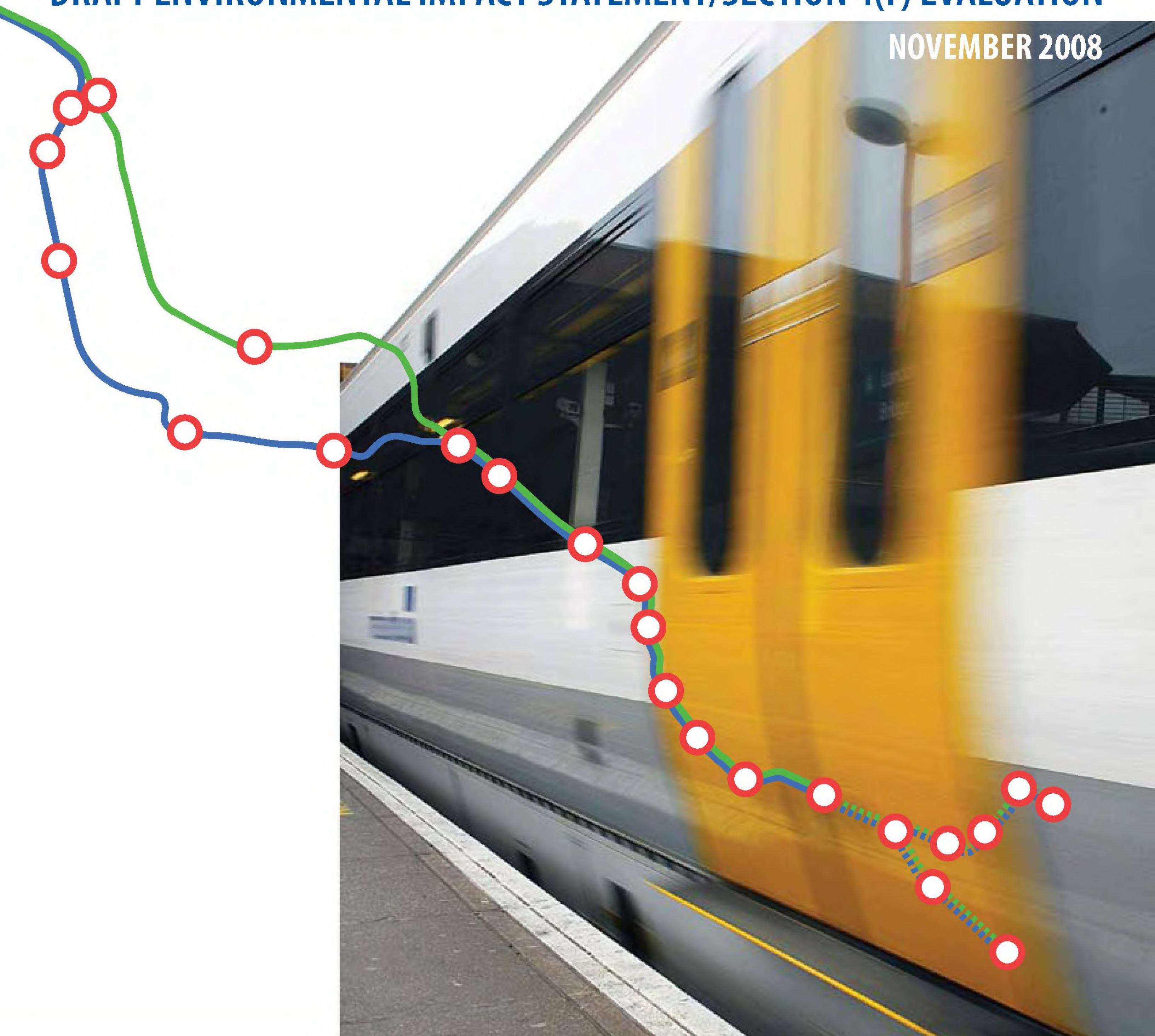
Honolulu High-Capacity Transit Corridor Project

DRAFT ENVIRONMENTAL IMPACT STATEMENT/SECTION 4(f) EVALUATION

NOVEMBER 2008



U.S. Department of Transportation
Federal Transit Administration

City and County of Honolulu
State of Hawaii

Honolulu High-Capacity Transit Corridor Project

City and County of Honolulu, O`ahu, Hawai`i

Draft Environmental Impact Statement/Section 4(f) Evaluation

Submitted pursuant to 49 USC 1601 et seq., 16 USC 470(f), 49 USC 303, 42 USC 4332(2)(c), 23 CFR 771, and Hawai'i Revised Statutes Chapter 343.

by the

U.S. Department of Transportation Federal Transit Administration
City and County of Honolulu Department of Transportation Services

in cooperation with the

U.S. Department of Defense (U.S. Army Corps of Engineers)
U.S. Department of Defense (U.S. Army Garrison—Hawai'i)
U.S. Department of Homeland Security (U.S. Coast Guard—14th Coast Guard District)
U.S. Department of Transportation Federal Highway Administration
State of Hawai'i Department of Transportation

OCT 2 9 2008

Date of Approval

Leslie T. Rogers

Regional Administrator
U.S. Department of Transportation
Federal Transit Administration

October 29, 2008

Date of Approval

Wayne Y. Yoshioka

Director, Department of Transportation Services
City and County of Honolulu

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Abstract

This Draft Environmental Impact Statement/Section 4(f) Evaluation identifies the current and future need to address mobility and travel reliability issues, to support transportation and land use planning policies, and improve transportation equity in the corridor between Kapolei and the University of Hawai'i at Mānoa on the Island of O'ahu in the State of Hawai'i. In compliance with the National Environmental Policy Act, this document considers a No Build and three Build Alternatives that would provide high-capacity transit service in the corridor between East Kapolei and Ala Moana Center. The alternatives range between 19 and 25 miles of elevated guideway and include transit stations, park-and-ride facilities, a maintenance and storage facility, and other ancillary facilities to support the transit system. This document evaluates the transportation effects and potential consequences on the natural and human environment, including effects on land use and economic activity; communities and neighborhoods; air quality and energy; noise and vibration; hazardous materials; natural resources; water quality; and archaeological, cultural, and historic resources. Financial implications of construction and operation of the proposed transit system are also evaluated. This document also includes a Section 4(f) Evaluation in compliance with the U.S. Department of Transportation Act of 1966.

Comments

Comments are requested by January 7, 2009, and should be returned to Mr. Matley and Mr. Yoshioka at the above address. A DVD of the document is available at no cost. The document is available on the project website at honolulutransit.org and may be reviewed at the following locations:

- City and County of Honolulu Municipal Library
- All O'ahu public libraries
- City and County of Honolulu Department of Transportation Services, 650 South King Street, 3rd floor
- City and County of Honolulu Department of Transportation Services, Rapid Transit Division, 1099 Alakea Street, 17th floor

Printed copies of the document are available for purchase.

State of Hawai`i Chapter 343 Draft EIS Summary Sheet

Description of Project	The Project would provide high-capacity transit service on O`ahu in the travel corridor between Kapolei and the University of Hawai`i at Mānoa (UH Mānoa)
Substantial Beneficial and Adverse Effects	• Improve transit access, speed and reliability • Improve access to planned development • Increase travel options for transit dependent, limited income and aging populations • Moderate future traffic congestion • Reduce air pollutant emissions • Reduce transportation energy use • Loss of parking, turn lanes and bicycle lanes in some locations • Right-of-way acquisition and displacement in some locations along the alignment • Changes to views associated with an elevated guideway, light, glare, and shadows • Noise impacts • Prune, remove, and transplant street trees • Adverse effects to historic and cultural resources • Temporary adverse effects during construction for access, noise, and traffic
Proposed Mitigation Measures	• Incorporate new traffic management into design, replace some parking in lots • Provide relocation assistance for displaced residents and businesses • Minimize visual impacts with project design • Noise mitigation, such as sound-absorptive materials • Transplant or replant street trees • Relocation assistance for cultural practices • Measures to avoid, minimize, and mitigate harm to historic resources, such as Historic American Building Surveys
Alternatives Considered	• No Build Alternative • Salt Lake Alternative • Airport Alternative • Airport & Salt Lake Alternative
Unresolved Issues	• Preferred alternative • Selection of the site of the maintenance and storage facility • Mitigation of adverse impacts to the natural and built environment during construction and operation • Historic resource effect determination
Compatibility with Plans and Policies	The Build Alternatives would be consistent with adopted State and Local government transportation and land use plans and policies.
Permits and Approvals	• Archaeological Inventory Survey Plan • Archaeological Resource Protection Permit • Certificate of Inclusion HDLNR (Division of Forestry and Wildlife) • Clean Water Act Section 404 • Coastal Zone Management • Drainage Injection Well • Farmland Conversion Impact Rating • Floodplain Management and Protection Approval • Jurisdictional Determination Clean Water Act Section 401 • National Pollutant Discharge Elimination System (Dewatering) • National Pollutant Discharge Elimination System (General) • Noise Variance • Road Closure • Section 10 • Section 106 Memorandum of Agreement • Sole Source Aquifer • Stream Channel Alteration

October 30, 2008
Date

Director, Department of Transportation Services
City and County of Honolulu

This document was prepared under my direction or supervision. The information, to the best of my knowledge, fully addresses document content requirements of HAR Section 11-200-17 and 11-200-18, as applicable.

Preface

Purpose of the Draft Environmental Impact Statement

The purpose of this Draft Environmental Impact Statement (EIS) is to provide the City and County of Honolulu Department of Transportation Services Rapid Transit Division (RTD), the Federal Transit Administration (FTA), and the public and interested parties with the information necessary to make an informed decision, based on a full and open analysis of costs, benefits, and environmental impacts of alternatives considered. Prior to this Draft EIS, the *Honolulu High-Capacity Transit Corridor Project Alternatives Analysis Report* (DTS 2006b) was completed in 2006. After review of the Alternatives Analysis Report and consideration of public comments, the Council of the City and County of Honolulu selected the Locally Preferred Alternative to be a fixed guideway project from Kapolei to the University of Hawai'i at Mānoa (UH Mānoa) with a connection to Waikīkī. The City Council directed the first construction project to be fiscally constrained to anticipated funding sources. The First Project was defined as extending from East Kapolei to Ala Moana Center via Salt Lake Boulevard.

A Hawai'i Revised Statutes Chapter 343 EIS preparation notice was issued for this Project on December 8, 2005. The Notice of Intent to prepare this Draft EIS was published in the *Federal Register* on March 15, 2007. After distribution of the Draft EIS for public and agency review, a public hearing will be held to receive comments from the public and agencies. A Final EIS will then be prepared, which will respond to the comments received. A recommended alternative will be identified. Following publication of the Final EIS, the Governor of Hawai'i will accept the EIS and the FTA will sign a Record of Decision. The Record of Decision will summarize the alternatives considered, factors that support selection of the recommended alternative, and commitments to measures that mitigate substantial environmental impacts.

The Honolulu High-Capacity Transit Corridor Project would provide high-capacity transit service in the travel corridor between Kapolei and UH Mānoa on O'ahu. This corridor includes the majority of housing and employment on O'ahu. The east-west length of the corridor is approximately 23 miles. The north-south width is at most 4 miles, because much of the corridor is constrained by the Koʻolau and Waiʻanae Mountain Ranges to the north and the Pacific Ocean to the south. This document discusses 34 miles of guideway within the 23-mile corridor included in the Locally Preferred Alternative selected by the City Council. However, the detailed environmental analysis and documentation applies to the core 19-mile alignment between East Kapolei and Ala Moana Center. Future planned extensions are from East Kapolei to West Kapolei and from Ala Moana Center to UH Mānoa and to Waikīkī. These future planned extensions are addressed as cumulative effects in Section 3.6, Cumulative Transportation System Effects, and Section 4.18, Indirect and Cumulative Effects.

This document builds on the finding of the Alternatives Analysis Report, follows FTA planning and guidance, and provides information on the four alternatives studied:

- No Build Alternative
- Fixed Guideway Transit Alternative via Salt Lake Boulevard (Salt Lake Alternative)
- Fixed Guideway Transit Alternative via the Airport (Airport Alternative)
- Fixed Guideway Transit Alternative via the Airport & Salt Lake (Airport & Salt Lake Alternative)

The Project is proposed to be constructed in the following four phases (Figure 2-44):

- East Kapolei to Pearl Highlands
- Pearl Highlands to Aloha Stadium
- Aloha Stadium to Middle Street
- Middle Street to Ala Moana Center

For the Airport & Salt Lake Alternative, the section between East Kapolei and Ala Moana Center along Salt Lake Boulevard would be constructed first, followed by the connection from the Middle Street Transit Center to the Honolulu International Airport, and finally the connection from the Airport to Aloha Stadium.

This document is a joint NEPA and Hawaiʻi Revised Statutes Chapter 343 Draft EIS. It is intended to provide decision-makers and the public with information on the Project's environmental impacts and benefits. It also serves as documentation of the coordination conducted in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, and as the Draft Section 4(f) Evaluation prepared under Section 4(f) of the Department of Transportation Act of 1966.

Organization of the Draft Environmental Impact Statement

This document is divided into two volumes. This volume contains the Draft EIS, which consists of the following eight Chapters:

Chapter 1 discusses the Project's background, describes the study corridor from Kapolei to UH Mānoa and Waikīkī, and explains the Purpose and Need for the fixed guideway project.

Chapter 2 details the alternatives and technologies considered during the screening and selection process and summarizes the alternatives considered during and after the Alternatives Analysis process.

Chapter 3 describes existing and future transportation conditions in the study corridor, presents consequences, and discusses proposed mitigation for potential transportation impacts.

Chapter 4 describes existing and future environmental conditions, presents consequences, and discusses proposed mitigation for the potential environmental impacts of all the alternatives.

Chapter 5 discusses the Project's effects on public parks, recreation areas, and historic properties to support determinations required to comply with the provisions of the U.S. Department of Transportation Act of 1966 (commonly referred to as Section 4(f)).

Chapter 6 presents the various funding sources and estimated capital and operating costs.

Chapter 7 compares the alternatives based on the information in Chapters 3 through 6.

Chapter 8 discusses the overall public outreach and agency coordination components.

Volume II consists of electronic files for the appendices referenced in the Draft EIS. The CD is located at the end of this volume. Technical reports supporting the analysis presented in this Draft EIS are available for review from the City and County of Honolulu.

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Figures

Tables

AASHTO	American Association of State Highway and Transportation Officials
ACHP	Advisory Council on Historic Preservation
APE	Area of Potential Effect (applies to cultural resources only)
AST	aboveground storage tank
AVO	average vehicle occupancy
BMP	Best Management Practice(s)
BRT	Bus Rapid Transit
BTU	British thermal unit
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CFR	Code of Federal Regulations
City	City and County of Honolulu
CO	carbon monoxide
CPI-U	Consumer Price Index for all Urban Consumers
CWA	Clean Water Act
CZM	Coastal Zone Management
dB	decibels
dBA	A-weighted decibels
DBEDT	State of Hawai`i Department of Business, Economic Development and Tourism
DBFS	City and County of Honolulu Department of Budget and Fiscal Services
HCDA	Hawaiian Community Development Authority
DFM	City and County of Honolulu Department of Facility Maintenance
DHHL	State of Hawai`i Department of Hawaiian Home Lands
DLNR-DOFAW	Department of Land and Natural Resources, Division of Forestry and Wildlife
DPP	City and County of Honolulu Department of Planning and Permitting
DPR	City and County of Honolulu Department of Parks and Recreation
DTS	City and County of Honolulu Department of Transportation Services
EIS	environmental impact statement
EJ	Environmental Justice
EMF	electric and magnetic field

EPA	U.S. Environmental Protection Agency
ESA	environmental site assessment
\`Ewa (direction)	toward the west (see also Wai\`anae)
FFGA	Full Funding Grant Agreement
FHWA	Federal Highway Administration
ft	feet
FTA	Federal Transit Administration
FY	fiscal year
GET	general excise and use tax
GIS	Geographic Information System
H-1	Interstate Route H-1 (the H-1 Freeway)
H-2	Interstate Route H-2 (the H-2 Freeway)
H-3	Interstate Route H-3 (the H-3 Freeway)
HAR	Hawai\`i Administrative Rules
HART	Honolulu Area Rail Rapid Transit
HBMP	Hawai\`i Biodiversity and Mapping Program
HDCA	Hawai'i Community Development Authority
HCP	Habitat Conservation Plan
HDLNR	State of Hawai\`i Department of Land and Natural Resources
HDOH	State of Hawai\`i Department of Health
HDOT	State of Hawai\`i Department of Transportation
HECO	Hawaiian Electric Company
HOV	high-occupancy vehicle
HRS	Hawai\`i Revised Statutes
HRT	Honolulu Rapid-Transit Development
HRT&L	Honolulu Rapid Transit & Land Company
HUD	U.S. Department of Housing and Urban Development
IVT	in-vehicle time
kg	kilogram
Koko Head (direction)	toward the east
kV	kilovolts
Ldn	day/night noise level (descriptor of daily noise environment; incorporates a penalty for high noise levels at night)
Leq	equivalent sound level (common environmental noise descriptor)
Leq(h)	hourly equivalent sound level

Lmax	maximum noise level during an event
LOS	level-of-service
LPA	Locally Preferred Alternative
LWCF	Land and Water Conservation Fund
makai (direction)	toward the sea
mauka (direction)	toward the mountains
MBTA	Migratory Bird Treaty Act
MBTU	million British thermal units
$\mu g/m^3$	micrograms per cubic meter
MOA	Memorandum of Agreement
MOT	Maintenance of Traffic (Plan)
mph	miles per hour
MSAT	mobile source air toxics
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHL	National Historic Landmark
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NOAA/FS	National Oceanic and Atmospheric Administration National Marine Fisheries Service
NOI	Notice of Intent
NO_x	nitrogen oxides
NPDES	National Pollution Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
O&M	operating and maintenance
O_3	ozone
O`ahuMPO	O`ahu Metropolitan Planning Organization
OEQC	State of Hawai‘i Office of Environmental Quality Control
OR&L	O`ahu Railway and Land Company
ORTP	O`ahu Regional Transportation Plan 2030
OTS	O`ahu Transit Services, Inc.
PA	Programmatic Agreement
Pb	lead

PE	preliminary engineering
PEEP	Preliminary Engineering and Evaluation Program
PIP	Public Involvement Plan
PM_{10}	particulate matter smaller than or equal to 10 microns in size
$PM_{2.5}$	particulate matter smaller than or equal to 2.5 microns in size
ppm	parts per million
PUC	Primary Urban Center
ROH	Revised Ordinances of Honolulu
RTD	City and County of Honolulu Department of Transportation Services Rapid Transit Division
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act—A Legacy for Users
Section 106	Section 106 of the National Historic Preservation Act of 1966, as amended (16 USC 470)
Section 4(f)	Section 4(f) of the U.S. Department of Transportation Act (USC 1653[f])
SHPD	State Historic Preservation Division
SO_2	sulfur dioxide
SR	State Route
SSMP	Safety and Security Management Plan
TAA	Transportation Analysis Area
TCP	Traditional Cultural Properties
TDM	Transportation Demand Management
TMK	Tax Map Key
TMP	Transit Mitigation Program
TOD	transit-oriented development
TPSS	traction power substation
TSD	transit-supportive development
TSM	Transportation System Management
UH	University of Hawai`i
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USDOE	U.S. Department of Energy
USDOT	U.S. Department of Transportation
USFWS	U.S. Fish and Wildlife Service

USHHS	U.S. Department of Health and Human Services
UST	underground storage tank
V/C	volume-to-capacity
VdB	vibration decibels (measure of vibration velocity)
VHD	vehicle hours of delay
VHT	vehicle hours traveled
VMT	vehicle miles traveled
VOC	volatile organic compounds
vph	vehicles per hour
Wai`anae (direction)	toward the west (see also `Ewa)
YOE	year of expenditure

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Executive Summary

The U.S. Department of Transportation Federal Transit Administration (FTA) and the City and County of Honolulu Department of Transportation Services Rapid Transit Division (RTD) are considering a project that would provide high-capacity transit service on the Island of O‘ahu.

The study corridor extends from Kapolei in the west (the Wai‘anae or ‘Ewa direction) to the University of Hawai‘i at Mānoa (UH Mānoa) in the east (the Koko Head direction). It is confined by the Wai‘anae and Ko‘olau Mountain Ranges in the mauka direction (toward the mountains, generally to the north within the study corridor) and the Pacific Ocean in the makai direction (toward the sea, generally to the south within the study corridor) (Figure S-1). This corridor includes the majority of housing and employment on O‘ahu. Its east-west length is approximately 23 miles, and between Pearl City and ‘Aiea its width is less than one mile between Pearl Harbor and the base of the Ko‘olau Mountains.

Purpose of and Need for Transportation Improvements

The purpose of the Honolulu High-Capacity Transit Corridor Project is to provide high-capacity rapid transit in the highly congested east-west transportation corridor between Kapolei and UH Mānoa, as specified in the *O‘ahu Regional Transportation Plan 2030* (ORTP) (O‘ahuMPO 2007). The Project is intended to provide faster, more reliable public transportation service than can be achieved with buses operating in congested mixed-flow traffic. It would provide reliable mobility in areas of the corridor where people of limited income and an aging population live and would serve rapidly developing areas of the corridor. The Project would also provide additional transit capacity and an alternative to private automobile travel, as well as improve transit links within the corridor. In conjunction with other improvements included in the ORTP, the Project would help moderate anticipated traffic congestion in the corridor. It also supports the goals of the *City and County of Honolulu General Plan* (DPP 2002a) and the ORTP by serving areas designated for urban growth.

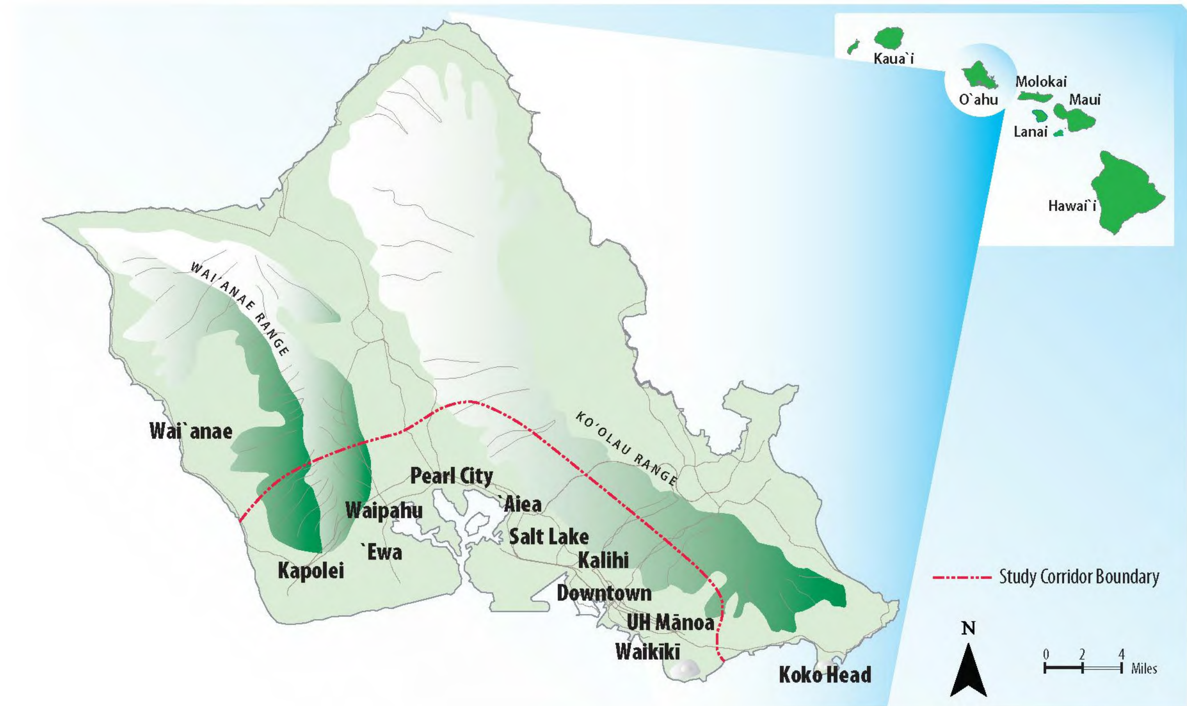


Figure S-1 Honolulu High-Capacity Transit Corridor Project Vicinity

The project would improve mobility for travelers who face increasingly severe traffic congestion, improve transportation system reliability, provide accessibility to new development in the ‘Ewa-Kapolei-Makakilo area in support of the City's policy to develop this as a "second city," and improve transportation equity for all travelers.

Alternatives Considered

Prior to completing this Draft Environmental Impact Statement (EIS), alternatives were evaluated at three stages. First, a broad range of alternatives was considered and screened to four alternatives for evaluation in the Alternatives Analysis. Second, the *Honolulu High-Capacity Transit Corridor Project Alternatives Analysis Report* (DTS 2006b) recommended (and the City Council selected) the Fixed Guideway Alternative as the Locally Preferred Alternative. Third, scoping for the National Environmental Policy Act (NEPA) process confirmed that no alternatives that had not been previously studied and eliminated for good cause would satisfy the Purpose and Need at less cost, with greater effectiveness, or with less environmental or community impact.

During the fall of 2005 and winter of 2006, the City and County of Honolulu (City) conducted an alternatives screening. This is documented in the *Honolulu High-Capacity Transit Corridor Project Alternatives Screening Memorandum* (DTS 2006a).

Scoping is an open process involving the public and other Federal, state, and local agencies to identify the important issues for consideration in the EIS process.

The alternatives were screened through a series of steps, including gathering data, creating a comprehensive list of potential alternatives, developing screening criteria, and presenting viable alternatives to the public and interested public agencies and officials for comment during the Hawai'i Revised Statutes (HRS) Chapter 343 (the State of Hawai'i's environmental impact statement law) preparation notice comment period and the Alternatives Analysis scoping process. Lastly, input from the scoping process was analyzed, and the alternatives were refined based on this input.

Once this evaluation was complete, the modal, technology, and alignment options were combined to create the following alternatives, which were evaluated in the Alternatives Analysis Report:

- **No Build Alternative**
- **Transportation System Management Alternative**
- **Managed Lane Alternative**
  - Two-Direction Option
  - Reversible Option
- **Fixed Guideway Alternative**
  - Kalaeloa-Salt Lake–North King–Hotel Option
  - Kamokila–Airport–Dillingham Option
  - Kalaeloa–Airport–Dillingham–Halekauwila Option

Chapter 2 of the Alternatives Analysis Report describes these alternatives in detail, and Chapter 6 of that report compares them. After review of the Alternatives Analysis Report and consideration of public comments, the City Council selected a Locally Preferred Alternative that was signed into law by the Mayor, becoming Ordinance 07-001. This ordinance authorized the City to proceed with planning and engineering of a fixed guideway project from Kapolei to UH Mānoa with an extension to Waikīkī. The City Council also passed Resolution 07-039, which directed the first construction project to be fiscally constrained to anticipated funding sources and to extend from East Kapolei to Ala Moana Center via Salt Lake Boulevard.

During the NEPA scoping process, several scoping comments were received requesting reconsideration of the Managed Lane Alternative. This was considered and rejected during the Alternatives Analysis process. Because no new information was provided that would have substantially changed the findings of the Alternatives Analysis process regarding the Managed Lane Alternative, this alternative is not included in this Draft EIS.

In addition to suggestions to reconsider previously eliminated alternatives, three separate proposals were received and documented in the *Honolulu High-Capacity Transit Corridor Project National Environmental Policy Act Scoping Report* (DTS 2007). One proposal was to provide additional bus service with either school buses or private vehicles. The second was for a High-Speed Bus Alternative to include aspects of the Fixed Guideway Alternative and the Managed Lane Alternative (which was eliminated during the Alternatives Analysis process). These proposals were similar to alternatives that had already been considered and eliminated during the Alternatives Analysis process. Therefore, they are not considered in this Draft EIS. The third proposal was for an additional fixed guideway alternative serving the Honolulu International Airport. This alternative is included in this Draft EIS.

During the scoping process, comments were requested on five transit technologies. The comments received did not substantially differentiate any of the following five considered technologies as being universally preferable to the other technologies:

- Light-rail transit
- Rapid-rail transit
- Rubber-tired guided vehicles
- Magnetic levitation system
- Monorail system

Subsequent to the scoping process, a technical review process that included opportunities for public comment was used to select a transit technology. This process included a broad request for information publicized to the transit industry. Transit vehicle manufacturers submitted 12 responses detailing the features of these different vehicle technologies. The responses were reviewed in February 2008 by a selection panel that ranked the performance, cost, and reliability of the proposed technologies and accepted public comment on the technology selection. The panel's findings are summarized in its report to the City Council dated February 22, 2008. The panel's report resulted in the City establishing steel wheel operating on steel rail as the technology for the Build Alternatives evaluated in this Draft EIS. This eliminated the other technologies from further consideration.

The alternatives evaluated in this Draft EIS are the result of this process of developing alternatives and reflect comments received during the scoping process. This information is summarized in the *Honolulu High-Capacity Transit Corridor Project National Environmental Policy Act Scoping Report* (DTS 2007).

The following four alternatives are evaluated in this Draft EIS. They were developed to comply with the Locally Preferred Alternative adopted by the City Council and to address the public and agency comments received during the comment period for the HRS 343 preparation notice for this project and the NEPA scoping process:

- No Build Alternative
- Fixed Guideway Transit Alternative via Salt Lake Boulevard (Salt Lake Alternative)
- Fixed Guideway Transit Alternative via the Airport (Airport Alternative)
- Fixed Guideway Transit Alternative via the Airport and Salt Lake (Airport & Salt Lake Alternative)

The No Build Alternative is included in this Draft EIS to provide a comparison of what future conditions would be if none of the Build Alternatives were implemented. This alternative includes completion of the committed transportation projects identified in the O'ahu Metropolitan Planning Organization (O'ahuMPO) ORTP.

The Build Alternatives would provide a fixed guideway transit system from East Kapolei to Ala Moana Center (the Project). Planned extensions are anticipated to West Kapolei, UH Mānoa, and Waikīkī. The Locally Preferred Alternative selected by the City Council includes the Project and the planned extensions. Detailed plans of the Project are included in Appendix A. The system would use steel-wheel-on-steel-rail technology and could be either automated or employ drivers. All parts of the system would either be elevated or in exclusive right-of-way. The guideway would follow the same alignment for all Build Alternatives through most of the study corridor, except between Aloha Stadium and Kalihi.

In addition to the guideway, the Project would require construction of transit stations and supporting facilities. Supporting facilities would include a vehicle maintenance and storage facility, transit centers, park-and-ride lots, and traction power substations. The maintenance and storage facility would be located either in Ho'opili near Farrington Highway between North-South Road and Fort Weaver Road or near Leeward Community College.

Some bus service would be reconfigured to bring riders on local buses to nearby fixed guideway transit stations. To support this system, the bus fleet would be increased. All Build Alternatives assume completion of the committed transportation projects identified in the ORTP.

Geographic areas of effect are typically discussed in four categories:

- **Project Region**—the entire Island of O'ahu
- **Study Corridor**—the southern coast of O'ahu where the Project would be located
- **Project Station Area**—all areas within one-half mile of a proposed project station

- **Project Alignment**—the fixed guideway's proposed route and properties adjacent to the alignment

Transportation

Existing and future (planning horizon year 2030) transportation system conditions, service characteristics, performance, and transportation effects for each of the alternatives (including the No Build Alternative) were evaluated. This evaluation was organized into four sections:

- Existing (2007) conditions and performance
- Future (2030) No Build conditions and performance, with comparisons made to existing conditions
- Future (2030) Build Alternatives conditions and performance, with comparisons made to 2030 No Build conditions
- Construction-related effects

The existing transportation network (streets, highways, parking, bicycle and pedestrian network, and public transportation) was evaluated. Current transit service in the corridor is heavily used, resulting in bus service productivity that is among the highest in the U.S. Congestion-related delays occur on roadways within the study corridor. This includes peak a.m. and p.m. congestion, especially in the peak direction (i.e., toward Downtown in the morning) and on existing HOV lanes.

These congestion-related delays increase travel times for the entire network; and increasing congestion and constrained operating conditions for public transit services have led to transportation conditions that are becoming less reliable. Although the bus system's productivity exceeds several systems that operate in larger metropolitan areas, gradually slower speeds, increased costs, and reduced service reliability have resulted from buses operating in mixed traffic. Even with the $3 billion in planned roadway improvements outlined in the ORTP, congestion will increase, making it more difficult for bus transit to effectively serve the population.

Under the No Build Alternative, transit service would experience somewhat slower operating speeds and reduced reliability through the 2030 horizon year.

Under the Build Alternatives, overall transit speeds would increase, which would reduce travel times and improve operating efficiency as a result of the fixed guideway system. The Build Alternatives would reduce travel time to major activity centers, such as Downtown and Ala Moana Center. For example, transit travel times from Kapolei to Ala Moana Center in the a.m. peak would be 105 minutes in 2030 with the No Build Alternative and between 57 and 59 minutes with the Build Alternatives. Trips to and from Central O'ahu and Waikīkī, while not directly served by the Project, also would benefit from reduced transit travel times.

Transit service would be improved through local bus routes and pedestrian and bicycle access to guideway stations, resulting in an increased transit share of total trips (particularly for work-related trips). A fixed guideway system would also improve transit equity by reducing travel times for transit-dependent populations to major employment areas. Total congestion would be reduced by 21 to 23 percent with the Build Alternatives.

With the Build Alternatives, the fixed guideway would affect existing streets, parking capacity, and pedestrian and bicycles facilities. Potential effects of the Project could include reduced travel lane widths, parking, bike lanes, and sidewalks. Careful design and placement of guideway columns would minimize these potential effects. The Build Alternatives would also have temporary effects on the transportation system, and mitigation would include a Maintenance of Traffic Plan and Transit Mitigation Plan.

Environmental Analysis, Consequences, and Mitigation

The study corridor's environmental aspects were analyzed, including existing conditions, future consequences, and required mitigation. All aspects of the natural and social environment were evaluated per NEPA and HRS 343 regulations. All probable adverse environmental effects and proposed mitigation measures are futher summarized in Table 4-1 of this Draft EIS.

Displacements and Relocations

Property acquisition ranging from 179 to 205 parcels would be required. The Project would require 34 or 35 full acquisitions, depending on the alternative selected. Partial acquisitions would range from 145 to 170 parcels. A partial acquisition could represent a portion of a parcel, possibly involving a structure or other facilities. However, for properties that would be partially acquired, existing land uses would not change.

Full acquisition of land used for residential and commercial purposes would result in displacements and relocations. Displaced residents would need to purchase or rent new dwellings. Displaced businesses would need to purchase or lease new commercial/industrial space, and the location where employees would work would change.

Depending on the alternative selected, 20 residences, 1 church, and between 62 and 67 businesses would be relocated by the Project. Acquisition of property for the Build Alternatives would be conducted in accordance with Federal and State regulations and procedures outlined in the *Real Estate Acquisition Management Plan* (RTD 2008q). Where relocations would occur, affected property owners, businesses, or residents would receive compensation in compliance with all applicable Federal and State laws. Compensation would be in accordance with the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act (CFR 1989).

Visual and Aesthetics

Visually sensitive resources in the study corridor include landmarks, significant views and vistas, historic and cultural sites, and Exceptional Trees. These resources are important because of their scenic quality, scale, and prominence within the visual environment.

The Project's potential visual effects include removing trees, altering 'Ewa-Koko Head and mauka-makai views, affecting light and shadow effects, and introducing project components that are out of scale or character with their setting.

Mitigation measures would focus on preserving visual resources and enhancing the project design to comply with applicable policies. The following measures would be included with the Project to minimize negative visual effects and enhance the visual and aesthetic opportunities that it creates:

- Develop and apply a Design Language Pattern Guidebook to establish a consistent design framework for the Project with consideration of local context
- Retain existing trees where practical and provide new vegetation
- Shield exterior lighting
- Coordinate the project design with transit-oriented development planning
- Consult with the public and local design community regarding design theme

Noise and Vibration

Noise impacts from the Project were evaluated using criteria established by the FTA, which are based on community reaction to environmental noise exposure (FTA 2006b).

Noise levels were measured at locations along the Build Alternative alignments and near proposed station locations to establish the most sensitive existing environment (i.e., existing baseline noise levels). This was done by performing a series of measurements at representative locations. All noise measurements were made in accordance with American National Standards Institute procedures for community noise measurements.

Noise measurements were taken at ground-level and elevated noise-sensitive locations along the study corridor. Moderate noise impacts are anticipated at between 18 and 23 residential buildings, depending on the alternative selected. Potential noise effects from transit park-and-ride lots and maintenance and storage facility operations were also evaluated.

A solid parapet wall and vehicle wheel skirts would be included in the Project design to reduce noise levels. In areas with high-rise apartments and hotels that have lanais above the elevation of and facing the rail, this wall and the wheel skirts would have some benefit (between a 2- and 5-dBA noise reduction) at floors above the level of the guideway. Additional mitigation measures to reduce noise levels above the track elevation will be evaluated during preliminary engineering of the Project.

The Project would not create vibration effects, so no mitigation is proposed.

Hazardous Materials

A number of sites within the study corridor were identified as potential sites of concern for hazardous materials. In some locations, large or specialized hazardous waste or hazardous materials sites may be affected by right-of-way acquisition. These include underground and aboveground storage tanks (USTs and ASTs), fuel islands, and engineered storage facilities. In a few cases, the Project may displace hazardous materials operations. This includes relocating gas station fuel islands and USTs and ASTs. Environmental Site Assessments would be conducted for potentially contaminated sites, and remediation would be completed where needed.

Water Resources

Although floodplains and surface and marine waters are found at various sections of the study corridor, mitigation to control stormwater quality and quantity using permanent best management practices (BMPs) would promote a natural, low-maintenance, sustainable approach where possible. An integral part of all permanent BMPs is implementing an Inspection and Maintenance Plan to ensure that BMPs operate as designed. As part of the permitting process, written plans would be prepared to establish good housekeeping practices that would help prevent stormwater pollution.

Where the guideway would cross floodplains, the columns supporting the guideway and stations would be designed to withstand flooding, as necessary. Facilities in floodplains at ground level (e.g., stairs and elevators) would be designed to function and remain safe during flooding. Traction power substations would be placed outside of floodplains. Hydraulic studies for specific locations where the Project would cross floodplains would be performed during project design. If hydraulic studies reveal that piers in the floodway would raise base flood elevations, these increases may be avoided by the design. In particular, the Pearl Highlands parking structure would be designed to allow floodwaters to pass unimpeded.

Street Trees

Coordination regarding street trees has been initiated with the City Department of Parks and Recreation Division of Urban Forestry and community groups such as the Outdoor Circle and Sierra Club. This has resulted in identifying Exceptional Trees along the project alignment. Coordination will be ongoing as the Project progresses.

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

Effects on street trees would be mitigated by transplanting existing trees or planting new ones. Most of the trees along Farrington Highway that would be affected could be transplanted.

Archaeological, Cultural, and Historic Resources

Under the National Historic Preservation Act (NHPA) (USC 1966a), Section 106 requires Federal agencies to consider the effects of their actions on historic properties. This includes archaeological and traditional cultural properties, which are the beliefs, customs, and practices of a living community of people that have been passed down through the generations. Hawaiʻi's historic preservation review legislation (HAR 2002) includes similar requirements.

Known and potential historic resources were identified and evaluated, and the Project's effects on them were determined. Properties within the Area of Potential Effect (APE) were identified as those with construction dates before 1969. Field observations were made and photographs were taken of these properties.

Archaeological resources already documented within the study corridor include remnants of fishponds, human burials, subsurface layers related to traditional Native Hawaiian occupation, historic building and structure foundations, and historic trash pits and privies. Because of the level of existing development along the study corridor, many of these resources have been destroyed or altered beyond repair.

The analysis of cultural resources was based on compliance requirements for NEPA, NHPA Section 106, and Act 50 (HHB 2000), as it amends the State of Hawaiʻi EIS law (HRS 343) to include "effects on the cultural practices of the community and State."

The APE contains 84 historic resources (individual or districts). Up to 61 of the resources could be affected by the Project. Potential long-term effects on these resources include permanent modification (e.g., moving, damage, or destruction). The permanent destruction of sub-surface resources, including filled fishponds, filled/covered terraces, enclosures, shrines, and ʻauwai (irrigation ditch system) is another potential long-term impact. Full and partial acquisitions would occur from parcels that contain historic resources.

Because archaeological resources could be affected during construction, appropriate mitigation measures are discussed in the following Construction Effects section. Where cultural resources remain or may be discovered, all effort would be made to avoid destruction. A plan for restoration and care would be made for each existing cultural site. Mitigation measures for historic resources are being developed in consultation with the State Historic Preservation Division. The current project design avoids affecting historic resources wherever possible.

Construction Effects

Construction effects would be temporary and limited in area as construction proceeds along the project alignment. These effects would vary depending on the land use in each sub-area. Construction-related effects would primarily result during construction of the main structural components: the foundations and columns, superstructure (the elevated guideway structure), and stations. Construction of other system components, such as traction power substations, would also have associated effects, but to a lesser degree. Construction activities at the maintenance and storage facility, park-and-ride lots, transit centers, and staging and support facilities would result in effects that are localized to the vicinity of those facilities.

During construction, access to businesses near construction activities could be affected. Mitigation would be implemented to reduce adverse economic hardships on existing businesses along the project alignment during construction.

The construction contractors would implement a project-specific Safety and Security Management Plan to mitigate effects on community services, such as fire prevention and emergency preparedness and response. This plan would also protect the general public, private property, and workers from construction risks.

During construction, visual quality may be altered for all viewer groups. Construction-related signage and heavy equipment would be visible at and near construction sites. Mature vegetation, including trees, may be removed from some areas or pruned to accommodate construction of the guideway, stations, and park-and-ride lots. This would degrade or partially obstruct views or vistas.

Noise during construction would be bothersome and annoying to nearby residents, visitors, and businesses. All of the Build Alternatives would generate similar types of noise, which would occur intermittently in different locations throughout the construction period.

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

Various mitigation methods may be utilized to minimize noise and vibration impacts during construction.

Section 4(f)

Section 4(f) of the U.S. Department of Transportation Act of 1966 (USC 1966b) protects public parklands, recreational lands, wildlife refuges, and historic sites of National, State, or Local significance from acquisition and conversion to transportation use. Because avoiding Section 4(f) resources was an important consideration, most public parks, recreational resources, and historic properties identified within the study corridor were avoided in designing the Build Alternatives. However, the Project would result in the direct use of between seven and eight Section 4(f) resources. The Project would result in *de minimis* (of minimum importance) impacts on between six and seven Section 4(f) resources. No temporary or constructive use would occur.

Cost and Financial Analysis

The capital cost of the Build Alternatives, in fiscal year 2008 dollars, would range from $3.9 billion for the Salt Lake Alternative to $4.8 billion for the Airport & Salt Lake Alternative. The capital cost for the Airport Alternative is estimated to be about $200 million higher than the Salt Lake Alternative.

The local funding source for the Project is a dedicated 0.5-percent surcharge on the State of Hawai‘i’s General Excise and Use Tax (GET). This GET surcharge revenue is to be exclusively used for the Project’s capital and/or operating expenditures and is expected to generate $4.1 billion (year-of-expenditure dollars) through 2022. The FTA has agreed to consider $1.2 billion (year-of-expenditure dollars) for the Federal contribution to the Project from the New Starts program.

The City receives Federal assistance through various funding programs from the FTA for ongoing capital investments to maintain and overhaul its transportation system. The financial analysis performed assumes the City will continue to receive these funds, some of which would increase noticeably after implementation of the Project.

Comments and Coordination

Agencies, non-governmental groups, and the public have been engaged throughout the project planning process, as required by Federal and State law. Public involvement efforts, including agency coordination and consultation, have been continuous throughout the Project, beginning with the Alternatives Analysis phase in December 2005. In accordance with Executive Order 12898, particular attention has been paid to reaching low-income and minority populations, which are traditionally underserved and underrepresented in the public involvement process.

Public involvement in the form of opportunities for comment and information sharing will continue through the remainder of the Project. The public involvement effort will continue to make use of existing citizen groups, neighborhood boards, and a wide variety of community organizations to inform the public and allow for community input into the project process.

Consultation with the State Historic Preservation Division and other Section 106 consulting parties has been on-going and will continue.

As part of the NEPA and Chapter 343 process, the Draft EIS is being circulated for a 45-day review and comment period. A formal public hearing will also be held during this period. The hearing's purpose is to give interested parties an opportunity to formally submit comments on the Project and the analysis contained in the Draft EIS. Attendance at the hearings is not required to submit comments.

01

CHAPTER

Background, Purpose and Need

The U.S. Department of Transportation Federal Transit Administration (FTA) and City and County of Honolulu Department of Transportation Services (DTS) Rapid Transit Division (RTD) are considering a project that would provide high-capacity transit service on O'ahu. The study corridor extends from Kapolei to the University of Hawai'i at Mānoa (UH Mānoa) and Waikīkī (Figure 1-1). The east-west length of the study corridor is approximately 23 miles. The north-south width is about 4 miles, because much of the study corridor is constrained by the Ko'olau and Wai'anae Mountain Ranges to the north and the Pacific Ocean to the south.

1.1 History of the Honolulu High-Capacity Transit Corridor Project

1.1.1 Conditions Leading to the Project

Transit has a long history on O'ahu starting with the O'ahu Railway and Land Company (OR&L) system that carried passengers on approximately 150 miles of track between 1890 and 1947. The route structure included a line in the corridor between 'Ewa and Honolulu (Chiddix 2004). The Honolulu Rapid Transit and Land Company (HRT&L) began operating an electric streetcar system in Honolulu in 1903 and had more than 20 miles of lines in operation at its peak.

Roadway development, buses, and private automobile ownership decreased rail-transit demand throughout the United States, including Hawai'i, beginning in the 1920s. The HRT&L streetcars were completely replaced by buses in 1942. Increasing transportation demand was met in the 1950s with the development of Interstate Route H-1 (H-1 Freeway). Population, automobile ownership, and vehicle travel trends for O'ahu are shown in Figure 1-2.

Despite increasing travel demand, public opposition to extensive freeway expansion began to develop in the early 1960s. A proposal for an elevated Makai Freeway along the waterfront between Kalihi and Mō'ili'ili was abandoned because of a combination of public opposition, lack of funds, and ecological impacts. The 1967 islandwide *O'ahu Transportation Study* (OTPP 1967) concluded that a fixed guideway transit system, serving a corridor between Pearl City and Hawai'i Kai, would provide cost-effective transportation capacity as part of a

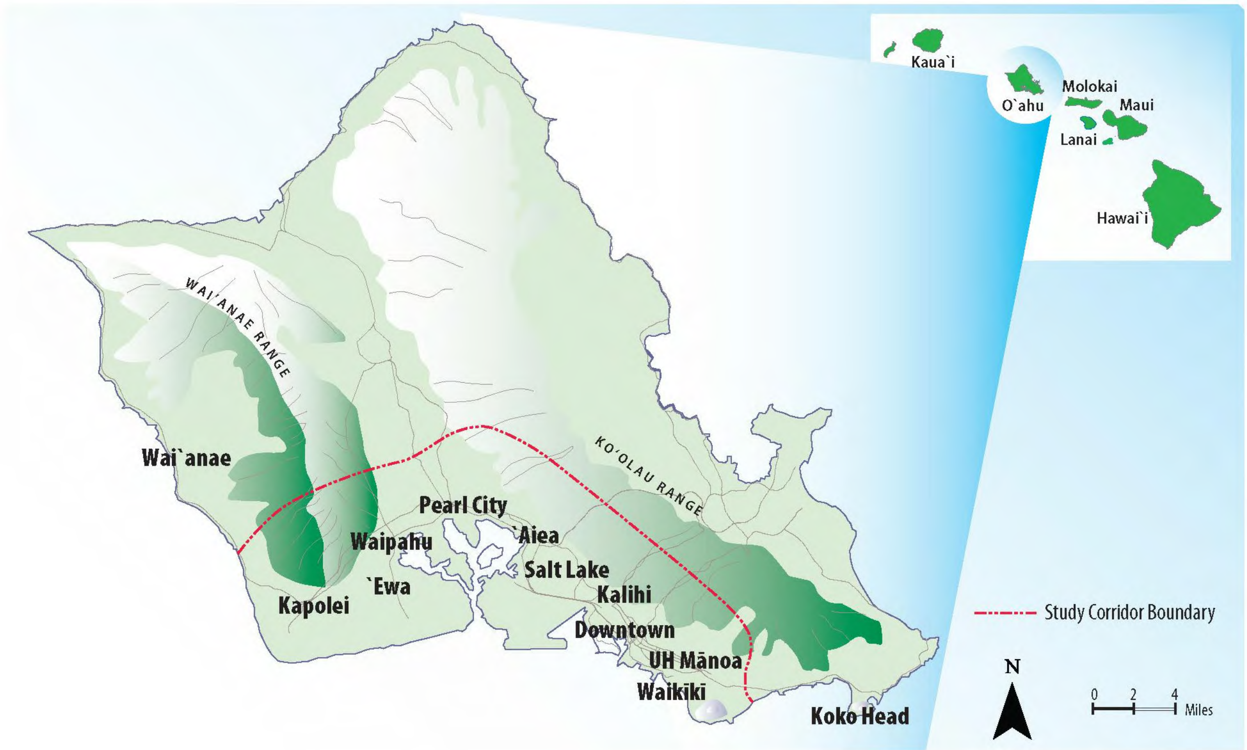
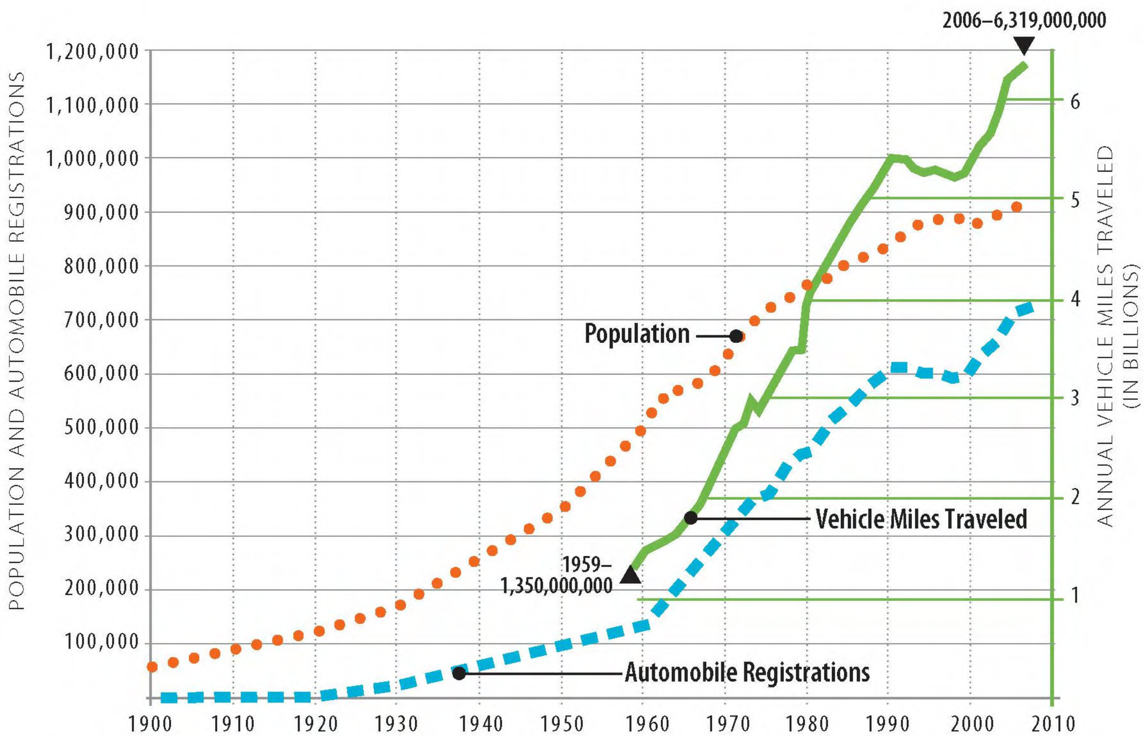


Figure 1-1 Honolulu High-Capacity Transit Corridor Project Vicinity



Source: City and County of Honolulu Department of Business, Economic Development and Tourism, 2007.

Figure 1-2 Population, Vehicle Ownership, and Vehicle Miles Traveled Trends for O`ahu larger transportation system expansion needed to meet increased demand.

During the early 1970s, the Preliminary Engineering and Evaluation Program (PEEP) I and PEEP II studies further explored options for a fixed guideway transit system. Based on these studies, the City and County of Honolulu (City) began planning the Honolulu Area Rail Rapid Transit (HART) Project to provide transit in the corridor from Pearl City to Hawai'i Kai. A change in City administration resulted in different transportation priorities, and work on the HART Project stopped.

In 1985, the City began a new study for an exclusive right-of-way, fixed-guideway rapid transit project. The Honolulu Rapid Transit Development (HRT) Project built on the planning completed for the HART Project but explored new automated transit technologies. In 1992, a Final Environmental Impact Statement (EIS) was issued for the HRT Project. However, the City Council failed to authorize the general use and excise tax (GET) surcharge to provide needed local funding and the project ended.

In 1998, the City began developing the *O'ahu Trans 2K Islandwide Mobility Concept Plan* (DTS 1998). Through an intensive public-involvement program, the plan identified the increasing need for improved mobility and links between land use and transportation. The plan endorsed an integrated transportation approach, with roadway, high-occupancy vehicle (HOV), and transit improvements. This study led to the Primary Corridor Transportation Project.

Unlike prior projects, the Primary Corridor Transportation Project focused on alternatives that could be constructed within existing transportation rights-of-way to provide mobility improvements at a lower cost and with fewer impacts than previous proposals. A Major Investment Study and Draft EIS was completed in 2000, which proposed a system based on bus rapid transit (BRT) operations.

Some of the facilities from the BRT system proposal were completed, including extension of the morning reversible-flow "zipper lane" for buses and HOVs on the H-1 Freeway between Radford Drive and the Ke'ehi Interchange, as well as additional transit stops.

As part of its work to update the Regional Transportation Plan, the O'ahu Metropolitan Planning Organization (O'ahuMPO) surveyed O'ahu residents about transportation issues in 2004. The survey results identified traffic congestion during the commute period in the study corridor extending from 'Ewa and Central O'ahu to Downtown Honolulu as the biggest concern. Nearly twice as many residents responded that improving transit was more important than building more roadways. Seventy percent of the respondents believed that rail rapid transit should be constructed as a long-term transportation solution, and 55 percent supported raising taxes to provide local funding for the system.

1.1.2 Progress of the Honolulu High-Capacity Transit Corridor Project

In 2005, the State Legislature recognized the need and public support for a high-capacity transit system on O'ahu and passed Act 247 (HRS 2005). The Act authorized the County to levy a GET surcharge to construct and operate a mass transit project serving O'ahu. The City Council subsequently adopted Ordinance 05-027 to levy a tax surcharge to fund public transportation. With dedicated, secure local funding established for the first time, the City began the Alternatives Analysis process to evaluate high-capacity transit alternatives in the study corridor between Kapolei and UH Mānoa. A range of alternatives was evaluated and screened to select alternatives that would provide the most improvement to person-mobility and travel reliability in the study corridor, while minimizing adverse social, economic, and environmental effects (see Chapter 2, Alternatives Considered).

The FTA published a Notice of Intent to Prepare an Alternatives Analysis in the *Federal Register* on December 7, 2005, and DTS published an EIS Preparation Notice for this project in the *State of Hawai'i Environmental Notice* on December 8, 2005. The public was asked to comment on the proposed alternatives, the Purpose and Need for the Project, and the range of issues to be evaluated at a series of scoping meetings in December 2005. Scoping activities related to the Alternatives Analysis and the Hawai'i Revised Statutes (HRS) Chapter 343 EIS preparation notice comment period processes were completed between December 2005 and January 2006.

Completed in October 2006, the *Honolulu High-Capacity Transit Corridor Project Alternatives Analysis Report* (Alternatives Analysis) (DTS 2006b) evaluated four alternatives to provide transit service in the study corridor between Kapolei and UH Mānoa:

- No Build
- Transportation System Management
- Express Buses Operating in Managed Lanes
- Fixed Guideway Transit System

After review of the Alternatives Analysis Report and consideration of nearly 3,000 comments received from the public, the City Council selected the Fixed Guideway Transit System Alternative, including an alignment extending from Kapolei to UH Mānoa with a branch to Waikīkī, as the Locally Preferred Alternative on December 22, 2006. Ordinance 07-001 made the City Council's selection law on January 6, 2007. The ordinance authorized the City to proceed with planning and engineering a fixed guideway project within these limits and following the alignment defined in the ordinance. The ordinance also required that a First Project be selected that is fiscally constrained to anticipated funding sources. City Council Resolution 07-039 defined the First Project as extending from East Kapolei to Ala Moana via Salt Lake Boulevard (the Project).

The Notice of Intent to prepare this EIS was published in the *Federal Register* on March 15, 2007, and scoping was concluded in April 2007.

1.2 Description of the Corridor

The study corridor for the Honolulu High-Capacity Transit Corridor Project extends from Kapolei in the west (Wai'anae or 'Ewa direction) to UH Mānoa in the east (Koko Head direction). It is confined by the Wai'anae and Ko'olau Mountain Ranges in the mauka direction (toward the mountains, generally to the north within the study corridor) and the Pacific Ocean in the makai direction (toward the sea, generally to the south within the study corridor) (Figure 1-1). From Pearl City to 'Aiea, the study corridor's width is less than 1 mile between Pearl Harbor and the base of the Ko'olau Mountain Range.

Directions on O'ahu
The Wai'anae or 'Ewa direction is west
The Koko Head direction is east
The mauka direction is toward the mountains
The makai direction is toward the sea

The *City and County of Honolulu General Plan* (Honolulu General Plan) (DPP 2002a) directs future population and employment growth to the

The *City and County of Honolulu General Plan* is a statement of objectives and policies for O'ahu. The General Plan delineates the island into planning areas, three of which, 'Ewa, Central O'ahu, and the Primary Urban Center, are in the study corridor.

'Ewa and Primary Urban Center (PUC) Development Plan areas and the Central O'ahu Sustainable Communities Plan area. The largest increases in population and employment are projected in the 'Ewa, Waipahu, Downtown, and Kaka'ako Districts, which are all located in the study corridor (Figure 1-3). Major activity centers in the study corridor are shown in Figure 1-4.

Table 1-1 identifies existing travel times, for both transit and autos, for selected origins and destinations. These times are modeled door-to-door trip times. In most cases, transit travel times are considerably longer than auto travel times.

According to the 2000 census, Honolulu ranks as the fifth densest city among U.S. cities larger than 500,000 population.

In 2000, 63 percent of O'ahu's population of 876,200 and 80 percent of its 501,100 jobs were located within the study corridor. By 2030, these distributions will increase to 69 percent of the population and 83 percent of the employment as development continues to be concentrated into the PUC and 'Ewa Development Plan areas. These trends are shown in Figures 1-5 and 1-6, which illustrate existing and year 2030 projected population of 1,117,200 and employment of 632,700, respectively, by transportation analysis area.

Kapolei is the center of the 'Ewa Development Plan area and has been designated O'ahu's "second city." City and State government offices have opened in Kapolei, and UH is developing a master plan for a new West O'ahu campus able to serve 7,600 students. The James Campbell Company and Campbell family have donated money for the construction of the Salvation Army Kroc Center in Kapolei, which will be located on 12 acres and will be the largest community center in Hawai'i. It will contain swimming pools, basketball courts, a performing arts center, and educational facilities. It is expected to open in 2010. The Kalaeloa Community Development District (formerly known as Barbers Point Naval Air Station) covers 3,700 acres adjacent to Kapolei and is planned for redevelopment. The Department of Hawaiian Home Lands is also a major landowner in the area and has plans for residential and retail development. In addition, developers propose to continue the construction of residential subdivisions, the largest of which

Table 1-1 Existing A.M. Peak-Period Travel Times (in Minutes)

	Travel Origin and Destination																
	From Wai`anae to Downtown	From Kapolei to Downtown	From `Ewa to Downtown	From Waipahu to Downtown	From Mililani Mauka to Downtown	From Pearlridge Center to Downtown	From Downtown to Ala Moana Center	From Downtown to Waikiki	From Downtown to UH Mānoa	From Airport to Waikiki	From Waipahu to Waikiki	From Downtown to Kapolei	From Wai`anae to UH Mānoa	From Kapolei to Ala Moana Center	From Salt Lake to Downtown	From `Ewa to Airport	From Airport to Downtown
2007 Base Year																	
Walk-to-transit	102	86	88	79	105	52	18	32	29	71	88	67	128	101	39	114	42
Auto travel time	100	89	88	58	84	35	14	19	18	35	69	32	109	94	26	75	25

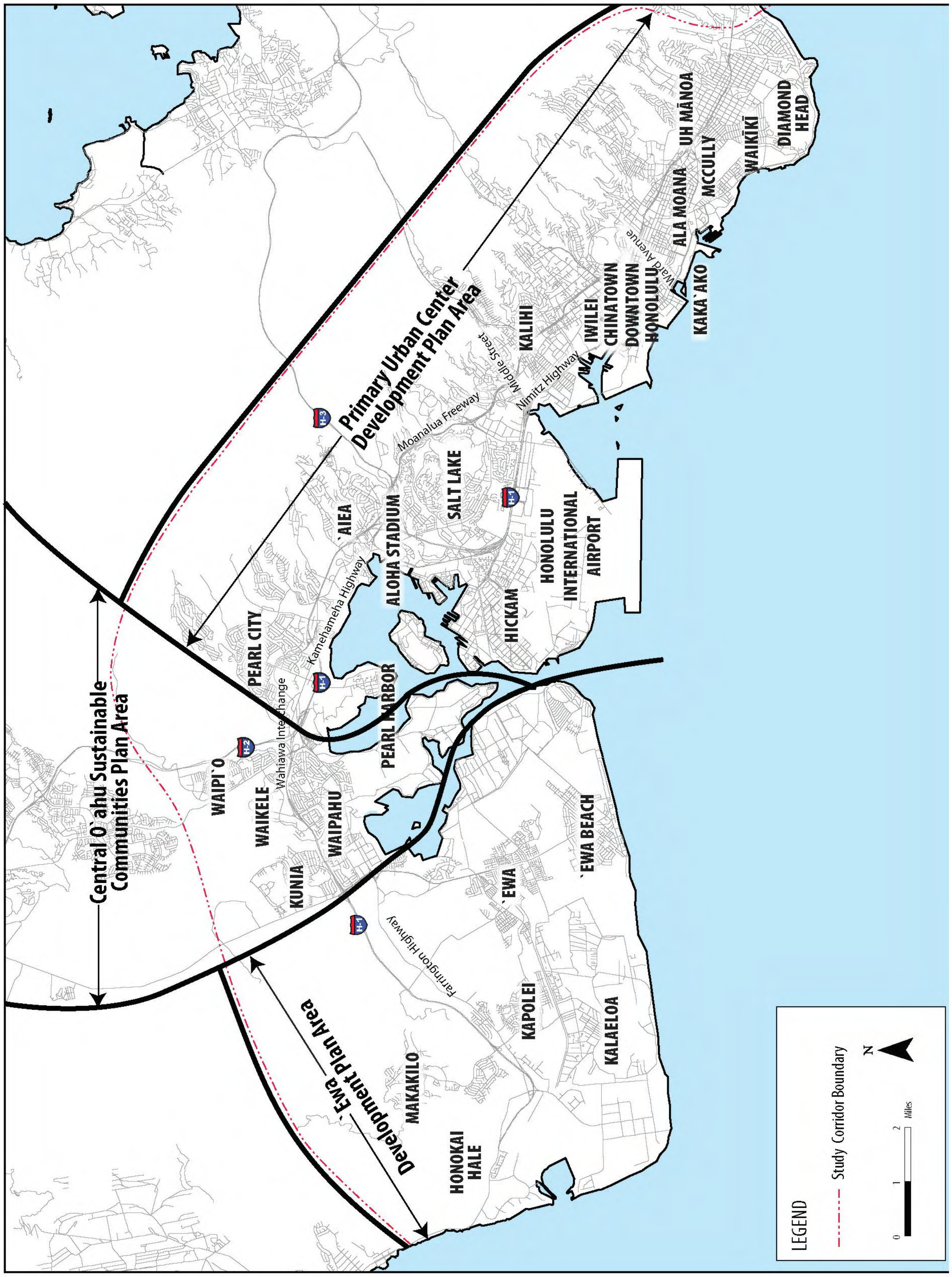
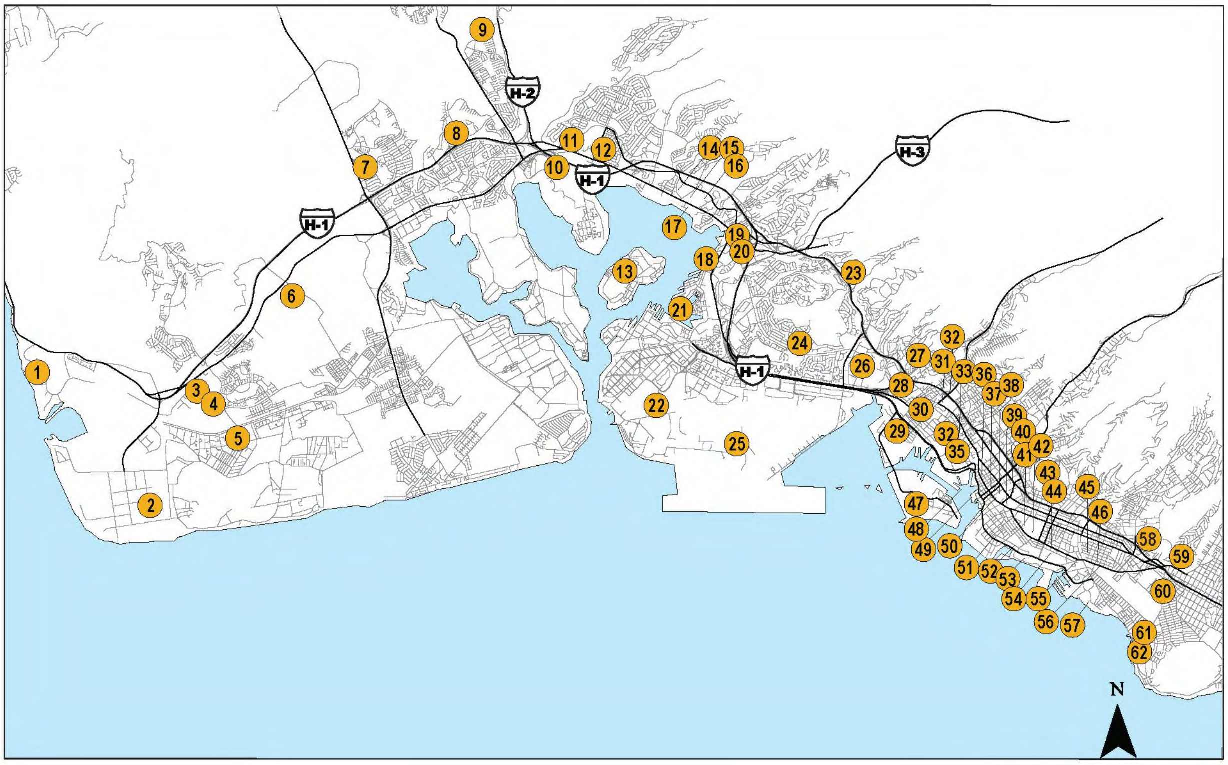
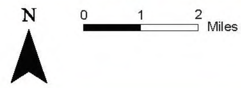


Figure 1-3 Areas and Districts in the Study Corridor





Activity Centers

1. Ko`Olina Resort
2. Campbell Industrial Park
3. State Office Building
4. Kapolei Hale
5. Kalaeloa Industrial Park
6. UH West O`ahu (proposed)
7. Royal Kunia Shopping Center
8. Waikele Premium Outlets
9. Costco Waipi`o
10. Leeward Community College
11. Pearl Highlands Center
12. Pearl City Center
13. Ford Island
14. Westridge Center
15. Pearlridge Center
16. Pali Momi Medical Center
17. Pearl Kai Center
18. Arizona Memorial & Visitor Center
19. Aloha Stadium
20. Stadium Mall
21. Pearl Harbor Naval Reservation
22. Hickam Air Force Base
23. Kaiser Medical Center
24. Salt Lake Center
25. Honolulu International Airport
26. Mapunapuna Industrial Area
27. Fort Shafter
28. Middle Street Industrial Center
29. Kalihi Kai Industrial Center
30. Kalihi-Palama Business District
31. Farrington High School
32. Bishop Museum
33. Honolulu Community College
34. Iwilei Industrial Area
35. Costco Iwilei
36. Chinatown
37. Downtown Financial District
38. State Capitol
39. Honolulu Hale
40. Queen's Medical Center
41. Neal S. Blaisdell Center
42. McKinley High School
43. Punchbowl National Memorial Cemetery
44. Kapi`olani Business District
45. McCully Business District
46. Tokai University Pacific Center
47. Sand Island Industrial Park
48. Honolulu Harbor
49. Aloha Tower
50. Hawai`i State Library
51. Kaka`ako Business District
52. Ward Center
53. Ala Moana Beach Park
54. Ala Moana Center
55. Hawai`i Convention Center
56. Ala Wai Park
57. Fort DeRussy
58. University of Hawai`i at Mānoa
59. Chaminade University
60. Kapahulu Business District
61. Honolulu Zoo
62. Kapi`olani Park

Figure 1-4 Major Activity Centers in the Study Corridor

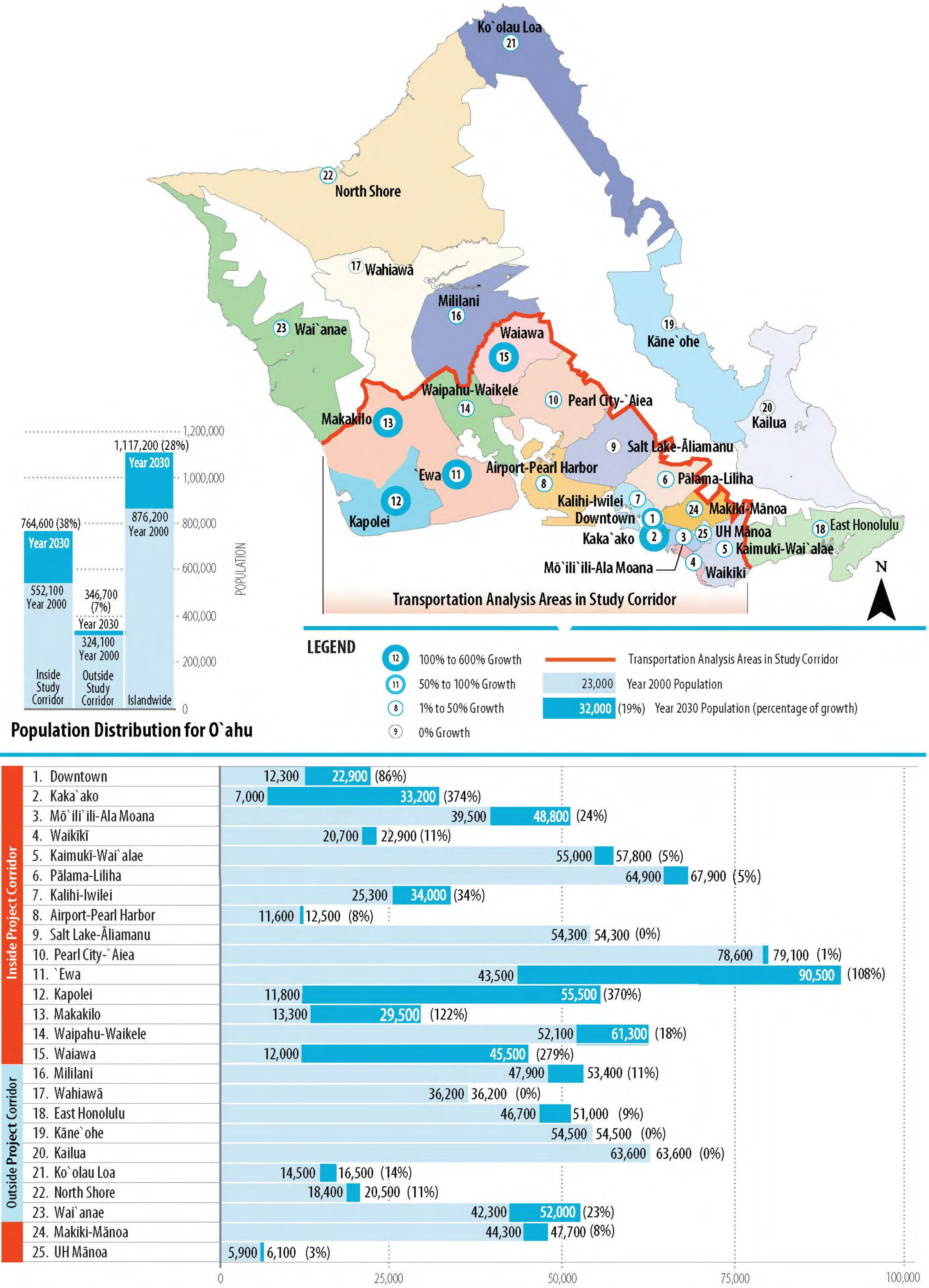
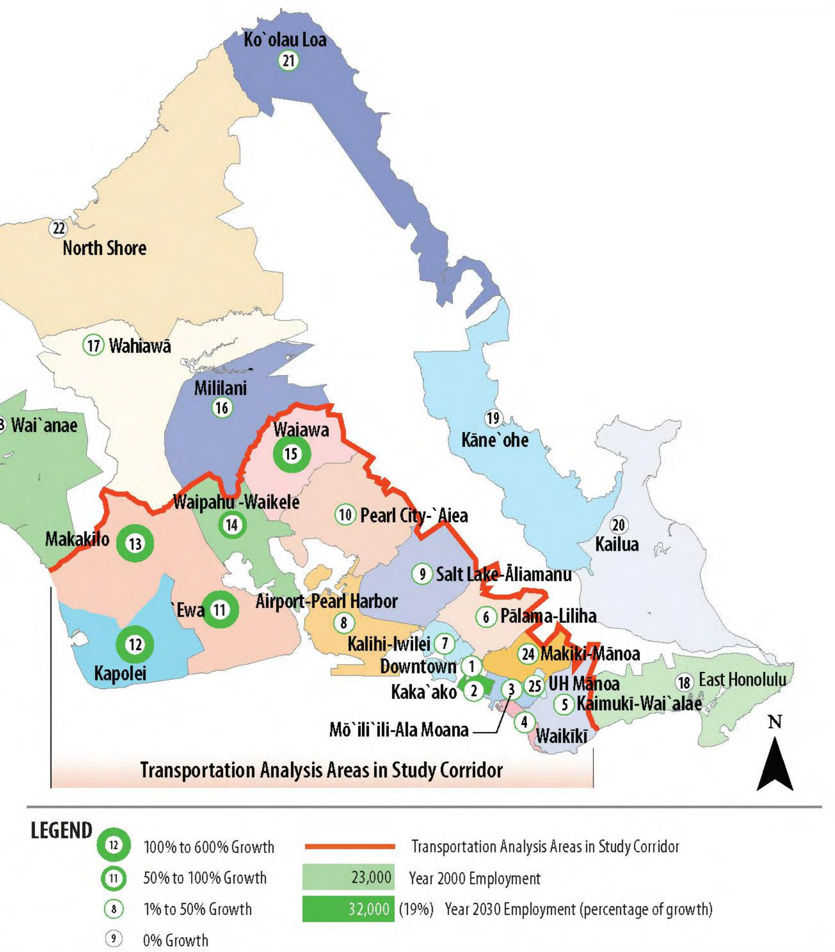
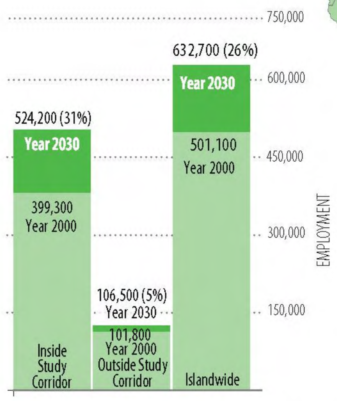
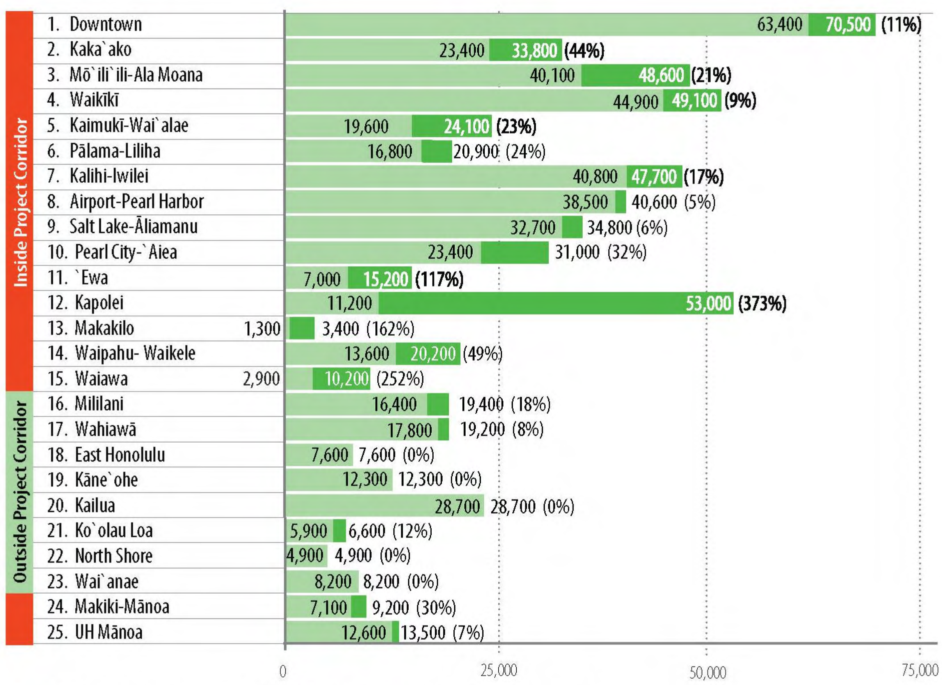


Figure 1-5 Population Distribution for O`ahu





Employment Distribution for O`ahu



Anaylsis of Employment Growth by Transportation Analysis Areas

Source: City and County of Honolulu Department of Planning and Permitting, 2008

Figure 1-6 Employment Distribution for O`ahu is Ho'opili, which would cover approximately 1,600 acres with mixed-use development, including approximately 12,000 residences.

Continuing Koko Head, the study corridor follows Farrington and Kamehameha Highways through a mixture of low-density commercial, light industrial, and residential development. Population is projected to grow by more than 275 percent in the Waiawa area (Figure 1-5). This part of the study corridor passes through the makai portion of the Central O'ahu Sustainable Communities Plan area.

Farther Koko Head, the study corridor enters the PUC Development Plan area, which is bounded by commercial and residential densities that begin to increase near Aloha Stadium. The Pearl Harbor Naval Reserve, Hickam Air Force Base, and Honolulu International Airport border the study corridor on the makai side. Military and civilian housing are the dominant land uses mauka of the H-1 Freeway, with a concentration of high-density housing along Salt Lake Boulevard.

As the study corridor continues Koko Head across the H-1 Freeway, land use becomes increasingly dense. Industrial and port land uses dominate along the harbor, shifting to a mixture of low-rise commercial, residential, and institutional uses through Kalihi.

Koko Head of Nu'uanu Stream, the study corridor continues through Chinatown and Downtown. The Downtown area, with 63,400 jobs, has the highest employment density in the study corridor (Figure 1-6). The Kaka'ako and Ala Moana neighborhoods, comprised historically of low-rise industrial and commercial uses, are being revitalized with a mixture of high-rise residential, commercial, retail, and entertainment-related development. Ala Moana Center, both a major transit hub and shopping destination, is served by more than 2,000 weekday bus trips and visited by more than 56 million shoppers annually.

The study corridor continues to Waikīkī and through the McCully neighborhood to UH Mānoa. Today, Waikīkī has more than 20,000 residents and provides more than 44,000 jobs. It is one of the densest tourist areas in the world, serving approximately 72,000 visitors daily (DBEDT 2003). UH Mānoa has an enrollment of more than 20,000 students and approximately 6,000 staff (UH 2005). Approximately 60 percent of students do not live within walking distance of campus (UH 2002) and must travel by private vehicle or transit to attend classes.

1.3 Existing Travel Patterns in the Corridor

The vast majority of trips made on the island occur within the study corridor. Currently, morning travel patterns in the study corridor are heavily directional. Morning town-bound (Koko Head direction) traffic volumes through the Waipahu and 'Aiea areas are more than twice the volume traveling in the 'Ewa direction. Afternoon flows are less directional with 'Ewa-bound traffic volumes about 50 percent greater than town-bound (Koko Head-bound) traffic.

Although most trips in the study corridor are made by residents, the large number of visitors to O'ahu and the location of visitor attractions within the study corridor combine to create a transit market of visitors traveling within the study corridor. O'ahu hosted 4.6 million visitors in 2007 (DBEDT 2008). Many of these visitors stay in the Waikīkī area and travel to points of interest outside of Waikīkī, including many of the activity centers in the study corridor (Figure 1-4). More than 17,000 transit trips are made by visitors daily.

1.3.1 Person-trip Patterns

Trip origins correlate closely with the level of population in a given area, while trip destinations correlate to a high degree with the level of employment. Based on these data, 2,036,000, or 73 percent, of the approximately 2,790,000 islandwide daily trips, and 350,000, or 64 percent, of the 544,000 a.m. peak-period work-related trips are currently generated within the study corridor. The study corridor attracts an even higher percentage of islandwide work-related trips with 446,000, or 82 percent, of a.m. peak-period work-related trips having destinations within the study corridor (Figure 1-7).

More trips will originate and remain within the PUC Development Plan area in 2030 than they do today. However, the greatest increases in trips will be to and from the ‘Ewa Development Plan area. These patterns illustrate the continued transportation importance of the study corridor with peak-period travel becoming less directional and more work trips destined for Kapolei.

1.3.2 Transit Travel Patterns

An on-board transit survey was conducted on all of the City's public transit system (TheBus) routes in December 2005 and January 2006. Information obtained from the survey included the origins and destinations of current transit bus users across a variety of trip purposes for both the 178,400 total daily transit trips and the 57,000 a.m. and p.m. peak-period work trips that were recorded over the survey period. A substantial majority of trips made by transit on the island occur within the study corridor (Figure 1-8).

When compared to total travel, the current number of transit trips within the study corridor as a percentage of total islandwide transit trips is even more pronounced. Based on the survey data, 83 percent of both islandwide daily and peak-period work-related transit trips originate within the study corridor, and the study corridor attracts 90 percent of total islandwide daily transit trips and 94 percent of peak-period work-related transit trips.

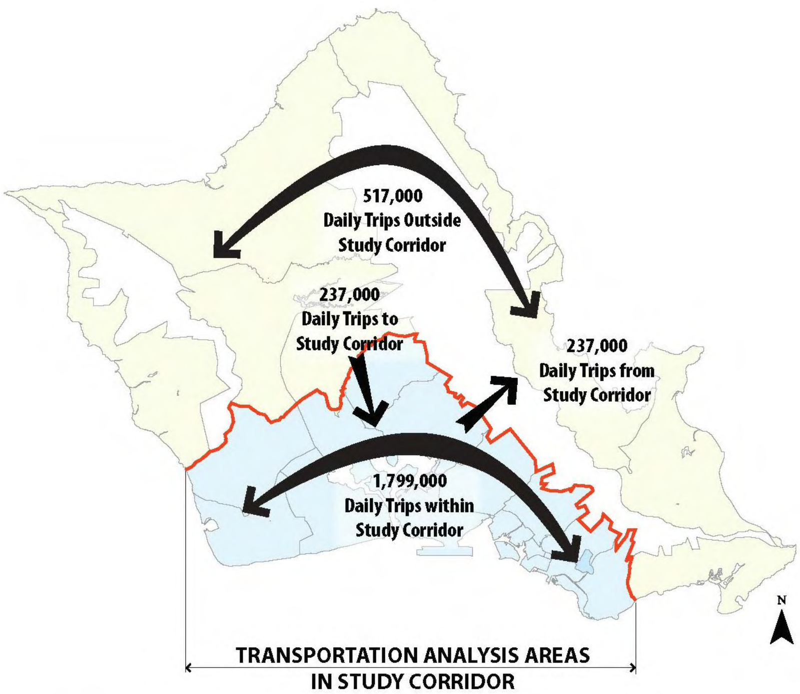


Figure 1-7 Current (2007) Daily Person-trip Patterns on O`ahu

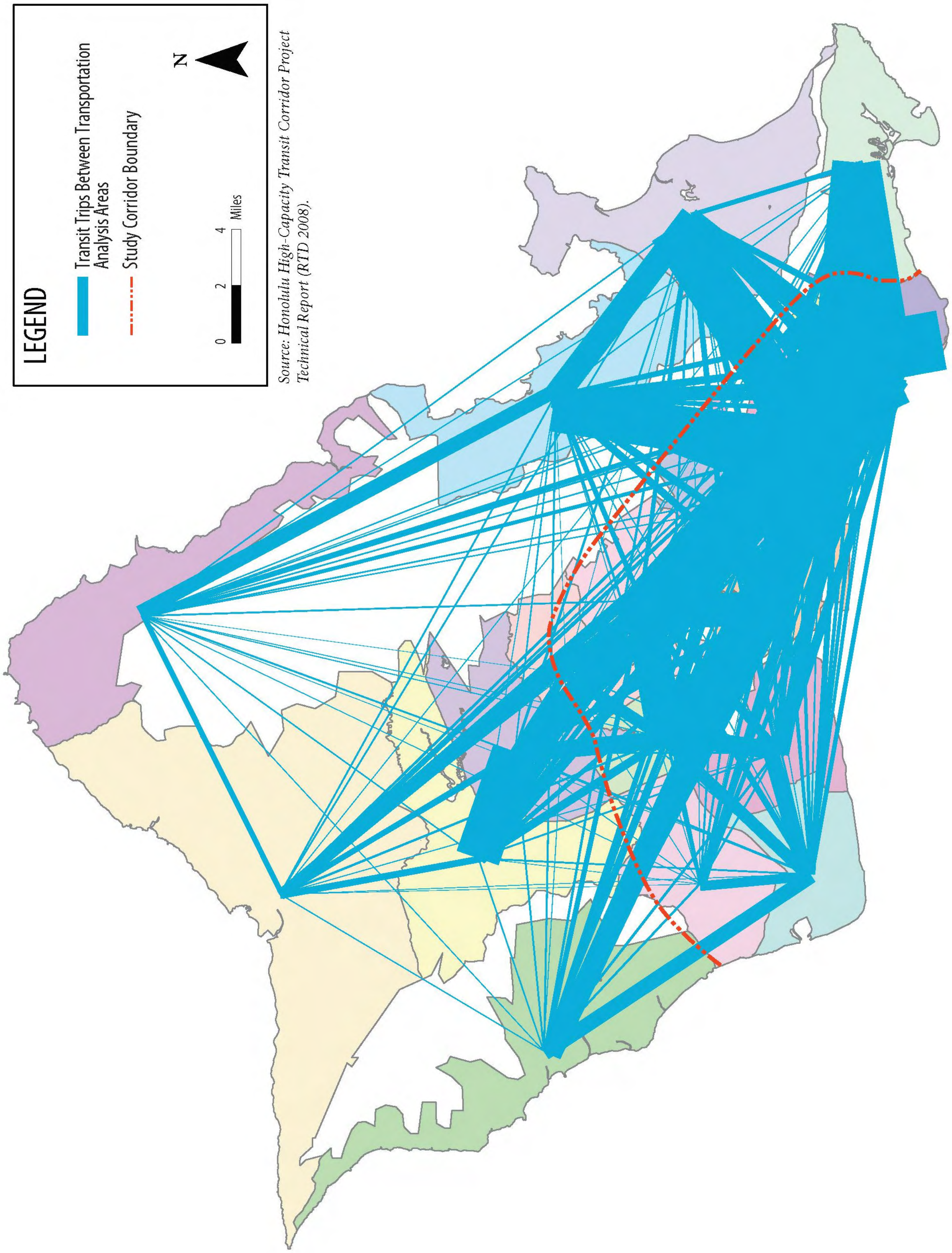


Figure 1-8 Daily 2007 Transit Trips between Transportation Analysis Areas

Daily Transit Trips

The major destinations for weekday bus riders are Downtown and the Mōʻiliʻili-Ala Moana area (Table 1-2). Downtown contains the region's highest concentration of jobs. Mōʻiliʻili-Ala Moana also contains a high concentration of jobs, as well as Ala Moana Center, the State's largest shopping complex.

Overall, the largest share of TheBus riders' trips originate in Waikīkī. In addition to Waikīkī, Mōʻiliʻili-Ala Moana, Kaimukī-Waiʻalae, and Kalihi-Iwilei are the origins of a large number of trips. These areas are densely populated, with relatively high concentrations of transit-dependent households (Figure 1-9).

Peak-Period Transit Work Trips

Nearly 34 percent of all a.m. peak-period work trips are destined to Downtown, while Punchbowl-Sheridan-Date and Waikīkī each are destinations for about 12.5 percent of trips. Combined, these areas are the destinations of approximately 60 percent of the islandwide a.m. peak-period home-based work trips. Waikīkī, Punchbowl-Sheridan-Date, Pauoa-Kalihi, Waipahu-Waikele, and Kāhala-Pālolo together account for about 50 percent of the home-based origins for work trips taken during the a.m. peak period on TheBus.

Table 1-2 Major Trip Generators and Attractors for Existing Bus Trips

Area	Percent of Islandwide Daily Transit Trips	
	Originating from	Attracted to
Downtown	3	18
Mō`ili`ili-Ala Moana	2	13
Waikīkī	13	6
Kaimuki-Wai`alae	7	6
Kalihi-Iwilei	7	4

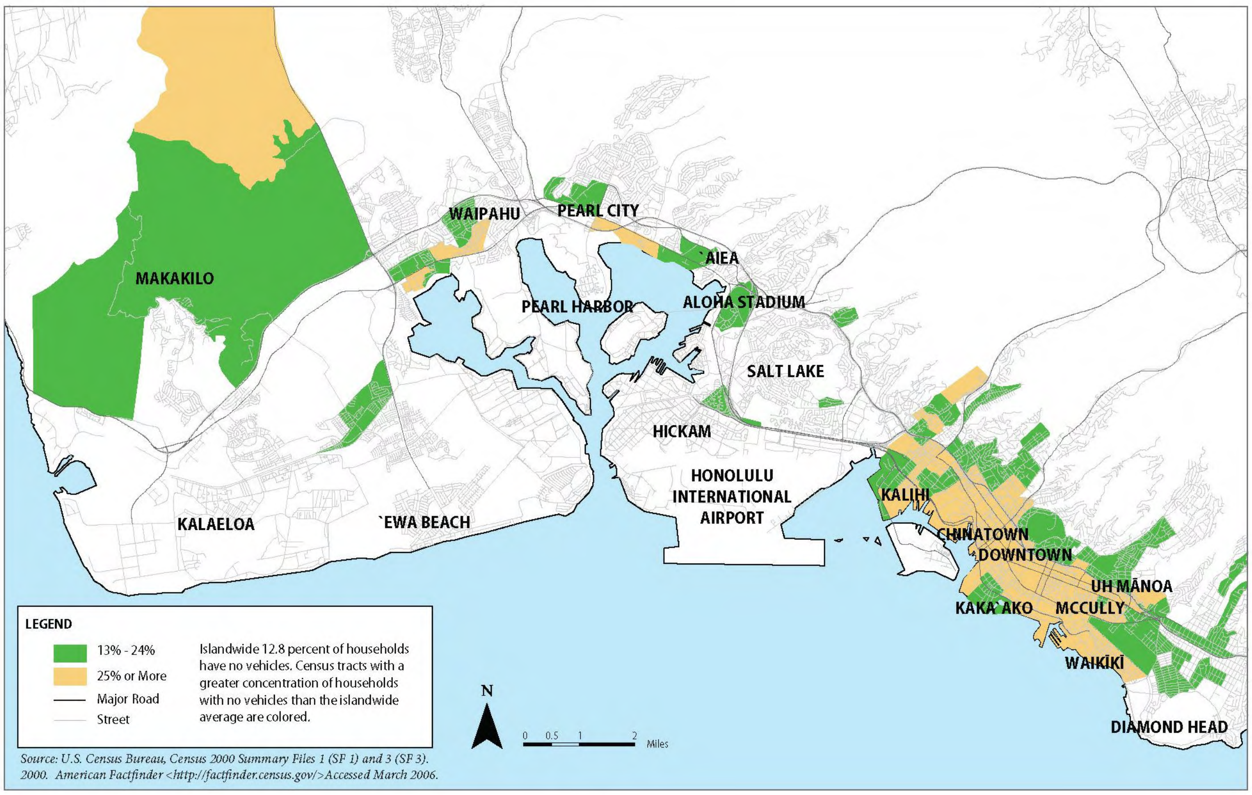


Figure 1-9 Concentrations of Transit-dependent Households (2000)

1.4 Existing Transportation Facilities and Services in the Corridor

The study corridor is currently served by roadway and transit systems, as well as parking, pedestrian, and bicycle facilities. Existing development throughout the study corridor, combined with the previously described geographic boundaries, limits the potential for new roadways or expansion of existing facilities.

1.4.1 Street and Highway System

The study corridor is served primarily by the H-1 and Moanalua Freeways (Route H-201), and the Farrington, Kamehameha, and Nimitz Highways. The H-2 Freeway provides access to the study corridor from Central O'ahu, and the H-3 Freeway provides access to the study corridor from the Windward side. Because of the constraints posed by geography and existing development, the expansion of existing roadways or the addition of new roadways in many sections of the study corridor would be extremely difficult and/or expensive. As a result, some sections of the study corridor are served by a relatively small number of facilities, and the lack of redundancy in the system at these locations can cause severe traffic problems should any of the facilities become overly congested or incapacitated. An example of this is in Pearl City where only three primary roadways, the H-1 Freeway, Moanalua Road, and Kamehameha Highway, serve the high volume of traffic traversing this area. Of these roadways, the H-1 Freeway carries 70 to 75 percent of the a.m. and p.m. peak-hour traffic. Hence, when traffic is congested on the H-1 Freeway through this location, traffic is affected for miles along the adjacent study corridor segments.

> A **contraflow** lane (zipper lane) typically provides vehicular travel in one direction, but is reversed during certain times of the day.
>
> **High Occupancy Vehicle (HOV)** lanes are freeway or surface street lanes designated for exclusive use by buses, carpools, and vanpools.

To better use the existing roadway facilities, both the Hawai'i Department of Transportation (HDOT) and the City have implemented a number of roadway management strategies, including the use of contraflow lanes and HOV lanes.

HDOT operates HOV lanes on several State highways during certain times of the day. HOV lanes currently require two or more occupants per vehicle and operate on the H-1 and H-2 Freeways, Moanalua Road, the H-1 zipper lane and shoulder express lane, and Nimitz Highway. As of July 8, 2008, the zipper lane occupancy requirement was increased to three or more.

1.4.2 Public Transit System

O'ahu Transit Services, Inc. (OTS) operates TheBus on O'ahu under contract to the City. TheBus system serves more than 80 percent of the developed areas of the island, carried approximately 72 million passenger trips in 2007, and experiences about 251,400 boardings on an average weekday. Annual transit passenger-miles-per-capita is higher in Honolulu than in any other major U.S. city without a fixed guideway transit system.

TheBus currently operates 108 routes that serve approximately 3,800 bus stops. Of the 108 routes, 99 are fixed, 4 are deviation routes operated by the paratransit division, and 5 are feeder routes for TheBoat. Most of TheBus routes serve the study corridor. Bus route categories include Rapid Bus, Urban Trunk, Community Circulators, Community Access, and Peak Express. Most routes operate seven days a week, including holidays. Passenger amenities include passenger shelters and benches. Public transit on O'ahu also includes paratransit service (TheHandi-Van) and a commuter ferry service between West O'ahu and Downtown Honolulu (TheBoat).

Boardings represent the total number of times someone gets on a transit vehicle, whereas a **trip** can include transfers. Therefore, the number of daily boardings is higher than the number of daily trips.

1.4.3 Parking

Median daily parking rates for Downtown Honolulu are the highest in the U.S., while monthly parking rates are the ninth-most expensive in the U.S. (Colliers 2008). The availability of parking Downtown is limited, and garages have an average waiting list of three months for monthly parking. Parking availability also is limited in Waikīkī and near UH Mānoa.

1.4.4 Pedestrian and Bicycle Systems

The extent and quality of Honolulu's existing pedestrian and bicycle systems vary by location. In certain neighborhoods, including Waikīkī, Chinatown, and Downtown, a continuous and accessible system of sidewalks provides pedestrians with a safe and convenient walking environment. In other areas, the pedestrian system is less complete. In addition, there are 98 miles of existing bicycle facilities on Oʻahu. Bike plans completed by both the City and the State anticipate more bikeways in the future.

1.5 Performance of the Existing Transportation System

This section includes information on the performance of the existing highway and transit system. It includes highway traffic volumes and existing operating conditions for transit.

1.5.1 Highway Traffic Volumes

The highest daily traffic volumes occur near Downtown Honolulu. In 2006, more than 395,000 vehicles crossed Kapālama Canal in Kalihi daily. During the a.m. and p.m. peak hours, more than 26,000 vehicles crossed Nuʻuanu Stream near Downtown each hour.

At the facility level, the Interstate Freeway system carries a considerable amount of the island's traffic, with the H-1 Freeway being the most heavily traveled on Oʻahu. At the Kalauao Stream screenline in Pearl City, approximately 20,000 and 17,000 vehicles currently travel on the H-1 Freeway (both directions combined) during the a.m. and p.m. peak hours, respectively. Approximately 245,000 vehicles travel through this section of the H-1 Freeway daily.

1.5.2 Highway Traffic Operating Conditions

The operating conditions of a roadway can be represented by a variety of measures, including operating speeds and the density of traffic on the facility. These measures can be used to determine level-of-service (LOS). Speeds are typically a reflection of the amount of congestion on a roadway or its geometric design characteristics. Traffic density is measured in terms of vehicles per mile per lane and is a function of both volumes and speeds. LOS is measured on a grading scale from "A" through "F" for roadway operation; LOS A represents a free flow or excess capacity condition, and LOS F represents more vehicles attempting to use a roadway than its capacity is able to accommodate.

Congested conditions (i.e., LOS E or F) occur during the a.m. and p.m. peak hours on many major roadways, particularly on sections of the H-1 Freeway from the Waiawa Interchange to the UH Mānoa area where stop-and-go conditions are typical. Signalized routes, such as Nimitz Highway, require motorists to wait more than one traffic-signal cycle to clear an intersection during peak periods. To avoid peak-hour congestion, motorists have changed their time of travel, resulting in extended peak traffic conditions. Weekday a.m. and p.m. peak traffic conditions generally last three to four hours each. Weekend traffic during the mid-day also resembles weekday peak-period conditions. Honolulu was recently ranked as having the worst travel time loss due to congestion in the U. S., with peak-period trips taking an average of 47 percent longer as a result of congestion (INRIX 2008).

Recent traffic counts for the study corridor indicate that existing travel conditions are congested during the a.m. peak period for Koko Head-bound traffic crossing Kalauao Stream in Pearl City (LOS F) and Kapālama Canal near Downtown (LOS F). These conditions are also indicated by estimated travel speeds along the H-1 Freeway in the study corridor, as shown in Table 1-3. The table indicates that existing speeds between the Waiawa Interchange and Downtown in the general purpose lanes range from 8 to 39 miles per hour (mph) (LOS F).

Travel-time measurements between Wai'anae and Downtown during the a.m. peak period indicate that HOV traffic moves substantially faster than general-purpose traffic, but that travel-time reliability is poor for both types of traffic (Table 1-1 and Figure 1-10). Faster HOV travel times are attributable to the presence of a zipper lane on the H-1 Freeway. The zipper lane provides an additional lane exclusively for HOV traffic in the peak direction. Twenty percent of trips take more than one and one-half hours. The data shown in Figure 1-10 exclude extreme events, such as major accidents resulting in closure of multiple lanes of the H-1 Freeway.

Based on recent traffic counts and field observations, the p.m. peak period also experiences a high level of congestion in the study corridor. Analysis of operations at Kalauao Stream and Kapālama Canal show a p.m. peak-period LOS of D or worse; the H-1 Freeway is over-capacity and operating at LOS F.

Table 1-3 2007 and 2030 A.M. Peak Period Speeds and Level-of-Service on H-1 Freeway

Location	2007 Existing		2030[2]	
	Average Speed (mph)	Level-of-Service[1]	Average Speed (mph)	Level-of-Service[1]
Waiawa Interchange—Koko Head-Bound				
General purpose traffic	18	F	20	F
HOV lane traffic	22	F	24	F
Zipper lane traffic	33	F	50[3]	D
Kalauao Stream—Koko Head-Bound				
General purpose traffic	30	F	28	F
HOV lane traffic	38	E	32	F
Zipper lane traffic	39	F	50[3]	D
East of Middle Street Merge—Koko Head-Bound				
General purpose traffic	8	F	19	F
Liliha Street—Koko Head-Bound				
General purpose traffic	23	F	15	F
East of Ward Avenue—`Ewa-Bound				
General purpose traffic	18	F	16	F
West of University Avenue—`Ewa-Bound				
General purpose traffic	36	F	33	F

[1]Level-of-service is calculated based on vehicle density, a function of traffic volume and speed.
[2]Assumes completion of ORTP roadway projects.
[3]Zipper lane reflects occupancy requirements of 3 or more in 2030.

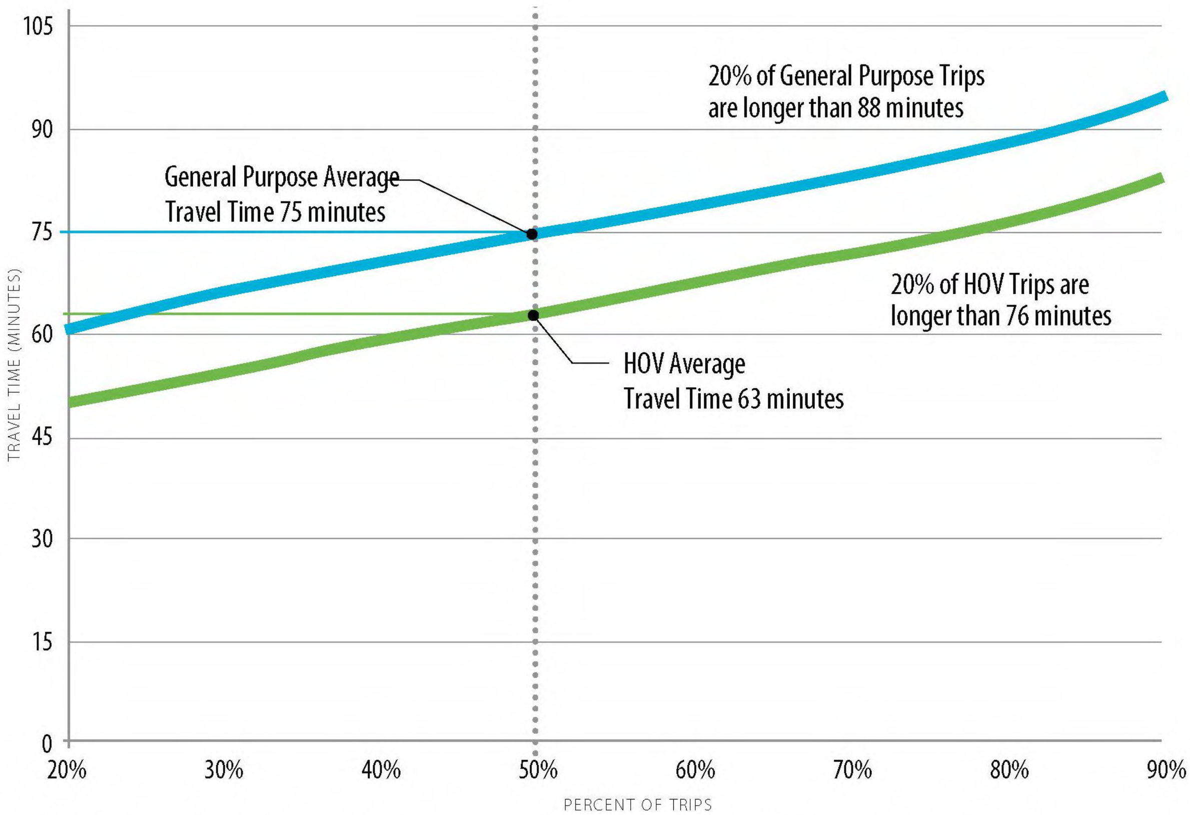


Figure 1-10 Existing A.M. Peak-Period Wai`anae to Downtown Travel Time Distribution (Highway Drive Time Only)

1.5.3 Transit Operating Conditions

TheBus uses the general roadway network described above. The major factors influencing bus operating conditions are the traffic conditions under which the service operates, passenger loading time, and bus-stop spacing. Honolulu has substantial traffic congestion, high ridership and load factors, and closely spaced bus stops. Combined, these factors have resulted in declining bus operating speeds over recent years. Between 2002 and 2006, islandwide average bus speeds decreased 4 percent to 13.4 mph. Because congestion in the study corridor is greater than in other parts of O‘ahu, the decrease in average bus speed in the study corridor is greater than the islandwide average. To account for the congestion, OTS has lengthened the peak-period scheduled trip travel times by between 9 and 26 percent for several routes in the study corridor. Trip travel times for these typical routes serving various parts of O‘ahu are shown in Figure 1-11. These routes are shown in Figure 1-12.

Implementation of peak-period HOV lanes on the H-1 and H-2 Freeways, as well as the addition of the H-1 Freeway a.m. peak zipper lane, were intended to provide higher priority and better mobility for buses and other HOVs. However, with a minimum eligibility requirement of only two persons per vehicle in 2007, these special lanes were often nearly as congested as the adjacent general purpose lanes (Table 1-3), thus negating much of the travel-time advantage for transit buses.

As roadways become more congested, they become more susceptible to substantial delays caused by incidents such as traffic accidents. As a result, current transit schedules in the study corridor are not reliable. Statistics from TheBus indicate that during 2006, 30 percent of all buses systemwide

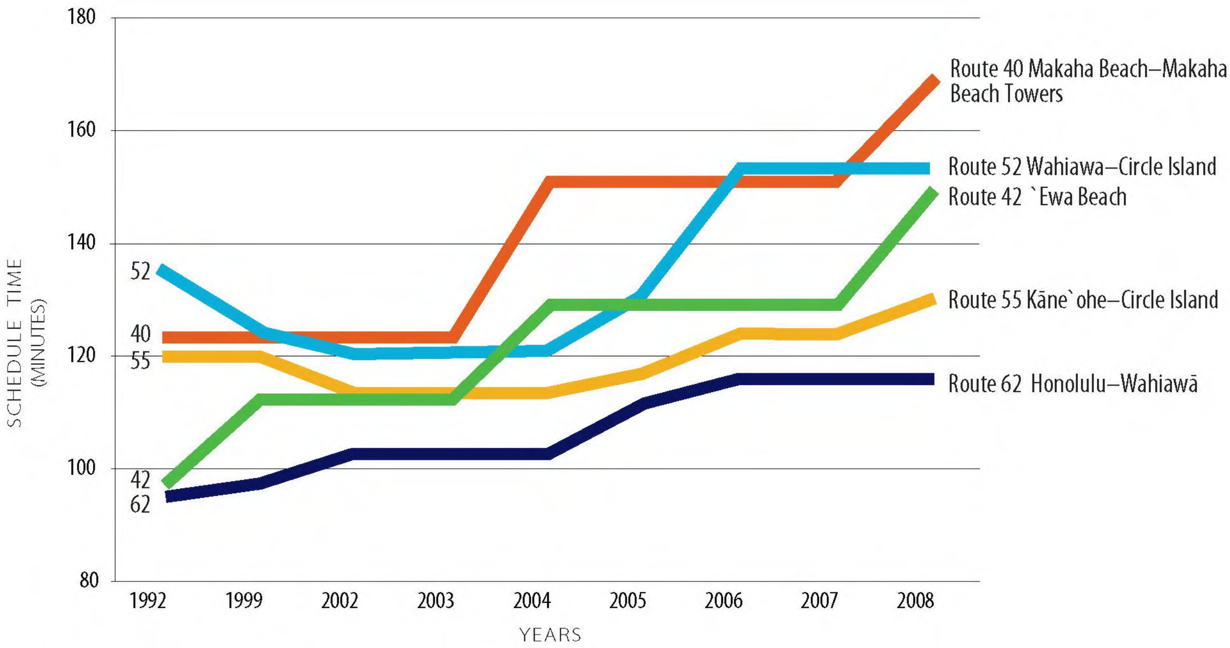


Figure 1-11 Selected Bus Trip Times for Selected Routes

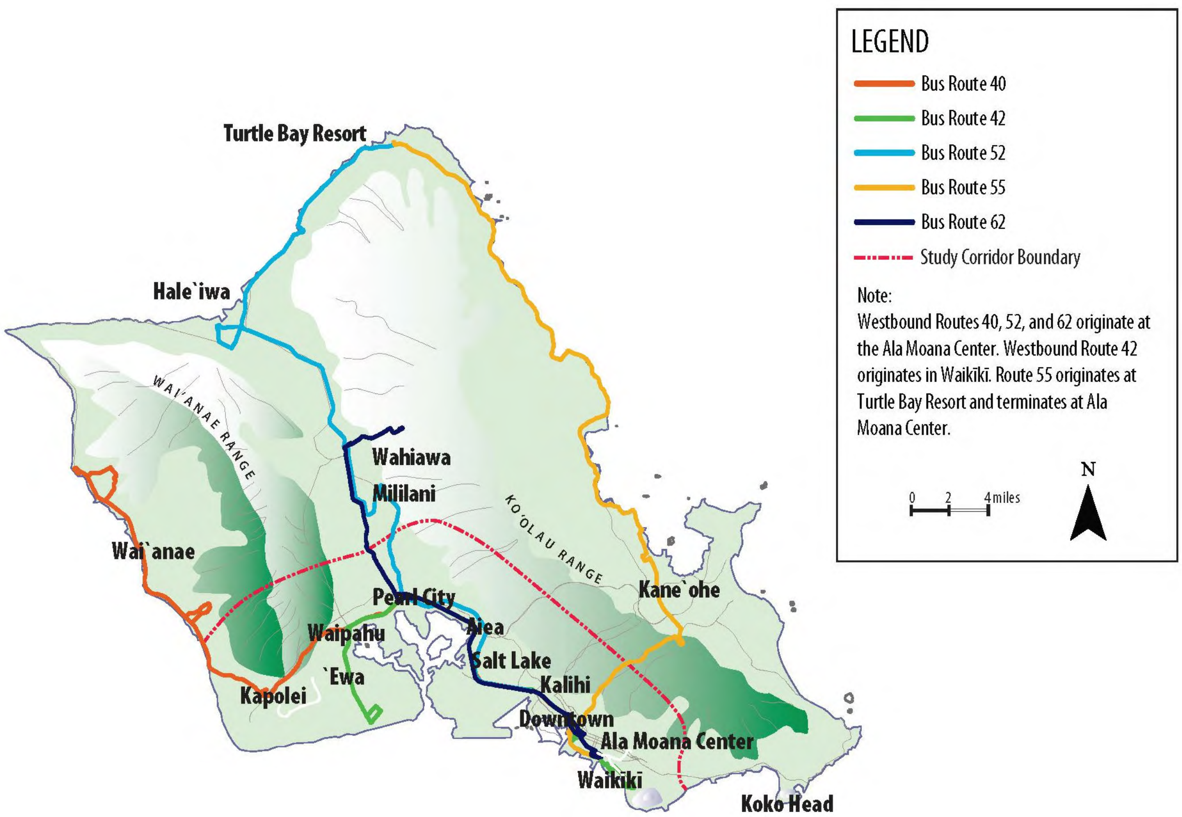


Figure 1-12 Route Maps for Sampled Routes

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were more than five minutes late. During the a.m. peak period, express buses were, on average, more than five minutes late 30 percent of the time (OTS 2006). The Transportation Research Board defines more than 25 percent of buses running late as LOS F reliability. Transit speed and reliability with mixed-traffic operations will continue to diminish in the study corridor as the number of transit passengers increases and traffic volumes approach roadway capacity on more streets.

1.6 Potential Transit Markets

A comparison of the location and number of new employment opportunities in relation to population growth shows that many workers will still be required to travel to the PUC Development Plan area for work (Figures 1-5 and 1-6). Despite the large growth of employment opportunities in the Kapolei area, population is projected to outpace and exceed the available employment in the area. Additionally, there will be a bidirectional flow of traffic throughout the day as more City and State administrative offices move their daily operations to Kapolei and as other employment grows in the area. The continued operation of UH Mānoa as a commuter school along with the opening of UH West Oʻahu will generate a strong student transportation market in the study corridor. These factors point to increased travel on the transportation system between Kapolei and the PUC Development Plan area and represent an important potential future transit market.

Relatively large areas within the study corridor are transit-dependent because they contain a large number of households without cars relative to other parts of Oʻahu. Persons living in households without cars are much more likely to use transit than other residents. Households without cars are concentrated in much of the PUC Development Plan area (including the Central Business District, Chinatown, Kakaʻako, Kalihi-Palama, and Iwilei) and some Waipahu neighborhoods, as indicated in Figure 1-9. These areas represent a robust transit market because they already rely on existing transit and are likely to use an improved system.

Finally, although the primary market for the study corridor improvements is residents, the tourist industry and location of tourist attractions within the study corridor combine to create a transit market for visitors traveling within the study corridor. In 2007, Oʻahu hosted 4.6 million visitors (DBEDT 2008), who take more than 17,000 transit trips daily. Many of these visitors stay in the Waikīkī area and travel to points of interest outside of Waikīkī, including many of the activity centers in the study corridor (Figure 1-4).

1.7 Purpose of the Project

The purpose of the Honolulu High-Capacity Transit Corridor Project is to provide high-capacity rapid transit in the highly congested east-west transportation corridor between Kapolei and UH Mānoa, as specified in the *Oʻahu Regional Transportation Plan 2030* (ORTP) (OʻahuMPO 2007). The project is intended to provide faster, more reliable public transportation service in the study corridor than can be achieved with buses operating in congested mixed-flow traffic, to provide reliable mobility in areas of the study corridor where people of limited income and an aging population live, and to serve rapidly developing areas of the study corridor. The project also would provide additional transit capacity, an alternative to private automobile travel, and improve transit links within the study corridor. Implementation of the project, in conjunction with other improvements included in the ORTP, would moderate anticipated traffic congestion in the study corridor. The Project also supports the goals of the Honolulu General Plan and the ORTP by serving areas designated for urban growth.

1.8 Need for Transit Improvements

There are several needs for transit improvements in the study corridor. These needs are the basis for the following goals:

- Improve corridor mobility
- Improve corridor travel reliability
- Improve access to planned development to support City policy to develop a second urban center
- Improve transportation equity

1.8.1 Improve Corridor Mobility

Motorists and transit users experience substantial traffic congestion and delay at most times of the day, both on weekdays and on weekends. Average weekday peak-period speeds on the H-1 Freeway are currently less than 20 mph in many places and will degrade even further by 2030. Transit vehicles are caught in the same congestion. In 2007, travelers on O‘ahu's roadways experienced 74,000 vehicle hours of delay on a typical weekday, a measure of how much time is lost daily by travelers stuck in traffic. This measure of delay is projected to increase to 107,000 daily vehicle hours of delay by 2030, assuming implementation of all planned improvements listed in the ORTP (except for a fixed-guideway system). Without these improvements, the ORTP indicates that daily vehicle hours of delay would increase to 154,000 vehicle hours.

Currently, motorists traveling from West O‘ahu to Downtown experience highly congested traffic during the a.m. peak period. By 2030, after including all the planned roadway improvements in the ORTP, the level of congestion and travel time are projected to increase further. Average bus speeds in the study corridor have been decreasing steadily as congestion has increased. TheBus travel times are projected to increase through 2030. Within the urban core, most major arterial streets will experience increasing peak-period congestion, including Ala Moana Boulevard, Dillingham Boulevard, Kalākaua Avenue, Kapi‘olani Boulevard, King Street, and Nimitz Highway. Expansion of the roadway system between Kapolei and UH Mānoa is constrained by physical barriers and by dense urban neighborhoods that abut many existing roadways. Given current and increasing levels of congestion, an alternative method of travel is needed within the study corridor independent of current and projected highway congestion.

1.8.2 Improve Corridor Travel Reliability

As roadways become more congested, they become more susceptible to substantial delays caused by such incidents as traffic accidents or heavy rain. Even a single driver unexpectedly braking can have a ripple effect that delays hundreds of cars. Because of the operating conditions in the study corridor, current travel times are not reliable for either transit or automobile trips. Because TheBus primarily operates in mixed-traffic, transit users experience the same level of travel time uncertainty as automobile users. To arrive at their destination on time, travelers must allow extra time in their schedules to account for the uncertainty of travel time. During the a.m. peak period, more than one-third of bus service is more than five minutes late. This lack of predictability is inefficient and results in lost productivity or free time. A need exists to provide a more reliable transit system.

1.8.3 Improve Access to Planned Development to Support City Policy to Develop a Second Urban Center

Consistent with the Honolulu General Plan, the highest population growth rates for the island are projected in the ‘Ewa Development Plan area (comprised of the ‘Ewa, ‘Ewa Beach, Kapolei, Kalaeloa, Honokai Hale, and Makakilo areas), which is expected to grow by approximately 150 percent between 2000 and 2030. This growth represents nearly 50 percent of the total growth projected for the entire island. The communities of Wai‘anae, Wahiawā, North Shore, Windward O‘ahu, Waimānalo, and East Honolulu will have much lower population growth of between 0 and 23 percent if infrastructure policies support the planned growth rates in the ʻEwa Development Plan area. Kapolei, which is developing as a "second city" to Downtown, is projected to grow by nearly 350 percent, to 52,400 people, the ʻEwa district by 100 percent, and Makakilo by 125 percent between 2000 and 2030.

Accessibility to the overall ʻEwa Development Plan area is currently severely impaired by the congested roadway network, which will only get worse in the future. This area is less likely to develop as planned unless it is accessible to Downtown and other parts of Oʻahu; therefore, the ʻEwa Development Plan area needs improved accessibility to support its future planned growth.

1.8.4 Improve Transportation Equity

Equity is about the fair distribution of resources so that no group carries an unfair burden of the negative environmental, social, or economic impacts or receives an unfair share of benefits. Many lower-income and minority workers who commute to work in the PUC Development Plan area live in the corridor outside of the urban core. Transit-dependent households concentrated in the Pearl City, Waipahu, and Makakilo areas (Figure 1-9) rely on transit availability, such as TheBus, for access to jobs in the PUC Development Plan area. Delay caused by traffic congestion accounts for nearly one-third of the scheduled time for routes between ʻEwa and Waikīkī. Many lower-income workers also rely on transit because of its affordability. These transit-dependent and lower-income workers lack a transportation choice that avoids the delay and schedule uncertainty currently experienced by TheBus. In addition, Downtown median daily parking rates are the highest among U.S. cities, further limiting this population's access to Downtown. Improvements to transit availability and reliability would serve all transportation-system users, including minority and moderate- and low-income populations.

1.9 Goals of the Project

The goals of the Honolulu High-Capacity Transit Project correspond to the needs described in Section 1.8. Table 1-4 lists these goals and the measures to compare how each of the alternatives would meet them.

Table 1-4 Project Goals and Objectives

Goal	Measure of Objective
Improve corridor mobility	• Transit ridership (daily linked trips) • Transit-user benefits • Corridor travel time • Vehicle miles of travel • Vehicle hours of travel • Vehicle hours of delay
Improve corridor travel reliability	• Percent of transit trips using fixed guideway • Percent of transit passenger miles in exclusive right-of-way
Improve access to planned development to support City policy to develop a second urban center	• Development within station areas compared to existing amount of development
Improve transportation equity	• User benefits to transit-dependent communities • Percent of project costs borne by communities of concern

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02

CHAPTER

Alternatives Considered

This chapter summarizes the alternatives considered for the Honolulu High-Capacity Transit Corridor Project. The alternatives evaluated in this Draft Environmental Impact Statement (EIS) resulted from a rigorous Hawai'i Revised Statutes (HRS) Chapter 343 EIS preparation notice comment period, alternatives analysis, and National Environmental Policy Act (NEPA) scoping process.

2.1 Alternatives Screening and Selection Process

Prior to completion of this Draft EIS, alternatives were evaluated at three stages. First, a broad range of alternatives was considered and screened to four alternatives for evaluation in the *Honolulu High-Capacity Transit Corridor Project Alternatives Analysis Report* (Alternatives Analysis) (DTS 2006b). Second, the Alternatives Analysis recommended, and the City Council selected, the Fixed Guideway Alternative as the Locally Preferred Alternative. Third, scoping for the NEPA process confirmed that there were no alternatives that had not been previously studied and eliminated for good cause that would satisfy the Purpose and Need at less cost, with greater effectiveness, or less environmental or community impact.

The Alternatives Analysis phase evaluated a range of transit mode and general alignment alternatives in terms of their costs, benefits, and impacts. An initial screening process considered alternatives identified through previous transit studies, a field review of the study corridor, an analysis of current population and employment data for the study corridor, a literature review of technology modes, work completed for the *O'ahu Regional Transportation Plan 2030* (ORTP) prepared by the O'ahu Metropolitan Planning Organization (O'ahuMPO) (O'ahuMPO 2007), and public and agency comments received during the formal scoping process.

The screened alternatives included a No Build Alternative, a Transportation System Management Alternative (enhanced busway), and a number of Build Alternatives. Transit technologies that were examined included conventional bus, guided bus, light rail transit, personal rapid transit, people mover, monorail, magnetic levitation, rapid rail, commuter rail, and waterborne ferry service.

Several highway improvements were considered, including a bridge or tunnel crossing of Pearl Harbor to connect ʻEwa with the Primary Urban Center (PUC) and the construction of a two-lane elevated structure from the Waiawa Interchange to Iwilei, which would be used by transit vehicles and potentially carpools and single-occupant vehicles willing to pay a congestion-based toll. In addition, 75 fixed guideway alignment options were screened.

2.1.1 Screening of a Broad Range of Alternatives

During the fall of 2005 and winter of 2006, the City and County of Honolulu (City) completed an alternatives screening process that is documented in the *Honolulu High-Capacity Transit Corridor Project Alternatives Screening Memorandum* (DTS 2006a). The alternatives screening was accomplished through an analysis completed in five major steps, as illustrated in Figure 2-1.

The first step was to gather input needed for the analysis. The input included the Purpose and Need for the project, past studies and their recommendations, requirements of the U.S. Federal Transit Administration (FTA) Section 5309 New Starts process, adopted community and area plans, and a visual assessment of the entire corridor. The second step used the information gathered to identify a comprehensive list of potential alternatives. The third step included developing screening criteria and undertaking the initial screening of all potential alternatives to identify those that would address the needs of the corridor and would not have any “fatal flaws.” The fourth step was a presentation of the viable alternatives to the public and interested public agencies and officials for comment through a scoping process. Also, the HRS Chapter 343 EIS preparation notice for the Project was issued in December 2005, and review comments were received in December 2005 and January 2006. Finally, input from the alternatives analysis scoping process and HRS 343 EIS preparation notice comment period was collected and considered, and, where appropriate, refinements were made to the alternatives.

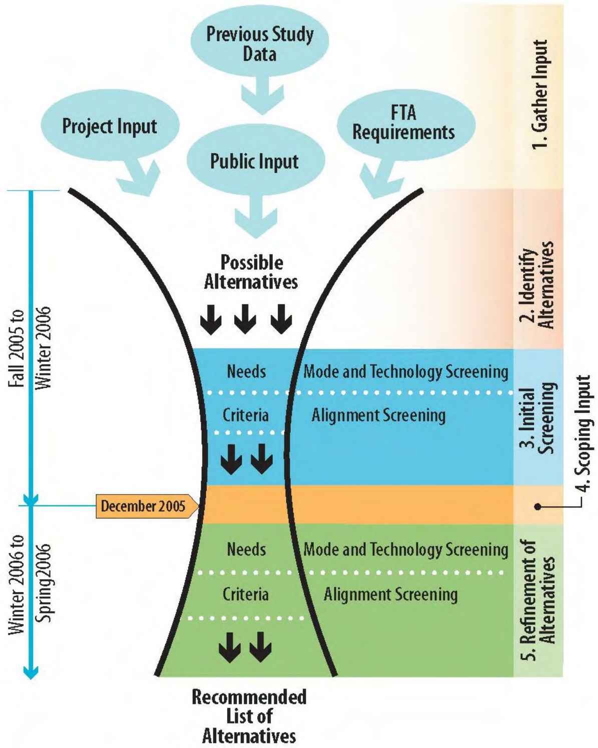


Figure 2-1 Alternatives Screening Process

The following alternatives were eliminated through this screening process before the Alternatives Analysis.

The tunnel crossing beneath Pearl Harbor was rejected because it would not improve connectivity within the study corridor, as it would bypass much of the corridor. The tunnel crossing also had been considered for the ORTP (OʻahuMPO 2007) but was rejected based on the cost compared to the limited benefit that it would have provided, as well as security concerns.

Waterborne ferry service was eliminated as a primary transit system because its capacity and travel times were not competitive with the other alternatives considered. On a demonstration basis, ferry service was implemented in 2007 as part of a separate project to provide an additional transit option for travelers in the corridor.

Several transit technologies also were eliminated for various reasons. Commuter rail, including diesel multiple unit, was eliminated based on poor operating and environmental performance because of the need for short station spacing in the study corridor. Personal rapid transit, which operates like a horizontal elevator, was eliminated based on lack of technical maturity and low capacity. Emerging rail concepts were eliminated because they have never been proven in real-world use and would not meet the rapid implementation schedule for the project.

For the Fixed Guideway Alternative screening analysis, the corridor was divided into geographic sections. Within each section, the alignments retained for evaluation in the Alternatives Analysis were those that demonstrated the best performance related to mobility and accessibility, smart growth and economic development, constructability and cost, community and environmental quality, and consistency with adopted plans.

2.1.2 Alternatives Considered in the Alternatives Analysis

Once the screening evaluations were completed, the modal, technology, and alignment options were combined to create the following alternatives, which were evaluated in the Alternatives Analysis Report (DTS 2006b):

- No Build Alternative
- Transportation System Management (TSM) Alternative
- Managed Lane Alternative
  - Two-Direction Option
  - Reversible Option
- Fixed Guideway Alternative
  - Kalaeloa-Salt Lake-North King-Hotel Option
  - Kamokila-Airport-Dillingham Option
  - Kalaeloa-Airport-Dillingham-Halekauwila Option

These alternatives were presented to the public during a scoping process for the Alternatives Analysis and the HRS Chapter 343 Environmental Review Process in December 2005. They were evaluated based on their effectiveness in meeting transportation needs, environmental effects, and cost. The comparison of the alternatives presented in the Alternatives Analysis concluded that the TSM Alternative would provide little benefit at a relatively low cost, and that the Managed Lane Alternative would provide slightly more benefit at a substantial cost. In addition to the technical findings, the overwhelming majority (more than 80 percent) of the nearly 3,000 public testimonies received during hearings on the selection of the Locally Preferred Alternative were in favor of some form of the Fixed Guideway Alternative. The findings for the TSM and Managed Lane Alternatives are summarized in the following sections. Table 2-1 compares the alternatives evaluated in the Alternatives Analysis for several performance measures. While the results for the No Build and Fixed Guideway Alternatives that are summarized here differ from the values presented in this Draft EIS as a result of refinement to the analysis and additional engineering work, the relative performance of the alternatives has not changed.

For the Fixed Guideway Alternative as compared to the Managed Lane Alternative, the cost per hour of transit-user benefits would be between 160 and 240 percent less; daily transit trips would be between 14 and 20 percent greater; vehicle miles traveled (VMT) would be reduced by between 3 and 5 percent; and congestion, as measured by vehicle hours of delay (VHD), would be reduced by between 6 and 22 percent.

Transportation System Management Alternative

In the Alternatives Analysis phase, the TSM Alternative was developed to evaluate how well a

Table 2-1 Summary of Alternatives Analysis Findings

Alternative	Daily Islandwide Transit Trips	Vehicle Miles Traveled	Vehicle Hours of Delay	Hours of Transit User Benefits	Total Capital Cost (Millions 2006 Dollars)	Cost per Hour of Transit-user Benefit Compared to No Build
2030 No Build	232,100	13,971,000	82,000	N/A	$660	N/A
2030 Transportation System Management (TSM)	243,100	13,874,000	80,000	4,325,100	$856	$13.54
2030 Managed Lane	244,400–247,000*	14,002,000–14,034,000*	78,500–82,500*	5,528,500–5,632,700*	$3,601–$4,727*	$50.34–$63.42*
2030 Fixed Guideway	281,900–294,100*	13,464,000–13,539,000*	65,000–73,500*	15,153,600–18,770,200*	$4,192–$6,075*	$21.32–$27.05*

* Range of values provided represents the range between options reported in the Alternatives Analysis Report (DTS 2006b).

combination of relatively low-cost transit improvements could meet the study area's transportation needs. FTA requires that the TSM Alternative reflect the best that can be done for mobility without constructing a new transit guideway. Bus service was optimized, per FTA guidelines, by increasing bus service but without building a new fixed guideway for transit, such as a system of dedicated bus lanes. The analysis demonstrated that the Purpose and Need for the Project could not be met through a lower-cost, bus-based alternative alone.

After consideration of various service options and operating plans, the TSM Alternative was designed to serve the study corridor based on a hub-and-spoke network of bus routes, similar to today. Bus frequencies would have been increased during peak periods to provide improved service for work-related trips, particularly from developing areas such as Royal Kunia, Koa Ridge, and Waiawa. The bus fleet was assumed to increase from 525 to 765 buses, and park-and-ride lots were assumed at West Kapolei, UH West O'ahu, Waipi'o, and Aloha Stadium. In addition, the present a.m. peak-hour-only zipper lane would have been modified to operate in both the a.m. and p.m. peak periods, and relatively low-cost improvements would have been made on selected roadways to give priority to buses.

The analyses found that the TSM Alternative would have improved transit travel times somewhat by reducing the amount of time riders would have to wait for a bus to arrive at a bus stop. As a result, the TSM Alternative would have led to a slightly larger number of daily transit trips than the No Build Alternative (Table 2-1). This alternative would have generated fewer hours of transit-user benefits than either the Managed Lane or Fixed Guideway Alternative. Since most buses would still operate in mixed traffic, the TSM Alternative would have done little to improve corridor mobility and travel reliability. Roadway congestion also would not have been alleviated. In addition, because of the dispersed nature of transit service, slow bus speeds, and unreliable service, the TSM Alternative would not have supported the City's goals of concentrating growth within the corridor and reducing development pressures in rural areas.

In terms of its environmental impacts, the TSM Alternative would have generated fewer physical impacts than the Managed Lane and Fixed Guideway Alternatives. However, it would have required more transportation system energy and generated more air and water pollution than the Fixed Guideway Alternative.

Although the TSM Alternative would have been very cost-effective, primarily because of this low cost, financial feasibility was a concern. Currently, State legislation does not allow the local excise and use tax surcharge to be used for enhancement of the existing bus transit system.

Managed Lane Alternative

The Managed Lane Alternative would have provided a two-lane elevated toll facility between Waipahu and Downtown, with variable pricing strategies for single-occupant vehicles to maintain free-flow speeds for transit and high-occupancy vehicles (HOVs). Two design and operational variations of the Managed Lane Alternative were evaluated: a Two-direction Option (one lane in each direction) and a two-lane Reversible Option. For both options, access to the facility from ʻEwa and Central Oʻahu would be via ramps from the H-1 and H-2 Freeways prior to the Waiawa Interchange. Both options would have required modification to the design of the Hawaiʻi Department of Transportation's planned Nimitz Flyover Project and would have terminated with ramps tying into Nimitz Highway at Pacific Street. An intermediate bus access point would have been provided near Aloha Stadium. The Two-direction Option would have served express buses operating in both directions during the entire day. The Reversible Option would have served peak-direction bus service, while reverse-direction service would have used the H-1 Freeway. Twenty-nine bus routes, with approximately 93 buses per hour, would have used the managed lane facility during peak hours for either option. The Alternatives Analysis found that of the two options, the Reversible Option would have provided a better transit-user benefit-to-cost ratio.

The Managed Lane Alternative was evaluated for its ability to meet project goals and objectives related to mobility and accessibility, supporting planned growth and economic development, constructability and cost, community and environmental quality, and planning consistency. VMT would have increased compared to any of the other alternatives. While this alternative would have slightly reduced congestion on parallel highways, systemwide traffic congestion would have been similar to the No Build Alternative as a result of increased traffic on arterials trying to access the facility. Total islandwide VHD would have increased with the Managed Lane Reversible Option as compared to the No Build Alternative, indicating an increase in systemwide congestion (Table 2-1). Transit reliability would not have been improved except for express bus service operating in the managed lanes. The Managed Lane Alternative would not have supported planned concentrated future population and employment growth because it would not provide concentrations of transit service that would serve as a nucleus for transit-oriented development. The Managed Lane Alternative would have provided very little transit benefit at a high cost. The cost-per-hour of transit-user benefits for the Managed Lane Alternative would have been two to three times higher than that for the Fixed Guideway Alternative (Table 2-1). Similar to the TSM Alternative, the Managed Lane Alternative would not have substantially improved service or access to transit for transit-dependent communities.

The Managed Lane Alternative would have generated the greatest amount of air pollution, required the greatest amount of energy for transportation use, and would have resulted in the largest number of transportation noise impacts of all the alternatives evaluated. Because the Managed Lane Alternative would have served a shorter portion of the study corridor, it would have resulted in fewer displacements and would have impacted fewer archaeological, cultural, and historic resources than the Fixed Guideway Alternative. The Managed Lane Alternative would not have affected any farmlands. Visually, the elevated structure would have extended a shorter distance, but it would have been more visually intrusive because its elevated structure would have been much wider than the Fixed Guideway Alternative. It would have provided little community benefit, as it would not have resulted in substantially improved transit access in the corridor. Lastly, no funding sources were identified for the Managed Lane Alternative.

Fixed Guideway Alternative

The Fixed Guideway Alternative presented in the Alternatives Analysis included the construction and operation of a fixed guideway system between Kapolei and the University of Hawaiʻi at Mānoa (UH Mānoa). The study corridor for the Fixed Guideway Alternative was evaluated in five sections to simplify the analysis and facilitate evaluation.

Each alignment was evaluated individually and compared to the other alignments in that section in relation to transportation benefits, environmental and social consequences, and costs. The comparison resulted in an optimal alignment of Saratoga Avenue/North-South Road to Farrington Highway/Kamehameha Highway to Aolele Street to Dillingham Boulevard to Nimitz Highway/Halekauwila Street/Kapiʻolani Boulevard.

Summary of Alternatives Considered during the Alternatives Analysis

The Fixed Guideway Alternative performed better at meeting the project's Purpose and Need than any of the other alternatives evaluated in the Alternatives Analysis. A fixed guideway system would improve transit performance and reliability, be more cost-effective, and would substantially reduce VHD for all travelers, not just transit users (Table 2-1). The Managed Lane Alternative would not have qualified for local excise and use tax surcharge funding. Because single-occupant vehicles would have been permitted, even if tolled, Federal New Starts funding could not have been used.

Table 2-2 summarizes the alternatives considered but rejected. The TSM Alternative would not have substantially reduced congestion relative to the No Build Alternative and would not have improved corridor mobility and travel reliability.

After review of the Alternatives Analysis Report (DTS 2006b) and consideration of public comments, the City Council selected a fixed guideway transit system extending from Kapolei to UH Mānoa with a connection to Waikīkī as the Locally Preferred Alternative. The selection, which eliminated the TSM and Managed Lane Alternatives, became Ordinance 07-001 on January 6, 2007.

2.1.3 Alternatives Consideration Process after the Alternatives Analysis

Ordinance 07-001 authorized the City to proceed with the planning and engineering of a fixed guideway project from Kapolei to UH Mānoa with a connection to Waikīkī. The City Council also passed City Council Resolution 07-039, which directed the first construction project to be fiscally constrained by anticipated funding sources and to extend from East Kapolei to Ala Moana Center via Salt Lake Boulevard.

The FTA issued a Notice of Intent to prepare this Draft EIS in the *Federal Register* on March 15, 2007. All interested individuals and organizations, as well as Federal, State, and Local agencies, were invited to comment on the Purpose and Need to be addressed by a fixed guideway transit system from East Kapolei to Ala Moana Center (the Project); the alternatives, including the modes and technologies to be evaluated and the alignments and termination points to be considered; and the environmental, social, and economic impacts to be analyzed.

The alternatives evaluated in this Draft EIS and described in this chapter are the result of the alternatives screening process and reflect

Table 2-2 Alternatives and Technologies Considered but Rejected

	Why Rejected	When Rejected
Alternative		
Pearl Harbor Tunnel	Rejected by O`ahuMPO based on high cost and limited benefit	Screening
Waterborne Ferry Service	Insufficient capacity and uncompetitive travel time	Screening
Transportation System Management	Would not have supported Honolulu General Plan; minimal impact to vehicle miles traveled and vehicle hours of delay	Alternatives Analysis
Managed Lane Alternative	Would not have supported Honolulu General Plan; minimal impact to vehicle miles traveled and vehicle hours of delay	Alternatives Analysis
Technologies		
Diesel Multiple Unit	Not suitable for urban transit	Screening
Personal Rapid Transit	Unproven technology and insufficient capacity	Screening
Commuter Rail	Not suitable for urban transit	Screening
Emerging Concepts	Unproven technology	Screening
Rubber-tired Guided Vehicles	Proprietary technology	After Alternatives Analysis
Magnetic Levitation	Proprietary technology unproven in U.S.	After Alternatives Analysis
Monorail	Proprietary technology	After Alternatives Analysis

comments received during the scoping process, as summarized in the *Honolulu High-Capacity Transit Corridor Project National Environmental Policy Act Scoping Report* (DTS 2007). The NEPA scoping process affirmed the selection of the Locally Preferred Alternative decision.

The Notice of Intent and Scoping Information Package included the No Build and two Build Alternatives (a Fixed Guideway Transit Alternative via Salt Lake Boulevard and a Fixed Guideway Transit Alternative via the Airport & Salt Lake Boulevard). They also included five technologies.

Several scoping comments were received requesting reconsideration of the Managed Lane Alternative that was considered and rejected during the Alternatives Analysis. No new information was provided that would have changed the findings of the Alternatives Analysis regarding the Managed Lane Alternative; therefore, it is not included in this Draft EIS.

In addition to suggestions for reconsideration of previously eliminated alternatives, three separate alternatives were proposed during the NEPA scoping process and documented in the Scoping Report (DTS 2007). One comment suggested providing additional bus service with either school buses or private vehicles. The second proposal was for a High Speed Bus Alternative that would include aspects of both the Managed Lane Alternative that was eliminated during the Alternatives Analysis and the Fixed Guideway Alternative. The third comment requested consideration of a third fixed guideway alternative.

Providing additional bus service with either school buses or private vehicles represents variations on the TSM Alternative that would provide additional bus capacity using different vehicles or be limited to certain times of day; it did not differ structurally from the TSM Alternative. As a result, providing additional bus service with school buses or private vehicles would not provide substantial benefit when compared to the TSM Alternative already evaluated; therefore, it is not included in this Draft EIS.

Constructing an elevated bus facility with multiple access points for the entire length of the Fixed Guideway Alternative would be more costly and have more severe impacts to many elements of the environment because of its increased width, both for the entire length of the system as compared to the Fixed Guideway Alternative, and at stations where the width would approach 100 feet. These impacts would be similar to those of the Two-direction Managed Lane Alternative that was evaluated in the Alternatives Analysis, but would have extended for the entire length of the corridor from Kapolei to UH Mānoa. Substantial right-of-way would have been required to accommodate the structure through urban Honolulu, including more right-of-way for the additional proposed ramps; therefore, this alternative is not included in this Draft EIS.

Scoping comments requested the evaluation of a third fixed guideway alternative that would serve the airport in lieu of following Salt Lake Boulevard. This alternative would meet the Project's Purpose and Need and could generate the same or fewer environmental or community impacts than the other fixed guideway alternative options under consideration; therefore, it was added for evaluation in this Draft EIS.

The NEPA Notice of Intent requested input on five transit technologies. The comments received did not substantially differentiate any of the following five considered technologies as being universally preferable to the other technologies:

- Light-rail transit
- Rapid-rail transit (steel wheel on steel rail)
- Rubber-tired guided vehicles
- Magnetic levitation system
- Monorail system

A technical review process that included opportunities for public comment was used subsequent to the scoping process to select a transit technology. The process included a broad request for information that was publicized to the transit industry. Transit vehicle manufacturers submitted 12 responses covering all of the technologies listed in the Notice of Intent.

The responses were reviewed in February 2008 by a five-member panel appointed by the City Council and the Mayor that considered the performance, cost, and reliability of the proposed technologies. The panel twice accepted public comment as part of its review. By a four-to-one vote, the panel selected steel wheel operating on steel rail as the technology for the Build Alternatives evaluated in this Draft EIS. Table 2-2 contains the technologies that were considered but rejected. The four panel members eliminated proprietary technologies, meaning that selection of one of those technologies would have required all future purchases of vehicles or equipment to be from a single manufacturer, because none of the proprietary technologies offered substantial proven performance, cost, and reliability benefits compared to steel wheel operating on steel rail.

The panel's findings were summarized in its report to the City Council dated February 22, 2008. The panel's report resulted in the City establishing steel wheel operating on steel rail as the technology for the Build Alternatives evaluated in this Draft EIS. Therefore, the analyses of the fixed guideway alternatives in this Draft EIS are based on steel wheel on steel rail technology.

2.2 Alternatives Evaluated in this Draft Environmental Impact Statement

Four alternatives are evaluated in this Draft EIS. They include the No Build Alternative and three fixed guideway alternatives (Build Alternatives) with different lengths and alignments:

- No Build Alternative
- Fixed Guideway Transit Alternative via Salt Lake Boulevard (Salt Lake Alternative) (Figure 2-2)
- Fixed Guideway Transit Alternative via the Airport (Airport Alternative) (Figure 2-3)
- Fixed Guideway Transit Alternative via the Airport and Salt Lake Boulevard (Airport & Salt Lake Alternative) (Figure 2-4)

All alternatives include existing transit and highway facilities, as well as committed transportation projects, exclusive of the fixed guideway transit project, anticipated to be operational by 2030. Committed transportation projects are those identified in the ORTP (O'ahuMPO 2007). Highway congestion relief projects in the ORTP are described in Table 2-3.

Transit fare policy is anticipated to be continued for all Build Alternatives.

Land use, population, and employment assumptions for the year 2030 have been kept constant for all alternatives. The data were provided by the City and County of Honolulu Department of Planning and Permitting (DPP) and are consistent with the ORTP forecast assumptions.

A connection to the Honolulu International Airport could be built as a construction phasing option of the Airport & Salt Lake Alternative following the completion of the section of the Project between East Kapolei and Ala Moana Center along Salt Lake Boulevard.

2.2.1 No Build Alternative

The No Build Alternative is included in this Draft EIS to provide a comparison of what the future conditions will be if none of the Build Alternatives were implemented. It includes the elements described as common to all alternatives.

The No Build Alternative bus network would include all routes in operation today, plus planned route modifications and additions to the existing bus network that are likely to occur between now and the year 2030 to respond to the population and employment estimates for the year 2030.

The No Build Alternative's transit component would include an increase in fleet size. However, due to increasing traffic congestion and slower travel times, transit service levels and passenger capacity would remain about the same as they are today (Table 2-4).

2.2.2 Build Alternatives

The Build Alternatives would include the construction and operation of a grade-separated fixed guideway transit system between East Kapolei and Ala Moana Center (Figures 2-5 to 2-8). Detailed plans of the alignment are included in Appendix A of this Draft EIS. The system would use steel wheel on steel rail technology. The vehicles could either be manually operated by a driver or fully automated (driverless). All parts of the guideway would be elevated, except near Leeward Community College, where it would be in exclusive right-of-way.

The guideway would follow the same alignment for all Build Alternatives through most of the study corridor, except between Aloha Stadium and Kalihi (Figure 2-7). From Wai'anae to Koko Head (west to east), the guideway would follow North-South Road and other future roadways to Farrington Highway (Figure 2-5). The guideway would follow Farrington Highway Koko Head on an elevated structure and continue along Kamehameha Highway to the vicinity of Aloha Stadium (Figure 2-6).

Between Aloha Stadium and Kalihi, the alignment differs for each of the Build Alternatives, as detailed later in this section (Figure 2-7). Koko Head of Middle Street, the guideway would follow Dillingham Boulevard to the vicinity of Ka'aahi

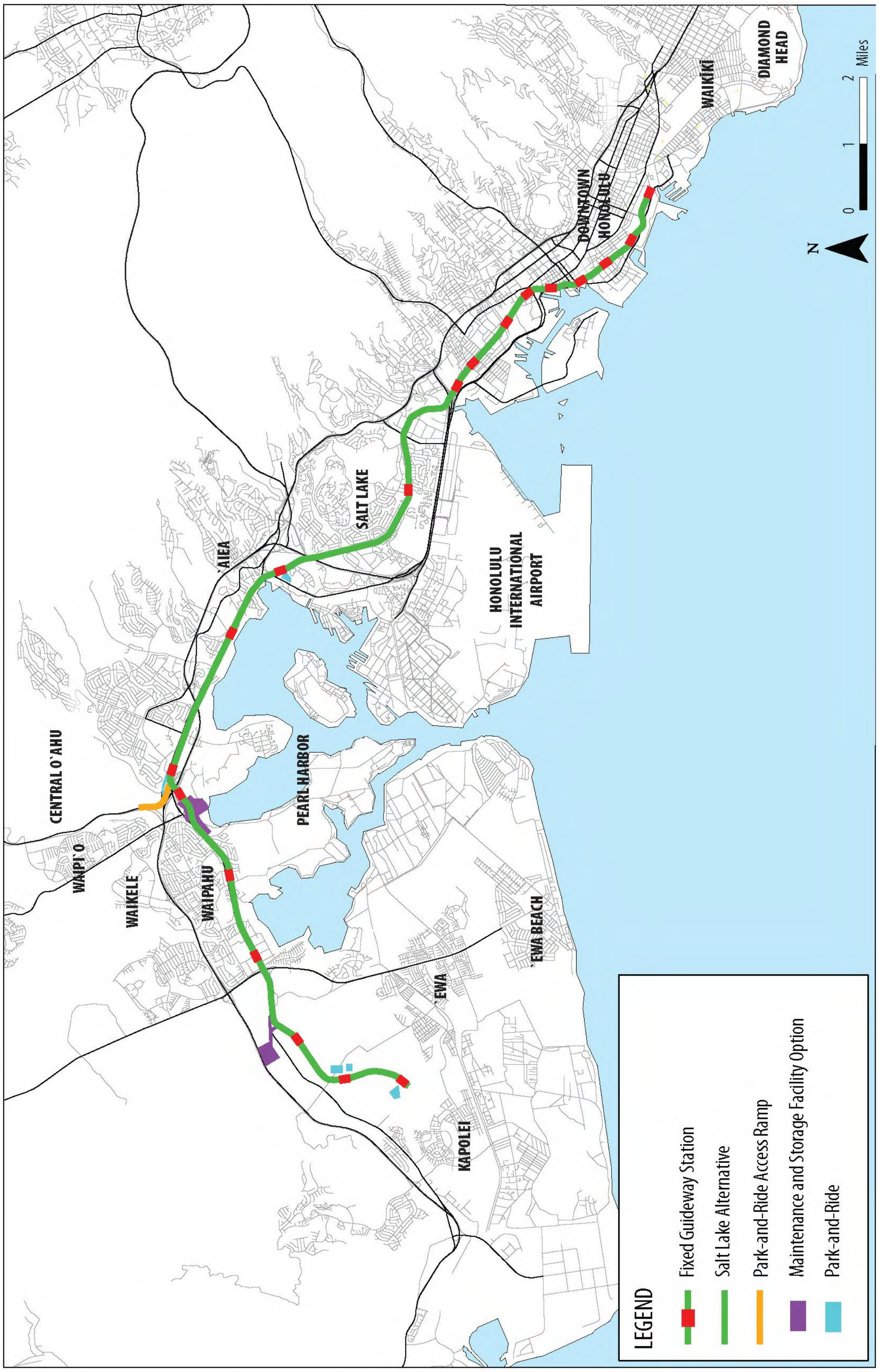


Figure 2-2 Salt Lake Alternative

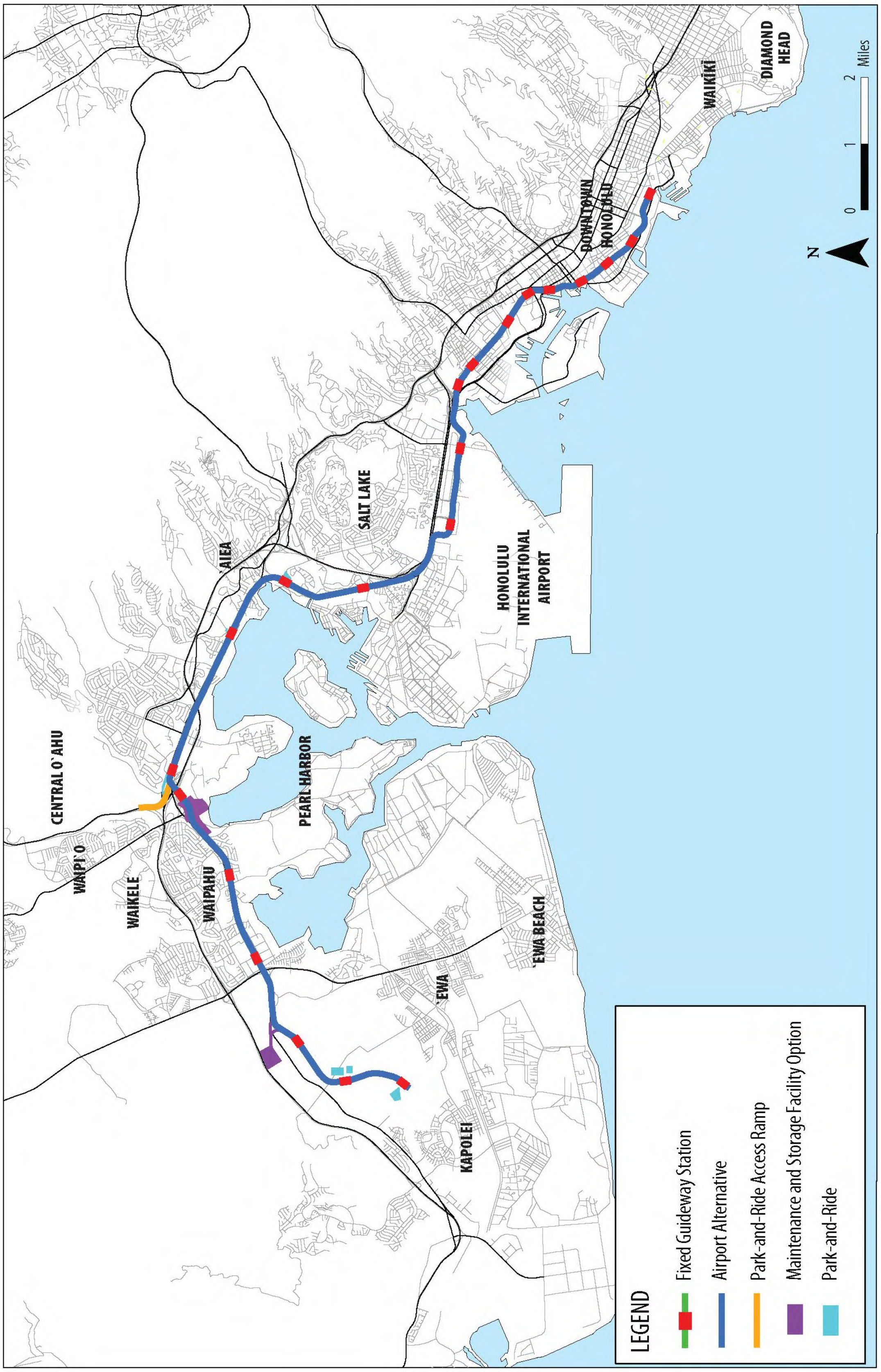


Figure 2-3 Airport Alternative

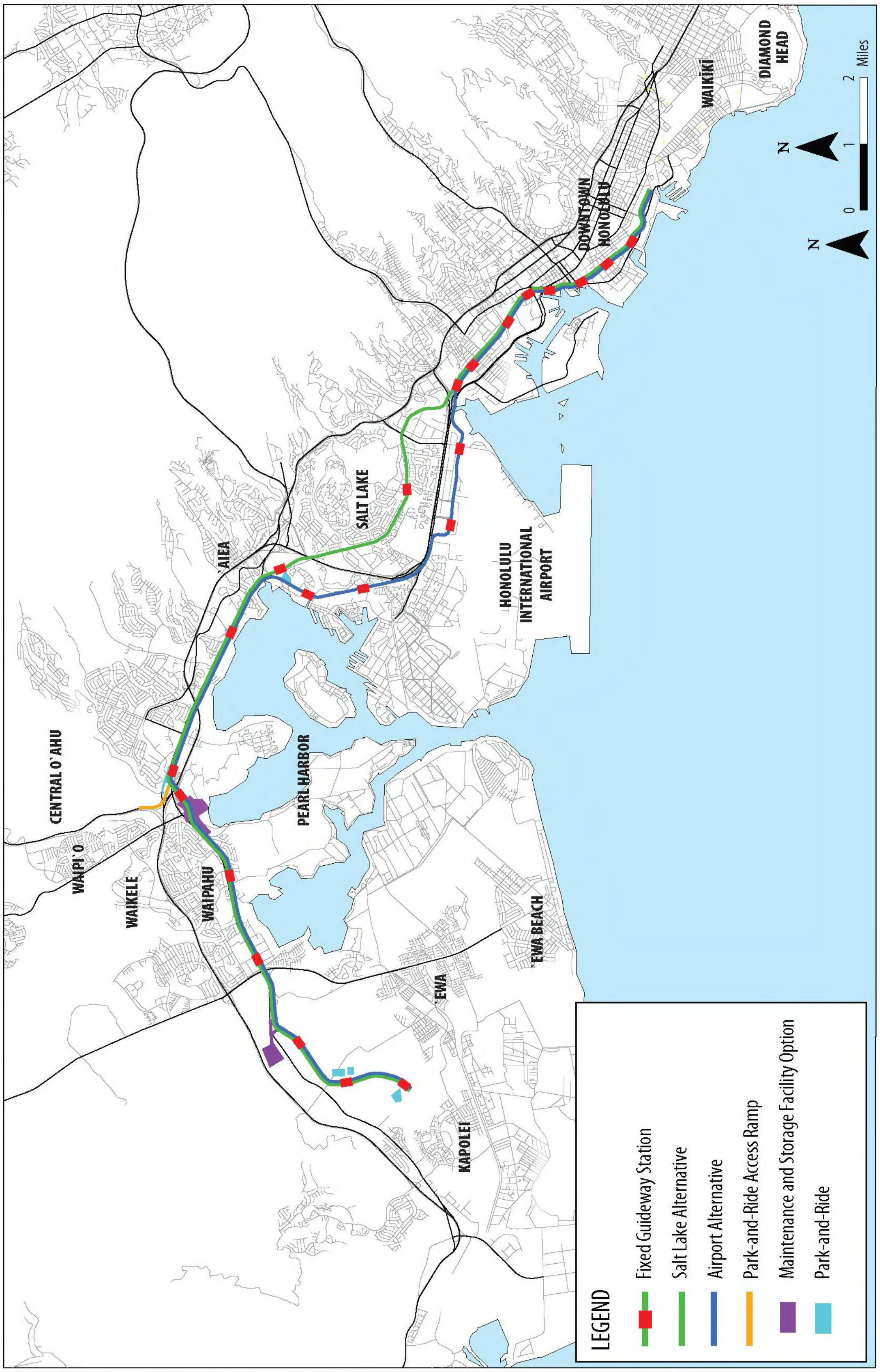


Figure 2-4 Airport & Salt Lake Alternative

Table 2-3 Committed Congestion-relief Projects in the O`ahu Regional Transportation Plan 2030

Facility	Description
Farrington Highway	Widen Farrington Highway from Golf Course Road to just west of Fort Weaver Road
Fort Barrette Road	Widen Fort Barrette Road from Farrington Highway to Franklin D. Roosevelt Avenue
Hanua Street	Extend Hanua Street from Malakole Street to Farrington Highway and construct new on- and off-ramps at H-1
H-1 Freeway	Construct new H-1 Kapolei Interchange
H-1 Freeway	Widen H-1 in the eastbound direction from Middle Street to Vineyard Boulevard
H-1 Freeway	Modify the weaving movements on H-1, in the westbound direction, between the Lunalilo Street on-ramp and the Vineyard Boulevard off-ramp
H-1 Freeway	Construct a new eastbound off-ramp and westbound on-ramp to H-1 at the Makakilo Interchange
H-1 Freeway	Widen H-1 in the westbound direction from the Waiau Interchange to the Waiawa Interchange
H-1 Freeway	Widen H-1 in the westbound direction through the Waiawa Interchange
H-1 Freeway	Construct a zipper lane on H-1 in the westbound direction from the Ke`ehi Interchange to the Kunia Interchange
H-1 Freeway	Widen the Waipahu Street off-ramp in the westbound direction
H-2 Freeway	Widen ramps at the Waipi`o Interchange
H-1 Freeway	Improve operations between Ward Avenue and University Avenue
H-1 and H-2 Freeways	Modify the H-1 and H-2 Waiawa Interchange
Kamehameha Highway	Widen Kamehameha Highway between Lanikuhana Avenue and Ka Uka Boulevard
Kapolei Parkway	Extend Kapolei Parkway
North-South Road	Widen and extend North-South Road
Makakilo Drive	Extend Makakilo Drive south to H-1 and connect to North-South Road
Farrington Highway	Widen Farrington Highway from Kunia to Waiawa Interchange
Farrington Highway	Widen Farrington Highway from Hakimo Road to Kalaeloa Boulevard
H-1 Freeway	Widen H-1 in the eastbound direction from Liliha Street to Pali Highway
H-1 Freeway	Modify and/or close various ramps on H-1 from Middle Street to University Avenue
H-1 Freeway	Modify on- and off-ramps at the University Avenue Interchange on H-1
H-1 Freeway	Widen H-1 in the westbound direction from Vineyard Boulevard to Middle Street
H-1 Freeway	Construct HOV lanes from the Waiawa Interchange to the Makakilo Interchange
H-1 Freeway	Widen H-1 in the eastbound direction from the Waiawa Interchange to the Hālawa Interchange
H-1 Freeway	Widen H-1 in the eastbound direction from Ward Avenue to Punahou Street
H-2 Freeway	Construct a new interchange between Meheula Parkway and Ka Uka Boulevard
Kahekili Highway	Widen Kahekili Highway from Kamehameha Highway to Ha`ikū Road
Kunia Road	Widen Kunia Road from Wilikina Drive to Farrington Highway
Likelike Highway	Widen Likelike Highway from Kamehameha Highway to Kahekili Highway
Makakilo Mauka Frontage Road	Construct a new Makakilo Mauka Frontage Road from Kalaeloa Boulevard to Makakilo Drive
Nimitz Highway	Construct a new two-lane elevated and reversible HOV flyover above Nimitz Highway
Pi`ikoi and Pensacola Streets	Reverse the existing one-way Pi`ikoi Street and Pensacola Street couplet
Pu`uloa Road	Widen Pu`uloa Road from Pukuloa Street to Nimitz Highway
Central Mauka Road	Construct Central Mauka Road, a new road from Mililani Mauka to Waiawa
Wahiawā, Second Access	Construct a new second access road between Whitmore Village and Wahiawā
Wai`anae, Second Access	Construct a new second access road to Wai`anae from Farrington Highway

Street and then turn Koko Head to connect to Nimitz Highway near Iwilei Road.

Table 2-4 Transit Vehicle Requirements

Alternative	Bus		Fixed Guideway	
	Peak	Fleet	Peak	Fleet
2007 Existing Conditions	434	540	0	0
2030 No Build	501	601	0	0
2030 Salt Lake	469	563	50-55	60-65
2030 Airport	465	558	56	67
2030 Airport & Salt Lake	465	558	52-57	62-67

The guideway would follow Nimitz Highway Koko Head to Halekauwila Street, then proceed along Halekauwila Street past Ward Avenue where it would transition to Queen Street. The guideway would cross from Waimanu Street to Kona Street in the vicinity of Pensacola Street. The guideway would run above Kona Street to Ala Moana Center.

In addition to the guideway, the Project would require the construction of stations and supporting facilities. Supporting facilities include a vehicle maintenance and storage facility, transit centers, park-and-ride lots, and traction power substations. The vehicle maintenance and storage facility would either be located in the planned Ho'opili development near Farrington Highway or near Leeward Community College (Figures 2-5 and 2-6).

Transit centers would be constructed as stand-alone facilities or as part of park-and-ride lots at:

- **UH West O`ahu**
- **West Loch**
- **Pearl Highlands**
- **Aloha Stadium**

Some bus routes would be reconfigured to bring riders on local buses to nearby fixed guideway transit stations. To support this system, the bus fleet would be increased (Table 2-4).

The Project would provide high-capacity transit service between East Kapolei and Ala Moana Center with future extensions planned for West Kapolei to East Kapolei and from Ala Moana Center to UH Mānoa and to Waikīkī.

The East Kapolei Station is the proposed Wai'anae terminus for the Project. It is located on North-South Road (under construction) near the planned Salvation Army Kroc Center, approximately one mile Koko Head of the UH West O'ahu Station (Figure 2-5). This area of East Kapolei is undergoing development that will be a mixture of residential, recreational, educational, industrial, and commercial land uses. The location of the terminus would support one of the project goals to "improve access to planned development to support City policy to develop a second urban center," as defined in the 'Ewa Development Plan.

As part of this development, the immediate area is also planned for future Department of Hawaiian Home Lands housing development. Kroc Center, scheduled to open in 2010, will be a 15-acre family support, education, recreation, and cultural arts facility for the general public and will provide services for low-income children, seniors, and families.

Projected year of opening (2018) ridership shows that the East Kapolei Station would have one of the highest boardings in the system. Because there is available space in the vicinity of the station, it would include a park-and-ride lot that would accommodate automobile, motorcycle, and bicycle commuters. The station would serve local and express transit commuters from 'Ewa, 'Ewa Beach, Kapolei, and Kalaeloa.

Figure 2-5 Fixed Guideway Transit Alternative Features, Kapolei to Fort Weaver Road

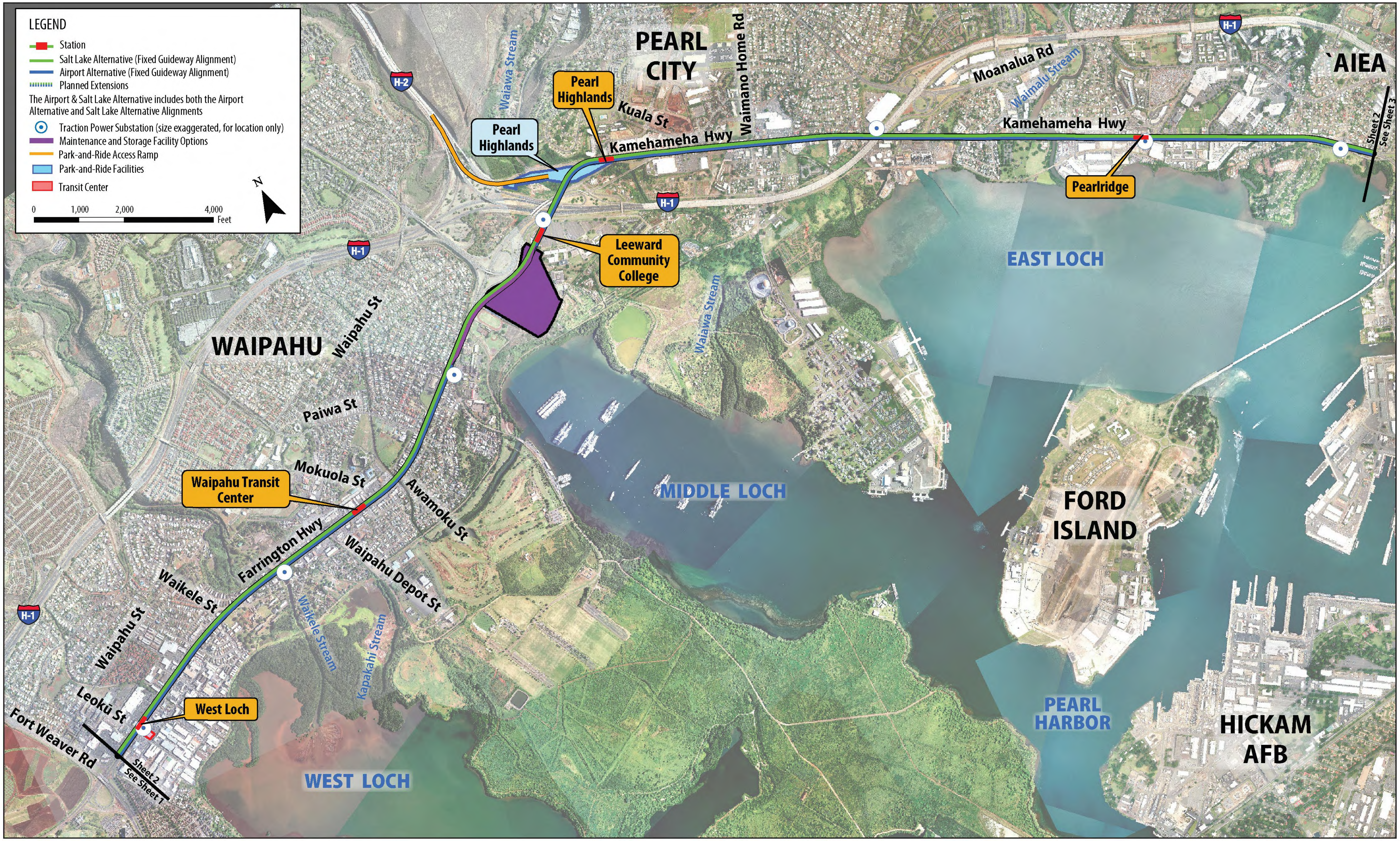


Figure 2-6 Fixed Guideway Transit Alternative Features, Fort Weaver Road to Aloha Stadium

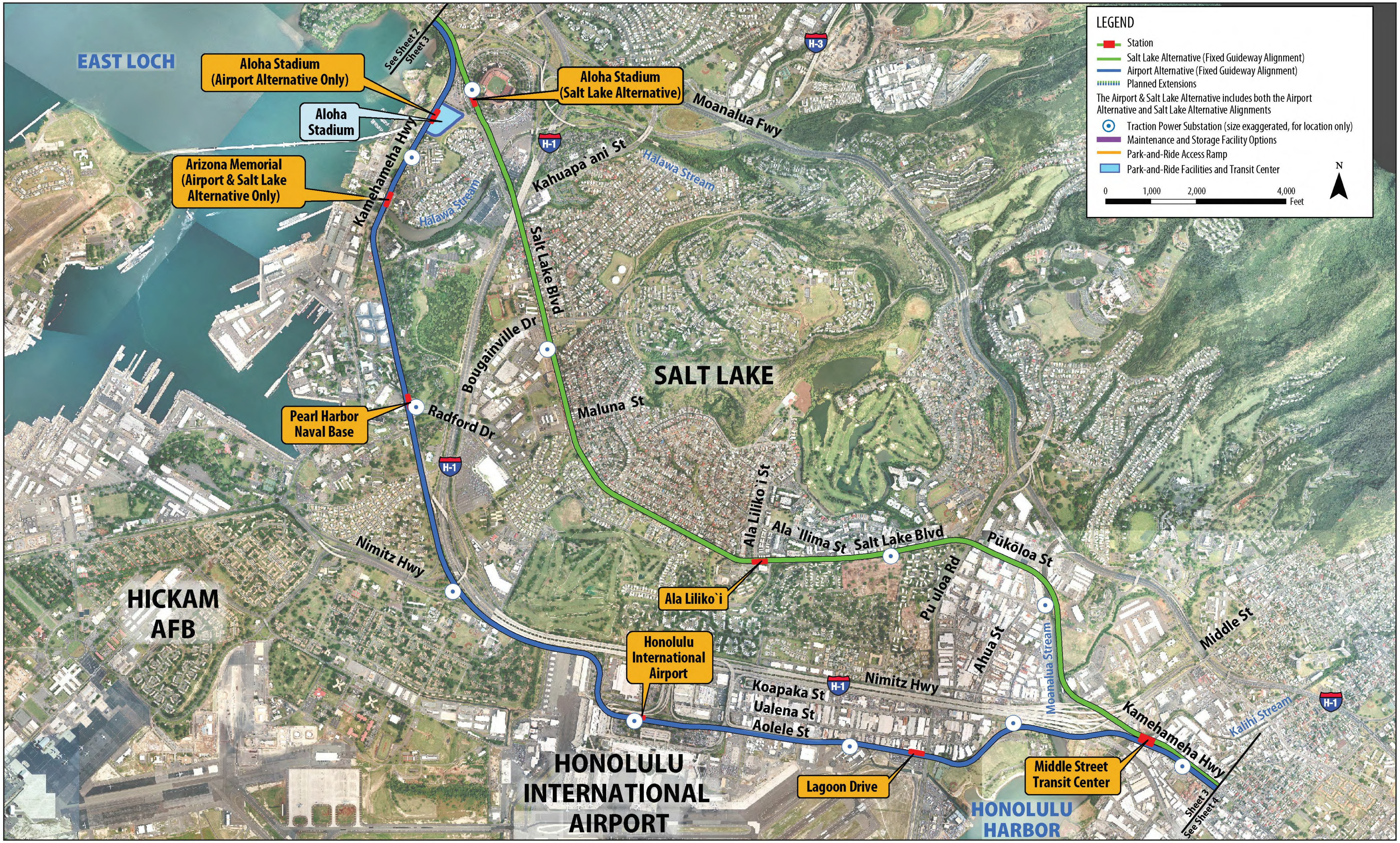


Figure 2-7 Fixed Guideway Transit Alternative Features, Aloha Stadium to Kalihi

Figure 2-8 Fixed Guideway Transit Alternative Features, Kalihi to UH Mānoa and Waikīkī

Ala Moana Center is the logical Koko Head terminus because as O'ahu's largest shopping center it is a major activity center. Ala Moana Center also is a major transit hub with more than 2,000 weekday bus trips. The Koko Head terminus would allow commuters the ability to link to the major employment centers and traffic generators in the area.

Therefore, East Kapolei and Ala Moana Center are rational end points for the system and can operate independent of any other transportation improvements, except those planned as part of the No Build Alternative and assumed in to be place prior project completion.

Salt Lake Alternative

The Salt Lake Alternative would leave Kamehameha Highway immediately 'Ewa of Aloha Stadium, cross the Aloha Stadium main parking lot, and continue Koko Head along Salt Lake Boulevard (Figure 2-7). It would follow Pūkōloa Street through Māpunapuna before crossing and following Moanalua Stream to cross over the H-1 Freeway and continue to the Middle Street Transit Center. Stations would be constructed at Aloha Stadium and Ala Liliko'i Street. The alignment for the Salt Lake Alternative is shown in Figure 2-2. Under this alternative, feeder bus connections would be provided from fixed guideway stations to Pearl Harbor Naval Base, Honolulu International Airport, and Hickam Air Force Base. The total guideway length for the Salt Lake Alternative would be approximately 19 miles and it would include 19 stations.

Airport Alternative

The Airport Alternative would continue past Aloha Stadium along Kamehameha Highway makai to Nimitz Highway and turn makai onto Aolele Street. It would then follow Aolele Street Koko Head to reconnect to Nimitz Highway near Moanalua Stream and continue to the Middle Street Transit Center (Figure 2-7). Stations would be constructed at Aloha Stadium, Pearl Harbor Naval Base, Honolulu International Airport, and Lagoon Drive. The alignment for the Airport Alternative is shown in Figure 2-3. Under this alternative, feeder bus connections would be provided from fixed guideway stations to locations along Salt Lake Boulevard. The total guideway length for the Airport Alternative would be approximately 20 miles and it would include 21 stations.

Airport & Salt Lake Alternative

The Airport & Salt Lake Alternative is identical to the Salt Lake Alternative, with the additional segment that follows Kamehameha Highway and Aolele Street from Aloha Stadium to Middle Street (Figure 2-7). This alternative would follow the alignments described for both the Salt Lake Alternative and the Airport Alternative. All the station locations discussed for the Salt Lake Alternative would be provided as part of this alternative. All stations discussed for the Airport Alternative also would be included, except that the Aloha Stadium Station on Kamehameha Highway would be relocated south to provide an Arizona Memorial Station instead of a second Aloha Stadium Station. At the Middle Street Transit Center Station, each line would have a separate platform with a mezzanine providing a pedestrian connection between them to allow passengers to transfer. The alignment for the Airport & Salt Lake Alternative is shown in Figure 2-4. The total guideway length for this alternative would be approximately 25 miles and it would include 23 stations.

Construction of the Airport & Salt Lake Alternative would be completed in phases. The section between East Kapolei and Ala Moana Center along Salt Lake Boulevard would be constructed first, followed by the connection from the Middle Street Transit Center to the airport, and finally the connection from the airport to Aloha Stadium.

Operating Parameters

The fixed guideway system is planned to operate between 4 a.m. and midnight (Table 2-5), with a train arriving in each direction at each station between every three and ten minutes. Trains would be capable of reaching 50 miles per hour (mph) or greater and achieve an average speed, including dwell times at stations, of 30 mph or greater. It is envisioned that bicycles would be allowed on trains.

Table 2-5 Fixed Guideway Operating Assumptions

Time of Day[1]	System Headway[2]
4 a.m. to 6 a.m.	6 minutes
6 a.m. to 9 a.m.	3 minutes
9 a.m. to 3 p.m.	6 minutes
3 p.m. to 6 p.m.	3 minutes
6 p.m. to 8 p.m.	6 minutes
8 p.m. to midnight.	10 minutes

[1]System is closed from midnight to 4 a.m.

[2]Branch-line headway on Airport and Salt Lake alignments would be twice that of the main line for the Airport & Salt Lake Alternative.

A unified fare structure is planned, similar to the current structure for TheBus and TheBoat; however, other fare policies could be considered in the future. Fare vending machines would be available at all stations, and standard fare boxes would be used on buses. Fare-collection for the fixed guideway system would be proof of payment. Fare inspectors would ride the system and randomly check that passengers have valid tickets, passes, or transfers. Violators would be cited and fined.

The system is planned to operate with multi-vehicle trains approximately 120 to 180 feet long, with each train capable of carrying 325 or more passengers. This would provide a peak capacity of at least 6,000 passengers per hour per direction. The system would be expandable to accommodate longer trains of up to 300 feet in the future to increase capacity by more than 50 percent. Also, the system could be operated with shorter headways (time between train arrivals) to increase peak capacity.

This level of service would require a peak-period fixed guideway fleet of 50 to 57 vehicles depending on the final vehicle design selected (Table 2-4).

Transit Technology

The selected transit technology would be electrically powered, industry-standard steel wheel on steel rail powered from a third-rail system (Figure 2-9). The selected vehicle would be capable of a top speed greater than 50 mph and meet the environmental and operating parameters discussed in this Draft EIS.

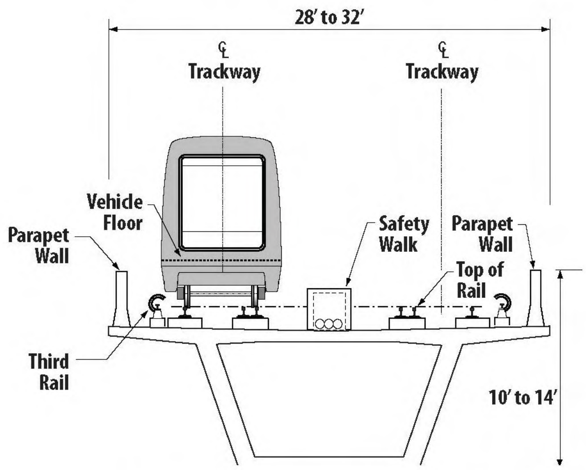
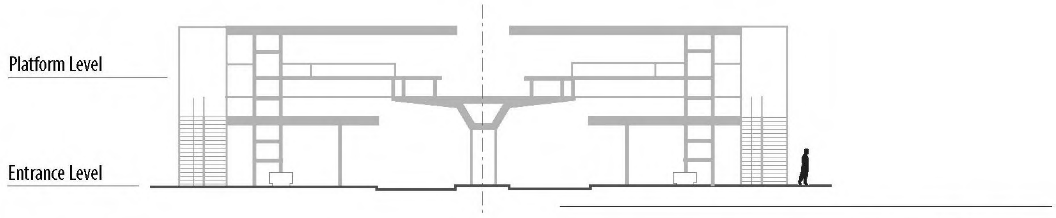


Figure 2-9 Example Vehicle on Elevated Guideway (Cross-section)

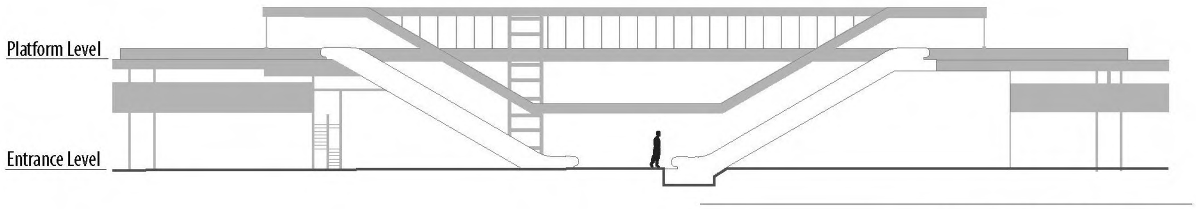
The vehicles could either be manually operated by a driver or fully automated (driverless). This is possible because the fixed guideway would operate in exclusive right-of-way with no automobile or pedestrian crossings.

Station Characteristics

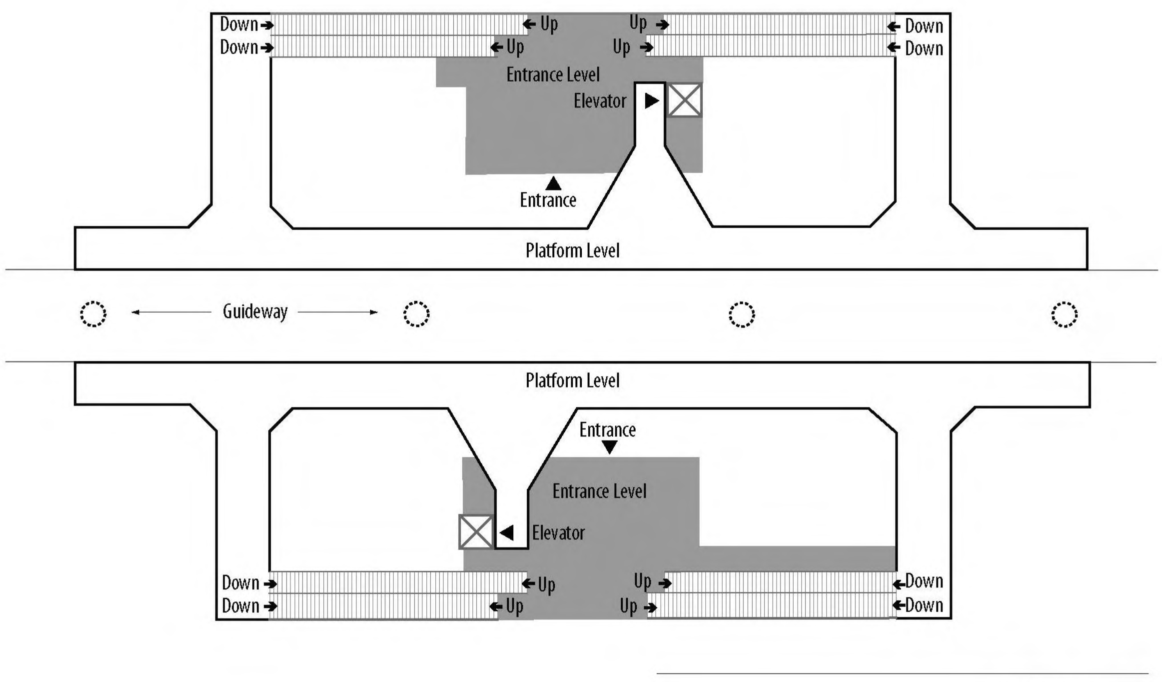
All fixed guideway stations would have similar design elements. The stations would provide one, two, or three platforms 300 feet long and be a minimum of 12 feet wide to accommodate passenger demand beyond 2030. Center platform stations would have a minimum 30-foot-wide platform. All platforms would be high level (at the same level as the vehicle floor) to provide level boarding for all passengers and to accommodate wheelchairs. In



Cross-section



Longitudinal Section



Plan View

Figure 2-10 Typical Side-platform Station Configuration without a Concourse

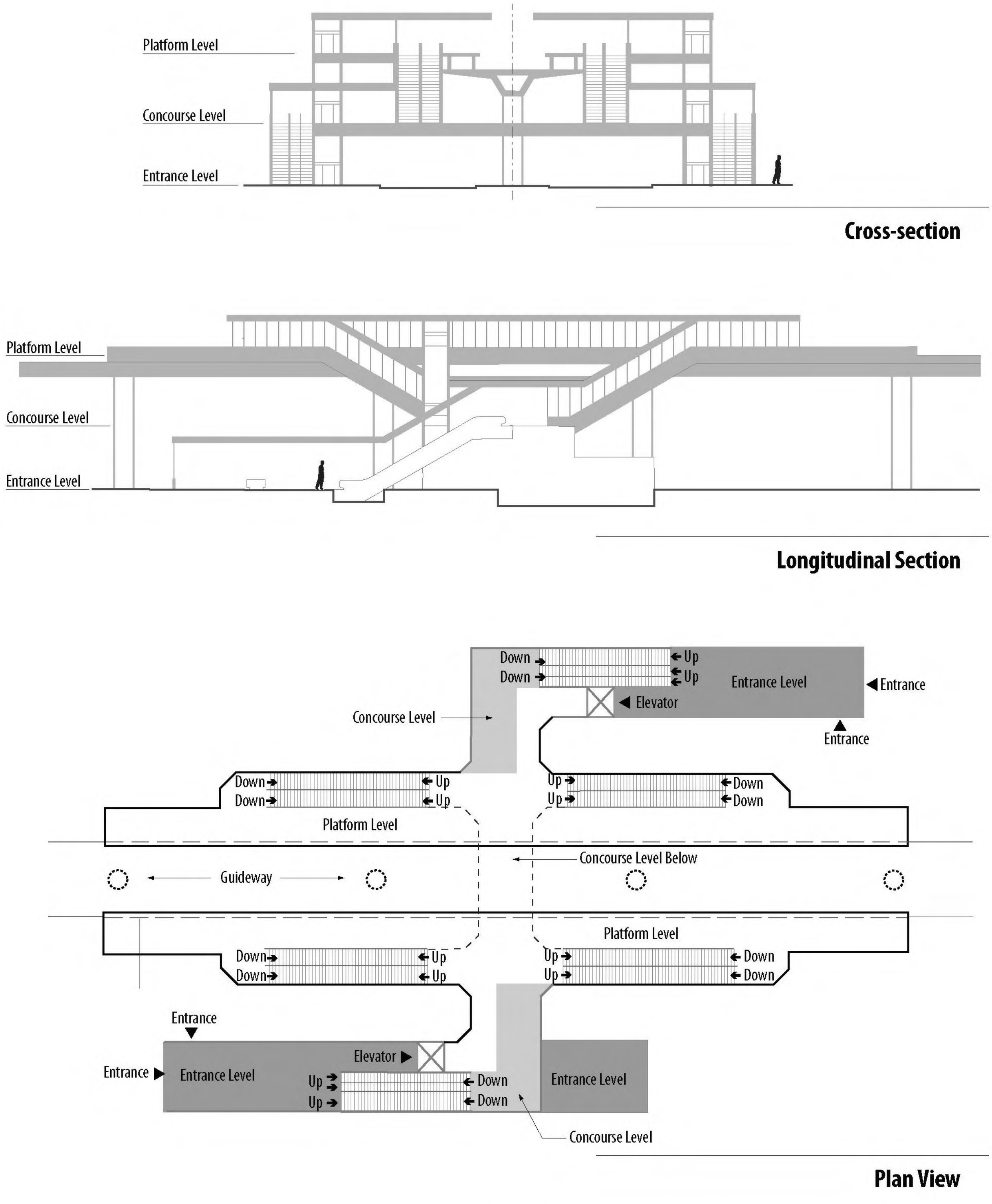


Figure 2-11 Typical Side-platform Station Configuration with a Concourse

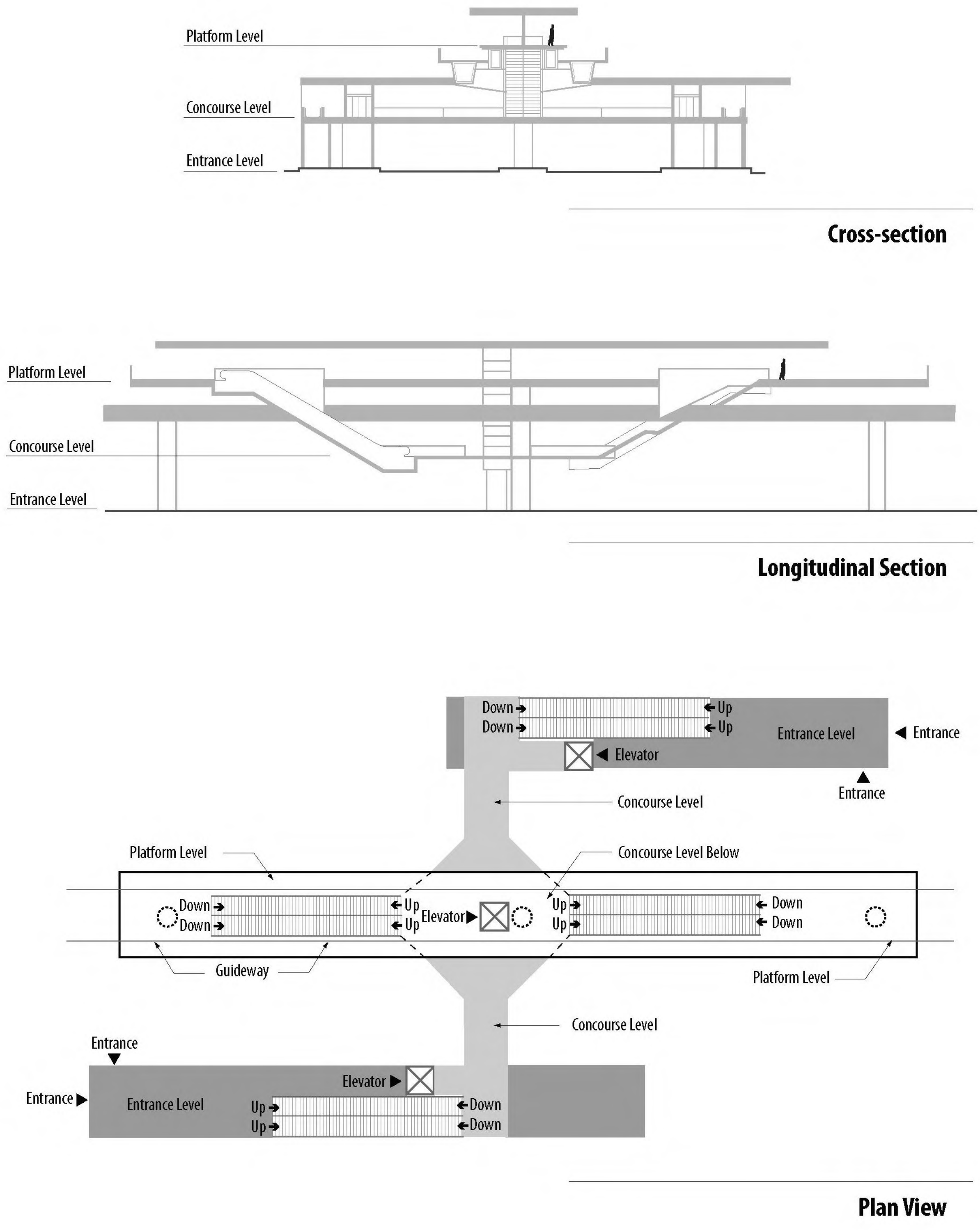


Figure 2-12 Typical Center-platform Station Configuration with a Concourse

addition to stairs and escalators, elevators would be provided at all stations to accommodate elderly and disabled riders. Bicycle racks or lockers also would be provided.

Each station would include the following:

- Stairs, elevators, and escalators for access
- Ticket-vending machines
- Bicycle parking
- Landscaping
- Lighting

Ticket-vending machines would be provided at all stations. Stations would be designed to accommodate fare gates and a station manager's booth, which could either be on the ground or mezzanine level. The stations would have one of three general configurations:

- Side platforms without a mezzanine (Figure 2-10)
- Side platforms with a mezzanine (Figure 2-11)
- Center platforms with a mezzanine (Figure 2-12)

Side-platform stations without a mezzanine allow the guideway to continue through the station without changing its height above the ground, which averages approximately 30 feet to the top of the tracks. Side-platform and center-platform mezzanine stations require the guideway to climb approximately 18 feet to provide clearance for a mezzanine below the platform that would provide adequate clearance above the street below. Center-platform mezzanine stations would require the tracks to split several hundred feet before the station to pass on each side of the platform. The specific layout would vary at each station for all three station types, depending on available space, the location of bus connections, and the number of passengers that would use each station.

Each of the 24 station locations is shown in Figures 2-13 through 2-37. The figure titles indicate which of the Build Alternatives would include the station.

Bus System

Bus fleet requirements are shown in Table 2-4. Bus service would be enhanced and the bus network would be modified to coordinate with the fixed guideway system. Some existing bus routes, including peak-period express buses, would be altered or eliminated to reduce duplication of services provided by the fixed guideway system. Buses removed from service in the study corridor would be shifted to service in other parts of O'ahu, resulting in improved transit service islandwide. Certain local routes would be rerouted or reclassified as feeder buses to provide frequent and reliable connections to the nearest fixed guideway station. Bus routes accessing the fixed guideway stations are shown in Figures 2-14 through 2-37.

In Wai'anae, local and express services would be enhanced through shorter routes and more frequent service to connect to the fixed guideway system in East Kapolei with the major connection point at the UH West O'ahu Station (Figure 2-38). Central O'ahu connections to the fixed guideway system would occur at the Pearl Highlands Station (Figure 2-39). Few changes would occur in Pearl City and 'Aiea. Pearl Harbor Naval Base and Hickam Air Force Base would be served by circulators connecting to fixed guideway stations. Kalihi services are anchored at the Middle Street Transit Center. A number of routes would connect to this transit center. In Downtown and Waikīkī, buses would continue to operate on the major east-west transit streets of King, Hotel, Beretania, Kapi'olani, and Ala Moana to provide local circulation (Figure 2-40). In Windward O'ahu, a few routes would be altered to connect with the fixed guideway system, thus offering Windward residents connections to Leeward O'ahu.

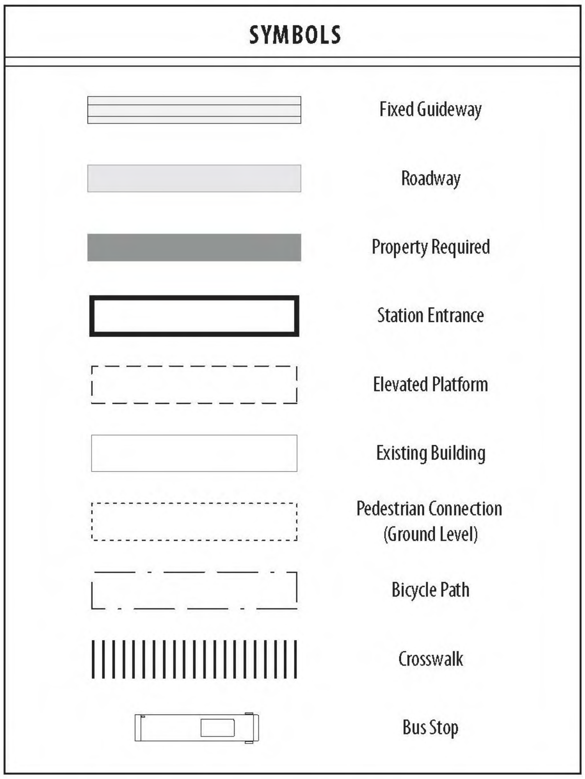


Figure 2-13 Legend for Figures 2-14 to 2-37

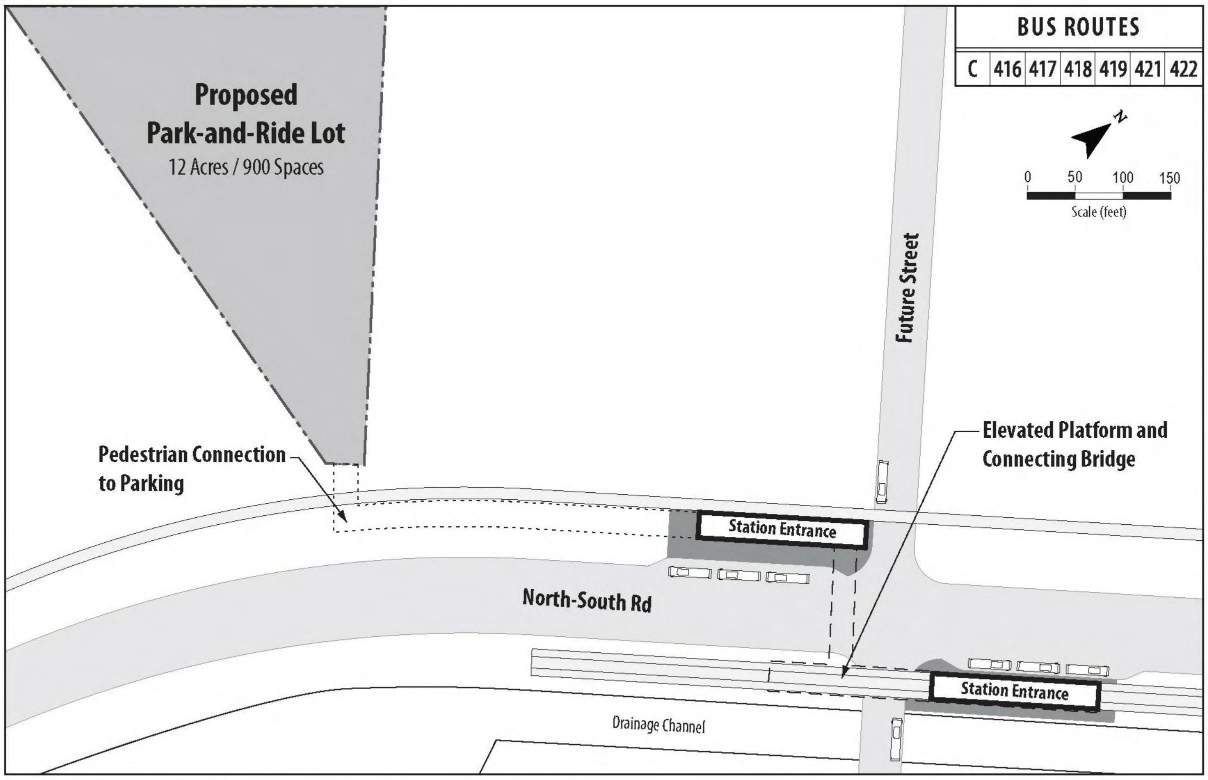


Figure 2-14 East Kapolei Station (All Build Alternatives)

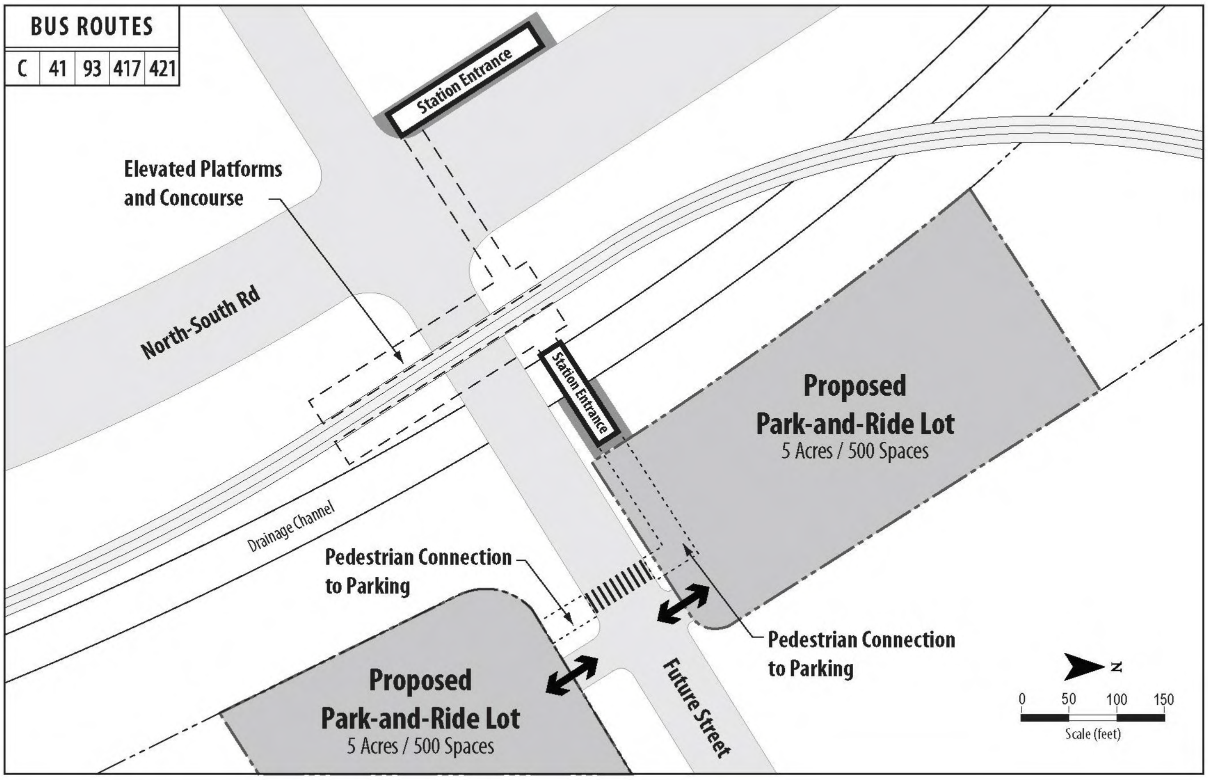


Figure 2-15 UH West O`ahu Station (All Build Alternatives)

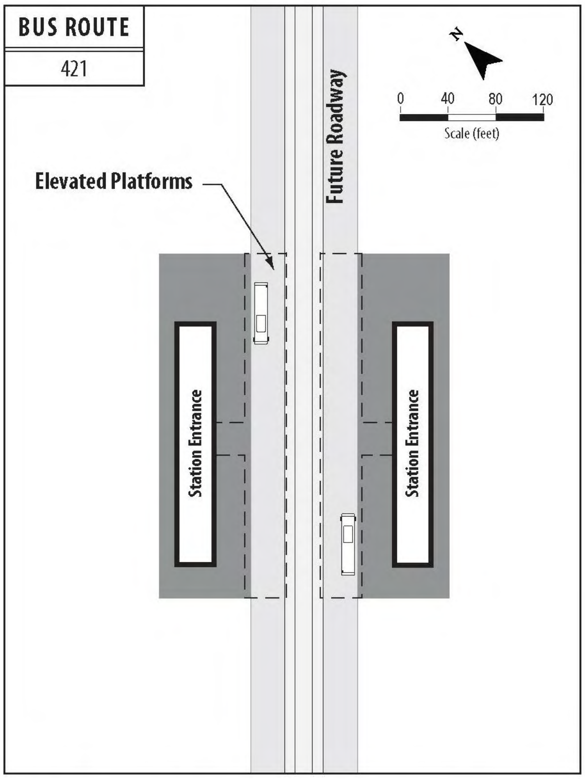


Figure 2-16 Ho`opili Station (All Build Alternatives)

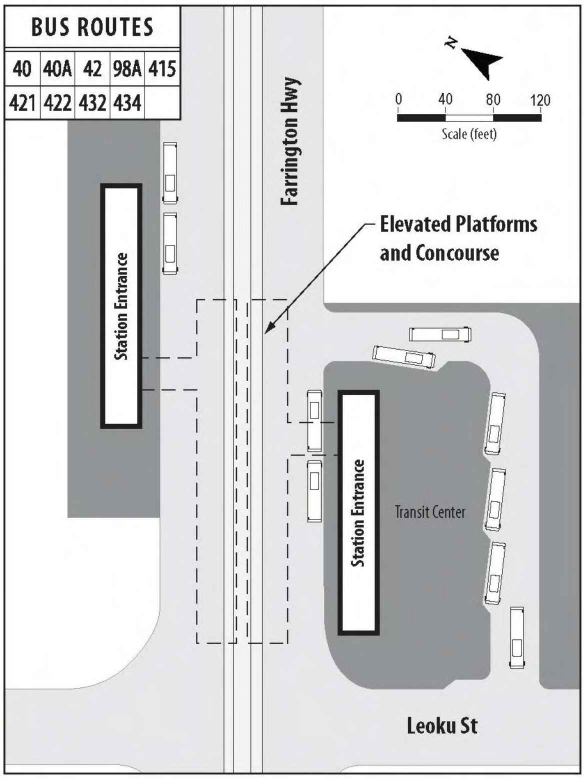


Figure 2-17 West Loch Station (All Build Alternatives)

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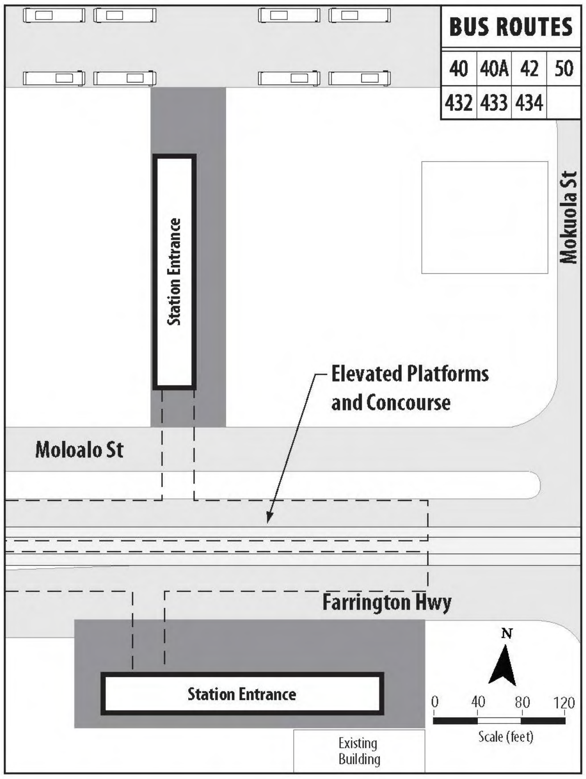

Figure 2-18 Waipahu Transit Center Station (All Build Alternatives)

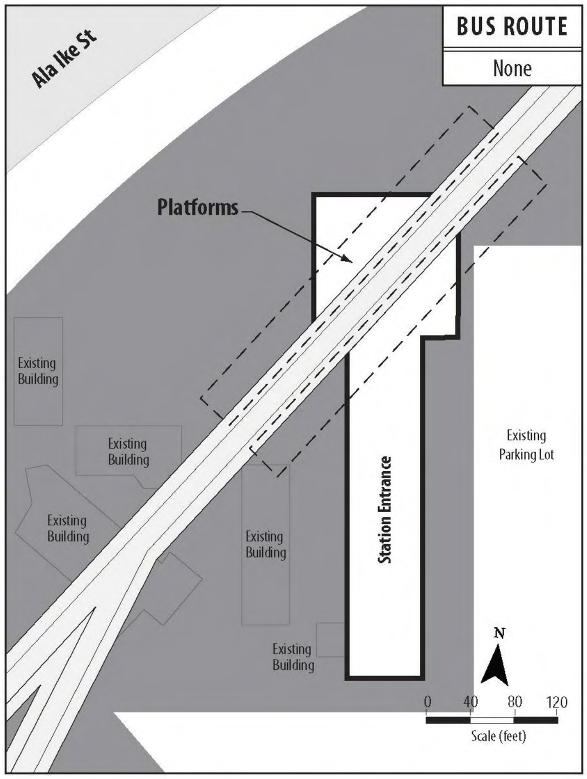

Figure 2-19 Leeward Community College Station (All Build Alternatives)

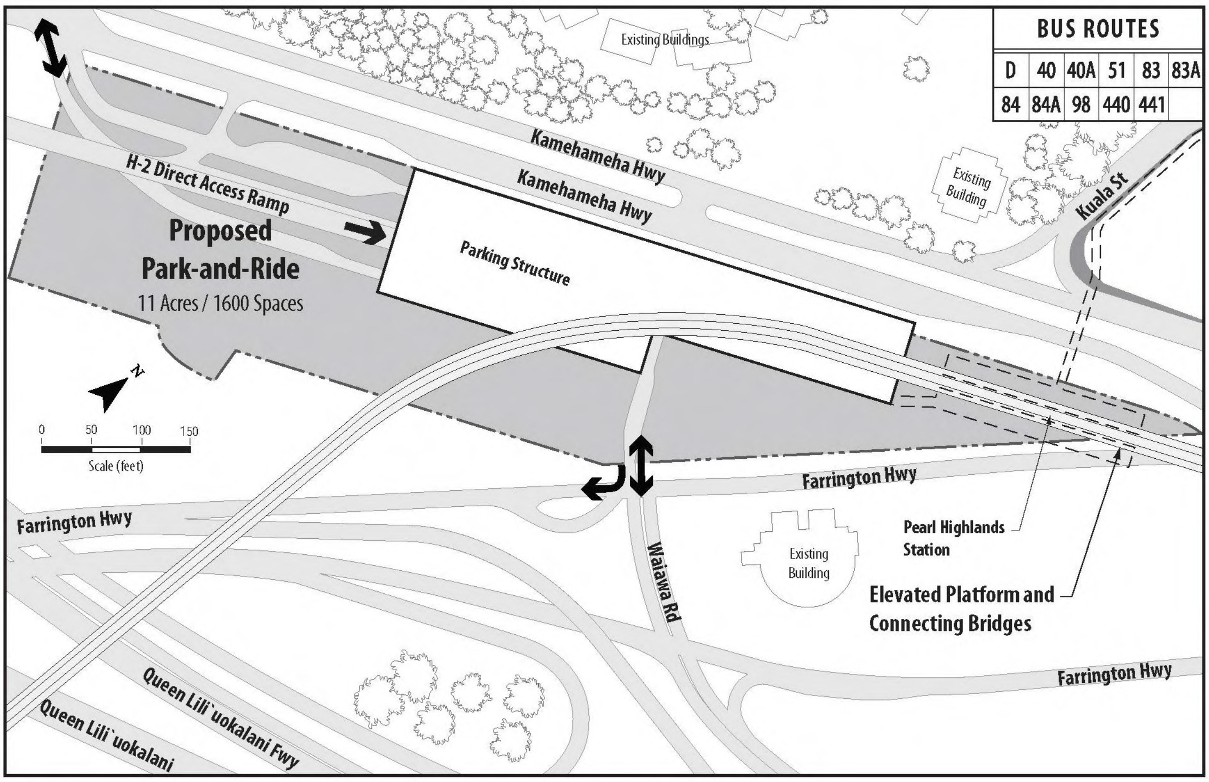

Figure 2-20 Pearl Highlands Station (All Build Alternatives)

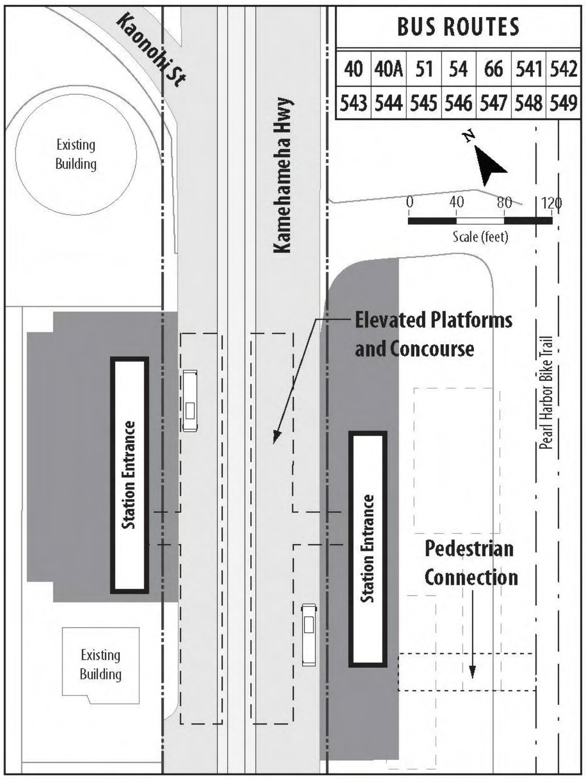

Figure 2-21 Pearlridge Station (All Build Alternatives)

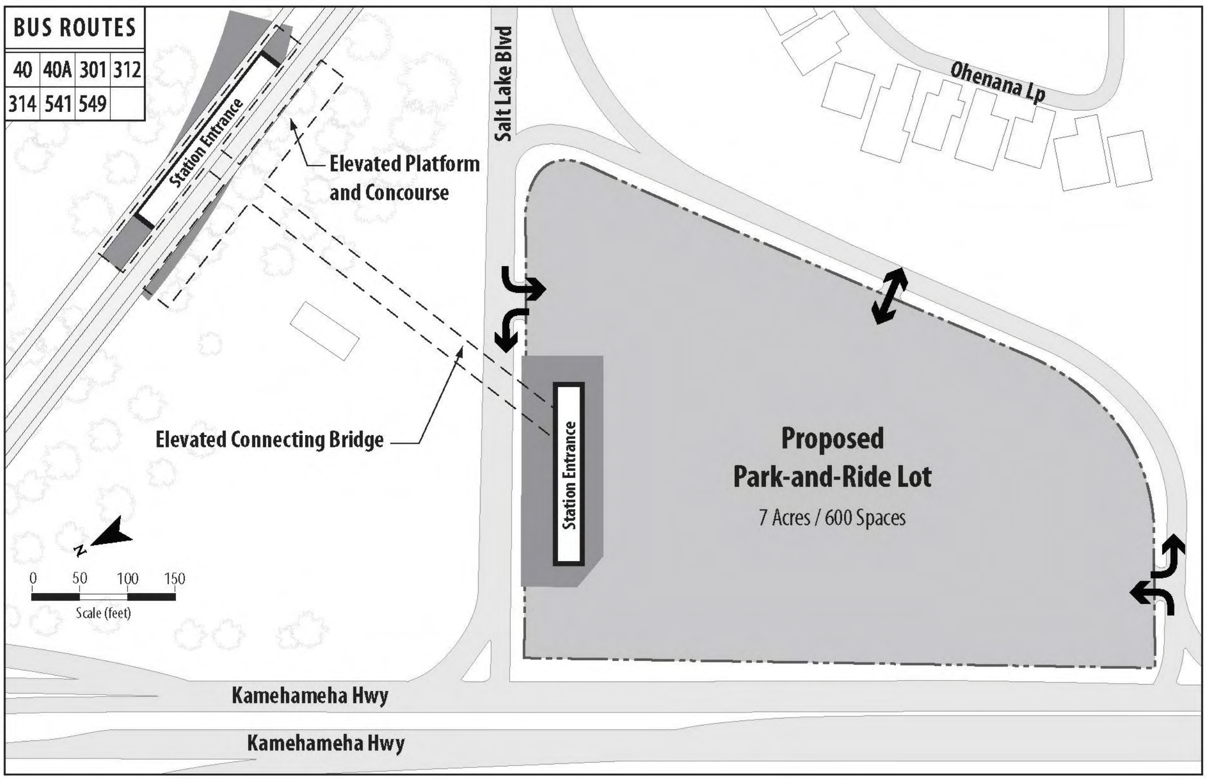

Figure 2-22 Aloha Stadium Station (Salt Lake Alternative and Airport & Salt Lake Alternative)

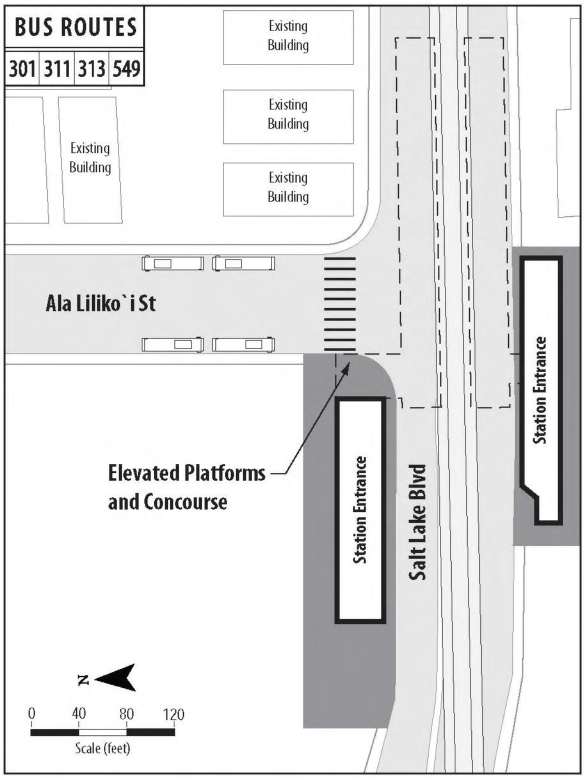

Figure 2-23 Ala Liliko`i Station (Salt Lake Alternative and Airport & Salt Lake Alternative)

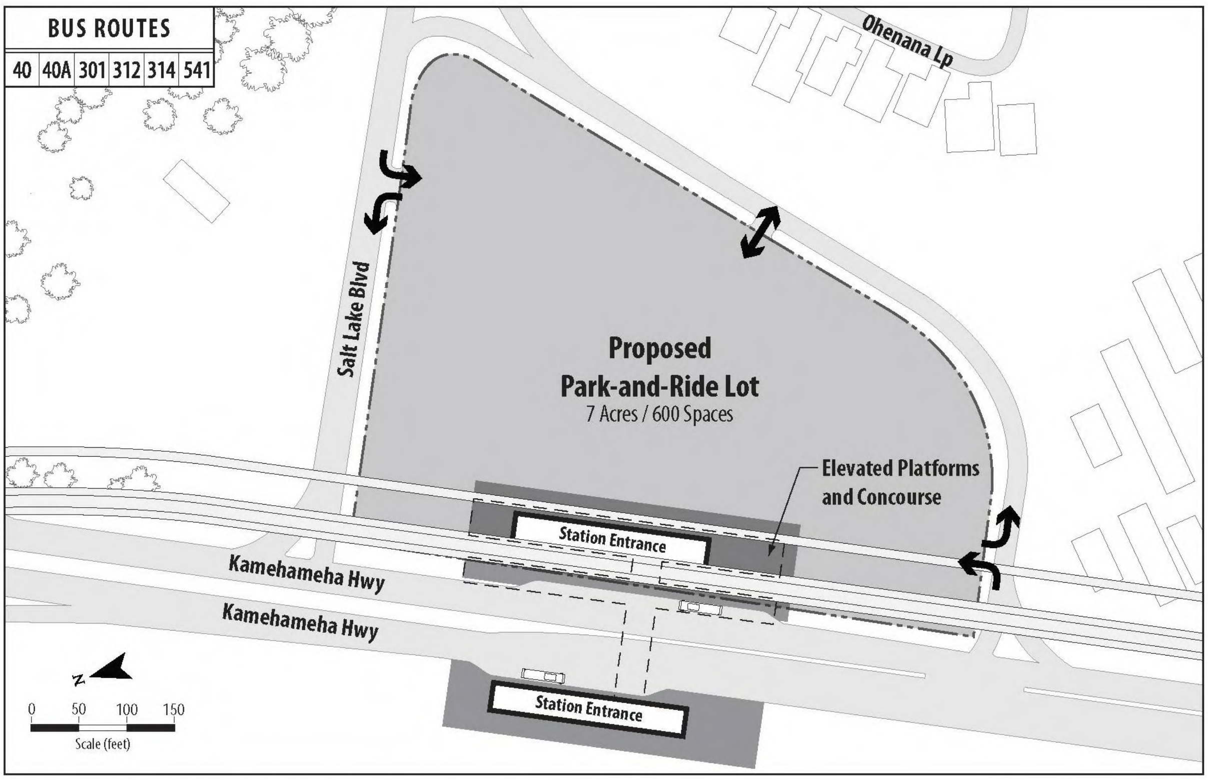

Figure 2-24 Aloha Stadium Station (Airport Alternative)

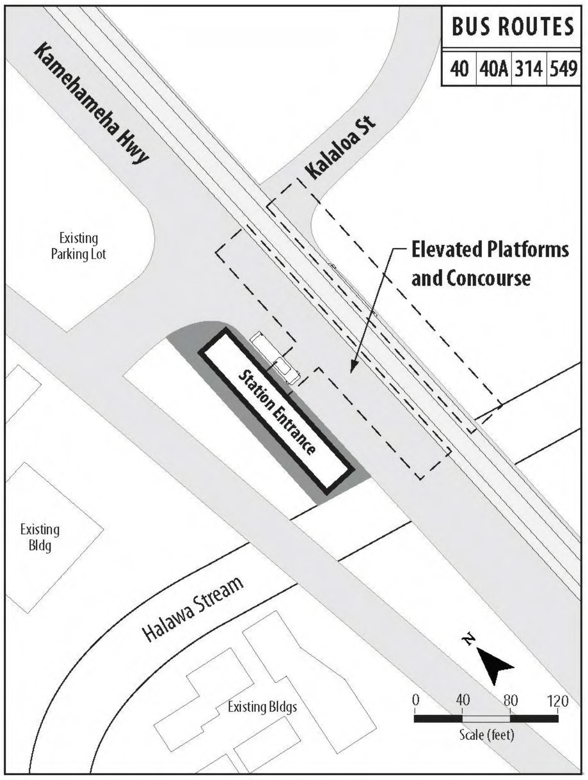

Figure 2-25 Arizona Memorial Station (Airport & Salt Lake Alternative)

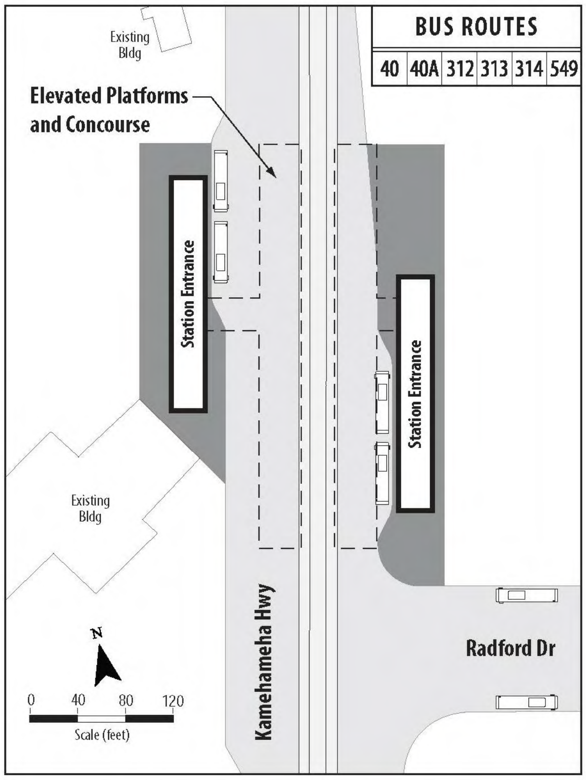

Figure 2-26 Pearl Harbor Naval Base Station (Airport Alternative and Airport & Salt Lake Alternative)

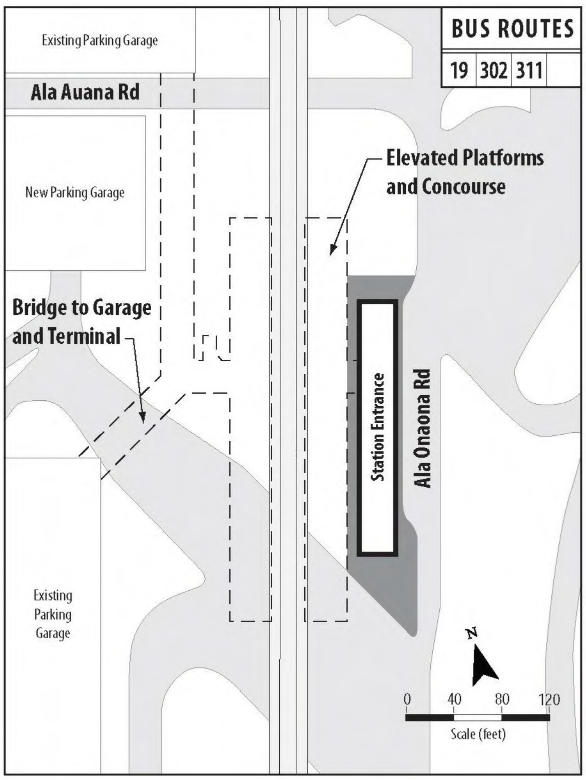

Figure 2-27 Honolulu International Airport Station (Airport Alternative and Airport & Salt Lake Alternative)

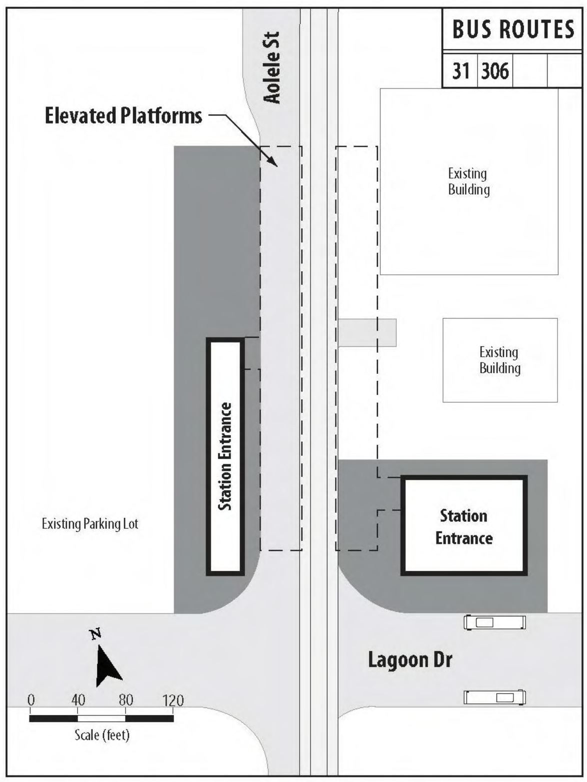

Figure 2-28 Lagoon Drive Station (Airport Alternative and Airport & Salt Lake Alternative)

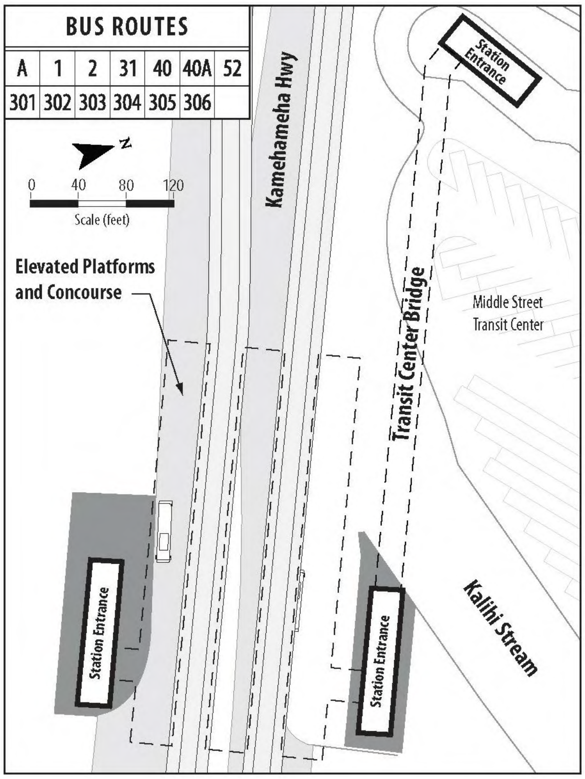

Figure 2-29 Middle Street Transit Center Station (All Build Alternatives)

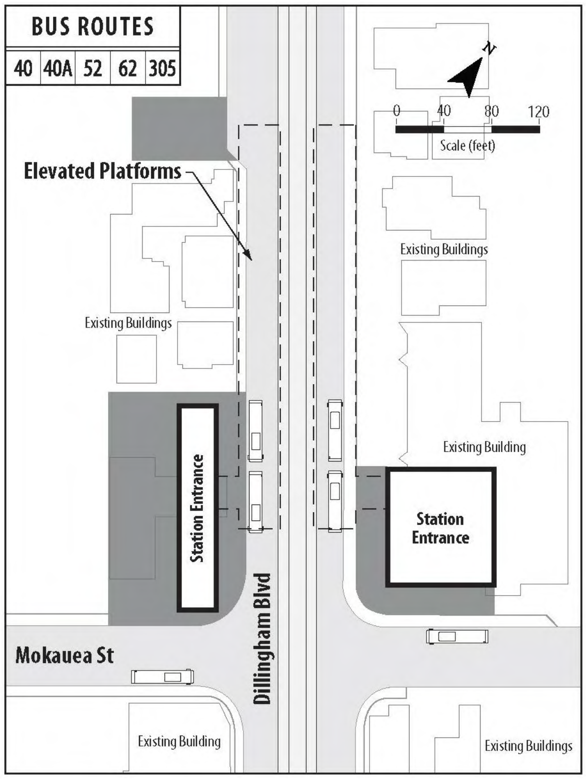

Figure 2-30 Kalihi Station (All Build Alternatives)

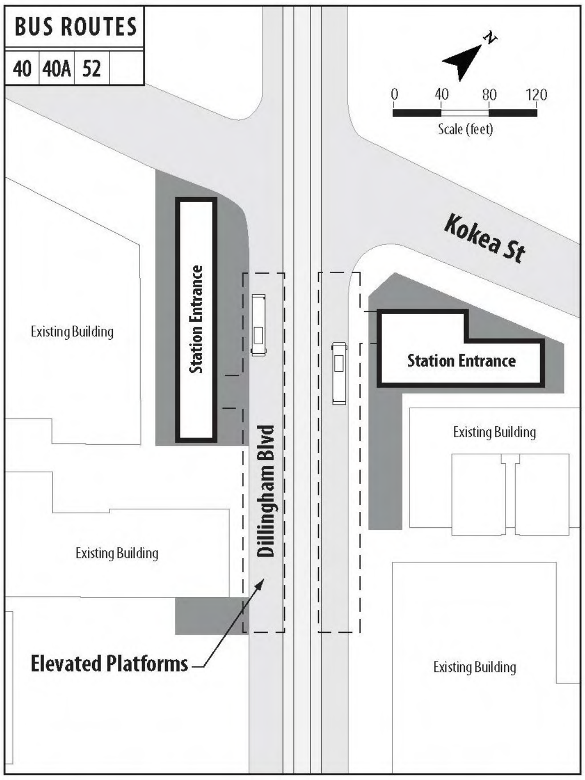

Figure 2-31 Kapālama Station (All Build Alternatives)

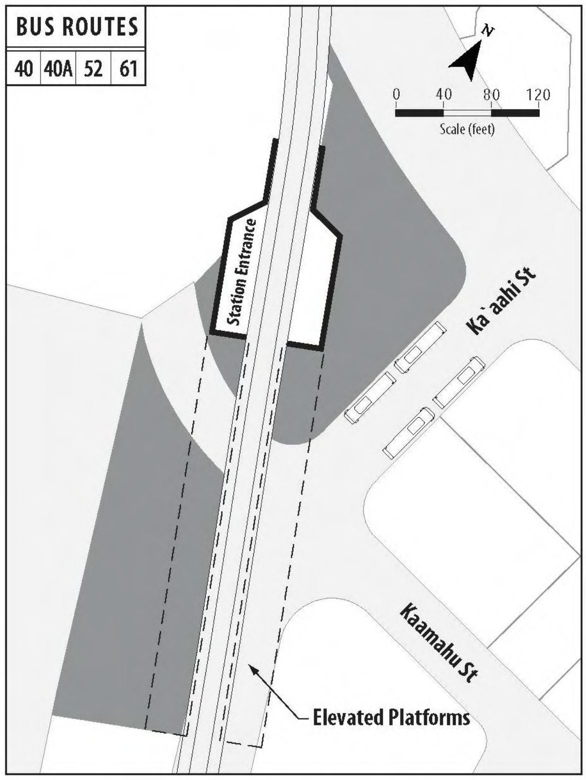

Figure 2-32 Iwilei Station (All Build Alternatives)

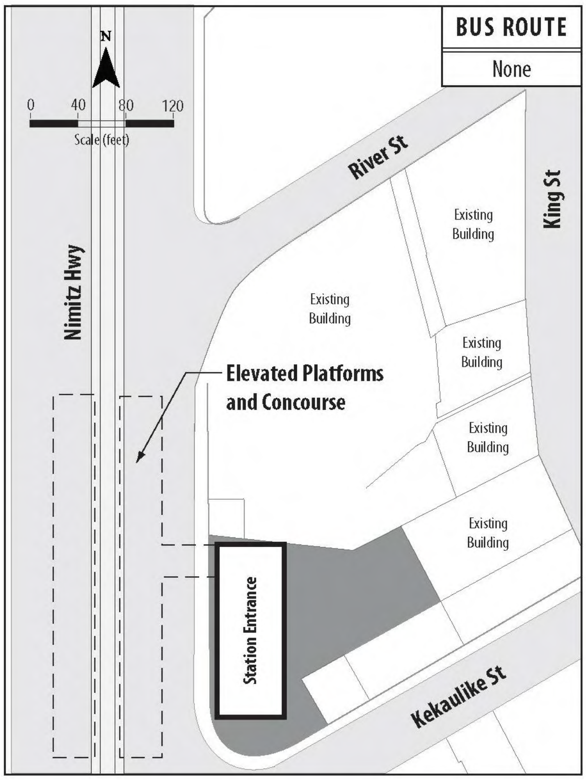

Figure 2-33 Chinatown Station (All Build Alternatives)

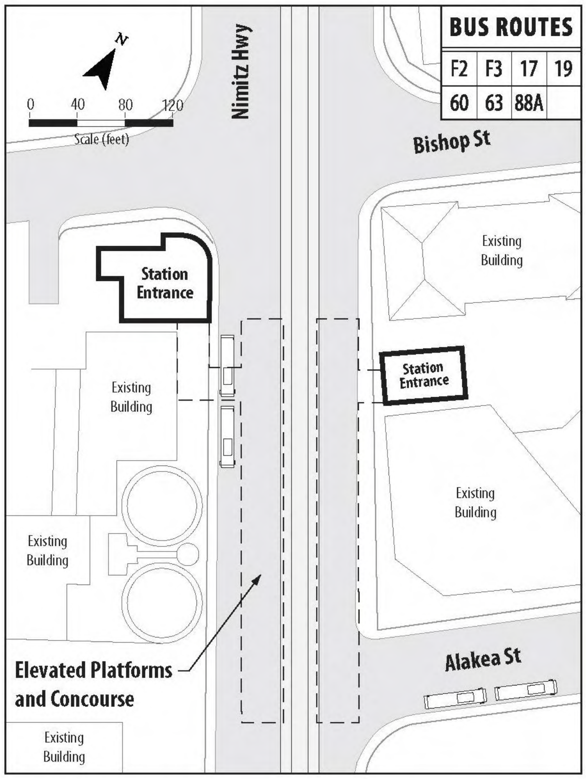

Figure 2-34 Downtown Station (All Build Alternatives)

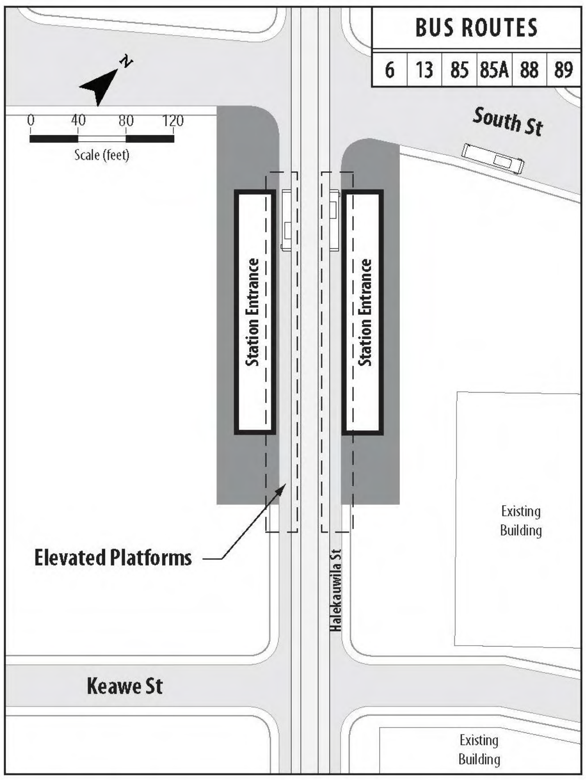

Figure 2-35 Civic Center Station (All Build Alternatives)

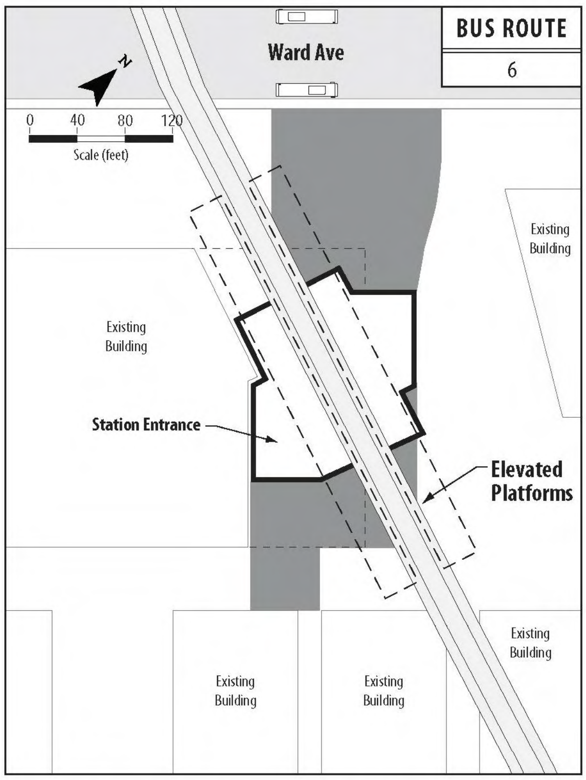

Figure 2-36 Kaka`ako Station (All Build Alternatives)

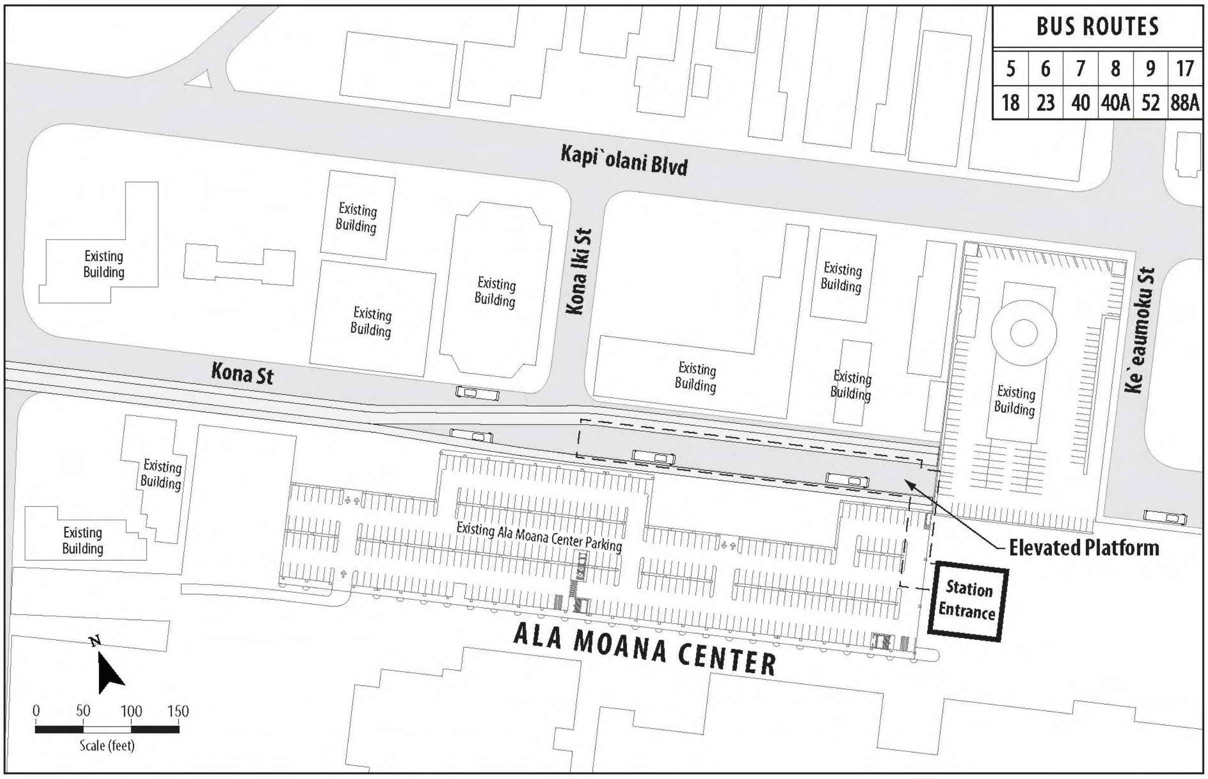

Figure 2-37 Ala Moana Center Station (All Build Alternatives)

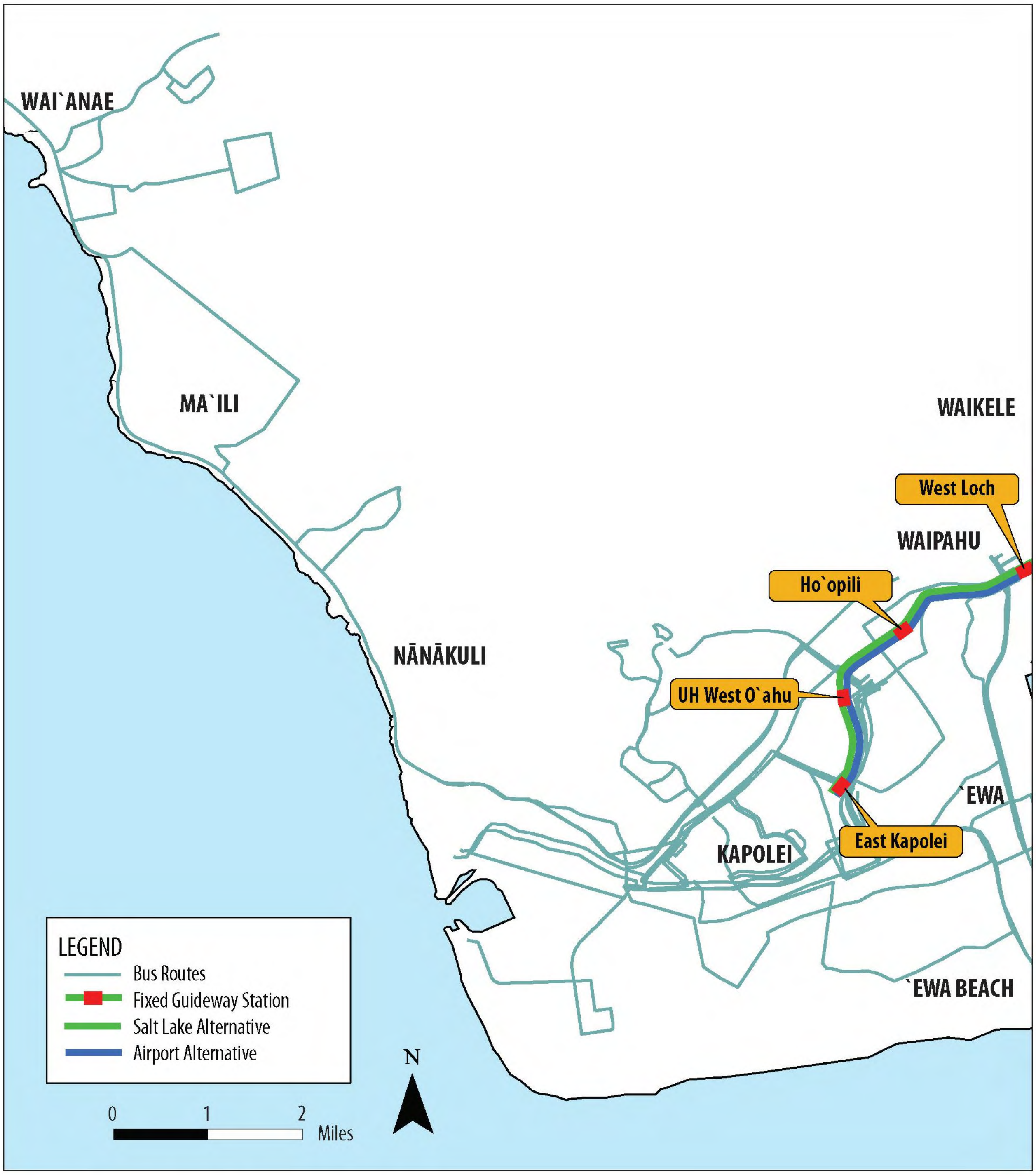

Figure 2-38 Kapolei Bus Service

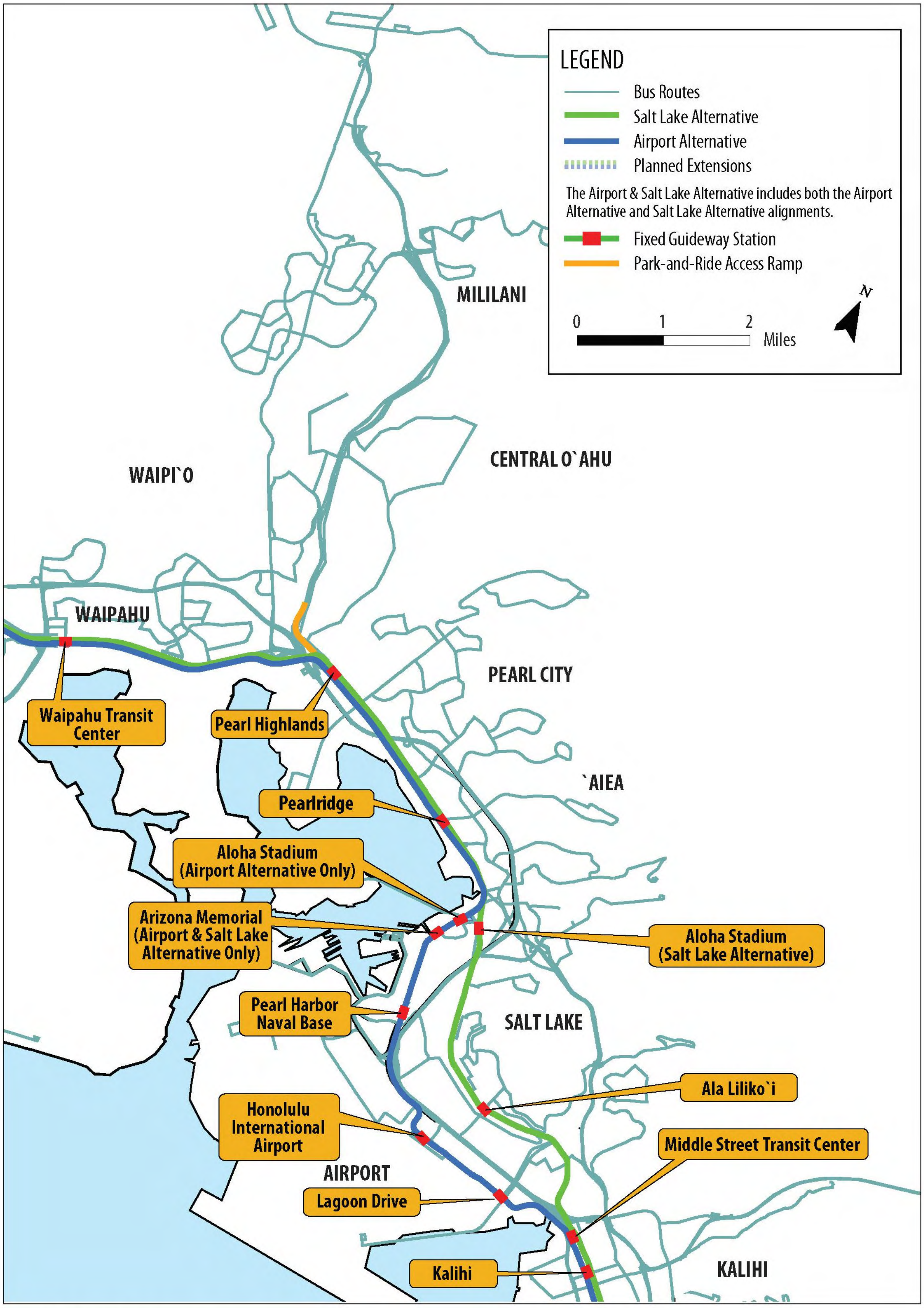

Figure 2-39 Central O`ahu Bus Service

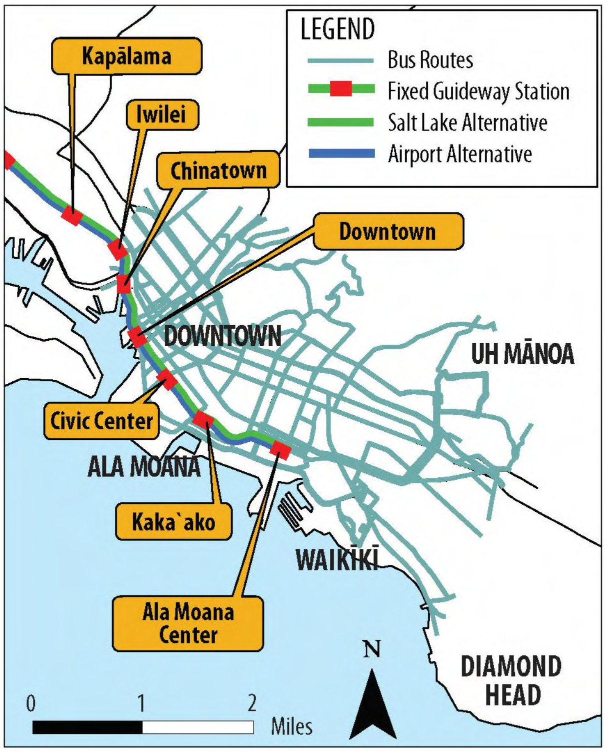

Figure 2-40 Ala Moana to UH Mānoa Bus Service

Most fixed guideway stations would offer connections to local bus routes. In some cases, an off-street transit center either already exists or would be built to accommodate transfers. In other cases, an on-street bus stop with dedicated curb space or a pullout would be located adjacent to the fixed guideway station. Paratransit vehicles would be accommodated at all stations and, in some cases, space for private tour buses, taxis, and/or special shuttles also would be included. Dedicated kiss-and-ride pullouts (passenger drop off) or parking spaces would be provided at many stations to facilitate drop-off and pick-up.

Bus System Enhancements

Traffic-signal priority turns signals green for transit buses before other traffic.

Automated vehicle identification uses GPS to track bus location at all times.

Off-vehicle fare collection allows passengers to buy their tickets before they board the bus or train.

Transit centers are facilities that accommodate transfers between fixed guideway, bus, bicycle, and walking. Park-and-ride and kiss-and-ride access and passenger amenities (covered waiting areas, benches, and transit information) are also available at some transit centers.

Bus transfers would be made at off-street transit centers adjacent to fixed guideway stations at UH West O'ahu, West Loch, Waipahu Transit Center, Pearl Highlands, Pearlridge, Aloha Stadium, Middle Street Transit Center, and Ala Moana Center. The transit centers at UH West O'ahu, West Loch, Pearl Highlands, and Aloha Stadium would be constructed as part of this Project. The other transit centers already exist or are planned for construction to support bus operations independent of this Project. On-street bus transfers would be accommodated at most other fixed guideway stations.

Enhanced bus service would be provided between the terminal stations of the Project and the planned extensions of the total fixed guideway system. System improvements, including traffic-signal priority, automated vehicle identification, and off-vehicle fare collection, would complement frequent bus service at the East Kapolei, Pearl Highlands, and Ala Moana Center Stations. These bus improvements would reduce travel time and improve intermodal transfers. Bus and fixed guideway departures and arrivals would be coordinated and predictable to minimize transfer time and total trip time.

Park-and-Ride Lots

Park-and-ride lots would be constructed at stations with the highest demand for drive-to-transit access (Table 2-6). With the exception of Pearl Highlands, which would be a parking structure, all park-and-ride lots are expected to be constructed as surface parking. The proposed size, location, and access for each proposed lot is shown in the figures for the

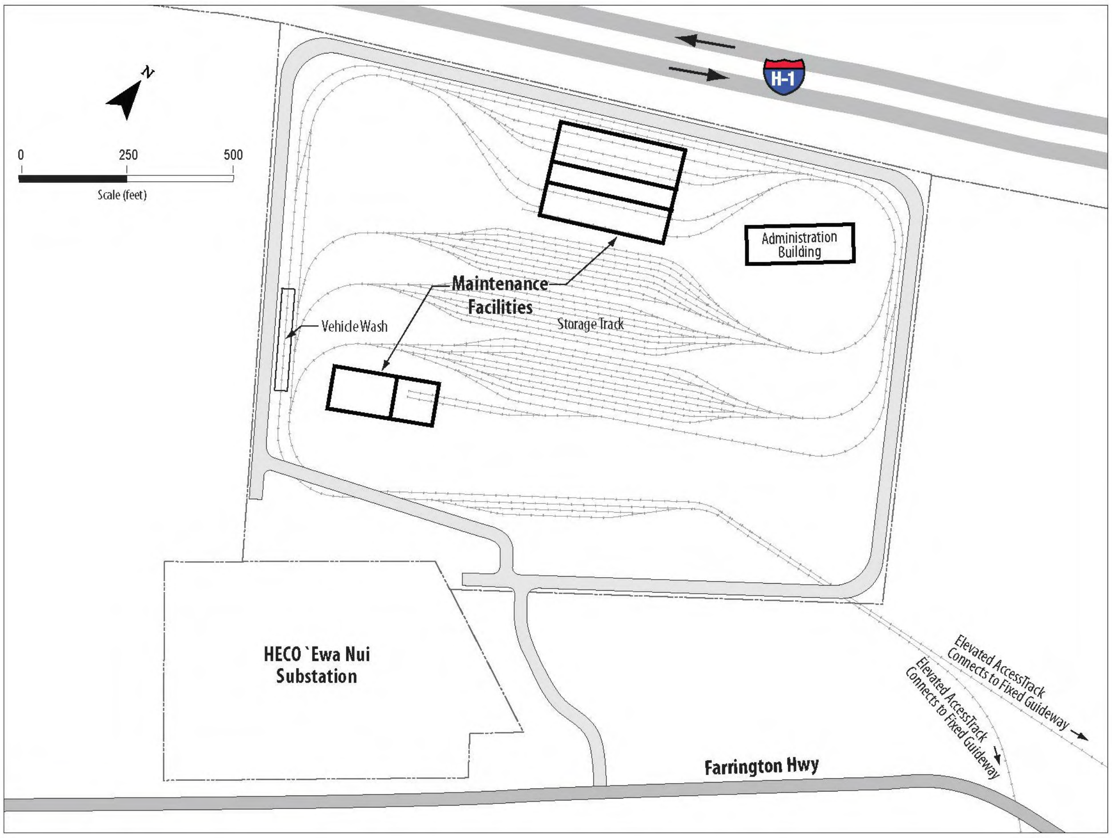

Figure 2-41 Maintenance and Storage Facility in Ho`opili Location and Conceptual Layout

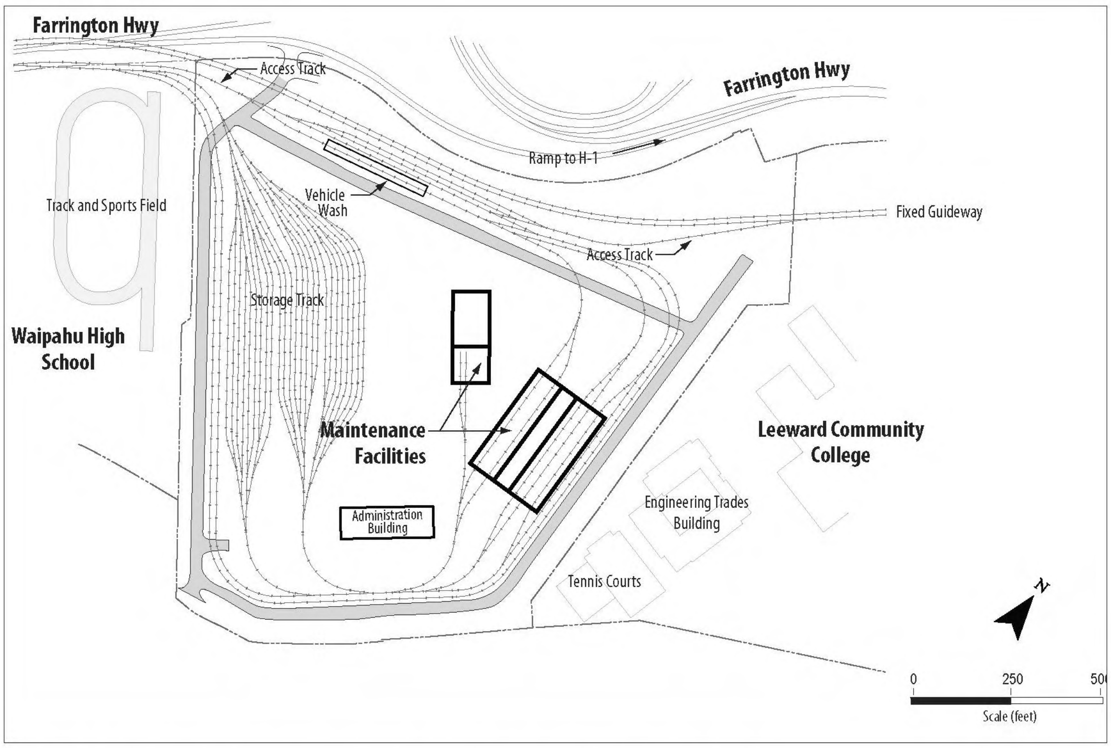

Figure 2-42 Leeward Community College Maintenance and Storage Facility Option

associated fixed guideway stations (Figures 2-14, 2-15, 2-20, and 2-22 or 2-24).

Table 2-6 Locations and Capacity of Park-and-Ride Facilities

Park-and-Ride Location	Size	Capacity
East Kapolei	12 acres	900 spaces
UH West O`ahu	10 acres	1,000 spaces
Pearl Highlands	11 acres	1,600 spaces
Aloha Stadium	7 acres	600 spaces

Vehicle Maintenance and Storage Facility

The Project would include a vehicle maintenance and storage facility to maintain and store up to 100 vehicles. Maintenance operations would occur over the 24-hour day in three shifts. Two locations are being considered for the facility: a 41-acre area currently in agricultural use adjacent to an electrical substation in Ho‘opili (Figure 2-41) and a 43-acre vacant site near Leeward Community College (Figure 2-42). Only one maintenance and storage facility site would be selected. Either site would include a number of buildings, maintenance facilities, a vehicle wash area, storage track, a system control center, and employee parking. The site near Leeward Community College would allow for more efficient system operation because it is more centrally located and vehicles could enter and exit the fixed guideway in either direction.

Traction Power Substations

The Project would require traction power substations approximately every mile to provide vehicle propulsion and auxiliary power. The planned locations are shown in Figures 2-5 through 2-8. Each substation would be approximately 40 feet long, 16 feet wide, and 12 feet high; would include transformers, rectifiers, batteries, and ventilation equipment; and would be connected to the existing power grid. Each substation would consist of a painted steel box housing the equipment and sufficient area to access and maintain the equipment (Figure 2-43). Many substations would be incorporated into fixed guideway stations. At other locations, the substations may be enclosed within a fence.

Figure 2-43 Installation of a Traction Power Substation

Project Phasing

The Locally Preferred Alternative adopted by the City Council identified a fixed guideway transit system between Kapolei and UH Mānoa with a branch line to Waikīkī. The Build Alternatives in this Draft EIS would begin to implement the Locally Preferred Alternative. The Project would begin near the planned UH West O‘ahu campus and extend to Ala Moana Center. This is the portion of the Locally Preferred Alternative that can be constructed with anticipated funding. The remainder of the Locally Preferred Alternative, referred to in this Draft EIS as “planned extensions,” would be constructed once additional funding is secured.

The Project connects East Kapolei and Ala Moana Center. The Project would connect multiple activity centers, provide cost-effective transit-user benefits, and meet the Purpose and Need for the Project whether or not the planned extensions are provided. Construction of the Project would not preclude future development of the planned extensions.

Because of its length, the Project would be constructed in phases to accomplish the following:

- Match the anticipated schedule for right-of-way acquisition and utility relocations
- Reduce the time that each area will experience traffic and community disturbances
- Allow for multiple construction contracts with smaller contract size to promote more competitive bidding
- Match the rate of construction to what can be maintained with local workforce and resources
- Balance expenditure of funds to minimize borrowing

The Project is proposed to be constructed in the following four phases (Figure 2-44):

- East Kapolei to Pearl Highlands
- Pearl Highlands to Aloha Stadium
- Aloha Stadium to Middle Street
- Middle Street to Ala Moana Center

As portions of the Project are completed, they would be opened so that system benefits, even if limited during the initial phases, would be realized prior to completion of construction of the entire Project. The temporary effects associated with the interim operations are discussed in Sections 3.5, Construction-related Effects on Transportation, and 4.17, Construction Phase Effects, of this Draft EIS. The Project's cash flow analysis, which is presented in Section 6.4, anticipates the use of Local funds for the first construction phase and a combination of Local and Federal funds for the remaining phases.

The Airport & Salt Lake Alternative would include additional construction phases. The section between East Kapolei and Ala Moana Center along Salt Lake Boulevard would be constructed as discussed above, followed by a 2.1-mile connection from the Middle Street Transit Center 'Ewa to the Honolulu International Airport, and finally the section from the airport to Aloha Stadium. The final phases could be completed after 2018.

Prior to completion of the section from the airport to Aloha Stadium, the connection to the airport would provide a direct link from the Koko Head terminus of the Project to the airport but would require a transfer at Middle Street for those traveling from the 'Ewa end of the line. It would accommodate the demand for access to the large employment base at and near the airport and provide access for travelers to and from the airport.

Construction Schedule

Construction is currently planned to be completed in four overlapping phases of work. Construction activities would be similar for each phase and are described in Appendix C, Construction Approach. The first phase would include construction of the vehicle maintenance and storage facility and a portion of the Project between the Wai'anae end of the Project and Pearl Highlands. The limits of the first phase have been selected so that the fixed guideway could connect to either maintenance and storage facility option because system testing and operation could not be completed without access to the maintenance and storage facility. Selection of the vehicle maintenance and storage facility near Leeward Community College would allow construction phasing in either the 'Ewa or Koko Head direction from that site. Station areas, park-and-ride lots, and the maintenance and storage facility site would function as construction staging areas for the first construction phase.

The remainder of the Project likely would be built in three overlapping phases continuing Koko Head from Pearl Highlands, first to Aloha Stadium, then to Middle Street, and finally to Ala Moana Center. Construction staging areas for future phases beyond station areas, park-and-ride lots, and the maintenance and storage facility site would be identified and developed by the contractors and approved by the City. Variations to the schedule would continue to be evaluated during Preliminary Engineering. Conceptual design for the Project is under way, and work on the first construction

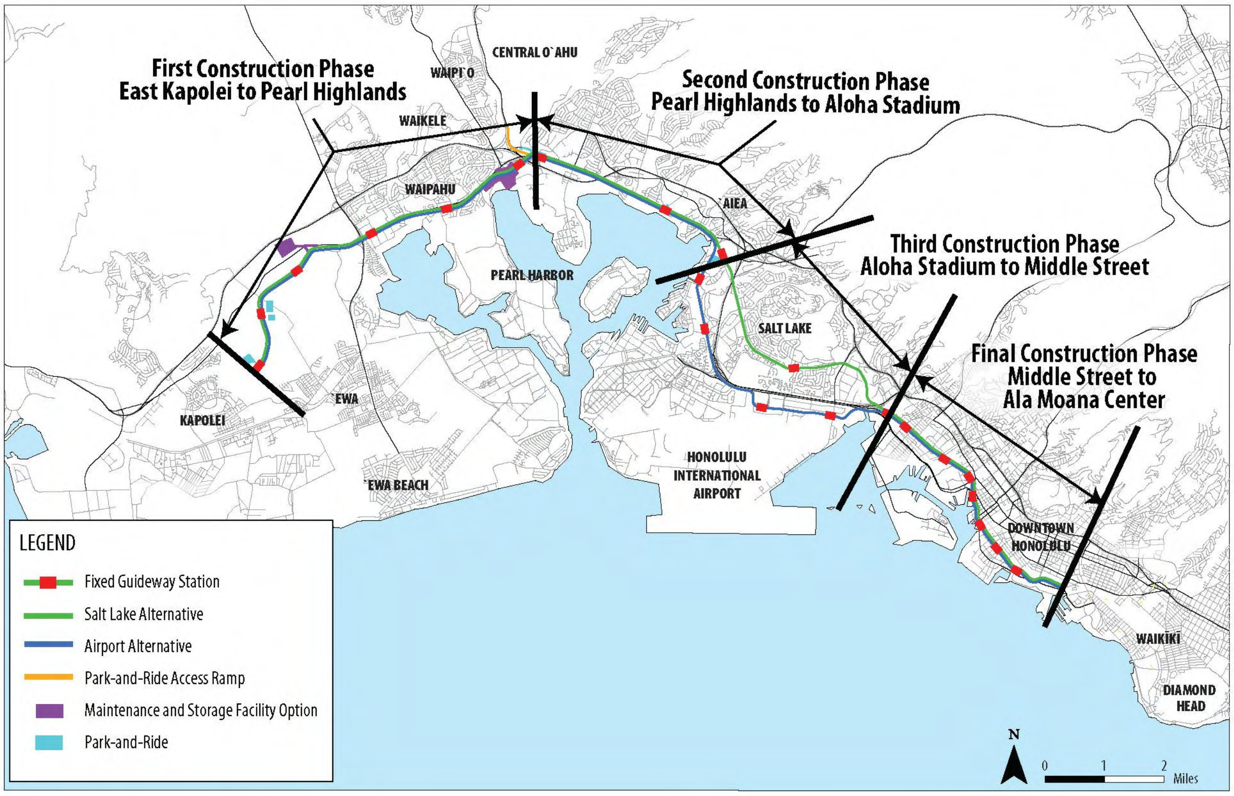

Figure 2-44 Project Construction Phases

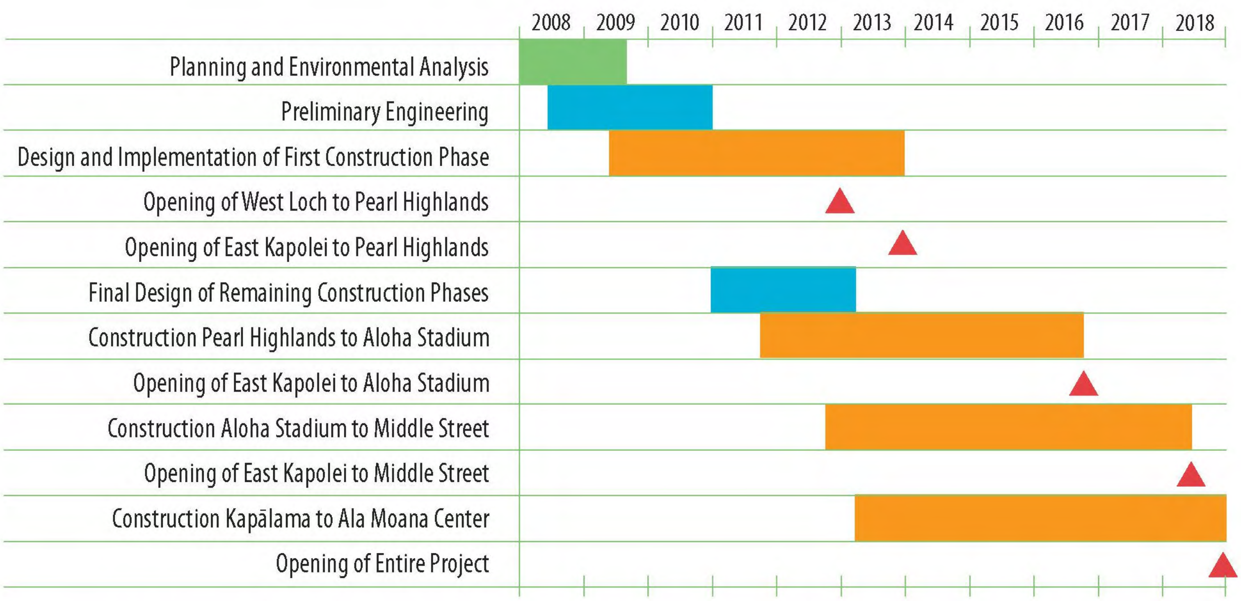

Figure 2-45 Project Schedule

phase would begin in 2009 (Figure 2-45). The entire Project is planned to be in operation in 2018.

Planned Extensions

In addition to the Project, the Locally Preferred Alternative includes three planned extensions connecting the Project to the following areas:

- West Kapolei
- UH Mānoa
- Waikīkī

The planned extensions are included as illustrative projects in the ORTP (O'ahuMPO 2007) and are anticipated by RTD to be completed at some time in the future prior to 2030 as separate projects that would receive detailed environmental review. The extensions include approximately 9 additional miles of guideway and 12 additional stations.

The West Kapolei extension would begin at the Wai'anae end of the corridor and is anticipated to follow Kapolei Parkway to Wākea Street and then turn makai to Saratoga Avenue. Proposed station locations and other project features in this area are shown in Figure 2-5. The guideway would continue on planned extensions of Saratoga Avenue and North-South Road and connect to the Wai'anae end of the current Project.

The UH Mānoa extension would connect to the current Project at Ala Moana Center and then veer mauka to follow Kapi'olani Boulevard to University Avenue. It would then turn mauka to follow University Avenue over the H-1 Freeway to a proposed terminal facility on UH Mānoa's Lower Campus (Figure 2-8).

The Waikīkī extension would follow Kalākaua Avenue to Kūhiō Avenue and end near O'ahu Avenue (Figure 2-8). The Ala Moana Center and Convention Center Stations would be transfer points between the UH Mānoa and Waikīkī branch lines.

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03

CHAPTER

Transportation

This chapter discusses existing and future 2030 transportation system conditions, service characteristics, performance, and transportation-related effects for each of the Project's alternatives. Transportation effects include project benefits as well as impacts on traffic (e.g., automobiles and trucks), parking, pedestrians, and bicycles. The analysis includes station area and system-level transportation-related effects for the Build Alternatives and makes comparisons to the No Build Alternative for the planning horizon year 2030.

The analysis is organized into five main sections:

- Existing (2007) conditions and performance
- Future (2030) No Build conditions and performance, with comparisons made to existing conditions
- Future (2030) Build Alternative conditions and performance, with comparisons made to 2030 No Build conditions (including transit-user benefits)
- Construction-related effects, including the effects of construction phasing
- Cumulative transportation system effects, including the effects of the planned extensions

The following transportation-related effects are addressed:

- Transit service, including changes in transit travel times
- Transit ridership, including changes in the transit share of total travel for each alternative
- Bus, pedestrian, and bicycle access in station areas
- Traffic (direct effects from the placement of support columns, station locations, etc.)
- Traffic on adjacent parallel or intersecting roadways
- Traffic related to park-and-rides, kiss-and-rides (passenger drop off), local bus access, and a fixed guideway maintenance and storage facility
- Parking, including potential spillover parking on neighborhood streets near proposed transit stations and the loss of on- and off-street parking

For additional information and references, including more detail about the planned extensions to West Kapolei, UH Mānoa, and Waikīkī, see the *Honolulu High-Capacity Transit Corridor Project Transportation Technical Report* (RTD 2008a).

3.1 Methodology

This section identifies the methodology used to estimate the potential transportation-related effects of the alternatives identified and discussed in Chapter 2, Alternatives Considered.

3.1.1 Analytical Tools and Data Sources

The primary quantitative method for evaluating the alternatives is a travel demand forecasting model used by the Oʻahu Metropolitan Planning Organization (OʻahuMPO) for the *Oʻahu Regional Transportation Plan 2030* (ORTP) (OʻahuMPO 2007). The OʻahuMPO model is based on "best practices" for urban travel models in the U.S. This modeling approach has proven effective in estimating ridership levels in other areas such as Los Angeles County, Salt Lake City, and the Denver region in the last 10 years.

The O`ahuMPO travel demand forecasting model was used to predict future traffic conditions and transit ridership.

The OʻahuMPO model uses the "sequential" approach to travel forecasting, in which travel is assumed to be the product of a sequence of individual decisions:

- The number of trips that a household will make—*trip generation*
- The destinations of these trips—*trip distribution*
- The form of transportation that will be used for travel—*mode choice*
- The paths on the transportation network that the trips will take—*network assignment*

The OʻahuMPO's existing model was reviewed, enhanced, recalibrated, and validated consistent with current Federal Transit Administration (FTA) guidelines. For the purpose of this Project, the model was refined and augmented to better represent transit alternatives in the study corridor. Concurrently, a new on-board transit survey was completed, and the latest socioeconomic information was incorporated. Finally, the mode choice component of the travel demand forecasting model was recalibrated and validated using data from the new on-board survey.

Additional detail on methodology, input, and model coding is documented in the *Honolulu High-Capacity Transit Corridor Project Travel Forecasting Methodology Report* (RTD 2008t).

3.1.2 Approach to Estimating Transportation Effects

Using the model and other information sources, existing transportation system conditions and performance were analyzed. Future 2030 No Build conditions and performance were then analyzed and compared to existing conditions. Finally, future 2030 Build Alternatives conditions and performance were analyzed and compared to future No Build conditions and performance.

The model was used to generate existing and future traffic volume forecasts, parking demand information, and transit ridership statistics. Model results include the following:

- Trip volumes by purpose
- Trip volumes by mode (e.g., automobile, bus, fixed guideway, walk)
- Trip time
- Changes in vehicle miles traveled (VMT)
- Changes in vehicle hours traveled (VHT)
- Changes in vehicle hours of delay (VHD)

Results include travel time changes by alternative for transit. Information from the model also includes transit-system user benefits and time savings.

Traffic Level-of-Service Definitions for Highways and Arterial Roadways

Level-of-Service	Definition
A	**EXCELLENT.** Completely free-flow conditions. Vehicle operation is virtually unaffected by the presence of other vehicles. Minor disruptions are easily absorbed without causing significant delays.
B	**VERY GOOD.** Reasonably unimpeded flow; the presence of other vehicles begins to be noticeable. Disruptions are still easily absorbed, although local deterioration in LOS will be more obvious.
C	**GOOD.** The ability to maneuver and select an operating speed is clearly affected by the presence of other vehicles. Minor disruptions may be expected to cause serious local deterioration in service, and queues may form behind any significant traffic disruption.
D	**FAIR.** Conditions border on unstable flow. Speed and the ability to maneuver are severely restricted due to traffic congestion. Only the most minor disruptions can be absorbed without the formation of extensive queues and deterioration of service to LOS F.
E	**POOR.** Conditions become unstable. Represents operation at or near capacity. Any disruption, no matter how minor, will cause queues to form and service to deteriorate to LOS F.
F	**FAILURE.** Represents forced or breakdown flow. Operation within queues is unstable and characterized by short spurts of movement followed by stoppages.

Effects on traffic at 215 intersections were estimated using procedures outlined in the *Highway Capacity Manual* (TRB 2000) of the Transportation Research Board. The analysis identified existing operating conditions at intersections and projected conditions under the future No Build and Build Alternatives in areas that would be affected by the fixed guideway system.

Traffic effects were determined by comparing changes in level-of-service (LOS) under the No Build Alternative with the Build Alternatives in 2030. An effect was considered to exist when the Project would cause any of the following conditions during either the a.m. or p.m. peak hours:

- LOS declines from D or better to E or F
- LOS declines from E to F
- The No Build Alternative LOS is E or F and the average vehicle delay increases

Where appropriate, measures to lessen or mitigate the Project's effects are identified. For more detail on the methods used to analyze transportation effects, see the Transportation Technical Report (RTD 2008a).

3.2 Existing Conditions and Performance

This section discusses existing transportation conditions in the study corridor. The discussion includes existing travel patterns and the conditions and performance of public transit, streets and highways, freight movement, parking, and the bicycle and pedestrian network. Unless otherwise noted,

Information presented in this section primarily involves islandwide travel conditions and performance. Islandwide data reflect traffic and conditions for the study corridor since this corridor dominates in terms of total transportation demand. For example, 83 percent of both islandwide daily and peak-period work-related transit trips originate within the study corridor. The study corridor also attracts 90 percent of total islandwide daily transit trips and 94 percent of peak-period work-related transit trips.

the source for information presented in this section is the Oʻahu MPO travel demand forecasting model (Oʻahu MPO 2007).

3.2.1 Existing Travel Patterns

Daily Person Trips

More than 3.2 million person trips are made on a daily (average weekday) basis on Oʻahu. As shown in Table 3-1, 86 percent of these trips are made by residents. Of this total, 34 percent originate or end at work. The remaining 14 percent of total daily trips are made by visitors, trucks, and ground access by air passengers.

Mode of Travel

Oʻahu has a relatively high number of transit and bicycle or walking trips compared to other U.S. cities. Of the approximately 2.8 million daily person trips made by residents, 6 percent are by transit and 12 percent are by bicycle and walking. Of the approximately 364,000 daily trips made by visitors, 5 percent are by transit and 45 percent are by bicycle and walking (Table 3-2).

Table 3-1 Person Trips by Trip Purpose—2007

Trip Purpose	2007 Daily Person Trips	2007 Percentage of Total Daily Trips
Trips by Residents		
To and from work	932,600	29%
While at work	173,100	5%
To and from school/university	287,900	9%
To and from shopping/other	994,800	31%
Do not end at work or home	401,600	12%
Total Trips by Residents	**2,790,000**	**86%**
Other Trips		
Trips by truck	44,700	1%
Ground access trips by air passengers	60,000	2%
Trips by visitors	364,400	11%
Total Daily Trips (All)	**3,259,100**	**100%**

Numbers are rounded to nearest hundred.

Major destinations for weekday bus riders include Downtown (18 percent) and the Mōʻiliʻili-Ala Moana area (13 percent). The Downtown area contains the region's highest concentration of jobs. The Mōʻiliʻili-Ala Moana area contains a high number of jobs and the State's largest shopping complex.

Approximately 50 percent of peak-period work trips on a bus originating from home come from the Waikīkī, Mōʻiliʻili-Ala Moana, Palama-Liliha, Waipahu-Waikele, and Kaimukī-Waiʻalae areas. These areas are all within the study corridor and are densely populated with relatively high concentrations of transit-dependent households and activity centers.

Table 3-2 Daily Trips by Mode—2007

Trips by Mode	2007 Daily Trips by Mode	2007 Percentage of Total Daily Trips
Residents		
Automobile–private	2,291,400	82%
Transit	165,900	6%
Bicycle and walk	332,700	12%
Total Daily Trips by Residents	**2,790,000**	**100%**
Visitors		
Automobile–private	116,400	32%
Transit	17,600	5%
Taxi	9,300	3%
Tour bus	56,000	15%
Bicycle and walk	165,100	45%
Total Daily Trips by Visitors	**364,400**	**100%**

Numbers are rounded to nearest hundred.

Vehicle Occupancy

Average vehicle occupancy (AVO) data were last collected by the Hawai'i Department of Transportation (HDOT) in 1998. The four monitoring stations in the study corridor are Moanalua Freeway at Moanalua Stream Bridge, Kalaniana'ole Highway, Pali Highway at Tunnel No. 1, and Likelike Highway. During the a.m. peak commute period (5:30 to 9:00 a.m.), traffic using Moanalua Freeway at Moanalua Stream Bridge had the highest AVO in the study corridor (1.28 persons per vehicle). Traffic on Pali Highway at Tunnel No. 1 experienced the highest peak-hour AVO in the study corridor at 1.31 persons per vehicle.

Vehicle Miles Traveled, Vehicle Hours Traveled, and Vehicle Hours of Delay

Travel conditions can be described in terms of VMT, VHT, and VHD. VMT is computed by multiplying the number of trips using a roadway by the facility's total length in miles. VHT is derived by multiplying the number of trips using a roadway by the travel time for each travel period. VHD is calculated by finding the difference between the congested VHT and the VHT that would be expected under free-flow conditions.

Table 3-3 summarizes islandwide total daily VMT, VHT, and VHD by facility type on the classified street and highway system. Most delays in the system occur on freeways and highways. (Section 3.2.3 provides a description of facility types.)

Reverse Commute

Currently, commuter-related trips are dominated by the demand to travel to the Downtown Transportation Analysis Area (TAA) in the a.m. peak period (6:00 to 8:00 a.m.) and away from Downtown in the p.m. peak period (3:00 to 5:00 p.m.). (A TAA is a geographic area used for transportation planning purposes.) Downtown-bound (Koko Head) traffic volumes through Waipahu and 'Aiea during the a.m. two-hour peak period are more than twice the volume traveling in the 'Ewa direction. This pattern is attributable to the dominance of Downtown and nearby areas as employment centers. Newly emerging employment centers in the 'Ewa-Kapolei area are expected to generate more reverse commuting in the future.

With 108 routes and 3,800 bus stops, 95 percent of O`ahu's urban residents can walk to a bus stop in 10 minutes or less

Captive versus Choice Riders

The on-board transit survey conducted in December 2005 and January 2006 provided information on captive and choice bus riders. In general, captive (transit-dependent) riders do not

Table 3-3 Vehicle Miles Traveled, Vehicle Hours Traveled, and Vehicle Hours of Delay—2007

Facility Type	Daily VMT		Daily VHT		Daily VHD	
Freeway	5,410,000	47%	120,000	36%	31,000	42%
Highway	1,306,000	11%	25,000	7%	4,000	5%
Arterial	3,345,000	29%	114,000	34%	18,000	24%
Collector	1,281,000	11%	53,000	16%	10,000	14%
Local	239,000	2%	22,000	7%	11,000	15%
Total	**11,581,000**	**100%**	**334,000**	**100%**	**74,000**	**100%**

Source: O'ahuMPO Travel Demand Forecasting Model.

have access to a personal vehicle to make the trip. Choice riders have a vehicle available to make the trip but use transit instead. The survey indicated that 65 percent of bus riders were captive. The remaining share consisted of 29 percent who could have used a personal vehicle and 6 percent who did not answer the question.

3.2.2 Existing Conditions and Performance: Transit

Transit in Honolulu consists of a fixed-route bus transit service known as TheBus, ferry service known as TheBoat, and paratransit service known as TheHandi-Van. The transit service coverage area is approximately 277 square miles, and 95 percent of the urban population lives within one-quarter mile of a bus stop.

System Characteristics

TheBus System

TheBus system currently consists of 108 routes that serve approximately 3,800 bus stops. Of the 108 routes, 99 are fixed routes, 4 are deviation routes operated by the paratransit division, and 5 are feeder routes for TheBoat. Most of the TheBus routes serve the study corridor. The Transportation Technical Report (RTD 2008a) includes a route map of the existing system.

Bus route categories include Rapid Bus, Urban Trunk, Urban Feeder, Suburban Trunk, Community Circulators, Community Access, and Peak Express. The characteristics of each service type are summarized below:

- **Rapid Bus** includes CityExpress! and CountryExpress! routes that provide limited-stop service in both directions. Service is provided early morning through late evening on weekdays. CityExpress! Routes A and B provide 15-minute service and CountryExpress! routes typically provide 30-minute service.
- **Urban Trunk** routes provide frequent, direct service connecting neighborhoods within the Primary Urban Center (PUC) along major ʻEwa/Koko Head corridors. Urban Trunk routes typically provide service every 15 minutes or less and include Routes 1, 2, 3, and 13.
- **Urban Feeder** routes connect the mauka/makai neighborhoods within the urban center. The routes serving the hills and valleys of Honolulu connect residential areas to the Urban Trunk and Rapid Bus routes and provide service to major destinations such as Downtown, the University of Hawaiʻi (UH) at Mānoa, and Waikīkī. These routes typically provide service every 30 minutes or less and include Routes 4, 5, 6, 7, and 8.
- **Suburban Trunk** routes provide service through late evenings and connect outlying communities to the urban center. These routes stop at all local bus stops every day. Suburban Trunk routes typically provide 30-minute service. Examples include Routes 40, 42, 52, 55, and 56.
- **Community Circulators** provide local transit access within their communities. They provide timed connections with other Community Circulators and Suburban Trunk routes at neighborhood hubs or transit centers. Routes with higher demand provide 30-minute service, and lower-demand routes provide 60-minute service. Some routes offer intermittent or peak-only service. Community Circulator service includes Routes 231-236 and 401-403.
- **Community Access** operates on a regular schedule using TheHandi-Van vehicles. Curb-to-curb service is provided to registered TheHandi-Van customers who give 24-hour advance notice and are located within one-quarter mile of the service route. TheHandi-Van service can be used to connect to transit hubs through route deviation. These routes operate every 60 minutes, and time is included in the schedule for possible route deviations. Examples include Routes 501, 503, and 504.

- **Peak Express** routes serve predominantly home-to-work trips by connecting neighborhoods to employment centers. Service is provided during peak periods and in the peak direction. Examples include Routes 81, 85, and 93. Feeder service to TheBoat is a subset of Peak Express. Examples include Routes F11, F12, and F13.

Most bus routes operate seven days a week, including holidays. Passenger amenities include approximately 980 passenger shelters and 2,400 benches. The Transportation Technical Report (RTD 2008a) provides detailed information on the system, including schedules and routes.

TheHandi-Van Service

TheHandi-Van is the City's paratransit service for persons who are eligible according to the Americans with Disabilities Act of 1990 or for persons certified by the City. The service area, days, and hours of operation are the same as TheBus. Trips must be reserved 24 hours in advance.

TheBoat Service

In September 2007, the City began offering a commuter ferry service between West O'ahu (Kalaeloa Harbor) and Downtown Honolulu (Aloha Tower Marketplace). TheBoat service operates each weekday, with three trips in the morning and three trips in the evening.

To complement TheBoat, local shuttle bus service connects ferry terminals with several locations in West O'ahu and Downtown Honolulu, as well as UH Mānoa and Waikīkī.

Fleet

TheBus fleet consists of 540 buses. This includes 72 vehicles that are 60-foot articulated buses, of which 10 are hybrid; 431 vehicles that are 40-foot buses; and 37 vehicles less than 40 feet long. TheHandi-Van vehicle fleet contains 129 vehicles.

TheBoat service is provided by two 149-passenger vessels chartered by the City. The vessels are passenger-only and do not accommodate vehicles.

Fare Structure

Fare structures for the TheBus and TheBoat are the same and are established by the City Council. Current fares were set in 2003. Table 3-4 provides information on the current breakdown of ridership by fare type. At 41 percent of total ridership, monthly adult pass holders predominate, followed by senior/disabled riders at 27 percent. Considering the various discounts available, the average fare paid is $0.77 per person trip. For TheHandi-Van, every cardholder and companion must pay a fare of $2.00 per person per trip.

Transit Facilities

Existing transit facilities include maintenance and storage facilities, park-and-ride lots, transit centers, major transfer points, and two dedicated bus-only roadways (Hotel Street between River and Alakea

Table 3-4 TheBus and TheBoat Fare Structure—2007

Fare Category	Current Fare	Percentage of Riders by Fare
Adult	$2.00	12%
Youth	$1.00	5%
Senior/Disabled	$1.00	27%
Transfer (1 per trip)	$0.00	7%
Monthly Adult Pass	$40.00	41%
Monthly Youth Pass	$20.00	6%
Monthly Senior/Disabled Pass	$5.00	(included with Senior/Disabled)
Annual Adult Pass	$440.00	(included with Monthly Adult Pass)
Annual Youth Pass	$220.00	(included with Monthly Youth Pass)
Annual Senior/Disabled Pass	$30.00	(included with Senior/Disabled)

Percentages do not add up to 100% because the table does not include minor fare categories such as Visitor Pass.

Source: 2007 City and County of Honolulu records.

Streets and Kūhiō/Kalākaua Avenue between Ena Road and Kuamoʻo Street).

There are two maintenance and storage facilities: the Kalihi-Middle Street facility and the Pearl City bus facility. Five park-and-ride lots are served by TheBus with a total capacity of 529 spaces. These lots are in Hawaiʻi Kai, Mililani Mauka, Royal Kunia, Wahiawā, and Haleʻiwa. The six transit centers are in Alapaʻi, Hawaiʻi Kai, Kapolei, Mililani, Waiʻanae, and Waipahu. There are also major transfer points, such as Ala Moana Center.

Transit inefficiency consumed $11.5 million in additional operating budget expenses in 2006.

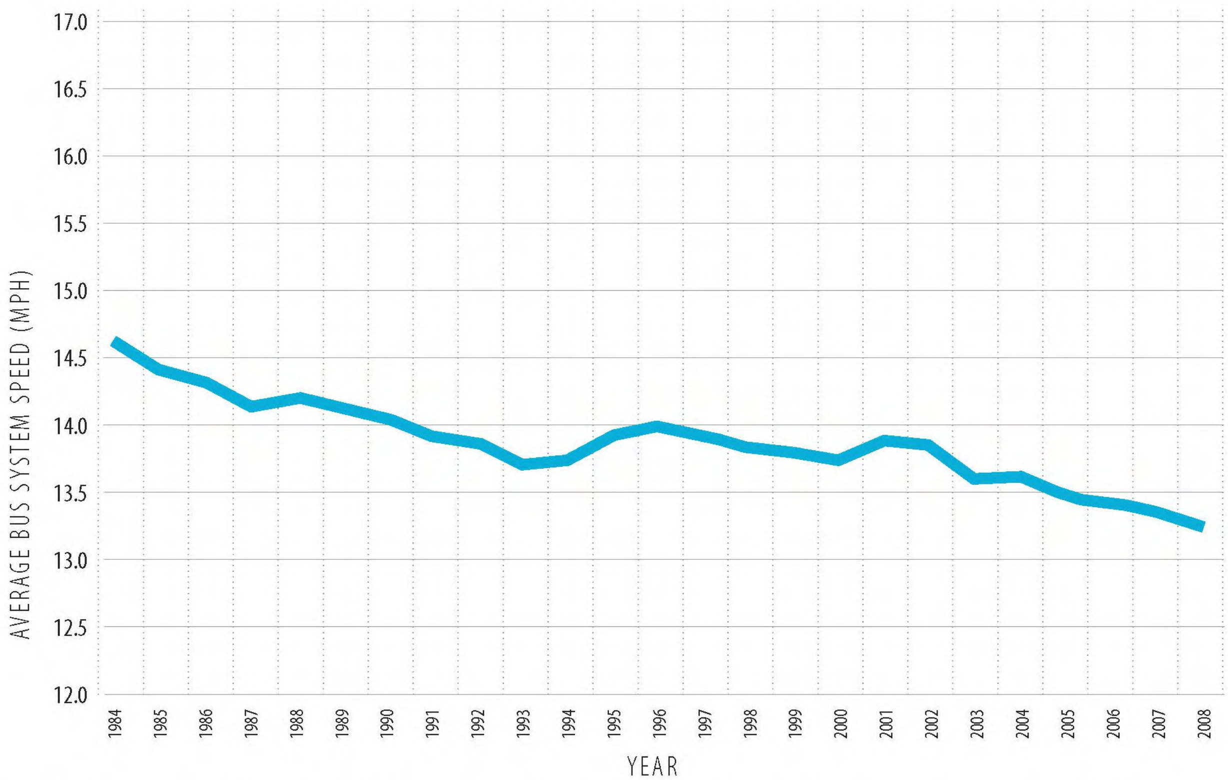
System Performance

This section examines existing transit system performance characteristics.

Transit Speed

TheBus operates in mixed traffic, without signal priority; therefore, buses are caught in the same congestion as general-purpose traffic. With increasing traffic congestion over the last 20 years, scheduled trip times for bus routes have been lengthened to reflect the additional time each bus trip takes. Average operating speeds for TheBus over time are shown in Figure 3-1.

As a result of longer bus travel times, approximately 111,700 additional revenue hours of bus service were needed in 2006 to deliver the same amount of service TheBus provided in 1984. This inefficiency consumed about $11.5 million in



Source: DTS reported National Transit Database (and formerly Section 15) reports: Annual Vehicle Revenue Miles and Annual Vehicle Revenue Hours.

Figure 3-1 TheBus Annual Average Operating Speed in Miles per Hour—1984–2007 additional annual operating budget expenses in 2006 (in 2006 dollars).

Temporary improvement to TheBus system's operating speeds was achieved by introducing new service concepts and restructuring the bus network in 2001. This improvement, known as the "hub-and-spoke" network, created new transit centers ("hubs") and new types of bus routes ("spokes") using rider-friendly features. For example, at a single facility riders can access routes that serve a variety of destinations. However, worsening roadway congestion further eroded average transit speeds and by 2006, a record low average speed of 13.4 miles per hour (mph) was recorded.

Figure 1-11 (in Chapter 1, Background, Purpose and Need) depicts the total time required to complete one scheduled afternoon peak-period trip for each of five selected routes (40, 42, 52, 55, and 62) in different years starting in 1992. These five routes travel through at least part of the study corridor and are considered Suburban Trunks. Routes 40 and 42 travel from the Mākaha Beach and ʻEwa Beach areas to Ala Moana Center and Waikīkī. Routes 52 and 55 jointly form the "Circle Island" route, which travels from Ala Moana Center through Downtown, Mililani, Wahiawā, Haleʻiwa, and Kāneʻohe and returns to Ala Moana Center. Route 62 also travels from Wahiawā to Honolulu (Figure 1-12). All five routes have had time added to their schedules due to congestion.

Using national standards for reliability, transit service on O`ahu has been gradually getting worse and now rates an "F" on a scale of "A" (best) to "F" (worst).

Route 52 is perhaps most illustrative of this schedule issue. This route was changed in 1999 to operate on Interstate Routes H-1 and H-2 (the H-1 and H-2 Freeways) instead of on Kamehameha Highway. This resulted in a drop from 135 to 121 scheduled minutes to operate the entire trip. This time was adequate from 2002 to 2004, but congestion caught up to this change. Time was added back into the schedule in 2005. In 2008, it is now scheduled to make a trip in 153 minutes—32 more minutes for the same distance than just four years ago—and more buses have been added to maintain the same service frequency.

Transit Ridership

Systemwide

TheBus system serves more than 80 percent of Oʻahu's developed areas and has about 251,400 boardings on an average weekday (2007 data). Of those boardings, approximately 10 percent are made by visitors. In fiscal year (FY) 2007 (July 2006 through June 2007), annual boardings were approximately 72 million.

Selected Routes in the Study Corridor

Most of TheBus routes, as well as most transit ridership in Oʻahu, occur within the study corridor. Routes 40, 42, 52, 55, and 62 are among the Suburban Trunk routes that travel through the study corridor and are part of the system's backbone. Average weekday boardings are shown in Table 3-5. These routes represent almost 20 percent of total islandwide daily boardings.

Table 3-5 Average Weekday Boardings on Selected Routes in the Study Corridor—2008

Route	Average Weekday Boardings
40	10,600
42	9,300
52	5,700
55	3,300
62	4,900

Transit Reliability

On-time performance is a measure of reliability and is based on the following service standard: a bus is considered to be late if it arrives at a route timepoint (a location along each route that has an identified schedule time) more than five minutes after the scheduled time. This standard has been used by the City's bus management services contractor to monitor service.

Figure 3-2 includes systemwide schedule adherence results for TheBus for weekdays in a typical month in each year since 1998. During four of the last six years, more than 30 percent of bus trips ran late. According to the LOS standards identified in the Transportation Research Board's *Transit Capacity and Quality of Service Manual* (TRB 2003), the extent of late trips indicated a grade of "F" on a scale of "A" (best) to "F" (worst).

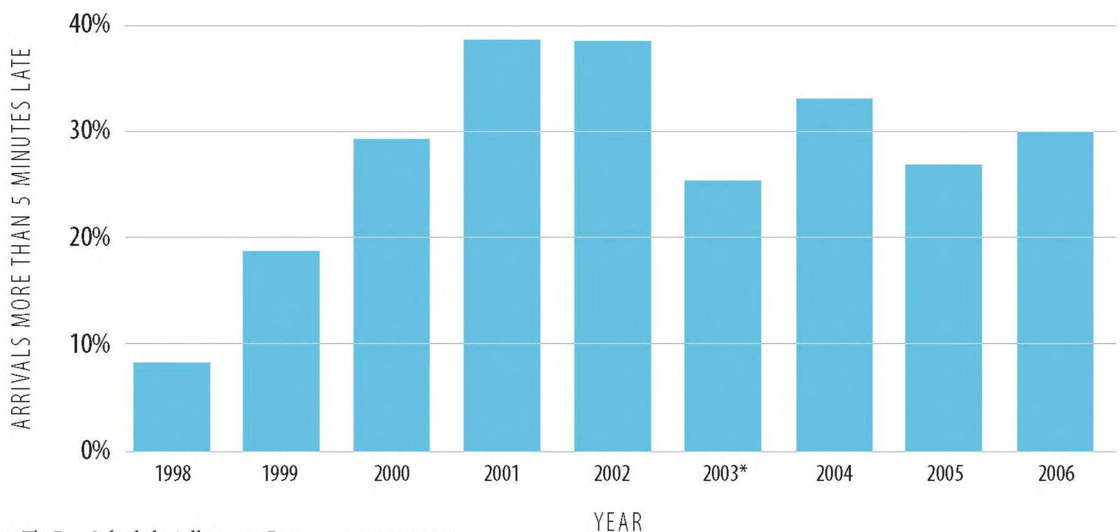
Buses are sometimes so far behind schedule that the trip does not reach its final destination. The bus operator is instructed to abandon the trip, off-load all passengers, and turn back so the next scheduled assignment for the operator and vehicle can be initiated on time. Figure 3-3 includes the total annual service incidents involving "turnbacks" from 1998 to 2007. The low number of turnbacks in 2003 reflects a work stoppage due to a 34-day bus operator strike.

Transit Effectiveness/Load Factors

For a city of its size, Honolulu has a very effective bus system, as measured by bus passenger trips per revenue hour (also known as *load factor*). As shown in Table 3-6, TheBus is the only one of the largest 20 bus operations in the U.S. that operates in a region without rail transit or a separated transit guideway system. Only three transit agencies (New York, San Francisco, and Los Angeles) have bus systems with higher service effectiveness than Honolulu.

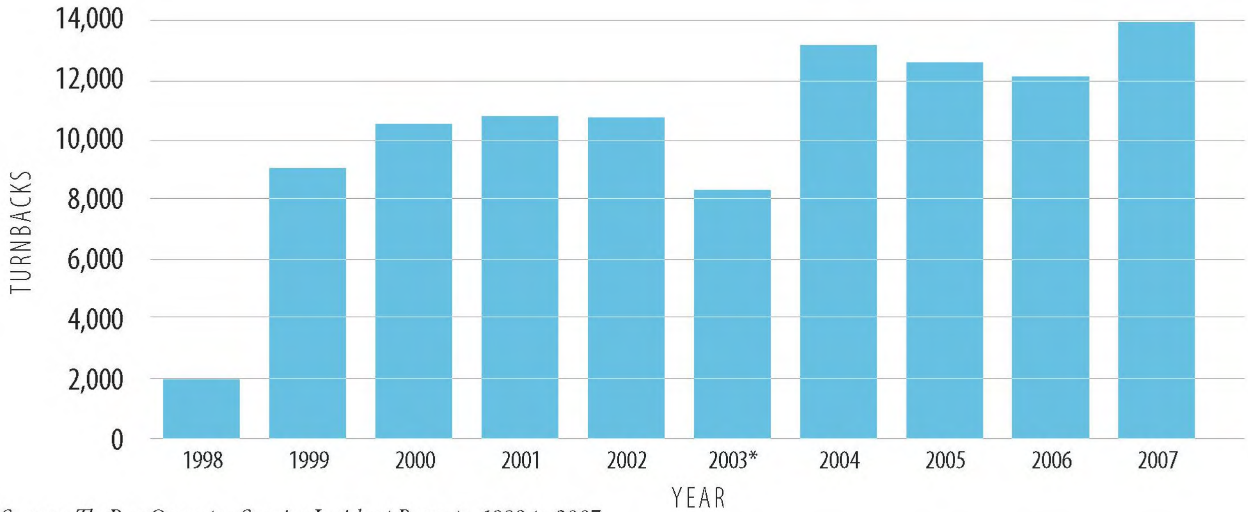
TheBus has maintained steady level-of-service effectiveness, as measured by bus passenger boardings per vehicle revenue hour. TheBus system's performance is consistently above the same service-effectiveness average for the nation among all transit modes.

In Honolulu, passenger boardings per vehicle revenue hour averaged 41.0 to 45.3 from 2001 to 2006, while the range for the nation was between



Source: TheBus Schedule Adherence Reports, 1998 to 2006.
* Affected by a 34-day bus operator strike.

Figure 3-2 TheBus Systemwide Schedule Adherence (Percent of Weekday Systemwide Arrivals more than Five Minutes Late)



Source: TheBus Operator Service Incident Reports, 1998 to 2007
* Affected by a 34-day bus operator strike.

Figure 3-3 TheBus Systemwide Annual Service Incidents Involving Turnbacks

37.3 and 40.4 during the same period. This is notable because the national rate includes the highest-capacity transit operations in the largest metropolitan areas.

Cost-effectiveness is measured by comparing service inputs (total operating expense) and service consumption (total passenger boardings). Between 2001 and 2006, the national average operating expense per passenger boarding increased from $2.39 to $3.09. TheBus experienced a commensurate increase in operating expense per passenger boarding of $1.60 to $2.25 over the same period, but TheBus expense has been consistently about 30 percent lower than the national average.

O`ahu has some of the highest transit ridership per vehicle revenue hour of service anywhere in the United States, making Honolulu a very transit-oriented city.

Access to Transit

Currently, access to transit service is dominated by walking and by transferring from other bus routes. Ninety-five percent of the urban population lives within one-quarter mile of a bus line. There are currently more park-and-ride spaces than demand.

Transfers

A major feature of O'ahu's existing transit service is reliance on transit centers and transfer locations as major focal points. The network of transit centers and the hub-and-spoke nature of the bus route system result in a high number of bus transfers. The current (2007) transfer rate is 37 percent, with an average of 1.4 bus rides or segments per transit trip.

3.2.3 Existing Conditions and Performance: Streets and Highways

Freeways, highways, and streets are the basic transportation network elements responsible for the movement of people and goods on O'ahu. This network is used by all types of vehicles, public and private transit services, bicycles, and pedestrians. O'ahu's roadway system is maintained by HDOT and the City and County of Honolulu Department of Facility Maintenance.

System Characteristics

The State highway system includes all freeways and major highways connecting various parts of

Table 3-6 Ranked Bus Passenger Vehicle Trips per Revenue Hour for the 20 Largest U.S. Bus Operations—2005

Transit Agency		Urbanized Area	Annual Bus Passenger Trips	Annual Bus Vehicle Revenue Hours	Bus Passenger Vehicle Trips per Revenue Hour	Transportation Modes Provided by Agency		
Rank	Name	Primary City	(1,000s)	(1,000s)		Bus	Rail	Other
1	MTA-NYC	New York, NY	952,418	12,870	74.0	B, DR	HR	–
2	MUNI	San Francisco, CA	163,149	2,495	65.4	B, TB, DR	LR	CC
3	LACMTA	Los Angeles, CA	377,268	7,482	50.4	B	HR, LR, CR	–
4	TheBus	Honolulu, HI	67,407	1,365	49.4	B, DR	–	–
5	SEPTA	Philadelphia, PA	187,960	3,830	49.1	B, TB, DR	HR, LR, CR	–
6	MBTA	Boston, MA	138,557	2,838	48.8	B, TB, DR	HR, LR, CR	FB
7	NYCDOT	New York, NY	71,347	1,559	45.8	B	–	FB
8	CTA	Chicago, IL	303,244	6,748	44.9	B, DR	HR	–
9	WMATA	Washington, DC	153,392	3,423	44.8	B, DR	HR	–
10	MTA	Baltimore, MD	77,806	1,922	40.5	B, DR	HR, LR, CR	–
11	MARTA	Atlanta, GA	71,066	1,798	39.5	B, DR	HR	–
12	TRI-MET	Portland, OR	68,765	1,873	36.7	B, DR	LR	–
13	OCTA	Santa Ana, CA	67,304	1,838	36.6	B, DR	–	–
14	AC Transit	Oakland, CA	64,601	1,800	35.9	B, DR	–	–
15	King County Metro	Seattle, WA	94,608	2,882	32.8	B, TB, DR	LR	VP
16	Metro Transit	Minneapolis, MN	61,797	2,011	30.7	B	LR	–
17	NJ Transit	New York, NY	156,147	5,184	30.1	B, DR	LR, CR	VP
18	MTA of Harris County	Houston, TX	81,547	2,848	28.6	B, DR	LR	VP
19	RTD	Denver, CO	74,683	2,639	28.3	B, DR	LR	VP
20	Miami Dade Transit	Miami, FL	76,753	2,732	28.1	B, DR	HR, AG	–

Data include all bus and trolleybus trips and exclude all demand response trips.

B = Bus, TB = Trolleybus, DR = Demand Response, HR = Heavy Rail, LR = Light Rail, CR = Commuter Rail, AG = Automated Guideway, FB = Ferry Boat, VP = Van Pool, CC = Cable Car

Source: 2005 Public Transportation Fact Book, APTA, April 2005.

the island and consists of approximately 280 route miles and 940 lane miles.

Interstate freeways on Oʻahu are dedicated transportation facilities that are fully grade-separated, access-controlled roadways. Access to the Interstate system is restricted to dedicated ramps, which minimizes disruptions to the flow of traffic. This allows for higher operational speeds and improved capacity compared to surface streets. The study corridor is served primarily by the H-1 Freeway and the Moanalua Freeway. The H-2 Freeway provides access from Central Oʻahu, and the H-3 Freeway provides access from the Windward side.

Highways, unlike freeways, are not fully grade-separated and tend to be major surface streets or expressways. Because local traffic can access these facilities at intersections, capacities and operational speeds are reduced.

To maximize the efficiency of the freeway and highway systems, the State and the City employ a variety of Transportation Demand Management (TDM) and Transportation System Management (TSM) strategies to reduce single-occupant motor vehicle trips and make the existing transportation system more efficient.

Examples of TDM measures used on O'ahu include contraflow operations and special traffic and high-occupancy vehicle (HOV) lanes. TSM measures include carpool and vanpool matching services, bicycle and pedestrian transportation alternatives, and park-and-ride facilities. These measures are overseen by either the City or HDOT. Reversible contraflow lanes operate during specific peak periods on portions of congested corridors, such as Kapi'olani Boulevard, Ward Avenue, Atkinson Drive, and Wai'alae Avenue.

HDOT operates HOV lanes on the following facilities during certain times of day: H-1 Freeway, H-2 Freeway, Moanalua Freeway, H-1 Freeway zipper lane and shoulder express lane, and Nimitz Highway. The H-1 zipper lane, H-1 shoulder express lane, and Nimitz Highway are contraflow lanes. Although transit vehicles use these HOV lanes, they still experience delays due to congestion. Once a vehicle exits an HOV lane, it is also subjected to congestion on surrounding roadways.

Performance of the Street and Highway System

For the purpose of this analysis, traffic volumes and other performance statistics were grouped by screenlines, which are imaginary lines drawn across the road network at selected locations to enable comparisons. Eight screenlines were used to describe existing conditions in the study corridor (as illustrated on Figure 3-4 and described in Table 3-7) for the a.m. and p.m. peak travel hours. Traffic count data for 2005 and 2006, the most recent set of counts, were used to analyze existing volume and LOS conditions.

Screenline Volumes and Operating Conditions

The operation of the roadway segments was calculated by comparing traffic volumes on each roadway facility to the saturated volume LOS thresholds for each individual facility. The saturated volume thresholds represent the capacity of a roadway and were developed based on the roadway functional classification and operating characteristics (e.g., number of intersections or interchanges per mile, divided or undivided roadways, number of travel lanes, and one-way or two-way facility).

Table 3-7 summarizes observed volumes and estimated LOS at each screenline for each direction during the a.m. and p.m. peak hours. In general, congested conditions (e.g., LOS E or F) occur during the a.m. and p.m. peak hours at several locations. Specifically, this occurs in the peak direction (i.e., toward Downtown in the morning and away from Downtown in the evening) at screenline locations such as 'Ewa (Screenline B) Koko Head-bound in the a.m. peak hour and Ward Avenue (Screenline G) 'Ewa-bound in the p.m. peak hour. The Kalauao and Kapālama screenlines (Screenlines D and F) Koko Head-bound operate at LOS F in the a.m. peak hour.

Traffic congestion occurs throughout the study corridor during peak travel hours, affecting cars, freight, and buses.

Under congested conditions, vehicle speeds are slow and vehicles back up in queues. As a result, less traffic gets through and any traffic counts conducted under these conditions tend to under-represent the true demand for the facility, making the roadway appear to operate better than it actually does. Table 1-3 (in Chapter 1) shows existing travel speeds at several locations in the a.m. peak hour. This information indicates a consistent LOS F throughout the study corridor and reflects current travel conditions in the corridor.

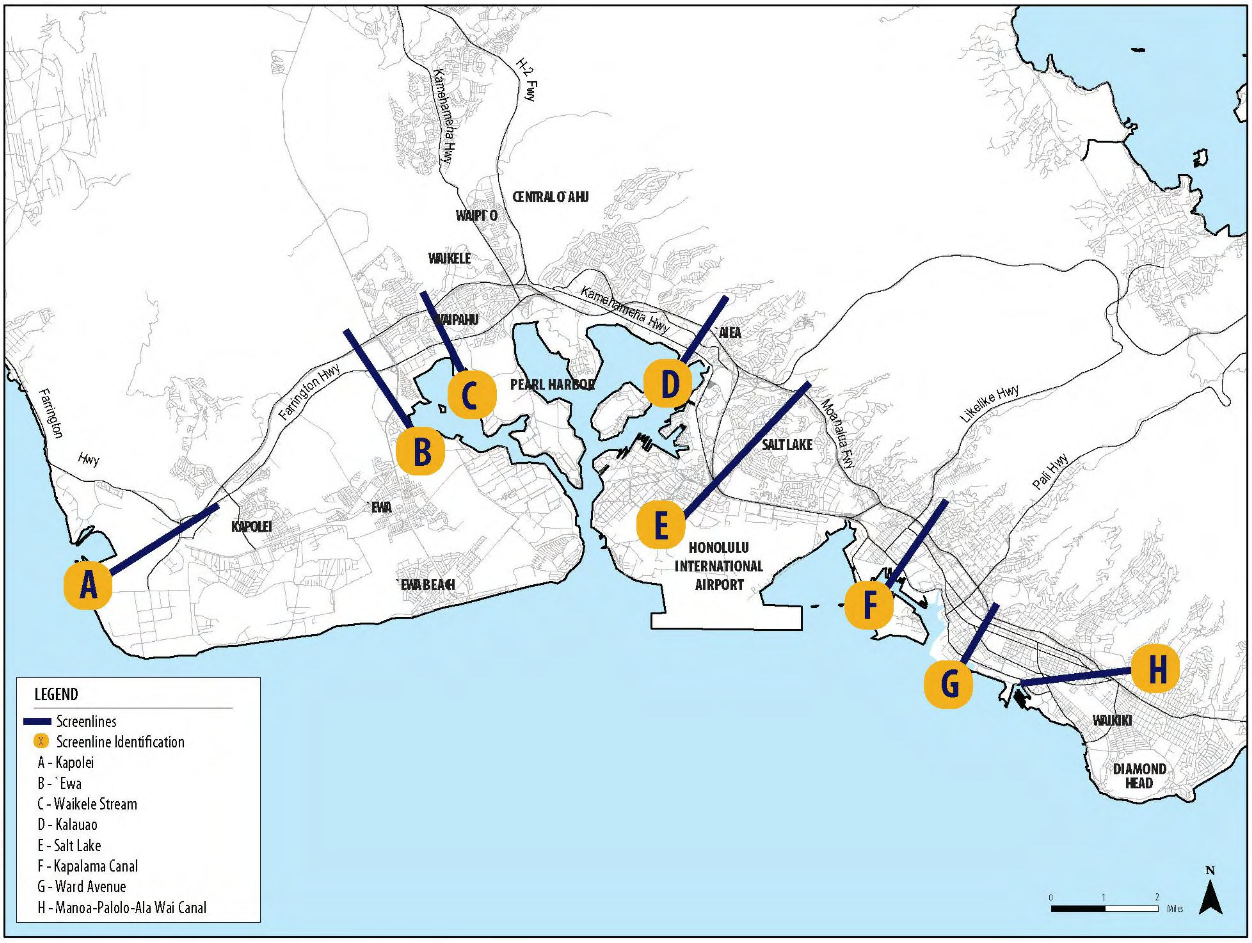


Figure 3-4 Selected Screenline Facilities Locations

Congestion on roadways currently affects overall mobility within the study corridor and affects the ability to add bus service in a cost-effective, reliable manner. This is because buses are using the same congested roadways as automobiles.

Freight Movement

The movement of goods and products is important to O'ahu's economic vitality. Ocean transportation delivers most imported food, building materials, manufactured goods, and energy products. Ocean transportation, shipbuilding and repair, commercial fishing, ocean recreation, and other support industries are the main activities in O'ahu's commercial harbors. The harbors are widely used by a variety of interests, from major cargo carriers to commercial fishermen to charter boat operators with a single vessel. O'ahu's two commercial harbors are Honolulu Harbor and Kalaeloa Barbers Point Harbor. Downtown Honolulu and government offices grew around Honolulu Harbor. A network of highways connects this harbor with outlying areas. Freight also enters O'ahu via Honolulu International Airport, which is located in the study corridor.

Trucks carrying freight enter and exit Honolulu Harbor on Nimitz Highway and use all major highways and freeways on O'ahu. Heavily used freight routes include Nimitz Highway, the H-1 Freeway, and Ala Moana Boulevard. These major roadways are also used by transit vehicles, so delays that automobiles and transit experience along major corridors are also experienced by truck traffic.

Table 3-7 Traffic Volumes and Level-of-Service at Screenlines—Existing Peak Hour

ID[1]	Screenline and Direction	A.M. Peak Hour		P.M. Peak Hour	
		Observed Volume (vph)[2]	LOS	Observed Volume (vph)[2]	LOS
A	Kapolei mauka-bound	1,840	D	2,550	D
	Kapolei makai-bound	2,640	D	1,680	D
B	`Ewa Wai`anae-bound	5,360	C	6,820	E
	`Ewa Koko Head-bound	7,460	E	6,760	D
C	Waikele Stream `Ewa-bound	7,630	D	8,520	E
	Waikele Stream Koko Head-bound	9,170	E	6,000	C
D	Kalauao `Ewa-bound	8,940	D	12,540	D
	Kalauao `Ewa-bound (H-1 Freeway HOV)[3]	n/a	n/a	1,530	D
	Kalauao Koko Head-bound	14,050	F	8,110	D
	Kalauao Koko Head-bound (H-1 Freeway HOV)[3]	1,740	E	1,360	D
	Kalauao Koko Head-bound (H-1 Freeway zipper)	1,510	D	n/a	n/a
E	Salt Lake `Ewa-bound	7,540	C	12,640	D
	Salt Lake `Ewa-bound (H-1 Freeway HOV)[3]	n/a	n/a	1,410	D
	Salt Lake Koko Head-bound	13,270	D	9,680	D
	Salt Lake Koko Head-bound (H-1 Freeway HOV and Moanalua Freeway HOV)[3]	2,640	E	240	A
	Salt Lake Koko Head-bound (H-1 Freeway zipper)[3]	1,510	D	330	A
F	Kapālama Canal `Ewa-bound	11,870	D	15,170	E
	Kapālama Canal Koko Head-bound	18,970	F	14,940	E
G	Ward Avenue `Ewa-bound	13,800	E	12,370	E
	Ward Avenue Koko Head-bound	11,390	E	15,350	D
H	Mānoa-Pālolo/Ala Wai Canal `Ewa-bound	14,940	D	12,780	D
	Mānoa-Pālolo/Ala Wai Canal Koko Head-bound	11,130	D	16,340	E

[1] Shown on Figure 3-4.
[2] Peak-hour traffic count data were obtained from HDOT (2005).
[3] Because separate HOV lane and zipper lane counts are not available at this location, HOV and zipper lane traffic volumes are estimated.

3.2.4 Existing Conditions and Performance: Parking

Parking availability varies widely throughout the study corridor. Parking is relatively accessible in suburban areas such as Pearl City and ʻAiea and at most shopping facilities, residences, and along the street. Parking is notably more limited in Downtown Honolulu, Chinatown, Kakaʻako, and near UH Mānoa.

On- and off-street parking facilities are heavily used in Downtown Honolulu, Waikīkī, and along University Avenue. Off-street parking structures are used by commercial and employment centers and, although they are available to the general public, the cost is relatively high. Inadequate parking supply has been a long-term problem in this portion of the study corridor. Permanent on-street parking is not available on Nimitz Highway, Kapiʻolani Boulevard, or Kalākaua Avenue, although metered parking is available and heavily used throughout these areas.

Downtown Honolulu parking rates are high. In 2008, the median daily parking rate in Honolulu was $44, nearly $29 more than the national median of $15.42. This rate exceeds those for major urban areas such as Midtown Manhattan ($40) and Chicago ($30). Monthly parking rates are the ninth highest of the 53 U.S. markets surveyed. Honolulu's monthly median parking rate for an unreserved space was $216, more than $60 higher than the national median of $154 (Colliers 2008).

3.2.5 Existing Conditions and Performance: Bicycle and Pedestrian Network

Three primary bikeway types constitute the bicycle infrastructure on the island, as defined by the *Bike Plan Hawaiʻi Master Plan* (HDOT 2003):

- **Shared Roadway**—any street or highway open to both bicycles and motor vehicle travel. Signs may be present designating their status as a preferred bike route. Currently, there are 30.1 miles of shared roadway on Oʻahu.
- **Bike Lane**—a section of roadway designated by striping, signing, and/or pavement markings for the preferential or exclusive use of bicyclists. There are 33.6 miles of bike lanes on Oʻahu.
- **Shared-use Path**—a route that is physically separated from motorized vehicular traffic by an open space or barrier and is located either within the highway right-of-way or has an independent right-of-way. There are 34.3 miles of shared-use paths on Oʻahu.

Although there are approximately 98 miles of bicycle facilities on Oʻahu, topography, safety issues, and an auto-oriented environment have generally limited these facilities in the study corridor. For instance, signs for a shared roadway are located on Farrington Highway. However, high traffic volumes and average vehicle speeds of 35 to 45 mph pose safety concerns for bicyclists using this facility. In the less developed ʻEwa area of the study corridor, bicycle facilities are being constructed in many new subdivisions. Buses are also equipped with bicycle racks.

The quality and extent of Honolulu's pedestrian system varies depending on location. In certain areas, such as Waikīkī, Chinatown, and Downtown, the City has invested heavily in creating a continuous and accessible pedestrian system. Pedestrian linkages are not yet fully developed in the Kapolei area because of the less dense land uses and the highway network. In most other areas, pedestrian facilities exist but are sometimes narrow or not continuous.

3.3 Future Conditions and Effects: No Build Alternative

This section discusses future conditions and estimated effects of the 2030 No Build Alternative. Unless otherwise noted, the source for information presented in this section is the OʻahuMPO travel demand forecasting model (OʻahuMPO 2007).

Even with $3 billion in roadway improvements under the No Build Alternative, traffic delay in 2030 would increase 44 percent compared to today.

The No Build Alternative includes all transportation improvements outlined in the ORTP, except the fixed guideway system. Although the ORTP includes the fixed guideway system, it is not included in the No Build Alternative so that a comparison can be made between "with" and "without" the Project.

The ORTP is the long-range plan for developing Oʻahu's multimodal transportation system. It includes additional roadway, bus, and bicycle and pedestrian projects planned within the study corridor. These improvements include congestion-relief projects, such as widening Farrington Highway and the H-1 Freeway, extending Kapolei Parkway, constructing HOV and zipper lanes on the H-1 Freeway, and widening and extending North-South Road. Bus improvements are also planned and include service expansion to and within ʻEwa, Kapolei, and Central Oʻahu. Bus transit centers are also planned at various locations islandwide. Roadway elements of the ORTP are further described in Chapter 2. The projects listed above are included in the analysis of the No Build and Build Alternatives.

Plans to expand Oʻahu's bikeway system are also underway and largely driven by the *Bike Plan Hawaiʻi Master Plan* (HDOT 2003) and the *Honolulu Bicycle Master Plan* (DTS 1999). Since publication of these reports, construction has begun on the following:

- 19 miles of shared roadways with 172 miles planned
- 5 miles of bike lanes with 50 miles planned
- 14 miles of shared-use paths with 37 miles planned

3.3.1 No Build Alternative—Future Travel Patterns

Daily Person Trips

As indicated in Table 3-8, total daily person trips are expected to increase by 780,000 trips (24 percent) between 2007 and 2030, with more than 4 million trips in 2030. Of these 4 million trips, almost 3.5 million would be made by residents. The remaining trips are made by visitors, trucks, and ground access by air passengers.

Table 3-8 Daily Person Trips by Mode—2007 and 2030 No Build Alternative

Trip Type	2007		2030 No Build	
	Number	Percent	Number	Percent
Trips by Residents				
Automobile–private	2,291,400	82%	2,814,600	82%
Transit	165,900	6%	205,700	6%
Bicycle and walk	332,700	12%	432,400	13%
Total Trips by Residents	2,790,000		3,452,700	
Trips by Visitors				
Automobile–private	116,400	32%	160,100	37%
Transit	17,600	5%	19,800	5%
Taxi	9,300	3%	9,700	2%
Tour bus	56,000	15%	77,500	18%
Bicycle and walk	165,100	45%	163,600	38%
Total Trips by Visitors	364,400		430,700	
Other Trips				
Trips by trucks	44,700	43%	51,600	33%
Ground access trips by air passengers	60,000	57%	103,900	67%
Total Other Trips	104,700		155,500	
Total Daily Trips (All)	3,259,100		4,038,900	

Numbers do not equal 100 percent due to rounding.

Mode of Travel

Table 3-8 also provides mode share information for islandwide daily trips in 2007 and under 2030 No Build conditions. For trips made by residents, there would be virtually no change in shares for the identified travel modes: private automobile, transit, and bicycle and walk. For trips made by visitors, the share by private automobile under No Build conditions would increase from 32 to 37 percent. The transit share would be unchanged, and minor changes are estimated for taxi and tour bus. However, the bicycle and walk share would decrease from 45 to 38 percent as more auto-oriented tourist destinations, such as Ko ʻOlina, are developed over time.

Vehicle Miles Traveled, Vehicle Hours Traveled, and Vehicle Hours of Delay

Table 3-9 shows the systemwide VMT, VHT, and VHD in the study corridor for 2007 and the 2030 No Build Alternative. Under 2030 No Build conditions, 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 17 percent (or 2 million miles) over 2007 conditions.

Table 3-9 Daily Vehicle Miles Traveled, Vehicle Hours Traveled, and Vehicle Hours of Delay—2007 and 2030 No Build Alternative

Alternative	Daily VMT	Daily VHT	Daily VHD
2007 Existing Conditions	11,581,000	334,000	74,000
2030 No Build	13,583,000	415,000	106,000
% Change from 2007	*17%*	*24%*	*43%*

VHT is expected to increase by 24 percent by 2030 compared to 2007 levels. Delay would increase by 43 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.

Reverse Commute Market

Reverse commute trips originate in central areas and are destined to outlying and more suburban locations. Similar to current conditions, the No Build Alternative would have two-way transit service along major travel corridors, thereby providing opportunities for reverse commute bus riders. However, the effectiveness of the service would be compromised by characteristics such as reduced overall bus travel speeds.

Service to Transit-Dependent Households

Bus service under the No Build Alternative would provide access to areas with high concentrations of transit-dependent households. Compared to 2007 conditions, some increases in transit travel times are projected for travel markets involving transit-dependent households. One example is between Pearlridge and Downtown Honolulu. Other travel markets would experience small reductions in transit travel times.

In 2030 under the No Build Alternative, even with ORTP planned improvements, the key measures of transit reliability, accessibility, mobility, and equity would all be worse than today.

3.3.2 Effects on Transit

This section provides information on the effects of the No Build Alternative on transit, including travel times, service reliability, and ridership resulting from anticipated limitations of the roadway network.

Transit Speed

In general, transit travel times during the a.m. two-hour peak period (6:00 to 8:00 a.m.) would be longer under the 2030 No Build Alternative when compared to 2007 due to generally slower transit speeds. Figure 3-5 shows system-level historic transit speeds as well as projected speeds under the No Build Alternative. Table 3-10 shows estimated

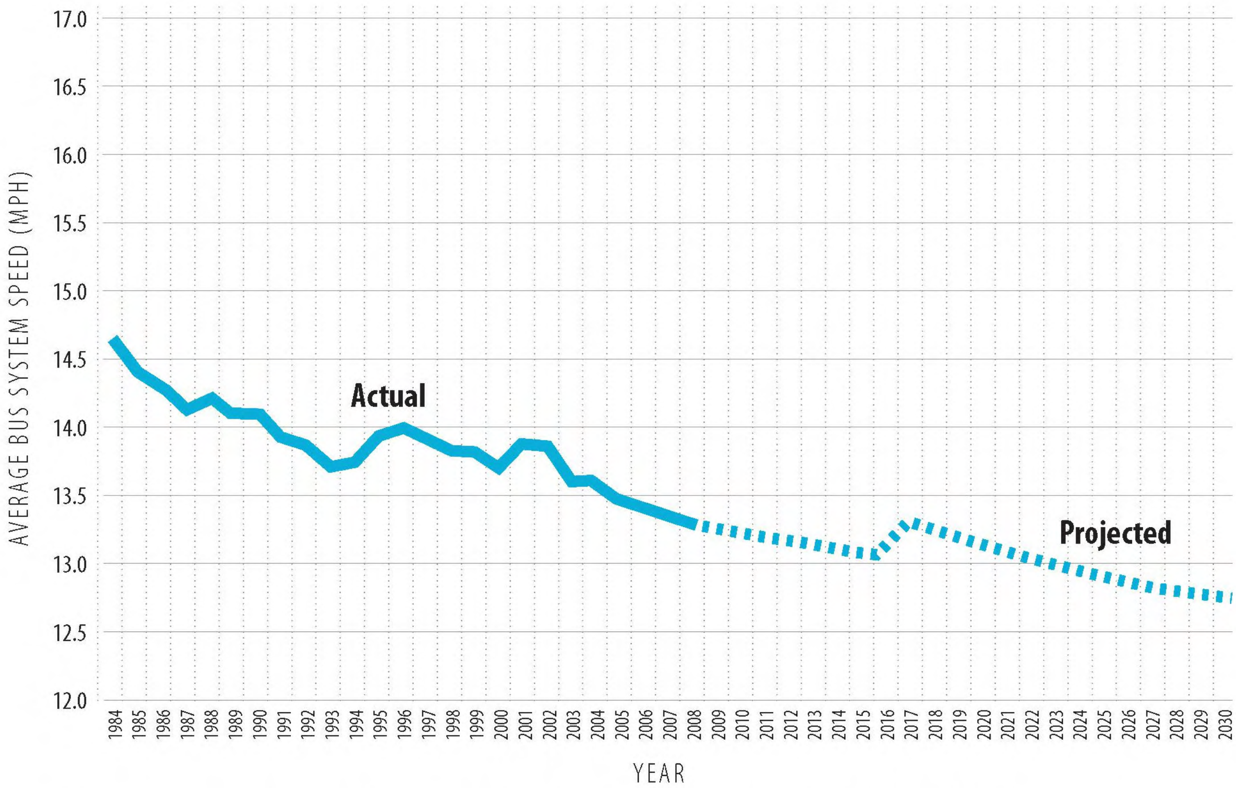


Figure 3-5 TheBus Average Operating Speeds in Miles per Hour—Historic and Projected under 2030 No Build Alternative

Table 3-10 A.M. Peak Period Transit Vehicle Speeds (in miles per hour)

Alternative	Kapolei to Downtown	`Ewa to Downtown	Waipahu to Downtown	Mililani Mauka to Downtown	Pearlridge Center to Downtown	Downtown to Ala Moana Center	Waipahu to Waikiki
2007 Base Year	19	15	19	20	15	13	17
2030 No Build	19	15	19	18	13	10	17
2030 Salt Lake	29	23	33	30	31	24	25
2030 Airport	28	22	32	30	29	24	25
2030 Airport & Salt Lake	29	23	33	31	31	24	25

changes in transit speeds for several locations in the corridor. Slower speeds are attributable to increased traffic along streets and highways on which buses operate. The temporary increase in transit speeds in 2018 is attributable to planned implementation of extended HOV lanes on the H-1 Freeway and improved transit operations in the zipper lane.

Some transit travel times, such as from Waipahu to Waikīkī and Mililani Mauka to Downtown, are projected to improve under the No Build Alternative. These trips would take advantage of extended HOV lanes on the H-1 Freeway, improved operations of the zipper lane (assumed to be limited to three or more-occupant vehicles in the year 2030), and/or the proposed Nimitz Flyover facility (which would give priority to HOVs and transit vehicles).

Transit Ridership

Transit boardings under the No Build Alternative are expected to keep pace with population growth and increase over 2007 existing conditions by approximately 25 percent (Table 3-11). No major increases in the transit share of total travel are projected for the No Build Alternative.

Table 3-11 Changes in Total Daily Transit Boardings and Trips—2007 and 2030 No Build Alternative

Alternative	Total Transit Boardings	Total Transit Trips
2007 Existing Conditions	251,000	184,000
2030 No Build	314,000	226,000
% Change from 2007	*25%*	*23%*

Although some increases in bus services would occur under the No Build Alternative, a review of route-specific demand and service levels for 2030 indicates that bus capacity would be exceeded for several routes. In some cases the demand per bus trip would be more than twice the seating capacity.

Adding substantial passenger capacity with more buses is not feasible in some key locations along the system because of roadway capacity constraints. Choke points occur in Downtown Honolulu during the a.m. peak period, especially at the merger of North Beretania, North King, and Liliha Streets, and Dillingham Boulevard. King Street has been used to introduce new service in recent years; however, choke points occur at the Chinatown bus stops and at the Punchbowl Street and King Street stops. Buses often must wait to move into an open and safe boarding position. Continuing to add additional service to King Street without major physical improvements would add to the gridlock in this corridor, deteriorate transit service, and complicate pedestrian and traffic safety issues.

Several routes, including CountryExpress! Routes C, D, and E are projected to be overloaded in 2030. Increasing frequency would require headways at five minutes or less. Further, the downtown street network cannot support the number of buses that would be required to meet projected demand.

Transit Reliability

In addition to the estimated increase in transit travel times, transit reliability under the No Build Alternative would likely worsen compared to existing conditions. This is due to projected increases in congestion and a longer duration of unstable traffic flow expected during the a.m. two-hour peak period. Operating conditions, such as missed trips and bus turnbacks, are expected to worsen. Of particular concern is the reliability of longer-distance service connecting the emerging population centers in West O‘ahu with major destinations such as Downtown.

Access to Transit Service

With the No Build Alternative, access to transit services would be generally similar to current characteristics. New transit centers would be built at five locations to allow transfers between TheBus routes. One additional park-and-ride facility would be built at the Middle Street Intermodal Transportation Center.

Transfers

The estimated rate of transfers under the No Build Alternative would be 39 percent (or 1.4 bus rides or segments per transit trip). This rate is close to the 37 percent transfer rate in 2007 (or 1.4 bus rides or segments per transit trip). The transfer rate would reflect that the bus route structure under the No Build Alternative would be generally similar to that in 2007.

Comfort and Convenience

With the No Build Alternative, additional bus service would be provided on some routes. Given the reliance on buses, most of which would continue to operate in mixed traffic, transit riders would be subject to service delays and long trip times for several travel markets. Riders who have to stand would be subject to frequent stop-and-go vehicle movements.

3.3.3 Effects on Streets and Highways

This section discusses the effects of the No Build Alternative on streets and highways and includes future highway volumes and travel times.

Screenline Volumes and Operating Conditions

Under the No Build Alternative, vehicular traffic volumes on major roadway facilities in the study corridor are projected to increase from existing conditions. Due to the high rate of population and employment growth in ʻEwa and Kapolei, daily traffic volumes are expected to increase even more substantially at the ʻEwa end of the study corridor. Growth in traffic volumes at screenlines (Figure 3-4) are projected to be between 35 and 45 percent at Waikele Stream (Screenline C) and the ʻEwa areas (Screenlines A and B) and by more than 75 percent in the developing area of Kapolei. Under 2030 No Build conditions, Kapālama Canal (Screenline F) would be the most traveled, with more than 464,000 daily vehicles crossing it.

Table 3-12 compares existing traffic volumes for the a.m. and p.m. peak hours to those of the No Build Alternative. The greatest percentage increases in traffic volumes would be observed in Kapolei and ʻEwa (Screenlines A, B, and C).

Changes in Transit and Private Vehicle Demand

Figure 3-6 shows the estimated share of home-based work trips on transit in 2007 and under the 2030 No Build Alternative during the a.m. two-hour peak period for selected locations in the corridor. As seen in the figure, there is not much difference between 2007 and 2030. In most cases, any changes in mode share are less than 10 percent.

Table 3-12 Traffic Volumes at Selected Screenlines—2005 and 2030 No Build Alternative

ID[1]	Screenline and Direction	Volume (vph)[2]				% Change from Existing (A.M.)	% Change from Existing (P.M.)
		2005 Conditions		2030 No Build			
		A.M. Peak Hour	P.M. Peak Hour	A.M. Peak Hour	P.M. Peak Hour		
A	Kapolei mauka-bound	1,840	2,550	4,260	4,160	132%	63%
	Kapolei makai-bound	2,640	1,680	5,120	3,010	94%	79%
B	\`Ewa Wai\`anae-bound	5,360	6,820	8,010	8,700	49%	28%
	\`Ewa Koko Head-bound	7,460	6,760	10,010	10,280	34%	52%
C	Waikele Stream \`Ewa-bound	7,630	8,520	10,650	11,130	40%	31%
	Waikele Stream Koko Head-bound	9,170	6,000	12,070	8,380	32%	40%
D	Kalauao \`Ewa-bound	8,940	14,070	10,250	16,150	15%	15%
	Kalauao Koko Head-bound	17,300	9,470	20,800	10,810	20%	14%
E	Salt Lake \`Ewa-bound	7,540	14,050	8,670	15,610	15%	11%
	Salt Lake Koko Head-bound	17,420	10,250	19,520	10,920	12%	7%
F	Kapālama Canal \`Ewa-bound	11,870	15,170	13,210	16,710	11%	10%
	Kapālama Canal Koko Head-bound	18,970	14,940	22,140	16,880	17%	13%
G	Ward Avenue \`Ewa-bound	13,800	12,370	15,000	13,600	9%	10%
	Ward Avenue Koko Head-bound	11,390	15,350	13,460	17,330	18%	13%
H	Mānoa-Pālolo/Ala Wai Canal \`Ewa-bound	14,940	12,780	15,790	13,890	6%	9%
	Mānoa-Pālolo/Ala Wai Canal Koko Head-bound	11,130	16,340	12,720	17,610	14%	8%

[1] Shown on Figure 3-4.
[2] Peak-hour traffic count data were obtained from HDOT (2005). 2030 data were obtained from the travel demand forecasting model.

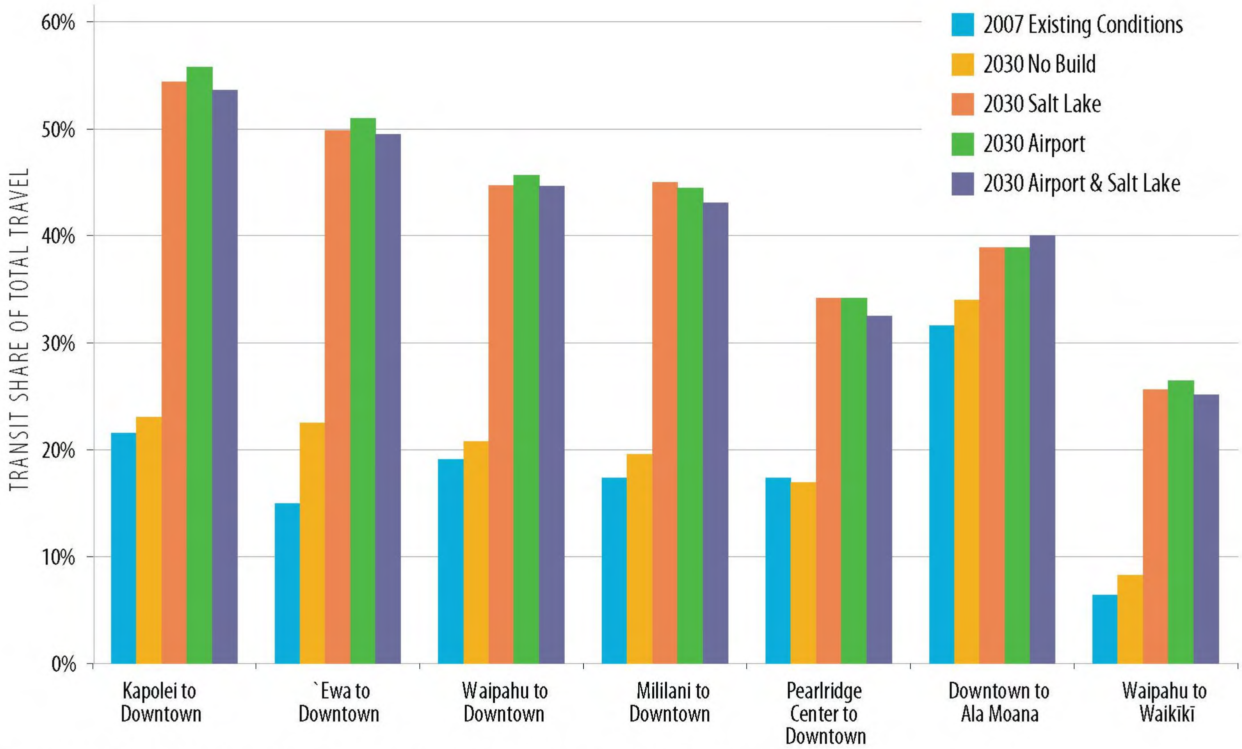


Figure 3-6 Transit Shares of Home-Based Work Trips in A.M. Two-hour Peak Period

3.3.4 Effects on Parking, Bicycle and Pedestrian Network, and Freight Movement

Other than improvements in the ORTP, the No Build Alternative would not directly affect parking, bicycle, pedestrian, or freight movement. However, these facilities would be affected by the continued increase in population, background traffic, and roadway delay that is expected with this alternative.

> **A single incident can cause major traffic disruptions. In 2006, an accident on the H-1 Freeway at a pedestrian overpass closed the `Ewa-bound lanes for eight hours, resulting in gridlock conditions.**

3.4 Future Conditions and Effects: Build Alternatives

This section analyzes the effects of the Build Alternatives and compares them to the No Build Alternative. This assessment of the future transportation effects (year 2030) of the Build Alternatives includes potential phasing of the alternatives, such as phasing of the Airport & Salt Lake Alternative that would include first the section between East Kapolei and Ala Moana Center along Salt Lake Boulevard, followed by the connection from the Middle Street Transit Center to Honolulu International Airport, and finally the connection from the airport to Aloha Stadium. The following issues are examined:

- Travel characteristics
- Transit effects, including changes affecting mobility, reliability, access, and equity
- Transit-user benefits
- Street and highway effects, including operating conditions that would result from the fixed guideway system and physical effects of the guideway's components
- Parking, including the effects of traffic conditions at guideway stations with park-and-ride

access, on- and off-street parking eliminated due to placement of the fixed guideway columns, and spillover parking
- Bicycle and pedestrian movement/access
- Freight movement

3.4.1 Build Alternatives—Future Travel Patterns

Daily Person Trips

Table 3-13 identifies daily person trips for the 2030 No Build and Build Alternatives. Approximately 4 million person trips are projected under each alternative.

Mode of Travel

Under each Build Alternative, the private automobile share would decrease from 82 to 80 percent and the transit share would increase from 6 to 7 percent. Bicycle and walk would remain the same at 13 percent under all alternatives.

For trips made by visitors, mode share would generally remain the same for the No Build and Build Alternatives.

Vehicle Miles Traveled, Vehicle Hours Traveled, and Vehicle Hours of Delay

VMT, VHT, and VHD are projected to decrease under each Build Alternative compared to the No Build Alternative (Table 3-14). Daily VMT would decrease by 4 percent and VHT would decrease by 7 percent for each alternative. VHD would experience the greatest decrease: up to 23 percent, depending on the alternative. This reflects the fact that even moderate decreases in traffic volumes under congested conditions can result in relatively large decreases in travel delay.

Table 3-13 Islandwide Mode Shares—2030 No Build and Build Alternatives

Trip Type	No Build Alternative		Salt Lake Alternative		Airport Alternative		Airport & Salt Lake Alternative	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Trips by Residents								
Automobile–private	2,814,600	82%	2,773,600	80%	2,771,800	80%	2,772,700	80%
Transit	205,700	6%	247,400	7%	249,200	7%	248,200	7%
Bicycle and walk	432,400	13%	431,600	13%	431,600	13%	431,600	13%
Total Trips by Residents	3,452,700		3,452,600		3,452,600		3,452,500	
Trips by Visitors								
Automobile–private	160,100	37%	158,500	37%	158,100	37%	158,100	37%
Transit	19,800	5%	22,900	5%	23,700	6%	23,700	6%
Taxi	9,700	2%	9,600	2%	9,600	2%	9,600	2%
Tour Bus	77,500	18%	76,600	18%	76,400	18%	76,400	18%
Bicycle and walk	163,600	38%	163,600	38%	163,600	38%	163,600	38%
Total Trips by Visitors	430,700		431,200		431,400		431,400	
Other Trips								
Trips by Trucks	51,600	1%	51,600	1%	51,600	1%	51,600	1%
Ground access trips by air passengers	103,900	3%	103,900	3%	103,900	3%	103,900	3%
Total Other Trips	155,500		155,500		155,500		155,500	
Total Daily Trips (All)	4,038,900		4,039,300		4,039,500		4,039,400	

Numbers do not equal 100 percent due to rounding.

Table 3-14 Vehicle Miles Traveled, Vehicle Hours Traveled, and Vehicle Hours of Delay—2030 No Build and Build Alternatives

Alternative	Total			Percent Change from No Build		
	Daily VMT	Daily VHT	Daily VHD	Daily VMT	Daily VHT	Daily VHD
No Build	13,583,000	415,000	106,000	n/a	n/a	n/a
Salt Lake	13,096,000	385,000	84,000	-4%	-7%	-21%
Airport	13,086,000	385,000	82,000	-4%	-7%	-23%
Airport & Salt Lake	13,103,000	386,000	83,000	-4%	-7%	-22%

Under congested conditions, even small reductions in traffic volumes can show large reductions in delay.

Reverse Commute Markets

Improved access to West O'ahu communities would also address reverse commute markets. Reverse commute trips originate in central areas and are destined to outlying and more suburban locations.

The fixed guideway service provided under the Build Alternatives would support and reinforce land use plans associated with O'ahu's planned "second city" in Kapolei. With an almost four-fold increase in employment estimated by 2030 for Kapolei, the quick and direct access provided by the fixed guideway system from PUC Development Plan area locations (e.g., Downtown and Kaka'ako) would help address the demand of future reverse commute markets. These markets include existing and planned local government offices and the future UH West O'ahu campus. Based on transit travel forecasts, about 20 percent of fixed guideway ridership during the a.m. two-hour peak period would be in the 'Ewa-bound direction, which demonstrates that the Project supports the goal of improving access to planned development and a second urban center.

With quick transit access provided to emerging employment centers, the Build Alternatives support enhanced transportation equity. Of the reverse commute transit trips with destinations in 'Ewa and Kapolei during the a.m. two-hour peak period, 54 to 55 percent originate from low-income communities.

Service to Transit-Dependent Households

Under the Build Alternatives, transit travel time benefits would occur for several communities with high concentrations of transit-dependent households (Figure 3-7). The transit-dependent communities are those with higher than average numbers of households without vehicles or residents who are unable to drive. There would be substantial travel time benefits for transit-dependent communities such as Waipahu, West Loch, Waikīkī, Chinatown, and Makakilo.

3.4.2 Effects on Transit

This section describes the effects of the Build Alternatives on various transit factors, including mobility, access, reliability, and equity.

The Build Alternatives would benefit the overall transportation system, enhancing the key measures of transit reliability, accessibility, mobility, and equity.

Transit Speed

Transit riders would experience substantially reduced travel times under the Build Alternatives compared to existing conditions and the No Build Alternative. Shorter travel times reflect faster systemwide transit speeds. Bus speeds have gradually declined over the past several years and would continue to decline under the No Build Alternative as a result of growth in traffic congestion and the lack of exclusive right-of-way

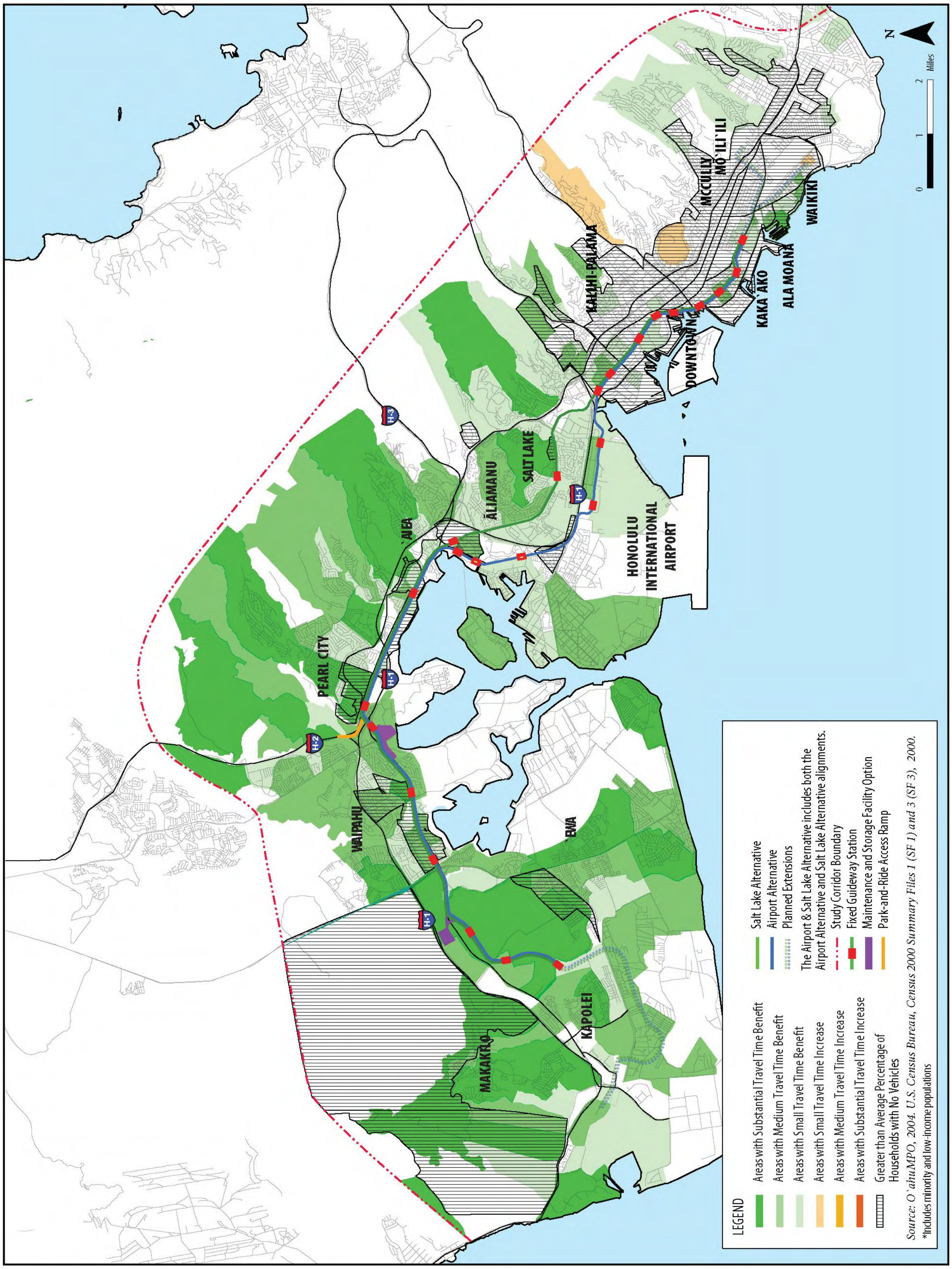


Figure 3-7 Transit Dependent Households

for transit vehicles. However, the fixed guideway operations would provide faster service compared to bus-only operations. Figure 3-8 compares system-level transit speeds for the No Build and Build Alternatives. Table 3-10 lists transit speeds for the No Build and Build Alternatives at selected locations. As a result of the increased transit speeds, major reductions in transit travel times would occur for several major markets, such as between Downtown Honolulu and developing areas in ‘Ewa.

Under any of the Build Alternatives, average travel times on transit would improve dramatically, enhancing overall mobility and accessibility. In some cases, transit travel times would be half of what they are today.

Figure 3-9 shows 2007 and 2030 travel times between selected locations. This information represents the time required to complete a trip from origin to destination and assumes that at least a portion of the trip would be made on the fixed guideway system. Travel-time information for 2030 is presented for the No Build Alternative and the Build Alternatives.

As demand increases after the fixed guideway system is fully operational, service would gradually be expanded with more frequent and longer trains. This would cause the overall average transit speed to continue to increase. Trips to and from Mililani and Waikīkī, which are not along the alignment, would also benefit from reduced travel times when using the guideway. Station-to-station travel times are shown in Table 3-15. Since the fixed guideway system would operate independently from traffic, these travel times would be the same at all times of the day, offering certainty and reliability to riders. For example, the travel time between the East Kapolei and UH West O‘ahu Station would only be two minutes. The travel time from East Kapolei to Pearlridge Station would be the sum of the travel times in between, or 18 minutes along a heavily traveled portion of the study corridor.

Transit Ridership

Transit Ridership—Systemwide

Table 3-16 shows projected daily transit ridership for the No Build and Build Alternatives. Ridership numbers are presented in terms of fixed guideway boardings and total transit boardings. Daily transit boardings for the Build Alternatives would increase up to 43 percent over the No Build, depending on the alternative. Service frequency would be lower on the Airport & Salt Lake Alternative, so slightly fewer fixed guideway boardings are projected for this alternative.

Station and Link Volumes

Figure 3-10 shows the number of fixed guideway boardings (passengers getting on) and alightings (passengers getting off) that would occur at each station during the a.m. two-hour peak period in each direction. The Pearl Highlands Station would have the highest number of boardings in the a.m. two-hour peak period, and the Ala Moana Center Station would have the highest number of alightings and total passenger activity (boardings plus alightings).

Figure 3-11 shows the passenger volumes on guideway trains between each station during the a.m. two-hour peak period. The location of the highest link volume would vary by alternative: between Ala Liliko‘i and Middle Street for the Salt Lake Alternative, between Aloha Stadium and Pearl Harbor for the Airport Alternative, and between Middle Street and Kalihi for the Airport & Salt Lake Alternative.

The maximum peak direction (Koko Head) volume during the a.m. two-hour peak period would be about 11,950 passengers in 2030. This is below the fixed guideway system’s currently planned minimum capacity of 13,000 passengers per direction for a two-hour period. Should higher passenger

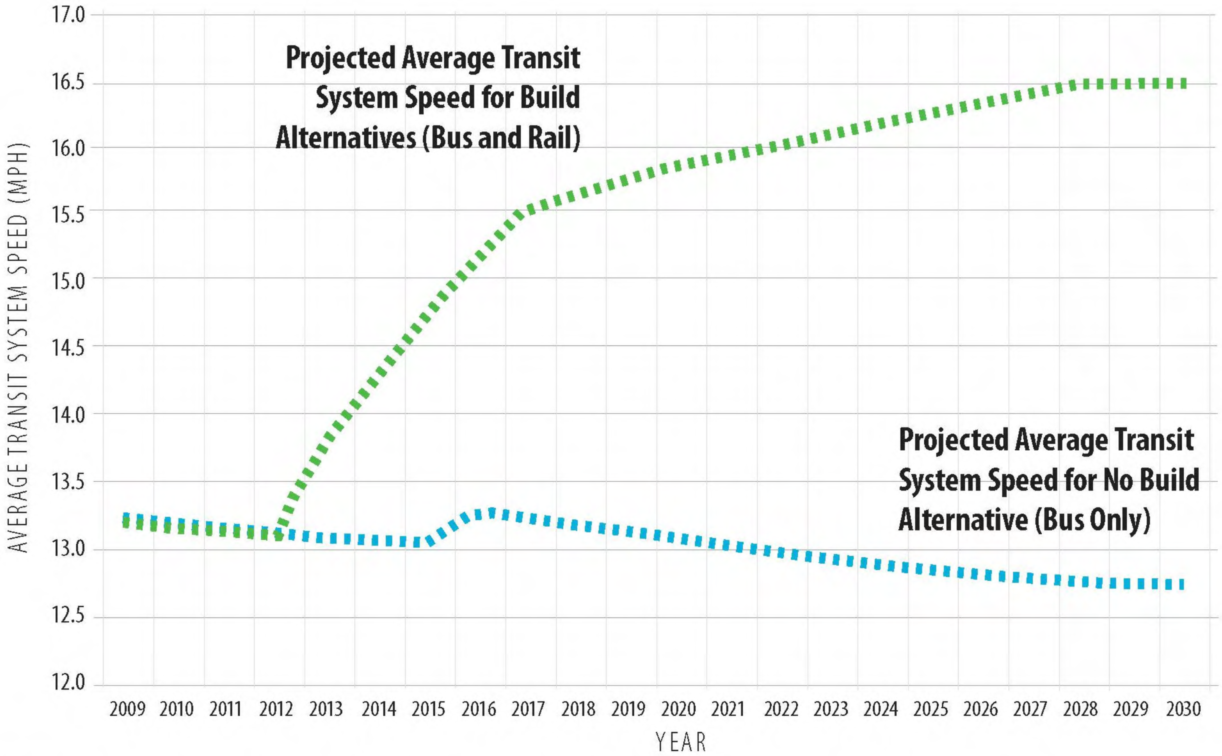


Figure 3-8 Transit Average Operating Speeds in Miles per Hour—2030 No Build and Build Alternatives

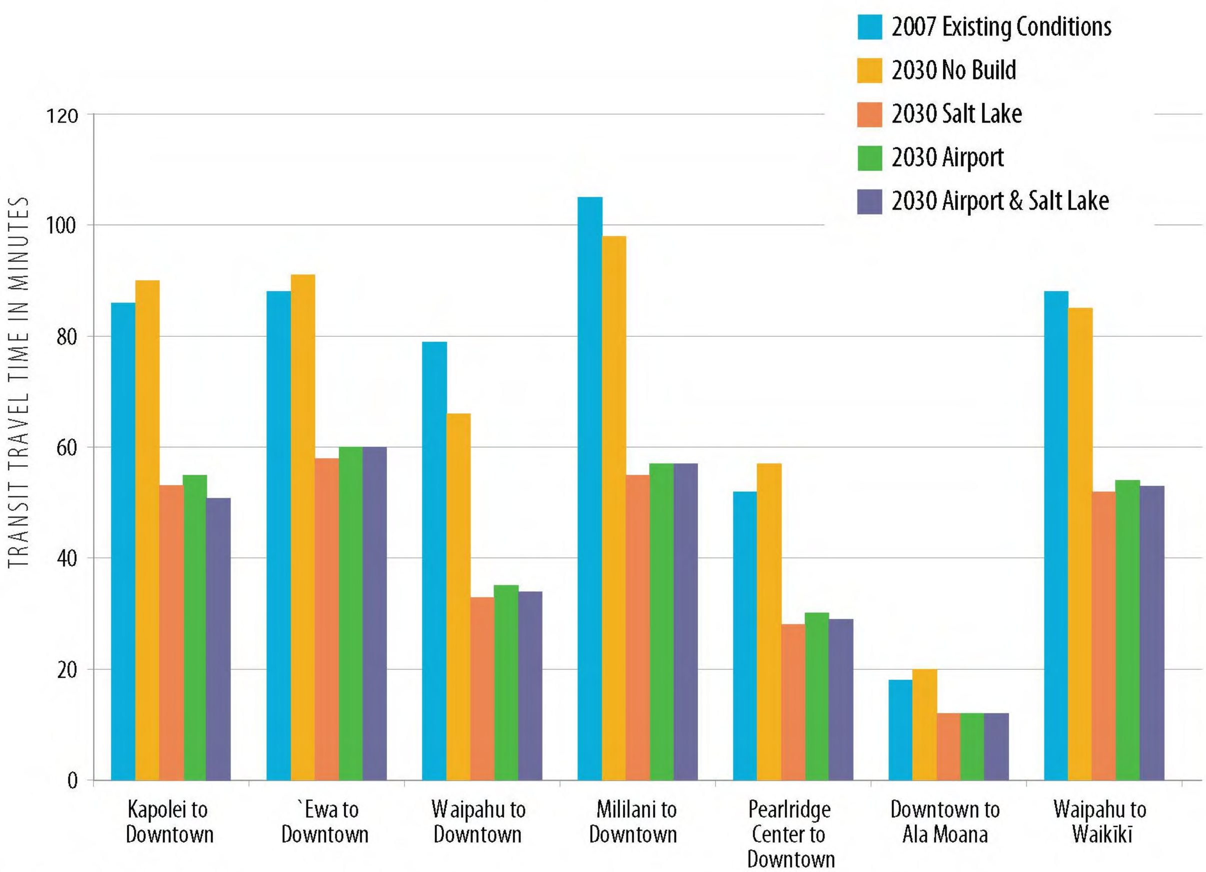


Figure 3-9 A.M. Peak-Period Transit Travel Times

Table 3-15 Station-to-Station Travel Times

Station to Station		Travel Time Between Stations (in minutes, including dwell time)			
		Salt Lake Alternative	Airport Alternative	Airport & Salt Lake Alternative	
				Salt Lake Alignment	Airport Alignment
East Kapolei	UH West O`ahu	2	2	2	2
UH West O`ahu	Ho`opili	4	4	4	4
Ho`opili	West Loch	2	2	2	2
West Loch	Waipahu TC	3	3	3	3
Waipahu TC	Leeward CC	2	2	2	2
Leeward CC	Pearl Highlands	1	1	1	1
Pearl Highlands	Pearlridge	4	4	4	4
Pearlridge	Aloha Stadium SLB	2	n/a	2	n/a
Aloha Stadium SLB	Ala Liliko`i	4	n/a	4	n/a
Ala Liliko`i	Middle Street	4	n/a	4	n/a
Pearlridge	Aloha Stadium KH	n/a	3	n/a	n/a
Pearlridge	Arizona Memorial	n/a	n/a	n/a	3
Aloha Stadium KH	Pearl Harbor	n/a	2	n/a	n/a
Arizona Memorial	Pearl Harbor	n/a	n/a	n/a	2
Pearl Harbor	Airport	n/a	3	n/a	3
Airport	Lagoon Drive	n/a	2	n/a	2
Lagoon Drive	Middle Street	n/a	2	n/a	2
Middle Street	Kalihi	2	2	2	2
Kalihi	Kapālama	2	2	2	2
Kapālama	Iwilei	2	2	2	2
Iwilei	Chinatown	1	1	1	1
Chinatown	Downtown	1	1	1	1
Downtown	Civic Center	1	1	1	1
Civic Center	Kaka`ako	1	1	1	1
Kaka`ako	Ala Moana	2	2	2	2
Total Travel Time		**40**	**42**	**40**	**42**

CC = Community College KH = Kamehameha Highway SLB = Salt Lake Boulevard TC = Transit Center

Table 3-16 Daily Transit Boardings and Trips for 2030 No Build and Build Alternatives

Alternative	Fixed Guideway Boardings	Total Transit Boardings	Total Transit Trips
No Build	n/a	314,000	226,000
Salt Lake	88,000	449,000	270,000
% Change from No Build		*43%*	*19%*
Airport	95,000	450,000	273,000
% Change from No Build		*43%*	*21%*
Airport & Salt Lake	93,000	446,000	272,000
% Change from No Build		*42%*	*20%*

Boardings represent the total number of times someone gets on a transit vehicle, whereas a trip can include transfers.

volumes be realized, the system will be designed to be able to provide substantially higher capacity by adding vehicles or reducing headways. Such operational adjustments would be evaluated as the system approaches the planned capacity toward 2030.

Figure 3-12 shows the number of daily fixed guideway boardings and alightings projected for each station. For all-day travel, the Ala Moana Center Station would experience the highest boardings, alightings, and total passenger activity. Figure 3-13 shows daily passenger volumes for each alternative. Under each alternative, the highest

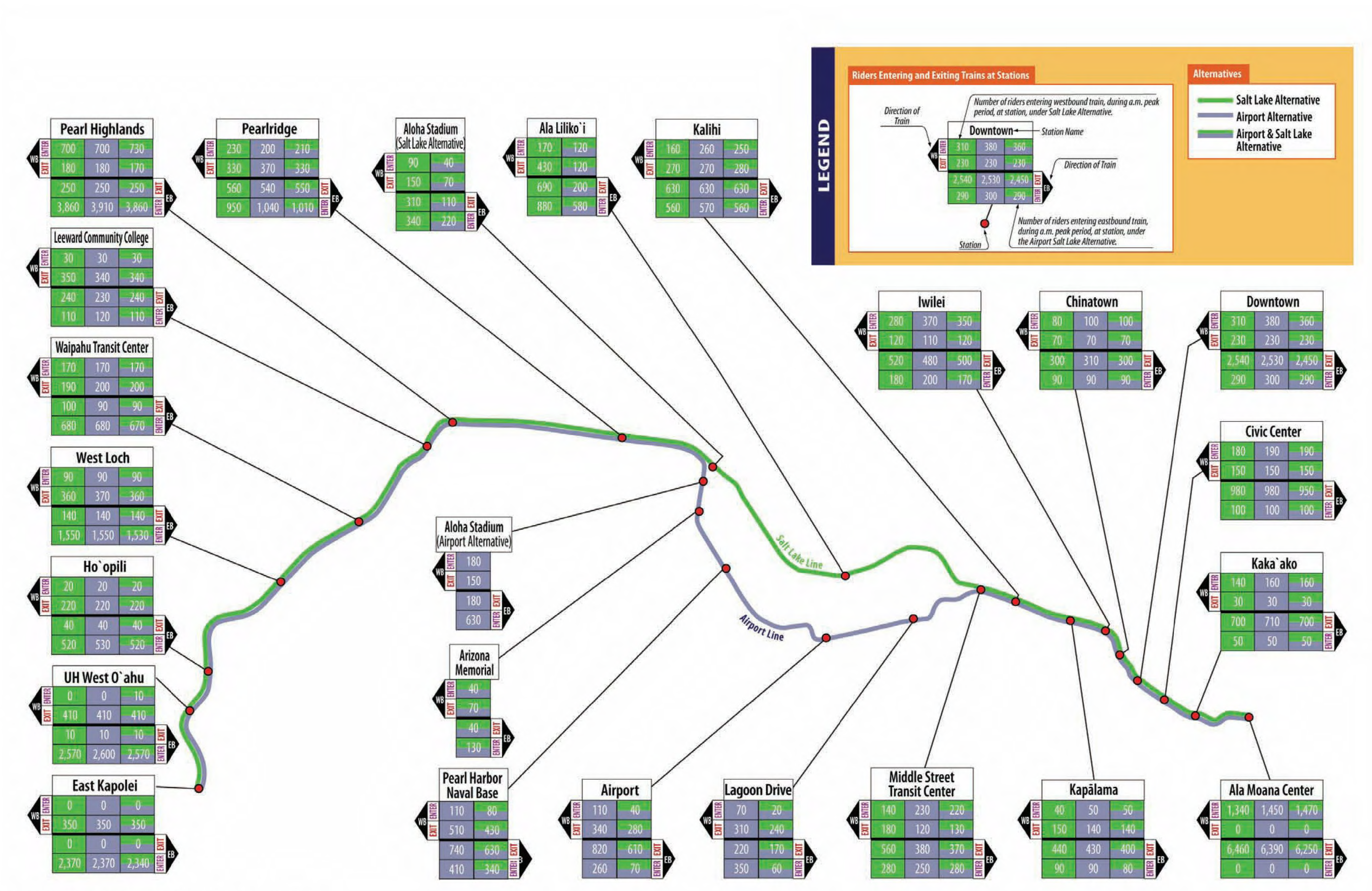


Figure 3-10 2030 A.M. 2-hour Peak Period Boardings and Alightings

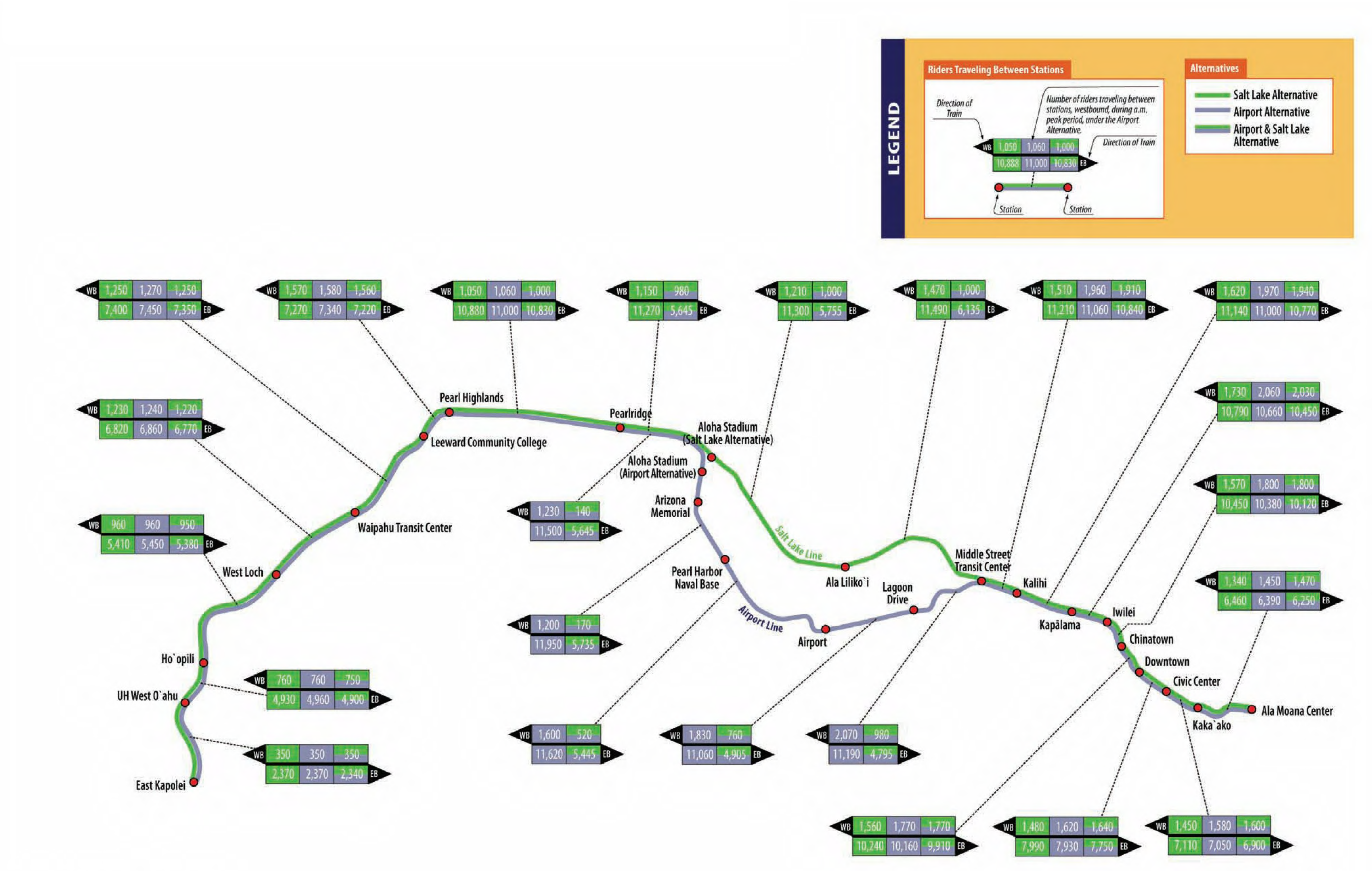


Figure 3-11 2030 A.M. 2-hour Peak Period Link Volumes

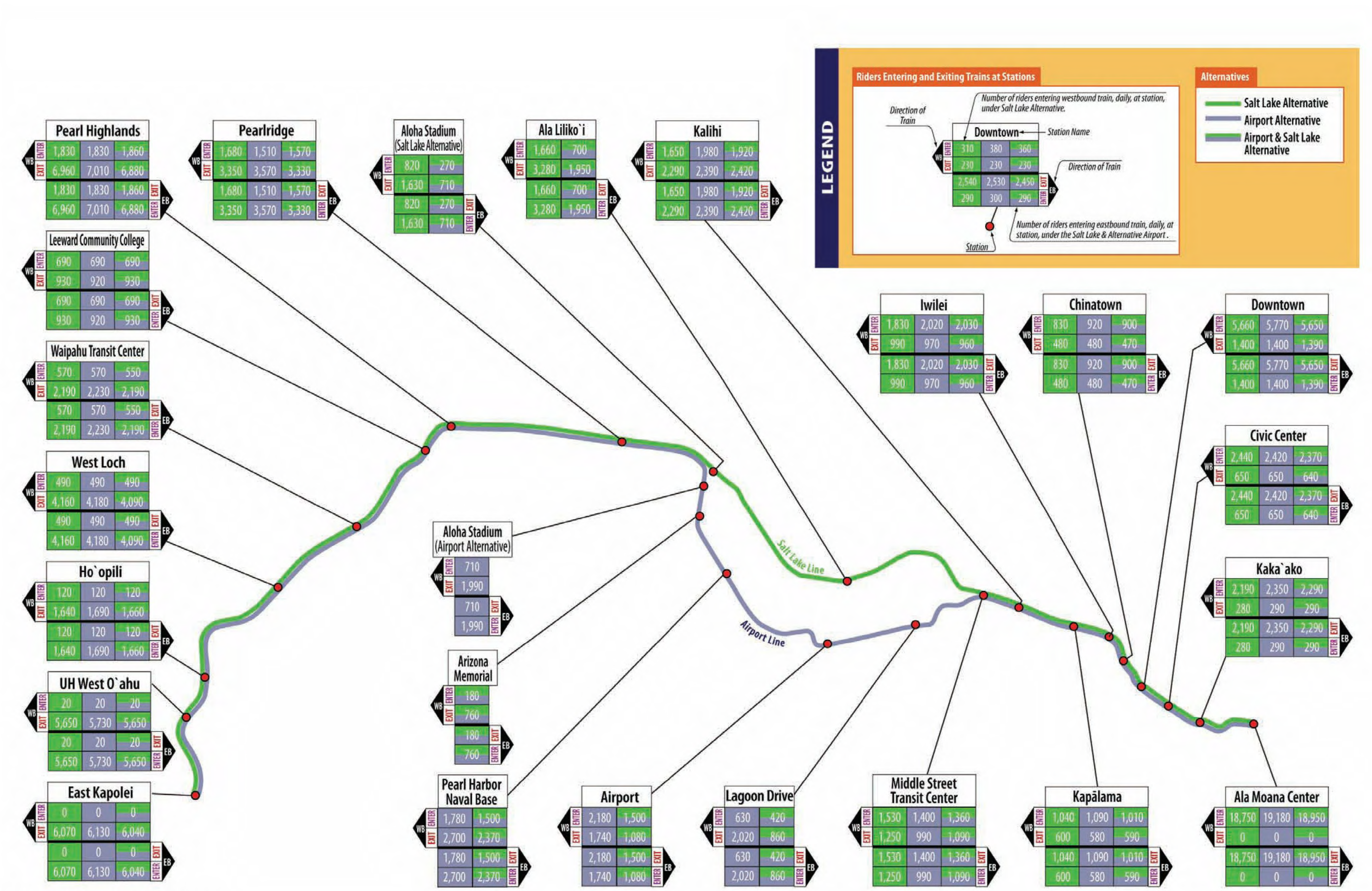


Figure 3-12 2030 Daily Boardings and Alightings

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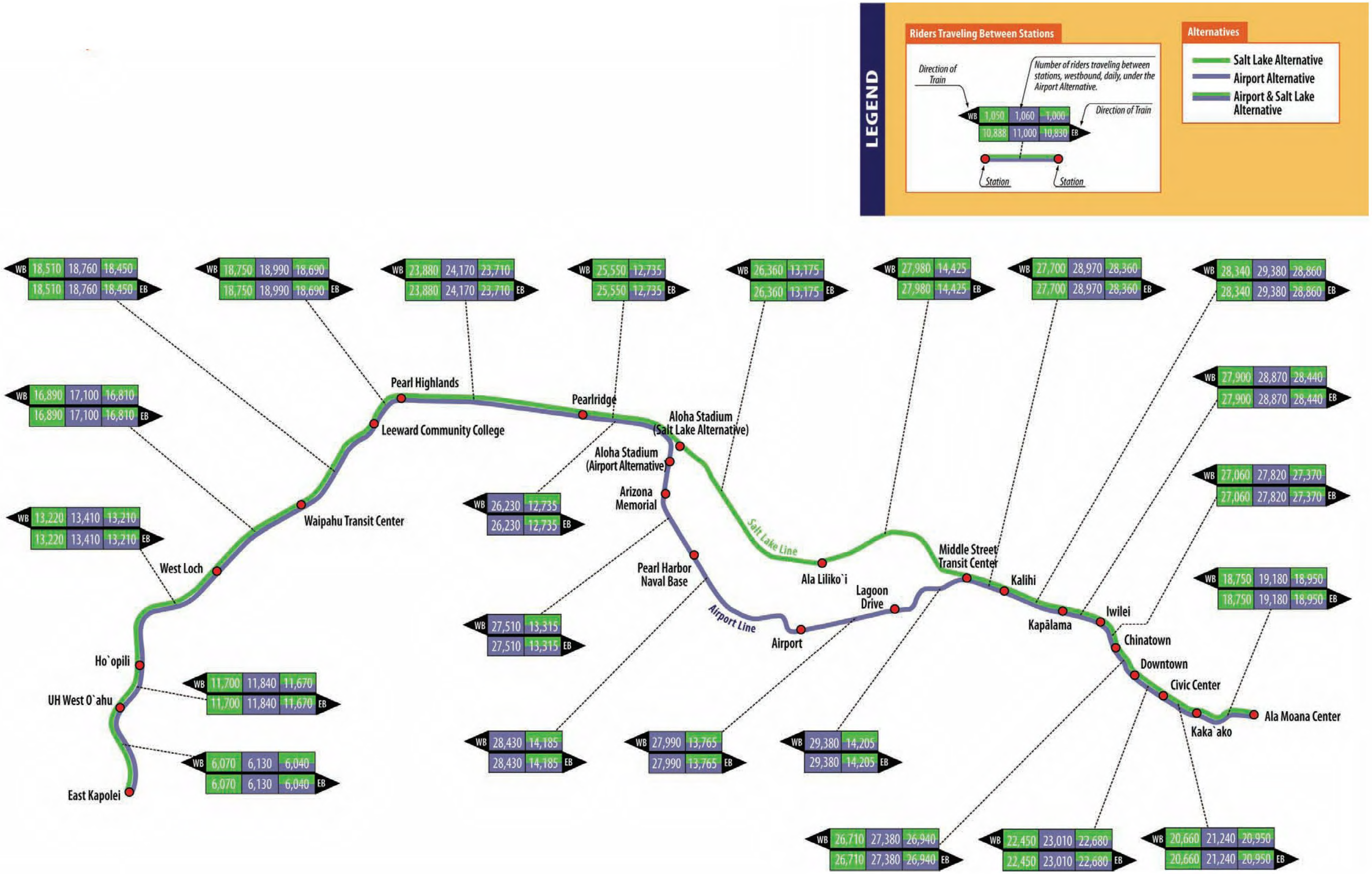

Figure 3-13 2030 Daily Link Volumes

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daily link volume would occur between the Kalihi and Kapālama Stations.

Ridership by Type of Service

Table 3-17 summarizes the estimated breakdown of transit boardings by service type for the No Build and Build Alternatives.

Under the No Build Alternative, local bus service would predominate with 98 percent of total boardings. With the Build Alternatives, a shift in ridership would occur from local bus to fixed guideway service. Compared to the No Build Alternative, the local service share of total transit ridership would change from 98 percent under the No Build Alternative to approximately 80 percent for each of the Build Alternatives.

Express bus service shares would be low, decreasing from 1.7 percent for the No Build Alternative to less than 0.5 percent for the Build Alternatives. The fixed guideway would serve as an express route for the entire system.

The amount of bus service provided under the Build Alternatives would approximate those for the No Build Alternative. A review of estimated route-specific demand and service levels for 2030 indicated that bus service capacity would be sufficient to accommodate ridership.

Changes in Transit and Private Vehicle Demand

Figure 3-6 identifies the estimated transit share of home-based work trips under existing conditions and the 2030 No Build and Build Alternatives during the a.m. two-hour peak period. The information is provided for selected travel pairs in the study corridor. As indicated by the figure, there is little difference between existing conditions and the No Build Alternative. In most cases, changes in transit share would be less than 10 percent.

Under the Build Alternatives, the transit mode share for home-based work trips during the a.m. two-hour peak period would increase substantially for most travel pairs compared to the No Build Alternative. For many travel markets, the transit share of trips under the Build Alternatives would double (and in one case triple) the share occurring under the No Build Alternative. For example, the commute-to-work transit share of the ʻEwa to Downtown Honolulu travel market would increase from 23 percent under No Build to between 54 percent and 56 percent under the Build Alternatives. In other words, more than half of the people going from ʻEwa to Downtown to work in the morning would use transit with the Build Alternatives, compared to only a quarter without the Project.

Substantial increases in transit share would also occur for travel markets not directly served by the fixed guideway. For example, the transit share of the Waipahu to Waikīkī market would increase

Table 3-17 Shares of Total Daily Boardings by Transit Service Type (Residents plus Visitors)—2030 No Build and Build Alternatives

Alternative	Local Bus		Express Bus		Fixed Guideway		Total
	Number of Boardings	Percent Share	Number of Boardings	Percent Share	Number of Boardings	Percent Share	
No Build	308,720	98.3%	5,360	1.7%	n/a	n/a	314,080
Salt Lake	360,580	80.2%	1,190	0.3%	87,570	19.5%	449,340
Airport	353,090	78.5%	1,240	0.3%	95,310	21.2%	449,640
Airport & Salt Lake	352,130	78.9%	1,230	0.3%	92,710	20.8%	446,070

from 8 percent under No Build to between 25 percent and 26 percent under the Build Alternatives. This increase in transit share is related to faster systemwide transit speeds and improved access to the fixed guideway system due to more reliable feeder bus service.

With the Build Alternatives, public transit's share of total travel would increase. For several travel markets, transit's share of a.m. two-hour peak-period commute-to-work trips would double.

Transit Reliability

Transit service reliability is highly influenced by the number of vehicles operating in exclusive right-of-way. Under the No Build Alternative, express bus routes would operate in the a.m. and p.m. zipper lanes and HOV lanes. However, these lanes would not be exclusively reserved for transit operations.

The No Build Alternative does not provide any exclusive right-of-way for transit vehicles along major highways that could enhance transit service reliability.

Operating transit vehicles on a fixed guideway would provide substantially higher transit service reliability compared to No Build conditions.

Since the fixed guideway vehicles would be completely separated from roadway traffic operations, the Build Alternatives would provide substantially higher transit service reliability compared to the No Build Alternative. This reliability would not deteriorate over time, even with projected population and employment growth in the study corridor. The reliability of fixed guideway vehicles would be better than the reliability of transit vehicles operating on increasingly congested highways.

The bus network would also be restructured to provide access from surrounding communities to the fixed guideway with more frequent bus service. Bus routes serving guideway stations would typically be shorter and would operate in less congested residential communities. These operations would help maintain service reliability compared to operations of longer-distance routes.

Providing this separation between the guideway system and general traffic would address the gradual deterioration of service reliability. Bus service on O'ahu has been experiencing a decline in service reliability, and this decline is predicted to continue under 2030 No Build conditions.

Access to Fixed Guideway Stations

With the Build Alternatives, overall accessibility to transit would be enhanced. The Build Alternatives would attract substantial ridership via local bus access and from people walking to stations (Table 3-18). Bus and walk access to stations would account for approximately 85 percent of total trips in the a.m. two-hour peak period. Although some drive access is projected at outlying stations, such as East Kapolei, the predominant access would be by local bus and walking. For those leaving stations in the a.m. two-hour peak period, egress via

Table 3-18 Mode of Access to Fixed Guideway Stations—2030 Build Alternatives

Alternative	Daily Persons Trips using Guideway Stations by Mode								
	Walk		Bus		Kiss-and-Ride		Auto		Total
	Volume	% Share	Volume	% Share	Volume	% Share	Volume	% Share	
Salt Lake	13,900	16%	61,190	69%	3,210	4%	10,080	11%	88,380
Airport	16,480	17%	65,190	68%	3,290	3%	10,730	11%	95,690
Airport & Salt Lake	16,330	18%	63,130	68%	3,220	3%	10,220	11%	92,900

Numbers do not equal 100 percent due to rounding.

walking dominates, particularly at stations with large employment concentrations. Escalators and elevators would be available at each station.

Access to stations would also be enhanced by accommodating bicyclists and pedestrians. Several stations would be located at or near existing or planned bicycle facilities. Each station would have facilities for parking bikes, and each guideway vehicle would be designed to accommodate bicycles during off-peak hours. Sidewalks and crosswalks are currently available at stations or would become available as streets and sidewalks are built in developing areas.

The dominance of local buses and walking to the fixed guideway system indicates that overall accessibility would be broad. This is especially important for riders who do not have access to automobiles.

Transfers

A major feature of O'ahu's existing transit service is reliance on transit centers as focal points of activity. The transfer rate in 2007 was 37 percent, and the estimated rate for the 2030 No Build Alternative is 39 percent, which equals about 1.4 bus rides or segments per transit trip.

With any of the Build Alternatives, the rate of transfers would be higher than under the No Build Alternative due to proposed changes in local bus service to maximize access to the fixed guideway system. Some existing routes, including peak-period express service, would be altered to avoid duplication with the fixed guideway system. Some local routes would also be rerouted or reclassified as feeder buses to provide better service to the nearest fixed guideway station. The projected rate of transfers would range from 64 to 67 percent, depending on the alternative, which is about 1.6 to 1.7 transfers per trip.

Because of the high frequency of the fixed guideway service (three-minute headways between trains during peak periods), riders transferring from buses to the fixed guideway would experience minimal wait times. Riders transferring from the guideway service to buses would benefit from improved frequencies on existing bus routes serving stations. Also, several new routes with high frequencies would be provided as feeders to the guideway system. Since these routes would primarily operate in residential areas, they would provide greater reliability versus routes operating along congested arterials. Riders transferring from rail-to-bus would also benefit from coordinated transfers between trains and buses, thereby minimizing wait times.

The use of local bus feeder service also makes the fixed guideway system highly accessible, particularly for people dependent on transit or who would prefer not to drive to stations. The fixed guideway system would facilitate the reorientation of the bus system and improve transit service beyond the immediate vicinity of the study corridor.

To facilitate transfers, fixed guideway stations and other major transit hubs would provide conveniences such as covered waiting areas. Off-vehicle fare collection would reduce travel and wait times.

Comfort and Convenience

As described in Chapter 2, the fixed guideway system's service frequencies (every three to ten minutes) and hours of operation (between 4 a.m. and midnight) would minimize wait times and thus provide major conveniences to riders. The service frequency and train *consists* (the number of cars per train) would also be designed to better meet peak-period/peak-direction rider demand. Comfort for riders would be enhanced by station amenities, including covered waiting areas and seats.

Operation of the fixed guideway in exclusive right-of-way would improve convenience. For riders who stand, the guideway service would also provide increased safety compared to frequent stop-and-go travel that occurs on buses that travel in mixed traffic on uneven roadway surfaces. Because the station platforms would be at the same level as the vehicles, this would accommodate quick and easy boardings for all patrons, especially those in wheelchairs or with strollers.

Transit User Benefits

Transit user benefits represent the amount of transit travel-time savings a user would experience with a given transit alternative compared to the No Build Alternative. This section discusses the transit-user benefits of the Build Alternatives compared to the No Build Alternative. Transit user benefits is an effective way to quantify the four key goals of the Project.

The main factor in determining benefits is travel time. User benefits are measured in minutes and are a summary measure that incorporates travel-time changes for all modes.

Positive Attributes of a Fixed Guideway System

Research indicates that positive attributes (both perceived and real) are associated with the use of a fixed guideway system, which make the system more attractive than general bus transit. These benefits include such things as improved safety, security, visibility, ease of use, comfort, and reliability. These factors or attributes are not captured by the standard travel demand forecasting process. To account for these attributes in this user benefit analysis, FTA has approved an additional factor equivalent to a 14.5-minute savings of in-vehicle time. The factor was incorporated for riders taking the fixed guideway only. A 5.5-minute savings of in-vehicle time was incorporated for riders taking feeder buses to the fixed guideway.

This factor is based on information from several regions where existing rail transit service has been a part of the transit system and where these systems have been recently surveyed.

Transit User Benefits—Selected Major Travel Markets

Transit user benefits have been estimated for various travel markets and at the geographic level. With the Build Alternatives, it is estimated that approximately 50,000 hours of transit travel times per weekday would be saved. Greater use of the transit system, higher transit speeds, and the other attributes noted previously would contribute to these user benefits.

The user benefits, expressed in terms of saved hours per day, can also be identified for specific transit travel markets. Table 3-19 shows estimated

Table 3-19 Estimated Transit User Benefits Resulting from 2030 Build Alternatives (Hours per Day)

Key Transit Market*	Salt Lake Alternative	Airport Alternative	**Airport & Salt Lake Alternative**
Work trips to Downtown Honolulu	3,840	3,680	3,590
Visitor trips from Waikīkī	1,050	1,450	1,490
Other trips to Downtown	340	310	240
Work trips to Waikīkī	2,830	2,760	2,730
Work trips to Kalihi	1,640	1,570	1,540
School trips to UH Mānoa	2,980	2,900	2,900
Work trips to Kaka`ako	1,400	1,360	1,330
Work trips Mō`ili`ili	1,290	1,250	1,220
Work trips from `Ewa	2,620	2,680	2,610
Work trips from Kapolei	1,420	1,460	1,400
Work trips from Waipahu	1,860	1,910	1,860
Work trips from Mililani	1,380	1,450	1,410
Subtotal	**22,650**	**22,780**	**22,320**
Other	26,330	29,120	27,850
Total	**48,980**	**51,900**	**50,170**

Source: O'ahuMPO Travel Demand Forecasting Model.
*Except for *Visitor trips from Waikīkī*, the markets involve home-based travel.

daily savings for several markets on O'ahu. These savings would range from approximately 240 to 340 hours per day (for Home-Based Other trips destined to Downtown) to almost 3,590 to 3,840 hours per day (for Home-Based Work trips to Downtown Honolulu). In addition, there are transit travel-time benefits for work trips from 'Ewa and Kapolei, both planned development areas. The estimated cumulative savings of approximately 22,320 to 22,780 hours per day represents just under one-half of the approximately 50,000 estimated total daily user benefits that would result from the Project.

As shown in Figure 3-7, there would be substantial travel-time savings for communities with high concentrations of transit-dependent households.

Most areas within the study corridor would experience "user benefits" under the Build Alternatives compared to No Build conditions due to a reduction in transit travel times.

In addition, several markets estimated to experience major user benefits would not be located on the guideway. These include Waikīkī, UH Mānoa, and 'Ewa. The Build Alternatives would result in benefits to users in these areas because residents could access the guideway via local bus service or park-and-rides. With travel-time savings between planned population and employment areas and for transit-dependent households, the Project supports each of the four goals.

3.4.3 Effects on Streets and Highways

This section presents the effects that the Build Alternatives would have on traffic. It focuses on the following:

- Changes in peak-hour traffic volumes at selected screenlines
- Effects on traffic from placing columns to support the fixed guideway structure
- Effects on traffic and parking near fixed guideway stations and the potential maintenance and storage facility

Screenline Volumes and Operating Conditions

To determine the effects of the Project, street and highway system peak-period traffic volumes were evaluated at key screenline locations in the study corridor (Figure 3-4). The Salt Lake Alternative was used as the representative Build Alternative for the purpose of the screenline volume analysis. Table 3-20 compares the No Build Alternative traffic volumes for a.m. and p.m. peak hours to those of the Salt Lake Alternative. Screenlines A and H were not included because they are beyond the ends of the Project. Traffic volumes at most screenlines would decrease compared to the No Build Alternative. Peak-hour/peak-direction traffic-volume would decrease by as much as 12 percent. Traffic reductions would result from people choosing to use transit during peak travel times.

Effects of Guideway on Traffic

Columns to support the fixed guideway would be placed to minimize effects on traffic patterns. In some cases, widening the median to accommodate columns would require reducing lane widths slightly. In almost all cases, there would be no reduction in the number of roadway lanes. These effects are summarized in Table 3-21.

There is only one location along the alignment where roadway capacity would be reduced by placement of the fixed guideway structure: Salt Lake Boulevard between Marshall Road/Pakini Street and Luapele Drive in the 'Ewa-bound direction. To determine the potential effect of this change in roadway capacity, four intersections were studied:

- Salt Lake Boulevard and Kahuapa'ani Street
- Salt Lake Boulevard and Luapele Drive
- Salt Lake Boulevard and Ala'oli Street
- Salt Lake Boulevard and Bouganville Drive

Table 3-20 Traffic Volumes at Screenlines—2030 No Build and Salt Lake Build Alternatives

ID[1]	Screenline and Direction/Facility	No Build Alternative		Build Alternatives		% Change from No Build Alternative (A.M.)	% Change from No Build Alternative (P.M.)
		A.M. Peak Hour	P.M. Peak Hour	A.M. Peak Hour	P.M. Peak Hour		
		Observed Volume (vph)[2]	Observed Volume (vph)[2]	Observed Volume (vph)[2]	Observed Volume (vph)[2]		
B	\`Ewa Wai\`anae-bound	8,010	8,700	7,860	8,140	-2%	-6.0%
	\`Ewa Koko Head-bound	10,010	10,280	9,280	10,040	-7%	-3.0%
C	Waikele Stream \`Ewa-bound	10,650	11,130	10,480	10,390	-2%	-9.0%
	Waikele Stream Koko Head-bound	12,070	8,380	11,040	8,280	-9%	-4.0%
D	Kalauao \`Ewa-bound	10,250	16,150	10,030	14,770	-2%	-12.0%
	Kalauao Koko Head-bound	20,800	10,810	18,910	10,490	-9%	-5.0%
E	Salt Lake \`Ewa-bound	8,670	15,610	8,390	14,380	-3%	-11.0%
	Salt Lake Koko Head-bound	19,520	10,920	17,920	10,990	-8%	0.5%
F	Kapālama Canal \`Ewa-bound	13,210	16,710	13,090	15,690	-1%	-9.0%
	Kapālama Canal Koko Head-bound	22,140	16,880	20,760	16,530	-6%	-4.0%
G	Ward Avenue \`Ewa-bound	15,000	13,600	14,890	12,960	-1%	-6.0%
	Ward Avenue Koko Head-bound	13,460	17,330	12,560	17,020	-7%	-2.0%

[1] Shown on Figure 3-4.
[2] Traffic count data was obtained from the travel demand forecasting model.

These intersections would be affected by the Salt Lake Alternative and the Airport & Salt Lake Alternative.

Under the No Build Alternative, three of these four intersections would operate at LOS D or better, and the Salt Lake Boulevard and Kahuapa‘ani Street intersection would operate at LOS F. With the Project, the intersections operating at LOS D under the No Build Alternative would continue to operate at LOS D, and the intersection already operating at LOS F would not experience an increase in average vehicle delays. Therefore, the Build Alternatives would not affect traffic operations in this area.

Traffic Effects at Stations with Park-and-Ride Facilities

Four guideway stations would have park-and-ride facilities (East Kapolei, UH West O‘ahu, Pearl Highlands, and Aloha Stadium). These stations would have the highest demand of people driving to access the fixed guideway system.

Intersections adjacent to each proposed location were analyzed to determine potential effects resulting from park-and-ride and kiss-and-ride traffic and feeder buses. Twenty-five intersections, both existing and planned, were analyzed. Delay and LOS were analyzed for both the 2030 No Build and Build Alternatives.

As shown in Table 3-22, analysis found that three intersections would be affected by park-and-ride and kiss-and-ride traffic and local bus activity in the a.m. and p.m. peak hours. These three intersections, near the Pearl Highlands Station, would experience traffic volumes under the Build Alternatives that would increase traffic delay compared with the No Build Alternative. Potential mitigation measures are discussed in Section 3.4.5, Mitigation of Long-term Transportation Effects.

Table 3-21 Column Placement Effects on Streets and Highways

Alternative and Street/Intersection	Column Placement	Summary of Potential Effects
Common to All Build Alternatives		
Farrington Highway and Fort Weaver Road	Side/Median	Expand median by 9 feet for column placement. Reduce existing through lanes to 11 feet and left-turn lanes to 10 feet.
Farrington Highway from Kunia Road to Kahualii Street	Median	Expand median. Reduce through lanes to 11 feet and left-turn lanes to 10 feet.
Kamehameha Highway from Acacia Road to Boathouse Entrance	Median	Expand median. Reduce through lanes to 11 feet and left-turn lanes to 10 feet. May restrict left turns at certain driveways.
Kamehameha Highway and Laumaka	Median	Construct 10-foot median. Acquire right-of-way on makai side of roadway.
Dillingham Boulevard from Pu`uhale to Costco Driveway	Median	Acquire 10 feet of additional right-of-way on makai side of roadway. Signal modification may be necessary to account for left-turn phasing.
Dillingham Boulevard from Ka`aahi to King	Varies	Acquire right-of-way to add makai-bound lane for buses to turn left at Ka`aahi.
Nimitz from Maunakea to Halekauwila	Median	Expand median by acquisition of additional right-of-way.
Kona Street and Ke`eaumoku Street	Median	Demolish portions of parking structure ramps.
Kona Street from Ala Moana Center to Mahukona Street	Median	Reduce lanes from 11 feet to 10 feet.
Salt Lake Alternative		
Salt Lake Boulevard from Lawehana Street to Luapele Street	Side	Remove travel lane in `Ewa direction.
Salt Lake Boulevard from Kahuapa`ani Street to Ala Napunani Street	Median	Expand median. Reduce lane widths and sidewalks.
Salt Lake Boulevard/Pūkōloa Street and Pu`uloa Road	Median/Side	Expand median. May need to remove travel/turn lane.
Airport Alternative		
Kamehameha Highway and Radford Drive	Median	Reduce existing through lanes to 11 feet and left-turn lanes to 10 feet.
Kamehameha Highway and Center Drive	Median	Reduce existing through lanes to 11 feet and left-turn lanes to 10 feet.
Airport & Salt Lake Alternative		
Salt Lake Boulevard from Lawehana Street to Luapele Street	Side	Remove travel lane in `Ewa direction.
Salt Lake Boulevard from Kahuapa`ani Street to Ala Napunani Street	Median	Expand median. Reduce lane widths and sidewalks.
Salt Lake Boulevard/Pūkōloa Street and Pu`uloa Road	Median/Side	Expand median. May need to remove travel/turn lane.
Kamehameha Highway and Radford Drive	Median	Reduce existing through lanes to 11 feet and left-turn lanes to 10 feet.
Kamehameha Highway and Center Drive	Median	Reduce existing through lanes to 11 feet and left-turn lanes to 10 feet.

Table 3-22 Effects on Traffic near Park-and-Ride Lots—2030 No Build and Build Alternatives

Station	Intersection			Control	Peak Hour	2030 No Build		2030 Build		Project Delay Change (sec)
						Delay (sec)	LOS	Delay (sec)	LOS	
Common to All Build Alternatives										
Pearl Highlands	Kamehameha Highway	and	Waihona Street/Pearl Highlands Station Park-and-Ride Driveway[1]	TWSC/S[2]	P.M.	122	F	137	F	15
Pearl Highlands	Kamehameha Highway	and	Kuala Street	TWSC	A.M.	71	F	205	F	134
					P.M.	>400	F	>400	F	n/a
Pearl Highlands	Farrington Highway	and	Waiawa Street/Pearl Highlands Station Park-and-Ride Driveway[3]	TWSC	A.M.	76	F	316	F	240
					P.M.	30	D	125	F	95

S = Signal Control, TWSC = Two-Way Stop-Controlled, sec = seconds

[1] Lane configuration would be dual left-turn lane, single through lane, and single right-turn.

[2] Waihona Street currently provides a single left- turn lane and a right- turn lane and is controlled by stop signs. Traffic on Kamehameha Highway is currently uncontrolled. Under future 2030 No Build conditions and 2030 Build conditions, the T-intersection of Waihona Street at Kamehameha Highway is assumed to be signalized under 2030 No Build conditions and 2030 Build Alternativesconditions.

[3] Access would be right-in and right-out only.

Effects of Buses on Traffic Near Stations

Bus routes would be modified to reduce duplication of service and facilitate transfers with the fixed guideway system. In addition to analyzing bus access at stations with planned park-and-ride facilities, an analysis was conducted at selected fixed guideway stations to determine if the increase in buses would affect traffic.

Five stations were selected for detailed traffic analysis: West Loch, Pearlridge, Middle Street, Downtown, and Ala Moana. These stations are projected to have relatively high levels of increased bus trips. Sixteen intersections were analyzed. The complete results of the analysis and number of buses serving each station can be found in the Transportation Technical Report (RTD 2008a).

The addition of feeder buses would not cause a substantial effect on traffic near the West Loch, Pearlridge, Middle Street, and Downtown Stations. LOS would remain the same or improve at 15 of the 16 intersections. The Kona/Ke‘eaumoku Street intersection near the Ala Moana Station is the only one studied that would worsen in the a.m. peak hour with the introduction of additional buses and kiss-and-ride traffic. However, this intersection would experience reduced delay during the p.m. peak hour.

Maintenance and Storage Facility Effects on Traffic

Any of the Build Alternatives would require development of a maintenance and storage facility, where up to 100 fixed guideway vehicles would be maintained and stored. Two locations are being considered, but only one of the following sites would be selected:

- Near Leeward Community College
- Near Ho‘opili

A detailed traffic analysis was conducted to determine the traffic effects of a maintenance and storage facility at each location. The study found that 63 trips would be generated by the facility during each a.m. and p.m. peak period. The traffic analysis concluded that these vehicle trips would not affect any of the intersections analyzed.

3.4.4 Effects on Parking, Bicycle and Pedestrian Facilities, and Freight

Effects on parking include two categories. One involves the estimated loss of existing parking due to placement of the guideway. The other involves effects relating to spillover parking demand in station areas.

Effects on Parking Supply

It is estimated that 820 to 960 off-street and 230 to 250 on-street parking spaces would be removed as a result of the Build Alternatives, depending on the alternative selected. Parking spaces would be removed primarily to accommodate guideway column placement or station entrance locations. The Salt Lake Alternative and the Airport & Salt Lake Alternative would result in greater parking effects than the Airport Alternative due to a high volume of off-street parking spaces removed at the Aloha Stadium (Salt Lake) and Ala Liliko'i Stations. Locations where parking could be removed are identified in Table 3-23.

To analyze the effect of losing parking capacity, a field survey of utilization was conducted in June 2008 of existing parking spaces along the study corridor. The survey counted turnover of parking spaces during weekdays and on Saturdays.

The results of the field survey indicated that most parking spaces that would be affected by the guideway are currently occupied at least part of the day. However, at several locations the extent of parking demand varies. The most dominant demand generally occurs on weekdays in the mid-afternoon.

Spillover Parking Effects on Station Areas

A review of patronage forecasts at each station indicates that some guideway transit passengers may park near stations that do not have designated parking. This is known as *spillover parking*.

An analysis was completed to determine if spillover parking would affect traffic and parking supply near stations. Locations with the largest projected demand for spillover parking were selected for further study. These included West Loch, Pearlridge, Iwilei, and Ala Moana Center. These four stations could attract a spillover parking demand of 140 to 370 automobiles each day, depending on the station and the alternative.

A traffic analysis was conducted for the a.m. peak hours. The intersection LOS analysis determined that additional traffic from spillover parking would not affect local traffic conditions.

The spillover demand for parking was identified by the travel demand forecasting model for the year 2030. However, the actual extent of spillover parking near stations would be influenced by a variety of factors:

- Lack of available parking—some neighborhoods, such as near Ala Moana Center, do not have long-term parking available for commuters. As a result, the actual number of spillover parking would be less because transit patrons would choose to park elsewhere (and use a different station) or would use a feeder bus to access the fixed guideway system.
- Changing conditions between now and 2030—additional parking could be provided in the future, or feeder bus service could be used at a higher rate than anticipated.
- Future development around station areas—new land uses near stations could change the demand for and supply of parking. These factors could influence how people choose to access the stations and where they would park.

Table 3-23 Potential Effects on Parking due to Fixed Guideway Column Placement

Alternative and Street/Intersection			Column Placement	Parking Spaces Lost		
				On-Street		Off-Street
Roadway or Station Name	Cross Street From	Cross Street To		Mauka	Makai	
Common to All Build Alternatives						
West Loch Station	–	–	Median			21
Waipahu Transit Center Station	–	–	Median			13
Ala Ike Street/LCC Station	–	–	Side			180
Kamehameha Highway	H-1/H-2 Interchange	Moanalua Freeway Interchange	Median			43
Dillingham Boulevard	Laumaka Street	Pu`uhale Road	Median			13
Dillingham Boulevard	Pu`uhale Road	Mokauea Street	Median			19
Dillingham Boulevard	Mokauea Street	Kalihi Street	Median			20
Dillingham Boulevard	Kalihi Street	McNeill Street	Median			6
Dillingham Boulevard	McNeill Street	Waiakamilo Road	Median			26
Dillingham Boulevard	Waiakamilo Road	Kohou Street	Side			10
Dillingham Boulevard	Kohou Street	Alakawa Street	Side			15
Dillingham Boulevard	Alakawa Street	Ka`aahi Street	Varies (Median/ Side)			130
Ka`aahi Street	Dillingham Boulevard	End of existing road	Side	8	9	
Halekauwila Street	Punchbowl Street	South Street	Side	8	13	
Halekauwila Street	South Street	Keawe Street	Side	9	6	
Civic Center Station	–	–	Off-street			35
Halekauwila Street	Keawe Street	Coral Street	Side	16	22	
Halekauwila Street	Cooke Street	Kamani Street	Side	17	27	12
Kaka`ako Station	Ward Entertainment Center and Ward Gateway Center	–	Off-street			183
Kona Street	Pensacola Street	Pi`ikoi Street	Median	53	39	
Ala Moana Center	–	–	Median			75
Salt Lake Alternative						
Salt Lake Boulevard	Kamehameha Highway	Luapele Drive	Roadside			89
Ala Liliko`i Station	–	–	Median			56
Airport Alternative						
Aloha Stadium Overflow Parking Lot	–	–	Side			20
Kamehameha Highway	Salt Lake Boulevard	Kohomua Street	Roadside	20		
Airport & Salt Lake Alternative						
Salt Lake Boulevard	Kamehameha Highway	Luapele Drive	Roadside			89
Ala Liliko`i Station	–	–	Median			56
Arizona Memorial Station	–	–	Median			14
Kamehameha Highway	Salt Lake Boulevard	Kohoma Street	Roadside	20		

Potential approaches to mitigating the effects of spillover parking are addressed in Section 3.4.5.

Effects on the Bicycle and Pedestrian Network

Locations where potential effects on bicycle and pedestrian facilities could occur are shown in Table 3-24. Effects could include either narrowing or widening sidewalks or bicycle lanes in some areas. Along Salt Lake Boulevard, striped bicycle lanes would be removed and replaced with a 14-foot-wide shared travel lane, which is generally accepted by the bicycle community.

Many bicycle lanes (planned by the City or State) could connect to fixed guideway stations. Proposed bicycle lanes along Farrington Highway could connect to stations at West Loch, the Waipahu Transit Center, Leeward Community College, and Pearl Highlands. Proposed bicycle lanes along Kamehameha Highway would be linked with the Pearlridge and Aloha Stadium Stations. With the Salt Lake Alternative, potential transit stations would be linked to the bicycle route along Salt Lake Boulevard. Allowing bicycles on trains, as is

Table 3-24 Summary of Potential Effects on Bicycle and Pedestrian Systems due to Fixed Guideway Column Placements

Roadway Name	Cross-street From	Cross-street To	Column Placement	Summary of Potential Effects
Common to All Build Alternatives				
Farrington Highway	Kunia Road	Pupukahi Street	Median	Signed shared roadway would be narrowed from 16 to 14 feet inbound and from 14 to 13 feet outbound.
Farrington Highway	Pupukahi Street	Pupupuhi Street	Median	Existing 4-foot inbound bike lane would be replaced with a 14-foot signed shared roadway.
Farrington Highway	Pupupuhi Street	Awanui Street	Median	Shared roadway (outbound) would be reduced from 15 to 14 feet.
Dillingham Boulevard and Kamehameha Highway	Pu`uhale Road	Mokauea Street	Median	Makai sidewalk would be narrowed to 5 feet (currently 4 to 6.5 feet).
Dillingham Boulevard	Mokauea Street	Kalihi Street	Median	Makai sidewalk would be narrowed from 8 to 5 feet.
Dillingham Boulevard	McNeill Street	Waiakamilo Road	Median	Makai sidewalk would be narrowed to 5 feet (currently 4 to 6 feet).
Dillingham Boulevard	Kokea Street	Alakawa Street	Side	Makai sidewalk would be narrowed to 5 feet (currently 4 to 7 feet).
Dillingham Boulevard	Ka`aahi Street	King Street	Side	Makai sidewalk would be narrowed to 5 to 10 feet (currently 10 to 15 feet).
Halekauwila Street	Punchbowl Street	South Street	Side	Sidewalks would be narrowed to 7 feet.
Halekauwila Street	Keawe Street	Coral Street	Side	Makai sidewalk would be narrowed from 12 to 7 feet.
Salt Lake Alternative [1]				
Salt Lake Boulevard	Lawehana Street	Maluna Street	Median	Width of shared inbound lanes would be reduced.
Salt Lake Boulevard	Ala Liliko`i Street	Peltier Avenue	Median	Removal of the existing inbound bike lane is planned to be replaced with a 14-foot signed shared roadway.
Salt Lake Boulevard	Peltier Avenue	Pu`uloa Road	Median	Both bike lanes are planned to be replaced by a 14-foot signed shared roadway.
Pūkōloa Street	Pu`uloa Road	Ahua Street	Side	Columns may be placed on part of the sidewalk.

[1] Effects of the Airport & Salt Lake Alternative would be the same as for the Salt Lake Alternative.

currently envisioned, would create a demand for bicycle lanes or routes near stations.

Effects on Freight Traffic

The Build Alternatives would generally have little direct effect on freight movement in the study corridor. Honolulu Harbor, Barbers Point Harbor, and Honolulu International Airport are the principal ports for the import and export of goods to and from O‘ahu and the primary sources of freight-related traffic. Cargo is delivered from these ports by truck to a wide array of destinations across O‘ahu. Sections of the fixed guideway structure and several stations would be near these facilities.

In some areas along the fixed guideway alignment, left turns in and out of driveways could be restricted due to column placements. In other locations, such as Kaka‘ako, column placement could interfere with existing truck traffic patterns along certain blocks and streets. This interference would vary by Build Alternative. For example, the Airport Alternative would likely have greater effects given the extent of freight traffic along the study corridor. However, reduced roadway congestion would have a positive effect on freight movement.

3.4.5 Mitigation of Long-term Transportation Effects

The Build Alternatives would benefit the overall transportation system. Where the Build Alternatives would affect roadways, improvements to maintain existing roadway operating conditions could be included.

Traffic

Park-and-ride, kiss-and-ride, and feeder buses would affect traffic at four intersections near the Pearl Highlands and Ala Moana station areas. Potential mitigation measures include widening existing roads, signalizing intersections, and other treatments that would result in fewer peak-hour delays.

Parking

In most cases, there is available parking on nearby side streets to accommodate people currently using parking spaces that may be lost to guideway construction. If parking capacity is not available along nearby streets, other approaches would be considered to replace lost parking, including adding off-street capacity.

Before identifying necessary parking replacement approaches, detailed surveys of the affected areas would be conducted. These surveys would include updated information on available parking use as well as existing and planned land uses in the affected areas. These surveys would occur prior to construction of guideway segments to allow identification of any mitigation measures and necessary follow-up action.

The approaches to mitigating effects of spillover parking would be unique to each station area. Mitigation strategies would be determined in coordination with appropriate stakeholders. Parking surveys of on-street unrestricted parking supply within proposed station areas would be conducted. These surveys would occur approximately six months before implementation of the fixed guideway service. Approximately six months after fixed guideway service starts, surveys would be repeated for all locations. The results of the surveys would be used to identify potential mitigation strategies.

To address spillover parking-related effects at stations, several potential strategies would be considered. These strategies have been successfully implemented in other cities and could include the following:

- Implementing neighborhood parking programs that provide residents with parking permits
- Identifying added parking capacity through leasing arrangements with nearby property

owners (e.g., churches with available parking capacity during weekdays)

- Building new parking facilities in affected areas
- Developing off-street parking management programs with retail centers to minimize on-street spillover demand

3.5 Construction-related Effects on Transportation

This section focuses on short-term, construction-related effects on transportation from the Build Alternatives. Section 4.17, Construction Phase Effects, discusses construction-related effects on the natural and built environments. These effects would be temporary and would occur between 2009 and 2018 at various times and locations in the study corridor.

The Project would be opened to the public as construction phases are completed, and there would be temporary effects on transportation conditions in station areas in the interim between the opening of each phase and project completion. These short-term effects would be primarily transit-related as bus routes are changed to complement the fixed guideway service.

3.5.1 Construction Staging Plans

Construction staging areas and plans would be identified and developed by the contractors and approved by the City. Specific details would be developed and reviewed with the relevant authorities and approvals sought. These details would include, but are not limited to, specific permitted lane closures or road closures, hours of operation, penalties for extending beyond permitted hours, and holiday restrictions. The maintenance and storage facility, park-and-ride lots, and stations could be used for construction staging areas. These areas would be sufficient for the first construction phase. Additional areas would be identified by the contractor as needed for later phases. The contractor would be responsible for obtaining any necessary permits and approvals. Additional construction and staging areas identified and requested by the contractor would be reviewed and approved by the City. Staging areas are not expected to cause a substantial effect.

3.5.2 Construction-related Effects on Transit Service

Local access to transit would be affected by lane closures within the construction corridor. Bus routes would generally be maintained but could be temporarily diverted or relocated to provide reliable service near areas where the fixed guideway would be constructed. Bus stops could also be temporarily relocated, particularly if a street's right lane is closed for construction. TheHandi-Van service could experience some delays due to construction activity.

Existing bus routes were examined to determine the degree of effect during construction. Effects were classified as none, minor, and/or direct. Minor effects would occur when a route intersects and crosses a street with construction activity or traverses a short section of a construction zone. Direct effects would occur where a transit route travels along a considerable length of the construction zone. Table 3-25 lists the bus routes that would be affected by construction. Since some bus routes would pass through multiple parts of the construction corridor, they may experience both minor and direct effects, depending on location.

Table 3-25 Bus Routes Affected by Construction

Minor Effects	Direct Effects
1, 2, 5, 7, 10, 11, 13, 17, 18, 31, 40, 40A, 44, 74, 83A, 86, 86A, 93A, 95, 201, 202, 413, 415, B, F11, F12, F13	2, 3 4, 6, 8, 9, 11, 13, 19, 20, 22, 23, 31, 32, 40, 40A, 42, 43, 52, 53, 54, 55, 56, 57, 57A, 62, 65, 71, 73, 88, 88A, 98A, 201, 202, 203, 434 , A, B, C, E, F2, F3

In addition to the TheBus routes operating near the fixed guideway alignment, construction would affect TheHandi-Van operations. A Transit Mitigation Program, further described in Section 3.5.7, Mitigation of Construction-related Effects, identifies efforts to address construction effects on transit service.

The Project would be constructed in phases and opened as sections are completed. As a result, there would be stations where fixed-guideway service would temporarily end while the next section is under construction. This phased opening approach would require interim changes to bus transit service to complement the fixed guideway service. This could have a short-term effect at station areas as bus routes are temporarily moved to connect with fixed-guideway stations. This includes additional buses traveling near certain fixed-guideway stations and associated traffic and pedestrian effects from the bus service. A plan to accommodate the use of phased openings would be developed in advance.

School buses may also be affected by temporary delays caused by construction activities. Construction-related detours may require alternative routes between school bus stops.

3.5.3 Construction-related Effects on Traffic

This section discusses potential construction-related traffic effects, such as lane closures, which may occur throughout the day, including peak travel periods. Additional lanes may be closed during off-peak travel periods. These additional lane closures would accommodate construction equipment. Construction activities would likely occur in temporary construction corridors. Estimates of construction-related procedures that would affect road closures are as follows:

- **Column Foundations (drilled shafts)**—lane closures would be required throughout the column foundation installation process. The degree of traffic disruption around areas of piling/caisson work would vary depending on the roadway's width and the availability of alternate routes. The following scenarios are anticipated:
  - **Off-peak closures**—two lanes would be closed for each half-mile construction segment for foundation and column construction. If the alignment is along a roadway that is less than three lanes wide (e.g., Halekauwila Street), the road would be closed to non-local vehicular traffic during off-peak periods. If the street's median is more than 8 feet wide (e.g., Farrington Highway in parts of Waipahu), closure of only two lanes may be possible.
  - **Peak closures**—during peak travel periods, closure may be restricted to one or two lanes. If a street is only two lanes wide, efforts would be made to open one lane during peak periods, if necessary.
  - **Cross-streets**—if cross-streets are at least 150 feet apart to allow space for the required equipment, the only restrictions on cross-streets could be turning movements onto the alignment road where lanes are closed. Access could be closed off-peak during erection of segments.
- **Columns**—lane closures would be required throughout the column construction process. Lane closures similar to those assumed for column foundations are assumed for above-ground column construction.
- **Guideway Structure**—during construction of the guideway structure between the columns, lane closures would be required. However, if the active work area spans an intersection, the cross-street would be open (with possible turning restrictions) during peak hours but closed during off-peak hours. Lane closure could also be needed in the off-peak direction during delivery and erection of segments.
- **Stations**—lane closures would be required at all locations where stations would be constructed over a roadway. Some work would

likely require complete road closures, and this would be scheduled for permitted night work.

- **Park-and-Ride and Other System Facilities**—park-and-ride and other system facilities (e.g., traction power substations and the maintenance and storage facility) would primarily be built on parcels not located on public streets and highways. Substantial lane closures are not anticipated during construction of these facilities, but brief lane closures may be necessary during construction of entrances and exitways.

Table 3-26 lists anticipated temporary lane closures along the alignment. In addition to travel lanes, a number of turning lanes would also be temporarily closed. Traffic signals adjacent to the fixed guideway could also be temporarily replaced or re-timed. Delivery of construction

Table 3-26 Potential Peak-Period Temporary Lane Closures During Construction [1]

Roadway Name	Cross Street From	Cross Street To	Number of Lanes	Number of Lanes to be Temporarily Closed	
				Kapolei Bound	Koko Head Bound
Common to All Build Alternatives					
Farrington Highway	Paiwa Street	Kahualii Street	4	1 (a.m.) 0 (p.m.)	0 (a.m.) 1 (p.m.)
Kamehameha Highway	Acacia Road	Boathouse Entrance	6 [2]	0	1
Kamehameha Highway	Middle Street	Laumaka Street	5	1	1
Dillingham Boulevard and Kamehameha Highway	Kohou Street	Alakawa Street (Costco rear parking)	4	1	1
Halekauwila Street	Punchbowl Street	South Street	2	1	0
Halekauwila Street	Keawe Street	Ward Avenue	2	0	1
Kona Street	Pensacola Street	Ke`eaumoku Street	2	1	0
Salt Lake Alternative					
Salt Lake Boulevard	Luapele Drive	Maluna Street/Namur Road	6	1	1
Salt Lake Boulevard	Wanaka Street	Kahikolu Place	2	0 [3]	0 [3]
Salt Lake Boulevard	Ala Liliko`i Street	Ala Napunani Street	5	1	1
Salt Lake Boulevard	Ala Napunani Street	Pu`uloa Road	5	0	1
Pūkōloa Street	Pu`uloa Road	Ahua Street	5	0	1
Airport Alternative					
Kamehameha Highway	Salt Lake Boulevard	Center Drive	5 [2]	0	1
Airport & Salt Lake Alternative					
Salt Lake Boulevard	Luapele Drive	Maluna Street/Namur Road	6	1	1
Salt Lake Boulevard	Wanaka Street	Kahikolu Place	2	0 [3]	0 [3]
Salt Lake Boulevard	Ala Liliko`i Street	Ala Napunani Street	5	1	1
Salt Lake Boulevard	Ala Napunani Street	Pu`uloa Road	5	0	1
Pūkōloa Street	Pu`uloa Road	Ahua Street	5	0	1
Kamehameha Highway	Salt Lake Boulevard	Center Drive	5 [2]	0	1

[1] Additional closures could occur in short segments and/or during off-peak travel periods.
[2] Kamehameha Highway narrows to four lanes around the Moanalua Freeway Interchange.
[3] An existing lane may be removed but would be supplemented with an additional lane at the time of construction.

materials would increase the number of trucks on local roadways.

Balanced cantilever construction likely would be used for the longer spans crossing the H-1 and H-2 Freeways and possibly Fort Weaver Road. Individual lanes would be closed to allow this work to be completed without a full roadway closure. A detailed schedule showing which lanes would be affected would be prepared for the erection of segments. The actual means and methods for erecting these segments would be the contractor's decision. Construction with segmented precast sections would avoid the need for substantial shoring or false work. Appendix C, Construction Approach, describes the general construction process and methods likely to be used to construct the Project.

Phased opening of the Project to the public would have only minor effects on traffic. This would be limited to the station areas where bus transit service has been temporarily altered to complement the interim configuration of the fixed-guideway service.

3.5.4 Construction-related Effects on Parking

In general, on-street parking would be temporarily affected by construction. Table 3-27 identifies on-street parking spaces that would be temporarily unavailable at various points along the alignment.

Some parking lots adjacent to the fixed guideway alignment could also be affected. Construction vehicle parking would occur in staging areas or on site. The contractor would determine the precise effects on parking during construction.

3.5.5 Construction-related Effects on Bicycle and Pedestrian Facilities

Access to existing bicycle and pedestrian facilities would be maintained during all phases of construction as safety allows. Warning and/or notification signs of modification to bicycle and pedestrian facilities during construction would be provided. Proposed pedestrian detours would be submitted to the City for review and approval to ensure they are reasonable for all pedestrians and meet ADA regulations. Proper deterrents, such as barriers or fencing, would be placed to prevent access (short-cuts) through the construction area.

Effects would occur in these areas as a result of the proximity of sidewalks to the roadway median. Many crossings would be temporarily eliminated, and disruptions would occur along adjacent sidewalks and bike paths. Sidewalk diversions would be made when necessary. In areas where additional right-of-way may be required (e.g., Dillingham Boulevard), sidewalks may be temporarily removed and pedestrians rerouted to safe locations.

The Transportation Technical Report (RTD 2008a) identifies potential conflicts or physical effects on existing and proposed bicycle facilities and the pedestrian circulation system that would result from construction of the Project.

3.5.6 Construction-related Effects on Freight Movement

The fixed guideway would be built along several roadways that are heavily used freight routes. Construction effects on freight could occur, especially during off-peak hours. Freight movement may be delayed by the need to use an alternative route. Loading zones along the route could be temporarily relocated.

3.5.7 Mitigation of Construction-related Effects

A Maintenance of Traffic (MOT) Plan and Transit Mitigation Program (TMP) would identify measures to mitigate temporary construction-related effects on transportation.

The MOT Plan would address effects on streets and highways, transit, businesses and residences, pedestrians and bicyclists, and parking. Coordination with TheBus would identify additional bus service to mitigate construction effects.

Table 3-27 Construction-related Parking Reductions

Roadway Name	Cross Street From	Cross Street To	On- Street Parking Temporarily Lost During Construction
Common to All Build Alternatives			
Moloalo Place	Waipahu Depot Street	Mokuola Street	5
Ka`aahi Street	Dillingham Boulevard	Iwilei Road	17
Halekauwila Street	Punchbowl Street	South Street	21
Halekauwila Street	South Street	Keawe Street	15
Halekauwila Street	Keawe Street	Coral Street	38
Halekauwila Street	Coral Street	Cooke Street	10
Halekauwila Street	Cooke Street	Kamani Street	44
Halekauwila Street	Kamani Street	Ward Avenue	9
Queen Street	Ward Avenue	Kamake`e Street	46
Queen Street Extension	Kamake`e Street	Waimanu Street	21
Kona Street	Pensacola Street	Pi`ikoi Street	92
Salt Lake Alternative and Airport & Salt Lake Alternative			
Salt Lake Boulevard	Lawehana Street	Maluna Street	17
Pūkōloa Street	Māpunapuna Street	Ahua Street	38

Construction methods identified by each contractor would be included in the MOT Plan. The TMP would mitigate effects on transit service operating during project construction. These plans would be developed by the contractor for each phase and coordinated/approved by HDOT (for the MOT Plan and HDOT highways only) and the City prior to starting construction in an area.

Construction-related transportation effects would be mitigated with implementation of a Maintenance of Traffic Plan and a Transit Mitigation Program to be prepared by the contractor prior to construction.

The MOT Plan and TMP would include site-specific traffic-control measures and would be developed in conjunction with the transit system's final design. The key objectives of these plans would be to limit effects on existing traffic and maintain access to businesses. These plans would be shared with the public.

Maintenance of Traffic Plan

The following sections discuss measures included in the MOT Plan that would help mitigate construction-related transportation effects. The contractor would be given parameters, such as the number of lanes that could be closed and the procedures for closures, and would develop the MOT plan accordingly with approval from the City or HDOT. The MOT plan would address roadway closures for streets identified in Table 3-26. The Plan would specifically account for the effect of drilled shaft installation, crane access and operations, and the delivery and operation of materials trucks. The MOT Plan would also address the delivery and unloading of pre-cast guideway sections, including crane positioning for unloading. The contractor would submit any proposed changes to the MOT Plan to the City for approval.

Streets and Highways
Construction would be phased so that the duration of pile, caisson, and column work (which have the largest effect on traffic) would be minimized. During final design, whether under design-build or design-bid-build, detailed Work Zone Traffic Control Plans, including detour plans, would be formulated in cooperation with the City, HDOT, and other affected jurisdictions.

Unless unforeseen circumstances dictate, no designated major or secondary highway would be closed to vehicular or pedestrian traffic. In areas where the roadway is more than three lanes wide, no roadways would be completely closed so vehicular or pedestrian access to residences, businesses, or other establishments would still be provided. Temporary lane closures would occur during non-peak hours so that effects on heavy commuter traffic would be minimized.

Delivery of large equipment, such as drilling devices, cranes, and launching gantry truss sections, would occur along arterial routes to the construction corridor. City and HDOT approvals would be sought for proposed haul routes and included in the contract packages.

An extensive public information program would be implemented to provide motorists with a thorough understanding of the location and duration of construction activities, as well as anticipated traffic conditions. The MOT Plan would also address traffic signal changes and relocation of freight loading zones that might be temporarily affected.

Transit
The MOT Plan would determine when and where changes in bus services could be needed and would include Transportation Demand Management elements. The Project would be integrated with TheBus on potential changes to bus routes and service. Changes in bus service could include improving frequencies on existing routes or adding new routes that circumvent specific construction areas.

Pedestrians and Bicycles
Pedestrian and bicycle access would be maintained during construction as much as possible while emphasizing safety. Measures to maintain safe and efficient pedestrian and bicycle access would meet ADA regulations and could include the following:

- Channelizing pedestrian flow in areas where sidewalks would be close to construction—channelized structures are generally steel-framed, three-sided plywood structures built above existing sidewalks
- Making extensive use of signage to direct pedestrians and bicyclists to the safest and most efficient routes through construction zones—signs would warn pedestrians and bicyclists well in advance of sidewalk and bike lane closures

Parking
The MOT would consider potential measures to replace parking spaces that would be temporarily lost during construction. These measures could include the possible lease of off-street spaces to address this temporary loss. A temporary loading zone relocation plan would also be included.

Construction Phasing
The Build Alternatives would be constructed in phases. For example, the Airport & Salt Lake Alternative could be phased so that the guideway between East Kapolei and Ala Moana Center along Salt Lake Boulevard would be built first, followed by a connection from Middle Street Transit Center to the Honolulu International Airport. The connection from the airport to Aloha Stadium could be completed as the final phase of the Project when additional funds become available.

The choice of phasing would not affect construction methods, but would affect the areas that would be disturbed at any specific time. The MOT

Plan and TMP would be developed for the different construction phases to minimize effects to the traveling public.

Transit Mitigation Program

The TMP would define adjustments that would mitigate the effects of construction on existing bus service and would be customized for each construction phase and sized to properly serve projected rider demands.

In some construction sections, parallel bus routes on roads not directly affected by construction may experience an increase in service to accommodate rider demand shifted from affected bus routes. Public information and outreach would be conducted to influence current and prospective transit rider behavior.

The TMP would consider the following factors in determining required bus route service adjustments:

- Minimization of the extent of changes for bus stops and rerouting (if necessary)
- The MOT Plan as it relates to bus routes and pedestrian access to existing or relocated bus stops
- The severity and duration of construction along each corridor section and within each construction phase
- Differences between the scheduled bus route travel time currently operating and the scheduled travel time expected during construction
- The difference between the current travel time for existing traffic and traffic during construction, and whether transit could and should be given temporary traffic priority treatments during construction
- The types of temporary traffic priority treatments for transit that could be provided at a reasonable cost during construction

The TMP would generally maintain existing bus routes and stops. In areas where interruptions are expected, the following approaches may be adopted:

- Temporarily closing or relocating bus stops
- Rerouting existing service for short sections where no additional buses are required
- Rerouting existing service for longer segments that require additional buses
- Introducing new services if they operate on different alignments not affected as heavily by construction
- Ceasing operation of routes or portions of routes temporarily and redeploying service hours to parallel routes
- Initiating a public information program to inform transit riders of service changes during construction
- Rerouting school bus routes that would be substantially delayed

3.6 Cumulative Transportation System Effects

Planned extensions to the fixed guideway system are described in Chapter 2 and include extensions to West Kapolei, UH Mānoa, and Waikīkī. These extensions would provide additional transportation benefits beyond those provided by the Project. Other planned transportation projects (see Table 2-3 in Chapter 2) are included in all of the 2030 analysis throughout this chapter. The cumulative effects of building the Project and these extensions are discussed in this section.

Effects on Transit

The planned extensions would further improve transit performance compared to the Build Alternatives by reducing transit travel times and increasing reliability. Bus system operating expenses also would decrease as more trips would be taken on the guideway and the overall need for transfers to UH Mānoa and Waikīkī would be eliminated.

As a result of the additional stations and destinations covered by the extensions, ridership on the fixed guideway system with the Project and planned extensions would be substantially higher than with the Project alone. As shown in Table 3-28, daily transit ridership would be more than 25 percent higher for each alternative with the planned extensions compared to the Project. The additional ridership would come from people accessing the fixed guideway system from stations both within and to the extension areas, such as UH Mānoa or Waikīkī.

Effects on Streets and Highways

As shown in Table 3-29, the planned extensions would reduce VMT, VHT, and VHD compared to the Project alone. The planned West Kapolei and Kapolei Parkway Stations would both have park-and-ride facilities. Neither park-and-ride facility would affect local traffic operations.

Table 3-28 Effects of the Planned Extensions on 2030 Daily Transit Ridership

Alternative	Fixed Guideway Boardings
2030 No Build	n/a
Salt Lake	88,000
Airport	95,000
Airport & Salt Lake	93,000
Salt Lake with planned extensions	112,000
% Change from Project	*27%*
Airport with planned extensions	120,000
% Change from Project	*26%*
Airport & Salt Lake with planned extensions	118,000
% Change from Project	*27%*

Other cumulative effects could include removing additional on-street and off-street parking spaces to accommodate the fixed guideway structure, some adjustments to widths of travel lanes, and possible spillover parking effects at stations without park-and-ride facilities. With the extensions, spillover parking effects would be reduced at Project stations as demand would become more dispersed.

Table 3-29 Vehicle Miles Traveled, Vehicle Hours Traveled, and Vehicle Hours of Delay—2030 Planned Extensions

Alternative	Daily VMT	Daily VHT	Daily VHD
Salt Lake	13,097,000	386,000	85,000
Airport	13,086,000	385,000	84,000
Airport & Salt Lake	13,104,000	385,000	83,000
Salt Lake with planned extensions	13,048,000	384,000	84,000
Airport with planned extensions	13,038,000	383,000	83,000
Airport & Salt Lake with planned extensions	13,044,000	383,000	82,000

Summary of Findings: Transportation Conditions and Effects

Existing Conditions

- The bus-only transit system operating on O`ahu is one of the most effective and productive in the country, exceeding several systems that operate in larger metropolitan areas.
- Increasing traffic congestion and constrained transit operating conditions have reduced system reliability and mobility for all travelers.
- Operating buses exclusively in mixed traffic has led to slower speeds, increased costs, and reduced service reliability.
- Reliability of transit service has worsened—almost one-third of bus trips are not meeting their on-time performance standard. Reliability is at level of service "F."
- Transit travel times are increasing. Longer-distance bus service is particularly affected by traffic congestion.

Effects of the No Build Alternative

- Transit operating speeds, reliability, and mobility would worsen by 2030.
- Traffic congestion would worsen, even with $3 billion in other planned roadway improvements, affecting mobility and reliability for all travelers.
- Transit service to new developments planned for West O`ahu would be ineffective, inefficient, and unreliable.
- Equitable distribution of transportation services would become more difficult as increasing congestion makes longer-distance trips slower and less reliable.

Effects of the Build Alternatives

- Transit service mobility, reliability, equity, and access to new development would improve.
- Transit travel times on the fixed guideway would be reliable and consistent regardless of traffic congestion on streets.
- Higher transit speeds would reduce travel times and improve operating efficiency.
- Vehicle miles traveled, vehicle hours traveled, and vehicle hours of delay would all decline compared to the No Build Alternative.
- Transit travel times would improve between major employment centers such as Downtown and emerging population and employment centers in West O`ahu.
- Overall transit system accessibility would be enhanced, resulting in transit carrying a greater share of total travel, particularly for work-related trips during peak hours.
- Daily transit ridership would grow by 40 percent over the No Build Alternative.
- Transit equity would improve as travel times are reduced between areas with high concentrations of transit-dependent households and major employment areas.
- Comfort and convenience would be enhanced through a smooth ride and frequent service available 20 hours a day.
- Guideway support columns would affect some existing streets, parking, and pedestrian and bicycle facilities.
- Effects on parking and other transportation elements would be minimized or mitigated.
- Transit user benefits would increase compared to the No Build Alternative.
- Construction activity would temporarily affect the transportation system, including traffic, parking, bus service, and access to some businesses and residences. Plans would be developed to minimize disruption.

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04

CHAPTER

Environmental Analysis, Consequences, and Mitigation

This chapter of the Draft Environmental Impact Statement (EIS) discusses the environmental analysis, consequences, and mitigation for the No Build and Build Alternatives of the Project. The analysis is based on Federal and Hawai'i regulatory requirements as well as Federal and State guidelines. The National Environmental Policy Act (NEPA) and Hawai'i Revised Statutes (HRS) Chapter 343 require the evaluation of potential effects of proposed government actions on the environment. The U.S. Department of Transportation (USDOT), through the Federal Highway Administration (FHWA) and the Federal Transit Administration (FTA), has adopted regulations to implement NEPA.

The alternatives studied in this Draft EIS include three Build Alternatives: the Salt Lake Alternative, the Airport Alternative, and the Airport & Salt Lake Alternative (see Chapter 2, Alternatives Considered). The Draft EIS also includes the No Build Alternative, under which this project would not be built. All other projects in the O'ahu Regional Transportation Plan 2030 (ORTP) would be implemented. In this document, the No Build Alternative serves as an environmental baseline to which the impacts of other alternatives are compared.

Sections 4.1 through 4.15 address the regulatory context and methodology by which each resource is studied, the affected environment, and the long-term effects on individual aspects of the environment for each alternative. Mitigation measures that could be incorporated into the Project to address long-term adverse effects are also identified. These sections are as follows:

- 4.1 Land Use
- 4.2 Economic Activity
- 4.3 Acquisitions, Displacements, and Relocations
- 4.4 Community Services and Facilities
- 4.5 Neighborhoods
- 4.6 Environmental Justice
- 4.7 Visual and Aesthetic Conditions
- 4.8 Air Quality

4.9 Noise and Vibration

4.10 Energy/Electric and Magnetic Fields

4.11 Hazardous Waste and Materials

4.12 Ecosystems

4.13 Water

4.14 Street Trees

4.15 Archaeological, Cultural, and Historic Resources

Section 4.16, Maintenance and Storage Facility, describes the environmental consequences of the two site options. Section 4.17, Construction Phase Effects, addresses the construction-phase effects and mitigation that could be considered and the relationship between short-term uses of the environment and long-term productivity. Section 4.18, Indirect and Cumulative Effects, presents the indirect and cumulative effects of the alternatives, including the effects of the future planned extensions and other planned projects. Section 4.19, Irreversible and Irretrievable Commitments of Resources, describes resources that would be used by the Project. Section 4.20, Anticipated Permits and Approvals, includes a list of environmental permits required for the Project.

The following *Honolulu High-Capacity Transit Corridor Project Technical Reports* include analyses of the individual environmental topics that have been evaluated for the Project:

- Land Use (RTD 2008b)
- Economics (RTD 2008c)
- Neighborhoods and Communities (RTD 2008d)
- Visual and Aesthetics Resources (RTD 2008e)
- Noise and Vibration (RTD 2008f)
- Air Quality and Energy (RTD 2008g)
- Electric and Magnetic Fields (RTD 2008h)
- Hazardous Materials (RTD 2008i)
- Ecosystems and Natural Resources (RTD 2008j)
- Water Resources (RTD 2008k)
- Street Trees (RTD 2008l)
- Geology, Soils, Farmlands, and Natural Hazards (RTD 2008m)
- Archaeological Resources (RTD 2008n)
- Historic Resources (RTD 2008o)
- Cultural Resources (RTD 2008p)

The analyses demonstrated that the Project would not have an adverse effect upon geology, soils, or natural hazards; therefore, they are not addressed in this chapter. The Project would be designed to meet seismic and other design standards related to natural hazards, such as wind forces from tropical storms. The project alignment is outside of the tsunami evacuation zones.

Geographic areas are discussed in four categories, as appropriate to the resource:

- **Project Region**—the entire Island of O‘ahu (Figure 1-1 in Chapter 1, Background)
- **Study Corridor**—the southern coast of O‘ahu where the Project is located (Figure 4-1)
- **Project Station Area**—all areas within one-half mile of a project station (Figure 4-1); one-half mile is generally considered an acceptable walking distance
- **Project Alignment**—the route of the fixed guideway (Figure 4-1); discussions involving the project alignment include those properties adjacent to the alignment (i.e., properties fronting the roadway along which the guideway would be built)

The environmental effects and possible mitigation measures to avoid, minimize, or reduce the impacts that are detailed in this chapter are summarized in Table 4-1.

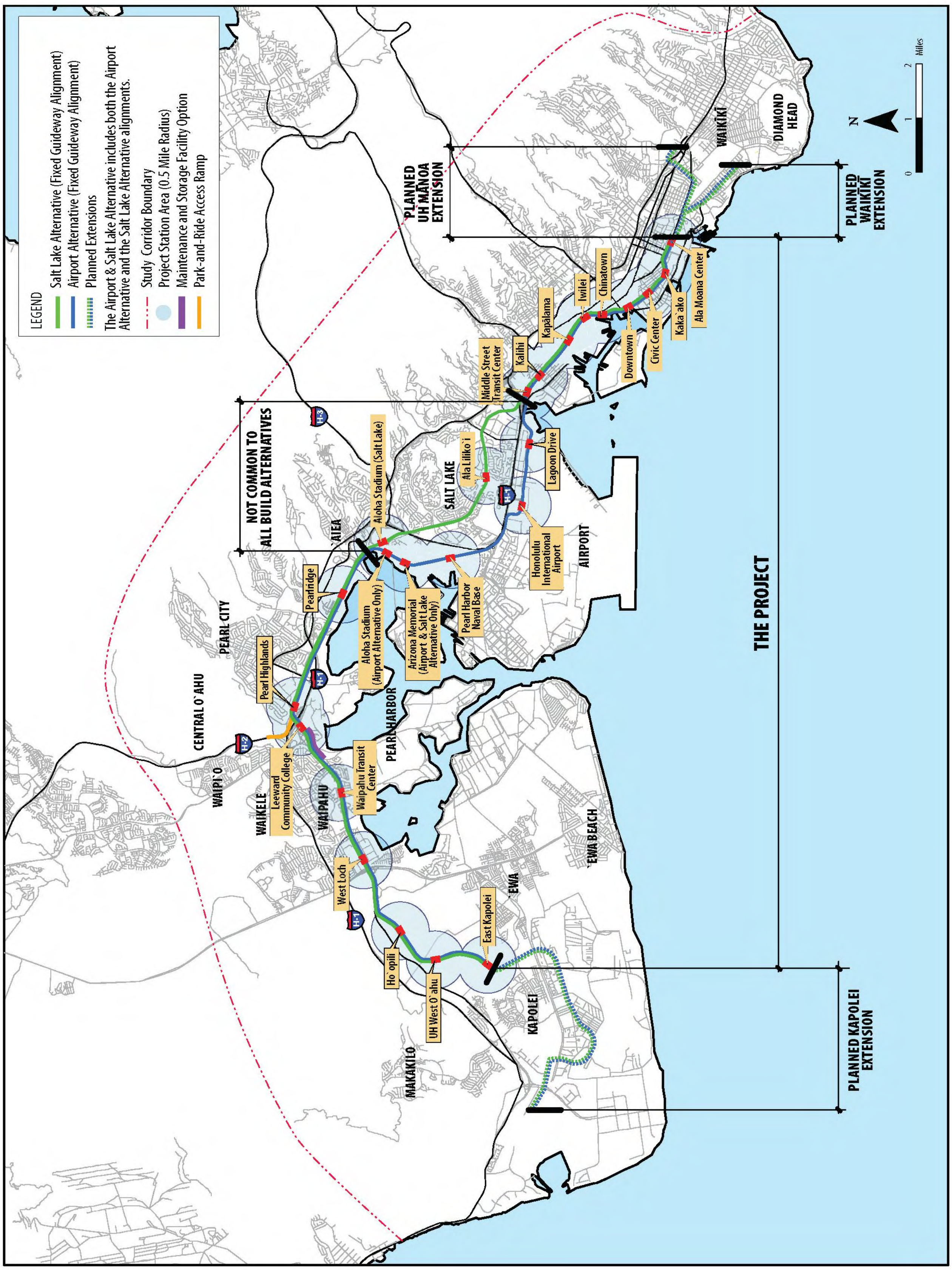

Figure 4-1 Project Overview

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As required by the Code of Federal Regulations Title 40 Part 1505.2(b), both the No Build and Build Alternatives are considered to be environmentally preferable, depending on the factors considered. The No Build Alternative would best protect historic and cultural resources, while the Build Alternatives would cause the least damage to the biological and physical environment and best preserve natural resources because they would reduce transportation energy consumption and air and water pollution.

Considered Resource	No Build Alternative	Build Alternatives
Biological Environment		X
Physical Environment		X
Historic Resources	X	
Cultural Resources	X	
Natural Resources		X

X = Alternative causes least damage or best protects, preserves, or enhances resource.

Table 4-1 Summary of Environmental Effects and Proposed Mitigation Measures to Avoid, Minimize, or Reduce Impacts (continued on next page)

Land Use (Section 4.1)—land acquired for transportation use		
Environmental Effects	**No Build Alternative**	Project would not be built and would not impact land use. However, it is not consistent with local and regional long-range plans.
	Common to All Build Alternatives	Land that would be acquired that is common to all Build Alternatives is included in the numbers presented for each alternative. Included is 88 acres of prime and statewide-important farmlands (included in acreage totals below). This is less than one-tenth of one percent of available agricultural land on O`ahu. The Build Alternatives are consistent with future land use plans and policies.
	Salt Lake Alternative	147 acres of existing land use converted to transportation use.
	Airport Alternative	141 acres of existing land use converted to transportation use.
	Airport & Salt Lake Alternative	160 acres of existing land use converted to transportation use.
	Proposed Mitigation Measures	The acquired acreage under each of the Build Alternatives represents approximately 1 percent of the total acreage within the study corridor. A majority of the land uses being converted to a transportation use represent business uses (approximately 84 percent), which include retail, office, industrial, and warehouse. The remaining 16 percent of land conversions would be residential land uses. Based on the relatively small amount of land that will be acquired, including farmland, no mitigation measures would be needed.
Economic Activity (Section 4.2)—property tax revenue		
Environmental Effects	**No Build Alternative**	Project would not be built and there would not be a conversion of property and associated reductions in tax base. There would be no mobility enhancements for travel to employment or recreation areas.
	Common to All Build Alternatives	For all of the Build Alternatives, property would be acquired from private owners and converted to a transportation use that is owned by the City. This would result in a direct reduction in property tax revenues. These reductions are estimated to be $1.2 million for any of the Build Alternatives.
	Salt Lake Alternative	Same as Common to All Build Alternatives.
	Airport Alternative	Same as Common to All Build Alternatives.
	Airport & Salt Lake Alternative	Same as Common to All Build Alternatives.
	Proposed Mitigation Measures	The Project is not expected to result in substantial long-term adverse effects on property tax revenues. No mitigation measures would be needed.

Table 4-1 Summary of Environmental Effects and Proposed Mitigation Measures to Avoid, Minimize, or Reduce Impacts (continued on next page)

Acquisitions, Displacements, and Relocations (Section 4.3)		
Environmental Effects	**No Build Alternative**	Project would not be built and would not have impacts on properties.
	Common to All Build Alternatives	Parcels that would be acquired that are common to all Build Alternatives are included in the numbers presented for each alternative
	Salt Lake Alternative	Acquisitions: 35 full, 155 partial Displacements: 20 residential, 62 businesses, 1 church
	Airport Alternative	Acquisitions: 34 full, 145 partial Displacements: 20 residential, 65 businesses, 1 church
	Airport & Salt Lake Alternative	Acquisitions: 35 full, 170 partial Displacements: 20 residential, 67 businesses, 1 church
	Proposed Mitigation Measures	Where relocations would occur, compensation would be provided to affected property owners, businesses, or residents in compliance with all applicable Federal and State laws and would follow the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act, as well as procedures outlined in the Real Estate Acquisition Management Plan.
Community Services and Facilities (Section 4.4)		
Environmental Effects	**No Build Alternative**	Project would not be built and would not have impacts to community services and facilities.
	Common to All Build Alternatives	There are impacts to schools, libraries, churches, parks, and recreation facilities adjacent to the alignment that are detailed below. All are partial acquisitions of property other than the displacement of one church. A number of properties owned by utility providers would be affected by partial acquisitions. This includes two properties owned by the Hawaiian Electric Company and one owned by the State of Hawai`i Department of Transportation. Relocation and modification of existing utilities would be required.
	Salt Lake Alternative	Partial acquisitions: 12 community facilities Displacements: 1 church Utilities: Partial property acquisition would be needed from the City Sewer Pump Station.
	Airport Alternative	Partial acquisitions: 10 community facilities Displacements: 1 church Utilities: Same as Common to All Build Alternatives.
	Airport & Salt Lake Alternative	Partial acquisitions: 15 community facilities Displacements: 1 church Utilities: Same as Salt Lake Alternative.
	Proposed Mitigation Measures	Measures to reduce adverse effects on community facilities would be evaluated during future design. Mitigation efforts would involve coordination with individual property owners as necessary.

Table 4-1 Summary of Environmental Effects and Proposed Mitigation Measures to Avoid, Minimize, or Reduce Impacts (continued on next page)

Neighborhoods (Section 4.5)		
Environmental Effects	**No Build Alternative**	Project would not be built and would not have any impacts to neighborhoods. The quality of life, however, would be reduced by increased congestion and travel time and reduced mobility.
	Common to All Build Alternatives	All Build Alternatives would provide people living and working in the neighborhoods within the study corridor with increased mobility. The Project would provide an alternative to traveling by personal vehicle or bus transit within the existing transportation corridors. Passengers using the new transit system would experience reduced travel time to other neighborhoods and growth centers along the project alignment and near transit stations. Potential new development and redevelopment along the Project, as well as scale of transit system, would not have substantial effect on community character.
	Salt Lake Alternative	The project alignment would follow Salt Lake Boulevard, which is the northern boundary of the Airport neighborhood and the southern boundary of the Āliamanu-Salt Lake neighborhood. The project alignment would be located on the fringe of the community and, therefore, there would not be changes to community character.
	Airport Alternative	The project alignment would travel along busy, heavily traveled Kamehameha Highway and transition to Aolele Street near the airport. The transit facility is not expected to be a visual or physical barrier in the neighborhood and would not affect community identity or cohesion.
	Airport & Salt Lake Alternative	The Airport & Salt Lake Alternative would have the combined effect on neighborhoods as described above for the Salt Lake Alternative and the Airport Alternative.
	Proposed Mitigation Measures	Since there would be no adverse effects to neighborhoods, no mitigation is required. Ongoing coordination efforts with the public would help develop design measures that would enhance the interface between the transit system and the surrounding community.
Environmental Justice (Section 4.6)		
Environmental Effects	**No Build Alternative**	Project would not be built and would not have impacts to O`ahuMPO Environmental Justice (EJ) Areas.
	Common to All Build Alternatives	There would be no disproportionately high and adverse effects on residents in O`ahuMPO EJ Areas.  The Banana Patch community was not identified as an EJ area using the O`ahuMPO method. However, after public outreach, the area has been identified as an EJ area of concern. The neighborhood is 100 percent minority and would need to be relocated as part of the Project.
	Salt Lake Alternative	Same as Common to All Build Alternatives.
	Airport Alternative	Same as Common to All Build Alternatives.
	Airport & Salt Lake Alternative	Same as Common to All Build Alternatives.
	Proposed Mitigation Measures	No disproportionately high and adverse impacts would be caused by the Project. Therefore, no specific mitigation measures to reduce impacts are warranted. Where relocations would occur, compensation would be provided to affected property owners, businesses, or residents in compliance with all applicable Federal and State laws and would follow the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act, as well as procedures outlined in the Real Estate Acquisition Management Plan. A community meeting will be held in the Banana Patch community. The FTA Civil Rights Officer will attend this meeting.

Table 4-1 Summary of Environmental Effects and Proposed Mitigation Measures to Avoid, Minimize, or Reduce Impacts (continued on next page)

Visual and Aesthetic Conditions (Section 4.7)		
Environmental Effects	**No Build Alternative**	Project would not be built and there would be no impact to the visual and aesthetic conditions.
	Common to All Build Alternatives	The Build Alternatives would be set in an urban context where visual change is expected and differences in scales of structures are typical. However, some viewer groups may perceive that visual changes associated with the Project are substantial, particularly when considered at a single location. The fixed guideway and stations would be elevated structures. They would result in changes to views where project elements would be near existing views or in the foreground of these views. This change would also occur for motorists traveling on the roadways along and under the guideway. The stations would be dominant visual elements in their settings and would noticeably change views. Impacts to visual quality would range from low to high. In some areas, the guideway would block views and contrast with the surrounding buildings in terms of size, scale, and character. In other areas, the guideway would not block any important views or contrast with local development.
	Salt Lake Alternative	Same as Common to All Build Alternatives.
	Airport Alternative	Same as Common to All Build Alternatives.
	Airport & Salt Lake Alternative	Same as Common to All Build Alternatives.
	Proposed Mitigation Measures	Mitigation measures would focus on preserving visual resources and enhancing the project design to comply with applicable policies: • Develop and apply design guidelines that would establish a consistent design framework for the Project with consideration of local context • Retain existing trees where practical and provide new vegetation • Shield exterior lighting • Coordinate the project design with transit-oriented development planning and DPP • RTD will consult with the communities surrounding each station for input on station design elements
Air Quality (Section 4.8)		
Environmental Effects	**No Build Alternative**	There would be no reduction in regional pollutant emissions. Study area in attainment for carbon monoxide, no violations of NAAQS.
	Common to All Build Alternatives	Reduce regional pollutant emissions between 3.2 to 4.0 percent. Study area in attainment for carbon monoxide, no violations of NAAQS.
	Salt Lake Alternative	Same as Common to All Build Alternatives.
	Airport Alternative	Same as Common to All Build Alternatives.
	Airport & Salt Lake Alternative	Same as Common to All Build Alternatives.
	Proposed Mitigation Measures	Because no substantial air quality impacts are anticipated, no mitigation would be required.

Table 4-1 Summary of Environmental Effects and Proposed Mitigation Measures to Avoid, Minimize, or Reduce Impacts
(continued on next page)

Noise and Vibration (Section 4.9)—project includes an integrated noise-blocking parapet wall at the edge of the guideway structure that extends 3 feet above the top of rail		
Environmental Effects	No Build Alternative	Project would not be built and future noise and vibration would be from traffic on local streets and highways.
	Common to All Build Alternatives	The Project would include an integrated noise blocking parapet wall that extends 3 feet above the top of rail and wheel skirts. This will substantially reduce ground-level noise. 94-340 Pupumomi Street: Moderate impact to 5th floor and above 1060 Kamehameha Highway: Moderate impact to 2nd through 5th floors Kamehameha Highway at Kauhale Street: 14 buildings with moderate impact at ground level 860 Halekauwila: Moderate impact to 6th floor and above 1133 Waimanu: Moderate impact to 7th through 9th floors Vibration: no impacts
	Salt Lake Alternative	3215 Ala `Ilima Boulevard: Moderate impact above 9th floor 2889 Ala `Ilima Boulevard: 4 buildings with moderate impact above 9th floor
	Airport Alternative	Same as Common to All Build Alternatives.
	Airport & Salt Lake Alternative	Same as Common to All Build Alternatives.
	Proposed Mitigation Measures	No feasible and reasonable mitigation is available to reduce moderate noise impacts that remain.
Energy/Electric and Magnetic Fields (Section 4.10)		
Environmental Effects	No Build Alternative	Motor vehicle consumption islandwide: 94, 610 MBTUs No EMF-generating features.
	Common to All Build Alternatives	Reduce daily transportation energy demand by 2 percent. EMF could affect one electron microscope.
	Salt Lake Alternative	Motor vehicle consumption islandwide: 91, 082 MBTUs Fixed guideway energy consumption: 1,163 MBTUs
	Airport Alternative	Motor vehicle consumption islandwide: 91,013 MBTUs Fixed guideway energy consumption: 1, 224 MBTUs
	Airport & Salt Lake Alternative	Motor vehicle consumption islandwide: 91,132 MBTUs Fixed guideway energy consumption: 1,194 MBTUs
	Proposed Mitigation Measures	None required.
Hazardous Waste and Materials (Section 4.11)		
Environmental Effects	No Build Alternative	Project would not be built and there would be no impacts associated with hazardous materials.
	Common to All Build Alternatives	8 sites of concern.
	Salt Lake Alternative	Same as Common to All Build Alternatives plus 1 additional site of concern.
	Airport Alternative	Same as Common to All Build Alternatives.
	Airport & Salt Lake Alternative	Same as Common to All Build Alternatives.
	Proposed Mitigation Measures	Some properties acquired for right-of-way may undergo a Phase I Environmental Site Assessment prior to acquisition. Depending on the outcome, a Phase II assessment may be appropriate. The City will decide the necessity of the Environmental Site Assessment for each property acquisition.
Ecosystems (Section 4.12)		
Environmental Effects	No Build Alternative	Project would not be constructed and there would not be impacts on ecosystems.
	Common to All Build Alternatives	There would be no effect on any threatened, endangered, or protected species.
	Salt Lake Alternative	Same as Common to All Build Alternatives.
	Airport Alternative	Same as Common to All Build Alternatives.
	Airport & Salt Lake Alternative	Same as Common to All Build Alternatives.
	Proposed Mitigation Measures	Obtain Certificate of Inclusion for Ko`oloa`ula and implement conditions of the certificate, if warranted

Table 4-1 Summary of Environmental Effects and Proposed Mitigation Measures to Avoid, Minimize, or Reduce Impacts (continued from previous page)

Water (Section 4.13)—best management practices would be incorporated into Project to address storm water quality; construction methods would be employed to protect contamination of Southern O`ahu Basal Aquifer; floodplains would be considered during design		
Environmental Effects	No Build Alternative	Project would not be built and there would not be impacts on water resources.
	Common to All Build Alternatives	There would be no adverse effect to surface and marine waters, groundwater, floodplains, and wetlands.
	Salt Lake Alternative	Same as Common to All Build Alternatives.
	Airport Alternative	Same as Common to All Build Alternatives.
	Airport & Salt Lake Alternative	Same as Common to All Build Alternatives.
	Proposed Mitigation Measures	No mitigation measures would be required based on project design.
Street Trees (Section 4.14)—tree removal would be minimized to greatest extent possible; pruning likely next to guideway		
Environmental Effects	No Build Alternative	Project would not be built and street trees would not be affected.
	Common to All Build Alternatives	Notable effects: 2 monkeypods identified as Excellent trees along Kamehameha Highway and 28 Notable true kamani trees would be removed along Dillingham Boulevard.
	Salt Lake Alternative	100 pruned 350 removed 250 transplanted
	Airport Alternative	100 pruned 550 removed 300 transplanted
	Airport & Salt Lake Alternative	150 pruned 650 removed 350 transplanted
	Proposed Mitigation Measures	Mitigation measures would consist of transplanting existing trees or planting new ones. Pruning would be in compliance with City and County ordinances and require supervision by a certified arborist.
Archaeological, Cultural, and Historic Resources (Section 4.15)		
Environmental Effects	No Build Alternative	Project would not be built and there would be no impacts associated with archaeological, cultural, or historic resources.
	Common to All Build Alternatives	There would be adverse effects to 7 historic resources and effects to 7 cultural resources.
	Salt Lake Alternative	Same as Common to All Build Alternatives.
	Airport Alternative	Same as Common to All Build Alternatives.
	Airport & Salt Lake Alternative	Same as Common to All Build Alternatives.
	Proposed Mitigation Measures	Mitigation measures for historic resources affected by the Project are being developed in consultation with the State Historic Preservation Division (SHPD) and other Section 106 consulting parties that will be incorporated into a Memorandum of Agreement. Discussions with SHPD have included preparation of cultural landscape reports. These will be developed in coordination with SHPD and appropriate stakeholders.

4.1 Land Use

This section describes the existing land uses, including farmlands, development trends, and long-term plans for the study corridor. It also evaluates the Project's consistency with the long-term plans for the study corridor. An assessment of potential changes in land use that could result from the improved mobility that would be provided by the long-term operation of the Project is presented in Section 4.18. For additional information and references, see the *Honolulu High-Capacity Transit Corridor Project Land Use Technical Report* (RTD 2008b) and the *Honolulu High-Capacity Transit Corridor Project Neighborhoods and Communities Technical Report* (RTD 2008d). Farmlands are described in detail in the *Honolulu High-Capacity Transit Corridor Project Geology, Soils, Farmlands, and Natural Hazards Technical Report* (RTD 2008m).

4.1.1 Background and Methodology

A variety of data sources, including field surveys, were used to record existing land uses on properties adjacent to and within close proximity of the study corridor.

For farmlands, this investigation documented the location of existing properties that are actively cultivated and also checked information published by the U.S. Department of Agriculture, Natural Resources Conservation Service, to see if properties in the study corridor have been designated as prime, unique, and/or of statewide importance.

Additionally, government documents related to planned transportation improvements and land development were reviewed to assess the future context of the Project in the urban environment. The Project was also evaluated to assess whether it would be consistent with transportation and urban development plans and policies.

4.1.2 Affected Environment

Existing Land Use

Table 4-2 provides an overview of existing land use within the study corridor in the planning areas delineated by the *City and County of Honolulu General Plan (as amended)* (DPP 2002a). Figure 4-2 illustrates the location of these planning areas and shows the future planned land uses. The corridor traverses through three major planning areas—'Ewa, Central O'ahu, and the Primary Urban Center (PUC).

The 'Ewa region is a rural and agricultural area that is undergoing urbanization and includes Kapolei, which is developing as O'ahu's "second city." The Wai'anae terminal station for the Project is at East Kapolei. The Wai'anae end of the Project would serve the area where both population and employment are forecasted to grow by approximately 400 percent. This area includes the UH West O'ahu campus, the Salvation Army Kroc Center, and a master-planned development in Ho'opili. All are planned to open between 2009 and 2012 and are consistent with the goals of transit-oriented development (TOD). Commercial space will grow to 7.1 million square feet (compared to 8.4 million square feet existing in Honolulu today). The UH West O'ahu campus is projected to have 7,600 students and 800 staff and faculty by 2020. Central O'ahu has a suburban development pattern

Prime farmland is land that has the best combination of physical and chemical characteristics for producing agricultural crops.

Unique farmland is land other than prime farmland with a special combination of qualities to produce specific high-value crops.

Farmland of statewide importance is land other than prime or unique farmland, important for the production of agricultural crops as determined by the State.

Table 4-2 Existing Land Use Overview by Planning Area

Planning Area	Land Use Overview[1]
\`Ewa—includes Kapolei-\`Ewa and Makakilo	\`Ewa, previously a predominantly agricultural area, is now being developed rapidly into single-family and garden-style apartment residential uses, as well as some light industry and commercial uses. A number of State and Local government offices , as well as some light industry, have moved to Kapolei.
Central O\`ahu—includes Waipahu-Waikele and Waiawa[2]	Waipahu, the portion of the Central O\`ahu planning region nearest the Project, is comprised of moderate-density residential, commercial, and light industrial uses. Waipahu's commercial and light industrial uses are mostly clustered along Farrington Highway. Other portions of the Central O\`ahu planning region within the study corridor include lower-density residential developments and some commercial and light industrial areas in Waikele and Kunia. The Waiawa and Koa Ridge areas remain largely undeveloped at this time.
Primary Urban Center—includes Pearl City-\`Aiea, Salt Lake-Āliamanu, Airport-Pearl Harbor, Kalihi-Iwilei, Palama-Liliha, Downtown, Kaka\`ako, Makiki-Mānoa, Mō\`ili\`ili-Ala Moana	The Primary Urban Center is a wide-ranging development region stretching from Pearl City through Salt Lake, Downtown, and Kaka\`ako to the Koko Head end of the study corridor. The uplands in this area are dominated by single-family residential uses while the coastal plain has a broader range of uses. Land uses in the Pearl Highlands and Pearlridge Station areas include big-box retail, a regional shopping center, health services, smaller commercial and industrial uses, and apartments. The Aloha Stadium Station area is dominated by the stadium and nearby military uses, but some civilian residential development and neighborhood shopping centers are also present. The Ala Liliko\`i Station area is dominated by civilian residential uses on the mauka side of the alignment and military residential and other facilities on the makai side. Other than the high-density residential Salt Lake area, most residences are single-family. All the station areas along the airport alignment are dominated by military, airport, or light industrial uses. As the corridor approaches Downtown, moderate- to high-density uses become more prominent. The four station areas in Kalihi and Iwilei are dominated by residential and commercial uses with commercial uses generally increasing closer to Downtown. The Chinatown and Downtown area is comprised of high-density uses, including major office buildings, retail, and high-density condominiums. Major State and local government offices are also located near the Downtown and Civic Center Stations. Adjacent to Downtown, Kaka\`ako contains a mix of large retail uses, restaurants, and theaters. Ala Moana Center has 1.8 million square feet of retail space; this area is dominated by this shopping center. Big-box retailers, medical, smaller commercial development, hotel, and residential uses are also in the area.

[1] Land uses described include current uses within the study corridor.
[2] Planning area extends beyond the study corridor.

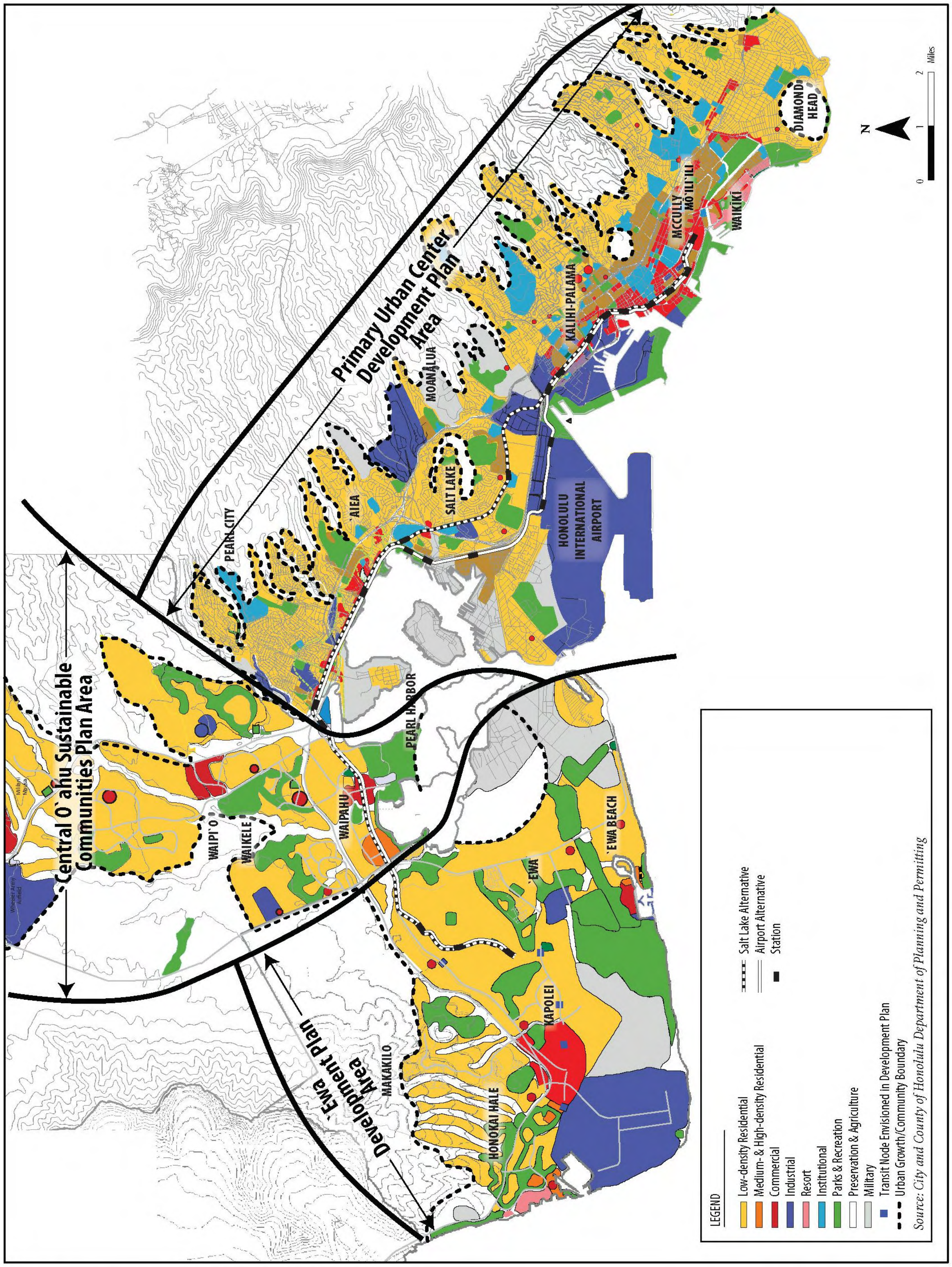

Figure 4-2 Planning Regions and Planned Land Use

encompassing smaller cities and community centers. Only part of the Central O'ahu planning area is within the study corridor. The PUC encompasses the most urbanized part of the island, including Downtown Honolulu. Figures 4-3 through 4-6 show existing land uses within the study corridor (one-half mile from the project alignment).

Farmlands

Much of the study corridor is currently developed, and only a small portion of the corridor—primarily in the 'Ewa Development Plan area—consists of land that is currently used for agriculture.

The 'Ewa Plain, including properties surrounding the Project, was once a major agricultural area. Prior to 1995, the primary crop had been sugar cane. Despite recent rapid urbanization, much of the 'Ewa Plain is still classified or zoned for agricultural use by either the State of Hawai'i or the City and County of Honolulu (City). Much of 'Ewa that is not developed is also classified as "Prime Agricultural Land."

Future Land Use Plans and Policies

State, regional, and community plans and policies affecting future land use are currently in place and enforced through zoning and other requirements at State and Local levels. Proactive neighborhood-based plans establish a comprehensive framework for implementing long-range land use policies and goals for O'ahu's future. The plans that are relevant to the goals and objectives of providing improved transit services within the study corridor include the following:

- The *Hawai'i Statewide Transportation Plan* (HDOT 2002)—this plan envisions a multi-modal transportation system and promotes transit-supportive development in activity centers along the corridor.
- The *O'ahu Regional Transportation Plan 2030* (O'ahuMPO 2006)—this plan focuses on improving mobility with a series of strategies and programs to address future transportation needs. Within the 2030 scope, this plan calls for a rail transit system that would serve the corridor between Kapolei and Honolulu.
- The *City and County of Honolulu General Plan (as amended)* (DPP 2002a)—this plan establishes transit-supportive objectives and policies for Honolulu's future and directs future growth on O'ahu to the PUC, Central O'ahu, and 'Ewa.

Development plans for the PUC and 'Ewa direct new growth and supporting transit facilities and TOD to these areas. Sustainable community plans for East Honolulu, Central O'ahu, and other parts of the island focus on supporting the character of these communities and preserving their natural and cultural resources.

The City is currently pursuing a TOD special district amendment to a land use ordinance. TOD special districts would restrict development in agricultural and open space areas and encourage mixed-use, high-density, walkable communities around transit stations. The special districts also encourage public input into the design of TOD neighborhood plans to reflect unique community identities. TOD planning would occur before the fixed guideway stations are constructed.

The *Waipahu Livable Communities Initiative* (DPP 1998) and the *'Aiea-Pearl City Livable Communities Plan* (DPP 2004b) promote transit-supportive development patterns and pedestrian-friendly environments.

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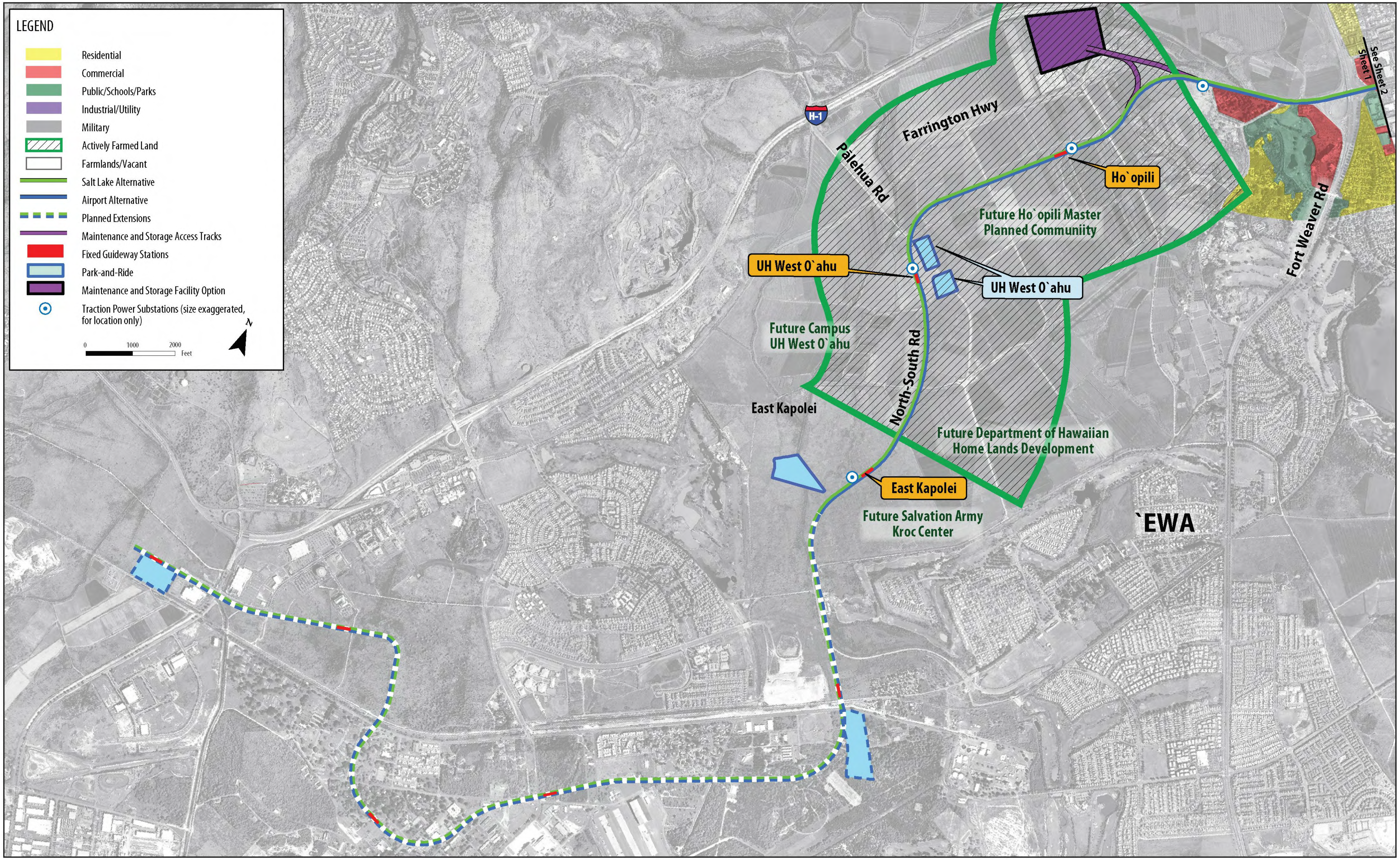

Figure 4-3 Existing Land Use, Kapolei to Fort Weaver Road

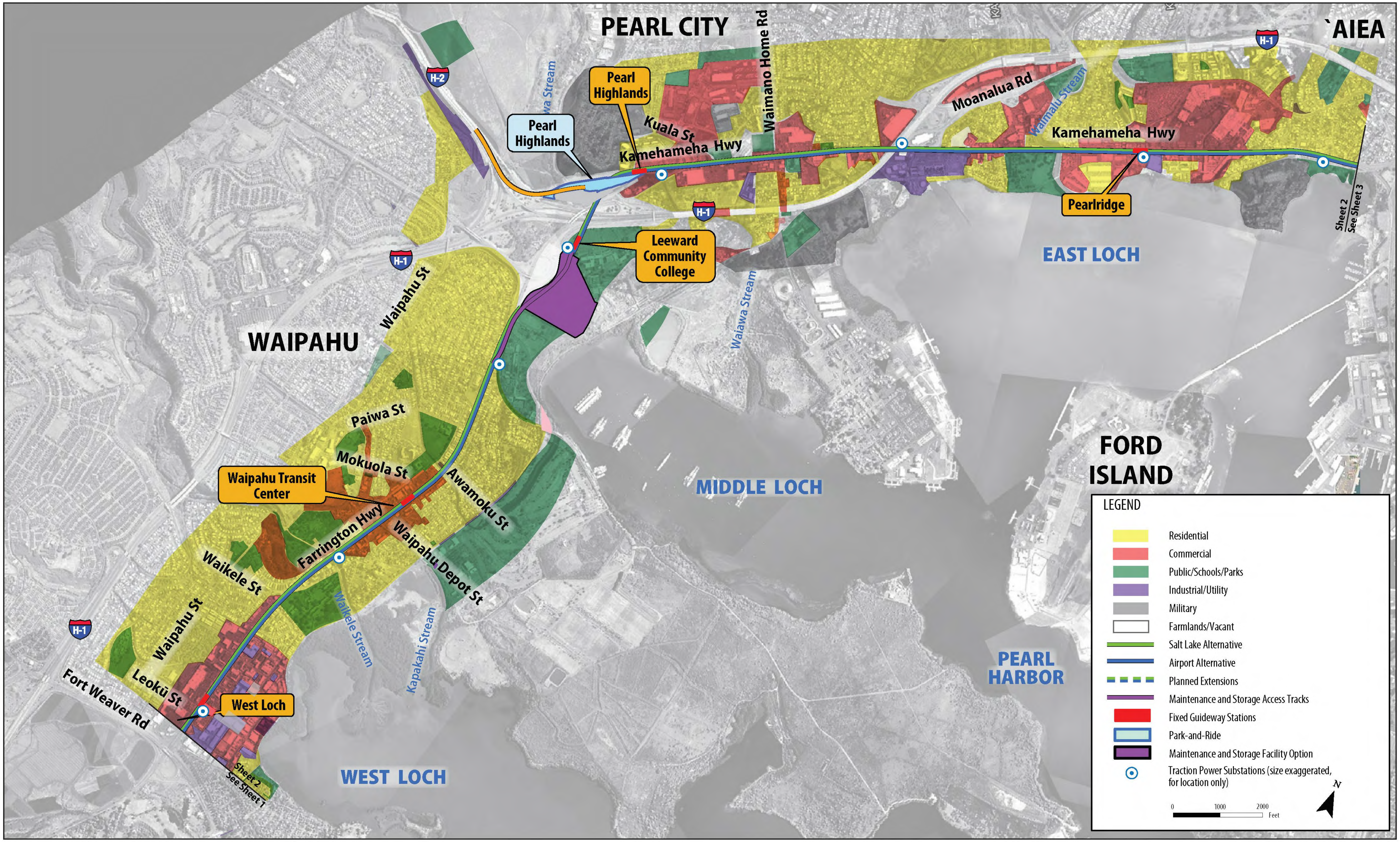

Figure 4-4 Existing Land Use, Fort Weaver Road to Aloha Stadium

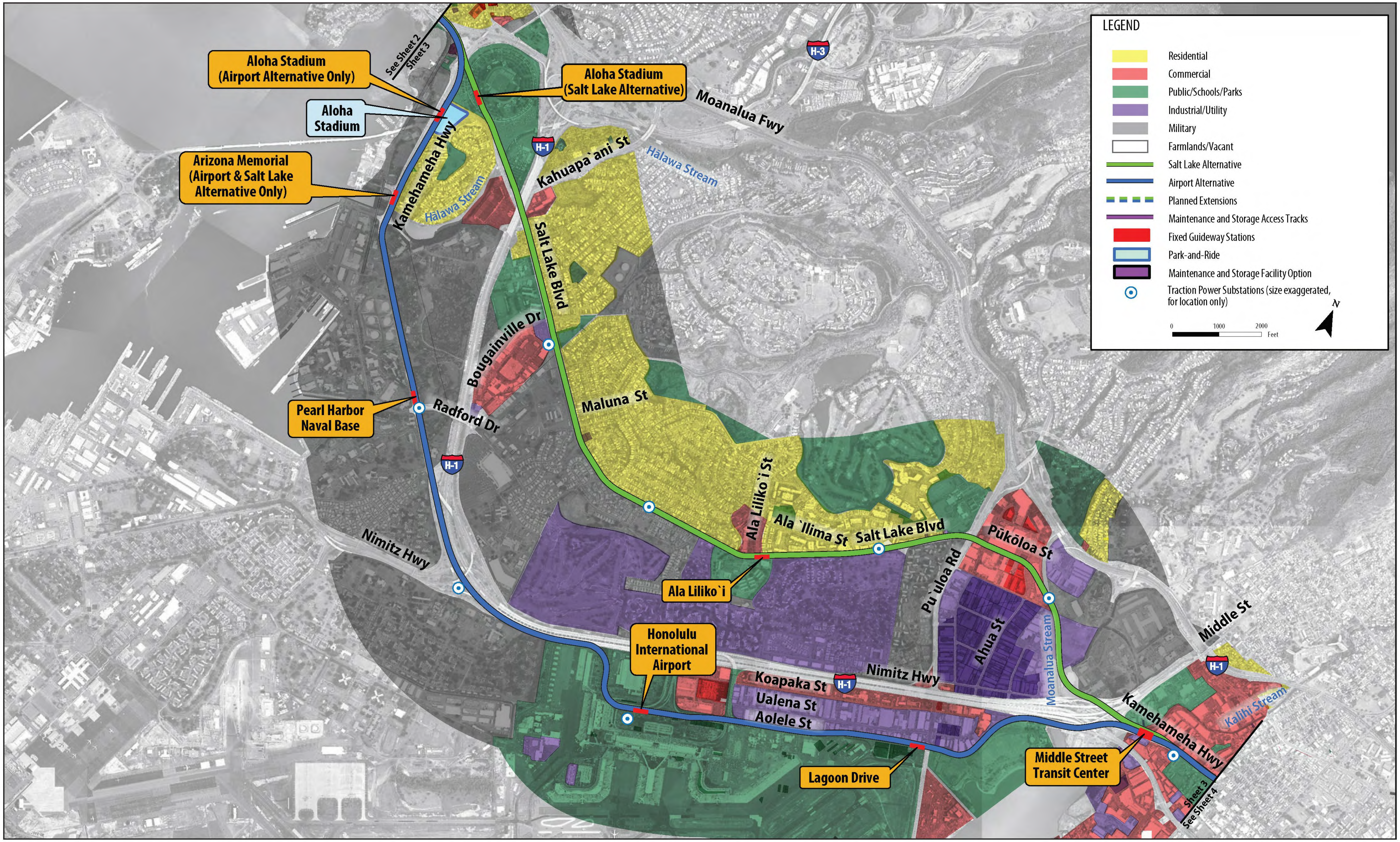

Figure 4-5 Existing Land Use, Aloha Stadium to Kalihi

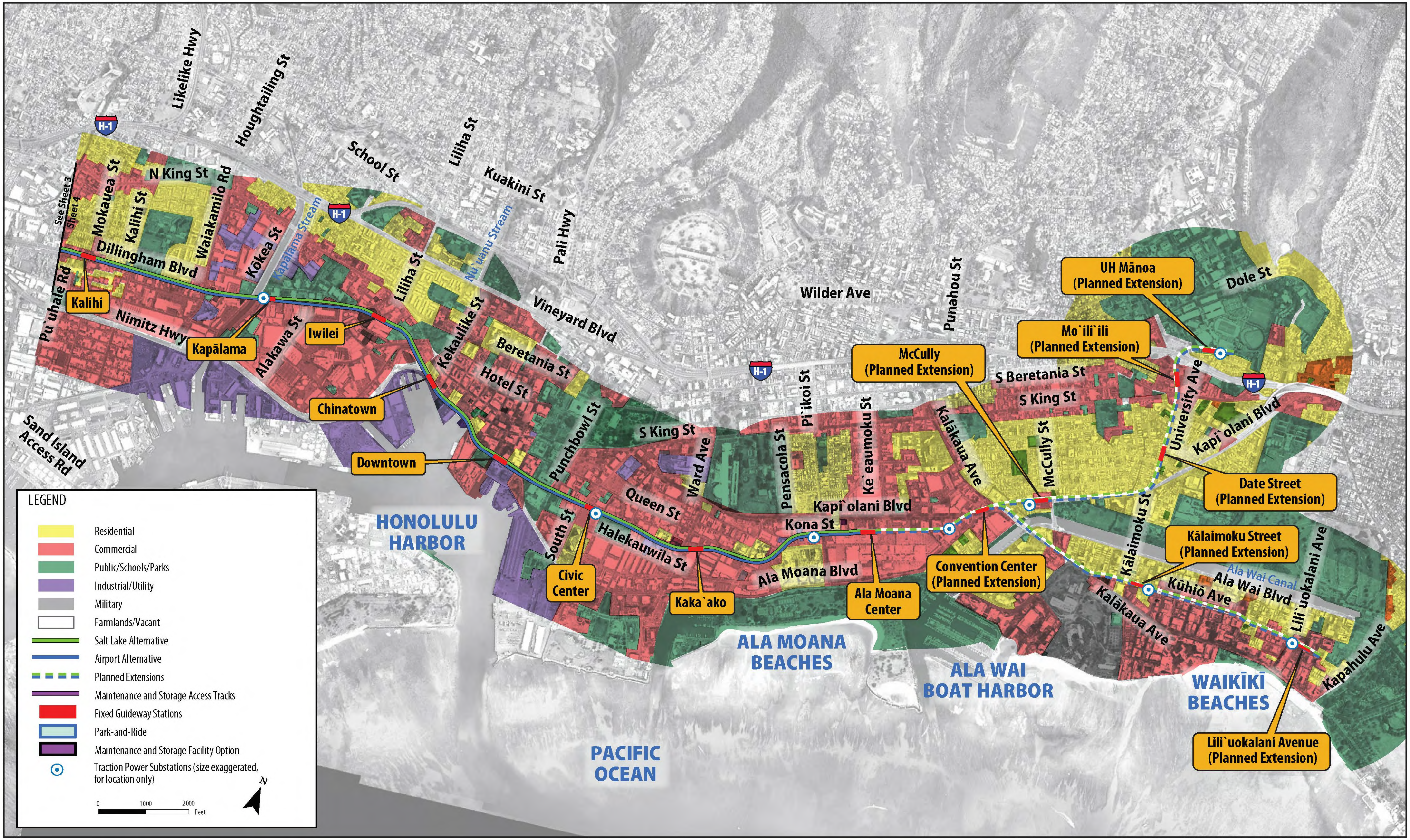

Figure 4-6 Existing Land Use, Kalihi to UH Mānoa and Waikīkī

4.1.3 Environmental Consequences and Mitigation

Environmental Consequences

Land Use

No Build Alternative

Under the No Build Alternative, the Project would not be built and would not have any impacts to existing land use. Although the projects on the ORTP would be built, their environmental impacts would be studied in separate documents. The No Build Alternative is not consistent with local and regional long-range plans.

Common to All Build Alternatives

Table 4-3 identifies the acreage that would be affected by each of the project's Build Alternatives where existing land use would be converted to a transportation use. Only those parcels that would be completely acquired (full acquisition) would result in changes in land use resulting directly from the Project. For some properties, only a small portion of the parcel would be required (partial acquisition), and existing land uses would remain unchanged by the Project. The largest potential effect would be displacement of Aloun Farms operations mauka of Farrington Highway for the proposed 45-acre maintenance facility. Traction power substations will be located approximately every mile. A description of the substations is provided in Chapter 2. The substations have been placed in roadway rights-of-way, vacant lots, or in rights-of-way that will be acquired for stations and station features. A more complete analysis of the types of land uses that would be affected is presented in Section 4.3, where displacements and relocations associated with the acquisition of residential, commercial, and other types of properties are discussed.

Table 4-3 Property Acquisition by Alternative

Alternative	Acquisition Acreage
Salt Lake	147
Airport	141
Airport & Salt Lake	160

The acquired acreage under each of the Build Alternatives represents approximately 1 percent of the total acreage within the study corridor. A majority of the land uses being converted to a transportation use represent business uses (approximately 84 percent), which include retail, office, industrial, and warehouse. The remaining 16 percent of land conversions would be residential land uses.

Farmlands

No Build Alternative

Under the No Build Alternative, the Project would not be built and would not have any impacts to farmlands designated prime, unique, or agricultural lands of statewide importance. Although the projects on the ORTP would be built, their environmental impacts would be studied in separate documents. The adopted *'Ewa Development Plan* (DPP 2000), however, has recognized that agricultural lands adjacent to the project alignment would be developed some time in the future.

Common to All Build Alternatives

The only farmlands that would be acquired for the Project are in the 'Ewa Plain and, therefore, common to all Build Alternatives. Because the properties are relatively large, only a small portion of each agricultural parcel would be acquired (Figures 4-7 and 4-8). The figures show the agricultural lands currently in cultivation as well as agricultural lands that have been designated by the U.S. Department of Agriculture (USDA), the Natural Resources Conservation Service (NRCS), or the State of Hawai'i as prime, unique, or of statewide importance. Some of the designated lands are not currently in active cultivation. Approximately 80 acres of prime farmland and 8 acres of statewide-important farmlands would be acquired by the Build Alternatives, of which 70 acres are actively cultivated.

All of the affected properties designated as prime, unique, or of statewide importance and/or actively being farmed are owned by individuals, corporations, or agencies that plan to develop them in conformance with the *'Ewa Development Plan* (DPP 2000).

The *2002 Census of Agriculture* (USDA 2004) reported that there are more than 70,000 acres of agricultural land in cultivation on O'ahu, including those designated as prime, unique, or of statewide importance. The displacement of agricultural lands as a result of the Project represents less than one-tenth of one percent of available agricultural land. Considering that the amount of affected farmland is such a small proportion of all agricultural lands on O'ahu, including those designated as prime, unique, or of statewide importance, the effect would not be significant and no mitigation would be required.

Future Land Use Plans and Policies

No Build Alternative

Under the No Build Alternative, a transit system would not be constructed. However, this is not consistent with public transportation and land use planning documents that call for the development of a central transit system within the study corridor. Projects on the ORTP will be constructed, and separate environmental documents will be prepared for those projects.

Common to All Build Alternatives

The Build Alternatives would be consistent with adopted State and Local government transportation and land use plans and policies. The transit system would link Honolulu with outlying developing areas and activity centers that have been designated to receive increasing amounts of future residential and employment growth. The system would provide reliable rapid transit within the study corridor that would serve all population groups, improve transit links, and offer an alternative to the use of private automobiles.

The *'Ewa Development Plan* was the first of the conceptual development plans to be adopted by the City. Significant growth in population and employment are projected for the 'Ewa area by 2030.

The *'Ewa Development Plan* states that higher-density residential and commercial uses should be developed along a major rapid transit corridor linking Kapolei with Primary Urban Center communities to the east (DPP 2000). In addition, the plan recommends that the new UH West O'ahu campus should be oriented to support pedestrian access to and from a major transit node on North-South Road.

All of the Build Alternatives are equally consistent with adopted State and Local plans and policies.

Mitigation

The acquisition of property for the Build Alternatives would be conducted consistent with Federal and State regulations and with the procedures outlined in the *Honolulu High-Capacity Transit Corridor Project Real Estate Acquisition Management Plan* (RTD 2008q).

Based on the relatively small number of parcels affected by full acquisitions, the effects on different types of land uses in the study corridor would be minimal. No mitigation measures would be needed.

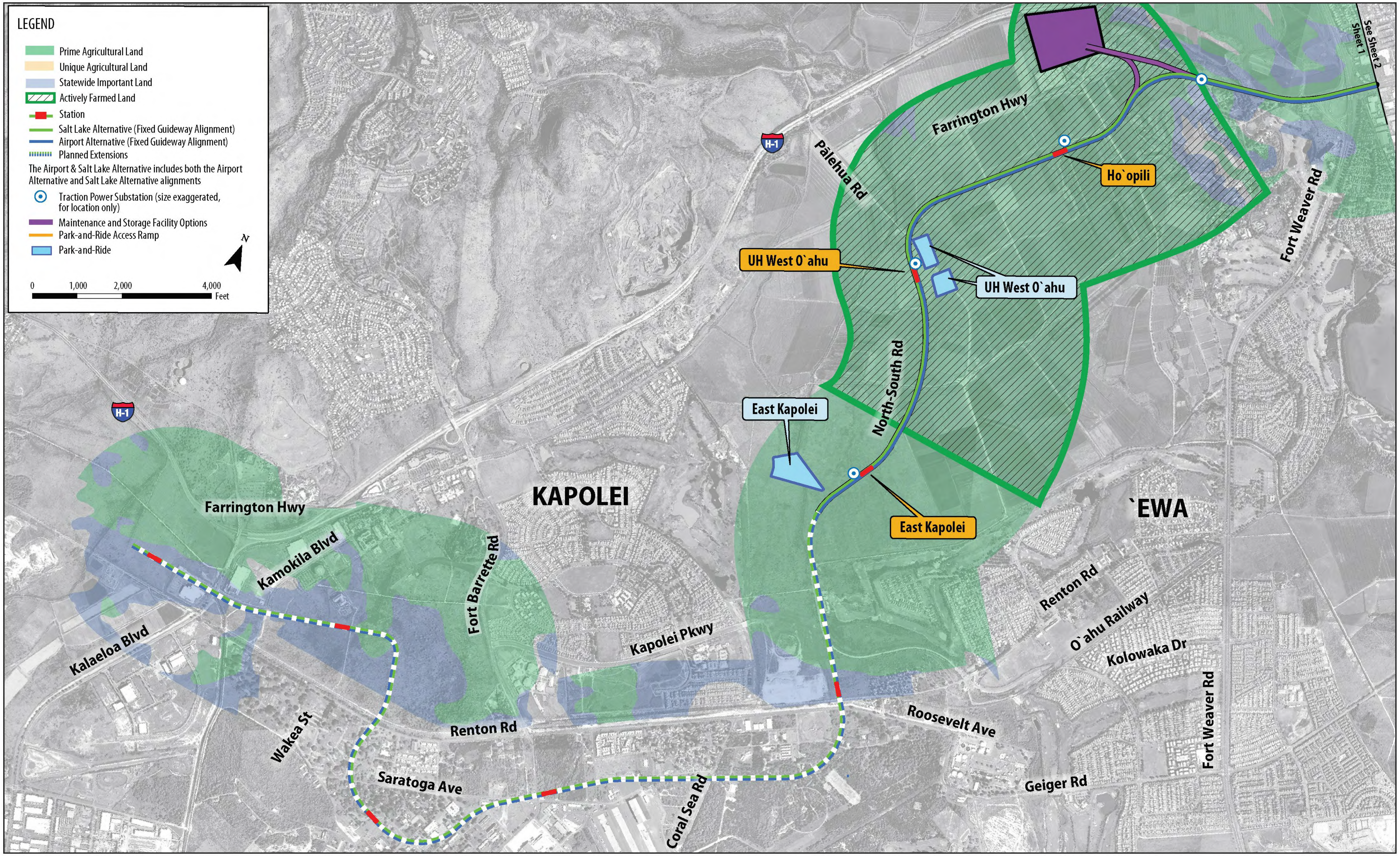

Figure 4-7 Designated Agricultural Lands , Kapolei to Fort Weaver Road

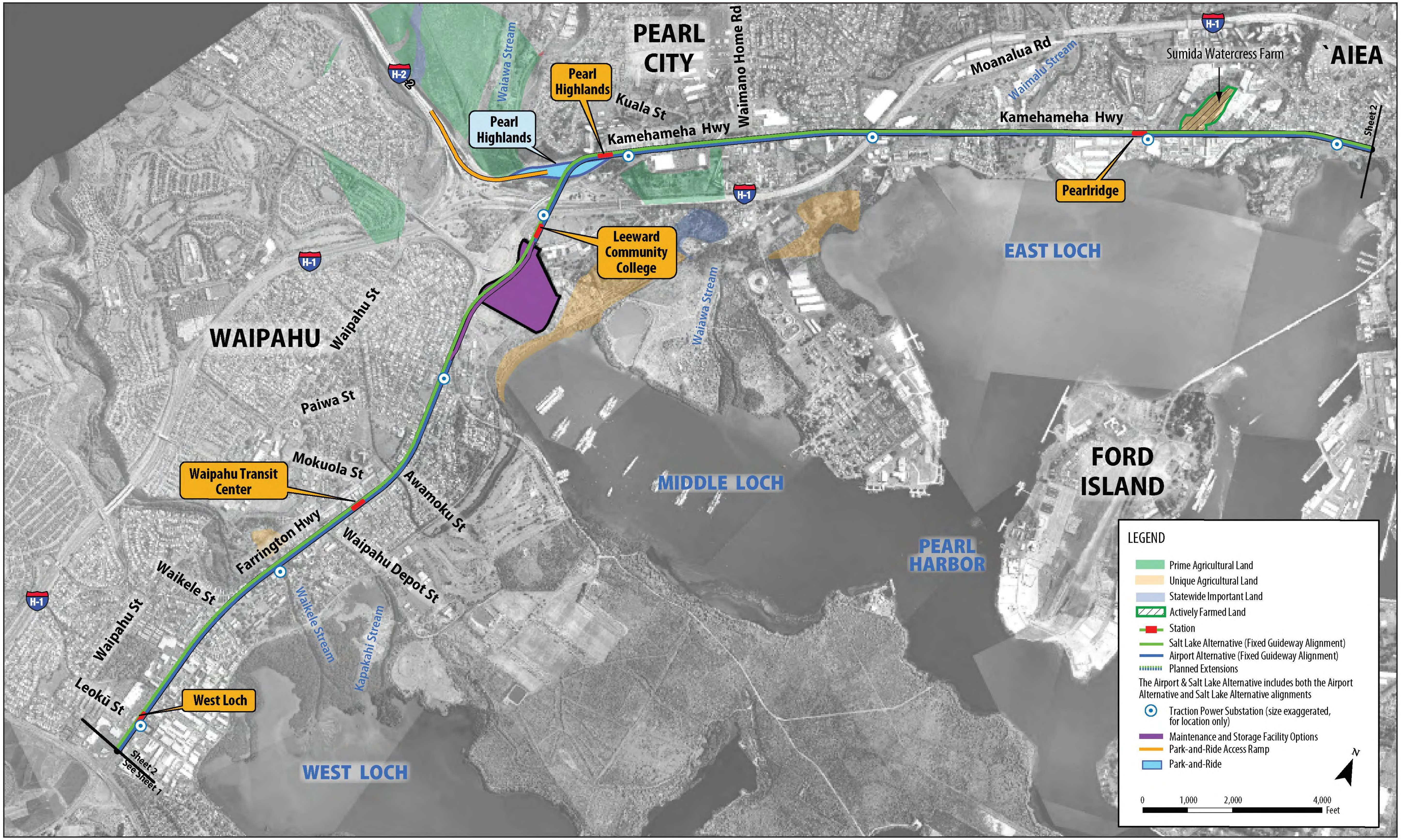

Figure 4-8 Designated Agricultural Lands, Fort Weaver Road to Aloha Stadium

4.2 Economic Activity

This section describes the effect of the Project on regional economics in the study corridor. Existing and future employment and growth in the study corridor were considered in the analysis. In addition, the anticipated changes to property tax revenues that would result from acquisition of property for the Project were evaluated. Economic effects related to construction are discussed in Section 4.17 and the Project's financial analysis is presented in Chapter 6, Cost and Financial Analysis. For additional information and references, see the *Honolulu High-Capacity Transit Corridor Project Economics Technical Report* (RTD 2008c).

4.2.1 Background and Methodology

Regulatory Context

Regulations applicable to this analysis are as follows:

- Definition of Real Property Tax Rates—Real Property Tax Rate Tables, City of Honolulu, Department of Budget and Fiscal Services, Real Property Assessment Division
- Definitions of Real Property Tax Classifications—Revised Ordinances of Honolulu, Chapter 8

Methodology

Employment trends and forecasted growth were reviewed for the three development and sustainable plan areas in the study corridor: the PUC, ʻEwa, and Central Oʻahu. The data were obtained from the Oʻahu Regional Transportation Plan Data, Department of Business, Economic Development, and Tourism (DBEDT).

Based on land acquisition information identified in Section 4.3, changes in tax revenue were estimated using the City's 2008 tax rates.

4.2.2 Affected Environment

Employment

The PUC has more jobs than any area on Oʻahu or in the State, accounting for 74 percent of the State's total non-farm employment. Employment is primarily dependent on the tourism industry, although the professional and business services sectors are growing and currently account for 14 percent of total non-farm employment.

In general, employment in Oʻahu and in the study corridor is expected to increase at a compound annual growth rate of approximately 1 percent per year between 2000 and 2030 (Table 4-4). In particular, growth in high-tech jobs in the sectors of biotechnology, research and development, and professional and business services is expected. According to DBEDT's second-quarter 2008 forecasts, visitor arrivals will decrease in 2008 and stabilize in 2009. However, tourism will continue to be the largest industry and job generator on Oʻahu.
As Oʻahu's emerging "second city," the ʻEwa and Kapolei areas are expected to experience the most growth in the study corridor (DPP 2000). This is due in large part to several major residential, governmental, and education projects currently under development. In particular, residential growth in West Oʻahu is expected to result in the need for additional population-serving employment, such as retail and service jobs.

Table 4-4 Forecast Employment for the Project Region and Study Corridor

	2000	2030	2000-2030 Compound Annual Growth Rate
O`ahu	501,100	630,700	0.8%
Study corridor	399,300	524,200	0.9%

Source: O`ahu Regional Transportation Plan Data, Department of Business, Economic Development, and Tourism.

Real Property Tax

For the fiscal year ended June 30, 2007, real property tax revenues totaled $685,868,000. This comprised approximately 70 percent of total revenues for the General Fund, which is the primary funding source for the City's operating budget and accounts for more than 60 percent of all City revenues. Other budget funds, including the Highway Fund, Sewer Fund, and Liquor Commission Fund, have different sources of revenue and collectively comprise less than 40 percent of the total budget.

4.2.3 Environmental Consequences and Mitigation

Environmental Consequences

No Build Alternative

Under the No Build Alternative, the Project would not be constructed. There would not be a conversion of property and associated reduction in tax base. This alternative would result in increased traffic congestion and delays with an associated loss in productivity. While TheBus would continue to provide transit services, there would be no mobility enhancements for travel to employment or recreation areas or additional transit options to transit-dependent households.

Common to All Build Alternatives

Employment

The Project would require the acquisition of some commercial and industrial properties. This would displace the businesses using the properties as well as their employees. It is anticipated that these businesses would be relocated to new sites.

Once constructed, the Project would employ workers for maintenance and operation of the system. It is anticipated that workers would be hired from the existing local labor force and trained to meet job expectations. The number of new workers would be very small compared to the total labor force on O'ahu. Employment related to construction of the Project is discussed in Section 4.17.

Real Property Tax

For all of the Build Alternatives, property would be acquired from private owners and converted to a transportation use that is owned by the City. This would result in a direct reduction in property tax revenues. These reductions are estimated to be $1.2 million for any of the Build Alternatives. Because all alternatives are similar, from a land acquisition perspective, all would have similar potential effects given the depth of this study. A more detailed table of results is included in the Economics Technical Report (RTD 2008c). Section 4.18 discusses the potential indirect economic effects of new development and redevelopment near the project alignment and around the stations, which could have a beneficial effect on the regional economy.

Mitigation

The Project is not expected to result in substantial long-term adverse effects on the economy or property tax revenues. No mitigation measures would be needed.

4.3 Acquisitions, Displacements, and Relocations

This section documents the effects on properties from required right-of-way acquisition for each of the Build Alternatives. For additional information and references, see the *Honolulu High-Capacity Transit Corridor Project Land Use Technical Report* (RTD 2008b), the *Honolulu High-Capacity Transit Corridor Project Neighborhoods and Communities Technical Report* (RTD 2008d), and the *Honolulu High-Capacity Transit Corridor Project Real Estate Acquisition Management Plan* (RTD 2008q).

4.3.1 Background and Methodology

Regulatory Context

Federal and State laws govern the acquisition of property for transportation projects. The Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (49 CFR 24), as amended, requires all Federal agencies to meet certain standards for the fair and equitable treatment of persons displaced by federally supported actions. The USDOT's regulations implementing this Act require that relocation and advisory assistance be provided to all individuals and businesses displaced and that it be done in accordance with the provisions set forth in 49 CFR 24. Comparable housing that is decent, safe, and sanitary must be available and affordable for displaced persons, and commercial space must be available for displaced businesses. It also prohibits discrimination with regard to appraisals and acquisitions of properties. HRS Chapter 101, Eminent Domain, and Chapter 113, Land Acquisition Policies for Federally Assisted Programs, encompass these Federal regulations.

Methodology

The parcels that could be affected by the Project were identified based on conceptual engineering drawings prepared for the Project's Build Alternatives. Generally, if only a portion of the property would be required, then it is considered a partial acquisition. However, if a substantial amount of the land and/or the primary structure were located within the portion of the parcel to be acquired, then the entire property would be purchased. This is referred to as a *full acquisition*. For residential properties, if the proposed right-of-way line comes within 5 feet of a residential structure, it is considered a full acquisition. If the right-of-way line is more than 5 feet away, it is considered a partial acquisition. For commercial properties, including situations where the commercial property could lose its function, full acquisition was considered. Once it was determined that a parcel would be acquired, the displacement and relocation of residences, businesses, and uses were analyzed. Information regarding the amount of acreage needed for each alternative, the number of parcels to be acquired, the type of acquisition (partial or full), the type of uses affected, and the number of dwelling units and businesses that would be relocated were included in the analysis.

Most of the information used to assess the types of land uses that would be affected by displacements and relocations was based on property tax assessment records. This information was used to determine land use type, including residential structures and units, commercial-type structures, and square footage. In addition to reviewing real property tax records, a windshield survey was conducted in 2008 to determine the number of businesses and, in some cases, residential units that would be acquired. The calculation of displaced persons for residential acquisitions was based on the average persons per household (2000 census data) in the study corridor. The calculation of displaced employees for business acquisitions was based on industry multipliers by type of commercial property (windshield survey).

4.3.2 Affected Environment

The project alignment traverses a variety of different land uses and different urban, suburban, rural, and agricultural environments as described in Section 4.1.

4.3.3 Environmental Consequences and Mitigation

Environmental Consequences

No Build Alternative

Under the No Build Alternative, the Project would not be built and would not have any impacts to residential or commercial properties. Although the projects in the ORTP would be built, their environmental impacts would be studied in separate documents.

Common to All Build Alternatives

Table 4-5 summarizes the number of partial and full parcel acquisitions by Build Alternative.

Partial acquisitions would vary more than full acquisitions depending on the alternative. A partial acquisition typically is either a narrow strip of land or a more substantial portion of a large parcel. It is assumed that for the properties that

Table 4-5 Acquisitions and Displacements Summary

Alternative	Parcel Acquisitions			Displacements by Land Use		
	Total*	Partial	Full	Residential Units	Commercial & Industrial Businesses	Churches
Salt Lake	190	155	35	20	62	1
Airport	179	145	34	20	65	1
Airport & Salt Lake	205	170	35	20	67	1

* Total parcel acquisitions includes full and partial acquisitions.
Partial Acquisition = acquisition of only land and possibly minor buildings on a property. The existing owners would continue to be able to own and use the property in the future.
Full Acquisition = acquisition of the entire property—land and all buildings on the property. The existing owner and existing land uses would be displaced by project improvements.

would be partially acquired, existing land uses would not change.

The number of full acquisitions for each of the Build Alternatives would only vary by one parcel. Of the full acquisitions required for each of the Build Alternatives, 34 of these acquisitions would be the same for each alternative.

Appendix B, Conceptual Right-of-Way Plans, provides information on a parcel-by-parcel basis for partial and full acquisitions anticipated for the Project.

Full acquisition of land would result in displacements and relocations. *Displacement* means that the uses, including any structures, would be acquired and converted to transportation land use and the user of that property would be relocated.

Table 4-5 also shows the number of residential units, business units, and churches located on the parcels that would be displaced as a result of the anticipated full acquisitions. The effects on residential units would be the same for all Build Alternatives. The remaining acquisitions, with the exception of one church, would be business displacements.

Considering that there are more than 1,200 parcels adjacent to the alignment, the full acquisitions and displacements from any Build Alternative would be a small change to the commercial and residential elements along the alignment. While displacements of residential and commercial properties may be difficult for the individuals involved, the number of displacements for a project of this length and magnitude would not have a substantial effect.

Salt Lake Alternative

The Salt Lake Alternative would require more parcel acquisitions than the Airport Alternative but would result in the same number of residential displacements and fewer business displacements. The one additional full parcel acquisition would affect a warehouse/wholesale business. The effects of full acquisitions on residential and commercial uses would be identical to the effects described under the heading *Common to All Build Alternatives,* which include conversion of land uses and displacements.

Airport Alternative

The Airport Alternative would require fewer parcel acquisitions than the Salt Lake Alternative but would result in more business displacements. The effects of full acquisitions on residential and commercial uses would be similar to the effects described under the heading *Common to All Build Alternatives.*

Airport & Salt Lake Alternative

The Airport & Salt Lake Alternative would require more parcel acquisitions than the other alternatives because it includes the effects of both the Airport and Salt Lake Alternatives. It would result in the same number of residential displacements and more business displacements than the other Build Alternatives. The effects of partial and full acquisitions on residential and commercial uses would be similar to the effects described under the headings *Common to All Build Alternatives, Salt Lake Alternative,* and *Airport Alternative.*

Mitigation

Where relocations would occur, compensation would be provided to affected property owners, businesses, or residents in compliance with all applicable Federal and State laws and would follow the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act, as well as procedures outlined in the *Real Estate Acquisition Management Plan* (RTD 2008q). The plan includes the following measures related to relocations:

- The City would assist all affected persons in locating suitable replacement housing and business sites within an individual's or business's financial means.
- The City would provide relocation advisory services to businesses where acquisition of adjacent property may substantially reduce clientele, limit accessibility, or affect a business in other substantial ways.
- A minimum 90-day written notice would be provided before any business or resident would be required to move.
- Relocation services would be provided to all affected business and residential property owners and tenants without discrimination; and persons, businesses, or organizations that are displaced as a result of the Project would be treated fairly and equitably.
- Where landscaping, sidewalks, and driveway access would be affected by the Project, coordination would occur with the landowner, and these property features would be replaced and/or the property owner would be compensated in accordance with the *Real Estate Acquisition Management Plan* (RTD 2008q).

4.4 Community Services and Facilities

This section describes the community services and facilities, public services, and utilities in the study corridor and the potential effects on these resources under each of the Build Alternatives as compared to the No Build Alternative. Community facilities are schools, libraries, religious institutions, cemeteries, government institutions, and military installations. Public and private parks and recreational facilities include pedestrian trails, golf courses, regional recreational complexes, community and neighborhood parks, memorial parks, and a major sports stadium. Public services include police, fire, hospitals and emergency medical services, and transit (bus). Utilities include electricity, natural gas, telecommunications, and surface-water management. For additional information and references, see the *Honolulu High-Capacity Transit Corridor Project Neighborhoods and Communities Technical Report* (RTD 2008d).

4.4.1 Background and Methodology

Regulatory Context

Section 6(f) of the Land and Water Conservation Fund Act of 1964 was created to preserve, develop, and increase accessibility of outdoor recreational resources. In the case of a transportation project, Section 6(f) protects recreational properties that were constructed from Land and Water Conservation Fund funds from being converted to transportation use. The study corridor does not contain any Section 6(f) properties. Section 4(f), as amended, of the USDOT Act of 1966 (49 USC 303) protects public parklands and recreational lands, wildlife refuges, and historic sites of National, State, or Local significance.

Methodology

Community services and facilities within one-half mile of the project alignment were identified via Geographic Information System (GIS) information provided by the City, Internet sources, and field verification. Parks and recreational facilities within one-half mile of the alignments were identified based on information from the General Plan (DPP 2002a), the Department of Planning and Permitting, the Department of Parks and Recreation, land use and zoning plans, the State of Hawai‘i Department of Land and Natural Resources, and field visits. Public services within one-half mile of the project alignment also were identified from the information above. These included fire stations, police stations, and hospitals.

Right-of-way acquisition and displacement impacts were analyzed to assess if community services and facilities, public service buildings, and/or public services would be disrupted or changed as a result of long-term operation of the Project. If right-of-way would be required, it was then determined whether full or partial acquisition would be required and the types of facilities and amenities that would be displaced by property acquisition (see Section 4.3 for information on acquisitions).

4.4.2 Affected Environment

The following sections describe community facilities, parklands and recreational facilities, public services, and utilities within one-half mile of and along the project alignment. Figures 4-9 through 4-12 illustrate the general location of religious institutions, police and fire services, hospitals and medical facilities, libraries, schools, parks, and recreation facilities within one-half mile of the project alignment. These figures identify, by name, facilities affected by the Project.

Community Facilities

Many community facilities are within one-half mile of the project alignment and station areas. Some are on large parcels with associated recreational amenities or large parking facilities. Others are buildings or structures located on small parcels. Only a few community facilities are located in the ‘Ewa area because of its rural, agricultural environment. In contrast, substantial numbers of community facilities are clustered in the dense urban environment of Downtown Honolulu.

Many different types of community facilities are within one-half mile of the project alignment. These include schools, libraries, churches, hospitals, parks and recreation areas, and cemeteries. Each is considered below. Impacts are listed in Section 4.4.3, Environmental Consequences and Mitigation.

Schools

There are 58 schools within one-half mile of the project alignments. The 16 following schools are adjacent to the alignment:

- Āliamanu Elementary and Middle School
- Honolulu Community College
- Kalākaua Middle School
- Kalihi Kai Elementary
- Makalapa Elementary
- Moanalua High
- Pearl City Elementary
- Radford High
- St. Joseph Elementary (private)
- Waipahu High
- Waipahu Intermediate
- Leeward Community College
- Moanalua/‘Aiea Community School
- UH Mānoa Urban Garden Center
- Holy Family Catholic Academy (private)
- Joy of Christ Preschool (private)

Public schools also typically have recreational amenities, including baseball diamonds, soccer

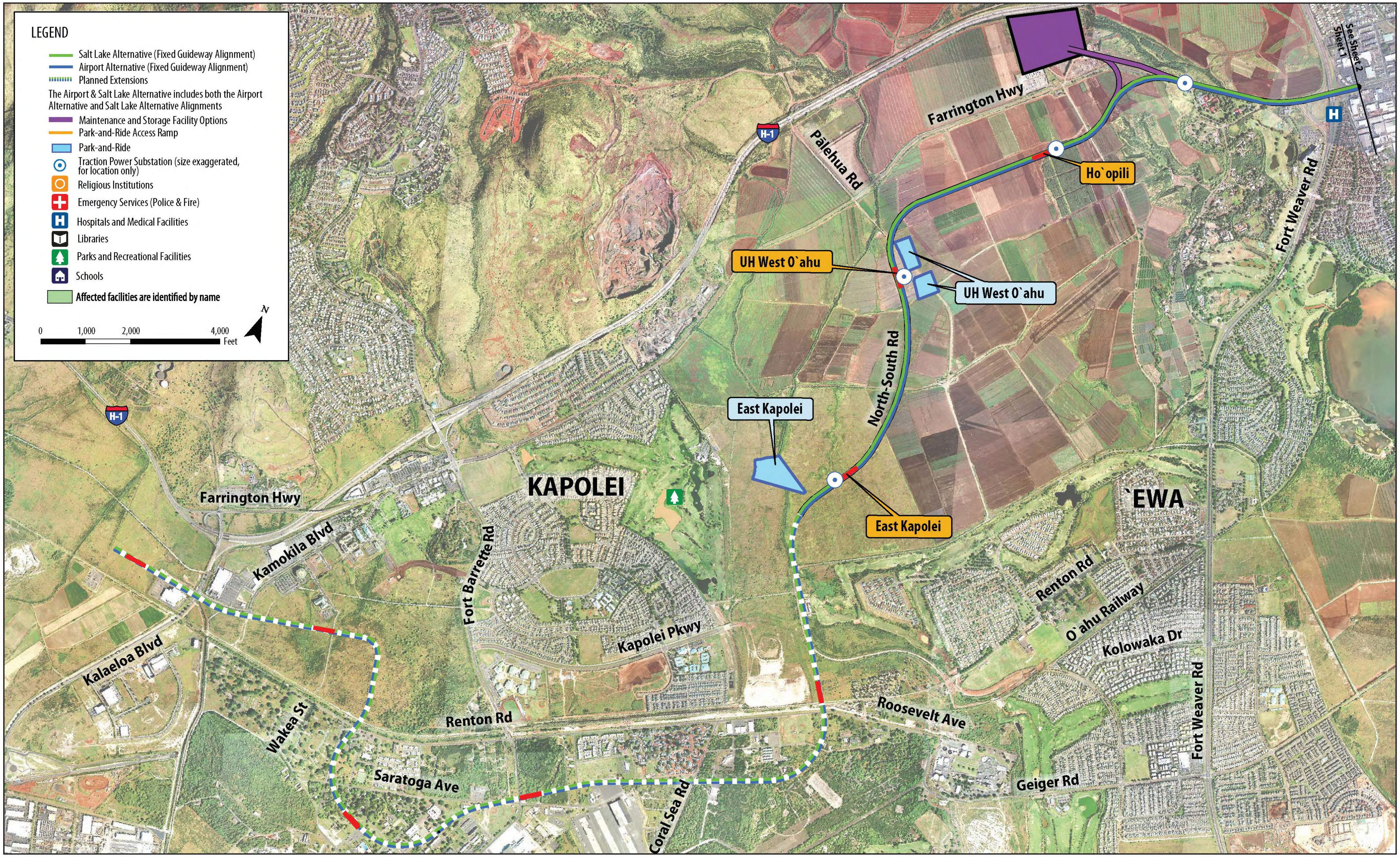

Figure 4-9 Community Resources and Facilities within One-half Mile, Kapolei to Fort Weaver Road

Figure 4-10 Community Resources and Facilities within One-half Mile, Fort Weaver Road to Aloha Stadium

Figure 4-11 Community Resources and Facilities within One-half Mile, Aloha Stadium to Kalihi

Figure 4-12 Community Resources and Facilities within One-half Mile, Kalihi to UH Mānoa and Waikīkī

fields, and gymnasiums. However, these types of recreational resources are considered a community facility, not a park, because their primary use is public education, not recreation.

Libraries

Six libraries are within one-half mile of the project alignment. The Salt Lake-Moanalua Public Library is the only library adjacent to the Project.

Religious Institutions

A total of 93 religious institutions are within one-half mile of the project alignment. Nineteen of these are adjacent to the project alignment. They are listed in Table 4-6 with addresses. (Addresses are included for religious institutions to identify the locations where religious institutions along the corridor have the same name.)

Table 4-6 Religious Institutions Adjacent to Project Alignment

Name	Address
Bible Baptist Church	94-210 Hanawai Circle
Hawai`i Fellowship	94-810 Moloalo Street
Iglesia Ni Cristo	765 Kamehameha Highway
Joy of Christ Lutheran Church	784 Kamehameha Highway
Koinonia Christian Center	94-216 Farrington Highway #A2
La Luz Del Mundo	719 Kamehameha Highway #A206
New Hope Leeward	94-050 Farrington Highway
Bethesda Temple Apostolic Church	941 Kamehameha Highway #202
St. Joseph Waipahu	94-675 Farrington Highway
Waipahu Church of Christ	94-289 Kahualena Street
West O`ahu Christian Church	94-420 Farrington Highway
Calvary United Methodist Church	3375 Salt Lake Boulevard
Fil-Am Christian Church	3600 Kamehameha Highway
Alpha Omega Christian Fellowship Church	96-171 Kamehameha Highway
First Samoan Full Gospel Pentecostal Church	3814 Salt Lake Boulevard
Iglesia Ni Cristo	94-592 Farrington Highway
Ola Nui	760 Halekauwila Street
Child Evangelical Fellowship	1190 Dillingham Boulevard
Church of Jesus Christ of Latter Day Saints	94-210 Kahualii Street

Cemeteries

Five cemeteries are located within one-half mile of the project alignment. One near Aloha Stadium-Cand one near Waimano Home Road are adjacent to the alignment.

Government and Military

For many decades, a sizable Federal government presence has been located on O'ahu, and the project alignment is adjacent to Pearl Harbor Naval Station, Hickam Air Force Base, and Fort Shafter Military Reservation. Land uses within these installations nearest the project alignment are primarily used for housing, offices, or recreation.

There are both Local government and Federal office buildings adjacent to the project alignment, as well as Honolulu International Airport (a State facility). In addition, a correctional facility, a post office, and several public housing complexes are in the study corridor.

In addition to military facilities, the following government facilities are adjacent to the project alignment:

- Kapolei Municipal Government Complex
- Ke'ehi Transfer Station
- Disabled American Veterans Memorial Headquarters Office
- Honolulu International Airport
- O'ahu Community Correctional Facility
- U.S. Post Office
- U.S. District Court

Parks and Recreational Facilities

There are 64 parklands and recreational facilities within one-half mile of the project alignment. These parks and recreational resources are scattered throughout the area and include large regional or community facilities exceeding 100 acres, as well as smaller neighborhood resources less than one-half acre in size. They include pedestrian trails, golf courses, regional recreational complexes, community and neighborhood parks, memorial parks, and a major sports stadium. These facilities include publicly owned resources, some of which are on military bases where public access is restricted, as well as resources that are privately owned. Of these 64 facilities, 14 are directly adjacent to the project alignment right-of-way:

- Irwin Memorial Park (public)
- Mother Waldron Park (public)
- Āliamanu Neighborhood Park (public)
- Ke'ehi Lagoon Park (public)
- 'Aiea Bay State Recreational Area (public)
- Aloha Stadium (public)
- Navy Housing Community Park (private)
- Navy-Marine Golf Course (military)
- Nimitz Field (military)
- Richardson Field (military)
- Neal S. Blaisdell Park (public)
- West Loch Golf Course (public)
- Walker Park (public)
- Future Queen Street Park (public)

Section 6(f) Resources

The Hawai'i State Parks and Recreation Department was contacted in September 2008. Two parks adjacent to the alignment have received Water and Land Funding and are, therefore, Section 6(f) resources. They are the Neal S. Blaisdell Park and 'Aiea Bay State Recreation Area. No Section 6(f) resources have been identified along the project alignment. Therefore, no Section 6(f) lands would be converted to a project use. For this reason, they are not considered below in Environmental Consequences.

Emergency Services

The Island of O'ahu is governed by the City and County of Honolulu, which provides a number of public services to both residents and businesses. The City has 18 emergency management centers that are typically located at either fire stations or hospitals and provide advanced life support, ambulance, and paramedic services. In addition, the Honolulu Department of Emergency Services has responsibility over Homeland Security and natural disasters caused by thunder and lightning, hurricanes, tropical storms, tsunamis, high surf conditions, floods, and earthquakes.

Police

The Honolulu Police Department provides public safety to residents and businesses via eight patrol districts. The project alignment traverses the following: District 1 Downtown, District 3 Pearl City, District 5 Kalihi, and District 7 East Honolulu. Five police stations are within one-half mile of the alignment, but none of them are adjacent to the alignment.

Fire

The Honolulu Fire Department has 5 battalions, or districts, on O'ahu and 42 individual fire stations; 13 of these are within one-half mile of the alignment. Three are adjacent to the alignment:

- Waterfront Fire Station
- #8 Mokulele Fire Station
- #30 Moanalua Fire Station

Hospitals and Medical Facilities

There are 21 hospitals and medical facilities within one-half mile of the alignment. Six of these are adjacent to the project alignment:

- Kahi Mohala Behavioral Health
- Y. Makalapa Branch Medical Clinic
- Waipahu Medical Center
- Dillingham Medical Building
- Maurice J. Sullivan Family Hospice Center
- Pu'uwai Momi Housing Complex—Teen Center

Buses

O'ahu Transit operates the bus system in the project region. The company works closely with the Honolulu Police Department. Individual bus operators are provided with two-way communication equipment and can call for assistance should there be a problem on the bus. In addition, the company participates with the Honolulu Police Department in the Mobile Watch Program. This program provides assistance to anyone in need of help. Anyone can board a bus and inform the bus operator of his or her need for either public safety or emergency medical assistance.

Utilities

Both public and private utilities operate within or adjacent to the study corridor and within the project alignment. The City provides many urban services. The Honolulu Board of Water Supply provides drinking water. The Department of Environmental Services provides solid waste, wastewater, and stormwater services. The Hawaiian Electric Company, an investor-owned utility regulated by the Hawai'i Public Utilities Commission, provides electricity to residential, commercial, and industrial customers. The Gas Company is also an investor-owned utility regulated by the Hawai'i Public Utilities Commission and provides synthetic natural gas manufactured at Campbell Industrial Park to mostly commercial and industrial customers on O'ahu. Telecommunications services are provided by Hawaiian Telecom. Cable services are provided by Oceanic Time Warner Cable.

Because much of the project alignment is located along heavily urbanized roadways, many utilities and associated infrastructure are located in the project study area. Typically, overhead utility lines and buried conduits and pipelines are installed in the right-of-way for those roadways. At-grade utility facilities, such as substations, pumping stations, pressurizing stations, and gas odorizing stations, are on parcels adjacent to the right-of-way.

4.4.3 Environmental Consequences and Mitigation

Environmental Consequences

No Build Alternative

Under the No Build Alternative, the Project would not be built and, therefore, would not have any impacts to community services and facilities, parklands and recreational facilities, public services, or utilities. However, continued congestion within the project alignment would impact emergency response times. Although the projects in the ORTP would be built, their environmental impacts would be studied in separate documents.

Community Facilities

Section 4.4.2, Affected Environment, lists schools, libraries, churches, parks and recreational facilities, and cemeteries adjacent to the alignment. Of those, one church would be displaced by the Project. Fourteen community facilities would be partially acquired by the Project. The number of community facilities varies by alternative. Table 4-7 lists all affected community facilities, the nature of the acquisition, and by which alternative the resource might be affected. No cemeteries or known burial sites would be affected by the Build Alternatives.

The schools that would be affected by partial acquisitions from the Build Alternatives are Honolulu Community College, Waipahu High, Leeward Community College, and the UH Mānoa Urban Garden Center. Partial acquisition would occur at the Bethesda Temple Apostolic Church, and the Alpha Omega Christian Fellowship would be displaced as part of full acquisition of the commercial building where this facility is located.

Additional community facilities expected to be affected by partial property acquisition would involve various parcels owned by the Local, State, and Federal governments. The Project would require partial acquisition of land from parcels associated with government or military

Table 4-7 Affected Community Facilities and Services

Facility	Acquisition[1]	Alternative
Schools/Libraries		
Āliamanu Elementary and Middle School	Partial acquisition of land (0.04 acre)	Salt Lake
Honolulu Community College	Partial acquisition of land (0.18 acre)	All
Radford High	Partial acquisition of parking (0.01 acre)	Salt Lake
Waipahu High	Partial acquisition of land (0.16 acre)—a small number of temporary or permanent buildings may be displaced or may require minor modification in addition to the required purchase of a narrow strip of land	All
Leeward Community College	Partial acquisition of land (3.94 acres)	All
UH Mānoa Urban Garden Center	Partial acquisition of land (0.16 acre)	All
Salt Lake-Moanalua Public Library	Partial acquisition of land (0.28 acre)	Salt Lake
Religious Institutions		
Bethesda Temple Apostolic Church	Partial acquisition of land (0.05 acre)	All
Calvary United Methodist Church/ Fil-Am Christian Church	Partial acquisition of land[2] (0.22 acre)	Salt Lake
Alpha Omega Christian Fellowship	Displacement	All
Parks and Recreational Facilities		
Nimitz Field	Partial acquisition of land (0.58 acres)	Airport
Richardson Field	Partial acquisition of land (0.05 acres)	Airport
Navy-Marine Golf Course	Partial acquisition of land[2] (0.22 acres)	Salt Lake
Ke`ehi Lagoon Park[3]	Partial acquisition of land (2.88 acres)	Airport
Aloha Stadium[3]	Partial acquisition of land and parking (6 acres for Salt Lake Alternative, 0.8 acre for Airport Alternative)	All
Future Queen Street Park	Partial acquisition of land (250 square feet)	All

[1] Acres of land acquisition are estimated based on Conceptual Plans and indicate the area of land underneath the elevated guideway. For many resources, the acquisition of land would be from support columns, and the actual acreage of impact would be less than shown in this table.
[2] Denotes permanent easement.
[3] 4(f) uses are discussed in Chapter 5.

facilities. These are the Pearl City Post Office (0.06 acres), the Federal office building at 300 Ala Moana Boulevard (0.34 acres), the O'ahu Correctional Facility (0.21 acres), and a City office building. Partial acquisitions would be required at the Fort Shafter Army Reservation, Makalapa Naval Housing, the Pearl Harbor Complex, and the Naval Reservation. The military properties include lands used for military operations as well as residential accommodations for enlisted personnel and their families.

Salt Lake Alternative

The Salt Lake Alternative would also require parts of Āliamanu Elementary and Middle Schools, Radford High, the Salt Lake-Moanalua Public Library, the Calvary United Methodist Church, and the Fil-Am Christian Church. There would be a partial parcel acquisition at U.S. Navy Base Housing and a State property.

Airport Alternative

There would be a partial parcel acquisition at Hickam Airforce Base.

Airport & Salt Lake Alternative

This alternative would include all of the effects discussed for the Salt Lake Alternative above.

Parklands and Recreational Facilities

Common to All Build Alternatives

Aloha Stadium would be affected by all Build Alternatives, but the Salt Lake Alternative would have a greater effect on Aloha Stadium than the Airport Alternative. This is because the Salt Lake Alternative includes a pedestrian structure, which connects to the park-and-ride lot, and a transit station within the stadium parking lot. Partial acquisitions at Aloha Stadium would affect long-term and temporary parking spaces and circulation as a result of the location of a park-and-ride connector and a bus turnout. In addition, the Aloha Stadium overflow parking lot bounded by two segments of Salt Lake Boulevard and Kamehameha Highway would become a shared-use facility providing event parking and a transit park-and-ride lot (see Chapter 3, Transportation, for a more detailed discussion of parking effects at Aloha Stadium). The presence of the transit station would reduce the need for stadium parking to a greater degree than it would displace parking.

Salt Lake Alternative

The Salt Lake Alternative would acquire 0.22 acres from the Navy-Marine Golf Course parcel but would not affect the course itself.

Airport Alternative

The Airport Alternative also would affect three additional facilities: Richardson Field, Nimitz Field, and Ke'ehi Lagoon Park.

The City-owned Ke'ehi Lagoon Park is a 72-acre park located at Lagoon Drive and Aolele Street near Honolulu International Airport. It contains 12 tennis courts, a baseball field, walking trails, picnic areas, and restrooms. Property acquisition would displace 4 of the 12 tennis courts and some parking stalls to accommodate the guideway columns. The tennis court that would be displaced is located at the end of the park near Nimitz Highway. An evaluation of the effect on this Section 4(f) park resource is discussed in more detail in Chapter 5, Section 4(f) Evaluation.

Richardson Field, located at Ford Island Boulevard and Kamehameha Highway, is a 25-acre military recreational facility with grassy fields, park tables, benches, and a swimming pool. Nimitz Field consists of five baseball diamonds on 10 acres on a larger military-owned property. Effects on these two parks include partial acquisitions of the grass fields near the fence line along Kamehameha Highway

Public Services

Common to All Build Alternatives

For all public services, response time during emergencies is critical and, for most of them, access to the sites of emergencies requires the use of public roadways. The Build Alternatives would improve the operation of the roadway network as compared to the No Build Alternative by reducing congestion and would improve emergency response times. The Build Alternatives would not affect police, fire, or emergency medical facilities adjacent to the alignment. A Maintenance of Traffic Plan would also be developed during final design to manage traffic and emergency services during construction (see Chapter 3 for more information about the Maintenance of Traffic Plan).

Airport Alternative

Section 4.4.2 lists three fire stations and six hospitals adjacent to the alignment. The only effect on these facilities would be a partial acquisition (0.28 acre) of land and parking in the vicinity of the Y. Makalapa Branch Medical Clinic. Only the Airport and the Airport & Salt Lake Alternatives would impact this facility.

Utilities

Common to All Build Alternatives

A number of properties owned by utility providers would be affected by partial acquisitions. This includes two properties owned by the Hawaiian Electric Company and one owned by the State of Hawai'i Department of Transportation. A narrow strip of land would be acquired from each. Coordination would occur to further assess these effects during preliminary and final engineering.

In addition to the direct effects on utilities from project right-of-way acquisitions, the construction of a new fixed guideway transit system would involve relocation and modification of existing utilities. These construction effects are discussed in more detail in Section 4.17.

Salt Lake Alternative

In addition to effects common to all Build Alternatives, required partial property acquisition for the Project would be needed from the City Sewer Pump Station.

Airport Alternative

No additional effects would occur under the Airport Alternative other than those described previously as common to all Build Alternatives.

Airport & Salt Lake Alternative

The effects on utilities for the Airport & Salt Lake Alternative would be the same as those described previously as common to all Build Alternatives, plus the additional effects described for the Salt Lake Alternative.

Mitigation

Community Facilities

Measures to reduce the adverse effects on individual community facilities would be evaluated during preliminary and final engineering design. Mitigation efforts would involve coordination with individual property owners as necessary to appropriately address effects to community facilities. In addition, all property would be acquired following the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act and applicable State regulations.

Parklands and Recreational Facilities

Effects to parklands and recreational resources would be mitigated in coordination with parkland property owners. Depending on the final design, additional mitigation measures may be necessary to avoid a net loss in recreational amenities in adjacent neighborhoods. A separate evaluation has also been conducted for each publicly owned parkland property that meets Federal criteria as a Section 4(f) resource (see Chapter 5).

Public Services

A project-specific Safety and Security Management Plan (SSMP) would be developed in accordance with FTA requirements to mitigate potential effects on community services, such as fire prevention, emergency preparedness, and response. The Honolulu Police Department, the Honolulu Fire Department, the Department of Emergency Management, and the Honolulu Emergency Services Department would be involved in preparing and implementing the plan. The plan would address public safety and security concerns, including the following:

- Threats and hazards associated with the Project
- Specific issues that arise through community outreach efforts
- Design and architectural details to enhance safety
- Use of closed-circuit television cameras and lighting included as a specific design measure
- Security patrols of transit property and vehicles, ongoing train safety awareness education, and ongoing public security awareness education.

4.5 Neighborhoods

This section describes the neighborhoods adjacent to the project alignment and the anticipated effects on these neighborhoods from the long-term operation of the Project. Effects on neighborhoods include adverse and beneficial effects on neighborhood character, quality of life, and cohesion. For additional information and references, see the *Honolulu High-Capacity Transit Corridor Project Neighborhoods and Communities Technical Report* (RTD 2008d).

4.5.1 Background and Methodology

Methodology

Neighborhood board boundaries were used to define neighborhood divisions. Neighborhood boards were created by City Charter to facilitate citizen participation on the island and in regional planning activities. Only those neighborhoods adjacent to the project alignment are discussed in this section. Figure 4-13 illustrates the neighborhood boundaries. The discussion of local neighborhoods is focused on their individual demographics and character.

4.5.2 Affected Environment

Neighborhoods

The Project transects nine city-designated neighborhoods (Figure 4-13). In 2000, the population within the study corridor was about 552,100. The area had experienced moderate growth over the previous decade with less than 1 percent average annual growth per year. The population of the neighborhoods ranges from 12,300 in Downtown and Ala Moana-Kaka'ako to more than 54,000 in Āliamanu-Salt Lake.

Residents in the neighborhoods of the study corridor are very diverse with 60 to 80 percent of Asian ancestry. However, based on the 2000 census, the Airport and Waikīkī neighborhoods are more than 50 percent White, including military personnel and their dependents, as well as people who have moved from the mainland. In general, there is a wide diversity of household sizes throughout the study corridor, ranging from studio apartments to larger multi-family households.

Due to their location in the urban core, the Kalihi-Palama, Downtown, Ala Moana-Kaka'ako, Waikīkī, and McCully-Mō'ili'ili neighborhoods are distinct from the western O'ahu neighborhoods, which are predominantly comprised of single-family residences. Households in these urban core neighborhoods tend to be smaller with more than 40 percent of individuals living alone.
The following paragraphs describe the general land use, character, and unique physical or social attributes of the study corridor neighborhoods.

`Ewa

'Ewa is one of O'ahu's suburban growth centers and is experiencing rapid change. It encompasses the communities of Kapolei (the "second city"), 'Ewa Villages, 'Ewa by Gentry, Hono'uli'uli, 'Ewa Beach, Ocean Pointe, and Iroquois Point. Between 1990 and 2000, the population of this neighborhood doubled as sugar cane lands were developed into housing and commercial uses. Despite the substantial development, some former sugar cane land is being used for diversified agriculture.

Waipahu

Historically, the Waipahu community makai of the H-1 Freeway was a sugar plantation town, and the community retains strong identity to this historic economic activity. Newer apartment buildings and strip retail plazas are generally limited to the fringes of the commercial district along Farrington Highway. Waipahu has a recreation center, health clinics, churches, and social services offices. Many residents travel outside of the community for employment.

Pearl City

The Pearl City area consists of residential development, mixed-commercial uses, and military housing and facilities. The community was originally

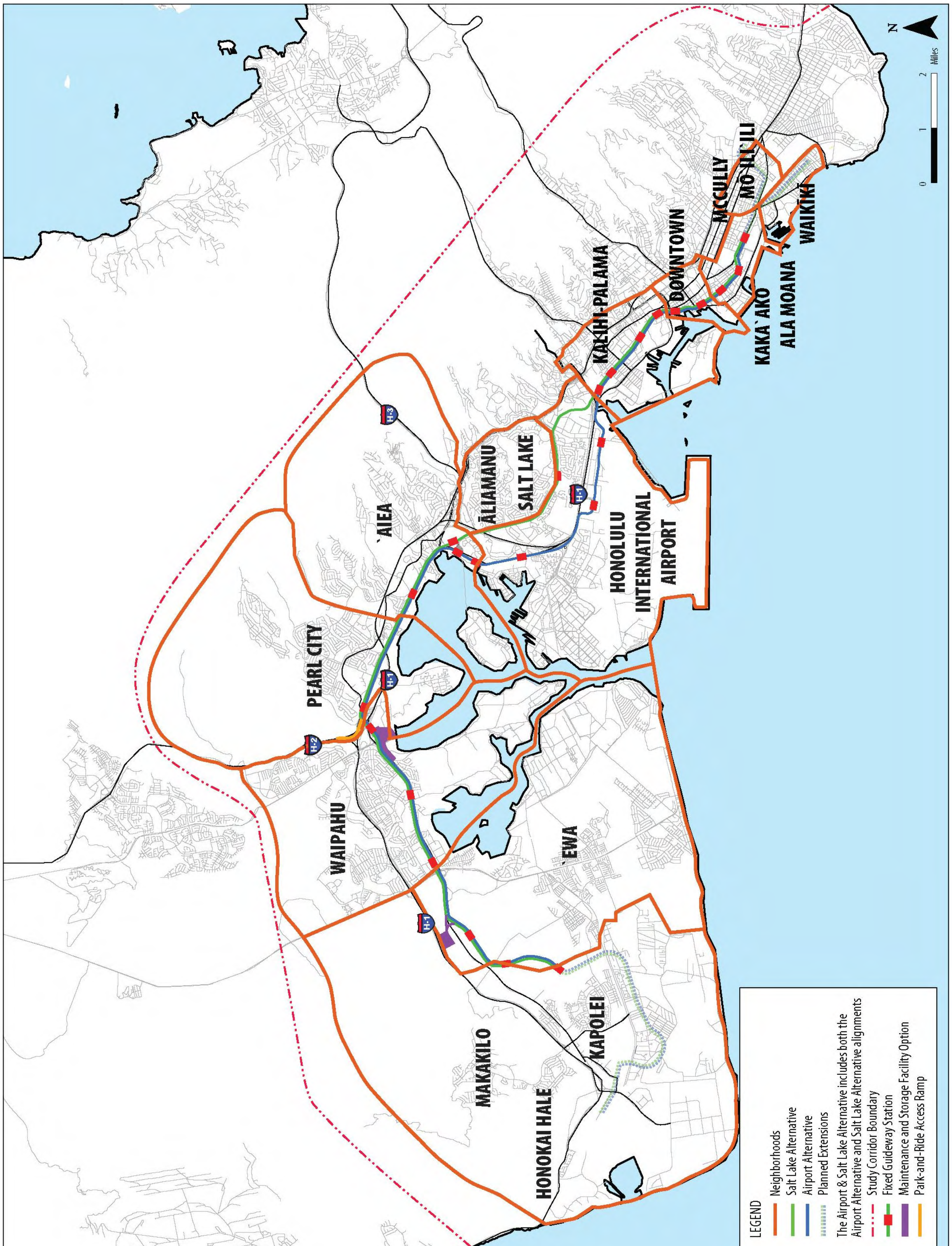

Figure 4-13 Corridor Neighborhoods

developed by Benjamin Dillingham in the 1890s as Hawai'i's first planned city and suburban development for affluent and independent farmers. Retail and commercial venues include the Pearl City Shopping Center and the Pearl Highlands Center. Blaisdell Park near Pearl Harbor is a regional recreation amenity that is popular for outdoor community activities. A small area known as the Banana Patch lies within the Pearl City neighborhood boundary. This neighborhood is unique in that, while it is in an urban region, residents are able to maintain an agricultural, subsistence lifestyle. The community, which is discussed in more detail in Section 4.6, Environmental Justice, has a high concentration of Filipinos.

`Aiea

This community consists of residential development, mixed-commercial uses, and military housing and facilities. Most of the residential subdivisions are mauka of Kamehameha Highway. The makai areas tend to be commercial or military. Pearlridge Center is a major employment center and tourist destination. Many 'Aiea residents work at the nearby Pearl Harbor Naval Base, Hickam Air Force Base, and Marine Corps Base Camp Smith.

Airport

The Airport neighborhood is characterized by non-residential land uses. The Airport Commercial District, located makai of the Nimitz Viaduct, is primarily an industrial, commercial, service-oriented district. The Māpunapuna Light Industrial District, between the Moanalua Freeway, Moanalua Stream, Nimitz Highway, and Pu'uloa Road, includes primarily light industrial businesses with some retail and commercial businesses and offices. The Fort Shafter Military Reservation, mauka of the H-1 Freeway in Moanalua, is an active military base. The Pearl Harbor Naval Base residential housing area (known as Catlin Housing) is bounded by Salt Lake Boulevard, Pu'uloa Road, Nimitz Highway, and Namur Road/Valkenburgh Street.

Āliamanu-Salt Lake

The Āliamanu-Salt Lake area offers a variety of housing options. The primary residential areas are Foster Village, Āliamanu, and Salt Lake. The area of Salt Lake within Ala 'Ilima Street and Likini Street between Ala Liliko'i and Ala Napunani Streets is dominated by a large number of high-rise apartments. The main commercial areas include the Salt Lake Shopping Center.

Kalihi-Palama

The Kalihi-Palama neighborhood contains a wide variety of land uses with unique community identities, such as Kalihi Kai, Kapālama, and Iwilei. The Kalihi-Palama communities makai of the H-1 Freeway are a mix of residential, business, retail, and industrial-commercial land uses. Residential housing is generally more prevalent in the mauka areas, and commercial and industrial businesses are more prevalent in the makai areas. Businesses vary in size from "mom-and-pop" stores to big box retail establishments, such as Costco and Best Buy, as well as Dole Cannery Mall. The Bishop Museum (mauka of the H-1 Freeway) is a popular tourist attraction that houses an extensive collection of Hawaiian artifacts and royal family heirlooms.

Downtown

Downtown Honolulu is a vibrant city center and one of the State's largest employment centers. It is experiencing substantial redevelopment to higher-density land uses. Although it is the State's principal government office and business center, as well as the location of many tourist attractions, it continues to have a substantial residential population. The Hawai'i Capital District is the seat of City and County, State, and Federal government offices and includes a number of historic mid-19th century buildings. The historic Chinatown District is a popular attraction for O'ahu residents and tourists. High-rise condominiums and apartments are interspersed throughout Downtown. Fort Street Mall is a major gathering place for

Table 4-8 Year 2000 Demographic Characteristics of Neighborhoods

Neighborhood	Household Median Income	White	Black	American Indian & Alaska Native	Asian	Native Hawaiian & Pacific Islander	Other	Two or More Races
\`Ewa	$58,230	17%	2%	0.2%	50%	7%	1%	23%
Waipahu	$60,270	9%	2%	0.2%	62%	9%	1%	18%
Pearl City	$66,500	16%	2%	0.2%	56%	6%	1%	18%
\`Aiea	$55,240	18%	2%	0.3%	49%	9%	1%	21%
Airport	$41,000	61%	12%	1.0%	11%	1%	4%	9%
Āliamanu-Salt Lake	$51,750	19%	6%	0.3%	52%	6%	2%	14%
Kalihi-Palama	$31,630	4%	1%	0.1%	66%	14%	1%	14%
Downtown	$29,950	22%	1%	0.2%	58%	6%	1%	12%
Ala Moana-Kaka\`ako	$30,620	19%	1%	0.2%	62%	4%	1%	12%
Total O\`ahu	$52,280	21%	2%	0.2%	46%	9%	1%	20%

Source: Department of Planning and Permitting, City and County of Honolulu, 2006. Selected Economic Characteristics: 2000 by Neighborhood Area.

Hawai'i Pacific University students, downtown workers, and residents.

Ala Moana-Kaka\`ako

The Ala Moana-Kaka'ako community encompasses the 600-acre Kaka'ako Community Development District from the shoreline makai of South King Street and between Pi'ikoi and Punchbowl Streets. Redevelopment is replacing old one- and two-story warehouses and light industrial uses with new urban mixed-use development. The area between Ke'eaumoku and Pensacola Streets mauka of Kapi'olani Boulevard is characterized by two- and three-story walk-up apartments in a quieter residential environment. The neighborhood's shopping and retail centers, especially the Ala Moana and Ward Centers, are popular with residents as well as tourists staying in nearby Waikīkī. These centers are being expanded and redeveloped. Other activity centers include a number of popular parks, Neal S. Blaisdell Center and Concert Hall, and the Hawai'i Convention Center.

Demographic Characteristics

Table 4-8 presents economic and racial characteristics for each neighborhood based on the 2000 census data. It illustrates considerable variation in neighborhood population size and median household income. Racial characteristics vary less widely. Military housing areas in the Airport neighborhood have higher percentages of White and Black residents in comparison to the racial composition of O'ahu.

4.5.3 Environmental Consequences and Mitigation

Environmental Consequences

This section evaluates potential effects on neighborhoods adjacent to the project alignment. A discussion of neighborhood safety and security issues is found in Section 4.4. Aesthetic issues and their effect on adjacent land uses are discussed in Section 4.7.

No Build Alternative

Under the No Build Alternative, the Project would not be built and would not have any impacts to neighborhoods. The quality of life, however, would be reduced by increased congestion, increased travel time, and reduced mobility affecting single-occupancy vehicles, high-occupancy vehicles, and bus transit passengers.

Common to All Build Alternatives

All Build Alternatives would provide people living and working in the neighborhoods within the study corridor with increased mobility. The Project would provide an alternative to traveling by personal vehicle or bus transit within the existing transportation corridors. Passengers using the new transit system would experience reduced travel time to other neighborhoods and growth centers along the project alignment and near transit stations. The Build Alternatives would provide a reliable and efficient travel mode for accessing the region's current and future jobs, shopping, and social resources, particularly those in Kapolei and Downtown—the major urban centers of the study corridor in the future. This increase in mobility for neighborhood residents would generally improve the quality of life, especially for those with limited financial resources and those who may be transit-dependent.

The transit agency could experience three types of crimes: crimes against persons, crimes involving transit property, and other crimes committed on transit property. To reduce the potential for crime, the FTA requires the development and implementation of an SSMP for new fixed guideway projects (49 CFR 633). The SSMP addresses the technical and management strategies for analyzing safety or determining security risks throughout the Project's life cycle. The SSMP commits that the highest practical level of operational safety and security would be used. In addition, it lays the foundation for future safety and security once the Project is operating. The SSMP is reviewed and updated regularly throughout the Project's life cycle.

Potential new development and redevelopment along the project alignment, as well as the scale of the transit system itself, may affect the character of development along the alignment. This change in character would not have a substantial effect on the existing development patterns or community character within the surrounding neighborhoods. Currently, most of the residential housing is more prevalent within the mauka areas, and commercial and industrial businesses are primarily within the makai areas. The Project would not substantially change this development pattern. Since the transit system would be elevated, it would not create a physical barrier to pedestrian or other forms of travel within the study corridor. It also would not pose a barrier to the social network of the community since it would be located within an existing transportation corridor or in the 'Ewa area, along a planned future transportation system.

The following paragraphs describe the Project's effects on individual neighborhoods.

ʻEwa—The three transit stations in ʻEwa, East Kapolei, UH West Oʻahu, and Hoʻopili, as well as the project alignment, would not affect community character and cohesion in ʻEwa because the affected area is undeveloped and primarily used for agriculture (see Section 4.1 for more information on farmlands). The area is planned to be developed into urban land uses, and the Project would support these development plans.

Waipahu—The project alignment follows Farrington Highway through the Waipahu neighborhood. The area is urbanized, with land uses along the highway consisting primarily of commercial uses, strip retail plazas, and both high-rise and medium-density apartments. The Koko Head end of Farrington Highway in Waipahu is mostly single-family housing but also includes Waipahu High School. Most of the residential communities are oriented away from this heavily traveled roadway. Because Farrington Highway functions as both a major arterial and collector road, and varies in width from four to six lanes with a landscaped median, the transit route would not create an access or transportation barrier between the makai and mauka sides of the road. As an elevated structure, which would span all intersections, it would not prevent pedestrians and motorists from conducting their normal travel pattern within the community. Potential redevelopment along the project alignment, and in particular at the station locations, may represent an asset to the neighborhood by providing new resources and an accessible transit option.

Pearl City—The project alignment extends through the Pearl City neighborhood, along the median of Kamehameha Highway, a heavily traveled roadway with adjacent multi-story commercial uses near the Pearl Highlands and Pearlridge Stations. The surrounding residential uses would not be affected by property acquisitions and, being located within the highway median, the Project would not form a barrier to adjacent residential communities as residences are oriented away from the highway. In addition, being an elevated structure, the transit system would not create a physical barrier to pedestrians or other forms of travel within the community. The Project would not affect community identity or cohesion as the transit system would be compatible with the existing community character along the alignment. The Project would impact the Banana Patch community, which is discussed in Section 4.6.

'Aiea—The route through the 'Aiea neighborhood continues to follow Kamehameha Highway, and the effects would be very similar to those described for the Pearl City and Waipahu neighborhoods. Most of the residential areas are mauka of Kamehameha Highway with land uses makai of the highway being primarily commercial or military. As such, the Project would not create a barrier to adjacent communities nor would it limit pedestrian or other travel modes within these communities. As the transit route passes Aloha Stadium, there are very few buildings adjacent to the alignment due to the expanse of the stadium parking. Few residential communities are located nearby.

The effects on the Airport and Āliamanu-Salt Lake neighborhoods are discussed separately for the individual alternatives below.

Kalihi-Palama—The project alignment through the Kalihi-Palama neighborhood follows Dillingham Boulevard. The boulevard is a major arterial that travels through smaller, well-established residential communities, but also functions as a major collector for neighborhood circulation. Small-scale commercial businesses and a few historic land uses line the boulevard. Dillingham Boulevard is a much narrower roadway than either the Farrington or Kamehameha Highways. As a result, the Project would require widening the roadway to maintain the same number of travel lanes while accommodating the guideway's support columns. This widening would result in full acquisitions of two residential parcels and partial property acquisitions along Dillingham Boulevard. Several true Kamani trees would also be removed by the Project. Impacts would occur to historic properties, as discussed in Section 4.15. These impacts would be mitigated, and mitigation may include replacing the trees.

Downtown—The Project would continue through the Downtown neighborhood within the median of Nimitz Highway. This highway is similar to Farrington and Kamehameha Highways as it is a heavily traveled roadway with limited cross traffic. As such, the highway already represents a physical barrier to the neighborhoods on each side. The Project would not create a new barrier or affect the physical character of adjacent communities. Within the Downtown area, the Project would pass the historic districts of Chinatown and Merchant Street. Nimitz Highway is located along the perimeter of these two districts between the downtown uses and the shoreline; therefore, the transit system would have little effect on the integrity of the historic districts or their uses. As the alignment transitions to Halekauwila Street, a relatively narrow city street, the adjacent buildings become primarily high-rise government office buildings with little or no open space between them. Views of the alignment would be limited to short segments as the guideway crosses city streets since high-rise buildings and tall trees already obstruct views. The transit system would be elevated so it would not affect the flow of traffic, bicyclists, or pedestrians within the Downtown neighborhood.

Ala Moana-Kaka'ako—The Project would extend to Ala Moana Center traveling mostly along Halekauwila and Kona Streets. The transition between these streets would require property acquisitions and displacements. Land uses adjacent to the alignment include two- and three-story walk-up apartments and commercial uses within the Kaka'ako area and newer urban mixed-use development within the Ala Moana area. In general, land uses are less dense than in the Downtown neighborhood. Because Kaka'ako has been designated a redevelopment area, changes in land uses to transit-oriented development (TOD) is likely, which may result in a change in character along the alignment, especially near stations. However, substantial development has recently occurred in the neighborhood; several high-rise condominium developments have been built; and additional residential and commercial development is planned. The elevated transit structure would not create a barrier to pedestrian or other modes of travel.

Salt Lake Alternative

The Salt Lake Alternative would affect all of the communities listed above under the heading Common to All Build Alternatives, plus the Āliamanu-Salt Lake neighborhood.

Āliamanu-Salt Lake—The project alignment would follow Salt Lake Boulevard, which is the northern boundary of the Airport neighborhood and the southern boundary of the Āliamanu-Salt Lake neighborhood. The boulevard is a busy, heavily traveled roadway. The section from Aloha Stadium to Wanaka Street was recently widened. The City is planning to widen the section from Wanaka Street to Ala Liliko'i Street. Most of Salt Lake Boulevard is adjacent to single-family and duplex residences. The mauka side includes the Foster Village and Āliamanu neighborhoods. The makai side of the street is mostly used for Navy housing, but is generally not visible from the road. Except for certain areas, the Navy allows the general public to drive through these areas, and many motorists travel to and from Kamehameha Highway and the H-1 Freeway. The access points along Salt Lake Boulevard are Maluna Street/Namur Road and Likini Place/Radford Drive. The project alignment would be located on the fringe of the community, and no full acquisitions or displacements would be necessary; therefore, changes in land use and potential effects on community character would not occur.

Airport Alternative

The Airport Alternative would affect all the communities listed above under the heading Common to All Build Alternatives, plus the Airport neighborhood.

Airport—The project alignment would travel along busy, heavily traveled Kamehameha Highway and transition to Aolele Street near the airport. The neighborhood is primarily characterized by military and industrial uses and Honolulu International Airport. Most of the residential land uses are mauka of Nimitz Highway. The project alignment would require minimal acquisitions, redevelopment, or changes in current land uses. No properties would be acquired in full under this alternative. The transit facility is not expected to be a visual or physical barrier in the neighborhood and would not affect community identity or cohesion.

Airport & Salt Lake Alternative

The Airport & Salt Lake Alternative would have the combined effect on neighborhoods as described above for the Salt Lake Alternative and the Airport

Alternative. The number of full acquisitions and displacements for the Airport & Salt Lake Alternative would be 35 parcels. These are the same full acquisitions and displacements that would occur for the Salt Lake Alternative.

Mitigation

Since there would be no adverse effects to these neighborhoods, no mitigation is required. Ongoing coordination efforts with the public will help develop design measures that would enhance the interface between the transit system and the surrounding community.

4.6 Environmental Justice

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (USEO 1994) was signed by President Clinton on February 11, 1994. This Executive Order directs Federal agencies to take appropriate and necessary steps to identify and address disproportionately high and adverse effects of their projects on the health or environment of minority and low-income populations to the greatest extent practicable and permitted by law. The order directs Federal actions, including transportation projects, to use existing law to avoid discrimination on the basis of race, color, or national origin, and to avoid disproportionately high and adverse impacts on minority and low-income populations. These are often referred to as environmental justice (EJ) populations.

There are three fundamental Environmental Justice principles:

- To avoid, minimize, or mitigate disproportionately high and adverse human health or environmental effects, including social and economic effects, on minority populations and low-income populations.
- To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
- To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority populations and low-income populations.

Executive Order 12898 requires all Federal agencies to incorporate EJ into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. A "disproportionately high and adverse effect" is defined as follows:

> Disproportionately High and Adverse Effect on Minority and Low-Income Populations means an adverse effect that:
>
> (1) is predominately borne by a minority population and/or a low-income population; or
>
> (2) will be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or non-low- income population. (USDOT Order 5610.2).

The EJ analysis for the Project identifies O'ahu Metropolitan Planning Organization (O'ahuMPO) EJ Areas within the study corridor and presents the impact determinations regarding the likelihood that disproportionately high and adverse impacts would be experienced. This section discusses potential measures to avoid, minimize, and/or mitigate those impacts to EJ populations and documents the Project's public outreach efforts to EJ communities. For more detailed information and references, see the *Honolulu High-Capacity Transit Corridor Project Neighborhoods and Communities Technical Report (RTD 2008d).*

4.6.1 Background and Methodology

Regulatory Context

The principles of EJ are rooted in Title VI of the Civil Rights Act of 1964, which prohibits discrimination on the basis of race, color, and national origin in programs and activities receiving Federal financial assistance. Additional laws, statues, guidelines, and regulations that relate to EJ issues include the following:

- Title 49 of the United States Code (USC) Section 5332, Nondiscrimination (USC 1994)
- Title 49 of the Code of Federal Regulations (CFR) Part 21, *Nondiscrimination in Federally Assisted Programs of the Department of Transportation—Effectuation of Title VI of the Civil Rights Act of 1964* (CFR 1996d)
- Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (USEO 1994)
- *Environmental Justice Guidance Under the National Environmental Policy Act* (CEQ 1997b)
- *USDOT Order to Address Environmental Justice in Minority Populations and Low-Income Populations* (USDOT 1997)
- *FHWA Actions to Address Environmental Justice in Minority Populations and Low-income Populations* (FHWA 1998)
- Hawai'i Revised Statutes (HRS) Chapter 368, Civil Rights Commission (HRS 1989)
- Executive Order 13166, *Improving Access to Services for Persons with Limited English Proficiency* (USEO 2000)
- *Americans with Disabilities Act of 1990* (ADA 1990)
- *Hawaii Environmental Justice Initiative Report* (HEC 2008)

Methodology

This analysis identifies potential effects on minority and low-income populations that reside within the study corridor. The effects of the Project on identified O'ahuMPO EJ Areas were analyzed as follows:

- How well the Project would serve the transportation needs of the identified EJ populations and communities of concern in comparison to all other population groups within the study corridor
- Whether the effects of the Project (e.g., construction, visual, noise) would have disproportionately high and adverse effects on the social, cultural, health, and well-being of the identified EJ populations and communities of concern as compared to other population groups within the study corridor

Defining Environmental Justice Areas

The USDOT Order 5610.2 and subsequent agency guidance defines the term "minority" to include any individual who is Black, Hispanic, Asian-American (Asian), American Indian and Alaskan Native, and Native Hawaiian and Other Pacific Islander. Based on guidance from the Federal Council on Environmental Quality (CEQ), "minority populations should be identified where either: (a) the minority population of the affected area exceeds 50 percent or (b) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographic analysis" (CEQ 1997a).

The term "low-income," in accordance with USDOT Order 5610.2 and agency guidance, is defined as a person with a household income at or below the U.S. Department of Health and Human Services (USHHS) poverty guidelines. These poverty guidelines are a simplified version of the Federal poverty thresholds used for administrative purposes (e.g., for determining financial eligibility for certain Federal programs). The U.S. Census Bureau has developed poverty thresholds, which are used for calculating all official poverty population statistics. The Census Bureau applies these thresholds to a family's income to determine its poverty status.

O'ahu, however, has unique demographic characteristics because minorities make up the majority of the population. Because of this racial and ethnic diversity, the O'ahuMPO developed a method to define O'ahuMPO EJ Areas that would be more meaningful to the demographics of the island. O'ahuMPO EJ Areas are defined as areas where the minority or low-income population concentration was meaningfully greater than the surrounding population.

Using 2000 Census data, O'ahuMPO's analysis uses the Federal definition of minority as well as the "poverty thresholds" as defined by the Census Bureau. Rather than relying on EJ definitions that are less meaningful to O'ahu's unique demographic composition, O'ahuMPO's method normalizes census block group data so that basic statistical measures can be applied. The method relates the relative concentration of a minority group or low-income households within a census block group to the total population within the census block group. A block group qualifies as EJ if the relative frequency of one or more minority groups or low-income households was in the highest 16 percent (greater than one standard deviation) of frequencies across the island. Block groups were then assembled into the O'ahuMPO EJ Areas (O'ahuMPO 2004). These data are presented in Section 4.6.2, Affected Environment.

Coordination with the City and County of Honolulu Department of Transportation Services (DTS) and Department of Planning and Permitting (DPP), the State of Hawai'i Department of Transportation (HDOT), the FTA, and the U.S. Environmental Protection Agency (EPA) resulted in the determination that the O'ahuMPO method for determining O'ahuMPO EJ Areas was appropriate for the Project. Therefore, the definition of EJ populations for this Project includes low-income and minority populations that are within the O'ahuMPO EJ Areas.

Communities of Concern

In addition to minority and income status, other data were used as additional indicators of communities of concern, including linguistically isolated households, transit-dependent populations, and areas with public housing and community services. The U.S. Census Bureau defines a "linguistically isolated household" as a household in which all members age 14 or over speak English less than "very well." Block groups with 25 percent or more of households with no vehicle or with 21 percent or more linguistically isolated households are included in the areas designated as communities of concern and are illustrated on Figure 4-15. These criteria serve to further identify transit-dependent populations but are not included in the definition of EJ populations. Data on communities of concern also serve to direct public outreach efforts. In addition to the census data, field surveys, data gathered for other projects within the study corridor, and on-going public involvement activities were used to assist in identification of communities of concern.

4.6.2 Affected Environment

Figure 4-14 shows the areas that have met the O'ahuMPO EJ threshold within the study corridor (one-half-mile from the project alignment). Figure 4-15 shows areas identified as containing communities of concern. As described in Section 4.5, the physical, social, and economic characteristics across and within each neighborhood vary, including the racial, ethnic, and economic composition of the population. The demographics of the neighborhood areas are also described in Section 4.5.

Table 4-9 lists each of the O'ahuMPO EJ Areas illustrated in Figure 4-14, with the demographic data from the 2000 census. It shows there is considerable ethnic and racial diversity along the project alignment.

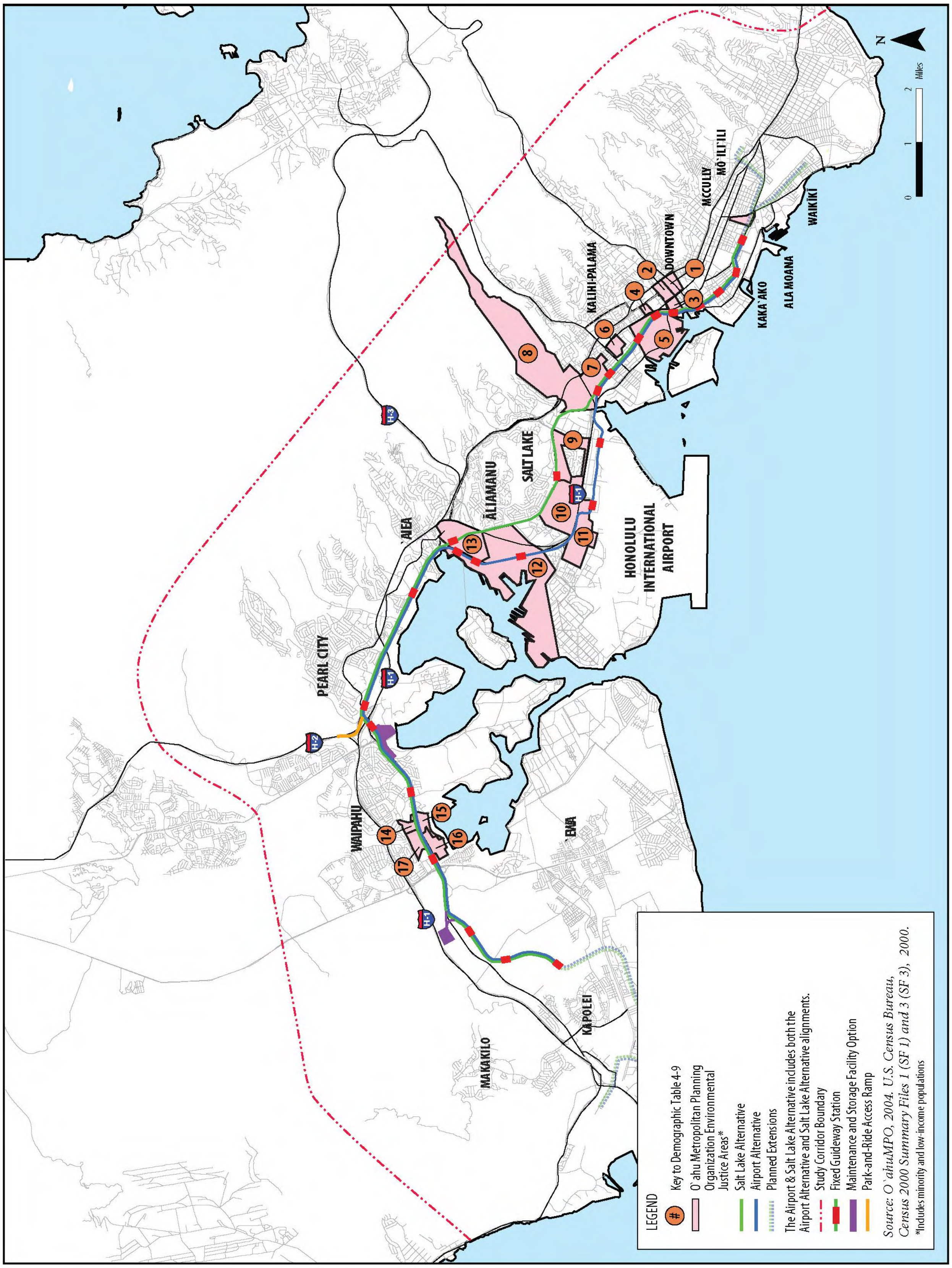

Figure 4-14 Environmental Justice Populations within the Study Corridor

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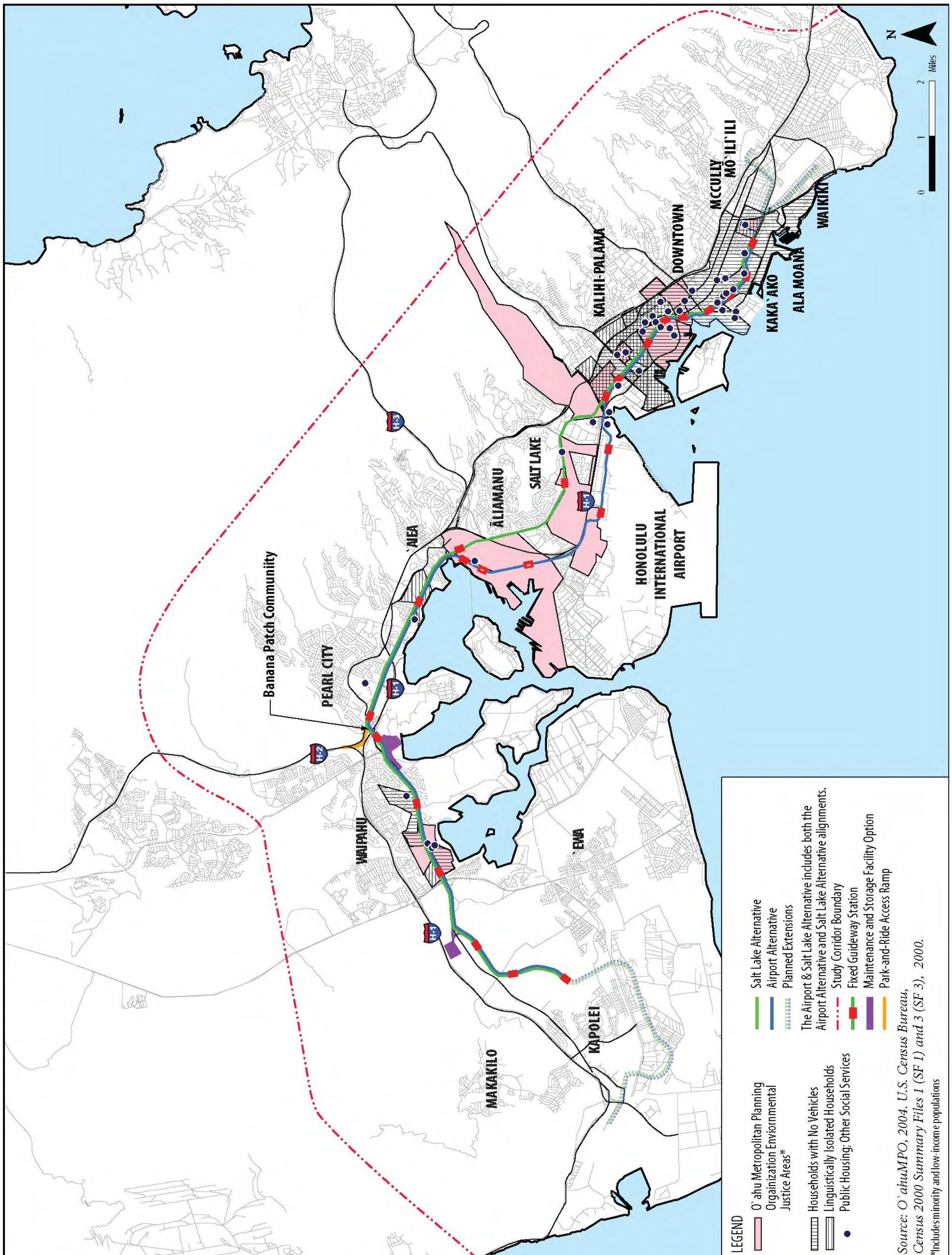

Figure 4-15 Communities of Concern within the Study Corridor

Table 4-9 Demographic Characteristics of O`ahuMPO Environmental Justice Area

O`ahuMPO EJ Area (illustrated on Figure 4-14)	% White	% Black	% American Indian or Alaska Native	% Asian	% Native Hawaiian or Pacific Islander	% Hispanic	Low income (Yes/No)
1	23	1	0	57	4	3	Yes
2	14	0	1	75	2	3	Yes
3	11	2	0	69	6	5	Yes
4	1	1	0	53	23	5	Yes
5	17	5	0	43	16	7	Yes
6	4	1	0	46	18	14	Yes
7	6	1	0	62	13	6	No
8	60	20	1	6	2	11	No
9	62	11	1	13	1	11	No
10	60	10	1	14	1	7	No
11	58	15	1	9	3	11	No
12	63	16	1	11	1	6	No
13	7	1	0	33	27	13	Yes
14	3	1	0	25	49	5	No
15	5	2	0	19	50	8	Yes
16	4	1	0	23	43	11	No
17	7	2	0	54	18	10	No

Source: O'ahuMPO, 2004. U.S. Census Bureau, Census 2000 Summary Files 1 (SF 1) and 3 (SF 3), 2000.

Because potential impacts to O'ahuMPO EJ Areas could include social and community resources, such as meeting halls, public gathering places, or community resources of special importance to EJ populations, this analysis documented five community resources adjacent to the alignment. Potential impacts to these facilities are discussed in the following section. The five community resources include:

- Goodwill
- Pu'uwai Momi
- Pu'uwai Momi Housing Complex Teen Center
- Salt Lake Apartments
- Institute for Human Services

Through public involvement activities, an EJ area of concern was identified. The Banana Patch community is not an O'ahuMPO EJ Area but is discussed in Section 4.6.5, Banana Patch Community.

4.6.3 Environmental Consequences

No Build Alternative

Under the No Build Alternative, the project would not be built and would not have any impacts to O'ahuMPO EJ Areas or populations. Although the projects in the ORTP would be built, their environmental impacts would be studied in separate documents.

Common to All Build Alternatives

As a result of the public outreach efforts, this EJ analysis, and the analyses presented throughout Chapter 4, the following have been identified as resource areas of particular concern for EJ populations:

- Impacts from right-of-way acquisition
- Impacts to community cohesion
- Impacts to social and cultural resources
- Visual quality impacts
- Noise and air quality impacts
- Traffic and transportation impacts
- Short-term construction impacts

Section 4.3 discusses right-of-way acquisitions. There are approximately 1,200 parcels adjacent to the alignment. The Project would acquire right-of-way from 14 percent of the parcels adjacent to the corridor. This number equally affects the O'ahuMPO EJ Areas and non-EJ Areas. This demonstrates that the relative proportion of the right-of-way acquisitions inside and outside the O'ahuMPO EJ Areas are about equal. Therefore, there are no disproportionately high and adverse effects on O'ahuMPO EJ Areas.

Sections 4.4 and 4.5 discuss potential effects on social and community cohesion and community facilities. There is a public perception that community cohesion would be adversely affected by the Project. Because the Project would be constructed primarily within an existing transportation corridor in developed areas, it would not divide or bisect any communities beyond existing conditions or the No Build Alternative. Therefore, there would be no adverse effect on community cohesion in O'ahuMPO EJ Areas. Unlike freeways, with restricted access, vehicular and pedestrian access to areas along the project alignment would not be restricted by the Project.

Section 4.7 discusses visual impacts from the Project. Examples of visual impacts include loss of trees, altered 'Ewa-Koko Head and mauka-makai views, and inconsistent scale and context of setting. The Project is set in an urban context where visual change is expected and differences in scales of structures are typical. Moderate to high visual impacts would occur throughout most of the study corridor. There would not be any disproportionately high and adverse effects in O'ahuMPO EJ Areas.

The air quality analysis described in Section 4.8 indicates a net improvement in air quality by 2030. O'ahuMPO EJ Area would not experience any disproportionately high and adverse impacts to air quality.

Section 4.9 discusses potential noise impacts that could occur along the corridor. The noise analysis indicates there would be no severe noise impacts in the study area, although moderate impacts would occur in several areas. These noise impacts would occur outside of O'ahuMPO EJ Areas.

Section 4.15 indicates the Project would result in seven adverse effects on historical resources. None of these occur in O'ahuMPO EJ Areas. Overall, the Project would have few effects on social or community facilities within O'ahuMPO EJ Areas. While there would be partial acquisition of some community facilities, there would not be any disproportionately high and adverse effects to resources of special importance to EJ populations within O'ahuMPO Areas.

The effects of construction within the study corridor are discussed in Chapters 3 and 4. Section 3.5, Construction-Related Effects on Transportation, discusses traffic-related impacts during construction, including road closures and rerouting; sidewalk and bike lane closures and rerouting; bus stop closures. Section 4.17 discusses construction impacts related to relocations; noise and dust generated by construction vehicles and activities; and visual disruption associated with large equipment use and storage, work-site screening, and removal of vegetation or structures. These construction effects would be temporary, and measures to mitigate or minimize temporary construction impacts would be implemented. Construction activities would occur throughout the study corridor and would affect both O'ahuMPO

EJ and non-EJ areas alike. Therefore, there would be no disproportionately high and adverse impacts on O'ahuMPO EJ Areas.

Effects of the Build Alternatives also would result in transit benefits. These benefits include increased transit options, improved mobility, proximity to transit links, and access to expanding employment opportunities. As Chapter 3 illustrates, traffic and transit performance would improve within the study corridor, and these benefits can be realized by all populations. The Salt Lake Alternative proposes 19 stations, 7 of which are in, or adjacent to, O'ahuMPO EJ Areas. Two of these are exclusive to the Salt Lake Alternative. There are 22 stations proposed for the Airport Alternative. Nine are in, or adjacent to, O'ahuMPO EJ Areas. Four stations exclusive to the Airport Alternative are located in O'ahuMPO EJ Areas. Therefore, people living in O'ahuMPO EJ Areas would have the same opportunity to access the transit and mobility improvements.

Based on the demographics within the study corridor, the need for public transit appears to be greatest within the project alignment. Transit service is meant to serve where the demand is greatest, and these areas are often within neighborhoods that have O'ahuMPO EJ Areas and communities of concern. Although populations adjacent to the alignment would be affected the most by operational and construction-related impacts, these groups include O'ahuMPO EJ and non-EJ Areas, and they would also receive improved transit access. Effects would be the same for all population groups and would not represent a high or disproportionate impact to residents in O'ahuMPO EJ Areas or communities of concern.

4.6.4 Public Outreach

During the public outreach effort for the Project, particular attention has been paid to reaching low-income and minority populations that are traditionally underserved and underrepresented in the public involvement process. This is in accordance with Executive Order 12898 (USEO 1994) and O'ahuMPO regulations. Materials have been prepared in the major languages of O'ahu, and translators have been available upon request at meetings. Information has been distributed through cultural organizations, ethnic associations, housing associations, community development groups, and similar organizations. Community issues brought forth in community meetings, stakeholder interviews, and at public workshops will be addressed as part of evaluating project alternatives.

The use of public involvement to engage communities of concern consists of public reading materials offered via the project website and handed out at meetings or other community events and the Speakers Bureau program. To reach populations that do not speak and/or read English, information on how to obtain reading materials in native languages has been provided. Project flyers containing information about the Scoping Meetings have been printed in 10 languages (Chinese, English, Ilocano, Japanese, Korean, Laotian, Samoan, Spanish, Tagalog, and Vietnamese) and placed at several local churches, health centers, and local civic and ethnic organizations. The project website is continually updated as new project information becomes available. Information concerning upcoming public meetings regarding the Project has been distributed periodically by "walkers" in several of the O'ahuMPO EJ Areas. Important project notifications also were placed in local ethnic and cultural newspapers, including the following:

- Hawai'i Hochi
- Korean Times
- Filipino Chronicle
- Korean Times
- Ka Nūpepa
- Fil-Am Courier
- Ka Wai Ola

In addition to sending flyers to all addresses on the project mailing list, an effort was made to distribute information to non-native English speakers in their appropriate languages. This action consisted of sending information to local churches and community service organizations that may have access to EJ populations and communities of concern. As the Project has progressed, more than 80 community service organizations have been included on the project mailing list. These organizations have also been provided with appropriate translated flyers to distribute to the community.

A concerted effort has been made to reach out to local churches, elderly care, and community organizations that cater to populations in need through the efforts of the Speakers Bureau. All organizations that previously received presentations were asked whether they would like to receive new presentations regarding updates to the Project, and new organizations were also contacted with offers to receive presentations.

Speakers Bureau presentations have been given at senior care facilities and local ethnic organizations (e.g., the Japanese and Chinese women's societies). Efforts have also been made to reach out to Native Hawaiian organizations. Targeted efforts through a new advertising campaign will also specifically target EJ populations and communities of concern. Public outreach and coordination with EJ populations and communities of concern have been ongoing throughout the Project. Outreach has included translated flyer materials, presentations to cultural groups (i.e., Japanese and Chinese organizations), distribution of project information to low-income communities, and one-on-one discussions with community members. The Project has been responsive to Neighborhood Boards, providing frequent updates about the Project in O'ahuMPO EJ Areas and communities of concern.

Although the public has been generally supportive of the Project, concerns regarding noise, costs, and visual impacts have been voiced. The majority of these concerns has been identified through scoping comments, Speakers Bureau presentations, Community Updates, Neighborhood Board presentations, and hotline and website comments. Community Updates have been held in or near communities of concern, including at Waipahu Elementary School, Alvah Scott Elementary School, Radford High School, and Farrington High School. Community Updates have been conducted at major project milestones. Presentations have also been given at senior living facilities throughout the study corridor.

Communications with Native Hawaiian groups have also identified potential concerns regarding impacts to burials, native Hawaiian landscapes, and indigenous flora and fauna. Communications with Hawaiian civic groups, recognized community leaders, and community organizations have increased as project information has become available, and this will continue throughout the process.

Public involvement efforts throughout the Draft EIS public comment period will continue to include close work with EJ populations, elderly, and communities of concern to identify potential concerns and to consider cultural sensitivity throughout the design and construction of the Project. Efforts will be made to identify and coordinate with EJ populations to actively solicit their input.

4.6.5 Banana Patch Community

The Banana Patch or lower Waiawa is located along the border of the Pearl City and Waipahu neighborhoods. It is bounded by Kamehameha Highway mauka, Farrington Highway makai, and the H-1 Freeway 'Ewa. Neither the Pearl City nor the Waipahu neighborhoods were identified as EJ areas using the O'ahuMPO method. However, the Banana Patch area has been identified as an EJ area of concern after outreach to community residents in July 2008 revealed that the predominantly Asian neighborhood would need to be relocated as part of the Project.

The Banana Patch community is in Census Tract 80.01 Block Group 2, Block 2001 and Census Tract 87.01 Block Group 2, Block 2001. According to the 2000 Census, 55 persons who identified themselves as Asian resided in this area. Some of the land in Census Tract 87.01 is used for construction equipment storage, and there are no residences in this portion of the Banana Patch. Approximately 10 residential structures and the Alpha Omega Christian Fellowship Church are within Census Tract 80.01. The census block that encompasses the entire Banana Patch community is 100 percent minority. Because income data are not available at the census block level, income determinations cannot be made.

Parcels within the Banana Patch area often contain multi-generational families living in several dwelling units. In some instances, the structures have been altered to accommodate additions, which is representative of multi-generational housing and is consistent with the Asian culture. The residents of this area do not have access to public water and sewer services. This community is unique in that it is located in an urban region, but residents are able to maintain an agricultural, subsistence lifestyle. While farming is not the primary source of employment or income for some of these families, it is a part of their household income.

The area was assessed in terms of potential property acquisition and/or displacements of residential and commercial buildings. An analysis of the potential displacements in the Banana Patch neighborhood was based on conceptual design plans for the Project. All of the Build Alternatives would displace residences, including single-family homes, businesses, and one church for the construction of the Pearl Highlands park-and-ride lot that would serve the Pearl Highlands Station. The community is bounded by several major highways and provides the optimal location for the Pearl Highlands park-and-ride lot. Further design refinements are not anticipated to reduce the number of impacts.

Although the alignment requires the above residential displacements, it would result in an overall minimal number of displacements that would result from construction of the Project. Therefore, displacements are not considered a disproportionately high or adverse impact from the alignment. However, impacts to the Banana Patch community suggest a disproportionate effect on community cohesion and isolation in addition to the relocation effects. The displacement of residences could result in adverse changes in social interaction or sense of community, stability, and psychological unity by removing residents from other residents who have resided in the same community for generations. Due to the high cost of living and available land, it is unlikely that residents would be co-located in another area of the city. Ongoing coordination with potentially affected residents would identify the extent of effects to social interactions and community cohesion.

The Project would have a beneficial effect on access to and from the Pearl City and Waipahu neighborhoods and other destinations by supporting the ability to travel using a variety of modes, including transit, motor vehicle, bicycle, and walking.

4.6.6 Mitigation

The identification of a disproportionately high and adverse effect on EJ populations does not preclude a project from moving forward. FHWA's Actions to Address Environmental Justice in Minority Populations and Low-income Populations (USDOT 1998) indicates that a disproportionately high and adverse effect may be carried out under the following conditions:

- "Programs, policies, and activities that will have disproportionately high and adverse effects on minority populations or low-income populations will only be carried out if further mitigation measures or alternatives that would avoid or reduce the disproportionately high and adverse effects are not practicable. In determining whether a mitigation measure or an alternative is 'practicable,' the social, economic (including costs), and environmental effects of avoiding or mitigating the adverse effects will be taken into account.

- Respective programs, policies or activities that have the potential for disproportionately high and adverse effects on populations protected by Title VI (protected populations) will only be carried out if:
  - (1) A substantial need for the program, policy, or activity exists, based on the overall public interest; and
  - (2) Alternatives that would have less adverse effects on protected populations have either:
    - (a) adverse social, economic, environmental, or human health impacts that are more severe; or
    - (b) would involve increased costs of an extraordinary magnitude."

CEQ guidelines state that "mitigation measures identified in an EIS or developed as part of a Finding of No Significant Impact should reflect the needs and preferences of affected low-income populations, minority populations, or Indian tribes to the extent practicable."

The Project would not result in disproportionately high and adverse impacts within O'ahuMPO EJ Areas. Therefore, no specific mitigation measures to reduce impacts are warranted.

Mitigation for Banana Patch Community

During the public comment period, a community meeting will be held in the Banana Patch community. All residents will be invited to attend this meeting. The FTA Civil Rights Officer will attend this meeting. This coordination will enable the FTA and RTD to develop mitigation specific to this community.

Mitigation Summary

The Project has and will continue to actively solicit input regarding project alternatives and design. This ongoing public outreach effort is described in Section 4.6.4, Public Outreach. EJ populations and communities of concern would receive the same level of mitigation that other population groups along the project alignment would receive. Such measures would include the following: the acquisition of property would comply with all applicable Federal and State laws, including the Federal Uniform Relocation Assistance and Real Property Acquisition Policies Act, as well as procedures outlined in the project-specific Real Estate Acquisition Management Plan (RTD 2008q). Coordination would occur with O'ahuMPO EJ populations and communities of concern during preparation of the project-specific SSMP and other design-phase plans.

4.7 Visual and Aesthetic Conditions

This section describes the existing landscape's character and quality and discusses the Project's potential visual effects. It discusses potential mitigation measures, including ways to avoid or minimize effects on visual quality and restore or enhance visual quality.

The Project's potential effects include removing trees, altering 'Ewa-Koko Head and mauka-makai views, and introducing project components that are out of scale or character with their setting. Potential effects consider viewer response to project changes, new light and shadow sources in sensitive areas, and effects on views designated in policy documents. The viewpoints and view direction are identified in Figure 4-16. For additional information and references, see the *Honolulu High-Capacity Transit Corridor Project Visual and Aesthetics Resources Technical Report* (RTD 2008e).

4.7.1 Background and Methodology

City policy documents and ordinances include provisions for protecting, enhancing, and developing resources related to the visual integrity and quality of communities and areas covered by these plans. The following plans include objectives related to the visual environment and identify key views within their plan areas:

- *City and County of Honolulu General Plan* (DPP 2002a)
- *'Ewa Development Plan* (DPP 2000)
- *Central O'ahu Sustainable Communities Plan* (DPP 2002b)
- *Primary Urban Center Development Plan* (DPP 2004a)
- *'Aiea-Pearl City Livable Communities Plan* (DPP 2004b)
- *Waipahu Livable Communities Initiative* (DPP 1998a)
- *Waipahu Town Plan* (DPP 1998b)

Special District Regulations in Chapter 21 of the *Revised Ordinances of Honolulu* (ROH 1978a) include policies that safeguard special features and characteristics of particular districts to allow for their preservation and enhancement. Districts that may be affected by the Project include Hawai'i Capitol (Section 21-9.30), Diamond Head (Section 21-9.40), Punchbowl (Section 21-9.50), Chinatown (Section 21-9.60), and Waikīkī (Section 21-9.80).

Visual assessment for the Project follows USDOT guidance. Although this guidance was developed for highway projects, it was used because the Project is a linear transportation facility and the FTA has not issued guidance specific to transit projects. DPP and other interested groups (e.g., the Outdoor Circle, Scenic Hawai'i, Inc., and the Honolulu Chapter of the American Institute of Architects) also provided data or input. The major components of the visual assessment process included the following tasks:

- Establishing the affected environment—this includes identifying visually sensitive resources, such as landmarks, significant views and vistas, and view corridors
- Describing and assessing the affected environment's character and quality
- Determining major viewer groups that have views to and from the project alignment
- Evaluating views that would be interrupted by the facility and views from the facility, including viewer response
- Describing significant visible changes that would occur
- Developing measures to mitigate the Project's significant impacts

4.7.2 Affected Environment

The visual environment that would be affected by the Project includes areas that would have a view of the Project, areas visible from the corridor, and views that the Project could affect or create.

The Wai'anae and Ko'olau Mountain Ranges and the coastline are visible from most of the project

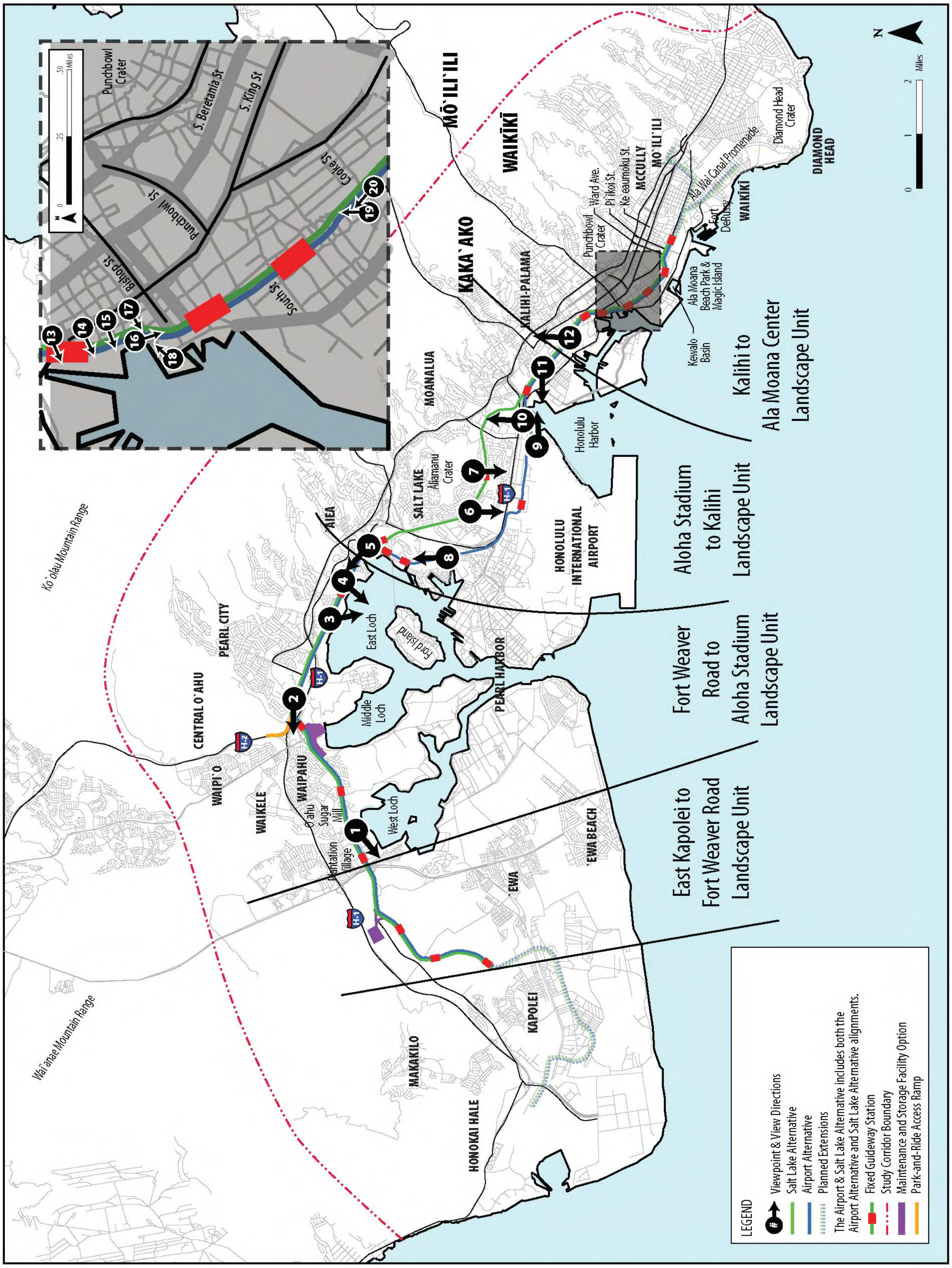

Figure 4-16 Visually Sensitive Resources and Representative Viewpoints within the Project Corridor

corridor along Farrington Highway, Kamehameha Highway, and Interstate Route H-1 (H-1 Freeway). The integrity of these landforms and the condition of public open spaces are important factors in determining visual character and quality.

Within coastal areas, the most scenic views are often captured when looking laterally along the coastline. These views capture the contrast between ocean and land form, usually in a distinctive visual pattern. Views at a strict 90-degree angle from the shoreline (e.g., along roadway corridors) are generally flat and uniform.

Viewer Groups

Major viewer groups within the project corridor include residents, commuters, business owners, recreationists, and visitors. *Residents* are people who observe the visual environment daily and for extended periods. *Commuters* are those who frequently travel through an area and, therefore, are familiar with the existing visual environment. However, this group does not have the same sense of ownership as residential viewer groups because they do not reside within that environment but only pass through it. *Business owners* have a vested interest in the visual environment surrounding their operations. Most business owners are familiar with their surrounding environment and may have a sense of ownership. *Recreationists* include people who frequent local parks, hiking trails, bikeways, and watercourses. They have definite expectations about the visual environment's condition. Visitors consist of both first-time and repeat visitors to the area. *Visitors* may consist of tourists, delivery or service personnel, or business employees and customers. This viewer group is less familiar with the existing visual environment's specific details, but they tend to have some sensitivity to and expectation of the surrounding environment.

Visually Sensitive Resources

Visually sensitive resources in the project corridor include landmarks, significant views and vistas, historic and cultural sites, and Exceptional Trees. These resources are important because of their scenic quality, scale, and prominence within the visual environment. Historic and cultural sites are discussed in Section 4.15, and Exceptional Trees are discussed in Section 4.14.

Landmarks, such as parks or open space, represent unique characteristics of a place or provide great value to local residents and visitors. Landmarks are also places or structures that have a unique style based on their architectural period, artistic merit, and the intrinsic qualities of Hawai'i. Landmarks represent the heart of a community and the people affected by events that occurred. Pearl Harbor is considered a historical landmark because of the part it played in the island's history.

Significant views and vistas are identified in policy documents that govern the project corridor and include protected mauka and makai views, as well as views of prominent landmarks.

The Project's visual environment changes from rural in the Wai'anae end of the corridor to dense high-rise development at the Koko Head end. The visual analysis considers the corridor in the following four landscape units, each of which is incrementally more urbanized (Figure 4-16).

Landscape Units are geographic areas where views of the Project would have a similar context or character.

East Kapolei to Fort Weaver Road Landscape Unit

This landscape unit extends from Kapolei to Fort Weaver Road and includes the communities of Kapolei and 'Ewa. Much of O'ahu's current and future population growth is expected to take place in this area, but it is still relatively rural and most of the area currently consists of agricultural cultivation and open space. Views across the 'Ewa Plain are still relatively open, allowing for mountain and ocean vistas as well as distant views of Downtown high-rises. Significant protected views and vistas in this landscape unit are identified in the 'Ewa Development Plan and include the following:

- Views of na pu'u (Kapolei, Pālailai, and Makakilo) and makai
- Views of the Wai'anae Mountain Range
- Distant vistas of the shoreline
- Views of Central Honolulu and Diamond Head

Fort Weaver Road to Aloha Stadium Landscape Unit

This landscape unit extends from Fort Weaver Road to Aloha Stadium. This area contains the wide fertile plateau that connects the Wai'anae and Ko'olau Mountains and was previously in extensive agricultural use. It is now a growing suburban area, with access facilitated by the H-1 Freeway, Kamehameha Highway, and Moanalua Road. The demands of growth and development within the Central O'ahu area have affected the natural environment, reducing some of its natural assets and replacing them with a built environment. This landscape unit is characterized by residential neighborhoods with one- and two-story residences. Clustered one- and two-story businesses are located along the Farrington Highway and Kamehameha Highway corridors. Most businesses are surrounded by parking lots that include large paved areas. Some of the paved areas include pockets of mature trees and shrubs that make the pavement appear less dominant. Utility poles and overhead utility lines are prevalent along both highway corridors. Significant protected views and vistas in this landscape unit are identified in the *Central O'ahu Sustainable Communities Plan* (DPP 2002b) and the *PUC Development Plan* (DPP 2004a) and include the following:

- Views of Pearl Harbor and Lochs framed by the ocean
- Views of Central O'ahu valleys and plains
- Views of the Wai'anae and Ko'olau Mountain Ranges
- Views of West Loch
- Views of the O'ahu Sugar Mill and Hawai'i's Plantation Village

Aloha Stadium to Kalihi Landscape Unit

The landscape unit from Aloha Stadium to Kalihi includes the Salt Lake portion of the PUC Development Plan Area, which comprises the communities of Salt Lake, Moanalua, and the Airport Area. These consist primarily of residential neighborhoods of one- and two-story residences and supporting commercial uses. The airport area encompasses industrial and commercial service-oriented buildings surrounded by large paved areas. Honolulu International Airport, Pearl Harbor Naval Base, and Hickam Air Force Base are located within this landscape unit. Views within this landscape unit are somewhat limited to the immediate surroundings because of dense development and the large scale of the many commercial and industrial buildings. The mountains can be viewed periodically from elevated locations and transportation corridors, such as Salt Lake Boulevard and Kamehameha Highway. Significant protected views and vistas in this landscape unit are identified in the *PUC Development Plan* (DPP 2004a) and include the following:

- Views of Pearl Harbor and Lochs framed by the Wai'anae Mountain Range
- Views of Diamond Head and Honolulu valleys
- Views of Punchbowl Crater
- Views of Āliamanu Crater and Central O'ahu valleys

Kalihi to Ala Moana Center Landscape Unit

The Kalihi to Ala Moana Center landscape unit comprises a continuous urban corridor and the highest densities of the PUC. Kalihi to Iwilei includes the neighborhood community of Kalihi-Palama, which contains waterfront properties that house extensive maritime operations. Business districts with major wholesale and distribution facilities line King Street and Nimitz Highway. Farther Koko Head, this landscape unit encompasses Downtown, Kaka'ako, and Ala Moana. The mountains and shoreline that define the mauka and makai edges of this landscape unit are dominant elements of the landscape. Within the corridor, open space consists of volcanic craters, streams, and other water bodies, as well as larger parks and campuses. The mauka edge includes the Ko'olau Mountain Range and its undeveloped foothills and slopes. The makai edge includes the shorelines and waters of the Pacific Ocean and such landmarks as Pearl Harbor (East Loch), Honolulu Harbor, and Ala Wai Harbor. Direct views of the mountains and ocean are not common, but the Downtown skyline is visible from several areas. Significant protected views and vistas in this landscape unit are identified in the *PUC Development Plan* (DPP 2004a) and include the following:

Panoramic Views of Natural Features and Landmarks

- Ko'olau and Wai'anae Mountain Ranges and foothills
- Pacific Ocean, Pearl Harbor's East Loch, Ford Island, Honolulu Harbor, Ke'ehi Lagoon, and Kewalo Basin
- Volcanic craters of Lē'ahi (Diamond Head), Pūowaina (Punchbowl), and Āliamanu
- From Ala Wai Canal Promenade toward the Ko'olau Mountain Range
- From Ala Moana Beach Park toward the Ko'olau Mountain Range
- From Kewalo Basin toward Punchbowl and the Ko'olau Mountain Range
- From Punchbowl Lookout toward Diamond Head

Mauka/Makai View Corridors

- Bishop Street
- Cooke Street
- Ward Avenue
- Pi'ikoi Street
- Ke'eaumoku Street
- 'Āina Moana Park (Magic Island)

4.7.3 Environmental Consequences and Mitigation

Environmental Consequences

Visual and aesthetic consequences are changes to the visual landscape and viewer response to those changes. The Project's visual consequences have been categorized as low, moderate, or high as follows:

- **Low** visual effects generally occur when transportation elements (such as roadways) are already part of the view, when the view has few or no visually sensitive resources, and when the Project would introduce few (if any) noticeable changes. Viewer groups would not likely notice a visual change or expect a scenic viewpoint. Minor changes in light and glare may occur.
- **Moderate** visual effects occur when changes to the existing view would be noticeable but not substantial and/or when visually sensitive resources would undergo a noticeable change in view. Viewer groups would be somewhat aware and sensitive to visual change. Noticeable changes in light and glare may occur.
- **High** visual effects occur when substantial changes to existing views would be made and would result in a greatly changed view and/or when visually sensitive resources would undergo a substantial change in view. Viewer groups would be sensitive to visual change because they would expect attractive views or surroundings. Substantial changes in light or glare would occur.

The potential visual effects of the Project are summarized in Table 4-10.

No Build Alternative

Under the No Build Alternative, the Project would not be built and there would be no impact to the visual and aesthetic conditions. Although the

Table 4-10 Potential Visual Effects of the Build Alternatives (continued on next page)

Viewpoint (illustrated on Figure 4-16)	Location/View Direction	Existing Visual Quality	Visual Impact	Assessment
East Kapolei to Fort Weaver Road Landscape Unit				
n/a	Views assessed are in the general context of planned development	Moderate to High	Low to Moderate	The guideway and stations would noticeably contrast with the smaller scale buildings nearby, such as the U.S. Navy housing. They would also contrast with the open, undeveloped character that is predominant in this area. However, these areas are expected to be developed or re-developed and become more urban in character in a similar timeframe as the transit improvements. As a result, the contrast would become less noticeable.
Fort Weaver Road to Aloha Stadium Landscape Unit				
1	Farrington Highway near Waikele Road, looking `Ewa	Moderate	Moderate	The guideway would not substantially affect most panoramic and distant views of the mountains and would have a limited effect on the area's scenic quality. Farrington Highway is a major transportation corridor and project elements would be in character with the surrounding area.
2	Kamehameha Highway Near Acacia Street, looking `Ewa	Moderate	Moderate	The guideway would affect mauka views by partially blocking existing distant views of the sky and mountains. The scale and height of the guideway is in character with the adjacent buildings.
3	Kamehameha Highway at Ka`ahumanu Street, looking makai	Moderate	High	The bulk and scale of the guideway and columns would be dominant features, obstructing views of the tree canopies in Neal S. Blaisdell Park and substantially changing makai views toward the park.
4	Kamehameha Highway at Kaonohi Street, looking makai	Low	Moderate	Although changes to the existing view would be noticeable, the project elements would blend with the existing visual environment. The utility lines would be less prominent against the guideway in the background.
Aloha Stadium to Kalihi Landscape Unit				
5	Aloha Stadium, looking mauka	High	Moderate	The project element would change the composition of panoramic views with the high visibility of the guideway. However, these more distant views, which include the mountains and urban skyline, take in a wider view and would not be substantially affected.
6	Salt Lake Neighborhood at Wanaka Street, looking makai	Moderate	Moderate	The guideway and columns would serve as noticeable components of the larger landscape; however, the visual effect would not be substantial. Some makai views from residences near the guideway would be obstructed.
7	Ala Liliko`i Street/Salt Lake Boulevard Intersection near the Ala Liliko`i Station Area, looking makai	Moderate	High	The Ala Liliko`i Station and guideway would be dominant elements that would substantially change views and visual character. They would also be a distinct contrast with surrounding one- and two-story buildings.
8	Kamehameha Highway near Radford Road and the Pearl Harbor Naval Base Station Area, looking makai	Low	Moderate	The Pearl Harbor Naval Base Station and guideway would dominate the linear view corridor above the highway. However, the Kamehameha Highway is a major transportation corridor and visual effects would not be substantial.
9	Ke`ehi Lagoon Park, looking Koko Head	High	Low	The guideway would be slightly more visible than the highway in the background. However, it would not noticeably conflict with the views' character.

Table 4-10 Potential Visual Effects of the Build Alternatives (continued from previous page)

Viewpoint (illustrated on Figure 4-16)	Location/View Direction	Existing Visual Quality	Visual Impact	Assessment
10	Ke`ehi Lagoon Park, looking mauka	High	Low	The guideway and columns would be prominent elements in the background of mauka views from the park, where it would extend above Waiwai Loop Road. In addition, the guideway's bulk and scale would contrast with the open character of park facilities as it traverses the perimeter of tennis courts and a ball field. Further Koko Head it would run parallel with the H-1 Highway where it would be less noticeable.
Kalihi to Ala Moana Center Landscape Unit				
11	Dillingham Boulevard at Kalihi, looking `Ewa	Low	Moderate	The bulk of the guideway and columns would be out of scale with existing buildings. However, overhead utility lines are prevalent along Dillingham Boulevard, and the project elements would not contrast substantially with the setting's character.
12	Dillingham Boulevard near Honolulu Community College and Kapālama Station Area, looking makai	Moderate	Moderate	The Kapālama Station and guideway would be dominant features in views along Dillingham Boulevard. The existing trees would soften this effect.
13	King Street Bridge and Chinatown Station Area, looking makai	Moderate	High	The Chinatown Station and guideway would be dominant features in views along Nimitz Highway. Distant makai views over Nu`uanu Stream and Honolulu Harbor would be partially blocked. The project elements would contrast substantially with Chinatown's historic character.
14	Maunakea Street, looking makai	High	Moderate	The guideway and columns would be prominent features in makai views of Honolulu Harbor, partially blocking views of the sky.
15	O`ahu Market at King Street, looking makai	High	Moderate	The guideway and columns would be prominent features in views down Kekaulike Street in Chinatown's O`ahu Market. The bulk and scale of these project elements would be out of character with the pedestrian-oriented environment created by the O`ahu Market's architecture and streetscape.
16	Nimitz Highway/Fort Street Intersection `Ewa of Irwin Park and Aloha Tower Market Place, looking Koko Head	Moderate	Moderate	The Downtown Station and guideway would be dominant features in views along Nimitz Highway. These project elements would contrast substantially with Irwin Park street trees along the highway and the nearby smaller scale office buildings.
17	Fort Street Mall at Merchant Street, looking makai	High	Low	Just visible through the trees, the guideway structure would partially block a view of the Aloha Tower. Visual effects would be more noticeable for viewers closer to Nimitz Highway.
18	Nimitz Highway near Irwin Park and Aloha Tower Market Place, looking mauka	High	Moderate	The guideway and columns would only be slightly visible beyond the trees. However, the bulk and scale of the guideway would contrast with the more pedestrian scale character of the streetscape.
19	Mother Waldron Park near Halekauwila Street/Cooke Street Intersection, looking mauka	High	High	The bulk and scale of the straddle bent guideway and columns would contrast substantially with the scale and character of Mother Waldron Park and the adjacent five-story residential building. These elements would also block makai views from upper-story residences.
20	Halekauwila Street/Cooke Street Intersection, looking `Ewa past Mother Waldron Park	Moderate	High	The bulk and scale of the straddle bent guideway and columns would contrast substantially with the scale and character of Mother Waldron Park and the adjacent five-story residential building.

projects in the ORTP would be built, their environmental impacts would be studied in separate documents.

Common to All Build Alternatives

The Build Alternatives would be set in an urban context where visual change is expected and differences in scales of structures are typical. However, some viewer groups may perceive that visual changes associated with the Project are substantial, particularly when considered at a single location. Residents living in high-rise buildings adjacent to the project alignment would experience visual changes as a result of the Project.

Visual simulations of the Build Alternatives were developed for 20 representative viewpoints that would be affected by the Project to illustrate commonly experienced visual effects. The locations of these viewpoints are shown on Figure 4-16. The simulations (Figures 4-17 through 4-36) depict the guideway and other project elements to illustrate the facilities' sizes and positions but do not include detailed design features. For stations, they show a typical prototype without design detail because station configurations and finishes have yet to be developed, and input will be considered from communities surrounding each station through the Draft EIS and design processes.

The fixed guideway and stations would be elevated structures. They would result in noticeable changes to views where project elements would be near existing views or in the foreground of these views. This change would also occur for motorists traveling on the roadways along and under the guideway. The stations would be dominant visual elements in their settings and would noticeably change views. Stations are represented by the visual simulations in Figures 4-23, 4-24, 4-26, and 4-32. Support facilities, such as traction power substations, would also noticeably change existing views. However, most would be located adjacent to roadways where utilities are already part of the view, so the change would not be dramatic or substantial.

There would be additional lighting associated with park-and-ride facilities, stations, maintenance and storage facility, and trains, which include interior and safety lighting for the stations and interior lighting and headlights on the trains. For most of the alignment, light and glare associated with the guideway and trains are not anticipated to have an effect because the guideway would generally be located in existing roadway rights-of-way, which currently produce transportation-related light and glare. Furthermore, the light intensity from trains is expected to be comparable to or less than existing buildings and vehicles along the alignment.

The shadow pattern created by the elevated stations and guideway would change throughout the day and seasonally, depending on the alignment's direction, time of day, and time of year. Shadow impacts along the alignment would vary with orientation, height of the stations and guideway, and the height of surrounding trees and local development.

Viewpoints not located near the alignment would generally be less affected by changes in the visual environment because they would take in a longer, more expansive landscape. Project elements would be noticeable but not dominant features in these views, and visual effects to significant views and vistas would be low to moderate. Passengers on trains would have enhanced views of these areas compared to passengers in vehicles, whose views are often obstructed by buildings, vehicles, and commercial signage. Public views include views along streets and highways, mauka-makai view corridors, panoramic and significant landmark views from public places, views of natural features, heritage resources and other landmarks, and view corridors between significant landmarks (ROH 1978b). The City's General Urban Design Principles and controls state that "[s]uch public

Figure 4-17 Viewpoint 1—Farrington Highway near Waikele Road, looking `Ewa

The guideway would not substantially affect most panoramic and distant views of the mountains and would have a limited effect on the area's scenic quality. Farrington Highway is a major transportation corridor and project elements would be in character with the surrounding area

AR00007443

Figure 4-18 Viewpoint 2—Kamehameha Highway near Acacia Street, looking `Ewa

The guideway would affect mauka views by partially blocking existing distant views of the sky and mountains. The scale and height of the guideway are in character with the adjacent buildings.

Figure 4-19 Viewpoint 3—Kamehameha Highway at Ka`ahumanu Street, looking Makai

The bulk and scale of the guideway and columns would be dominant features, obstructing views of the tree canopies in Neal S. Blaisdell Park and substantially changing makai views toward the park.

Figure 4-20 Viewpoint 4—Kamehameha Highway at Kaonohi Street, looking Makai

Although changes to the existing view would be noticeable, the project elements would blend with the existing visual environment. The utility lines would be less prominent against the guideway in the background.

Figure 4-21 Viewpoint 5—Aloha Stadium, looking Mauka

The project element would change the composition of panoramic views with the high visibility of the guideway. However, these more distant views, which include the mountains and urban skyline, take in a wider view and would not be substantially affected.

Figure 4-22 Viewpoint 6—Salt Lake Neighborhood at Wanaka Street, looking Makai

The guideway and columns would serve as noticeable components of the larger landscape; however, the visual effect would not be substantial. Some makai views from residences near the guideway would be obstructed.

Figure 4-23 Viewpoint 7—Ala Liliko`i Street/Salt Lake Boulevard Intersection near the Ala Liliko`i Station Area, looking Makai

The Ala Liliko'i Station and guideway would be dominant elements that would substantially change views and visual character. They would also be a distinct contrast with surrounding one- and two-story buildings.

Figure 4-24 Viewpoint 8—Kamehameha Highway near Radford Road and the Pearl Harbor Naval Base Station Area, looking `Ewa

The Pearl Harbor Naval Base Station and guideway would dominate the linear view corridor above the highway. However, the Kamehameha Highway is a major transportation corridor and visual effects would not be substantial.

AR00007450

Figure 4-25 Viewpoint 9—Ke`ehi Lagoon Park, looking Koko Head

The guideway would be slightly more visible than the highway in the background. However, it would not noticeably conflict with the view's character.

Figure 4-26 Viewpoint 10—Ke`ehi Lagoon Park, looking Mauka

The guideway would be slightly more visible than the highway in the background. However, it would not noticeably conflict with the view's character.

AR00007452

Figure 4-27 Viewpoint 11— Dillingham Boulevard at Kalihi, looking Mauka

The bulk of the guideway and columns would be out of scale with existing buildings. However, overhead utility lines are prevalent along Dillingham Boulevard, and the project elements would not contrast substantially with the setting's character.

Figure 4-28 Viewpoint 12—Dillingham Boulevard near Honolulu Community College and Kapālama Station Area, looking `Ewa

The Kapālama Station and guideway would be dominant features in views along Dillingham Boulevard. The existing trees would soften this effect.

Figure 4-29 Viewpoint 13—King Street Bridge and Chinatown Station Area, looking Makai

The Chinatown Station and guideway would be dominant features in views along Nimitz Highway. Distant makai views over Nu'uanu Stream and Honolulu Harbor would be partially blocked. The project elements would contrast substantially with Chinatown's historic character.

Figure 4-30 Viewpoint 14—Maunakea Street, looking Makai

The guideway and columns would be prominent features in makai views of Honolulu Harbor, partially blocking views of the sky.

Figure 4-31 Viewpoint 15—O`ahu Market at King Street, looking Makai

The guideway and columns would be prominent features in views down Kekaulike Street in Chinatown's O'ahu Market. The bulk and scale of these project elements would be out of character with the pedestrian-oriented environment created by the O'ahu Market's architecture and streetscape.

Figure 4-32 Viewpoint 16—Nimitz Highway/Fort Street Intersection `Ewa of Irwin Park and Aloha Tower Market Place, looking Koko Head

The Downtown Station and guideway would be dominant features in views along Nimitz Highway. These project elements would contrast substantially with Irwin Park street trees along the highway and the nearby smaller scale office buildings.

Figure 4-33 Viewpoint 17—Fort Street Mall at Merchant Street, looking Makai

Just visible through the trees, the guideway structure would partially block a view of the Aloha Tower. Visual effects would be more noticeable for viewers closer to Nimitz Highway.

AR00007459

Figure 4-34 Viewpoint 18—Nimitz Highway near Irwin Park and Aloha Tower Market Place, looking Mauka

The guideway and columns would only be slightly visible beyond the trees. However, the bulk and scale of the guideway would contrast with the more pedestrian scale character of the streetscape.

Figure 4-35 Viewpoint 19—Halekauwila Street/Cooke Street Intersection, looking Mauka past Mother Waldron Park

The bulk and scale of the straddle bent guideway and columns would contrast substantially with the scale and character of Mother Waldron Park and the adjacent five-story residential building.

Figure 4-36 Viewpoint 20—Mother Waldron Park near Halekauwila Street/Cooke Street Intersection, looking `Ewa

The bulk and scale of the straddle bent guideway and columns would contrast substantially with the scale and character of Mother Waldron Park and the adjacent five-story residential building. These elements would also block makai views from upper-story residences.

views shall be protected by appropriate building heights, setbacks, design and siting controls" and that "[t]hese controls shall be determined by the particular needs of each view and applied to public streets and to both public and private structures." The guideway and some stations would partially block mauka-makai public views from streets that intersect with the alignment.

RTD will coordinate with the City to identify the particular needs of each view; however, the Build Alternatives would introduce a new linear visual element to the corridor, and changes to some views would be unavoidable. Depending on the degree of view obstruction or blockage, some view changes would be substantial. The viewer's response to this change would vary with exposure and sensitivity and depend on the alignment orientation, guideway and station height, and height of surrounding trees and/or buildings. View changes would be less notable in wider vista or panoramic views where the project elements serve as smaller components of the larger landscape. Generally, the project elements would not be dominant features in these views.

Effects on views within three of the four landscape units would be common to all Build Alternatives. Only effects on views within the Aloha Stadium to Kalihi landscape unit would differ between the Build Alternatives. Significant views and vistas and an assessment of expected changes in visual quality for viewpoints and views along the project alignment are presented below for each landscape unit.

The Project would provide users with expansive views from several portions of the corridor by elevating riders above highway traffic, street trees, and low structures adjacent to the alignment.

East Kapolei to Fort Weaver Road Landscape Unit

The surrounding visual environment consists mostly of scattered residential development and open agricultural land. The area is planned for future development, which would substantially alter the visual environment independent of the Project. The Build Alternatives would change the visual environment in this area, but these changes are expected to occur in a similar time frame as the planned development.

The potential for the guideway and stations to block mauka-makai views and vistas of features and landmarks would vary throughout this landscape unit. Viewpoints that are not close to the alignment would generally be less sensitive to changes in the visual environment because they take in a longer, more expansive landscape. Several mauka views of na pu'u are designated significant views under the 'Ewa Development Plan. Project elements would not likely be dominant features in these views or the following significant protected views and vistas, and visual effects would be low:

- Views of the Wai'anae Mountain Range
- Distant vistas of the shoreline
- Views of Central Honolulu and Diamond Head

The guideway would introduce an elevated linear structure and urban elements (e.g., transit stations, park-and-ride lots, traction power substations, and a possible maintenance and storage facility) to what is currently an open, rural, and country-like setting. The guideway would range from 30 to 45 feet in height. The top of the stations with a mezzanine would be about 15 feet higher than the guideway where it enters the station. The guideway and stations would noticeably contrast with the smaller scale buildings nearby, such as the U.S. Navy housing. They would also contrast with the open, undeveloped character that is predominant in this area. However, these areas are expected to be developed or re-developed and become more urban in character in a similar time frame as the transit improvements. As a result, the contrast would become less noticeable.

Panoramas and distant views of the shoreline, Downtown, and Diamond Head would change to include views of the guideway, support columns, and stations. However, panoramic views take in a wider, more expansive landscape and are usually less sensitive to change. Generally, the project elements would not be dominant features in these views. However, large open-paved surfaces would be noticeable at the proposed East Kapolei and UH West O'ahu park-and-ride lots. Views of the 'Ewa Plain from the elevated trains and stations would be enhanced. Overall visual effects, including the viewer response to change, would be moderate.

Fort Weaver Road to Aloha Stadium Landscape Unit

Farrington Highway is a major transportation corridor through this area. The West Loch Station and respective transit center would blend well with the bulk and scale of the Waipahu Town Center's densely developed commercial character. However, the guideway and columns along the alignment would be prominent visual features due in part to the long, straight view down the Farrington Highway and because the guideway's height of about 40 feet would be greater than many of the one- and two-story surrounding buildings.

Although the guideway at 30 to 45 feet in height would obstruct some makai and mauka views across the highway, panoramic views near the alignment and from the Waipahu Cultural Garden Park, Hawai'i's Plantation Village, and Waipahu District Park comprise a wider panoramic scene and, therefore, would not be substantially affected. Mature trees in the Farrington Highway median would be removed to accommodate the guideway, reducing the visual interest and memorability of views. Visual effects in this area would range from moderate to high.

The Waipahu Transit Center Station would be farther Koko Head along the alignment. Similar to the West Loch Station, it would blend well with the bulk and scale of the commercial setting that has developed around this section of the Farrington Highway corridor. As the guideway continues Koko Head toward Leeward Community College, it would be a more dominant feature and dramatically contrast with the suburban residential character makai and mauka of the highway. The mass and height of the guideway and columns would block some residents' views over Middle Loch to Pearl Harbor. However, many views in this area comprise a wider panoramic scene and, therefore, would not be substantially affected. Visual effects in this area would range from moderate to high.

The guideway would shift makai of Farrington Highway at Waipahu High School, which is near the site of a potential maintenance and storage facility. This area is a flat knoll makai of the H-1 Freeway/Farrington Highway Interchange. The Leeward Community College Station would be adjacent to a parking lot on the college campus and would be at ground level. The potential maintenance and storage facility would be makai of the interchange. These project elements would be highly visible from low-lying areas mauka of the interchange and from residences on the foothills above. However, most views in these areas comprise a wider panoramic scene and, therefore, would not be substantially affected. Visual effects in this area would range from low to moderate.

The guideway would cross over the H-1 Freeway Interchange and merge with Kamehameha Highway at Pearl City. The Pearl Highlands Station and park-and-ride structure would be 'Ewa of the Pearlridge Center and would blend well with the bulk and scale of its commercial character. However, these project elements would be highly visible and dominant features. The guideway would pass by Pacheco Neighborhood Park at Waimano Home Road, where nearby residents mauka and makai of the guideway would experience noticeable changes in their view. Makai views of East Loch and Pearl Harbor from the park and residences near the mauka side of the Waimano Home Road and Kamehameha Highway Intersection would include the guideway and columns, and some views beyond the intersection would be blocked. Visual effects would range from low in the area around the H-1 Freeway Interchange to moderate in the rest of this area.

Koko Head of Puʻu Poni Street, the guideway would cross over the H-1 Freeway and continue above the Kamehameha Highway median to the vicinity of Aloha Stadium. The H-1 Freeway cross-over would be a dominant feature, visible at great distance. However, this change would be in context with the freeway setting and likely would not be perceived as substantial. Farther Koko Head, the guideway would continue above the Kamehameha Highway median through residential neighborhoods and mauka of Neal S. Blaisdell Park before crossing over Waimalu Stream. The bulk and scale of the guideway and columns would substantially change mauka and makai views from residences, such as panoramic views through the park toward Pearl Harbor and Downtown. Panoramic views would be less sensitive to change because they take in a wider, more expansive landscape. Visual effects would range from moderate to high in this area.

Continuing to the Pearlridge Station and Transit Center, three historic sites, including Sumida Farm, would be mauka of the guideway and station. The elevated station of about 40 feet above Kamehameha Highway would be a noticeable change, altering views and contrasting with the scale of these resources and the surrounding environment. Some ʻEwa and makai views of the skyline from the Sumida Farm would be blocked by the guideway. However, because it is at a much lower elevation than the highway, these views are already somewhat confined by the surrounding embankments. Overall visual effects near the station would be moderate because the project elements would blend with the surrounding commercial character, which is a heavily used transportation corridor with one- and two-story businesses and warehouses.

From residences on the hillside above Pearlridge, Kamehameha Highway is already a prominent feature in makai views toward the ʻEwa Plain, East Loch, and Downtown. However, the guideway would be a noticeable change. These project elements would also change panoramic views over the ʻAiea Bay State Recreation Area where the guideway would be about 30 feet above the Kamehameha Highway and Honomanu Street Intersection. Most scenic views from the recreation area are makai and would not be affected. Overall visual effects from Pearlridge to the Aloha Stadium area would range from moderate to high.

Throughout this landscape unit, the potential for the guideway and stations to block protected mauka-makai views and vistas of the following features and landmarks would vary:

- Views of Pearl Harbor and Lochs framed by the ocean
- Views of the Central Oʻahu valleys and plains
- Views of the Waiʻanae and Koʻolau Mountain Ranges
- Views of West Loch
- Views of the Oʻahu Sugar Mill and Hawaiʻi's Plantation Village

Viewpoints 1 through 4 illustrate views of the Project within this landscape unit (Figures 4-17 through 4-20). Viewpoints that are not close to the alignment would generally be less sensitive to changes in the visual environment because they would take in a longer, more expansive landscape. The project elements would be noticeable, but not dominant, features in these views, and visual effects to significant protected views and vistas would range from moderate to high, depending on the viewer's position and location.

Aloha Stadium to Kalihi Landscape Unit

The unique consequences of each Build Alternative on this landscape unit are discussed individually later in this section.

Kalihi to Ala Moana Center Landscape Unit

From Kalihi Koko Head, the guideway would follow Dillingham Boulevard to the vicinity of Ka'aahi Street. The canopies of several mature trees along Dillingham Boulevard would be trimmed to accommodate the guideway and additional trees would be removed at the Kapālama and Iwilei station areas. The guideway and columns would be prominent visual features due in part to the long, straight view down the boulevard and because the guideway's height of about 40 feet above Dillingham Boulevard would be slightly greater than many of the one- and two-story surrounding buildings. Mauka and makai views would be obstructed from various points. Makai-view obstructions would be greatest from residences on the mauka side of Dillingham Boulevard. Overall visual effects in this area would be moderate.

The guideway could come within 10 feet of some facades along Dillingham Boulevard, depending on the setback, and would block views from the upper stories of mixed-use buildings Koko Head of Kalihi Street. The upper-story residences along Dillingham Boulevard would be affected by light and glare from trains traveling on the guideway and from station lighting. Due to the close proximity of the guideway and Kalihi and Kapālama Stations, the visual setting of several nearby historic sites would change and views of their facades would be partially obscured. The visual effects on these resources are expected to be high.

As the guideway turns farther Koko Head to connect to Nimitz Highway near Iwilei Road, it would blend with the bulk and scale of the surrounding one- and two-story commercial buildings, including light industrial warehouses and distribution centers. The Iwilei Station would be a noticeable visual change, and some views of building facades would be blocked. However, many viewers would not notice a blockage of views since the surrounding land is used mostly for light industry and offices or is under used. Visual effects in this area would be moderate.

The alignment would follow Nimitz Highway Koko Head to Halekauwila Street. This area of Downtown includes several historic districts and other sensitive visual resources, including view corridors. Although the Chinatown Station would generally be centered approximately 30 feet above Nimitz Highway, it would be a dominant visual element, contrasting in scale with the pedestrian environment and substantially changing makai views of Honolulu Harbor. However, the Downtown Station would not block views of Honolulu Harbor. The guideway and columns would reduce the open character of the streetscape, create shade and shadows, and block portions of makai views along the following perpendicular streets: Kekaulike, Maunakea, Nu'uanu, Bethel, Fort, Bishop, and Richards. Views from the fourth- and fifth-story windows of adjacent offices and residences would also be blocked. In addition, trains traveling on the guideway would create light and glare, and the Chinatown and Downtown Stations would increase this effect. The addition of the guideway and columns would change the visual character of the streetscape and substantially affect the visual setting of the Dillingham Transportation Building and Irwin Park. Overall visual effects in this area would be high.

The alignment would leave Downtown Koko Head along Halekauwila Street where it would begin on the makai side of the street and transition to the center near Punchbowl Street. The canopies of several mature monkeypod trees along Halekauwila Street would be trimmed. The guideway and columns would also block views from the fourth- and fifth-story windows of adjacent offices and residences and create additional shade and shadows. Trains traveling on the guideway would increase light and glare at upper-story residences. Overall visual effects in this area would be high.

The Civic Center Station area is currently in transition from scattered one- and two-story businesses to higher-density taller structures. The guideway and columns would block views from the fourth- and fifth-story windows of adjacent offices and residences and create additional shade and shadows. Trains traveling on the guideway would increase light and glare. Mother Waldron Park is Koko Head at Cooke Street. The proposed station would substantially change views and contrast with the scale and character of the surrounding environment. Overall visual effects would be high.

Past Ward Avenue and the Kaka'ako Station, the alignment would transition to Queen Street. Property on the mauka side of Waimanu Street would be acquired to allow the alignment to cross over to Kona Street. No visually sensitive resources are in this area. Kaka'ako Station would be noticeable, but it would blend with the character of nearby big-box stores and smaller industrial use buildings. Visual effects would be moderate.

The guideway would run above Kona Street through Ala Moana Center. Mature trees would be removed from Pi'ikoi Street through the Ala Moana Center Station area, substantially changing the character of the streetscape. With the exception of the mature trees near Pi'ikoi Street, visually sensitive resources would not be affected, and most views of the mountains, Koko Head, and skyline would not be blocked. The Ala Moana Center Station would be at the end of the Project. The station and the guideway would be located between the Ala Moana Center and mid- to high-rise buildings and would not change the view from adjacent offices and residences.

Throughout this landscape unit, the potential would vary for the guideway and stations to block protected mauka-makai views of the following features and landmarks that are identified in policy documents:

- Ko'olau and Wai'anae Mountain Ranges and foothills
- Pacific Ocean, Pearl Harbor's East Loch, Ford Island, Honolulu Harbor, Ke'ehi Lagoon, and Kewalo Basin
- Volcanic craters of Lē'ahi (Diamond Head), Pūowaina (Punchbowl), and Āliamanu
- From Ala Moana Beach Park toward the Ko'olau Mountain Range
- From Kewalo Basin toward Punchbowl and the Ko'olau Mountain Range

Viewpoints that are not close to the alignment would generally be less sensitive to changes in the visual environment because they would take in a longer, more expansive landscape. The project elements would be noticeable, but not dominant, features in these views, and visual effects to significant protected views and vistas would range from moderate to high depending on the viewer's position and location.

The Project would cross, but not block, views along the following protected mauka-to-makai street view corridors:

- Bishop Street—the guideway and columns would be dominant elements in makai views between Nimitz Highway and Queen Street, and views of the horizon would be partially blocked. The bulk and scale of the guideway and columns would be compatible with Nimitz Highway, which functions as a major transportation corridor. Mauka of Queen Street, these elements would likely appear less dominant because the vista would take in a longer view and be more expansive.
- Cooke Street—the guideway and columns would be dominant elements in mauka-makai views, respectively, between Pohukaina Street and Queen Street. Views of the horizon would be partially blocked from viewpoints near the alignment, including mauka views from the park at Halekauwila Street and Cooke Street. The bulk and scale

of the guideway and columns would conflict with the pedestrian-oriented streetscape.

- Ward Avenue—the guideway and columns would be dominant elements in mauka-makai views, respectively, between Auahi Street and Queen Street. Views of the horizon would be partially blocked from viewpoints near the alignment. The bulk and scale of the guideway and columns would conflict with the pedestrian-oriented streetscape. For mauka views from Ala Moana Boulevard and makai views mauka of Queen Street, these elements would likely appear less dominant because the vista would take in a longer view and be more expansive.
- Pi‘ikoi Street—the guideway and columns would be dominant elements in mauka-makai views, respectively, between Waimanu Street and Kapi‘olani Boulevard. Views of the horizon would be partially blocked from viewpoints near the alignment. Although the bulk and scale of the guideway and columns would conflict with the pedestrian-oriented streetscape, the view includes rows of mature trees, which would reduce this effect.
- Ke‘eaumoku Street—the guideway and columns would run along the mauka side of Ala Moana Center and blend with the bulk and scale of its three and four-story buildings. The Koko Head end of the station would also be visible. Mauka views from upper stories of the shopping center would be partially blocked by the guideway. The guideway and columns would be a noticeable change in makai views from Kapi‘olani Boulevard.
- Aina Moana Park (Magic Island)— the guideway would be noticeable behind Ala Moana Center in mauka views from Magic Island. However, the contrast in bulk and scale would be low because the overall view is dominated by tall buildings and the parking garage.

Viewpoints 12 through 20 illustrate views of the Project within this landscape unit (Figures 4-28 through 4-36).

Salt Lake Alternative

The Salt Lake Boulevard alignment would leave Kamehameha Highway just ‘Ewa of Aloha Stadium, cross the Aloha Stadium parking lot, and continue Koko Head along Salt Lake Boulevard. Aloha Stadium is at a major freeway interchange and is surrounded by parking lots where transportation elements are already part of the view. The contrast in scale and character of the guideway and columns with the existing environment would be low. As the guideway continues Koko Head to the Aloha Stadium Station, the contrast with the makai residential neighborhood at Kalaloa Street would be more noticeable and some mauka views would be obstructed by the station, guideway, and columns. The proposed park-and ride lots nearby are not expected to result in a substantial change because large parking lots are already prevalent. Visual effects in this area are expected to be moderate.

As the guideway crosses over the H-1 Freeway and beyond Maluna Street, it would continue 30 to 40 feet above Salt Lake Boulevard. This area is a mix of one- and two-story residences mauka and taller buildings that comprise industrial parks and schools makai. The bulk and scale of the guideway, columns, and station would contrast with this character. In addition, the guideway, with a height of about 40 feet above the roadway, would be noticeable elements that would obstruct some views across Salt Lake Boulevard. Residents whose homes are adjacent to Salt Lake Boulevard would be the most sensitive to the visual change. However, many of the residences on the hillside above the boulevard have panoramic views where the project elements would serve as smaller components of the larger landscape in a wider vista. Visual effects in this area are expected to be moderate.

The guideway would shift to the makai side of Salt Lake Boulevard as it continues to the Ala Liliko'i Station. This area is comprised primarily of one- and two-story residences mauka with more open space, larger multi-story apartments, condominiums, and military housing makai. Mature trees would be removed at several locations to accommodate the guideway, which would vary from about 20 to 40 feet above the roadway. The guideway and columns would be a distinct contrast with single-story homes. View obstructions would be greatest from the residential neighborhood mauka of the boulevard where the guideway would block some views makai across the boulevard. However, as with other residential neighborhoods in this area, many of the residences on the hillside above the boulevard have panoramic views where the project elements would serve as smaller components of the larger landscape in a wider vista.

The Ala Liliko'i Station, at about 60 feet above the Salt Lake Boulevard and Ala Liliko'i intersection, would be a substantial change and a dominant element. It would also contrast with the two-story and taller residential character established by the surrounding apartments, military housing, and neighborhood shopping center. Views from upper-story windows of some multi-story residences would be obstructed by the station. These upper story residences would also be affected by light and glare from trains traveling on the guideway and from station lighting. Visual effects in this area are expected to range from moderate along the alignment to high in the station area Koko Head from the Ala Liliko'i Station to Pu'uloa Road, where the guideway would generally be above the median of Salt Lake Boulevard. Businesses and multi-story apartments and condominiums are mauka of the boulevard, with military family housing makai. Views from some fourth- and fifth-floor windows would be obstructed by the guideway and columns. View obstructions would be greatest mauka of Peltier Avenue. However, the guideway would be similar in scale to the surrounding multi-story buildings. Visual effects in this area are expected to be moderate to high.

The guideway would continue Koko Head through the Servco Māpunapuna Plaza and industrial park. Visual effects from the guideway and columns would be low in this area because it contains primarily automobile-oriented businesses and high volumes of traffic. However, the guideway and columns would be adjacent to Moanalua Stream where they would be dominant elements in views along the steam and from the park Koko Head. Mature trees along the stream would be trimmed or removed. The open, natural character of the stream bank and park would change substantially with the contrasting bulk and scale of the guideway, which would be on both sides of the stream. The most substantial changes would be along Moanalua Stream, and visual effects in this area are expected to range from moderate to high.

From Moanalua Stream, the guideway would cross over the H-1 Freeway interchange to the Middle Street Transit Center. The guideway over the H-1 Freeway and the Middle Street Transit Center would be dominant elements, visible at a great distance. However, they would fit with the large scale of the interchange and the surrounding developed urban character of the mostly industrial and commercial uses. Views of Honolulu Harbor from the park are already obstructed by the interchange and would not be substantially affected by the Project. Visual effects in this area are expected to be moderate.

The potential for the guideway and stations to block protected mauka-makai views and vistas of the following features and landmarks would vary throughout the Aloha Stadium to Kalihi landscape unit:

- Views of Pearl Harbor and Lochs framed by the Wai'anae Mountain Range
- Views of Diamond Head and Honolulu valleys

- Views of Punchbowl Crater
- Views of Āliamanu Crater and Central O'ahu valleys

Viewpoints that are not close to the alignment would generally be less sensitive to changes in the visual environment because they would take in a longer, more expansive landscape. The project elements would be noticeable, but not dominant, features in these views, and visual effects to significant protected views and vistas would range from moderate to high depending on the viewer's position and location.

Viewpoints 5 through 8 illustrate views of the Project within this landscape unit (Figures 4-21 through 4-24).

Airport Alternative

The Airport alignment would continue Koko Head of the Kamehameha Highway makai past Aloha Stadium and over Hālawa Stream. Aloha Stadium is at a major freeway interchange and surrounded by parking lots. Views of East Loch and the Pearl Harbor historic sites from residences near Kohomua Street would be obstructed by the guideway and columns. Hālawa Bridge is a historic site, and its appearance would be substantially changed to accommodate the guideway and support columns. The contrast in the scale and character of the guideway, columns, station, and park-and-ride lot with the existing environment would be a noticeable change. Visual effects in this area are expected to range from moderate to high.

Between Hālawa Stream and the H-1 Freeway Intersection, the guideway would be above the Kamehameha Highway median. Six historic sites, including the Makalapa U.S. Navy housing and other U.S. Navy facilities, lie along this section of the alignment. The visual effects on these resources are expected to be moderate. Although 'Ewa views of Pearl Harbor from the U.S. Navy housing would change, the project elements would fit within the context of the highway as a transportation corridor, so overall visual effects would be moderate.

The Pearl Harbor Naval Base Station would fit with the scale and character of commercial development at the intersection of the Kamehameha Highway and Radford Drive. However, the guideway and columns would be noticeable changes in the visual environment makai of the H-1 Freeway as it intersects with Nimitz Highway. This area is a major interchange that includes wide paved areas and several elevated ramps. Visual effects would vary from low to moderate.

Project elements, including the Honolulu International Airport Station and Lagoon Drive Station, would fit with the bulk and scale of other structures in the vicinity of the airport, which is surrounded by other transportation elements and industrial buildings. Although the guideway and columns would reduce the open character of parking lots and the streetscape, and mature trees would be removed makai of the H-1 Freeway and 'Ewa of the Honolulu International Airport Station, the overall visual effect would be low.

The guideway would connect with Kamehameha Highway and the Middle Street Transit Center after passing over a portion of Ke'ehi Lagoon Park and Nimitz Highway. The open spatial quality of the park would be altered by the guideway and columns. This change would be noticeable but not substantial to park users because the alignment would be along the periphery of the park and closely follow Nimitz Highway and the H-1 Freeway. Views of Honolulu Harbor and the park are already obstructed by the interchange and would not be substantially affected by the Project. Although the Middle Street Transit Center would be a dominant element, it would fit with the large scale of the interchange and the surrounding developed urban character of the mostly industrial and commercial uses. The overall visual effects would be moderate.

The potential for the guideway and stations to block protected mauka-makai views and vistas of the following features and landmarks would vary throughout the Aloha Stadium to Kalihi landscape unit:

- Views of Pearl Harbor and Lochs framed by the Waiʻanae Mountain Range
- Views of Diamond Head and Honolulu valleys
- Views of Punchbowl Crater
- Views of Āliamanu Crater and Central Oʻahu valleys

Viewpoints 9 through 11 illustrate views of the Project within this landscape unit (Figures 4-25 through 4-27).

Viewpoints that are not close to the alignment would generally be less sensitive to changes in the visual environment because they would take in a longer, more expansive landscape. The project elements would be noticeable, but not dominant, features in these views, and visual effects to significant protected views and vistas would range from moderate to high depending on the viewer's position and location.

Airport & Salt Lake Alternative

Visual effects of the Airport & Salt Lake Alternative would include all the effects described previously for these individual alternatives. An exception would be the Arizona Memorial Station, which would only be included for this alternative. This station would create a moderate visual effect on views of East Loch and Pearl Harbor historic sites.

Mitigation

Mitigation measures will focus on preserving visual resources and enhancing the project design to comply with applicable policies. The following measures would be included with the Project to minimize negative visual effects and enhance the visual and aesthetic opportunities that it creates:

- Develop and apply design guidelines that would establish a consistent design framework for the Project with consideration of local context
- Retain existing trees where practical and provide new vegetation
- Shield exterior lighting
- Coordinate the project design with City TOD planning and DPP
- RTD will consult with the communities surrounding each station for input on station design elements.

4.8 Air Quality

This section evaluates the quantity of air pollutant emissions that would occur with each of the project alternatives. *Air pollution* is a general term that refers to one or more chemical substances that degrade the quality of the atmosphere. *Air quality* describes the amount of pollution in the air. Individual air pollutants degrade the atmosphere by reducing visibility, damaging property, reducing the productivity or vigor of crops or natural vegetation, or reducing human or animal health. For more information and references, see the *Honolulu High-Capacity Transit Corridor Project Air Quality and Energy Technical Report* (RTD 2008g).

4.8.1 Background and Methodology

Regulatory Requirements

The Clean Air Act Amendments of 1990 (40 CFR 51) and the Final Transportation Conformity Rule (40 CFR 93) direct the EPA to implement environmental policies and regulations that will ensure acceptable air quality levels.

As required by the Clean Air Act, National Ambient Air Quality Standards (NAAQS) have been established for six major air pollutants. Known as *criteria pollutants*, these are carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2) and lead (Pb). The State of Hawai'i has also established ambient air quality standards that are either the same or more stringent than the corresponding Federal standards. State and Federal standards are summarized in Table 4-11.

Table 4-11 National and State Ambient Air Quality Standards

Pollutant	Standards	
	Hawai`i State Standard	Federal Primary Standard (Health)
Carbon Monoxide (CO)		
1 hour	9 ppm	35 ppm
8 hour	4.5 ppm	9 ppm
Nitrogen Dioxide (NO_2)		
Annual (arithmetic)	0.04 ppm	0.05 ppm
PM_{10}		
24 hour	150 µg/m^3	150 µg/m^3
Annual (arithmetic)	50 µg/m^3	Revoked
$PM_{2.5}$		
24 hour	No standard	35 µg/m^3
Annual (arithmetic)	No standard	15 µg/m^3
Ozone (O_3)		
8 hour	0.08 ppm	0.08 ppm
Sulfur Dioxide (SO_2)		
3 hour	0.5 ppm	No standard
24 hour	0.14 ppm	0.14 ppm
Annual (arithmetic)	0.03 ppm	0.03 ppm
Lead (Pb)		
3 months (arithmetic)	1.5 µg/m^3	1.5 µg/m^3

µg/m^3 = micrograms per cubic meter

ppm = parts per million

Sources: State of Hawai'i, Department of Health, Clean Air Branch—Hawai'i Administrative Rules, Chapter 59 Code of Federal Regulations, Title 40, Part 50, Accessed: December 10, 2007. EPA, National Ambient Air Quality Standards.

In addition to the criteria pollutants addressed in the NAAQS, the EPA regulates air toxics. Toxic air pollutants are those known or suspected to cause cancer or other serious health effects. In 2001, the EPA identified 21 Mobile Source Air Toxics (MSAT) and highlighted 6 as priority MSATs.

In February 2007, the EPA finalized the *Control of Hazardous Air Pollutants from Mobile Sources* (EPA 2007) rule to reduce hazardous air pollutants from mobile sources. This rule limits gasoline's benzene content and reduces toxic emissions from passenger vehicles and gas cans.

Methodology

Air quality effects predicted to result from the Project's operation are based on the anticipated vehicle miles traveled (VMT) and average network speed for each alternative. A regional mobile source pollutant burdens analysis was completed. It was based on link-by-link VMT and speed for each of the Build Alternatives and compared to the No

Build Alternative. VMT and the associated traffic simulation network speeds were used.

Emissions factors were obtained through the EPA's mobile source emission model, MOBILE6.2, in accordance with Hawai'i Department of Health Clean Air Branch's recommendation. This analysis compares regional pollutant burdens (the total quantity of each pollutant released in the region) for each alternative. Changes in regional emission levels were estimated to describe the potential effect the alternatives may have on regional air quality.

In 2006, the USDOT issued Interim Guidance regarding MSAT analysis in NEPA documentation. This guidance includes a three-tiered approach to determining potential project-induced MSAT impacts, depending on the nature of the project. A qualitative analysis of MSAT effects was completed.

4.8.2 Affected Environment

Relevant Pollutants

The Project would affect travel patterns within the study area, so pollutants that can be traced principally to motor vehicles are relevant in evaluating project consequences. These pollutants include CO, volatile organic compounds (VOC), nitrogen oxides (NO_x), PM_{10} and $PM_{2.5}$, and MSATs.

Air pollutant levels in Hawai'i are monitored by a network of sampling stations operated under the supervision of the State of Hawai'i Department of Health (HDOH) at various locations around O'ahu. The only NAAQS for which pollution levels have been measured greater than the standard since 2004 is $PM_{2.5}$. $PM_{2.5}$ concentrations exceeded the 24-hour standard on four occasions in Pearl City in 2004 as a result of fireworks.

Regional Compliance with the Standards

Section 107 of the 1977 Clean Air Act Amendments requires the EPA to publish a list of all geographic areas that are in compliance with the NAAQS and areas that do not attain the NAAQS. Areas not in compliance are called nonattainment areas. Areas for which insufficient data is available to make a determination are unclassified and treated as being in compliance (attainment areas) until proven otherwise. Designation of an area is made on a pollutant-by-pollutant basis.

The entire State of Hawai'i is designated as an attainment area for CO, O_3, PM_{10}, and $PM_{2.5}$. This means that the State is in compliance with the NAAQS for these pollutants.

Projects included in Hawai'i's regional transportation network are found in the Transportation Improvement Plan. The Honolulu High-Capacity Transit Corridor Project is listed in the area's Transportation Improvement Plan and complies with the goals set forth in the Statewide Transportation Plan.

4.8.3 Environmental Consequences and Mitigation

Environmental Consequences

No Build Alternative

The No Build Alternative provides a baseline to which the Build Alternatives are compared. Under this alternative, the Project would not be built. It is predicted that 6,854 kilograms (kg) of VOCs, 147,464 kg of CO, 4,842 kg of NO_x, 375 kg of PM_{10}, and 174 kg of $PM_{2.5}$ would be generated daily by transportation sources within the study area in 2030, including other projects in the ORTP.

Regional Analysis

It is anticipated that the Project would reduce regional pollutant emissions by between 3.2 to 4.0 percent (varying by Build Alternative) compared to the No Build Alternative (Table 4-12). Table 4-12 shows the results of the analysis of VOC, CO, NO_x, PM_{10}, and $PM_{2.5}$ for each of the Build Alternatives compared to the No Build Alternative. If the electricity used to operate any one of the Build Alternatives is generated by combustion, this

Table 4-12 2030 Regional Pollutant Burdens (kg/day)

Alternative	Emission Burden (kg/day)					Percent Change from No Build				
	VOC	CO	NO_x	PM_{10}	$PM_{2.5}$	VOC	CO	NO_x	PM_{10}	$PM_{2.5}$
No Build	6,854	147,464	4,842	375	174	n/a	n/a	n/a	n/a	n/a
Salt Lake	6,585	142,616	4,678	361	168	-3.9%	-3.3%	-3.4%	-3.7%	-3.4%
Airport	6,580	142,500	4,674	361	167	-4.0%	-3.4%	-3.5%	-3.7%	-4.0%
Airport & Salt Lake	6,588	142,694	4,680	362	168	-3.9%	-3.2%	-3.3%	-3.5%	-3.4%

n/a = not applicable

may produce additional emissions. However, these emissions would be offset in whole or part by the reductions generated by reduced VMT. Furthermore, power plant emissions may be much more easily controlled than emissions from individual automobiles.

The Build Alternatives are expected to have a small positive effect on MSAT emissions in the study area, compared to the No Build Alternative because of the reduction of VMT. In comparing the Build Alternatives, MSAT levels could be higher in some locations than others, but current tools and science are not adequate to quantify these levels. However, for all the Build Alternatives, EPA's vehicle and fuel regulations coupled with fleet turnover will result in lower region-wide MSAT levels from current levels.

Salt Lake Alternative

With the Salt Lake Alternative, the Project is predicted to demonstrate a 4-percent reduction in VMT and no change in overall network speed compared to the No Build Alternative. This would result in predicted pollution reductions ranging from 3.3 to 3.9 percent compared to the No Build Alternative.

Airport Alternative

With the Airport Alternative, the Project is predicted to demonstrate a 4-percent reduction in VMT and no change in overall network speed compared to the No Build Alternative. This would result in predicted pollution reductions ranging from 3.4 to 4.0 percent compared to the No Build Alternative.

Airport & Salt Lake Alternative

With the Airport & Salt Lake Alternative, the Project is predicted to demonstrate a 4-percent reduction in VMT and no change in overall network speed compared to the No Build Alternative. This would result in predicted pollution reductions ranging from 3.2 to 3.9 percent compared to the No Build Alternative.

Local Effects

The study area is currently in attainment for CO, and monitored CO values are less than 20 percent of the applicable NAAQS. Therefore, no violations of the applicable NAAQS are likely to occur with the Project. As a result, microscale CO analysis was not conducted.

Mitigation

Because no substantial air quality impacts are anticipated to result from operation of any of the project alternatives, mitigation would not be required. Any measures to reduce automobile travel would reduce air pollutant emissions.

4.9 Noise and Vibration

This section describes the Project's effects on environmental noise and vibration levels in the study corridor. For more information and references, see the *Honolulu High-Capacity Transit Corridor Project Noise and Vibration Technical Report* (RTD 2008f).

4.9.1 Background and Methodology

Background

Environmental noise is composed of many frequencies, each occurring simultaneously at its own sound pressure level. The range of magnitude, from the faintest to the loudest sound the ear can hear, is so large that sound pressure is expressed on a logarithmic scale in units called decibels (dB). The commonly used frequency weighting for environmental noise is A-weighting (dBA), which simulates how an average person hears sound.

A common noise descriptor for environmental noise is the equivalent sound level (Leq). Leq is a measure of total noise—a summation of all sounds during a period of time. Leq measured over a one-hour period is the hourly Leq [Leq(h)]. The day/night noise level (Ldn) is a descriptor of the daily noise environment, which incorporates a penalty for high noise levels at night. Lmax is the maximum noise level from an event.

Typical sound levels experienced in urban environments are shown in Figure 4-37.

Noise from rail transit operations is generated from the interaction of wheels on track, motive power, and the operation of traction power substations. The interaction of steel wheels on rails generates the following three different types of noise, depending on track work: (1) noise generated by pass-by trains operating on tangent track sections, (2) noise generated from wheel squeal on tightly curved track, and (3) noise generated on special trackway sections, such as at crossovers or turnouts.

Noise Terminology

dBA is an A-weighted decibel, a measure that considers how people hear sound

Lmax is the maximum noise level during an event

Leq measures the average sound energy over time

Ldn is the day/night sound level, a 24-hour average with a penalty that makes sounds at night more important

Noise Criteria for the Project

Noise impacts from transit projects are evaluated using criteria established by the FTA, which are based on community reaction to environmental noise exposure (FTA 2006a). The FTA noise impact

Relative Sound Level	½ as loud		Baseline			Twice as loud				Four times as loud
Typical Sound Environment	Indoor Office		Urban Residential			Urban Commercial				
Lmax of Common Noise Sources		Washing Machine (3 ft)	Auto (50 mph at 50 ft)	Vacuum Cleaner (3 ft)		Garbage Disposal (3 ft)	Delivery Truck (50 mph at 50 ft)		Dump Truck (50 mph at 50 ft)	Blender (3 ft)
Sound Level dBA	60	65	70		75	80		85		90
Lmax at 50 ft of Transit Noise Source			Rail Transit with a Barrier (50 mph)		Rail Transit (50 mph)	City Bus (50 mph)				

Source: EPA 1971, EPA 1974, FTA 2006

Figure 4-37 Typical Sound Levels

Table 4-13 FTA Transit Noise Impact Criteria—Land Use Categories

Category	Metric	Land Use Description
1	Leq(h) (dBA)	Tracts of land where quiet is an essential element in their intended purpose. This category includes lands set aside for serenity and quiet, land uses such as outdoor amphitheaters and concert pavilions, and National Historic Landmarks with substantial outdoor use.
2	Ldn (dBA)	Residences and buildings where people normally sleep. This category includes homes, hospitals, and hotels where a nighttime sensitivity to noise is assumed to be of utmost importance.
3	Leq(h) (dBA)	Institutional land uses with primary daytime and evening use. This category includes schools, libraries, and churches where it is important to consider interference with such activities as speech, meditation, and concentration on reading material. Buildings with interior spaces where quiet is important, such as medical offices, conference rooms, recording studios, and concert halls, fall into this category. It also includes places for meditation or study associated with cemeteries, monuments, and museums. Certain historical sites, parks, and recreational facilities are also included.

Source: FTA 2006a.

criteria group noise-sensitive land uses into the categories shown in Table 4-13.

The FTA criteria define moderate and severe impacts. The project-generated noise level (project noise exposure) at which an impact would occur depends on the existing noise environment and the category of land use. The noise impact criteria for transit operations are shown on Figure 4-38. Reading from the graph, if the existing noise level in a residential area is 60 dBA Ldn, then a project that generates less than 58 dBA Ldn would not have an effect. If it generates between 58 and 63 dBA Ldn, it would cause a moderate impact, and if it generates more than 63 dBA Ldn, it would cause a severe impact. Future noise exposure is the combination of existing noise exposure and the additional noise exposure caused by a project.

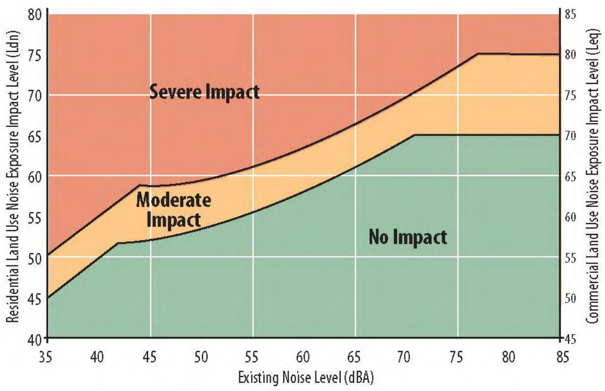

Figure 4-38 FTA Transit Project Noise Exposure Impact Criteria

Severe noise impacts are considered significant within the context of NEPA and HRS 343. Severe noise impacts require the evaluation of alternative locations/alignments to avoid severe impacts altogether. If it is not practical to avoid severe impacts by changing the location of the Project, mitigation measures must be considered and incorporated into the Project unless there are truly extenuating circumstances that prevent it. Moderate noise impacts also require consideration and adoption of mitigation measures when it is reasonable. The mitigation of moderate impacts should consider the predicted increase over existing noise levels, the type and number of noise-sensitive land uses affected, existing outdoor/indoor sound insulation, community views, special protection provided by law, and the cost-effectiveness of mitigating noise to more acceptable levels.

The State of Hawai'i regulates community noise pollution through HAR 11-16. The regulations are applicable to stationary noise sources, such as traction power substations and the vehicle maintenance and storage facility.

Vibration Criteria for the Project

Vibration effects from transit operations are generated by motions/actions at the wheel/rail interface. The smoothness of these motions/actions are influenced by wheel and rail roughness, transit vehicle suspension, train speed, track construction (including types of fixation and ballast), location of switches and crossovers, and the geologic strata (layers of rock and soil) underlying the track. Vibration from a passing train has the potential to move through the geologic strata, resulting in vibration transferred through the building foundation. The principal concern is annoyance to building occupants.

Ground-borne vibration is usually characterized in terms of vibration velocity. This is because—over the frequency range relevant to ground-borne vibration (about 1 to 200 hertz)—both human and building response tends to be more proportional to velocity than to displacement or acceleration. Vibration velocity is often reported as vibration decibels (VdB) relative to a reference velocity of 10^{-6} inches/second.

The FTA has developed criteria for acceptable levels of ground-borne vibration (FTA 2006a) as shown in Table 4-14.

Noise and Vibration Assessment Methodology

Project-related noise levels for the Build Alternatives were calculated using FTA reference sound levels for rail transit. Potentially noise-sensitive land uses and vibration-sensitive buildings were identified, as well as appropriate locations for noise monitoring.

Ground-level noise levels were measured at locations along the Build Alternative alignments and near proposed station locations to establish the most sensitive existing environment (i.e., existing baseline noise levels). This is done by performing a series of measurements at representative locations. All noise measurements were made in accordance with American National Standards Institute procedures for community noise measurements.

Noise measurements were taken at 53 noise-sensitive locations along the study corridor. Measurements for 24-hour periods were conducted at 29 sites that include residences and other buildings where people normally sleep (Category 2 sites). These measurement locations were supplemented with short-term 15-minute measurement sites to determine existing noise levels at typical recreational, institutional, and commercial land uses with primarily daytime and evening activity (Category 3 sites). Additional measurements were taken from upper floors of residential buildings with open lanais. Potential noise effects from transit park-and-ride lots and maintenance and storage facility operations were also identified.

Noise effects from the Project were determined by comparing the project-generated noise exposure

Table 4-14 FTA Ground-borne Vibration Impact Criteria

Land Use Category	Ground-borne Vibration Impact Levels (VdB)	
	Frequent Events[1]	Infrequent Events[2]
Category 1: Buildings where low ambient vibration is essential for interior operations	65 VdB[3]	65 VdB[3]
Category 2: Residences and buildings where people normally sleep	72 VdB	80 VdB
Category 3: Institutional land uses with primarily daytime use	75 VdB	83 VdB

Source: FTA2006a.

[1] "Frequent Events" are defined as over 70 vibration events per day.
[2] "Infrequent Events" are defined as less than 70 vibration events per day. This includes most commuter rail systems.
[3] This criterion is based on levels that are acceptable for most moderately sensitive equipment, such as optical microscopes. Vibration-sensitive manufacturing or research will require detailed evaluation to define acceptable vibration levels. Ensuring lower vibration levels in a building often requires special design of the HVAC system and stiffened floors.

level at each representative receptor in the corridor to the appropriate FTA criterion, given the land use and existing noise levels. If the project-generated noise would be below the level for moderate impact, no impact would occur. If the noise level would be between the level for moderate impact and severe impact, a moderate impact would occur. If the project noise level would be equal to or above the severe impact level, a severe impact would occur.

Vibration effects from the Build Alternatives were determined using the detailed vibration assessment information and procedures contained in the FTA's *Guidance Manual for Transit Noise and Vibration Impact Assessment* (FTA 2006b). FTA reference levels for a transit vehicle and FTA reference data on ground transmission of vibration energy were used to estimate vibration levels at distance from the fixed guideway.

4.9.2 Affected Environment

This section describes the noise survey used to establish baseline conditions. Ambient vibration levels were not measured as part of this study.

Ambient Noise Conditions in the Study Area

The measurement locations and existing sound levels are shown in Figures 4-39 through 4-42. These locations represent noise-sensitive land uses along the corridor.

Ambient Vibration Conditions in the Study Area

Ambient vibration levels were not measured as part of this study but are anticipated to be below perceptible levels.

4.9.3 Environmental Consequences and Mitigation

Environmental Consequences

No Build Alternative

Under the No Build Alternative, the Project would not be built and the only source of future noise levels would be traffic movements on local streets and highways. The Project would not generate any new noise impacts. Similarly, no new vibration sources would occur in the absence of the Project. Although the projects in the ORTP would be built, their environmental impacts would be studied in separate documents.

Common to All Build Alternatives

Noise

The Project would include an integrated noise-blocking parapet wall at the edge of the guideway structure that extends 3 feet above the top of rail and a system specification for vehicles with wheel skirts. The parapet wall would substantially reduce ground-level noise. Wheel skirts would increase the benefit of the parapet wall at locations above the elevation of the track. Figures 4-39 through 4-42 show the measured existing noise level and future project noise exposure at each site for each Build Alternative. The data table included in these figures for each site is labeled no impact or moderate impact for each site. Table 4-15 shows the total number of residential buildings that would experience adverse noise effects.

Table 4-15 Number of Residential Buildings, Parks, and Schools with Noise Impacts

Alternative (2030)	Moderate Impacts	Severe Impacts
Salt Lake	23	0
Airport	18	0
Airport & Salt Lake	18	0

The Project would cause no severe noise impacts. Moderate impacts would occur at between five and seven areas, depending on the alternative (Table 4-16). The lowest number of noise impacts experienced at sensitive receptors would occur under the Airport Alternative because the guideway would travel near fewer sensitive receptors. Noise levels in the Salt Lake neighborhood would be lower with the Airport & Salt Lake Alternative than with the Salt Lake Alternative because only

Table 4-16 Noise Impacts

Area	Receptor Description	Buildings Affected	Level of Impact
Common to All Build Alternatives			
West Loch to Waipahu Transit Center	94-340 Pupumomi Street	1 9-floor building	Moderate impact to 5th floor and above
Pearl Highlands	1060 Kamehameha Highway	1 46-floor building	Moderate impact to 2nd through 5th floors
Pearlridge to Aloha Stadium	Kamehameha Highway at Kauhale Street	14 single-family residences	Moderate impact at ground level
Civic Center to Kaka`ako	860 Halekauwila	1 30-floor building	Moderate impact to 6th floor and above
Kaka`ako to Ala Moana Center	1133 Waimanu	1 28-floor building	Moderate impact to 7th through 9th floors
Salt Lake Alternative			
Ala Liliko`i	3215 Ala `Ilima Boulevard	1 12-floor building	Moderate impact above 9th floor
Ala Liliko`i to Middle Street Transit Center	2889 Ala `Ilima Boulevard	4 10- to 20-floor buildings	Moderate impact above 9th floor

half as many trains would travel on the Salt Lake alignment under that alternative.

The greatest noise source from the traction power substations would be air-conditioning equipment, which would not generate substantial noise impacts. Project park-and-ride lots would be located in undeveloped or commercial areas. The nearest distance from a park-and-ride lot to a residential use would be more than 1,000 feet to the center of the park-and-ride site at the Pearl Highlands park-and-ride lot.

Noise sources at the maintenance and storage facility would include trains operating and switching within the facility and maintenance and cleaning activities. These activities would occur over a 24-hour period. There are no noise-sensitive uses near the Ho'opili maintenance site option. Leeward Community College and Waipahu High School are both approximately 700 feet from the center of the Leeward Community College site. At this distance, the maintenance activities would not generate substantial noise impacts.

Vibration

Vibration levels at adjacent properties would not exceed 65 VdB for the elevated rail transit. This level is less than the FTA criterion of 72 VdB for residential buildings and other structures where people normally sleep (Category 2). No land use along the alignment is identified as having vibration-sensitive equipment that would require the use of lower vibration impact criteria; therefore, no vibration effects are anticipated.

Mitigation Common to All Build Alternatives

Noise

Between five and seven sites would experience moderate noise impacts. No feasible and reasonable mitigation is available to eliminate the moderate impact at Kauhale Street.

In areas with high-rise apartments and hotels that have lanais above the elevation of and facing the rail, the parapet wall would have a limited benefit (less than a 3-dBA noise reduction) at floors above the level of the guideway. Wheel skirts, which would be used on the vehicles, would reduce noise levels at floors above the guideway. The moderate noise impact that would occur at the high-rise buildings identified in Table 4-16 would only be experienced from units above track level. Measures to reduce noise levels above the track elevation, such as sound-absorptive materials in the track area, would be evaluated during preliminary engineer-

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Figure 4-39 Noise Measurement Locations and Results (Kapolei to Fort Weaver Road)

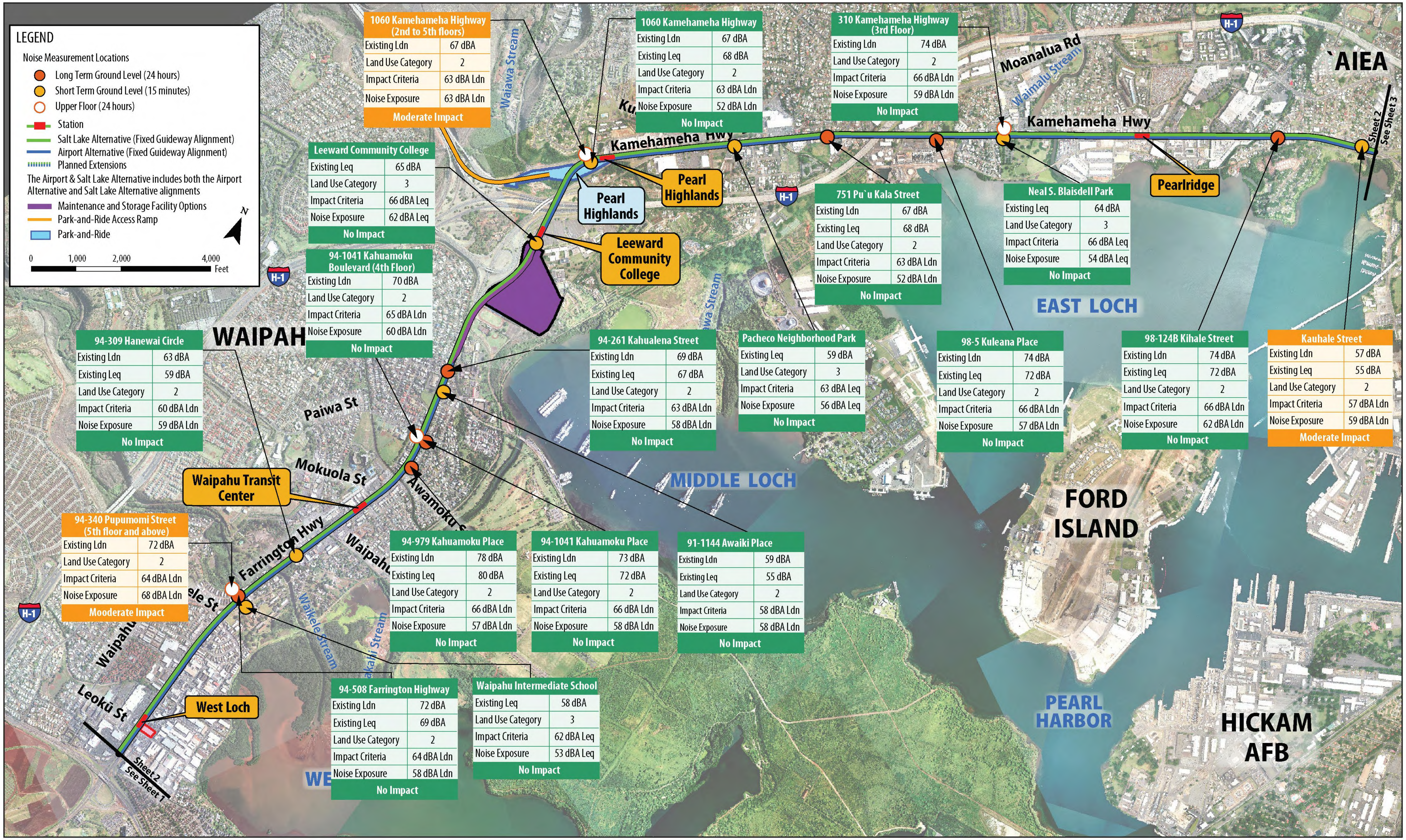

Figure 4-40 Noise Measurement Locations and Results (Fort Weaver Road to Aloha Stadium)

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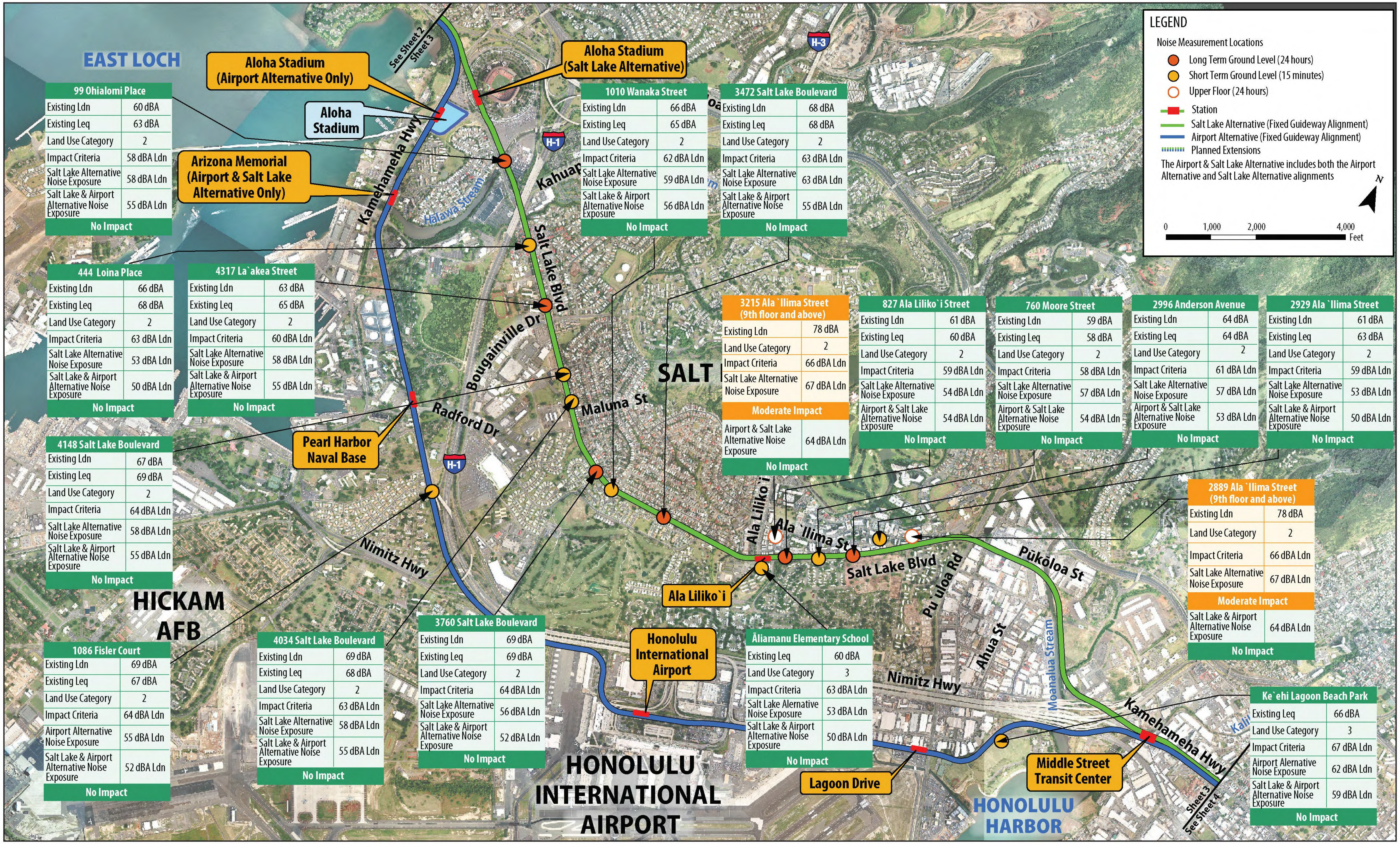


Figure 4-41 Noise Measurement Locations and Results (Aloha Stadium to Kalihi)

Figure 4-42 Noise Measurement Locations and Results (Kalihi to UH Mānoa and Waikīkī)

ing of the Project. Once the Project is operating, noise levels will be measured to determine the actual extent of project noise impacts.

Vibration

Because no vibration effects are projected for the Build Alternatives, no mitigation is proposed.

4.10 Energy and Electric and Magnetic Fields

This section describes the energy required for operating the Project and analyzes electric and magnetic fields (EMFs) as related to the Project's operation. Energy used during the Project's operation would include fuel consumed by buses, electricity used to power transit vehicles, and a negligible amount of energy for signals, lighting, and maintenance. For more information and references, see the *Honolulu High-Capacity Transit Corridor Project Electric and Magnetic Fields Technical Report* (RTD 2008h).

EMFs are a result of the voltage or electric potential of an object. For this Project, the high-capacity transit system would be powered by electricity from a third line located next to the rail tracks. Whenever an electrical current flows, it creates a magnetic field. An analysis of EMFs is included in this Draft EIS because of public concern about potential health effects and effects on equipment and machines adjacent to the corridor that may be sensitive to EMFs.

4.10.1 Background and Methodology

Energy

The analysis of operational energy consumption on O'ahu was based on the transportation analysis prepared for the Project. Changes in overall transportation energy use for vehicles traveling on O'ahu were assessed using daily VMT and speed values calculated from the transportation demand forecasting model.

The energy consumed by electrically powered transit operations for the high-capacity transit system was also considered. Fixed guideway high-capacity transit systems require energy for propulsion and to account for energy lost during transmission from the energy-generation site to the transit vehicles. The average energy consumption for a rail transit vehicle in the U.S. is 62,700 British thermal units (BTUs) per vehicle-mile of service (USDOE 2007).

Electric and Magnetic Fields

EMFs are produced wherever wires distribute electric power and wherever electrical equipment is used. EMFs decrease with the square of distance away from operating equipment or away from current-carrying electric lines. Sensitive equipment that may be affected by changes to the Earth's geomagnetic field caused by operation of the Project may be located at research, manufacturing, medical, and possibly military facilities. Available data on high-voltage power lines, medical and diagnostic facilities, institutional and research facilities, and military operations were assembled. This information was confirmed through field reconnaissance to verify site locations and identify equipment that may be sensitive to the influence of EMFs associated with the Project.

Research into the health effects of EMFs has not established a link between EMFs and any health effects. National Academy of Sciences National Research Center findings "do not support the contention that the use of electricity poses a major unrecognized public-health danger" (NRC 1999). The International Commission on Non-Ionizing Radiation Protection also concluded that data related to cancer do not provide a basis for assessing the health risks of human exposure to power frequency fields (ICNIRP 1998), but it did establish a protective guideline of 830 milligauss magnetic field density for exposure to the general public.

4.10.2 Affected Environment

Energy

In 2006, 291 million gallons of gasoline were consumed on the Island of O'ahu. Gasoline represents the largest segment of transportation energy consumption, closely followed by aviation fuel, then by diesel.

Transportation modeling results for 2007 show approximately 11.5 million daily VMT on O'ahu. This results in a daily consumption of approximately 666,000 gallons of fuel with an energy content of 85,600 million BTUs (MBTUs).

Electric and Magnetic Fields

Twenty locations were found during a field survey that are within 200 feet of the centerline of the Build Alternatives and which could have sensitive electronic equipment that could be affected by operation of the Project. The facility managers were contacted, and all but one facility was eliminated (Table 4-17). Honolulu Community College has an electron microscope that is between 200 and 250 feet from the alignment.

4.10.3 Environmental Consequences and Mitigation

Environmental Consequences

Energy

No Build Alternative

Transportation energy consumption for the No Build Alternative would include motor vehicle fuel consumption islandwide. This is estimated to be 94,610 MBTUs in 2030 (Table 4-18).

Common to All Build Alternatives

For all of the Build Alternatives, the total transportation energy demand for transit and highway vehicles would be lower than for the No Build Alternative. Table 4-18 summarizes the anticipated average daily transportation demand in 2030 for each of the alternatives. All Build Alternatives are anticipated to reduce daily transportation energy demand by approximately 2 percent compared to the No Build Alternative.

The Project would consume approximately 1 to 2 percent of the total projected electricity generated on O'ahu in 2030. The planned electricity generation capacity on O'ahu would be sufficient to support the transit system, but the electricity distribution system would require various upgrades to support the system (HECO 2008).

Integration of photo-voltaic cells into stations and other project features could reduce net project electricity demand.

Electric and Magnetic Fields

No Build Alternative

There would be no features generating EMFs.

Common to All Build Alternatives

The magnetic-field disturbance generated by operation of the Project would be low-frequency (0 to 10 hertz) and would occur at intervals determined by passing trains. EMFs produced by the Project would be of such low magnitude that the only potential effects would be to highly sensitive instruments that may be in use within facilities adjacent to the right-of-way. The electron microscope at Honolulu Community College is

Table 4-17 Location of Potential EMF Receptors within 200 Feet of Project Alternatives

Address	Building Name	Equipment
Institutional—University/Research		
874 Dillingham Boulevard	Honolulu Community College	Electron microscope

Table 4-18 2030 Summary of Average Daily Transportation Energy Demand by Alternative

Alternative	Roadway and Bus Energy Consumption (MBTUs)[1]	Fixed Guideway Vehicle Energy Consumption (MBTUs)[1]	Total Energy Consumption (MBTUs)[1]	Percent Change from No Build
No Build	94,610	0	94,610	n/a
Salt Lake	91,082	1,163	92,245	-2%
Airport	91,013	1,224	92,237	-2%
Airport & Salt Lake	91,132	1,194	92,326	-2%

[1] MBTUs = million British thermal units

unlikely to be affected by the Project; however, this will be confirmed during preliminary engineering. A review of the state of the science regarding health effects associated with EMFs found no new evidence linking these fields to biological issues. Project-generated magnetic fields would be less than the International Commission on Non-Ionizing Radiation Protection guideline limit in areas where the public may be regularly exposed. Because no negative health effects or effects on equipment related to EMFs are anticipated, mitigation would not be needed.

4.11 Hazardous Waste and Materials

This section analyzes potential contaminant sources that may be present in the study corridor. It also assesses the potential of encountering hazardous waste and chemically impacted soil and/or groundwater adjacent to the project alignment, as well as the Project's potential use of hazardous materials. For more information and references, see the *Honolulu High-Capacity Transit Corridor Project Hazardous Materials Technical Report* (RTD 2008i).

4.11.1 Background and Methodology

Regulatory Background

Many Federal and State laws regulate hazardous waste and materials. The primary Federal laws are the *Resource Conservation and Recovery Act of 1976* (USC 1976) and the *Comprehensive Environmental Response, Compensation and Liability Act of 1980* (CERCLA) (USC 1980). The National Priority List is a listing of the most polluted sites in the nation that are eligible for cleanup funding (Superfund) under CERCLA.

Hazardous waste in the City is primarily regulated by the Office of Hazard Evaluation and Emergency Response and the Solid and Hazardous Waste Branch, both within the HDOH. The Office of Hazard Evaluation and Emergency Response is responsible for implementing the *Hawai'i Environmental Response Law* (HRS 128D), the *State Contingency Plan* (HAR 11-451), and *the Hawai'i Emergency Planning and Community Right-to-Know Act* (HRS 128E). The Solid and Hazardous Waste Branch is responsible for overseeing the Office of Solid Waste Management, the Underground Storage Tank Program, and the Hazardous Waste Program.

Methodology

An Initial Site Assessment of the study corridor was conducted to identify potential hazardous waste areas. The following steps were performed during this assessment to establish existing conditions and to evaluate potential impacts and whether project-related activities have the potential to disturb, generate, use, and/or dispose of hazardous materials:

- Reviewed environmental database records to evaluate potential impacts to the Project. Environmental Database Resources, Inc., prepared a report for the Project on November 2,

2007 (EDR 2007). To generate this report, they conducted a search of all databases relevant to hazardous waste and materials operations in Hawai'i.
- Reviewed previous Honolulu transit project hazardous materials surveys.
- Coordinated with HDOH.
- Reviewed historical land uses using maps and historic aerial photos to identify any past business uses in the immediate project vicinity that could have a negative impact on the Project in terms of hazardous materials and wastes.
- Conducted field reconnaissance to identify land uses that may indicate the presence of hazardous materials or waste. Field reconnaissance was conducted from public access areas and within the study corridor, as feasible.
- Contacted owners of oil and fuel pipelines to establish pipeline locations. Preliminary information was obtained, but coordination would be ongoing throughout design and construction.

Potential mitigation measures to be employed during further design, planning, and construction of the Project were developed based on the data collected and evaluations conducted.

4.11.2 Affected Environment

The study corridor is currently dominated by commercial and residential developments, with some areas of military activity and localized industrial activity. This assessment is based on field reconnaissance. Information from the database search and the review of historic maps and aerial photographs indicates a more industrial past for certain areas of the study corridor.

Past and present industrial activities along the study corridor are mostly agricultural, food processing, or warehousing. Contaminants associated with these uses are primarily petroleum hydrocarbons, such as gasoline, diesel, and oil. Other contaminants can include pesticides, herbicides, metals, and solvents, but solvents and metals are generally not used in bulk in agriculture, food processing, and warehousing.

Agricultural Uses

Specific areas of past industrial agricultural activity near the Project include the following:

- Former 'Ewa Sugar Mill
- Former O'ahu Sugar Mill
- Former 'Aiea Sugar Mill
- Former Dole Pineapple Cannery

These industrial agricultural sites appear in the databases searched. However, these sites all ceased operations in the 1990s and were largely remediated and redeveloped in the late 1990s and early 2000s.

Industrial Uses

In some areas along the project alignment, current and historic land uses indicate a more industrial past than other areas, so they have a higher potential of harboring soil or groundwater contamination. These areas include the following:

- Waipahu (West Loch)—this neighborhood is dominated by gas stations and car dealerships along Farrington Highway, with warehouse and automobile repair businesses makai of Farrington Highway.
- Airport Industrial Area—this neighborhood is dominated by airport/airline support activities (tank farms and maintenance facilities), car dealerships, rental car agencies, warehouses, and light industrial activities.
- Māpunapuna—this area is dominated by warehouses, light industrial activities, and an automobile dealership.
- Kapālama-Iwilei—this area was dominated by the Dole Cannery and supporting businesses in the past but is increasingly becoming commercial. The former Kapālama Incinerator was located in the area along with a number of warehouse and light manufac-

turing businesses. Warehousing continues along Kapālama Canal.

- Kaka'ako—this neighborhood was once dominated by automobile dealerships and repair shops, warehouses, and light industry. However, it is becoming increasingly commercial and residential in character.

Military Uses

Military activities are also present within the study corridor and tend to have a broader array of associated pollutants. Pollutants included in the Pearl Harbor Naval Station Superfund Record of Decision include petroleum, solvents (perchloroethylene and others), polychlorinated biphenyls, metals (mercury and chromium), and pesticides. Military bases and activities near the Project include the following:

- Former Naval Air Station Barbers Point—now closed and under the Hawai'i Community Development Agency's jurisdiction
- Pearl Harbor Naval Station (former Navy Drum site)—an active Navy base on the National Priority List (Superfund)
- Hickam Air Force Base—an active Air Force base, but uses near the Project are primarily housing
- Fort Shafter Flats—an active military base, but the area near the Project is a relatively undeveloped floodplain

Petroleum Contaminants

Petroleum handling and transportation facilities are frequently associated with releases of oil or hazardous materials to the environment through leaks, spills, maintenance, and other activities. These facilities include gas stations, tank farms, large maintenance base yards, and pipelines and must be considered potential sites of contaminants wherever they appear along the project right-of-way. Petroleum contaminants (e.g., gasoline and diesel fuels) have been shown to migrate less than 300 feet from their source once released into a subsurface environment similar to that found in the study corridor. Therefore, only petroleum releases within this relatively short distance of the Project are considered a concern.

A recent utility survey identified a number of petroleum pipelines in the study corridor. These pipelines are owned by a variety of firms, including the military, the Hawaiian Electric Company, Chevron, and Tesoro. Pipeline locations include the following:

- Under Kapolei Parkway
- Along the O'ahu Railway and Land right-of-way in Kapolei, Pearl City, Waimalu, and 'Aiea
- On the mauka side of Farrington Highway through Waipahu
- Under Kamehameha Highway from Pearl City to the airport
- Throughout the airport area, primarily on the makai side of Aolele Road
- Under Salt Lake Boulevard from Aloha Stadium to Pu'uloa Road
- Under Nimitz Highway to the Hawaiian Electric Company's downtown power plant

The fixed guideway would cross or run parallel to these pipelines in many areas of the study corridor. These pipelines have been in place for many years, and releases from them are possible.

Sites of Concern

Individual sites of concern have been identified during the environmental database review and field reconnaissance activities. Sites were first identified during database review, and their presence was verified and additional sites were identified during field reconnaissance. Sites of concern were ranked "1" or "2." A "1" ranking means there is a high probability that releases at the site have impacted soil or groundwater beneath the Project. A "2" ranking means there is a low probability that releases at the site have impacted soil or groundwater beneath the Project, but further evaluation is needed based on proximity to the Project. The number of sites ranked "1" or "2" is summarized in Table 4-19. Sites that have been remediated or would not be of concern if the Project were built are identified in the Hazardous Materials Technical Report (RTD 2008i).

Examples of sites ranked "1" include the following:

- Pearl Harbor Naval Station (a Superfund site)
- Leaking underground storage tank sites that have not been remediated and are within 300 feet of the project alignment (e.g., Holiday Action Gas in Pearl City)

Examples of sites ranked "2" include the following:

- Sites adjacent to the Project that have been remediated (e.g., Pacific Machinery in Waipahu)
- Sites with large releases that are somewhat distant or downgradient from the Project (e.g., BHP Gas Company in Iwilei)
- Sites with institutional controls (e.g., where excavation is restricted due to the presence of contaminants) that are near the Project (e.g., Chuei Shokoh in Kaka'ako, a former dry cleaner)
- Sites observed to have limited hazardous materials issues (e.g., improper waste storage at Hi-Pace Racing in Kaka'ako)

The ground beneath any portion of the Project could be contaminated, most likely by petroleum products. Contamination is most likely to be present in the historically more industrial neighborhoods and near individual sites ranked "1" or "2." In addition, the geology and hydrogeology of the Airport Industrial Area, Māpunapuna, Kapālama-Iwilei, and Kaka'ako areas make them particularly likely to harbor residual pollutants. In these areas there would be a greater likelihood that spilled chemicals would remain in the area and not readily migrate or degrade. Therefore, soil and groundwater in these neighborhoods is frequently found to be degraded by petroleum and other contaminants. The potential for contamination has been confirmed by other projects in the industrial areas.

The Navy Drum site, inactive since the early 1970s, is a potential location for the fixed guideway maintenance and storage facility near Leeward Community College. In 1971, vandals started a fuel pump, which resulted in the release of motor gasoline to the ground surface. A remedial investigation was completed at the Navy Drum property by the Department of Navy in 2000 (Navy 2000). The investigation concluded that contaminants from the property have not and would not migrate to the deep freshwater aquifer or the artesian well water supply for the watercress ponds. There are no adverse human health or ecological effects that have, or will, result from the 1971 motor gasoline release. The U.S. Department of Health & Human Services and Hawai'i DOH reviewed the study and concur with the findings (DHHS 2005).

Table 4-19 Summary of Sites of Concern that Could Be Polluted near the Project

Alternative	Number of Sites Ranked 1 Based on Database Records	Number of Sites Ranked 2 Based on Database Records	Number of Additional Sites Ranked 1 Based on Field Reconnaissance	Number of Additional Sites Ranked 2 Based on Field Reconnaissance	Total Number of Sites Ranked 1	Total Number of Sites Ranked 2
Salt Lake	22	16	0	9	22	25
Airport	26	14	1	8	27	22
Airport & Salt Lake	22	16	0	9	22	25

4.11.3 Environmental Consequences and Mitigation

Environmental Consequences

No Build Alternative

Under the No Build Alternative, the Project would not be built, and there would be no impacts associated with hazardous materials. The projects defined in the ORTP would be built, and environmental impacts associated with those projects would be studied in separate documents.

Common to All Build Alternatives

In some locations, large or specialized hazardous wastes or materials sites may be affected by right-of-way acquisition. Large or specialized hazardous wastes and materials include underground and aboveground storage tanks (USTs and ASTs), fuel islands, and engineered storage facilities.

In a few cases, the Project may displace hazardous materials operations. This includes relocating gas station fuel islands and USTs and ASTs. Table 4-20 lists all sites from which right-of-way would be acquired where the Project would result in potential impacts to ongoing hazardous materials operations (Figure 4-43).

The operation and maintenance of a fixed guideway transit system would require using some hazardous materials and may generate hazardous waste. Likely hazardous materials include the following:

- Lubricants (both grease and oils) of various weights and viscosities
- Hydraulic fluid for transit vehicles and servicing equipment
- Cleaning products for maintaining equipment, cleaning electronic components and vehicles, and removing graffiti—cleaning solutions can range from acids to alkaline to petroleum-based solvents

Wastes (beyond standard office-type) that would require disposal or recycling could include the following:

- Used oil (not hazardous)
- Cleaning product waste (typically recycled through closed systems)
- Vehicle components that wear out or break, including fluorescent light tubes
- Sediment from vehicle washing

Most of these materials and wastes would be used or generated at the maintenance and storage facility. However, limited use of hazardous materials would be necessary to maintain the guideway, stations, and traction power substations.

Releases at sites ranked "1" or "2" (summarized in Table 4-19), petroleum pipelines, and in industrial areas may have resulted in contaminated soil and/or groundwater beneath the Project. The presence of contaminants would affect project construction. Effects during construction and related mitigation are discussed in Section 4.17.

Mitigation

Some properties that would be acquired to obtain required right-of-way for the Project received a rank of "1" or "2" during the Initial Site Assessment and, therefore, may be polluted. In some cases, it may be appropriate to do either a partial or complete Phase I Environmental Site Assessment (ESA) prior to acquiring portions of these properties to mitigate the chance that the City would acquire a degraded piece of real estate or that workers would be exposed to contaminants during construction. ESAs would be conducted per the American Society for Testing and Materials' *Standard Practice for Environmental Site Assessments—Phase I Environmental Site Assessments Process (E1527-05)* (ASTM 2005). Depending on the outcome of the Phase I ESAs, a Phase II assessment (including collecting and analyzing samples) may be appropriate. The City would decide whether a

Table 4-20 Hazardous Materials Sites from Which Right-of-Way Would Be Acquired

Site #	Site Name	Tax Map Key	Address	Type of Right-of-Way Acquisition	Potential Long-term Consequences
Common to All Build Alternatives					
1	7-11/Aloha Petroleum	97022006	897 Kamehameha Highway	Partial acquisition	Fuel island is very close to street and may need to be relocated
2	Fuji's Chevron Gas Station	98014012	98-121 Kamehameha Highway	Partial acquisition	One fuel island and USTs are close to street and may need to be relocated
3	7-11/Aloha Petroleum	12010068	1900 Dillingham Boulevard	Full acquisition	Fuel island and USTs affected
4	Arco AM/PM	12003101	1701 Dillingham Boulevard	Partial acquisition	Fuel islands are very close to street and may need to be relocated
5	Awa Wastewater Pump Station	15040003	190 North Nimitz Highway	Partial acquisition	Possible impact to existing UST
6	Motor Imports Service Center	21031030	607 South Street	Partial acquisition	Auto maintenance building and oil AST in acquisition area
7	Tio's Mexican Restaurant	21050062	404 Ward Avenue	Full acquisition	An unidentified AST is located on this property
8	Hi-Pace Racing	23007054	500 Pi`ikoi Place	Full acquisition	Full acquisition, including drum storage area
Salt Lake Alternative					
9	Ke`ehi Solid Waste Transfer Station	11006013	606 Middle Street	Partial acquisition	Relocation of truck wash and fuel AST may be necessary

partial or complete Phase I ESA is necessary for each property acquisition.

The use of hazardous materials for the fixed guideway system's operation and maintenance would be unavoidable. However, the volume of materials used and extent of worker exposure could be limited in the following ways:

- Using non-hazardous alternatives where possible
- Using closed systems designed to limit exposure
- Training employees in the safe use and management of hazardous materials
- Instituting waste minimization programs to limit the volume and type of materials used and resulting wastes
- Providing appropriate waste storage locations and receptacles
- Periodically evaluating wastes to establish whether they are hazardous
- Recycling wastes to the maximum extent practicable

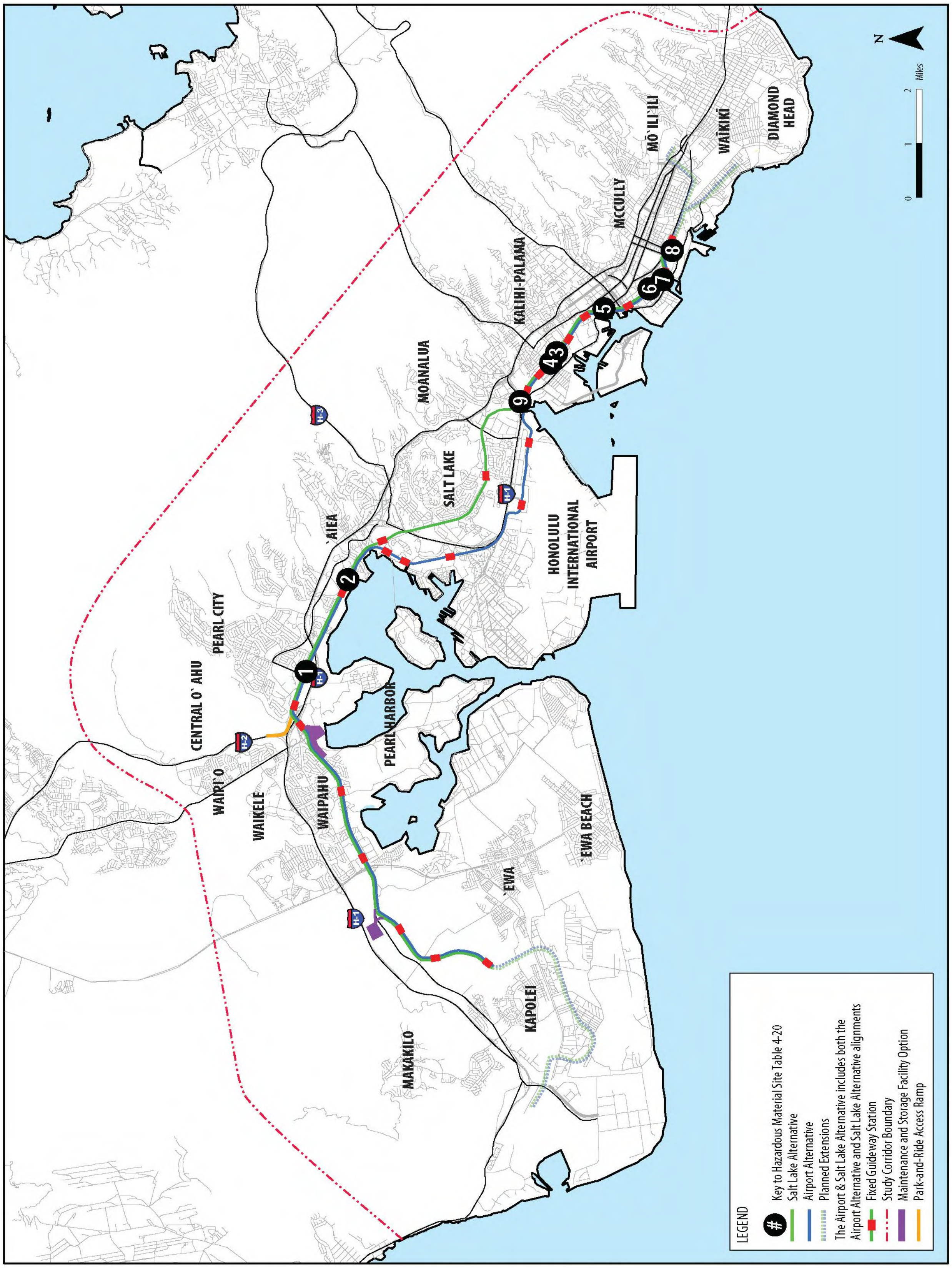


Figure 4-43 Locations of Potential Impacts to Ongoing Hazardous Materials Operations

4.12 Ecosystems

This section describes vegetation and wildlife within the study corridor. The assessment of vegetation and wildlife was made by reviewing existing studies, consulting with resource agencies, and conducting field surveys. Emphasis was placed on the potential presence of Federal- and/or State-protected species and sensitive habitats. For more information and references, see the *Honolulu High-Capacity Transit Corridor Project Ecosystems and Natural Resources Technical Report* (RTD 2008j).

4.12.1 Background and Methodology

Regulatory Context

Threatened and Endangered Species Regulations

Section 7 of the Endangered Species Act of 1973, as amended (7 USC 136; 16 USC 1531 et seq.), requires Federal agencies to consider impacts on endangered or threatened species and these species' critical habitat. It requires that Federal agencies consult with the U.S. Fish and Wildlife Service (USFWS) and/or the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA/FS), depending on whether terrestrial or marine species may be affected. If effects on protected species are identified, a Biological Assessment would be required to address a project's effects on a listed or candidate species or on the destruction or adverse modification of designated critical habitat. Subsequently, the USFWS would issue a Biological Opinion (40 CFR 402).

The State of Hawai'i's counterpart law is HRS 195D, under which species are similarly protected from state actions. HRS 195D stipulates that where there may be an incidental take of a listed species, a Habitat Conservation Plan (HCP) must be "designed to result in an overall net gain in the recovery of Hawai'i's threatened and endangered species."

Migratory Bird Treaty Act

The Federal Migratory Bird Treaty Act (MBTA) (16 USC 703-711) protects migratory birds listed in the MBTA by prohibiting the taking of any listed bird, or any part, nest, or egg of any such bird. *Take* is defined as an attempt to "pursue, hunt, shoot, capture, collect, or kill." This act applies to all persons and organizations in the U.S., including Federal and State agencies. The USFWS administers the MBTA, and protection of listed migratory birds is delegated to USFWS staff handling Endangered Species Act Section 7. Regulation of unlisted migratory birds is delegated to the USFWS Migratory Bird Division.

Marine Mammal Protection Act

The Marine Mammal Protection Act of 1972 (16 USC 1361-1407) protects marine mammals listed in the act by prohibiting the taking of them in waters of the U.S. and by U.S. citizens on the high seas, as well as importing marine mammals and marine mammal products into the U.S. *Take,* as defined by Congress, is "to harass, hunt, capture, or kill or attempt to harass, hunt, capture, or kill any marine mammal."

Correspondence with State and Federal Agencies

In March 2006, the following regulatory agencies were consulted to identify species that could be affected by the Project:

- U.S. Department of the Interior, USFWS
- U.S. Department of Commerce, NOAA/FS
- State of Hawai'i Department of Land and Natural Resources, Division of Forestry and Wildlife (DLNR-DOFAW)
- State of Hawai'i Department of Land and Natural Resources, Division of Aquatic Resources

This correspondence is included in the Ecosystems and Natural Resources Technical Report (RTD 2008j). Correspondence letters are also included in Appendix D of this Draft EIS.

Agencies indicated that no designated critical habitats exist on or within one-third mile of the project alignment. However, the agencies did mention that the species listed in Table 4-21 may be present in the study corridor.

Methodology

Literature Review

Previous studies, pertinent literature, and USFWS Critical Habitat maps for O'ahu within the study corridor were reviewed prior to undertaking the field surveys. Topographic maps and aerial photographs were examined to assess terrain and habitat characteristics, access, boundaries, and reference points. The Hawai'i Biodiversity and Mapping Program (HBMP) also provided a database of Federal- and State-protected species (plants and animals) previously observed within one-quarter mile of the project alignment.

The review reaffirmed that field surveys should focus on identifying or assessing the likely presence of the species listed by the agencies (Table 4-21) but also indicated that other species listed in Table 4-22 should be considered.

Field Surveys

Field surveys were performed for flora in the undeveloped 'Ewa Plain as well as for birds along the entire project alignment. A field survey was not performed for marine mammals and marine turtles because the Project would not approach or directly affect a marine habitat.

Flora Survey of Undeveloped 'Ewa Plain

Field surveys of the vegetation present in the undeveloped 'Ewa Plain portion of the project alignment were completed in September 2007 and January 2008. In areas along the corridor where rare or endangered species were previously reported, an intensive survey was conducted to attempt to establish whether these species and populations still remained. Encountered populations were photographed and mapped.

Wildlife Survey along the Alignment

Wildlife field surveys and observations along the project alignment were conducted in September 2007, and bird point counts were conducted from December 2007 to January 2008. The point-count method provides a species list and quantitative results for a given area in a short period of time. Point counts were performed at locations approximately 1 mile apart along the project alignment, except from Kalihi to UH Mānoa and Waikīkī, where point count locations were spaced every one-half mile to improve the possibility of detecting the State-listed threatened white tern. Counts were also performed at the following locations:

Table 4-21 Threatened, Endangered, and Protected Species Identified by Agencies

Common Name	Scientific Name	Mentioned by	Status
Endangered Flora			
Ko`oloa`ula or red `ilima	Abutilon menziesii	USFWS and DLNR-DOFAW	Endangered (S,F)
Maui chaff flower	Achyranthes splendens spp. rotundata	DLNR-DOFAW	Endangered (S,F)
Skottsberg's broomspurge	Chamaesyce skottsbergii	DLNR-DOFAW	Endangered (S,F)
Endangered Terrestrial Fauna			
`Ōpe`ap`a or Hawaiian hoary bat	Lasiurus cinereus semotus	USFWS	Endangered (S,F)
`Alae`ula or Hawaiian common moorhen	Gallinula chloropus sandvicensis	USFWS	Endangered (S,F)

F = Federal; S = State
DLNR-DOFAW = State of Hawai`i Department of Land and Natural Resources, Division of Forestry and Wildlife
USFWS = U.S. Fish and Wildlife Service

Table 4-22 Threatened, Endangered, and Protected Species Identified by Research

Common Name	Scientific Name	Status	Literature Source
Endangered Flora			
`Awīwī	Centaurium sebaeoides	Endangered (S,F)	HBMP, Bishop Museum website
`Ihi`ihi	Marsilea villosa	Endangered (S,F)	The *Recovery Plan for Marsilea Villosa* (USFWS 1996)
Endangered Terrestrial Fauna			
O`ahu `elepaio	Chasiempis sandwichensis ibidis	Endangered (S,F)	Vanderwerf 2001; and others
Hawaiian coot	Fulica americana alai	Endangered (S,F)	*Draft Revised Recovery Plan for Hawaiian Waterbirds, Second Draft of Second Revision* (USFWS 2005b); and others
Hawaiian duck	Anas wyvilliana	Endangered (S,F)	*Draft Revised Recovery Plan for Hawaiian Waterbirds, Second Draft of Second Revision* (USFWS 2005b); and others
Hawaiian stilt	Himantopus mexicanus	Endangered (S,F)	*Draft Revised Recovery Plan for Hawaiian Waterbirds, Second Draft of Second Revision* (USFWS 2005b); and others
Protected Migratory Waterbirds			
Pacific golden-plover	Pluvialis fulva	MBTA Protected	*Draft Revised Recovery Plan for Hawaiian Waterbirds* (USFWS 2005a); and others
Black-crowned night heron	Nycticorax nycticorax hoactii	MBTA Protected	*Draft Revised Recovery Plan for Hawaiian Waterbirds* (USFWS 2005a); and others
Ruddy turnstone	Arenaria interpres	MBTA Protected	*Draft Revised Recovery Plan for Hawaiian Waterbirds* (USFWS 2005a); and others
Wandering tattler	Heteroscelus incanus	MBTA Protected	*Draft Revised Recovery Plan for Hawaiian Waterbirds* (USFWS 2005a); and others
State Threatened and Endangered Terrestrial Fauna			
Pueo	Asio flammeus sandwichensis	Endangered (S)	Various
Newell's shearwater	Puffinus auricularis newelli	Threatened (S)	Various
White tern	Gygis alba	Threatened (S)	Miles 1986; Vanderwerf 2003

F = Federal; S = State
HBMP = Hawai`i Biodiversity and Mapping Program
MBTA = Migratory Bird Treaty Act
USFWS = U.S. Fish and Wildlife Service

- The makai perimeter of the proposed maintenance and storage facility adjacent to Leeward Community College—this bird point-count site was selected because of the proximity of the site to waterbird habitat in Pearl Harbor.
- A stand of ironwoods *(Causaurina equistefolia)* along the southern edge of Kapi'olani Park—this bird point-count site was selected because it historically has been an area of high concentrations of white terns in Waikīkī and could be used as a reference site to gauge the level of nesting activity in the population.

The point count involved identifying and recording the number of birds seen and heard at all distances from the point-count stations for a period of eight minutes. The Ecosystems and Natural Resources Technical Report (RTD 2008j) documents the results of this survey.

4.12.2 Affected Environment

A distinctive feature of O'ahu's geomorphology is the broad plain that extends from 'Ewa and Kalaeloa across Pearl Harbor to Diamond Head. It is composed of raised coralline limestone and has natural harbors, a dry leeward climate, and abundant freshwater streams with headwaters in the Ko'olau and Wai'anae Mountain Ranges. Upland perennial streams are sustained by groundwater from high-level aquifers and, on the coastal plain, perennial flow may originate from basal groundwater springs. Where groundwater is not accessible in a drainage basin, streams exhibit intermittent flow because they respond only to rainfall and runoff; this is particularly prevalent in the 'Ewa and Kapolei areas. Freshwater streams that enter the marine coastal waters create estuaries at stream mouths and embayments, such as Pearl Harbor, where freshwater nutrients stimulate productivity.

The past century of urbanization on O'ahu, especially within the areas along much of the project alignment, has resulted in a highly altered environment, and this is reflected in the present state of the remaining communities of vegetation. No intact native vegetation species remain within the study area, and few native plant species are still extant near the alignment. The 'Ewa Plain is an area where relatively undeveloped land is present in the project study area, and vegetation in this area was found to consist of the following:

- Ruderal (weedy) patches in undeveloped areas or abandoned properties
- Plants in abandoned agricultural areas, such as the area makai of the H-1 Freeway near Kapolei
- Plantings in areas reserved for cultivation and diversified agriculture

Beyond the 'Ewa Plain, a few relatively undeveloped areas exist where the vegetation present is not restricted to maintained landscaping or weeds. Street trees, the most common ecological element of the maintained urban landscape, are discussed in Section 4.14. The undeveloped areas beyond the 'Ewa Plain are illustrated on Figures 4-44 and 4-45 and include the following:

- Pearl Harbor National Wildlife Refuge, Waiawa and Hono'uli'uli Units
- Waiawa Spring, which is occupied by taro patches
- Waiau Spring, which is currently wild but has been used for farming in the past
- Kalauao Spring, which is occupied by the Sumida Watercress Farm
- The Koko Head bank of Moanalua Stream

Table 4-23 lists all threatened, endangered, and protected species and indicates whether the species were observed during surveys performed for this Project.

Endangered Flora

Ko'oloa'ula *(Abutilon menziesii)* (Figure 4-46) was not observed during the field surveys; however, the Project is known to be in close proximity to extant plant clusters and within approximately 200 feet of the northern border of the established contingency reserve (Figure 4-44). Ko'oloa'ula is an endangered Hawaiian endemic hibiscus shrub that grows in dry forests. An HCP that addresses potential effects on the Ko'oloa'ula population near the corner of North-South Road and Kapolei Parkway is already in place (HDOT 2004). This HCP is being incrementally phased in over a 20-year period. The HCP describes impacts that assume the population would be incrementally taken as development in the vicinity of North-South Road is implemented.

Figure 4-46 Ko`oloa`ula

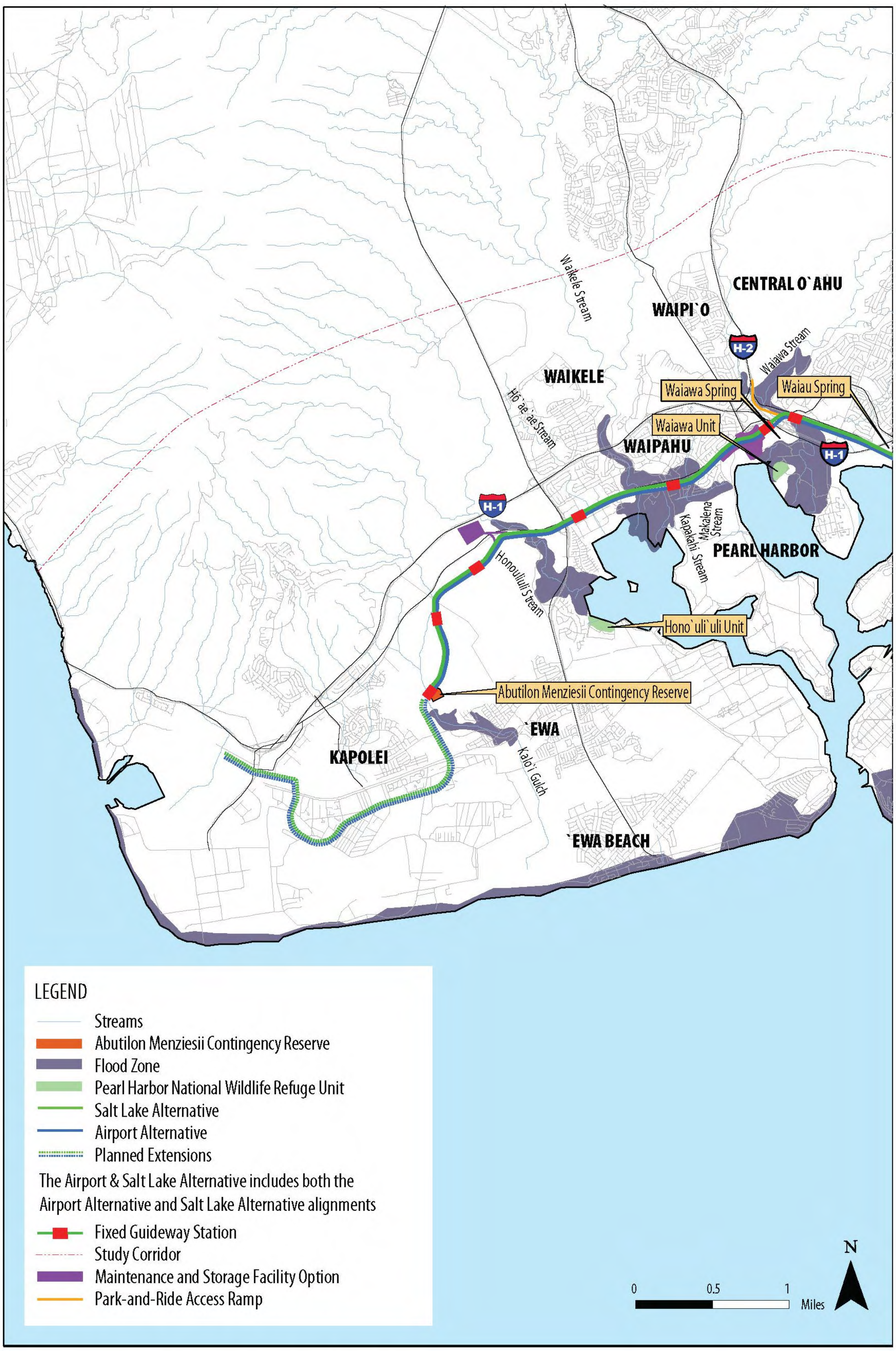


Figure 4-44 Natural Resources (Kapolei to Aloha Stadium)

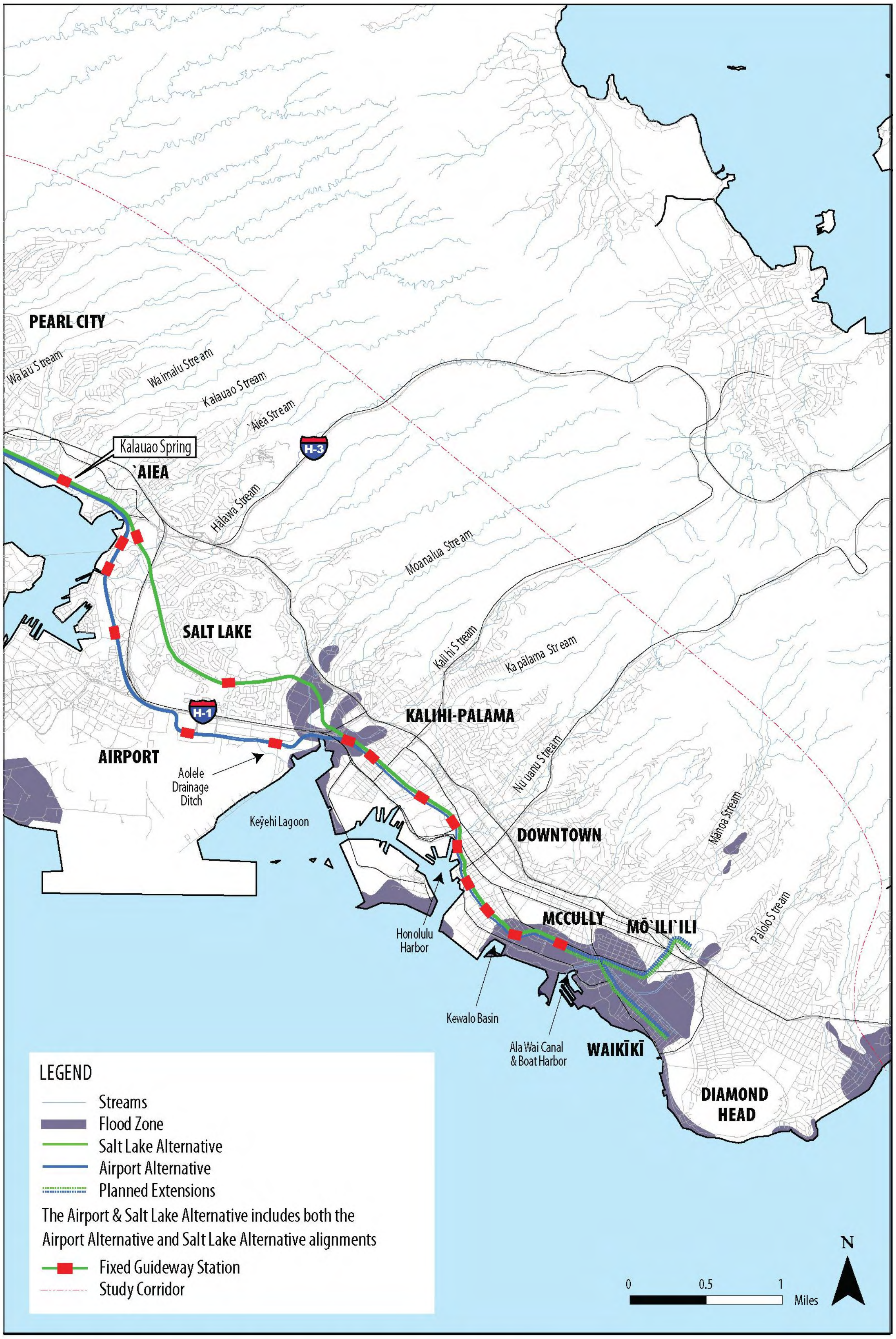


Figure 4-45 Natural Resources (Aloha Stadium to UH Mānoa and Waikīkī)

Table 4-23 Threatened, Endangered, and Protected Species Observed along the Study Corridor

Common Name	Scientific Name	Status	Observed During Survey
Endangered Flora			
Ko`oloa`ula or red `ilima	Abutilon menziesii	Endangered (S,F)	No
Maui chaff flower	Achyranthes splendens spp. rotundata	Endangered (S,F)	No
Skottsberg's broomspurge	Chamaesyce skottsbergii	Endangered (S,F)	No
`Awīwī	Centaurium sebaeoides	Endangered (S,F)	No
`Ihi`ihi	Marsilea villosa	Endangered (S,F)	No
Endangered Terrestrial Fauna			
`Ōpe`ape`a or Hawaiian hoary bat	Lasiurus cinereus semotus	Endangered (S,F)	No
O`ahu `elepaio	Chasiempis sandwichensis ibidis	Endangered (S,F)	No
Hawaiian common moorhen or `alae`ula	Gallinula chloropus sandvicensis	Endangered (S,F)	No
Hawaiian coot or `alae ke`oke`o	Fulica americana alai	Endangered (S,F)	No
Hawaiian duck or koloa maoli	Anas wyvilliana	Endangered (S,F)	No
Hawaiian stilt or ae`o	Himantopus mexicanus	Endangered (S,F)	Yes
Protected Migratory Waterbirds			
Pacific golden-plover	Pluvialis fulva	MBTA Protected	Yes
Black-crowned night heron	Nycticorax nycticorax hoactii	MBTA Protected	Yes
Ruddy turnstone	Arenaria interpres	MBTA Protected	Yes
Wandering tattler	Heteroscelus incanus	MBTA Protected	Yes
State Threatened and Endangered Terrestrial Fauna			
Pueo	Asio flammeus sandwichensis	Endangered (S)	No
Newell's shearwater	Puffinus auricularis newelli	Threatened (S)	No
White tern	Gygis alba	Threatened (S)	Yes

F = Federal; S = State
MBTA =Migratory Bird Treaty Act

The Maui chaff flower, Skottsberg's broomspurge, ʻawīwī, and ʻihiʻihi generally grow in dry forests and could be present on the ʻEwa Plain. They have reportedly been seen on the ʻEwa Plain in the past but were not observed near the project alignment.

There are no HCPs related to any of these species. Four of the reasons why these four endangered species are less likely to be present along the study corridor than koʻoloaʻula are as follows:

- The Maui chaff flower *(Achyranthes splendens spp. rotundata)*, a small shrub, is typically found on talus or rocky slopes and on coral-line plains with numerous sinkholes. The project alignment generally traverses farmed or relatively developed areas rather than talus or rocky slopes. The project alignment also avoids areas with sinkholes because of their structural instability.
- Skottsberg's broomspurge *(Chamaesyce skottsbergii)*, a small shrub, is generally found closer to the coast in drier and sandier areas than the project alignment.
- ʻAwīwī *(Centaurium sebaeoides)*, a small herb, is thought to be extinct on Oʻahu. It is generally found on rocky slopes near the coast.
- ʻIhiʻihi *(Marsilea villosa)*, a small fern resembling a four-leaf clover, requires periodic

flooding for spore release and fertilization, followed by a decrease in water levels for the young plants to establish. It typically occurs in shallow depressions in clay soil or lithified sand dunes overlaid with alluvial clay. This plant is known to occur in areas of Kalaeloa that meet these criteria; however, it does not occur in the more developed portion of Kalaeloa where the project alignment is planned.

Endangered Terrestrial Fauna

A number of endangered terrestrial fauna species are potentially present in the study corridor (birds and fresh/brackish water dwellers). The following is a discussion of these species:

- ʻŌpeʻapeʻa, or the Hawaiian hoary bat (*Lasiurus cinereus semotus),* was not observed during the project survey. Bats have been observed on Oʻahu according to the HBMP; however, the USFWS indicated that those reported sightings were "likely incidental occurrences of transient individuals." The *Recovery Plan for the Hawaiian Hoary Bat* (USFWS 1998) indicates that the species is a medium-sized, nocturnal, insectivorous bat most often observed in open areas and river mouths near wet forests on the Islands of Kauaʻi and Hawaiʻi. The plan further states that more research is needed prior to determining a recovery strategy for the bat.
- Oʻahu ʻelepaio *(Chasiempis sandwichensis ibidis)* is a monarch flycatcher endemic to the forests on Oʻahu and was not observed during the project survey. The Oʻahu ʻelepaio is provided for in the *Revised Recovery Plan for Hawaiian Forest Birds* (USFWS 2006), which indicates there are approximately 2,000 birds in the wild. The recovery area illustrated in the plan for the Oʻahu ʻelepaio is located well mauka of the project alignment.
- Four waterbirds are listed as endangered—the Hawaiian common moorhen, the Hawaiian coot, the Hawaiian duck, and the Hawaiian stilt. These four species inhabit similar habitats and are often found together; they are generally restricted to wetlands (freshwater and marine estuaries) but will visit temporarily flooded areas. Habitat in the study corridor where some or all of these species have been observed previously include Pearl Harbor National Wildlife Refuge, Waiawa Spring, Waiau Spring, and Kalauao Spring (the Sumida Watercress Farm). The *Draft Revised Recovery Plan for Hawaiian Waterbirds* (USFWS 2005a) provides for these four species and indicates that the only core habitat on the southern coast of Oʻahu is the Pearl Harbor National Wildlife Refuge, which is the only listed habitat in the study corridor. The plan lists no supporting habitat on the southern coast of Oʻahu. Observations of these endangered waterbirds during the project survey were limited to the following:
  - A pair of ducks was observed at a distance flying over agricultural fields along North-South Road. Field identification of mallard/koloa hybrids and true koloa is difficult, and positive identification requires closer inspection in the hand. Therefore, it is not known if the ducks observed were the endangered species *Anas wyvilliana.*
  - Five Hawaiian stilts *(Himantopus mexicanus)* were observed at Kalauao Spring (the Sumida Watercress Farm) during the project survey.

Protected Migratory Waterbirds

Four protected migratory waterbirds were observed during the project survey. The MBTA protects these species, but they are not considered threatened or endangered. The four species are as follows:

- The Pacific golden plover *(Pluvialis fulva)* breeds on the Arctic tundra in the summer and spends the winter primarily in South Asia and Australia with a few in California and Hawai'i. Twenty-seven Pacific golden plovers were observed in wetlands near count stations during the survey.

- Black-crowned night heron *(Nycticorax nycticorax hoactii)* is a migratory bird common throughout the world; some winter in Hawai'i, but they can be present throughout the year. They nest in colonies and feed in both freshwater and saltwater wetlands. Individuals were observed during the project survey at the Kalauao Spring (the Sumida Watercress Farm), Moanalua Stream, and the drainage channel along Aolele Street. Local colonies are known to roost and nest in mangrove trees within Pearl Harbor and Ke'ehi Lagoon; however, nests have not been observed in the mangroves along the Diamond Head bank of Moanalua Stream.
- Ruddy turnstone *(Arenaria interpres)* is a sandpiper that breeds in the northern parts of Eurasia and North America during the summer and winters on coastlines almost worldwide, including Hawai'i. Six individuals were observed at Kalauao Spring (the Sumida Watercress Farm) during the project survey.
- Wandering tattler *(Heteroscelus incanus)* summer and breed in Alaska and northwestern Canada; in winter they are found on rocky islands in the Southwest Pacific, including Hawai'i, and on rocky Pacific coasts from California to South America and as far as Australia. They feed on aquatic invertebrates. One wandering tattler was observed at Kalauao Spring (the Sumida Watercress Farm) during the project survey.

State Threatened and Endangered Terrestrial Fauna

Three species may be present in the study corridor that are designated as threatened or endangered by the State of Hawai'i but not the USFWS. They are as follows:

- Pueo *(Asio flammeus sandwichensis)* are a subspecies of short-eared owl endemic to Hawai'i that nests on the ground. Its habitat includes wet and dry forests on all the Hawaiian Islands. The Pueo has been observed on the 'Ewa Plain, but it is in decline due to habitat loss and was not observed during the project survey. There are no recovery plans or designed critical habitat for the Pueo.
- Newell's shearwater *(Puffinus auricularis newelli)* is endemic to the Hawaiian Islands and nests in burrows dug in forested uplands. No nesting colonies have been found on O'ahu (Ainley 1997). Small numbers of fledgling Newell's shearwater have been recovered on O'ahu following downing incidents and were probably individuals that were attracted to shore from elsewhere by coastal lights (Ainley 1997). No Newell's shearwater were observed during the project survey.
- White tern *(Gygis alba)* (Figure 4-47), also known as fairy tern, could only be observed with regularity in the Northwestern Hawaiian Islands prior to the 1960s. Their establishment on O'ahu may be a result of crowded conditions elsewhere, which have forced the birds to search for other roosting and nesting locations (Miles 1986; Vanderwerf 2003). The white tern is Honolulu's official bird and is currently found only along the southeastern coast of O'ahu, where

Figure 4-47 White Tern

they breed and roost exclusively in large trees. White terns lay their eggs on bare branches in a small fork or depression, without a nest. The peak nesting period is from February through July. Nine white terns were observed during the project survey, all between Middle Street and UH Mānoa.

Threatened, Endangered, and Protected Marine Fauna

The nearest marine habitat is approximately one-quarter mile from the Project, which is beyond the area that would be affected by the Project.

4.12.3 Environmental Consequences and Mitigation

Environmental Consequences

No Build Alternative

Under the No Build Alternative, the Project would not be constructed and would not have any impacts to the ecosystem. Although the projects in the ORTP would be built, their environmental impacts would be studied in separate environmental documents.

Common to All Build Alternatives

As explained in Section 4.13, the Project would result in fewer VMT; therefore, the overall pollutant load in stormwater would be lower than it would be under the No Build Alternative and there would be less threat of surface and marine water contamination. The Project would rely on electric propulsion, which would generate minimal pollutants on the guideway compared to pollutants generated by roadway traffic. This improvement in water quality could provide some relative benefit to downstream habitats, including nearby wetlands, streams, and the Pacific Ocean.

As summarized in Table 4-24, the Project would have no effect on any threatened, endangered, or protected species as described in the following sections.

Endangered Flora

The Project would have no effect on endangered flora. The only endangered flora in the study corridor is koʻoloaʻula *(Abutilon menziesii)*. The presence of this species has previously been well documented, and the HDOT addressed potential effects on the koʻoloaʻula in the study corridor in an HCP prepared for the North-South Road Project in 2004. Mitigation measures are specified in the HCP related to the construction of a variety of developments in the area. Therefore, the Project would not have an effect on the koʻoloaʻula.

Endangered Terrestrial Fauna

The Project would have no effects on endangered terrestrial fauna. The Project would not affect the hoary bat or the Oʻahu ʻelepaio because none of these species are expected to occur in the study corridor.

The Project would not impact any designated critical, core, or supporting habitat for any of the endangered terrestrial fauna species. The nearest such habitat is the Pearl Harbor National Wildlife Refuge Waiawa Unit (Figure 4-44), which is designated as core habitat for the four endangered waterbirds. The Waiawa Unit is more than 1,000 feet southeast of one of the possible

Table 4-24 Summary of the Project's Effects on Threatened, Endangered, and Protected Species Common to All Build Alternatives

Endangered Flora	Endangered Terrestrial Fauna	Protected Migratory Waterbirds	State Threatened and Endangered Terrestrial Fauna	Threatened, Endangered, and Protected Marine Fauna
No effect, with mitigation for ko`oloa`ula	No effect	No effect	No effect	No effect

maintenance and storage facility locations. As stated in Section 4.13, the Project would not affect other wetlands where the endangered waterbirds have been observed, such as Waiawa Spring, Waiau Spring, and Kalauao Spring (the Sumida Watercress Farm).

"No effect" is the project determination even though some of the endangered waterbirds have been observed adjacent to the study corridor. Over time, the waterbirds would adjust to new structures built for the Project since the wetlands would remain intact. This is expected because the waterbirds have continued to occupy the wetlands after the construction of nearby buildings and overhead utilities and the construction or widening of adjacent roads and highways.

Protected Migratory Waterbirds

The Project would not result in the taking of any protected migratory waterbirds. The only protected waterbird that nests in Hawai'i is the black-crowned night heron. The heron is known to nest in mangrove stands in Pearl Harbor and Ke'ehi Lagoon, which are remote from the study corridor. Over time, the waterbirds would adjust to new structures built for the Project and be able to avoid the structures and vehicles. This is expected because the waterbirds have continued to occupy the wetlands, streams, and drainage features after the construction of nearby buildings and utilities and the construction or widening of adjacent roads and highways, including viaducts.

State Threatened and Endangered Terrestrial Fauna

The Project would have no effect on state threatened and endangered terrestrial fauna. The only state threatened or endangered species that is present in the study corridor is the white tern, and none of the species have critical habitat in the area. As explained in Section 4.14, some large street trees along the project alignment would require pruning or removal. White terns select the largest high canopy trees for roosting and nesting. The pruning and removal of these trees are not expected to affect the white tern population because there are numerous other large canopy trees in the urban area of Honolulu that would not be affected by the Project and that could be used by the white terns.

Mitigation

Although the Project would have no effect on threatened, endangered, and protected species, some mitigation would be implemented to ensure this determination in the case of ko'oloa'ula.

A State Incidental Take License for ko'oloa'ula was issued on March 18, 2005, to the HDOT. The DLNR-DOFAW would require that the Project secure a Certificate of Inclusion from the State for the Project. Mitigation measures have already been specified in an HCP for this population of ko'oloa'ula related to construction of a variety of developments, and the Project would comply with those measures. One of the measures has established the 18-acre contingency reserve that contains the largest number of individual plants. The reserve would need to remain *in-situ* until other success criteria of the HCP are met. Success will depend on qualitative and quantitative measures, and the reserve duration is unspecified. The Project would also consider ko'oloa'ula during construction activities, as discussed in Section 4.17.7

4.13 Water

This section identifies surface and marine waters, groundwater, navigable waters, coastal zone management areas, floodplains, and wetland resources in the study corridor. It addresses the potential effects of implementing the Project on these resources and presents mitigation measures that would be incorporated into the Project for each alternative. For more information and references, see the *Honolulu High-Capacity Transit Corridor Project Water Resources Technical Report* (RTD 2008k).

4.13.1 Background and Methodology

Numerous water bodies are located in the study corridor and regulated by a variety of Federal and State programs under several different laws.

Regulatory Context

Surface and Marine Waters

The State of Hawai'i's general policy is to maintain or improve existing water quality in all State waters. Streams that are not expected to meet State water quality standards, even after application of technology-based effluent limitations, are included in the 303(d) List of Impaired Waters (HDOH 2008).

Coastal areas and embayments can be listed by the Hawai'i Department of Health as "Water Quality-Limited Segments," as required by the Clean Water Act (CWA) Section 305(b) and defined by 40 CFR 130.8. These segments are water bodies with pollutants in excess of established water quality standards, such that they cannot reasonably be expected to attain or maintain State water quality standards without additional action to control sources of pollution.

Alterations to stream channels are regulated by the State of Hawai'i Commission on Water Resource Management (Water Commission) through a Stream Channel Alteration Permit.
Surface water resources in the study corridor were identified from existing maps, and their use and quality as described in this section are in relationship to State standards. The potential surface water permits required for the Project have been identified and would be obtained when appropriate (see Section 4.20).

Navigable Waters

The U.S. Army Corps of Engineers (USACE) is also authorized to regulate activities in the Nation's waters pursuant to Section 10 of the Rivers and Harbors Act of 1899 (USC 1899) and Section 103 of the Marine Protection, Research, and Sanctuaries Act of 1972 (USC 1972). Section 10 of the Rivers and Harbors Act of 1899 requires authorization for the construction of any structure in or over a navigable water of the U.S. Structures or work that occurs outside the defined limits for navigable waters of the U.S. require a Section 10 permit if the structure or work affects the water body's course, location, or condition.

Waters subject to tidal influence and non-tidal streams that carry commercial traffic are generally defined as navigable by the U.S. Coast Guard. The Coast Guard's authority comes from Section 9 of the Rivers and Harbors Act of 1899 (USC 1899), the Act of March 23, 1906 (USC 1906), and the General Bridge Act of 1946 (USC 1946). New bridges or causeways, and the reconstruction or modification of existing bridges and causeways, require a Coast Guard bridge permit to protect the right of navigation. Project structures that would cross navigable waterways have been identified, and consultation with the Coast Guard is underway to determine permit requirements.

Coastal Zone Management Area Program

The Hawai'i Coastal Zone Management Program has the following goals:

- Protecting valuable resources
- Preserving management options
- Ensuring public access to beaches, recreation areas, and natural reserves

Groundwater

The EPA has designated the Southern O'ahu Basal Aquifer as the sole or principal source of drinking water for southern O'ahu. The 1984 Sole Source Aquifer Memorandum of Understanding between the EPA and the USDOT requires projects potentially impacting a sole-source aquifer to coordinate with the EPA to evaluate potential impacts.

Floodplains

Protection of floodplains is required by Presidential Executive Order 11988 (USEO 1977); USDOT

Order 5650.2 (USDOT 1979); the Federal Aid Highway Program Manual (FHWA 1992b); and 23 CFR 650 (CFR 1999). These regulations place special importance on floodplains and require Federal agencies to avoid conducting, allowing, or supporting actions on a floodplain. If a project is located within a floodplain, a sufficient analysis must be included in the project's Final EIS, as specified in USDOT Order 5650.2.

Existing floodways and floodplain limits within the study corridor have been identified using Federal Emergency Management Agency Flood Insurance Rate Maps and other existing data. The State National Flood Insurance Program staff has also been consulted.

As piers for the Project are located and designed, the proposed structures' potential effects on floodplains would be evaluated by conducting hydraulic studies at these specific locations.

Wetlands

Several Federal and State agencies are authorized to regulate wetlands through the CWA and Section 10 of the Rivers and Harbors Act of 1899 (USC 1899), as well as associated State rules for water quality standards. The Army Corps of Engineers makes a Jurisdictional Determination for wetlands in the study corridor. Under Section 404 of the CWA, the discharge of dredge or fill material into "waters of the U.S." and adjacent wetlands, as defined by 33 CFR 328, automatically triggers the need for a permit from the Corps of Engineers. This is called a "Department of the Army permit." Under Section 401 of the CWA, the need for a Department of the Army permit triggers the need for a Section 401 Water Quality Certification from the Clean Water Branch of the Hawai'i Department of Health.

The criteria used in evaluating Section 404 filling activities have been promulgated by the EPA in 40 CFR 230, also known as the "404(b)(1) Guidelines." To demonstrate compliance with these guidelines, applicants for Section 404 permits must conduct an alternatives analysis to determine that there are no practicable alternatives to placing fill in wetlands.

If mitigation is required for fill placed in wetlands, the Project must comply with *Compensatory Mitigation for Losses of Aquatic Resources Final Rule.*

Methodology

Field investigations for wetlands were conducted along the project alignment in December 2007 and January 2008 to identify areas with wetland characteristics, including the presence of water (hydrology), hydrophytic vegetation, and hydric soils. Functions and values (e.g., waterbird habitat, stormwater storage, and riverine watercourses) were qualitatively assessed for any wetlands that the Project could affect.

4.13.2 Affected Environment

Surface and Marine Waters

Streams

Streams within the study corridor are listed in Table 4-25 and illustrated in Figures 4-44 and 4-45. Most of these stream channels have been altered in their lower reaches and are not of high ecological quality. The overall water quality in these urban streams is poor, and many are included on Hawai'i Department of Health's 303(d) List of Impaired Waters (HDOH 2008). Complete navigability determinations for each affected waterway are pending with the Coast Guard. Tentatively, the Coast Guard may classify these channels as Advanced Approval Waterways because they are only navigated by rowboats, canoes, and small motorboats.

Recreational use of many of the navigable streams in the study corridor is minimal because they are located in urban areas and lined with concrete, which is unsuitable for kayaking, fishing, or other recreational opportunities.

Table 4-25 Streams in the Study Corridor

Stream	Navigable Water[1]	Associated Floodplain[2]	Stream Channel within the Study Corridor	303(d) Impaired[3]
Kalo`i Gulch	No	Yes	Natural	No
Honouliuli Stream	No	Yes	Natural	No
Hō`ae`ae Stream	No	No	Concrete	No
Waikele Stream	No	Yes	Concrete	Yes
Kapakahi Stream	No	Yes	Natural	Yes
Makalena Stream	No	Yes	Concrete	No
Waiawa Stream	No	Yes	Natural	No
Pearl City Stream	No	No	Concrete	No
Waiau Stream	No	No	Natural	No
Waimalu Stream	No	No	Natural	Yes
Kalauao Stream	No	Yes	Natural	No
`Aiea Stream	Yes	No	Natural	Yes
Hālawa Stream	Yes	No	Concrete	Yes
Moanalua Stream	Yes	Yes	Natural	Yes
Kalihi Stream	Yes	Yes	Natural	Yes
Kapālama Canal	Yes	No	Concrete	Yes
Nu`uanu Stream	Yes	No	Natural	Yes

[1] Navigability as defined by the U.S. Coast Guard.
[2] Floodplains as defined by the Federal Emergency Management Agency.
[3] 303(d) Impaired Waterway as defined by State of Hawai`i Department of Health.

Marine Waters

The large coastal surface water bodies within or adjacent to the study corridor are listed in Table 4-26 and illustrated in Figures 4-44 and 4-45. These water bodies are all highly urbanized and/or altered from their natural state.

Coastal Zone Management Areas

Recreational uses of surface and marine waters within or adjacent to the study corridor are limited primarily to the ocean. The ʻEwa portion of the corridor falls within a non-designated ocean recreation segment from Pearl Harbor to Kalaeloa. The remainder of the corridor falls within the South Shore Oʻahu Ocean Recreation Management segment, which includes all ocean waters and navigable streams from Makapuʻu Point to the western boundary of the Reef Runway of Honolulu International Airport. Activities in this area include swimming, sunbathing, surfing, snorkeling, paddling, canoeing, sailing, cruising, riding jet skis, whale watching, water skiing, and fishing.

Offshore of Ala Moana Regional Park is the Ala Moana Commercial Thrill Craft Zone, which is restricted to commercial operators. ʻEwa of this zone and Koko Head of the airport is the Keʻehi Lagoon/Kahakaʻaulana Islet Commercial Zone, which is the site of commercial thrill craft and other commercial ocean activities. Recreational thrill craft are accommodated in the Reef Runway Zone that parallels the airport's Reef Runway.

For all Build Alternatives, project construction would occur within the South Shore Oʻahu Ocean Recreation Management area.

Table 4-26 Marine Waters in the Study Corridor

Water Body	Class	Associated Aquifer	Associated Inlets	303(d) Impaired[1]
Pearl Harbor	2—Inland water/estuary	Pearl Harbor	Point-source discharges; streams	Yes
Ke`ehi Lagoon	A—Marine embayment	Honolulu	Storm drains; streams	Yes
Honolulu Harbor	A—Marine embayment	Honolulu	Storm drains; streams	Yes
Kewalo Basin	A—Marine embayment	Honolulu	Storm drains	Yes

[1] 303(d) Impaired Waterway as defined by State of Hawai`i Department of Health.

Table 4-27 Floodplains

Associated Water Body	Developed	Functions	Flood Zone(s) Traversed by Fixed Guideway
Kalo`i Gulch	Yes	Groundwater recharge; stormwater conveyance	AE
Honouliuli Stream	No	Groundwater recharge; stormwater conveyance	A
Waikele Stream	Yes	Stormwater conveyance	AEF, AE
Kapakahi Stream	Yes	Stormwater conveyance	AEF, AE
Makalena Stream	Yes	Stormwater conveyance	AEF, AE
Waiawa Stream	Yes	Stormwater conveyance	AEF, AE
Kalauao Stream	Yes	Stormwater conveyance	AEF
Moanalua Stream	Yes	Stormwater conveyance	AEF, AE, AO
Kalihi Stream	Yes	Stormwater conveyance	AEF, AE, AO

Zone A = the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE = the flood insurance rate zones that correspond to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. In most instances, base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone AEF = the area within Zone "AE" reserved to pass the base flood.

Zone AO = the flood insurance rate zone that corresponds to the areas of 100-year shallow flooding (usually sheet flow on sloping terrain) where average depths are between 1 and 3 feet. The depth should be averaged along the cross-section and then along the direction of flow to determine the extent of the zone. Average flood depths derived from the detailed hydraulic analyses are shown within this zone. In addition, alluvial fan flood hazards are shown as Zone AO on the Flood Insurance Rate Map.

Groundwater

The entire Project overlies the Southern O'ahu Basal Aquifer and includes two aquifer sectors. The Pearl Harbor Aquifer Sector contains the 'Ewa, Waipahu, Waiawa, and Waimalu Aquifer Systems, and the Honolulu Aquifer Sector contains the Moanalua, Kalihi, and Nu'uanu Aquifer Systems.

Floodplains

Flood Insurance Rate Maps show that the project alignment would cross several floodplains associated with streams, estuaries, and canals (Figures 4-44 and 4-45). Floodplains along the project alignment mostly recharge groundwater levels, convey stormwater toward the ocean, and help moderate floods when they occur. These areas also support plants and wildlife within urbanized areas, while maintaining areas for outdoor recreation and enjoyment and preserving the land's natural beauty. The floodplains and their associated waters, functions, and zones are listed in Table 4-27.

Wetlands

Wetlands near the project alignment are associated with riverine, tidal, and spring water systems. Wetland areas are listed in Table 4-28 and illustrated in Figures 4-44 and 4-45. Land development has altered or destroyed most of these wetlands, leaving only a few remnants today.

4.13.3 Environmental Consequences and Mitigation

Environmental Consequences

No Build Alternative

Under the No Build Alternative, the Project would not be built and would not have any impacts to water resources. The projects in the ORTP would be built and the consequences of those projects would be studied in separate environmental documents.

Common to All Build Alternatives

The Project would not adversely affect water resources. The following sections discuss possible effects to surface water, groundwater, floodplains, and wetlands and presents coordination activities and mitigation that would occur to address possible effects. Effects during construction are discussed in Section 4.17.

Surface and Marine Waters

The number of vehicle miles traveled in the corridor is expected to be lower if the Project is constructed when compared to the No Build Alternative. With fewer VMT, the overall pollutant

Table 4-28 Water Resource Systems

Associated Water Resource	Channel	Potential Wetlands Classification	Functions/Values
Honouliuli Stream at Fort Weaver Road	Concrete culvert	Riverine	Drainage
Hō`ae`ae Stream at Farrington Highway	Concrete channel	Riverine	Drainage
Waikele Stream at Farrington Highway	Concrete channel	Riverine	Drainage
Kapakahi Stream at Farrington Highway	Natural drainage	Riverine	Drainage
Makalena Stream at Farrington Highway	Concrete channel	Riverine	Drainage
Waiawa Stream at Farrington Highway	Natural drainage	Riverine	Drainage
Waiau Stream at Kamehameha Highway	Natural drainage	Riverine	Drainage
Waiau Spring at Kamehameha Highway (mauka of HECO power plant)[1]	Natural drainage	Palustrine	Agricultural, water storage, water purification, wildlife habitat/aesthetic, cultural
Waimalu Stream at Kamehameha Highway	Natural/concrete drainage	Riverine	Drainage
Sumida Watercress Farm (Kalauao Spring) at Kamehameha Highway[2]		Wet agricultural field	Agricultural, water storage, water purification, wildlife habitat/waterbird watching, cultural
Kalauao Stream at Kamehameha Highway	Natural drainage	Riverine	Drainage
`Aiea Stream at Kamehameha Highway	Natural drainage	Riverine	Drainage
Hālawa Stream at Salt Lake Boulevard	Concrete channel	Riverine	Drainage
Hālawa Stream at Kamehameha Highway	Concrete channel	Riverine	Drainage
Drainage Ditch parallel to Aolele Street	Concrete drainage	Man-made channel	Localized drainage sump
Moanalua Stream at Nimitz Highway	Natural drainage	Riverine	Drainage/fishing, recreation
Kalihi Stream at Dillingham Boulevard	Natural drainage	Riverine	Drainage
Kapālama Canal at Dillingham Boulevard	Concrete channel	Riverine	Drainage

[1] The proposed guideway will be adjacent to Waiau Spring for a distance of approximately 300 feet. There is an approximately 15- to 20-foot upland buffer from the mauka edge of the highway. The adjacent area surrounding the wetland is developed with residential housing.

[2] The Sumida Watercress Farm is hydrologically linked to the Kalauao Spring approximately 900 feet to the north of the highway. The Project will be adjacent to this watercress farm for a distance of approximately 530 feet.

load in stormwater would be lower and there would be less threat of surface and marine water contamination. The Project would rely on electric propulsion, which would generate minimal pollutants on the guideway compared to pollutants generated by roadway traffic.

Some stream crossings would be required along the alignment. In some instances, the discharge of stormwater from the guideway may increase stormwater inflow to some of these waters. However, because stormwater quality is not expected to be adversely affected, no streams or downstream marine waters are expected to experience negative effects.

Permanent best management practices (BMPs) would be installed as part of the Project to address stormwater quality before the water is discharged to streams or existing storm drain systems. The BMPs would promote a natural, low-maintenance, sustainable approach to managing and increasing stormwater quality. An integral part of the permanent BMPs will be an inspection and maintenance plan to ensure that the BMPs operate as designed. Examples of likely permanent BMPs include grit removal, in-line physical structures, vegetated swales, and retention ponds. The selection of BMPs would depend on developments and the availability of land in the area.

The design of the vehicle maintenance and storage facility will include an increased level of BMPs because it would be the system's most industrial facility. BMPs would likely include vegetated swales, berms, and infiltration trenches to route on-site stormwater to an infiltration basin and prevent off-site stormwater from entering the site. Oil-water separators may be used in specific areas where maintenance is routinely performed or where fueling and washing activities occur.

In some instances, piers may need to be built in streams. Areas where elevated structures would cross navigable waterways have been identified, and consultation with the Coast Guard is underway to address effects. Bridges will be designed to maintain the current navigability of streams. Any piers in streams would be placed to line up with existing bridge structures where feasible.

In conclusion, surface and marine waters within the study corridor are not expected to be adversely affected by the Project.

Coastal Zone Management Area

The objectives and policies of the Hawai'i Coastal Zone Management (CZM) Program are designed to protect and manage Hawaii's valuable coastal areas and resources. The Project is located within the State's CZM area, which covers the entire State. Pursuant to 15 CFR 930.32, federally permitted, licensed, or assisted activities undertaken in or affecting Hawaii's coastal zone must be consistent with the CZM objectives and policies.

The following discussion describes the Project's consistency with the objectives and policies of the State's CZM Program. This assessment will be reviewed by the DBEDT Office of Planning, the agency administering the State's CZM Program.

Recreation Resources

The Project would improve access to existing and future park and recreational facilities along the alignment.

Historic Resources

Consultation with the State Historic Preservation Division (SHPD) would result in commitments or conditions to reduce impacts on historic resources, so that agreement can be reached on findings of effect. No historic resources that are completely coastal in origin (lighthouses, shipyards, etc.) would be affected by the Project. For a full discussion of historic resources, see Section 4.15.

Scenic and Open Space Resources
Scenic impacts associated with the Build Alternatives include potential removal or relocation of Exceptional Trees, a change in the setting of a historic or cultural site or Section 4(f) resource, alteration of ʻEwa-Koko Head and mauka-makai views, and the introduction of project components that are out of scale or character with their setting. The guideway would be visible from some coastal areas and affect views. However, areas where one can clearly see the guideway from the shoreline are already urbanized. Section 4.7 describes visual impacts.

Coastal Ecosystems
The study corridor does not appear to be located within the Shoreline Setback Area or the Special Management Area. None of the Build Alternatives would affect coastal ecosystems. Construction impacts that could affect coastal water quality would be mitigated, as described in Section 4.17.

Economic Uses
To accomplish the economic development objectives for Oʻahu's urban corridor, suitable infrastructure must be developed. The Project would result in improved infrastructure and long-term benefits to residents, businesses, commuters, and developers. None of the alternatives would adversely affect coastal-dependent economic activities.

Coastal Hazards
The Project is not located in a tsunami evacuation zone and would not affect coastal hazards.

Managing Development
The Project would require State and City permits and approvals that include provisions for public participation and ensure protection of coastal resources. The Project would also provide necessary infrastructure to accommodate existing and planned future travel demand.

Public Participation
Agencies, non-governmental groups, and the public have been engaged throughout the Project's planning process, as required by Federal and State law. For more details on public participation opportunities, see Chapter 8, Comments and Coordination.

Beach Protection
The Project is not adjacent to or abutting a beach. None of the alternatives would affect coastal erosion or Oʻahu's beaches.

Marine Resources
The Project is not adjacent to or abutting a shoreline and would not affect marine resources.

Groundwater
The Project would meet the coordination requirements of Section 1424(e) of the Safe Drinking Water Act, in accordance with the 1984 Sole Source Aquifer Memorandum of Understanding between the EPA and the FHWA. A Water Quality Impact Assessment for EPA is underway. It is anticipated that contamination of the Southern Oʻahu Basal Aquifer would not occur, based on the construction methods that would be employed and the presence of an upward hydraulic gradient in the study corridor. Therefore, there would be no adverse effect to groundwater quality.

The Build Alternatives would increase impermeable surfaces and redirect runoff. By installing permanent BMPs, runoff would be directed back into the ground to recharge the groundwater system, resulting in no change in the amount of infiltration. In this way, although runoff from surrounding surfaces may enter the groundwater system along a different path than previous, the groundwater recharge needed to sustain the aquifer system would continue. Therefore, the Project would not result in any long-term changes to groundwater levels, including artesian conditions. Runoff from the guideway itself is expected to be relatively free of pollutants and would not threaten groundwater quality.

Floodplains

As a linear feature, the guideway would cross several floodplains. However, the Build Alternatives would not cause significant floodplain encroachment as defined by USDOT Order 5650.2. The guideway and stations would be elevated above the floodplain by piers, but some facilities, such as stairs, elevators, and traction power substations, would have to be built at ground level. These features could be affected by flooding if and where they are placed within a floodplain.

The fixed guideway would provide a safe alternative to surface transportation during storms. No likely future damage associated with floodplain encroachment is anticipated that could be substantial in cost or extent. The guideway would be elevated and could continue to run even if flooding occurred on the ground below.

There would be no notable adverse impacts on natural and beneficial floodplain values. In general, the only beneficial functions for the floodplains analyzed in the study corridor are the recharge of groundwater and drainage conveyance. None of the Build Alternatives would affect these functions.

Wetlands

Most of the guideway, stations, and transit facilities are planned within existing roadway corridors and in non-wetland areas. Therefore, no direct impacts to wetlands are expected for any of the Build Alternatives.

One major spring-fed wetland system in Kalauao is adjacent to a segment of the Project and is currently used by the Sumida Watercress Farm. Placement of the guideway structure within the median of Kamehameha Highway would not directly impact these wetlands, but shadows cast by the elevated structure may slightly affect water temperatures and affect watercress growth. These consequences are anticipated to be very slight to non-existent, based on the proposed guideway's distance from open water and watercress farming areas. Shade would only reach open water and watercress in the late afternoon. No direct impact to either of the springs and associated wetlands is anticipated.

A letter has been sent to the Army Corps of Engineers asking for their Jurisdictional Determination concurring that the Project will not have a direct impact on wetlands.

Mitigation

Surface and Marine Waters

Since no adverse impacts to surface and marine waters are expected, no mitigation is required.

Groundwater

Because no impacts to groundwater or the Southern O'ahu Basal Aquifer are expected, no mitigation other than the BMPs discussed above would be required.

Floodplains

Facilities in floodplains at ground level, such as stairs and elevators, would be designed to function and remain safe during flooding.

Hydraulic studies for specific locations where the Project crosses floodplains would be performed during project design. If hydraulic studies reveal that piers in the floodway would raise base flood elevations, such increases may be avoided by the design. In particular, the Pearl Highlands parking structure would require a design that allows floodwaters to pass unimpeded. Since the Project will be designed to meet these requirements when constructed in the floodplain, no mitigation would be required.

Wetlands

Because no impacts to wetlands are expected, no mitigation is expected to be required.

4.14 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 approximately 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).

4.14.1 Background and Methodology

City and County of Honolulu Street Tree Regulations

Exceptional street trees are regulated by Revised Ordinances of Honolulu (ROH), Chapter 41, Article 13. Coordination with the City Department of Parks and Recreation, 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 Draft EIS 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.

4.14.2 Affected Environment

Nearly 50 different tree species were identified during the survey (Figure 4-48). 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 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).

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 4-49)
- 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

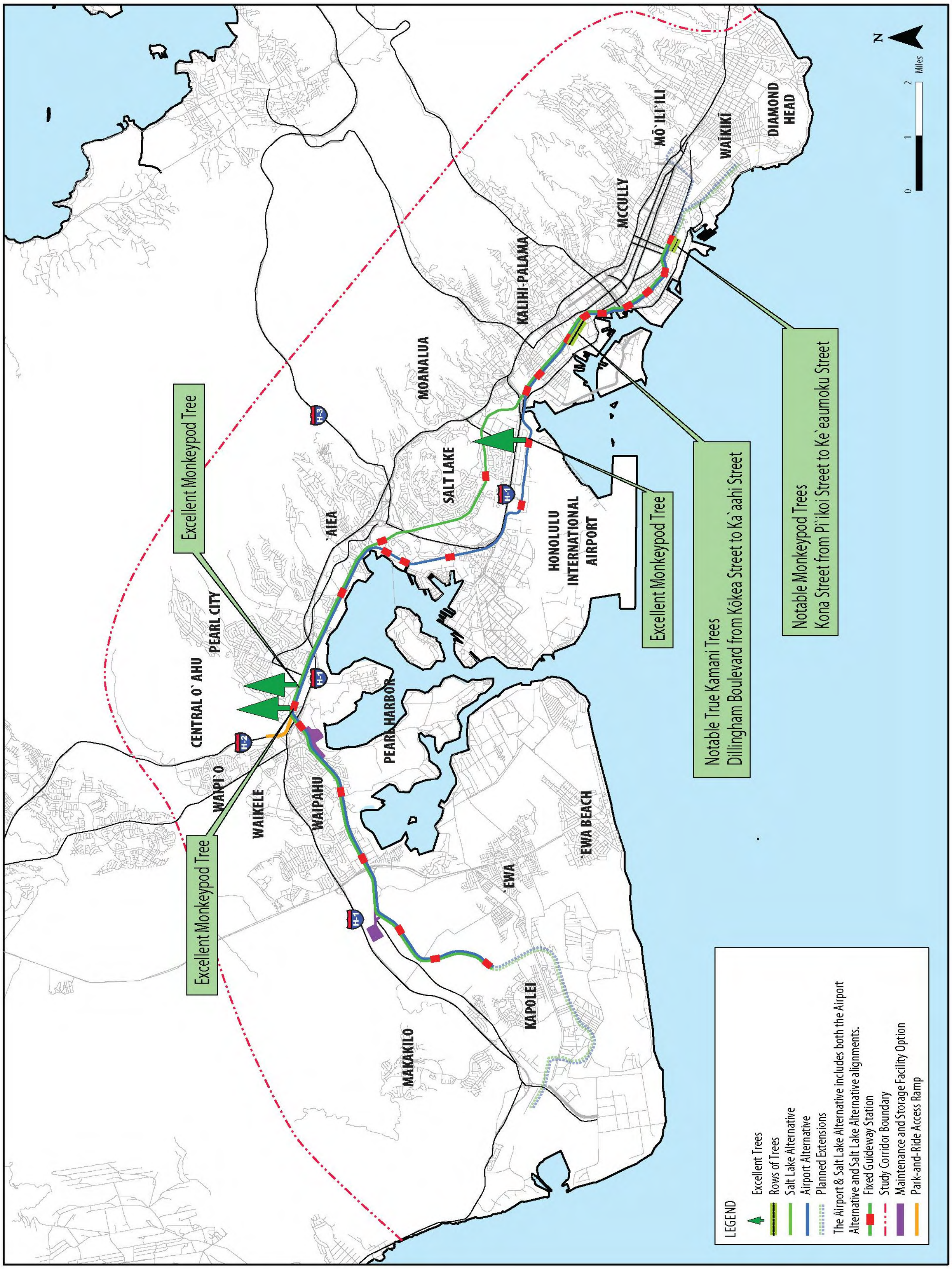


Figure 4-48 Identified Street Trees

Figure 4-49 True Kamani Trees on Dillingham Boulevard

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.

4.14.3 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 would be built, their environmental impacts would be studied in separate environmental documents.

Common to All Build Alternatives

Table 4-29 shows the approximate number of street trees that would be pruned, removed, or transplanted as a result of the Build Alternatives.

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

The following effects would result from the Project. The fixed guideway would primarily affect street trees in Waipahu and Downtown. Notable effects would 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.
- Along Dillingham Boulevard, 28 Notable true kamani trees would be removed. . Trees on the makai side of the street are already periodically pruned because of the presence of utilities.
- Most of the relatively newly planted trees along Farrington Highway in Waipahu would be removed.
- Monkeypod Trees on Kona Street between Pi‘ikoi Street and Ke‘eaumoku Street would be removed.

The consequences of the Build Alternatives would be fairly similar because the Notable and Excep-

Table 4-29 Summary of Street Tree Effects/Transplanting Mitigation

Alternative	Trees to Be Pruned	Trees to Be Removed	Trees that Could Be Transplanted
Salt Lake	100	350	250 (71 percent)
Airport	100	550	300 (55 percent)
Airport & Salt Lake	150	650	350 (53 percent)

Note: (71 percent) = approximate percent of trees that would be removed that are transplantable.

tional trees that would be affected are in areas common to all alternatives.

Salt Lake Alternative

The Salt Lake Alternative would prune and remove the fewest number of street trees of all the Build Alternatives.

Airport Alternative

The Airport Alternative would remove approximately 200 more trees than the Salt Lake Alternative. Although the number of trees affected is higher than that for the Salt Lake Alternative, the overall affect is not much greater. Many of the trees that would be affected along the Airport Alternative are relatively small and easily replaceable be-still trees, which explains why a lower percentage of the affected trees along this alternative are considered transplantable. However, the Airport Alternative would require the removal and possible transplant of 14 newly planted rainbow shower trees near the old interisland terminal. In addition, one Excellent monkeypod in Ke'ehi Lagoon Beach Park may require slight pruning. Specific quantities of trees to be pruned, removed, and transplanted are included in the totals in Table 4-29.

Airport & Salt Lake Alternative

The Airport & Salt Lake Alternative would result in the combined effects of both the Salt Lake Alternative and the Airport Alternative.

Mitigation

Effects to street trees would be mitigated by transplanting existing trees 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 would be transplanted would be selected based on project-specific criteria that could include the following:

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

Street tree pruning, removal, and planting would comply with City ordinances and would require that a certified arborist manage the pruning of any Exceptional trees.

In addition to transplanting existing trees, plans for new plantings would 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 would be given to developing landscaping plans so that new plantings would provide similar advantages to the community. If new plantings would not offer equitable mitigation (e.g., older mature trees that are removed), additional younger trees could be planted that would, in time, develop similar benefits.

4.15 Archaeological, Cultural, and Historic Resources

This section provides the regulatory context that governs archaeological and cultural resources, as well as historic structures. It also discusses how the Project would affect resources and structures within the Area of Potential Effect (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 Cultural Resources Technical Report* (RTD 2008p), and the *Honolulu High-Capacity Transit Corridor Project Historic Resources Technical Report* (RTD 2008o).

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

4.15.1 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 a project on cultural resources (consisting of archaeological, historic, and architectural properties) included or eligible for inclusion on the National Register of Historic Places (NRHP). The lead Federal agency, in consultation with the State Historic Preservation Division (SHPD), is responsible for the determination 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 comment on the Project and its effects on cultural resources and participate in development of the Memorandum of Agreement (MOA).

Cultural resources include prehistoric and historic districts, sites, buildings, structures, and objects that represent past human activities. This term includes artifacts, features, and remains that are related to and located within such properties, as well as properties of traditional religious and cultural importance that meet the significance criteria described in this section. This section defines archeological, cultural, and historic resources separately, although each of them are called "historic properties" when they are determined eligible for the NRHP.

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 historical 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 NHPA, Section 106 requires Federal agencies to consider the effects of their actions on historic properties. This includes traditional cultural properties, which are beliefs, customs, and practices of a living community of people that have been passed down through the generations. Hawai'i's historic preservation review legislation [HAR 13-275(b)] includes similar requirements. The following steps describe the consultation process:

- 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 on the NRHP
- Involve SHPD and other consulting parties in discussions regarding adverse effects on historic properties resulting in an MOA

- Submit the MOA to the Advisory Council on Historic Preservation
- Implement provisions of the MOA

Area of Potential Effect

After coordination with SHPD, the FTA defined the APE for aboveground cultural and historic resources to be generally one parcel deep from the project alignment but larger around stations and in a few other locations. 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 around transit stations 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 D of this Draft 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

NRHP criteria defined in 36 CFR 60.4 were applied to evaluate pre-1969 properties in the APE, which would be 50 years or older at completion of the Project. 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 broad cultural/historic 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 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 D of this Draft EIS includes a letter from SHPD dated September 26, 2008, that includes its review comments on the Historic Resources Technical Report (RTD 2008o).

Archaeological Resources

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

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 encounter 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 would undoubtedly be smaller.

Similarly, the rating system says nothing regarding the NRHP eligibility of potential archaeological resources. That evaluation and consultation will be deferred until an alignment is selected and design is further along. The Archaeological Resources Technical Report (RTD 2008n) describes the methodology and consultation process in detail.

The primary goal of the Project's archaeological effort would be to provide additional background research and limited field investigation results for those areas that would be disturbed by the Project, as well as cultural consultation to support development of the archaeological portions of the Project's Programmatic Agreement (PA). The PA would describe the archaeological historic property and resource identification and evaluation effort, as well as the mitigation procedures for identified archaeological resources. Mitigation would be conducted in advance of, and in some cases during, the construction phases in the Project's different geographic areas. See Section 4.15.3, Environmental Consequences and Mitigation, 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 Act 50 information-gathering process included: (1) identifying individuals and groups with expertise about cultural resources, practices, and beliefs within the transit and station corridor; (2) conducting field surveys (e.g., canvassing or conducting ethnographic pedestrian surveys) in selected areas of the corridor; (3) conducting semi-focused interviews of cultural experts or other individuals familiar with details of cultural practices that would be adversely affected; (4) making site visits; and (5) reviewing pertinent archival documents. In addition to the NRHP criteria A-D, Act 50 adds criteria that have traditional cultural significance to an ethnic group, including religious structures and/or burials.

Historic Resources

Known and potential historic 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 on resources evaluated as eligible at the Tax Office and other research centers. Summary forms were prepared for all surveyed properties. These were reviewed by SHPD.

Section 106 Consultation

Extensive effort was made to contact, identify, and consult with various cultural and ethnic groups to identify traditional cultural properties and practices during the Alternatives Analysis process. The information gathered at that time provided a starting-point for work to support this Draft EIS.

The purpose of consultation was to identify cultural resources and 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 project study area. A reasonable and good faith effort must be made to identify Native Hawaiian organizations that might attach religious and cultural significance to historic properties in the APE, and they must be given an adequate opportunity to express their views.

In addition to consultation with SHPD, Section 106 consultation letters were sent to Native Hawaiian historic and cultural preservation organizations to request the identification of any cultural concerns that may require attention. The letters 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 (for Kaka'ako)
- U.S. Navy, Naval Facilities Engineering Command, Hawai'i
- Office of Hawaiian Affairs
- O'ahu Island Burial Council
- Hui Malama I Na Kupuna O Hawai'i Nei (Group Caring for the Ancestors of Hawai'i)
- Royal Order of Kamehameha
- The Ahahui Ka'ahumanu (civic club formed in 1864 to celebrate the life of Queen 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 clubs

For a copy of the letters, see Appendix D. FTA will consult directly with the Advisory Council on Historic Preservation.

4.15.2 Affected Environment

Archaeological Resources in the APE

Archaeological resources already documented within the APE include remnants of fishponds, human burials, subsurface cultural layers related to traditional Native Hawaiian occupation, historic building and structure foundations, and historic trash pits and privies.

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 4-50 (see Archaeological Resources under Methodology in Section 4.15.1, Background and Methodology).

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 84 historic resources (individual or districts). The Historic Resources Technical Report (RTD 2008o) lists all historic resources identified within the Project's APE. SHPD completed determinations of eligibility for historic structures on October 3, 2008. A copy of the determination letter is included in Appendix D of this Draft EIS.

4.15.3 Environmental Consequences and Mitigation

Environmental Consequences

No Build Alternative

Under the No Build Alternative, the Project would not be built, and there would be no impacts associated with archaeological, cultural, or historic resources. The projects defined in the ORTP would be built, and environmental impacts associated with those projects would be studied in separate documents.

Archaeological Resources

Subsurface features and deposits that have not been previously identified may be affected by the Project. Native Hawaiian testimonies in Land Commission Award claims indicate that there are documented burials within the study corridor. These effects would occur during construction (see Section 4.17 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. Toward that end, a PA is being drafted by the joint leads. When final, the PA will stipulate the full extent of RTD's and FTA's Section 106 responsibilities prior to each construction phase, identify invited and concurring signatories, and provide direction on mitigation of adverse effects.

Cultural Resources

Potential long-term effects on cultural resources include permanent modification, such as displacement, damage, or destruction. Table 4-30 summarizes the number of resources possibly affected by each Build Alternative. Any cultural resources that are uncovered would be assessed through collaborative consultation with appropriate cultural practitioners and/or community groups. Table 4-31 lists resources within the APE that would be affected.

The phased approach PA discussed above will also include Traditional Cultural Properties (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.

Historic Resources

Eighty-four listed or eligible historic resources are identified within the APE. Full or partial acquisitions would occur from some of these historic properties. In addition, possible "diminishment of integrity of setting, feeling and/or association" could result from any Build Alternative. All Build Alternatives would cross the Chinatown Historic District, but none of them would directly affect any contributing elements. These properties, and potential impacts, are shown on Figure 4-51 and listed in Table 4-32.

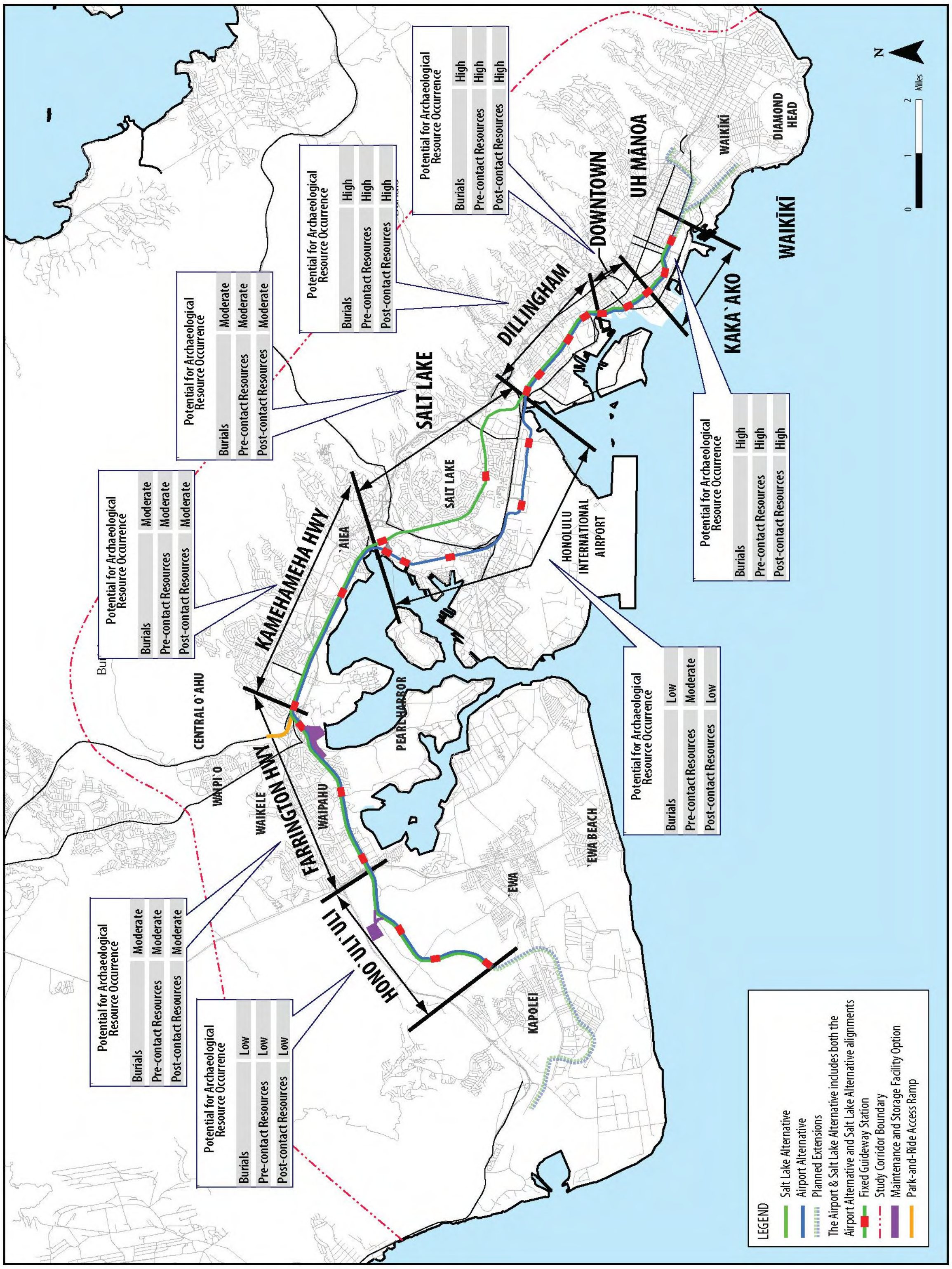


Figure 4-50 Potential to Affect Archaeological Resources

Table 4-30 Summary of Effects on Cultural Resources

Alternative	Cultural Resources Affected
Salt Lake	7
Airport	7
Airport & Salt Lake	7

Of the seven resources that would be adversely affected by all Build Alternatives, one is a grouping of street trees that would require removal and the remainder are historic structures where right-of-way needs would demolish buildings, create a parcel acquisition, or where there would be an adverse visual effect. For the Airport Alternative and the Airport & Salt Lake Alternative, a small amount of right-of-way would also be required from the Pearl Harbor Naval Base National Historic Landmark, but none of its contributing resources would be directly affected.

SHPD has reviewed the preliminary determination of effect presented in this Draft EIS. The division has not yet completed concurrence on determinations of adverse effects and has inquired about indirect effects to several resources and the magnitude of effect to the Chinatown Historic District. Figures 4-29 through 4-31 show views of the Project within the Chinatown Historic District. Consultation is ongoing related to the effects of the Project and commitment of mitigation to reduce those effects to historic resources.

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)).

Mitigation

To comply with NHPA Section 106, consultation with SHPD regarding NRHP eligibility and effects resulting from a proposed undertaking is required through preparation of a Determination of Eligibility/Finding of Effect. Because this Project would result in adverse effects and avoidance is not possible, an MOA will be prepared to outline responsibilities and measures to mitigate or reduce project effects. The ACHP and other Section 106 consulting parties will be notified of the potential adverse effects and will be invited to participate in development of the MOA. The MOA will be prepared concurrently with the effects determination to ensure that any project commitments considered in the effects determination are addressed in the MOA.

Because archaeological resources are only expected to be affected during construction, mitigation

Table 4-31 Potential Long-term Adverse Effects on Cultural Resources Related to Act 50

Resource	Type	Effect
Waiawa Stream	Resource (water)	Route crosses in two places. May adversely affect access to stream and resources within stream.
Dee Lite Bakery	Practice	Displacement
Aku Bone Lounge & Grill	Practice	Displacement
Hawai`i International Child	Practice	Displacement
Makana Esthetics Wellness Academy	Practice	Displacement
Tio Restaurant	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).

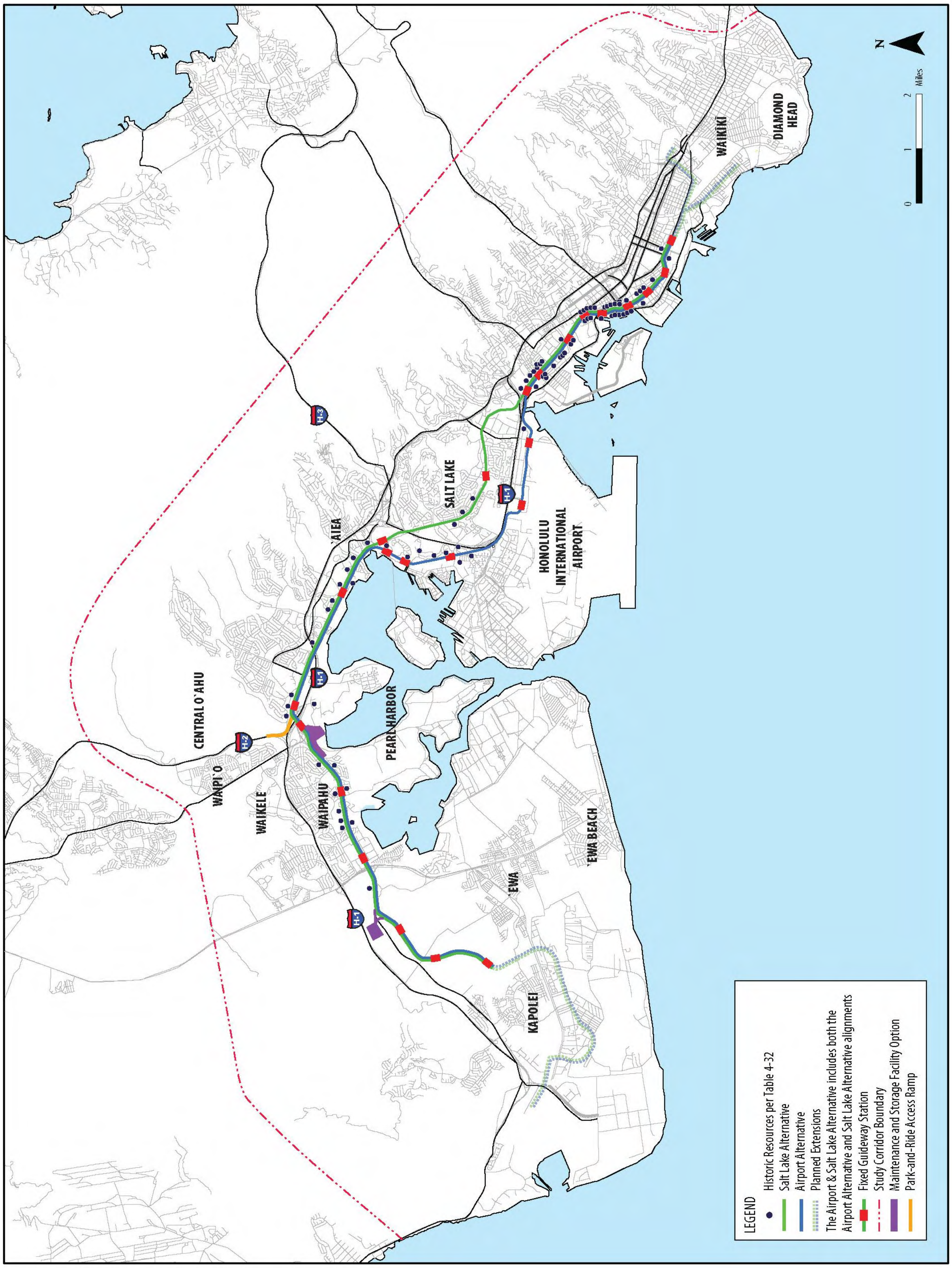


Figure 4-51 Historic Resources

Table 4-32 Historic Properties within Project's Area of Potential Effect (continued on next page)

Tax Map Key	Resource Name	Description of Effect	Preliminary Section 106 Determination
Common to All Build Alternatives			
None	Hono`uli`uli Stream Bridge (Farrington Highway)	No property acquisition	No Effect
94025008	Ishihara House	No property acquisition	No Adverse Effect
94027127	West O`ahu Christian Church/former American Security Bank (round plan)	No property acquisition	No Adverse Effect
94036071	Waipahu Hawai`i Stake, Church of Jesus Christ of Latter-Day Saints	No property acquisition	No Adverse Effect
94039082	Tehahira Apartments	No property acquisition	No Adverse Effect
None	Waikele Stream Bridge, eastbound span and bridge over OR&L spur	No property acquisition	No Effect
94017043	Cavalho Apartments	No property acquisition	No Adverse Effect
94019020	Ohara Apartments	No property acquisition	No Adverse Effect
94038050	Sandobal House	No property acquisition	No Adverse Effect
96003026	Watercress of Hawaii	No property acquisition	No Effect
96003018	***Solmirin House***	***Full acquisition, including building***	***Adverse Effect***
None	Waiawa Booster Pump Station	No property acquisition	No Effect
None	Waiawa Stream 1932 Bridge (westbound lanes)	No property acquisition	No Effect
None	Waiawa Stream 1952 Bridge (eastbound lanes)	No property acquisition	No Effect
None	Waiawa Separation Bridge	No property acquisition	No Effect
98003010	Hawaiian Electric Company Waiau Plant	No property acquisition	No Adverse Effect
98006024	Nishi Service	No property acquisition	No Adverse Effect
98016047	Sumida Watercress Farm	No property acquisition	No Adverse Effect
98018041	Akiona House (Quonset)	No property acquisition	No Adverse Effect
98018042	Forty-Niner Saimin Restaurant	No property acquisition	No Adverse Effect
98022081	Waimalu Shopping Center	No property acquisition	No Adverse Effect
None	Waimalu Stream Bridge	No property acquisition	No Effect
None	Kalauao Springs Bridge	No property acquisition	No Effect
None	Kalauao Stream Bridge	No property acquisition	No Effect
99012006 & 99012001	`Aiea (Honolulu Plantation) Cemetery	No property acquisition	No Adverse Effect
12013006	Foremost Dairy	No property acquisition	No Adverse Effect
12013007	GasPro Store	No property acquisition	No Adverse Effect
None	Lava Rock Curbs (Laumaka Street to South Street, except not along Nimitz Highway)	No property acquisition	No Effect
12002108	Duarte House	No property acquisition	No Adverse Effect
12002113	Ten Courtyard Houses	No property acquisition	No Adverse Effect
12009017	***Afuso House***	***Acquisition, including building***	***Adverse Effect***
12009017	***Higa Fourplex***	***Acquisition, including building***	***Adverse Effect***

Table 4-32 Historic Properties within Project's Area of Potential Effect (continued on next page)

Tax Map Key	Resource Name	Description of Effect	Preliminary Section 106 Determination
12009018	*Teixeira House*	*Full acquisition, including building*	*Adverse Effect*
12009060	Pang Craftsman-style House	No property acquisition	No Effect
12012014	Pu`uhale Market	No property acquisition	No Adverse Effect
15029060	*Boulevard Saimin Restaurant*	*Minor parcel acquisition (0.01 acre), close to building*	*Adverse Effect*
15015008	Six Quonset Huts	Minor strip acquisition (0.1 acres) along Dillingham Boulevard	No Adverse Effect
15022004	Two-story (Tsumoto) Shop House	No property acquisition	No Adverse Effect
15022005	AC Electric	No property acquisition	No Adverse Effect
None	Kapālama Stream Bridge	No property acquisition	No Effect
None	*True Kamani Trees on Dillingham Boulevard*	*Removal of approximately 28 trees along Dillingham Boulevard*	*Adverse Effect*
15007001 & 15007002	OR&L Office/Document Storage Building and Terminal Building	No impact to historic resources	No Adverse Effect
15007001 & 15007002	OR&L basalt street paving	No impact to historic resources	No Adverse Effect
15007001	Former filling station on OR&L Property	No impact to historic resources	No Adverse Effect
15007003	Tong Fat Co.	No property acquisition	No Adverse Effect
15007003	Wood Tenement Buildings	No property acquisition	No Adverse Effect
15007033	Tamura Building	No property acquisition	No Adverse Effect
17002, 17003, & 17004 plats	Chinatown Historic District	Minor parcel acquisition near Chinatown Marketplace (0.3 acre), no impact to building	No Adverse Effect
None	Nu'uanu Stream Bridge	No property acquisition	No Effect
21001056	Harbor retaining wall of coral blocks from Honolulu Fort	No property acquisition	No Effect
Tax Map Keys in plats 17002 & 21002	Merchant Street Historic District	No property acquisition	No Adverse Effect
21001001	Pier 10/11 Building	No property acquisition	No Adverse Effect
21001005	Department of Transportation Harbors Division Offices	No property acquisition	No Adverse Effect
21001013	Aloha Tower	No property acquisition	No Effect
21013007	Irwin Park	No property acquisition	No Adverse Effect
21014003	*Dillingham Transportation Building*	*Minor parcel acquisition (0.06 acre), close to building*	*Adverse Effect*
21014006	Hawaiian Electric Company Downtown Plant	Minor parcel acquisition (0.14 acre), no impact to building	No Adverse Effect
various	Hawai`i Capital Historic District	No property acquisition	No Adverse Effect

Table 4-32 Historic Properties within Project's Area of Potential Effect (continued on next page)

Tax Map Key	Resource Name	Description of Effect	Preliminary Section 106 Determination
None	Walker Park	No property acquisition	No Adverse Effect
21030014	Kamaka Ukulele	No property acquisition	No Effect
21031012	Department of Transportation Building	No property acquisition	No effect
21031018	[Old] Kaka`ako Fire Station	No property acquisition	No Effect
21031021	Royal Brewery/The Honolulu Brewing & Malting Co.	No property acquisition	No Effect
21051006 & 21051005	Mother Waldron Playground	No property acquisition	No Adverse Effect
21050049	Ching Market & House	No property acquisition	No Effect
21050052	American Savings Bank/Liberty Bank—Queen-Ward Branch	No property acquisition	No Effect
21052008	Fuji Sake Brewing Co.	No property acquisition	No Adverse Effect
23007029	Pacific Development Office Building	No property acquisition	No Adverse Effect
23039023	Hawaiian Life Building	No property acquisition	No Adverse Effect
23039001	Ala Moana Building	No property acquisition	No Adverse Effect
Salt Lake Alternative			
11010011	Facility X-24/Quonset Hut (Navy Public Works Center)	No impact to historic resources	No Adverse Effect
99002023	Radford High School	Minor parcel acquisition (0.01 acres)	No Adverse Effect
11021018	Āliamanu Pumping Station (Board of Water Supply)	No property acquisition	No Adverse Effect
11007036	First Hawaiian Bank—Māpunapuna Branch	No property acquisition	No Adverse Effect
11017006–11018014	Potential Salt Lake Duplexes Historic District	No property acquisition	No Adverse Effect
Airport Alternative			
99003029	Pearl Harbor Naval Base National Historic Landmark	Minor parcel acquisition (0.6 acre)	No Adverse Effect
99003066 (partial)	Kamehameha Highway Bridge over Hālawa Stream (mauka span)	No property acquisition	No Effect
99002004	CINCPACFLT Admin Building/CINCPAC Headquarters—Facility 250	No property acquisition	No Adverse Effect
99001008	Ossipoff's Aloha Chapel, SMART Clinic, and Navy-Marine Corps Relief Society—Facility 1514	No impact to historic resources	No Adverse Effect
99001008	Navy WWII splinterproof shelter —Facility S-51	No property acquisition	No Adverse Effect
99001008	Navy Rehab Center/former Fire Station—Facility 199	No property acquisition	No Adverse Effect
99002004	Potential Makalapa Housing Historic District	No impact to historic resources	No Adverse Effect
99002004	Potential Little Makalapa Housing Historic District	No impact to historic resources	No Adverse Effect
11016004	Hawai`i Employers Council	No property acquisition	No Adverse Effect
Airport & Salt Lake Alternative			
11010011	Facility X-24/Quonset Hut (Navy Public Works Center)	No impact to historic resources	No Adverse Effect

Table 4-32 Historic Properties within Project's Area of Potential Effect (continued from previous page)

Tax Map Key	Resource Name	Description of Effect	Preliminary Section 106 Determination
99002023	Radford High School	Minor parcel acquisition (0.01 acres)	No Adverse Effect
11021018	Āliamanu Pumping Station (Board of Water Supply)	No property acquisition	No Adverse Effect
11007036	First Hawaiian Bank—Māpunapuna Branch	No property acquisition	No Adverse Effect
11017006–11018014	Potential Salt Lake Duplexes Historic District	No property acquisition	No Adverse Effect
99003029	Pearl Harbor Naval Base National Historic Landmark	Minor parcel acquisition (0.5 acre)	No Adverse Effect
99003066 (partial)	Kamehameha Highway Bridge over Hālawa Stream (mauka span)	No property acquisition	No Effect
99002004	CINCPACFLT Admin Building/CINCPAC Headquarters—Facility 250	No property acquisition	No Adverse Effect
99001008	Ossipoff's Aloha Chapel, SMART Clinic, and Navy-Marine Corps Relief Society—Facility 1514	No impact to historic resources	No Adverse Effect
99001008	Navy WWII splinterproof shelter —Facility S-51	No property acquisition	No Adverse Effect
99001001	Fuel Oil Pump House—Facility S-386	No impact to historic resources	No Adverse Effect
99002004	Potential Makalapa Housing Historic District	No impact to historic resources	No Adverse Effect
99002004	Potential Little Makalapa Housing Historic District	No property acquisition	No Adverse Effect
11016004	Hawai`i Employers Council	No property acquisition	No Adverse Effect

measures for these resources are discussed in Section 4.17. Where archaeological, cultural, or historic resources remain or are discovered, all efforts would be made to avoid destruction.

Mitigation measures for historic resources affected by the Project are being 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). Discussions with SHPD regarding mitigation have included preparation of cultural landscape reports and NRHP forms for eligible resources, and historic significance signing and design review with SHPD and other appropriate stakeholders. The NRHP nominations would be updated for already listed affected resources. These will be developed in coordination with SHPD and appropriate stakeholders.

Decisions to avoid adverse effects were made during the Project's Alternatives Analysis phase, including selecting an alignment that would affect the fewest historic resources. Modifications to the Project that could minimize adverse effects involved making engineering refinements (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. Discussions with SHPD will continue to determine engineering choices to minimize adverse effects on areas with the highest-density and highest-quality historic resources.

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 would be adversely affected. The greatest effect would be displacement of current traditional/ethnic/urban resources. These would be mitigated with the same measures identified in Section 4.3. Effects on traditional cultural practices associated with streams will be mitigated by minimizing the effects on streams, as discussed in Section 4.13.

4.16 Maintenance and Storage Facility

This section describes the effects of the maintenance and storage facility options on the natural and built environments. Two locations are being considered for the maintenance and storage facility: a 41-acre site in the proposed Hoʻopili development in ʻEwa and a 43-acre vacant site in Waipahu near Leeward Community College. Only one site would be selected, and either location would be compatible with any of the Build Alternatives. The maintenance and storage facility is described in Chapter 2, and the site options are illustrated on Figures 2-41 and 2-42. Effects of the maintenance and storage facility on transportation are described in Chapter 3, Transportation, of this Draft EIS.

The selected site would contain several buildings for administration, a system control center, and parking for maintenance and employees. It would 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 would operate 24 hours a day. Each option would require special track work for trains to access the site from the guideway.

4.16.1 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.

4.16.2 Common to All Build Alternatives

Land Use

Hoʻopili Option

The Hoʻopili maintenance and storage facility option would be mauka of Farrington Highway, makai of the H-1 Freeway between Palehua 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 owned by D.R. Horton-Schuler Homes and is in the area of the future Hoʻopili Master Planned Community. The site would be converted from current agricultural use and planned industrial/commercial use to a transportation facility. This option would be consistent with planned land use in the area.

Option near Leeward Community College

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. This site 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; the site is no longer used for fuel storage but remains under caretaker status with the Navy. The site would 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 for housing or light industrial uses. Use of the site for a vehicle maintenance and storage facility is consistent with the past industrial land use of the site.

Noise

Noise would be produced at the maintenance and storage facility. Noise generated would be similar at both sites.

Ho`opili 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 would 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 would also include residential development that would be susceptible to noise and vibration impacts, but these uses are planned to be makai of Farrington Highway.

Option near Leeward Community College

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 would not experience noise impacts.

Visual

Ho`opili Option

This site is currently an open flat agricultural area adjacent to an electrical substation. The maintenance and storage facility would contrast with the open, rural setting. In addition, the facility buildings would be visible from mauka foothill residences. Planned future development near the proposed Hoʻopili site includes light industrial and commercial uses that are expected to occur in a similar timeframe as the Project. Development of these uses on surrounding properties would reduce the visual contrast of the maintenance and storage facility. A maintenance and storage facility at this site would result in moderate visual effects. Light from the site is not anticipated to affect wildlife.

Option near Leeward Community College

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 would be highly visible from low-lying areas makai of the interchange and from residences on the foothills above. However, the facility would 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 would result in moderate visual effects. Light from the site is not anticipated to affect wildlife.

Other Environmental Effects

Effects on air quality, energy use, and natural resources are not anticipated to result from either site option. Cultural and historic resources are not anticipated to be affected; the Hoʻopili site has been disturbed by farming activities, and the site near Leeward Community College was formerly used by the military. Both sites are near or include some flood zones; however, the area that would be developed for the maintenance and storage facility is outside of the flood zone area. Stormwater treatment measures would be installed at either site to prevent the runoff of pollution or polluted stormwater.

Hazardous materials, waste, and contamination are not anticipated to be encountered at either site. The Hoʻopili site has been used for agricultural purposes. The site 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. The U.S. Department of Health & Human Services and HDOH concur with this assessment.

Mitigation

Operation of the maintenance and storage facility would meet local regulations related to noise, air quality, and stormwater management typical of light industrial operations.

4.17 Construction Phase Effects

Construction effects would 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. This section of the Draft EIS discusses construction effects related to the natural and built environment with regard to the entire Project. Section 3.5, Construction-Related Effects on Transportation, of this Draft EIS discusses transportation-related construction impacts.

Construction-related effects would result primarily during construction of the main structural components, 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, and park-and-ride lots, would also have associated effects but to a lesser degree.

The maintenance and storage facility, park-and-ride lots, and stations could be used for construction staging areas. Additional areas would be identified by the contractor as needed. The contractor would be responsible for obtaining any necessary permits and approvals. 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.

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

Project construction would 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.

As described in Chapter 2, the Project would open in phases, including potentially a connection to the airport as a phase construction of the Airport & Salt Lake Alternative. Stations at the ends of each phase would operate temporarily as terminal stations until the next phase is completed. This operation would temporarily affect access and travel patterns around the stations.

4.17.1 Land Use and Economic Activity

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

Business Access

Access to businesses near construction activities could be temporarily affected. In several locations left-turn lanes would be closed during construction, requiring drivers to change their approach and make a right-hand turn to the businesses. Such closures are expected on Farrington Highway in Waipahu, Kamehameha Highway in Pearl City, Salt Lake Boulevard, and Dillingham Boulevard. Segments of Halekauwila and Queen Streets may be made temporarily one-way or have parking eliminated during construction. The MOT Plan would be developed by the contractor prior to construction and would 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:

- Access to businesses would be maintained during construction.
- A public involvement plan would be developed prior to construction to inform business owners of the construction schedule and activities
- Initiating public information campaigns to reassure people that businesses are open during construction and to encourage their continued patronage
- Minimizing the extent and number of businesses, jobs, and access affected during construction
- To the extent practicable, coordinating the timing of temporary facility closures to minimize impacts to business activities—especially those related to seasonal or high sales periods
- Minimizing, as practical, the duration of modified or lost access to businesses
- Providing signage, lighting, or other information to indicate that businesses are open
- Providing public information (e.g., press releases or newsletters) regarding construction activities and ongoing business activities, including advertisements in print and on television and radio
- Phasing 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
- Providing advance notice if utilities would be disrupted and scheduling major utility shut-offs 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 11,700 jobs per year over the nine-year construction period (Table 4-33).

4.17.2 Communities and Neighborhoods

During construction, automobile, pedestrian, and transit access to communities and neighborhoods surrounding the project alignment would be affected. These effects are discussed further in the following sections.

The site-specific Construction Safety and Security Plans would 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 would be consulted in preparing the Construction Safety and Security Plans and would have some

Table 4-33 Employment Effects

Alternative	Construction Cost 2007 $ (millions)	Average Number of Jobs per Year (9 years of Construction)[1]			
		Direct	Indirect	Induced	Total
No Build	$0	0	0	0	0
Salt Lake	$3,921	4,000	1,700	3,900	9,600
Airport	$4,125	4,200	1,800	4,100	10,100
Airport & Salt Lake	$4,803	4,900	2,100	4,700	11,700

[1] Multipliers of 9.25 for direct, 4.03 for indirect, and 8.90 for induced jobs are based on the 2008 State of Hawai`i Input-Output factor for heavy civil construction (jobs per million $)

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

During development of the Construction Safety and Security Plans, measures would 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 would 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 would include relocating and rearranging certain facilities, noise mitigation, and other efforts deemed necessary to maintain full functionality. In cases where project placement would restrict existing vehicular or pedestrian access routes to public service buildings, alternate access points would 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.

The Salt Lake Alternative would have a greater effect than the Airport Alternative to schools, parklands, and recreational resources during construction because of the greater number of such facilities along Salt Lake Boulevard.

In instances where any school, parkland, or recreational resource would experience a disruption in access, the effects would be mitigated as necessary and appropriate using applicable practices similar to those outlined in Business Access in Section 4.17.1, Land Use and Economics Activity. Temporary barrier walls or fences would be placed around any school, parkland, or recreational resource near a construction area.

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 would continue throughout design and construction. HDOT would be involved with utility coordination for utility work in the state roadways and roadway rights-of-way.

Design criteria would govern all new utility construction outside of buildings, as well as the support, maintenance, relocation, and restoration of utilities encountered or affected by construction of the fixed guideway. Utility service to abutting properties would not be interrupted. If facilities were temporarily relocated, the area would be restored as close as possible to its original condition. Replacements for existing utilities would provide service or capacity equal to that currently offered.

Utility rearrangements would ensure that construction of transit facilities may proceed without affecting utility service. Utilities that penetrate through or cross over transit structures would 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. Coordination would 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 would occur along the entire project alignment and would affect all population groups equally.

4.17.3 Visual and Aesthetic Conditions

During construction, visual quality may be altered for all viewer groups. Construction-related signage and heavy equipment would 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, would 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 would 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 following mitigation measures are proposed to minimize visual impacts during construction:

- Removing visibly obtrusive erosion-control devices, such as silt fences, plastic ground cover, and straw bales, as soon as an area is stabilized
- Locating stockpile areas in less visibly sensitive areas whenever possible so they are not visible from the road or to residents and businesses
- Shielding temporary lighting and directing it downward to the extent possible

- Limiting the times construction lighting could be used in residential areas
- Replacing removed street trees and other vegetation with appropriately sized vegetation after construction is completed; this would be achieved by implementing a Landscape Architecture Plan for the Project

4.17.4 Air Quality

Air pollution from construction activities would 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 of Hawai'i regulates fugitive air pollutant emissions (HAR 11-60.1). The Project would 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 following control measures can substantially reduce fugitive dust:

- Minimize land disturbance
- Use watering trucks to minimize dust
- 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, Construction-Related Effects on Transportation, for more detail). All State and Local regulations for dust control and other air quality emission reduction controls would be followed.

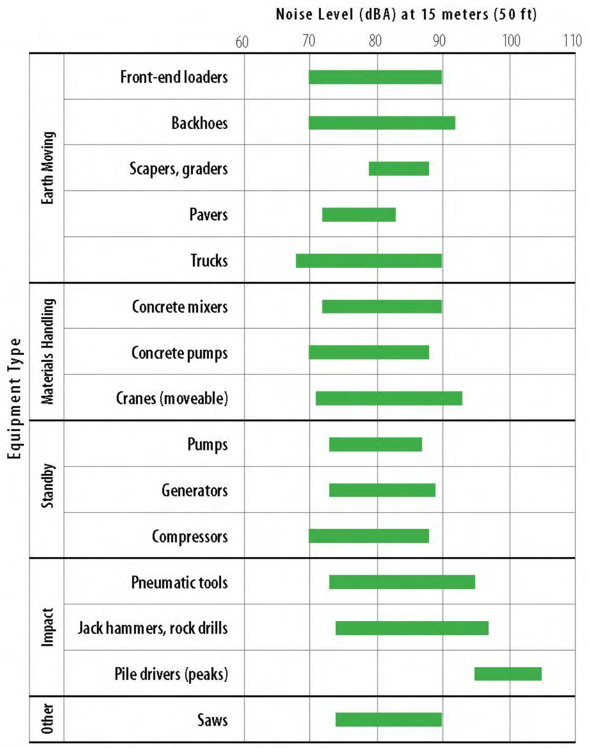
4.17.5 Noise and Vibration

Noise

Noise during construction would be bothersome and annoying to nearby residents, visitors, tourists, and businesses. All of the alternatives would generate similar types of noise, which would occur sporadically in different locations throughout the nine-year construction period.

The most common noise source in construction areas would 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) operates in a cyclic manner, and stationary equipment (generators and compressors) generates noise at fairly constant levels. The loudest and most disruptive construction activities would be impact pile-driving followed by demolition, jackhammers, and hoe rams. Impact pile-driving, if used as a method for pile placement, would result in the loudest and most disruptive construction work. Impact pile-driving would 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 4-52 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 would be reduced to approximately 83 dBA at 100 feet and 76 dBA at 200 feet. Doubling the number of noise sources would increase the noise level by 3 dBA. In the above example, two jackhammers operating together would generate a noise level of 93 dBA at 50 feet from the activity.



Source: EPA, 1971, and WSDOT, 1991.

Figure 4-52 Typical Construction Equipment Noise Levels

The mitigation discussed in this section is meant to be a guideline for developing project-specific measures to reduce construction noise. Prior to construction, the contractor would be required to obtain an approved Community Noise Variance from HDOH. The permit would regulate construction times and activities and include mitigation commitments. The following measures are examples of what could be incorporated. They would be re-evaluated in more detail during preliminary design because impacts to residences cannot be accurately determined without detailed construction plans and schedules.

- 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 can 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 developed. Construction hours could be set, and noise-level criteria could be decided upon and adhered to during construction. Construction noise monitors could be required. 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 would comply with standard specifications and all applicable local sound control and noise level rules, as well as regulations set by HDOH. For all alternatives, 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 would be required for such nighttime work, which would likely be necessary at certain locations and during certain phases of the Project. Variance permits would 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 would 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 would cause the highest vibration levels of the proposed construction activities. Pile-driving activities more than 75 feet from newer, non-historic buildings would not exceed risk criteria for those buildings. For buildings closer than 75 feet to pile-driving activities, the contractor would be required to provide mitigation for vibration levels during these activities. Contractors could 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. The most appropriate method for reducing vibration would be to use drilled shafts or auger-cast piles, which are cast in-place rather than driven into the ground, in areas where vibration-sensitive buildings or utilities are located. By using these types of foundations, impact driving would be eliminated and drilling would generate lower vibration levels.

Construction vibration would have less of an effect on underground and buried utilities than on buildings. Pile-driving is the only proposed construction activity that would 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.

4.17.6 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 Build Alternatives are all elevated, an additional 150,000 MBTUs of energy per track mile would be required to construct the elevated structure. Table 4-34 summarizes the energy that would be required to construct the Build Alternatives.

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 would also decrease energy consumption. Mitigation of traffic impacts during construction are discussed in Chapter 3.

Table 4-34 Total Construction Energy Required

Alternative	Project Construction Energy (MBTUs)
Salt Lake	7,140,000
Airport	7,480,000
Airport & Salt Lake	9,020,000

MBTUs = million British thermal units

4.17.7 Natural Resources

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

Vegetation

During construction, impacts to vegetation would 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

Accidental fires and excessive dust could directly and adversely impact the endangered koʻoloaʻula *(A. 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 Terminal Station and associated guideway. No other endangered or threatened species or critical habitat would be affected by project construction.

To mitigate impacts to vegetation, cranes and other equipment would be sited on previously disturbed areas to the extent possible, and clearing and grubbing would be kept to a minimum. Construction impacts to the endangered koʻoloaʻula would be mitigated by following a Habitat Conservation Plan, using high-visibility construction barriers, implementing fire-prevention measures, and establishing appropriate buffers. Additionally, prior to clearing and grubbing near the koʻoloaʻula contingency reserve, the area would be surveyed. DLNR permitting requirements will be met. If any koʻoloaʻula are found, a horticulturist from the DLNR would be given an opportunity to remove the plants and transplant them to the contingency reserve.

Street Trees

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

Streams and Wetlands

The alteration of stream channels may be necessary as part of the construction process. Stream crossings that exceed 130 feet would likely require placing a 6- to 10-foot-diameter supporting column in the stream. This would affect water quality and require a permit from the USACE.

BMPs would be developed to mitigate potential impacts to streams and wetlands. Migration of the native fish ʻoʻopu also would be considered in BMP design and permit applications. Agency reviews conducted as part of the permit process would ensure that the permits identify proper control techniques to be implemented during construction.

To mitigate the potential impacts of construction on streams and wetlands where no in-water work is required, a construction buffer from the top of the stream bank (or the ordinary high water line for non-tidal streams and the mean high tide for tidal streams) would be established during work in the area.

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 would adjust to the new structures. 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.

Mitigation of construction impacts on wildlife would include avoiding spring-fed wetlands and minimizing construction activities near endangered Hawaiian waterbirds' habitat. A wildlife biologist would survey all large canopy trees to be pruned prior to construction to ensure that no trees have chicks that have not yet fledged, including white terns. If any are found, pruning could be delayed until chicks fledge.

4.17.8 Contaminated Media, Stormwater Quality, and Solid Waste

Contaminated Media

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

Earthwork could uncover contaminated soil. The Initial Site Assessment prepared for this Draft EIS identified a number of sites and neighborhoods of concern where contaminated soil and groundwater may be present (Section 4.11). 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 would 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 would vary by area or site and would depend on the level of concern in each area.

Stormwater Quality

Over the anticipated nine-year construction period (2009–2018), stormwater runoff from the construction sites may enter streams, bays, and harbors along the south shore of O'ahu and could affect the quality of nearby surface waters. Sediment loading of stormwater could occur when unstabilized, exposed soil at excavations and stockpiles are exposed to heavy rain, resulting in stormwater runoff. Excavated soil may contain oil, grease, and other contaminants that could be carried away by stormwater into streams, bays, and harbors. Sediment-laden stormwater could create unacceptable levels of turbidity and high sedimentation rates, and contaminated stormwater could contaminate surrounding waters.

Other water sources could flow into natural streams or stormwater collection systems if not properly controlled. Other water sources of concern include water used to wash concrete trucks and control dust, as well as drilling fluids.

In some areas, drilled shafts may extend close to or into the aquifer, and artesian heads may be considerably above the existing ground. To control the flow of groundwater in these cases, dewatering may be necessary to lower groundwater levels to workable levels. Localized grouting may be necessary to stem the inflow.

Dewatering, ground amendment, a combination thereof, or other ground stabilization techniques would likely be required where excavations extend more than several feet below static groundwater levels. Although a dewatering method would be determined during the design stage, it would likely consist of pumping from a sump. To achieve satisfactory drawdown, a more sophisticated technique (e.g., a well point system) may be required if a sump cannot keep up with the recharge. Pile caps, utility trenches, and partially or fully embedded structures are possible dewatering scenarios, depending on groundwater conditions at particular sites.

Dewatering disturbs groundwater's natural level and flow characteristics. Depression of the natural groundwater table can induce consolidation of subsoils and subsequent ground settlement, called *subsidence*. Subsidence can cause cracking and other damage to buildings and facilities.

Dewatering would be required where groundwater is above the base of the pile caps or footings. Dewatering requirements would be greatest in floodplains, including near streams and Pearl and Honolulu Harbors. Dewatering effluent would be discharged to streams, bays, and harbors along the project alignment. As with excavated soil, groundwater could contain petroleum and other contaminants that could be discharged to streams, bays, and harbors. The process of removing groundwater from an excavation may also disturb natural characteristics of the groundwater and result in subsidence, which could damage structures in the area.

Prior to the start of construction, a National Pollution Discharge Elimination System (NPDES) permit for construction would be obtained. The information gathered during a future Phase I Environmental Site Assessment and sampling activities would be considered in the permit preparation. Project and site-specific BMPs would be prepared and submitted with the NPDES permit. BMPs would include methods to mitigate possible pollution, soil erosion, and turbidity caused by stormwater runoff from all sources. Agency reviews conducted as part of the NPDES permit process would ensure that proper control techniques are identified in the permit and implemented during construction. Stormwater BMPs overlap with air quality mitigation measures to a degree and could include the following:

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

The NPDES permit would also address other sources of water and their proper management, including water used to wash concrete trucks and control dust, as well as drilling fluids.

An NPDES permit would also be obtained for the discharge of groundwater from dewatering activities. All water discharged into the stormwater drainage system or surface-water bodies as a result of the dewatering processes would be required to meet prevailing water quality standards. Site-specific dewatering BMPs would be identified and designed so that the effluent would meet applicable standards. BMPs that could be employed include using settlement tanks or basins, oil-water separators, and sediment filtration, among other dewatering management techniques. The method of dewatering and BMPs employed would vary at each location based on site-specific needs and would also depend on which method is least invasive for each site.

Where settlement due to dewatering is a concern, ground-stabilization methods would be conducted to protect existing conditions. Performance criteria would be established to limit the extent of any adverse influences beyond the work zone to acceptable and time-proven limits. Induced settlement or movement of nearby facilities would not be permitted. Where this possibility may exist, pre- and post-construction monitoring would be required to monitor for unexpected movements or displacements.

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 would prepare the following plans to mitigate construction impacts related to wastes:

- **A Construction Safety and Security Plan**—this plan would 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.
- **A Construction Health and Safety Plan**—this plan would meet the requirements of 29 CFR 1910 and 1926 and all other applicable Federal, State, and Local regulations and requirements. It would also include provisions for identifying asbestos and lead-based paint that would be disturbed by the Project.
- **A Construction Contaminant Management Plan**—this plan would 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.

- **A Construction Contingency Plan**—this plan would 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.
- **A Solid Waste Management Plan**—this plan would 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.

4.17.9 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 would be completed to investigate the potential for sub-surface deposits. This additional work would focus on locations of columns, once they are known.

An MOA pertaining to archaeological resources would be 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 potential MOA components that would be employed during construction to mitigate potential impacts to archaeological resources.

Archaeological Monitoring

Consultation with SHPD would assess the need for archaeological monitoring during construction. The archaeological monitoring program would follow the MOA. A monitoring report would 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 would also avoid those resources. Protection zones would be established around these resources to avoid disturbance during construction.

Burial Treatment

During the inventory survey, burials would be identified and managed in compliance with applicable laws. This would 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 would 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 would be encountered during construction.

In each geographic area, the parties consulted regarding burials during the Project's inventory survey phase would be consulted if a find is made during construction. The MOA would outline the treatment of burials discovered during construction.

Cultural Resources

Adverse impacts related to cultural resources resulting from construction of the Project would 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 would 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 would 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 would be established around such resources to avoid disturbance during construction activities.

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

Construction of the Project would have short-term effects on the environment during construction, as described in this section. These effects would end with the completion of construction. The Project would provide the following improvements in productivity, which are identified as the Purpose of the Project in Chapter 1 of this Draft 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 would be provided by the Project would be greater than the short-term adverse effects to the human environment.

4.18 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 summarizes the assessment of 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. Additional details about the anticipated effects of the planned extensions may be found by topic in the 16 Honolulu High-Capacity Transit Corridor Project Technical Reports (RTD 2008a through 2008p); however, because the planned extensions are not being constructed at this time and would require further planning and design, information about the extensions is less definitive than information about the Project.

4.18.1 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 effects was based on land use and economic analyses, information gained from planning officials in the area regarding future development, and from land developers active in the study area.

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).

Timeframe for the Analysis

The timeframe 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 but essentially considered the time since the start of O'ahu's rapid population growth in 1920. Generally, the time for future effect analysis extends from the present day to 2030. This is the timeframe 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. The station areas are where the greatest changes in access to the transit system would occur; these also 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 both the region and study corridor, including the planned extensions.

4.18.2 Indirect Effects

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 Hawai'i as well as how, when, and to what degree land is developed on O'ahu. The growth projections in the City and State plans are predicated on current information. Actual growth may be more or less than projected.

Regardless of whether the Project is built, City plans direct future development to occur within the study corridor. City policies and plans for areas outside the study corridor allow for limited growth and development.

According to the 2000 census, 63 percent of O'ahu'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 residing within the study corridor. This level and concentration of growth within the study corridor are consistent with public policy and plans.

Common to All Build Alternatives

After completion of construction, the Project would not decrease or increase regional population or the number of jobs; however, it would influence the distribution of development.

Within station areas, the Project combined with supportive public policies and favorable real estate market conditions could attract transit-supportive development (TSD) and TOD. TSD includes land uses such as office space and multi-story residential buildings near transit stations. Office uses generate more transit riders per square foot of space than any other land use. TOD is more intensive and deliberately planned to integrate with transit and generally includes pedestrian-oriented moderate- to high-density mixed uses.

If one of the Build Alternatives is constructed, it is likely that the City would adopt zoning rules that would allow more dense development near transit stations relative to existing conditions and surrounding areas. The City Council has already taken steps in this direction. The ʻEwa Development Plan, in particular, stresses development in concert with a transit system. Although the addition of transit does not directly cause development to occur, plans and policies would encourage new development to be located near transit stations to take advantage of the transportation infrastructure and increased accessibility if a new transit line is built. 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 would support the development programmed in the *ʻEwa Development Plan* (DPP 2000), *Central Oʻahu Sustainable Communities Plan* (DPP 2002b), and *Primary Urban Center Development Plan* (DPP 2004a). It would provide greater choice in mode of travel.

At a regional level, the greater attractiveness of the ʻEwa Plain could lessen the pressure on development outside the study corridor. Therefore, relative to the No Build Alternative, a greater percentage of the future population and jobs would be located in the study corridor.

Station Area Development

The City is developing a TOD ordinance, which is expected to be enacted in 2008. Development in the study corridor, whether highway-oriented or TOD, would be based on market demands.

Pursuant to the policy, if adopted, TOD would be expected to occur in project station areas as an indirect effect of the Project. The increased mobility and accessibility that the Project may provide would also increase the desirability and value of land near the stations, thereby attracting new real estate investment nearby. Therefore, the Project's primary indirect effect would 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 would be improved in these areas.

It is not expected that the Project would lead to an increase in the overall level of growth allowed or expected in the study corridor. Rather, it would focus the growth into patterns that would 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 would 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 discuss TOD potential at stations.

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

The undeveloped ʻEwa Plain area has the greatest 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 would 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 presented below:

- East Kapolei—developments by the Department of Hawaiian Home Lands (DHHL), Hunt Development Group (developer of

- UH West Oʻahu), 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 by Hunt Development Group on the ʻEwa side of North-South Road and Hoʻopili by DR Horton on the Diamond Head side of North-South Road.
- Hoʻopili—the proposed Hoʻopili development by DR Horton surrounds this station.

Waipahu: West Loch and Waipahu Transit Center

TOD in Waipahu and the remainder of the stations would primarily involve redevelopment of existing uses rather than greenfields development due to a lack of undeveloped land. The same factors that spur TOD in undeveloped areas would 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.

TOD visioning for these two station areas is being conducted by DPP. This process started in late 2007 and will continue for some time. This process is scheduled to be replicated for all other project station areas.

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 would 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 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 would 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.

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

These stations would be in relatively urban areas where uses differ parcel to parcel, generally becoming more commercial approaching Downtown (Figures 4-5 and 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 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 underutilized parcels owned by Kamehameha Schools and General Growth Partners, among others, would be more likely to redevelop and incorporate TOD elements.

Property Values

Changes in property values that would result from construction of the transit system would be indirect effects. Research based on New York and other cities has shown that residential property values can increase close to a transit station (Table 4-35). While most studies of transit's impact on real estate values show increases, they cannot explicitly isolate transit benefits from other market forces.

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, 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 would 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 would be placed on already busy roadways, the likelihood of negative effects on real estate value is minimal.

Salt Lake Alternative

Any additional indirect effects specific to this alternative would be minimal. The Ala Liliko'i Station area is dominated by residential and military uses (Figure 4-5) and considerable redevelopment is unlikely.

Airport Alternative

The three stations along the airport alignment, Pearl Harbor Naval Base, Honolulu International Airport, and Lagoon Drive, are largely industrial, airport operations, or military in character (Figure 4-5). TOD is not considered likely in these areas given their industrial nature; however, the proximity of Ke'ehi Lagoon Park and airport jobs suggests that TOD could be attractive in the airport and Lagoon Drive area. The height, and therefore density, of any development in this area would be limited by the proximity of the airport. Development restrictions around the airport decrease the likelihood of TOD in the area.

Airport & Salt Lake Alternative

The indirect impacts of the Airport & Salt Lake Alternative would be the same as for the other alternatives combined. The one exception is that development may occur near the Arizona Memorial Station, which is included only in this alternative. However, this is unlikely since most

Table 4-35 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

of the land is under the control of the military (Figure 4-5).

4.18.3 Cumulative Effects

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

Past Actions

O‘ahu experienced major population growth (between 42 and 64 percent per decade) between 1920 and 1950. 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 most notable past action was the urban and suburban development of O‘ahu 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, ‘Ewa and Kapolei have been developing. The latter is the only section of the study corridor with vast amounts of land available for new development.

Construction of the H-1 and H-2 Freeways supported this western push into Central and West O‘ahu. The construction of other highways, such as Farrington, Kamehameha, and Nimitz, helped improve accessibility between West O‘ahu and Downtown and reinforced growth and development.

Present and Reasonably Foreseeable Actions

Depending on which alternative is constructed, the 2030 population within one-half mile from a project station would range from 229,000 to 252,000, which would be approximately a 10-percent increase from 2007. Employment in 2030 within the same area would 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 O‘ahu by 2030. Table 2-3 (in Chapter 2) lists major roadway projects that are anticipated to be completed. The planned extensions to West Kapolei, UH Mānoa, and Waikīkī also are included in the ORTP and anticipated to be completed by 2030.

Table 4-36 summarizes planned and foreseeable development within the Central O‘ahu Sustainable Community Plan area and the ‘Ewa and PUC Development Plan areas in the study corridor. The development areas within the study corridor are illustrated in Figure 4-2.

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. 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 already developed lands within the study corridor also are likely to be redeveloped to higher-density uses. Expansion of public services and facilities would be associated with future growth. Such growth would be consistent with community plans.

The planned Kapolei extension would result in conversion of approximately 20 additional acres of farmland to transportation use, none of which is actively cultivated (Figure 4-7). The UH Mānoa and Waikīkī extensions would not have substantial effects on land use because those areas are already highly urbanized.

Economy

Economic changes have come with transitions to and from agricultural, military, and tourism economies. Continued focus on tourism is anticipated. The economic forecast is for continued steady growth. Planned projects are intended to continue to encourage and enable economic growth in the region. Completion of the planned extensions would include additional land conversion to public transportation use, decreasing the taxable land and associated property tax revenues.

It also would require hiring of additional workers to support the expanded system.

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 approximately 15 full and 50 partial acquisitions. These acquisitions would result in the displacement of approximately 20 residential units and 60 businesses.

Community Facilities and Public Services

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

The network of utilities would grow and be upgraded as a result of continued development. Water, sewer, and electrical upgrades would be a benefit to the community as they would improve availability and reliability of services.

The planned extensions would affect existing parks and recreational resources in Kalaeloa and would cross the Ala Wai Promenade. They also would affect, but not displace, fewer than 10 existing community resources through partial acquisition of properties where they operate. Effects to utilities would be similar to the effects of the Project, but located in the areas of the extensions.

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

Table 4-36 Planned and Foreseeable Actions in the Study Corridor

Corridor Area	Present and Known Planned Developments	Foreseeable Actions
\`Ewa Development Plan Area	• Ka Makana Ali\`i, a 1.1-million-square-foot mixed-use development with commercial, office, and hotel space on 67 acres developed by DeBartolo on behalf of DHHL • Salvation Army-sponsored Kroc Center in Kapolei • Disney hotel and timeshare with 800 units at Ko \`Olina Resort • Kapolei Commons, a 610,000-square-foot shopping center on 50 acres • University of Hawai\`i West O\`ahu campus—a 76-acre planned campus near the proposed UH West O\`ahu station; 4,000 homes and commercial areas would be developed around the campus as part of the plan • Ho\`opili, a mixed-use community planned by DR Horton on land it already owns, which would include 11,700 homes • Ocean Pointe residential, harbor, and golf course development by Haseko Homes on 1,100 acres • Makaiwa Hills, a planned community of 4,100 homes plus business areas • Mehana at Kapolei, a single- and multi-family residential development by DR Horton with 1,000 homes • New electric power plant for peak demand in Campbell Industrial Park • Transportation projects in the 2030 ORTP • Kalaeloa Harbor 2020 Master Plan improvements • Kalaeloa Airport improvements • Redevelopment of Kalaeloa (former Barbers Point Naval Air Station) • Near complete buildout of residential, commercial, and public facilities as planned in the \`Ewa Development Plan by 2030 • Planned fixed guideway extension to West Kapolei	• Development of a Downtown Kapolei • Redevelopment of Kalaeloa (former Barbers Point Naval Air Station) • Near complete buildout of residential, commercial, and public facilities as planned in the \`Ewa Development Plan by 2030
Central O\`ahu Sustainable Communities Plan Area	• A TOD plan in two station site areas initiated by DPP • Koa Ridge, a master planned development with 3,500 homes by Castle and Cooke • Transportation projects in the 2030 ORTP	• Near complete buildout of residential, commercial, and public facilities as planned in the Central O\`ahu Sustainable Communities Plan
Primary Urban Center Development Plan Area	• Plans by Kamehameha Schools to redevelop land it owns in Kalihi into mixed-use developments, including residential and retail • Potential redevelopment in Kaka\`ako on land owned by Kamehameha Schools, General Growth Properties, and others • Transportation projects in the 2030 ORTP • Honolulu International Airport Master Plan improvements • Honolulu Harbor 2020 Master Plan improvements • Planned fixed guideway extension to UH Mānoa • Planned fixed guideway extension to Waikīkī	• Possible development of the downtown HECO power-plant site • Redevelopment of aging and underutilized land to higher-density uses

would not occur. Future projects would likely have less severe effects than previous H-1 Freeway construction. Those effects would be gradual as individual projects are implemented.

Redevelopment, and specifically TOD, could occur in certain neighborhoods. In areas such as Chinatown, Downtown, and Waikīkī, TOD would not 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 would serve additional neighborhoods with transit stations, such as Makakilo-Kapolei-Honokai Hale, McCully-Mōʻiliʻili, and Waikīkī. No substantial effects to those neighborhoods are expected. This is primarily because the extensions would follow already busy thoroughfares or pass through undeveloped areas. The increase in mobility resulting from the extensions would 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

EJ communities are expected to benefit from the Project, planned extensions, and related development. The planned extensions would expand the extent of the fixed guideway transit system, which would improve travel options for transit-dependent groups. An affordable and reliable means of transportation throughout the study corridor would provide more opportunity for low-income groups to live and work throughout the study corridor. The planned extensions would not be located within any areas of EJ populations (Figure 4-14).

Visual

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 would 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.

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 around station areas and away from more rural portions of Oʻahu.

Views of the planned extensions would be similar to those of the Project shown in Section 4.7. Figures 4-53 and 4-54 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 and as air and road traffic have increased. As the study corridor becomes more densely developed, ambient noise levels will continue to increase. The planned extensions would create additional noise impacts in the vicinity of the alignment, which are similar to those discussed for the Project in Section 4.9. With existing land uses, no noise impacts would occur at ground level, but users of outdoor lanais located above the height of the guideway and facing the extensions would experience moderate noise impacts at some locations between the Ala Moana Center Station and the end of the Waikīkī 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

Figure 4-53 Visual Simulation of UH Mānoa Extension at Convention Center, looking Mauka

Figure 4-54 Visual Simulation Waikīkī Extension at Kālaimoku, looking Mauka

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.

The planned extensions to the fixed guideway system are anticipated to affect approximately 10 additional sites of concern for hazardous material 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 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 former sugar cane lands do not provide significant habitat; however, continued development could have a lasting effect on bird species that adapt well to urbanization. The Project could indirectly result in the preservation of a larger volume of vacant and undeveloped land outside the study corridor by supporting development within the corridor. This would have a commensurate benefit to ecosystems.

There would be no additional cumulative effect to ecosystems as a result of the planned extensions.

Threatened and Endangered Flora

An 18-acre koʻoloaʻula *(Abutilon menziesii)* contingency reserve lies within the ʻEwa Development Plan area. Proposed development in the Kapolei 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 is unlikely because few species are present within the area and, if any are encountered, they would receive protection and mitigation similar to the Habitat Conservation Plan for koʻoloaʻula.

Threatened and Endangered Wildlife

More threatened and endangered wildlife species were observed in the developed portion of the study corridor than in the undeveloped area. This is because 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.

Water Resources

Water resources have been degraded by past residential and farm development. 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

Past development has resulted in degraded water quality within the PUC. In the Central Oʻahu and ʻEwa areas, continued development will likely cause additional degradation of water resources in those areas. However, most streams in the ʻEwa area are ephemeral, responding only to storm events, and golf courses in the area have been designed to collect stormwater to manage water quality and mitigate flooding. In addition, future projects in the ʻEwa Plain would not affect wetlands because the developable upland area is dry and has permeable soil that does not contain any wetlands.

There would be no additional cumulative effect to water resources as a result of the planned extensions.

Street Trees

The planned extensions to Waikīkī and UH Mānoa 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.

Archaeological, Cultural, and Historic Resources

Archaeological, cultural, and historic resources have been impacted 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.

In the Kalaeloa development area (formerly the Barbers Point Naval Air Station), the redevelopment outlined in the Master Plan would affect the World War II vintage military housing and support facilities.

The planned extensions could affect additional archaeological, cultural, and historic resources. The likelihood of encountering burials would be high for the Waikīkī extension. Any future development would be required to comply with appropriate Federal and State laws, such as Section 106, Section 4(f). and Act 50, as described here and in Section 4.15.

4.19 Irreversible and Irretrievable Commitments of Resources

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

4.20 Anticipated Permits and Approvals

Table 4-37 summarizes permits, certificates, and/or approvals anticipated to be required for implementation of the Project.

Table 4-37 List of Anticipated Permits

Permit or Approval	Coordinating Agencies
Federal	
Archaeological Resource Protection Permit	NPS
Clean Water Act Section 404	USACE/EPA
Farmland Conversion Impact Rating	NRCS
Floodplain Management and Protection Approval	FTA
Jurisdictional Determination	USACE
Section 10	USACE/USCG
Sole Source Aquifer	EPA
State	
Archaeological Inventory Survey Plan	SHPD
Certificate of Inclusion	HDLNR (Division of Forestry and Wildlife), HDOT/USFWS
Clean Water Act Section 401	HDOH
Coastal Zone Management	DBEDT
Drainage Injection Well	HDOH (Safe Drinking Water Branch)
Memorandum of Agreement	SHPD
National Pollutant Discharge Elimination System (Dewatering)	HDOH (Clean Water Branch), City and County Environmental Services Department, HDOT (Highways Division), HDOT (Airports Division), UH Mānoa, U.S. Navy (Pearl Harbor)
National Pollutant Discharge Elimination System (General)	HDOH (Clean Water Branch)
Noise Variance	HDOH
Road Closure	HDOT
Stream Channel Alteration	HDLNR
City and County	
Pruning of Exceptional Trees	HDPR (Division of Urban Forestry)

DBEDT = State of Hawai`i Department of Business, Economic Development and Tourism
EPA = Environmental Protection Agency
FTA = Federal Transit Administration
HDLNR = State of Hawai`i Department of Land and Natural Resources
HDOH = State of Hawai`i Department of Health
HDOT = State of Hawai`i Department of Transportation
HDPR = Honolulu Department of Parks and Recreation
NPS = National Park Service
NRCS = Natural Resources Conservation Service
SHPD = State Historic Preservation Division
UH = University of Hawai`i
USACE = U.S. Army Corps of Engineers
USCG = U.S. Coast Guard
USFWS = U.S. Fish and Wildlife Service

05

CHAPTER

Section 4(f) Evaluation

This chapter provides documentation necessary to support determinations required to comply with the provisions of Section 4(f) of the U.S. Department of Transportation Act of 1966 (commonly referred to as Section 4(f)).

5.1 Introduction

The Project, as described in Chapter 2, Alternatives Considered, is a transit project that may receive Federal funding and/or discretionary approvals through the U.S. Department of Transportation (USDOT) Federal Transit Administration (FTA); therefore, documentation of compliance with Section 4(f) is required. Section 4(f), as amended, of the USDOT Act of 1966 (49 USC 303) protects public parklands and recreational lands, wildlife refuges, and historic sites of National, State, or Local significance. Federal regulations that implement Section 4(f) may be found in 23 CFR 774.3.

Section 4(f) specifies that the FTA may not approve the use, as defined in 23 CFR 774.17, of a Section 4(f) property unless the FTA determines the following:

- There is no prudent and feasible alternative, as defined in Section 774.17, to the use of land from the property; and
- The program or project includes all possible planning, as defined in Section 774.17, to minimize harm to the property resulting from such use.

Section 4(f) regulations further require consultation with the Department of the Interior and, as appropriate, the involved offices of the Department of Agriculture (USDA) and the Department of Housing and Urban Development (HUD), as well as relevant State and Local officials, in developing transportation projects and programs that use lands protected by Section 4(f). Consultation with the USDA would occur whenever a project uses Section 4(f) land from the National Forest System. Consultation with HUD would occur whenever a project uses Section 4(f) land for/on which certain HUD funding had been used. Since neither of these conditions apply to the Project, consultation with the USDA and HUD is not required.

For historic sites, consultation with the State Historic Preservation Officer is required. For recreational resources, consultation with the agency responsible for the resources is also required.

This Section 4(f) evaluation has been prepared in accordance with the joint Federal Highway Administration (FHWA)/FTA regulations for Section 4(f) compliance codified as 23 CFR 774 and the *Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users* (SAFETEA-LU) (PL 2005). Although not directly applicable to FTA programs and activities, additional guidance has been obtained from the FHWA Technical Advisory T6640.8A (FHWA 1987b) and the revised FHWA Section 4(f) Policy Paper (FHWA 2005).

5.1.1 Section 4(f) "Use" Definitions

As defined in 23 CFR 774.17, the "use" of a protected Section 4(f) property occurs when any of the following conditions are met.

Direct Use

A direct use of a Section 4(f) resource occurs when property is permanently incorporated into a proposed transportation project. This may occur as a result of partial or full acquisition of a fee simple interest, permanent easements, or temporary easements that exceed regulatory limits noted below.

Temporary Use

A temporary use of a Section 4(f) resource occurs when there is a temporary occupancy of property that is considered adverse in terms of the preservationist purpose of the Section 4(f) statute. Under the FHWA/FTA regulations (23 CFR 774.13), a temporary occupancy of property does not constitute a use of a Section 4(f) resource when all the following conditions are satisfied:

- Duration is temporary (i.e., less than the time needed for construction of the project), and there is no change in ownership of the land
- Scope of work is minor (i.e., both the nature and magnitude of the changes to the Section 4(f) property are minimal)
- There are no anticipated permanent adverse physical impacts, nor is there interference with the protected activities, features, or attributes of the property, on either a temporary or permanent basis
- The land being used will be fully restored (i.e., the property must be returned to a condition that is at least as good as that which existed prior to the project)
- There is a documented agreement of the official(s) having jurisdiction over the Section 4(f) resource regarding the above conditions

Constructive Use

A constructive use of a Section 4(f) resource occurs when a transportation project does not permanently incorporate land from the resource, but the proximity of the project results in impacts (e.g., noise, vibration, visual, and property access) so severe that the protected activities, features, or attributes that qualify the resource for protection under Section 4(f) are substantially impaired. Substantial impairment occurs only if the protected activities, features, or attributes of the resource are substantially diminished (23 CFR 774.15).

De Minimis Impacts

The requirements of Section 4(f) would be considered satisfied with respect to a Section 4(f) resource if it is determined that a transportation project would have only a "*de minimis* impact" on the Section 4(f) resource. The provision allows avoidance, minimization, mitigation, and enhancement measures to be considered in making the *de minimis* determination. The agencies with jurisdiction must concur in writing with the determination. *De minimis* impact is defined in 23 CFR 774.17 as follows:

- For parks, recreation areas, and wildlife and waterfowl refuges, a *de minimis* impact is one that would not adversely affect the features, attributes, or activities qualifying the property for protection under Section 4(f).

- For historic sites, *de minimis* impact means that the FTA has determined, in accordance with 36 CFR 800, that no historic property is affected by the project or the project would have "no adverse effect" on the property in question. The State Historic Preservation Division (SHPD) must be notified that the FTA intends to enter a *de minimis* finding for properties where the project results in "no adverse effect."

5.2 Description of the Project

The Build Alternatives would include the construction and operation of a grade-separated fixed guideway transit system between East Kapolei and Ala Moana Center. The alternatives are described in Chapter 2, and conceptual plans of the alignment are included in Appendix A, Conceptual Alignment Plans and Profiles. The system would use steel-wheel-on-steel-rail technology and could be either automated or employ drivers.

The guideway would follow the same alignment for all Build Alternatives through most of the project alignment, except between Aloha Stadium and Kalihi.

Beginning at the East Kapolei end of the corridor, the alignment would follow Farrington Highway Koko Head on an elevated structure and continue along Kamehameha Highway to near Aloha Stadium.

Between Aloha Stadium and Kalihi, the alignment differs for each of the Build Alternatives, as detailed in Chapter 2. The Salt Lake Alternative would follow Salt Lake Boulevard until it crosses Puʻuloa Road and then follow Pūkōloa Street across Nimitz Highway to Middle Street. The Airport Alternative would follow Kamehameha Highway and North Nimitz Highway to Aolele Street and Middle Street.

Koko Head of Middle Street, both alternatives would follow Dillingham Boulevard to the vicinity of Kaʻaahi Street and then turn Koko Head to connect to Nimitz Highway near Iwilei Road. The alignment would follow Nimitz Highway Koko Head to Halekauwila Street, then along Halekauwila Street past Ward Avenue where it would transition to Queen Street and Kona Street. The alignment would cross from Waimanu Street to Kona Street near Pensacola Street. The guideway would run above Kona Street to Ala Moana Center.

In addition to the guideway, the Project would require the construction of stations and supporting facilities. Supporting facilities include a vehicle maintenance and storage facility, transit centers, park-and-ride lots, and traction power substations.

5.3 Description of Section 4(f) Properties

Properties subject to Section 4(f) consideration include publicly owned parks, recreation areas, wildlife refuges of National or Local significance, and historic properties of National, State, or Local significance, whether privately or publicly owned. As described in Section 4.4, Community Services and Facilities, 14 parks and recreational resources are adjacent to the project alignment. Only 10 of these are publicly owned (Table 5-1), which under Section 4(f) definition qualifies them as Section 4(f) resources.

The Section 106 consultation and evaluation of historic properties along the alignment is ongoing. The FTA has finalized determination of eligibility through consultation with SHPD (see Appendix D letter from SHPD, September 26, 2008). Table 4-32 in Section 4.15, Archaeological, Cultural, and Historic Resources, presents affects to these historic properties, as established by current consultation.

Table 5-1 Publicly Owned Parks and Recreation Areas Adjacent to Project Alignment

Property	Description	Section 4(f) Use Determination
West Loch Golf Course	West Loch Golf Course is located off Fort Weaver Road. The parcel is a 94-acre municipal golf course owned by the City and County of Honolulu. It extends across Fort Weaver Road and is adjacent to Honouliuli (Village) and the St. Francis West Medical Center. The golf course is generally a quiet setting, but bounded on end by Farrington Highway, a major transportation corridor. Scenic views are in the background, mauka toward the mountains.	All alternatives—no use
Neal S. Blaisdell Park	The park is approximately 26 acres and is owned by the City and County of Honolulu. The park consists primarily of open space, but also supports some amenities, such as trails and exercise areas. It is located immediately makai of Kamehameha Highway, a major transportation corridor. All views are makai, toward the harbor.	All alternatives—no use
\`Aiea Bay State Recreation Area	\`Aiea Bay State Recreation Area encompasses approximately 7.75 acres. The recreation area is owned by the State and is under the jurisdiction of the Hawai'i Department of Land and Natural Resources. The area is used for general recreation and picnicking. It is located immediately makai of Kamehameha Highway, a major transportation corridor. All views are makai toward the harbor.	All alternatives—no use
Āliamanu Neighborhood Park	The park is approximately 4 acres and is owned by the City. Park amenities include a baseball field playground, basketball court, tennis courts, and picnic areas. This public facility would not be affected by the project footprint. The park is located mauka of Salt Lake Boulevard, surrounded by residential and commercial development.	All alternatives—no use
Walker Park	This small urban park provides shade in a busy downtown area. It is primarily used by pedestrians walking through downtown. It does not provide any benches, picnic tables or other amenities.	All alternatives—no use
Irwin Memorial Park	Irwin Memorial Park is at the \`Ewa-makai corner of the Bishop Street and Nimitz Highway intersection. The park is approximately 2 acres and can be accessed from Aloha Tower Drive. Irwin Memorial Park is primarily used as a parking lot for surrounding office buildings. Amenities include sitting areas and tables near the corner of Bishop Street and Nimitz Highway. The property is owned by the State Department of Transportation Harbors Division and is part of the Aloha Tower Project administered by the Aloha Tower Development Corporation. All scenic views are makai toward the harbor and Aloha Tower.	All alternatives—no use
Mother Waldron Park	This neighborhood park is mauka of Ala Moana Boulevard and makai of Kapi\`olani Boulevard at 525 Coral Street in the redeveloped area of Downtown Kaka\`ako. The park is approximately 1 acre and supports a children's play structure and unlit basketball courts. The park also hosts the People's Open Market Program, which offers local agriculture and aquaculture products. The park is owned by the State. The park is located in a predominantly commercial/industrial area, and one side is bordered by a residential area.	All alternatives—no use
Aloha Stadium	This 50,000-seat stadium is on an 89-acre property owned by the State under the jurisdiction of the Stadium Authority. Aloha Stadium is primarily used for athletic competitions, such as the Hula Bowl, the Aloha Bowl, the Pro Bowl, and University of Hawai\`i football games. Other recreational uses include hosting various concerts and family-oriented fairs; the stadium parking lot is used for a weekly flea market.	All alternatives—direct use *(de minimis)*
Ke\`ehi Lagoon Beach Park	Ke\`ehi Lagoon Beach Park is an approximately 72-acre community park at Lagoon Drive and Aolele Street. Recreational amenities include canoeing and boating, 12 tennis courts, 1 baseball field, restroom facilities, walking trails, and picnic areas. The park is operated and maintained by the City of Honolulu on State-owned land. All scenic views are makai toward the harbor.	Airport and Airport & Salt Lake Alternatives—direct use Salt Lake Alternative—no use
Future Queen Street Park	Queen Street Park will be a 2-acre passive recreation area, with a children's playground and other limited amenities. The land is owned by HCDA and is surrounded by mixed-use commercial and high-rise residential development.	All alternatives—direct use *(de minimis)*

Each historic property is listed in Table 5-2 with a Section 4(f) use determination.

The following sections describe use of Section 4(f) resources. An assessment has been made as to whether any permanent or temporary occupancy of a property would occur and whether the proximity of the Project would cause any access disruption, noise, vibration, or aesthetic impacts that would substantially impair the features or attributes that qualify the resource for protection under Section 4(f) and, therefore, constitute a use.

5.4 Direct Use of Section 4(f) Properties

Chapter 2 provides a history of the systematic process by which alternatives were developed, evaluated, and refined to become the alternatives remaining under consideration in this Draft EIS. During the Alternatives Analysis, several other alternative corridors and multimodal alternatives were considered to determine if the Project's Purpose and Need could be achieved. No such alternative was identified that would completely avoid Section 4(f) resources while meeting the Project's Purpose and Need. Only the No Build Alternative would not use any Section 4(f) resources. However, the No Build Alternative would not meet the Project's Purpose and Need; therefore, it would not be prudent.

The avoidance of Section 4(f) properties was an important consideration in designing and screening the alternatives; thus, the majority of public parks, recreational resources, and historic properties identified within the study corridor were avoided in designing the Build Alternatives.

As the design phase evolved, each alignment was further refined, with site-specific shifts occurring in the alignment or placement of individual stations to avoid, where feasible, Section 4(f) resources. Through this iterative process, the number of Section 4(f) properties that would be affected by the Build Alternatives was reduced to six direct uses and four (Salt Lake Alternative) or five (Airport Alternative and Airport & Salt Lake Alternative) *de minimis* impacts identified in Sections 5.4.1, Park and Recreational Resources, and 5.4.2, Historic Sites, and shown in Table 5-3.

5.4.1 Park and Recreational Resources

As described in Section 4.4, there are 14 parks and recreational resources adjacent to the project alignment. Only 10 of these are publicly owned. The Project would require direct property acquisition at Aloha Stadium, Ke‘ehi Lagoon Beach Park, and Queen Street Park, which would result in a Section 4(f) use. The use of Aloha Stadium and Queen Street Park would be *de minimis*, as described below. The existing environment includes major highways and thoroughfares. Since significant elements of urban development already exist, the Project would not impair or diminish the activities, features, or attributes that qualify these properties for protection under Section 4(f). Table 5-1 lists the publicly owned parks and their Section 4(f) use. Potential constructive uses are discussed in Section 5.5, Constructive Use of Section 4(f) Properties.

Aloha Stadium

Description and Significance of Property

Aloha Stadium is bordered by Salt Lake Boulevard, H-1 Freeway, Kamehameha Highway, and Moanalua Road (Figures 5-1 and 5-2). The 50,000-seat stadium is on an 89-acre property, most of which is used for event parking, and is under the jurisdiction of the Stadium Authority. Aloha Stadium is designated as a General Preservation District (P2).

The stadium property was originally owned by the U.S. Department of the Interior and was transferred to the City in 1967. The Quitclaim Deed of that transfer, dated June 30, 1967, requires the land be used and maintained for public recreational

Table 5-2 Historic Properties and Section 4(f) Use (continued on next page)

Tax Map Key	Resource Name	Description of Impact[1]	Preliminary Section 106 Determination	Section 4(f) Use Determination[2]
Common to All Build Alternatives				
None	Hono`uli`uli Stream Bridge (Farrington Highway)	No use of land	No Effect	No Use
94025008	Ishihara House	No use of land	No Adverse Effect	No Use
94027127	West O`ahu Christian Church/former American Security Bank (round plan)	No use of land	No Adverse Effect	No Use
94036071	Waipahu Hawai`i Stake, Church of Jesus Christ of Latter-Day Saints	No use of land	No Adverse Effect	No Use
94039082	Tehahira Apartments	No use of land	No Adverse Effect	No Use
None	Waikele Stream Bridge, eastbound span and bridge over OR&L spur	No use of land	No Effect	No Use
94017043	Cavalho Apartments	No use of land	No Adverse Effect	No Use
94019020	Ohara Apartments	No use of land	No Adverse Effect	No Use
94038050	Sandobal House	No use of land	No Adverse Effect	No Use
96003026	Watercress of Hawaii	No use of land	No Effect	No Use
96003018	***Solmirin House***	***Full acquisition, including building***	***Adverse Effect***	***Direct Use***
None	Waiawa Booster Pump Station	No use of land	No Effect	No Use
None	Waiawa Stream 1932 Bridge (westbound lanes)	No use of land	No Effect	No Use
None	Waiawa Stream 1952 Bridge (eastbound lanes)	No use of land	No Effect	No Use
None	Waiawa Separation Bridge	No use of land	No Effect	No Use
98003010	Hawaiian Electric Company Waiau Plant	No use of land	No Adverse Effect	No Use
98006024	Nishi Service	No use of land	No Adverse Effect	No Use
98016047	Sumida Watercress Farm	No use of land	No Adverse Effect	No Use
98018041	Akiona House (Quonset)	No use of Land	No Adverse Effect	No Use
98018042	Forty-Niner Saimin Restaurant	No use of land	No Adverse Effect	No Use
98022081	Waimalu Shopping Center	No use of land	No Adverse Effect	No Use
None	Waimalu Stream Bridge	No use of land	No Effect	No Use
None	Kalauao Springs Bridge	No use of land	No Effect	No Use
None	Kalauao Stream Bridge	No use of land	No Effect	No Use
99012006 & 99012001	`Aiea (Honolulu Plantation) Cemetery	No use of land	No Adverse Effect	No Use
12013006	Foremost Dairy	No use of land	No Adverse Effect	No Use
12013007	GasPro Store	No use of land	No Adverse Effect	No Use
None	Lava Rock Curbs (Laumaka Street to South Street, except not along Nimitz Highway)	No use of land	No Effect	No Use
12002108	Duarte House	No use of land	No Adverse Effect	No Use
12002113	Ten Courtyard Houses	No use of land	No Adverse Effect	No Use
12009017	***Afuso House***	***Acquisition, including building***	***Adverse Effect***	***Direct Use***

Table 5-2 Historic Properties and Section 4(f) Use (continued on next page)

Tax Map Key	Resource Name	Description of Impact[1]	Preliminary Section 106 Determination	Section 4(f) Use Determination[2]
12009017	***Higa Fourplex***	***Acquisition, including building***	***Adverse Effect***	***Direct Use***
12009018	***Teixeira House***	***Full acquisition, including building***	***Adverse Effect***	***Direct Use***
12009060	Pang Craftsman-style House	No use of land	No Effect	No Use
12012014	Pu`uhale Market	No use of land	No Adverse Effect	No Use
15029060	***Boulevard Saimin Restaurant***	***Minor parcel acquisition (0.01 acre), close to building***	***Adverse Effect***	***Direct Use***
15015008	Six Quonset Huts	Minor strip acquisition (0.1 acres) along Dillingham Boulevard	No Adverse Effect	Direct Use *(de minimis)*
15022004	Two-story (Tsumoto) Shop House	No use of land	No Adverse Effect	No Use
15022005	AC Electric	No use of land	No Adverse Effect	No Use
None	Kapālama Stream Bridge	No use of land	No Effect	No Use
None	***True Kamani Trees on Dillingham Boulevard***	***Removal of approximately 28 trees along Dillingham Boulevard***	***Adverse Effect***	***Direct Use***
15007001 & 15007002	OR&L Office/Document Storage Building and Terminal Building	No impact to historic resources	No Adverse Effect	No Use
15007001 & 15007002	OR&L basalt street paving	No impact to historic resources	No Adverse Effect	No Use
15007001	Former filling station on OR&L Property	No impact to historic resources	No Adverse Effect	No Use
15007003	Tong Fat Co.	No use of land	No Adverse Effect	No Use
15007003	Wood Tenement Buildings	No use of land	No Adverse Effect	No Use
15007033	Tamura Building	No use of land	No Adverse Effect	No Use
17002, 17003, & 17004 plats	Chinatown Historic District	Minor parcel acquisition near Chinatown Marketplace (0.3 acre), no impact to building	No Adverse Effect	Direct Use *(de minimis)*
None	Nu'uanu Stream Bridge	No use of land	No Effect	No Use
21001056	Harbor retaining wall of coral blocks from Honolulu Fort	No use of land	No Effect	No Use
Tax Map Keys in plats 17002 & 21002	Merchant Street Historic District	No use of land	No Adverse Effect	No Use
21001001	Pier 10/11 Building	No use of land	No Adverse Effect	No Use
21001005	Department of Transportation Harbors Division Offices	No use of land	No Adverse Effect	No Use
21001013	Aloha Tower	No use of land	No Effect	No Use

Table 5-2 Historic Properties and Section 4(f) Use (continued on next page)

Tax Map Key	Resource Name	Description of Impact[1]	Preliminary Section 106 Determination	**Section 4(f) Use Determination[2]**
21013007	Irwin Park	No use of land	No Adverse Effect	No Use
21014003	*Dillingham Transportation Building*	*Minor parcel acquisition (0.06 acre), very close to building*	*Adverse Effect*	*Direct Use*
21014006	Hawaiian Electric Company Downtown Plant	Minor parcel acquisition (0.14 acre), no impact to building	No Adverse Effect	Direct Use *(de minimis)*
various	Hawai`i Capital Historic District	No use of land	No Adverse Effect	No Use
None	Walker Park	No use of land	No Adverse Effect	No Use
21030014	Kamaka Ukulele	No use of land	No Effect	No Use
21031012	Department of Transportation Building	No use of land	No effect	No Use
21031018	[Old] Kaka`ako Fire Station	No use of land	No Effect	No Use
21031021	Royal Brewery/The Honolulu Brewing & Malting Co.	No use of land	No Effect	No Use
21051006 & 21051005	Mother Waldron Playground	No use of land	No Adverse Effect	No Use
21050049	Ching Market & House	No use of land	No Effect	No Use
21050052	American Savings Bank/Liberty Bank—Queen-Ward Branch/Blair's	No use of land	No Effect	No Use
21052008	Fuji Sake Brewing Co.	No use of land	No Adverse Effect	No Use
23007029	Pacific Development Office Building	No use of land	No Adverse Effect	No Use
23039023	Hawaiian Life Building	No use of land	No Adverse Effect	No Use
23039001	Ala Moana Building	No use of land	No Adverse Effect	No Use
Salt Lake Alternative				
11010011	Facility X-24/Quonset Hut (Navy Public Works Center)	No impact to historic resources	No Adverse Effect	No Use
99002023	Radford High School	Minor parcel acquisition (0.01 acres)	No Adverse Effect	Direct Use *(de minimis)*
11021018	Āliamanu Pumping Station (Board of Water Supply)	No use of land	No Adverse Effect	No Use
11007036	First Hawaiian Bank—Māpunapuna Branch	No use of land	No Adverse Effect	No Use
11017006–11018014	Potential Salt Lake Duplexes Historic District	No use of land	No Adverse Effect	No Use
Airport Alternative				
99003029	Pearl Harbor Naval Base National Historic Landmark	Minor parcel acquisition (0.6 acre)	No Adverse Effect	Direct Use *(de minimis)*
99003066 (partial)	Kamehameha Highway Bridge over Hālawa Stream (mauka span)	No use of land	No Effect	No Use
99002004	CINCPACFLT Admin Building/CINCPAC Headquarters—Facility 250	No use of land	No Adverse Effect	No Use
99001008	Ossipoff's Aloha Chapel, SMART Clinic, and Navy-Marine Corps Relief Society—Facility 1514	No impact to historic resources	No Adverse Effect	No Use
99001008	Navy WWII splinterproof shelter —Facility S-51	No use of land	No Adverse Effect	No Use

Table 5-2 Historic Properties and Section 4(f) Use (continued from previous page)

Tax Map Key	Resource Name	Description of Impact[1]	Preliminary Section 106 Determination	Section 4(f) Use Determination[2]
99001008	Navy Rehab Center/former Fire Station—Facility 199	No use of land	No Adverse Effect	No Use
99002004	Potential Makalapa Housing Historic District	No impact to historic resources	No Adverse Effect	No Use
99002004	Potential Little Makalapa Housing Historic District	No impact to historic resources	No Adverse Effect	No Use
11016004	Hawai`i Employers Council	No use of land	No Adverse Effect	No Use
Airport & Salt Lake Alternative				
11010011	Facility X-24/Quonset Hut (Navy Public Works Center)	No impact to historic resources	No Adverse Effect	No Use
99002023	Radford High School	Minor parcel acquisition (0.01 acres)	No Adverse Effect	Direct Use *(de minimis)*
11021018	Āliamanu Pumping Station (Board of Water Supply)	No use of land	No Adverse Effect	No Use
11007036	First Hawaiian Bank—Māpunapuna Branch	No use of land	No Adverse Effect	No Use
11017006–11018014	Potential Salt Lake Duplexes Historic District	No use of land	No Adverse Effect	No Use
99003029	Pearl Harbor Naval Base National Historic Landmark	Minor parcel acquisition (0.5 acre)	No Adverse Effect	Direct Use *(de minimis)*
99003066 (partial)	Kamehameha Highway Bridge over Hālawa Stream (mauka span)	No use of land	No Effect	No Use
99002004	CINCPACFLT Admin Building/CINCPAC Headquarters—Facility 250	No use of land	No Adverse Effect	No Use
99001008	Ossipoff's Aloha Chapel, SMART Clinic, and Navy-Marine Corps Relief Society—Facility 1514	No impact to historic resources	No Adverse Effect	No Use
99001008	Navy WWII splinterproof shelter —Facility S-51	No use of land	No Adverse Effect	No Use
99001001	Fuel Oil Pump House—Facility S-386	No impact to historic resources	No Adverse Effect	No Use
99002004	Potential Makalapa Housing Historic District	No impact to historic resources	No Adverse Effect	No Use
99002004	Potential Little Makalapa Housing Historic District	No use of land	No Adverse Effect	No Use
11016004	Hawai`i Employers Council	No use of land	No Adverse Effect	No Use

Adverse effects are noted in bold italic font.

[1] Some impacts are listed as "no impact to historic properties." These are Section 4(f) properties located on large TMKs. Although the Project might require right-of-way from these TMKs, the impact would be away from the historic building(s) listed in this table.

[2] Some properties with no Section 4(f) use have Section 106 determinations of No Adverse Effect. This is because they do not incorporate any land into the transportation facility, and Federal guidance stipulates that where there is a Section 106 determination of No Adverse Effect, there cannot be a constructive use.

Table 5-3 Parks, Recreation Areas and Historic Properties Section 4(f) Uses by Alternative

Alternative	Direct Use	Direct Use, *de minimis*	Temporary Use	Constructive Use
Salt Lake	7	6	0	0
Airport	8	6	0	0
Airport & Salt Lake	8	7	0	0

purposes. In October 1970, with the approval of the Department of the Interior, the property was transferred to the State with similar provisions as the Quitclaim Deed.

Aloha Stadium is primarily used for athletic competitions, such as the Hula Bowl, the Aloha Bowl, the Pro Bowl, and University of Hawai'i football games. Other recreational uses include hosting various concerts and family-oriented fairs; and the stadium parking lot is used for a weekly flea market.

Figure 5-1 Aloha Stadium

Application of Section 4(f)

All Build Alternatives would use Aloha Stadium parking facilities, with no effect on recreational use. As illustrated in Figure 5-2, the Project would require a narrow strip through the Aloha Stadium parcel. The Salt Lake Alternative and the Airport & Salt Lake Alternative would require approximately 6.2 acres to accommodate the elevated guideway, station, and access to the adjacent park-and-ride lot. While the alternatives would displace a maximum of 125 parking spaces, they would provide off-site park-and-ride lots with more than 600 additional spaces along the alignment, which would be connected to Aloha Stadium by the Project. The Airport Alternative would require less area and displace no parking spaces. Because the Project would permanently incorporate land from the Aloha Stadium parcel into the transportation facility, this would be a direct use.

The Project would result in a net benefit to Aloha Stadium operations through enhanced access. The operation of the Project would not interfere with the features, attributes, or activities of the property. Therefore, any of the Build Alternatives would have a *de minimis* impact as defined in 23 CFR 774.17. The Aloha Stadium Authority is being consulted regarding the findings of the *de minimis* impact. Because the Project would have a *de minimis* impact on Aloha Stadium, consideration of avoidance alternatives is not required.

Coordination and Consultation

The Aloha Stadium Authority has participated in the planning of the alignment, the station location, and the park-and-ride lot within the boundaries of Aloha Stadium. Coordination included meetings on March 14 and March 25, 2008, and is ongoing with the Aloha Stadium Authority to ensure that the Project would result in a net benefit, in terms of both enhanced access and parking.

Measures to Minimize Harm

The direct impacts to the Aloha Stadium parcel would be the placement of the station and support piers within the parking lot. These support piers have been designed to be as unobtrusive as possible, while maintaining safety.

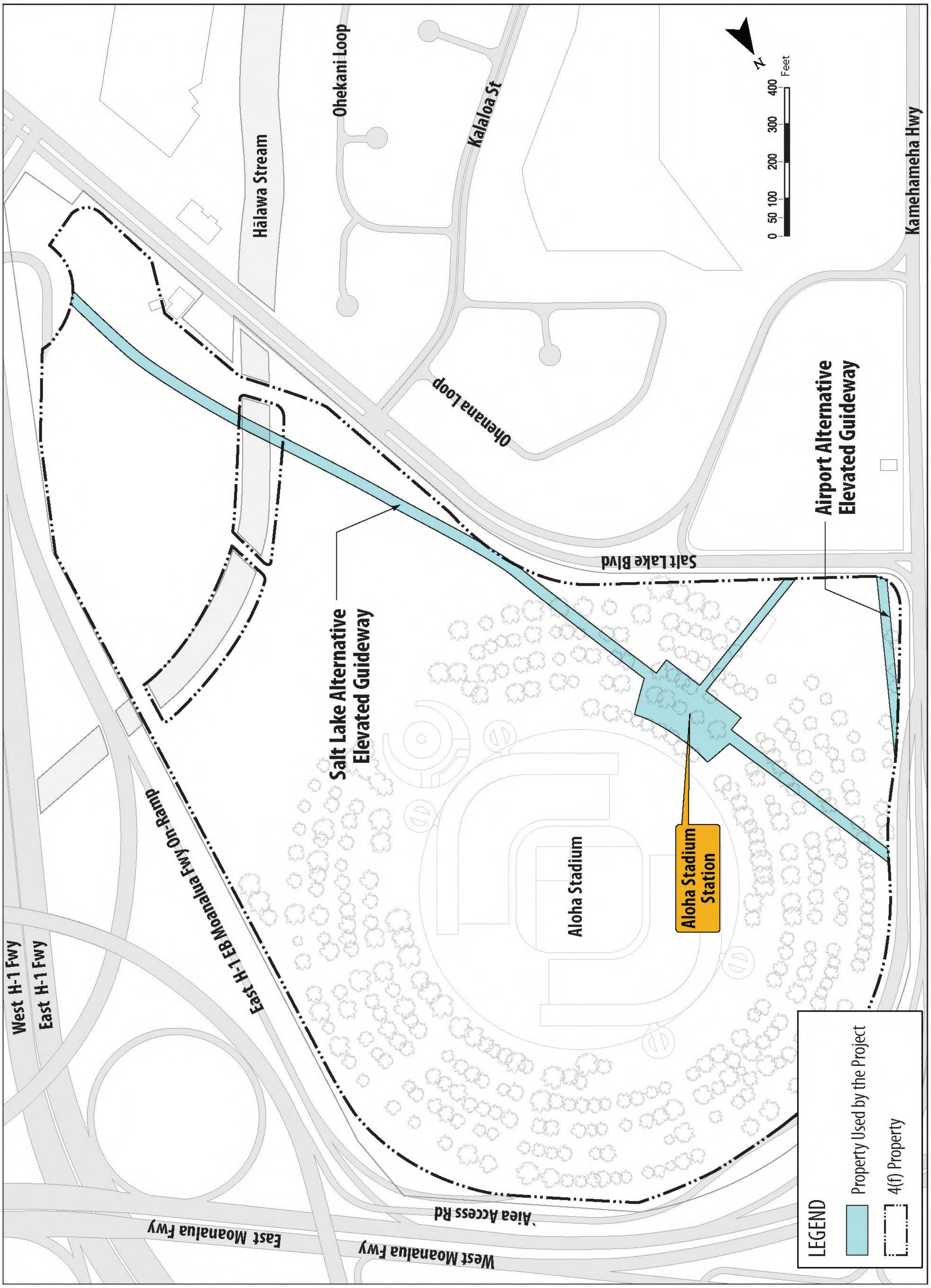


Figure 5-2 Aloha Stadium Project Alternative Alignments and Features

Ke'ehi Lagoon Beach Park

Description and Significance of Property

Keʻehi Lagoon Beach Park is an approximately 72-acre community park at Lagoon Drive and Aolele Street (Figures 5-3 and 5-4). It is bounded on the mauka side by Nimitz Highway and some industrial developments, on the makai side by the lagoon and airport property, ʻEwa by Lagoon Drive, and Koko Head by the Veterans of Foreign Wars Memorial property. It is operated and maintained by the City and is part of a General Preservation District (P2) on State-owned land. Recreational amenities include twelve tennis courts, one baseball field, restroom facilities, walking trails, and picnic areas. The baseball field is near the shoreline of Keʻehi Lagoon, and eight of the tennis courts are near Lagoon Drive, while the other four are near Nimitz Highway. Canoe clubs engage in active practice sessions. Soccer and softball practices and games are also held regularly. Two separate parking areas contain 50 and 435 parking spaces.

Figure 5-3 Ke'ehi Lagoon Beach Park

Since Keʻehi Lagoon Beach Park is located under a flight path of one of the main runways at Honolulu International Airport, night lights are prohibited in the park; therefore, the park is only used during the day.

Application of Section 4(f)

The Airport Alternative and the Airport & Salt Lake Alternative would impact Keʻehi Lagoon Beach Park (Figure 5-4); the Salt Lake Alternative would not impact the park, as it does not directly serve the airport area. The approximately 2.8 acres (122,000 square feet) of impact would be associated with the elevated guideway. The placement of support columns would require 1,600 square feet of use. The elevated guideway would be approximately 40 feet above the ground to maintain clearance over Lagoon Drive and still meet the clearance required by the airport's runway flight path. This 40-foot clearance from grade would be maintained through the park to provide continued use of the area under the guideway, including an area for replacement parking.

The alignment through the park would be located adjacent to the mauka property line of the park on a narrow strip of parkland between the access road through the park and its northern boundary. This station would serve nearby industrial areas as well as the park. Because the Project would permanently incorporate the land for the columns into the transportation facility, this would be a direct use.

Avoidance Alternatives

The guideway would pass 40 feet above approximately 2.8 acres of the 72-acre park on its mauka side, using approximately 1,600 square feet for the placement of columns. In evaluating alternatives to the use of Keʻehi Lagoon Beach Park, consideration was given to providing the greatest accessibility to the system with minimum impact to the park and the community.

Avoidance alternatives are limited by the need to connect the Lagoon Drive Station to the proposed Airport Station. Avoidance alternatives that run parallel to the proposed alignment on Ualena Street or Koapaka Street would create additional impacts by requiring more right-of-way acquisition

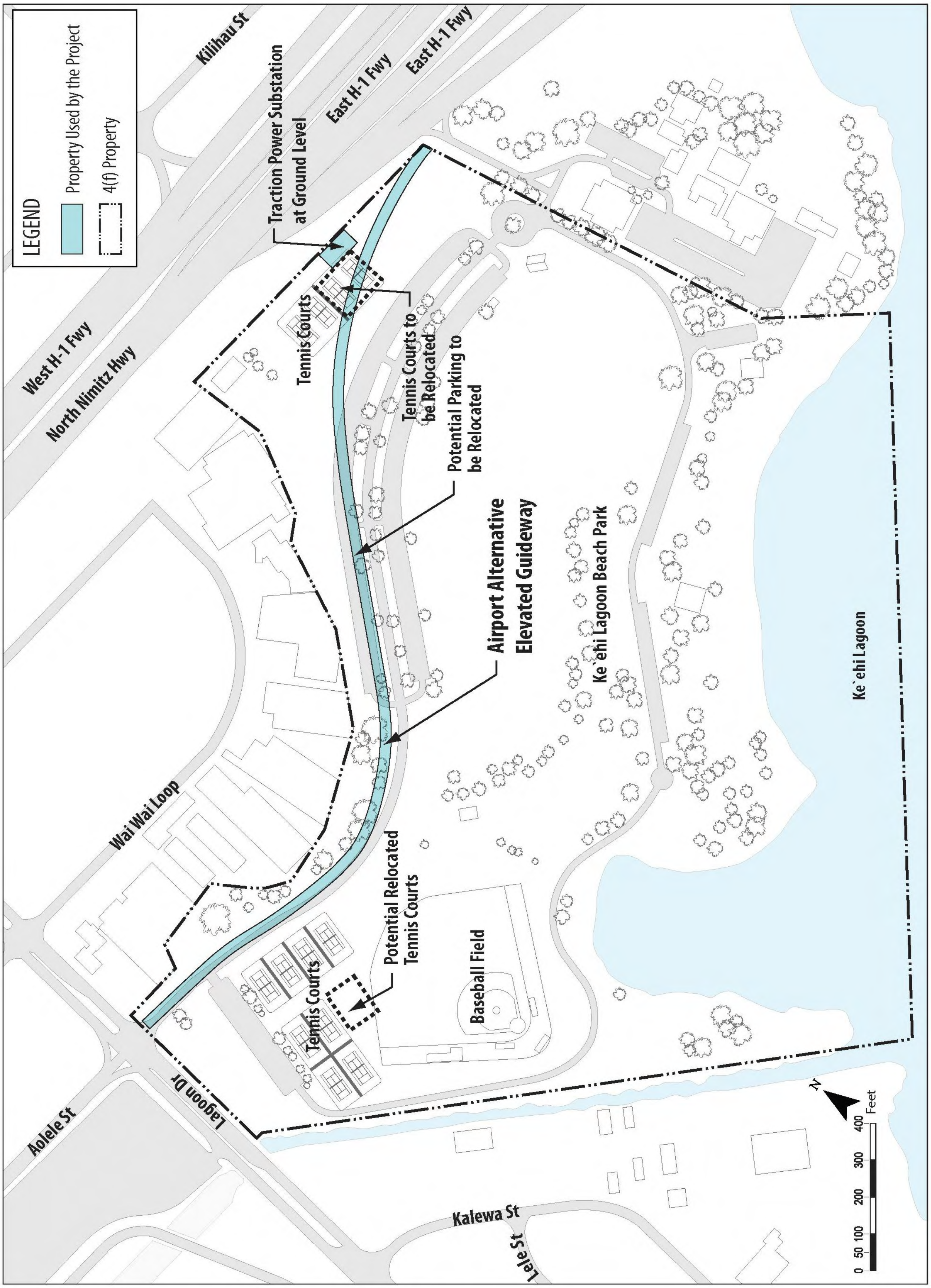


Figure 5-4 Ke`ehi Lagoon Beach Park Project Alignment and Features

and displacing more commercial properties along Waiwai Loop before entering the park. They would reduce the impact to the park but would still impact the tennis courts and parking.

The avoidance alternative that presents the least impact to Ke'ehi Lagoon Beach Park runs immediately makai of the Nimitz Highway and moves the Lagoon Drive Station mauka, adjacent to the highway. In order to connect the Airport and Lagoon Drive Stations, the alignment turns mauka at Aolewa Place (Figure 5-5). This avoidance alternative entirely avoids the parking and tennis courts at Ke'ehi Lagoon Beach Park.

To connect the Airport Station and Lagoon Drive Station, the guideway would pass over several additional commercial properties, resulting in at least nine additional full acquisitions and nine business displacements than the proposed alignment. Further, the Lagoon Drive Station would have to be double-stacked (one platform above the other), and the guideway would have to be double-stacked from approximately Peltier Avenue to Ahua Street, a distance of about 600 meters. This, and the right-of-way requirements, would result in an additional $75 million (2007 USD) in construction costs. For these reasons, this alternative is not considered prudent.

Agency Coordination and Consultation

Officials with the City Department of Parks and Recreation (DPR), which has jurisdiction over Ke'ehi Lagoon Beach Park, have been involved in the project planning and design process within the boundaries of the park. A meeting was held with DPR in May 2008 to discuss project impacts and ensure that the Project would result in a net benefit with regard to parking and recreational use.

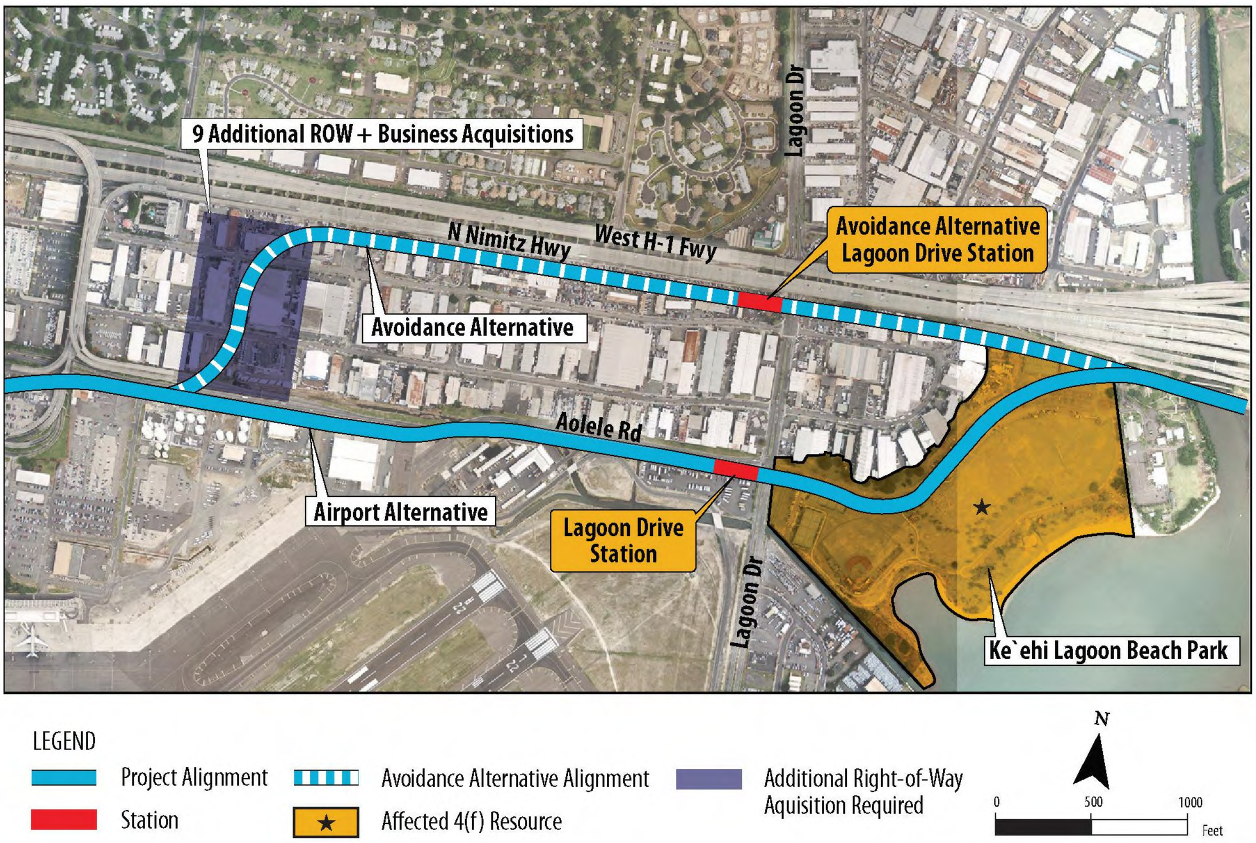


Figure 5-5 Ke`ehi Lagoon Beach Park Project Alignment and Avoidance Alternative

Measures to Minimize Harm

To minimize impacts to the park, minimum radius curves were used that would maintain efficient system operation while serving the Lagoon Drive Station. Although the four tennis courts adjacent to Nimitz Highway would be displaced, impacts to the tennis courts would be mitigated in their entirety and their use would be enhanced as the Project would move the tennis courts away from the highway or would provide another beneficial recreational facility that would be comparable. This could include bleachers or other improved facilities to provide a more enjoyable experience for the park's users. The lost parking spaces would be replaced with shaded parking under the guideway, which would result in no net loss of parking.

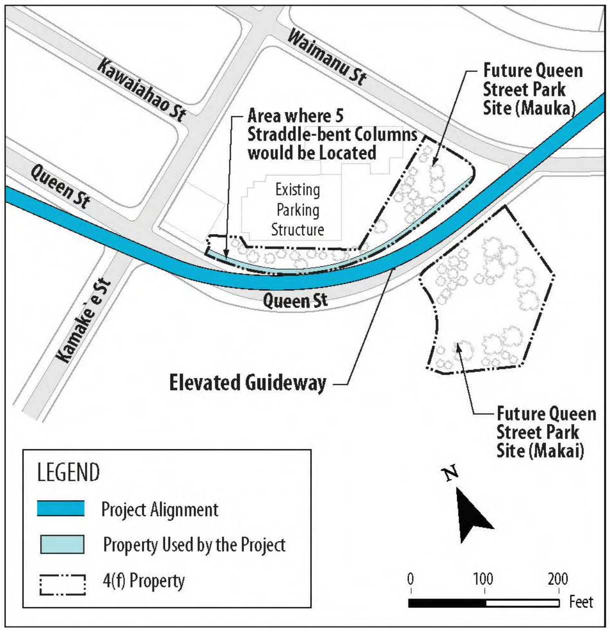


Figure 5-6 Future Queen Street Park Project Alignment and Features

Figure 5-7 Future Queen Street Park Site

Queen Street Park

Description and Significance of Property

The Hawai'i Community Development Authority (HCDA) has set aside public funding for a 2-acre planned park on the Queen Street extension. It is planned as a passive recreation area with a children's playground and limited other amenities. The park will be built on both the mauka and makai sides of the street. The Project would use a portion of the park on the mauka side of Queen Street (Figures 5-6 and 5-7).

Application of Section 4(f)

All of the Build Alternatives would use Queen Street Park. Because the park is being funded with public money, and because it is planned for a recreational use, it qualifies as a Section 4(f) resource. The Project would use approximately 250 square feet of land along the mauka side of Queen Street for construction of five straddle-bent column structures to support the guideway. The Project would require right-of-way from the park and convert land to a transportation use. This constitutes a direct use of the park. The use is not temporary and cannot be considered a constructive use (23 CFR 774.15).

The area required from the park is small, approximately 250 square feet of the 2 acres, and would be located within a 10-foot-wide strip along the mauka side of Queen Street. Only five straddle-bent columns would touch down within the park itself, and they would not interfere with the use of the park because they are located adjacent to Queen Street where no park amenities would be located. The park owner would be compensated for all land acquired. Because the amount of right-of-way required is small, is located along the mauka edge, and does not substantially impact use of the park, the use of this planned park is considered *de minimis* and no avoidance alternatives are necessary.

Agency Coordination and Consultation

A meeting was held with representatives from HCDA on October 20, 2008, to discuss the Project and the planned development of this park. Coordination is ongoing to ensure that the Project would not impact park use.

Measures to Minimize Harm

The direct impacts to the Queen Street Park parcel are limited to the placement of supports for straddle-bent structures within a small strip of land on the mauka side of Queen Street within the Park. No additional measures other than coordination for park planning are required.

5.4.2 Historic Sites

This section discusses the historic sites with potential Section 4(f) use. Section 4.15 discusses 63 historic sites that would be affected by the Project.

Table 5-2 lists each historic 4(f) property and includes a use determination. For most of the properties, there has been a proposed Section 106 determination of "No Adverse Effect" (see Section 4.15). For these properties, FTA has determined that there would be either no Section 4(f) use of the property (No Use) or only a *de minimis* impact (direct use, *de minimis*). Therefore, no consideration of avoidance alternatives is necessary. The Project would have a direct use of seven historic properties. They are described in greater detail below, with a consideration of avoidance alternatives and planning to minimize harm.

Although the majority of the historic resources have no direct use from the Project, ongoing discussion with the SHPD indicate that the agency may consider that under Section 106 there would be an effect, but no adverse effect, on these resources. In consultation with SHPD, effects to these resources may include effects upon, for example, visual settings and community context. As a result, under Section 4(f), no use findings have been identified for these resources, as listed in Table 5-2. Concurrence of findings will be completed prior to the Final EIS.

Historic sites with no Section 4(f) use include sites that the elevated guideway would pass over, such as eight low-level highway bridges, lava rock curbs along Dillingham Boulevard, and the O'ahu Railway and Land Company basalt street paving. For all sites with no use, the elevated guideway, stations, and other project-related features would not substantially impair or diminish the activities, features, or attributes that qualify these sites for protection under Section 4(f).

De Minimis Impacts

Five historic properties would be directly impacted by the Project, but not adversely affected. In each case, the impact from the Project would be a small partial acquisition of land adjacent to the project alignment ranging from 0.01 to 0.6 acre, with no direct impact to any structures or contributing resources. The impact to each would be small enough that the historic properties would not be adversely affected, as described in 36 CFR 800.5. These historic properties listed in Table 5-2 are the Six Quonset Huts, the Chinatown Historic District, the HECO Downtown Plant, Radford High School, and the Pearl Harbor National Historic Landmark (Figures 5-8 through 5-12).

As described above, Section 4(f) regulations are clear that Section 106 findings of no adverse effect equate to *de minimis* impact findings. Because the use of these five properties would be *de minimis,* and Section 4(f) is satisfied once *de minimis* applies, no avoidance alternatives are discussed.

Figure 5-8 Six Quonset Huts

Figure 5-9 Chinatown Historic District

Figure 5-10 HECO Downtown Plant

Figure 5-11 Radford High School

Figure 5-12 Pearl Harbor National Historic Landmark

Solmirin House

Description and Significance of Property

This single-story plantation-style house dates from 1937 and is an example of vernacular residential style. Although this structure has no particular architectural distinction or known association with an important historic person or event, it is representative of a local building type in a rural setting (Figure 5-13).

Figure 5-13 Solmirin House

Application of Section 4(f)

The Solmirin House would be affected by the Pearl Highlands park-and-ride facilities. The park-and-ride structure would be constructed on an 11-acre site that would provide 1,600 parking spaces for the Pearl Highlands Transit Center. The parking facility would require acquisition of the Solmirin House and underlying parcel. The property would permanently be incorporated into the transportation facility, resulting in a direct use. Consultation between FTA and SHPD has determined that this would be an Adverse Effect; therefore, it would be a Section 4(f) use.

Avoidance Alternatives

The Pearl Highlands Station is projected to have the second-highest passenger volume of all stations in the system and would serve as the transfer point for all users in Central O'ahu, whether they drive to the station or transfer from TheBus. This transit center and park-and-ride facility would be designed to provide easy access to the fixed guideway transit system from the H-1 and H-2 Freeways, Kamehameha Highway, and Farrington Highway. This station location would provide the most convenient access to the system for residents of Central O'ahu (i.e., locations mauka and 'Ewa of the station). Therefore, elimination of the station and associated park-and-ride structure is not prudent. Two alternative guideway and highway ramp alignments, station locations, and park-and-ride locations have been evaluated to avoid the Solmirin House (Figures 5-14 and 5-15). Neither of these alternatives represents a prudent or feasible avoidance alternative or minimization measure, as described below.

One avoidance alternative would move the park-and-ride to Leeward Community College. Under this alternative, the H-2 Freeway access ramp would need to be re-designed from a one-way ramp to a two-way ramp. This would cost approximately $50 million more than the ramps that would serve the Pearl Highlands Station. For this location, the access road for Leeward Community College would also require improvement, which would cost approximately $25 million. In addition, the guideway's crossing of the H-1 Freeway would need to be realigned, costing an additional $5 million.

In addition to the $80 million of roadway and guideway improvements discussed above, there would be an additional $1 million cost to acquire right-of-way from the Hawai'i Laborers Training Program site Koko Head and makai of the ramp connecting Farrington Highway to Kamehameha Highway, as well as loss of parking for Leeward Community College which would cost $30 million to replace. These costs would be offset by approximately $20 million since the Pearl Highlands Station would not be constructed under this avoidance alternative. Therefore, the net increase in cost for this avoidance alterative would be approximately $90 million.

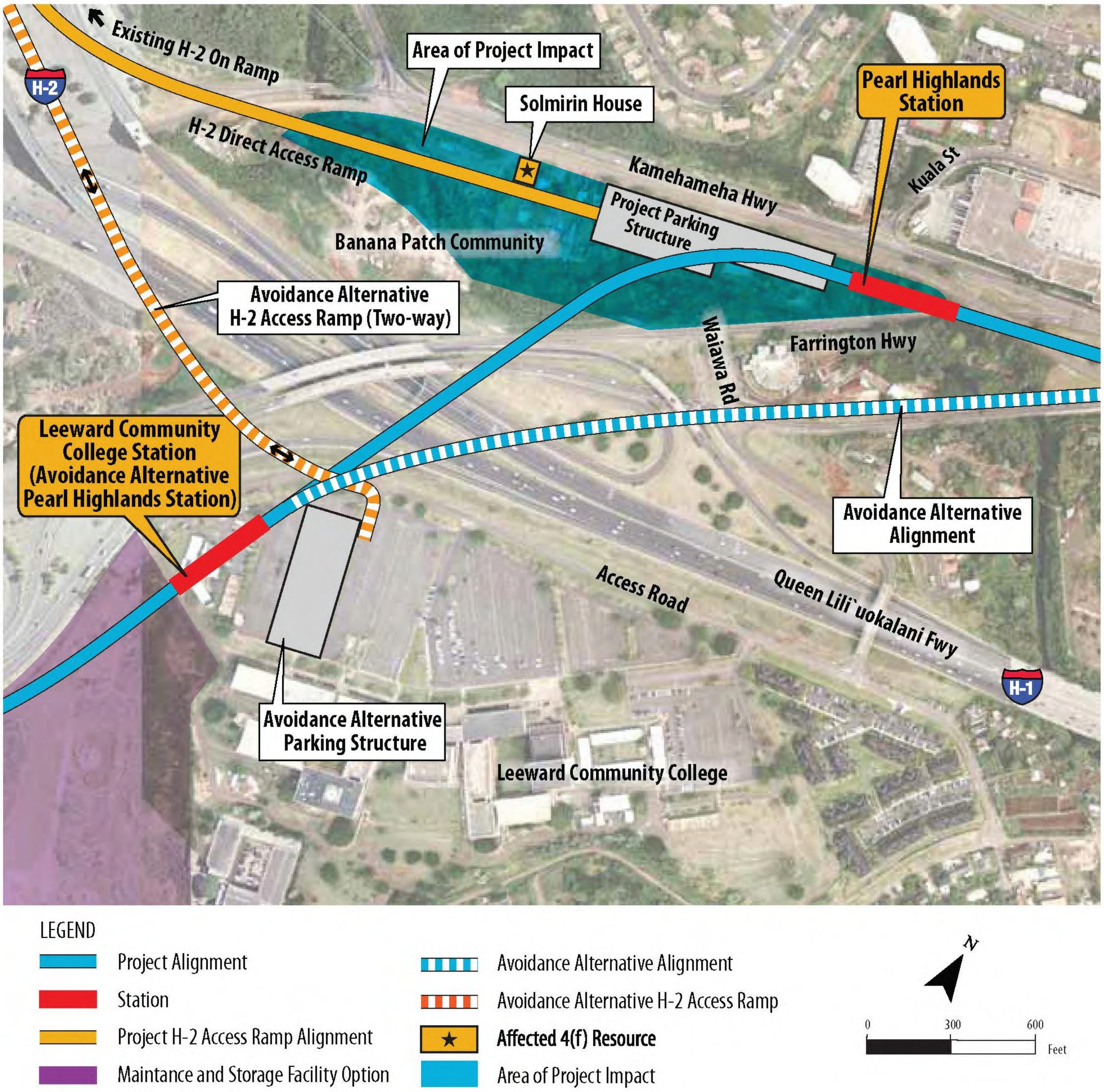


Figure 5-14 Leeward Community College Avoidance Alternative

The second avoidance alternative that was evaluated would move the park-and-ride to the Hawai'i Laborers Training Program site. The shift in guideway alignment to serve this location would prevent the placement of a track switch to access the maintenance and storage facility site near Leeward Community College in the Koko Head direction, which would make this maintenance and storage facility impractical with this alternative. The design also would require spanning both directions of the H-1 Freeway with a single guideway span exceeding 300 feet in length at a cost of $5 million. A longer access ramp from the H-2 Freeway would be required at a cost of $20 million. Access roads would also need to be improved at a cost of about $20 million.

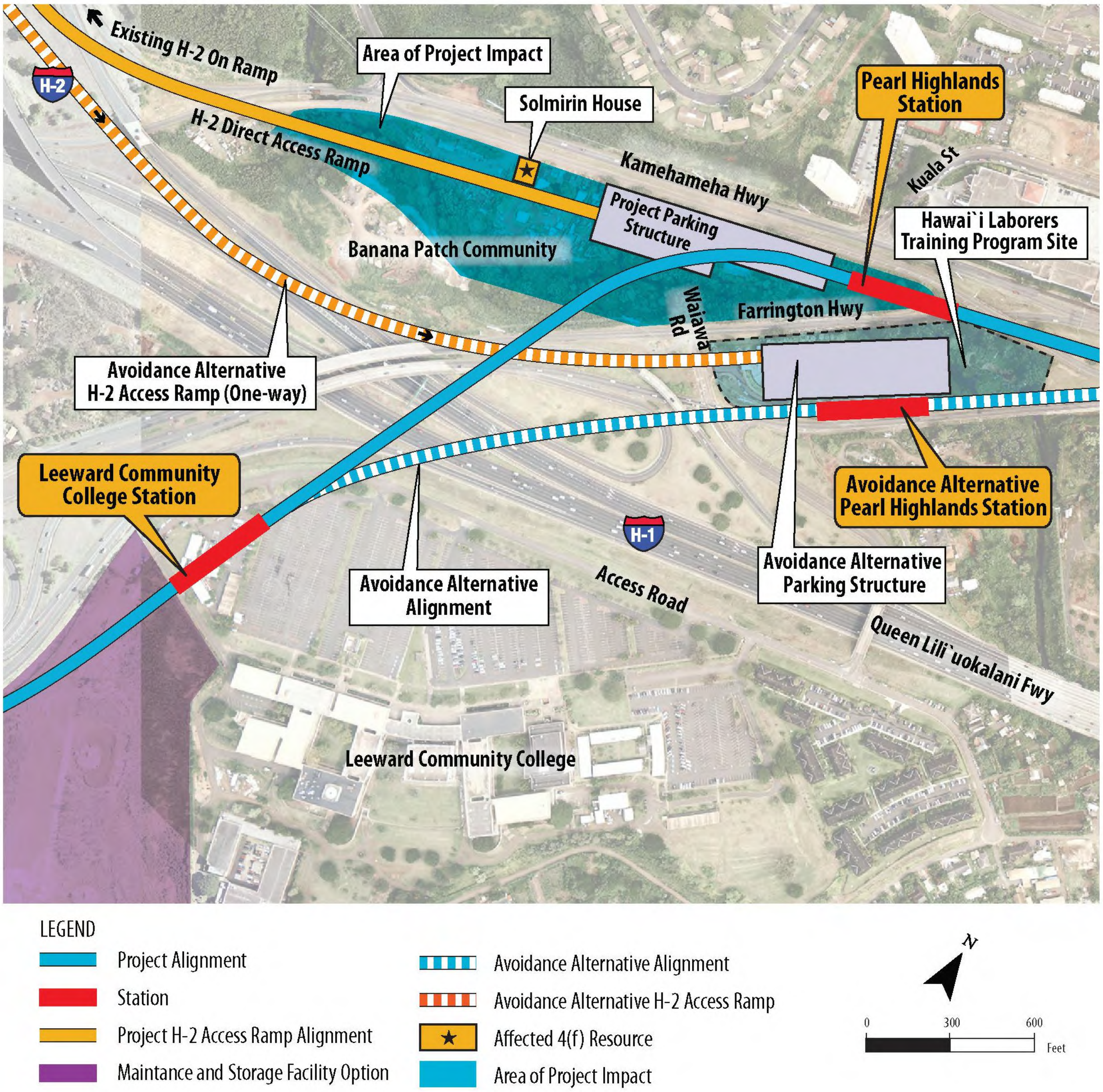


Figure 5-15 Hawai`i Laborers Training Program Site Avoidance Alternative

Land improvements, right-of-way, and relocation costs at this site would add an additional $8 million dollars. In addition, the park-and-ride structure would cost approximately $10 million more than it would for the proposed Pearl Highlands Station.

Locating the park-and-ride facilities at either of the two avoidance alternative sites would cost substantially more and provide less efficient transportation circulation, as access would be less direct. For these reasons, this alternative is not considered prudent.

Agency Coordination and Consultation

Consultation among FTA, Hawai'i SHPD, and other Section 106 consulting parties is ongoing, as described in Chapter 8, Comments and Coordination. The Solmirin House has been determined to be a historic property, eligible for nomination to the National Register of Historic Places (NRHP).

The impact of the Project would be an Adverse Effect under Section 106 of the National Historic Preservation Act (NHPA).

Measures to Minimize Harm

The park-and-ride lot has been designed to minimize impacts to the extent practicable. Given that a prudent avoidance alternative cannot be found, the Project would require full acquisition of Solmirin House. There are no further design measures to minimize harm beyond mitigating for the residential relocation. Mitigation under Section 106 of the NHPA would also serve to minimize harm.

Afuso House

Description and Significance of Property

This single-story plantation-style residence is associated with the residential development of the Kalihi Kai neighborhood in the early 1900s. This structure embodies the distinctive characteristics of a type and period of construction and retains a high degree of integrity of location, design, materials, workmanship, feeling, and association. Its integrity of setting has been somewhat changed from its historic dense residential character, as there are now adjacent vacant lots on one side; however, other historic residential buildings are present in the immediate area. The added carport and jalousie windows are apparent non-historic alterations; however, most of the other features are historic and part of the design history of the house (Figure 5-16).

Figure 5-16 Afuso House and Higa Fourplex

Application of Section 4(f)

As a result of the widening of Dillingham Boulevard, approximately 10 feet to accommodate the columns of the fixed guideway, all Build Alternatives would impact the Afuso House (Figure 5-17). There would be an acquisition of the parcel and the structure. Because the widening of Dillingham Boulevard would permanently incorporate land into the transportation facility, this qualifies as a direct use.

Avoidance Alternatives

During the Alternatives Analysis phase, two alignments between Middle Street and Iwilei were considered, one along Dillingham Boulevard and another along North King Street. The North King Street alignment would have resulted in as many as 36 historic Section 4(f) property impacts, a greater number of residential relocations, and more noise-sensitive issues compared to the Dillingham Boulevard alignment.

Other avoidance alternatives to the project alignment would be to move the guideway to either the mauka or makai side of Dillingham Boulevard. Neither alternative represents a prudent or feasible avoidance or minimization measure, as discussed below:

- Mauka Shift (Figure 5-17)—to shift the guideway mauka and out of the median would require relocating 8,000 feet of a 138-kilovolt (kV) high-voltage electrical line and 20 steel poles. This would result in an extremely high cost, in excess of $12 million. In addition, a mauka shift would also impact more historic Section 4(f) properties, such as the AC Electric building, the Duarte House, 10 Courtyard Houses, Pu‘uhale Market, the Tsumoto shophouse, and additional True Kamani Trees. Therefore, a mauka shift would not avoid Section 4(f) uses.
- Makai Shift—to shift the alignment makai and out of the median would impact this Section 4(f) resource to the same extent

Figure 5-17 Afuso House, Higa Fourplex, and Teixeira House and Avoidance Alternative

(removal of resource) as placing the guideway in the median and widening the road to the makai side.

Agency Coordination and Consultation

Consultation among FTA, Hawai'i SHPD, and other Section 106 consulting parties is ongoing, as described in Chapter 8. The Afuso House has been determined to be a historic property, eligible for nomination to the NRHP. The impact of the Project would have an Adverse Effect under Section 106 of the NHPA.

Measures to Minimize Harm

The project guideway has been designed to be as narrow as possible to minimize impact. The widening of Dillingham Boulevard has been reduced to as narrow a width as possible to still address all safety concerns. Mitigation under Section 106 of the NHPA would also serve to minimize harm.

Higa Fourplex

Description and Significance of Property

This two-story plantation-style fourplex residence (Figure 5-16) is associated with the residential development of the Dillingham Boulevard area in the 1940s when there was increased demand for housing in the build-up period before World War II. This structure is also associated with the history of Dillingham Boulevard's development and its effect on the Kalihi Kai neighborhood, which originally consisted of mostly single-family residences. The building has a high degree of integrity; all alterations appear to be historic and are considered part of the building's design history.

Application of Section 4(f)

The Higa Fourplex would be affected by widening Dillingham Boulevard (Figure 5-17) approximately 10 feet to accommodate the Project in the median, as common to all Build Alternatives. There would be a full acquisition, requiring the parcel and the structure. Because the widening of Dillingham Boulevard by approximately 10 feet would permanently incorporate land into the transportation facility, this qualifies as a direct use. Consultation between FTA and SHPD has determined this to be an Adverse Effect and, therefore, a Section 4(f) use.

Avoidance Alternatives

During the Alternatives Analysis phase, two alignments between Middle Street and Iwilei were considered, one along Dillingham Boulevard and another along North King Street. The North King Street alignment would have resulted in as many as 36 historic Section 4(f) property impacts, a greater number of residential relocations, and more noise-sensitive issues, compared to the Dillingham Boulevard alignment.

Other avoidance alternatives to the project alignment would be to move the guideway to either the mauka or makai side of Dillingham Boulevard. Neither alternative represents a prudent or feasible avoidance or minimization measure, as discussed below:

- Mauka Shift (Figure 5-17)—to shift the guideway mauka and out of the median would require relocating 8,000 feet of a 138-kV high-voltage electrical line and 20 steel poles. This would result in an extremely high cost, in excess of $12 million. In addition, a mauka shift would also impact more historic Section 4(f) properties, such as the AC Electric building, the Duarte House, 10 Courtyard Houses, Pu'uhale Market, the Tsumoto shophouse, and additional True Kamani Trees. Therefore, a mauka shift would not avoid Section 4(f) uses.
- Makai Shift—to shift the alignment makai and out of the median would impact this Section 4(f) resource to the same extent (removal of resource) as placing the guideway in the median and widening the road to the makai side.

Agency Coordination and Consultation

Consultation among FTA, Hawai'i SHPD, and other Section 106 consulting parties is on-going, as described in Chapter 8. The Higa Fourplex has been determined to be a historic property, eligible for nomination to the NRHP. The impact of the Project would have an Adverse Effect under Section 106 of the NHPA by the FTA and Hawai'i SHPD.

Measures to Minimize Harm

The project guideway has been designed to be as narrow as possible to minimize impact. The widening of Dillingham Boulevard has been reduced to as narrow a width as possible to still address all safety concerns. Mitigation under Section 106 of the NHPA would also serve to minimize harm.

Teixeira House

Description and Significance of Property

This single-story plantation-style residence is associated with the residential development of the Kalihi Kai neighborhood in the first half of the 20th century, before North Queen Street was renamed Dillingham Boulevard. This structure embodies the distinctive characteristics of a type, period, and method of construction and is a good example of a 1940s, single-wall, plantation-style house. There have been some changes made to the structure, but it retains sufficient integrity to qualify for the NRHP. Integrity of setting is especially compromised from its historic dense residential character due to a new, large commercial building on the consolidated adjacent lot. The historic setting remains apparent due to the presence of other historic residential buildings in the immediate area. There have been some non-historic design changes made to the structure, including installation of jalousies and removal of a rock wall fronting the lot (Figure 5-18).

Application of Section 4(f)

The Teixeira House parcel would be affected by widening Dillingham Boulevard by approximately

Figure 5-18 Teixeira House

10 feet (Figure 5-17) to accommodate the fixed guideway in the median under all Build Alternatives. There would be a full acquisition, requiring the parcel and the structure. Because the widening of Dillingham Boulevard would permanently incorporate land into the transportation facility, this qualifies as a direct use. Consultation between FTA and SHPD has determined this to be an Adverse Effect and Section 4(f) use.

Avoidance Alternatives

During the Alternatives Analysis phase, two alignments between Middle Street and Iwilei were considered, one along Dillingham Boulevard and another along North King Street. The North King Street alignment would have resulted in as many as 36 historic Section 4(f) property impacts, a greater number of residential relocations, and more noise-sensitive issues compared to the Dillingham Boulevard alignment.

Other avoidance alternatives to the project alignment would be to move the guideway to either the mauka or makai side of Dillingham Boulevard. Neither alternative represents a prudent or feasible avoidance or minimization measure, as discussed below:

- Mauka Shift (Figure 5-17)—to shift the guideway mauka and out of the median would require relocating 8,000 feet of a 138-kV high-voltage electrical line and 20 steel poles. This would result in an extremely high cost, in excess of $12 million. In addition, a mauka shift would also impact more historic Section 4(f) properties, such as the AC Electric building, the Duarte House, 10 Courtyard Houses, Puʻuhale Market, the Tsumoto shophouse, and additional True Kamani Trees. Therefore, a mauka shift would not avoid Section 4(f) uses.

- Makai Shift—to shift the alignment makai and out of the median would impact this Section 4(f) resource to the same extent (removal of resource) as placing the guideway in the median and widening the road to the makai side.

Agency Coordination and Consultation

Consultation among FTA, Hawaiʻi SHPD, and other Section 106 consulting parties is ongoing, as described in Chapter 8. The Teixeira House has been determined to be a historic property, eligible for nomination to the NRHP. The impact of the Project would have an Adverse Effect under Section 106 of the NHPA.

Measures to Minimize Harm

The project guideway has been designed to be as narrow as possible to minimize impact. The widening of Dillingham Boulevard has been reduced to as narrow a width as possible to still address all safety concerns. Mitigation under Section 106 of the NHPA would also serve to minimize harm.

Boulevard Saimin Restaurant

Description and Significance of Property

This two-story building fronting Dillingham Boulevard was built in 1960 and is of masonry construction with a stucco finish and flat roof. This building has a full-height section of decorative concrete grille on the side facing Dillingham Boulevard and contains multiple storefronts. This structure is associated with the commercialization of saimin (a noodle soup unique to Hawaiʻi). Boulevard Saimin Restaurant has become an important and popular purveyor of saimin on Oʻahu. This structure appears unaltered and retains a high level of integrity (Figure 5-19).

Figure 5-19 Boulevard Saimin Restaurant

Application of Section 4(f)

The Boulevard Saimin parcel would be affected widening Dillingham Boulevard approximately 10 feet (Figure 5-17) to accommodate the fixed guideway in the median, as common to all Build Alternatives. A total of 698 square feet of parking area would be necessary. Because the widening of Dillingham Boulevard would permanently incorporate land into the transportation facility, this qualifies as a direct use. Consultation between FTA and SHPD has determined this to be an Adverse Effect; therefore, there would be a Section 4(f) use.

Avoidance Alternatives

During the Alternatives Analysis phase, two alignments between Middle Street and Iwilei were considered, one along Dillingham Boulevard and another along North King Street. The North King Street alignment would have resulted in as many as 36 historic Section 4(f) property impacts, a greater number of residential relocations, and more noise-sensitive issues compared to the Dillingham Boulevard alignment.

Other avoidance alternatives to the project alignment would be to move the guideway to either the mauka or makai side of Dillingham Boulevard. Neither alternative represents a prudent or feasible avoidance or minimization measure, as discussed below:

- Mauka Shift (Figure 5-17)—to shift the guideway mauka and out of the median would require relocating 8,000 feet of a 138-kV high-voltage electrical line and 20 steel poles. This would result in an extremely high cost, in excess of $12 million. In addition, a mauka shift would also impact more historic Section 4(f) properties, such as the AC Electric building, the Duarte House, 10 Courtyard Houses, Puʻuhale Market, the Tsumoto shophouse, and additional True Kamani Trees. Therefore, a mauka shift would not avoid Section 4(f) uses.
- Makai Shift—to shift the alignment seaward and out of the median would impact this Section 4(f) resource to a greater extent than placing the guideway in the median and widening the road to the makai side.

Agency Coordination and Consultation

Consultation among FTA, Hawaiʻi SHPD, and other Section 106 consulting parties is ongoing, as described in Chapter 8. Boulevard Saimin Restaurant has been determined to be a historic property, eligible for nomination to the NRHP. The impact of the Project would have an Adverse Effect under Section 106 of the NHPA.

Measures to Minimize Harm

The project guideway has been designed to be as narrow as possible to minimize impact. The widening of Dillingham Boulevard has been reduced to as narrow a width as possible to still address all safety concerns. Mitigation under Section 106 of the NHPA would also serve to minimize harm.

True Kamani Trees on Dillingham Boulevard

Description and Significance of Property

These mature True Kamani Trees were planted along both sides of Dillingham Boulevard, circa 1934, and are spaced about 55 to 75 feet apart. Many of the trees have asymmetrical canopies, due to pruning them away from overhead utility lines. These trees are associated with the 1930s roadway infrastructure development of Dillingham Boulevard and the history of street tree plantings in Honolulu. They have also been found to embody distinctive characteristics of 1930s landscaping and remain unaltered, except for necessary maintenance pruning (Figure 5-20).

Figure 5-20 True Kamani Trees on Dillingham Boulevard

Application of Section 4(f)

The True Kamani Trees would be affected by widening Dillingham Boulevard by approximately 10 feet (Figure 5-21) to accommodate the fixed guideway being placed in the median, as common to all Build Alternatives. Approximately 28 trees would be removed. Because the widening of Dillingham Boulevard would permanently incorporate land into the transportation facility, this qualifies as a direct use. Consultation between FTA and SHPD has determined this to be an Adverse Effect; therefore, there would be a Section 4(f) use.

Avoidance Alternatives

During the Alternatives Analysis phase, two alignments between Middle Street and Iwilei were considered, one along Dillingham Boulevard and another along North King Street. The North King Street alignment would have resulted in as many as 36 historic Section 4(f) property impacts, a greater number of residential relocations, and more

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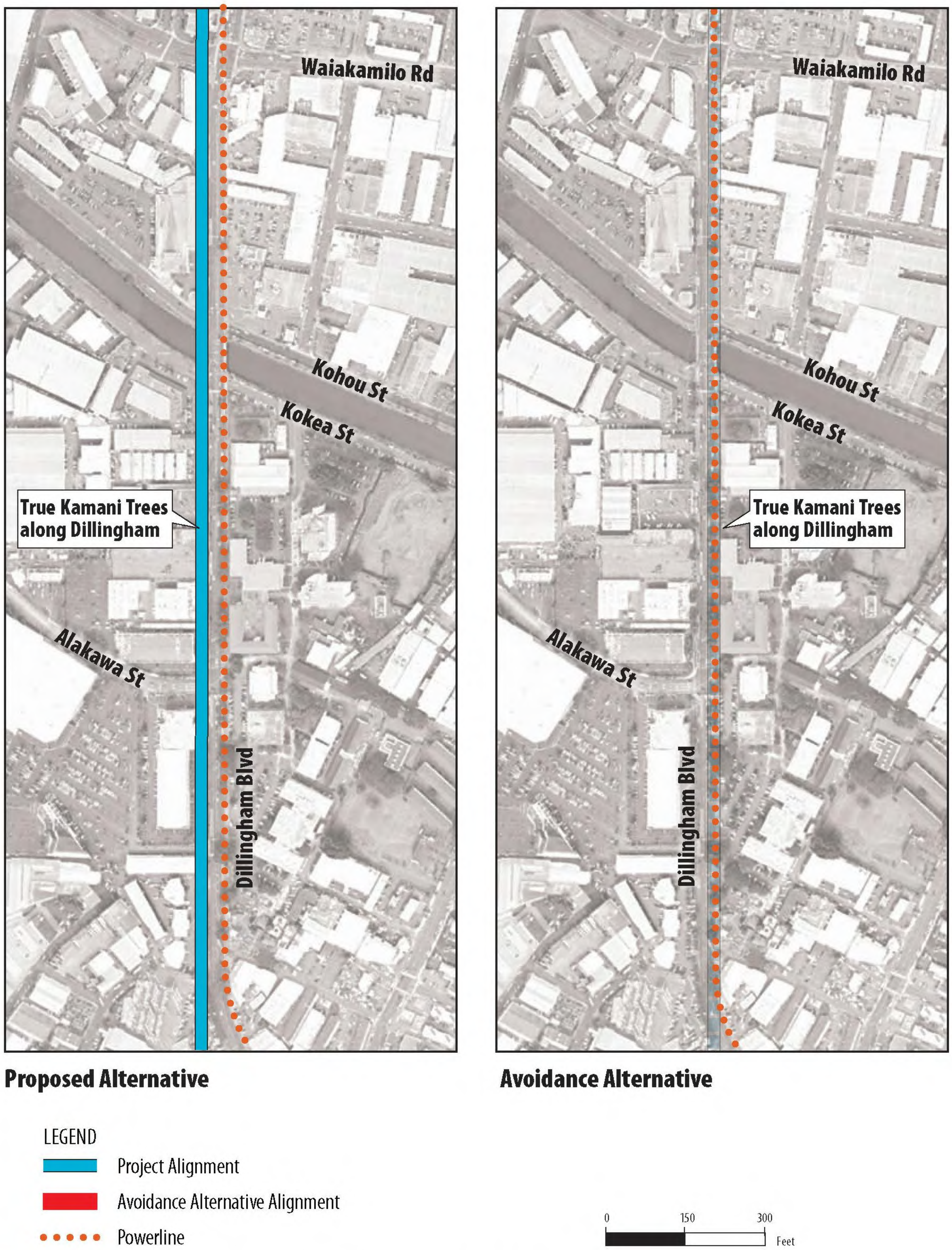

Figure 5-21 True Kamani Trees on Dillingham Boulevard and Avoidance Alternatives

noise-sensitive issues compared to the Dillingham Boulevard alignment.

The other avoidance alternative to the Project would be to move the guideway to the mauka side of Dillingham Boulevard. This does not represent a prudent or feasible avoidance or minimization measure, as discussed below:

- Mauka Shift (Figure 5-21)—to shift the guideway mauka and out of the median would require relocating 8,000 feet of a 138-kV high-voltage electrical line and 20 steel poles. This would result in an extremely high cost, in excess of $12 million. In addition, a mauka shift would also impact more historic Section 4(f) properties, such as the AC Electric building, the Duarte House, 10 Courtyard Houses, Pu'uhale Market, the Tsumoto shophouse, and additional True Kamani Trees. Therefore, a mauka shift would not avoid Section 4(f) uses.

Agency Coordination and Consultation

Consultation among FTA, Hawai'i SHPD, and other Section 106 consulting parties is ongoing, as described in Chapter 8. The True Kamani Trees have been determined to be a historic resource, eligible for nomination to the NRHP. The impact of the Project would have an Adverse Effect under Section 106 of the NHPA.

Measures to Minimize Harm

The project guideway has been designed to be as narrow as possible to minimize impact. The widening of Dillingham Boulevard has been reduced to as narrow a width as possible to address all safety concerns. Five trees would be removed, but could not be transplanted. The trees would be replaced. Mitigation under Section 106 of the NHPA would also serve to minimize harm.

Dillingham Transportation Building

Description and Significance of Property

This structure is associated with the commercial development of Downtown Honolulu, specifically the early development of Bishop Street as the center of commerce for the territory of Hawai'i, as well as the Dillingham family empire of businesses. The Dillingham Transportation Building is listed on the Hawai'i Register of Historic Places. It is a four-story Italian Renaissance Revival-style building. The entry lobby has elaborate Art Deco decorations. This building retains a high level of integrity, as the only major changes involve the creation of first-floor storefronts and two arcades by removal of some of the store spaces to provide Bishop Street access and addresses for the circa-1980 Pacific Guardian Center towers (Figure 5-22).

Figure 5-22 Dillingham Transportation Building

Application of Section 4(f)

An entrance to the planned Downtown Station would impact the Dillingham Transportation Building under all Build Alternatives. The Downtown Station would be the highest-volume station in the system without an associated transit center. It is the only station that would serve the Central Business District. Approximately 2,400 square feet of the plaza area between the Dillingham Transportation Building and neighboring office buildings would be used for the station entrance. This area is part of the parcel eligible for the

NRHP. It is privately owned and currently used as an open space, with tables, chairs, and walkways (Figure 5-23). The station entrance would replace a fountain and trash dumpster storage area. It would not eliminate the open space or alter its use. The station entrance would be designed to be compatible with the use of the open space. Because the Project would permanently incorporate land from within the boundaries of a historic property into the transportation facility, it would result in a Section 4(f) use.

Figure 5-23 Plaza at Planned Downtown Station Entrance

Avoidance Alternatives

Avoidance alternatives are limited by Honolulu Harbor and by the geometry of Nimitz Highway. Several alternative alignments were considered during the Alternatives Analysis phase, one of which included Queen Street. While this alternative would avoid this particular resource, it was determined that it would also affect properties within the Hawai'i Capital Historic District, including the Post Office, Ali'iōlani Hale, and Hale Auhau. It would also affect three National Register properties along Queen Street (the C. Brewer, Alexander and Baldwin, and Royal Brewery Buildings). Therefore, it does not represent a Section 4(f) avoidance.

Another alternative, suggested by the American Institute of Architects, would replace the elevated guideway through the downtown section with at-grade operation. The Project's third-rail technology could not be used at-grade in mixed traffic flow. Switching technologies for this section of the alignment would compromise reliability and maintenance and would not meet the operating parameters outlined in Chapter 2. Therefore, after careful consideration, it was determined that this alternative is not prudent and feasible.

Other, small shifts of the station entrance are not feasible because they would require the demolition of one of the high-rise office buildings that surround the parcel. In addition to considering small shifts of the station entrance, three more significant avoidance alternatives were considered. Each considers relocating the Downtown Station to avoid this Section 4(f) use (Figures 5-24 through 5-26).

Bishop Street

The Downtown Station could be moved 'Ewa to Bishop Street (Figure 5-24). This shift would require moving the entrance 60 feet closer to the Dillingham Building, creating a greater visual impact to this historic resource. In addition, the entrance serving the makai side of Nimitz Highway would impact Irwin Memorial Park, another Section 4(f) property. The station would overhang across Bishop Street and impact the Protected View Corridor (DPP 2004a). This potential avoidance alternative is not considered prudent because it would worsen the impact to the Dillingham Building, directly impact Irwin Memorial Park, and impact the Bishop Street Protected View Corridor.

Note that Bishop Street was originally considered for the Downtown Station entrance, but the additional impacts described above prompted a design shift Koko Head to its proposed location. Thus, the proposed location represents the avoidance and minimization of harm alternative to the original Bishop Street location.

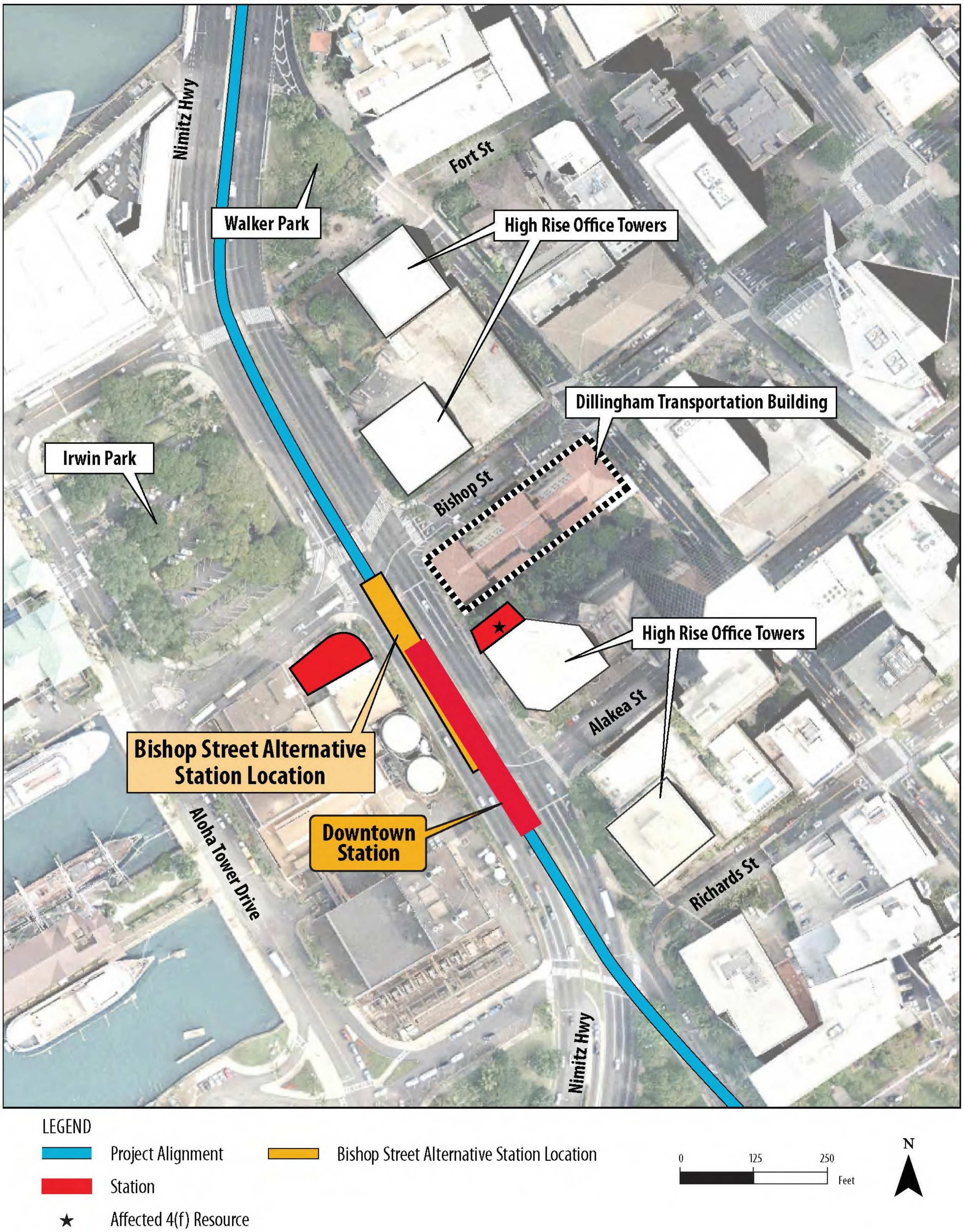

Figure 5-24 Dillingham Transportation Building and Avoidance Alternatives—Bishop Street Alternative

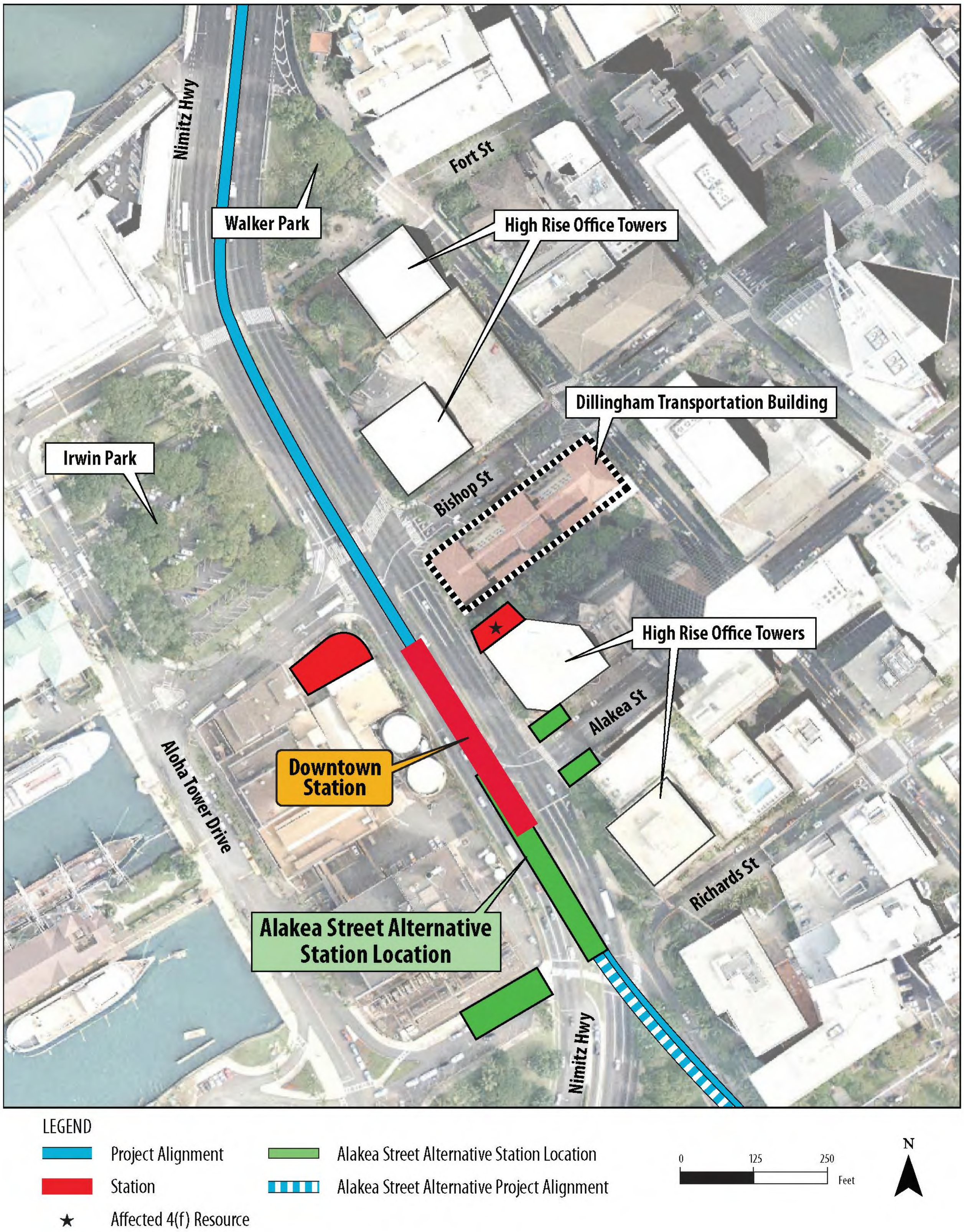

Figure 5-25 Dillingham Transportation Building and Avoidance Alternatives—Alakea Street Alternative

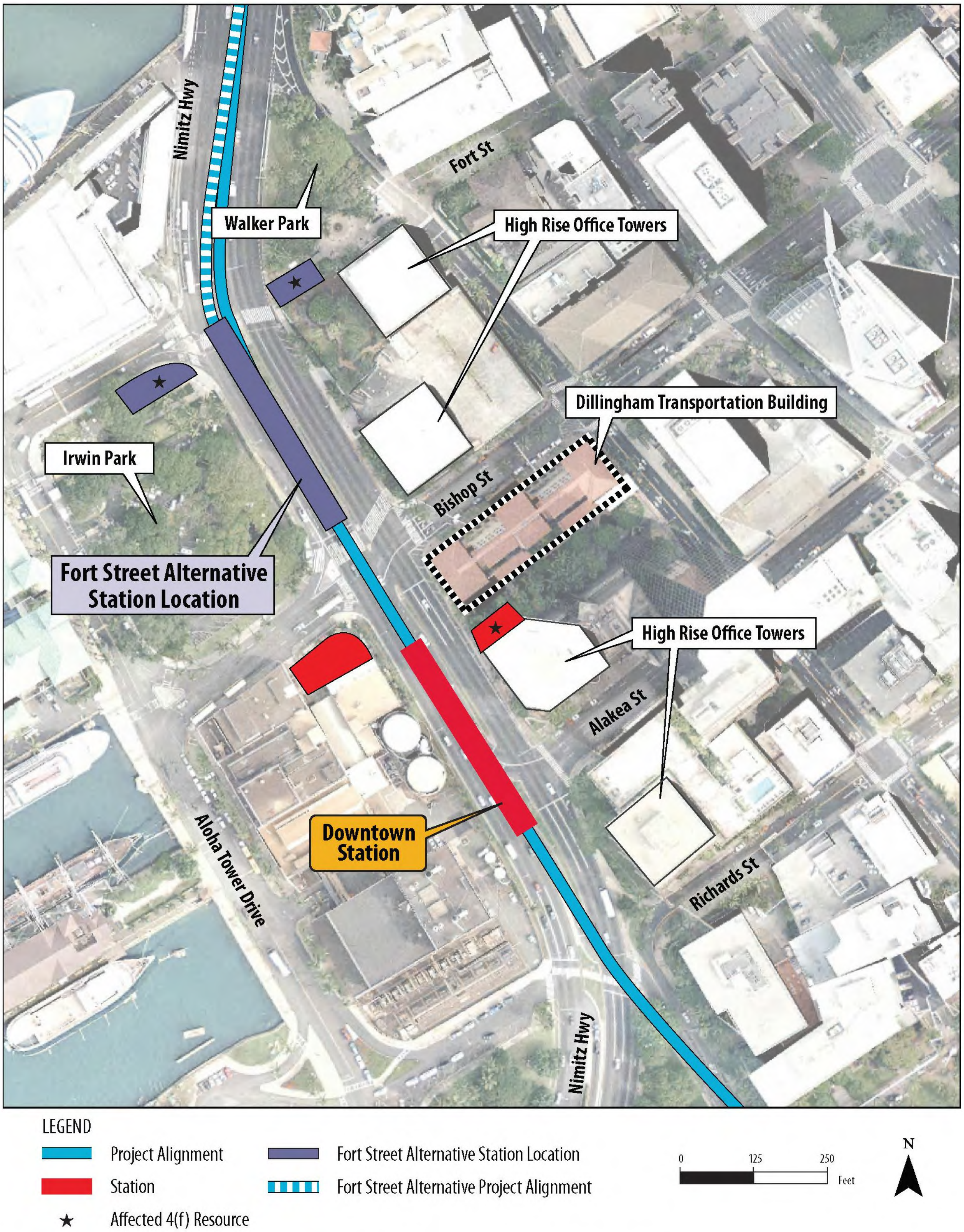

Figure 5-26 Dillingham Transportation Building and Avoidance Alternatives—Fort Street Alternative

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Alakea Street

Moving the station Koko Head and shifting the entrance to Alakea Street (Figure 5-25) were evaluated to avoid the historic parcel and to site them away from the Dillingham Transportation Building. Two options exist for the station entrance on Alakea Street. One option would be to locate the entrance on the ʻEwa side of the street, adjacent to the Pacific Guardian Center. The other would be to place the entrance on the Koko Head side of Alakea Street, adjacent to the Harbor Square building. Neither alternative is considered prudent and feasible for the reasons discussed below.

A station entrance adjacent to the Pacific Guardian Center (Figure 5-27) would force pedestrians to walk past the entrance to the building's parking garage. The garage is a busy facility for downtown commuters and has 760 parking stalls. This alternative would create an unsafe conflict between pedestrians and automobiles, with an average of 16 pedestrians crossing and 4 automobiles using the entrance each minute of the peak hour. For these reasons, a station entrance adjacent to the Pacific Guardian Center would create an unsafe conflict between pedestrians and automobiles at the Pacific Guardian Center parking garage and is not considered prudent.

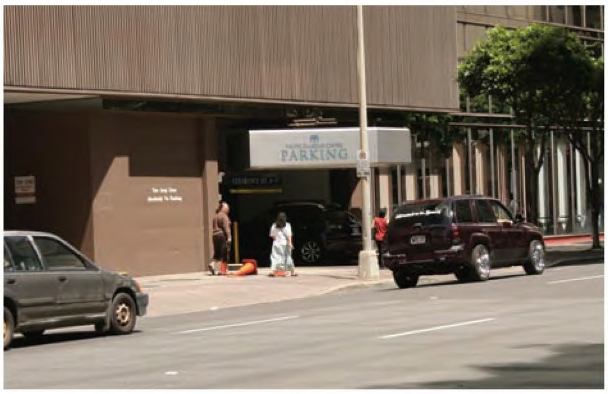

Figure 5-27 Entrance to Pacific Guardian Center

Placing the station entrance on the Koko Head side (Figure 5-25) presents many of the same problems. The Harbor Square building is a residential high-rise with a parking garage below (Figure 5-28). As with the ʻEwa side of the street, a station entrance at this location would create an unsafe conflict between pedestrians and automobiles using the parking garage. This is not considered prudent.

Figure 5-28 Parking Entrance at Harbor Square Building

In either case, the station entrance on the makai side of Nimitz Highway would also have to be moved about 500 feet Koko Head to Richards Street. This would place transit users farther from the primary destinations of the Waterfront and Aloha Tower Marketplace. It would force a longer walk along Nimitz Highway, which currently lacks a sidewalk, or along Ala Moana Boulevard.

Fort Street

The third alternative would move the station ʻEwa to Fort Street (Figure 5-26). Under this avoidance alternative, the entrances would be in Irwin Memorial Park on the makai side and either Walker Park or the Fort Street Mall on the mauka side.

However, this station location would require a 250-foot curve radius to maintain a minimum distance between the edge of the station platform and end of curve. A 250-foot curve radius is substantially less than the Project's design criteria

of 500 feet. Such a tight radius would necessitate reducing speeds to 5 to 10 miles per hour, which is substantially below the Project's design speed of 30 miles per hour. This would result in increased travel time and a substantial decrease in user benefits. Additionally, placing an entrance makai of Nimitz Highway would impact Section-4(f)-protected Irwin Memorial Park, and a mauka entrance would block either the Fort Street Mall or Walker Park, another Section 4(f) resource.
The Fort Street alternative would: (1) violate the Project's design standards, (2) reduce user benefits in a manner contrary to the Purpose and Need of the Project, and (3) impact additional Section 4(f) properties. For these reasons it is not considered a prudent avoidance alternative.

Agency Coordination and Consultation

Consultation among FTA, Hawai'i SHPD, and other Section 106 consulting parties is ongoing, as described in Chapter 8, Comments and Coordination. The impact of the Project has been deemed an Adverse Effect under Section 106 of the NHPA by the FTA and Hawaii's SHPD.

Measures to Minimize Harm

The station has been placed Koko Head of the Dillingham Transportation Building facade to minimize exposure to the building. As a result, there would be minimal use of property and no physical impact to the historic building. Mitigation under Section 106 of the NHPA would also serve to minimize harm.

5.5 Constructive Use of Section 4(f) Properties

5.5.1 Historic 4(f) Resources

Section 4(f) regulations, 23 CFR 774.15(a), states: "A constructive use occurs when the transportation project does not incorporate land from a Section 4(f) property, but the project's proximity impacts are so severe that the protected activities, features, or attributes that qualify the property for protection under Section 4(f) are substantially impaired." Therefore, for each of the six historic properties discussed in Section 5.4, Direct Use of Section 4(f) Properties, the use is determined to be a direct use, not a constructive use, because the Project would incorporate land from each one.

The Project would have an adverse effect at each of these six resources, and ongoing consultation is particularly focused on visual impacts of the proposed raised guideway. This is especially true at the Dillingham Transportation Building where the proposed Downtown Station would be built very close to this historic structure. Despite the adverse visual impact to this resource, its Section 4(f) use is considered a direct use because the Project requires right-of-way within the historic parcel, therefore precluding a constructive use determination. Mitigation for all adverse impacts will take visual effects into account.

In summary, the Project would not result in a constructive use of any historic Section 4(f) resources because:

- The Project would create a direct use at the Solmirin House, Afuso House, Higa Fourplex, Teixeira House, the Boulevard Saimin Restaurant, the True Kamani Trees along Dillingham Boulevard, and Dillingham Transportation Building because it would incorporate land into the transportation facility, therefore precluding constructive use (23 CFR 774.15(a)); and,
- The Project would have no adverse effect or no effect on the remaining historic Section 4(f) resources (23 CFR 774.15(f)1).

5.5.2 Parks and Recreation Resources

Table 5-1 lists nine parks or recreation areas considered for Section 4(f) use. As discussed in Section 5.4.1, the Project would create a direct use of two of them—Ke'ehi Lagoon Beach Park and Aloha Stadium (albeit a *de minimis* impact at Aloha Stadium). Because the Project would incorporate land from these two resources into the proposed facility, they constitute direct uses, which necessarily excludes constructive use, as described above and in 23 CFR 774.15(a). The remaining seven parks and recreation areas are considered for constructive uses.

23 CFR 774.15(d) states: "When a constructive use determination is made, it will be based upon the following:

1. Identification of the current activities, features, or attributes of the property which qualify for protection under Section 4(f) and which may be sensitive to proximity impacts;
2. An analysis of the proximity impacts of the proposed project on the Section 4(f) property. If any of the proximity impacts will be mitigated, only the net impact need be considered in this analysis. The analysis should also describe and consider the impacts which could reasonably be expected if the proposed project were not implemented, since such impacts should not be attributed to the proposed project; and
3. Consultation, on the foregoing identification and analysis with the official(s) with jurisdiction over the Section 4(f) property."

This constructive use analysis is focused on identifying potential proximity impacts that would substantially impair Section 4(f) properties. "Substantial impairment occurs only when the protected activities, features, or attributes of the property are substantially diminished (23 CFR 774.15(a))."

Table 5-1 lists the seven remaining 4(f) properties and identifies the current activities, features, or attributes of the properties that qualify them for protection under Section 4(f). Each of these properties is within an urban or semi-urban setting where major transportation facilities or commercial/industrial developments are present. Users have little to no expectation of high visual quality. While setting has some importance, these facilities do not derive their value in *substantial* part due to their setting.

West Loch Golf Course

West Loch Golf Course is a recreational golf course. The proposed guideway would be placed at the mauka end of the course, along the Farrington Highway. Although the guideway would introduce a new element, Farrington Highway is a major transportation corridor. The guideway would not substantially impair any distant or panoramic views, and would have limited effect on the area's scenic quality (Section 4.7). Therefore, the Project would not substantially impair aesthetic features that are important contributing elements of the property and would not create a constructive use from visual impairment.

Neal S. Blaisdell Park and `Aiea Bay State Recreation Area

Neal S. Blaisdell Park (Figure 5-29) and 'Aiea Bay State Recreation Area are located immediately makai of Kamehameha Highway. To the extent that the facilities derive any part of their value from their visual setting, all high quality views are makai, toward Pearl Harbor. In each case, the elevated guideway would be located along Kamehameha Highway, a 12-lane, major transportation corridor mauka of the parks. No views of the harbor would be obstructed. Therefore, the Project would not substantially impair aesthetic features that are important contributing elements of the property, and the Project would not be a constructive use of these properties.

Figure 5-29 Neal S. Blaisdell Park

Āliamanu Neighborhood Park

Āliamanu Neighborhood Park is located mauka of Salt Lake Boulevard, where the elevated guideway would be located (Figure 5-30). The park provides baseball, basketball, and tennis facilities and is sometimes used by pedestrians and joggers. The mauka end of the park is separated from Salt Lake Boulevard by a retaining wall about 15 feet high. The rest of the park is surrounded by commercial and residential development. The park does not derive a substantial part of its value from its visual setting. To the extent that the facility derives any part of its value from visual setting, the guideway would be located on the mauka side, above the 15-foot retaining wall. The only obstructed view would be of the Tesoro Gas Station.

Figure 5-30 Āliamanu Park, looking makai. Guideway would be above retaining wall.

Walker Park

Walker Park is a small park located in Downtown Honolulu, makai of Nimitz Highway (Figure 5-31). It is surrounded by high-rise buildings and the highway. The elevated guideway would be located in the median of the highway. The park provides shade in a busy downtown area and is primarily used by pedestrians walking through Downtown. It does not provide any benches, picnic tables, or other amenities and does not derive a substantial part of its value due to its visual setting. Although the Aloha Tower is makai of the park, the Project's impact on surrounding views would be limited, as the park is situated within an urban core. Therefore, the Project would not substantially impair aesthetic features that are important contributing elements of the property, and the Project would not be a constructive use of this property.

Figure 5-31 Walker Park

Irwin Memorial Park

Irwin Memorial Park is a publicly owned park in Downtown Honolulu (Figure 5-32). It is most commonly used for parking and lunch breaks in a busy urban setting. To the extent that it derives any part of its value from its visual setting, all high-quality views are makai toward Honolulu Harbor and the Aloha Tower. The Project is proposed for the mauka side of the park and recreation areas. As a result, most obstructed views would be of high-rise office buildings. The guideway would run between this park and the Dillingham Transportation Building (Figure 5-33). However, since the park does not derive a substantial part of its value from its visual setting and is already bordered by a seven-lane highway, the Project would not substantially impair aesthetic features that are important contributing elements of the property, and the Project would not be a constructive use of this property.

Figure 5-32 Irwin Memorial Park

Figure 5-33 Nimitz Highway/Fort Street Intersection `Ewa of Irwin Memorial Park and Aloha Tower Market Place, looking Koko Head

Mother Waldron Park

Mother Waldron Park is in a commercial and industrial area. The park is surrounded by commercial buildings and an apartment building and does not derive a substantial part of its value from its visual setting. To the extent that the park derives any part of its value from its visual setting, the guideway would be located on the mauka side, in front of 610 Cooke Street (Figure 5-34). Therefore, the Project would not substantially impair any aesthetic features that are important contributing elements of the property, and the Project would not be a constructive use of this property.

Figure 5-34 Halekauwila Street/Cooke Street Intersection, looking Mauka past Mother Waldron Park

5.5.3 Refuges and Restriction of Access

None of the Section 4(f) resources along the alignment are wildlife or waterfowl refuges and, therefore, impacts due to ecological intrusion are not applicable. Likewise, the Project's design would not restrict access to any Section (4)f property.

Vibration impacts are expected to be low or absent throughout the entire corridor (Section 4.9). Similarly, noise analysis indicates no more than moderate impacts along the alignment. Therefore, as described in 23 CFR 774.15(f), no constructive uses to any Section 4(f) resources would result from these potential impacts (see Table 5-3).

23 CFR 774.15(d)2 states that the constructive use analysis "should also describe and consider the impacts which could reasonably be expected if the proposed project were not implemented, since such impacts should not be attributed to the proposed project." Because many of these parks are located within urban or commercial areas, it is reasonable to expect continued development will contribute visual impairment that compromises the setting of these parks. In particular, the Hawai'i Community Development Association Master Plan allows for conversion of the area surrounding Mother Waldron Park to mid- and high-rise mixed-use buildings (HCDA 2005).

5.5.4 Summary

In summary, there would be no constructive use of Section 4(f) resources. For historic properties, regulations prohibit a constructive use determination when the proposed action would incorporate land into the transportation facility, or when a No Adverse Effect finding is applicable via Section 106 consultation. These two conditions cover all historic Section 4(f) properties along the corridor. This determination does not deny the potential for indirect or proximity impacts to historic properties, which have been a focus of Section 106 consultation.

Regarding other types of Section 4(f) resources, there are no wildlife or waterfowl refuges along the corridor and, therefore, there would be no proximity impacts from ecological intrusion. The Project would not restrict access to any Section 4(f) resources.

Vibration and noise impacts along the corridor range from negligible to moderate and do not rise to the level of "substantial impairment." Few, if any, of the Section 4(f) parks and recreation areas derive a substantial part of their value through their visual setting. Rather, they are used for games and sports, picnics, and parking. Visual impacts, while present, would not substantially impair any aesthetic features that are important contributing elements of the property. For these reasons, the Project would not result in a constructive use of any Section 4(f) resource.

5.6 Temporary Use or Occupancy of Section 4(f) Properties

Section 5.1.1 defines temporary use of Section 4(f) properties. The Project does not include any temporary use of Section 4(f) properties, nor do project plans include any temporary occupancy of Section 4(f) properties.

5.7 Determination of Section 4(f) Use

Considering the foregoing discussion of the Project's potential use of Section 4(f) resources, avoidance alternatives, and measures to minimize harm, there would be a direct use (not *de minimis*) of seven historic 4(f) properties. For all Build Alternatives, the use of these seven properties would be identical. The Airport and Airport & Salt Lake Alternatives would create one additional use of Ke'ehi Lagoon Beach Park. There would be an additional five or six *de minimis* uses, depending on the alternative selected (Table 5-3).

For this Project, the Airport and Airport & Salt Lake Alternatives impact Ke'ehi Lagoon Beach Park. This means that the Salt Lake Alternative would have less Section 4(f) impact than any other alternative; however, the Salt Lake Alternative would not serve the airport. In situations where all Build Alternatives use Section 4(f) properties, "the Administration may approve only the alternative that causes the least overall harm in light of the statute's preservation purpose. The least overall harm is determined by balancing the following factors:

- The ability to mitigate adverse impacts to each Section 4(f) property (including any measures that result in benefits to the property);
- The relative severity of the remaining harm, after mitigation, to the protected activities, attributes, or features that qualify each Section 4(f) property for protection;
- The relative significance of each Section 4(f) property;
- The views of the official(s) with jurisdiction over each Section 4(f) property;
- The degree to which each alternative meets the Purpose and Need for the Project;
- After reasonable mitigation, the magnitude of any adverse impacts to resources not protected by Section 4(f); and
- Substantial differences in costs among the alternatives. (23 CFR 774.3(c)1)"

All Build Alternatives meet Purpose and Need. For historic resources, the alternatives only differ by one *de minimis* use. No mitigation is required for the one *de minimis* use because the Section 106 effect is "No Adverse Effect." Therefore, all mitigation under each alternative would be identical.

Least Overall Harm

Because the use of Ke'ehi Lagoon Beach Park is the only difference in non-*de minimis* Section 4(f) resource use between the alternatives, and because the Section 4(f) value of the park would be enhanced, all three alternatives would be about equal in impact to Section 4(f) resources. For Ke'ehi Lagoon Beach Park, consultation has identified mitigation measures and potential benefits. Consultation is ongoing with regard to the measures are discussed below.

The Project would pass above 2.8 acres and affect tennis courts and parking stalls (Figure 5-4). Minimally, impacts to the tennis courts would be mitigated by moving them makai of their current location. This provides a better setting by moving them away from the H-1 Freeway. Consultation with DPR has considered other kinds of athletic amenities in lieu of moving the tennis courts, such as bleachers, and improvements to the park's ballfield.

The Project would provide compensatory mitigation for the loss of park amenities, and the park would benefit by moving parking under the guideway. This would provide shade where existing parking is currently exposed. This effort would also include providing shade trees or awnings for picnic tables, most of which are currently underused because they are exposed to the sun.

As a result, the Project would provide compensatory mitigation for all impacts to the park and include improvements for users of the park that would provide for a more enjoyable experience. After the mitigation and improvements are provided to the park, the severity of the remaining harm would be low.

These benefits would provide greater recreational value to the park's users and enhance the elements and attributes that qualify the park for Section 4(f) protection.

5.8 Mitigation

Section 4.15, Archaeological, Cultural, and Historic Resources, discusses mitigation for historic properties, and Section 4.17, Construction Phase Effects, discusses mitigation of construction-related impacts. At the conclusion of the Section 106 consultation process, a Memorandum of Agreement will be completed that describes mitigation for adverse effects to historic properties. All Section 106 consulting parties will be invited to participate in the creation of the Memorandum of Agreement.

06
CHAPTER

Cost and Financial Analysis

This chapter presents estimates for capital and operating and maintenance (O&M) costs for the No Build and Build Alternatives. These cost estimates are based on conceptual engineering and operations analysis that followed the Honolulu High-Capacity Transit Corridor Project's Alternatives Analysis phase. This chapter also presents a financing plan for the Project.

Year-of-expenditure dollar cost estimates include assumed inflation between today and the expected date of the expenditure.

2007 dollar cost estimates reflect prices in fiscal year 2007.
2008 dollar cost estimates reflect prices in fiscal year 2008.

This financial analysis only considers costs, resources, and funding strategies associated with public transit services provided by the City. Unless otherwise stated, costs and revenues in this chapter are presented in fiscal year (FY) 2007 dollars and/or year-of-expenditure (YOE) dollars. The forecast period referred to is between 2007 and 2030. For the City and County of Honolulu (City), the fiscal year begins on July 1 and ends on June 30 (e.g., FY2007 is from July 1, 2006, to June 30, 2007). In this chapter, all year references are to fiscal years.

6.1 Cost Estimate Methodology

6.1.1 Capital Costs Methodology

The capital cost estimate is the total cost of implementing the Project. It is based on standard cost categories the Federal Transit Administration (FTA) created in establishing a consistent format for reporting, estimating, and managing capital costs for New Starts projects. This method allows for the summary of quantities to be tracked during the Project's follow-on design phases. These categories follow:

- **Guideway and Track Elements**—includes construction of the guideway structure and all supportive structural elements, including preparatory work, track work, and special track work elements.
- **Stations, Stops, Terminals, Intermodals**—includes rough grading, excavation, ventilation structures and equipment, station power and lighting, and other station elements.

- **Support Facilities**—includes construction of and equipment for support facilities (yards, shops, and administrative buildings).
- **Site Work and Special Conditions**—includes capital costs for unique or non-typical elements. Elements that address project-wide construction activities include clearing, demolition, fine grading, and other earthwork items outside the guideway limits.
- **Systems**—includes traction power, traction power substations, signals, crossing protection, communications, the fare collection system, equipment, and central control.
- **Right-of-Way, Land, and Existing Improvements**—includes securing and providing all property rights and relocations.
- **Vehicles**—includes rail rolling stock and support vehicles.
- **Professional Services (Soft Costs)**—includes engineering and design services, project management for design and construction, and other design-related activities.
- **Unallocated Contingency (Project Reserve)**—includes contingency that applies to the overall project and cannot be applied to a specific standard cost category.
- **Finance Charges**—includes costs related to financing the Project, including interest and bond issuance costs.

In this chapter, the cost estimates for specific items are based on typical construction practices and procedures on similar projects. Quantities are estimated based on service plans and conceptual engineering performed to date. Estimated costs for each standard cost category were increased in accordance with FTA guidance for estimates developed prior to preliminary engineering, to account for unknown but expected additional expenses.

Inflation was applied to the cost estimate based on the Project's implementation schedule (Figure 2-42 in Chapter 2). The forecast of inflation is based on the Consumer Price Index for all Urban Consumers (CPI-U), as determined by the Hawai'i Department of Business, Economic Development, and Tourism. A consistent set of inflation assumptions has been applied to all costs and revenues. Early capital costs were escalated at an annual rate of 1.1 percent above the CPI-U in FY2009 and by an annual rate of 0.4 percent above the CPI-U in FY2010, to reflect the uncertainty of some near-term labor and material costs.

The capital cost estimate of implementing each Build Alternative is presented in Table 6-1. Capital cost estimates, excluding finance charges, range from $3.9 billion for the Salt Lake Alternative to $4.8 billion for the Airport & Salt Lake Alternative in fiscal year 2008 dollars. The capital cost for the Airport Alternative is estimated to be about $200 million higher than the Salt Lake Alternative.

6.1.2 Operating and Maintenance Cost Methodology

Fixed Guideway Operating and Maintenance

O&M costs for the Build Alternatives were estimated based on historical O&M costs for existing rail transit systems that have similar characteristics to the Project, including Washington, D.C. (WMATA), Miami, and Los Angeles. These costs were adjusted to reflect O'ahu's higher costs of goods and services, where appropriate.

TheBus and TheHandi-Van Operating and Maintenance

A cost allocation model was used to estimate O&M costs for each bus system component. For each Build Alternative, bus system O&M costs reflect current costs for TheBus, the transit service plan, and anticipated inflation.

6.2 Capital Plan

The capital plan analyzes capital expenditures for each Build Alternative and for ongoing systemwide capital costs. The capital plan reflects the costs and revenues related to implementing the Project and

Table 6-1 Capital Cost Estimates for the Build Alternatives by Cost Category (millions of 2008 and YOE dollars)

Cost Categories	Salt Lake Alternative		Airport Alternative		Airport & Salt Lake Alternative	
	2008 $M	YOE $M	2008 $M	YOE $M	2008 $M	YOE $M
Guideway construction	$1,239	$1,522	$1,300	$1,547	$1,633	$1,961
Station construction	255	328	297	359	325	396
Yard, shops, and support facilities	120	137	120	138	120	138
Site work and special conditions	668	781	664	763	732	849
Systems	239	307	272	341	329	417
Right-of-way	137	159	150	174	157	183
Vehicles	286	355	295	357	295	357
Professional services	756	937	795	972	941	1,129
Unallocated contingency (project reserve)	221	270	232	278	271	324
Total Cost Excluding Finance Charges	**$3,921**	**$4,797**	**$4,125**	**$4,927**	**$4,803**	**$5,753**
Finance charges	356	479	378	506	538	727
Total Cost	**$4,277**	**$5,276**	**$4,503**	**$5,433**	**$5,341**	**$6,480**
Project cost (construction, vehicles, right-of-way, soft costs)	$3,100	$3,824	$4,263	$3,897	$3,796	$4,546
Contingency	821	973	862	1,030	1,007	1,206
Total Cost Excluding Finance Charges	**$3,921**	**$4,797**	**$4,125**	**$4,927**	**$4,803**	**$5,753**

Totals may not add due to rounding.

maintaining the bus and fixed guideway systems in a state of good repair.

6.2.1 Capital Costs

Capital costs for all Build Alternatives are presented in Table 6-2.

The estimates include ongoing costs for replacing, rehabilitating, and maintaining capital assets in a state of good repair throughout the forecast period (2007 to 2030). Rail rehabilitation and replacement costs are expected to begin 16 years after initial construction activities are completed.

Current bus service would be restructured and expanded to support general growth in service. To support this, the number of buses operating during peak periods is expected to grow from 435 in FY2007 to 469 in FY2030. Assuming that 20 percent of the bus fleet is held in reserve would increase the total bus fleet from the current 540 buses to about 563 by FY2030. TheHandi-Van fleet is expected to grow from 146 vehicles in FY2007 to 185 in FY2030.

Figure 6-1 summarizes capital costs for all transit travel modes through the forecast period. It includes an expenditure of $129 million (YOE $) for bus facilities that are not part of the Project, as programmed in the O'ahu Metropolitan Planning Organization's (O'ahuMPO) *FYs 2008–2011 Transportation Improvement Program* (O'ahuMPO 2008).

6.2.2 Proposed Capital Funding Sources for Build Alternatives

This section describes the various funding sources assumed for implementation of the Project and for the system's ongoing capital needs. These sources include General Excise and Use Tax (GET)

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Table 6-2 Overview of Capital Expenditures through 2030 (millions of 2008 and YOE dollars)

Alternative		Fixed Guideway Implementation	Fixed Guideway Rehabilitation and Replacement	TheBus and TheHandi-Van Expansion and Replacement	Total
No Build	2008 $M	$0	$0	$978	$978
	YOE $M	$0	$0	$1,421	$1,421
Salt Lake	2008 $M	$3,921	$59	$902	$4,867
	YOE $M	$4,797	$113	$1,305	$6,182
Airport	2008 $M	$4,125	$62	$902	$5,084
	YOE $M	$4,927	$116	$1,305	$6,336
Airport & Salt Lake	2008 $M	$4,803	$73	$902	$5,767
	YOE $M	$5,753	$136	$1,305	$7,173

Totals may not add due to rounding.

surcharge funds, FTA New Starts revenues, and other Federal assistance programs for ongoing capital needs, complemented by local assistance.

General Excise and Use Tax Surcharge

The local funding source for the Project is a dedicated 0.5-percent surcharge on the State of Hawai'i's GET. In 2005, the Hawai'i State Legislature authorized counties to adopt this surcharge for public transportation projects. Following this authorization, the City enacted Ordinance 05-027 establishing a 0.5-percent surcharge on the GET collected in the City and County of Honolulu to be levied through December 31, 2022. This revenue is to be exclusively used for the Project's capital and/or operating expenditures and could be used to back General Obligation Bonds as needed for the Project. GET surcharge revenues are estimated to be $4,054 million (YOE $) through FY2023.

FTA Section 5309 New Starts Program (49 USC 5309)

The FTA's discretionary New Starts program is the primary Federal source of funds for supporting fixed guideway transit projects. This financial analysis assumes the Project would receive $1.2 billion (YOE $) for the Salt Lake Alternative and $1.4 billion (YOE $) for the Airport and Airport & Salt Lake Alternatives from the New Starts program. FTA has agreed to consider a funding request of $1.2 billion but has not been approached regarding a higher level.

City General Obligation Bonds

This financial analysis assumes that General Obligation Bonds would be the main financial instrument used by the City to finance the Project. This funding source would be required to bridge funding gaps in any given year and would be repaid by the revenue sources described in previous sections. General Obligation Bonds are direct obligations of the City, for which its full faith and credit are pledged. Section 6.4, Cash Flow Analysis, provides further details on financing assumptions for the Project.

6.2.3 Funding Sources for Ongoing Capital Expenditures

Federal Assistance

The City receives Federal assistance for ongoing transit capital investments through various funding programs from the FTA. The three main sources of Federal funds for ongoing capital expenses are as follows:

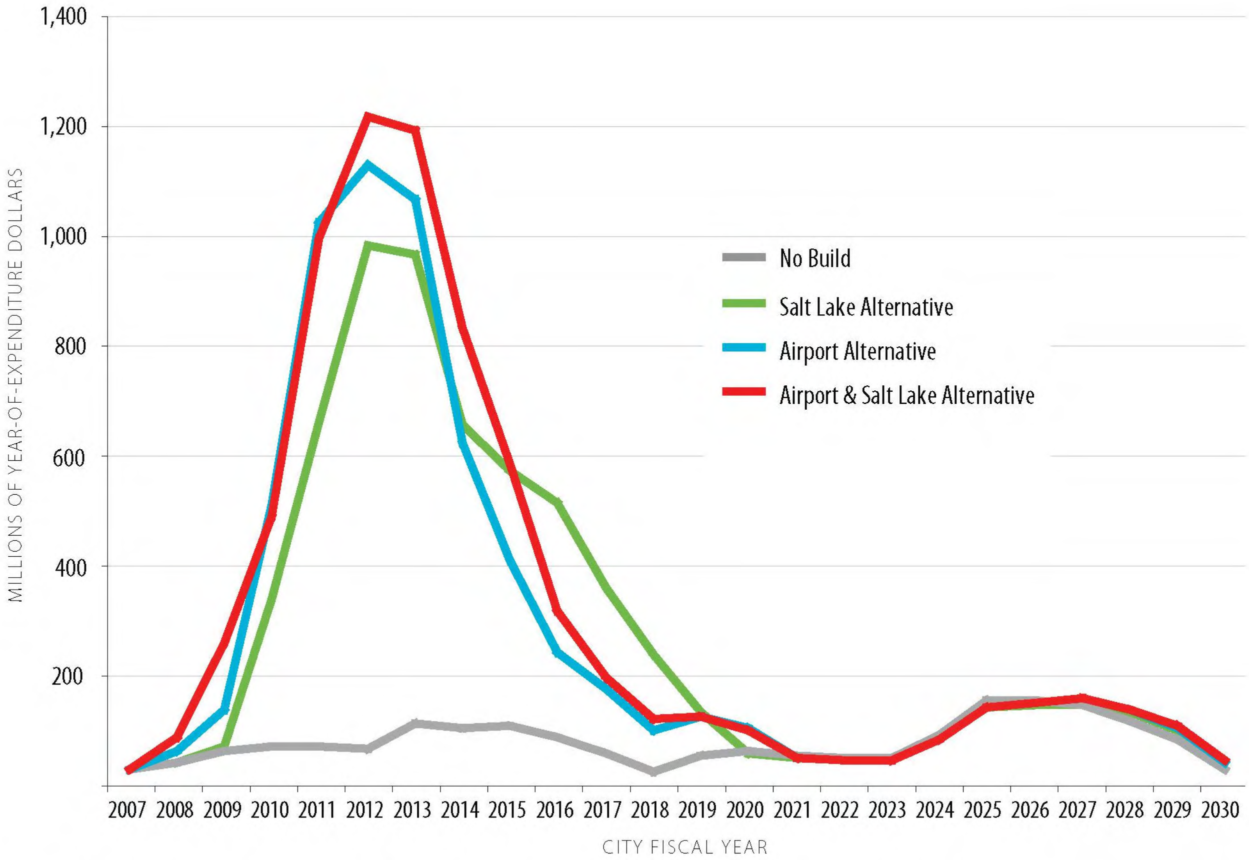

Figure 6-1 Total Capital Expenditures by Alternative (Excluding Finance Charges) FY2007–FY2030 (YOE $M)

- **FTA Urbanized Area Formula Program (49 USC 5307)**—these funds are distributed to the Honolulu and Kailua-Kāne'ohe urbanized areas using a formula set by law. Activities eligible for Section 5307 funds include capital investments in bus and bus-related activities (e.g., the replacement of buses, overhaul of buses, rebuilding of buses, crime prevention and security equipment, and construction of maintenance and passenger facilities). The total amount of Section 5307 funds received by the City through FY2030 would depend on the alternative selected and would amount to approximately $1.0 billion (YOE $).
- **FTA Capital Investment Grants (49 USC 5309): Fixed Guideway Modernization Program**—these funds are distributed using a formula specified by law. Implementation of the Project would increase Fixed Guideway Modernization funds for Honolulu because the formula is largely based on the number of fixed guideway miles. Total Section 5309 Fixed Guideway Modernization funding is expected to be approximately $120 million (YOE $) through FY2030.
- **FTA Capital Investment Grants (49 USC 5309): Bus and Bus-Related Equipment and Facilities Capital Program**—these funds are distributed on a discretionary basis. All bus-related elements of the Project are eligible for bus capital funds. It is assumed that Honolulu's bus capital allocations between 2008 and 2030 will be equal to the average of the allocations between 1996 and 2008 ($6 million per year). Total Section 5309 bus funding is expected to be $132 million (YOE $) through FY2030.

City General Obligation Bonds

The City currently issues General Obligation Bonds to finance ongoing transit capital expenses. This includes TheBus and TheHandi-Van purchases, construction of facilities and transit centers, and other public transportation capital improvements. The financial analysis assumes that the City will continue to use General Obligation Bond proceeds to match Federal contributions and finance ongoing systemwide capital expenditures. This would correspond to approximately $267 million (YOE $) in General Obligation Bond proceeds through FY2030.

No private source of capital revenue was assumed to fund the Project. Opportunities for joint development or other forms of public-private partnerships could affect the amount needed from the City or could help fund construction of additional sections of the Project.

6.3 Operating and Maintenance Plan

This section discusses the data and unit costs used to calculate O&M needs and the sources and uses of operating funds through FY2030 by alternative.

6.3.1 Operating and Maintenance Costs

Table 6-3 summarizes O&M costs in 2030 for each Build Alternative, by travel mode. Total O&M costs for the Salt Lake Alternative would be $109 million (YOE $) greater than for the No Build Alternative in 2030. The O&M costs for the Airport and Airport & Salt Lake Alternatives would be $119 and $172 million (YOE $) greater than the No Build Alternative, respectively.

The fixed guideway system's operating costs are anticipated to be 24 percent of total O&M costs for the public transportation system in FY2030. O&M costs would increase in a step-like manner as operable segments are opened for revenue service, until the entire alignment is completed in FY2018.

6.3.2 Operating and Maintenance Funding Sources

This section describes the range of O&M funding sources anticipated. These sources include FTA Section 5307 funds for preventive maintenance, fare revenues, and transit contributions from the City's General and Highway Funds.

Federal Funding

Section 5307 funds were first applied to capital needs, with the remainder going to preventive maintenance. Based on historical trends, it is assumed that a maximum of 20 percent of annual O&M expenditures would be associated with preventive maintenance, and thus could be covered by Section 5307 funds.

In FY2008, the Honolulu and Kailua-Kāne'ohe urbanized areas were apportioned a combined $29 million in Section 5307 formula funds by FTA. This amount is expected to increase to $31.5 million in FY2009 based on current authorization levels. Over the longer term, the City is expected to receive a total of approximately $1.0 billion (YOE $) through FY2030 from this funding program, $650 million of which is assumed to be used for capital needs and the remainder going to preventive maintenance.

Fare Revenues

Approximately 273,000 linked trips per day are forecast in 2030. The fare structure for the fixed guideway is assumed to follow the current bus fare structure, with transfers between modes assumed to be free. This would yield fare box revenues ranging from $41 million in FY2007 to $140 million (YOE $) in FY2030.

To maintain consistency with the travel demand analysis, the actual 2007 average fare of $0.77 per linked trip was assumed to grow with inflation throughout the forecast period. Figure 6-2 shows the annual fare revenues (in YOE $) expected for

Table 6-3 2030 Operating and Maintenance Cost by Alternative, by Mode

Alternative	TheBus		Fixed Guideway		TheHandi-Van		Total		Difference from No Build	
	YOE $M	2007 $M	YOE $M	2007 $M	YOE $M	2007 $M	YOE $M	2007 $M	YOE $M	2007 $M
No Build	$363	$186	—	—	$48	$25	$411	$211	—	—
Salt Lake	$348	$179	$123	$63	$48	$25	$519	$267	$109	$56
Airport	$349	$179	$133	$68	$48	$25	$530	$272	$119	$61
Airport & Salt Lake	$348	$179	$187	$96	$48	$25	$583	$300	$172	$88

Totals may not add due to rounding.

the Project's Salt Lake Alternative; revenues for the other Build Alternatives would be similar. Fares would likely be increased in steps consistent with historical practice. In 2001, the City Council adopted a resolution to adjust fare levels so that the fare box recovery ratio (the ratio of annual fare revenues to annual O&M costs) for TheBus would be maintained between 27 and 33 percent in any given year. The assumed average fare discussed previously would result in a fare box recovery ratio for the combined bus and fixed guideway systems that follows the City's resolution in most years, including 2030 when the ratio is expected to equal about 30 percent.

City Contribution

The City's contribution to transit O&M is currently funded using revenues from the General and Highway Funds. The General Fund mainly comprises real property tax revenues, but also includes revenues from a transient accommodations tax (transferred from the State), motor vehicle annual registration fees, and a public service company tax. The Highway Fund consists of revenues from the City fuel tax, the vehicle weight tax, and a public utility franchise tax. General and Highway Fund revenues were assumed to increase by the CPI-U inflation rates (as defined in Section 6.3.1, Operating and Maintenance Costs) plus 1.5 percent, which reflects the historical real growth rate of General and Highway Fund revenues.

Between FY1994 and FY2002, the transit subsidy has averaged 11 percent of the total Highway and General Fund revenues. Since 2003, City revenues have increased, as a result of large increases in real estate values on O'ahu, more quickly than O&M costs for TheBus. This has resulted in a transit subsidy below 10 percent. Figure 6-3 shows that this percentage is likely to increase through FY2030, averaging 14 percent over the entire forecast period with the Build Alternatives.

The City receives about $375,000 annually in transit-related advertising revenues, but this analysis is conservative and does not assume operating revenues from advertising or parking. In the event that more of these revenues are made available, the City's required operating subsidy would be proportionally lower.

6.4 Cash Flow Analysis

The cash flow analysis compares costs with revenues on a year-by-year basis, factoring in financing as necessary. Table 6-4 summarizes funding sources and the use of funds for each Build Alternative over the forecast period. The *Honolulu High-Capacity Transit Corridor Project Summary Cash Flow Tables* (RTD 2008s) present the year-by-year cash flow tables for the Build Alternatives.

6.4.1 Financing Assumptions for the Project

This financial analysis assumes that GET surcharge revenues would be the only source of funding

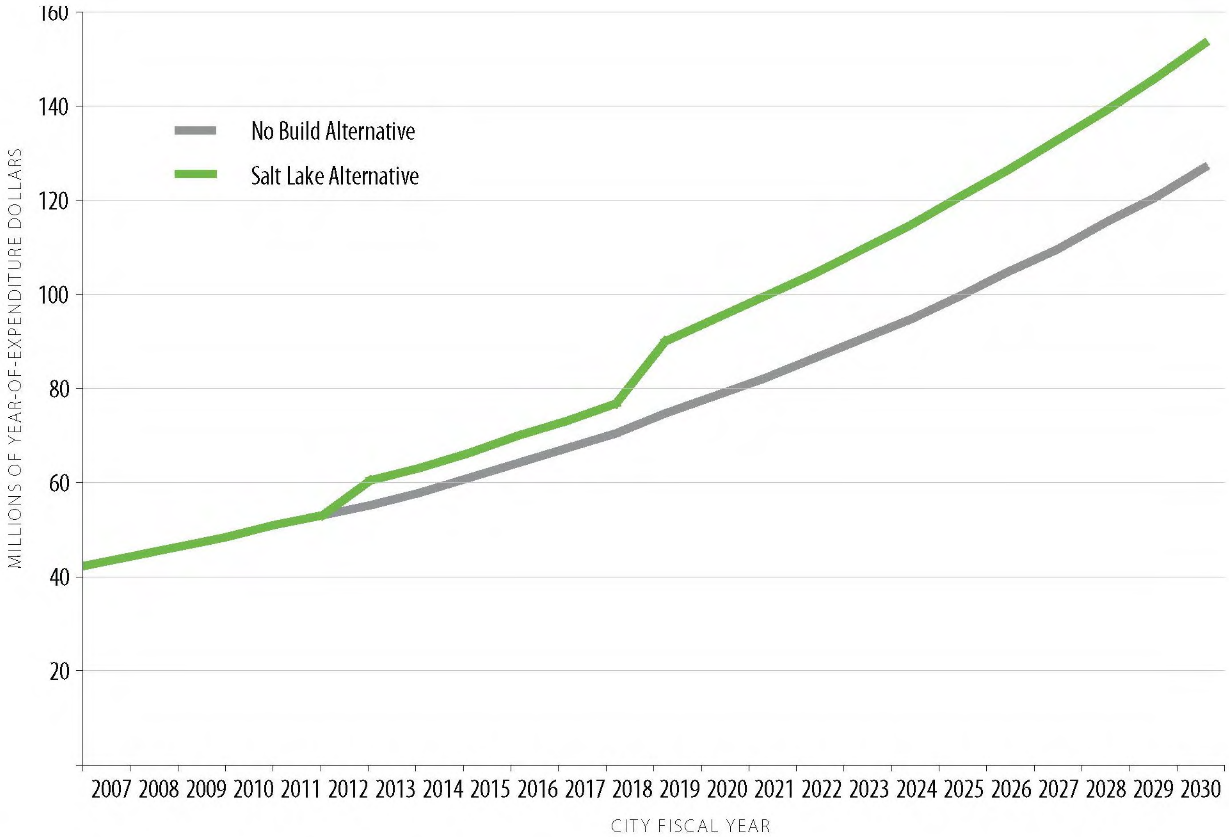

Figure 6-2 Systemwide Fare Revenues for the Salt Lake and the No Build Alternatives (YOE $M)

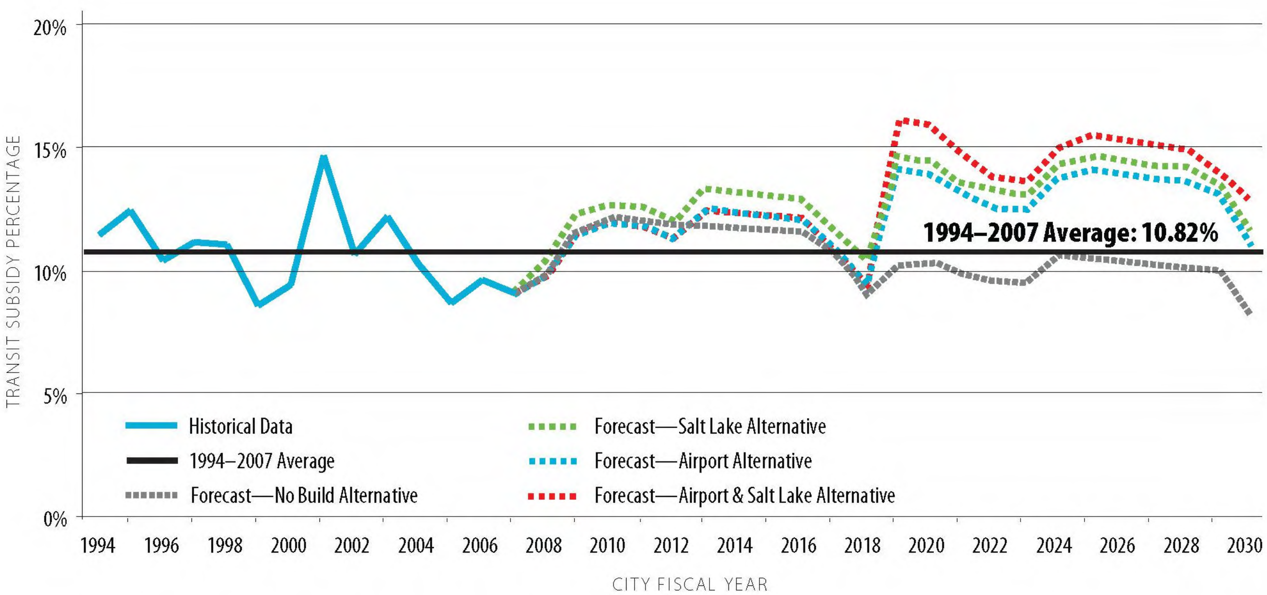

Figure 6-3 Projected Transit Contribution from the General Fund

Table 6-4 Project Sources and Uses of Capital Funds by Alternative (Millions of YOE Dollars)

	Salt Lake Alternative (YOE $M)	Airport Alternative (YOE $M)	Airport & Salt Lake Alternative (YOE $M)
GET and New Starts (PAYGO Only)	$2,564	$2,622	$1,001
GO bond proceeds	$2,255	$2,329	$3,707
Project Sources	**$4,819**	**$4,951**	**$4,707**
Project capital cost (excluding finance charges)	$4,797	$4,927	$5,753
Issuance cost on GO bonds	$23	$23	$37
Project Uses	**$4,819**	**$4,951**	**$5,790**
Surplus/(Shortfall)	$0	$0	($1,083)

Totals may not add due to rounding.

through FY2012, with FTA New Starts funding starting in FY2013.

In years when GET surcharge revenues and/or New Starts funding would not be sufficient to meet the cash flow requirement to cover capital expenditures, a mix of City General Obligation Bonds and short-term borrowing would be used to bridge the funding gap. The weighted average interest rate on long-term debt is assumed to be 3.71 percent, which is consistent with the City's current AA financial rating and based on rates as of July 17, 2008. All General Obligation debt is assumed to mature in FY2023, corresponding to the last fiscal year of receipt of GET revenues.

The finance charges incurred for each Build Alternative would range from $479 million for the Salt Lake Alternative to $727 million (YOE $) for the Airport & Salt Lake Alternative. Most of these finance charges would correspond to interest payments on General Obligation Bonds. The remainder would include finance charges related to the cost of issuance of General Obligation Bonds and short-term debt and the interest expense on commercial paper proceeds.

Interest would be earned on any positive year-end cash balances, which has been calculated at 3 percent per year. Interest income is expected to range from $9 million for the Airport & Salt Lake Alternative to $32 million for the Airport Alternative (YOE $).

6.4.2 Project Cash Flow

The Salt Lake and Airport Alternatives would be financially feasible. The primary difference between them is the amount of Federal funding assumed in the capital plan. The Salt Lake Alternative is based on $1.2 billion of Federal funding and the Airport Alternative would require $1.4 billion. The Airport & Salt Lake Alternative would require much higher revenues from the GET surcharge and/or New Starts funding to be financially viable. While FTA has agreed to consider a funding request of $1.2 billion, the agency has not been approached to consider the $1.4 billion for the Airport Alternative. Should additional New Starts funding not be available, other funding would be necessary.

Airport Connection

The Airport & Salt Lake Alternative could be constructed in phases, with completion of the guideway between East Kapolei and Ala Moana Center along Salt Lake Boulevard followed by a connection from the Middle Street Transit Center to the airport. Additional funding would be required to build the phased airport connection. The cost of this alternative phasing would be somewhere between the costs of the Salt Lake and Airport Alternatives. Therefore, this could be a more feasible short-term option for serving the airport than building the Airport & Salt Lake Alternative.

6.4.3 Ongoing Capital Expenditure Cash Flow

Systemwide ongoing capital expenditures include all necessary replacement, rehabilitation, and improvements to the existing system (TheBus and TheHandi-Van) as well as the Project. Funding sources used to pay for these capital expenses consist of discretionary and formula-based Federal funding programs (see Section 6.2.3, Funding Sources for Ongoing Capital Expenditures, for descriptions of these programs). Any resulting funding gap is assumed to be bridged on an annual basis with City General Obligation Bonds, as is currently the case with transit-related budgets. Therefore, the resulting ongoing capital sources and uses would balance in any given year.

6.4.4 Operating and Maintenance Expenditure Cash Flow

O&M funds would be used for the bus and paratransit system as well as for the Project. Sources of O&M funds include fare box revenues and Federal grants, and any remaining funding requirements are assumed to be funded through City subsidies from its General and Highway Funds. The resulting operating sources and use of funds would balance in any given year. The Summary Cash Flow Tables (RTD 2008s) include year-by-year ongoing operating expenditure cash flows.

6.5 Risks and Uncertainties

The financial analysis described in this chapter and the sources and uses of funds are subject to a number of risks and uncertainties. Some risks are project specific and others are related to macro-level uncertainties affected by the local and global economies. Although this analysis has defined a set of most-likely scenarios based on the cost, revenue, funding, and financing assumptions described, several operating and capital risks could materially affect the final financial results. Uncertainties can be organized into the following major categories.

6.5.1 Project Cost Risks

Changes in Project Scope

As the Project progresses through the planning stages and more information is gathered, differences in construction costs could occur. Cost increases could be due to unexpected soil conditions and geotechnical issues, the need for unexpected utility relocations, the presence of unanticipated groundwater and other environmental impacts and mitigation measures, and changes stemming from the community involvement process.

Changes in Project Schedule

Schedule delays could be related to unforeseen construction challenges, local decision-making processes, equipment malfunctions, or general construction delays. Although a longer construction period would translate into a greater exposure to inflationary risk, this may be somewhat mitigated by a better match between available sources and uses of funds, which would reduce the amount of borrowing required.

Operating Cost Increases

Potential increases in labor, fuel, electrical rates, and other key variables that comprise operating expenses could have a material impact on O&M costs. As an example, fuel costs have risen drastically in the past year and continue to go up. Differences in bus and rail operating costs are possible, due to differences in technology and variations in labor productivity and unit costs between the two modes.

System Operation

Project costs have been estimated assuming that trains would operate with drivers, even though they would be able to function in fully automated mode without drivers. A decision not to use drivers could reduce operating costs.

6.5.2 Economic and Financial Risks

Inflation

Inflation is applied to costs and revenues alike, and risks would exist if construction-related inflation is underestimated. For example, global factors such as a supply/demand imbalance in commodities play a major role in construction material prices, such as steel.

Interest Rates

Variations in interest rates could affect the interest earnings rate on cash balances and the interest paid on any outstanding debt, as well as the size of the long-term bonded debt service.

Municipal Market Uncertainties

Because it is assumed that the City will continue to be able to issue bonds in the tax-exempt municipal marketplace, uncertainties about market factors should not be overlooked. For example, although municipal borrowing rates are near historical lows, interest rates, issuance expenses, tax-exempt status and regulations, and preferred debt structures may change from today's market factors. Also, given the global credit climate and the challenges that bond insurance providers are currently experiencing, liquidity and access to credit enhancement mechanisms may be structurally different in the future.

GET Surcharge Revenues

Local tax revenues are dependent on O'ahu's economic activity, which relies heavily on the economy on the mainland and Japan. Variables like tourism spending and retail sales could materially impact the net GET surcharge revenues available to fund the Project.

6.5.3 Funding Risks

FTA New Starts Funding

The Project assumes Federal participation in funding through the Section 5309 New Starts process. The magnitude of this funding source requires the City to have confidence and assurance that Federal funding will be forthcoming once a commitment is made to the Project. For its part, FTA must assure that any Federal funds provided will be fully and productively used and leveraged by the City to the greatest extent possible. During final design, these and other mutual assurances would be described in a Full Funding Grant Agreement between the City and the FTA.

The amount of money that a project sponsor can expect to receive in any given year depends on available authorizations by Congress and the nationwide competition for this funding. The availability of New Starts or other funds could affect the Project's timing and ultimate cost. Additional bond proceeds could be used to cover shortfalls in capital funds, but as a result the Project's overall cost could increase due to debt service expenses.

Fare Policy and Ridership

Growth in transit ridership is uncertain because the availability of alternate modes and riders' price sensitivity could decrease ridership, at least in the short-term. For purposes of the Draft EIS, the assumption is made that there would be free transfers to and from the fixed guideway service. Upside risks also exist, and demand could be higher than expected. Although this would affect fare revenues positively, it could also increase the system's level-of-service requirements. Any changes in ridership that vary from what is forecasted could also affect the required level-of-service, which would affect operating costs.

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07

CHAPTER

Evaluation of Alternatives

This chapter compares the Honolulu High-Capacity Transit Corridor Project's Build Alternatives from several perspectives. Section 7.1 draws on information in prior chapters and summarizes how well each Build Alternative is projected to meet the Project's Purpose and Need. Section 7.2 discusses the Build Alternatives' potential effect on transportation and the environment. Section 7.3 adds a cost perspective to the effectiveness comparison, to consider an alternative's benefits in justifying its capital and operating costs. Section 7.4 looks at affordability given available funding sources. The chapter concludes with Section 7.5, a discussion of trade-offs to be made in selecting an alternative for implementation.

The evaluation measures used in this chapter reflect local goals for the Project (described in Chapter 1, Background, Purpose and Need) as well as Federal Transit Administration (FTA) criteria for evaluating projects proposed for funding under the Section 5309 New Starts program. FTA criteria that are meaningful to a comparative analysis of the Build Alternatives include user benefits and development potential (both measures of effectiveness) and the FTA's cost-effectiveness index. By including these criteria, this chapter fulfills Council on Environmental Quality regulations (40 CFR 1502.23), which require that an Environmental Impact Statement (EIS) "indicate those considerations, including factors not related to environmental quality, which are likely to be relevant and important to a decision."

7.1 Effectiveness in Meeting Project Purpose and Need

Section 1.8, Need for Transit Improvement, of this Draft EIS describes four needs that the Project is intended to meet. This section evaluates how well each alternative meets these needs, based on the variety of measures of effectiveness shown in Table 7-1. Several of these measures are primarily intended to address local goals, while others are also factors considered in FTA New Starts evaluations.

7.1.1 Improve Corridor Mobility

Just as mobility and congestion have worsened over the years, conditions in 2030 will be worse than

Table 7-1 Project Goals and Objectives

Goal	Evaluation Measures
Improve corridor mobility	• Transit ridership (daily linked trips) • Transit user benefits • Corridor travel time • Vehicle miles of travel (VMT) • Vehicle hours of travel (VHT) • Vehicle hours of delay (VHD)
Improve corridor travel reliability	• Percent of transit trips using fixed guideway • Percent of transit passenger miles in exclusive right-of-way
Improve access to planned development to support City policy to develop a second urban center	• Development within station area compared to existing amount of development
Improve transportation equity	• User benefits to transit-dependent communities • Percent of project costs borne by communities of concern

today unless actions are taken to accommodate the expected growth in islandwide travel and particularly in the study corridor. Despite implementation of the planned $3 billion in roadway improvements identified in the *Oʻahu Regional Transportation Plan 2030* (ORTP), the No Build Alternative still would not relieve traffic congestion for drivers or improve mobility for transit riders compared to today. Average travel times along major corridors would increase. Locations farthest from employment centers would experience the largest increase in congestion, decline in mobility, and constrained access. The Build Alternatives would substantially improve corridor mobility compared to the No Build Alternative. Differences between the Build Alternatives would be small.

As shown in Table 7-2, vehicle miles traveled (VMT), vehicle hours traveled (VHT), and vehicle hours of delay (VHD) would increase under the No Build Alternative compared to today. Vehicular traffic volumes on major roadways would grow substantially between now and 2030. Increases in daily traffic across screenlines would range from 10 to 50 percent (Table 3-11 in Chapter 3).

For TheBus and TheHandi-Van riders, these increases in highway congestion would directly affect their mobility because travel times on buses would increase. For the No Build Alternative, transit would continue to operate in mixed traffic, except on several short bus-only segments and in high-occupancy vehicle lanes on freeways. As shown in Figure 3-5 (in Chapter 3), average transit speed has dropped by approximately 10 percent since 1984 (from 14.6 to 13.2 mph) and is projected to continue to decline through 2030 to approximately 12.7 mph under the No Build Alternative.

The Build Alternatives would increase average transit speeds by approximately 25 percent compared to 2007, leading to higher transit ridership and travel time savings for existing and new transit users. Transit travel times between major destinations would drop by nearly 50 percent compared to the No Build Alternative (Table 7-2). As transit becomes a faster, and thus more attractive, travel choice, ridership would increase. As shown in Table 7-2, transit ridership would increase by approximately 45,000 trips per day (20 percent) by 2030 with the Build Alternatives compared to the No Build Alternative, and transit users would save

Table 7-2 Effectiveness of Alternatives in Improving Corridor Mobility

Objective	2007 Existing Conditions	Alternative			
		2030 No Build	2030 Salt Lake	2030 Airport	2030 Airport & Salt Lake
Transit Travel Time (minutes)					
Wai`anae to UH Mānoa	128 minutes	121 minutes (1 transfer)	91 minutes (2 transfers)	93 minutes (2 transfers)	92 minutes (2 transfers)
Kapolei to Ala Moana Center	101 minutes	105 minutes	57 minutes	59 minutes	58 minutes
Transit Performance*					
Transit ridership (daily linked trips)	183,500	225,500	270,300	272,800	271,900
Transit user benefits (hours per year)	n/a	n/a	16,246,000	17,043,000	16,643,000
Highway Performance					
Daily islandwide VMT	11,581,000	13,583,000	13,097,000	13,086,000	13,104,000
Daily islandwide VHT	334,000	415,000	386,000	385,000	385,000
Daily islandwide VHD	74,000	106,000	85,000	84,000	83,000

*FTA is currently reviewing the estimates made for ridership and user benefits.

up to 16 million or more equivalent hours of travel time per year by 2030.

The transit mobility benefits of the three Build Alternatives would differ, but not significantly. Because it would serve more employment, the Airport Alternative is projected to attract more riders and to have higher user benefits than the other two Build Alternatives. Fewer riders would use the Airport & Salt Lake Alternative than the Airport Alternative because of less frequent service on the airport alignment under the Airport & Salt Lake Alternative. For travelers from 'Ewa to Downtown and points farther Koko Head, travel time for the Airport Alternative would be one minute longer.

Increases in transit ridership would benefit highway users as well, by removing drivers from the roadways through better transit service. The Build Alternatives would reduce traffic congestion and improve mobility compared to the No Build Alternative (Table 7-2). Daily VMT would decrease by 4 percent; VHT would decrease by about 7 percent; and VHD would decrease by 20 to 22 percent, depending on the alternative.

In terms of highway performance measures, the Airport Alternative would be more effective than the other two Build Alternatives in terms of reducing VMT and VHT, but the Airport & Salt Lake Alternative would be more effective in reducing VHD.

7.1.2 Improve Corridor Travel Reliability

With the No Build Alternative, travel reliability for both drivers and transit riders would decrease by 2030. Because delay on the system is not predictable from one day to another, reliability for drivers would worsen. The large increase (44 percent) in VHD that would occur with the No Build Alternative includes an element of unpredictability that requires special accommodations in travel planning. Average travel times would increase somewhat under the No Build Alternative, but the impact on reliability would be more dramatic, especially in the morning. The reason is that drivers are forced to allocate more time to account for the possibility that delays will occur. These unknowns make it difficult to estimate a trip's duration when scheduling appointments.

All transit riders would experience similar decreases in reliability under the No Build Alternative. Problems with turnbacks and schedule adherence already plague the transit system. These reliability factors are expected to get worse in the future as the highway system becomes more congested.

Under the Build Alternatives, reliability for transit riders would increase substantially as trips are moved from buses operating on streets in mixed traffic and congested freeways to the fixed guideway, which would provide a predictable travel time. Between 31 and 33 percent of transit trips and between 63 and 65 percent of transit passenger miles would be carried on an exclusive fixed guideway that is not subject to traffic delay (Table 7-3).

With the Build Alternatives, bus passengers would also realize service reliability as a result of route restructuring that replaces long-haul bus routes with shorter local routes integrated with the fixed guideway system. Driver and bus transit reliability would also improve as a result of reduced congestion and delay on the highway.

The Build Alternatives would substantially improve transit reliability compared to the No Build Alternative. The transit reliability benefits of the three Build Alternatives differ slightly. The percentage of transit trips carried on the fixed guideway would be slightly greater for the Airport Alternative than for the other Build Alternatives.

7.1.3 Improve Access to Planned Development to Support City Policy to Develop a Second Urban Center

A goal of the Project is to support urban development consistent with the City General Plan (DPP 2002a), which is the blueprint for future population and employment growth. By providing improved mobility and access, a fixed guideway transit facility can serve as a catalyst for shaping development patterns in a corridor.

Although all of the alternatives are generally consistent with Local, District, and State plans, the Build Alternatives best serve the areas of O‘ahu designated for future growth and development.

Compared to the No Build Alternative, the Build Alternatives would support a greater amount of development and redevelopment around stations by enhancing access and supplying a daily influx of transit riders and potential customers for businesses. Differences between the Build Alternatives would be small.

The relative effectiveness of the Build Alternatives is presented in Table 7-4. As shown, the benefits are similar in terms of providing better access to the “second city” planned for Kapolei. As shown in Table 7-2, transit travel times from Kapolei to Ala Moana Center would be reduced by between 40 and 45 percent as a result of the Project compared to the No Build Alternative. The improved transit conditions are further illustrated in Figure 7-1, which shows travel time savings for the majority of

Table 7-3 Effectiveness of Alternatives in Improving Corridor Travel Reliability

Objective	2007 Existing Conditions	Alternative			
		2030 No Build	2030 Salt Lake	2030 Airport	2030 Airport & Salt Lake
Percent of transit trips carried on fixed guideway	0%	0%	31%	33%	32%
Percent of transit passenger miles in exclusive right-of-way	3%	4%	63%	65%	64%

Table 7-4 Effectiveness of Alternatives in Supporting Planned Development

Objective	Alternative			
	2030 No Build	2030 Salt Lake	2030 Airport	2030 Airport & Salt Lake
Development within Station Area Compared to Existing Amount of Development				
Growth in population 2007 to 2030	n/a	59,580	59,720	59,640
Growth in employment 2007 to 2030	n/a	26,440	27,070	27,600

transit users in ʻEwa and Central Oʻahu, which are areas planned for future development. By providing better transit access, the Kapolei area would be better able to grow and develop than it would be if it remained isolated from the rest of the region by congested roadways.

Differences between the alternatives relate to the amount of development that would be allowed at each station area. The Airport Alternative has greater potential benefit in this regard, because the growth in trips within walking distance of transit stations would be slightly higher than with the other Build Alternatives.

7.1.4 Improve Transportation Equity

Equity relates to the fair distribution of a project's benefits and impacts, so that no group would carry an unfair burden of a project's negative environmental, social, or economic impacts or receive less than a fair share of a project's benefits. This section focuses on considering the following evaluation criteria:

- Population segments benefiting from alternative investments
- Population segments paying for alternative investments
- Net benefits by population segment, compared to needs
- Travel-time savings for transit-dependent populations

Approximately 35 percent of Oʻahu's population currently lives in areas that have concentrations of communities of concern. Communities of concern are defined as concentrations of minority, low-income, transit-dependent, and linguistically isolated households (Figure 7-1).

A majority of the population living in communities of concern is located within or adjacent to the study corridor (Figure 7-1). The Project would provide service where the transit need is greatest, connecting areas that have the highest transit dependency, which includes communities of concern. The percentage of the population within communities of concern that would be located within one-half mile of a transit station is shown in Table 7-5.

Table 7-5 Population of Communities of Concern within Easy Walking Distance of Stations in 2030

Alternative	Percentage of Communities of Concern within One-Half Mile of Fixed Guideway Stations
No Build	n/a
Salt Lake	37%
Airport	36%
Airport & Salt Lake	38%

The Project would provide transit travel-time savings to approximately 65 percent of the islandwide population in 2030 compared to the No Build Alternative (Table 7-6). Of the 35 percent of the island's population that resides in areas containing concentrations of communities of concern, over half would realize a substantial transit travel-time savings. The rest of

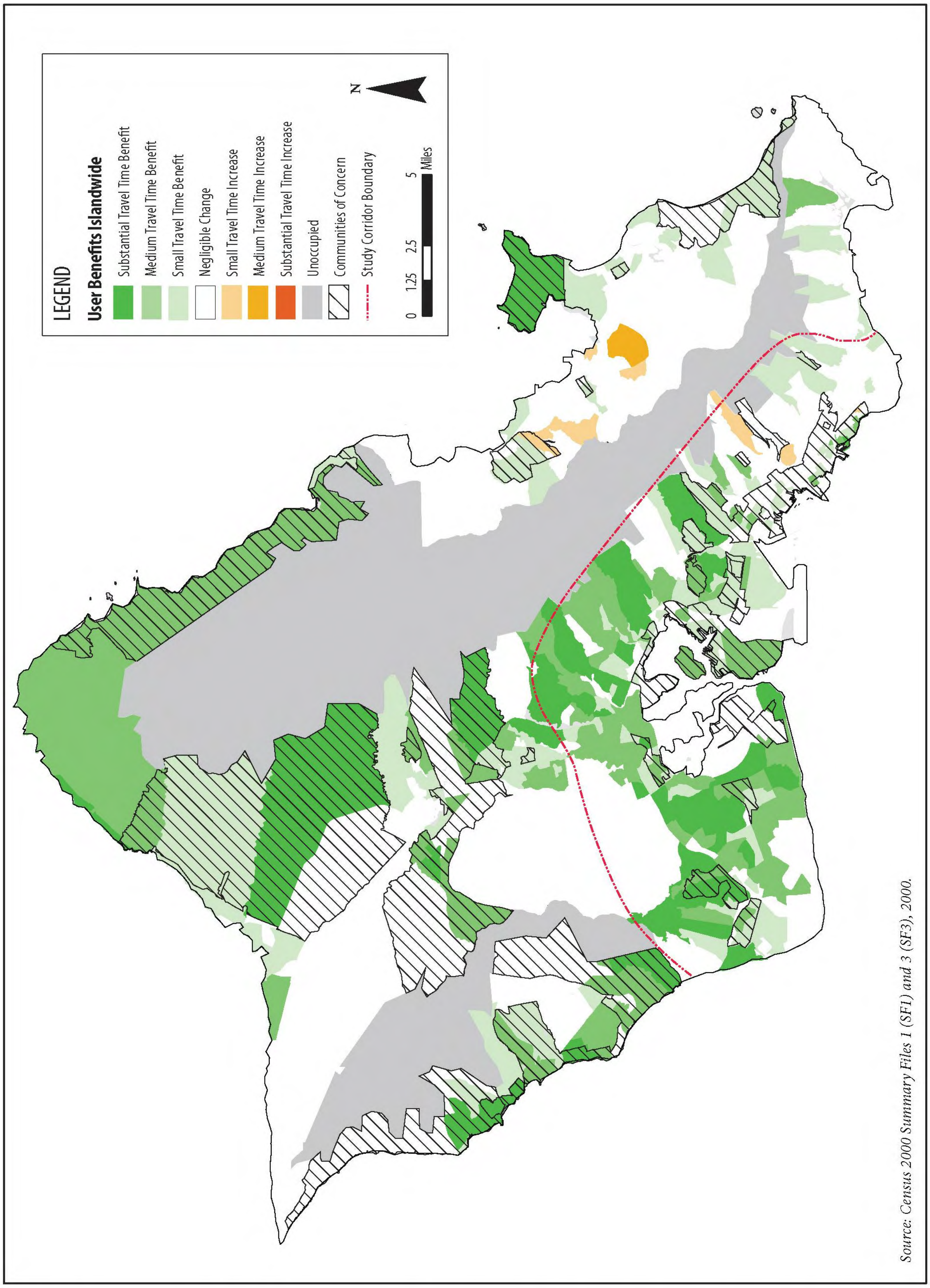

Figure 7-1 Communities of Concern and User Benefits for the Build Alternatives Compared to the No Build Alternative

Table 7-6 Equity Comparison of 2030 Transit Travel-Time Savings for Build Alternatives Compared to the No Build Alternative

Effect on Transit Travel Time	Percent of Islandwide Population		
	Within Communities of Concern	Outside Communities of Concern	Total
Travel-time savings compared to the No Build Alternative	23%	42%	65%
Negligible travel-time change compared to the No Build Alternative	12%	21%	33%
Travel-time increase compared to the No Build Alternative	0%	2%	2%
Total	35%	65%	100%

the island's population that resides in areas with concentrations of communities of concern would experience little change in transit travel time as a result of the Project. Approximately 2 percent of the population would experience an increase in travel times, and less than 0.5 percent of the areas that would experience a substantial increase in transit travel times contain high concentrations of communities of concern.

Tourists pay approximately 30 percent of the general excise and use tax surcharge collected, which is the Project's local funding source. The remaining local transit investment costs are distributed throughout the Island proportional to how much each individual expends on goods and services.

The Build Alternatives would substantially improve transportation equity compared to the No Build Alternative. Although adverse effects would occur with each Build Alternative, these effects would be similar for each. Based on demographics within the study corridor, the need for public transit is greatest within the areas served by the Project.

7.2 Transportation and Environmental Consequences

The Build Alternatives' effect on transportation and the environment would differ substantially from the No Build Alternative but would only vary slightly among the Build Alternatives.

7.2.1 Transportation

Each Build Alternative would have a positive effect on transit use within the study corridor, which would help reduce delay in the transportation system as a whole, regardless of travel mode. Although each Build Alternative would be effective in attracting high transit ridership, the highest number of transit trips would occur with the Airport Alternative (Table 7-2). The Salt Lake Alternative would have the shortest end-to-end transit travel time. The time to specific destinations would vary depending on the destination and the alignment. However, with the exception of destinations within the Airport and Salt Lake areas, the differences would be very small (within 1 to 2 minutes).

The Project would affect parking availability, both during construction and permanently once the Project is complete and in operation. The Airport & Salt Lake Alternative would remove approximately 1,200 parking spaces, which would be the most of all the Build Alternatives. The Airport Alternative would remove approximately 1,050 parking spaces, which would be the least of all the Build Alternatives. Mitigation of parking loss and the effects of spillover parking at stations could include replacing lost spaces or implementing parking management programs.

As indicated in Table 3-22 (in Chapter 3), the Salt Lake Alternative would affect more bicycle and pedestrian facilities along the study corridor, but as with other aspects, these differences are minor among the Build Alternatives.

During the construction period, lanes would be closed for construction of the overhead guideway located in the median of existing roadways. Although the time to build these improvements would be kept as short as possible, one or more lanes in sections of major highways would be closed while columns are placed and the guideway erected. The greatest number of lane closures during construction would be required for the Airport & Salt Lake Alternative and the fewest would occur with the Airport Alternative. Through most of the study corridor, these closures would be the same for all Build Alternatives.

7.2.2 Environmental Consequences

The Project would convert between 145 and 165 acres of land to transportation use (Table 4-3 in Chapter 4). The Airport Alternative would require the least land conversion, and the Airport & Salt Lake Alternative would require the most. Any of the Build Alternatives would convert approximately 88 acres of currently prime, unique, or important farmland to transportation use. However, all the land that would be converted is within the area planned for conversion to non-farm use by other projects. The number of property acquisitions and displacements would vary slightly among the Build Alternatives, with the fewest acquisitions for the Airport Alternative at 179 affected properties and the most for the Airport & Salt Lake Alternative with 205 affected properties (Table 4-5 in Chapter 4). The Build Alternatives would have similar visual effects, with differences only between Aloha Stadium and Kalihi.

The guideway's design would ensure that ground-level environmental noise levels with the Build Alternatives would be comparable to the No Build Alternative. Project-generated noise at two locations along Kamehameha Highway would exceed the FTA impact criteria, resulting in moderate impacts.

Construction of the Project could encounter contaminated soils. Eight potentially contaminated sites would be affected by all of the Build Alternatives. One additional site would be affected by the Salt Lake and Airport & Salt Lake Alternatives.

The Salt Lake, Airport, and Airport & Salt Lake Alternatives would require removal of approximately 350, 550, and 650 street trees, respectively, and pruning of approximately 100, 100, and 150 additional street trees, respectively. Between 50 and 75 percent of the removed trees are anticipated to be able to be transplanted.

Archaeological resources and burials are anticipated to be encountered with any of the Build Alternatives. The likelihood of encountering burials is slightly greater for the Salt Lake and Airport & Salt Lake Alternatives than for the Airport Alternative. The Airport and Airport & Salt Lake Alternatives would affect more historic resources (including the Pearl Harbor National Historic Landmark) compared to the Salt Lake Alternative, but all of the Build Alternatives would adversely affect the same historic resources.

All Build Alternatives would result in reduced air pollution, energy consumption, and water pollution compared to the No Build Alternative. The differences among the alternatives would be small: the Airport Alternative would have the greatest benefit and the Salt Lake Alternative would have the least benefit for these elements of the environment. The Build Alternatives would have no substantial effect on geology; natural hazards; or threatened, endangered, or protected species.

7.3 Cost-effectiveness

The cost-effectiveness analysis compares the benefits of each alternative with its costs. It considers whether an alternative's benefit would justify its capital and operating costs and whether the added benefits of a more expensive alternative would justify the added costs.

Cost-effectiveness is one of the key criteria that FTA uses to evaluate projects proposed for Section 5309 New Starts funding. The FTA's cost-effectiveness index is a ratio formed by adding an alternative's annualized capital cost to its year 2030 operating and maintenance cost, and the total is divided by user benefits. Costs and benefits were both calculated compared to a baseline alternative that represents the best that can be done to improve transit service in the study corridor without building a fixed guideway transit facility.

The cost-effectiveness indices for the Build Alternatives compared to the baseline fall within the "medium" range established by FTA for its New Starts ratings, which, along with other considerations, is currently required to qualify for New Starts funding. FTA is currently reviewing the estimates made for ridership and user benefits, operating and maintenance costs, and capital costs for the Build Alternatives. If these results hold up through subsequent phases of project development, along with other FTA considerations, the Project would be in the competitive range for funding consideration. Funding recommendations are made each year from among the projects that have completed the planning and project development process, including the National Environmental Policy Act process. These recommendations reflect the merits of the projects competing for available Federal funds at the time, as well as the availability of New Starts funding authorization.

Comparing the Build Alternatives using the FTA cost-effectiveness index, the Salt Lake and Airport Alternatives achieve similar results (Table 7-7). The higher cost of the Airport Alternative would be offset by the higher ridership and user benefits for that alternative. The Airport & Salt Lake Alternative would be less cost-effective because user benefits would not fully offset the additional costs.

Table 7-7 Cost-effectiveness of the Build Alternatives

Measure	Alternative		
	2030 Salt Lake	2030 Airport	2030 Airport & Salt Lake
Cost per hour of transportation system user benefits*	$17.53	$17.78	$22.86

*FTA is currently reviewing the estimate of user benefits.

7.4 Financial Feasibility

7.4.1 Measure of Capital Financial Feasibility

The primary sources of capital for the Project are the general excise and use tax (GET) surcharge revenues and Federal New Starts funds. Any capital funding shortfalls, including any shortfall on debt repayment incurred from the issuance of bonds, would need to be covered using additional revenues from other as-yet-unidentified sources. The amount of other revenues required over and above GET surcharge and New Starts revenues provides a measure of the relative financial feasibility for each Build Alternative (Table 7-8).

The Salt Lake and Airport Alternatives would be financially feasible based on this measure, because they would not require additional funding sources beyond the GET surcharge revenues and Federal New Starts funds. The Airport & Salt Lake Alternative would require additional revenues, given the assumptions underlying the financial analysis in Chapter 6, Cost and Financial Analysis. If the Airport & Salt Lake Alternative was constructed in phases, the phase between the Middle Street Transit Center and the Airport would also require additional revenue.

Table 7-8 Financial Feasibility

	2030 No Build Alternative	2030 Salt Lake Alternative	2030 Airport Alternative	2030 Airport & Salt Lake Alternative
Other City revenues required for capital (million year-of-expenditure dollars)	n/a	$0 ($24 surplus)	$0	$1,080
Average percentage of City General and Highway Funds needed for operating and maintenance	12%	14%	14%	14%

7.4.2 Measure of City Financial Contribution for Operating and Maintenance

Fare revenues and the GET surcharge would need to be supplemented to cover total future operations and maintenance costs. As with the current bus transit system, additional funding would be obtained through an allocation from the City's General and Highway Funds. Between fiscal years 1994 and 2007, an average of 11 percent of the total revenue from General and Highway Funds revenues was spent on transit (the maximum was 15 percent in 2001). A measure of the relative operating financial feasibility for the Project is the City's contribution to transit operations as a percentage of total forecast General and Highway Funds revenues.

7.4.3 Comparison of Alternatives

The Salt Lake and Airport Alternatives would be financially feasible with the currently identified capital revenue sources. All Build Alternatives would increase the total operation and maintenance subsidy from the City's General and Highway Funds.

7.5 Important Trade-offs

All Build Alternatives would provide similar levels of transportation benefit. However, benefits are somewhat different in communities that would be served by each alternative. Table 7-9 compares transit travel times for several locations that would be served differently by each of the three Build Alternatives. All travel times would be greater for the No Build Alternative than for any of the Build Alternatives.

At $3.9 billion (2008 dollars), the Salt Lake Alternative would be the least expensive to construct and would carry the fewest passengers, with 88,000 daily passengers in 2030 (Table 3-16 in Chapter 3). It would provide the most direct connection between the ends of the study corridor, resulting in a slight increase in through trips but a substantially smaller number of trips to Pearl Harbor Naval Base and Honolulu International Airport compared to the other Build Alternatives. It would directly serve residential areas in the Salt Lake neighborhood.

The Airport Alternative would cost more than the Salt Lake Alternative but would carry the most passengers with 95,000 daily passengers in 2030. It would provide access to employment centers at Pearl Harbor Naval Base and Honolulu International Airport and would have substantially greater ridership to those areas than the Salt Lake Alternative. It would serve the Salt Lake neighborhood with connecting bus service.

The Airport Alternative would have approximately 5 percent fewer parcel acquisitions than the Salt Lake Alternative. It would also result in slightly less air pollution and energy consumption. Because of its proximity to the Pearl Harbor National Historic Landmark, it would have more of an effect on the setting of historic resources than the Salt Lake Alternative. The Airport Alternative would affect one additional Section 4(f) resource.

Table 7-9 Comparison of Transit Travel Times (Minutes) among Alternatives

Travel Origin and Destination	2030 No Build Alternative	2030 Salt Lake Alternative	2030 Airport Alternative	2030 Airport & Salt Lake Alternative
From `Ewa to Pearl Harbor	99	62	48	50
From `Ewa to Salt Lake	109	53	63	55
From Salt Lake to Downtown	41	26	32	27
From `Ewa to Airport	115	65	51	53
From Airport to Downtown	43	38	21	22

Overall, the differences in effects on environmental resources among these alternatives would not be significant.

The Airport & Salt Lake Alternative would directly serve both the Salt Lake and Airport areas, but at $5.0 billion (2008 dollars) the cost to complete this alternative would be greater than currently identified available funds. The Airport & Salt Lake Alternative could be constructed in phases, with completion of the guideway between East Kapolei and Ala Moana Center along Salt Lake Boulevard followed by a connection from Middle Street Transit Center to the Airport. The connection from the Airport to Aloha Stadium would be completed as the final phase of the Project when additional funds become available.

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08

CHAPTER

Comments and Coordination

Agencies, non-governmental groups, and the public have been engaged throughout the planning process for the Honolulu High-Capacity Transit Corridor Project, as required by Federal and State law. The National Environmental Policy Act (NEPA) (USC 1969) mandates agency and public participation in defining and evaluating the impacts of the project alternatives. The Project has followed Section 6002 of the *Safe, Accountable, Flexible, Efficient, Transportation Equity Act—A Legacy for Users* (SAFETEA-LU) (PL 2005) guidance for federally funded projects. It has also followed U.S. Department of Transportation guidelines for public participation, including Title VI of the Civil Rights Act of 1964 (USC 1964c) and Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (USEO 1994).

The requirements of Chapter 343 of the Hawai'i Revised Statutes (HRS) (HRS 2008) and implementing regulations contained in Title 11, Chapter 200 (HAR 1996) of the Hawai'i Administrative Rules (HAR) also include consultation with agencies, citizen groups, and concerned individuals during the Project. Coordination activities required under the implementing regulations of Section 106 of 36 CFR 800, *Protection of Historic and Cultural Properties,* have also been implemented during the course of the Project.

NEPA and HRS 343 require that a Draft Environmental Impact Statement (EIS) provide full disclosure of the environmental impacts associated with a proposed action. The agencies and the public must be given a reasonable opportunity to comment on that action.

8.1 Public and Community Outreach

The Project's public involvement efforts began with the Project's Alternatives Analysis phase in December 2005. Opportunities for public comment and information sharing will continue throughout the remainder of the Project, using the now well-established network of existing civic and community groups.

The Public Involvement Plan (PIP) developed for the Alternatives Analysis and Draft EIS phase details public involvement strategies to be used throughout the Project. Its fundamental goal is to engage, inform, and respond to the public. As public comments are received and evaluated, the PIP will be updated and revised to reflect changes in the Project and ensure that coordination is thorough, effective, and relevant.

8.1.1 Public Outreach Techniques

To reach as many community members as possible, a wide variety of public involvement tools have been used throughout the Project. Informational materials produced on an ongoing basis include monthly newsletters, fact sheets, brochures, media releases, public meeting announcements, and other relevant project handouts. At the conclusion of the Alternatives Analysis, a video was produced highlighting the report's findings. Complementing materials include the project website (honolulutransit.org), telephone information line (808-566-2299), radio programs, and a monthly show on public access television.

Islandwide community updates were held during the course of the Project to share information and gather input on significant milestone decisions. The Project maintains an active Speakers Bureau to provide informational presentations to community groups, agencies, and organizations. A full list of Speakers Bureau presentations is included in Appendix E, General Record of Correspondence and Coordination. To date, over 1,500 comments on the Project have been submitted through the website, and over 400 have been received via the project information line.

8.1.2 Government and Other Agency Coordination

Government agencies that have an interest in and/or regulatory authority regarding the Project have been actively engaged. These agencies were sent scoping information and requests to become participating or cooperating agencies during the environmental process.

Feedback was solicited from the following government and other agencies through direct contact:

- Elected officials
- Neighborhood Boards
- The Transit Advisory Committee (formerly the Transit Solutions Advisory Committee)
- Governmental agencies and stakeholders
- Interested organizations

Appendix D includes a list of governments, agencies, and organizations contacted.

Lead, Cooperating, and Participating Agencies

The Council on Environmental Quality defines *lead agency* as the agency or agencies preparing or taking primary responsibility for preparing an EIS. Lead agencies for the Project include the City and County of Honolulu Department of Transportation Services Rapid Transit Division (RTD) and the Federal Transit Administration (FTA). RTD is the local transit agency, the designated recipient of project funds, and a co-lead agency with the FTA.

The Council on Environmental Quality defines a *cooperating agency* as any Federal agency (other than a lead agency) with jurisdiction by law or special expertise with respect to any environmental impacts that may be involved in a proposed project or project alternative (40 CFR 1508.5). A State or Local agency with similar qualifications may, with agreement from the lead agencies, also become a cooperating agency.

Also, pursuant to 40 CFR 1506.3, "a cooperating agency may adopt without recirculating the Draft EIS of a lead agency when, after an independent review of the statement, the cooperating agency concludes that its comments and suggestions have been satisfied."

Cooperating agencies for the Project include:

- U.S. Department of Defense (U.S. Army Corps of Engineers)—the Project will likely require the U.S. Army Corps of Engineers' permits and approval related to stream crossings along the alignment.

- U.S. Department of Defense (U.S. Army Garrison–Hawai'i)—the Project will likely require the U.S. Army's approval related to crossing U.S. Army property.
- U.S. Department of Homeland Security (U.S. Coast Guard–14th Coast Guard District)—the Project will likely require the U.S. Coast Guard's permits and approval related to crossing streams and navigable waterways.
- U.S. Department of Transportation, Federal Highway Administration—the Project will likely require the Federal Highway Administration's approval related to crossing and accessing the interstate highway system.
- State of Hawai'i Department of Transportation—the Project will likely require the State of Hawai'i Department of Transportation's approval related to using state rights-of-way.

Participating agencies are those with an interest in the Project. The standard for participating agency status is broader than for cooperating agency status. According to SAFETEA-LU regulations, "any Federal, State, regional, and local government agency that may have an interest in the project should be invited to serve as participating agencies. Nongovernmental organizations and private entities cannot serve as participating agencies."

For this Project, participating agencies include:

- U.S. Department of Agriculture (Natural Resource Conservation Service)
- U.S. Department of Defense (U.S. Naval Base Pearl Harbor)
- U.S. Department of the Interior (Fish and Wildlife Service)
- U.S. Department of the Interior (National Park Service)
- U.S. Department of the Interior (U.S. Geological Survey Pacific Island Ecosystems Research Center)
- U.S. Department of Transportation, Federal Aviation Administration
- U.S. Environmental Protection Agency
- U.S. Federal Emergency Management Agency
- State of Hawai'i Department of Accounting and General Services
- State of Hawai'i Department of Business, Economic Development, and Tourism
- State of Hawai'i Department of Defense
- State of Hawai'i Department of Education
- State of Hawai'i Department of Hawaiian Home Lands
- State of Hawai'i Department of Health
- State of Hawai'i Department of Land and Natural Resources
- State of Hawai'i Department of Land and Natural Resources (State Historic Preservation Division)
- State of Hawai'i, Hawai'i Community Development Authority
- State of Hawai'i Office of Environmental Quality Control
- State of Hawai'i Office of Hawaiian Affairs
- University of Hawai'i
- O'ahu Metropolitan Planning Organization

Participating agencies were identified and invited to participate at the start of the NEPA process. Their participation includes providing input to scoping, development of the Purpose and Need, and identification of potential effects. Project scoping and issuance of the Draft EIS provide official comment periods for the public and participating and cooperating agencies.

The lead, cooperating, and participating agencies have worked cooperatively throughout the Project's environmental process, as required by the SAFETEA-LU regulations described in this chapter. During this process, their main goal is to ensure that all agency concerns are satisfactorily addressed and that the permit review and approval process proceeds smoothly and expeditiously.

Table 8-1 summarizes the roles and responsibilities of the Project's lead, participating, and cooperating agencies. Appendix D includes agency correspondence.

8.1.3 Section 106 and Consulting Party Coordination

The lead agency is responsible for complying with Section 106 of the National Historic Preservation Act. Section 106 requires the lead agency to "accommodate historic preservation concerns with the needs of Federal undertakings through consultation among the agency official and other parties with an interest in the effects of the undertaking on historic properties..." (36 CFR 800.1(a)). Although other parties are consulted for their input, the Federal agency has the authority to make all decisions.

To comply with Section 106, consultation with the State Historic Preservation Division (SHPD) has been continuous since October 2007. SHPD has agreed on methodologies and definitions of the Area of Potential Effect. Agreement on the significance of properties within the study corridor is anticipated. The Project team is currently consulting with SHPD regarding Memorandums of Agreement for potential impacts to archaeological, cultural, or historic resources. The final results of consultation with the SHPD on assessing effects will be included in the Final EIS.

Opportunities for ongoing public input on historic, cultural, and archaeological resources will continue through the remainder of the EIS process. Members of the public will have an opportunity to review and comment on archaeological, cultural, and historical resource findings during the Draft EIS public hearing and public comment period.

Consulting parties who have a demonstrable interest in historic properties that may be affected are invited to participate in a proposed project's Section 106 process. The City sent letters to Section 106 consulting parties inviting them to be consulting parties for the Project's Section 106 process and also to update them on the Archaeological Resources, Cultural Resources, and Historic Resources Technical Reports. Project team members are also meeting with Section-106 consulting parties to refine the technical reports and to also inform them on the Project and upcoming

Table 8-1 Summary of Agency Roles and Responsibilities

Agency Designation	Role	Responsibility
Lead	Primary responsibility: ensuring compliance with NEPA and preparing the environmental document.	Requests participation from other agencies; provides project information; conducts field reviews; holds scoping meetings; provides pre-draft and pre-final documents; ensures documentation is adequate for project and related decisions; and makes final decisions on key milestones.
Cooperating	Any Federal agency, other than a lead agency, that has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposed project or project alternative (may also be a State agency).	Participates early in the NEPA process; participates in developing the Purpose and Need and alternatives and in the scoping process; develops information and analysis; provides staff support; attends joint field reviews; participates in public involvement activities; reviews draft environmental documents; and provides comments.
Participating	Any Federal, State, Regional, or Local government agency that may have an interest in a proposed project. Nongovernmental organizations and private entities cannot serve as participating agencies.	Participates in developing the Purpose and Need and alternatives and identifying potential impacts during scoping and the Draft EIS. Will be briefed on the Project before issuance of the Draft EIS.

activities. The following organizations are Section-106 consulting parties:

- State of Hawai'i Department of Land and Natural Resources (State Historic Preservation Division)
- U.S. Department of Defense (U.S. Naval Base Pearl Harbor)
- Historic Hawai'i Foundation
- University of Hawai'i Historic Preservation Certificate Program
- American Institute of Architects
- Hawai'i Community Development Authority (for Kaka'ako and Kalaeloa)
- Office of Hawaiian Affairs
- O'ahu Island Burial Council
- Hui Malama I Na Kupuna O Hawai'i Nei (Group Caring for the Ancestors of Hawai'i)
- Royal Order of Kamehameha
- The Ahahui Ka'ahumanu (civic club formed in 1864 to celebrate the life of Queen Ka'ahumanu)
- The Hale O Na Ali'i O Hawai'i
- The Daughters and Sons of the Hawaiian Warriors
- Association of Hawaiian Civic Clubs
- 15 Individual Hawaiian Civic Clubs

Appendix D includes copies of all Section 106 correspondence.

8.1.4 HRS Chapter 343 Coordination

The EIS preparation notice for this Project was published in the Hawai'i Office of Environmental Quality Control's (OEQC's) Environmental Notice on December 8, 2005, thus beginning the 30-day comment period under HRS 343 for the Project. Comments received are contained in the *Honolulu High Capacity Transit Corridor Project Scoping Report* (DTS 2006d) located in Appendix E. Written responses were prepared and sent to all commenters who provided either a mailing address or an e-mail address for responses. This Draft EIS addresses comments and issues raised during the EIS preparation notice comment period and issues noted during the NEPA scoping process in 2007.

HRS 343 and its implementing regulations contained in Title 11, Chapter 200, of the HAR, require that agencies, citizen groups, and concerned individuals be consulted for input. Interested parties may request consulting party status to receive ongoing project and coordination information. Downtown Neighborhood Board No. 13 and the Outdoor Circle requested and were granted consulting party status under HRS 343. Both parties have received periodic updates on the Project, and consultation activities will continue throughout the Project.

Notification of the Draft EIS will also be published in the OEQC Environmental Notice. This will begin the 45-day comment period for the EIS. All comments submitted will be separately addressed on a point-by-point basis, and written responses will be prepared and sent. Responses will also be included in the Final EIS. All agencies, citizen groups, and concerned individuals who submitted comments during the comment period will also be sent a copy of the Final EIS once it is issued.

8.2 Community Outreach during the Alternatives Analysis Phase

Federal regulations (40 CFR 1501) require scoping to follow publication of a Notice of Intent to prepare an EIS and take place before the Draft EIS is prepared. A public meeting was held during the scoping process. Notice of this meeting was published in the *Federal Register,* in local newspapers, and through other means of announcing public meetings.

An initial Notice of Intent was published for the Project on December 5, 2005. Two public scoping meetings and one agency scoping meeting were held in December 2005. The first public meeting was on December 13, 2005 at the Neal S. Blaisdell

Center Pīkake Room at 777 Ward Avenue in Downtown Honolulu from 5:00 to 8:00 p.m. The second public meeting was on December 14, 2005 at the Kapolei Middle School Cafeteria at 91-5335 Kapolei Parkway in Kapolei, from 7:00 to 9:00 p.m. Agencies, non-governmental groups, and the general public were given the opportunity to comment on the Project's Purpose and Need, alternatives, and other project issues.

The comment period for these scoping meetings ended on January 9, 2006. In all, 528 comments were received via mail, website, and telephone and at the meetings (requests to be placed on the mailing list were not included in this total). Comments were grouped into three categories: Purpose and Need, Alternatives, and Scope of Analysis.

The agency scoping meeting was on December 13, 2005 at the Neal S. Blaisdell Center Pīkake Room at 777 Ward Avenue from 2:00 to 4:00 p.m. Invitation letters were mailed between December 5 and 7, 2005 to 87 Federal, State, and County agencies and to utility companies. This meeting was attended by 20 agencies and utility companies. Comments were received from the following agencies and utilities:

- U.S. Department of Transportation, Federal Aviation Administration
- U.S. Environmental Protection Agency
- U.S. National Park Service
- Hawai'i Community Development Authority
- State of Hawai'i Department of Accounting and General Services
- State of Hawai'i Department of Education
- State of Hawai'i Department of Hawaiian Home Lands
- State of Hawai'i Department of Land and Natural Resources
- State of Hawai'i Office of Environmental Quality Control
- Office of Hawaiian Affairs
- University of Hawai'i
- City and County of Honolulu Department of Design and Construction
- City and County of Honolulu Fire Department
- Downtown Neighborhood Board No. 13
- Hawaiian Electric Company

Project personnel attended 104 neighborhood board meetings and 204 Speakers Bureau events during the Project's Alternatives Analysis phase.

The Alternatives Analysis was completed in October 2006 and submitted to the City Council for use in its selection of a Locally Preferred Alternative. Agency and public comments on the Alternatives Analysis were generally categorized as either supporting a specific alternative or opposing the Project. Numerous other general comments or questions did not directly support or oppose specific options.

8.3 Community Outreach during the Project's Preliminary Engineering/EIS Phase

Another series of public and agency scoping meetings was held prior to beginning the Project's preliminary engineering (PE)/EIS phase. A Notice of Intent was published on March 15, 2007 stating that this notice superseded the previous Notice of Intent published on December 5, 2005.

Agencies, non-governmental groups, and the general public were again given the opportunity to comment on the Project's Purpose and Need, alternatives, or other project issues. Coordination is currently continuing with cooperating and participating agencies. Meetings with individual agencies have been held to discuss and finalize evaluation methods and project issues and to collect project data.

Three public scoping meetings were held in March and April 2007. The first was on March 28, 2007 at

Kapolei Hale at 1000 Uluohia Street from 6:00 to 9:00 p.m. The second was on March 29, 2007 at McKinley High School at 1039 South King Street from 5:00 to 8:00 p.m. The third was on April 3, 2007 at Salt Lake Elementary School at 1131 Ala Liliko'i Street from 5:00 to 8:00 p.m.

There were 104 comments received via mail, website, and telephone and at scoping meetings. The following types of comments were not included in this total: requests to be placed on the mailing list, comments on alternatives already considered and/or eliminated from further consideration, comments on new alternatives considered previously and eliminated, Council hearing comments from the Alternatives Analysis phase, and taxation comments.

An agency scoping meeting was held on March 28, 2007 at Honolulu Hale, Mission Memorial Auditorium, 550 King Street from 10:00 a.m. to 12:00 p.m. Twenty agencies attended.

The public involvement techniques used during the Alternatives Analysis phase will continue throughout the PE/EIS phase. In addition to updating groups and organizations on the Project's progress, additional presentations have been made to new groups and organizations. Public meetings have been held throughout the study corridor in the form of community updates, participation in the Town Hall meetings, and informational displays. Project personnel have also attended Neighborhood Board meetings and have been available via radio call-in shows. The Project website and hotline are updated and maintained.

Cooperating agencies have been offered the opportunity to be briefed on the Project and given an opportunity to comment on the Draft EIS. Cooperating agencies will be invited to attend the Draft EIS public hearings. Participating agencies will receive a copy of the Draft EIS for review and comment and will be invited to attend the Draft EIS public hearings.

All cooperating agencies will receive a preliminary copy of the Final EIS for review and comment prior to its distribution. All Participating Agencies will receive a copy of the Final EIS, and will receive notification when the Record of Decision is issued.

Agencies with permitting authority will continue to be consulted during the permit application process. Permit applications will be submitted, and data will be developed to support the needs identified by permitting agencies.

8.4 Public Hearings

As part of the NEPA and HRS 343 process, the Draft EIS is being circulated for a 45-day review and comment period. During this period, the document is being made available to interested and concerned parties, including residents, property owners, community groups, the business community, elected officials, and public agencies, for public and agency comment.

A series of formal public hearings will also be held during this 45-day period. The purpose of the hearings is to give interested parties an opportunity to formally submit comments on the Project and the analysis contained in the Draft EIS. Attendance at the hearings is not required to submit comments. Responses to comments received will be addressed in the Final EIS.

8.5 Accommodations for Minority, Low-Income, and Persons with Disabilities

All meetings are held in handicapped-accessible facilities in compliance with the Americans with Disabilities Act. Every effort has been made to respond to members of the public who require a sign language interpreter, an assistive learning system, a translator, or any other accommodations to facilitate participation in the transit planning process. Every reasonable effort is made to accommodate individuals requiring assistance.

Executive Order 12898 requires that, as part of the environmental evaluation of the alternatives, the Project must address environmental justice issues. To comply with this requirement, community demographics and socioeconomic impacts were carefully considered in analyzing the alternatives. The public participation process ensures "full and fair participation by potentially affected communities" throughout the duration of the Project.

Particular attention has been paid to reaching low-income and minority populations that are traditionally underserved and underrepresented in the public involvement process. Materials have been prepared in the major languages used on O'ahu, and translators have been available upon request at meetings. Information has been distributed through cultural organizations, ethnic associations, housing associations, community development groups, and similar organizations. Community issues brought forth in community meetings, during stakeholder interviews, and at public workshops have been addressed as part of evaluating the project alternatives.

The use of public involvement techniques to engage communities of concern consists of public information materials offered via the project website, handed out at meetings or other community events, and provided through the Speakers Bureau program. To reach populations who do not speak and/or read English, information on how to obtain reading materials in their native languages has been provided. An informational flyer has been developed in 11 languages (Chinese, English, Hawaiian, Ilocano, Japanese, Korean, Laotian, Samoan, Spanish, Tagalog, and Vietnamese) and is continually updated as new project information is available. For these translated materials, the major languages spoken on the Island were selected. These flyers have been mailed to potential environmental justice neighborhoods, handed out in person, and provided to churches and community service organizations.

As the Project has progressed, over 100 community service organizations have been included on the project mailing list. These organizations have also been provided with appropriate translated flyers to distribute to their communities.

Through the Speakers Bureau and literature deliveries, a concerted effort has been made to reach out to local churches, elderly care facilities, and community organizations that cater to these populations. All organizations that previously received presentations were contacted with requests to conduct new presentations to provide updates on the Project's progress.

References

ADA 1990 — One Hundred First Congress of the United States of America at the Second Session. January 1990. *Americans with disabilities act of 1990.*

Ainley 1997 — Ainley, D.G., T.C. Telfer, and M.H. Reynolds. 1997. *Townsend's and Newell's Shearwater (Puffinus Auricularis). The birds of North America* (A. Poole, Ed.). Ithaca: Cornell Lab of Ornithology. *http://bna.birds.cornell.edu/bna/species/297*

Al-Mosaind 1993 — Al-Mosaind, M.A., K.J. Dueker, and J.G. Strathman. 1993. *Light rail transit stations and property values: A hedonic price approach.* Portland, Oregon Center for Urban Studies. Preprint, *Transportation Research Board.* 72nd Annual Meeting.

ASTM 2005 — ASTM International. November 2005. E1527-50. *Standard practice for environmental site assessments—Phase I environmental site assessments process.*

Caltrans 1983 — California Department of Transportation Division of Engineering Services. July 1983. *Energy and transportation systems.*

CEQ 1997a — Council on Environmental Quality, Executive Office of the President. January 1997. *Considering cumulative effects under the National Environmental Policy Act.*

CEQ 1997b — Council on Environmental Quality, Executive Office of the President. December 1997. *Environmental justice guidance under the National Environmental Policy Act.*

CFR 1978 — Code of Federal Regulations. November 1978. 40 CFR 1500 et seq. *Council on environmental quality.*

CFR 1986 — Code of Federal Regulations. September 1989. 36 CFR 800. *Protection of historic and cultural properties.*

CFR 1987 — Code of Federal Regulations. 1987. 23 CFR 771. *Environmental impact and related procedures.*

CFR 1989 — Code of Federal Regulations. 1989. 49 CFR 24. *Uniform relocation assistance and real property acquisition for federal and federally assisted programs.*

CFR 1992 — Code of Federal Regulations. July 1992. 40 CFR 130.8. *Water quality report,* as amended.

CFR 1996a — Code of Federal Regulations. July 1996. 40 CFR 51. *Protection of the environment, chapter 1: Environmental Protection Agency, subchapter C: Air programs.*

CFR 1996b — Code of Federal Regulations. July 1, 1996. 40 CFR 230. *Protection of the environment, chapter 1: Environmental Protection Agency, subchapter H: Ocean dumping.*

CFR 1996c — Code of Federal Regulations. July 1996. 40 CFR 402. *Protection of the environment, chapter 1: Environmental Protection Agency, subchapter N: effluent guidelines and standards.*

CFR 1996d	Code of Federal Regulations. October 1996. 49 CFR 21. *Nondiscrimination in federally-assisted programs of the Department of Transportation—Effectuation of Title VI of the Civil Rights Act of 1964.*
CFR 1997	Code of Federal Regulations. July 1997. 33 CFR 328. *Protection of the environment, chapter 1: Environmental Protection Agency, subchapter J: Superfund, emergency planning, and community right-to-know programs.*
CFR 1999	Code of Federal Regulations. 1999. 23 CFR 650. *Bridges, structures, and hydraulics.*
CFR 2000	Code of Federal Regulations. November 2000. 29 CFR 1910. *Occupational safety and health standards for general industry.*
CFR 2003	Code of Federal Regulations. 2003. 29 CFR 1926. *Safety and health regulations for construction.*
CFR 2004	Code of Federal Regulations. 2004. 36 CFR 800. *Protection of historic properties.*
CFR 2005a	Code of Federal Regulations. 2005. 49 CFR 633. *Project management oversight.*
CFR 2005b	Code of Federal Regulations. 2005. 40 CFR 93. *Determining conformity of federal actions to state or federal implementation plans (the Final Transportation Conformity Rule).*
CFR 2007	Code of Federal Regulations. Revised January 2007. 36 CFR 60.4. *National Register of Historic Places: Criteria for evaluation.*
CFR 2008	Code of Federal Regulations. March 2008. 23 CFR 774 et seq. *Parks, recreation areas, wildlife and waterfowl refuges, and historic sites (Section 4(f)).*
Chiddix 2004	Chiddix, J., and M. Simpson. 2004. *Next stop Honolulu! The story of the O'ahu Railway and Land Company.* Sugar Cane Press, Ltd., Honolulu, Hawai'i.
City 2007	City and County of Honolulu, City Council. 2007. Resolution 07-039, FD1(c). *Approving the minimum operable segment (MOS) for the Honolulu high-capacity transit corridor project.*
Colliers 2008	Colliers International. 2008. *North America CBD parking rate survey.*
DBEDT 2003	State of Hawai'i Department of Business, Economic Development, and Tourism. May 2003. *The economic contribution of Waikīkī.*
DBEDT 2007	State of Hawai'i Department of Business, Economic Development, and Tourism. 2007. *2006 the State of Hawai'i data book: A statistical abstract.*
DBEDT 2008	State of Hawai'i Department of Business, Economic Development, and Tourism. 2008. *http://hawaii.gov/dbedt*
DBFS 1990	City and County of Honolulu Department of Budget and Fiscal Services. 1990. Revised Ordinances of Honolulu Chapter 8, Article 4, Section 8-4.2. *Remission of taxes in cases of natural disasters.*
DBFS 2008	City and County of Honolulu Department of Budget and Fiscal Services Real Estate Property Division. February 2008. *Real estate tax rate tables. http://www.honolulu.gov/rpa/staterpt/2007_staterpt.htm*

DHHS 2005	Department of Health and Human Services. December 2005. *Public health assessment: Pearl Harbor Naval Complex, Pearl Harbor, Hawaii, EPA facility ID: HI4170090076.*
DPP 1995	City and County of Honolulu Department of Planning and Permitting. December 1995. *Waipahu town plan.*
DPP 1998	City and County of Honolulu Department of Planning and Permitting. May 1998. *Waipahu livable communities initiative.*
DPP 2000	City and County of Honolulu Department of Planning and Permitting. August 1997 (revised May 2000). *'Ewa development plan.*
DPP 2002a	City and County of Honolulu Department of Planning and Permitting. 1997 (amended 2002). *City and County of Honolulu general plan (as amended).*
DPP 2002b	City and County of Honolulu Department of Planning and Permitting. December 2002. *Central O'ahu sustainable communities plan.*
DPP 2004a	City and County of Honolulu Department of Planning and Permitting. June 2004. *Primary urban center development plan.*
DPP 2004b	City and County of Honolulu Department of Planning and Permitting. May 2004. *'Aiea-Pearl City livable communities plan.*
DTS 1998	City and County of Honolulu Department of Transportation Services. 1998. *O'ahu trans 2K islandwide mobility concept plan.*
DTS 1999	City and County of Honolulu Department of Transportation Services. April 1999. *Honolulu bicycle master plan.*
DTS 2003	City and County of Honolulu Department of Transportation Services. 2003. *Final environmental impact statement primary corridor transportation project.* In conjunction with the U.S. Federal Transit Administration.
DTS 2006a	City and County of Honolulu Department of Transportation Services. October 2006. *Honolulu high-capacity transit corridor project alternatives screening memorandum.*
DTS 2006b	City and County of Honolulu Department of Transportation Services. November 2006. *Honolulu high-capacity transit corridor project alternatives analysis report.*
DTS 2006c	City and County of Honolulu Department of Transportation Services. April 2006. *Honolulu high-capacity transit corridor project scoping report.*
DTS 2006d	City and County of Honolulu Department of Transportation Services. 2006. *Honolulu high-capacity transit corridor project revised final operations and maintenance costing methodology report.*
DTS 2007	City and County of Honolulu Department of Transportation Services. May 2007. *Honolulu high-capacity transit corridor project National Environmental Policy Act scoping report.*
EDR 2007	Environmental Data Resources, Inc. November 2007. *EDR data map environmental atlas.*
EPA 1971	Environmental Protection Agency. December 1971. NTID 300.1. *Noise from construction equipment and operations, building equipment and home appliances.*

EPA 2007	Environmental Protection Agency. February 2007. EPA420-F-07-017. *Control of hazardous air pollutants from mobile sources: final rule to reduce mobile source air toxics.*
FHWA 1987a	U.S. Department of Transportation, Federal Highway Administration. September 1987. *FHWA Section 4(f) policy paper.*
FHWA 1987b	U.S. Department of Transportation, Federal Highway Administration. October 1987. *Technical advisory guidance for preparing and processing environmental and Section 4(f) document T6640.8A.*
FHWA 1992a	U.S. Department of Transportation, Federal Highway Administration. April 1992. *Position paper: Secondary and cumulative impact assessment in the highway project development process.*
FHWA 1992b	U.S. Department of Transportation, Federal Highway Administration. September 1992. Volume 6, Chapter 7, Section 3, Subsection 2. *Federal aid highway program manual.*
FHWA 1998	U.S. Department of Transportation, Federal Highway Administration. December 1998. *Order 6640.23: FHWA actions to address environmental justice in minority populations and low-income populations.*
FHWA 2003	U.S. Department of Transportation, Federal Highway Administration. January 2003. *Questions and answers regarding the consideration of indirect and cumulative impacts in the NEPA process.*
FHWA 2005	U.S. Department of Transportation, Federal Highway Administration. March 2005. *FHWA Section 4(f) policy paper.*
FHWA/EPA 1984	Federal Highway Administration and Environmental Protection Agency. 1984. *Sole source aquifer memorandum of understanding.*
FTA 2000	U.S. Department of Transportation, Federal Transit Administration. 2000. *Transit benefits 2000 working papers: a public choice policy analysis.*
FTA 2006a	U.S. Department of Transportation, Federal Transit Administration. May 2006. FTA-VA-90-1003-06. *Transit noise and vibration impact assessment, final report.*
FTA 2006b	U.S. Department of Transportation, Federal Transit Administration. May 2006. *Guidance manual for transit noise and vibration impact assessment.*
HAR 1996	Hawai‘i Administrative Rules. September 1996. Title 13 Subtitle 13 Chapter 300. *Historic Preservation Division, rules of practice and procedure relating to burial sites and human remains.*
HAR 1996	Hawai‘i Administrative Rules. 1996. Title 11 Chapter 200. *Environmental impact statement rules.*
HAR 1997	Hawai‘i Administrative Rules. November 1997. Title 11 Chapter 451. *State contingency plan. State of Hawai‘i Office of Hazard Evaluation and Emergency Response.*
HAR 2002	Hawai‘i Administrative Rules. October 2002. Title 13, Chapter 275. *Rules governing procedures for historic preservation review for governmental projects covered under Sections 6E-7 and 6E-8, Hawai‘i Revised Statutes.*

HHB 2000	State of Hawaii. House Bill No. 2895, H.D.1, passed by the 20th Legislature and approved by the Governor on April 26, 2000. *National Environmental Policy Act: Section 106 and Act 50.*
HDOH 2004	State of Hawai'i Department of Health, Environmental Planning Office. 2004. *Final 2004 list of impaired waters in Hawai'i.*
HDOH 2008	State of Hawai'i Department of Health. February 2008. *2006 State of Hawai'i water quality monitoring and assessment report: Integrated report to the U.S. Environmental Protection Agency and the U.S. Congress pursuant to Sections 303(d) and 305(b), Clean Water Act (PL 97-117).*
HDOT 1995	State of Hawai'i Department of Transportation. 1995. *The O'ahu commercial harbors 2020 master plan.*
HDOT 1999	State of Hawai'i Department of Transportation. 1999. *Kalaeloa harbor 2020 master plan.*
HDOT 2002	State of Hawai'i Department of Transportation. September 2002. *Hawai'i statewide transportation plan.*
HDOT 2003	State of Hawai'i Department of Transportation. 2003. *Bike plan Hawai'i master plan.*
HDOT 2004	State of Hawai'i Department of Transportation. 2004. *Habitat conservation plan for abutilon menziesii at Kapolei.*
HEC 2008	State of Hawai'i Environmental Council. January 2008. *Hawaii environmental justic initiative report.*
HRS 1971	Hawai'i Revised Statutes. 1971. Chapter 113. *Land acquisition policies for federally assisted programs.*
HRS 1983	Hawai'i Revised Statutes. 1983. Chapter 195D. *Conservation of aquatic life, wildlife, and land plants.*
HRS 1988	Hawai'i Revised Statutes. 1988. Chapter 6E-43. *Historic preservation, part II (monuments and memorials): Prehistoric and historic burial sites.*
HRS 1989	Hawai'i Revised Statutes. 1989. Chapter 368. *Hawai'i civil rights commission.*
HRS 1993	Hawai'i Revised Statutes. 1993. Chapter 128E. *Hawai'i emergency planning and community right-to-know act..*
HRS 2003	Hawai'i Revised Statues. 2003. Section 201G-113. *Housing and community development corporation of Hawai'i.*
HRS 2005	Hawai'i Revised Statutes. 2005. Act 247. *County surcharge on state tax:*
HRS 2007	Hawai'i Revised Statutes. October 2007. Chapter 128D. *Hawai'i environmental response law.* State of Hawai'i Office of Hazard Evaluation and Emergency Response.
HRS 2008	Hawai'i Revised Statutes. 2008. Chapter 343. *Environmental impact statements.*
ICNIRP 1998	International Commission on Non-Ionizing Radiation Protection. 1998. "Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz)." *Health Physics.* 74(4):494-522.

INRIX 2008	INRIX, Inc. 2008. *INRIX® national traffic scorecard #38: Honolulu metropolitan area. http://scorecard.inrix.com*
Landis 1995	Landis, J., R. Cervero, S. Guhathukurta, D. Loutzenheiser, and M. Zhang. 1995. *Rail transit investments, real estate values, and land use change: A comparative analysis of five California rail transit systems.* Monograph 48, Institute of Urban and Regional Studies, University of California at Berkeley.
Lewis-Workman 1997	Lewis-Workman, S., and D. Brod. 1997. "Measuring the neighborhood benefits of rail transit accessibility." *Transportation Research Record* 1576:147-153.
Miles 1986	Miles, D.H. 1986. "White terns breeding on O`ahu, Hawai`i." *'Elepaio: journal of the Hawai'i Audubon Society.* 46:171-175.
Navy 2000	Department of the Navy Pacific Division. November 2000. *Phase II remedial investigation: Ewa junction fuel drumming facility.*
NCHRP 1998	National Cooperative Highway Research Program. 1998. *Report 403: Estimating the indirect effects of proposed transportation projects.*
NPS 1991	U.S. Department of the Interior, National Park Service. 1991. *Guidelines for completing National Register of Historic Places forms.* National Register Bulletin 16. Interagency Resources Division, National Park Service.
NRC 1999	National Academy of Sciences National Research Center. 1999. *Final report of the committee to review the research activities completed under the Energy Policy Act of 1992.*
O'ahuMPO 2004	O'ahu Metropolitan Planning Organization. March 2004. *Environmental justice in the OMPO planning process: Defining environmental justice populations.*
O'ahuMPO 2007	O'ahu Metropolitan Planning Organization. April 2006 *(Amendment #1, 2007). O'ahu regional transportation plan 2030.*
O'ahuMPO 2008	O'ahu Metropolitan Planning Organization. January 2008. *FYs 2008–2011 transportation improvement program.*
Oshiro 2008	Oshiro, Earlynne, Hawaiian Electric Company, Inc., and Lawrence Spurgeon, PB Americas, Inc. February 2008. *Personal communication.*
OTPP 1967	O'ahu Transportation Planning Program. 1967. *O'ahu transportation study.*
OTS 2006	Oahu Transit Services, Inc. 2006. *Monthly schedule adherence reports.*
PL 1990	U.S. Public Law 101-549. November 1990. *Clean Air Act amendments of 1990.*
PL 2005	U.S. Public Law 109-59. August 2005. 119 Stat 1144. *Safe, accountable, flexible, efficient transportation equity act: A legacy for users (SAFETEA-LU).*
ROH 1978a	Revised Ordinances of Honolulu. 1978. Chapter 21. *Land use ordinance.* City and County of Honolulu, Hawai'i.
ROH 1978b	Revised Ordinances of Honolulu. 1978. Chapter 24. *Development plans.* City and County of Honolulu, Hawai'i.
ROH 1990	Revised Ordinances of Honolulu. 1990. Chapter 41, Article 13. *Protective regulations for exceptional trees.* City and County of Honolulu, Hawai'i.
ROH 2005	Revised Ordinances of Honolulu. 2005. Section 6-60, Ordinance 05-027. *Transportation surcharge—use of funds.* City and County of Honolulu, Hawai'i.

ROH 2007 — Revised Ordinances of Honolulu. 2007. Section 6-60, Ordinance 07-001. *Transportation surcharge—use of funds.* City and County of Honolulu, Hawai'i.

RPA 2008 — City and County of Honolulu Department of Budget and Fiscal Services, Real Property Assessment Division. February 2008. *http://www.honolulu.gov/rpa/staterpt/2007_staterpt.htm*

RTD 2008a — City and County of Honolulu Department of Transportation Services, Rapid Transit Division. July 2008. *Honolulu high-capacity transit corridor project transportation technical report.*

RTD 2008b — City and County of Honolulu Department of Transportation Services, Rapid Transit Division. July 2008. *Honolulu high-capacity transit corridor project land use technical report.*

RTD 2008c — City and County of Honolulu Department of Transportation Services, Rapid Transit Division. July 2008. *Honolulu high-capacity transit corridor project economics technical report.*

RTD 2008d — City and County of Honolulu Department of Transportation Services, Rapid Transit Division. July 2008. *Honolulu high-capacity transit corridor project neighborhoods and communities technical report.*

RTD 2008e — City and County of Honolulu Department of Transportation Services, Rapid Transit Division. July 2008. *Honolulu high-capacity transit corridor project visual and aesthetics resources technical report.*

RTD 2008f — City and County of Honolulu Department of Transportation Services, Rapid Transit Division. July 2008. *Honolulu high-capacity transit corridor project noise and vibration technical report.*

RTD 2008g — City and County of Honolulu Department of Transportation Services, Rapid Transit Division. July 2008. *Honolulu high-capacity transit corridor project air quality and energy technical report.*

RTD 2008h — City and County of Honolulu Department of Transportation Services, Rapid Transit Division. July 2008. *Honolulu high-capacity transit corridor project electric and magnetic fields technical report.*

RTD 2008i — City and County of Honolulu Department of Transportation Services, Rapid Transit Division. July 2008. *Honolulu high-capacity transit corridor project hazardous materials technical report.*

RTD 2008j — City and County of Honolulu Department of Transportation Services, Rapid Transit Division. July 2008. *Honolulu high-capacity transit corridor project ecosystems and natural resources technical report.*

RTD 2008k — City and County of Honolulu Department of Transportation Services, Rapid Transit Division. July 2008. *Honolulu high-capacity transit corridor project water resources technical report.*

RTD 2008l — City and County of Honolulu Department of Transportation Services, Rapid Transit Division. July 2008. *Honolulu high-capacity transit corridor project street trees technical report.*

RTD 2008m	City and County of Honolulu Department of Transportation Services. July 2008. *Honolulu high-capacity transit corridor project geology, soils, farmlands, and natural hazards technical report.*
RTD 2008n	City and County of Honolulu Department of Transportation Services, Rapid Transit Division. July 2008. *Honolulu high-capacity transit corridor project archaeological resources technical report.*
RTD 2008o	City and County of Honolulu Department of Transportation Services, Rapid Transit Division. July 2008. *Honolulu high-capacity transit corridor project historic resources technical report.*
RTD 2008p	City and County of Honolulu Department of Transportation Services, Rapid Transit Division. July 2008. *Honolulu high-capacity transit corridor project cultural resources technical report.*
RTD 2008q	City and County of Honolulu Department of Transportation Services, Rapid Transit Division. 2008. *Real estate acquisition management plan.*
RTD 2008r	City and County of Honolulu Department of Transportation Services, Rapid Transit Division. February 2008. *Bus fleet maintenance plans.*
RTD 2008s	City and County of Honolulu Department of Transportation Services, Rapid Transit Division. 2008. *Honolulu high-capacity transit corridor project summary cash flow tables.*
RTD 2008t	City and County of Honolulu Department of Transportation Services Rapid Transit Division. 2008. *Honolulu High-capacity transit corridor project travel forecasting methodology report.*
TRB 2000	Transportation Research Board. 2000. *Highway capacity manual.*
TRB 2003	Transportation Research Board (Transit Cooperative Research Program). 2003. *Transit capacity and quality of service manual, 2nd edition.*
UH 2002	University of Hawai'i. 2002. *Enrollment data.*
UH 2005	University of Hawai'i. 2005. *Campus commuting data.*
USC 1899	United States Code. 1899. 33 USC 403 et seq. *Navigation and navigable waters: Obstruction of navigable waters generally; wharves; piers, etc.; excavations and filling in* (the Rivers and Harbors Act of 1899).
USC 1906	United States Code. 1906. 33 USC 1401 et seq. *Navigation and navigable waters: Congressional finding, policy, and declaration of purpose.*
USC 1918	United States Code. July 1918. 16 USC 703-711. *Migratory bird treaty act of 1918.*
USC 1946	United States Code. 1946. 33 USC 491-535. *Navigation and navigable waters: Bridges over navigable waters* (The General Bridge Act of 1946).
USC 1948a	United States Code. 1948. 33 USC 1251-1387. *Navigation and navigable waters: Water pollution prevention and control* (The Clean Water Act).
USC 1948b	United States Code. 1948. 33 USC 1344. *Navigation and navigable waters: Permits for dredged or fill material.*
USC 1964a	United States Code. 1964. 49 USC 5307. *Transportation: Urbanized area formula grants.*

USC 1964b	United States Code. 1964. 49 USC 5309. *Transportation: Capital investment grants.*
USC 1964c	United States Code. 1964. 42 USC 2000e-16. *The civil rights act of 1964.*
USC 1964d	United States Code. 1964. 49 USC 1601 et seq. *The urban mass transportation act of 1964.*
USC 1966a	United States Code. October 1966. 16 USC 470. *National historic preservation act of 1966* (NHPA).
USC 1966b	United States Code. October 1966. 49 USC 303. *Department of Transportation Act—Policy on lands, wildlife and waterfowl refuges, and historic sites.*
USC 1969	United States Code. 1969. 42 USC 4321-4345. The *national environmental policy act of 1969* (NEPA).
USC 1972	United States Code. 1972. 16 USC 1361-1407. The *marine mammal protection act of 1972* (MMPA).
USC 1973	United States Code. December 1973. 16 USC 1531-1544. The *endangered species act of 1973.*
USC 1974	United States Code. 1974. 42 USC 300f et seq. *The safe drinking water act of 1974* (SDWA).
USC 1976	United States Code. 1976. 42 USC 6901 et seq. *The public health and welfare: Solid waste disposal—The resource conservation and recovery act of 1976.*
USC 1980	United States Code. 1980. 42 USC 103. *Comprehensive environmental response—The compensation and liability act of 1980* (CERCLA).
USC 1983	United States Code. 1983. 49 USC 303. *Policy on lands, wildlife and waterfowl refuges, and historic sites.*
USC 1986	United States Code. 1986. 42 USC 300 et seq. *The emergency planning and community right to know act of 1986.*
USC 1994	United States Code. July 1994. 49 USC 5332. *Transportation, subtitle III, chapter 53: General and intermodal programs—Mass transportation.*
USC 1995	United States Code. January 1995. 16 USC 1531 et seq. *Endangered species act, U.S. Fish and Wildlife Service.*
USC 2002	United States Code. January 2, 2002. 7 USC 136. *Agriculture: Insecticides and environmental pesticide control: Subchapter II—Environmental pesticide control.*
USDA 2004	U.S. Department of Agriculture, National Agricultural Statistics Service. June 2004. *2002 census of agriculture.*
USDOE 2007	U.S. Department of Energy. 2007. ORNL-6978. *Transportation energy data book: Edition 26.*
USDOT 1979	U.S. Department of Transportation. April 1979. Order 5650.2. *Flood management and protection.*
USDOT 1997	U.S. Department of Transportation. April 1997. Order 5610.2. *USDOT order to address environmental justice in minority populations and low-income populations.*

USDOT 1998	U.S. Department of Transportation Federal Highway Administration. December 1998. Order 6640.23. *FHWA actions to address environmental justice in minority populations and low-income populations.*
USEO 1977	U.S. Presidential Executive Order 11988. 1977. *Floodplain management.*
USEO 1994	U.S. Presidential Executive Order 12898. 1994. *Federal actions to address environmental justice in minority populations and low-income populations.*
USEO 2000	U.S. Presidential Executive Order 13166. August 2000. *Improving access to services for persons with limited English proficiency.*
USFWS 1996	U.S. Fish and Wildlife Service. April 1996. *Recovery plan for marsilea villosa.*
USFWS 1998	U.S. Fish and Wildlife Service. May 1998. *Recovery plan for the Hawaiian hoary bat.*
USFWS 2005a	U.S. Fish and Wildlife Service. 2005. *Draft revised recovery plan for Hawaiian waterbirds.*
USFWS 2005b	U.S. Fish and Wildlife Service. 2005. *Draft revised recovery plan for Hawaiian waterbirds. Second draft of second revision.*
USFWS 2006	U.S. Fish and Wildlife Service. September 2006. *Revised recovery plan for Hawaiian forest birds.*
VanderWerf 2001	VanderWerf, E.A., J.L. Rohrer, D.G. Smith, and M.D. Burt. 2001. "Current distribution and abundance of the O'ahu 'Elepaio." *The Wilson Bulletin.* 113:10-16.
VanderWerf 2003	Vanderwerf, E.A. 2003. "Distribution, abundance, and breeding biology of white terns on O'ahu, Hawai'i." *The Wilson Bulletin.* 115:258-262.

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Kaku Associates

Name	Education	Title/Draft EIS Role	Years of Experience
Dick Kaku	B.S., Civil Engineering, Cornell University; M.S., Civil Engineering, University of California at Berkeley	Firm Principal	36
Jill Y. Liu	B.S., Civil Engineering, National Taiwan University; Master of Engineering Civil Engineering (Transportation Engineering Program), University of California at Berkeley	Engineer	4
John Muggridge	Bachelor of Engineering, Mechanical and Process Engineering, University of Sheffield; M.S. Transportation Planning and Engineering, University of Leeds	Firm Project Manager	11

Ku`iwalu

Name	Education	Title/Draft EIS Role	Years of Experience
Brian Cruz	A.A., Liberal Arts, Big Ben Community College, Germany; B.S., Business Management, University of Phoenix Online	Cultural Research Specialist (Subconsultant Ka`imipono Consulting)	5
Lynette Hiilani Cruz	B.A., Pacific Island Studies, Hawai`i Pacific University; M.A. and Ph.D., Anthropology, University of Hawai`i at Mānoa	Anthropology (Subconsultant Ka`imipono Consulting)	10
Maria Ka`imipono Orr	B.A., Archaeology, and M.A., Anthropology, University of Hawai`i at Mānoa	Investigator, Ethnographer (Subconsultant Ka`imipono Consulting)	20
Lani Ma`a Lapilio	B.A., University of Hawai`i at Mānoa; Graduate Certificate of Historic Preservation, University of Hawai`i at Mānoa; J.D. William S. Richardson School of Law	Cultural Report	20
I`ini Patelesio	B.A., Hawaiian Studies, University of Hawai`i at Mānoa	Cultural Research Assistant	5

Lee + Elliott

Name	Education	Title/Draft EIS Role	Years of Experience
Theodore Barker	B.S. and M.S., Industrial Engineering, West Virginia University	Maintenance Planner	38
John Dexter	B.S., Mechanical Engineering, General Motors Institute	Maintenance Planner	36

Christopher Gambla	B. S., Aviation Management, University of Dubuque; M.S., Business Administration, Benedictine University	Operations Planning and Cost Estimating	20
Sebastian Gladney	B.S., Civil Engineering, University of California at Berkeley	Operations Analysis and Train Performance	28
Donna Heid	Course Work, Cleveland State University	Report Generation and Word Processing	30
Aaron Hester	B.S., Electrical Engineering, University of Texas at Arlington	Operations Analysis	30
Jee Gun Kim	B.S., Mechanical Engineering, University of California at Berkeley	Operations Analysis and Train Performance	2
Scott F. Kutchins	B.S., Civil Engineering, Texas A&M University	Operations Analysis	17
Janice Li	B.S., Industrial Engineering, University of Washington; Master of Business Administration, University of Delaware	Maintenance Planner	16
Hal Lindsey	B.S., Business Administration, University of Central Florida	Train Performance (Technology Motor Curves)	33
David D. Little, AICP	B.A., Economics (Minor, Business Administration), University of New Hampshire; M.S., Transportation Engineering, University of California at Berkeley	Operations Analysis and Coordination	24
Maggie Picard	B.S., Economics, University of Massachusetts Dartmouth	Graphics and Planning	1
Nate Yemane	B.S., Industrial and Systems Engineering, Virginia Polytechnic Institute and State University	Operations Analysis and Route Synchronizing	4

Steve Nimz & Associates, LLC

Name	Education	Title/Draft EIS Role	Years of Experience
Steve M. Nimz	Associate, Orchid Management Horticulture, Michigan State University; Associate, Agriculture Science, Lake Michigan College; B.S., Tropical Agriculture, Economics, and Horticulture, University of Hawai`i at Mānoa	Arborist	37

Yukie Ohashi Planning Consultants, LLC

Name	Education	Title/Draft EIS Role	Years of Experience
Tim Ohashi	B.S., Wildlife Resources, University of Idaho; M.S., Wildlife Sciences, New Mexico State University	Wildlife Biologist	10
Yukie Ohashi	Bachelor of Fine Arts and Masters Candidate, Urban and Regional Planning, University of Hawai`i at Mānoa	Wetlands, Natural Resources Planner	19

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List of Draft EIS Recipients

Category	Contact
Federal Agencies	Commander, Naval Base Pearl Harbor Directorate of Public Works District Chief, Department of the Interior Federal Aviation Administration Federal Emergency Management Agency Manager, U.S. Environmental Protection Agency, Pacific Islands Contact Office National Marine Fisheries Service, Pacific Islands Area Office State Conservationist, U.S. Department of Agriculture U.S. Army Corps of Engineers U.S. Coast Guard, 14th Coast Guard District U.S. Department of Transportation Federal Transit Division, Region IX U.S. Federal Highway Administration U.S. National Park Service
Federal Officials	
U.S. Senate	The Honorable Daniel K. Inouye The Honorable Daniel K. Akaka
U.S. Representatives	The Honorable Neil Abercrombie The Honorable Mazie Hirono
State of Hawai`i Officials	
Governor	The Honorable Linda Lingle
Lt. Governor	The Honorable James R. Aiona, Jr.
State Senators	The Honorable Brian T. Taniguchi The Honorable Carol Fukunaga The Honorable Clarence Nishihara The Honorable Clayton Hee The Honorable Colleen Hanabusa The Honorable David Y. Ige The Honorable Donna Mercado Kim The Honorable Fred Hemmings The Honorable Gary L. Hooser The Honorable Gordon Trimble The Honorable Jill N. Tokuda The Honorable Kalani J. English The Honorable Les Ihara, Jr. The Honorable Lorraine Inouye The Honorable Mike Gabbard The Honorable Norman Sakamoto The Honorable Paul Whalen The Honorable Robert Bunda The Honorable Ron Menor The Honorable Rosalyn H. Bake

Category	Contact
State Senators (continued)	The Honorable Russell S. Kokubun The Honorable Sam Slom The Honorable Shan S. Tsutsui The Honorable Suzanne Chun Oakland The Honorable Will Espero The Honorable Kymberly Marcos Pine
State House of Representatives	The Honorable Alex M. Sonson The Honorable Angus L.K. McKelvey The Honorable Barbara C. Marumoto The Honorable Blake K. Oshiro The Honorable Bob Nakasone The Honorable Calvin K.Y. Say The Honorable Cindy Evans The Honorable Clift Tsuji The Honorable Colleen Rose Meyer The Honorable Cynthia Thielen The Honorable Della Au Belatti The Honorable Dwight Y. Takamine The Honorable Faye P. Hanohano The Honorable Gene Ward, Ph.D. The Honorable Glenn Wakai The Honorable Hermina Morita The Honorable James Kunane The Honorable Jerry L. Chang The Honorable Joe Betram, III The Honorable Joey Manahan The Honorable John Mizuno The Honorable Jon Riki Karamatsu The Honorable Joseph M. Souki The Honorable Josh Green, M.D. The Honorable Karen Leinani Awana The Honorable Karl Rhoads
State of Hawai`i Agencies	Airports Division Offices Aloha Tower Development Corporation Chairman, Department of Hawaiian Home Lands Convention Center Authority Department of Business, Economic Development, and Tourism—Land Use Commission Department of Accounting and General Services Department of Agriculture Department of Archives Department of Budget and Fiscal Services Department of Defense Department of Land and Natural Resources Department of Transportation Department of Health, Environmental Planning Office Department of Land and Natural Resources, O`ahu Island Burial Council Hawai`i Community Development Authority Housing Finance and Development Corporation Legislative Reference Bureau

Category	Contact
State of Hawai`i Agencies (continued)	O`ahu Metropolitan Planning Organization Office of Environmental Quality Control Office of Hawaiian Affairs Office of Planning State Historic Preservation Office State of Hawai`i Department of Defense Superintendent, Department of Education
City and County of Honolulu Officials	The Honorable Mufi Hannemann The Honorable Ann Kobayashi The Honorable Barbara Marshall The Honorable Charles Djou The Honorable Donovan Dela Cruz The Honorable Gary Okino The Honorable Nestor Garcia The Honorable Rod Tam The Honorable Romy Cachola The Honorable Todd Kala Apo Chief Engineer, Board of Water Supply Chief Planning Officer Chief, Honolulu Fire Department Chief, Honolulu Police Department Department of Community Services Department of Design and Construction Department of Environmental Services Department of Facility Maintenance Department of Parks and Recreation Department of Transportation Services
Neighborhood Boards	Chair Albert Fukushima, Pearl City No. 21 Chair Amy Luersen, Kahalu`u No. 29 Chair Anne Stevens, Ala Moana-Kaka`ako No. 11 Chair Ben Acohido, Wahiawa No. 26 Chair Bernadette Young, Kalihi-Palama No. 15 Chair Bert Narita, Neighborhood Board No. 5 Chair Bill Woods-Bateman, Kalihi Valley No. 16 Chair Bob Stubbs, Neighborhood Board No. 14 Chair Dean Hazama, Neighborhood Board No. 35 Chair Deedee Letts, Ko`olauloa No. 28 Chair Dick Poirier, Mililani-Waipi`o-Melemanu No. 25 Chair Georgette "Jo" Jordan, Wai`anae Coast No. 24 Chair Greg Knudsen, Hawai`i Kai No. 1 Chair John Steelquist, Neighborhood Board No. 10 Chair Kathy Bryant-Hunter, Kailua No. 31 Chair Kelley Roberson, Wai`alae-Kahala No. 3 Chair Len Pepper, Neighborhood Board No. 18 Chair M. Kioni Dudley, Neighborhood Board No. 34 Chair Michael Lyons, North Shore No. 27 Chair Patty Teruya, Nānākuli-Mā`ili No. 36

Category	Contact
Neighborhood Boards (continued)	Chair Paul Holtrop, Mānoa No. 7 Chair Paula S. Kurashige, Nu`uanu-Punchbowl No. 12 Chair Rachel Orange, Pālolo No. 6 Chair Richard H. Oshiro, Waipahu No. 22 Chair Richard Hargrave, `Ewa No. 23 Chair Robert "Bob" Chuck, Kuliou-Kalani Iki No. 2 Chair Robert Finley, Waikīkī No. 9 Chair Ron Lockwood, McCully-Mō`ili`ili No. 8 Chair Roy S. Yanagihara, Kāne`ohe No. 30 Chair Tom Smyth, Downtown No. 13 Chair Vernon Tam, Kaimukī No. 4 Chair William B. Clark, `Aiea No. 20 Chair Wilson Kekoa Ho, Waimānalo No. 32
Other Hawai`i Counties	
Hawai`i County	Hawai`i County Planning Department Hawai`i County Department of Parks and Recreation Hawai`i County Department of Public Works Hawai`i County Department of Research and Development Hawai`i County Department of Water Supply
Kaua`i County	County Engineer, Department of Public Works Kaua`i Department of Planning Manager, Kaua`i Department of Water
Maui County	Coordinator, Maui Economic Development Agency Maui Department of Parks and Recreation Maui Department of Planning Maui Department of Public Works Maui Department of Water Supply
Other	
Colleges	Brigham Young University-Hawai`i Chaminade University Hawai`i Community College Hawai`i Pacific University Honolulu Community College Kapi`olani Community College Kaua`i Community College Leeward Community College Maui Community College TransPacific Hawai`i College University of Hawai`i at West O`ahu University of Hawai`i at Hilo University of Hawai`i at Mānoa University of Hawai`i at Mānoa Environmental Center University of Hawai`i at Mānoa Marine Programs University of Hawai`i at Mānoa Water Resources Research Center

Category	Contact
Libraries	\`Aiea Public Library \`Āina Haina Public Library Bond Memorial Public Library Department of Business, Economic Development, and Tourism Library \`Ewa Beach Public and School Library Hamilton Library, Hawn Collection Hana Public and School Library Hanapēpē Public Library Hawai\`i Kai Public Library Hawai\`i State Library Hilo Public Library Honoka\`a Public Library Honolulu Municipal Reference and Records Center Hōlualoa Public Library Kahili-Palama Public Library Kahuku Public and School Library Kahului Public Library Kailua Public Library Kailua-Kona Public Library Kaimukī Public Library Kāne\`ohe Public library Kapa\`a Public Library Kaua\`i Community College Library Kea\`au Public and School Library Kealakekua Public Library Kīhei Public Library Kōloa Public and School Library Lāhainā Public Library Lāna\`i Public and School Library Laupāhoehoe Public and School Library University of Hawai\`i at Hilo Library Library for the Blind and Physically Handicapped Līhu\`e Public Library Liliha Public Library Makawao Public Library Mānoa Public Library Maui Community College Library McCully-Mō\`ili\`ili Public Library Mililani Public Library Moloka\`i Public Library Mountain View Public and School Library Nā\`ālehu Public Library Pāhala Public and School Library Pāhoa Public and School Library Pearl City Public Library Princeville Library Salt Lake-Moanalua Public Library Thelma Parker Memorial Public and School Library Wahiawa Public Library

Category	Contact
Libraries (continued)	Waialua Public Library Waianae Public Library Waikīkī-Kapahulu Public Library Wailuku Public Library Waimānalo Public and School Library Waimea Public library Waipahu Public Library
Newspapers	City Editor, Honolulu Star Bulletin Editor, Hawai`i Tribune Herald Editor, Honolulu Advertiser Editor, Maui News Editor, Moloka`i Dispatch Editor, Sun Press Editor, The Garden Island Newspaper Editor, West Hawai`i Today
Group/Organizations	Ahahui Siwila Hawai`i O Kapolei Hawaiian Civic Club American Institute of Architects, Honolulu Ali`i Pauahi Hawaiian Civic Club Association of Hawaiian Civic Clubs Chamber of Commerce of Hawai`i El-rayna Adam Hailama Farden Hawaiian Civic Club of `Ewa-Pu`uloa Hawaiian Civic Club of Honolulu Hawaiian Civic Club of Wahiawa Hawai`i's Thousand Friends Hawaii Community Development Authority Historic Hawai`i Foundation, Executive Director Faulkner Hui Malama I Na Kupuna O Hawai`i Nei Ka Lei Maile Ali`i Hawaiian Civic Club Kalihi-Palama Hawaiian Civic Club King Kamehameha Hawaiian Civic Club Merchant Street Hawaiian Civic Club Mr. Walter Billingsley Ms. Donna Lei Smythe Ms. Janet Gillmar Ms. Kalene Shim Nānāikapono Hawaiian Civic Club Pearl Harbor Hawaiian Civic Club Prince Kūhīo Hawaiian Civic Club Princess Ka`iulani Hawaiian Civic Club Royal Order of Kamehameha I Sierra Club The Garden Club of Honolulu The Hawai`i Chapter of the American Planning Association The Outdoor Circle University of Hawai`i Historic Preservation Certificate Office Wai`anae Hawaiian Civic Club Waikīkī Hawaiian Civic Club

Category	Contact
Miscellaneous	Captain Edward Enos, Jr. Conservation Council of Hawai`i Dale Evans Director, Environmental Health General Manager, Ala Moana Center Hawaiian Electric Company Hawaiian Telephone Company Kalihi-Palama Community Council Mr. Bill Wilson Mr. Bruce Plasch, Ph.D. Mr. David Aki Mr. David Dodge Mr. Don Carroll Mr. Gareth Sakakida Mr. George T. Arizumi Mr. Gordon Lum Mr. Gordon Scruton Mr. Guy Nakamoto Mr. Henry Eng Mr. James Bassett Mr. John F. Mathias, Jr. Mr. Katsumi Tanaka Mr. Keith Hamada Mr. Kyle Yamada Mr. Mark Snyder Mr. Michael Mazzone Mr. Murray Towill Mr. Richard Kane Mr. Robert Gersard Mr. Rodney Kim Mr. Steve Golden Mr. Tony Vericella Mr. W. Richard Boddy, O`ahu Metropolitan Planning Organization Citizen Advisory Committee (O`ahuMPO CAC) Ms. Arlene Ellis Ms. Georgia E. Miller, O`ahuMPO CAC Ms. Juli Kobayashi, O`ahuMPO CAC Ms. Kimberly Mills Ms. Laura Kodama Ms. Patricia Blum, O`ahuMPO CAC Ms. Patricia Tummons Ms. Ruby Hargrave Ms. Sherry Goya Pearl City Shopping Center Pearlridge Center Management Office Rusty Leonard Victoria Ward Limited Waldron Steamship Company

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