
Final
Archaeological Inventory Survey Plan
For the Airport (Phase 3) Construction of the
Honolulu High-Capacity Transit Corridor Project
Hālawā and Moanalua Ahupua‘a, ‘Ewa and Honolulu
Districts, O‘ahu Island
TMK Sections [1] 1-1 and 9-9

Prepared for
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and
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Management Summary

Reference	Archaeological Inventory Survey Plan for the Airport (Phase 3) Construction of the Honolulu High-Capacity Transit Corridor Project Hālawā and Moanalua Ahupua‘a, ‘Ewa and Honolulu Districts, O‘ahu Island TMK Sections [1] 1-1 and 9-9 (Hammatt and Shideler 2011)
Date	August 2011
Project Number (s)	Cultural Surveys Hawaii, Inc. (CSH) Job Code: HALAWA 6
Investigation Permit Number	The fieldwork proposed in this archaeological inventory survey plan (AISP) will likely be carried out under archaeological permit number 11-17 issued by the Hawai‘i State Historic Preservation division/ Department of Land and Natural Resources per Hawaii Administrative Rules (HAR) Chapter 13-282.
Project Location and Planned AIS Study Area	The proposed Honolulu High-Capacity Transit Corridor Project (HHCTCP) extends approximately 23 miles (37.0 kilometers) from Kapolei in the west to the Ala Moana Center in the east. The project was divided into four construction phases, with phase 1 towards Kapolei and phase 4 towards Ala Moana. The study area for this AISP is most of the third and a small portion of the fourth construction phases, extending from Kamehameha Hwy. at Kalaloa Drive (just northwest of Hālawā Stream) in the west to Kamehameha Hwy. at Middle Street (just west of Kalihi Stream) in the east. The AISP for Phase 2 (reviewed and accepted by the SHPD), by general agreement extended slightly east of the construction phase terminus at Aloha Stadium (to Hālawā Stream). Similarly the AISP for construction phase 4 (presently under SHPD review), by general agreement extends slightly west from the western terminus of construction phase 4 in the vicinity of the Middle Street Transit Center (to Kalihi Stream).
Land Jurisdiction	<p>Federal, State, City and Private.</p> <p>Federal lands bound by Radford Dr., Tarawa Dr. and Kamehameha Hwy. are proposed for the Pearl Harbor Naval Base Station</p> <p>State lands include portions of the corridor along Kamehameha Hwy., North Nimitz Hwy., the H-1 Freeway, Aolele Street and the Honolulu International Airport.</p> <p>City lands include portions of the corridor along Ualena Street and Waiwai Loop</p> <p>Private lands (privately owned at the present time) are understood to include: Harry B. Kronick Trust lands near Kamehameha Hwy & Kalaoa St. and private holdings on Waiwai Loop including lands of the John V. Brewer Trust, Chevron USA Inc., International Express, Inc,</p>

	Queen Bee Limited Partnership, Waiwai Loop Rental Inc., Window World Inc., Watumull Enterprises Ltd., Alert Holdings Group, Inc., and 2676 Waiwai Loop LLC.
Agencies	City and County of Honolulu (City), SHPD/DLNR, Federal Transit Administration (FTA), U.S. Navy, and the Hawaii State Department of Transportation (Airport Division)
Project Description and Related Ground Disturbance	The HHCTCP purpose is to provide high-capacity rapid transit in the highly congested east-west transportation corridor between Kapolei and the Ala Moana Center via a fixed guideway rail transit system. In addition to the guideway, the project will require construction of transit stations and ancillary support facilities. Proposed transit stations within the Airport AISP study area, include: 1) the Pearl Harbor Naval Base Station, 2) the Honolulu International Airport Station and 3) the Lagoon Drive 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 station and ancillary facility foundation construction. The majority of the area of disturbance will be due to utility relocation.
Area of Potential Effect (APE) and AIS Study Area Acreage	The HHCTCP APE for archaeological cultural resources is defined in the HHCTCP final Programmatic Agreement (Stipulation II.A.1) as all areas of direct ground disturbance. The Airport AIS study area includes all of the HHCTCP APE between Station 994+00 and Station 1248+00, for a distance of 25,400 feet or 4.8 miles (7.74 kilometers). The total Airport AIS study area/APE is approximately 9.06 acres (394,504 square feet) including the three stations.
Historic Preservation Regulatory Context	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 (NRHP). The Hawaii State Historic Preservation Officer (SHPO) concurred with this undertaking effect determination. To alleviate the undertaking's potential adverse effect, a Programmatic Agreement (PA) was executed January 18 th , 2011, with FTA, Hawaii SHPO, the United States Navy, and the Advisory Council on Historic Preservation as signatories. This AISP was prepared to fulfill PA Stipulation III, which requires that an AISP be prepared and reviewed and approved by SHPD for each HHCTCP construction section. This

	<p>AISP was also prepared in consideration of 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> <p>This document was also 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. This plan defines the scope of work and details the proposed methods and sampling strategy of the AIS, in accordance with the requirements for an AISP stated in HAR Chapter 13-275-5(c).</p> <p>Native Hawaiian human remains, funerary objects, sacred objects, or objects of cultural patrimony discovered on federal lands will required compliance with the Native American Graves and Repatriation Act (43 CFR Part 10). Human skeletal remains and associated objects found on non-federal lands will be treated in accordance with Hawaii Revised Statutes (HRS) Chapter 6E-43 and HAR Chapter 13-300.</p> <p>In addition, 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>Summary of the Planned AIS Research Design [per HRS Chapter 13-275-5(c)(2)]</p>	<p>A. CSH principal investigators Matt McDermott, M.A., and Hallett H. Hammatt, Ph.D. will complete the Phase 3 Airport AIS.</p> <p>B. An anticipated field crew of 4 to 8 archaeologists, a field director, two GPS/GIS specialists, and two GPR specialists will complete the AIS investigation under the direction of the principal investigators. Detailed sample analysis will be provided by International Archaeological Research Associates (wood/charcoal speciation), PaleoResearch, Inc. (pollen speciation), and Beta Analytic, Inc. (radiocarbon dating).</p> <p>C. Two to four months are estimated to completed AIS fieldwork.</p> <p>D. Fieldwork will include 100 percent pedestrian inspection of the study area; global positioning system (GPS) data collection; ground penetrating radar (GPR) survey; and subsurface testing. All areas selected for subsurface testing will be surveyed with a Geophysical Survey Systems, Inc. SIR-3000 GPR unit equipped with a 400 MHz antenna. The planned subsurface testing program will be backhoe-assisted. In general, linear trenches measuring approximately 3 m or 6 m (10 feet or 20 feet) long and 0.6 or 0.9 m (2 feet or 3 feet) wide will be excavated within the project footprint (based on preliminary engineering) at selected station locations, guideway column locations and utility relocation areas. Forty (40) test excavations are proposed,</p>

	<p>with the potential for additional testing to refine the boundaries of subsurface deposits.</p> <p>The subsurface testing sampling strategy was developed giving consideration to: sediment types; natural geographic features, such as streams; background research, including information from historic maps and Land Commission Award (LCA) documents; the results of previous archaeological studies in the vicinity; the results of consultation with the Native Hawaiian community; an assessment of the impact of prior land development; and a consideration of safety concerns for actually carrying out the archaeological work.</p> <p>E. The greatest factors limiting the survey effort include: 1) the survey area's large (9.06 acres), dispersed (4.8 miles) area; 2) the survey area's highly developed and highly active setting (in-use city streets, sidewalks, and buildings); and, 3) the dense, complex array of existing subsurface utilities in the survey area.</p> <p>F. Test excavations will be the primary means of identifying archaeological properties.</p> <p>G. AIS documentation of observed archaeological historic properties will include stratigraphic profiles and plan views, available historic property boundary information based on additional testing, sample collection and analysis, written descriptions, photographs, and artifact analysis.</p> <p>H. All identified archaeological historic properties will be documented and located with a Trimble ProXH mapping-grade GPS unit (sub-foot accuracy).</p>
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Section 1 Introduction

1.1 Project Background

Cultural Surveys Hawai'i, Inc. (CSH) completed this archaeological inventory survey plan (AISP) for the Honolulu High-Capacity Transit Corridor Project's (HHCTCP) Construction Phase 3 (Airport) for the City & County of Honolulu (City) and the Federal Transit Administration (FTA), and on behalf of PB Americas, Inc. (PB), The AISP Airport study area is from Kalaloa Drive (just northwest of Hālawā Stream) in the west to Middle Street (just west of Kalihi Stream) in the east, located within the traditional Hawaiian land divisions of Hālawā ('Ewa District), and Moanalua Ahupua'a, (Honolulu District), Island of O'ahu, TMK: [1] 1-2, 1-5, 1-7, 2-1, 2-3 (Various Plats and Parcels).

The entire proposed HHCTCP extends approximately 23 miles (37 km) from Kapolei in the west to the Ala Moana Center in the east. The focus of this AISP is the majority of the Airport Phase 3 Construction section from Station 994+00 Kamehameha Hwy. at Kalaloa Drive (just northwest of Hālawā Stream) to Station 1248+00 (Kamehameha Hwy. at Middle Street just west of Kalihi Stream) for a distance of 25,400 feet or 4.8 miles (7.74 kilometers) and includes three stations. The AISP for Phase 2 (reviewed and accepted by the SHPD) extended, by general agreement, slightly east of the construction phase terminus at Aloha Stadium (to Hālawā Stream). Similarly the AISP for construction phase 4 (presently under SHPD review), by general agreement, extends slightly west from the western terminus of construction phase 4 in the vicinity of the Middle Street Transit Center (to Kalihi Stream).

The portion of the route addressed in this archaeological inventory survey plan has a western end on Kamehameha Hwy. at Kalaloa Drive 100 m northwest of Hālawā Stream (where it meets the southeast end of the Phase 2 AIS project corridor). The route continues south on Kamehameha Highway. Just south of Radford Drive is a Pearl Harbor Naval Base Station platform extending over Kamehameha Hwy. with an associated transit station on the ground level on the southeast corner of Radford Drive and Kamehameha Highway. From the Pearl Harbor Naval Base Station the route continues south on Kamehameha Highway passing over the Center Drive intersection where it continues south on the *makai* (west) side of Makai Frontage road (on the *makai* side of Kamehameha Hwy.) crossing to the *makai* side of Nimitz Hwy. by Valkenburgh Street. The route continues southeast on the *makai* side of Nimitz and the H-1 Freeway viaduct passing Main Street and Elliott Street. Just east of Elliott Street the route arcs *mauka* over the east bound lanes of the H-1 Freeway and then curves *makai* again crossing the east bound lanes of the H-1. The route continues south (*makai*) roughly parallel to the east side of the *mauka/makai* trending SW end of Aolele Street curving east at Ala Onaona Street to the Honolulu International Airport Station. The Honolulu International Airport Station is located (in a presently at grade parking area) just NW of the main Honolulu Airport overseas parking structure. From that station the route continues east on the *makai* side of Ala Onaona Street but east of Pai'ea Street the route veers slightly *mauka* crossing *mauka* of Aolele Street to Ualena Street. The route then follows Ualena Street crossing Lagoon Drive. The Lagoon Drive Station is immediately east of Lagoon Drive on the south portion of Waiwai Loop (*mauka* and *makai* entrance buildings are on either side of this portion of Waiwai Loop). From that station the route continues east on the south side of the south portion of Waiwai Loop crossing over an area of

warehouses to Ke'ehi Lagoon Beach Park. The route angles NE through Ke'ehi Lagoon Beach Park, *makai* of the tennis courts, and crosses Moanalua Stream *makai* and parallel to Nimitz Highway. In the short stretch between Moanalua Stream and Kalihi Stream the route crosses *mauka* of Nimitz Hwy. joining Kamehameha Hwy. at the Middle Street intersection (where it meets the Phase 4 AIS project area).

This AISP study area includes the majority of HHCTCP Construction Section 3 but is truncated slightly at both ends. The AISP study area is depicted on a U.S. Geological Survey 7.5-Minute Series Topographic Map, Honolulu (1998) Quadrangle (Figure 1), on the two applicable Tax Map Key (TMK) Section maps (Figure 2 and Figure 3) and an aerial photograph (Figure 4).

The AISP Phase 3 Airport study area, is primarily located within existing road rights-of-way owned by the State of Hawai'i or the City & County of Honolulu, including Kamehameha Highway, North Nimitz Highway, Aolele Street, Ualena Street to the vicinity of Lagoon Drive then back to Nimitz Highway then turning to Kamehameha Highway just west of Kalihi Stream. Support facilities along the project corridor are located on adjacent privately-owned lands.

The HHCTCP purpose is to provide high-capacity rapid transit in the highly congested east-west transportation corridor between Kapolei and the Ala Moana Center via a fixed guideway rail transit system. FTA and the City will fund project construction. In addition to the guideway, the project will require construction of transit stations and ancillary support facilities. Three proposed transit stations are within the current AISP study area, including: Pearl Harbor Naval Base Station, Honolulu International Airport Station and the Lagoon Drive Station (see Figure 1 to Figure 4). 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 station and ancillary facility foundation construction.

The HHCTCP area of potential effect (APE) for archaeological cultural resources is defined in the HHCTCP final Programmatic Agreement (Stipulation II.A.1.) as all areas of direct ground disturbance. For the present Airport AISP survey area (most of Construction Section 3) HHCTCP project engineers estimate that the project's area of direct ground disturbance is approximately 604,289 square feet (or 13.87 acres). These 13.87 acres are the survey area for this Phase 3 Airport AISP investigation.

1.2 Historic Preservation Regulatory Context

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 (NRHP). The Hawaii State Historic Preservation Officer (SHPO) concurred with this undertaking effect determination. To address the undertaking's potential adverse effect, a Programmatic Agreement (PA) was executed January 18th, 2011, with FTA, Hawaii SHPO, the United States Navy, and the Advisory Council on Historic Preservation as signatories. This AISP was prepared to fulfill PA

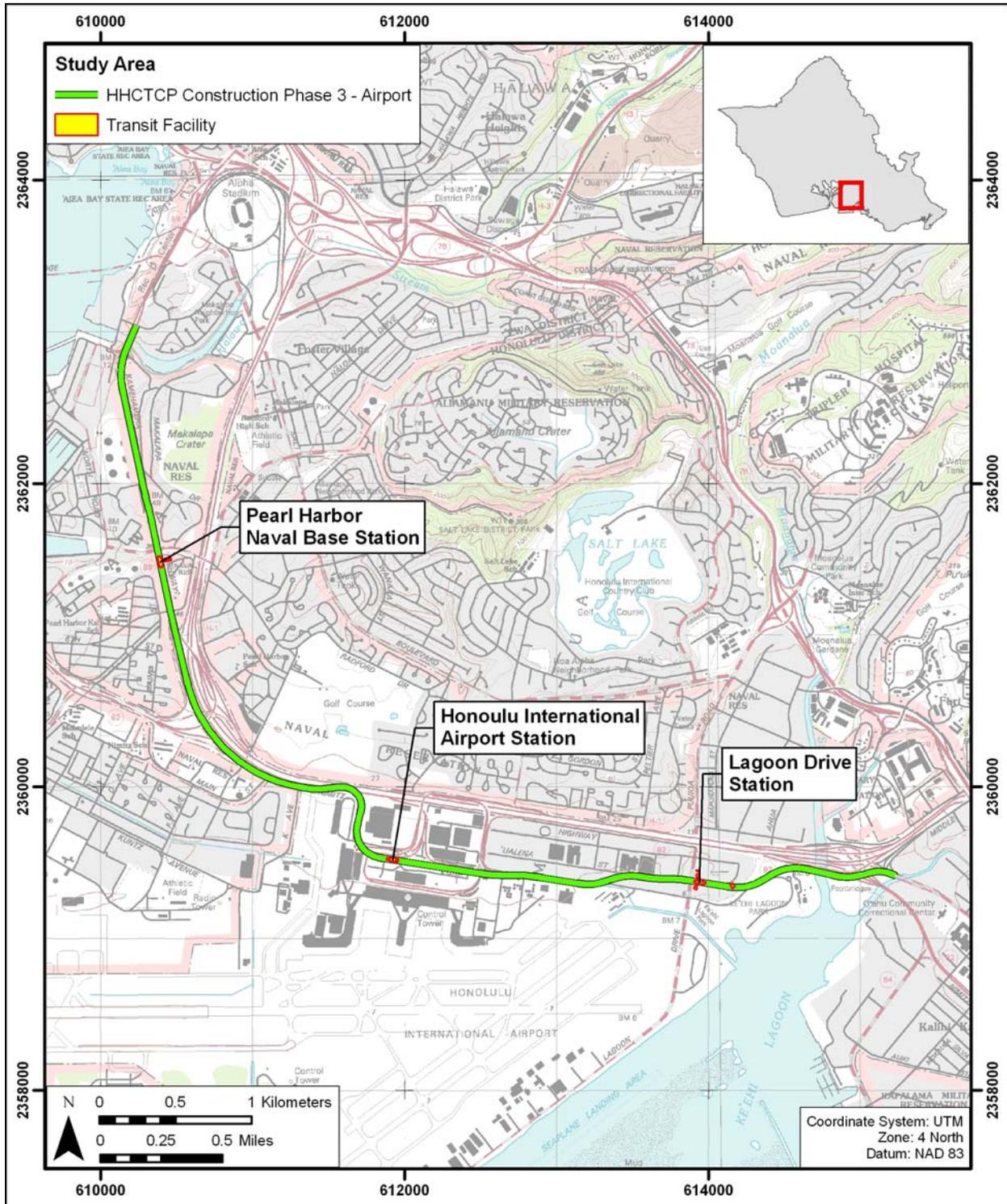


Figure 1. A portion of the 1999 Pearl Harbor U.S. Geological Survey 7.5-minute topographic quadrangle

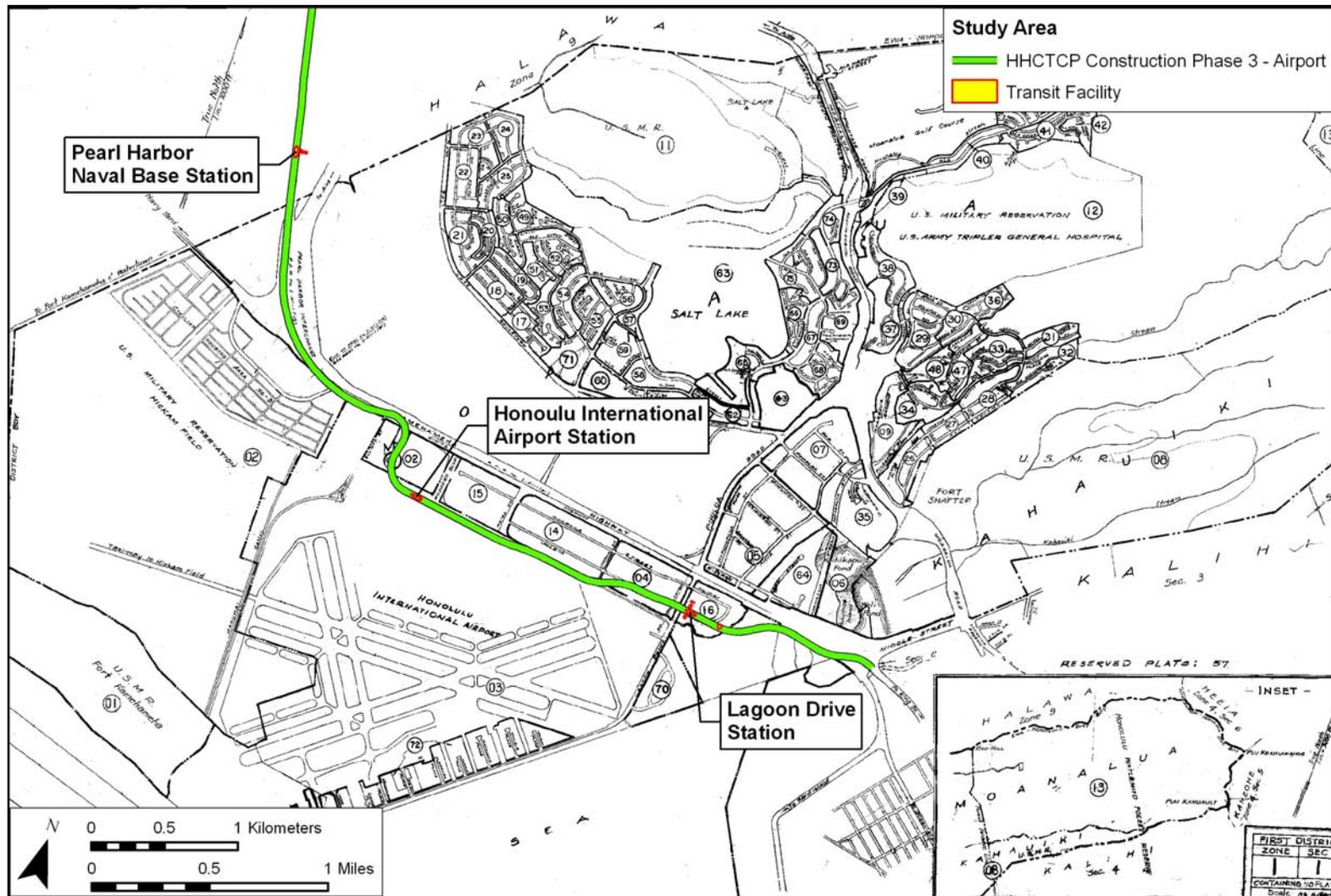


Figure 3. Tax Map Key (TMK) Section map [1] 1-1 showing eastern portion of project area



Figure 4. Aerial photograph of project area

Stipulation III, which requires that an AISP be prepared and reviewed and approved by SHPD for each HHCTCP construction section. This AISP was also prepared in consideration of the *Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation* and is intended to support the project's PA and Section 106 compliance.

This document was also 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. This plan defines the scope of work and details the proposed methods and sampling strategy of the AIS, in accordance with the requirements for an AISP stated in HAR Chapter 13-275-5(c). The AISP will be submitted for review and approval of the State Historic Preservation Division (SHPD).

An AIS of HHCTCP Construction Section 1 (extending east from the East Kapolei Station to the Pearl Highlands Station), was completed by CSH in February 2010 and reviewed and approved by SHPD on April 19th, 2010 (SHPD correspondence LOG NO: 2010.1749 / DOC NO: 1004MV01).

At the time of writing (7/1/11) the AIS fieldwork for HHCTCP Construction Section 2 (extending east from Waimano Home Road to Kalaloa Street (just west of Hālawā Stream) was almost completed (following an SHPD reviewed and approved AISP for Section 2—SHPD correspondence May 7th, 2010 LOG NO: 2010.1748 / DOC NO: 1005NM14).

At the time of writing (7/1/11) the Archaeological Inventory Survey Plan for Section 4 is under SHPD review.

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).

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. The use of the term cultural resources in these instances is common practice in cultural resource management and is in keeping with the historic preservation requirements/definitions of both 36 CFR 800 and HAR Chapter 13-275.

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 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 maintained by the Secretary of the Interior. This includes artifacts, records, and remains that are related to and located within such properties, a 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 State Historic Preservation Officer (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 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.

1.3 Overview of Proposed Project Construction

The design, method of construction, and timeline of the HHCTCP continue to be refined. This overview of proposed project construction is a synopsis of the information provided in the HHCTCP Environmental Impact Statement (EIS) (USDOT/FTA and C&C/DTS 2008).

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 8-foot diameter column spaced, on average, about every 120 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

Ancillary support facilities for the transit system include maintenance and storage facilities 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 or relocation, 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. The nature and extent of utility relocations in the project area are still being determined but, as shown in Table 1, present estimates are that the vast majority of subsurface impacts will be ancillary impacts (particularly for utility relocation, roadway work and building demolition).

Guideway foundation excavations will extend below the water table, potentially 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 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 ancillary maintenance and storage facility areas and transit stations have been identified as potential staging areas, additional locations may be needed. The locations of additional construction staging areas have not yet been determined. Grading of the construction staging areas may be necessary.

1.3.4 Summary of Subsurface Impacts

While the construction of the “touch down” facilities of the three Transit Stations and the excavations for the column foundations for the fixed guideway may be the most obvious project-related subsurface impacts the data available to us (see Table 1) is that collectively these will account for only an estimated 9.05 % of the area of project-related subsurface impacts.

The utility relocations needed for this project are quite substantial. The “dry” utilities including electric & gas line relocations are estimated to account for a third (33%) of the ground disturbance.

The “wet” utility relocations including water, sewer and storm sewer improvements are anticipated to account for approximately 20% of the project-related subsurface impacts.

Demolition is anticipated to account for approximately 10% of project-related subsurface impacts. Existing building demolition will include excavations to remove building foundations and associated utilities and grading of the cleared land surface once demolition is done.

Table 1. Summary of Total Area of Disturbance Anticipated for Different Aspects of the Transit Airport Section Project

Airport Section AIS Summary of Anticipated Ground Disturbance (Est. 9.06 acres or 394,504 ft² Total)		
Components	Area (ft²)	% of Project-related Ground Disturbance
Utilities (WET)	78,975	20.02%
Utilities (DRY)	130,403	33.05%

Components	Area (ft ²)	% of Project-related Ground Disturbance
Traction Power Substation (TPSS)	27,968	7.09%
Fiber Optic Cables	12,300	3.12%
Building Demolition	39,228	9.94%
Roadway Work	69,707	17.67%
Traffic Signals	189	0.05%
Stations	11,257	2.85%
Columns	24,477	6.20%

1.4 Environmental Setting

1.4.1 Natural Environment

The project area lies at approximately 40 foot elevation on what has come to be referred to in the archaeological literature as the Hālawā-Moanalua plain. The plain is largely formed by raised reef limestone shelf overlain by clay alluvium and colluvium eroding down from the lower slopes of the Koʻolau volcanic range and sediments transported by air and water from various post-erosional volcanic events. Three of these post-erosional volcanic craters lie close to the HHCTCP alignment: Makalapa Crater just south of Hālawā Stream and approximately 300 m to the east of the alignment along Kamehameha Highway, Āliamanu Crater also just south of Hālawā Stream and approximately 1.1 km to the east of the alignment along Kamehameha Highway and Salt Lake (Āliapaʻakai) Crater approximately 800 meters to the north of the North Nimitz Highway portion of the Phase 3 alignment (see Figure 1). These three volcanic events significantly displaced the lower reaches of Moanalua Stream pushing the stream to the east. Hālawā Stream, is effectively the northwest end of the present project area entering the East Loch of Pearl Harbor approximately 250 m west of the HHCTCP alignment along Kamehameha Highway (McDonald and Ogg 1974:374-5).

The current project area traverses (Figure 5) Mixed Fill Land (FL) as it heads south from the Hālawā Stream crossing. After approximately 500 m the Kamehameha Highway alignment forms the effective transition zone between Mixed Fill Lands on the *makai* side and Kokokahi very stony clay, 0 to 35 percent slopes (KTKE) lands on the *mauka* side. In the vicinity of Radford Drive are small exposures of Rock Land (rRK) bracketing a small exposure of Hanalei silty clay, 2 to 6 percent slopes (HnB) soil. Most of the central North Nimitz Highway portion of the HHCTCP alignment traverses Makalapa clay, 6 to 12 percent slopes (MdC) soils. As the alignment heads *makai* and extends east along Aolele Street it traverses Keaau stony clay, 2 to 6 percent slopes (KmaB) soils with Fill Land on the *makai* side. In the vicinity of Lagoon Drive are Ewa silty clay loam soils, moderately shallow, 0 to 2 percent slopes (EmA) soils. The eastern end of the project area is again Mixed Fill Land (Figure 5).

Mixed Fill Land (FL) is common near Pearl Harbor and includes “areas filled with materials dredged from the ocean or hauled from nearby areas, garbage, and general material from other sources” (Foote et al. 1972:31).

Kokokahi very stony clay, 0 to 35 percent slopes (KTKE) consists of moderately well drained soils on talus slopes and alluvial fans developed in colluviums and alluvium derived from basic igneous rock with many stones and boulders on the surface. These soils are used for pasture and homesites (Foote et al. 1972:73).

Rock Land (rRK) is made up of areas where exposed bedrock covers more than 90 percent of the surface. This land type is not suited to farming (Foote et al. 1972:119).

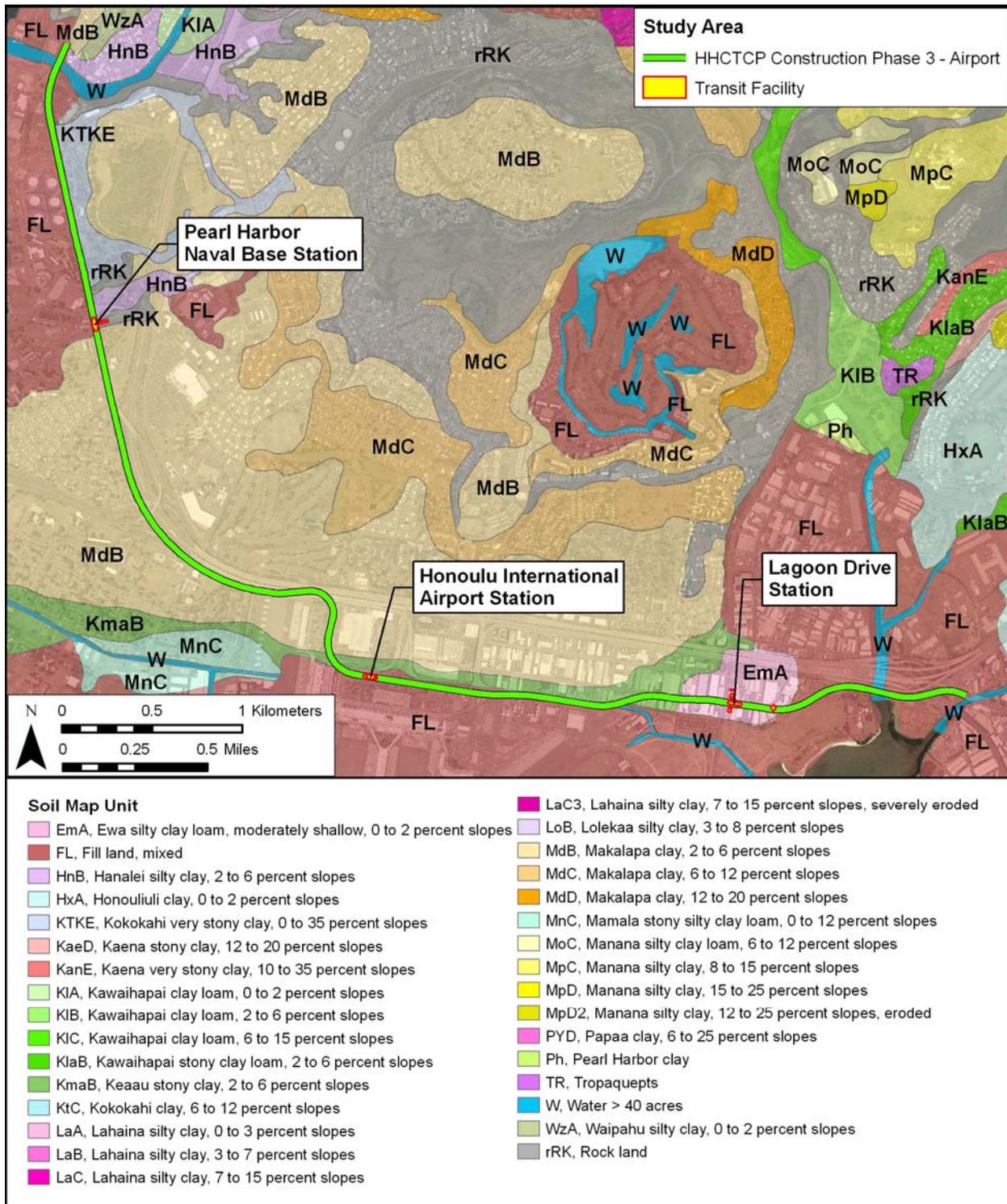


Figure 5. Soils of the project area

Hanalei silty clay, 2 to 6 percent slopes (HnB) is typically found on stream bottoms and flood plains. Soil runoff is slow and the erosion hazard is slight. This soil is used for sugarcane, taro and pasture. (Foote et al. 1972:38).

Makalapa clay, 6 to 12 percent slopes (MdC) soils is a dark to very dark grayish-brown clay to silty clay loam understood to be derived primarily from volcanic tuff. The permeability and run-off is slow and erosion hazard is slight but these soils have a high shrink-swell potential. These soils are associated with urban development and pasture (Foote et al. 1972:87-88).

Keaau stony clay, 2 to 6 percent slopes (KmaB) consists of poorly drained soils on coastal plains developed in alluvium deposited over raised reef limestone or consolidated coral sand with sufficient stones to hinder machine cultivation (Foote et al. 1972:64-65).

Ewa silty clay loam, moderately shallow, 0 to 2 percent slopes (EmA) soils develop in alluvial fans and terraces with a depth to coral limestone of 20 to 50 inches. Runoff is very slow. These lands are used for sugar cane, truck crops and pasture (Foote et al. 1972:29-30).

In general the soil types of the HHCTCP Airport Phase 3 study area are not good agricultural soils. The small patches of Hanalei silty clay and Ewa silty clay loam are exceptionally good agricultural soils for the corridor.

The project area receives between approximately 500 mm (20 inches to 800 mm (31 inches) of rainfall per year (Giambelluca et al. 1986), which is marginal at best for non-irrigated agriculture. The project area is in a general vicinity of fairly intensive development of buildings, concrete and asphalt surfaces with minimal landscaping within existing developed areas.

Undeveloped areas in the vicinity away from streams are mostly in *kiawe* (*Prosopis pallida*) and *koa haole* (*Leucana glauca*) scrub.

1.4.2 Built Environment

The project area lies in a fairly urbanized portion of Honolulu generally known today as “Salt Lake” in reference to the major landform Āliapa‘akai Crater (and the salty pond that existed there into the 1970s) approximately 800 meters to the north of the North Nimitz Highway portion of the Phase 3 alignment.

1.4.3 Land Jurisdiction

Land Jurisdiction includes Federal, State, City and Private lands (Table 2 and Table 3). Federal lands bound by Radford Dr., Tarawa Dr. and Kamehameha Hwy. are proposed for the Pearl Harbor Naval Base Station State lands include portions of the corridor along Kamehameha Hwy., North Nimitz Hwy., the H-1 Freeway, Aolele Street and the Honolulu International Airport. City lands include portions of the corridor along Ualena Street and Waiwai Loop. Land Ownership is summarized in Table 2 below:

Table 2 Land Ownership of the Phase 3 Project Area: Non-Right-of-Way Properties

TMK	Owner	Type	Location
9-9-003:066	KRONICK,HARRY B TRUST	Private	Kamehameha Hwy & Kalaloa St
9-9-002:004	UNITED STATES OF AMERICA	Federal	Kamehameha Hwy - Hālawa Dr to Radford Dr

TMK	Owner	Type	Location
1-1-002:004	UNITED STATES OF AMERICA	Federal	Nimitz Hwy & Main St
1-1-003:001	S OF H DOT AIRPORTS DIV	State	Airport
1-1-002:001	U S POSTAL SERVICE	Federal	Nimitz Hwy & Aolele St
1-1-003:011	S OF H DOT AIRPORTS DIV	State	Airport
1-1-003:010	S OF H DOT AIRPORTS DIV	State	Airport
1-1-003:009	S OF H DOT AIRPORTS DIV	State	Airport
1-1-004:018	S OF H DOT AIRPORTS DIV	State	Ualena St
1-1-004:017	S OF H DOT AIRPORTS DIV	State	Ualena St
1-1-004:015	S OF H DOT AIRPORTS DIV	State	Ualena St
1-1-004:014	S OF H DOT AIRPORTS DIV	State	Ualena St
1-1-004:013	S OF H DOT AIRPORTS DIV	State	Ualena St
1-1-004:012	S OF H DOT AIRPORTS DIV	State	Ualena St
1-1-016:015	BREWER,JOHN V TR	Private	Waiwai Loop & Lagoon Dr
1-1-016:014	CHEVRON U S A INC	Private	Waiwai Loop & Lagoon Dr
1-1-016:016	INTERNATIONAL EXPRESS INC	Private	Waiwai Loop
1-1-016:013	QUEEN BEE LIMITED PARTNERSHIP	Private	Waiwai Loop
1-1-016:017	WAIWAI LOOP RENTAL INC	Private	Waiwai Loop
1-1-016:012	WINDOW WORLD INC	Private	Waiwai Loop
1-1-016:007	WATUMULL ENTERPRISES LTD	Private	Waiwai Loop
1-1-016:006	ALERT HOLDINGS GROUP INC	Private	Waiwai Loop
1-1-016:005	2676 WAIWAI LOOP LLC	Private	Waiwai Loop
1-1-003:006	S OF H DOT AIRPORTS DIV	State	Ke'ehi Lagoon Park
1-1-003:004	S OF H DOT AIRPORTS DIV	State	Ke'ehi Lagoon Veterans Memorial
1-1-003:138	STATE OF HAWAII	State	Moanalua Stream
1-1-003:003	S OF H DOT AIRPORTS DIV	State	Nimitz Hwy & Moanalua Stream

Table 3. Land Ownership of the Phase 3 Project Area: Right-of-Way Properties

ROW	Owner
Kamehameha Hwy	State
H-1 Freeway	State
N Nimitz Hwy	State
Aolele St	State
Ualena St	City
Waiwai Loop	City