
Task 1: Deliverable A Report
Assessment of Previous Studies and Surveys
September 2016

Central Oahu Transportation Study

Prepared for
Oahu Metropolitan Planning Organization



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Document Control

Deliverable Name	Date	Activity Completed
Assessment of Previous Studies and Surveys	07/30/16	1 st Draft
	9/12/16	2 nd Draft based on OahuMPO comments-August 31
	9/29/16	Final with HART comments (9/28) incorporated
	10/18/16	Final Rev. 1 with additional HART comments (10/18) incorporated

This report was funded in part through grants from the Federal Highway Administration and Federal Transit Administration, U.S. Department of Transportation. The views and opinions of the agency expressed herein do not necessarily state or reflect those of the U.S. Department of Transportation.

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1.0 Overview

The Central Oahu Transportation Study (COTS) will assess the multi-modal transportation needs of the region and identify key transportation system improvements, strategies and policies that can improve regional transportation mobility and access in a sustainable way. The strategies and system improvements will be technically feasible, financially realistic, sustainable, and meet regional transportation needs.

The Central Oahu Transportation Study is composed of nine tasks:

- Task 1: Coordinate and review past and on-going traffic, transit, and land use studies prepared by other agencies, establish a project management working group, and develop a stakeholder involvement process.
- Task 2: Identify performance measures and measures of economic sustainability to collect and establish a comprehensive baseline multi-modal transportation dataset.
- Task 3: Analyze and evaluate regional transportation, demographic, economic, and land use trends and issues.
- Task 4: Determine and assess current and future multi-modal needs and opportunities for the region through technical methodologies, user survey and stakeholder outreach. The technical forecasting of future traffic, transit, land use, and other related projections will utilize and be done in coordination with OahuMPO's current travel demand forecast model and Congestion Management Process.
- Task 5: Identify potential strategies and system improvements for key corridors in the region, including but not limited to, transit improvements with connections to the Honolulu rail transit system and H-2.
- Task 6: Assess order-of-magnitude of impacts of the potential strategies and system improvements utilizing identified performance measures. This order-of-magnitude assessment will include expected project and strategy implementation timing, project delivery costs including land acquisition, environmental impacts, and estimates of operations and maintenance costs.
- Task 7: Define the benefits and costs of the potential strategies and system improvements and compare those benefits and costs to each other.
- Task 8: Compare and prioritize those potential strategies and system improvements that meet the desired purpose mentioned above (technically feasible, financially realistic, and sustainable).
- Task 9: Develop recommendations and an implementation timeframe to set priorities for those strategies and system improvements.

I. Deliverable Background

Twelve deliverables will document the results of the nine tasks and their subtasks. Briefly the reports include:

- A. Assessment of Previous Studies and Surveys associated with the study area and recommendations for further data collection or survey work as needed. Report A provides the assessment of the studies and surveys identified in two deliverables that have been submitted: List of Previous Studies and List of Previous Surveys.
- B. Identification of the Trends and Issues impacting the COTS area. This report will include the demographics, economics and land trends occurring in the study area as well as identify the impacts of those trends.
- B.2 Identification and definitions of Performance Measures, Sustainability Measures, Baseline and Data Elements that will be used to guide and evaluate project alternatives.
- C. Data Needs Memo will list the information needed based upon Deliverables A through B.2.
- C.2 Documents the results of the data collection identified in the Data Needs Memo.
- D. A discussion of previous Alternatives as well as strategies for improvements will be presented in this report.
- E. The Preliminary Ranking of identified Alternatives will be detailed in this report. The performance measures identified in Report B will be applied to the alternatives. TransCAD model runs will provide a means to compare alternatives. The outcome of these tasks will be a ranking of alternatives and their impacts on the study area.
- F. Documents the Feasibility Assessment of the alternatives. Documentation will include identifying criteria for feasibility and sustainability assumptions; reporting on the impacts by performance measure; identification of environmental impacts and identified mitigations; and, assumptions for implementation all leading to a refinement of the alternative rankings.
- G. The Financial Assessment will be documented in this report. Financial assumptions and requirements including costs will be reviewed. The benefits and costs of the alternatives will be assessed and compared including any identified trade-offs.
- H. The Final Report on Prioritization and Recommendations for Implementation will summarize and prioritize strategies; identify recommendations; identify impacts of no implementation; recommend an implementation timeframe; and, identify any impacts if implementation is not accomplished within the recommended timeframe.
- I. This report will provide a summary of the Community Input and how that input was used to inform the study.
- J. Survey Results from any new surveys will be documented in this report.

This deliverable, Report A, includes documenting work conducted under Tasks 1.1 and 1.4. This deliverable includes an identification of missing data (part of Task 2.2) relating to prior studies and surveys.

Deliverable A is organized as follows:

- Chapter 1: Overview of the project and this deliverable
- Chapter 2: Oahu Regional Transportation Plans and Related Documents
- Chapter 3: City and County Plans, Reports and Documents
- Chapter 4: State of Hawaii Plans, Reports and Documents
- Chapter 5: Koa Ridge Makai and Waiawa Study Related Documents
- Chapter 6: List of Transportation Projects Identified in Previous Studies
- Chapter 7: Oahu Transportation User Surveys
- Chapter 8: Resident Opinion Surveys and Focus Groups
- Chapter 9: Recommendations for Further Data Collection & Survey Work

The purpose of Chapters 2 through 6 is to review past, published plans performed by public agencies or the private development community that have identified potential transportation projects in the study area. By reviewing these plans, the study team can produce an initial long list of potential transportation projects that can be evaluated in future phases of this study.

2.0 Oahu Regional Transportation Plan Related Documents

This chapter lists the Oahu Regional Transportation Plan (ORTP) related documents including those from the 2040, 2035 and 2030 updates prepared by the OahuMPO. The ORTP is updated at least every five years to ensure that transportation decisions are based on current information and community priorities. As part of each update, future population and employment are projected and corresponding changes in travel patterns, revenue, and construction costs are forecast to validate and test past and new directions for transportation development on Oahu. The most recent ORTP supersedes previous plans and represents the current transportation vision, goals, and project list; however, previous plans are reviewed in order to gather historic information about project proposals in the study area.

I. Oahu Regional Transportation Plan 2040

The objective of this Oahu Regional Transportation Plan (ORTP) is to guide the development of transportation to the year 2040. It presents both a vision of an improved transportation system to serve the needs of Oahu's population and projects to achieve that vision. It was approved by the OahuMPO Policy Board on April 13, 2016. The Policy Board is the decision-making body of the OahuMPO and approves the ORTP.¹



ORTP 2040 acknowledges Oahu faces several major transportation challenges and opportunities. While most of Oahu's existing development lies along the southern portion of the island, future population and job growth is expected to occur to the west side of the island as well as in the Central Oahu and Kakaako areas. Without improvements, this growth will result in increasing congestion and longer travel times along already congested roadways such as Interstate Route H-1.

The vision statement in ORTP 2040 proposes that Oahu should be a place where we will have efficient, well-maintained, safe, secure, convenient, appropriate, and economical choices in getting from place to place. The regional goals and objectives in ORTP 2040 propose that the transportation system should move people and goods in a manner that supports the island's high quality of life, natural beauty, economic vitality, and land use plans.

Public input was obtained on ORTP 2040 in several phases, including a subcommittee of the Citizen Advisory Committee, public listening sessions held in each of Oahu's eight planning districts, and an online survey. Overall, the results of the public outreach activities identified several themes that were consistent across all geographies. Traffic congestion, roadway maintenance, and safety were repeatedly identified as major concerns. There was strong public support for continuing investments in public transit, pedestrian and bicycle facilities.

The ORTP 2040 proposes a comprehensive package of more than \$17 billion in transportation projects and programs including:

- Congestion Mitigation and Alternative Projects: ORTP 2040 includes projects that increase and enhance Oahu’s existing network of bicycle and pedestrian facilities. In addition, it identifies Travel Demand Management (TDM) and technological projects that improve traffic flow through Intelligent Transportation Systems (ITS);
- Modernization Projects: Because transportation by automobile will continue to be the primary travel mode in the future, roadway capacity improvements (adding lanes, new or reconfigured interchanges) will be needed along Interstate Route H-1 corridor and in the developing areas of Oahu to handle future growth;
- Transit Projects: The Honolulu High-Capacity Transit Corridor Project and improvements in both transit service and facilities are key components of ORTP 2040; and,
- Operations, Maintenance, Preservation, and Safety: ORTP 2040 proposes a significant amount of funding to support the maintenance, preservation, and safety of the existing transportation system.

The projects and programs included in the ORTP 2040 reflect the desire to make Oahu’s transportation system more sustainable. The overwhelming share (85%) of plan expenditures is committed to support maintenance and operations and transit expansion while other funding is for system preservation, high technology projects such as ITS, and bicycle and pedestrian improvements. The remaining balance goes to modernization projects. Figure 2.1 provides ORTP 2040 project locations.

Figure 2-1: ORTP 2040 Project Location Map
Source: ORTP 2040 Figure 6-1



The projects in ORTP 2040 are prioritized as either “Mid-Range Projects,” (proposed for implementation by the year 2029) or as “Long-Range Projects” (proposed for implementation by the year 2040). The list of projects includes “Illustrative Projects” which are unfunded. Projects were placed within each time period based on input from the implementing agencies. Projects of most relevance to COTS are listed in Table 2-1.²

Table 2-1: ORTP 2040 Projects Most Relevant to Central Oahu

TIMING	PROJECT NUMBER AND TYPE	RESPONSIBLE AGENCY AND TYPE OF PROJECT	PROJECT TITLE	DESCRIPTION	COST (in millions of year of expenditure \$)
Mid-Range Projects 2019-2029	207	State Modernization Project	Kamehameha Highway (Route 99), Widening, Lanikuhana Avenue to Ka Uka Uka Boulevard	Widen Kamehameha Highway from a three-lane to a four-lane divided facility between Lanikuhana Avenue and Ka Uka Uka Boulevard. This project includes shoulders for bicycles and disabled vehicles, bridge crossing replacement, bikeways, etc.	\$300
	307	State - Developer Funded Modernization Project	Interstate Route H-2, Widening, Waipio Interchange	Widen both on- and off-ramps on Interstate Route H-2, at the Waipio Interchange. This project includes the widening of the Ka Uka Uka Boulevard overpass and intersection improvements to facilitate movement to and from the on- and off-ramps.	\$33
	308	State - Developer Funded Modernization Project	Interstate Route H-2, New Interchange, Pineapple Road Overpass	Construct a new full-service freeway interchange on Interstate Route H-2, between Meheula Parkway and Ka Uka Uka Boulevard, to accommodate future developments in Central Oahu. This project includes the widening of the existing Pineapple Road Overpass from two lanes to four lanes; and addition of new on- and off- ramps to and from Interstate Route H-2 at Pineapple Road Overpass.	\$111
Illustrative Projects	704	State Modernization Project	Interstate Routes H-1 and H-2, Operational Improvements, Waiawa Interchange	Modify the Interstate Routes H-1 and H-2 Waiawa Interchange, to improve merging characteristics through operational improvements (e.g., additional transition lanes).	\$112.1
	754	City	Fixed Guideway, Central Oahu	Plan, design, and construct a fixed guideway system / corridor between Pearl Highlands and Central Oahu.	\$1,858

ORTP 2040 is a fiscally constrained plan that identifies the revenues to cover the estimated costs of the projects and programs proposed in the Plan. Substantial revenues for new highway projects come from private sources including projects 307 and 308 listed in Table 2-1. The placement of project 308 into the “Mid-Range Projects 2019-2029” group represents a change from the ORTP 2040 draft released on February 17, 2016 for public comment. Project 308, a new H-2 interchange at the Pineapple Road Overpass, was listed as Project 357 in the “Long-Range Projects – 2030-2040” group. The developer requested that this be project be moved into the “Mid-Range Projects 2019-2029” group.



The developer (Castle & Cooke) has State Land Use Commission and County Zoning conditions requiring the completion of the Pineapple Road Interchange prior to the Koa Ridge project reaching construction of 1,800 residential units. The Koa Ridge development plan is anticipated to hit that benchmark well before 2030. More information about the transportation projects included with the Koa Ridge project are presented in chapter 6.

The costs presented in ORTP 2040 are planning-level cost estimates. Amounts for programs are expressed in Year-of-Expenditure (YOE) dollars and a two percent (2%) annual inflation rate is assumed for projects. A variety of Federal, State, and local revenue sources are expected to finance the more than \$17 billion in proposed transportation improvements.

ORTP 2040 will be implemented through updates to the OahuMPO TIP. Successful implementation of the ORTP will require the evaluation of the effectiveness of its proposed transportation projects and programs. ORTP 2040 identifies several potential evaluation methods, including the preparation of a data management and sharing study; the development of quantifiable criteria in the TIP; and survey research.

Using the OahuMPO travel demand forecasting model, a series of analyses were conducted to evaluate the performance of the ORTP 2040 implementation in comparison to forecasted (year 2040) No-build conditions with only existing and committed transportation projects in place. These technical analyses concluded that implementation of the ORTP projects will help reduce hours of delay and travel on an island-wide basis and will alleviate some congestion on roadways in the Ewa/Kapolei and Waianae Coast areas and in the Interstate Routes H-1/H-2 merge area.

II. Oahu Regional Transportation Plan 2035

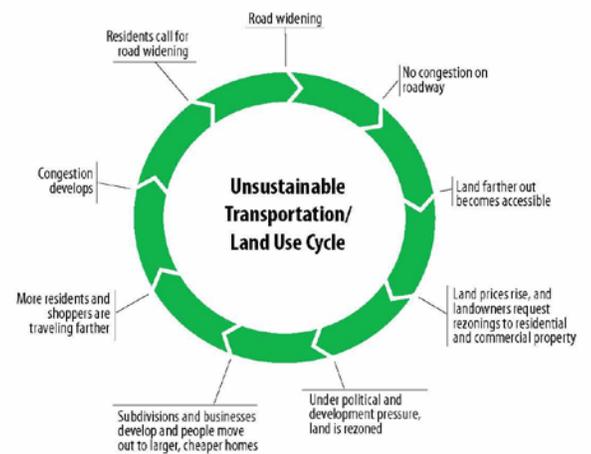
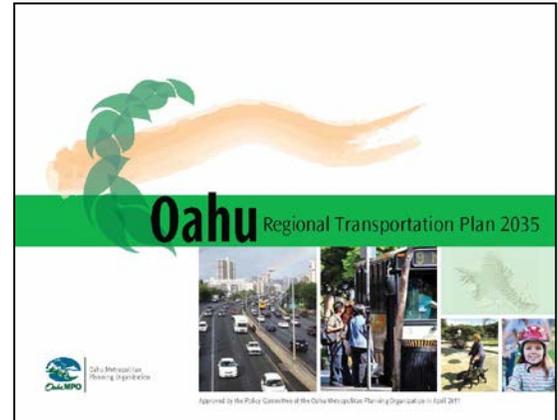
The plan before ORTP 2040 was ORTP 2035. ORTP was adopted by the predecessor to the current OahuMPO Policy Board, the Policy Committee, in April 2011. This was the first regional transportation plan to recognize the impact of the transportation/land use cycle that has been repeated many times on Oahu and throughout the U.S. ORTP 2035 reflected how regional transportation plans professionals throughout the United States were vainly trying to get ahead of the curve, recognizing the reality that we cannot build our way out of traffic congestion. ORTP recognized that the best way to achieve mobility and accessibility is through providing more transportation choices.

ORTP 2035 was the first regional transportation plan to address concerns related to sustainability and climate change. These two issues are tightly intertwined. Increasing the sustainability of the transportation system by increasing operational efficiency and reducing greenhouse gases will slow the progression of climate change.

ORTP 2035 analyzed traffic conditions projected until 2035, assuming the construction of the initial phase of the Honolulu High-Capacity Transit Corridor Project (HHCTCP) from East Kapolei to Ala Moana Center. The results of this analysis showed continued worsening of the already congested conditions found along the H-1 corridor, the H-1 and H-2 merge, and in bus transit reliability.

ORTP revealed that vehicle travel time to Downtown Honolulu will get longer. The longest travel times were forecast to be from 120 to 160 minutes. The plan observed that while the rail project does relieve some congestion, rail alone will not be able to keep Oahu's transportation "statistics" such as drive time and level-of-service from getting worse. Specific problems identified by the analysis of the ORTP 2035 roadway network included the following:

- The "reverse" commute along the H-1 corridor will take more time.
- More than 26 percent of freeways, expressways, and ramps will operate under congested conditions in 2035, compared to 23 percent in 2007.
- H-1 between the Middle Street merge and University Avenue will continue to be congested in both directions.
- Increased development and roadway congestion will inhibit bus transit.



The Transportation/Land Use Cycle

- Traffic on H-2 and Kamehameha Highway will get significantly worse without alternative roadways to provide access to-and-from the Waiawa-Koa Ridge area.
- The planned growth in the Ewa/Kapolei area will require significant investment in transportation infrastructure.

ORTP 2035 included was supported by the following list of supporting documents:

- Deliverable 2.1 Public Outreach Plan
- Deliverable 2.2.7 Planning Issue Identification Report: Stakeholder interviews, Focus Groups and Telephone Survey August-October 2009
- Deliverable 3.1.2 Existing Transportation System Inventory Report
- Deliverable 4.1.2 ORTP 2035 Vision Statement
- Deliverable 4.2.2 ORTP 2035 Goals and Objectives
- Deliverable 4.3.2 ORTP 2035 Performance Measures
- Deliverable 5.1.2 Multi-Modal Transportation Existing Conditions Performance Report
- Deliverable 6.1.2 Revenue Sources Report
- Deliverable 6.2.2 Revenue Forecasts Report
- Deliverable 7.1.2 Socioeconomic Data Reasonableness Report
- Deliverable 7.2.2 Baseline Projects Report
- Deliverable 7.3.2 Baseline Auto and Transit Travel Demand Forecasts Report
- Deliverable 7.4.2 Baseline Forecast Analysis Technical Memorandum
- Deliverable 7.5.2 Baseline Problems and Issues Technical Memorandum
- Deliverable 8.1.2 Potential New Transportation System Improvement Projects Matrix
- Deliverable 8.2.2 Cost Estimation Report
- Deliverable 9.1.2 ORTP Scenarios Evaluation Methodology Technical Memorandum
- Deliverable 9.2.2 Sensitivity Test Scenarios Definition Technical Memorandum
- Deliverable 9.3.2 Final Alternative Scenarios Summary Report
- Deliverable 9.4.2 ORTP 2035 Qualitative Project-Level Performance Analysis Report
- Deliverable 9.5.2 Congestion Management Process Report
- Deliverable 10.1.2 ORTP 2035 Preferred Alternative Report
- Deliverable 10.2.2 and 10.3.2 Draft Travel Demand Model Elements and Preferred ORTP 2035 Scenario Analysis Report
- Deliverable 11.1.4 Title VI/Environmental Justice Analysis
- Deliverable 11.1.2 2035 ORTP Adopted Plan
- Deliverable 12.1.2 2035 ORTP Technical Report
- Deliverable 12.1.2 2035 ORTP Technical Report Appendices
- Environmental Justice in the OMPO Planning Process: Environmental Justice Populations
- Resident Focus Groups, April 2010
- 2010 Resident Opinion Survey on Oahu Transportation, August-September 2010
- Resident Opinion Survey on Oahu Transportation, October 2009
- Stakeholder Interviewers, May 2010

Some of these deliverables provide information of potential value to the COTS. For example, deliverable 9.2.2, the Sensitivity Test Scenarios Definition Technical Memorandum, included managed lanes and cordon pricing projects and programs benefiting Central Oahu. These were not included in the list of projects. Table 2-2 provides those ORTP 2035 projects relevant to the COTS.³

Table 2-2: ORTP 2035 Projects Most Relevant to the Central Oahu

TIMING	PROJECT NUMBER AND TYPE	RESPONSIBLE AGENCY AND TYPE OF PROJECT	PROJECT TITLE	DESCRIPTION	COST <i>(in millions of year of expenditure \$)</i>
Mid-Range Projects 2011-2020	26 <i>(ORTP 2040 #207)</i>	State Congestion Mitigation Project	Kamehameha Highway (Route 99), Widening, Lanikuhana Avenue to Ka Uka Uka Boulevard	Widen Kamehameha Highway from a three-lane to a four-lane divided facility between Lanikuhana Avenue and Ka Uka Boulevard. This project includes shoulders for bicycles and disabled vehicles, bridge crossing replacement, bikeways, etc.	\$130.0
	27 <i>(ORTP 2040 #307)</i>	State -- Developer Funded Congestion Mitigation Project	Interstate Route H-2, Widening, Waipio Interchange	Widen both on- and off-ramps on Interstate Route H-2, at the Waipio Interchange. This project includes the widening of the Ka Uka Boulevard overpass and intersection improvements to facilitate movement to and from the on- and off-ramps.	\$30.6
Long-Range Projects 2021-2035	60 <i>(ORTP 2040 #308)</i>	State -- Developer Funded Congestion Mitigation Project	Interstate Route H-2, New Interchange, Pineapple Road Overpass	Construct a new full-service freeway interchange on Interstate Route H-2, between Meheula Parkway and Ka Uka Boulevard, to accommodate future developments in Central Oahu. This project includes the widening of the existing Pineapple Road Overpass from two lanes to four lanes; and addition of new on- and off- ramps to and from Interstate Route H-2 at Pineapple Road Overpass.	\$102.5
Illustrative Projects	73 <i>(ORTP 2040 #704)</i>	State	Interstate Routes H-1 and H-2, Operational Improvements, Waiawa Interchange	Modify the Interstate Routes H-1 and H-2 Waiawa Interchange, to improve merging characteristics through operational improvements (e.g., additional transition lanes).	\$112.1
	80 <i>(ORTP 2040 #754)</i>	City	Fixed Guideway, Central Oahu, Pearl City to Mililani	Plan, design, and construct a fixed guideway system/corridor between Pearl City and Mililani.	\$1,828.4

III. Oahu Regional Transportation Plan 2030

ORTP 2030 was approved by the Policy Committee in April 2006 and modified by Amendment #1 in May 2007. ORTP 2030 identified projects and provided an implementation program for investments using available transportation funds across Oahu in a fair and equitable manner.

ORTP 2030 was based upon the requirements of the Safe, Accountable, Flexible, Efficient Transportation Equity Act – A Legacy for Users (“SAFETEA-LU”). These requirements were mandated by the U.S. Department of Transportation as a means of verifying the eligibility of metropolitan areas for federal funds earmarked for surface transportation systems.

A key component of the ORTP 2030 was a fixed guideway to serve the H-1 travel corridor. The fixed guideway was not included in ORTP 2025. Another difference in ORTP 2030 and subsequent ORTP’s is that there is no comparison to ORTP 2025 and TOP 2020. No accounting is provided of what projects have been completed or what projects have been removed from the plans.

ORTP 2030 made it clear that building a fixed guideway will not eliminate congestion. The plan states that “We will also not be able to eliminate congestion by building more highways”.⁴ The fixed guideway in ORTP 2030 represented a major policy shift – it gives priority to moving people rather than cars.

ORTP 2030 identified the fixed guideway from East Kapolei to Ala Moana as the backbone of the transit system – connecting major employment and residential centers to each other and to downtown Honolulu. ORTP emphasized the fixed guideway project included feeder bus services for each station and access ramps and other freeway improvements to facilitate the flow of buses that supplement the fixed guideway.

As part of the ORTP 2030, new and expanded roadway projects were proposed for the Ewa area, Central Oahu, and the Primary Urban Corridor where the majority of the residential and employment growth is projected. Examples of roadway projects in the Central Oahu area are shown in Table 2-3 and include the expansion of Kamehameha Highway and H-1 between the Waiiau and Waiawa Interchanges; and widening and improvements at the H-1 and H-2 Waiawa Interchange.⁵

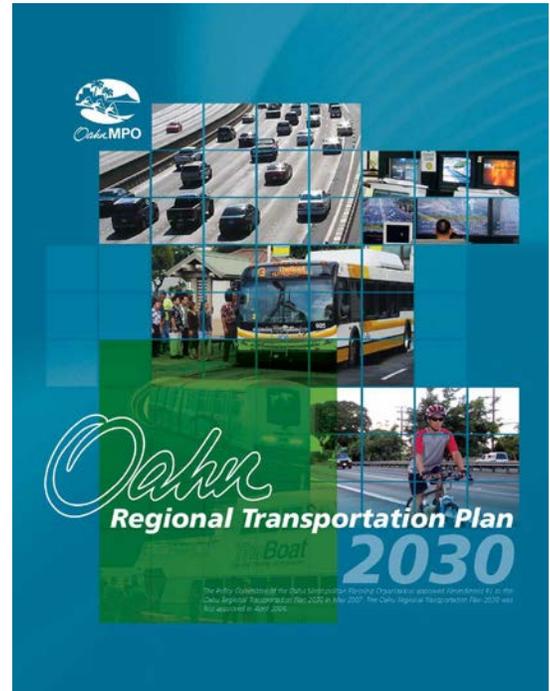


Table 2-3: ORTP 2030 Projects Most Relevant to the Central Oahu

TIMING	PROJECT NUMBER AND TYPE	RESPONSIBLE AGENCY AND TYPE OF PROJECT	PROJECT TITLE	DESCRIPTION	COST (in millions of year of expenditure \$)
Mid-Range Projects 2006-2015	22 (ORTP 2040 #307)	State -- Developer Funded Congestion Relief Project	Interstate Route H-2, Widening, Waipio Interchange	Widen both on- and off-ramps on H-2, at the Waipio Interchange. This project includes the widening of the Ka Uka Boulevard overpass and intersection improvements to facilitate movement to and from the on- and off-ramps.	\$20.7
	25 (ORTP 2040 #207)	State Congestion Relief Project	Kamehameha Highway, Widening, Lanikuhana Avenue to Ka Uka Boulevard	Widen Kamehameha Highway from a three-lane to a four-lane divided facility between Lanikuhana Avenue and Ka Uka Boulevard. This project includes shoulders for bicycles and disabled vehicles, bridge crossing replacement, bikeways, etc.	\$78.9
Long-Range Projects 2016-2030	47 (ORTP 2040 #308)	State -- Developer Funded Congestion Mitigation Project	Interstate Route H-2, New Interchange, Pineapple Road Overpass	Construct a new full-service freeway interchange on H-2, between Meheula Parkway and Ka Uka Boulevard, to accommodate future developments in Central Oahu. This project includes widening the existing Pineapple Road Overpass from two to four lanes; and addition of new on- and off-ramps to and from H-2 at Pineapple Road Overpass.	\$50.0
	55 (not included in ORTP 2040)	City	Central Mauka Road, Second Access, Mililani to Waiawa	Construct Central Mauka Road, a new 4-lane road from Mililani Mauka to Waiawa. Road connects Meheula Parkway to Kamehameha Highway in Pearl City; parallel to (and mauka of) H-2. The new 4-lane north-south road includes connections to Route H-2 interchanges.	\$160.0
	56 (not included in ORTP 2040)	City	Wahiawa, Second Access, Whitmore Avenue to Meheula Parkway	Construct a new 2-lane second access road between Whitmore Village and Wahiawa, from Whitmore Avenue to California Avenue. Continue the new 2-lane second access road to Mililani Mauka, from California Avenue to Meheula Parkway.	\$64.4
Illustrative Projects	1-4 (not included in ORTP 2040)	not identified	Paiwa Street, Extension, Ka Uka Boulevard to Lumiauau Street	Extend Paiwa Street from north of Lumiauau Street to the intersection of Kamehameha Highway and Ka Uka Boulevard.	\$15

IV. *Transportation for Oahu Plan TOP 2025*

The Transportation for Oahu Plan (TOP) 2025 was approved by the Policy Committee in April 2001. The projects with the most relevance to COTS are listed in Table 2-4.⁶

The financial analysis presented in TOP 2025 demonstrated that the highway and transit projects for the fiscally-constrained regional transportation plan will have sufficient revenues through a combination of existing revenue sources and additional revenue assumed to be in place over the next 25 years. However, the total identified TOP 2025 need of almost \$4.7 billion exceeded the revenues that could be assumed to be in place from only existing sources.

In addition to the traditional FHWA, FTA, state and local contributions to TOP 2025 projects, two other sources of revenues were identified. The first was developer contributions or private financing of selected elements of projects, facilities or land donations. The other additional revenue source was from the typical increases in the tax rates of state highway funding.

Twenty TOP 2025 highway projects were identified as potential candidates for developer contributions. Seventeen were in the Ewa area and three were in Central Oahu.⁷ The total cost of these projects was estimated to be \$706 million in year 2000 dollars. The analysis assumed that 20 percent of these potential developer-funded project costs will be paid for using developer contributions. This yield contributes an additional \$141 million of revenues for the TOP 2025 highway projects.

Estimated revenues from developer contributions for TOP 2025 projects were for planning purposes only. The assumed level of revenues from developer contributions was not intended to establish developer funding obligations or commitments. Final funding obligations and commitments are determined on a project-by-project basis through separate planning and negotiations.

The Top 2025 financial analysis observed that over the previous 25 years State Highway Special Fund taxes had experienced growth in their rates of taxation as shown in Table 2-5. Between 1975 and 2000, the motor fuel tax rate had increased from 8.5 cents to 16 cents per gallon, the vehicle registration fee had increased from \$1.00 to \$20.00, and the rental car surcharge had increased from \$2.00 in 1992 to \$3.00 in 2000.

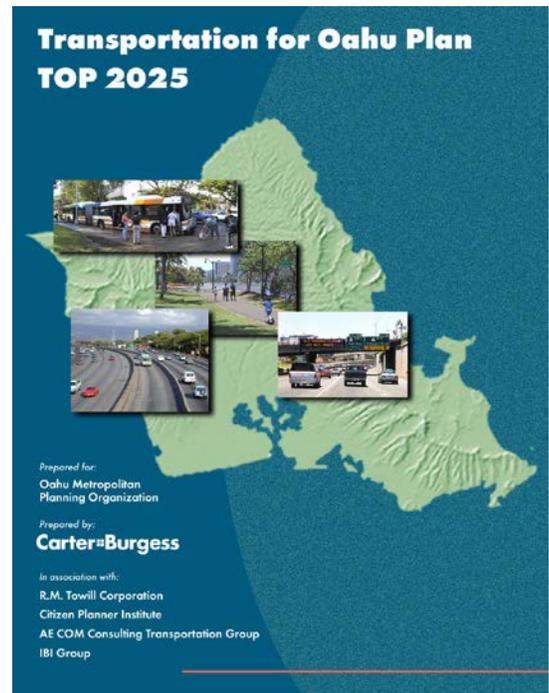


Table 2-4: TOP 2025 Projects Most Relevant to the Central Oahu

TIMING	PROJECT NUMBER AND TYPE	RESPONSIBLE AGENCY AND TYPE OF PROJECT	PROJECT TITLE	DESCRIPTION	COST (in millions of year of expenditure \$)
2001-2025	C-7 (ORTP 2040 #207)	Operations and Safety Project	Kamehameha Highway, Widening, Lanikuhana Avenue to Ka Uka Boulevard	Widen Kamehameha Highway from a three-lane to a four-lane divided facility between Lanikuhana Avenue and Ka Uka Boulevard. This project includes shoulders for bicycles and disabled vehicles, bridge crossing replacement, bikeways, etc.	\$97.5
Illustrative Projects	C-1 (ORTP 2040 #704)	A project that supports community planning goals	Interstates H-1 & H-2, Operational Improvements, Waiawa Interchange	Modify the Interstate Routes H-1 and H-2 Waiawa Interchange, to improve merging characteristics through operational improvements (e.g., additional transition lanes).	\$18.4
	C-3 (not included in ORTP 2040)	A project that supports community planning goals	Central Mauka Road, Second Access, Mililani to Waiawa, 2.5 miles	Construct Central Mauka Road, a new 4-lane road from Mililani Mauka to Waiawa. Road connects Meheula Parkway to Kamehameha Highway in Pearl City; parallel to (and mauka of) H-2. The new 4-lane north-south road includes connections to Interstate Route H-2 interchanges.	\$13.0
	C-14 (not included in ORTP 2040)	Second Access	Wahiawa, Second Access, Whitmore Avenue to Meheula Parkway	Construct a new 2-lane second access road between Whitmore Village and Wahiawa, from Whitmore Avenue to California Avenue. Continue the new 2-lane second access road to Mililani Mauka, from California Avenue to Meheula Parkway.	\$50.0
	not included in TOP 2025 (ORTP 2040 #307)	not identified	Interstate Route H-2, Widening, Waipio Interchange	Widen both on- and off-ramps on Interstate Route H-2, at the Waipio Interchange. This project includes the widening of the Ka Uka Boulevard overpass and intersection improvements to facilitate movement to and from the on- and off-ramps.	\$20.7
	not included in TOP 2025 (ORTP 2040 #308)	not identified	Interstate Route H-2, New Interchange, Pineapple Road Overpass	Construct a new full-service freeway interchange on H-2, between Meheula Parkway and Ka Uka Boulevard, to accommodate future developments in Central Oahu. This project includes the widening of the existing Pineapple Road Overpass from two to four lanes; and addition of new on- and off- ramps to and from H-2 at Pineapple Road Overpass.	\$50.0
	not included in TOP 2025 (ORTP 2040 #754)	not identified	Fixed Guideway, Central Oahu, Pearl City to Mililani	Plan, design, and construct a fixed guideway system/corridor between Pearl City and Mililani.	none

Table 2-5: State Highway Special Fund Tax Rate History

TAX SOURCE	YEAR					
	1975	1979	1985	1991	1992	2000
Motor Fuel Tax	\$0.09	\$0.09	\$0.11	\$0.16	\$0.16	\$0.16
Vehicle Registration Fee		\$1.00	\$10.00	\$20.00	\$20.00	\$20.00
Rental Car Surcharge					\$2.00	\$3.00

Based on historical increases in tax rates, it was assumed similar increases to tax rates would occur over the next 25 years. These additional revenues would be available for system preservation projects in Oahu and the neighboring islands, or for TOP 2025 projects. An analysis was performed to determine a reasonable estimate of the additional potential revenues for Oahu through the year 2025.

The analysis indicated that Oahu could generate well over \$500 million (in year 2000 dollars) in additional revenues between 2000 and 2025 using any one of several tax rate growth scenarios. Table 2-6 presents the three tax rate growth scenarios for the 25 years of TOP 2025. Table 2-6 demonstrated that continuing the historical growth of the State Highway Special Fund tax rates will generate similar increases in revenues that can reasonably be available for financing TOP 2025.⁸

Table 2-6: TOP 2025 Potential State Tax Revenue Growth Scenarios

TIMING		SCENARIO				Revenue (in millions of year 2000 \$)
	Year	Description	Action	Amount		
1	2005	Vehicle Registration Fee	Increase	\$20.00	\$521	
	2005	Rental Car Surcharge	Increase	\$1.00		
	2010	Fuel Tax	Increase	\$0.06		
2	2003	Rental Car Surcharge	Increase	\$2.00	\$506	
	2010	Rental Car Surcharge	Increase	\$1.00		
3	2003	Rental Car Surcharge	Increase	\$1.00	\$521	
	2003	Vehicle Registration Fee	Increase	\$10.00		
	2010	Fuel Tax	Increase	\$0.05		
	2015	Rental Car Surcharge	Increase	\$1.00		
	2015	Vehicle Registration Fee	Increase	\$5.00		

V. Central Oahu Regional Transportation Plan Project History

Altogether, eight major transportation projects have been identified in some manner in the last four regional transportation plans as illustrated in Table 2-7.

Table 2-7: Most Relevant Transportation Projects Included in a Regional Transportation Plan

MOST RECENT PLAN PROJECT NUMBER	PROJECT TITLE	REGIONAL PLAN PROJECT NUMBER, COST AND TIMING			
		ORTP 2040	ORTP 2035	ORTP 2030	TOP 2025
207	Kamehameha Highway (Route 99), Widening, Lanikuhana Avenue to Ka Uka Boulevard	207 \$300 2019-2029	26 \$130.0 2011-2020	25 \$78.9 2006-2015	C-7 \$97.5 2001-2025
307	Interstate Route H-2, Widening, Waipio Interchange	307 \$33 2019-2029	27 \$30.6 2011-2020	22 \$20.7 2006-2015	<i>not included</i>
308	Interstate Route H-2, New Interchange, Pineapple Road Overpass	308 \$111 2019-2029	60 \$102.5 2021-2035	47 \$50.0 2016-2030	<i>not included</i>
704	Interstate Routes H-1 and H-2, Operational Improvements, Waiawa Interchange	704 \$112.1 <i>Illustrative</i>	73 \$112.1 <i>Illustrative</i>	<i>not included</i>	<i>not included</i>
754	Fixed Guideway, Central Oahu	754 \$1,858 <i>Illustrative</i>	80 \$1,858 <i>Illustrative</i>	<i>not included</i>	<i>not included</i>
55	Central Mauka Road, Second Access, Mililani to Waiawa	<i>not included</i>	<i>not included</i>	55 \$160.0 2016-2030	C-3 \$13.0 <i>Illustrative</i>
56	Wahiawa, Second Access, Whitmore Avenue to Meheula Parkway	<i>not included</i>	<i>not included</i>	56 \$64.4 2016-2030	C-14 \$50.0 <i>Illustrative</i>
I-4	Paiwa Street, Extension, Ka Uka Boulevard to Lumiaua Street	<i>not included</i>	<i>not included</i>	I-4 \$15 <i>Illustrative</i>	<i>not included</i>

The first three projects in ORTP 2040 have a long standing history of being prominently included in previous plans. ORTP 2040 Project 207, Kamehameha Highway (Route 99), Widening, Lanikuhana Avenue to Ka Uka Boulevard, was included in every plan. This project cost in year of expenditure dollars has tripled, from \$97.5 million in TOP 2025 to \$300 million in ORTP 2040.

V.1 ORTP 2035 Additions

ORTP 2040 Projects 307, Interstate Route H-2, Widening, Waipio Interchange, and 308, Interstate Route H-2, New Interchange, Pineapple Road Overpass, have been included in the previous three plans with significant cost increases over time as the projects become better defined. The other two projects with the greatest relevance to COTS are “Illustrative Projects” originally added in ORTP 2035.

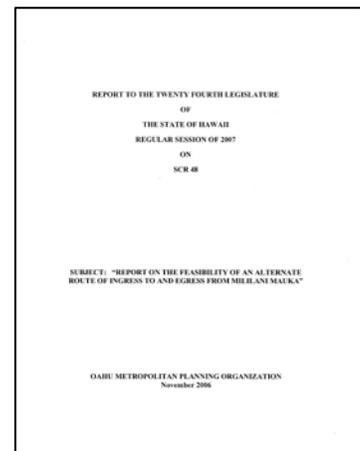
ORTP 2030 included three relevant Central Oahu projects that have not been included in subsequent ORTP’s. ORTP 2030 Projects 55, Central Mauka Road, Mililani to Waiawa, and 56, Whitmore Avenue to Meheula Parkway, were included as “Illustrative Projects” in TOP 2025 and advanced into the “2016-2030” time period as “Second Access Projects”. ORTP 2030 explained this category of projects as follows:

While the coastal plains are relatively flat, Oahu’s interior terrain is divided by two primary mountain ranges that can make access between communities difficult. Many of the established communities on the island have only one roadway into and out of the area. Providing a second means of access to these communities serves to increase the capacity to these areas and to provide needed emergency access. Four “second access” projects are included in the ORTP 2030 for Makakilo, Mililani Mauka, Wahiawa, and the Waianae Coast.⁹

V.2 Senate Concurrent Resolution 48 Report: Central Mauka Road

Senate Concurrent Resolution #48, passed during the 2005 Legislature, requested OahuMPO to study the feasibility of an alternate route of ingress to and egress from Mililani Mauka, better known as the Central Mauka Road. This project is a new 4-lane arterial from Mililani Mauka to Waiawa. The Central Mauka Road would connect Meheula Parkway in Mililani Mauka to Kamehameha Highway in Pearl City and run parallel to and mauka of H-2.

The analysis of proposed ORTP projects including the Central mauka Road is documented in the *Congestion Management System Analysis of Proposed Projects* for the 2030 ORTP, December 2005. Analysis results for the Central Mauka Road presented in the SCR 48 report are taken from this document.



In the Year 2030, over 1000 vehicles are projected to use the new roadway in the southbound direction in the morning peak period, with another 300 in the northbound direction. During the morning peak period, the roadway is forecasted to be at Level of Service (LOS) A in both directions. LOS A represents free flow conditions due to the relatively low projected traffic volumes when compared to the capacity of the roadway.



The Central Mauka Road was forecast to shift 600 resident work trips from transit to auto trips while producing 400 more AM peak hours of delay (from 104,100 to 104,500) in the year 2030.

A total of 10 second access projects were evaluated through the Congestion Management System (CMS) process as part of ORTP 2030. A point system based upon the following performance measures was utilized (see Table 2-8):

- change in traffic volume to roadway capacity ratio
- if the project is on the CMS list of congested roadways
- impact to transit mode share of work trips
- additional number of vehicles forecasted to use the facility
- impact to system-wide change in VMT during the morning peak period
- impact to system-wide change in VHT during the morning peak period
- impact to system-wide change in VHD during the morning peak period

Table 2-8: Point System for Highway Projects
Source: Report on SCR 48

PERFORMANCE MEASURE	POSSIBLE POINTS													
	Increase	No Change	Decrease	New Roadway	Congested Roadway	Additional Vehicle Volume								
						0	1-500	501-1000	1001-1500	1501-2000	2001-2500	2501-3000	3001-3500	3501-4000
Change in V/C Ratio	0	2	5	3		--	--	--	--	--	--	--	--	--
List of Congested Roadways	--	--	--	--	1	--	--	--	--	--	--	--	--	--
Transit Mode Share	3	1	0	--	--	--	--	--	--	--	--	--	--	--
Vehicle Volume	--	--	--	--	--	0	1	2	3	4	5	6	7	8
Vehicle Miles Traveled	0	1	2	--	--	--	--	--	--	--	--	--	--	--
Vehicle Hours Traveled	0	1	2	--	--	--	--	--	--	--	--	--	--	--
Vehicle Hours of Delay	0	1	2	--	--	--	--	--	--	--	--	--	--	--

The results of the CMS analysis for second access projects are included in Table 2-9. The Central Mauka Road received 7 points and was ranked near the bottom. The SCR 48 report noted that the CMS analysis attempts to evaluate projects from a congestion relief perspective. For a second access project, congestion relief may not be the sole focus. Residents have requested a second access route when natural disasters, traffic accidents, congestion, hostage control, or other incidents restrict access to or from their community.

Table 2-9: Rankings of Second Access Projects
Source: Report on SCR 48

SECOND ACCESS PROJECT	POINTS
Waianae Mauka Highway - Makaha Valley Road to Kunia Road	18
Mauka Frontage Road - Makakilo to Ko Olina	15
Leeward Community College Second Access - Ala Ike Road to Waipio Point Access Rd.	15
Makakilo Drive - Extension to H-1 at North South Road	14
Waianae Mauka Road Waianae to Ko Olina	14
Halawa Valley Second Access	11
Central Mauka Road - Mililani Mauka to Waiawa	7
Pacific Palisades Second Access - Komo Mai Drive to Kaahumanu St	7
Wahiawa Second Access - Between Whitmore Village, Wahiawa Hts. & Mililani Mauka	5
Mililani Second Access - Mililani Mauka to Pineapple Road	5

3.0 City and County Plans, Reports and Documents

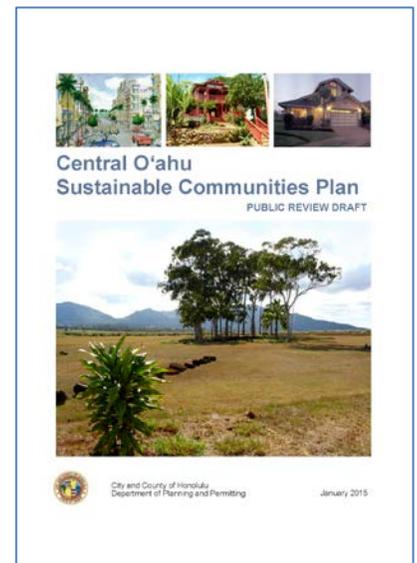
This chapter lists City and County of Honolulu plans, studies and related documents prepared by the Department of Transportation Services (DTS), the Department of Planning and Permitting (DPP) and the Honolulu Authority for Rapid Transportation (HART). Emphasis is placed on extracting policies, programs, procedures and projects from these documents with possible application to COTS.

I. Department of Planning and Permitting

One of the major partners in the OahuMPO Planning Process and the development of the ORTP's reviewed in the previous chapter is DPP. This section documents the content and functionality of the following with emphasis on their historic, current and future linkage to transportation and the development of the COTS:

- *Central Oahu Sustainable Communities Plan*, December 2002
- *Central Oahu Sustainable Communities Plan Five Year Review Orientation Workshop*, October 2007
- *Planning Team Responses to Comments/Queries from Central Oahu Stakeholders*, October 27, 2007
- *Central Oahu Sustainable Communities Plan Review-Transportation Discussion Group* (Notes from September 3, 2008 meeting Mililani Mauka, Recreation Center 6)
- *Central Oahu Issues and Opportunities: Preliminary Review Findings Draft*, 1/30/2013
- *Central Oahu Sustainable Communities Plan Vision Implementation Summary Scorecard Draft*, 1/30/2013
- *Central Oahu Sustainable Communities Plan Review: A Community Discussion on the Plan, Implementation and Issues* (Comments by Participants at the January 31, 2013 Workshop)
- *Proposed Significant Changes to the Central Oahu Sustainable Communities Plan*, 1/20/2015.
- *The Purpose, Process and Findings of the Review of the Central Oahu Sustainable Communities Plan*, 1/20/2015.

Most of the documents listed above resulted from the planning process designed to produce the next Central Oahu Sustainable Communities Plan or COSCP. The most recent COSCP Public Review Draft is dated January 2015. The document must be approved by the City Council for the plan to become official. The official plan is the COSCP adopted by City and County of Honolulu Ordinance 02-62 on December 20, 2002.¹⁰

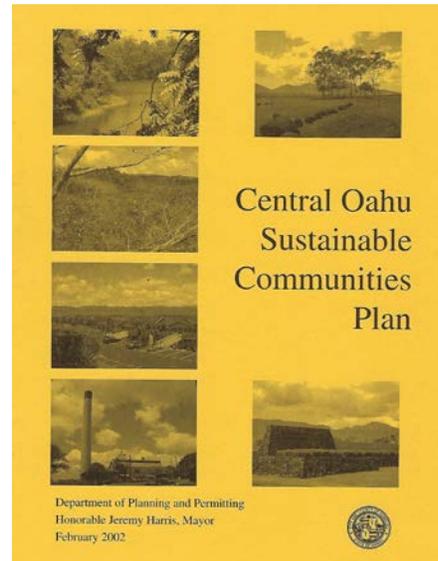


I.1 Central Oahu Sustainable Communities Plan

The following is a review of the official 2002 COSCP. Any significant changes to the enacted document that are proposed in the January 2015 Public Review Draft are noted where applicable. This section highlights the most pertinent excerpts from the plan that relate to the development of transportation in the project area.

The COSCP 2002 Transportation section lists the planned and proposed roadway elements and other transportation system features needed to meet the projected development in Central Oahu. This list was derived from regional planning and transportation analysis done for the Sustainable Communities Plan Revision Program, the revision of the Oahu Regional Transportation Plan, and the City's Oahu Trans 2K transportation planning process.

COSCP 2020 references the *2020 Oahu Regional Transportation Plan* (November 1995, hereinafter referred to as ORTP 2020), which concluded that the existing roadway system in Central Oahu had sufficient capacity for current volumes during peak-hour traffic, but experiences congested conditions because of bottlenecks and lack of capacity on the corridor from Pearl City to Downtown Honolulu.



The substantial development of jobs in Ewa and Central Oahu (from 52,000 jobs in 2000 to 110,000 jobs by 2025) was projected to increase the number of Central Oahu residents who work in Ewa or Central Oahu from existing levels. However, it is also projected that the number of commuters traveling to the Primary Urban Corridor (PUC) from Ewa and Central Oahu will increase, although at a lower rate than would occur if development of the Secondary Urban Center was not supported.

Traffic going from Central Oahu to the Primary Urban Center must transition through interchanges to get onto the H-1 Freeway. A major bottleneck occurs at the Waiawa Interchange where the H-2 Freeway joins the H-1 Freeway. Traffic volume on the H-2 at Kipapa was projected to increase by almost 40% by 2020, while traffic on the H-1 by Aiea was projected to increase by 10%.¹¹

COSCP 2002 relied upon the content of ORTP 2020. ORTP 2020 provided recommendations based on year 2020 traffic volumes projected to be generated by land uses approved under the previous Development Plan Special Provisions and Land Use Map. Figure 3-1 includes COSCP 2002 Table 4-1. For comparison, Figure 3-2 includes COSCP Public Review Draft 2015 Table 4-1.

Figure 3-1: Central Oahu Roadway Projects Proposed in 2002
 Source: Central Oahu Sustainable Communities Plan, December 2002

TABLE 4.1: CENTRAL OAHU ROADWAY NETWORK		
Existing System		
<p><u>Major East-West Arterials</u></p> <ul style="list-style-type: none"> o H-1 Freeway o Farrington Highway <p><u>Major North-South Arterials</u></p> <ul style="list-style-type: none"> o H-2 Freeway o Kamehameha Highway o Kunia Road 		
Planned Extensions	ORTP #	ORTP 2000 Phasing
<p><u>North-South Corridors</u></p> <ul style="list-style-type: none"> o Widen Kunia Road (4 lanes, H-1 to Royal Kunia) o Widen HOV lane inbound connector and bridges through Waiawa Interchange to provide PM outbound HOV lane o Widen Kunia Road (6 lanes, H-1 to Royal Kunia) o Widen Kunia Road (4 lanes, Royal Kunia to Wahiawa) o Widen Kam. Hwy (4 lanes, Ka Uka Blvd to Lanikuhana Ave) o Village Park Connector o Waipahu Depot Rd widening makai of Farrington Hwy <p><u>East-West Corridors</u></p> <ul style="list-style-type: none"> o Widen Waipahu Street from Kamehameha Highway to Paiwa Street and/or add turn lanes, bus pull-outs, etc. o Realign Farrington Hwy eastbound near Waipahu Depot Road o Extend Waipahu Street eastward to Waihona Street <p><u>Interchange Improvements</u></p> <ul style="list-style-type: none"> o Waipio Interchange o Waiawa Interchange <p><u>New Interchanges</u></p> <ul style="list-style-type: none"> o Second Waipio Interchange 	<p>S23a (C-10)</p> <p>HOV-3 S23b</p> <p>S40</p> <p>S39 (C-9) NA (C-15)</p> <p>C27 (C-17)</p> <p>(C-7) (C-16)</p> <p>S6 S18</p> <p>S30</p>	<p>1995-2000</p> <p>2001-2005 2001-2005</p> <p>2006-2020</p> <p>2006-2020 NA NA</p> <p>2001-2005</p> <p>NA NA</p> <p>1995-2000 2001-2005</p> <p>2006-2020</p>

KEY: NA (Not applicable, project proposed after 2020 ORTP completed)
 SOURCE: Identification numbers and phasing from **2020 Oahu Regional Transportation Plan**, November 1995. (Numbers in parentheses are project numbers for projects identified by the Oahu Metropolitan Planning Organization Policy Committee on March 19, 2001 for inclusion in the Draft 2025 Oahu Regional Transportation Plan.)

Figure 3-2: Central Oahu Roadway Projects Proposed in 2015
 Source: Central Oahu Sustainable Communities Plan Public Review Draft, January 2015

Planned Extensions and Improvements	2035 ORTP Project Number (Responsibility)	ORTP 2035 Phasing
<u>North-South Corridors</u> <ul style="list-style-type: none"> • Widen Kamehameha Hwy (4 lanes, Ka Uka Blvd to Lanikūhana Ave) • Widen Kunia Road (6 lanes, H-1 to Royal Kunia) • Widen Kunia Road (4 lanes, Royal Kunia to Wahiawā) • Central Mauka Road, Whitmore to Waiawa ⁽¹⁾ • Pāiwa Street extension to Ka Uka Blvd. ⁽¹⁾ 	<p style="text-align: center;">26 (S)</p> <p style="text-align: center;">71 (S)</p> <p style="text-align: center;">71 (S)</p>	<p style="text-align: center;">2011-2020</p> <p style="text-align: center;">Illustrative</p> <p style="text-align: center;">Illustrative</p>
<u>East-West Corridors</u> <ul style="list-style-type: none"> • Contraflow Lane extension to Kunia Interchange • Widen Farrington Hwy, Kunia to Waiawa (2 more lanes) • Widen H-1 Freeway, Waiiau to Waiawa 	<p style="text-align: center;">28(S)</p> <p style="text-align: center;">59 (S)</p> <p style="text-align: center;">72 (S)</p>	<p style="text-align: center;">2011-2020</p> <p style="text-align: center;">2021-2035</p> <p style="text-align: center;">Illustrative</p>
<u>Interchange Improvements</u> <ul style="list-style-type: none"> • Waipi'o Interchange (H-2) • Waiawa Interchange (H-1) • Waipahū off-ramp (H-1) 	<p style="text-align: center;">27 (S)</p> <p style="text-align: center;">25 (S)</p> <p style="text-align: center;">24 (S)</p>	<p style="text-align: center;">2011-2020</p> <p style="text-align: center;">2011-2020</p> <p style="text-align: center;">2011-2020</p>
<u>New Interchanges</u> <ul style="list-style-type: none"> • New H-2 Interchange (Koa Ridge/Waiawa) 	<p style="text-align: center;">60 (S)</p>	<p style="text-align: center;">2021-2035</p>
<u>Transit Projects:</u> <ul style="list-style-type: none"> • Rail Transit • Bus service expansion • Construct transit centers • Fixed guideway, Pearl City to Mililani 	<p style="text-align: center;">36 (C)</p> <p style="text-align: center;">37 (C)</p> <p style="text-align: center;">38 (C)</p> <p style="text-align: center;">80 (C)</p>	<p style="text-align: center;">2011-2020</p> <p style="text-align: center;">2011-2020</p> <p style="text-align: center;">2011-2020</p> <p style="text-align: center;">Illustrative</p>
<p>Notes:</p> <p>⁽¹⁾ Projects in O'ahu Regional Transportation Plan 2030 (ORTP 2030), but omitted from ORTP 2035.</p> <p>Projects are identified as C (City) or S (State) projects.</p> <p>Project numbers from ORTP 2035 Table 7.</p> <p>Illustrative projects were not included in the financially-constrained ORTP 2035 due to funding limitations. If additional funding becomes available, they may be considered for amendment to the ORTP.</p> <p>Source: O'ahu Regional Transportation Plan 2035, April 2011.</p>		

Both COSCP tables list some of the same major Central Oahu roadway projects.

- Widening of Kamehameha Highway to four lanes between Ka Uka Boulevard and the Lanikuhana Avenue intersections (ORTP 2040 Project #207);
- Waipio Interchange Improvements (ORTP 2040 Project #307); and,
- A new interchange at Waipio (ORTP 2040 Project #308).

COSCP 2015 Table 4-1 also lists the following two controversial second access projects that were in TOP 2025 and ORTP 2030, but deleted from ORTP 2035 and ORTP 2040:

- Central Mauka Road, Whitmore to Waiawa, and
- Paiwa Street Extension to Ka Uka Boulevard.

Table 4-1 lists four transit projects that were all in ORTP 2035 and are in ORTP 2040:

- Rail Transit;
- Bus Service Expansion;
- Construct Transit Centers; and
- Fixed Guideway, Pearl City to Mililani.

Chapter 3 of the COSCP 2002 includes land use policies, principles and guidelines to be used in the review and approval of public and private projects to help implement the vision for Central Oahu's development. Some of the policies address particular locations and make specific reference to transit. These include the following:

“A transit linkage should be established between Waikele Center and Waipahu Town.”

“Street patterns and rights-of-way should be designed to accommodate mass transit (bus) service and make it convenient to access for as many households as possible.”

COSCP 2002 provides further guidance: Guidelines under Subsection 3.8.2.4. Circulation System, specific guidelines are listed including the following statements:

“Potential transit routes should be identified by the developer such that at least 85% of all proposed residential housing units are within 1/4 mile of a proposed transit stop, unless localized topographic conditions make such a requirement impractical.

“All development should be within 1/2 mile of a transit stop, unless localized topographic conditions make such a requirement impractical.

“All commercial development with more than 1,000 square feet, and all employment sites with more than ten employees, should be within 1/8th mile of a transit stop.

“The developer should construct all necessary transit stops in accordance with DTS design standards.

“Proposed transit routes should have two different access points into the proposed development. The route alignment should seek to achieve optimal operational efficiency between the two access points.”

These guidelines have been used for designing new bus routes to serve Central Oahu in other planning documents reviewed in this report. The guideline “The route alignment should seek to achieve optimal operational efficiency between the two access points.” was refined during various bus planning projects described elsewhere in this report to mean a bus route alignment that measures no more than 1.2 times the airline distance between the two access points. This approach avoids circuitous bus routing which becomes expensive, operationally inefficient and unattractive to intending riders.

The standard rule of the transit industry is that areas within a "five-minute walk" of a transit bus stop, or approximately one quarter mile, are considered "served by transit." Beyond the five-minute walk radius, the experience in the United States has been that the percent of persons desiring transit drops due to their unwillingness or inability to walk greater distances. It is intended that the bus route design for new developments such as Koa Ridge exceed the guidelines in the COSCP 2002 by having more of the development within one quarter mile of proposed bus stops.

One of the most important functions DPP performs is the review of major developments such as Koa Ridge to make sure that the development is consistent with the COSCP. How this was achieved is described in this report in the chapter dedicated to Koa Ridge.

II. Department of Transportation Services

Another major partner in the OahuMPO Planning Process and the development of the ORTP’s reviewed in the previous chapter is DTS. DTS is responsible for the modal plans and project development plans. This section documents the content and functionality of the following with emphasis on their historic, current and future linkage to transportation and the development of the COTS:

- *O’ahu Bike Plan, A Bicycle Master Plan, August 2012*
- *Honolulu Complete Streets Design Manual Draft, January 2015*
- *Mililani Mauka Park and Ride Facility Master Plan, October 2002*
- *Central Oahu Bus Service Plan; 2005*
- *Short Range Transit Plan, 2012*
- *Central Oahu Hub and Spoke Project, 2002*

II.1 O’ahu Bike Plan, A Bicycle Master Plan

The 2012 *O’ahu Bike Plan* vision is “Oahu is a bicycle friendly community where bicycling is a safe, viable and popular travel choice for residents and visitors of all ages.” The plan details an increase from 132 miles of bikeway facilities to 691 miles over a thirty-year period.

Chapter 3 refers to AASHTO’s Bike Guide as the basis for defining three facility types: Paths, Lanes, and Routes. Table 3-1 provides how these bike facility types are distributed throughout Oahu by Development Area and by the responsible jurisdiction for that bike facility.

Table 3-1: Oahu Proposed Bikeway Projects by Jurisdiction and Development Area
 Source: *O’ahu Bike Plan*, August 2012, Table 4

DEVELOPMENT PLAN AREA	PROPOSED BIKEWAY PROJECTS BY JURISDICTION								TOTALS
	City				State				
	Type			Subtotal	Type			Subtotal	
	Path	Lane	Route		Path	Lane	Route		
Central Oahu	12	13	11	36	9	6	20	35	71
East Honolulu	2	<1	9	11	0	0	5	5	16
Ewa	21	31	15	67	27	14	14	55	122
Koolau Loa	0	0	7	7	0	0	25	25	32
Koolau Poko	<1	5	36	41	8	4	21	33	74
PUC	8	54	59	121	3	15	16	34	155
Waianae	0	0	15	15	8	0	17	25	40
TOTALS	50	103	157	310	62	39	148	249	559

The Central Oahu Development Area is much larger than the COTS study boundary. The 71 miles of bike facilities shown for Central Oahu includes all bike projects within the COTS area, but some that are outside of it. Table 3-2 lists all of the bike facility projects for both the City and the State that are within the COTS study boundary.

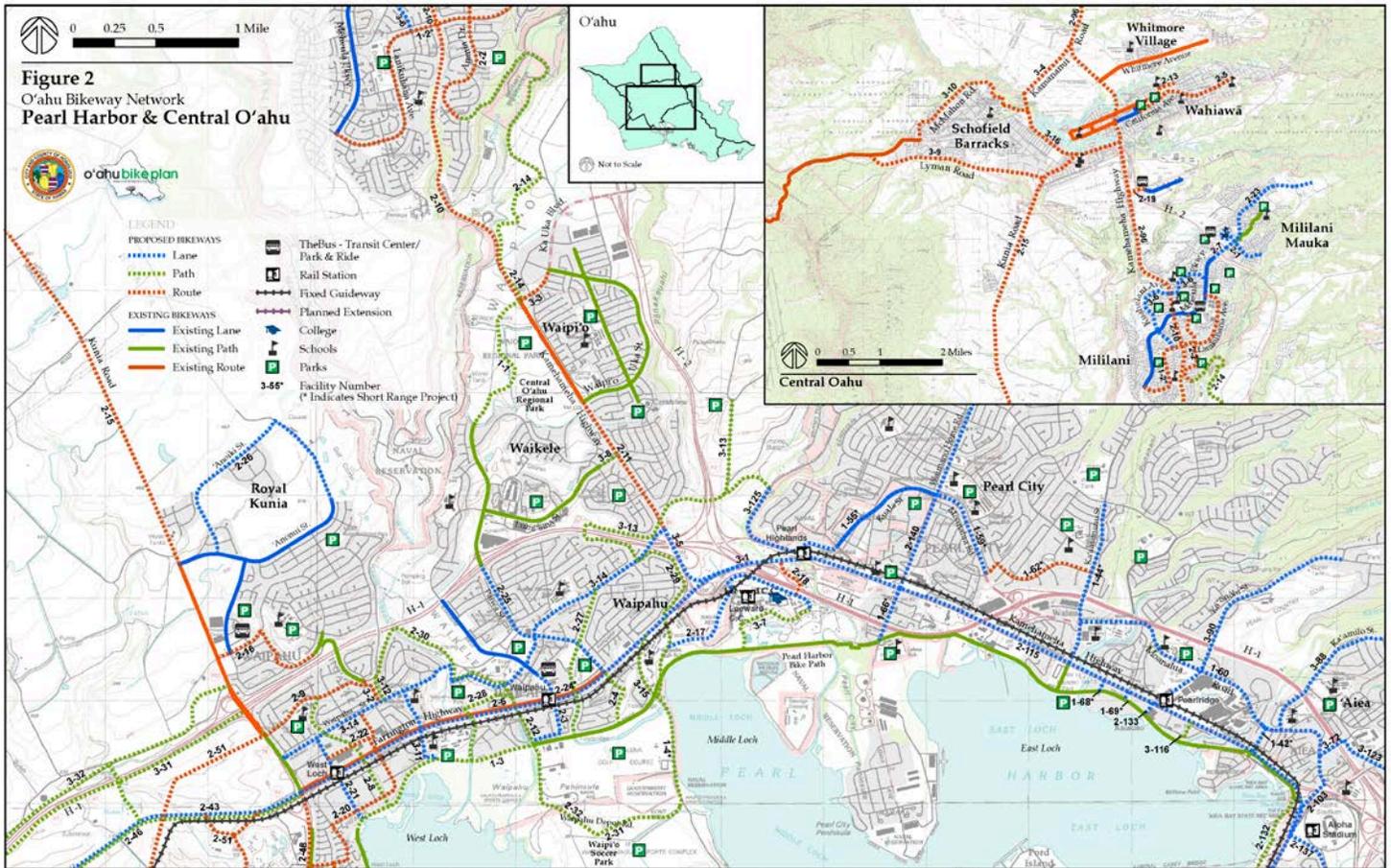
Table 3-2: Oahu Proposed Bikeway Projects in Central Oahu Transportation Study Area
By Project Characteristics

Source: *O'ahu Bike Plan*, August 2012, Table 5

PRIORITY GROUP	PROJECT			CHARACTERISTICS			
	Code	Name	Description and/or Limits	Type	Owner	Length (miles)	Cost (1,000s)
1	1-1	Central Oahu Regional Park	Kamehameha Highway to Paiwa Street	Path	City	0.95	\$734
	1-2	Lanikuhana Avenue	South End of Meheula Parkway to Mililani Shopping Center	Route	City	2.64	\$132
2	2-1	Ainamakua Drive	Mililani Mauka Park and Ride to Kualapa St.	Lane	City	1.12	\$128
	2-2	Anania Drive	Meheula Parkway to Kipapa Gulch Path	Route	City	1.27	\$135
	2-7	H-2 Mililani Interchange	Meheula Parkway	Lane	City	0.26	--
	2-10	Kamehameha Hwy. (Mililani)	Meheula Parkway to Ka Uka Boulevard	Route	State	2.76	--
	2-11	Kamehameha Hwy. (Waipio)	Waipio Uka Street to Waipahu Street	Route	State	0.91	--
	2-14	Kipapa Gulch Pathway	Anania Drive to Central Oahu Regional Park	Path	State	2.60	--
	2-18	LCC Access Road (Mauka)	Kamehameha Highway to LCC	Route	State	0.27	--
	2-19	Leilehua Golf Course Road	Kamehameha Highway to Wikao Street	Route	City	0.27	\$29
	2-23	Meheula Parkway (Mililani Mauka)	H-2 Interchange to Kapanoe Street	Lane	City	1.98	\$228
	2-96	Kamehameha Hwy. (Wahiawa)	Haleiwa Bypass to Kuahelani Ave.	Route	State	11.44	--
3	3-3	Ka Uka Boulevard	Kamehameha Highway to Waipio Uka	Route	City	0.27	\$29
	3-4	Kamananui Road	Kamehameha Highway to Wilikina Drive	Route	State	1.13	--
	3-5	Kamehameha Hwy. (Waipahu)	Widen overpass across H-1/H-2	Lane	State	0.26	--
	3-6	Kuahelani Avenue	Hokuahiahi Park to Meheula Parkway	Lane	City	2.20	\$253
	3-9	Lyman Road	Trimble Road to Kunia Road	Route	Federal	2.90	--
	3-16	Wilikina Drive	Kamananui Road to Kamehameha Highway	Route	S/C	2.16	--

Table 3-2 lists 18 bikeway projects identified in the *2012 O'ahu Bike Plan* that are within the COTS study boundary. These projects are located on a map in the plan provided in Figure 3-3.

Figure 3-3: Oahu Proposed Bikeway Projects in Pearl Harbor & Central Oahu
 Source: O'ahu Bike Plan, August 2012)



The 18 selected COTS projects include a total of 35 miles of bikeways, but 26 miles of these projects are bike routes as shown in Table 3-3. Providing a bike route has some benefits, but there is no evidence simply providing a bike route sign along a roadway with no other infrastructure improvements for bicyclists influences a shift in travel behavior.

The 2012 *O'ahu Bike Plan* states that bicycle route guide signs can be very important in assisting cyclists locate the best routes, distance, and direction of popular destinations such as Downtown, Waikiki, college campuses, and parks, and can direct cyclists to short loop rides around a community. Most (73.5%) of the new bikeways in the 2012 *O'ahu Bike Plan* are bicycle routes.

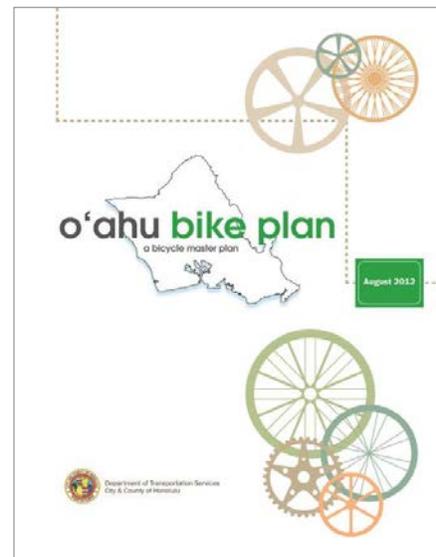


Table 3-3: Oahu Proposed Bikeway Projects in Central Oahu Transportation Study Area
By Facility Types

Source: O'ahu Bike Plan, August 2012, Table 5

PRIORITY GROUP	PROJECT			BIKE FACILITY TYPES				TOTALS
				Paths	Lanes - Protected	Lanes - Unprotected	Routes	
	Code	Name	Description and/or Limits					
1	1-1	Central Oahu Regional Park	Kamehameha Highway to Paiwa Street	0.95				0.95
	1-2	Lanikuhana Avenue	South End of Meheula Parkway to Mililani Shopping Center				2.64	2.64
2	2-1	Ainamakua Drive	Mililani Mauka Park and Ride to Kualapa St.			1.12		1.12
	2-2	Anania Drive	Meheula Parkway to Kipapa Gulch Path				1.27	1.27
	2-7	H-2 Mililani Interchange	Meheula Parkway			0.26		0.26
	2-10	Kamehameha Hwy. (Mililani)	Meheula Parkway to Ka Uka Boulevard				2.76	2.76
	2-11	Kamehameha Hwy. (Waipio)	Waipio Uka Street to Waipahu Street				0.91	0.91
	2-14	Kipapa Gulch Pathway	Anania Drive to Central Oahu Regional Park	2.60				2.60
	2-18	LCC Access Road (Mauka)	Kamehameha Highway to LCC				0.27	0.27
	2-19	Leilehua Golf Course Road	Kamehameha Highway to Wikao Street				0.27	0.27
	2-23	Meheula Parkway (Mililani Mauka)	H-2 Interchange to Kapanoe Street			1.98		1.98
	2-96	Kamehameha Hwy. (Wahiawa)	Haleiwa Bypass to Kuahelani Ave.				11.44	11.44
3	3-3	Ka Uka Boulevard	Kamehameha Highway to Waipio Uka				0.27	0.27
	3-4	Kamananui Road	Kamehameha Highway to Wilikina Drive				1.13	1.13
	3-5	Kamehameha Hwy. (Waipahu)	Widen overpass across H-1/H-2			0.26		0.26
	3-6	Kuahelani Avenue	Hokuahiahi Park to Meheula Parkway			2.20		2.20
	3-9	Lyman Road	Trimble Road to Kunia Road				2.90	2.90
	3-16	Wilikina Drive	Kamananui Road to Kamehameha Highway				2.16	2.16
			TOTALS	3.55	0.00	5.82	26.02	35.39

The 9.37 miles of COTS projects that offer paths and lanes are more attractive candidates than routes. Routes offer bicyclists no infrastructure safety improvements and weren't even a bike facility classification in previous plans.¹² The 2012 *O'ahu Bike Plan* references the City's Subdivision Street Standards (June 2001) to identify typical right-of-way (ROW) details for all new public roadways. The standards essentially offer an option of providing off-street shared use paths (SUPs) for new multilane streets or bike lanes.

According to AASHTO, SUP's are considered to be a complementary system of off-road transportation routes for bicyclists and others. They should not be considered a substitute for on-street facilities because many cyclists will find it less convenient to ride on these paths compared with the streets, particularly for utilitarian trips.

The 2012 *O'ahu Bike Plan* recommends that the street standards be changed to require on-street bike lanes on all new multilane roadways while continuing to recommend inclusion of SUPs. The plan's development process included the Typical Facility Design Treatments Report, December 2008 (work product No. 3.1.1.). Included in this report are discussions on design principles and standards for a bicycle box (Figure 16) bicycle boulevard (Figure 18), cycle track (Figure 21) and various traffic calming treatments beneficial to bicycle boulevards. These are the types of treatments now included in DTS's *Complete Streets Design Manual*.

II.2 Honolulu Complete Streets Design Manual

Honolulu has joined the nationwide movement for complete streets. The *Honolulu Complete Streets Design Manual* presents the guidelines needed for making this happen. A two-day workshop was conducted July 14 and 15, 2014 to engage stakeholders in modifying the manual for conditions in Honolulu.



One of the features of Honolulu's manual is the table shown in Figure 3-4 that summarizes the suitability of various design treatments for application on different types of streets and intersections in the City and County of Honolulu. The table is presented at the beginning of the manual and on the next page of this review. Additional information about each street type and design treatment is provided in the chapters of the Honolulu design manual. For each street and intersection type, design treatments are classified into five categories:

- 1 - Incorporate: These design treatments must be incorporated into all street improvement projects on designated street types.
- 2 - Priority: These design treatments should be incorporated into all street improvement projects on designated street types.

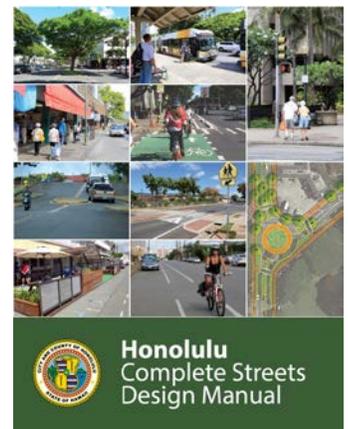


Figure 3-4: Master Design Treatment Matrix
 Source: *Honolulu Complete Streets Design Manual*

Street Component	Design Treatment	Street Type						
		2.3.1. Boulevard and Parkway	2.3.2. Avenue	2.3.3. Main Street	2.3.4. Street	2.3.5. Mall	2.3.6. Rural Road	2.3.7. Lane/Alley
Travel Way	3.4 Design Vehicle	DL- 23 default (see guidelines)						
	3.5. Lane Width	10' wide default (see guidelines)						
	3.8. Medians	2	3	3	4	4	N/R	N/R
	3.10 Traffic Calming/Speed Reduction	4	4	2	2	4	3	N/R
	4.7.1. Left-Turn Lanes	acceptable in urban area where volumes necessitate (see guidelines)						
	4.7.2. Right-Turn Lanes	should be generally avoided unless volumes necessitate (see guidelines)						
Parking Lane	3.7. On-Street Parking	2	2	2	4	4	4	N/R
	3.7.4. Parklets	3	2	2	4	4	4	N/R
	3.7.5. (6.5.7.) Bike Corrals	2	2	2	4	4	4	N/R
Intersection	4.4. Corner Radii	15' actual curb radius default (see guidelines)						
	4.5. (5.6.2.) Curb Extensions	2	2	2	3	3	N/R	N/R
Pedestrian Crossing	5.3. Pedestrian Signals	everywhere traffic signals are provided (see guidelines)						
	5.6.1. Marked Crosswalks	all signalized intersections and other places where volumes necessitate (see guidelines)						
	5.6.2. Pedestrian 'Scrambles'	4	4	4	4	4	N/R	N/R
	5.6.3. Lighting	at all pedestrian crossing locations (see guidelines)						
	5.6.4. Signage	see guidelines						
	5.6.6. Angled Median Crossing	see guidelines						
	5.6.7. Raised Crosswalks	see guidelines						
	5.6.8. Rectangular Rapid Flash Beacon	see guidelines						
5.6.9. Pedestrian Hybrid Beacon	see guidelines							
Bicycle Facility	6.4.2.1. Shared Roadways	N/R	N/R	4	3	3	N/R	1
	6.4.2.3. Shoulder Bikeways	4	4	4	4	4	1	N/R
	6.4.2.5. Centerline Removal	N/R	N/R	N/R	3	4	4	2
	6.4.2.6. Bicycle Boulevards	N/R	4	N/R	4	N/R	4	N/R
	6.4.3. Bike Lanes	1	2	2	4	4	2	N/R
Sidewalk Zone (minimum width)	7.3.1. Frontage Zone	18"	18"	30"	18"	N/A	N/A	N/A
	7.3.2. Pedestrian Zone	6'	6'	6'	5'	N/A	N/A	N/A
	7.3.3. Furniture Zone	5'	5'	5'	4'	N/A	N/A	N/A
	8.5. Bus Stop Zone	8'	8'	8'	8'	8'	N/R	N/R
Street Furnishings	7.7.1. Street Trees	1	1	1	2	3	4	4
	7.8.1. Benches and Seating	3	3	1	4	2	N/R	N/R
	7.8.2. News Racks	4	4	2	2	2	N/R	N/R
	7.8.3. Bollards	4	4	4	4	4	N/R	4
	7.8.4. Street Vendor Stands	4	4	3	4	3	N/R	N/R
	7.8.5. Informational Kiosks	4	4	2	4	2	N/R	N/R
	7.8.10. Public Art	3	3	2	4	2	N/R	4
	7.8.11. Sidewalk Dining	3	3	2	4	2	N/R	4
	7.10. Lighting	1	1	1	1	1	3	2

- 3 - Accommodate: These design treatments should be considered for incorporation into all street improvement projects on designated street types, if adequate space is available after accommodating all category 1 and 2 treatments. Additional consideration should be given to how the design treatment complements the surrounding context and desired function of the street.
- 4 - Limited Circumstances: These design treatments may be incorporated into street improvement projects on designated street types in a limited number of circumstances such as, but not limited to, near schools, transit stops, trails and other non-auto oriented trip generators.
- 5 - Not Recommended – These design treatments are generally not recommended for use on designated street types.

Implementing Complete Streets requires integrating transportation with community planning. Changes are brought about by transforming the built environment. Engineers, planners, architects, landscape architects, and urban design professionals work along with health providers, business leaders, elected officials, community organizations, and residents to promote Complete Streets implementation. Actively engaged community members in Complete Streets are important participants and stakeholders. They help to ensure that efforts are relevant to the community’s use, values, and priorities for the neighborhood.

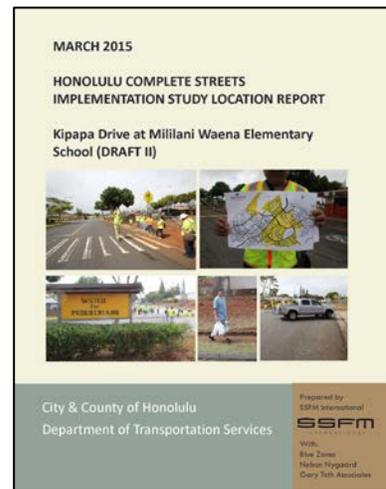
The State of Hawaii adopted Complete Streets in 2009 and required each County to follow suit. In May 2012, the Honolulu City Council adopted a “Complete Streets” policy and passed Ordinance 12-15. The City and County of Honolulu is now taking aggressive steps to implement Complete Streets by updating policies, guidelines during maintenance and paving projects, and designing projects in specific locations. The City and County of Honolulu selected fourteen across the island of Oahu for in-depth study to illustrate how Complete Streets can be applied in a specific location. Two of the projects are within the COTS area: Kipapa Drive at Mililani Waena Elementary School and California Avenue from Kamehameha Highway to Wahiawa District Park

Kipapa Drive at Mililani Waena Elementary School

Kipapa Drive at Mililani Waena Elementary School was selected due to reported high levels of speeding, vehicle-to-vehicle, and vehicle-to-student/pedestrian conflicts at the intersection of Kipapa Drive and Hookelewaa Street. Area schools are also interested in, and working on, ways to increase the number of students walking and bicycling to school.

The Honolulu Complete Streets Implementation Study for Kipapa Drive at Mililani Waena Elementary School recommendations include:¹³

- Create an intersection at Kipapa Drive and Hookelewaa Street that is compact, creates a sense of place, and emphasizes pedestrian safety, using a domed mini-circle



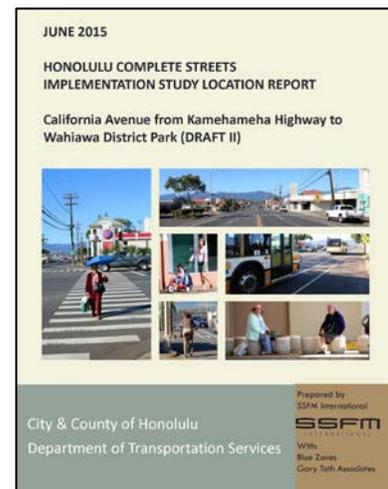
- Redesign Kipapa Drive for a target speed of 25 mph by narrowing travel lanes
- Reconfigure cross-section of Kipapa Drive, installing pavement marking for narrowed travel lanes and designated bike lanes
- Enhance marked pedestrian crossings of Kipapa Drive
- Address parking and school loading zone along Hookelewaa Street to improve pedestrian access and safety
- Reduce the driveway crossing at Mililani Waena Elementary School to reduce vehicle-pedestrian conflicts

California Avenue from Kamehameha Highway to Wahiawa District Park

The stated need for the project: California Avenue from Kamehameha Highway to Wahiawa District Park “has a strong potential to become a vibrant, walkable corridor.”¹⁴ There are many commercial destinations at the east end of the corridor, institutions and public facilities to the west, and residences to the north and south. California Avenue also serves as the arterial spine road for all of Wahiawa.

The Honolulu Complete Streets Implementation Study for California Avenue from Kamehameha Highway to Wahiawa District Park recommendations include:¹⁵

- Implement a road diet that transitions the street from four to three vehicle lanes.
- Encourage bicycle usage by creating protected bike lanes.
- Promote bicycle-bus commuting by installing bicycle lockers at Wahiawa Transit Center.
- Convert unsignalized pedestrian crossings to “Z-crossings” and protect them with raised medians.
- Make improvements to the pedestrian environment at the intersection of California Avenue and Kamehameha Highway:
 - Remove the right-turn lane from California Avenue to Kamehameha Highway, and instead direct right turning traffic on to Maalo Street;
 - Improve the pedestrian sidewalk zone and reduce crossing distances by extending curbs and relocating utilities; and,
 - Eliminate the right-turn lane from Kamehameha Highway to California Avenue; convert one existing through-lane to a shared right/through-lane.
- Enhance walkability by closing or narrowing driveways at multiple locations.
- Install roundabouts at California Avenue and Lehua Street, and at California Avenue and North Cane Street to facilitate traffic flow while calming vehicle speeds.



II.3 Bus Service Improvement Plans

DTS has prepared, and routinely updates, various types of bus service improvement plans. Some of these are island wide, such as the *Short Range Transit Plan*, while others focus on geographic areas including Central Oahu. The *Short Range Transit Plan* completed in 2012 was conducted during a City budget cycle in which DTS was directed to reduce costs. Consequently, the *Short Range Transit Plan* was used as a basis for bus service reductions that proved to be very unpopular. The subsequent administration reinstated the service reductions making the *Short Range Transit Plan* a dubious basis for any further significant service changes.

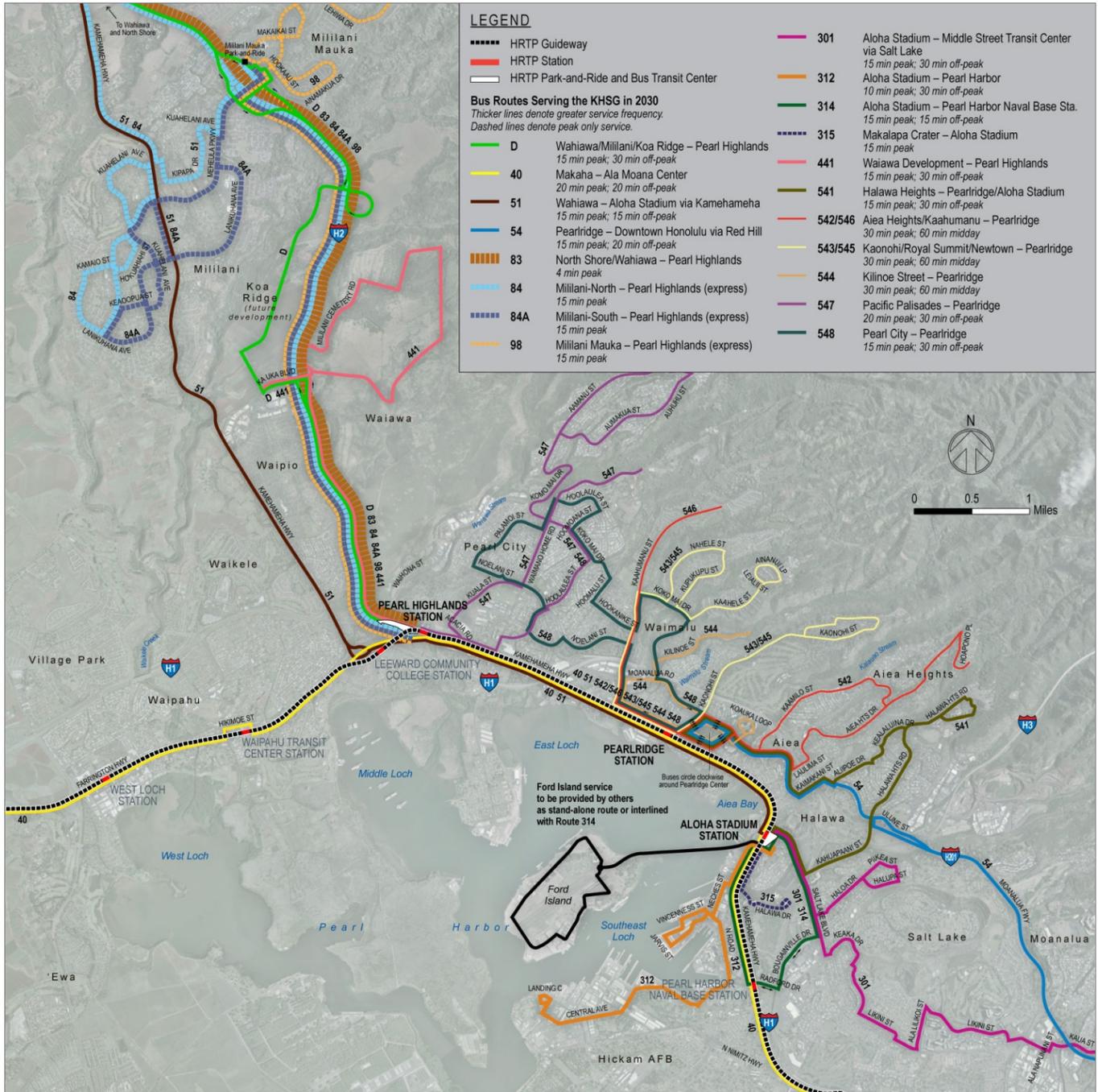
The *Short Range Transit Plan* was preceded by several other DTS transit planning projects that did identify substantive service improvements. Many of the recommendations resulting from these studies and plans have been implemented, but others have not. These remaining service additions and capital investments have received continuous technical and public support throughout the years and are worthy of further evaluation as part of the COTS.

Current Central Oahu peak express routes emphasize peak-period, peak-direction service making travel at other times and in other directions unappealing. Long routes serving local needs are delayed in traffic at other parts of the island. The DTS *Central Oahu Bus Service Plan* developed in 2005 and the *Central Oahu Hub and Spoke Project* conducted in 2002 identified transit routes that operated as coherent and fully integrated networks to better serve Central Oahu. These transit networks were subsequently included in the rail planning and design work and are documented in the *Honolulu High Capacity Transit Corridor Project Final Environmental Impact Statement*, Appendix D, June 2010.

Elements of the 2002 Central Oahu bus route network are included in the Bus Rail Integration Plans for the Honolulu Rail Transit Project (H RTP). The Bus-Rail Integration Plans were used to identify the long-term (2030) bus facility needs at all 21 H RTP rail stations. These are conceptual plans only, and illustrate how high-frequency community circulators and regional trunk routes can complement the rail system to enhance island-wide mobility. DTS is using these plans as a starting point for the service planning process. Community input and additional technical planning will be conducted before any service changes are implemented.

Two of the 2002 H RTP Bus-Rail Integration Plans apply to Central Oahu and COTS: 1) *Bus/Rail Integration Plan for the Kamehameha Highway Station Group*, April 2014 and 2) the *Bus/Rail Integration Plan for the Kamehameha Highway Station Group*, April 2014. Figures 3-5 and 3-6 illustrate the conceptual bus networks from these two bus/rail integration plans and include the same bus routes that have been identified in all of the major DTS and HART transit operations plans developed over the past ten years.

Figure 3-5: Bus Routes Serving the Kamehameha Station Group in 2030
 Source: HART Bus/Rail Integration Plan for the Kamehameha Highway Station Group, April 2014



Route D, shown in Figure 3-5 with an alignment through Koa Ridge, could also serve this area via a flyer stop accessed using the H-2 HOV lanes and new direct access ramps connecting to the isolated H-2 island mauka of Ka Uka Boulevard as illustrated in Figure 3-7.

Figure 3-7: Possible H-2 Flyer Stop Location

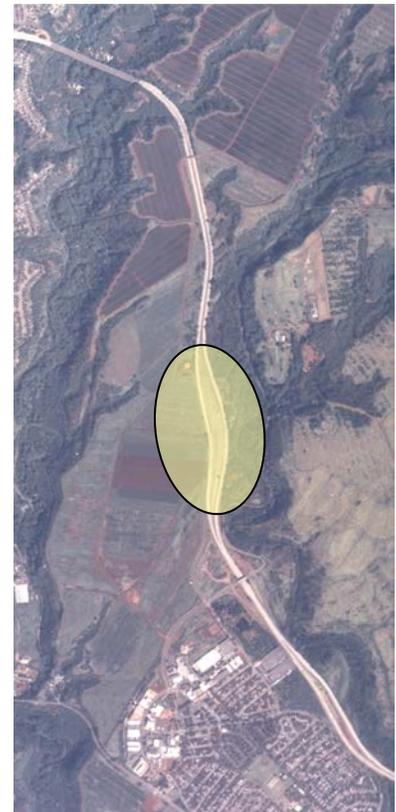
Source: *Mililani Mauka Park-and-Ride Facility Master Plan, 2002*



Two routes are designed to serve the new development at Koa Ridge. One is a new CountryExpress! Route D. CountryExpress routes such as Routes C and E provide seven-day, all-day, limited-stop service. The possible alignment of this proposed route has varied slightly over the past ten years, but it has always connected transit centers in Wahiawa and Mililani with downtown Honolulu using H-2 and H-1 for the middle part of the trip. CountryExpress! Route D will operate along the H-2 HOV lanes. This route has not been implemented due to funding constraints, but it has consistently been viewed by DTS transit planners as a reasonable and necessary service improvement for Central Oahu. Route D could serve Koa Ridge via the new H-2 Pineapple Road interchange (ORTP 2040 Project # 308).

The location of the Central Oahu Regional Park-and-Ride (P & R) is the H-2 center median between the Plantation Road bridge over H-2 and the Ka Uka Boulevard bridge over H-2. This median island is up to 250 feet wide and 2000 feet long providing a footprint that is larger than the size of the entire Mililani Mauka Park-and-Ride parcel (5.75 acres).

The site is relatively flat. It is shaped like an 'S' with narrow ends and a wide middle. The width is over 200 feet for over 1,000 feet of the length of the median. HDOT researched the history of the site during the development of the *Mililani Mauka Park-and-Ride Facility Master Plan* and could find no documented reasons for its existence. The speculation was that the roadway simply followed the contour of the land in this location since the cost of even minor cut and fill grading would be greater than the cost of the land at the time of construction. HDOT could find no evidence of any environmental or other reasons for avoiding the site.



The proposed Central Oahu Regional P & R is immediately adjacent to HOV lanes in each direction allowing direct access from and to the HOV lanes. An additional three general purpose traffic lanes are on the outside cross-section of the freeway. The proposed site is located in the adjacent to the Koa Ridge development to the west and the Waiawa developments to the east.

Examples of the type of regional park-and-ride, access ramps, and flyer stop envisioned constructed within an interstate freeway corridor can be found in Washington DC, Los Angeles and Seattle. Figure 3-8 includes direct HOV access ramps, a transit center and a 2,000 car parking structure known as the Herndon Monroe Park-and-Ride. This facility illustrates the scale of the proposed parking facility envisioned for the Central Oahu Regional Park-and-Ride.

Figure 3-8: Example of Regional Park-and-Ride with Direct Freeway Access Ramps
Herndon Monroe Park-and-Ride on Washington DC's Dulles Freeway
Source: *Mililani Mauka Park-and-Ride Facility Master Plan, 2002*

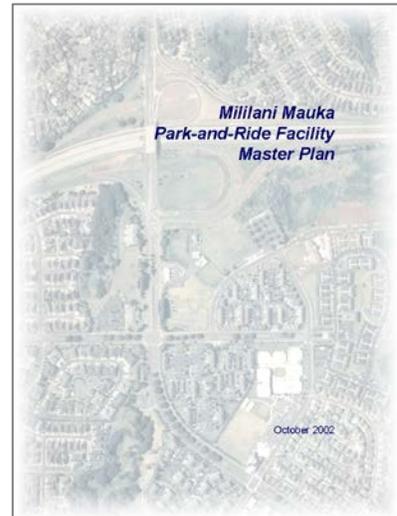


The Rosecrans Bus Station on the Los Angeles I-110 freeway in Figure 3-9 presents how HOV lanes on the interior cross-section of a high volume freeway can be configured to serve boarding platforms in the freeway right-of-way accessed by pedestrians from a widened overpass. Parking is provided at a large lot outside of the freeway right-of-way. Such a widened bridge with boarding platforms would be part of the proposed Central Oahu Regional Park-and-Ride.

Figure 3-9: Example of Regional Park-and-Ride with Direct Freeway Access Ramps
Rosecrans Bus Station on LA's I-110 Freeway
Source: *Mililani Mauka Park-and-Ride Facility Master Plan, 2002*



Seattle has similar examples. Altogether, the Puget Sound region has 189 park-and-rides.¹⁶ Some of these such as the Eastgate and South Everett P & Rs are located between inbound and outbound sets of interstate freeway lanes as is proposed in the *Mililani Mauka Park-and-Ride Facility Master Plan* for the Central Oahu Regional P & R. The extensive P & R lot network with direct access lanes in these other metropolitan areas highlights the fact that an excellent rail network does not diminish the need for such bus related investments. The need for the Central Oahu Regional P & R is further highlighted by the expectation of the COSCP 2002.



No major roadway capacity increases for general purpose traffic are offered for the commuter demands anticipated between Central Oahu and downtown Honolulu in COSCP 2002. COSCP 2002 relies upon transit investments to serve peak period commuter travel demand. The plan includes the following observations and elements:

With population growth, the City should increase transit service in Central Oahu in order to enhance circulation among Central Oahu communities and between Central Oahu and the adjacent Ewa and North Shore areas, and provide convenient service for peak-hour commuting.¹⁷

Three specific programs were identified intended to offer the increased transit service needed. These are:

- Hub-and-Spoke system, a combination of express, local and community circulator buses which meet at transit centers throughout the island.
- The Regional BRT element includes a continuous Interstate H-1 BRT corridor from Kapolei to Middle Street comprised of zipper lanes and new express lanes to and from an uninterrupted transitway. Special ramps may facilitate movement between the H-1 BRT Corridor and selected transit centers.
- The In-Town BRT component would be a high capacity transit spine from Middle Street to the University of Hawaii-Manoa and Waikiki.

None of these three sets of transit services listed in COSCP 2002 have been fully implemented. The BRT program was abandoned with a change in City administration and with the emphasis on building rail. The “Hubs” identified in the Central Oahu portion of the Hub-and-Spoke system have been constructed, but some of the important services to make this program function still need to be done.

In addition to the Route D mentioned previously a second new route that would serve Koa Ridge is the proposed Route 50. As with Route D, this route has been included in HART's Bus/Rail Integration Program and is shown in Figure 3-6. Route 50 is a suburban trunk route with the primary function to connect transit hubs while providing direct service along major development corridors. Suburban trunk routes are designed to connect hubs with frequent service and only deviate from the most expedient alignment possible when the majority of passengers on board are served by the destinations requiring the deviation. These routes provide all-day, two-directional, regular-capacity service seven days a week. Route 50's primary function is to connect the Mililani, Waipahu and Kapolei hubs or transit centers.

Routes operating with the average to less than average distance between stops to achieve the highest degree of access to neighborhoods and community destinations are Community Circulator services. Their primary function is to serve one transit hub within one major geographic area. They deviate from the most expedient alignment possible when neighborhood access is required. These routes provide service designed to meet the needs of the community provided that certain levels of productivity are maintained. These routes often do not provide frequent service, but operate such that they make timed connections at their assigned transit hub to minimize wait times either between these routes or with other higher frequency routes.

Thirteen Community Circulators are depicted in Figure 3-5. Of these, only Route 441 serves the COTS area. Six Community Circulators are depicted in Figure 3-6. Of these, only Route 433 serves the COTS area. None of Route 441 exists. A portion of Route 433 currently is anchored at the Waipahu transit center. It serves Waipio and would be extended to operate into the Koa Ridge development from Ka Uka Boulevard.

Aside from the route alignments and function it is important to understand the role and level of service assumed for transit by the COSAP 2002 in mitigating anticipated peak-period, peak-direction commuter travel demand. To do this, a sketch planning exercise was conducted as part of the *Mililani Mauka Park-and-Ride Facility Master Plan* to identify the maximum level of travel demand transit was expected to serve if sufficient additional roadways are not constructed to absorb the expected growth. This sketch planning exercise is referred to as a "Commuter-Shed Analysis." A commuter-shed is like a watershed. A watershed defines the entire geographical drainage area above a point in a stream that contributes to the water flowing past that point. Likewise, a commuter-shed defines the entire geographical residential area beyond a point on a roadway that contributes to all vehicles flowing past that point.

The Central Oahu Commuter-Shed Analysis considered all travel flowing in the morning peak period from the North Shore and Central Oahu areas destined for locations makai of Ka Uka Blvd. This street served as a technical analysis screenline intersected by two major roadways: Kamehameha Highway and H-2. These are the two roadways (or streams) used by workers with employment destinations outside the Commuter-Shed Area.

Table 3-4 contains the results of the Commuter-Shed Analysis of Central Oahu. The primary objective of the Commuter-Shed Analysis was to calculate the total person trips leaving Central Oahu makai-bound during the morning peak period both now and after 20,000 more housing units are constructed. The number 20,000 housing units is not an exact number. North Shore housing units are not added and Royal Kunia housing units not oriented toward Ka Uka are not subtracted since these would largely offset one another.

Table 3-4: Central Oahu Commuter Shed Analysis
 Source: *Mililani Mauka Park-and-Ride Facility Master Plan, 2002, Figure 24*¹⁸

SCENARIO	POPULATION	PERSON TRIPS LEAVING CENTRAL OAHU (makai bound between 4:30 AM and 7:30 AM)				BUS MODE SPLIT	BUSES REQUIRED
		Total	SOVs & Other Vehicles	HOVs	Bus		
Existing Conditions	103,114	15,532	13,116	1,180	1,236	8%	37
20,000 More Housing Units	163,114	24,532	13,116	1,864	9,552	40%	252

The *Mililani Mauka Park-and-Ride Facility Master Plan* Commuter Shed Analysis "20,000 More Housing Units" scenario shows a population of 163,114 based on 3.0 persons per household. The total 24,532 person trips leaving Central Oahu was based on the same proportion of 15% of the population traveling makai bound between 4:30 am and 7:30 am as was observed for the existing conditions scenario. The 13,116 of person trips using SOVs and other vehicles were held constant. This was based on the prevailing public belief that the Central Oahu roadway system cannot feed any more cars onto H-1 since it is at capacity. The 1,864 person trips leaving Central Oahu in HOVs was based on maintaining the same percent (7.6%) of person trips using HOVs in the future as exists today.

The 9,552 person trips by bus were determined by subtracting those person trips using other modes from the total of 24,532. This results in a total of 252 bus trips required assuming the same average persons per bus occupancy as exists today. This number could be lessened if higher-capacity, articulated buses are used in the future. Even if this number is reduced to account for buses on Kamehameha, Handi-vans and high-capacity buses, it is still likely that about 180 buses might be required to serve the estimated maximum commuter demand. This transit person trip demand might be reasonable since 180 buses means a bus departure every minute from a centrally located regional park-and-ride; a very high level of service that could be attractive to even the most ardent commuter who may be wedded to their car, but not to the traffic gridlock by-passed by commuter buses in the zipper lane.

III. Honolulu Authority for Rapid Transportation

HART is also a major partner in the OahuMPO Planning Process. HART is responsible for the planning, design, construction and operation of rail. HART has produced a significant amount of documentation, but the three most significant to COTS are the following:

- Honolulu High Capacity Transit Corridor Project Environmental Impact Statement, June 2010
- Honolulu Authority for Rapid Transportation Bus/Rail Integration Plan for the Kamehameha Highway Station Group, April 2014
- Honolulu Authority for Rapid Transportation Bus/Rail Integration Plan for the Farrington Highway Station Group, April 2014
- On-board transit survey

These three documents have all been referenced and reviewed in the preceding sections. The reader should keep in mind the *Mililani Mauka Park-and-Ride Facility Master Plan Commuter Shed Analysis* and other comparable sketch planning efforts performed in the years before HART was created are what led many active transportation planners on Oahu to firmly believe the current rail project was technically justified. Although going from 37 to 252 buses required in just the morning peak period may seem exaggerated to some, the results of the rail planning work through the extensive alternatives analysis and environmental impact statement stages proved that the future transit demand from Central Oahu could be substantial. Figure 3-10 shows that the Pearl Highlands station has the highest demand of person trips accessing rail by private vehicle.

Figure 3-10: Daily Mode of Access to Project Stations in 2030

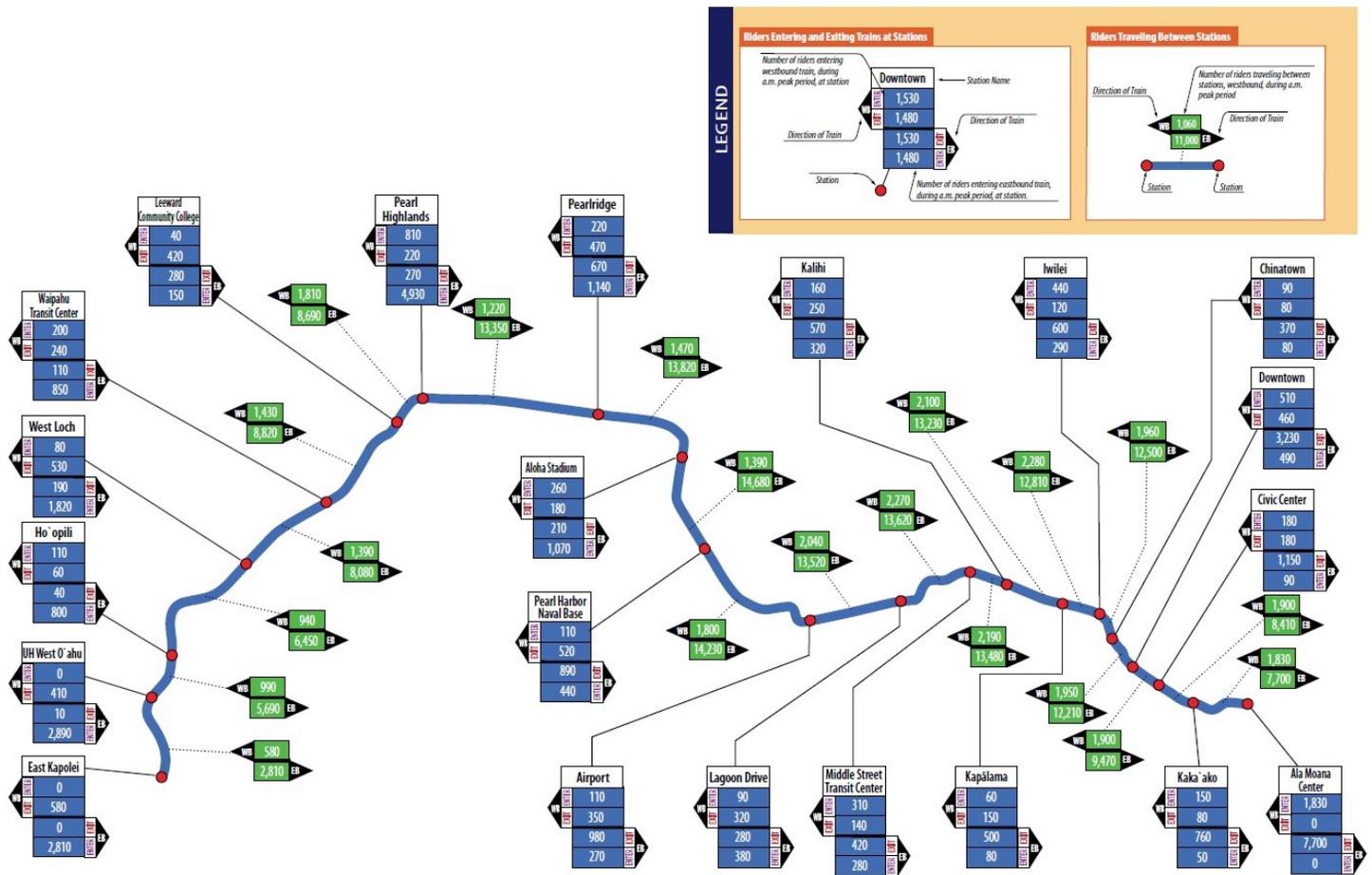
Source: *Honolulu High Capacity Transit Corridor Project Environmental Impact Statement, June 2010*¹⁹

Station	Daily Person Trips Using Guideway Stations by Mode								
	Walk/Bike		Bus		Kiss-and-Ride		Parking		Total
	Volume	% Share	Volume	% Share	Volume	% Share	Volume	% Share	
East Kapolei	420	6%	5,040	69%	380	5%	1,430	20%	7,270
UH West O'ahu	550	9%	4,750	76%	260	4%	680	11%	6,240
Ho'opili	1,390	77%	130	7%	230	13%	50	3%	1,800
West Loch	670	13%	4,020	76%	500	9%	110	2%	5,300
Waipahu Transit Center	550	18%	2,260	73%	230	7%	50	2%	3,090
Leeward Community College	2,850	89%	300	9%	40	1%	10	0%	3,200
Pearl Highlands	1,500	14%	5,410	51%	590	6%	3,110	29%	10,610
Pearlridge	490	8%	5,080	87%	230	4%	60	1%	5,860
Aloha Stadium	790	20%	1,410	36%	110	3%	1,610	41%	3,920
Pearl Harbor Naval Base	2,750	51%	2,530	47%	130	2%	30	1%	5,440
Honolulu International Airport	3,360	53%	2,910	46%	40	1%	10	0%	6,320
Lagoon Drive	700	23%	2,230	73%	100	3%	20	1%	3,050
Middle Street Transit Center	320	11%	2,320	83%	140	5%	30	1%	2,810
Kalihi	2,180	60%	1,200	33%	200	6%	50	1%	3,630
Kapālama	1,830	82%	330	15%	60	3%	10	0%	2,230
Iwilei	720	21%	2,010	60%	520	15%	120	4%	3,370
Chinatown	1,250	80%	300	19%	10	1%	-	0%	1,560
Downtown	2,830	26%	7,930	74%	10	0%	-	0%	10,770
Civic Center	3,020	77%	880	22%	30	1%	-	0%	3,930
Kaka'ako	2,650	80%	650	20%	20	1%	-	0%	3,320
Ala Moana Center	3,680	16%	17,790	79%	890	4%	250	1%	22,610
Total	34,500	30%	69,480	60%	4,720	4%	7,630	7%	116,330

Of the total 7,630 person trips using rail and needing a place to park, 3,110, or about 41% of the total, need to do so at the Pearl Highlands station. Almost all of these trips are coming from Central Oahu. Another 5,410 are accessing rail by bus at Pearl Highlands, the third highest access by bus volume in the system. Figures 3-10 includes the graphic from the *Honolulu High Capacity Transit Corridor Project Environmental Impact Statement* with peak period forecasts by station.

Figure 3-11: Two-Hour Peak Period Boardings and Alightings By Station In 2030

Source: *Honolulu High Capacity Transit Corridor Project Environmental Impact Statement*, June 2010²⁰



The graphic reveals that 5,790 of the 10,620 person trips using rail at the Pearl Highlands station do so during the morning peak two hours.

The Pearl Highlands station was included in the COTS project area to assure future peak-period, peak-direction commuter demand from Central Oahu is taken into consideration. It may be that the 1,600 parking spaces being planned for the Pearl Highlands station are not sufficient to satisfy all of the potential demand and the Regional P & R north of Ka Uka may be needed to provide future capacity and/or bus levels of service many need to be increased beyond what has been assumed to satisfy all of the expectations for transit reflected in the COSCP 2002 and the current update.

4.0 State of Hawaii Plans, Reports and Documents

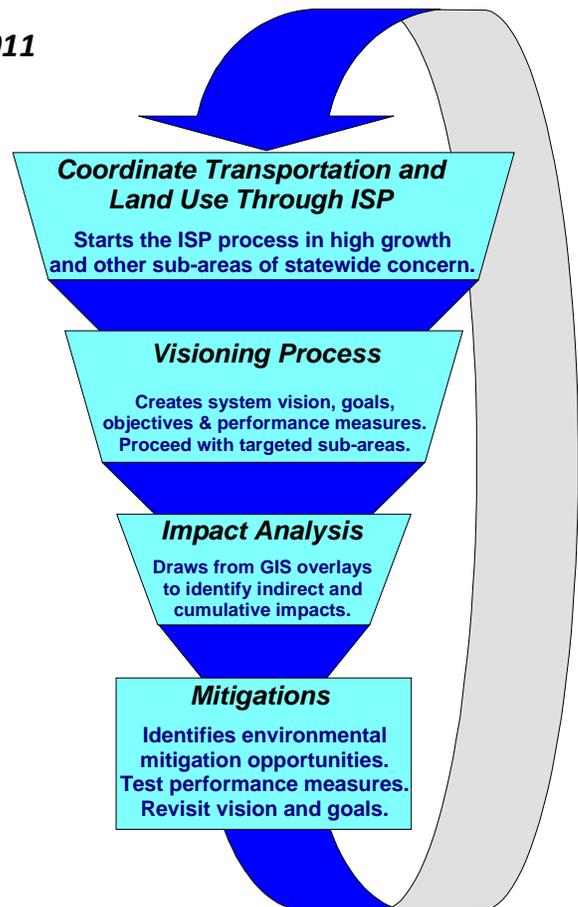
This chapter lists State of Hawaii plans, studies and documents prepared by the Hawaii Department of Transportation (HDOT). HDOT is another full partner in the OahuMPO planning process and the state's projects have already been included in Chapter 2, Oahu Regional Transportation Plan Related Documents and parts of Chapter 3, City and County Plans, Reports and Documents since some sections, such as the review of the *Oahu Bike Plan* included all of the projects in the *Bike Plan Hawaii Master Plan*. Emphasis was placed in this chapter on extracting other policies, programs, procedures and projects from some of the following state documents with possible application to COTS.

- *Hawaii Statewide Transportation Plan, 2011*
- *Federal-Aid Functional Classification Update: Policy and Procedures, December 2012*
- *Hawaii Strategic Highway Safety Plan 2007 thru 2012*
- *Bike Plan Hawaii Master Plan, 2003*
- *Statewide Pedestrian Master Plan, May 2013*
- Interstate Access Modification Request Update, Waipio Interchange Modifications, Waiawa, Oahu, Hawaii; February 2006; Revised September 2007
- Report to the Twenty Fourth Legislature of the State of Hawaii Regular Session of 2007 on SCR 48, Subject: "Report on the Feasibility of an Alternate Route of Ingress to and Egress from Mililani Mauka, November 2006

I. *Hawaii Statewide Transportation Plan, 2011*

The theme of the *Hawaii Statewide Transportation Plan* (HSTP) is "Making Connections." This refers not just to connections amongst modes, but to the natural environment. Federal law now requires that environmental mitigation opportunities must be discussed in statewide plans. This mandate provides an opportunity to shift toward a more strategic approach to identifying environmental mitigation measures. SAFETEALU requires coordinated research on environmentally sensitive areas with responsible state and federal agencies.

The HSTP offers a way to rebuild the planning process to offer a more strategic approach involving multi-agency coordination at an early stage. HSTP proposed the Integrated Sub-Area Planning approach, or ISP to accomplish this objective. The COTS offers an opportunity to include some of the ISP principles.



ISP links strategic planning to project implementation. ISP starts with the coordination of transportation and land use. Sub-areas are identified for the next step – the visioning process. An impact analysis is conducted for each subarea. Mitigation opportunities are identified for use in environmental assessments and EIS's.

II. **Statewide Pedestrian Master Plan, May 2013**

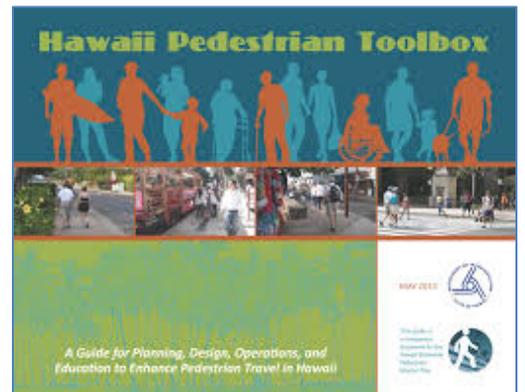
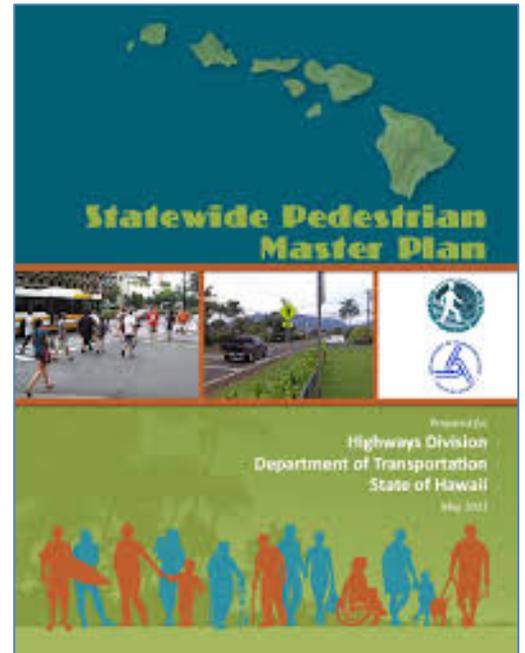
The purpose of the *Hawaii Statewide Pedestrian Master Plan* is to improve pedestrian safety and enhance pedestrian mobility on state highways, so it doesn't address City streets, but it has content applicable to the COTS.

The need for the state plan comes from the high level of pedestrian fatalities in Hawaii, as identified in the Hawaii Strategic Highway Safety Plan. The Alliance for Biking and Walking listed Hawaii as the 8th highest state in the nation for overall levels of bicycling and walking, but 30th for pedestrian safety. According to the plan report between 2005 and 2007, the state of Hawaii had an average of 5.5 pedestrian deaths per 10,000 pedestrians, while the national average was 5.6. Most pedestrian fatalities occurred in urbanized areas and most have involved a pedestrian 65 years or older.

Many pedestrian crashes involved collisions between pedestrians and vehicles in crosswalks. The Hawaii Statewide Pedestrian Master Plan helps prioritize pedestrian infrastructure improvements and programs throughout the state and promote the Complete Streets vision for the state. None of these locations are in the COTS area.

The most valuable component of the *Hawaii Statewide Pedestrian Master Plan* is the companion document, the Hawaii Pedestrian Toolbox. This is a 444-page showcase of best practices (national and international) for planning, design, and operation of pedestrian facilities based on a compilation of adopted guidance from around the world.

The toolbox directly supports the policy framework (vision, goals, and objectives) of the *Statewide Pedestrian Master Plan* and addresses many of the specific issues raised in the study analysis. The toolbox is organized into subject matter sections that practitioners can quickly reference to find the guidance they need for their project. Section 2 addresses "Pedestrian-Friendly Streets" including Complete Streets, Sustainable Streets, Green Street and Shared Streets (also referred to as Home Zones, Keala O Ke Ola, Living Streets and Woonerfs in various City Neighborhood Plan documents).



The plan's development included 11 public workshops. None were held in Central Oahu. The closest was held in Kapolei. Thirty-one pedestrian projects were ranked for the entire state. Thirteen were identified for Oahu. The one for Central Oahu is just outside the COTS project area, but is worthy of mention. It is the sixth overall ranked project in the state.

The Central Oahu *Hawaii Statewide Pedestrian Master Plan* project is located at Kamehameha Highway between Avocado Street and Kilani Avenue. The project description was to investigate the signal phasing. This was to address a serious problem along Kamehameha Highway, between Avocado Street and Kilani Avenue. The problem at this location was described as follows:

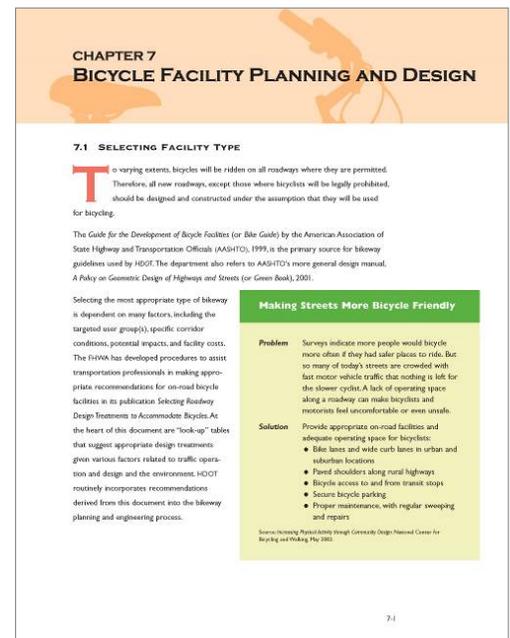
Between 2004 and 2008, there were ten pedestrian crashes that occurred on this section of Kamehameha Highway. Six of them occurred at the intersection of the Kamehameha Highway and Olive Avenue. Most crashes occurred in the crosswalk when there was a conflict between turning vehicles and pedestrians crossing. Left turns from Kamehameha Highway onto Olive Avenue are protected but vehicles are also allowed to make the left turns on green when it is permissive.²¹

III. Bike Plan Hawaii Master Plan, 2003

Bike Plan Hawaii 2003 updates the previous plan completed in 1994. Chapter 7 of the plan addresses bicycle facility planning and design. It refers to the Guide for the Development of Bicycle Facilities (or Bike Guide) by the American Association of State Highway and Transportation Officials (AASHTO), 1999, as the primary source for bikeway guidelines used by HDOT. The department also refers to AASHTO's more general design manual, A Policy on Geometric Design of Highways and Streets (or Green Book), 2001.

Chapter 7 outlines the procedures used to identify the right type of bikeway. It states that bikeway selection is dependent on the targeted user groups, specific corridor conditions, potential impacts, and facility costs. The Federal Highway Administration (FHWA) has developed procedures to assist transportation professionals in making appropriate recommendations for on-road bicycle facilities in its publication *Selecting Roadway Design Treatments to Accommodate Bicycles*.

At the heart of this document are "look-up" tables that suggest appropriate design treatments given various factors related to traffic operation and design and the environment. HDOT routinely incorporates recommendations derived from this document into the bikeway planning and engineering process.



The specific corridor conditions listed in Chapter 7 include the environment, on-street parking, traffic volume, traffic speed and the amount of heavy vehicle traffic. It introduces the concept of “bicycle boulevards” where residential streets are designated for bicycle use rather than more heavily traveled arterials. It describes “bicycle boulevard” treatments including removal of stop signs and introduction of traffic calming measures. It identifies the Honolulu’s Young Street Park Boulevard as the prototype for design.

Chapter 7 includes bike lane design details for cross sections and at intersections. The minimum recommended width is 5-feet or 4-feet exclusive of the gutter.

Chapter 8, Plan Implementation Strategies, identifies three projects for the County of Hawaii: 1) Alii Drive, 2) Kanoelehua Avenue and 3) Akoni Pule Highway. All of these were to be completed by the year 2000.

5.0 Koa Ridge Documents

This chapter reviews the major developments that have been proposed, are under review and/or have been approved. The major project that is nearing construction is Koa Ridge Makai.

I. Background

The master plan for the Koa Ridge community consists of separate development areas known as Koa Ridge Makai and Waiawa. Figure 5-1 shows the location and area maps of Koa Ridge and Waiawa developments. The combined project is a master-planned, mixed-use residential community in Central Oahu with commercial, light industrial and health care components.

Plans to move forward with the current development were initiated in the late 1990s to meet anticipated future demand for a wide range of housing opportunities in a new master planned community in Central Oahu. A petition was submitted to the State Land Use Commission together with a preparation notice for a combined Environmental Impact Statement (EIS) for the Koa Ridge Makai and Waiawa developments. The EIS was prepared in support of a State Land Use District Boundary Amendment petition and a subsequent zone change application for the Koa Ridge Makai and Waiawa areas.

The proposed site of the master-planned community is located in Waipio and Waiawa, Oahu. It consists of approximately 766 acres of land in two separate areas: Waiawa and Koa Ridge Makai. The Waiawa area is located east of the H-2 Freeway, east of the Waipio Interchange, and adjacent to and northwest of the proposed Waiawa Ridge development. The Koa Ridge Makai (also referred to as Koa Ridge in the following discussion) area is located north of the Waipio Business Park and west of the H-2 Freeway.

According to documents submitted in support of the petition to the State Land Use Commission the Koa Ridge master planned community will include the following:

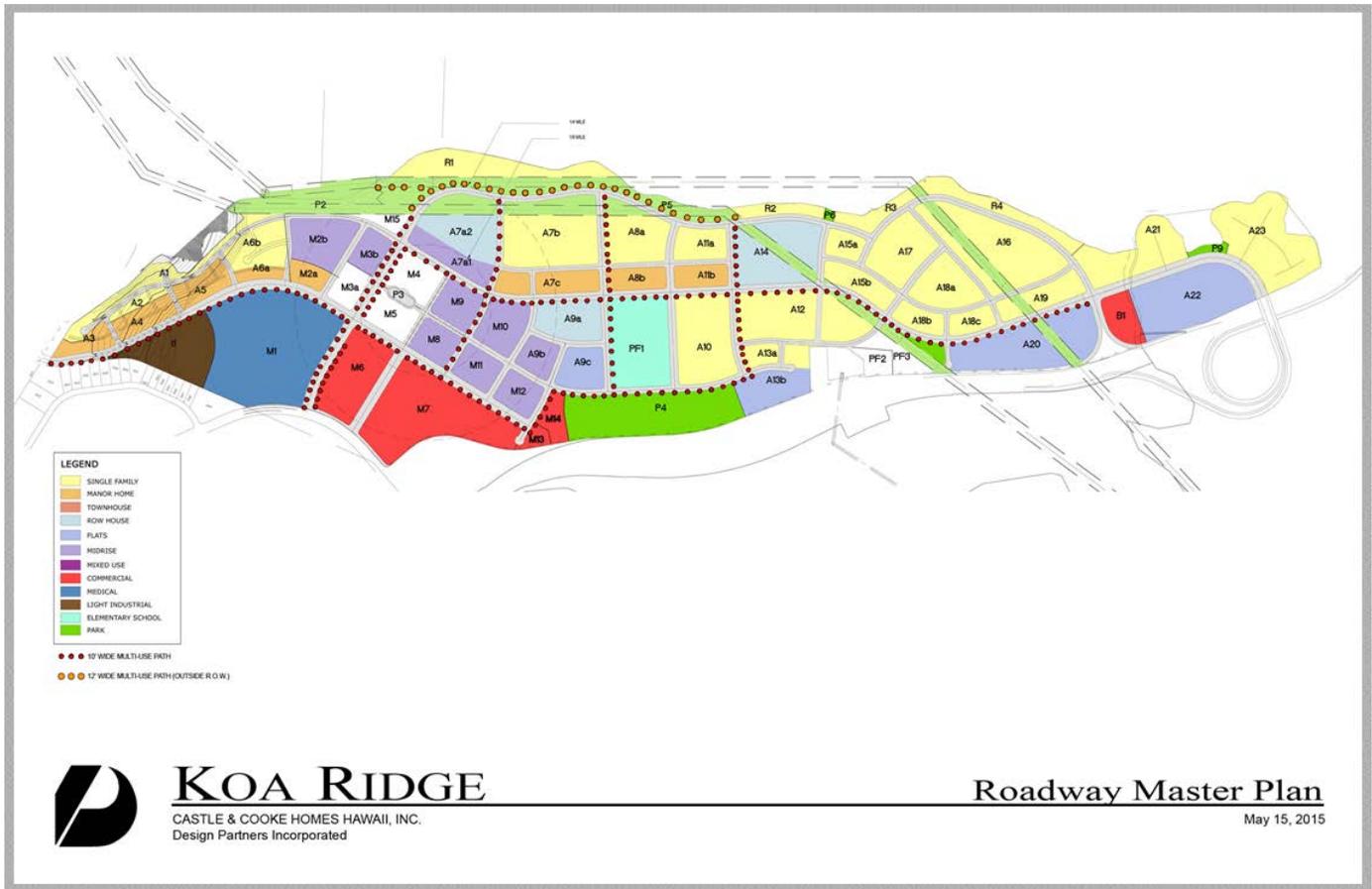
“a mix of approximately 3,500 single-family homes and multi-family units, school site, neighborhood and community commercial sites, light industrial uses, church/day care centers, recreational centers, community parks, park and ride facilities, and a health care component. The development will feature generous landscaping and open space. The new community will be one that is safe and walkable, where residents can live, work and recreate in a vibrant and healthy master-planned, sustainable community encompassing principles consistent with ‘smart growth’”.

II. Project Description

Koa Ridge Makai provides a master-planned mixed use community that features a health care component providing comprehensive health care and wellness services and facilities. The development encompasses approximately 575 acres and will include approximately 3,500 homes balanced by the employment-generating health care, commercial, light industrial and educational facilities. A mix of multi-family and single-family homes is planned.

Multi-family housing is planned near the village center, employment centers, schools and services and in close proximity to the entry points at the makai and mauka ends of the site. Figure 5-2 presents the overall plan for Koa Ridge Makai.

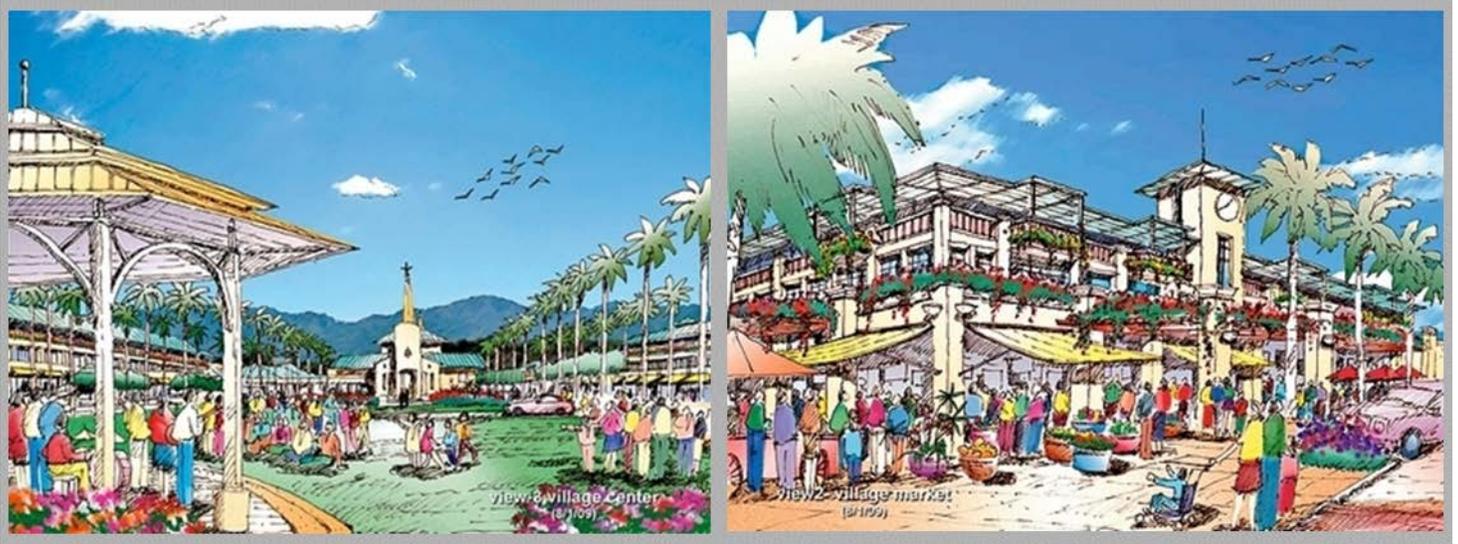
Figure 5-2: Koa Ridge Makai Roadway Master Plan
(Source: Castle & Cooke Homes, Hawaii, Inc.)



A key element of the community is the mixed-use "Village Center" area that is planned as the social and community focus conceptually depicted in Figure 5-3. The commercial and health care components will be integrated with the village center, which in turn will be linked by pedestrian pathways to the residential areas.

A mix of uses and higher densities around the village center encourage walking and bicycling rather than the use of the private automobile. Senior housing is an integral part of the village center to facilitate convenient access to retail services and health care. Neighborhoods designed around planned schools, community centers and churches also increase the opportunity to walk rather than drive for short trips.

Figure 5-3: Koa Ridge Village Center
(Source: Castle & Cooke Homes, Hawaii, Inc.)



Koa Ridge Makai provides pedestrian access along the edge of Kipapa Gulch and within utility easements. A spine road with pedestrian and bike trails alongside will link the makai end of Koa Ridge Makai to the mauka end of the property. The health care component will encompass approximately 28 acres for medical and health care facilities, which may include a hospital, skilled nursing, physicians' office building, diagnostic and testing center, and other medical and wellness facilities.

Waiawa encompasses approximately 191 acres adjacent to the proposed Waiawa Ridge development. Primary access to the community is provided along a spine road. The central portion of the site will feature a community center with neighborhood retail, a neighborhood park, and an elementary school site with 1,200 multi-family homes located within walking distance of these activities. Lower density homes consisting of approximately 300 single-family residences are located along the spine road extending to the mauka end of the site. The development of Waiawa is dependent on the progress of infrastructure development including transportation access at the adjacent Waiawa Ridge community that will serve both projects.

III. Traffic Impact Analysis Report for the Koa Ridge Makai and Waiawa Development

The purpose of the Traffic Impact Analysis Report for Koa Ridge Makai and Waiawa Development (hereinafter referred to as the Koa Ridge TIAR) was to identify and assess the traffic impacts resulting from the proposed Castle & Cooke Koa Ridge Makai and Waiawa Developments located in Central Oahu and serve as an update to the traffic report dated May 2012. Koa Ridge TIARs were also prepared dated in 2008, 2009 and 2010.

Access to Koa Ridge is through new roadway connections at Ka Uka Boulevard west of the Waipio Interchange, a proposed new freeway interchange along the Interstate H-2 Freeway at the existing Pineapple Road Overpass, and a temporary connection on Kamehameha Highway north of Ka Uka Boulevard. Primary access to the proposed Waiawa development would be through a new eastward extension of Ka Uka Boulevard east of the Waipio Interchange along the Interstate H-2 Freeway. The most recent July 2014 Koa Ridge TIAR evaluated traffic conditions of several development scenarios including the initial development of Koa Ridge Makai without the development of the Waiawa portion until later in the future.

III.1 Methodology

Previous Koa Ridge TIARs were based on internal trip capture rates during the peak periods of traffic, reflecting trip interactions between the various uses within the proposed development, availability of multiple travel mode choices, and other potential incentives to reduce project-related vehicular traffic generation on the external roadways in the vicinity. The initial Koa Ridge TIAR assumed an internal trip capture at 30%. However, following discussions with HDOT, a 15% cumulative total internal capture rate during peak periods was incorporated to represent a pessimistic assumption.

The most recent Koa Ridge TIAR incorporated a northbound loop on-ramp as a key roadway improvement at the Waipio Interchange to mitigate projected adverse traffic impacts as a result of the projects in the vicinity. Although other alternatives including several interchange configurations were investigated for the Waipio Interchange to address projected traffic demands, Castle & Cooke Homes Hawaii and the HDOT have agreed in concept to the northbound loop on-ramp alternative as one of the mitigating measures in the vicinity of the project.

The Koa Ridge TIAR was prepared in conjunction with an Incremental Development Plan, an updated phased schedule of development with Koa Ridge Makai developed as the First Increment and Castle & Cooke Waiawa as the Second Increment. The adjacent Waiawa Ridge Development must initially construct a roadway extension of Ka Uka Boulevard towards the east and across Panakauahi Gulch. The development of this roadway is entirely dependent on the Waiawa Ridge Development. Given the uncertainty of the Waiawa Ridge Development's schedule for the construction of this roadway, Castle & Cooke Homes Hawaii proposes to proceed independently with its Koa Ridge Makai development to be completed by Year 2025.

III.2 Existing Pre-Development Conditions

Most of the intersections and movements are functioning at acceptable levels of service for urban areas (Level of Service D or better). Problem intersections include Ka Uka Boulevard and Moaniani Street, particularly the northbound approach during the PM peak period, and Kamehameha Highway and Waipahu Street in the eastbound approach during the PM peak period.

The H-2 Freeway segments to the south and north of the Waipio Interchange as well as Waipio Interchange on- and off-ramps were evaluated. All of these segments operate at acceptable levels of service.

The Koa Ridge TIAR analyzed travel time for Central Oahu freeway commuters. The amount of time it takes a commuter to travel between the Mililani Interchange with H-2 and the Kaahumanu Street Overpass of H-1, a distance of about 7.5 miles, was used in the analysis. This segment spans the H-1 and H-2 merge at the Waiawa Interchange, considered to be one of the most congested segments of the freeway system. It currently takes between 8-16 minutes in the morning peak period heading southbound (8 minutes or less before 5 AM and after 8 AM, with the longest time (16 minutes) occurring about 6:30 AM). The afternoon peak period of traffic heading northbound experiences less delay with travel times consistently in the range of 7-9 minutes. Traffic conditions during these periods include southbound vehicles queuing on H-2 about 4,000 feet up the H-2 freeway from the Waiawa Interchange and eastbound vehicles queuing along H-1 freeway back to the Paiwa Interchange.

III.3 Future Pre-Development Conditions

Travel forecasts were based upon the average annual vehicle traffic growth rate described in ORTP 2035. Annual growth factors of 1.035 and 1.06 were derived and applied to the existing through traffic demands along the Interstate H-2 Freeway, Ka Uka Boulevard, and Kamehameha Highway to establish projected Year 2020 and Year 2025 traffic demands using 2013 as the base year.

The adjacent Waiawa Ridge Development is anticipated to generate an external total of approximately 3,489 trips and 5,661 trips during the AM and PM peak hours of traffic, respectively, based on Institute for Transportation Engineers (ITE) trip generation rates and procedures. These resulting external trips were assigned to the street network in the project vicinity to account for trips generated by the proposed Waiawa Ridge Development. Castle & Cooke Homes Hawaii and Waiawa Ridge Development have initiated discussions towards formulating a cost-sharing agreement to fund and construct Waipio Interchange improvements to mitigate the combined impacts of the developments. These improvements are therefore considered committed projects.

The future pre-development analysis incorporated projected 2020 traffic demands over existing roadway facilities. The necessary roadway and intersection improvements to mitigate traffic operational deficiencies under this scenario included the following:

Ka Uka Boulevard/Interstate H-2 Northbound On-Ramp

- Modify eastbound approach of Ka Uka Boulevard at the northbound on-ramp to provide an exclusive left-turn lane and shared left-turn/through lane. Widen the northbound on-ramp to accept two left-turn lanes.
- Modify traffic signal system and operation to accommodate lane changes.

Ka Uka Boulevard/Interstate H-2 Southbound On-Ramp

- Two exclusive right-turn lanes and a through lane on the eastbound approach of the Ka Uka Boulevard.

Ka Uka Boulevard/Interstate H-2 Southbound Off Ramp/Moaniani Street

- Two exclusive left-turn lanes and two through lanes on the westbound approach of Ka Uka Boulevard.

- Two southbound departure lanes along Moaniani Street to accept the double left-turn lanes from westbound Ka Uka Boulevard.
- Additional eastbound lane on Ka Uka Boulevard between Moaniani Street on the southbound on-ramp of Waipio Interchange.
- Provide a channelized right-turn lane on the northbound approach of Moaniani Street.

Kamehameha Highway/Lumiaina Street

- Provide an additional eastbound left-turn lane that results in an exclusive left-turn lane, a shared left-turn/through lane, and an exclusive right-turn lane on Lumiaina Street.
- Modify traffic signal system to permit split phases for the eastbound and westbound approaches of Lumiaina Street.

Kamehameha Highway/Waipahu Street

- Restripe the eastbound approach of Waipahu Street that results in separate left-turn and right-turn lanes.
- Modify traffic signal timing to permit overlap phasing for the eastbound right-turn movements.

Based on the implementation of the intersection and roadway improvements discussed above, the two existing problem intersections (Kamehameha Highway at Lumiaina Street and Kamehameha Highway at Waipahu Street) are within acceptable capacity levels. Traffic conditions in Year 2020 along the H-2 Freeway and Waipio Interchange remain within acceptable levels of operation with the implementation of the committed Interchange and ramp improvements identified above.

III.4 Future Development Impacts and Mitigations

The probable impacts and mitigations of the projected Year 2020 and 2025 traffic volumes with Koa Ridge Makai and Waiawa Developments were identified using standard Institute of Transportation Engineers (ITE) trip generation and distribution methods.²² Adjustments were applied based on the type of development envisioned. There is dispute over how much of an adjustment should be made and the implications of such adjustments.

Although it is believed that the Koa Ridge project's plans which advocate mixed use, compact development, and a pedestrian/transit emphasis would reduce the external vehicular trips generated by the project, a more vehicle emphasis assumption of 15% total reduction of site-generated trips was assumed for the vehicle traffic analysis due to concerns expressed by the HDOT regarding a general lack of Hawaii experience in mixed use and transit-oriented developments to fully justify higher trip reduction rates experienced in other mainland states. The concern was that an overly optimistic estimate could result in insufficient roadway improvements. This methodology assumption should be addressed by the COTS.

Based upon the traffic impact analysis Castle & Cooke Homes Hawaii has committed to fund and construct the following additional improvements to mitigate potential roadway deficiencies as a result of the development of Increment 1, Phase 1, under the Year 2020 scenario with the proposed development:

Ka Uka Boulevard/Interstate H-2 Northbound Off Ramp

- Modify traffic signal system and operations to provide split phasing.

Ka Uka Boulevard/Interstate H-2 Southbound Off-Ramp/Moaniani Street

- Provide additional lane on the southbound approach that results in an exclusive left-turn lane, an exclusive through movement lane, and an exclusive right-turn lane.
- Modify traffic signal timing to provide simultaneous left-turn movements for the northbound and southbound approaches.

Ka Uka Boulevard between Moaniani Street and Commercial Driveway/Spine Road

- Provide an additional westbound lane between the Interstate H-2 southbound freeway off-ramp and Spine Road.

Ka Uka Boulevard/Commercial Driveway/Spine Road

- Provide two lanes on the southbound approach of Spine Road that result in an exclusive left-turn lane, and a shared left-turn/through/right-turn lane.
- Provide two exclusive left-turn lanes on Ka Uka Boulevard eastbound approach.
- Maintain two eastbound lanes on Ka Uka Boulevard eastbound approach.
- Signalize intersection and provide protected left-turn phase on Ka Uka Boulevard and protected phase on the Spine Road approach.

Kamehameha Highway/Ka Uka Boulevard

- Provide two exclusive left-turn lanes, a through movement lane, and an exclusive channelized right-turn lane on the westbound approach.

Kamehameha Highway North of Ka Uka Boulevard

- Additional northbound lane on Kamehameha Highway between Ka Uka Boulevard and new temporary project access.
- Construct new right-in, right-out temporary project access on Kamehameha Highway just north of Ka Uka Boulevard.

Commute times are projected to increase. Morning peak period commute times between Mililani Interchange and the Kaahumanu Street Overpass would increase from 8-16 minutes in the morning peak period (existing condition) to between 10-20 minutes (6:30 AM continues to represent the slowest time period). Traffic conditions during these periods include vehicles southbound queuing on H-2 about 8,000 feet up from the H-2/H-1 merge. The simulation reflects existing roadway configurations (e.g., no improvements to the roadway infrastructure or consideration of the City's rail transit project). It is expected that travel time would reduce when incorporating these factors.

The cumulative traffic volumes that were analyzed consisted of project-generated vehicle traffic superimposed over Year 2025 projected vehicle traffic demands. The implementation of intersection and roadway improvements identified above for the Year 2020 analysis scenario is also assumed. Under the Year 2025 scenario, Castle & Cooke Homes Hawaii has committed to fund and construct the

following additional improvements to mitigate potential roadway deficiencies as a result of the development of Increment 1, Phase 2, and Increment 2, under the Year 2025 scenario with the proposed development:

Ka Uka Boulevard/Commercial Driveway/Spine Road

- Provide an additional lane on the southbound approach of Spine Road that result in two exclusive left-turn lanes and a shared through/right-turn lane.

Interstate H-2 Freeway at Pineapple Road Overpass

- Construct freeway interchange including associated on- and off-ramps. When the interchange is operational and functional, close the temporary project access located along Kamehameha Highway as required by HDOT.

The predominant traffic volumes would continue to occur in the westbound direction as a result of significant future developments expected on the west side of the island during the afternoon peak periods. Along the westbound Interstate H-1 Freeway, traffic queues would continue to extend upstream through the Waiau Interchange and beyond the Halawa Interchange. Just east of the Waiawa Interchange, the westbound lanes of the Interstate H-1 Freeway segment would operate at capacity during the projected afternoon peak periods of traffic for both Year 2020 and Year 2025. should be noted that this does not consider planned improvements such as that proposed in HDOT's Highway Modernization Program, including a PM Contraflow Lane and construction of an additional eastbound lane on the H-1 between Waiau and Halawa.

Commute time in 2025 will increase slightly over 2020 conditions with the project. Morning peak period commute times between Mililani Interchange and the Kaahumanu Street Overpass would increase from 10-20 minutes in the 2020 morning peak period to between 11-22 minutes in 2025 (5:45AM represents the slowest time period). Traffic conditions during these periods include vehicles southbound queuing about 10,000 feet up H-2 from the H-2/H-1 merge.

In addition, the proposed Waiawa Ridge development is planned for Central Oahu, east of the Interstate H-2 Freeway and immediately south of the proposed Castle & Cooke Waiawa development in Waipio. Access to the Waiawa Ridge development will be provided via an extension of Ka Uka Boulevard, east of the Interstate H-2 northbound on- and off-ramp junction. Based on past discussions with Waiawa Ridge Development representatives, the proposed Waiawa Ridge project may include a mix of single-family and multi-family residential units (total of approximately 5,000 units), as well as, 770,000 square feet of commercial uses representing the primary trip generating components of the project. However, the timeframe for the Waiawa Ridge development is unknown. In any case, to represent a worst- case scenario in terms of traffic demands in the region should the Waiawa Ridge development proceed, it is assumed that the Waiawa Ridge project could start in Year 2022. Therefore, information identified in the associated traffic study titled "Waiawa Gentry Phase 2 Traffic Study" dated December 2001, and its supplemental report dated February 2002 were incorporated in the analyses and included the implementation of traffic mitigation measures for the region. Discussions between Castle & Cooke Homes Hawaii and Waiawa Ridge Development representatives or associated entities to formulate an Agreement to fund and implement improvements are anticipated to continue in the future when specific timing and cost information are better known. These improvements are therefore considered to be implemented by Castle & Cooke Homes Hawaii and/or Waiawa Ridge Development or associated entities. These additional roadway improvements include the following:

Ka Uka Boulevard/Interstate H-2 Northbound Off-ramp

- Relocate ramp junction to align with the existing Cemetery Road.
- Provide an exclusive left-turn lane, shared left-turn/through lane, and two exclusive right-turn lanes on the northbound approach.
- Provide two through lanes on the eastbound approach.
- Provide two through lanes and a shared through/right-turn lane on the westbound approach.
- Provide an exclusive southbound right-turn lane on the southbound approach.
- Provide traffic signal system with northbound/southbound split phasing operation.
- Extend Ka Uka Boulevard eastbound to provide access to the Waiawa developments.
- Provide four eastbound departure lanes serving two eastbound lanes on Ka Uka Boulevard and two lanes from the northbound off-ramp.

Interstate H-2 Freeway Waipio Interchange Northbound On-ramp

- Construct a northbound loop on-ramp in the southeast quadrant of the Waipio Interchange.
- Provide one through lane and a shared through/right-turn lane on the eastbound approach of the northbound loop on-ramp/Ka Uka Boulevard diverge point.
- Reconfigure the Waipio Interchange Overpass to provide three westbound through lanes along with other eastbound lane requirements.

Ka Uka Boulevard/Interstate H-2 Freeway Southbound Loop On-ramp

- Construct a southbound on-ramp in the northwest quadrant of the Waipio Interchange.
- Provide one through lane, a shared through/right-turn lane, and an exclusive right-turn lane on the westbound approach of the loop on-ramp at the Ka Uka Boulevard diverge point.
- Provide one through lane, a shared through/right-turn lane, and an exclusive right-turn lane on the eastbound approach of the direct southbound on-ramp at the Ka Uka Boulevard diverge point.

The Koa Ridge TIAR is a valuable baseline for COTS. To be most useful the projects identified above need to be organized and inventoried so that they can be compared to other projects in other studies and plans. Table 5-1 was prepared to do this. Table 5-1 includes all roadway projects identified in the Koa Ridge TIAR. Each project has a title (with a unique number and the associated major road), location (with the project area and the beginning and ending limits of the project). The table provides the project characteristics (type, function, length, lanes, sidewalk, bike, bus, cost and timing) and includes source documentation (COSCP, ORTP, other special studies that may apply and whether the project is assumed to be included without or with the project).

Table 5-1: Koa Ridge Roadway Master Plan & Traffic Impact Analysis Report Projects
List of Projects Considered by Project Title and Location
(Source: Castle & Cooke Homes, Hawaii, Inc.; TIAR, July 2014)

(SEE ATTACHMENT Table 5-1)

Table 5-3 also includes the project's responsible party (HDOT, City, HART and private). The projects are generally by the way they are presented in the Koa Ridge TIAR with some liberty taken with abbreviating the precise project description so that they can fit into a master table presented in the next chapter ([6.0 List of Transportation Projects Identified in Previous Studies](#)) that adds transportation projects from other sources.

The Koa Ridge TIAR offered other strategies to reduce traffic demands in the region and improve traffic operations. These Transportation Demand Management (TDM) strategies are related to land use planning concepts and operations of the individual land uses.

III.5 Factors Influencing Future Development Impacts and Mitigations

The Koa Ridge TIAR identified other factors influencing the impacts and mitigations of future development. The Honolulu High-Capacity Transit Corridor Project (HHCTCP) is intended to increase east-west mobility on Oahu's most heavily congested corridor. As described in the HHCTCP EIS, the transit project is intended to:

- provide faster, more reliable public transportation service than can be achieved with buses operating in congested mixed-flow traffic
- provide reliable mobility in areas of the corridor having with people of limited income, an aging population and rapidly developing areas
- provide additional transit capacity and an alternative to the automobile, and
- moderate anticipated traffic congestion in conjunction with other improvements included in ORTP 2035.

The funded rail transit system alignment does not extend to Central Oahu, however, Central Oahu commuters would benefit to the extent that the Interstate H-1 freeway corridor from Kapolei to the Waiawa Interchange experiences capacity relief and there is a reduction in traffic congestion on the H-1 Freeway to and from the west. The HHCTCP EIS reports that total congestion would be reduced by 23 percent with the transit improvements.

Although not directly served by the rail system, Central Oahu commuters can make use of a complementary system to realize the benefits of travel mode choices afforded to those along the proposed route. This would be in the form of transit system feeder buses or shuttles traveling between established and planned park-and-ride facilities and the rail transit stations. The current community service and long haul bus routes would need to be modified to provide connections between users and these stations. Existing park-and-ride lots in Central Oahu and existing and proposed bus transit stations could be integrated with the high-capacity transit system with modified shuttle services supporting the high-capacity transit system.

A major transit station and supporting park-and-ride facility are planned in the vicinity of the Pearl Highlands Shopping Center (Kamehameha Highway at Kuala Street). The Pearl Highlands Station on approximately 11 acres will have a parking structure with approximately 1,600 parking stalls for Park-and-Ride commuters. Central Oahu commuters will benefit from the construction of a new direct access ramp from the H-2 Freeway. The ramp connection will allow both bus transit vehicles and park-and-ride automobiles direct access with the proposed Pearl Highlands Transit Station park-and-ride lot. Of all the stations along the rail route, the Pearl Highlands Station is expected to have the highest number of boardings in the morning two-hour peak period. The Park-and-Ride Lot at Pearl Highlands with 1,600 stalls is the largest of four proposed park-and-ride lots, and is the only one with structure parking.

The transit project's construction phasing has the East Kapolei to Pearl Highlands segment as the first of four phases of development. Central Oahu commuters thus would be one of the early beneficiaries of the rail transit project. Upon build-out of the system, Central Oahu commuters can be expected to benefit from the following transit project effects:

- improved transit service mobility, reliability, equity, and access,
- decline in vehicle miles traveled, vehicle hours traveled, and vehicle hours of delay, and
- improved transit travel times between major employment centers in Downtown and West Oahu.

A number of regional transportation projects are planned in the vicinity of Koa Ridge that are in various stages of planning and implementation. These projects are identified in ORTP 2035. The following are transportation projects in the region identified in ORTP 2035.

The proposed Interstate H-1 Freeway widening project of the westbound lanes between Waiiau Interchange and the Waiawa Interchange includes improvements to provide an additional travel lane in the westbound direction for general-purpose use. This segment of the freeway includes five existing westbound lanes. An additional lane would provide a total of six westbound travel lanes east of the Waiawa Interchange. During the morning peak period of traffic, the deployment of the eastbound zipper lane utilizes two of the westbound lanes resulting in a total of three westbound lanes at this freeway section. Near the Waiawa Interchange, two of the resulting three westbound lanes are used for the Waipahu exit and connections to the northbound Interstate H-2 Freeway. The remaining single lane services all of the westbound traffic beyond the Waiawa Interchange during the morning peak periods of traffic. Immediately east of the Waiawa Interchange during eastbound zipper lane deployment, there are three westbound lanes. During periods other than the morning peak, the additional lane would provide a total of six westbound lanes immediately east of the Waiawa Interchange and four westbound lanes through the interchange, with two westbound lanes transitioning to the northbound Interstate H-2 Freeway. The ORTP identifies this project as a congestion relief project and is characterized as an Illustrative Project. An Illustrative Project may be considered as a potential project in the regional transportation plan that could prove beneficial as a transportation improvement and is considered as a high priority project for potential inclusion to the regional transportation plan should funding become available. However, Illustrative Projects are not considered part of the official regional transportation plan. Therefore, no timeframe or funding source is listed in the ORTP for these types of projects.

The proposed Interstate H-1 Freeway widening project of the westbound and eastbound lanes between Waiawa Interchange and Paiwa Interchange includes improvements to provide an additional general-purpose travel lane in the westbound direction and accompanying freeway shoulder improvements. The additional lanes would serve as a continuation of the freeway widening efforts along the Interstate H-1 Freeway providing additional freeway capacity in both directions. The additional lanes would improve westbound and eastbound traffic flow through the freeway section during all periods of the day. The ORTP identifies this project as a congestion relief project to be implemented within a 2020 timeframe.

The Interstate H-1 Freeway Waipahu Street westbound off-ramp widening project includes the construction of an additional off-ramp lane to facilitate traffic movement exiting the freeway. The additional off-ramp lane would connect to westbound Kamehameha Highway/Farrington Highway with direct access to Waipahu town and surrounding communities. During the existing afternoon peak hours of traffic, the off-ramp is generally congested with vehicles exiting the freeway. The congestion oftentimes impedes traffic flow in the westbound and northbound directions. An additional off-ramp lane would provide increased capacity resulting in improvements to both westbound and northbound traffic flows of the Interstate H-1 and H-2 Freeways, respectively. The ORTP identifies this project as a congestion relief project to be implemented within a 2020 timeframe.

The Interstate H-2 Waipio Interchange on- and off-ramps, and Ka Uka Overpass widening project includes the widening of the ramps to facilitate traffic movements through the interchange. These improvements include separate turning lanes and intersection modifications that will provide additional storage capacity and improved traffic flow at the ramp junctions of the interchange. In addition, this project includes the widening of the Ka Uka Overpass to include a total of seven lanes and includes the extension of existing turning lanes or provisions for separate turning lanes providing additional storage capacity at the on- and off-ramp intersections. These improvements are intended to improve intersection operations at the ramp junctions and provide additional capacity to accommodate increased traffic demands. The ORTP identifies this project as a congestion relief project to be implemented within a 2020 timeframe.

The Interstate H-1/H-2 Merge Eastbound Transition Lane project is to improve the merging characteristics between the southbound Interstate H-2 Freeway and the eastbound Interstate H-1 Freeway with additional transition lanes. The Interstate H-1 and H-2 merge is the convergence of three southbound lanes on the Interstate H-2 freeway and three eastbound lanes on the Interstate H-2 to a total of five lanes. The bottleneck condition in addition to the eastbound Waipahu on-ramp traffic demands oftentimes result in queuing at the Waiawa Interchange on both the southbound Interstate H-2 and eastbound Interstate H-1 freeways during the morning peak periods of traffic. The removal of the bottleneck condition is expected to improve southbound and eastbound traffic flows on the freeways. The ORTP also identifies this project as a congestion relief project and is characterized as an Illustrative Project. Therefore, no timeframe is set in the ORTP for these types of projects.

The proposed Interstate H-1 Freeway widening project of the eastbound lanes between Waiawa Interchange and the Halawa Interchange includes improvements to provide an additional general purpose travel lane in the eastbound direction and associated freeway shoulder improvements. Currently, portions within this section of freeway include a shoulder lane used by motorists during restricted morning peak periods of traffic, providing added freeway capacity. The existing shoulder lane will be upgraded to a general-purpose lane providing some increase in freeway capacity. Between the Waiawa Interchange and Waiawa Interchange, the widening of the freeway viaduct may be necessary to

accommodate an additional lane. New freeway shoulders will also be provided for clearances, drainage, and emergency uses. The new lane would be available to motorists throughout the day and is intended to improve traffic flow and increase safety through the freeway section for eastbound motorists. The ORTP identifies this project as a congestion relief project to be implemented within the 2021 and 2035 timeframe.

The Pineapple Road Interchange and Overpass Widening project is located along the Interstate H-2 Freeway between the Waipio Interchange and the Mililani Interchange. The project entails the development of a full-service freeway interchange to accommodate future developments in Central Oahu and surrounding regions. The project also includes the widening of the Pineapple Road Overpass from two lanes to four lanes to accommodate anticipated traffic demands at the interchange. Although the Castle & Cooke Waiawa Development is not expected to connect directly with the proposed Pineapple Road Interchange since there is no feasible connection available, the Koa Ridge Makai development proposes the construction of interchange ramps at this location to facilitate access for the development and relieve traffic demand at the Waipio Interchange. The ORTP identifies this project as a congestion relief project to be implemented within the 2021 and 2035 timeframe.

HDOT is pursuing a Kamehameha Highway widening project. The project includes the widening of the highway from a three-lane undivided roadway to a four lane divided roadway between Lanikuhana Avenue in Mililani and Ka Uka Boulevard in Waipio. The highway widening will provide added service capacity and improve safety along the alignment, and will provide a continuous four-lane roadway between Waipio and Mililani. The ORTP identifies this project as a congestion relief project to be implemented within a 2020 timeframe.

6.0 List of Transportation Projects Identified in Previous Studies

This chapter lists transportation projects identified in previous studies as a basis to start the COTS process of identifying the candidate projects that will be analyzed.

I. Initial List of Previously Identified Candidate Projects

The purpose of the review of the past studies and plans relevant to Central Oahu is to establish a foundation of sources from which a list of candidate projects can be created for the COTS. COTS will identify the relative impacts, at a conceptual planning level, of various transportation projects for Central Oahu to determine which choices should be explored further, and which, if any, should be dropped from further consideration.

COTS will determine if any of the proposed transportation alternatives for Central Oahu are likely to have positive net-benefits and, thus, may be worthy of further development, planning, and design. This project is not intended to be a detailed corridor study, but rather a general indicator of the broad impacts of each alternative.

II. Comprehensive List of Previously Identified Candidate Projects

The review of potential projects highlighted the need to assemble a more complete master list of all major transportation projects that have been considered in the past and documented in one of the studies or plans identified in this deliverable. Table 6-1 provides that list.

Table 6-1 includes all major transportation projects identified in previous studies. Projects are identified using a consistent methodology for all projects. Each project has a title (with a unique number and major road), location (with the project area and limits), characteristics (type, function, length, lanes, sidewalk, bike, bus, cost and timing), source documentation (COSCP, ORTP or special study) and the project's responsible party (HDOT, City, HART and private). The projects are organized by transportation mode or program (roadway, transit, bicycle, pedestrian, transportation demand management (TDM), Intelligent Transportation Systems (ITS) and Enhancement Projects (including Complete Streets)).

Table 6-1: List of Transportation Projects Identified in Previous Studies

(SEE ATTACHMENT Table 6-1)

7.0 Oahu Transportation User Surveys

This chapter reviews the Oahu transportation user surveys conducted by the COTS coordinating agencies relevant to Central Oahu since 2000 and the goals of the COTS. Other transportation user surveys conducted by other agencies are listed. Table 7-1 lists the surveys identified for review in Deliverable 1.4a. The surveys, agency, relevance to the Central Oahu area and COTS, and whether the database was acquired is shown in the table.

Table 7-1: Oahu Transportation User Surveys

Oahu Transportation User Surveys	Relevance to COTS		
	Relevant to Central Oahu Area	Relevant to Goals of COTS	Data Acquired
OahuMPO:			
OahuMPO 2012 Household Interview Travel Survey	✓	✓	✓
City and County of Honolulu:			
TheBus 2006 Transit Rider Database	✓	✓	✓
Hawaii Department of Transportation:			
Bike Plan Hawaii Master Plan - 2002 Telephone Survey	Further analysis required	Further analysis required	No, but report is available
Honolulu Authority for Rapid Transportation:			
Honolulu 2012 Onboard Transit Rider Survey	✓	✓	✓
United States Census Bureau:			
The American Community Survey	✓	✓	✓

The 2002 Telephone Survey as part of the *Bike Plan Hawaii Master Plan* listed under Hawaii Department of Transportation in the above table is not reviewed in detail. A total of 402 randomly selected participants included 237 from Oahu of which 94 were identified as from Central Oahu. The report did not provide responses to the survey by subarea and did not give results for each question on the questionnaire. Most of the information presented was for statewide responses. Of interest is that statewide 70 percent of the respondents indicated they would support changes to make Hawaii more bicycle friendly (68 percent from Oahu). Statewide, 73 percent of the respondents supported using government funds for bicycle improvements. Oahu respondents rated maintenance, bike paths, and bike parking as the most important from a list of ten ideas to improve the bicycling environment. These responses are important in that COTS is a multi-modal transportation study including the bicycle mode.

The following sections provide a description of each of the most relevant surveys listed in Table 7-1. These include the OahuMPO 2012 Household Interview Travel Survey, the American Community Survey and TheBus Transit Rider Survey.

7.1 The OahuMPO 2012 Household Interview Travel Survey

The primary objective of the OahuMPO 2012 Household Interview Travel Survey was to obtain travel behavior data from a representative sample of residents throughout Oahu to be used for the development and calibration of transportation models. The study region was broken up into four districts to ensure participation and coverage for the entire island of Oahu:

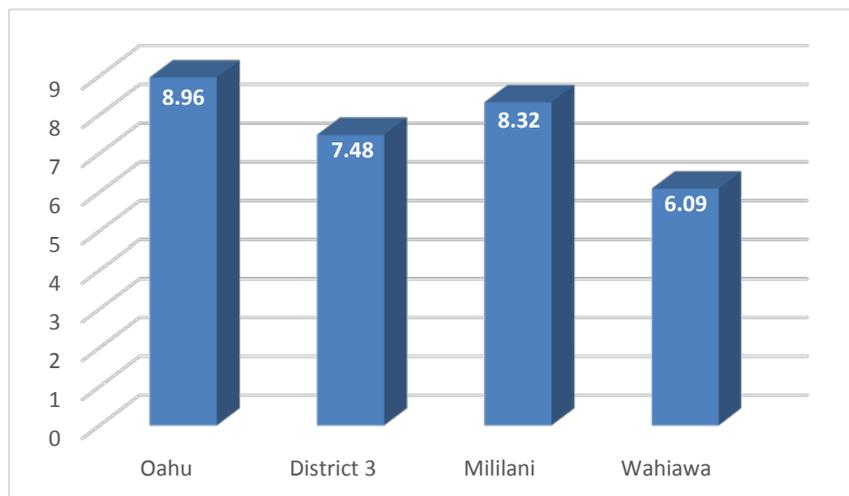
1. District 1: Pearl City to Hawaii Kai
2. District 2: Koolauloa, Koolaupoko, Kaneohe, and Kailua
3. District 3: Mililani, Waipahu, Wahiawa, Haleiwa, and Northshore
4. District 4: Ewa, Kapolei, and Waianae

The Oahu Household Travel Survey was conducted using standard travel survey methods and was designed to map all locations the participants visited in a specific 24-hour period. The details of each trip including mode of travel was included. Respondents provided demographic information about the household, its members, and vehicles. Household members were asked to record all travel-related details for a specific 24-hour period, including information for all locations visited, trip purpose, mode, and travel times.

The survey was conducted between November 2011 and May 2012. In total, 5,984 households were recruited to participate in the full study and 4,001 households provided travel data. The overall response rate was 53 percent. Of the 4,001 households, 833 were from District 3. District 3 includes households from Waipahu, Wahiawa, Mililani, Haleiwa, and Waiialua. Mililani households accounted for 381 of the total and Wahiawa had 133 participating households. Waipio households, included in the COTS area, are included in the District 3 sample as Waipahu households (of which there are 249 participants).

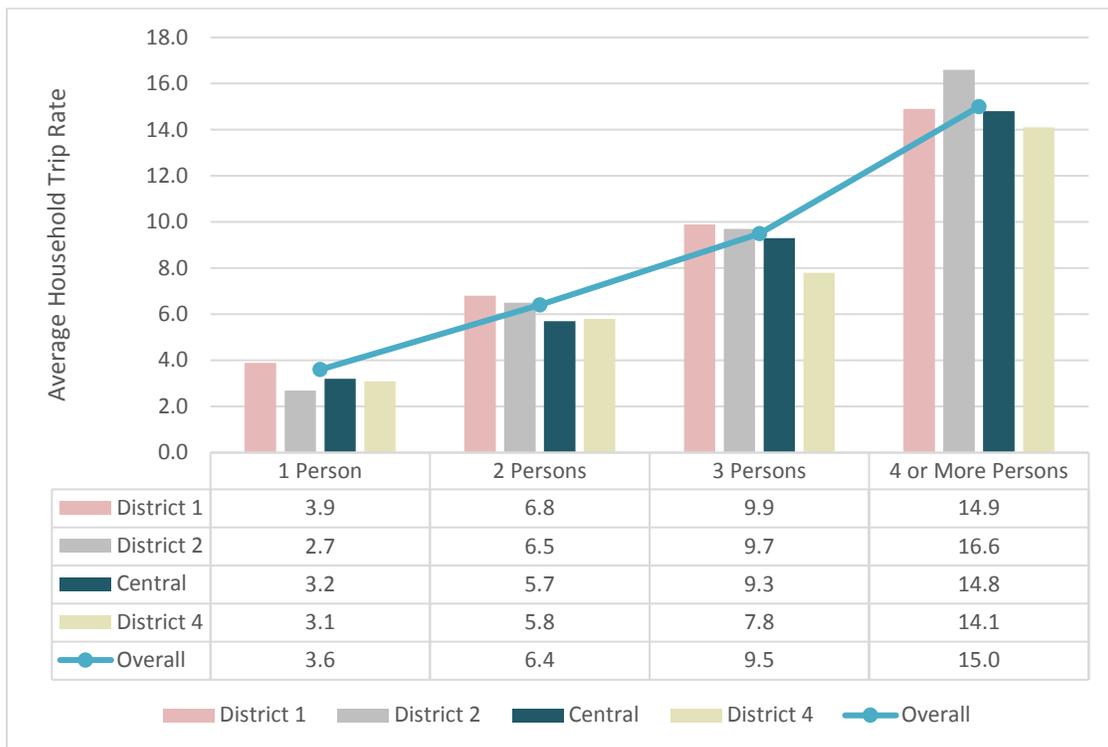
Figure 7-1 shows the average household trip rate for Oahu, District 3 (Central area as defined by the Household Travel Survey and the communities of Mililani and Wahiawa). These rates show that within Central Oahu there is a great variation of household trip making.

Figure 7-1: Average Household Trip Rates
Source: Oahu Household Travel Survey



The Oahu Household Travel Survey provided details to determine the average household trip rate by a number of characteristics including household size, number of vehicles available in the household, number of workers, and household income. Figure 7-2 compares the average household trip rate by household size and district. As shown, participants from the Central area consistently have a lower trip rate than overall. District 1 (Pearl City to Hawaii Kai) has the highest household trip rate perhaps due to an abundance of bus routes and shorter travel times.

Figure 7-2: Average Household Trip Rates by Household Size and District
 Source: Oahu Household Travel Survey



As expected, households with workers had higher trip rates than those without. A one-person household that was a worker had an average trip rate of 3.8 while a one person, non-worker household had an average trip rate of 2.4. As shown in Figure 7-3, trip rates increase with the number of workers in a household. Notably, Central residents had a lower average trip rate than all other districts with a no-worker household (average household trip rate of 3 versus the overall average household trip rate of 4 for households with no workers).

Figure 7-4 shows the average household trip rate by number of vehicles. Household rates were similar for all districts and overall for respondents with one, two or three or more vehicles. Differences can be seen in the responses from those reporting no vehicles in the household. Central area households with no vehicles had an average trip rate of 3.3 versus 5.1 overall.

Figure 7-3: Average Household Trip Rates by Number of Household Workers and District
 Source: Oahu Household Travel Survey

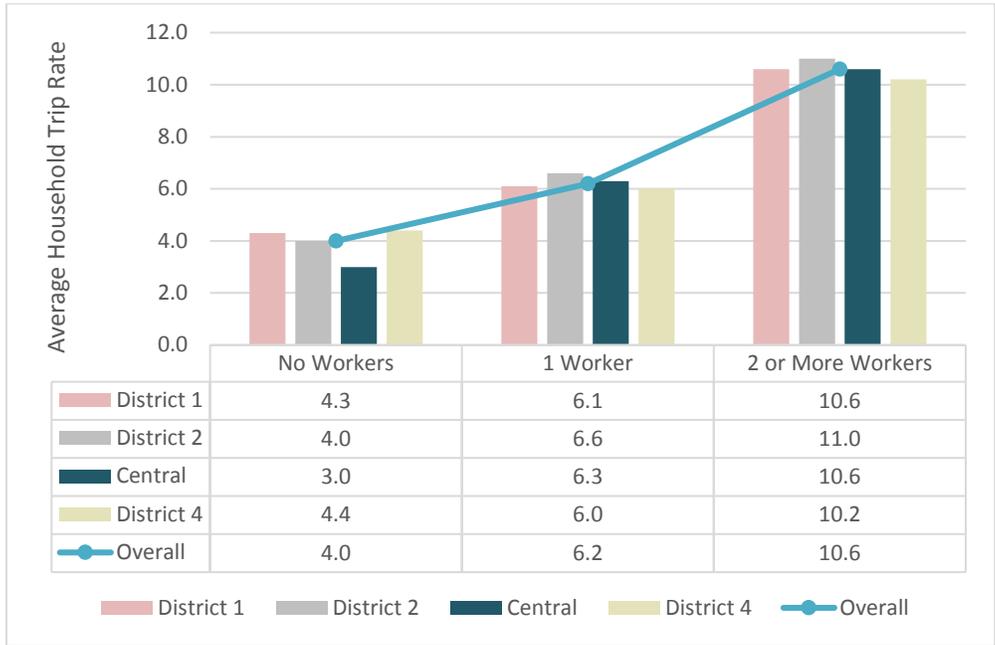


Figure 7-4: Average Household Trip Rates by Number of Household Vehicles and District
 Source: Oahu Household Travel Survey

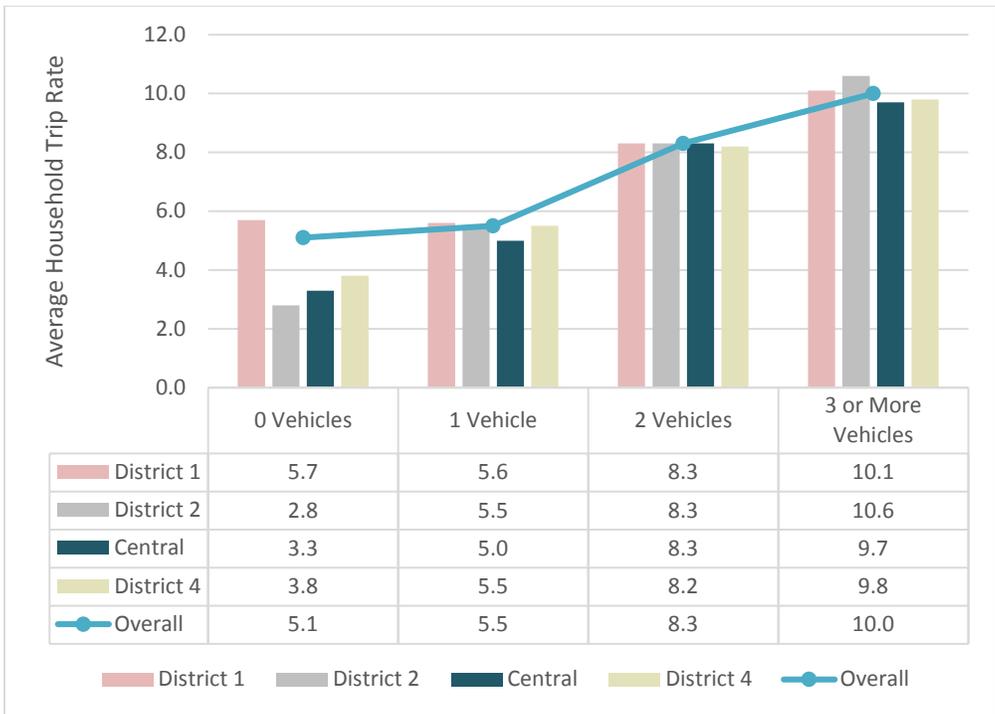
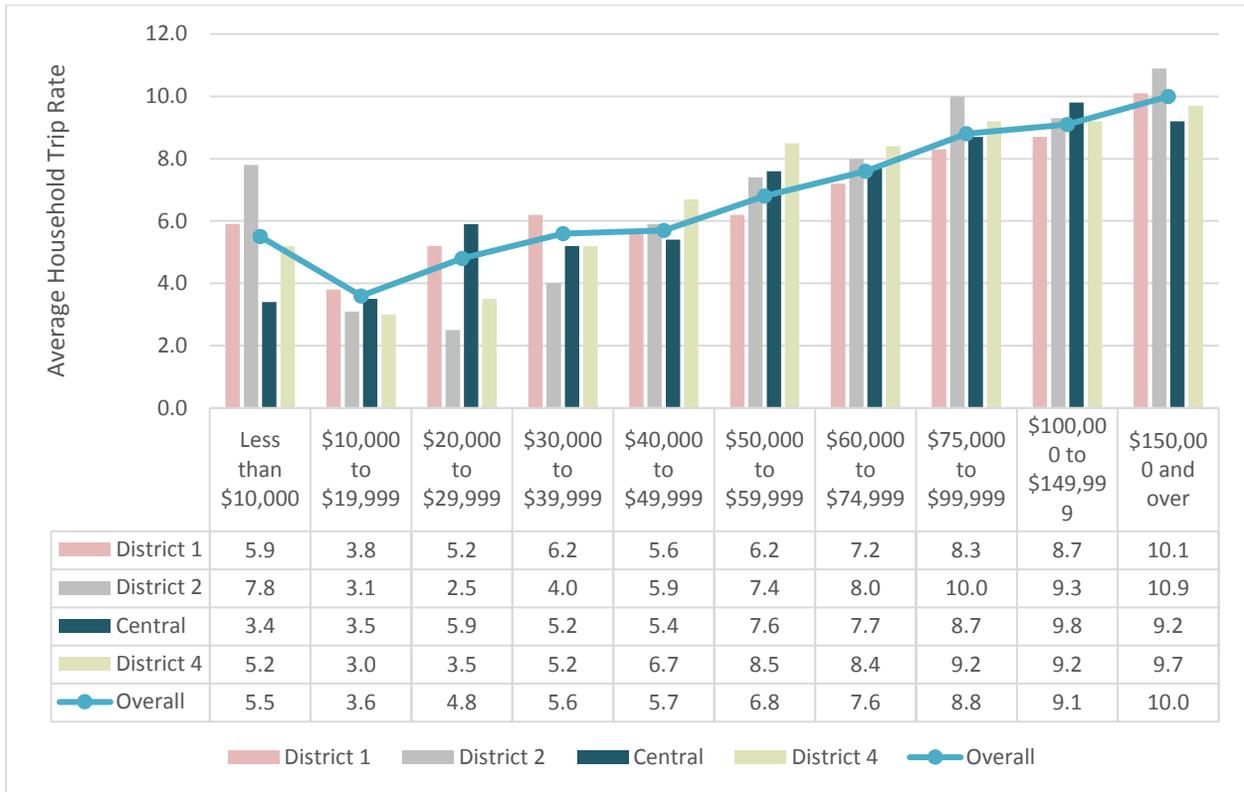


Figure 7-5 shows that the lowest-income residents in Central have by far the lowest household trip rate, reporting 3.4 average household trips compared to the overall average of 5.5 household trips for those reporting household incomes of less than \$10,000.

Figure 7-5: Average Household Trip Rates by Household Income and District
Source: Oahu Household Travel Survey



Based on weighted data and excludes cases where income was not provided.

Figure 7-6 shows that overall 12.6 percent of those participating stated they had a household member who walked or biked to work or school at least once per week. Over 83 percent reported no walk or bike trips to work or school.

Figure 7-6: Household Members Walk or Bike to Work/School at Least Once per Week
Source: Oahu Household Travel Survey

Non-Motorized Travel	Percent (n=6,061)
Zero Walk/Bike Trips	83.6
At least 1 Walk/Bike trip to work or school	12.6
Don't Know/Refused	3.9
Total	100.0

Overall, 14 percent of those participating stated they had a household member who used transit at least once a week and another 17.2 percent indicating a household member used transit less than once a week. This is shown in Figure 7-7. Just over 68 percent stated their household had never used transit.

Figure 7-7: Households Use Transit at Least Once per Week
 Source: *Oahu Household Travel Survey*

Used Transit	Percent (n=8,970)
Never	68.3
Transit Less than once a Week	17.2
Transit At least once a Week	14.0
Don't Know/Refused	0.6
Total	100.0

Figure 7-8 shows that 77.8 percent of the participants indicated they drove to work as their primary mode of travel. Combined, 8.3 percent indicated they used a local or express bus as their primary mode of travel to work. This compares to the 8.4 percent indicating bus as their primary mode of travel to work in the American Community Survey (ACS, discussed next).

Figure 7-8: Primary Mode to Travel to Work
 Source: *Oahu Household Travel Survey*

Mode	Percent (n=4,325)
Auto/van/truck driver	77.8
Auto/van/truck passenger	7.5
Local bus	7.3
Walk	3.6
Bike	1.3
Express/commuter bus	1.0
Motorcycle/moped	0.9
Other	0.5
Handi-van/paratransit	0.1
Taxi/limo	0.0
School bus	0.0

The Oahu Household Travel Survey provides an excellent resource for travel behavior from Central Oahu residents. This survey combined with the ACS provides a rich database to draw upon for current travel patterns and demographics of area residents.

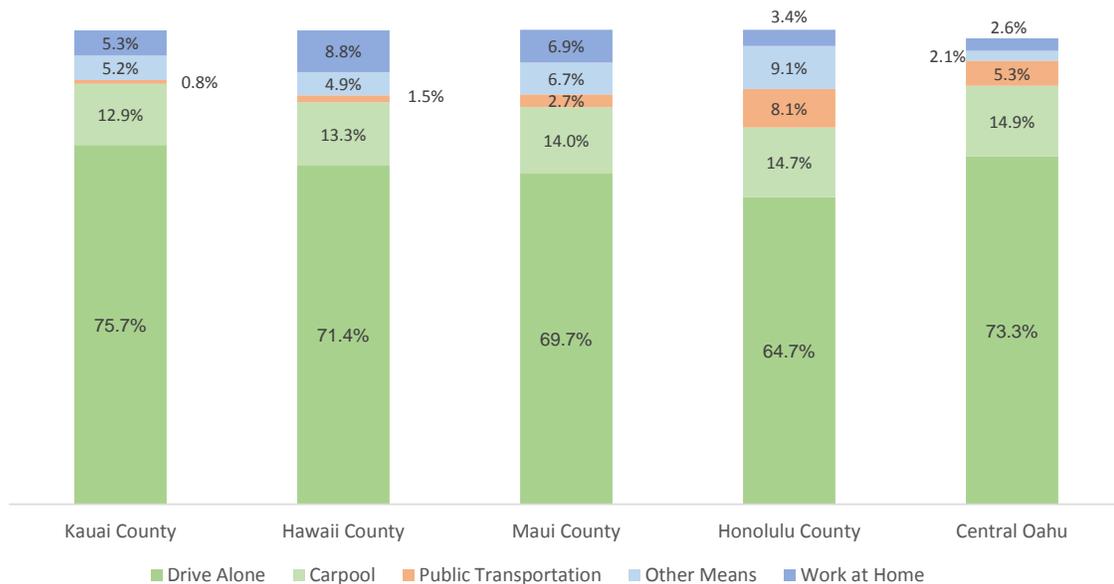
7.2 The American Community Survey

The American Community Survey (ACS) is a continuous measurement of social, economic, and housing data collected by the Census Bureau. This continuous data collection replaces the decennial census long form data collection. Population and housing profiles are available every year for specific areas with populations of 65,000 or more; three-year estimates are available for areas with populations of 20,000 or more and five-year estimates provide data for almost all geographic areas including census block groups and census tracts.

Figure 7-9 shows the commute mode by county for the State of Hawaii and for the census tracts included in the project area, shown as Central Oahu. The commute mode is reported for all employed people age 16 and over in the work force. Honolulu County overall has the lowest percentage of employed driving alone to work; however as shown, Central Oahu employed have a higher percent of people driving alone to work. The category “Other Means” includes walking. As shown, Central Oahu employed residents have few workers walking or working at home as compared to Honolulu County as a whole and the other counties.

Figure 7-9: Commute Mode by County

Source: U.S. Census Bureau, 2014 American Community Survey 5 year estimates



Figures 7-10 and 7-11 present the total number (Figure 7-10) and percent (Figure 7-11) of mode of travel to work for the United States, State of Hawaii, Honolulu and Central Oahu. Central Oahu residents have a much higher incidence of carpooling than the national average, but only a slightly higher incidence of using public transportation to work; lower than the state rate of 6.5 percent. The state public transportation use is impacted by the high percentage from Honolulu of 8.4 percent.

Figure 7-10: Mode of Travel to Work by Geographic Area
 Source: U.S. Census Bureau, 2014 American Community Survey 5 year estimates

MODE OF TRAVEL TO WORK	GEOGRAPHIC AREA			
	U.S.	Hawaii	Honolulu	Central Oahu
Drove alone (car, truck or van)	107,990,698	444,513	308,370	35,278
Carpooled (car, truck or van)	13,554,363	94,728	70,422	7,184
Public transportation (excluding taxicabs)	7,157,671	43,773	40,426	2,571
Walked	3,932,118	31,187	25,162	862
Taxicab, motorcycle, bicycle or other	2,530,707	24,169	19,377	1,028
Worked at home	6,171,591	30,087	16,635	1,228
Totals	141,337,148	668,457	480,392	48,151

Figures 7-11: Mode of Travel to Work by Geographic Area
 Source: U.S. Census Bureau, 2014 American Community Survey 5 year estimates

MODE OF TRAVEL TO WORK	GEOGRAPHIC AREA			
	U.S.	Hawaii	Honolulu	Central Oahu
Drove alone (car, truck or van)	76.4%	66.5%	64.2%	73.3%
Carpooled (car, truck or van)	9.5%	14.2%	14.7%	14.9%
Public transportation (excluding taxicabs)	5.1%	6.5%	8.4%	5.3%
Walked	2.8%	4.7%	5.2%	1.8%
Taxicab, motorcycle, bicycle or other	1.8%	3.6%	4.0%	2.1%
Worked at home	4.4%	4.5%	3.5%	2.6%
Totals	100.0%	100.0%	100.0%	100.0%

Figure 7-12 shows that within Oahu, those individuals traveling to work from the COTS project area have a higher incidence of driving alone or carpooling than other areas. Figure 7-13 clearly shows the differences in use of public transportation or walking and bicycling.

Figures 14 and 15 show commute mode for Census Designated Places within or adjoining the COTS area. Figure 15 shows that Waipio-Acres and Wahiawa have a much higher rate of using public transportation at 9.4 and 8.1 percent, respectively. Wahiawa residents had the highest rate of walking to work at 6.4 percent and the lowest overall of driving along as shown in Figure 15.

Figure 7-12: Commute Mode by Oahu Area

Source: U.S. Census Bureau, 2014 American Community Survey 5 year estimates

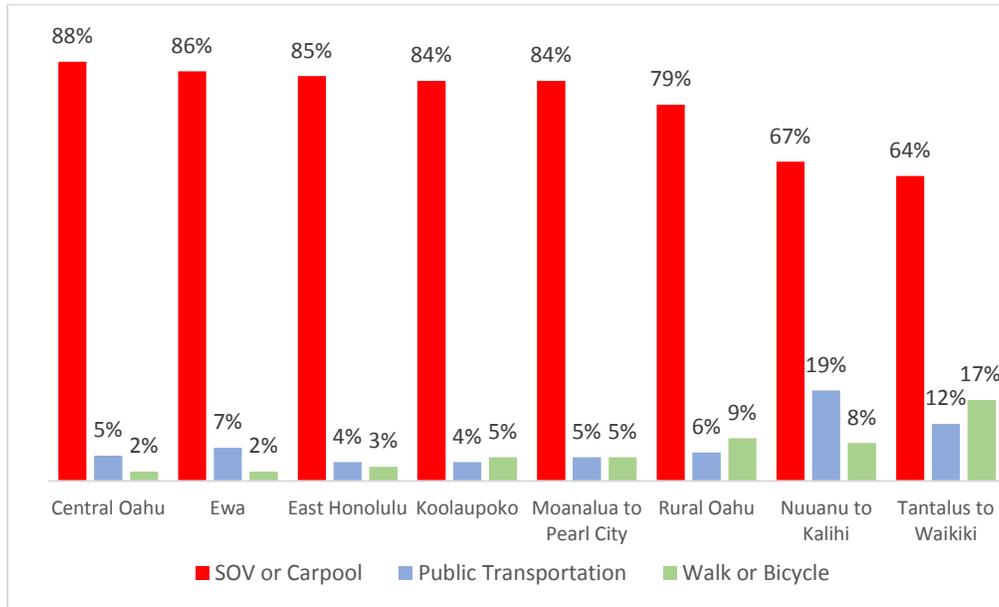


Figure 7-13: Alternative Commute Mode by Oahu Area

Source: U.S. Census Bureau, 2014 American Community Survey 5 year estimates

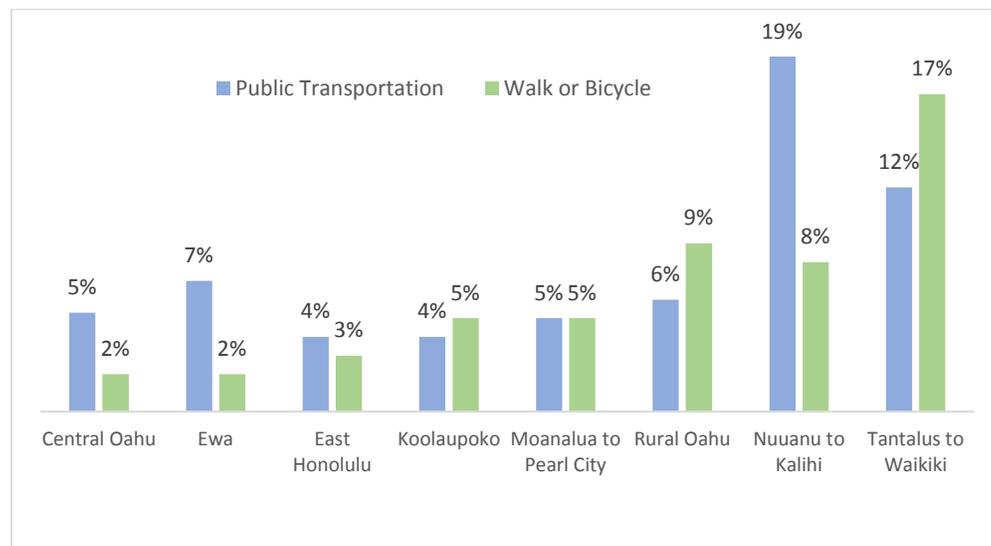


Figure 7-14: Mode of Travel to Work by Central Oahu Census Designated Places
 Source: U.S. Census Bureau, 2014 American Community Survey 5 year estimates

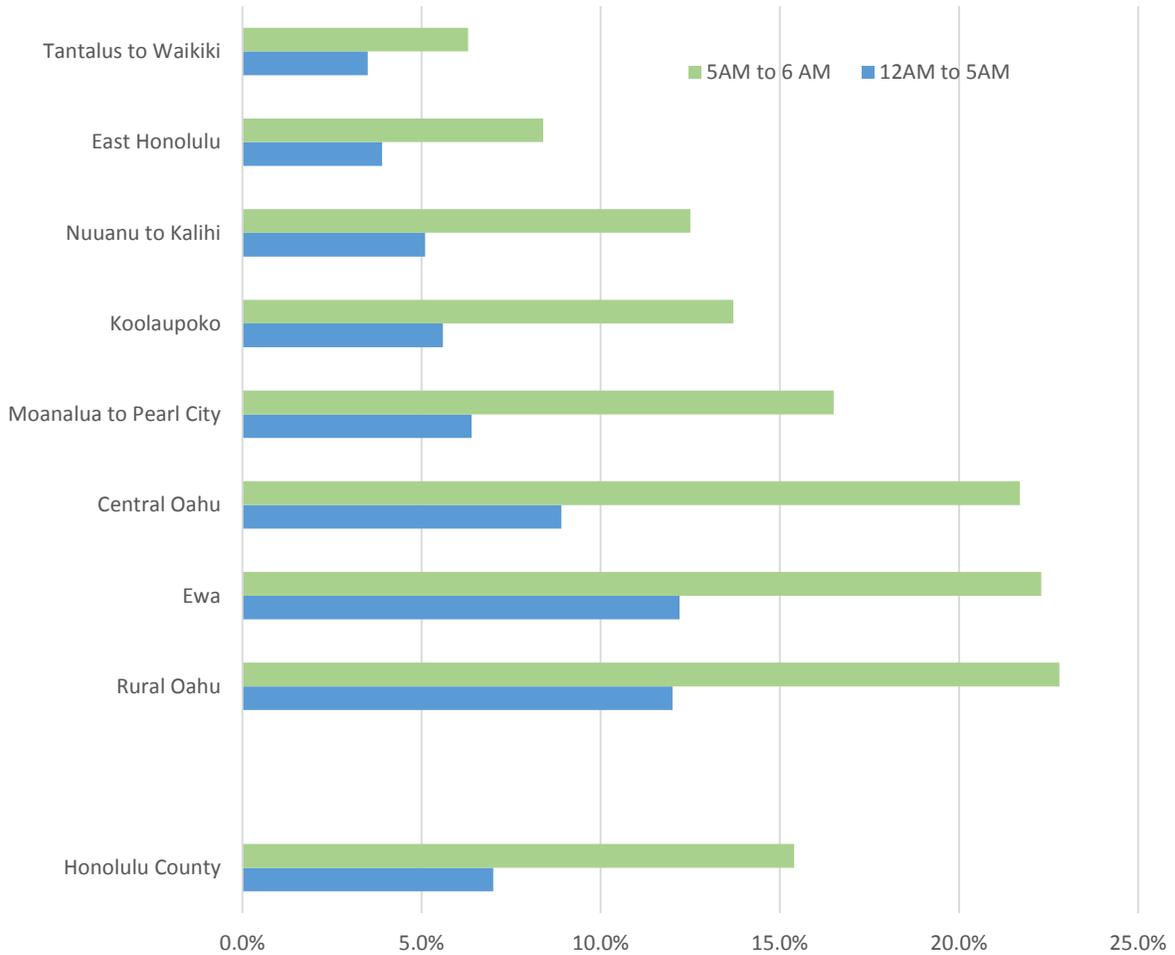
MODE OF TRAVEL TO WORK	CENSUS DESIGNATED PLACES						
	Mililani Town	Mililani Mauka	Waipio Acres	Waipio	Wahiawa	Wheeler AFB	Waikele
Drove alone (car, truck or van)	10,829	8,522	1,941	4,525	5,463	759	3,239
Carpooled (car, truck or van)	1,984	1,628	195	1,083	1,394	75	825
Public transportation (excluding taxicabs)	602	504	236	285	686	25	233
Walked	66	57	7	35	539	48	110
Taxicab, motorcycle, bicycle or other	252	75	77	170	228	61	165
Worked at home	355	407	48	73	117	5	223
Totals	14,088	11,193	2,504	6,171	8,427	973	4,795

Figure 7-15: Mode of Travel to Work by Central Oahu Census Designated Places
 Source: U.S. Census Bureau, 2014 American Community Survey 5 year estimates

MODE OF TRAVEL TO WORK	CENSUS DESIGNATED PLACES						
	Mililani Town	Mililani Mauka	Waipio Acres	Waipio	Wahiawa	Wheeler AFB	Waikele
Drove alone (car, truck or van)	76.9%	76.1%	77.5%	73.3%	64.8%	78.0%	67.5%
Carpooled (car, truck or van)	14.1%	14.6%	7.8%	17.5%	16.6%	7.7%	17.2%
Public transportation (excluding taxicabs)	4.3%	4.5%	9.4%	4.6%	8.1%	2.6%	4.9%
Walked	0.4%	0.5%	0.3%	0.6%	6.4%	4.9%	2.3%
Taxicab, motorcycle, bicycle or other	1.8%	0.7%	3.1%	2.8%	2.7%	6.3%	3.4%
Worked at home	2.5%	3.6%	1.9%	1.2%	1.4%	0.5%	4.7%
Totals	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Central, Ewa and Rural Oahu have the highest percentage of employed residents leaving for work by 6 AM as shown in Figure 7-16.

Figure 7-16: Time Departed for Work by Area
Source: U.S. Census Bureau, 2014 American Community Survey 5 year estimates



The ACS, with information updated annually, is an excellent resource in describing the COTS demographics and commute patterns. Combined with the OahuMPO sponsored Household Survey which provided additional trip making information, a fairly complete picture of residents and their travel behavior is available.

7.3 Honolulu 2012 Onboard Transit Rider Survey

In 2012-2013, HART and DTS conducted a comprehensive survey of transit riders in order to gather accurate, updated travel behavior data and obtain a better understanding of how transit services are being utilized. This survey was one of the first major system in the nation to gather boarding and alighting data on wide scale (20% of all riders, or 58,000 data points), as well as the widespread use of handheld tablets to conduct the survey interviews and validate the data in real-time (10% of all riders, or about 22,400 completed surveys). The onboard survey results are being used to enhance the regional travel demand forecasting model and will be used to evaluate the accuracy of the original ridership forecasts.

A total of 26,247 valid trips were recorded. Of these, the following are the number of samples where the respondent indicated their home was located in Central Oahu: 311 lived in Waipio or Waipio Acres, 124 in Waikele, 435 in Wahiawa and 655 in Mililani Town or Mililani Mauka. This is a total of 1,525 or 5.8% of the number of survey records.

The 2012 Transit Rider Survey provides a detailed description of the transit trip. Included in the data was the following along with a brief overview of responses:

- Origin of trip – 48% overall indicating home and 19.4% indicated work
- Mode of access to transit – Over 96% walked to the bus; 2.2% were dropped off
- Destination – Almost 37% indicated home, 23.2% stated work, and 11.3 % were going shopping
- Mode of egress from transit – 97.6% walked to their destination
- If no transit were available how would they make this trip:
 - Drive with someone – 28.3%
 - Would not make trip – 26.5%
 - Walk or bike – 20.3%
 - Drive – 17.3
 - Taxi – 6.4%
- How long riding TheBus – 25.7% more than 15 years, 42.5% 3 to 14 years
- Number of days per week normally ride TheBus – 34.7% 5 days; 24.5 % 7 days
- Total number of transfers to complete trip – 70.3 % none, 26.9% one, and 2.6% two

In addition to trip characteristics passenger demographics were collected including age, gender, language spoken at home, employment status, ethnicity, number of vehicles in household, household income, whether the respondent was a student, has a valid driver's license, or a disability.

The detailed information on the transit trip making and passenger characteristics can be compared to the Household Travel Survey and ACS information for the individual areas listed above. A COTS area subset provides a reliable data resource since over 1,500 samples are available from the area and due to the recent conduct of the survey.

8.0 Resident Opinion Surveys and Focus Groups

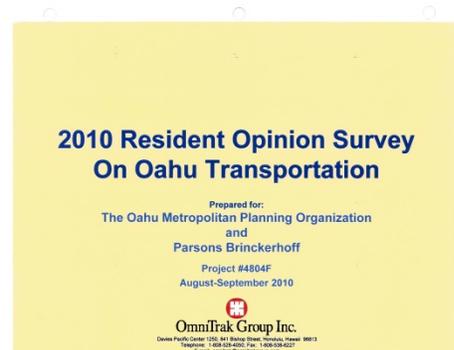
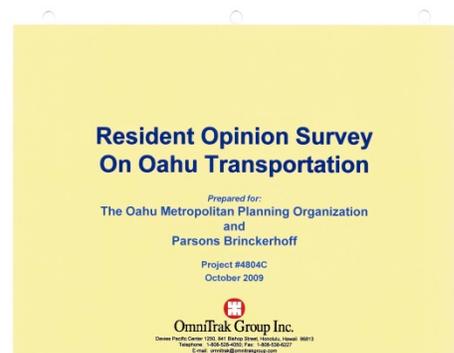
The surveys presented in the prior chapter provided detailed information on the respondent, their household information and their trip making characteristics. However, the surveys did not include an opportunity for the respondent to provide opinions on how their trips or travel needs could be improved.

This chapter describes Oahu opinion surveys from two sources: two OahuMPO resident opinion surveys conducted as part of the ORTP process and the National Citizen Survey for Honolulu conducted annually and provided by the Honolulu Office of the City Auditor. Reports from these two sources were reviewed although the datasets were not available.

8.1 The OahuMPO Resident Opinion Surveys

The OahuMPO Resident Opinion Surveys were conducted in conjunction with an update of the ORTP. The ORTP identifies transportation strategies and actions to the year 2035.

Two telephone surveys were conducted, one in October 2009 and the second in September 2010. Both surveys were conducted islandwide with a total of 601 samples in 2009 and 600 samples collected in 2010. An additional 400 surveys were conducted from Title 6/Environmental Justice populations in 2010.



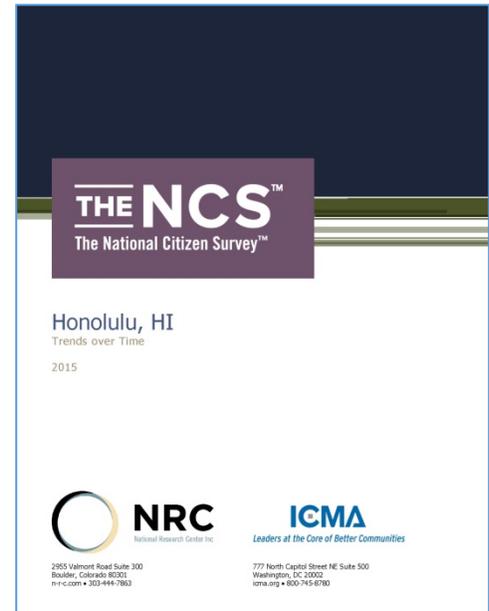
8.2 The National Citizen Survey

The National Research Center of Boulder, Colorado conducted a statistical survey of residents of the City and County of Honolulu. This National Citizen Survey (NCS) of Honolulu is the seventh survey of Honolulu.

The NCS is a collaborative effort between the National Research Center and the International City/County Management Association (ICMA). It is standardized to ensure the research methods and results are directly comparable for over 500 communities across the U.S.

NCS results are provided by the City and County of Honolulu as a companion to the Service Efforts and Accomplishments (SEA). The purpose of the SEA report is to: 1) Provide consistent, reliable information on the performance of city services; 2) Broadly assess trends in government efficiency and effectiveness; and 3) Improve city accountability to the public. The SEA annual report contains summary information on spending and staffing, workload, and performance results for each fiscal year ending June 30. The most recent fiscal year reported ended June 30, 2015 (FY 2015). The sixth Honolulu SEA report was produced by the Office of the City Auditor and is dated March 7, 2016.

This survey does provide the opportunity to ask attitudinal questions of Honolulu residents. This has been done. Some questions are asked each year with the City being able to track resident opinions. These types of questions include asking about overall ease of travel, traffic flow, bus or transit services, traffic enforcement, street repair, etc. Other questions are added each year which unfortunately appear to change based upon current events, so it is difficult to track changing opinions.



9.0 Recommendations for Further Data Collection & Survey Work

This chapter provides the recommendations for further data collection and survey needed to conduct the Central Oahu Transportation Study.

There is a wealth of information on COTS area resident characteristics and current travel patterns. Additional survey work focusing upon current trip making is not required. However, it is recommended that the COTS include strategies to capture attitudinal information from area residents. Those strategies should ask a series of questions that allow comparison to the travel surveys. These strategies are discussed in the Stakeholder Involvement Plan & Stakeholder List (Task 1, Deliverables 1.3a and 1.3b).

I. OahuMPO Central Oahu Transportation Study Public Attitudinal Survey#1

- Baseline Questions to Compare to Other Survey Sources
 - American Community Survey
 - place of work
 - traveltime
 - mode of travel
 - National Citizen Survey
 - standard transportation questions
 - Honolulu Community Surveys
 - standard transportation questions
- Questions related to Central Oahu Transportation Study
 - Past study participation.
 - Opinions about problem
 - Opinions about solutions

II. OahuMPO Central Oahu Transportation Study Public Survey#2

- Baseline Questions to Compare To Other Survey Sources
 - American Community Survey
 - place of work
 - traveltime
 - mode of travel
 - National Citizen Survey
 - standard transportation questions
 - Honolulu Community Surveys
 - standard transportation questions
- Questions related to Central Oahu Transportation Study
 - Past study participation.
 - Opinions about problem
 - Opinions about solutions
 - Opinions about strategies for implementation (see Task 5.1)

Endnotes

¹ The preamble or introduction to each ORTP is virtually the same except that the name of the approving body was changed from the Policy Committee to the Policy Board. This was done to respond to a review of compliance with Federal requirements. The need to change the name of the decision-making body was listed as a Tier 1 corrective action. This type of corrective action identifies the changes necessary to support a fully functioning 3-C process as described in 23 CFR 450 and are fundamental to the success of the OahuMPO to meet all other planning requirements. The Tier 1 corrective action was identified by a Federal Review Team and documented in the 2014 Federal Certification Review Final Report. The report provided a deadline for completion for each Tier 1 corrective action. If each Tier 1 corrective action was not adequately addressed by the stated deadline, FHWA and FTA would not certify the MPO planning process, resulting in a withholding of 20 percent of the federal apportionment attributed to the metropolitan planning area. Non-certification would remain in place until compliance is demonstrated through the resolution of any outstanding Tier 1 corrective actions. One of the corrective actions was to define the decision-making body as the Policy Board. See: Oahu Metropolitan Planning Organization Planning Process Review Final Report, September 30, 2015.

² Projects were extracted from ORTP 2040, April 13, 2016, Table 6-1, pages 27-41. Many islandwide projects are listed that will also potentially benefit Central Oahu such as project #1, Bike Plan Hawaii – Oahu and Oahu Bike Plan. This project will implement Oahu elements of the State of Hawaii’s Bike Plan Hawaii and the City and County Bike projects. These are excluded from this table since they are addressed in this report when those individual islandwide studies and plans are reviewed in subsequent chapters.

³ Projects were extracted from ORTP 2035, April 2011, Table 7, pages 20-27.

⁴ ORTP 2030, page 6.

⁵ Projects were extracted from ORTP 2030, April 2006, Table 1, pages 18-22 and Table 2, page 23.

⁶ Projects were extracted from TOP 2025, April 2006, Table 4-1, pages 4-4 to 4-6.

⁷ TOP 2025, April 2001, page 6-2. The report does not identify which three projects in Central Oahu are developer funded and only one project (C-7) is listed in Table 4-1.

⁸ As of July 2016 the three tax rates are as follows: 1) State Motor Fuel Tax is \$0.16 per gallon, 2) Vehicle Registration Fee is \$45.00 per vehicle each year, and 3) Rental Car Surcharge is \$3.00 per day. The City and County of Honolulu has a separate additional motor fuel tax of \$0.165. The state and counties have a separate additional tax based on motor vehicle weight. Airports impose an additional \$4.50 per day on rental cars. The three subsequent regional transportation plans did not include comparable funding and financial analysis. ORTP 2035 Deliverables 6.1.2, Revenue Sources Report and 6.2.2, Revenue Forecasts Report addressed funding; but, these did not investigate how to best fund transportation needs beyond what funding was available from existing sources.

⁹ ORTP 2030, Amendment #1, May 2008, page 8.

¹⁰ The Central Oahu Sustainable Communities Plan becomes enacted by ordinance and is included in the Revised Ordinances of Honolulu as Article 5. Central Oahu.

¹¹ A summary of the transportation analysis and needs assessment done in preparing the Plan is provided on pages 2-32 to 2-34 of the Central Oahu Development Plan Report (June 1995), the technical report prepared by the consultant team.

¹² See Central Oahu Sustainable Communities Plan; December, 2002: Section 4.1.4 Bikeways, The proposed bikeway system for Central Oahu incorporates facilities recommended in Bike Plan Hawaii (the State Bikeway Plan) with two types of bicycle facilities: bike paths which are separated from the roadway and bike lanes which are four- to six-foot lanes exclusively for bike use included in the roadway.

¹³ *Honolulu Complete Streets Implementation Study Location Report Kipapa Drive at Mililani Waena Elementary School* (DRAFT II), March 2015, page i.

¹⁴ *Honolulu Complete Streets Implementation Study Location Report California Avenue from Kamehameha Highway to Wahiawa District Park* (DRAFT II), June 2015, page i.

¹⁵ *Honolulu Complete Streets Implementation Study Location Report California Avenue from Kamehameha Highway to Wahiawa District Park* (DRAFT II), June 2015, page i.

¹⁶ See: Park and Ride Inventory, Capacity and typical use at publically owned or leased lots, Washington State Department of Transportation; Spring 2015.

¹⁷ *Ibid*, page 4-6.

¹⁸ The Commuter Shed Analysis of the Central Oahu Area was defined as including Neighborhood Boards #25, 26, 27 and 35. The person trips leaving Central Oahu used an east-west screenline parallel and mauka of Ka Uka along H-2 and Kamehameha Highway. Population was for the year 2000 from Census PL94 data by neighborhood board obtained from DPP. The total person trips leaving Central Oahu was based on field counts conducted 3/4-3/6/2002. Existing conditions SOVs & other vehicles includes all vehicles on Kamehameha Highway excluding buses at 1.1 persons per vehicle and all vehicles using the general purpose traffic lanes on H-2 at 1.0 persons per vehicle. Existing conditions HOVs includes all vehicles in the H-2 makai bound HOV lane at 2.0 persons per vehicle. Existing conditions person trips leaving Central Oahu by bus includes 24 persons per bus along Kamehameha based on 2001 counts, 2 persons per vehicle for Handivans and 42 persons per vehicle for buses on H-2. Existing conditions buses required includes 3 Handivans, 2 LOTMA

commuter buses and 32 TheBus buses. Future population for the 20,000 more housing units was based on 3.0 persons per household. The total future person trips leaving Central Oahu was based on 15% of population continuing to travel makai bound between 4:30 am and 7:30 am.

¹⁹ *Honolulu High Capacity Transit Corridor Project Environmental Impact Statement*, June 2010, Table 3-20, page 3-46.

²⁰ *Ibid*, Figure 3-9, page 3-41.

²¹ Hawaii Statewide Pedestrian Master Plan; May 2013, page4-12, ID No. 02.

²² The trip generation methodology that was utilized was based upon generally accepted techniques developed by ITE and published in "Trip Generation, 9th Edition," 2012. The north-south distribution of projected traffic is based on the relative distribution of traffic between the two major arterials of Kamehameha Highway and the Interstate H-2 Freeway located within the north-south corridor of the region, and the localized distribution is based on traffic distribution along the collector road Ka Uka Boulevard linking the two primary roadway facilities.