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**Final  
Archaeological Monitoring Plan  
for Construction Phase 2 of the  
Honolulu High-Capacity Transit Corridor Project,  
Waiawa, Mānana, Waimano, Waiau, Waimalu, Kalauao,  
'Aiea, and Hālawā Ahupua'a, 'Ewa District, Island of  
O'ahu**

**TMK: [1] 9-7, 9-8, and 9-9 (Various Plats and Parcels)**

**Prepared on behalf of  
Parsons Brinkerhoff, Inc.**

**Prepared for  
The Federal Transit Administration  
and  
The City & County of Honolulu**

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May 2012**

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## Management Summary

<b>Reference</b>	Archaeological Monitoring Plan for Construction Phase 2 of the Honolulu High-Capacity Transit Corridor Project, Waiawa, Mānana, Waimano, Waiau, Waimalu, Kalauao, 'Aiea, and Hālawā Ahupua'a, 'Ewa District, Island of O'ahu TMK: [1]9-7, 9-8, and 9-9 (Various Plats and Parcels) (Sroat and McDermott 2012)
<b>Date</b>	May 2012
<b>Project Number (s)</b>	Cultural Surveys Hawai'i, Inc. (CSH) Job Code: MANANA 3
<b>Investigation Permit Number</b>	Monitoring will likely be performed under Hawai'i State Historic Preservation Division/Department of Land and Natural Resources (SHPD/DLNR) permit No. 12-04, and subsequent annual permits, issued per Hawai'i Administrative Rules (HAR) Chapter 13-282.
<b>Project Location</b>	The proposed Honolulu High-Capacity Transit Corridor Project (HHCTCP) extends approximately 23 miles (37.0 km) from Kapolei in the west to Ala Moana Shopping Center in the east. The focus of this archaeological monitoring plan consists of the entire Construction Phase 2 of the HHCTCP, which is an approximately 3.9-mile segment within Kamehameha Highway extending 400 m west of Acacia Road in Pearl City to 175m north of Kalaloa Street in Hālawā. The monitoring program area is depicted on the U.S. Geological Survey 7.5-Minute Series Topographic Map, Waipahu (1998) and Pearl Harbor (1999) Quadrangles.
<b>Project Funding and Land Jurisdiction</b>	Project funding comes from the Federal Transit Administration (FTA) and the City & County of Honolulu (City). The HHCTCP Construction Phase 2 project area is primarily located within the existing, or planned expansions of, the Kamehameha Highway right-of-way, which is owned by the State of Hawai'i. The Pearlridge Station <i>mauka</i> portion is located on a parcel owned by the City & County of Honolulu, recently transferred from 50 <sup>th</sup> State Properties. The Pearlridge Station <i>makai</i> portion is located on a parcel owned by Continental Investment Company. The Aloha Stadium Station and Park and Ride Facility are located on a parcel owned by the State of Hawai'i.
<b>Agencies</b>	FTA; City; SHPD/DLNR
<b>Project Description</b>	The HHCTCP will provide high-capacity rapid transit in the highly congested east-west transportation corridor between Kapolei and the Ala Moana Shopping Center via a fixed guideway rail transit system. In addition to the guideway, the project will require construction of transit stations and support facilities, including a vehicle maintenance and storage facility and park-and-ride lots. Two proposed transit stations are within the Phase 2 project area; the Pearlridge Station and Aloha Stadium Station. Project construction will also require relocation of existing utility lines within the project corridor that conflict with the proposed project design.

<b>Project Acreage</b>	The 72.6-acre Construction Phase 2 project area consists of: the approximately 3.9-mile long transit corridor; two transit stations (approximately 1.5 acres); and one park-and-ride facility (approximately 6.8 acres).
<b>Project Related Ground Disturbance</b>	Direct project-related ground-disturbing activities includes any areas excavated for the placement of piers to support the elevated structures, foundations for buildings and structures, utility installation, grading to provide parking, or other construction-related ground disturbance, including preparation of construction staging areas. The APE includes the new location of any utilities that will be relocated by the project.
<b>Historic Preservation Regulatory Context</b>	Due to federal (FTA) funding, this project is a federal undertaking, requiring compliance with Section 106 of the National Historic Preservation Act (NHPA), the National Environmental Policy Act (NEPA), and Section 4(f) of the Department of Transportation Act. Through the Section 106 historic preservation review process, the project’s lead federal agency, FTA, has determined that the project will have an adverse effect on historic properties currently listed, or eligible for listing, on the National Register of Historic Places. The Hawai‘i State Historic Preservation Officer (SHPO) concurred with this undertaking effect determination. To address the undertaking’s adverse effect, a Programmatic Agreement (PA) was executed January 18, 2011, with FTA, Hawai‘i SHPO, the United States Navy, and the Advisory Council on Historic Preservation as signatories. PA Stipulation III requires that archaeological inventory survey plans (AISP) and archaeological inventory survey (AIS) investigations be completed for each of the HHCTCP project’s four construction phases. These AIS investigations must support decisions regarding appropriate mitigation for identified archaeological cultural resources <sup>1</sup> /archaeological historic properties <sup>2</sup> . CSH prepared AISP (Hammatt and Shideler 2009, Hammatt 2010) and AIS reports (Hammatt 2010, Sroat et al. 2012) for HHCTCP Construction Phases 1 and 2. Through FTA’s and SHPD’s approval of the Construction Phases 1 and 2 AIS reports, it was determined that Construction Phase 2 would be constructed under an archaeological monitoring program as an archaeological historic property mitigation measure. Archaeological monitoring is specified in Section III.E.1 of the the project’s PA as an appropriate form of historic property mitigation. This plan describes the archaeological monitoring program for HHCTCP Construction Phase 2.
<b>Document Purpose</b>	This archaeological monitoring plan fulfills the state requirements for monitoring plans under HAR Chapter 13-279-4 and was written to support the proposed project’s historic preservation review under Hawai‘i Revised Statutes (HRS) Chapter 6E-8 and HAR Chapter 13-275. This document was prepared in compliance with the Secretary of the Interior’s Standards and Guidelines for Archaeology and Historic Preservation and is intended to support the project’s PA and Section 106 compliance.

<p><b>Historic Properties/ Potentially Affected</b></p>	<p>The HHCTCP Construction Phase 2 AIS (Sroat et al. 2012) represents a good faith effort to identify and document the archaeological cultural resources within the project area. Due to the inherent limitations of any sampling strategy, however, it is possible that additional archaeological cultural resources or features may be uncovered during the Construction Phase 2 construction. According to the Construction Phase 2 AIS’s historic background research and excavation results, the Construction Phase 2 project area has one known archaeological historic property (SIHP # 50-80-09-7150) and the potential to contain as-yet unidentified archaeological cultural resources. SIHP #50-80-09-7150 is described as a subsurface agricultural sediment (likely from cultivation of wetland <i>kalo</i> (taro)—buried <i>lo ‘i</i> (irrigated pond-field) deposit. It was determined National and Hawai‘i Register eligible under significance criterion D<sup>3</sup> (have yielded, or may be likely to yield, information important in prehistory or history).</p>
<p><b>Recommended Monitoring</b></p>	<p>The proposed monitoring program will serve as a mitigation measure<sup>4</sup> that facilitates identification, proper documentation, and treatment decisions should previously unidentified archaeological cultural resources, including burials, be encountered. If encountered and if appropriate, these previously unknown archaeological cultural resources will be treated as “post-review discoveries” under 36 CFR 800.13 and HAR Chapter 13-280 (“Procedures for Inadvertent Discoveries During A Project Covered by the Historic Preservation Review Process”). Inadvertent burial discoveries will follow the procedures outlined in Hawaii State burial law (HAR Chapter 13-300-40). Because the project does not involve federal or tribal (Department of Hawaiian Homelands) property, the Native American Graves Protection and Repatriation Act (NAGPRA) will not apply for potentially Native Hawaiian inadvertent burial discoveries. The monitoring program will also provide the opportunity for archaeological data recovery<sup>5</sup> to gather additional information regarding the Construction Phase 2 project area’s previously documented archaeological historic property (SIHP #50-80-09-7150). Based on the results of the AIS and historic document research, four discrete segments within Construction Phase 2 are recommended for on-site monitoring, including the area of SIHP #50-80-09-7150. The remaining segments within the project area are recommended for on-call monitoring with weekly spot-checks.</p>

<sup>1</sup>In historic preservation parlance, cultural resources are the physical remains and/or geographic locations that reflect the activity, heritage, and/or beliefs of ethnic groups, local communities, states, and/or nations. Generally, they are at least 50 years old, although there are exceptions, and include: buildings and structures; groupings of buildings or structures (historic districts); certain objects; archaeological artifacts, features, sites, and/or deposits; groupings of archaeological sites (archaeological districts); and, in some instances, natural landscape features and/or geographic locations of cultural significance.

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<sup>2</sup>Historic properties, as defined in 36 CFR 800.16, are any prehistoric or historic districts, sites, buildings, structures, or objects included in, or eligible for inclusion in, the National Register of Historic Places (National Register) maintained by the Secretary of the Interior. This includes artifacts, records, and remains that are related to and located within such properties, as well as properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization and that meet the National Register criteria. Determinations of eligibility are generally made by a federal agency official in consultation with the SHPO. Under federal legislation, a project's (undertaking's) potential effect on historic properties must be evaluated and potentially mitigated. Under Hawai'i State historic preservation legislation, historic properties are defined as any cultural resources that are 50 years old, regardless of their historic/cultural significance under state law, and a project's effect and potential mitigation measures are evaluated based on the project's potential impact to "significant" historic properties (those historic properties determined eligible, based on their integrity and historic/cultural significance in terms of established significance criteria, for inclusion in the Hawai'i Register of Historic Places [Hawai'i Register]). Determinations of eligibility to the Hawai'i Register result when a state agency official's historic property "significance assessment" is approved by SHPD, or when SHPD itself makes an eligibility determination for a historic property.

<sup>3</sup>Cultural resource significance is evaluated and expressed as eligibility for listing on the National and/or Hawai'i Register. To be considered eligible for listing on the National and/or Hawai'i Register a cultural resource should possess integrity of location, design, setting, materials, workmanship, feeling, and association, and meet one or more of the following broad cultural/historic significance criteria: "A" reflects major trends or events in the history of the state or nation; "B" is associated with the lives of persons significant in our past; "C" is an excellent example of a site type/work of a master; "D" has yielded or may be likely to yield information important in prehistory or history; and, "E" (Hawai'i Register only) has traditional cultural significance to an ethnic group, includes religious structures and/or burials.

<sup>4</sup>Under HAR Chapter 13-279-3, "archaeological monitoring may be an identification, mitigation, or post-mitigation contingency measure. Monitoring shall entail the archaeological observation of, and possible intervention with, on-going activities which may adversely affect historic properties."

<sup>5</sup>Under Hawai'i State historic preservation review legislation, there are five potential forms of historic preservation mitigation: A) Preservation; B) Architectural Recordation; C) Archaeological Data Recovery (which includes archaeological monitoring); D) Historical Data Recovery; and E) Ethnographic Documentation (HAR Chapter 13-275-8).

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## Section 1 Introduction

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### 1.1 Project Background

At the request of Parsons Brinkerhoff, Inc. (PB), and for the the City & County of Honolulu (City) and the Federal Transit Administration (FTA), Cultural Surveys Hawai'i, Inc. (CSH) prepared this archaeological monitoring plan for Construction Phase 2 of the Honolulu High-Capacity Transit Corridor Project, Waiawa, Mānana, Waimano, Waiau, Waimalu, Kalauao, 'Aiea, and Hālawā Ahupua'a, 'Ewa District, Island of O'ahu TMK: [1] 9-7, 9-8, and 9-9 (Various Plats and Parcels). In its entirety, the Honolulu High-Capacity Transit Corridor Project (HHCTCP) extends approximately 23 miles from Kapolei in the west to Ala Moana Shopping Center in the east. The focus of this archaeological monitoring plan is the Construction Phase 2 portion of the overall project corridor (Figures 1-5).

The 72.6-acre Construction Phase 2 project area consists of: the approximately 3.9-mile long transit corridor; two transit stations (Pearlridge and Aloha Stadium--approximately 1.5 acres); and one park-and-ride facility (at Aloha Stadium--approximately 6.8 acres). It extends from 400m west of Acacia Road to 175m north of Kalaloa Street along the corridor route. The Construction Phase 2 project area is depicted on the U.S. Geological Survey 7.5- Minute Series Topographic Map, Waipahu (1998) and Pearl Harbor (1999) Quadrangles (refer to Figure 1).

The HHCTCP will provide high-capacity rapid transit in the highly congested east-west transportation corridor between Kapolei and Ala Moana Shopping Center via a fixed guideway rail transit system. In addition to the guideway, the project will require construction of transit stations and support facilities, including a vehicle maintenance and storage facility and park-and-ride lots. Two transit stations are within the Construction Phase 2 project area--the Pearlridge Station and Aloha Stadium Station. Project construction will also require relocation of existing utility lines within the project corridor that conflict with the proposed project design.

The Construction Phase 2 project area is primarily located within the existing, or planned expansions of, the Kamehameha Highway right-of-way, which is owned by the State of Hawai'i. The Pearlridge Station *mauka* portion is located on a parcel owned by the City & County of Honolulu, recently transferred from 50<sup>th</sup> State Properties. The Pearlridge Station *makai* portion is located on a parcel owned by Continental Investment Company. The Aloha Stadium Station and Park and Ride Facility are located on a parcel owned by the State of Hawai'i. Project-related agencies include: the City; the State Historic Preservation Division / Department of Land and Natural Resources (SHPD/DLNR); and FTA.

Following the HHCTCP's PA, the Construction Phase 2 area of potential effect (APE) for archaeological cultural resources is defined as all areas of direct ground disturbance. Direct project-related ground-disturbing activities includes any areas excavated for the placement of piers to support the elevated structures, foundations for buildings and structures, utility installation, grading to provide parking, or other construction-related ground disturbance, including preparation of construction staging areas. The APE includes the new location of any utilities that will be relocated by the project. Although the extent of ancillary subsurface impacts, for example those related to the relocation of existing utilities, is still to be determined, it is estimated that the Construction Phase 2 area of direct ground disturbance (i.e. the APE) is approximately 10 acres.

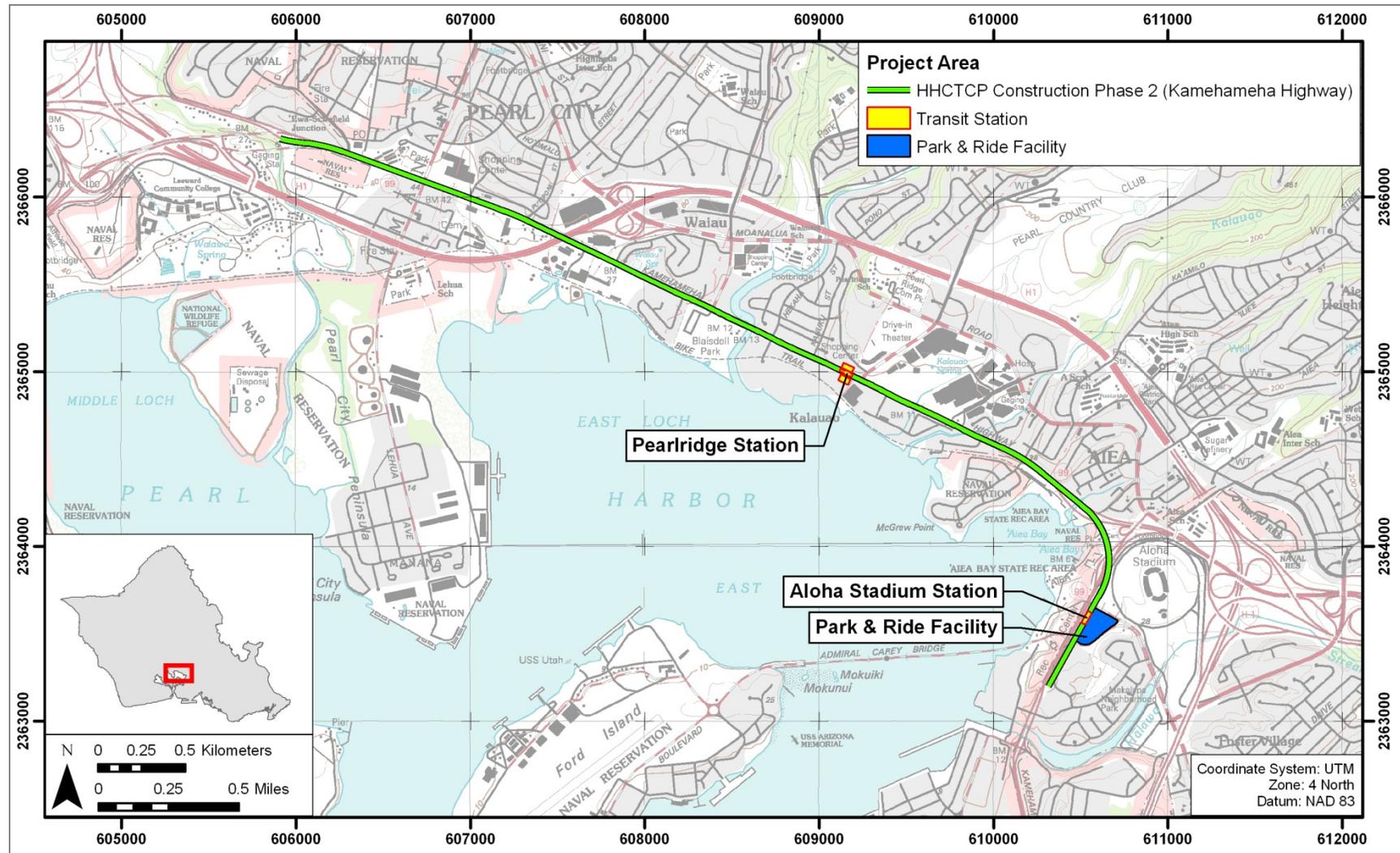


Figure 1. U.S. Geological Survey 7.5-Minute Series Topographic Map, Waipahu (1998) and Pearl Harbor (1999) Quadrangles, showing the location of the Phase 2 project area



Figure 2. Aerial photograph (source: U.S. Geological Survey Orthoimagery 2005), showing the location of the Phase 2 project area

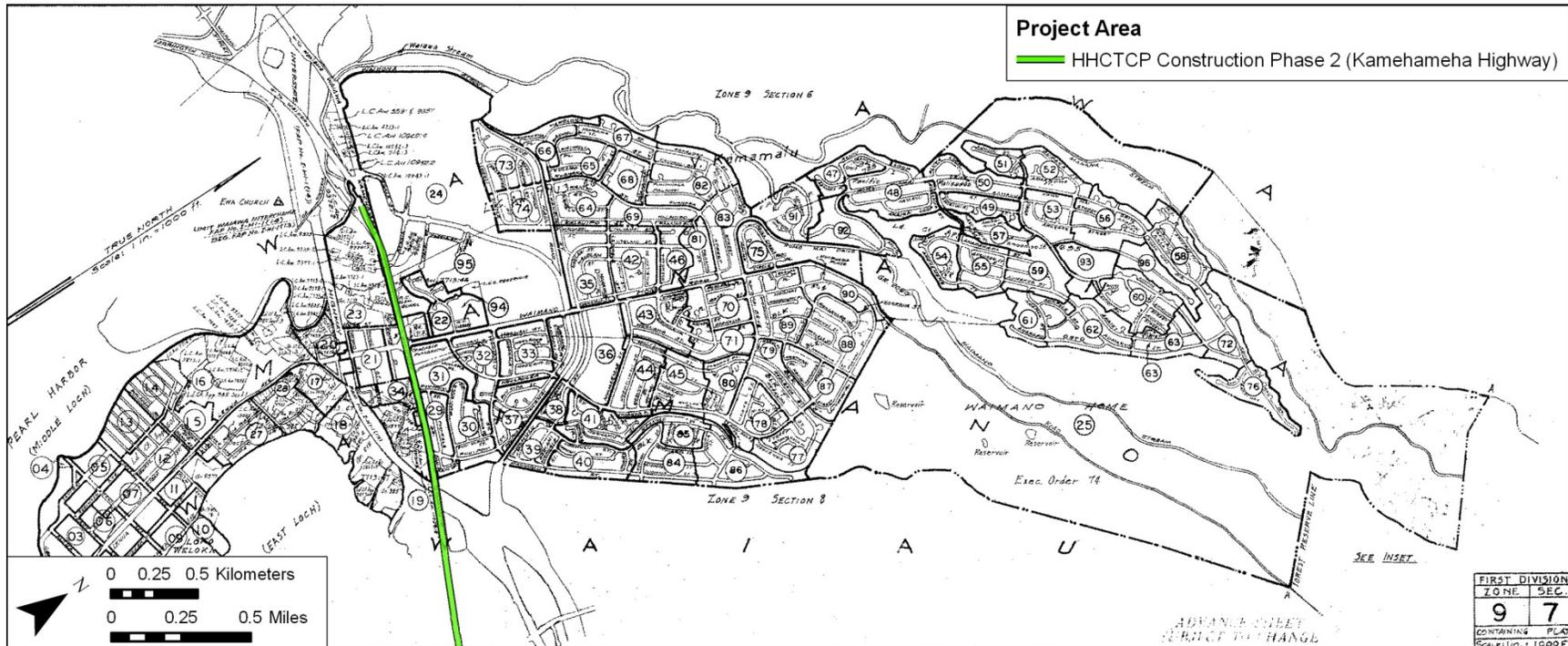


Figure 3. Tax Map Key 9-7, showing the western portion of the Phase 2 project area

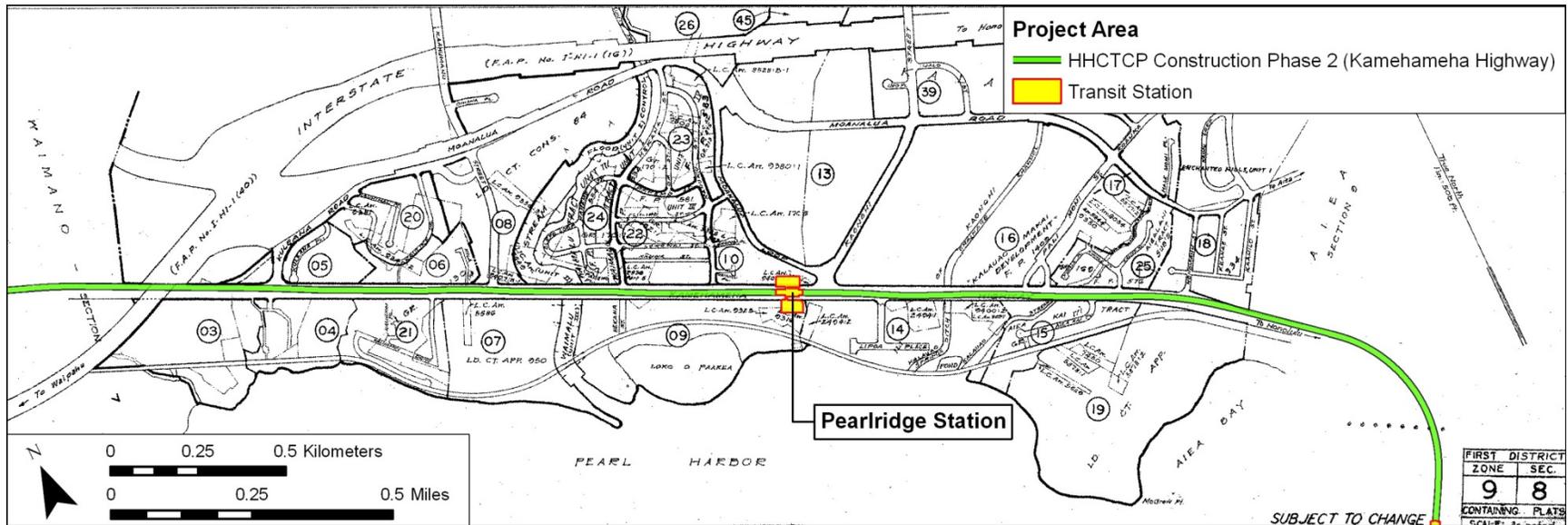


Figure 4. Tax Map Key 9-8, showing the central portion of the Phase 2 project area

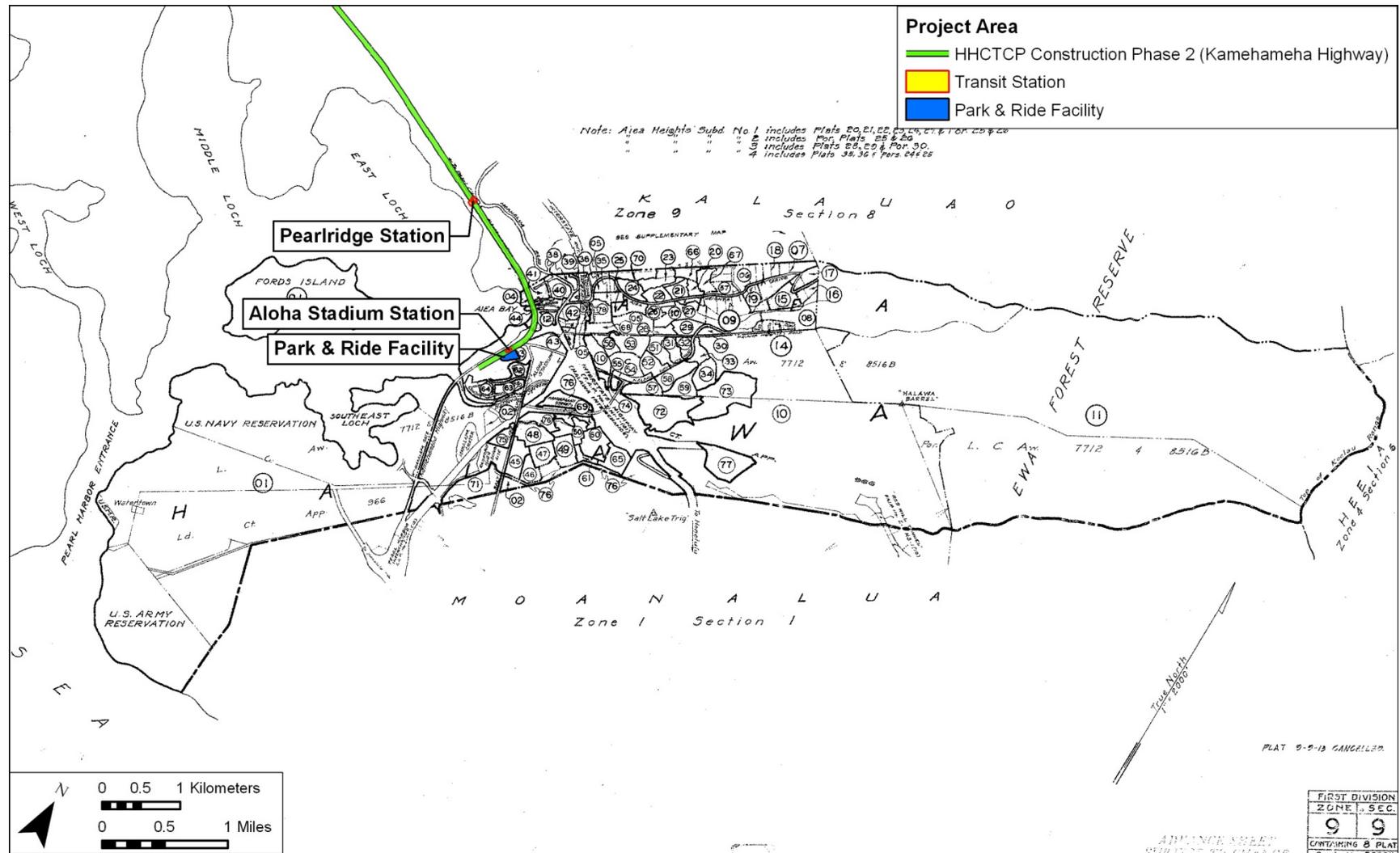


Figure 5. Tax Map Key 9-9, showing the eastern portion of the Phase 2 project area

## 1.2 Historic Preservation Regulatory Context and Document Purpose

Due to federal (FTA) funding, this project is a federal undertaking, requiring compliance with Section 106 of the National Historic Preservation Act (NHPA), the National Environmental Policy Act (NEPA), and Section 4(f) of the Department of Transportation Act. Through the Section 106 historic preservation review process, the project's lead federal agency, FTA, has determined that the project will have an adverse effect on historic properties currently listed, or eligible for listing, on the National Register of Historic Places. The Hawai'i State Historic Preservation Officer (SHPO) concurred with this undertaking effect determination. To address the undertaking's adverse effect, a Programmatic Agreement (PA) was executed January 18, 2011, with FTA, Hawai'i SHPO, the United States Navy, and the Advisory Council on Historic Preservation as signatories.

PA Stipulation III requires that an archaeological inventory survey plan (AISP) be prepared, reviewed, and approved by the SHPD for each of the four HHCTCP construction phases. CSH prepared the AISP for the majority of Construction Phase 2 in 2010 (Hammatt 2010), which was reviewed and approved by SHPD on May 7, 2010 (SHPD correspondence LOG NO: 2010.1748, DOC NO: 1005NM14) (see Appendix A). The western-most 0.6 mile section of Construction Phase 2 had previously been included in the AISP for Construction Phase 1 so that the historic preservation review process of at least a portion of the project's Construction Phase 2 would be concluded well ahead of actual construction. The AISP for Construction Phase 1 (Hammatt and Shideler 2009) was reviewed and approved by SHPD in March 2009 (SHPD correspondence LOG NO: 2009.1325, DOC NO: 0903WT115) (see Appendix B).

Following completion of archaeological inventory survey (AIS) investigations described in the AISP's, AIS reports were prepared for Construction Phases 1 and 2. The AIS report for Construction Phase 1 (Hammatt 2010), including the 0.6 mile western-most section of Construction Phase 2, was reviewed and approved by SHPD on April 19, 2010 (SHPD correspondence LOG NO: 2010.1749, DOC NO: 1004MV01) (see Appendix C). The AIS report for Construction Phase 2 (Sroat et al. 2012) was reviewed and approved by SHPD on \_\_ (Note: AIS report is currently under SHPD review) (SHPD correspondence LOG NO: \_\_, DOC NO: \_\_) (see Appendix D).

The HHCTCP Construction Phase 2 AIS (Sroat et al. 2012) represents a good faith effort to identify and document the archaeological cultural resources within the project area. Due to the inherent limitations of any sampling strategy, however, it is possible that additional archaeological cultural resources or features may be uncovered during the Construction Phase 2 construction. According to the Construction Phase 2 AIS's historic background research and excavation results, the Construction Phase 2 project area has one known archaeological historic property (SIHP # 50-80-09-7150) and the potential to contain as-yet unidentified archaeological cultural resources. SIHP #50-80-09-7150 is described as a subsurface agricultural sediment (likely from cultivation of wetland *kalo* (taro)—buried *lo'i* (irrigated pond-field) deposit). It was determined National and Hawai'i Register of Historic Places-eligible under significance criterion D (have yielded, or may be likely to yield, information important in prehistory or history). Accordingly, the Construction Phase 2 AIS recommended a program of archaeological monitoring as an appropriate form of historic property mitigation during project construction. Archaeological monitoring is specified in Section III.E.1 of the the project's PA as an appropriate form of historic property mitigation.

FTA's and SHPD's approval of the Construction Phases 1 and 2 AIS reports determined that Construction Phase 2 would be constructed under an archaeological monitoring program as an archaeological historic property mitigation measure. This plan describes the archaeological monitoring program for HHCTCP Construction Phase 2. This archaeological monitoring plan was designed to fulfill the state requirements for monitoring plans under Hawai'i Administrative Rules (HAR) Chapter 13-279-4 and to support the proposed project's historic preservation review under Hawai'i Revised Statutes (HRS) Chapter 6E-8 and HAR Chapter 13-275. Additionally, this document was prepared in compliance with the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation and is intended to support the project's PA and Section 106 compliance.

## **1.3 Overview of Proposed Project Construction**

### **1.3.1 Fixed Guideway and Transit Stations**

The HHCTCP involves construction of a fixed guideway rail transit system that would consist primarily of elevated structures. The main components of the fixed guideway system are: the elevated guideway structure, guideway foundation columns, and transit stations. The guideway foundation columns generally consist of a single 6-foot diameter column spaced every 150 feet, with shorter or longer spans used where needed. Transit stations generally consist of elevated platform structures with ground-level entrance buildings. The subsurface impacts associated with the fixed guideway and transit stations would be primarily associated with excavations for the guideway foundation columns and excavations associated with the construction of ground-level station buildings, including subsurface utilities, elevator shafts, etc.

Two methods would be used to construct the guideway foundations, dictated by structural demands and existing subsurface conditions. Drilled shafts are the preferred foundation excavation method, which involves: drilling with a 6- to 10-foot diameter auger to depths of 50 to 150 feet; installation of a rebar cage in the shaft; and filling the shaft with concrete. Driven-pile foundations would be constructed where lateral loads, geotechnical, or other site conditions prohibit the use of drilled shafts. Construction of driven-pile foundations involves: excavations to accommodate the pile cap; pile driving by striking the pile with a heavy weight, vibrating the pile or jacking the pile into the ground; and forming and casting the pile cap with concrete.

### **1.3.2 Support Facilities**

Support facilities for the transit system include park-and-ride lots, a vehicle maintenance and storage facility, and traction power substations. These facilities would be constructed at ground-level, adjacent to the transit corridor. Subsurface impacts would include: grading of the facility locations and excavations for building foundations, subsurface utility installation, and landscaping.

### **1.3.3 Ancillary Impacts**

Project construction will require relocation of existing utility lines within the project corridor that conflict with the proposed project design. Guideway foundation excavations will extend below the water table, creating significant need for the management of displaced water and/or drilling slurry. De-watering pits may be excavated to temporarily collect and treat wastewater and drilling slurry prior to reuse or disposal.

Construction staging areas would be needed throughout the Construction Phase 2 project area to provide adequate space for construction equipment, stockpiling and transfer of construction materials, parking, and other construction-related activities. The proposed ancillary maintenance and storage facility areas and transit stations have been identified as potential staging areas. Grading of the construction staging areas may be necessary.

## 1.4 Environmental Setting

### 1.4.1 Natural Environment

The Phase 2 project area is situated along the low-lying coastal flats immediately inland of the East Loch of Pearl Harbor, generally within a quarter-mile of the shoreline. The project area traverses Waiau Stream, Waimalu Stream, Kalauao Stream, and 'Aiea Stream, as well as wetland areas fed by Waiau Spring and Kalauao Spring. Elevations in the project area range from approximately 10 to 45 feet above mean sea level. The project area receives an average of approximately 30 inches of annual rainfall (Giambelluca et al. 1986). As the project area traverses a predominantly urban landscape, vegetation in the project area and immediate vicinity consists primarily of introduced landscaping trees, shrubs, and ground cover plants.

According to U.S. Department of Agriculture soil survey data (Figure 6), sediment types in the project area include: Hanalei Silty Clay (HnB); Helemano Silty Clay (HLMG); Honouliuli Clay (HxA); Kawaihapai Clay Loam (K1A); Keaau Clay (KmbA); Makalapa Clay (MdB); Molokai Silty Clay Loam (MuB, MuC); Pearl Harbor Clay (Ph); Rock Land (rRK); Tropaquepts (TR); and Waipahu Silty Clay (WzA, WzB, WzC).

Soils of the Hanalei Series are described as follows:

This series consists of somewhat poorly drained to poorly drained soils on bottom lands on the islands of Kauai and O'ahu. These soils developed in alluvium derived from basic igneous rock. They are level to gently sloping. Elevations range from nearly sea level to 300 feet. The annual rainfall amounts to 20 to 120 inches. The mean annual soil temperature is 74° F. Hanalei soils are geographically associated with Haleiwa, Hihimanu, Mokuleia, and Pearl Harbor soils.

These soils are used for taro, pasture, sugarcane, and vegetables. The natural vegetation consists of paragrass, sensitiveplant, honohono, Java plum, and guava. [Foote et al. 1972:38]

Soils of the Helemano Series are described as follows:

This series consists of well-drained soils on alluvial fans and colluvial slopes on the sides of gulches. These soils are on the island of Oahu. They developed in alluvium and colluvium derived from basic igneous rock. They are steep to extremely steep. Elevations range from 500 to 1,200 feet. The annual rainfall dominantly amounts to 30 to 60 inches but ranges to 75 inches at the highest elevations. The mean annual soil temperature is 72° F. Helemano soils are geographically associated with Lahaina, Leilehua, Manana, Molokai, and Wahiawa soils.

These soils are used for pasture, woodland, and wildlife habitat. The natural vegetation consists of bermudagrass, Christmas berry, eucalyptus, Formosa koa, guava, Japanese tea, Java plum, and koa haole. [Foote et al. 1972:40]

Soils of Honouliuli Series are described as follows:

This series consists of well-drained soils on coastal plains on the island of O'ahu in the 'Ewa area. These soils developed in alluvium derived from basic igneous material. They are nearly level and gently sloping. Elevations range from 15 to 125 feet. The annual rainfall amounts to 18 to 30 inches and occurs mainly between November and April. The mean annual soil temperature is 74° F.

Honouliuli soils are geographically associated with 'Ewa, Lualualei, Mamala, and Waialua soils.

These soils are used for sugarcane, truck crops, orchards, and pasture. The natural vegetation consists of kiawe, koa haole, fingergrass, bristly foxtail, and bermudagrass. [Foote et al. 1972:43]

Soils of the Kawaihapai Series are described as follows:

This series consists of well-drained soils in drainage ways and on alluvial fans on the coastal plains on the islands of O'ahu and Moloka'i. These soils formed in alluvium derived from basic igneous rock in humid uplands.

They are nearly level to moderately sloping. Elevations range from nearly sea level to 300 feet. The annual rainfall amounts to 30 to 50 inches. The mean annual soil temperature is 73° F. Kawaihapai soils are geographically associated with Haleiwa, Waialua, and Jaucas soils.

These soils are used for sugar cane, truck crops, and pasture. The natural vegetation consists of *kiawe*, *koa haole*, lantana, and bermudagrass. [Foote et al. 1972:63-64]

Soils of the Keaa Series are described as follows:

This series consists of poorly drained soils on coastal plains on the island of Oahu. These soils developed in alluvium deposited over reef limestone or consolidated coral sand. They are nearly level and gently sloping. Elevations range from 5 to 40 feet. The annual rainfall amounts to 20 to 35 inches. Most of the rainfall occurs between November and April. The mean annual soil temperature is 73° F. Keaa soils are geographically associated with Kaloko, Mokuleia, and Pearl Harbor soils.

These soils are used for sugarcane and pasture. The natural vegetation consists of kiawe, bermudagrass, bristly foxtail, and fingergrass. [Foote et al. 1972: 64-65]

Soils of the Makalapa Series are described as follows:

This series consists of well-drained soils on uplands on the island of Oahu, near Salt Lake Crater, Diamond Head, and the Mokapu Peninsula. These soils formed in volcanic tuff. They are gently sloping to moderately steep. Elevations range from 20 to 200 feet. The annual rainfall amounts to 20 to 35 inches. A long dry

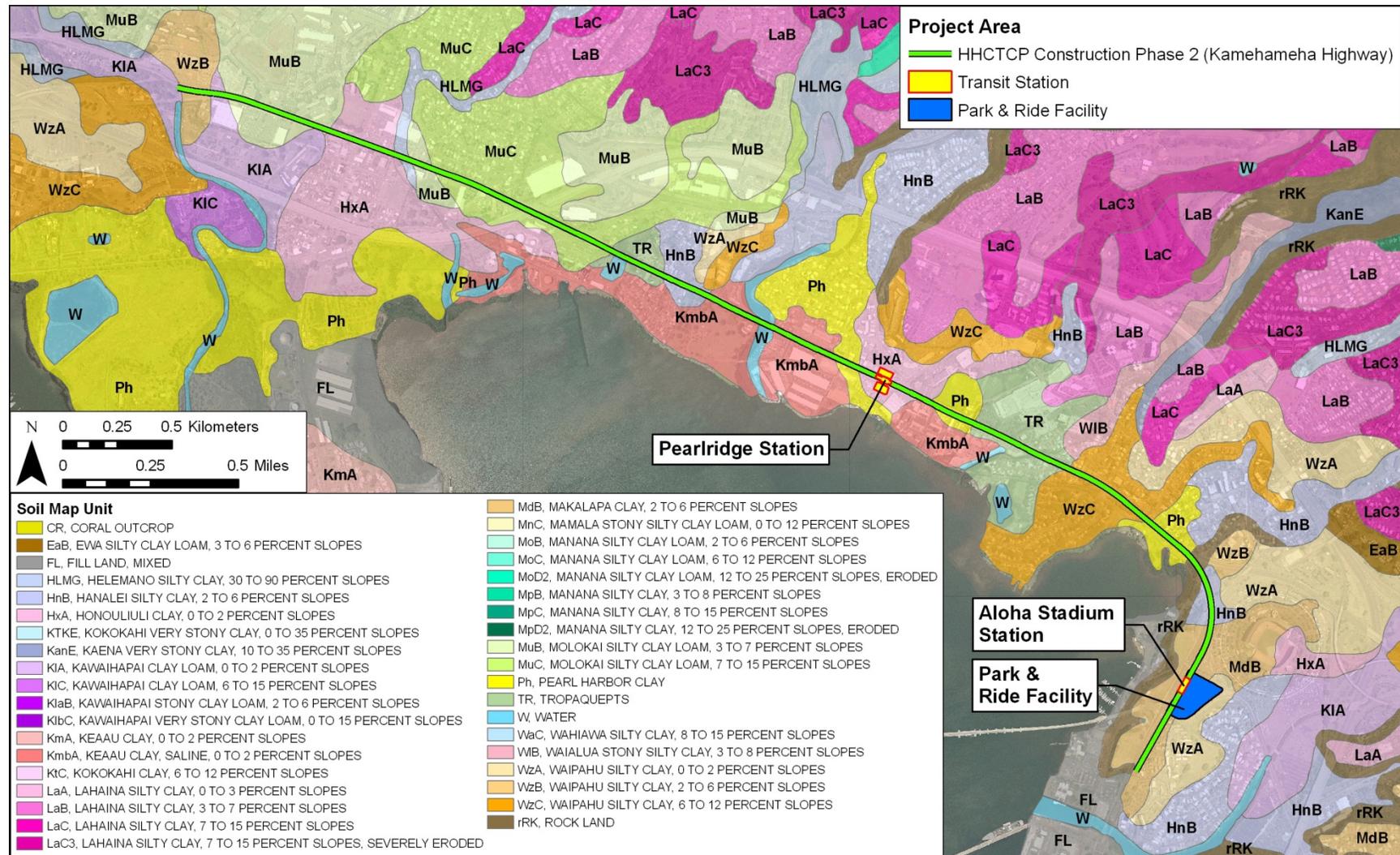


Figure 6. Aerial photograph (source: U.S. Geological Survey Orthoimagery 2005) with overlay of the Soil Survey of Hawai'i (Foote et al. 1972), showing sediment types in the vicinity of the Phase 2 project area

period occurs in summer. The mean annual soil temperature is 74° F. Makalapa soils are geographically associated with Kokokahi and Mamala soils.

These soils are used for urban development and pasture. The natural vegetation consists of kiawe, koa haole, lantana, bermudagrass, and fingergrass. [Foote et al. 1972:87]

Soils of the Molokai Series are described as follows:

This series consists of well-drained soils on uplands on the islands of Maui, Lanai, Molokai, and Oahu. These soils formed in material weathered from basic igneous rock. They are nearly level to moderately steep. Elevations range mainly from nearly sea level to 1,000 feet but are as much as 1,500 feet on Lanai. The annual rainfall amounts to 20 to 25 inches, most of which occurs between November and April. The summers are hot and dry. The mean annual soil temperature is 73° F. Molokai soils are geographically associated with Holomua, Keahua, Lahaina, and Uwala soils.

In this survey area a shallow variant of the Molokai series was mapped. This soil, Molokai silty clay loam, shallow variant, 15 to 25 percent slopes, severely eroded, is described in alphabetical order, along with other mapping units of this series.

These soils are used for sugarcane, pineapple, pasture, wildlife habitat, and home sites. The natural vegetation consists of *kiawe*, *'ilima*, *uhaloa*, feather fingergrass, and buffalo grass. [Foote et al. 1972:96]

Soils of the Pearl Harbor Series are described as follows:

This series consists of very poorly drained soils on nearly level coastal plains on the island of Oahu. These soils developed in alluvium overlying organic material. Elevations range from nearly sea level to 5 feet. The annual rainfall amounts to 18 to 40 inches. The mean annual soil temperature is 74° F. Pearl Harbor soils are geographically associated with Hanalei, Kaloko, and Keaau soils.

These soils are used for taro, sugarcane, and pasture. The natural vegetation consists of cattails, mangrove trees, California grass, and sedges. [Foote et al. 1972:112]

Rock Land sediments are described as follows:

Rock land (rRK) is made up of areas where exposed rock covers 25 to 90 percent of the surface. It occurs on all five islands. The rock outcrops and very shallow soils are the main characteristics. The rock outcrops are mainly basalt and andesite. This land type is nearly level to very steep. Elevations range from nearly sea level to more than 6,000 feet. The annual rainfall amounts to 15 to 60 inches.

Rock land is used for pasture, wildlife habitat, and water supply. The natural vegetation at the lower elevations consists mainly of kiawe, klu, piligrass, Japanese tea, and koa haole. Lantana, guava, Natal redbud, and molassesgrass are dominant at the higher elevations. This land type is also used for urban

development. In many areas, especially on the island of Oahu, the soil material associated with the rock outcrops is very sticky and very plastic. It also has high shrink-swell potential. Buildings on the steep slopes are susceptible to sliding when the soil is saturated. Foundations and retaining walls are susceptible to cracking. [Foote et al. 1972:119]

Soils of the Tropaquepts Series are described as follows:

Tropaquepts (TR) are poorly drained soils that are periodically flooded by irrigation in order to grow crops that thrive in water. They occur as nearly level flood plains on the islands of Oahu and Maui. Elevations range from sea level to 200 feet. The annual rainfall amounts to 20 to 150 inches.

These soils have been flooded for varying lengths of time, and soil development differs in degree from place to place. Generally, the surface layer, about 10 inches thick, consists of dark-gray, soft, mucky silt loam. This layer overlies firm to compact silty clay loam, 5 to 10 inches thick, that is mottled with gray, yellow, and brown. The mottled layer overlies friable alluvium.

Tropaquepts are used for production of taro, rice, and watercress on flooded paddies. [Foote et al. 1972:121]

Soils of the Waipahu Series are described as follows:

This series consists of well-drained soils on marine terraces on the island of O'ahu. These soils developed in old alluvium derived from basic igneous rock. They are nearly level to moderately sloping. Elevations range from nearly sea level to 125 feet. Rainfall amounts to 25 to 35 inches annually; most of it occurs between November and April. The mean annual soil temperature is 75° F. Waipahu soils are geographically associated with Hanalei, Honouliuli, and Waialua soils. [Foote et al. 1972:134]

#### **1.4.2 Built Environment**

The Phase 2 project area traverses a predominantly urban environment, through the towns of Pearl City, Waimalu, 'Aiea, and Hālawā. The centerline of the HHCTCP alignment is generally located within the median or shoulder of Kamehameha Highway. The project area also crosses the H-1 Interstate Highway. Parcels bordering the highway include a mix of commercial, industrial, and residential developments. Large developments in the vicinity of the project area include: the Hawaiian Electric Company's (HECO) Waiāu Power Plant; the Pearlridge Center shopping mall; and Aloha Stadium.

## Section 2 Background Research

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### 2.1 Mythological and Traditional Accounts

#### 2.1.1 Place Names of Eastern 'Ewa

In 1873, S. K. Kuhano described the ancient O'ahu land divisions. The island was as divided into 6 *moku* (districts), consisting of: Kona, 'Ewa, Wai'anae, Waialua, Ko'olauloa and Ko'olaupoko. These *moku* were further divided into 86 *ahupua'a* (land division within a *moku*). 'Ewa was divided into 12 *ahupua'a*, consisting of (from east to west): Hālawā, 'Aiea, Kalauao, Waimalu, Waiāu, Waimano, Mānana, Wai'awa, Waipi'o, Waikele, Hō'ae'ae and Honouliuli (Kame'eleihiwa 1992:330). The current study area, located in eastern 'Ewa, traverses the *ahupua'a* of Waiāwa, Mānana, Waimano, Waiāu, Waimalu, Kalauao, 'Aiea, and Hālawā (Figure 7).

##### 2.1.1.1 Place Names along the Main Trail through the 'Ewa District

John Papa 'Ī'ī (1959:96-98) described a network of trails through Leeward O'ahu, which in historic times encircled and traversed the Wai'anae Range (Figure 8). The coastal trail, that connected 'Ewa with the Kona District to the east and the Wai'anae District to the west, ran along the inland boundary of the Pearl Harbor floodplain and irrigated taro fields of the *ahupua'a* of eastern 'Ewa. This coastal trail was described by 'Ī'ī, who was traveling from Honolulu, through the 'Ewa District, and on to Wai'anae:

...From there the trail went to Kaleinakauhane [Moanalua Ahupua'a in the Kona District], then to Kapukaki [Red Hill on the Moanalua / Hālawā boundary], from where one could see the irregular sea of Ewa; then down the ridge to Napeha [in Hālawā], a resting place for the multitude that went diving there at a deep pool. This pool was named Napeha (Lean Over), so it is said, because Kaulii, a chief of ancient Oahu, went there and leaned over the pool to drink water.

The trail began again on the opposite side of the pool and went to the lowland of Halawa, on to Kauwamoa, a diving place and a much-liked gathering place. It was said to be the diving place of Peapea, son of Kamehamehanui of Maui who was swift in running and leaping. The place from which he dove into the water was 5 to 10 fathoms above the pool.

There the trail led to the taro patches in Aiea and up the plain of Kukiiāhu. Just below the trail was the spot where Kaeo, chief of Kaua'i, was killed by Kalanikupule. From there the trail went along the taro patches to the upper part of Kohokoho and on to Kahuewai [in Kalauao], a small waterfall. On the high ground above, a little way on, was a spring, also a favorite gathering place for travelers. From there it continued over a small plain down the small hill of Waimalu, and along the taro patches that lay in the center of the land...

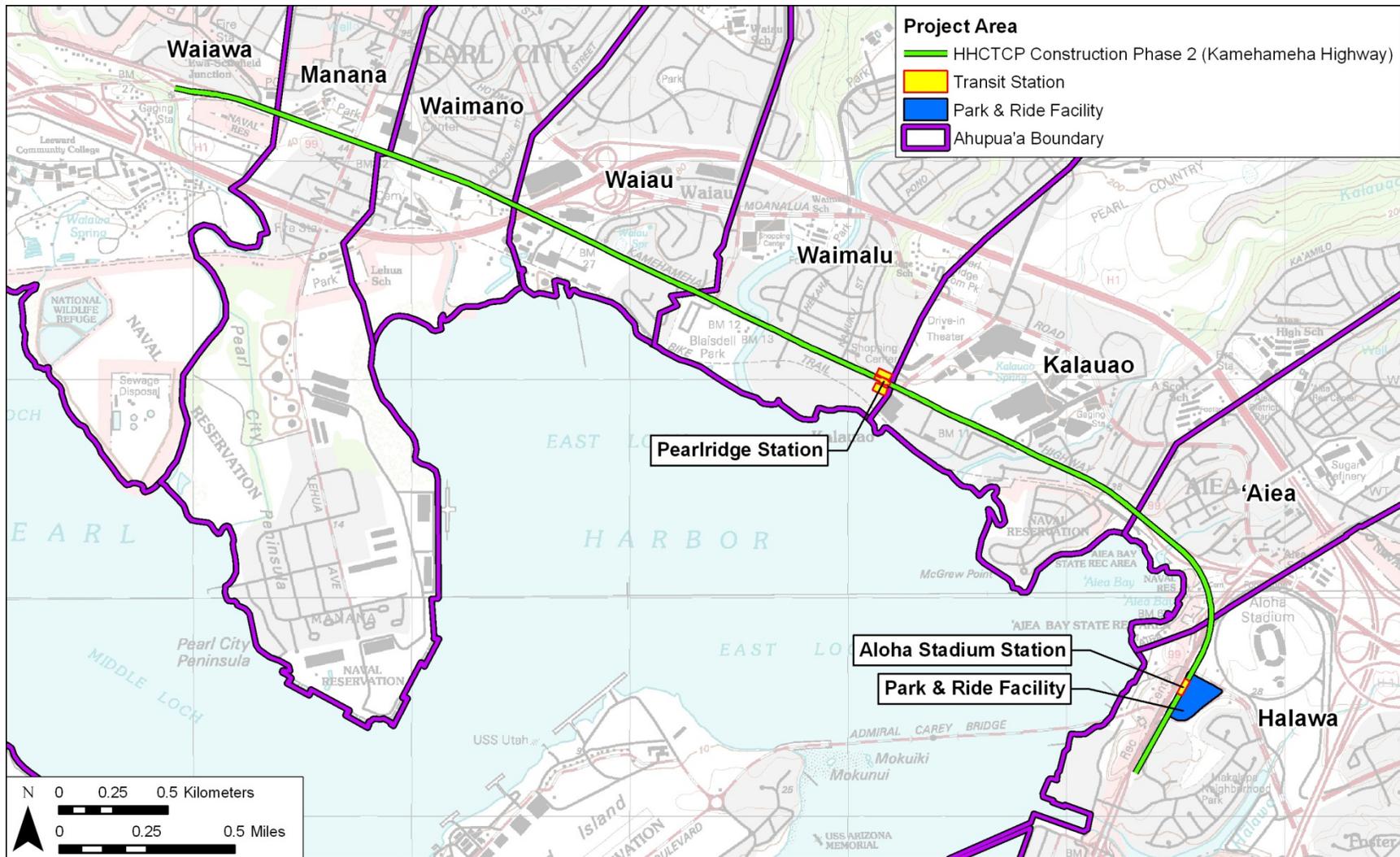


Figure 7. U.S. Geological Survey 7.5-Minute Series Topographic Map, Waipahu (1998) and Pearl Harbor (1999) Quadrangles, showing the boundaries of the *ahupua'a* traversed by the project area

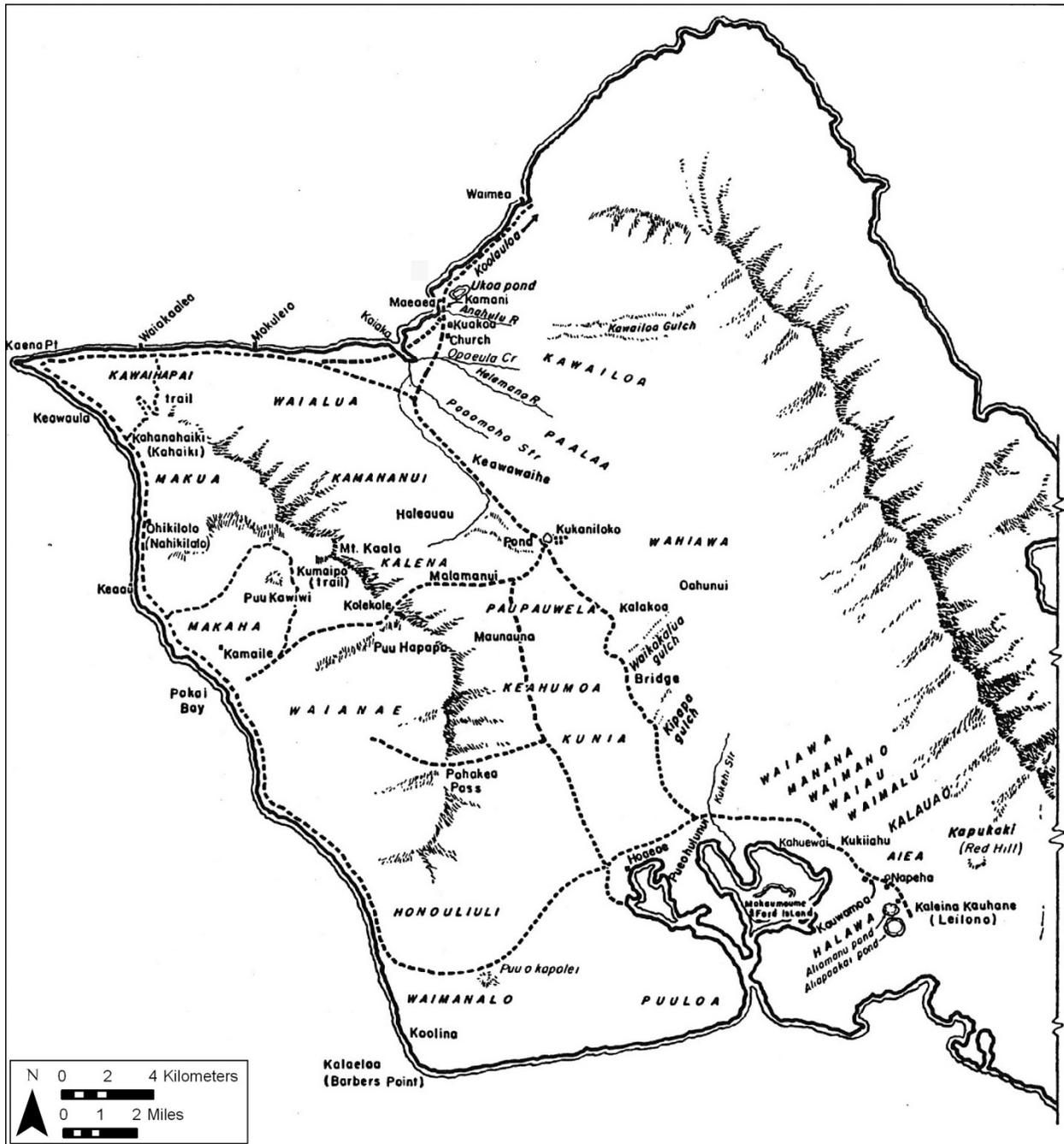


Figure 8. Trails of Leeward O'ahu, as described by 'I'i, map by Paul Rockwood ('I'i 1959:96)

The trail went down to the stream and up again, then went above the taro patches of Waiau, up to a *maika* [game with rolling stones] field, to Waimano, to Manana, and to Waiawa...[‘Ī‘Ī 1959:95, 97]

The place names mentioned by ‘Ī‘Ī are discussed in Section 2.1.1.3, below.

### 2.1.1.2 Place Names in the Chant for Kualī‘i

The *ahupua‘a* of the ‘Ewa District are mentioned in a chant for the chief, Kualī‘i, as dictated by Fornander (1917, History of Kualī‘i, Vol. IV, Part II:400-401). Each phrase usually contains a play on words, as the place name and one meaning of the word, or portion of the word, appears on each line (e.g. *kele* in Waikele means “slippery”). These word plays are not necessarily related to the actual place name meaning.

<i>Uliuli ka poi e piha nei—o Honouliuli;</i>	Blue is the poi which appeases [the hunger] of Honouliuli;
<i>Aeae ka paakai o Kahuaiki—Hoeae;</i>	Fine the salt of Kahuaike—Hoeae;
<i>Pikele ka ia e Waikele—o Waikele;</i>	Slippery the fish of Waikele—Waikele;
<i>Ka hale pio i Kauamoa—o Waipio;</i>	The arched house at Kauamoa—Waipio;
<i>E kuu kaua i ka loko awa—o Waiawa;</i>	Let us cast the net in the awa-pond—of Waiawa;
<i>Mai hoomanana ia oe—o Manana.</i>	Do not stretch yourself at—Manana.
<i>He kini kahawai,</i>	Many are the ravines,
<i>He lau kamano—o Waimano;</i>	Numerous the sharks, at Waimano;
<i>Ko ia kaua e ke au—o Waiau;</i>	We are drawn by the current of Waiau;
<i>Kukui malumalu kaua—Waimalu;</i>	In the kukui grove we are sheltered—in Waimalu;
<i>E ala kaua ua ao-e—o Kalauao;</i>	Let us arise, it is daylight—at Kalauao;
<i>E kipi kaua e ai-o Aiea;</i>	Let us enter and dine-at Aiea;
<i>Mai hoohalawa ia oe—O Halawa.</i>	Do not pass by—Halawa.

### 2.1.1.3 Place Name Locations and Meanings

Place names or *wahi pana* (“legendary place” Pukui and Elbert 1986: 376) are an integral part of Hawaiian culture. In Hawaiian culture, if a particular spot is given a name, it is because an event occurred there which has meaning for the people of that time. The *wahi pana* were then passed on through language and oral traditions, thus preserving the unique significance of the place. Hawaiians named all sorts of objects and places, points of interest that may have gone unnoticed by persons of other cultural backgrounds. Hawaiians named taro patches, rocks and trees that represented deities and ancestors, sites of houses and *heiau* (places of worship), canoe landings, fishing stations in the sea, resting places in the forests, and the tiniest spots where miraculous or interesting events are believed to have taken place. *Place Names of Hawai‘i* (Pukui et al. 1974) was used as the primary source for all place name translations. In some cases, where there were no known translations, a literal translation of the place name was made using the *Hawaiian Dictionary* (Pukui and Elbert 1971) or from another source.

## Waiawa

Waiawa Ahupua'a extends from the Middle Loch of Pearl Harbor to the crest of the Ko'olau Range. The seaward portion of *ahupua'a* is watered by Waiawa Stream, which is fed by both Waiawa and Mānana Streams, that join at a junction in the inland portion of the *ahupua'a*. Near this junction is a long ridge called Lae Pōhaku ("stone point"), which is the boundary between Waiawa and Mānana Ahupua'a. Some historic maps also indicate a peak called Pu'u Pōhaku ("stone hill"), located on the boundary between Waiawa and Waipi'o Ahupua'a.

The meaning and correct pronunciation of Waiawa is in dispute. It is variously spelled Waiawa or Wai'awa, which leads to different interpretations. *Awa* is the word for milkfish (*Chanos chanos*), while *'awa* is the word for the native *'awa* plant (*Piper methysticum*), which was used to make a mild narcotic drink.

Other traditional accounts suggest that Waiawa may have been acknowledged in early times as the site of a special variety of the *'awa* plant:

...When the wondrous maiden [Ke-ao-melemele] arrived at the entrance to the mountain of Konahuanui, all the offerings were in charge of Ke-anuenue, a puko'a or reddish brown pig, a clump of dark 'awa (pu'awa popolo) which was not common in these islands. This variety of 'awa now grows in the upland of Waiawa, down here in 'Ewa. [Kuokoa Jan. 17, 1885, cited in Sterling and Summers 1978:19]

Tin Hu Young, a lifelong resident of Waiawa, suggested a different origin of the name Waiawa:

...In fact, the name "Wai'awa" means water and 'awa. You know the meaning of 'awa? 'Awa is that kava root that you drink, Hawaiians call it 'awa. I kind of didn't like the idea they called it "bitter water." Because 'awa is a little bitter when you drink it, so Wai'awa—Wai'awa Valley was an area known in the ancient days of harvesting 'awa root. It was a ceremonial drink that they had. Of course in the old days only the royalty used that root, until later on, and then the commoners would use it. Then you could sell it in the market and go buy it, like other things. So, Wai'awa was a source of that. But, I like to think that the meaning of "bitter water" for the name Wai'awa, to me, could come from—because the area is the farther lot, the bottom on the lowland, mauka of Pearl Harbor. And when I used to watch the water, the rivulets would come twisting and turning like little 'awa roots, twisted. If you ever harvest that 'awa root, you got to see, its like a big root coral. It's all tangled into each other. And it reminds me, when it flooded down in the lowland, all these little rivulets, twisting and turning, like the 'awa root. But it's just my romantic—it's just because I live there. I don't want them to say, Ehh you live in bitter water? [Interview with T. H. Young, October 9, 2002, in Bushnell et al. 2003:9-10]

In addition to the *awa* fish (milkfish; *Chanos chanos*), and the *'awa* plant (*Piper methysticum*), the Hawaiian word *awa* can also be translated as: harbor, cove, or channel (Pukui and Elbert 1971:30). This translation of the Waiawa place name may be a reference to Pearl Harbor.

Kuhialoko was a large fishpond in Waiawa, located along the eastern coast of the Middle Loch of Pearl Harbor (Figure 9). The following account indicates the area was named for Kuhia, a *konohiki* [*ahupua'a* supervisor under the chief]:

Polea and Kuhia were *konohikis* in Ewa and was why there are places on the shore named Polea and Kuhia. There were two Kuhias, Kuhia-loko and Kuhia-waho who were twin brothers. [*Ke Au Hou* Dec. 21, 1910, cited in Sterling and Summers 1978:18]

Kuhia was said to be “one of the butlers or purveyors to Kaahupahau, the shark queen of Ewa” (*Saturday Press* Jan. 12, 1888, cited in Sterling and Summers 1978:17).

### Manana

Mānana Ahupua'a extends from the Mānana Peninsula (presently known as the Pearl City Peninsula), between the Middle and East Lochs of Pearl Harbor, to the headwaters of Mānana Stream, near the crest of the Ko'olau Range. The inland portion of the *ahupua'a* was called Mānanauka (“upland Mānana”) or Mānananui (“large Mānana”), and the coastal portion was called Mānanaiki (“little Mānana”) (Handy 1940:81). The word *manana* is translated as: “to stretch out,” “to spread out,” or “to protrude” (Pukui and Elbert 1971:218). This may be a reference to the Manana Peninsula, which protrudes into Pearl Harbor. Other sources indicate the place name means “the meeting of land,” and that it was named after the convergence of two lava flows in the Pearl City area (Ching 1996:1).

Loko Pā'au'au was a large fishpond located on the western coast of the Mānana Peninsula (Figure 9). Pukui et al. (1974: 173) translate *pā'au'au* as “bath enclosure.” Pā'au'au was also the name of the *'ili* (land division within an *ahupua'a*) surrounding the pond, and the name of the home of John F. Colburn, an early resident who had a home near the pond. There are two songs about Pā'au'au, written by John U. Iosepa, which were first published in 1916. The first song, Pā'au'au Hula, was dedicated to John Colburn and contains a reference to his wife, Kuliakanu'u. The song mentions the beauty of Pā'au'au, bathing in the pool, and the “silent fish,” or oysters, that could be gathered there. The second song, Pā'au'au Waltz, also referencing the beauty of Pā'au'au, mentions the pearl oysters, the trade winds (*moa'e*), and the “sea of Pōlea.” The Hawaiian word *pōlea* is translated as “blurred, as eyes of a diver” (Pukui and Elbert 1971:312), which may refer to the murky waters of Pearl Harbor.

### Waimano

Waimano Ahupua'a extends from the east side of the Mānana Peninsula to the crest of the Ko'olau Range, generally following Waimano Stream. The word *waimano* is translated as “many waters” (Pukui et al. 1974:225). Pukui et al. (1974:225) also note “the shark demigoddess Ka'ahupāhau bathed here.” Ma'ipuhi, a locality in Waimano was also mentioned as “a bathing place of the shark chiefess, Kaahupahau” (*Ke Au Hou*, Dec. 21, 1910, cited in Sterling and Summers 1978:16).

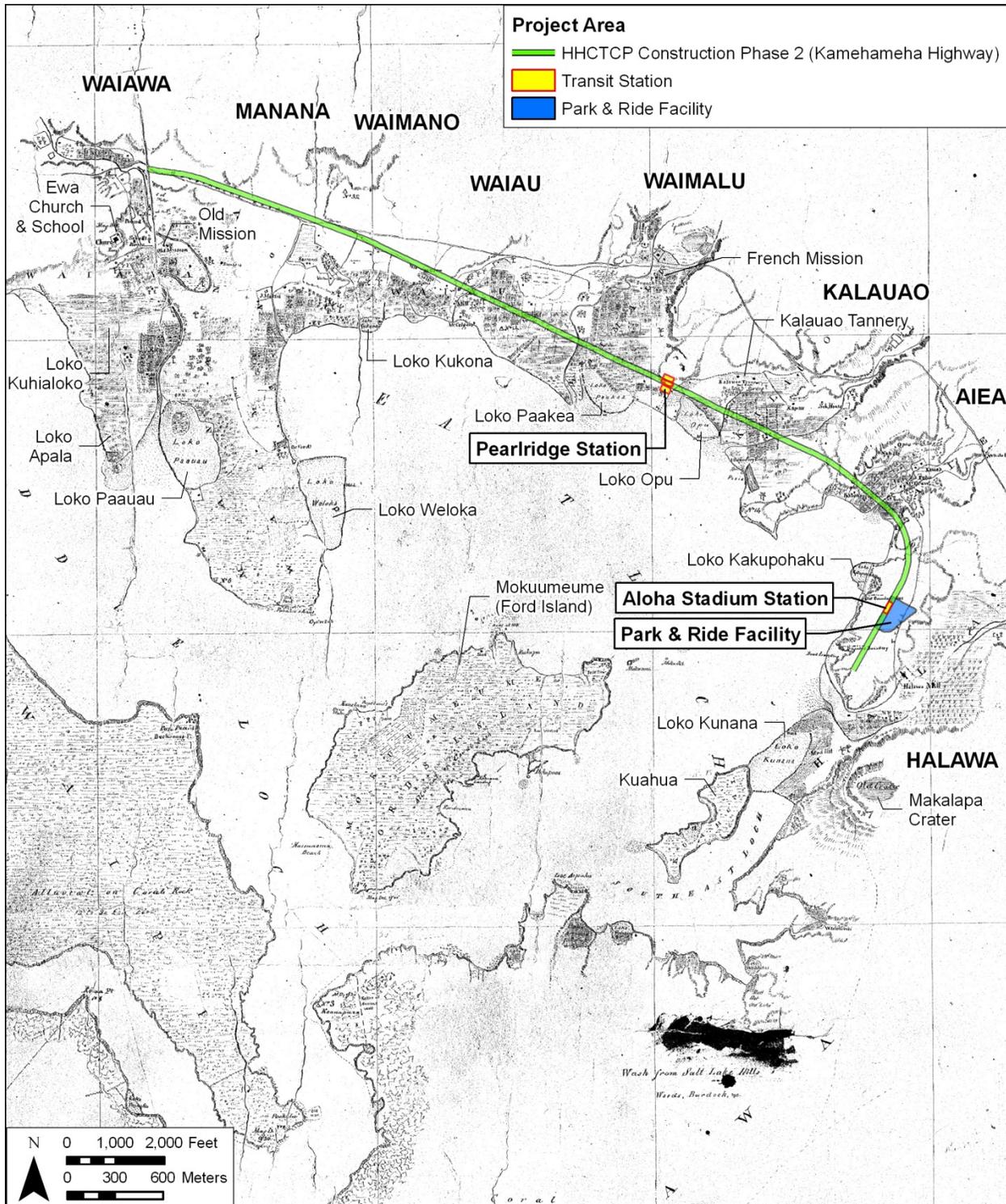


Figure 9. 1873 Map of Pearl Lochs and Puuloa Entrance, Ewa, Oahu, C. J. Lyons Surveyor (Hawai'i Land Survey Division, Registered Map No. 567), showing the location of the Phase 2 project area and features discussed in the text

Loko Welokā, a large fishpond with a small island in the center, was located in Waimano, along the eastern shore of the Manana Peninsula (see Figure 9). The word *welokā* is translated as “thrashing, smiting, as a fishtail” (Pukui and Elbert 1971:355), which may also be a reference to the shark demigoddess associated with Waimano. Loko Kūkona, another large fishpond in Waimano, was located along the northern coast of Pearl Harbor (see Figure 9). The word *kūkona* is translated as “unfriendly, cross, or sullen” (Pukui and Elbert 1971:163).

### Waiau

Waiau Ahupua‘a extends from the East Loch of Pearl Harbor to the crest of the Ko‘olau Range, generally following Waiau Gulch. Waiau Spring and Waiau Pond are located near the Pearl Harbor coast. Waiau is translated as “swirling water” (Pukui et al. 1974:221). However, Thrum (1922:672) indicates the pronunciation is Wai‘au, meaning “water to swim in.” A small fishery was also attached to Waiau Ahupua‘a. The fishery was named Kai o Kalua‘o‘opu, which is translated as “the hole” (*ka lua*) of the “goby fish” (*‘o‘opu*) (Pukui and Elbert 1971:196,267). Puhikani, a locality in Waiau was also mentioned as “a bathing place of the shark chiefess, Kaahupahau” (*Ke Au Hou*, Dec. 21, 1910, cited in Sterling and Summers 1978:16).

### Waimalu

Waimalu Ahupua‘a extends from the East Loch of Pearl Harbor to the crest of the Ko‘olau Range, generally following Waimalu Stream. The word *waimalu* is translated as “sheltered water” (Pukui et al. 1974:225), likely in reference to Pearl Harbor and the fishponds along the coast. Loko Pa‘akea, a large fishpond in Waimalu along the Pearl Harbor coast (see Figure 9), was said to have been built by the chiefess, Kalaimanuia (McAllister 1933:103-104). The word *pa‘akea* is translated as “coral bed, limestone” (Pukui et al. 1974:173).

The offshore island of Moku‘um‘ume (Ford Island) (see Figure 9) was considered part of Waimalu Ahupua‘a. McAllister (1933:102) indicates the place name means “‘Isle of Strife’ from the fact that among former chiefs it was the center of contention over certain fishing rights.” Pukui et al. (1974:156) state that the island was named for the *‘ume*, a sexual game that was once played on the island.

### Kalauao

Kalauao Ahupua‘a extends from the East Loch of Pearl Harbor to the crest of the Ko‘olau Range, generally following Kalauao Stream. Kalauao Spring is located near the Pearl Harbor coast. The word *kalauao* is translated as “the multitude of clouds” (Pukui et al. 1974:75). Pu‘u Kaiwipo‘o, a peak on the ridge separating Kalauao and Hālawa Ahupua‘a, is translated as “the skull hill” (Pukui et al. 1974:197). A small waterfall along Kalauao Stream, named Kahuawai (or Kahuwai), was located along the coastal trail connecting Honolulu to Wai‘anae. Kahuawai, translated as “water gourd container,” was indicated to have been “a favorite resting place exclusively for chiefs” (Pukui et al. 1974:66). Loko Opu, a large fishpond located in Kalauao along the Pearl Harbor coast (see Figure 9), is said to have been built by the chiefess Kalamanu‘ia (McAllister 1933:103).

## ‘Aiea

‘Aiea Ahupua‘a extends from the East Loch of Pearl Harbor to the Pu‘u ‘Ua‘u mountain peak, generally following ‘Aiea Stream. ‘Aiea is said to have been named for the ‘*aiea* (*Nothocestrum* sp.) tree or shrub (Pukui et al. 1974:7), which was used for thatching sticks and for fire-making (Pukui and Elbert 1971:9). Pu‘u ‘Ua‘u is named after the ‘*ua‘u*, or dark-rumped petrel (*Pterodroma phaeopygia sandwichensis*), a seabird that travels inland to nest (Pukui et al. 1974:206). The wall of Loko Kakupōhaku, a large fishpond in ‘Aiea along the Pearl Harbor coast (see Figure 9), marked the boundary between ‘Aiea and Hālawa Ahupua‘a.

## Hālawa

Hālawa Ahupua‘a extends from the East Loch of Pearl Harbor to the crest of the Ko‘olau Range, generally following Hālawa Stream. The word *hālawa* is translated as “curve” (Pukui et al. 1974:36). Along the coastal trail connecting Honolulu to Wai‘anae, ‘Ī (1959:95) mentioned two resting places in Hālawa for travelers, Napehā and Kauwamoa. Napehā, translated as “bend over breath” (Pukui et al. 1974:163), was a pool and resting place where people went diving. The pool was said to have been named for the chief, Kūali‘i, who stopped and bent over the pool to take a drink (‘Ī 1959:95). Kauwamoa was also a diving place where people liked to gather, said to be a favorite diving spot of Pe‘ape‘a, son of Kamehamehanui of Maui (‘Ī 1959:95).

Kūāhua, a small offshore island considered a part of Hālawa Ahupua‘a, is translated as “standing heap” (Pukui et al. 1974:118). Kūāhua was attached to the coast via the Loko Kunana fishpond (see Figure 9). A long time resident stated the fishpond was named after Kūanānā, the mother of Ka‘ahupahau, the shark chiefess of Pu‘uloa, who liked to fish there (Sterling and Summers 1978:10). Makalapa Crater is a prominent geological feature located inland of Loko Kunana (see Figure 9). The word *makalapa* is translated as “ridge features” (Pukui et al. 1974:140). Leilono, located on the hill of Kapukaki (Red Hill) at the boundary between Hālawa and Moanalua Ahupua‘a, “was a place said to be the opening, on the island of O‘ahu, for mankind to enter eternal night” (*Kuokoa* Aug. 11, 1899, cited in Sterling and Summers 1978:9).

### **2.1.2 Traditions Associated with the ‘Ewa District**

Some of the themes associated with ‘Ewa include connections with Kahiki, the traditional homeland of Hawaiians in central Polynesia. There are several versions of the chief Kaha‘i leaving from Kalaeloa on a trip to Kahiki. Upon his return to the Hawaiian Islands, he brought back the first breadfruit (Kamakau 1991:110) and planted it at Pu‘uloa, near Pearl Harbor in ‘Ewa (Pukui et al. 1974:200). Several stories associate places in ‘Ewa to the gods Kāne and Kanaloa, with the Hawaiian pig god Kamapua‘a and the Hina family, and with the sisters of the volcano goddess Pele, all of whom have strong connections with Kahiki (Kamakau 1991:111).

‘Ewa literally translates as “crooked” (Pukui et al. 1974:28) or “imperfect” (Pukui and Elbert 1971:39). Others interpret the meaning of ‘Ewa as “strayed,” in association with a story about the gods Kāne and Kanaloa, who threw a stone to determine the boundary of the district:

When Kane and Kanaloa were surveying the islands they came to Oahu and when they reached Red Hill saw below them the broad plains of what is now Ewa. To mark boundaries of the land they would throw a stone and where the stone fell would be the boundary line. When they saw the beautiful land lying below them, it was their thought to include as much of the flat level land as possible. They

hurled the stone as far as the Waianae range and it landed somewhere, in the Waimanalo section. When they went to find it, they could not locate the spot where it fell. So Ewa (strayed) became known by the name. The stone that strayed. [Sterling and Summers 1978:1]

‘Ewa was at one time the political center for O‘ahu chiefs. This was probably due to its abundant resources that supported the households of the chiefs, particularly the many fishponds around the lochs of Pu‘uloa (“long hill”; Pukui, et al. 1974:201), better known today as Pearl Harbor (Handy and Handy 1972:470). Handy says about ‘Ewa:

The salient feature of ‘Ewa, and perhaps its most notable difference, is its spacious coastal plain, surrounding the deep bays (“lochs”) of Pearl Harbor, which are actually the drowned seaward valleys of ‘Ewa’s main streams, Waikele and Waipi‘o...The lowlands, bisected by ample streams, were ideal terrain for the cultivation of irrigated taro. The hinterland consisted of deep valleys running far back into the Ko‘olau range. Between the valleys were ridges, with steep sides, but a very gradual increase of altitude. The lower parts of the valley sides were excellent for the culture of yams and bananas. Farther inland grew the ‘awa for which the area was famous. The length or depth of the valleys and the gradual slope of the ridges made the inhabited lowlands much more distant from the wao, or upland jungle, than was the case on the windward coast. Yet the wao here was more extensive, giving greater opportunity to forage for wild foods in famine time. [Handy and Handy 1972:469]

Handy goes on to describe some of the prized resources of the district:

In the interior was the same avifauna, including the birds whose feathers were prized for feather capes, helmets, and lei making. In fact this, with its spacious wao inland, was the region where these birds were most numerous. There were more extensive areas also where wauke and māmaki, which supplied bast for the making of tapa, grew in abundance. In fact, ‘Ewa was famous for its māmaki. There was, too, much olonā grown in the interior, and wild bananas and yams flourished. [Handy and Handy 1972:470]

The following ‘*ōlelo no ‘eau* (poetical saying or proverb) refers to ‘Ewa’s reputation for being very dusty:

*‘Ewa: ‘Āina koi ‘ula i ka lepo: ‘Ewa, land reddened by the rising dust [Pukui 1983: O.N. 2357].*

‘Ewa was also known for a special and tasty variety of *kalo* (taro; *Colocasia esculenta*) called *kāī*, which was native to the district. Varieties of *kāī* included: the *kāī eleele* (black *kāī*); *kāī kea* (white *kāī*); and *kāī koi* (forceful *kāī*) (*Ka Loea Kalaiaina* June 3, 1899, cited in Sterling and Summers 1978:8). It was said that the *kāī koi* “is the taro that visitors gnaw on and find it so good that they want to live until they die in ‘Ewa” (*Ka Loea Kalaiaina* June 3, 1899, cited in Sterling and Summers 1978:8).

### 2.1.2.1 Pu'uloa (Pearl Harbor)

#### The "Silent Fish" of Pearl Harbor

Pearl Harbor was known by Hawaiians as Pu'uloa or *Keawalau-o-Pu'uloa*, "the many harbored-sea of Pu'uloa" (Pukui 1983:182). An alternate name was Awawalei, or "garland (*lei*) of harbors" (Handy and Handy 1972:469). Pukui (1983:120) uses the name Awalau for Pearl Harbor, as in the saying "*Huhui na 'ōpua i Awalau*, The clouds met at Pearl Harbor. Said of the mating of two people." Emerson (1993:167) interpreted Awalau as "leaf-shaped lagoon."

Clark (1977:70) says that its English name came from the name Waimomi, or "water of the pearl," an alternate name for the Pearl River (Pearl Harbor). The harbor was named Pearl Harbor after the pearl oysters, which were once abundant on the harbor reefs, but were later decimated by over-harvesting. Samuel Kamakau describes the *pipi* (pearl oyster) of Pu'uloa:

The pearl oyster, the oyster from Namakaohalawa to the cliff of Honouliuli, from the sea ponds of upper Ewa clear out to Kapakule. That was the pearl shell that came in from deep water to the mussel beds near shore, from the channel entrance to the rocks along the edges of the lochs. They grew right on the mussel shells and thus supplied sea food. Not six months after the hau branches were set up [that placed a *kapu* on harvesting *pipi*], pearl oysters were found in abundance for all Ewa, fat with flesh: and within the oyster was a jewel called a pearl, beautiful as the eyeball of the fish, white and shining, white as the cuttle-fish, shining with the colors of the rainbow with red, yellow, or dark colors and some pinkish white, ranging in size from small to large and of great value, but in those days mere rubbish in Ewa. [Kamakau, *Mo'olelo Hawai'i*, cited in Sterling and Summers 1978:51]

The *pipi* was sometimes called "the silent fish," or, *i'a hamau leo o 'Ewa*, 'Ewa's silent sea creature (Handy and Handy 1972:471). The *pipi* collectors were supposed to stay quiet while harvesting the shells, as in the following sayings:

*Ka i'a hāmau leo o 'Ewa.* The fish of 'Ewa that silences the voice.

The pearl oyster, which has to be gathered in silence. [Pukui 1983:144]

*Haunāele 'Ewa i ka Moa'e.* 'Ewa is disturbed by the Moa'e wind.

Used about something disturbing, like a violet argument. When the people of 'Ewa went to gather the *pipi* (pearl oyster), they did so in silence, for if they spoke, a Moa'e breeze would suddenly blow across the water, rippling it, and the oysters would disappear. [Pukui 1983:59]

*E hāmau o makani mai auane'i.* Hush, lest the wind rise.

Hold your silence or trouble will come to us. When the people went to gather pearl oysters at Pu'uloa, they did so in silence, for they believed that if they spoke, a gust of wind would ripple the water and the oysters would vanish [Pukui 1983:34].

*Ka i'a kuhi lima o 'Ewa.* The gesturing fish of 'Ewa.

The *pipi*, or pearl oyster. Fishermen did not speak when fishing for them but gestured to each other like deaf-mutes. [Pukui 1983:148]

The *pipi* was said to have been brought from Kahiki, the Hawaiian ancestral lands, by a *mo'o* (lizard or water spirit) named Kānekua'ana:

Another guardian of Pearl Harbor was Kanekua'ana (Kane-the-elder) who was said to have introduced the *pipi* or pearl oyster to the waters there. They were her special care and interest. Like Ka'ahupahau, she was a supernatural being, a *Mo'o* or lizard-like water spirit.

The *pipi* was called the "i'a hamau leo" or "fish with a silenced voice." It was not the *pipi* that was silent but the people who gathered them, for it was taboo to utter a sound lest a breeze arise suddenly to ripple the surface of the water and the *pipi* would vanish completely. Those who gathered the *pipi* gestured and pointed like deaf mutes until they had all they wanted. [Pukui 1943, cited in Sterling and Summers 1978:50]

It was believed that the *pipi* disappeared around the time of the smallpox epidemic of 1850-1853, because Kānekua'ana became displeased at the greed of some *konohiki* (overseers):

The people of the place believe that the lizard was angry because the *konohikis* imposed *kapus* [bans], were cross with the women and seized their catch of oysters. So this "fish" was removed to Tahiti and other lands. When it vanished a white, toothed thing grew everywhere in the sea of Ewa, which the natives of Ewa had named the *pahikaua* (sword). It is sharp edged and had come from Kauai-helani, according to this legend. [*Kuokoa* Apr. 25, 1885, cited in Sterling and Summers 1978:50]

Sereno Bishop, an early resident of O'ahu, attributed the disappearance of *pipi* from Pu'uloa to sedimentation of the harbor:

The lochs or lagoons of Pearl River were not then as shoal as now. The subsequent occupation of the uplands by cattle denuded the country of herbage, and caused vast quantities of earth to be washed down by storms into the lagoons, shoaling the water for a long distance seaward. No doubt the area of deepwater and anchorage has been greatly diminished. In the thirties, the small oyster was quite abundant, and common on our table. Small pearls were frequently found in them. No doubt the copious inflow of fresh water favored their presence. I think they have become almost entire extinct, drowned out by the mud. There was also at Pearl River a handsome speckled clam, of a delicate flavor which contained milk white pearls of exquisite luster and perfectly spherical. I think the clam is still found in the Ewa Lochs. [Bishop 1901:87, cited in Sterling and Summers 1978: 46]

Kamakau mentioned other important sea foods that were once abundant in Pu'uloa:

The fine -fleshed shrimp, the coarse-fleshed shrimp, such as came from the sea into the inland sea ponds. Yellow nehu fish and the common variety of the nehu filled the lochs from the channel of Pu'uloa inland to the Ewas; hence the saying

of the natives of this land, “The sea that blows up nehu fish, the sea of Ewa that blows them up in rows until they rest in the calm great Ewa of La‘akona”. Other noted shell fish of Ewa, that land famous to our ancestors, where mahamoe, okupe, and many others that have now disappeared. [Kamakau, *Mo‘olelo Hawai‘i*, cited in Sterling and Summers 1978:51]

### Ka‘ahupāhau, the Shark Goddess of Pu‘uloa

Pearl Harbor is closely associated with shark ‘aumakua (guardian spirits for specific Hawaiian families or clans). The most famous guardian shark was Ka‘ahupāhau (“cloak well cared for”), the chiefess of sharks in Pu‘uloa (Pukui, *Ke Awa Lau o Puuloa* 1943, cited in Sterling and Summers 1978:54). The following story relates the reasons for Ka‘ahupāhau’s protection of the people of Ewa:

Her brother and she were born, not sharks, but human beings. One day a great shark god saw them and converted them into sharks like himself. Every day they swam up a stream at Waipahu and there they were fed on ‘awa by relatives. (‘Awa was always the food of the gods). When they became too large to swim up stream, the offerings of food were carried to the lochs to them.

Ka‘ahupāhau made a law that no man should be harmed in her domain, nor should any shark touch the corpse of one who was drowned. This law was the result of remorse over the death of Papio.

Papio was a pretty girl who used to go surfing at Keahi, a place between Pu‘uloa and Kalaeloa (Barber’s Point). One day she met Koihala, an aged relative of Ka‘ahupāhau, who was busy stringing kou, ma‘o and ilima blossoms into leis for her beloved shark “grandchildren”, Ka‘ahupāhau and Kahi‘uka. Papio begged for a lei, which was, according to the standards of that time, a very rude thing to do. Each time she begged, Koihala refused to give her a lei. Papio then went to her surfing and on her return, snatched one of the leis from Koihala and went away with a laugh. Koihala was filled with anger and when she took the leis to the beach, she told Ka‘ahupāhau all about it. Ka‘ahupāhau too, became angry with Papio.

Papio crossed the channel, found a large rock and stretched herself on it with her long, beautiful hair trailing in the water. She did not suspect that Ka‘ahupāhau had sent a shark to destroy her. Papio was seized, drawn under water and killed. Then her blood was spewed on the shore not far away, staining the soil there red to this day.

Ka‘ahupāhau soon recovered from her anger and became very sorry. She declared that from hence forth all sharks in her domain should not destroy but protect the people round about. As flowers were the cause of the trouble she forbade their being carried or worn on the waters of Pu‘uloa. From that time all the people of that locality and the sharks in the lochs were the best of friends. [Pukui, *Ke Awa Lau o Puuloa* 1943, cited in Sterling and Summers 1978:54]

Another story relates that Ka‘ahupāhau also protected the people of ‘Ewa from man-eating sharks that visited O‘ahu from the other islands:

Ka'ahupahau hardly ever ventured from home but sharks from the other islands came to pay her visits instead. She had them watched very closely and should there be a man-eater among them he was beaten to death by her brother Kahi'ukā and the other sharks. Kahi'ukā's tail was longer on one side than the other and with this tail he thrashed and smote any shark that offended his sister.

It was said that a man-eater was often detected by the way he spoke. He referred to the fishermen he saw as "fat crabs", that is, a dainty morsel.

At one time a large company of sharks came to visit from Hawaii, Maui and Molokai. They had planned to make a circuit of the islands and perhaps later to visit Kahiki. They stopped at Pu'uloa to visit Ka'ahupahau. Most of these had human relatives and were not desirous of eating human flesh, but among them were some who disregarded the relationship, and learned to like them. Mikololou was one of the latter. "What fine, fat crabs you have here", he remarked. Ka'ahupahau, pretending not to hear, led them into the lochs to entertain. A signal was given to the fishermen who stretched nets across the entrance. One net was not enough, but many, many nets were needed, one behind the other. After a pleasant visit with Ka'ahupahau the sharks made ready to continue on their journey. There at the entrance they met a barrier. The sharks of the lochs attacked the man-eaters from outside and beat them unmercifully...

It was said that when the nets of the fishermen, (used as an entrance barrier) were torn by an enemy shark, she made a net or barrier of her own body which none was able to tear through. Never would she let any monster of the deep destroy her people. She loved them and they loved her. [Pukui, *Ke Awa Lau o Puuloa* 1943, cited in Sterling and Summers 1978:54-55]

The watchful eye of Ka'ahupāhau led to these Hawaiian sayings:

<i>Alahula Pu'uloa, he alahele na Ka'ahupāhau</i>	Everywhere in Pu'uloa is the trail of Ka'ahupāhau
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Said of a person who goes everywhere, looking, peering, seeing all, or of a person familiar with every nook and corner of a place. Ka'ahupāhau is the shark goddess of Pu'uloa (Pearl Harbor) who guarded the people from being molested by sharks. She moved about, constantly watching. [Pukui 1983:14]

<i>Ho'ahewa na niuhi ia. Ka'ahupāhau</i>	The man-eating sharks blamed Ka'ahupāhau.
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Evil-doers blame the person who safeguards the rights of others. Ka'ahupāhau was the guardian shark goddess of Pu'uloa (Pearl Harbor) who drove out or destroyed all the man-eating sharks. [Pukui 1983:108]

<i>Mehameha wale no o Pu'uloa, i ka hele a Ka'ahupāhau.</i>	Pu'uloa became lonely when Ka'ahupāhau went away.
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The home is lonely when a loved one has gone. Ka'ahupāhau, guardian shark of Pu'uloa (Pearl Harbor), was dearly loved by the people. [Pukui 1983:234]

<i>Make o Mikololou a ola</i>	Mikololou died and came to life again
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*i ke ale lo*

through his tongue.

Said of one who talks himself out of a predicament. [Pukui 1983:229]

Ka'ahupāhau's brother, Kahi'ukā, was said to warn people in Pu'uloa when unfriendly sharks were in the area:

Kahi'uka was the brother of Ka'ahupahau. The name means "smiting tail." This shark was called by this name because it was his duty to warn the people of Ewa of the presence of strange and unfriendly sharks in these waters and he did so by nudging them or striking at them with his tail. When ever anyone was fishing and felt a nudge they would know it was Kahi'uka warning them and they would leave the water immediately. [E.S. as told by Simeon Nawaa, Mar. 22, 1954, cited in Sterling and Summers 1978:56]

### Kāne and Kanaloa and the Fishponds of Pu'uloa

Traditional accounts indicate several of the fishponds in the Pu'uloa area were believed to have been constructed by the brother gods, Kāne and Kanaloa:

Here, let me relate the story of a man named Hanakahi who lived in Puuloa. He was a fisherman and did as Maihea did, in straining awa, broiling fish and preparing poi with prayers to the unknown gods whose names he did not know. This was how he prayed, "O unknown gods of mine, here is awa, fish and poi. Grant me success and blessings in fishing." Thus he prayed constantly until he met the gods to whom he prayed.

After the gods had left Maihea to go to Puuloa they reached Hanakahi's house in the afternoon. When they arrived, Hanakahi had returned from his fishing. The fish was cooked, the awa was chewed and he was in the act of straining it when they got to the door. As soon as Hanakahi saw them he invited them in, which they did. Hanakahi knew that he had company to share his awa with so he set down two more cups, making three in all. He finished his straining and poured the awa into the three cups. When the cups were filled, Hanakahi said, "Wait before drinking your awa until I have called upon my unknown gods." "Where are you?" Answered Kane, "the gods whom you have never seen are the two of us and in the future call us by our names, Kane and Kanaloa. This was the first time that Hanakahi beheld his unknown gods.

After Kane had finished speaking, they drank their awa and then he said again, "Because you have asked to prosper in your fishing, for you are weary in going out to the ocean, therefore we will bless you and there will not be any more weariness. We are going now and shall return in the early morning. "They went as far as Keana-puaa and began to build an enclosure for fish. The walls are there to this day. They looked at the wall that they built and found it unsatisfactory therefore they moved on to ke-pō'o-kala and made another. Finding that, that too, was unsatisfactory they moved to the opposite and built another one which satisfied them. Then they placed fish of every kind in the enclosure that they built and made a fixed law that all fish that entered it were never to go out through the entrance in which they came; nor go over the wall. The laws which they imposed

on the fish remain fixed to this day. This enclosure is the one called Kapakule to this day, and is at Puuloa. In the early morning they returned to Hanakahi's house and told him of the enclosure they built for fish for him, that he and his descendants might be benefited. [*Ka Loea Kalaiaina* July 8, 1899, cited in Sterling and Summers 1978:43]

### 2.1.2.2 Mānana (Pearl City)

#### The Eel Boy of Pilimo‘o

The following is the story of the “Eel Boy of Pilimo‘o,” a pool in Pearl City, Mānana Ahupua‘a:

...This pool had an underground tunnel that led to the sea. For a long time there was no danger to the children that came to swim in the pool until a man-eating shark discovered the tunnel and slipped in and out at will.

One day, a boy went to the pool and disappeared. No trace of him was found. His father was so worried that he went to consult a Makaula or prophet. The makaula asked his gods, who told him that it was the will of the gods to change him into a small eel, so that he could live in the depth of the pool and warn the children of danger.

The father of the boy went to the pool to see if it were so. He sat there for a long time and neither saw nor heard anything. Then the children gathered at the opposite side of the pool from him and began to dive and play.

Suddenly he heard a whistle which sounded so like the whistling of his son when he went home every day after playing. “That sounds very much like my son’s whistling,” he said to himself. He looked around and saw nothing. The whistling was repeated. Then looking toward a ledge under some hau trees, he noticed the head of an eel. Every now and then it whistled. He drew closer to it and spoke to it, “Can it be that you are my son? How did your human body change to an eel?” The boy replied, “Yes I was once a boy, now I am an eel because the gods have willed it, so that I may save human lives from the wicked sharks of the deep that come here. Go and tell those children to go home. Tell them to listen and if they hear whistling that it is a warning that they are in danger.”

The man went as he was told to do. He told them to listen for a shrill whistle every now and then. That was a signal to go away at once.

The eel whistled again so loudly that the children heard him and went away. The father remained to see if a shark would appear. A little while later he saw the dark form of a big shark swim about in the pool.

So it was that ever after, a whistle was a signal of danger.

This is the story of Pilimoo pool [Namau 1940, cited in Sterling and Summers 1978:16-17].

### Pearl City Stone

The “Pearl City Stone” myth tells of a “supernatural” rock that was located at the site of the Pearl City Mormon Church:

When the church was built the stone remained undisturbed until some of the Hawaiians began to talk about it and call the attention of the visitors to this “female” rock. True, it was regarded as a sacred rock by the ancients but no one was worried about it in particular except to stare at it in curiosity and think what it must have meant to their ancestors.

Then some of the “higher ups” in the church heard it. These were Hawaiians who looked upon anything that the ancients revered as detrimental to their own faith when brought in such close contact as this. They insisted that it be thrown out to the road side.

Waiwaiole, a man who lived in the neighborhood and knew the legend of this rock was assigned the work of removing it to the roadside. He put it off from week to week as he hoped that his friends would forget about it, but they did not. They became more insistant until he found some one to help him to carry it out. At first he tried to lift it but it would not move until he talked to it. He told it that it was unwelcome in the church yard and it would be better for it to be by the roadside. After that, the two men had no trouble in moving it.

Some years later the road was widened where the stone stood and it was blasted. Part of it is gone and a part remains to this day.

Waiwaiole, the man who removed it fell sick and gradually grew worse until he was brought to the Queen’s Hospital where he died.

The man who helped him also became sick with a disease that made him look bloated and dark. He became an inmate of the Mino‘aka Home until death took him. Waiwaiole’s beautiful home was burned down with fire. No one knew what caused it. His widow is still at Pearl City and expects to build a new home ere long. [Naumau 1940, cited in Sterling and Summers 1978:17]

### Pōhaku Anae

The following story describes a famous stone in Pearl City associated with the mullet of Pearl Harbor:

I saw the beauty and charm of the broken currents at Moanalua and also heard the tooting of the whistle at the turn of Kauwahipouli. I heard it three and four times and asked the person sitting on my left, “What place is this?” Answer – “This is Pearl City.” It was here that mullets were bred in the ancient times and that flat stone there was called Mullet Rock or Pōhaku Anae. It lies near the beach by Ewa mill. [*Kuokoa*, Oct. 2, 1908, cited in Sterling and Summers 1978:53]

### 2.1.2.3 Waiawa and Waimalu

#### Legend of Maihea

The legend of Maihea tells of a visit by the gods Kāne and Kanaloa, where the gifts of abundant natural resources and spiritual knowledge were given to the people of Waiawa and Waimalu:

Maihea, a man, resided at Waimalu at a place called Punanalo. He cultivated sweet potatoes, taros and planted awa. The place where he planted the awa was on a hill in the upland of Waiawa. This is what he did up to the time when the gods [Kane and Kanaloa] came to earth. He chewed the awa, cooked young taro leaves and strained the awa into coconut shells that had been polished till they shone. With the awa in cups, the taro greens in a dish made of gourd, and sweet potatoes in a shallow calabash, he called on the gods whose names he did not know, "O unknown gods of mine, here is awa, taro greens and sweet potatoes raised by me, Maihea, the great farmer. Grant health to me, to my wife, and to my son. Grant us mana, knowledge and skill. Amama, it is freed." The he drank the awa. He did this a long time without knowing of the gods upon whom he called. This was the result he received without others knowing because of this prayer of his to be granted mana and knowledge. The two gods sent a large fish, a whale, which came up at the sea of Waimalu, below Paakea...As Ula-a-Maihea, the son went down to the beach, he came to where the beach was covered with children and adults. Because he saw the children climb up on the fish, he did likewise, but when he got onto it, it began to move. It had waited for him for about four weeks and when the person it was sent to fetch was on it, it moved out slowly...The children cried out, "Ula-a-Maihea is taken away!" The fish and the burden it bore passed on to Kahiki. There Ula-a-Maihea was trained in priestly lore and all of its arts through the instructions of these gods, Kane and Kanaloa. [*Ka Loea Kalaiaina* July 1, 1899, cited in Sterling and Summers 1978:5].

The legend continues with the gods Kāne and Kanaloa revealing themselves to Maihea:

"...The gods to whom you pray are ourselves and none else." Maihea heard this, was startled at these words, but Kane continued, "We are they upon whom you call and in the future call us by name. I am Kane and this is Kanaloa. Call us by these names after this." This was the beginning of the travels of these gods on earth and this was also the time when the boundaries of Ewa were made as I told you when I mentioned Pohaku-pili. On their return after dividing the land, they came to the top of Haupuu (that is the present site of the Kahikuonalani Church at Waiawa), they turned to look at Ewa and when they saw the fish ponds at Waiawa, they said, "May the fish ponds down at Waiawa be as the stars in the sky above. May there be mullets a Kuhia-loko, fine sea weeds at Kuhia-waho, salt at Ninauele, the single fruited coconut at Hapenui, the taro greens at Mokaalika and the water of Kaaimalu, to remove the bitterness of the awa of Kalahikuola." This was the last thing they did before returning to Maihea's house. They drank awa again that afternoon. They spent the remainder of the day going to Puuloa. The result of this was that Maihea obtained the knowledge of the priesthood, oratory

and so on. This was the first time that these arts were practiced here in Hawaii. [*Ka Loea Kalaiaina* July 1, 1899, cited in Sterling and Summers 1978:5-6].

King Kalākaua relates a story of Naulu-a-Maihea, a well-known prophet who resided in Waimalu:

At that time there lived at Waimalu, in the district of Ewa, the celebrated priest and prophet Naulu-a-Maihea. No one in the Hawaiian priesthood of the past was ever more feared or respected. It was thought by some that he had visited the shadowy realms of *Milu*, and from *Paliuli* had brought back the waters of life. He must have been well on in years, for, as already mentioned, he is credited with having been the priest of Laa-mai-kahiki on the romantic journey of that prince from the southern islands.

In evidence of the great sanctity of Naulu, tradition relates that his canoe was upset during a journey from Waianae, Oahu, to Kauai. He was swallowed by a whale, in whose stomach he remained without inconvenience until the monster crossed the channel and vomited him up alive on the beach at Waialua, Kauai, the precise place of his destination. At another time, when crossing to Hawaii, and beset with adverse winds, two huge black sharks, sent by *Mooalii*, the shark-god of Molokai, towed him to Kohala so swiftly that the sea-birds could scarcely keep him company.

He built a *heiau* at Waimalu, the foundations of which may still be traced, and in the inner temple of the enclosure it is asserted that *Lono* conversed with him freely; and at his bidding the spirits of the living (*kahaoka*) as well as the shades of the dead (*unihipili*) made their appearance; for it was believed by the ancient Hawaiians that the spirits or souls of the living sometimes separated themselves from the body during slumber or while in a condition of trance, and became visible in distant places to priests of especial sanctity. [Kalākaua 1990:169-170]

#### 2.1.2.4 Waiau

##### Kalua‘o‘opu and Honokawailani

Two *mo‘olelo* (stories) describing noted springs located within Waiau Ahupua‘a are recounted by Sarah Keli‘ilolena Nākoa in the book “Lei Momi o ‘Ewa”. The first *mo‘olelo*, “Ke Ki‘owai ‘o Honokawailani”, relates the story of a beautiful girl with legs that turn into a fish tail, who was associated with the *ki‘owai* (fresh water pond) of Honokawailani. The pond was described as located *mauka* (upland) of the modern Hawaiian Electric Company power plant. It was fed by a fresh spring beneath the earth. Nākoa recounts that sometimes, when the sea water rose, the pond would overflow and create a tiny stream (*muliwai li‘i li‘i*). Honokawailani was noted for its lush plant growth and waterlilies.

The second *mo‘olelo*, “Kalua‘o‘opu”, recounts the escape of two ‘o‘opu fish from the nets of two men, who then track their trail to the pond Kalua‘o‘opu. In later times this pond was covered up by houses. Despite the houses, however, the story describes how the water would still well up from the earth and flow underground to the nearby pond of Honokawailani.

### Kaluaolohe Plain

The following account describes a legendary dog that would warn travelers along the plain of Kaluaolohe, in Waiau:

There was a pit where the hairless dog, seen in the olden days, lived. The name of the dog was Ku-ilio-loa and he was hairless. He often met with those who went on the [Kaluaolohe] plain at night and he changed his colors from black to brown, to white or to brindle. He showed himself when something was going to happen, such as the death of a ruling chief or other things pertaining to the government such as disagreements and so on. Here on this very plain the writer met with one of the forms of this dog mentioned above, but the dog's appearance did not denote that there was trouble for the person going on his way. This plain is in Waiau.

It is said in the story of Kualii that Waiau was his birthplace. His father belonged to Koolau, to Kua-loa and his mother to Waiau. That might be so. This was said to be a land of chiefs in the olden days and so Ku-ilio-loa was of the royal lineage of Waiau. [Ka Loea Kalaiaina July 29, 1899, cited in Sterling and Summers 1978:15]

#### 2.1.2.5 Kalauao

### Kahuawai Pond

The following account describes Kahuawai, a pond in Kalauao that was used as a bathing place by chiefs in ancient times:

Kahuawai was a noted bathing place since ancient times and was guarded so that any one did not bathe in it except the chiefs. Later it was used by all. Kakuhihewa's daughters and the hero Kalelealuaka (their husband) bathed in this pool. Kaeokulani, the chief of Kauai also bathed here when he came to war here on Oahu. He was killed at Kukiiahu. Many visitors from Hawai'i to Kauai that came to see this pool and it was well known to Ewa's inhabitants. [*Ke Au Hou*, December 21, 1910, cited in Sterling and Summers 1978:13]

### Opelemoemoe, the Heavy Sleeper of Kalauao

The following is the story of Opelemoemoe, a resident of Kalauao who would fall into a deep sleep for long periods of time:

Opelemoemoe made his home at Kahuoi in Kalauao. He had the strange power of being able to sleep days and months on end only being awakened by thunder.

One day he left Kalauao and went to Puu Kapolei where he fell asleep. Two men from Kauai looking for a human sacrifice found him and took him to Pokai in Waianae where their canoes were moored and from there to Kauai. There he was placed on the altar as a sacrifice and left. Eventually a thunder storm woke him. He then married and settled on Kauai for some time. Finally he decided to return to his home in Kalauao. Before leaving he gave his spear to his wife and said that if she bore a son to name him Kalelealuaka.

The son grew up as a mischievous boy. His mother at last told him who his father was and he came to Kalauao where they were reunited. [Fornander Vol V, Part 1:168, cited in Sterling and Summers 1978:14]

#### 2.1.2.6 'Aiea

In ancient times, Keaiwa Heiau was the site of a medicinal herb garden and training area for traditional healers:

At the time the Keaiwa heiau at the top of Aiea Heights was discovered in 1951 to be the ruins of an ancient medical center, few Hawaiians knew of its ancient usage.

Eminent anthropologists acknowledged that they had never heard of such centers but were convinced when several Hawaiians independently told of them.

In telling of these centers, Mrs. Mary Kawena Pukui, associate in Hawaiian culture at the Bishop Museum, translated the name Ke-a-iwa as "Incomprehensible."

The thought being that no one could explain the powers of the priests or the herbs used in healing.

She said Ke-a-iwa came from an obsolete word aiwa-iwa which means the mysterious or the incomprehensible.

Further confirmation of the use of Ke-a-iwa has lately been given me by Paul Keliikoa, a Hawaiian living in Aiea.

Mr. Keliikoa has the story from his grandmother Kamoekai.

In her day Ke-a-iwa was interpreted as "a period of fasting and meditation" and the heiau was so named because novitiates in the art of healing spent long hours in fasting, praying and meditation.

Kamoekai also told her grandson that the very young were taken to Ke-a-iwa to be trained as kahuna lapaau. There they were taught the prayers needed to compound medicines and heal the sick.

They cared for the great herb garden which lay beyond the heiau walls.

After the novice learned his first steps in the art of the kahuna lapaau, he was sent out to other medical centers to learn the advanced art of diagnosis and other treatments.

Mr. Keliikoa's interpretation of the name means a change in the pronunciation. Not Ke-a-iwa, but Ke-ai-wa.

Ke-ai is the Hawaiian word for fasting. [*Saturday Star Bulletin* Feb. 28, 1959, cited in Sterling and Summers 1978:11-12]

### 2.1.2.7 Hālawa

#### Leilono and the Wandering Spirits

Leilono, located on Red Hill in Hālawa, was said to be a place where wandering spirits would enter the “eternal night”:

It was a place said to be the opening, on the island of Oahu, for mankind to enter eternal night.

This place is on the northern side of the famous hill of Kapukaki (now Red Hill), at the boundary of Kona and Ewa, right in line with the burial hill of Aliamanu, on the upper side of the old road. It is said that this place is round, about two feet or more in circumference. This is the hole through which the hosts of people slipped through to go down and this was the strata of Papa-ia-Laka. Through this opening appeared the supernatural branches of the breadfruit of Leiwalo. If a ghost who lacked an aumakua to save him climbed on a branch of the western side of the breadfruit tree, the branch withered at once and broke off, thus plunging the ghost down to the pit of darkness. The boundaries of this place, so the ancients said, were these: Papa-kolea which was guarded by a plover; Koleana whose guard was a big caterpillar and Napeha, the western boundary which was guarded by a lizard. [*Kuokoa* Aug. 11, 1899, cited in Sterling and Summers 1978:9]

## 2.2 Historical Background

### 2.2.1 ‘Ewa as a Political Center

There are many documented references that chiefs resided in ‘Ewa and that it was a political center in the past. Oral accounts of chiefs and chiefesses recorded by noted Hawaiian historian Samuel Kamakau date back to at least the 12<sup>th</sup> century. He tells us that:

The chiefs of Līhu‘e, Wahiawā, and Halemano on O‘ahu were called *lō ali‘i*. Because the chiefs at these places lived there continually and guarded their *kapu*, they were called *lō ali‘i* [from whom a “guaranteed” chief might be obtained, *loa‘a*]. They were like gods, unseen, resembling men. [Kamakau 1991:40]

Circa A.D. 1320, ‘Ewa, Kona, and Ko‘olaupoko were the dominant political districts of O‘ahu, ruled by the sons of a chief named Māweke (Cordy 2002:21). ‘Ewa at this time included the traditional districts of ‘Ewa, Wai‘anae, and Waialua (Fornander 1996:48). Around A.D. 1400, the entire island was ruled by King La‘akona. Chiefs within his line, the Māweke-Kumuhonua line, reigned until about A.D. 1520-1540, with their major royal center in Līhu‘e, in ‘Ewa. (Cordy 2002:24). Haka was the last chief of the Māweke-Kumuhonua line. He was slain by his men at the fortress of Waewae near Līhu‘e (Kamakau 1991:54; Fornander 1996:88). Power shifted between the chiefs of different districts from the 1500s until the early 1700s, when Kūali‘i achieved control of all of O‘ahu by defeating the Kona chiefs, then the ‘Ewa chiefs, and then expanding his control on windward Kaua‘i. Peleiholani, the heir of Kūali‘i, gained control of O‘ahu ca. 1740, and later conquered parts of Moloka‘i. He was ruler of O‘ahu until his death circa 1778, when Kahahana, of the ‘Ewa line of chiefs, was selected as the ruler of O‘ahu (Cordy 2002:24-41).

A 14<sup>th</sup> century account speaks of the reign of Mā'ilikūkahī, an *ali'i kapu* who was born at Kūkaniloko in Wahiawā around the 14<sup>th</sup> century A.D. (Pukui et al. 1974:113). Upon consenting to become *mō'i* (king) at the age of 29, he was taken to Kapukapuākea Heiau (temple) at Pa'ala'akai in Waialua to be consecrated. Soon after becoming king, Mā'ilikūkahī was taken by the chiefs to live at Waikīkī. The story tells us that he was probably one of the first chiefs to live there. Up until this time the chiefs had always lived at Waialua and 'Ewa. Under his reign, the land divisions were reorganized and redefined.

In reference to the productivity of the land and the population during Mā'ilikūkahī's reign, Kamakau writes:

In the time of Mā'ili-kūkahī, the land was full of people. From the brow, *lae*, of Kulihemo to the brow of Maunauna in 'Ewa, from the brow of Maunauna to the brow of Pu'ukea [Pu'u Ku'ua] the land was full of chiefs and people. From Kānewai to Halemano in Wai'alua, from Halemano to Paupali, from Paupali to Hālawa in 'Ewa the land was filled with chiefs and people. [Kamakau 1991:55]

The picture presented here is that the whole *moku* (district) of 'Ewa was one of prosperity and productivity and the land was heavily populated. 'Ewa continued to be a political center until the 18<sup>th</sup> century when Kahahana, a Maui chief, was chosen by the O'ahu chiefs to rule over the whole island. Kahahana was killed by Kahekili of Maui. Kahahana's father, 'Elani, along with other O'ahu chiefs, plotted to kill Kahekili and his chiefs who were residing at Kailua, O'ahu, as well as his chiefs residing at 'Ewa and Waialua. The plot was discovered by Kahekili and a messenger was sent to warn Hū'eu at Waialua. For some reason, the messenger never reached Hū'eu and he and his retinue were killed. This slaughter became known as the *Waipi'o Kīmopō* or the Waipi'o assassination because it originated there. Kahekili avenged the death of Hū'eu by pillaging and destroying the districts of Kona and 'Ewa. It is said that the streams of Makaho and Niuhelewai in Kona, as well as Hō'ae'ae in 'Ewa were choked with the bodies of the slain. It was during this time that the O'ahu chiefly lines were nearly exterminated. It is said that one of the Maui chiefs, Kalaikoa, used the bones of the slain to build a wall around his house at Lapakea in Moanalua. The house was known as Kauwalua and could be seen as one passed by the "old upper road to 'Ewa" (Fornander 1996:290).

Even though Waikīkī was a favorite playground for the chiefs of Kona, as with 'Ewa chiefs, there were no deep harbors where large ships could enter port. With the introduction of trade and foreign goods, along with Kamehameha's unification of the islands, attention shifted to Kou (old name for Honolulu, used until about 1800) (Pukui et al. 1974:117), which had a deep enough harbor for ships to pull in and anchor. Kou became the center of activity as royalty moved away from the outer districts toward the center of commerce. The general populace also moved away from the rural areas, as they too became dependent on a cash economy. Archibald Campbell writes about O'ahu in 1809:

Although only of secondary size, it [O'ahu] has become the most important island in the group, both on account of its superior fertility, and because it possesses the only secure harbour to be met with in the Sandwich Islands.

In consequence of this, and of the facility with which fresh provisions can be procured, almost every vessel that navigates the North Pacific puts in here to refit.

This is probably the principal reason why the king has chosen it as his place of residence. [Campbell 1967:109-110]

‘Ewa is depicted as an abundant and populated land where chiefs of distinguished lineages were born and resided. The land was fertile and well fed by mountain streams that helped sustain the agricultural lifestyle needed to support the chiefs, their households and their people. An examination of place names reveals that water was a very important factor in this district. Six of the twelve *ahupua‘a* names begin with *wai*, the Hawaiian word for water: Waikele; Waipi‘o; Waiawa; Waimano; Waiiau; and Waimalu. The fact that there were so many fishponds in the ‘Ewa District and in the Pu‘uloa area, more than any other district on O‘ahu, indicates that agricultural/aquacultural intensification was a direct link to the chiefs who resided there, and also to the increasing needs of the population.

### 2.2.1.1 The Battle of ‘Ewa

The rich resources of the Pu‘uloa (Pearl Harbor), the shoreline fishponds, the numerous springs, and the fertile lands along the streams made central ‘Ewa a prize for competing chiefs. Battles were fought for and on ‘Ewa lands, sometimes from competing O‘ahu chiefs, and sometimes by invading chiefs from other islands. Kamakau gives the following account of a battle fought near Kalauao and ‘Aiea:

...A battle was fought on the plains of Pu‘unahawe in which some foreigners were killed by Mare Amara. Natives also fell, and Kalanikūpule was forced to retreat. Some six days later another battle was fought in which Ka‘eo was again victorious. This gain he followed up by approaching further upon ‘Ewa, hoping to push on to Waikiki which was at that time the center of government. On December 12, 1794, a great battle was fought on the ground of Kalanimanua between Kalauao and ‘Aiea in ‘Ewa. The heights of Kuamo‘o, Kalauao, and ‘Aiea were held by the right wing of Kalanikūpule’s forces commanded by a warrior named Koa-lau-kani; the shore line of Malie [was held] by the left wing under the command of Ka-mohomoho, Kalanikūpule himself with the main army held the middle ground between ‘Aiea and the taro patches; Captain Brown’s men were in boats guarding the shoreline. Thus surrounded, Ka‘eo found his men fighting at close quarters and cut off by Koa-lau-kani between Kalauao and Kuamo‘o, he was hemmed in on all sides and compelled to meet the onset, which moved like the ebb and flow of the tide. Shots from guns and cannon, thrusts of the sword and spear fell upon his helpers. Ka‘eo with six of his men escaped into a ravine below ‘Aiea and might have disappeared there had not the red of his feather cloak been seen from the boats at sea and there shots drawn the attention of those on land. Hemmed in from above, he was killed fighting bravely. His wives were killed with him, and his chiefs and warriors. This war called Kuki‘iahu, was fought from November 16 to December 12, 1794 at Kalauao in ‘Ewa. [Kamakau 1992:169]

### 2.2.2 Observations of Early Explorers and Foreign Residents

During the first decades of the 19<sup>th</sup> century, several western visitors described the ‘Ewa landscape near Pearl Harbor. Archibald Campbell, an English sailor, spent some time in Hawai‘i from 1809-1810. He had endured a shipwreck off the Island of Sannack on the northwest coast

of America, whereby both his feet were frostbitten and had to be amputated, and spent over a year recuperating in the Hawaiian Islands. His narrative is considered noteworthy because it describes life before the missionaries arrived. During part of his stay, he resided with King Kamehameha I, who granted him 60 acres in Waimano Ahupua'a in 1809:

In the month of November the king was pleased to grant me about sixty acres of land, situated upon the Wymummee [traditional Hawaiian name for Pearl River], or Pearl-water, an inlet of the sea about twelve miles to the west of Hanaroora [Honolulu]. I immediately removed thither; and it being Macaheite time [Makahiki], during which canoes are tabooed, I was carried on men's shoulders. We passed by footpaths winding through an extensive and fertile plain, the whole of which is in the highest state of cultivation. Every stream was carefully embanked, to supply water for taro beds. Where there was no water, the land was under crops of yams and sweet potatoes. The roads and numerous houses are shaded by cocoa-nut trees, and the sides of the mountains are covered with wood to a great height. We halted two or three times, and were treated by the natives with the utmost hospitality. My farm, called Wymannoo [Waimano], was upon the east side of the river, four or five miles from its mouth. Fifteen people with their families resided upon it, who cultivated the ground as my servants. There were three houses upon the property; but I found it most agreeable to live with one of my neighbours, and get what I wanted from my own land. This person's name was William Stevenson a native of Borrowstouness. [Campbell 1967:103-104]

Of the Pearl River area, Campbell wrote:

Wymumme, or Pearl River, lies about seven miles farther to the westward. This inlet extends ten or twelve miles up the country. The entrance is not more than a quarter of a mile wide, and is only navigable for small craft; the depth of water on the bar, at the highest tides, not exceeding seven feet; farther up it is nearly two miles across. There is an isle in it, belonging to Manina [Paul Marin], the king's interpreter, in which he keeps a numerous flock of sheep and goats.

Pearls and mother-of-pearl shells are found here in considerable quantity. Since the king has learned of their value, he has kept the fishing to himself, and employs divers for the purpose...

The flat land along shore is highly cultivated; taro root, yams, and sweet potatoes, are the most common crops; but taro forms the chief object of their husbandry, being the principal article of food amongst every class of inhabitants. [Campbell 1967:114-115]

The botanist F. J. F. Meyen, visiting in 1831, also confirms the abundant vegetation described by Campbell in the vicinity of Pearl Harbor:

At the mouth of the Pearl River the ground has such a slight elevation, that at high tide the ocean encroaches far into the river, helping to form small lakes which are so deep, that the long boats from the ocean can penetrate far upstream. All around these water basins the land is extraordinarily low but also exceedingly fertile and nowhere else on the whole island of Oahu are such large and continuous stretches

of land cultivated. The taro fields, the banana plantations, the plantations of sugar cane are immeasurable. [Meyen 1981:63]

Gilbert Mathison, an early visitor to the Pearl Harbor area, described the landscape as it was circa 1821:

...The sea here forms a small bay, which has the appearance of a salt-water lake, being landlocked on every side except at the narrow entrance. Two or three small streams, too insignificant to merit the appellation of rivers discharge their united waters into the bay, which is full six miles in length and two in breadth. The adjoining low country is overflowed both naturally and by artificial means, and is well stocked with tarrow-plantations, bananas, &c. The land belongs to many different proprietors; and on every estate there is a fishpond surrounded by a stone wall, where the fish are strictly preserved for the use of their rightful owners, or tabooed, as the native express it. One of particularly large dimensions belongs to the King. [Mathison 1825:416-417]

### 2.2.3 Missionary Stations and the Population Census

The first company of Protestant missionaries from America, part of the American Board of Commissioners of Foreign Missions (ABCFM), arrived in Honolulu in 1820. They quickly established churches in Kona, Hawai'i, Waimea, Kauai, and Honolulu, O'ahu. Although the missionaries were based in Honolulu, they traveled around the islands intermittently to preach to the rural Hawaiian population and to check on the progress of English and Bible instruction schools set up by local converts.

In 1828, the missionary Levi Chamberlain (1956:39-40) made a circuit of O'ahu Island, stopping wherever there was a large enough population to warrant a sermon or to visit a school. In his trek through the 'Ewa District, coming from Wai'anae, Chamberlain first stopped at Waimanalo 'Ili in Honouliuli, on the western border of 'Ewa. The next day, Chamberlain and his companions set out toward the east, reaching Waikele, which had two schools. Chamberlain decided to stay in Waikele until the next day, the Sabbath, where he preached to a group of 150 to 200 Hawaiians who lived there. The next day, Chamberlain set out for the villages of Waipi'o, which had one school, and Waiawa, which had two schools. Chamberlain's final stop in the 'Ewa District was at Kalauao. The account does not provide much information on the surroundings, but does indicate the relatively populated areas of the 'Ewa District, including western Honouliuli, Waikele, Waipi'o, Waiawa, and Kalauao.

Protestant missionaries later established smaller churches in outlying areas, which were sometimes presided over by a foreign missionary or led by a Hawaiian convert, with periodical visits by a pastor from one of the main churches. The first mission in 'Ewa was established in 1834 at Waiawa, near Pearl Harbor (see Figure 9). Two missionaries, Lowell and Abigail Smith, were assigned to the station, and were in charge of building a church and a house for themselves near the church (Hawaiian Mission Children's Society 1969:3-9). The *ali'i*, Kīna'u, daughter of Kamehameha I and an early Christian convert, offered the missionaries to "settle upon her land" and "do anything to promote our happiness" (letter from Lowell Smith, June 24th, 1833, cited in Frear 1934:69). Citing his wife's poor health, the Smiths went to Molokai instead. However, at the general meeting of the ABCFM in June and July of 1834, the board decided that the Smith's

should be transferred to 'Ewa, to a place three miles from the king's favorite country seat (Frear 1934:93).

Because of her poor health, Abigail Smith stayed in Honolulu as her husband began to build their new home. In November of 1854, Lowell Smith brought his wife to their new home:

November 15th, 1834...This morning at half past twelve o'clock Abba and myself left the mission families at Honolulu and took up our anchor—and on a double canoe we came to this place, Waiawa, in four hours...She finds the climate, the water, taro, etc. to agree with her much better than at Honolulu...Nov. 25<sup>th</sup>...We have been favored with considerable many presents since her arrival viz: some seven or eight fowls, four turkeys, one hog, fish, oysters, potatoes, taro, cabbage, wood, etc. [letters of Lowell Smith, cited in Frear 1934:95-96]

The Smith's congregation was spread out over an area of 20 miles, and Lowell Smith traveled to different areas to preach to crowds usually several hundred strong. He also established two schools, one for boys and one for girls, and treated the sick, including inoculating his parishioners against smallpox. In 1836, Abigail's health deteriorated, and the mission decided that the two should live in Honolulu instead. To carry on the work at the mission, the Rev. Artemas Bishop and his family were transferred to 'Ewa. Sereno Bishop, the son of Artemas Bishop, remembered the move:

Our predecessors at Ewa were Rev. and Mrs. Lowell Smith, specially capable and devoted missionaries who had been only two years in the field. Mr. Smith had built a comfortable house of adobe bricks, thatched with grass and well plastered inside and out. He had also erected the adobe walls of a church, capable of holding an audience of about one thousand people. I think the roof also was on...The adobe walls fifteen feet high were covered by a steeply pitched roof, which extended out in a verandah on all four sides, in order to protect the base of the mud walls from being destroyed by raindrip. The timbers of the roof were long beams dragged from the mountains entirely by human strength, the labor being secured by volunteering, under the leadership of the chiefs.

The mission house was located on the west bank of the Waiawa creek, about one-fourth mile northwest of the present railway station at Pearl City. There was nearly an acre of ground enclosed in an adobe wall. Some distance seaward was a glebe of a couple of acres of taro swamp, a little below where the railway bridge now crosses the creek. A small cattle pen was enclosed about twenty rods north. An old wall of the natives separated the upland from the planted lands and kept out the pigs and afterward the cattle. Copious springs of most delicious water abounded throughout the district of Ewa, a small one being in our own grounds. [Bishop 1916:41-42]

In 1837, a new 'Ewa Church was completed (Frear 1934:137) (see Figure 9). It was described as:

An elegant church building, ninety feet long, forty two feet wide with a veranda all around it,—plastered inside and out, a good pulpit, etc., etc. The house will

contain from ten to twelve hundred people. [letter from Lowell Smith Feb. 4th, 1857, cited in Frear 1934:115]

One of the main contributions of the missionaries was their establishment of a census of the population. The reports left by Artemus Bishop of the Ewa Protestant Station in Waiawa sheds light on the massive impact disease was having on the Hawaiian people in the 'Ewa district. The 1831-32 census of O'ahu recorded a population of 4,015 within the 'Ewa district. Four years later, in 1836, the 'Ewa population had dropped to 3,423 (Schmitt 1973:9, 36):

The people of Ewa are a dying people. I have not been able to obtain an exact count of all the deaths & births since the last general meeting. But my impression is that there have been as many as 8 or 10 deaths to one birth. I have heard of but 4 births on Waiawa during the year, & all of these children are dead. I have attended about 20 funerals on that one land, & 16 of these were adults. [Rev. L. Smith, Ewa Station Report, 1835:8-9]

Population stabilized in the 1830s and early 1840s, but saw a sharp decline in the late 1840s, due in-part to a measles epidemic in October of 1849. The pastor of the 'Ewa church noted that some of the depopulation was due to emigration, mainly to Honolulu. Between 1848 and 1853, there was a series of epidemics of measles, influenza, and whooping cough, including the smallpox epidemic of 1853-1854, that often wiped out whole villages:

The people of the district are rapidly diminishing, and whole neighborhoods where in former years were numerous families and cultivated lands, there are now no inhabitants, and the land is left to run to waste. The fathers have died off, and the children wander into other parts, and there are none to fill their places. [Bishop, Ewa Station Report 1860:1]

The combined population of 'Ewa and Wai'anae was 2,451 people in 1853, and 1,671 people in 1872 (Schmitt 1968:71). The consequences of the population decline were far reaching, one of which was the large displacement of people from traditionally settled lands. Despite the population decline, the lands surrounding Pearl Harbor continued to be a population center of O'ahu in the mid-1800s (Figure 10).

#### **2.2.4 Pre-Contact and Early Post-Contact Agriculture**

Numerous fishponds were constructed along the shores of Pearl Harbor, as described in the preceding sections and shown on Figure 9. Although not necessarily representing beneficial resources for the commoners, fishponds can be seen as evidence for a thriving chiefly class in the *ahupua'a*, that must have been supported by a sizable population. Apple and Kikuchi (1975:2) discuss the impact that such fishponds had on the general population of an area:

Accessibility to these ponds and their products was limited to the elite minority of the native population - the chiefs and priests. Prehistoric ponds and pond products appear to have been taboo to the vast majority of Hawaiians and to have yielded them no direct benefit. However, indirect public benefit came from ownership by the chiefs of exclusive food sources. Royal fishponds...insured less demand on the commoners' food production resources. Every fish taken from a royal fishpond left its counterpart in the natural habitat available to lesser chiefs and commoners.

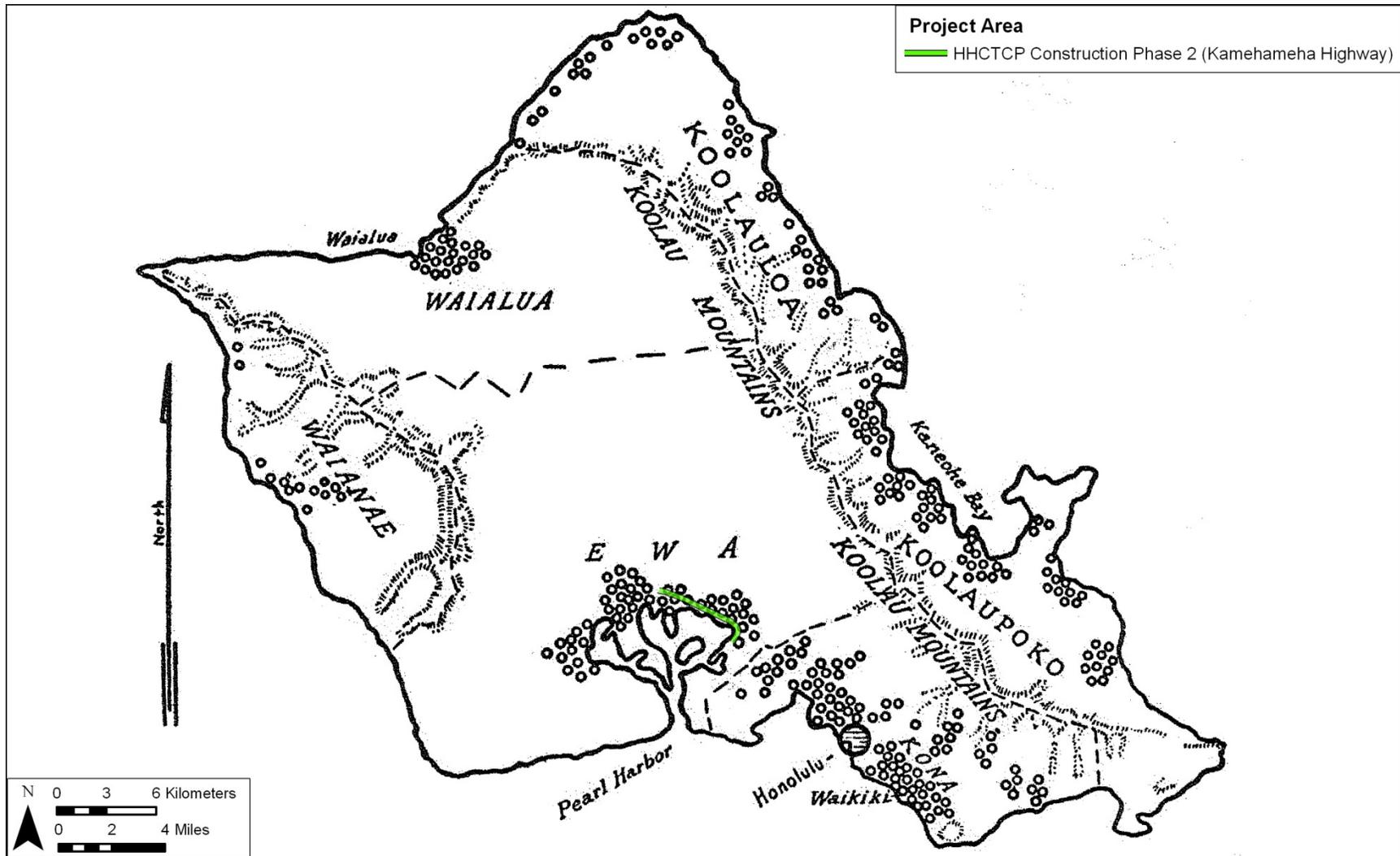


Figure 10. Map of O'ahu, showing population estimates in 1853 (source: Coulter 1931:18). Each symbol represents approximately 50 individuals

The low-lying and well-watered coastal areas of the *ahupua'a* of 'Ewa were prime locales traditional agricultural activities, as well as post-contact cultivation. Irrigation systems from the streams and freshwater springs of the area enabled the coastal flats to become highly productive. In the early 1940s, Handy (1940) made a survey of existing and remnant agricultural areas of the Hawaiian Islands. The following description of the Pearl Harbor area was given:

The neighborhood of the Pearl River is very extensive, rising backwards with a gentle slope toward the woods, but is without cultivation, except around the outskirts to about a half mile from the water. The country is divided into separate farms or allotments belonging to the chiefs, and enclosed with walls from 4 to 6 feet high, made of a mixture of mud and stone. [Handy 1940:81, cited in Sterling and Summers 1978:10]

At the Waiawa/Mānana floodplain, it was noted that “there were a few terraces seaward, irrigated by Waiawa Stream” (Handy 1940:81, cited in Sterling and Summers 1978:16). In Waimano, it was noted that “Waimano Stream irrigated small terrace areas east of what is now called Pearl City” (Handy 1940:81, cited in Sterling and Summers 1978:16). An 1887 map of the *makai* (seaward) portions of Waiawa, Mānana, and Waimano (Figure 11) shows the extensive areas of cultivation along Waiawa Stream. The cultivated areas are generally located *makai* of the study area, with the exception of a cluster of cultivation immediately west of the western end of the study area (at the site of the Pearl Highlands Station, HHCTCP Construction Phase I project area).

Waiiau Ahupua'a was noted to have been named after Waiiau Spring and pond, located in the coastal portion of the *ahupua'a*, “south and west of which are small terrace areas now mostly planted in truck” (Handy 1940:81, cited in Sterling and Summers 1978:15). An 1887 map of the *makai* portions of Waimano and Waiiau (Figure 12) shows the cultivated areas of the *ahupua'a*. In Waimano, cultivation was generally centered along Waiiau Stream, *makai* of the Phase II study area. In Waiiau, an intensive area of cultivation was located in the vicinity of Waiiau Spring and pond, covering an area both *mauka* (inland) and *makai* of the study area.

The lowland portion of Waimalu Ahupua'a was described as:

The extensive flats between East Loch of Pearl Harbor and the present highway were formerly developed in terraces irrigated from Waimalu Stream and Waipi spring, which is east of Waiiau Pond. There are banana groves here now. Terraces also covered the flats extending three quarters of a mile above the highway into Waimalu Valley, and there were small terrace areas several miles upstream beyond these flats. [Handy 1940:81, cited in Sterling and Summers 1978:14]

An 1874 map of the *makai* portion of Waimalu (Figure 13) shows Phase 2 study area traversing the cultivated lands located along Waimalu Stream.

The cultivated areas of Kalauao Ahupua'a were described as follows:

The lowlands seaward of the highway and for a short distance inland, now mostly under cane with a few banana groves, were all formerly terraces irrigated from Kalauao stream. Kalauao Gulch was too narrow to have terraces inland. [Handy 1940:81, cited in Sterling and Summers 1978:12]



Figure 11. 1887 Map Showing Ahupuaas of Waiawa, Manana, and a part of Waimano, Ewa, Oahu, by Rev. Artimas Bishop (Hawai'i Land Survey Division, Registered Map No. 1258), showing the cultivated lands of the *makai* (seaward) portions of the *ahupua'a*, in relation to the Phase 2 project area

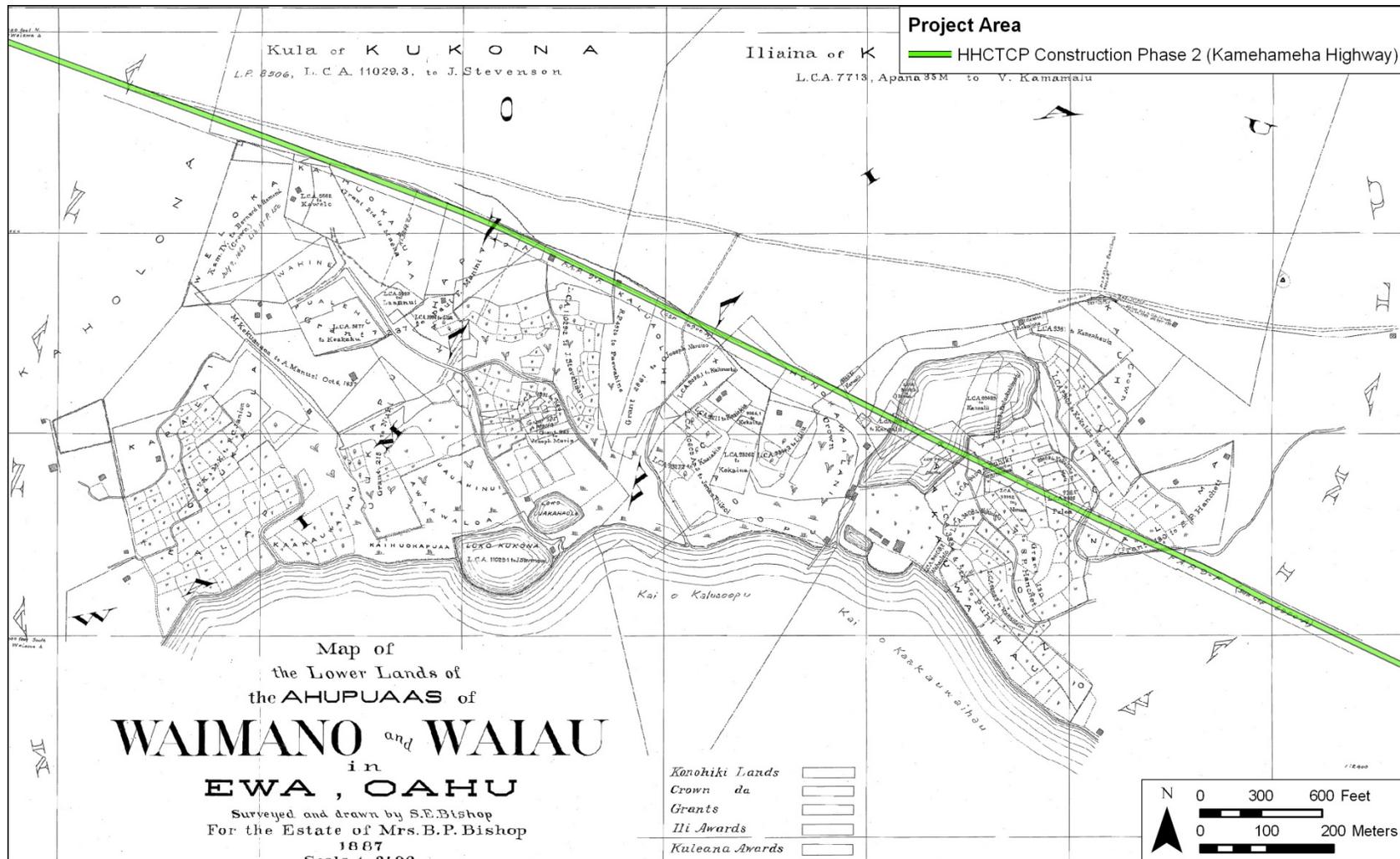


Figure 12. 1887 Map of the Lower Lands of the Ahupuaas of Waimano and Waiau, Ewa, Oahu, S.E. Bishop Surveyor (Hawai'i Land Survey Division, Registered Map No. 1147), showing the cultivated lands of the *makai* (seaward) portions of the *ahupua'a*, in relation to the Phase 2 project area

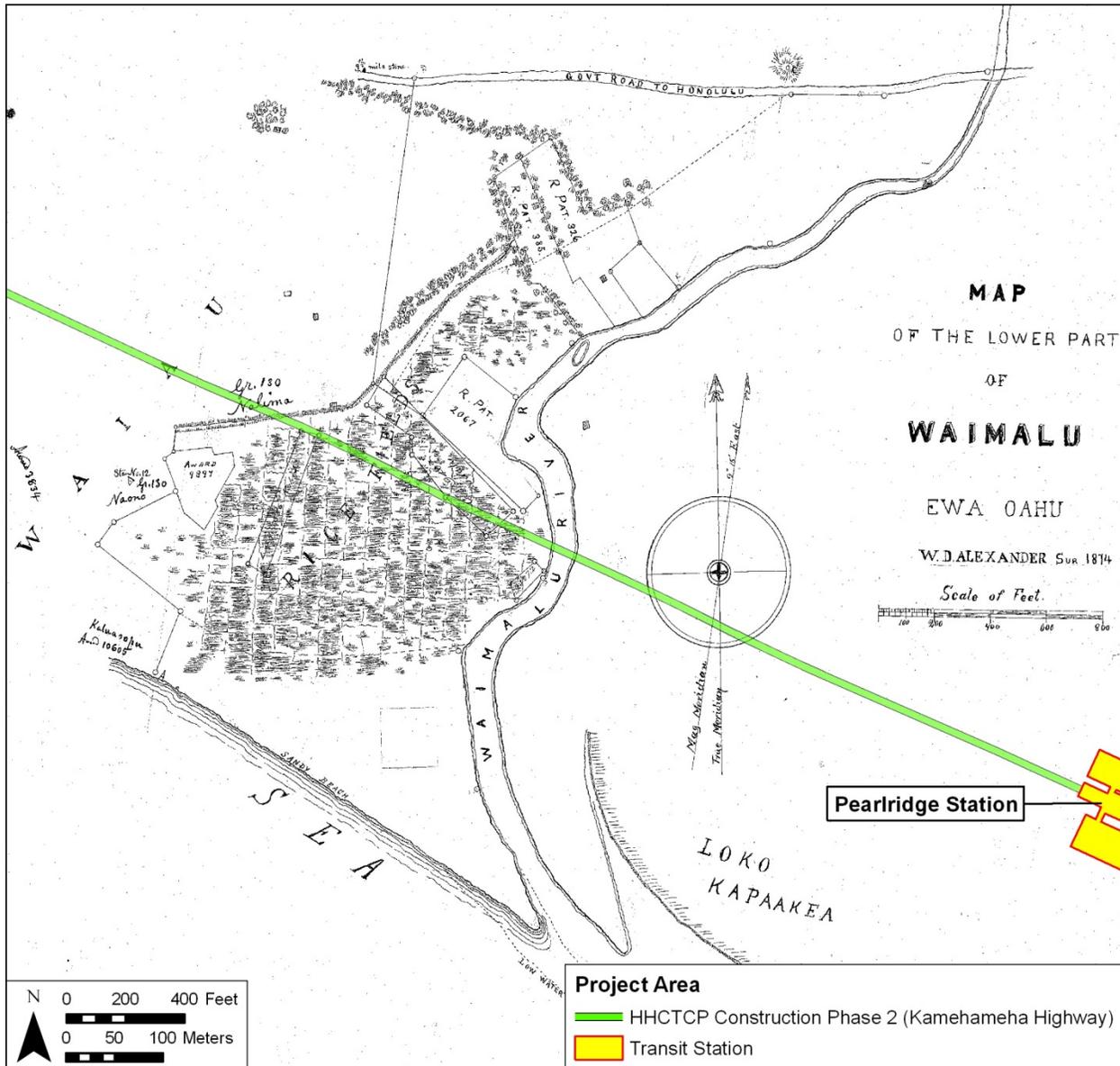


Figure 13. 1874 Map of the Lower Part of Waimalu, Ewa, Oahu, W.D. Alexander Surveyor (Hawai'i Land Survey Division, Registered Map No. 131), showing the cultivated lands of the *makai* (seaward) portion of the *ahupua'a*, in relation to the Phase 2 project area

The Phase 2 project area traverses the area of intensive agriculture in Kalauao, with cultivated areas extending both *mauka* and *makai* of the current study area (see Figure 9).

The agricultural area of 'Aiea Ahupua'a was described as "the small area of low flatland covered by plantation camp, railroad, etc. below the old highway was formerly in terraces" (Handy 1940:81, cited in Sterling and Summers 1978:10). A 1921 map of the *makai* portion of 'Aiea (Figure 14) shows the area of intensive cultivation, centered on 'Aiea Stream, the *makai* portion of which is traversed by the Phase 2 project area.

The cultivated lands of Hālawa Ahupua'a were described as:

The broad flatlands extending 1.5 miles below the highway along Halawa Stream are now under cane but were formerly terraces. The terraces also extended up the flats along the lower courses of Kamananui and Kamanaiiki streams which join to form Halawa, and I am told that there were small terraces farther up both streams. Four and five miles inland, dry taro was planted on the banks of gulches. [Handy 1940:80, cited in Sterling and Summers 1978:9]

The Phase 2 project area (here incorporating the western portion of Phase 3) terminates before crossing Hālawa Stream. The area of intensive cultivation in Hālawa, along Hālawa Stream, is generally located *mauka* of Phase 2 project area (see Figure 9).

### 2.2.5 Mid-1800s and the Māhele

In 1845, the Board of Commissioners to Quiet Land Titles, also called the Land Commission, was established "for the investigation and final ascertainment or rejection of all claims of private individuals, whether natives or foreigners, to any landed property" (Chinen 1958:8). This led to the Māhele, the division of lands between the king of Hawai'i, the *ali'i* (chiefs), and the common people, which introduced the concept of private property into the Hawaiian society. Kamehameha III divided the land into four categories: certain lands to be reserved for the king and the royal house were known as Crown Lands; lands set aside to generate revenue for the government were known as Government Lands; lands claimed by *ali'i* and their *konohiki* (supervisors) were called Konohiki Lands; and habitation and agricultural plots claimed by the common people were called *kuleana* (Chinen 1958:8-15).

In 1848, the crown and the *ali'i* received their land titles, known as Land Commission Awards (LCA). Members of the royal family were awarded entire *ahupua'a*, while high-ranking *ali'i* were awarded entire *'ili* (land section within an *ahupua'a*), and lesser *konohiki* were awarded half of an *'ili* (Kame'elehiwa 1992:269, 279). Title to an *ahupua'a* or *'ili* typically included ownership of the area's fishpond and offshore fishing rights (Devaney et al. 1982:143).

During the Māhele, much of the lands in the *ahupua'a* of 'Ewa, as in other districts, were awarded to *Ali'i Nui* (high chiefs), who were either the grandchildren or great-grandchildren of Kamehameha I. The *ahupua'a* of Waiawa, Mānana, Waimano, and Waiiau, were awarded to Princess Victoria Kamāmalu (granddaughter of Kamehameha I and sister of Kamehameha IV and V) as part of LCA 7713. Waimalu Ahupua'a was awarded to Mikahela Kekau'ōnohi (granddaughter of Kamehameha I) as part of LCA 11216. Half of the *ahupua'a* of Kalauao was awarded to Laura Konia (either granddaughter or grandniece of Kamehameha I) as part of LCA 5524. The other half of Kalauao Ahupua'a was awarded to John Meek, an important merchant in the sandalwood trade, as part of LCA 591. Hālawa Ahupua'a was awarded to Mataio Kekuanao

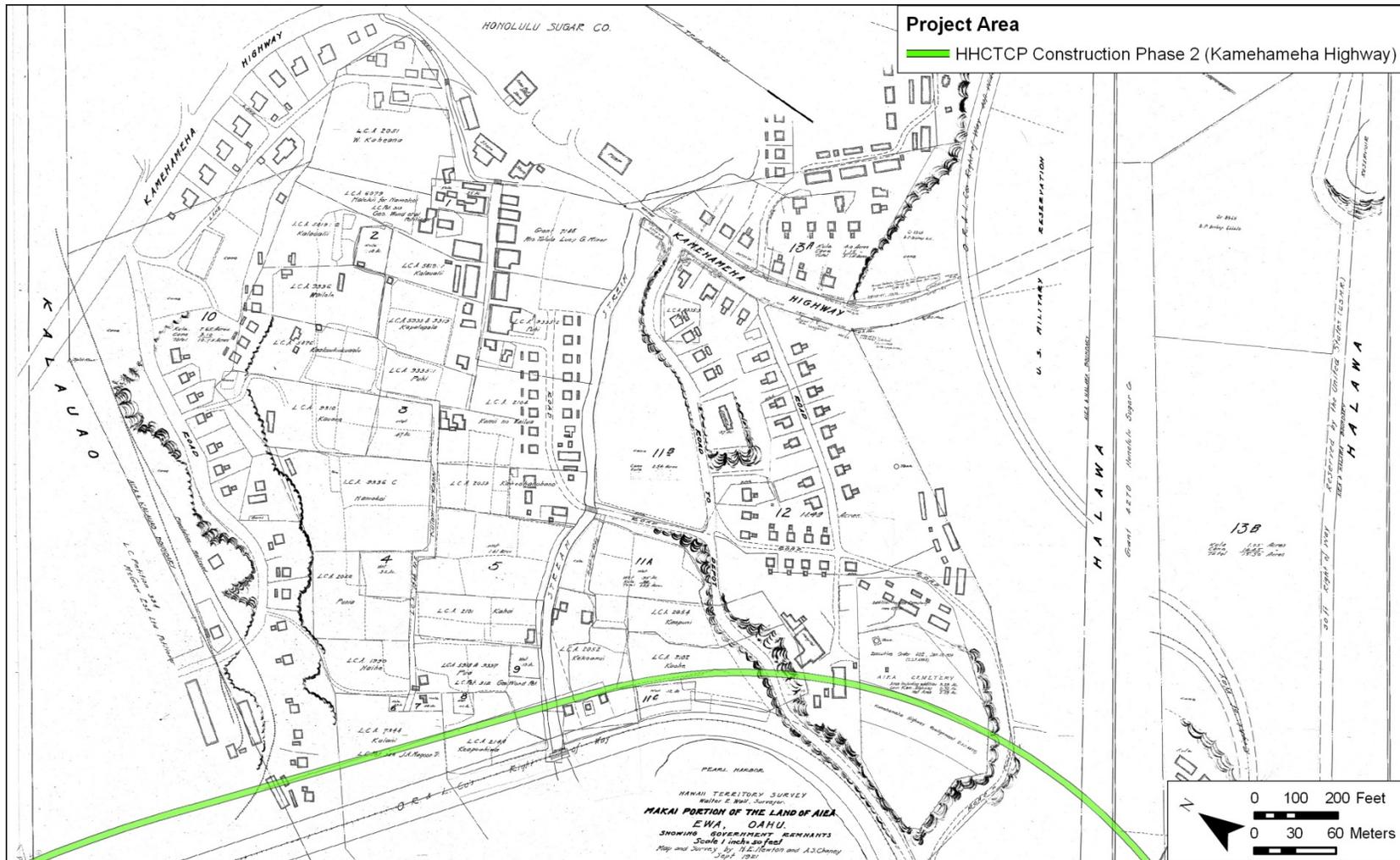


Figure 14. 1921 Map of the Makai Portion of the Land of Aiea, Ewa, Oahu, W.E. Wall Surveyor (Hawai'i Land Survey Division, Registered Map No. 2677), showing the cultivated lands of the *makai* (seaward) portion of the *ahupua'a*, in relation to the Phase 2 project area

(father of Kamehameha IV and V) and Grace Kama'iku'i (daughter of John Young, advisor to Kamehameha I), as parts of LCA 7712 and LCA 8516 B respectively. 'Aiea Ahupua'a was retained as Crown Lands.

In 1866, Victoria Kamāmalu died at the age of twenty-seven, leaving her entire estate to her father, Mataio Kekūanao'a. Kekūanao'a died two years later, leaving the estate his son, Lot Kapuāiwa (Kamehameha V). In 1872, Kapuāiwa died intestate. Kapuāiwa's half-sister, Ruta Ke'elikōlani, received the entire estate in 1873. Ruta Ke'elikōlani died circa 1883, leaving her estate to her cousin Bernice Pauahi Bishop (Kame'eleihiwa 1992:309-310). Bernice Pauahi Bishop, who had then inherited the estates of Ruta Ke'elikōlani, Mataio Kekūanao'a, and Lot Kapuāiwa, as well as land from her parents, Abnera Pakī and Laura Konia, "became the largest landowner of the remaining *Ali'i Nui 'Āina* in Hawai'i" (Kame'eleihiwa 1992:310). Bernice Pauahi Bishop died in 1884, leaving her estate in trust for the establishment of the Kamehameha Schools.

### 2.2.5.1 Kuleana Land Commission Awards

The lands awarded as Crown Lands and Konohiki Lands, as well as lands designated as Government Lands, were "subject to the rights of native tenants." The Kuleana Act of 1850 "authorized the Land Commission to award fee simple titles to all native tenants who occupied and improved any portion of Crown, Government, or Konohiki Lands" (Chinen 1958:29). Surveyor C.J. Lyons stated:

Small tenants were permitted to acquire a full title to the lands which they had been improving for their own use...for it was the labor of these people and their ancestors that had made the land what it was. [Lyons 1875:127, cited in Devaney et al. 1982:22]

Historic maps dating to the late-1800s and early-1900s (see Figure 11 to Figure 14) show high densities of *kuleana* LCAs on the low-lying floodplains inland of Pearl Harbor. The distribution of LCA parcels generally reflects the distribution of the population in the mid-1800s, and the agricultural nature of the region. Thirty-six LCAs were located in the immediate vicinity of the Phase 2 project area (Table 1; Figure 15). Testimony associated with these LCAs indicates land use primarily consisted of wetland agriculture (*lo'i* and fishponds) centered on perennial streams and springs, with associated *kula* (pasture) lands and house lots in drier areas away from the water sources.

## 2.2.6 Historic Agricultural Enterprises

### 2.2.6.1 Sugar Cane Cultivation

During the second half of the 19<sup>th</sup> century, traditional agricultural pursuits in 'Ewa were being displaced by other agricultural interests, including commercial cultivation of rice and sugar cane. Although sugar cane was being commercially grown in the early 1800s, it wasn't until 1879 when the first artesian well was drilled in 'Ewa, that the industry revealed its economic potential (Ellis 1995:22). The availability of ample groundwater resources enabled greater irrigation possibilities for expanding plantations, aside from the use of surface water from streams and reservoirs.

Table 1. Land Commission Awards in the Immediate Vicinity of the Phase 2 project area

LCA	Awardee	Ahupua'a	Land Use
9294	Kekeni	Waiawa	house lot
9372	Keiki	Waiawa	<i>kalo</i> pond
5662	Kawelo	Waimano	<i>lo 'i, kula</i>
11029	J. Stevenson	Waimano	No information
9328	Kalimaeha	Waiau	<i>lo 'i, kula</i>
9344	Liliu	Waiau	<i>lo 'i, kula</i> , house lot
9369	Kanealii	Waiau	<i>lo 'i, kula</i>
9410	Hema	Waiau	<i>lo 'i, kula</i> , house lot
9409	Puhiki	Waiau	<i>lo 'i, kula</i>
9410 B	Wahaolelo	Waiau	<i>lo 'i</i>
9338	Nonoaea	Waiau	<i>lo 'i</i> , fishpond, house lot
9339	Nonoaea	Waiau	<i>lo 'i</i>
8340	Kekalohe	Waiau	No information
9385	Palea	Waiau	<i>lo 'i</i>
9387 B	Kekaula	Waiau	<i>lo 'i</i> , house lot
5586	Kahiki	Waimalu	<i>lo 'i, kula</i> , house lot
9407	Kuaalu	Waimalu	<i>lo 'i</i> , fishpond
5649	Kuhanaipuaa	Waimalu	<i>lo 'i</i> , house lot
2938 Part 5	Lahilahi	Waimalu	No information
9315	Haki	Waimalu	<i>lo 'i, kula</i>
8525 B	Kauwa	Waimalu	No information
9400	Kaoio	Waimalu	<i>lo 'i</i> , house lot, pond, breadfruit tree
2494	Kekoa	Kalauao	<i>lo 'i</i>
5581	Kalaimanuia	Kalauao	<i>lo 'i, kula</i>
6156	Nua	Kalauao	<i>lo 'i, kula</i>
6156 B	Mahoe	Kalauao	<i>lo 'i, kula</i>
9297	Kanikela	Kalauao	<i>lo 'i</i>
5840	Kuohao	Kalauao	<i>lo 'i</i>
5910 & 5934	Piko	Kalauao	<i>lo 'i, kula</i>
7344	Kalohi	'Aiea	<i>lo 'i</i> , pond

<b>LCA</b>	<b>Awardee</b>	<b>Ahupua'a</b>	<b>Land Use</b>
1990	Naihe	'Aiea	<i>lo'i, kula</i>
5918 & 9337	Pua	'Aiea	<i>lo'i</i>
2141	Keapoahiwa	'Aiea	<i>lo'i, fishpond, house lot</i>
2052	Kekoanui	'Aiea	<i>lo'i, kula</i>
2102	Kaohe	'Aiea	<i>lo'i, kula, fishpond house lot</i>
2054	Kaapuni	'Aiea	<i>lo'i, kula</i>

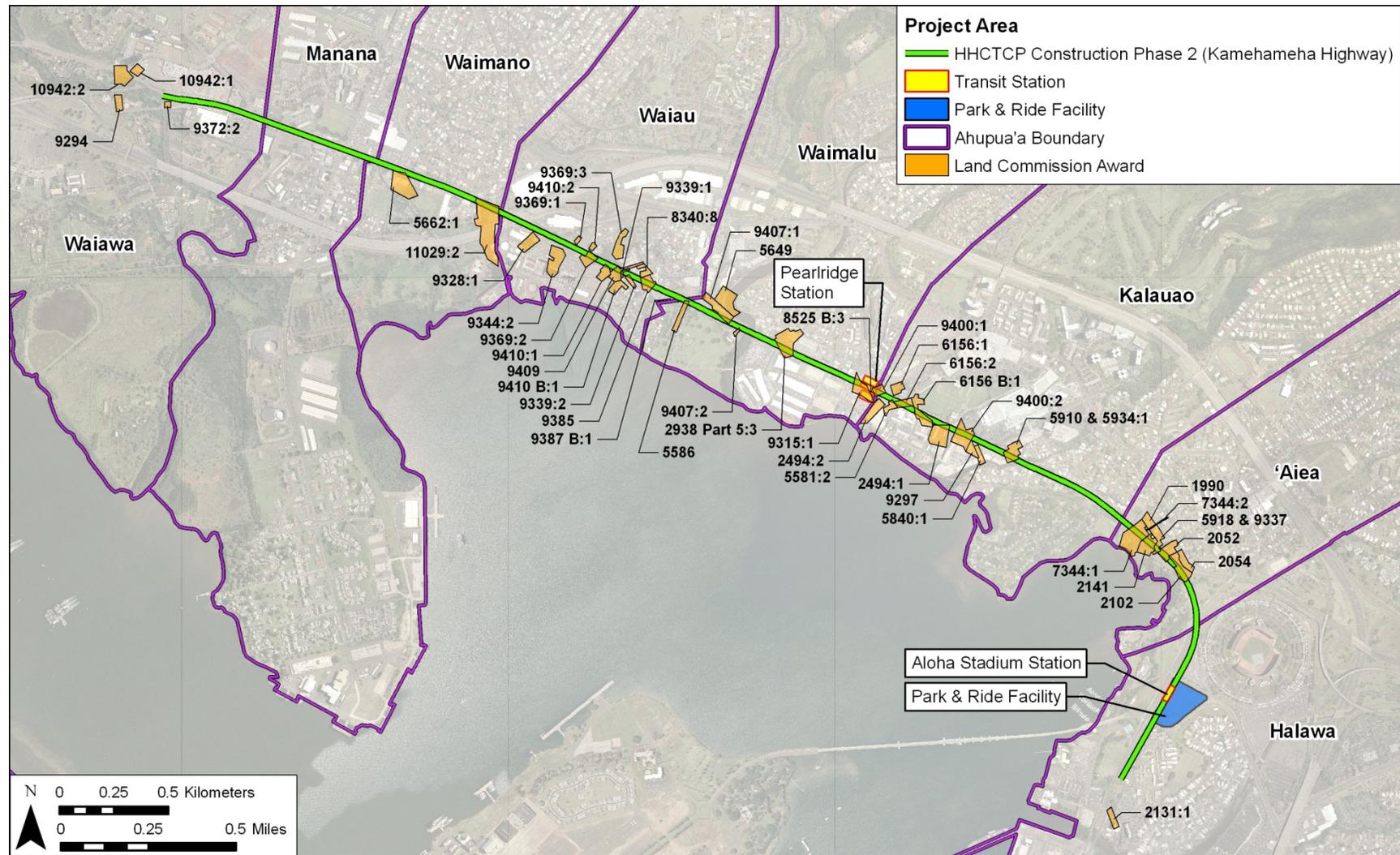


Figure 15. Aerial photograph (source: U.S. Geological Survey Orthoimagery 2005), showing the locations of *kuleana* (commoner) Land Commission Awards in the immediate vicinity of the Phase 2 project area

Commercial sugar cane cultivation began in Waimalu and Hālawā in the 1850s, on the estate of Mr. J.R. Williams (Conde and Best 1973:327). The plantation was first known as the Honolulu Sugar Company. In 1900, along with a change in ownership, the name of the company was changed to the Honolulu Plantation Company. The plantation's mill and refinery were located in 'Aiea, with the plantation's fields stretching across the plains and foothills *mauka* (inland) of Pearl Harbor. A map of the Honolulu Plantation Company's fields (Figure 16) shows the extent of plantation development in the vicinity of the Phase 2 project area. Much of the cane fields were located *mauka* of the project area, as the marsh-type lands near the Pearl Harbor coastline were likely too wet to be cultivated in cane.

Conversion of formerly uncultivated lands to commercial sugar cane cultivation resulted in an extensive modification of the landscape. This included removal of the native forest and grasslands, grading of the land, diversion of streams, and the installation of irrigation infrastructure such as wells, pumping stations, and ditches. Plantation camps were built to house workers near the fields, plantation hospitals were established, and a vast transportation network was constructed to connect the fields to the mill:

The most modern devices for the economic handling of cane are used on this plantation. There are thirty-six miles of main railroad and seven miles of portable track, with four locomotives and 500 cane cars. The capacity of the mill is 900 tons of raw sugar a week and 1100 tons of cane a day. This is the only mill in the islands that turns out refined sugar, and it supplies that commodity which is used in the pineapple canneries. The mill is equipped with all kinds of auxiliary shops. [San Francisco Chronicle July, 10 1910, cited in Conde and Best 1973:328]

Circa 1900, the Honolulu Plantation Company also established a cemetery in 'Aiea for the plantation community, near the sugar mill. A former caretaker "estimated that as many as 3,000 people were buried at Aiea Cemetery" (Pang, *Honolulu Star Bulletin* June 12, 2002). The graveyard was originally approximately 2.5 acres, however:

...the military took over the makai section during World War II to make way for Kamehameha Highway and parking. The graves were reinterred on the mauka side. [Pang, *Honolulu Star Bulletin* June 12, 2002]

In the early 1900s, the development of Pearl Harbor as a military base and the construction of John Rodgers Field and Hickam Field (present site of Honolulu International Airport) necessitated condemnation of portions of the Honolulu Plantation Company's lands bordering Pearl Harbor. Despite its economic promise and gains, the gradual condemnation of the Honolulu Plantation Company's lands led to declines in production:

Inroads of the Military, due to successive condemnations by the Government, totaling half of the H.P. Co. [Honolulu Plantation Company] cane area has sounded the end of this company this year. [Plantation Manager Report of 1944, cited in Conde and Best 1973:330]

The loss of lands during the heavy buildup of military infrastructure in the 1940s, following the bombing of the Pearl Harbor Naval Base and the U.S. entrance into World War II, eventually forced the Honolulu Plantation Company to cease operations in 1947. The company's assets were sold to the neighboring Oahu Sugar Company (Conde and Best 1973:330).

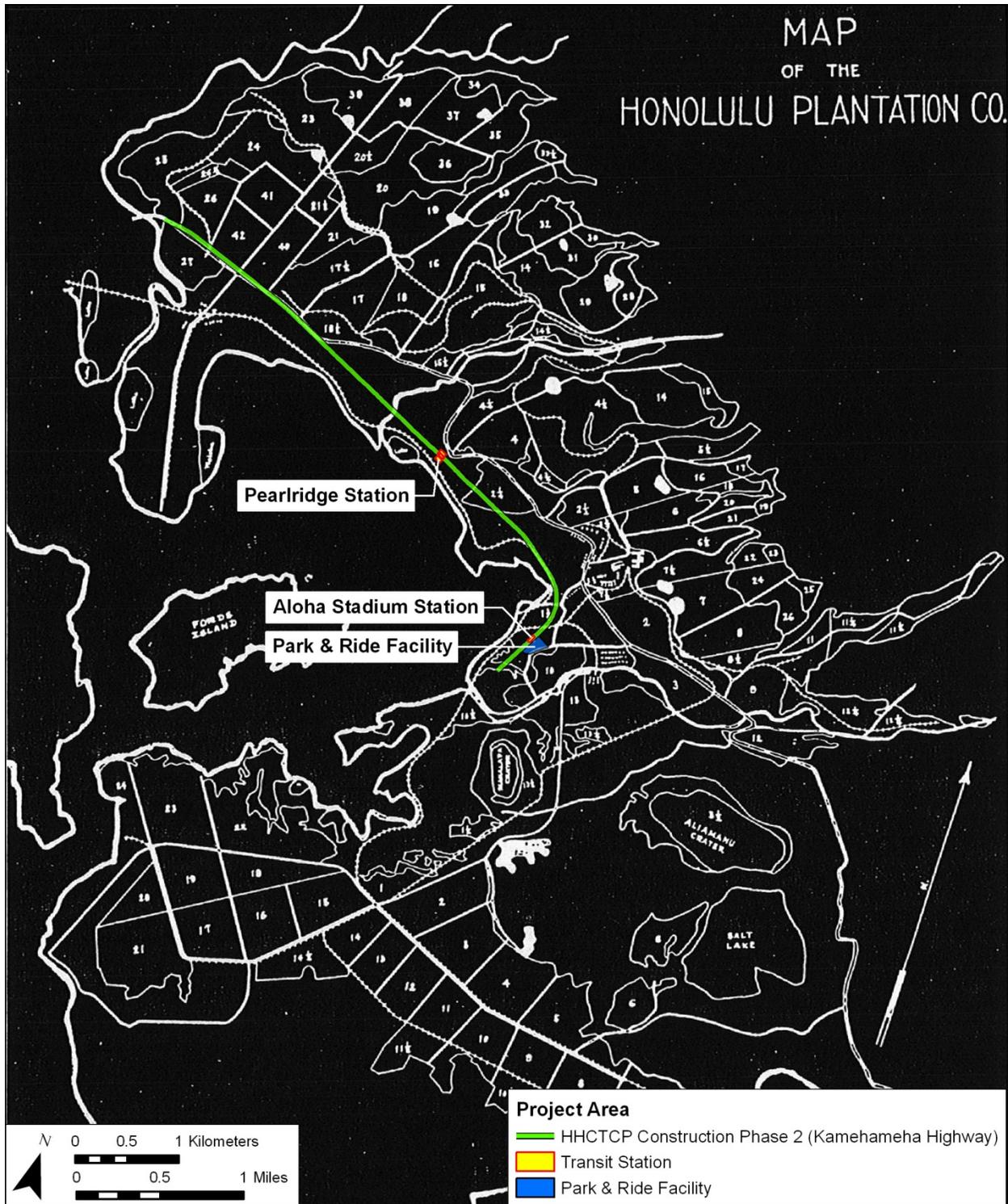


Figure 16. Map of the Honolulu Plantation Company (in Conde and Best 1973:331), showing the extent of plantation development in the Pearl Harbor area

### 2.2.6.2 Rice Cultivation

A market for rice had developed in California as increasing numbers of Chinese laborers immigrated there to work on railroads, in gold mines, and other pursuits. The first Chinese were brought to the Hawaiian Islands in 1852 to work in the expanding sugar plantations (Coulter and Chun 1937:9). Similarly, as Chinese immigration to the Islands accelerated, a domestic market for rice also developed.

In the late 1850s, a horticulturalist from the Royal Hawaiian Agricultural Society began experimenting with cultivating rice in Hawai'i. Following successful harvests, rice cultivation was promoted by the Society, as well as the Hawaiian government, as a potential commercial industry (Coulter and Chun 1937:9). In 1862, missionaries noted that Hawaiians in residing in the well-watered areas of Hawai'i were encouraged to convert their *lo'i* (irrigated taro fields) into rice paddies:

Considerable effort has been made to induce the natives to be more industrious to cultivate the soil and particularly to try to [sic] the cultivation of rice...Foreigners too have begun the culture of rice in this district extensively and it was hoped their example would stimulate the natives to cultivate their own lands, but most of them choose to hire themselves to the foreigners at low wages and put their lands in the hands of the foreigners for a few dollars rather than cultivate or improve it themselves. [Mission Station Report 1862:1, cited in Devaney et al. 1982:49]

Following the completion of their plantation labor contracts, some Chinese immigrants began rice farming, to which they were accustomed in their native land. The availability of former *lo'i* lands throughout the islands in the late 1800s reflected the declining demand for taro as the native Hawaiian population diminished. Chinese rice farmers acquired lands by leasing small plots of land for individual farms, or by forming *hui* (partnerships) with other farmers and acquiring large tracts of land (Coulter and Chun 1937:17-18). During the height of rice cultivation (circa 1880-1920), the industry was dominated by Chinese firms who controlled the growing and milling of rice (Devaney et al. 1982:49).

Rice cultivation replaced much of the former taro lands and became widespread in the lowlands surrounding Pearl Harbor. By 1892, approximately 262 acres were under rice cultivation in Waiawa, Mānana, and Waiiau, 135 acres in Waimalu, 76 acres in Kalauao and 'Aiea, and 117 acres in Hālawa (Coulter and Chun 1937:21). The ancient taro *lo'i* and *'auwai* (irrigation ditches) were modified and expanded to support rice cultivation:

The great demand for rice land brought disused taro patches into requisition – especially because water rights attached to them. Such was the desire of the Chinese to use every piece of land to its fullest extent for paddy that they cut away the paths which the Hawaiians had used between taro patches to strips so narrow that a man could walk along them only with difficulty...As the demand for rice continued, it became profitable to bring into use land hitherto unused. The land most easily rendered fit for rice cultivation was swamp or marsh land of which there was a large amount in the islands. Most of such land was at or near sea level-undrained areas at the mouths of streams: lowlands, which could be reclaimed without great expense...lands hitherto unused became fields of waving grain. [Coulter and Chun 1937:11]

The following account was describes a visit to the rice fields of 'Aiea, circa 1904:

On the morning of June 2nd, for instance, our destination was Aiea. At ten minutes past seven we boarded the first passenger train going towards Honolulu. For a distance of eight miles the road skirts the shore and then turns landwards or mauka through rice and sugar plantations, Ewa Mill, Waipahu, Pearl City. We reached Aiea at eleven minutes past eight. Like all rice fields in Hawaii, this one is worked entirely by Chinamen, they alone being able to endure the conditions of location and climate necessary for the cultivation of this cereal. On one side of the railroad track was the broad, muddy inland lake or bay of salt water, Pearl Harbor; on the other side were the terraced plots or fields, flooded to a depth of several inches with water and separated by narrow raised earthen ridges on which the careful Chinaman doubtless succeeded in walking, but which many times proved treacherous to our unsteady feet. A rice plantation, laid out as it generally is on the low flats at the foot of a valley, where mountain streams empty into the sea, is an ideal collecting ground for certain kinds of algae. [Josephine E. Tilden, in Thrum 1904:134]

By the 1920s, commercial rice cultivation in Hawai'i was in decline. Two of the primary reasons for this were: the increase rice production in California, which eliminated an important export market; and the annexation of Hawai'i by the United States in 1898, which resulted in restrictions on the number of Chinese allowed into Hawai'i, the source of cheap labor for the rice plantations" (Devaney et al. 1982:52-53).

### **2.2.7 The Oahu Railway and Land Company (O.R. & L.)**

In 1889, the Oahu Railway and Land Company (O.R. & L.) was organized by B.F. Dillingham to connect the outlying areas of O'ahu to Honolulu by rail, in order to spur development of lands owned by himself and his business partners (Kuykendall 1967:99). In its first year of construction, the railway extended from the wharves of Honolulu Harbor to 'Aiea, transporting passengers and freight along the coastline of Pearl Harbor. During the 1890s, the railway would reach from Honolulu to Pearl City in 1890, to Wai'anae in 1895, to Wai'alu in 1898, and to Kahuku in 1899 (Kuykendall 1967:100).

The O.R. & L. railway was a vital link in the transportation network for the growing sugar plantations along its lines, including the Honolulu Plantation Company. The railway was also utilized by the military in transporting materials between ports and the various military installations along its routes. In addition to construction of the railroad, the O.R. & L. also led the development of Pearl City. Dillingham conceived a residential subdivision on and above the present Pearl City Peninsula. The Pearl City development was:

...one of [Dillingham's] devices to build railway traffic during the first years of the struggling Oahu Railway and Land Company.

Newspapers in 1890 carried numerous announcements of the "great land sale of Pearl City lots" at public auction, with special excursion rates on the new railway.

Lots were sold with a guarantee that O.R. and L. would transport buyers and their families between Pearl City and Honolulu for nine years at one cent per mile, second class. [Johnson, *Honolulu Star Bulletin* Sept. 16, 1956]

The following account noted the significant interest in purchasing suburban lots in Pearl City, a reflection of the overall growth in population and development in the area prompted by the construction of the O.R. & L. railway:

The Oahu Railway and Land Company in their sales just held of lots at Pearl City, recently laid out at Manana, Ewa, fully realized the promoter's prognostications of the eagerness with which these suburban lots would be sought for when once they were properly put upon the market. At the first offering about one hundred and ten lots were disposed of, realizing \$44,000. Responding to further demand another sale was held a week later when \$22,795 was realized from fifty-eight additional lots. [Thrum 1890:147]

In 1900, the O.R. & L. also established the "Loch View" cemetery in Pearl City, near the rail station. The cemetery was marketed to the government as:

...offering a complete burial package for the indigent, including opening and closing the grave and use of the 'funeral car' from the depot at Iwilei all the way to the cemetery. [Chiddix and Simpson 2004:49]

It was also noted that the cemetery was "divided into blocks by religion as was the custom of the day" (Chiddix and Simpson 2004:49).

O.R. & L. railway operations began to decline in the 1920s, when electric streetcars were built for public transportation within the city of Honolulu and automobiles began to be used by families for transportation outside the city (Chiddix and Simpson 2004:185). However, the years preceding World War II temporarily reversed this decline, as the military utilized the O.R. & L. railway lines to transport materials for defense projects around the island. Soon after the attack on Pearl Harbor in 1941, the O.R. & L. operated 24 hours a day, transporting war materials and troops from Honolulu to the new and expanded military installations. In August of 1945, the war ended, and so did the O.R. & L.'s heyday as a military transport line:

She had served her country well and proudly during the war, but operating round-the-clock on what little maintenance could be squeezed in, had taken a prodigious hit on the locomotives and track. Traffic stayed steady for a short time, but soon dropped precipitously as soldiers and sailors went home, military posts were shrunk or razed, and civilians could again get tires, gasoline and new cars. [Chiddix and Simpson 2004:257]

There was no choice but to abandon the O.R. & L. main line, and in 1946 Water F. Dillingham, son of B.F. Dillingham, wrote:

The sudden termination of the war with Japan changed not only the character of our transportation, but cut the freight tonnage to a third and the passenger business to a little above the pre-war level. With the increased cost of labor and material and the shrinkage in freight tonnage and passenger travel, it was definite that the road could not be operated as a common carrier. With no prospect of increased tonnage, and the impossibility of increasing rates against truck competition, your management has applied to the Interstate Commerce for authority to abandon its mainline. [Walter Dillingham, cited in Chiddix and Simpson 2004:257]

Following the termination of commercial service by the O.R. & L., most of the over 150 miles of track were pried up, locomotives were sold to businesses on the U.S. mainland, and railway cars were scrapped. In 1947, the U.S. Navy took over a section of the O.R. & L. railway for their own use, to transport material from the naval ammunition storage magazines at Lualualei, West Loch in Pearl Harbor, and Waikēle to the Pearl Harbor Naval Base (Treiber 2005:25-26).

### **2.2.8 Military Development at Pearl Harbor**

In 1819, Russian explorer Otto Von Kotzebue tried to observe Pearl River, but his group could not obtain a canoe. What he was told led him to speculate on the possible importance of Pearl Harbor to the future:

In the mouth of this river are several islands; it is so deep, that the greatest ship of the line can lie at anchor a few fathoms from the shore; and so broad, that a hundred vessels can conveniently find room in it. The entrance into the Pearl Rivers is in the same situation as the harbor of Hana-rura [Honolulu]; but the windings between the reefs are, however, said to render a passage more difficult. If this place were in the hands of the Europeans, they would certainly employ means to make this harbour the finest in the world. [Kotzebue 1821:338-348]

The first foreign attempt to survey Pearl Harbor was made in 1840, during the U.S. Exploring Expedition led by Charles Wilkes:

The inlet has somewhat the appearance of a lagoon that has been partly filled up by alluvial deposits. At the request of the king, we made a survey of it: the depth of water at its mouth was found to be only fifteen feet; but after passing this coral bar, which is four hundred feet wide, the depth of water becomes ample for large ships, and the basin is sufficiently extensive to accommodate any number of vessels. If the water upon the bar should be deepened, which I doubt not can be effected, it would afford the best and most capacious harbour in the Pacific...[Wilkes 1970:79]

Although Wilkes was impressed by the harbor, he was not cognizant its future benefit to the U.S. Government. Wilkes (1970:79) concluded, “as yet there is no necessity for such an operation, for the port of Honolulu is sufficient for all the present wants of the islands, and the trade that frequents them.”

In 1873, General Schofield presented a confidential report to the U.S. Secretary of War, recommending that Pearl Harbor should be available to the U.S. Navy. Schofield wrote:

In case it should become the policy of the Government of the United States to obtain the possession of this harbor for naval purposes, jurisdiction over all the waters of Pearl River with the adjacent shores to the distance of 4 miles from any anchorage should be ceded to the United States by the Hawaiian Government...

The cession of Pearl River could probably be obtained by the United States in consideration of the repeal of the duty of Sandwich Island sugar. Indeed, the sugar-planters are so anxious for a reciprocity treaty, or so anxious rather for free trade in sugar with the United States, that many of them openly proclaim themselves in favor of annexation of these islands of the United States. [Sen. Ex.

Docs, 52<sup>nd</sup> Cong. 2<sup>nd</sup> Sess. No. 77, pp. 150-154, reproduced in Judd 1971:Appendix 3]

The reciprocity treaty was ratified in 1876, with the provision that Hawai'i would not “lease or relinquish sovereignty to another country or any harbor, etc.” In 1887, the treaty was renewed and amended and allowed the United States the “exclusive right to enter the harbor of Pearl River, in the Island of Oahu, and to establish and to maintain there a coaling and repair station for the use of vessels of the United States” (Judd 1971:128).

Following the 1901 U.S. Congressional “Act of Annexation,” which formally ratified the annexation of the Territory of Hawai'i, the first 1,356 acres of Pearl Harbor land were transferred to U.S. Government ownership. Between 1903 and 1911, civilian contractor Walter Dillingham dredged Pearl Harbor deep enough to receive the largest warships of the fleet. By the 1930s, a gradual expansion of facilities at Pearl Harbor kept pace with increasing levels of instability in the Pacific region. Prior to the bombing of Pearl Harbor in December 1941, there existed a high degree of coordination between civilian interests and the military. The Honolulu Plantation Company granted blanket permission to the 64<sup>th</sup> Coast Artillery (Anti-Aircraft) Regiment to occupy positions from time to time on plantation lands surrounding Pearl Harbor. Troop maneuvers involving thousands of men using plantation roads and lands occurred throughout 1940 and 1941 (Spalding 1945).

By the end of 1941, Pacific Naval Air Bases (PNAB) expenditures for construction of new facilities Pearl Harbor construction measured in the hundreds of millions of dollars. With the Japanese surprise attack on Pearl Harbor in December of 1941, much of the new construction was damaged or destroyed. A furious pace of reconstruction was instituted to double the war capacity of Pearl Harbor. Military planners approved a new ammunition depot in the mountainside of Waipahu, a new hospital in 'Aiea, and thousands of additional changes to the Navy Yard to accommodate the new aircraft carrier task forces (Woodbury 1946). The government also acquired additional lands in order to further expand military base functionality. By 1944, the U.S. Navy occupied nearly 2,400 acres of land in the Pearl Harbor and Pearl City areas, as well as in Mānana, Waiawa, and Hālawā, for use as military staging areas in the war effort (Allen 1999:234).

Following World War II, much of the Pearl City area remained part of the Naval Reservation, primarily used for military housing and storage warehouses. In 1949, the Hawaiian Board of Health leased a former military-related complex in Pearl City from the federal government for use as a hospital for treating Hansen's Disease patients. Hale Mohalu (“house of comfort”) Hospital was established as a “modern facility” to replace Kalihi Hospital, which had been in use since 1865. The Board of Health had also determined that no new patients needed to transfer to Kalaupapa on Moloka'i since sulfones, new drugs that significantly arrested the disease, had become available (Tayman 2006:269, 281).

### 2.2.9 From Rural Farms to Modern Urban Development

A series of topographic maps illustrates the progression of land use in the vicinity of the Phase 2 project area from a primarily rural agricultural region to a modern urban landscape. The 1919 War Department map (Figure 17) indicates land use in the vicinity of the project area to be predominantly agricultural in nature. The main government road is situated along the *mauka* (inland) edge of the low-lying marshlands bordering Pearl Harbor. Lands *makai* (seaward) of the

government road are cultivated in rice and taro, while lands *mauka* of the government road are cultivated in sugar cane. The limited commercial and residential development of the area is concentrated in the vicinity of the Honolulu Plantation Company's sugar mill in 'Aiea. Limited development is also shown in the Pearl City area, near the O.R. & L. station and on the Pearl City Peninsula. The map also indicates the location of the Loch View Cemetery in Pearl City, immediately *makai* of the government road and the Phase 2 project area, and the 'Aiea Cemetery, which is traversed by the project area.

The 1927-1928 U.S. Geological Survey map (Figure 18) shows little additional development, which continues to be focused in the Pearl City area and in the vicinity of the 'Aiea sugar mill. The former Waiawa Pond is indicated to have been converted to a plantation reservoir, indicative of the continued expansion of sugar cane cultivation in the area. Use of surface water from streams and springs, as well as tapping of groundwater resources led to a decline in the taro and rice fields along the Pearl Harbor coast, which also required large amounts of water.

The 1943 War Department map (Figure 19) shows substantial development along the Pearl Harbor coast, as well as on Ford Island, related to the military buildup associated with U.S. involvement in World War II. Much of the lands along the shores of Pearl Harbor, including the Pearl City Peninsula, were acquired by the government for use by the military. A large military-related development is indicated in the Hālawā area. Kamehameha Highway was also constructed during the World War II era, which greatly improved transportation from Honolulu, along the Pearl Harbor coast, and on to military installations to the west. As the highway was constructed through the low-lying areas along the coast, it is presumed that much of the marshlands in the vicinity of the Phase 2 project area, which were formerly occupied by taro and rice fields, were drained and filled during this period. The map also indicates the 'Aiea Cemetery was bisected by the highway.

The 1953 Army Mapping Service map (Figure 20) indicates that much of the lands in the Pearl Harbor area that were acquired by the government during World War II remained under control of the military as Naval Reservations, with varied uses including military housing, storage warehouses, fuel storage, and other support facilities for the Pacific Fleet. Substantial commercial and residential development also occurred in the region during this period, primarily in the 'Aiea and Pearl City areas. A small cluster of structures is also indicated in the Waiāu area. The map also shows the location of the Hale Mohalu Hospital in Pearl City, which was a military facility converted for use as a Hansen's Disease treatment facility.

By 1977, the vicinity of the Phase 2 project area, from Pearl City in the west to Hālawā in the east, was almost completely developed and urban (Figure 21). The lowlands along the Pearl Harbor coast consisted primarily of commercial and industrial developments, with residential subdivisions along the *mauka* foothills. The H-1 Interstate Highway was constructed to replace Kamehameha Highway as the primary east-west transportation corridor.

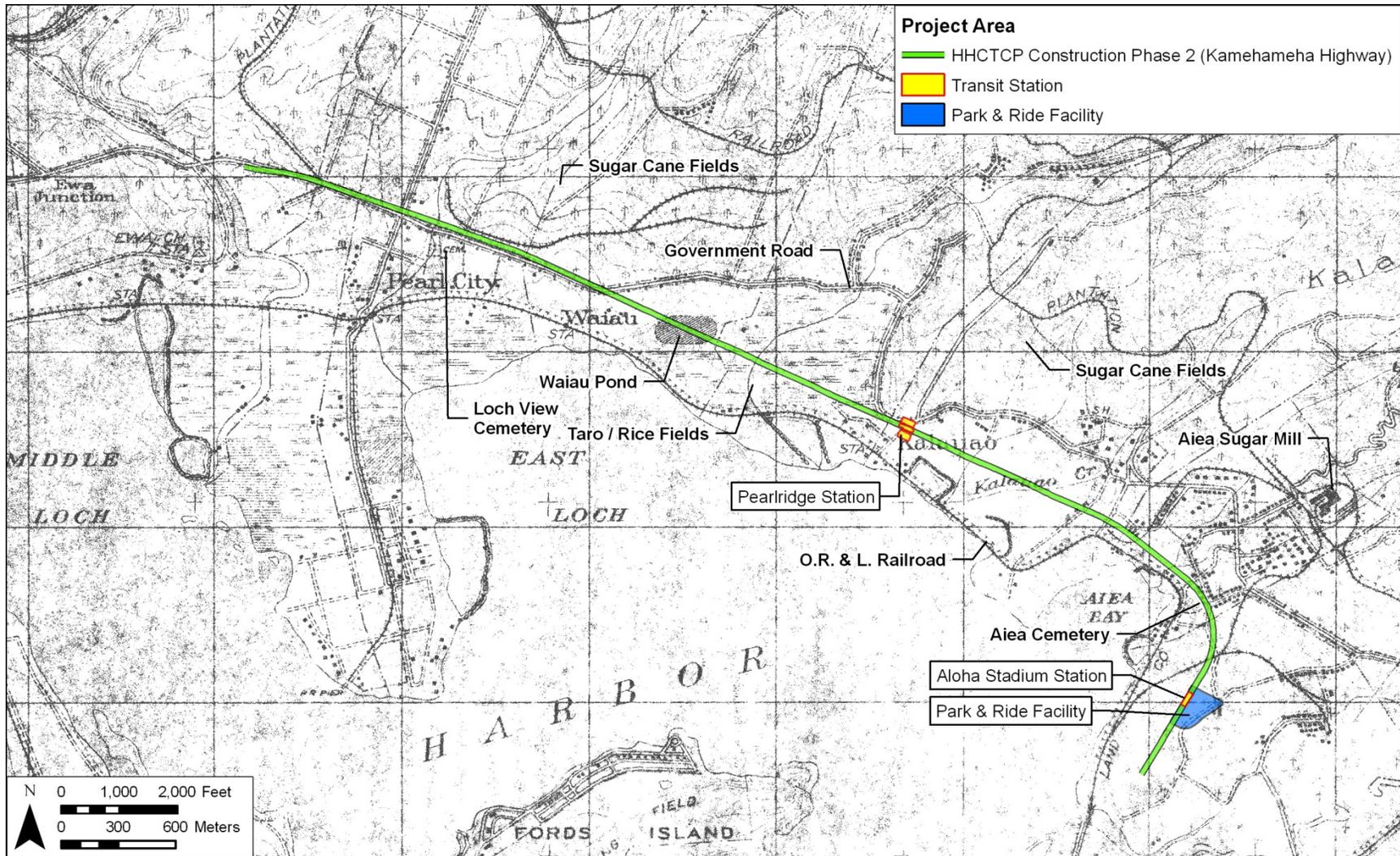


Figure 17. 1919 War Department Fire Control Map, Pearl Harbor Quadrangle, showing the location of the Phase 2 project area and features discussed in the text

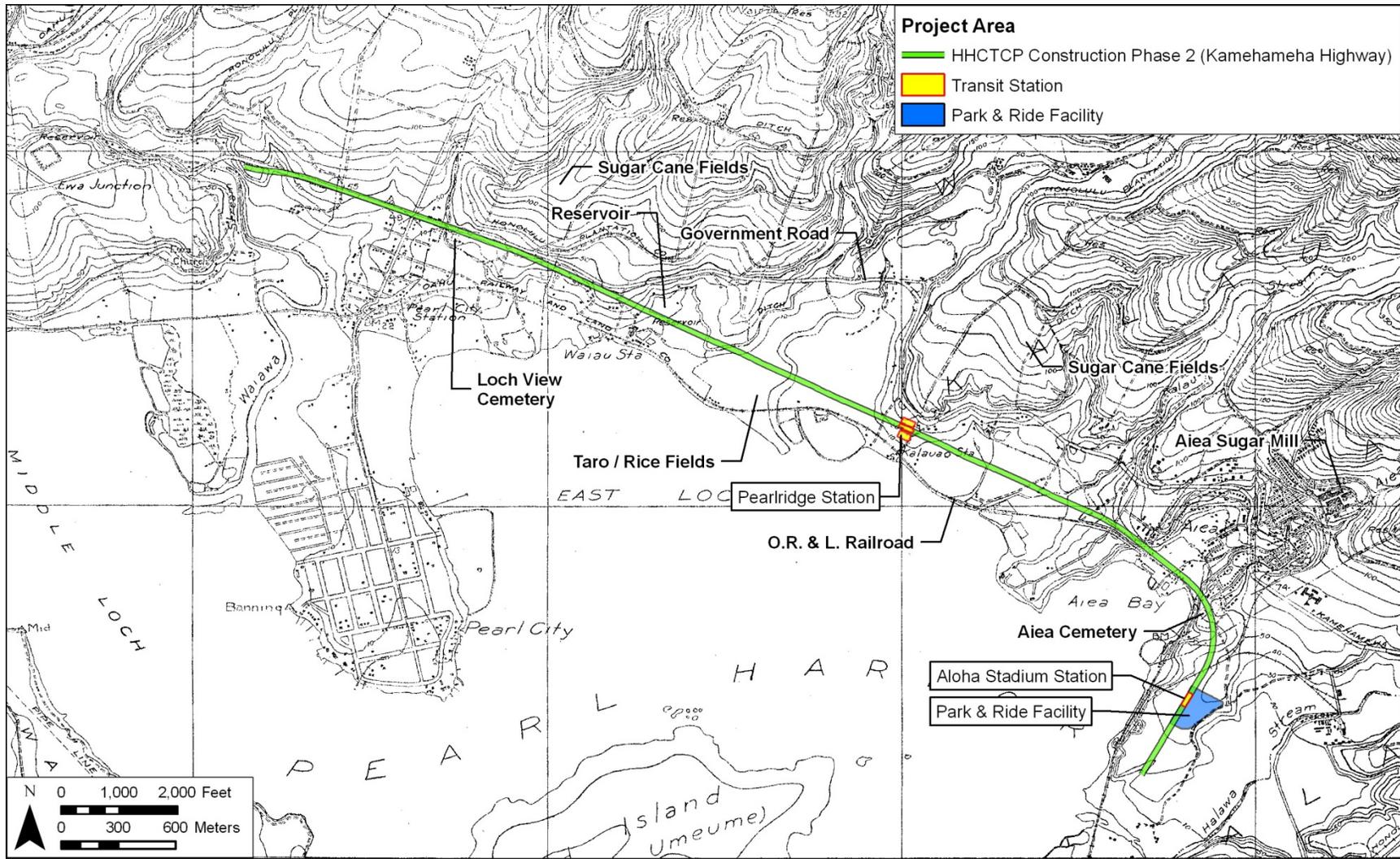


Figure 18. 1927-1928 U.S. Geological Survey Topographic Map, Waipahu Quadrangle, showing the location of the Phase 2 project area and features discussed in the text

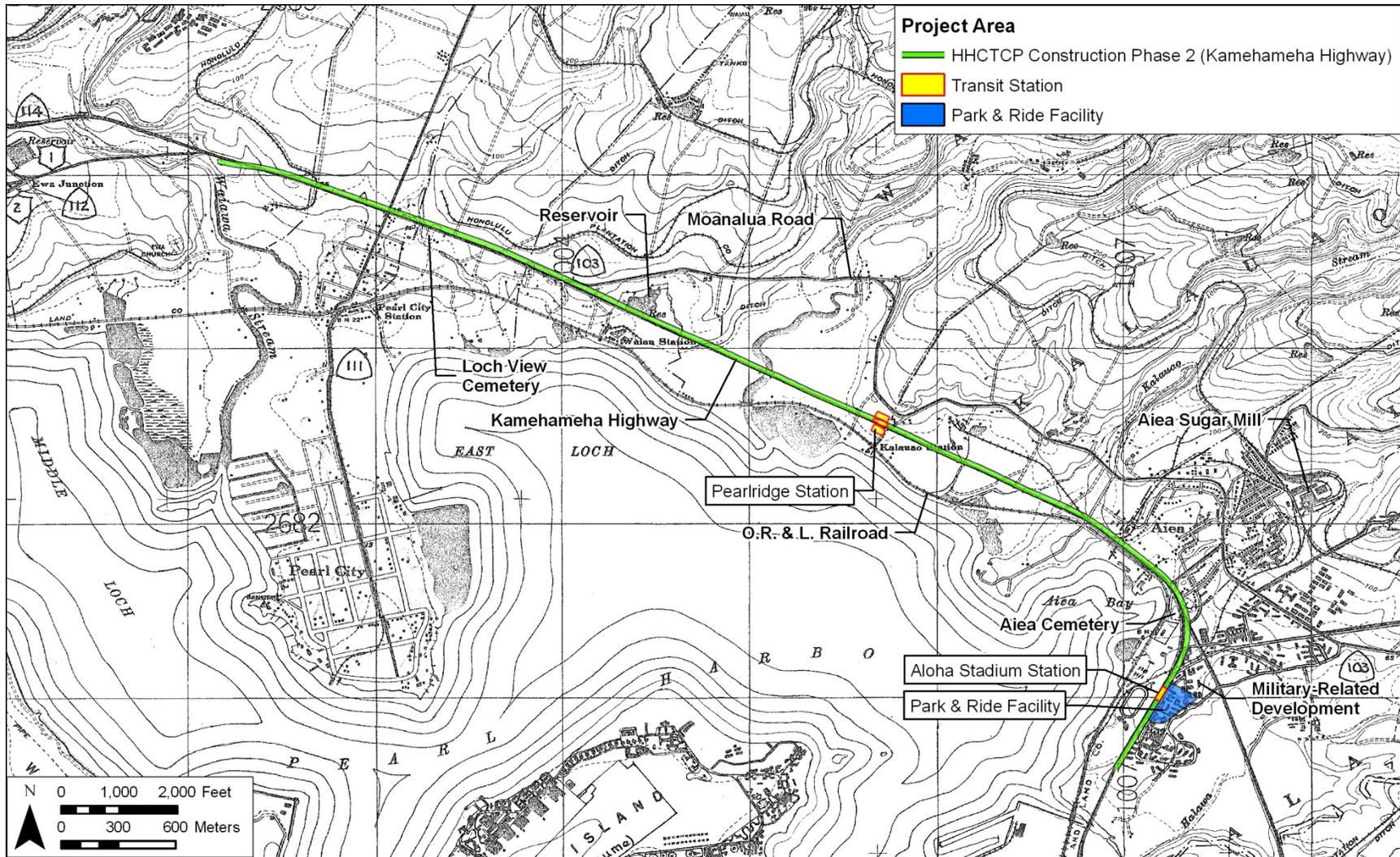


Figure 19. 1943 War Department Topographic Map, Aiea Quadrangle, showing the location of the Phase 2 project area and features discussed in the text



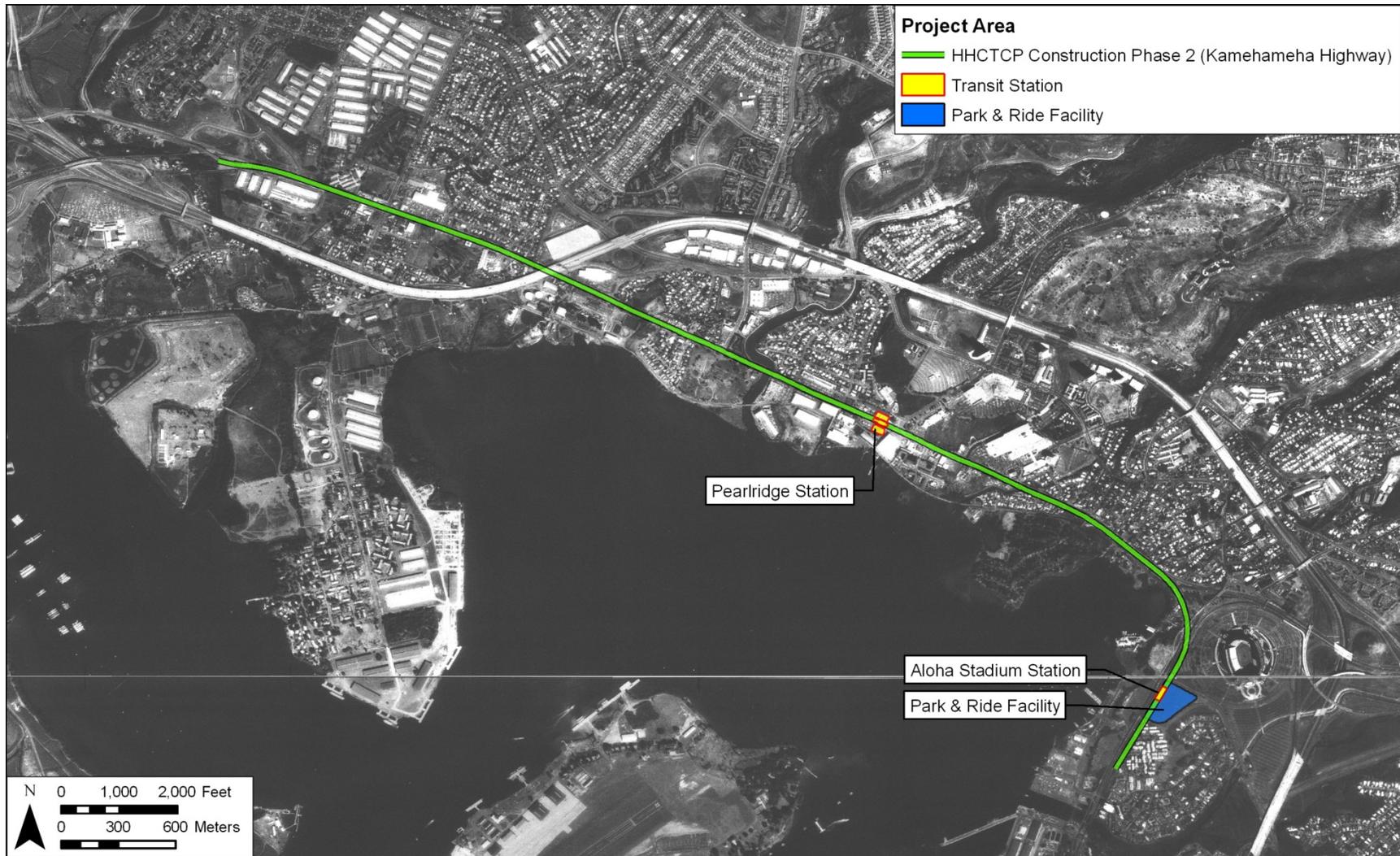


Figure 21. 1977 U.S. Geological Survey Orthophotograph, Waipahu and Puuloa Quadrangles, showing the location of the Phase 2 project area and features discussed in the text

## 2.3 Previous Archaeological Research

Much of the lands in the vicinity of the HHCTCP Phase 2 project area were developed prior to the establishment of legislation requiring cultural resource management efforts to mitigate the impact of development on archaeological resources. As a result, there have been relatively few archaeological studies conducted in the vicinity of the project area. The few historic properties that have been identified document post-contact land use associated with World War II military operations, the O'ahu Railway & Land Company, and historic cemeteries. The following discussion of previous archaeological investigations proceeds from west to east (Table 2; Figure 22).

### 2.3.1 Archaeological Research in the Immediate Vicinity of the Project Area

#### McGerty & Spear 1995

In 1995, Scientific Consultant Services (SCS) (McGerty and Spear 1995) completed an archaeological assessment for the Manana and Pearl City Junction Sites. The study area consisted of two parcels in Pearl City, bisected by Kamehameha Highway, west of Waimano Home Road. The archaeological assessment involved background research and a limited field inspection. Background research indicated pre-contact land-use in the area included habitation and agriculture (*kula* and *lo'i*), and post-contact land-use included rice and sugar cane cultivation, as well as military activities. No historic properties were identified during the field inspection. Due to intensive post-contact use of the area, no historic properties were anticipated to be present within the subject property. Accordingly, no further cultural resources management work was recommended.

#### Yent 1985

In 1985, the Department of Land and Natural Resources (DLNR), Division of State Parks, Outdoor Recreation, and Historic Sites (Yent 1985) conducted an archaeological reconnaissance and limited subsurface testing at the former Hale Mohalu Hospital in Pearl City. The purpose of the archaeological work was to define and evaluate archaeological resources on the property as part of an Environmental Assessment and prior to the leasing of the property by DLNR. No historic properties were identified during the archaeological investigation. However, archival research indicated Land Commission Awards within the subject property, suggesting traditional Hawaiian agricultural use. It was recommended that if a construction project involving ground disturbance were proposed for the subject property, a more intensive archaeological subsurface testing program should be conducted prior to construction.

#### Groza et al. 2007

In 2007, Cultural Surveys Hawai'i Inc. (CSH) (Groza et al. 2007) completed an archaeological inventory survey of the Hale Mohalu II Project, located on a portion of the site of the former Hale Mohalu Hospital in Pearl City. Fieldwork consisted of a surface survey and the excavation of 24 backhoe trenches. One surface historic property, SIHP # 50-80-09-6918, was identified within the project area – the remains of a former World War II barracks built by the U.S. Navy in 1945. This barracks was used as a tuberculosis treatment annex at the end of World War II and leased a few years later by the Hawaiian Board of Health to treat Hansen's disease

Table 2. Previous Archaeological Investigations in the Immediate Vicinity of the Phase 2 Project Area

Reference	Nature of Study	Location	Results
Hammatt 2010	Archaeological Inventory Survey	Construction Phase 1 and Western Portion of Phase 2 of the HHCTCP	SIHP #50-80-09-7751, subsurface cultural deposit of <i>lo'i</i> sediments
Sroat et al. 2012	Archaeological Inventory Survey	Construction Phase 2 and Western Portion of Phase 3 of the HHCTCP	SIHP #50-80-09-7150; Subsurface testing noted <i>lo'i</i> sediments associated with former LCAs. Charcoal samples collected from the sediments yielded a radiocarbon date range of A.D. 1414-1480
McGerty & Spear 1995	Archaeological Assessment	Manana and Pearl City Junction Sites, Pearl City	No historic properties identified.
Yent 1985	Archaeological Reconnaissance & Limited Subsurface Testing	Hale Mohalu, Pearl City	No historic properties identified.
Groza et al. 2007	Archaeological Inventory Survey	Hale Mohalu, Pearl City	SIHP # 50-80-09-6918, former World War II barracks built by the U.S. Navy in 1945. Subsurface testing noted <i>lo'i</i> sediments associated with former LCAs. Charcoal samples collected from the sediments yielded a radiocarbon date range of A.D. 1610-1690
Sroat & McDermott 2012 (in prep.)	Archaeological Investigation	Hale Mohalu, Pearl City	Investigation of inadvertent discovery of human remains, consisting of 3 historic coffin burials (SIHP #50-80-09-7214)
Kaschko 1990	Archaeological Subsurface Survey	Loch View B Cemetery, Pearl City	Documented post-contact burials within a historic cemetery. No SIHP # assigned.

Reference	Nature of Study	Location	Results
2000 (referenced in Dega and O'Rourke 2003) & 2011 (Shikina 2011)	Archaeological Investigations	Neal Blaisdell Park, Waiau	Inadvertent discovery of human remains documented within the coastline of Neal Blaisdell Park in 2000 and 2011. SIHP #50-0812-6383, the partial remains of two individuals, was discovered along the southeastern shoreline in 2000. The discovery appeared to be associated with a cultural layer. In March 2011, the partial remains of three individuals were found within 10-14 feet of the shoreline. Investigations are ongoing.
Sinoto 1986	Archaeological Surface Survey	Pearl Promenade, Aiea	SIHP #50-80-12-9714, the O.R. & L. Railroad right-of-way.
Yent and Ota 1981	Archaeological Reconnaissance	Rainbow Bay State Park, Aiea	No historic properties identified.
Barrera 1971	Archaeological Surface Survey	Aloha Stadium, Hālawā	No historic properties identified in the subject property. Noted graves in the adjacent 'Aiea Cemetery
C&C/RTD 2008	Archaeological Resources Technical Report	HHCTCP Corridor	Documentation of 'Aiea Cemetery
Avery et al. 1994	Archaeological Monitoring	Kamehameha Highway, Hālawā	No historic properties identified

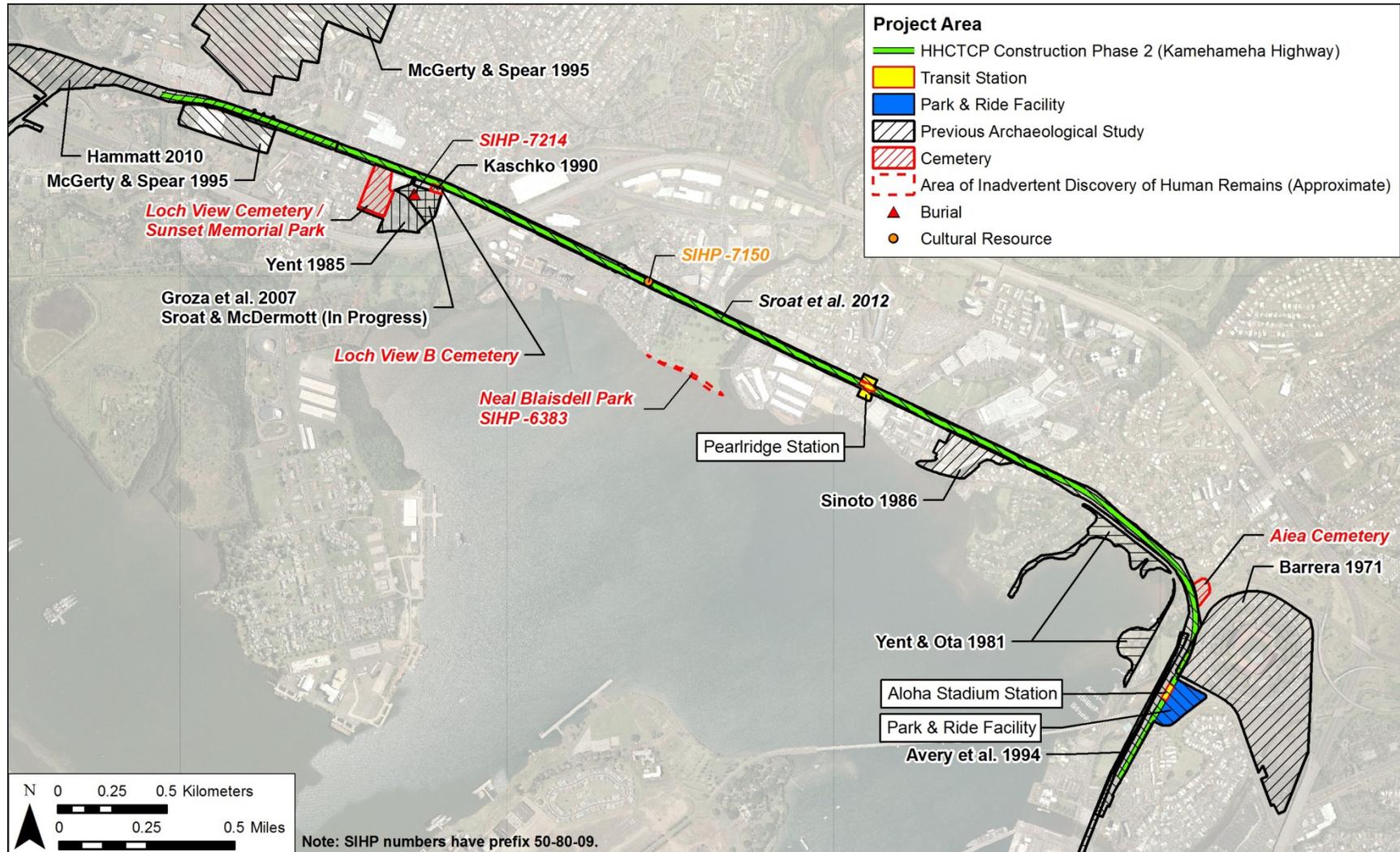


Figure 22. Aerial photograph (source: U.S. Geological Survey Orthoimagery 2005), showing the locations of previous archaeological investigations, historic cemeteries, and archaeological historic properties in the immediate vicinity of the Phase 2 project area

patients. The features associated with SIHP # 50-80-09-6918 consist of two freestanding walls at the property entrance, a rock and mortar wall around the base of a banyan tree, and concrete stairs.

The stratigraphy observed in the subject property generally consisted of thick fill deposits exhibiting extensive disturbance from prior development of the area. Of note were cultural deposits identified within former LCA boundaries. These deposits consisted of culturally enriched (via charcoal flecking) clay loam, indicative of wetland taro cultivation. Charcoal samples collected from the deposits yielded a radiocarbon date range of A.D. 1610-1690, which is completely within the pre-contact period. No SIHP number was assigned to the agricultural sediments.

#### Sroat & McDermott 2012 (in prep.)

In December of 2011, an inadvertent discovery of human skeletal remains was made during the course of water line excavations for the Hale Mohalu II Project. CSH conducted an archaeological investigation of the discovery, which documented a cluster of 3 historic wooden coffin burials, as well as the imprint of a fourth coffin. The burial cluster was designated SIHP #50-80-09-7214. A half silver dollar associated with one of the burials was dated 1905, indicating that the burial area was used at least up until 1905.

#### Kaschko 1990

In 1990, International Archaeological Research Institute, Inc. (IARII) (Kaschko 1990) conducted an archaeological subsurface survey on a parcel in Pearl City, immediately *makai* of Kamehameha Highway. Surface survey identified five intact graves with whole or partial headstones at the 'Ewa end of the property. Additionally, a number of broken headstones were observed piled in the *makai* and 'Ewa corner of the property. A majority of the headstones contained Portuguese names with dates ranging from 1900 to 1908. Backhoe excavations and subsequent hand probing identified seven burial pits containing wooden coffins within the property. All burials were left in place and the trenches were backfilled. Background research identified the parcel as the Loch View B Cemetery. It was noted that "headstones and grave outlines, etc. could have been disturbed during past construction work on Kamehameha Highway," and "one disturbed/disarticulated burial was encountered, the condition of which suggested the removal and reburial of the remains" (Kaschko (1990:3). This may indicate that burials from the cemetery extend into the Kamehameha Highway right-of-way. No SIHP number was assigned to the historic cemetery.

#### Neal Blaisdell Park 2000 and 2011

In 2000, an inadvertent discovery of human remains was made along the southeastern coast of Neal Blaisdell Park, designated SIHP #50-0812-6383. The inadvertent discovery consisted of the partial remains of two individuals which appeared to have been previously disturbed and reburied. Archaeological investigations identified an associated cultural layer; however, due to the disturbance of the burial, the archaeological context remained unclear (referenced in Dega and O'Rourke 2003).

In March of 2011, an additional inadvertent discovery of human remains within Neal Blaisdell Park was made by an area fisherman. Three human skulls and other skeletal remains

were encountered within 3-4 inches of mud approximately 10-14 feet from the shoreline. According to a preliminary analysis by archaeologists with the Naval Facilities Engineering Command, the remains are likely a traditional Hawaiian or historic era burial site (Shikina 2011). Further information regarding the results of this investigation is not available at this time.

#### Sinoto 1986

In 1986, the Bishop Museum (Sinoto 1986) conducted an archaeological surface survey for the Pearl Promenade Project, near the Pearlridge shopping center. One historic property was identified: SIHP #50-80-12-9714, the O.R. & L. Railroad right-of-way. Background research indicated that the area was traditionally utilized by Hawaiians for aquaculture (i.e. fishponds). However, surface survey revealed that the entire area was filled-in and graded, associated with historic and modern development. As the entire study area showed signs of extensive land alteration, no further cultural resource management work was recommended.

#### Yent and Ota 1981

In 1981, the DLNR Division of State Parks (Yent and Ota 1981) conducted an archaeological reconnaissance survey at Rainbow Bay State Park, along the 'Aiea Bay shoreline. No historic properties were observed, and extensive land disturbance was noted. The study did indicate the likely presence of subsurface cultural deposits associated with pre-contact land use, specifically associated with aquaculture (i.e. fishponds).

#### Barrera 1971

In 1971, the Bishop Museum (Barrera 1971) conducted an archaeological surface survey of the Aloha Stadium property in Hālawā. A number of marked and unmarked graves were observed near the housing area adjacent to the proposed stadium site. It appears that the author was likely referring to graves within the historic 'Aiea Cemetery, located immediately northwest of the Aloha Stadium property. No SIHP number was assigned to the historic cemetery. No additional archaeological resources were encountered during the investigation.

#### 'Aiea Cemetery

In 2008, CSH completed an archaeological technical report for the HHCTCP (CSH 2008). The report identified likely impacts to archaeological resources within the HHCTCP corridor. Within the Kamehameha Highway portion of the project corridor, the study identified and provided brief documentation of 'Aiea Cemetery, located on the *mauka* side of Kamehameha Highway, adjacent to the Aloha Stadium property. The following description of 'Aiea Cemetery was provided:

The approximately 1.5-acre, roughly diamond-shaped cemetery parcel is surrounded by roadways, including Kamehameha Highway and the access roads that feed traffic into Aloha Stadium and the H-1 Freeway...The cemetery is owned by the State of Hawai'i and is actively maintained, based on the recently trimmed lawn and graves with fresh flowers. A rusted, partially collapsed chain link fence marks the cemetery boundary...The graves appear to be grouped in clusters and cover nearly all of the available area within the cemetery. Grave markers are concrete, native basalts, and various non-native stones, such as granite. Most grave markers have some sort of inscription, either in the Roman

alphabet or in Japanese characters. The largest, centrally-located grave marker or monument may be inscribed with Chinese characters. The Roman inscriptions are predominantly Portuguese names with associated text in English; although in some cases the text is written in Portuguese as well. What appeared to be Anglo-American and Filipino names were also noted. The observed Roman alphabet inscriptions all marked interments between 1911 and 1948. The date on a single Japanese character inscription was tentatively translated as 1917. Based on available evidence, the cemetery's period of use was the first half of the 20th century, although the many Japanese inscriptions were not dated.

No SIHP number has been designated for the cemetery and it does not appear to have been evaluated for eligibility for either the Hawaii or National Register of Historic Places. [CSH 2008:4-28, 29]

Background research associated with the Phase 2 project area (see Section 2.2.6.1 and Section 2.2.9) indicated the cemetery was established by the Honolulu Plantation Company. The cemetery previously extended *makai* of Kamehameha Highway, but was bisected during highway construction. The burials in the *makai* portion of the cemetery were indicated to have been relocated to the *mauka* portion of the cemetery prior to highway construction.

#### Avery et al. 1994

From 1992 to 1993, Archaeological Consultants of Hawaii, Inc. (ACH) (Avery et al. 1994) monitored subsurface drilling associated with the installation of power line poles along Kamehameha Highway from Aloha Stadium to the Makalapa Gate of the Pearl Harbor Naval Base. No historic properties were identified during the archaeological monitoring. A paleoenvironmental analysis of alluvial sediments was also undertaken, indicating the possible existence of a lowland *Pritchardia* palm forest prior to Polynesian settlement.

### **2.3.2 Archaeological Research within the Phase 2 Project Area**

#### Hammatt 2010

In 2010, CSH completed an archaeological inventory survey for Construction Phase 1 and the western portion of Phase 2 of the HHCTCP, which included the portion of the project area from the Pearl Highlands Station to Waimano Home Road in Pearl City. Fieldwork involved pedestrian inspection, ground penetrating radar (GPR) survey, and subsurface testing via backhoe. Pedestrian inspection of the Phase 2 portion of the HHCTCP project area confirmed that the entire Phase 2 project area was previously disturbed by urban development. No surface cultural resources were identified. The results of GPR survey within the survey area were limited. Test excavations were made at proposed transit stations with a focus on testing areas that are planned for subsurface disturbance (i.e. elevator shafts, subsurface utilities, etc.). Test excavations were also located at selected guideway column foundation locations along the proposed elevated rail line.

Fifteen test excavations were made at the Pearl Highlands station and park-and-ride facility. In general, the stratigraphy at the Pearl Highlands station consisted of varying layers of fill to depths in excess of 3.5 m. Fill events were determined to be associated with residential and agricultural development. Natural alluvial sediments, which were expected along the margins of

Waiawa Stream, were encountered beneath the extensive fill deposits in only 3 of the test excavations. Three test excavations at planned guideway column foundation locations were made within the Phase 2 portion of the HHCTCP project area. The stratigraphy along Kamehameha Highway consisted of varying layers of fill overlying naturally deposited alluvial sediment, which was encountered at approximately 1.1 to 1.4 m below surface. No archaeological historic properties were identified in the western portion of Phase 2 project area.

#### Sroat et al. 2011

In 2011, CSH conducted an archaeological inventory survey for Construction Phase 2 along with a small western portion of the HHCTCP Construction Phase 3. Fieldwork for the Phase 2 project area began at Waimano Home Road in Pearl City along the project corridor route, which was the eastern termination of the Phase 1 AIS completed by CSH in 2010 (Hammatt 2010). The eastern margin of the Phase 2 project area is approximately 175m north of Kalaloa Street along the corridor route.

The Construction Phase 2 AIS investigation was carried out following the methods and procedures outlined in the Construction Phase 2 AIS Plan (Hammatt 2010), which was reviewed and approved by SHPD (refer to Appendix A). Fieldwork included pedestrian inspections, ground penetrating radar (GPR) survey, and subsurface testing via backhoe. Pedestrian inspections for the Phase 2 project area were conducted concurrent with the test trench layout and One-Call utility location process. Inspections found no evidence for surficial cultural deposits and confirmed that the entire Phase 2 area was previously disturbed by urban development. The GPR surveys of the project area were able to locate subsurface anomalies and provided some useful information in identifying utilities prior to excavation. Subsurface excavations included test trench sites that were based on the location of transit stations and selected guideway column foundation locations along the proposed elevated rail line.

The subsurface testing strategy followed the SHPD-approved AISP for Construction Phase 2. The selection of areas for subsurface testing for this archaeological survey was based on the location of guideway column foundations relative to the locations of commoner (*kuleana*) Land Commission Awards as indicators of areas of intensive traditional Hawaiian activity. Another factor in selection was consideration of the proximity of documented cemeteries and of landscape features, particularly streams, springs and ponds, which also would have been locales of intensive traditional Hawaiian activity. In addition, subsurface testing was focused on the Pearlridge Transit Station and the Aloha Stadium Station due to the relatively high density of subsurface impacts related to the stations' construction, and also because the stations would be problematic to re-locate owing to geographical and engineering constraints.

A total of 31 backhoe-assisted test trenches (Refer to Figure 2 in Appendix E for a trench location map) were excavated within the project area, including three trenches within the *makai* (southern) footprint of the Pearlridge Transit Station, three trenches within the central corridor of the Pearlridge Transit Station, three trenches within the footprint of the Aloha Stadium Transit Station and associated Park and Ride facility, and 22 trenches within the location or vicinity of guideway column foundations within the center portion of Kamehameha Highway (see Appendix E for stratigraphic descriptions of each trench). Two trenches proposed at the locations of guideway foundation columns (trenches E3 and E8) could not be excavated because of conflicts with numerous existing utility lines. Because the affected private landowner would not

grant right-of entry, the three proposed trenches in the *mauka* Pearlridge Station had to be moved into immediately adjacent portions of Kamehameha Highway (within proposed guideway column locations).

One historic property was identified as a result of this survey, SIHP # 50-80-09-7150. The cultural deposit consists of two silty clay strata containing organic material, yellowish-red mottling, charcoal flecking, and oxidized root tubes. These inclusions are consistent with wetland *lo'i* sediments. The results of radiocarbon dating of two samples of charcoal from SIHP #50-80-09-7150 yielded a date range of A.D. 1414-1480. Appendix H in this document contains the full historic property description for SIHP # 50-80-09-7150.

Background research (Hammatt 2010) indicated that the Construction Phase 2 project area had a long history of pre- and post-Contact land use. The research also indicated that the development of the Kamehameha Highway road corridor, with its cutting and filling, grading, roadway widening, and the installation of many utilities as part of a major utility corridor, most likely affected and potentially removed previously existing remnants of this earlier pre- and post-Contact land use. Accordingly, although it was not surprising that the sediments that make up SIHP # 50-80-09-7150 were documented preserved beneath Kamehameha Highway fill layers, it was also not surprising that these sediments represented the only archaeological historic property that was found during the AIS investigation. The fact that the SIHP -7150 cultural sediments were identified within only one test trench reflects and confirms the heavy previous disturbance of the project area associated with the construction of Kamehameha Highway and its associated subsurface utility corridor.

Nineteen archaeological test trenches were excavated within LCAs whose associated records report mid-1800s land use such as *lo'i*, as well as *kula*, fishpond, breadfruit, or houses, etc., within these parcels (see Appendix F). Within five of the 19 trenches within LCAs, obstacles such as utility lines, unstable trench side-walls containing fill with large angular cobbles and boulders, and concrete layers limited the depth of excavation (Trenches E5, E20, E21, PRS2, and PRS3). Within another seven of the 19 trenches, culturally sterile, natural B-horizon sediments were encountered, indicating that the previous A-horizon had been removed (Trenches E6, E9, E14, E15, E22, E23, and PRS1). Trenches E19 and E12 also showed previous disturbance in the form of: intermixed natural and fill sediments (E19) and a charcoal-enriched A-horizon with historic/modern inclusions (E12). Four of the 19 trenches encountered a culturally sterile A-horizon (E13), stream bank sediment (E18), a charcoal-enriched alluvium with no other indications of cultural use (E24), and an indeterminate organic layer, which due to trench collapse could not be closely analyzed (E16). SIHP # 50-80-09-7150 was documented in Trench E7 within LCA # 9385.

Of the remaining 11 trenches out of a total of 31 test trenches, the majority also evidenced moderate to heavy previous disturbance (Trenches E1, E2, E4, E17, E25-E27 and AS1-AS3), including thick, sometimes unstable, fill layers, disturbed upper boundaries of natural strata, the absence of an A-horizon, and significant road cut activity. In addition, Trench E10, located on the western bank of Waimalu Stream, identified natural estuary sediments with abundant bivalves beneath a thick layer of fill.

The archaeological survey report concluded that intensive modifications to the cultural and natural landscape within the post-contact era and in particular with the plantation era

development, the construction of Kamehameha Highway in the 1930s and 1940s, and the intensifying urban development of the latter part of the twentieth century, had severely impacted the project area (see Appendix E). This conclusion was supported by examination of the Hawai'i Department of Transportation construction drawings for the development of Kamehameha Highway, which clearly show the massive alterations to the landscape that took place as part of the building of a straight and mostly flat transportation corridor along the Pearl Harbor coastline (see Appendix G). The archaeological survey report concluded that it is likely that the once abundant cultural resources within the project area remain only as intermittent remnants beneath the highway and adjacent development.

## Section 3 Discussion of Cemeteries within the Vicinity of Construction Phase 2

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The Construction Phase 2 project area traverses through or within close proximity to several documented cemeteries or previously documented inadvertent finds, including: Loch View Cemetery/Sunset Memorial Park, Loch View B Cemetery, an un-named cemetery between the two Loch View cemeteries, the Neal Blaisdell Park inadvertent finds, an area of graves near the 'Ewa bank of Kalauao Stream, and 'Aiea Cemetery. Although no human remains were encountered within the AIS Construction Phase 2 trenches (Sroat et al. 2012) located in the vicinity of these historic and pre-contact burial grounds, the proximity of many of these sites warrants further documentation and discussion.

### 3.1 Loch View Cemeteries

Loch View Cemetery/Sunset Memorial Park and Loch View B Cemetery are located on the *makai* side of Kamehameha Highway between Waimano Home Road and Pu'u Poni Street. According to an HDOT 1938 engineering plan map of the development of Kamehameha Highway (refer to Figure 1 in Appendix G) the area of the Loch View B Cemetery is located in the previously designated "Roman Catholic Church in the Terr. of Hawaii [Owner] Cemetery". The area of the Loch View Cemetery/Sunset Memorial Park is located in the previously designated "Haw'n Cemetery Assn. Ltd. [Owner] Japanese Cemetery". A third burial ground located between these two cemeteries is described as "Haw'n Cemetery Assn. Ltd. [Owner] Cemetery". This third cemetery is no longer extant; a large commercial building and parking lot are currently located in the area.

The Loch View Cemetery ("Japanese Cemetery") was owned and operated by the Hawaiian Cemetery Association. The cemetery opened in 1900 on 17 acres of land provided by the Oahu Railway and Land Company (O.R. & L.) and was in use up until 1920. In 1930 land use reverted back to O.R. & L. in accordance with the original land deed since no interments had taken place within the previous ten years ([www.Ancestry.com](http://www.Ancestry.com)). The present-day Loch View Cemetery is located in only a portion of the original acreage. Possibly the third cemetery documented on the HDOT map, also owned by the Hawaiian Cemetery Association, made up some of the remaining acreage. It is unclear whether the 1938 development of Kamehameha Highway extended into these cemeteries; however, the HDOT map contains a figure indicating that at least the middle (third) cemetery may have been truncated by the development.

The Loch View B Cemetery (Roman Catholic cemetery) abuts the present-day Kamehameha Highway *makai* sidewalk. The area of Kamehameha Highway lies in a significant road cut with the cemetery on the *makai* side raised approximately 3 feet above the highway surface and the *mauka* house lots raised approximately 10 feet. If any previous extension of the cemetery into the roadway existed, it would have been either removed or severely impacted by development.

### 3.2 Neal Blaisdell Park

According to historic maps the area of Neal Blaisdell Park, which is located adjacent to (west of) Waimalu Stream, consisted of taro and rice fields bordered by a sandy beach up until at least 1943 (refer to Figure 17, Figure 18, Figure 19). By 1953 the area was utilized as a Naval

Reservation (refer to Figure 20). Subsequently, the land was converted into a 25.9 acre park named after former Mayor of Honolulu, Neal Shaw Blaisdell.

In 2000 (referenced in Dega and O'Rourke 2003) and 2011 (Shikina 2011), several inadvertent finds of human skeletal remains were documented along the shoreline. SIHP #50-0812-6383, discovered in 2000, consisted of the partial remains of two individuals within an associated cultural layer. Recently, in 2011, three human skulls and other skeletal remains were discovered partially exposed along the shoreline. All inadvertent finds were encountered somewhat distant from the project corridor along the shoreline. Thus, it is unlikely that project construction will have any impact on any related shoreline burials in the area.

### 3.3 Area of “Graves”

According to an HDOT 1935 engineering plan map for the development of Kamehameha Highway, an area of “Graves” (measuring approximately 9 x 10 ft) was previously located just west of Kalauao Stream (refer to Figure 4 in Appendix G). This area is currently occupied by the town-bound lanes of Kamehameha Highway and the *makai* sidewalk. It is also an area of dense subsurface utility lines. It is unknown whether the burials were relocated at the time of the 1930s highway construction; however, it is apparent that the area has undergone extensive disturbance in the form of the development and widening of Kamehameha highway and the installation of the complex of utility lines.

### 3.4 ‘Aiea Cemetery

The ‘Aiea Cemetery was established circa 1900 by the Honolulu Plantation Company as a burial grounds for the plantation community in the area. A former caretaker “estimated that as many as 3,000 people were buried at Aiea Cemetery” (Pang, *Honolulu Star Bulletin* June 12, 2002). The graveyard was originally approximately 2.5 acres located on a bluff overlooking Pearl Harbor (refer to Figure 14). During World War II, however, the military took over the *makai* section of the cemetery in order to make way for Kamehameha Highway. The *makai* section of the bluff was sheared away, creating a severe road cut. The graves within this *makai* section “were reintereed on the *mauka* side” (Pang, *Honolulu Star Bulletin* June 12, 2002). According to a long-time area resident of ‘Aiea, during the construction of the highway “all those who were being affected by the road, we had to go and get our bones or whatever was buried” (‘Aiea Oral History Project, Higuchi 2003:11). An HDOT 1933 engineering plan map of the development of Kamehameha Highway notes that 414 graves within ‘Aiea Cemetery were located within the right-of-way of the highway and also appears to outline the former extent of the cemetery (refer to Figure 6 in Appendix G).

Trench E25 of the Construction Phase 2 AIS, which was located at the base of the road cut, clearly documents the severe disturbance to the landscape in this area (refer to Figures 48 and 49 in Appendix E). Two strata of road-building episodes were underlain by a C-horizon of basalt bedrock. According to the HDOT 1933 engineering plan map, the bluff was cut and graded approximately 24 ft below the 1933 ground surface. The continued existence of any ‘Aiea Cemetery burials in this area appears unlikely.

## Section 4 Background Summary and Predictive Model

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The margins of Pearl Harbor were highly productive lands, owing to the availability of marine resources, riparian resources, well-watered bottom lands for *kalo* cultivation and other forms of agriculture, and the generally sheltered conditions. These lands responded rapidly to human endeavor, and the many fishponds, irrigation ditches, and pond-fields of the region supported a substantial pre-contact and early post-contact population. The richness of the margins of Pearl Harbor also attracted later settlement by ethnic groups throughout the early post-contact period.

During the second half of the 19<sup>th</sup> century, traditional agricultural pursuits in the Pearl Harbor area were being displaced by other agricultural interests, including commercial cultivation of rice and sugar cane. The expansion of commercial agricultural interests resulted in an extensive modification of the pre-contact landscape. The establishment of the O.R. & L. railway line along the Pearl Harbor coast in the late-1800s and U.S. military development in the Pearl Harbor region in the early-1900s contributed to increased post-contact settlement and urban development in the region. By the mid-1900s the Pearl City and 'Aiea areas had developed into modern towns, and by the 1970s, much of the Pearl Harbor area was urbanized.

There have been relatively few archaeological studies conducted in the vicinity of the current study area, as the Pearl Harbor area was developed prior to the establishment of legislation requiring cultural resource management efforts. The archaeological studies that have been conducted in the vicinity generally lack significant findings, which have been attributed to extensive disturbance from prior development activities. However, these previous archaeological studies were generally conducted on previously developed parcels adjacent to Kamehameha Highway, with little or no subsurface testing undertaken.

Based on the Construction Phase 2 archaeological survey investigation (Sroat et al. 2012) the intensive modifications to the cultural and natural landscape within the post-contact era, particularly the construction of Kamehameha Highway in the 1930s and 1940s with its associated development of adjacent lands, had severely impacted the project area. The report concluded that it is likely that the once abundant cultural resources within the project area remain only as intermittent remnants beneath the highway and adjacent development. These intermittent archaeological deposits, if preserved, would most likely be buried under substantial construction fill deposits.

Intact subsurface archaeological deposits, features, and/or human skeletal remains, relating to both pre-contact and early post-contact traditional Hawaiian habitation and agriculture, may be encountered beneath fill sediments associated with the construction of Kamehameha Highway and development of the surrounding area. Traditional Hawaiian cultural deposits or features could include: pond and *lo'i* (irrigated terrace) sediments (such as SIHP # -7150); or associated *kuāuna* (embankments) that served as boundaries of ponds or *lo'i*; and buried land surfaces containing midden, artifacts, or hearth features. The likelihood of such finds is suggested to be higher in the vicinity of known Land Commission Awards, and in close proximity to streams, springs, and the coast. Historic archaeological cultural resources, associated with post-contact habitation, commercial agricultural interests, or military development, may also be encountered within the Construction Phase 2 project area. Post-contact cultural deposits or features could include: isolated artifacts; trash pits; privies; and building foundations or other subsurface structural features.

## Section 5 Archaeological Monitoring Provisions

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In consultation among the project proponents, FTA and the City, and SHPD, it was determined that an archaeological monitoring program was warranted as an historic preservation mitigation measure for the HHCTCP Construction Phase 2 project area. According to the Construction Phase 2 AIS's historic background research and excavation results (Sroat et al. 2012), the Construction Phase 2 project area has one known archaeological historic property (SIHP # 50-80-09-7150) and the potential to contain as-yet unidentified archaeological cultural resources, potentially including burials and/or human skeletal remains. SIHP #50-80-09-7150 is described as a subsurface agricultural sediment (likely from cultivation of wetland *kalo* (taro)—buried *lo'i* (irrigated pond-field) deposit. It was determined National and Hawai'i Register eligible under significance criterion D (have yielded, or may be likely to yield, information important in prehistory or history).

Under Hawai'i State historic preservation legislation, "Archaeological monitoring may be an identification mitigation, or post-mitigation contingency measure. Monitoring shall entail the archaeological observation of, and possible intervention with, on-going activities which may adversely affect historic properties" (HAR Chapter 13-279-3). Under Hawai'i State historic preservation review legislation, there are five potential forms of historic preservation mitigation: A) Preservation; B) Architectural Recordation; C) Archaeological Data Recovery (which includes archaeological monitoring); D) Historical Data Recovery; and E) Ethnographic Documentation (HAR Chapter 13-275-8).

The proposed monitoring program will serve as a mitigation measure that facilitates identification, proper documentation, and treatment decisions should previously unidentified archaeological cultural resources, including burials, be encountered. If encountered and if appropriate, these previously unknown archaeological cultural resources will be treated as "post-review discoveries" under 36 CFR 800.13 and HAR Chapter 13-280 ("Procedures for Inadvertent Discoveries During a Project Covered by the Historic Preservation Review Process"). Inadvertent discoveries of human skeletal remains will follow the procedures outlined in Hawaii State burial law (HAR Chapter 13-300-40). Because the project does not involve federal or tribal (Department of Hawaiian Homelands) property, the Native American Graves Protection and Repatriation Act (NAGPRA) will not apply for potentially Native Hawaiian inadvertent burial discoveries.

The monitoring program will also provide the opportunity for archaeological data recovery to gather additional information regarding the Construction Phase 2 project area's previously documented archaeological historic property (SIHP #50-80-09-7150). The archaeological monitoring program will provide an opportunity to study and record, collect samples, and perform detailed sample analysis that may further refine the characteristics, function, age of use, and geographic extent of SIHP #50-80-09-7150.

Based on background research and the results of the Construction Phase 2 AIS investigation, CSH recommends that Construction Phase 2 construction proceed under an archaeological monitoring program with both on-call and on-site components. On-site archaeological monitoring is recommended for four more sensitive areas located in the vicinity of LCA clusters,

documented cemeteries, and SIHP #50-80-09-7150 (Figure 23 and compare to Figure 22). From west to east, the four areas are:

- 1) an area in the vicinity of Loch View B Cemetery and extending westwards in the vicinity of a previously documented "Cemetery" (see Appendix G);
- 2) a portion of the area between Kuleana Road and Ka'ahumanu Street surrounding the location of SIHP #50-80-09-7150;
- 3) the entire area between Kanuku Street and Kahale Street, including all construction related to the Pearlridge Station and encompassing both sides of Kalauao Stream; and
- 4) from the location of Dixie Grill to just past the Moanalua Freeway overpass encompassing numerous LCAs and the area of the previously removed *makai* section of the 'Aiea Cemetery.

For the on-site monitoring areas listed above, an archaeological monitor will be present during all ground disturbance activities that extend two feet (60 cm) below the current (pre-construction) land surface. This two foot (60 cm) depth threshold for archaeological monitoring is warranted based on the excavation results from the 31 test trenches in the Construction Phase 2 AIS. In these trenches the average depth of natural sediments (below historic fill sediments associated with Kamehameha Highway and related construction/development) was 4.6 feet (140 cm). The three trenches where natural sediments were observed higher than 2 feet (60 cm) below the current land surface (refer to Appendix E: Trenches E4, AS2 and AS3) are located in areas of much reduced archaeological sensitivity, based on background research and test excavation results. These three trenches (E4, AS2, and AS3) are not located in the on-site monitoring areas (Compare Figure 23 with Appendix E Figure 2).

On-call archaeological monitoring with weekly spot checks is recommended for the remaining sections of the Construction Phase 2 project area. An archaeological monitor may be called-in by the contractor at any time to monitor an excavation between spot checks within the on-call areas. Based on discoveries or observations, areas of on-call monitoring can become on-site monitoring areas as appropriate.

Changes from this combination monitoring program of full-time, on-site and on-call monitoring will only be made following consultation with and concurrence from SHPD.

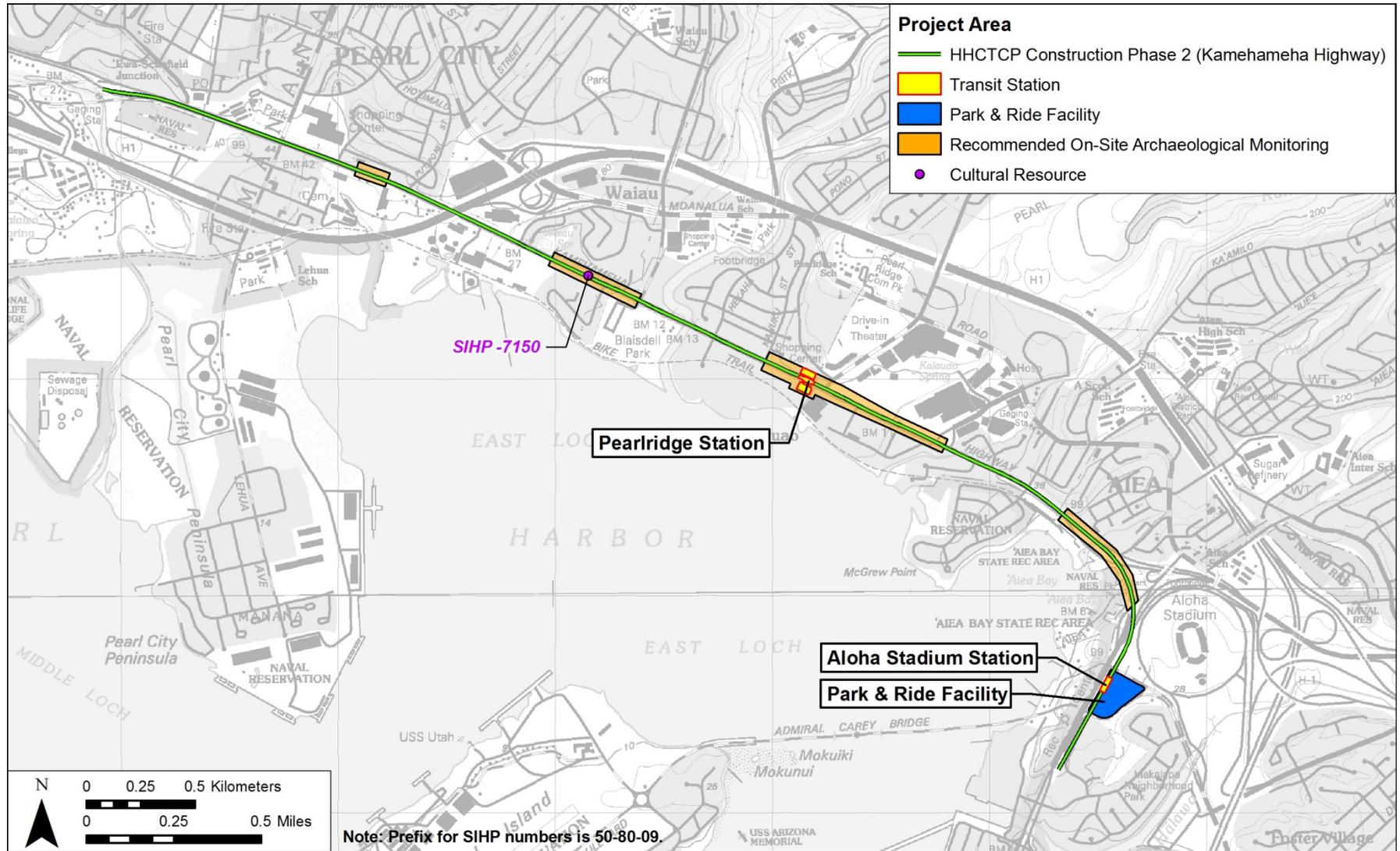


Figure 23. Areas within HHCTCP Construction Phase 2 recommended for on-site archaeological monitoring

Hawai'i State historic preservation legislation governing archeological monitoring programs requires that each monitoring plan discuss eight specific items (HAR Chapter 13-279-4). Additionally, SHPD has asked that monitoring plans also include a brief discussion of research questions and goals that may be addressed by an archaeological monitoring program. The nine monitoring provisions below address these requirements in terms of the archaeological monitoring for the construction within the project area.

1. Anticipated Historic Properties:

Based on background research and previous archaeological studies conducted within the current project area, historic properties (i.e., archaeological sites) in the form of pre- and post-contact subsurface cultural deposits may be encountered during archaeological monitoring of ground disturbance within the project area.

Evidence of indigenous Hawaiian land use could include subsurface cultural deposits containing midden and artifacts, and human burials. Evidence of post-contact land use could include subsurface cultural deposits in the form of trash pits, privies, building foundations, and human burials.

2. Locations of Historic Properties:

Based on Construction Phase 2 AIS results, including background research and subsurface testing, archaeological cultural resources/historic properties are more likely to be found in the areas designated for on-site archaeological monitoring on Figure 23. AIS testing results indicated that significant archaeological cultural deposits (e.g. archaeological cultural resources eligible for listing on the Hawaii and/or National Register) would be found below 2 feet (60 cm) below the current (pre-construction) land surface.

3. Fieldwork:

On-site archaeological monitoring is recommended for four discrete sections within the Construction Phase 2 project area where project-related ground disturbance will exceed two feet (60 cm) below the current (preconstruction) ground surface (see discussion above). The remaining portions of the project area are recommended for on-call monitoring with weekly spot-checks.

The monitoring fieldwork may encompass the documentation of subsurface archaeological deposits (e.g., trash pits and structural remnants) and will employ current standard archaeological recording techniques. This will include drawing and recording the stratigraphy of excavation profiles where cultural features or artifacts are exposed as well as representative profiles. These exposures will be photographed, located on project area maps, and sampled. Photographs and representative profiles of excavations will be taken even if no historically-significant sites are documented. As appropriate, sampling will include the collection of representative artifacts, bulk sediment samples, and/or the on-site screening of measured volumes of feature fill to determine feature contents.

If human remains are identified, no further work will take place, including no screening of back dirt, no cleaning and/or excavation of the burial area, and no exploratory work of

any kind unless specifically requested by the SHPD/DLNR. All human skeletal remains that are encountered during construction will be handled in compliance with HRS Chapter 6E-43 and HAR Chapter 13-300 and in consultation with the SHPD/DLNR.

Included with this plan are various archaeological and historical documentary resources to assist the archaeological monitors in the field, consisting of: AIS trench descriptions (Appendix E), aerial photographs showing the locations of AIS test trenches in relation to LCAs (Appendix F), Hawai'i Department of Transportation As-Built maps of the construction of Kamehameha Highway showing early 20<sup>th</sup> century historic and landscape features (Appendix G), and a historic property description for SIHP #50-80-09-7150 (Appendix H).

4. Archaeologist's Role:

The on-site archaeologist will have the authority to stop work immediately in the area of any findings so that documentation can proceed and appropriate treatment can be determined. In addition, the archaeologist will have the authority to slow and/or suspend construction activities in order to insure that the necessary archaeological sampling and recording can take place.

5. Coordination Meeting:

Before work commences on the project, the on-site archaeologist shall hold a coordination meeting to orient the construction managers and crew to the requirements of the archaeological monitoring program. At this meeting the monitor will emphasize his or her authority to temporarily halt construction and that all historic finds, including objects such as bottles, are the property of the landowner and may not be removed from the construction site.

6. Laboratory work:

Laboratory work will be conducted in accordance with HAR 13-279-5(6). Laboratory analysis of non-burial related finds will be tabulated into table form and standard artifact and midden recording will be conducted as follows: artifacts will be documented as to provenience, weight, length, width, type of material, and presumed function. Photographs of representative artifacts will be taken for inclusion into the archaeological monitoring report. Bone and shell midden materials will be sorted down to species, when possible, and then tabulated by provenience.

As appropriate, collected charcoal material obtained within intact cultural deposits will be analyzed for species identification. Charcoal samples ideal for dating analyses will be sent to Beta Analytic, Inc. for radiocarbon dating. If appropriate, artifacts may be sent to the University of Hawai'i-Hilo Geoarchaeology Lab for Energy-Dispersive X-Ray Fluorescence analysis in order to identify and possibly geographically locate the source material. All analyzed samples, provenience information, and results will be presented in table form within the archaeological monitoring report.

## 7. Report Preparation:

One of the primary objectives of the report will be to present a stratigraphic overview of the project area which will allow for predictive assessments of adjacent properties, which may be the subject of future development. The report will contain a section on stratigraphy, description of archaeological findings, monitoring methods, and results of laboratory analyses. The report will address the requirements of a monitoring report (HAR section 13-279-5). Photographs of excavations will be included in the monitoring report even if no significant archaeological sites/features/deposits are documented. Should burial treatment be completed as part of the monitoring effort, a summary of this treatment will be included in the monitoring report. Should burials and/or human remains be identified, additional letters, memos, and/or reports may be requested by the SHPD Burial Sites Program.

## 8. Archiving Materials:

All burial materials and/or human skeletal remains will be addressed as directed by the SHPD, following Hawai'i State burial law (HRS Chapter 6E-43 and HAR Chapter 13-300). In compliance with the Project's Programmatic Agreement, Stipulation III.F "Curation," the City will curate recovered materials in accordance with applicable laws, including HAR Chapter 13-278 and 36 C.F.R. 79. The City is currently developing a curation program and seeking a curation facility that will meet these requirements. Until these curation measures are in place, all collected materials and associated records generated by the HHCTCP Phase 2 AIS fieldwork will be temporarily curated at CSH's main O'ahu office in Waimānalo.

## 9. Research Objectives:

Relative to many other portions of O'ahu's south shore, the Construction Phase 2 project area has experienced little previous archaeological study. This monitoring program will provide an opportunity to document this area in greater detail and attain a better understanding of pre-Contact and post-Contact archaeological deposits that remain within this coastal region. General research questions that may be explored during this monitoring program include:

- a. What were pre-contact environmental conditions like in this region and how might they have changed through time or been impacted by human activity? Should appropriate desposts be encountered that could potentially inform on past environmental conditions (for example low-energy alluvial sediments that deposited over time) sediment samples will be collected and detailed sample analysis will be made (e.g. radiocarbon dating, charcoal speciation, pollen identification).
- b. Other than SIHP- 7150, are there other remnants of the once extensive pre-Contact and historic pondfield (*lo 'i*) agricultural system that was once extent through portions of the project area? Feature types that could be found include pondfield berms, and irrigation features (*'auwai*).

- c. Are pre-Contact and post-Contact habitation remnants preserved in the project area, and if so, are they distributed in a similar manner within the project area?
- d. Are burials associated with the adjacent historic cemeteries extent within the project area?

The Construction Phase 2 monitoring program may also provide the opportunity to gather additional information regarding SIHP # 50-80-09-7150, an historic property consisting of pondfield (*lo'i*) sediments. Potential research questions to be answered by further documentation of SIHP # 50-80-09-7150 include:

- a) When was the initial development of the irrigated taro fields in the vicinity and what was their history of use;
- b) Do the culturally modified/used, low energy alluvial sedimentary deposits that make up the SIHP # -7150 deposits preserve an environmental record, and if so, what does it tell us about changing environment and land use.
- c) Are there structural remains of the pondfield system preserved in the vicinity? What do these tell us about the use of SIHP #-7150?

Depending on the exposures of SIHP # 50-80-09-7150 that are available for further study during the monitoring program, additional investigation at SIHP # -7150 may consist of:

- 1) Documented stratigraphic profiles showing pondfield system structural remnants;
- 2) Collection of dateable organic material from specific cultural features (berms etc.) that may help better define the pondfield system's use-history.
- 3) Collection of midden and/or artifacts associated with SIHP # 50-80-09-7150 that may better define the age and specific function(s) of the site (presumed to include taro cultivation, but possibly including other cultivars);
- 4) Collection of bulk sediment samples for more detailed sample analysis, including radiocarbon dating, charcoal speciation, pollen analysis, and taro root tubule quantification.
- 5) Collection of columns of sediment samples for detailed sample analysis—specifically to address environmental and/or land use change over time.

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# Appendix A SHPD Acceptance of AISP Construction Phase 2

 <p>LINDA LINGLE GOVERNOR OF HAWAII</p>		<p>LAURA H. THIELEN CHAIRPERSON BOARD OF LAND AND NATURAL RESOURCES COMMISSION ON WATER RESOURCE MANAGEMENT</p> <p>RUSSELL Y. TSUJI FIRST DEPUTY</p> <p>KEN C. KAWAHARA DEPUTY DIRECTOR - WATER</p> <p>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 KAOLOLAWA ISLAND RESERVE COMMISSION LANDS STATE PARKS</p>
<p>May 7, 2010</p>	<p>STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES STATE HISTORIC PRESERVATION DIVISION 601 KAMOKILA BOULEVARD, ROOM 555 KAPOLEI, HAWAII 96707</p>	<p>LOG NO: 2010.1748 DOC NO: 1005NM14 Archaeology</p>
<p>Mr. Matt McDermott Cultural Surveys Hawai'i P. O. Box 1114 Kailua, Hawai'i 96736</p>		
<p>Dear Mr. McDermott:</p>		
<p><b>SUBJECT: Section 106 National Historic Preservation Act (NHPA) Review Archaeological Inventory Survey Plan-- For Construction Phase II of the Honolulu High-Capacity Transit Corridor Project, Waiawa, Manana, Waimano, Waiiau, Waimalu, Kalauao, 'Aiea and Halawa Ahupua'a, 'Ewa District, O'ahu, Hawai'i TMK: (1) 9-7, 9-8, 9-9 (Various Plats and Parcels)</b></p>		
<p>Thank you for providing us the opportunity to review this Archaeological Inventory Survey Plan (AISP), (<i>Archaeological Inventory Survey Plan For Construction Phase II of the Honolulu High-Capacity Transit Corridor Project, Waiawa, Manana, Waimano, Waiiau, Waimalu, Kalauao, 'Aiea and Halawa Ahupua'a, 'Ewa District, O'ahu, Hawai'i TMK: (1) 9-7, 9-8, 9-9 (Various Plats and Parcels)</i>)[Hammatt and Shideler MA, March 2009]) which we received on April 7, 2010.</p>		
<p>The transit corridor is a very complex project which includes stations, park-and-ride facilities, and piers and requires flexibility on the part of archaeological contractors in inventorying historic properties. Due to geography, urban settlement, previous archaeological work, or the lack thereof, and the non-sensitive and sensitive archaeological areas, the approach was to split the project area in construction phases. All aspects of the archaeological inventory survey were developed around these distinct loci.</p>		
<p>Archaeological survey techniques to be employed are driven by the necessity to determine historic properties subsurface in areas of sensitivity. Additionally, these techniques will also confirm the lack of properties in areas not sensitive. These techniques include test trenching, Ground Penetrating Radar (GPR) and limited areal excavations. We agree that these methods will adequately document historic properties that, if significant and with further consultation with this office, be investigated in a mitigation phase.</p>		
<p>At the Oahu Island Burial Council Meeting on May 13, 2010, the AISP was presented and no specific comments or revisions were made. The OIBC did suggest that some literature on the chants be included in the background section of the final report.</p>		
<p>This AISP is accepted and meets the minimum standards for compliance under Hawai'i administrative Rules.</p>		
<p>We are in receipt of a hardcopy of this document, which we will mark as FINAL. Please send text-searchable PDF version on CD along with a copy of this review letter to the attention of Wendy Tolleson and "SHPD Library" at the Kapolei SHPD office.</p>		
<p>Please contact me at (808) 692-8015 if you have any questions or concerns regarding this letter.</p>		

Matt McDermott  
Page 2

Aloha,



Nancy A. McMahon (Deputy SHPO)  
State Historic Preservation Officer

# Appendix B SHPD Acceptance of AISP Construction Phase 1

 <p>LINDA LINGLE GOVERNOR OF HAWAII</p>		<p>LAURA H. TRIELEN CHAIRPERSON BOARD OF LAND AND NATURAL RESOURCES COMMISSION ON WATER RESOURCE MANAGEMENT</p> <p>RUSSELL Y. TSUJI FIRST DEPUTY</p> <p>KEN C. KAWAHARA DEPUTY DIRECTOR - WATER</p> <p>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</p>
<p align="center"><b>STATE OF HAWAII</b> <b>DEPARTMENT OF LAND AND NATURAL RESOURCES</b> STATE HISTORIC PRESERVATION DIVISION 601 KAMOKILA BOULEVARD, ROOM 555 KAPOLEI, HAWAII 96707</p>		
<p>March 16, 2009</p>		
<p>Mr. David Shideler Cultural Surveys Hawai'i P. O. Box 1114 Kailua, Hawai'i 96736</p>	<p>LOG NO: 2009.1325 DOC NO: 0903WT115 Archaeology</p>	
<p>Dear Mr. Shideler:</p>		
<p><b>SUBJECT: Section 106 National Historic Preservation Act (NHPA) Review Archaeological Inventory Survey Plan-- For Construction Phase I of the Honolulu High-Capacity Transit Corridor Project, Station 392+00 (Near East Kapolei Station) to Station 776+00 (Near Waimano Home Road), Hono'uli'uli, Hō'ae'ae, Waikēle, Waipi'o, and Waiawa Ahupua'a, 'Ewa District, O'ahu, Hawai'i TMK: (1) 0-1, 9-4, 9-5, 9-6, 9-7 (Various Plats and Parcels)</b></p>		
<p>Thank you for providing us the opportunity to review this Archaeological Monitoring Plan (AMP), (<i>Archaeological Inventory Survey Plan For Construction Phase I of the Honolulu High-Capacity Transit Corridor Project, Station 392+00 (Near East Kapolei Station) to Station 776+00 (Near Waimano Home Road), Hono'uli'uli, Hō'ae'ae, Waikēle, Waipi'o, and Waiawa Ahupua'a, 'Ewa District, O'ahu, Hawai'i TMK: (1) 0-1, 9-4, 9-5, 9-6, 9-7 (Various Plats and Parcels)[Hammatt and Shideler MA, March 2009]</i>) which we received on March 10, 2009.</p>		
<p>The transit corridor is a very complex project which includes stations, park-and-ride facilities, and piers and requires flexibility on the part of archaeological contractors in inventorying historic properties. Due to geography, urban settlement, previous archaeological work, or the lack thereof, and the non-sensitive and sensitive archaeological areas, the approach was to split the project area in to western and eastern sections with Kunia Road being the arbitrary dividing line. All aspects of the archaeological inventory survey were developed around these distinct loci.</p>		
<p>Archaeological survey techniques to be employed are driven by the necessity to determine historic properties subsurface in areas of sensitivity. Additionally, these techniques will also confirm the lack of properties in areas not sensitive. This is an efficient and cost reducing methodology. These include test trenching, Ground Penetrating Radar (GPR) and limited areal excavations. We agree that these methods will adequately document historic properties that, if significant and with further consultation with this office, be investigated in a data recovery phase. Another measure to mitigate possible effects to historic properties, especially human burials, would be the development of a monitoring plan to address the results of this inventory survey and/or data recovery studies.</p>		
<p>This AISP is accepted and meets the minimum standards for compliance under Hawai'i administrative Rules.</p>		

Dr. David Shideler  
Page 2

We are in receipt of a hardcopy of this document, which we will mark as FINAL. Please send text-searchable PDF version on CD along with a copy of this review letter to the attention of Wendy Tolleson and "SHPD Library" at the Kapolei SHPD office.

Please contact Wendy Tolleson at (808) 692-8024 if you have any questions or concerns regarding this letter.

Aloha,



Nancy A. McMahon (Deputy SHPO)  
State Historic Preservation Officer

# Appendix C SHPD Acceptance of AIS Report for Construction Phase 1

 <p>LINDA LINGLE GOVERNOR OF HAWAII</p>		<p>LAURA H. THELEN CHAIRPERSON BOARD OF LAND AND NATURAL RESOURCES COMMISSION ON WATER RESOURCE MANAGEMENT</p> <p>RUSSELL Y. TSUJI FIRST DEPUTY</p> <p>KEN C. KAWAHARA DEPUTY DIRECTOR - WATER</p> <p>AQUATIC RESOURCES BOATING AND OCEAN RECREATION BUREAU OF CONSERVANCIES COMMISSION ON WATER RESOURCE MANAGEMENT CONSERVATION AND COASTAL LANDS CONSERVATION AND RESOURCE ENFORCEMENT ENGINEERING FORESTRY AND WILDLIFE HISTORIC PRESERVATION KAOHOLAWE ISLAND RESERVE COMMISSION LAND STATE PARKS</p>
<p>STATE OF HAWAII DEPARTMENT OF LAND AND NATURAL RESOURCES</p>		
<p>STATE HISTORIC PRESERVATION DIVISION 601 KAMOKILA BOULEVARD, ROOM 555 KAPOLEI, HAWAII 96707</p>		
<p>April 19, 2010</p>	<p>Dr. Hal Hammatt Cultural Surveys Hawai'i P. O. Box 1114 Kailua, Hawai'i 96736</p>	<p>LOG NO: 2010.1749 DOC NO: 1004MV01 Archaeology</p>
<p>Dear Dr. Hammatt:</p>		
<p><b>SUBJECT: Section 106 National Historic Preservation Act (NHPA) Review Revised Draft Archaeological Inventory Survey For Construction Phase I of the Honolulu High-Capacity Transit Corridor Project, Hono'uli'uli, Hō'ae'ae, Waikele, Waipi'o, and Waiawa Ahupua'a, 'Ewa District, O'ahu, Hawai'i TMK: (1) 9-1, 9-4, 9-6, 9-7 (Various Plats and Parcels)</b></p>		
<p>Thank you for providing us the opportunity to review this Archaeological Inventory Survey (AIS), (Revised Draft <i>Archaeological Inventory Survey For Construction Phase I of the Honolulu High-Capacity Transit Corridor Project, Hono'uli'uli, Hō'ae'ae, Waikele, Waipi'o, and Waiawa Ahupua'a, 'Ewa District, O'ahu, Hawai'i TMK: (1) 9-1, 9-4, 9-6, 9-7 (Various Plats and Parcels)</i>[Hammatt, Ph.D, CSH, February 2010]).</p>		
<p>The transit corridor, Phase 1 included 156 acres; the APE was 75 acres for direct surface disturbance. Field work was conducted for approximately 125 days. Field work was conducted from August 5 through October 14, 2009. A pedestrian survey was conducted for a 100% of the APE 7.4 miles corridor. The total length of the survey, 6.8 miles of Phase I and 0.6 miles of the western most Phase II (7.4 miles total) has been clarified and the distinction between backhoe trenches and column excavations has been made.</p>		
<p>One historic site was identified 50-80-09-7751, a subsurface cultural deposit (lo'i sediments). This site dates from AD 990-1190. Site #7751 is significant under criteria D. In addition, we support the change in mitigating action for SIHP # 50-80-09-7751 from monitoring to data recovery, and we will look forward to the opportunity to review your investigation of the subsurface agricultural sediment.</p>		
<p>We believe that the changes made to the document are sufficient. Please resubmit a copy of this report, marked "FINAL," along with a copy of this review letter and a text-searchable PDF version on CD to the attention of the "SHPD Library" at the Kapolei SHPD office.</p>		
<p>Please contact Mike Vitousek at (808) 692-8015 if you have any questions or concerns regarding this letter.</p>		
<p>Aloha,  Nancy A. McMahon (Deputy SHPO) State Historic Preservation Officer</p>		

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## **Appendix D SHPD Acceptance of AIS Report for Construction Phase 2**

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\*NOTE: The Archaeological Inventory Survey report for Construction Phase 2 is currently under SHPD review. This appendix will be added upon SHPD approval of the Phase 2 AIS report.

# Appendix E AIS Construction Phase 2 Trench Descriptions

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## 1. Trench E1

Trench E1 is located along Kamehameha Highway on the east side of the Pu'u Momi Street intersection. The trench is near the northern boundary of Land Commission Award (LCA) #5662:1. Land use for this LCA is described as *lo'i* and *kula*.



Figure 1. Photograph of the south wall stratigraphy of Trench E1, view southeast

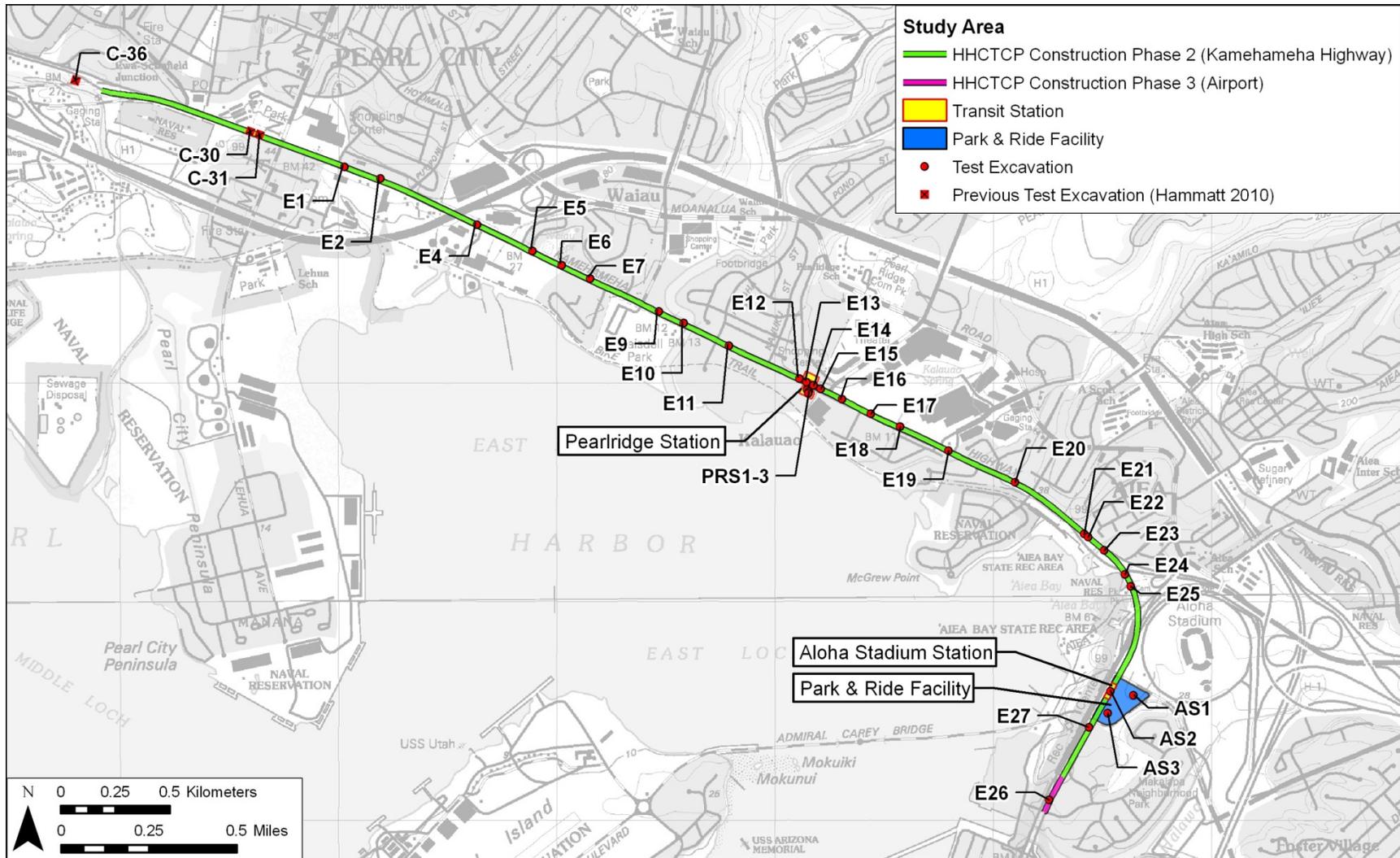


Figure 2. Location of test excavations within Construction Phase 2; Trenches E1-E27, Trenches PRS1-PRS3, and Trenches AS1-AS3

Archaeological Monitoring Plan, HHCTCP Construction Phase 2, Waiawa, Mānana, Waimano, Waiaua, Waimalu, Kalauao, ‘Aiea, and Hālawā Ahupua‘a, ‘Ewa District, Island of O‘ahu

TMK[1] 9-7, 9-8, and 9-9 (Various Plats and Parcels)

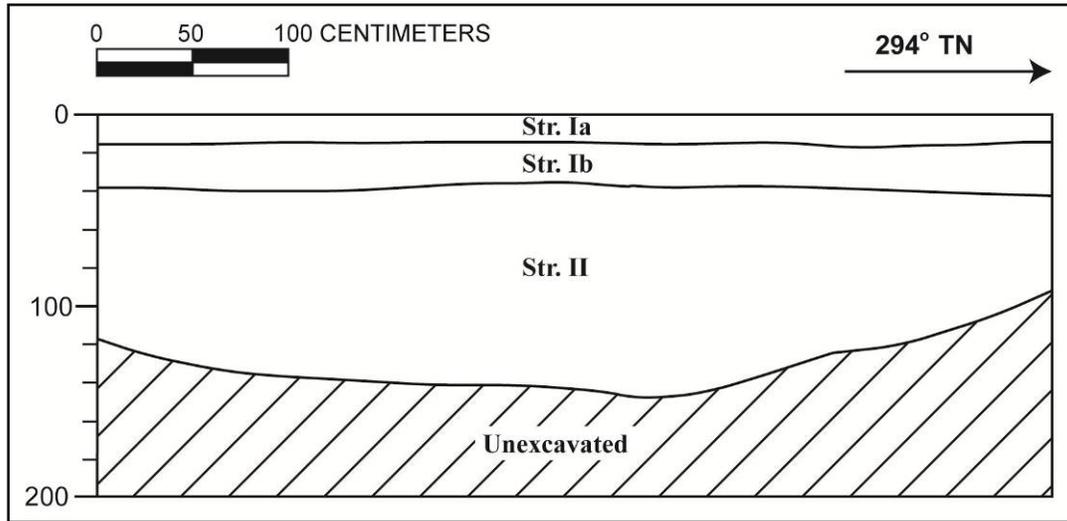


Figure 3. Profile of the south wall of Trench E1

Table 1. Stratigraphic Description for Trench E1

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-15	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	15-40	Fill; basalt gravel base course; clear, smooth lower boundary
II	35-149 (BOE)	Fill; 5 YR 3/4 (dark reddish brown); gravelly clay loam; weak, fine, crumb structure; dry, weakly coherent consistency; non-plastic; terrigenous origin; lower boundary not visible; no roots; contains concrete and basalt cobbles

**2. Trench E2**

Trench E2 is located along Kamehameha Highway immediately north of Loch View B Cemetery .



Figure 4. Photograph of the north wall of Trench E2, with fuel line visible in the center of the trench floor

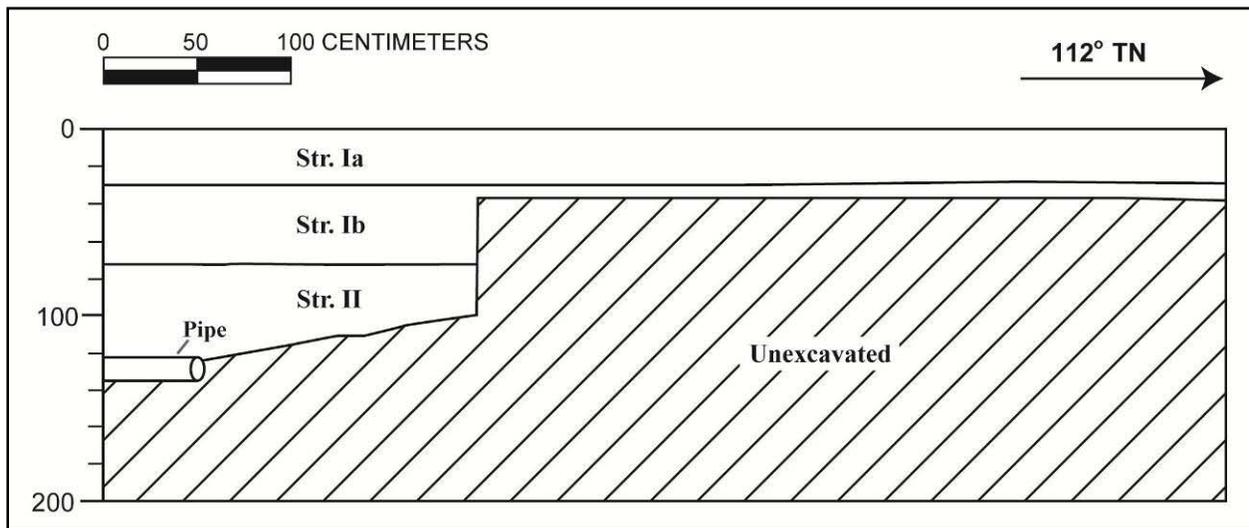


Figure 5. Profile of the north wall of Trench E2

Table 2. Stratigraphic Description for Trench E2

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-30	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	30-72	Fill; gravelly silty clay base course; clear, smooth lower boundary
II	72-124 (BOE)	Fill; 7.5 YR 3/3 (dark brown); silty clay loam; moderate, medium, crumb structure; moist, very friable consistency; slightly plastic; terrigenous and marine origin; lower boundary not visible; no roots; contains fragmentary pearl shells; likely fill imported from nearby coastal area

### 3. Trench E4

Trench E4 is located along Kamehameha Highway east of the H-1 Freeway overpass, midway between Pu'u Poni Street to the west and Kuleana Road to the east. The trench is near the northern boundary of LCA #9328:1. Land use for this LCA is documented as *lo'i* and *kula*.

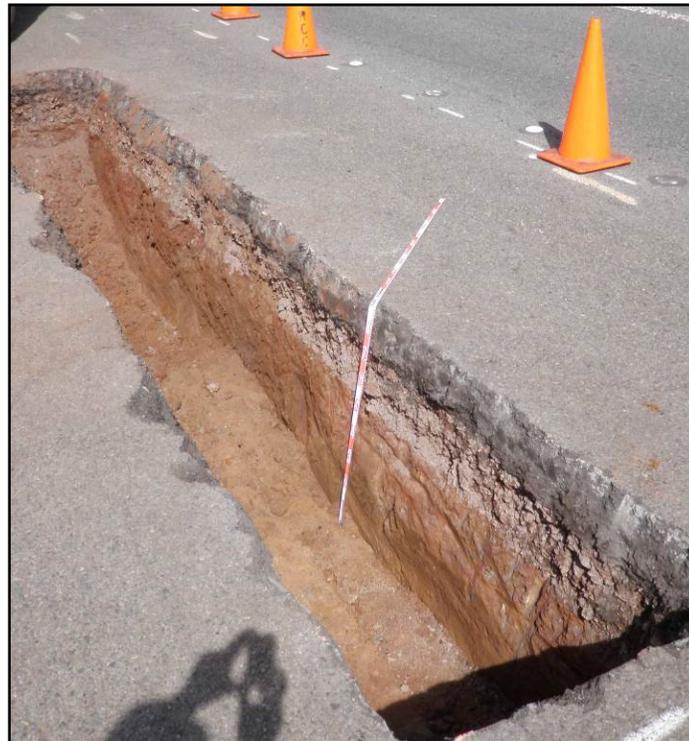


Figure 6. Photograph of the north profile wall of Trench E4

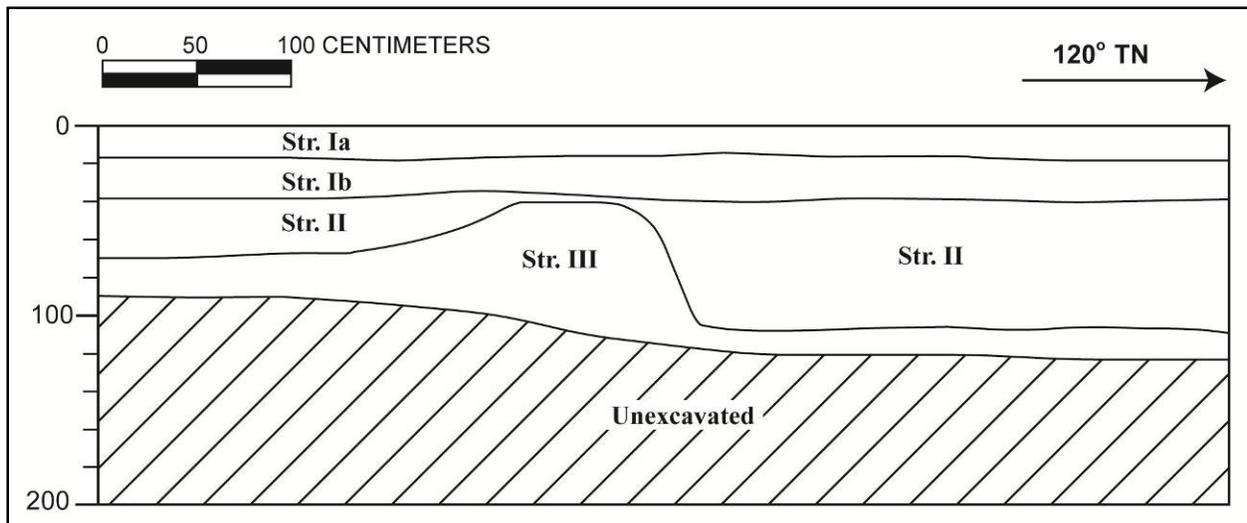


Figure 7. Profile of the north wall of Trench E4

Table 3. Stratigraphic Description for Trench E4

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-18	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	18-40	Fill; basalt gravel base course; clear, smooth lower boundary
II	38-108	Natural; 5 YR 3/4 (dark reddish brown); silty clay; weak, fine, crumb structure; moist, friable consistency; plastic; terrigenous origin; abrupt, wavy lower boundary; no roots
III	40-120 (BOE)	Natural C-Horizon; 10YR 3/4 (dark yellowish brown); gravelly clay; strong, coarse, blocky structure; dry, hard consistency; non-plastic; terrigenous; lower boundary not visible; no roots; natural decomposing basalt

**4. Trench E5**

Trench E5 is located along Kamehameha Highway east of Kuleana Road. The trench is within the former boundary for LCA #9369:2. Land use for this LCA is documented as *lo'i* and *kula*.



Figure 8. Photograph of the north wall of Trench E5, view to the north

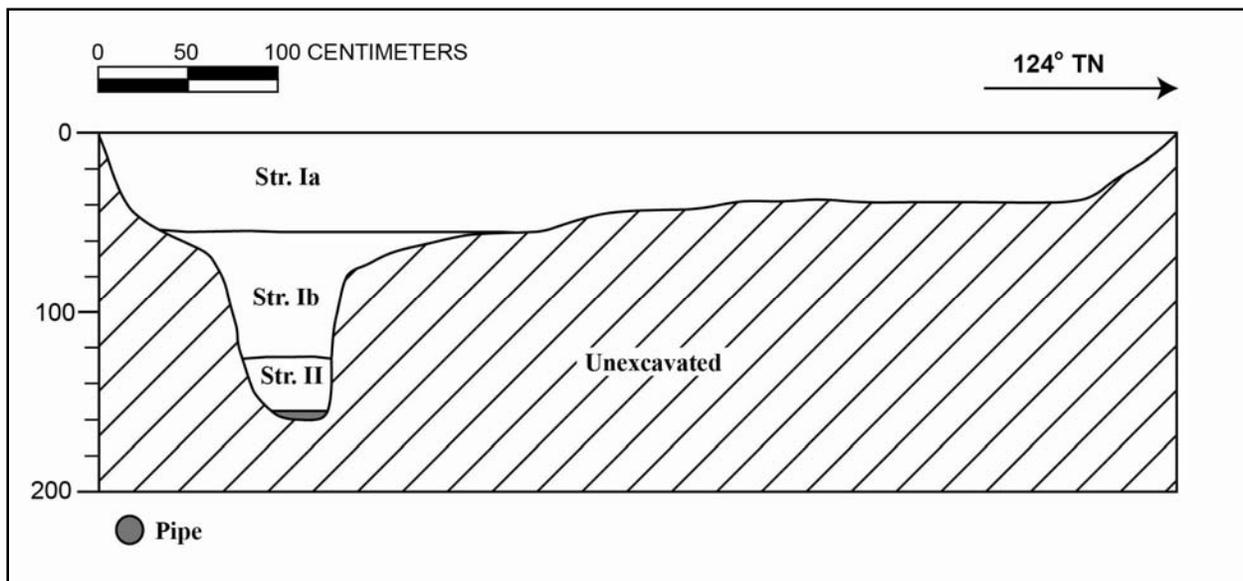


Figure 9. Profile of the north wall of Trench E5

Table 4. Stratigraphic Description for Trench E5

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-55	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	55-125	Fill; very gravelly silt loam base course; clear smooth lower boundary
II	125-160 (BOE)	Fill; 2.5 YR 3/4 (dark reddish brown); gravelly silty clay; weak, fine, crumb structure; moist, friable consistency; slightly plastic; terrigenous origin; lower boundary not visible; no roots; fill associated with a gas line

### 5. Trench E6

Trench E6 is located along Kamehameha Highway east of Kuleana Road and west of Ka'ahumanu Street. The trench is south of Zippy's parking lot. The trench is within the former boundaries of LCA #9410 and 9409. Land uses for these LCA's are documented as *lo'i* and *kula*.



Figure 10. Photograph of the south wall of Trench E6, view to the southeast

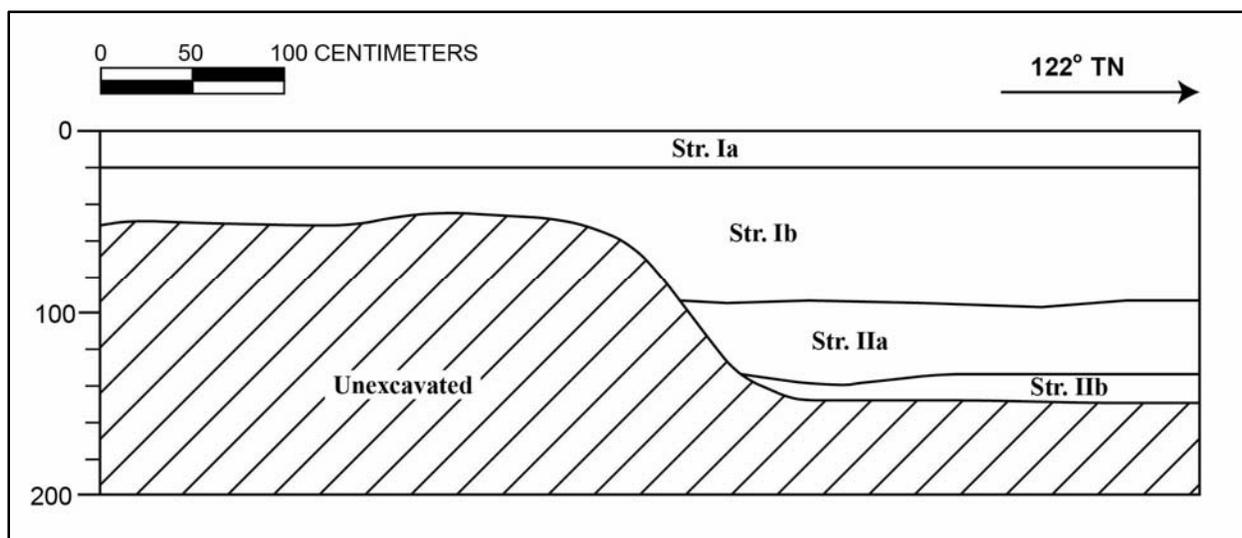


Figure 11. Profile of the south wall of Trench E6

Table 5. Stratigraphic Description for Trench E6

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-20	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	20-95	Fill; basalt gravel base course; abrupt, smooth lower boundary
IIa	95-133	Fill; 5 YR 3/4 (dark reddish brown); silty clay loam; structureless, massive; moist, very friable consistency; plastic; terrigenous origin; abrupt, smooth lower boundary; no roots
IIb	133-150 (BOE)	Likely Fill; 10 YR 3/4 (yellowish brown); gravelly clay; moderate, coarse, blocky structure; dry, hard consistency; non-plastic; terrigenous origin; lower boundary not visible; no roots; natural decomposing basalt

## 6. Trench E7

Trench E7 is located along Kamehameha Highway midway between Kuleana Road and Ka'ahumanu Street. The trench is situated within the former boundary of LCA #9385. Land use for this LCA is documented as *lo'i*.

Strata IIIa and IIIb were consistent with wetland irrigated *lo'i* sediment and were designated a cultural resource layer, SIHP #50-80-09-7150. Stratum IV appeared to be unmodified natural stratigraphy, the result of natural weathering action.

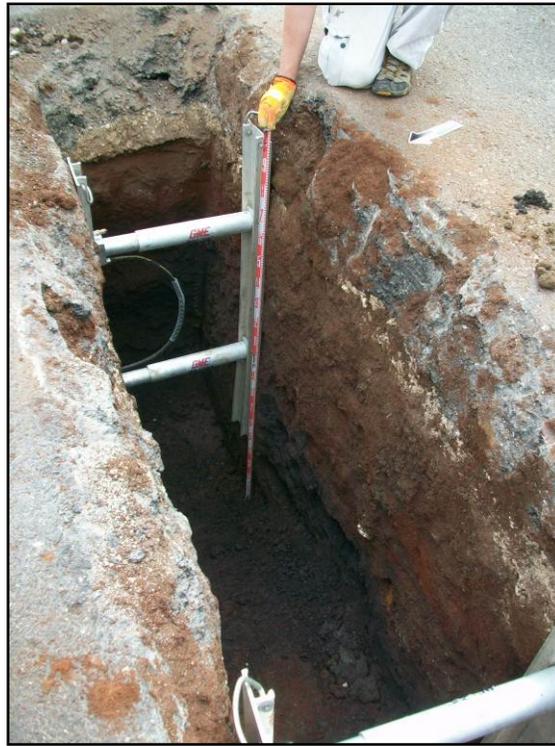


Figure 12. Photograph of the south profile wall of Trench E7, view to the southeast



Figure 13. Close-up of natural sediment within Trench E7, view to the southeast; area of Samples A and C visible within Strata IIIa and IIIb, respectively, on south wall

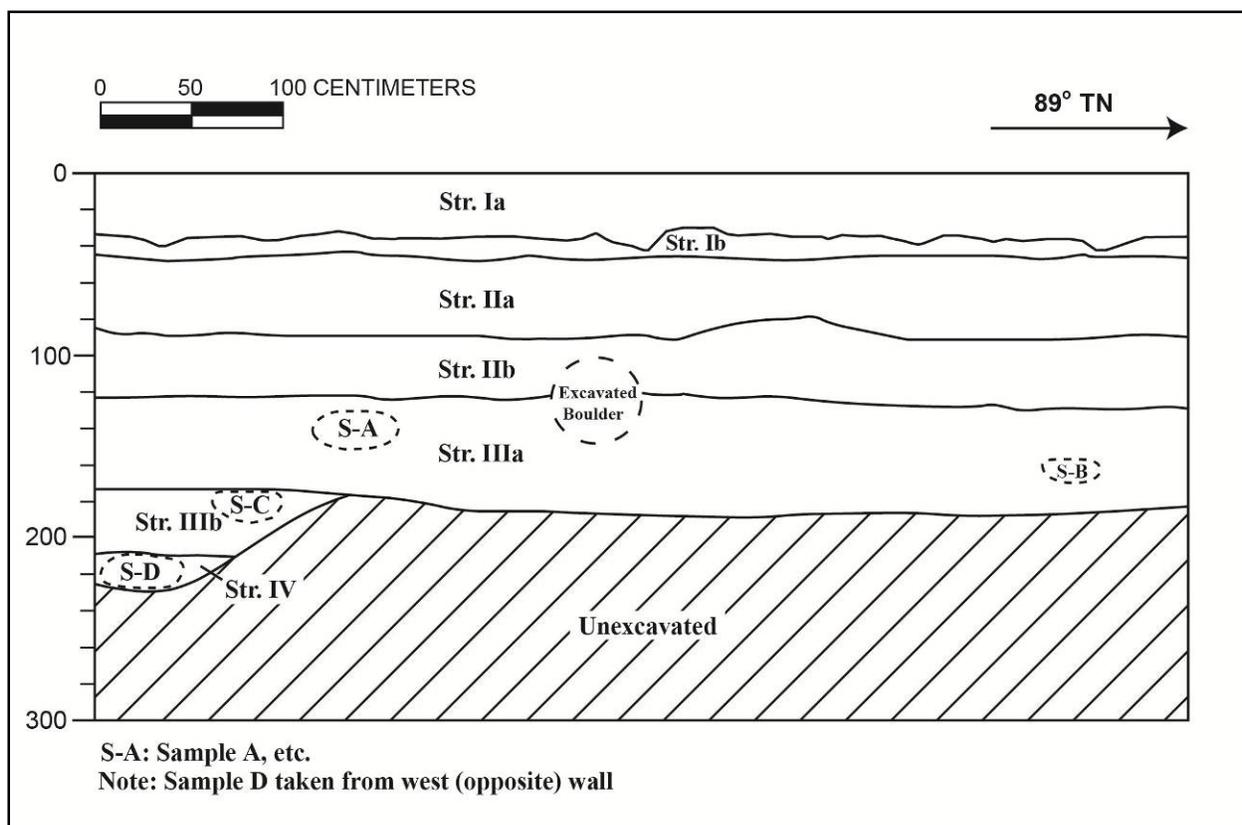


Figure 14. Profile of the south wall of Trench E7

Table 6. Stratigraphic Description for Trench E7

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-40	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	35-45	Fill; crushed coral base course; clear, smooth lower boundary
IIa	45-90	Fill; 2.5 YR 3/3 (dark reddish brown); silty clay; moderate, fine, crumb structure; moist, friable consistency; slightly plastic; terrigenous origin; clear, smooth lower boundary; no roots
IIb	80-130	Fill; 50% 5 YR 4/3 (reddish brown), 50% 2.5 Y 4/3 (olive brown); silty clay loam; moderate, fine, crumb structure; moist, friable consistency; slightly plastic; terrigenous origin; clear, smooth lower boundary; no roots; few basalt and coral small cobbles

IIIa	120-190	Natural; Gley 2 4/5 (dark bluish gray), 20% mottles of 7.5 YR 4/6 (strong brown) and 5 YR 3/4 (dark reddish brown); silty clay; weak, fine, blocky structure; moist, very firm consistency; very plastic; terrigenous origin; clear, smooth lower boundary; common very fine rootlets; very few charcoal flecks; wetland clay sediment, likely culturally modified <i>lo 'i</i> sediment
IIIb	170-210	Natural; 50% Gley 2 3/5b (very dark bluish gray), 50% 5 YR 4/6 (yellowish red; silty clay); weak, fine, blocky structure; moist, firm consistency; plastic; terrigenous; clear, smooth lower boundary; common, very fine rootlets; contains charcoal; wetland clay sediment, likely culturally modified <i>lo 'i</i> sediment
IV	210-230 (BOE)	Natural; 10 YR 4/4 (dark yellowish brown); gravel with clay matrix; strong, coarse, blocky structure; moist, loose to wet, sticky consistency; slightly plastic; terrigenous origin; lower boundary not visible; no roots; water-worn, iron-stained basalt cobbles

### 7. Trench E9

Trench E9 is located along Kamehameha Highway east of Ka'ahumanu Street and north of the Neal S. Blaisdell Park. The trench is situated within the former boundary of LCA #9407:1. Land use for this LCA is documented as *lo 'i* and fishpond.

The natural sediment encountered was sterile, containing no evidence of past land utilization or modification. A wet-screened bulk sample of Stratum III yielded fragments of marine shell and oyster shell, one partial crab claw, and several possible sea urchin teeth. No cultural deposits associated with LCA #9407:1 were identified.



Figure 15. Photograph of the north profile wall of Trench E9, view to the northeast



Figure 16. Photograph close up of the stratigraphy of Trench E9

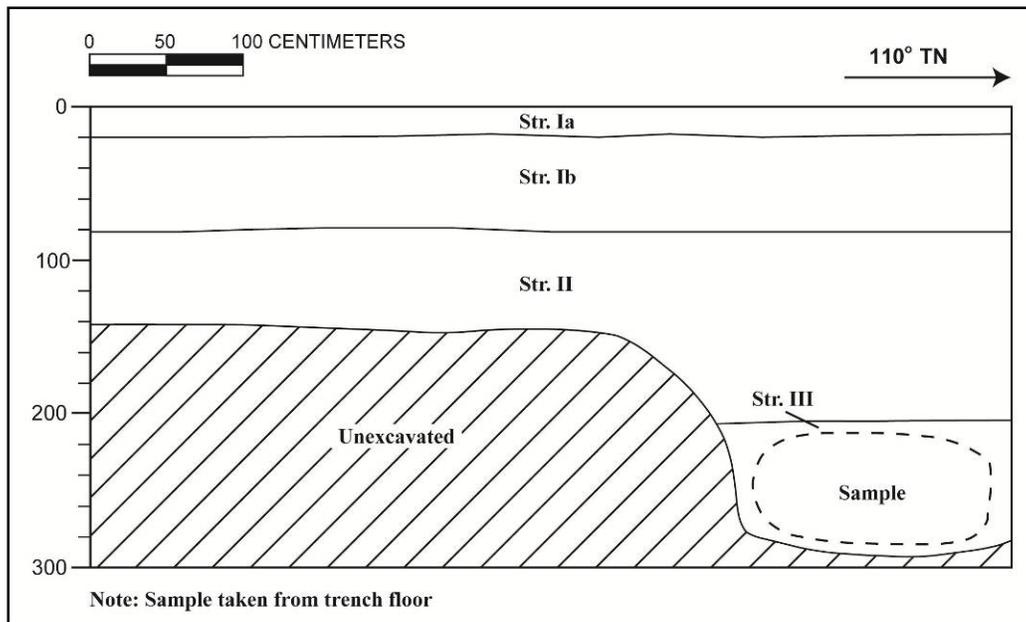


Figure 17. Profile of the north wall of Trench E9

Table 7. Stratigraphic Description for Trench E9

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-20	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	20-80	Fill; basalt gravel base course; abrupt, smooth lower boundary
II	80-205	Fill; 70% 10 YR 3/3, dark brown, 30% 5 YR 3/3 (dark reddish brown); silty clay; structureless, single-grain; moist, friable consistency; slightly plastic; terrigenous origin; abrupt, smooth lower boundary; no roots
III	205-280 (BOE)	Natural; 10 YR 4/4 (dark yellowish brown); silty clay; moderate, medium, blocky structure; moist, friable consistency; plastic; terrigenous origin; lower boundary not visible; no roots

### 8. Trench E10

Trench E10 is located along Kamehameha Highway immediately west of Waimalu Stream. The trench is situated ~20 meters northeast of the northern boundary of LCA #9407:2. Land use for this LCA is documented as *lo'i* and fishpond.

The natural sediment contained an abundance of oyster and marine shell as well as a small amount of coral, indicating this area to have been within the estuary zone of Pearl Harbor.



Figure 18. Photograph of the north profile wall of Trench E10, view to the northeast



IIC	97-145	Fill; 7.5 YR 3/3 (dark brown); gravelly silt loam; strong, very coarse, blocky structure; moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots; 90% basalt cobbles and boulders
IId	145-300	Fill; 2.5 YR 3/4 (dark reddish brown); silty clay; weak, fine, crumb structure; moist, friable consistency; plastic; terrigenous origin; clear, smooth lower boundary; no roots
III	300-310 (BOE)	Natural; 7.5 YR 3/2 (dark brown); sandy clay loam; weak, fine, crumb structure; moist, very friable consistency; slightly plastic; terrigenous and marine origin; lower boundary not visible; contains abundant oyster shells, marine shells, and coral fragments

### 9. Trench E11

Trench E11 is located along Kamehameha Highway east of Hekaha Street. The trench is situated within the former boundary of LCA #2938 part 5:3. No land use information was documented for this LCA.

No natural sediments were encountered, therefore no information pertaining to the past land use was derived. No cultural deposits associated with LCA #2938 were identified.



Figure 20. Photograph of the north profile wall of Trench E11, view to the northeast

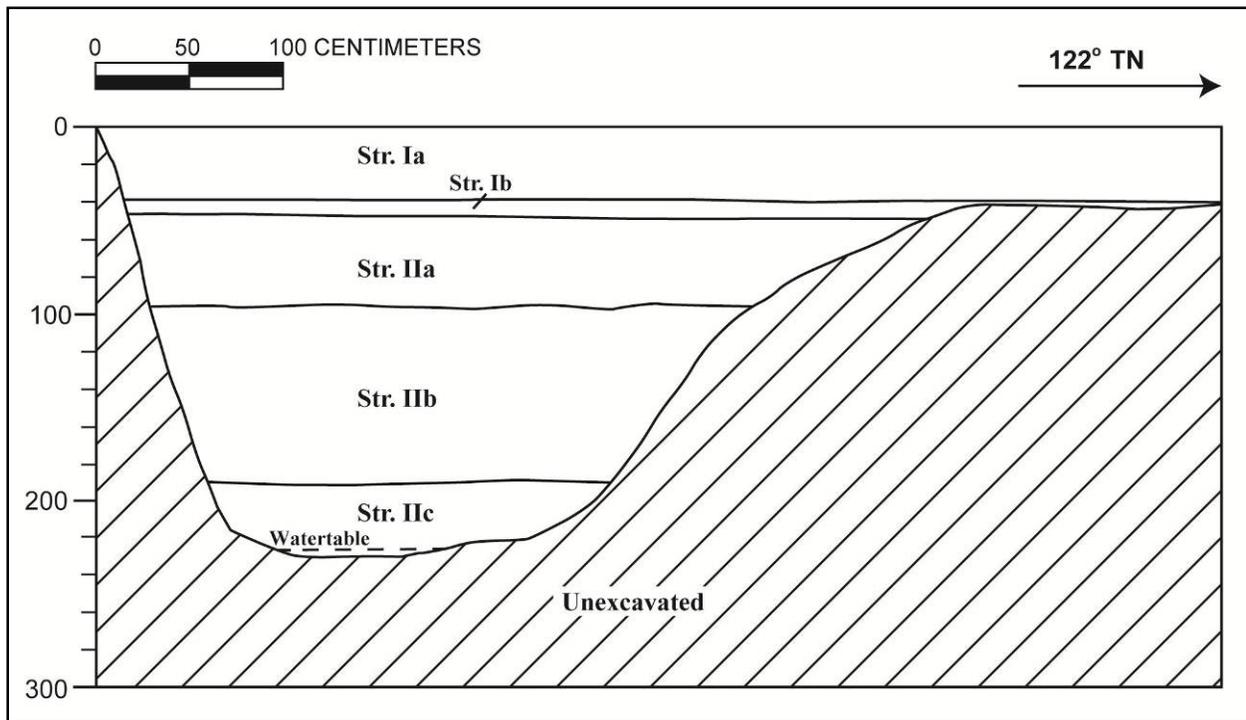


Figure 21. Profile of the north wall of Trench E11

Table 9. Stratigraphic Description for Trench E11

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-40	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	40-49	Fill; 2.5 YR 4/3 (reddish brown); gravelly silty clay; clear, smooth lower boundary; basalt gravel base course
IIa	49-95	Fill; 10 YR 3/4 (dark yellowish brown); silt loam; weak, fine, crumb structure; moist, very friable consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots; contains basalt cobbles
IIb	95-190	Fill; 2.5 YR 3/4 (dark reddish brown); silty clay; weak, very fine, crumb structure; moist, friable consistency; slightly plastic; terrigenous origin; clear, smooth lower boundary; no roots
IIc	190-225 (BOE)	Fill; 5 YR 4/3 (reddish brown); very cobbly, stony silty clay; moderate, fine to very coarse, blocky structure; moist, friable consistency; plastic; terrigenous origin; lower boundary not visible; no roots; contains 50% angular basalt cobbles and boulders

## 10. Trench E12

Trench E12 is located along Kamehameha Highway east of Kanuku Street and west of Kaonohi Street near the proposed *mauka* location for the Pearl Ridge Station. The trench is situated within the former boundary of LCA #9315:1. Land use for this LCA is documented as *lo'i* and *kula*.

The natural sediment was located just below the watertable. A bulk sediment sample scraped from the trench floor yielded charcoal fragments, organic filaments, pearl shell fragments, and a brown glass fragment, indicating a possible disturbed cultural layer. Due to the presence of the watertable and limited observance, the stratum could not be further analyzed for any possible association with LCA #9315.



Figure 22. Photograph of the south profile wall of Trench E12, view to the southeast

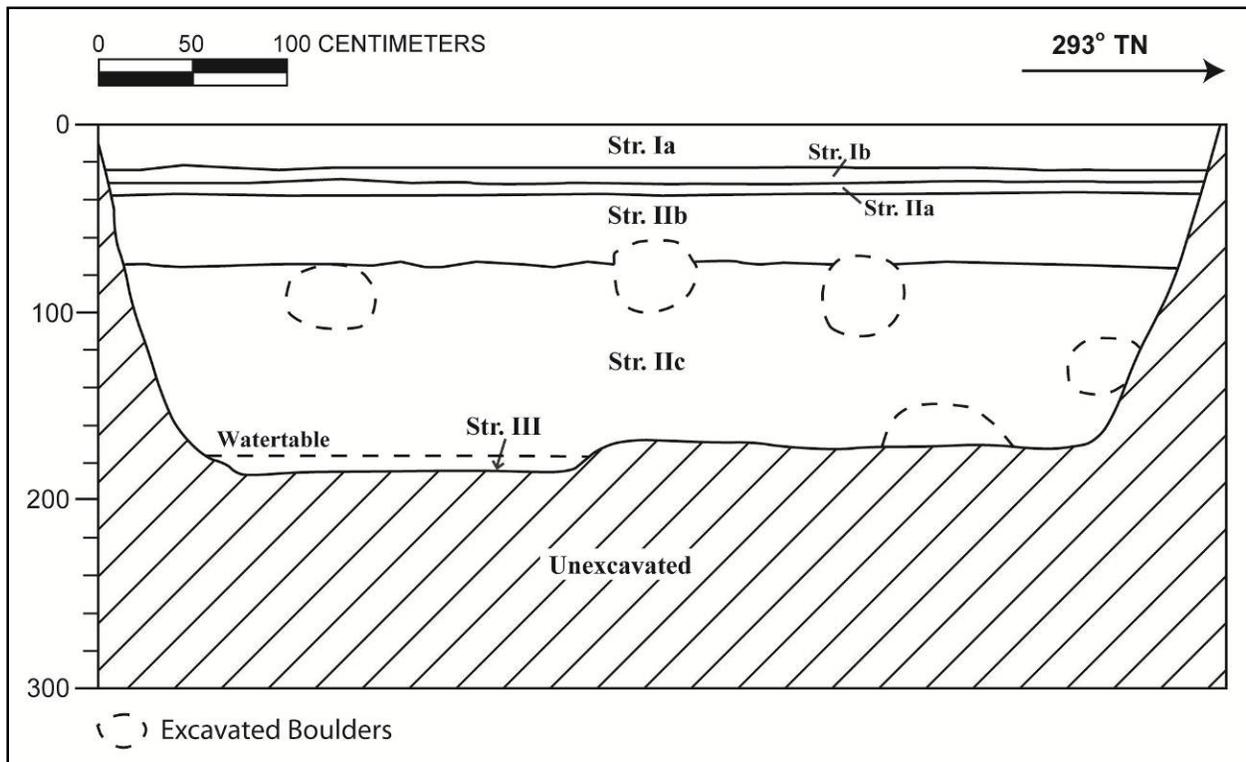


Figure 23. Profile of the south wall of Trench E12

Table 10. Stratigraphic Description for Trench E12

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-23	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	23-30	Fill; crushed coral base course; abrupt, smooth lower boundary
IIa	30-38	Fill; 2.5 YR 3/1 (very dark gray); gravel; structureless; moist, loose consistency; non-plastic; terrigenous origin; clear, wavy lower boundary; no roots; fill likely related to gas line mauka of trench
IIb	38-77	Fill; 5YR 3/3 (dark reddish brown); silty clay; weak, fine, crumb structure; moist, friable consistency; plastic; terrigenous origin; clear, smooth lower boundary; no roots; orange plastic lid found between 150 and 170 cmbs
IIc	77-183	Fill; 2.5 YR 3/4 (dark reddish brown); silty clay; weak, fine crumb structure; moist, friable consistency; plastic; terrigenous origin; clear, smooth lower boundary; no roots
III	183-185 (BOE)	Natural; 10 YR 3/2 (very dark grayish brown); silty clay loam; moderate, fine, blocky structure; moist, friable consistency; plastic; terrigenous origin; lower boundary not visible; no roots

### 11. Trench E13

Trench E13 is located along Kamehameha Highway east of Kanuku Street and west of Kaonohi Street within the proposed location for the Pearl Ridge Station. The trench is situated within the former boundary of LCA #9315:1. Land use for this LCA is documented as *lo'i* and *kula*.

The natural sediment encountered contained abundant rootlets and likely represents a buried organic A-Horizon. The strata were culturally sterile, containing no evidence of past land utilization or modification. No cultural deposits associated with LCA #9315 were identified.



Figure 24. Photograph of the south profile wall of Trench E13

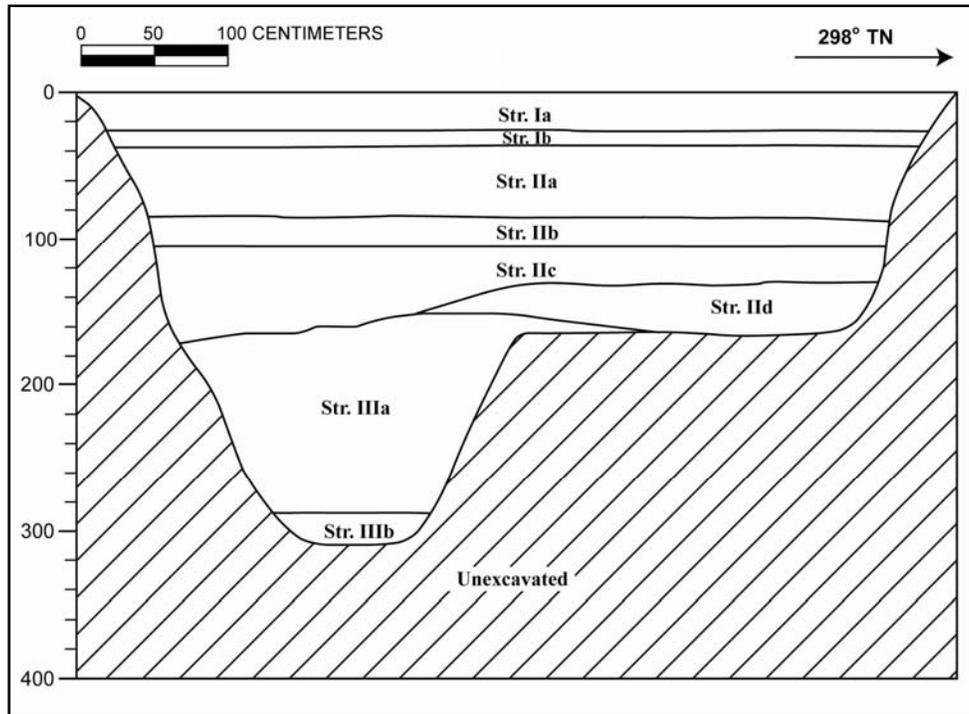


Figure 45. Profile of the south wall of Trench E13

Table 11. Stratigraphic Description for Trench E13

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-25	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	25-36	Fill; crushed coral base course; clear, smooth lower boundary
IIa	36-85	Fill; 7.5 YR 3/3 (dark brown); silty clay; weak, fine, crumb structure; moist, friable consistency; plastic; terrigenous origin; clear, smooth lower boundary; no roots
IIb	85-105	Fill; 5 YR 3/4 (dark reddish brown); silty clay loam; weak, fine, crumb structure; moist, very friable consistency; slightly plastic; terrigenous origin; clear, smooth lower boundary; no roots
IIc	105-170	Fill; 5 YR 4/3 (reddish brown); gravelly silty clay; moderate, fine to very coarse, blocky structure; moist, friable; consistency plastic; terrigenous origin; clear, smooth lower boundary; no roots; contains basalt cobble and boulders
IId	170-165	Fill; 2.5 YR 3/4 (dark reddish brown); silty clay; weak, fine, crumb structure; moist, friable consistency; plastic; terrigenous origin; clear, smooth lower boundary; no roots; contains asphalt debris

IIIa	155-290	Buried A-Horizon; Gley 1 3/10y –Gley 2 3/5pb (very dark greenish gray to very dark bluish gray); gravelly, cobbly clay loam; structureless, massive; wet, very sticky consistency; very plastic; terrigenous origin; clear, smooth lower boundary; many medium rootlets; ~ 30% inclusions of water-rounded gravel and cobbles; culturally sterile soil
IIIb	290-310 (BOE)	Natural; 10 YR 4/6 (dark yellowish brown) with 40% coarse bluish gray mottles; clay loam; structureless, massive; wet, sticky consistency; very plastic; terrigenous origin; lower boundary not visible; common, fine to medium roots; culturally sterile soil

## 12. Trench E14

Trench E14 is located along Kamehameha Highway east of Kanuku Street and west of Kaonohi Street within the proposed location for the Pearl Ridge Station. The trench is situated within the former boundaries of LCA #8525 B:3, and #9400:1. No information of the land use for LCA #8525 B:3 is documented. Land use information for LCA #9400 is documented as *lo'i*, house lot, pond, and breadfruit tree.

The natural sediment encountered was sterile, containing no evidence of past land utilization or modification. No cultural deposits associated with LCA #8525 B:3 or #9400:1 were identified.



Figure 26. Photograph of the south profile wall of Trench E14, view to the southeast

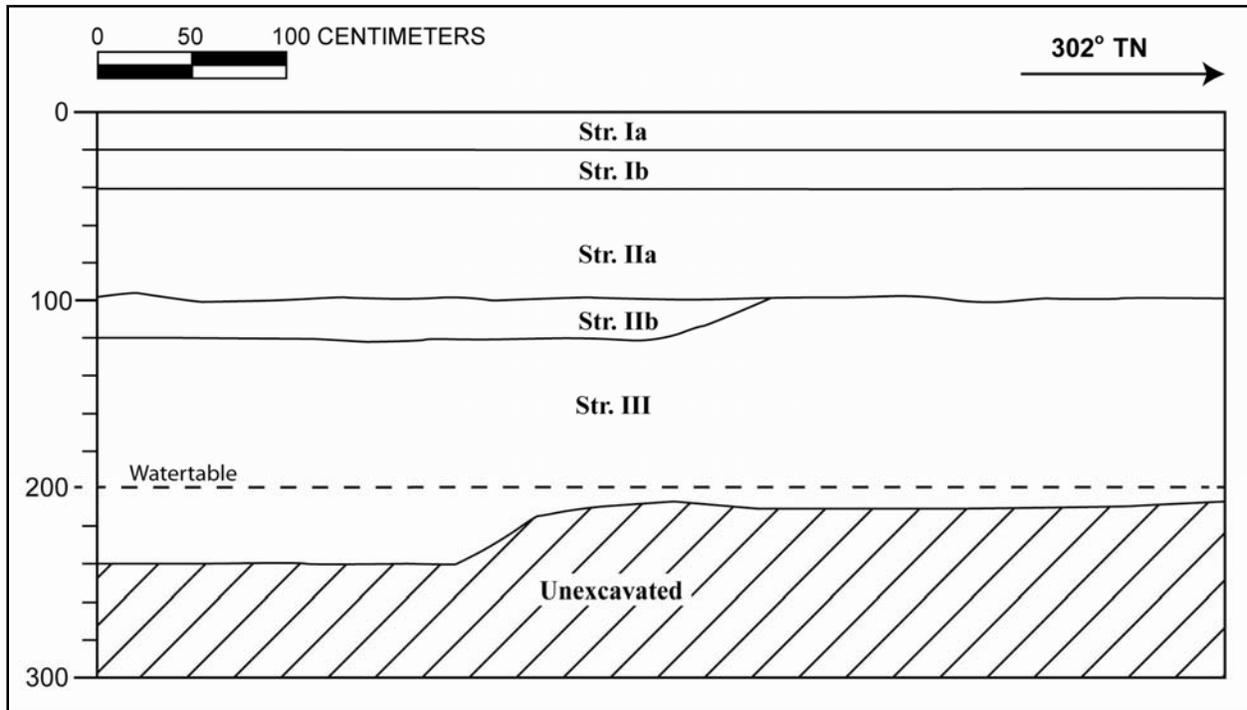


Figure 27. Profile of the south wall of Trench E14

Table 12. Stratigraphic Description for Trench E14

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-20	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	20-40	Fill; crushed coral base course; clear, smooth lower boundary
IIa	40-100	Fill; 5 YR 3/4 (dark reddish brown); clay loam; weak, fine, crumb structure; moist, very friable consistency; slightly plastic; terrigenous origin; abrupt, smooth lower boundary; no roots
IIb	100-120	Fill; 10 YR 5/1 (gray); clay; moderate, medium, blocky structure; moist, firm consistency; very plastic; terrigenous origin; abrupt, broken lower boundary; no roots
III	100-240 (BOE)	Natural; 10 YR 3/3 (dark brown); clay loam; weak, fine, crumb structure; moist, loose consistency; plastic; terrigenous origin; lower boundary not visible; no roots; sterile sediment

### 13. Trench E15

Trench E15 is located along Kamehameha Highway west of Kaonohi Street. The trench is situated within the former boundary of LCA #9400:1. Land use information for LCA #9400 is documented as *lo 'i*, house lot, pond, and breadfruit tree.

The natural sediment encountered was sterile, containing no evidence of past land utilization or modification. A wet-screened bulk sample taken from 90-110 cmbs yielded decomposing basalt, several small pieces of asphalt and abundant organic filaments, indicating a disturbed upper boundary. No cultural deposits associated with LCA #9400:1 were identified.



Figure 28. Photograph of the north profile wall of Trench E15, view to the northeast

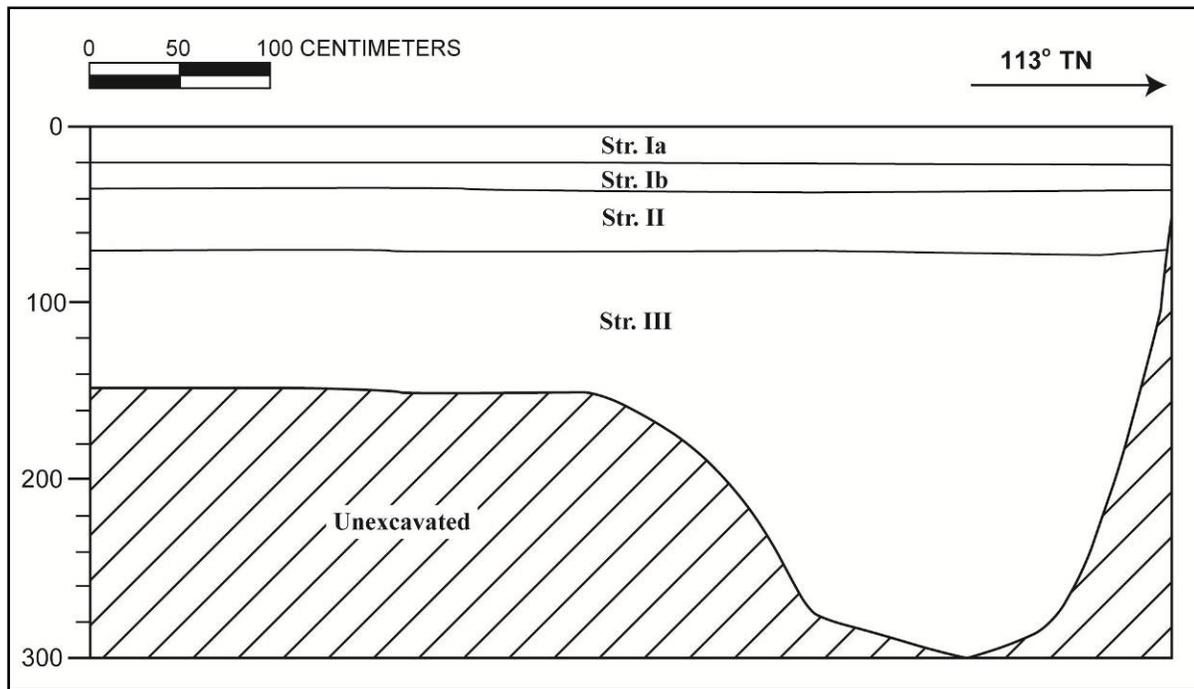


Figure 29. Profile of the north wall of Trench E15

Table 13. Stratigraphic Description for Trench E15

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-20	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	20-35	Fill; crushed coral base course; clear, smooth lower boundary
II	35-70 (BOE)	Fill; 7.5 YR 3/4 (dark brown); silty clay loam; moderate, fine, blocky structure; moist, friable consistency; slightly plastic; terrigenous origin; abrupt, smooth lower boundary; no roots
III	70-295	Disturbed Natural; Gley 2 5/10b (bluish gray) with 40% large mottles of 5 YR 4/4 (reddish brown); silty clay; moderate, medium, blocky structure; moist, friable consistency; plastic; terrigenous origin; lower boundary not visible; few medium rootlets

#### 14. Trench E16

Trench E16 is located along Kamehameha Highway east of Kaonohi Street, south of the parking lot for Anna Miller’s restaurant. The trench is situated within the former boundary of LCA #6156:2. Land use information for this LCA is documented as *lo‘i* and *kula*.



Figure 30. Photograph of the south wall profile of Trench E16, view to the southeast

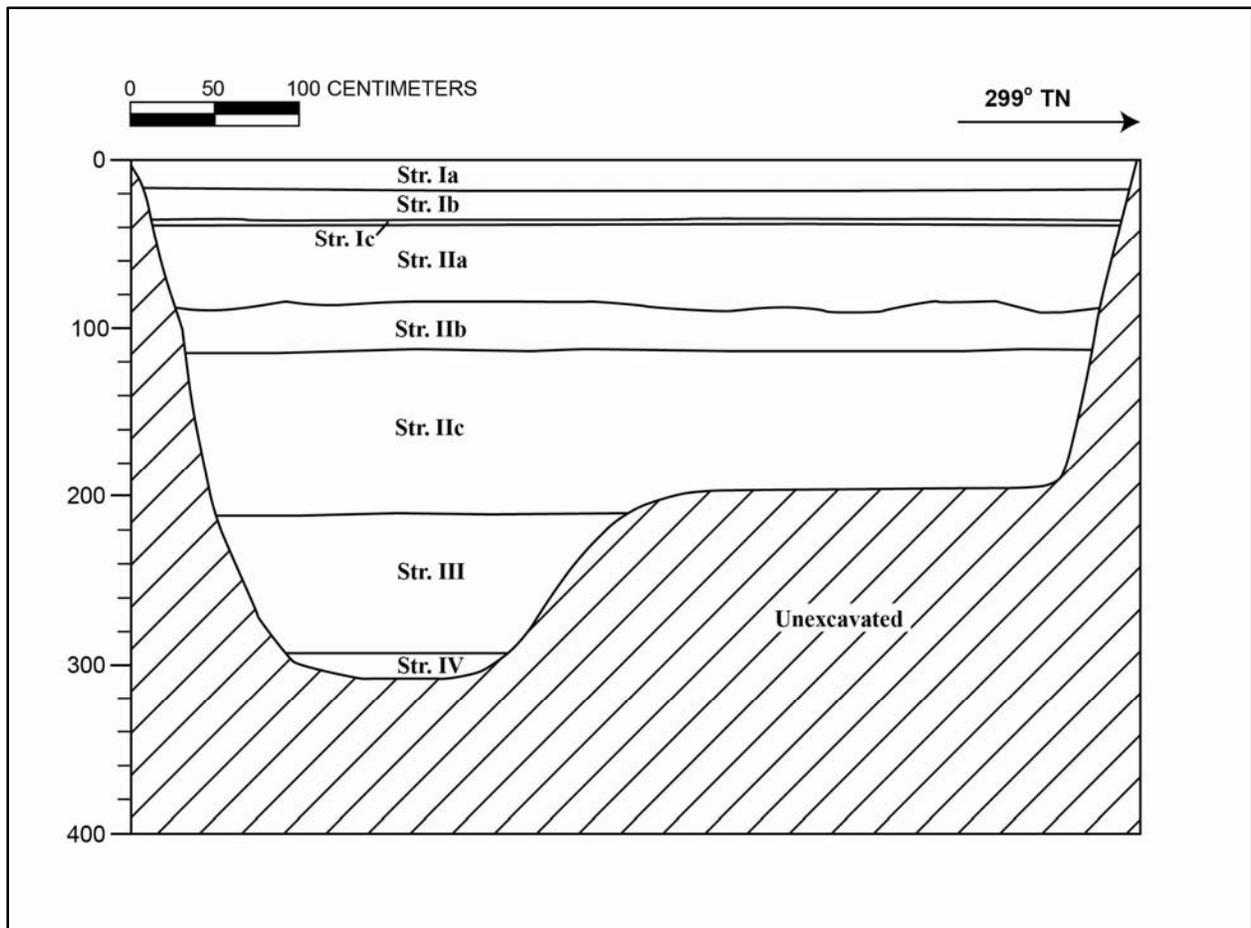


Figure 31 Profile of the south wall of Trench E16

Table 14. Stratigraphic Description for Trench E16

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-18	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	18-35	Fill; crushed coral base course; clear, smooth lower boundary
Ic	35-38	Fill; 10 YR 4/1 (dark gray); gravel; structureless; dry, loose consistency; non-plastic; terrigenous origin; abrupt, smooth lower boundary
IIa	38-90	Fill; 5 YR 3/3 (dark reddish brown); silty clay; weak, fine, crumb structure; moist, friable consistency; slightly plastic terrigenous origin; clear, smooth lower boundary; few fine to medium rootlets; contains 10% basalt cobbles

I Ib	85-113	Fill; Gley 2 3/1 (bluish gray) with 30% medium mottles of 10 YR 4/4 (dark yellowish brown); clay loam; weak, fine, blocky structure; moist, firm consistency; plastic; terrigenous origin; clear, smooth lower boundary; no roots
I Ic	113-210	Fill; 7.5 YR 3/4 (dark brown) with 60% fine reddish brown mottles; very gravelly silty clay loam; weak, fine to very coarse, blocky structure; moist, very friable consistency; slightly plastic; terrigenous origin; clear, smooth lower boundary; no roots; contains basalt cobble and boulders
IIIa	210-292	Natural; Gley 1 3/1 (very dark greenish gray); clay loam; weak, fine, crumb structure; moist, firm consistency; very plastic; terrigenous origin; clear, smooth lower boundary; few fine rootlets
IIIb	292-305 (BOE)	Natural; Gley 1 3/10y (very dark greenish gray); clay; structureless, massive; moist, very firm consistency; very plastic; terrigenous origin; lower boundary not visible; few, very fine rootlets; sterile clay

### 15. Trench E17

Trench E17 is located along Kamehameha Highway east of Kaonohi Street and west of Kalauao Springs Canal. It is at the former boundary of LCA #6156 B:1. Land use information for this LCA is documented as *lo'i* and *kula*. In the twentieth century, the area is documented as containing abundant springs and a former spring-fed waterfall, which during the early part of the century contained a plantation water pump, the Kalauao Pump ('Aiea Oral History Project, Ho 2009:8). The area just north of the trench is currently leased by the Sumida Watercress Farm.

The excavation was abandoned due to side wall collapse, which posed a safety concern for the stability of the highway.



Figure 32. Photograph of the north profile wall of Trench E17, view to the northeast

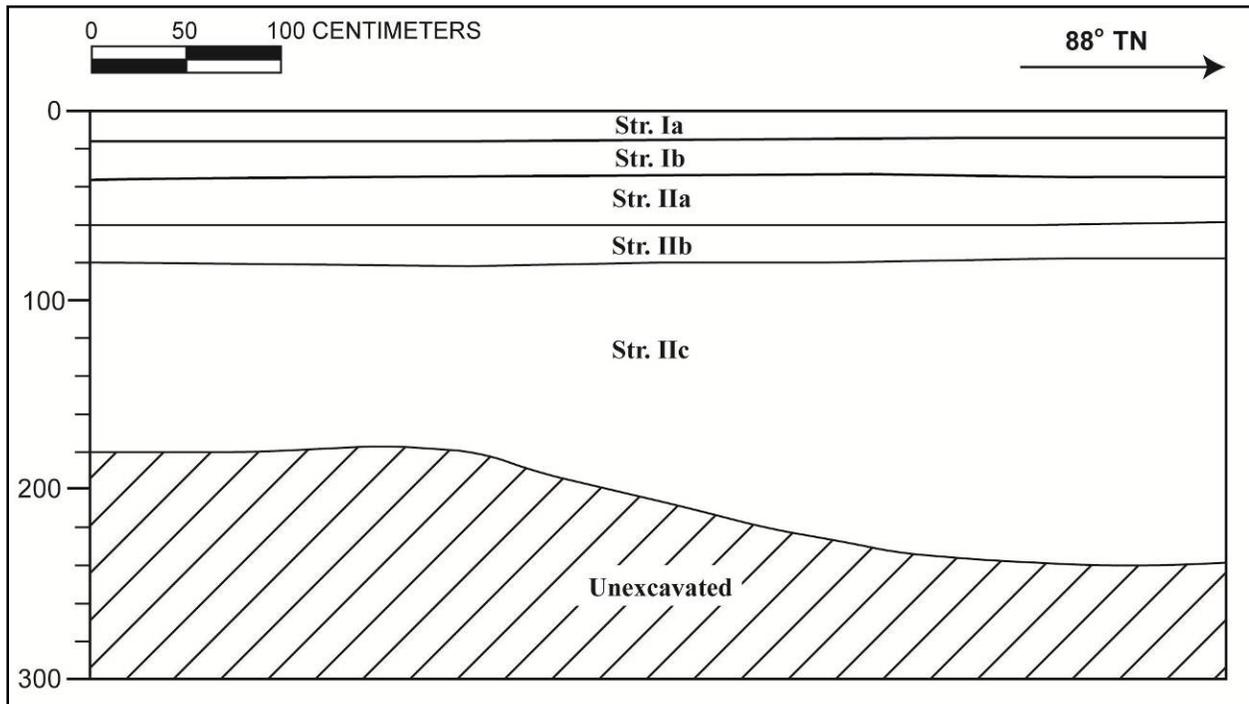


Figure 33. Profile of the north wall of Trench E17

Table 15. Stratigraphic Description for Trench E17

Stratum	Depth (cmts)	Description of Sediment
Ia	0-15	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	15-32	Fill; crushed coral base course; clear, smooth lower boundary
IIa	32-60	Fill; 10 YR 4/4 (dark yellowish brown); sandy clay loam; structureless, single grain; dry, weakly coherent consistency; non-plastic; terrigenous and marine origin; clear, smooth lower boundary; no roots
IIb	60-80	Fill; Gley 2 6/5b (bluish gray); silty clay; structureless, massive; moist, friable consistency; non-plastic; terrigenous and marine origin; abrupt, smooth lower boundary; no roots
IIc	80-240 (BOE)	Fill; 5 YR 4/4 (reddish brown); gravelly clay; structureless, single grain; moist, loose consistency; slightly plastic; terrigenous and marine origin; lower boundary not visible; no roots; contains basalt and coral cobbles and boulders

### 16. Trench E18

Trench E18 is located along Kamehameha Highway east of the Kalauao Spring Canal. The trench is situated within the former boundary of LCA #9400:2. Land use information for LCA #9400 is documented as *lo'i*, house lot, pond, and breadfruit tree.

A wet-screened bulk sample of Stratum IIIa yielded very small oyster shell fragments, wood pieces, charcoal fragments and water-rounded gravel and small cobbles. The stratum showed no evidence of cultural land modification and likely represents a natural deposition of stream bank sediment and waterborn materials. No cultural deposits associated with LCA #9400:2 were identified.

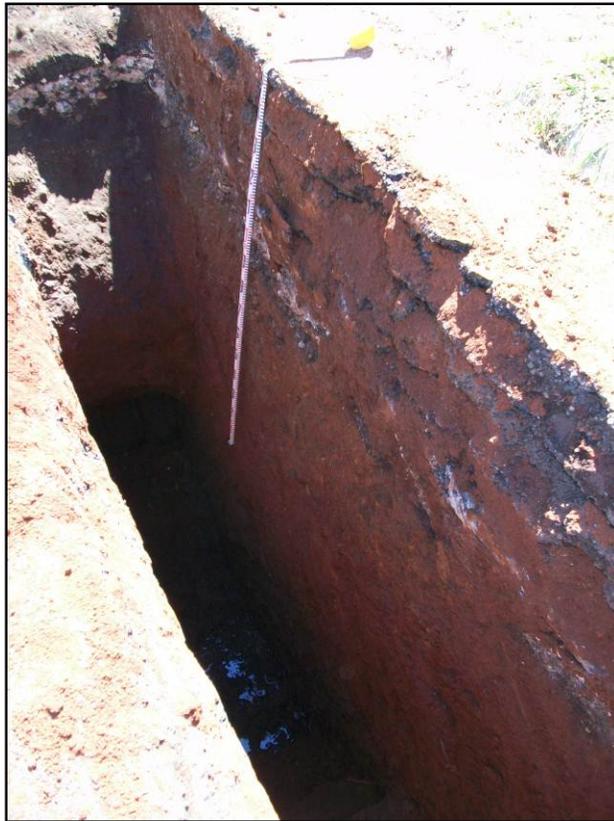


Figure 34. Photograph of the south profile wall of Trench E18, view to the southeast

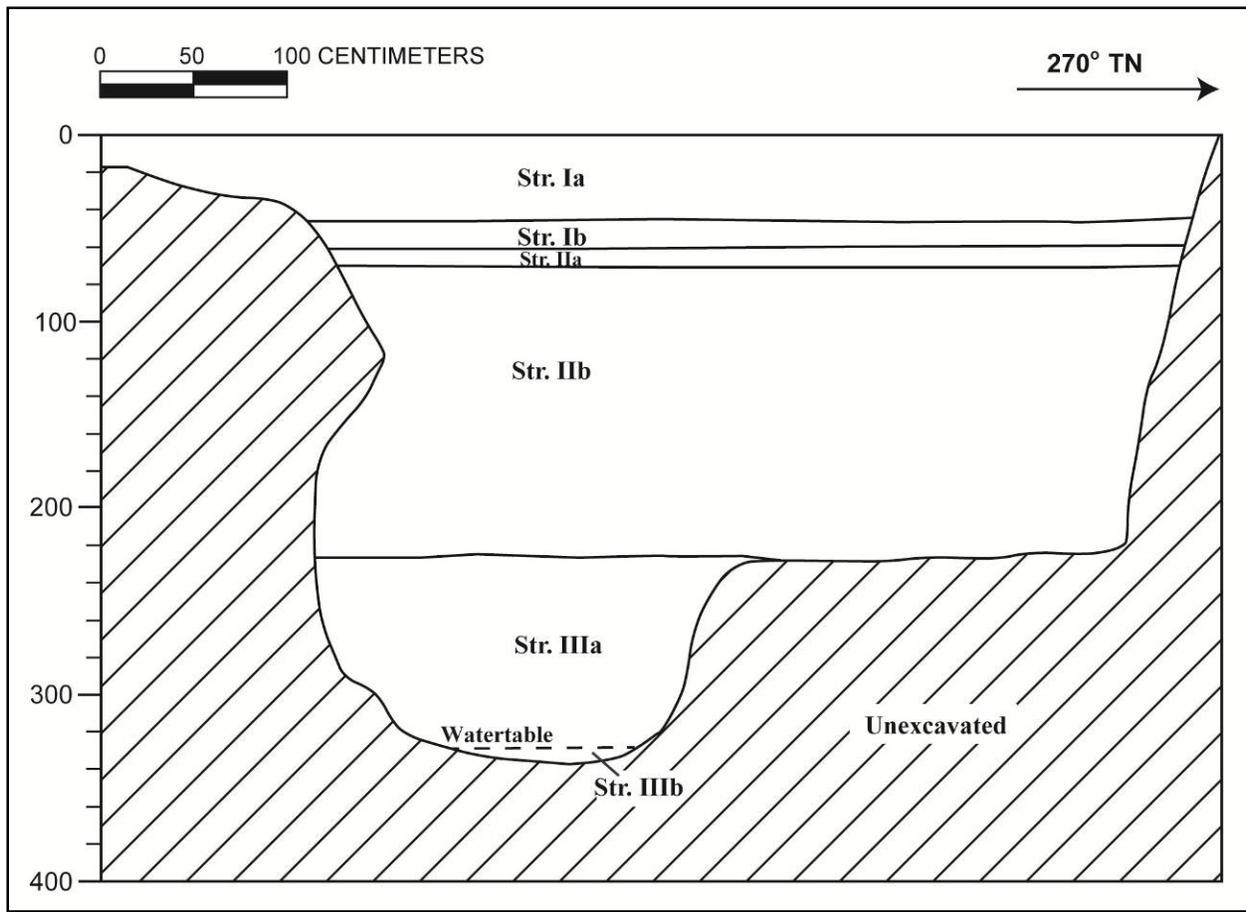


Figure 35. Profile of the south wall of Trench E18

Table 16. Stratigraphic Description for Trench E18

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-45	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	45-60	Fill; crushed coral base course; clear, smooth lower boundary
IIa	60-70	Fill; basalt gravel base course; clear, smooth lower boundary
IIb	70-225	Fill; 2.5 YR 3/4 (dark reddish brown); silty clay; weak, fine, crumb structure; moist, very friable consistency; slightly plastic; terrigenous origin; clear, smooth lower boundary; few fine rootlets

IIIa	225-330	Natural; 10 YR 3/3 (dark brown); clay loam; weak, fine, crumb structure; moist, very firm to wet sticky consistency; plastic; terrigenous origin; clear, smooth lower boundary; few fine rootlets; contains bivalves, clams, and water-rounded basalt cobbles; likely stream bank sediment
IIIb	330-335 (BOE)	Natural; 10 YR 3/1 (very dark gray); clay loam; structureless, massive; plastic; terrigenous origin; lower boundary not visible; no roots; contained shell fragments and water-rounded pebbles

### 17. Trench E19

Trench E19 is located along Kamehameha Highway between the Pali Momi Street northbound intersection to the west and Pali Momi Street southbound intersection to the east. The trench is situated within the former boundary of LCA #5910 and #5934:1. Land use information for these LCA is documented as *lo'i* and *kula*.



Figure 36. Photograph of the stratigraphy within Trench E19, view to the southwest

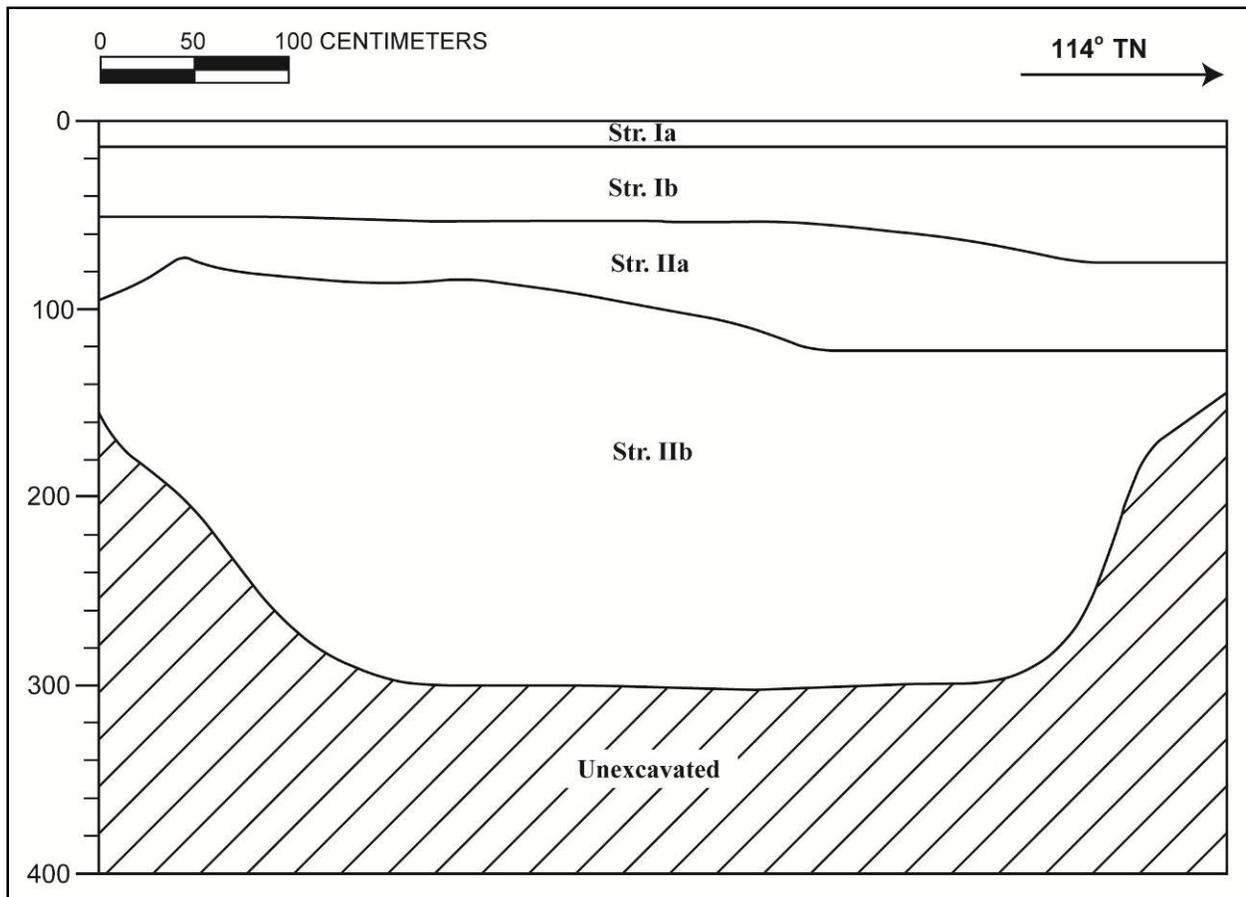


Figure 37. Profile of the north wall of Trench E19

Table 17. Stratigraphic Description for Trench E19

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-13	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	13-75	Fill; basalt gravel base course; abrupt, smooth lower boundary
IIa	50-120	Fill; 5 YR 4/4 (reddish brown); gravelly clay; structureless, single grain; dry, weakly coherent consistency; slightly plastic; terrigenous origin; abrupt, irregular lower boundary; no roots
IIb	72-300 (BOE)	Disturbed natural sediment; 10 YR 4/4 (dark yellowish brown) with 5% med mottles of 5 YR 4/4 (reddish brown); clay loam; weak, fine, blocky structure; dry, weakly coherent consistency; slightly plastic; terrigenous origin; lower boundary not visible; no roots; contained small basalt cobble to medium boulders

**18. Trench E20**

Trench E20 is located along Kamehameha Highway between Kihale Street and Honomanū Street. The trench is located within the former boundary of LCA #5365. Land use information for this large LCA is documented as *lo'i*, *mala taro*, *kula*, house lot, salt lands, and numerous other crops and fruit bearing trees.



Figure 38. Photograph of the south profile wall of Trench E20, view to the south

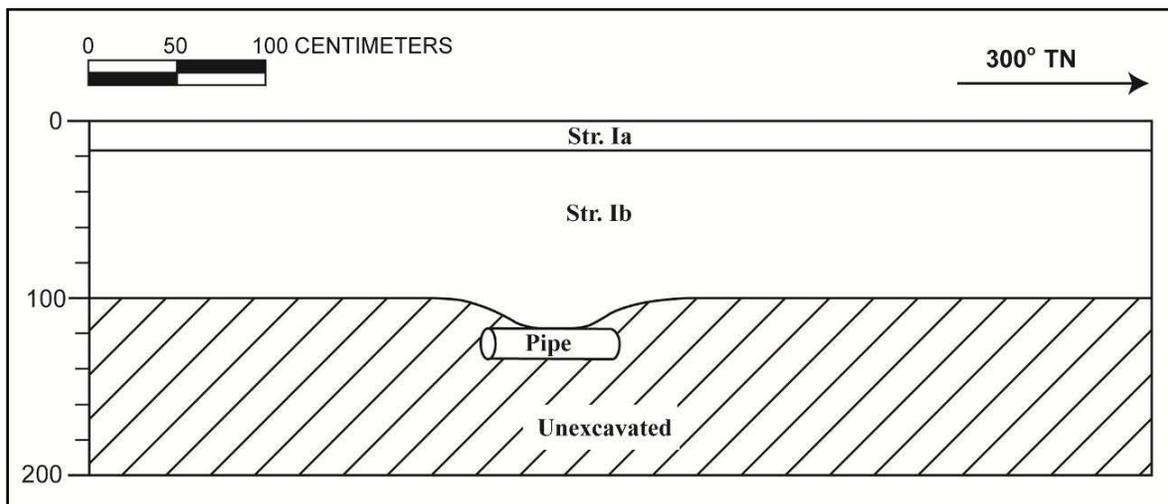


Figure 39. Profile of the south wall of Trench E20

Table 18. Stratigraphic Description for Trench E20

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-15	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	15-120 (BOE)	Fill; basalt gravel base course; old metal utility line encountered at lower boundary

### 19. Trench E21

Trench E21 is located along Kamehameha Highway east of Honomanū Street. The trench is ~120 meters west of 'Aiea Stream. Trench E21 is situated within the former boundary of LCA #7344:1. Land use information for this LCA is documented as *lo'i* and a pond.

The excavation was abandoned at 170 cmbs due to the presence of several large boulders, the removal of which would have likely caused wall instability or collapse.



Figure 40. Photograph of the north profile wall of Trench E21, view to the southeast

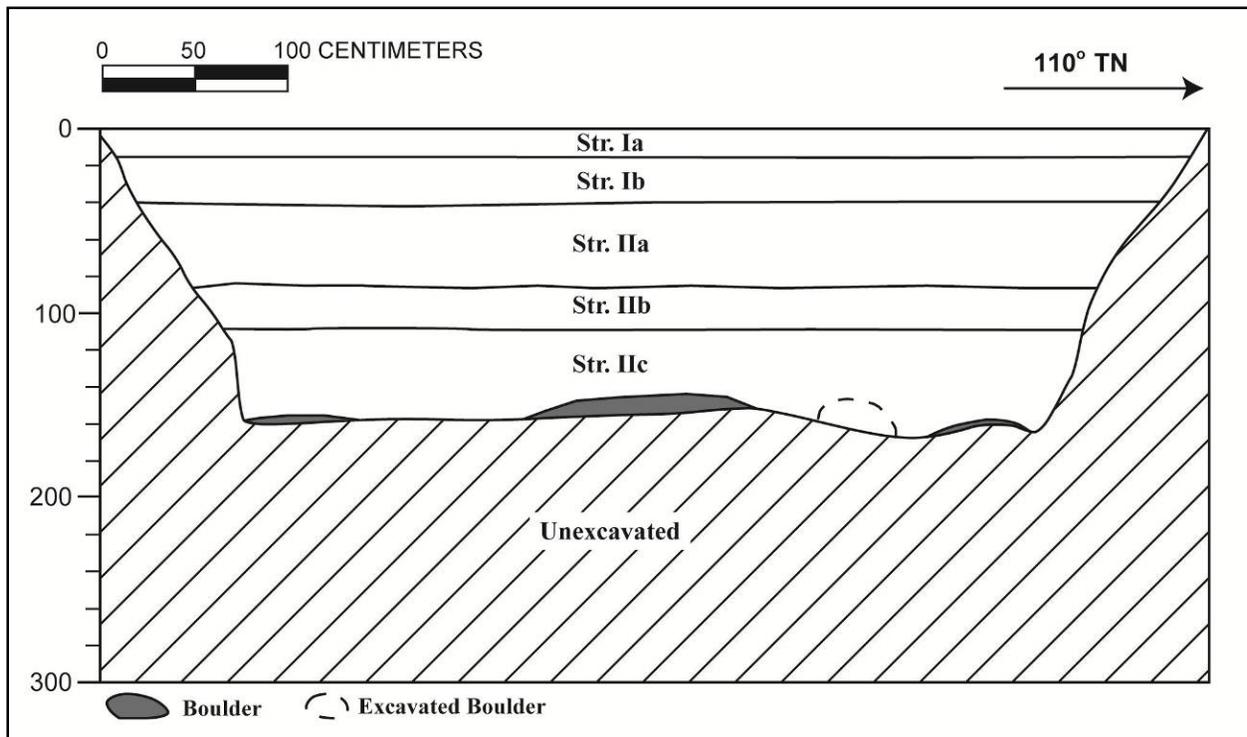


Figure 41. Profile of the north wall of Trench E21

Table 19. Stratigraphic Description for Trench E21

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-14	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	14-40	Fill; basalt gravel base course; clear, smooth lower boundary
IIa	40-85	Fill; basalt gravel fill; clear, smooth lower boundary
IIb	85-110	Fill; 10 YR 4/2 (dark grayish brown); extremely gravelly silty clay; moderate, fine, crumb structure; moist, firm consistency; plastic; terrigenous origin; clear, smooth lower boundary; no roots; contains basalt cobbles to large boulders
IIc	110-170 (BOE)	Fill; 5 YR 3/3 (dark reddish brown); stony clay loam; weak, fine, crumb structure; moist, friable consistency; slightly plastic; terrigenous origin; lower boundary not visible; no roots; contains 10% basalt cobbles

## 20. Trench E22

Trench E22 is located along Kamehameha Highway east of Honomanū Street and ~50 meters west of ʻAiea Stream. The trench is situated within the former boundary of LCA #2141. Land use information for this LCA is documented as *loʻi*, fishpond, and house lot. Trench E22 is located on a causeway which is ~5 meters above the surrounding coastal flatlands.

No natural sediments were observed. A wet-screened bulk sample of Stratum IIc yielded only a few fragments of organic material. No cultural deposits associated with LCA #2141 were identified.



Figure 42. Photograph of the southwest wall profile of Trench E22, view to the west

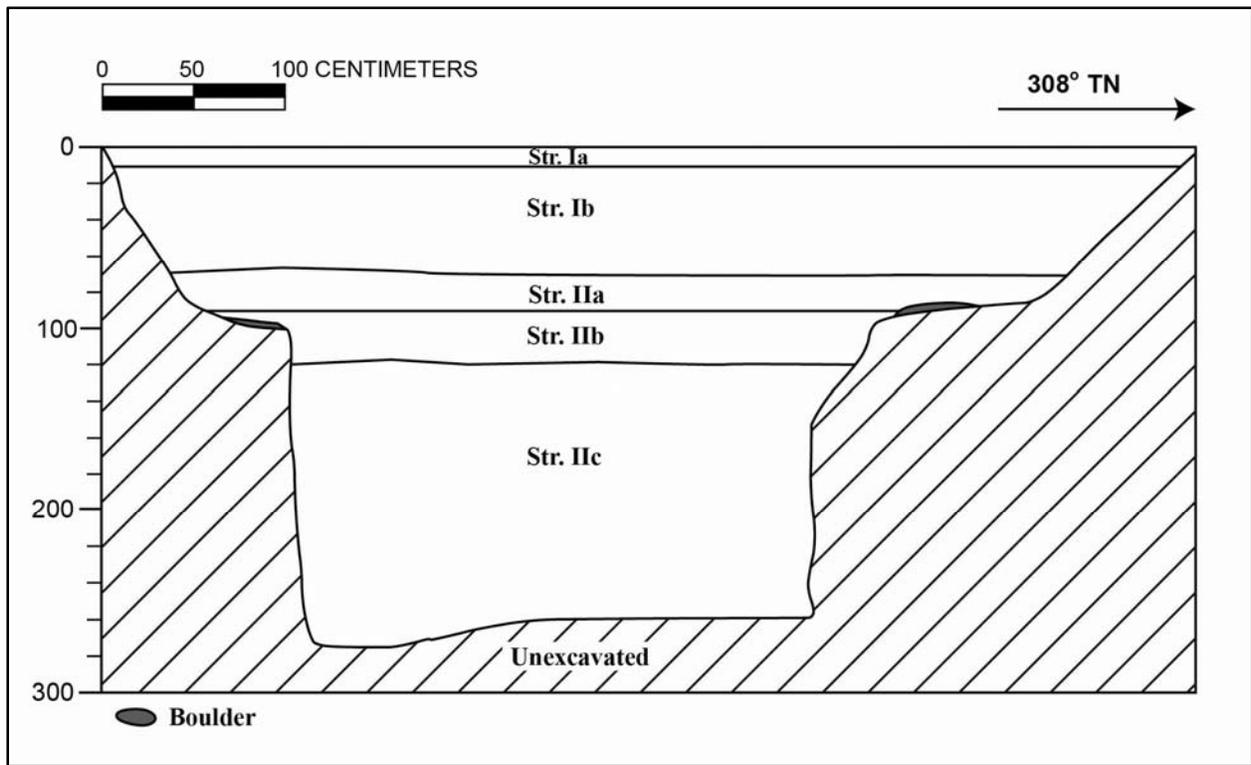


Figure 43. Profile of the west wall of Trench E22

Table 20. Stratigraphic Description for Trench E22

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-10	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	10-70	Fill; basalt gravel base course; clear, smooth lower boundary
IIa	70-90	Fill; 7.5 YR 3/2 (dark brown) with 40% large mottles of 2.5 YR 3/4 (dark reddish brown); clay loam; weak, fine, crumb structure; moist, firm consistency; plastic; terrigenous origin; clear, smooth lower boundary; no roots
IIb	90-120	Fill; 10 YR 4/2 (dark grayish brown); very gravelly silty clay loam; weak to moderate, fine, blocky structure; moist, firm consistency; plastic; terrigenous origin; clear, smooth lower boundary; no roots; contains basalt cobbles to medium boulders
IIc	110-285 (BOE)	Fill; 10 YR 3/2 (very dark grayish brown); clay loam; structureless, massive; moist, very firm consistency; very plastic; terrigenous origin; lower boundary not visible; few fine rootlets; culturally sterile soil

### 21. Trench E23

Trench E23 is located along Kamehameha highway ~20 meters east of 'Aiea Stream. The trench is situated within the former land boundary of LCA #2052. Land use information for this LCA is documented as *lo'i* and *kula*. Trench E23 is located on a causeway which is ~3 meters above the surrounding coastal flatlands.

No natural sediments were observed. A wet-screened bulk sample of Stratum IIb yielded a few organic filaments, a marine shell fragment, abundant angular basalt gravels and cobbles, and several small pieces of asphalt. No cultural deposits associated with LCA #2052 were identified.



Figure 44. Photograph of the south wall profile of Trench E23, view to the southwest

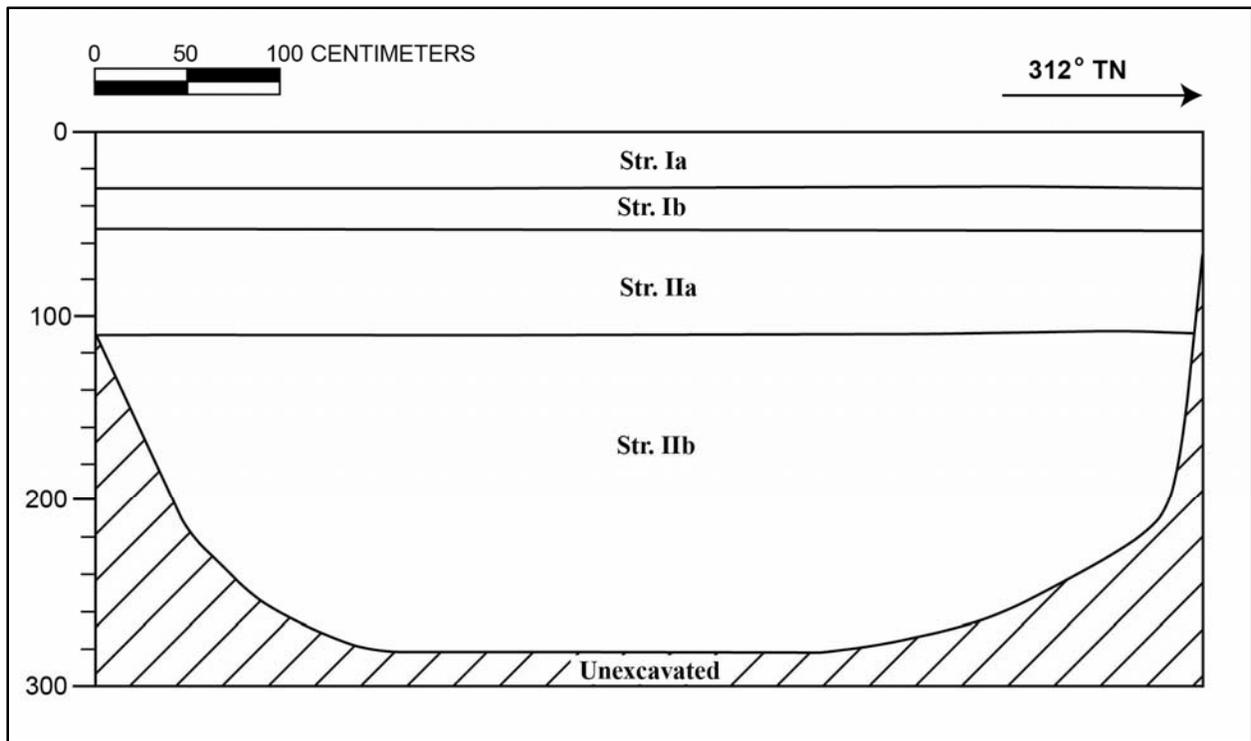


Figure 45. Profile of the west wall of Trench E23

Table 21. Stratigraphic Description for Trench E23

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-30	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	30-50	Fill; basalt gravel base course; clear, smooth lower boundary
IIa	50-110	Fill; 5 YR 4/4 (reddish brown); gravelly clay; structureless, single grain; dry, weakly coherent consistency; non-plastic; terrigenous origin; abrupt, smooth lower boundary; no roots; contains basalt cobbles
IIb	110-285 (BOE)	Fill; 10 YR 5/4 (yellowish brown); clay loam; weak, fine, crumb structure; dry, weakly coherent consistency; non-plastic; terrigenous origin; lower boundary not visible; few medium rootlets; sterile sediment; contains basalt gravels and cobbles, and several small pieces of asphalt

## 22. Trench E24

Trench E24 is located along Kamehameha Highway just southeast of the Moanalua Freeway overpass. The trench is within the former land boundary of LCA #2102. Land use for this LCA is documented as *lo 'i*, *kula*, fishpond, and house lot.

A wet-screened bulk sample of the natural sediment yielded several waterworn gravels, small charcoal fragments, a small coral piece, several angular basalt cobbles and 6 organic filaments. As the charcoal fragments were not encountered within a feature, but rather floated generally within the stratigraphy, and no evidence of agricultural land usage was observed, the stratum appeared to be charcoal-enriched alluvial sediment. No cultural deposits associated with LCA #2102 were identified.



Figure 46. Photograph of the southwest wall profile of Trench E24, view to the northwest

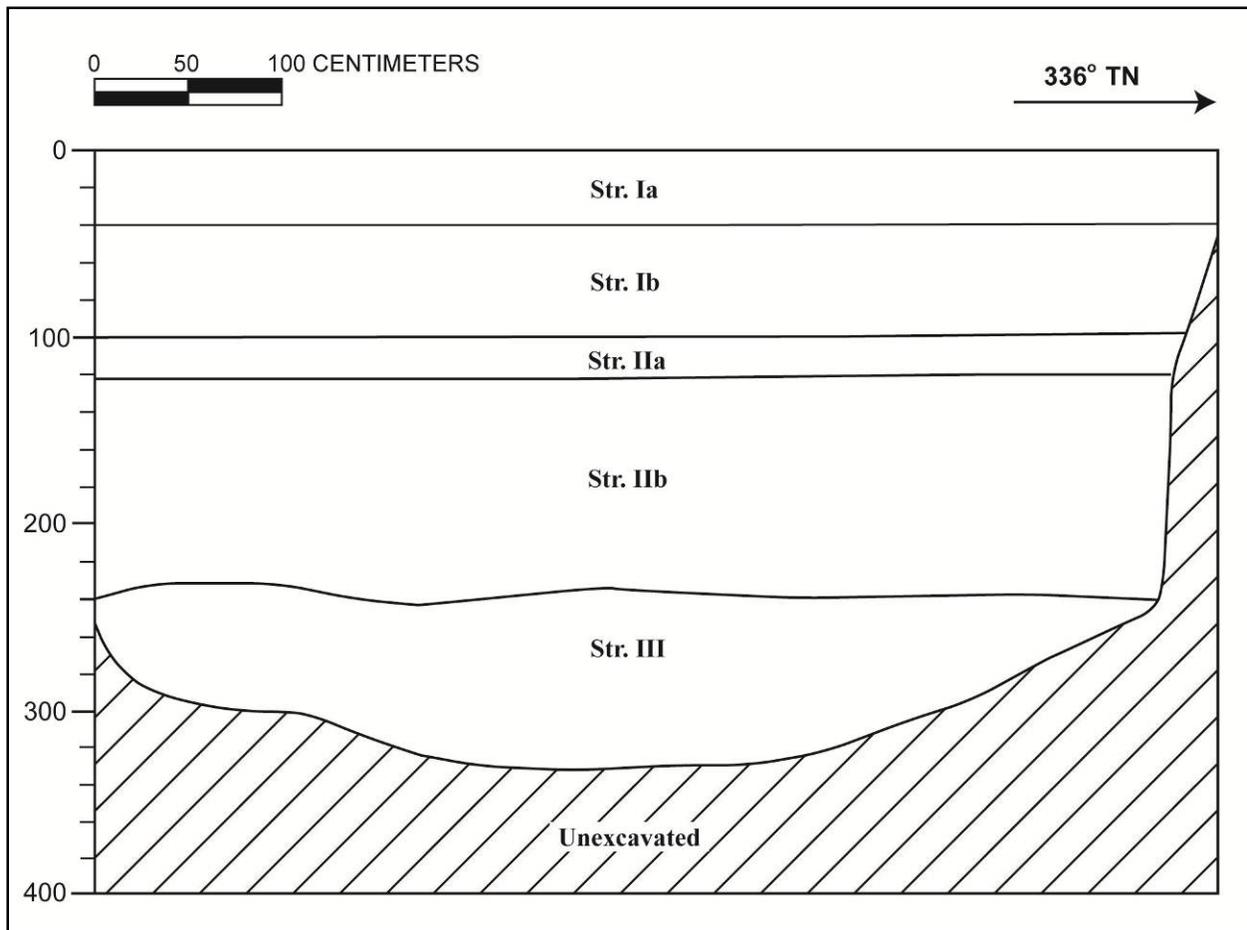


Figure 47. Profile of the west wall of Trench E24

Table 22. Stratigraphic Description for Trench E24

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-40	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	40-100	Fill; crushed coral base course; clear, smooth lower boundary
IIa	100-125	Asphalt or rock tar and mud conglomerate, buried road or driveway surface
IIb	125-240	Fill; 10 YR 5/3 (brown); gravelly clay; structureless, single grain; moist, firm consistency; non-plastic; terrigenous origin; abrupt, smooth lower boundary; no roots; contains angular basalt cobbles
III	240-330 (BOE)	Natural; 10 YR 4/2 (dark grayish brown); silty clay loam; weak, medium, crumb structure; moist, friable consistency; slightly plastic; terrigenous origin; lower boundary not visible; no roots; sterile sediment

### 23. Trench E25

Trench E25 is located along Kamehameha Highway South of 'Aiea Cemetery. During construction the road surface in this area was cut and graded ~24 feet (~7.32 m) below the 1933 ground surface

The natural sediment encountered was sterile, containing no evidence of past land utilization or modification. No cultural deposits associated with 'Aiea Cemetery were identified.



Figure 48. Photograph of the west wall profile of Trench E25, view to the northwest

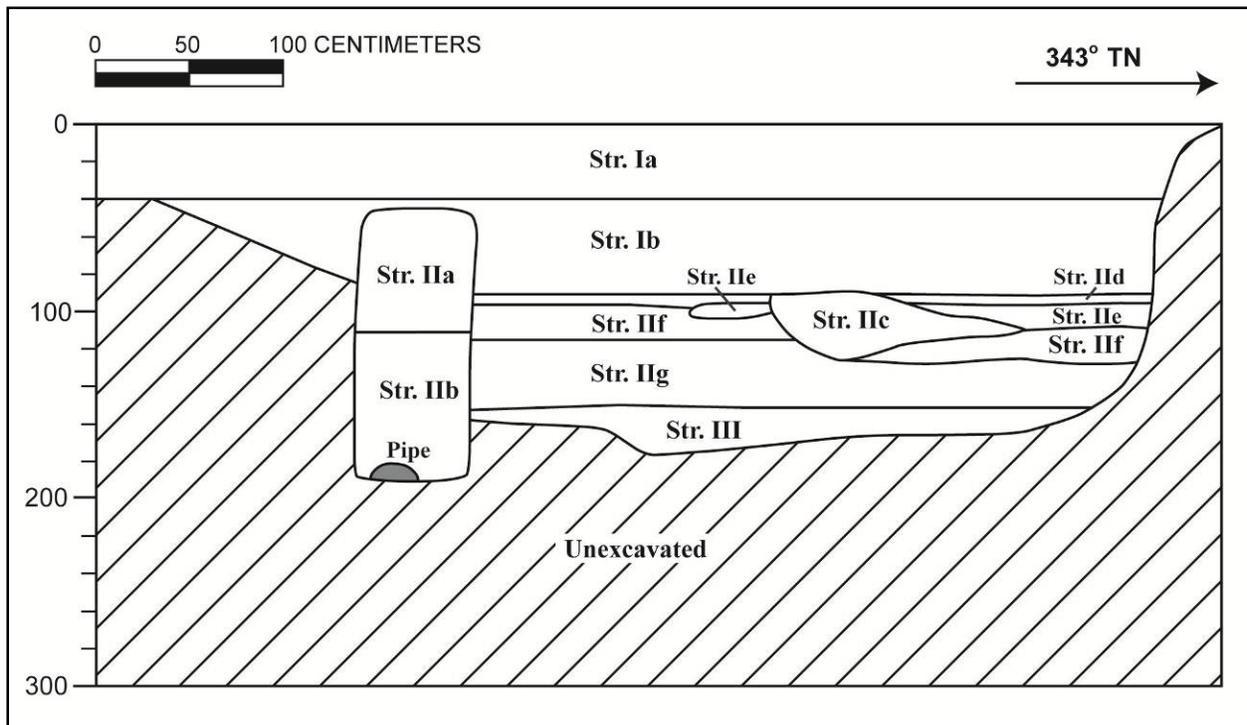


Figure 49. Profile of the west wall of Trench E25

Table 23. Stratigraphic Description for Trench E25

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-40	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	40-90	Fill; crushed coral base course; clear, smooth lower boundary
IIa	45-110	Fill; 10 YR 3/2 (very dark grayish brown); gravelly silt loam; structureless; dry, loose consistency; non-plastic; terrigenous origin; very abrupt, smooth lower boundary; no roots; fill associated with sewer line
IIb	110-190	Fill; crushed coral; lower boundary not visible; fill around sewer line
IIc	90-125	Fill; 10 YR 3/3 (dark brown) with 40 % coral gravel; sandy silt loam; weak, fine, crumb structure; dry, weakly coherent to moist, very friable consistency; non-plastic; terrigenous and marine origin; clear, irregular lower boundary; no roots
IId	90-95	Fill; 10 YR 3/3 (dark brown); clay loam; weak, fine, crumb structure; moist, friable consistency; slightly plastic; terrigenous origin; clear, smooth lower boundary; no roots

Iie	95-110	Fill; crushed coral fill clear smooth lower boundary
IIf	95-129	Fill; asphalt and basalt gravel pieces; clear, smooth lower boundary; buried road surface
IIG	115-151	Fill; 10 YR 3/2 (very dark grayish brown); gravelly clay loam; weak, fine to medium, crumb structure; moist, friable to firm consistency; slightly plastic; terrigenous origin; very abrupt, smooth lower boundary; no roots
III	150-175 (BOE)	C-Horizon; basalt bedrock; lower boundary not visible

#### 24. Trench E26

Trench E26 is located along Kamehameha Highway north of Kalaloa Street east of the Arizona Memorial. The trench is situated near the former land boundary of LCA #2131:1. Land use information for this LCA is documented as *lo'i* and *kula*.

The natural sediment encountered was sterile, containing no evidence of past land utilization or modification. A wet-screened bulk sample yielded fine roots and one water-rounded fish tooth. No cultural deposits associated with LCA #2131:1 were identified.



Figure 50. Photograph of the east wall profile of Trench E26, view to the northeast

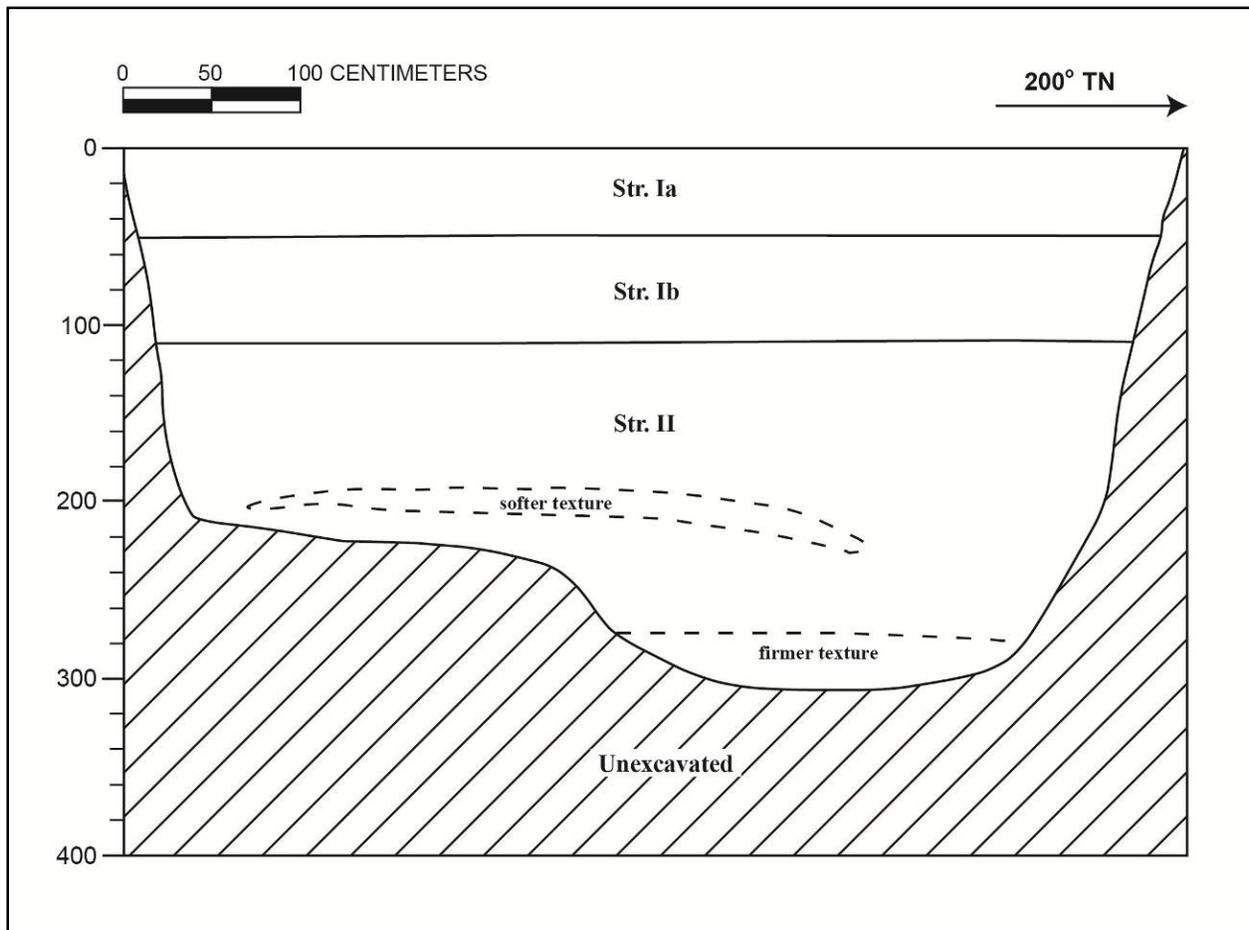


Figure 51. Profile of the east wall of Trench E26

Table 24. Stratigraphic Description for Trench E26

Stratum	Depth (cmbs)	Description of Sediment
Ia	0-50	Asphalt; Kamehameha Highway road surface; abrupt, smooth lower boundary
Ib	50-110	Fill; basalt gravel base course with rootlets; clear, smooth lower boundary
II	110-310 (BOE)	Natural; 10 YR 6/3 (pale brown); silt; weak, fine, crumb structure; dry, weakly coherent consistency; non-plastic; terrigenous origin; lower boundary not visible; no roots

## 25. Trench E27

Trench E27 is located along Kamehameha Highway, north of Kalaloa Street and east of the Arizona Memorial. The trench is within an empty, fenced-off lot adjacent to an apartment complex. No LCA's were intersected by the trench area.

The natural sediment encountered was sterile, containing no evidence of past land utilization or modification. A wet-screened bulk sample of Stratum IIa yielded a few fine roots and fine basaltic gravel. No cultural deposits were identified within this trench.



Figure 52. Photograph of the east wall profile of Trench E27

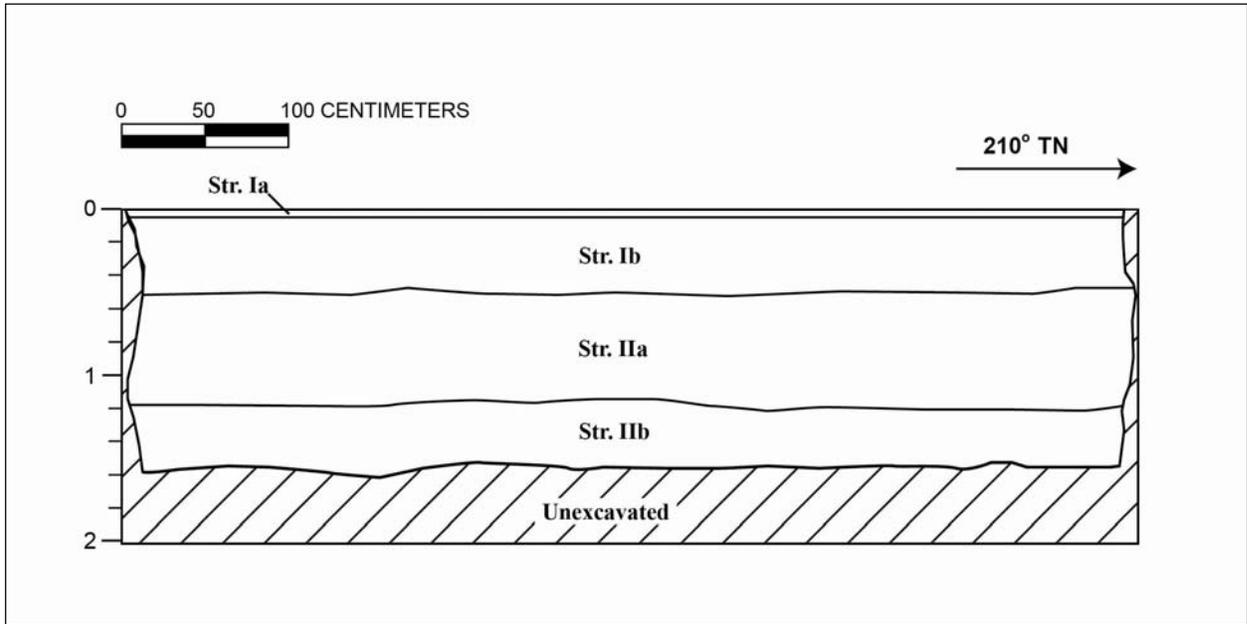


Figure 53. Profile of the east wall of Trench E27

Table 25. Stratigraphic Description for Trench E27

Stratum	Depth (cmbs)	Description
Ia	0-10	Asphalt; parking lot surface; very abrupt, smooth lower boundary
Ib	10-50	Fill; clay loam base course; very abrupt, smooth lower boundary
IIa	50-120	Natural; 10 YR 3/3 (dark brown); clay loam; moderate, fine, crumb structure; moist, firm consistency; slightly plastic; terrigenous origin; diffuse, smooth lower boundary; no roots visible; natural material, possibly graded prior to fill importation
IIb	120-BOE	Natural; 10 YR 3/3 (dark brown); clay loam; moderate, fine, crumb structure; moist, firm consistency; slightly plastic; terrigenous origin; diffuse, smooth lower boundary; no roots visible; natural material

### Pearlridge Transit Station

The following provides a description of the stratigraphy observed within three test trenches excavated within the *makai* portion of the Pearlridge Station. The *makai* Pearlridge Station is situated within the former boundary of LCA #9315:1 The land use information for this LCA is documented as *lo 'i* and *kula*.

Test trenches were additionally proposed for the *mauka* portion of the Pearlridge Station footprint. However, due to lack of permitted access to the *mauka* property on the part of the land

owner, the proposed *mauka* test trenches were instead switched to the central corridor of Kamehameha Highway, adjacent to the *makai* and *mauka* station footprints. The alternative test trenches were placed in the location of proposed guideway columns. The alternative trenches (E12, E13, and E14) are detailed in the previous section.

## 26. Trench PRS1



Figure 54. Photograph of east wall profile of Trench PRS1, showing the north end and fill stratigraphy, view to the west

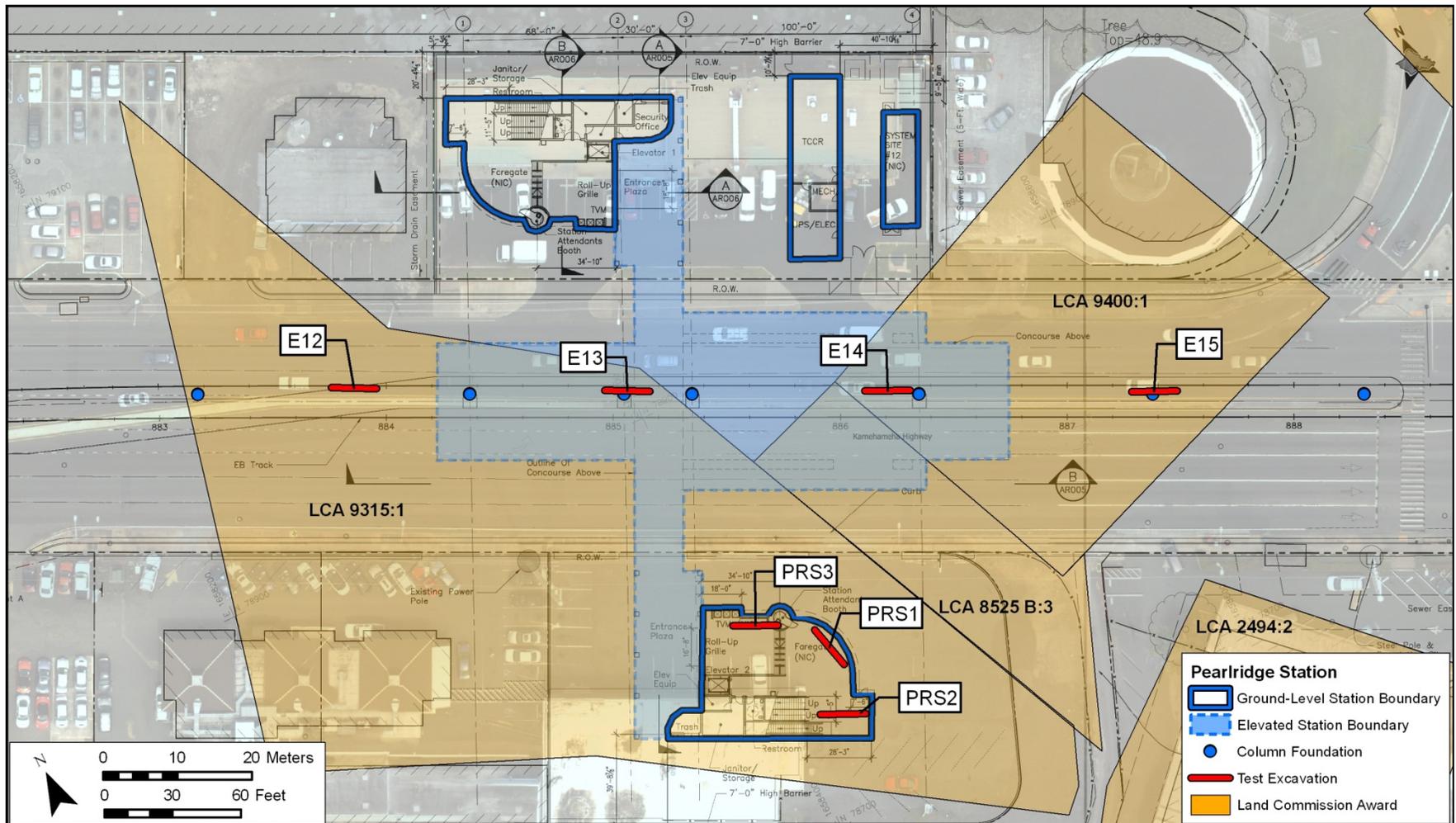


Figure 55. General project area and test trench locations of the *makai* Pearlridge Transit Station



Figure 56. Photograph of east wall profile of Trench PRS1, south end, showing clay loam fill strata (gray color) overlying natural sandy clay loam and sandy loam strata (the area of bulk sample collection visible above the watertable)

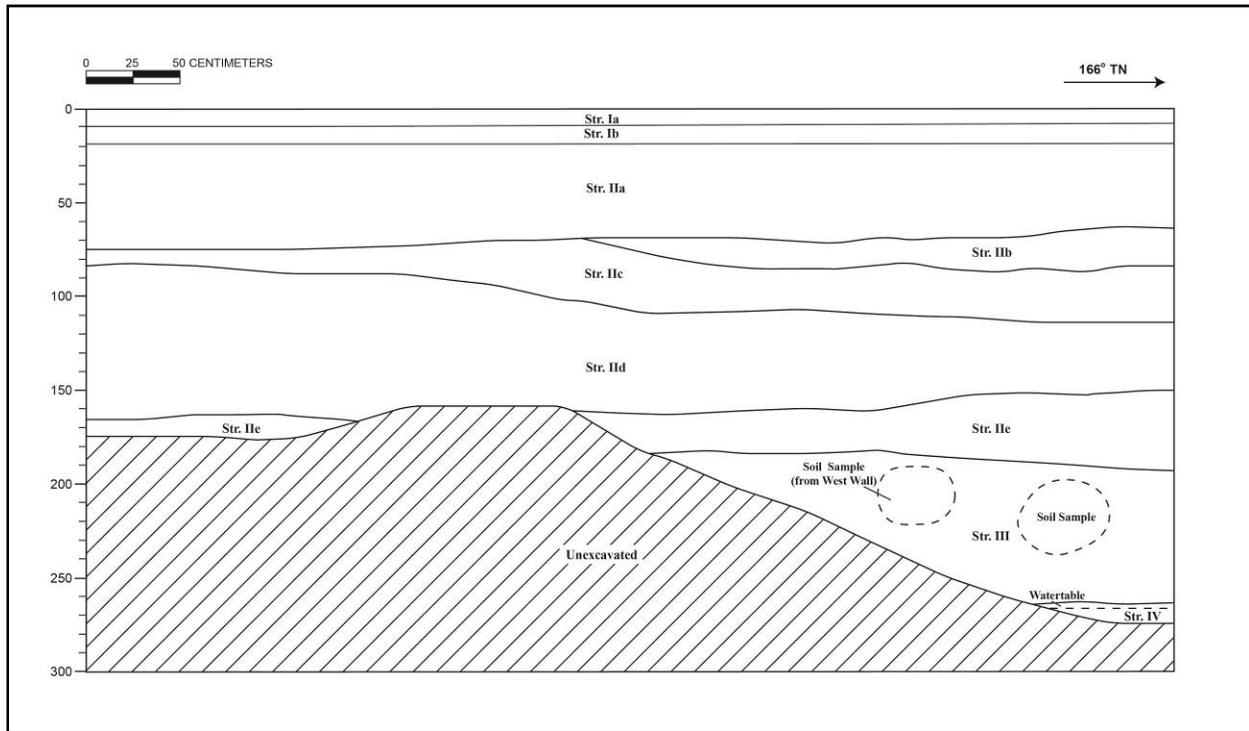


Figure 57. Profile of the east wall of Trench PRS1

Table 26. Stratigraphic Description for Trench PRS1

Stratum	Depth (cmbs)	Description
Ia	0-10	Asphalt; parking lot surface; very abrupt, smooth lower boundary
Ib	10-20	Fill; crushed coral base course; very abrupt, smooth lower boundary
IIa	20-75	Fill Layer; 5 YR 3/3 (dark reddish brown); clay loam; moderate, fine, granular structure; moist, friable consistency; slightly plastic; terrigenous origin; very abrupt, smooth lower boundary; grading fill
IIb	65-85	Fill; 7.5 YR 4/2 (brown); clay loam; moderate, medium, blocky structure; moist, friable consistency; slightly plastic; terrigenous origin; very abrupt, smooth lower boundary; mixed fill with inclusions of gray clay, flecks of dusky red sediment, and coral and basalt gravel
IIc	70-115	Fill; GLEY 1 4/1 (dark greenish gray); sandy clay loam; moderate, fine, blocky structure; moist, friable consistency; slightly plastic; terrigenous origin; clear, wavy lower boundary
IId	85-165	Fill; GLEY 1 4/1 (dark greenish gray); sandy clay loam; moderate, fine, angular blocky structure; moist, firm consistency; slightly plastic; terrigenous origin; clear, smooth lower boundary; slightly darker and less plastic fill stratum than IVa
IIE	150-195	Fill; GLEY 1 4/1 (dark greenish gray) with mottles of 10R 3/4 (dusky red); clay loam; moderate, fine, blocky structure; moist, firm consistency; slightly plastic; terrigenous origin; very abrupt, smooth lower boundary; mottles <1 mm
III	185-265	Natural; 7.5 YR 3/3 (dark brown) with mottles of 2.5 YR 4/6 (red); sandy clay loam; moderate, fine, crumb structure; moist, friable consistency; slightly plastic; terrigenous origin; clear, smooth lower boundary; few medium roots; 40% inclusions of red flecks and striations <1 mm
IV	265-275	Natural; 10 YR 4/2 (dark grayish brown) with mottles of 7.5 YR 4/6 (strong brown); sandy loam; strong, medium, blocky structure; moist, firm consistency; weak cementation; non-plastic; terrigenous and marine origin; included oxidizing basalt flecks and small cobbles and at lowest level of stratum contained striations of strong brown < 2 cm

## 27. Trench PRS2

Due to the presence of a concrete jacket and buried utility line, the trench was not excavated to the water table and did not reach the underlying natural stratigraphy. However, given the proximity to Trench PRS1 and the similarity of the overlying fill strata, it is likely that the natural strata are consistent with those observed within Trench PRS1.



Figure 58. Photograph of southeast wall profile of Trench PRS2, view to the west



Figure 59. Photograph of southeast wall profile of Trench PRS2, showing concrete jacket, view to the south

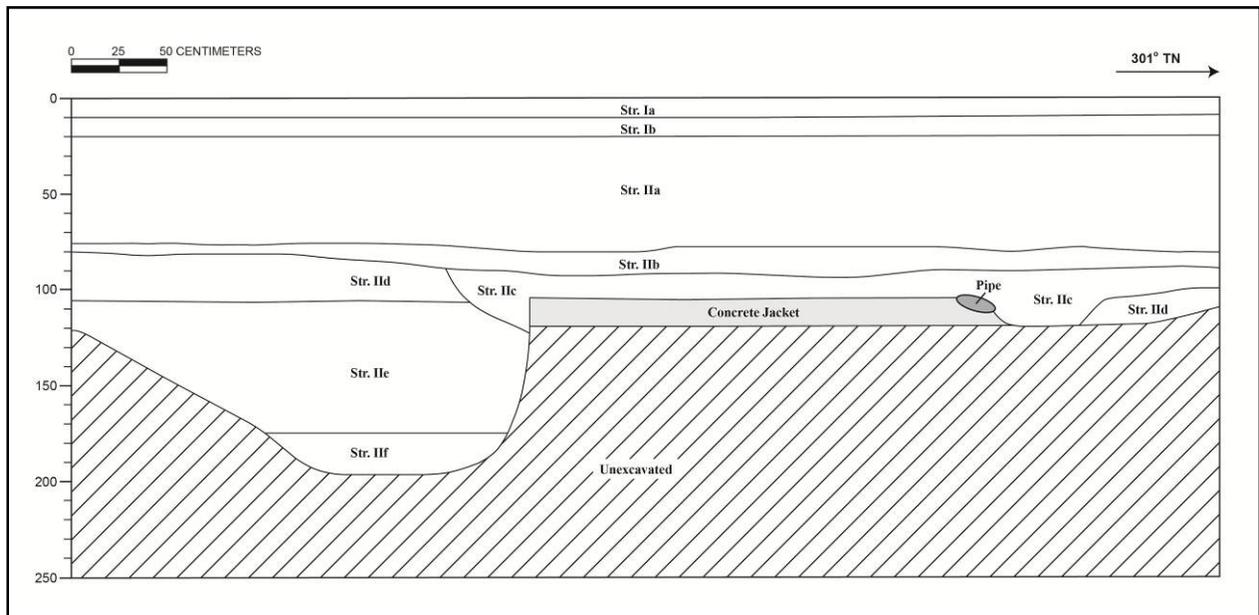


Figure 60. Profile of the southwest wall of Trench PRS2

Table 27. Stratigraphic Description for Trench PRS2

Stratum	Depth (cmbs)	Description
Ia	0-10	Asphalt; parking lot surface; very abrupt, smooth lower boundary
Ib	10-20	Fill; crushed coral base course; very abrupt, smooth lower boundary
IIa	20-80	Fill; 5 YR 3/3 (dark reddish brown); clay loam; moderate, fine, granular structure; moist, friable consistency; slightly plastic; terrigenous origin; very abrupt, smooth lower boundary; grading fill
IIb	70-90	Fill; 7.5 YR 4/2 (brown); clay loam; moderate, medium, blocky structure; moist, friable consistency; slightly plastic; terrigenous origin; very abrupt, smooth lower boundary; mixed fill with inclusions of gray clay, flecks of dusky red/white/black sediment, and crushed coral and basalt gravel
IIc	90-120	Fill; 7.5 YR 3/1 (very dark gray) with mottles of GLEY 1 4/1 (dark gray); clay loam; moderate, fine, blocky structure; moist, friable consistency; slightly plastic; terrigenous origin; very abrupt, irregular lower boundary; approximately 40% inclusions of clay loam, 1-2 mm in diameter; fill surrounding pipe and concrete jacket
IId	80-120	Fill; GLEY 1 4/1 (dark greenish gray); sandy clay loam; moderate, fine, blocky structure; moist, friable consistency; slightly plastic; terrigenous origin; clear, wavy lower boundary

Iie	105-175	Fill; GLEY 1 4/1 (dark greenish gray); sandy clay loam; moderate, fine, angular blocky structure; moist, firm consistency; slightly plastic; terrigenous origin; clear, smooth lower boundary; slightly darker and less plastic fill stratum than IId
IIf	175-195	Fill; 7.5 YR 3/1 (very dark gray) with mottles of 5 YR 4/6 (yellowish red); sandy clay loam; moderate, fine, blocky structure; moist, firm consistency; slightly plastic; terrigenous origin; very abrupt, smooth lower boundary; few mottles, 1-2 mm in diameter, possible inclusions from underlying natural strata (similar to Stratum III of Trench PRS1)

### **28. Trench PRS3**

The excavation of Trench PRS2 was halted by a concrete slab underlying the parking lot asphalt surface. These findings agreed with GPR imaging performed prior to the test excavations, which indicated an indurated layer throughout this quadrant, overlying highly disturbed stratigraphy. The findings likely represent the removal of previous infrastructure and backfilling.

### **Aloha Stadium Transit Station**

The following provides a description of the stratigraphy observed within three test trenches excavated in the Aloha Stadium Transit Station project area. Trenches AS1 and AS3 are within the boundaries of the Park and Ride Facility and Trench AS2 is located within the footprint of the Aloha Stadium Transit Station (Figure).

### **29. Trench AS-1**

Trench AS1 is located in the northeastern section of the Park and Ride project area. The Strata III sequence contained inclusions of vesiculated, well rounded basaltic pebbles and cobbles associated with fluvial transport. The inclusions are highly weathered and appear to be in-situ. These layers may indicate a localized, variable energy, fluvial environment that predates any historic development. Bulk samples from Strata I Ib and IIIa were wet-screened and yielded a few fine roots and fine to course basaltic gravel. No cultural deposits were identified within this trench.

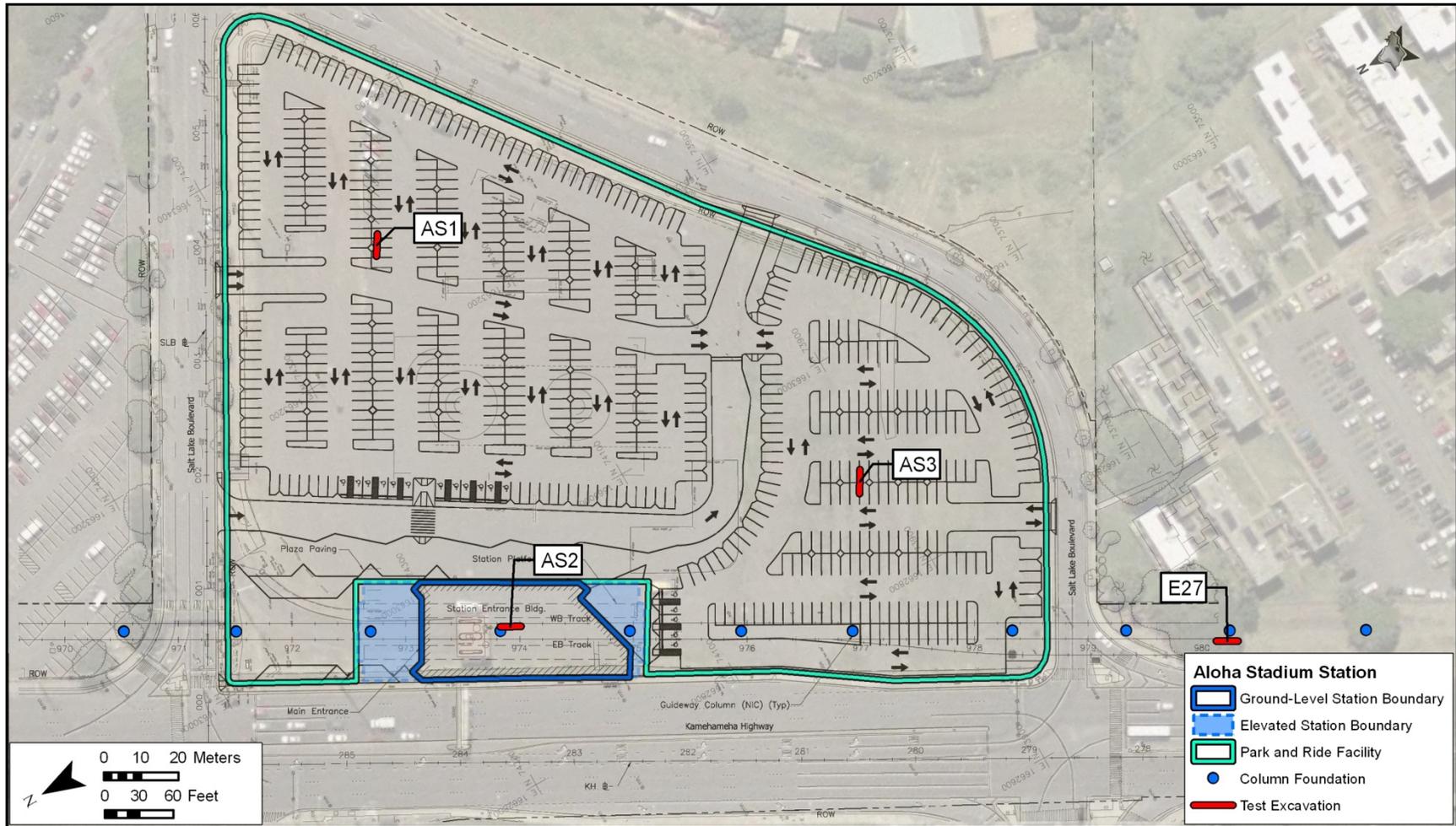


Figure 61. Test trench locations for the Aloha Stadium Station and Park and Ride project area



Figure 62. Photograph of Trench AS1, showing the profile wall, view facing south

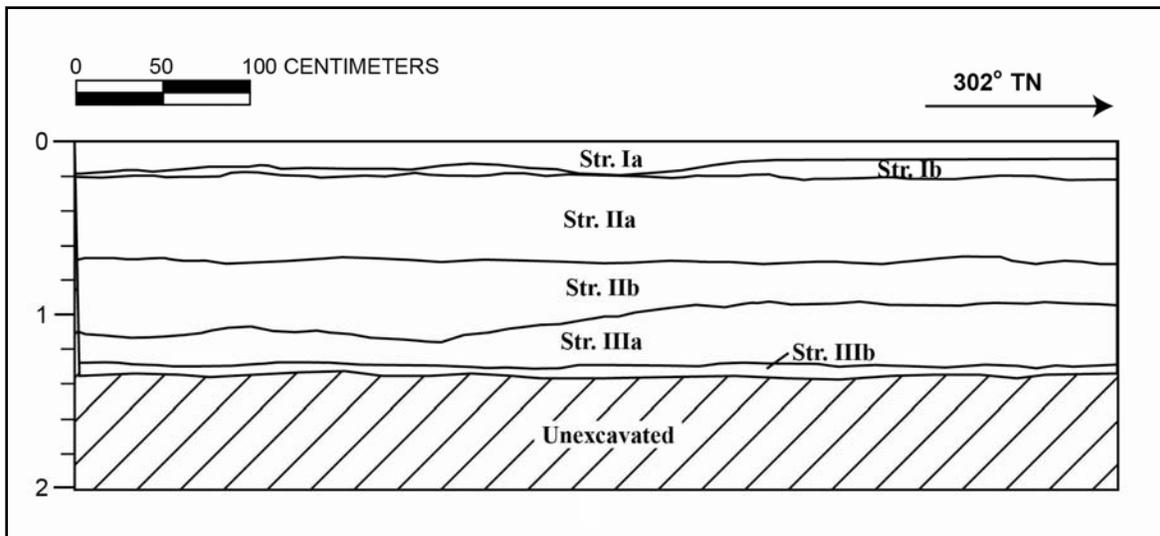


Figure 63. Profile of the southeast wall of Trench AS1

Table 28. Stratigraphic Description for Trench AS1

Stratum	Depth (cmbs)	Description
Ia	0-10	Asphalt; parking lot surface; very abrupt, smooth lower boundary
Ib	10-20	Fill; crushed coral base course; very abrupt, smooth lower boundary
IIa	20-70	Fill; 7.5 YR 3/4 (dark brown); clay loam; structureless; moist, firm consistency; slightly plastic; terrigenous origin; clear, smooth lower boundary; no roots visible; graded clay fill
IIb	70-115	Fill; 10 YR 4/1 (dark grey) with abundant mottles of 10 YR 4/4 (dark yellowish brown); silty clay loam; structureless; moist, firm consistency; slightly plastic; terrigenous origin; abrupt, smooth lower boundary; no roots observed
IIIa	95-130	Natural ; 10 YR 4/3 (brown); gravelly sandy silt; structureless; dry, loose consistency; non-plastic; terrigenous origin; abrupt, wavy lower boundary; no roots observed; pebble to medium cobble inclusions
IIIb	130-139	Natural; 10YR 4/3 (brown); gravelly sandy silt; structureless; dry, loose consistency; non-plastic; terrigenous origin; abrupt, wavy lower boundary; no roots observed; pebble to medium cobble inclusions; similar to IIIa but with a higher degree of cementation

### 30. Trench AS-2

Trench AS2 is located within the footprint of the Aloha Stadium Transit Station project area. Strata III contained inclusions of vesiculated, well rounded basaltic pebbles and cobbles associated with fluvial transport. The inclusions are highly weathered and appear to be in-situ. These layers may indicate a localized, variable energy, fluvial environment that predates any historic development.

A bulk sample of Stratum II was collected, wet-screened through fine mesh, and yielded a small number of fine sand sized basaltic particles. No cultural deposits were encountered within this trench.



Figure 64. Photograph of Trench AS2, showing the profile wall, view facing northeast



Figure 65. Photograph of Trench AS2, showing the profile wall, view facing southeast

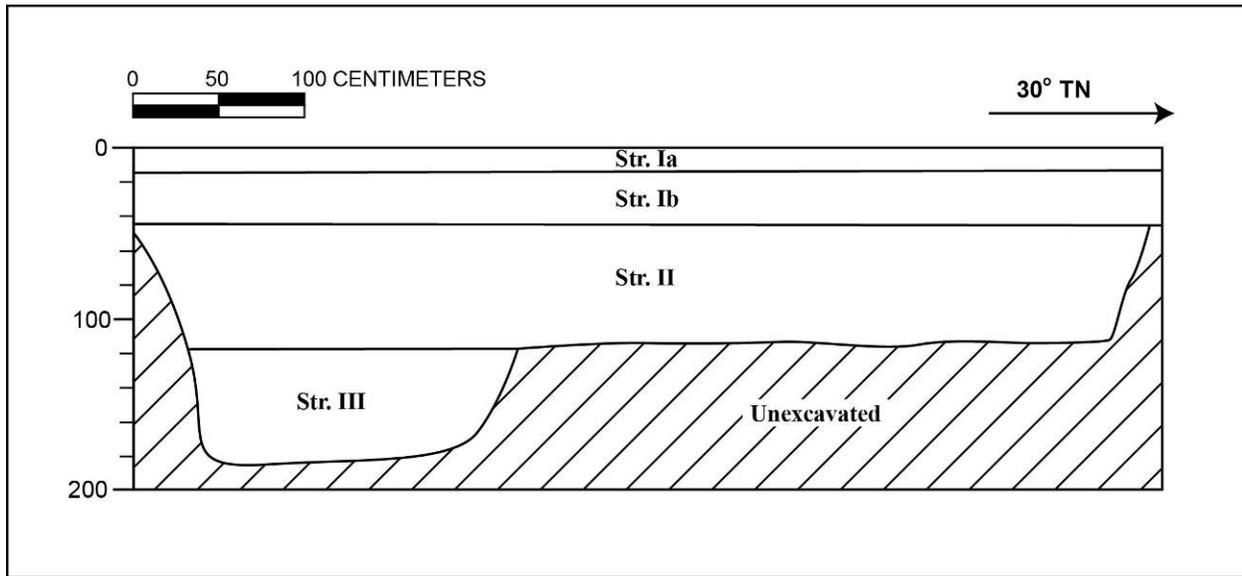


Figure 66. Profile of the southeast wall of Trench AS2

Table 29. Stratigraphic Description for Trench AS2

Stratum	Depth (cmbs)	Description
Ia	0-17	Asphalt; parking lot surface; very abrupt, smooth lower boundary
Ib	17-45	Fill; crushed coral base course; very abrupt, smooth lower boundary
II	45-114	Natural; 10 YR 4/4 (dark yellow brown); clay loam; moderate, very fine structure; moist, very friable consistency; slightly plastic; terrigenous origin; clear, smooth lower boundary; no roots visible
III	114-187	Natural; 10 YR 2/2 (very dark brown); gravely sandy silt; fine structure; weakly coherent, very friable consistency; non-plastic; terrigenous origin; lower boundary not visible; no roots observed; well-rounded pebble and cobble inclusions

### 31. Trench AS-3

Trench AS3 is located in the southwestern section of the Park and Ride project area. Bulk samples of Strata IIa and IIb were collected, wet-screened through fine mesh, and yielded fine gravel sized basaltic particles with few fine roots. No cultural deposits were encountered within this trench.



Figure 67. Photograph of Trench AS3, showing the profile wall, view facing south

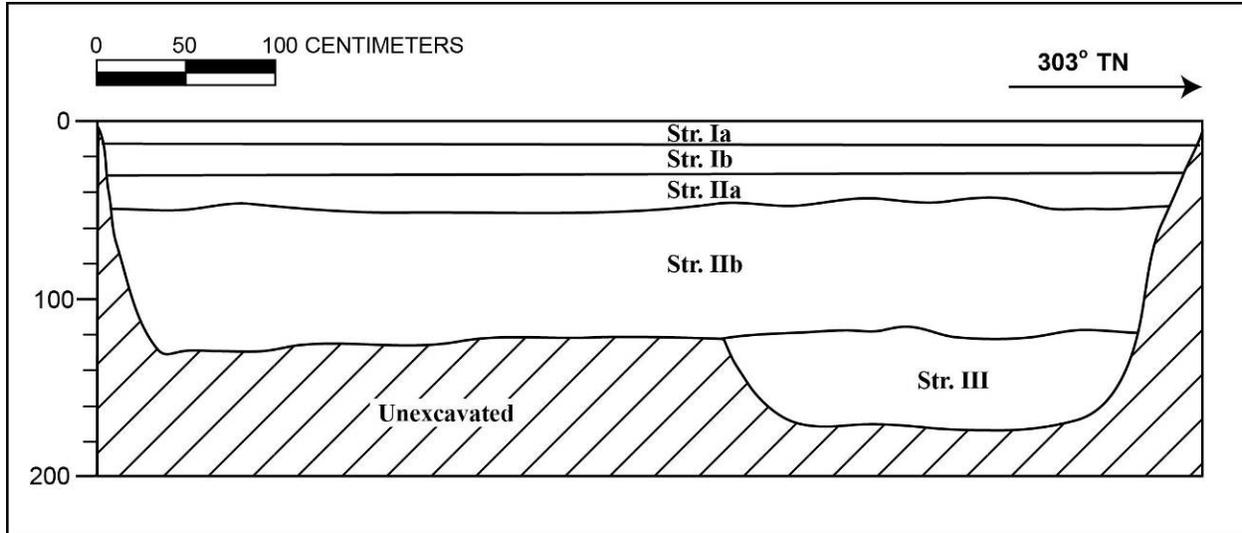


Figure 68. Profile of the south wall of Trench AS3

Table 30. Stratigraphic Description for Trench AS3

Stratum	Depth (cmbs)	Description
Ia	0-10	Fill; 10 YR 3/3 (dark brown); gravely silt; weak, very fine, crumb structure; dry, weakly coherent consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; many fine roots; top soil and gravel layer
Ib	10-30	Fill; 10 YR 3/6 (dark yellowish brown); sandy silt; weak, very fine, crumb structure; dry, slightly hard consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; few fine roots; top soil; inclusions of scattered coral and gravel
IIa	30-45	Natural; 10 YR 3/,( very dark grayish brown); clay loam; moderate, very fine, blocky structure; dry, hard consistency; slightly plastic; terrigenous origin; clear, wavy lower boundary; few fine roots; evidence of disturbance from the importation of fill layers
IIb	45-130	Natural; 10 YR 3/2 (very dark grayish brown); clay loam; moderate, very fine, blocky structure; moist, very firm consistency; plastic; terrigenous origin; clear, smooth lower boundary; few fine roots; sterile
III	120-170	Natural; 10 YR 4/4 (dark yellowish brown); clay loam; moderate, fine, blocky structure; moist, very firm consistency; plastic; terrigenous origin; lower boundary not visible; no roots visible; natural layer with decomposing basalt inclusions

# **Appendix F    AIS Construction Phase 2 Aerial Photos Showing Location of LCAs and Test Trenches**

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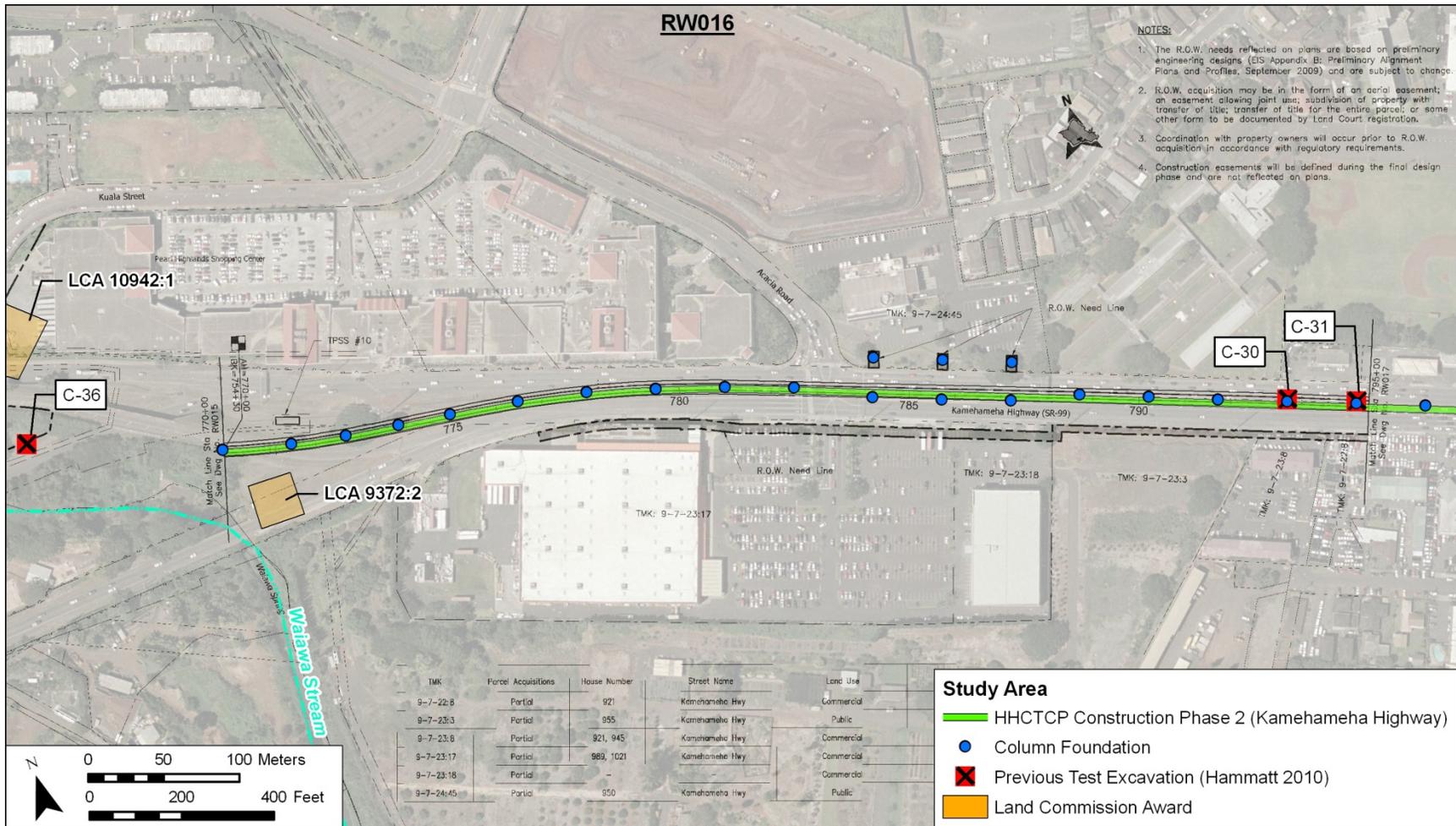


Figure 1. Location of LCAs within vicinity of western-most section of Construction Phase 2

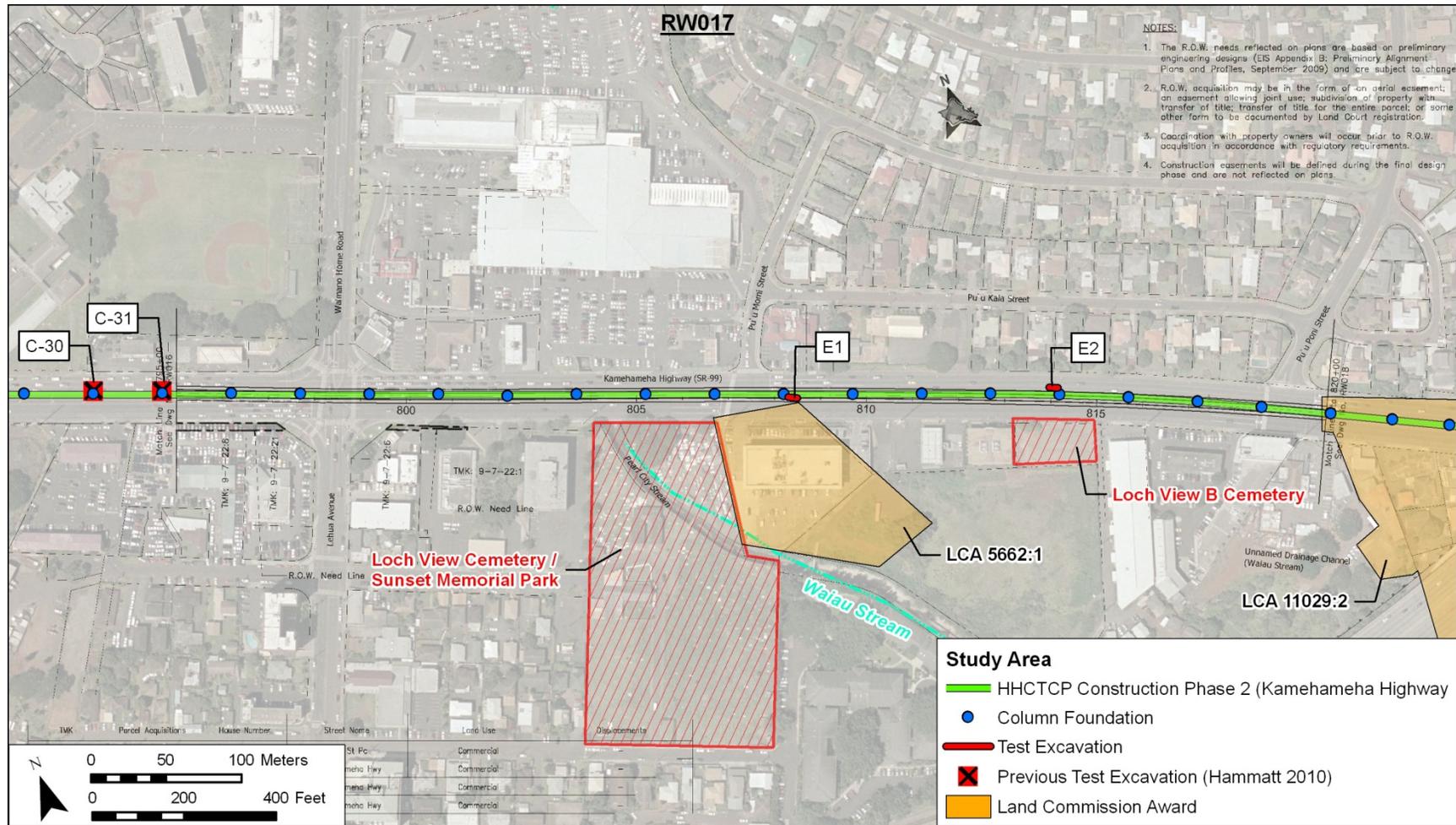


Figure 2. Location of LCAs near Loch View Cemeteries and AIS Construction Phase 2 Trenches E1 and E2

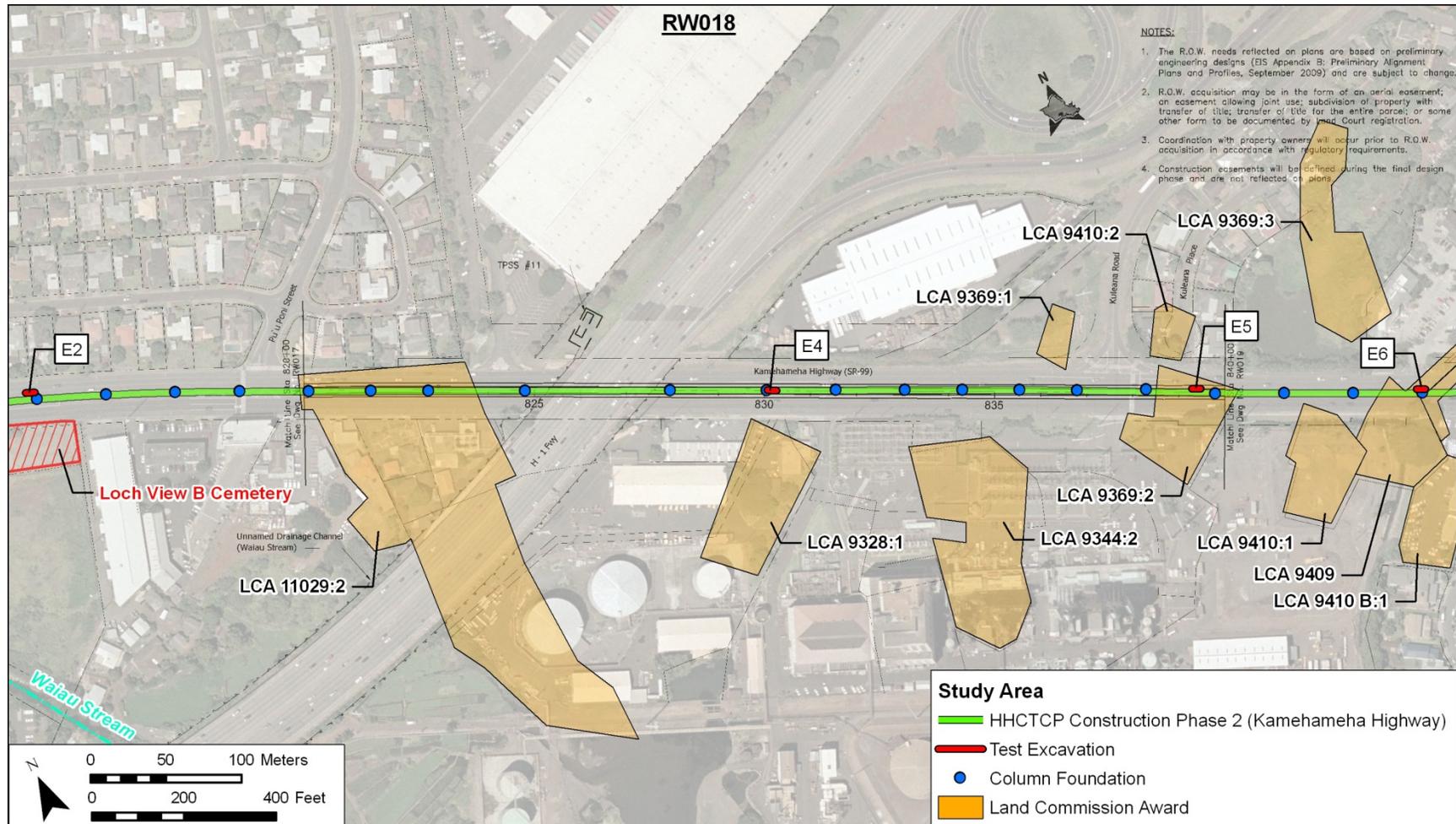


Figure 3. Location of LCAs in vicinity of project corridor and AIS Construction Phase 2 Trenches E4 to E6

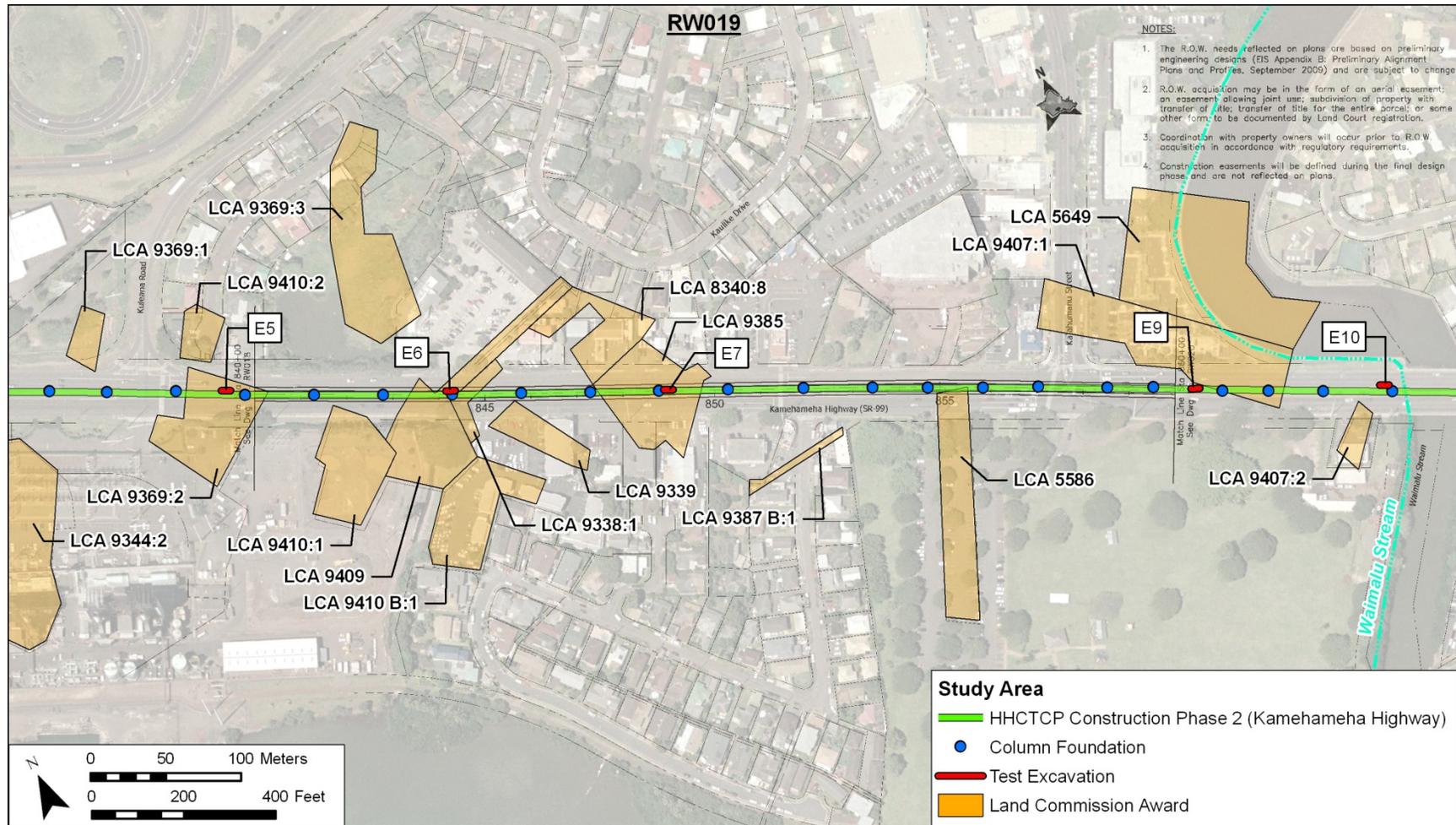


Figure 4. Location of LCAs in vicinity of project corridor and AIS Construction Phase 2 Trenches E5 to E10

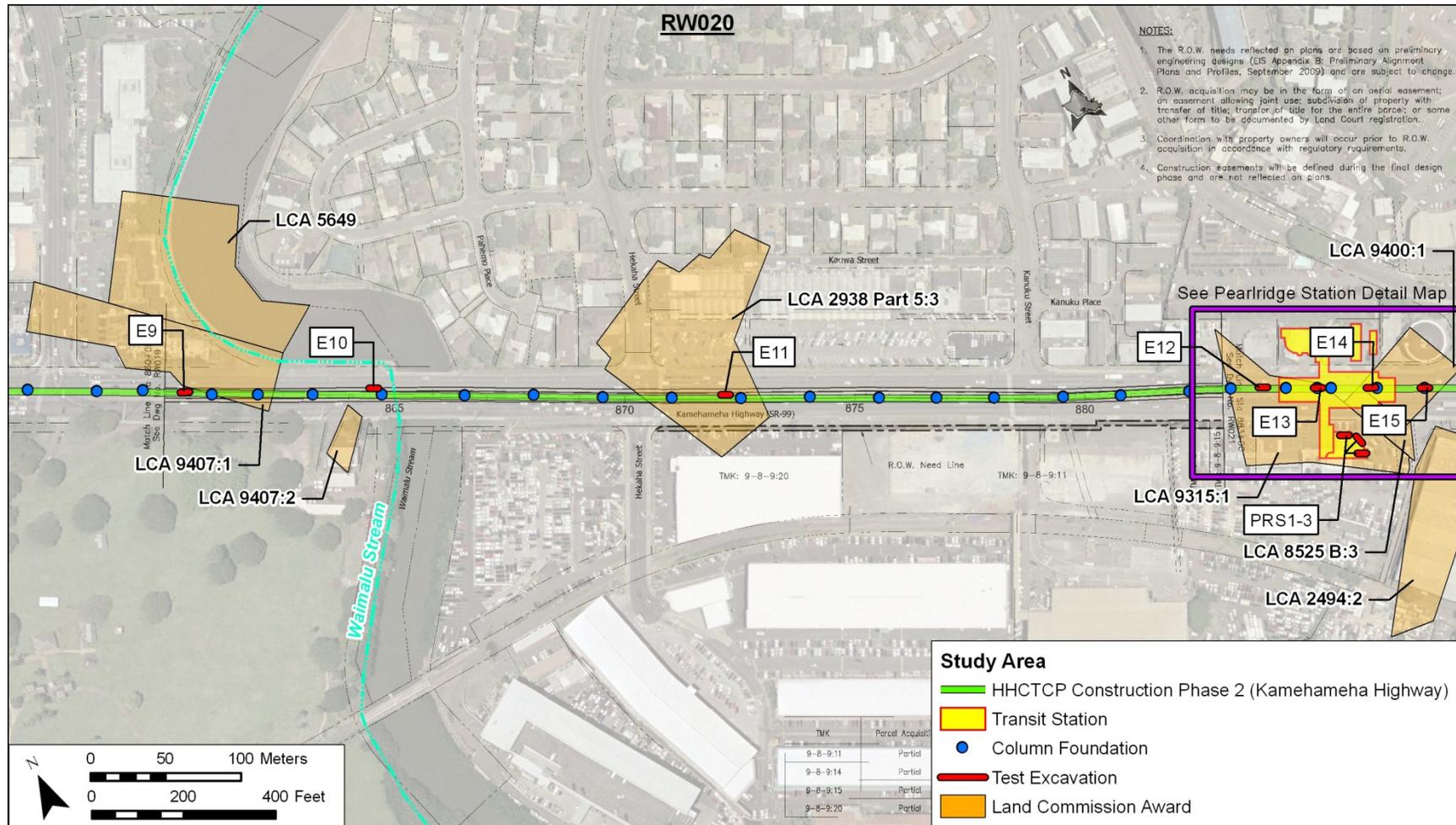


Figure 5. Location of LCAs in vicinity of project corridor and AIS Construction Phase 2 Trenches E9 to E 15 and the Pearlridge Transit Station

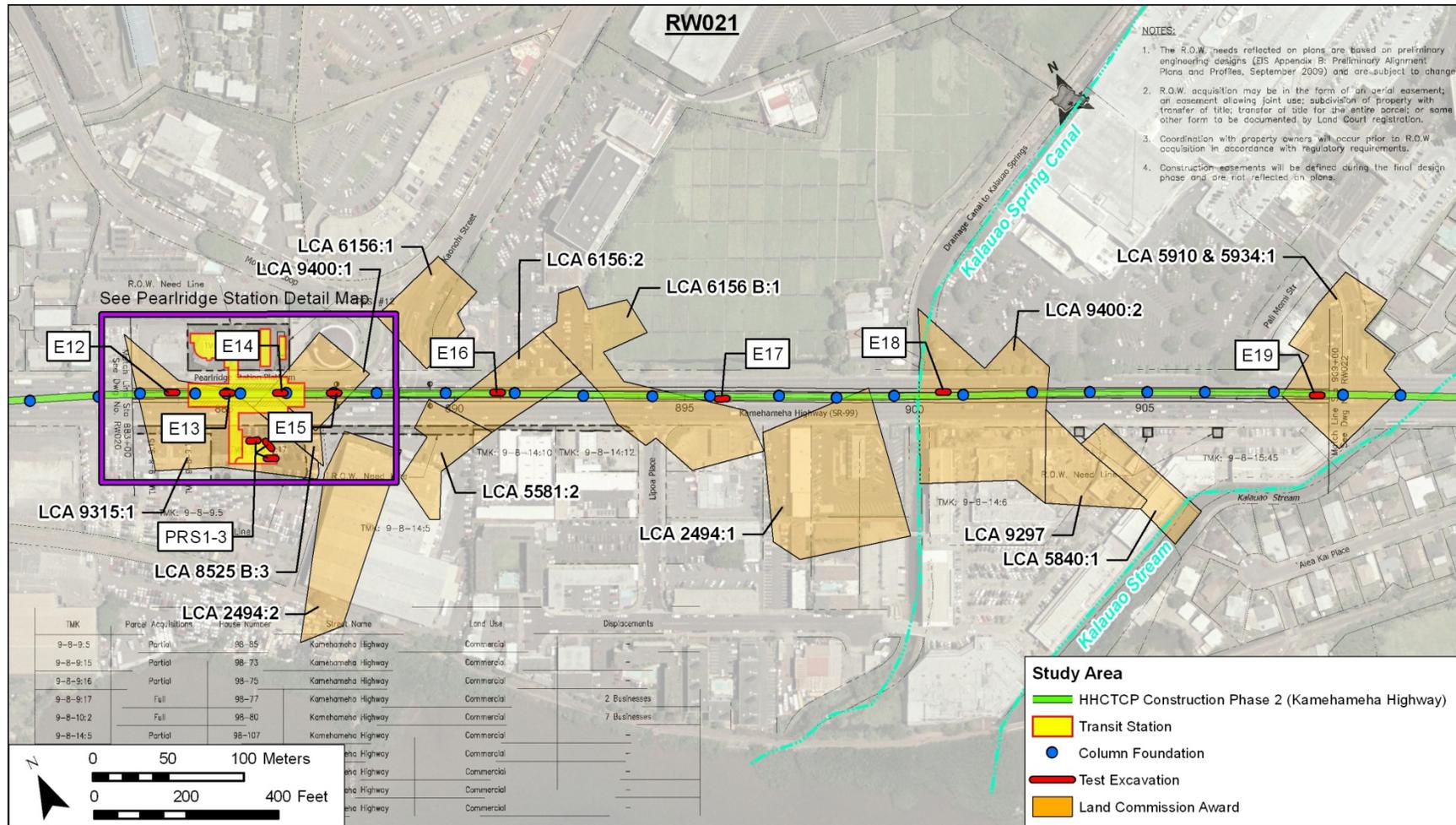


Figure 6. Location of LCAs in the vicinity of the project corridor and AIS Construction Phase 2 Trenches E12 to E19 and Pearlridge Transit Station

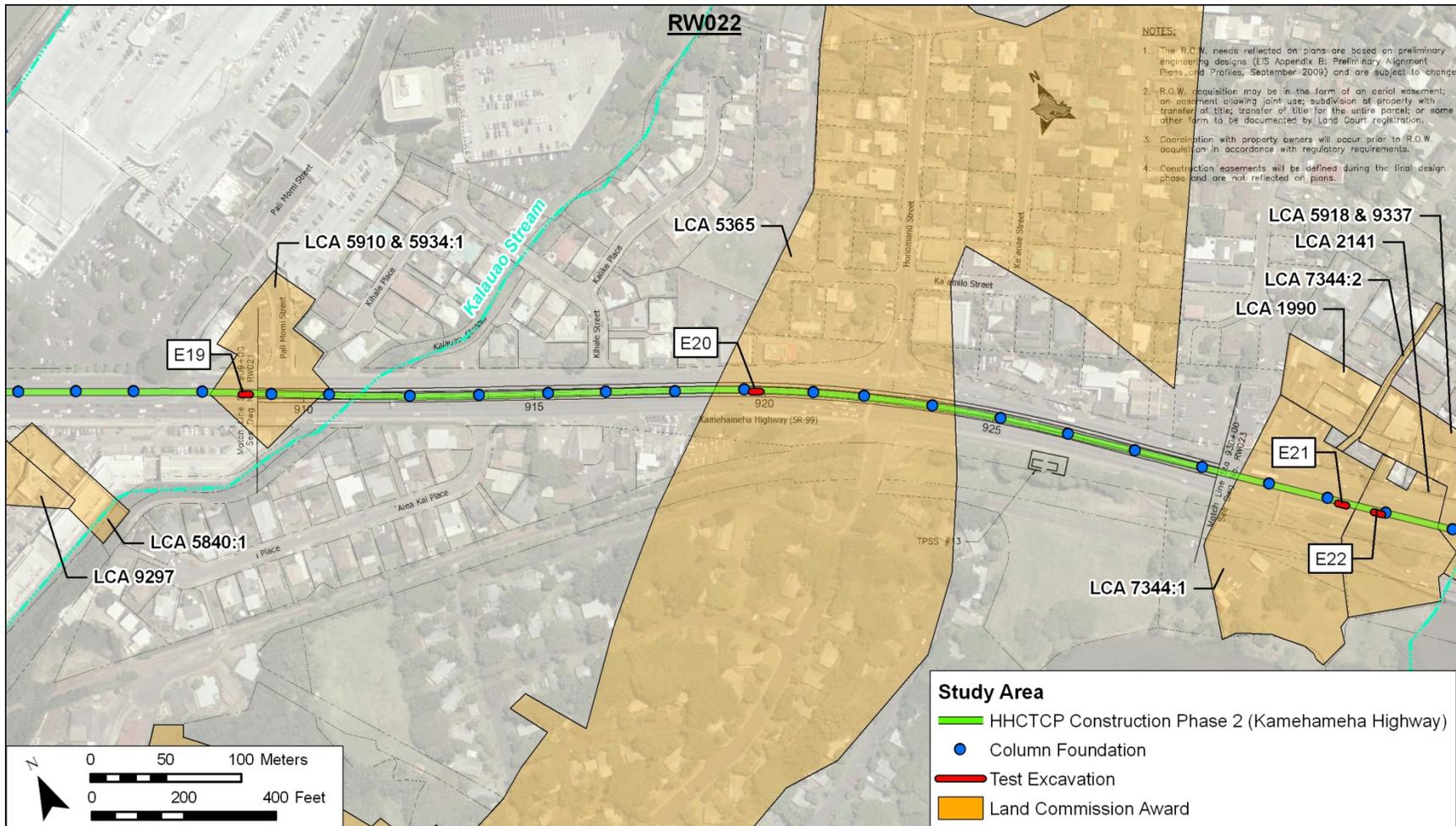


Figure 7. Location of LCAs in vicinity of project corridor and AIS Construction Phase 2 Trenches E19 to E22

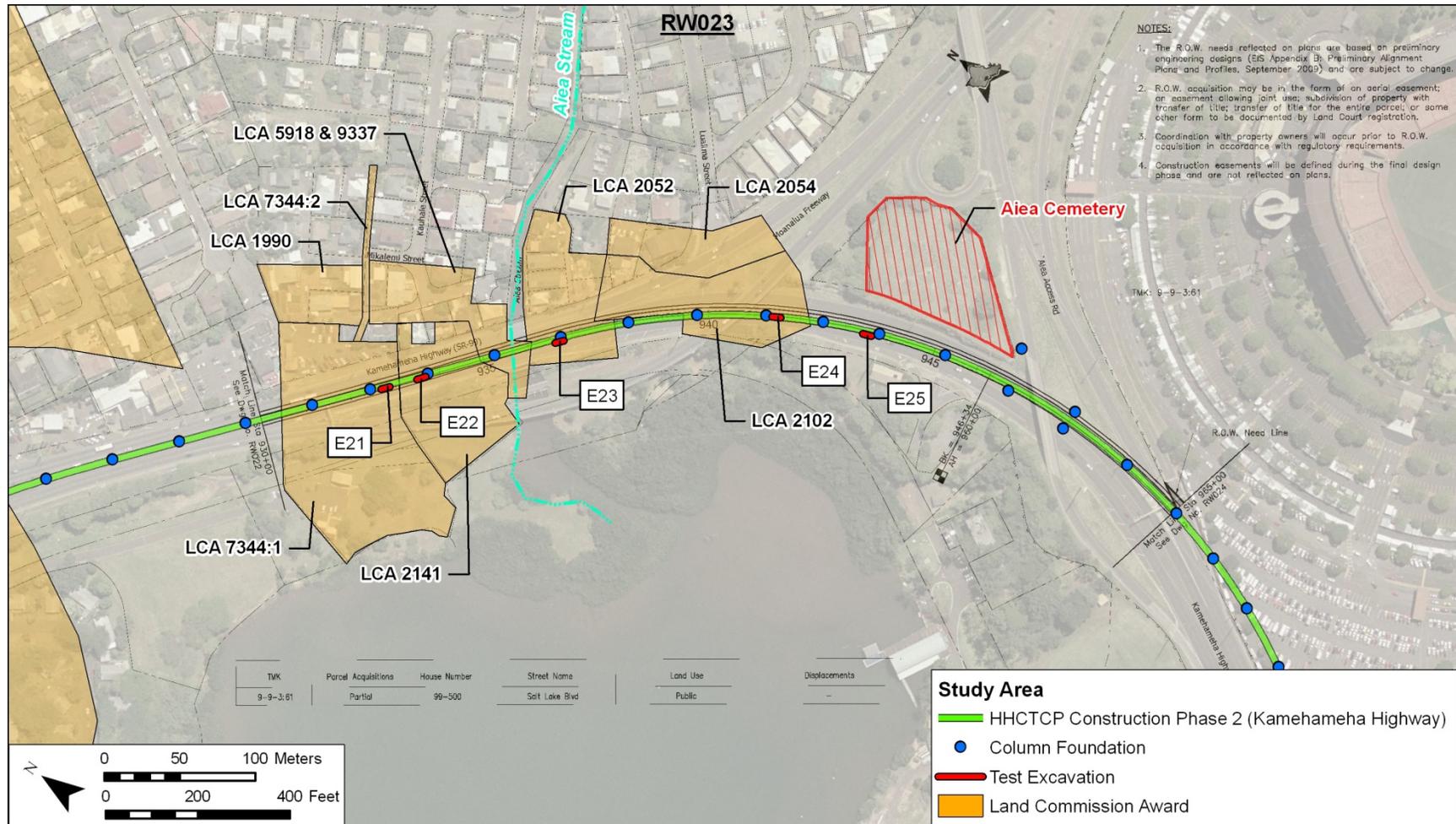


Figure 8. Location of LCAs in vicinity of project corridor and AIS Construction Phase 2 Trenches E12 to E25

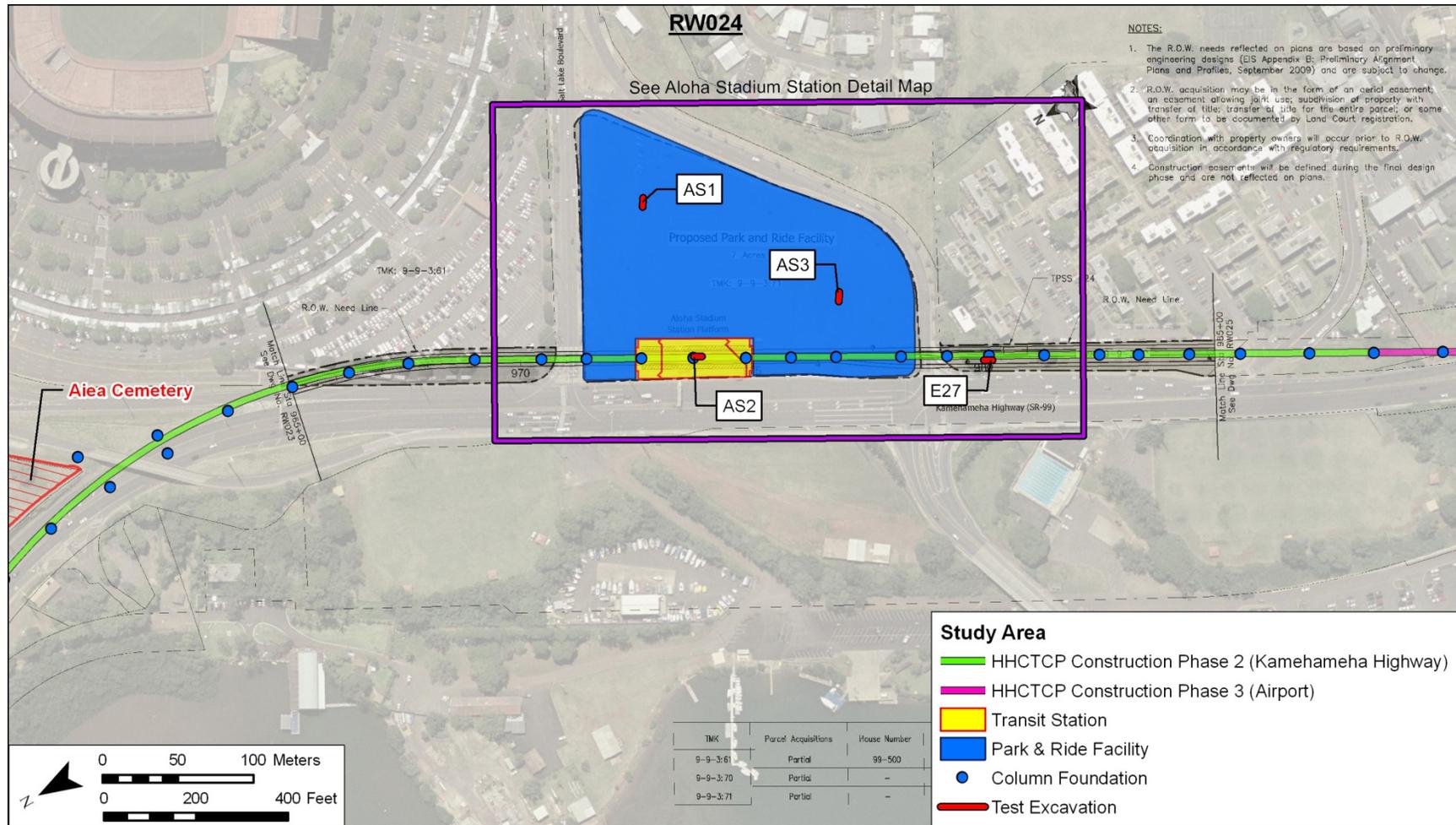


Figure 9. No LCAs documented within the eastern-most section of the Construction Phase 2 project area

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# **Appendix G HDOT As-built Maps of the Construction of Kamehameha Highway Showing Historic Properties**

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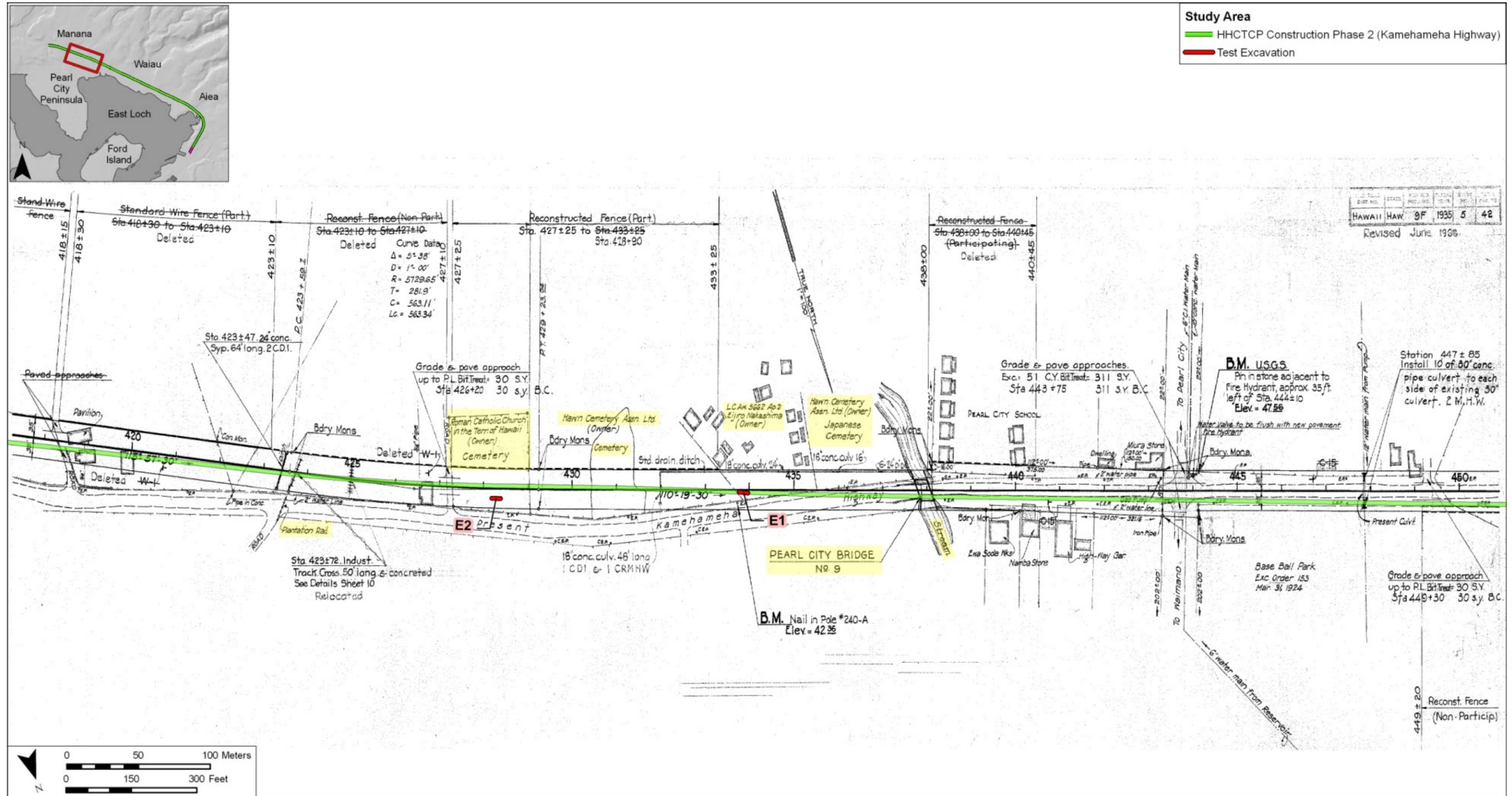


Figure 1. Location of the Construction Phase 2 project corridor (and AIS Trenches E1 and E2) in relation to the 1938 development of Kamehameha Highway, Roman Catholic Church cemetery, Hawaiian cemetery, Japanese cemetery, LCA #5662:2, and Waiu Stream(1938 Hawai'i Department of Transportation engineering plans for the development of Kamehameha Highway, Map 4338.5)



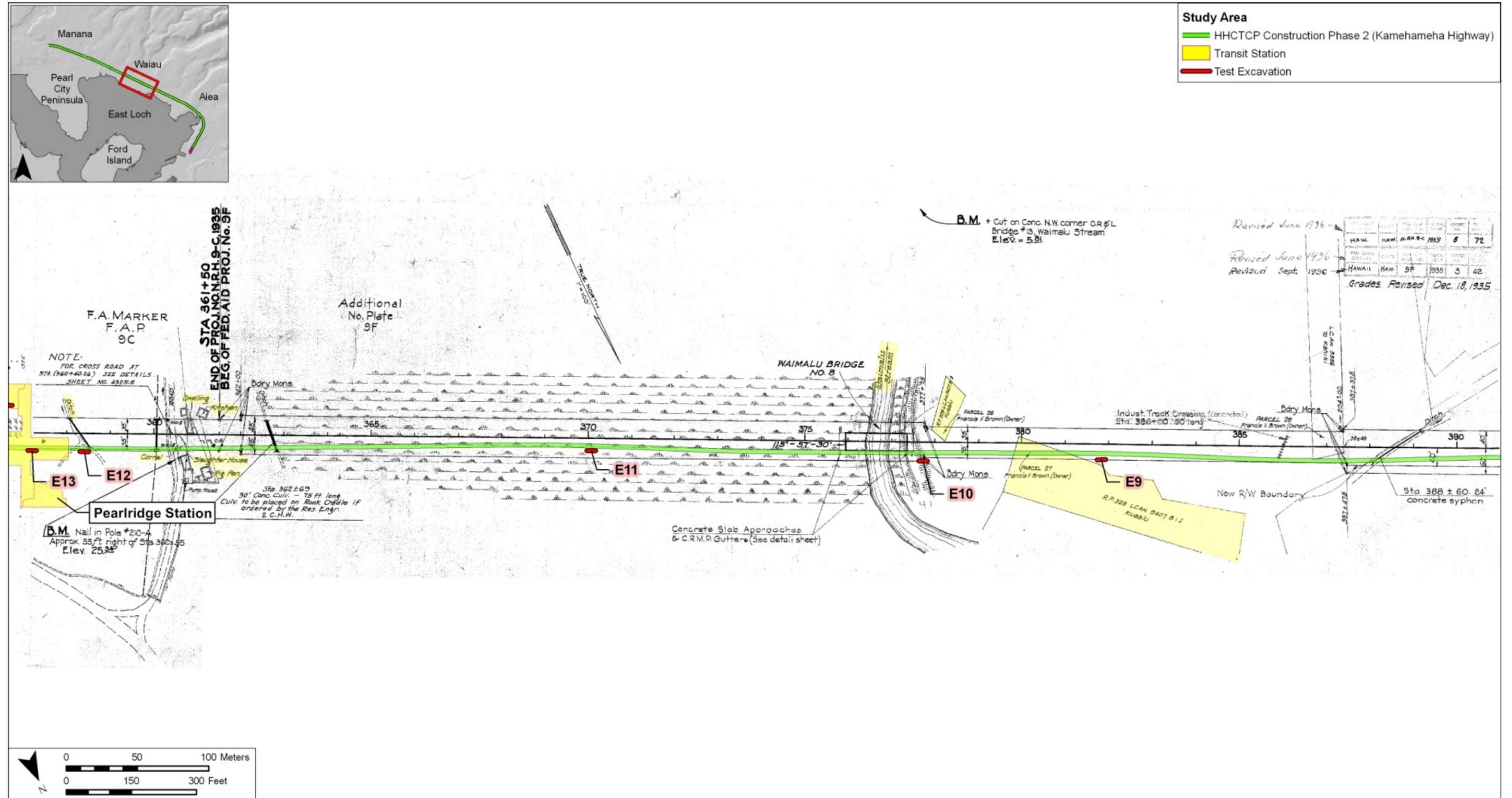


Figure 3. Location of the Construction Phase 2 project corridor (and AIS Trenches E9-E13) in relation to the 1935 development of Kamehameha Highway, existing infrastructure, LCA #9407:1, wetlands, Waimalu Stream, and existing infrastructure (1935 Hawai'i Department of Transportation engineering plans for the development of Kamehameha Highway, Map 4325.5)

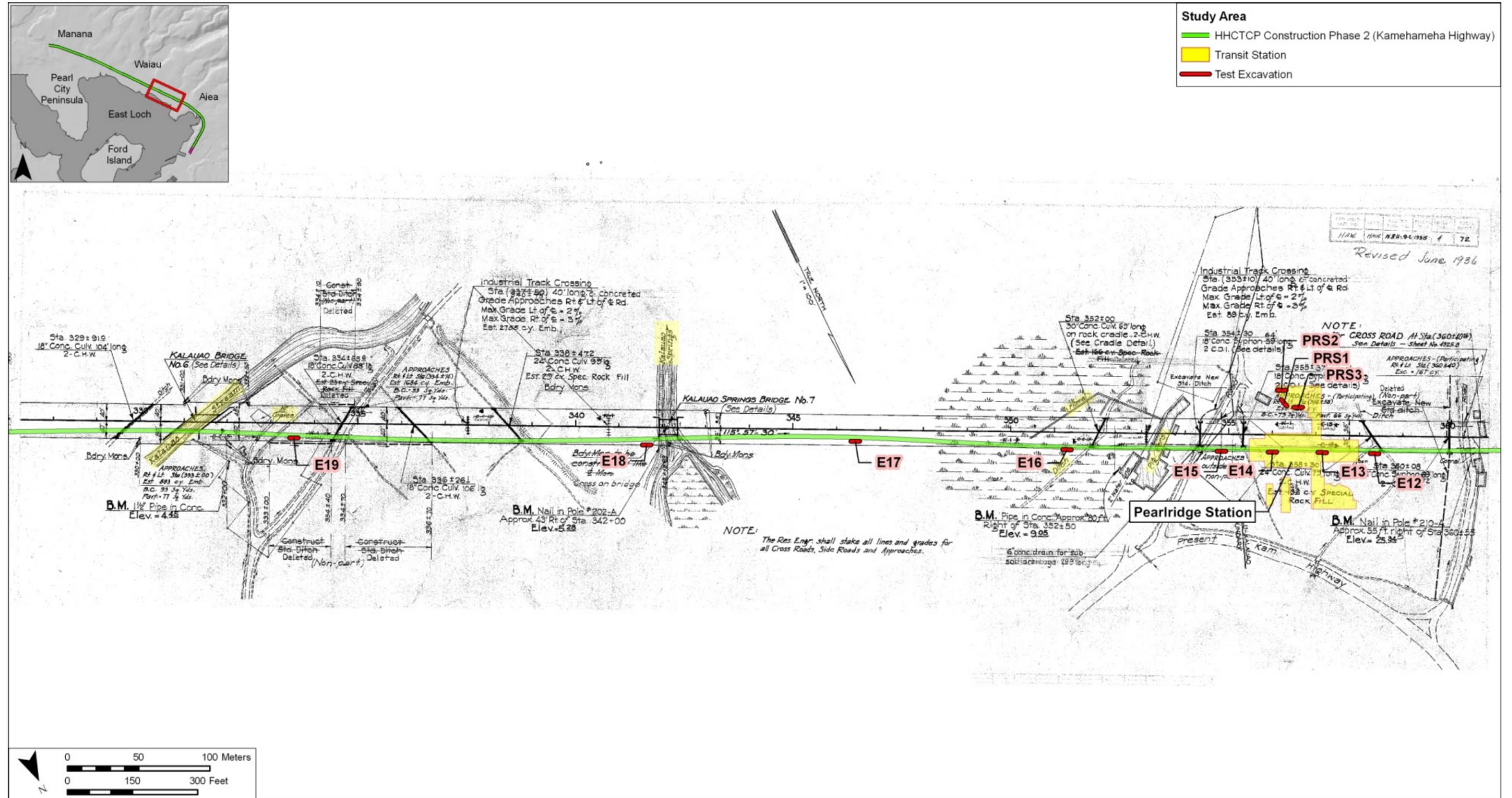


Figure 4. Location of the Construction Phase 2 project corridor (and AIS Trenches E12-E19) in relation to the 1935 development of Kamehameha Highway, existing infrastructure, wetlands, Kalauao Stream and Kalauao Springs (1935 Hawai'i Department of Transportation engineering plans for the development of Kamehameha Highway, Map 4325.4)

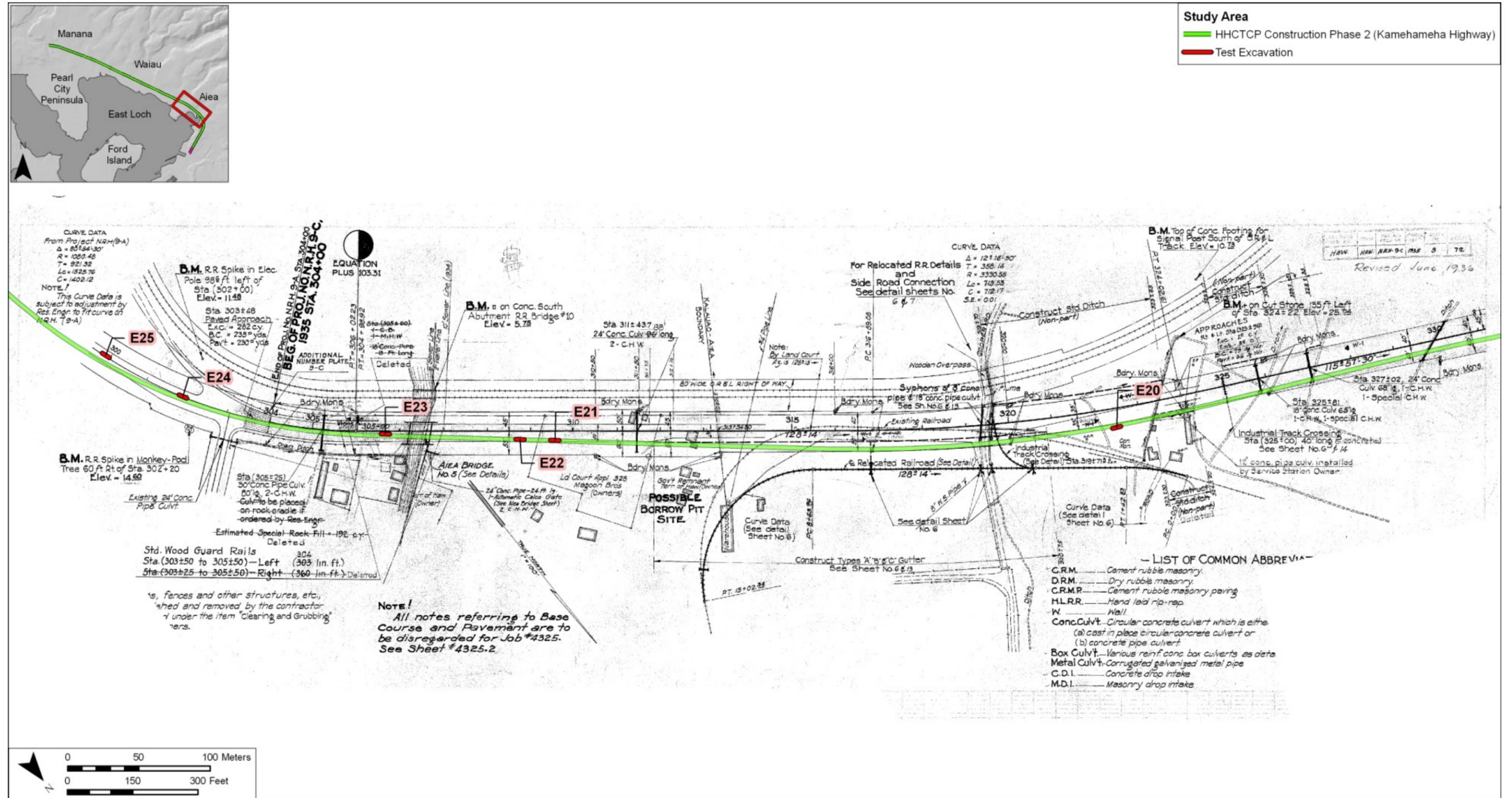


Figure 5. Location of the Construction Phase 2 project corridor (and AIS Trenches E20-E25) in relation to the 1933 development of Kamehameha Highway and existing infrastructure (1933 Hawai'i Department of Transportation engineering plans for the development of Kamehameha Highway, Map 4325.3)

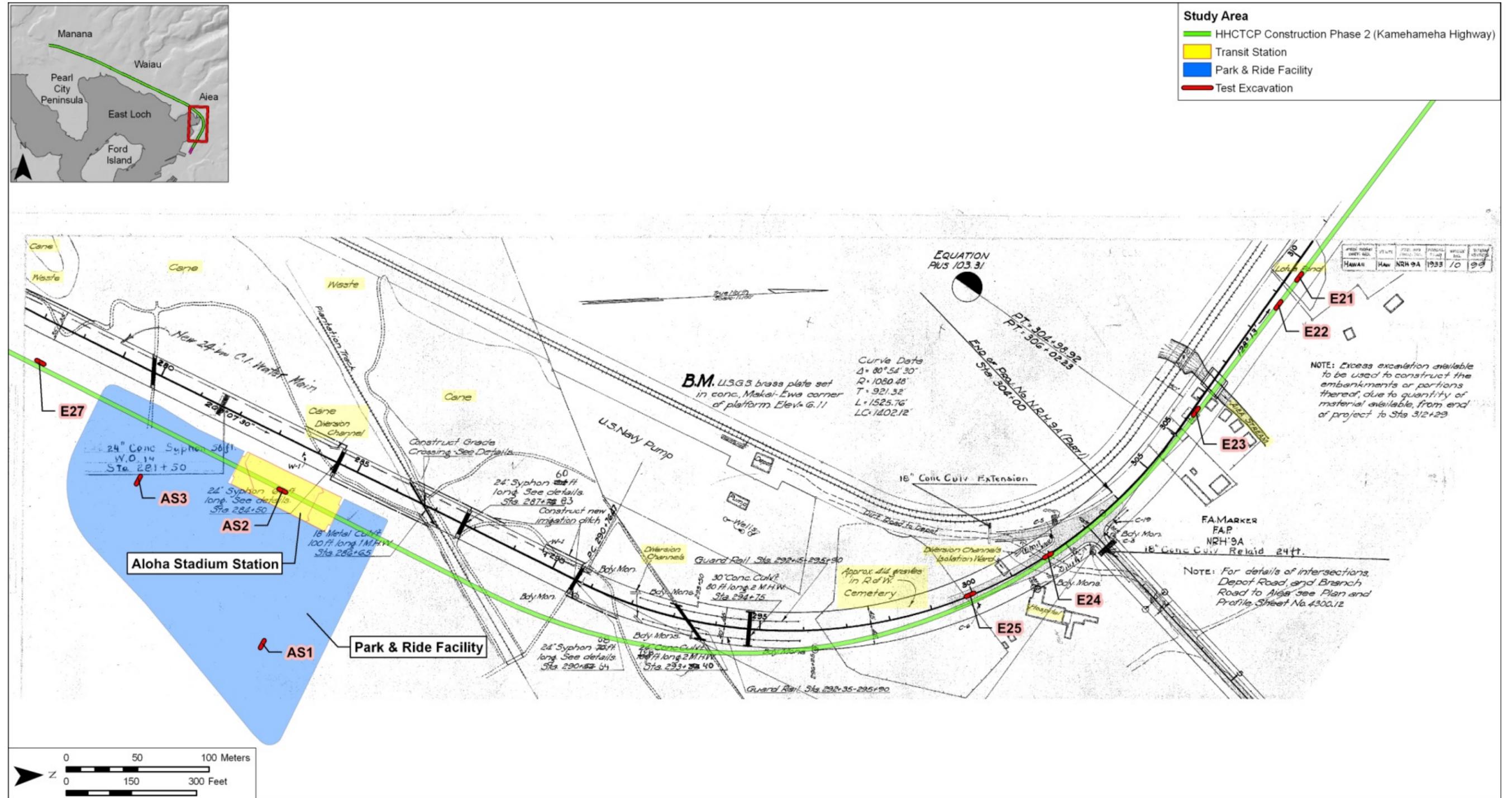


Figure 6. Location of the Construction Phase 2 project corridor (and AIS Trenches E21-E27) in relation to the 1933 development of Kamehameha Highway, existing infrastructure, 'Aiea Cemetery, 'Aiea Stream, cane fields, and ponds (1933 Hawai'i Department of Transportation engineering plans for the development of Kamehameha Highway, Map 4300.10)

## Appendix H SIHP -50-80-09-7150 Historic Property Description

FORMAL TYPE:	Subsurface agricultural sediment (likely from cultivation of wetland <i>kalo</i> (taro)—buried <i>lo 'i</i> (irrigated pond-field) deposit
FUNCTION:	Agriculture
# OF FEATURES:	N/A
AGE:	19 <sup>th</sup> and 20 <sup>th</sup> century and likely pre-Contact
DIMENSIONS:	Observed within Trench E7, measuring 6 m long by 0.8 m wide. The overall extent of the subsurface layer is not known at this time
LOCATION:	Within the <i>makai</i> turning lane of westbound traffic in Kamehameha Highway, approximately 183 meters east of Waiau Pond UTM Coordinates*: 2365476.70N, 608148.39E
TAX MAP KEY:	[1] 9-8
LAND JURISDICTION:	State of Hawai'i

\*UTM Datum = NAD 83, Zone 4N

SIHP #50-80-09-7150 was documented within the *makai* turning lane of westbound traffic in Kamehameha Highway, south of Nishi Service Station and approximately 183 meters east of Waiau Pond (Figure 1). The cultural resource was identified during the subsurface testing of Trench E7. The surrounding landscape is fully developed with paved parking lots and commercial buildings lining both sides of this portion of Kamehameha Highway. There are no surface indications of archaeological cultural resources in the vicinity. Based on background research, however, Trench E7 is located within LCA #9385, which is documented as *lo 'i*. Additionally, a 1945 Hawai'i Department of Transportation map detailing the construction of Kamehameha Highway documented a cluster of in-use “taro patches” in the location of Trench E7 and Trench E6 (see Figure 7 below).

During the subsurface testing of Trench E7, several fill layers associated with the construction of Kamehameha Highway were observed to a depth of 1.2 to 1.3 meters. The observed lower boundary of the fill strata corresponded to the elevation of the former ground surface shown on the 1945 construction plans for Kamehameha Highway, which proposed elevating and grading approximately 4 ft (~1.21 m) above the natural land surface in the area of Trench E7 (refer to Appendix G).

As currently documented, SIHP #50-80-09-7150 consists of two layers of silty clay (Strata IIIa and IIIb), overlying natural waterworn basalt gravels and cobbles (Stratum IV). Both strata of silty clay contained organic and cultural material consisting of very fine rootlets and small fragments of charcoal (~2-4 mm), with Stratum IIIb differentiated from Stratum IIIa by a slightly darker bluish gray color, higher plasticity and more abundant (~50%) yellowish-red mottling (Figure 2 and Figure 3). Samples collected from Strata IIIa and IIIb that were wet-screened

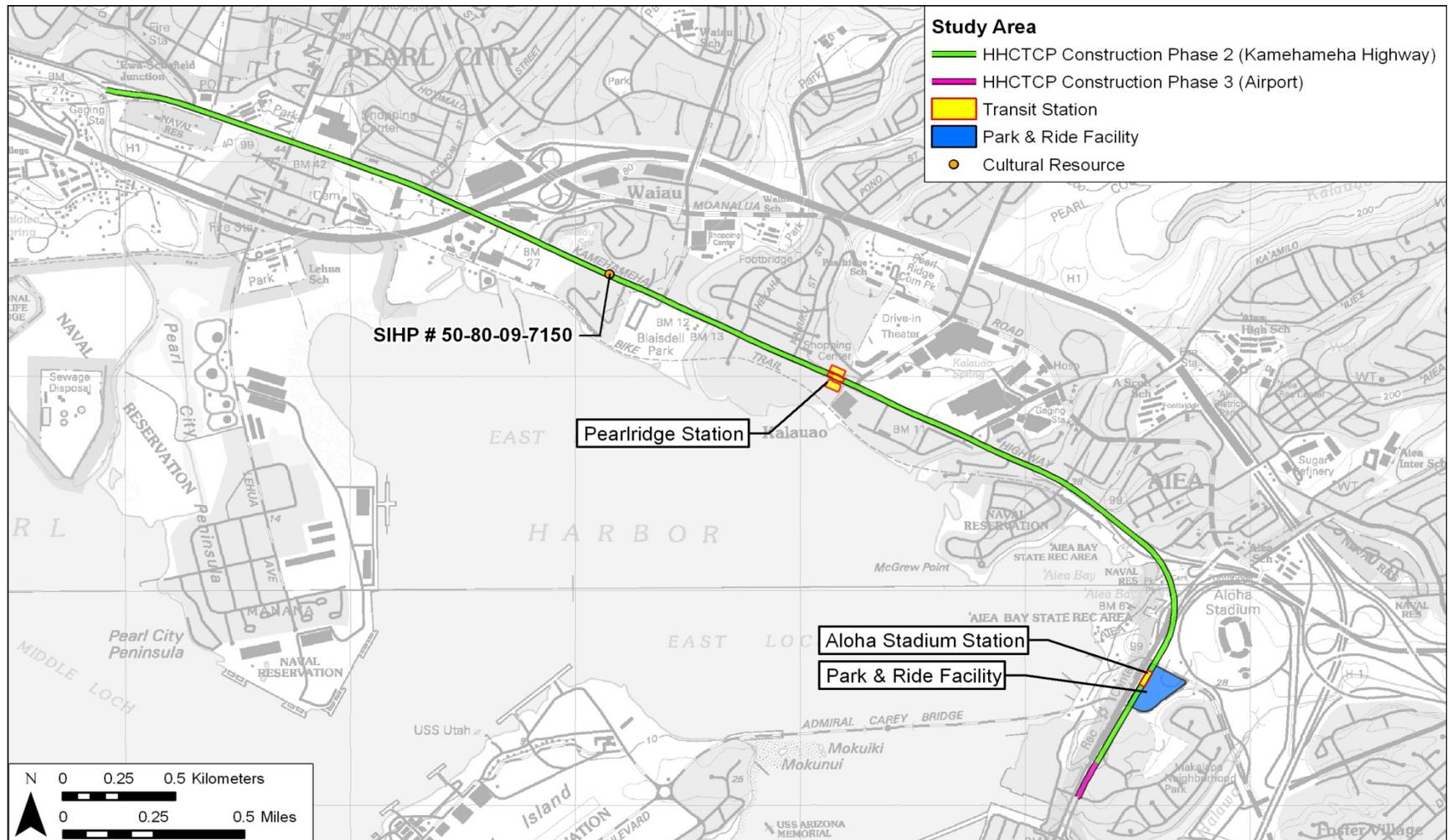


Figure 1. U.S. Geological Survey 7.5-Minute Series Topographic Map, Waipahu (1998) and Pearl Harbor (1999) Quadrangles, showing the location of State Inventory of Historic Properties (SIHP) #50-80-09-7150, documented in Trench E7.



Figure 2. Photograph of sediment sample from SIHP #50-80-09-7150, Stratum IIIa (Sample A), showing yellowish-red mottling



Figure 3. Photograph of sediment sample from SIHP #50-80-09-7150, Stratum IIIb (Sample C), showing reddish mottling

through 1/16-inch screen in the CSH lab (Samples B and C—refer to Figure) also yielded a moderate amount of oxidized root tubes (Figure 4, Figure 5, and Figure 6).

The presence of yellowish-red mottling, charcoal fragments, and oxidized root tubes is indicative of remnant (abandoned and buried) *lo'i* sediments. As A. Rose Schilt observed in her work with buried and abandoned *lo'i* sediments in Hanalei Valley, Kauai:

Previous archaeological projects in Mākaha Valley, O'ahu, and Hālawā Valley, Molokai have documented the appearance of pondfield soils in which irrigated taro has been cultivated (Morgenstein and Burnett 1972; Riley 1975). These soils are characterized by hydrated iron-oxide (limonite) tubes which appear as prominent reddish mottles. These ferrogenous tubes are known to develop around the roots of taro plants, although the mechanism of concentration is not well understood . . . These tubes or mottles were quite prominent in the soil core we took in a recently cultivated *lo'i* in Hanalei Valley. (Schilt 1980:29)

Regarding her extensive investigations of former *lo'i* in Luluku, Kāneohe, O'ahu, Jane Allen made the following observations:

In ponded soils, aeration along roots also oxidizes small areas in the subsoil, resulting in bright mottling within a dark, gleyed soil matrix; precipitates of iron and manganese as limonite casts and manganese nodules, respectively, often occur . . . Charcoal in pondfields is typically churned and dispersed throughout the soil through subsequent cultivation and ponding activities. (Allen et al. 1987:36)

Morgenstein's work with abandoned and buried *lo'i* sediments in Kawainui Marsh, Kailua, O'ahu documented abundant diffused charcoal particles and former root tubes stained red/orange with "ferruginous oxyhydroxides," which were interpreted as directly related to the function of former pond fields (e.g. taro cultivation) (Morgenstein 1978:7-8). Based on Morgenstein's (1978) sediment profiles, the iron oxyhydroxide root tubes he observed in Kawainui Marsh were quite pronounced and very "tube-like." Strata IIIa and IIIb observed within Trench E7 clearly evidenced similar yellowish-red mottling and scattered charcoal fragments, however the pronounced tube-like structures were only observed after wet-screening bulk samples from Strata IIIa and IIIb back in the laboratory. The root tubes measured between 3 mm and 1 cm long and between 2 and 3.5 mm in diameter.

Laboratory analysis results further substantiated the presence of *lo'i* sediments. Pollen analysis results, described in detail within Results of Laboratory Analysis (see Section 5.4 above), documented the presence of taro (*Colocasia*) within Stratum IIIa and the presence of sweet potato (*Ipomoea batatas*) within Stratum IIIb. Pollen analysis also indicated a shift from dry conditions (Stratum IIIb) to more wetland conditions (Stratum IIIa) consistent with wetland agriculture.

Radiocarbon dates obtained from the underlying Stratum IIIb yielded a single date range of A.D. 1414-1480, while Stratum IIIa yielded two equally possible date ranges of A.D. 1450-1530 and A.D. 1540-1635. However, due to the fact



Figure 4. Photograph of oxidized root tubules collected from SIHP #50-80-09-7150, Stratum IIIa (Sample B)



Figure 5. Photograph of oxidized root tubules collected from SIHP #50-80-09-7150, Stratum IIIb (Sample C)



Figure 6. Close-up photograph of oxidized root tubules from SIHP #50-80-09-7150, Stratum IIIb (Sample C)—scale is in cm

that the charcoal samples collected from both Strata IIIa and IIIb were retrieved from bulk sediment samples and not from within a specific cultural feature (such as a field wall or berm) or depositional event, the dating of the culturally-enriched sediment remains inconclusive. It is possible that the small charcoal remnants could have traveled from elsewhere higher up in the watershed and/or the charcoal predates the cultural use of the sediment layer. Additionally, pollen analysis detected within the underlying Stratum IIIb a fair amount of the historically-introduced trees *kiawe* (*Prosopis*) and *koa haole* (*Leucaena*), indicating the possible usage or exposure of this stratum during the post-contact period.

Based on stratigraphic observations, the results of laboratory analyses, Māhele land documentation (refer to Appendix A), a 1945 HDOT map for the construction of Kamehameha Highway (Figure 7), and an 1939 aerial photograph (Figure 8), the area of Trench E7 was utilized for wetland taro cultivation minimally from the mid-1800s up through 1945, and likely was in agricultural use well prior during the pre-contact period. Almost certainly then, SIHP #50-80-09-7150 represents the buried remnants of former *lo'i*. Based on current evidence, these deposits contain sufficient archaeological information to be determined Hawai'i and National Register eligible.

SIHP #50-80-09-7150 has integrity of location and materials, but not integrity of design, setting, workmanship, feeling, or association. It is recommended National and Hawai'i Register eligible under significance criterion D, for the archaeological information that it contains.

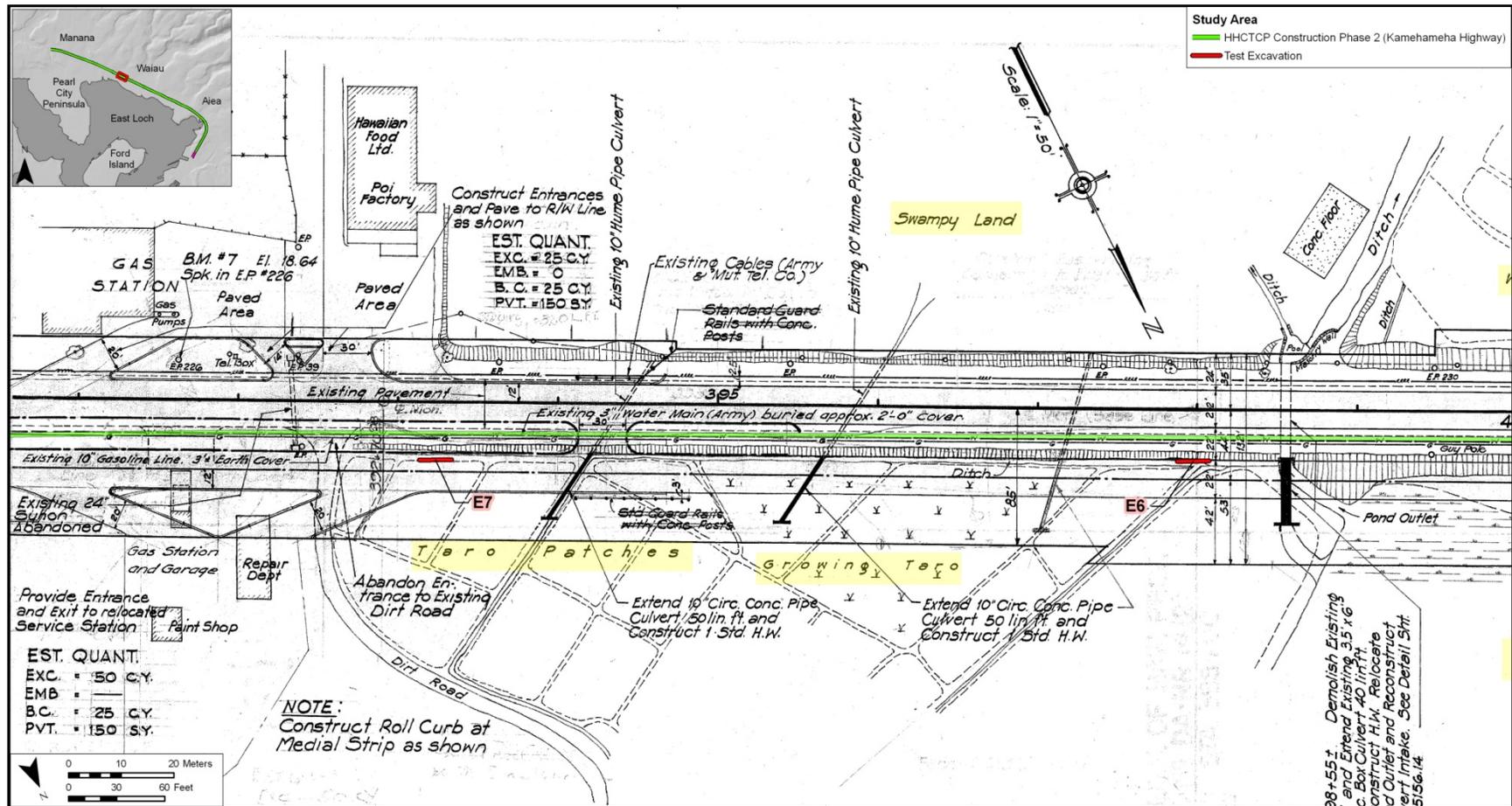


Figure 7. Close-up of HDOT 1945 engineering plan map of the development of Kamehameha Highway, showing the location of Trench E7 (containing SIHP #50-80-09-7150) in relation to 1945 agricultural fields (labeled “Taro Patches”) (1945 Hawai'i Department of Transportation engineering plans for the development of Kamehameha Highway, Map 5156.8)



Figure 8. Close-up of 1939 aerial photograph showing the location of Trench E7 (containing SIHP #50-80-09-7150) within an area of agricultural fields

It is anticipated that project construction effects on SIHP # 50-80-09-7150 may include excavation and removal of portions of this subsurface deposit, for example through utility relocation excavations or support column installation. The areal extent of SIHP #50-80-09-7150 is not known based on AIS testing results, which were confined to the project area/APE; however, based on historic maps and aerial photographs (refer to Figure 7 and Figure 8) it is clear that these former lo'i (pondfields) once extended over a broad area outside the current Construction Phase 2 project area. Based on this historic evidence, it is reasonable to conclude that the portions of SIHP #50-80-09-7150 within the project area represent only a small portion of similar buried (beneath historic fill layers), former agricultural sediments with similar characteristics. If this is the case, as seems likely, the project-related effect on SIHP # 50-80-09-7150 is quite limited in terms of geographic area.