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 Oʻahu. The study corridor extends from Kapolei to the University of Hawaiʻi 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 Koʻolau and Waiʻanae 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 Oʻahu starting with the Oʻahu 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 ʻEwa 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 Hawaiʻi, 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 Oʻahu 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 Mōʻiliʻili was abandoned because of a combination of public opposition, lack of funds, and ecological impacts. The 1967 islandwide *Oʻahu Transportation Study* (OTPP 1967) concluded that a fixed guideway transit system, serving a corridor between Pearl City and Hawaiʻi Kai, would provide cost-effective transportation capacity as part of a

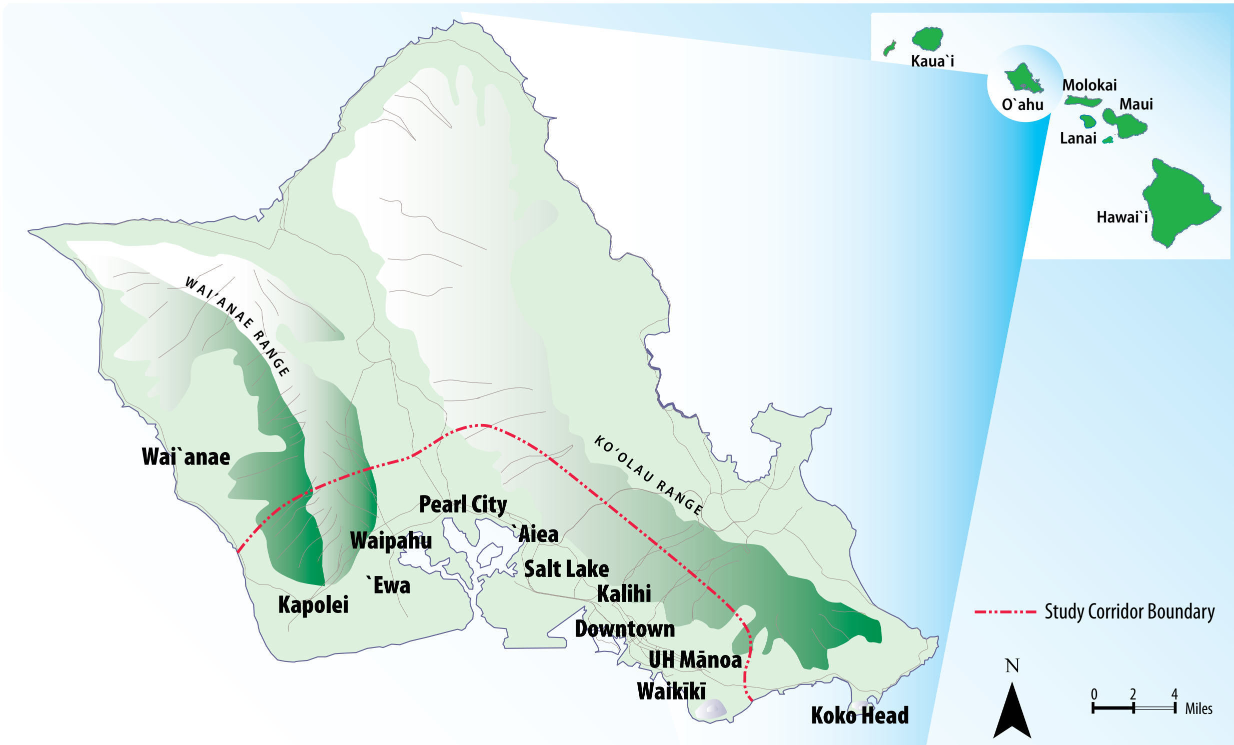
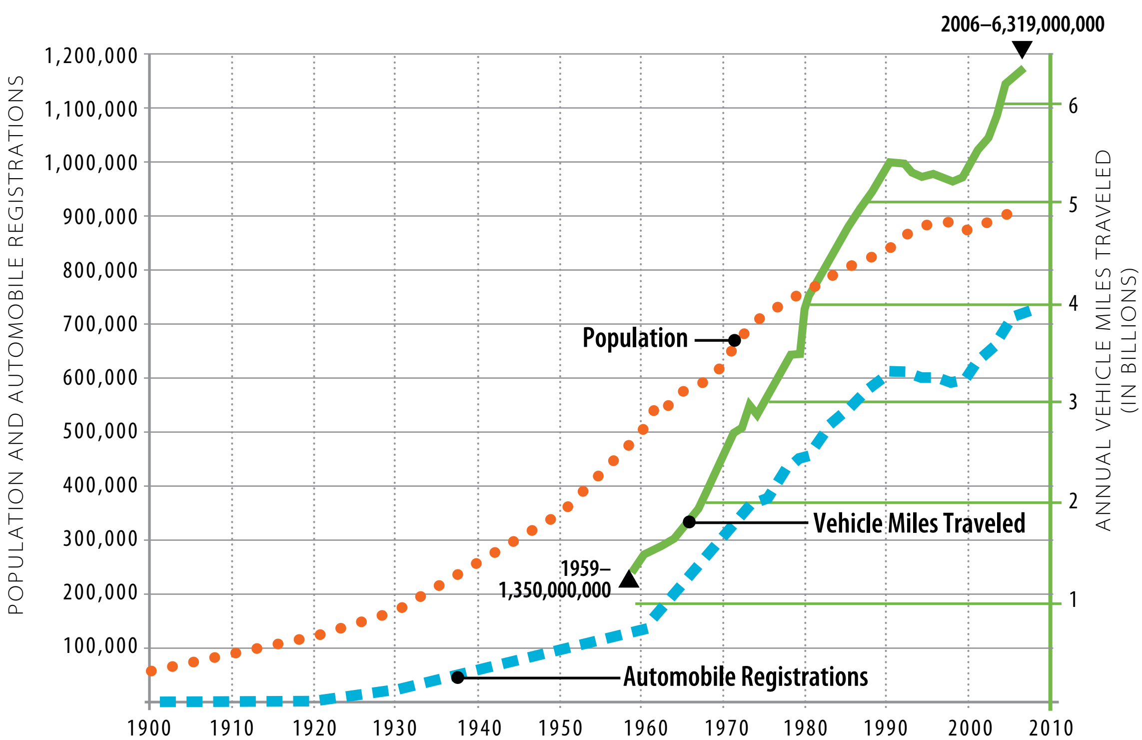


Figure 1-1 Honolulu High-Capacity Transit Corridor Project Vicinity



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 Waikīkī	From Downtown to UH Mānoa	From Airport to Waikīkī	From Waipahu to Waikīkī	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

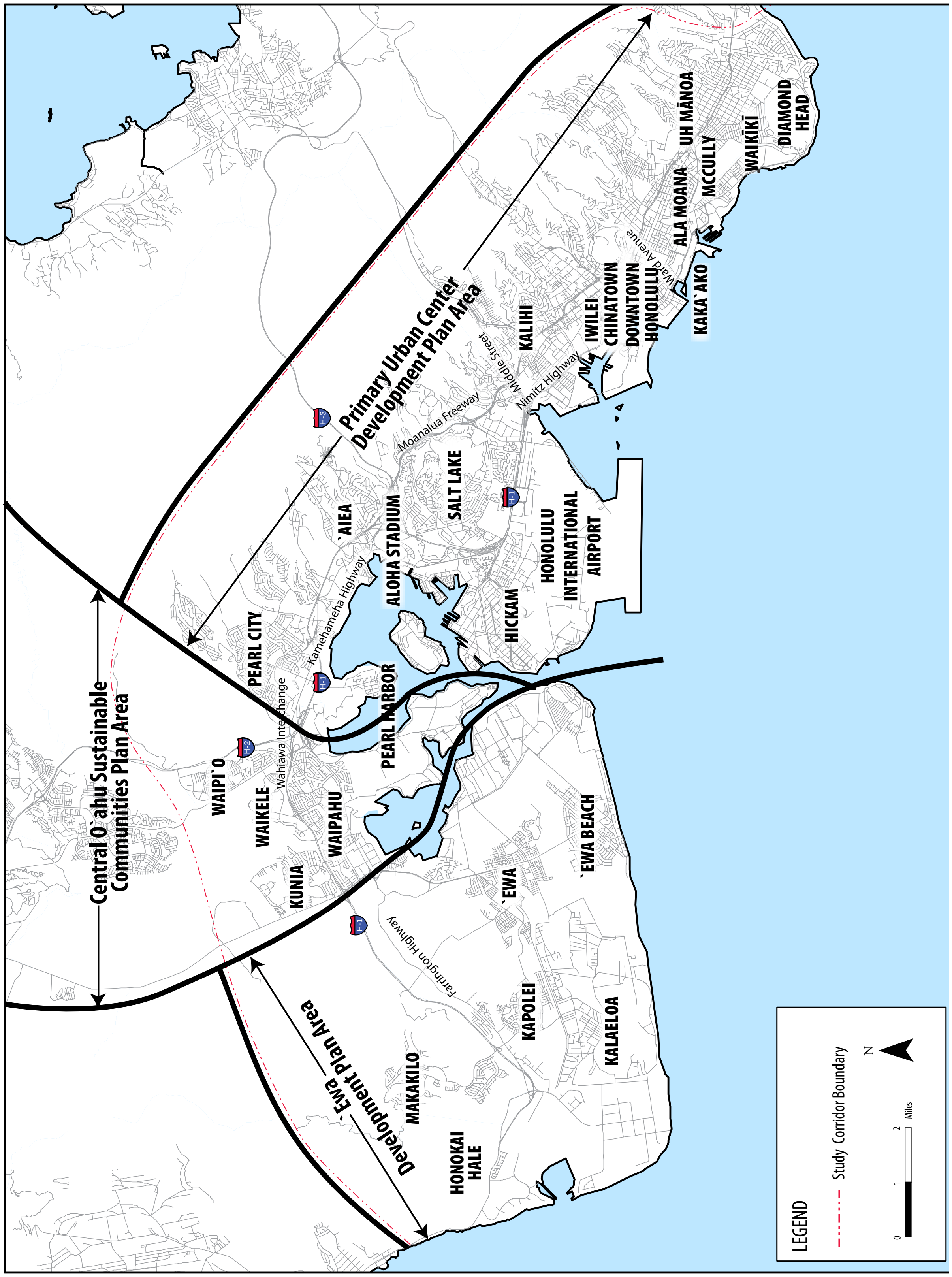
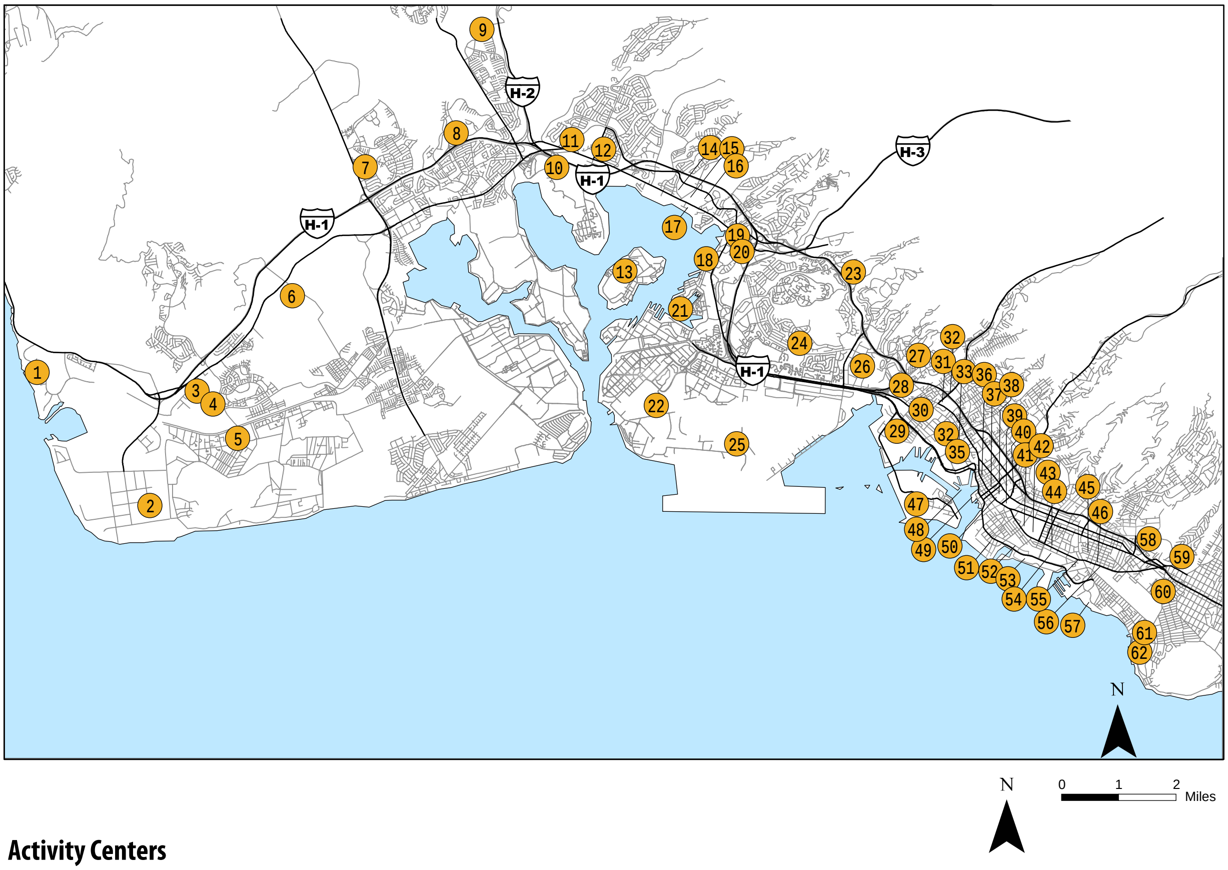


Figure 1-3 Areas and Districts in the Study Corridor



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

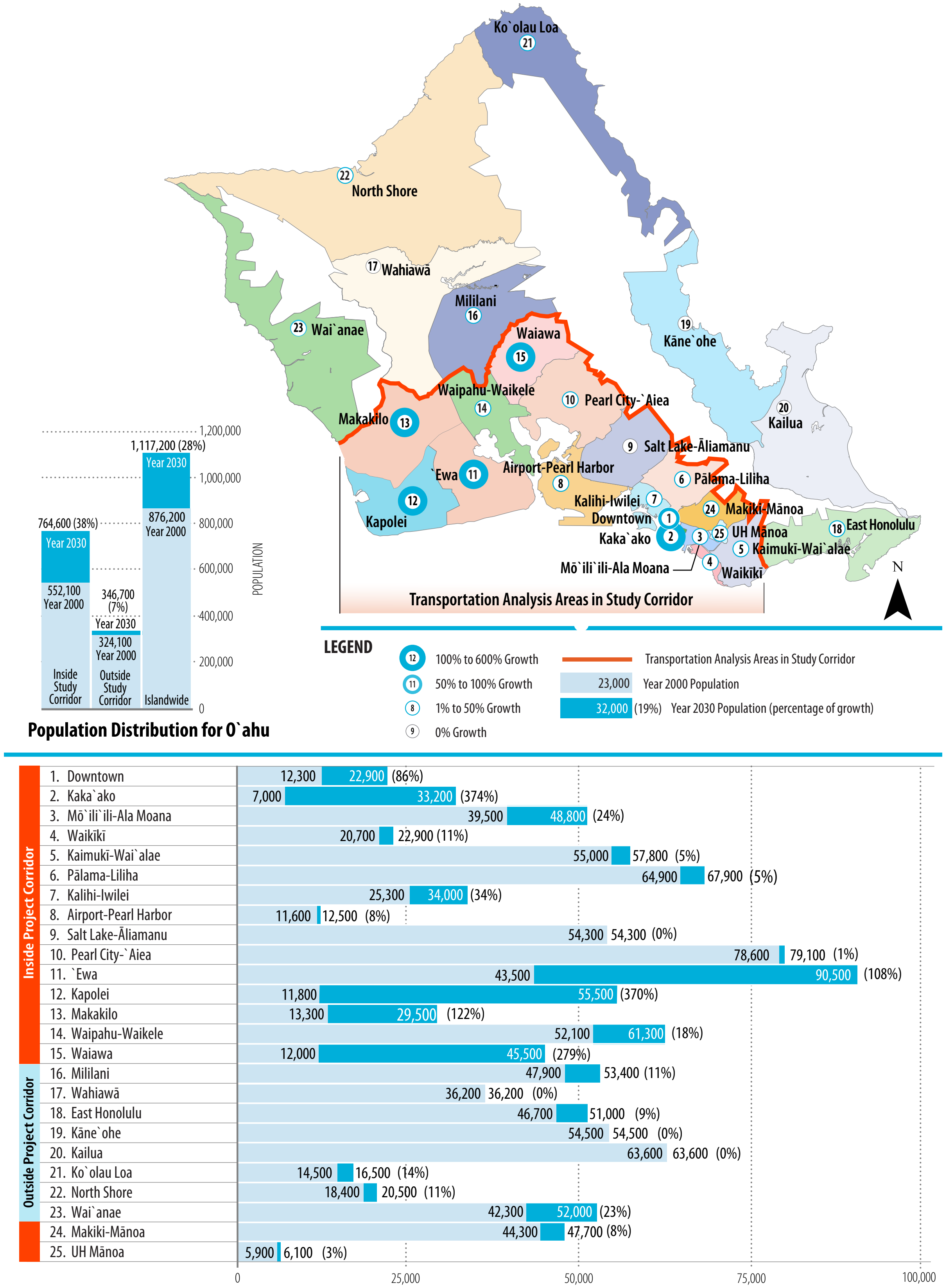
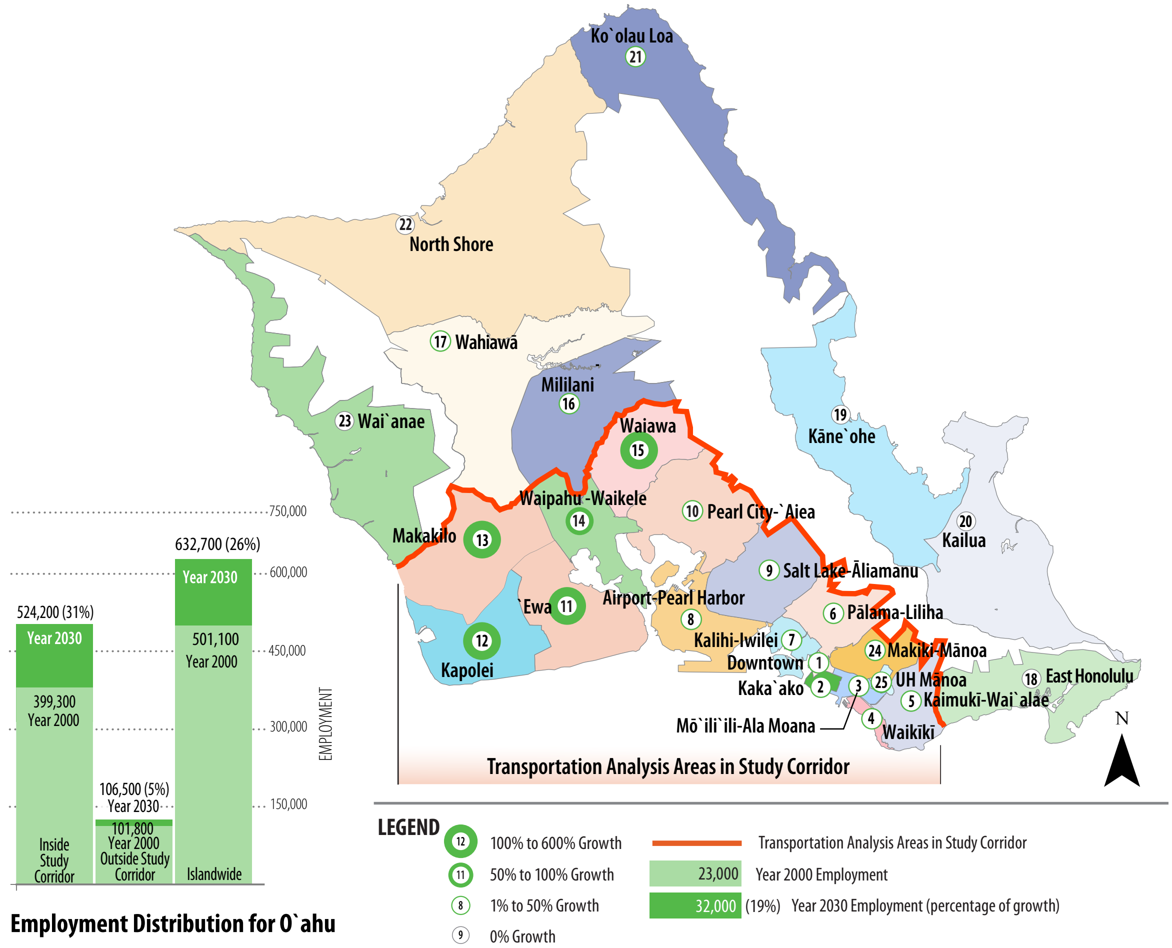
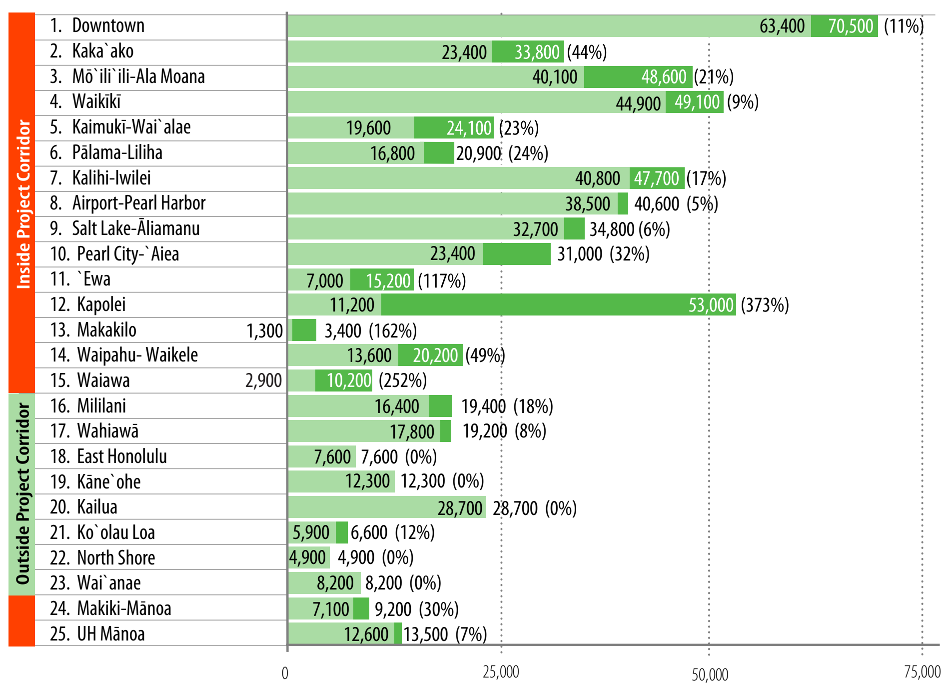


Figure 1-5 Population Distribution for O`ahu



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 Hoʻopili, 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 Oʻahu 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 Nuʻuanu 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 Kakaʻako 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 ʻAiea areas are more than twice the volume traveling in the ʻEwa direction. Afternoon flows are less directional with ʻEwa-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 Oʻahu and the location of visitor attractions within the study corridor combine to create a transit market of visitors traveling within the study corridor. Oʻahu 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 ʻEwa 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.

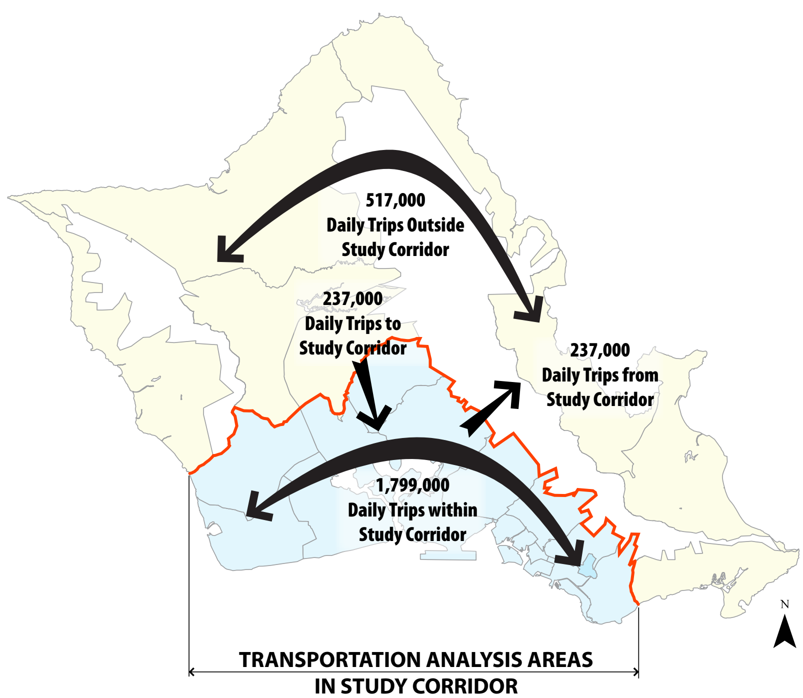


Figure 1-7 Current (2007) Daily Person-trip Patterns on O`ahu

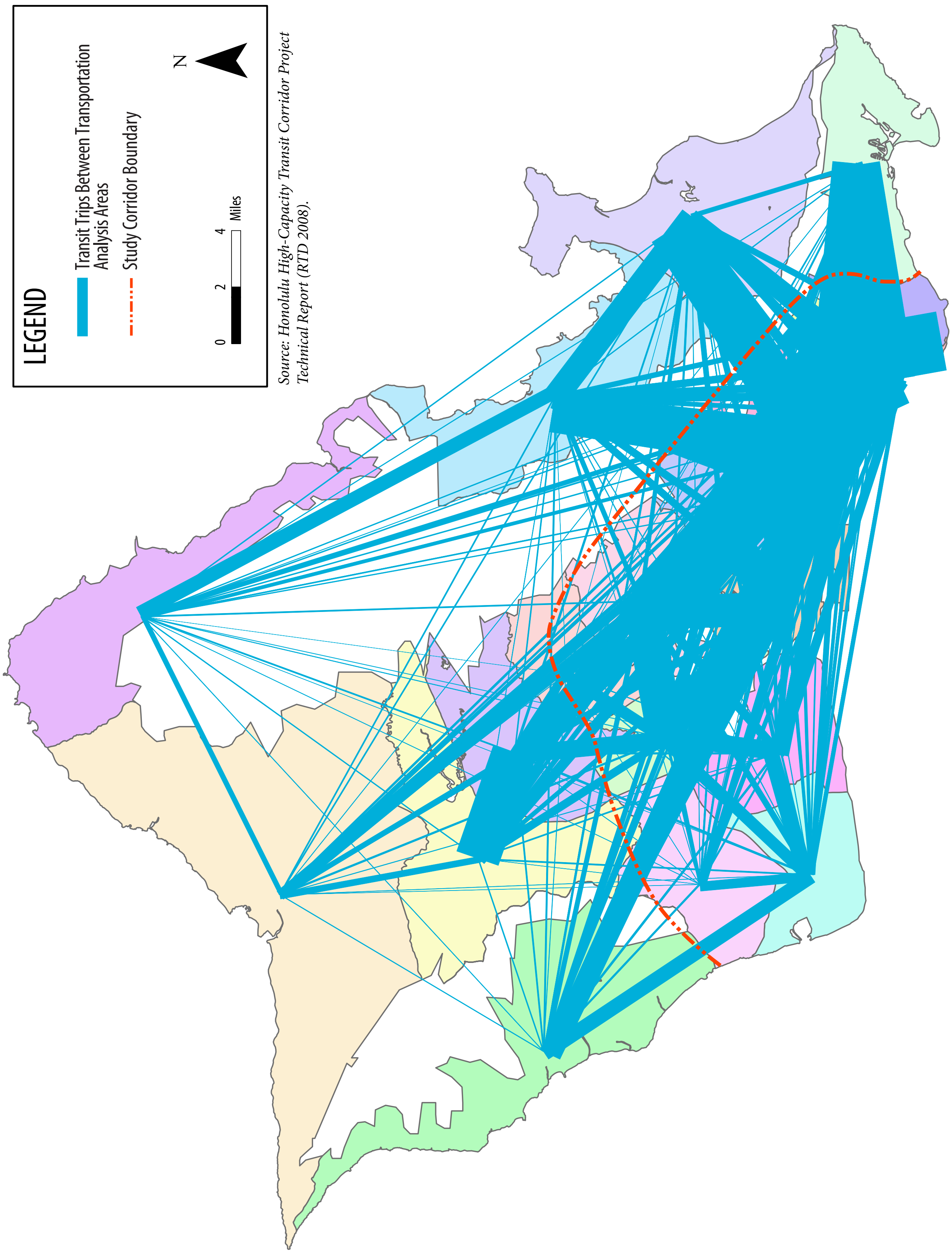


Figure 1-8 Daily 2007 Transit Trips between Transportation Analysis Areas

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

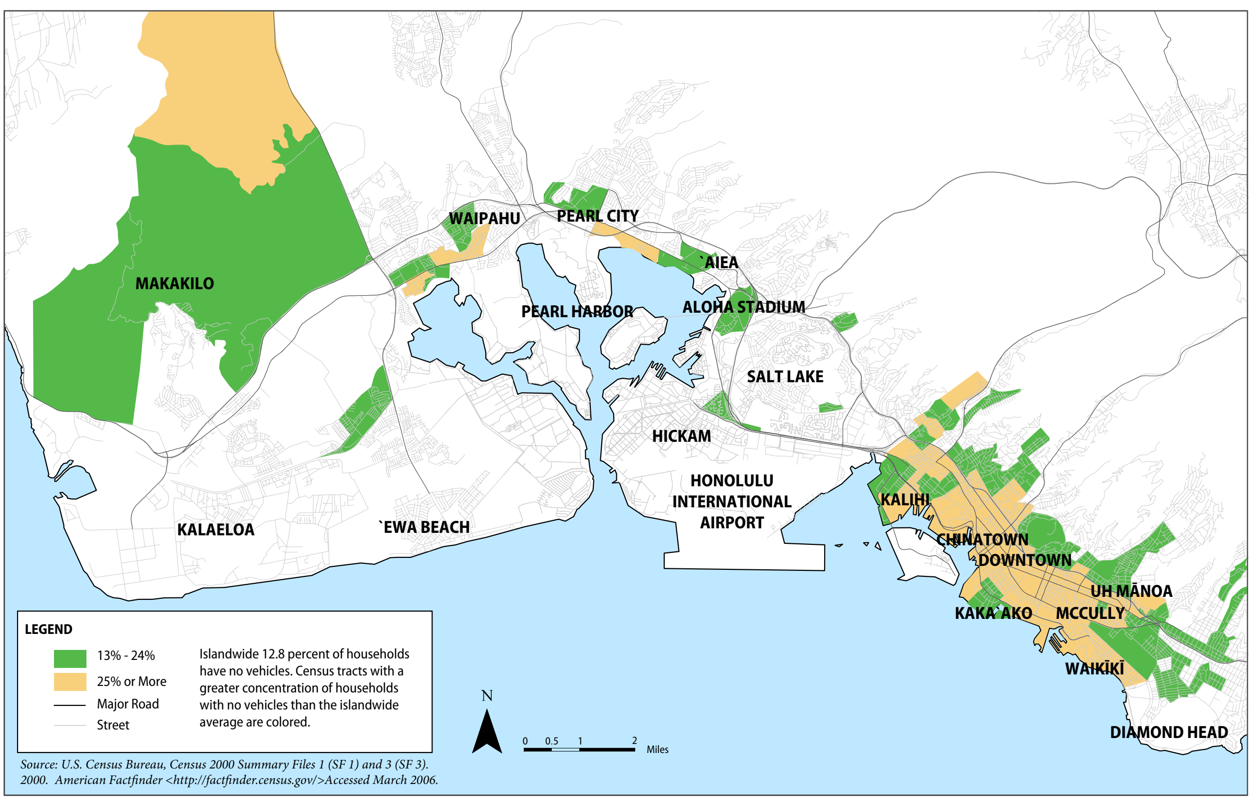


Figure 1-9 Concentrations of Transit-dependent Households (2000)

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 Oʻahu, 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 Hawaiʻi 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

Oʻahu Transit Services, Inc. (OTS) operates TheBus on Oʻahu 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 Oʻahu also includes paratransit service (TheHandi-Van) and a commuter ferry service between West Oʻahu 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 Waiʻanae 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.

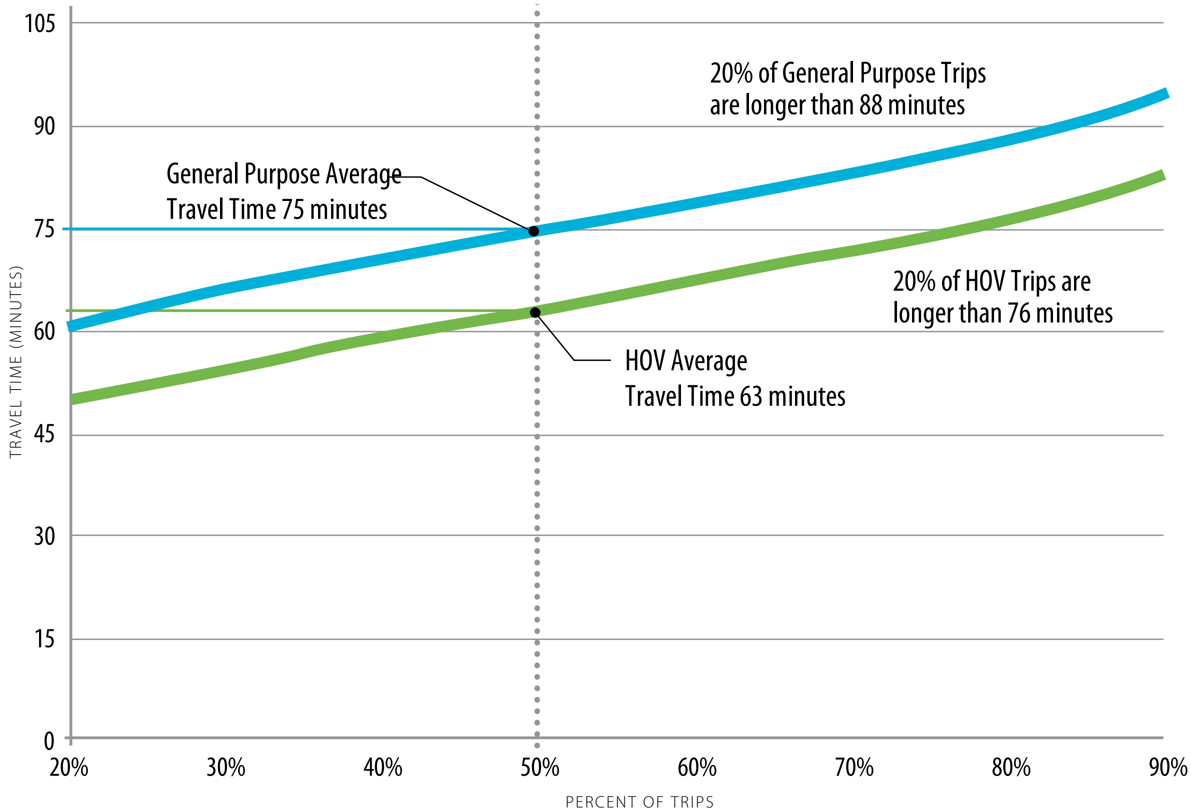


Figure 1-10 Existing A.M. Peak-Period Wai`anae to Downtown Travel Time Distribution (Highway Drive Time Only)

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

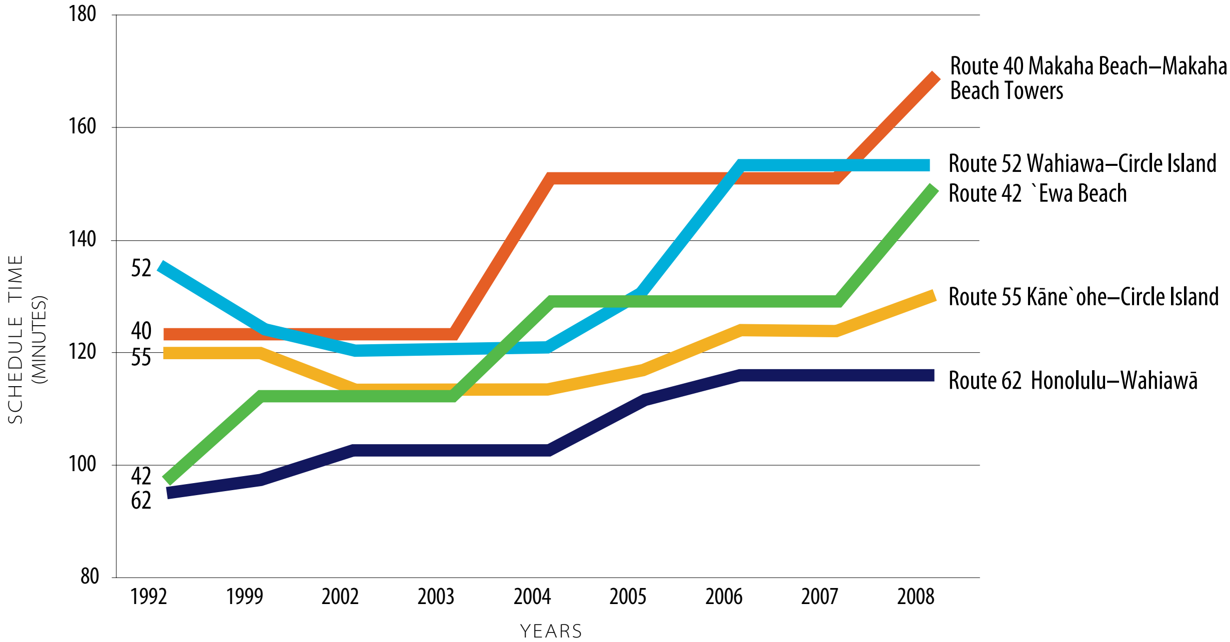


Figure 1-11 Selected Bus Trip Times for Selected Routes

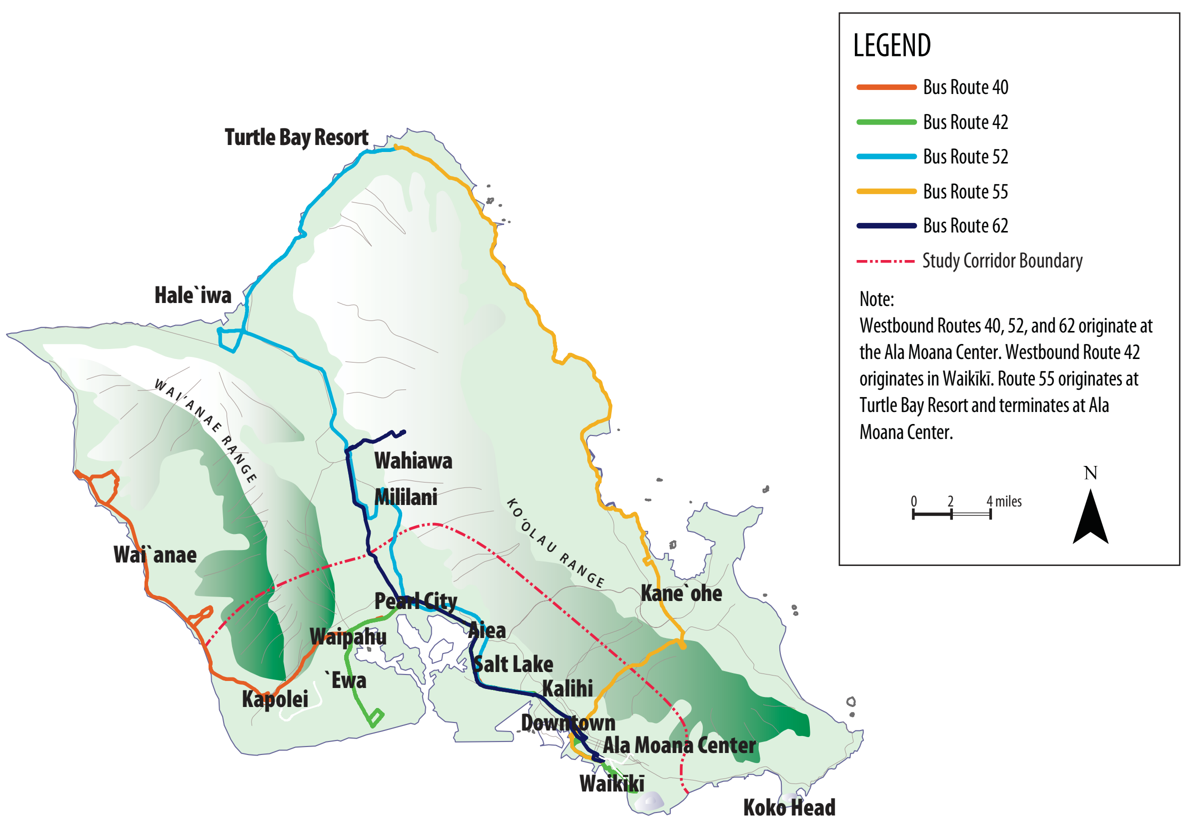


Figure 1-12 Route Maps for Sampled Routes

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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