CONGESTION MANAGEMENT PROCESS

STATE OF CONGESTION ON OAHU

Updated November 2011

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GLOSSARY OF ACRONYMS

CMP	Congestion Management Process
DPA	Development Plan Area
LOS	Level of Service
OahuMPO	Oahu Metropolitan Planning Organization
ORTP	Oahu Regional Transportation Plan
PUC	Primary Urban Center
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
TAA	Transportation Analysis Area
TIP	Transportation Improvement Program
TMA	Transportation Management Area
V/C	Volume-to-Capacity
VHD	Vehicle Hours of Delay
VHT	Vehicle Hours Traveled
VMT	Vehicle Miles Traveled

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1.0 INTRODUCTION

This report updates the December 2006 Congestion Management Process *State of Congestion on Oahu* report. It identifies the status of congestion in the Oahu Transportation Management Area[1] (TMA). It provides a "baseline" reference with which projects proposed in Oahu Metropolitan Planning Organization's (OahuMPO) Transportation Improvement Program (TIP) and Oahu Regional Transportation Plan (ORTP) can be compared with and prioritized.

The *Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)*, signed into law by the President in August 2005, requires that the planning process in a TMA include a congestion management process. The intent was to stress the importance of the congestion management process to TMA transportation planning and programming. Since its development, the congestion management process (formerly called "congestion management system") has been an integral part of developing the ORTP and TIP, and will continue to be integrated in the metropolitan transportation planning process.

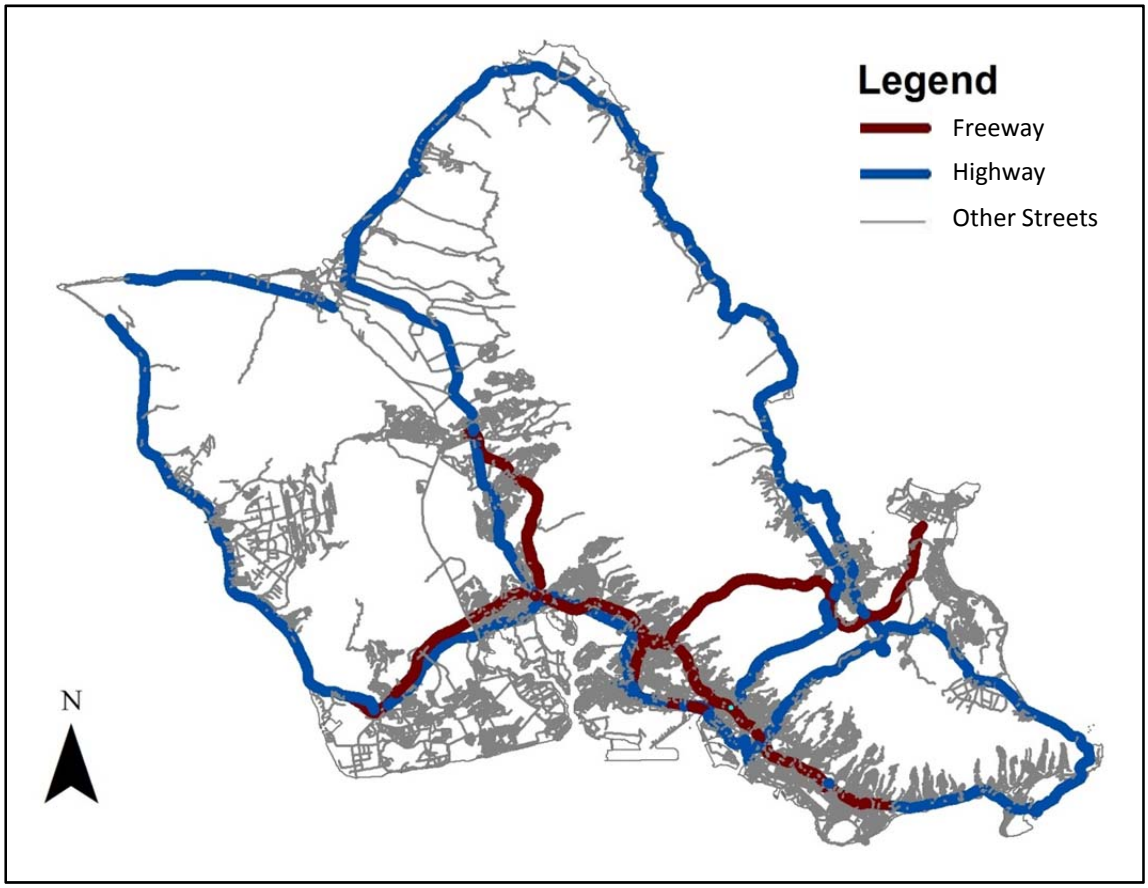
In describing the state of congestion on Oahu, this report will:

- Provide an overview of the socioeconomic conditions and travel forecasts on Oahu;
- Apply performance measures to the roadway system on Oahu; and
- Identify the roadways that have significant congestion in the 2-hour AM peak period.

The roadway network for Oahu is shown in Figure 1. A subset of this roadway network will form the basis of Oahu's Congestion Management Process (CMP) network.

[1] A TMA is an urbanized area with a population over 200,000.

FIGURE 1: OAHU'S ROADWAY NETWORK



2.0 STATE OF CONGESTION ON OAHU

By policy in the *General Plan*,[2] population and employment on Oahu is concentrated in Ewa, Central Oahu, and the Primary Urban Center. About 73% of the population lived in these areas in 2007, with additional growth forecasted to add to these areas in the next twenty-five years, such that the residential population increases to 77% of the total.

The State of Hawaii's Department of Business, Economic Development and Tourism is the agency that is responsible for forecasting Hawaii's population and employment. Using that forecast, the City and County of Honolulu Department of Planning and Permitting forecasts where employment and population growth will occur on Oahu over the next twenty-five years.

[2] General Plan for the City and County of Honolulu, 2002 (http://honoluludpp.org/Planning/GeneralPlan/GPReport.pdf)

2.1 SOCIOECONOMIC CONDITIONS

The *General Plan* defines two urban centers on Oahu. The Primary Urban Center development plan area (DPA) extends from Waialae-Kahala in the east to Pearl City in the west. The secondary urban center is in Kapolei, in the Ewa DPA. It is within these two DPAs where population and employment growth is being directed through land use policies and zoning over the next 25 years.

2.1.1 Population

Table 1 and Figure 2 summarize population data by transportation analysis area[3] (TAA) and DPA for years 2007 and 2035. About 60% of Oahu's population is projected to live in the PUC and Ewa DPAs in year 2035; with another 17% residing in the Central Oahu DPA; translating to the fact that less than 25% of Oahu residents will live in the North Shore, Waianae, East Honolulu, and Windward Oahu (comprised of the Koolauloa and Koolaupoko DPAs) areas in year 2035.

TABLE 1: POPULATION

TAA	2007	2035	Difference	Percent Difference
1. Ward-Chinatown	10,600	19,400	8,800	83%
2. Kakaako	10,400	37,300	26,900	260%
3. Punchbowl-Sheridan-Date	72,800	84,700	11,800	16%
4. Waikiki	19,500	21,800	2,300	12%
5. Kahala-Tantalus	73,300	76,100	2,800	4%
6. Pauoa-Kalihi	77,200	84,200	7,000	9%
7. Iwilei-Mapunapuna-Airport	16,300	19,800	3,500	21%
8. Hickam-Pearl Harbor	18,500	18,600	100	1%
9. Moanalua-Halawa	54,000	54,400	400	1%
10. Aiea-Pearl City	67,300	68,000	700	1%
11. Honouliuli-Ewa Beach	53,600	102,200	48,600	91%
12. Kapolei-KoOlina-Kalaeloa	18,300	51,300	33,000	180%
13. Makakilo-Makaiwa	15,600	29,900	14,300	91%
14. Waipahu-Waikele-Kunia	56,100	60,900	4,800	9%
15. Waiawa-Koa Ridge	11,900	46,700	34,800	291%
16. Mililani-Melemanu-Kipapa	53,400	52,600	-800	-1%
17. Wahiawa-Whitmore-Schofield	35,700	34,500	-1,100	-3%
18. East Honolulu	48,800	49,300	600	1%
19. Kaneohe-Kahaluu-Kualoa	53,600	52,300	-1,200	-2%
20. Kailua-Mokapu-Waimanalo	62,500	61,800	-700	-1%
21. Koolauloa	14,400	16,200	1,800	12%
22. North Shore	18,000	20,400	2,400	13%
23. Waianae Coast	43,700	51,100	7,400	17%
Total	**905,500**	**1,113,500**	**208,200**	**23%**

Note: Values may not add exactly to the totals due to rounding.

[3] The PUC DPA is comprised of TAAs #1 through #10, the Ewa DPA consists of TAAs #11 through #13, the Central Oahu DPA includes TAAs #14 through #17, and the Koolaupoko DPA is made up of TAAs #19 through #20. The East Honolulu, Koolauloa, North Shore, and Waianae DPA boundaries are the same as their respective TAA boundaries.

FIGURE 2: PERCENT POPULATION ALLOCATED TO DPAS
YEAR 2035

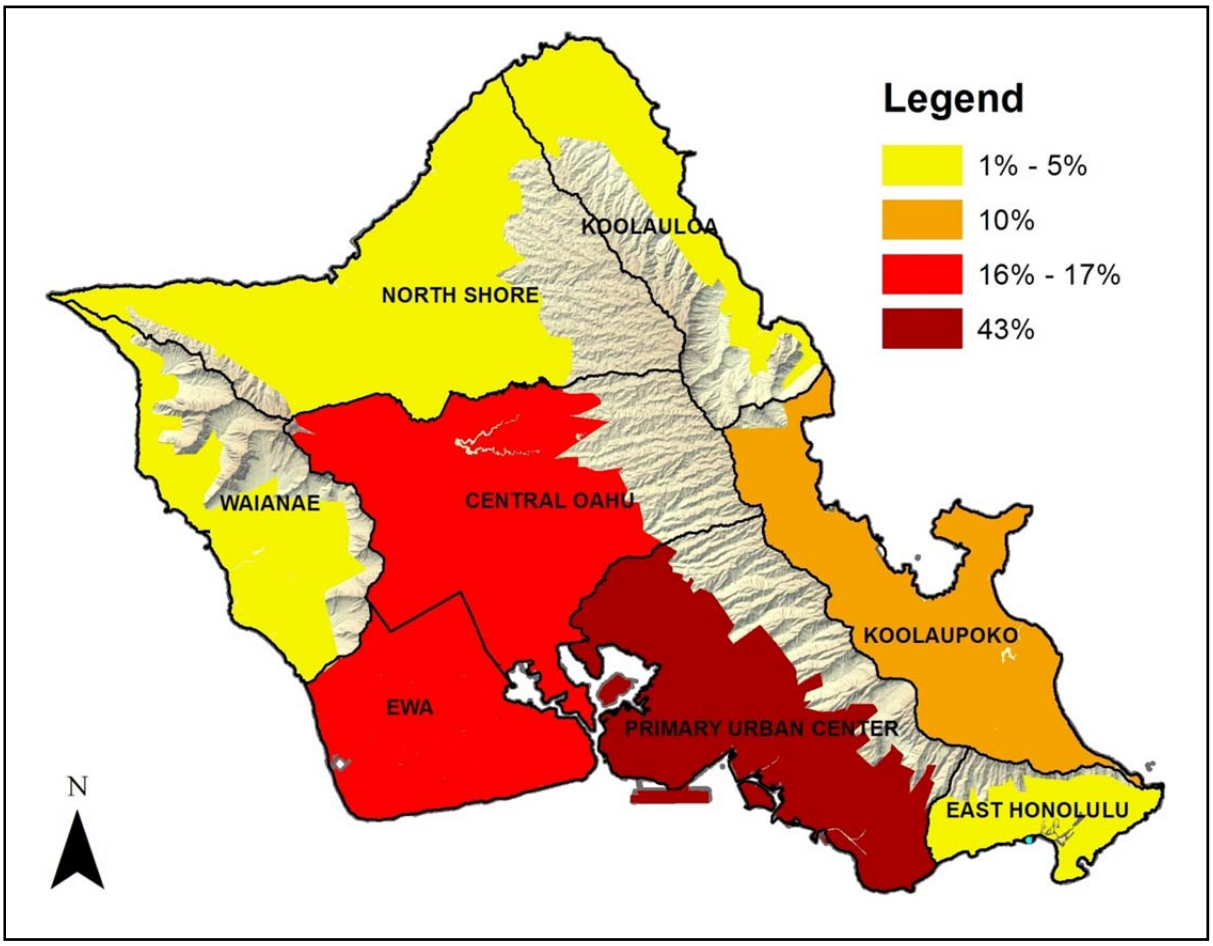
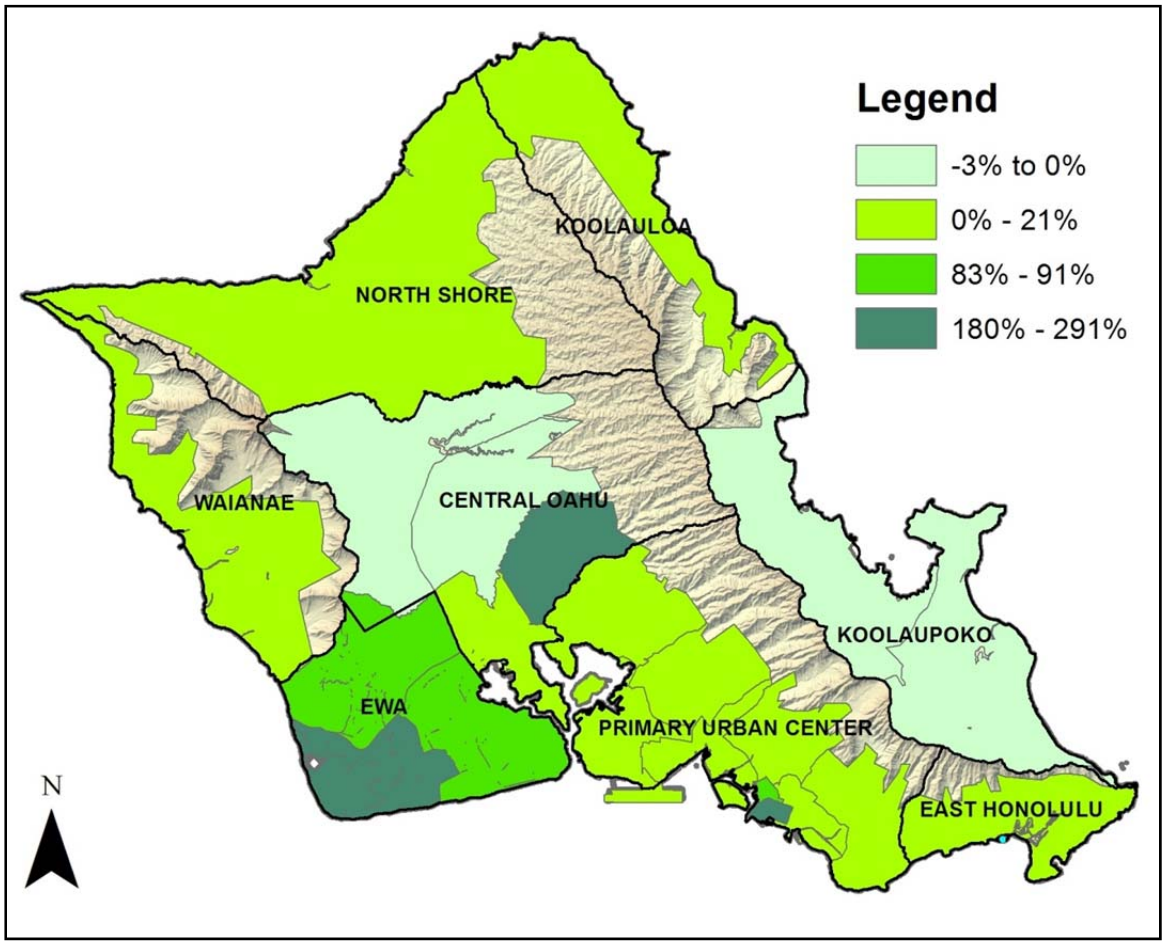


Figure 3 summarizes the projected population change between years 2007 and 2035. By year 2035, it is projected that there will be about 1,113,500 residents on Oahu. The projected growth over 25 years is approximately 208,000 residents, amounting to a 23% increase over year 2007. The PUC is projected to increase by about 64,300 residents, or 15%. Population in the Ewa DPA is projected to increase by 95,900 residents, more than double the number of Ewa residents in year 2007. In the Central Oahu DPA, the population is forecasted to increase by more than 37,000 or 24%. The population in the Kakaako TAA is expected to triple by the year 2035, which is consistent with the *Primary Urban Center Development Plan,*[4] which shows that this area already has the infrastructure and regulations in place to build higher density, residential, and mixed use development. The Kapolei-Ko Olina-Kalaeloa and Waiawa-Koa Ridge TAAs are expected to more than double in population between 2007 and 2035, consistent with the policy set forth in the *General Plan* to encourage development within the secondary urban center of Kapolei and the Ewa and Central Oahu urban-fringe areas.

[4] The Primary Urban Center Development Plan for the City and County of Honolulu, June 2004 (http://honoluludpp.org/Planning/DevSust_PrimaryUrbanCenter.asp)

The Mililani-Melemanu-Kipapa, Wahiawa-Whitmore-Schofield, Kaneohe-Kahaluu-Kualoa, and Kailua-Mokapu-Waimanalo TAAs are forecasted to experience slight decreases in population. However, as summarized in Table 2 in the next section, increases in housing units are projected for those areas. The decrease in population reflects the expected decline in household size.

FIGURE 3: PERCENT CHANGE IN RESIDENT POPULATION
BETWEEN YEARS 2007 AND 2035



2.1.2 Housing Units

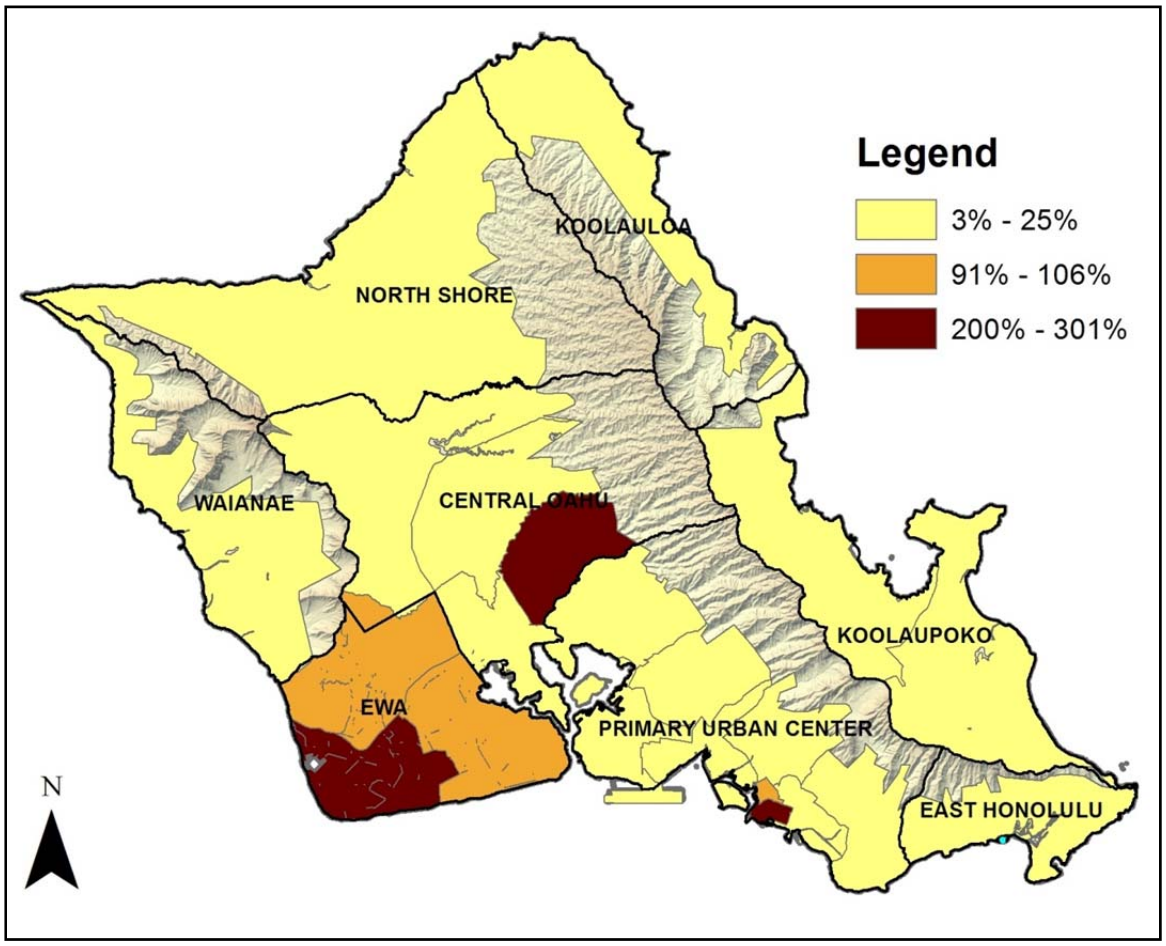
The number of housing units in the PUC is projected to increase by over 40,000, or 24%. In addition, the number of housing units in Ewa and Central Oahu is projected to increase dramatically. In Ewa, the number of housing units is projected to more than double to over 60,000 units by year 2035; in Central Oahu the number of housing units is projected to increase by 34% (16,900 units) by year 2035.

TABLE 2: HOUSING UNITS

TAA	2007	2035	Difference	Percent Difference
1. Ward-Chinatown	5,900	11,200	5,300	91%
2. Kakaako	6,100	23,300	17,200	282%
3. Punchbowl-Sheridan-Date	41,500	49,900	8,500	20%
4. Waikiki	18,600	21,100	2,500	14%
5. Kahala-Tantalus	28,200	30,200	2,000	7%
6. Pauoa-Kalihi	24,800	28,400	3,500	14%
7. Iwilei-Mapunapuna-Airport	5,000	6,200	1,200	23%
8. Hickam-Pearl Harbor	5,800	6,000	200	4%
9. Moanalua-Halawa	18,400	19,100	800	4%
10. Aiea-Pearl City	22,900	24,100	1,200	5%
11. Honouliuli-Ewa Beach	16,500	34,000	17,500	106%
12. Kapolei-KoOlina-Kalaeloa	5,800	17,400	11,600	200%
13. Makakilo-Makaiwa	5,000	10,000	4,900	98%
14. Waipahu-Waikele-Kunia	15,900	18,800	2,800	18%
15. Waiawa-Koa Ridge	4,200	16,800	12,600	301%
16. Mililani-Melemanu-Kipapa	18,900	20,000	1,100	6%
17. Wahiawa-Whitmore-Schofield	11,100	11,500	400	3%
18. East Honolulu	18,400	19,900	1,500	8%
19. Kaneohe-Kahaluu-Kualoa	17,900	18,800	800	5%
20. Kailua-Mokapu-Waimanalo	19,400	20,500	1,100	5%
21. Koolauloa	4,600	5,500	900	21%
22. North Shore	6,700	8,200	1,400	22%
23. Waianae Coast	13,100	16,500	3,300	25%
Total	**334,700**	**437,200**	**102,500**	**31%**

Note: Values may not add exactly to the totals due to rounding.

FIGURE 4: PERCENT CHANGE IN NUMBER OF HOUSING UNITS
BETWEEN YEARS 2007 AND 2035



2.1.3 Employment

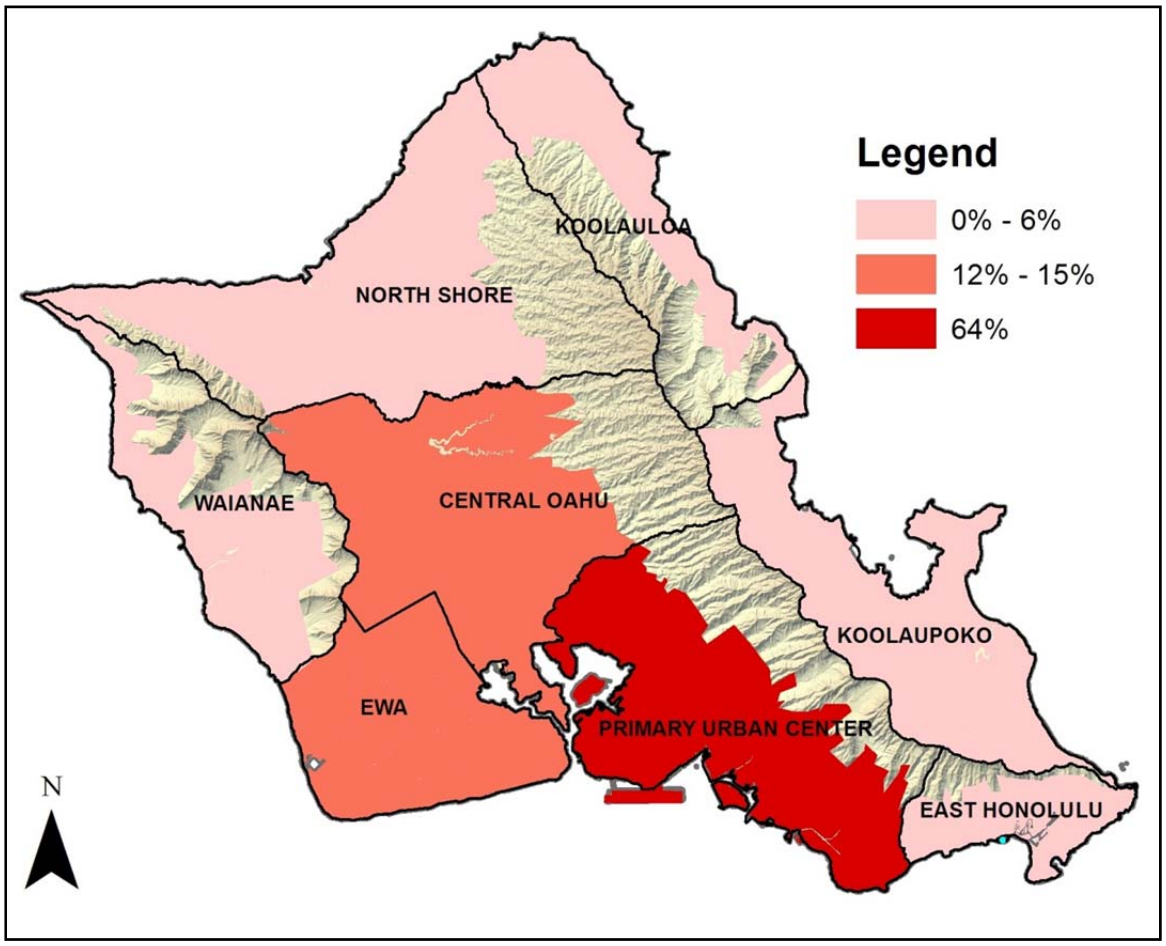
The PUC is considered by many as the employment center for the island, as about 71% of jobs were located there in 2007. The policies outlined in the *General Plan* continue to identify the PUC as where a majority of jobs will be located. Future employment in the area is projected to increase by about 13%, or 52,200 jobs. The number of jobs in Honouliuli-Ewa Beach, Kapolei-Ko Olina-Kalaeloa, Makakilo-Makaiwa, and Waiawa-Koa Ridge are forecast to more than double to 116,100 jobs, but these areas would consist of only 17% of all jobs in 2035. The growth in jobs in these areas may take a large number of work trips away from the PUC. However, as shown in Table 3 and Figure 5, the PUC is still expected to be a major employment destination, with 64% of the jobs in the year 2035.

TABLE 3: EMPLOYMENT

TAA	2007	2035	Difference	Percent Difference
1. Ward-Chinatown	57,300	64,200	6,900	12%
2. Kakaako	33,300	43,100	9,800	29%
3. Punchbowl-Sheridan-Date	52,600	61,600	9,000	17%
4. Waikiki	46,100	48,100	2,000	4%
5. Kahala-Tantalus	38,500	43,500	5,000	13%
6. Pauoa-Kalihi	22,500	29,200	6,700	30%
7. Iwilei-Mapunapuna-Airport	76,900	81,700	4,800	6%
8. Hickam-Pearl Harbor	26,800	27,700	900	3%
9. Moanalua-Halawa	16,500	17,700	1,200	7%
10. Aiea-Pearl City	24,300	30,100	5,800	24%
11. Honouliuli-Ewa Beach	14,000	40,300	26,200	187%
12. Kapolei-KoOlina-Kalaeloa	22,500	55,200	32,600	145%
13. Makakilo-Makaiwa	2,100	5,700	3,600	171%
14. Waipahu-Waikele-Kunia	17,500	23,000	5,500	31%
15. Waiawa-Koa Ridge	6,200	14,900	8,700	141%
16. Mililani-Melemanu-Kipapa	19,300	22,700	3,400	18%
17. Wahiawa-Whitmore-Schofield	19,500	21,800	2,300	12%
18. East Honolulu	7,000	6,600	-400	-6%
19. Kaneohe-Kahaluu-Kualoa	12,600	12,700	100	1%
20. Kailua-Mokapu-Waimanalo	25,000	25,800	800	3%
21. Koolauloa	5,800	7,100	1,300	22%
22. North Shore	4,000	3,900	-100	-2%
23. Waianae Coast	6,500	6,800	300	4%
Total	**556,800**	**693,400**	**136,400**	**24%**

Note: Values may not add exactly to the totals due to rounding.

FIGURE 5: PERCENT OF JOBS ALLOCATED TO DPAS
YEAR 2035



2.1.4 Visitor Units

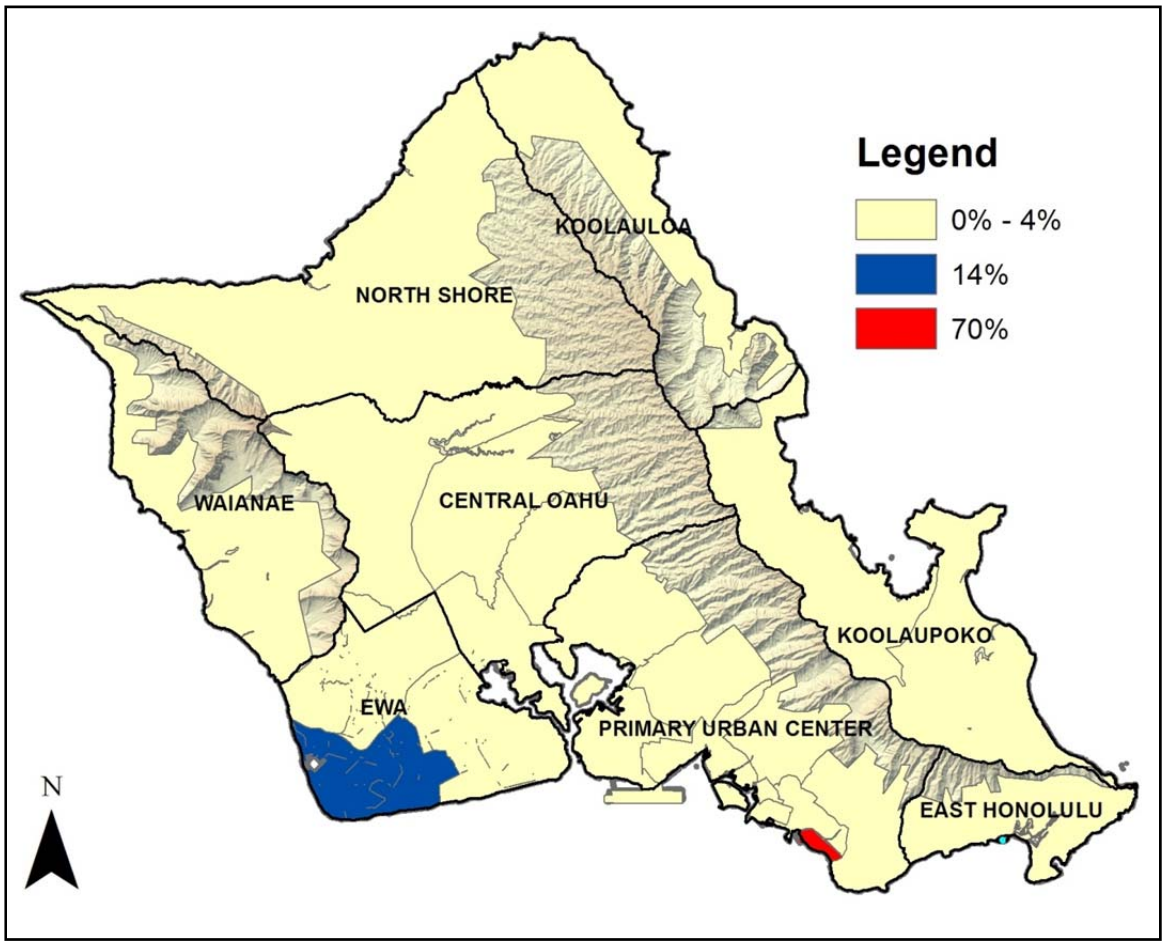
As illustrated in Table 4 and Figure 6, the PUC, which includes Waikiki (the dominant tourist area on the island in 2007), is projected to contain 70% of all visitor units by 2035, including hotel rooms and resort condominiums, which support service and other tourism jobs. The City's policy, as stated in the *General Plan*, relative to hotels on the island is not to intensify development in Waikiki, but rather to direct growth to resort areas such as Ko Olina and Turtle Bay. Unit count in Waikiki is projected to decrease slightly because of the trend toward more luxury units, which generally means units with more interior space. Since development is regulated on the basis of floor area, the number of units produced is likely to be smaller. It is forecasted that by 2035, Ewa will have about 6,400 visitor units (about 16% of the islandwide total) located primarily in the Kapolei-Ko Olina-Kalaeloa TAA, a 700% increase from the 800 visitor units located there in 2007.

TABLE 4: VISITOR UNITS

TAA	2007	2035	Difference	Percent Difference
1. Ward-Chinatown	100	100	0	0%
2. Kakaako	0	300	300	0%
3. Punchbowl-Sheridan-Date	1,400	1,400	0	0%
4. Waikiki	28,800	27,800	-1,000	-3%
5. Kahala-Tantalus	300	200	-100	-33%
6. Pauoa-Kalihi	0	0	0	0%
7. Iwilei-Mapunapuna-Airport	700	1,000	300	43%
8. Hickam-Pearl Harbor	0	0	0	0%
9. Moanalua-Halawa	0	0	0	0%
10. Aiea-Pearl City	100	100	0	0%
11. Honouliuli-Ewa Beach	0	1,000	1,000	0%
12. Kapolei-KoOlina-Kalaeloa	800	5,500	4,700	588%
13. Makakilo-Makaiwa	0	0	0	0%
14. Waipahu-Waikele-Kunia	0	0	0	0%
15. Waiawa-Koa Ridge	0	0	0	0%
16. Mililani-Melemanu-Kipapa	0	0	0	0%
17. Wahiawa-Whitmore-Schofield	200	200	0	0%
18. East Honolulu	400	400	0	0%
19. Kaneohe-Kahaluu-Kualoa	0	0	0	0%
20. Kailua-Mokapu-Waimanalo	100	0	-100	-100%
21. Koolauloa	600	1,400	800	133%
22. North Shore	0	0	0	0%
23. Waianae Coast	200	200	0	0%
Total	**33,700**	**39,600**	**5,900**	**18%**

Note: Values may not add exactly to the totals due to rounding.

FIGURE 6: PERCENT VISITOR UNITS ALLOCATED TO TAAS
YEAR 2035



2.2 GROWTH, IN TERMS OF TRANSPORTATION

The distribution of population and employment, in 2007 and in 2035, is the starting point from which OahuMPO's work in transportation begins. The TAAs to which people, housing units, visitor units, and jobs are distributed have an effect on transportation in a number of ways. Identifying where the existing population lives and works today and where they will live and work in the future is the first step in understanding how land use is related to transportation. Specifically, through the use of OahuMPO's travel demand forecasting models, it will provide the basis with which to understand how the transportation system is operating in year 2007 and year 2035.

2.2.1 Determination of Committed Transportation Projects

Oahu's year 2035 roadway and transit system for the Congestion Management Process is based on year 2035 baseline highway and transit networks that were used for the ORTP 2035[5]. The

[5] ORTP 2035 (April 2011): http://www.oahumpo.org/programs/ortpcurrent.html.

year 2035 baseline highway network consisted of the roadway system that existed in 2007 plus only those projects for which there was a high degree of commitment and a high probability of implementation. To be considered as a baseline improvement for the ORTP 2035, a project must have met the following conditions:

- Project is performance enhancing at a regional scale AND is currently being constructed;

  OR

- Project is programmed for construction within the first two years of the Federal Fiscal Years 2008-2011 TIP, as revised.

The baseline projects that could be modeled, and were, therefore, part of year 2035 baseline model networks for the ORTP 2035, are as follows. Refer to the ORTP 2035 for additional information on each of the projects.

- Fort Weaver Road Widening, Vicinity of Aawa Drive to Geiger Road
- Interstate Route H-1, PM Zipper Lane, Westbound
- Honolulu High Capacity Transit Corridor Project
- Interstate Route H-1, Addition and Modification of Freeway Access, Makakilo Interchange to Palailai Interchange (Kapolei Interchange Complex)
- Interstate Route H-1, Kinau Off-Ramp Improvements, Near The Queen's Medical Center
- Kalaeloa Boulevard (Route 95), Widening and Reconstruction, Phase 1, Oahu Railway and Land Company (O.R. & L.) Right-of-Way to Lauwiliwili Street
- Kalanianaole Highway (Route 72) Improvements, Vicinity of Hawaii Kai Drive to Keahole Street
- Kamokila Boulevard Extension
- Kapolei Parkway, between Renton Road and the City/State property line at the western boundary of Ewa Villages
- North-South Road, Vicinity of Kapolei Parkway to Interstate Route H-1

The following analysis of the transportation system represents a nearly worst-case scenario – if nothing is done other than those projects listed above. The analysis identifies our transportation deficiencies and serves as a baseline from which to compare proposed congestion-relief projects.

2.2.2 How Many Trips are Residents Making a Day?

Travel patterns for a typical weekday are estimated using the OahuMPO travel demand forecasting model. Daily resident trips for years 2007 and 2035 are identified in Table 5. Approximately 4,043,000 resident trips per day are estimated to occur on Oahu in year 2035, an increase of 27% from year 2007.

In 2035, 1,459,000 trips are projected to be made by residents to and from work each day, which is an increase of 25% from year 2007. For purposes of the CMP analysis, this journey-to-work trip will be considered, which includes trips directly from home to work (and back) in addition to trips from home to work with stops along the way.

TABLE 5: DAILY RESIDENT TRIPS

Trip Purpose	2007	2035	Percent Difference
Trips to and from Work	1,166,000	1,459,000	25%
Trips While at Work	179,000	230,000	28%
Trips to and from School/University	281,000	356,000	27%
Trips to and from Shopping/Other	299,000	385,000	29%
Trips with Neither End at Home or at Work	1,261,000	1,613,000	28%
Total	**3,185,000**	**4,043,000**	**27%**

Note: Values may not add exactly to the totals due to rounding.

2.2.3 Where are Residents Traveling to Work?

Recall the socioeconomic data discussion that comprised part of Oahu's story: Residential population is increasing substantially in Ewa and Central Oahu, while the PUC remains the primary employment location.

Tables 6 and 7 show the number of work trips to and from each of the eight DPAs to various employment centers in the PUC. Table 6 provides this information for the year 2007; Table 7 provides the same information for the year 2035.

TABLE 6: YEAR 2007 DAILY RESIDENT TRIPS TO AND FROM WORK

DPA	Primary Urban Center	Ewa	Central Oahu	East Honolulu	Koolaupoko	Koolauloa	North Shore	Waianae	Total
1. Primary Urban Center	565,900	4,200	15,800	4,800	8,600	100	100	100	599,600
2. Ewa	34,700	51,900	10,400	300	1,400	200	200	1,500	100,600
3. Central Oahu	67,500	16,700	97,600	400	2,500	500	2,200	500	187,900
4. East Honolulu	47,600	100	400	9,900	1,800	0	0	0	59,800
5. Koolaupoko	63,900	700	1,700	1,600	66,300	600	0	0	134,800
6. Koolauloa	3,400	100	300	100	900	9,800	500	0	15,100
7. North Shore	7,000	600	6,000	100	300	1,500	6,500	0	22,000
8. Waianae	22,000	5,000	2,200	300	1,000	200	100	15,000	45,800
Total	**812,000**	**79,300**	**134,400**	**17,500**	**82,800**	**12,900**	**9,600**	**17,100**	**1,165,600**

Note: Values may not add exactly to the totals due to rounding.

TABLE 7: YEAR 2035 DAILY RESIDENT TRIPS TO AND FROM WORK

DPA	Primary Urban Center	Ewa	Central Oahu	East Honolulu	Koolaupoko	Koolauloa	North Shore	Waianae	Total
1. Primary Urban Center	652,000	8,900	21,000	4,800	9,200	100	100	100	696,200
2. Ewa	37,200	163,600	18,900	200	1,400	100	200	2,200	223,800
3. Central Oahu	76,700	32,200	124,300	400	2,400	500	1,900	300	238,700
4. East Honolulu	50,200	400	500	10,000	1,900	0	0	0	63,000
5. Koolaupoko	64,100	1,900	2,300	1,400	68,300	500	0	0	138,500
6. Koolauloa	3,700	300	500	100	800	11,900	500	0	17,800
7. North Shore	7,300	1,500	7,000	100	300	2,300	7,000	0	25,500
8. Waianae	28,400	6,600	2,000	400	1,300	300	100	16,200	55,300
Total	**919,600**	**215,400**	**176,500**	**17,400**	**85,600**	**15,700**	**9,800**	**18,800**	**1,458,800**

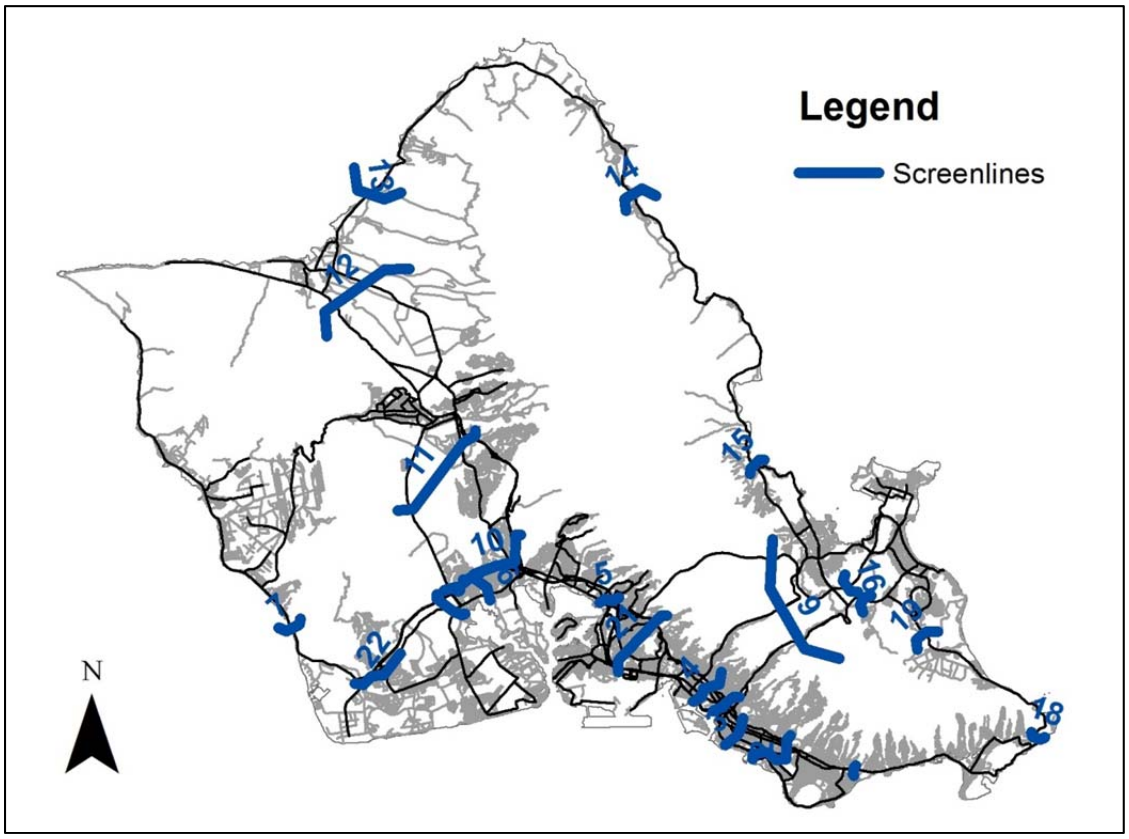
Note: Values may not add exactly to the totals due to rounding.

In 2007, approximately 34,700 Ewa residents and 67,500 Central Oahu residents traveled to the PUC to and from work on a daily basis. Joining them along the Interstate Route H-1 travel corridor to and from the PUC were about 7,000 North Shore residents and 22,000 Waianae residents. By the year 2035, work trips to and from the PUC by Ewa residents are projected to increase by about 7% and trips by Central Oahu residents are expected to increase by 14%.

The number and share of work trips to Ewa and Central Oahu are expected to increase considerably by the year 2035. Ewa is forecasted to experience a 172% increase, while Central Oahu is forecasted to experience a 31% increase in work trips to the region. However, although additional work trips are forecasted to be made to Central Oahu and Ewa in the year 2035, the PUC is still expected to be a major employment destination, with 63% of the total work trips.

Figure 7 illustrates the locations of screenlines that were used to analyze person trips for years 2007 and 2035.

FIGURE 7: SCREENLINE LOCATIONS



Screenline 5 (Kalauao), near Aiea, captures person trips traveling between downtown Honolulu and Pearl City, Waipahu, Central Oahu, Ewa, and Kapolei. As shown in Table 8, Screenline 5 is estimated to have the most daily person trips in 2035 out of all of the screenlines. Screenline 18 (Sandy Beach Park), near Hawaii Kai, has the least number of daily person trips out of all the screenlines in 2035.

Screenline 22 (Kalaeloa/Kapolei) is anticipated to experience an 84% increase in travel between 2007 and 2035, the highest rate of all screenlines. This is likely due to the large increase in population and employment in this area. Screenline 5 (Kalauao) grows only by 5% between 2007 and 2035, despite being the highest traveled screenline in the system. This is likely due to the large growth in population and employment in the Ewa-Kapolei area that results in a higher concentration of trips staying within the area as opposed to traveling to Downtown.

TABLE 8: DAILY SCREENLINE PERSON TRIPS (YEARS 2007 AND 2035)

Screenline	2007	2035	Percent Difference
1. Nuuanu Stream Bridge	439,000	511,900	17%
2. Manoa Palolo/ Ala Wai Canal	456,300	499,400	9%
3. East of Ward Avenue	450,300	529,500	18%
4. Kapalama Drainage Canal	443,100	561,100	27%
5. Kalauao	585,400	612,100	5%
6. Waikele	253,700	287,500	13%
7. Kahe Point	72,200	93,500	30%
8. Ewa	183,900	241,300	31%
9. Trans Koolau	165,900	178,300	7%
10. Waipahu	248,900	322,700	30%
11. Wahiawa/ Mililani	128,400	145,700	13%
12. Haleiwa	32,800	39,400	20%
13. Waimea	16,300	21,500	32%
14. Hauula	19,400	24,600	27%
15. Kahaluu	26,400	32,500	23%
16. Kailua/Kaneohe	85,300	89,600	5%
17. Maunawili	60,900	64,400	6%
18. Sandy Beach Park	7,100	7,800	10%
19. Waimanalo	22,000	24,100	10%
20. Kahala	119,600	127,200	6%
21. Salt Lake	411,700	431,300	5%
22. Kalaeloa/ Kapolei	218,200	401,700	84%

2.2.4 How are Residents Getting to Work?

The roadway network on Oahu is used primarily by automobiles. Other transportation modes include transit (e.g., TheBus), bicycle, and pedestrian. As shown in Table 9, of the estimated 1,459,300 total daily resident trips to and from work in year 2035, 84% are projected to be in private automobiles, 9% are projected to be made by transit, and the remaining 7% are projected to be made by either bicycling or walking.

TABLE 9: DAILY TRIPS BY RESIDENTS TO AND FROM WORK

Mode	2007	Percent	2035	Percent
Automobile Trips	1,011,000	87%	1,227,100	84%
Transit Trips	85,900	7%	137,100	9%
Bicycle and Walk Trips	68,900	6%	95,100	7%
Total	**1,165,700**	**100%**	**1,459,300**	**100%**

Note: Values may not add exactly to the totals due to rounding.

The total number of trips to and from work is projected to increase by 25% by the year 2035. In comparison, transit trips to and from work are forecasted to increase by more than 59%. This is likely due to the implementation of a fixed guideway system between Kapolei and Ala Moana Center, which will provide improved transit accessibility by year 2035.

Table 10 shows transit boardings by period (peak versus off-peak) for residents, visitors, and ground access air passengers combined. Transit boardings in the peak period are projected to increase by 84% by the year 2035. Daily transit boardings are forecasted to increase by 70%.

As indicated earlier in Table 9, *linked* transit trips (transit trips from an origin to a destination, including transfers) to work are forecasted to increase by 59%. The reason transit boardings are increasing at a higher rate than overall linked transit trips is that an increase in the number of average transfers per transit trips is expected, many of which are anticipated to occur between the bus and fixed guideway transit.

TABLE 10: TRANSIT BOARDINGS BY PERIOD

Period	2007	2035	Difference	Percent Difference
Peak	142,500	261,600	119,100	84%
Off-Peak	85,800	126,200	40,400	47%
Total	**228,300**	**387,800**	**159,500**	**70%**

Note: Values may not add exactly to the totals due to rounding.

2.2.5 What is the State of Our Highway System?

As discussed earlier, approximately 64% of the jobs on Oahu are projected to be located in the PUC by the year 2035. Because of this, major roadways leading into the PUC, such as the Interstate Route H-1, are expected to be heavily utilized. Other heavily utilized roadways to the PUC from selected origins include:

- From Central Oahu: Interstate Route H-2, Kunia Road, and Kamehameha Highway;
- From the Waianae Coast: Farrington Highway;
- From Windward Oahu to the PUC and Ewa: Interstate Route H-3, Pali Highway, and Likelike Highway; and
- From East Honolulu: Kalanianaole Highway.

Specific locations forecasted to experience significant congestion in the year 2035 are identified in Section 3.0. Islandwide congestion can be measured using vehicle miles traveled (VMT), vehicle hours traveled (VHT), and vehicle hours of delay (VHD), which are estimated using the travel demand forecasting model.

VMT measures vehicle travel made by motorized vehicles, such as automobiles, commercial vehicles, and motorcycles. Each mile traveled is counted as one vehicle mile regardless of the number of persons in the vehicle. VHT measures the total hours traveled by all vehicles. It is calculated by multiplying the number of vehicles by the travel time of those vehicles. VHD is defined as the difference between vehicle hours traveled under congested conditions and vehicle hours of travel that would otherwise be expected under free flow conditions.

Table 11 shows that the daily VMT is projected to increase by about 16% between 2007 and 2035. The fact that VMT grows at a slower rate than the forecasted increase in daily resident trips (27%) indicates that the average length of trips in year 2035 will be less than in year 2007, and that more trips will be made by transit. The shorter trips are likely due to more residents staying within the Ewa-Kapolei areas to work, as opposed to traveling to Downtown. The increase in transit trips is likely due to the implementation of a fixed guideway transit system between Kapolei and Ala Moana Center, as indicated in the previous section. Of the 15,209,000 VMT in 2035, about 39% are estimated to occur on the freeway system, while 11% are on expressways, 5% on ramps, 33% on arterials, and 12% are on collectors.

TABLE 11: DAILY VEHICLE MILES TRAVELED

Facility Type[6]	2007	2035	Difference	Percent Difference
Freeways	5,272,900	5,959,300	686,400	13%
Expressways	1,555,000	1,707,800	152,800	10%
Ramps	704,800	791,300	86,500	12%
Arterials	4,102,300	4,963,300	861,000	21%
Collectors	1,507,600	1,787,300	279,800	19%
Total	**13,142,500**	**15,209,000**	**2,066,400**	**16%**

Note: Values may not add exactly to the totals due to rounding.

The travel model forecasts an increase in islandwide two-hour AM Peak VHT of approximately 12,300 hours (16% overall) between years 2007 and 2035. Table 12 presents a full breakdown of these results. By year 2035, arterials are expected to carry the greatest share of AM two-hour peak period VHT, with 39% of the total, followed by freeways (27%) and collectors (16%). Note that while VMT is projected to be higher on freeways, VHT is projected to be higher for arterials, reflecting the overall slower speeds (and increased travel times) on the arterial system.

TABLE 12: AM PEAK VEHICLE HOURS TRAVELED

Facility Type	2007	2035	Difference	Percent Difference
Freeways	23,600	24,400	900	4%
Expressways	7,500	9,500	2,000	26%
Ramps	5,600	6,500	900	17%
Arterials	29,100	34,500	5,400	19%
Collectors	11,400	14,500	3,100	28%
Total	**77,100**	**89,400**	**12,300**	**16%**

Note: Values may not add exactly to the totals due to rounding.

Table 13 shows that, overall, there is a projected islandwide increase in delay in the two-hour AM peak of about 5,800 hours – amounting to a 19% increase between years 2007 and 2035.

[6] Examples of roadways classified as the various facility types include: freeways (e.g., Interstate Route H-1, H-2, H-3, and Moanalua Freeway); expressways (e.g., Likelike Highway and Pali Highway); arterials (e.g., Nimitz Highway, Dillingham Boulevard, and Moanalua Road); and collectors (e.g., Kaahumanu Street and Waipahu Street).

Delay is projected to increase on all facility types. The freeways are likely to experience a significantly smaller increase in delay because congestion levels during the AM peak period currently exceed capacity and are oversaturated, so there is not much opportunity for additional delay. By year 2035, the facilities with the largest forecasted delays are expected on arterials (33 percent), freeways (29 percent), and expressways (14 percent). In 2035, while more travel is expected to occur on the freeway system overall, the arterial system is projected to experience proportionately higher congestion and delay overall.

TABLE 13: AM PEAK VEHICLE HOURS OF DELAY

Facility Type	2007	2035	Difference	Percent Difference
Freeways	10,200	10,300	100	1%
Expressways	3,400	5,100	1,700	49%
Ramps	3,200	3,800	600	19%
Arterials	9,700	11,800	2,100	21%
Collectors	3,100	4,400	1,300	43%
Total	**29,600**	**35,400**	**5,800**	**19%**

Note: Values may not add exactly to the totals due to rounding.

3.0 IDENTIFICATION OF CONGESTION

As discussed in the *CMS Performance Monitoring and Evaluation Plan*[7], for the purpose of the CMP, a facility will be defined as congested if the volume-to-capacity (V/C) ratio in the AM peak is greater than 0.90, which equates to Level of Service (LOS) E or F.

LOS is a measure that characterizes the operating conditions perceived by a driver or user of a roadway. Although LOS is a qualitative measure, it is based on quantitative indicators. LOS, as presented in this report, is based on V/C ratios[8] as reported from the travel demand forecasting model. Six LOS designations, from A to F, are defined in the Transportation Research Board's *2000 Highway Capacity Manual*. LOS A represents ideal, congestion-free operating conditions; LOS B through D represent intermediate operating conditions; LOS E denotes congested conditions at the point of maximum service rate, and is considered "at capacity"; and LOS F designates extremely congested breakdown conditions, and reflects overcapacity conditions.

OahuMPO's travel demand forecasting models were used to calculate the estimated V/C ratio of every link in the model highway network for years 2007 and 2035. Table 14 provides LOS summaries for all major roadways in lane-miles, for the AM two-hour peak period under 2007 and Baseline 2035 conditions. Approximately 73% of all roadway lane-miles islandwide are

[7] *CMS Performance Monitoring and Evaluation Plan* (December 2005): http://www.oahumpo.org/reports-docs/CMS_Perf_Monitoring-Eval_Plan.pdf

[8] LOS is based on the following V/C ratios: LOS A (V/C 0.00-0.60), LOS B (V/C 0.61-0.70), LOS C (V/C 0.71-0.80), LOS D (V/C 0.81-0.90), LOS E (V/C 0.91-1.00), and LOS F (V/C > 1.00).

estimated to operate at LOS A in the 2035 Baseline as opposed to 77% in the year 2007; 12% are projected to operate under congested conditions at LOS E or F compared to 10% in 2007. More than 25% of freeways, expressways, and ramps are estimated to operate under congested conditions in 2035, compared to 23% in 2007. This higher level of congestion reflects the fact that freeways, expressways, and ramps serve a proportionately higher level of commute trips than arterials and collectors, which show congested conditions in 2035 of roughly 8% and 4%, respectively.

TABLE 14: AM TWO-HOUR PEAK PERIOD LOS – LANE MILES

Facility Type	LOS A	LOS B	LOS C	LOS D	LOS E	LOS F	Total Lane Miles
Freeways							
2007	213	17	22	28	33	33	346
2035 Baseline	202	24	25	23	33	41	348
Expressways							
2007	65	6	9	9	18	22	129
2035 Baseline	64	6	8	9	19	23	129
Ramps							
2007	60	6	5	6	6	20	103
2035 Baseline	56	5	4	7	6	25	103
Arterials							
2007	619	42	27	27	19	30	764
2035 Baseline	595	56	35	34	28	34	782
Collectors							
2007	561	24	13	7	7	10	622
2035 Baseline	559	35	14	12	13	15	648
Total							
2007	1,518	95	76	77	83	115	1,964
2035 Baseline	1,476	126	86	85	99	138	2,010
Percentage							
2007	77.3%	4.8%	3.9%	3.9%	4.2%	5.9%	100.0%
2035 Baseline	73.4%	6.3%	4.3%	4.2%	4.9%	6.9%	100.0%

The modeled highway segments projected to experience significant congestion during the two-hour AM peak period under 2035 baseline conditions are illustrated in Figure 8. The majority of congested conditions can be seen in the Interstate Route H-1 corridor between Ewa and downtown Honolulu.

Table 15 lists each of the roadway segments colored in red in Figure 8. When an evaluation of a proposed congestion mitigation project is conducted, it will be this list to which the roadway will be compared. This list will be referenced for each congestion-relief project that is proposed for the TIP or ORTP.

FIGURE 8: OAHU'S CMP NETWORK
TWO-HOUR AM PEAK

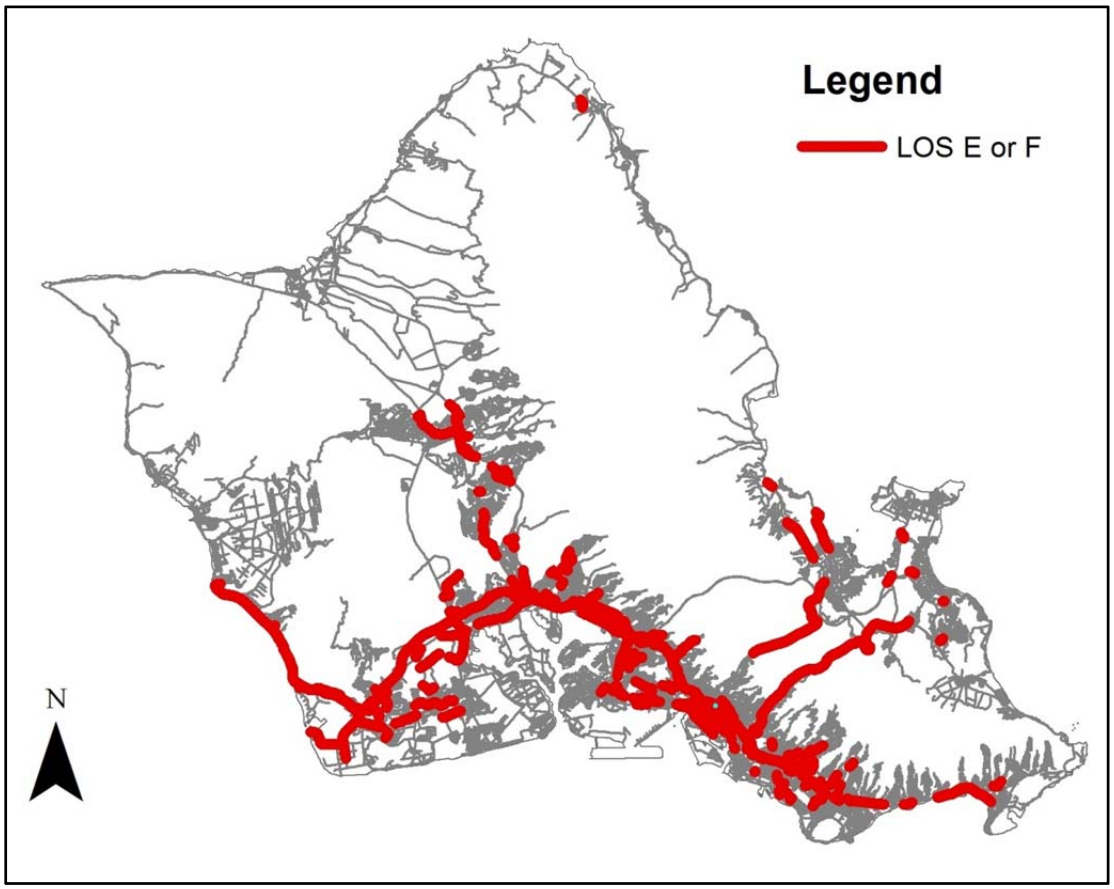


TABLE 15: LOCATIONS OF SIGNIFICANT CONGESTION (LOS E OR F)

1.	Dillingham Boulevard Koko Head-bound between Middle Street and Alakawa Street.
2.	Farrington Highway Koko Head-bound between Maliona Street in Waianae and the Interstate Route H-1 on-ramp in Waipahu.
3.	Fort Barrette Road between Kamaaha Avenue and Farrington Highway mauka-bound.
4.	Fort Weaver Road mauka-bound between Aawa Drive and the Farrington Highway underpass.
5.	Interstate Route H-1 Ewa-bound between the Interstate Route H-1 / Interstate Route H-2 merge and Paiwa Street.
6.	Interstate Route H-1 Ewa-bound between Fifth Avenue and Middle Street.
7.	Interstate Route H-1 Koko Head-bound between the Kapolei Interchange at Kalaeloa Boulevard to the Halawa Interchange.
8.	Interstate Route H-1 Koko Head-bound Middle Street merge to Punahou Street.
9.	Ka Uka Boulevard Interchange (over Interstate Route H-2) both directions.
10.	Kahekili Highway town-bound between Hui Iwa Street and Haiku Road.

LOCATIONS OF SIGNIFICANT CONGESTION (LOS E OR F), CONTINUED

11.	Kalaeloa Boulevard makai-bound between Farrington Highway and makai of Malakole Street.
12.	Kalakaua Avenue Koko Head-bound between Kanunu Street and Kuhio Avenue.
13.	Kalanianaole Highway Ewa-bound between Lunalilo Home Road and Halemaumau Street.
14.	Kalanianaole Highway Ewa-bound between Halemaumau Street and Interstate Route H-1 at Ainakoa Avenue.
15.	Kamehameha Highway makai-bound between Whitmore Avenue in Wahiawa to the Interstate Route H-1/ Interstate Route H-2 merge in Waipahu.
16.	Kapolei Parkway Waianae-bound between Kolowaka Drive and the new University of Hawaii West Oahu campus East Kapolei Road.
17.	Kunia Road makai-bound between Kupuna Loop and the Interstate Route H-1 west-bound on ramp.
18.	Kunia Road mauka-bound between Farrington Highway and the Interstate Route H-1 east-bound on ramp.
19.	Likelike Highway town-bound in Kaneohe.
20.	Makakilo Drive makai-bound before the Interstate Route H-1 Interchange.
21.	Malakole Street.
22.	Moanalua Freeway Koko Head-bound between Red Hill and Middle Street.
23.	Moanalua Road Koko Head-bound between the Interstate Route H-1 east-bound Waimalu/Pearlridge off ramp and Honomanu Street.
24.	Nimitz Highway Koko Head-bound between Middle Street and Alakawa Street.
25.	North King Street Koko Head-bound between the North King Street off-ramp from Moanalua Road to Liliha Street.
26.	Old Waialae Road Ewa-bound over Interstate Route H-1 to South King Street.
27.	Pali Highway town-bound from Kaneohe to Downtown (Vineyard Boulevard).
28.	Puuloa Road mauka-bound toward Interstate Route H-1 makai of Pukoloa Street.
29.	Salt Lake Boulevard Koko-Head bound between Ala Kapuna and Ala Lilikoi.
30.	Wilikina Drive town-bound between McCornack Road and Interstate Route H-2.

4.0 PURPOSE OF THE CMP BASELINE RESULTS

In presenting Oahu's story, the scene is being set for the comparison of proposed congestion-relief strategies (e.g., TIP and ORTP projects) to the year 2035 baseline condition. The way in which this will be achieved will be through the use of performance measures, as described in the *CMS Performance Monitoring and Evaluation Plan*.

Proposed congestion relief projects will be evaluated, as appropriate, using the OahuMPO travel demand forecasting model. The results of each project will be compared with those of the baseline (as presented in this report), and then ranked, as described in the *CMS Performance Monitoring and Evaluation Plan.*

5.0 CONCLUSION

Analysis of the CMP year 2035 baseline results has shown that Oahu's story looks rather grim if no improvements are made to the transportation system other than projects that are already funded for implementation within the next few years.

Population in the PUC is projected to increase by over 64,000 residents by year 2035. Population in the Ewa area is forecasted to increase by 96,000 residents, more than double the number of Ewa residents as compared to year 2007. In Central Oahu, the population is projected to increase by more than 37,000, or 24%.

Future employment in the PUC is projected to increase by about 13%, or 52,000 jobs. By the year 2035, work trips to and from the PUC by Ewa residents are projected to increase by about 7% and trips by Central Oahu residents are expected to increase by 14%. The number and share of work trips to Ewa and Central Oahu are also expected to increase considerably by the year 2035. Ewa is forecasted to experience a 172% increase, while Central Oahu is forecasted to experience a 31% increase in work trips to the region. However, although additional work trips are forecasted to be made to Central Oahu and Ewa in the year 2035, the PUC is still expected to be a major employment destination, with 63% of the total work trips.

As a result, major roadways leading to the PUC are expected to operate at a poor or failing LOS by year 2035 if no improvements are made to the transportation system. More than 25% of the freeways, expressways, and ramps are forecasted to operate at LOS E or F during the two-hour AM peak period. Daily VMT, and the two-hour AM peak period VHT and VHD are all projected to increase by the year 2035. The roadway network on Oahu is currently used primarily by automobiles, and is expected to remain that way in the year 2035. Of the estimated 1,459,000 total daily resident trips to and from work in year 2035, 84% are projected to be in private automobiles, 9% are projected to be made by transit, and the remaining 7% are projected to be made by either bicycling or walking.

Daily VMT is projected to grow at a slower rate (16%) compared to the forecasted increase in daily resident trips (27%), which indicates that the average length of trips in year 2035 will be less than in year 2007, and that more trips will be made by transit. The shorter trips are likely due to more residents staying within the Ewa-Kapolei areas to work, as opposed to traveling to Downtown. Transit trips to and from work are forecasted to increase by more than 59%. This is likely due to the implementation of a fixed guideway system between Kapolei and Ala Moana Center, which will provide improved transit accessibility by year 2035.

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