4.15 Street Trees

This section describes street trees within the study corridor. A street tree is considered any planting in a street or highway right-of-way that exceeds a height of 8 feet. Street trees are prevalent along many of the corridor's roadways, starting in Waipahu and extending to UH Mānoa and Waikīkī. For more information and references, see the *Honolulu High-Capacity Transit Corridor Project Street Trees Technology Report* (RTD 2008l).

4.15.1 Background and Methodology

City and County of Honolulu Street Tree Regulations

Exceptional street trees are regulated by ROH Chapter 41, Article 13. Coordination with the DPR Division of Urban Forestry and community groups, such as the Outdoor Circle and Sierra Club, with regard to street trees was initiated at the start of the NEPA process. This coordination has resulted in the identification of *Exceptional Trees* along the project alignment. Coordination will be ongoing as the Project progresses.

Street Tree Survey

A comprehensive survey of street trees was conducted in the project corridor to identify species, size, maturity, condition, and the Project's probable effect on each tree. Trees were also listed as *Notable* or *Excellent*, if applicable.

Notable Trees are those deemed to be important to the urban landscape character.

Excellent Trees are mature trees, without any other plantings nearby, that have been allowed to expand to their fullest possible canopy and have not been pruned or affected in such a manner to take away from their appearance.

Exceptional Trees are a single tree or grove of trees with historic or cultural value or which, by reason of their age, rarity, location, size, aesthetic quality, or endemic status, have been designated by the City Council as worthy of preservation (ROH 1990).

4.15.2 Affected Environment

Nearly 50 different tree species were identified during the survey (Figure 4-71). Along most of the alignment, street trees belong to the following species: rainbow shower, be-still, monkeypod, tall fan palm, and coconut palm. Many of the other species present are relatively common in Hawai'i, but some uncommon plantings are present, such as autograph trees *(Clusia rosea)* in Ke'ehi Lagoon Beach Park.

Notable Trees along the entire route include the following clusters:

- 43 true kamani trees in rows along both sides of Dillingham Boulevard between Kōkea and Ka'aahi Streets (Figure 4-72)
- 10 privately owned monkeypod trees in the median along Kona Street within Ala Moana Center

The following trees were not identified as Exceptional or Notable, but are important to consider:

- Plantings in the median of Farrington Highway between Fort Weaver Road and Waipahu High School helped beautify this roadway approximately five years ago and were nominated for a landscaping/beautification award. These currently juvenile or semi-mature plantings of rainbow shower trees, tall fan palms, and kou trees are important to the community and the Waipahu streetscape.
- Several streets, including Dillingham Boulevard, Kapi'olani Boulevard, Kona Street, Kalākaua Avenue, and portions of Halekauwila Street, contain mature vegetation within the medians and streetscapes.
- At Honolulu International Airport, near the old interisland terminal, there are many relatively newly planted rainbow shower trees.

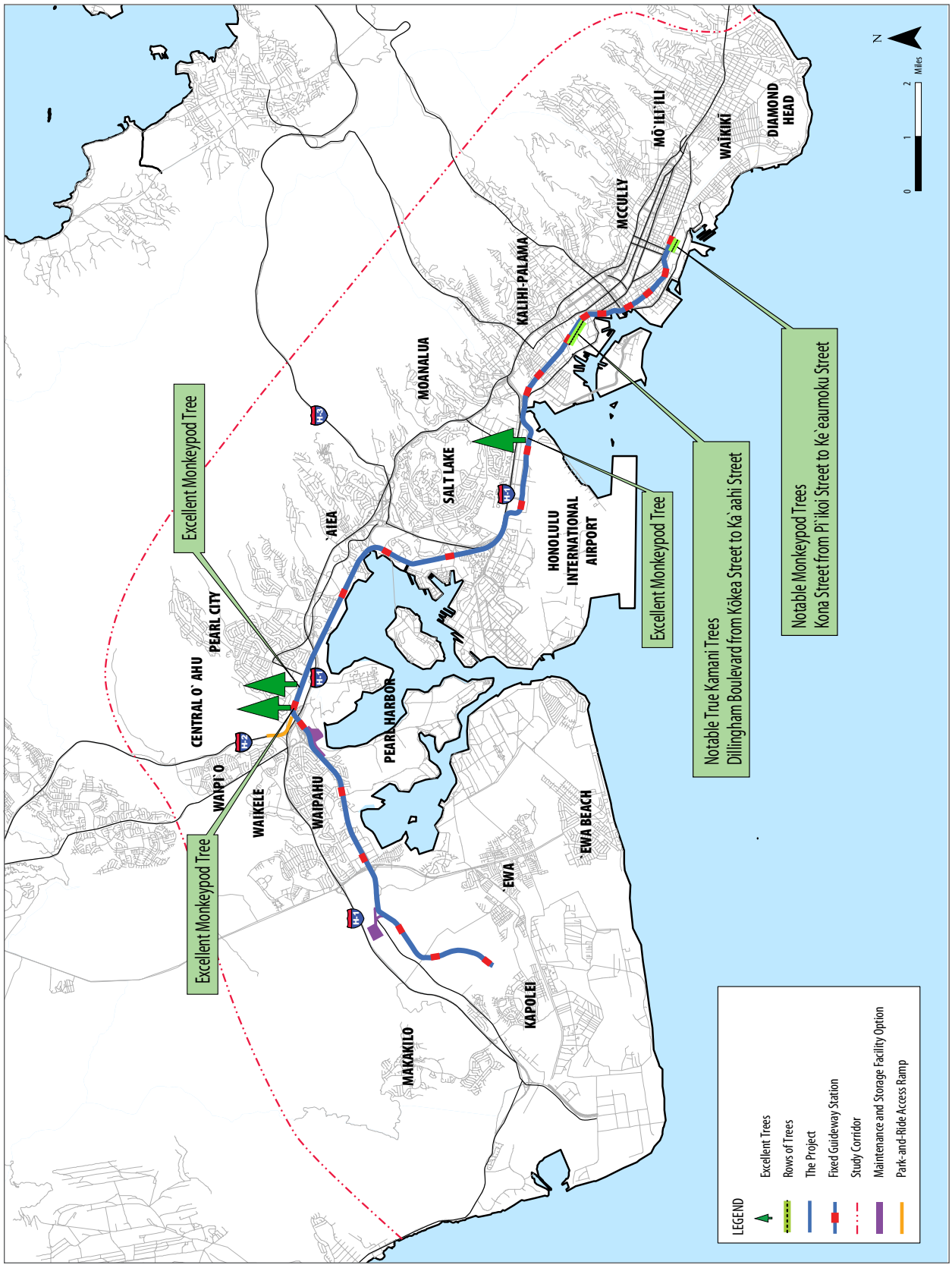


Figure 4-71 Identified Street Trees

Figure 4-72 True Kamani Trees on Dillingham Boulevard

4.15.3 Environmental Consequences and Mitigation

Environmental Consequences

No Build Alternative

Under the No Build Alternative, the Project would not be built and would not impact street trees. Although the projects in the ORTP are assumed to be built, their environmental impacts will be studied and documented in separate environmental documents.

Project

Table 4-32 shows the approximate number of street trees that will be pruned, removed, or transplanted as a result of the Project.

The Project will require tree pruning and removal. Tree removal will be minimized to the greatest extent possible, but if a street tree is close to the guideway, it will likely require periodic pruning, if not removal.

The following effects will result from the Project. The fixed guideway will primarily affect street trees in Waipahu and Downtown. Notable effects will include the following:

- Two monkeypods identified as Excellent trees along Kamehameha Highway near Pearlridge Center have very large canopies that are approximately 50 feet from the center of the planned guideway. They may require minimal pruning.
- Twenty-eight Notable true kamani trees on the makai side of Dillingham Boulevard will be removed. Trees on the makai side of the street are already periodically pruned because of the presence of utilities. Trees on the mauka side of Dillingham Boulevard are not pruned and will be preserved.
- Most of the relatively newly planted trees along Farrington Highway in Waipahu will be removed.
- Monkeypod trees on Kona Street between Piʻikoi Street and Keʻeaumoku Street will be removed.

Many of the trees that will be affected along the project alignment are relatively small and easily replaceable be-still trees and are considered transplantable. However, the Project will require the removal and possible transplant of 14 newly planted rainbow shower trees near the old

Table 4-32 Summary of Street Tree Effects/Transplanting Mitigation

	Trees to Be Pruned	Trees to Be Removed	Trees that Could Be Transplanted
Project	100	550	300 (55 percent)

Note: (55 percent) = approximate percent of trees that will be removed that are transplantable.

interisland terminal. In addition, one Excellent monkeypod in Keʻehi Lagoon Beach Park may require slight pruning. Specific quantities of trees to be pruned, removed, and transplanted are included in the totals in Table 4-32.

Mitigation

Effects to street trees will be mitigated by transplanting existing trees to areas as close to their original location as feasible or planting new ones. Among the trees that require removal but could be transplanted are most of the trees along Farrington Highway. The location where street trees will be transplanted will be selected based on project-specific criteria that could include the following:

- Areas where existing landscaping will be lost along the study corridor
- Areas where opportunities exist for enhancing existing streetscapes near the study corridor
- Areas where stations and parking lots will be constructed
- Areas where shared benefits will be accomplished, such as areas adjacent to parks or historic sites

Street tree pruning, removal, and planting will comply with City ordinances and will require that a certified arborist manage the pruning of any Exceptional trees. Trees suitable for transplanting displaced by construction will be relocated to a City project nursery until they can be transplanted to another part of the project area. The City will coordinate with HDOT's highway landscape architect.

In addition to transplanting existing trees, plans for new plantings will be prepared by a landscape architect during final design to further mitigate effects to street trees. To mitigate any substantial effects in areas that require tree removal, special attention will be given to developing landscaping plans so that new plantings will provide similar advantages to the community. If new plantings will not offer equitable mitigation (e.g., older mature trees that are removed), additional younger trees could be planted that will, in time, develop similar benefits.

4.16 Archaeological, Cultural, and Historic Resources

This section provides the regulatory context that governs archaeological and cultural resources, as well as historic resources. It also discusses how the Project will affect resources and historic properties within the APE and proposed mitigation to address those effects. For more information and references, see the *Honolulu High-Capacity Transit Corridor Project Archaeological Resources Technical Report* (RTD 2008n), the *Honolulu High-Capacity Transit Corridor Project Historic Resources Technical Report* (RTD 2008o), the *Honolulu High-Capacity Transit Corridor Project Cultural Resources Technical Report* (RTD 2008p), the *Honolulu High-Capacity Transit Corridor Project Addendum 01 to the Historic Resources Technical Report* (RTD 2009c), and the *Honolulu High-Capacity Transit Corridor Project Historic Effects Report* (RTD 2009d).

The *Area of Potential Effects* (APE) is the geographical area or areas within which an undertaking may directly or indirectly change the character or use of historic properties.

4.16.1 Background and Methodology

Regulations

The Project must comply with Federal and State archaeological, cultural, and historic preservation laws and regulations.

Federal

The Project is subject to compliance with the National Historic Preservation Act (NHPA) of 1966, as amended (16 USC 470 et seq.). According to Section 106 of the NHPA, the responsible Federal agency is required to consider the effect

of its project on historic properties (consisting of any prehistoric or historic district, site, building, structure, or object) eligible for listing in the National Register of Historic Places (NRHP). The lead Federal agency, in consultation with SHPD, is responsible for the determinations of eligibility for listing on the NRHP and for the finding of effect. The Federal Advisory Council on Historic Preservation (ACHP) is given the opportunity to participate in the Section 106 consultation process.

Section 106 requires that Federal agencies consider the effects of their actions on traditional cultural properties (TCP). TCPs are places that a community regards as important for association with cultural practices or beliefs that are rooted in a community's history and important in maintaining a community's cultural identity, as well as properties of traditional religious and cultural importance.

This section defines archeological, cultural, and historic (i.e., built) resources separately, although each of them are called "historic properties" when they are determined eligible for the NRHP. If the undertaking is determined to have an adverse effect on historic properties, then mitigation is developed and either a Memorandum of Agreement (MOA) or Programmatic Agreement (PA) is executed.

Section 4(f) of the U.S. Department of Transportation Act of 1966 also applies to historic properties and is addressed separately in Chapter 5.

State

HRS 343 also includes a cultural component: House Bill No. 2895 H.D.1, passed by the 20th Legislature and approved by the Governor on April 26, 2000, as Act 50. This act amends the EIS law and expands the definition of "significant effect" to include adverse effects on cultural practices.

HRS 6E promotes the preservation of significant historic resources of value to the people of Hawai'i. HRS 6E-43 and HAR 13-300 establish provisions pertaining to the discovery of historic burial sites outside of established, maintained cemeteries on non-Federal lands within the State.

Process for Applying Regulations

Under the NHPA, Section 106 requires Federal agencies to consider the effects of their undertakings on historic properties. FTA delegated the authority to coordinate the Section 106 process to the City in 2005. Hawai'i's historic preservation review legislation [HAR 13-275(b)] includes similar requirements to the Section 106 process. The following steps describe the Section 106 process:

- Identify consulting parties
- Initiate consultation and public involvement
- Identify the APE
- Identify and evaluate the NRHP eligibility of resources within the APE
- Assess effects on historic properties currently listed or eligible for listing in the NRHP
- Mitigate adverse effects with SHPD and other consulting parties resulting in an MOA or PA
- Implement provisions of the MOA or PA

Area of Potential Effects

After coordination with SHPD, the FTA and the City defined the APE for above-ground cultural and historic resources to be generally one parcel deep from the project alignment. The APE also includes parcels immediately adjacent to all facilities associated with the fixed guideway system, such as park-and-ride lots, traction power substations, and the maintenance and storage facility. The APE is larger around transit stations and has been defined to include entire blocks (or to extend 500 feet where blocks are not discernible) around the facilities. A copy of correspondence from SHPD dated February 4, 2008, concurring with the APE is located in Appendix F of this Final EIS.

The Project's APE for below-ground archaeological resources is defined as all areas of direct ground disturbance. Confining the archaeological resources' APE to the limits of ground disturbance is warranted because the surrounding built environment is largely developed and becomes progressively more urban as the Project progresses Koko Head.

Methodology

Archaeological Resources

The vast majority of previously identified archaeological resources within the APE have been investigated and recorded as a result of historic preservation and/or environmental compliance efforts of various private-, Municipal-, State-, and Federal-funded projects and undertakings since the 1970s.

To evaluate below-ground effects on archaeological resources within the study corridor, the corridor was divided into 10 different sub-areas. A qualitative rating system describing potential archaeological impacts was developed and applied to each sub-area. This rating system considered existing archaeological documentation, geological and depositional characteristics, and some field inspection within the study corridor. The 10 sub-areas are rated Low, Moderate, or High as defined below:

- A *Low* rating indicates potential effects are possible but not considered likely, or that there is a reasonable expectation of potential effects in no more than 10 percent of a given sub-area.
- A *Moderate* rating indicates a reasonable potential for effects on between 10 and 50 percent of a given sub-area.
- A *High* rating indicates a reasonable expectation of potential effects on more than 50 percent of a given sub-area.

A *High* rating does not mean that at least 50 percent of a sub-area is expected to contain archaeological deposits. Rather, this rating only means that there is a reasonable potential to encounter archaeological deposits within at least 50 percent of the sub-area. The actual percentage of the sub-area where archaeological resources are encountered will undoubtedly be smaller.

Similarly, the rating system says nothing regarding the NRHP eligibility of potential archaeological resources. The Archaeological Resources Technical Report (RTD 2008n) describes the methodology and consultation process in detail.

The primary goal of the Project's archaeological effort will be to provide additional background research and limited field investigation results for those areas that will be disturbed by the Project, as well as cultural consultation to support development of the archaeological portions of the Project's PA. The PA describes the archaeological historic property and resource identification and evaluation effort, as well as the mitigation procedures for identified archaeological resources. Mitigation will be conducted in advance of, and in some cases during, the construction phases in the Project's different geographic areas. See Section 4.16.3 for additional information on the PA.

Cultural Resources

Cultural resources are sites or places associated with significant events and/or people important to the native Hawaiian patterns of prehistory in the study corridor. These resources also include sites or places that embody distinctive characteristics or that are likely to yield information important for research on the prehistory of Hawai'i. Sites that yield resources important for past and present native Hawaiian cultural practices and items that are part of a cultural place-based context are also included.

The analysis of cultural resources was based on compliance requirements for NEPA (USC 1969), HRS 343 (HRS 2008); Section 106 (USC 1966a), and Act 50 (HHB 2000). The purpose of an Act 50

Cultural Impact Assessment is to: (1) gather information about traditional cultural practices, ethnic cultural practices, urban cultural practices, and pre-historic and historic cultural resources and practices that may be affected by implementation of a development project; (2) analyze the data; (3) produce an impact assessment; and (4) provide mitigation measures and suggestions.

The purpose of Act 50 is to (1) require that environmental impact statements include the disclosure of the effects of a proposed action on the cultural practices of the community and State; and (2) amend the definition of "significant effect" to include adverse effects on cultural practices.

The State of Hawai'i Office of Environmental Quality Control (OEQC) guidelines recommend that "an environmental assessment of cultural impacts gathers information about cultural practices and cultural features that may be affected by actions subject to Chapter 343, and promotes responsible decision making."

The OEQC Guidelines for Assessing Cultural Impacts state that "cultural impacts differ from other types of impacts assessed in environmental assessments or environmental impact statements. A cultural impact assessment includes information relating to the practices and beliefs of a particular cultural or ethnic group or groups" and suggest the following methodology: (1) gather information about traditional cultural practices, ethnic cultural practices, urban cultural practices, and prehistoric and historic cultural resources and practices that may be affected by implementation of a development project; (2) analyze the data; (3) produce an impact assessment; and (4) provide mitigation measures and suggestions.

Historic Resources

The Project's Alternative Analysis phase included an initial assessment of the location of historic resources along each evaluated alignment. This was one of the evaluation criteria used in the selection of alternatives to study in the Draft EIS. Modifications to the Project that could avoid or minimize adverse effects involved making substantial engineering changes (e.g., alignment variations and changes in station designs) and shifting station locations. Further design refinement, such as exact column placement to avoid archaeological resources, will continue during the ongoing design of the Project. Consultation with SHPD will continue regarding engineering options to minimize adverse effects where feasible.

Previously identified and potentially eligible historic (i.e., built) resources were identified and evaluated, and the Project's effects on them were determined. GIS data were compiled and used to initially identify resources to survey. Properties within the APE were identified as those with construction dates before 1969. In addition, several buildings were surveyed at the request of SHPD, despite being past the 1969 cut-off date or slightly outside the APE. Field observations were made and photographs were taken of more than 1,000 surveyed properties. Research was conducted at the City and County of Honolulu Real Property Assessment and Treasury Divisions and other research centers. Summary forms were prepared for all surveyed properties. These were reviewed by SHPD.

NRHP criteria defined in 36 CFR 60.4 were applied to evaluate pre-1969 properties in the APE—which will be 50 years or older at completion of the Project—for eligibility for listing in the NRHP. These regulations state that "the quality of significance in American history, architecture, archaeology, engineering, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association." These properties must also meet one or more of the following Significance Criteria (NPS 1991; 36 CFR 60.4):

- Criterion A—resource is associated with events that have made a significant contribution to the broad patterns of our history.
- Criterion B—resource is associated with the lives of persons significant in our past.
- Criterion C—resource embodies the distinctive characteristics of a type, period, or method of construction; represents the work of a master; possesses high artistic values; or represents a significant and distinguishable entity whose components may lack individual distinction.
- Criterion D—resource has yielded or may be likely to yield information important in prehistory or history.

In addition to 36 CFR 60.4, two criteria considerations were applied to resources within the APE. Criteria Consideration D provides guidance on applying NRHP eligibility criteria to cemeteries (Potter 1992). Criterion Consideration G offers guidance on applying the criteria to properties that achieved significance in the last 50 years (Sherfy 1998).

In its review of technical reports prepared for the Project, SHPD did not have any questions or comments regarding the methodology used to determine National Register eligibility. Appendix F of this Final EIS includes correspondence from SHPD that includes its review comments on the Historic Resources Technical Report (RTD 2008o) and the Historic Effects Report (RTD 2009d), along with other correspondence related to the Project.

Effects to all identified eligible or listed properties were evaluated within the current context and setting of the property, with regards to the identified historic significance and level of retention of historic integrity, and in relation to changes to the property or within its vicinity that the Project would or may cause. An adverse effect was determined when the Project would alter, directly or indirectly, any of the characteristics of the historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration was given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register.

Using the criteria of adverse effect established in 36 CFR 800.5(a)(1) and guidance found in the National Register Bulletin *How to Apply the National Register Criteria for Evaluation*, each historic property was evaluated to determine if implementation of the Project will alter any historically significant characteristics or features of a historic property by diminishing relevant aspects of that property's historic integrity. For some eligible or listed resources within the Project's APE, certain aspects of integrity are not critical to the reasons that a property was determined to be eligible for listing. For each historic property, one of the following findings was made regarding the Project's potential to affect each aspect of integrity:

- No effect
- No adverse effect
- Adverse effect

The majority of historic properties identified within the APE were not associated with and/or did not retain historic setting. Therefore, when integrity of setting was determined to not be critical to character-defining features and/or National Register eligibility (regardless of whether the individual aspects of integrity were specifically called out in prior documentation) or when integrity of setting was no longer retained, introduction of the rail guideway in a portion of a historic property's setting or viewshed generally resulted in a No Adverse Effect determination.

While only one aspect of integrity for a single property may receive a No Adverse Effect or

Adverse Effect determination, while all other aspects receive No Effect determinations, the property's effect determination will correspond with the effect determination that accounts for the greatest impacts to the overall property.

Section 106 Consultation

Extensive effort was made to identify, contact, and consult with groups with demonstrated interests relating to archeological, cultural, and historic resources within the APE. The information gathered at that time provided a starting-point for work to support this Final EIS.

The purpose of consultation was to identify archaeological, cultural, and historic resources and to discuss other issues relating to the Project's potential effects on such resources. Information was obtained from individuals and organizations likely to have knowledge of potential resources in the study corridor. A reasonable and good faith effort was made to identify Native Hawaiian organizations that might attach religious and cultural significance to historic properties in the APE, and they were given opportunities to discuss issues and concerns.

In addition to consultation with SHPD, the City also consulted with organizations and agencies with concerns regarding archaeological, cultural, and historic areas. This consultation included Hawaiian civic clubs that may have an interest in the Project. Letters sent by the FTA initiated an ongoing consultation process with the following groups (Section 106 consulting parties) to identify resources, consider project effects, and develop mitigation to limit the adverse effects of the Project:

- National Trust for Historic Preservation
- Historic Hawai'i Foundation
- University of Hawai'i Historic Preservation Certificate Program
- American Institute of Architects
- Hawai'i Community Development Authority
- U.S. Navy (U.S. Naval Base Pearl Harbor)
- Office of Hawaiian Affairs
- O'ahu Island Burial Council
- Hui Malama I Na Kupuna O Hawai'i Nei
- Royal Order of Kamehameha
- The Ahahui Ka'ahumanu
- The Hale O Na Ali'i O Hawai'i
- The Daughters and Sons of the Hawaiian Warriors
- Association of Hawaiian Civic Clubs—and 15 individual civic clubs
- Department of the Interior, National Park Service (NPS)
- Advisory Council on Historic Preservation

This Section 106 consultation process has included contacting each consulting party and offering a meeting to gather input from each party, distributing all Section 106 related documents to the consulting parties with a request for review and comment, attending meetings as requested to provide project updates, and responding to requests for information. SHPD concurred on the Project's APE on February 4, 2008, Determination of Eligibility on October 3, 2008, and Effects on July 22, 2009. For a copy of the consultation letters, see Appendix F.

Between July 28, 2009, and October 14, 2009, FTA and the City invited all consulting parties to participate in a series of meetings to develop the PA. The process considered all adverse effects, including indirect and cumulative, to historic properties, measures undertaken to avoid and minimize harm, and additional evaluations required prior to construction. All comments from consulting parties were considered in the development of the PA. The PA (included as Appendix H to this Final EIS) stipulates the ongoing coordination process to be followed during project development and the measures required to mitigate adverse effects to historic properties.

4.16.2 Affected Environment

Archaeological Resources in the APE

Archaeological resources already documented within the APE include remnants of fishponds, cultivation terraces, irrigation systems, habitated sites, and subsurface cultural layers related to Native Hawaiians that may include religious or cultural artifacts and resources, including iwi kupuna or Hawaiian burials.

Three general categories of archaeological resources that could be affected are identified: burials, pre-contact archaeology, and post-contact archaeology. They are shown by area and rated by probability of occurrence in Figure 4-73.

Cultural Resources in the APE

Because of the level of existing development along the study corridor, many cultural resources have been destroyed or altered beyond repair. The Cultural Resources Technical Report (RTD 2008p) lists cultural resources identified within the Project's APE.

Historic Resources in the APE

The APE contains 81 historic resources (individual or districts). These resources are shown in Figures 4-74 through 4-77. The Historic Resources Technical Report (RTD 2008o) and Addendum 01 to the Historic Resources Technical Report (RTD 2009c) include all historic resources identified within the Project's APE. SHPD concurred with determinations of eligibility for historic structures on November 14, 2008. A copy of the SHPD correspondence is included in Appendix F of this Final EIS.

Two historic resources identified in the Draft EIS, the Sandobal House and the Solmirin House, are no longer considered eligible following additional consultation with the SHPD. Two additional historic resources, the Two-story (Tsumoto) Shop House and A/C Electric, have been demolished since their identification as historic resources. The OR&L Terminal Building and the OR&L Office/Document Storage Building were individually evaluated on separate survey forms in the Historic Resources Technical Report (RTD 2008o) and individually evaluated in the Historic Effects Report (RTD 2009d); thus, these properties are counted and listed as individual properties in the Final EIS. These changes account for the 81 historic resources listed in this Final EIS compared to 84 historic resources listed in the Draft EIS.

4.16.3 Environmental Consequences and Mitigation

Environmental Consequences

Archaeological Resources

Subsurface features and deposits, including iwi kupuna or Hawaiian burials, that have not been previously identified may be affected by the Project. Native Hawaiian testimonies in Land Commission Award claims indicate that there are burials within the study corridor. Other historical accounts related to land use and current understanding of traditional Native Hawaiian burials and mortuary traditions and practices are other indicators that iwi kupuna may be discovered in subsurface burials. These effects will occur during construction (see Section 4.18 for more information). After completion of construction, no additional project-related effects on archaeological resources are expected.

The Project will use a phased approach to identify archaeological resources, including burials. A PA was signed by FTA and SHPD and is included in Appendix H, Section 106 of the National Historic Preservation Act Programmatic Agreement. The PA stipulates the full extent of the City's and FTA's Section 106 responsibilities prior to each construction phase, identifies invited and concurring signatories, and provides direction on mitigation of adverse effects.

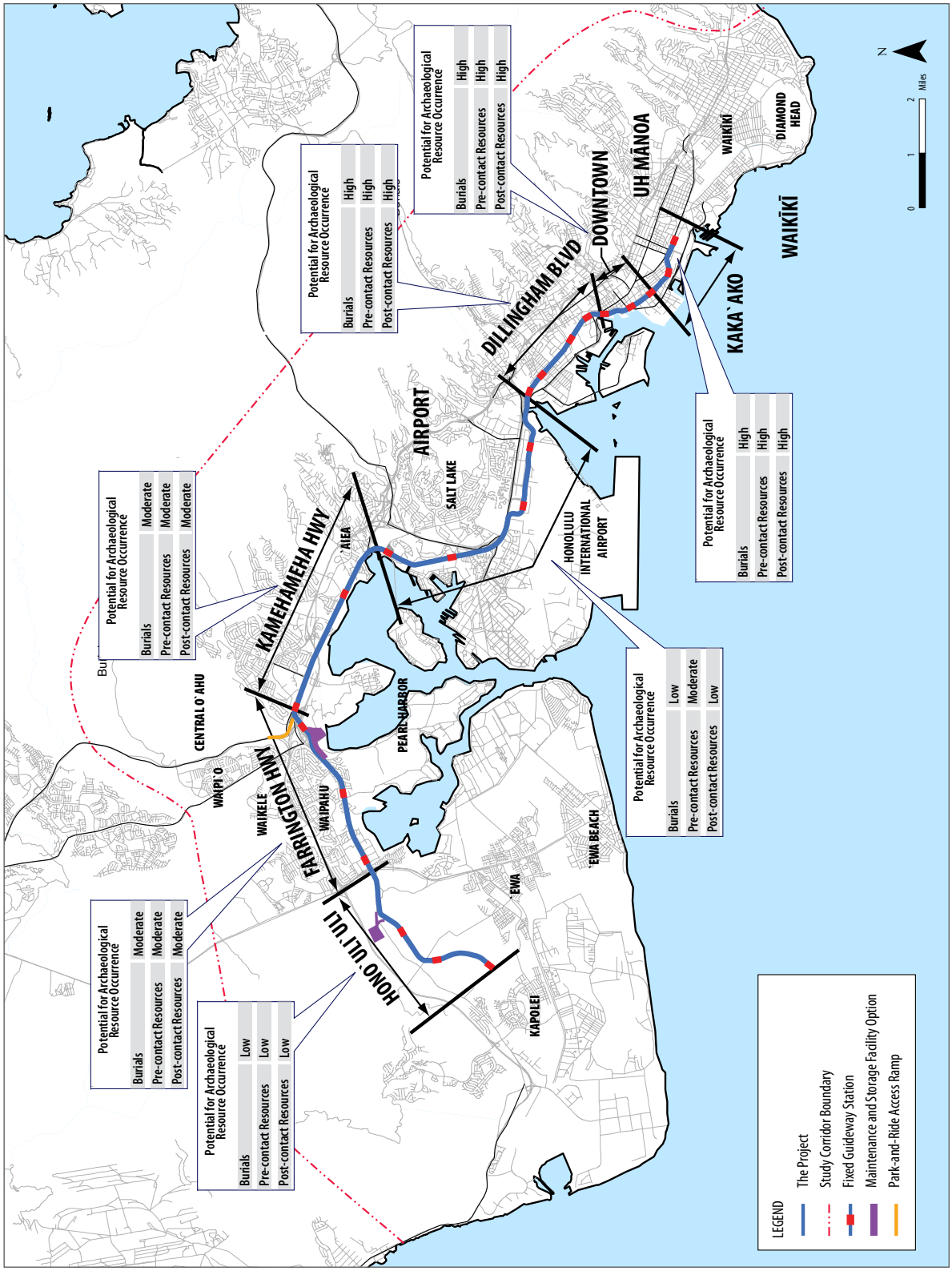


Figure 4-73 Potential to Affect Archaeological Resources

Cultural Resources

Potential long-term effects on cultural resources include permanent modification, such as displacement, damage, or destruction. Any cultural resources that are uncovered will be assessed through collaborative consultation with appropriate cultural practitioners and/or community groups. Table 4-33 lists resources within the APE that will be affected.

Traditional Cultural Properties

The phased approach PA discussed above also includes TCPs in its scope. TCPs are not necessarily the same properties as those identified in the Cultural Resources Technical Report (RTD 2008p), so further evaluation has been initiated to identify TCPs. Chinatown is the only known TCP adjacent to the Project.

Historic Resources

Eighty-one listed or eligible historic resources were identified within the APE. These properties, and potential impacts, are shown on Figures 4-74 through 4-77 and listed in Table 4-34.

An *adverse effect* is found when an undertaking may alter any of the characteristics that qualify an historic property for inclusion on the National Register [36 CFR 800.5(a)(1)].

At the time of the Draft EIS, SHPD had reviewed the preliminary Section 106 effects determination but had not yet provided concurrence on the effects. Consultations with SHPD and Section 106 consulting parties have continued regarding the effect determinations since the Draft EIS. Of the 81 historic resources. FTA has determined that the Project will have adverse effects to 33 historic resources. Adverse effect determinations recommended by SHPD were accepted by the FTA. SHPD did not provide the basis for these determinations. Therefore, general effects to the resource are assumed.

The Project is adjacent to the U.S. Naval Base, Pearl Harbor NHL and near the CINCPACFLT Building NHL, also a part of the Pearl Harbor Naval Base. The FTA accepted SHPD determination of adverse effect. The Project is not within the boundary of the NHLs and does not have a direct impact on the resources. Therefore, individual, eligible resources located on the Pearl Harbor Naval Base that will be adversely affected by the Project due to changes to setting include Makalapa Navy Housing, Vladimir Ossipoff's Aloha Chapel, SMART Clinic, and Navy-Marine Corps Relief Society–Facility 1514. These resources are not considered contributing elements to the NHL district. The USS Bowfin and the wrecks of the USS Arizona and USS Utah are NHLs located within the Pearl Harbor NHL, but they are not located within the APE for the Project.

Table 4-33 Potential Long-term Adverse Effects on Cultural Resources Related to Act 50

Resource	Type	Effect
Waiawa Stream	Resource (water)	Project crosses stream. Transit center and park-and-ride in vicinity of stream may adversely affect access to stream and resources within stream.
Aku Bone Lounge & Grill	Practice	Displacement
Hawai`i International Child	Practice	Displacement
Makana Esthetics Wellness Academy	Practice	Displacement
Rock-n-Roll Sushi	Practice	Displacement

These resources are identified as having potentially adverse long-term impacts. Under Act 50, these types of impacts are called "significant effects" (HHB 2000).

Figure 4-74 Historic Resources in Area of Potential Effect (East Kapolei to Fort Weaver Road)

Figure 4-75 Historic Resources in Area of Potential Effect (Fort Weaver Road to Aloha Stadium)

Figure 4-76 Historic Resources in Area of Potential Effect (Aloha Stadium to Kalihi)

Figure 4-77 Historic Resources in Area of Potential Effect (Kalihi to Ala Moana Center)

Table 4-34 Historic Resources within Project's Area of Potential Effect (continued on next page)

Tax Map Key	Resource Name	Description of Effect	Section 106 Determination
n/a	Hono`uli`uli Stream Bridge	***Effects to integrity of setting, feeling, and association***	***Adverse effect***
94039582	Lum-Tehahira Three-Story Apartments	No direct impact to resource	No adverse effect
94027127	West O`ahu Christian Church/former American Security Bank (round plan)	No direct impact to resource	No adverse effect
94025008	Tanaka-Ishihara House	No direct impact to resource	No adverse effect
n/a	Waikele Stream Bridge eastbound span and Bridge over OR&L spur	***Effects to integrity of setting, feeling, and association***	***Adverse effect***
94019020 and 94019021	Ohara & Okahara Two-story Apartments	No effect	No effect
94017043	Codera-Carvalho Two-story Apartments/Waipahu Hale	No direct impact to resource	No adverse effect
94036071	Waipahu Hawai`i Stake, Church of Jesus Christ of Latter-Day Saints	No direct impact to resource	No adverse effect
96003026	Watercress of Hawai`i	No direct impact to resource	No adverse effect
96003045	Waiawa Booster Pump Station		No effect
n/a	Waiawa Stream Bridge 1932 (westbound lanes)	***Effects to integrity of setting, feeling, and association***	***Adverse effect***
n/a	Waiawa Stream Bridge 1932 (eastbound lanes)	No direct impact to resource	No adverse effect
n/a	Waiawa Separation Bridge	No direct impact to resource	No adverse effect
98003010	HECO Waiau Plant	No direct impact to resource	No adverse effect
98006024	Nishi Service	No direct impact to resource	No adverse effect
n/a	Waimalu Stream Bridge	***Effects to integrity of setting, feeling, and association***	***Adverse effect***
98022074, 98022081	Waimalu Shopping Center	No direct impact to resource	No adverse effect
98016047	Sumida Watercress Farm	No direct impact to resource	No adverse effect
n/a	Kalauao Springs Bridge	***Effects to integrity of setting, feeling, and association***	***Adverse effect***
n/a	Kalauao Stream Bridge	***Effects to integrity of setting, feeling, and association***	***Adverse effect***
98018041	Akiona House (Quonset)	No effect	No effect
98018042	Forty-Niner Restaurant	No direct impact to resource	No adverse effect
	`Aiea Cemetery/Honolulu Plantation Cemetery	No direct impact to resource	No adverse effect
99003038	Bombproof Switch Station – Facility B-6	No effect	No effect

Table 4-34 Historic Resources within Project's Area of Potential Effect (continued on next page)

Tax Map Key	Resource Name	Description of Effect	Section 106 Determination
99003029	Richardson Recreation Center Pool Complex (Swimming Pool – Facility S-21; Recreation – Facility 1; Bath House/Locker Room – Facility 2; Handball Court – Facility S-20)	No direct impact to resource	No adverse effect
n/a	Kamehameha Highway Bridge over Halawa Stream (mauka span)	No direct impact to resource	No adverse effect
99001001	Fuel Oil Pump-out House – Facility S-386	No property acquisition, less than adverse effect to attributes	No adverse effect
99002004	Commander-in-Chief Pacific Fleet (CINCPACFLT) Headquarters – Facility 250, National Historic Landmark	***General effects to resource ****	***Adverse effect***
99001008	Publications Printing Office and Plant – Facility 550/ District Printing Plant	No direct impact to resource	No adverse effect
99001008	Navy Upper Tank Farm (fuel storage)	No direct impact to resource	No adverse effect
99002004	Potential Makalapa Navy Housing Historic District	***Effects to setting and feeling***	***Adverse effect***
Various	United States Naval Base, Pearl Harbor National Historic Landmark	***General effects to resource ****	***Adverse effect***
99001008	Ossipoff's Aloha Chapel, SMART Clinic, and Navy-Marine Corps Relief Society – Facility 1514	***Effects to setting only***	***Adverse effect***
99002004	Potential Little Makalapa Navy Housing Historic District	No property acquisition, less than adverse effect to attributes	No adverse effect
99001008	Navy WWII splinterproof shelter – Facility S-51	No property acquisition, less than adverse effect to attributes	No adverse effect
99001008	Navy Rehab Center/former Navy Fire Station – Facility 199	No property acquisition, less than adverse effect to attributes	No adverse effect
11016004	Hawai`i Employers Council	***Effects to setting, feeling, and association***	***Adverse effect***
12013007	Gaspro Store	No direct impact to resource	No adverse effect
12013006	Foremost Dairy	No direct impact to resource	No adverse effect
12012014	Pu`uhale Market	No direct impact to resource	No adverse effect
12009017	Afuso House	***Full acquisition***	***Adverse effect***
12009017	Higa Four-plex	***Full acquisition***	***Adverse effect***
12009018	Teixeira House	***Full acquisition***	***Adverse effect***
12009060	Pang Craftsman-style House	No direct impact to resource	No adverse effect
12002113	10 Courtyard Houses	No direct impact to resource	No adverse effect
n/a	Lava Rock Curbs	***Curb removal; effects to location, design, setting, materials, workmanship, feeling, and association***	***Adverse effect***
12002108	Duarte House	No direct impact to resource	No adverse effect
15029060	Boulevard Saimin	No direct impact to resource	No adverse effect

Table 4-34 Historic Resources within Project's Area of Potential Effect (continued on next page)

Tax Map Key	Resource Name	Description of Effect	Section 106 Determination
n/a	Kapālama Canal Bridge	***Effects to setting, feeling, and association***	***Adverse effect***
15015008	Six Quonset Huts	***General effects to resource ****	***Adverse effect***
n/a	True Kamani Trees	***Removal of approximately 28 trees along dillingham boulevard***	***Adverse effect***
15007033	Institute for Human Services/Tamura Building	***Effects to setting, feeling, and association***	***Adverse effect***
15007003	Tong Fat Co.	No direct impact to resource	No adverse effect
15007003	Wood Tenement Buildings behind Tong Fat Co.	***General effects to resource ****	***Adverse effect***
15007001, 15007002	O`ahu Railway & Land Co. Office/Document Storage Building	***Guideway will require 50 feet of right-of-way on property; effects to integrity of location, design, setting, feeling, and association***	***Adverse effect***
15007001, 15007002	O`ahu Railway & Land Co. Terminal Building	***Guideway will require 50 feet of right-of-way on property; effects to integrity of location, design, setting, feeling, and association***	***Adverse effect***
15007001	Former filling station on OR&L Property	No direct impact to resource	No adverse effect
15007001, 15007002	O`ahu Railway & Land Co. basalt paving blocks	No direct impact to resource	No adverse effect
n/a	Nu`uanu Stream Bride	***Effects to integrity of setting, feeling, and association***	***Adverse effect***
17002, 17003, & 17004 plats	Chinatown Historic District	***Minor parcel acquisition near chinatown marketplace (0.3 Acre); adverse effects to integrity of design, setting, feeling, and association***	***Adverse effect***
17002 &21002 plats	Merchant Street Historic District (including Walter Murray Gibson Building/Honolulu Police Station)	***General effects to resource ****	***Adverse effect***
21001056	Harbor retaining wall of coral blocks from Honolulu Fort	No direct impact to resource	No effect
n/a	Walker Park	***General effects to resource ****	***Adverse effect***
21001005	DOT Harbors Division Offices	***General effects to resource ****	***Adverse effect***
21001001	Pier 10/11 Building	***General effects to resource ****	***Adverse effect***
21001013	Aloha Tower	***General effects to resource ****	***Adverse effect***
21013007	Irwin Memorial Park	***General effects to resource ****	***Adverse effect***
21014003	Dillingham Transportation Building	***Minor parcel acquisition, no impact to building; adverse effects to integrity of setting, feeling, and association***	***Adverse effect***
21014006	HECO Downtown Plant and Leslie A. Hicks Building	***General effects to resource ****	***Adverse effect***

Table 4-34 Historic Properties within Project's Area of Potential Effect (continued from previous page)

Tax Map Key	Resource Name	Description of Effect	Section 106 Determination
21026022	Hawai`i Capital Historic District (including Attorney General's Office/Hale Auhau)	No direct impact to resource	No adverse effect
21031012	Department of Transportation	No direct impact to resource	No adverse effect
21031021	Royal Brewery/The Honolulu Brewing & Malting Co.	No effect	No effect
21030014	Kamaka Ukulele	No direct impact to resource	No adverse effect
21031018	[Old] Kaka`ako Fire Station	No effect	No effect
21051005, 21051006	Mother Waldron Neighborhood Playground	***Effects to setting***	***Adverse effect***
21052008	Fuji Sake Brewing Company	No direct impact to resource	No adverse effect
21050049	Ching Market and House	No effect	No effect
21050052	American Saving Bank/Liberty Bank – Queen-Ward Branch	No direct impact to resource	No adverse effect
23007029	Pacific Development Office Building	No direct impact to resource	No adverse effect
23039023	Hawaiian Life Building	No direct impact to resource	No adverse effect
23039001	Ala Moana Building	No direct impact to resource	No adverse effect

Basis for effect determination not provided by SHPD.

In addition, some properties within the NHL that also constitute a portion of the newly designated World War II Valor in the Pacific National Monument, including the Arizona Memorial and Visitor Center, were located outside of the APE.

Mitigation

Because archaeological resources are only expected to be affected during construction, mitigation measures for these resources are discussed in Section 4.18. Where archaeological, cultural, or historic resources remain or are discovered, all efforts will be made to avoid destruction.

Mitigation measures for historic resources adversely affected by the Project were developed in consultation with SHPD and other Section 106 consulting parties. In addition, Section 106 regulations direct the Federal (or designated) agency to consult with the State Historic Preservation Officer, Chairperson of the Hawai'i Department of Land and Natural Resources, to develop "modifications to the undertaking that could avoid, minimize, or mitigate adverse effects on historic properties" (36 CFR 800.6).

While the Project was designed to avoid and minimize effects to historic resources, this was not always possible in meeting the Project's Purpose and Need. Therefore, a PA was prepared to outline responsibilities and measures to mitigate or reduce adverse project effects. The PA was developed during extensive consultation with Section 106 consulting parties and included mitigation measures suggested by these consulting parties whenever possible.

Mitigation measures for the Project detailed in the PA include the preparation of cultural landscape reports for select areas of the project's alignment; the development of NRHP nomination forms for select eligible resources, including TCPs, large-format archival photography, interpretive signage; and the development of historic context studies. Also, NRHP nomination forms for select resources that are listed in the NRHP will be updated. Mitigation measures, including planning, development, and

review, will be coordinated with the SHPD and appropriate agencies. A copy of the PA documenting the agreed-upon mitigation measures and programmatic planning is included in Appendix H of this Final EIS.

State of Hawai`i Act 50 Findings

Act 50 findings are detailed in the Cultural Resources Technical Report (RTD 2008p). Archival and ethnographic research shows that most traditional cultural resources within the study corridor have been heavily damaged or destroyed through previous development, with the exception of a few sink holes in the ʻEwa-Kapolei section and streams in the Pearl City-Moanalua sections. A few of the identified cultural resources will be adversely affected. The greatest effect will be displacement of current traditional/ethnic/urban resources. These will be mitigated with the same measures identified in Section 4.4. Effects on traditional cultural practices associated with Waiawa Stream will be mitigated through mitigation commitments, as discussed in Section 4.14.

4.17 Maintenance and Storage Facility

This section describes the effects of the maintenance and storage facility options on the natural and built environments. The preferred site option for the maintenance and storage facility is a 44-acre vacant site in Waipahu near Leeward Community College. A 41-acre site in the proposed Hoʻopili development in ʻEwa is the alternative site for the maintenance and storage facility. The maintenance and storage facility is described in Chapter 2, and the site options are illustrated on Figures 2-38 and 2-39. Effects of the maintenance and storage facility on transportation are described in Section 3.4.3 of this Final EIS.

The site will contain several buildings for administration, a system control center, and parking for maintenance employees. It will also include areas for operation and maintenance of the trains, including storage for approximately 100 vehicles, a vehicle-wash area, and storage track. The facility will operate 24 hours a day. Each option will require special track work for trains to access the site from the guideway.

4.17.1 No Build Alternative

Under the No Build Alternative, the maintenance and storage facility would not be built and would not affect the natural or built environments.

4.17.2 The Project

Land Use

Option near Leeward Community College (preferred option)

This site is near Middle Loch, between Waipahu and Pearl City. The site is makai of Farrington Highway and the H-1 and H-2 Freeways and is near Waipahu High School and Leeward Community College. The site is vacant but was used by the Navy as a fuel storage and delivery facility during World War II; it is no longer used for fuel storage but remains under caretaker status with the Navy. The site will be converted from vacant land to a transportation facility. If not developed as a maintenance and storage facility, the potential exists that the Department of Hawaiian Home Lands could develop the site. Use of the site for a vehicle maintenance and storage facility is consistent with the past industrial land use of the site.

Hoʻopili Option

The Hoʻopili maintenance and storage facility option will be mauka of Farrington Highway, makai of the H-1 Freeway between Pālehua and Fort Weaver Roads. This site is adjacent to a Hawaiian Electric Company (HECO) substation. The site is used for agricultural purposes by Aloun Farms and includes orchards, fields, storage facilities, operations buildings, and plant nursery shade areas. However, the site is near the future Hoʻopili Master Planned Community. The site will be converted from current agricultural use and planned industrial/commercial use to a transportation

facility. This option is consistent with planned land use in the area.

Noise

Noise generated from operations at the maintenance and storage facility will be similar at both sites. The nearest noise-sensitive use is approximately 700 feet or greater from the center of either site. No noise impacts will occur.

Option near Leeward Community College (preferred option)

This site lies between Waipahu High School in the ʻEwa direction and Leeward Community College Koko Head. Pearl Harbor is makai of the site, and a bike path runs between the site and Pearl Harbor. The two schools and the bike path are susceptible to noise and vibration effects. However, the school properties are approximately 700 feet from the center of the site. The nearest use at Waipahu High School is a sports field. The schools and the bike path will not experience noise impacts.

Hoʻopili Option

This site is makai of the H-1 Freeway, which is a substantial noise generator. A HECO transmission station is makai of the site. The HECO site does not generate much noise, nor will it be affected by noise from the maintenance and storage facility. There are no existing noise-sensitive land uses near the site. Planned development adjacent to the site is anticipated to be light industrial and commercial. The Master Planned community will also include residential development that will be susceptible to noise and vibration impacts, but these uses are planned to be makai of Farrington Highway.

Visual

Option near Leeward Community College (preferred option)

This site is vacant and undeveloped. It is on a flat knoll makai of the H-1 Freeway/Farrington Highway interchange. The maintenance and storage facility buildings will be highly visible from low-lying areas makai of the interchange and from residences on the foothills above. However, the facility will not contrast substantially with elements of the surrounding visual character, which include the highway interchange, community college buildings, and adjacent parking lots. A maintenance and storage facility at this site will result in moderate visual effects.

Hoʻopili Option

This site is currently an open flat agricultural area adjacent to an electrical substation. The maintenance and storage facility will contrast with the open, rural setting. In addition, the facility buildings will be visible from mauka foothill residences. Planned future development near the Hoʻopili option includes light industrial and commercial uses that are expected to occur in a similar time frame as the Project. Development of these uses on surrounding properties will reduce the visual contrast of the maintenance and storage facility. A maintenance and storage facility at this site will result in moderate visual effects.

Other Environmental Effects

Effects on air quality, energy use, and natural resources are not anticipated to result from either site option. Light from either site option is not anticipated to affect wildlife. Cultural and historic resources are not anticipated to be affected by either option; the preferred site near Leeward Community College was formerly used by the military, and the Hoʻopili site has been disturbed by farming activities. Both sites are near or include some flood zones; however, the area that will be developed for the maintenance and storage facility is outside of the flood zone area. Stormwater treatment measures will be installed at either site to prevent the runoff of pollution or polluted stormwater. The option near Leeward Community College will have one stormwater outfall to Pearl Harbor. Section 4.14 discusses impacts to waters of the U.S. associated with this outfall.

An SWMP and Report addressing permanent stormwater runoff and water quality will be

prepared prior to construction of either option. Stormwater runoff from the developed area of the site will be collected through an on-site drainage system consisting of catch basins, swales, and underground perforated pipe systems to direct runoff to a stormwater detention basin located on-site. The yard and shops will be designed to minimize stormwater runoff from the operations areas. Drainage from inside buildings will enter an oil/water separator and then be disposed of into the sanitary sewer. Runoff from facilities located outside that are not covered by a roof or shelter will also require the installation of collection and pre-treatment facilities. Washing and service areas will drain into a collection system where all discharges will be treated before appropriate disposal. A separating system will be used to remove unwanted or harmful substances, such as oil or sediment, from discharged water. These permanent stormwater BMPs will be designed, installed, and maintained in accordance with the criteria and guidelines described in the State's Storm Water Permanent Best Management Practices Manual.

Hazardous materials, waste, and contamination are not anticipated to be encountered at either site. The preferred option near Leeward Community College was formerly occupied by the military, but a remedial investigation and environmental analysis completed by the Department of the Navy revealed that no adverse human health or ecological effects have resulted, or will result, from the previous petroleum spill on the site. USHHS and HDOH concur with this assessment. The Hoʻopili option has been used for agricultural purposes.

Mitigation

Operation of the maintenance and storage facility will meet Federal, State, and Local regulations related to noise, air quality, and stormwater management typical of light industrial operations. The maintenance and storage facility will pursue Leadership in LEED Certification. This involves the incorporation of proven sustainable materials, methods, and technologies into its facility design to increase life-cycle value, including reduction of energy and resource use, and to enhance the health and comfort of employees and visitors. LEED is a performance-oriented system where credits are earned for satisfying criteria related to specific environmental impacts inherent in the design, construction, and operations and maintenance of buildings. The maintenance and storage facility will be designed to achieve Silver certification.

4.18 Construction Phase Effects

This section of the Final EIS discusses construction effects related to the natural and built environment with regard to the entire Project and mitigation. Section 3.5, Construction-Related Effects on Transportation, of this Final EIS discusses transportation-related construction impacts and mitigation. Construction effects will be temporary and limited in area as construction proceeds along the length of the project alignment. Construction work details will be developed during preliminary and final design. Effects could include dust, noise, and traffic disruption, congestion, and diversion, as well as limited or temporarily lost access and parking to residences and businesses.

Construction-related effects will result primarily during construction of the foundations and columns, superstructure (the elevated guideway structure), and stations. Construction of other system components, such as traction power substations, the maintenance and storage facility, access roadways, and park-and-ride lots, will also have associated effects.

The parcels acquired for the maintenance and storage facility, park-and-ride lots, and stations could be used for construction staging areas. Additional areas will be identified by the contractor as needed and obtained by the City. The effects of activities in the staging areas known at this time are included in the discussion of construction effects on the

natural and built environments Section 4.21 identifies who is responsible for obtaining anticipated permits, approvals, and agreements.

The City will coordinate with affected residents and businesses prior to construction. A public involvement plan will be developed prior to each construction phase that will detail outreach tailored to the construction phase. The City will maintain the Project website (www.honolulutransit.org) and telephone hotline, which will also provide information to the community regarding construction phasing.

As described in Chapter 2, the Project will open in phases. Stations at the ends of each phase will operate temporarily as terminal stations until the next phase is completed. This operation will temporarily affect access and travel patterns around the stations.

The proposed construction methods, as described in Appendix E, Construction Approach, will minimize potential adverse construction effects. Construction is expected to begin in late 2009, and construction is anticipated to be complete in 2018. Because construction will generally be completed sequentially from the UH West Oʻahu to Ala Moana termini, the duration of disruption in any single location will be substantially less than the nine-year total construction period.

The City will ensure that the environmental commitments in the Final EIS and the permit conditions are met during the final design and construction of the Project. The City will employ a dedicated environmental compliance manager to oversee construction contractor compliance with all stormwater BMPs, construction noise mitigation measures, utility coordination, business access requirements, and any mitigation plans prepared for the Project, including those presented in permit conditions and the MOT Plan.

Project construction will not have a substantial effect on some resources discussed in earlier sections of Chapter 4, including electric and magnetic fields, natural hazards, and farmlands. Effects on other resources are discussed in the following sections.

4.18.1 Land Use and Economic Activity

Developed areas Koko Head of Waipahu will experience more land use and community effects during construction than currently undeveloped sections in West Oʻahu. Temporary construction activities, such as detours, may be required in parcels near the project right-of-way. Effects on land use from these activities will be temporary.

Business Access

Access to businesses near construction activities could be temporarily affected but will be maintained. In several locations, left-turn lanes will be closed during construction, requiring drivers to change their approach and make a right-hand turn to businesses. Such closures are expected on Farrington Highway in Waipahu, Kamehameha Highway in Pearl City, and Dillingham Boulevard. Segments of Halekauwila and Queen Streets may be made temporarily one-way or have parking eliminated during construction.

The MOT Plan that is described in Chapter 3 will address temporary effects on access to businesses during construction. Proposed mitigation to reduce adverse economic hardships for existing businesses along the project alignment during construction activities may include the following:

- Coordinate construction planning and phasing with nearby property owners and businesses
- Develop a public involvement plan prior to construction to inform business owners of the construction schedule and activities
- Initiate public information campaigns, including signs and lighting, to reassure people

that businesses are open during construction and to encourage their continued patronage
- Minimize the extent and number of businesses, jobs, and access affected during construction
- To the extent practicable, coordinate the timing of temporary facility closures to minimize impacts to business activities—especially those related to seasonal or high sales periods
- Minimize, as practical, the duration of modified or lost access to businesses
- Provide public information (e.g., press releases or newsletters) regarding construction activities and ongoing business activities, including advertisements in print and on television and radio
- Phase construction in each area so as to maintain access to individual businesses for pedestrians, bicyclists, passenger vehicles, and trucks during business hours and important business seasons
- Provide advance notice if utilities will be disrupted and scheduling major utility shutoffs during non-business hours

Employment

Based on construction cost estimates and state-specific employment multipliers, construction-related employment was estimated for direct, indirect, and induced employment. *Direct employment* refers to all new jobs created within the heavy civil engineering and construction sector. *Indirect employment* is created when jobs are created in other sectors as a result of construction (i.e., increases in the food service sector to support increases in construction employment). *Induced employment* results from an overall expansion of the regional economy (and thus new jobs) as a result of the proposed construction.

This analysis estimates the total direct, indirect, and induced jobs to be as high as 7,500 jobs per year over the nine-year construction period (Table 4-35).

4.18.2 Communities and Neighborhoods

During construction, automobile, pedestrian, and transit access to communities and neighborhoods surrounding the project alignment will be affected. These effects are discussed further in the following sections. Site-specific Construction Safety and Security Plans will be developed and implemented by the construction contractors to mitigate effects on community services, such as fire prevention and emergency preparedness and response, as well as to protect the general public, private property, and workers from construction risks. The FTA requires that such plans be prepared to address these potential construction effects.

The following emergency services departments will be consulted in preparing the Construction Safety and Security Plans and will have some responsibility for the Project's safety hazards and security risks:

- The Honolulu Police Department
- The Honolulu Fire Department
- The Department of Emergency Management
- The Honolulu Emergency Services Department

Table 4-35 Employment Effects

Alternative	Construction Cost 2009 (million $)	Average Number of Jobs per Year (nine years of construction)[1]		
		Direct and Indirect	Induced	Total
No Build	$0	0	0	0
Project	$4,330	5,600	1,900	7,500

[1] Multipliers of 11.7 for direct and indirect and 4.0 for induced jobs are based on the 2009 State of Hawai`i Input-Output factor for heavy civil construction (jobs per million $).

During development of the Construction Safety and Security Plans, measures will be identified to minimize effects on communities and their resources that address specific consequences anticipated at each location within the various communities, as well as ensure the safety of the public and the environment.

In cases where traffic rerouting or delays are expected to affect access to public facilities or the functioning of public and emergency services, alternate access routes will be maintained during construction. Construction in high-volume traffic and pedestrian areas could employ police support to direct and control traffic and pedestrian movements to lessen effects on mobility. To maintain the functionality of public facilities, social resources, and transportation routes during construction, mitigation will include relocating and rearranging certain facilities, noise mitigation, and other efforts deemed necessary to maintain full functionality. In cases where project placement will restrict existing vehicular or pedestrian access routes to public service buildings, alternate access points will be included in mitigation efforts.

Schools, Parklands, and Recreational Resources

Schools adjacent to the project alignment may be affected by a variety of construction issues, such as noise, vibration, air quality, and visual intrusion, depending on a school's distance from the Project. The various parks and recreational resources directly along the project alignment are expected to be affected by temporary nuisances associated with construction, such as noise, dust, and visual intrusion.

In instances where any school, parkland, or recreational resource will experience a disruption in access, the effects will be mitigated as necessary and appropriate using applicable practices similar to those outlined in Business Access in Section 4.18.1. Temporary barrier walls or fences will be placed around any school, parkland, or recreational resource to clearly delimit a construction area, to avoid public exposure to any possible construction hazards.

Utilities

Utilities comprise facilities owned by public utility agencies and private utility companies and include service lines to adjoining properties. Utilities include sanitary sewers; storm drains; water, gas, electric power, telephone, and oil pipelines; street lights; and traffic signals. Communication and coordination have been initiated with the affected utility agencies and companies and will continue throughout design and construction. HDOT will be involved with utility coordination for utility work in the state roadways and roadway rights-of-way.

Design criteria will govern all new utility construction outside of buildings, as well as the support, maintenance, relocation, and restoration of utilities encountered or affected by project construction. Utility service to abutting properties may be temporarily interrupted for short periods. Property owners will be contacted prior to interruption of utility services. If facilities are temporarily relocated, the area will be restored as close as possible to its original condition. Replacements for existing utilities will provide service or capacity equal to that currently offered.

Utility rearrangements will ensure that construction of transit facilities may proceed without affecting utility service. Utilities that penetrate through or cross over transit structures will be designed so as to prevent damage. The vertical and lateral clearances of overhead and underground utility lines shall comply with the rules and regulations of the appropriate utility agency and Hawai'i Administrative Rules during final design and approved by the utility agencies. Existing underground utilities that are in the way of structural foundations and overhead utilities in the way of the aerial guideway will be relocated. Along several roadway corridors,

most existing overhead utilities are in conflict with the guideway and safety clearance requirements and will be relocated underground. Existing overhead utilities not in conflict with the aerial guideway and safety clearance requirements will remain overhead. Coordination will occur with emergency services and utility companies to ensure that utility relocations meet their needs and that sufficient clearance is provided.

Environmental Justice

Construction activities will occur along the entire project alignment and will affect all population groups equally.

4.18.3 Visual and Aesthetic Conditions

During construction, visual quality may be altered for all viewer groups. Construction-related signage and heavy equipment will be visible at and near construction sites. The removal or pruning of mature vegetation, including trees, to accommodate construction of the guideway, stations, and park-and-ride lots will degrade or partially obstruct views or vistas. Short-term changes to the visual character of areas adjacent to the alignment could result from introducing the following construction elements:

- Construction vehicles and equipment
- Clearing and grading activities that result in exposed soils until replanting or repaving occurs
- Erosion-control devices, such as silt fences, plastic ground cover, and straw bales
- Dust, exhaust, and airborne debris in areas of active construction
- Stockpiling of excavated material
- Staging areas for equipment storage and construction materials

These short-term changes will be greatest at station locations, park-and-ride lots, elevated guideway, and maintenance and storage facility sites.

Temporary lighting may be necessary for nighttime construction of certain project elements or in existing highway rights-of-way to minimize disruption to daytime traffic. Temporary lighting could affect residential areas by exposing residents to glare from unshielded light sources or increasing ambient nighttime light levels.

The contractor will incorporate construction management practices as practical to minimize visual impacts during construction, including:

- Remove visibly obtrusive erosion-control devices, such as silt fences, plastic ground cover, and straw bales, as soon as an area is stabilized
- Locate stockpile areas in less visibly sensitive areas whenever possible so they are not visible from the road or to residents and businesses
- Shield temporary lighting and direct it downward to the extent possible
- Limit the times construction lighting could be used in residential areas
- Replace removed street trees and other vegetation with appropriately sized vegetation as soon as practical after construction is completed in the same location or another location in accordance with City and State requirements

4.18.4 Air Quality

Air pollution from construction activities will be limited to short-term increased fugitive dust or airborne particulate matter (generally of a relatively large particulate size) and mobile-source emissions. Fugitive dust primarily results from particulate matter being "kicked up" by vehicle movement around a construction site and material being blown from uncovered haul trucks. The State regulates fugitive air pollutant emissions (HAR 11-60.1). The Project will comply with these regulations. Mobile-source pollution is generated from the operation of construction equipment near construction sites and from traffic disruption and congestion during construction.

The contractor will select appropriate measures to comply with fugitive dust requirements. The following control measures can substantially reduce fugitive dust:

- Minimize land disturbance
- Use watering trucks to moisten disturbed soil
- Use low emission equipment when feasible
- Cover loads when hauling dirt
- Cover soil stock piles if exposed for long periods of time
- Use windbreaks to prevent accidental dust pollution
- Limit the number of vehicular paths and stabilize temporary roads
- Maintain stabilized construction area ingress/egress areas
- Wash or clean trucks prior to leaving construction sites
- Minimize unnecessary vehicular activities

Mobile-source pollution can be reduced by minimizing unnecessary vehicular and machinery activities and limiting traffic disruptions, particularly during peak travel hours (see Section 3.5 for more detail). All State and Local regulations for dust control and other air quality emission reduction controls will be followed.

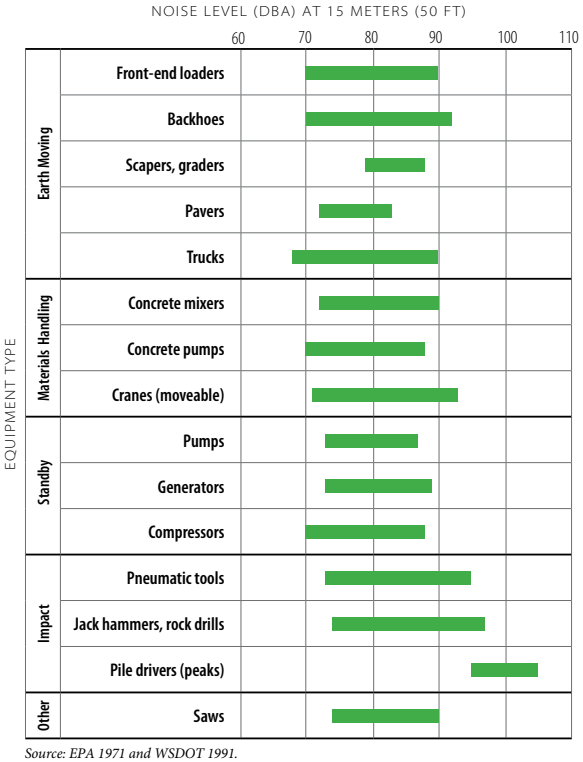
4.18.5 Noise and Vibration

Noise

Noise during construction could be bothersome and annoying to nearby residents, visitors, tourists, and businesses. Project construction will generate noise, which will occur sporadically in different locations throughout the nine-year construction period.

The most common noise source in construction areas will be engine-powered machinery, such as earth-moving equipment (bulldozers), materials handling equipment (cranes), and stationary equipment (generators). Mobile equipment (e.g., trucks and excavators) operate in a cyclic manner, and stationary equipment (generators and compressors) generate noise at fairly constant levels. The loudest and most disruptive construction activities could be impact pile-driving followed by demolition, jackhammers, and hoe rams. Impact pile-driving, if used as a method for pile placement, will result in the loudest and most disruptive construction work. Impact pile-driving will only be used where less disruptive foundation placement methods cannot be used. Vibration or hydraulic insertion could be used where appropriate to replace impact pile-driving to reduce noise.

Figure 4-78 shows the range of noise levels that can be expected from different types of construction equipment. Construction noise at locations more than 50 feet away decreases at a rate of 6 to 8 dBA per doubling of the distance from the source. For example, if the noise level is 90 dBA at 50 feet from a jackhammer, it will decrease to approximately 83 dBA at 100 feet and 76 dBA at 200 feet. Doubling the number of noise sources will increase the noise level by 3 dBA. In the above example, two



Source: EPA 1971 and WSDOT 1991.

Figure 4-78 Typical Construction Equipment Noise Levels

jackhammers operating together will generate a noise level of 93 dBA at 50 feet from the activity.

The mitigation discussed in this section is meant to be a guideline for developing project-specific measures to reduce construction noise. Prior to construction, an approved Community Noise Variance will be obtained from HDOH. The permit will regulate construction times and activities and include mitigation commitments. The following measures are examples of what could be incorporated:

- Develop a monitoring plan with noise limits
- Construct temporary noise barriers or curtains
- Equip construction equipment engines with adequate mufflers and intake silencers
- Strategically place stationary equipment, such as compressors and generators

These measures will be incorporated into site-specific construction noise mitigation plans to minimize noise impacts to sensitive receivers along the project alignment. Noise emission limits could also be set by variance requirements. Construction hours could be set, and noise-level criteria could be decided upon and adhered to during construction. Construction noise monitors will be used if required by HDOH. Community meetings could be held to explain the construction work, the time involved, and control measures to be taken to reduce the effects of construction noise.

The contractor will comply with standard specifications and all applicable local sound control and noise level rules, as well as regulations set by HDOH. Construction noise from some activities (e.g., pile-driving in certain sections of the alignment) could exceed levels set in the State noise regulations for work between 6 p.m. and 7 a.m. A variance will be required for such nighttime work. Variance requirements will specify mitigation measures to minimize effects by limiting the time of day that certain activities could occur.

Vibration

Common sources of vibration during construction activities include jackhammers, pavement breakers, hoe rams, bulldozers, and backhoes. Pavement breaking and soil compaction will likely produce the highest levels of vibration. Depending on soil conditions in an area, activities such as pile-driving can generate enough vibration to result in substantial short-term noise impacts.

Pile-driving, where required, will cause the highest vibration levels of the proposed construction activities. Pile-driving activities more than 75 feet from newer, non-historic buildings will not exceed risk criteria for those buildings. For buildings closer than 75 feet to pile-driving activities, the contractor will be required to provide mitigation for vibration levels during these activities. Contractors will be required to perform a video survey of the immediate area prior to the start of any construction activity where vibration levels may be high enough to affect surrounding structures. Drilled shafts or auger-cast piles, which are cast in-place rather than driven into the ground, will be used by the Project wherever possible. By using these types of foundations, impact driving will be eliminated and drilling will generate lower vibration levels.

Construction vibration will have less of an effect on underground and buried utilities than on buildings. Pile-driving is the only proposed construction activity that will generate vibration levels that could damage utilities. Utilities less than 25 feet from pile-driving locations may need to be further evaluated during final design to determine whether mitigation is needed.

4.18.6 Construction Energy Consumption

Construction of at-grade high-capacity transit systems generally requires 20,000 MBTUs of energy per track mile (Caltrans 1983), including track and power systems. Because the guideway is elevated, an additional 150,000 MBTUs of energy per track

mile will be required to construct the elevated structure. Table 4-36 summarizes the energy that will be required to construct the Project.

Measures that maintain roadway speeds and construction practices that reduce energy consumption could reduce energy demand during construction. Any transportation-control measures that reduce traffic volumes and congestion will also decrease energy consumption. Mitigation of traffic impacts during construction are discussed in Chapter 3.

Table 4-36 Total Construction Energy Required

Alternative	Project Construction Energy (MBTUs)
Project	7,480,000

MBTUs = million British thermal units

4.18.7 Contaminated Media and Solid Waste

Contaminated Media

Subsurface conditions are highly variable throughout the construction area where earthwork will occur. Excavation will primarily occur during installation of guideway foundations and relocation of utilities. Other ground disturbance and grading will occur at the maintenance and storage facility, park-and-ride lots, and construction baseyards.

Earthwork could uncover contaminated soil. The Initial Site Assessment prepared for the Project identified a number of sites and neighborhoods of concern where contaminated soil and groundwater may be present (Section 4.12). The presence of unanticipated contamination could threaten worker health and safety and affect the Project's schedule and cost. Contaminated media can also negatively impact water quality as a result of stormwater runoff and drainage.

To identify soil and groundwater conditions along the project alignment, in-depth assessments of the sites and neighborhoods identified as concerns in the Initial Site Assessment will be performed during the Project's design phase. It is appropriate to perform additional studies during the design or construction phase because subsurface conditions can change dramatically between the time a project is planned and constructed. Additional studies could include a complete Phase I Environmental Site Assessment, or portions of an Environmental Site Assessment, as well as soil and groundwater sampling. The nature of any future study will vary by area or site and will depend on the level of concern in each area.

If hazardous materials are identified during construction, the City will follow notification procedures in accordance with regulations (as described in Section 4.12).

Solid Waste

Large volumes of solid waste are often generated at construction sites. Solid waste, ranging from unused construction materials to soda containers, can blow around causing a general nuisance in addition to degrading the quality of stormwater runoff.

In addition to and/or in support of NPDES permits, the contractor will prepare the following plans to mitigate construction impacts related to wastes:

- **Construction Safety and Security Plan—** this plan will meet the FTA requirement in 49 CFR 633 and address fire prevention, emergency preparedness and response, and protection of the general public and private property from construction activities, including exposure to toxic materials.
- **Construction Health and Safety Plan—** this plan will meet the requirements of 29 CFR 1910 and 1926 and all other applicable Federal, State, and Local regulations and requirements. It will also include provisions for identifying asbestos and lead-based paint that will be disturbed by the Project.

- **Construction Contaminant Management Plan—**this plan will identify procedures for contaminant monitoring and identification and the temporary storage, handling, treatment, and disposal of waste and materials in accordance with applicable Federal, State, and Local regulations and requirements.
- **Construction Contingency Plan—**this plan will identify provisions for responding to events, such as discovery of unidentified underground storage tanks, hazardous materials, petroleum hydrocarbons, or hazardous or solid wastes, during construction.
- **Solid Waste Management Plan—**this plan will identify procedures for recycling green waste during clearing and grubbing activities; maximizing the recycling of construction and demolition wastes, if appropriate; and properly containing solid waste generated during construction and disposing of it at solid waste disposal or recycling facilities permitted by the HDOH. Every effort will be made to recycle all appropriate demolished material.

4.18.8 Natural Resources

Construction activities could affect wildlife, vegetation, wetlands, and streams near the Project.

Vegetation

During construction, impacts to vegetation will result from the following:

- Footprints cleared for cranes and other equipment
- General clearing and grubbing activities
- Accidental fires resulting from the operation of construction equipment
- Dust generated from construction equipment and from moving and grading earth

To mitigate impacts to vegetation, cranes and other equipment will be sited on previously disturbed areas to the extent possible, and clearing and grubbing will be kept to a minimum. Accidental fires and excessive dust could directly and adversely impact the endangered koʻoloaʻula *(Abutilon menziesii,* red ʻilima*)*, a native Hawaiian dryland shrub that is present in an 18-acre contingency reserve located within 200 feet of the East Kapolei Station and associated guideway. No other endangered or threatened species or critical habitat will be affected by project construction.

Construction impacts to the endangered koʻoloaʻula will be mitigated by following a Habitat Conservation Plan, using high-visibility construction barriers, having all contractors create fire mitigation plans, educating site workers, maintaining emergency site access, and establishing appropriate buffers. A Construction Safety and Security Plan addressing fire prevention, including worker education, access maintenance, designated smoking areas, identification of fire-fighting resources, and other requirements, is being reviewed for other projects in the area and will be incorporated into the Project as appropriate. Additionally, prior to clearing and grubbing near the koʻoloaʻula contingency reserve, the area will be surveyed. If any koʻoloaʻula are found, a horticulturist approved by DLNR will be given an opportunity to remove the plants and transplant them to the contingency reserve (see Section 4.13 for a discussion on abutilon plants).

Street Trees

Street trees that require pruning for construction activities will be pruned more extensively than they will later for system operation. For street trees that will not be affected by system operation, a tree protection zone will be established during construction. The protection zone will be delineated by protective fencing.

Wildlife

Construction activities near wetlands and other wildlife habitat that do not permanently alter the habitat are likely to only temporarily disturb wildlife in these areas, including endangered

waterbirds. It is anticipated that, over time, wildlife in nearby habitats will adjust to the new structures.

Although noise and activity associated with construction may cause stilts and other shore and water birds to temporarily vacate the two open wetlands near the Project, there remains adequate like habitat within relatively close proximity to the Project to provide feeding and loafing areas for any potentially displaced birds. Water and shore birds use of these wetlands will return to preconstruction levels once construction along the adjacent highway is completed.

The white tern uses large canopy trees for roosting and nesting. The pruning of large canopy trees prior to construction could affect the nests of this species. The City will survey all large canopy trees to be pruned prior to construction to ensure that no trees have white tern chicks. If any are found, pruning will be delayed until chicks fledge.

4.18.9 Invasive Species

Construction equipment and materials and landscaping plants that will be imported to the island may harbor species that do not currently occur on Oʻahu and may become invasive. Dirty construction equipment is a known pathway for plant and animal invasive species. Seeds, vegetative matter, insects, and even small animals can be accidentally transported to Oʻahu on vehicles and harm its watersheds, local agriculture, environment, and way of life.

Construction equipment or material imported to Oʻahu from the mainland, neighbor islands, or foreign countries must be free of dirt, vegetative matter, and animals. Construction equipment will be cleaned and inspected before being brought to the project site. On-site workers will be trained to recognize common invasive species growing in the construction area. Site surveys to assess the construction area for invasive species will be conducted before, during, and after construction. When fill is imported to or exported from the job site, care will be taken to avoid spreading invasive species, and location records will be kept. Criteria for cleaning, inspection, and treatment of plants that are at risk of harboring pests will be part of the landscaping requirements. Species that can be harmful invaders will not be used for project plantings.

4.18.10 Water Resources

There are several types of temporary construction-phase impacts from the Project on water resources, as follows:

- **Placement of Fill in Waters of the U.S.—**the Project will encroach into a maximum of 0.13 acre of waters of the U.S. temporarily during construction of the guideway (Table 4-37) in Waiawa Springs, Moanalua

Table 4-37 Construction Impacts to Waters of the U.S. (Linear Transportation Features)

	Waiawa Stream & Springs (Sites 12 and 13)	Moanalua Stream (Site 27)	Kapālama Canal Stream (Site 29)	Nu`uanu Stream (Site 30)	Total Impact of Project
Total impact area (acres)	0.06	0.002	0.06	0.00	0.13
Total impact volume (cubic yards) (below OHWM and above mudline)	300	11	511	35	857
Total impact volume (cubic yards) (below mudline)	0	305	1,633	276	2,215

Stream, Kapālama Canal Stream, and Nuʻuanu Stream. There will be temporary construction inpacts in Kaloʻi Gulch, which is not under the jurisdiction of the USACE. Construction in Kaloʻi Gulch will encroach into 0.86 acre of temporary impact during construction of a park-and-ride lot and 0.07 acre during construction of the guideway.

- **Stormwater Drainage from Construction Sites**—prior to the start of construction, an NPDES permit for construction stormwater will be obtained. Project and site-specific BMPs will be prepared and submitted with the NPDES permit. BMPs will include methods to mitigate possible pollution, soil erosion, and turbidity caused by stormwater runoff from all sources during construction. Agency reviews conducted as part of the NPDES permit process will ensure that proper control techniques are identified in the permit and implemented during construction. Possible stormwater BMPs are discussed in more detail below.
- **Wastewater Discharges**—discharges, such as concrete truck wash down water, dust control sprays, and drilling fluids, will be collected and managed in accordance with NPDES requirements.
- **Groundwater Impacts**—a range of measures will be employed to ensure there are no adverse impacts to groundwater resources.

Placement of Fill

Stream channel alterations will be necessary during construction. Section 4.14 discusses the measures taken to avoid and minimize impact on water resources. The activities described here have been determined to be necessary only after all reasonable and feasible means are employed to avoid and minimize encroachment. Columns, foundations, diversions, and other temporary and permanent structures will be placed in or on the banks of Kaloʻi Gulch, Waiawa Stream, Waiawa Springs, Moanalua Stream, Kapālama Canal Stream, and Nuʻuanu Stream.

Work in these waters is highly regulated and will require permits from Federal and State agencies. Through the permitting process, details of BMPs will be developed to mitigate potential impacts to streams due to placement of fill. BMPs used may include, but not be limited to:

- Isolate the column construction area from the water through the use of cofferdams, sandbags, or other temporary water-diversion structures
- Prohibit fueling of equipment while in the stream channel
- Prevent wet or green concrete from coming into contact with flowing water
- Maintain fish passage—consider migration of native fish (e.g., ʻoʻopu) and avoid work in streams during spawning
- Minimize removal of riparian vegetation
- Monitor for turbidity both upstream and downstream of the work area
- When demolition of preexisting structures is required, such as the retaining walls at Kapālama Canal Stream, enclose the work area during demolition to contain airborne dust and debris and keep it from entering the stream
- To mitigate potential impacts to streams or wetlands where there is no inwater work, establish a construction buffer during work in the area.
- Prohibit the contractor from entering wetlands during construction (The wetlands will be designated as a no-work area on the plan sheets, and 3-foot-high orange fencing will be installed around the wetland to designate the no-work area. The orange fencing will be inspected routinely to ensure that it is maintained.)
- Secure netting below guideway superstructure construction to prevent construction debris from falling into streams

- Secure tight-woven netting under joints to catch excess epoxy when segments are post-tensioned
- Install toe boards along edge of the guideway deck to prevent loose material from being knocked off the deck into streams
- Air-test post-tensioning ducts before grouting to ensure no grout seepage
- Use silt fence and casing between foundation construction and stream to contain soil and construction debris
- Collect and handle drilling spoils to eliminate uncontrolled releases into surface waters
- Construct columns during the dry season, where feasible
- Place silt fencing around temporary construction platforms or structures to contain disturbed sediment
- Provide sheet piling around abutment extensions at Kapālama Canal Stream to prevent soil and sediment from entering the stream during abutment and wall construction

Wetlands

The contractor will be prohibited from entering the wetlands during construction. The wetlands will be designated as a no-work area on the plan sheets and 3-foot-high orange fencing will be installed around the wetland to designate the no-work area. The orange fencing will be inspected routinely to ensure that it is maintained.

Groundwater

Shallow excavations for utility work, support structure foundations, and pile caps may encounter groundwater along parts of the alignment. Typical groundwater management practices for shallow excavations include dewatering by shallow well points or dewatering wells, cutoff walls in combination with sumps from within the stabilized excavation, ground treatment, such as soil amendment or possibly even ground freezing, or a combination of these methods to enable construction in dry conditions. Actual dewatering methods will be determined during the final design and construction stage, depending on actual conditions encountered, size/depth of excavations, and site-specific considerations.

Dewatering operations are required to comply with NPDES permit requirements. A variety of methods can be used to treat water during dewatering operations. The size of particles present in the sediment and NPDES permit or receiving water limitations on sediment will be key considerations for selecting sediment treatment options. In some cases, such as where contamination may occur, use of multiple devices may be appropriate to manage sediments and any chemical contaminants. Typical dewatering BMPs include sediment traps or a larger basin, dewatering tank with filter or baffled weir tank, gravity bag filter, and various mechanical filtering systems. In addition, oil-water separators, specialty media filters, and bio-filters can be used in conjunction with the sediment filters to mitigate groundwater contaminants.

Dewatering alters groundwater's natural level and flow characteristics. Depression of the natural groundwater table in soft ground areas can induce consolidation of subsoils and subsequent ground settlement. Excessive or differential settlement can cause cracking and other damage to structures. Settlement is expected to be minimal because the level of the groundwater depression is expected to be localized and generally not greater than about 5 feet below static groundwater levels. Where dewatering produces a drawdown in excess of 5 feet, construction monitoring will be required to monitor for dewatering-induced settlement.

Deep excavations, exceeding more than about 10 feet below grade, are limited to drilled foundations for support of the aerial guideway and possibly some stations. These deep foundations will likely extend below groundwater levels along a substantial portion of the alignment. Dewatering

of drilled foundation excavations is typically not practicable except under special circumstances where the groundwater inflow quantity is minimal over a finite period and the seepage forces do not destabilize the completed excavation before concreting. Generally, when groundwater is encountered in the drilled foundations, the contractor will employ construction methods where the fluid within the excavation is allowed to remain as it is displaced by the concrete. Uncontrolled releases of drilling fluids are not permitted. The displaced water will be collected and treated as necessary for either reuse or disposal in accordance with permit requirements.

In localized areas, drilled foundations will likely penetrate caprock and extend into the deep-seated artesian conditions associated with the Southern Oʻahu Basal Aquifer basalts. At locations where the level of the groundwater pressure head exceeds existing ground surface, casing will likely be used to extend the work zone sufficiently above existing ground surface to counterbalance the excess water column. Another alternative is to use special additives in the drilling fluid to substantially increase the unit weight of the medium to counterbalance the artesian pressure head with a column of fluid. Another alternative may be to locally grout the water bearing stratum to reduce the excess pressure head through the work zone. The contractor may have other methods for construction in these conditions, but any methods used will consider the vulnerability of the sole source aquifer.

Drilled foundations that penetrate into the underlying basalt bedrock will only remain open long enough to insert a waiting, premade rebar cage support system. The project standard specifications for reinforcing steel require that it be clean and free of deleterious substances, which is anything that would hinder the bonding of the concrete to the rebar (e.g., require that the rebar is not sprayed or coated with any petroleum or other potentially contaminating product). Surface water will be prevented from draining into the open hole. No hazardous materials will be stored within the drilling area. Standard construction BMPs, such as regular inspections of equipment to ensure there are no leaks, will be employed. Drilling spoils will be collected and managed in accordance with applicable regulations.

Stormwater

Stormwater BMPs may include, but not be limited to:

- Minimize land disturbance
- Stabilize or cover the surface of soil piles
- Revegetate all cleaned and grubbed areas to the extent possible
- Maintain stabilized construction area ingress/egress areas
- Wash or clean trucks prior to leaving the construction site
- Install silt fences and storm drain inlet filters
- Prevent off-site stormwater from entering the construction site
- Implement other stormwater management techniques

4.18.11 Archaeological, Cultural, and Historic Resources

Archaeological Resources

Three general categories of archaeological resources (burials, pre-contact archaeology, and post-contact archaeology) could be affected during construction of the Project. With few exceptions, the resources that could be affected are subsurface features and deposits that have not been previously identified. Prior to construction, additional archaeological work will be completed to investigate the potential for sub-surface deposits. This additional work will focus on locations of columns, once they are known.

A PA pertaining to archaeological resources has been developed in consultation with SHPD, the Advisory Council on Historic Preservation, Native Hawaiian organizations, and other stakeholders to

address management of inadvertent finds during construction. The following sections describe the PA components that will be employed during construction to mitigate potential impacts to archaeological resources.

Archaeological Sampling

Prior to construction, an archaeological sampling plan will be developed for each construction phase in coordination with the O'ahu Island Burial Council and SHPD. The sampling will be completed prior to construction.

Archaeological Monitoring

Consultation with SHPD will assess the need for archaeological monitoring during construction. The archaeological monitoring program will follow the PA. A monitoring report will be prepared to document all results at the completion of construction.

Preserving Archaeological Resources

In advance of construction, archaeological resources deemed worthy of preservation in place may be identified. If this occurs and the Project is modified to avoid such resources, construction activities will also avoid those resources. Protection zones will be established around these resources to avoid disturbance during construction.

Burial Treatment

During the archaeological sampling, burials will be identified and managed in compliance with applicable laws. This will include consulting with project proponents, the O'ahu Island Burial Council, SHPD, and recognized lineal and/or cultural descendants to develop burial treatment plans. Although the goal of the archaeological sampling will be to identify all burials and treat them appropriately prior to the start of construction in a particular area, the chance exists that additional previously undiscovered burials will be encountered during construction.

In each geographic area, the parties consulted regarding burials during the Project's archaeological sampling phase will be consulted if a find is made during construction. The PA will outline the treatment of burials discovered during construction.

Cultural Resources

Adverse impacts related to cultural resources resulting from construction of the Project will likely be short-term and consist of affecting access to areas where cultural resources exist or cultural activities are practiced. The impact to cultural resources or areas will be mitigated using the same maintenance of access policies outlined for businesses.

Historic Resources

Historic resources could be inadvertently affected during construction. Any potential construction impacts will be mitigated using measures outlined in previous construction sections related to noise, vibration, air quality, and water quality. In addition, to avoid collision with or damage to historic resources during construction, protection zones will be established around such resources to avoid disturbance during construction activities.

4.18.12 Relationship between Short-term Uses of the Environment and Long-term Productivity

Construction of the Project will have short-term effects on the environment during construction, as described in this section. These effects will end with the completion of construction. The Project will provide the following improvements in productivity, which are identified as the Purpose of the Project in Chapter 1 of this Final EIS:

- Provide faster, more reliable public transportation service
- Provide reliable mobility in areas of the corridor with limited income and aging populations
- Serve rapidly developing areas

- Provide an alternative to the private automobile
- Moderate anticipated growth in traffic congestion

The long-term benefit that will be provided by the Project will be greater than the short-term adverse effects to the human environment.

The Project is consistent with the land use and transportation elements of plans, policies, and controls within the study corridor. The Project does not exclude future options, narrow the range of beneficial uses of the environment, or pose long-term risks to health and safety.

4.19 Indirect and Cumulative Effects

The CEQ regulations at 40 CFR 1500 et seq. and HRS 343 (HAR 11-200) require an assessment of indirect and cumulative impacts. This section describes and analyzes these impacts. For more information on land use impacts associated with TOD, see *the Honolulu High-Capacity Transit Corridor Project Land Use Technical Report* (RTD 2008b). For more information on study corridor and regional economics, see the *Honolulu High-Capacity Transit Corridor Project Economics Technical Report* (RTD 2008c).

The cumulative effects analysis includes evaluation of the planned extensions to the Project and the effects of past, present, and reasonably foreseeable future projects in the study corridor. Additional details about the anticipated effects of the planned extensions may be found by topic in the Honolulu High-Capacity Transit Corridor Project Technical Reports; however, because the planned extensions are not being constructed at this time and will require further planning and design, information about the extensions is less specific than information about the Project. For more information on existing and future land use development in the study corridor, see the *City and County of Honolulu General Plan* (DPP 2002a) and the other planning information provided in Section 4.2.

4.19.1 Background and Methodology

Regulatory Requirements

Indirect impacts are defined by CEQ as "effects which are caused by the [proposed] action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to changes in the pattern of land use, population density, or growth rate…"

Cumulative impacts are defined by CEQ as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time." Cumulative impacts include the direct and indirect impacts of a project together with the reasonably foreseeable future actions of others.

Methodology

A qualitative assessment of indirect and cumulative effects, including growth, was based on available information on historical, present, and foreseeable future development. Information was obtained from DPP, planning officials in the areas, and plans and studies prepared by others related to future development, including land developers active in the study area. Quantitative analysis is included for resources where data was available and for the resource areas. Federal guidance was used in evaluating the Project's cumulative effects, specifically CEQ's Considering Cumulative Effects under the National Environmental Policy Act (CEQ 1997a).

Time Frame for the Analysis

The time frame for the cumulative impacts analysis included both past actions and reasonably foreseeable future actions. The time period of the past analysis was determined by the information available for the resources studied, in broad terms, the time since the start of Oʻahu's rapid population growth in 1920. Generally, the time for future effect analysis extends from the present day to 2030. This is the time frame for which the City has plans and projections and anything beyond that is speculation and not reasonably foreseeable.

Geographic Areas of the Analysis

Indirect effects of the Project are likely to occur within the station areas and within the area of the `Ewa Development Plan, which is in the process of converting from an agricultural area into an urban area. The `Ewa area and the station areas are where the greatest changes in access to the transit system will occur; these are likely to be the areas where development and change in development densities can be reasonably expected in response to the Project.

The cumulative effects analysis considers many of the planned and reasonably foreseeable projects within three major planning areas (ʻEwa, Central Oʻahu, and the PUC) within the study corridor. The cumulative effects analysis compares the amount of land required for planned and reasonably foreseeable developments with the amount of developable land within the study corridor.

For the ʻEwa and Central Oʻahu planning areas, estimates of the amount of developable land within the study corridor were made based on GIS analysis of existing undeveloped land. Because the PUC currently lacks undeveloped land, estimates of the amount of land available for redevelopment were used for the comparative analysis described above.

Planned development within the study corridor was used to qualitatively analyze the cumulative effects on the visual environment and impervious surfaces and changes to the hydrology for water resources. Other resources were analyzed for the cumulative effect based on past, present, and future development.

4.19.2 Indirect Effects

Large infrastructure projects play an important role in determining the amount, density, and pace of land use development. However, other factors also determine the amount and type of additional growth in the study corridor, including market demand, local planning policies, land availability, and the availability of other infrastructure (roads, wastewater treatment, schools, etc.). Future development will be greatly influenced by factors outside the control of the project sponsor or any of the other planned projects. U.S. and Asian economic trends can affect the economy of Hawaiʻi as well as how, when, and to what degree land is developed on Oʻahu. The growth projections in the City and State plans are predicated on current information. Actual growth may be more or less than projected.

The City has adopted plans that direct future development to occur within the study corridor and away from less developed portions of Oʻahu. City policies and plans for areas outside the study corridor allow for limited growth and development. The Project is consistent with the City's policies to direct growth on Oʻahu to the study corridor.

The study corridor has the highest population and employment area in Hawaiʻi. It is a center of Hawaiʻi's tourism and trade industries. The study corridor is served by substantial existing transportation and other infrastructure that tends to encourage continued growth.

According to the 2000 census, 63 percent of Oʻahu's population of 876,200 was located within the study corridor. By 2030, the total island population will increase by 28 percent, with 91 percent of that increase occurring within the study corridor.

This level and concentration of growth within the study corridor are consistent with public policy and plans.

Effects of the Project on Growth

After completion of construction, the Project will not decrease or increase regional population or the number of jobs; however, it will influence the distribution, rate, density, and intensity of development in the study corridor. Without the Project, growth is more likely to be dispersed outside of the study corridor, including in undeveloped areas of central and northern O'ahu. Development in these areas will affect environmental resources as would be expected of dispersed development patterns. Planned and reasonably foreseeable actions presented in Section 4.19.3 will occur with or without the construction of the Project and constitute the basis for the No Build Alternative in this document.

The Project is a major element of the O'ahu Regional Transportation Plan, 2030 (RTP). The RTP is intended to provide a transportation system to support existing and planned growth in accordance with Local and State land use policies. These policies and the presence of a transit system can also have an indirect effect on property values in station areas (increases have been demonstrated in other cities with transit systems). At the study corridor level, the Project will support the development programmed in the *'Ewa Development Plan* (DPP 2000), *Central O'ahu Sustainable Communities Plan* (DPP 2002b), and *Primary Urban Center Development Plan* (DPP 2004a).

Development in `Ewa

The *'Ewa Development Plan* supports development in concert with a transit system. Although the construction of a transit system does not directly cause development to occur, land use plans and policies will encourage new development to be located near transit stations to take advantage of the transportation infrastructure and increased accessibility with the Project. The Project may also increase the rate of development in the 'Ewa Plain.

Transportation from the 'Ewa area to the employment centers in the study corridor is constrained by traffic congestion and increasing commute times to employment centers in the study corridor. As shown in Table 3-14 (in Chapter 3), the Project will reduce traffic congestion and improve mobility in the corridor by providing an alternative to the automobile.

The State is constructing a major new north-south highway in the 'Ewa Plain that is intended to serve planned growth in this area (North-South Road and Kapolei Parkway Final Environmental Assessment Finding of No Significant Impact [September 2004]). The State and the City have concluded that the highway study corridor will continue to grow and that this growth is likely to occur regardless of whether the highway project is built.

Station Area Development

Within station areas, the Project combined with land use policies and favorable real estate market conditions will likely attract TSD and TOD. TSD supports the development of uses such as office space and multi-story residential buildings near transit stations. For example, offices generate more transit riders per square foot of space than any other land use. TOD integrates land use and transportation elements. The intent is to plan development to combine transit with land use that may include retail, high density residential, mixed use, and pedestrian-oriented communities.

The City has adopted plans that direct future development to occur within the study corridor and away from less developed portions of O'ahu. City policies provide for TOD. This policy will focus the growth into patterns that will increase the viability of a number of travel options available to corridor residents and employees, including transit, walking, and bicycling.

The City passed a TOD ordinance in March 2009 in anticipation of the Project. Development in the study corridor, whether highway-oriented or TOD, will be based on market demands. Pursuant to the policy, TOD may occur in project station areas as an indirect effect of the Project. The increased mobility and accessibility that the Project will provide may also increase the desirability and value of land near the stations, attracting new real estate investment nearby. Therefore, the Project's primary indirect effect will be to alter development near the stations, bringing higher densities than presently planned or could otherwise be developed near transit stations. These land use effects could take the form of TOD or TSD. If development occurs around stations, it is anticipated that City infrastructure will be improved in these areas. It is not expected that the Project will lead to an increase in the overall level of growth allowed or expected in the study corridor. Rather, it will focus the growth into patterns that will increase the number of viable travel options available to corridor residents and employees, including transit, walking, and bicycling. As an additional benefit, compact TOD development will reduce the cost of providing utilities, facilities, and services to new residential and commercial developments. The potential for TOD differs at each station site. Factors that could spur TOD development, beyond the addition of a transit station, include available and undeveloped land, adoption of TOD zoning and policies, other real estate investment in the area, and market demand for new and additional floor space. The following sections generally discuss TOD potential at stations.

`Ewa Plain: East Kapolei, UH West O`ahu, and Ho`opili

The undeveloped ʻEwa Plain area has potential for TOD because of the availability of vacant parcels (Figure 4-3). The undeveloped nature of this area and the fact that fixed guideway construction will occur during or prior to many of the surrounding developments make this area ideal for TOD. The specific stations and planned developments in the station areas that could incorporate TOD elements are as follows:

- East Kapolei—developments by the Department of Hawaiian Home Lands (DHHL) and the Salvation Army (Kroc Center) are planned in this area. In addition, a regional shopping center is being planned by the DHHL.
- UH West Oʻahu—developments are planned for the campus as well as the surrounding area on the ʻEwa side of North-South Road.
- Hoʻopili—the proposed Hoʻopili development surrounds this station.

Waipahu: West Loch and Waipahu Transit Center

Due to a lack of undeveloped land, TOD in Waipahu and the West Loch Station areas will primarily be the result of redevelopment of existing land uses rather than greenfields development. The same factors that spur TOD in undeveloped areas will apply in these areas but, instead of the availability of undeveloped land, the presence of outdated buildings and uses could spur redevelopment and, hence, TOD.

Leeward Community College and Aloha Stadium

These two stations differ from the other project stations. Both are fairly remote from other developments and not likely to have any indirect TOD effects. The Leeward Community College Station area is difficult to access by vehicle, and the little available land in the area will most likely be used as a Project maintenance and storage facility. The maintenance and storage facility is not expected to have any indirect land use effects. The primary land use near the Aloha Stadium Station is the stadium and Pearl Harbor Navy facilities, neither of which is likely to be redeveloped before 2030.

Pearl City and `Aiea: Pearl Highlands and Pearlridge

The commercial uses near the stations in Pearl City and ʻAiea are well established and draw regional customers. These include big-box retail stores near the Pearl Highlands Station and Pearlridge Center

near the Pearlridge Station. The volume of traffic through the area and recent investments indicate that development will continue; however, the lack of open space and the relative newness of surrounding development suggest TOD will likely be limited in the near term. One of the few exceptions related to large under-used space is the former drive-in theater adjacent to Pearlridge Center.

Pearl Harbor-Lagoon Drive: Pearl Harbor Naval Base, Honolulu International Airport, and Lagoon Drive

The Pearl Harbor Naval Base, Honolulu International Airport, and Lagoon Drive Stations are largely industrial, airport operation-related, or military in character (Figure 4-5). TOD is not considered likely in these areas given their military industrial use. Development in this area is limited by the proximity of the airport due to development and height limitations.

Kalihi-Iwilei: Middle Street Transit Center, Kalihi, Kapālama, and Iwilei

These stations will be in relatively urban areas where existing land uses differ parcel to parcel, generally becoming more commercial approaching Downtown (Figure 4-5 and Figure 4-6). Parcel size may limit TOD in some areas; parcels near the Kalihi Station tend to be small, but some parcels near the other three stations are of sufficient size to support TOD. Parcel ownership may also affect redevelopment potential; the smaller parcels are owned by individuals unlikely to substantially change land use, but Kamehameha Schools has substantial holdings in the area and has suggested it is planning redevelopment. Public housing in the area could also be redeveloped to take advantage of the transit system. Considerable investments have been made in the area Koko Head of Kapālama Stream in the last 10 years. These investments suggest redevelopment in the area is possible and could be further spurred by the Project.

Chinatown and Downtown

Chinatown and Downtown already have TOD or TOD-like developments. Redevelopment in the area has taken place with recent condominium towers being built Downtown. Further redevelopment could occur, particularly around the port, and incorporate more TOD elements in the future. The historic districts restrict redevelopment to a degree. The Project is unlikely to substantially alter existing development plans in the Chinatown and Downtown areas.

Kaka`ako: Civic Center, Kaka`ako, and Ala Moana Center

Land use in much of this area is overseen by the Hawai'i Community Development Authority, and new developments already include some TOD features. Considerable investments in both condominium high-rises and commercial developments have been made in this area recently. Continued redevelopment is planned and is expected to continue. Similar to Kalihi, parcel size and ownership is likely to play a role; the smaller parcels in the mauka area are less likely to undergo TOD, while the larger underused parcels owned by Kamehameha Schools and General Growth Partners, among others, will be more likely to redevelop and incorporate TOD elements.

Property Values

Changes in property values that will result from construction of the transit system will have an indirect effect. Research based on New York and other cities has shown that residential property values can increase close to a transit station (Table 4-38). While most studies of transit's impact on real estate values show increases, they cannot explicitly isolate transit benefits from other market forces.

Property value increases near a transit station are realized in sales prices or rents. For residential properties, these increases probably reflect better access to the transit system and associated reductions in vehicle costs. For commercial properties,

Table 4-38 Rail System Benefits on Real Estate Values

Rail System	Rail Technology	Increase in Home Sales Price	Source
BART—San Francisco	Rapid rail	$1,578 increase for every 100 feet closer to a station	Lewis-Workman and Brod 1997
MTA—New York City	Rapid rail	$2,300 increase for every 100 feet closer to a station	Lewis-Workman and Brod 1997
San Diego	Light rail transit	$82.90 increase for every 100 feet closer to a station	Landis, et al., 1995
San Jose	Light rail transit	$60 increase for every 100 feet closer to a station	Landis, et al., 1995
MAX—Portland	Light rail transit	$202 increase for every 100 feet closer to a station	Al-Mosaind, et al., 1993
Metro—Washington, D.C.	Rapid rail	$0.23 increase in per square foot rent for every 100 feet closer to a station	FTA 2000

transit proximity potentially broadens the customer base, increases foot traffic near the business, and contributes to employee accessibility.

In some cases, transit may have a negative effect on real estate values due to what are often called "nuisance" effects—noise, increased foot traffic, visible infrastructure, transit-associated parking lots, and increased bus traffic. These factors can reduce the desirability of properties in the immediate vicinity of the fixed guideway. Such nuisance effects will most likely occur in areas where value is attributable to the remoteness of the location. Because the Project is forecast to result in travel time savings and will be placed on already busy roadways, the likelihood of negative effects on real estate value is minimal.

4.19.3 Cumulative Effects

This section describes the cumulative effects of the Project with other past, present, and reasonably foreseeable actions.

Past Actions

Oʻahu experienced major population growth (between 42 and 64 percent per decade) between 1920 and 1950 (Figure 1-2 in Chapter 1). Much of this growth can be attributed to a military buildup before, during, and after World War II, as well as rapid increases in the tourism industry as air travel became more available. Growth rates decreased steadily in subsequent decades and fell to only 5 percent during the 1990s.

The study corridor has been extensively modified by land reclamation, sugar cane production, military construction, and urban development. The most notable past action was the urban and suburban development of Oʻahu beginning in the 1940s. This development pressure has continued as Waipahu, the Pearl Harbor area, Salt Lake, Kalihi, and Downtown Honolulu became built-out and in-filled in the post-World War II years. By 1960, the study corridor was virtually built out between Downtown and Waipahu. Since then, ʻEwa and Kapolei have been developing. The latter is the only section of the study corridor with vast amounts of land available for new development. However, even in ʻEwa and Kapolei, these areas has been drastically altered by historic and modern land use, including intensive sugar cane cultivation, large-scale limestone quarrying operations, and residential and commercial development.

The development of the Oʻahu Railway & Land Company's route across ʻEwa, also established the first urban development at Pearl City in the late-19th century. By 1920, urban development had begun at ʻAiea, followed by further development at Waimalu and Pearl City in the 1950s. Construction of the H-1 and H-2 Freeways further supported this western push into Central and West Oʻahu. The construction of other highways, such as Farrington, Kamehameha, and Nimitz, helped improve accessibility between West Oʻahu and Downtown and reinforced growth and development.

Present and Reasonably Foreseeable Actions

The 2030 population within one-half mile of a project alignment will range from 229,000 to 252,000, which will be approximately a 10 percent increase from 2007. Employment in 2030 within the same area will range from 299,000 to 317,000, an approximate 6 percent increase from 2007.

In addition to the Project, other transportation improvements are anticipated to be completed on Oʻahu by 2030. Table 2-3 in Chapter 2 lists major roadway projects that are anticipated to be completed. The planned extensions to West Kapolei, Salt Lake Boulevard, UH Mānoa, and Waikīkī also are included in the Oʻahu Regional Transportation Plan (ORTP). The planned extensions will be evaluated through a separate NEPA and HAR 343 environmental review process.

The OʻahuMPO updates and revises the ORTP every five years in accordance with Federal regulations. It is an essential part of the continuing, cooperative, and comprehensive statewide multimodal transportation planning efforts conducted in Hawaiʻi. It focuses on improving mobility with a series of strategies and programs to address future transportation needs.

Table 4-39 summarizes planned and foreseeable development within the ʻEwa Development Plan, Central Oʻahu Sustainable Community Plan, and PUC Development Plan areas in the study corridor. The development areas within the study corridor are illustrated in Figure 4-2. The Project will not change the effects of development in the vicinity of the Project. The current ʻEwa Development Plan anticipates extensive development of the ʻEwa Plain whether or not the Project is built. Although the Project may have the effect of intensifying land use in the areas near the planned station (as discussed in Section 4.19.2), the overall development plan will not be substantially altered by the Project. Planned development is occurring independent of the Project; consequently, the Project will not cumulatively affect the resources described below beyond what will occur due to these planned and reasonably foreseeable developments.

The State of Hawai'i prepared an Environmental Assessment (EA) of the effects of two major transportation projects (North-South Road and Kapolei Parkway) in the ʻEwa area. The EA evaluated the growth-inducing and cumulative impacts of these transportation projects under the Hawai'i Environmental Policy Act. These transportation projects and others under construction, such as the widening of Fort Weaver Road, will facilitate the planned and foreseeable developments within the ʻEwa plain, even in the absence of this Project.

The City, other state and local agencies, and private developers also prepared EIS/environmental assessments (EA) under NEPA and HRS 343 with regard to several of the planned development projects in the ʻEwa area. (See Table 4-39 and specific EIS/EAs, including Hoʻopili *Final Environmental Impact Statement* [July 2008], *Kapolei Sustainable Energy Park Final Environmental Impact Statement* [July 2007], *Ocean Pointe Final Supplemental Environmental Assessment* [June 2001], and *Kapolei Village Final Environmental Impact Statement* [February 1988]).

Land Use

At a regional level, land use changes associated with past projects have included transformation of the land from undeveloped to urban, suburban, and rural farm uses. This has coincided with the population growth in the City and County of Honolulu from 490,000 in 1959 to 905,600 in 2007. The bulk of future regional land use changes are expected in the study corridor. Most undeveloped land within the study corridor is likely to become urban or suburban. Many developed lands within the study corridor also are likely to be redeveloped to higher-density uses. Expansion of public services and facilities will be associated with future

Table 4-39 Planned and Foreseeable Actions in the Study Corridor (continued on next page)

Plan Areas in the Project Study Corridor		
Name of Projects	**Development Characteristics**	**Development Status**
O`ahu Regional Transportation Plan (ORTP) 2030	The O`ahuMPO updates and revises the ORTP every five years in accordance with Federal regulations. It is an essential part of the continuing, cooperative, and comprehensive statewide multimodal transportation planning efforts conducted in Hawai`i. It focuses on improving mobility with a series of strategies and programs to address future transportation needs.	The ORTP 2030, as of Amendment #1, was endorsed by the O`ahuMPO Policy Committee in April 2006. ORTP 2035 began in early 2009.
**`Ewa Development Plan Area** This plan area includes Kapolei, `Ewa and Makakilo		
West Kapolei Future Extension	Provides direct connection with the Project to West Kapolei communities and the Kapolei Transit Center.	Future Planning Effort
North South Road (ORTP 2030)	A 4-mile Federal-aid, limited-access, principal arterial highway that would connect the H-1 Freeway to the proposed Kapolei Parkway. This is the connection between the East Kapolei Station and the UH West O`ahu Station.	Construction started Final EA, September 2004
Ka Makana Ali`i Project	1.1 million square feet of mixed-use development with commercial, office, and hotel space on 67 acres.	Planned Project Construction anticipated late 2010 Opening anticipated 2013
Kroc Center (Salvation Army)	Recreation and community center on 10 acres with 100,000 square feet.	Planned Project
DHHL Shopping Center	Located in East Kapolei on 67 acres with 1.5 million square feet.	Planned Project
Disney Resort	Hotel and timeshare with 800 units on 21 acres. Expansion of existing Ko `Olina Resort & Marina development.	Construction started 2009 Opening anticipated 2011
Kapolei Commons	Located on Kalaeloa Boulevard. This is a 610,000 square foot shopping center on 50 acres.	Completed Project Opened 2009
University of Hawai`i West O`ahu	A new campus on less than 70 acres.	Planned Project Ground breaking 2009 Opening anticipated 2010
Ho`opili	Mixed-use community with up to 15,000 dwellings on 1,554 acres. Features a traditional neighborhood design with a grid street pattern and neighborhood facilities.	Planned Project Final EIS, July 2008 (Hawai`i 343 EIS)
Ocean Pointe	1,100-acre residential, retail, harbor, and golf course development.	Final EA completed April 1998 Final Supplemental EA, June 2001 Under Construction
Makaiwa Hills residential development	Located `Ewa of Makakilo. This is a mixed-use community on 1,781 acres with 4,100 homes with commercial and retail elements, recreational facilities, and a school. Affordable housing will be provided in accordance with City standards.	Planned Project Final EIS for Makaiwa Hills accepted by the County Department of General Planning, April 1991 EIS Preparation Notice, October 2006
Mehana Subdivision	Residential community on 135 acres with 1,000 square feet and multi-family residences in eight communities. Nanala, one of eight communities within the Mehana Subdivision, will have 78 townhomes including 20 "Live-Work" units and a community park. This is an expansion of an existing development.	Planned Project Conceptual Master Plan completed by Helber Hastert & Fee.

Table 4-39 Planned and Foreseeable Actions in the Study Corridor (continued on next page)

Plan Areas in the Project Study Corridor		
Name of Projects	**Development Characteristics**	**Development Status**
Kaupe`a – Villages of Kapolei	Located on the `Ewa Plains. The Villages of Kapolei is an 888-acre mixed-use community made up of eight villages. It features affordable and market-priced single-family and multi-family residences spread over 888 acres. It includes schools, religious facilities, parks, recreation centers, retail centers, and a golf course. Seven of eight villages are complete. The eighth village, Kaupe`a, is 52 acres. Affordable housing will be available. This is an expansion of an existing development.	Planned Project Kapolei Village Final EIS, February 1988
Kānehili (East Kapolei 1) and East Kapolei 2	A DHHL affordable sustainable housing community on a 92-acre parcel with 403 residences located on the `Ewa Plain. It is adjacent to the UH West O`ahu campus and between the existing Kapolei Golf Course and the future North-South Road.	Under construction as of April 2009
Kapolei Sustainable Energy Park – solar farm (Campbell Industrial Park)	New electric power plant supplying biodiesel energy.	Planned Project Final EIS, July 2007
DHHL Shopping Center	Located in Kapolei. This is 67 acres with 1.5 million square feet.	Planned Project
O`ahu Commerical Harbors 2020 Master Plan	Located about 19 nautical miles `Ewa of Honolulu Harbor near the southwestern tip of O`ahu, Kalaeloa Barbers Point Harbor is the state's second busiest commercial harbor.	Final EIS for the O`ahu Commercial Harbors 2020 Master Plan Immediate Phase, September 1999
Kalaeloa Master Plan	The Master Plan serves as an amendment to the existing Kalaeloa Community Redevelopment Plan, prepared as part of the U.S. Navy's Base Realignment and Closure process. Kalaeloa, the former site of the Barbers Point Naval Air Station, consists of approximately 3,700 acres. The goal of the plan is to create a Wahi Ho'okela (center of excellence), by increasing opportunities for new employment, educational institutions, mass transit, regional connectivity, recreation, affordable housing, resource protection, new industries, economic growth, and national defense in Kalaeloa.	Kalaeloa Master Plan, 2006
Central O`ahu Sustainable Communities Plan Area This plan area includes Waipahu, Waikele, and Waiawa		
Salt Lake Future Extension	Provides direct connection with the Project to residential, retail, and commercial developments on and in the vicinity of Salt Lake Boulevard.	Future Planning Efforts
Koa Ridge	Koa Ridge is a 578-acre mixed use community in Central O`ahu that includes more than 3,100 residences, a mixed-use village center and town center to serve regional shopping needs.	Planned Project EIS Preparation Notice, May 2008

Table 4-39 Planned and Foreseeable Actions in the Study Corridors (continued on next page)

Plan Areas in the Project Study Corridor		
Name of Projects	**Development Characteristics**	**Development Status**
Waipahu Neighborhood Transit-oriented Development (TOD) Plan (includes two community plans for future urban redevelopment) Leokū TOD, also known as the future West Loch Station Mokuola TOD, also known as the future Waipahu Transit Center	Leokū TOD will be the retail and employment center of Waipahu with infill and mixed-use developments. Development intensity will be adjacent to the station. Mokuola TOD within the Waipahu Transit Center Station development will reflect the historic plantation town once located at this site. It will use both infill and mixed-use developments. Development intensity will be within one-quarter mile creating a pedestrian-friendly environment.	Planned Projects Waipahu Neighborhood TOD Plan (Public Review Draft), March 2009
Wahiawā Transit Center	The purpose of this project is to develop a transit center/park-and-ride facility to accommodate express, trunk, and circulator bus services. It will provide connections to the Project.	Planned Project Final EA, February 2009
Primary Urban Center (PUC) Development Plan This area includes Pearl City-`Aiea, Salt Lake- Āliamanu, Airport-Pearl Harbor, Kalihi-Iwilei, Palama-Liliha, Downtown, Kaka`ako, Makiki-Mānoa, and Mō`ili`ili-Ala Moana		
UH Mānoa Future Extension	Provides direct connection with the Project to residential, retail, and commercial developments in areas near UH Mānoa and Waikīkī.	Future Planning Efforts
Waikīkī Future Extension	Provides direct connection with the Project to residential, retail, and commercial developments in Waikīkī.	Future Planning Efforts
Redevelopment of Kalihi properties	Mixed-use developments, including residential and retail.	Kalihi Palama Action Plan, September 2004 Planned Projects Projects Under Construction Constructed Projects
Kamehameha Schools Kaiāulu `O Kaka`ako Master Plan (KKMP)	This Master Plan proposes a mixed-use urban village that will add more than 2 million square feet for commercial use, more than 4 million square feet for residential uses, and more than 125,000 square feet for industrial uses. It includes redevelopment of 29 acres in Kaka`ako, including 2,750 residential units in seven high rises and commercial/retail development.	Planned Projects Kaiāulu `O Kaka`ako Master Plan, Nov 2008
Ward Village Shops Project	Includes a 17-story structure with 165 rental residential units, 224,000 square feet of commercial space, 34,000 square feet of open space, and 1,010 parking spaces. Expansion of the existing Ward Village development.	Planned Project
Halekauwila Place	A 1.25-acre, 14- to 17-story proposed affordable housing mixed-use complex with street-level commercial development. It will contain approximately 202 units.	Planned Project
Vanguard Lofts	It involves the renovation and conversion of the old National Cash Register (NCR) office building into a modern mixed-use urban loft project with 32 residential lofts and 3,470 square feet of ground floor retail.	Project Under Construction

Table 4-39 Planned and Foreseeable Actions in the Study Corridors (continued from previous page)

Plan Areas in the Project Study Corridor		
Name of Projects	**Development Characteristics**	**Development Status**
Hawai`i Airports Modernization Program	Part of the Terminal Modernization Program, the first phase of the HNL Modernization Program is a 12-year effort to transform Honolulu International Airport into a distinctive, functional airport, worthy of a first-class visitor destination.	Planned Project Hawai`i Airports Modernization Program, 2006
University of Hawai`i John A. Burns School of Medicine (JABSOM)	Medical research facilities on 9.1 acres strategically located in the Kaka`ako Waterfront area. Phase Two will include a research center and parking structure containing 363 spaces. Expansion of existing JABSOM development.	Planned Project EA for the JABSOM campus in 2002 New Proposed EA for the Pacific Regional Biosafety Lab, December 2008

Sources: DPP, DHHL, DBEDT, HCDA

growth. Such growth will be consistent with community plans.

Much of the cumulative effect of development on resources in the ʻEwa Plain and West Kapolei in West Oʻahu is on transformation of rural and currently undeveloped lands. These areas are rapidly urbanizing due to development in Kapolei, ʻEwa Villages, and elsewhere. Alternatively, the cumulative effect of development on resources in the Central Oʻahu and PUC areas is the redevelopment of existing urbanized areas. The direct effect of the Project on land use is the conversion of approximately 1 percent (161 acres) of total land within the study corridor to a transportation use. Many of the planned and foreseeable actions presented in Table 4-39 will have a larger direct effect than the Project. Therefore, the Project will not cumulatively affect land use resources beyond what will occur due to these planned developments.

The Salt Lake Boulevard, UH Mānoa, and Waikīkī planned extensions will not substantially affect land use because those areas are already highly urbanized.

`Ewa Development Plan Area

By 2020, the ʻEwa Development Plan area, which covers approximately 10,000 acres, will have experienced growth and will have made progress toward providing a Secondary Urban Center for Oʻahu. At the heart of the Secondary Urban Center will be the City of Kapolei with an urban mix of commercial, office and residential uses. It is projected that the City of Kapolei will house over 7,000 residents and provide work sites for about 25,000 private jobs and 5,000 City and State jobs (located at the City's Civic Center).

Many of the jobs in the City of Kapolei will be supported by development of the University of Hawaiʻi West Oʻahu campus, which is expected to have approximately 7,600 students and 800 staff and faculty by 2020. Continued expansion of industrial uses at Campbell Industrial Park, Barbers Point Deep Draft Harbor, and Kapolei Business Park and growth of the Koʻolina Resort and ʻEwa Marina, to include over 3,700 visitor units, will also provide jobs in the City of Kapolei.

Open space will be preserved in parks, golf courses, and agricultural areas, which will also help to protect significant views. Wildlife habitats will be located at the former Barbers Point Naval Air Station (now known as Kalaeloa), ʻEwa Marina, and West Loch. Many of the ʻEwa Development Plan projects listed in Table 4-39 and all of the developable acreage are within the study corridor. Less than 1 percent of the planned development is outside of the study corridor. Within the study

corridor, approximately 90 acres within this plan area will be developed by the Project, including land associated with the optional maintenance and storage facility at Hoʻopili, proposed park-and-ride facilities, and other guideway infrastructure. If the maintenance and storage facility is not constructed at Hoʻopili, approximately 50 acres will be used by the Project within the ʻEwa Development Plan area.

Moreover, future development in East Kapolei has spurred opportunities for roadway connectivity. The completion of North-South Road, currently under construction, and Kapolei Parkway, between Renton Road and the Kapolei Middle School area, will significantly enhance roadway connectivity in the area. As the area builds out, Farrington Highway will be widened between North-South Road and Fort Weaver Road.

A key roadway in this area is a new east-west arterial roadway through the Hoʻopili and UH West Oʻahu projects that would facilitate mobility within this area. This new roadway would provide relief for Farrington Highway and would help to preserve the collector status of Renton Road. Without the new east-west roadway, Renton Road could easily become the east-west arterial by default.

The extension of North-South Road makai into Kalaeloa would facilitate access to future planned development in Kalaeloa as described in the *Kalaeloa Master Plan* (HCDA 2006) and provide an alternative path to new developments, such as Ocean Pointe, as well as to the Project. Additionally, a supportive collector roadway system would relieve the pressure on North-South Road, Farrington Highway, and the proposed East-West Arterial. These roadway projects are supporting future growth and development in the ʻEwa Development Plan area independent of the Project.

The North-South Road EA and the environmental analyses of the development projects in the ʻEwa Plain identified the following impacts of growth:

- Conversion of agricultural land-to-urban uses
- Short-term adverse air quality impacts from construction
- Increased long-term air emissions flood plain and water quality impacts from urban runoff to wetlands streams and coastal surface waters
- Impacts to several cultural and historic sites
- Increased noise from urban uses
- Visual impacts from conversion from agricultural to urban uses
- Impacts to vegetation and wildlife.

Many of the waters in the Project area are degraded with several listed as impaired or water quality limited segments by the State of Hawaiʻi. In the absence of measures to offset these impacts, the increased urbanization of the Project area will increase the existing adverse condition of the water quality in the Project area.

The 2002 Census of Agriculture (USDA 2004) reported that there are more than 70,000 acres of agricultural land in cultivation on Oʻahu, including those designated as prime, unique, or of statewide importance. The past, proposed, and reasonably foreseeable developments in the ʻEwa Plain will eliminate approximately 6,000 acres from agricultural uses or 8.6 percent of the remaining agricultural lands in Oʻahu and 3.8 percent of the approximately 160,000 acres of agricultural lands in the State of Hawaiʻi. This includes the conversion of approximately 20 additional acres of farmland from the planned Kapolei extension, none of which is actively cultivated. The estimate of the loss of agricultural land use is based on the assumption that all land in the ʻEwa Development Area is agricultural, which was the historical use of this land.

As described in Section 4.2.3, the Project will only contribute to the displacement of less than one tenth of one (<0.1) percent of available agricultural

land. The projected reduction in agricultural lands in the ʻEwa area is not substantial. The current ʻEwa Development Plan preserves 3,000 acres of the highest value prime agricultural land for protection from development. By protecting agricultural lands from urban development, an opportunity is created for retention and development of diversified agriculture on small farms and agricultural parks. Agriculture within the ʻEwa Plain would likely change in character over time from intensive monoculture farming of export crops to diversified crops for consumption on the islands in the State of Hawaiʻi. The loss of agricultural production from the Project and other reasonably foreseeable projects throughout the State of Hawaiʻi are expected to be offset by:

- Hawaiʻi Agriculture Research Center (HARC) conducting studies on vegetable crops and forage to help diversify agricultural activities in the area
- Agricultural businesses maintaining their current levels of operation and production by leasing replacement lands in Kunia and/or the North Shore and possibly cultivating their remaining lands more intensively

Statewide agricultural production, revenues, employment, or payroll are not anticipated to be adversely affected but may change as the agricultural industry changes.

Central Oʻahu Sustainable Communities Plan Area

The Central Oʻahu Sustainable Communities Plan Area, which covers approximately 3,000 acres, is expected to experience moderate growth as existing areas zoned for residential development are built out by 2025. Over 11,000 new housing units will have been built in master-planned communities, and substantial job growth is also expected to be over 65,000 new jobs (almost 10 percent of Oʻahu total projected). The bulk of the private non-construction job growth is projected to be in services, retail, or transportation/communications/utilities (about 70 percent) with another 20 percent in industrial occupations.

Urban growth will be contained within a boundary which will protect prime agricultural lands for diversified agriculture and pineapple. Preservation of these lands will help retain open space, in addition to supporting economic diversification. A regional system of open space and greenways will give Central Oʻahu the feel of a network of communities "within a garden." Open space will be preserved in parks, golf courses, agricultural areas, deep ravines, and wildlife habitats.

A Shoreline Park and Preservation Area developed along the entire shoreline in Pearl Harbor's West Loch and Middle Loch will restore the shoreline in Waipahu to public use, provide active and passive recreational facilities, and help create the Pearl Harbor Historic Trail, a pedestrian path, bikeway, and restored historic train system running from Rainbow Marina near Aloha Stadium to the Waiʻanae Coast.

Special area plans prepared in partnership with the Waipahu and Wahiawā communities will guide redevelopment of these gateway towns. To support the revitalization of these towns, commercial and industrial development outside of Waipahu and Wahiawā will be limited to completing the Mililani Technology Park development and building new commercial centers designed to meet the demand from their surrounding residential communities, rather than for a regional or islandwide market.

Central Oʻahu will be developed with a transportation system that provides easy access to transit, uses traffic calming design, and encourages people to walk and bike, reducing the need for use of automobiles. Moderate density housing and commercial development will be built along a rapid transit corridor stretching from the City of Kapolei through Waipahu to Pearl City in the PUC.

Many of the projects in the Central Oʻahu Sustainable Communities Plan area listed in Table 4-39 and about 450 acres (15 percent) of developable acreage are within the study corridor. Approximately 70 acres will be used for the Project, including for the preferred site option of 44 acres for the maintenance and storage facility near Leeward Community College, proposed park-and-ride facilities, and other guideway infrastructure. If the maintenance and storage facility is not constructed near Leeward Community College, then approximately 26 acres will be used by the Project within the Central Oʻahu Plan area.

A roadway project located in Central Oʻahu includes Central Mauka Road, a new four-lane road from Mililani mauka to Waiawa, as shown in the ORTP is further evidence of growth in Central Oʻahu independent of the Project. The road connects Meheula Parkway to Kamehameha Highway in Pearl City. It is parallel to and mauka of the H-2 Freeway. The new four-lane north-south road includes connections to the H-2 Freeway interchanges. Another project is a new two-lane second access road to Waiʻanae. It runs from Farrington Highway in the vicinity of Maili, over the Waiʻanae Mountain Range, to Kunia Road. Both projects would provide improved mobility options in areas close to future planned development in Central Oʻahu.

Primary Urban Center Area

The PUC is an interconnected network of vibrant, distinct neighborhoods. Each has qualities that make it a livable and enjoyable place to live, work, and play. The City supports an ongoing program of neighborhood planning and improvement with the redevelopment of existing urban land. Livable neighborhoods include business and community services as well as residences. Key to livability is convenient access to work and to the many services and attractions found in an urban center.

Mauka residential neighborhoods primarily consist of single-family homes and townhouses on the edges of the central city. They retain their historically residential character, with mostly one- and two-story buildings and plenty of yard space and trees. Shops, parks, and schools are located within walking or bicycling distance of most residents. Churches, schools, and other uses coexist harmoniously. In-town residential neighborhoods offer the greatest amenities for urban living. Consisting mostly of apartment dwellings, these neighborhoods are closest to employment centers, universities, and cultural institutions. They are also close to grocery stores, shopping districts, and other government, health, and commercial services. Proximity to the Project will give residents mobility and make it possible to live with fewer automobiles. Newer apartment buildings are typically four to six stories tall, with shops and services on the ground floor. Small parks, plazas and "green streets" provide places for people to meet and for small children to play.

The PUC Plan, which covers approximately 24,000 acres, is an interconnected network of vibrant, distinct neighborhoods. All of the PUC Plan, including several PUC projects, approximately 45 acres listed in Table 4-39, is within the study corridor. Less than 45 acres will be developed by the Project for proposed park-and-ride facilities and other guideway infrastructure. According to the PUC Plan, there are no large areas of developable land. Therefore, the majority of development in the PUC will be redevelopment of existing urban land.

Future roadway projects in the PUC would be enhancements or maintenance of existing infrastructure. For example, a new two-lane elevated and reversible HOV flyover above Nimitz Highway will be constructed from the Keʻehi Interchange to Pacific Street, as shown in the ORTP.

Economy

Economic changes have come with transitions to and from agricultural, military, and tourism economies. In 1958, military defense operations and sugar and pineapple production were the state's primary economic activities, accounting for 40 percent of the Gross State Product (GSP). In 2007, the GSP reached $61.69 billion. Honolulu County's Gross Metropolitan Product (GMP) in 2005 was $41.11 billion. Hawai'i's retail sales revenue has been in excess of $21.5 billion, partially driven by its tourism industry. In 2007, Hawai'i's visitor expenditures were more than $12.2 billion. "Finance, insurance, and real estate" and "services" are the biggest private sector industry contributors, contributing 22 percent and 29 percent of the State's 2006 output, respectively. Retail and wholesale trade together account for 11 percent of the GSP.

The economic forecast is for continued steady growth. Planned projects are intended to continue to encourage and enable economic growth in the region. Continued focus on tourism is anticipated. To the extent that the Project will reduce travel times and decrease the growth of congestion, the Project is expected to generate an atmosphere conducive to future economic development. Completion of the planned extensions and other planned projects will include additional land conversion to public transportation use, decreasing the taxable land and associated property tax revenues.

The Project also will require hiring of additional workers to support the expanded system.

In general, the Project is not a major long-term economic driver for O'ahu's economy.

Displacements

Past projects, such as the H-1 Freeway construction project, have resulted in a number of relocations. Planned projects, including transportation projects listed in the ORTP, will result in some level of displacement of a variety of land uses. Projects likely to result in displacements include widening of the H-1 Freeway in Kalihi and Pearl City. The planned extensions to the fixed guideway system are anticipated to require additional acquisitions and displacements of residential units and businesses.

Community Facilities and Public Services

As growth proceeds, community facilities and public services will need to expand to meet increasing demand as has historically occurred with the past development. Public policy requires that large developments provide land and develop such facilities, including schools. As development proceeds, the tax base also will grow to fund the expansion of such facilities.

The network of utilities will grow and be upgraded as a result of continued development. Water, sewer, and electrical upgrades will be a benefit to the community as they will improve availability and reliability of services. Additional electrical generation will be required to support the increase in population and employment as well as to provide energy for propulsion for the Project. Since the majority of the electricity generated on O'ahu is through the combustion of fuel oil, increased fuel oil consumption and air emissions would be expected. However, this will be partially offset by the Hawai'i Clean Energy Initiative, which has as its goal that 40 percent of the electrical-generating capacity will be from clean sources by 2030.

Potable water is currently limited on the Island of O'ahu and is delivered by the City and County of Honolulu Board of Water Supply. Since 1990, demand for potable water supplies on O'ahu has remained constant at 155 million gallons per day even with significant urban residential and commercial development growth occurring within the water supply system area of service. This has been accomplished through conservation, loss

prevention, and growth in the use of recycled water for industrial and irrigation activities.

Additional potable water supplies will be required to support the increase in population and employment as well as at the stations and at the maintenance and storage facility for the Project, although the Project is not anticipated to be a major water consumer. Since all of the potable water on Oʻahu is from sole source aquifers, it is imperative that Oʻahu residents embrace water conservation measures and that the Board of Water Supply continue to upgrade their facilities in order to minimize system loss through upgrades to their aging water delivery system. To the extent that recycled water supplies are available, the Project will use recycled water at their maintenance and storage facilities, at their stations, and through irrigation of landscaped areas.

Planned development, including the planned extensions, will affect existing parks and recreational resources. They also may affect, but not displace, some existing community resources through partial acquisition of properties where they operate.

Neighborhoods

Past projects, such as construction of the H-1 Freeway, have affected neighborhoods by cutting through and separating communities in the urban area and changing the character of communities. Continued development and increased density in the study corridor will affect the character of neighborhoods; however, effects as extensive as those caused by the construction of a new freeway will not occur. Future projects will likely have less severe effects than previous H-1 Freeway construction. Those effects will be gradual as individual projects are implemented.

Redevelopment, and specifically TOD, will occur in neighborhoods and communities where stations are planned. However, in areas such as Chinatown, Downtown, and Waikīkī, TOD will not likely change neighborhood character. In other areas, TOD could have an effect. The principles of TOD, such as pedestrian-orientation and mixed uses, are generally credited with reviving neighborhoods or making them more vibrant.

The planned extensions will serve additional neighborhoods with transit stations, such as Makakilo-Kapolei-Honokai Hale, Ala Liliko'i, McCully-Mōʻiliʻili, and Waikīkī. No substantial effects to those neighborhoods are expected. This is primarily because the extensions will follow already busy thoroughfares or pass through undeveloped areas. The increase in mobility resulting from the extensions will generally improve the quality of life for neighborhood residents, especially for those with limited financial resources and those who may be transit-dependent.

Environmental Justice

Environmental Justice communities and communities of concern are expected to benefit from the Project, planned extensions, and related development. The planned extensions will expand the extent of the fixed guideway transit system, which will improve travel options for transit-dependent groups and improve mobility in the corridor by providing an alternative to the automobile. An affordable and reliable means of transportation throughout the study corridor will provide more opportunity for low-income groups to live and work throughout the study corridor.

Visual

In general, the visual environmental has been transformed from rural to urban over the past 70 years. The visual environment has been affected by past changes in land use and by the increasing height of buildings in the Downtown, Kakaʻako, and Waikīkī areas. Similar effects are expected to gradually continue throughout the study corridor. In the ʻEwa area, visual resources will be affected more rapidly than other areas in the study corridor

by the replacement of undeveloped land and farmland with housing, commercial, and public facility developments in accordance with development plans. Currently, when traveling from the Wai'anae direction of the H-1 Freeway near Exit 5 (East) Kunia Road/'Ewa/Waipahu, drivers have an unobstructed panoramic view towards the Koʻolau Mountain Range, Pearl City, Pearl Harbor, 'Ewa, and the Pacific Ocean. The planned developments in the 'Ewa Plain, which will be located at a lower elevation than the freeway, will be visible from the freeway; and the visual character will change from open space to urban development.

Modification of height limit and/or setback distances near transit stations could change the aesthetic character and design in transit station areas. More views and open areas outside the study corridor may be preserved as a result of concentrating development within station areas and away from more rural portions of Oʻahu.

Views of the planned extensions will be similar to those of the Project shown in Section 4.8, Visual. Figures 4-79 and 4-80 show simulated views of the planned UH Mānoa and Waikīkī extensions.

Noise

Noise has been steadily increasing in the region as it has become more urban and suburban as traffic has increased. As the study corridor becomes more densely developed, ambient noise levels will continue to increase. The planned extensions and other future development will create additional noise impacts in the vicinity of the alignment, which are similar to those discussed for the Project in Section 4.10, Noise and Vibration. With existing land uses, no noise impacts will occur at ground level, but users of outdoor lanais located above the height of the guideway and facing the planned extensions would experience moderate noise impacts at some locations between the Ala Moana Center Station and the end of the Waikīkī extension and along the Salt Lake extension.

Hazardous Materials

Industrial and military land uses in the past have resulted in the release of hazardous materials, such as fuels and solvents, into the environment. Several brownfield sites are located in the study corridor. As a result of laws enacted since the 1970s, new developments and industrial activities are not expected to result in the release of hazardous materials. Redevelopment of previously contaminated properties offers the potential to remove some of the legacy chemicals in the soil and groundwater that resulted from waste discharge practices occurring before the current regulatory framework was established. This would be an overall benefit to the environment.

Planned future development, including the planned extensions to the fixed guideway system, are anticipated to affect additional sites of concern for hazardous materials contamination.

Ecosystems

Past development of suburban areas and farms has replaced undeveloped lands throughout the region. Even in the 1920s, there was almost no undeveloped land in the study corridor due primarily to sugar cane plantations. The former sugar cane lands do not provide significant habitat. The few wetland areas that were not used for sugar cane production were mostly developed for post-war housing, such as in the Salt Lake area. The Project is in a disturbed urban environment and will remain urbanized in the future. Continued development will not likely affect bird species that adapt well to urbanization. The Project could result in the preservation of a larger volume of vacant and undeveloped land outside the study corridor by supporting development within the corridor. This will have a commensurate benefit to ecosystems.

Threatened and Endangered Flora

An 18 acre koʻoloaʻula (Abutilon menziesii) contingency reserve lies within the 'Ewa Development Plan area. Proposed development in the Kapolei

Figure 4-79 Visual Simulation of UH Mānoa Planned Extension at Convention Center, looking Mauka

Figure 4-80 Visual Simulation of Waikīkī Planned Extension at Kālaimoku, looking Mauka

area could affect endangered plants in the vicinity. The transplantation of plants and special protective measures during construction may be needed in this area as outlined in the approved Habitat Conservation Plan.

Impacts to other threatened and endangered flora are unlikely because few species are present within the area and, if any are encountered, they will be protected by existing regulations; all future developments will be responsible for complying with the Federal Endangered Species Act for their own projects.

Threatened and Endangered Wildlife

There is no habitat for threatened and endangered wildlife species in the ʻEwa area even though it is relatively undeveloped. Because no cumulative impacts to habitat are likely, no cumulative impacts to these species are likely. All endangered species are currently protected by existing regulations; all future developments will be responsible for complying with the Federal Endangered Species Act for their own projects.

Water Resources

Water resources have been degraded by past residential, industrial, military, and farm developments. The most substantial effects of past actions include the following:

- The channelization of most streams in urban and suburban areas
- The draining and filling of wetlands in Waikīkī, Salt Lake, and Pearl Harbor
- The pollution of surface water and groundwater with agricultural (herbicide and insecticide) and other chemicals

Future projects, including the incremental effect of the Project, will modify surface-water resources in the ʻEwa Development Plan Area by the incremental conversion of pervious surface to impervious surface. The loss of pervious surface increases the pollutant load that is discharged to surface-water resources, increases peak flow due to the loss of infiltration, and decreases base flow due to the loss of infiltration. There is the potential for loss of flood storage capacity due to encroachments into regulated flood zones. However, infrastructure, such as the Kaloʻi Gulch Drainage Canal being constructed as part of the North-South Road project, will be constructed as part of future development as required by regulations to accommodate flood storage capacity. Landscapes in the Central Oʻahu Sustainable Communities Plan area and the PUC Development Plan area are already altered by past loss of pervious surfaces, altered flow conditions, and conversion to a built environment. The future projects for Central Oʻahu and the PUC listed in Table 4-39 would have less cumulative impact on water resources compared to developments in the ʻEwa area because conversion to urbanization has already occurred. The additive effects of the Project, in combination with other actions, could further degrade surface-water resources. However, mitigation measures that will be part of Federal, State, and Local permitting requirements will help offset negative effects to surface-water resources. In addition, future projects in the ʻEwa Plain will not affect wetlands because the developable upland area is dry and has permeable soil that does not contain any wetlands.

The current and reasonably foreseeable actions described in Table 4-39 will also be required to follow City, County, State, and Federal environmental regulations and mitigation measures; therefore, the additional cumulative effects to water resources as a result of the planned extensions are the same as described above.

Street Trees

The planned extensions would affect street trees along those alignments, including monkeypod trees on Kapiʻolani Boulevard and mahogany trees along Kalākaua Avenue. Some of the monkeypod trees would require removal, while the mahogany trees could be preserved with pruning. All street

trees are currently protected by existing regulations; future development is also subject to these regulations to protect street trees.

Archaeological, Cultural, and Historic Resources

Archaeological, cultural, and historic resources have been affected during development within the study corridor.

Future development will occur near pre-contact and post-contact archaeological and burial sites. Future development also could affect historic resources, churches, cemeteries, schools, parks, recreational facilities, and other urban cultural entities. Such resources are located throughout the corridor.

The planned extensions could affect additional archaeological, cultural, and historic resources. The likelihood of encountering burials will be high for the Waikīkī extension. Any future development or future extensions to this Project will be required to comply with appropriate Federal and State laws to protect archaeological, cultural, and historic resources.

4.19.4 Effects of No Build Alternative on Growth

The effects on growth with the No Build Alternative would be more severe than the impacts of the Project. If the Project is not built, Oʻahu will experience continued growth, but the growth is likely to be more dispersed and less dense. Under the No Build Alternative, there would be increasing pressure to develop in the undeveloped areas of central and northern Oʻahu. Development in these areas would have greater impacts on agricultural and natural resources, including to threatened and endangered plant and animal species.

Those portions of the island do not have sufficient infrastructure to support growth; expenditure of funds for infrastructure development in these undeveloped areas would impact the ability to meet the infrastructure needs of the rest of the island. The central and northern areas would undergo a dramatic change in community character with the transformation from rural to suburban in areas that have been fairly rural since Hawaiʻi entered statehood.

The No Build Alternative would have more adverse impacts on growth in the ʻEwa Plain. The No Build Alternative would be likely to displace more farmland than the Project because lower density development patterns are likely under the No Build Alternative. There would be increased traffic congestion and air quality emissions because of the absence of a rapid transit system to service the Project corridor.

The No Build Alternative would have greater greenhouse gas emission than the Project because the development pattern would be less dense and would require greater reliance on the use of private automobiles. The No Build Alternative would result in higher VMT with a corresponding higher level of greenhouse gas emissions. On a daily basis, the Project will reduce greenhouse gas emissions by approximately 171 metric tons of carbon dioxide.

The No Build Alternative does not include the Project; it does incorporate transportation improvements identified in the ORTP. Under the 2030 No Build Alternative, approximately 13.6 million VMT per day are projected in the transportation system, including major freeways, highways, arterials, and collectors. This would be an increase of approximately 21 percent (or over 2 million miles) over 2007 conditions. VHT would increase by 28 percent by 2030 compared to 2007 levels. VHD would increase by 46 percent. VHT and VHD would increase at a higher rate than VMT because as roadway facilities become oversaturated, travel times through the affected sections would increase dramatically. The increase in congestion within the study corridor would have a ripple effect on the following resources, facilities, and services:

- Increase in emergency response times
- Underserve transit-dependent and low income populations
- Increase in air pollutant burdens for the air basin
- Increase in pollutant load in stormwater runoff

VMT, VHT, and VHD are projected to decrease under the Project compared to the No Build Alternative. Daily VMT will decrease by 4 percent and VHT will decrease by 8 percent. VHD will experience the greatest decrease—18 percent. This reflects that even moderate decreases in traffic volumes under congested conditions can result in relatively large decreases in travel delay.

4.20 Irreversible and Irretrievable Commitments of Resources

As described in Chapter 4 of this Final EIS, the Project will convert land to transportation use and consume energy, construction materials, and labor and impact natural and cultural resources. These resources will not be available for other projects.

4.21 Anticipated Permits, Approvals, and Agreements

Table 4-40 summarizes permits, certificates, and/or approvals anticipated to be required for implementation of the Project. When it states that permits, approvals, and agreements are required, it is anticipated that they will be received prior to commencing the activity that triggers the permit, approval or agreement.

The City will be responsible for obtaining all permits, approvals, and agreements unless otherwise noted. The City will ensure that all permit, approval, and agreement conditions are met. This will be the responsibility of DTS.

Table 4-40 List of Anticipated Permits, Approvals and Agreements (continued on next page)

Type of Permit, Approval, or Agreement	Granting Agency	Responsible Party and Status
Preliminary Engineering Phase		
CWA Section 404—Department of the Army Permit; various nationwide permits	USACE, Regulatory Branch; EPA	City will submit application prior to construction of the Project
CWA Section 401—Water quality certification	HDOH–CWB	City will submit application prior to construction of the Project
Stream channel alteration permit	DLNR–Water Commission	City will submit application prior to construction of the Project
Section 10 bridge permit	USDHS; USCG; USACE	City will submit application prior to construction of the Project; USCG has provided advanced approval
CWA Section 402—NPDES for stormwater associated with construction activity	HDOH–CWB	General application submitted by City
Community noise permit	HDOH–IRHB	Application for first segment submitted by City
Community noise variance	HDOH–IRHB	Application for first segment submitted by City
CZM Program consistency determination—Section 404	DBEDT–OP	City will submit application prior to construction of the Project
CZM Program consistency determination—FTA funds	DBEDT–OP	Application will be submitted by City following submittal of FTA New Starts FFGA application
Special management area (Figure 4-80)	DPP–LUPD	Application submitted by City; public hearing to take place soon after Final EIS is available
Special district permit	DPP–LUPD	Application will be submitted by the City when project design in vicinity of Chinatown and Capital Special Districts matures
Project eligibility permit and development permit	HCDA	Application will be submitted by the City when project design in vicinity of Kaka`ako matures
Agreement for storm drain connection to existing MS4—construction, dewatering, and operation; right-of-way access to construct Project (use and occupancy)	HDOT–Highways; Airport	City and HDOT working on master agreement to be completed prior to construction in highway and airport property
Agreement for storm drain connection to existing MS4—construction, dewatering, and operation; right-of-way access to construct Project	University of Hawai`i	City working with University to secure easement
Agreement for storm drain connection to existing MS4—construction, dewatering, and operation; right-of-way to construct Project	U.S. Navy	City will seek an easement on Navy property

Table 4-40 List of Anticipated Permits, Approvals and Agreements (continued on next page)

Type of Permit, Approval, or Agreement	Granting Agency	Responsible Party and Status
Utility engineering agreement	Private and public utility companies	Submitted by the City as segment designs become available
Final Design Phase		
City one-time review of construction plans	Various City agencies	To be submitted by contractor by construction segment as designs become available
Sewer connection	DPP–SDD/Wastewater	To be submitted by contractor by construction segment as designs become available
Permit for storm drain connection	DES; DPP–SDD/Civil Engineering	To be submitted by contractor by construction segment as designs become available
Interstate airspace use approval for crossing: H-1 Freeway in Pearl City; H-1 Freeway in `Aiea; H-2 Freeway in Pearl City; H-1 Freeway Koko Head-bound lanes near Honolulu Airport; H-201 Freeway access ramp near Aloha Stadium; H-1 Freeway access ramps near Pearl Harbor Naval Base; and H-1 Freeway access ramps at Ke`ehi Interchange	FHWA	To be submitted by City prior to construction
FAA Part 77	FAA	To be submitted by City by construction segment as designs become available
Interstate access modification	FHWA	To be submitted by City by construction segment as designs become available
Waiver to construct in runway protect zone	HDOT–Airport (submitted to FAA)	To be submitted by contractor within two years of intended construction of airport portion of the Project
Utility construction agreement	Private and public utility companies	Submitted by the City as segment designs become available
Final design subdivision/easement	DPP–SDD/Subdivision	City to submit subdivisions and easements for each construction segment when final design is complete and before construction of segment begins
Flood hazard district compliance	DPP–SDD/Subdivision	City to submit documents as required to comply with Flood Hazard District Regulation (Article 9. Special District Regulations, Section 21-9.10) before construction of segment begins
Building permit—for work outside of right-of-way	DPP–BD	To be submitted by contractor by construction segment as designs become available
Construction Phase		
CWA Section 402—NPDES for dewatering discharges	HDOH–CWB; DPP–SDD/Civil Engineering	To be prepared and submitted by contractors as needed
CWA Section 402—NPDES for hydrotesting discharges	HDOH–CWB	To be prepared and submitted by contractors as needed
Underground injection control	HDOH–SDWB	To be prepared and submitted as required by project designs
Permit to perform work upon state highways	HDOT–Highways	To be prepared and submitted by contractors
Street usage permit—for city streets	DTS	To be prepared and submitted by contractors

Table 4-40 List of Anticipated Permits, Approvals and Agreements (continued from previous page)

Type of Permit, Approval, or Agreement	Granting Agency	Responsible Party and Status
Grading, grubbing, stockpiling, trenching	DPP–SDD/Civil Engineering	To be prepared and submitted by contractors
Construction to cross or enter the state energy corridor	HDOT–Harbors	To be prepared and submitted by contractors as needed
Landscape plans affecting HDOT roadways	HDOT	To be prepared and submitted by contractors as needed
Operation Phase		
Agreement for operation phase stormwater discharge	DES	DTS and DES will submit MS4 to HDOH prior to initiation of operation of the Project

CWA	Clean Water Act
CZM	Hawai`i Coastal Zone Management
DBEDT–OP	State of Hawai`i Department of Business, Economic Development and Tourism, Office of Planning
DES	City and County of Honolulu, Department of Environmental Services
DLNR–Water Commission	State of Hawai`i Department of Land and Natural Resources, Commission on Water Resource Management
DPP–BD	City and County of Honolulu, Department of Planning and Permitting, Building Division
DPP–LUPD	City and County of Honolulu, Department of Planning and Permitting, Land Use Permits Division
DPP–SDD/Civil Engineering	City and County of Honolulu, Department of Planning and Permitting, Site Development Division, Civil Engineering Branch
DPP–SDD/Subdivision	City and County of Honolulu, Department of Planning and Permitting, Site Development Division, Subdivision Branch
DPP–SDD/Wastewater	City and County of Honolulu, Department of Planning and Permitting, Site Development Division, Wastewater Branch
DTS	City and County of Honolulu, Department of Transportation Services
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FFGA	Full Funding Grant Agreement
FHWA	Federal Highway Administration
HCDA	State of Hawai`i, Hawai`i Community Development Authority
HDOH–CWB	State of Hawai`i Department of Health, Environmental Management Division, Clean Water Branch
HDOH–IRHB	State of Hawai`i Department of Health, Environmental Health Services Division, Indoor and Radiological Health Branch
HDOH–SDWB	State of Hawai`i Department of Health, Environmental Management Division, Safe Drinking Water Branch
HDOT–Airport	State of Hawai`i Department of Transportation, Airport Division
HDOT–Harbors	State of Hawai`i Department of Transportation, Harbors Division
HDOT–Highways	State of Hawai`i Department of Transportation, Highways Division
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDHS	U.S. Department of Homeland Security

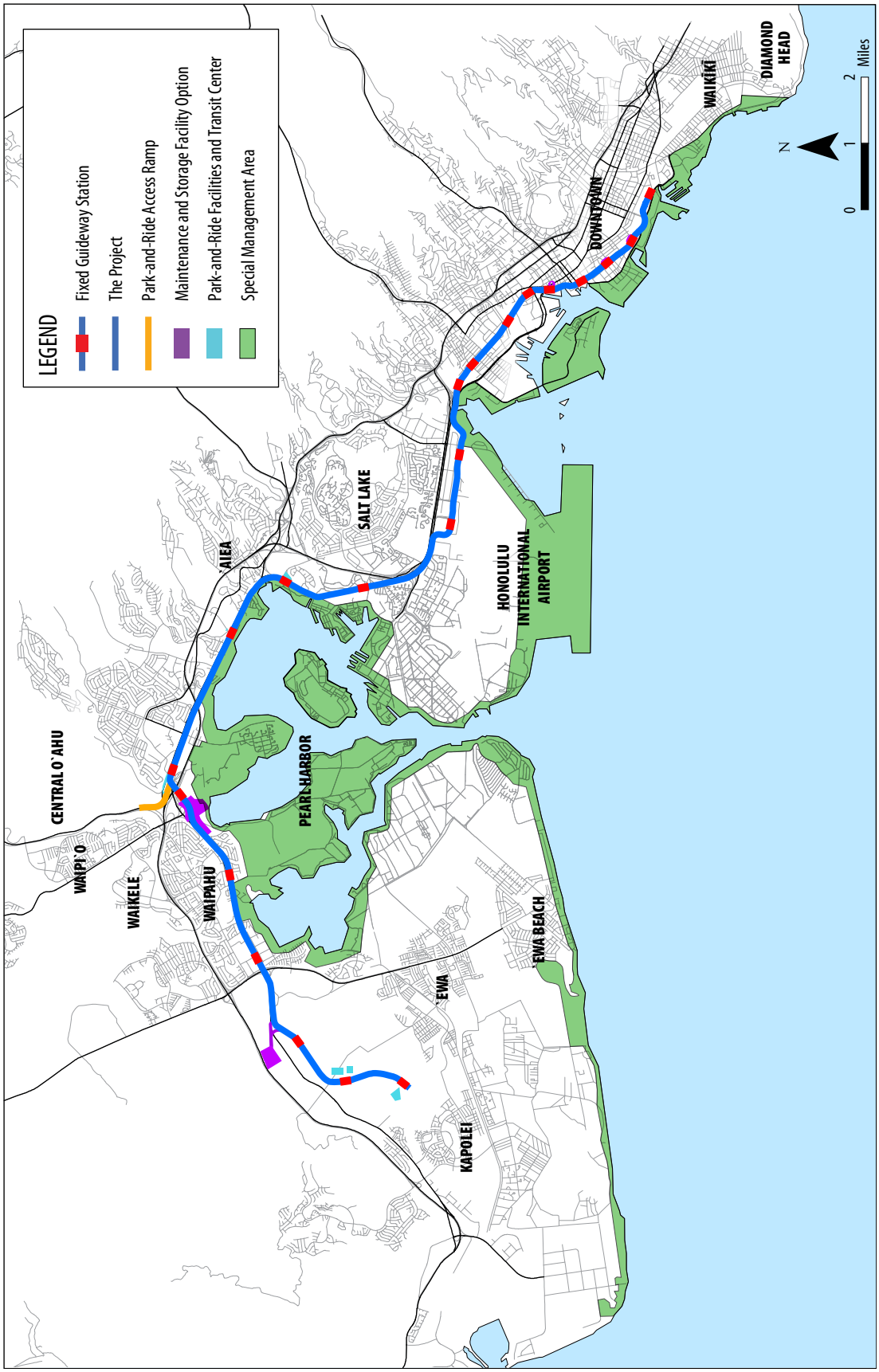


Figure 4-81 Special Management Area

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