

PROPOSED ROADWAY DEVELOPMENT PROGRAM

JANUARY 2007

PREPARED FOR
COUNTY OF MAUI PLANNING DEPARTMENT

PREPARED BY



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January 2007

Prepared for:

**COUNTY OF MAUI
PLANNING DEPARTMENT**

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I. INTRODUCTION

This study was commissioned by the County of Maui, which is in the process of updating its General Plan to the year 2030. Despite its best efforts, the County of Maui has been forced to acknowledge that the growth and development on the island in the past several decades has resulted in increases in travel demand. The pressures for growth and development on Maui are such that it is necessary to develop a transportation improvement plan that addresses the changes expected over the next 10 to 20 years. Residents have clearly expressed their opinion that improvement to the transportation system is one of the most important problems facing the county.

The purpose of this study is to provide a capacity assessment of Maui's roads as they exist today and as they may exist in 2030 if current land use and development trends are projected to 2030. The study will demonstrate the effectiveness of roadway improvements that will be proposed to support the Planning Department's land use program outlined in the Maui Island Plan.

The following chapters include a discussion on existing conditions, the assumptions made, future conditions, and the methodology/techniques used to conduct the analyses.

II. EXISTING CONDITIONS

This chapter provides a description of the land use and socioeconomic conditions on the Island of Maui and the existing transportation system that serves this land use. Data to be provided includes:

- An inventory of land use and socioeconomic and demographic data was assembled to provide a base of information for Maui
- An inventory of the existing circulation system including all major roadways
- An assessment of the current volumes on the key elements of the roadway system

LAND USE AND SOCIOECONOMIC DATA

In order to provide a detailed description of the demographic characteristics and land uses on the island of Maui by location, it was necessary to divide the island geographically. The system used by the county for its community plans (CPs) was used as the starting point for this process. The six community plan areas, illustrated in Figure 1, are described below:

- Lahaina CP Area - The Lahaina CP area is located on the west side of Maui. The communities in the area are: Olowalu, Waiane'e, Lahaina, Kaanapali, Honokowai, Kahana, Kapalua, Napili, and Honokahau. The Kaanapali community contains a large number of hotels and resorts. The Lahaina community is a major tourist attraction with shops aligned on Front Street. The land uses in the area consist of agriculture in the hillsides, residential along Honoapiilani Highway, commercial and hotels along the coast.
- Wailuku-Kahului CP Area - The Wailuku-Kahului CP area is located on the north side of the island with the Lahaina CP to the west, the Paia-Haiku CP to the east, and the Kihei-Makena Community to the south. The major points of interest are the Kahului Airport, Maui Community College, Maui Memorial Hospital, County and State government offices, Kahului Harbor, Kaahumanu Shopping Center, and Maui Mall. The communities located within the area are Kahului, Wailuku, Kahakuloa, Waihee, Waikapu, Puunene, and Sprekelsville. The land uses consist of commercial/business, residential, and industrial in the urban areas of Kahului and Wailuku, and residential and agriculture in the rural areas.

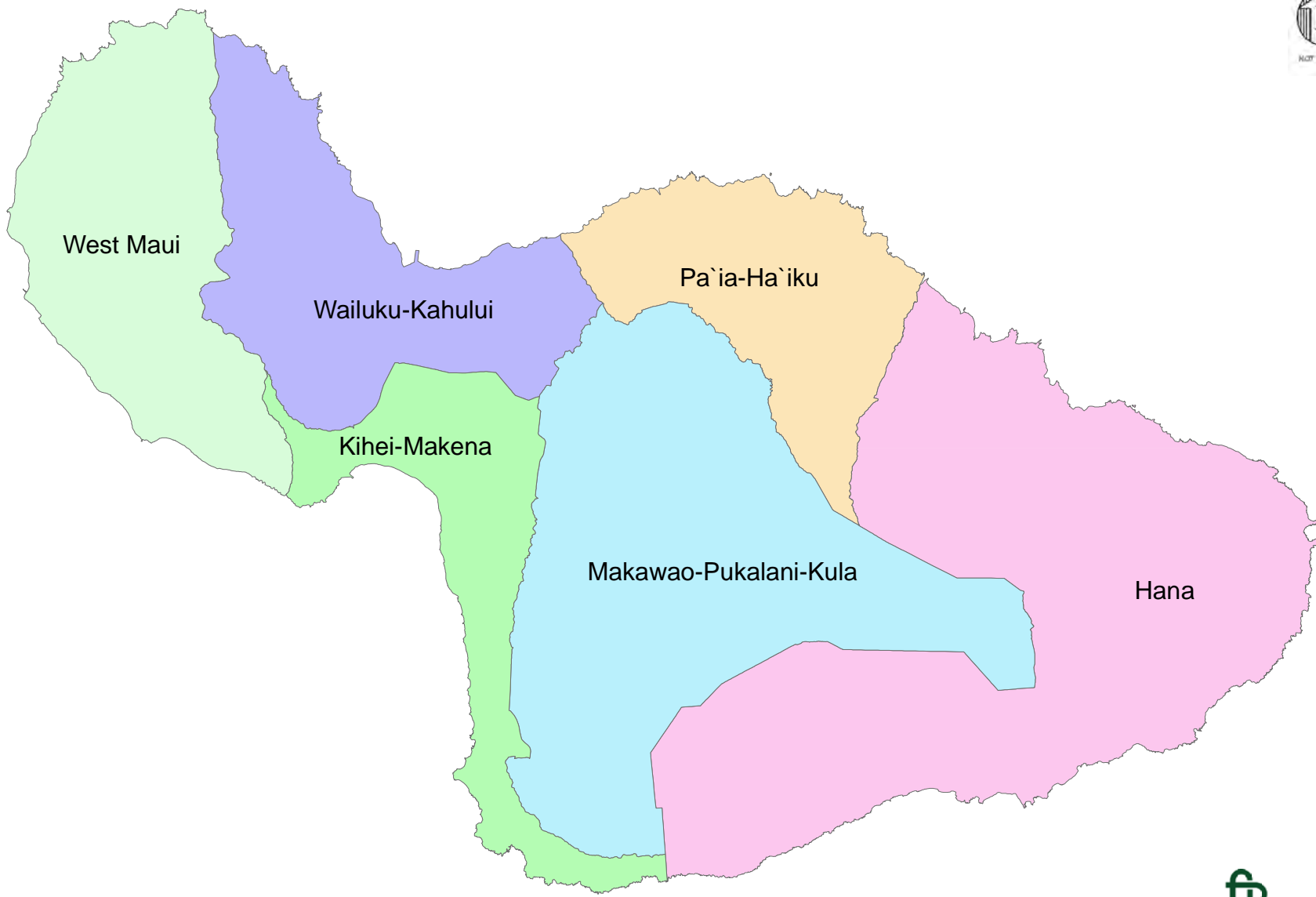


FIGURE 1
COMMUNITY PLAN AREAS

- Kihei-Makena CP Area - The Kihei-Makena CP area is located on the southwest side of the island. The communities located in this area are Kihei, Kamaole, Wailea, and Makena. Along the coast, the area contains a large number of resorts and hotels. The other land uses are commercial areas along South Kihei Road, residential areas at Maui Meadows and between South Kihei Road and Piilani Highway, and agriculture to the east of Piilani Highway.
- Paia-Haiku CP Area - The Paia-Haiku CP area is located on the northeast side of the island with the Wailuku-Kahului CP area to the west, the Hana CP area to the east, and the Makawao-Pukalani-Kula CP area to the south. The Paia-Haiku CP area contains mainly residential areas, with commercial areas in the towns. Agriculture is a large part of the area's land use. The communities located in the area are Lower Paia, Paia, Kuau, Haiku, Kokomo, Kaupakulua, Kuiaha, Pauwela, Ulumalu, Huelo, and Kailua.
- Makawao-Pukalani-Kula Community Plan Area - The Makawao-Pukalani-Kula CP area is located in the center part of the island. This area borders all the other community areas except for the Lahaina CP area. The communities located in the area are Haliimaile, Makawao, Pukalani, Olinda, Omaopio, Kula, Keokea, Ulupalakua. The major points of interest are the Kula Forest Reserve and the Haleakala National Park. A large part of the area is agricultural. Residential areas are concentrated in the towns.
- Hana Community Plan Area - The Hana CP area is located on the east side of the island. Some of the communities located in the area are Keanae, Wailua, Ka'eleku, Hana, Kakio, Hamoa, Haou, Muolea, Koali, and Kipahulu. The major points of interest are the Koolau Forest Reserve, Hana Forest Reserve, and Hana. Agriculture is a large part of the land use. Residential areas are located in the towns along the Hana Highway.

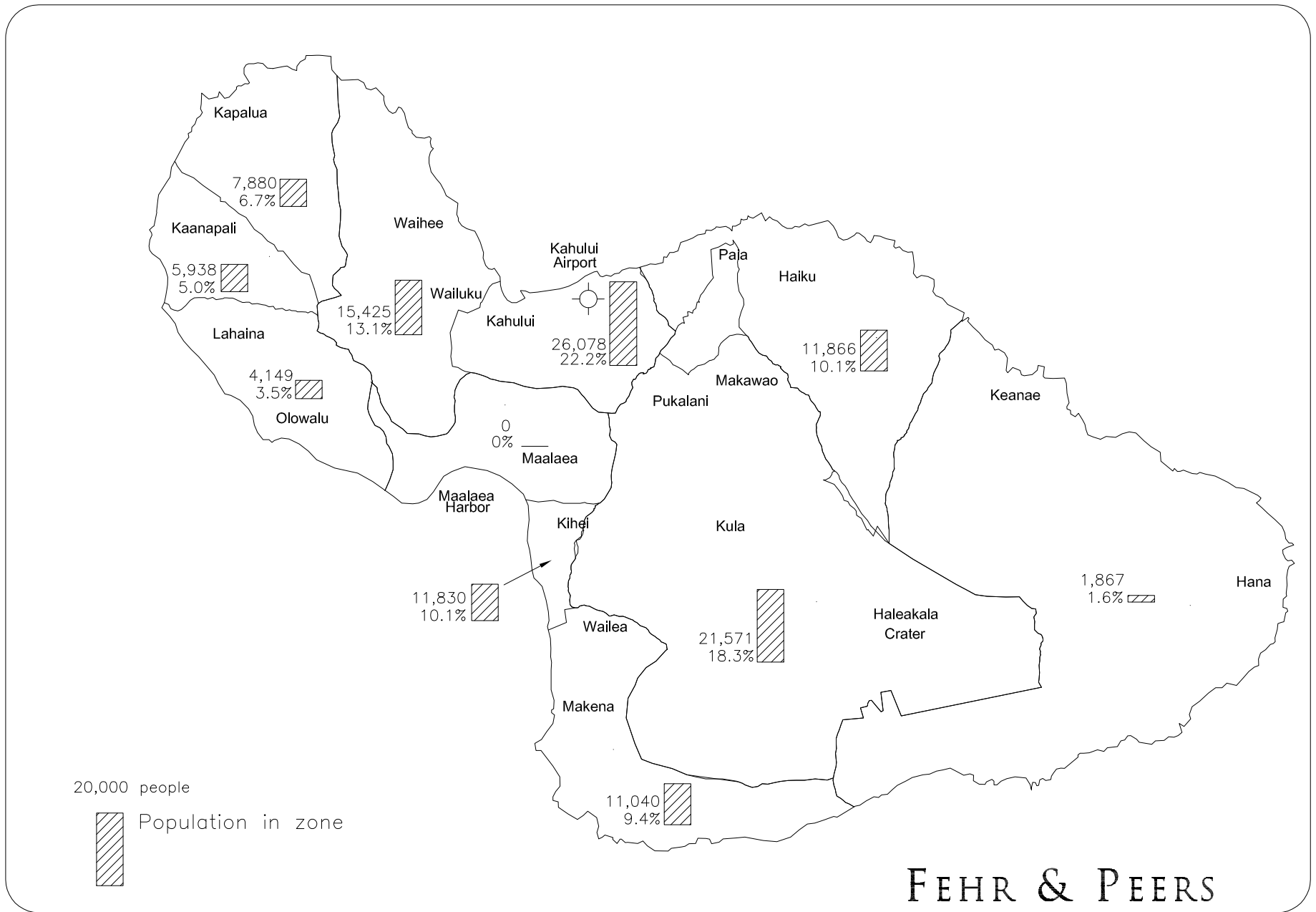
The county's CP system was used as the basis for disaggregating land use and socioeconomic data on the island.

Population

The island of Maui had an estimated population of 117,644, according to the 2000 Census. Table 1 indicates that the population of the island increased by 28.8% from 91,361 to 117,644 between 1990 and 2000. It can be seen that the Wailuku-Kahului CP area and the Kihei-Makena CP area combined contain more than half of the island's population (Wailuku-Kahului at 35.3% and Kihei-Makena at 19.4% for a total of 54.7%). The next most populated areas are the Makawao-Pukalani-Kula CP area (18.3%) and Lahaina CP (15.3%). The remaining population is located in the community plan areas of Paia-Haiku (10.1%) and Hana (1.6%). Figure 2 illustrates the breakdown of the population by CP area.

**TABLE 1
POPULATION BY COMMUNITY PLAN AREA**

| COMMUNITY PLAN AREA | 1990 | | 2000 | | % Growth |
|-----------------------|------------|-------------|------------|-------------|----------|
| | Population | % of Island | Population | % of Island | |
| West Maui | 14,574 | 16.0% | 17,967 | 15.3% | 23.3% |
| Kihei-Makena | 15,365 | 16.8% | 22,870 | 19.4% | 48.8% |
| Wailuku-Kahului | 32,816 | 35.9% | 41,503 | 35.3% | 26.5% |
| Makawao-Pukalani-Kula | 18,923 | 20.7% | 21,571 | 18.3% | 14.0% |
| Paia-Haiku | 7,788 | 8.5% | 11,866 | 10.1% | 52.4% |
| Hana | 1,895 | 2.1% | 1,867 | 1.6% | -1.5% |
| Islandwide | 91,361 | 100.0% | 117,644 | 100.0% | 28.8% |



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FIGURE 2
 EXISTING POPULATION DISTRIBUTION

The Paia-Haiku CP area experienced the greatest growth in population from 1990 to 2000. The population increased by about 52.4 percent from 7,788 in 1990 to 11,866 in 2000. The growth in the Kihei-Makena CP area was nearly as great, increasing by 48.8 percent from 15,365 in 1990 to 22,870 in 2000. Because of its size, however, the Wailuku-Kahului CP area experienced the largest absolute increase from 32,816 in 1990 to 41,503 in 2000, a 26.5 percent increase. The Makawao-Pukalani-Kula and Lahaina CP areas increased by 14.0% and 23.3%, respectively, from 1990 to 2000. The Hana CP experienced a 1.5% decrease in population during this period, from 1,895 to 1,867.

Employment

The data in Table 2 indicates that over 70% of the employment on Maui is concentrated in the two community plan areas of Wailuku-Kahului (43.8%) and Lahaina (28.4%). The Kihei-Makena CP area contains 18.7% of the employment. The remaining three community areas yielded less than 10% of the island's total employment opportunities: Makawao-Pukalani-Kula at 5.3%, Paia-Haiku at 2.8%, and Hana at 1.1%. Figure 3 illustrates the distribution of employment on the island by CP area.

Land Use Inventory

For the purpose of this analysis, the data from the land use inventory was summarized by the following five categories for all six CP areas:

- Residential dwelling units (du)
- Hotel and resort units
- Retail space
- Office space
- Industrial space

Table 3 summarizes the land use data by CP area by the types of land uses described below:

**TABLE 2
EMPLOYMENT BY COMMUNITY PLAN AREA**

| COMMUNITY PLAN AREA | 1990 | | 2000 | | % Growth |
|-----------------------|-------------|-------------|-------------|-------------|----------|
| | Employment* | % of Island | Employment* | % of Island | |
| West Maui | 14,731 | 28.5% | 21,344 | 28.4% | 44.9% |
| Kihei-Makena | 8,669 | 16.7% | 14,002 | 18.7% | 61.5% |
| Wailuku-Kahului | 24,195 | 46.7% | 32,851 | 43.8% | 35.8% |
| Makawao-Pukulani-Kula | 2,312 | 4.5% | 3,953 | 5.3% | 71.0% |
| Paia-Haiku | 1,172 | 2.3% | 2,077 | 2.8% | 77.2% |
| Hana | 680 | 1.3% | 840 | 1.1% | 23.5% |
| Islandwide | 51,759 | 100.0% | 75,067 | 100.0% | 45.0% |

Note:

* - Denotes Total Civilian Jobs

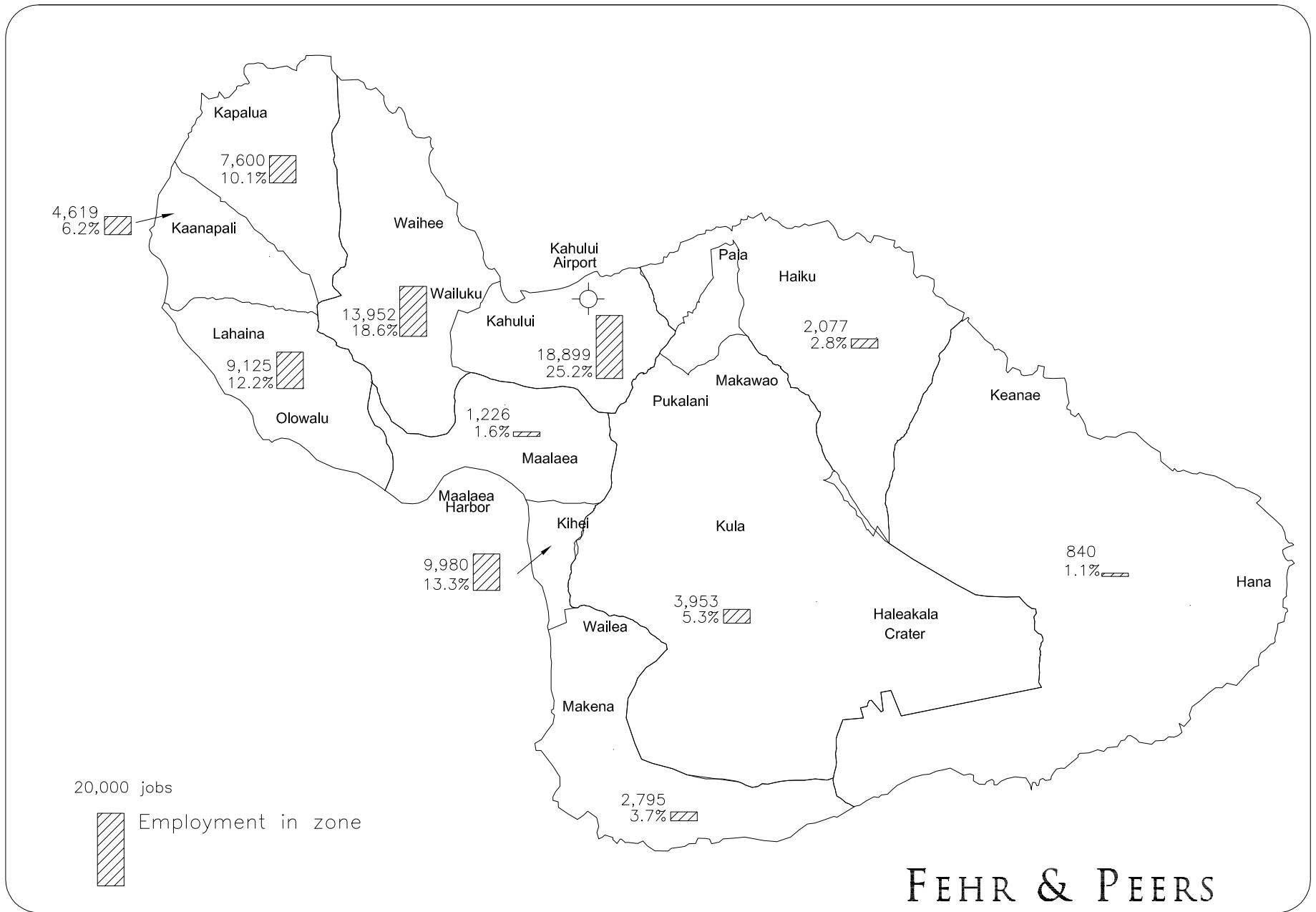


FIGURE 3
EXISTING EMPLOYMENT DISTRIBUTION

**TABLE 3
2004 LAND USE SUMMARY**

| CPA | Name | SF DU | MF DU | INDUSTRIAL (SF) | RETAIL (SF) | OFFICE (SF) | HOTEL (RM) |
|--------------|-----------------------|--------------|--------------|------------------------|--------------------|--------------------|-------------------|
| 1 | Wailuku-Kahului | 10,737 | 1,377 | 4,945,257 | 2,858,737 | 2,028,038 | 548 |
| 2 | Kihei-Makena | 6,039 | 4,914 | 204,319 | 1,720,047 | 294,217 | 8,208 |
| 3 | West Maui | 3,677 | 3,455 | 569,921 | 1,651,290 | 493,586 | 11,774 |
| 4 | Hana | 780 | 16 | 1,140 | 63,471 | 9,466 | 16 |
| 5 | Makawao-Pukalani-Kula | 8,265 | 189 | 36,874 | 471,901 | 84,658 | 21 |
| 6 | Pa`ia-Ha`iku | 4,503 | 112 | 153,749 | 233,668 | 27,318 | 26 |
| Total | | 34,001 | 10,063 | 5,911,260 | 6,999,114 | 2,937,283 | 20,593 |

Sources:

Existing Land Use Database, Island of Maui (Plan Pacific, Inc., 2005).

Certified Real Property Tax Database, 2004 (Real Property Tax Division, Finance Department, County of Maui, March 2005).

- Residential Units - As of 2004, there were a total of 44,064 residential units on the island of Maui, of which 34,001 are single family units and 10,063 are multi-family units. More than half of all residential units are located in two CP areas, Wailuku-Kahului (27.5.1%) and Kihei-Makena (24.9%).
- Hotels and Condominiums - There are an estimated total 20,593 hotel and resort condominium rooms island-wide as of 2004. About 97% of the hotels and condominiums are located in two CP areas, West Maui (57.2%) and Kihei-Makena (39.9%).
- Retail Space - Of the total estimated retail floor space on the island of Maui (6,999,114 square feet [sf]) about 40%, 2,858,737 sf is located in the Wailuku-Kahului area. The second largest concentration of retail space, 1,720,047 sf, is located in the Kihei-Makena CP area.
- Office Space - The total estimated office space on Maui is 2,937,283 sf. The Wailuku-Kahului CP area contains almost 70% of the total office space, with 2,028,038 sf. A large percentage of this office space is related to the government offices for the State of Hawaii and the County of Maui in Wailuku. West Maui has 493,586 sf.
- Industrial Space - The total estimated amount of industrial space (which includes heavy and light industrial) on Maui is 5,911,260 sf. Over 83% of the total industrial square footage is located in the Wailuku-Kahului CP area. The industrial areas in Wailuku are located northwest of Kanaloa Road west of Waiehu Beach Road and along Mill Street. In Kahului, the industrial areas are located near Pier 1 in the Kahului Harbor and along Hana Highway and Dairy Road.

Visitor Activity

Visitor activity on the Island of Maui is most commonly described in terms of the average visitor census, i.e., the average number of visitors that stay overnight in lodging on the island. Visitor activity is also described in terms of the number of visitor arrivals, i.e., the total number of visitors that annually arrive on the island and stay overnight in one of the lodgings.

Table 4 summarizes the average visitor census and the visitor arrivals on the island by district. It can be seen that the West Maui CP has over half of the visitors and arrivals. The Kihei-Makena district has the second highest number of each.

**TABLE 4
VISITOR DATA SUMMARY**

| CPA | Name | Historical Visitor Arrivals 2000 | Historical Average Visitor Census* 2000 |
|--------------|-----------------------|---|--|
| 1 | Wailuku-Kahului | 103,438 | 1,931 |
| 2 | Kihei-Makena | 870,344 | 16,247 |
| 3 | West Maui | 1,238,385 | 23,118 |
| 4 | Hana | 25,076 | 468 |
| 5 | Makawao-Pukalani-Kula | 1,306 | 24 |
| 6 | Paia-Haiku | 1,567 | 29 |
| Total | | 2,240,116 | 41,817 |

* Community plan average visitor census is equal to Maui Island visitors per occupied visitor unit multiplied by community plan occupied visitor units

STREET AND HIGHWAY SYSTEM INVENTORY

The street and highway system inventory for the island includes the primary roadways, collectors and secondary roadways and local streets. Several major highways travel around the island and converge in the Wailuku-Kahului area, as shown in Figures 4A and 4B. Honoapiilani Highway (Route 30) serves primarily the west side of the island. From Wailuku this highway runs southward to Maalaea then northward to Honokahua. Hana Highway (Routes 36 and 360) serves the east side of the island. The southern section of the island is served by Piilani Highway (Route 31), which is connected to Kahului through either Mokulele Highway (Route 311) or Honoapiilani Highway/Kuihelani Highway (Route 380) via North Kihei Road. The central section of the island near the Haleakala Crater is served by Haleakala Highway/Kula Highway (Route 37).

A brief description of the principal roadways serving the island is provided below:

- Honoapiilani Highway (Route 30) - Honoapiilani Highway is a two-lane major arterial from Keanu Street in Wailuku to Lahainaluna Road in Lahaina. From Lahainaluna Road to Lower Honoapiilani Road, there are four lanes. After Lower Honoapiilani Road, the highway has two lanes to the end of the segment near Mokolea Point. The median alternates between double yellow and single dashed yellow striping for the entire segment. The posted speed limit in the urban and mountainous areas range from 20 to 35 miles per hour (mph). For the rural areas the posted speed limit is 45 to 55 mph. Honoapiilani Highway is signalized at the following locations: Kuikahi Drive, Kuihelani Highway, North Kihei Road, Kapoli Street, Kai Hele Ku Street, Shaw Street, Lahainaluna Road, Papalaua Street, Hinau Street, Keawe Street, Kapunakea Street, Lealii Parkway, Fleming Road, Halelo Street, Puukolii Road, Halawai Drive, Lower Honoapiilani Road, Akalele Street, Hoohui Road, Napilihau Street, Recreation Center Drive, and Halelo Road.
- Lower Honoapiilani Road - Lower Honoapiilani Road is a two-lane minor urban collector that runs parallel with Honoapiilani Highway on the west. A bikeway runs along the roadway. The roadway has a double yellow striped median. Resorts and hotels are serviced by the roadway.
- Front Street - Front Street is a two-lane major urban collector that has parallel parking on both sides. The roadway runs parallel to Honoapiilani Highway and travels through the Lahaina town servicing the residential and commercial areas.
- North Kihei Road - North Kihei Road is a two-lane major arterial that runs in a north-south direction. It connects Honoapiilani Highway to South Kihei Road and Piilani Highway. The roadway has a median that varies from a single dashed yellow to double striping to a continuous left-turn lane in the commercial area. The posted speed limit is 45 mph in rural areas and 35 mph in urban areas.



FIGURE 4A
MAJOR HIGHWAYS ON MAUI



NOT TO SCALE



FIGURE 4B
STREETS IN WAILUKU-KAHULUI

- Piilani Highway (Route 31) - Piilani Highway is a four-lane major arterial from Mokulele Highway to Mapu Place/Kilohana Street. After Mapu Place/Kilohana Street, Piilani Highway continues as a two-lane southbound major arterial serving the resort areas of Wailea and Makena. The posted speed limit is 40 mph. The roadway is signalized at Mokulele Highway, Uwapo Road, Ohukai Road, Piikea Avenue, East Lipoa Street, Kanani Road, Kealii Alanui Place, Mapu/Kilohana Drive.
- South Kihei Road - South Kihei Road is a two-lane major urban collector from the junction of North Kihei Road and Piilani Highway to south of Okolani Drive. The roadway is stop-controlled at North Kihei Road. South Kihei Road is signalized at Piilani Highway, Piikea Avenue, Azeka Marketplace, East Lipoa Street, Welakahao Road, Keala Place and KeAalii Alanui Place. South Kihei Road serves residential areas and commercial areas. The posted speed limits are 20-30 mph.
- East Lipoa Street - East Lipoa Street is a two-lane minor urban collector that runs in an east-west direction. The roadway connects South Kihei Road to Piilani Highway. The north side of the roadway contains commercial areas. The south side of the roadway contains an elementary school and residential areas. East Lipoa Street is signalized at South Kihei Road, Liloa Street and Piilani Highway.
- Main Street/Kaahumanu (Route 32) - Main Street is a two-lane major collector. It serves the commercial areas in Wailuku. The roadway is signalized at High Street, Market Street, and Central Avenue. Main Street turns into Kaahumanu Avenue at the Lower Main Street intersection. Kaahumanu Avenue is a four-lane major arterial from Nanihoa Drive, traveling east, to Kahului Beach Road. Kaahumanu Avenue opens up to a six-lane roadway from Kahului Beach Road to east of Wharf Street. The roadway has raised divided median. Major shopping facilities including the Kaahumanu Shopping Center, Kahului Shopping Center, and Maui Mall are serviced by this roadway. Kaahumanu Avenue is signalized at Lunalilo Street, Maui Lani Parkway, Kanaloa Avenue/Mahalani Street, South Papa Avenue, South Wakea Avenue, Kahului Beach Road/Kane Street, Lono Avenue, South Puunene Avenue, and Wharf Street/Maui Mall. The posted speed limit is 45 mph.
- Kanaloa Avenue - Kanaloa Avenue runs north-south and is a four-lane major urban collector from Kaahumanu Avenue to Mikohu Loop. From Mikohu Loop to Kahului Beach road, the number of lanes is reduced to two. To the west of Kanaloa Avenue, there are residential areas and the Baldwin High School. To the east of the road are the Zoological and Botanical Gardens and a youth center. Kanaloa Avenue has a striped double yellow median and is signalized at Kaahumanu Avenue and Kahului Beach Road.
- South Papa Avenue/West Papa Avenue - South Papa Avenue is a three-lane major urban collector (one southbound and two northbound) from Kaahumanu Avenue to Kea Street. From Kea Street to South Kamehameha Avenue, South Papa Avenue is a two-lane roadway. The area served by South Papa Avenue is primarily residential. The roadway has double yellow striped median and is signalized at Kaahumanu Avenue, Onehee Avenue, and South Kamehameha Avenue. South Papa Avenue continues as West Papa Avenue from South Kamehameha Avenue to South Puunene Avenue. West Papa is a two-lane road that has a single dashed yellow striped median and is signalized at Puunene Avenue. West Papa Avenue provides access to Maui High School. The posted speed limit for South Papa and West Papa Avenues is 30 mph.

- East Wakea/West Wakea Avenue - East Wakea/West Wakea Avenue is a two-lane major urban collector. The roadway provides access to the Kahului Park, residential areas, and commercial areas. There is parking available on both sides of the roadway from Hana Highway to Alamaha Street. East Wakea Avenue is signalized at Kaahumanu Avenue, Kea Street, Onehee Avenue, South Kamehameha Avenue, Lono Avenue and Puunene Avenue. West Wakea Avenue is signalized at Lono Avenue, Hoohana Street, Alamaha Street, Hana Highway and South Puunene Avenue. The median alternates between double yellow and single dashed yellow striping.
- Lono Avenue - Lono Avenue is a two-lane major urban collector and runs in a north-south direction. Lono Avenue serves commercial areas on the north and residential area on the south. The median has double yellow striping. Lono Avenue is signalized at Kaahumanu Avenue, Kamehameha Avenue, West Wakea, and Hina Avenue.
- Kamehameha Avenue/South Kamehameha Avenue - Kamehameha Avenue is a two-lane major urban collector from Papa Avenue to Lono Avenue. This roadway segment serves residential areas and the median alternates between single dashed yellow and double yellow striping. From Lono Avenue to Hana Highway, Kamehameha Avenue widens from two to four lanes. The four lanes are separated with a raised median. The four-lane segment primarily provides access to commercial areas. Kamehameha Avenue is signalized at Hana Highway, Alamaha Street, Hoohana Street, Puunene Avenue, Lono Avenue, West Wakea Avenue, Hina and South Papa Avenue.
- South Puunene Avenue - South Puunene Avenue is four-lane major arterial from Kaahumanu Avenue to Wakea Avenue. From Wakea Avenue to Puakani Street, the travel lanes are reduced from four to two lanes. South Puunene Avenue has a double yellow striped median from Kaahumanu Avenue to Puakani Street. The roadway serves commercial and residential areas. South Puunene, from Puakani Street to north of Kuihelani Highway, has two northbound lanes and one southbound lane. The northbound traffic lanes are separated from the southbound lane by guardrails and trees. South Puunene Avenue is signalized at Kaahumanu Avenue, Kamehameha Avenue, Wakea Avenue, West Papa Avenue and Kuihelani Highway. The posted speed limit is 30 mph.
- Waiale Road - Waiale Road is a two lane major urban collector with a striped double yellow median. It provides access to residents in the southern areas in Wailuku. Future improvements will be made to Waiale Road, increasing the number of lanes from two to four.
- Market Street - Market Street is a major urban collector street. South of Main Street, Market Street is a two-lane street. Between Main Street and Vineyard Street, Market Street is a one-way street that travels northbound and contains two lanes. Thereafter, Market Street is a two-way street. Market Street is signalized at Main Street. Market Street provides access to the commercial core areas in Wailuku.
- Kahekili Highway (Route 330/340) - Kahekili Highway is two lane major arterial. North Market Street turns into Kahekili Highway at Mokuhau Road/Piihana Road. From the junction at Waiehu Beach Road to the entrance of Camp Maluhia, Kahekili Highway turns into Route 340. The posted speed limit is 35 mph in rural areas and 20 mph in populated

and mountainous areas. Kahekili Highway provides access to Waihee town and residential areas.

- Kahului Beach Road/Waiehu Beach Road (Route 340) - Kahului Beach Road/Waiehu Beach Road is a two lane major arterial. Kahului Beach Road turns into Waiehu Beach Road at East Main Street. Waiehu Beach Road turns into Kahekili Highway at the Waiehu Beach Road and Kahekili Highway junction. The Kahului Beach Road/Waiehu Beach Road serves residential areas and the Kahului Beach Park. The posted speed limit is 30 miles per hour. Kahului Beach Road is signalized at Kaahumanu Avenue and Kanaloa Avenue.
- Mokulele Highway (Route 311) - Mokulele Highway is a two lane major arterial. Mokulele Highway starts from Kuihelani Highway to the North Kihei Road/Piilani Highway junction. The highway has a double yellow striped median. The posted speed limit is 45 miles per hour in the rural areas and 30 miles in Puunene town. Mokulele Highway is signalized at Kuihelani Highway.
- Dairy Road/Kuihelani Highway (Route 380) - Dairy Road is a four-lane major arterial that runs from Haleakala Highway (Keolani Place junction) to South Puunene Avenue. Dairy Road is signalized at Hana Highway and South Puunene Avenue. Dairy Road has a double yellow striped median and is surrounded by commercial areas such as Costco, K-mart, Home Depot, etc. The posted speed limit is 30 miles per hour. Dairy Road turns into Kuihelani Highway south of South Puunene Avenue. Kuihelani Highway is a two-lane major arterial that ends at Honoapiilani Highway. This portion of the highway runs through an agricultural area. The posted speed limit is 55 mile per hour. Kuihelani Highway is signalized at Honoapiilani Highway.
- Keolani Place - Keolani Place is a four lane major arterial separated by a double yellow striped median. Keolani Place provides access to the Kahului Airport. The posted speed limit is 30 miles per hour. Keolani Place is signalized at Lanui Circle.
- Hana Highway (Route 36) - Hana Highway is a four lane major arterial from Kaahumanu Avenue to Haleakala Highway (Upcountry junction). Along this segment, the median is raised and the posted speed limit is 45 to 55 mph. From Haleakala Highway (Upcountry junction) to Kaupakalua Road, Hana Highway has two lanes and a double yellow striped median. The posted speed limit along this segment is 35 to 45 mph. Hana Highway begins to narrow from ten to seven feet from Kaupakalua Road to Hana Bay. This segment is rural and mountainous, thus the posted speed limit is 10 to 35 mph. Hana Highway is signalized at Kamehameha Avenue, Dairy Road, Haleakala Highway (Upcountry junction), and Baldwin Avenue.
- Haleakala Highway (Route 37/377) - Haleakala Highway is a two lane major arterial from Hana Highway (Kanaha Pond) to Hana Highway (Upcountry junction). Haleakala Highway turns into a three-lane highway (two lanes southbound and one lane northbound) from Hana Highway (Upcountry junction) to Haliimaile Road. Of the two southbound lanes, the inner southbound lane is used as a contra-flow (reversible) lane. This lane is coned off to operate as a northbound lane in the a.m. peak period, thus increasing the northbound lanes from one to two. During the p.m. period, the lane is converted back to a southbound lane. The highway has a double yellow striped median. The posted speed limit is 45 to 55

mph in rural areas and 35 mph in urbanized areas. From Haliimaile Road to Haleakala Crater Road, Haleakala Highway remains a two lane major arterial. The posted speed limit is 30 miles per hour. Haleakala Highway is signalized at Keolani Place, Hana Highway (Upcountry junction), Fire Break Road, Pukalani Street, and Kula Highway and Makawao Avenue.

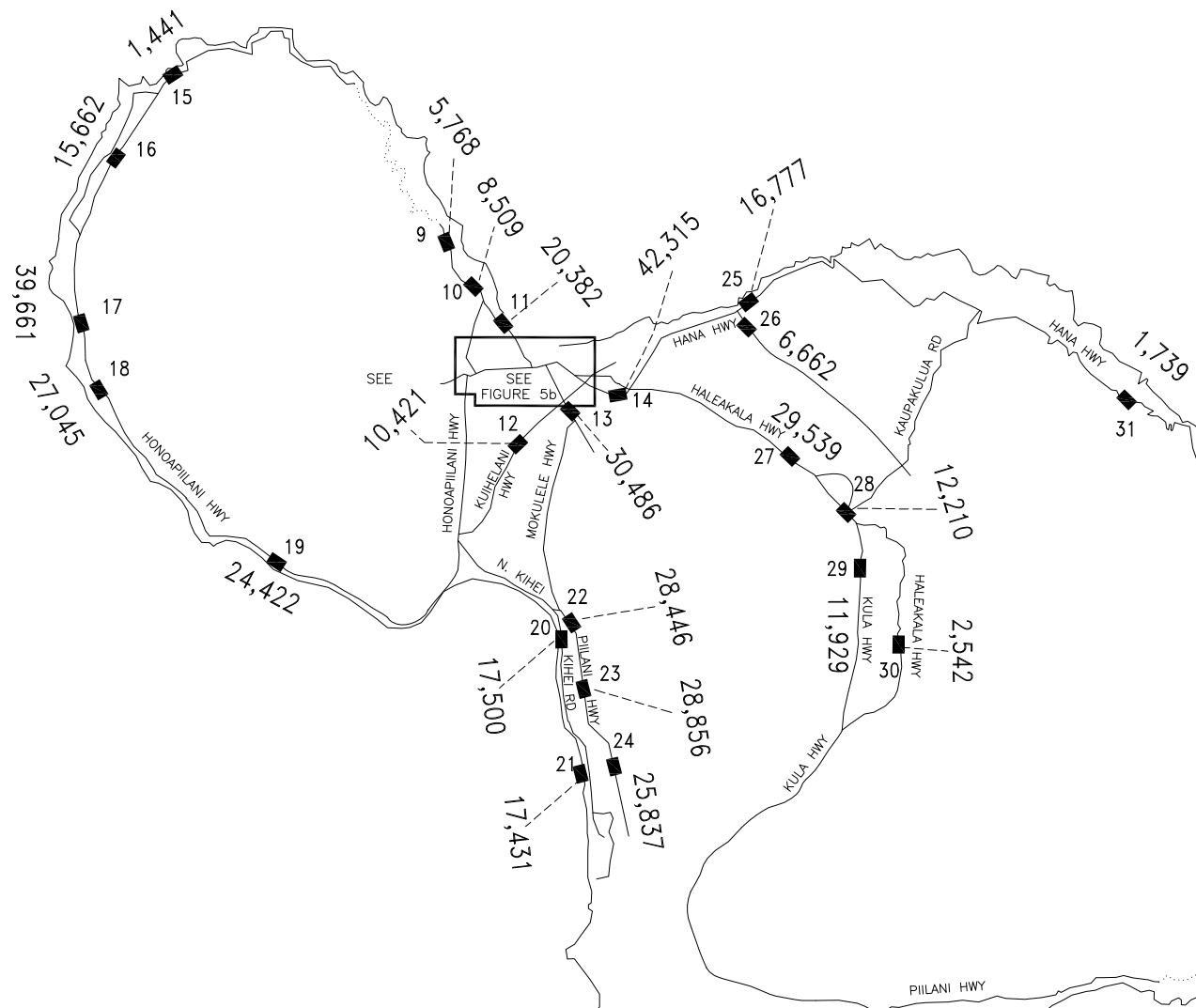
- Kula Highway (Route 37) - Kula Highway begins at the junction of Haleakala Highway and the Haleakala By-Pass Highway. Kula Highway is a two-lane major arterial. Kula Highway provides access to the towns of Waiakoa, Keokea, and Ulupalakua. Kula Highway is signalized at Haleakala Highway and Aapueo Drive and has a double yellow striped median.
- Makawao Avenue/Kaupakalua Road (Route 365) - Makawao Avenue/Kaupakalua Road is a two-lane minor collector running from Haleakala Highway to Hana Highway. The roadway provides access to the towns of Makawao, Kokomo, Kaupakulua, and Ulumalu. The posted speed limit is 20 to 30 mph. Makawao Avenue/Kaupakalua Road is signalized at Haleakala Highway and Haleakala By-Pass Highway and stop-controlled at Baldwin Avenue/Olinda Avenue.
- Baldwin Avenue - Baldwin Avenue is a two-lane street from Makawao Avenue to Hana Highway. Baldwin Avenue provides access to Lower Paia, Paia, and Maunaolu College. Baldwin Avenue is signalized at Hana Highway.
- Kekaulike Highway/Haleakala Highway (Route 377) - Kekaulike Avenue is two-lane major arterial. Haleakala Highway runs from Kula Highway/Haleakala By-Pass Highway to Haleakala Crater Road and thereafter it becomes Kekaulike Highway. Kekaulike Avenue serves the town of Kula and the Kula Botanical Gardens. The posted speed limit is 30 mph.
- Haleakala Crater Road (Route 378) - Haleakala Crater Road is a two lane major collector. The roadway provides access to the Haleakala National Park. The posted speed limit is 30 mph.

TRAFFIC VOLUMES

Existing traffic volumes were obtained from the State of Hawaii Department of Transportation for the year 2003. The 31 count locations and the average daily traffic volumes are illustrated in Figures 5A and 5B. The average daily traffic volumes indicate that the most heavily traveled roadways on Maui during the day are Honoapiilani Highway, Kaahumanu Avenue, and Hana Highway. Honoapiilani Highway carries approximately 39,660 vehicles per day (vpd) north of Lahaina Civic Center Drive. Kaahumanu Avenue carries about 50,150 vpd east of Kahului Beach Road and decreases to approximately 22,120 vpd east of Central Avenue. Hana Highway carries



NOT TO SCALE



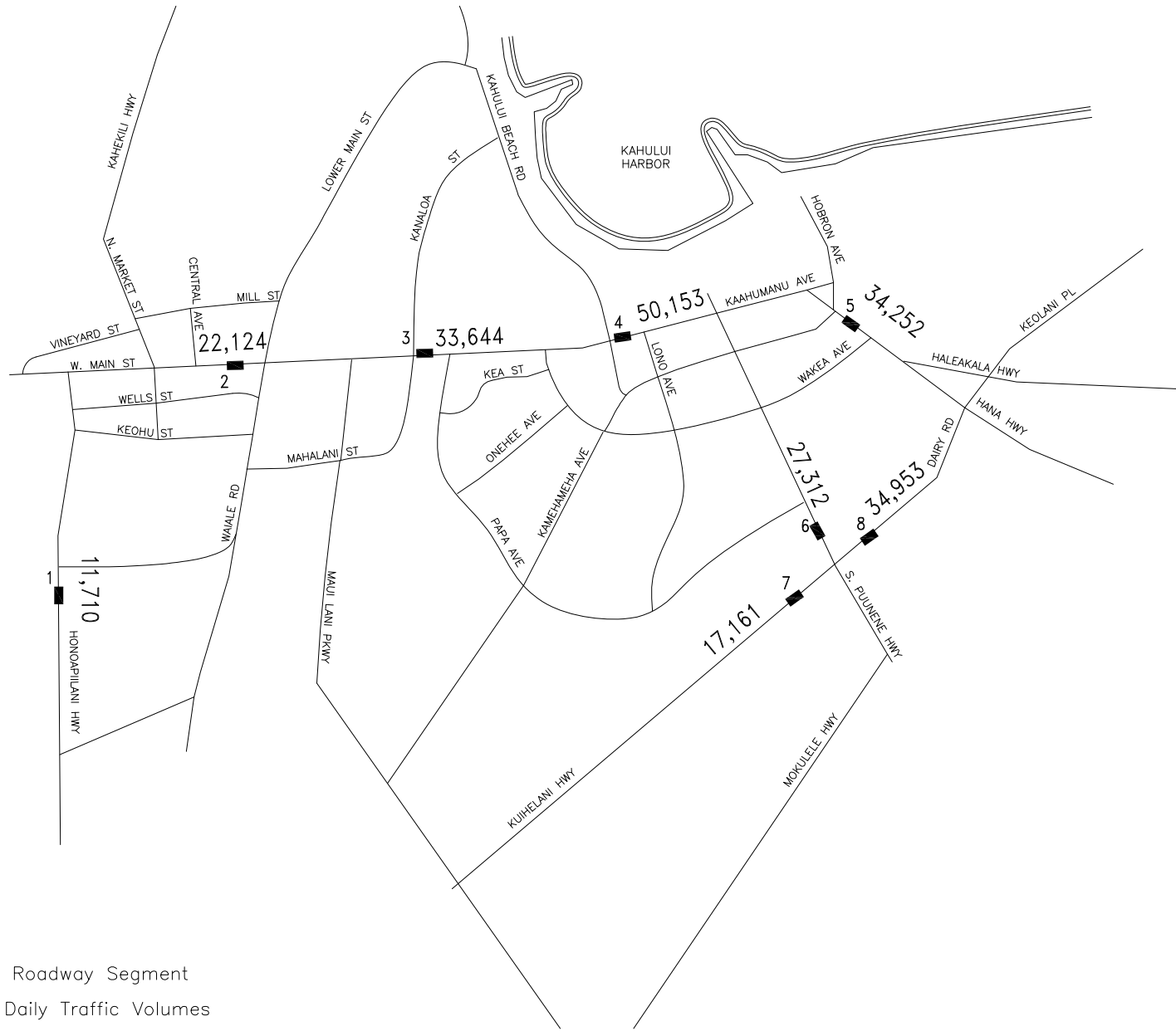
Legend:

- # ■ Analyzed Roadway Segment
- X,XXX Average Daily Traffic Volumes

FIGURE 5A
ISLAND-WIDE 2003 AVERAGE DAILY TRAFFIC VOLUMES



NOT TO SCALE



Legend:



Analyzed Roadway Segment

X,XXX

Average Daily Traffic Volumes

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FIGURE 5B
WAILUKU-KAHULUI 2003 AVERAGE DAILY TRAFFIC VOLUMES

approximately 42,320 vpd south of Haleakala Highway (Pukalani junction) and decreases to about 1,740 vpd east of Kailua Bridge. Haleakala Highway carries about 29,540 vpd, while Piilani Highway carries approximately 28,860 vpd.

III. FUTURE CONDITIONS

An analysis of conditions in the General Plan buildout year of 2030 was conducted using forecasts of land use and other relevant parameters for Year 2030 to develop future traffic projections.

LAND USE FORECASTS

Data similar to the socioeconomic and land use data for year 2004 discussed earlier was provided by the Maui County Planning Department for year 2030. This data, summarized in Table 5, was used to develop traffic forecasts for Year 2030. The table below summarizes the incremental increase in development that these Year 2030 forecasts represent:

Residential:

| | |
|---------------|-----------|
| Single Family | 19,511 du |
| Multi-Family | 10,549 du |

Commercial:

| | |
|------------|--------------|
| Retail | 2,309,433 sf |
| Office | 1,145,777 sf |
| Industrial | 1,490,838 sf |
| Hotel | 4,185 rooms |

As shown in Table 5, the total number of dwelling units and the total square footage in commercial and non-commercial development and the total number of hotel units projected to be completed on the island by Year 2030 by CP area.

**TABLE 5
2030 LAND USE SUMMARY**

| CPA | Name | SF DU | MF DU | INDUSTRIAL (SF) | RETAIL (SF) | OFFICE (SF) | HOTEL (RM) |
|--------------|-----------------------|---------------|---------------|------------------------|--------------------|--------------------|-------------------|
| 1 | Wailuku-Kahului | 18,582 | 7,425 | 5,938,168 | 3,857,295 | 2,737,433 | 824 |
| 2 | Kihei-Makena | 10,416 | 7,535 | 378,142 | 2,279,228 | 477,677 | 9,859 |
| 3 | West Maui | 6,533 | 5,189 | 844,511 | 2,128,377 | 674,979 | 13,864 |
| 4 | Hana | 1,067 | 23 | 4,533 | 74,704 | 13,979 | 16 |
| 5 | Makawao-Pukalani-Kula | 11,528 | 303 | 47,485 | 678,379 | 128,750 | 189 |
| 6 | Pa`ia-Ha`iku | 5,386 | 137 | 189,258 | 290,564 | 50,242 | 26 |
| Total | | 53,512 | 20,612 | 7,402,097 | 9,308,547 | 4,083,060 | 24,778 |

Sources:

2005 Vacant Lands Inventory (Planning Department, County of Maui, June 2006).

Socio-Economic Forecast; The Economic Projections for the Maui County General Plan 2030

(Planning Department, County of Maui. June 2006).

Existing Land Use Database, Island of Maui (Plan Pacific, Inc., 2005).

Certified Real Property Tax Database, 2004 (Real Property Tax Division, Finance Department, County of Maui, March 2005).

IV. 2030 ROADWAY CAPACITY RESULTS

This chapter presents the results of the level of service (LOS) analyses conducted for the Island of Maui roadway system. The analyses evaluated Year 2004 conditions, a 2030 “No Build” scenario, and the General Plan Horizon Year of 2030. A total of 31 locations were analyzed to assess islandwide operating conditions. The location of the 31 analyzed roadway segments are illustrated in Figures 6 and 7.

METHODOLOGY

The *2000 Highway Capacity Manual* (Transportation Research Board, 2000) standards were used to determine LOS on the highways. A general description of the levels of service can be seen in Table 6.

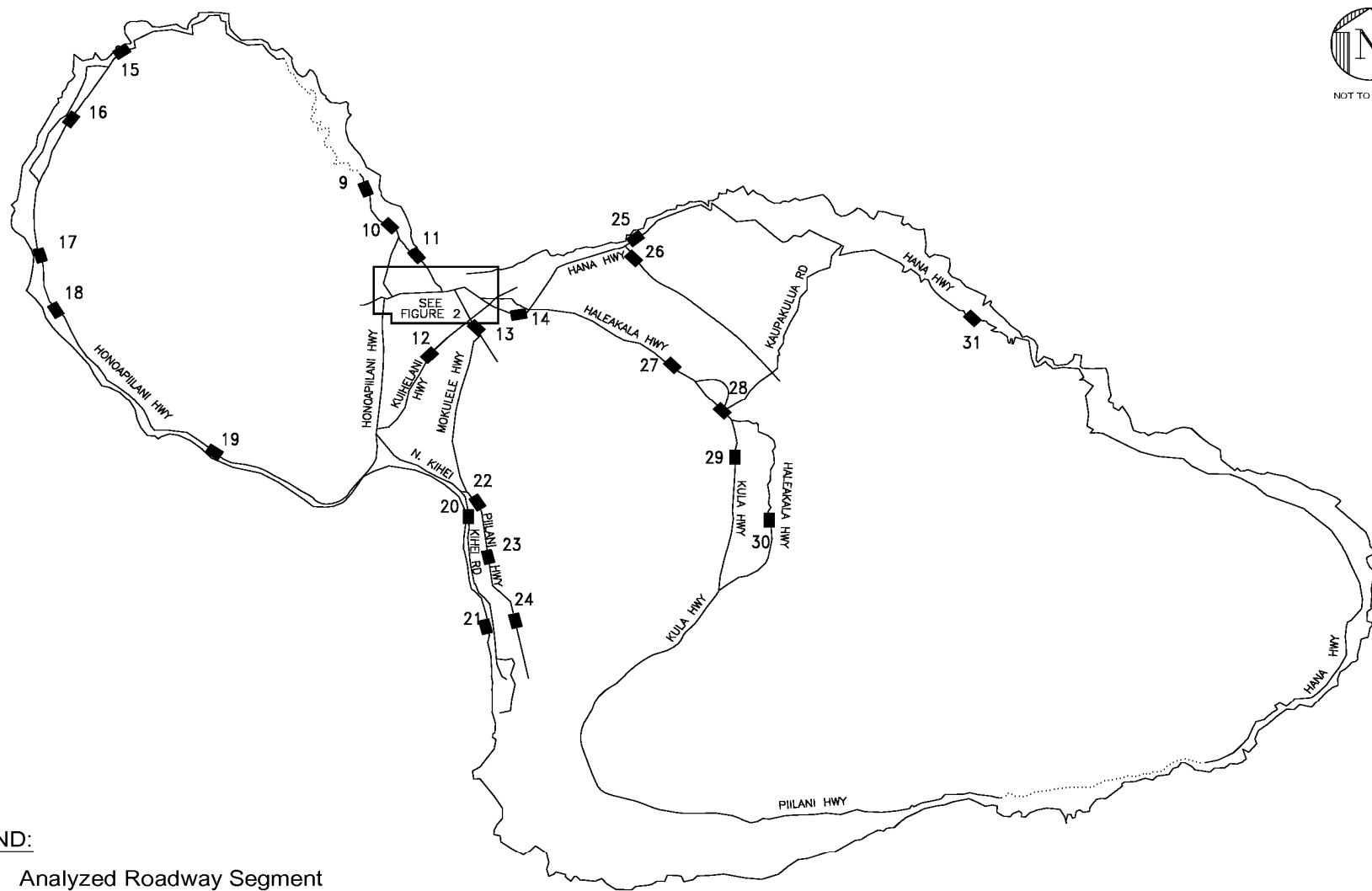
The roadway capacities used in the analysis are summarized below by vehicles per hour (vph) per lane:

ESTIMATED ROADWAY CAPACITIES BY HIGHWAY CLASSIFICATION

| | <u>Range of Capacities (vph/lane)</u> | |
|---------------------|---------------------------------------|------------|
| <u>Roadway Type</u> | <u>High</u> | <u>Low</u> |
| Multi-lane Arterial | 1,200 | 800 |
| Parkway | 875 | 875 |
| Major Collector | 600 | 500 |
| Minor Collector | 500 | 400 |
| Local Street | 300 | 300 |



NOT TO SCALE



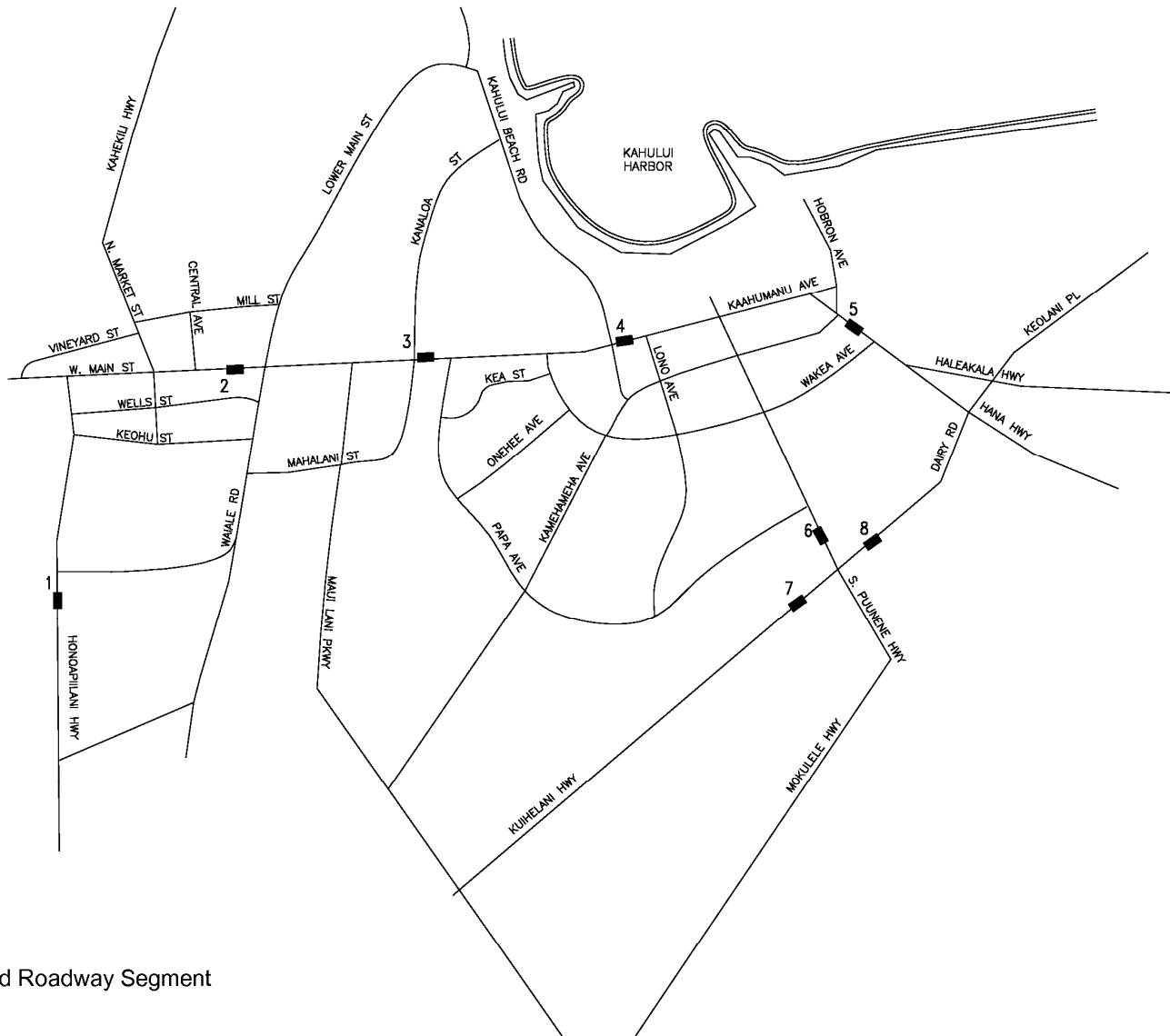
LEGEND:

■ Analyzed Roadway Segment

FIGURE 6: ISLAND-WIDE ROADWAY SEGMENT LOCATIONS



NOT TO SCALE



LEGEND:

■ Analyzed Roadway Segment

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KAKU ASSOCIATES

FIGURE 7: WAILUKU-KAHULUI ROADWAY SEGMENT LOCATIONS

**TABLE 6
LEVEL OF SERVICE DEFINITIONS**

| LOS | Definition |
|-----|--|
| A | Describes completely free-flow conditions. The operation of vehicles is virtually unaffected by the presence of other vehicles, and operations are constrained only by the geometric features of the highway and by driver preferences. Maneuverability within the traffic stream is good. Minor disruptions to flow are easily absorbed without a change in travel speed. |
| B | Also indicates free flow, although the presence of other vehicles becomes noticeable. Average travel speeds are the same as in LOS A, but drivers have slightly less freedom to maneuver. Minor disruptions are still easily absorbed, although local deterioration in LOS will be more obvious. |
| C | The influence of traffic density on operations becomes marked. The ability to maneuver within the traffic stream is clearly affected by other vehicles. Minor disruptions can cause serious local deterioration in services, and queues will form behind any significant traffic disruption. |
| D | The ability to maneuver is severely restricted due to traffic congestion. Travel speed is reduced by the increasing volume. Only minor disruptions can be absorbed without extensive queues forming and the service deteriorating. |
| E | Represents operations at or near capacity, an unstable level. The densities vary, depending on the FFS. Vehicles are operating with the minimum spacing for maintaining uniform flow. Disruptions cannot be dissipated readily, often causing queues to form and service to deteriorate to LOS F. |
| F | Represents forced or breakdown flow. It occurs either when vehicles arrive at a rate greater than the rate at which they are discharged or when the forecast demand exceeds the computed capacity of a planned facility. Although operations at these points---and on sections immediately downstream---appear to be at capacity, queues form behind these breakdowns. Operations within queues are highly unstable, with vehicles experiencing brief periods of movement followed by stoppages. Note that the term LOS F may be used to characterize both the point of the breakdown and the operating condition within the queue. Although the point of breakdown causes the queue to form, operations within the queue generally are not related to deficiencies along the highway segment. |

Source: *Highway Capacity Manual, Special Report 209* (Transportation Research Board, National Research Council, 2000).

YEAR 2004 LEVEL OF SERVICE

Table 7 summarizes the results of the analysis of traffic operating conditions at the 31 locations in Year 2004 (existing) using peak hour traffic volumes provided by the County of Maui. The table provides the roadway configuration for each segment in terms of number of through lanes, the assumed capacity of the segment based on this configuration, the peak hour volumes for each segment, the resulting volume/capacity (V/C) ratio at each location, and the corresponding levels of service. As indicated in Table 7, the results of the analysis can be summarized as follows:

- Three locations operating at LOS E or F in the northbound/eastbound direction in the a.m. peak hour and seven locations operating at LOS E or F in the northbound/eastbound direction in the p.m. peak hour.
- 28 locations operating at LOS D or better in the northbound/eastbound direction in the a.m. peak hour and 24 locations operating at LOS D or better in the northbound/eastbound direction in the p.m. peak hour.
- Eight locations operating at LOS E or F in the southbound/westbound direction in the p.m. peak hour and nine locations operating at LOS E or F in the southbound/westbound direction in the p.m. peak hour.
- 23 locations operating at LOS D or better in the southbound/westbound direction in the p.m. peak hour and 22 locations operating at LOS D or better in the southbound/westbound direction in the p.m. peak hour.

YEAR 2030 NO BUILD LEVEL OF SERVICE

Table 8 summarizes the results of the analysis of traffic operating conditions at the 31 locations in Year 2030 No Build scenario. This scenario projects the roadway conditions at the 31 locations if the current land uses and development trends are projected to 2030 with no improvements to the highway system (maintaining the 2004 highway system).

The table provides the roadway configuration for each segment in terms of number of through lanes, the assumed capacity of the segment based on this configuration, the peak hour volumes for each segment, the resulting V/C ratio at each location, and the corresponding levels of service

**TABLE 7
2004 ROADWAY SEGMENT LEVEL OF SERVICE ANALYSIS**

| | Location | Peak Hour | Lanes N/E | Lanes S/W | Capacity N/E | Capacity S/W | Volume N/E | Volume S/W | V/C N/E | V/C S/W | LOS N/E | LOS S/W |
|----|---|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|---------|---------|
| 1 | Honoapiilani Hwy 0.2 Mi South of Keanu St | AM PM | 1 1 | 1 1 | 850 850 | 850 850 | 730 479 | 404 542 | 0.86 0.56 | 0.48 0.64 | D A | A B |
| 2 | Main St @ Central Av | AM PM | 1 1 | 1 1 | 800 800 | 800 800 | 806 1074 | 914 812 | 1.01 1.34 | 1.14 1.02 | F F | F F |
| 3 | Kaahumanu Av @ Kanaloa Av & Mahalani St | AM PM | 2 2 | 2 2 | 850 850 | 850 850 | 1196 1749 | 1714 1204 | 0.70 1.03 | 1.01 0.71 | C F | F C |
| 4 | Kaahumanu Av @ Kahului Beach Rd & Kane St | AM PM | 3 3 | 2 2 | 850 850 | 850 850 | 1502 1917 | 1902 2020 | 0.59 0.75 | 1.12 1.19 | A C | F F |
| 5 | Hana Hwy @ Kamehameha Av & Hobron Av | AM PM | 2 2 | 2 2 | 850 850 | 850 850 | 1595 1188 | 856 1797 | 0.94 0.70 | 0.50 1.06 | E B | A F |
| 6 | Puunene Av n/o Kuihelani Hwy/Dairy Rd | AM PM | 2 2 | 1 1 | 800 800 | 800 800 | 1037 1098 | 978 969 | 0.65 0.69 | 1.22 1.21 | B B | F F |
| 7 | Kuihelani Hwy w/o Puunene Av | AM PM | 2 2 | 2 2 | 1200 1200 | 1200 1200 | 531 664 | 658 775 | 0.22 0.28 | 0.27 0.32 | A A | A A |
| 8 | Dairy Rd e/o Puunene Av | AM PM | 2 2 | 2 2 | 800 800 | 800 800 | 1014 1592 | 1018 1607 | 0.63 1.00 | 0.64 1.00 | B E | B F |
| 9 | Kahekili Hwy 0.7 Mi N of Waiehu Beach Rd Junction | AM PM | 1 1 | 1 1 | 800 800 | 800 800 | 371 176 | 250 415 | 0.46 0.22 | 0.31 0.52 | A A | A A |
| 10 | Kahekili Hwy @ Waiehu Beach Rd | AM PM | 1 1 | 1 1 | 800 800 | 800 800 | 516 386 | 660 335 | 0.65 0.48 | 0.83 0.42 | B A | D A |
| 11 | Waiehu Beach Rd @ Iao Stream Bridge | AM PM | 1 1 | 1 1 | 900 900 | 900 900 | 547 1008 | 1058 733 | 0.61 1.12 | 1.18 0.81 | B F | F D |
| 12 | Kuihelani Hwy 0.33 Mi N of Waikapu Bridge | AM PM | 2 2 | 2 2 | 1200 1200 | 1200 1200 | 436 486 | 329 441 | 0.18 0.20 | 0.14 0.18 | A A | A A |
| 13 | Puunene Av @ Mokulele Hwy | AM PM | 2 2 | 2 2 | 800 800 | 800 800 | 1217 1239 | 1091 1096 | 0.76 0.77 | 0.68 0.69 | C C | B B |
| 14 | Hana Hwy @ Haleakala Hwy (Pukalani Junction) | AM PM | 2 2 | 2 2 | 1200 1200 | 1200 1200 | 955 2130 | 2745 1467 | 0.40 0.89 | 1.14 0.61 | A D | F B |
| 15 | Honoapiilani Hwy 0.7 Mi W of Honolua Bridge | AM PM | 1 1 | 1 1 | 300 300 | 300 300 | 37 90 | 19 55 | 0.12 0.30 | 0.06 0.18 | A A | A A |
| 16 | Honoapiilani Hwy @ Kahana Kai Bridge | AM PM | 1 1 | 1 1 | 850 850 | 850 850 | 529 554 | 497 771 | 0.62 0.65 | 0.58 0.91 | B B | A E |
| 17 | Honoapiilani Hwy @ Fleming Rd & Front St (N Junction) | AM PM | 2 2 | 2 2 | 1000 1000 | 1000 1000 | 1280 1612 | 1251 1783 | 0.64 0.81 | 0.63 0.89 | B D | B D |

**TABLE 7
2004 ROADWAY SEGMENT LEVEL OF SERVICE ANALYSIS**

| | Location | Peak Hour | Lanes N/E | Lanes S/W | Capacity N/E | Capacity S/W | Volume N/E | Volume S/W | V/C N/E | V/C S/W | LOS N/E | LOS S/W |
|----|---|-----------|-----------|-----------|--------------|--------------|------------|------------|---------|---------|---------|---------|
| 18 | Honoapiilani Hwy @ Fleming Rd & Front St (S Junction) | AM | 2 | 2 | 850 | 850 | 1069 | 778 | 0.63 | 0.46 | B | A |
| | | PM | 2 | 2 | 850 | 850 | 1155 | 1142 | 0.68 | 0.67 | B | B |
| 19 | Honoapiilani Hwy 1.07 Mi W of Tunnel | AM | 1 | 1 | 1000 | 1000 | 655 | 993 | 0.66 | 0.99 | B | E |
| | | PM | 1 | 1 | 1000 | 1000 | 1105 | 1001 | 1.11 | 1.00 | F | F |
| 20 | South Kihei Rd @ Mokulele Hwy | AM | 1 | 1 | 800 | 800 | 935 | 540 | 1.17 | 0.68 | F | B |
| | | PM | 1 | 1 | 800 | 800 | 641 | 914 | 0.80 | 1.14 | D | F |
| 21 | South Kihei Rd @ Keonekai Rd | AM | 1 | 1 | 750 | 750 | 482 | 498 | 0.64 | 0.66 | B | B |
| | | PM | 1 | 1 | 750 | 750 | 672 | 651 | 0.90 | 0.87 | D | D |
| 22 | Piilani Hwy @ Mokulele Hwy | AM | 2 | 2 | 850 | 850 | 857 | 1305 | 0.50 | 0.77 | A | C |
| | | PM | 2 | 2 | 850 | 850 | 1168 | 1069 | 0.69 | 0.63 | B | B |
| 23 | Piilani Hwy @ Lipoa St & Lipoa Pkwy | AM | 1 | 1 | 1200 | 1200 | 969 | 1079 | 0.81 | 0.90 | D | D |
| | | PM | 1 | 1 | 1200 | 1200 | 1195 | 1046 | 1.00 | 0.87 | E | D |
| 24 | Piilani Hwy between Kanani & Alanui Ke Alii Rds | AM | 1 | 1 | 1200 | 1200 | 943 | 928 | 0.79 | 0.77 | C | C |
| | | PM | 1 | 1 | 1200 | 1200 | 1107 | 1005 | 0.92 | 0.84 | E | D |
| 25 | Hana Hwy & Baldwin Av | AM | 1 | 1 | 1000 | 1000 | 463 | 890 | 0.46 | 0.89 | A | D |
| | | PM | 1 | 1 | 1000 | 1000 | 729 | 557 | 0.73 | 0.56 | C | A |
| 26 | Hana Hwy & Baldwin Av | AM | 1 | 1 | 400 | 400 | 294 | 193 | 0.74 | 0.48 | C | A |
| | | PM | 1 | 1 | 400 | 400 | 262 | 271 | 0.66 | 0.68 | B | B |
| 27 | Haleakala Hwy @ Haliimaile Rd | AM | 2 | 2 | 1200 | 1200 | 2076 | 545 | 0.87 | 0.23 | D | A |
| | | PM | 2 | 2 | 1200 | 1200 | 918 | 1918 | 0.38 | 0.80 | A | C |
| 28 | Haleakala Hwy @ Makawao Av & Loha St | AM | 1 | 1 | 600 | 600 | 461 | 588 | 0.77 | 0.98 | C | E |
| | | PM | 1 | 1 | 600 | 600 | 516 | 552 | 0.86 | 0.92 | D | E |
| 29 | Kula Hwy @ Omaopio Rd | AM | 1 | 1 | 1000 | 1000 | 729 | 447 | 0.73 | 0.45 | C | A |
| | | PM | 1 | 1 | 1000 | 1000 | 471 | 546 | 0.47 | 0.55 | A | A |
| 30 | Haleakala Hwy & Kekaulike Av @ Haleakala Crater Rd | AM | 1 | 1 | 850 | 850 | 147 | 94 | 0.17 | 0.11 | A | A |
| | | PM | 1 | 1 | 850 | 850 | 110 | 88 | 0.13 | 0.10 | A | A |
| 31 | Hana Hwy & Kailua Bridge | AM | 1 | 1 | 300 | 300 | 28 | 101 | 0.09 | 0.34 | A | A |
| | | PM | 1 | 1 | 300 | 300 | 120 | 39 | 0.40 | 0.13 | A | A |

**TABLE 8
2030 NO BUILD ROADWAY SEGMENT LEVEL OF SERVICE ANALYSIS**

| | Location | Peak Hour | Lanes N/E | Lanes S/W | Capacity N/E | Capacity S/W | Volume N/E | Volume S/W | V/C N/E | V/C S/W | LOS N/E | LOS S/W |
|----|---|-----------|-----------|-----------|--------------|--------------|------------|------------|---------|---------|---------|---------|
| 1 | Honoapiilani Hwy 0.2 Mi South of Keanu St | AM | 1 | 1 | 850 | 850 | 1185 | 817 | 1.39 | 0.96 | F | E |
| | | PM | 1 | 1 | 850 | 850 | 884 | 884 | 1.04 | 1.04 | F | F |
| 2 | Main St @ Central Av | AM | 1 | 1 | 800 | 800 | 1334 | 956 | 1.67 | 1.20 | F | F |
| | | PM | 1 | 1 | 800 | 800 | 1256 | 786 | 1.57 | 0.98 | F | E |
| 3 | Kaahumanu Av @ Kanaloa Av & Mahalani St | AM | 2 | 2 | 850 | 850 | 1845 | 2042 | 1.09 | 1.20 | F | F |
| | | PM | 2 | 2 | 850 | 850 | 2028 | 1863 | 1.19 | 1.10 | F | F |
| 4 | Kaahumanu Av @ Kahului Beach Rd & Kane St | AM | 3 | 2 | 850 | 850 | 2303 | 2573 | 0.90 | 1.51 | D | F |
| | | PM | 3 | 2 | 850 | 850 | 2490 | 2894 | 0.98 | 1.70 | E | F |
| 5 | Hana Hwy @ Kamehameha Av & Hobron Av | AM | 2 | 2 | 850 | 850 | 1982 | 1209 | 1.17 | 0.71 | F | C |
| | | PM | 2 | 2 | 850 | 850 | 1639 | 2337 | 0.96 | 1.37 | E | F |
| 6 | Puunene Av n/o Kuihelani Hwy/Dairy Rd | AM | 2 | 1 | 800 | 800 | 2071 | 1529 | 1.29 | 1.91 | F | F |
| | | PM | 2 | 1 | 800 | 800 | 1638 | 1512 | 1.02 | 1.89 | F | F |
| 7 | Kuihelani Hwy w/o Puunene Av | AM | 2 | 2 | 1200 | 1200 | 1584 | 972 | 0.66 | 0.41 | B | A |
| | | PM | 2 | 2 | 1200 | 1200 | 1013 | 1642 | 0.42 | 0.68 | A | B |
| 8 | Dairy Rd e/o Puunene Av | AM | 2 | 2 | 800 | 800 | 1152 | 1337 | 0.72 | 0.84 | C | D |
| | | PM | 2 | 2 | 800 | 800 | 2018 | 2078 | 1.26 | 1.30 | F | F |
| 9 | Kahekili Hwy 0.7 Mi N of Waiehu Beach Rd Junction | AM | 1 | 1 | 800 | 800 | 635 | 412 | 0.79 | 0.52 | C | A |
| | | PM | 1 | 1 | 800 | 800 | 279 | 669 | 0.35 | 0.84 | A | D |
| 10 | Kahekili Hwy @ Waiehu Beach Rd | AM | 1 | 1 | 800 | 800 | 824 | 1303 | 1.03 | 1.63 | F | F |
| | | PM | 1 | 1 | 800 | 800 | 611 | 568 | 0.76 | 0.71 | C | C |
| 11 | Waiehu Beach Rd @ Iao Stream Bridge | AM | 1 | 1 | 900 | 900 | 808 | 1456 | 0.90 | 1.62 | D | F |
| | | PM | 1 | 1 | 900 | 900 | 1341 | 1007 | 1.49 | 1.12 | F | F |
| 12 | Kuihelani Hwy 0.33 Mi N of Waikapu Bridge | AM | 2 | 2 | 1200 | 1200 | 1115 | 631 | 0.46 | 0.26 | A | A |
| | | PM | 2 | 2 | 1200 | 1200 | 943 | 1072 | 0.39 | 0.45 | A | A |
| 13 | Puunene Av @ Mokulele Hwy | AM | 2 | 2 | 800 | 800 | 1462 | 1910 | 0.91 | 1.19 | E | F |
| | | PM | 2 | 2 | 800 | 800 | 1831 | 1361 | 1.14 | 0.85 | F | D |
| 14 | Hana Hwy @ Haleakala Hwy (Pukalani Junction) | AM | 2 | 2 | 1200 | 1200 | 1307 | 3169 | 0.54 | 1.32 | A | F |
| | | PM | 2 | 2 | 1200 | 1200 | 2618 | 1952 | 1.09 | 0.81 | F | D |
| 15 | Honoapiilani Hwy 0.7 Mi W of Honolulu Bridge | AM | 1 | 1 | 300 | 300 | 68 | 92 | 0.23 | 0.31 | A | A |
| | | PM | 1 | 1 | 300 | 300 | 277 | 105 | 0.92 | 0.35 | E | A |
| 16 | Honoapiilani Hwy @ Kahana Kai Bridge | AM | 1 | 1 | 850 | 850 | 788 | 863 | 0.93 | 1.02 | E | F |
| | | PM | 1 | 1 | 850 | 850 | 888 | 1047 | 1.04 | 1.23 | F | F |
| 17 | Honoapiilani Hwy @ Fleming Rd & Front St (N Junction) | AM | 2 | 2 | 1000 | 1000 | 2057 | 2234 | 1.03 | 1.12 | F | F |
| | | PM | 2 | 2 | 1000 | 1000 | 2914 | 2936 | 1.46 | 1.47 | F | F |

**TABLE 8
2030 NO BUILD ROADWAY SEGMENT LEVEL OF SERVICE ANALYSIS**

| | Location | Peak Hour | Lanes N/E | Lanes S/W | Capacity N/E | Capacity S/W | Volume N/E | Volume S/W | V/C N/E | V/C S/W | LOS N/E | LOS S/W |
|----|---|-----------|-----------|-----------|--------------|--------------|------------|------------|---------|---------|---------|---------|
| 18 | Honoapiilani Hwy @ Fleming Rd & Front St (S Junction) | AM | 2 | 2 | 850 | 850 | 1665 | 1488 | 0.98 | 0.88 | E | D |
| | | PM | 2 | 2 | 850 | 850 | 2186 | 1829 | 1.29 | 1.08 | F | F |
| 19 | Honoapiilani Hwy 1.07 Mi W of Tunnel | AM | 1 | 1 | 1000 | 1000 | 1184 | 1515 | 1.18 | 1.52 | F | F |
| | | PM | 1 | 1 | 1000 | 1000 | 1783 | 1783 | 1.78 | 1.78 | F | F |
| 20 | South Kihei Rd @ Mokulele Hwy | AM | 1 | 1 | 800 | 800 | 1500 | 1143 | 1.88 | 1.43 | F | F |
| | | PM | 1 | 1 | 800 | 800 | 1286 | 1409 | 1.61 | 1.76 | F | F |
| 21 | South Kihei Rd @ Keonekai Rd | AM | 1 | 1 | 750 | 750 | 984 | 867 | 1.31 | 1.16 | F | F |
| | | PM | 1 | 1 | 750 | 750 | 1089 | 1190 | 1.45 | 1.59 | F | F |
| 22 | Piilani Hwy @ Mokulele Hwy | AM | 2 | 2 | 850 | 850 | 1767 | 1899 | 1.04 | 1.12 | F | F |
| | | PM | 2 | 2 | 850 | 850 | 1829 | 2145 | 1.08 | 1.26 | F | F |
| 23 | Piilani Hwy @ Lipoa St & Lipoa Pkwy | AM | 1 | 1 | 1200 | 1200 | 1510 | 1824 | 1.26 | 1.52 | F | F |
| | | PM | 1 | 1 | 1200 | 1200 | 2059 | 1638 | 1.72 | 1.37 | F | F |
| 24 | Piilani Hwy between Kanani & Alanui Ke Alii Rds | AM | 1 | 1 | 1200 | 1200 | 1422 | 1314 | 1.19 | 1.10 | F | F |
| | | PM | 1 | 1 | 1200 | 1200 | 1636 | 1503 | 1.36 | 1.25 | F | F |
| 25 | Hana Hwy & Baldwin Av | AM | 1 | 1 | 1000 | 1000 | 529 | 1067 | 0.53 | 1.07 | A | F |
| | | PM | 1 | 1 | 1000 | 1000 | 840 | 628 | 0.84 | 0.63 | D | B |
| 26 | Hana Hwy & Baldwin Av | AM | 1 | 1 | 400 | 400 | 74 | 48 | 0.19 | 0.12 | A | A |
| | | PM | 1 | 1 | 400 | 400 | 66 | 68 | 0.17 | 0.17 | A | A |
| 27 | Haleakala Hwy @ Haliimaile Rd | AM | 2 | 2 | 1200 | 1200 | 2366 | 784 | 0.99 | 0.33 | E | A |
| | | PM | 2 | 2 | 1200 | 1200 | 1299 | 2351 | 0.54 | 0.98 | A | E |
| 28 | Haleakala Hwy @ Makawao Av & Loha St | AM | 1 | 1 | 600 | 600 | 560 | 750 | 0.93 | 1.25 | E | F |
| | | PM | 1 | 1 | 600 | 600 | 698 | 573 | 1.16 | 0.96 | F | E |
| 29 | Kula Hwy @ Omaopio Rd | AM | 1 | 1 | 1000 | 1000 | 763 | 719 | 0.76 | 0.72 | C | C |
| | | PM | 1 | 1 | 1000 | 1000 | 694 | 629 | 0.69 | 0.63 | B | B |
| 30 | Haleakala Hwy & Kekaulike Av @ Haleakala Crater Rd | AM | 1 | 1 | 850 | 850 | 123 | 280 | 0.14 | 0.33 | A | A |
| | | PM | 1 | 1 | 850 | 850 | 379 | 148 | 0.45 | 0.17 | A | A |
| 31 | Hana Hwy & Kailua Bridge | AM | 1 | 1 | 300 | 300 | 48 | 119 | 0.16 | 0.40 | A | A |
| | | PM | 1 | 1 | 300 | 300 | 149 | 64 | 0.50 | 0.21 | A | A |

As indicated in Table 8, the results of the analysis can be summarized as follows:

- 18 locations operating at LOS E or F in the northbound/eastbound direction in the a.m. peak hour and 21 locations operating at LOS E or F in the northbound/eastbound direction in the p.m. peak hour.
- 13 locations operating at LOS D or better in the northbound/eastbound direction in the a.m. peak hour and 10 locations operating at LOS D or better in the northbound/eastbound direction in the p.m. peak hour.
- 19 locations operating at LOS E or F in the southbound/westbound direction in the a.m. peak hour and 19 locations operating at LOS E or F in the southbound/westbound direction in the p.m. peak hour.
- 12 locations operating at LOS D or better in the southbound/westbound direction in the a.m. peak hour and 12 locations operating at LOS D or better in the southbound/westbound direction in the p.m. peak hour.

ANALYSIS OF GENERAL PLAN HORIZON YEAR 2030 CONDITIONS

Proposed Improvements

A range of alternative improvements are under consideration by the County as a means of addressing future needs and deficiencies on the County's highway system. Consistent with the standards established for the County of Maui as part of their transportation planning process, the proposed list of improvements for the Maui County traffic are directed at the goal of achieving LOS D throughout the island.

Table 9 lists the 22 improvements recommended for implementation as part of this program. The proposed improvements are also illustrated in Figure 8.

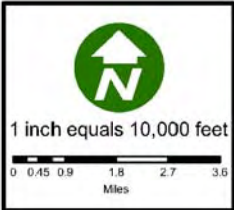
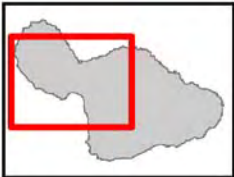
Land use projections representing the Horizon Year 2030 for the General Plan were obtained from the County of Maui Planning Department. These land use forecast were used to develop Year 2030 traffic projects for the Island of Maui. These Year 2030 traffic projections were assigned to the 2030 General Plan roadway network, which represents improvements to the island's roadway system expected to be implemented by 2030, the horizon year of the General



Proposed & Conceptual Roads
Island Wide


Legend
Proposed Roads Status

- Programmed - 2015 Buildout
- - - Conceptual - 2015 Buildout
- Programmed - 2030 Buildout
- - - Conceptual - 2030 Buildout
- mau_roads_2006



PREPARED BY:

Long Range Planning Division
Department of Planning
County of Maui
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Source: County of Maui Department of Planning

FEHR & PEERS
KAKU ASSOCIATES

FIGURE 8
PROPOSED IMPROVEMENT PROGRAM

**TABLE 9
PROPOSED HIGHWAY IMPROVEMENT PROJECT LIST**

| Project Number | Project Description |
|-----------------------|--|
| 1 | Haleakala Widening 2 (Firebreak Road to Haliimaile) |
| 2 | Up-Country - Kihei Corridor |
| 3 | Honoapiilani Realignment - aka Lahaina By-Pass |
| Phase A | Keawe St. to Lahainaluna Road |
| Phase B | Lahainaluna Road to Launiupoko |
| Phase C | Keawe St. to Honokowai |
| 4 | Pali to Puamana realignment aka Honoapiilani Realignment |
| 5 | Keawe St. Extension |
| 6 | Mill Street Extension (Aholo St to Keawe) |
| 7 | Paia By-Pass |
| 8 | Mokulele Widening |
| 9 | Kihei North-South Collector Road |
| 10 | Waiale Extension |
| 11 | Kahului Airport |
| 12 | Honoapiilani widening Aholo St to Lahainaluna |
| 13 | Waiale/Kuihelani Hwy Connector |
| 14 | Lono Ave extension to Kuihelani Hwy |
| 15 | Imi Kala/Piihana extension (bridge) |
| 16 | Imi Kala/Waiale -Mill St, extension |
| 17 | Paniolo Connector (Haleakala Hwy - Baldwin Ave) |
| 18 | Kehekili Hwy widening |
| 19 | Maui Lani Parkway |
| 20 | Kuikahi Drive Extension |
| 21 | Kehalani Collector Road |
| 22 | Kehalani Loop Road |

**TABLE 10
2030 ROADWAY SEGMENT LEVEL OF SERVICE ANALYSIS**

| | Location | Peak Hour | Lanes N/E | Lanes S/W | Capacity N/E | Capacity S/W | Volume N/E | Volume S/W | V/C N/E | V/C S/W | LOS N/E | LOS S/W |
|----|---|-----------|-----------|-----------|--------------|--------------|------------|------------|---------|---------|---------|---------|
| 1 | Honoapiilani Hwy 0.2 Mi South of Keanu St | AM | 1 | 1 | 850 | 850 | 985 | 673 | 1.16 | 0.79 | F | C |
| | | PM | 1 | 1 | 850 | 850 | 739 | 701 | 0.87 | 0.82 | D | D |
| 2 | Main St @ Central Av | AM | 1 | 1 | 800 | 800 | 1054 | 810 | 1.32 | 1.01 | F | F |
| | | PM | 1 | 1 | 800 | 800 | 1061 | 723 | 1.33 | 0.90 | F | E |
| 3 | Kaahumanu Av @ Kanaloa Av & Mahalani St | AM | 2 | 2 | 850 | 850 | 1287 | 1809 | 0.76 | 1.06 | C | F |
| | | PM | 2 | 2 | 850 | 850 | 1670 | 1274 | 0.98 | 0.75 | E | C |
| 4 | Kaahumanu Av @ Kahului Beach Rd & Kane St | AM | 3 | 2 | 850 | 850 | 1925 | 2416 | 0.75 | 1.42 | C | F |
| | | PM | 3 | 2 | 850 | 850 | 2305 | 2426 | 0.90 | 1.43 | E | F |
| 5 | Hana Hwy @ Kamehameha Av & Hobron Av | AM | 2 | 2 | 850 | 850 | 1914 | 946 | 1.13 | 0.56 | F | A |
| | | PM | 2 | 2 | 850 | 850 | 1385 | 2078 | 0.81 | 1.22 | D | F |
| 6 | Puunene Av n/o Kuihelani Hwy/Dairy Rd | AM | 2 | 1 | 800 | 800 | 2170 | 1389 | 1.36 | 1.74 | F | F |
| | | PM | 2 | 1 | 800 | 800 | 1381 | 1588 | 0.86 | 1.99 | D | F |
| 7 | Kuihelani Hwy w/o Puunene Av | AM | 2 | 2 | 1200 | 1200 | 2191 | 1178 | 0.91 | 0.49 | E | A |
| | | PM | 2 | 2 | 1200 | 1200 | 1226 | 2376 | 0.51 | 0.99 | A | E |
| 8 | Dairy Rd e/o Puunene Av | AM | 2 | 2 | 800 | 800 | 1368 | 1292 | 0.86 | 0.81 | D | D |
| | | PM | 2 | 2 | 800 | 800 | 2043 | 2221 | 1.28 | 1.39 | F | F |
| 9 | Kahekili Hwy 0.7 Mi N of Waiehu Beach Rd Junction | AM | 1 | 1 | 800 | 800 | 632 | 414 | 0.79 | 0.52 | C | A |
| | | PM | 1 | 1 | 800 | 800 | 279 | 668 | 0.35 | 0.84 | A | D |
| 10 | Kahekili Hwy @ Waiehu Beach Rd | AM | 1 | 1 | 800 | 800 | 820 | 1308 | 1.03 | 1.64 | F | F |
| | | PM | 1 | 1 | 800 | 800 | 612 | 567 | 0.77 | 0.71 | C | C |
| 11 | Waiehu Beach Rd @ Iao Stream Bridge | AM | 1 | 1 | 900 | 900 | 800 | 1451 | 0.89 | 1.61 | D | F |
| | | PM | 1 | 1 | 900 | 900 | 1290 | 1020 | 1.43 | 1.13 | F | F |
| 12 | Kuihelani Hwy 0.33 Mi N of Waikapu Bridge | AM | 2 | 2 | 1200 | 1200 | 560 | 319 | 0.23 | 0.13 | A | A |
| | | PM | 2 | 2 | 1200 | 1200 | 545 | 629 | 0.23 | 0.26 | A | A |
| 13 | Puunene Av @ Mokulele Hwy | AM | 2 | 2 | 800 | 800 | 1702 | 2173 | 1.06 | 1.36 | F | F |
| | | PM | 2 | 2 | 800 | 800 | 2046 | 1475 | 1.28 | 0.92 | F | E |
| 14 | Hana Hwy @ Haleakala Hwy (Pukalani Junction) | AM | 2 | 2 | 1200 | 1200 | 1175 | 2847 | 0.49 | 1.19 | A | F |
| | | PM | 2 | 2 | 1200 | 1200 | 2185 | 1765 | 0.91 | 0.74 | E | C |
| 15 | Honoapiilani Hwy 0.7 Mi W of Honolulu Bridge | AM | 1 | 1 | 300 | 300 | 68 | 81 | 0.23 | 0.27 | A | A |
| | | PM | 1 | 1 | 300 | 300 | 252 | 94 | 0.84 | 0.31 | D | A |
| 16 | Honoapiilani Hwy @ Kahana Kai Bridge | AM | 1 | 1 | 850 | 850 | 1089 | 1032 | 1.28 | 1.21 | F | F |
| | | PM | 1 | 1 | 850 | 850 | 1031 | 1317 | 1.21 | 1.55 | F | F |

**TABLE 10
2030 ROADWAY SEGMENT LEVEL OF SERVICE ANALYSIS**

| | Location | Peak Hour | Lanes N/E | Lanes S/W | Capacity N/E | Capacity S/W | Volume N/E | Volume S/W | V/C N/E | V/C S/W | LOS N/E | LOS S/W |
|----|---|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|---------|---------|
| 17 | Honoapiilani Hwy @ Fleming Rd & Front St (N Junction) | AM PM | 2 2 | 2 2 | 1000 1000 | 1000 1000 | 1435 2340 | 1743 2208 | 0.72 1.17 | 0.87 1.10 | C F | D F |
| 18 | Honoapiilani Hwy @ Fleming Rd & Front St (S Junction) | AM PM | 2 2 | 2 2 | 850 850 | 850 850 | 1314 1724 | 1120 1569 | 0.77 1.01 | 0.66 0.92 | C F | B E |
| 19 | Honoapiilani Hwy 1.07 Mi W of Tunnel | AM PM | 1 1 | 1 1 | 1000 1000 | 1000 1000 | 647 659 | 616 858 | 0.65 0.66 | 0.62 0.86 | B B | B D |
| 20 | South Kihei Rd @ Mokulele Hwy | AM PM | 1 1 | 1 1 | 800 800 | 800 800 | 1569 1195 | 1155 1311 | 1.96 1.49 | 1.44 1.64 | F F | F F |
| 21 | South Kihei Rd @ Keonekai Rd | AM PM | 1 1 | 1 1 | 750 750 | 750 750 | 754 871 | 679 973 | 1.01 1.16 | 0.91 1.30 | F F | E F |
| 22 | Piilani Hwy @ Mokulele Hwy | AM PM | 2 2 | 2 2 | 850 850 | 850 850 | 1320 1770 | 1828 1763 | 0.78 1.04 | 1.08 1.04 | C F | F F |
| 23 | Piilani Hwy @ Lipoa St & Lipoa Pkwy | AM PM | 1 1 | 1 1 | 1200 1200 | 1200 1200 | 1167 1548 | 1489 1288 | 0.97 1.29 | 1.24 1.07 | E F | F F |
| 24 | Piilani Hwy between Kanani & Alanui Ke Alii Rds | AM PM | 1 1 | 1 1 | 1200 1200 | 1200 1200 | 1114 1335 | 1152 1140 | 0.93 1.11 | 0.96 0.95 | E F | E E |
| 25 | Hana Hwy & Baldwin Av | AM PM | 1 1 | 1 1 | 1000 1000 | 1000 1000 | 239 261 | 210 192 | 0.24 0.26 | 0.21 0.19 | A A | A A |
| 26 | Hana Hwy & Baldwin Av | AM PM | 1 1 | 1 1 | 400 400 | 400 400 | 74 66 | 48 68 | 0.19 0.17 | 0.12 0.17 | A A | A A |
| 27 | Haleakala Hwy @ Haliimaile Rd | AM PM | 2 2 | 2 2 | 1200 1200 | 1200 1200 | 2450 1104 | 719 2090 | 1.02 0.46 | 0.30 0.87 | F A | A D |
| 28 | Haleakala Hwy @ Makawao Av & Loha St | AM PM | 1 1 | 1 1 | 600 600 | 600 600 | 542 700 | 734 569 | 0.90 1.17 | 1.22 0.95 | E F | F E |
| 29 | Kula Hwy @ Omaopio Rd | AM PM | 1 1 | 1 1 | 1000 1000 | 1000 1000 | 760 663 | 700 591 | 0.76 0.66 | 0.70 0.59 | C B | B A |
| 30 | Haleakala Hwy & Kekaulike Av @ Haleakala Crater Rd | AM PM | 1 1 | 1 1 | 850 850 | 850 850 | 88 305 | 214 125 | 0.10 0.36 | 0.25 0.15 | A A | A A |
| 31 | Hana Hwy & Kailua Bridge | AM PM | 1 1 | 1 1 | 300 300 | 300 300 | 48 149 | 119 64 | 0.16 0.50 | 0.40 0.21 | A A | A A |

Plan. The results of the LOS analysis for Year 2030 are summarized in Table 10. The table provides the projected roadway configuration for Year 2030 indicating the number of lanes on each facility, the assumed capacity of the each roadway segment based on this configuration, the Year 2030 peak hour traffic volumes by direction for each of the 31 locations, the V/C ratio projected for each location, and the resulting LOS for all 31 segments.

The results of the analysis as summarized in Table 10 can be described as follows:

- 14 locations operating at LOS E or F in the northbound/eastbound direction in the a.m. peak hour and 16 locations operating at LOS E or F in the northbound/eastbound direction in the p.m. peak hour.
- 17 locations operating at LOS D or better in the northbound/eastbound direction in the a.m. peak hour and 15 locations operating at LOS D or better in the northbound/eastbound direction in the p.m. peak hour.
- 15 locations operating at LOS E or F in the southbound/westbound direction in the a.m. peak hour and 17 locations operating at LOS E or F in the southbound/westbound direction in the p.m. peak hour.
- 16 locations operating at LOS D or better in the southbound/westbound direction in the a.m. peak hour and 14 locations operating at LOS D or better in the southbound/westbound direction in the p.m. peak hour.

Overall, the highway projects lead to improvements in V/C ratios over the 2030 No Build scenario. There are 24 locations where the V/C ratios show little or no change or significant improvements when compared to the scenario with no highway projects.

V. SUMMARY

This study was undertaken to examine the roadway performance under three different scenarios: existing conditions (2004), a scenario projecting land use growth for 2030 but with no change in the highway system and a 2030 general plan scenario with a detailed highway improvement program.

Under the 2030 General Plan buildout conditions there are improvements in V/C ratios at 24 locations in both directions and both peak hours. The reductions in V/C ratios at many locations indicate the effectiveness of the improvement projects in reducing congestion over the 2030 “No Build” conditions.

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