Honolulu High-Capacity Transit Corridor Project
Alternatives Analysis Report

Department of Transportation Services
City and County of Honolulu
Mayor Mufi Hannemann

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Context of the Alternatives Analysis

This Alternatives Analysis (AA) supports the selection of a locally preferred transit alternative for the City and County of Honolulu consistent with the planning and project development process defined by the Federal Transit Administration (FTA). The first step of the process was systems planning, which culminated with the O‘ahu Metropolitan Planning Organization (OMPO) including a fixed guideway transit system in the *2030 O‘ahu Regional Transportation Plan* (OMPO, 2006a). This phase, Alternatives Analysis, evaluates a range of transit mode and general alignment alternatives in terms of their costs, benefits and impacts.

The Honolulu City Council will select a locally preferred alternative (LPA) based on the findings of this AA report. Subsequently, design options within the LPA will be evaluated and an Environmental Impact Statement (EIS) will be prepared according to the National Environmental Policy Act (NEPA) as part of the Preliminary Engineering phase. Final Design, construction, and operation of the LPA will follow.

Purpose of the Alternatives Analysis Report

The purpose of this report is to provide the Honolulu City Council with the information necessary to select a mode and general alignment alternative for high-capacity transit service on O‘ahu. The primary project study area is the travel corridor between Kapolei and the University of Hawai‘i at Mānoa. The report summarizes the results of an AA that followed FTA planning guidance and provides information on the costs, benefits, and impacts of four alternatives:

- No Build Alternative
- Transportation System Management Alternative
- Managed Lane Alternative
- Fixed Guideway Alternative.

The goal of the AA process is to reach a broad consensus regarding which alternative best meets the goals and objectives for the study corridor. The analysis in the AA is defined by the need to make an intelligent selection of a preferred mode and general alignment. After public release of this report, the City Council will conduct public hearings to solicit community views on the evaluated alternatives. Considering both the technical information provided in the AA and the comments from the public, the Council will select an LPA to provide improved transit service in the study corridor. After selection of the LPA, the City and County of Honolulu Department of Transportation Services (DTS) will apply to FTA to begin Preliminary Engineering.

Organization of the Alternatives Analysis Report

This report is organized into a summary followed by seven chapters. Chapter 1 provides the context for the study, including a description of the corridor and the existing transportation system, planned growth and improvements in the corridor, the need for an improved transit system, and a definition of the purpose of the alternatives evaluated. Chapter 2 describes the alternatives being evaluated and how they were selected through both technical review and public comment.

Chapters 3 through 5 evaluate the technical merits and consequences of the alternatives. Chapter 3 presents the effects that the alternatives would have on the transportation system. The physical and social environment that would be affected by the alternatives and the effects on that environment are described in Chapter 4. Chapter 5 presents the financial evaluation of the alternatives, including their costs and how their implementation and long-term operation would be funded.

Chapter 6 summarizes all of the technical findings and describes how each alternative would meet the goals and objectives established for the project. It also compares the trade-offs among the alternatives. The final chapter, Chapter 7, describes the public involvement and agency coordination that has been conducted to include the concerns of affected parties in the planning process.

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Acronyms Used in this Document

AA	Alternatives Analysis
DTS	Department of Transportation Services
EIS	Environmental Impact Statement
FGM	Fixed Guideway Modernization
FTA	Federal Transit Administration
FY	Fiscal Year
GET	General Excise and Use Tax
GO	General Obligation
HDOT	Hawaiʻi Department of Transportation
HOV	High Occupancy Vehicle
LOS	Level-of-Service
LPA	Locally Preferred Alternative
NEPA	National Environmental Policy Act
O&M	Operation and Maintenance
OMPO	Oʻahu Metropolitan Planning Organization
ORTP	Oʻahu Regional Transportation Plan
OTS	Oʻahu Transit Services, Inc.
PE	Preliminary Engineering
PUC	Primary Urban Center
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act
SCC	Standard Cost Categories
TSM	Transportation System Management
UH	University of Hawaiʻi
USC	United States Code
V/C	Volume-to-Capacity Ratio
VHD	Vehicle Hours of Delay
YOE	Year of Expenditure

The City and County of Honolulu Department of Transportation Services (DTS), in coordination with the U.S. Department of Transportation Federal Transit Administration (FTA), has carried out an Alternatives Analysis (AA) to evaluate alternatives that would provide high-capacity transit service on Oʻahu. The primary project study area is the travel corridor between Kapolei and the University of Hawaiʻi at Mānoa (UH Mānoa) (Figure S-1). This corridor includes the majority of housing and employment on Oʻahu. The east-west length of the corridor is approximately 23 miles. The north-south width of the corridor is at most four miles, as much of the corridor is bounded by the Koʻolau and Waiʻanae Mountain Ranges to the north and the Pacific Ocean to the south.

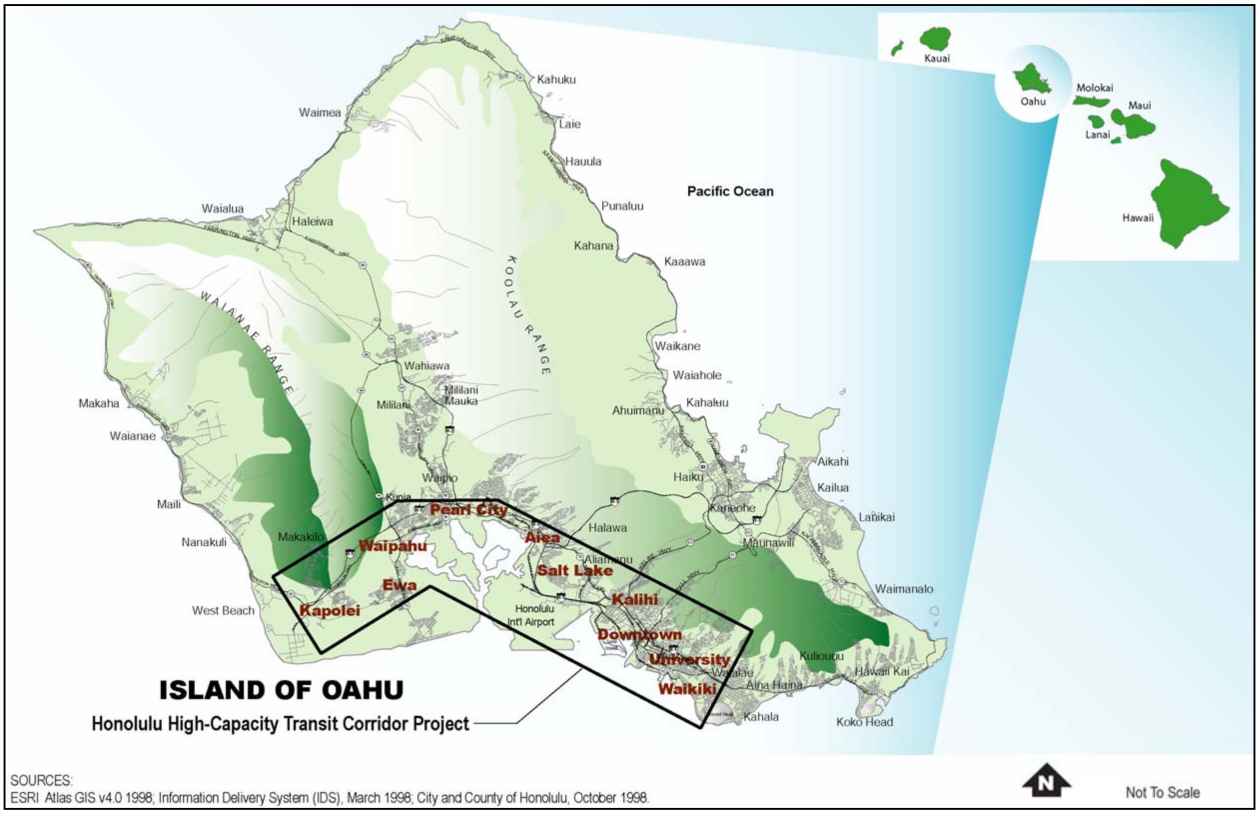

Figure S-1. Project Vicinity

Purpose of and Need for Transportation Improvements

The purpose of the Honolulu High-Capacity Transit Corridor Project is to provide improved mobility for persons traveling in the highly congested east-west transportation corridor between Kapolei and UH Mānoa. System planning for the corridor culminated in the *2030 Oʻahu Regional Transportation Plan* (OMPO, 2006a).

The Oʻahu Metropolitan Planning Organization (OMPO) concluded that the existing transportation infrastructure in this corridor is overburdened handling current levels of travel demand. Motorists experience substantial traffic congestion and delay at most times of the day during both the weekdays and weekends. Currently, transit is caught in the same congestion. As roadways become more congested, they become more susceptible to substantial delays caused by incidents such as traffic accidents or heavy rain. Current travel times are not reliable for either transit or automobile trips.

The highest population growth rates for the island, consistent with the General Plan for the City and County of Honolulu, are projected in the ‘Ewa Development Plan area. Many lower-income and minority workers live in the corridor outside of the urban core and commute to work in the Primary Urban Center Development Plan area. Many lower-income workers also rely on transit because of its affordability.

Alternatives Considered

Four alternatives are evaluated in this report. They were developed through a screening process that considered alternatives identified through previous transit studies, a field review of the study corridor, an analysis of current population and employment data for the corridor, a literature review of technology modes, work completed by the O‘ahu Metropolitan Planning Organization (OMPO) for its *2030 O‘ahu Regional Transportation Plan (OMPO, 2006a),* and public and agency comments received during a formal project scoping process. The four alternatives are described in detail in the *Honolulu High-Capacity Transit Corridor Project Alternatives Analysis Detailed Definition of Alternatives (DTS, 2006a)*. The alternatives evaluated are as follows:

- No Build Alternative
- Transportation System Management Alternative
- Managed Lane Alternative
- Fixed Guideway Alternative.

Two operational options were studied for the Managed Lane Alternative. Several alignments were studied for the Fixed Guideway Alternative, including a shorter 20-mile Alignment.

Transportation Impacts and Benefits

In the year 2030, the only alternative that is expected to significantly affect transit mode share and attract additional transit riders is the Fixed Guideway Alternative. Many Fixed Guideway alignment options were evaluated and the Kalaeloa - Airport - Dillingham - Halekauwila alignment combination is projected to attract the highest number of daily transit trips systemwide.

In regards to serving existing and future transit markets, the Fixed Guideway Alternative does the best job in accommodating both longer corridor transit trips, as well as the increase in work commute trips to West O‘ahu, which is expected to become much more pronounced in the future. Two operational concepts for the Managed Lane Alternative were evaluated, and the Two-direction Option best serves the increase in work commute trips to West O‘ahu.

The Fixed Guideway Alternative most consistently results in improved transit travel times between key corridor origins and destinations. In many cases these travel times are equivalent to, or faster than, the same trip time made by private vehicle under No Build conditions, especially when considering the use of park-and-ride trips. The Fixed Guideway Alternative would produce the most reliable travel times because the vehicles would operate in their own right-of-way separate from roadways and associated congestion. The Managed Lane Alternative would provide some travel time improvements between selected origins and destinations that are well served by the facility, but in many cases the travel time savings experienced is offset by the increased congestion experienced before entering and upon exiting the facility.

Traffic congestion on key corridor facilities is expected to continue to exist under all alternatives, particularly during peak travel periods. Systemwide vehicle hours of delay (VHD) are projected to be substantially lower for the Fixed Guideway Alternative as compared to all other alternatives. While all other alternatives have a minimal to negligible impact on peak-period traffic volumes in the corridor (in fact, the Managed Lane options are expected to increase vehicle peak-hour volumes in the corridor), the Fixed Guideway Alternative is projected to reduce peak traffic volumes that cross Kalauao Stream and Kapālama Canal by three to 12 percent. Most importantly, however, the Fixed Guideway Alternative would provide a mobility option that the other alternatives do not. It gives users the opportunity to bypass the congestion that will occur on roadways throughout the study corridor.

Environmental Impacts and Benefits

The No Build and TSM Alternatives would generate minimal environmental impacts; however, they also would not generate environmental benefits.

The Managed Lane Alternative would require a moderate number of displacements and would affect a moderate number of potentially historic structures and one recreational facility. It would generate the greatest amount of air pollution, require the greatest amount of energy for transportation use, and would result in the largest number of transportation noise impacts. It would provide little community benefit, as it would not provide substantially improved transit access to the corridor.

Compared to the other alternatives, the Fixed Guideway Alternative would require more acquisitions and affect more potentially historic structures, as well as three park or recreational facilities. It would result in fewer transportation noise impacts than the Managed Lane Alternative.

Visual impacts for the Fixed Guideway Alternative would be less than those for the Managed Lane Alternative in areas where both alternatives would include structures, but the Fixed Guideway Alternative would extend beyond the area of the Managed Lane Alternative. The visual impacts of the 20-mile Alignment would be less than that for the 28-mile Full-corridor Alignment because the area of effect would be less.

The Fixed Guideway Alternative would generate the least air pollution and require the least energy for transportation. It would provide improved connections between communities, employment, and services in the corridor. The benefits of the Full-corridor Alignment would be somewhat greater than those for the 20-mile Alignment.

Financial Feasibility

Capital Costs

Capital costs for the No Build and TSM Alternatives would be $660 and $856 million, respectively, which accounts for bus replacement and system expansion. Total capital costs for the Managed Lane Alternative would range between $3.6 and $4.7 billion, of which $2.6 to $3.8 billion would be for construction of the managed lanes. Capital costs for the Fixed Guideway Alternative, including bus system costs, would range between $5.2 and $6.1 billion for the Full-corridor Alignments, of which $4.6 to $5.5 billion would be for the fixed guideway system. The costs would be $4.2 billion for the 20-mile Alignment, of which $3.6 billion would be for the fixed guideway system.

Operating and Maintenance Costs

Operating costs in 2030 for the No Build Alternative, in 2006 dollars, would be approximately $192 million. Operating costs for the TSM Alternative would be approximately $42 million greater than for the No Build Alternative. Transit operating costs for the Managed Lane Alternative would range between approximately $251 and $261 million as a result of additional buses that would be put in service under that alternative. These costs do not include the cost of maintaining the managed lane facility. The total operating costs for the Fixed Guideway Alternative, including the bus and fixed guideway, would range between approximately $248 and $256 million.

Funding Options

Funding sources for capital investments include a State General Excise and Use Tax (GET) surcharge, City general obligation bonds, and FTA funds. Only the Fixed Guideway Alternative could be funded with the GET surcharge. The No Build and TSM Alternatives are a continuation of existing bus services and system costs reflect ongoing operations with current funding sources.

With the Managed Lane Alternative, toll revenues would pay for ongoing operation and maintenance; remaining revenues would be used to contribute to repaying debt incurred to construct the system. Projections identify a funding deficit of $2.3 billion in 2006 dollars. Other funding sources would need to be identified to provide the remaining funding. Toll revenues would pay for less than one-quarter of debt service; other city funds would be needed for the remaining three-quarters.

For the Fixed Guideway Alternative, the GET surcharge is expected to yield between $2.6 and $3.2 billion in 2006 dollars. The 20-mile Alignment would require between $0.7 and $1.2 billion in 2006 dollars in funds from FTA New Starts or other sources. The Full-corridor Alignment would require between $1.7 and $2.2 billion in 2006 dollars in funds from FTA New Starts or other sources.

Evaluation of Alternatives

The alternatives were compared regarding their ability to improve corridor mobility, support smart growth and economic development, provide a cost-effective and equitable transportation solution, be constructible, minimize community and environmental impacts, and be consistent with other planning efforts.

The relative merits of two operational options were evaluated for the Managed Lane Alternative, and one was determined to be more effective than the other. Similarly, the Fixed Guideway Alternatives were evaluated and an optimal option of the alignments was selected. Because the performance differences between the two Managed Lane options would be small, the less costly Reversible Option would offer a better benefit-to-cost ratio; therefore, it would be the best option for the Managed Lane Alternative. The Kalaeloa - Airport - Dillingham - Halekauwila combination is the optimal Fixed Guideway alignment for the entire corridor. A 20-mile portion of that alignment from East Kapolei to Ala Moana Center provides a lower-cost option within the Fixed Guideway Alternative.

The Fixed Guideway Alternative performs the best when considering the goal of improving corridor mobility. The Full-corridor Alignment provides greater transportation benefits than the 20-mile Alignment. Although less effective than the full-corridor system, the 20-mile Alignment is still more effective at providing improved mobility than any of the other three alternatives.

In relation to encouraging patterns of smart growth and economic development, the No Build, TSM, and Managed Lane Alternatives generally maintain existing transit service patterns and methods. None of these alternatives would provide a high level of transit service that would serve as a nucleus for transit-oriented development. The Fixed Guideway Alternative would include new stations providing reliable high-capacity transit at locations zoned for new development or suitable for redevelopment. The Full-corridor Alignment would provide the greatest opportunity for smart growth, but considerable opportunities also would occur with the 20-mile Alignment.

The Fixed Guideway Alternative is substantially more cost-effective than the Managed Lane Alternative when the respective transit user benefits per dollar of cost relative to the TSM Alternative are compared.

The Fixed Guideway Alternative best meets the goal of providing equitable solutions. The Full-corridor Alignment would best serve transit-dependent populations, but the 20-mile Alignment would serve the majority of those served by the Full-corridor Alignment.

The No Build and Fixed Guideway Alternatives are financially feasible considering reasonably certain funding sources. The No Build Alternative would continue bus service using existing funding sources. The TSM Alternative would require a limited amount of additional funds, which could be from existing funding sources. Because the implementing legislation prohibits the GET surcharge from being used to fund existing transit systems, it would not be available to fund the TSM Alternative. The Managed

Lane Alternative has no defined funding source. Because it would be open to general purpose vehicles, including single-occupancy vehicles (cars carrying only the driver), neither the GET surcharge nor FTA funds could be used for its construction. The 20-mile Alignment for the Fixed Guideway Alternative could be funded with a combination of expected GET revenues and FTA New Starts funds. There is more uncertainty in funding of the Full-corridor Alignment. Either a larger share of FTA funds would be needed or other sources would need to be tapped.

The alternatives range widely in relation to community and environmental impacts. The No Build and TSM Alternatives would have little direct effect on existing resources; however, they also would not offer community or environmental benefits. The Managed Lane Alternative would require acquisition of private property, generate the highest levels of air and water pollution, consume the greatest amount of energy for transportation uses, and create the greatest number of noise impacts. The Fixed Guideway Alternative would require the greatest number or property acquisitions and have the greatest number of utility conflicts during construction, but it would also provide a new safe transportation connection between communities in the corridor. It would provide the greatest environmental benefits related to air and water pollution and energy consumption.

All alternatives are generally consistent with Local, District, and State plans. The Fixed Guideway Alternative best serves the areas of O‘ahu that are designated for future growth and development. The Fixed Guideway Alternative is the only alternative that is consistent with regional transportation system planning defined in the *2030 O‘ahu Regional Transportation Plan* (OMPO, 2006a).

Residents’ Alternatives Preferences

The residents of Honolulu are very concerned about transportation. In the *Honolulu Advertiser* Hawai‘i Poll conducted in June 2006, traffic was identified by most respondents as the most important issue currently facing Hawai‘i (*Honolulu Advertiser*, 2006). While preparing the *2030 O‘ahu Regional Transportation Plan*, OMPO conducted a telephone survey of O‘ahu residents to gauge public reaction to transportation solutions (OMPO, 2006b). More than 50 percent of the respondents said that they would use rapid transit regularly or occasionally.

Scoping conducted for the Honolulu High-Capacity Transit Corridor Project also indicated broad interest and a majority of support for transportation improvements in the corridor. The majority of comments received during scoping related to a preference for one of the alternatives or a proposed modification to one of the alternatives. As a result of public comments, moderating the growth in traffic congestion was added to the purpose and need, a second Managed Lane option was added, and the presentation of the Fixed Guideway Alternative was changed. There continues to be both organized support for and opposition to the Managed Lane and Fixed Guideway Alternatives.

Issues to be Resolved

This AA report supports the selection of an LPA by the Honolulu City Council. Subsequently, an Environmental Impact Statement (EIS) will be prepared and preliminary engineering will be completed for the selected alternative. While the AA defines the alternatives under consideration, many issues have to be resolved, beginning with selection of the LPA. Many of the other issues will be resolved as the project is refined during the environmental and preliminary engineering phases. The following outstanding issues have been identified:

- Selection of mode, alignment, and limits (this will be defined in selection of the Locally Preferred Alternative)
- Selection of transit technology for the Fixed Guideway Alternative (if selected)
- Development of a financial plan to provide project funding
- Opportunities for public-private partnership to enhance the project that can be delivered with limited public funds
- Environmental commitments.

Chapter 1 Purpose and Need

Purpose of the Project

The purpose of the Honolulu High-Capacity Transit Corridor Project is to provide improved mobility for persons traveling in the highly congested east-west transportation corridor between Kapolei and UH Mānoa, confined by the Wai‘anae and Ko‘olau Mountain Ranges to the north and the Pacific Ocean to the south. The project would provide faster, more reliable public transportation services in the corridor than those currently operating in mixed-flow traffic. The project would also provide an alternative to private automobile travel and improve linkages between Kapolei, the urban core, UH Mānoa, Waikīkī, and urban areas in between. Implementation of the project, in conjunction with other improvements included in the 2030 O‘ahu Regional Transportation Plan (ORTP), would moderate anticipated traffic congestion in the corridor. The project also supports the goals of the O‘ahu General Plan and the ORTP by serving areas designated for urban growth.

Need for Transportation Improvements

Improved mobility for travelers facing increasingly severe traffic congestion.

The existing transportation infrastructure in the corridor between Kapolei and UH Mānoa is overburdened handling current levels of travel demand. Motorists experience substantial traffic congestion and delay at most times of the day during both the weekdays and 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. Travelers on O‘ahu’s roadways currently experience 51,000 vehicle hours of delay, a measure of how much time is lost daily by travelers stuck in traffic, on a typical weekday. This is projected to increase to more than 71,000 daily vehicle hours of delay by 2030, assuming implementation of all of the planned improvements listed in the ORTP (except for a fixed guideway system). Without these improvements, the ORTP indicates that daily vehicle-hours of delay could increase to as much as 326,000 vehicle hours.

Current a.m. peak-period travel times for motorists from West O‘ahu to Downtown average between 45 and 81 minutes. By 2030, after including all of the planned roadway improvements in the ORTP, this travel time is projected to increase to between 53 and 83 minutes. Average bus speeds in the system have been decreasing steadily as congestion has increased. Currently, express bus travel times from ‘Ewa Beach to Downtown range from 45 to 76 minutes and local bus travel times from ‘Ewa Beach to Downtown range from 65 to 110 minutes during the peak period. By 2030, these travel times are projected to increase by 20 percent on an average weekday. 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 the current and increasing levels of congestion, a need exists to offer an alternative way to travel within the corridor independent of current and projected highway congestion.

Improved transportation system reliability.

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

Accessibility to new development in ‘Ewa/Kapolei/Makakilo as a way of supporting policy to develop the area as a second urban center.

Consistent with the General Plan for the City and County of Honolulu, the highest population growth rates for the island are projected in the ‘Ewa Development Plan area (comprised of the ‘Ewa, Kapolei and Makakilo communities), which is expected to grow by 170 percent between 2000 and 2030. This growth represents nearly 50 percent of the total growth projected for the entire island. The Wai‘anae, Wahiawā, North Shore, Windward, Waimānalo, and East Honolulu areas will have population growth of between zero and 16 percent because of this policy. This keeps the country country. Kapolei, which is developing as a “second city” to Downtown Honolulu, is projected to grow by nearly 600 percent to 81,100 people, the ‘Ewa neighborhood by 100 percent, and Makakilo by 125 percent between 2000 and 2030. Accessibility to the overall ‘Ewa 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 O‘ahu; therefore, the ‘Ewa, Kapolei, and Makakilo area needs improved accessibility to support its future growth as planned.

Improved transportation equity for all travelers.

Many lower-income and minority workers live in the corridor outside of the urban core and commute to work in the Primary Urban Center Development Plan area. Many lower-income workers also rely on transit because of its affordability. In addition, daily parking costs in Downtown Honolulu are among the highest in the United States (Colliers, 2005), further limiting this population’s access to Downtown. Improvements to transit capacity and reliability will serve all transportation system users, including low-income and under-represented populations.

Description of the Corridor

The study corridor extends from Kapolei in the west (Wai‘anae or ‘Ewa direction) to the University of Hawai‘i at Mānoa (UH Mānoa) in the east (Koko Head direction), and is confined by the Wai‘anae and Ko‘olau Mountain Ranges to the north (mauka direction) and the Pacific Ocean to the south (makai direction). Between Pearl City and ‘Aiea, the corridor’s width is less than one mile between the Pacific Ocean and the base of the Ko‘olau Mountains.

The General Plan for the City and County of Honolulu directs future population and employment growth to the ‘Ewa and Primary Urban Center 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 corridor (Figure 1-1). Major activity centers in the corridor are shown in Figure 1-2.

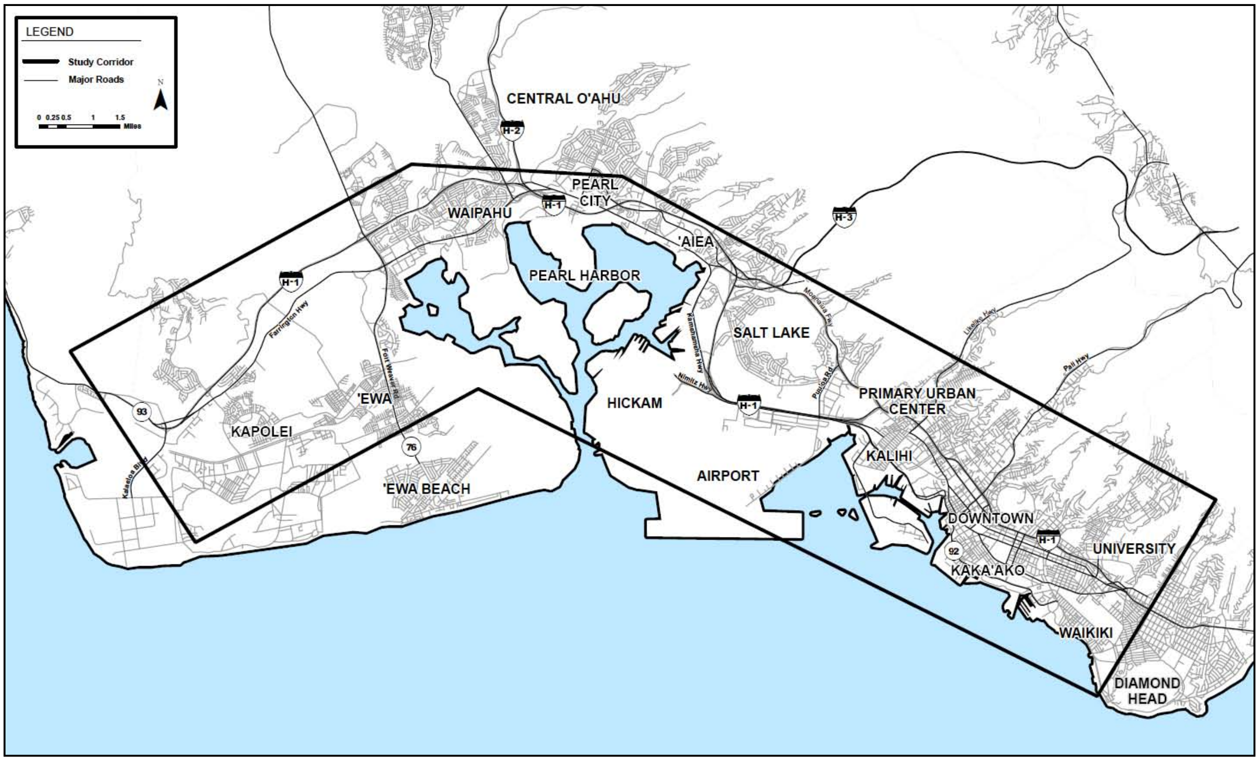

Figure 1-1. Areas and Districts in the Study Corridor

Currently, 63 percent of the population of 876,200 and 81 percent of the employment of 499,300 on O‘ahu are located within the study corridor. By 2030 this distribution will increase to 69 percent of the population and 84 percent of the employment as development continues to be concentrated into the Primary Urban Center (PUC) and ‘Ewa Development Plan areas. These trends are shown in two figures, Figure 1-3 and Figure 1-4, which illustrate existing and year 2030 projected population of 1,117,300 and employment of 632,900, 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 the University of Hawai‘i is developing a master plan for a new West O‘ahu campus there. 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 have several proposals to continue the construction of residential subdivisions.

Continuing Koko Head, the corridor follows Farrington and Kamehameha Highways through a mixture of low-density commercial and residential development. This part of the corridor passes through the makai portion of the Central O‘ahu Sustainable Communities Plan area.

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

As the corridor continues Koko Head across Moanalua Stream, the land use becomes increasingly dense. Industrial and port land uses dominate along the harbor, shifting to primarily commercial uses along Dillingham Boulevard, a mixture of residential and commercial uses along North King Street, and primarily residential use mauka of the H-1 Freeway.

Koko Head of Nu‘uanu Stream, the corridor continues through Chinatown and Downtown. The Chinatown and Downtown areas, with 62,300 jobs, have the highest employment density in the corridor. The Kaka‘ako and Ala Moana neighborhoods, comprised historically of low-rise industrial and commercial uses, are being revitalized with several high-rise residential towers currently under construction. 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 corridor continues to Waikīkī and through the McCully neighborhood to the University of Hawai‘i. 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 is the other major destination at the Koko Head end of the corridor. It 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 vehicle or transit to attend classes.

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 corridor are heavily directional. Morning town-bound (Koko Head direction) traffic volumes through the Waipahu and ‘Aiea areas are more than twice the volume traveling in the ‘Ewa direction. Afternoon flows are less directional with ‘Ewa-bound traffic volumes about 50 percent greater than town-bound (Koko Head-bound) traffic.

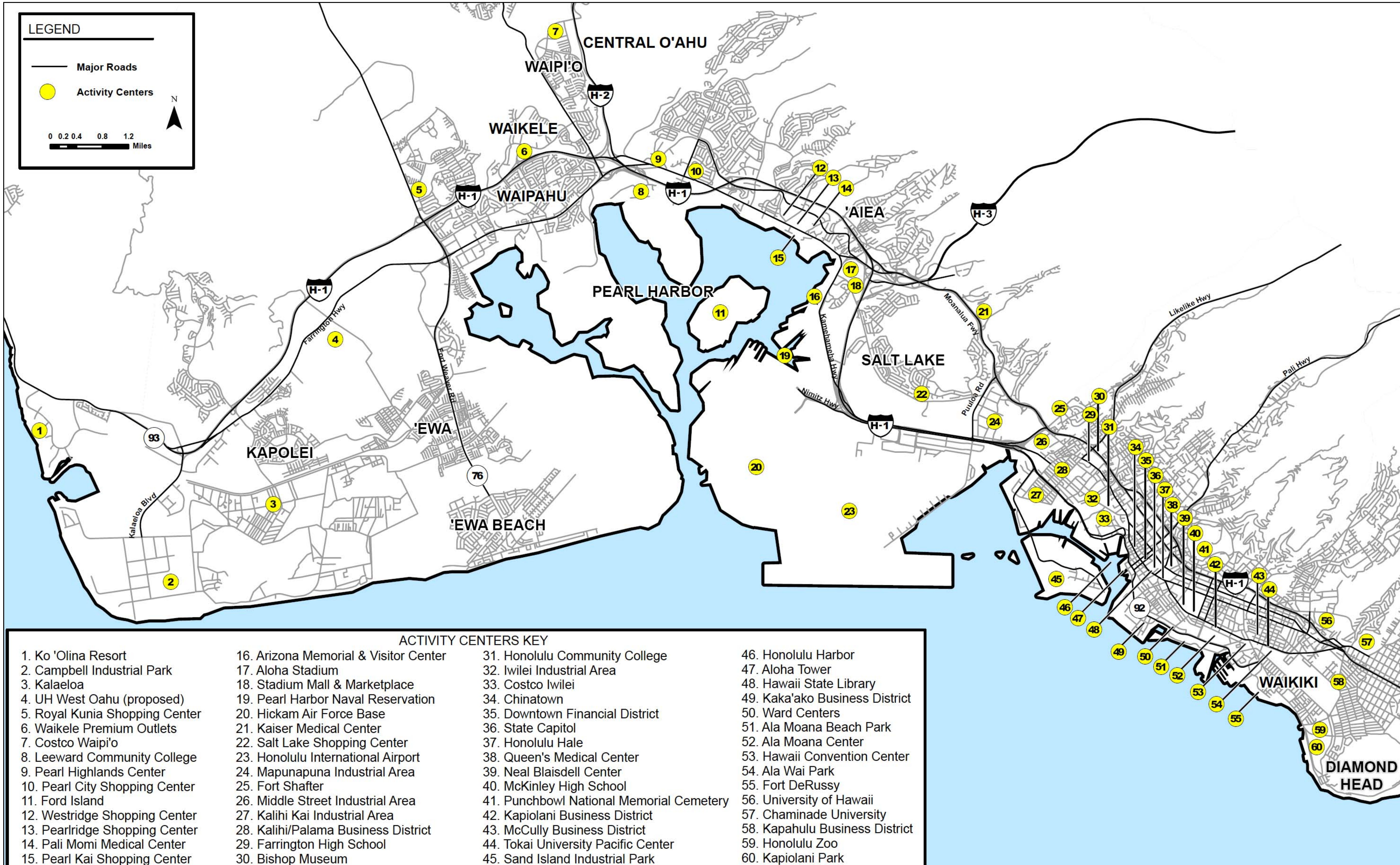

Figure 1-2. Major Activity Centers in the Study Corridor

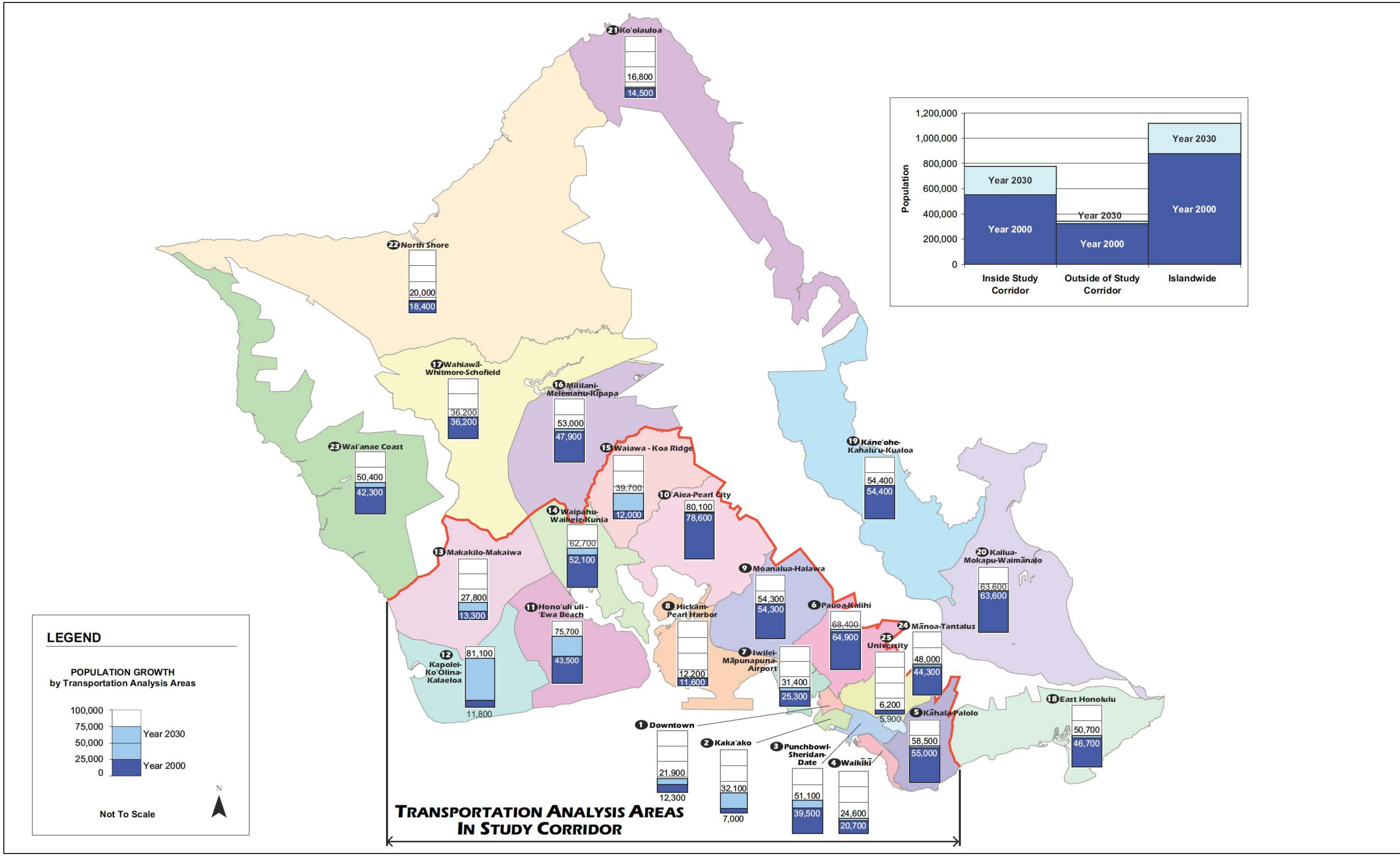

Figure 1-3. Population Distribution for O'ahu

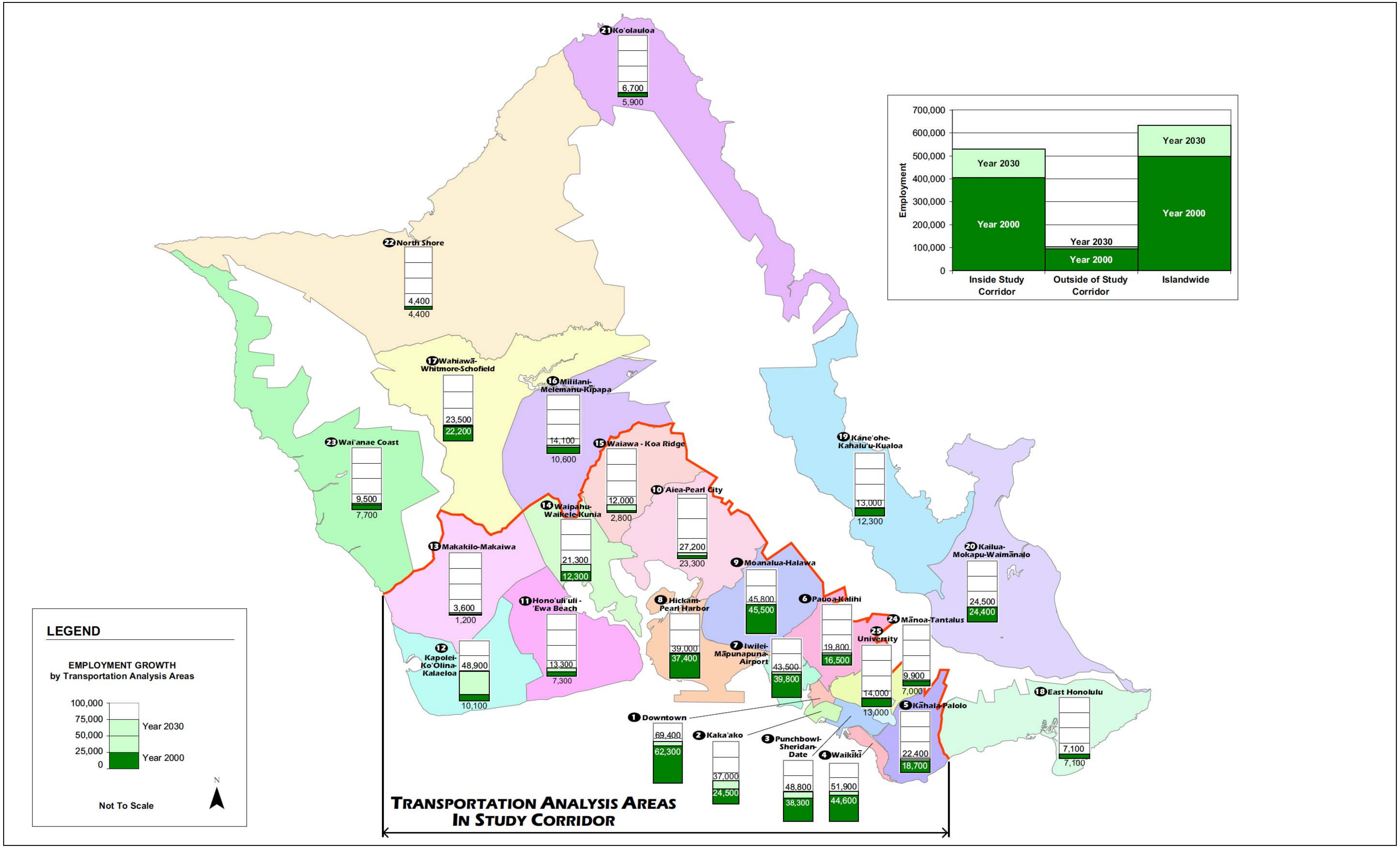

Figure 1-4. Employment Distribution for O'ahu

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, 1,826,000 or 68 percent of the 2,698,000 islandwide daily trips and 335,000, or 64 percent of the 523,000 peak-period work-related trips are currently generated within the study corridor. The study corridor attracts an even higher percentage of islandwide trips with 2,092,000, or 78 percent of daily trips and 424,000 or 82 percent of peak-period work-related trips having destinations within the study corridor.

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

Transit Travel Patterns

An on-board transit survey was conducted on all of 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 trips and the 57,000 peak-period work trips. These survey data indicate that the substantial majority of trips made by transit on the island occur within the study corridor.

When compared to total travel, the current number of transit trips within the 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 trips originate within the study corridor; while the study corridor attracts 90 percent of total islandwide daily trips and 94 percent of peak-period work-related trips.

Daily Transit Trips

The major destinations for weekday bus riders are Downtown (20 percent) and the Punchbowl-Sheridan-Date area (18 percent). Downtown contains the region’s highest concentration of jobs. Punchbowl-Sheridan-Date also contains a high number of jobs, as well as Ala Moana Center, the state’s largest shopping complex.

Overall, the largest share of TheBus riders’ trips originates in Waikīkī (16.5 percent). The major destinations for these trips are Downtown (24 percent) and Punchbowl-Sheridan-Date (27 percent). In addition to Waikīkī, Punchbowl-Sheridan-Date (9 percent), Kāhala-Pālolo (8 percent), and Pauoa-Kalihi (9 percent) are the origins of a large number of trips. These areas are densely populated, with relatively high concentrations of transit-dependent households (Figure 1-5).

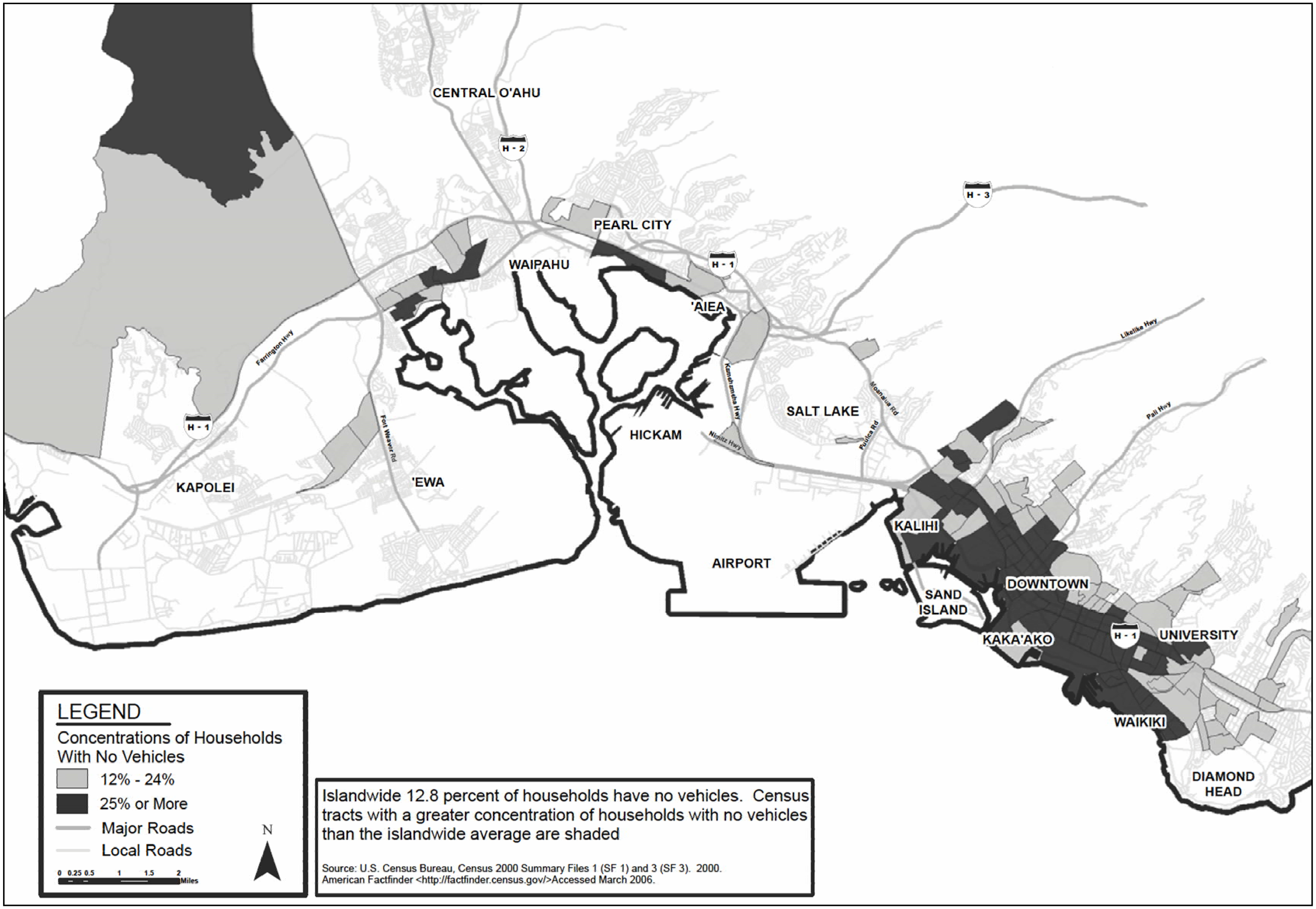

Figure 1-5. Concentrations of Transit-dependent Households

Peak-Period Transit Work Trips

Nearly 34 percent of all 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 peak-period home-based work trips. Waikīkī, Punchbowl-Sheridan-Date, Pauoa-Kalihi, Waipahu-Waikele-Kunia, and Kāhala-Pālolo together account for about 50 percent of the home-based origins for work trips taken during the peak period on TheBus.

Existing Transportation Facilities and Services in the Corridor

The study corridor is currently served by roadway and transit systems, parking facilities, and 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.

Street and Highway System

The study corridor is served primarily by the H-1 Freeway, Farrington Highway, Kamehameha Highway, Nimitz Highway, and Moanalua Road (Route H201). The H-2 Freeway provides access to the corridor from Central O‘ahu, and the H-3 Freeway provides access to the 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 corridor would be extremely difficult and/or expensive. As a result, some sections of the 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, 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 H-1 through this location, traffic is affected for miles along the adjacent corridor segments.

To better utilize the existing roadway facilities, both the Hawai‘i Department of Transportation (HDOT) and the City and County of Honolulu have implemented a number of roadway management strategies, including the use of contraflow lanes and high-occupancy vehicle (HOV) lanes. A contraflow lane is a strategy wherein a lane that typically provides vehicular travel in one direction is reversed during certain times of the day. Current contraflow lanes operate on the H-1 Freeway, Nimitz Highway, Kapi‘olani Boulevard, Ward Avenue, Atkinson Drive, and Wai‘alae Avenue during the a.m. peak period. During the p.m. peak period, contraflow lanes operate on Kapi‘olani Boulevard.

HOV lanes are freeway or surface street lanes designated for exclusive use by buses, carpools, and vanpools. HDOT operates HOV lanes on several state highways during certain times of the day. HOV lanes currently operate on the H-1 and H-2 Freeways, the Moanalua Road, the H-1 Zipper Lane and Shoulder Express Lane, and Nimitz Highway.

Public Transit System

O‘ahu Transit Services, Inc. (OTS) operates the public transit system (TheBus) on the island of O‘ahu under contract to the City and County of Honolulu. TheBus system serves more than 80 percent of the developed areas of the island and carries approximately 73 million passengers per year and experiences about 236,600 boardings on an average weekday. Annual transit passenger miles per-capita is higher in Honolulu than in all other major U.S. cities without a fixed guideway transit system.

Parking

Downtown Honolulu parking rates are high; however, many employers subsidize parking for their employees. Daily parking rates are the third-highest in the United States behind New York and Boston, while monthly parking rates are in the top 15 (Colliers, 2005). Downtown parking availability is considered 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.

Performance of the Existing Transportation System

Traffic Volumes

The highest daily traffic volumes occur near Downtown Honolulu. More than 398,000 vehicles cross Nu‘uanu Stream daily on a total of nine roadways. During the a.m. and p.m. peak hours, more than 26,000 vehicles cross Nu‘uanu Stream each hour.

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

Traffic Operating Conditions

The operating conditions of a roadway can be represented by a variety of measures, including the volume-to-capacity (V/C) ratio, operating speeds, and the density of traffic on the facility. These measures can be used to determine level-of-service (LOS). A roadway’s V/C ratio compares the volume of traffic traveling on the roadway to the physical capacity of the roadway. 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 a grading scale from A through F for roadway operation; LOS A represents the best condition and LOS F represents more vehicles attempting to use a roadway than the capacity is able to accommodate.

In general, congested conditions (e.g., LOS E or F) occur during the a.m. and p.m. peak hours on many of the major roadways, particularly on segments 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 more than one traffic signal cycle to clear intersections 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.

Recent traffic counts for the corridor indicate that existing travel conditions are congested during the a.m. peak hour for Koko Head-bound traffic crossing the Kalauao Stream in Pearl City (V/C ratio of 1.06 [LOS F]) and the Kapālama Canal closer to Downtown (V/C 1.04 [LOS F]). These conditions are also indicated by estimated travel speeds along H-1 in the corridor, as shown in Table 1-1. The table indicates that existing speeds between the Waiawa Interchange and Downtown in the general purpose lanes range from 14 to 20 mph (LOS F) and will generally get worse by the year 2030 despite many planned roadway improvements.. The only location where speeds in the corridor on H-1 are predicted to increase in 2030 as compared to today is east of the Middle Street merge, where the addition of a lane is expected to result in an average a.m. peak period speed of 24 mph, which still indicates LOS F at this location.

Table 1-1. Existing and 2030 No Build Alternative A.M. Peak Period Speeds and Level-of-Service on H-1

Location	2005 Speed (mph)	2005 Level-of-Service[1]	2030 Speed (mph)	2030 Level-of-Service
Waiawa Interchange - Koko Head Bound				
General Purpose Traffic	19	F	12	F
HOV Lane Traffic	24	F	14	F
Zipper Lane Traffic	39	F	37	F
Kalauao Stream - Koko Head Bound				
General Purpose Traffic	20	F	15	F
HOV Lane Traffic	46	E	24	F
Zipper Lane Traffic	37	F	36	F
East of Middle Street Merge - Koko Head Bound				
General Purpose Traffic	14	F	24	F
Liliha Street - Koko Head Bound				
General Purpose Traffic	19	F	12	F
East of Ward Avenue - ‘Ewa Bound				
General Purpose Traffic	21	F	18	F
West of University Avenue - ‘Ewa Bound				
General Purpose Traffic	36	F	34	F

[1]Level-of-Service is calculated based on vehicle density, a function of traffic volume and speed.

Based on recent traffic counts as well as field observations, the p.m. peak period is also experiencing a high level of congestion in the corridor. Analysis of operations at Kalauao Stream and Kapālama Canal show p.m. peak-hour levels-of-service of E for each; however, H-1 itself is over capacity and operating at LOS F.

Transit Operating Conditions

The public transit system, 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 result in declining bus operating speeds over recent years, which are not competitive with the private automobile. Between 2002 and 2006, islandwide average bus speeds decreased four percent to 13.4 miles per hour. Because congestion in the study corridor is greater than in other parts of O'ahu, the decrease in average bus speed in the corridor is greater than the islandwide average. To account for the congestion, OTS has lengthened the peak-period scheduled trip lengths by between nine and 26 percent for several routes operating in the study corridor. Trip lengths for these typical routes serving various parts of O'ahu are shown in Figure 1-6.

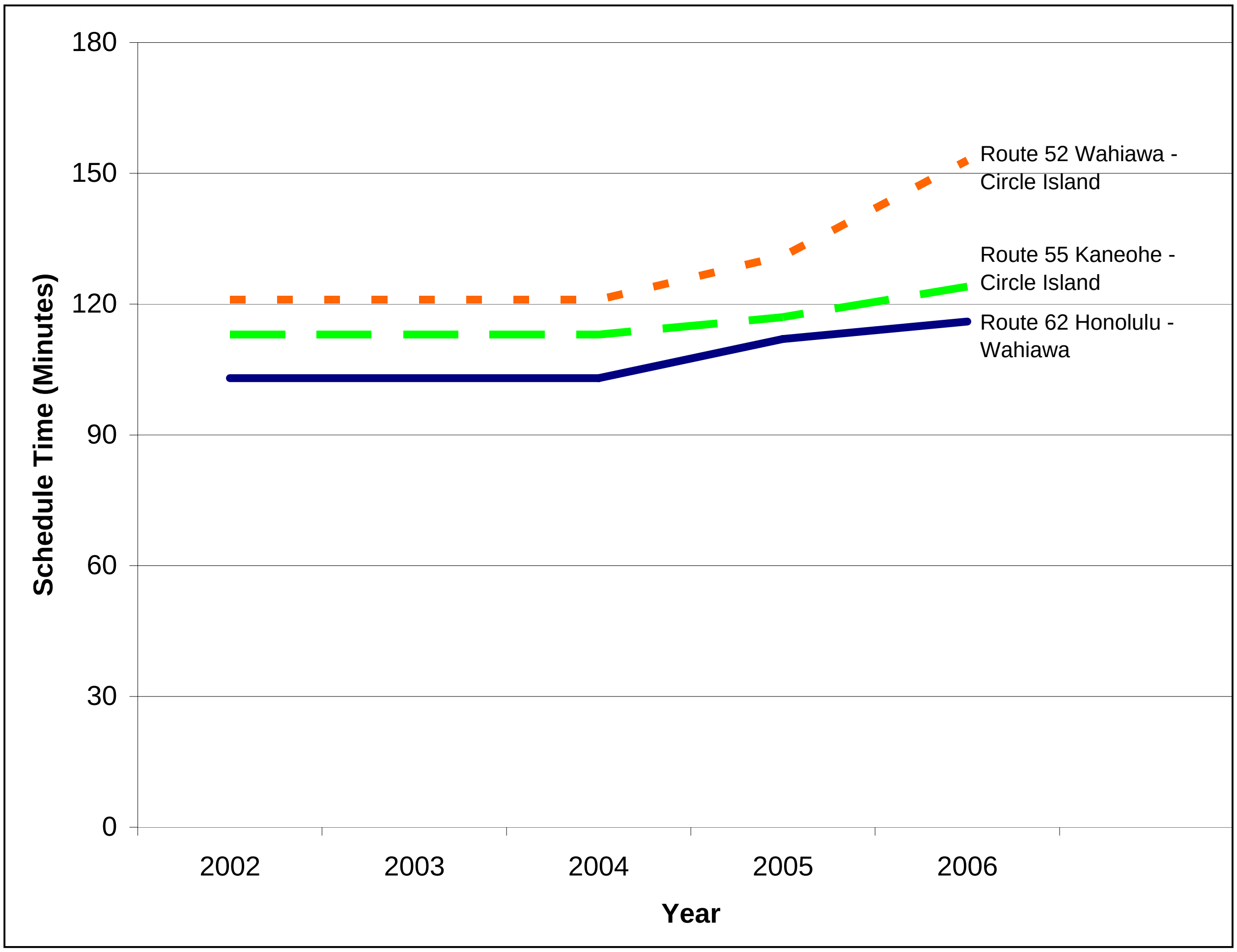

Figure 1-6. P.M. Peak-period Scheduled Bus Trip Times

Implementation of peak-period HOV lanes on H-1 and H-2, as well as the addition of the H-1 a.m. peak zipper lane, were intended to provide higher priority and mobility to buses and other high-occupancy vehicles. However, with a minimum eligibility requirement of only two persons per vehicle, these special lanes are often just as congested as the adjacent general purpose lanes (Table 1-1), 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 or heavy rain. As a result, current transit schedules in the corridor are not reliable. Recent statistics from TheBus indicate that on a systemwide basis 27 percent of all buses were more than five minutes late. During the a.m. peak period, express buses were more than five minutes late 38 percent of the time (OTS, 2006).

Transit speed and reliability with mixed-traffic operations will continue to diminish in the corridor as the number of transit passengers increases and traffic volumes approach roadway capacity on more streets.

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 Primary Urban Center for work (Figure 1-4). 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 County administrative offices move their daily operations to Kapolei and other employment grows in the area. Both of these factors point to increased travel on the transportation system between Kapolei and the Primary Urban Center and represent an important potential future transit market.

Relatively large areas within the corridor are transit-dependent because they contain a large number of zero-car households relative to other parts of O‘ahu. Persons living in zero-car households are much more likely to use transit than other residents. These concentrations of zero-car household areas include much of the Primary Urban Center (including the Central Business District, Chinatown, Kaka‘ako, Kalihi-Pālama, and Iwilei) and some Waipahu neighborhoods as indicated in Figure 1-5. 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 transit corridor improvements are for the residents, the visitor industry and location of visitor attractions within the corridor combine to create a transit market for visitors traveling within the corridor. O‘ahu hosts more than 4.4 million visitors annually (DBEDT, 2005). 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 corridor (Figure 1-2).

History of the Project

During the summer of 2005, the State legislature recognized the need and public support for a high-capacity transit system on O‘ahu and passed Act 247. Act 247 authorized the County to levy a general excise tax 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 secure local funding established for the first time, the City began the AA process to analyze the feasibility of a high-capacity transit system in the 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. FTA published a Notice of Intent to Prepare an AA and an EIS in the *Federal Register* on December 7, 2005, and DTS published an EIS Preparation Notice 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.

Goals and Objectives

Seven project goals were developed to address the transportation needs identified in the study corridor. The project has several objectives related to each of the project goals (Table 1-2).

Table 1-2. Project Goals and Objectives

Goal	Objectives
Improve Corridor Mobility	Reduce corridor travel times
	Improve corridor travel time reliability[1]
	Provide convenient, attractive, and effective transit service within the corridor
	Provide transit corridor travel times competitive with auto travel times
	Connect major trip attractors/generators within the corridor[1]
	Maximize the number of persons within convenient access range of transit
	Provide safe and convenient access to corridor transit stations[1]
Encourage Patterns of Smart Growth and Economic Development	Encourage transit-oriented development in existing and new growth areas
	Utilize corridor land use policies/opportunities related to economic development
	Support economic development of major regional economic centers
Find Cost-Effective Solutions	Provide solutions with benefits commensurate with their costs
	Provide solutions that meet the project purpose and needs while minimizing total costs
	Improve transit operating efficiency
Provide Equitable Solutions	Distribute costs and benefits fairly across different population groups[1]
	Avoid disproportionate impacts on low income and minority population groups
	Provide effective transit options to transit-dependent communities
Develop Feasible Solutions	Ensure the cost of building, operating, and maintaining the alternative is within the range of likely available funding
	Develop a feasible alternative in terms of constructability and ROW availability
Minimize Community and Environmental Impacts	Minimize impacts on natural and cultural resources
	Minimize the effect on homes and businesses
	Minimize disruption to traffic operations[1]
	Minimize conflicts with utilities
	Minimize construction impacts
	Minimize impacts to the community and community amenities
	Reduce energy consumption
	Minimize impacts to future development
Achieve Consistency with Other Planning Efforts	Achieve consistency with adopted community, regional, and state plans

[1]This objective was considered during project development, but is not evaluated in the comparison of alternatives.