
**Final
Archaeological Inventory Survey
of Construction Phase I for the
Honolulu High-Capacity Transit Corridor Project,
Honouliuli, Hō‘ae‘ae, Waikele, Waipi‘o, Waiawa,
and Manana Ahupua‘a, ‘Ewa District, Island of O‘ahu
TMK: [1] 9-1, 9-4, 9-6, 9-7 (Various Plats and Parcels)**

**Prepared for
Parsons Brinkerhoff
and
The City & County of Honolulu**

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(Job Code: HONOULIULI 18)**

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Management Summary

Reference	Archaeological Inventory Survey of Construction Phase I for the Honolulu High-Capacity Transit Corridor Project, Honouliuli, Hō‘ae‘ae, Waikele, Waipi‘o, Waiawa, and Manana Ahupua‘a, ‘Ewa District, Island of O‘ahu {TMK: [1] 9-1, 9-4, 9-6, 9-7 (Various Plats and Parcels)} (Hammatt 2010)
Date	April 2010
Project Number (s)	Cultural Surveys Hawai‘i, Inc. Job Code: HONOULIULI 18
Investigation Permit Number	The fieldwork component of the archaeological inventory survey (AIS) investigation was carried out under archaeological permit number 09-20, issued by the Hawai‘i State Historic Preservation Division/Department of Land and Natural Resources (SHPD / DLNR), per Hawai‘i Administrative Rules (HAR) Chapter 13-282.
Project Location and AIS Study Area	The proposed Honolulu High-Capacity Transit Corridor Project (HHCTCP) extends approximately 23 miles from Kapolei in the west to the University of Hawai‘i at Mānoa and Waikīkī in the east. The focus of this AIS investigation is the western-most 7.4 miles of the overall project area. This AIS study area includes all of Construction Phase I of the HHCTCP, which consists of an approximately 6.8-mile segment of the HHCTCP extending from North-South Road in East Kapolei to the Pearl Highlands Station, and the western portion of Construction Phase II, extending approximately 0.6 miles from the Pearl Highlands Station to Waimano Home Road in Pearl City. The AIS study area is depicted on the U.S. Geological Survey 7.5-Minute Series Topographic Map, Ewa (1998), Schofield Barracks (1998), and Waipahu (1998) Quadrangles. The western-most portion of Construction Phase II was included in this AIS study so that the historic preservation review process of at least a portion of the project’s Construction Phase II would be concluded well ahead of actual construction. For the purposes of this investigation, the project area (7.4 linear miles) includes all of Construction Phase I (6.8 linear miles) and the western-most portion of Construction Phase II (0.6 linear miles).
Land Jurisdiction	The AIS study area (all of Construction Phase I and the western portion of Construction Phase II) is primarily located within existing or planned road rights-of-way owned by the State of Hawai‘i or the City & County of Honolulu, including North-South Road, Farrington Highway, and Kamehameha Highway. The project corridor also traverses: agricultural lands privately owned by D.R. Horton; the Ewa Drum Filling and Fuel Storage Area, formerly owned by the U.S. Navy and now under State of Hawai‘i (Department of Hawaiian Home Lands) jurisdiction; and Leeward Community College, owned by the State of Hawai‘i. The support facilities along the project corridor are located on privately-owned lands.

Agencies	City & County of Honolulu (City); SHPD; Federal Transit Administration (FTA)
Project Description and Related Ground Disturbance	The purpose of the proposed HHCTCP is to provide high-capacity rapid transit in the highly congested east-west transportation corridor between Kapolei and the University of Hawai'i at Mānoa 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. Seven proposed transit stations are within the AIS study area, including: East Kapolei Station; University of Hawai'i at West O'ahu Station; Ho'opili Station; West Loch Station; Waipahu Transit Center Station; Leeward Community College Station; and Pearl Highlands Station. Project construction will also require relocation of existing utility lines within the project corridor that conflict with the proposed project design. Minimally, land-disturbing activities would include grading of facility locations and excavations for guideway column foundations, subsurface utility relocation and installation, and facility construction.
Project Acreage	The approximately 156-acre Construction Phase I project area (which includes the western-most portion of Construction Phase II) consists of: the approximately 7 mile long transit corridor; seven transit stations (approximately 5 acres); four park-and-ride facilities (approximately 25 acres); and a vehicle maintenance and storage facility (approximately 44 acres).
Area of Potential Effect (APE) and Survey Acreage	The survey area for this AIS investigation included the entire approximately 156-acre project area. The Construction Phase I project's area of potential effect (APE) for archaeological cultural resources is defined as all areas of direct ground disturbance. 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 project's area of direct ground disturbance / APE is approximately 75 acres.
Historic Preservation Regulatory Context	<p>This document was prepared to support the proposed project's historic preservation review under Hawai'i Revised Statutes (HRS) Chapter 6E-8 and Hawai'i Administrative Rules (HAR) Chapter 13-275. 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.</p> <p>In consultation with SHPD, an AIS plan was prepared prior to conducting the current AIS investigation. The <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), Honouliuli, Hō'ae'ae, Waikele, Waipi'o, and Waiawa Ahupua'a, 'Ewa District, O'ahu</i> (Hammatt and Shideler 2009) was reviewed and accepted by SHPD in March 2009 (LOG NO: 2009.1325, DOC NO: 0903WT115).</p>

Document Purpose	<p>This AIS investigation was prepared in consideration of the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation, and was conducted to identify, document, and make National Register of Historic Places (National Register) and Hawai'i Register of Historic Places (Hawai'i Register) eligibility recommendations for the project area's archaeological cultural resources¹. Identification and National/Hawai'i Register eligibility recommendations for the project area's architectural cultural resources, including historic roads, bridges, and structures, was conducted by historic architectural firm Mason Architects, Inc., in association with the project's Environmental Impact Statement (EIS) (USDOT/FTA and C&C/DTS 2008).</p> <p>In consultation with the Hawai'i State Historic Preservation Division (SHPD), this investigation was also designed to fulfill the State requirements for an AIS per Hawai'i Administrative Rules (HAR) Chapter 13-13-276. The investigation includes an undertaking-specific effect recommendation and treatment/mitigation recommendations for the cultural resources recommended National/Hawai'i Register eligible. This document is intended to support project-related historic preservation consultation among stake-holding federal and state agencies, interested Native Hawaiian groups and individuals, and community groups.</p>
Fieldwork Effort	<p>The CSH field crew included: Jeff Fong, M.A.; Matt McDermott, M.A.; David Shideler, M.A.; Jane Dregson, B.S.; Michelle Pammer, B.A.; Peter Moser-Samson, B.A.; Ena Sroat, B.A.; Douglas Thurman, B.A.; Jon Tulchin, B.A.; and Todd Tulchin, B.S.; under the general direction of Hallett H. Hammatt, Ph.D (principal investigator). Fieldwork was conducted between August 5 and October 14, 2009, and required approximately 125 person-days to complete.</p>
Cultural Resources/Historic Properties² Identified and Recommended Eligibility to the National/Hawai'i Registers³	<p>SIHP # 50-80-09-7751, subsurface cultural deposit (<i>lo'i</i> sediments), recommended National/Hawai'i Register-eligible under Criterion D</p>
Effect Recommendation	<p>This AIS investigation identified one cultural resource (SIHP # 50-80-09-7751) in the project area that may be affected by the proposed project. Under Hawaii State historic preservation review legislation, CSH's project-specific effect recommendation is "effect, with proposed mitigation commitments." Under federal historic preservation review legislation a project effect recommendation of "no adverse effect" is warranted, with the understanding that the proposed mitigation measures (described below) are carried out to mitigate the undertaking's potential effect to National register-eligible cultural resources.</p>

<p>Mitigation Recommendations⁴</p>	<p>SIHP # 50-80-09-7751, subsurface cultural deposit (<i>lo‘i</i> sediments): an archaeological data recovery program is recommended prior to project-related construction activities within the footprint of the <i>makai</i> (seaward) entrance building of the Waipahu Transit Center Station. In accordance with Hawai‘i Administrative Rules (HAR) 13-278 (governing archaeological data recovery programs), an archaeological data recovery plan should be prepared for review and approval of the SHPD. Once approved, the plan should be implemented prior to project-related construction activities in the vicinity.</p> <p>Based on the results of this AIS, other archaeological mitigation measures for the remainder of the HHCTCP Construction Phase I project area are unwarranted. If, in the unlikely event that subsurface cultural deposits or human skeletal remains are encountered during the course of project-related construction activities, all work in the immediate area should stop and the SHPD should be promptly notified.</p>
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¹In 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.

²Historic properties, as defined under federal historic preservation legislation, are cultural resources that are at least 50 years old (with exceptions) and have been determined eligible for inclusion in the National Register of Historic Places based on their integrity and historic/cultural significance in terms of established significance criteria. Determinations of eligibility are generally made by a federal agency official in consultation with SHPD. 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). 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.

³Cultural 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” (Hawaii Register only) has traditional cultural significance to an ethnic group, includes religious structures and/or burials.

⁴Under 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; D) Historical Data Recovery; and E) Ethnographic Documentation (HAR Chapter 13-275-8).

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Section 1 Introduction

1.1 Project Background

At the request of Parsons Brinkerhoff (PB) and the City & County of Honolulu (C&C), Cultural Surveys Hawai'i Inc. (CSH) completed an archaeological inventory survey (AIS) for Construction Phase I of the Honolulu High-Capacity Transit Corridor Project, Honouliuli, Hō'ae'ae, Waikele, Waipi'o, Waiawa and Manana Ahupua'a, 'Ewa District, Island of O'ahu (TMK: [1] 9-1, 9-4, 9-6, 9-7 various plats and parcels). The proposed Honolulu High-Capacity Transit Corridor Project (HHCTCP) extends approximately 23 miles from Kapolei in the west to the University of Hawai'i at Mānoa and Waikīkī in the east. The focus of this AIS investigation is the western-most 7.4 miles of the overall project area (Figures 1-6).

This AIS study area includes all of Construction Phase I of the HHCTCP, which consists of an approximately 6.8-mile segment extending from North-South Road in East Kapolei to the Pearl Highlands Station, and the western portion of Construction Phase II, extending approximately 0.6 miles from the Pearl Highlands Station to Waimano Home Road in Pearl City. The AIS study area is depicted on the U.S. Geological Survey 7.5-Minute Series Topographic Map, Ewa (1998), Schofield Barracks (1998), and Waipahu (1998) Quadrangles. The western-most portion of Construction Phase II was included in this AIS study so that the historic preservation review process of at least a portion of the project's Construction Phase II would be concluded well ahead of actual construction. **For the purposes of this investigation, the project area (7.4 linear miles) includes all of Construction Phase I (6.8 linear miles) and the western-most portion of Construction Phase II (0.6 linear miles).**

The AIS study area (all of Construction Phase I and the western portion of Construction Phase II) is primarily located within existing or planned road rights-of-way owned by the State of Hawai'i or the City & County of Honolulu, including North-South Road, Farrington Highway, and Kamehameha Highway. The project corridor also traverses: agricultural lands privately owned by D.R. Horton; the Ewa Drum Filling and Fuel Storage Area, formerly owned by the U.S. Navy and now under State of Hawai'i (Department of Hawaiian Home Lands) jurisdiction; and Leeward Community College, owned by the State of Hawai'i. The support facilities along the project corridor are located on lands owned by various private land owners. Project related agencies include the City and County of Honolulu, the State Historic Preservation Division / Department of Land and Natural Resources (SHPD / DLNR), and the Federal Transit Administration (FTA).

The purpose of the proposed HHCTCP is to provide high-capacity rapid transit in the highly congested east-west transportation corridor between Kapolei and the University of Hawai'i at Mānoa 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. Seven proposed transit stations are within the AIS study area, including: East Kapolei Station; University of Hawai'i at West O'ahu Station; Ho'opili Station; West Loch Station; Waipahu Transit Center Station; Leeward Community College Station; and Pearl Highlands Station. Project construction will also require relocation of existing utility lines within the project corridor that conflict with the proposed project design. Minimally, land-disturbing activities would include grading of facility locations and excavations for guideway column foundations, subsurface utility relocation and installation, and facility construction.

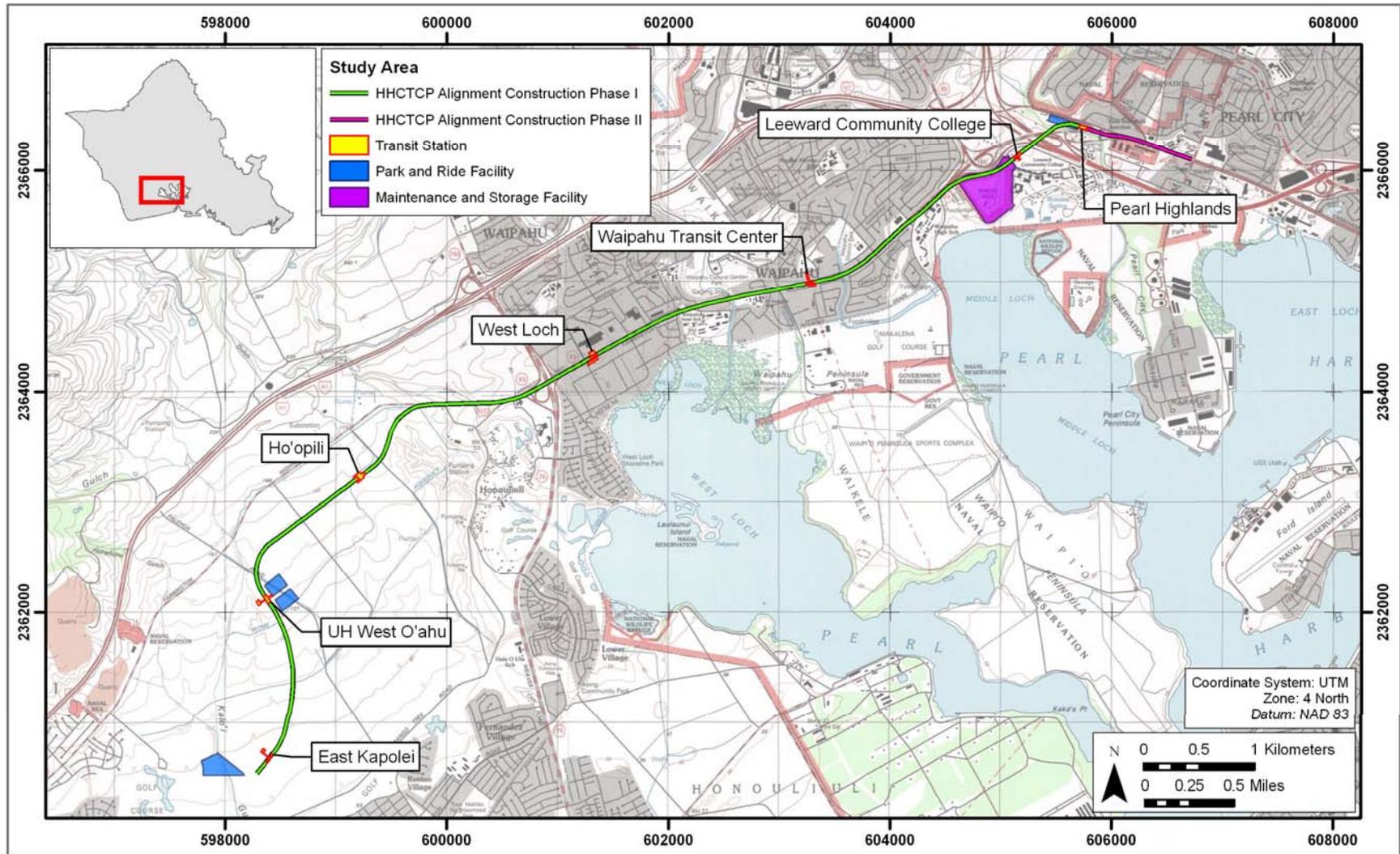


Figure 1. U.S. Geological Survey 7.5-Minute Series Topographic Map, Ewa (1998), Pearl Harbor (1999), Schofield Barracks (1998), and Waipahu (1998) Quadrangles, showing the locations of the project corridor and support facilities

Archaeological Inventory Survey, HHCTCP Construction Phase I, Honouliuli, Hō'ae'ae, Waikēle, Waipi'o, Waiawa, and Manana Ahupua'a, 'Ewa District, Island of O'ahu

TMK: [1] 9-1, 9-4, 9-6, 9-7 (various plats and parcels)

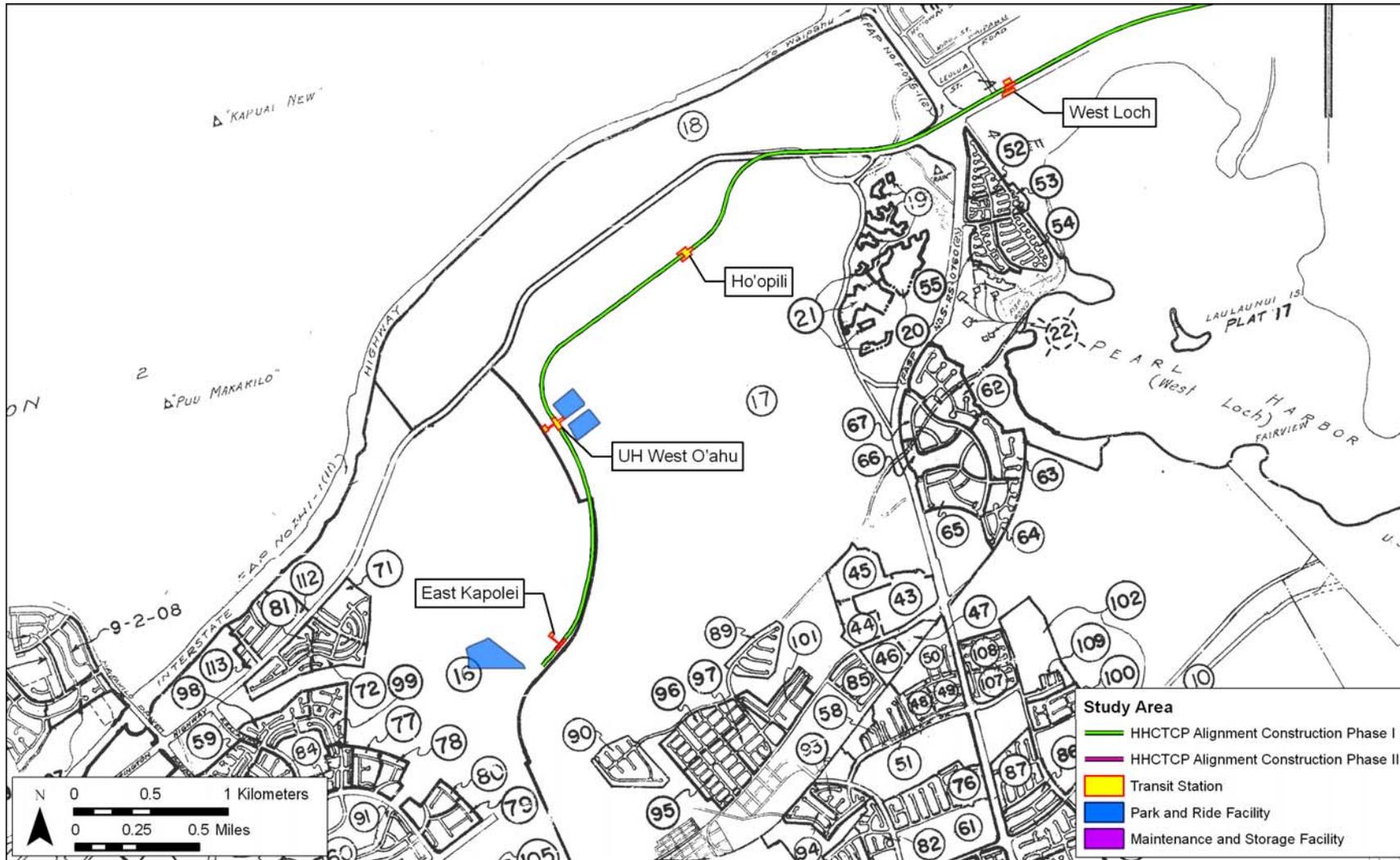


Figure 2. Portion of Tax Map Key 9-1, showing the locations of the project corridor and support facilities

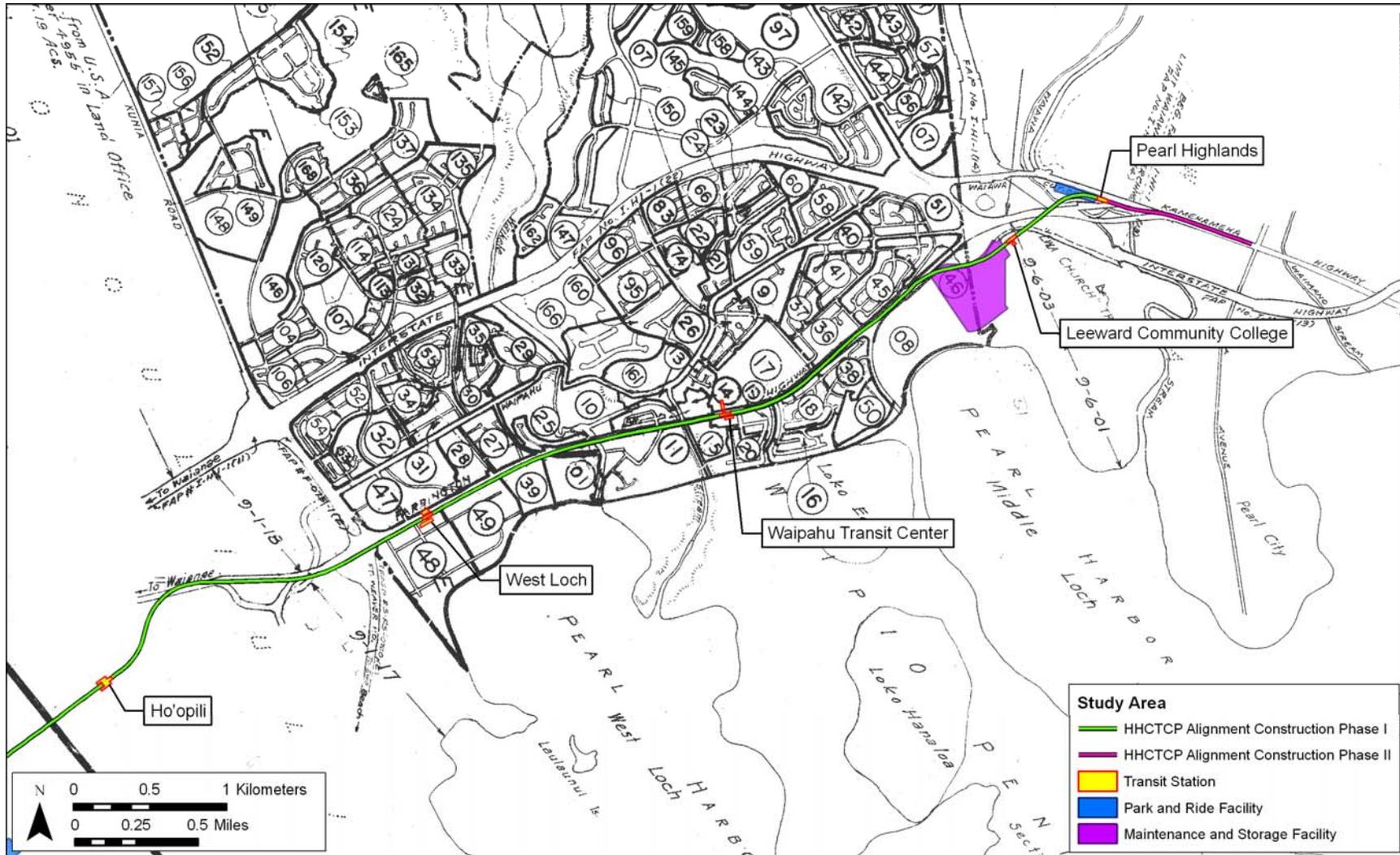


Figure 3. Portion of Tax Map Key 9-4, showing the locations of the project corridor and support facilities

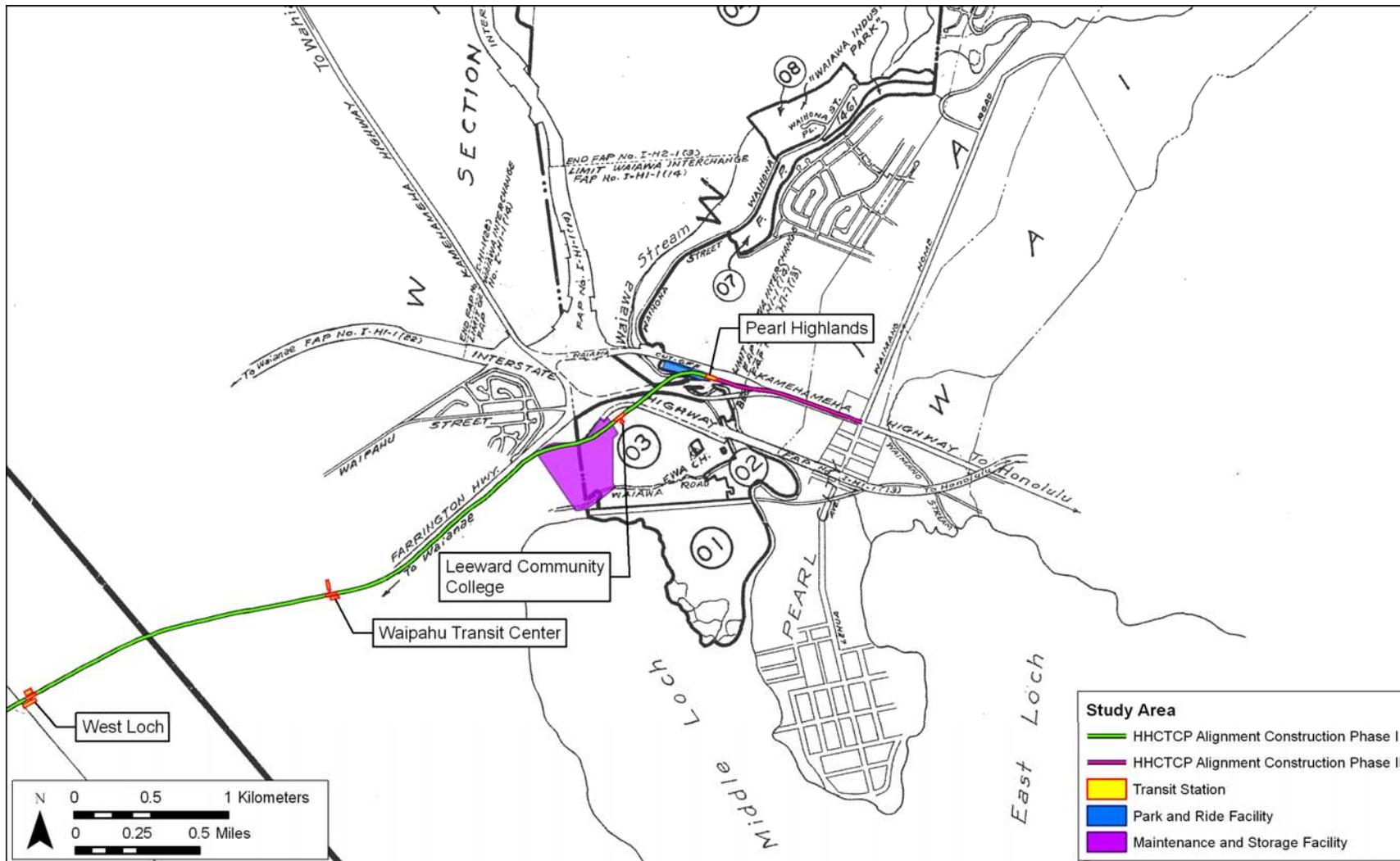


Figure 4. Portion of Tax Map Key 9-6, showing the locations of the project corridor and support facilities

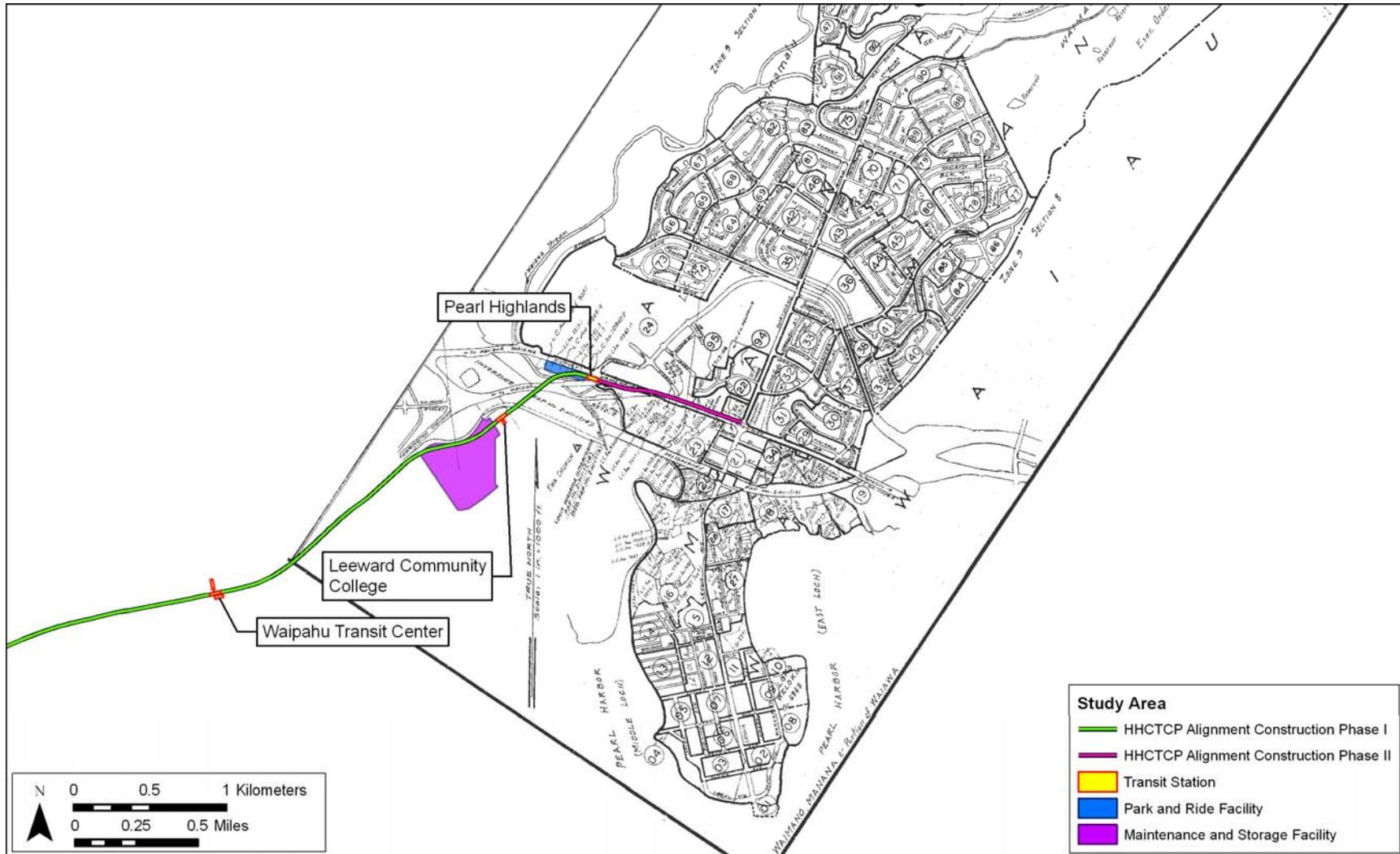


Figure 5. Portion of Tax Map Key 9-7, showing the locations of the project corridor and support facilities



Figure 6. Aerial photograph (source: U.S. Geological Survey Orthoimagery 2005), showing the locations of the project corridor and support facilities

The approximately 156-acre Construction Phase I project area (which includes the western most portion of Construction Phase II) consists of: the approximately 7 mile long transit corridor; seven transit stations (approximately 5 acres); four park-and-ride facilities (approximately 25 acres); and a vehicle maintenance and storage facility (approximately 44 acres). The survey area for this AIS investigation included the entire approximately 156-acre project area. The Construction Phase I project's area of potential effect (APE) for subsurface cultural resources is defined as all areas of direct ground disturbance. 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 project's area of direct ground disturbance / APE is approximately 75 acres.

This document was prepared to support the proposed project's historic preservation review under Hawai'i Revised Statutes (HRS) Chapter 6E-8 and Hawai'i Administrative Rules (HAR) Chapter 13-275. 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. In consultation with SHPD, an AIS plan was prepared prior to conducting the current AIS investigation. The *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), Honouliuli, Hō'ae'ae, Waikele, Waipi'o, and Waiawa Ahupua'a, 'Ewa District, O'ahu* (Hammatt and Shideler 2009) was reviewed and accepted by SHPD in March 2009 (LOG NO: 2009.1325, DOC NO: 0903WT115)—refer to Appendix A).

This AIS investigation was prepared in consideration of the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation, and was conducted to identify, document, and make National Register of Historic Places (National Register) and Hawai'i Register of Historic Places (Hawai'i Register) eligibility recommendations for the project area's archaeological cultural resources¹. Identification and National/Hawai'i Register eligibility recommendations for the project area's architectural cultural resources, including historic roads, bridges, and structures, was conducted by historic architectural firm Mason Architects, Inc., in association with the project's Environmental Impact Statement (EIS) (USDOT/FTA and C&C/DTS 2008).

In consultation with the Hawai'i State Historic Preservation Division (SHPD), this investigation was also designed to fulfill the State requirements for an AIS per Hawai'i Administrative Rules (HAR) Chapter 13-13-276. The investigation includes an undertaking-specific effect recommendation and treatment/mitigation recommendations for the cultural resources recommended National/Hawai'i Register eligible. This document is intended to support project-related historic preservation consultation among stake-holding federal and state agencies, interested Native Hawaiian groups and individuals, and community groups.

This archaeological inventory survey investigation is designed to comply with both federal and Hawai'i state historic preservation legislation. Generally, under both Hawai'i state and federal historic preservation legislation, archaeological inventory surveys are designed to identify, document, and make significance recommendations for "historic properties." As discussed in the paragraphs below, there are important distinctions between the federal and Hawai'i State definitions of "historic property." To alleviate any confusion these different definitions might cause, CSH has opted in this document to use the more generic term "cultural resources," as defined below, in its discussion of the cultural remains within the current project area.

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.

Historic properties, as defined under federal historic preservation legislation, are cultural resources that are at least 50 years old (with exceptions) and have been determined eligible for inclusion in the National Register based on established significance criteria. Determinations of eligibility are generally made by a federal agency official in consultation with SHPD. 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 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 established significance criteria, for inclusion in the 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.

1.2 Overview of Proposed Project Construction

The design, method of construction, and timeline of the Honolulu High-Capacity Transit Corridor Project (HHCTCP) continue to be refined. This overview of proposed project construction is a synopsis of the information provided in Appendix E - Construction Approach of the HHCTCP Environmental Impact Statement (EIS).

1.2.1 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. The HHCTCP Construction Phase 1 includes approximately 250 guideway foundation columns. 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.

1.2.2 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.

1.2.3 Ancillary Impacts

Project construction will require relocation of existing utility lines within the project corridor that conflict with the proposed project design. The nature and extent of utility relocations in the Construction Phase I project area are still being determined.

Guideway foundation excavations will extend below the water table, creating significant need for the management of displaced water and/or drilling slurry. It is unclear at this time how wastewater and drilling slurry will be managed. 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 I project area to provide adequate space for construction equipment, stockpiling and transfer of construction materials, parking, and other construction-related activities. While the use of the proposed park and ride lots and the vehicle maintenance and storage facility areas have been identified as potential staging areas, additional locations would be needed. The locations of additional construction staging areas have not yet been determined. Grading of the construction staging areas may be necessary.

1.3 Scope of Work

The following scope of work satisfies State and County requirements for an archaeological inventory survey [per HAR 13-13-276]. The scope of work included:

1. Historic and archaeological background research, including a search of historic maps, written records, Land Commission Award documents, and the reports from prior archaeological investigations. This research focused on the specific project area's past land use, with general background on the pre-contact and historic settlement patterns of the *ahupua'a* and district. The background information was used to compile a predictive model for the types and locations of historic properties that could be expected within the project area.
2. A complete (100%) systematic pedestrian inspection of the project area (with the exception of areas previously addressed in SHPD-accepted inventory surveys) for the

purpose of cultural resource identification and documentation. Surface cultural resources would be recorded with an evaluation of age, function, interrelationships, and significance. Documentation would include photographs, scale drawings, and limited controlled excavation of select features. Each cultural resource was assigned a Hawai'i State Inventory of Historic Properties (SIHP) number.

3. Based on the project area's environment and the results of the background research, substantial subsurface testing with a combination of hand and backhoe excavation was conducted to identify and document subsurface cultural resources that would not be located by surface pedestrian inspection. Appropriate samples from these excavations were analyzed for cultural and chronological information. All subsurface cultural resources identified were documented to the degree possible, including geographic extent, cultural content, function/derivation, age, interrelationships, and significance.
4. Appropriate consultation with knowledgeable individuals regarding the project area's history, past land use, and the function and age of the cultural resources identified in the project area.
5. Appropriate laboratory work to process and gather relevant environmental and/or archaeological information from collected samples.
6. Preparation of this archaeological inventory survey report, including the following:
 - a. A project description;
 - b. A section of a U.S. Geological Survey topographic map showing the project area boundaries and the location of all recorded cultural resources;
 - c. Historical and archaeological background sections summarizing pre-contact and post-contact land use of the Project area and its vicinity;
 - d. Descriptions of all historic properties, including selected photographs, scale drawings, and discussions of age, function, laboratory results, and significance;
 - e. If appropriate, a section concerning cultural consultations [per the requirements of HAR 13-276-5(g) and HAR 13-275/284-8(a)(2)];
 - f. A summary of cultural resource categories, integrity, and significance based upon the National and Hawai'i Registers of Historic Places evaluation criteria;
 - g. A project effect recommendation;
 - h. Treatment recommendations to mitigate the project's potential effect on any cultural resources identified in the project area that are recommended eligible to the National/Hawaii Registers of Historic Places.

This scope of work also included full coordination with the State Historic Preservation Division (SHPD), and City and County of Honolulu (C&C) relating to archaeological matters. This coordination took place after consent of Parsons Brinkerhoff (PB) and the C&C Rapid Transit Division (RTD).

1.4 Environmental Setting

Construction Phase I of the HHCTCP traverses two distinct geographic areas. This discussion of the project area's environmental setting includes the inland southwestern Honouliuli lands that were, as a generalization, relatively barren and little used prior to being placed under a century of sugar cane cultivation, and the lands on the margins of Pearl Harbor that were much more intensively used in traditional Hawaiian times and that have continued under fairly intensive habitation to the present time. For the purposes of this discussion, the east/west division between these geographic areas is defined as Kunia Road.

1.4.1 Construction Phase I West of Kunia Road

1.4.1.1 Natural Environment

The western portion of the Construction Phase I project area extends through the 'Ewa Plain, seaward (*makai*) of the Wai'anae Mountains. The 'Ewa Plain is a Pleistocene (>38,000 years old) reef platform overlain by alluvium. The terrain consists of limestone and alluvial deposits, which overlie flows of the Wai'anae volcanic series (MacDonald et al. 1983:423). In pre-contact Hawai'i, the project area would have been covered by lowland dry shrub and grassland. However, the area has been extensively disturbed and transformed by human activity, and is now dominated by a variety of exotic grasses, weeds, and shrubs.

In the late 19th and early 20th centuries, the Ewa Plantation Company installed ditches running from the lower slopes of the Wai'anae Mountains to the lowlands and then plowed the slopes vertically just before the rainy season to induce erosion (Frierson 1972:17). These activities relocated sediments from the higher, soil-rich slopes of the Wai'anae Mountains down to the soil-poor Pleistocene limestone plains of the Kalaeloa area. Portions of the agricultural lands in Honouliuli were developed from this arable land expansion program. In traditional Hawaiian times, the areas of exposed coral outcrop were undoubtedly more extensive.

The western portion of the Construction Phase I project area receives an average of 24 inches of annual rainfall (Giambelluca et al. 1986). Honouliuli Stream is the only major stream traversed by the western portion of the Construction Phase I project area. Elevations within western portion of the Construction Phase I project area range from approximately 80 to 160 feet above mean sea level.

According to U.S. Department of Agriculture (USDA) soil survey data (Foote et al. 1972), sediments in western portion of the Construction Phase I project area include: Honouliuli Clay (HxA, HxB); Kawaihapai Clay Loam (K1A); Kunia Silty Clay (KyA); and Waipahu Silty Clay (WzA, WzB, WzC) (Figure 7).

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 sugar cane, truck crops, orchards, and pasture. The natural vegetation consists of kiawe, koa haole, fingergrass, bristly foxtail, and bermudagrass. [Foote et al. 1972]

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]

Soils of the Kunia Series are described as follows:

This series consists of well-drained soils on upland terraces and fans on the island of Oahu. These soils developed in old alluvium. They are nearly level to moderately sloping. Elevations range from 700 to 1,000 feet. The mean annual rainfall amounts to 30 to 40 inches, most of which occurs from November to April. The mean annual soil temperature is 71° F. Kunia soils occur on the foot slopes of the Waianae Range, near Schofield Barracks. They are geographically associated with Kolekole, Lahaina, and Wahiawa soils.

These soils are used for sugarcane, pineapple, home sites, and military reservations. Most areas are cultivated, and the natural vegetation is not significant.

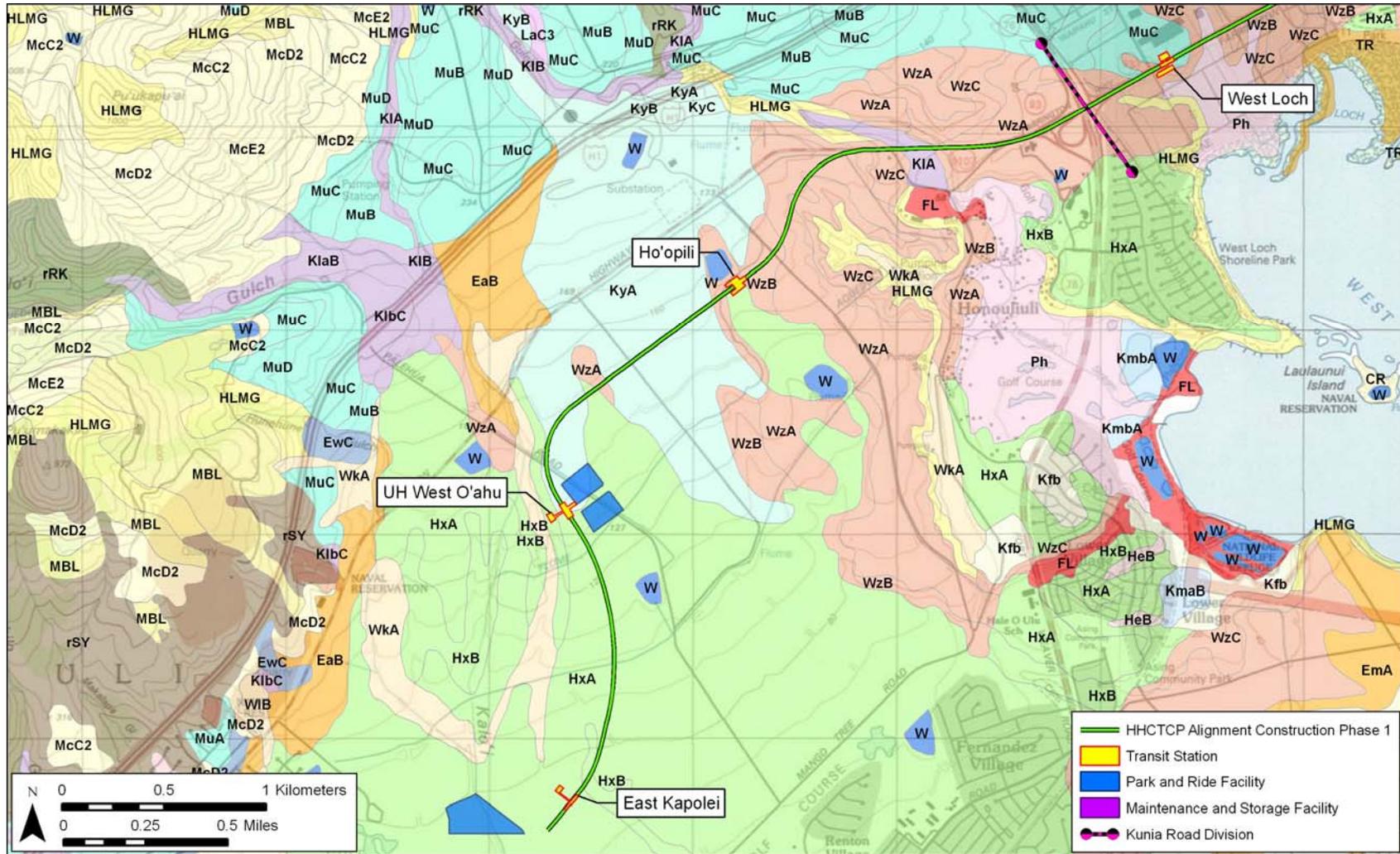


Figure 7. U.S. Geological Survey 7.5-Minute Series Topographic Map, Ewa (1998), Pearl Harbor (1999), Schofield Barracks (1998), and Waipahu (1998) Quadrangles, with overlay of the Soil Survey of Hawai'i (Foote et al. 1972), showing sediment types in the western portion of the Construction Phase I project area

Archaeological Inventory Survey, HHCTCP Construction Phase I, Honouliuli, Hō'ae'ae, Waikele, Waipi'o, and Waiawa Ahupua'a, 'Ewa District, Island of O'ahu

TMK: [1] 9-1, 9-4, 9-6, 9-7 (various plats and parcels)

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]

The western portion of the Construction Phase I project area extends through a number of active agricultural fields. Vegetation outside of the cultivated fields consists predominantly of introduced perennial grasses and weeds, along with *kiawe* (*Prosopis pallida*) and *koa haole* (*Leucaena leucocephala*).

1.4.1.2 Built Environment

The western portion of the Construction Phase I project area has been drastically altered by historic and modern land use, including in particular intensive commercial sugar cane cultivation. In recent years, the western portion of the Construction Phase I project area has also been drastically altered by the construction of the North-South Road project and related infrastructure improvement projects. Aside from North-South Road project, the vicinity of the western portion of the Construction Phase I project area are generally consists of rural agricultural lands.

1.4.2 Construction Phase I East of Kunia Road

1.4.2.1 Natural Environment

The eastern portion of the Construction Phase I project area is generally located between 0.5 and 1 mile inland of the West and Middle Lochs of Pearl Harbor. Elevations within the eastern portion of the Construction Phase I project area range from 10 to 100 feet above mean sea level. The eastern portion of the Construction Phase I project area receives an average of 24 to 32 inches of annual rainfall (Giambelluca et al. 1986).

The largest stream traversed by the eastern portion of the Construction Phase I project area is Waikele Stream in Waikele Ahupua'a. The name Waikele translates as "muddy water" (Pukui et al. 1983), likely referring to the two permanent streams in the *ahupua'a*, Waikakalaua Stream and Kīpapa Stream, which flow through the Schofield Plateau and converge to form Waikele Stream in the lowland portion of the *ahupua'a*. These streams drain a "large expanse of lateritic soils of fine particle size [and therefore] the water would have appeared muddy in prehistoric times even during periods of normal flow" (Hammatt and Borthwick 1988). In addition to Waikele Stream, four smaller streams are traversed by the eastern portion of the Construction Phase I project area, including: Hō'ae'ae Stream, Kapakahi Stream, Makalena Stream, and Waiawa Stream.

According to USDA soil survey data (Foote et al. 1972), sediments in the eastern portion of the Construction Phase I project area include: Fill Land, mixed (FL); Helemano silty clay (HLMG); Honouliuli Clay (HxA); Kawaihapai Clay Loam (KIA); Molokai Silty Clay Loam

(MuB, MuC); Pearl Harbor Clay (Ph); Tropaquepts (TR); and Waipahu Silty Clay (WzA, WzB, WzC) (Figure 8).

Soils of the Honouliuli, Kawaihapai, and Waipahu Series are described in Section 1.4.1.1, above. Fill Land is described as follows:

This land type occurs mostly near Pearl Harbor and in Honolulu, adjacent to the ocean. It consists of areas filled with material dredged from the ocean or hauled from nearby areas, garbage, and general material from other sources. Included in mapping were a few areas that have been excavated.

This land type is used for urban development including airports, housing areas, and industrial facilities. [Foote et al. 1972]

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]

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]

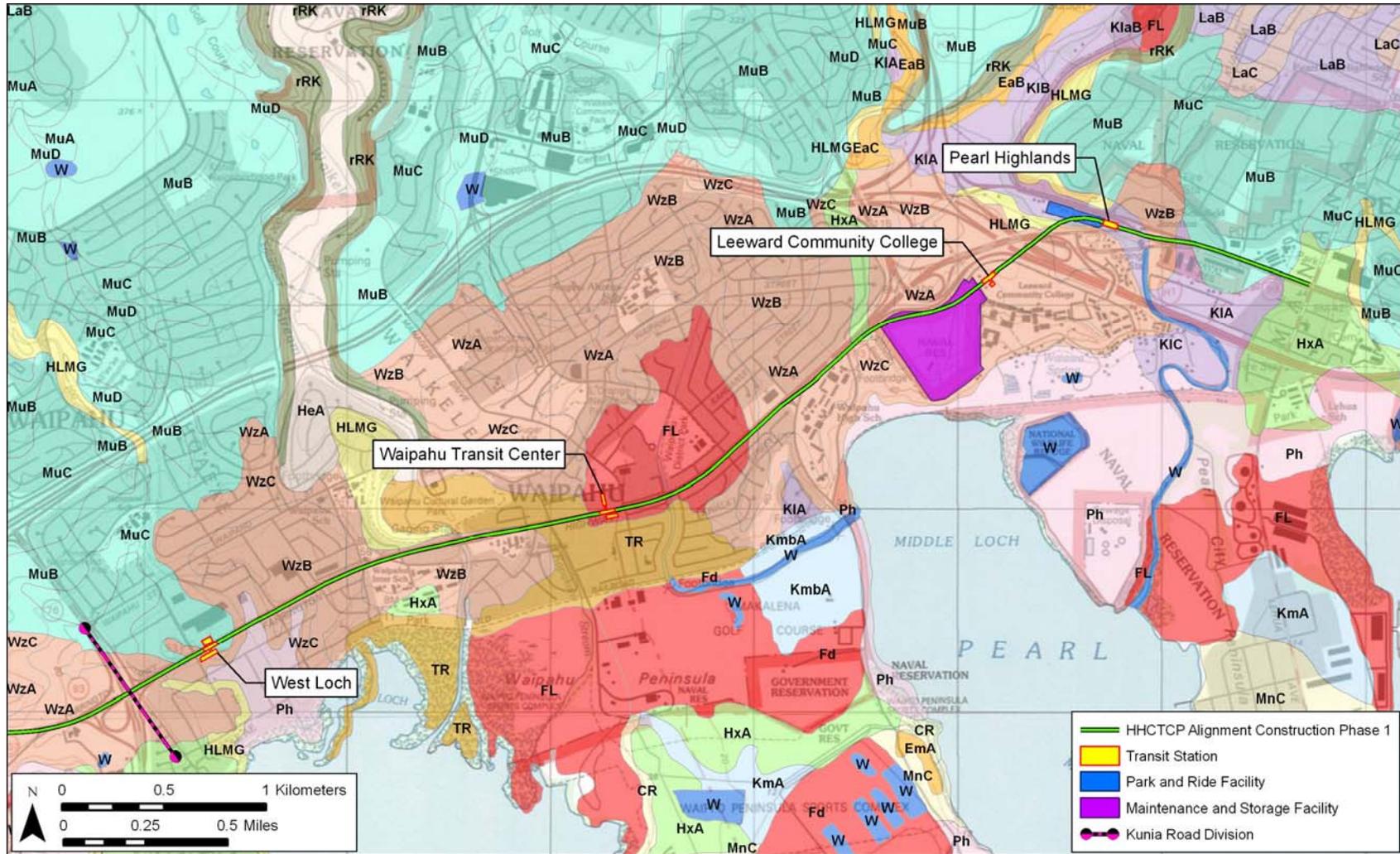


Figure 8. U.S. Geological Survey 7.5-Minute Series Topographic Map, Ewa (1998), Pearl Harbor (1999), Schofield Barracks (1998), and Waipahu (1998) Quadrangles, with overlay of the Soil Survey of Hawai'i (Foote et al. 1972), showing sediment types in the eastern portion of the Construction Phase I project area

Archaeological Inventory Survey, HHCTCP Construction Phase I, Honouliuli, Hō'ae'ae, Waikele, Waipi'o, and Waiawa Ahupua'a, 'Ewa District, Island of O'ahu

TMK: [1] 9-1, 9-4, 9-6, 9-7 (various plats and parcels)

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]

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]

Vegetation in the eastern portion of the Construction Phase I project area consists primarily of grasses, shrubs, and introduced, non-native plants and trees used for landscaping.

1.4.2.2 Built Environment

The immediate vicinity of the intersection of Kunia Road and Farrington Highway, marks a distinct change in the built environment of the Construction Phase I project area, as the landscape abruptly transitions from rural and agricultural to an urban environment. East of Kunia Road, the project area continues through the towns of Waipahu and Pearl City, with the guideway centerline generally located within the median of Farrington Highway and Kamehameha Highway. Properties bordering the highways include a mix of commercial, industrial, and residential developments. Between Leeward Community College and the proposed Pearl Highlands Station, the project area traverses the H-1 Interstate Highway alignment. The immediate vicinity of the proposed Pearl Highlands Station is an exception to the predominantly urban environment. Lands bordering Waiawa Stream include the “banana patch” residential community that retains a rural character.