02

CHAPTER

Alternatives Considered

This chapter summarizes the alternatives considered for the Honolulu High-Capacity Transit Corridor Project. Section 2.2, Alternatives Screening and Selection Process, and Section 2.3, Alternatives Considered in the Draft Environmental Impact Statement, of this Chapter discuss each alternative that has been considered in detail and the reasons that other alternatives were eliminated from detailed study, including alternatives not within the jurisdiction of FTA and the City. The No Build Alternative is included in the consideration. As described in Section 2.4, Preferred Alternative Identification Process, the Preferred Alternative identified in Section 2.5, The Project: Fixed Guideway Alternative from East Kapolei to Ala Moana Center via the Airport, and evaluated throughout this Final Environmental Impact Statement (EIS) resulted from a rigorous process involving compliance with and response to Hawaiʻi Revised Statutes (HRS) Chapter 343 EIS preparation notice comment period, Alternatives Analysis, National Environmental Policy Act (NEPA) scoping process, and comments received during the public review of the Draft EIS.

The Project was developed following the process outlined in the U.S. Federal Transit Administration's (FTA) *Advancing Major Transit Investments through Planning and Project Development* (FTA 2003), which is summarized as follows:

"Planning and project development for New Starts projects is a continuum of analytical activities carried out as part of the metropolitan planning and National Environmental Policy Act of 1969 (NEPA) review processes. Systems planning results in the identification and prioritization of transportation corridors in greatest need of more detailed planning and analysis. Alternatives analysis focuses on a specific transportation need (or set of needs), identifies alternative actions to address these needs, and generates information needed to select an option for further engineering and implementation. Once a Locally Preferred Alternative is selected and adopted in the region's long-range plan, the project sponsor may request FTA entrance into Preliminary Engineering (PE). PE includes additional engineering analysis and results in the completion of all environmental requirements. PE also typically marks the beginning of FTA's project management

oversight function. The next stage of development is Final Design, which also requires FTA approval. It is within Final Design that candidate projects are considered by FTA for a Full Funding Grant Agreement."

Figure 2-1 illustrates the process annotated with major steps that have been completed for the Project. Following FTA guidance, the Alternatives Analysis defined the range of alternatives for evaluation in the NEPA process, and the NEPA scoping process was completed after identification of the Locally Preferred Alternative (FTA 2006b). As summarized in Section 2.2, the Alternatives Analysis process and the Draft EIS rigorously explored and objectively evaluated all reasonable alternatives. Under FTA's New Starts Program, the alternatives considered in the NEPA process may be narrowed in those instances when the Alternatives Analysis required by 49 USC 5309(e) is conducted as a planning study prior to the NEPA review (FTA 2005). In this scenario, FTA's PE approval was for the alternative that was advanced from the Alternatives Analysis into the NEPA process and selected as the Preferred Alternative within the NEPA process (FTA 2003). This Final EIS addresses the Build Alternative approved by FTA for PE. Following a 30-day publication notice of this Final EIS, FTA will issue a Record of Decision that will identify the selected alternative and conclude the Federal environmental review process.

2.1 Changes to this Chapter since the Draft Environmental Impact Statement

This chapter has been changed to reflect identification of the Airport Alternative as the Preferred Alternative for the Honolulu High-Capacity Transit Corridor Project. The term the "Project" refers to the Fixed Guideway Transit Alternative via the Airport that was evaluated in the Draft EIS. The following sections have been added since the publication of the Draft EIS or contain substantial new information in response to public and agency comments received on the Draft EIS. The introductory section contains additional information on the alternative and project development process. In response to comments, information about the elimination of at-grade light rail has been added to Section 2.2. Figures 2-17 through 2-39 in this chapter and the plans included in Appendix B, Preliminary Alignment Plans and Profiles, and Appendix C, Preliminary Right-of-Way Plans, reflect Preliminary Engineering design, including revisions that have resulted from coordination with agencies and landowners adjacent to the Project.

Section 2.3 describes alternatives considered, and Section 2.4 describes the selection process for the Preferred Alternative. Section 2.5 details the features of the Project. Section 2.5.4 provides additional information about safety and security, and Section 2.5.5 provides information about pedestrian and bicycle access to stations. Much of the detail of future bus operations has been moved from Section 2.5.6 to Chapter 3, Transportation. Section 2.5.8 identifies the site near Leeward Community College as the preferred site option for the maintenance and storage facility. Section 2.5.10 has been revised to reflect the latest project schedule and addition of the Salt Lake alignment as a planned extension that may be constructed as a future project.

2.2 Alternatives Screening and Selection Process

Prior to completion of the Draft EIS, a full range of reasonable alternatives was evaluated at three stages. First, a broad range of alternatives was considered and screened down 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

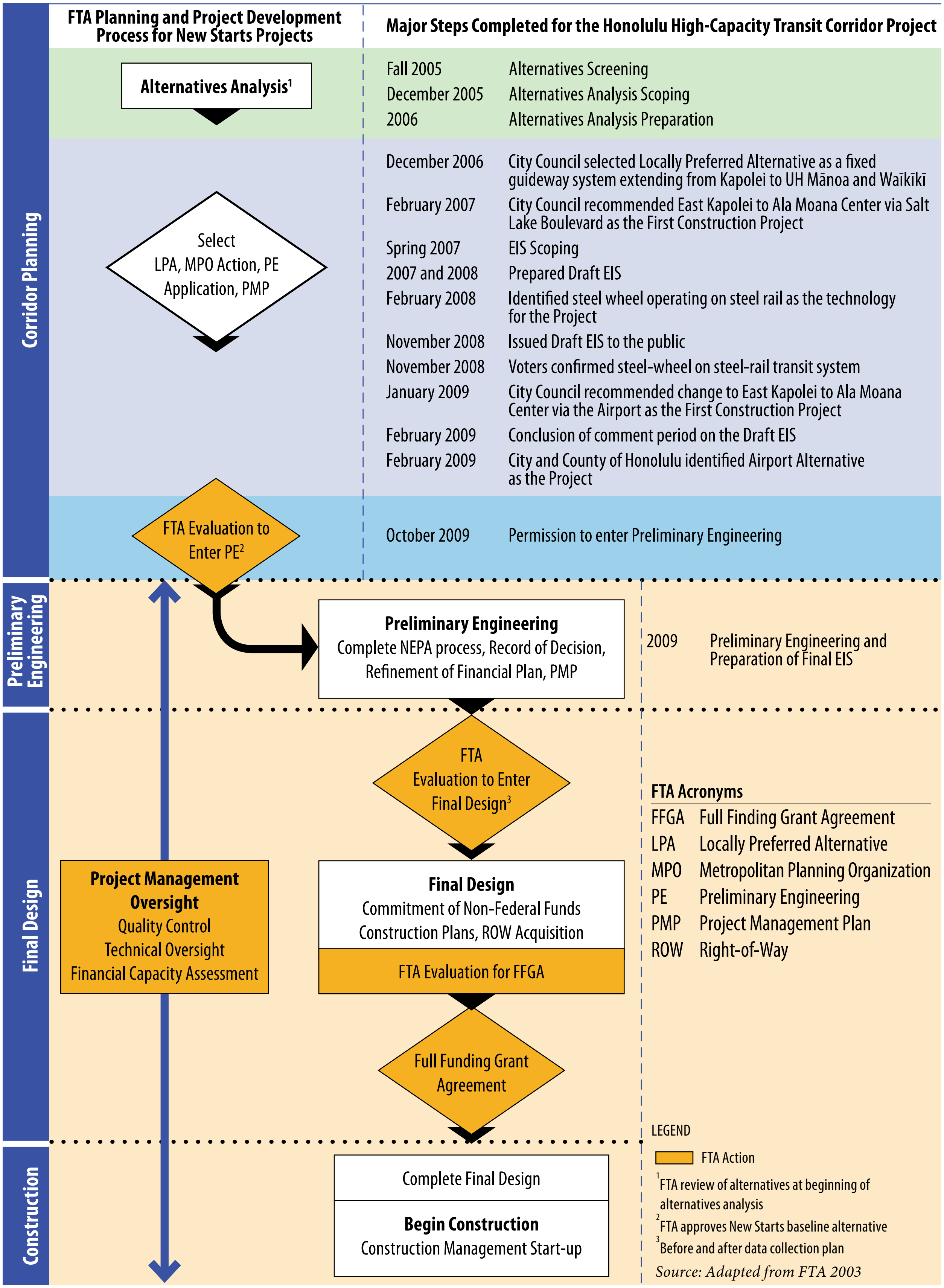


Figure 2-1 Planning and Project Development Process

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.

Prior to selecting an elevated fixed guideway system, a variety of high-capacity transit options were evaluated during the Primary Corridor Transportation Project (1998–2002) and Alternatives Analysis. Options evaluated and rejected included an exclusively at-grade fixed-guideway system using light-rail or bus rapid transit (BRT) vehicles, as well as a mix of options consisting of both at-grade and grade-separated segments. In addition to comments received during the Alternatives Analysis and EIS scoping sessions, these studies provided a critical foundation for the conclusion that an elevated system would result in the best overall performance and better support the Purpose and Need for the Project.

2.2.1 Screening of a Broad Range of Alternatives

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 Alternatives Analysis scoping process.

During the fall of 2005 and winter of 2006, the City and County of Honolulu (City) completed the 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 2-2.

The first step was to gather input needed for the analysis. The input included the preliminary Purpose and Need for the Project, past studies and their recommendations, requirements of the FTA Section 5309 New Starts Program, adopted community and area plans, and a visual assessment of the entire study 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 included a scoping process that involved a presentation of the viable alternatives to the public and interested public agencies and officials to receive comments on the Purpose and Need, alternatives, and scope of the

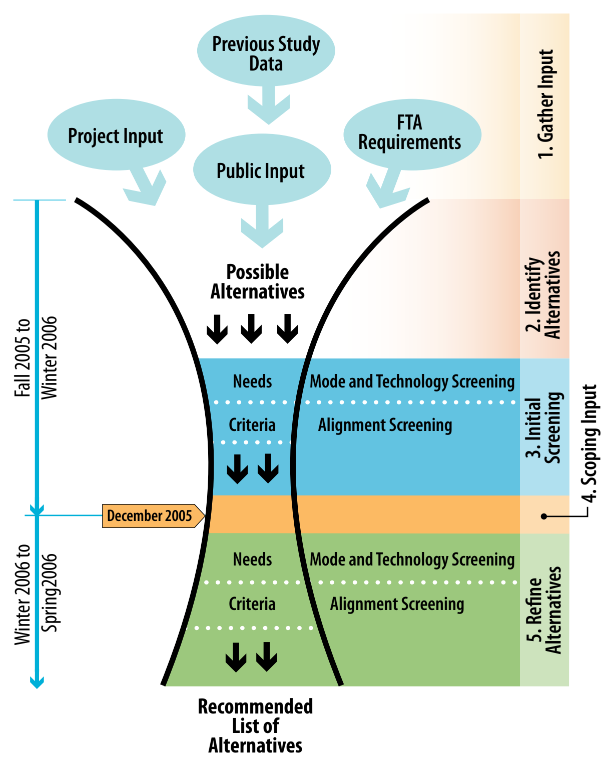


Figure 2-2 Alternatives Screening Process

analysis for the Alternatives Analysis. 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.

The following alternatives (Table 2-1) 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 and it would not provide an alternative to the private automobile. 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. The service terminated in July 2009.

Several transit technologies also were eliminated from further consideration for various reasons (Table 2-1). 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

Table 2-1 Alternatives and Technologies Considered but Rejected

	Why Rejected	When Rejected
Alternative		
Pearl Harbor Tunnel	Would not meet Purpose and Need; rejected by O`ahuMPO based on high cost and limited benefit	Screening
Waterborne Ferry Service	Would not meet Purpose and Need; insufficient capacity and uncompetitive travel time	Screening
Transportation System Management	Would not meet Purpose and Need; would not have supported Honolulu General Plan; minimal reduction in vehicle miles traveled and vehicle hours of delay	Alternatives Analysis
Managed Lane Alternative	Would not meet Purpose and Need; would not have supported Honolulu General Plan; increase in vehicle miles traveled and minimal reduction in vehicle hours of delay	Alternatives Analysis
Technologies		
Commuter rail	Not suitable for urban transit	Screening
Diesel multiple unit	Not suitable for urban transit	Screening
Personal rapid transit	Unproven technology and insufficient capacity	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

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.

Corridor-wide at-grade light-rail transit was rejected because it would have required conversion of traffic lanes to rail throughout the corridor, thereby substantially reducing roadway capacity since no abandoned or undeveloped alignments are available in the study corridor. At-grade light-rail would have required either the acquisition and removal of buildings throughout the corridor or the conversion of two or more traffic lanes. Acquisition of right-of-way and the associated displacements would be required for stations in any event.

An at-grade system would not have provided a reliable, high-capacity, exclusive right-of-way system. Short blocks in the downtown area would limit the length of trains to two vehicles, and coordination of signals would limit headways to three minutes. This would prevent any future expansion of capacity. Average speed would be approximately one-half of that of an exclusive right-of-way system. Any automobiles that block the tracks, either at intersections or by trespass onto the tracks, as well as accidents that affect the tracks, would delay the transit system. This would not occur with an exclusive right-of-way system.

In addition, electrically powered trains are quieter than buses and because they come every few minutes rather than constantly, as does traffic, pedestrians and motorists are often unaware of their approach. The potential for accidents with at-grade light rail is substantially greater than it is with a separated right-of-way system. Excavation to a depth of between 4 and 5 feet would be required for the entire length of the at-grade system to construct track support. As a result, the potential for disturbance to archaeological resources or burials would be much greater than it would be for an elevated system.

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 phase 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. In total, 75 fixed guideway alignment options were screened (DTS 2006a).

2.2.2 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 and documented 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 evaluated based on their effectiveness in meeting the Project's goals and objectives related to mobility and accessibility, supporting planned growth and economic development, constructability and cost, community and environmental quality, and planning consistency. All four alternatives were evaluated to the same set of criteria. This Final EIS summarizes the individual criteria for each alternative that differentiated it from the other alternatives. There were no other major issues identified for any of the alternatives.

The comparison of these alternatives 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 2-2 compares the alternatives evaluated during the Alternatives Analysis process for several performance measures and Table 2-3 compares the environmental effects. While the results for the No Build and Fixed Guideway Alternatives that are summarized here differ from the values presented in the 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, depending on the option constructed.

Transportation System Management Alternative

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

Table 2-2 Summary of Alternatives Analysis Findings

Alternative	Daily Islandwide Transit Trips	Vehicle Miles Traveled	Vehicle Hours of Delay	Hours of Transit-user Benefits[1]	Total Capital Cost (Millions 2006 Dollars)	Cost per Hour of Transit-user Benefits 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[2]	14,002,000–14,034,000[2]	78,500–82,500[2]	5,528,500–5,632,700[2]	$3,601–$4,727[2]	$50.34–$63.42[2]
2030 Fixed Guideway	281,900–294,100[2]	13,464,000–13,539,000[2]	65,000–73,500[2]	15,153,600–18,770,200[2]	$4,192–$6,075[2]	$21.32–$27.05[2]

[1] Transit-user Benefits captures a set of benefits to transit riders—including reductions in walk times, wait times, number of transfers, and costs (converted to time)—in terms of savings in travel time.

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

Table 2-3 Summary of Alternatives Analysis Environmental Findings

Alternative	Property Acquisitions	Historic Resources Adjacent to Project	Visual Effects	Residences Affected by Noise (without Mitigation)	Energy Consumption
2030 No Build	0	0	None	0	Baseline
2030 Transportation System Management (TSM)	0	0	Minor	0	Modreate reduction
2030 Managed Lane	31	30	Moderate	260	Increased consumption
2030 Fixed Guideway	79-90[1]	70-82[1]	Moderate to High1	170-200[1]	Greatest Reduction

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

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. The alternative included express bus service that operated as bus rapid transit in existing facilities. 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 Oʻahu, Waipiʻo, 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 2-2). 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 pollutant emissions and water pollution than the Fixed Guideway Alternative.

Although the TSM Alternative would have been very cost-effective, 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 (Figure 2-3). 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 operating as bus rapid transit, 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 2-2). 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 the 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 2-2). 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 fail to meet the Project's Purpose and Need, as described in Chapter 1 of this Final EIS, because it fails to moderate anticipated traffic congestion. It also would be less effective than the Fixed Guideway Alternative at providing a faster and more reliable public transportation service as well as an alternative to private automobile travel.

The Managed Lane Alternative would have generated the greatest amount of air pollution, required the greatest amount of energy for transportation use, and 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. The elevated structure would have extended a shorter distance, but it would have been more visually intrusive because its elevated structure, with a typical width of between 36 and 46 feet, 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

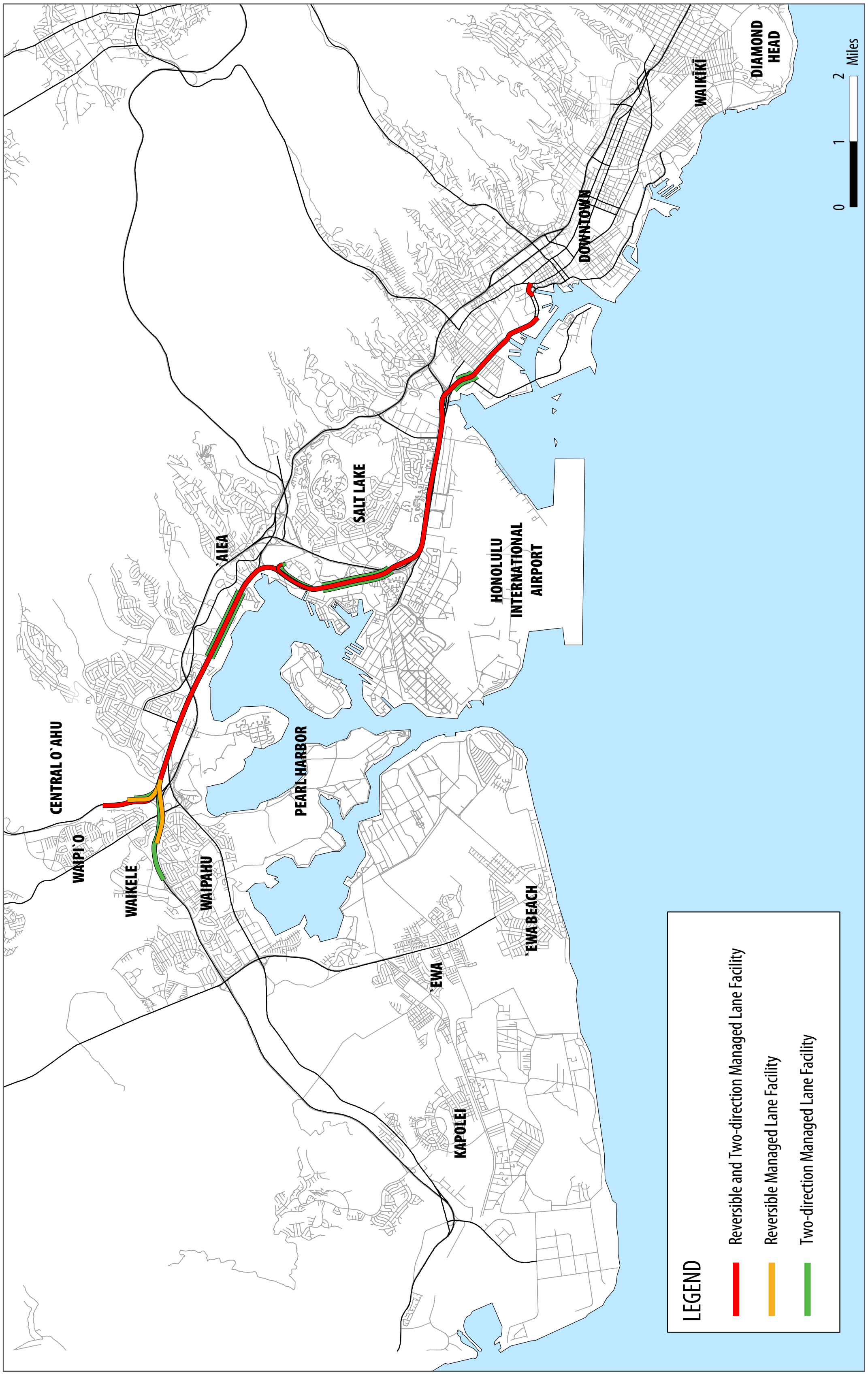


Figure 2-3 Managed Lane Alternative Evaluated in the Alternatives Analysis

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 Hawai'i at Mānoa (UH Mānoa). The study corridor for the Fixed Guideway Alternative was evaluated in five geographical sections to simplify the analysis and facilitate evaluation (Figure 2-4).

Each alignment was evaluated individually and compared to the other alignments in the respective section in relation to mobility and accessibility, supporting planned growth and economic development, constructability and cost, community and environmental quality, and planning consistency.

Effects to aquatic resources would have been similar for each of the Fixed Guideway options evaluated in the Alternatives Analysis. Each option included construction of an elevated fixed-guideway through much of the corridor. The various alignments generally crossed the same water resources but at different river miles. The Kamokila–Airport–Dillingham–King Option would have tunneled under Nu'uanu Stream rather than being on a bridge above the stream. This option was not financially feasible, however, since its costs exceeded the other options by more than $500 million.

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/Kapi'olani Boulevard.

The Alternatives Analysis included an evaluation of light-rail transit with at-grade operation in portions of the corridor. The Kalaeloa–Salt Lake–North King–Hotel Option included at-grade operation on Hotel Street that would have reduced visual impacts Downtown; however, it also would have decreased system speed, capacity, reliability, safety, and roadway capacity and speed. The Kalaeloa–Salt Lake–North King–Hotel Option had the greatest potential for disturbance of archaeological and burial resources and would have caused the greatest number of residential displacements. It would not have substantially changed impacts to other environmental resources. It would not have provided overall project cost savings, including the connections to grade-separated operations.

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 substantially reduce VHD for all travelers, not just transit users (Table 2-2).

Table 2-1 summarizes the alternatives considered but rejected. 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. Because the Managed Lane Alternative would not have met the Project's Purpose and Need, would not have resulted in substantially fewer environmental impacts, and would not have been financially feasible, it is not a practicable alternative.

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; therefore, it would

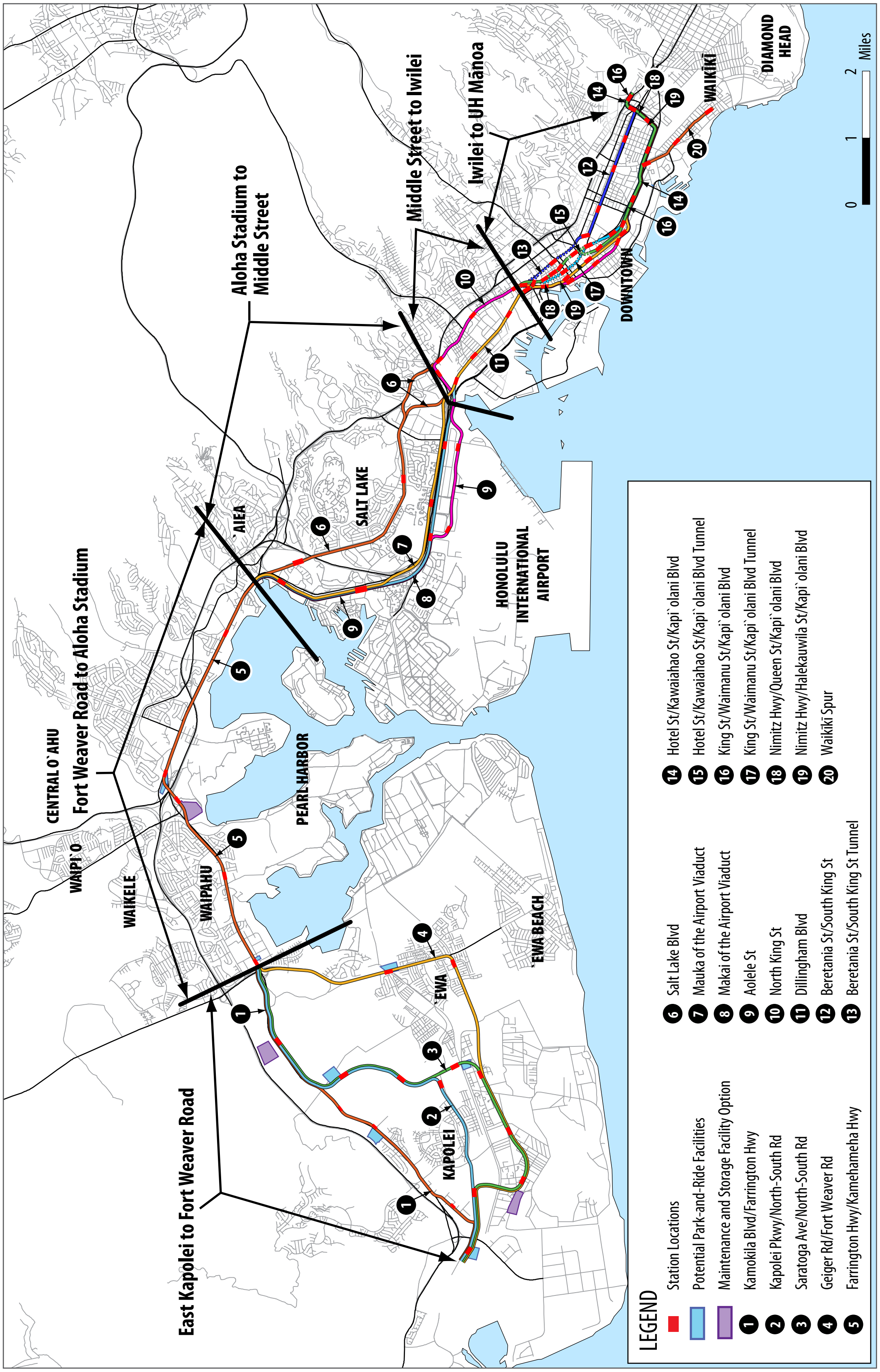


Figure 2-4 Fixed Guideway Alternative Evaluated in the Alternatives Analysis

not have met the Project's Purpose and Need and is not a practicable alternative.

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.

2.2.3 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 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 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 that were evaluated in the Draft EIS and described in this chapter are the result of the alternatives screening process and reflect 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.

The NEPA 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). The Notice of Intent also included five technologies for consideration.

Several scoping comments were received requesting reconsideration of the Managed Lane Alternative that was considered and rejected during the Alternatives Analysis. Because no new information was provided that would have changed the findings of the Alternatives Analysis regarding the Managed Lane Alternative, it was not included in the Draft EIS for further consideration.

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 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. In addition, more acquisition of right-of-way would have increased the potential for additional impacts to burial sites and cultural resources; therefore, it was not included in the 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 was not included in the 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 the 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 initiated 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 of transportation experts 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 Project evaluated in this Final EIS. Table 2-1 lists the technologies that were considered but rejected. The four panel members selected steel-wheel technology because it is mature, proven, safe, reliable, economical, and non-proprietary. Proprietary technologies, meaning those technologies that would have required all future purchases of vehicles or equipment to be from a single manufacturer, were eliminated because none of the proprietary technologies offered substantial proven performance, cost, and reliability benefits compared to steel wheel operating on steel rail. Selecting a proprietary technology also would have precluded a competitive bidding process, likely resulting in increased overall project costs.

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 to be evaluated for the Project. Therefore, the analysis of the Project in this Final EIS is based on steel wheel on steel rail technology.

2.3 Alternatives Considered in the Draft Environmental Impact Statement

Based on the results of the preceding screening process, four alternatives were evaluated in the Draft EIS. They included the No Build Alternative and three fixed guideway alternatives (Build Alternatives):

- 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 Boulevard (Airport & Salt Lake Alternative)

All alternatives included 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 (OʻahuMPO 2007). Highway congestion relief projects in the ORTP are listed in Table 2-4.

Current transit fare policy was assumed to be continued for all Build Alternatives.

Land use, population, and employment assumptions for the year 2030 were kept consistent 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.

2.3.1 No Build Alternative

The No Build Alternative was evaluated to provide a comparison of what the future conditions would be if none of the Build Alternatives were implemented. The No Build Alternative also provides a point of comparison for identifying the benefits, costs, and impacts of each Build Alternative.

Table 2-4 Committed Congestion-relief Projects in the O`ahu Regional Transportation Plan 2030 (continued on next page)

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

Table 2-4 Committed Congestion-relief Projects in the O`ahu Regional Transportation Plan 2030 (continued from previous page)

Facility	Description
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

The No Build Alternative bus network would have included 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 have included an increase in bus fleet size (Table 2-5). However, due to increasing traffic congestion and slower travel times, transit service levels and passenger capacity would have remained about the same as they are today.

Table 2-5 Transit Vehicle Requirements

Alternative	Bus		Fixed Guideway	
	Peak	Fleet	Peak	Fleet
2007 Existing Conditions	434	540	0	0
2030 No Build	514	618	0	0
2030 Airport	490	588	76	85

2.3.2 Salt Lake Alternative

The Salt Lake Alternative would have included the construction and operation of a grade-separated fixed guideway transit system between East Kapolei and Ala Moana Center (Figure 2-5) with the same system characteristics described in Section 2.5 for the Project.

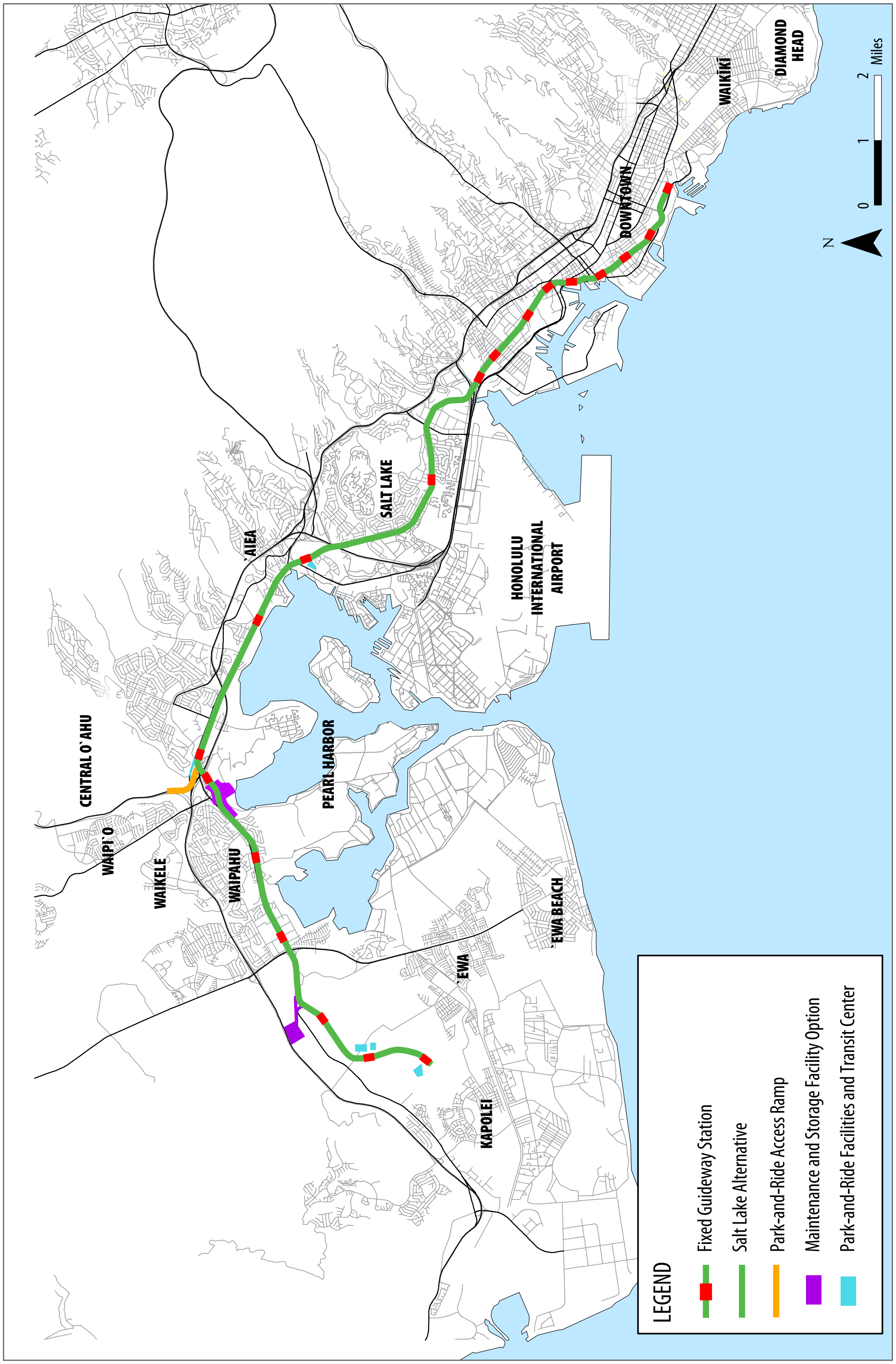


Figure 2-5 Salt Lake Alternative

From Waiʻanae to Koko Head (west to east), the guideway would have followed North-South Road and other future roadways to Farrington Highway. The guideway would have followed Farrington Highway Koko Head on an elevated structure and continued along Kamehameha Highway to the vicinity of Aloha Stadium.

The guideway would have left Kamehameha Highway immediately ʻEwa of Aloha Stadium, crossed the Aloha Stadium main parking lot, and continued Koko Head along Salt Lake Boulevard. It would have followed Pūkōloa Street through Māpunapuna before crossing and following Moanalua Stream to cross over the H-1 Freeway and continued to the Middle Street Transit Center.

Koko Head of Middle Street, the guideway would have followed Dillingham Boulevard to the vicinity of Kaʻaahi Street and then turned Koko Head to connect to Nimitz Highway near Iwilei Road. It would have followed Nimitz Highway Koko Head to Halekauwila Street, then proceeded along Halekauwila Street past Ward Avenue where it would have transitioned to Queen Street. The guideway would have crossed from Waimanu Street to Kona Street near Pensacola Street. The guideway would have run above Kona Street to Ala Moana Center.

The Salt Lake Alternative would have included feeder bus connections 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 have been approximately 19 miles, and it would have included 19 stations.

2.3.4 Airport Alternative

The Airport Alternative (Figure 2-6) is identical to the Salt Lake Alternative except between Aloha Stadium and Middle Street where it will follow Kamehameha Highway and Aolele Street. Feeder bus connections from fixed-guideway stations will serve locations in the Salt Lake neighborhood. The total guideway length for this alternative is approximately 20 miles, and it includes 21 stations.

2.3.5 Airport & Salt Lake Alternative

The Airport & Salt Lake Alternative (Figure 2-7) would have been identical to the Salt Lake Alternative, with an additional segment that would have followed Kamehameha Highway and Aolele Street from Aloha Stadium to Middle Street. This alternative would have followed the alignments described for both the Salt Lake Alternative and the Airport Alternative. The Aloha Stadium Station on Kamehameha Highway would have been relocated makai to provide an Arizona Memorial Station instead of a second Aloha Stadium Station. At the Middle Street Transit Center Station, each line would have had a separate platform with a concourse providing a pedestrian connection between them to allow passengers to transfer. The total guideway length for this alternative would have been approximately 25 miles and it would have included 23 stations.

2.4 Preferred Alternative Identification Process

The Draft EIS documented that of the three Build Alternatives evaluated, the Airport Alternative will carry the most passengers, with 95,000 daily passengers and 249,200 daily transit trips in 2030, and provide the greatest transit-user benefits (Table 2-6). While these numbers have changed since the Draft EIS was published, the relative differences among the alternatives would remain similar. The Airport Alternative also will result in the fewest vehicle miles traveled and vehicle hours of delay. It will provide access to employment centers at Pearl Harbor Naval Base and Honolulu International Airport and will have substantially greater ridership to those areas than the Salt Lake Alternative. It will serve the Salt Lake neighborhood with connecting bus service.

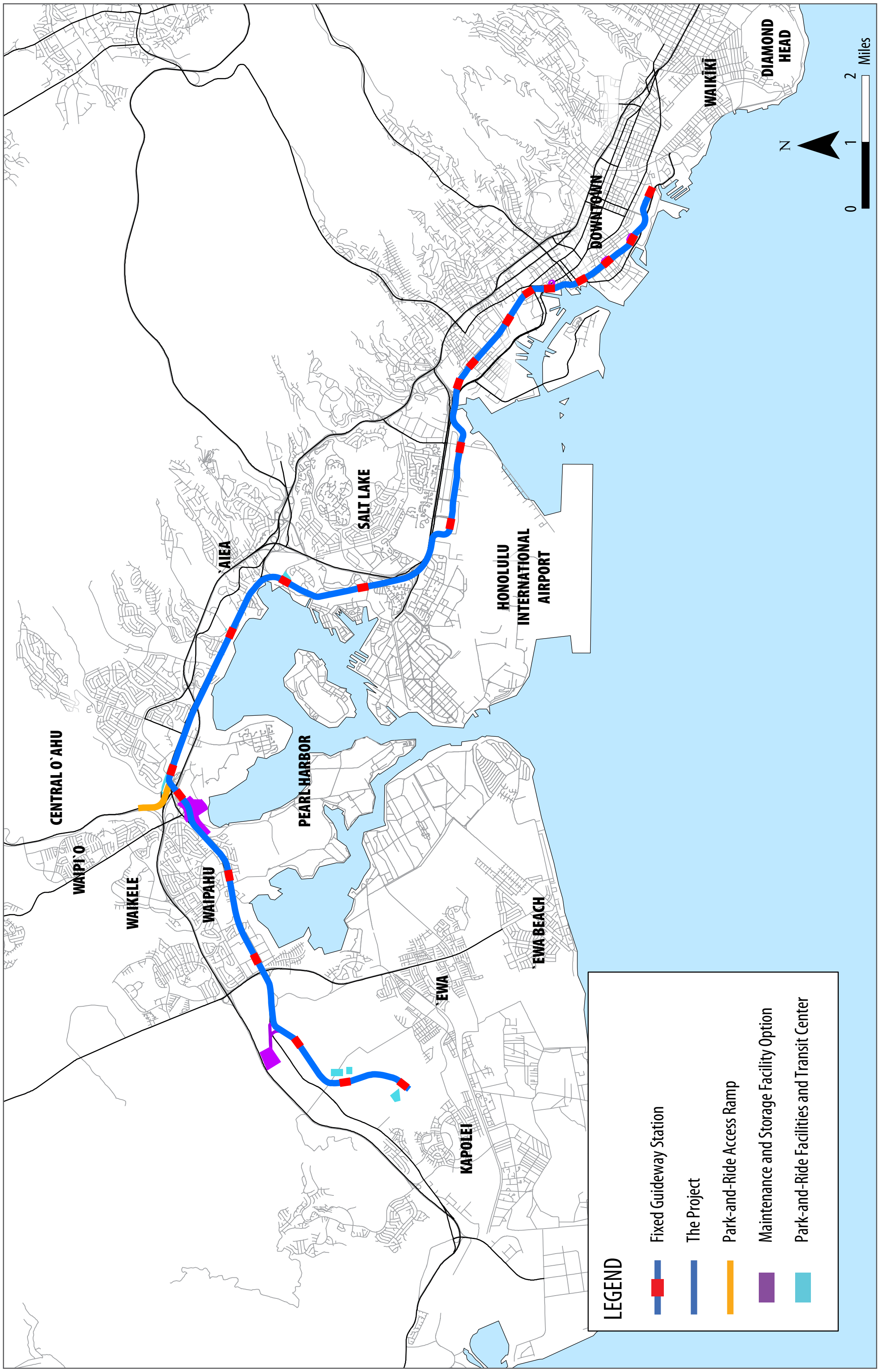


Figure 2-6 Airport Alternative

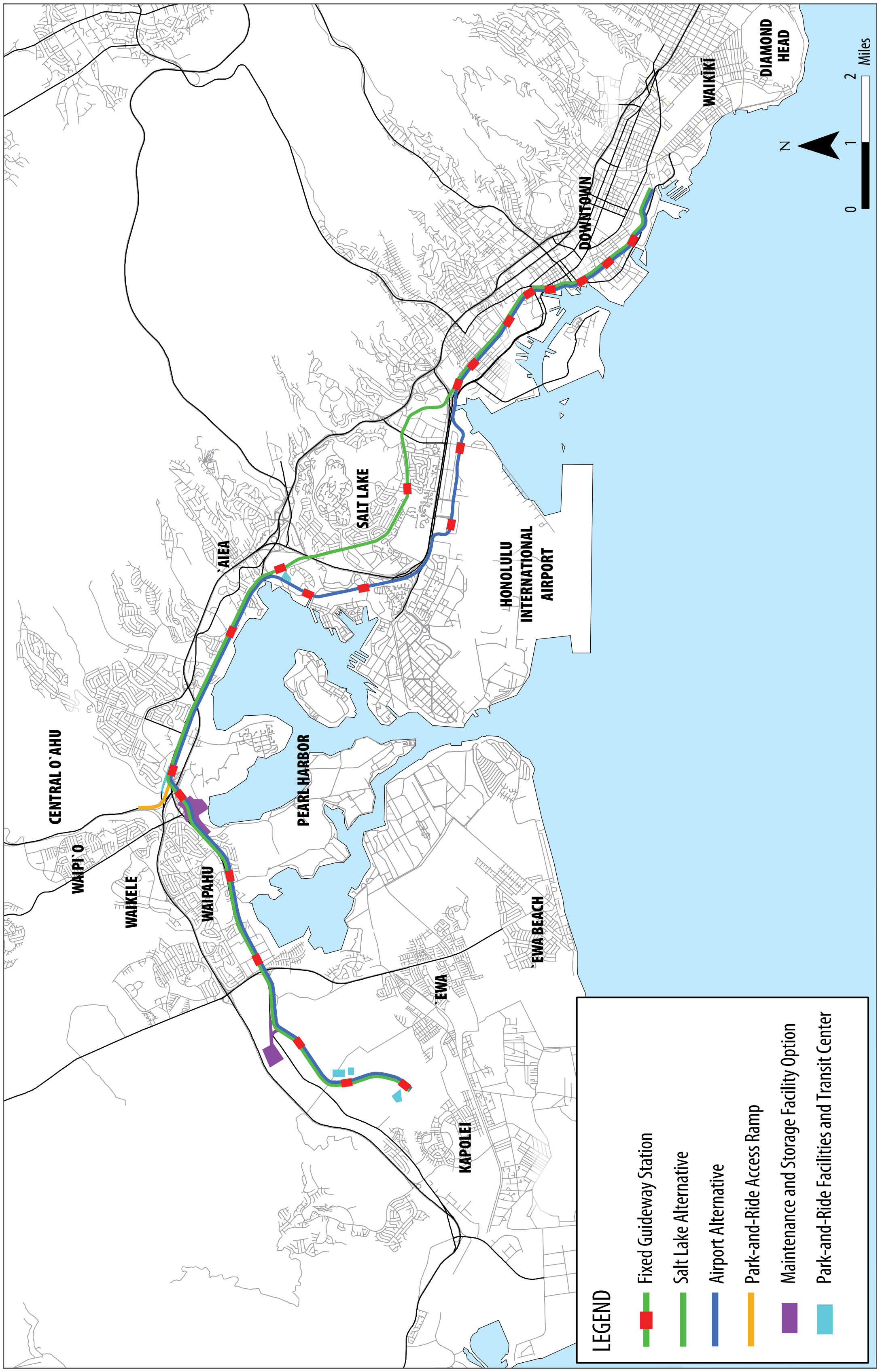


Figure 2-7 Airport & Salt Lake Alternative

Table 2-6 Summary of Data for Alternatives Considered in Draft Environmental Impact Statement

Alternative	Daily Islandwide Transit Trips	Vehicle Miles Traveled	Vehicle Hours of Delay	Hours of Transit-user Benefits	Total Capital Cost (Millions 2008 Dollars)	Cost per Hour of Transit-user Benefits Compared to No Build
2030 No Build	226,000	13,583,000	107,000	—	$978	—
2030 Salt Lake Alternative	270,000	13,096,000	84,000	48,980	$4,876	$17.53
2030 Airport & Salt Lake Alternative	272,000	13,103,000	83,000	50,170	$5,767	$22.86
2030 Airport Alternative	273,000	13,086,000	82,000	51,900	$5,084	$17.78

The Airport Alternative will have approximately 5 percent fewer parcel acquisitions than would the Salt Lake Alternative. It will have noise impacts to five fewer residential high-rise buildings and it will also result in slightly less air pollution, energy consumption, and water pollution because it will have the greatest reduction in vehicle miles traveled. The Airport Alternative will have slightly lower potential for encountering archaeological resources but will affect more historical resources than would the Salt Lake Alternative. The Airport Alternative will have less visual effect than would the Salt Lake Alternative because the guideway and station would dominate views in residential areas along Salt Lake Boulevard.

There would be few differences between the three Build Alternatives with regard to resources that are protected by Section 4(f) of the U.S. Department of Transportation Act. The Airport & Salt Lake Alternative would have had the greatest impact because the most resources would have been affected. Both the Airport Alternative and the Salt Lake Alternative would result in a direct (non *de minimis*) use of one recreational resource. None of the affected historic properties would experience impairment severe enough to constitute constructive use under Section 4(f) from the project alignment. The Airport Alternative was determined to be the alternative that will result in the least overall harm to resources that are protected by Section 4(f).

Of the three Build Alternatives addressed in the Draft EIS, the Airport Alternative encroaches the least into Waters of the U.S. during both construction and operation.

During the public comment period on the Draft EIS, the public overwhelmingly supported the Airport Alternative. Of the comments that specifically supported one of the alternatives, more than 75 percent were in support of the Airport Alternative. Also, the City Council adopted Resolution 08-261, which specifies that planning, engineering, design, and construction should be completed for the Airport Alternative.

The Airport Alternative is the Preferred Alternative and is described in this Final EIS as the "Project." The Salt Lake Boulevard Alignment is part of the Locally Preferred Alternative and may be constructed in the future if funding can be secured.

2.5 The Project: Fixed Guideway Alternative from East Kapolei to Ala Moana Center via the Airport

The Project will include the construction and operation of a grade-separated fixed guideway transit system between East Kapolei and Ala Moana Center (Figures 2-8 to 2-11). Detailed plans of the alignment are included in Appendix B of this Final EIS. The system will use steel wheel on steel rail technology. The vehicles could either be manually operated by a driver or fully automated (driverless). Operating goals for system speed and reliability require that the entire system operate in exclusive right-of-way, with no potential for vehicle or pedestrian conflicts. All parts of the guideway will be elevated, except near Leeward Community College, where it will be at-grade in exclusive right-of-way.

From Waiʻanae to Koko Head (west to east), the guideway will follow North-South Road and other future roadways to Farrington Highway (Figure 2-8). The guideway will follow Farrington Highway Koko Head on an elevated structure and continue along Kamehameha Highway to the vicinity of Aloha Stadium (Figure 2-9).

The guideway will continue past Aloha Stadium along Kamehameha Highway makai to Nimitz Highway and turn makai onto Aolele Street. It will then follow Aolele Street Koko Head to reconnect to Nimitz Highway near Moanalua Stream and continue to the Middle Street Transit Center (Figure 2-10). Koko Head of Middle Street, the guideway will follow Dillingham Boulevard to the vicinity of Kaʻaahi Street and then turn Koko Head to connect to Nimitz Highway near Iwilei Road.

The guideway will follow Nimitz Highway Koko Head to Halekauwila Street, then proceed along Halekauwila Street past Ward Avenue, where it will transition to Queen Street. The guideway will cross from Waimanu Street to Kona Street in the vicinity of Pensacola Street. The guideway will run above Kona Street to Ala Moana Center (Figure 2-11). The total guideway length for the Project will be approximately 20 miles.

In addition to the guideway, the Project will require the construction of 21 stations and supporting facilities. Supporting facilities include a vehicle maintenance and storage facility, transit centers, park-and-ride lots, traction power substations, a parking structure, and an access ramp from the H-2 Freeway to the Pearl Highlands park-and-ride. The vehicle maintenance and storage facility would either be located in the planned Hoʻopili development near Farrington Highway or near Leeward Community College (Figures 2-8 and 2-9).

The Project will require widening existing streets to accommodate the guideway columns, provide bus stops, improve sidewalks, or related improvements. Appendix C of this Final EIS shows which locations would require additional right-of-way to accommodate the widening. The widenings will occur at the following locations:

- Makai side of Farrington Highway at Waipahu High School (Figure 2-9)
- Kamehameha Highway at various locations between Pearl Highlands and Pearl Harbor Naval Base Station
- Makai side of Dillingham Boulevard between Puʻuhale Road and King Street (Figure 2-11)
- Makai side of Halekauwila Street between Cooke Street and Kamani Street (Figure 2-11)
- Both sides of Kona Street between Pensacola Street and Piʻikoi Street

Runway 22R/4L at Honolulu International Airport will be relocated approximately 750 feet makai of its current position, and Runway 22L/4R will be reloacted approximately 300 feet makai of its current position to make the runway protection zone compatible with the Project and existing buildings near Lagoon Drive. Some bus routes will be reconfigured to bring riders on local buses to nearby fixed guideway transit stations. Service on some routes will be reduced as the service is replaced by the fixed guideway system. To support this system, the bus fleet will be increased (Table 2-5). Appendix D, Bus Transit Routes, details future transit routes.

The Project will provide high-capacity transit service between East Kapolei and Ala Moana Center with future extensions planned for West

Figure 2-8 Fixed Guideway Transit Alternative Features (East Kapolei to Fort Weaver Road)

Figure 2-9 Fixed Guideway Transit Alternative Features (Fort Weaver Road to Aloha Stadium)

Figure 2-10 Fixed Guideway Transit Alternative Features (Aloha Stadium to Kalihi)

Figure 2-11 Fixed Guideway Transit Alternative Features (Kalihi to Ala Moana Center)

Kapolei to East Kapolei, Salt Lake Boulevard, and from Ala Moana Center to UH Mānoa and to Waikīkī.

The East Kapolei Station is the proposed Waiʻanae 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 Oʻahu Station (Figure 2-8). 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 will 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 *ʻEwa Development Plan* (DPP 2000).

A future Department of Hawaiian Home Lands housing development is also planned for the immediate area as part of the planned development in the ʻEwa Development Plan. 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 of the entire system (2019) ridership shows that the East Kapolei Station will have among the highest boardings in the system. Because there is available space in the vicinity of the station, it will include a park-and-ride lot that will accommodate automobile, motorcycle, and bicycle commuters. The station will serve local and express transit commuters from ʻEwa, ʻEwa Beach, Kapolei, and Kalaeloa.

Ala Moana Center is the logical Koko Head terminus because as Oʻahu'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 will allow riders to link to the major employment centers and traffic generators in the area.

Therefore, East Kapolei and Ala Moana Center are logical termini for the system, and the Project can operate independent of any other transportation improvements. The Project does assume completion of those improvements planned as part of the No Build Alternative (Table 2-4) and assumed to be in place prior to project completion.

All buildings, facilities, and vehicles will conform to applicable Federal, State, and County accessibility guidelines and standards. HRS 103-50 requires that all State or County government buildings, facilities, and sites be designed and constructed to conform to the Architectural Barriers Act/Americans with Disabilities Act Accessibility Guidelines (36 CFR 1190 and 1191), issued by the U.S. Access Board, and other applicable design standards as adopted and amended by the Disability and Communication Access Board. The law further requires all plans and specifications prepared for construction of State or County government buildings, facilities, and sites be reviewed by the Disability and Communication Access Board for conformance to those guidelines and standards.

Project design criteria describe the Project's design goals, including track work, utilities, landscaping, architecture, station features, environmental, safety and security, and communications. The criteria for landscaping will apply to streetscapes, station areas, areas around traction power substations, and in medians. In addition, new plantings will be non-invasive as defined by the Hawaiʻi Chapter of the American Society of Landscape Architects, and native plants will be included where appropriate.

2.5.1 Operating Parameters

The fixed guideway system will operate in exclusive right-of-way to ensure system speed and reliability and to avoid conflicts with automobile and pedestrian traffic. It is planned to operate between 4 a.m. and midnight (Table 2-7), with a train arriving in each direction at each station every three to ten minutes. Trains will be capable of reaching 50 miles per hour (mph) or greater and achieving an average speed, including dwell times at stations, of 30 mph or greater. Bicycles, luggage, and surfboards will be allowed on trains and regulated by policy.

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

Table 2-7 Fixed Guideway Weekday Operating Assumptions

Time of Day[1]	System Headway
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.

The system is planned to operate with multi-vehicle trains approximately 120 to 180 feet long, with each train capable of carrying between 325 and 500 passengers. This will provide a peak capacity of approximately 8,650 passengers per hour per direction. The system will be expandable to accommodate longer trains of up to 240 feet in the future to increase capacity. Also, the system could be operated with shorter headways (time between train arrivals) to increase peak capacity. This level of service will require a peak-period fixed guideway fleet of 75 vehicles (Table 2-5).

2.5.2 Transit Technology

The selected transit technology will be electrically powered, industry-standard steel wheel on steel rail powered from a third-rail system (Figure 2-12). The selected vehicle will be capable of a top speed greater than 50 mph and meet the environmental and operating parameters discussed in this Final EIS. The vehicles will be equipped with wheel skirts.

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

The system will draw power from many points along the route, so an electrical outage in a few areas will not disrupt service. If electrical power is lost systemwide, the train brakes will stop the rail cars. Backup batteries will provide lighting for several hours in trains and stations. The train operations center will communicate with passengers via the public address system and intercom. If power is restored within a short time, service will resume. With a prolonged outage, the operations center will direct passengers to exit the trains via a lighted

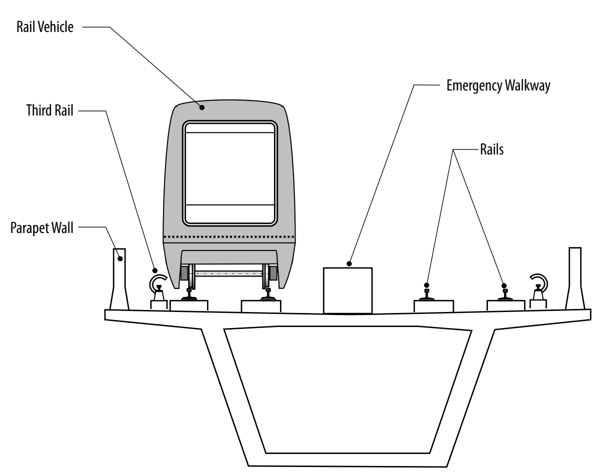


Figure 2-12 Example Vehicle on Elevated Guideway (Cross-section)

emergency walkway to the nearest station. For those unable to exit rail cars, help will be provided by emergency responders and transit staff.

2.5.3 Station Characteristics

All fixed guideway stations will have similar design elements to make system use easier for all patrons, including infrequent users, the elderly, and persons with disabilities. The stations will provide one, two, or three platforms 240 feet long and be a minimum of 12 feet wide to accommodate passenger demand beyond 2030. Center platform stations will have a minimum 30-foot-wide platform. All platforms will be high level (at the same level as the vehicle floor) to provide level boarding for all passengers and to accommodate wheelchairs. In addition to stairs and escalators, elevators will be provided at all stations to accommodate elderly and disabled riders. Bicycle racks or lockers also will be provided.

Each station will include the following:

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

Ticket-vending machines will be provided at all stations. Stations will be designed to accommodate fare gates and a station manager's booth should they be needed in the future. They could either be on the ground or concourse level. At stations with a concourse, which is an elevated level located below the platform, patrons will be able to transfer between platforms without descending to street level. The stations will have one of three general configurations:

- Side platforms without a concourse (Figure 2-13)
- Side platforms with a concourse (Figure 2-14)
- Center platforms with a concourse (Figure 2-15)

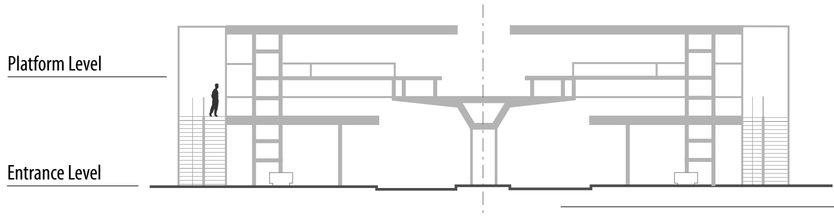
Side-platform stations without a concourse allow the guideway to continue through the station without changing its height above the ground, which averages approximately 30 feet to the top of the tracks. Side-platform and center-platform concourse stations require the guideway to climb approximately 15 feet higher to provide clearance for a concourse below the platform. Center-platform concourse stations will require the tracks to split several hundred feet before the station to pass on each side of the platform. The specific layout will vary at each station for all three station types, depending on available space, the location of bus connections, and the number of passengers that will use each station.

Each of the 21 station locations is shown in Figures 2-17 through 2-37.

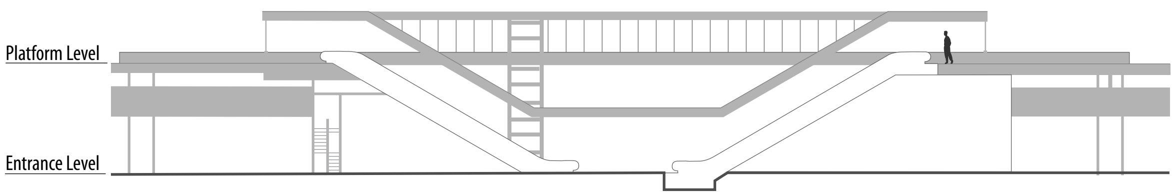
2.5.4 Safety and Security Measures

The Project is designed to meet safety and security criteria typical of fixed-guideway transit systems. The criteria have been developed in coordination with emergency service providers and comply with applicable National Fire Protection Association, American National Standards Institute, and Hawai'i Occupational Safety and Health Division standards.

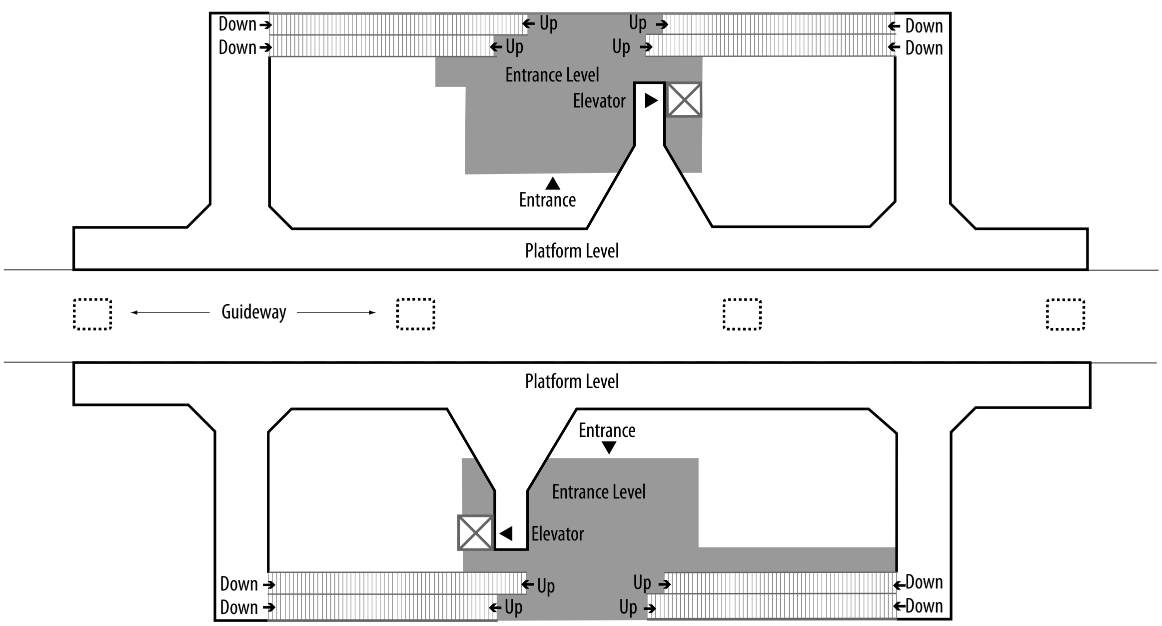
The design of stations and public areas will apply crime prevention through environmental design principles. Crime prevention through environmental design is a crime-prevention philosophy based on the theory that proper design and effective use of the built environment can reduce the fear and incidence of crime, as well as improve the quality of life. These measures have been effective with other transit systems. The principles include natural surveillance (maximizing visibility and interaction through placement of physical features), natural access control (differentiating between public and private space to control access and flow), natural territorial reinforcement (delineating private space so "intruders" are more easily



Cross-section



Longitudinal Section



Plan View

Figure 2-13 Typical Side-platform Station Configuration without a Concourse

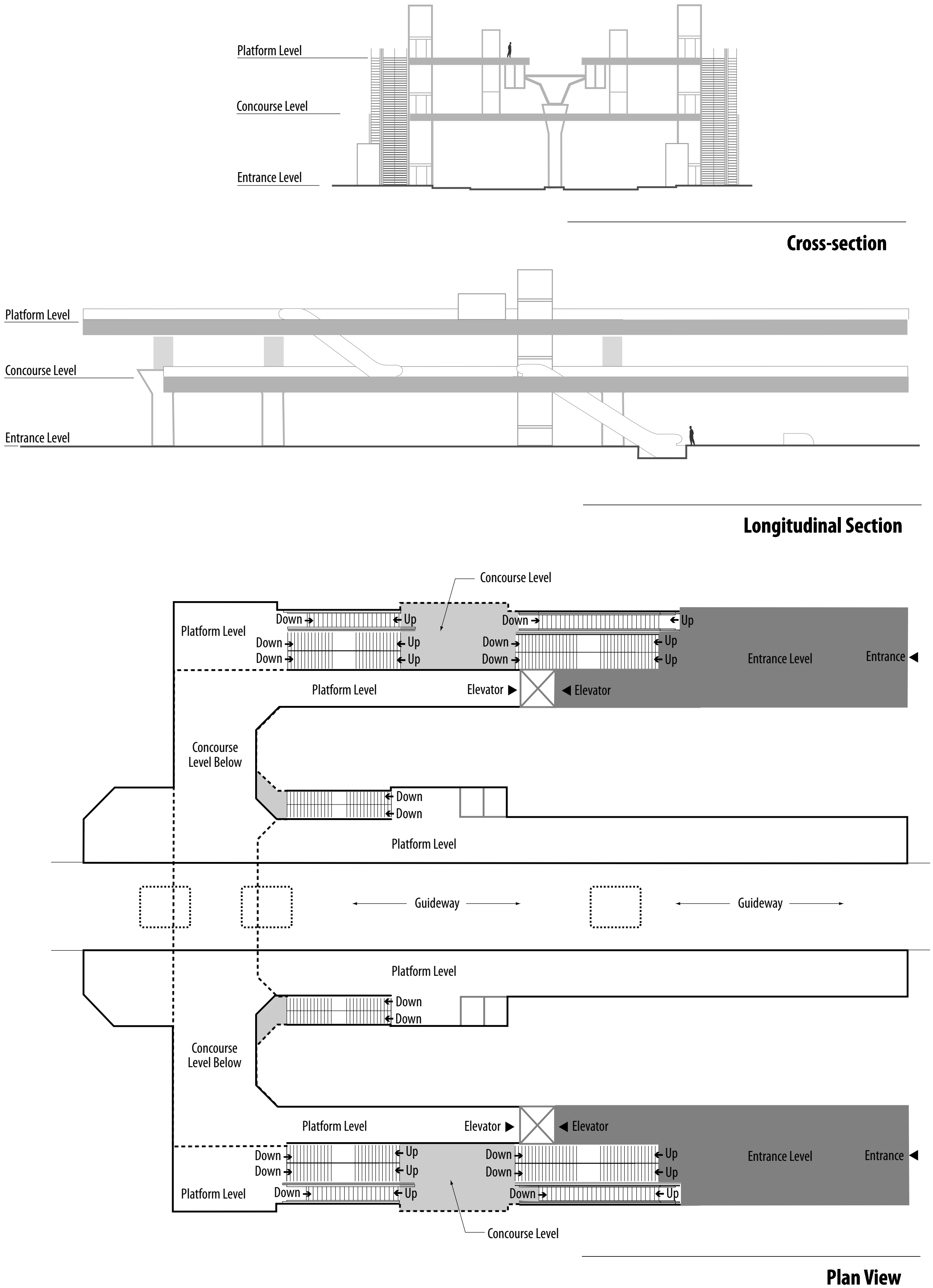
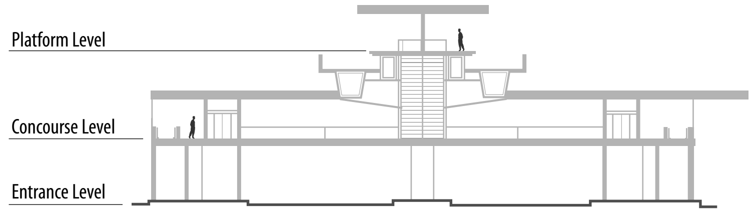
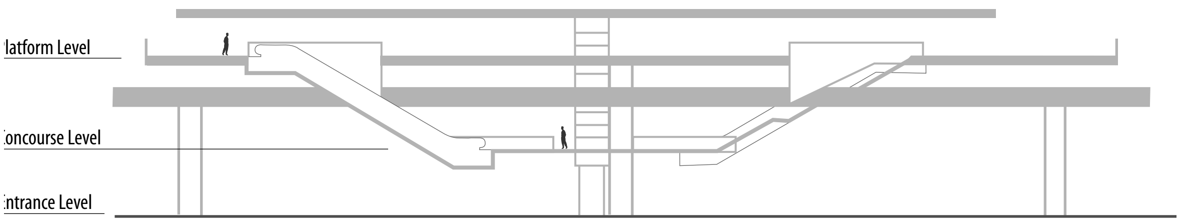


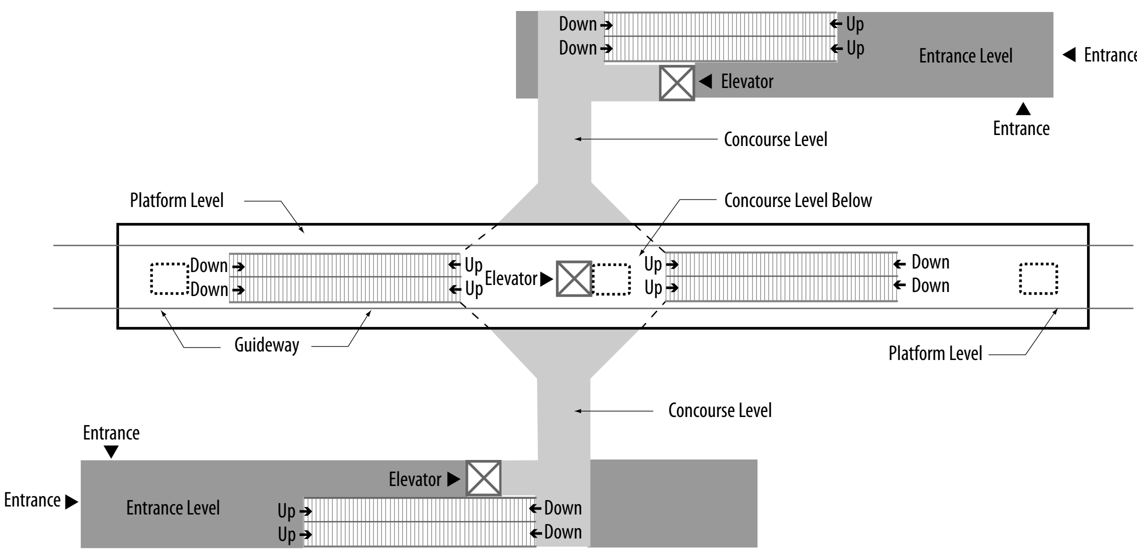
Figure 2-14 Typical Side-platform Station Configuration with a Concourse



Cross-section



Longitudinal Section



Plan View

Figure 2-15 Typical Center-platform Station Configuration with a Concourse

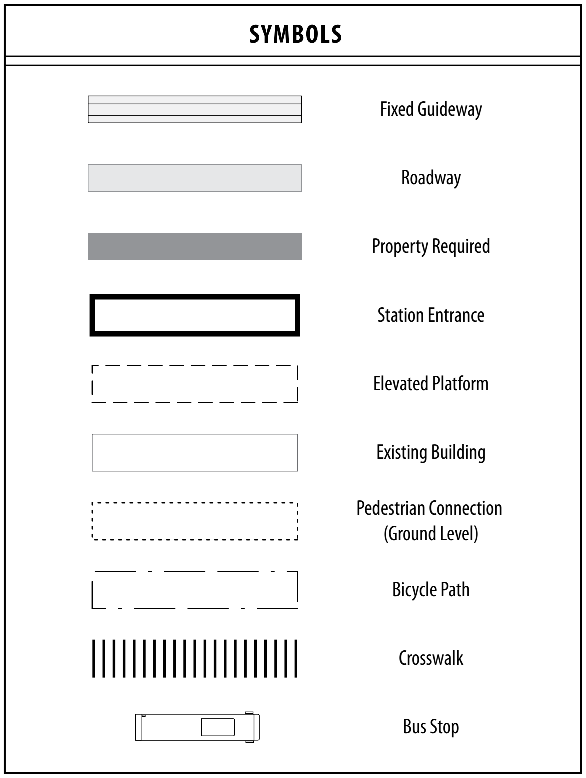


Figure 2-16 Legend for Figures 2-17 to 2-39

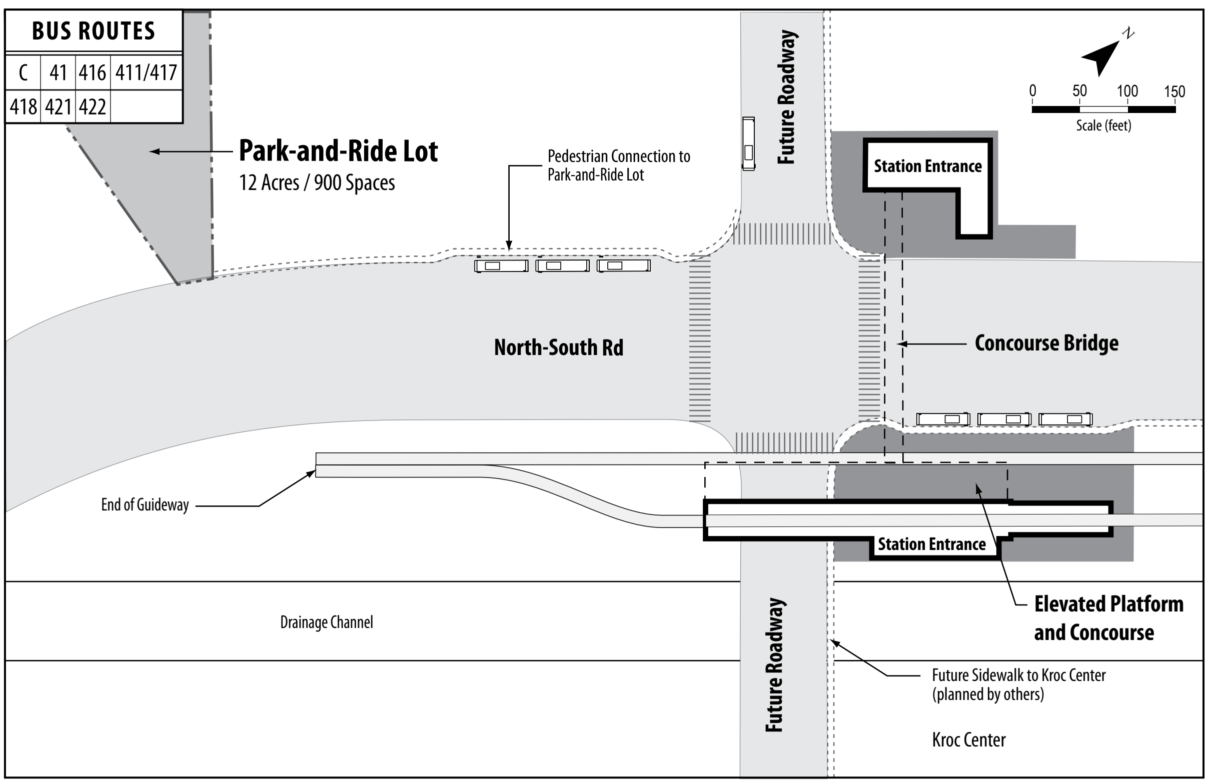


Figure 2-17 East Kapolei Station

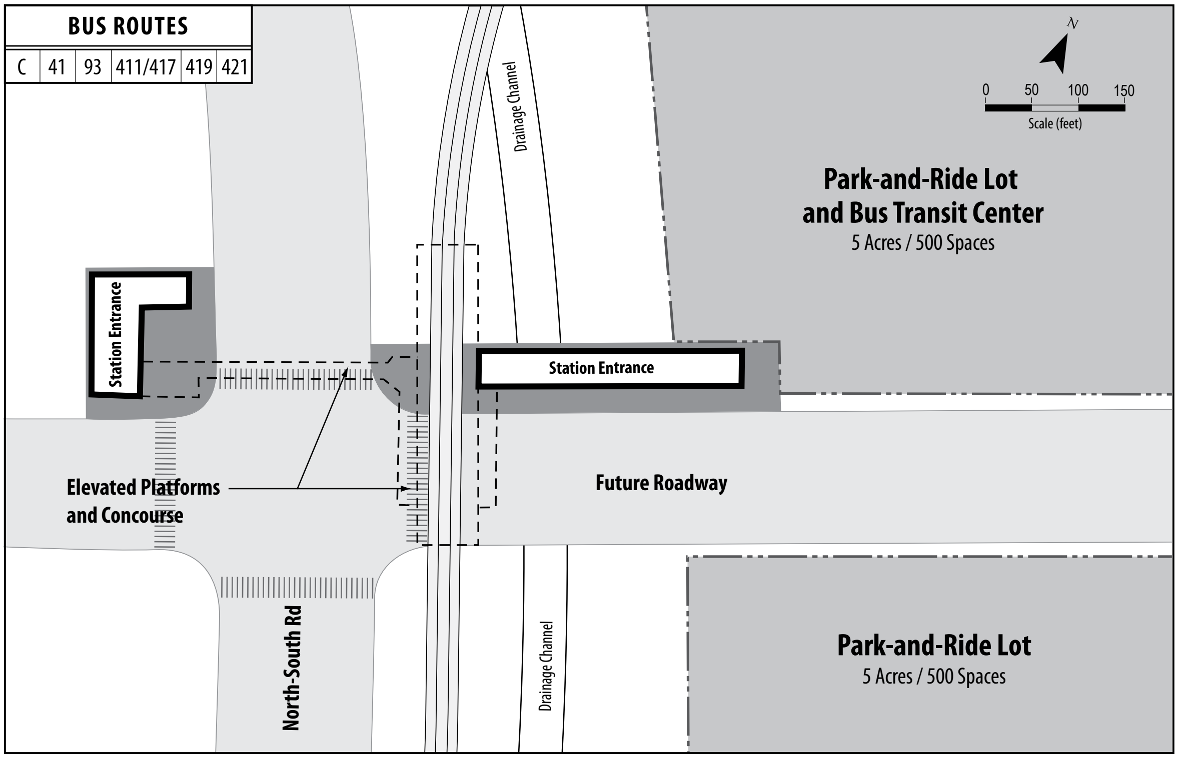


Figure 2-18 UH West O`ahu Station

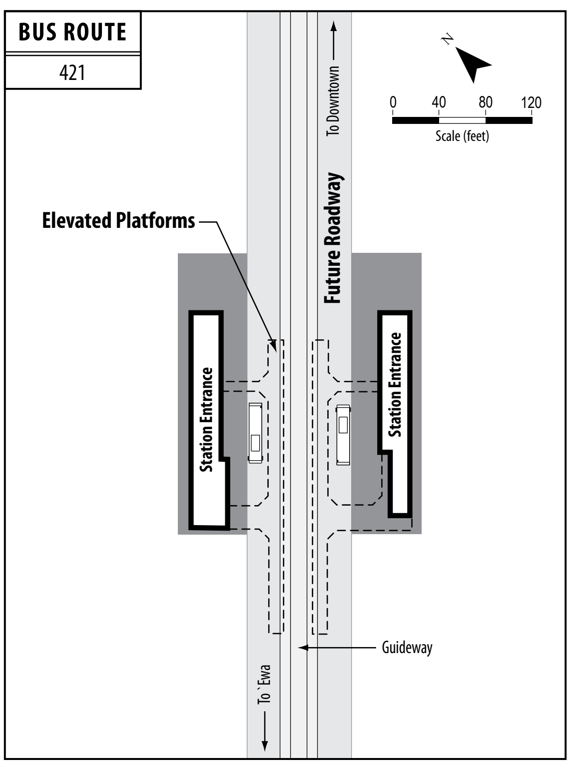


Figure 2-19 Ho`opili Station

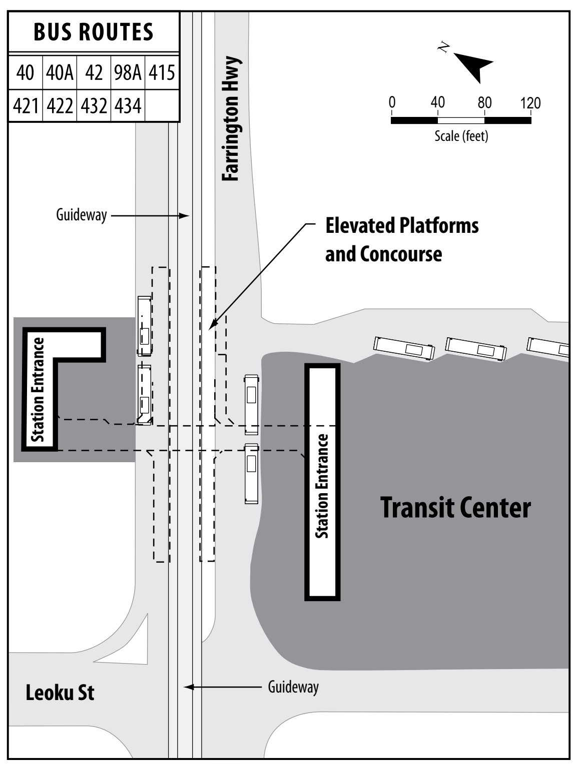


Figure 2-20 West Loch Station

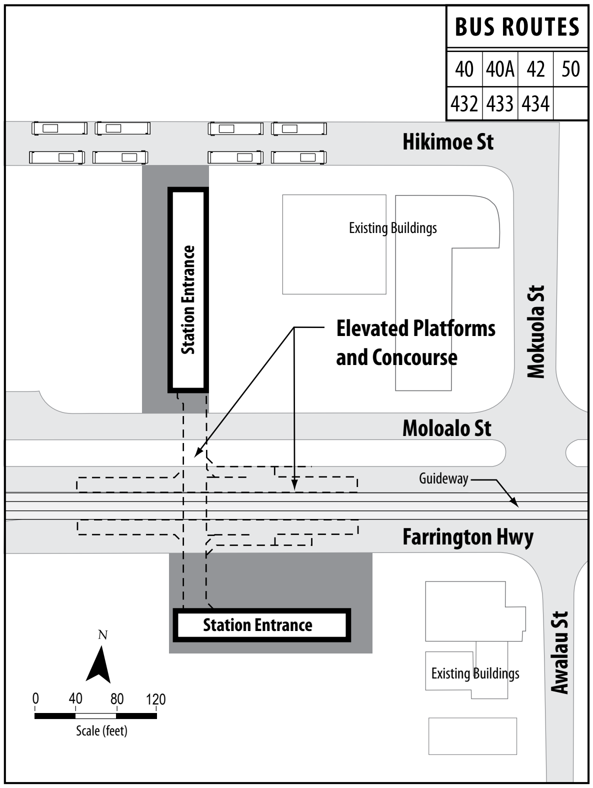


Figure 2-21 Waipahu Transit Center Station

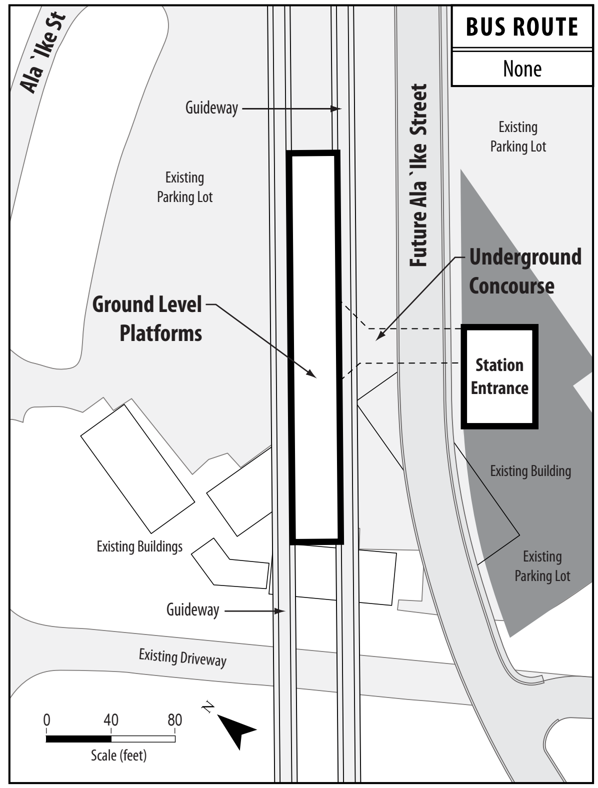


Figure 2-22 Leeward Community College Station

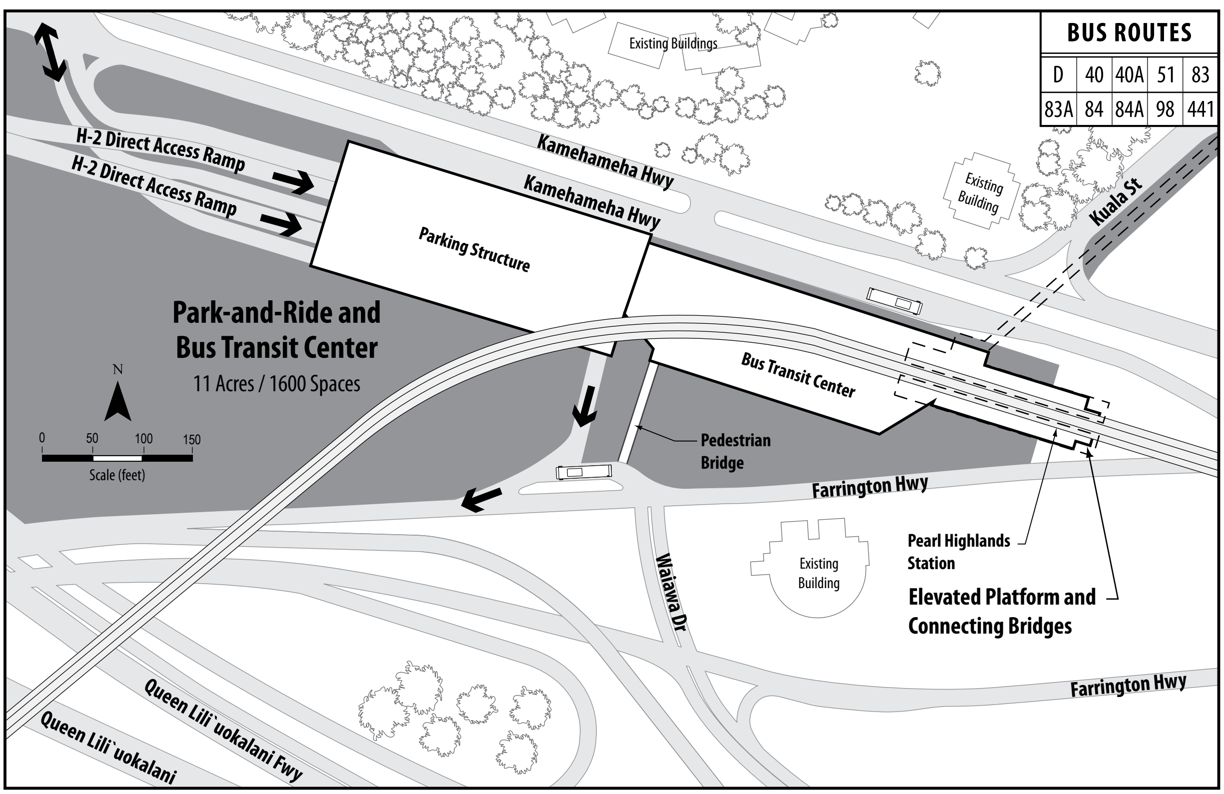


Figure 2-23 Pearl Highlands Station

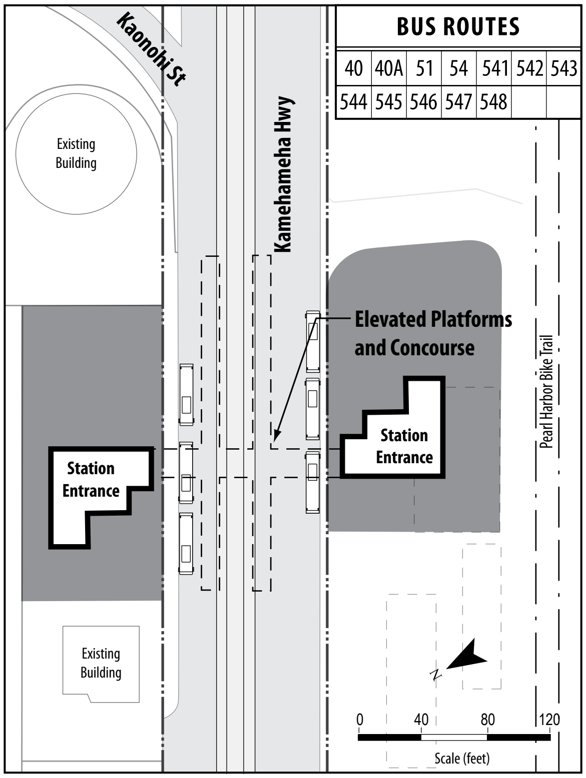


Figure 2-24 Pearlridge Station

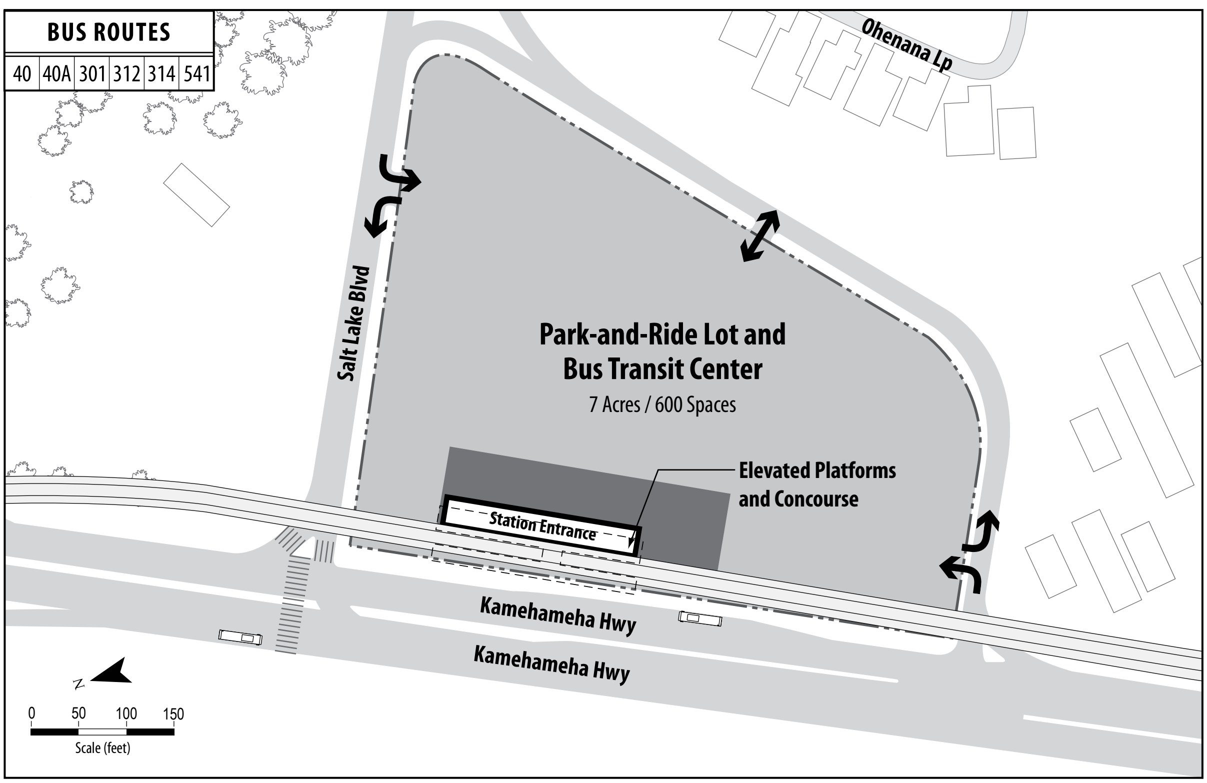


Figure 2-25 Aloha Stadium Station

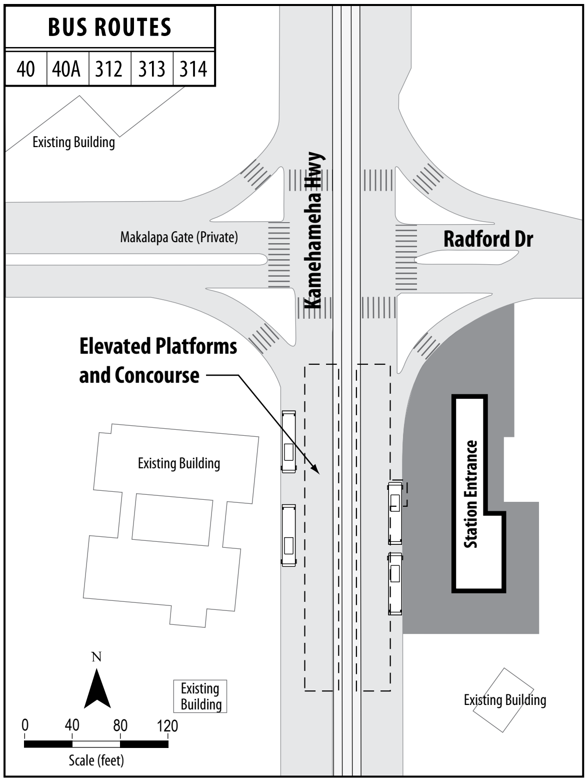


Figure 2-26 Pearl Harbor Naval Base Station

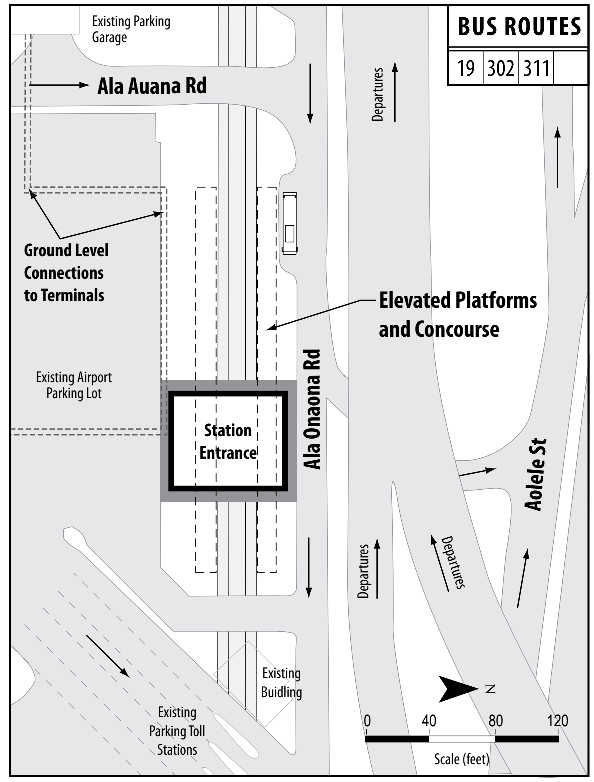


Figure 2-27 Honolulu International Airport Station

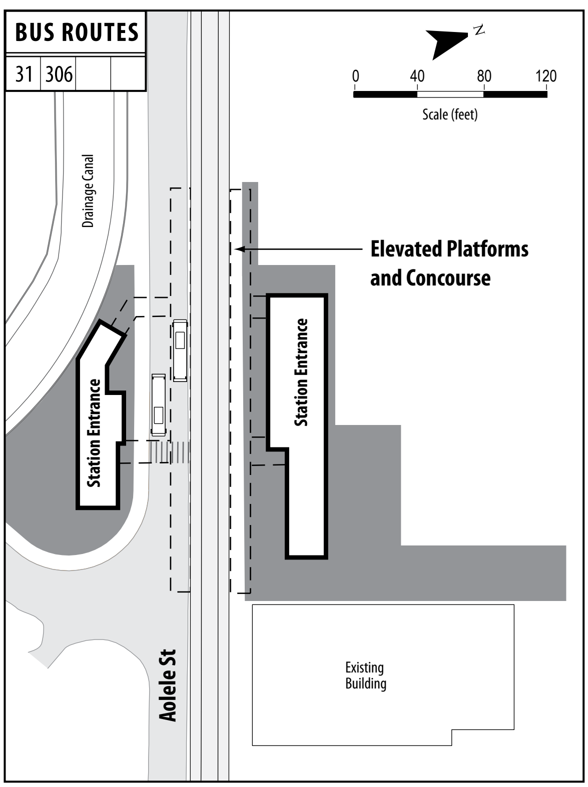


Figure 2-28 Lagoon Drive Station

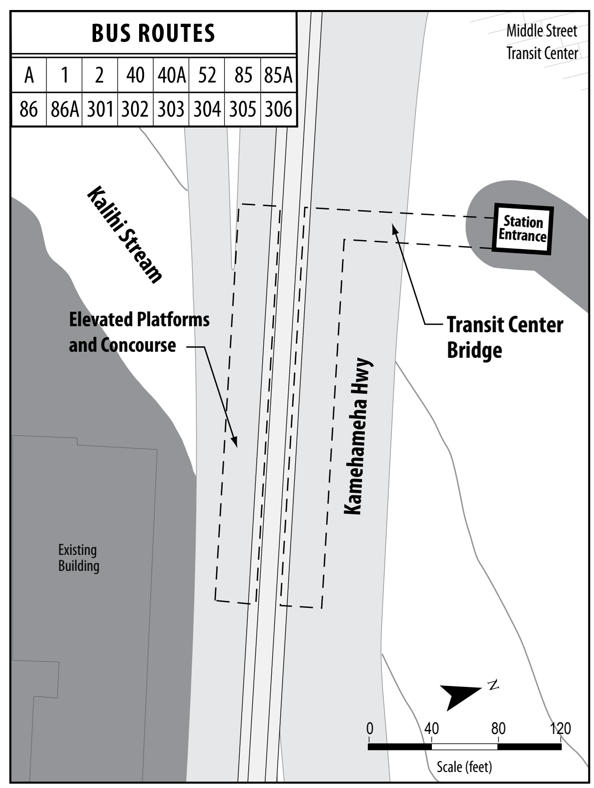


Figure 2-29 Middle Street Transit Center Station

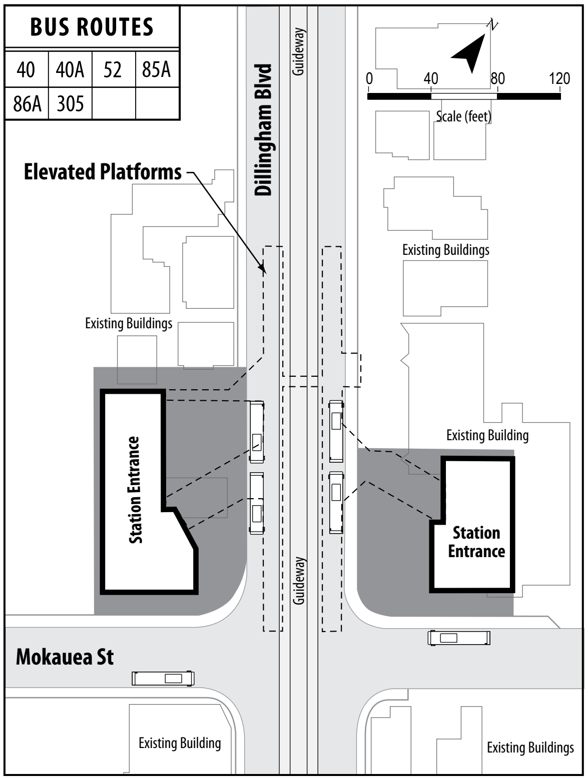


Figure 2-30 Kalihi Station

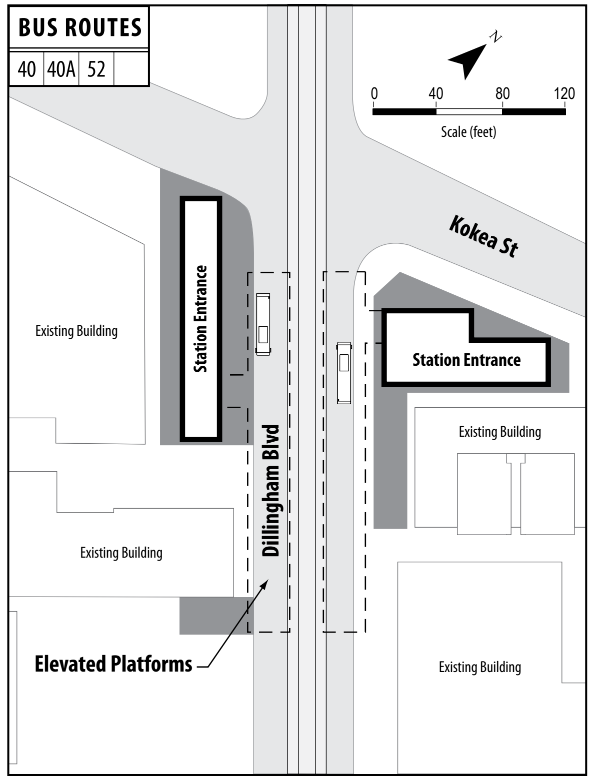


Figure 2-31 Kapālama Station

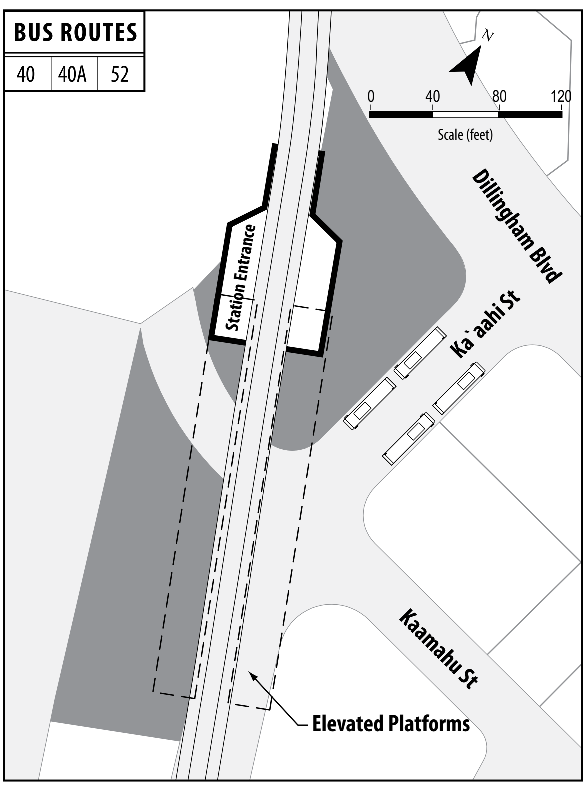


Figure 2-32 Iwilei Station

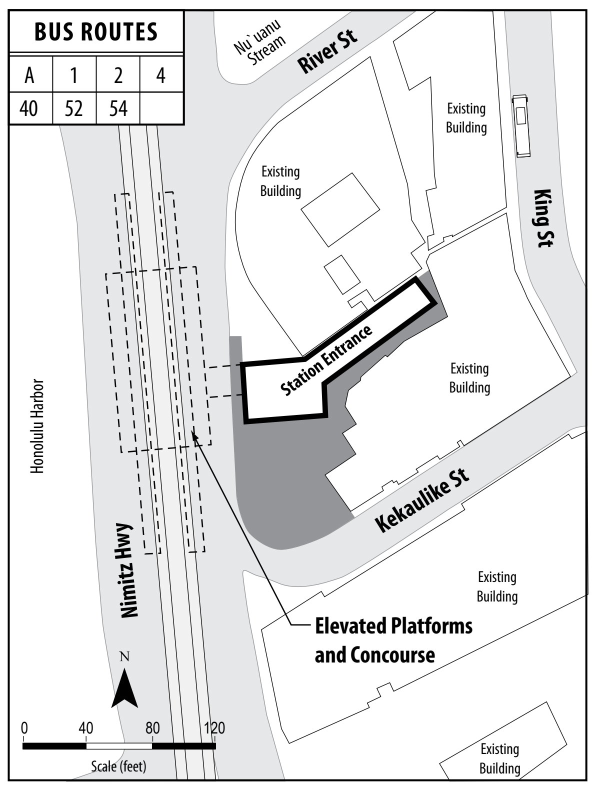


Figure 2-33 Chinatown Station

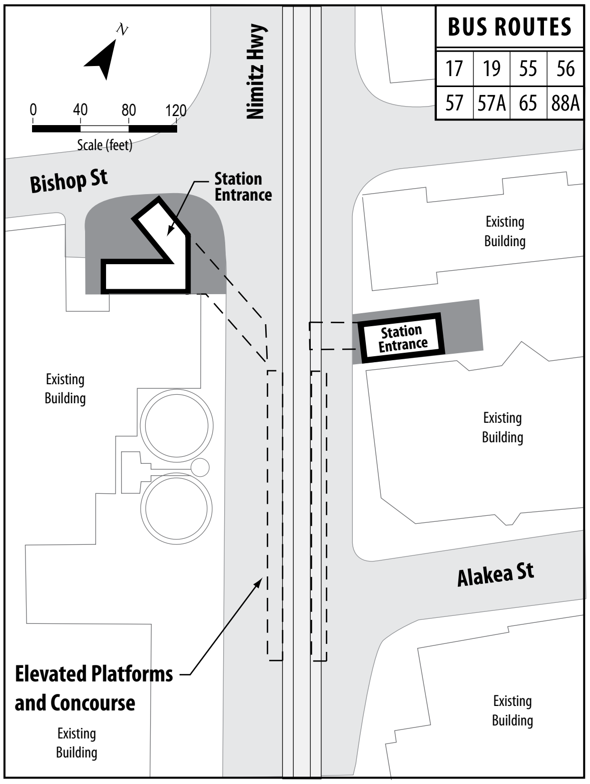


Figure 2-34 Downtown Station

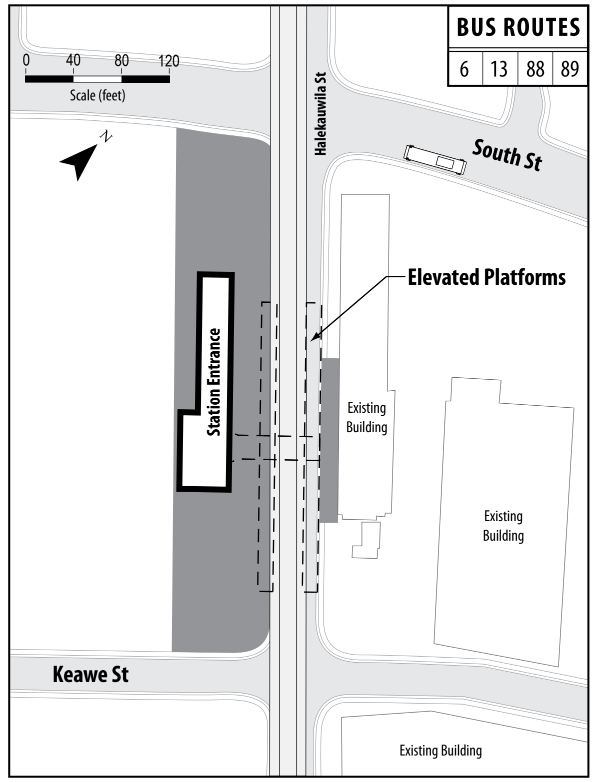


Figure 2-35 Civic Center Station

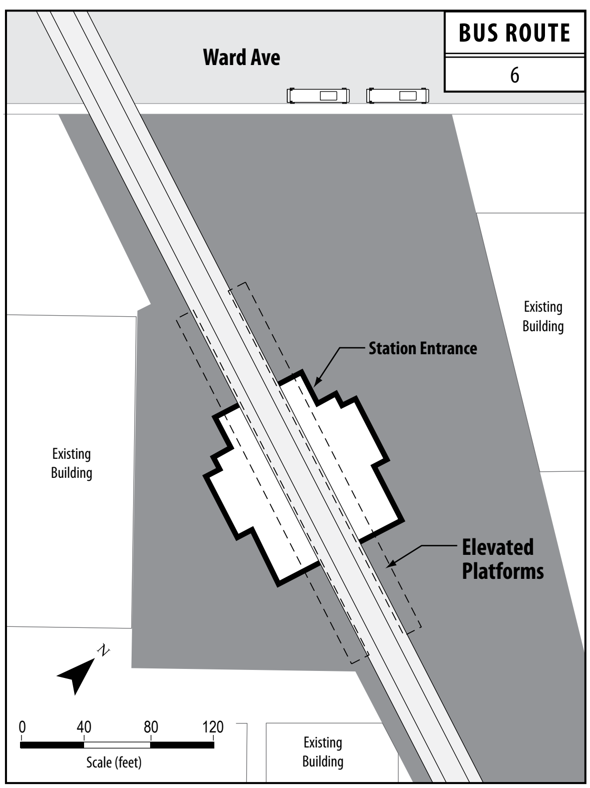


Figure 2-36 Kaka`ako Station

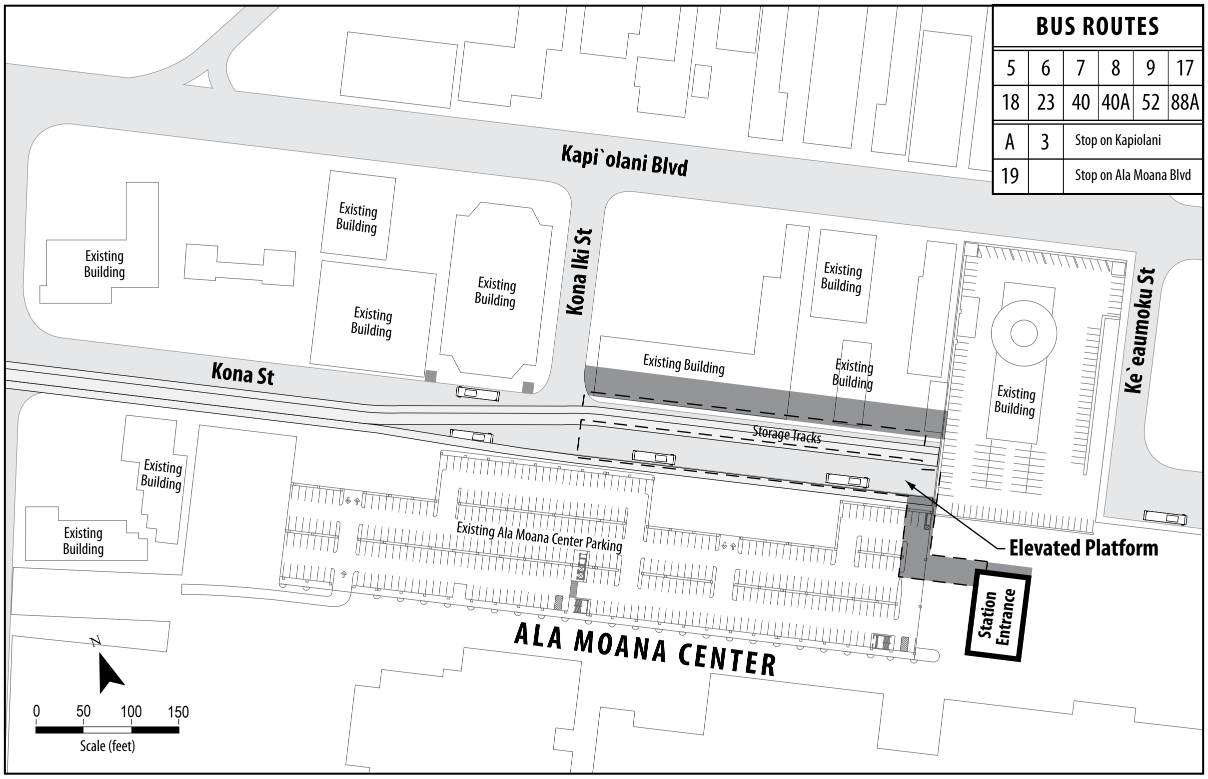


Figure 2-37 Ala Moana Center Station

identified), and maintenance. Applying the design principles reduces crime and fear by reducing criminal opportunity and fostering positive social interaction among legitimate users of a building or space.

Operation in exclusive right-of-way eliminates the potential for accidents between automobiles and fixed-guideway transit vehicles. Because pedestrians will not be allowed to cross the tracks, the potential for pedestrian accidents is virtually eliminated. Platform edges will be delineated with high-contrast visual and textured markings. All stations, park-and-ride facilities, and vehicles will include security cameras that are monitored at all times of operation, audible and visual messaging systems, and an intercom link to the system operations center. Security personnel will also patrol the system. Interior and safety lighting will be provided at all stations and park-and-ride facilities.

A project-specific Safety and Security Management Plan will be developed in accordance with FTA requirements to define the safety and security activities and methods for identifying, evaluating, and resolving potential safety hazards and security vulnerabilities of these systems. It establishes responsibility and accountability for safety and security during the Preliminary Engineering, Final Design, construction, testing, and start-up phases of the Project. The Honolulu Police Department, the Honolulu Fire Department, the Department of Emergency Management, and the Honolulu Emergency Services Department will be involved in preparing and implementing the plan. The plan will address public safety and security concerns, including threats and hazards associated with the Project, specific issues that arise through community outreach efforts, and design and architectural details to enhance safety.

A Threat and Vulnerability Analysis will be prepared to identify any security weaknesses created by the Project. A risk-level criticality matrix will evaluate the severity of threats and the likelihood of occurrence to determine possible consequences. The consequences will be assessed in terms of severity and probability for each threat. Security measures will be developed to address any threats with high vulnerabilities.

2.5.5 Pedestrian and Bicycle Access

Stations will be designed to encourage and accommodate pedestrian and bicycle access. In addition to providing bicycle racks or lockers, non-motorized access will be supported by features included in the Design Criteria that guide the Preliminary Engineering and Final Design of the Project. The Design Criteria provide specific direction for pedestrian and bicycle access features at stations. For example, the criteria state that adequate pedestrian circulation routes shall be provided with an emphasis on avoiding pedestrian and vehicular conflicts and enabling good visibility to each station entrance. This emphasis will be complemented by distinct and clear graphic signage. For bicycle access, the criteria include language stating that racks shall be placed at the station plaza near the station entrance where public visual surveillance is possible and/or where closed circuit television monitoring is present. Bicycles will be allowed on trains in accordance with a system-wide policy.

2.5.6 Bus System

Bus fleet requirements are shown in Table 2-5. Bus service will be enhanced and the bus network will be modified to coordinate with the fixed guideway system. Some existing bus routes, including peak-period express buses, will be altered or eliminated to reduce duplication of services provided by the fixed guideway system. Buses removed from service in the study corridor will be shifted to service in other parts of O‘ahu, resulting in improved transit service islandwide. Certain local routes will 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 2-17 through 2-37.

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

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

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

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.

2.5.7 Park-and-Ride Facilities

Park-and-ride facilities will be constructed at stations with the highest demand for drive-to-transit access (Table 2-8). With the exception of Pearl Highlands, which will be a parking structure, all park-and-ride lots are expected to be constructed as surface parking. Park-and-ride capacity may be built in phases as demand develops. The proposed size, location, and access for each proposed facility is shown in the figures for the associated fixed guideway stations (Figures 2-17, 2-18, 2-23, and 2-25).

Table 2-8 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

2.5.8 Vehicle Maintenance and Storage Facility

The Project will include a vehicle maintenance and storage facility to maintain and store up to 150 vehicles. Maintenance operations will occur over the 24-hour day in three shifts. A 44-acre vacant site near Leeward Community College (Figure 2-38) is the preferred location for the maintenance and storage facility, which will allow for more efficient system operation because it is more centrally located and vehicles could enter and exit the fixed guideway in either direction. The facility will be located at-grade in a fenced area. A second site option, a 41-acre area currently in agricultural use adjacent to an electrical substation in Ho‘opili (Figure 2-39), is under consideration if the site near Leeward Community College does not become available. Only one maintenance and storage facility site will be selected. Either site will include four buildings, maintenance facilities, a vehicle wash area, storage track, a system control center, and employee parking. The buildings will have a combined size of approximately 130,000 square feet. The buildings on the maintenance and storage facility site will be designed to meet Leadership in Energy and Environmental Design (LEED) silver certification requirements. Roadways and parking will require approximately 300,000 square feet of new paved area.

2.5.9 Traction Power Substations

The Project will require traction power substations approximately every mile to provide vehicle propulsion and auxiliary power. The planned locations are shown in Figures 2-8 through 2-11. Each substation will require an approximately 3,200-square-foot area to access and maintain an approximately 40-foot-long, 16-foot-wide,

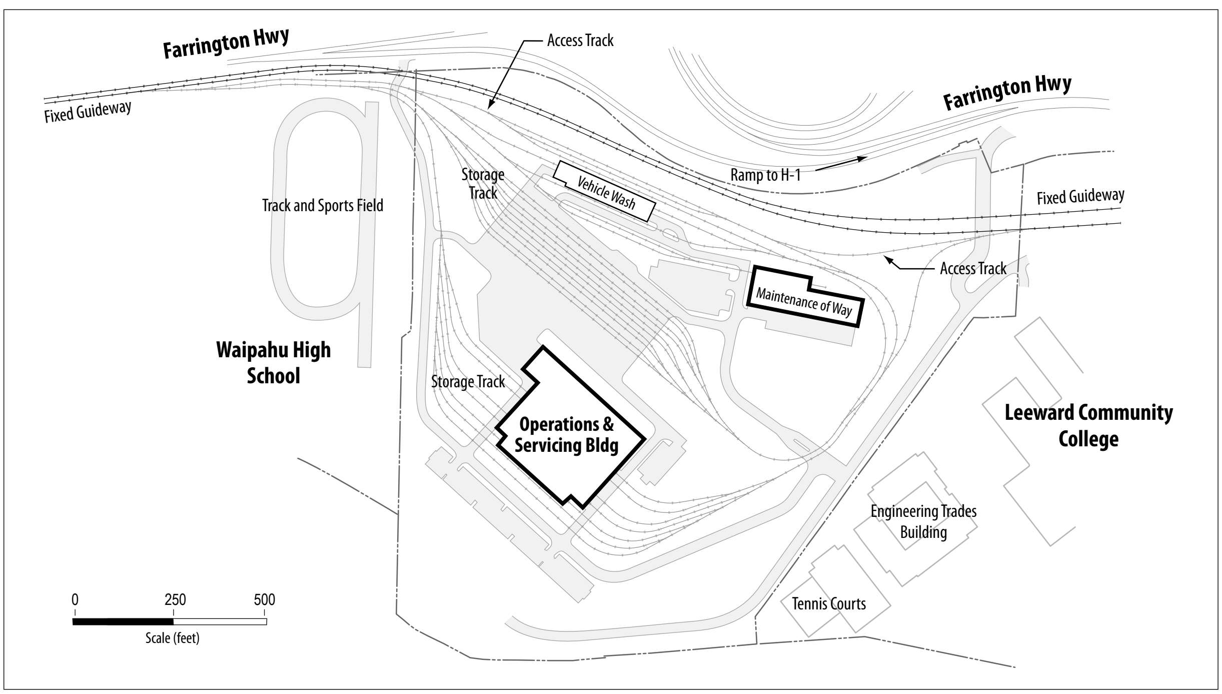


Figure 2-38 Leeward Community College Maintenance and Storage Facility Location and Conceptual Layout

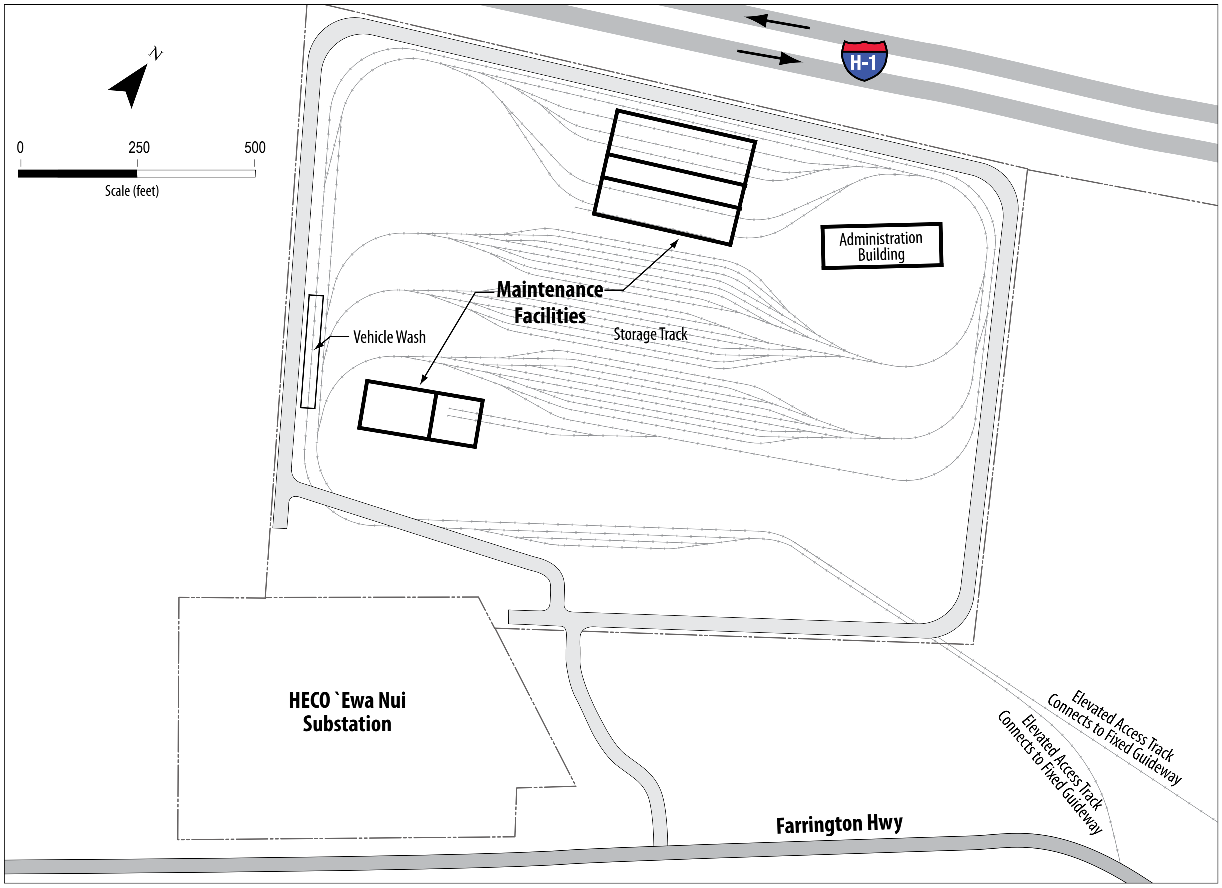


Figure 2-39 Maintenance and Storage Facility in Ho`opili Location and Conceptual Layout

and 12-foot-high painted steel box that houses transformers, rectifiers, batteries, and ventilation equipment (Figure 2-40). It will be connected to the existing power grid. As design progresses, some of the identified sites may not require all of the equipment included in a complete substation; therefore, some may be smaller than described.

Figure 2-40 Example of a Traction Power Substation

Many substations will be incorporated into fixed guideway stations. At other locations, the substations may be enclosed within a fence. Landscaping will be installed around substations.

2.5.10 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 Project described in this Final EIS will implement 20 miles of the overall 34-mile Locally Preferred Alternative. The Project will begin in East Kapolei near the planned UH West Oʻahu 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 Final EIS as "planned extensions," would be evaluated through a separate NEPA and HRS Chapter 343 process and designed and constructed once additional funding is secured.

The Project will connect multiple activity centers, provide cost-effective transit-user benefits, and meet the Purpose and Need whether or not the planned extensions are built. Construction of the Project will not preclude future development of the planned extensions.

Because of its length, the Project will 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 disruptions
- 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 2-41):

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

The method of contracting the individual construction contracts will vary for the various phases of construction. The first construction phase will use a design-build contract where both design and construction are included in a single contract package. Later phases may use this method or the design and construction may be completed under separate contracts. The contract method will not

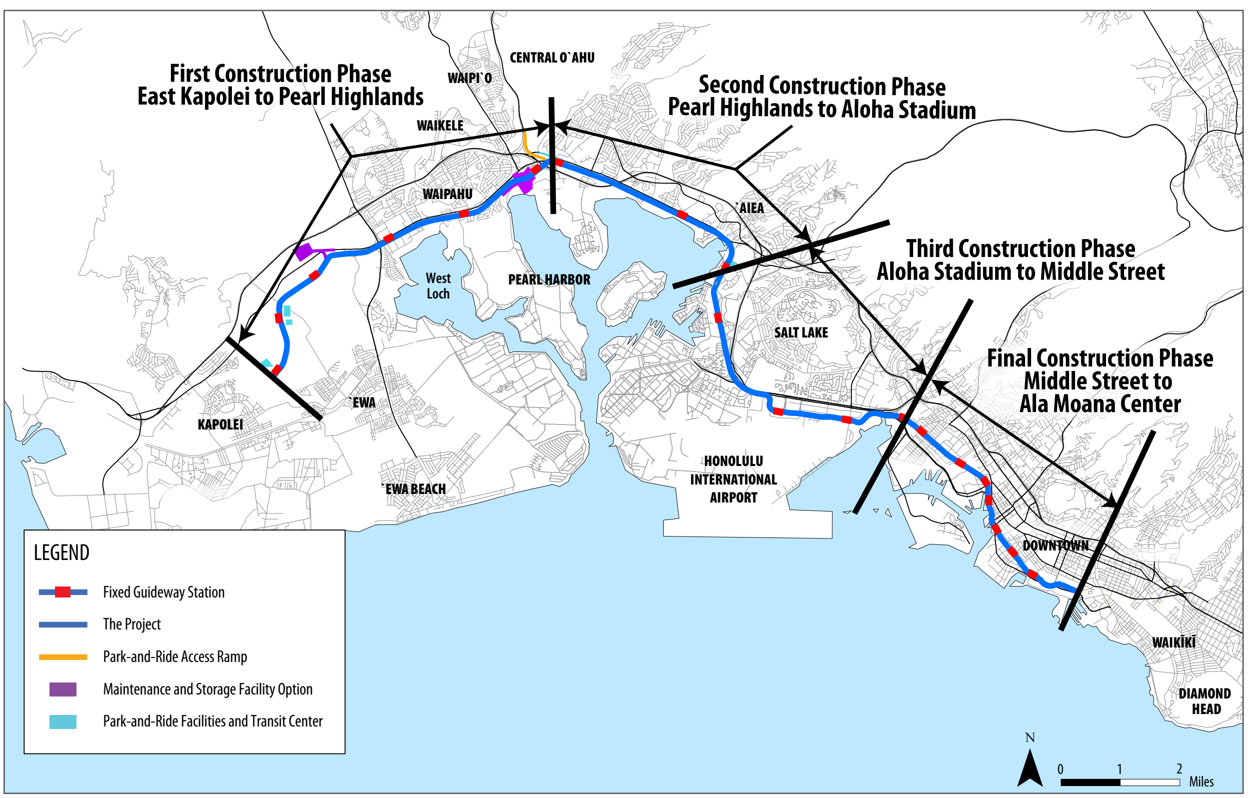


Figure 2-41 Project Construction Phases

change the effects of the Project as described in this Final EIS.

Construction of stations in under-developed areas may be deferred until those areas are developed. As portions of the Project are completed, they will be opened for revenue service so that system benefits, even if limited during the initial phases, will 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 4.18, Construction Phase Effects, of this Final EIS. The Project's cash flow analysis, which is presented in Section 6.4, Operating and Maintenance Plan, anticipates the use of Local funds for the first construction phase and a combination of Local and Federal funds for the remaining phases.

Construction Schedule

Construction is currently planned to be completed in four overlapping phases of work. Construction activities will be similar for each phase and are described in Appendix E, Construction Approach. The first phase will include construction of the vehicle maintenance and storage facility and a portion of the Project between the Waiʻanae 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 site option. This is because system testing and operation could not be completed without access to a maintenance and storage facility. Selection of the vehicle maintenance and storage facility near Leeward Community College would allow construction phasing in either the ʻEwa or Koko Head direction from that site. Because right-of-way is anticipated to be available ʻEwa of Leeward Community College before it is available in the Koko Head direction, constructing Koko Head from that location would delay the start of construction and affect project cash flow. Station areas, park-and-ride lots, and the maintenance and storage facility site will function as construction staging areas for the first construction phase. The vehicle maintenance and storage facility near Leeward Community College is the preferred location; however, the Hoʻopili site remains an option.

The remainder of the Project likely will 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 will be identified and developed by the contractors and approved by the City. Variations to the schedule will continue to be evaluated during Preliminary Engineering. Preliminary Engineering for the Project is under way, and work on the first construction phase will begin in 2009 (Figure 2-42). Construction of the entire Project is planned to be completed in 2018, and the entire system is planned to open for revenue service in 2019.

Planned Extensions

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

- West Kapolei
- UH Mānoa
- Waikīkī
- Salt Lake

The planned extensions are included as illustrative projects in the ORTP (OʻahuMPO 2007) and are anticipated by RTD to be completed at some time in the future prior to 2030 as separate projects that would receive separate detailed environmental review. The extensions include approximately 14 additional miles of guideway and 13 additional stations (Figure 2-43).

The West Kapolei extension would begin at the Waiʻanae end of the corridor and is anticipated to follow Kapolei Parkway to Wākea Street and

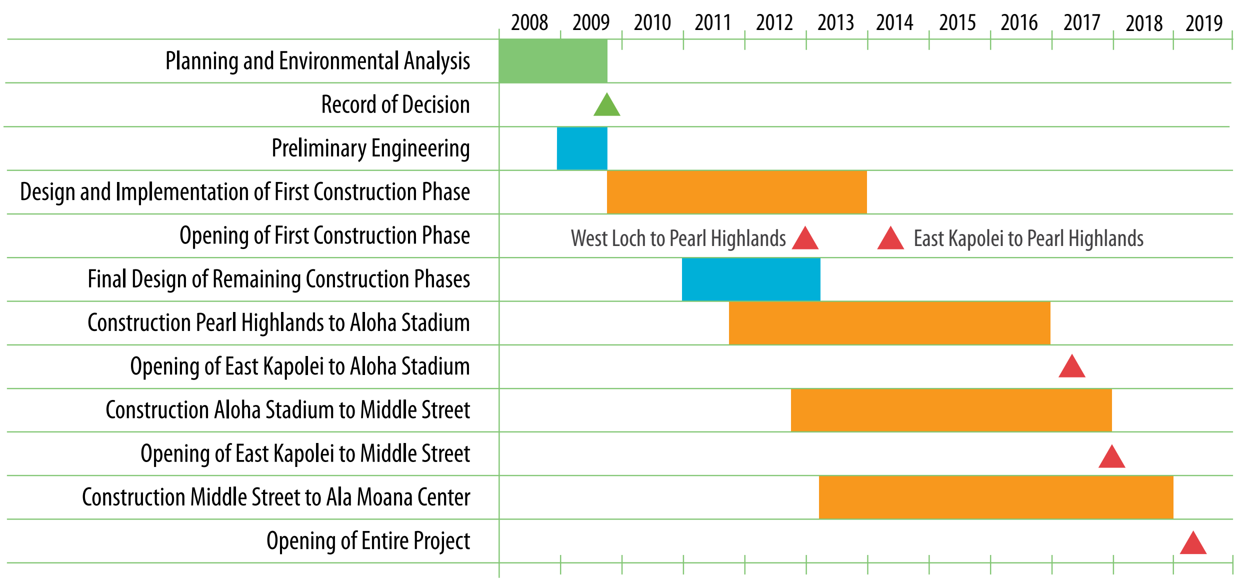


Figure 2-42 Project Schedule

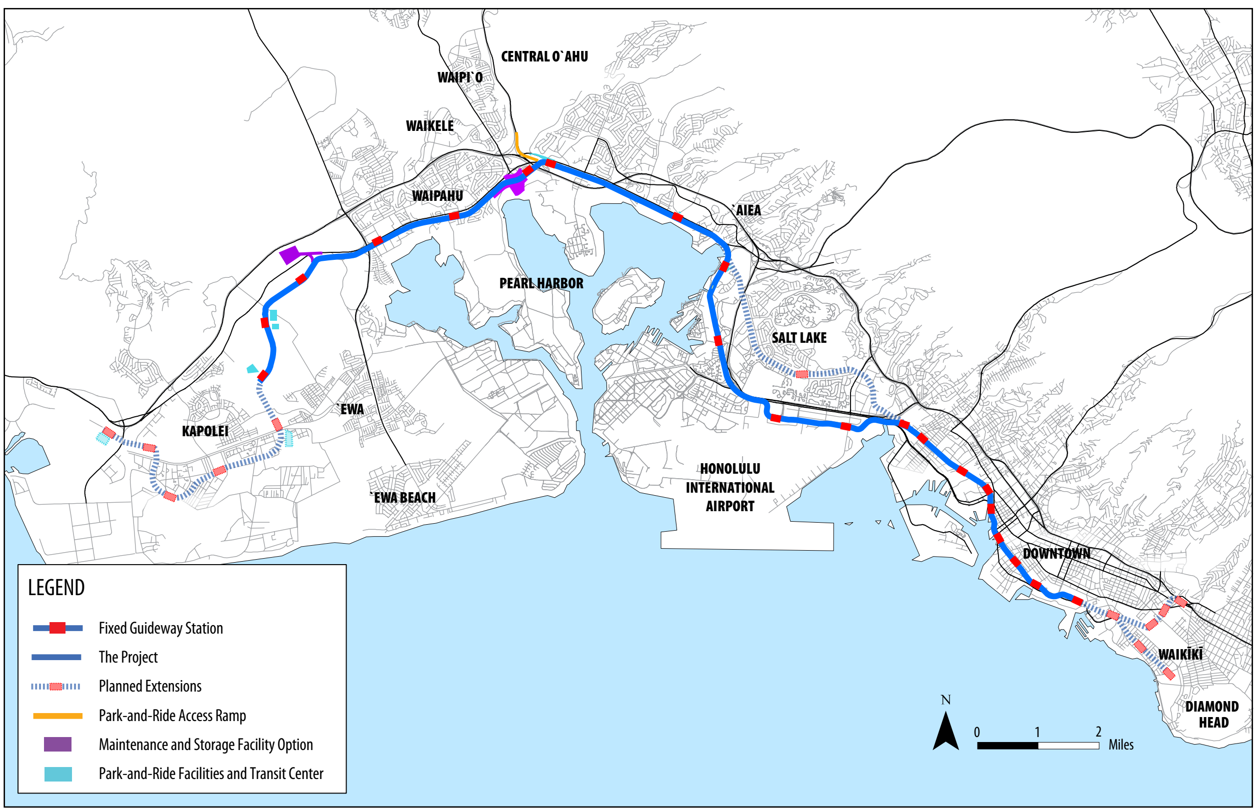


Figure 2-43 Planned Extensions

then turn makai to Saratoga Avenue. Proposed station locations and other project features in this area are shown in Figure 2-43. The guideway would continue on planned extensions of Saratoga Avenue and North-South Road and connect to the Waiʻanae end of the current Project.

The UH Mānoa and Waikīkī extensions would connect to the Project at Ala Moana Center. A third track would be constructed from ʻEwa of Piʻikoi Street that would climb above the parking garage for the shopping center. An additional station platform serving passengers continuing toward UH Mānoa and Waikīkī would be constructed along the higher track. The lower platforms that are being constructed as part of the current Project would continue to serve transit service terminating at Ala Moana Center.

The UH Mānoa extension would connect to the current Project at Ala Moana Center and then veer mauka to follow Kapiʻolani 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 2-43).

The Waikīkī extension would follow Kalākaua Avenue to Kūhiō Avenue and end near Oʻahu Avenue (Figure 2-43). The Ala Moana Center Station and a future planned station at the Convention Center would be transfer points between the UH Mānoa and Waikīkī branch lines.

The Salt Lake extension would connect to the Project at Aloha Stadium and continue Koko Head along Salt Lake Boulevard. 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 where it would connect back to the Project.

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