvenile bats are known to reside within the proposed project area.

Although no ESA-listed Hawaiian waterbirds were found at the project site during the Terrestrial Biological Resources Survey by Koehler Enterprises, in October 2014, the U.S. Fish and Wildlife Service (USFWS) reported that there is a high probability that Hawaiian waterbirds may occur in the vicinity of the proposed project (refer to Appendix D, USFWS comment letter dated November 20, 2014). The proposed project specifications shall stipulate the following measures be followed by the Contractor to avoid and minimize impacts to listed Hawaiian waterbirds prior to and during all construction earth moving activities.

- The Contractor shall designate a competent bird observer to survey the work area and verify no Hawaiian waterbirds and their nests are adversely affected by project activities.
- If a listed Hawaiian waterbird is observed within the project site, or flies into the site while activities are occurring (within 100-ft), all potentially disruptive activities (including human activity, mechanical or construction disturbance) shall be stopped until the animal(s) voluntarily leave the area.
- Relevant portions of the FWS's recommended *BMPs for In-Water Work* regarding sedimentation and erosion in aquatic environments shall be incorporated into the project design to protect listed Hawaiian waterbirds.

DDC and its project team have begun early consultations with NOAA Fisheries Office of Protected Resources at Pacific Islands Regional Office (PIRO) for any applicable Essential Fish Habitat (EFH) requirements or concerns. Issues related to the Endangered Species Act (ESA) Section 7 will be discussed with the U.S. Fish and Wildlife Service.

#### **4.8 Archaeological and Cultural Resources**

A Draft Archaeological Inventory Survey (AIS) was prepared by Scientific Consultant Services, Inc. (SCS) in October 2015 and is included in Appendix B. SCS has not yet received confirmation from SHPD that the report has been accepted as Final.

Additionally, a Draft Cultural Impact Assessment (CIA) was prepared by SCS in June 2015 and included in Appendix C.

The AIS meets the requirements of the State Historic Preservation Division (SHPD). These requirements include: review of previous archaeological work conducted in the general area of the project; field work, consisting of surface reconnaissance, mapping, and recording of identified surface archaeological features; limited subsurface testing, if necessary; laboratory analysis, including the processing of radiocarbon dates, if available; and production of a report acceptable to SHPD.

The CIA also meets the requirements of SHPD and includes appropriate archival/background research, focusing on traditions and legends; limited historic research; review of previous oral histories conducted in the general area of the project (if known); a search for persons/organizations knowledgeable with the project area; interviews with identified informants; and production of report detailing Consultant's findings.

SCS reviewed historical references and fourteen archaeological studies conducted in the project region. SCS also conducted a field pedestrian survey which covered the entire proposed project area. The intent of the pedestrian survey was to record information, identify archaeological sites and assess geographical and physiographical features. Archival research and a review of previous archaeological studies show that the project vicinity has a considerable cultural history. The area has been extensively altered in both modern and historical times indicating that traditional Hawaiian surface structures and artifacts are unlikely to be found in the project area. No historic Hawaiian cultural sites were identified in the proposed project area. However, one historical site was identified adjacent to the project area (State Site 50-80-7766). This site is the Kāne'ohē Bay Drive Bridge and it is located immediately downstream of the work area. The bridge is significant for its association with early developments in concrete masonry bridge construction in Hawaii.

The Cultural Impact Assessment (CIA) by SCS identifies the possibility of ongoing cultural activities and resources within the proposed project area, or its vicinity, and then assesses the potential for impacts on those identified cultural resources. The report was prepared in accordance with the Guidelines for Assessing Cultural Impacts, Office of Environmental Quality Control (OEQC) 1997. Letters of Inquiry were sent to individuals and organizations within close proximity to the proposed project area that may have knowledge or information pertaining to the cultural resources. Additionally, historical and cultural source materials were used extensively during the research phase of the report.

A Cultural Impact Assessment Notice will be published on in *The Honolulu Advertiser*, and in an issue of the OHA newspaper, *Ka Wai Ola*. These notices request information of cultural resources or activities in the area of the proposed project.

#### **4.8.1 Impacts and Mitigation**

No archaeological sites were found in the project area. The Kāneʻohe Bay Drive Bridge is not located in the project area. Therefore no adverse impacts are anticipated on archaeological resources and no mitigation is proposed.

Based upon historical research and the lack of responses from organizations and individuals contacted, the proposed project area has not been used for traditional cultural purposes within recent times. Additionally, it is reasonable to conclude that Hawaiian rights related to gathering, access or other customary activities within the proposed project area would not be affected and there would be no adverse effect upon cultural practices and beliefs.

If historic resources, including human skeletal remains, cultural layers, cultural deposits, features, artifacts, sinkholes, lava tubes or lava blisters/bubbles are identified during construction, all work will be stopped in the immediate vicinity of the find, the site would be protected from additional disturbance and the State Historic Preservation Division would be contacted. This directive would also be included in applicable project permits.

#### **4.9 Visual Resources**

According to The Vision for Koʻolaupoko's Future section of the *Koʻolaupoko Sustainable Communities Plan*, "streams should be made more physically and visually acceptable as routes for pedestrians or bicyclists, especially in urbanized areas. Existing maintenance easements or rights-of-way along several streams and drainage channels could become public greenways with natural or additional landscaping for this purpose." While vegetation, fences, and walls still exist on much of the private property, the proposed project calls for installation of new grassy maintenance and access easements along sections of the top of the stream banks. Turf reinforcement matting and wedelia flowering groundcover would be planted to stabilize and beautify the banks and easements. In addition, several sections of the concrete lined channel would be replaced with boulders and gabion rock walls, creating a much more natural looking setting.

##### **4.9.1 Impacts and Mitigation**

The erosion protection features would beautify the Kawa stream and Ditch area resulting in improved local visual resources of residence back yards. Improvements, especially non-structural vegetative methods would partially return the stream to its original visual appearance. The Proposed Action would positively impact visual resources and therefore no mitigation would be necessary.

#### **4.10 Air Quality and Noise**

The State Department of Health, Clean Air Branch, monitors ambient air in the State of Hawai'i via 14 air quality monitoring stations on three Hawaiian Islands. O'ahu has six monitoring stations, Big Island has seven monitoring stations and there is one monitoring station located on Maui. The Environmental Protection Agency (EPA) has set standards

for six pollutants: 1) carbon monoxide; 2) nitrogen dioxide; 3) sulfur dioxide; 4) lead; 5) ozone; and 6) particulate matter (PM<sub>2.5</sub> and PM<sub>10</sub>). Particulate matter is measured in microns. The subscript 2.5 and 10 represents microns in aerodynamic diameter. Because of volcanic activity, the State has also set standards for hydrogen sulfide, which is monitored on the Big Island.

The State has set more stringent standards for nitrogen dioxide and carbon monoxide. The Federal standard for nitrogen dioxide is 100 µg/m<sup>3</sup> (micrograms per cubic meter of air) whereas the State standard is 70 µg/m<sup>3</sup>. For Carbon Monoxide, the 1-hour Federal standard is 40,000 µg/m<sup>3</sup> and the State standard is 10,000 µg/m<sup>3</sup>.

According to the 2006 annual summary, none of these pollutants exceeded State or Federal standards in the last three years from 2006 to 2008. Ambient air quality in the State of Hawai‘i continues to be one of the best in the nation.

Noise pollution is regulated by the State Department of Health, which has set specific decibel levels into three classes based on land use. Hawai‘i Administrative Rules Title 11, Chapter 46, Community Noise Control contains the specific sound levels in dBA and is shown in **Table 4-2**.

**Table 4-2. Maximum permissible sound levels in dBA**

Zoning District	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Class A	55	45
Class B	60	50
Class C	70	70

Class A zoning districts are lands zoned residential, conservation, preservation, public space, open space, or similar type. Class B lands are zoned for multi-family dwellings, apartment, business, commercial, hotel, resort, or similar. Class C includes lands zoned agriculture, country, industrial, or similar types. Since the reservoir is located in a conservation zoned area, Class A has been identified as the standard to use for this assessment.

Noise levels cannot exceed the dBA identified above for more than 10 percent of the time within any twenty-minute period, except by permit or variance. Impulsive noise can be 10 dBA above the maximum permissible sound levels. Impulsive noise includes activities such as hammering, pile driving, and explosion.

#### **4.10.1 Impacts and Mitigation**

It is anticipated that construction activities and emissions from construction equipment would result in short-term adverse impacts on air quality. Construction activities would include excavation of trees, vegetation, concrete, cobbles, and rocks to implement the Proposed Action. Release of particulate matter (dust) is expected to occur since there would be a significant amount of concrete and vegetation removal from the channel. Fugitive dust would be mitigated through BMP measures.

It is anticipated that short-term adverse noise impacts would be produced by construction activity throughout the duration of the proposed project. Heavy equipment would be used to remove and place rocks, concrete, and new vegetation. Single family residences are located immediately adjacent to and surrounding the majority of the stream and ditch channels. Much of the project work would occur within 100 feet from the nearest residence. The only location where work would not be surrounded by residences on both sides of the stream channel is within close proximity to Castle High School. During this time, work would occur within 100 feet of the nearest home and within 500 feet of the nearest classroom. Noise pollution would need to be addressed through work practice controls and, if necessary, engineering controls.

Noise impacts would also be generated from construction equipment. Due to the close proximity to residences, curfew times for construction would be established and mufflers would be used on equipment to minimize noise from construction equipment. A Department of Health Community Noise Permit would be required for this proposed project and if work is to be performed outside the hours of 7:00 am to 6:00 pm, Monday through Friday and 9:00 am to 6:00 pm Saturdays then a Community Noise Variance would also be required.

While dense vegetation exists on the banks and buffers the majority of the channel as well as in several residential backyards, much of this vegetation is slated for removal during the first phase of work on the proposed project. The effects of dust and noise pollution would only be exacerbated once portions of this vegetative buffer are removed. In the final stages of the proposed project, Vetiver grass would be planted along the stream banks. This type of grass grows in thick clumps, up to 5 feet high and would help mitigate noise and air quality pollution as the project progresses through the stream channel.

Dust emissions would be mitigated during construction by periodic watering of disturbed ground and demolished concrete and installation of dust fencing to prevent airborne particulate matter from escaping the work area during construction. Stockpiled materials shall also be watered and/or surrounded by dust fencing to prevent fugitive dust. Once construction is complete, the air quality would be restored to similar or better than pre-construction conditions. The Vetiver grass and Wedelia plantings would also help control dust and restore long-term air quality.

The City will designate a Construction Manager (CM) who will oversee the proposed project. Contract documents shall state that the CM would contact Castle High School's

principal in the early stages of the project and would keep the school's principal informed of construction activities throughout the duration of the project.

The Contractor would also deliver a Public Notice to the residences and school immediately adjacent to the proposed project site prior to starting construction. The notice shall include at a minimum:

- Contractor contact information;
- Planned weekly hours of construction;
- Planned overall construction schedule;
- Brief description of construction activity; and
- Any planned hindrances to the public.

These noise impacts are short-term and would occur only during construction. After construction is completed, no noise impacts would be generated by the Proposed Action.

#### **4.11 Social and Economic Factors**

This section describes the social and economic environment of the Kāneʻohe census-designated place (CDP) where the Proposed Action would occur. Factors such as demographic characteristics and economic context are described below.

#### **4.12 Social Factors**

According to the U.S. Census Bureau, the population of the City and County of Honolulu in 2010 was 953,207. This represents approximately 68 percent of the total population of the State of Hawaiʻi. The Koʻolaupoko District has a population of 121,180 people (13 percent of Oʻahu's population) and Kāneʻohe CDP has a population of 34,597. The average number of people per household in the community of Kāneʻohe in 2010 was 3.11 people.

The largest ethnic population of Kāneʻohe is Asian with 12,754 people, followed by people reporting two or more races with 11,014 people. The third largest ethnic population is White with 7,109. Native Hawaiʻian and Pacific Islander are the fourth largest ethnic population with 3,177 people. These numbers represent people on the 2010 U.S. Census Bureau Survey.

Housing units in Kāneʻohe in year 2010 totaled 11,138 compared to 519,508 units in the State. Owner occupied units totaled 7,790 units and renter occupied units totaled 3,348 units. Vacant units totaled 415. Homeowner vacancy rate was 0.9 percent while the rental vacancy rate was 4.4 percent. The median value of housing units in Kāneʻohe in 2012 was \$626,750.

##### **4.12.1 Impacts and Mitigation**

The Kawa Stream and Ditch improvements project is located adjacent to Castle High School and residential neighborhoods. Noise due to construction activities and interruption of local traffic are potential adverse impacts to the local social environment.

The weekly limitation of work hours as deemed practical is recommended in order to minimize these social impacts. Refer to section 4.10 for air quality and noise impacts.

The Proposed Action would help prevent further erosion and subsequent damage to adjacent properties. Landowners and tenants occupying properties adjacent to Kawa Stream and Ditch would benefit in the long-term from the reduced risk of property damage due to erosion.

#### **4.13 Economic and Fiscal Factors**

The civilian labor force for Honolulu County in 2010 was estimated at 483,480 people. The labor force is comprised of persons 16 years of age and over. Honolulu has the largest labor force compared to the other three counties. The unemployment rate is 3.8 percent. The median household income from 2008-2012 was \$72,292 in Honolulu County compared to \$67,492 for the State of Hawai'i.

Government (federal and local) has the highest number of civilian jobs at 95,700 with federal government jobs accounting for 91,850 of those. The second highest job count was trade, transportation and utilities with 79,300, then leisure and hospitality industry with 60,500 jobs. Professional and business services accounted for 57,200 jobs. The job count in the educational and health services industry is 53,300 jobs.

In 2010, there were 47,410 military personnel stationed in the State of Hawai'i with the majority of those located in Honolulu County. Eleven of the state's fourteen major military installations are located on Island of O'ahu. One of these, Marine Corps Base Hawai'i, is located within 4 miles of the proposed project site.

##### **4.13.1 Impacts and Mitigation**

Long-term adverse impacts on the economy are not anticipated from the Proposed Action. Short-term positive impacts are anticipated from direct and indirect employment and supplies required for construction. In the long-term the economy would be positively impacted because the Kawa Stream and Ditch would be protected from damage and require less continued maintenance.

No mitigation is required regarding the economic environment associated with the proposed project since the Proposed Action is not anticipated to have adverse impacts on the economy and would result in short and long-term positive impacts.

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## **5 INFRASTRUCTURE, PUBLIC FACILITIES and UTILITIES**

This section describes the existing infrastructure, public facilities, and utilities in the vicinity of the proposed project site and any adverse impacts that the proposed project would incur. Water, wastewater, drainage, solid waste, transportation, power, communications, medical, schools, police, and fire services will be addressed in this section.

### **5.1 Water, Wastewater, Drainage, and Solid Waste**

Services provided by the City and County of Honolulu include potable water, wastewater, drainage, and solid waste. Potable water is managed by the Board of Water Supply (BWS). BWS obtains water from a network of wells and tunnels stretching from Punalu'u to Kāne'ohe. Wastewater conveyance and treatment is provided by the Department of Environmental Services. Treatment occurs at the Kāne'ohe Wastewater Pre-Treatment Facility, which is located less than one mile from the proposed project site after which it is pumped to the Kailua Regional Wastewater Treatment Plant.

There are two operational landfills located approximately thirty miles away from the proposed project site; PVT Landfill, and Waimanalo Gulch Sanitary Landfill. The City and County maintains an island-wide system of solid waste collection, transfer, and disposal. The Contractor shall discard excess material from construction project activities at an appropriate landfill.

Although the Proposed Action is not expected to impact potable water, wastewater or solid waste facilities there is always the possibility that excavation would uncover undocumented utility lines.

Kawa Stream and Ditch are a part of the City and County of Honolulu Municipal Separate Storm Sewer System. The stream and ditch have been channelized with concrete bank and bed lining, grade control structures, and retaining walls throughout much of the length. The nearby streets drain into a storm drain system that discharges into the stream or ditch. Storm water runoff flows into Kawa Stream and eventually flows into Kāne'ohe Bay. During the construction of the project, runoff associated with the proposed project is expected to show a temporary increase in the levels of suspended solids. In addition, there may be alterations or impacts to drainage pipes and conduits that discharge into the stream or ditch. Long term impacts are expected to be beneficial, in that sediment production and turbidity would decrease.

#### **5.1.1 Impacts and Mitigation**

The Proposed Action is not expected to result in adverse impacts on water, wastewater, or solid waste facilities. In order to mitigate against the possibility of damaging existing pipelines, the Contractor would be required to notify the Utility Notification Center before excavating and coordinated excavation activities with the City and County.

The proposed activities would impact the area's storm water drain structures and mitigation measures should be implemented to address the following short-term adverse impacts.

During channel demolition activities equipment, personnel, loose sediment, vegetative debris, and concrete rubble would be present within the stream and ditch channels. In order to prevent these solids from polluting State waters, BMPs would be implemented. Typical BMPs for concrete channel demolition, include: regular inspection and maintenance of equipment for leaks or damage; temporary diversion of water away from demolition sites; catchment of loose solids and debris; stockpiling of accumulated debris away from the channel; proper containment of runoff from stockpiles; insuring safe passage of wildlife; and daily inspection of all BMPs.

During channel improvement activities; equipment, personnel, and new permanent materials including boulders, concrete, pipe, geotextile fabric, A-jacks, backfill, seed, turf reinforcement matting, and vegetative cover would be present within the stream and ditch channels. Typical BMPs for grout/concrete repairs and other channel improvements include: regular inspection and maintenance of equipment for leaks or damage; temporary diversion of water away from active concrete pour sites; proper concrete washout disposal from truck; pump and line; catchment of loose solids and debris; stockpiling of accumulated debris away from the channel; proper containment of runoff from stockpiles; insuring safe passage of wildlife; and daily inspection of all BMPs.

Throughout most of the project's duration sufficient access would be provided for City Maintenance personnel to maintain the stream, as required. While constructing Grade Control Structure (GCS) #3 [Phase 2] and GCS #4 [Phase 3] and installation of boulder basins below those structures there may be limited access but, the Contractor shall follow the BMPs described above so the stream and surrounding areas are properly maintained during construction.

Long-term impacts after the completion of the proposed project include: a reduction of the total daily loads of pollutants and decreased rates of erosion throughout the stream and ditch channels. Both of these benefits are consistent with the 2012 O'ahu and *Ko'olaupoko Watershed Management Plan* objectives to "protect and enhance water quality..." and to "recognize the connection between land and sea by improving stream water, ground water, and coastal water quality through a reduction in land-based sources of pollution." In addition, the prevention of further erosion would stabilize adjacent land and act to maintain the integrity of nearby structures. Refer to **Section 4.3** for more information regarding land and slope stability.

## **5.2 Transportation**

A number of residential neighborhood streets are adjacent to Kawa Stream and Ditch within the boundaries for this proposed project. In addition, Kāne'ohe Bay Drive is the northernmost boundary for the proposed project. Kāne'ohe Bay Drive is one of three roads that connect the Kāne'ohe community with the neighboring Kailua community.

According to the Ko'olaupoko *Sustainable Community Plan (2000)*, none of these streets are slated for improvements or changes by 2020.

Equipment and staging areas would not be located off of Kāne'ōhe Bay Drive or on City streets and are not expected to impede traffic flow along these roadways. Many neighborhood residents park their cars on the streets.

### **5.2.1 Impacts and Mitigation**

The proposed stream improvement project is not expected to have any adverse impacts on neighborhood streets or Kāne'ōhe Bay Drive. If the Contractor cannot find an appropriate area for equipment and staging he may contact the Department of Education - Facilities Development Branch to determine if an appropriate area is available on the Castle High School property. These areas should not be on or adjacent to roadways as much as practical to reduce parking impacts and inconvenience to residents. No temporary closures of traffic lanes on City streets are expected. If temporary closures on City streets do become necessary the Contractor shall obtain a street usage permit from the City's Department of Transportation Services and obtain approval of traffic control plans from the Department of Planning and Permitting.

Contract documents would contain provisions for transferring any construction-related materials and equipment to and from the proposed project site only during off-peak traffic hours (8:30 a.m. to 3:30 p.m.) to minimize disruption to traffic on the local streets, including school arrivals and departures.

## **5.3 Power and Communications**

Electricity is provided by Hawai'ian Electric Company, and telephone communications are provided by several private companies. Oceanic Time Warner Cable provides cable TV service. The proposed erosion control project would not require electricity, telephones or cable service.

### **5.3.1 Impacts and Mitigation**

Since the proposed project would not require electricity, telephone, or cable services, no impacts on these systems are expected and no mitigation is required.

## **5.4 Medical, Schools, Police, and Fire**

Castle Medical Center is the medical facility located closest to the proposed project site and the largest medical facility in the area. It is located approximately 5 miles southeast in the town of Kailua. Other medical centers in close proximity include Kaiser Permanente and Straub Clinics in Kāne'ōhe

The Kāne'ōhe community is served by the State Department of Education public school system and private schools. The Department of Education facilities in Kāne'ōhe include Kāne'ōhe, Kapunahala, Pu'ōhala, and Parker Elementary Schools, King Intermediate

School, and Castle High School. Other existing facilities in the area include Ahuimanu, Kahaluu, and Waiahole Elementary Schools, and Hakipu' u Learning Center Public Charter School. Windward Community College and Hawai'i Pacific University are located in Kāne'ohē. Leeward Community College, Kapi 'olani Community College, Chaminade University and the University of Hawai' i Mānoa and West O'ahu campuses are also located on O'ahu.

There are three schools in the vicinity of the project. The Windward Nazarene Academy is located about 600 feet east of the project area. Castle High School is directly adjacent to the project area. Kāne'ohē Elementary School is about 800 feet west of the project area.

Police protection for the Kāne'ohē CDP is provided by the Honolulu Police Department headquartered in the city of Honolulu approximately 11 miles south of the proposed project site. Honolulu Police Department operates the Kāne'ohē Substation located approximately 1 mile north of the proposed project site. Fire department services are provided by the Honolulu Fire Department's Kāne'ohē Station also located approximately 1 mile north of the proposed project site.

#### **5.4.1 Impacts and Mitigation**

No impacts on medical, police, and fire services are expected. Thus, no mitigation is required for these services. No impact is anticipated to the Windward Nazarene School or Kāne'ohē Elementary however, James B. Castle High School is located adjacent to the project site and mitigation measures would be implemented to minimize impacts to this school.

Short-term impacts may include noise during school hours and utilization of a portion of the grass school grounds adjacent to the stream channel. Possible mitigation measures include: scheduling of work to avoid months where class is in session and providing advance notice to school administration in order for preparations to be made. See **Section 4.10** for more information on air and noise pollution.

There would be some brush cutting to prepare the stream bed and banks for repair. Noise shall be kept within acceptable levels at all times in conformance with the State Department of Health, Administrative Rules, Title 11, Chapter 46 – Community Noise Control. The Contractor shall obtain and pay for the Community Noise Permit from the State Department of Health when the construction equipment or other devices emit noise at levels exceeding the allowable limits. All internal combustion engine-powered equipment shall have mufflers to minimize noise and shall be properly maintained to reduce noise to acceptable levels. Construction equipment meeting allowable noise limits shall not be started prior to 6:45 a.m. without prior approval of the City Engineer.

The City shall designate a Construction Manager (CM) who will oversee the proposed project. Contract documents shall state that the CM would contact Castle High School's principal in the early stages of the proposed project and would keep the school's principal informed of construction activities throughout the duration of the proposed project. If the

Contractor cannot find an appropriate area for equipment and staging he may contact the Department of Education - Facilities Development Branch to determine if an appropriate area is available on the Castle High School property.

## 6 CONFORMANCE WITH PLANS AND POLICIES

This section will describe the relationship of the proposed project to applicable State and City and County policies. Only those policies related to the erosion control project will be described.

### 6.1 Hawai‘i 2050 Sustainability Plan (2008)

The *Hawai‘i 2050 Sustainability Plan (2008)* is the successor to the *Hawai‘i State Plan* and twelve functional plans. The plan lists five goals with associated strategic actions and indicators for each. The five established goals are 1) A way of life; 2) The economy; 3) Environment and natural resources; 4) Community and social well-being; and 5) Kanaka Maoli and island values.

The Proposed Action would have implications on each of these five goals but primarily would speak to the economy, environment and natural resources, and community and social well-being.

#### 6.1.1 Goal One: A Way of Life

The strategic actions recommended for goal one are to:

- Develop a sustainability ethic;
- Conduct ongoing forums and cross-sector dialogue to promote collaboration and progress on achieving Hawai‘i’s sustainability goals; and
- Continually monitor trends and conditions in Hawai‘i’s economy, society and natural systems.

The design of the proposed project directly addresses several issues related to the sustainability of Hawai‘i’s storm water management infrastructure. Any educational and public exposure opportunities that arise regarding the sustainable design basis for the proposed project would serve to further advance the strategic actions associated with goal one.

#### 6.1.2 Goal Two: The Economy

The strategic actions recommended for goal two are to:

- Develop a more diverse and resilient economy;
- Support the building blocks for economic stability and sustainability;
- Increase the competitiveness of Hawai‘i’s workforce; and
- Identify, prioritize and fund infrastructure “crisis points” that need fixing.

The proposed project would have a positive short-term impact on the economy by creation of direct and indirect jobs. After construction is completed, no additional jobs would be created. The proposed project has been designed to address a “crisis point” in the storm water management infrastructure.

### **6.1.3 Goal Three: Environment and Natural Resources**

The strategic actions recommended for goal three are to:

1. Reduce reliance on fossil (carbon based) fuels;
2. Conserve water and ensure adequate water supply;
3. Increase recycling, reuse and waste reduction strategies;
4. Provide greater protection for air, and land-, fresh water- and ocean-based habitats;
5. Conserve agricultural, open space and conservation lands and resources;
6. Research and strengthen management initiatives to respond to rising sea levels, coastal hazards, erosion and other natural hazards; and
7. Develop a comprehensive environmental mapping and measurement system to evaluate the overall health and status of Hawai'i's natural ecosystems.

The proposed project has distinct short-term and long-term impacts to the environment and natural resources. Although short-term adverse impacts are expected during the construction; long-term positive impacts are expected after project completion. The following long-term positive impacts all coincide with the strategic actions called for under goal three.

The proposed project specifically addresses the fourth and sixth recommended actions regarding protection of fresh water- and ocean-based habitats and response to erosion. The current stream configuration contributes to land erosion by funneling all storm water runoff from the watershed into a concrete and natural bottom channel. The concrete lined portions of the channel accelerate the water downstream so that by the time it comes into contact with the natural bottom sections, erosion occurs at an accelerated rate. The sediment that is eroded then becomes suspended in the water column as a pollutant along with any other contaminants present. These pollutants get washed out into Kāneʻohe Bay where they further interfere with wildlife and coral health.

### **6.1.4 Goal Four: Community and Social Well-Being**

The strategic actions recommended for goal four are to:

- Strengthen social safety nets;
- Improve public transportation infrastructure and alternatives;
- Strengthen public education; and
- Provide access to diverse recreational facilities and opportunities.

The project is not expected to impact these goals.

### **6.1.5 Goal Five: Kanaka Maoli and Island Values**

The strategic actions recommended for goal five are to:

- Honor Kānaka 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; and
- Provide support for subsistence-based business and economics.

The proposed project was designed in order to return the stream to a more natural setting and a more functional means of preventing flooding while also reducing the negative impacts to the local fresh and ocean waters. It is possible that the project may contribute to this Goal by incrementally improving the water quality in Kawa Stream and the downstream estuary, thus improving the fishing and gathering.

## **6.2 Total Maximum Daily Load Criteria for Kawa Stream**

Typical concentrations and state criteria of some pollutants of interest were detailed in the report *Total Maximum Daily Loads of Total Suspended Solids (TMDLS), Nitrogen and Phosphorus for Kawa Stream* (Oceanit/AECOS, 2002). The majority of water samples taken for the study showed levels of pollutants well above the applicable criteria set forth by the state Department of Health (DOH). These measurements show that current infrastructure design is adversely impacting fresh- and ocean-water wildlife.

The proposed project aims to alleviate these adverse impacts by installing concrete and rock features along the channel bottom, replacing some concrete side slopes with permeable alternatives, and installing native vegetation mats on side slopes. Respectively, these installations would serve to reduce flow velocity, allow for percolation of ground water, and retain water within vegetation. All serve to limit the transfer of pollutants into the local fresh water and ocean systems while at the same time reducing the erosion of the streambed and surrounding land.

## **6.3 Ko‘olaupoko Watershed Restoration Action Strategy (2007)**

The *Ko‘olaupoko Watershed Restoration Action Strategy* was authored by the Kailua Bay Advisory Council and addresses technical and financial, watershed monitoring strategy, and public participation, outreach and education needs of each separate watershed within the Ko‘olaupoko District. Within this plan sections specifically address the Kawa Stream watershed. The general recommendations on erosion and sedimentation on Kawa Stream include the following:

- Identify badly eroding hillslopes and stream banks
- Revegetate hillslopes to reduce their ability to erode
- Create sediment detention/retention basins to manage hillslope runoff
- Create vegetated buffers along the stream to filter runoff and prevent it from reaching stream
- Revegetate stream banks with plants that have extensive root systems to hold soil

- Reduce herbicide use on vegetated stream banks and buffers
- Reduce erosion in deeply incised channel sections by stabilizing stream banks with toe protection and/or bank protection (e.g. boulders, gabions, vegetative root structure)

Other specific recommendations include the following:

1. Create a partnership and provide technical support to Hawai'i Veterans Cemetery and Hawai'i Memorial Park Cemetery for fertilizer management, erosion, irrigation and weed and pest management;
2. Create partnership with Bayview Golf Course for fertilizer management, erosion control, irrigation and riparian planting. Upward of 1,300' (400 meters) on both sides of Kawa Stream could potentially benefit from native plantings.
3. Implement bank stability in the upper reaches of Kawa Stream
4. We recommend that revegetation efforts take place at every section of stream that is not hardened.
5. Work with Castle High School on Storm Water Management and Riparian Restoration opportunities and watershed education; and
6. Distribute homeowner/resident curriculum and management guidelines for nutrient and fertilizer application.

The Proposed Action is intended to directly address many of the general and some of the specific recommendations. Within the proposed project area, badly eroded stream banks have been identified. To address recommendations three and four, it is proposed that deeply rooted vegetation would help to stabilize the stream banks. In addition more structural techniques are proposed for other portions of the stream. Therefore, the Proposed Action is deemed to be in alignment with the recommendations as set forth in the Ko'olaupoko Watershed Restoration Action Strategy.

#### **6.4 Ko'olaupoko Sustainable Communities Plan (2000)**

The *Ko'olaupoko Sustainable Communities Plan* is one of eight community-oriented plans on the Island of O'ahu intended to help guide public policy, investment, and decision making through the 2020 planning horizon. It addresses the areas of development, vision for the future, land use, public facilities and infrastructure, and implementation.

The plan addresses drainage systems under the public facilities and infrastructure section and outlines the following general policies:

1. Promote drainage system that emphasizes control and minimization of non-point source pollution and the retention of storm water on-site and in wetlands;
2. A comprehensive study of local flooding and drainage problems should be developed and should include a phased plan for improvements;

3. Modifications needed for flood protection should be designed and constructed to maintain habitat and aesthetic values, and avoid and/or mitigate degradation of stream, coastline and nearshore water quality;
4. Planned drainageway improvements should be integrated into the regional open space network by providing access for pedestrians and bicyclists;
5. View storm water as a potential irregular source of water that should be retained for recharge of the aquifer rather than quickly moved to coastal waters;
6. 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;
7. Keep drainageways clear of debris to avoid the flooding problems that have occurred in the past.

The plan also details the following planning principles to guide the maintenance and improvement of the drainage systems:

- Retention and detention;
- Stream channel improvements; and
- Channel and Basin Management.

The Proposed Action most clearly aligns with the third and sixth general policies regarding mitigating the degradation of water quality and the vegetation of drainageways as well as each of the planning principles. The proposed replacement of concrete surfaces with permeable surfaces such as turf reinforced mats, native vegetation, and gabion retaining walls would divert a portion of the water entering the drainage system from the stream where it would percolate through the ground or be retained within the regional vegetation. Each of these approaches would serve to reduce the amount of erosion occurring in the streambed and lower the amount of associated water pollutants suspended by storm water runoff.

### **6.5 HDOT Highways O‘ahu Storm Water Management Program Plan (2007)**

The *O‘ahu Storm Water Management Program Plan* was developed to specify the programs and activities that the State of Hawai‘i Department of Transportation (HDOT), Highways Division implements to reduce, to the maximum extent practicable, the amount of storm water containing pollutants entering and discharging from the HDOT Highways municipal separate storm sewer system.

The Proposed Action does not address any highway or roadway specific storm water management infrastructure. Storm water from Kamehameha Highway may ultimately outfall into the City and County storm water management infrastructure including Kawa Stream. Once the runoff from highways enters the City and County storm water management infrastructure, it is mixed with all other runoff.

## 6.6 Kāneʻohe Bay Master Plan (1992)

The *Kāneʻohe Bay Master Plan* was published in 1992 with these stated goals:

- Preserve and protect the unique natural resources of Kāneʻohe Bay for the continued use and enjoyment of the general public and future generations;
- Resolve conflict among various users of the Bay; including the general public, anglers, and commercial ocean recreation operations; and
- Assess the environmental and ecological impacts of activities on the Bay and in the watershed.

The plan also addresses four values and twenty one issues pertaining to the bay conditions and uses. Each of the twenty one issues was rated as either: high, higher or highest priority to the quality of the Bay. Runoff and storm drain discharges was rated of the highest priority. These discharges were evaluated on the premise that they constitute non-point source pollution falling into the following six categories:

- Nutrients- Nutrients such as nitrogen and phosphorus can slow down coral growth and contribute to plant growth by shutting off light, oxygen, food, and promoting erosion;
- Pathogens- While there are no fecal coliform standards for class AA waters, indication of fecal coliform is considered undesirable;
- Sediment- Sediment is the most prevalent form of runoff pollution in Hawaiʻi. Suspended sediment reduces light levels, limits visibility, and is a major carrier of nutrients and toxins. Sedimentation can also bury corals and kill them after prolonged periods of time;
- Freshwater inflows- channelization, impermeable surfaces, and loss of wetlands cause excess direct freshwater exposure to ocean environments; and
- Thermal pollution- runoff from heated surfaces such as roads can raise the temperature of the receiving stream greatly.

To address the six non-point pollution sources above the report lists the four following conceptual solutions:

- Monitoring of water quality, sediment, and biota;
- Minimization of erosion and runoff;
- Preservation and expansion of wetlands; and
- Environmental education.

The Proposed Action directly aims to reduce the amount of erosion within the Kawa Stream drainage system. Because the stream terminates into Kāneʻohe Bay, all of the above issues are applicable to reducing pollution levels in Kāneʻohe Bay. By lessening the erosion and runoff volumes of the stream channel, the long-term impacts of the project serve to lessen pollution input into Kāneʻohe Bay.

## 6.7 Hawai'i Watershed Guidance

The Hawai'i Coastal Zone Management (CZM) Program and Hawai'i Department of Health developed the Watershed Guidance (State of Hawai'i, 2010) to help people managing watersheds develop and implement management plans that have the greatest potential for achieving water quality goals. Section 5.0 of the Watershed Guidance proposes management measures to help reduce nonpoint source pollution. Management measures are defined as, "economically achievable measures for the control of the addition of pollutants from existing and new categories and classes of nonpoint sources of pollution, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint pollution control practices, technologies, processes, siting criteria, operating methods, or other alternatives." Section 5.5 of the Watershed Guidance addresses hydromodifications of shorelines and coastal streams. It is appropriate to discuss this guidance document because the proposed project would constitute hydromodification and Kawa Stream is a coastal stream.

The Watershed Guidance suggests four Management Measures for Eroding Streambanks and Shorelines.

1. *Where streambank or shoreline erosion is a serious nonpoint source pollution problem, streambanks and shorelines may need to be stabilized. Vegetative methods are strongly preferred. Structural methods may be necessary where vegetative methods cannot work and where they do not interfere with natural processes or harm other sensitive ecological areas.*

The Proposed Action consists of utilizing a combination of several erosion control features of various designs. The features recommended for implementation are described in Section 3.2 and involve improving and stabilizing areas where embankments have steepened and erosive forces have damaged the stream's manmade erosion control structures. Proposed hydromodifications include both structural and vegetative (bioengineering) methods. Structural methods were utilized only when necessary. The area is not ecologically sensitive.

2. *Protect streambank and shoreline features with the potential to reduce nonpoint source pollution.*

The proposed hydromodifications are intended to reduce nonpoint source pollution.

3. *Protect streambanks and shorelines from erosion due to uses of either the shorelands or adjacent surface waters.*

The proposed project is not intended to change the use of the streambank.

4. *Where artificial fill is eroding into adjacent streams or coastal waters, it should be removed.*

The bank of the existing stream is composed of unaltered channel and channel altered by human activity. Some of the human-altered areas may be comprised of artificial fill. At this point it is uncertain which portions are artificial and which portions are natural. In addition, all excess fill material would be removed from the site. This may include demolished concrete and rock.

## 6.8 Coastal Zone Management Program §205A-2

The Coastal Zone Management (CZM) Area is defined as, “all lands of the State and the area extending seaward from the shoreline to the limit of the State’s police power and management authority, including the territorial sea”. This project falls under the jurisdiction of the Coastal Zone Management Program. The CZM program covers the following areas; recreational resources, historic resources, scenic and open space resources, coastal ecosystems, economic uses, coastal hazards, managing development, public participation, beach protection and marine resources. The objectives and policies for these areas and the project’s impacts on these areas are described below.

### 6.8.1 Recreational resources

Objective: Provide coastal recreational opportunities accessible to the public.

The proposed project is located in an inland stream and would not provide any new coastal recreation opportunities. Project improvements would improve water quality within the stream by reducing the sediment load transported by the stream that eventually discharges into Kāne‘ohe Bay.

Policies:

- (A) Improve coordination and funding of coastal recreational planning and management

The proposed project would not affect coordination and funding of coastal recreational planning and management.

- (B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

- (i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas.

Proposed improvements would stabilize the banks and repair existing structures built in the stream that would be damaged by erosive forces during high stream flows. These

improvements would also decrease the sediment transport in the stream, which eventually discharges into Kāneʻohe Bay and may also help protect water quality within Kāneʻohe Bay.

- (ii) Requiring replacement of coastal resources having significant recreational value including, but not limited to, surfing sites, fishponds, and sand beaches, when such resources would be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable.

The proposed stream erosion protection improvements would not adversely impact surfing sites, fishponds and sand beaches.

- (iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value.

The proposed improvements would not hinder public access to and along shorelines with recreational value.

- (iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation.

The proposed improvements would not affect the number of shoreline parks and recreational facilities.

- (v) Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources.

The proposed project improvements would not affect potential recreational uses of the project area.

- (vi) Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters.

Project improvements would not adversely affect potential recreational uses of the coastal waters. It is expected that there would be an improvement in water quality in the stream

and that this would lead to a slight improvement in overall water quality of the coastal waters.

(vii) Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing.

The proposed project would not develop or improve any new shoreline opportunities, but would improve the existing stream water quality environment and downstream areas.

(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of section 46-6.

The proposed project would not affect the dedication of shoreline areas for public use.

#### **6.8.2 Historic resources**

Objective: Protect, preserve, and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policies:

(A) Identify and analyze significant archaeological resources;

An Archaeological Inventory Survey (AIS) has been conducted to identify and analyze archaeological resources. The AIS shall meet the requirements of the State Historic Preservation Division (SHPD). These requirements include; review of previous archaeological work conducted in the general area of the project; field work, consisting of surface reconnaissance, mapping, and recording of identified surface archaeological features; limited subsurface testing, if necessary; laboratory analysis, including the processing of radiocarbon dates, if available; and production of a report acceptable to SHPD.

The bridge over Kāneʻohe Bay Drive has been identified as a historic site. It would not be affected by the project.

(B) Maximize information retention through preservation of remains and artifacts or salvage operations

If historic resources, including human skeletal remains, cultural layers, cultural deposits, features, artifacts, sinkholes, lava tubes or lava blisters/bubbles are identified during construction, all work would be stopped in the immediate vicinity of the find, the site

would be protected from additional disturbance and the State Historic Preservation Division would be contacted. This directive would also be included in applicable project permits.

(C) Support state goals for protection, restoration, interpretation, and display of historic resources.

If significant archaeological or historic resources are discovered, they would be treated in a manner that complies with state goals.

### **6.8.3 Scenic and open space resources**

Objective: Protect, preserve, and, where desirable, restore or improve the quality of coastal scenic and open space resources.

Policies:

(A) Identify valued scenic resources in the coastal zone management area;

The project area has been heavily altered by historical and modern development. No valued scenic resources would be impacted.

(B) Ensure that new developments 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;

The project is not along the shoreline and therefore would not impact the shoreline visual environment.

(C) Preserve, maintains, and, where desirable, improve and restore shoreline open space and scenic resources.

The project is not along the shoreline and therefore would not impact the shoreline scenic resources or open space.

(D) Encourage those developments that are not coastal dependent to locate in inland areas.

The proposed project is located in an inland area.

### **6.8.4 Coastal ecosystems**

Objective: Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policies:

(A) Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;

The project is intended to stabilize the Kawa Stream bank and would help to protect coastal resources by reducing sediment transport into Kāneʻohe Bay.

(B) Improve the technical basis for natural resource management;

One of the project requirements is to establish baseline water quality monitoring levels for the stream. These baseline levels are a prerequisite to assessing potential water quality impacts of project improvements on the stream and development of effective BMPs.

(C) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;

The proposed project would help preserve valuable coastal ecosystems by reducing the sediment input into Kāneʻohe Bay.

(D) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and

The proposed project would not include any off-stream diversions.

(E) Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

The proposed project would include the use of BMPs to reduce pollution during construction. BMPs to minimize turbidity by controlling and preventing construction related runoff for the proposed project may include the use of sandbags, bulk bags, drain by-pass pipes, pumped geotubes, grassing, geotextiles, and silt fences. The Contractor would consider the weather while performing construction in the stream. Work would be performed during low rain conditions. All construction would be halted during storm conditions or when storm conditions threaten the watershed. For the purpose of this watershed, “storm conditions” consists of any storm anticipated of delivering more than 0.5 inches of rain in 12 hours.

#### **6.8.5 Economic uses**

Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policies:

(A) Concentrate coastal dependent development in appropriate areas;

(B) Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area;

(C) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

- (i) Use of presently designated locations is not feasible;
- (ii) Adverse environmental effects are minimized; and
- (iii) The development is important to the State's economy.

The proposed project is not located along the coast. The Economic use objective and policies listed above would not be adversely affected by project improvements.

#### **6.8.6 Coastal hazards**

Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.

Policies:

- (A) Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;
- (B) Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution hazards;
- (C) Ensure that developments comply with requirements of the Federal Flood Insurance Program; and
- (D) Prevent coastal flooding from inland projects.

The proposed project is not located along the coast and is not expected to have any adverse effects on coastal hazards.

#### **6.8.7 Managing development**

Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policies:

- (A) Use, implements, and enforces existing law effectively to the maximum extent possible in managing present and future coastal zone development;

The proposed project is not along the coast and would not have any effect on this policy.

- (B) Facilitate timely processing of applications for development permits and resolve overlapping or conflicting permit requirements

**Table 6-1.** shows the permits that are anticipated for the project. Every effort would be made to coordinate these permits between the approving agencies.

**Table 6-1. Permits Required**

<b>Permit</b>	<b>Agency Approval</b>
CWA Section 401 Water Quality Certification (WQC)	State of Hawai‘i Department of Health (HDOH), Clean Water Branch (CWB)
Department of Army Pre-Construction Notification	U.S. Army Corps of Engineers (USACE)
Coastal Zone Management (CZM) Certification	State of Hawai‘i Department of Business & Economic Development & Tourism (EBEDT)
Stream Channel Alteration Permit (SCAP)	State Department of Land and Natural Resources (DLNR)

- (C) Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

The proposed project area is not located along the coast and would not have any effect on this policy. The EA process includes a public meeting which would disclose any potential impacts as a result of the Proposed Action.

**6.8.8 Public participation**

Objective: Stimulate public awareness, education, and participation in coastal management.

Policies:

- (A) Promote public involvement in coastal zone management processes;
- (B) Disseminate information on coastal management issues by means of educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and
- (C) Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

The environmental assessment and permits would be available for public review. Comments would be encouraged and addressed. The contractor would coordinate with the community and stakeholders before and during construction.

#### **6.8.9 Beach protection**

Objective: Protect beaches for public use and recreation.

Policies:

- (A) Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;
- (B) Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and
- (C) Minimize the construction of public erosion-protection structures seaward of the shoreline.

The proposed project is not located near or on a beach and would have no effect on beaches.

#### **6.8.10 Marine resources**

Objective: Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

Policies:

- (A) Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;
- (B) Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;
- (C) Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;
- (D) Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and

- (E) Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

The Proposed Action is not anticipated to result in long-term adverse impacts on marine resources.

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## 7 SIGNIFICANCE CRITERIA

The planned use does not conflict with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.

*(1) Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;*

The Proposed action under this project would not result in the irrevocable destruction of a cultural resource; the AIS was approved by SHPD.

*(2) Curtails the range of beneficial uses of the environment;*

The proposed project involves reconstructing or improving Kawa Stream and Ditch manmade concrete erosion control structures and stabilizing steepened embankment areas. These improvements to stream elements would enable residents and the school attendees to use and enjoy the environment immediately above the stream banks without hazardous conditions.

*(3) Conflicts with the state's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders;*

The proposed project would not conflict with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS. Evaluation of the construction activity described in this EA shows that the proposed project would not have long-term adverse impacts. Short-term adverse impacts would occur during construction from noise, dust and turbidity in the water. However, these impacts can be mitigated by the use of BMPs), such as mufflers used on equipment, frequent watering to keep dust down, and control of construction material.

*(4) Substantially affects the economic or social welfare of the community or state;*

The proposed project would have a short-term positive effect on the economy from the creation of new jobs and increased revenue during construction. After project completion, the improvements would not directly affect the economy. Additionally, the proposed project would affect the social welfare of the community and the State by lessening the pollution input into Kāneʻohe Bay from the stream and would help to preserve a popular recreational area.

*(5) Substantially affects public health;*

Stabilizing the stream's banks and rehabilitating concrete or stone erosion control structures would stabilize land above the stream and maintain the safety of residents and students who frequent the area.

*(6) Involves substantial secondary impacts, such as population changes or effects on public facilities;*

The proposed stream improvement project would not result in any substantial secondary impacts, such as population changes or effects on public facilities. A positive, but indirect secondary impact of the project is the improvements would help maintain real estate property values for residences located along the stream.

*(7) Involves a substantial degradation of environmental quality;*

The stabilization and erosion protection measures proposed for this project would not degrade environmental quality. These improvements would improve the environmental quality of the stream and its surroundings and would reduce the loss of material from stream banks once permanent erosion protection components are in place.

*(8) Is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions;*

The proposed project is not part of a larger action and would not contribute to cumulative adverse environmental effects on the environment. The stream bed and banks do require periodic maintenance to ensure erosion is kept under control.

*(9) Substantially affects a rare, threatened, or endangered species, or its habitat;*

There were no aquatic resources currently listed or proposed for listing under the Federal or State of Hawai'i endangered species during the course of the in-stream survey. No avian or mammalian species currently listed or proposed for listing under the Federal or State of Hawai'i endangered species statutes were observed or detected during the course of the in-stream survey.

*(10) Detrimentially affects air or water quality or ambient noise levels;*

Short-term impacts on air quality and noise levels would occur during construction. However, when the construction is completed, no long-term effects on air quality and noise level are expected.

Improving and stabilizing Kawa Stream's bed and banks may temporarily increase turbidity in the stream and runoff waters. BMP plans initiated by the design engineer, reviewed and approved by the various regulatory agencies and adapted for site-specific conditions and according to the Contractor's means and methods shall be implemented to minimize the effects of turbidity and other pollutants on the stream.

*(11) Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters;*

The Kawa Stream project site falls within three flood zones as shown in **Figure 4-3**. These areas are the 0.2% Annual Chance Flood Zone (500-year flood), Zone AE for 100-year flood and Zone X which is an area determined to be outside of the 0.2% annual chance floodplain.

*(12) Substantially affects scenic vistas and view planes identified in county or state plans or studies;*

The proposed project would have no adverse effects on scenic vistas or view planes.

*(13) Requires substantial energy consumption.*

The proposed project would not require any substantial energy consumption.

### **7.1 Final Determination**

An Anticipated Finding of No Significant Impact (AFONSI) determination for the proposed project is based upon the information provided in this Draft EA document. The results of the assessments conducted have determined that there would be no “significant” impact in accordance with HRS Chapter 343 from the proposed improvements along Kawa Stream and Ditch in Kāneʻohe, Oʻahu.

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## 8 PERMITS AND APPROVALS

This section lists the anticipated permits and approvals that would be required to improve and stabilize embankments along Kawa Stream and Ditch in Kāneʻohe, Oʻahu.

### 8.1 Permits Required

**Table 8-1. Permits Required**

<b>Permit</b>	<b>Agency Approval</b>
CWA Section 401 Water Quality Certification (WQC)	State of Hawaiʻi Department of Health (HDOH), Clean Water Branch
Department of Army Pre-Construction Notification	U.S. Army Corps of Engineers (USACE)
Coastal Zone Management (CZM) Certification	State of Hawaiʻi Department of Business & Economic Development & Tourism
Stream Channel Alteration Permit (SCAP)	State Department of Land and Natural Resources (DLNR)

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**Appendix A**  
**Terrestrial Biological Resources Survey**

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Terrestrial Biological Resources Survey for the Proposed Kawa Stream Improvements Project

Kaneohe, Oahu, Hawaii

TMK: 4-5-034, 4-5-061, 4-5-063, 4-5-066, 4-5-070, 4-5-084

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October 29, 2014

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## 1.0 INTRODUCTION

The City and County of Honolulu Department of Design and Construction is developing a stream rehabilitation plan for portions of the Kawa Ditch and Kawa Stream in Kaneohe, on the Island of Oahu, Hawaii (Figure 1). Kawa Ditch intersects with Kawa Stream near the center of the project area. The urban stream passes through a residential neighborhood, and the areas planned for rehabilitation are bounded by Mokulele Dr. to the south and east (upstream boundaries), and by Kaneohe Bay Drive to the north (downstream boundary). Most sections in the study area have been heavily modified through channelization, installation of drop structures, and stream bank reinforcement. The prioritized, multi-phased rehabilitation plan includes stabilizing, repairing, and/or reconstructing the streambed and stream banks along most sections of the Kawa Ditch and Kawa Stream for the purpose of flood control, minimizing erosion, as well as enhancing the natural functions of the watercourse. The proposed rehabilitation work is planned to take place over the next several years as funding becomes available.

This report presents the findings of a terrestrial flora and fauna inventory survey of the segments of Kawa Ditch and Kawa Stream proposed for rehabilitation, with a primary focus on Endangered Species Act-listed or otherwise protected species. It is prepared for Oceanit Laboratories, Inc. in support of environmental planning and regulatory permitting purposes.

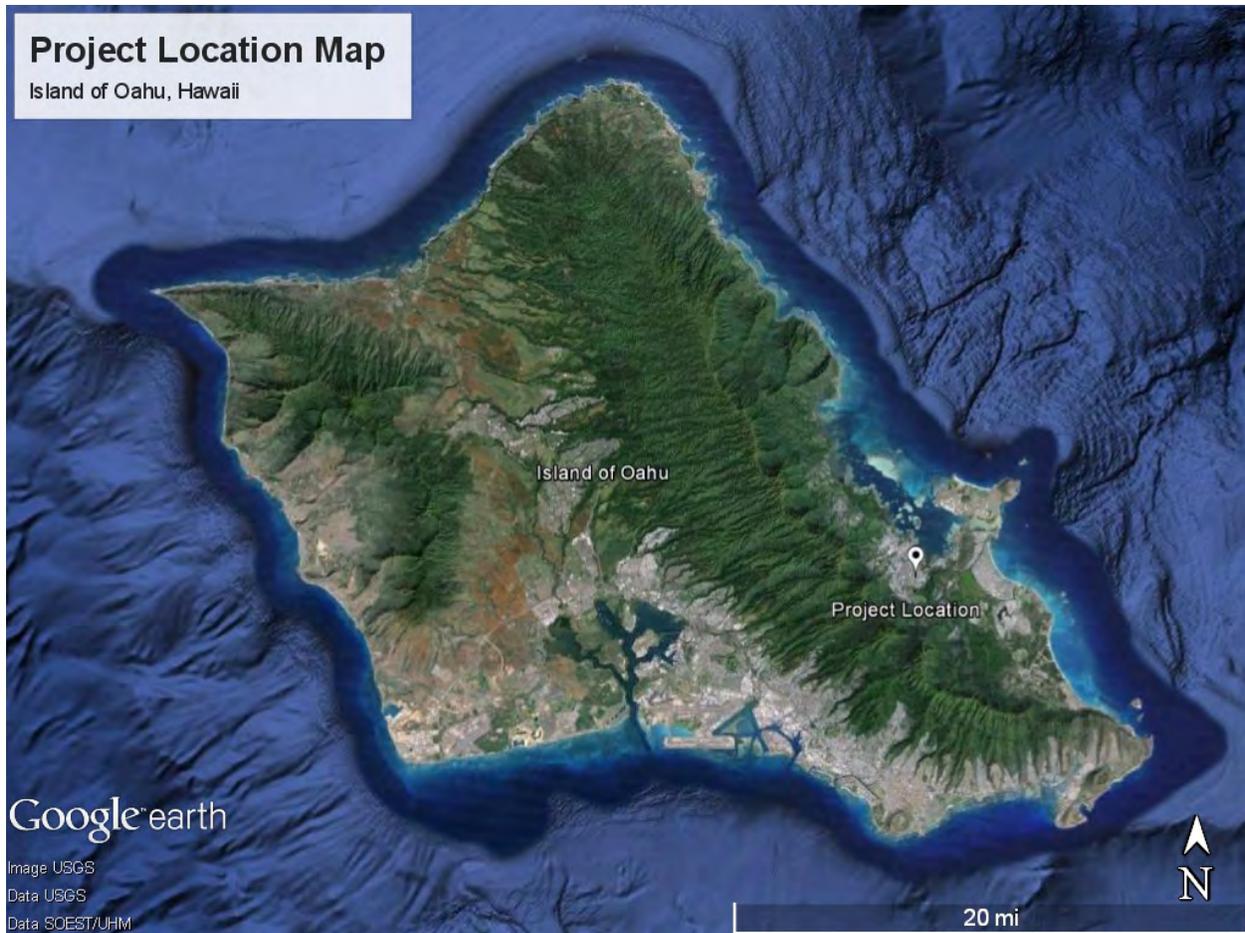
## 2.0 SITE DESCRIPTION

### 2.1 Background

The Kawa Ditch and Kawa Stream rehabilitation project is located in Kaneohe, on the windward side of the island of Oahu, Hawaii. Kawa Stream, and its tributary, Kawa Ditch, drain an approximately 3.3 km<sup>2</sup> watershed bounded by the Kapaa Ridge to the south and east. Kawa Stream and Kawa Ditch converge in, and flow through, the Pikoila subdivision, and past Castle High School. After passing beneath Kaneohe Bay Drive, Kawa Stream flows through the Bay View Golf Course into Kaneohe Bay. The area is relatively wet year-round, receiving an average annual rainfall of approximately 1,500 mm (Giambelluca 2013). At the time of the survey, both Kawa Stream and Kawa Ditch had flowing water, despite only trace amounts (< 2.54 mm/day) of rainfall in the area in the previous 10 days. The most recent rainfall event with greater than 2.54 mm/day occurred on October 7, 2014 (measured at 44-638 Kaneohe Bay Dr.).

Kawa Stream is an approximately 3.6 km (2.25 mi) long perennial stream that originates in the Hawaiian Memorial Park and National Veteran's Cemetery. The stream is variously channelized, lined, or otherwise modified between Mokulele Dr. and Kaneohe Bay drive. The study area begins 240 m downstream of Mokulele Dr., at the end of a vertical walled concrete channel that flows through the Parkway Condominium complex (Figure 2). The study area ends at the Kaneohe Bay Drive bridge.

The approximately 600 m long Kawa ditch is also referred to as the East Branch of the Kawa Stream in some reports. It forms between Nakuluai St. and Lehuuila St., mauka (uphill) of the study area and the first 275 m above Mokulele Dr. are fully lined. For the remainder of Kawa Ditch (below Mokulele Dr.), the stream bottom is unlined, and the stream banks are concrete lined (for the most part), and a service road runs beside the stream to the junction with Kawa Stream.



**Figure 1. Kawa stream terrestrial biological resources survey location.**

The streambed and banks of both Kawa Stream and Kawai Ditch are owned by the City and County of Honolulu. Aside from Castle High School, all the properties adjacent to the stream in the project area are privately owned, single-family homes first developed in the late 1960's. Prior to the residential development of this area in the 1950's, McCurdy et al (2008) reports that the area was subject to decades of heavy use. Pre-contact uses included traditional harvesting and plant cultivation, such as Hala (*Pandanus tectorius*), followed by intensive agriculture (sugar cane and pineapple), and by beef and dairy ranching. The substantial modification of the physical and natural landscape culminated in the approval of the Pikoila subdivision in the late 1960's.

## 2.2 Summary of Previous Biological Resources Studies

A literature search, primarily of reports on file at the DOH, yielded a handful of studies in the vicinity of the project. The most recent study found which encompassed this project's area is a stream bioassessment prepared by Burr (2001), as part of efforts to improve the water quality across the Kawa Stream watershed. The study examined terrestrial vegetation in the riparian zone as well as aquatic plant and animal life. Across all the stations sampled, "only one or two individual specimens of native plants or Polynesian-introductions were found..." giving them a score of "zero for presence of native vegetation." (Burr 2001). The study mentioned that spraying to control vegetation was taking place along sections of

the stream and ditch, and images in the report showed denuded streambanks in areas not already lined with concrete.

Examining water quality issues, in 2002 Oceanit contributed its Total Maximum Daily Load (TMDL) for Kawa Stream report, which examined nutrients and suspended solids. This report formed the basis for the formal publication in June 2005 of the Kawa Stream TMDL by the DOH Environmental Planning Office.

The most recent set of studies come from upstream in the Kawa Watershed, and were conducted for the Final Environmental Impact Statement for the Hawaiian Memorial Park Expansion (2008). Studies included a botanical resources assessment by LeGrande Biological Surveys, Inc. (2006), a terrestrial vertebrate survey by P. Bruner (2006), and an invertebrate survey by S. Montgomery (2008).

While these studies examined areas well outside the project area on overgrown forested land, as the headwaters for the Kawa Stream they were considered for the possibility as a source for plant and animal species. LeGrande Biological Surveys, Inc. concluded that the entire site was a “highly disturbed *Schefflera/Java Plum* forest,” and while 7% of the species encountered were native, their abundance at the site was low. All native species detected are commonly found elsewhere in the islands. Bruner (2006) did not detect any native birds or seabirds, and noted one Pacific Golden Plover or *kolea*, (*Pluvialis.fulva*) on a mowed cemetery lawn. All mammals detected were feral species. Montgomery (2008) concluded that the “few Hawaiian invertebrates observed are widespread in distribution,” none of which were protected species. These conditions persist, as the project for which the studies were conducted has not been built.

### 2.3 Present Conditions

At the time of this study, the Kawa Stream and Kawa Ditch remain an urbanized stream system with private residential properties abutting the crest of the stream bank in many cases. It is also often the case that fence lines form the physical boundary between private property and City & County property in the stream. The observed boundaries may not reflect surveyed property boundaries. In other cases, the boundary is less distinguishable: either overgrown with vegetation, or the transition more or less landscaped. In all cases, plant and animal life exchange across these boundaries. Spraying by the City and County of Honolulu to control vegetation appears to have ceased. “Flood control” and other impervious “erosion control” structures are in various stages of repair, prompting the plans for rehabilitation and consequently this study.

## 3.0 METHODS

### 3.1 Botanical Survey

A pedestrian survey of the project area was conducted on October 17<sup>th</sup>, 2014, and consisted of walking the entire stream course within the project area, examining all areas potentially impacted by the project. The survey area is slightly larger than the proposed footprint of the project, including the fence-lines of adjacent private property and overhanging tree canopies. A Garmin *GPSMAP 62S* handheld GPS unit was used to track and record the survey area and important features (Figure 2).

Where possible, plants were identified to species in the field and abundance qualitatively assessed. Samples were collected for unidentified species requiring further analysis and subsequently identified. Plant names follow Gagne and Cuddihy (1999), Palmer (2003) and Wagner, Herbst and Sohmer (1999).

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### 3.2 Fauna Survey

Owing to the small and narrow project area, observations were made at four avian point count stations on October 17<sup>th</sup>, 2014 (Figure 2). Data were collected for 8 minutes at each of the four stations. A foot survey was conducted for the remainder of the project site. Observations were made with the assistance

**Figure 2. Biological resources survey area for the Kawa Stream Improvements project.**

of Bausch & Lomb 8 X 24 binoculars and by listening for vocalizations. Avian species present, but not detected during the point count survey were noted and tallied separately.

Direct terrestrial vertebrate observation techniques were limited to visual and auditory detection. Indirect observations (scat, tracks and other evidence of presence) were also recorded in a running tally.

Phylogenetic Order and nomenclature for avian species follows the *AOU Check-List of North American Birds* (American Ornithologists' Union 1998), and the 42<sup>nd</sup> through 54<sup>th</sup> Supplements (American Ornithologist's Union 2000, Banks et al. 2002,2003,2004,2005,2006,2007,2008; Chesser et al. 2009,2010,2011,2012,2013). Mammal names follow Tomich 1986. Amphibian and reptile names follow ITIS (2014).

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## 4.0 RESULTS

### 4.1 General Habitat Observations

Habitat in the survey area can be roughly broken down into four categories: aquatic, open canopy heavily overgrown streambank, streambank with high overstory and limited understory, and residents' yards.

The aquatic habitat was not examined as part of this study, however the stream width, depth, construction, and slope of streambank influence the degree to which vegetation intrudes upon the waterway. Vegetation-free surface flow (of varying widths) was visible along all sections surveyed. Waterbirds tended to congregate areas where the open water was at its widest (up to 5 meters), especially around the largest concrete drop structures.

In open areas without canopy-forming trees, the streambank is heavily overgrown with non-native, invasive species. In the upper reaches, the dominant species was Guinea grass (*Megathyrsus maximus*) on higher ground, growing to over 2 meters, with California grass (*Urochloa mutica*) closer to water. In the lower reaches Guinea grass and California grass remain, but Job's tears (*Coix lacryma-jobi*) is more common near the water.

A few stream sections have a closed or semi-closed high canopy formed by non-native invasive, and non-native ornamental trees, primarily Java Plum (*Syzygium cumini*). Low-growing, shade tolerant, mostly non-native species grow on the streambanks in the understory.

Adjacent yards variously influence the habitat in the survey area. For example, properties that clear vegetation to the crest of the streambank and have no shade-forming trees tended to have overgrown streambanks, while those with trees that contribute to the overstory tended to have less grass-dominated streambanks. With the exception of one property, no plantings were native. Fruit bearing trees were common.

### 4.2 Botanical Survey

One hundred sixty-nine (169) plant species were identified in the survey area. Of these, seven (4%) are indigenous, and four (2%) are endemic. Of the four endemic species, only the *Cibotium chamissoi*, a tree fern, appeared naturally established (not from cultivation and planted in a yard). Appendix B contains a complete list of plant species detected.

No federally listed threatened or endangered plant species were observed while undertaking the survey. Eleven (11) non-endangered endemic and indigenous plant species were observed. Two indigenous ferns *Ptilotum nudum* and *Nephrolepis exaltata* were observed along with several indigenous Angiosperm species, including: *Waltheria indica*, *Mucuna gigantea subsp. gigantea* and *Cyperus polystachyos*. The grass species, *Paspalum scrobiculatum*, was also observed. The origins of this taxon in Hawaii are presently unknown and it is occasionally considered indigenous.

The vegetation in the survey area forms a relatively homogenous vegetation assemblage and therefore cannot be easily segregated into true vegetation zones. Overall, the vegetation community is dominated by invasive and introduced plant species. In open areas immediately adjacent to the stream, the introduced grasses Job's tears (*Coix lacrymal-jobi*), Guinea grass (*Megathyrsus maximus*) and California or Para grass (*Urochloa mutica*) dominate. The invasive ground cover species, *Wedelia trilobata*, was also common on open banks. In places where trees and buildings provide shade, the lianas, *Paederia foetida*

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and *Epipremnum pinnatum* dominate the understory vegetation. A canopy of introduced trees occurs along sections of the stream banks. The most common species were: *Aleurites moluccanus*, *Mangifera indica*, *Persea americana*, *Samanea saman*, *Schefflera actinophylla*, *Spathodea campanulata* and *Syzygium cumini*.

Given that the stream is located in a residential area, many of the plant species that were observed had either escaped directly from nearby house lots or appear to have been planted along the stream bank (See Appendix B). Plant species that had likely naturalized from gardens included species such as: *Alpinia purpurata*, *Morinda citrifolia*, *Musa x paradisiaca* and *Russelia equisetiformis*. Plant species that were clearly being cultivated by property owners along the stream banks are identified as “cultivated” in Appendix B. These included several native plant species (*Hibiscus arnottianus*, *Metrosideros polymorpha*, *Psydrax odorata*) that were planted on the edge of the stream bank at one property.

Confirming the observations in the Burr (2001) bioassessment that crews were clearing the stream of vegetation, one neighbor encountered during the survey stated that crews previously used to control vegetation on the stream bank behind her home, but no longer do so.

Confirming implementation of a no-spray recommendation made in the Burr (2001) bioassessment, a City & County of Honolulu maintenance crew encountered during the survey also stated that they were no longer permitted to use herbicides and were observed using hand-tools and equipped to use small motorized tools. They also confirmed that the day before (October 16<sup>th</sup>, 2014), a tractor-mower had mowed the access road along Kawa Ditch to the junction of the ditch and stream, as well as the access road from Kaneohe Bay drive along the stream fronting Castle High School to the inlet of a dry swale.

### 4.3 Fauna Survey

#### 4.3.1 Avian Survey

During the avian survey of the project site, 207 individual birds of 13 different species were encountered. Of those, 77 individuals, representing nine species were observed during the four point counts (Table 1).

Ten families of birds were represented at the site. Two Black Crowned Night Herons (*Nycticorax nycticorax*) encountered near the edges of open areas were the only indigenous species detected. Zebra Doves (*Geopelia striata*) and Rock Pigeons (*Columba livia*) were the most common species observed at the site. This included a flyover of a flock of over 50 pigeons early in the survey from a neighboring property where feeding likely takes place.

#### 4.3.2 Mammal Survey

Evidence of rat (*Rattus sp.*) activity in the form of bite marks on a fallen avocado was the only sign of mammal activity detected in during the surveys. Several pet dogs were observed confined to private properties adjacent to the survey area.

#### 4.3.3 Other Observations

Though not a focus of this survey, Brown anole (*Anolis sagrei*) lizards were abundant in grassy areas, with greater than 10 observed. In addition, six cane toads (*Rhinella marina*, formerly *Bufo marinus*) were flushed from hiding during the course of the surveys. Both are introduced pest species.

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**Figure 3. View of Kawa Stream facing downstream from above Namoku Street.**

## **5.0 DISCUSSION**

### **5.1 Botanical Resources**

The survey did not reveal any botanical resources of notable value or worthy of consideration for conservation or protective measures. While the survey methods differed from that of Burr's (2001) bioassessment, the conclusions of this study are essentially the same.

Consideration, however, should be given to the ecosystem services, such as erosion control, which the present vegetation cover is providing, and that future projects strive to at a minimum replace these beneficial functions.

### **5.2 Faunal Resources**

#### **5.2.1 Avian**

Avian abundance and diversity at the project location are in line with the habitat in and around the project area. Of the 13 species encountered during this survey, only the Black Crowned Night Heron, is indigenous.

**Table 1. Avian species detected during the Biological Resources Survey for Kawa Stream Improvements.**

Common Name	Scientific Name	Status*	Count**	# of Stations	RA <sup>+</sup>	Note
<b>ANSERIFORMES</b>						
ANATIDAE - Ducks, Geese & Swans						
Mallard	<i>Anas platyrhynchos</i>	A	2	1	0.03	[1]
	<i>Anas sp.</i>					[2]
<b>GALLIFORMES</b>						
PHASIANIDAE - Pheasants & Chickens						
Chicken	<i>Gallus Gallus domesticus</i>	A				[3]
<b>PELECANIFORMES</b>						
ARDEIDAE - Herons						
Cattle Egret	<i>Bubulcus ibis</i>	A	1	1	0.01	[1]
Black Crowned Night Heron	<i>Nycticorax nycticorax</i>	I				[1][4]
<b>COLUMBIFORMES</b>						
COLUMBIDAE - Pigeons & Doves						
Rock Pigeon	<i>Columba livia</i>	A	17	4	0.22	[5]
Zebra Dove	<i>Geopelia striata</i>	A	17	4	0.22	
<b>PASSERIFORMES</b>						
PYCNONOTIDAE - Bulbuls						
Red-vented Bulbul	<i>Pycnonotus cafer</i>	A	14	4	0.18	
MUSCICAPIDAE - Old World flycatchers						
White Rumped Shama	<i>Copsychus malabaricus</i>	A				[6]
STURNIDAE - Starlings						
Common Myna	<i>Acridotheres tristis</i>	A	2	1	0.03	
CARDINALIDAE - Cardinals, Saltators, & Allies						
House Finch	<i>Haemorhous mexicanus</i>	A	3	1	0.04	[1]
PASSERIDAE - Old World Sparrows						
House Sparrow	<i>Passer domesticus</i>	A	10	3	0.13	
ESTRILDIDAE - Waxbills						
Common Waxbill	<i>Estrilda astrild</i>	A	11	3	0.14	

\* Status: A - Alien, I - Indigenous, N - Native, E - Endemic, V - Visitor

\*\* Count: Number of individuals encountered at four point count stations

<sup>+</sup> RA: Relative Abundance across four point count stations

[1] Protected under the Migratory Bird Treaty Act

[2] One domesticated hybrid individual observed mingling with mallards.

[3] Hen observed upstream of project area in Kawa ditch.

[4] Two individuals observed roosting at edge of clear area.

[5] A flock of 50+ individuals over-flew the survey area, but not during point count periods.

[6] Two individuals observed outside of point count periods.

A cosmopolitan species, Black Crowned Night Heron are often found at the edges of ponds, ditches and wetlands standing motionless trying to catch their prey. They perch in trees near open water areas when not feeding. Populations in the main Hawaiian islands are considered stable. While there are no active management programs specific to conservation of this species, primary threats include loss of habitat (shallow open water areas) and predators (cats, dogs, mongoose, cattle egrets and barn owls). (Mitchell *et al* 2005).

The ground nesting Hawaiian short-eared owl, *pueo* (*Asio flammeus sandwichensis*) is listed by the State as endangered on Oahu only. Even though the Hawaiian short-eared owl was not observed in the project area, the likelihood that it occurs in or near the project area is low given the abundance of predators, and lack of open habitat. Efforts to enhance the survival of this species are taking place in protected areas outside the urban environment (Mitchell *et al* 2005).

The threatened Newell's Shearwater (*Puffins auricularis newelli*) was not detected in this survey, nor was suitable nesting habitat observed in or around the project site. It is a pelagic seabird species unlikely to over-fly the project area, and if so, only between the months of May and early December. This bird nests at high altitudes in the mountains transiting to sea in the evening, and returning to nesting sites early in the morning. The primary threat to this species is believed to be predation by non-native mammals at nesting colonies, with collision with man-made structures the second leading contributor to mortality. Disorientation due to exterior lighting contributes to this nocturnally-flying species' collisions with man-made structures. (Ainley *et al* 2007, Melgar 2002)

## 5.2.2 Mammals

The mammal species observed during the survey are in keeping with the general project site habitat and surrounding areas. Fallen fruits gnawed by rats were observed. Roof rats (*Rattus r. rattus*), Norway rats (*Rattus norvegicus*), Polynesian rats (*Rattus exulans*) are likely ubiquitous. Given the habitat characteristics and surrounding urban environment, in addition to the rat detection, Indian Mongoose (*Herpestes javanicus*), cats (*Felis catus*), and mice (*Mus musculus domesticus*) are likely present. However no observations, direct or indirect, of these species were made during the survey. Several dogs were observed confined in adjacent yards. No signs other large vertebrates (i.e. pigs, or goats) were observed, though they may, on rare occasion, occur.

The endangered Hawaiian hoary bat (*Lasiurus cenerus semotus*) was not detected during the survey, though a remote possibility exists that the species could make limited, seasonal use of the project area for foraging (Menard 2001). Further, the urbanized, degraded habitat in and around the project are not optimal pupping and roosting habitat. The taller, canopy-forming trees such as Java plum, mango, Chinese banyan, and other fruit trees may offer sufficient daytime roosting habitat (Menard 2001, Mitchell *et al* 2005, Pinzari 2014).

## 5.3 Potential Impacts to Protected Species

### 5.3.1 Flora

No plant species identified in the survey are currently protected or proposed for protection under Federal or State endangered species programs (DLNR 1997, USFWS 2010a, USFWS 2014a).

### 5.3.2 Fauna

#### 5.3.2.1 *Newell's Shearwater*

The Newell's Shearwater is listed as Threatened under the Endangered Species Act (ESA) (DLNR 1998, USFWS 2010, USFWS 2014a). At most, the proposed project may present a potential for disorientation of Newell's Shearwaters caused by exterior lighting associated with construction. To minimize the possibility for interactions between this nocturnal flying species, it is recommended that as little lighting be employed during construction and that all fixtures be shielded and downward-angled.

#### 5.3.2.2 *Hawaiian Short-eared Owl (Pueo)*

The Hawaiian short-eared owl, *pueo* is listed by the State as endangered on Oahu only (DLNR 1998). It prefers open grassland (Denny 2010, Bonaccorso 2011). Impacts of this project are unlikely as this species may, on a rare occasion, forage in parts of the project area.

#### 5.3.2.3 *Migratory Bird Treaty Act Protect Species*

Several species detected during the surveys are protected under the Migratory Bird Treaty Act (MBTA). Mallards are protected under the MBTA, but are also considered a serious threat to the recovery of the endangered Koloa due to hybridization (Mitchell *et al* 2005). Though relatively common, the indigenous black crowned night heron, cattle egret and house finch are also protected under the MBTA.

Impacts, if any, to these species are most likely to occur during construction. Efforts should be made to minimize/avoid actions that may harass or injure birds. Special permits are required if take or possession is necessary.

#### 5.3.2.4 *Hawaiian Hoary Bat*

The Hawaiian Hoary Bat is listed as Endangered under the ESA (USFWS 2010, USFWS 2014a). The likelihood of project actions having any impact on this species is very small. Clearing of woody vegetation greater than 15 ft. tall is the project's primary potential impact, if any. To avoid impacts, the project should refrain from clearing trees above 15 feet in height for construction between June 1 and September 15, which is the period when a slight possibility exists that Hawaiian hoary bat juveniles may occur in the project area, and may not be able to escape a tree being felled.

### 5.3.3 Critical Habitat

No critical habitat is present in our in the vicinity of the project site, based on review of data in the United States Fish (USFWS) and Wildlife Service's Critical Habitat Portal (USFWS 2014).

### 5.3.4 Wetlands

While the study did not conduct a formal wetland investigation, the combination of indicators required for a United States Army Corps of Engineers jurisdictional wetland (vegetation, hydrology and soils) were absent from the survey area. Perennial flow, steep banks, and other modifications of the watercourse did not appear to be conducive to the formation of jurisdictional wetlands. The National Wetlands Inventory maintained by the USFWS does not list any wetlands in the project area (USFWS 2014b).

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**APPENDIX A.        SITE PHOTOGRAPHS**



Photo 1. View of Kawa Ditch facing downstream from Mokulele Dr. Note the service road that was recently mowed.

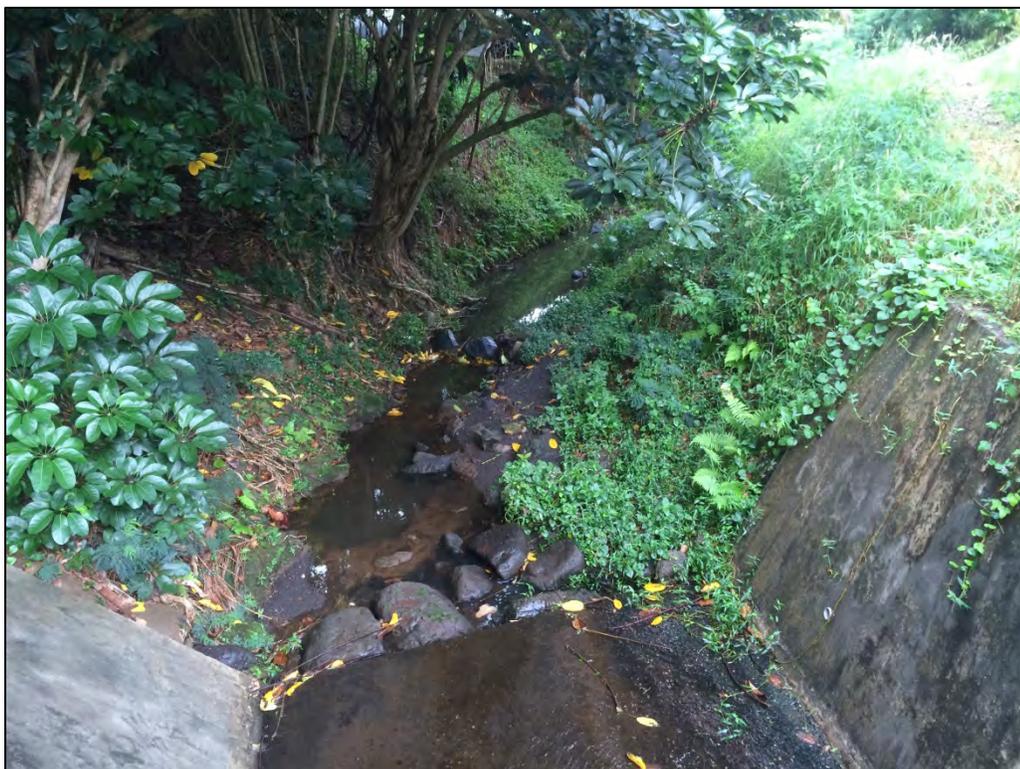


Photo 2. View of Kawa Ditch facing downstream from service road bridge.



Photo 3. View facing downstream of the junction of Kawa Ditch and Kawa Stream (coming in from the far left), and the end of the service road.



Photo 4. View of Kawa Stream facing upstream, just upstream of the junction.



Photo 5. View of Kawa Stream facing downstream from located between Mokulele Dr. and Namoku St. Example of understory on stream banks when there is a mostly-closed canopy.

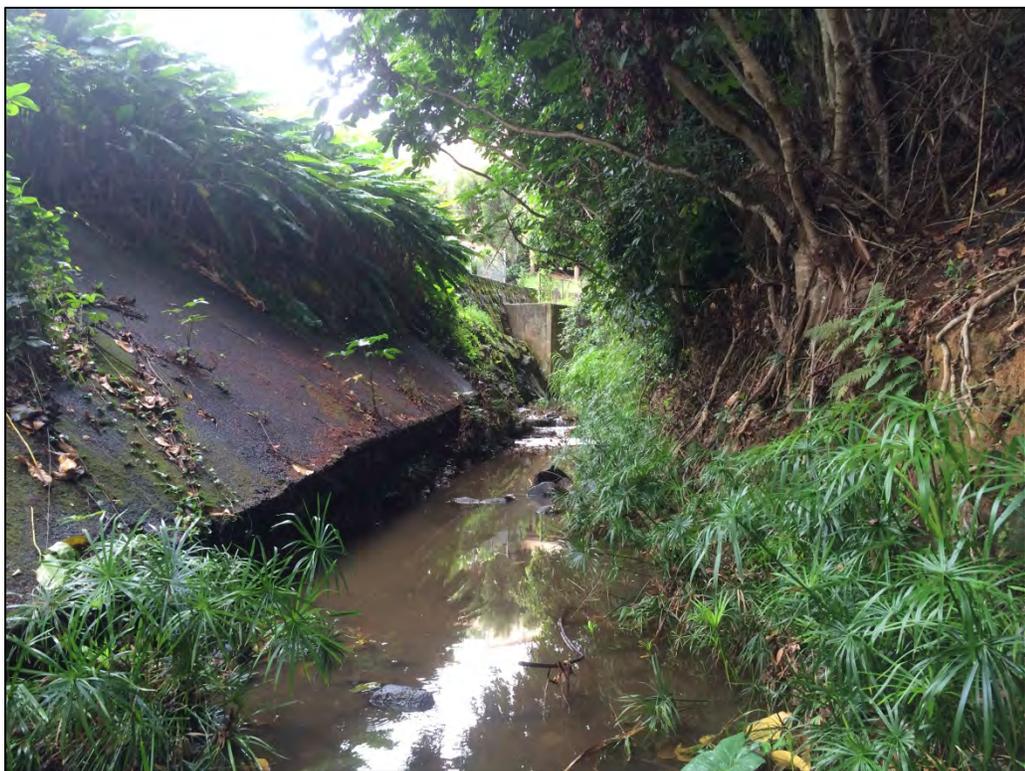


Photo 6. View of the upstream limit of the survey along Kawa Stream.



Photo 7: View facing downstream of Kawa Stream a short distance downstream of the confluence with Kawa Ditch.



Photo 8. View facing downstream of Kawa Stream part way between the confluence and Kaneohe Bay Dr.



Photo 9. View of Kawa Stream facing downstream from the lower half of the reach between the confluence and Kaneohe Bay Drive.



Photo 10. View of Kawa Stream before it turns and passes beneath Kaneohe Bay Dr. Note the recently mowed service road on the left.

**APPENDIX B. PLANT SPECIES LIST**

Common Name	Scientific Name	Status	Occurrence *	Note
<b>FERNS &amp; FERN ALLIES</b>				
	ATHYRIACEAE			
Vegetable fern	<i>Diplazium esculentum</i>	Introduced	Occasional	
	CIBOTIACEAE			
Hapuu	<i>Cibotium chamissoi</i>	Endemic	Occasional	
	DAVALLIACEAE			
	<i>Davallia sp.</i>	Introduced (Cultivated)	Rare	
	NEPHROLEPIDACEAE			
	<i>Nephrolepis brownii</i>	Introduced	Rare	
Sword fern	<i>Nephrolepis exaltata</i>	Indigenous	Occasional	
	POLYPODIACEAE			
Maile-scented fern	<i>Phymatosorus grossus</i>	Introduced	Occasional	
Elkhorn fern	<i>Platyterium bifurcatum</i>	Introduced (Cultivated)	Rare	
	PSYLOTACEAE			
Whisk fern	<i>Psilotum nudum</i>	Indigenous	Occasional	
	PTERIDACEAE			
Delta maidenhar fern	<i>Adiantum raddianum</i>	Introduced	Occasional	
	THELYPTERIDACEAE			
	<i>Christella parasitica</i>	Introduced	Common	
	<i>Cyclosorus parasiticus</i>	Introduced	Common	
<b>MONOCOTYLEDONES</b>				
	ARACEAE			
Wild taro	<i>Colocasia esculenta</i>	Introduced	Occasional	
Arrowhead vine	<i>Syngonium podophyllum</i>	Introduced	Rare	
	<i>Dieffenbachia species</i>	Introduced	Rare	
Elephant ear	<i>Xanthosoma robustum</i>	Introduced	Rare	
Golden pothos	<i>Epipremnum pinnatum</i>	Introduced	Abundant	
Fernleaf philodendron	<i>Philodendron pinnatifidum</i>	Introduced	Rare	
	<i>Philodendron sp.</i>	Introduced	Rare	
	ARECACEAE			
Coconut palm	<i>Cocos nucifera</i>	Introduced	Common	
Fan palm	<i>Pritchardia sp.</i>	Possibly endemic (Cultivated)	Rare	
Manila palm	<i>Adonidia merrillii</i>	Introduced (Cultivated)	Rare	
Areca palm	<i>Dyopsis lutescens</i>	Introduced	Rare	
	ASPARAGACEAE			
Lion's tail	<i>Agave attenuata</i>	Introduced (Cultivated)	Rare	

Common Name	Scientific Name	Status	Occurrence*	Note
ASPARAGACEAE (cont'd)				
Asparagus	<i>Asparagus densiflorus</i>	Introduced	Rare	
Ti	<i>Cordyline fruticosa</i>	Introduced	Occasional	
Dragon tree	<i>Dracaena reflexa</i> cultivar	Introduced (Cultivated)	Rare	
Corn plant	<i>Dracaena fragrans</i> cultivar	Introduced (Cultivated)	Rare	
Mother-in-law's tongue	<i>Sansevieria trifasciata</i>	Introduced	Rare	
BROMELIACEAE				
	<i>Aechmea blanchetiana</i>	Introduced (Cultivated)	Rare	
COMMELINACEAE				
Benghal dayflower	<i>Commelina diffusa</i>	Introduced	Occasional	
Oyster plant	<i>Tradescantia spathacea</i>	Introduced	Rare	
Wandering Jew	<i>Tradescantia zebrina</i>	Introduced	Rare	
CYPERACEAE				
Slimjim flatsedge	<i>Cyperus gracilis</i>	Introduced	Rare	
Umbrella plant	<i>Cyperus involucreatus</i>	Introduced	Occasional	
Purple nutsedge, kili'o'opu	<i>Cyperus rotundus</i>	Introduced	Occasional	
Manyspike flatsedge	<i>Cyperus polystachyos</i>	Indigenous	Occasional	
Canada spikesedge	<i>Eleocharis geniculata</i>	Introduced	Occasional	
Whitehead spikesedge	<i>Kyllinga nemoralis</i>	Introduced	Occasional	
HELICONEACEAE				
Macaw flower	<i>Heliconia bihai</i> cultivar	Introduced (Cultivated)	Rare	
Expanded lobster claw	<i>Heliconia latispatha</i>	Introduced	Occasional	
	<i>Heliconia sp.</i>	Introduced (Cultivated)	Rare	
IRIDACEAE				
Bicolor iris	<i>Dietes bicolor</i>	Introduced (Cultivated)	Rare	
MUSACEAE				
Banana	<i>Musa x paradisiaca</i>	Introduced	Occasional	
ORCHIDACEAE				
Orchid	<i>Bulbophyllum sp.</i>	Introduced (Cultivated)	Rare	
POACEAE				
Fingergrass	<i>Chloris barbata</i>	Introduced	Common	
Job's tears	<i>Coix lachrymal-jobi</i>	Introduced	Common	[1]
Lovegrass	<i>Eragrostis tenella</i>	Introduced	Occasional	
Centipede grass	<i>Eremochloa ophiuroides</i>	Introduced (Cultivated)	Occasional	
Guinea grass	<i>Megathyrsus maximus</i>	Introduced	Abundant	[1]
Natal Redtop	<i>Melinis repens</i>	Introduced	Occasional	
Hilo grass	<i>Paspalum conjugatum</i>	Introduced	Common	

Common Name	Scientific Name	Status	Occurrence*	Note
	POACEAE (cont'd)			
Kodo millet	<i>Paspalum scrobiculatum</i>	Indigenous?	Occasional	
Fishpole bamboo	<i>Phyllostachys aurea</i>	Introduced (Cultivated)	Rare	
Glenwood grass	<i>Sacciolepis indica</i>	Introduced	Occasional	
California grass, para grass	<i>Urochloa mutica</i>	Introduced	Common	[1]
	STRELITZIACEAE			
White Bird of Paradise	<i>Strelitzia nicolai</i>	Introduced (Cultivated)	Rare	
	ZINGIBERACEAE			
Red ginger	<i>Alpinia purpurata</i>	Introduced	Occasional	
White ginger, awapuhi	<i>Hedychium coronarium</i>	Introduced	Rare	
<b>DICOTYLEDONES</b>				
	ACANTHACEAE			
Chinese violet	<i>Asystasia gangetica</i>	Introduced	Occasional	
Shrubby whitevein	<i>Sanchezia speciosa</i>	Introduced (Cultivated)	Rare	
Caricature plant	<i>Graptophyllum pictum</i>	Introduced (Cultivated)	Rare	
	AMARANTHACEAE			
Green amaranth	<i>Amaranthus viridis</i>	Introduced	Rare	
	AMARYLLIDACEAE			
Poison bulb	<i>Crinum asiaticum</i>	Introduced	Rare	
	ANACARDIACEAE			
Mango	<i>Mangifera indica</i>	Introduced (Cultivated)	Occasional	
	ANNONACEAE			
Custard apple	<i>Annona reticulata</i>	Introduced (Cultivated)	Rare	
	APIACEAE			
Marsh parsley	<i>Cyclospermum leptophyllum</i>	Introduced	Occasional	
	APOCYNACEAE			
	<i>Plumeria pudica</i>	Introduced	Rare	
	<i>Plumeria rubra</i>	Introduced (Cultivated)	Rare	
	ARALIACEAE			
Octopus tree	<i>Schefflera actinophylla</i>	Introduced	Common	
Aralia	<i>Polyscias scutellaria</i>	Introduced	Rare	
	ARAUCARIACEAE			
Cook pine	<i>Araucaria columnaris</i>	Introduced (Cultivated)	Rare	
	ASTERACEAE			
Chick weed	<i>Ageratum conyzoides</i>	Introduced	Occasional	

Common Name	Scientific Name	Status	Occurrence*	Note
ASTERACEAE (cont'd)				
Beggar's ticks	<i>Bidens pilosa</i>	Introduced	Common	
Straggler daisy	<i>Calyptocarpus vialis</i>	Introduced	Occasional	
Horseweed	<i>Conyza canadensis</i>	Introduced	Occasional	
Little ironweed	<i>Cyanthillium cinereum</i>	Introduced	Occasional	
Florida tasselflower	<i>Emilia fosbergii</i>	Introduced	Occasional	
Bellorita	<i>Erigeron bellioides</i>	Introduced	Rare	
Nodeweed	<i>Synedrella nodiflora</i>	Introduced	Common	
Dandelion	<i>Taraxacum officinale</i>	Introduced	Occasional	
Wedelia	<i>Wedelia trilobata</i>	Introduced	Abundant	[1]
Oriental false hawkbeard	<i>Youngia japonica</i>	Introduced	Occasional	
BALSAMINACEAE				
Impatiens	<i>Impatiens sodenii</i>	Introduced	Rare	
BIGNONEACEAE				
Jacaranda	<i>Jacaranda mimosifolia</i>	Introduced (Cultivated)	Rare	
African tulip tree	<i>Spathodea campanulata</i>	Introduced	Common	
BORAGINACEAE				
Scorpionbush	<i>Carmona retusa</i>	Introduced	Rare	
CANNABACEAE				
Oriental trema	<i>Trema orientalis</i>	Introduced	Rare	
CANNACEAE				
Canna lily	<i>Canna sp.</i>	Introduced	Rare	
CARICACEAE				
Papaya	<i>Carica papaya</i>	Introduced (Cultivated)	Rare	
CARYOPHYLLACEAE				
Chickweed	<i>Drymaria cordata var. pacifica</i>	Introduced	Occasional	
CLUSIACEAE				
Autograph tree	<i>Clusia rosea</i>	Introduced	Rare	
COMBRETACEAE				
Tropical almond	<i>Terminalia catappa</i>	Introduced	Rare	
CONVOLVULACEAE				
Water spinach	<i>Ipomoea aquatica</i>	Introduced	Occasional	
Obscure morning glory	<i>Ipomoea obscura</i>	Introduced	Abundant	
Aiea morning glory	<i>Ipomoea triloba</i>	Introduced	Abundant	
Wood rose	<i>Merremia tuberosa</i>	Introduced	Rare	
CUCURBITACEAE				
Ivy gourd	<i>Coccinia grandis</i>	Introduced	Abundant	
Balsam-pear	<i>Momordica charantia</i>	Introduced	Common	
EUPHORBIACEAE				
Kukui	<i>Aleurites moluccanus</i>	Introduced	Occasional	
Pillpod sandmat	<i>Euphorbia hirta</i>	Introduced	Occasional	

Common Name	Scientific Name	Status	Occurrence*	Note
EUPHORBIACEAE (cont'd)				
Graceful spurge	<i>Euphorbia hypericifolia</i>	Introduced	Occasional	
Hyssopleaf sandmat	<i>Euphorbia hyssopifolia</i>	Introduced	Occasional	
Ground spurge	<i>Euphorbia prostrata</i>	Introduced	Occasional	
Parasol leaf tree	<i>Macaranga tanarius</i>	Introduced	Rare	
Cassava, manioc	<i>Manahot esculenta</i>	Introduced	Rare	
Castor bean	<i>Ricinus communis</i>	Introduced	Rare	
FABACEAE				
Ohai alii	<i>Caesalpinia pulcherrima</i>	Introduced (Cultivated)	Rare	
Maunaloa	<i>Canavalia cathartica</i>	Introduced	Occasional	
Partridge pea	<i>Chamaecrista nictitans subsp. patellaria var. glabrata</i>	Introduced	Occasional	
Shakeshake	<i>Crotalaria incana</i>	Introduced	Occasional	
oyal poinciana	<i>Delonix regia</i>	Introduced (Cultivated)	Rare	
Pigeon bundleflower	<i>Desmanthus pernambucanus</i>	Introduced	Occasional	
Dixie ticktrefoil	<i>Desmodium tortuosum</i>	Introduced	Occasional	
Albizia	<i>Falcataria moluccana</i>	Introduced	Rare	
Haole koa	<i>Leucaena leucocephala</i>	Introduced	Abundant	
Kiawe	<i>Prosopis pallida</i>	Introduced	Common	
Needlebush	<i>Acacia farnesiana</i>	Introduced	Occasional	
Purple bush-bean	<i>Macroptilium atropurpureum</i>	Introduced	Rare	
Australian pea	<i>Lablab purpureus</i>	Introduced	Occasional	
Creeping indigo	<i>Indigofera spicata</i>	Introduced	Occasional	
Indigobush	<i>Indigofera suffruticosa</i>	Introduced	Occasional	
Sensitive plant	<i>Mimosa pudica var unijuga</i>	Introduced	Occasional	
Seabean	<i>Mucuna gigantea subsp. gigantea</i>	Indigenous	Occasional	
Raintree	<i>Samanea saman</i>	Introduced (Cultivated)	Occasional	
GENTIANACEAE				
Pua keni keni	<i>Fagraea berteriana</i>	Introduced	Rare	
LAMIACEAE				
	<i>Clerodendrum buchananii var. fallax</i>	Introduced	Rare	
Comb hyptis	<i>Hyptis pectinata</i>	Introduced	Occasional	
LAURACEAE				
Avocado	<i>Persea americana</i>	Introduced	Occasional	
MALVACEAE				
Ma'ō	<i>Abutilon incanum</i>	Indigenous	Rare	
-	<i>Abutilon grandiforum</i>	Introduced	Rare	
Koki'o ke'oke'o	<i>Hibiscus arnottianus</i>	Endemic (Cultivated)	Rare	
Hibiscus	<i>Hibiscus sp.</i>	Introduced (Cultivated)	Occasional	

Common Name	Scientific Name	Status	Occurrence*	Note
	MALVACEAE (cont'd)			
	Unidentified Malvaceae sp.	Introduced (Cultivated)	Rare	
False mallow	<i>Malvastrum coromandelianum</i> subsp. <i>coromandelianum</i>	Introduced	Occasional	
Bracted fanpetals	<i>Sida ciliaris</i>	Introduced	Occasional	
'Ilima	<i>Sida fallax</i>	Indigenous	Rare	
	MELASTOMATACEAE			
Pinkfringe	<i>Arthrostemma ciliatum</i>	Introduced	Rare	
Koster's curse	<i>Clidemia hirta</i>	Introduced	Occasional	
Pinklady	<i>Heterotic rotundifolia</i>	Introduced	Occasional	
	MELIACEAE			
Indian lilac	<i>Azadirachta indica</i>	Introduced (Cultivated)	Rare	
	MORACEAE			
Breadfruit	<i>Artocarpus altilis</i>	Introduced	Rare	
Chinese banyan	<i>Ficus microcarpa</i>	Introduced	Occasional	
	MORINGACEAE			
Horseradish tree	<i>Moringa oleifera</i>	Introduced	Rare	
	MYRTACEAE			
Paper bark tea tree	<i>Melaleuca quinquenervia</i>	Introduced	Occasional	
Ohia	<i>Metrosideros polymorpha</i>	Endemic (Cultivated)	Rare	
Strawberry guava	<i>Psidium cattleianum</i>	Introduced	Rare	
Common guava	<i>Psidium guajava</i>	Introduced	Rare	
Java plum	<i>Syzygium cumini</i>	Introduced	Occasional	[1]
Mountain apple	<i>Syzygium malaccense</i>	Introduced	Occasional	
	NYCTAGINACEAE			
Hogweed	<i>Boerhavia coccinea</i>	Introduced	Occasional	
Bougainvillea	<i>Bougainvillea spectabilis</i>	Introduced	Rare	
	OCHNACEAE			
Mickey-mouse plant	<i>Ochna thomasiiana</i>	Introduced	Rare	
	ONAGRACEAE			
Mexican primrose-willow	<i>Ludwigia octovalvis</i>	Introduced	Abundant	
Marsh seedbox	<i>Ludwigia palustris</i>	Introduced	Occasional	
	OXALIDACEAE			
Yellow wood sorrel	<i>Oxalis corniculata</i>	Introduced	Occasional	
Pink wood sorrel	<i>Oxalis debilis</i> var. <i>corymbosa</i>	Introduced	Occasional	
	PHYLLANTHACEAE			
Darkleaf phyllanthus, niruri	<i>Phyllanthus debilis</i>	Introduced	Occasional	
	PHYTOLACCACEAE			
Pigeonberry	<i>Rivina humilis</i>	Introduced	Common	
	PLANTAGINACEAE			
Narrowleaf plantain	<i>Plantago lanceolata</i>	Introduced	Occasional	

Common Name	Scientific Name	Status	Occurrence*	Note
	PLANTAGINACEAE (cont'd)			
Broadleaf plantain	<i>Plantago major</i>	Introduced	Occasional	
Fountainbush	<i>Russelia equisetiformis</i>	Introduced	Rare	
	RUBIACEAE			
Flat-top mille grains	<i>Oldenlandia corymbosa</i>	Introduced	Rare	
Creeping bluet	<i>Oldenlandiopsis callitrichoides</i>	Introduced	Rare	
Noni	<i>Morinda citrifolia</i>	Introduced	Occasional	
Skunkvine	<i>Paederia foetida</i>	Introduced	Abundant	
Egyptian starcluster	<i>Pentas lanceolata</i>	Introduced	Rare	
Alahe'e	<i>Psydrax odorata</i>	Indigenous (Cultivated)	Rare	
Woodland false buttonweed	<i>Spermacoce assurgens</i>	Introduced	Occasional	
	RUTACEAE			
	<i>Citrus sp.</i>	Introduced (Cultivated)	Occasional	
Orange jessamine	<i>Murraya paniculata</i>	Introduced	Rare	
	SAPINDACEAE			
Fern tree	<i>Filicium decipiens</i>	Introduced	Occasional	
Lychee	<i>Litchi chinensis</i>	Introduced (Cultivated)	Rare	
	SCROPHULARIACEAE			
Dogtail	<i>Buddleja asiatica</i>	Introduced	Occasional	
	SOLANACEAE			
Prickly solanum	<i>Solanum torvum</i>	Introduced	Rare	
	STERCULIACEAE			
'Uhaloa	<i>Waltheria indica</i>	Indigenous	Occasional	
	URTICACEAE			
Rockweed	<i>Pilea microphylla</i>	Introduced	Common	
	VERBENACEAE			
Fiddlewood	<i>Citharexylum caudatum</i>	Introduced	Occasional	

Notes:

\* Occurrence = how often detected during this survey.

[1] Dominant, vegetation-defining species

**Appendix B**  
**Archaeological Inventory Survey**

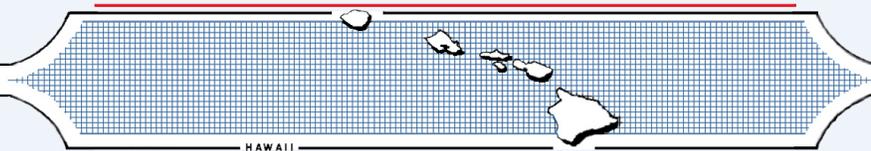
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**AN ARCHAEOLOGICAL INVENTORY SURVEY FOR THE  
PROPOSED KAWA STREAM AND DITCH IMPROVEMENT  
PROJECT IN KĀNE`OHE AHUPUA`A, KO`OLAUPOKO  
DISTRICT, ISLAND OF O`AHU, HAWAI`I  
[TMKs (1) 4-5-034:014 por.; 4-5-061 por.; 4-5-062 por.;  
4-5-063 por.; 4-5-066:063; 4-5-70:049; 4-5-084:059; 4-5-067:065]**

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## **INTRODUCTION**

At the request of Cris Takushi, of Oceanit Laboratories, Inc., Scientific Consultant Services (SCS), Inc. performed an archaeological inventory survey for the proposed Kawa Stream and Ditch Improvement Project in Kāne`ohe Ahupua`a, Ko`olaupoko District, Island of O`ahu, Hawai`i [TMKs (1) 4-5-034:014 por.; 4-5-061 por.; 4-5-062 por.; 4-5-063 por.; 4-5-066:063; 4-5-70:049; 4-5-084:059; 4-5-067:065] (Figures 1 through 7). The land owner is the City and County of Honolulu.

Fieldwork was conducted on February 18, 2015 by SCS archaeologist Stephanie Medrano, B.A., under the direction of the Principal Investigator Robert L. Spear, Ph.D. The archaeological inventory survey consisted of: historical background and archival research, pedestrian survey, photographic documentation, and reporting. The survey was performed to investigate the presence/absence of archaeological features on the subject parcel, and if found, assess feature function, construction methods, associated cultural deposits, and site significance, in accordance with Hawai`i Administrative Rules (HAR) §13-276. The survey resulted in the identification of one historic property (State Site 50-80-10-7766).

## **PROJECT AREA DESCRIPTIONS**

The project area is located in [TMKs (1) 4-5-034:014 por.; 4-5-061 por.; 4-5-062 por.; 4-5-063 por.; 4-5-066:063; 4-5-70:049; 4-5-084:059; 4-5-067:065], within Kawa Stream, about 0.58 miles (936 m) southwest of the coastline. The project area is bounded to the north by Kāne`ohe Bay Drive, to the east by James B. Castle High School and residential lots, and to the east and south by residential lots and Mokulele Dr. Overall surface topography is relatively flat throughout the vicinity of the project area.

According to Foote *et al.* (1972:38, 83; Map Sheet 60), the project area is located within Hanalei silty clay, 0 to 2 percent slopes (HnA) and Lolekaa silty clay, 3 to 8 percent slopes (LoB) soils. Hanalei Series soils are described as somewhat poorly drained to poorly drained soils on the islands of Kauai and Oahu, usually found on stream bottoms and flood plains (Foote *et al.* 1972: 38). These soils are used for taro, pasture, sugarcane, and vegetables. Lolekaa Series soils are described as well-drained soils on fans and terraces on the windward side of the island of Oahu, which developed in old, gravelly colluvium and alluvium (Foote *et al.* 1972: 83). These soils are used for pasture, homesites, orchards, and truck crops.

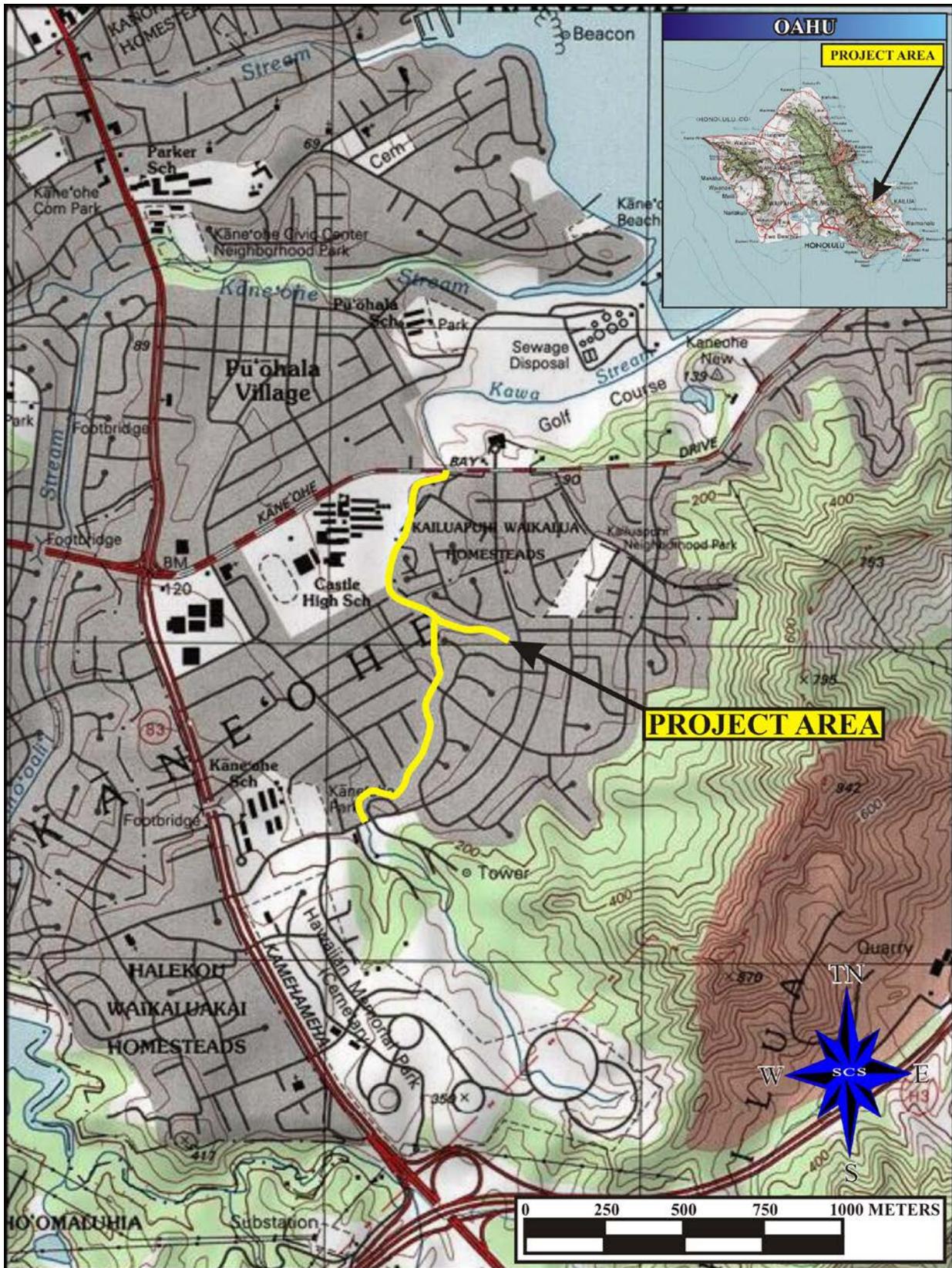


Figure 1: Portion of USGS Topographic Map Showing the Location of the Project Area.





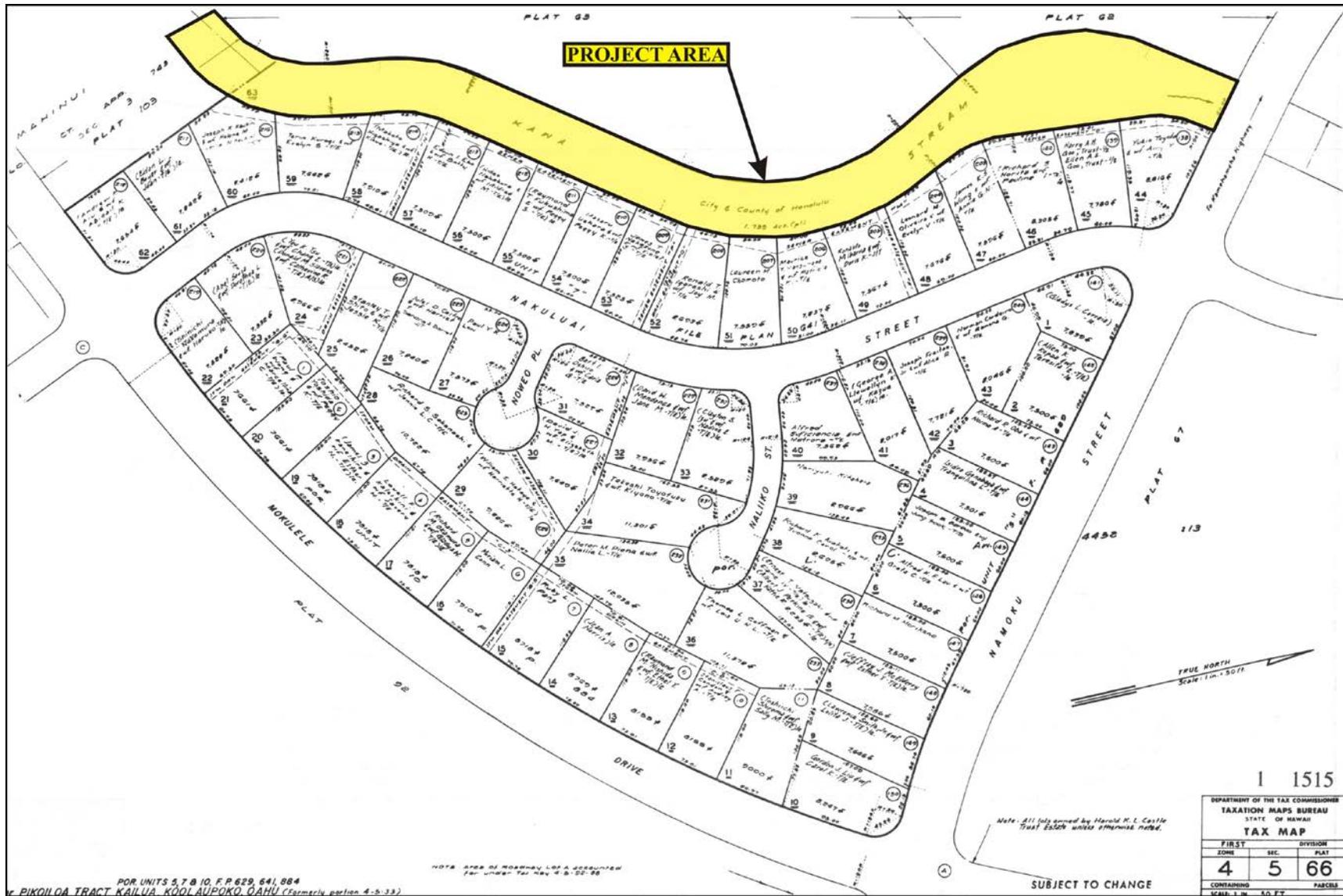


Figure 4: TMK (1) 4-5-066 Showing a Portion of the Project Area.



Figure 5: TMK (1) 4-5-067 Showing a Portion of the Project Area.

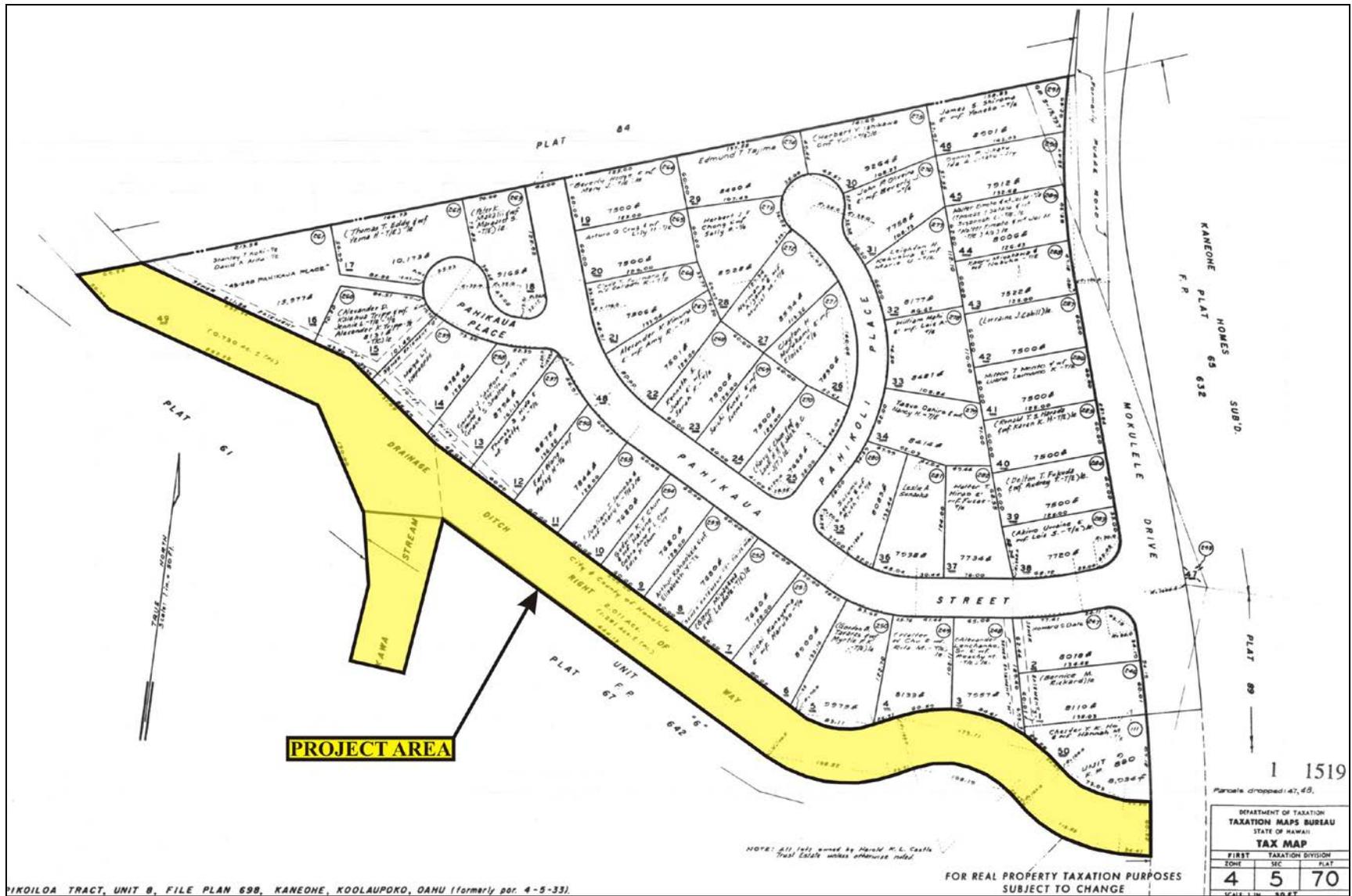


Figure 6: TMK (1) 4-5-070 Showing a Portion of the Project Area.



The total length of Kawa Stream is about 2 miles (3218 m). The Kawa Watershed has an area of approximately 1,000 acres (1.5 sq. miles). Kawa Stream's headwaters originate from three perennial branches, which are fed year-round by small groundwater seeps and springs at elevations from 100-150 feet (30-46 m). Above this elevation the stream is ephemeral, flowing only during periods of rain (Oceanit Laboratories, Inc. 2002).

## **CLIMATE**

Rainfall in this area typically averages 40 inches annually (Giambelluca *et al.* 1986), though higher amounts fall in the nearby mountains, through which numerous streams, including Kawa Stream, flow to the sea. Elevation in the vicinity of the project area ranges between 35 to 135 feet mean sea level.

## **VEGETATION**

Vegetation within the project area included but was not limited to: java plum (*Syzygium cumini*), elodea (*Egeria densa*), waterweed (*Hydrilla verticillata*), begger's tick (*Bidens pilosa*), sow thistle (*Sonchus oleraceus*), prostrate spurge (*Chamaesyce prostrate*), promrose willow, (*Ludwigia octovalvis*), banyan (*Ficus sp.*), elephant grass (*Pennisetum purpureum*), hau (*Hibiscus sp.*).

## **TRADITIONAL LAND DIVISION**

Traditionally, the division of O`ahu's land into districts (*moku*) and sub-districts was said to be performed by Mā`ilikukahi who was chosen by the chiefs to be the *mō`īho`oponopono o ke aupuni* (administrator of the government) (Kamakau 1991: 53-56). Cordy (2002), places Mā`ilikukahi at the beginning of the 16<sup>th</sup> century. Before this event, the island of O`ahu had been united as a single kingdom under Kumuhonua in the A.D. 1400s, at which time the royal center was located in `Ewa (Cordy 2002). Mā`ilikukahi, appearing later, created six districts and six district chiefs (*ali`i`ai moku*). Land was considered the property of the king, or *ali`i`ai moku* (the *ali`i`ai* who eats the island/district), which he held in trust for the gods. The title of *ali`i`ai moku* ensured rights and responsibilities to the land, but did not confer absolute ownership. The king kept the parcels he wanted, his higher chiefs received large parcels from him and, in turn, distributed smaller parcels to lesser chiefs. The *maka`āinana* (commoners) worked the individual plots of land. It is said that Mā`ilikukahi gave land to *maka`āinana* (commoners) throughout the island of O`ahu (*ibid*).

In general, several terms, such as *moku*, *ahupua`a*, *`ili* or *`ili`āina* were used to delineate various land sections. A district (*moku*) contained smaller land divisions (*ahupua`a*) that

customarily continued inland from the ocean and upland into the mountains. Extended household groups living within the *ahupua`a* were therefore able to harvest from both the land and the sea. Ideally, this situation allowed each *ahupua`a* to be self-sufficient by supplying needed resources from different environmental zones (Lyons 1875:111). The *`ili `āina* or *`ili* were smaller land divisions next in importance to the *ahupua`a* and were administered by the chief who controlled the *ahupua`a* in which it was located (Lyons 1875:33; Lucas 1995:40). The *mo`o`āina* were narrow strips of land within an *`ili*. The land holding of a tenant, or *hoa `āina*, residing in an *ahupua`a* was called a *kuleana* (Lucas 1995:61).

As the Hawaiian culture developed, land became the property of the king, or *ali`i `ai moku* (the *ali`i* who eats the island/district), which he held in trust for the gods. His title of *ali`i `ai moku* ensured rights and responsibilities to the land, but did not confer absolute ownership. The king kept the parcels he wanted, his higher chiefs received large parcels from him and, in turn they, distributed smaller parcels to lesser chiefs. The *maka`āinana* (commoners) worked the individual plots of land (Kirch and Sahlins 1992 vol.1:25).

### **TRADITIONAL AND HISTORIC SETTING**

Early settlement and agricultural development was probably first established on the windward side of the Hawaiian Islands and may have begun as early as A.D. 900-1000 on O`ahu during what is known as the Colonization Period (Kirch 2011:22). Most likely arriving from east Polynesia, these early inhabitants brought with them tools, fishing gear, and other artifacts, as well as useful plants and animals. Settling in favorable localities offering both fishing and agricultural opportunities and having near access to inland resources was a priority (Kirch 1985). Although receiving the majority of their protein from fish, Handy and Handy (1972: vi) have stated: "...for every fisherman's house along the coasts there were hundreds of homesteads of planters in the valley and on the slopes and plains between the shore and forest."

The Hawaiian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua`a*. During pre-Contact times, there were primarily two types of agriculture, wetland and dry land, both of which were dependent upon geography and physiography. River valleys provided ideal conditions for wetland *kalo* (*Colocasia esculenta*) agriculture that incorporated pond fields and irrigation canals. Other cultigens, such as *kō* (sugar cane, *Saccharum officinarum*) and *mai`a* (banana, *Musa* sp.), were also grown, and where appropriate, such crops as *`uala* (sweet potato, *Ipomoea batatas*) were produced. This was the typical agricultural pattern seen during traditional times on all the Hawaiian Islands (Kirch 1985;

Kirch and Sahlins Vol. 1, 1992:5, 119). Agricultural development on the windward side of O`ahu was likely to have begun early (A.D. 1100–1300) during what is known as the Expansion Period (Kirch 1985). Traditionally Kāne`ohe ahupua`a was viewed as valuable because of its productive agriculture and marine resources (Kamakau 1961:303).

### **TRADITIONAL SETTING**

The *ahupua`a* of Kāne`ohe lies in the *moku* of Ko`olaupoko; as one descends the *pali* (precipice) from leeward O`ahu, Kāne`ohe appears as a “vast green amphitheater below the serrated sheer cliffs” (Handy and Handy 1972: 456). The place name of Kāne`ohe (which literally means “bamboo husband”) is said to have evolved from a story about a woman who lamented that her husband’s cruelty was likened to the cutting edge of a bamboo knife (Pukui *et al.* 1974:85, 106; Sterling and Summers 1978:205). Kāne`ohe contains a very geographically diverse region divided into six zones (shoreline, raised limestone, lower valley, upper valley, hills and cliffs) (Cordy 1977: 6-7). Each environmental zone has provided opportunities for certain settlement patterns types. Typically, traditional Native Hawaiian burials, traditional cultural deposits, and historic cultural materials have been found in sandy deposits and fill throughout Hawai`i. In Kāne`ohe, the high sand dunes, low sand dunes, and alluvial make up the three types of shorelines. The shoreline along Kāne`ohe Bay is comprised of alluvial soils with the Mōkapu portion of the Bay being man-made (*ibid*).

The lower valley (location of the project area) lies behind Kāne`ohe Bay and between Kalokohanahou ridge at He`eia and the eastern side of Kawa Stream. This geographic region is divided by three major streams (Kea`ahala, Kāne`ohe and Kawa). The soils in the low valley primarily consist of humic latosols with the gray hydromorphic soils next to the streams. Much interpretive work still needs to be accomplished in Kāne`ohe as little work has been accomplished in the lower valley region.

The *ahupua`a* of Kāne`ohe received high rainfall, and along with its perennial streams, supplied a constant source of water for agriculture (Cordy 2002). There was also easy access to marine resources, evidenced by the numerous fishponds lining the coast. Early settlement (A.D. 300–600) of Ko`olaupoko, which included habitation, as well as agriculture, has been established in several *ahupua`a*: the sandy beaches and dunes of Waimānalo; Kailua, especially the upper valleys of Maunawili, Kahanaiki, and Kapa`a and the Kawainui Marsh area; and Kāne`ohe, with the possibly irrigated terraces, its dryland terraces and their associated habitation sites identified in Luluku (Cordy 2002). According to Cordy, the early dates from these sites suggest an expanding population by A.D. 500s to A.D.1000s (Cordy 2002).

The land below the forest was covered with taro plantations that were still present into the 20<sup>th</sup> century.

Some of these [taro] plantations vary in size from a forty-foot square to two or three acres. Like many of the fish-ponds, the size indicates the wealth and rank of the owner. Forty square feet of land planted with kalo will afford subsistence for one person during a whole year. A square mile of land planted with the same vegetable will feed fifty-one persons for the same length of time [Bates 1845:122].

Fisheries were included in Kāne`ohe Ahupua`a, supplementing the productive agricultural plots:

The ahupua`a of Kane-ohe and its sources of foods such as the pond of Kalopulolia, the nehu fish of Waihaukalua, the pods of Palawai and Nu`upia, and the bird islands of Mokulua, these belonged to Maui-waena [Kamakau in Sterling and Summers 1978:206]

At least 14 *heiau* were recorded by Thrum and McAllister in Kāne`ohe Ahupua`a (Thrum 1915; McAllister 1933). Kawa`ewa`e Heiau, reportedly built by the *menehune*, was said to be where the 15th century chief, Olopana, had the demi-god Kamapua`a brought for sacrifice. A *holua* slide was enjoyed by the *ali`i* but was destroyed in modern times to make way for pineapple cultivation (McAllister 1933:181).

During the A.D. 1000s to 1300s, the windward population continued to expand and grow. At this time, there was cultivation along Kawainui Marsh as well as *lo`i kalo* extending from the Maunawili Stream out into the marsh (Cordy 2002). The inland terracing at Kāne`ohe became complex and extensive, and included inland permanent habitation and field shelters. This was also the period that island-wide political changes occurred with the formation of district-based polities, which suggested a complex-rank political organization (Cordy 2002). By the 1700s, individual households were tenants of the land under a hierarchy of chiefs. Kāne`ohe and Kailua were the economic and demographic centers of Ko`olaupoko. Habitations were dense in the Kāne`ohe Bay area and in the drier areas along the lower valleys. The floors of narrow and wide valleys produced taro, as did lower valley marshes. Terracing in the uplands was located in almost all tributary streams extending to the base of the *pali* (cliff).

There were at least 23 stone-walled fishponds established in the shallow waters of Kāne`ohe Bay (Cordy 2002). In the southern portion of Kāne`ohe Bay, three fishponds were

constructed (Waikalua Loko, Loko Keana, and Kalokohanahou), two of which still exist. Waikalua Loko (McAllister Site 349) literally means “water of the *lua* fighter” or “water of the pit” (Pukui *et al.* 1974: 222). According to Genz and Hammatt (2011:37), Wai-ka-lua translates literally as “the two freshwaters”, which may refer to the two streams that originally provided fresh water to the fishpond—Kāne`ohe Stream and Kawa Stream. The Kawa Stream originally provided fresh water to the Waikalua Loko Fishpond until it was channeled due to residential development. Waikalua Loko still exists today and is cared for by the Waikalua Loko Fishpond Preservation Society.

Handy (1940) provides the following description of the extensive cultivation observed in Kāne`ohe:

Kāne`ohe is one of the most complicated terrace areas in the islands. It can be comprehended only in light of its stream system. It is one of the most active communities in planting commercial taro, and a goodly portion of its lowland terraces, tucked away in pockets flanked an often hidden by low hills or by the town itself, are still planted in taro (for milling) by Hawaiians who own the land and by Orientals who lease the land or are hired.

This ahupua`a was described in glowing terms a century and a half ago by Portlock. “...The bay all around has a very bountiful appearances, the low land and valleys being in a high state of cultivation, and crowded with plantation of taro, sweet potatoes, sugar, cane, etc., interspersed with a great number of coconut trees, which renders the prospect truly delightful” (Handy 1940:97).

The project area is situated in an area that was known for its extensive agricultural use. Handy (1940) notes that “some of the best terraces” were located in the vicinity of the project area:

On the north side of the ahupua`a near the boundary of He`eia, Keaahala Stream flows into Kalimukele. Some of the best terraces now in use are inland of the highway and are irrigated by Keaahala; a large old terrace system extends downstream below the highway. An elaborate system of water rights prevailed in ancient times throughout these sections irrigated by Keaahala (Handy 1940:97).

## **HISTORICAL SETTING**

In 1783, Kahahana, the nephew of Kalekili who had been put in charge of O`ahu, was killed by his uncle. While staying on O`ahu, Kahekili chose to live in the *ahupua`a* of Kailua, Kāne`ohe, and He`eia (Kamakau 1961).

Kamehameha's campaign to bring the islands under one rule started on Hawai'i Island. Moving to Maui, he fought the famous battle of Ka PaniWai in `Īao Valley against the ruling chief, Kalanikupule. Escaping over the mountains to Olowalu, Kalanikupule quickly sailed to O'ahu to seek protection from his father, Kahekili. Kamehameha eventually sailed with his *peleleu* (fleet) of warriors to O'ahu where the Battle of Nu'uauu was fought and where he became the ruler of the all the islands except Kaua'i.

After Kamehameha's conquest of O'ahu in 1795, he dispersed its lands to his loyal chiefs and counselors as rewards for their support. However, Kamehameha retained control over Kāne`ohe (Ii 1959). Much of Kāne`ohe and all of Kahaluu and Kualoa were inherited as personal lands by Kamehameha's sons Liholiho and Kauikeaouli, Kamehameha II and III (Indices 1929:27-28).

Kamehameha III (Kauikeaouli) presided over the Māhele, the division of lands given to Hawaiian royalty and commoners. Kamehameha III, as mentioned, had inherited Kāne`ohe and retained the bulk of the *ahupua`a* during the Māhele. After his death, his wife Queen Kalama (Hakaleleponi), retained their portion of Kāne`ohe (Barrère 1994, Kame`eleihiwa 1992).

## **THE MĀHELE**

In the 1840s, a drastic change in the traditional land tenure resulted in a division of island lands and a system of private ownership based on Western law. While it is a complex issue, many scholars believe that in order to protect Hawaiian sovereignty from foreign powers, Kauikeaouli (Kamehameha III) was forced to establish laws changing the traditional Hawaiian economy to that of a market economy (Kuykendall 1938, Vol. I:145; Daws 1977:111; Kelly 1983:45; Kame`eleihiwa 1992:169-70, 176; Kelly 1998:4).

The Organic Acts of 1845 and 1846 initiate the process of the Māhele, the division of Hawaiian lands, which introduced private into Hawaiian society. In 1848, the crown and the *ali`i* received their lands and titles. The common people (*maka`āinana*) received their *kuleana* awards (individuals land parcels) in 1850. The Māhele of 1848 divided Hawaiian lands between the king, the chiefs, the government, and began the process of private ownership of lands. The subsequently awarded parcels were called Land Commission Awards (LCAs). Once lands were thus made available and private ownership was instituted, the *maka`āinana* (commoners), if they had been made aware of the procedures, were able to claim the plots on which they had been cultivating and living. These claims did not include any previously cultivated but presently fallow land, `okipu`u (forest clearing on O'ahu), stream fisheries, or many other resources

necessary for traditional survival (Kelly 1983; Kame`eleihiwa 1992:295; Kirch and Sahlins 1992). If occupation could be established through the testimony of two witnesses, the petitioners were awarded the claimed LCA and issued a Royal Patent after which they could take possession of the property (Chinen 1961:16).

Māhele land records provide a component to understanding land use history during the early to mid-1800s. However, due to the fact that many people who had use rights in the land did not register their claims with the Board of Commissioners, the land commission documents represent only a portion of the population that was living on and cultivating the land (Kelly and Nakamura 1981).

The average *kuleana* award was 2.38 acres (Kelly 1976:8). These claims were not only for *maka`āinana* but for *konohiki* (chiefs) were also awarded lots. The bulk of Kāne`ohe Ahupua`a went to Queen Kalama, 11 to *konohiki*, and 3 to non-*konohiki* (privileged awardees who received large parcels of land) (Kelly 1976:7). The primary type of land use claimed in Kāne`ohe was taro cultivation, identified in the LCA's as *lo`i* (wetland taro fields). Additionally, there are references of *loko* (fishponds) and *kula* (dry land agricultural plots).

During the Māhele, A total of 150 LCAs were awarded within the *ahupua`a* of Kāne`ohe (Waihona`Aina 2015). LCA 4452:13 is located within and in the vicinity of the project area. LCA documentation indicates lands in the vicinity of the project area were utilized for traditional Hawaiian habitation and agriculture, such as house lots, *lo`i* (wetland taro fields), sweet potato, and bitter melon fields (Waihona`Aina 2015).

### **MID-1800S TO 1900S**

After the Māhele of 1848, the possession of Kāne`ohe passed from Kamehameha I to his son, Liholiho (Kamehameha II), and then to Kauikeaouli (Kamehameha III). Eventually, the *ahupua`a* was inherited by Kauikeaouli's widow, Kalama. In 1876, Judge C.C. Harris bought 20,000 acres from Kalama consisting of lands from Kailua and Kāne`ohe. His daughter, Nannie R. Rice inherited the land, which she leased to J.P. Mendonca in 1890 for raising Angus cattle. James B. Castle bought stock in the ranch, and ten years later, his son, Harold K. Castle purchased the land from Mrs. Rice (in the vicinity of the project area). Castle's Kaneohe Ranch Company consisted of some 12, 000 acres with 2,000 head of cattle.

Land portions that were not used as pasture were still in agriculture producing either taro or, with the growing Oriental population, rice. In the 1930s, Handy (1940: 97) reported:

Kan`e`ohe is one of the most complicated terrace areas of the islands. It can be comprehended only in the light of its stream system. It is still one of the most active communities in planting commercial taro, and a goodly portion of its lowland terraces, tucked away in pockets flanked and often hidden by low hills or by the town itself, are still planted in taro by Hawaiians who own the land and by Orientals who lease land or are hired [1940:97–98].

This ahupua`a was described in glowing terms a century and a half ago by Portlock. “...The bay all around has a very bountiful appearance, the low land and valleys being in a high state of cultivation, and crowded with plantation of taro, sweet potatoes, sugar cane, etc., interspersed with a great number of coconut trees, which renders the prospect truly delightful”.

Handy (1940:97) notes that “some of the best terraces” were located in the vicinity of the project area:

On the north side of the ahupua`a near the boundary of He`eia, Keaahala Stream flows into Kalimukele. Some of the best terraces now in use are inland of the highway and are irrigated by Keaahala; a large old terrace system extends downstream below the highway. An elaborate system of water rights prevailed in ancient times throughout these sections irrigated by Keaahala.

In the 1860s commercial sugar cane and rice cultivation began in Kāne`ohe. The Kāne`ohe Sugar Plantation, which started around 1865 was on Queen Kalama’s land with Charles Coffin Harris (C.C. Harris) as a partner and manager. In 1871, C.C. Harris bought Queen Kalama’s Ko`olaupoko properties from her heir, Charles Kanaina, as well as some land in Honolulu for \$22,448. The sale included “...livestock, tool, fishpond, and fishing rights” (Bureau of Conveyances, Book 34:53; cited in Devaney *et al.* 1982:29).

Rice cultivation was to eventually succeed taro and dominated the lowlands of Kāne`ohe. Rice was cultivated mainly by Chinese, who rented or leased lo`i lands from Hawaiian land owners. By the late 1880’s much of the floodplain areas of Kāne`ohe were under rice cultivation and remained so until early in the 20th century. In 1890-92, the Kāne`ohe Rice Mill was erected and put into production on property adjoining Kāne`ohe Stream. The mill had a long flume coming to it from further up Kāne`ohe Stream. It also had a short railway leading to a small landing in Kāne`ohe Bay, north of Kāne`ohe Stream. By the 1920, rice production gradually

declined when it could no longer compete with the price of California grown rice (Dorrance 1998:94).

Ranching and pineapple also became major business endeavors during the mid-19th to early 20th centuries. Cattle had been left on O`ahu by Vancouver in 1793, which multiplied on to a large herd by the 1840's (Devaney *et al.* 1982:70). Kāne`ohe Ranch was formed in 1876, on lands which originally belonged to Queen Kalama. At its peak, the ranch included 12,000 acres and 2,000 head of cattle. Heavy cattle grazing resulted in much of the land modification in the upland and hill portions of Kāne`ohe.

Commercial cultivation of Pineapple began in the 1890's into the first decade of the 1900's in Kāne`ohe. From 1910 to 1925, pineapple cultivation was a major industry in Kāne`ohe. In 1910, after assessing the demand for pineapple on the mainland United States, Libby, McNeill and Libby of Honolulu (a subsidiary of the mainland firm) began purchasing several of the windward pineapple companies. In 1911, Libby, McNeill and Libby built a pineapple cannery in Kahalu`u. At its peak, 2,500 acres were under pineapple cultivation on the windward side of O`ahu (Harper 1972), stretching from Kāne`ohe to Kahalu`u. A large percentage of this acreage was in the Kāne`ohe Bay region, including He`eia.

The pineapple industry created havoc with traditional Hawaiian sites. During the 15-year period that pineapple was produced in the Kāne`ohe Bay region, at least five ancient Hawaiian sites were either badly damaged or completely destroyed. McAllister (1933) claims Haluakaiaamoana, Kaulauki, Keikipuipui, Kukuiokāne, and perhaps Kalaeulaula to be among these, and possibly many other smaller sites as well. The failure of pineapple in Ko`olaupoko was attributed to the destruction of these sacred sites (McAllister 1933:170, 177). According to older Hawaiians of the area, the destruction of Kukuiokāne Heiau, brought on a disease that wiped out a large amount of Libby pineapple (McAllister 1933:177). According to Richard Miller, the loss was attributed to too much rainfall, saturated soils, aphids, mealybugs, and chlorosis, a disease that results from a deficiency of available iron in the soil (Miller interview 1988, in Allen *et al.* 1987).

The pineapple files were abandoned when Molokai and Lāna`i pineapple cultivation began to boom, and Libby pulled out of the Ko`olaupoko enterprise (Kelly 1976:47). The cannery closed in 1923 (Dorrance 1998:95).

## **PREVIOUS ARCHAEOLOGICAL STUDIES**

This section relies on information from the SCS library, Honolulu, and the availability of archaeological reports on file at the State Historic Preservation Division Office, Kapolei. Numerous archaeological projects have been conducted in Kāne`ohe Ahupua`a (Figure 8; Table 1). This section provides an overview of the archaeological studies conducted in the general area. No significant findings have been identified within or in close vicinity of the subject project area.

One of the earliest archaeological surveys on O`ahu was conducted by J. Gilbert McAllister in the early 1930s, under the auspices of the Bernice P. Bishop Museum (McAllister 1933). McAllister (1970:178,179) reported on nine sites (McAllister Sites 345 through 353) in the general vicinity of the project area. Kawa Stream once partially drained into Waikalua Loko (McAllister Site 349).

Hammatt and Borthewick (1989) conducted an archaeological survey and assessment of the 90-ac parcel for the proposed expansion of the Bay View Golf Course. McAllister Sites 349 (Waikalua Loko) and 350 (Waikalua Pond) were relocated. No additional prehistoric or historic sites or cultural layers were encountered within the project area. Preservation of Waikalua Loko and Waikalua Pond was recommended. Archaeological monitoring of the project area was also recommended during initial clearing and grading.

Szabian *et al.* (1989) conducted a reconnaissance survey for the proposed Pikoiloa Cemetery. In addition to the relocation of McAllister Site -354 (Kawaewae Heiau), 11 sites (State Sites -4676 through -4686) with at least 25 features were recorded. Four sites were interpreted as pre-historic, which included agricultural and habitation sites. Seven sites were interpreted as historic in nature, which included agricultural/water control, habitation, charcoal kiln, and boundary marker sites. State Site -4682 was later determined to be non-cultural in nature and is therefore not considered a historic property.

Hammatt and Shideler (1989) conducted an archaeological survey of a 90-ac parcel for the proposed Hawai`i State Veterans Cemetery. No prehistoric or historic sites or cultural layers were encountered within the project area.

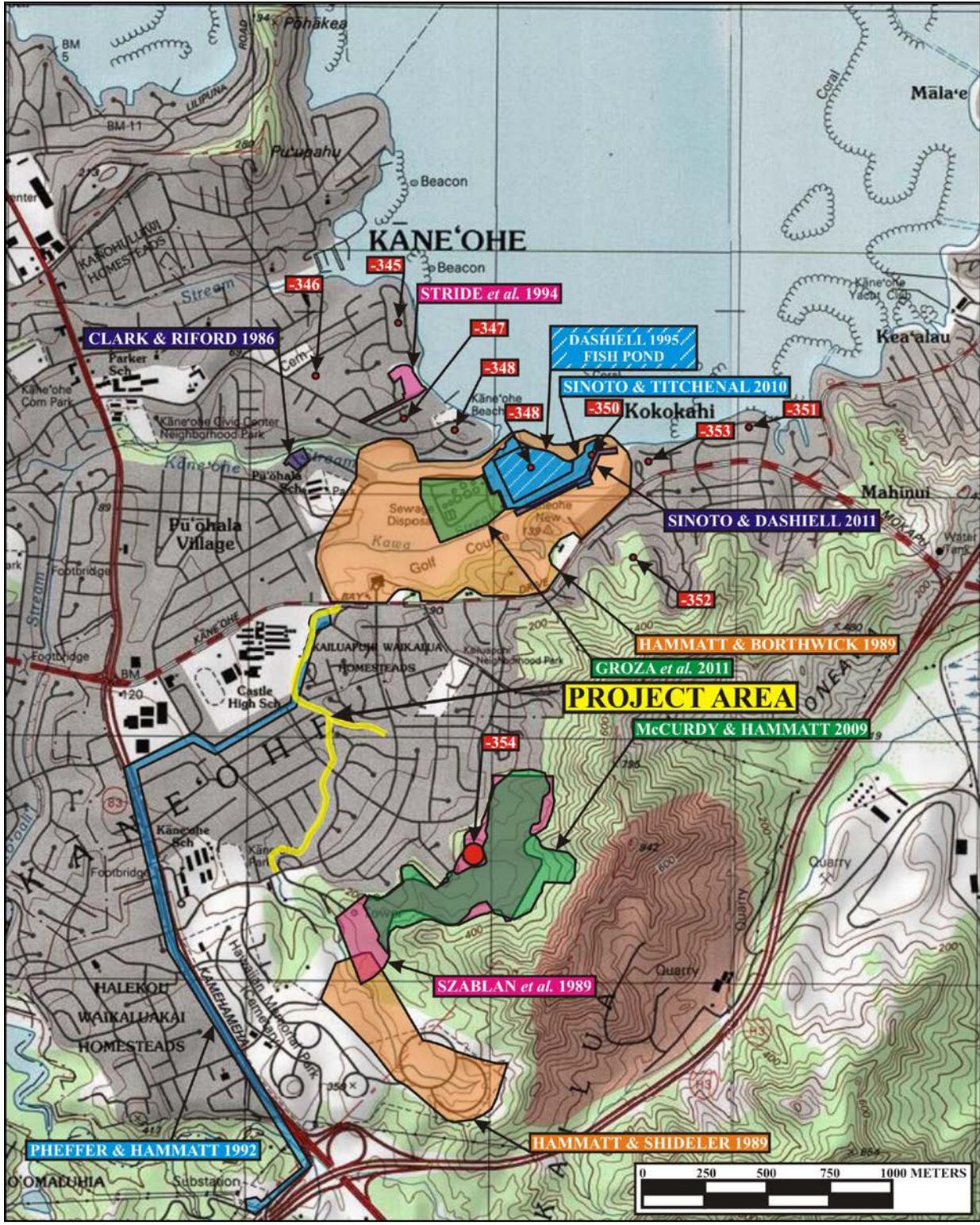


Figure 8: Portion of USGS Topographic Map Showing Previous Archaeology.

**Table 1: Previous Archaeology**

<b>Reference</b>	<b>Location of Study</b>	<b>Nature of Study</b>	<b>Site Number(s) 50-80-10-</b>
McAllister 1933	Island-wide	Island-wide Survey	10 Sites: -345 through -354
Clark & Rifard 1986	Archaeological Salvage Excavations	Nani Pua Gardens II Subdivision	BPBM Site 50-Oa-G5-101 (State Site -2937)
Kurashia <i>et al.</i> 1986	Archaeological Survey	Nani Pua Gardens II Subdivision	BPBM Site 50-Oa-G5-101 (State Site -2937), 50-Oa-G5-100, 50-Oa-G5-103, 50-Oa-G5-103
Hammatt & Borthwick	Archaeological Survey & Assessment	Bay View Golf Course	Relocates and documents Waikalua-Loko (-349) and Waikalua Pond (- 350)
Hammatt & Shideler 1989	Archaeological Survey	Veterans Cemetery	No Significant Finds
Szabian <i>et al.</i> 1989	Reconnaissance Survey	North & West Facing Ridge Separating Kailua and Kāne`ohe	4676 through -4686
Pfeffer & Hammatt 1992	Archaeological Assessment	Transmission Corridor mostly along Kamehameha Highway	No Significant Finds
Stride <i>et al.</i> 1994	Inventory Survey & Subsurface Testing	Waikalua Roud (TMK 4-5-005:001, 002, 012, 014) 3.3-ac at shoreline	No Significant Finds
Dashiell 1995	Preservation Plan	Waikalua Loko fishpond	Recommended Preserving, Restoring, and Maintaining the Fishpond
McCurdy & Hammatt 2009	Archaeological Inventory Survey	Hawaiian Memorial Park	Relocated -354, -4680, - 4681, -4683, -4684, and - 4686. Newly Identified - 6929 through -6933 and -7079

Reference	Location of Study	Nature of Study	Site Number(s) 50-80-10-
Sinoto & Titchenal 2010	Archaeological Assessment	Kāne`ohe-Kailua Force Main	No Significant Finds
Sinoto & Dashiell 2011	Archaeological Monitoring	Bay View Golf Course	No Significant Finds
Groza <i>et al.</i> 2011	Literature Review and Field Inspection	Kāne`ohe WWPTF & Kailua WWTP	No Significant Finds
Groza & Monahan 2012	Archaeological Assessment	Kāne`ohe WWPTF & Kailua WWTP	No Significant Finds

Pfeffer and Hammatt (1992) conducted an archaeological assessment for the proposed improvements to existing sub-transmission lines between Koolau Substation to Puohala Substation to create a new 46kV circuit. This project ran through a small portion of the subject project area. No prehistoric or historic sites or cultural layers were encountered within the project area. No further work was recommended.

McCurdy and Hammatt (2009) conducted an archaeological inventory survey for the proposed development of the Hawaiian Memorial Park expansion. Twelve sites were observed within or near the project area. Six sites (State Sites 354, -4680, -4681, -4683, -4684, and -4686) were previously recorded during the Szabian *et al.* (1989) project. The remaining six sites (State Sites -6929 through -6933 and -7079) were newly documented. State Sites -4683, -4684, -4686 Feature B, -6930, -6932, -6933, and 7079 were recommended for preservation. Archaeological monitoring is also recommended to address the potential of project related excavations impacting subsurface cultural material.

Groza *et al.* (2011) conducted an archaeological literature review and field inspection for the proposed Kāne`ohe-Kailua Wastewater Conveyance and Treatment Facility Project, Alternative 2-Tunnel Route. No prehistoric or historic sites were encountered within the project area. The following year, an archaeological assessment (Groza and Monahan 2012) was subsequently conducted within the same project area. Two trenches excavated in the eastern portion of the project area contained fill to the water table. No prehistoric or historic sites or cultural layers were encountered within the project area.

## **METHODOLOGY**

### **FIELD METHODOLOGY**

Multiple field tasks were completed during the Archaeological Inventory Survey. First, a pedestrian survey, which included 100 percent coverage of the project area, was conducted in order to identify archaeological sites and assess project area geographical/physiographical features. Results were recorded with digital photography; photographs taken within various portions of the project area attests to past land disturbances. There were some limits to surface visibility, as some portions of Kawa stream are heavily vegetated.

### **LABORATORY METHODOLOGY**

All field notes and digital photographs were curated at the SCS laboratory in Honolulu. The final disposition of all project materials will be determined in consultation with the landowner and SHPD per HAR §13-284- and HAR §13-276-6(a).

## **ARCHAEOLOGICAL INVENTORY SURVEY RESULTS**

The subject archaeological inventory survey was conducted in Kaneohe Ahupua`a, Ko`olaupoko District, Island of O`ahu, Hawai`i, [TMKs (1) 4-5-034:014 por.; 4-5-061 por.; 4-5-062 por.; 4-5-063 por.; 4-5-066:063; 4-5-70:049; 4-5-084:059; 4-5-067:065]. The project resulted in the identification of one archaeological site (State Site 50-80-10-7766) (Figures 9 through 12). State Site 50-80-10-7766 is located within [TMK (1) 4-5-084:059]. Based on feature type, construction methods, and construction materials, State Site 50-80-10-7766 is interpreted to be associated with Historic use of the area.

## **SITE DESCRIPTION**

### **STATE SITE 50-80-10-7766**

**Condition:** Fair

**GPS Coordinates:** E 0625372 N02367539

**Site Type:** Bridge

**Function:** Bridge

**Feature (#):** 1

**Age:** Historic

**Description:** According to the Hawaii State Historic Bridge Inventory and Evaluation (2013:9, 98), Kawa Bridge (Bridge Number 003063001400065) was built in 1939. This site carries Kaneohe Bay Drive/pedestrian walkway and crosses Kawa Stream. Construction materials include basalt cobbles, mortar, and asphalt concrete pavement. The bridge has masonry parapets, concrete deck is supported by masonry abutments. Max height (from top of wall to floor of stream) is 29.8 ft. (9.10 m), max span is 20.0 ft. (6.1 m), deck width is 50.2 ft. (15.3 m), and total length is 23.0 ft. (7 m). Kawa Bridge extends from TMK (1) 4-5-084:059 through Kaneohe Bay

Drive and into TMK (1) 4-5-030:037. Kaneohe Bay Drive and TMK (1) 4-5-030:037 are outside of the project area.

Additionally, this location also includes the site of gaging station 16265000, which was first established in 1914. According to USGS, upgrades are planned for the last quarter of 2016.

### **SITE SIGNIFICANCE ASSESSMENTS**

During the Archaeological Inventory Survey, State Site 50-80-10-7766 was newly identified. State Site 50-80-10-7766 has been evaluated for significance according to the established criteria specified in HAR §13-284-6(b)(4). The administrative rules state that a historic property, to be considered significant, must possess integrity of location, design, setting, materials, workmanship, feeling, and association, and meet one or more of the following criteria:

Criterion a: Site is associated with events that have made a significant contribution to the broad patterns of our history.

Criterion b: Site is associated with the lives of persons significant to our past.

Criterion c: Site is an excellent site type; embodies distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual construction.

Criterion d: Site has yielded or has the potential to yield information important in prehistory or history.

Criterion e: Site has cultural significance to an ethnic group; examples include religious structures, burials, major traditional trails, and traditional cultural places.

State Sites 50-80-10-7766 has been evaluated in accordance with criteria specified in HAR §13-284-6 and found to be significant under Criterion "c" for its association with early developments in concrete masonry bridge construction in Hawaii. According to the Hawaii State Historic Bridge Inventory and Evaluation (2013:9, 98), it is a good example of a 1930's masonry structure bridge that is typical of its period in its use of materials, method of construction, and craftsmanship. The design of the bridge has a high artistic value".

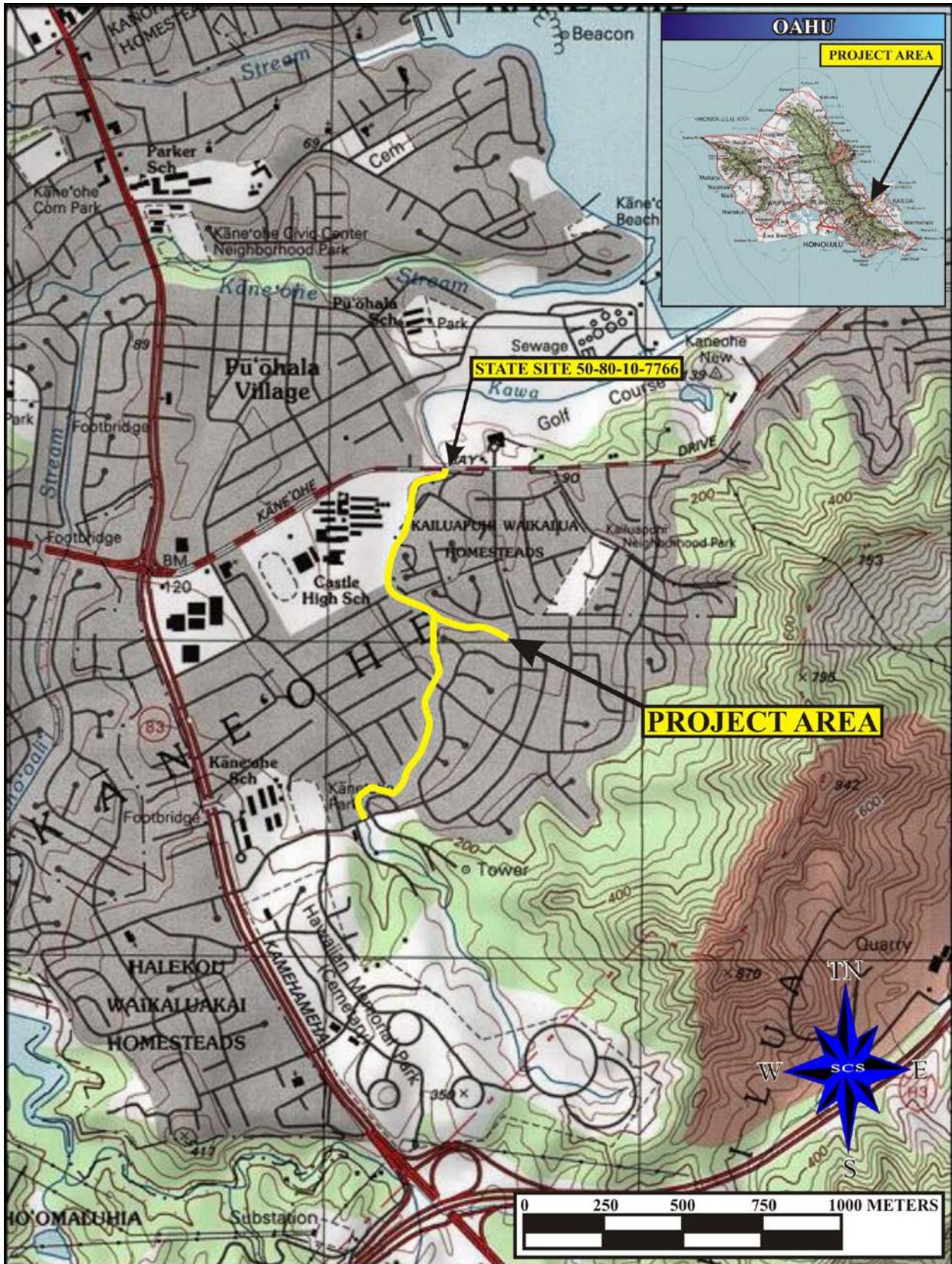


Figure 9: Portion of USGS Topographic Map Showing Location of State Site 50-80-10-7766.



**Figure 10: Photograph of State Site 50-80-10-7766. North View.**



**Figure 11: Photograph of State Site 50-80-10-7766. Northeast View.**



**Figure 12: Photograph of State Site 50-80-10-7766. Northwest View.**

## **DISCUSSION AND RECOMMENDATIONS**

Archival research and a review of previous archaeological studies have shown that the vicinity of the project area has a considerable cultural history. Prior to extensive historic and modern land alteration, this area of Kaneohe would be expected to yield the remnants of traditional agricultural and habitation sites (*e.g* Szabian *et al.* 1989; McCurdy and Hammatt 2009). However, due to the massive landscape modifications that have taken place in the area, traditional Hawaiian surface structures and/or artifacts are not expected to be recovered within the project area. Based on the findings of the literature search and the AIS field survey work, sufficient information has been obtained from State Site 50-80-10-7766 and no further archaeological work is recommended for the proposed Kawa Stream Project area.

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## **Appendix C**

# **Cultural Impact Analysis**

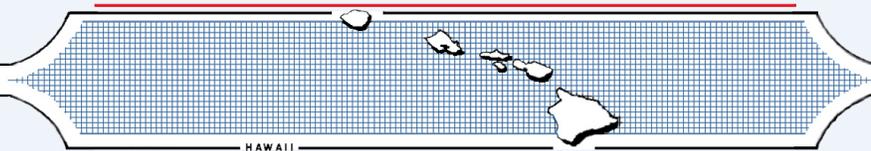
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**A CULTURAL IMPACT ASSESSMENT  
FOR THE KAWA STREAM AND DITCH IMPROVEMENTS PROJECT  
KĀNE'OHE AHUPUA'A, KO'OLAUPOKO DISTRICT  
ISLAND OF O'AHU, HAWAII  
[TMK: (1) 4-5-034:014 por.; 4-5-061 por.; 4-5-062 por.; 4-5-063 por.;  
4-5-066:063; 4-5-70:049; 4-5-084:059; 4-5-067:065]**

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## INTRODUCTION

At the request of Cris Takushi, of Oceanit Laboratories, Inc., Scientific Consultant Services, Inc. (SCS), Inc. has prepared a Cultural Impact Assessment for the proposed Kawa Stream and Ditch improvements project in Kāne`ohe Ahupua`a, Ko`olaupoko District, Ahupua`a, `Ewa, Island of O`ahu, Hawai`i [TMK: (1) 4-5-034:014 por.; 4-5-061 por.; 4-5-062 por.; 4-5-063 por.; 4-5-066:063; 4-5-70:049; 4-5-084:059; 4-5-067:065] (Figures 1, 2, and 2a through 2g). The project area is owned by the City and County of Honolulu

The Constitution of the State of Hawai`i clearly states the duty of the State and its agencies is to preserve, protect, and prevent interference with the traditional and customary rights of Native Hawaiians. Article XII, Section 7 (2000) requires the State to “protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by *ahupua`a* tenants who are descendants of Native Hawaiians who inhabited the Hawaiian Islands prior to 1778.” In spite of the establishment of the foreign concept of private ownership and western-style government, Kamehameha III (Kauikeaouli) preserved the peoples traditional right to subsistence. As a result in 1850, the Hawaiian Government confirmed the traditional access rights to Native Hawaiian *ahupua`a* tenants to gather specific natural resources for customary uses from undeveloped private property and waterways under the Hawaiian Revised Statutes (HRS) 7-1. In 1992, the State of Hawai`i Supreme Court, reaffirmed HRS 7-1 and expanded it to include, “native Hawaiian rights...may extend beyond the *ahupua`a* in which a Native Hawaiian resides where such rights have been customarily and traditionally exercised in this manner” (Pele Defense Fund v. Paty, 73 Haw.578, 1992).

Act 50, enacted by the Legislature of the State of Hawai`i (2000) with House Bill (HB) 2895, relating to Environmental Impact Statements, proposes that:

...there is a need to clarify that the preparation of environmental assessments or environmental impact statements should identify and address effects on Hawaii’s culture, and traditional and customary rights... [H.B. NO. 2895].

Articles IX and XII of the State constitution, other state laws, and the courts of the State impose on government agencies a duty to promote and protect cultural beliefs and practices, and resources of Native Hawaiians as well as other ethnic groups. Act 50 also requires state agencies

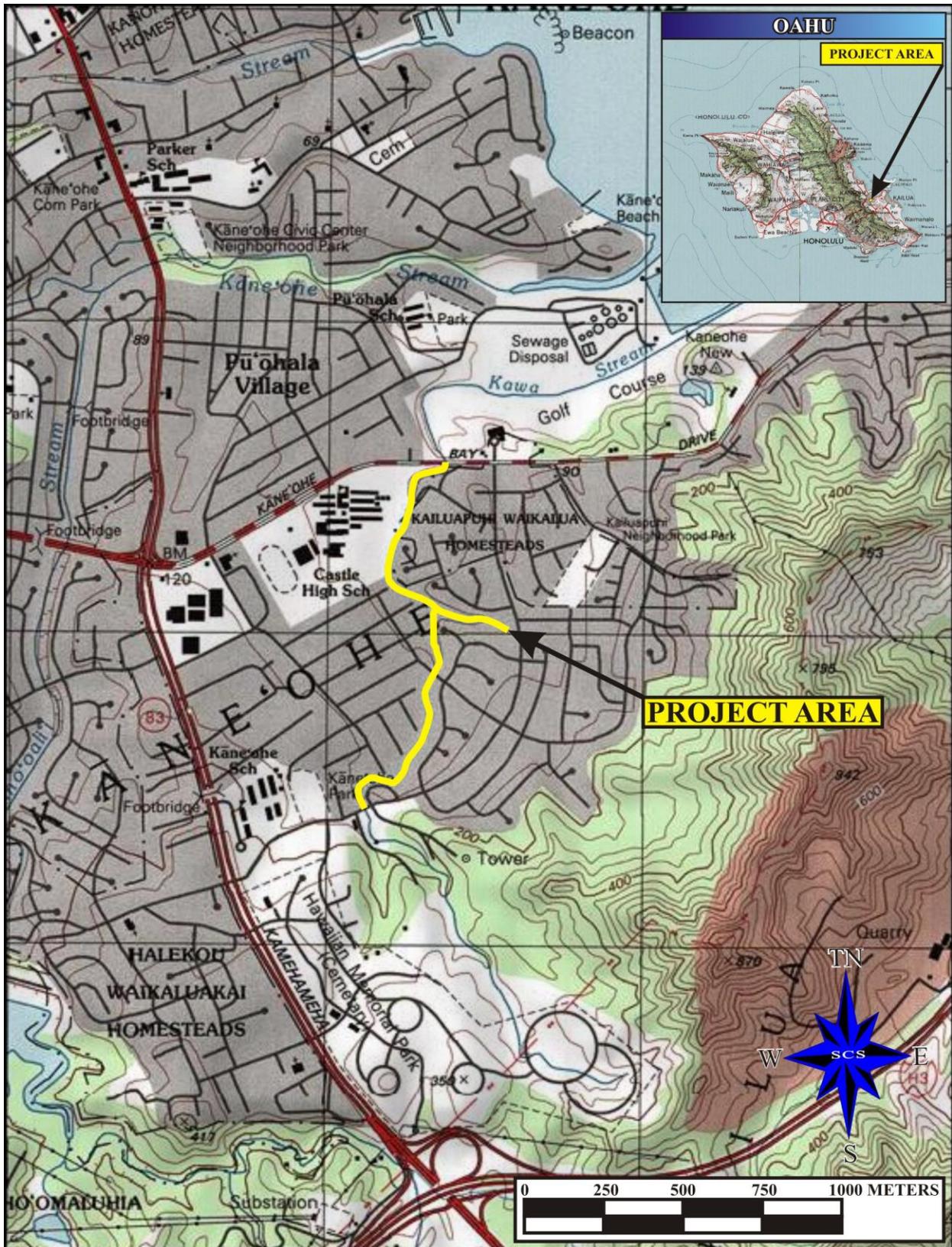


Figure 1: USGS Quadrangle (Kaneohe 1998) Map Showing Project Area Location.





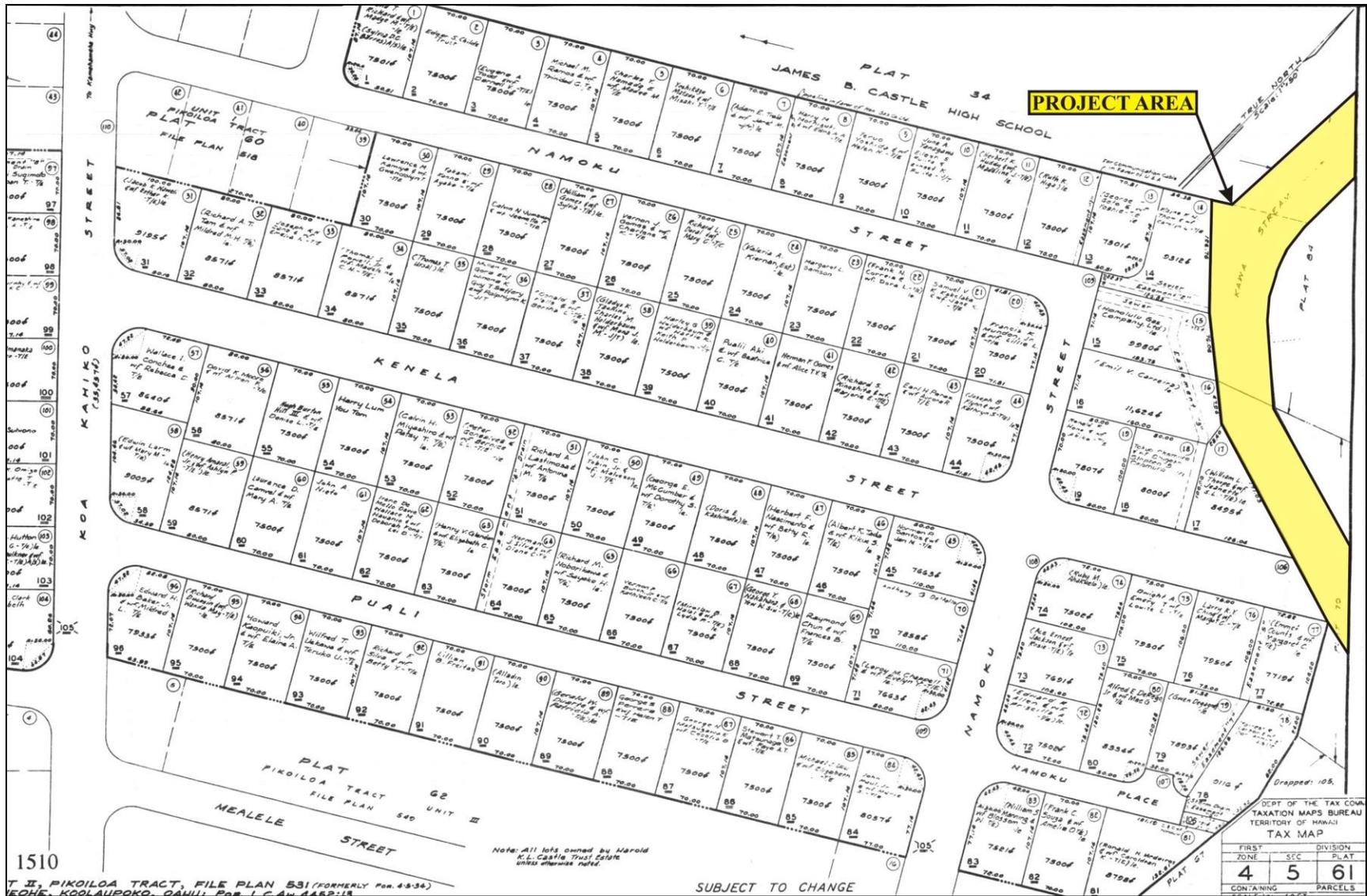


Figure 4b: Tax Map Key [TMK: (1) TMK 4-5-61] Showing Project Area Location.



Figure 5c: Tax Map Key [TMK: (1) TMK 4-5-63] Showing Project Area Location.

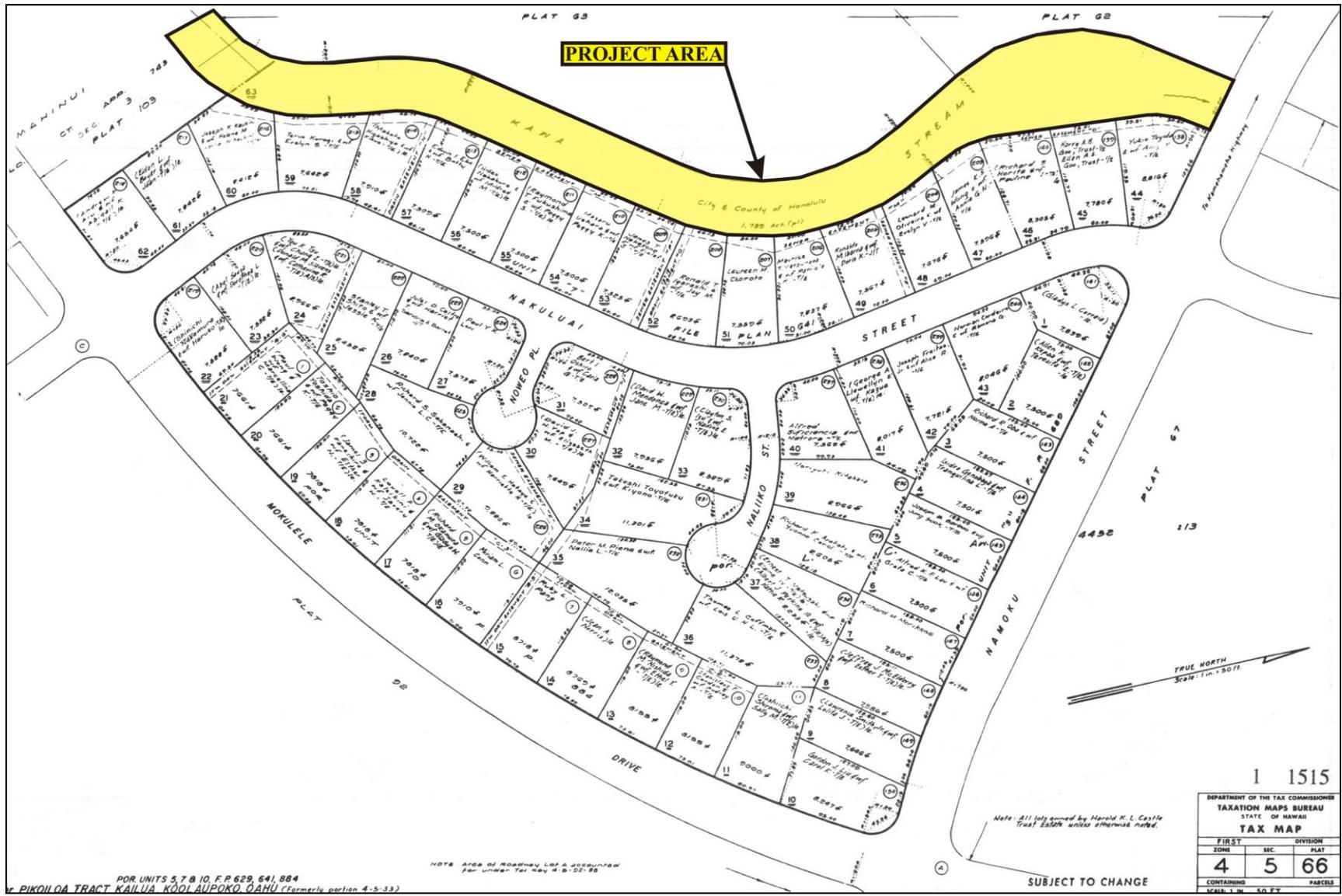


Figure 6d: Tax Map Key [TMK: (1) TMK 4-5-66] Showing Project Area Location.

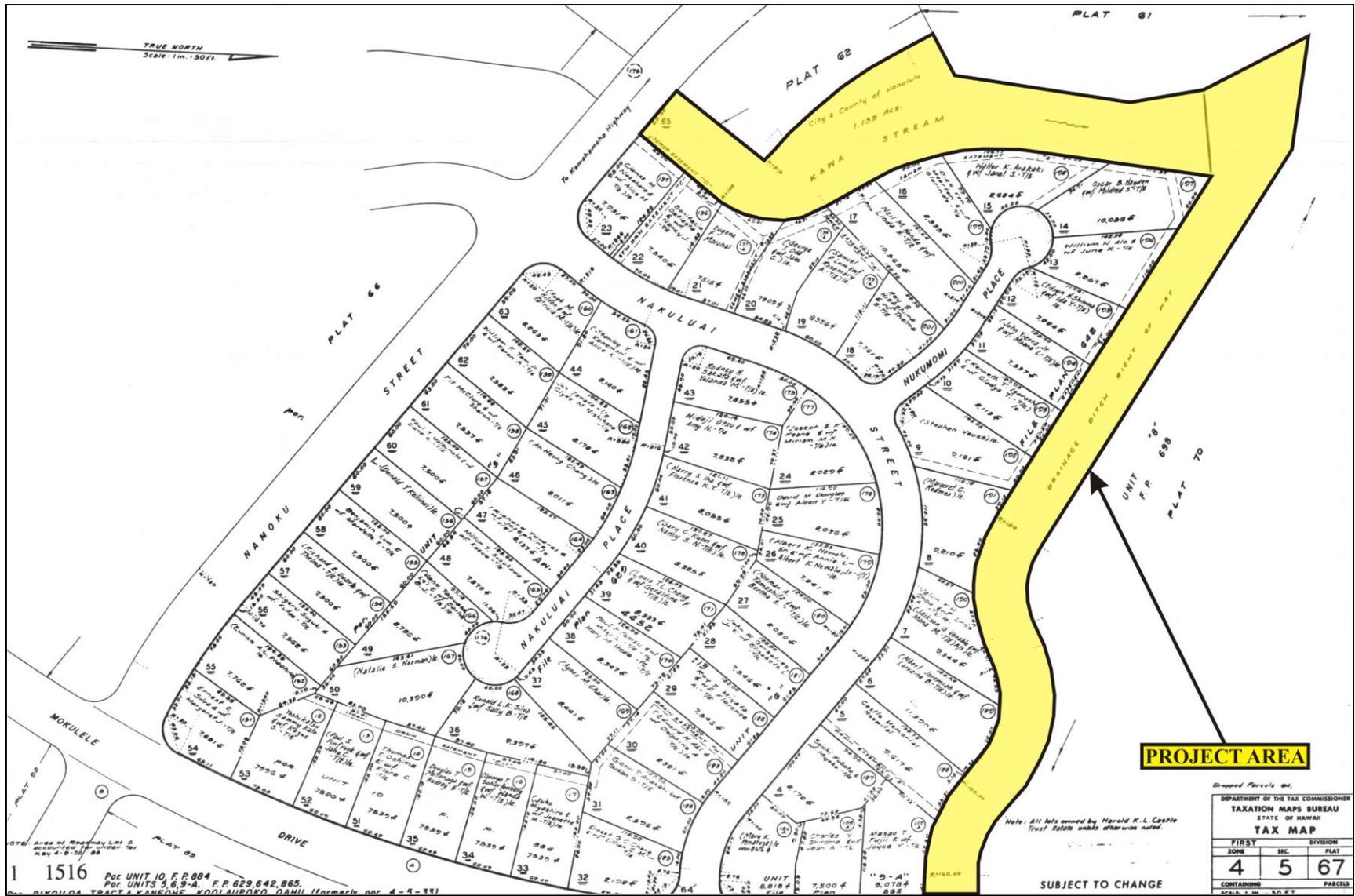


Figure 7e: Tax Map Key [TMK: (1) TMK 4-5-67] Showing Project Area Location.

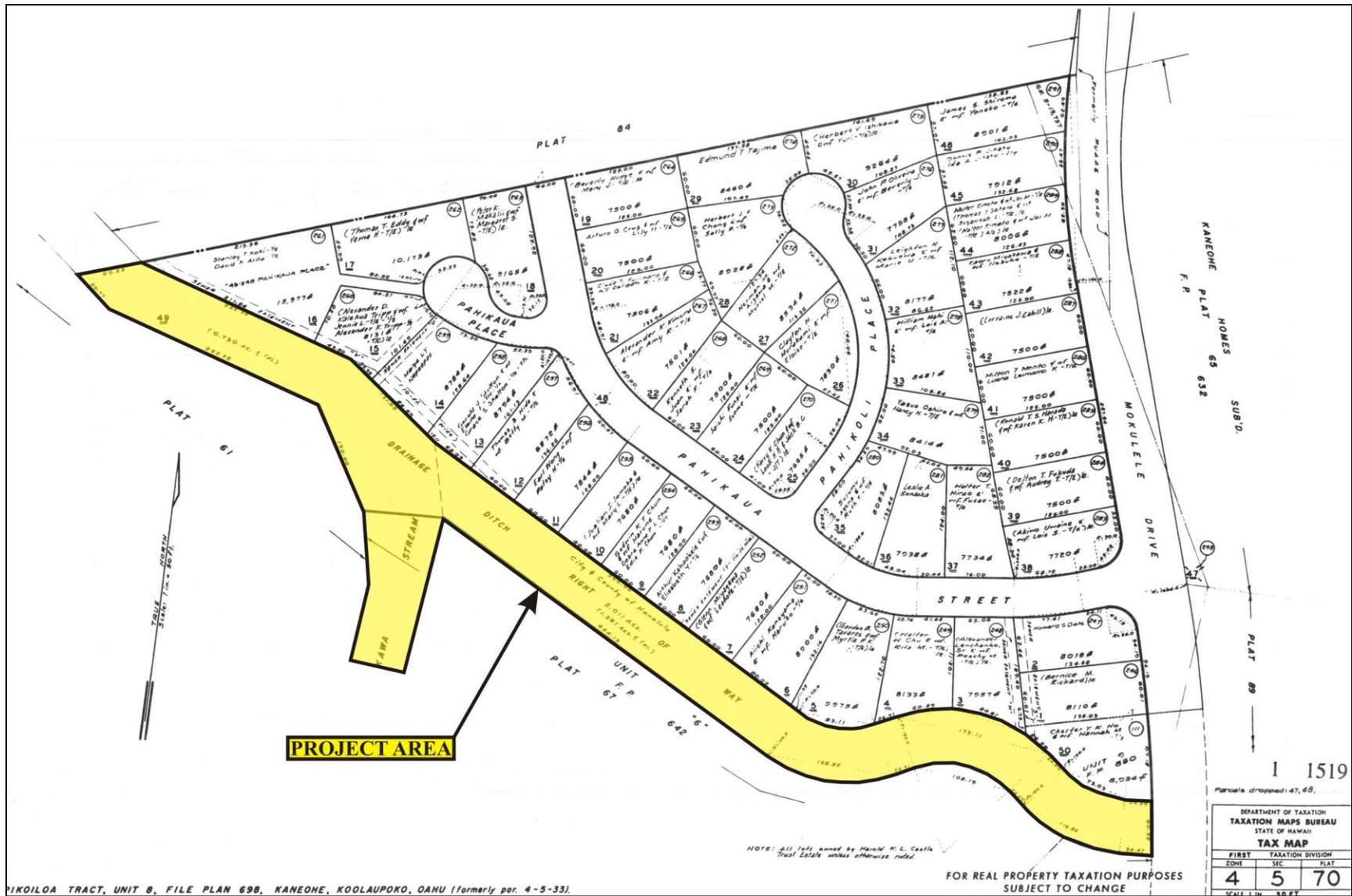


Figure 8f: Tax Map Key [TMK: (1) TMK 4-5-70] Showing Project Area Location.



and other developers to assess the effects of proposed land use or shoreline developments on the “cultural practices of the community and State” as part of the HRS Chapter 343 (2001) environmental review process.

It also redefined the definition of “significant effect” to include “...the sum of effects on the quality of the environment, including actions that irrevocably commit a natural resource, curtail the range of beneficial uses of the environment, are contrary to the State’s environmental policies . . . or adversely affect the economic welfare, social welfare or cultural practices of the community and State” (H.B. 2895, Act 50, 2000). Cultural resources can include a broad range of often overlapping categories, including places, behaviors, values, beliefs, objects, records, stories, etc. (H.B. 2895, Act 50, 2000).

Thus, Act 50 requires that an assessment of cultural practices and the possible impacts of a proposed action be included in Environmental Assessments and Environmental Impact Statements, and to be taken into consideration during the planning process. As defined by the Hawaii State Office of Environmental Quality Control (OEQC), the concept of geographical expansion is recognized by using, as an example, “the broad geographical area, e.g. district or *ahupua`a*” (OEQC 2012:12). It was decided that the process should identify ‘anthropological’ cultural practices, rather than ‘social’ cultural practices. For example, *limu* (edible seaweed) gathering would be considered an anthropological cultural practice, while a modern-day marathon would be considered a social cultural practice.

Therefore, the purpose of a CIA is to identify the possibility of ongoing cultural activities and resources within a project area, or its vicinity, and then assessing the potential for impacts on these cultural resources. The CIA is not intended to be a document of in-depth archival-historical land research, or a record of oral family histories, unless these records contain information about specific cultural resources that might be impacted by a proposed project.

According to the Guidelines for Assessing Cultural Impacts established by the Hawaii State Office of Environmental Quality Control (OEQC 2012:12):

The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religions and spiritual customs. The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both manmade and natural, which support such cultural beliefs.

The meaning of “traditional” was explained in *National Register Bulletin*:

“Traditional” in this context refers to those beliefs, customs, and practices of a living community of people that have been passed down through the generations, usually orally or through practice. The traditional cultural significance of a historic property then is significance derived from the role the property plays in a community’s historically rooted beliefs, customs, and practices. . . . [Parker and King 1990:1]

### **METHODOLOGY**

This CIA was prepared as much as possible in accordance with the suggested methodology and content protocol in the Guidelines for Assessing Cultural Impacts (OEQC 2012:11-13). In outlining the “Cultural Impact Assessment Methodology,” the OEQC (2012:11) states that:

“...information may be obtained through scoping, community meetings, ethnographic interviews and oral histories...”

This report contains archival and documentary research, as well as communications with organizations having knowledge of the project area, its cultural resources, and its practices and beliefs. An example of the letters of inquiry is presented in Appendix A. Copies of the posted legal notice and the affidavit are presented in Appendix B. An example of the follow-up letter of inquiry is presented in Appendix C. The signed information release form is presented in Appendix D. This CIA was prepared in accordance with the suggested methodology and content protocol provided in the Guidelines for Assessing Cultural Impacts (OEQC 2012:13), whenever possible. The assessment concerning cultural impacts may include, but not be limited to:

- A. A discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints or limitations which might have affected the quality of the information obtained.
- B. A description of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken.
- C. Ethnographic and oral history interview procedures, including the circumstances under which the interviews were conducted, and any constraints or limitations which might have affected the quality of the information obtained.

- D. Biographical information concerning individuals and organizations consulted, their particular expertise, and their historical and genealogical relationship to the project area, as well as information concerning the persons submitting information or interviewed, their particular knowledge and cultural expertise, if any, and their historical and genealogical relationship to the project area.
- E. A discussion concerning historical and cultural source materials consulted, the institutions and repositories searched and the level of effort undertaken. This discussion should include, if appropriate, the particular perspective of the authors, any opposing views, and any other relevant constraints, limitations or biases.
- F. A discussion concerning the cultural resources, practices and beliefs identified, and, for resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site.
- G. A discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area affected directly or indirectly by the proposed project.
- H. An explanation of confidential information that has been withheld from public disclosure in the assessment.
- I. A discussion concerning any conflicting information in regard to identified cultural resources, practices and beliefs.
- J. An analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place.
- K. A bibliography of references, and attached records of interviews which were allowed to be disclosed.

If ongoing cultural activities and/or resources are identified within the project area, assessments of the potential effects on the cultural resources in the project area and recommendations for mitigation of these effects can be proposed.

## **ARCHIVAL RESEARCH**

Archival research focused on a historical documentary study involving both published and unpublished sources. These sources included legendary accounts of native and early foreign writers; early historical journals and narratives; historic maps; land records, such as Land Commission Awards, Royal Patent Grants, and Boundary Commission records; historic accounts; and previous archaeological reports.

## **INTERVIEW METHODOLOGY**

Interviews are conducted in accordance with Federal and State laws and guidelines when knowledgeable individuals are able to identify cultural practices in, or in close proximity to, the project area. If they have knowledge of traditional stories, practices and beliefs associated with a project area or if they know of historical properties within the project area, they are sought out for additional consultation and interviews. Individuals who have particular knowledge of traditions passed down from preceding generations and a personal familiarity with the project area are invited to share their relevant information concerning particular cultural resources. Often people are recommended for their expertise, and indeed, organizations, such as Hawaiian Civic Clubs, the Island Branch of Office of Hawaiian Affairs (OHA), historical societies, Island Trail clubs, and Planning Commissions are depended upon for their recommendations of suitable informants. These groups are invited to contribute their input and suggest further avenues of inquiry, as well as specific individuals to interview. It should be stressed again that this process does not include formal or in-depth ethnographic interviews or oral histories as described in the OEQC's *Guidelines for Assessing Cultural Impacts* (2012). The assessments are intended to identify potential impacts to ongoing cultural practices, or resources, within a project area or in its close vicinity.

If knowledgeable individuals are identified, personal interviews are sometimes taped and then transcribed. These draft transcripts are returned to each of the participants for their review and comments. After corrections are made, each individual signs a release form, making the interview available for this study. When telephone interviews occur, a summary of the information is usually sent for correction and approval, or dictated by the informant and then incorporated into the document. If no cultural resource information is forthcoming and no knowledgeable informants are suggested for further inquiry, interviews are not conducted.

## **ENVIRONMENTAL SETTING**

O`ahu, the third largest island of the Hawaiian Island chain, formed as two volcanic masses (the older Wai`anae on the west and the younger Ko`olau Volcanic Series on the east) joined together (Macdonald *et al* 1983:431). As lava flowing from the Ko`olau Volcano moved to the northwest, the ocean separating the Ko`olau and Wai`anae Volcanoes was filled in, connecting the two volcanic masses and forming the Schofield Plain (Handy and Handy 1972: 434; Macdonald *et al.* 1983:420). Subsequently, active volcanism ceased and rain caught in the upper reaches of the newly formed Ko`olau Range began to sculpt the deep valleys and streams on the windward and leeward faces of the Ko`olau Range (Handy and Handy 1973:435). The project area is situated on the slope of one of these steep-sided valleys on the windward side of O`ahu.

## **PROJECT AREA LOCATION**

The project area is located in [TMKs (1) 4-5-034:014 por.; 4-5-061 por.; 4-5-062 por.; 4-5-063 por.; 4-5-066:063; 4-5-70:049; 4-5-084:059; 4-5-067:065], within Kawa Stream, about 0.58 miles (936 m) southwest of the coastline. The project area is bounded to the north by Kāne`ohe Bay Drive, to the east by James B. Castle High School and residential lots, and to the east and south by residential lots and Mokulele Dr. Overall surface topography is relatively flat throughout the vicinity of the project area.

The total length of Kawa Stream is about 2 miles (3218 m). The Kawa Watershed has an area of approximately 1,000 acres (1.5 sq. miles). Kawa Stream's headwaters originate from three perennial branches, which are fed year-round by small groundwater seeps and springs at elevations from 100-150 feet (30-46 m). Above this elevation the stream is ephemeral, flowing only during periods of rain (Oceanit Laboratories, Inc. 2002).

## **CLIMATE**

Rainfall in this area typically averages 40 inches annually (Giambelluca *et al.* 1986), though higher amounts fall in the nearby mountains, through which numerous streams, including Kawa Stream, flow to the sea. Elevation in the vicinity of the project area ranges between 35 to 135 feet mean sea level.

## **SOILS**

According to Foote *et al.* (1972:38, 83; Map Sheet 60), the project area is located within Hanalei silty clay, 0 to 2 percent slopes (HnA) and Lolekaa silty clay, 3 to 8 percent slopes

(LoB) soils. Hanalei Series soils are described as somewhat poorly drained to poorly drained soils on the islands of Kauai and Oahu, usually found on stream bottoms and flood plains (Foote *et al.* 1972: 38). These soils are used for taro, pasture, sugarcane, and vegetables. Lolekaa Series soils are described as well-drained soils on fans and terraces on the windward side of the island of Oahu, which developed in old, gravelly colluvium and alluvium (Foote *et al.* 1972: 83). These soils are used for pasture, homesites, orchards, and truck crops.

## VEGETATION

Vegetation within the project area included but was not limited to: java plum (*Syzygium cumini*), elodea (*Egeria densa*), waterweed (*Hydrilla verticillata*), begger's tick (*Bidens pilosa*), sow thistle (*Sonchus oleraceus*), prostrate spurge (*Chamaesyce prostrate*), promrose willow, (*Ludwigia octovalvis*), banyan (*Ficus sp.*), elephant grass (*Pennisetum purpureum*), hau (*Hibiscus sp.*).

## HISTORIC BACKGROUND

### TRADITIONAL LAND DIVISION

Traditionally, the division of O`ahu's land into districts (*moku*) and sub-districts was said to be performed by Mā`ilikukahi who was chosen by the chiefs to be the *mō`īho`oponopono o ke aupuni* (administrator of the government) (Kamakau 1991: 53-56). Cordy (2002), places Mā`ilikukahi at the beginning of the 16<sup>th</sup> century. Before this event, the island of O`ahu had been united as a single kingdom under Kumuhonua in the A.D. 1400s, at which time the royal center was located in `Ewa (Cordy 2002). Mā`ilikukahi, appearing later, created six districts and six district chiefs (*ali`i`ai moku*). Land was considered the property of the king, or *ali`i`ai moku* (the *ali`i* who eats the island/district), which he held in trust for the gods. The title of *ali`i`ai moku* ensured rights and responsibilities to the land, but did not confer absolute ownership. The king kept the parcels he wanted, his higher chiefs received large parcels from him and, in turn, distributed smaller parcels to lesser chiefs. The *maka`āinana* (commoners) worked the individual plots of land. It is said that Mā`ilikukahi gave land to *maka`āinana* (commoners) throughout the island of O`ahu (*ibid*).

In general, several terms, such as *moku*, *ahupua`a*, *`ili* or *`ili`āina* were used to delineate various land sections. A district (*moku*) contained smaller land divisions (*ahupua`a*) that customarily continued inland from the ocean and upland into the mountains. Extended household groups living within the *ahupua`a* were therefore able to harvest from both the land and the sea. Ideally, this situation allowed each *ahupua`a* to be self-sufficient by supplying

needed resources from different environmental zones (Lyons 1875:111). The *`ili `āina* or *`ili* were smaller land divisions next in importance to the *ahupua`a* and were administered by the chief who controlled the *ahupua`a* in which it was located (Lyons 1875:33; Lucas 1995:40). The *mo`o`āina* were narrow strips of land within an *`ili*. The land holding of a tenant, or *hoa`āina*, residing in an *ahupua`a* was called a *kuleana* (Lucas 1995:61).

As the Hawaiian culture developed, land became the property of the king, or *ali`i`ai moku* (the *ali`i* who eats the island/district), which he held in trust for the gods. His title of *ali`i`ai moku* ensured rights and responsibilities to the land, but did not confer absolute ownership. The king kept the parcels he wanted, his higher chiefs received large parcels from him and, in turn they, distributed smaller parcels to lesser chiefs. The *maka`āinana* (commoners) worked the individual plots of land (Kirch and Sahlins 1992 vol.1:25).

## TRADITIONAL AND HISTORIC SETTING

Early settlement and agricultural development was probably first established on the windward side of the Hawaiian Islands and may have begun as early as A.D. 900-1000 on O`ahu during what is known as the Colonization Period (Kirch 2011:22). Most likely arriving from east Polynesia, these early inhabitants brought with them tools, fishing gear, and other artifacts, as well as useful plants and animals. Settling in favorable localities offering both fishing and agricultural opportunities and having near access to inland resources was a priority (Kirch 1985). Although receiving the majority of their protein from fish, Handy and Handy (1972: vi) have stated: "...for every fisherman's house along the coasts there were hundreds of homesteads of planters in the valley and on the slopes and plains between the shore and forest."

The Hawaiian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua`a*. During pre-Contact times, there were primarily two types of agriculture, wetland and dry land, both of which were dependent upon geography and physiography. River valleys provided ideal conditions for wetland *kalo* (*Colocasia esculenta*) agriculture that incorporated pond fields and irrigation canals. Other cultigens, such as *kō* (sugar cane, *Saccharum officinarum*) and *mai`a* (banana, *Musa* sp.), were also grown and, where appropriate, such crops as *`uala* (sweet potato, *Ipomoea batatas*) were produced. This was the typical agricultural pattern seen during traditional times on all the Hawaiian Islands (Kirch 1985). Agricultural development on the windward side of O`ahu was likely to have begun early (A.D. 1100–1300). Agricultural development on the windward side of O`ahu was likely to have

begun early (A.D. 1100–1300) during what is known as the Expansion Period (Kirch 1985). Traditionally Kāne`ohe ahupua`a was viewed as valuable because of its productive agriculture and marine resources (Kamakau 1961:303).

### **TRADITIONAL SETTING**

The *ahupua`a* of Kāne`ohe lies in the *moku* of Ko`olaupoko; as one descends the *pali* (precipice) from leeward O`ahu, Kāne`ohe appears as a “vast green amphitheater below the serrated sheer cliffs” (Handy and Handy 1972: 456). The place name of Kāne`ohe (which literally means “bamboo husband”) is said to have evolved from a story about a woman who lamented that her husband’s cruelty was likened to the cutting edge of a bamboo knife (Pukui *et al.* 1974:85, 106; Sterling and Summers 1978:205). Kāne`ohe contains a very geographically diverse region divided into six zones (shoreline, raised limestone, lower valley, upper valley, hills and cliffs) (Cordy 1977: 6-7). Each environmental zone has provided opportunities for certain settlement patterns types. Typically, traditional Native Hawaiian burials, traditional cultural deposits, and historic cultural materials have been found in sandy deposits and fill throughout Hawai`i. In Kāne`ohe, the high sand dunes, low sand dunes, and alluvial make up the three types of shorelines. The shoreline along Kāne`ohe Bay is comprised of alluvial soils with the Mōkapu portion of the Bay being man-made (*ibid*).

The lower valley (location of the project area) lies behind Kāne`ohe Bay and between Kalokohanahou ridge at He`eia and the eastern side of Kawa Stream. This geographic region is divided by three major streams (Kea`ahala, Kāne`ohe and Kawa). The soils in the low valley primarily consist of humic latosols with the gray hydromorphic soils next to the streams. Much interpretive work still needs to be accomplished in Kāne`ohe as little work has been accomplished in the lower valley region.

The *ahupua`a* of Kāne`ohe received high rainfall, and along with its perennial streams, supplied a constant source of water for agriculture (Cordy 2002). There was also easy access to marine resources, evidenced by the numerous fishponds lining the coast. Early settlement (A.D. 300–600) of Ko`olaupoko, which included habitation, as well as agriculture, has been established in several *ahupua`a*: the sandy beaches and dunes of Waimānalo; Kailua, especially the upper valleys of Maunawili, Kahanaiki, and Kapa`a and the Kawainui Marsh area; and Kāne`ohe, with the possibly irrigated terraces, its dryland terraces and their associated habitation sites identified in Luluku (Cordy 2002). According to Cordy, the early dates from these sites suggest an expanding population by A.D. 500s to A.D.1000s (Cordy 2002).

The land below the forest was covered with taro plantations that were still present into the 20<sup>th</sup> century.

Some of these [taro] plantations vary in size from a forty-foot square to two or three acres. Like many of the fish-ponds, the size indicates the wealth and rank of the owner. Forty square feet of land planted with kalo will afford subsistence for one person during a whole year. A square mile of land planted with the same vegetable will feed fifty-one persons for the same length of time [Bates 1845:122].

Fisheries were included in Kāne`ohe Ahupua`a, supplementing the productive agricultural plots:

The ahupua`a of Kane-ohe and its sources of foods such as the pond of Kalopulolia, the nehu fish of Waihaukalua, the pods of Palawai and Nu`upia, and the bird islands of Mokulua, these belonged to Maui-waena [Kamakau in Sterling and Summers 1978:206]

During the A.D. 1000s to 1300s, the windward population continued to expand and grow. At this time, there was cultivation along Kawainui Marsh as well as *lo`i kalo* extending from the Maunawili Stream out into the marsh (Cordy 2002). The inland terracing at Kāne`ohe became complex and extensive, and included inland permanent habitation and field shelters. This was also the period that island-wide political changes occurred with the formation of district-based polities, which suggested a complex-rank political organization (Cordy 2002). By the 1700s, individual households were tenants of the land under a hierarchy of chiefs. Kāne`ohe and Kailua were the economic and demographic centers of Ko`olaupoko. Habitations were dense in the Kāne`ohe Bay area and in the drier areas along the lower valleys. The floors of narrow and wide valleys produced taro, as did lower valley marshes. Terracing in the uplands was located in almost all tributary streams extending to the base of the *pali* (cliff). There were at least 23 stone-walled fishponds established in the shallow waters of Kāne`ohe Bay (Cordy 2002).

### **WAHI PANA (SACRED PLACES)**

There are many important legends associated with the environs of Kāne`ohe Ahupua`a (Fornander 1969; Beckwith 1970; Sterling and Summers 1978). One legend provides the meaning of “Kāne`ohe” as “bamboo husband (Pukui *et al.* 1974:85).” Reverend Kamau (in

Sterling and Summers 1978:205) recounts this legend as one woman asked another about the character of her husband and the other responded by likening her husband to the sharp edge of a bamboo knife:

Is he a good husband?" The second woman replied, "He is kane ohe." (He is like a bamboo knife, this is cruel and heartless).

Scattered amongst the agricultural and habitation sites were other places of cultural significance to the *kama`āina* of the district. The gods and goddess of traditional Hawai`i were a constant in everyday life. Place names, springs, forests, agriculture, and fishing all reflected the pervading influence of the mysterious. Hi`iaka i-ka-poli-o-Pele, the younger sister of Pele, is associated with many places in Ko`olaupoko, as is Hina-i-ka-mālama who lives on the moon (Puku`i 1926). Kane and Kanaloa, known for producing springs with their staffs, first dug in Waikāne. Each loci associated with the gods and demigods has an auspicious name and *mo`olelo* attached. While these are too numerous to mention, many can be found in more detail in Sterling and Summers (1978).

At least 14 *heiau* were recorded McAllister (1933) in Kāne`ohe Ahupua`a (McAllister 1933). Two of these are said to have been built by the chief Olopana in the 12<sup>th</sup> century (Thrum 1907:48 in McAllister 1933: 179, 181). Kawa`ewa`e Heiau (McAllister Site 354), reportedly build by *menehune*, was said to be where the 15<sup>th</sup> century chief, Olopana, had the demi-god Kamapua`a brought for sacrifice (McAllister 1933:179). A *holua* slide (McAllister Site 355) was enjoyed by the *ali`i* but was destroyed in modern times to make way for pineapple cultivation (McAllister 1933: 181). The `ili of Kekele (now the general area of Kaeleuli) was extolled in song as "the sweet land of fragrance and perfume" due to the *hala* blossoms from the grove of pandanus trees covering the plains of Kāne`ohe and known as the forest of Moelana (Sterling and Summers 1978:221). Fornander (1919 Vol. IV, 3:532) recounted that:

...when Kaulu took unto himself a wife, Kekele by name. Kekele was a very handsome woman whose breath and skin were as sweet as the *inamona*. She was a very quiet woman. Her favorite flowers and vines were the *hala*, *maile*, *ieie* and all the fragrant leaves. When she retired at night she used to sleep with her *hala* wreaths and would wear them until they were dried up; therefore he *hala* at Kekele was planted for her and it grows to this day.

The fruit from the *hala* tree was used for *lei* making. The `ili of Kekele was also known as a rich and fertile land. According to Bates (1845:104), by 1866, much of the native vegetation was gone as a result of grazing animals.

From the precipice [*pali*], the plains below present the features of a fine landscape. They are marked by heavy undulations, and rent in many places by shallow ravines. Hundreds of cattle may be seen feeding on the rich pasture with which these plains are covered.

Below the *hala* groves at Kekele lies another famous stone called Ka-laau-Hoeu. Above this is another stone named Kaho-a-pohaku at resting place at the fork of the road to Kailua and Kāne`ohe. It was said that two more famous stones, Hapuu and Kalanaihauola, are at the top of the trail (Makanikeoe 1908 in Sterling and Summers 1978:224).

A spring (McAllister Site 353) was located "...on the land known as Keana (now Kokokahi), called Kinikailua-Manukaneohe, as it is said that the people from both Kailua and Kaneohe died in great numbers from drinking its waters" (McAllister 1933:179).

Located just below the old *pali* trail was another famous spring named Waiaka, which means "shadowy water" (Pukui *et al.* 1974: 219). Although the trail was difficult and steep, people would hold on with hands and feet to reach the water. Further along the trail was a supernatural stone, called Puu-o-Hauloa, which was located inside a cave. It was said that the cave, where the spirit of the deity Pumaia flew and stayed there ablaze, is located on the highest peak to the east of the pass. It can be seen from Ho`owahapōhaku on the trail in Kāne`ohe (Fornander 1919, Vol. IV:474).

According to Bates (1845:122), the land below the forest was covered with taro plantations that were still present into the 20<sup>th</sup> century:

Some of these [taro] plantations vary in size from a forty-foot square to two or three acres. Like many of the fish-ponds, the size indicates the wealth and rank of the owner. Forty square feet of land planted with kalo will afford subsistence for one person during a whole year. A square mile of land planted with the same vegetable will feed fifty-one persons for the same length of time.

Numerous fishponds lined Kāne`ohe Bay during the pre-Contact Period (see Figure 4), attesting to the significance of the area, as fishponds were traditionally owned by the *ali`i*. Kamakau (in Sterling and Summers 1978:206) stated that:

The ahupua`a of Kane-ohe and its sources of foods such as the pond of Kalopulolia, the nehu fish of Waihaukalua, the pods of Palawai and Nu`upia, and the bird islands of Mokulua, these belonged to Maui-waena.

Mc Allister (1933:344-345) described Waikalua Fishpond (McAllister Site 349) as located next to the `ili of Waikalua (literally “water of the *lua* fighter or the pit” (Pukui *et al.* 1974:222). According to Mc Allister (1933:178):

The rebuilding of the pond has been completed. The wall was 1420 feet long, of waterworn basalt 3 to 4 feet high but somewhat wider. The pond covers 11 acres.

McAllister Site 350 consisted of two ponds located to the east of Waikalua Fishpond (McAllister Site 349). At the time of McAllister’s 1930 survey of the island, Keana Fishpond, which covered 1.5 acres in area, was still in use (McAllister 1933: 178). McAllister (1933:179) further stated that”

According to Bell, name of the other is Kalokohanahnu (See Site 343.) Its wall is broken. Both were built of waterworn basalt. The dirt-filled wall of Keana is wide enough for trees to grow on it.

McAllister Site 351, which consists of three adjacent ponds, located off the lands of Mikiola and Mahinui, is to the east of McAllister Site 350, in Kāne`ohe Bay. McAllister (1933:179) stated that:

The two end ponds were probably built first, the middle pond being added later so as to take advantage of the walls of the other two. The pond on the east is known as Mahinui and that on the west as Mikiola. The name of the middle pond is Kaluoa, according to John Bell, but appears as Kapuu on a map in the Bishop Estate office. The wall of Mikiola is broken.

McAllister Sites 361, 362, and 362 are three adjacent fishponds are located in in Kāne`ohe Bay (see Figure 4). McAllister Site 361, Keaalau Fishpond, once covered 3 acres, is adjacent to the `ili of Keaalau; McAllister Site 362, Hanalua Fishpond “takes its name from the

adjacent land. It is a small pond a few acres in size and marks off an inlet”, and McAllister Site 363, Papaa Fishpond, “named for the land to which it is adjacent. It is a small pond” (McAllister 1933:182).

Trails extended from the ocean to the mountains, as well as around the coast, linking various ahupua`a for both economic and social reasons. A pali trail crossed the Ko`olau Mountains and was a link to lands on the leeward side, although it was easier to go by canoe, the most popular mode of travel. In his 1825 description of the Pali Trail, Lord Byron (in Sterling and Summers 1978:225) recorded:

The descent to this plain [Kāne`ohe], which, like that of Honoruru, extends to the sea, is the most fearful imaginable. In many places the path consists of little more than holes cut in the rock for the hands and feet; and, where most commodious, it lies along narrow ledges, where a false step would be inevitable destruction...At the bottom of the Parre there are two large stones, on which, even now, offerings of flowers and fruits are laid to propitiate the Akua Wahini, of goddesses, who are supposed to have the power of granting a safe passage.

## **HISTORIC PERIOD**

According to Kamakau, after the death of Olopana (mid-1400s, Cordy 2002), La`amaikahiki from Tahiti became the ali`i nui of Kāne`ohe. According to Kamakau (n.d. in Sterling and Summers 1978:210), in 1737 at the spot where he had arrived (Naonealaa), the chiefs of Maui and Oahu met to end a period of fighting:

So it was that Peleioholani and Alapai met at Naonealaa in Kaneohe. The canoes were lined up from Ki`i at Mokapu to Naonealaa and there on the shore line they remained. The chiefs of Oahu and Kauai and the fighting men and the country people remained inland...Alapai declared an end of war with all things as they were before, the chiefs of Maui and Molokai to be at peace with those of Oahu and Kauai; so also those of Hawaii.

In 1783, Kahahana, the nephew of Kalekili who had been put in charge of O`ahu, was killed by his uncle. While staying on O`ahu, Kahekili chose to live in the ahupua`a of Kailua, Kāne`ohe, and He`eia (Kamakau 1961).

Kamehameha's campaign to bring the islands under one rule started on Hawai'i Island. Moving to Maui, he fought the famous battle of Ka PaniWai in `Īao Valley against the ruling chief, Kalanikupule. Escaping over the mountains to Olowalu, Kalanikupule quickly sailed to O`ahu to seek protection from his father, Kahekili. Kamehameha eventually sailed with his *peleleu* (fleet) of warriors to O`ahu where the Battle of Nu`uanu was fought and where he became the ruler of the all the islands except Kaua`i.

After Kamehameha's conquest of O`ahu in 1795, he dispersed its lands to his loyal chiefs and counselors as rewards for their support. However, Kamehameha retained control over Kāne`ohe (1795). Much of Kāne`ohe and all of Kahaluu and Kualoa were inherited as personal lands by Kamehameha's sons Liholiho and Kauikeaouli, Kamehameha II and III (Indices 1929:27-28).

Kamehameha III (Kauikeaouli) presided over the Māhele, the division of lands given to Hawaiian royalty and commoners. Kamehameha III, as mentioned, had inherited Kāne`ohe and retained the bulk of the *ahupua`a* during the Māhele. After his death, his wife Queen Kalama (Hakaleleponi), retained their portion of Kāne`ohe (Barrère 1994, Kame`eleihiwa 1992:264)

### **THE MĀHELE (1848-1851)**

In the 1840s, a drastic change in the traditional land tenure resulted in a division of island lands and a system of private ownership based on Western law. While it is a complex issue, many scholars believe that in order to protect Hawaiian sovereignty from foreign powers, Kauikeaouli (Kamehameha III) was forced to establish laws changing the traditional Hawaiian economy to that of a market economy (Kuykendall 1938, Vol. I:145; Daws 1977:111; Kelly 1983:45; Kame`eleihiwa 1992:169-70, 176; Kelly 1998:4).

The Organic Acts of 1845 and 1846 initiate the process of the Māhele, the division of Hawaiian lands, which introduced private into Hawaiian society. In 1848, the crown and the *ali`i* received their lands and titles. The common people (*maka`āinana*) received their *kuleana* awards (individuals land parcels) in 1850. The Māhele of 1848 divided Hawaiian lands between the king, the chiefs, the government, and began the process of private ownership of lands. The subsequently awarded parcels were called Land Commission Awards (LCAs). Once lands were thus made available and private ownership was instituted, the *maka`āinana* (commoners), if they had been made aware of the procedures, were able to claim the plots on which they had been cultivating and living. These claims did not include any previously cultivated but presently

fallow land, `okipu`u (forest clearing on O`ahu), stream fisheries, or many other resources necessary for traditional survival (Kelly 1983; Kame`eleihiwa 1992:295; Kirch and Sahlins 1992). If occupation could be established through the testimony of two witnesses, the petitioners were awarded the claimed LCA and issued a Royal Patent after which they could take possession of the property (Chinen 1961:16).

Māhele land records provide a component to understanding land use history during the early to mid-1800s. However, due to the fact that many people who had use rights in the land did not register their claims with the Board of Commissioners, the land commission documents represent only a portion of the population that was living on and cultivating the land (Kelly and Nakamura 1981).

The average *kuleana* award was 2.38 acres (Kelly 1976:8). These claims were not only for *maka`āinana* but for *konohiki* (chiefs) were also awarded lots. The bulk of Kāne`ohe Ahupua`a went to Queen Kalama, 11 to *konohiki*, and 3 to non- *konohiki* (privileged awardees who received large parcels of land) (Kelly 1976:7). The primary type of land use claimed in Kāne`ohe was taro cultivation, identified in the LCA's as *lo`i* (wetland taro fields). Additionally, there are references of *loko* (fishponds) and *kula* (dry land agricultural plots).

During the Māhele, a total of 150 LCAs were awarded within the *ahupua`a* of Kāne`ohe (Waihona`Aina 2015). Land Commission Award 4452:13 is located within and in the vicinity of the project area. Land Commission Award documentation indicates lands in the vicinity of the project area were utilized for traditional Hawaiian habitation (*i.e.*, house lots) and agriculture, including *lo`i* (wetland taro fields), sweet potato, and bitter melon fields (Waihona`Aina 2015).

## **MID-1800S TO 1900S**

After the Māhele of 1848, the possession of Kāne`ohe passed from Kamehameha I to his son, Liholiho (Kamehameha II), and then to Kauikeaouli (Kamehameha III). Eventually, the *ahupua`a* was inherited by Kauikeaouli's widow, Kalama. In 1876, Judge C.C. Harris bought 20,000 acres from Kalama consisting of lands from Kailua and Kāne`ohe. His daughter, Nannie R. Rice inherited the land, which she leased to J.P. Mendonca in 1890 for raising Angus cattle. James B. Castle bought stock in the ranch, and ten years later, his son, Harold K. Castle purchased the land from Mrs. Rice (in the vicinity of the project area). Castle's Kaneohe Ranch Company consisted of some 12, 000 acres with 2,000 head of cattle.

Land portions that were not used as pasture were still in agriculture producing either taro or, with the growing Oriental population, rice. In the 1930s, Handy (1940: 97-98) reported:

Kan`e`ohe is one of the most complicated terrace areas of the islands. It can be comprehended only in the light of its stream system. It is still one of the most active communities in planting commercial taro, and a goodly portion of its lowland terraces, tucked away in pockets flanked and often hidden by low hills or by the town itself, are still planted in taro by Hawaiians who own the land and by Orientals who lease land or are hired.

Handy and Handy (1972:455) state that *ahupua`a* of Kāne`ohe “in glowing terms” by Portlock in 1789:

The bay all around has a very bountiful appearances, the low land and valleys being in a high state of cultivation, and crowded with plantation of taro, sweet potatoes, sugar, cane, etc., interspersed with a great number of coconut trees, which renders the prospect truly delightful.

Handy (1940:97) notes that “some of the best terraces” were located in the vicinity of the project area:

On the north side of the *ahupua`a* near the boundary of He`eia, Keaahala Stream flows into Kalimukele. Some of the best terraces now in use are inland of the highway and are irrigated by Keaahala; a large old terrace system extends downstream below the highway. An elaborate system of water rights prevailed in ancient times throughout these sections irrigated by Keaahala.

In the 1860s commercial sugar cane and rice cultivation began in Kāne`ohe. The Kāne`ohe Sugar Plantation, which started around 1865 was on Queen Kalama’s land with Charles Coffin Harris (C.C. Harris) as a partner and manager. In 1871, C.C. Harris bought Queen Kalama’s Ko`olaupoko properties from her heir, Charles Kanaina, as well as some land in Honolulu for \$22,448. The sale included “...livestock, tool, fishpond, and fishing rights” (Bureau of Conveyances, Book 34:53; cited in Devaney *et al.* 1982:29).

Rice cultivation was to eventually succeed taro and dominated the lowlands of Kāne`ohe. Rice was cultivated mainly by Chinese, who rented or leased *lo`i* lands from Hawaiian land owners. By the late 1880’s much of the floodplain areas of Kāne`ohe were under rice cultivation and remained so until early in the 20th century. Between 1890 and 1892, the Kāne`ohe Rice Mill

was erected and put into production on property adjoining Kāne`ohe Stream. The mill had a long flume coming to it from further up Kāne`ohe Stream. It also had a short railway leading to a small landing in Kāne`ohe Bay, north of Kāne`ohe Stream. By the 1920, rice production gradually declined when it could no longer compete with the price of California grown rice (Dorrance 1998:94).

Ranching and pineapple also became major business endeavors during the mid-19th to early 20th centuries. Cattle had been left on O`ahu by Vancouver in 1793, which multiplied in to a large herd by the 1840's (Devaney 1982:70). Kāne`ohe Ranch was formed in 1876, on lands which originally belonged to Queen Kalama. At its peak, the ranch included 12,000 acres and 2,000 head of cattle. Heavy cattle grazing resulted in much of the land modification in the upland and hill portions of Kāne`ohe.

Commercial cultivation of Pineapple began in the 1890's into the first decade of the 1900's in Kāne`ohe. From 1910 to 1925, pineapple cultivation was a major industry in Kāne`ohe. In 1910, after assessing the demand for pineapple on the mainland United States, Libby, McNeill and Libby of Honolulu (a subsidiary of the mainland firm) began purchasing several of the windward pineapple companies. In 1911, Libby, McNeill and Libby built a pineapple cannery in Kahalu`u. At its peak, 2,500 acres were under pineapple cultivation on the windward side of O`ahu (Harper 1972), stretching from Kāne`ohe to Kahalu`u. A large percentage of this acreage was in the Kāne`ohe Bay region, including He`eia.

The pineapple industry created havoc with traditional Hawaiian sites. During the 15-year period that pineapple was produced in the Kāne`ohe Bay region, at least five ancient Hawaiian sites were either badly damaged or completely destroyed. McAllister (1933) claims Haluakaiaamoana, Kaulauki, Keikipuipui, Kukuiokāne, and perhaps Kalaeulaula to be among these, and possibly many other smaller sites as well. The failure of pineapple in Ko`olaupoko was attributed to the destruction of these sacred sites (McAllister 1933:170, 177). According to older Hawaiians of the area, the destruction of Kukuiokāne Heiau, brought on a disease that wiped out a large amount of Libby pineapple (McAllister 1933:177). According to Richard Miller, the loss was attributed to too much rainfall, saturated soils, aphids, mealybugs, and chlorosis, a disease that results from a deficiency of available iron in the soil (Miller interview 1988, in Allen *et al.* 1987).

The pineapple fields were abandoned when Molokai and Lāna`i pineapple cultivation began to boom, and Libby pulled out of the Ko`olaupoko enterprise (Kelly 1976:47). The cannery closed in 1923 (Dorrance 1998:95).

### **PREVIOUS ARCHAEOLOGY**

This section relies on information from the SCS library, Honolulu, and the availability of archaeological reports on file at the State Historic Preservation Division Office, Kapolei. Based on proximity to the current project area, the locations of selected previous archaeological studies are depicted in Figure 3. Research indicates numerous archaeological projects have been conducted in Kāne`ohe Ahupua`a. The discussion below, summarized in Table 1, provides an overview of the archaeological studies conducted in the general area.

One of the earliest archaeological surveys on O`ahu was conducted by J. Gilbert McAllister in the early 1930s, under the auspices of the Bernice P. Bishop Museum (McAllister 1933). McAllister (1933:178,179) reported on ten sites (McAllister Sites 345 through 354; Figure 4) in the general vicinity of the project area. Kawa Stream once partially drained into Waikalua Loko (McAllister Site 349).

Cultural Surveys Hawai`i (Hammatt and Borthwick 1989) conducted an archaeological survey and assessment of an approximately 90-acre parcel for the proposed expansion of the Bay View Golf Course. During the survey, McAllister Sites 349 (Waikalua Loko) and 350 (Keana Pond) were relocated. No additional pre- or post-Contact historic properties, including cultural deposits were encountered within the project area. Preservation of Waikalua Loko and Waikalua Pond was recommended. Archaeological monitoring of the project area was also recommended during initial clearing and grading.

The Archaeological Research Group of Bisop Museum (Szabian *et al.* 1989) conducted an archaeological reconnaissance survey for the proposed Pikoiloa Cemetery. In addition to the relocation of McAllister Site 354 (Kawaewae Heiau), 11 sites (State Sites 50-80-10-4676 through -4686) with at least 25 features were recorded. Four sites were interpreted as pre-historic, which included agricultural and habitation sites. Seven sites were interpreted as historic in nature, which included agricultural/water control, habitation, charcoal kiln, and boundary marker sites. State Site -4682 was later determined to be non-cultural in nature and is therefore not considered a historic property.



**Table 1: Previous Archaeology**

Reference	Location of Study	Nature of Study	Site Number(s)
McAllister 1933	Island-wide	Island-wide Survey	McAllister Sites 345 through -354
Clark & Riford 1986	Archaeological Salvage Excavations	Nani Pua Gardens II Subdivision	BPBM Site 50-Oa-G5-101 (State Site -2937)
Kurashia <i>et al.</i> 1986	Archaeological Survey	Nani Pua Gardens II Subdivision	BPBM Site 50-Oa-G5-101 (State Site -2937), 50-Oa-G5-100, 50- Oa-G5-103, 50-Oa-G5-103
Hammatt & Borthwick	Archaeological Survey & Assessment	Bay View Golf Course	Relocates and documents Waikalua-Loko (-349) and Waikalua Pond (-350)
Hammatt & Shideler 1989	Archaeological Survey	Veterans Cemetery	No Significant Finds
Szabian <i>et al.</i> 1989	Reconnaissance Survey	North & West Facing Ridge Separating Kailua and Kāne`ohe	State Sites 50-80-10-4676 through -4686
Pfeffer & Hammatt 1992	Archaeological Assessment	Transmission Corridor mostly along Kamehameha Highway	No Significant Finds
Stride <i>et al.</i> 1994	Inventory Survey & Subsurface Testing	Waikalua Roud (TMK 4-5-005:001, 002, 012, 014) 3.3-ac at shoreline	No Significant Finds
Dashiell 1995	Preservation Plan	Waikalua Loko fishpond	Recommended Preserving, Restoring, and Maintaining the Fishpond
McCurdy & Hammatt 2009	Archaeological Inventory Survey	Hawaiian Memorial Park	Relocated State Sites 50-80- 10-354, -4680, -4681, -4683, - 4684, and -4686. Newly Identified State Sites 50-80- 6929 through -6933 and -7079

Reference	Location of Study	Nature of Study	Site Number(s)
Sinoto & Titchenal 2010	Archaeological Assessment	Kāne`ohe-Kailua Force Main	No Significant Finds
Sinoto & Dashiell 2011	Archaeological Monitoring	Bay View Golf Course	No Significant Finds
Groza <i>et al.</i> 2011	Literature Review and Field Inspection	Kāne`ohe WWPTF & Kailua WWTP	No Significant Finds
Groza & Monahan 2012	Archaeological Assessment	Kāne`ohe WWPTF & Kailua WWTP	No Significant Finds

Cultural Surveys Hawai`i (Hammatt and Shideler 1989) conducted an archaeological survey of a 90-ac parcel for the proposed Hawai`i State Veterans Cemetery. No historic properties were identified.

Cultural Surveys Hawai`i (Pfeffer and Hammatt 1992) conducted an archaeological assessment for the improvements to existing sub-transmission lines between Koolau Substation to Puohala Substation to create a new 46kV circuit. This project ran through a small portion of the subject project area. No historic properties were identified.

Cultural Surveys Hawai`i (McCurdy and Hammatt 2009) conducted an archaeological inventory survey for the development of the Hawaiian Memorial Park expansion. Twelve sites were observed within or near the project area. Six sites (State Sites 50-80-10354, -4680, -4681, -4683, -4684, and -4686) were previously recorded during the Szabian *et al.* (1989) project. The remaining six sites (State Sites 50-80-10-6929 through -6933 and -7079) were newly identified. State Sites 50-80-10-4683, -4684, -4686 Feature B, -6930, -6932, -6933, and 7079 were recommended for preservation. A program of Archaeological Monitoring was recommended to address the potential of project related excavations impacting subsurface cultural material.

Groza *et al.* (2011) conducted an archaeological literature review and field inspection for the proposed Kāne`ohe-Kailua Wastewater Conveyance and Treatment Facility Project, Alternative 2-Tunnel Route. No prehistoric or historic sites were encountered within the project area.

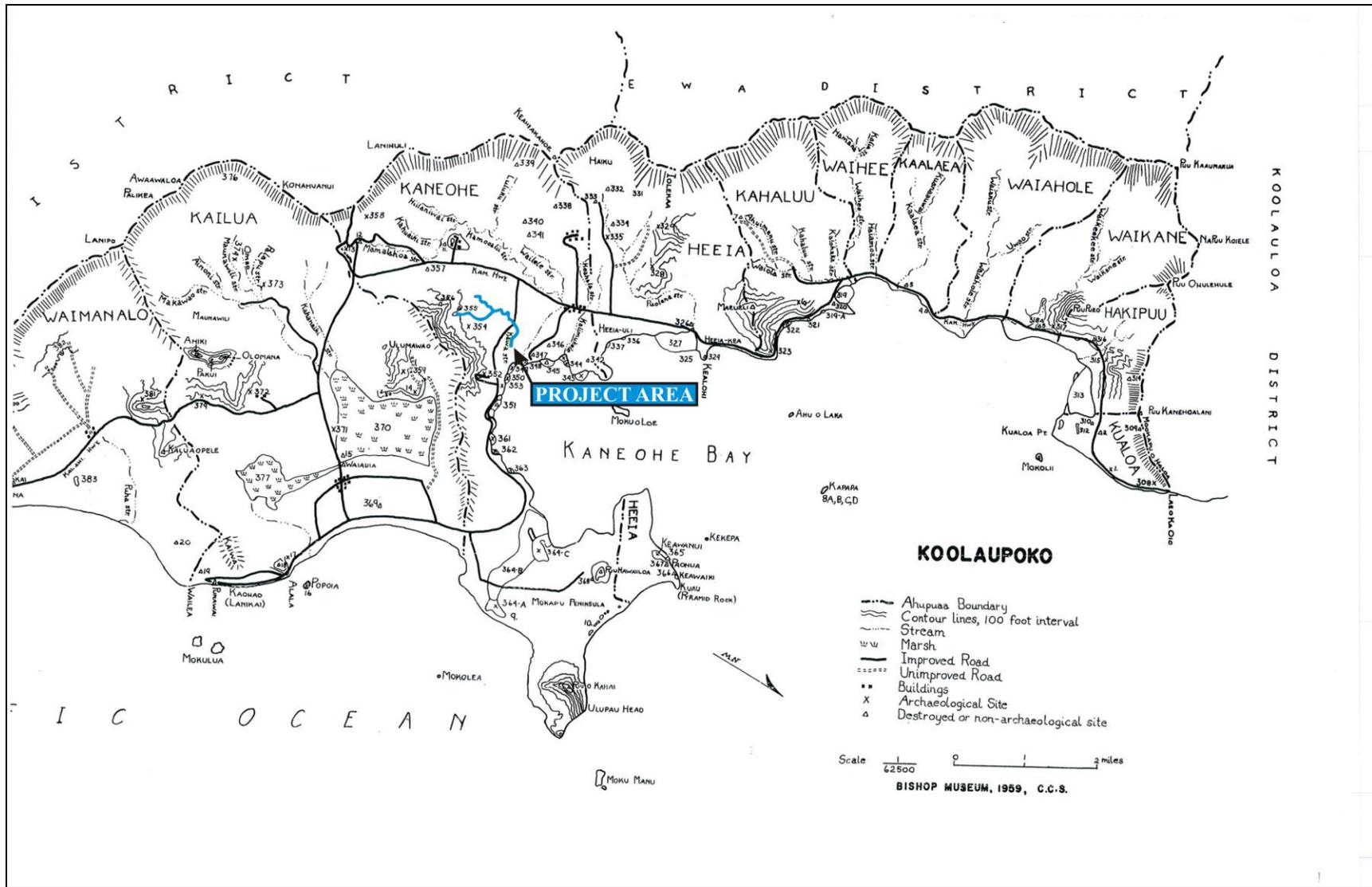


Figure 11: Koolau District Map Showing Location of McAllister Sites (Bishop Museum 1959, prepared by Catherine C. Summers, in Sterling and Summers 1998).

In February 2015 Scientific Consultant Services, Inc. (Medrano and Spear 2015, in prep.) conducted an archaeological inventory survey, for the proposed Kawa Stream and Ditch Improvement Project in Kāne`ohe Ahupua`a, Ko`olaupoko District, Island of O`ahu, Hawai`i [TMKs (1) 4-5-034:014 por.; 4-5-061 por.; 4-5-062 por.; 4-5-063 por.; 4-5-066:063; 4-5-70:049; 4-5-084:059; 4-5-067:065]. During the survey, one site, the historic Kawa Bridge (State Site 50-80-10-7766) was newly identified. According to the Hawaii State Historic Bridge Inventory and Evaluation (2013:9, 98), Kawa Bridge (Bridge Number 003063001400065) was built in 1939. This site carries Kāne`ohe Bay Drive/pedestrian walkway and crosses Kawa Stream. Additionally, this location also includes the site of gaging station 16265000, which was first established in 1914.

### **CONSULTATION**

Consultation was conducted via telephone, e-mail, personal interviews, and the U.S. Postal Service. Consultation was sought from Dr. Kamana`opono M. Crabbe, Chief Executive Officer Office of Hawaiian Affairs; Vincent H. Rodrigues, Cultural Historian, State Historic Preservation Division; Ko`olaupoko Hawaiian Civic Club; Aaron Mahi, community member; and William Ho`ohuli, community member.

In addition, a Cultural Impact Assessment Notice was published on April 4, 9, and 12, 2015, in *The Honolulu Star-Advertiser* and the June 2015 issue of the OHA newspaper, *Ka Wai Ola* (see Appendix B). These notices requested information of cultural resources or activities in the area of the proposed project, stated the Tax Map Key (TMK) number, and where to respond with pertinent information. Based on the responses, an assessment of the potential effects on cultural resources in the project area and recommendations for mitigation of these effects can be proposed.

### **CULTURAL IMPACT ASSESSMENT INQUIRY RESPONSES**

Analysis of the potential effect of the project on cultural resources, practices or beliefs, the potential to isolate cultural resources, maintain practices or beliefs in their original setting, and the potential of the project to introduce elements that may alter the setting in which cultural practices take place is a requirement of the OEQC (2012:13). As stated earlier, this includes the cultural resources of the different groups comprising the multiethnic community of Hawai`i.

During the consultation process, SCS received no responses to the inquiries pertaining to any information that individuals or organizations may have which might contribute to the knowledge of traditional cultural activities that were, or are currently, conducted in the vicinity of the proposed Kawa Stream and Ditch improvements project in Kāne`ohe Ahupua`a, Ko`olaupoko District, Ahupua`a, `Ewa, Island of O`ahu, Hawai`i [TMK: (1) 4-5-034:014 por.; 4-5-061 por.; 4-5-062 por.; 4-5-063 por.; 4-5-066:063; 4-5-70:049; 4-5-084:059; 4-5-067:065].

### **SUMMARY**

The “level of effort undertaken” to identify potential effect by a project to cultural resources, places or beliefs (OEQC 2012) has not been officially defined and is left up to the investigator. A good faith effort can mean contacting agencies by letter, interviewing people who may be affected by the project or who know its history, researching sensitive areas and previous land use, holding meetings in which the public is invited to testify, notifying the community through the media, and other appropriate strategies based on the type of project being proposed and its impact potential. Sending inquiring letters to organizations concerning development of a piece of property that has already been totally impacted by previous activity and is located in an already developed industrial area may be a “good faith effort.” However, when many factors need to be considered, such as in coastal or mountain development, a good faith effort might mean an entirely different level of research activity.

In the case of the current undertaking, letters of inquiry were sent to individuals and organizations that may have knowledge or information pertaining to the collection of cultural resources and/or practices currently, or previously, conducted in close proximity to the proposed Kawa Stream and Ditch improvements project in Kāne`ohe Ahupua`a, Ko`olaupoko District, Ahupua`a, `Ewa, Island of O`ahu, Hawai`i [TMK: (1) 4-5-034:014 por.; 4-5-061 por.; 4-5-062 por.; 4-5-063 por.; 4-5-066:063; 4-5-70:049; 4-5-084:059; 4-5-067:065]

Historical and cultural source materials were extensively used and can be found listed in the References Cited portion of this report. Such scholars as Samuel Kamakau, Martha Beckwith, Jon J. Chinen, Lilikalā Kame`eleihiwa, R. S. Kuykendall, Marion Kelly, E. S. C. Handy and E.G. Handy, Elspeth P. Sterling, and Mary Kawena Puku`i and Samuel H. Elbert continue to contribute to our knowledge and understanding of Hawai`i, past and present. The works of these and other authors were consulted and incorporated in this report where appropriate. Land use document research was supplied by the Waihona `Aina Database (2015).

## **CULTURAL ASSESSMENT AND RECOMMENDATIONS**

Analysis of the potential effect of the project on cultural resources, practices or beliefs, its potential to isolate cultural resources, practices or beliefs from their setting, and the potential of the project to introduce elements which may alter the setting in which cultural practices take place is a suggested guideline of the OEQC (2012). Based on the response from those organizations and individuals contacted, the proposed project area has not been used for traditional cultural purposes within recent times. Based on historical research and the lack of responses from those organizations and individuals contacted, it is reasonable to conclude that Hawaiian rights related to gathering, access or other customary activities within the project area will not be affected and there will be no adverse effect upon cultural practices or beliefs.

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**APPENDIX A: EXAMPLE LETTER OF INQUIRY**

Dear:

In compliance with the State of Hawai'i Revised Statute (HRS) Chapter 343 Environmental Impact Statements Law, and in accordance with the State of Hawai'i Department of Health's Office of Environmental Quality Control (OEQC) Guidelines for Assessing Cultural Impacts as adopted by the Environmental Council, State of Hawai'i on November 19, 1997, Scientific Consultant Services, Inc. (SCS) is in the process of preparing a Cultural Impact Assessment (CIA) pertaining to proposed improvements at Kawa Stream and Ditch, located in Kāne`ohe Ahupua`a, Ko`olaupoko District, O`ahu Island [TMK: (1) 4-5-034:014 por.; 4-5-061 por.; 4-5-062 por.; 4-5-063 por.; 4-5-066:063; 4-5-70:049; 4-5-084:059; 4-5-067:065] (Figures 1 and 2). The project area is owned by the City and County of Honolulu.

According to the *Guidelines for Assessing Cultural Impacts* (Office of Environmental Quality Control, Nov. 1997):

The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs... The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both man made and natural which support such cultural beliefs...

We are asking you for any information that you or other individuals have which might contribute to the knowledge of traditional cultural activities that were, or are currently, conducted in the vicinity of the proposed project area. We are also asking for any information pertaining to traditional cultural activities or traditional rights which may be impacted by the proposed undertaking. The results of the cultural impact assessment are dependent on the response and contributions made by individuals, such as you.

Enclosed are maps showing the proposed project area. Please contact me at the Scientific Consultant Services, Honolulu, office at (808) 597-1182 with any information or recommendations concerning this Cultural Impact Assessment.

Sincerely yours,

Cathleen Dagher  
Senior Archaeologist  
Enclosures (2)

Cc:

**APPENDIX B: NEWSPAPER NOTICE AND AFFIDAVIT**

Scientific Consultant Services, Inc. (SCS) is seeking information on cultural resources and cultural practices on or near the Kawa Stream and Ditch, in Kāne`ohe Ahupua`a, Ko`olaupoko District, O`ahu Island [TMK: (1) 4-5-034:014 por.; 4-5-061 por.; 4-5-062 por.; 4-5-063 por.; 4-5-066:063; 4-5-70:049; 4-5-084:059; 4-5-067:065]. The project area is owned by the City and County of Honolulu. Please respond within 30 days to Cathleen Dagher at (808) 597-1182.

1638

AFFIDAVIT OF PUBLICATION

IN THE MATTER OF  
SCS Proj 1638 Kawa Stream CIA

}  
}  
}  
}  
}

STATE OF HAWAII }  
} SS.  
City and County of Honolulu }

Doc. Date: APR 13 2015 # Pages: 1

Notary Name: Patricia K. Reese First Judicial Circuit

Doc. Description: Affidavit of Publication

*Patricia K. Reese* APR 13 2015  
Notary Signature Date



Scientific Consultant Services, Inc. (SCS) is seeking information on cultural resources and cultural practices on or near the Kawa Stream and Ditch, in Kamehame Ahupua'a, Ko'olaupoko District, Oahu Island (TMK: (1) 4-5-034-014 por. 4-5-061 por. 4-5-062 por. 4-5-063 por. 4-5-066-063; 4-5-70-048; 4-5-084-059; 4-5-067-065). The project area is owned by the City and County of Honolulu. Please respond within 30 days to Cathleen Dagher at (808) 597-1182.  
(SA742231 4/8, 4/9, 4/12/15)

Julie Clark being duly sworn, deposes and says that she is a clerk, duly authorized to execute this affidavit of Oahu Publications, Inc. publisher of The Honolulu Star-Advertiser, MidWeek, The Garden Island, West Hawaii Today, and Hawaii Tribune-Herald, that said newspapers are newspapers of general circulation in the State of Hawaii, and that the attached notice is true notice as was published in the aforementioned newspapers as follows:

- Honolulu Star-Advertiser 3 times on: 04/08, 04/09, 04/12/2015
- MidWeek 0 times on:
- The Garden Island 0 times on:
- Hawaii Tribune-Herald 0 times on:
- West Hawaii Today 0 times on:

Other Publications: 0 times on:

And that affiant is not a party to or in any way interested in the above entitled matter.

*Julie Clark*  
Julie Clark

Subscribed to and sworn before me this 13th day of April A.D. 20 15

*Patricia K. Reese*  
Patricia K. Reese, Notary Public of the First Judicial Circuit, State of Hawaii  
My commission expires: Oct 07, 2018

Ad # 0000742231

SP.NO.: \_\_\_\_\_ L.N.



**APPENDIX C: EXAMPLE FOLLOW-UP LETTER**

Dear Mr.:

This is the follow-up letter to our April 3, 2015 letter, which was in compliance with the State of Hawai'i Revised Statute (HRS) Chapter 343 Environmental Impact Statements Law, and in accordance with the State of Hawai'i Department of Health's Office of Environmental Quality Control (OEQC) Guidelines for Assessing Cultural Impacts as adopted by the Environmental Council, State of Hawai'i on November 19, 1997.

Scientific Consultant Services, Inc. (SCS) is in the process of preparing a Cultural Impact Assessment (CIA) pertaining to proposed improvements at Kawa Stream and Ditch, located in Kāne'ohe Ahupua'a, Ko'olaupoko District, O'ahu Island [TMK: (1) 4-5-034:014 por.; 4-5-061 por.; 4-5-062 por.; 4-5-063 por.; 4-5-066:063; 4-5-70:049; 4-5-084:059; 4-5-067:065]. The project area is owned by the City and County of Honolulu.

In February 2015, SCS (Medrano and Spear 2015) conducted an Archaeological Inventory Survey of the proposed Kawa Stream and Ditch improvement project area. During the survey, one historic property, the Kawa Bridge (State Site 50-80-10-7766), was newly identified and documented.

According to the *Guidelines for Assessing Cultural Impacts* (Office of Environmental Quality Control, Nov. 1997):

The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs... The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both man made and natural which support such cultural beliefs...

We are asking you for any information that you or other individuals have which might contribute to the knowledge of traditional cultural activities that were, or are currently, conducted in the vicinity of the proposed project area. We are also asking for any information pertaining to traditional cultural activities or traditional rights which may be impacted by the proposed undertaking. The results of the cultural impact assessment are dependent on the response and contributions made by individuals, such as you.

Please contact me at the Scientific Consultant Services, Honolulu, office at (808) 597-1182 with any information or recommendations concerning this Cultural Impact Assessment.

Sincerely yours,

Cathleen Dagher  
Senior Archaeologist

**Appendix D**  
**Agency Comment Letters**  
**to DEA and Responses**

---

DAVID Y. IGE  
GOVERNOR OF HAWAII



VIRGINIA PRESSLER, M.D.  
DIRECTOR OF HEALTH

**STATE OF HAWAII**  
**DEPARTMENT OF HEALTH**  
P. O. BOX 3378  
HONOLULU, HI 96801-3378

In reply, please refer to:  
File:

EPO 15-183

July 29, 2015

Mr. Cris Takushi, P.E., Project Manager  
828 Fort Street Mall, Suite 600  
Honolulu, Hawaii 96813

Dear Mr. Takushi:

**SUBJECT: Draft Environmental Assessment (DEA) for Kawa Stream and Ditch Improvements, Oahu**

The Department of Health (DOH), Environmental Planning Office (EPO), acknowledges receipt of your DEA to our office on July 23, 2015. Thank you for allowing us to review and comment on the proposed Kawa Stream and Ditch Improvements available on the OEQC website at:

[http://oeqc.doh.hawaii.gov/Shared%20Documents/EA\\_and\\_EIS\\_Online\\_Library/Oahu/2010s/2015-07-23-OA-5B-DEA-Kawa-Stream-and-Ditch-Improvements.pdf](http://oeqc.doh.hawaii.gov/Shared%20Documents/EA_and_EIS_Online_Library/Oahu/2010s/2015-07-23-OA-5B-DEA-Kawa-Stream-and-Ditch-Improvements.pdf)

The DEA was routed to various branches. The various branches will provide specific comments to you if necessary. EPO recommends that you review the standard comments and available strategies to support sustainable and healthy design provided at: <http://health.hawaii.gov/epo/home/landuse-planning-review-program/>. Projects are required to adhere to all applicable standard comments.

We encourage you to examine and utilize the Hawaii Environmental Health Portal. The portal provides links to our e-Permitting Portal, Environmental Health Warehouse, Groundwater Contamination Viewer, Hawaii Emergency Response Exchange, Hawaii State and Local Emission Inventory System, Water Pollution Control Viewer, Water Quality Data, Warnings, Advisories and Postings. The Portal is continually updated. Please visit it regularly at: <https://eha-cloud.doh.hawaii.gov>

You may also wish to review the revised Water Quality Standards Maps that have been updated for all islands. The Water Quality Standards Maps can be found at: <http://health.hawaii.gov/cwb/site-map/clean-water-branch-home-page/water-quality-standards/>.

We request that you utilize all of this information on your proposed project to increase sustainable, innovative, inspirational, transparent and healthy design.

Mahalo nui loa,

A handwritten signature in blue ink, appearing to read "Laura Leialoha Phillips McIntyre".

Laura Leialoha Phillips McIntyre, AICP  
Program Manager, Environmental Planning Office

c: CWB {via email only}



October 9, 2015

Ms. Laura Leialoha Philips McIntyre,  
Program Manager, Environmental Planning Office  
Department of Health  
P.O. Box 3378  
Honolulu, Hawaii 96801-3378

Dear Ms. McIntyre:

Subject: Draft Environmental Assessment (EA)  
Kawa Stream and Ditch Improvements Project  
Kaneohe, Oahu, Hawaii  
TMK: 4-5-066, 4-5-067, 4-5-070, 4-5-084  
**EPO 15-183**

This letter is in response to your comment letter of July 29, 2015, regarding the City and County of Honolulu, Department of Design and Construction (DDC) Kawa Stream and Ditch Improvements Project on the Island of Oahu. On behalf of the applicant, DDC, thank you for reviewing the Draft EA and providing comments to the Draft EA.

We will review the standard comments and available strategies to support sustainable and healthy design provided on your website, examine the Hawaii Environmental Health Portal and will review the Water Quality Standards Maps as it relates to this project.

If there are any questions, please contact Cris Takushi at (808) 531-3017, ext. 129 or by email at [ctakushi@oceanit.com](mailto:ctakushi@oceanit.com).

Sincerely,

  
Cris Takushi  
Project Manager

cc: Department of Design and Construction – Scott Nakamatsu  
ParEn Inc. – Steven Harano



**STATE OF HAWAII**  
**DEPARTMENT OF EDUCATION**

P.O. BOX 2360  
HONOLULU, HAWAII 96804

OFFICE OF SCHOOL FACILITIES AND SUPPORT SERVICES

August 18, 2015

Ms. Kristine Kutscher  
Oceanit  
828 Fort Street Mall, Suite 600  
Honolulu, Hawaii 96813

Re: Draft Environmental Assessment for Kawa Stream and Ditch Improvement Project,  
Kaneohe, Oahu

Dear Ms. Kutscher:

The Department of Education (DOE) has reviewed the Draft Environmental Assessment (DEA) for the Kawa Stream and Ditch improvements. We will accept the DEA's assurance that early communication links will be established between the construction manager of the project and the principal of Castle High School. We anticipate that efforts will be made to schedule loud activities and traffic congestion generating activities with consideration of the school schedule. We also understand that efforts will be made to control dust emissions from the project site.

We would like to point out a small discrepancy in your stated plans. In your March 27, 2015 response to Superintendent Matayoshi regarding the possibility of equipment and other work being staged on the Castle campus, you mentioned such a request would be made if no other City land is available. In the July 2015 DEA, there is a reference to contacting the DOE if an appropriate staging area is available on Castle property. The DEA appendix includes a December 19, 2014 letter from Theresa K. Donham, Archaeology Branch Chief of the State Historic Preservation Division of the Department of Land and Natural Resources (DLNR) to Russell Y. Tsuji, Administrator of the Land Division of DLNR. The letter states that "Supplemental information received on December 15, 2014 indicates the staging area for equipment and machinery will be within the parking lot of Castle High School."

The DOE was never provided any supplemental information in December 2014 indicating interest in the Castle campus for a project staging area. We ask that the Final Environmental Assessment clarify whether any decision has been made about using school property for the project and when the Principal of Castle was contacted about the use of school land.

Ms. Kristine Kutscher  
August 18, 2015  
Page 2

The DOE has no other comment at this time. We appreciate this opportunity to review the DEA. If you have any questions, please call Heidi Meeker of the Facilities Development Branch, at 377-8301.

Respectfully,



*for*  
Kenneth G. Masden II  
Public Works Manager  
Planning Section

KGM:jmb

c: Matthew C.W. Ho, Complex Area Superintendent, Castle-Kahuku Complex Areas



October 9, 2015

Mr. Kenneth G. Masden, Public Works Manager  
Department of Education  
P.O. Box 2360  
Honolulu, Hawaii 96804  
Attention: Hiedi Meeker

Dear Ms. Meeker:

Subject: Draft Environmental Assessment (EA)  
Kawa Stream and Ditch Improvements Project  
Kaneohe, Oahu, Hawaii  
TMK: 4-5-066, 4-5-067, 4-5-070, 4-5-084

This letter is in response to your comment letter of August 18, 2015, regarding the City and County of Honolulu, Department of Design and Construction (DDC) Kawa Stream and Ditch Improvements Project on the Island of Oahu. On behalf of the applicant, DDC, thank you for reviewing the Draft EA and pointing out some discrepancies in the document and related responses to the Draft EA. A letter was sent to DLNR State Historic Preservation Division informing them that the need for storage of equipment or machinery on the Castle High School property has yet to be determined. The following statement was included in the Impacts and Mitigation, Section 5.2.1 for Transportation and Section 5.4.1 for Medical, Schools, Police, and Fire.

“If the Contractor cannot find an appropriate area for equipment and staging he may contact the Department of Education - Facilities Development Branch to determine if an appropriate area is available on the Castle High School property.”

If there are any questions, please contact Cris Takushi at (808) 531-3017, ext. 129 or by email at [ctakushi@oceanit.com](mailto:ctakushi@oceanit.com).

Sincerely,

  
Cris Takushi  
Project Manager

cc: Department of Design and Construction – Scott Nakamatsu  
ParEn Inc. – Steven Harano

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

August 20, 2015

Oceanit Laboratories Inc.  
Attn: Kristine Kutscher  
828 Fort Street Mall #600  
Honolulu, HI 96813

via email: [kkutscher@oceanit.com](mailto:kkutscher@oceanit.com)

Dear Ms. Kutscher,

**SUBJECT:** Draft Environmental Assessment (EA) Notice of Publication, Kawa Stream and Ditch Improvements Project

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

At this time, enclosed are comments from (1) Land Division – Oahu District; and (2) Office of Conservation and Coastal Lands. No other comments were received as of our suspense date. Should you have any questions, please feel free to call Supervising Land Agent Steve Molmen at 587-0439. Thank you.

Sincerely,

A handwritten signature in blue ink, appearing to read "Russell Y. Tsuji".

Russell Y. Tsuji  
Land Administrator

Enclosure(s)

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

August 4, 2015

MEMORANDUM

TO:

**DLNR Agencies:**

- Div. of Aquatic Resources
- Div. of Boating & Ocean Recreation
- Engineering Division
- Div. of Forestry & Wildlife
- Div. of State Parks
- Commission on Water Resource Management
- Office of Conservation & Coastal Lands
- Land Division – Oahu District
- Historic Preservation

FROM:

Russell Y. Tsuji, Land Administrator

SUBJECT:

Draft Environmental Assessment (EA) Notice of Publication, Kawa Stream and Ditch Improvements Project

LOCATION:

Kaneohe, Oahu, Hawaii; TMK: 4-5-034, 4-5-061, 4-5-063, 4-5-070, 4-5-084

APPLICANT:

City and County of Honolulu, Department of Design and Construction by its consultant Oceanit Laboratories Inc.

Transmitted for your review and comment on the above-referenced document. We would appreciate your comments on this document which can be found at the website of the Office of Environmental Quality Control (OEQC) as listed in Oceanit's cover letter.

Please submit any comments by **August 19, 2015**. If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

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

Signed: \_\_\_\_\_  
Print Name: \_\_\_\_\_  
Date: \_\_\_\_\_

BC



October 10, 2015

Mr. Russell Y. Tsuji  
Land Administrator  
Hawaii Department of Land and Natural Resources  
Land Division  
P.O. Box Office 621  
Honolulu, Hawaii 96809

Dear Mr. Tsuji:

Subject: Draft Environmental Assessment (EA)  
Kawa Stream and Ditch Improvements Project  
Kaneohe, Oahu, Hawaii  
TMK: 4-5-066, 4-5-067, 4-5-070, 4-5-084

On behalf of the applicant, Department of Design and Construction (DDC), we thank you for reviewing the DEA for the Kawa Stream and Ditch Improvements Project on the Island of Oahu.

If there are any questions, please contact Cris Takushi at (808) 531-3017, ext. 129 or by email at [ctakushi@oceanit.com](mailto:ctakushi@oceanit.com).

Sincerely,

  
Cris Takushi  
Project Manager

cc: Department of Design and Construction – Scott Nakamatsu  
ParEn Inc. – Steven Harano

DAVID Y. IGE  
GOVERNOR OF HAWAII

OA-16-32



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

RECEIVED  
OFFICE OF CONSERVATION  
AND COASTAL LANDS

2015 AUG -5 P 3:08

STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
LAND DIVISION

RECEIVED  
NATURAL RESOURCES  
STATE OF HAWAII

POST OFFICE BOX 621  
HONOLULU HAWAII 96809

August 4, 2015

MEMORANDUM

TO:

**DLNR Agencies:**

- Div. of Aquatic Resources
- Div. of Boating & Ocean Recreation
- Engineering Division
- Div. of Forestry & Wildlife
- Div. of State Parks
- Commission on Water Resource Management
- Office of Conservation & Coastal Lands
- Land Division – Oahu District
- Historic Preservation

RECEIVED  
LAND DIVISION  
2015 AUG 19 PM 12:27  
DEPT. OF LAND &  
NATURAL RESOURCES  
STATE OF HAWAII

FROM:

Russell Y. Tsuji, Land Administrator

SUBJECT:

Draft Environmental Assessment (EA) Notice of Publication, Kawa Stream and Ditch Improvements Project

LOCATION:

Kaneohe, Oahu, Hawaii; TMK: 4-5-034, 4-5-061, 4-5-063, 4-5-070, 4-5-084

APPLICANT:

City and County of Honolulu, Department of Design and Construction by its consultant Oceanit Laboratories Inc.

Transmitted for your review and comment on the above-referenced document. We would appreciate your comments on this document which can be found at the website of the Office of Environmental Quality Control (OEQC) as listed in Oceanit's cover letter.

Please submit any comments by **August 19, 2015**. If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

- We have no objections.
- We have no comments.
- Comments are attached.

Parcel is not in  
the Conservation  
District

Signed: MICHAEL CAIN

Print Name: Michael Cain

Date: 18 AUG 2015



October 10, 2015

Department of Land and Natural Resources  
Office of Conservation and Coastal Lands  
Kalanimoku Building  
1151 Punchbowl Street, Room 131  
Honolulu, Hawaii 96813  
Attention: Michael Cain

Dear Mr. Cain,

Subject: Draft Environmental Assessment (EA)  
Kawa Stream and Ditch Improvements Project  
Kaneohe, Oahu, Hawaii  
TMK: 4-5-066, 4-5-067, 4-5-070, 4-5-084

This letter is in response to your letter signed August 18, 2015, regarding the City and County of Honolulu, Department of Design and Construction (DDC) Kawa Stream and Ditch Improvements Project on the Island of Oahu. On behalf of the applicant, DDC, we thank you for reviewing the Draft EA and providing verification that the project parcels are not in a Conservation District.

If there are any questions, please contact Cris Takushi at (808) 531-3017, ext. 129 or by email at [ctakushi@oceanit.com](mailto:ctakushi@oceanit.com).

Sincerely,

Cris Takushi  
Project Manager

cc: Department of Design and Construction – Scott Nakamatsu  
ParEn Inc. – Steven Harano

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

August 20, 2015

Oceanit Laboratories Inc.  
Attn: Kristine Kutscher  
828 Fort Street Mall #600  
Honolulu, HI 96813

via email: [kkutscher@oceanit.com](mailto:kkutscher@oceanit.com)

Dear Ms. Kutscher,

SUBJECT: Draft Environmental Assessment (EA) Notice of Publication, Kawa Stream and  
Ditch Improvements Project

Thank you for the opportunity to review and comment on the subject matter. In addition to the comments sent to you dated August 20, 2015, enclosed are additional comments from the Engineering Division. Should you have any questions, please feel free to call Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you..

Sincerely,

A handwritten signature in blue ink, appearing to read "Russell Y. Tsuji".

Russell Y. Tsuji  
Land Administrator

Enclosure(s)

DAVID Y. IGE  
GOVERNOR OF HAWAII



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

RECEIVED  
LAND DIVISION

2015 AUG 20 AM 10:23

STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
LAND DIVISION

POST OFFICE BOX 621  
HONOLULU, HAWAII 96809

August 4, 2015

MEMORANDUM

TO: PR:

**DLNR Agencies:**

- Div. of Aquatic Resources
- Div. of Boating & Ocean Recreation
- Engineering Division
- Div. of Forestry & Wildlife
- Div. of State Parks
- Commission on Water Resource Management
- Office of Conservation & Coastal Lands
- Land Division – Oahu District
- Historic Preservation

FROM:

Russell Y. Tsuji, Land Administrator

SUBJECT:

Draft Environmental Assessment (EA) Notice of Publication, Kawa Stream and Ditch Improvements Project

LOCATION:

Kaneohe, Oahu, Hawaii; TMK: 4-5-034, 4-5-061, 4-5-063, 4-5-070, 4-5-084

APPLICANT:

City and County of Honolulu, Department of Design and Construction by its consultant Oceanit Laboratories Inc.

Transmitted for your review and comment on the above-referenced document. We would appreciate your comments on this document which can be found at the website of the Office of Environmental Quality Control (OEQC) as listed in Oceanit's cover letter.

Please submit any comments by **August 19, 2015**. If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Supervising Land Agent Steve Molmen at (808) 587-0439. Thank you.

Attachments

additional

- We have no objections.
- We have no comments.
- Comments are attached.

Signed:

Print Name: Carty S. Chang, Chief Engineer

Date: 8/19/15

15 AUG 05 PM 10:44 ENGINEERING



October 10, 2015

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

Dear Mr. Chang:

Subject: Draft Environmental Assessment (EA)  
Kawa Stream and Ditch Improvements Project  
Kaneohe, Oahu, Hawaii  
TMK: 4-5-066, 4-5-067, 4-5-070, 4-5-084

On behalf of the applicant, Department of Design and Construction (DDC), we thank you for reviewing the DEA for the Kawa Stream and Ditch Improvements Project on the Island of Oahu.

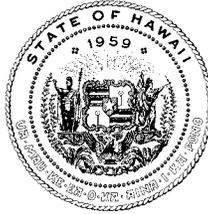
If there are any questions, please contact Cris Takushi at (808) 531-3017, ext. 129 or by email at [ctakushi@oceanit.com](mailto:ctakushi@oceanit.com).

Sincerely,

  
Cris Takushi  
Project Manager

cc: Department of Design and Construction – Scott Nakamatsu  
ParEn Inc. – Steven Harano

DAVID Y. IGE  
GOVERNOR OF HAWAII



**STATE OF HAWAII**  
**DEPARTMENT OF LAND AND NATURAL RESOURCES**

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

**WILLIAM J. AILA, JR.**  
CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES  
COMMISSION ON WATER RESOURCE MANAGEMENT

**JESSE K. SOUKI**  
FIRST DEPUTY

**WILLIAM M. TAM**  
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

December 19, 2014

Mr. Russell Y. Tsuji, Administrator  
Department of Land and Natural Resources  
Land Division  
P.O. Box 621  
Honolulu, HI 96809

LOG NO.: 2014.04623  
DOC NO.: 1411GC09  
Archaeology, Architecture

Dear Mr. Tsuji:

**SUBJECT: Chapter 6E-8 Historic Preservation Review-  
City and County of Honolulu, Department of Design and Construction  
Kawa Stream and Ditch Improvements Project  
Pre-Assessment Consultation for Environmental Assessment  
Kaneohe Ahupua'a, Ko'olaupoko District, Island of O'ahu  
Adjacent TMK: (1) 4-5-034, 061, 062, 063, 066, 067, 070, 084, and 103**

Thank you for the opportunity to provide comments for the aforementioned project that was received by our Kapolei office on October 21, 2014. According to your submittal, the City and County of Honolulu, Department of Design and Construction (DDC) is proposing a stream rehabilitation/erosion plan for Kawa Stream and its tributary known as Kawa Ditch located in Kaneohe, O'ahu, the recorded TMKs are adjacent to Kawa Stream. According to your submittal the proposed project occurs on lands controlled by the City and County of Honolulu. Your site map indicates that the project will occur on approximately 2.05 miles of Kawa Stream and Kawa Ditch. Your letter indicates that the Kawa Stream and Kawa Ditch flow through an urbanized watershed, and that land development within the watershed has dramatically altered the natural hydrology of the original stream. Your submittal also indicates that due to the magnitude of the project a priority/phasing scheme will be used to facilitate the manageability of the project and to address specific areas within the proposed project site as indicated in Table 1 below.

Table 1.

Phase	TMK	Proposed Improvements
1	4-5-034, 062, 063, 067, 084, 103	Repair lined channels and grade control structures by patching and filling. Construct CRM or concrete cutoff walls.
2	4-5-084	Install and reconstruct grade control structure #3, install boulder basins, reconstruct drainage outlet structure, install turf reinforced matting and grass.
3	4-5-034, 070, 084	Reconstruct grade control structure, install three boulder basins, reconstruct drainage outlet, install turf reinforced matting and grass.
4	4-5-067	Install new CRM, reconstruct grade structure and drainage outlet, install boulder basin, reinforced matting, grass and new access road.
5	4-5-034, 084	Construct toe protection, stabilize bank, install boulder basin, reconstruct drainage outlet structure, install reinforced matting and grass.
6	4-5-066	Install gabion retaining walls and turf reinforced matting and grassing.
7	4-5-070	Construct grouted rubble pavement (GRP) bank lining.

Our records indicate that no archaeological inventory survey has been conducted within the proposed project areas, and that no historic properties have been identified. In February 2001, Environmental Planning Office, Hawaii Department of Health conducted the Kawa Stream Bio-assessment (Burr 2001). This report indicates that 200 meters of Kawa Stream was destroyed, and the entire lower stream was channelized in 1958. In 1978 2.6 kilometers of Kawa Stream had been channelized and almost the entire length (3.4-km) had been realigned in the name of flood protection (Burr 2001: 4). Furthermore our records indicate that the soil composition surrounding Kawa Stream and its tributary consists of Hanalei silty clay, Kaneohe silty clay and Loleka'a silty clay. The scope of work for the proposed project will occur within the footprints of the previous construction of Kawa ditch, the existing channels, drainage outlets, and basins. Supplemental information received on December 15, 2014 indicates the staging area for equipment and machinery will be within the parking lot of Castle High School.

### **Architecture**

The Kawa Stream and ditch lack the historic significance or design distinction necessary for listing and are not eligible for the State or National Registers of Historic Places.

### **SHPD Determination**

Due to the disturbed nature of the project area and due to the lack of architectural historic significance, we believe **no historic properties will be affected** by the proposed Kawa Stream and Kawa Ditch rehabilitation improvements.

Please attach the following to the permit: In the event that historic resources, including human skeletal remains, cultural layers, cultural deposits, features, artifacts, or sinkholes, lava tubes or lava blisters/bubbles are identified during construction activities, cease all work in the immediate vicinity of the find, protect the find from additional disturbance, and immediately contact the State Historic Preservation Division at (808)692-8015.

Please contact Anna Broverman at (808) 692-8028 or at [Anna.E.Broverman@hawaii.gov](mailto:Anna.E.Broverman@hawaii.gov) if you have any architectural concerns. Please contact Susan Lebo at (808) 692-8019 or at [Susan.A.Lebo@hawaii.gov](mailto:Susan.A.Lebo@hawaii.gov) if you have any questions or concerns regarding this letter.

Aloha,



Theresa K. Donham  
Archaeology Branch Chief

cc: Steve Molmen, DLNR Land Division ([Steve.Molmen@hawaii.gov](mailto:Steve.Molmen@hawaii.gov))  
Kristine Kutscher, Environmental Planner/Scientist ([kkutscher@oceanit.com](mailto:kkutscher@oceanit.com))



October 10, 2015

State Historic Preservation Division  
Kakuhihewa Building  
601 Kamokila Blvd, Ste 555  
Kapolei, Hawaii 96707  
Attention: Susan Lebo

Dear Ms. Lebo,

Subject: Draft Environmental Assessment (EA)  
Kawa Stream and Ditch Improvements Project  
Kaneohe, Oahu, Hawaii  
TMK: 4-5-066, 4-5-067, 4-5-070, 4-5-084  
**LOG NO.:2014.04623, DOC NO.:1411GC09**

This letter is in response to your letter dated December 19, 2014, regarding the City and County of Honolulu, Department of Design and Construction (DDC) Kawa Stream and Ditch Improvements Project on the Island of Oahu. On behalf of the applicant, DDC, we thank you for reviewing the Draft EA.

The Department of Education pointed out a statement in your letter that states that “Supplemental information received on December 15, 2014 indicates the staging area for equipment and machinery will be within the parking lot of Castle High School.” This information was given in error. At this time, it has not been determined if the Contractor will need to use Castle High School property as a storage and staging area. The Final EA was revised to state “If the Contractor cannot find an appropriate area for equipment and staging he may contact the Department of Education - Facilities Development Branch to determine if an appropriate area is available on the Castle High School property.”

If there are any questions, please contact Cris Takushi at (808) 531-3017, ext. 129 or by email at [ctakushi@oceanit.com](mailto:ctakushi@oceanit.com).

Sincerely,

  
Cris Takushi  
Project Manager

cc: Department of Design and Construction – Scott Nakamatsu  
ParEn Inc. – Steven Harano

DAVID Y. IGE  
GOVERNOR OF HAWAII



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES

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

SUZANNE D. CASE  
CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES  
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KEKOA KALUHIWA  
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W. ROY HARDY  
ACTING DEPUTY DIRECTOR - WATER

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CONSERVATION AND COASTAL LANDS  
CONSERVATION AND RESOURCES ENFORCEMENT  
ENGINEERING  
FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
KAHOOLAWE ISLAND RESERVE COMMISSION  
LAND  
STATE PARKS

August 31, 2015

Mr. Russell Y. Tsuji, Administrator  
Land Division  
Department of Land and Natural Resources  
P.O. Box 621  
Honolulu, HI 96809

LOG NO: 2015.02936  
DOC NO: 1508GC17  
Archaeology, Architecture

Dear Mr. Tsuji:

SUBJECT: **Chapter 6E-8 Historic Preservation Review –  
City and County of Honolulu, Department of Design and Construction  
Kawa Stream and Ditch Improvements Project, Draft EA – Request for Comments  
Kāne‘ohe Ahupua‘a, Ko‘olaupoko District, Island of O‘ahu  
Adjacent TMK: (1) 4-5-034, 061, 062, 063, 066, 067, 070, 084, and 103**

Thank you for the opportunity to comment on the document titled *Draft Environmental Assessment (DEA), Kawa Stream and Ditch Improvements (Oceanit Laboratories, Inc. (July 2015))*. We received this submittal on August 7, 2015. The approximate 2.05 mile Kawa Stream and its tributary Kawa Ditch is controlled by the City and County of Honolulu. The DEA indicates that the proposed project will involve improving and stabilizing areas where embankments have steepened and where erosive forces have damaged previously installed erosion control structures. Three practices will be employed, consisting of (1) bank protection within damaged areas, (2) stream stabilization involving constructing non-structural and bioengineering stabilizers, and (3) grade control where existing drop structures have failed.

Our records indicate that the *City and County of Honolulu, Department of Design and Construction Kawa Stream and Ditch Improvements Project Pre-Assessment Consultation for Environmental Assessment (October 2014)* was reviewed by SHPD on December 19, 2014, and resulted in a determination of no historic properties affected (Log No. 2014.04623, Doc. No. 1411GC09).

Based on the above, SHPD's determination is **no historic properties affected**.

Please contact me at (808) 692-8019 or at [Susan.A.Lebo@hawaii.gov](mailto:Susan.A.Lebo@hawaii.gov) if you have any questions regarding archaeological resources or this letter.

Aloha,

A handwritten signature in cursive script that reads "Susan A. Lebo".

Susan A. Lebo, PhD  
Archaeology Branch Chief

cc: Scott Nakamatsu, DDC ([snakamatsu@honolulu.gov](mailto:snakamatsu@honolulu.gov))  
Kristine Kutscher, Oceanit, Environmental Planner/Scientist ([kkutscher@oceanit.com](mailto:kkutscher@oceanit.com))  
Steve Molmen, DLNR-Land Division ([Steve.Molment@hawaii.gov](mailto:Steve.Molment@hawaii.gov))



October 12, 2015

State Historic Preservation Division  
Kakuhihewa Building  
601 Kamokila Blvd, Ste 555  
Kapolei, Hawaii 96707  
Attention: Susan Lebo

Dear Ms. Lebo,

Subject: Draft Environmental Assessment (EA)  
Kawa Stream and Ditch Improvements Project  
Kaneohe, Oahu, Hawaii  
TMK: 4-5-066, 4-5-067, 4-5-070, 4-5-084  
**LOG NO.:2015.02936, DOC NO.:1508GC17**

This letter is in response to your letter dated August 31, 2015, regarding the City and County of Honolulu, Department of Design and Construction (DDC) Kawa Stream and Ditch Improvements Project on the Island of Oahu. On behalf of the applicant, DDC, we thank you for reviewing the Draft EA and providing the Chapter 6E-8 Historic Preservation Review.

If there are any questions, please contact Cris Takushi at (808) 531-3017, ext. 129 or by email at [ctakushi@oceanit.com](mailto:ctakushi@oceanit.com).

Sincerely,

Cris Takushi  
Project Manager

cc: Department of Design and Construction – Scott Nakamatsu  
ParEn Inc. – Steven Harano

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 • Internet: www.honolulu.gov

KIRK CALDWELL  
MAYOR



MICHAEL D. FORMBY  
DIRECTOR

MARK N. GARRITY, AICP  
DEPUTY DIRECTOR

TP8/15-584794R

August 18, 2015

Ms. Kristine Kutscher  
Environmental Planner/Scientist  
Oceanit  
828 Fort Street Mall, Suite 600  
Honolulu, Hawaii 96813

Dear Ms. Kutscher:

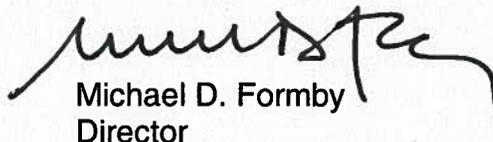
**SUBJECT:** Draft Environmental Assessment (DEA), Kawa Stream and Ditch Improvement Project, Kaneohe, Oahu, Hawaii

This is in response to your letter dated July 28, 2015, requesting our review and comments on the DEA for the Kawa Stream and Ditch Improvement Project.

Regarding the Transportation section, Impacts and Mitigation, we require in addition to obtaining a street usage permit from the Department of Transportation Services, a traffic control plan approved by the Department of Planning and Permitting for any temporary lane closure on a City street.

Thank you for the opportunity to review this matter. Should you have any questions, please contact Renee Yamasaki of my staff at 768-8383.

Very truly yours,



Michael D. Formby  
Director



October 9, 2015

Mr. Michael D. Formby, Director  
City and County of Honolulu  
Department of Transportation Services  
650 South King Street, 3<sup>rd</sup> Floor  
Honolulu, Hawaii 96813

Dear Mr. Formby:

Subject: Draft Environmental Assessment (EA)  
Kawa Stream and Ditch Improvements Project  
Kaneohe, Oahu, Hawaii  
TMK: 4-5-066, 4-5-067, 4-5-070, 4-5-084  
Ref No.: **TP8/15-584794R**

This letter is in response to your comment letter of August 18, 2015, regarding the City and County of Honolulu, Department of Design and Construction (DDC) Kawa Stream and Ditch Improvements Project on the Island of Oahu. On behalf of the applicant, DDC, thank you for reviewing the Draft EA. The following was added to the Section 5.2.1 Impacts and Mitigation of the Final EA.

No temporary closures of traffic lanes on City streets are expected. If temporary closures on City streets do become necessary the Contractor shall obtain a street usage permit from the City's Department of Transportation Services and obtain approval of traffic control plans from the Department of Planning and Permitting.

If there are any questions, please contact Cris Takushi at (808) 531-3017, ext. 129 or by email at [ctakushi@oceanit.com](mailto:ctakushi@oceanit.com).

Sincerely,

Cris Takushi  
Project Manager

cc: Department of Design and Construction – Scott Nakamatsu  
ParEn Inc. – Steven Harano

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](http://www.honolulu.gov/hfd)

KIRK CALDWELL  
MAYOR



MANUEL P. NEVES  
FIRE CHIEF

LIONEL CAMARA JR.  
DEPUTY FIRE CHIEF

August 20, 2015

Ms. Kristine Kutscher  
Environmental Planner/Scientist  
Oceanit  
828 Fort Street Mall, Suite 600  
Honolulu, Hawaii 96813

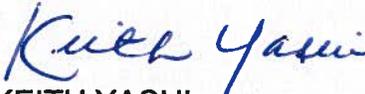
Dear Ms. Kutscher:

Subject: Draft Environmental Assessment Notice of Publication  
Kawa Stream and Ditch Improvement Project

In response to your letter dated July 28, 2015, regarding the above-mentioned subject, the Honolulu Fire Department determined that there will be no significant impact to fire department services.

Should you have questions, please contact Battalion Chief Terry Seelig of our Fire Prevention Bureau at 723-7151 or [tseelig@honolulu.gov](mailto:tseelig@honolulu.gov).

Sincerely,

  
KEITH YASUI  
Acting Assistant Chief

KY/SY:bh



October 9, 2015

Mr. Manuel P. Neves, Fire Chief  
Honolulu Fire Department  
636 South Street  
Honolulu, Hawaii 96813-5007

Dear Mr. Neves:

Subject: Draft Environmental Assessment (EA)  
Kawa Stream and Ditch Improvements Project  
Kaneohe, Oahu, Hawaii  
TMK: 4-5-066, 4-5-067, 4-5-070, 4-5-084

This letter is in response to your comment letter of August 20, 2015, regarding the City and County of Honolulu, Department of Design and Construction (DDC) Kawa Stream and Ditch Improvements Project on the Island of Oahu. On behalf of the applicant, DDC, we thank you for reviewing the Draft EA.

If there are any questions, please contact Cris Takushi at (808) 531-3017, ext. 129 or by email at [ctakushi@oceanit.com](mailto:ctakushi@oceanit.com).

Sincerely,

  
Cris Takushi  
Project Manager

cc: Department of Design and Construction – Scott Nakamatsu  
ParEn Inc. – Steven Harano