



APPENDIX G
Traffic Impact Analysis Report

TRAFFIC IMPACT ANALYSIS

MAUI RESEARCH
AND TECHNOLOGY PARK

KIHEI, MAUI, HAWAII

February 2012

Revised February 2013



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TRAFFIC IMPACT ANALYSIS

MAUI RESEARCH AND TECHNOLOGY PARK

Kihei, Maui, Hawaii

February 2012

Revised February 2013

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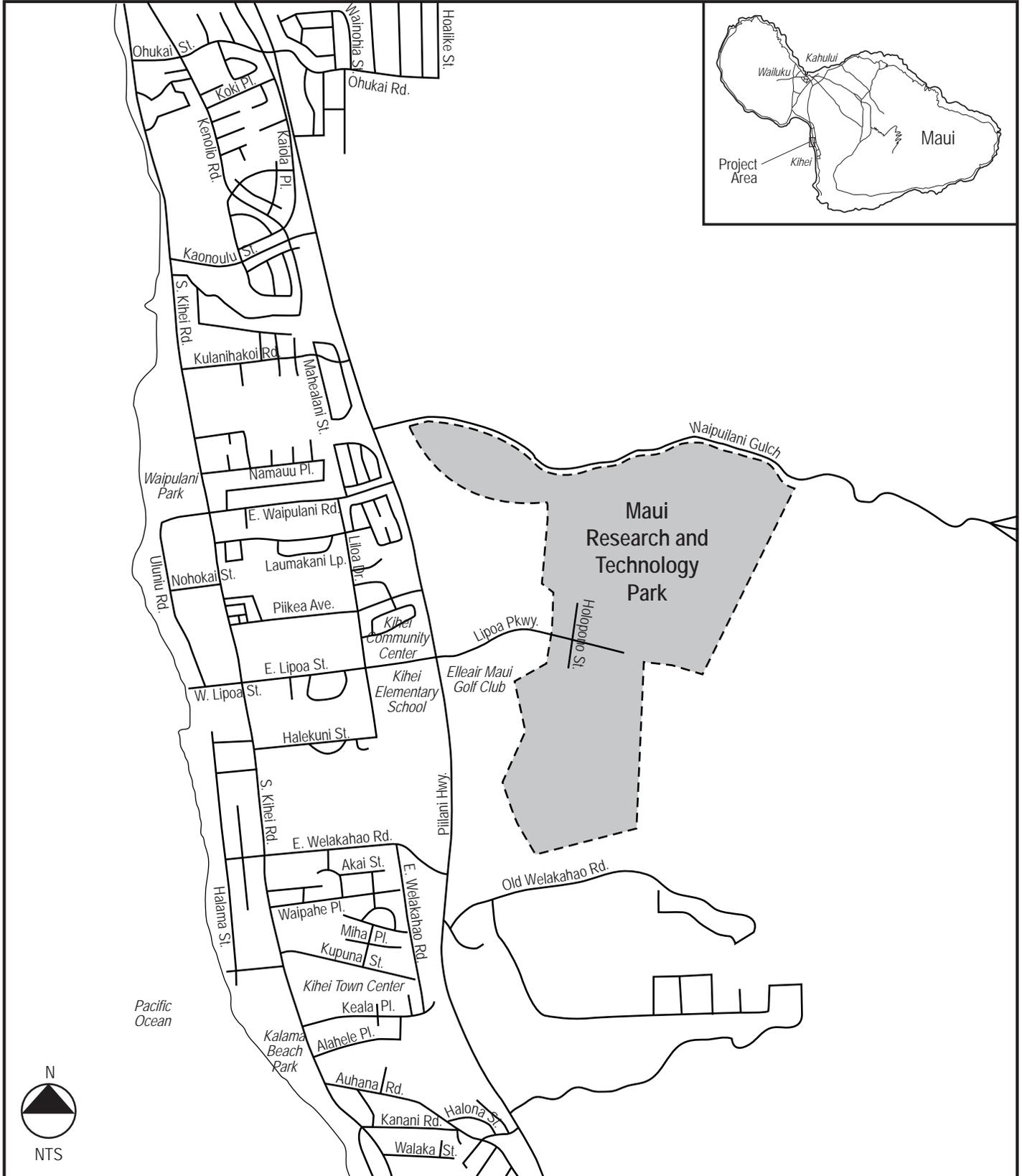
I. INTRODUCTION

The Maui Research and Technology Park (MRTP) is located mauka (east) of the intersection of Piilani Highway and Lipoa Parkway (called Lipoa Street makai (west) of Piilani Highway). The vicinity map is shown in Figure 1. Prior to its development, the lands comprising the MRTP were part of the Haleakala Ranch. The MRTP was the vision of a core group of community leaders in the early 1980's who sought to diversify the economic and employment base on Maui beyond tourism and agriculture. The MRTP is now home to a diverse range of companies and government projects working in such areas as space surveillance, communications, scientific research, advanced materials development, optics, and photonics.

However, since its inception in the late 1980's, the approximate 432 acre MRTP is only at approximately 10 percent build-out, with 11 lots sold and approximately 175,000 square feet of structures in five (5) buildings with a total of approximately 400 employees. Today, everyone working in the Park commutes since the development has no housing and few support services or amenities. The Master Plan Update proposed utilizes the principles of New Urbanism and Smart Growth to transform the current, single-use large lot research and technology campus into an integrated and vibrant mixed-use community focused around a regional knowledge-based industry employment base. The planned housing will target industries characterized by highly-skilled workers in science and research, information technology, education, healthcare and medicine, manufacturing and professional services and similarly related knowledge-based organizations.

The Master Plan will be implemented in two phases, with key infrastructure tied to the first phase of development and as the improvements are warranted. Figure 2 identifies the two phases of the implementation program. Phase 1 will be located directly off of Lipoa and will consist of residential, mixed-use commercial, civic, and the employment core land uses. Phase 1 will consist of the following:

- 723,200 Square Feet (SF) of Employment
- 100,000 SF of Retail
- 750 Residential Dwelling Units (DU) broken down as follows:
 - 150 DU Mid-Rise



Vicinity Map

Figure

1

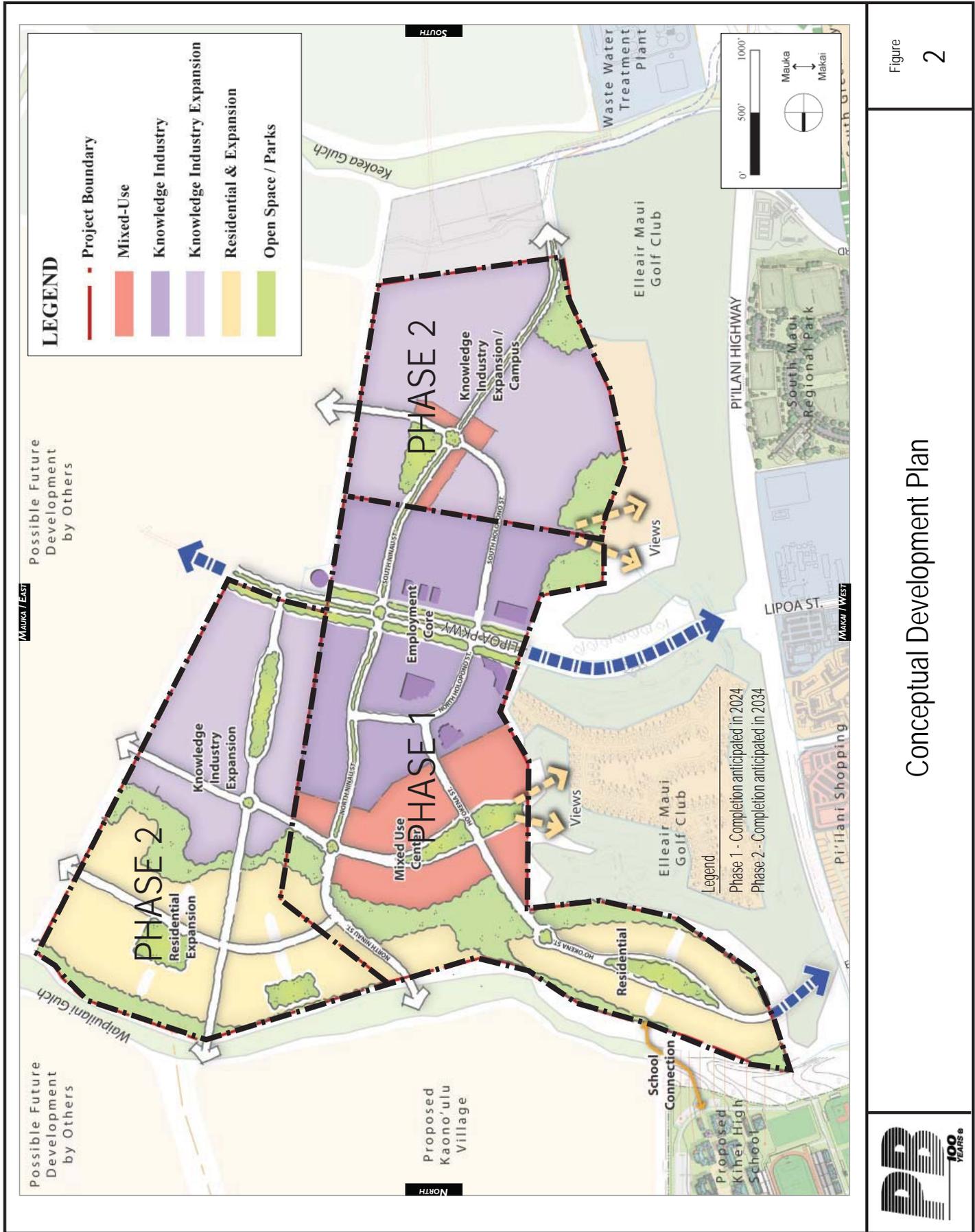


Figure 2

Conceptual Development Plan



- 450 DU Single Family
 - 150 DU Townhouse
- 150 Hotel Rooms
- 102,000 SF of Elementary School.

Building upon the land uses in Phase 1, Phase 2 will consist of residential and employment land uses on either side of Lipoa Parkway. When constructed, Phases 2 will consist of:

- 1,014,800 SF of Employment
- 500 Residential DU broken down as follows:
 - 100 DU Mid-Rise
 - 300 DU Single Family
 - 100 DU Townhouse

This report documents the traffic impact of the MRTP development and evaluates roadway conditions with and without MRTP.

Phases 1 and 2 of MRTP were analyzed in the horizon years of 2024 and 2034. For each phase, four scenarios were analyzed:

- Scenario 1 – No Build. The No Build scenario represents the background conditions without MRTP development scenario. Only existing roadways and those roadways committed by other developments, the State, and the County are included.
- Scenario 2 – Build. The Build scenario adds MRTP development generated trips to the No Build scenario. The assumed roadway network is the same as in the No Build scenario.
- Scenario 3 – Build with MRTP Roadway Improvements. This scenario represents the Build scenario with additional transportation improvements committed by MRTP.
- Scenario 4 – Build with MRTP and Regional Roadway Improvements. The final scenario represents the Build with MRTP Roadway Improvements with other needed regional transportation improvements in the analysis year (2024 for Phase 1 and 2034 for Phase 2).

II. EXISTING CONDITIONS

A. EXISTING LAND USE

The proposed MRTP expansion site is located mauka of Piilani Highway and both north and south of Lipoa Parkway. The MRTP is envisioned to continue to serve as a major employment generator for the island of Maui. Existing development in the MRTP is on five parcels, with a variety of private companies and government projects working primarily in high-technology related fields. Buildings are one and two stories, and all development (as required by the existing design guidelines) sits behind deep setbacks. Most roads have sidewalks, and large canopy shade street trees are a dominant feature.

The existing Elleair Golf Course is located makai of the proposed development areas, between the proposed development and Piilani Highway. This is an 18-hole golf course with the front nine and clubhouse located south of Lipoa Parkway and the back nine located north of Lipoa Parkway.

Hokulani Golf Villas is located along Lipoa Parkway just makai of Elleair Golf Course. Hokulani consists of condominiums mixed with single family homes.

Public facilities are located makai of Piilani Highway, along Lipoa Street. North of Lipoa Street is the Kihei Community Center, while the Kihei Elementary School/Lokelani Intermediate School complex is located to the south.

B. EXISTING ROADWAY SYSTEM

Piilani Highway provides primary regional and sub-regional access to the MRTP study area. Within the study area, Lipoa Parkway/Lipoa Street provides east-west traffic circulation, and Piilani Highway, South Kihei Road, and Liloa Drive provide north-south traffic circulation.

Piilani Highway

Piilani Highway provides primary regional mobility for the Kihei and Wailea-Makena areas. Between Mokulele Highway to the north and Kilohana Drive to the south, Piilani Highway is a four-lane major arterial roadway. Further south between Kilohana Drive and Wailea Ike Drive, it is a two-lane major arterial roadway. Paved shoulders are provided along the entire length of Piilani Highway and exclusive, median left-turn lanes are provided at intersections. Many intersections also have exclusive right-turn deceleration lanes on

Piilani Highway. Within the project study limits, Piilani Highway intersects Lipoa Parkway/Lipoa Street at a signalized intersection. Piilani Highway has a right-turn deceleration lane at the southbound approach and exclusive left-turn lanes at both south and northbound approaches. The posted speed limit on Piilani Highway is 40 miles per hour. Within the study area, Piilani Highway forms signalized intersections at:

- Piikea Avenue
- Lipoa Parkway/Lipoa Street

Within the study area, Piilani Highway forms unsignalized T-intersections at:

- Kaonoulu Street
- Kulanihakoi Street
- East Waipuilani Road
- East Welakahao Road
- Old Welakahao Road

South Kihei Road

South Kihei Road is a collector road providing north-south mobility and property access within the Kihei Community. It is generally a two-lane roadway. Major segments of South Kihei Road have been improved to provide either a median turn lane or parallel parking on the makai-side. Sidewalks were provided on these enhanced segments along with striped bike lanes. Unimproved sections of South Kihei Road usually have only two undivided traffic lanes. The posted speed limit on South Kihei Road is 25 miles per hour. Signalized intersections on South Kihei Road near the study area are:

- Piikea Avenue
- Lipoa Street
- East Welakahao Road

Lipoa Parkway/Lipoa Street

Mauka of Piilani Highway, Lipoa Parkway is a two-lane, undivided roadway providing access to MRTP and Elleair Golf Course. It is configured to allow for future expansion to a four-lane roadway with raised median.

Makai of Piilani Highway, the roadway is named Lipoa Street. It is configured as a two-lane roadway with a painted median for left-turn lanes. Between Piilani Highway and Liloa Street, there are two unsignalized, T-intersections at the driveways for the Kihei Recreation Center and Kihei Elementary School. The Lipoa Street/Liloa Street intersection is signalized with exclusive left-turn lanes provided at all approaches.

The speed limits at both Lipoa Parkway and Lipoa Street are posted at 20 miles per hour.

Liloa Drive

Liloa Drive is part of the future North-South Collector in the Kihei area and is located approximately midway between Piilani Highway and South Kihei Road. Within the study area, just south of Lipoa Street, Liloa Drive is configured as a two-lane roadway with painted median, while north of Lipoa Street, Liloa Drive, has two lanes in the northbound direction and one lane in the southbound direction. North of Piikea Avenue, Liloa Drive reverts to a two-lane roadway.

The posted speed limit on Liloa Drive is 20 miles per hour.

Piikea Avenue

Piikea Avenue is a collector roadway oriented in the mauka-makai direction. Piikea is four lanes between Piilani Highway and Liloa Drive and two lanes makai of Liloa. Piilani Village Shopping Center is located on the north side of Piikea Avenue between Liloa and Piilani. Piikea Avenue provides access to the adjacent residential community and is part of the overall roadway network providing mobility in the Kihei area.

Piikea Avenue's intersections with South Kihei Road and Piilani Highway are signalized. The traffic control at the intersection of Piikea Avenue and Liloa is a roundabout. The posted speed limit is 20 miles per hour.

C. PUBLIC TRANSIT

The island of Maui is served by the Maui Public Bus Transit System, operated by Maui County. Kihei is served by the Kihei Villager and Islander bus routes. The Kihei Villager route is the shorter of the two, serving Kihei and Maalaea. The Kihei Islander route extends further to the north and south, connecting Kahului to Makena via Maalaea and Kihei. Both routes operate with a headway of one hour throughout the day. Within Kihei, the Maui buses use South Kihei Road. Currently, the bus accesses MRTP twice a day.

D. EXISTING INTERSECTION GEOMETRY AND CONTROL

Existing traffic conditions were observed and documented, and operations of study area signalized and unsignalized intersections were analyzed. The existing intersection operational characteristics established base conditions for comparison to future operations with and without the project.

Traffic-related data was collected for each of the study intersections. Traffic turning movement counts, field observations of intersection operations, and general intersection characteristics were noted. Geometric lane configurations, intersection traffic control, and traffic signal phasing and timing data were collected. Intersection geometry inventory included the following:

- Number of lanes and lane widths,
- Crosswalk locations,
- Unsignalized intersection control,
- Signalized intersection locations,
- Posted speed limits.

These data were used as inputs into the intersection analyses. Appendix A contains the traffic count data.

E. EXISTING TRAFFIC VOLUMES

Traffic turning movement counts were conducted at the following intersections from Tuesday, November 16 to Thursday, November 18, 2010 during the AM and PM peak hours at the following intersections:

- Piilani Highway/East Waipuilani Road
- Piilani Highway/Piikea Avenue
- Piilani Highway/Lipoa Street/Lipoa Parkway
- Piilani Highway/East Welakahao Road
- Piilani Highway/Old Welakahao Road
- South Kihei Road/Piikea Avenue
- South Kihei Road/Lipoa Street
- South Kihei Road/East Welakahao Road/West Welakahao Road
- Liloa Drive/Lipoa Street

These counts were supplemented with additional counts.

- Piilani Highway/Kaonoulu Street
- Piilani Highway/Kulanihakoi Street
- Liloa Drive/Piikea Avenue

The additional Piilani Highway counts were conducted on Tuesday, November 15 to Wednesday, November 16, 2012. The Liloa/Piikea intersection was counted on Tuesday, January 8, 2013.

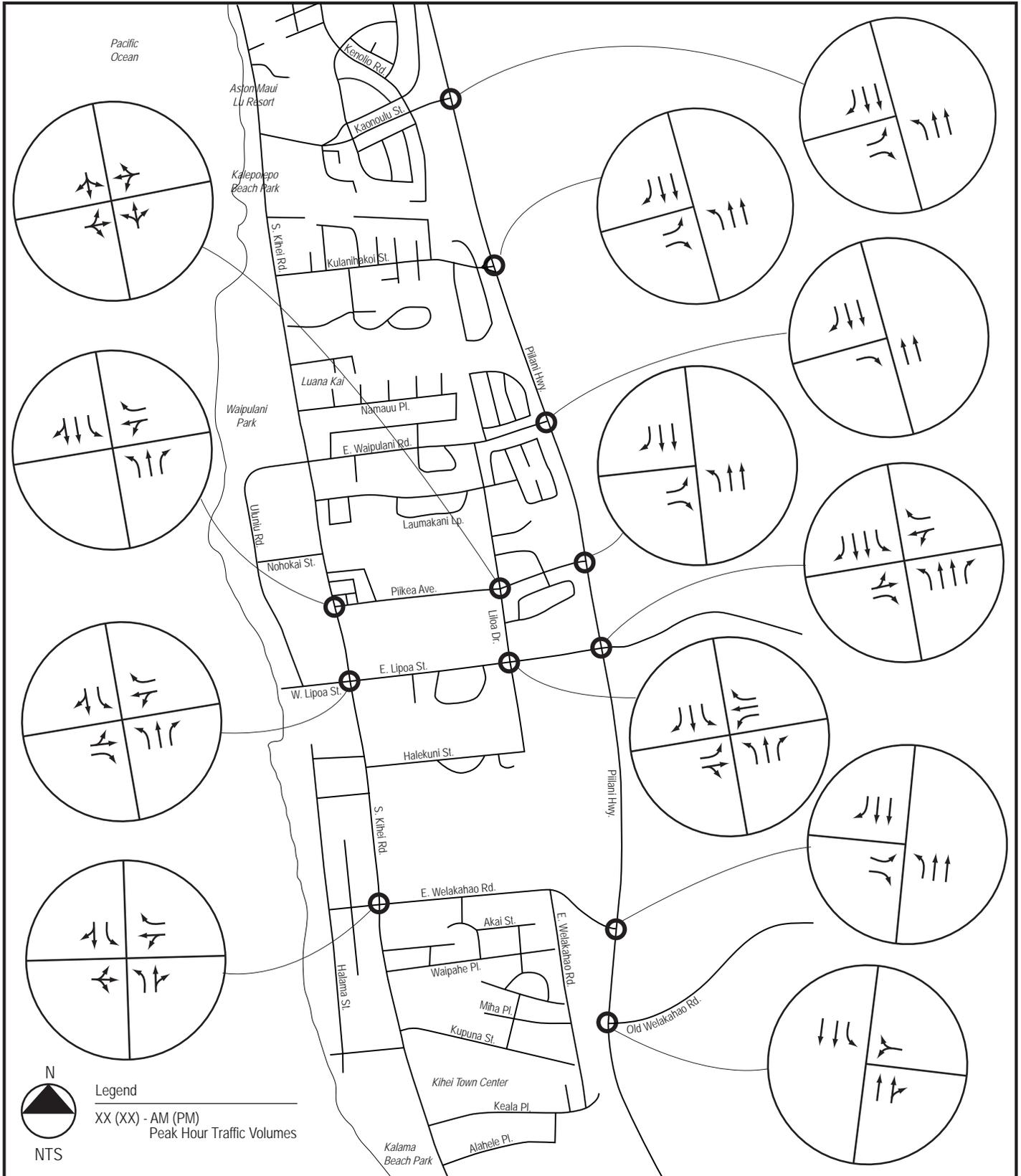
The AM and PM peak hours were found to occur from 7:15 to 8:15 AM and from 3:45 to 4:45 PM, respectively. Figure 3 shows the existing peak hour traffic volumes for each turning movement at these intersections. The existing lane configurations are shown in Figure 4. Existing traffic count data can be found in Appendix A.

F. EXISTING TRAFFIC OPERATIONS

The intersections were analyzed using the methodologies for unsignalized and signalized intersections outlined in the 2000 Highway Capacity Manual (HCM). Operating conditions at an intersection by approach are expressed as a qualitative measure known as Level of Service (LOS) ranging from A to F. LOS A represents free-flow operations with low delay, while LOS F represents congested conditions with relatively high delay. The overall intersection LOS is a weighted average of the LOS of individual traffic movement groups. Appendix B has more detailed definitions of intersection LOS. Appendix C contains the Synchro worksheets.

Field observations were performed at selected intersections to verify the results of the intersection analyses. Table 1 displays the existing conditions LOS for each intersection.

As shown in Table 1, Piilani Highway intersects Kaonoulu Street and forms an unsignalized tee intersection. The eastbound left turn operates at LOS F during the AM and PM peak hours. A refuge lane is provided for the Kaonoulu Street left turn, which allows the vehicles turning from the minor street to complete the left turn movement in two parts. As a result, the delay shown in Table 1 is mitigated by this refuge lane.



Existing Lane Configurations

Figure
4

Table 1 Existing Level of Service

Existing	AM		PM	
	LOS	Delay	LOS	Delay
Kaonoulu St & Piilani Hwy	Unsignalized		Unsignalized	
Piilani NB Left	C	17	C	18
Kaonoulu EB Left	F	*	F	*
Kaonoulu EB Right	E	40	C	25
Kulanihakoi St & Piilani Hwy	Unsignalized		Unsignalized	
Piilani NB Left	C	19	C	19
Kulanihakoi EB Left	F	*	F	*
Kulanihakoi EB Right	C	22	C	20
E. Waipuilani Rd & Piilani Hwy	Unsignalized		Unsignalized	
E. Waipuilani EB Right	C	20	C	16
S. Kihei Rd & Piikea Ave	B	10	B	17
S. Kihei NB Left	A	8	A	10
S. Kihei NB Through	B	12	B	19
S. Kihei NB Right	A	9	B	12
S. Kihei SB Left	A	5	A	10
S. Kihei SB Through-Right	A	7	B	11
Piikea WB Left-Through	B	17	C	27
Piikea WB Right	B	15	B	20
Piikea Ave & Liloa Dr	A	6	A	7
Liloa NB Approach	A	5	A	7
Liloa SB Approach	A	6	A	7
Piikea EB Approach	A	5	A	7
Piikea WB Approach	A	6	A	8
Piikea Ave & Piilani Hwy	C	22	C	26
Piilani NB Left	E	61	D	54
Piilani NB Through	A	9	B	11
Piilani SB Through	C	26	D	36
Piilani SB Right	B	16	C	24
Piikea EB Left	D	55	E	69
Piikea EB Right	A	1	A	1

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 1 Existing Level of Service (Continued)

Existing	AM		PM	
	LOS	Delay	LOS	Delay
W. Lipoa St & S. Kihei Rd	B	11	B	19
S. Kihei NB Left	A	8	B	11
S. Kihei NB Through	B	11	B	15
S. Kihei NB Right	A	8	A	10
S. Kihei SB Left	A	6	A	9
S. Kihei SB Through-Right	A	9	C	21
W. Lipoa EB Left-Through	B	15	C	25
W. Lipoa EB Right	B	15	C	23
W. Lipoa WB Left-Through	B	16	C	31
W. Lipoa WB Right	B	15	C	24
E. Lipoa St & Liloa Dr	B	11	A	10
Liloa NB Left	B	16	B	11
Liloa NB Through	B	16	B	12
Liloa NB Right	B	14	B	11
Liloa SB Left	B	17	B	12
Liloa SB Through	B	16	B	12
Liloa SB Right	B	14	B	11
E. Lipoa EB Left	A	9	A	7
E. Lipoa EB Through-Right	B	11	A	9
E. Lipoa WB Left	A	5	A	7
E. Lipoa WB Through	A	7	A	10
E. Lipoa WB Right	A	7	A	8
E. Lipoa St & Piilani Hwy	C	27	C	34
Piilani NB Left	D	47	F	128
Piilani NB Through	C	23	C	27
Piilani NB Right	B	16	B	15
Piilani SB Left	E	61	E	57
Piilani SB Through	C	26	C	28
Piilani SB Right	B	18	B	18
E. Lipoa EB Left-Through	C	35	D	38
E. Lipoa EB Right	C	25	C	26
E. Lipoa WB Left-Through	C	25	C	27
E. Lipoa WB Right	C	25	C	26

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 1 Existing Level of Service (Continued)

Existing	AM		PM	
	LOS	Delay	LOS	Delay
E. Welakahao Rd & S. Kihei Rd	B	11	B	14
Kihei NB Left	A	7	A	7
Kihei NB Through-Right	B	13	B	13
Kihei SB Left	A	7	A	7
Kihei SB Through-Right	A	9	B	11
W. Welakahao EB Left-Through-Right	B	13	C	24
E. Welakahao WB Left-Through	B	14	C	34
E. Welakahao WB Right	B	12	C	23
E. Welakahao Rd & Piilani Hwy	Unsignalized		Unsignalized	
Piilani NB Left	B	14	B	14
E. Welakahao EB Left	E	47	F	223
Old Welakahao Rd & Piilani Hwy	Unsignalized		Unsignalized	
Piilani SB Left	B	11	B	13
Old Welakahao WB Left-Right	C	22	D	25

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Piilani Highway intersects Kulanihakoi Street and forms an unsignalized tee intersection. The eastbound left turn operates at LOS F during the AM and PM peak hours. A refuge lane is provided and utilized.

The eastbound right turn at the intersection of Piilani Highway and East Waipuilani operates at LOS C during both the AM and PM peaks. Right turns from Waipuilani are given an acceleration lane which helps them merge onto Piilani.

The intersection of South Kihei Road and Piikea Avenue operates at LOS B overall during both the AM and PM peaks. All movements operate at LOS B or better during the AM peak hour and at LOS C or better during the PM peak hour.

The intersection of Liloa Drive and Piikea Avenue is a roundabout. All approaches operate at LOS A or better during both the AM and PM peak hours.

The intersection of Piilani Highway and Piikea Avenue operates at LOS C during the AM peak. The northbound Piilani left turn to Piikea operates at LOS E. The Piikea turning movements operate at LOS A and D. During the PM peak, the intersection operates at LOS

C as well. The northbound Piilani left and southbound Piilani through operate at LOS D. The eastbound Piikea left turn operates at LOS E. This intersection has been observed to have a fairly long cycle length of approximately three minutes, which contributes to the intersection's overall delay.

The intersection of South Kihei Road and Lipoa Street operates at LOS B during both the AM and PM peak hours. All movements operate at LOS B or better during the AM peak hour and at LOS C or better during the PM peak hour.

Liloa Drive and Lipoa Street form a signalized cross intersection which operates at LOS B during the AM peak hour and LOS A during the PM peak hour.

The intersection of Piilani Highway and Lipoa Street/Lipoa Parkway operates at LOS C during the AM peak hour. The north and southbound Piilani left turns operate at LOS D and E, respectively. The Piilani through movements operate at LOS C. During the PM peak hour, the intersection also operates at LOS C. The Piilani through movements operate at LOS C. The north and southbound Piilani left turns operate at LOS F and E, respectively.

South Kihei Road forms a cross intersection with East Welakahao Road. The intersection operates at LOS B during the AM and PM peak hours. During the AM peak hour, all movements operate at LOS B or better. All movements operate at LOS C or better during the PM peak hour.

At the intersection of Piilani Highway and East Welakahao Road, the westbound approach operates at LOS E during the AM peak hour and at LOS F during the PM peak hour.

At the intersection of Piilani Highway and Old Welakahao Road, the westbound approach operates at LOS C during the AM peak hour and at LOS D during the PM peak hour.

G. SUMMARY OF RESULTS

Overall the study area intersections operate well in the existing condition with a couple of exceptions. Two issues were identified under the existing conditions:

- Piilani Highway/Piikea Avenue - During the AM peak hour, the northbound Piilani left turn is projected to operate at LOS E. During the PM peak hour, the eastbound Piikea left turn is projected to operate at LOS E. The delay is caused by high volumes and a long cycle length which contributes to the delay.

- Piilani Highway unsignalized intersections – Eastbound left turns to Piilani Highway at unsignalized intersections are projected to operate at LOS E-F. Refuge lanes are provided to reduce the delay.

III. YEAR 2024 TRAFFIC CONDITIONS

Phase 1 of the MRTP project is projected to be completed in the Year 2024, which was used as the basis for future traffic analysis. As described earlier, four scenarios including Scenario 1 – No Build, Scenario 2 – Build, Scenario 3 – Build with MRTP Roadway Improvements, and Scenario 4 – Build with MRTP and Regional Roadway Improvements were analyzed.

A. SCENARIO 1 – NO BUILD

The No Build scenario represents the background conditions without MRTP development scenario. Only existing roadways and those roadways committed by other developments, the State, and the County are included.

1. Projected Year 2024 Background Traffic

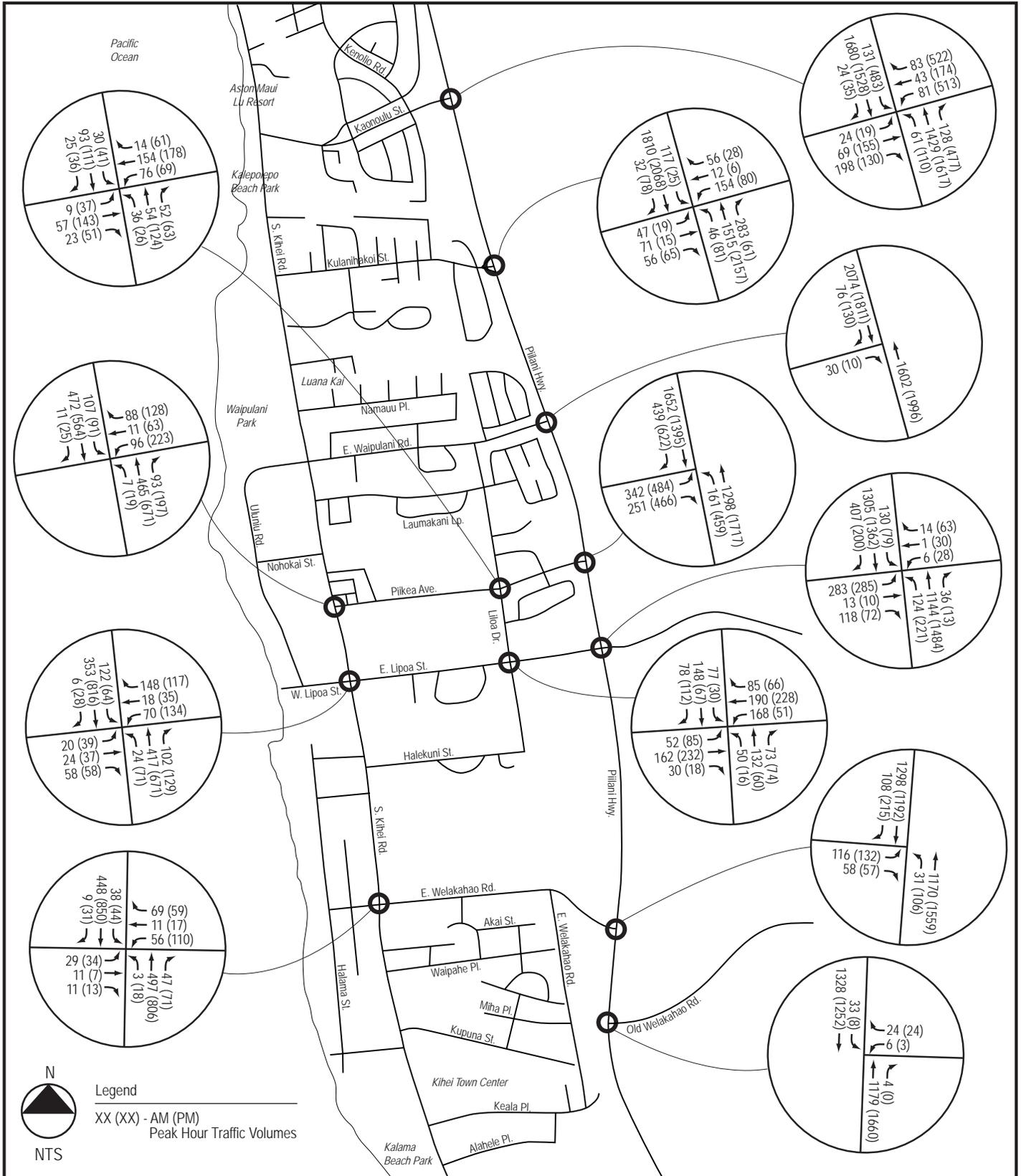
The Year 2024 background traffic volumes were derived using existing traffic along with trip generation obtained from the Maui Travel Demand Forecasting Model. The future Year 2024 background traffic assumes the presence of the following developments:

- Kihei High School
- Piilani Promenade
- Downtown Kihei
- Maui Lu Resort
- Kenolio 6
- Kaiwahine Village
- A&B N. Kihei Residential
- Honua'ula
- Wailea Resort
- Makena Resort

The projected Scenario 1 background traffic volumes are shown in Figure 5.

2. Scenario 1 Traffic Operations Without Project

Level of Service analysis was performed on the study area intersections. These results are shown in Table 2. Synchro 8 was used to analyze the roundabout at Liloa Drive/Piikea Avenue due to updated HCM 2010 standards.



Year 2024 No Build Traffic Volumes

Figure

5



Table 2 Year 2024 No Build Level of Service

Scenario 1	AM		PM	
	LOS	Delay	LOS	Delay
Kaonoulu St & Piilani Hwy	C	24	E	74
Piilani NB Left	E	67	F	164
Piilani NB Through	C	20	F	92
Piilani NB Right	B	11	C	29
Piilani SB Left	D	52	F	139
Piilani SB Through	C	22	D	36
Piilani SB Right	A	9	B	16
Kaonoulu EB Left	D	51	E	56
Kaonoulu EB Through	E	57	F	84
Kaonoulu EB Right	A	0	A	0
Kaonoulu WB Left	D	52	F	142
Kaonoulu WB Through	D	53	E	65
Kaonoulu WB Right	D	50	D	53
Kulanihakoī St & Piilani Hwy	C	28	C	25
Piilani NB Left	E	64	E	71
Piilani NB Through	C	26	C	22
Piilani NB Right	A	0	A	0
Piilani SB Left	E	66	E	61
Piilani SB Through	C	27	C	25
Piilani SB Right	A	0	A	0
Kulanihakoī EB Left-Through	D	46	D	50
Kulanihakoī EB Right	A	0	A	0
Kulanihakoī WB Left-Through	E	69	E	60
Kulanihakoī WB Right	A	0	A	0
E. Waipuilani Rd & Piilani Hwy	Unsignalized		Unsignalized	
E. Waipuilani EB Right	D	27	C	20
S. Kihei Rd & Piikea Ave	A	9	B	18
S. Kihei NB Left	A	7	A	9
S. Kihei NB Through	B	10	C	20
S. Kihei NB Right	A	7	B	11
S. Kihei SB Left	A	5	B	12
S. Kihei SB Through-Right	A	6	B	10
Piikea WB Left-Through	C	21	C	31
Piikea WB Right	B	18	C	23

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 2 Year 2024 No Build Level of Service (Continued)

Scenario 1	AM		PM	
	LOS	Delay	LOS	Delay
Piikea Ave & Liloa Dr	A	6	A	8
Liloa NB Approach	A	5	A	7
Liloa SB Approach	A	6	A	7
Piikea EB Approach	A	5	A	7
Piikea WB Approach	A	6	A	8
Piikea Ave & Piilani Hwy	C	34	F	84
Piilani NB Left	F	127	F	*
Piilani NB Through	A	9	B	11
Piilani SB Through	C	30	C	34
Piilani SB Right	B	16	C	25
Piikea EB Left	F	150	F	*
Piikea EB Right	A	0	A	1
W. Lipoa St & S. Kihei Rd	B	12	C	21
S. Kihei NB Left	A	8	B	16
S. Kihei NB Through	B	13	B	14
S. Kihei NB Right	A	9	A	8
S. Kihei SB Left	A	6	A	10
S. Kihei SB Through-Right	A	9	C	23
W. Lipoa EB Left-Through	B	18	C	29
W. Lipoa EB Right	B	17	C	27
W. Lipoa WB Left-Through	B	19	D	36
W. Lipoa WB Right	B	18	C	28
E. Lipoa St & Liloa Dr	B	12	A	10
Liloa NB Left	B	13	B	11
Liloa NB Through	B	14	B	11
Liloa NB Right	B	13	B	11
Liloa SB Left	B	14	B	11
Liloa SB Through	B	14	B	11
Liloa SB Right	B	13	B	11
E. Lipoa EB Left-Through	B	10	A	9
E. Lipoa EB Right	B	13	B	10
E. Lipoa WB Left	A	6	A	6
E. Lipoa WB Through	A	10	A	9
E. Lipoa WB Right	A	9	A	7

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 2 Year 2024 No Build Level of Service (Continued)

Scenario 1	AM		PM	
	LOS	Delay	LOS	Delay
E. Lipoa St & Piilani Hwy	C	31	D	48
Piilani NB Left	E	61	F	89
Piilani NB Through	C	26	D	37
Piilani NB Right	B	16	B	17
Piilani SB Left	E	62	E	78
Piilani SB Through	C	30	D	51
Piilani SB Right	B	20	C	26
E. Lipoa EB Left-Through	E	60	F	81
E. Lipoa EB Right	A	0	A	0
E. Lipoa WB Left-Through	E	74	E	78
E. Lipoa WB Right	A	0	A	0
E. Welakahao Rd & S. Kihei Rd	B	10	B	18
S. Kihei NB Left	A	6	A	9
S. Kihei NB Through-Right	A	10	B	16
S. Kihei SB Left	A	6	B	10
S. Kihei SB Through-Right	A	8	B	15
E. Welakahao EB Left-Through-Right	B	17	C	27
E. Welakahao WB Left-Through	B	18	D	43
E. Welakahao WB Right	B	16	C	26
E. Welakahao Rd & Piilani Hwy	Unsignalized		Unsignalized	
Piilani NB Left	C	17	C	18
E. Welakahao EB Left	F	139	F	*
Old Welakahao Rd & Piilani Hwy	Unsignalized		Unsignalized	
Piilani SB Left	B	12	C	16
Old Welakahao WB Left-Right	D	35	E	42

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

As shown in Table 2 and described earlier, Piilani Highway's intersection with Kaonoulu Street is projected to be a four-legged, signalized intersection. The intersection is projected to operate at LOS C overall during the AM peak hour. During the PM peak hour, the intersection is projected to operate at LOS E overall. Multiple movements, including the north Piilani through movement, are projected to operate at LOS F.

According to the Kihei High School Final Environmental Impact Statement (FEIS), Piilani Highway's intersection with Kulanihakoi Street is projected to be a four-legged, signalized intersection. The intersection is projected to operate at LOS C overall during the AM and PM peak hours. During both peaks, multiple movements are projected to operate at LOS E.

The eastbound right turn at the intersection of Piilani Highway and East Waipuilani is projected to operate at LOS D during the AM peak hour and at LOS C during the PM peak hour.

The intersection of South Kihei Road and Piikea Avenue is projected to operate at LOS A overall during the AM peak and at LOS B during the PM peak hour. All movements are projected to operate at LOS C or better during both peak hours.

The intersection of Liloa Drive and Piikea Avenue is a roundabout. All approaches are projected to operate at LOS A or better during both the AM and PM peak hours.

The intersection of Piilani Highway and Piikea Avenue is projected to operate at LOS C during the AM peak hour and LOS F during the PM peak hour. The northbound Piilani left turn to Piikea and the eastbound Piikea left turn to Piilani are projected to operate at LOS F during the AM and PM peak hours.

The intersection of South Kihei Road and Lipoa Street is projected to operate at LOS B during the AM peak hour and at LOS C during the PM peak hour. All movements are projected to operate at LOS B or better during the AM peak hour and at LOS D or better during the PM peak hour.

The intersection of Liloa Drive and Lipoa Street is projected to operate at LOS B during the AM peak hour and LOS A during the PM peak hour.

The intersection of Piilani Highway and Lipoa Street/Lipoa Parkway is projected to operate at LOS C during the AM peak hour and LOS D during the PM peak hour. During the AM peak hour, the north and southbound Piilani left turns are projected to operate at LOS E. The Piilani through movements are projected to operate at LOS C. During the PM peak hour, the north and southbound Piilani through movements are projected to operate at LOS D. The north and southbound Piilani left turns are projected to operate at LOS F and E, respectively.

The intersection of South Kihei Road and East Welakahao Road is projected to operate at LOS B during both the AM and PM peak hours. During the AM peak hour, all movements are projected to operate at LOS B or better. All movements are projected to operate at LOS C or better during the PM peak hour with the exception of the westbound East Welakahao left/through movement (LOS D).

At the intersection of Piilani Highway and East Welakahao Road, the eastbound Welakahao left turn is projected to operate at LOS F during both peak hours.

At the intersection of Piilani Highway and Old Welakahao Road, the westbound approach is projected to operate at LOS D during the AM peak hour and at LOS E during the PM peak hour.

B. SCENARIO 2 – BUILD

The Build scenario adds MRTP development Phase 1 generated trips to the No Build scenario. The assumed roadway network is the same as in the No Build scenario.

As shown in Figure 2, Phase 1 consists of residential, mixed-use commercial, and the employment core. It will also contain an elementary school and business hotel. The employment will be located directly off of Lipoa Parkway. The mixed use will be located just north of the employment core. The residential will be located northwest of the mixed-use, close to Piilani Highway as well as the future Kihei High School. An elementary school is planned to be located within the northern portion of Phase 1. Finally, a business hotel is planned to be located on the fringe of the mixed-use core.

1. Future Roadways

The roadway network assumptions are the same as the No Build scenario.

2. Trip Generation

The Institute of Transportation Engineers (ITE), Trip Generation, 8th edition was used to estimate the number of trips generated by the Maui R&T development based on land uses identified in the conceptual development plan shown in Figure 2.

The conceptual development plan shows proposed development parcels within the MRTP development. Existing MRTP parcels were treated as background traffic. The site-generated traffic acknowledges only the development yet to be constructed and occupied. Phase 1 of MRTP consists of the following:

- 723,200 SF of Employment
- 100,000 SF of Retail
- 750 Residential DU broken down as follows:
 - 150 DU Mid-Rise
 - 450 DU Single Family
 - 150 DU Townhouse
- 150 Hotel Rooms
- 102,000 SF of Elementary School.

Table 3 summarizes the trips generated by Phase 1 of the proposed MRTP development. An internal capture rate was devised using ITE methodology. In addition, a 5% mode choice share was assumed for pedestrians and cyclists.

MRTP has been working with HDOT to estimate the external trips based on the assumed low, medium, and high internal capture rates in order to gauge the traffic impact by different levels of internal capture. In addition, the development will utilize the principles of new urbanism and smart growth providing diverse housing options within close proximity of the park's employment and integrating neighborhood serving retail, civic and commercial uses in a manner that encourages bicycling and walking. The residential component of the development will be targeted at the employees of the tech park that will eliminate the need for worker to drive to and from work. Conservatively, 15% of internal capture was applied to residential and office land uses.

Internal capture for local school, community shopping center, and business hotel are not clearly defined by the ITE Trip Generation Manual. The planned elementary school will be built largely for MRTP. It is not anticipated that the school will generate a significant amount of external trips. Similarly the community shopping center as currently planned is not visible from Piilani Highway and will mostly serve the MRTP itself. The planned hotel targets only those patrons who will have businesses such as meetings, seminars, and conferences in MRTP. With Kihei Elementary School nearby, other more convenient shopping centers, and plenty of hotels located makai of Piilani Highway, an internal capture rate higher than 15% rate was assumed for the planned school, community shopping center, and hotel.

Table 3 Phase 1 Trip Generation Summary

			AM Peak Hour		Total	PM Peak Hour		Total
	In	Out	In	Out		In	Out	
OFFICE	760	723,200 SF	605	124	729	99	559	658
		After Mode Reductions	575	118	693	94	531	625
RETAIL	814	100,000 SF	45	28	73	115	146	261
		After Mode Reductions	43	27	70	109	139	248
RESIDENTIAL	223	150 DU	15	33	48	35	26	61
	210	450 DU	81	369	450	256	151	407
	230	150 DU	11	55	66	52	26	78
			107					
		Residential Total						
HOTEL	310	150 Rooms	102	434	536	326	193	519
		After Mode Reductions	41	27	68	47	42	89
INSTITUTION	522	102,000 SF	39	26	65	45	40	85
		After Mode Reductions	279	219	498	55	68	123
		After Mode Reductions	265	208	473	52	65	117
		Subtotal Trips (Before Mode Reductions)	1,077	855	1,932	659	1,018	1,677
		Subtotal Trips (After Mode Reductions)	1,024	813	1,837	626	968	1,594
		Residential Internal Capture Reduction	48	196	244	113	74	187
		Retail Internal Capture Reduction	6	10	16	84	35	119
		Office Internal Capture Reduction	86	25	111	22	105	127
		Institution Internal Capture Reduction	130	31	161	26	33	59
		Hotel Internal Capture Reduction	6	14	20	24	22	46
		Total Internal Capture Reductions	276	276	552	269	269	538
		Total External Trips	748	537	1,285	357	699	1,056

Trips generated expressed in vehicles per hour

Low, medium, and high internal capture rates were developed to represent the internal interactions between the different land uses for Phase 1. For the purpose of this analysis, the low internal capture that would result in highest external trips was used. Specifically,

- 220/1055 or 21% of residential trips interacted directly with the school;
- 68/1055 or 6% of residential trips interacted directly with the commercial
- 143/1318 or 11% of employment trips interacted directly with the residential;
- 47/1318 or 4% of employment trips interacted directly with the business hotel;

A more detailed explanation of internal capture assumptions is shown in Appendix D.

3. Trip Assignment

The traffic generated by the proposed MRTP Development was directionally distributed and assigned to the future roadway network.

A summary of regional travel patterns within the Kihei area was created from the Maui travel demand model. MRTP traffic was assigned to the projected roadway network using this distribution. Internal traffic was distributed between the residential, hotel, school, employment, and retail commercial land uses. These distributions were applied to the trips generated.

4. Total Traffic

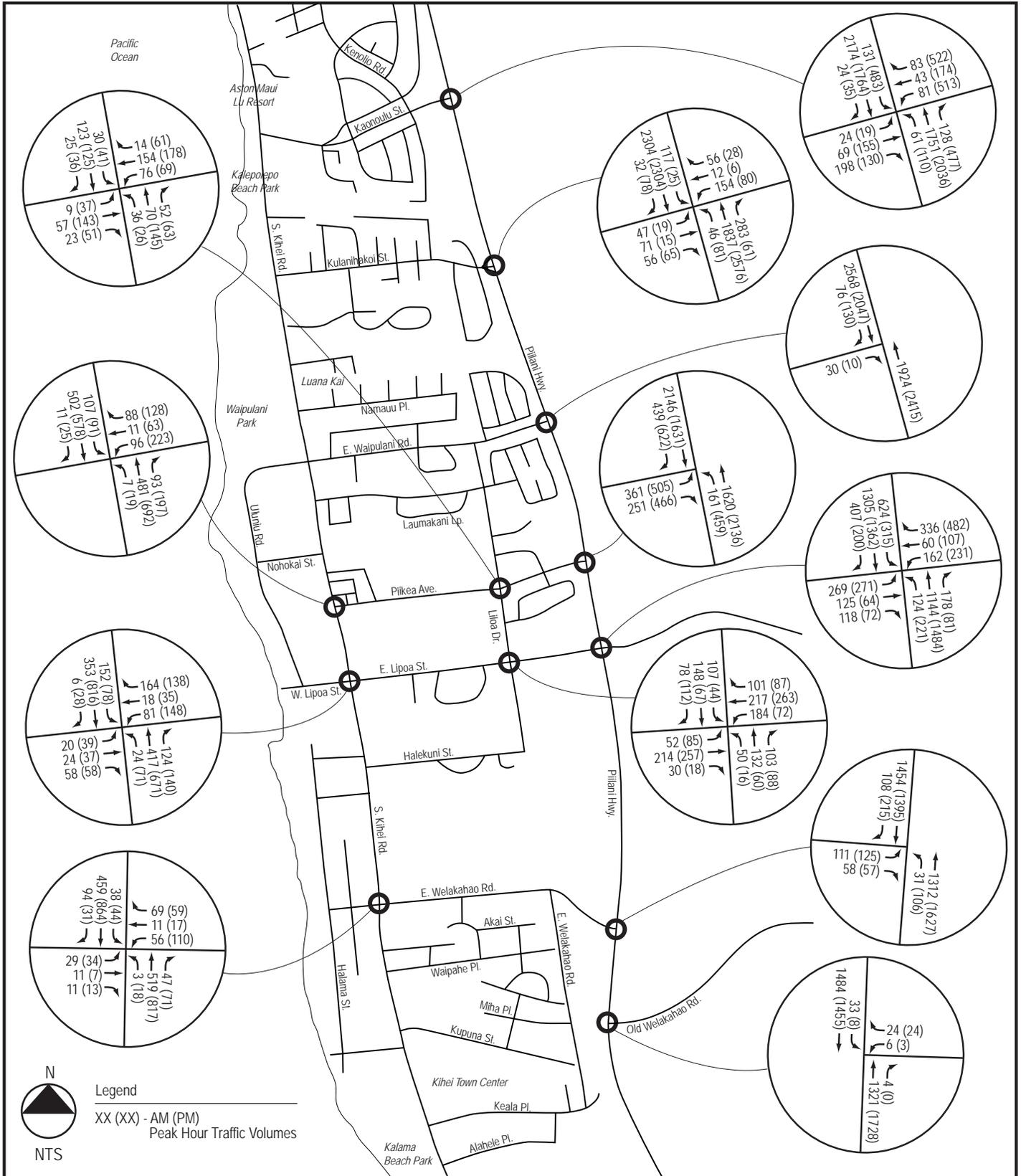
The traffic generated by the MRTP development was added to the projected background traffic to obtain the total peak hour traffic volumes shown in Figure 6.

5. Scenario 2 Traffic Operations With Project

Level of Service analysis was performed on the study area intersections. These results are shown in Table 4.

Piilani Highway's intersection with Kulanihakoi Street is projected to operate at LOS E overall during the AM and PM peak hours. During both peaks, multiple movements are projected to operate at LOS E or F. The eastbound right turn at the intersection of Piilani Highway and East Waipuilani is projected to operate at LOS E during the AM peak hour. It is projected to operate at LOS C during the PM peak hour.

The intersection of South Kihei Road and Piikea Avenue is projected to operate at LOS A during the AM peak hour and at LOS B during the PM peak hour. All movements are projected to operate at LOS C or better during the AM and PM peak hours.



Year 2024 Build Traffic Volumes

Figure
6

Table 4 Year 2024 Build Level of Service

Scenario 2	AM		PM	
	LOS	Delay	LOS	Delay
Kaonoulu St & Piilani Hwy	D	51	F	116
Piilani NB Left	E	68	F	127
Piilani NB Through	C	30	F	204
Piilani NB Right	B	11	C	29
Piilani SB Left	D	52	F	139
Piilani SB Through	E	74	E	63
Piilani SB Right	A	9	B	16
Kaonoulu EB Left	D	52	E	56
Kaonoulu EB Through	E	58	F	84
Kaonoulu EB Right	A	0	A	0
Kaonoulu WB Left	D	53	F	142
Kaonoulu WB Through	D	53	E	65
Kaonoulu WB Right	D	51	D	53
Kulanihakoi St & Piilani Hwy	E	63	E	61
Piilani NB Left	E	67	E	71
Piilani NB Through	D	41	E	75
Piilani NB Right	A	0	A	0
Piilani SB Left	E	73	E	61
Piilani SB Through	F	91	D	51
Piilani SB Right	A	0	A	0
Kulanihakoi EB Left-Through	D	50	D	50
Kulanihakoi EB Right	A	0	A	0
Kulanihakoi WB Left-Through	F	81	E	60
Kulanihakoi WB Right	A	0	A	0
E. Waipuilani Rd & Piilani Hwy	Unsignalized		Unsignalized	
E. Waipuilani EB Right	E	41	C	24
S. Kihei Rd & Piikea Ave	A	10	B	18
S. Kihei NB Left	A	7	A	9
S. Kihei NB Through	B	11	C	21
S. Kihei NB Right	A	7	B	11
S. Kihei SB Left	A	5	B	13
S. Kihei SB Through-Right	A	6	B	10
Piikea WB Left-Through	C	21	C	32
Piikea WB Right	B	19	C	23

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 4 Year 2024 Build Level of Service (Continued)

Scenario 2	AM		PM	
	LOS	Delay	LOS	Delay
Piikea Ave & Liloa Dr	A	6	A	8
Liloa NB Approach	A	5	A	7
Liloa SB Approach	A	7	A	7
Piikea EB Approach	A	5	A	7
Piikea WB Approach	A	6	A	9
Piikea Ave & Piilani Hwy	D	54	F	95
Piilani NB Left	F	155	F	*
Piilani NB Through	B	11	B	15
Piilani SB Through	E	72	D	36
Piilani SB Right	B	15	C	23
Piikea EB Left	F	186	F	*
Piikea EB Right	A	0	A	1
W. Lipoa St & S. Kihei Rd	B	13	C	21
S. Kihei NB Left	A	9	B	16
S. Kihei NB Through	B	14	B	15
S. Kihei NB Right	B	10	A	8
S. Kihei SB Left	A	6	B	10
S. Kihei SB Through-Right	A	9	C	24
W. Lipoa EB Left-Through	B	20	C	29
W. Lipoa EB Right	B	19	C	27
W. Lipoa WB Left-Through	C	22	D	39
W. Lipoa WB Right	B	20	C	28
E. Lipoa St & Liloa Dr	B	13	B	10
Liloa NB Left	B	16	B	11
Liloa NB Through	B	17	B	12
Liloa NB Right	B	15	B	11
Liloa SB Left	B	17	B	12
Liloa SB Through	B	17	B	12
Liloa SB Right	B	15	B	11
E. Lipoa EB Left-Through	B	11	A	10
E. Lipoa EB Right	B	15	B	13
E. Lipoa WB Left	A	6	A	6
E. Lipoa WB Through	A	9	A	9
E. Lipoa WB Right	A	8	A	7

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 4 Year 2024 Build Level of Service (Continued)

Scenario 2	AM		PM	
	LOS	Delay	LOS	Delay
E. Lipoa St & Piilani Hwy	F	224	F	134
Piilani NB Left	F	90	F	108
Piilani NB Through	D	47	E	58
Piilani NB Right	C	29	C	24
Piilani SB Left	F	*	F	*
Piilani SB Through	E	62	E	79
Piilani SB Right	C	32	C	32
E. Lipoa EB Left-Through	F	105	F	103
E. Lipoa EB Right	A	0	A	0
E. Lipoa WB Left-Through	F	184	F	*
E. Lipoa WB Right	A	0	A	1
E. Welakahao Rd & S. Kihei Rd	B	10	B	18
S. Kihei NB Left	A	6	A	10
S. Kihei NB Through-Right	B	10	B	17
S. Kihei SB Left	A	6	B	11
S. Kihei SB Through-Right	A	8	B	16
E. Welakahao EB Left-Through-Right	B	18	C	28
E. Welakahao WB Left-Through	B	19	D	44
E. Welakahao WB Right	B	17	C	26
E. Welakahao Rd & Piilani Hwy	Unsignalized		Unsignalized	
Piilani NB Left	C	20	C	24
E. Welakahao EB Left	F	*	F	*
Old Welakahao Rd & Piilani Hwy	Unsignalized		Unsignalized	
Piilani SB Left	B	13	C	17
Old Welakahao WB Left-Right	F	50	F	54

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

All approaches at the intersection of Liloa Drive and Piikea Avenue are projected to operate at LOS A or better during both the AM and PM peak hours.

The intersection of Piilani Highway and Piikea Avenue is projected to operate at LOS D during the AM peak hour and at LOS F during the PM peak hour. During both the AM and PM peak hours, the northbound Piilani left turn to Piikea and the eastbound Piikea left turn to Piilani are projected to operate at LOS F. The Piilani southbound through movement is

projected to operate at LOS E during the AM peak hour and at LOS D during the PM peak hour.

The intersection of South Kihei Road and Lipoa Street is projected to operate at LOS B during the AM peak hour and at LOS C during the PM peak hour. All movements are projected to operate at LOS C or better during the AM peak hour and at LOS D or better during the PM peak hour.

The intersection of Liloa Drive and Lipoa Street is projected to operate at LOS B during the both the AM and PM peak hours. All movements are projected to operate at LOS B or better during both peak hours.

With no project-related improvements, the intersection of Piilani Highway and Lipoa Street/Lipoa Parkway is projected to operate at LOS F during both the AM and PM peak hours. During the AM peak hour, the Piilani left turns are projected to operate at LOS F. The north and southbound Piilani through movements are projected to operate at LOS D and LOS E, respectively. During the PM peak hour, the Piilani through movements are projected to operate at LOS E. The north and southbound Piilani left turns are projected to operate at LOS F. The eastbound Lipoa left/through movements are projected to operate at LOS F during both peaks.

The intersection of South Kihei Road and East Welakahao Road is projected to operate at LOS B during both the AM and PM peak hours. During the AM peak hour, all movements are projected to operate at LOS B or better. All movements are projected to operate at LOS D or better during the PM peak hour.

At the intersection of Piilani Highway and East Welakahao Road, the eastbound Welakahao left turn is projected to operate at LOS F during both peak hours.

At the intersection of Piilani Highway and Old Welakahao Road, the westbound Welakahao left turn is projected to operate at LOS F during both peak hours.

C. SCENARIO 3 – BUILD WITH MRTP ROADWAY IMPROVEMENTS

The Build with Project Roadway Improvements scenario represents the Build scenario with additional transportation improvements committed by MRTP. As described in the Build Condition, Phase 1 consists of residential, mixed-use commercial, and the employment core along with an elementary school and business hotel.

1. Future Roadways

The roadway network assumptions are nearly identical to Scenario 2. Additional improvements assumed to be the responsibility of MRTP are included. These are:

1. Piilani Highway/Hookena Street Access

- a. Construct 2-lane Hookena Street from within MRTP to intersect Piilani Highway across from East Waipuilani Road;
- b. Configure the westbound Hookena approach as a right-in/right-out access with stop control;
- c. Provide acceleration and deceleration lanes to and from Piilani Highway;
- d. Maintain existing delineators on Piilani Highway to prevent left turns from East Waipuilani Road or Hookena Street from crossing the center line of Piilani Highway.

2. Piilani Highway/Piikea Avenue

- a. Construct an additional eastbound Piikea Avenue left turn lane (two total);
- b. Retime the traffic signal accordingly to optimize the intersection operation.

3. Piilani Highway/Lipoa Parkway

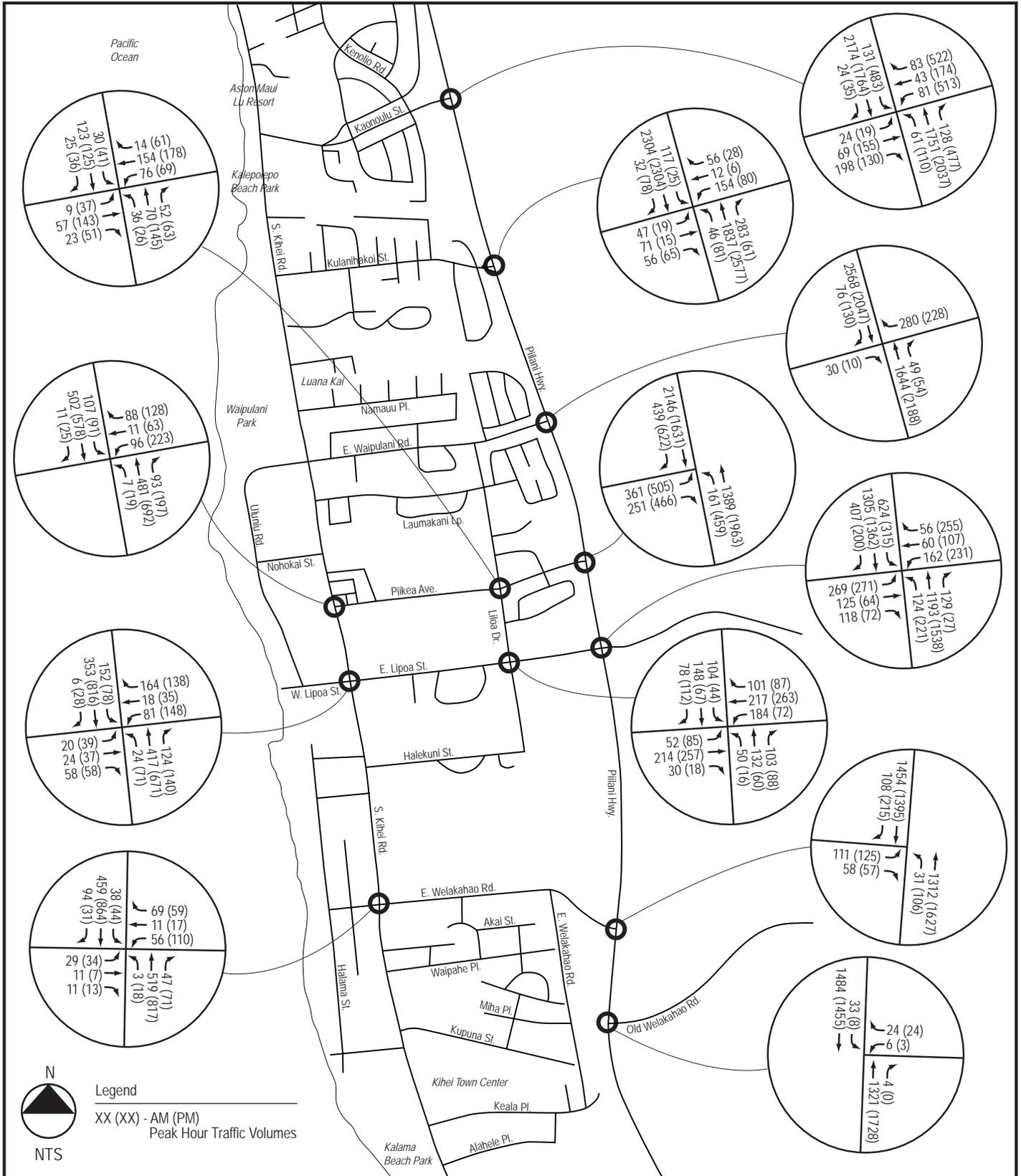
- a. Construct an additional southbound Piilani left turn lane (two total);
- b. Widen westbound Lipoa Parkway to provide for left, through, and right turn lanes;
- c. Widen and/or restripe eastbound Lipoa Street to provide left, through, and right turn lanes;
- d. Adjust signal timing and phasing to provide leading protected left turn phases for the east and westbound Lipoa left turn movements;
- e. Add the missing crosswalk on north Piilani leg of the intersection to improve pedestrian connectivity.

4. Internal Kihei High School Access

- a. Construct an internal Kihei High School Access from within MRTP;
- b. Provide bicycle and pedestrian connectivity between the school and MRTP

2. Trip Generation

The trip generation for Scenario 3 is shown in Table 3.



Year 2024 Build Traffic Volumes
 With MRTP Roadway Improvements

Figure

7



3. Trip Assignment

The traffic generated by the proposed MRTP Development was directionally distributed and assigned to the future roadway network.

4. Total Traffic

The traffic generated by the MRTP development was added to the projected background traffic to obtain the total peak hour traffic volumes shown in Figure 7.

5. Scenario 3 Traffic Operations With Project

Level of Service analysis was performed on the study area intersections. These results are shown in Table 5.

As shown in Table 5 the intersection of Piilani Highway and Kaonoulu Street is projected to operate at LOS D overall during the AM peak hour. The southbound Piilani through movement is projected to operate at LOS E. During the PM peak hour, the intersection is projected to operate at LOS F overall. Multiple movements are projected to operate at LOS F. The north and southbound Piilani through movements are projected to operate at LOS F and E, respectively.

Piilani Highway's intersection with Kulanihakoi Street is projected to operate at LOS E overall during the AM and PM peak hours. During both peaks, multiple movements are projected to operate at LOS E or worse.

The eastbound right turn at the intersection of Piilani Highway and East Waipuilani is projected to operate at LOS A during the AM and PM peak hours. The westbound right turn out of MRTP is also projected to operate at LOS A during the AM and PM peak hours.

The intersection of South Kihei Road and Piikea Avenue is projected to operate at LOS A during the AM peak hour and at LOS B during the PM peak hour. All movements are projected to operate at LOS C or better during the AM and PM peak hours.

All approaches at the intersection of Liloa Drive and Piikea Avenue are projected to operate at LOS A or better during both the AM and PM peak hours.

Table 5 Year 2024 Build With MRTP Roadway Improvements Level of Service

Scenario 3	AM		PM	
	LOS	Delay	LOS	Delay
Kaonoulu St & Piilani Hwy	D	51	F	120
Piilani NB Left	E	68	F	164
Piilani NB Through	C	30	F	214
Piilani NB Right	B	11	C	30
Piilani SB Left	D	52	F	139
Piilani SB Through	E	74	E	63
Piilani SB Right	A	9	B	16
Kaonoulu EB Left	D	52	E	56
Kaonoulu EB Through	E	58	F	68
Kaonoulu EB Right	A	0	A	0
Kaonoulu WB Left	D	53	F	142
Kaonoulu WB Through	D	53	E	65
Kaonoulu WB Right	D	51	D	53
Kulanihakoī St & Piilani Hwy	E	63	E	61
Piilani NB Left	E	67	E	71
Piilani NB Through	D	41	E	76
Piilani NB Right	A	0	A	0
Piilani SB Left	E	73	E	61
Piilani SB Through	F	91	D	51
Piilani SB Right	A	0	A	0
Kulanihakoī EB Left-Through	D	50	D	50
Kulanihakoī EB Right	A	0	A	0
Kulanihakoī WB Left-Through	F	81	E	60
Kulanihakoī WB Right	A	0	A	0
E. Waipuilani Rd & Piilani Hwy	Unsignalized		Unsignalized	
E. Waipuilani EB Right	A	5	A	1
E. Waipuilani WB Right	A	3	A	2

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 5 Year 2024 Build With MRTP Roadway Improvements Level of Service (Continued)

Scenario 3	AM		PM	
	LOS	Delay	LOS	Delay
S. Kihei Rd & Piikea Ave	A	10	B	18
S. Kihei NB Left	A	7	A	9
S. Kihei NB Through	B	11	C	21
S. Kihei NB Right	A	7	B	11
S. Kihei SB Left	A	5	B	13
S. Kihei SB Through-Right	A	6	B	10
Piikea WB Left-Through	C	21	C	32
Piikea WB Right	B	19	C	23
Piikea Ave & Liloa Dr	A	6	A	8
Liloa NB Approach	A	5	A	7
Liloa SB Approach	A	7	A	7
Piikea EB Approach	A	5	A	7
Piikea WB Approach	A	6	A	9
Piikea Ave & Piilani Hwy	D	44	E	58
Piilani NB Left	F	81	F	102
Piilani NB Through	A	7	B	14
Piilani SB Through	E	73	F	108
Piilani SB Right	B	14	D	41
Piikea EB Left	E	66	F	103
Piikea EB Right	A	0	A	1
W. Lipoa St & S. Kihei Rd	B	13	C	21
S. Kihei NB Left	A	9	B	16
S. Kihei NB Through	B	14	B	15
S. Kihei NB Right	B	10	A	8
S. Kihei SB Left	A	6	B	10
S. Kihei SB Through-Right	A	9	C	24
W. Lipoa EB Left-Through	B	20	C	29
W. Lipoa EB Right	B	19	C	27
W. Lipoa WB Left-Through	C	22	D	39
W. Lipoa WB Right	B	20	C	28

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 5 Year 2024 Build With MRTP Roadway Improvements Level of Service With Project (Continued)

Scenario 3	AM		PM	
	LOS	Delay	LOS	Delay
E. Lipoa St & Liloa Dr	B	13	B	10
Liloa NB Left	B	16	B	11
Liloa NB Through	B	17	B	12
Liloa NB Right	B	15	B	11
Liloa SB Left	B	17	B	12
Liloa SB Through	B	17	B	12
Liloa SB Right	B	15	B	11
E. Lipoa EB Left	B	11	A	10
E. Lipoa EB Through-Right	B	15	B	13
E. Lipoa WB Left	A	6	A	6
E. Lipoa WB Through	A	9	A	9
E. Lipoa WB Right	A	8	A	7
E. Lipoa St & Piilani Hwy	D	53	F	92
Piilani NB Left	E	76	E	74
Piilani NB Through	E	57	F	118
Piilani NB Right	C	20	B	12
Piilani SB Left	F	95	E	74
Piilani SB Through	D	36	F	118
Piilani SB Right	A	9	B	14
E. Lipoa EB Left	E	67	E	67
E. Lipoa EB Through	D	52	D	54
E. Lipoa EB Right	A	0	A	0
E. Lipoa WB Left	F	152	E	65
E. Lipoa WB Through	E	69	E	61
E. Lipoa WB Right	A	0	A	0
E. Welakahao Rd & S. Kihei Rd	B	10	B	18
S. Kihei NB Left	A	6	A	10
S. Kihei NB Through-Right	B	10	B	17
S. Kihei SB Left	A	6	B	11
S. Kihei SB Through-Right	A	8	B	16
E. Welakahao EB Left-Through-Right	B	18	C	28
E. Welakahao WB Left-Through	B	19	D	44
E. Welakahao WB Right	B	17	C	26

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 5 Year 2024 Build With MRTP Roadway Improvements Level of Service With Project (Continued)

Scenario 3	AM		PM	
	LOS	Delay	LOS	Delay
E. Welakahao Rd & Piilani Hwy	Unsignalized		Unsignalized	
Piilani NB Left	C	20	C	24
E. Welakahao EB Left	F	*	F	*
Old Welakahao Rd & Piilani Hwy	Unsignalized		Unsignalized	
Piilani SB Left	B	13	C	17
Old Welakahao WB Left-Right	F	50	F	54

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

The intersection of Piilani Highway and Piikea Avenue is projected to operate at LOS D during the AM peak hour and at LOS E during the PM peak hour. During both the AM and PM peak hours, the northbound Piilani left turn to Piikea is projected to operate at LOS F. With the project-related improvements, the eastbound Piikea left turn to Piilani is projected to operate at LOS F during the PM peak hour. The Piilani southbound through movement is projected to operate at LOS E during the AM peak hour and at LOS F during the PM peak hour.

The intersection of South Kihei Road and Lipoa Street is projected to operate at LOS B during the AM peak hour and at LOS C during the PM peak hour. All movements are projected to operate at LOS C or better during the AM peak hour and at LOS D or better during the PM peak hour.

The intersection of Liloa Drive and Lipoa Street is projected to operate at LOS B during the both the AM and PM peak hours. All movements are projected to operate at LOS B or better during both peak hours.

With project-related improvements, the intersection of Piilani Highway and Lipoa Street/Lipoa Parkway is projected to operate at LOS D during the AM peak hour and at LOS F during PM peak hour. During the AM peak hour, the north and southbound Piilani left turns are projected to operate at LOS E and F, respectively. The north and southbound Piilani through movements are projected to operate at LOS E and LOS D, respectively. During the PM peak hour, the Piilani through movements are projected to operate at LOS F.

The north and southbound Piilani left turns are projected to operate at LOS E. The eastbound Lipoa left turn movements are projected to operate at LOS E-F during both peaks.

The intersection of South Kihei Road and East Welakahao Road is projected to operate at LOS B during both the AM and PM peak hours. During the AM peak hour, all movements are projected to operate at LOS B or better. All movements are projected to operate at LOS D or better during the PM peak hour.

At the intersection of Piilani Highway and East Welakahao Road, the eastbound Welakahao left turn is projected to operate at LOS F during both peak hours.

At the intersection of Piilani Highway and Old Welakahao Road, the westbound Welakahao left turn is projected to operate at LOS F during both peak hours.

D. SCENARIO 4 – BUILD SCENARIO WITH MRTP AND REGIONAL ROADWAY IMPROVEMENTS

The Build with Project and Regional Roadway Improvements scenario represents the Build scenario with additional transportation improvements committed by MRTP as well as the Liloa Drive extension. In this scenario, it is assumed that the project-related improvements described in Scenario 3 are in place along with the Liloa Drive extension between Kaonoulu Street and Kanani Road.

As described in Scenarios 2 and 3, Phase 1 consists of residential, mixed-use commercial, and the employment core along with an elementary school and business hotel.

1. Future Regional Roadways

It is assumed that the makai north-south collector roadway (an extension of the existing Liloa Drive) would be in place by 2024 due to its presence in the six-year Capital Program. Liloa Drive is already built between Waipuilani Road past Lokelani School. According to the Maui County 2013 Capital Improvement Program budget approved by the Maui County Council, the North South Collector Road (makai collector) is budgeted from fiscal year 2015 to 2018 at a cost of \$18.2 million with two phases. An excerpt is included in Appendix E. Phase 1 will be the segment from Kaonoulu Street to Waipuilani Road and Phase 2 will be the segment from Lokelani School to Kanani Road. It is believed that the Liloa Drive Extension is committed by the County and will be placed in the next STIP.

Liloa Drive would provide additional mobility throughout the Kihei area and is necessary to divert traffic from Piilani Highway. For the purpose of this study, it is assumed that the Liloa Drive would be complete between Kaonoulu Street and Kanani Road.

2. Trip Generation

The trip generation for Scenario 4 is shown in Table 3.

3. Trip Assignment

The traffic generated by the proposed MRTP Development was directionally distributed and assigned to the future roadway network and is shown in Figure 8.

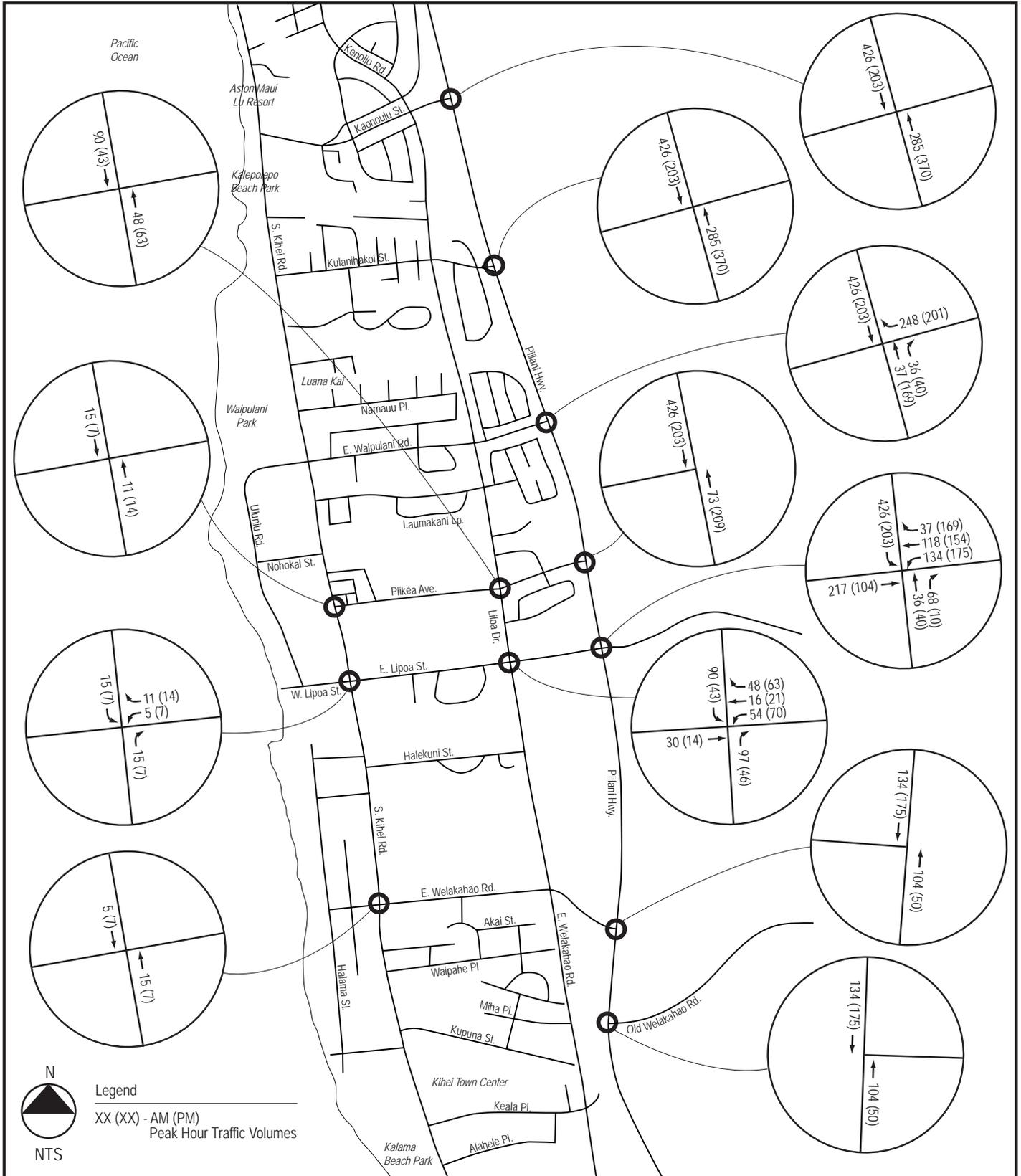
4. Total Traffic

The traffic generated by the MRTP development was added to the projected background traffic to obtain the total peak hour traffic volumes shown in Figure 9. The recommended lane configurations for Scenario 4 are shown in Figure 10.

5. Scenario 4 Traffic Operations With Project

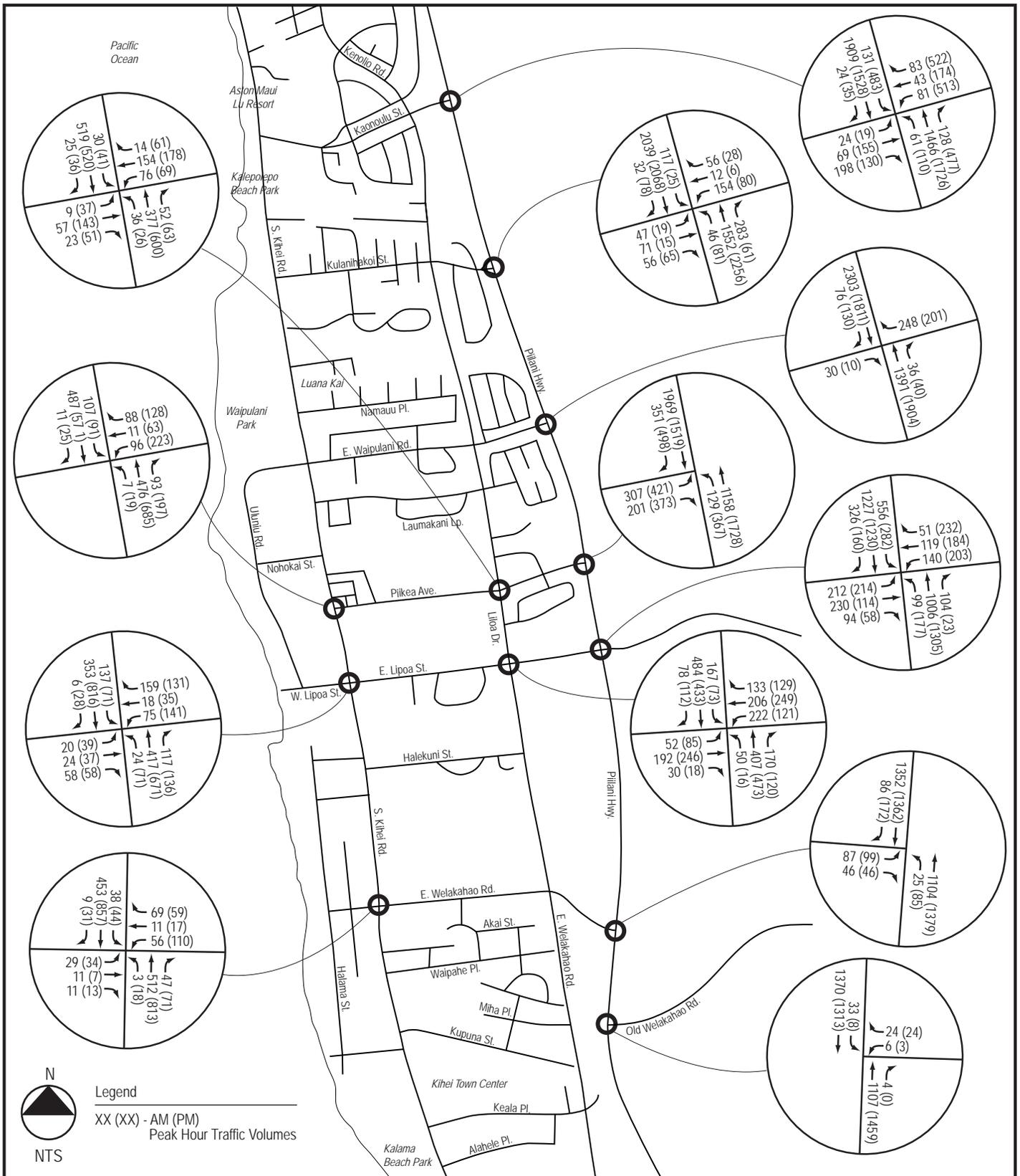
Level of Service analysis was performed on the study area intersections. These results are shown in Table 6. As shown in Table 6 the intersection of Piilani Highway and Kaonoulu Street is projected to operate at LOS C overall during the AM peak hour. The Piilani through movements are projected to operate at LOS C. During the PM peak hour, the intersection is projected to operate at LOS F overall. Multiple movements are projected to operate at LOS F. The north and southbound Piilani through movements are projected to operate at LOS F and D, respectively.

Piilani Highway's intersection with Kulanihakoi Street is projected to operate at LOS D overall during the AM peak hour and at LOS C during the PM peak hour. During both peaks, left turns and some minor street movements are projected to operate at LOS E but Piilani Highway through movements are projected to operate at LOS D or better. The eastbound right turn at the intersection of Piilani Highway and East Waipuulani is projected to operate at LOS A during the AM and PM peak hours. The westbound right turn out of MRTP is also projected to operate at LOS A during the AM and PM peak hours.



Phase 1 Project-Generated Traffic Volumes

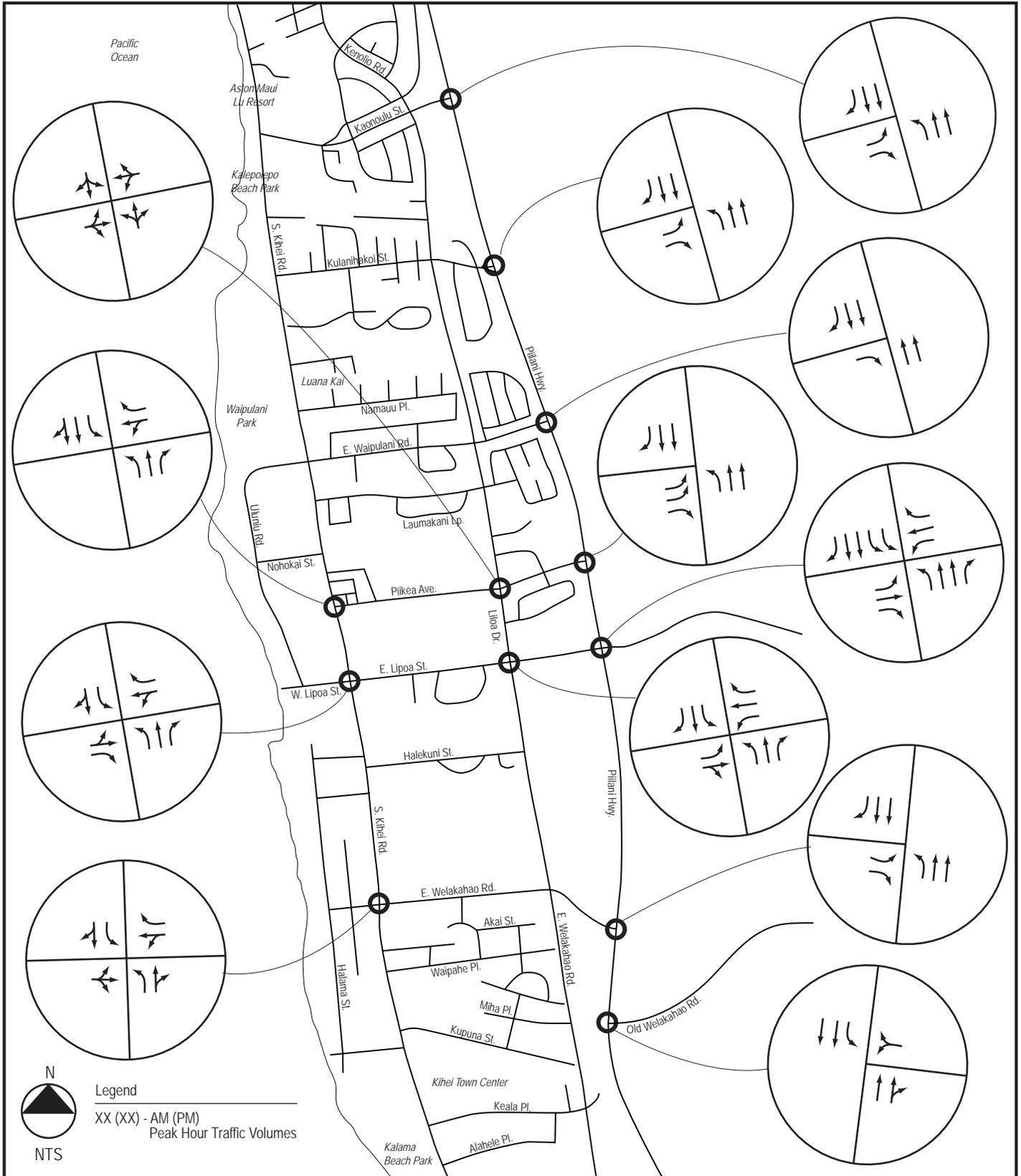
Figure 8



Year 2024 Build Traffic Volumes
 With MRTP and Regional Roadway Improvements

Figure
 9





Year 2024 Lane Configurations

Figure
10

Table 6 Build With MRTP and Regional Roadway Improvements Level of Service

Scenario 4	AM		PM	
	LOS	Delay	LOS	Delay
Kaonoulu St & Piilani Hwy	C	30	F	122
Piilani NB Left	E	67	F	164
Piilani NB Through	C	21	F	122
Piilani NB Right	B	11	C	29
Piilani SB Left	D	52	F	*
Piilani SB Through	C	34	D	36
Piilani SB Right	A	9	B	16
Kaonoulu EB Left	D	51	E	56
Kaonoulu EB Through	E	57	F	84
Kaonoulu EB Right	A	0	A	0
Kaonoulu WB Left	D	52	F	142
Kaonoulu WB Through	D	53	E	65
Kaonoulu WB Right	D	50	D	53
Kulanihakoi St & Piilani Hwy	D	36	C	28
Piilani NB Left	E	66	E	71
Piilani NB Through	C	25	C	31
Piilani NB Right	A	0	A	0
Piilani SB Left	E	71	E	61
Piilani SB Through	D	45	C	25
Piilani SB Right	A	0	A	0
Kulanihakoi EB Left-Through	D	48	D	50
Kulanihakoi EB Right	A	0	A	0
Kulanihakoi WB Left-Through	E	79	E	60
Kulanihakoi WB Right	A	0	A	0
E. Waipuilani Rd & Piilani Hwy	Unsignalized		Unsignalized	
E. Waipuilani EB Right	A	1	A	1
E. Waipuilani WB Right	A	2	A	2

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 6 Year 2024 Build With MRTP and Regional Roadway
Improvements Level of Service (Continued)

Scenario 4	AM		PM	
	LOS	Delay	LOS	Delay
S. Kihei Rd & Piikea Ave	A	10	B	18
S. Kihei NB Left	A	7	A	9
S. Kihei NB Through	B	10	C	21
S. Kihei NB Right	A	7	B	10
S. Kihei SB Left	A	5	B	13
S. Kihei SB Through-Right	A	6	B	10
Piikea WB Left-Through	C	21	C	32
Piikea WB Right	B	19	C	23
Piikea Ave & Liloa Dr	B	14	C	23
Liloa NB Approach	A	10	D	28
Liloa SB Approach	C	20	C	23
Piikea EB Approach	A	9	B	14
Piikea WB Approach	B	10	C	21
Piikea Ave & Piilani Hwy	C	26	D	36
Piilani NB Left	E	71	F	86
Piilani NB Through	A	5	A	10
Piilani SB Through	C	35	D	53
Piilani SB Right	B	12	C	29
Piikea EB Left	E	64	F	84
Piikea EB Right	A	0	A	0
W. Lipoa St & S. Kihei Rd	B	13	C	21
S. Kihei NB Left	A	9	B	16
S. Kihei NB Through	B	14	B	14
S. Kihei NB Right	A	10	A	8
S. Kihei SB Left	A	6	A	10
S. Kihei SB Through-Right	A	9	C	24
W. Lipoa EB Left-Through	B	20	C	29
W. Lipoa EB Right	B	19	C	27
W. Lipoa WB Left-Through	C	22	D	37
W. Lipoa WB Right	B	19	C	28

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 6 Year 2024 Build With MRTP and Regional Roadway
Improvements Level of Service (Continued)

Scenario 4	AM		PM	
	LOS	Delay	LOS	Delay
E. Lipoa St & Liloa Dr	C	20	C	20
Liloa NB Left	B	17	B	12
Liloa NB Through	B	20	C	34
Liloa NB Right	B	15	B	12
Liloa SB Left	C	34	B	16
Liloa SB Through	C	23	C	25
Liloa SB Right	B	14	B	12
E. Lipoa EB Left	C	20	B	14
E. Lipoa EB Through-Right	C	25	B	18
E. Lipoa WB Left	B	13	A	8
E. Lipoa WB Through	B	16	B	12
E. Lipoa WB Right	B	14	B	10
E. Lipoa St & Piilani Hwy	D	46	D	51
Piilani NB Left	E	68	E	78
Piilani NB Through	D	46	D	48
Piilani NB Right	B	19	B	12
Piilani SB Left	E	75	E	77
Piilani SB Through	D	36	D	51
Piilani SB Right	B	12	B	14
E. Lipoa EB Left	E	70	E	75
E. Lipoa EB Through	E	60	D	53
E. Lipoa EB Right	A	0	A	0
E. Lipoa WB Left	E	71	E	73
E. Lipoa WB Through	D	55	E	64
E. Lipoa WB Right	A	0	A	0
E. Welakahao Rd & S. Kihei Rd	B	10	B	18
S. Kihei NB Left	A	6	A	9
S. Kihei NB Through-Right	B	10	B	17
S. Kihei SB Left	A	6	B	10
S. Kihei SB Through-Right	A	8	B	15
E. Welakahao EB Left-Through-Right	B	18	C	27
E. Welakahao WB Left-Through	B	78	D	44
E. Welakahao WB Right	B	17	C	26

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 6 Year 2024 Build With MRTP and Regional Roadway Improvements Level of Service (Continued)

Scenario 4	AM		PM	
	LOS	Delay	LOS	Delay
E. Welakahao Rd & Piilani Hwy	Unsignalized		Unsignalized	
Piilani NB Left	C	17	C	19
E. Welakahao EB Left	F	75	F	*
Old Welakahao Rd & Piilani Hwy	Unsignalized		Unsignalized	
Piilani SB Left	B	12	B	14
Old Welakahao WB Left-Right	D	32	E	49

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

The intersection of South Kihei Road and Piikea Avenue is projected to operate at LOS A during the AM peak hour and at LOS B during the PM peak hour. All movements are projected to operate at LOS C or better during the AM and PM peak hours.

All approaches at the intersection of Liloa Drive and Piikea Avenue are projected to operate at LOS C or better during the AM peak hour and at LOS D or better during the PM peak hour.

The intersection of Piilani Highway and Piikea Avenue is projected to operate at LOS C during the AM peak hour and at LOS D during the PM peak hour. The northbound Piilani left turn to Piikea is projected to operate at LOS E and F during the AM and PM peak hours, respectively. With the project-related improvements, the eastbound Piikea left turn to Piilani is projected to operate at LOS E during the AM peak hour and at LOS F during the PM peak hour. The Piilani southbound through movement is projected to operate at LOS D or better during both peak hours.

The intersection of South Kihei Road and Lipoa Street is projected to operate at LOS B during the AM peak hour and at LOS C during the PM peak hour. All movements are projected to operate at LOS C or better during the AM peak hour and at LOS D or better during the PM peak hour.

The intersection of Liloa Drive and Lipoa Street is projected to operate at LOS C during the both the AM and PM peak hours. All movements are projected to operate at LOS C or better during both peak hours.

With project-related improvements, the intersection of Piilani Highway and Lipoa Street/Lipoa Parkway is projected to operate at LOS D during the both the AM and PM peak hours. All Piilani through movements are projected to operate at LOS D and all turning movements or minor street movements are projected to operate at LOS E or better.

The intersection of South Kihei Road and East Welakahao Road is projected to operate at LOS B during both the AM and PM peak hours. During the AM peak hour, all movements are projected to operate at LOS B or better. All movements are projected to operate at LOS D or better during the PM peak hour.

At the intersection of Piilani Highway and East Welakahao Road, the eastbound Welakahao left turn is projected to operate at LOS F during both peak hours.

At the intersection of Piilani Highway and Old Welakahao Road, the westbound Welakahao left turn is projected to operate at LOS D during the AM peak hour and at LOS E during the PM peak hour.

E. SUMMARY OF RESULTS

The following issues were identified within the project study area:

- The intersection of Piilani Highway and Kaonoulu Street is projected to operate at LOS F with or without MRTP. This intersection would be signalized as part of the Piilani Promenade project located on Kaonoulu Street on the mauka side of Piilani Highway. Even with double southbound left turns and double left and right turns out of makai-bound Kaonoulu Street, many turning movements at the intersection are projected to operate at LOS F for all scenarios. Even with the makai collector in place, the intersection is projected to operate at LOS F during the PM peak.
- The construction of the Liloa Drive Extension (Makai collector) is necessary to relieve congestion on Piilani Highway. The makai collector is projected to improve the traffic operation on Piilani Highway to an acceptable LOS except at Kaonoulu Street during PM peak hour. Without makai collector, traffic operation on Piilani Highway would fail with or without MRTP.

- Along with the Makai collector, the MRTTP project-related improvements are also essential to overall traffic operations on Piilani Highway especially at the intersections with Piikea Avenue and Lipoa Parkway.
 - At the intersection of Piilani Highway and Piikea Avenue, the LOS for the eastbound Piikea Avenue left turn improves is projected to improve from LOS F to C during the AM peak hour with the addition of the additional eastbound left turn lane. The left turn movement is projected to operate at LOS E or F during both peak hours, but the delay is greatly decreased and the left turn queuing is not expected to spillover with the project-related improvements.
 - At the intersection of Piilani Highway and Lipoa Parkway, project-related improvements are projected to improve the overall LOS from F to D during both AM and PM peak hour. The left turn movement is projected to operate at LOS E during both peak hours, but the delay is greatly decreased and the left turn queuing is not expected to spill over with the project-related improvements.

IV. YEAR 2034 TRAFFIC CONDITIONS

Phase 2 of the MRTP project is projected to be completed in the Year 2034, which was used as the basis for future traffic analysis. As described earlier, four scenarios including Scenario 1 – No Build, Scenario 2 – Build, Scenario 3 – Build with MRTP Roadway Improvements, and Scenario 4 – Build with MRTP and Regional Roadway Improvements. were analyzed.

A. SCENARIO 1 – NO BUILD

The No Build scenario represents the without project scenario. Only existing roads and regional roadways identified in the STIP are included.

1. Future Roadways

The roadway network assumptions are the same as the 2024 No Build scenario.

2. Projected Year 2034 Background Traffic

The Year 2034 background traffic volumes were derived using existing traffic along with trip generation obtained from the Maui Travel Demand Forecasting Model.

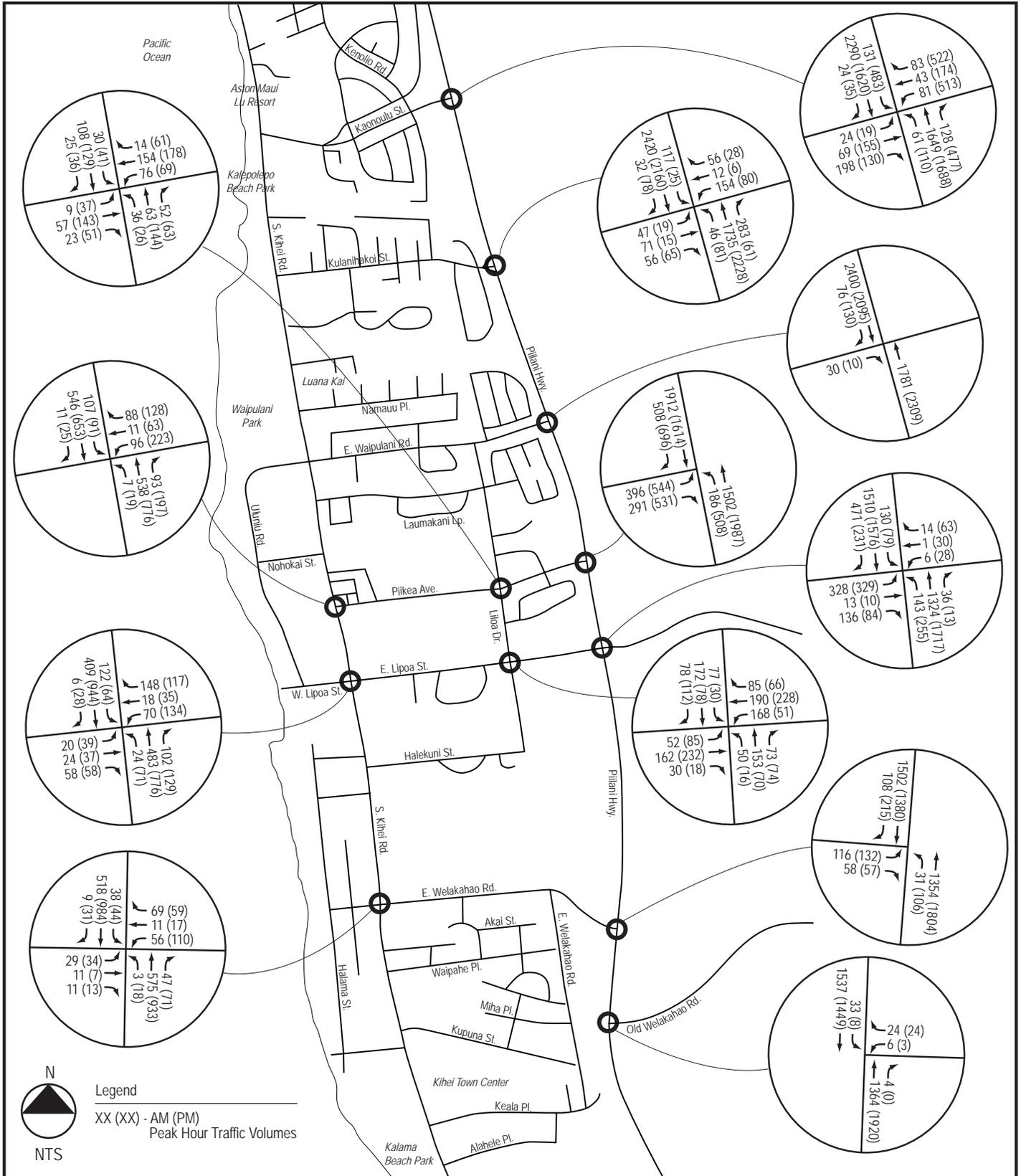
The future Year 2034 background traffic assumes the presence of the developments described in the 2024 background conditions. The projected Scenario 1 traffic volumes are shown in Figure 11.

3. Scenario 1 Traffic Operations

Level of Service analysis was performed on the study area intersections. These results are shown in Table 7.

As shown in Table 7, Piilani Highway's intersection with Kaonoulu Street is projected to be a four-legged, signalized intersection. The intersection is projected to operate at LOS E overall during the AM peak hour. During the PM peak hour, the intersection is projected to operate at LOS F overall. During the AM peak hour, the SB Piilani through movement is projected to operate at LOS F. During the PM peak hour, multiple movements, including the NB Piilani through movement, are projected to operate at LOS F.

Piilani Highway's intersection with Kulanihako'i Street is projected to operate at LOS E during the AM peak hour and at LOS C overall during the PM peak hour. During both peaks, multiple movements are projected to operate at LOS E. The westbound Kulanihako'i left/through movement is projected to operate at LOS F during the AM peak hour.



Year 2034 No Build Traffic Volumes

Figure

11

Table 7 Year 2034 No Build Level of Service

Scenario 1	AM		PM	
	LOS	Delay	LOS	Delay
Kaonoulu St & Piilani Hwy	E	62	F	81
Piilani NB Left	E	68	F	164
Piilani NB Through	C	25	F	111
Piilani NB Right	B	11	C	29
Piilani SB Left	D	52	F	139
Piilani SB Through	F	98	D	42
Piilani SB Right	A	9	C	16
Kaonoulu EB Left	D	52	E	56
Kaonoulu EB Through	E	58	F	84
Kaonoulu EB Right	A	0	A	0
Kaonoulu WB Left	D	53	F	142
Kaonoulu WB Through	D	53	E	65
Kaonoulu WB Right	D	51	D	53
Kulanihakoī St & Piilani Hwy	E	72	C	30
Piilani NB Left	E	67	E	71
Piilani NB Through	C	32	C	27
Piilani NB Right	A	0	A	0
Piilani SB Left	E	73	E	61
Piilani SB Through	F	115	C	33
Piilani SB Right	A	0	A	0
Kulanihakoī EB Left-Through	D	50	D	50
Kulanihakoī EB Right	A	0	A	0
Kulanihakoī WB Left-Through	F	81	E	60
Kulanihakoī WB Right	A	0	A	0
E. Waipuilani Rd & Piilani Hwy	Unsignalized		Unsignalized	
E. Waipuilani EB Right	E	35	C	25
S. Kihei Rd & Piikea Ave	A	10	B	20
S. Kihei NB Left	A	6	A	9
S. Kihei NB Through	B	11	C	24
S. Kihei NB Right	A	7	B	10
S. Kihei SB Left	A	5	B	16
S. Kihei SB Through-Right	A	6	B	10
Piikea WB Left-Through	C	23	D	36
Piikea WB Right	B	20	C	25

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 7 Year 2034 No Build Level of Service (Continued)

Scenario 1	AM		PM	
	LOS	Delay	LOS	Delay
Piikea Ave & Liloa Dr	A	6	A	8
Liloa NB Approach	A	5	A	7
Liloa SB Approach	A	7	A	7
Piikea EB Approach	A	5	A	8
Piikea WB Approach	A	6	A	8
Piikea Ave & Piilani Hwy	D	45	F	113
Piilani NB Left	F	155	F	*
Piilani NB Through	A	10	B	13
Piilani SB Through	D	39	D	35
Piilani SB Right	B	15	C	25
Piikea EB Left	F	234	F	*
Piikea EB Right	A	0	A	1
W. Lipoa St & S. Kihei Rd	B	13	C	24
S. Kihei NB Left	A	8	C	26
S. Kihei NB Through	B	14	B	15
S. Kihei NB Right	A	9	A	8
S. Kihei SB Left	A	6	C	11
S. Kihei SB Through-Right	A	9	B	28
W. Lipoa EB Left-Through	B	20	D	36
W. Lipoa EB Right	B	19	C	33
W. Lipoa WB Left-Through	C	21	D	46
W. Lipoa WB Right	B	19	C	33
E. Lipoa St & Liloa Dr	B	13	A	10
Liloa NB Left	B	15	B	11
Liloa NB Through	B	16	B	11
Liloa NB Right	B	14	B	11
Liloa SB Left	B	15	B	11
Liloa SB Through	B	16	B	12
Liloa SB Right	B	14	B	11
E. Lipoa EB Left-Through	B	11	A	9
E. Lipoa EB Right	B	14	B	10
E. Lipoa WB Left	A	6	A	6
E. Lipoa WB Through	A	10	A	9
E. Lipoa WB Right	A	9	A	7

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 7 Year 2034 No Build Level of Service (Continued)

Scenario 1	AM		PM	
	LOS	Delay	LOS	Delay
E. Lipoa St & Piilani Hwy	D	44	F	87
Piilani NB Left	E	75	F	120
Piilani NB Through	C	35	E	70
Piilani NB Right	B	18	B	19
Piilani SB Left	E	71	F	83
Piilani SB Through	D	53	F	115
Piilani SB Right	C	24	C	30
E. Lipoa EB Left-Through	E	65	F	93
E. Lipoa EB Right	A	0	A	0
E. Lipoa WB Left-Through	F	81	F	81
E. Lipoa WB Right	A	0	A	0
E. Welakahao Rd & S. Kihei Rd	B	11	C	23
S. Kihei NB Left	A	5	B	14
S. Kihei NB Through-Right	B	11	C	22
S. Kihei SB Left	A	6	B	15
S. Kihei SB Through-Right	A	8	C	21
E. Welakahao EB Left-Through-Right	B	19	C	31
E. Welakahao WB Left-Through	C	20	D	47
E. Welakahao WB Right	B	18	C	30
E. Welakahao Rd & Piilani Hwy	Unsignalized		Unsignalized	
Piilani NB Left	C	21	C	23
E. Welakahao EB Left	F	*	F	*
Old Welakahao Rd & Piilani Hwy	Unsignalized		Unsignalized	
Piilani SB Left	B	14	C	19
Old Welakahao WB Left-Right	F	57	F	79

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

The eastbound right turn at the intersection of Piilani Highway and East Waipuilani is projected to operate at LOS E during the AM peak hour and at LOS C during the PM peak hour.

The intersection of South Kihei Road and Piikea Avenue is projected to operate at LOS A overall during the AM peak and at LOS B during the PM peak hour. All movements are

projected to operate at LOS C or better during the AM peak hour and at LOS D or better during the PM peak hour.

The intersection of Liloa Drive and Piikea Avenue is a roundabout. All approaches are projected to operate at LOS A during both the AM and PM peak hours.

The intersection of Piilani Highway and Piikea Avenue is projected to operate at LOS D during the AM peak hour and LOS F during the PM peak hour. The northbound Piilani left turn to Piikea and the eastbound Piikea left turn to Piilani are projected to operate at LOS F during the AM and PM peak hours.

The intersection of South Kihei Road and Lipoa Street is projected to operate at LOS B during the AM peak hour and at LOS C during the PM peak hour. All movements are projected to operate at LOS B or better during the AM peak hour and at LOS D or better during the PM peak hour.

The intersection of Liloa Drive and Lipoa Street is projected to operate at LOS B during the AM peak hour and LOS A during the PM peak hour.

The intersection of Piilani Highway and Lipoa Street/Lipoa Parkway is projected to operate at LOS D during the AM peak hour and LOS F during the PM peak hour. During the AM peak hour, the north and southbound Piilani left turns are projected to operate at LOS E. The Piilani north and southbound through movements are projected to operate at LOS C and D respectively. The eastbound and westbound left/through movements are projected to operate at LOS E and F, respectively. During the PM peak hour, the north and southbound Piilani through movements are projected to operate at LOS E and F, respectively. Additional left turns and minor street movements are also projected to operate at LOS F.

The intersection of South Kihei Road and East Welakahao Road is projected to operate at LOS B during the AM and at LOS C during the PM peak hour. During the AM peak hour, all movements are projected to operate at LOS C or better. All movements are projected to operate at LOS D or better during the PM peak hour.

At the intersection of Piilani Highway and East Welakahao Road, the eastbound Welakahao left turn is projected to operate at LOS F during both peak hours.

At the intersection of Piilani Highway and Old Welakahao Road, the westbound approach is projected to operate at LOS F during both peak hours.

B. SCENARIO 2 – BUILD

The Build scenario consists of the No Build scenario with Phases 1 and 2 of MRTTP. The Build scenario adds MRTTP development generated trips to the No Build scenario. The assumed roadway network is the same as in the No Build scenario. Building upon the residential, mixed-use, and employment land uses in Phase 1, Phase 2 is planned to consist of expansion of residential and employment land uses on either side of Lipoa Parkway as shown in Figure 2.

1. Future Roadways

The roadway network assumptions are the same as the No Build scenario.

2. Trip Generation

As with the Year 2024 scenario, the Institute of Transportation Engineers (ITE), Trip Generation, 8th edition was used to estimate the number of trips generated by the Maui R&T Park development based on land uses identified in the conceptual development plan shown in Figure 2.

The Year 2034 scenario consists of Phases 1 and 2. Building upon Phase 1, Phase 2 consists of the following:

- 1,014,800 SF of Employment
- 500 Residential DU broken down as follows:
 - 100 DU Mid-Rise
 - 300 DU Single Family
 - 100 DU Townhouse

Table 8 summarizes the trips generated by the sum of Phases 1 and 2. Similar to Phase 1, low, medium, and high internal capture rates were developed to represent the internal interactions between the different land uses when Phase 2 is added to Phase 1.

For the purpose of this analysis, the low internal capture that would result in highest external trips was used. The detailed discussion is included in Appendix D. Specifically,

- 220/1536 or 14% of residential trips interacted directly with the school;
- 68/1536 or 4% of residential trips interacted directly with the commercial

Table 8 Phase 1 and 2 Trip Generation Summary

			AM Peak Hour		Total	PM Peak Hour		Total
	In	Out	In	Out		In	Out	
OFFICE	760	1,738,000 SF	1,287	263	1,550	203	1,147	1,350
		After Mode Reductions	1,223	250	1,473	193	1,090	1,283
RETAIL	814	100,000 SF	45	28	73	115	146	261
		After Mode Reductions	43	27	70	109	139	248
RESIDENTIAL	223	250 DU	28	61	99	63	46	109
	210	750 DU	134	401	535	406	238	644
	230	250 DU	19	91	100	87	43	130
		Residential Total	181	553	784	556	327	883
		After Mode Reductions	172	525	697	528	311	839
HOTEL	310	150 Rooms	41	27	68	47	42	89
		After Mode Reductions	39	26	65	45	40	85
INSTITUTION	522	102,000 SF	279	219	498	55	68	123
		After Mode Reductions	265	208	473	52	65	117
		Subtotal Trips (Before Mode Reductions)	1,833	1,090	2,923	976	1,730	2,706
		Subtotal Trips (After Mode Reductions)	1,742	1,036	2,778	927	1,645	2,572
		Residential Internal Capture Reduction	80	213	293	143	89	232
		Retail Internal Capture Reduction	6	10	16	84	35	119
		Office Internal Capture Reduction	100	40	140	42	135	177
		Institution Internal Capture Reduction	133	52	185	26	33	59
		Hotel Internal Capture Reduction	10	14	24	24	27	51
		Total Internal Capture Reductions	329	329	658	319	319	638
		Total External Trips	1,413	707	2,120	608	1,326	1,934

Trips generated expressed in vehicles per hour

- 244/2756 or 8% of employment trips interacted directly with the residential;
- 56/1318 or 2% of employment trips interacted directly with the business hotel;

3. Trip Assignment

The traffic generated by the proposed MRTP Development was directionally distributed and assigned to the future roadway network.

A summary of regional travel patterns within the Kihei area was created from the Maui travel demand model. MRTP traffic was assigned to the projected roadway network using this distribution. Internal traffic was distributed between the residential, hotel, school, employment, and retail commercial land uses. These distributions were applied to the trips generated.

4. Total Traffic

The traffic generated by the Maui R&T development was added to the projected background traffic to obtain the total peak hour traffic volumes shown in Figure 12.

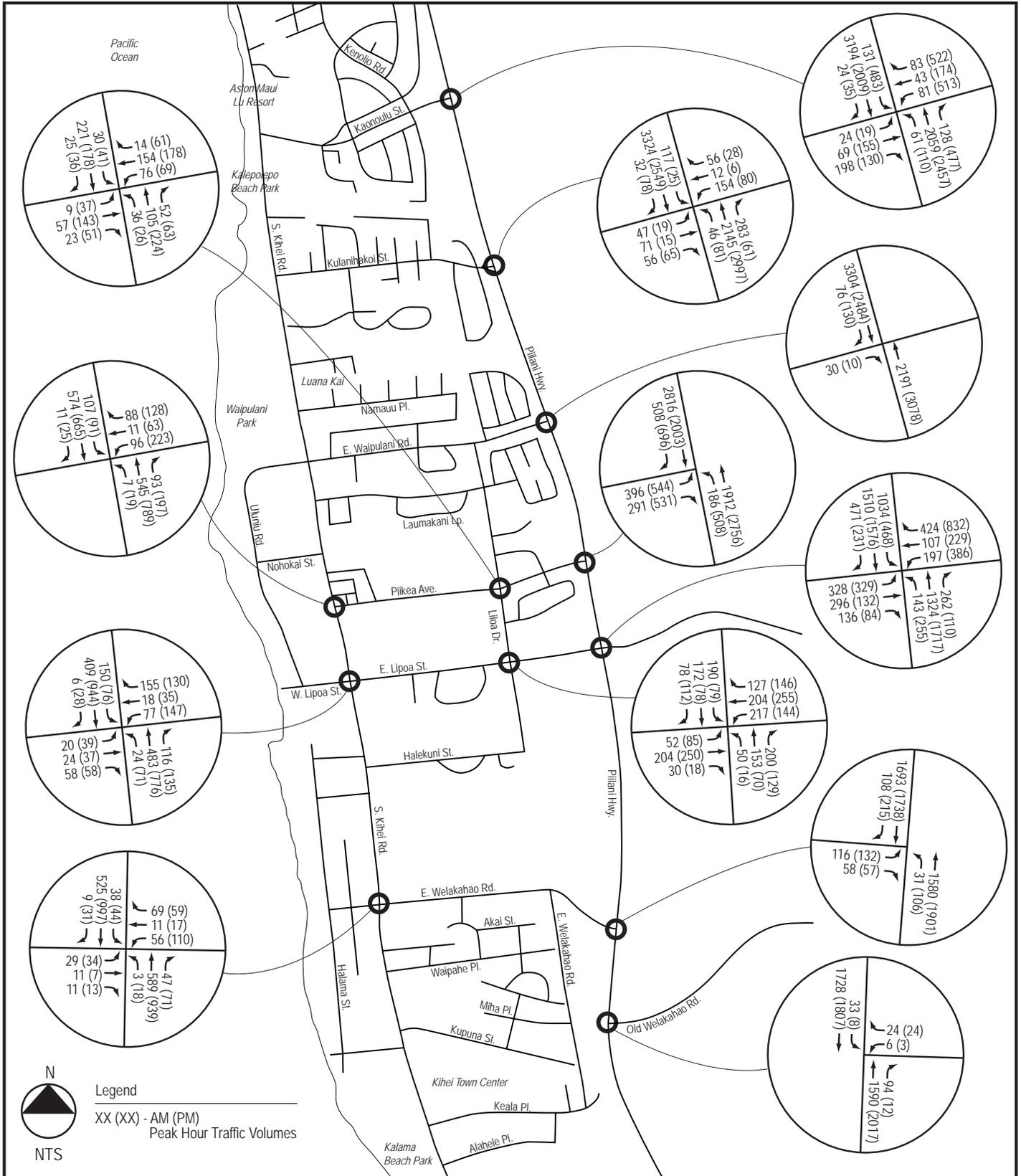
5. Scenario 2 Traffic Operations

Level of Service analysis was performed on the study area intersections. The results are shown in Table 9.

As shown in Table 9, Piilani Highway's intersection with Kaonoulu Street is projected to operate at LOS F overall during the AM and PM peak hours. During the AM peak hour, the southbound Piilani through movement is projected to operate at LOS F with a high delay. During PM peak hour, multiple movements, including the north and southbound Piilani through movements, are projected to operate at LOS F.

Piilani Highway's intersection with Kulanihako'i Street is projected to operate at LOS F overall during the AM and PM peak hours. During both peaks, multiple movements are projected to operate at LOS F, including the north and southbound Piilani Highway through movements.

The eastbound right turn at the intersection of Piilani Highway and East Waipuilani is projected to operate at LOS F during the AM peak hour and at LOS D during the PM peak hour.



Year 2034 Build Traffic Volumes

Figure

12

Table 9 Year 2034 Scenario 2 Build Level of Service

Scenario 2	AM		PM	
	LOS	Delay	LOS	Delay
Kaonoulu St & Piilani Hwy	F	186	F	179
Piilani NB Left	E	68	F	127
Piilani NB Through	E	74	F	*
Piilani NB Right	B	11	C	29
Piilani SB Left	D	52	F	139
Piilani SB Through	F	299	F	119
Piilani SB Right	A	9	B	16
Kaonoulu EB Left	D	52	E	56
Kaonoulu EB Through	E	58	F	84
Kaonoulu EB Right	A	0	A	0
Kaonoulu WB Left	D	53	F	142
Kaonoulu WB Through	D	53	E	65
Kaonoulu WB Right	D	51	D	53
Kulanihakoī St & Piilani Hwy	F	201	F	120
Piilani NB Left	E	67	E	71
Piilani NB Through	F	97	F	154
Piilani NB Right	A	0	A	0
Piilani SB Left	E	73	E	61
Piilani SB Through	F	*	F	65
Piilani SB Right	A	0	A	0
Kulanihakoī EB Left-Through	D	50	D	50
Kulanihakoī EB Right	A	0	A	0
Kulanihakoī WB Left-Through	F	81	E	60
Kulanihakoī WB Right	A	0	A	0
E. Waipuilani Rd & Piilani Hwy	Unsignalized		Unsignalized	
E. Waipuilani EB Right	F	96	D	33
S. Kihei Rd & Piikea Ave	A	10	B	20
S. Kihei NB Left	A	6	A	9
S. Kihei NB Through	B	11	C	25
S. Kihei NB Right	A	7	B	10
S. Kihei SB Left	A	5	B	17
S. Kihei SB Through-Right	A	6	B	10
Piikea WB Left-Through	C	23	D	36
Piikea WB Right	B	20	C	26

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 9 Year 2034 Scenario 2 Build Level of Service (Continued)

Scenario 2	AM		PM	
	LOS	Delay	LOS	Delay
Piikea Ave & Liloa Dr	A	7	A	9
Liloa NB Approach	A	6	A	9
Liloa SB Approach	A	9	A	8
Piikea EB Approach	A	6	A	8
Piikea WB Approach	A	7	B	10
Piikea Ave & Piilani Hwy	F	126	F	132
Piilani NB Left	F	209	F	*
Piilani NB Through	B	14	E	59
Piilani SB Through	F	215	E	62
Piilani SB Right	B	16	C	24
Piikea EB Left	F	234	F	*
Piikea EB Right	A	0	A	1
W. Lipoa St & S. Kihei Rd	B	13	C	25
S. Kihei NB Left	A	8	C	27
S. Kihei NB Through	B	15	B	16
S. Kihei NB Right	A	10	A	8
S. Kihei SB Left	A	6	B	12
S. Kihei SB Through-Right	A	9	C	30
W. Lipoa EB Left-Through	C	22	D	36
W. Lipoa EB Right	C	21	C	33
W. Lipoa WB Left-Through	C	24	D	48
W. Lipoa WB Right	C	21	C	33
E. Lipoa St & Liloa Dr	B	15	B	11
Liloa NB Left	B	16	B	12
Liloa NB Through	B	17	B	13
Liloa NB Right	B	15	B	12
Liloa SB Left	C	21	B	14
Liloa SB Through	B	17	B	13
Liloa SB Right	B	15	B	12
E. Lipoa EB Left-Through	B	14	B	11
E. Lipoa EB Right	B	18	B	14
E. Lipoa WB Left	A	8	A	5
E. Lipoa WB Through	B	11	A	8
E. Lipoa WB Right	B	10	A	7

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 9 Year 2034 Scenario 2 Build Level of Service (Continued)

Scenario 2	AM		PM	
	LOS	Delay	LOS	Delay
E. Lipoa St & Piilani Hwy	F	*	F	299
Piilani NB Left	F	107	F	139
Piilani NB Through	E	68	F	105
Piilani NB Right	C	30	C	25
Piilani SB Left	F	*	F	*
Piilani SB Through	F	114	F	142
Piilani SB Right	C	34	C	33
E. Lipoa EB Left-Through	F	339	F	231
E. Lipoa EB Right	A	0	A	0
E. Lipoa WB Left-Through	F	*	F	*
E. Lipoa WB Right	A	1	A	2
E. Welakahao Rd & S. Kihei Rd	B	11	C	24
S. Kihei NB Left	A	5	B	15
S. Kihei NB Through-Right	B	11	C	23
S. Kihei SB Left	A	6	B	16
S. Kihei SB Through-Right	A	8	C	22
E. Welakahao EB Left-Through-Right	B	19	C	31
E. Welakahao WB Left-Through	C	21	D	47
E. Welakahao WB Right	B	18	C	30
E. Welakahao Rd & Piilani Hwy	Unsignalized		Unsignalized	
Piilani NB Left	D	25	E	45
E. Welakahao EB Left	F	*	F	*
Old Welakahao Rd & Piilani Hwy	Unsignalized		Unsignalized	
Piilani SB Left	C	17	C	21
Old Welakahao WB Left-Right	F	137	F	142

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

The intersection of South Kihei Road and Piikea Avenue is projected to operate at LOS A overall during the AM peak hour and at LOS B during the PM peak hour. All movements are projected to operate at LOS C or better during the AM peak and at LOS D or better during the PM peak hour.

The intersection of Liloa Drive and Piikea Avenue is projected to operate at LOS A overall during both peak hours.

The intersection of Piilani Highway and Piikea Avenue is projected to operate at LOS F during the during both the AM and PM peak hours. The southbound Piilani through movement, the northbound Piilani left turn movement, and the eastbound Piikea left turn movement all are projected to operate at LOS F during the AM peak hour. Both Piilani through movements are projected to operate at LOS E during the PM peak hour.

The intersection of South Kihei Road and Lipoa Street is projected to operate at LOS B during the AM peak hour and at LOS C during the PM peak hour. All movements are projected to operate at LOS C or better during the AM peak hour and at LOS D or better during the PM peak hour.

The intersection of Liloa Drive and Lipoa Street is projected to operate at LOS B during both peak hours. All movements are projected to operate at LOS C or better during the AM peak hour. All movements are projected to operate at LOS B or better during the PM peak hour.

With no project-related improvements, the intersection of Piilani Highway and Lipoa Street/Lipoa Parkway is projected to operate at LOS F during both peak hours with a high overall delay. Most critical movements on Piilani Highway and Lipoa Parkway are projected to operate at LOS F with a high delay.

The intersection of South Kihei Road and East Welakahao Road is projected to operate at LOS B during the AM peak hour and at LOS C during the PM peak hour. During the AM peak hour, all movements are projected to operate at LOS C or better. All movements are projected to operate at LOS D or better during the PM peak hour.

At the intersection of Piilani Highway and East Welakahao Road, the eastbound Welakahao left turn is projected to operate at LOS F during both peak hours.

At the intersection of Piilani Highway and Old Welakahao Road, the westbound Welakahao left turn is projected to operate at LOS F during both peak hours.

C. SCENARIO 3 – BUILD WITH MRTP ROADWAY IMPROVEMENTS

This scenario represents the Build scenario with additional transportation improvements committed by MRTP.

1. Future Roadways

The roadway network assumptions are nearly identical to Scenario 2. Additional improvements assumed to be the responsibility of MRTP are included. These are:

1. Piilani Highway/Old Welakahao Road

- a. Construct 2-lane Old Welakahao Road as MRTP's direct access to Piilani Highway;
- b. Signalize the intersection and provide a leading protected left turn phase for the southbound Piilani Highway left turn into Old Welakahao Road;
- c. Provide southbound left turning lane from Piilani Highway to Old Welakahao Road and westbound left turning lane from Old Welakahao Road to Piilani Highway;
- d. Provide acceleration and deceleration lanes to and from Piilani Highway.

2. Trip Generation

The trip generation for Scenario 3 is shown in Table 8.

3. Trip Assignment

The traffic generated by the proposed MRTP Development was directionally distributed and assigned to the future roadway network.

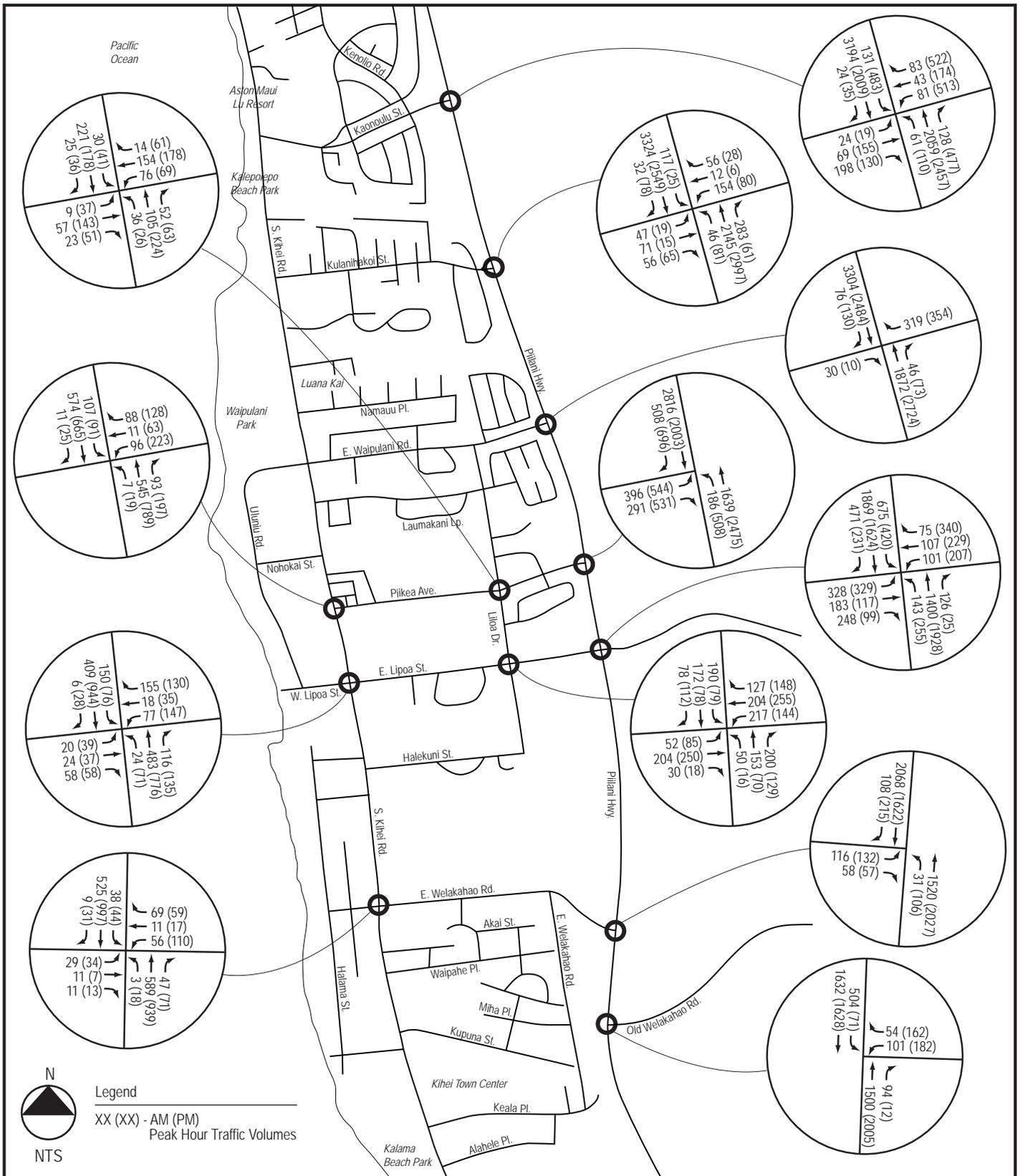
4. Total Traffic

The traffic generated by the MRTP development was added to the projected background traffic to obtain the total peak hour traffic volumes shown in Figure 13.

5. Scenario 3 Traffic Operations

Level of Service analysis was performed on the study area intersections. These results are shown in Table 10.

As shown in Table 10 the intersection of Piilani Highway and Kaonoulu Street is projected to operate at LOS F overall during both the AM and PM peak hours. The southbound Piilani through movement is projected to operate at LOS F during both peaks. During the PM peak hour, multiple movements are projected to operate at LOS F, including the north and southbound Piilani through movements.



Year 2034 Scenario 3 Build Traffic Volumes
 With MRTP Roadway Improvements

Figure
 13

Table 10 Year 2034 Scenario 3 Build With MRTP Roadway Improvements
Level of Service

Scenario 3	AM		PM	
	LOS	Delay	LOS	Delay
Kaonoulu St & Piilani Hwy	F	186	F	184
Piilani NB Left	E	68	F	164
Piilani NB Through	E	74	F	*
Piilani NB Right	B	11	C	30
Piilani SB Left	D	52	F	139
Piilani SB Through	F	299	F	119
Piilani SB Right	A	9	B	16
Kaonoulu EB Left	D	52	E	56
Kaonoulu EB Through	E	58	F	84
Kaonoulu EB Right	A	0	A	0
Kaonoulu WB Left	D	53	F	142
Kaonoulu WB Through	D	53	E	65
Kaonoulu WB Right	D	51	D	54
Kulanihakoī St & Piilani Hwy	F	201	F	120
Piilani NB Left	E	67	E	71
Piilani NB Through	F	97	F	154
Piilani NB Right	A	0	A	0
Piilani SB Left	E	73	E	61
Piilani SB Through	F	*	F	95
Piilani SB Right	A	0	A	0
Kulanihakoī EB Left-Through	D	50	D	50
Kulanihakoī EB Right	A	0	A	0
Kulanihakoī WB Left-Through	F	81	E	60
Kulanihakoī WB Right	A	0	A	0
E. Waipuilani Rd & Piilani Hwy	Unsignalized		Unsignalized	
E. Waipuilani EB Right	A	2	A	1
E. Waipuilani WB Right	A	2	A	3

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 10 Year 2034 Scenario 3 Build With MRTP Roadway Improvements
Level of Service (Continued)

Scenario 3	AM		PM	
	LOS	Delay	LOS	Delay
S. Kihei Rd & Piikea Ave	A	10	B	20
S. Kihei NB Left	A	6	A	9
S. Kihei NB Through	B	11	C	25
S. Kihei NB Right	A	7	B	10
S. Kihei SB Left	A	5	B	17
S. Kihei SB Through-Right	A	6	B	10
Piikea WB Left-Through	C	23	D	36
Piikea WB Right	B	20	C	26
Piikea Ave & Liloa Dr	A	7	A	9
Liloa NB Approach	A	6	A	9
Liloa SB Approach	A	9	A	8
Piikea EB Approach	A	6	A	8
Piikea WB Approach	A	7	B	10
Piikea Ave & Piilani Hwy	F	125	F	102
Piilani NB Left	F	93	F	135
Piilani NB Through	A	9	D	35
Piilani SB Through	F	235	F	217
Piilani SB Right	B	17	D	49
Piikea EB Left	E	68	F	117
Piikea EB Right	A	0	A	1
W. Lipoa St & S. Kihei Rd	B	13	C	25
S. Kihei NB Left	A	8	C	27
S. Kihei NB Through	B	15	B	16
S. Kihei NB Right	A	10	A	8
S. Kihei SB Left	A	6	B	12
S. Kihei SB Through-Right	A	9	C	30
W. Lipoa EB Left-Through	C	22	D	36
W. Lipoa EB Right	C	21	C	33
W. Lipoa WB Left-Through	C	24	D	48
W. Lipoa WB Right	C	21	C	33

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 10 Year 2034 Scenario 3 Build With MRTP Roadway Improvements
Level of Service (Continued)

Scenario 3	AM		PM	
	LOS	Delay	LOS	Delay
E. Lipoa St & Liloa Dr	B	15	B	11
Liloa NB Left	B	16	B	12
Liloa NB Through	B	17	B	13
Liloa NB Right	B	15	B	12
Liloa SB Left	C	21	B	14
Liloa SB Through	B	17	B	13
Liloa SB Right	B	15	B	12
E. Lipoa EB Left	B	14	B	11
E. Lipoa EB Through-Right	B	18	B	14
E. Lipoa WB Left	A	8	A	5
E. Lipoa WB Through	B	11	A	8
E. Lipoa WB Right	B	10	A	7
E. Lipoa St & Piilani Hwy	F	121	F	219
Piilani NB Left	F	89	F	95
Piilani NB Through	F	134	F	*
Piilani NB Right	C	23	B	17
Piilani SB Left	F	143	F	184
Piilani SB Through	F	175	F	*
Piilani SB Right	B	13	B	18
E. Lipoa EB Left	F	108	E	77
E. Lipoa EB Through	D	51	D	48
E. Lipoa EB Right	A	0	A	0
E. Lipoa WB Left	F	83	F	90
E. Lipoa WB Through	E	71	F	111
E. Lipoa WB Right	A	0	A	0
E. Welakahao Rd & S. Kihei Rd	B	11	C	24
S. Kihei NB Left	A	5	B	15
S. Kihei NB Through-Right	B	11	C	23
S. Kihei SB Left	A	6	B	16
S. Kihei SB Through-Right	A	8	C	22
E. Welakahao EB Left-Through-Right	B	19	C	31
E. Welakahao WB Left-Through	C	21	D	47
E. Welakahao WB Right	B	18	C	30

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 10 Year 2034 Scenario 3 Build With MRTP Roadway Improvements
Level of Service (Continued)

Scenario 3	AM		PM	
	LOS	Delay	LOS	Delay
E. Welakahao Rd & Piilani Hwy	Unsignalized		Unsignalized	
Piilani NB Left	E	41	E	35
E. Welakahao EB Left	F	*	F	*
Old Welakahao Rd & Piilani Hwy	D	38	B	20
Piilani NB Through	D	37	C	23
Piilani NB Right	B	17	A	7
Piilani SB Left	F	148	F	89
Piilani SB Through	A	5	A	7
Old Welakahao WB Left	E	67	F	83
Old Welakahao WB Right	A	0	A	0

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Piilani Highway's intersection with Kulanihakoi Street is projected to operate at LOS F overall during the AM and PM peak hours. During both peaks, multiple movements are projected to operate at LOS F.

The eastbound right turn at the intersection of Piilani Highway and East Waipuilani is projected to operate at LOS A during the AM and PM peak hours. The westbound right turn out of MRTP is also projected to operate at LOS A during the AM and PM peak hours.

The intersection of South Kihei Road and Piikea Avenue is projected to operate at LOS A during the AM peak hour and at LOS B during the PM peak hour. All movements are projected to operate at LOS C or better during the AM peak hour and at LOS D or better during the PM peak hour.

All approaches at the intersection of Liloa Drive and Piikea Avenue are projected to operate at LOS A or better during the AM peak hour and at LOS B or better during the PM peak hour.

The intersection of Piilani Highway and Piikea Avenue is projected to operate at LOS F during the AM and PM peak hours. During both peak hours, the northbound Piilani left turn to Piikea is projected to operate at LOS F. With the project-related improvements, the

eastbound Piikea left turn to Piilani is projected to operate at LOS F during the PM peak hour. The Piilani southbound through movement is projected to operate at LOS F during both peak hours.

The intersection of South Kihei Road and Lipoa Street is projected to operate at LOS B during the AM peak hour and at LOS C during the PM peak hour. All movements are projected to operate at LOS C or better during the AM peak hour and at LOS D or better during the PM peak hour.

The intersection of Liloa Drive and Lipoa Street is projected to operate at LOS B during the both the AM and PM peak hours. All movements are projected to operate at LOS C or better during the AM peak hour and at LOS B or better during the PM peak hour.

With project-related improvements, the intersection of Piilani Highway and Lipoa Street/Lipoa Parkway is projected to operate at LOS F during both peak hours. During both peak hours, the north and southbound Piilani left turn and through movements are projected to operate at LOS F. The Lipoa approaches also are projected to have LOS F turning movements.

The intersection of South Kihei Road and East Welakahao Road is projected to operate at LOS B during both the AM peak hour and at LOS C during the PM peak hour. During the AM peak hour, all movements are projected to operate at LOS C or better. All movements are projected to operate at LOS D or better during the PM peak hour.

At the intersection of Piilani Highway and East Welakahao Road, the eastbound Welakahao left turn is projected to operate at LOS F during both peak hours.

As part of the project-related improvements, the intersection of Piilani Highway and Old Welakahao Road is planned to be signalized and the Old Welakahao approach widened. The intersection is projected to operate at LOS D overall during the AM peak hour and at LOS B during the PM peak hour. The southbound Piilani left turn is projected to operate at LOS F during both peak hours. The westbound Old Welakahao left is projected to operate at LOS E during the AM peak and at LOS F during the PM peak hour.

D. SCENARIO 4 – BUILD SCENARIO WITH MRTP AND REGIONAL ROADWAY IMPROVEMENTS

The Build with MRTP and Regional Roadway Improvements scenario represents the Build scenario with additional transportation improvements committed by MRTP as well as other regional roadway improvements. In this scenario, it is assumed that the project-related improvements described in Scenario 3 are in place along with the following additional regional roadway improvements:

- Liloa Drive extension as a two-lane roadway between Kaonoulu Street and Kanani Road is completed.
- Kihei Upcountry Road as a four-lane roadway connecting Upcountry Maui to Kihei at Kaonoulu Street;
- Mauka Collector as a two-lane roadway between Mokulele Highway and Piilani Highway at a point somewhere south of MRTP and an additional two-lane in-tract roadway

1. Future Regional Roadways

In addition to roadways committed by MRTP, the Liloa Drive extension, are assumed to be in place as discussed in Phase 1

In addition, it is assumed that Kihei Upcountry Highway would be constructed as a four-lane roadway. This road would provide a direct connection between the Upcountry area to Piilani Highway in Kihei at Kaonoulu Street.

Furthermore, the mauka collector roadway, providing direct access to Mokulele Highway, is also assumed to be constructed. The initial configuration would be a two-lane facility connecting Mokulele Highway to Piilani Highway at a point south of MRTP. An additional two-lane in-tract roadway can be constructed later when warranted. The mauka collector is not included in the current STIP, as it is not anticipated to be necessary for many years. However, the community and county government have carefully planned for and considered the eventual need for the road.

Maui County strongly supports an interconnected Kihei Mauka transportation network as shown in an August 13, 2012 letter included in Appendix F. A North-South roadway mauka of Piilani, to be constructed as growth in the region warrants, is also identified as being supported in the 1998 Kihei-Makena Community Plan.

The Maui Island Plan, December 2012 also contemplates a future north south roadway in several sections. The directed growth chapter description of the Maui Research and Technology Park, states “the build-out of MRTP should be coordinated with the development of the neighboring Kihei Mauka planned growth area to ensure efficient intra- and inter-regional transportation connectivity for both motorized and non-motorized transportation.” Similar directions are included in the project descriptions of Kihei Mauka and the North Kihei residential planned growth areas to the north of MRTP. MRTP has initiated discussions with other landowners about providing a continuous in-tract mauka collector roadway as directed by the County general plan.

The mauka collector would diverge from Piilani Highway at a point south of the MRTP development. It would proceed through MRTP and continue north, eventually providing direct access to Mokulele Highway. For the purpose of this analysis, the mauka collector was analyzed as a two-lane facility with an additional two-lane roadway in-tract. It was assumed that the mauka collector would not be used exclusively by the MRTP development, but would divert regional background traffic from Piilani Highway.

2. Trip Generation

The trip generation for Scenario 4 is shown in Table 8.

3. Trip Assignment

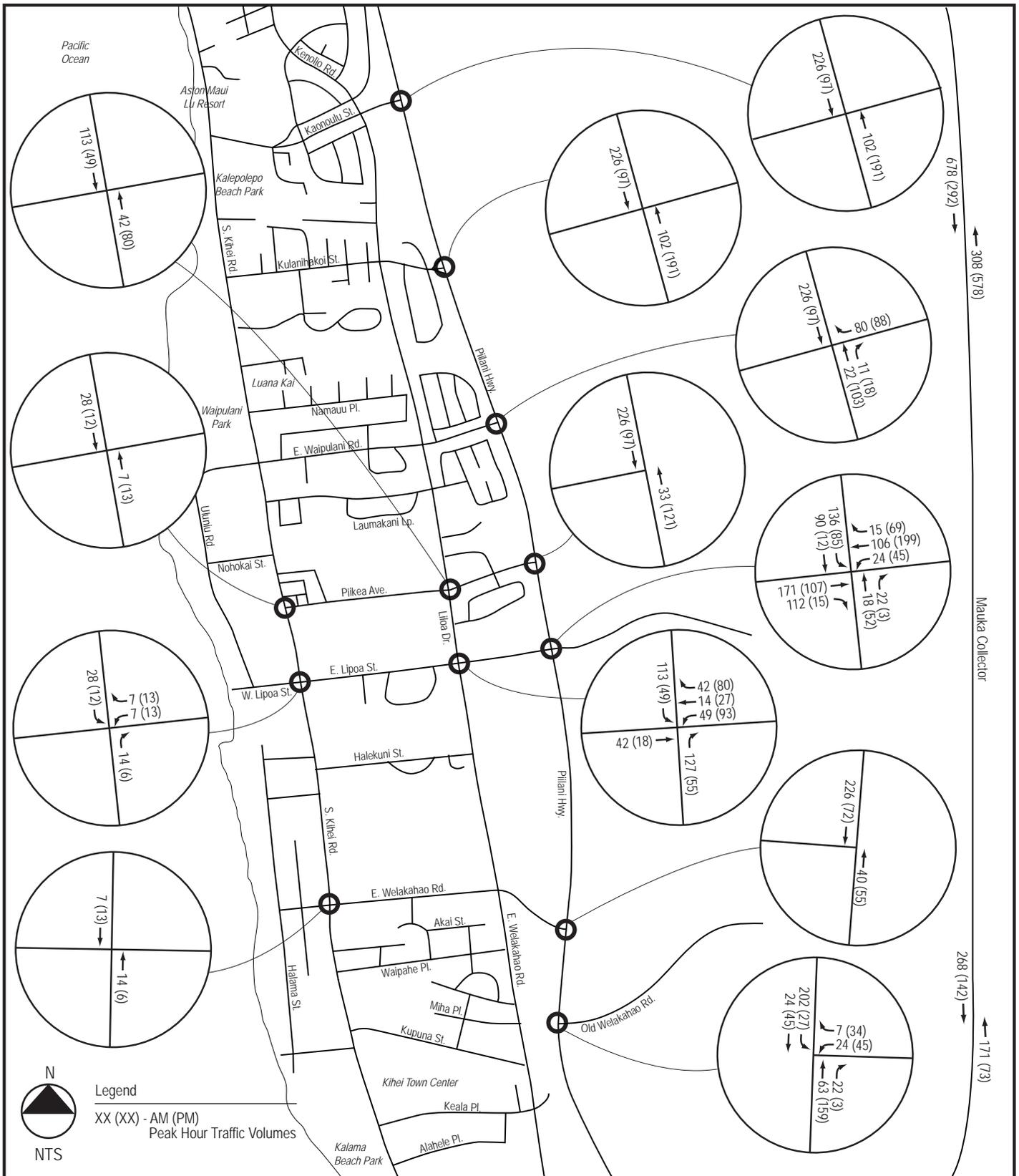
The traffic generated by the proposed MRTP Development was directionally distributed and assigned to the future roadway network and are shown in Figure 14.

4. Total Traffic

The traffic generated by the MRTP development was added to the projected background traffic to obtain the total peak hour traffic volumes shown in Figure 15. The recommended lane configurations for Scenario 4 are shown in Figure 16.

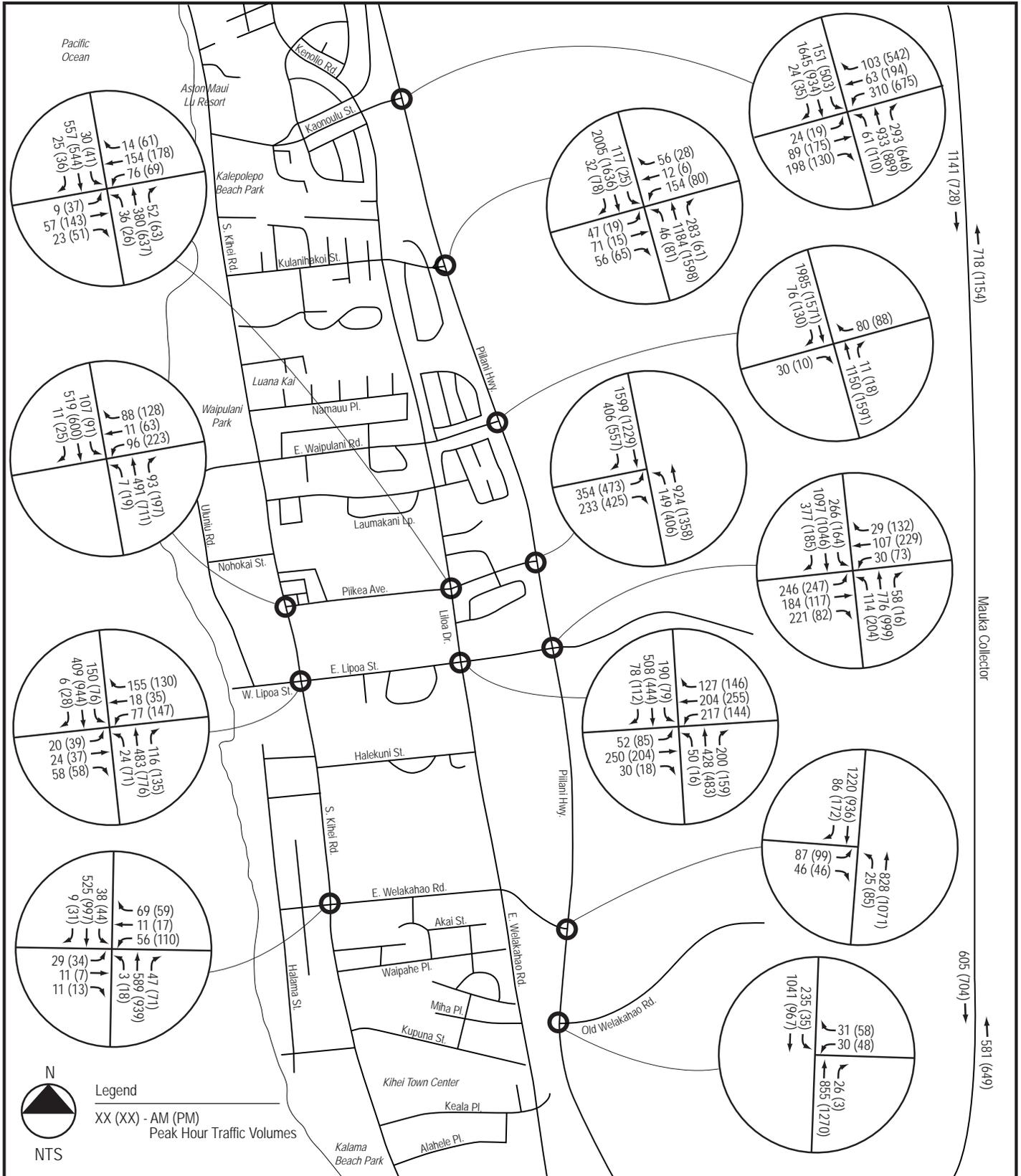
5. Scenario 4 Traffic Operations With Project

Level of Service analysis was performed on the study area intersections. These results are shown in Table 11.



Phase 2 Project-Generated Traffic Volumes

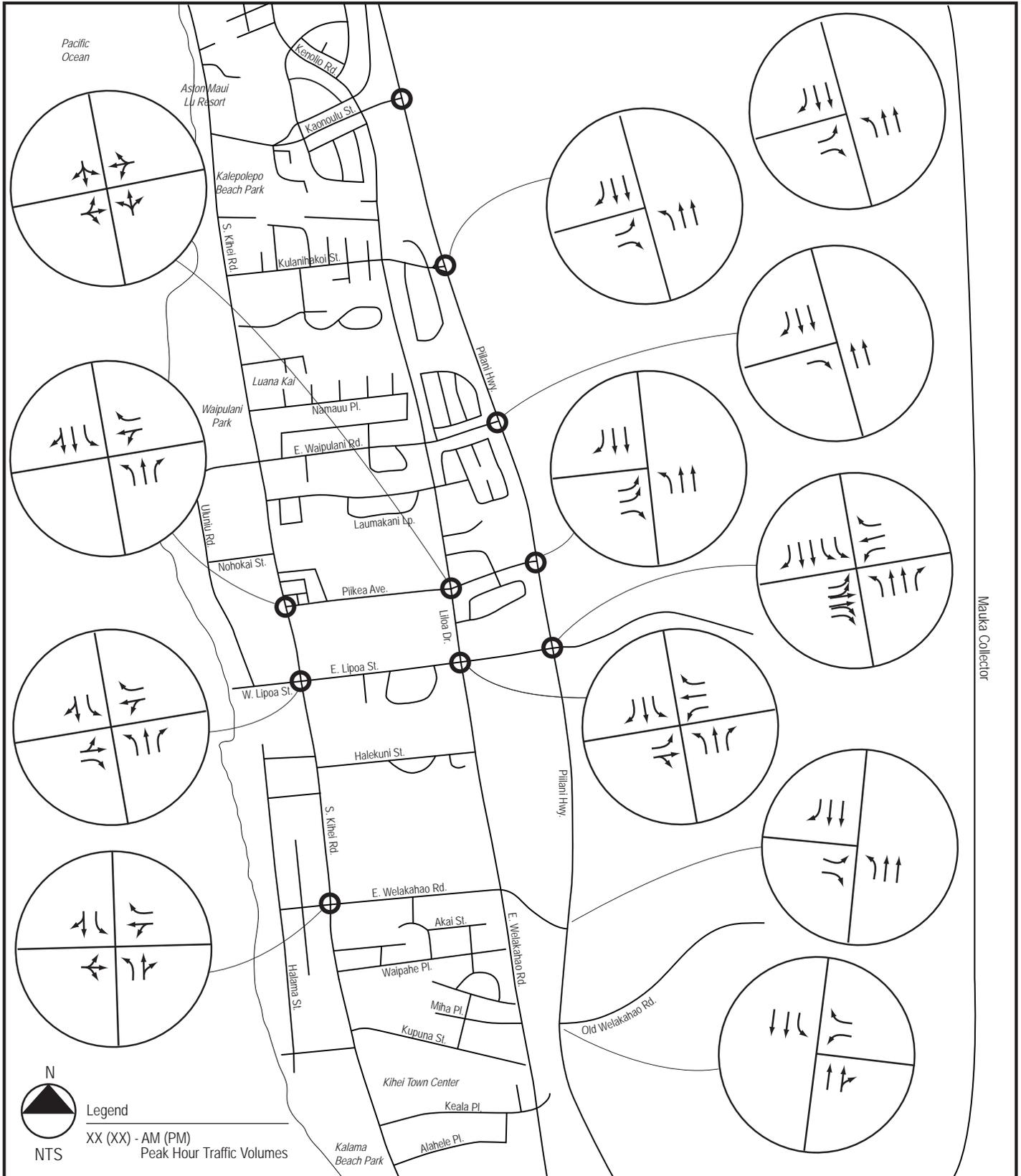
Figure
14



PB 100 YEARS

Year 2034 Scenario 4 Build Traffic Volumes With MRTP and Regional Roadway Improvements

Figure 15



Maui Collector



Year 2034 Lane Configurations

Figure

16

Table 11 Year 2034 Scenario 4 Build With MRTP and Regional Roadway
Improvements Level of Service

Scenario 4	AM		PM	
	LOS	Delay	LOS	Delay
Kaonoulu St & Piilani Hwy	C	33	F	115
Piilani NB Left	F	81	F	121
Piilani NB Through	C	22	C	34
Piilani NB Right	B	18	C	34
Piilani SB Left	E	58	F	535
Piilani SB Through	C	35	C	25
Piilani SB Right	B	13	B	18
Kaonoulu EB Left	D	54	D	50
Kaonoulu EB Through	E	59	E	77
Kaonoulu EB Right	A	0	A	0
Kaonoulu WB Left	E	59	F	220
Kaonoulu WB Through	D	50	E	59
Kaonoulu WB Right	D	48	D	47
Kulanihakoi St & Piilani Hwy	C	33	B	15
Piilani NB Left	E	66	E	57
Piilani NB Through	B	19	B	12
Piilani NB Right	A	0	A	0
Piilani SB Left	E	71	D	55
Piilani SB Through	D	41	B	16
Piilani SB Right	A	0	A	0
Kulanihakoi EB Left-Through	D	48	D	44
Kulanihakoi EB Right	A	0	A	0
Kulanihakoi WB Left-Through	E	79	D	51
Kulanihakoi WB Right	A	0	A	0
E. Waipuilani Rd & Piilani Hwy	Unsignalized		Unsignalized	
E. Waipuilani EB Right	A	2	A	1
E. Waipuilani WB Right	A	1	A	1

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 11 Year 2034 Scenario 4 Build With MRTP and Regional Roadway
Improvements Level of Service (Continued)

Scenario 4	AM		PM	
	LOS	Delay	LOS	Delay
S. Kihei Rd & Piikea Ave	A	10	B	18
S. Kihei NB Left	A	7	A	9
S. Kihei NB Through	B	11	C	21
S. Kihei NB Right	A	7	B	10
S. Kihei SB Left	A	5	B	13
S. Kihei SB Through-Right	A	6	B	10
Piikea WB Left-Through	C	22	C	33
Piikea WB Right	B	19	C	24
Piikea Ave & Liloa Dr	C	20	D	28
Liloa NB Approach	A	10	D	34
Liloa SB Approach	D	32	D	29
Piikea EB Approach	A	10	C	15
Piikea WB Approach	B	10	C	23
Piikea Ave & Piilani Hwy	C	22	D	35
Piilani NB Left	E	66	E	78
Piilani NB Through	A	6	A	9
Piilani SB Through	C	26	D	46
Piilani SB Right	B	14	C	33
Piikea EB Left	E	57	F	80
Piikea EB Right	A	0	A	1
W. Lipoa St & S. Kihei Rd	B	13	C	25
S. Kihei NB Left	A	8	C	27
S. Kihei NB Through	B	15	B	16
S. Kihei NB Right	A	10	A	8
S. Kihei SB Left	A	6	B	12
S. Kihei SB Through-Right	A	9	C	30
W. Lipoa EB Left-Through	C	22	D	36
W. Lipoa EB Right	C	21	C	33
W. Lipoa WB Left-Through	C	24	D	48
W. Lipoa WB Right	C	21	C	33

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 11 Year 2034 Scenario 4 Build With MRTP and Regional Roadway Improvements Level of Service (Continued)

Scenario 4	AM		PM	
	LOS	Delay	LOS	Delay
E. Lipoa St & Liloa Dr	C	21	C	22
Liloa NB Left	B	16	B	12
Liloa NB Through	B	19	D	39
Liloa NB Right	B	15	B	12
Liloa SB Left	D	38	B	18
Liloa SB Through	C	22	C	28
Liloa SB Right	B	14	B	12
E. Lipoa EB Left	C	23	B	15
E. Lipoa EB Through-Right	C	29	B	18
E. Lipoa WB Left	B	15	A	8
E. Lipoa WB Through	B	18	B	11
E. Lipoa WB Right	B	16	B	10
E. Lipoa St & Piilani Hwy	C	35	D	48
Piilani NB Left	E	60	E	79
Piilani NB Through	C	32	D	37
Piilani NB Right	C	20	B	18
Piilani SB Left	D	53	E	64
Piilani SB Through	D	38	D	54
Piilani SB Right	B	13	B	17
E. Lipoa EB Left	E	59	E	80
E. Lipoa EB Through	D	38	D	41
E. Lipoa EB Right	A	0	A	0
E. Lipoa WB Left	E	58	E	65
E. Lipoa WB Through	D	53	E	67
E. Lipoa WB Right	A	0	A	0
E. Welakahao Rd & S. Kihei Rd	B	11	C	24
S. Kihei NB Left	A	5	B	15
S. Kihei NB Through-Right	B	11	C	24
S. Kihei SB Left	A	6	B	16
S. Kihei SB Through-Right	A	8	C	22
E. Welakahao EB Left-Through-Right	B	20	B	31
E. Welakahao WB Left-Through	C	21	D	47
E. Welakahao WB Right	B	19	B	30

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

Table 11 Year 2034 Scenario 4 Build With MRTP and Regional Roadway Improvements Level of Service (Continued)

Scenario 4	AM		PM	
	LOS	Delay	LOS	Delay
E. Welakahao Rd & Piilani Hwy	Unsignalized		Unsignalized	
Piilani NB Left	C	15	B	13
E. Welakahao EB Left	E	36	E	44
Old Welakahao Rd & Piilani Hwy	B	10	A	7
Piilani NB Through	B	15	A	9
Piilani NB Right	B	11	A	5
Piilani SB Left	C	24	C	35
Piilani SB Through	A	3	A	3
Old Welakahao WB Left	C	31	C	32
Old Welakahao WB Right	A	0	A	0

Delay expressed in seconds per vehicle.

* Delay greater than 300 seconds per vehicle.

As shown in Table 11 the intersection of Piilani Highway and Kaonoulu Street is projected to operate at LOS C overall during the AM peak hour. The Piilani through movements are projected to operate at LOS C. Left turns and certain minor street movements are projected to operate at LOS E or F. During the PM peak hour, the intersection is projected to operate at LOS F overall. Multiple movements are projected to operate at LOS F. The north and southbound Piilani through movements are projected to operate at LOS C.

Piilani Highway's intersection with Kulanihakoi Street is projected to operate at LOS C overall during the AM peak hour and at LOS B during the PM peak hour. During both peaks, left turns and minor street movements are projected to operate at LOS E, but Piilani Highway through movements are projected to operate at LOS D or better.

The eastbound right turn at the intersection of Piilani Highway and East Waipuilani is projected to operate at LOS A during the AM and PM peak hours. The westbound right turn out of MRTP is also projected to operate at LOS A during the AM and PM peak hours.

The intersection of South Kihei Road and Piikea Avenue is projected to operate at LOS A during the AM peak hour and at LOS B during the PM peak hour. All movements are projected to operate at LOS C or better during the AM and PM peak hours.

All approaches at the intersection of Liloa Drive and Piikea Avenue are projected to operate at LOS D or better during both peak hours.

The intersection of Piilani Highway and Piikea Avenue is projected to operate at LOS C during the AM peak hour and at LOS D during the PM peak hour. The northbound Piilani left turn to Piikea is projected to operate at LOS E during the AM and PM peak hours. With the project-related improvements, the eastbound Piikea left turn to Piilani is projected to operate at LOS E during the AM peak hour and at LOS F during the PM peak hour. The Piilani southbound through movement is projected to operate at LOS D or better during both peak hours.

The intersection of South Kihei Road and Lipoa Street is projected to operate at LOS B during the AM peak hour and at LOS C during the PM peak hour. All movements are projected to operate at LOS C or better during the AM peak hour and at LOS D or better during the PM peak hour.

The intersection of Liloa Drive and Lipoa Street is projected to operate at LOS C during the both the AM and PM peak hours. All movements are projected to operate at LOS D or better during both peak hours.

With project-related improvements, the intersection of Piilani Highway and Lipoa Street/Lipoa Parkway is projected to operate at LOS C during the AM peak hour and at LOS D during the PM peak hour. The intersection benefits from project-related traffic being diverted to the mauka collector. All Piilani through movements are projected to operate at LOS D or better and all turning movements or minor street movements are projected to operate at LOS E or better.

The intersection of South Kihei Road and East Welakahao Road is projected to operate at LOS B during the AM peak hour and at LOS C during the PM peak hour. During the AM peak hour, all movements are projected to operate at LOS B or better. All movements are projected to operate at LOS D or better during the PM peak hour.

At the intersection of Piilani Highway and East Welakahao Road, the eastbound Welakahao left turn is projected to operate at LOS E during both peak hours.

The intersection of Piilani Highway and Old Welakahao Road is projected to operate at LOS B during the AM peak hour and at LOS A during the PM peak hour.

E. SUMMARY OF RESULTS

The following issues were identified within the project study area:

- The intersection of Piilani Highway and Kaonoulu Street is projected to operate at LOS F during PM peak hour with or without MRTP. The construction of the Mauka Collector is necessary to relieve congestion on Piilani Highway. The addition of the Mauka Collector is projected to improve the overall intersection LOS to an acceptable level on Piilani Highway except for at the intersection with Kaonoulu Street during PM peak hour.
- The addition of MRTP project-related improvements at the intersection of Piilani Highway and Old Welakahao Road results in better LOS. Specifically,
 - At the intersection of Piilani Highway and Piikea Avenue, the overall LOS is projected to improve from F to C in the AM peak hour and from F to D in the PM peak hour.
 - At the intersection of Piilani Highway and Lipoa Parkway, the overall LOS is projected to improve from F to C in the AM peak hour and from F to D in the PM peak hour.

V. CONCLUSIONS & RECOMMENDATIONS

A. PHASE 1 IN YEAR 2024

Phase 1 will be located directly off of Lipoa Parkway and will consist of residential, mixed-use commercial, civic, and employment core land uses. Phase 1 will consist of 723,200 SF of Employment, 100,000 SF of Retail, 750 Residential Dwelling Units, 150 Hotel Rooms, 102,000 SF of Elementary School. The planned MRTP Phase 1 will generate 1,285 trips during AM peak hour and 1,056 during PM peak hour.

Based on the intersection operational analyses, it is recommended that MRTP construct the following necessary transportation improvements to mitigate Phase 1 project generated impacts along Piilani Highway:

1. Piilani Highway/Hookena Street Access
 - a. Construct 2-lane Hookena Street from within MRTP to intersect Piilani Highway across from East Waipuilani Road;
 - b. Configure the westbound Hookena approach as a right-in/right-out access with stop control;
 - c. Provide acceleration and deceleration lanes to and from Piilani Highway;
 - d. Maintain existing delineators on Piilani Highway to prevent left turns from East Waipuilani Road or Hookena Street from crossing the center line of Piilani Highway.
2. Piilani Highway/Piikea Avenue
 - a. Construct an additional eastbound Piikea Avenue left turn lane (two total);
 - b. Retime the traffic signal accordingly to optimize the intersection operation.
3. Piilani Highway/Lipoa Parkway
 - a. Construct an additional southbound Piilani left turn lane (two total);
 - b. Widen westbound Lipoa Parkway to provide for left, through, and right turn lanes;
 - c. Widen and/or restripe eastbound Lipoa Street to provide left, through, and right turn lanes;
 - d. Adjust signal timing and phasing to provide leading protected left turn phases for the east and westbound Lipoa left turn movements;

- e. Add the missing crosswalk on north Piilani leg of the intersection to improve pedestrian connectivity.
4. Internal Kihei High School Access
- a. Construct an internal Kihei High School Access from within MRTP;
 - b. Provide bicycle and pedestrian connectivity between the school and MRTP

In addition, the background traffic growth from planned future developments including developments in the Kihei/Wailea/Makena areas warrants extending Liloa Drive as a two-lane facility to provide a direct connection between Kaonoulu Street and Kanani Road. It is essential that the Liloa Drive Extension be constructed as the added capacity as the area continues to grow. Without Liloa Drive extension, the traffic conditions along Piilani Highway would be adversely affected and generally deteriorate to Level of Services E or F with and without MRTP.

The County of Maui has included Liloa Drive Extension in its Fiscal Year (FY) 2013 Capital Improvement Project Proposal. \$18.2 million was budgeted for design and construction from FY 2015 to 2018. The project is not, however, included in Hawaii State DOT's current Statewide Transportation Improvement Program (STIP). Extensive consultation and discussions with the County indicated that Liloa Drive Extension project will be the County's priority and will be programmed into future STIP.

B. PHASE 2 IN YEAR 2034

Building upon the land uses in Phase 1, Phase 2 will consist of 1,014,800 SF of Employment and 500 Residential DU. In addition to the trips generated by Phase 1, the planned MRTP Phase 2 will generate 835 trips during AM peak hour and 878 during PM peak hour.

Based on the intersection operational analyses, it is recommended that MRTP construct the following necessary transportation improvements to mitigate Phase 2 project generated impacts along Piilani Highway:

- 1. Piilani Highway/Old Welakahao Road
 - a. Construct 2-lane Old Welakahao Road as MRTP's direct access to Piilani Highway;

- b. Signalize the intersection and provide a leading protected left turn phase for the southbound Piilani Highway left turn into Old Welakahao Road;
 - c. Provide southbound left turning lane from Piilani Highway to Old Welakahao Road and westbound left turning lane from Old Welakahao Road to Piilani Highway;
 - d. Provide acceleration and deceleration lanes to and from Piilani Highway.
2. Mauka collector within MRTP property
- a. Construct the two-lane mauka collector within MRTP property and additional two-lane in-tract roadway when warranted;
 - b. Construct three mauka-bound access points to the mauka collector with proper intersection spacing within MRTP property;

Piilani Highway will continue to encounter conditions of congestion and excessive delays with and without MRTP by Year 2034 due to regional growth. The construction of the Mauka collector between Mokulele Highway and a point somewhere south of MRTP on Piilani Highway will be critical to north-south mobility in Kihei because it would provide much needed additional capacity and divert regional trips away from Piilani Highway. The issues associated with the operating condition of the intersections along Piilani Highway would become an element of the overall regional transportation planning issue associated with all the major arterials in Kihei. Because these issues are long range and of a regional nature, they must be addressed collectively by the State, the County, the land owners, and other stakeholders as part of the long-range highway planning documents.

Maui County strongly supports an interconnected Kihei Mauka transportation network as growth in the region warrants. The 1998 Kihei-Makena Community Plan also echoed the need for a North-South roadway mauka of Piilani. The Maui Island Plan, December 2012 contemplates a future north south roadway in several sections and depicts the preferred road alignment. Similar directions are included in the project descriptions of Kihei Mauka and the North Kihei residential planned growth areas to the north of MRTP. MRTP has initiated discussions with other landowners about providing a continuous in-tract mauka collector roadway as directed by the County general plan. MRTP is willing to work with other land owners located mauka of Piilani Highway to coordinate on Mauka collector cost sharing and alignment.

APPENDICES

Appendix A Traffic Count Data

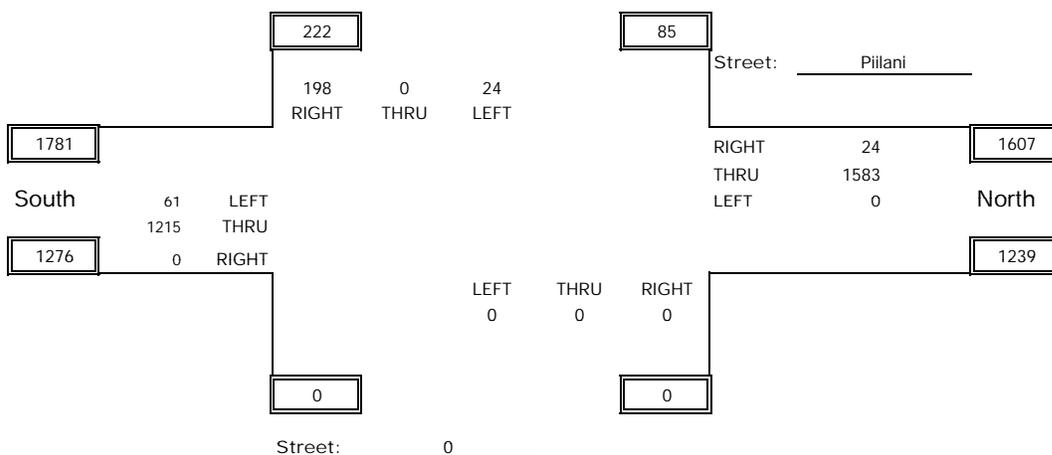
AM COUNT SHEET

Intersection: Piilani & Kaonoulu
 Date: Tuesday, 11/15/2012
 By: Phil
 Weather: Clear

TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	0	211	3	27	0	8	5	242	0	0	0	0	496	1986
6:45 AM - 7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	2324
7:00 AM - 7:15 AM	0	297	12	37	0	8	2	324	0	0	0	0	680	3082
7:15 AM - 7:30 AM	0	311	13	59	0	6	8	413	0	0	0	0	810	3105
7:30 AM - 7:45 AM	0	328	17	62	0	7	5	415	0	0	0	0	834	2918
7:45 AM - 8:00 AM	0	315	21	34	0	5	6	377	0	0	0	0	758	
8:00 AM - 8:15 AM	0	261	10	43	0	6	5	378	0	0	0	0	703	
8:15 AM - 8:30 AM	0	266	7	21	0	8	3	318	0	0	0	0	623	
Phf	#DIV/0!	0.926	0.726	0.798	#DIV/0!	0.857	0.750	0.954	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Peak	Phf
7:15 AM - 8:15 AM	0	1215	61	198	0	24	24	1583	0	0	0	0	3105	0.931

Peak Hour

7:15 AM - 8:15 AM



PM COUNT SHEET

Intersection: Piilani & Kaonoulu

Date: Wednesday, 11/16/2012

By: Phil

Weather: Clear

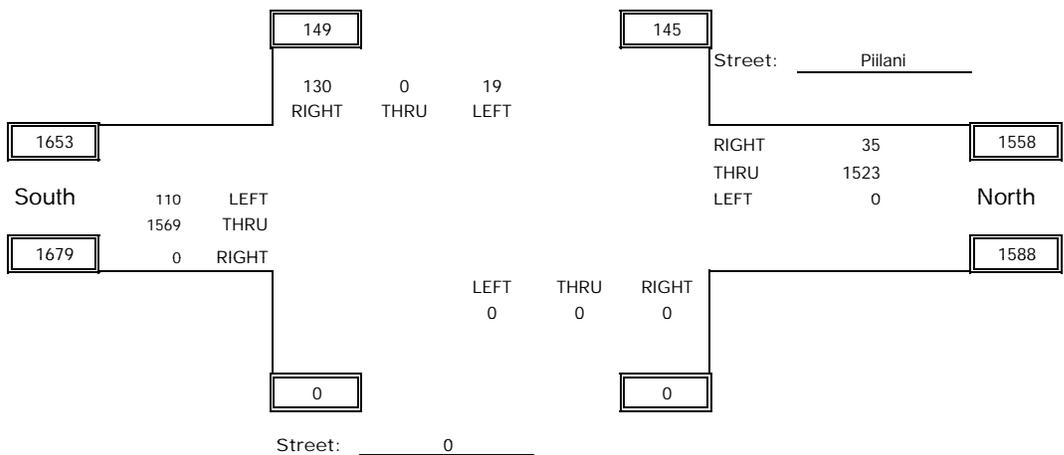
Street: Kaonoulu Road

Street: Piilani

TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:15 PM - 3:30 PM	0	361	24	30	0	4	8	339	0	0	0	0	766	3258
3:30 PM - 3:45 PM	0	383	23	25	0	6	15	386	0	0	0	0	838	3369
3:45 PM - 4:00 PM	0	331	22	34	0	6	10	412	0	0	0	0	815	3386
4:00 PM - 4:15 PM	0	394	32	35	0	7	7	364	0	0	0	0	839	3359
4:15 PM - 4:30 PM	0	445	21	28	0	5	7	371	0	0	0	0	877	3222
4:30 PM - 4:45 PM	0	399	35	33	0	1	11	376	0	0	0	0	855	
4:45 PM - 5:00 PM	0	331	24	30	0	8	14	381	0	0	0	0	788	
5:00 PM - 5:15 PM	0	305	25	18	0	6	15	333	0	0	0	0	702	
Phf	#DIV/0!	0.881	0.786	0.929	#DIV/0!	0.679	0.795	0.924	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Peak	Phf
3:45 PM - 4:45 PM	0	1569	110	130	0	19	35	1523	0	0	0	0	3386	0.965

Peak Hour

3:45 PM - 4:45 PM



AM COUNT SHEET

Intersection: Piilani & Kulanihakai

Date: Tuesday, 11/15/2012

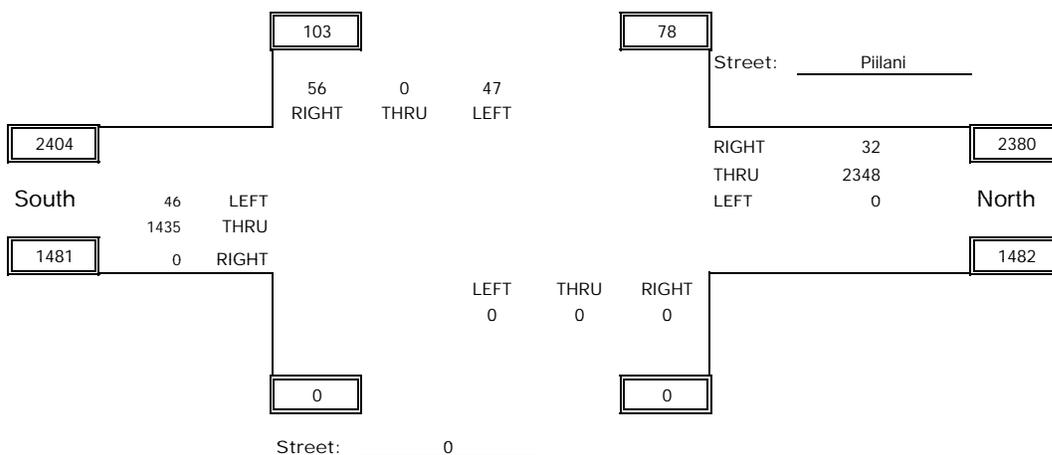
By: Phil

Weather: Clear

TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	0	193	2	16	0	14	9	279	0	0	0	0	513	2724
6:45 AM - 7:00 AM	0	214	12	16	0	19	7	299	0	0	0	0	567	3205
7:00 AM - 7:15 AM	0	277	6	16	0	18	4	338	0	0	0	0	659	3670
7:15 AM - 7:30 AM	0	333	6	18	0	13	2	613	0	0	0	0	985	3964
7:30 AM - 7:45 AM	0	353	6	11	0	9	8	607	0	0	0	0	994	3770
7:45 AM - 8:00 AM	0	410	12	10	0	13	8	579	0	0	0	0	1032	
8:00 AM - 8:15 AM	0	339	22	17	0	12	14	549	0	0	0	0	953	
8:15 AM - 8:30 AM	0	303	9	8	0	7	7	457	0	0	0	0	791	
Phf	#DIV/0!	0.875	0.523	0.778	#DIV/0!	0.904	0.571	0.958	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Peak	Phf
7:15 AM - 8:15 AM	0	1435	46	56	0	47	32	2348	0	0	0	0	3964	0.960

Peak Hour

7:15 AM - 8:15 AM



PM COUNT SHEET

Intersection: Piilani & Kulanihakoi

Date: Wednesday, 11/16/2012

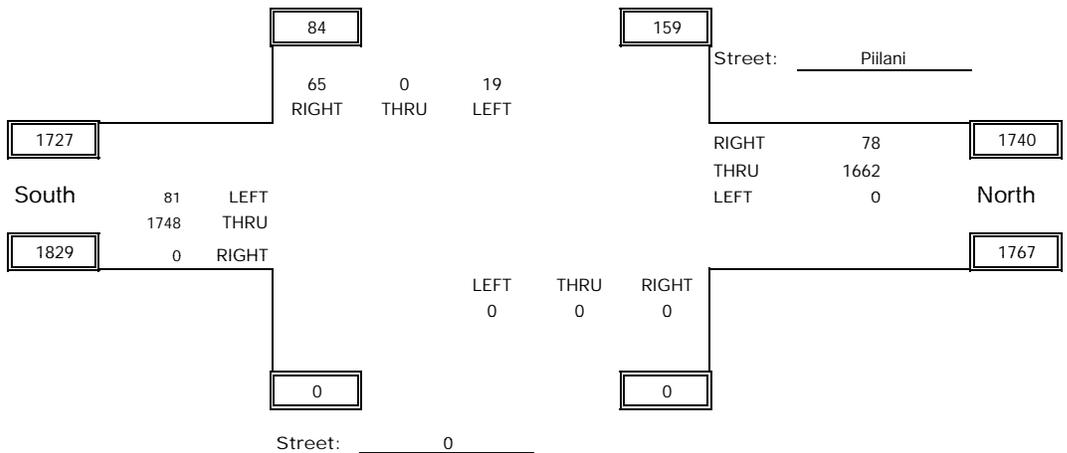
By: Phil

Weather: Clear

TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:15 PM - 3:30 PM	0	396	17	14	0	7	21	383	0	0	0	0	838	3612
3:30 PM - 3:45 PM	0	476	11	13	0	10	7	446	0	0	0	0	963	3708
3:45 PM - 4:00 PM	0	409	18	17	0	13	20	434	0	0	0	0	911	3653
4:00 PM - 4:15 PM	0	463	13	8	0	3	19	394	0	0	0	0	900	3593
4:15 PM - 4:30 PM	0	458	18	17	0	3	23	415	0	0	0	0	934	3392
4:30 PM - 4:45 PM	0	418	32	23	0	0	16	419	0	0	0	0	908	
4:45 PM - 5:00 PM	0	368	18	32	0	10	13	410	0	0	0	0	851	
5:00 PM - 5:15 PM	0	313	20	19	0	3	18	326	0	0	0	0	699	
Phf	#DIV/0!	0.944	0.633	0.707	#DIV/0!	0.365	0.848	0.957	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Peak	Phf
3:45 PM - 4:45 PM	0	1748	81	65	0	19	78	1662	0	0	0	0	3653	0.978

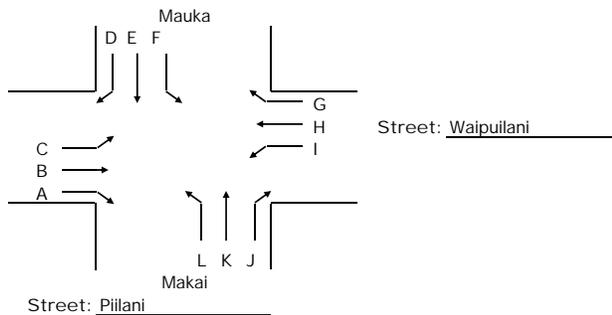
Peak Hour

3:45 PM - 4:45 PM

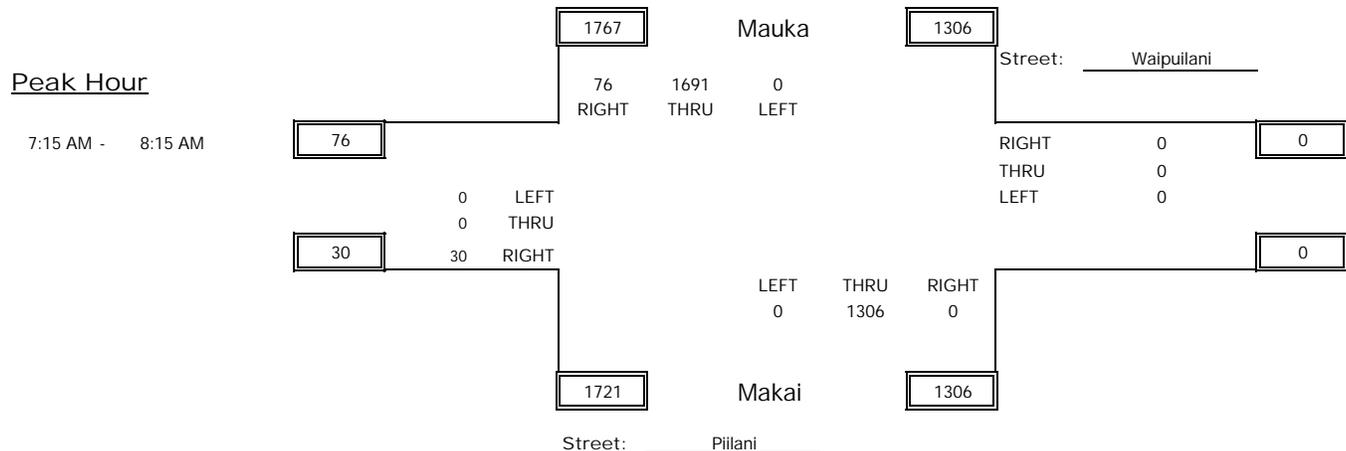


AM COUNT SHEET

Intersection: Piilani Hwy & Waipuilani Rd
 Date: 11/17/2010
 By: 0
 Weather: 0

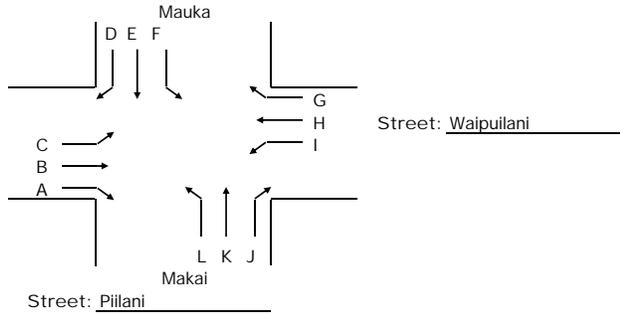


TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	8	0	0	4	220	0	0	0	0	0	194	0	426	2312
6:45 AM - 7:00 AM	5	0	0	7	253	0	0	0	0	0	288	0	553	2718
7:00 AM - 7:15 AM	4	0	0	10	305	0	0	0	0	0	247	0	566	3004
7:15 AM - 7:30 AM	7	0	0	14	397	0	0	0	0	0	349	0	767	3103
7:30 AM - 7:45 AM	3	0	0	24	476	0	0	0	0	0	329	0	832	2982
7:45 AM - 8:00 AM	13	0	0	22	467	0	0	0	0	0	337	0	839	
8:00 AM - 8:15 AM	7	0	0	16	351	0	0	0	0	0	291	0	665	
8:15 AM - 8:30 AM	15	0	0	20	353	0	0	0	0	0	258	0	646	
8:30 AM - 8:45 AM														
8:45 AM - 9:00 AM														
Phf	0.577	#DIV/0!	#DIV/0!	0.792	0.888	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.936	#DIV/0!	Peak	Phf
7:15 AM - 8:15 AM	30	0	0	76	1691	0	0	0	0	0	1306	0	3103	0.925

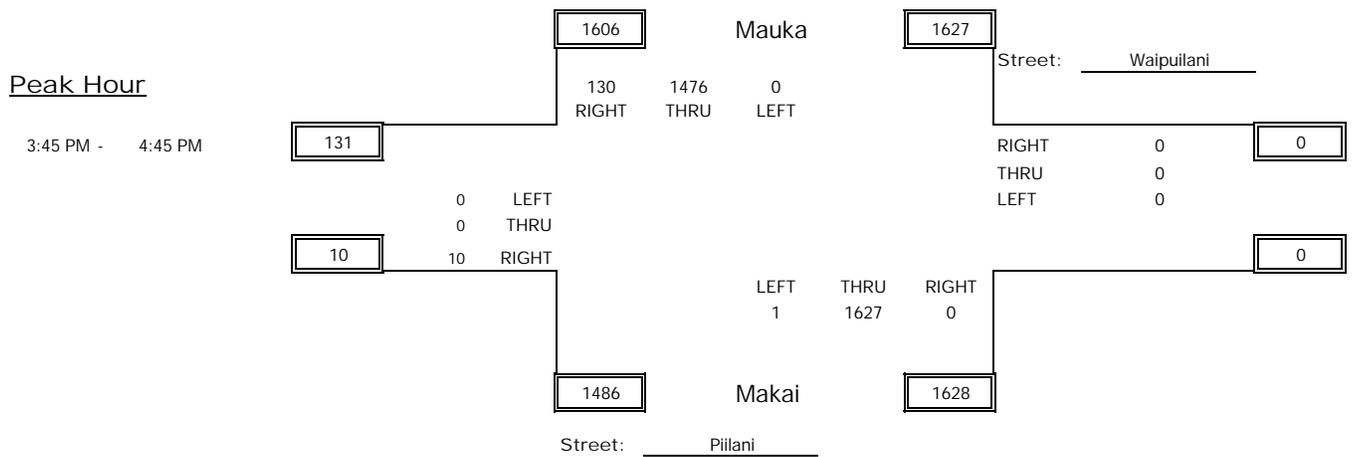


PM COUNT SHEET

Intersection: Piilani Hwy & Waipuilani Rd
 Date: 11/16/2010
 By: 0
 Weather: 0

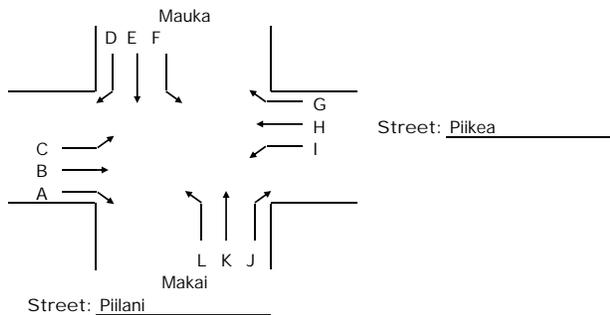


TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 PM - 3:45 PM	2	0	0	33	373	0	0	0	0	0	353	0	761	3213
3:45 PM - 4:00 PM	2	0	0	36	375	0	0	0	0	0	364	1	778	3244
4:00 PM - 4:15 PM	2	0	0	22	369	0	0	0	0	0	348	0	741	3125
4:15 PM - 4:30 PM	5	0	0	32	387	0	0	0	0	0	509	0	933	3041
4:30 PM - 4:45 PM	1	0	0	40	345	0	0	0	0	0	406	0	792	2872
4:45 PM - 5:00 PM	5	0	0	28	334	0	0	0	0	0	292	0	659	
5:00 PM - 5:15 PM	3	0	0	25	343	0	0	0	0	0	286	0	657	
5:00 PM - 5:15 PM	7	0	0	22	336	0	0	0	0	0	399	0	764	
5:15 PM - 5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
Phf	0.500	#DIV/0!	#DIV/0!	0.813	0.953	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.799	0.250	Peak	Phf
3:45 PM - 4:45 PM	10	0	0	130	1476	0	0	0	0	0	1627	1	3244	0.869

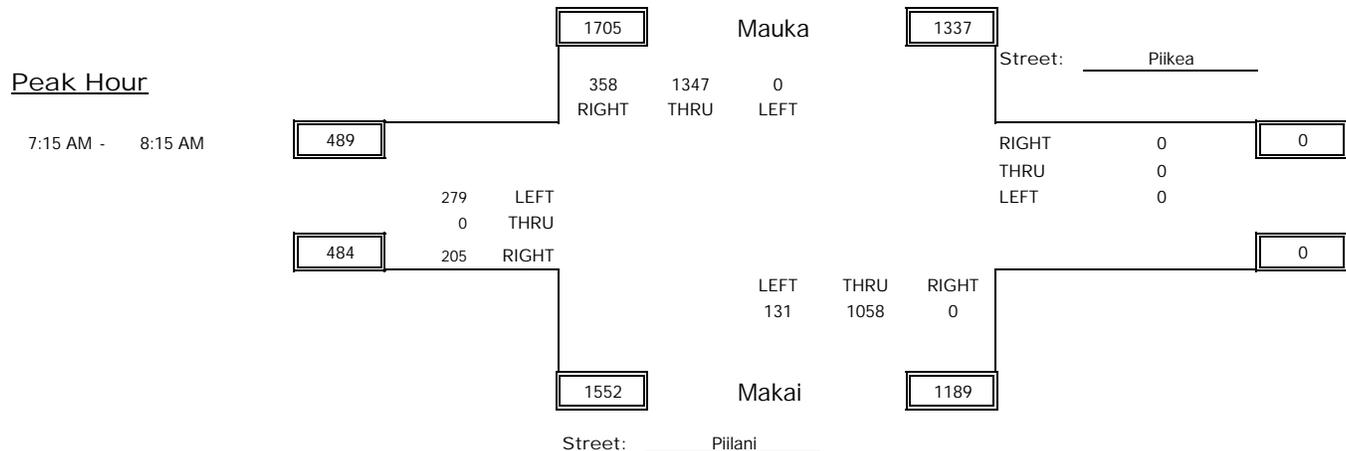


AM COUNT SHEET

Intersection: Piilani Hwy & Piikea Ave
 Date: 11/17/2010
 By: 0
 Weather: 0

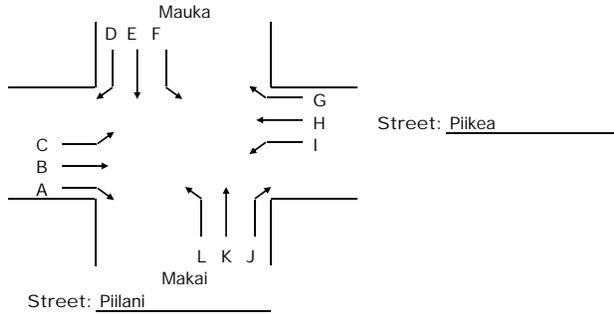


TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	26	0	38	31	187	0	0	0	0	0	161	6	449	2474
6:45 AM - 7:00 AM	33	0	37	57	221	0	0	0	0	1	225	17	591	2942
7:00 AM - 7:15 AM	37	0	53	61	244	1	0	0	0	0	198	20	614	3271
7:15 AM - 7:30 AM	52	0	58	88	324	0	0	0	0	0	273	25	820	3378
7:30 AM - 7:45 AM	47	0	78	112	364	0	0	0	0	0	282	34	917	3232
7:45 AM - 8:00 AM	66	0	90	99	363	0	0	0	0	0	268	34	920	
8:00 AM - 8:15 AM	40	0	53	59	296	0	0	0	0	0	235	38	721	
8:15 AM - 8:30 AM	47	0	45	60	294	0	0	0	0	0	189	39	674	
8:30 AM - 8:45 AM														
8:45 AM - 9:00 AM														
Phf	0.777	#DIV/0!	0.775	0.799	0.925	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.938	0.862	Peak	Phf
7:15 AM - 8:15 AM	205	0	279	358	1347	0	0	0	0	0	1058	131	3378	0.918

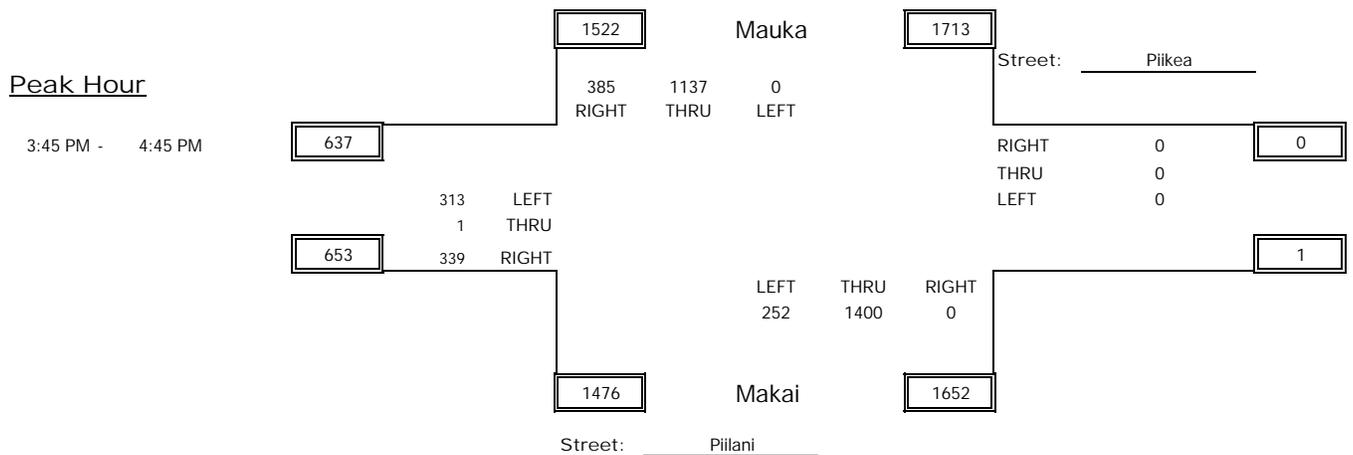


PM COUNT SHEET

Intersection: Piilani Hwy & Piikea Ave
 Date: 11/6/2010
 By: 0
 Weather: 0

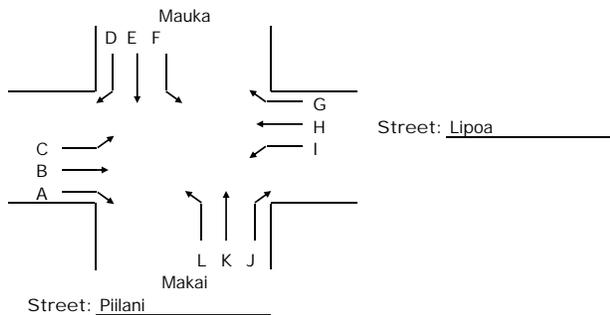


TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 PM - 3:45 PM	54	5	70	97	279	0	0	0	0	0	323	57	885	3727
3:45 PM - 4:00 PM	81	0	83	91	310	0	0	0	0	0	356	62	983	3827
4:00 PM - 4:15 PM	89	1	82	90	267	0	0	0	0	0	306	68	903	3732
4:15 PM - 4:30 PM	92	0	70	104	261	0	0	0	0	0	370	59	956	3623
4:30 PM - 4:45 PM	77	0	78	100	299	0	0	0	0	0	368	63	985	3559
4:45 PM - 5:00 PM	84	0	78	122	235	0	0	0	0	0	307	62	888	
5:00 PM - 5:15 PM	84	0	85	87	233	0	0	0	0	0	261	44	794	
5:00 PM - 5:15 PM	82	0	74	101	271	0	0	0	0	0	302	62	892	
5:15 PM - 5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
Phf	0.921	0.250	0.943	0.925	0.917	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.946	0.926	Peak	Phf
3:45 PM - 4:45 PM	339	1	313	385	1137	0	0	0	0	0	1400	252	3827	0.973

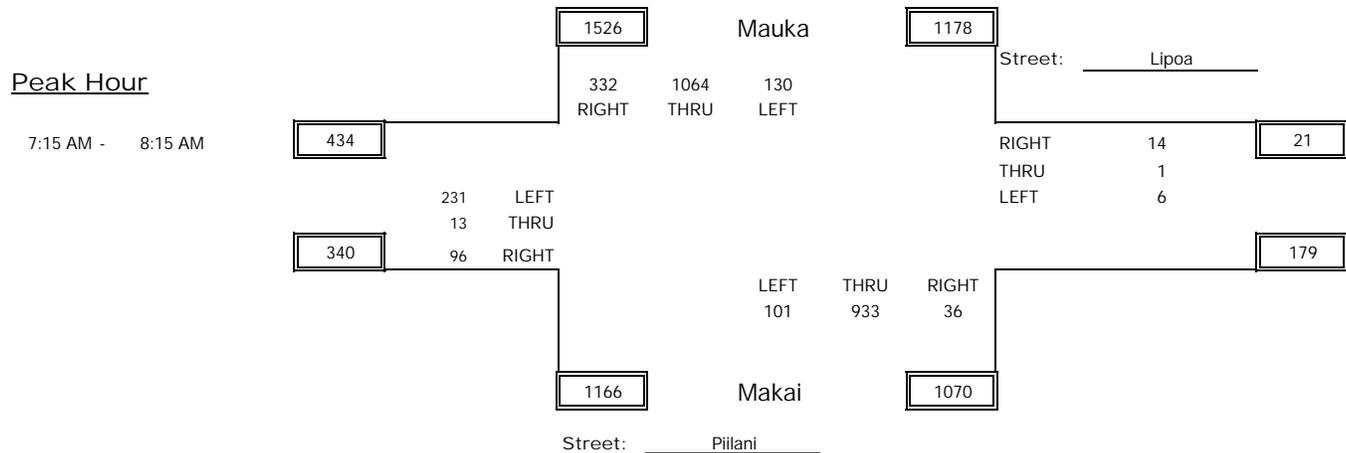


AM COUNT SHEET

Intersection: Piilani Hwy & Lipoa St
 Date: 11/17/2010
 By: 0
 Weather: 0

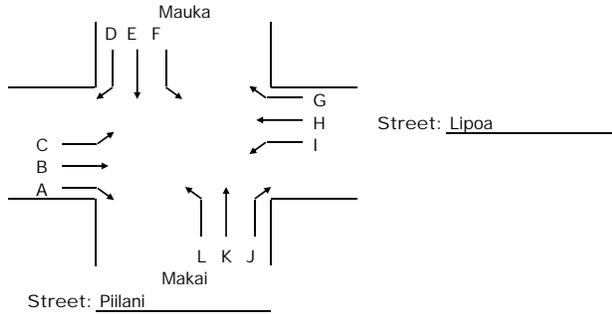


TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	10	0	34	36	186	8	1	0	1	6	161	23	466	2347
6:45 AM - 7:00 AM	9	1	45	53	199	6	3	0	0	7	186	26	535	2701
7:00 AM - 7:15 AM	19	2	37	66	212	12	3	0	1	6	205	20	583	2906
7:15 AM - 7:30 AM	25	1	61	112	246	32	2	0	2	6	247	29	763	2957
7:30 AM - 7:45 AM	31	5	73	125	270	26	4	0	0	10	240	36	820	2841
7:45 AM - 8:00 AM	24	4	69	57	294	32	3	0	3	8	224	22	740	
8:00 AM - 8:15 AM	16	3	28	38	254	40	5	1	1	12	222	14	634	
8:15 AM - 8:30 AM	22	5	34	25	277	31	5	1	6	9	212	20	647	
8:30 AM - 8:45 AM														
8:45 AM - 9:00 AM														
Phf	0.774	0.650	0.791	0.664	0.905	0.813	0.700	0.250	0.500	0.750	0.944	0.701	Peak	Phf
7:15 AM - 8:15 AM	96	13	231	332	1064	130	14	1	6	36	933	101	2957	0.902

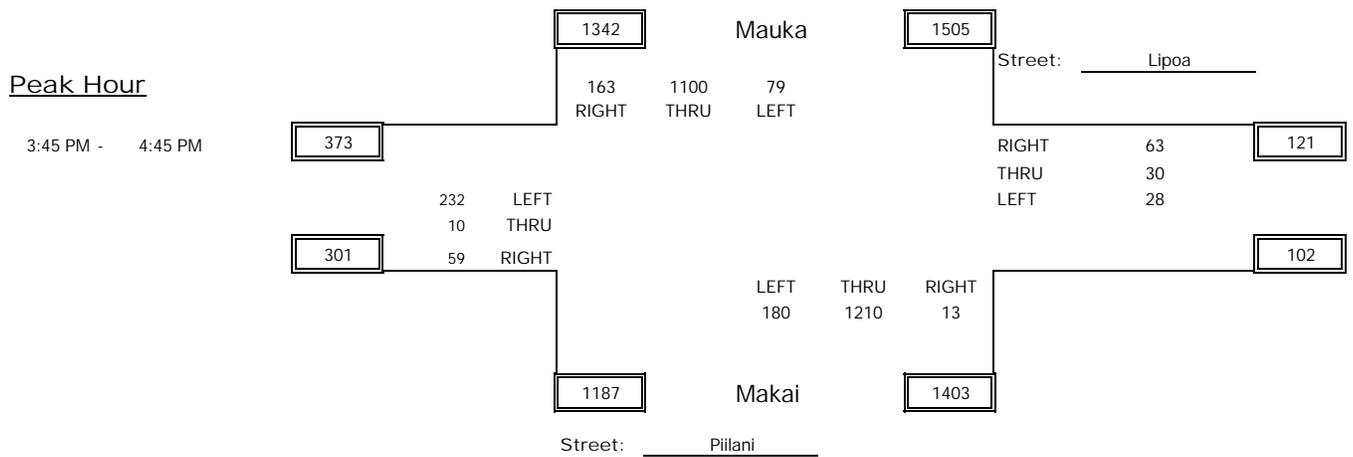


PM COUNT SHEET

Intersection: Piilani Hwy & Lipoa St
 Date: 11/6/2010
 By: 0
 Weather: 0



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 PM - 3:45 PM	8	2	76	55	303	6	3	8	3	2	289	45	800	3143
3:45 PM - 4:00 PM	11	7	58	50	264	11	14	5	4	5	250	39	718	3167
4:00 PM - 4:15 PM	19	1	67	48	283	19	16	6	8	4	279	39	789	3138
4:15 PM - 4:30 PM	3	1	54	30	251	45	11	9	4	2	364	62	836	3050
4:30 PM - 4:45 PM	26	1	53	35	302	4	22	10	12	2	317	40	824	2937
4:45 PM - 5:00 PM	36	1	51	39	276	6	22	0	10	1	224	23	689	
5:00 PM - 5:15 PM	18	2	56	30	259	3	17	7	10	1	269	29	701	
5:00 PM - 5:15 PM	15	1	35	36	303	9	21	7	14	3	249	30	723	
5:15 PM - 5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
Phf	0.567	0.357	0.866	0.815	0.911	0.439	0.716	0.750	0.583	0.650	0.831	0.726	Peak	Phf
3:45 PM - 4:45 PM	59	10	232	163	1100	79	63	30	28	13	1210	180	3167	0.947



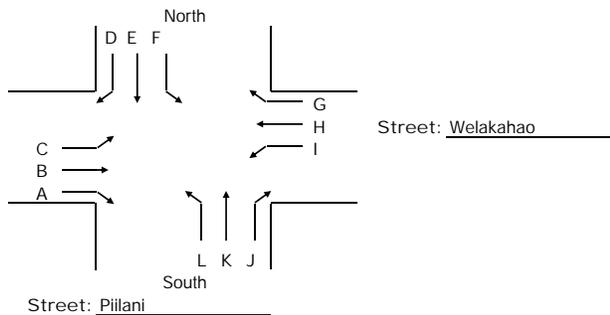
AM COUNT SHEET

Intersection: Piihni Highway and Welakahao Road (North)

Date: 11/17/2010

By: 0

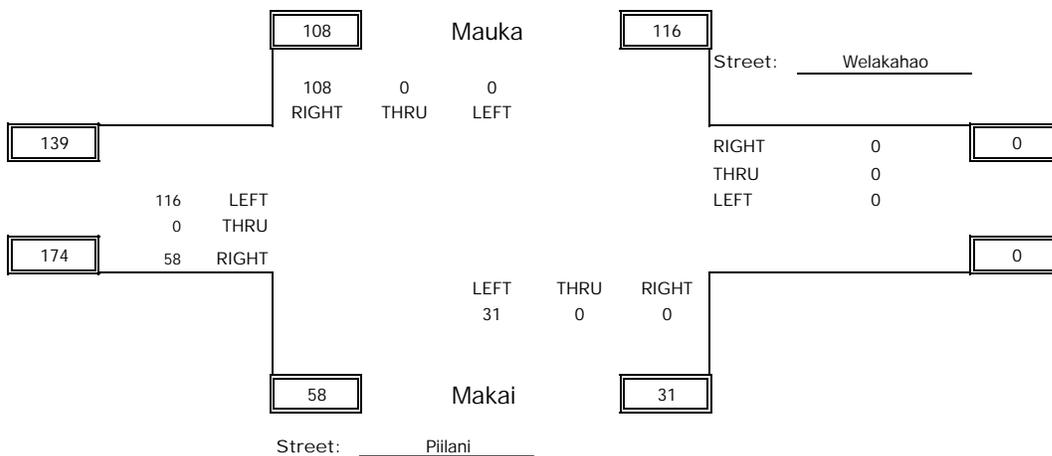
Weather: 0



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	10	0	17	11	0	0	0	0	0	0	0	7	45	216
6:45 AM - 7:00 AM	4	0	20	12	0	0	0	0	0	0	0	8	44	244
7:00 AM - 7:15 AM	3	0	28	16	0	0	0	0	0	0	0	6	53	291
7:15 AM - 7:30 AM	17	0	27	22	0	0	0	0	0	0	0	8	74	313
7:30 AM - 7:45 AM	10	0	31	24	0	0	0	0	0	0	0	8	73	319
7:45 AM - 8:00 AM	20	0	26	35	0	0	0	0	0	0	0	10	91	
8:00 AM - 8:15 AM	11	0	32	27	0	0	0	0	0	0	0	5	75	
8:15 AM - 8:30 AM	14	0	26	33	0	0	0	0	0	0	0	7	80	
8:30 AM - 8:45 AM														
8:45 AM - 9:00 AM														
Phf	0.725	#DIV/0!	0.906	0.771	#DIV/0!	0.775	Peak	Phf						
7:15 AM - 8:15 AM	58	0	116	108	0	0	0	0	0	0	0	31	313	0.860

Peak Hour

7:15 AM - 8:15 AM



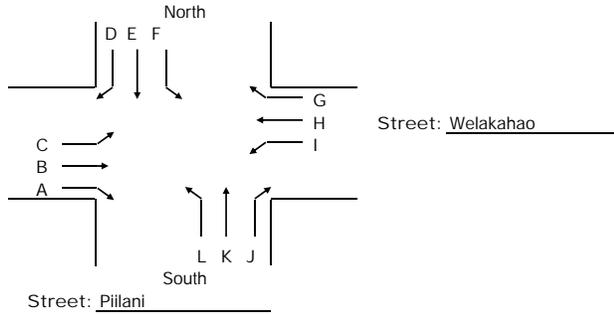
PM COUNT SHEET

Intersection: Piiilani Highway and Welakahao Road (North)

Date: 11/16/2010

By: 0

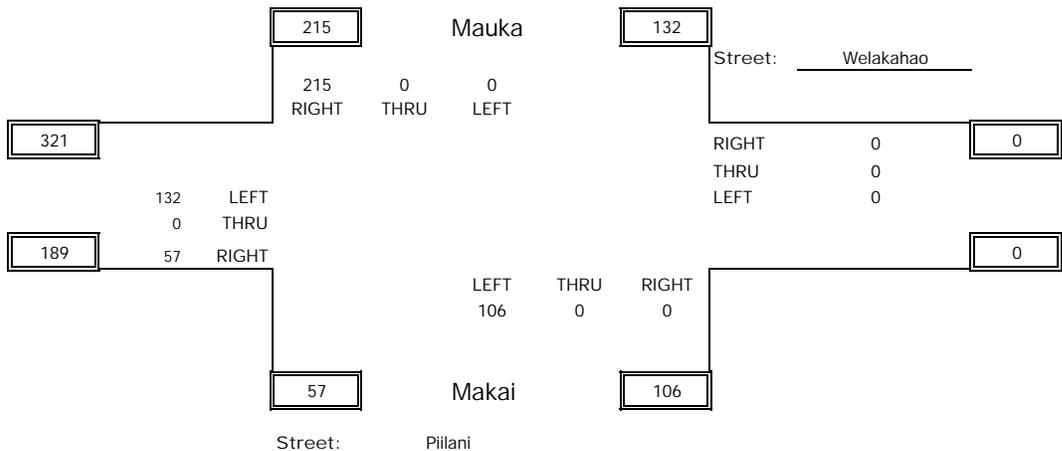
Weather: 0



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 PM - 3:45 PM	17	0	35	40	0	0	0	0	0	0	0	23	115	504
3:45 PM - 4:00 PM	11	0	35	55	0	0	0	0	0	0	0	30	131	510
4:00 PM - 4:15 PM	15	0	32	50	0	0	0	0	0	0	0	25	122	494
4:15 PM - 4:30 PM	15	0	40	55	0	0	0	0	0	0	0	26	136	481
4:30 PM - 4:45 PM	16	0	25	55	0	0	0	0	0	0	0	25	121	436
4:45 PM - 5:00 PM	13	0	26	60	0	0	0	0	0	0	0	16	115	412
5:00 PM - 5:15 PM	13	0	25	55	0	0	0	0	0	0	0	16	109	
5:15 PM - 5:30 PM	8	0	24	42	0	0	0	0	0	0	0	17	91	
5:30 PM - 5:45 PM	12	0	26	49	0	0	0	0	0	0	0	10	97	
5:45 PM - 6:00 PM	8	0	20	45	0	0	0	0	0	0	0	7		
Phf	0.891	#DIV/0!	0.825	0.977	#DIV/0!	0.883	Peak	Phf						
3:45 PM - 4:45 PM	57	0	132	215	0	0	0	0	0	0	0	106	510	0.938

Peak Hour

3:45 PM - 4:45 PM



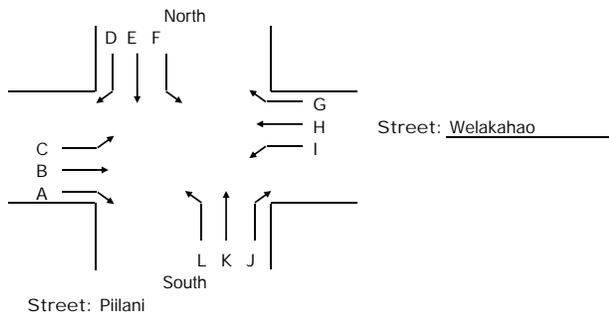
AM COUNT SHEET

Intersection: Pili Highway and Welakahao Road (South)

Date: 11/18/2010

By: 0

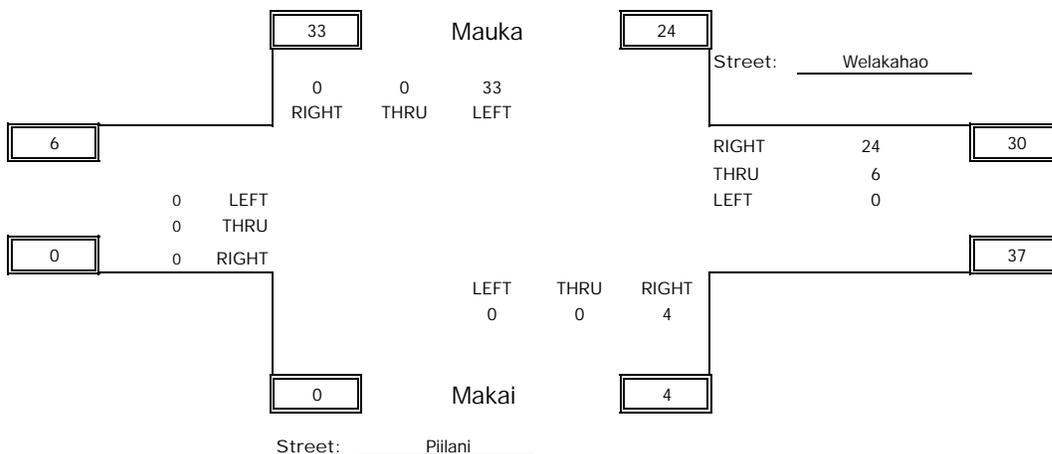
Weather: 0



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	0	0	0	0	0	12	2	0	0	4	0	0	18	79
6:45 AM - 7:00 AM	0	0	0	0	0	16	7	0	0	1	0	0	24	75
7:00 AM - 7:15 AM	0	0	0	0	0	13	3	0	0	3	0	0	19	65
7:15 AM - 7:30 AM	0	0	0	0	0	9	7	1	0	1	0	0	18	67
7:30 AM - 7:45 AM	0	0	0	0	0	9	4	1	0	0	0	0	14	75
7:45 AM - 8:00 AM	0	0	0	0	0	5	5	2	0	2	0	0	14	
8:00 AM - 8:15 AM	0	0	0	0	0	10	8	2	0	1	0	0	21	
8:15 AM - 8:30 AM	0	0	0	0	0	8	12	2	0	4	0	0	26	
8:30 AM - 8:45 AM														
8:45 AM - 9:00 AM														
Phf	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.825	0.750	0.750	#DIV/0!	0.500	#DIV/0!	#DIV/0!	Peak	Phf
7:15 AM - 8:15 AM	0	0	0	0	0	33	24	6	0	4	0	0	67	0.798

Peak Hour

7:15 AM - 8:15 AM



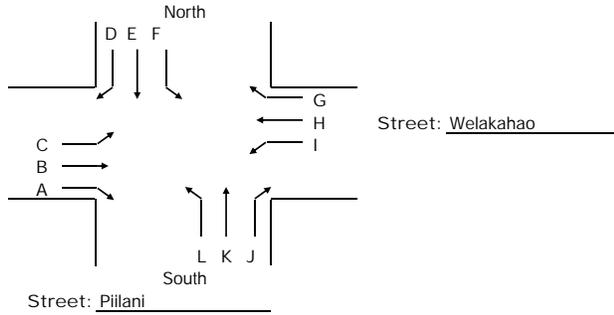
PM COUNT SHEET

Intersection: Piiilani Highway and Welakahao Road (South)

Date: 11/17/2010

By: 0

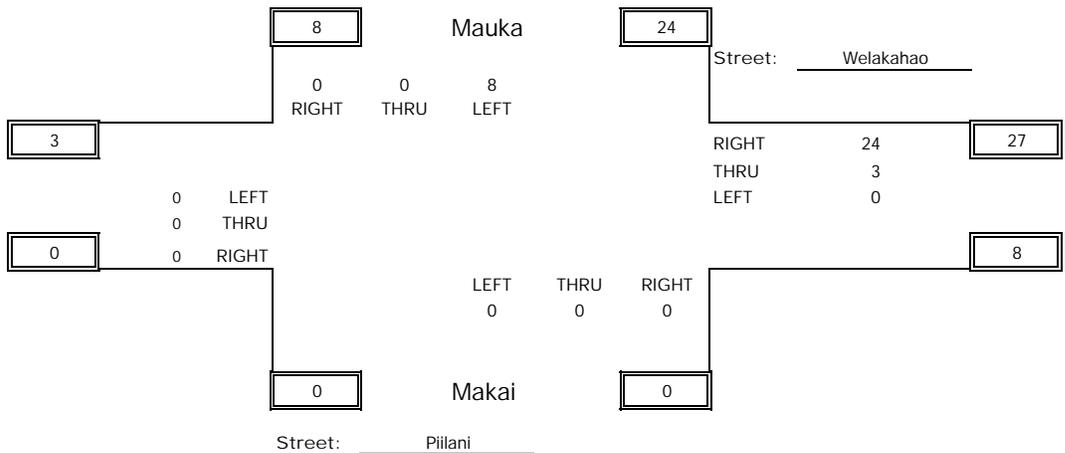
Weather: 0



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 PM - 3:45 PM	0	0	0	0	0	2	13	4	0	2	0	0	21	47
3:45 PM - 4:00 PM	0	0	0	0	0	3	3	0	0	0	0	0	6	35
4:00 PM - 4:15 PM	0	0	0	0	0	2	12	2	0	0	0	0	16	32
4:15 PM - 4:30 PM	0	0	0	0	0	0	4	0	0	0	0	0	4	24
4:30 PM - 4:45 PM	0	0	0	0	0	3	5	1	0	0	0	0	9	24
4:45 PM - 5:00 PM	0	0	0	0	0	0	2	1	0	0	0	0	3	
5:00 PM - 5:15 PM	0	0	0	0	0	3	4	0	0	1	0	0	8	
5:15 PM - 5:30 PM	0	0	0	0	0	1	2	1	0	0	0	0	4	
Phf	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.667	0.500	0.375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	Peak	Phf
3:45 PM - 4:45 PM	0	0	0	0	0	8	24	3	0	0	0	0	35	0.417

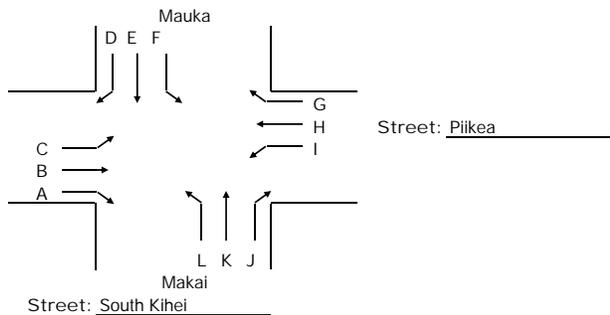
Peak Hour

3:45 PM - 4:45 PM

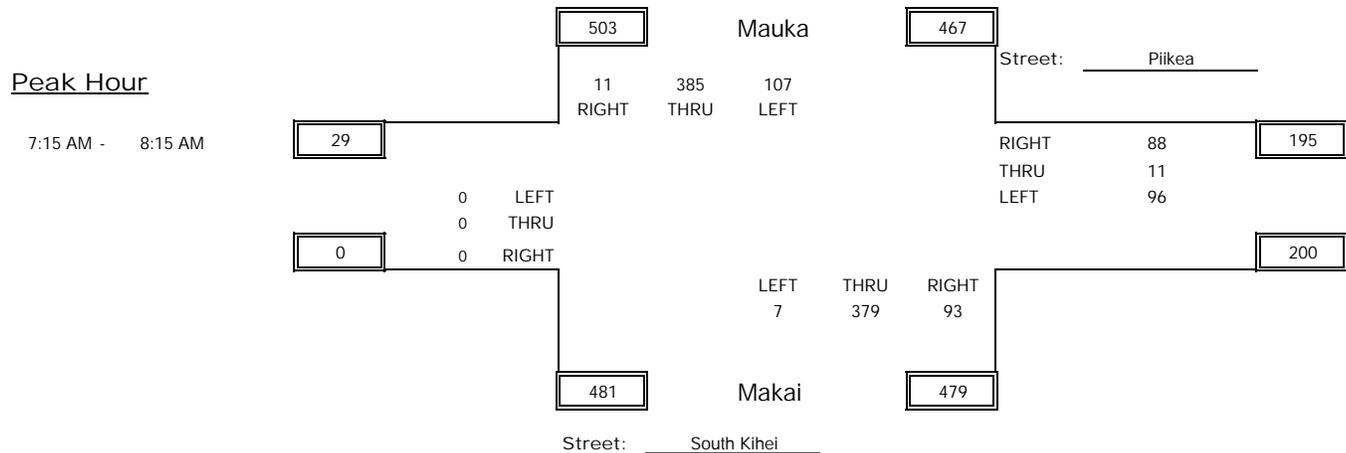


AM COUNT SHEET

Intersection: South Kihei Rd & Piikea
 Date: 11/17/2010
 By: 0
 Weather: 0

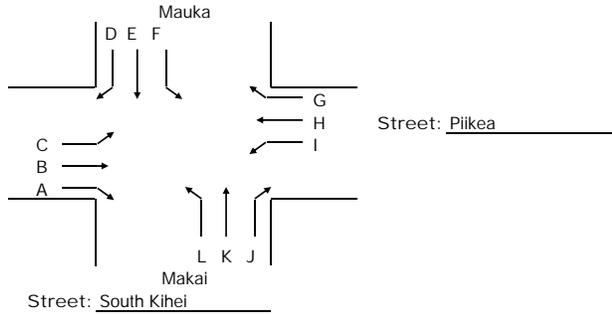


TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	0	0	0	0	46	12	6	0	6	9	51	3	133	814
6:45 AM - 7:00 AM	0	0	0	4	68	18	12	1	13	17	67	0	200	1005
7:00 AM - 7:15 AM	0	0	0	3	82	21	19	0	14	13	59	3	214	1141
7:15 AM - 7:30 AM	0	0	0	3	96	26	18	1	13	21	88	1	267	1177
7:30 AM - 7:45 AM	0	0	0	3	112	35	27	1	25	28	93	0	324	1177
7:45 AM - 8:00 AM	0	0	0	4	97	29	25	5	34	26	114	2	336	
8:00 AM - 8:15 AM	0	0	0	1	80	17	18	4	24	18	84	4	250	
8:15 AM - 8:30 AM	0	0	0	7	94	15	15	2	26	28	79	1	267	
8:30 AM - 8:45 AM														
8:45 AM - 9:00 AM														
Phf	#DIV/0!	#DIV/0!	#DIV/0!	0.688	0.859	0.764	0.815	0.550	0.706	0.830	0.831	0.438	Peak	Phf
7:15 AM - 8:15 AM	0	0	0	11	385	107	88	11	96	93	379	7	1177	0.876

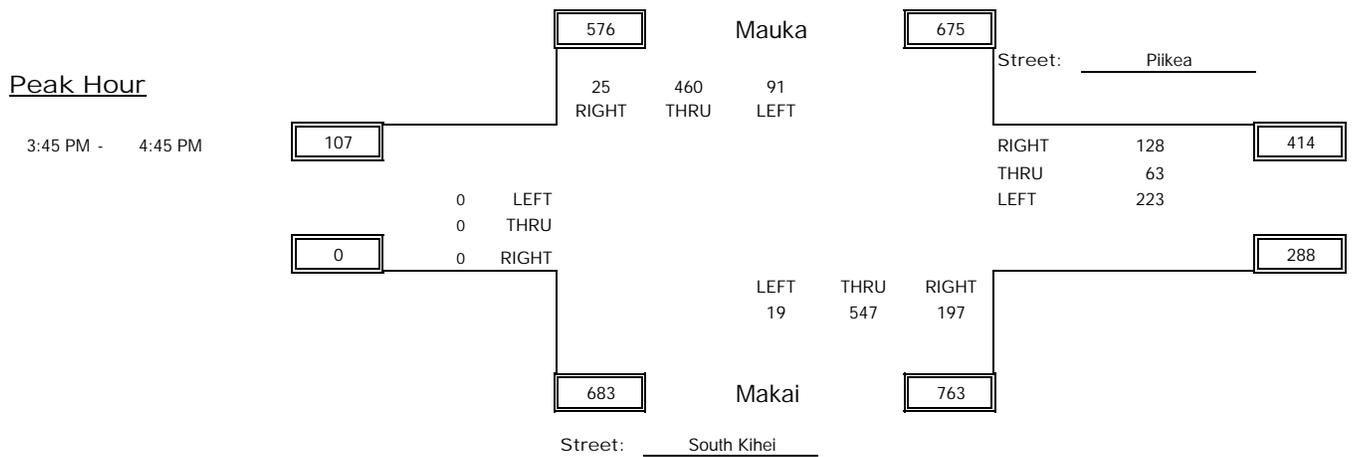


PM COUNT SHEET

Intersection: South Kihei Rd & Piikea
 Date: 11/16/2010
 By: 0
 Weather: 0

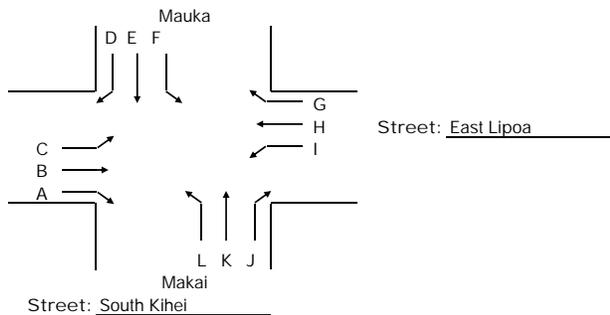


TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 PM - 3:45 PM	0	0	0	2	120	28	36	10	55	44	137	2	434	1749
3:45 PM - 4:00 PM	0	0	0	7	97	22	34	30	49	49	130	8	426	1753
4:00 PM - 4:15 PM	0	0	0	5	130	27	36	6	59	42	140	4	449	1736
4:15 PM - 4:30 PM	0	0	0	8	107	17	32	19	54	56	144	3	440	1653
4:30 PM - 4:45 PM	0	0	0	5	126	25	26	8	61	50	133	4	438	1643
4:45 PM - 5:00 PM	0	0	0	4	122	20	33	8	37	48	135	2	409	1563
5:00 PM - 5:15 PM	0	0	0	2	114	15	28	2	37	37	131	0	366	
5:00 PM - 5:15 PM	0	0	0	5	124	28	26	5	67	50	124	1	430	
5:15 PM - 5:30 PM	0	0	0	5	100	17	24	3	55	28	125	1	358	
Phf	#DIV/0!	#DIV/0!	#DIV/0!	0.781	0.885	0.843	0.889	0.525	0.914	0.879	0.950	0.594	Peak	Phf
3:45 PM - 4:45 PM	0	0	0	25	460	91	128	63	223	197	547	19	1753	0.976

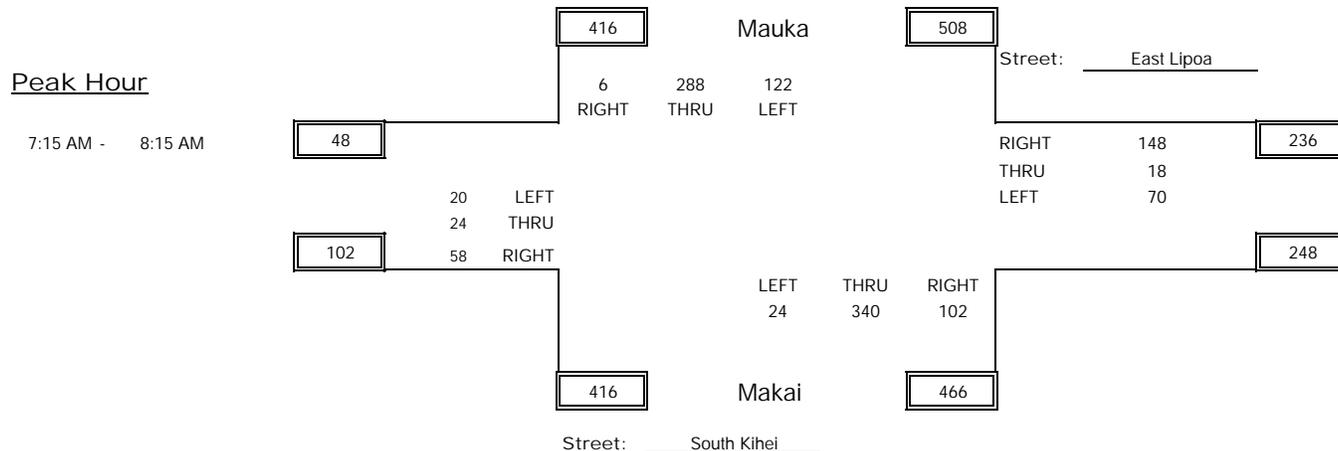


AM COUNT SHEET

Intersection: South Kihei Rd & East Lipoa St
 Date: 11/18/2010
 By: 0
 Weather: 0

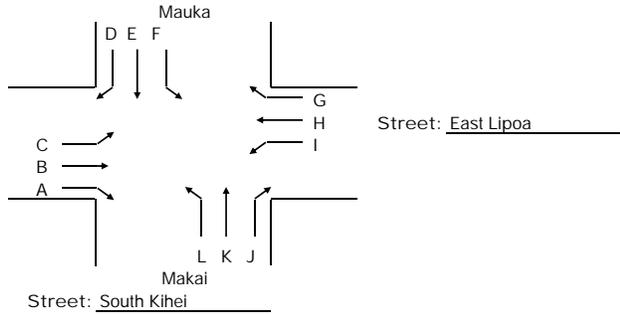


TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	4	3	1	4	35	13	11	3	7	17	56	3	157	834
6:45 AM - 7:00 AM	7	3	2	4	51	17	6	9	11	19	59	17	205	996
7:00 AM - 7:15 AM	3	4	3	3	44	16	15	6	6	25	62	6	193	1119
7:15 AM - 7:30 AM	7	3	2	2	58	32	28	2	20	30	91	4	279	1220
7:30 AM - 7:45 AM	22	10	7	1	68	42	48	3	16	27	67	8	319	1259
7:45 AM - 8:00 AM	19	4	7	1	76	25	49	8	21	26	88	4	328	
8:00 AM - 8:15 AM	10	7	4	2	86	23	23	5	13	19	94	8	294	
8:15 AM - 8:30 AM	17	6	5	3	89	31	15	5	23	25	96	3	318	
8:30 AM - 8:45 AM														
8:45 AM - 9:00 AM														
Phf	0.659	0.600	0.714	0.750	0.837	0.726	0.755	0.563	0.833	0.850	0.904	0.750	Peak	Phf
7:15 AM - 8:15 AM	58	24	20	6	288	122	148	18	70	102	340	24	1220	0.930

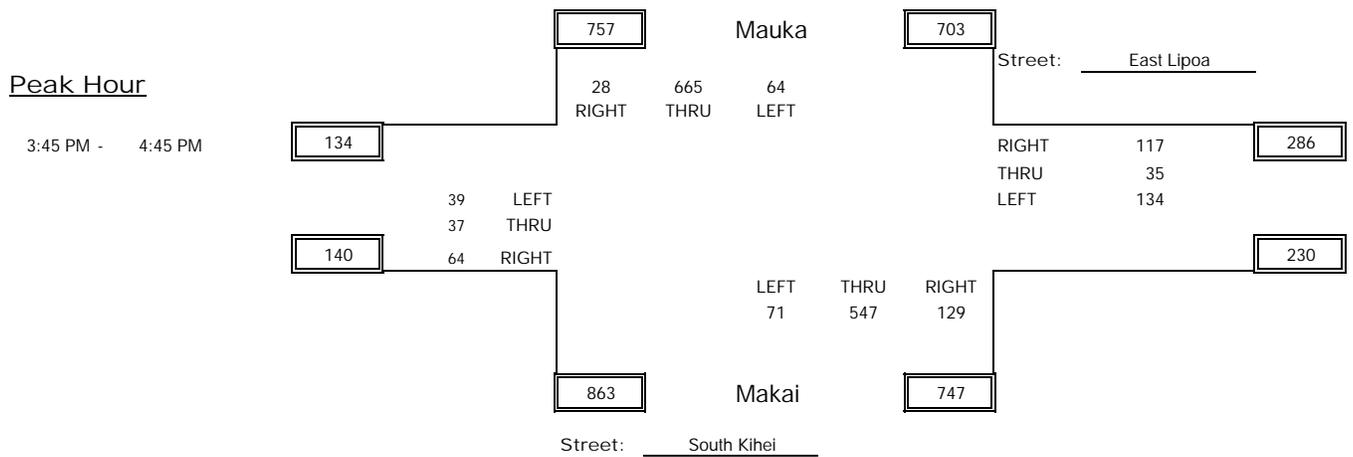


PM COUNT SHEET

Intersection: South Kihei Rd & East Lipoa St
 Date: 11/17/2010
 By: 0
 Weather: 0

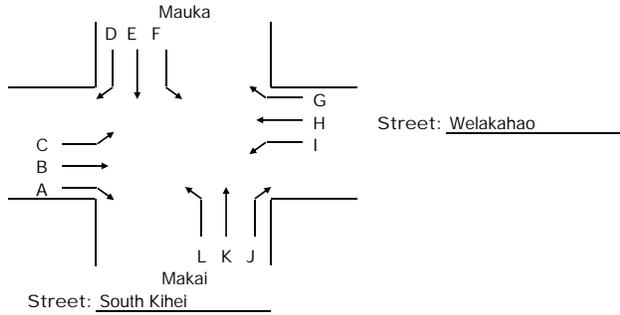


TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 PM - 3:45 PM	20	5	14	7	136	32	37	12	29	40	139	7	478	1933
3:45 PM - 4:00 PM	8	7	8	11	189	25	33	6	34	37	136	10	504	1930
4:00 PM - 4:15 PM	14	9	9	5	161	11	32	8	27	39	142	15	472	1922
4:15 PM - 4:30 PM	19	11	15	8	150	20	28	9	43	24	133	19	479	1926
4:30 PM - 4:45 PM	23	10	7	4	165	8	24	12	30	29	136	27	475	1931
4:45 PM - 5:00 PM	24	19	15	5	155	23	31	8	39	40	123	14	496	
5:00 PM - 5:15 PM	18	11	7	5	158	14	37	11	17	20	163	15	476	
5:00 PM - 5:15 PM	22	8	17	9	181	19	19	11	20	36	112	30	484	
5:15 PM - 5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
Phf	0.696	0.841	0.650	0.636	0.880	0.640	0.886	0.729	0.779	0.827	0.963	0.657	Peak	Phf
3:45 PM - 4:45 PM	64	37	39	28	665	64	117	35	134	129	547	71	1930	0.957

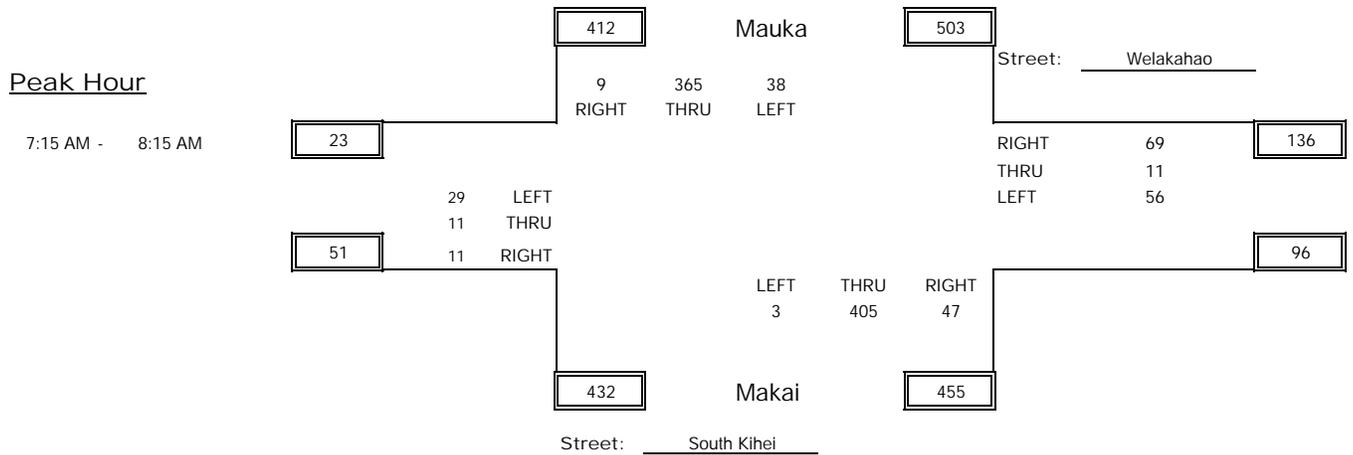


AM COUNT SHEET

Intersection: South Kihei Rd & Welakahao
 Date: 11/18/2010
 By: 0
 Weather: 0

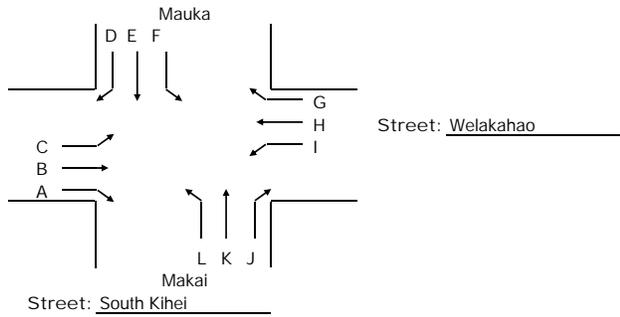


TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	1	2	4	0	18	2	2	0	4	3	27	1	64	662
6:45 AM - 7:00 AM	1	8	6	6	47	2	5	3	11	17	76	0	182	861
7:00 AM - 7:15 AM	0	3	5	1	66	2	6	1	9	8	90	2	193	987
7:15 AM - 7:30 AM	2	2	5	0	60	3	14	1	11	17	108	0	223	1054
7:30 AM - 7:45 AM	4	3	11	4	88	13	17	4	11	6	100	2	263	1124
7:45 AM - 8:00 AM	1	3	6	2	124	12	28	3	12	16	101	0	308	
8:00 AM - 8:15 AM	4	3	7	3	93	10	10	3	22	8	96	1	260	
8:15 AM - 8:30 AM	4	3	5	3	115	7	10	2	10	16	115	3	293	
8:30 AM - 8:45 AM														
8:45 AM - 9:00 AM														
Phf	0.688	0.917	0.659	0.563	0.736	0.731	0.616	0.688	0.636	0.691	0.938	0.375	Peak	Phf
7:15 AM - 8:15 AM	11	11	29	9	365	38	69	11	56	47	405	3	1054	0.856

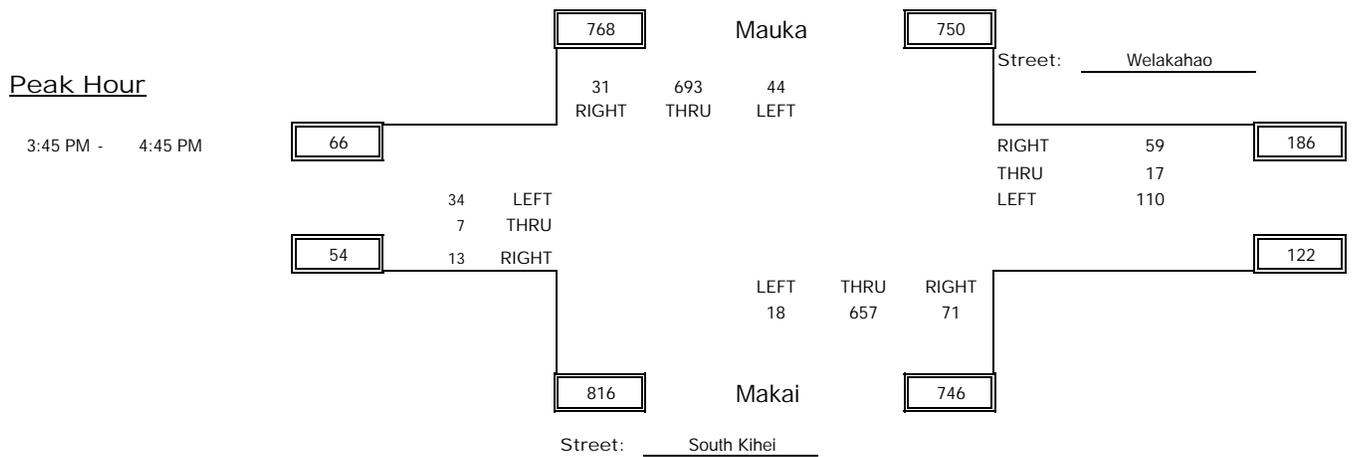


PM COUNT SHEET

Intersection: South Kihei Rd & Welakahao
 Date: 11/17/2010
 By: 0
 Weather: 0

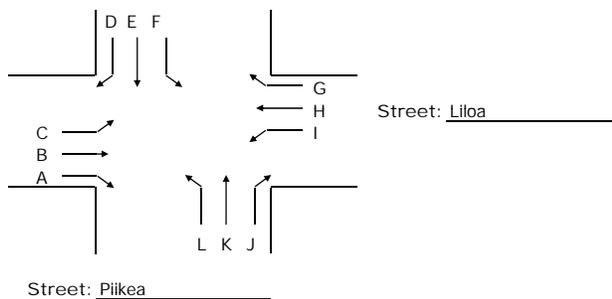


TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 PM - 3:45 PM	2	2	6	3	170	8	17	3	26	19	157	6	419	1723
3:45 PM - 4:00 PM	6	1	13	5	166	13	9	5	30	19	154	4	425	1754
4:00 PM - 4:15 PM	3	0	6	7	181	10	17	6	31	24	165	4	454	1808
4:15 PM - 4:30 PM	2	2	7	9	169	11	16	3	24	11	165	6	425	1770
4:30 PM - 4:45 PM	2	4	8	10	177	10	17	3	25	17	173	4	450	1676
4:45 PM - 5:00 PM	6	1	5	14	207	13	13	3	29	9	175	4	479	
5:00 PM - 5:15 PM	3	3	11	5	149	10	17	4	25	18	169	2	416	
5:00 PM - 5:15 PM	3	3	3	5	146	8	11	6	19	10	115	2	331	
5:15 PM - 5:30 PM														
Phf	0.542	0.438	0.654	0.775	0.957	0.846	0.868	0.708	0.887	0.740	0.949	0.750	Peak	Phf
3:45 PM - 4:45 PM	13	7	34	31	693	44	59	17	110	71	657	18	1754	0.966

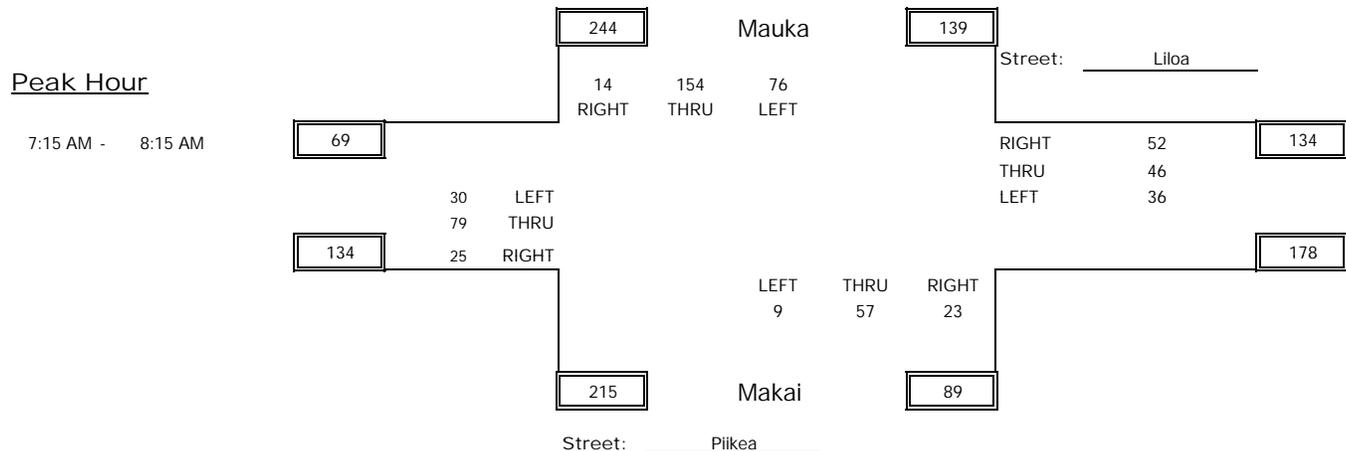


AM COUNT SHEET

Intersection: Liloa St & Piikea Ave
 Date: 1/8/2013
 By: Linda McLain
 Weather: 0



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	7	10	10	5	20	4	8	4	1	2	22	2	95	492
6:45 AM - 7:00 AM	10	15	14	2	33	7	6	6	2	5	16	2	118	610
7:00 AM - 7:15 AM	4	13	10	3	30	24	4	5	3	1	10	2	109	611
7:15 AM - 7:30 AM	11	30	9	3	40	21	15	8	4	7	22	0	170	601
7:30 AM - 7:45 AM	8	32	11	2	38	36	24	19	15	10	13	5	213	544
7:45 AM - 8:00 AM	2	10	9	4	33	12	9	15	10	1	11	3	119	
8:00 AM - 8:15 AM	4	7	1	5	43	7	4	4	7	5	11	1	99	
8:15 AM - 8:30 AM	7	8	8	7	38	9	3	7	1	5	18	2	113	
8:30 AM - 8:45 AM														
8:45 AM - 9:00 AM														
Phf	0.568	0.617	0.682	0.700	0.895	0.528	0.542	0.605	0.600	0.575	0.648	0.450	Peak	Phf
7:15 AM - 8:15 AM	25	79	30	14	154	76	52	46	36	23	57	9	601	0.705



PM COUNT SHEET

Intersection: Liloa St & Piikea Ave

Date: 1/8/2013

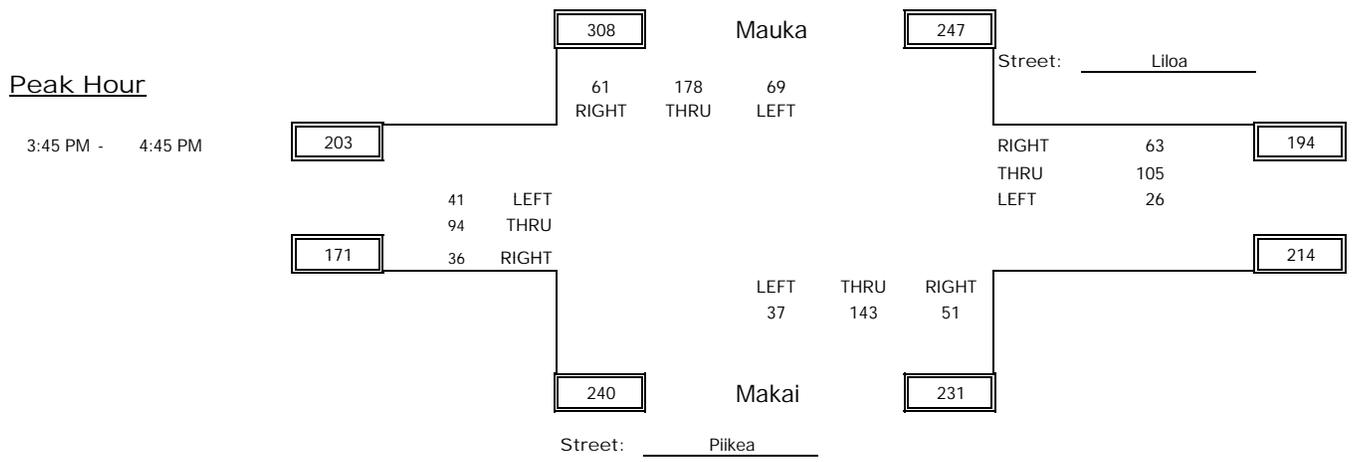
By: Linda McLain

Weather: 0

Street: Liloa

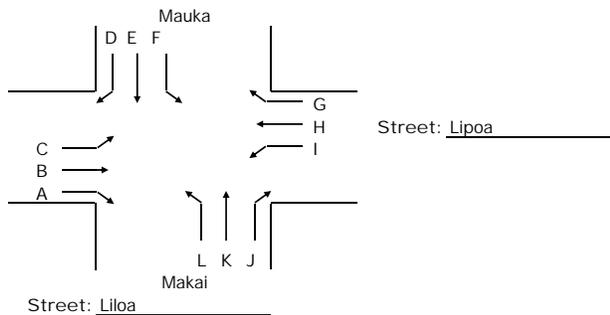
Street: Piikea

TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:15 PM - 3:30 PM	8	30	2	5	50	5	10	27	1	10	53	17	218	944
3:30 PM - 3:45 PM	2	17	8	11	65	12	8	28	2	16	38	13	220	952
3:45 PM - 4:00 PM	17	32	1	23	53	20	23	33	10	16	46	21	295	904
4:00 PM - 4:15 PM	8	21	11	13	48	15	17	25	6	2	35	10	211	759
4:15 PM - 4:30 PM	9	20	17	17	43	17	10	24	5	20	40	4	226	672
4:30 PM - 4:45 PM	2	21	12	8	34	17	13	23	5	13	22	2	172	
4:45 PM - 5:00 PM	7	13	4	6	35	13	8	23	7	6	25	3	150	
5:00 PM - 5:15 PM	3	17	8	5	31	1	11	18	2	2	20	6	124	
5:15 PM - 5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
Phf	0.529	0.734	0.603	0.663	0.840	0.863	0.685	0.795	0.650	0.638	0.777	0.440	Peak	Phf
3:45 PM - 4:45 PM	36	94	41	61	178	69	63	105	26	51	143	37	904	0.766

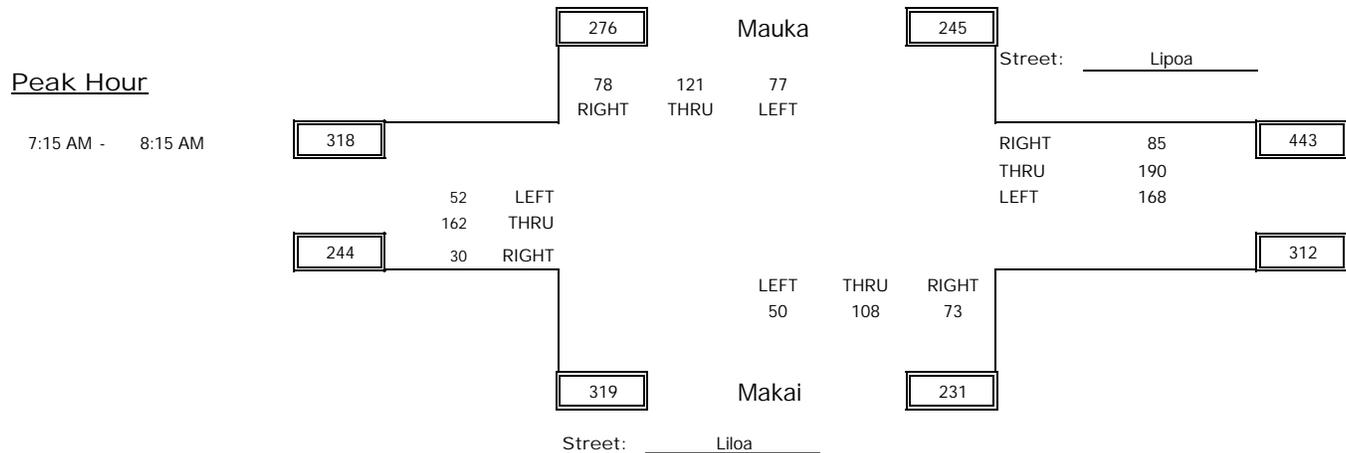


AM COUNT SHEET

Intersection: Liloa Dr & Liloa St
 Date: 11/17/2010
 By: 0
 Weather: 0

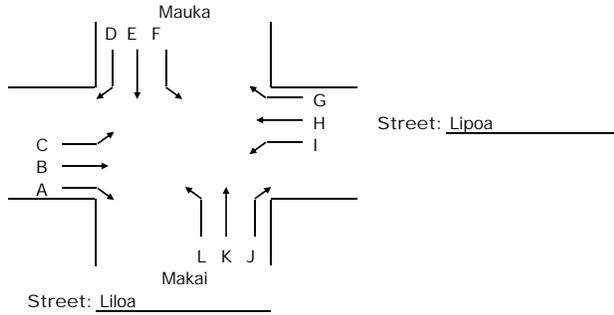


TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 AM - 6:45 AM	1	25	5	3	10	11	7	18	17	12	1	2	112	736
6:45 AM - 7:00 AM	5	29	4	10	13	9	9	32	24	8	1	0	144	1033
7:00 AM - 7:15 AM	8	23	12	10	19	12	5	19	38	21	15	6	188	1224
7:15 AM - 7:30 AM	18	43	9	14	14	34	21	42	47	23	17	10	292	1194
7:30 AM - 7:45 AM	7	48	17	17	67	28	20	44	84	24	44	9	409	1037
7:45 AM - 8:00 AM	3	42	14	27	32	11	36	63	28	14	35	30	335	
8:00 AM - 8:15 AM	2	29	12	20	8	4	8	41	9	12	12	1	158	
8:15 AM - 8:30 AM	3	23	9	15	11	2	4	38	14	7	5	4	135	
8:30 AM - 8:45 AM														
8:45 AM - 9:00 AM														
Phf	0.417	0.844	0.765	0.722	0.451	0.566	0.590	0.754	0.500	0.760	0.614	0.417	Peak	Phf
7:15 AM - 8:15 AM	30	162	52	78	121	77	85	190	168	73	108	50	1194	0.730

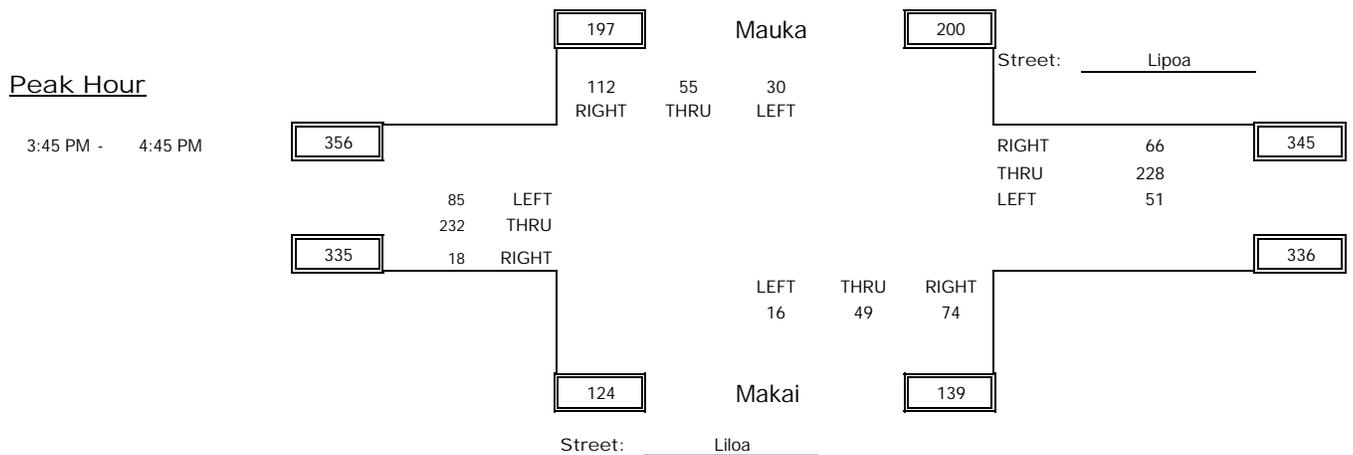


PM COUNT SHEET

Intersection: Liloa Dr & Liloa St
 Date: 11/17/2010
 By: 0
 Weather: 0



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 PM - 3:45 PM	3	58	15	27	9	6	27	52	18	31	26	3	275	1071
3:45 PM - 4:00 PM	4	55	31	25	17	4	14	57	10	28	17	4	266	1016
4:00 PM - 4:15 PM	9	60	23	35	13	8	15	58	15	13	9	3	261	1008
4:15 PM - 4:30 PM	1	80	15	23	6	8	18	65	16	21	10	6	269	970
4:30 PM - 4:45 PM	4	37	16	29	19	10	19	48	10	12	13	3	220	919
4:45 PM - 5:00 PM	1	70	16	24	11	7	20	62	10	12	18	7	258	
5:00 PM - 5:15 PM	3	68	19	14	8	10	12	41	13	16	15	4	223	
5:00 PM - 5:15 PM	4	54	15	26	2	5	21	45	12	20	10	4	218	
5:15 PM - 5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	
Phf	0.500	0.725	0.685	0.800	0.724	0.750	0.868	0.877	0.797	0.661	0.721	0.667	Peak	Phf
3:45 PM - 4:45 PM	18	232	85	112	55	30	66	228	51	74	49	16	1016	0.924



Appendix B Level of Service Definitions

The Highway Capacity Manual defines six Intersection Levels of Service (LOS), labeled A through F, from free flow to congested conditions.

Levels of Service for signalized intersections is defined in terms of control delay, which is a measure of driver discomfort, frustration, fuel consumption, and increased travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, geometrics, traffic, and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during base conditions: in the absence of traffic control, geometric delay, any incidents, and any other vehicles. Specifically, LOS criteria for traffic signals are stated in terms of the average control delay per vehicle, typically for a 15-minute analysis period. Delay is a complex measure and depends on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group.

LEVEL-OF-SERVICE A: Low control delay, up to 10 s/veh. This LOS occurs when progression is extremely favorable and most vehicles arrive during the green phase. Many vehicles do not stop at all. Short cycle lengths may tend to contribute to low delay values.

LEVEL-OF-SERVICE B: Control delay greater than 10 and up to 20 s/veh. This level generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of delay.

LEVEL-OF-SERVICE C: Control delay greater than 20 and up to 35 s/veh. These higher delays may result from only fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. Cycle failure occurs when a given green phase does not serve queued vehicles, and overflows occur. The number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.

LEVEL-OF-SERVICE D: Control delay greater than 35 and up to 55 s/veh. At LOS D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, and high v/c ratios.

Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

LEVEL-OF-SERVICE E: Control delay greater than 55 and up to 80 s/veh. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent.

LEVEL-OF-SERVICE F: Control delay in excess of 80 s/veh. This level, considered unacceptable to most drivers, often occurs with oversaturation, that is when arrival flow rates exceed the capacity of lane groups. It may also occur at high v/c ratios with many individual cycle failures. Poor progression and long cycle lengths may also contribute significantly to high delay levels.

For unsignalized intersections, the Highway Capacity Manual evaluates gaps in the major street traffic flow and calculates available gaps for left-turns across oncoming traffic and for the left and right-turns onto the major roadway from the minor street. Average control delay, based on these factors, is still used to define the levels of service.

LEVEL-OF-SERVICE A: Low control delay, up to 10 s/veh.

LEVEL-OF-SERVICE B: Control delay greater than 10 and up to 15 s/veh.

LEVEL-OF-SERVICE C: Control delay greater than 15 and up to 25 s/veh.

LEVEL-OF-SERVICE D: Control delay greater than 25 and up to 35 s/veh.

LEVEL-OF-SERVICE E: Control delay greater than 35 and up to 50 s/veh.

LEVEL-OF-SERVICE F: Control delay in excess of 50 s/veh.

Appendix C Intersection Capacity Analysis Worksheets

HCM Unsignalized Intersection Capacity Analysis

3: Old Welakahao Road & Pi'ilani Highway

AM Existing
2/6/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	24	961	4	33	1083
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	26	1045	4	36	1177
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1707	524			1049	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1707	524			1049	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	92	95			95	
cM capacity (veh/h)	78	498			659	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	33	696	353	36	589	589
Volume Left	7	0	0	36	0	0
Volume Right	26	0	4	0	0	0
cSH	239	1700	1700	659	1700	1700
Volume to Capacity	0.14	0.41	0.21	0.05	0.35	0.35
Queue Length 95th (ft)	12	0	0	4	0	0
Control Delay (s)	22.4	0.0	0.0	10.8	0.0	0.0
Lane LOS	C			B		
Approach Delay (s)	22.4	0.0		0.3		
Approach LOS	C					

Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			39.9%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

7: East Welakahao Road & Pi'ilani Highway

AM Existing
2/6/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	116	58	31	954	1058	108
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	126	63	34	1037	1150	117
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)	6					
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1736	575	1150			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1736	575	1150			
tC, single (s)	*5.0	*5.0	*5.0			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	29	90	93			
cM capacity (veh/h)	177	629	458			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	189	34	518	518	575	575	117
Volume Left	126	34	0	0	0	0	0
Volume Right	63	0	0	0	0	0	117
cSH	265	458	1700	1700	1700	1700	1700
Volume to Capacity	0.71	0.07	0.30	0.30	0.34	0.34	0.07
Queue Length 95th (ft)	123	6	0	0	0	0	0
Control Delay (s)	46.7	13.5	0.0	0.0	0.0	0.0	0.0
Lane LOS	E	B					
Approach Delay (s)	46.7	0.4	0.0				
Approach LOS	E						

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	42.3%	ICU Level of Service	A
Analysis Period (min)	15		

* User Entered Value

HCM Signalized Intersection Capacity Analysis

8: West Welakahao Road & South Kihei Road

AM Existing
2/6/2013



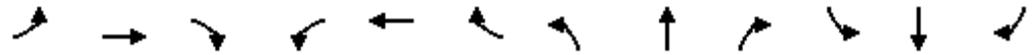
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔	↔	↔		↔	↔	
Volume (vph)	29	11	11	56	11	69	3	405	47	38	365	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.98		1.00	1.00	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1759			1788	1583	1770	1834		1770	1856	
Flt Permitted		0.78			0.72	1.00	0.49	1.00		0.35	1.00	
Satd. Flow (perm)		1415			1345	1583	922	1834		645	1856	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	32	12	12	61	12	75	3	440	51	41	397	10
RTOR Reduction (vph)	0	10	0	0	0	62	0	6	0	0	1	0
Lane Group Flow (vph)	0	46	0	0	73	13	3	485	0	41	406	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		6.1			6.1	6.1	13.7	13.2		14.9	13.8	
Effective Green, g (s)		6.1			6.1	6.1	13.7	13.2		14.9	13.8	
Actuated g/C Ratio		0.17			0.17	0.17	0.39	0.37		0.42	0.39	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		244			232	273	369	684		306	724	
v/s Ratio Prot							0.00	c0.26		c0.00	0.22	
v/s Ratio Perm		0.03			c0.05	0.01	0.00			0.05		
v/c Ratio		0.19			0.31	0.05	0.01	0.71		0.13	0.56	
Uniform Delay, d1		12.5			12.8	12.2	6.7	9.5		6.3	8.4	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.4			0.8	0.1	0.0	3.4		0.2	1.0	
Delay (s)		12.9			13.6	12.3	6.7	12.8		6.5	9.4	
Level of Service		B			B	B	A	B		A	A	
Approach Delay (s)		12.9			12.9			12.8			9.2	
Approach LOS		B			B			B			A	

Intersection Summary

HCM Average Control Delay	11.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	35.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 11: East Lipoa Street & Pi'ilani Highway

AM Existing
 2/6/2013



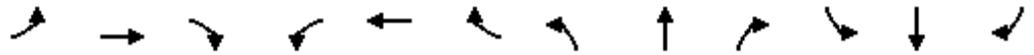
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↗	↗	↖	↗	↗
Volume (vph)	231	13	96	6	1	14	101	933	36	130	1064	332
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1779	1583		1785	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.95	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1779	1583		1785	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	251	14	104	7	1	15	110	1014	39	141	1157	361
RTOR Reduction (vph)	0	0	81	0	0	15	0	0	23	0	0	170
Lane Group Flow (vph)	0	265	23	0	8	0	110	1014	16	141	1157	191
Turn Type	Split		Perm	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)		23.0	23.0		3.3	3.3	12.1	43.9	43.9	13.8	45.6	45.6
Effective Green, g (s)		23.0	23.0		3.3	3.3	12.1	43.9	43.9	13.8	45.6	45.6
Actuated g/C Ratio		0.22	0.22		0.03	0.03	0.11	0.41	0.41	0.13	0.43	0.43
Clearance Time (s)		5.0	5.0		5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		386	343		56	49	202	1466	656	230	1522	681
v/s Ratio Prot		c0.15			c0.00		0.06	0.29		c0.08	c0.33	
v/s Ratio Perm			0.01			0.00			0.01			0.12
v/c Ratio		0.69	0.07		0.14	0.01	0.54	0.69	0.02	0.61	0.76	0.28
Uniform Delay, d1		38.2	33.0		50.0	49.8	44.3	25.5	18.4	43.6	25.6	19.6
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		5.0	0.1		1.2	0.1	3.0	1.4	0.0	4.8	2.3	0.2
Delay (s)		43.2	33.0		51.1	49.8	47.3	26.9	18.4	48.4	27.9	19.8
Level of Service		D	C		D	D	D	C	B	D	C	B
Approach Delay (s)		40.3			50.3			28.6			27.8	
Approach LOS		D			D			C			C	

Intersection Summary

HCM Average Control Delay	29.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	106.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	69.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 12: West Lipoa Street & South Kihei Road

AM Existing
 2/6/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Volume (vph)	20	24	58	70	18	148	24	340	102	122	288	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1821	1583		1792	1583	1770	1863	1583	1770	1857	
Flt Permitted		0.83	1.00		0.74	1.00	0.57	1.00	1.00	0.43	1.00	
Satd. Flow (perm)		1542	1583		1375	1583	1055	1863	1583	809	1857	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	26	63	76	20	161	26	370	111	133	313	7
RTOR Reduction (vph)	0	0	51	0	0	130	0	0	67	0	1	0
Lane Group Flow (vph)	0	48	12	0	96	31	26	370	44	133	319	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)		8.7	8.7		8.7	8.7	18.8	17.8	17.8	22.8	19.8	
Effective Green, g (s)		8.7	8.7		8.7	8.7	18.8	17.8	17.8	22.8	19.8	
Actuated g/C Ratio		0.20	0.20		0.20	0.20	0.42	0.40	0.40	0.51	0.44	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		301	309		269	309	462	745	633	479	826	
v/s Ratio Prot							0.00	c0.20		c0.02	0.17	
v/s Ratio Perm		0.03	0.01		c0.07	0.02	0.02		0.03	0.12		
v/c Ratio		0.16	0.04		0.36	0.10	0.06	0.50	0.07	0.28	0.39	
Uniform Delay, d1		14.9	14.5		15.5	14.7	7.5	10.0	8.2	5.9	8.3	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.2	0.1		0.8	0.1	0.1	0.5	0.0	0.3	0.3	
Delay (s)		15.1	14.6		16.3	14.8	7.6	10.5	8.3	6.2	8.6	
Level of Service		B	B		B	B	A	B	A	A	A	
Approach Delay (s)		14.8			15.4			9.9			7.9	
Approach LOS		B			B			A			A	

Intersection Summary		
HCM Average Control Delay	10.7	HCM Level of Service
HCM Volume to Capacity ratio	0.43	B
Actuated Cycle Length (s)	44.5	Sum of lost time (s)
Intersection Capacity Utilization	48.6%	15.0
Analysis Period (min)	15	ICU Level of Service
c Critical Lane Group		A

HCM Signalized Intersection Capacity Analysis

15: Pi'ikea Avenue & Pi'ilani Highway

AM Existing
2/6/2013



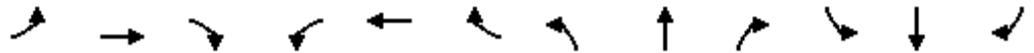
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	279	205	131	1058	1347	358
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	1770	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	303	223	142	1150	1464	389
RTOR Reduction (vph)	0	0	0	0	0	184
Lane Group Flow (vph)	303	223	142	1150	1464	205
Turn Type		Free	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Actuated Green, G (s)	26.6	121.7	14.1	84.1	64.0	64.0
Effective Green, g (s)	26.6	121.7	14.1	84.1	64.0	64.0
Actuated g/C Ratio	0.22	1.00	0.12	0.69	0.53	0.53
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	387	1583	205	2446	1861	832
v/s Ratio Prot	c0.17		c0.08	0.32	c0.41	
v/s Ratio Perm		0.14				0.13
v/c Ratio	0.78	0.14	0.69	0.47	0.79	0.25
Uniform Delay, d1	44.8	0.0	51.7	8.6	23.3	15.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.9	0.2	9.7	0.1	2.3	0.2
Delay (s)	54.8	0.2	61.4	8.7	25.6	15.9
Level of Service	D	A	E	A	C	B
Approach Delay (s)	31.6			14.5	23.6	
Approach LOS	C			B	C	

Intersection Summary

HCM Average Control Delay	21.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	121.7	Sum of lost time (s)	17.0
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Pi'ikea Avenue & South Kihei Road

AM Existing
 2/6/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↗	↖	↑	↗	↖	↕	↕
Volume (vph)	0	0	0	96	11	88	7	379	93	107	385	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt					1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected					0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1783	1583	1770	1863	1583	1770	3524	
Flt Permitted					0.96	1.00	0.50	1.00	1.00	0.33	1.00	
Satd. Flow (perm)					1783	1583	934	1863	1583	619	3524	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	104	12	96	8	412	101	116	418	12
RTOR Reduction (vph)	0	0	0	0	0	81	0	0	64	0	3	0
Lane Group Flow (vph)	0	0	0	0	116	15	8	412	37	116	427	0
Turn Type				Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases					8		5	2		1	6	
Permitted Phases				8		8	2		2	6		
Actuated Green, G (s)					6.4	6.4	15.8	15.0	15.0	24.0	19.1	
Effective Green, g (s)					6.4	6.4	15.8	15.0	15.0	24.0	19.1	
Actuated g/C Ratio					0.15	0.15	0.38	0.36	0.36	0.58	0.46	
Clearance Time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)					276	245	374	677	575	496	1630	
v/s Ratio Prot							0.00	c0.22		c0.03	0.12	
v/s Ratio Perm					0.07	0.01	0.01		0.02	0.11		
v/c Ratio					0.42	0.06	0.02	0.61	0.06	0.23	0.26	
Uniform Delay, d1					15.8	14.9	7.9	10.8	8.6	4.5	6.8	
Progression Factor					1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2					1.0	0.1	0.0	1.6	0.0	0.2	0.1	
Delay (s)					16.8	15.0	7.9	12.3	8.6	4.8	6.9	
Level of Service					B	B	A	B	A	A	A	
Approach Delay (s)		0.0			16.0			11.5			6.4	
Approach LOS		A			B			B			A	

Intersection Summary

HCM Average Control Delay	10.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	41.3	Sum of lost time (s)	20.0
Intersection Capacity Utilization	44.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 19: East Waipuilani Road & Pi'ilani Highway

AM Existing
 2/6/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↕↗	↕↗	↗
Volume (veh/h)	0	30	0	1306	1691	76
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	33	0	1420	1838	83
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2548	919	1838			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2548	919	1838			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	88	100			
cM capacity (veh/h)	22	273	327			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	33	710	710	919	919	83
Volume Left	0	0	0	0	0	0
Volume Right	33	0	0	0	0	83
cSH	273	1700	1700	1700	1700	1700
Volume to Capacity	0.12	0.42	0.42	0.54	0.54	0.05
Queue Length 95th (ft)	10	0	0	0	0	0
Control Delay (s)	19.9	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	19.9	0.0		0.0		
Approach LOS	C					

Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization		56.7%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis

21: East Lipoa Street & Liloa Drive

AM Existing
2/6/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	162	30	168	190	85	50	108	73	77	121	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1819		1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.63	1.00		0.47	1.00	1.00	0.67	1.00	1.00	0.68	1.00	1.00
Satd. Flow (perm)	1170	1819		884	1863	1583	1253	1863	1583	1270	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	57	176	33	183	207	92	54	117	79	84	132	85
RTOR Reduction (vph)	0	7	0	0	0	52	0	0	66	0	0	71
Lane Group Flow (vph)	57	202	0	183	207	40	54	117	13	84	132	14
Turn Type	pm+pt			pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	14.7	13.4		23.3	17.7	17.7	6.6	6.6	6.6	6.6	6.6	6.6
Effective Green, g (s)	14.7	13.4		23.3	17.7	17.7	6.6	6.6	6.6	6.6	6.6	6.6
Actuated g/C Ratio	0.36	0.33		0.57	0.44	0.44	0.16	0.16	0.16	0.16	0.16	0.16
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	443	600		630	812	690	204	303	257	206	303	257
v/s Ratio Prot	0.00	0.11		c0.04	0.11			0.06			c0.07	
v/s Ratio Perm	0.04			c0.13		0.03	0.04		0.01	0.07		0.01
v/c Ratio	0.13	0.34		0.29	0.25	0.06	0.26	0.39	0.05	0.41	0.44	0.05
Uniform Delay, d1	8.5	10.2		4.4	7.3	6.6	14.9	15.2	14.4	15.2	15.3	14.4
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.3		0.3	0.2	0.0	0.7	0.8	0.1	1.3	1.0	0.1
Delay (s)	8.7	10.6		4.6	7.4	6.7	15.6	16.0	14.4	16.6	16.3	14.4
Level of Service	A	B		A	A	A	B	B	B	B	B	B
Approach Delay (s)		10.2			6.2			15.4			15.9	
Approach LOS		B			A			B			B	

Intersection Summary

HCM Average Control Delay	11.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	40.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	46.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection				
Intersection Delay, s/veh	5.8			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	97	265	146	146
Demand Flow Rate, veh/h	99	270	149	150
Vehicles Circulating, veh/h	207	101	107	295
Vehicles Exiting, veh/h	238	155	198	76
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	5.0	6.2	5.0	6.2
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	99	270	149	150
Cap Entry Lane, veh/h	919	1021	1015	841
Entry HV Adj Factor	0.977	0.980	0.980	0.975
Flow Entry, veh/h	97	265	146	146
Cap Entry, veh/h	898	1001	995	820
V/C Ratio	1.08	2.64	1.47	1.78
Control Delay, s/veh	5.0	6.2	5.0	6.2
LOS	A	A	A	A
95th %tile Queue, veh	0.0	0.1	0.1	0.1

HCM Unsignalized Intersection Capacity Analysis

33: Kulanihako'i Street & Pi'ilani Highway

AM Existing
2/6/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	47	56	46	1260	1711	32
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	51	61	50	1370	1860	35
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2645	930	1895			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2645	930	1895			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	77	84			
cM capacity (veh/h)	16	269	311			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	51	61	50	685	685	930	930	35
Volume Left	51	0	50	0	0	0	0	0
Volume Right	0	61	0	0	0	0	0	35
cSH	16	269	311	1700	1700	1700	1700	1700
Volume to Capacity	3.24	0.23	0.16	0.40	0.40	0.55	0.55	0.02
Queue Length 95th (ft)	Err	21	14	0	0	0	0	0
Control Delay (s)	Err	22.3	18.8	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	C	C					
Approach Delay (s)	4574.8		0.7		0.0			
Approach LOS	F							

Intersection Summary			
Average Delay	149.8		
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis

36: Kaonoulu Street & Pi'ilani Highway

AM Existing
2/6/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	24	198	61	1246	1545	24
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	26	215	66	1354	1679	26
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2489	840	1679			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2489	840	1679			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	30	82			
cM capacity (veh/h)	20	309	377			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	26	215	66	677	677	840	840	26
Volume Left	26	0	66	0	0	0	0	0
Volume Right	0	215	0	0	0	0	0	26
cSH	20	309	377	1700	1700	1700	1700	1700
Volume to Capacity	1.31	0.70	0.18	0.40	0.40	0.49	0.49	0.02
Queue Length 95th (ft)	89	122	16	0	0	0	0	0
Control Delay (s)	591.5	39.6	16.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	E	C					
Approach Delay (s)	99.3	0.8		0.0				
Approach LOS	F							

Intersection Summary			
Average Delay	7.4		
Intersection Capacity Utilization	61.6%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis

3: Old Welakahao Road & Pi'ilani Highway

PM Existing
2/6/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	3	24	1353	0	8	1021
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	26	1471	0	9	1110
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2043	735			1471	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2043	735			1471	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	93			98	
cM capacity (veh/h)	48	362			455	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	29	980	490	9	555	555
Volume Left	3	0	0	9	0	0
Volume Right	26	0	0	0	0	0
cSH	209	1700	1700	455	1700	1700
Volume to Capacity	0.14	0.58	0.29	0.02	0.33	0.33
Queue Length 95th (ft)	12	0	0	1	0	0
Control Delay (s)	25.0	0.0	0.0	13.1	0.0	0.0
Lane LOS	D			B		
Approach Delay (s)	25.0	0.0		0.1		
Approach LOS	D					
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			47.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 7: East Welakahao Road & Pi'ilani Highway

PM Existing
 2/6/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	132	57	106	1271	972	215
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	143	62	115	1382	1057	234
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)	6					
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1978	528	1057			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1978	528	1057			
tC, single (s)	*5.0	*5.0	*5.0			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	91	77			
cM capacity (veh/h)	115	658	509			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	205	115	691	691	528	528	234
Volume Left	143	115	0	0	0	0	0
Volume Right	62	0	0	0	0	0	234
cSH	160	509	1700	1700	1700	1700	1700
Volume to Capacity	1.29	0.23	0.41	0.41	0.31	0.31	0.14
Queue Length 95th (ft)	302	22	0	0	0	0	0
Control Delay (s)	223.4	14.1	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	B					
Approach Delay (s)	223.4	1.1			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay	15.9		
Intersection Capacity Utilization	50.1%	ICU Level of Service	A
Analysis Period (min)	15		

* User Entered Value

HCM Signalized Intersection Capacity Analysis

8: West Welakahao Road & South Kihei Road

PM Existing
2/6/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔	↔	↔		↔	↔	
Volume (vph)	34	7	13	110	17	59	18	657	71	44	693	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1748			1785	1583	1770	1836		1770	1851	
Flt Permitted		0.73			0.71	1.00	0.24	1.00		0.19	1.00	
Satd. Flow (perm)		1315			1327	1583	439	1836		354	1851	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	8	14	120	18	64	20	714	77	48	753	34
RTOR Reduction (vph)	0	12	0	0	0	54	0	3	0	0	2	0
Lane Group Flow (vph)	0	47	0	0	138	10	20	788	0	48	785	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		9.5			9.5	9.5	36.0	35.4		39.6	37.2	
Effective Green, g (s)		9.5			9.5	9.5	36.0	35.4		39.6	37.2	
Actuated g/C Ratio		0.15			0.15	0.15	0.58	0.57		0.64	0.60	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		201			202	241	266	1043		280	1105	
v/s Ratio Prot							0.00	c0.43		c0.01	0.42	
v/s Ratio Perm		0.04			c0.10	0.01	0.04			0.10		
v/c Ratio		0.23			0.68	0.04	0.08	0.76		0.17	0.71	
Uniform Delay, d1		23.2			25.0	22.5	6.9	10.2		7.0	8.8	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6			9.2	0.1	0.1	3.2		0.3	2.2	
Delay (s)		23.8			34.1	22.6	7.1	13.3		7.3	11.0	
Level of Service		C			C	C	A	B		A	B	
Approach Delay (s)		23.8			30.5			13.2			10.8	
Approach LOS		C			C			B			B	

Intersection Summary

HCM Average Control Delay	14.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	62.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 11: East Lipoa Street & Pi'ilani Highway

PM Existing
 2/6/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↕	↗	↖	↕	↗
Volume (vph)	232	10	59	28	30	63	180	1210	13	79	1110	163
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1778	1583		1819	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.95	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1778	1583		1819	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	252	11	64	30	33	68	196	1315	14	86	1207	177
RTOR Reduction (vph)	0	0	51	0	0	62	0	0	6	0	0	81
Lane Group Flow (vph)	0	263	13	0	63	6	196	1315	8	86	1207	96
Turn Type	Split		Perm	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)		24.1	24.1		10.0	10.0	14.5	54.3	54.3	11.1	50.9	50.9
Effective Green, g (s)		24.1	24.1		10.0	10.0	14.5	54.3	54.3	11.1	50.9	50.9
Actuated g/C Ratio		0.20	0.20		0.08	0.08	0.12	0.45	0.45	0.09	0.42	0.42
Clearance Time (s)		5.0	5.0		5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		353	314		150	130	211	1582	707	162	1483	663
v/s Ratio Prot		c0.15			c0.03		c0.11	c0.37		0.05	0.34	
v/s Ratio Perm			0.01			0.00			0.00			0.06
v/c Ratio		0.75	0.04		0.42	0.04	0.93	0.83	0.01	0.53	0.81	0.14
Uniform Delay, d1		45.8	39.4		53.0	51.3	53.0	29.6	18.7	52.7	31.1	21.8
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		8.3	0.1		1.9	0.1	42.0	3.9	0.0	3.3	3.5	0.1
Delay (s)		54.1	39.4		54.9	51.5	95.0	33.4	18.7	56.0	34.7	21.9
Level of Service		D	D		D	D	F	C	B	E	C	C
Approach Delay (s)		51.2			53.1			41.2			34.4	
Approach LOS		D			D			D			C	

Intersection Summary		
HCM Average Control Delay	39.7	HCM Level of Service
HCM Volume to Capacity ratio	0.81	D
Actuated Cycle Length (s)	121.5	Sum of lost time (s)
Intersection Capacity Utilization	74.9%	22.0
Analysis Period (min)	15	ICU Level of Service
c Critical Lane Group		D

HCM Signalized Intersection Capacity Analysis

12: West Lipoa Street & South Kihei Road

PM Existing
2/6/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Volume (vph)	39	37	58	134	35	117	71	547	129	64	665	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1816	1583		1792	1583	1770	1863	1583	1770	1852	
Flt Permitted		0.78	1.00		0.72	1.00	0.16	1.00	1.00	0.30	1.00	
Satd. Flow (perm)		1461	1583		1333	1583	289	1863	1583	554	1852	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	42	40	63	146	38	127	77	595	140	70	723	30
RTOR Reduction (vph)	0	0	49	0	0	99	0	0	68	0	1	0
Lane Group Flow (vph)	0	82	14	0	184	28	77	595	72	70	752	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)		17.1	17.1		17.1	17.1	45.4	39.4	39.4	43.6	38.5	
Effective Green, g (s)		17.1	17.1		17.1	17.1	45.4	39.4	39.4	43.6	38.5	
Actuated g/C Ratio		0.22	0.22		0.22	0.22	0.59	0.51	0.51	0.57	0.50	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		326	353		298	353	287	958	814	396	931	
v/s Ratio Prot							c0.02	0.32		0.01	c0.41	
v/s Ratio Perm		0.06	0.01		c0.14	0.02	0.14		0.05	0.09		
v/c Ratio		0.25	0.04		0.62	0.08	0.27	0.62	0.09	0.18	0.81	
Uniform Delay, d1		24.5	23.3		26.8	23.5	10.6	13.3	9.5	8.5	15.9	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.4	0.0		3.8	0.1	0.5	1.3	0.0	0.2	5.2	
Delay (s)		24.9	23.4		30.6	23.6	11.1	14.5	9.5	8.7	21.1	
Level of Service		C	C		C	C	B	B	A	A	C	
Approach Delay (s)		24.2			27.7			13.3			20.1	
Approach LOS		C			C			B			C	

Intersection Summary

HCM Average Control Delay	18.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	76.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	69.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 15: Pi'ikea Avenue & Pi'ilani Highway

PM Existing
 2/6/2013



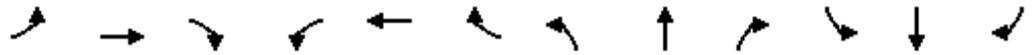
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	313	339	252	1400	1137	385
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	1770	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	340	368	274	1522	1236	418
RTOR Reduction (vph)	0	0	0	0	0	236
Lane Group Flow (vph)	340	368	274	1522	1236	182
Turn Type		Free	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Actuated Green, G (s)	29.2	132.9	28.9	92.7	57.8	57.8
Effective Green, g (s)	29.2	132.9	28.9	92.7	57.8	57.8
Actuated g/C Ratio	0.22	1.00	0.22	0.70	0.43	0.43
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	389	1583	385	2469	1539	688
v/s Ratio Prot	c0.19		c0.15	0.43	c0.35	
v/s Ratio Perm		0.23				0.11
v/c Ratio	0.87	0.23	0.71	0.62	0.80	0.26
Uniform Delay, d1	50.1	0.0	48.1	10.7	32.6	24.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	19.0	0.3	6.1	0.5	3.1	0.2
Delay (s)	69.1	0.3	54.2	11.1	35.7	24.2
Level of Service	E	A	D	B	D	C
Approach Delay (s)	33.4			17.7	32.8	
Approach LOS	C			B	C	

Intersection Summary

HCM Average Control Delay	26.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	132.9	Sum of lost time (s)	17.0
Intersection Capacity Utilization	76.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Pi'ikea Avenue & South Kihei Road

PM Existing
 2/6/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↗	↖	↑	↗	↖	↕	↕
Volume (vph)	0	0	0	223	63	128	19	547	197	91	460	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt					1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected					0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1793	1583	1770	1863	1583	1770	3512	
Flt Permitted					0.96	1.00	0.46	1.00	1.00	0.22	1.00	
Satd. Flow (perm)					1793	1583	850	1863	1583	406	3512	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	242	68	139	21	595	214	99	500	27
RTOR Reduction (vph)	0	0	0	0	0	103	0	0	118	0	4	0
Lane Group Flow (vph)	0	0	0	0	310	36	21	595	96	99	524	0
Turn Type				Perm	Perm	pm+pt		Perm	pm+pt			
Protected Phases					8	5		2		1	6	
Permitted Phases				8		2			2		6	
Actuated Green, G (s)					18.3	33.7		31.7	31.7	40.9	35.3	
Effective Green, g (s)					18.3	33.7		31.7	31.7	40.9	35.3	
Actuated g/C Ratio					0.26	0.48		0.45	0.45	0.58	0.50	
Clearance Time (s)					5.0	5.0		5.0	5.0	5.0	5.0	
Vehicle Extension (s)					3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)					465	410		837	711	343	1756	
v/s Ratio Prot						0.00		c0.32		c0.02	0.15	
v/s Ratio Perm					0.17	0.02			0.06	0.14		
v/c Ratio					0.67	0.09		0.71	0.14	0.29	0.30	
Uniform Delay, d1					23.4	19.8		15.7	11.4	9.2	10.4	
Progression Factor					1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2					3.6	0.1		2.9	0.1	0.5	0.1	
Delay (s)					27.0	19.9		18.6	11.5	9.6	10.5	
Level of Service					C	B		B	B	A	B	
Approach Delay (s)		0.0			24.8			16.6			10.3	
Approach LOS		A			C			B			B	

Intersection Summary

HCM Average Control Delay	16.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	70.6	Sum of lost time (s)	20.0
Intersection Capacity Utilization	62.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 19: East Waipuilani Road & Pi'ilani Highway

PM Existing
 2/6/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↕↗	↕↗	↗
Volume (veh/h)	0	10	0	1627	1476	130
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	11	0	1768	1604	141
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2489	802	1604			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2489	802	1604			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	97	100			
cM capacity (veh/h)	24	327	404			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	11	884	884	802	802	141
Volume Left	0	0	0	0	0	0
Volume Right	11	0	0	0	0	141
cSH	327	1700	1700	1700	1700	1700
Volume to Capacity	0.03	0.52	0.52	0.47	0.47	0.08
Queue Length 95th (ft)	3	0	0	0	0	0
Control Delay (s)	16.4	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	16.4	0.0		0.0		
Approach LOS	C					

Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			50.8%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
 21: East Lipoa Street & Liloa Drive

PM Existing
 2/6/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	232	18	51	228	66	16	49	74	30	55	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1842		1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.58	1.00		0.59	1.00	1.00	0.77	1.00	1.00	0.77	1.00	1.00
Satd. Flow (perm)	1081	1842		1103	1863	1583	1433	1863	1583	1433	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	252	20	55	248	72	17	53	80	33	60	122
RTOR Reduction (vph)	0	6	0	0	0	51	0	0	67	0	0	102
Lane Group Flow (vph)	92	266	0	55	248	21	17	53	13	33	60	20
Turn Type	pm+pt			pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	11.7	9.8		10.9	9.4	9.4	5.2	5.2	5.2	5.2	5.2	5.2
Effective Green, g (s)	11.7	9.8		10.9	9.4	9.4	5.2	5.2	5.2	5.2	5.2	5.2
Actuated g/C Ratio	0.37	0.31		0.35	0.30	0.30	0.17	0.17	0.17	0.17	0.17	0.17
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	443	573		413	556	472	237	308	261	237	308	261
v/s Ratio Prot	c0.01	c0.14		0.01	0.13			0.03			c0.03	
v/s Ratio Perm	0.06			0.04		0.01	0.01		0.01	0.02		0.01
v/c Ratio	0.21	0.46		0.13	0.45	0.05	0.07	0.17	0.05	0.14	0.19	0.08
Uniform Delay, d1	6.6	8.7		7.0	8.9	7.9	11.1	11.3	11.1	11.2	11.3	11.1
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.6		0.1	0.6	0.0	0.1	0.3	0.1	0.3	0.3	0.1
Delay (s)	6.8	9.3		7.1	9.5	7.9	11.2	11.6	11.2	11.5	11.7	11.2
Level of Service	A	A		A	A	A	B	B	B	B	B	B
Approach Delay (s)		8.7			8.9			11.3			11.4	
Approach LOS		A			A			B			B	

Intersection Summary

HCM Average Control Delay	9.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.28		
Actuated Cycle Length (s)	31.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	37.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection				
Intersection Delay, s/veh	7.2			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	250	334	210	186
Demand Flow Rate, veh/h	255	340	214	190
Vehicles Circulating, veh/h	226	186	245	302
Vehicles Exiting, veh/h	266	273	236	224
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.1	7.9	6.7	6.8
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	255	340	214	190
Cap Entry Lane, veh/h	901	938	884	835
Entry HV Adj Factor	0.980	0.983	0.980	0.979
Flow Entry, veh/h	250	334	210	186
Cap Entry, veh/h	883	922	867	818
V/C Ratio	2.83	3.62	2.42	2.27
Control Delay, s/veh	7.1	7.9	6.7	6.8
LOS	A	A	A	A
95th %tile Queue, veh	0.1	0.2	0.1	0.1

HCM Unsignalized Intersection Capacity Analysis

33: Kulanihako'i Street & Pi'ilani Highway

PM Existing
2/6/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	19	65	81	1546	1541	78
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	71	88	1680	1675	85
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2691	838	1760			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2691	838	1760			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	77	75			
cM capacity (veh/h)	13	310	351			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	21	71	88	840	840	838	838	85
Volume Left	21	0	88	0	0	0	0	0
Volume Right	0	71	0	0	0	0	0	85
cSH	13	310	351	1700	1700	1700	1700	1700
Volume to Capacity	1.58	0.23	0.25	0.49	0.49	0.49	0.49	0.05
Queue Length 95th (ft)	82	22	24	0	0	0	0	0
Control Delay (s)	872.3	20.0	18.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	C	C					
Approach Delay (s)	212.8	0.9		0.0				
Approach LOS	F							

Intersection Summary		
Average Delay	5.8	
Intersection Capacity Utilization	60.4%	ICU Level of Service B
Analysis Period (min)	15	

HCM Unsignalized Intersection Capacity Analysis
 36: Kaonoulu Street & Pi'ilani Highway

PM Existing
 2/6/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	19	130	110	1455	1489	35
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	21	141	120	1582	1618	38
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2648	809	1618			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2648	809	1618			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	56	70			
cM capacity (veh/h)	13	323	399			

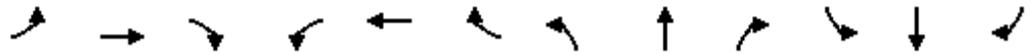
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	21	141	120	791	791	809	809	38
Volume Left	21	0	120	0	0	0	0	0
Volume Right	0	141	0	0	0	0	0	38
cSH	13	323	399	1700	1700	1700	1700	1700
Volume to Capacity	1.58	0.44	0.30	0.47	0.47	0.48	0.48	0.02
Queue Length 95th (ft)	82	53	31	0	0	0	0	0
Control Delay (s)	871.4	24.5	17.9	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	C	C					
Approach Delay (s)	132.5	1.3		0.0				
Approach LOS	F							

Intersection Summary			
Average Delay	6.7		
Intersection Capacity Utilization	60.6%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
 1: Kulanihako'i St & Pi'ilani Highway

2024 Scenario 1 AM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕	↕	↕	↑↑	↕	↕	↑↑	↕
Volume (vph)	47	71	56	154	12	56	46	1515	283	117	1810	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1826	1583		1780	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.69	1.00		0.58	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1291	1583		1087	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	77	61	167	13	61	50	1647	308	127	1967	35
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	128	61	0	180	61	50	1647	308	127	1967	35
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8		Free			Free			Free
Actuated Green, G (s)		25.1	124.7		25.1	124.7	6.4	69.9	124.7	12.7	76.2	124.7
Effective Green, g (s)		25.1	124.7		25.1	124.7	6.4	69.9	124.7	12.7	76.2	124.7
Actuated g/C Ratio		0.20	1.00		0.20	1.00	0.05	0.56	1.00	0.10	0.61	1.00
Clearance Time (s)		5.0			5.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		260	1583		219	1583	91	1984	1583	180	2163	1583
v/s Ratio Prot							0.03	0.47		c0.07	c0.56	
v/s Ratio Perm		0.10	0.04		c0.17	0.04			0.19			0.02
v/c Ratio		0.49	0.04		0.82	0.04	0.55	0.83	0.19	0.71	0.91	0.02
Uniform Delay, d1		44.2	0.0		47.7	0.0	57.7	22.5	0.0	54.2	21.2	0.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.5	0.0		21.3	0.0	6.6	3.1	0.3	11.9	6.1	0.0
Delay (s)		45.6	0.0		69.0	0.0	64.4	25.6	0.3	66.1	27.3	0.0
Level of Service		D	A		E	A	E	C	A	E	C	A
Approach Delay (s)		30.9			51.5			22.7			29.2	
Approach LOS		C			D			C			C	

Intersection Summary		
HCM Average Control Delay	27.6	HCM Level of Service C
HCM Volume to Capacity ratio	0.90	
Actuated Cycle Length (s)	124.7	Sum of lost time (s) 17.0
Intersection Capacity Utilization	83.4%	ICU Level of Service E
Analysis Period (min)	15	
c Critical Lane Group		

HCM Unsignalized Intersection Capacity Analysis
 3: Old Welakahao Road & Pi'ilani Highway

2024 Scenario 1 AM
 1/11/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	24	1179	4	33	1328
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	26	1282	4	36	1443
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2077	643			1286	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2077	643			1286	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	85	94			93	
cM capacity (veh/h)	43	416			535	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	33	854	432	36	722	722
Volume Left	7	0	0	36	0	0
Volume Right	26	0	4	0	0	0
cSH	152	1700	1700	535	1700	1700
Volume to Capacity	0.21	0.50	0.25	0.07	0.42	0.42
Queue Length 95th (ft)	19	0	0	5	0	0
Control Delay (s)	34.9	0.0	0.0	12.2	0.0	0.0
Lane LOS	D			B		
Approach Delay (s)	34.9	0.0		0.3		
Approach LOS	D					

Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			46.7%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 7: East Welakahao Road & Pi'ilani Highway

2024 Scenario 1 AM
 1/11/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	111	58	31	1170	1298	108
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	121	63	34	1272	1411	117
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)	6					
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2114	705	1411			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2114	705	1411			
tC, single (s)	*5.0	*5.0	*5.0			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	89	90			
cM capacity (veh/h)	116	554	342			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	184	34	636	636	705	705	117
Volume Left	121	34	0	0	0	0	0
Volume Right	63	0	0	0	0	0	117
cSH	174	342	1700	1700	1700	1700	1700
Volume to Capacity	1.06	0.10	0.37	0.37	0.41	0.41	0.07
Queue Length 95th (ft)	224	8	0	0	0	0	0
Control Delay (s)	138.6	16.7	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	C					
Approach Delay (s)	138.6	0.4			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		8.6	
Intersection Capacity Utilization	48.7%		ICU Level of Service A
Analysis Period (min)		15	

* User Entered Value

HCM Signalized Intersection Capacity Analysis

8: West Welakahao Road & South Kihei Road

2024 Scenario 1 AM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔	↔	↔		↔	↔	
Volume (vph)	29	11	11	56	11	69	3	497	47	38	448	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1759			1788	1583	1770	1839		1770	1857	
Flt Permitted		0.78			0.72	1.00	0.42	1.00		0.31	1.00	
Satd. Flow (perm)		1415			1345	1583	784	1839		580	1857	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	32	12	12	61	12	75	3	540	51	41	487	10
RTOR Reduction (vph)	0	10	0	0	0	64	0	5	0	0	1	0
Lane Group Flow (vph)	0	46	0	0	73	11	3	586	0	41	496	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		6.3			6.3	6.3	22.1	21.6		23.3	22.2	
Effective Green, g (s)		6.3			6.3	6.3	22.1	21.6		23.3	22.2	
Actuated g/C Ratio		0.14			0.14	0.14	0.50	0.49		0.53	0.50	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		203			193	227	405	903		337	937	
v/s Ratio Prot							0.00	c0.32		c0.00	0.27	
v/s Ratio Perm		0.03			c0.05	0.01	0.00			0.06		
v/c Ratio		0.23			0.38	0.05	0.01	0.65		0.12	0.53	
Uniform Delay, d1		16.7			17.1	16.3	5.5	8.4		5.5	7.4	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6			1.2	0.1	0.0	1.6		0.2	0.5	
Delay (s)		17.3			18.3	16.3	5.6	10.0		5.7	7.9	
Level of Service		B			B	B	A	A		A	A	
Approach Delay (s)		17.3			17.3			10.0			7.7	
Approach LOS		B			B			A			A	

Intersection Summary

HCM Average Control Delay	10.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	44.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 11: East Lipoa Street & Pi'ilani Highway

2024 Scenario 1 AM

1/11/2013



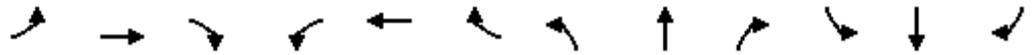
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↗	↕↕	↗	↗	↕↕	↗
Volume (vph)	269	13	118	6	1	14	124	1144	36	130	1305	407
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1778	1583		1785	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.95	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1778	1583		1785	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	292	14	128	7	1	15	135	1243	39	141	1418	442
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	16	0	0	148
Lane Group Flow (vph)	0	306	128	0	8	15	135	1243	23	141	1418	294
Turn Type	Split		Free	Split		Free	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1		6
Permitted Phases			Free			Free			2			6
Actuated Green, G (s)		25.2	121.0		1.3	121.0	13.5	58.7	58.7	13.8	59.0	59.0
Effective Green, g (s)		25.2	121.0		1.3	121.0	13.5	58.7	58.7	13.8	59.0	59.0
Actuated g/C Ratio		0.21	1.00		0.01	1.00	0.11	0.49	0.49	0.11	0.49	0.49
Clearance Time (s)		5.0			5.0		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		370	1583		19	1583	197	1717	768	202	1726	772
v/s Ratio Prot		c0.17			c0.00		0.08	0.35		c0.08	c0.40	
v/s Ratio Perm			c0.08			0.01			0.01			0.19
v/c Ratio		0.83	0.08		0.42	0.01	0.69	0.72	0.03	0.70	0.82	0.38
Uniform Delay, d1		45.8	0.0		59.5	0.0	51.7	24.7	16.3	51.6	26.5	19.5
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		14.0	0.1		14.4	0.0	9.5	1.5	0.0	10.0	3.3	0.3
Delay (s)		59.8	0.1		73.8	0.0	61.2	26.3	16.3	61.6	29.8	19.8
Level of Service		E	A		E	A	E	C	B	E	C	B
Approach Delay (s)		42.2			25.7			29.3			29.8	
Approach LOS		D			C			C			C	

Intersection Summary		
HCM Average Control Delay	31.0	HCM Level of Service C
HCM Volume to Capacity ratio	0.76	
Actuated Cycle Length (s)	121.0	Sum of lost time (s) 16.0
Intersection Capacity Utilization	79.4%	ICU Level of Service D
Analysis Period (min)	15	
c Critical Lane Group		

HCM Signalized Intersection Capacity Analysis
 12: West Lipoa Street & South Kihei Road

2024 Scenario 1 AM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Volume (vph)	20	24	58	70	18	148	24	417	102	122	353	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1821	1583		1792	1583	1770	1863	1583	1770	1858	
Flt Permitted		0.83	1.00		0.74	1.00	0.53	1.00	1.00	0.32	1.00	
Satd. Flow (perm)		1554	1583		1375	1583	989	1863	1583	600	1858	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	26	63	76	20	161	26	453	111	133	384	7
RTOR Reduction (vph)	0	0	51	0	0	131	0	0	65	0	1	0
Lane Group Flow (vph)	0	48	12	0	96	30	26	453	46	133	390	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)		9.7	9.7		9.7	9.7	23.3	21.4	21.4	30.9	25.2	
Effective Green, g (s)		9.7	9.7		9.7	9.7	23.3	21.4	21.4	30.9	25.2	
Actuated g/C Ratio		0.19	0.19		0.19	0.19	0.45	0.41	0.41	0.60	0.49	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		291	296		257	296	474	770	654	487	904	
v/s Ratio Prot							0.00	c0.24		c0.03	c0.21	
v/s Ratio Perm		0.03	0.01		c0.07	0.02	0.02		0.03	0.13		
v/c Ratio		0.16	0.04		0.37	0.10	0.05	0.59	0.07	0.27	0.43	
Uniform Delay, d1		17.7	17.2		18.4	17.4	8.0	11.8	9.2	5.5	8.6	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.3	0.1		0.9	0.2	0.0	1.2	0.0	0.3	0.3	
Delay (s)		17.9	17.3		19.3	17.6	8.0	12.9	9.2	5.8	9.0	
Level of Service		B	B		B	B	A	B	A	A	A	
Approach Delay (s)		17.6			18.2			12.0			8.2	
Approach LOS		B			B			B			A	

Intersection Summary

HCM Average Control Delay	12.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	51.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	52.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 15: Pi'ikea Avenue & Pi'ilani Highway

2024 Scenario 1 AM

1/11/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	361	251	161	1298	1652	439
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	1770	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	392	273	175	1411	1796	477
RTOR Reduction (vph)	0	0	0	0	0	196
Lane Group Flow (vph)	392	273	175	1411	1796	281
Turn Type		Free	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Actuated Green, G (s)	29.2	149.3	15.1	109.1	88.0	88.0
Effective Green, g (s)	29.2	149.3	15.1	109.1	88.0	88.0
Actuated g/C Ratio	0.20	1.00	0.10	0.73	0.59	0.59
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	346	1583	179	2586	2086	933
v/s Ratio Prot	c0.22		c0.10	0.40	c0.51	
v/s Ratio Perm		0.17				0.18
v/c Ratio	1.13	0.17	0.98	0.55	0.86	0.30
Uniform Delay, d1	60.1	0.0	66.9	9.0	25.6	15.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	89.5	0.2	60.1	0.2	3.9	0.2
Delay (s)	149.5	0.2	127.0	9.2	29.5	15.5
Level of Service	F	A	F	A	C	B
Approach Delay (s)	88.2			22.2	26.5	
Approach LOS	F			C	C	

Intersection Summary

HCM Average Control Delay	34.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	149.3	Sum of lost time (s)	17.0
Intersection Capacity Utilization	88.8%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Pi'ikea Avenue & South Kihei Road

2024 Scenario 1 AM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↕	↕	↑	↕	↕	↕	↕
Volume (vph)	0	0	0	96	11	88	7	465	93	107	472	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95
Frt					1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected					0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1783	1583	1770	1863	1583	1770	3527	
Flt Permitted					0.96	1.00	0.46	1.00	1.00	0.32	1.00	
Satd. Flow (perm)					1783	1583	852	1863	1583	595	3527	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	104	12	96	8	505	101	116	513	12
RTOR Reduction (vph)	0	0	0	0	0	83	0	0	54	0	2	0
Lane Group Flow (vph)	0	0	0	0	116	13	8	505	47	116	523	0
Turn Type				Perm	Perm	pm+pt		Perm	pm+pt			
Protected Phases					8	5		2		1	6	
Permitted Phases				8		2			2		6	
Actuated Green, G (s)					6.5	6.5	23.1	22.6	22.6	30.5	26.3	
Effective Green, g (s)					6.5	6.5	23.1	22.6	22.6	30.5	26.3	
Actuated g/C Ratio					0.13	0.13	0.48	0.47	0.47	0.63	0.54	
Clearance Time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)					240	213	417	872	741	478	1920	
v/s Ratio Prot							0.00	c0.27		c0.02	0.15	
v/s Ratio Perm					0.07	0.01	0.01		0.03	0.13		
v/c Ratio					0.48	0.06	0.02	0.58	0.06	0.24	0.27	
Uniform Delay, d1					19.3	18.2	6.6	9.4	7.0	4.4	5.9	
Progression Factor					1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2					1.5	0.1	0.0	0.9	0.0	0.3	0.1	
Delay (s)					20.9	18.4	6.6	10.3	7.1	4.7	6.0	
Level of Service					C	B	A	B	A	A	A	
Approach Delay (s)		0.0			19.7			9.7			5.7	
Approach LOS		A			B			A			A	

Intersection Summary

HCM Average Control Delay	9.4	HCM Level of Service	A
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	48.3	Sum of lost time (s)	20.0
Intersection Capacity Utilization	48.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 19: East Waipuilani Road & Pi'ilani Highway

2024 Scenario 1 AM

1/11/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑↑	↑↑	↗
Volume (veh/h)	0	30	0	1602	2074	76
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	33	0	1741	2254	83
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3125	1127	2254			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3125	1127	2254			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	84	100			
cM capacity (veh/h)	9	199	225			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	33	871	871	1127	1127	83
Volume Left	0	0	0	0	0	0
Volume Right	33	0	0	0	0	83
cSH	199	1700	1700	1700	1700	1700
Volume to Capacity	0.16	0.51	0.51	0.66	0.66	0.05
Queue Length 95th (ft)	14	0	0	0	0	0
Control Delay (s)	26.7	0.0	0.0	0.0	0.0	0.0
Lane LOS	D					
Approach Delay (s)	26.7	0.0		0.0		
Approach LOS	D					

Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			67.3%	ICU Level of Service		C
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
 21: East Lipoa Street & Liloa Drive

2024 Scenario 1 AM
 1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	162	30	168	190	85	50	132	73	77	148	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1819		1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.63	1.00		0.47	1.00	1.00	0.66	1.00	1.00	0.67	1.00	1.00
Satd. Flow (perm)	1170	1819		874	1863	1583	1220	1863	1583	1240	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	57	176	33	183	207	92	54	143	79	84	161	85
RTOR Reduction (vph)	0	7	0	0	0	58	0	0	61	0	0	65
Lane Group Flow (vph)	57	202	0	183	207	34	54	143	18	84	161	20
Turn Type	pm+pt			pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	13.7	11.6		21.5	15.5	15.5	9.9	9.9	9.9	9.9	9.9	9.9
Effective Green, g (s)	13.7	11.6		21.5	15.5	15.5	9.9	9.9	9.9	9.9	9.9	9.9
Actuated g/C Ratio	0.32	0.27		0.51	0.36	0.36	0.23	0.23	0.23	0.23	0.23	0.23
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	407	496		569	679	577	284	434	369	289	434	369
v/s Ratio Prot	0.01	c0.11		c0.05	0.11			0.08			c0.09	
v/s Ratio Perm	0.04			0.12		0.02	0.04		0.01	0.07		0.01
v/c Ratio	0.14	0.41		0.32	0.30	0.06	0.19	0.33	0.05	0.29	0.37	0.05
Uniform Delay, d1	10.1	12.6		6.0	9.6	8.8	13.1	13.5	12.7	13.4	13.7	12.7
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.5		0.3	0.3	0.0	0.3	0.4	0.1	0.6	0.5	0.1
Delay (s)	10.2	13.2		6.3	9.9	8.8	13.4	14.0	12.7	14.0	14.2	12.7
Level of Service	B	B		A	A	A	B	B	B	B	B	B
Approach Delay (s)		12.6			8.3			13.5			13.8	
Approach LOS		B			A			B			B	

Intersection Summary

HCM Average Control Delay	11.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	42.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	47.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

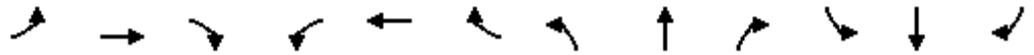
Intersection				
Intersection Delay, s/veh	5.9			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	97	265	155	161
Demand Flow Rate, veh/h	99	270	158	165
Vehicles Circulating, veh/h	222	110	107	295
Vehicles Exiting, veh/h	238	155	213	85
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	5.1	6.3	5.1	6.4
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	99	270	158	165
Cap Entry Lane, veh/h	905	1012	1015	841
Entry HV Adj Factor	0.977	0.980	0.980	0.976
Flow Entry, veh/h	97	265	155	161
Cap Entry, veh/h	885	992	995	821
V/C Ratio	1.09	2.67	1.56	1.96
Control Delay, s/veh	5.1	6.3	5.1	6.4
LOS	A	A	A	A
95th %tile Queue, veh	0.0	0.1	0.1	0.1

HCM Signalized Intersection Capacity Analysis

2024 Scenario 1 AM

34: Kaonoulu St & Pi'ilani Highway

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	24	69	198	81	43	83	61	1429	128	131	1680	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	75	215	88	47	90	66	1553	139	142	1826	26
RTOR Reduction (vph)	0	0	0	0	0	83	0	0	31	0	0	5
Lane Group Flow (vph)	26	75	215	88	47	7	66	1553	108	142	1826	21
Turn Type	Split		Free	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	8.4	8.4	116.0	8.6	8.6	8.6	6.7	66.8	66.8	10.2	70.3	70.3
Effective Green, g (s)	8.4	8.4	116.0	8.6	8.6	8.6	6.7	66.8	66.8	10.2	70.3	70.3
Actuated g/C Ratio	0.07	0.07	1.00	0.07	0.07	0.07	0.06	0.58	0.58	0.09	0.61	0.61
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	128	135	1583	255	138	207	102	2038	912	302	2145	959
v/s Ratio Prot	0.01	c0.04		c0.03	0.03		0.04	0.44		c0.04	c0.52	
v/s Ratio Perm			0.14			0.00			0.07			0.01
v/c Ratio	0.20	0.56	0.14	0.35	0.34	0.03	0.65	0.76	0.12	0.47	0.85	0.02
Uniform Delay, d1	50.6	52.0	0.0	51.0	51.0	49.8	53.5	18.6	11.2	50.3	18.6	9.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	4.9	0.2	0.8	1.5	0.1	13.3	1.7	0.1	1.2	3.5	0.0
Delay (s)	51.4	56.9	0.2	51.8	52.5	49.9	66.8	20.3	11.3	51.5	22.1	9.1
Level of Service	D	E	A	D	D	D	E	C	B	D	C	A
Approach Delay (s)		17.9			51.2			21.4			24.0	
Approach LOS		B			D			C			C	

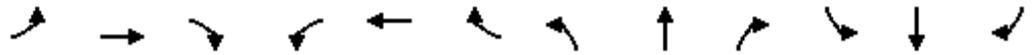
Intersection Summary

HCM Average Control Delay	23.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	116.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	73.0%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 1: Kulanihako'i St & Pi'ilani Highway

2024 Scenario 1 PM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↗	↕↕	↗	↗	↕↕	↗
Volume (vph)	19	15	65	80	6	28	81	2157	61	25	2068	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1811	1583		1780	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.80	1.00		0.71	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1495	1583		1332	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	16	71	87	7	30	88	2345	66	27	2248	85
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	37	71	0	94	30	88	2345	66	27	2248	85
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		4			8		5	2		1		6
Permitted Phases	4		Free	8		Free			Free			Free
Actuated Green, G (s)		13.7	122.5		13.7	122.5	8.8	87.0	122.5	4.8	83.0	122.5
Effective Green, g (s)		13.7	122.5		13.7	122.5	8.8	87.0	122.5	4.8	83.0	122.5
Actuated g/C Ratio		0.11	1.00		0.11	1.00	0.07	0.71	1.00	0.04	0.68	1.00
Clearance Time (s)		5.0			5.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		167	1583		149	1583	127	2513	1583	69	2398	1583
v/s Ratio Prot							c0.05	c0.66		0.02	0.64	
v/s Ratio Perm		0.02	0.04		c0.07	0.02			0.04			0.05
v/c Ratio		0.22	0.04		0.63	0.02	0.69	0.93	0.04	0.39	0.94	0.05
Uniform Delay, d1		49.5	0.0		52.0	0.0	55.5	15.3	0.0	57.4	17.5	0.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.7	0.1		8.4	0.0	15.1	7.2	0.0	3.6	7.8	0.1
Delay (s)		50.2	0.1		60.4	0.0	70.6	22.4	0.0	61.1	25.3	0.1
Level of Service		D	A		E	A	E	C	A	E	C	A
Approach Delay (s)		17.2			45.8			23.5			24.8	
Approach LOS		B			D			C			C	

Intersection Summary		
HCM Average Control Delay	24.5	HCM Level of Service C
HCM Volume to Capacity ratio	0.91	
Actuated Cycle Length (s)	122.5	Sum of lost time (s) 17.0
Intersection Capacity Utilization	87.9%	ICU Level of Service E
Analysis Period (min)	15	
c Critical Lane Group		

HCM Unsignalized Intersection Capacity Analysis
 3: Old Welakahao Road & Pi'ilani Highway

2024 Scenario 1 PM
 1/11/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	3	24	1660	0	8	1252
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	26	1804	0	9	1361
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2502	902			1804	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2502	902			1804	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	86	91			97	
cM capacity (veh/h)	23	281			337	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	29	1203	601	9	680	680
Volume Left	3	0	0	9	0	0
Volume Right	26	0	0	0	0	0
cSH	125	1700	1700	337	1700	1700
Volume to Capacity	0.23	0.71	0.35	0.03	0.40	0.40
Queue Length 95th (ft)	21	0	0	2	0	0
Control Delay (s)	42.4	0.0	0.0	15.9	0.0	0.0
Lane LOS	E			C		
Approach Delay (s)	42.4	0.0		0.1		
Approach LOS	E					

Intersection Summary						
Average Delay			0.4			
Intersection Capacity Utilization			55.9%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 7: East Welakahao Road & Pi'ilani Highway

2024 Scenario 1 PM
 1/11/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	125	57	106	1559	1192	215
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	136	62	115	1695	1296	234
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)	6					
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2373	648	1296			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2373	648	1296			
tC, single (s)	*5.0	*5.0	*5.0			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	89	70			
cM capacity (veh/h)	69	586	389			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	198	115	847	847	648	648	234
Volume Left	136	115	0	0	0	0	0
Volume Right	62	0	0	0	0	0	234
cSH	96	389	1700	1700	1700	1700	1700
Volume to Capacity	2.06	0.30	0.50	0.50	0.38	0.38	0.14
Queue Length 95th (ft)	426	30	0	0	0	0	0
Control Delay (s)	582.6	18.1	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	C					
Approach Delay (s)	582.6	1.2			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		33.2	
Intersection Capacity Utilization	56.7%		ICU Level of Service B
Analysis Period (min)	15		

* User Entered Value

HCM Signalized Intersection Capacity Analysis

8: West Welakahao Road & South Kihei Road

2024 Scenario 1 PM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕	↕	↕		↕	↕	
Volume (vph)	34	7	13	110	17	59	18	806	71	44	850	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1748			1785	1583	1770	1840		1770	1853	
Flt Permitted		0.73			0.71	1.00	0.14	1.00		0.13	1.00	
Satd. Flow (perm)		1315			1327	1583	254	1840		239	1853	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	8	14	120	18	64	20	876	77	48	924	34
RTOR Reduction (vph)	0	12	0	0	0	55	0	3	0	0	2	0
Lane Group Flow (vph)	0	47	0	0	138	9	20	950	0	48	956	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		9.7			9.7	9.7	43.8	42.5		45.0	43.1	
Effective Green, g (s)		9.7			9.7	9.7	43.8	42.5		45.0	43.1	
Actuated g/C Ratio		0.14			0.14	0.14	0.63	0.62		0.65	0.62	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		185			186	222	190	1132		198	1156	
v/s Ratio Prot							0.00	0.52		c0.01	c0.52	
v/s Ratio Perm		0.04			c0.10	0.01	0.06			0.15		
v/c Ratio		0.25			0.74	0.04	0.11	0.84		0.24	0.83	
Uniform Delay, d1		26.5			28.5	25.7	9.0	10.6		9.5	10.1	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.7			14.7	0.1	0.2	5.6		0.6	5.0	
Delay (s)		27.2			43.2	25.8	9.2	16.2		10.1	15.1	
Level of Service		C			D	C	A	B		B	B	
Approach Delay (s)		27.2			37.7			16.0			14.9	
Approach LOS		C			D			B			B	

Intersection Summary

HCM Average Control Delay	17.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	69.1	Sum of lost time (s)	10.0
Intersection Capacity Utilization	66.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 11: East Lipoa Street & Pi'ilani Highway

2024 Scenario 1 PM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↘	↕↕	↗	↘	↕↕	↗
Volume (vph)	271	10	72	28	30	63	221	1484	13	79	1362	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1777	1583		1819	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.95	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1777	1583		1819	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	295	11	78	30	33	68	240	1613	14	86	1480	217
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	4	0	0	67
Lane Group Flow (vph)	0	306	78	0	63	68	240	1613	10	86	1480	150
Turn Type	Split		Free	Split		Free	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1		6
Permitted Phases			Free			Free			2			6
Actuated Green, G (s)		30.1	153.7		9.1	153.7	23.7	80.7	80.7	11.8	68.8	68.8
Effective Green, g (s)		30.1	153.7		9.1	153.7	23.7	80.7	80.7	11.8	68.8	68.8
Actuated g/C Ratio		0.20	1.00		0.06	1.00	0.15	0.53	0.53	0.08	0.45	0.45
Clearance Time (s)		5.0			5.0		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		348	1583		108	1583	273	1858	831	136	1584	709
v/s Ratio Prot		c0.17			c0.03		c0.14	c0.46		0.05	c0.42	
v/s Ratio Perm			0.05			0.04			0.01			0.09
v/c Ratio		0.88	0.05		0.58	0.04	0.88	0.87	0.01	0.63	0.93	0.21
Uniform Delay, d1		60.0	0.0		70.5	0.0	63.6	31.9	17.4	68.8	40.3	25.9
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		21.4	0.1		7.8	0.1	25.8	4.6	0.0	9.2	10.6	0.1
Delay (s)		81.4	0.1		78.2	0.1	89.4	36.5	17.4	78.1	50.9	26.0
Level of Service		F	A		E	A	F	D	B	E	D	C
Approach Delay (s)		64.9			37.7			43.1			49.2	
Approach LOS		E			D			D			D	

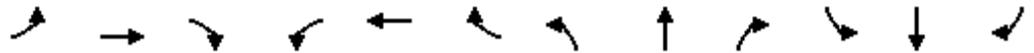
Intersection Summary

HCM Average Control Delay	47.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	153.7	Sum of lost time (s)	28.0
Intersection Capacity Utilization	86.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 12: West Lipoa Street & South Kihei Road

2024 Scenario 1 PM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Volume (vph)	39	37	58	134	35	117	71	671	129	64	816	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1816	1583		1792	1583	1770	1863	1583	1770	1854	
Flt Permitted		0.78	1.00		0.72	1.00	0.10	1.00	1.00	0.24	1.00	
Satd. Flow (perm)		1457	1583		1333	1583	193	1863	1583	447	1854	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	42	40	63	146	38	127	77	729	140	70	887	30
RTOR Reduction (vph)	0	0	50	0	0	100	0	0	59	0	1	0
Lane Group Flow (vph)	0	82	13	0	184	27	77	729	81	70	916	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)		18.5	18.5		18.5	18.5	54.2	50.5	50.5	52.6	49.7	
Effective Green, g (s)		18.5	18.5		18.5	18.5	54.2	50.5	50.5	52.6	49.7	
Actuated g/C Ratio		0.21	0.21		0.21	0.21	0.62	0.58	0.58	0.61	0.57	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		310	337		284	337	188	1083	920	315	1060	
v/s Ratio Prot							c0.02	0.39		0.01	c0.49	
v/s Ratio Perm		0.06	0.01		c0.14	0.02	0.24		0.05	0.13		
v/c Ratio		0.26	0.04		0.65	0.08	0.41	0.67	0.09	0.22	0.86	
Uniform Delay, d1		28.5	27.1		31.2	27.4	14.2	12.5	8.0	9.3	15.7	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.5	0.0		5.0	0.1	1.5	1.7	0.0	0.4	7.5	
Delay (s)		29.0	27.2		36.2	27.5	15.7	14.2	8.1	9.7	23.2	
Level of Service		C	C		D	C	B	B	A	A	C	
Approach Delay (s)		28.2			32.7			13.4			22.2	
Approach LOS		C			C			B			C	

Intersection Summary

HCM Average Control Delay	20.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	86.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	77.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 15: Pi'ikea Avenue & Pi'ilani Highway

2024 Scenario 1 PM

1/11/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	505	466	459	1717	1395	622
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	1770	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	549	507	499	1866	1516	676
RTOR Reduction (vph)	0	0	0	0	0	255
Lane Group Flow (vph)	549	507	499	1866	1516	421
Turn Type		Free	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Actuated Green, G (s)	29.3	163.3	30.4	123.0	86.6	86.6
Effective Green, g (s)	29.3	163.3	30.4	123.0	86.6	86.6
Actuated g/C Ratio	0.18	1.00	0.19	0.75	0.53	0.53
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	318	1583	330	2666	1877	839
v/s Ratio Prot	c0.31		c0.28	0.53	c0.43	
v/s Ratio Perm		0.32				0.27
v/c Ratio	1.73	0.32	1.51	0.70	0.81	0.50
Uniform Delay, d1	67.0	0.0	66.5	10.5	31.5	24.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	339.8	0.5	245.6	0.8	2.7	0.5
Delay (s)	406.8	0.5	312.0	11.3	34.2	25.0
Level of Service	F	A	F	B	C	C
Approach Delay (s)	211.8			74.8	31.3	
Approach LOS	F			E	C	

Intersection Summary

HCM Average Control Delay	83.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	163.3	Sum of lost time (s)	17.0
Intersection Capacity Utilization	106.1%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Pi'ikea Avenue & South Kihei Road

2024 Scenario 1 PM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↗	↖	↑	↗	↖	↕	↕
Volume (vph)	0	0	0	223	63	128	19	671	197	91	564	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt					1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected					0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1793	1583	1770	1863	1583	1770	3517	
Flt Permitted					0.96	1.00	0.41	1.00	1.00	0.16	1.00	
Satd. Flow (perm)					1793	1583	761	1863	1583	301	3517	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	242	68	139	21	729	214	99	613	27
RTOR Reduction (vph)	0	0	0	0	0	104	0	0	107	0	3	0
Lane Group Flow (vph)	0	0	0	0	310	35	21	729	107	99	637	0
Turn Type				Perm	Perm	pm+pt		Perm	pm+pt			
Protected Phases					8	5		2		1	6	
Permitted Phases				8		2			2	6		
Actuated Green, G (s)					19.5	40.3		39.1	39.1	46.7	42.3	
Effective Green, g (s)					19.5	40.3		39.1	39.1	46.7	42.3	
Actuated g/C Ratio					0.25	0.52		0.50	0.50	0.60	0.54	
Clearance Time (s)					5.0	5.0		5.0	5.0	5.0	5.0	
Vehicle Extension (s)					3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)					448	396		934	794	263	1907	
v/s Ratio Prot						0.00		c0.39		c0.02	0.18	
v/s Ratio Perm					0.17	0.02		0.03		0.07	0.20	
v/c Ratio					0.69	0.09		0.05	0.78	0.14	0.38	0.33
Uniform Delay, d1					26.5	22.4		9.2	15.9	10.4	11.2	10.0
Progression Factor					1.00	1.00		1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2					4.6	0.1		0.1	4.3	0.1	0.9	0.1
Delay (s)					31.1	22.5		9.3	20.2	10.5	12.1	10.1
Level of Service					C	C		A	C	B	B	B
Approach Delay (s)		0.0			28.4			17.8				10.3
Approach LOS		A			C			B				B

Intersection Summary			
HCM Average Control Delay	17.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	78.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	68.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 19: East Waipuilani Road & Pi'ilani Highway

2024 Scenario 1 PM
 1/11/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↕	↕	↘
Volume (veh/h)	0	10	0	1996	1811	130
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	11	0	2170	1968	141
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3053	984	1968			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3053	984	1968			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	96	100			
cM capacity (veh/h)	10	247	291			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	11	1085	1085	984	984	141
Volume Left	0	0	0	0	0	0
Volume Right	11	0	0	0	0	141
cSH	247	1700	1700	1700	1700	1700
Volume to Capacity	0.04	0.64	0.64	0.58	0.58	0.08
Queue Length 95th (ft)	3	0	0	0	0	0
Control Delay (s)	20.2	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	20.2	0.0		0.0		
Approach LOS	C					

Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			60.1%	ICU Level of Service		B
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
 21: East Lipoa Street & Liloa Drive

2024 Scenario 1 PM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	232	18	51	228	66	16	60	74	30	67	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1842		1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.61	1.00		0.51	1.00	1.00	0.74	1.00	1.00	0.74	1.00	1.00
Satd. Flow (perm)	1127	1842		951	1863	1583	1380	1863	1583	1380	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	252	20	55	248	72	17	65	80	33	73	122
RTOR Reduction (vph)	0	5	0	0	0	48	0	0	66	0	0	101
Lane Group Flow (vph)	92	267	0	55	248	24	17	65	14	33	73	21
Turn Type	pm+pt			pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	9.3	8.8		12.1	10.2	10.2	5.4	5.4	5.4	5.4	5.4	5.4
Effective Green, g (s)	9.3	8.8		12.1	10.2	10.2	5.4	5.4	5.4	5.4	5.4	5.4
Actuated g/C Ratio	0.30	0.28		0.39	0.33	0.33	0.17	0.17	0.17	0.17	0.17	0.17
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	347	521		420	611	519	240	323	275	240	323	275
v/s Ratio Prot	0.00	c0.14		c0.01	0.13			0.03			c0.04	
v/s Ratio Perm	0.07			0.04		0.01	0.01		0.01	0.02		0.01
v/c Ratio	0.27	0.51		0.13	0.41	0.05	0.07	0.20	0.05	0.14	0.23	0.08
Uniform Delay, d1	8.1	9.4		6.0	8.1	7.1	10.8	11.0	10.7	10.9	11.1	10.8
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.9		0.1	0.4	0.0	0.1	0.3	0.1	0.3	0.4	0.1
Delay (s)	8.6	10.2		6.2	8.5	7.2	10.9	11.3	10.8	11.1	11.4	10.9
Level of Service	A	B		A	A	A	B	B	B	B	B	B
Approach Delay (s)		9.8			7.9			11.0			11.1	
Approach LOS		A			A			B			B	

Intersection Summary

HCM Average Control Delay	9.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	31.1	Sum of lost time (s)	15.0
Intersection Capacity Utilization	37.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection				
Intersection Delay, s/veh	7.5			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	250	334	231	205
Demand Flow Rate, veh/h	255	340	236	209
Vehicles Circulating, veh/h	245	208	245	302
Vehicles Exiting, veh/h	266	273	255	246
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.3	8.2	7.0	7.1
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	255	340	236	209
Cap Entry Lane, veh/h	884	918	884	835
Entry HV Adj Factor	0.980	0.983	0.980	0.979
Flow Entry, veh/h	250	334	231	205
Cap Entry, veh/h	867	902	867	818
V/C Ratio	2.88	3.70	2.67	2.50
Control Delay, s/veh	7.3	8.2	7.0	7.1
LOS	A	A	A	A
95th %tile Queue, veh	0.1	0.2	0.1	0.1

HCM Signalized Intersection Capacity Analysis
 34: Kaonoulu St & Pi'ilani Highway

2024 Scenario 1 PM
 1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖↗	↑	↖↗	↖	↑↑	↗	↖↗	↑↑	↗
Volume (vph)	19	155	130	513	174	522	110	1617	477	483	1528	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	168	141	558	189	567	120	1758	518	525	1661	38
RTOR Reduction (vph)	0	0	0	0	0	463	0	0	129	0	0	10
Lane Group Flow (vph)	21	168	141	558	189	104	120	1758	389	525	1661	28
Turn Type	Split		Free	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	15.2	15.2	139.2	20.0	20.0	20.0	9.0	63.0	63.0	19.0	73.0	73.0
Effective Green, g (s)	15.2	15.2	139.2	20.0	20.0	20.0	9.0	63.0	63.0	19.0	73.0	73.0
Actuated g/C Ratio	0.11	0.11	1.00	0.14	0.14	0.14	0.06	0.45	0.45	0.14	0.52	0.52
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	193	203	1583	493	268	400	114	1602	716	469	1856	830
v/s Ratio Prot	0.01	c0.09		c0.16	0.10		0.07	c0.50		c0.15	0.47	
v/s Ratio Perm			0.09			0.04			0.25			0.02
v/c Ratio	0.11	0.83	0.09	1.13	0.71	0.26	1.05	1.10	0.54	1.12	0.89	0.03
Uniform Delay, d1	55.9	60.7	0.0	59.6	56.8	53.0	65.1	38.1	27.7	60.1	29.7	16.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	23.3	0.1	82.0	8.2	0.3	99.1	54.1	0.8	78.4	6.0	0.0
Delay (s)	56.1	84.0	0.1	141.6	65.0	53.4	164.2	92.2	28.5	138.5	35.7	16.0
Level of Service	E	F	A	F	E	D	F	F	C	F	D	B
Approach Delay (s)		46.4			92.5			82.0			59.6	
Approach LOS		D			F			F			E	

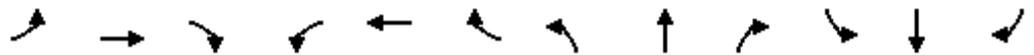
Intersection Summary

HCM Average Control Delay	74.4	HCM Level of Service	E
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	139.2	Sum of lost time (s)	22.0
Intersection Capacity Utilization	99.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 1: Kulanihako'i St & Pi'ilani Highway

2024 Scenario 2 AM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑↑	↗	↖	↑↑	↗
Volume (vph)	47	71	56	154	12	56	46	1837	283	117	2304	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1826	1583		1780	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.67	1.00		0.57	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1242	1583		1068	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	77	61	167	13	61	50	1997	308	127	2504	35
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	128	61	0	180	61	50	1997	308	127	2504	35
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8		Free			Free			Free
Actuated Green, G (s)		25.4	130.8		25.4	130.8	6.7	75.7	130.8	12.7	81.7	130.8
Effective Green, g (s)		25.4	130.8		25.4	130.8	6.7	75.7	130.8	12.7	81.7	130.8
Actuated g/C Ratio		0.19	1.00		0.19	1.00	0.05	0.58	1.00	0.10	0.62	1.00
Clearance Time (s)		5.0			5.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		241	1583		207	1583	91	2048	1583	172	2211	1583
v/s Ratio Prot							0.03	0.56		c0.07	c0.71	
v/s Ratio Perm		0.10	0.04		c0.17	0.04			0.19			0.02
v/c Ratio		0.53	0.04		0.87	0.04	0.55	0.98	0.19	0.74	1.13	0.02
Uniform Delay, d1		47.3	0.0		51.1	0.0	60.6	26.6	0.0	57.4	24.6	0.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		2.2	0.0		29.8	0.0	6.6	14.4	0.3	15.2	65.9	0.0
Delay (s)		49.6	0.0		80.9	0.0	67.2	41.0	0.3	72.7	90.5	0.0
Level of Service		D	A		F	A	E	D	A	E	F	A
Approach Delay (s)		33.6			60.5			36.2			88.4	
Approach LOS		C			E			D			F	

Intersection Summary

HCM Average Control Delay	62.7	HCM Level of Service	E
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	130.8	Sum of lost time (s)	17.0
Intersection Capacity Utilization	97.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 3: Old Welakahao Road & Pi'ilani Highway

2024 Scenario 2 AM
 1/11/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	24	1321	4	33	1484
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	26	1436	4	36	1613
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2316	720			1440	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2316	720			1440	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	78	93			92	
cM capacity (veh/h)	29	370			467	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	33	957	483	36	807	807
Volume Left	7	0	0	36	0	0
Volume Right	26	0	4	0	0	0
cSH	111	1700	1700	467	1700	1700
Volume to Capacity	0.29	0.56	0.28	0.08	0.47	0.47
Queue Length 95th (ft)	28	0	0	6	0	0
Control Delay (s)	50.3	0.0	0.0	13.3	0.0	0.0
Lane LOS	F			B		
Approach Delay (s)	50.3	0.0		0.3		
Approach LOS	F					

Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			51.0%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
7: East Welakahao Road & Pi'ilani Highway

2024 Scenario 2 AM
1/11/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	111	58	31	1312	1454	108
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	121	63	34	1426	1580	117
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)	6					
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2361	790	1580			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2361	790	1580			
tC, single (s)	*5.0	*5.0	*5.0			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	88	88			
cM capacity (veh/h)	87	510	283			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	184	34	713	713	790	790	117
Volume Left	121	34	0	0	0	0	0
Volume Right	63	0	0	0	0	0	117
cSH	127	283	1700	1700	1700	1700	1700
Volume to Capacity	1.45	0.12	0.42	0.42	0.46	0.46	0.07
Queue Length 95th (ft)	314	10	0	0	0	0	0
Control Delay (s)	302.8	19.5	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	C					
Approach Delay (s)	302.8	0.4			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		16.8	
Intersection Capacity Utilization	53.0%		ICU Level of Service A
Analysis Period (min)	15		

* User Entered Value

HCM Signalized Intersection Capacity Analysis

8: West Welakahao Road & South Kihei Road

2024 Scenario 2 AM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔	↔	↔		↔	↔	
Volume (vph)	29	11	11	56	11	69	3	519	47	38	459	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1759			1788	1583	1770	1840		1770	1857	
Flt Permitted		0.78			0.72	1.00	0.41	1.00		0.30	1.00	
Satd. Flow (perm)		1415			1345	1583	767	1840		551	1857	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	32	12	12	61	12	75	3	564	51	41	499	10
RTOR Reduction (vph)	0	10	0	0	0	64	0	5	0	0	1	0
Lane Group Flow (vph)	0	46	0	0	73	11	3	611	0	41	508	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		6.4			6.4	6.4	23.0	22.5		24.2	23.1	
Effective Green, g (s)		6.4			6.4	6.4	23.0	22.5		24.2	23.1	
Actuated g/C Ratio		0.14			0.14	0.14	0.51	0.50		0.54	0.51	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		201			191	225	403	920		326	953	
v/s Ratio Prot							0.00	c0.33		c0.00	0.27	
v/s Ratio Perm		0.03			c0.05	0.01	0.00			0.06		
v/c Ratio		0.23			0.38	0.05	0.01	0.66		0.13	0.53	
Uniform Delay, d1		17.1			17.5	16.7	5.5	8.4		5.5	7.3	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6			1.3	0.1	0.0	1.8		0.2	0.6	
Delay (s)		17.7			18.8	16.8	5.5	10.2		5.7	7.9	
Level of Service		B			B	B	A	B		A	A	
Approach Delay (s)		17.7			17.8			10.2			7.7	
Approach LOS		B			B			B			A	

Intersection Summary

HCM Average Control Delay	10.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	50.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 11: East Lipoa Street & Pi'ilani Highway

2024 Scenario 2 AM

1/11/2013



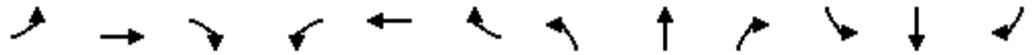
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕	↕	↕	↕↕	↕	↕	↕↕	↕
Volume (vph)	269	125	118	162	60	336	124	1144	178	624	1305	407
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1801	1583		1797	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.97	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1801	1583		1797	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	292	136	128	176	65	365	135	1243	193	678	1418	442
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	92	0	0	170
Lane Group Flow (vph)	0	428	128	0	241	365	135	1243	101	678	1418	272
Turn Type	Split		Free	Split		Free	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1		6
Permitted Phases			Free			Free			2			6
Actuated Green, G (s)		35.0	149.2		17.0	149.2	14.2	60.2	60.2	15.0	61.0	61.0
Effective Green, g (s)		35.0	149.2		17.0	149.2	14.2	60.2	60.2	15.0	61.0	61.0
Actuated g/C Ratio		0.23	1.00		0.11	1.00	0.10	0.40	0.40	0.10	0.41	0.41
Clearance Time (s)		5.0			5.0		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		422	1583		205	1583	168	1428	639	178	1447	647
v/s Ratio Prot		c0.24			c0.13		0.08	0.35		c0.38	c0.40	
v/s Ratio Perm			0.08			c0.23			0.06			0.17
v/c Ratio		1.01	0.08		1.18	0.23	0.80	0.87	0.16	3.81	0.98	0.42
Uniform Delay, d1		57.1	0.0		66.1	0.0	66.1	40.9	28.3	67.1	43.5	31.5
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		47.4	0.1		118.3	0.3	23.5	6.1	0.1	1277.6	18.8	0.4
Delay (s)		104.5	0.1		184.4	0.3	89.7	47.0	28.5	1344.7	62.3	31.9
Level of Service		F	A		F	A	F	D	C	F	E	C
Approach Delay (s)		80.5			73.5			48.4			399.6	
Approach LOS		F			E			D			F	

Intersection Summary		
HCM Average Control Delay	223.8	HCM Level of Service
HCM Volume to Capacity ratio	1.30	F
Actuated Cycle Length (s)	149.2	Sum of lost time (s)
Intersection Capacity Utilization	118.1%	16.0
Analysis Period (min)	15	ICU Level of Service
c Critical Lane Group		H

HCM Signalized Intersection Capacity Analysis
 12: West Lipoa Street & South Kihei Road

2024 Scenario 2 AM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Volume (vph)	20	24	58	81	18	164	24	417	124	152	353	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1821	1583		1790	1583	1770	1863	1583	1770	1858	
Flt Permitted		0.83	1.00		0.73	1.00	0.53	1.00	1.00	0.30	1.00	
Satd. Flow (perm)		1549	1583		1365	1583	989	1863	1583	563	1858	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	26	63	88	20	178	26	453	135	165	384	7
RTOR Reduction (vph)	0	0	52	0	0	146	0	0	80	0	0	0
Lane Group Flow (vph)	0	48	11	0	108	32	26	453	55	165	391	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)		10.2	10.2		10.2	10.2	25.2	23.2	23.2	36.3	29.3	
Effective Green, g (s)		10.2	10.2		10.2	10.2	25.2	23.2	23.2	36.3	29.3	
Actuated g/C Ratio		0.18	0.18		0.18	0.18	0.45	0.41	0.41	0.64	0.52	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		280	286		246	286	469	765	650	535	964	
v/s Ratio Prot							0.00	c0.24		c0.04	c0.21	
v/s Ratio Perm		0.03	0.01		c0.08	0.02	0.02		0.04	0.15		
v/c Ratio		0.17	0.04		0.44	0.11	0.06	0.59	0.09	0.31	0.41	
Uniform Delay, d1		19.6	19.1		20.6	19.4	8.8	13.0	10.2	5.3	8.3	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.3	0.1		1.3	0.2	0.0	1.2	0.1	0.3	0.3	
Delay (s)		19.9	19.2		21.9	19.5	8.8	14.2	10.2	5.7	8.6	
Level of Service		B	B		C	B	A	B	B	A	A	
Approach Delay (s)		19.5			20.4			13.1			7.7	
Approach LOS		B			C			B			A	

Intersection Summary

HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	56.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	55.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 15: Pi'ikea Avenue & Pi'ilani Highway

2024 Scenario 2 AM
 1/11/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	361	251	161	1620	2146	439
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	1770	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	392	273	175	1761	2333	477
RTOR Reduction (vph)	0	0	0	0	0	150
Lane Group Flow (vph)	392	273	175	1761	2333	327
Turn Type		Free	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Actuated Green, G (s)	29.0	159.0	15.0	119.0	98.0	98.0
Effective Green, g (s)	29.0	159.0	15.0	119.0	98.0	98.0
Actuated g/C Ratio	0.18	1.00	0.09	0.75	0.62	0.62
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	323	1583	167	2649	2181	976
v/s Ratio Prot	c0.22		c0.10	0.50	c0.66	
v/s Ratio Perm		0.17				0.21
v/c Ratio	1.21	0.17	1.05	0.66	1.07	0.34
Uniform Delay, d1	65.0	0.0	72.0	10.0	30.5	14.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	121.2	0.2	82.9	0.6	41.0	0.2
Delay (s)	186.2	0.2	154.9	10.7	71.5	15.0
Level of Service	F	A	F	B	E	B
Approach Delay (s)	109.9			23.7	61.9	
Approach LOS	F			C	E	

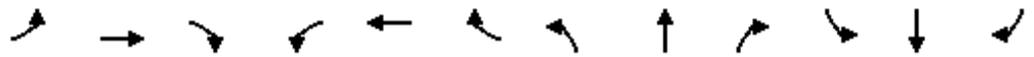
Intersection Summary

HCM Average Control Delay	54.1	HCM Level of Service	D
HCM Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	159.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	102.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Pi'ikea Avenue & South Kihei Road

2024 Scenario 2 AM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↕	↕	↑	↕	↕	↕↔	
Volume (vph)	0	0	0	96	11	88	7	481	93	107	502	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt					1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected					0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1783	1583	1770	1863	1583	1770	3528	
Flt Permitted					0.96	1.00	0.44	1.00	1.00	0.31	1.00	
Satd. Flow (perm)					1783	1583	825	1863	1583	574	3528	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	104	12	96	8	523	101	116	546	12
RTOR Reduction (vph)	0	0	0	0	0	83	0	0	53	0	2	0
Lane Group Flow (vph)	0	0	0	0	116	13	8	523	48	116	556	0
Turn Type				Perm	Perm	pm+pt		Perm	pm+pt			
Protected Phases					8	5		2		1	6	
Permitted Phases				8		2			2		6	
Actuated Green, G (s)					6.6	6.6	23.7	23.2	23.2	31.1	26.9	
Effective Green, g (s)					6.6	6.6	23.7	23.2	23.2	31.1	26.9	
Actuated g/C Ratio					0.13	0.13	0.48	0.47	0.47	0.63	0.55	
Clearance Time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)					240	213	409	882	750	467	1937	
v/s Ratio Prot							0.00	c0.28		c0.02	0.16	
v/s Ratio Perm					0.07	0.01	0.01		0.03	0.14		
v/c Ratio					0.48	0.06	0.02	0.59	0.06	0.25	0.29	
Uniform Delay, d1					19.6	18.5	6.6	9.4	7.0	4.5	5.9	
Progression Factor					1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2					1.5	0.1	0.0	1.1	0.0	0.3	0.1	
Delay (s)					21.2	18.6	6.6	10.5	7.0	4.8	6.0	
Level of Service					C	B	A	B	A	A	A	
Approach Delay (s)		0.0			20.0			9.9			5.8	
Approach LOS		A			C			A			A	

Intersection Summary

HCM Average Control Delay	9.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	49.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	49.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 19: East Waipuilani Road & Pi'ilani Highway

2024 Scenario 2 AM

1/11/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑↑	↑↑	↗
Volume (veh/h)	0	30	0	1924	2568	76
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	33	0	2091	2791	83
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3837	1396	2791			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3837	1396	2791			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	75	100			
cM capacity (veh/h)	3	131	137			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	33	1046	1046	1396	1396	83
Volume Left	0	0	0	0	0	0
Volume Right	33	0	0	0	0	83
cSH	131	1700	1700	1700	1700	1700
Volume to Capacity	0.25	0.62	0.62	0.82	0.82	0.05
Queue Length 95th (ft)	23	0	0	0	0	0
Control Delay (s)	41.4	0.0	0.0	0.0	0.0	0.0
Lane LOS	E					
Approach Delay (s)	41.4	0.0		0.0		
Approach LOS	E					

Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			81.0%	ICU Level of Service		D
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
 21: East Lipoa Street & Liloa Drive

2024 Scenario 2 AM
 1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	214	30	184	217	101	50	132	103	107	148	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1828		1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.61	1.00		0.42	1.00	1.00	0.66	1.00	1.00	0.67	1.00	1.00
Satd. Flow (perm)	1140	1828		774	1863	1583	1220	1863	1583	1240	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	57	233	33	200	236	110	54	143	112	116	161	85
RTOR Reduction (vph)	0	5	0	0	0	63	0	0	87	0	0	66
Lane Group Flow (vph)	57	261	0	200	236	47	54	143	25	116	161	19
Turn Type	pm+pt			pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	16.8	14.6		28.0	20.8	20.8	10.7	10.7	10.7	10.7	10.7	10.7
Effective Green, g (s)	16.8	14.6		28.0	20.8	20.8	10.7	10.7	10.7	10.7	10.7	10.7
Actuated g/C Ratio	0.34	0.30		0.57	0.43	0.43	0.22	0.22	0.22	0.22	0.22	0.22
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	422	548		617	796	676	268	409	348	272	409	348
v/s Ratio Prot	0.01	c0.14		c0.06	0.13			0.08			0.09	
v/s Ratio Perm	0.04			0.13		0.03	0.04		0.02	c0.09		0.01
v/c Ratio	0.14	0.48		0.32	0.30	0.07	0.20	0.35	0.07	0.43	0.39	0.05
Uniform Delay, d1	10.8	13.9		5.4	9.2	8.2	15.5	16.1	15.1	16.4	16.2	15.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.7		0.3	0.2	0.0	0.4	0.5	0.1	1.1	0.6	0.1
Delay (s)	10.9	14.6		5.7	9.4	8.3	15.9	16.6	15.1	17.4	16.9	15.1
Level of Service	B	B		A	A	A	B	B	B	B	B	B
Approach Delay (s)		13.9			7.8			15.9			16.6	
Approach LOS		B			A			B			B	

Intersection Summary

HCM Average Control Delay	12.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	48.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	52.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection				
Intersection Delay, s/veh	6.1			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	97	265	172	194
Demand Flow Rate, veh/h	99	270	176	199
Vehicles Circulating, veh/h	256	128	107	295
Vehicles Exiting, veh/h	238	155	247	103
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	5.3	6.4	5.2	6.9
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	99	270	176	199
Cap Entry Lane, veh/h	875	994	1015	841
Entry HV Adj Factor	0.977	0.980	0.980	0.976
Flow Entry, veh/h	97	265	172	194
Cap Entry, veh/h	855	975	995	821
V/C Ratio	1.13	2.72	1.73	2.37
Control Delay, s/veh	5.3	6.4	5.2	6.9
LOS	A	A	A	A
95th %tile Queue, veh	0.0	0.1	0.1	0.1

HCM Signalized Intersection Capacity Analysis
 34: Kaonoulu St & Pi'ilani Highway

2024 Scenario 2 AM
 1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	24	69	198	81	43	83	61	1751	128	131	2174	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	75	215	88	47	90	66	1903	139	142	2363	26
RTOR Reduction (vph)	0	0	0	0	0	83	0	0	25	0	0	4
Lane Group Flow (vph)	26	75	215	88	47	7	66	1903	114	142	2363	22
Turn Type	Split		Free	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	8.5	8.5	117.6	8.6	8.6	8.6	6.8	68.3	68.3	10.2	71.7	71.7
Effective Green, g (s)	8.5	8.5	117.6	8.6	8.6	8.6	6.8	68.3	68.3	10.2	71.7	71.7
Actuated g/C Ratio	0.07	0.07	1.00	0.07	0.07	0.07	0.06	0.58	0.58	0.09	0.61	0.61
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	128	135	1583	251	136	204	102	2055	919	298	2158	965
v/s Ratio Prot	0.01	c0.04		c0.03	0.03		0.04	0.54		c0.04	c0.67	
v/s Ratio Perm			0.14			0.00			0.07			0.01
v/c Ratio	0.20	0.56	0.14	0.35	0.35	0.03	0.65	0.93	0.12	0.48	1.09	0.02
Uniform Delay, d1	51.4	52.7	0.0	51.8	51.8	50.6	54.2	22.4	11.1	51.2	22.9	9.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	4.9	0.2	0.8	1.5	0.1	13.3	7.8	0.1	1.2	50.8	0.0
Delay (s)	52.1	57.6	0.2	52.7	53.4	50.7	67.5	30.1	11.2	52.4	73.8	9.1
Level of Service	D	E	A	D	D	D	E	C	B	D	E	A
Approach Delay (s)		18.1			52.0			30.0			71.9	
Approach LOS		B			D			C			E	

Intersection Summary

HCM Average Control Delay	50.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	117.6	Sum of lost time (s)	22.0
Intersection Capacity Utilization	78.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 1: Kulanihako'i St & Pi'ilani Highway

2024 Scenario 2 PM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↗	↕↕	↗	↗	↕↕	↗
Volume (vph)	19	15	65	80	6	28	81	2576	61	25	2304	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1811	1583		1780	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.80	1.00		0.71	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1495	1583		1332	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	16	71	87	7	30	88	2800	66	27	2504	85
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	37	71	0	94	30	88	2800	66	27	2504	85
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		4			8		5	2		1		6
Permitted Phases	4		Free	8		Free			Free			Free
Actuated Green, G (s)		13.7	122.5		13.7	122.5	8.8	87.0	122.5	4.8	83.0	122.5
Effective Green, g (s)		13.7	122.5		13.7	122.5	8.8	87.0	122.5	4.8	83.0	122.5
Actuated g/C Ratio		0.11	1.00		0.11	1.00	0.07	0.71	1.00	0.04	0.68	1.00
Clearance Time (s)		5.0			5.0		6.0	6.0		6.0		6.0
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0		3.0
Lane Grp Cap (vph)		167	1583		149	1583	127	2513	1583	69	2398	1583
v/s Ratio Prot							c0.05	c0.79		0.02	0.71	
v/s Ratio Perm		0.02	0.04		c0.07	0.02			0.04			0.05
v/c Ratio		0.22	0.04		0.63	0.02	0.69	1.11	0.04	0.39	1.04	0.05
Uniform Delay, d1		49.5	0.0		52.0	0.0	55.5	17.8	0.0	57.4	19.8	0.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.7	0.1		8.4	0.0	15.1	57.6	0.0	3.6	31.2	0.1
Delay (s)		50.2	0.1		60.4	0.0	70.6	75.4	0.0	61.1	50.9	0.1
Level of Service		D	A		E	A	E	E	A	E	D	A
Approach Delay (s)		17.2			45.8			73.6			49.4	
Approach LOS		B			D			E			D	

Intersection Summary		
HCM Average Control Delay	61.0	HCM Level of Service
HCM Volume to Capacity ratio	1.06	E
Actuated Cycle Length (s)	122.5	Sum of lost time (s)
Intersection Capacity Utilization	91.8%	17.0
Analysis Period (min)	15	ICU Level of Service
c Critical Lane Group		F

HCM Unsignalized Intersection Capacity Analysis
 3: Old Welakahao Road & Pi'ilani Highway

2024 Scenario 2 PM
 1/11/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	3	24	1728	0	8	1455
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	26	1878	0	9	1582
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2686	939			1878	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2686	939			1878	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	81	90			97	
cM capacity (veh/h)	17	265			316	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	29	1252	626	9	791	791
Volume Left	3	0	0	9	0	0
Volume Right	26	0	0	0	0	0
cSH	102	1700	1700	316	1700	1700
Volume to Capacity	0.29	0.74	0.37	0.03	0.47	0.47
Queue Length 95th (ft)	27	0	0	2	0	0
Control Delay (s)	54.3	0.0	0.0	16.7	0.0	0.0
Lane LOS	F			C		
Approach Delay (s)	54.3	0.0		0.1		
Approach LOS	F					

Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			57.8%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 7: East Welakahao Road & Pi'ilani Highway

2024 Scenario 2 PM

1/11/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	125	57	106	1627	1395	215
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	136	62	115	1768	1516	234
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		6				
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2631	758	1516			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2631	758	1516			
tC, single (s)	*5.0	*5.0	*5.0			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	88	62			
cM capacity (veh/h)	46	526	304			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	198	115	884	884	758	758	234
Volume Left	136	115	0	0	0	0	0
Volume Right	62	0	0	0	0	0	234
cSH	64	304	1700	1700	1700	1700	1700
Volume to Capacity	3.07	0.38	0.52	0.52	0.45	0.45	0.14
Queue Length 95th (ft)	Err	43	0	0	0	0	0
Control Delay (s)	Err	23.9	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	C					
Approach Delay (s)	Err	1.5			0.0		
Approach LOS	F						

Intersection Summary

Average Delay	517.0
Intersection Capacity Utilization	61.4%
ICU Level of Service	B
Analysis Period (min)	15

* User Entered Value

HCM Signalized Intersection Capacity Analysis
8: West Welakahao Road & South Kihei Road

2024 Scenario 2 PM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕	↕	↕		↕	↕	
Volume (vph)	34	7	13	110	17	59	18	817	71	44	864	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1748			1785	1583	1770	1840		1770	1853	
Flt Permitted		0.73			0.71	1.00	0.13	1.00		0.12	1.00	
Satd. Flow (perm)		1315			1327	1583	240	1840		229	1853	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	8	14	120	18	64	20	888	77	48	939	34
RTOR Reduction (vph)	0	12	0	0	0	55	0	3	0	0	1	0
Lane Group Flow (vph)	0	47	0	0	138	9	20	962	0	48	972	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		9.8			9.8	9.8	44.4	43.1		45.6	43.7	
Effective Green, g (s)		9.8			9.8	9.8	44.4	43.1		45.6	43.7	
Actuated g/C Ratio		0.14			0.14	0.14	0.64	0.62		0.65	0.63	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		185			186	222	181	1136		192	1160	
v/s Ratio Prot							0.00	0.52		c0.01	c0.52	
v/s Ratio Perm		0.04			c0.10	0.01	0.07			0.16		
v/c Ratio		0.25			0.74	0.04	0.11	0.85		0.25	0.84	
Uniform Delay, d1		26.7			28.8	25.9	9.4	10.7		9.8	10.3	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.7			14.7	0.1	0.3	6.0		0.7	5.4	
Delay (s)		27.5			43.5	26.0	9.6	16.7		10.5	15.7	
Level of Service		C			D	C	A	B		B	B	
Approach Delay (s)		27.5			38.0			16.5			15.4	
Approach LOS		C			D			B			B	

Intersection Summary

HCM Average Control Delay	18.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	69.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 11: East Lipoa Street & Pi'ilani Highway

2024 Scenario 2 PM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↘	↕↕	↗	↘	↕↕	↗
Volume (vph)	271	64	72	231	107	482	221	1484	81	315	1362	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96	1.00		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1790	1583		1801	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.96	1.00		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1790	1583		1801	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	295	70	78	251	116	524	240	1613	88	342	1480	217
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	29	0	0	72
Lane Group Flow (vph)	0	365	78	0	367	524	240	1613	59	342	1480	145
Turn Type	Split		Free	Split		Free	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free			Free			2			6
Actuated Green, G (s)		35.0	166.4		17.0	166.4	24.3	78.4	78.4	14.0	68.1	68.1
Effective Green, g (s)		35.0	166.4		17.0	166.4	24.3	78.4	78.4	14.0	68.1	68.1
Actuated g/C Ratio		0.21	1.00		0.10	1.00	0.15	0.47	0.47	0.08	0.41	0.41
Clearance Time (s)		5.0			5.0		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		377	1583		184	1583	258	1667	746	149	1448	648
v/s Ratio Prot		c0.20			c0.20		0.14	c0.46		c0.19	c0.42	
v/s Ratio Perm			0.05			0.33			0.04			0.09
v/c Ratio		0.97	0.05		1.99	0.33	0.93	0.97	0.08	2.30	1.02	0.22
Uniform Delay, d1		65.1	0.0		74.7	0.0	70.2	42.8	24.2	76.2	49.2	32.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		37.5	0.1		466.4	0.6	37.6	14.9	0.0	603.6	29.4	0.2
Delay (s)		102.7	0.1		541.1	0.6	107.8	57.7	24.2	679.8	78.5	32.1
Level of Service		F	A		F	A	F	E	C	F	E	C
Approach Delay (s)		84.6			223.2			62.4			174.4	
Approach LOS		F			F			E			F	

Intersection Summary

HCM Average Control Delay	134.2	HCM Level of Service	F
HCM Volume to Capacity ratio	1.28		
Actuated Cycle Length (s)	166.4	Sum of lost time (s)	28.0
Intersection Capacity Utilization	97.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 12: West Lipoa Street & South Kihei Road

2024 Scenario 2 PM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Volume (vph)	39	37	58	148	35	138	71	671	140	78	816	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1816	1583		1790	1583	1770	1863	1583	1770	1854	
Flt Permitted		0.76	1.00		0.71	1.00	0.10	1.00	1.00	0.24	1.00	
Satd. Flow (perm)		1411	1583		1325	1583	190	1863	1583	443	1854	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	42	40	63	161	38	150	77	729	152	85	887	30
RTOR Reduction (vph)	0	0	49	0	0	117	0	0	64	0	1	0
Lane Group Flow (vph)	0	82	14	0	199	33	77	729	88	85	916	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)		19.5	19.5		19.5	19.5	55.3	51.6	51.6	53.7	50.8	
Effective Green, g (s)		19.5	19.5		19.5	19.5	55.3	51.6	51.6	53.7	50.8	
Actuated g/C Ratio		0.22	0.22		0.22	0.22	0.62	0.58	0.58	0.60	0.57	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		309	347		290	347	184	1080	918	311	1058	
v/s Ratio Prot							c0.02	0.39		0.01	c0.49	
v/s Ratio Perm		0.06	0.01		c0.15	0.02	0.24		0.06	0.16		
v/c Ratio		0.27	0.04		0.69	0.09	0.42	0.68	0.10	0.27	0.87	
Uniform Delay, d1		28.8	27.4		31.9	27.7	14.8	12.9	8.3	9.8	16.2	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.5	0.0		6.6	0.1	1.5	1.7	0.0	0.5	7.6	
Delay (s)		29.3	27.4		38.5	27.8	16.3	14.6	8.4	10.3	23.8	
Level of Service		C	C		D	C	B	B	A	B	C	
Approach Delay (s)		28.5			33.9			13.7			22.6	
Approach LOS		C			C			B			C	

Intersection Summary

HCM Average Control Delay	21.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	89.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	77.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 15: Pi'ikea Avenue & Pi'ilani Highway

2024 Scenario 2 PM

1/11/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	505	466	459	2136	1631	622
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	1770	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	549	507	499	2322	1773	676
RTOR Reduction (vph)	0	0	0	0	0	227
Lane Group Flow (vph)	549	507	499	2322	1773	449
Turn Type		Free	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Actuated Green, G (s)	29.2	182.6	30.2	142.4	106.2	106.2
Effective Green, g (s)	29.2	182.6	30.2	142.4	106.2	106.2
Actuated g/C Ratio	0.16	1.00	0.17	0.78	0.58	0.58
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	283	1583	293	2760	2058	921
v/s Ratio Prot	c0.31		c0.28	0.66	c0.50	
v/s Ratio Perm		0.32				0.28
v/c Ratio	1.94	0.32	1.70	0.84	0.86	0.49
Uniform Delay, d1	76.7	0.0	76.2	12.9	32.0	22.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	435.7	0.5	330.6	2.5	4.0	0.4
Delay (s)	512.4	0.5	406.8	15.4	36.0	22.7
Level of Service	F	A	F	B	D	C
Approach Delay (s)	266.7			84.6	32.3	
Approach LOS	F			F	C	

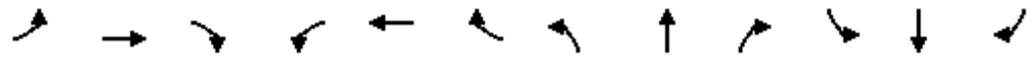
Intersection Summary

HCM Average Control Delay	94.8	HCM Level of Service	F
HCM Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	182.6	Sum of lost time (s)	17.0
Intersection Capacity Utilization	112.7%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Pi'ikea Avenue & South Kihei Road

2024 Scenario 2 PM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↗	↖	↑	↗	↖	↕	↕
Volume (vph)	0	0	0	223	63	128	19	692	197	91	578	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95
Frt					1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected					0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1793	1583	1770	1863	1583	1770	3517	
Flt Permitted					0.96	1.00	0.40	1.00	1.00	0.15	1.00	
Satd. Flow (perm)					1793	1583	744	1863	1583	279	3517	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	242	68	139	21	752	214	99	628	27
RTOR Reduction (vph)	0	0	0	0	0	104	0	0	106	0	3	0
Lane Group Flow (vph)	0	0	0	0	310	35	21	752	108	99	652	0
Turn Type				Perm	Perm	pm+pt		Perm	pm+pt			
Protected Phases					8	5		2		1	6	
Permitted Phases				8		2			2		6	
Actuated Green, G (s)					19.8	41.5		40.3	40.3	47.9	43.5	
Effective Green, g (s)					19.8	41.5		40.3	40.3	47.9	43.5	
Actuated g/C Ratio					0.25	0.52		0.51	0.51	0.60	0.55	
Clearance Time (s)					5.0	5.0		5.0	5.0	5.0	5.0	
Vehicle Extension (s)					3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)					447	394		944	802	251	1924	
v/s Ratio Prot						0.00		c0.40		c0.02	0.19	
v/s Ratio Perm					0.17	0.02			0.07	0.22		
v/c Ratio					0.69	0.09		0.80	0.14	0.39	0.34	
Uniform Delay, d1					27.1	22.9		16.2	10.4	11.7	10.0	
Progression Factor					1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2					4.6	0.1		4.7	0.1	1.0	0.1	
Delay (s)					31.7	23.0		20.9	10.5	12.7	10.1	
Level of Service					C	C		C	B	B	B	
Approach Delay (s)		0.0			29.0			18.4			10.5	
Approach LOS		A			C			B			B	

Intersection Summary

HCM Average Control Delay	17.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	79.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 19: East Waipuilani Road & Pi'ilani Highway

2024 Scenario 2 PM

1/11/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑↑	↑↑	↘
Volume (veh/h)	0	10	0	2415	2047	130
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	11	0	2625	2225	141
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3538	1112	2225			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3538	1112	2225			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	95	100			
cM capacity (veh/h)	4	203	231			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	11	1312	1312	1112	1112	141
Volume Left	0	0	0	0	0	0
Volume Right	11	0	0	0	0	141
cSH	203	1700	1700	1700	1700	1700
Volume to Capacity	0.05	0.77	0.77	0.65	0.65	0.08
Queue Length 95th (ft)	4	0	0	0	0	0
Control Delay (s)	23.7	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	23.7	0.0		0.0		
Approach LOS	C					

Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			70.1%	ICU Level of Service		C
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
 21: East Lipoa Street & Liloa Drive

2024 Scenario 2 PM
 1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	257	18	72	263	87	16	60	88	44	67	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1844		1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.58	1.00		0.44	1.00	1.00	0.74	1.00	1.00	0.74	1.00	1.00
Satd. Flow (perm)	1089	1844		814	1863	1583	1380	1863	1583	1380	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	279	20	78	286	95	17	65	96	48	73	122
RTOR Reduction (vph)	0	4	0	0	0	63	0	0	80	0	0	101
Lane Group Flow (vph)	92	295	0	78	286	32	17	65	16	48	73	21
Turn Type	pm+pt			pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	8.6	8.1		13.8	10.7	10.7	5.4	5.4	5.4	5.4	5.4	5.4
Effective Green, g (s)	8.6	8.1		13.8	10.7	10.7	5.4	5.4	5.4	5.4	5.4	5.4
Actuated g/C Ratio	0.27	0.26		0.44	0.34	0.34	0.17	0.17	0.17	0.17	0.17	0.17
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	307	473		449	631	536	236	318	271	236	318	271
v/s Ratio Prot	0.00	c0.16		c0.02	c0.15			0.03			c0.04	
v/s Ratio Perm	0.08			0.06		0.02	0.01		0.01	0.03		0.01
v/c Ratio	0.30	0.62		0.17	0.45	0.06	0.07	0.20	0.06	0.20	0.23	0.08
Uniform Delay, d1	8.9	10.4		5.4	8.2	7.1	11.0	11.3	11.0	11.3	11.3	11.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	2.5		0.2	0.5	0.0	0.1	0.3	0.1	0.4	0.4	0.1
Delay (s)	9.5	12.9		5.5	8.7	7.1	11.1	11.6	11.1	11.7	11.7	11.1
Level of Service	A	B		A	A	A	B	B	B	B	B	B
Approach Delay (s)		12.1			7.8			11.3			11.4	
Approach LOS		B			A			B			B	

Intersection Summary

HCM Average Control Delay	10.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	31.6	Sum of lost time (s)	20.0
Intersection Capacity Utilization	40.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection				
Intersection Delay, s/veh	7.7			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	250	334	254	220
Demand Flow Rate, veh/h	255	340	259	225
Vehicles Circulating, veh/h	261	231	245	302
Vehicles Exiting, veh/h	266	273	271	269
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.4	8.5	7.3	7.4
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	255	340	259	225
Cap Entry Lane, veh/h	870	897	884	835
Entry HV Adj Factor	0.980	0.983	0.980	0.979
Flow Entry, veh/h	250	334	254	220
Cap Entry, veh/h	853	881	867	818
V/C Ratio	2.93	3.79	2.93	2.69
Control Delay, s/veh	7.4	8.5	7.3	7.4
LOS	A	A	A	A
95th %tile Queue, veh	0.1	0.2	0.1	0.1

HCM Signalized Intersection Capacity Analysis
 34: Kaonoulu St & Pi'ilani Highway

2024 Scenario 2 PM

1/13/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	155	130	513	174	522	110	2036	477	483	1764	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	168	141	558	189	567	120	2213	518	525	1917	38
RTOR Reduction (vph)	0	0	0	0	0	473	0	0	103	0	0	9
Lane Group Flow (vph)	21	168	141	558	189	94	120	2213	415	525	1917	29
Turn Type	Split		Free	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	15.2	15.2	139.2	20.0	20.0	20.0	10.0	64.0	64.0	19.0	73.0	73.0
Effective Green, g (s)	15.2	15.2	139.2	20.0	20.0	20.0	10.0	64.0	64.0	19.0	73.0	73.0
Actuated g/C Ratio	0.11	0.11	1.00	0.14	0.14	0.14	0.07	0.46	0.46	0.14	0.52	0.52
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	193	203	1583	493	268	400	127	1627	728	469	1856	830
v/s Ratio Prot	0.01	c0.09		c0.16	0.10		0.07	c0.63		c0.15	c0.54	
v/s Ratio Perm			0.09			0.03			0.26			0.02
v/c Ratio	0.11	0.83	0.09	1.13	0.71	0.24	0.94	1.36	0.57	1.12	1.03	0.04
Uniform Delay, d1	55.9	60.7	0.0	59.6	56.8	52.8	64.3	37.6	27.5	60.1	33.1	16.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	23.3	0.1	82.0	8.2	0.3	62.4	166.2	1.1	78.4	29.9	0.0
Delay (s)	56.1	84.0	0.1	141.6	65.0	53.1	126.8	203.8	28.6	138.5	63.0	16.1
Level of Service	E	F	A	F	E	D	F	F	C	F	E	B
Approach Delay (s)		46.4			92.4			168.7			78.2	
Approach LOS		D			F			F			E	

Intersection Summary

HCM Average Control Delay	116.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.28		
Actuated Cycle Length (s)	139.2	Sum of lost time (s)	27.0
Intersection Capacity Utilization	110.4%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 1: Kulanihako'i St & Pi'ilani Highway

2024 Scenario 3 AM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑↑	↗	↖	↑↑	↗
Volume (vph)	47	71	56	154	12	56	46	1837	283	117	2304	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1826	1583		1780	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.67	1.00		0.57	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1242	1583		1068	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	77	61	167	13	61	50	1997	308	127	2504	35
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	128	61	0	180	61	50	1997	308	127	2504	35
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		4			8		5	2		1		6
Permitted Phases	4		Free	8		Free			Free			Free
Actuated Green, G (s)		25.4	130.8		25.4	130.8	6.7	75.7	130.8	12.7	81.7	130.8
Effective Green, g (s)		25.4	130.8		25.4	130.8	6.7	75.7	130.8	12.7	81.7	130.8
Actuated g/C Ratio		0.19	1.00		0.19	1.00	0.05	0.58	1.00	0.10	0.62	1.00
Clearance Time (s)		5.0			5.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		241	1583		207	1583	91	2048	1583	172	2211	1583
v/s Ratio Prot							0.03	0.56		c0.07	c0.71	
v/s Ratio Perm		0.10	0.04		c0.17	0.04			0.19			0.02
v/c Ratio		0.53	0.04		0.87	0.04	0.55	0.98	0.19	0.74	1.13	0.02
Uniform Delay, d1		47.3	0.0		51.1	0.0	60.6	26.6	0.0	57.4	24.6	0.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		2.2	0.0		29.8	0.0	6.6	14.4	0.3	15.2	65.9	0.0
Delay (s)		49.6	0.0		80.9	0.0	67.2	41.0	0.3	72.7	90.5	0.0
Level of Service		D	A		F	A	E	D	A	E	F	A
Approach Delay (s)		33.6			60.5			36.2			88.4	
Approach LOS		C			E			D			F	

Intersection Summary

HCM Average Control Delay	62.7	HCM Level of Service	E
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	130.8	Sum of lost time (s)	17.0
Intersection Capacity Utilization	97.0%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

3: Old Welakahao Road & Pi'ilani Highway

2024 Scenario 3 AM

1/11/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	24	1321	4	33	1484
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	26	1436	4	36	1613
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2316	720			1440	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2316	720			1440	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	78	93			92	
cM capacity (veh/h)	29	370			467	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	33	957	483	36	807	807
Volume Left	7	0	0	36	0	0
Volume Right	26	0	4	0	0	0
cSH	111	1700	1700	467	1700	1700
Volume to Capacity	0.29	0.56	0.28	0.08	0.47	0.47
Queue Length 95th (ft)	28	0	0	6	0	0
Control Delay (s)	50.3	0.0	0.0	13.3	0.0	0.0
Lane LOS	F			B		
Approach Delay (s)	50.3	0.0		0.3		
Approach LOS	F					

Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			51.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 7: East Welakahao Road & Pi'ilani Highway

2024 Scenario 3 AM
 1/11/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	111	58	31	1312	1454	108
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	121	63	34	1426	1580	117
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)	6					
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2361	790	1580			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2361	790	1580			
tC, single (s)	*5.0	*5.0	*5.0			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	88	88			
cM capacity (veh/h)	87	510	283			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	184	34	713	713	790	790	117
Volume Left	121	34	0	0	0	0	0
Volume Right	63	0	0	0	0	0	117
cSH	127	283	1700	1700	1700	1700	1700
Volume to Capacity	1.45	0.12	0.42	0.42	0.46	0.46	0.07
Queue Length 95th (ft)	314	10	0	0	0	0	0
Control Delay (s)	302.8	19.5	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	C					
Approach Delay (s)	302.8	0.4			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		16.8	
Intersection Capacity Utilization	53.0%		ICU Level of Service A
Analysis Period (min)	15		

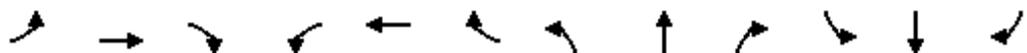
* User Entered Value

HCM Signalized Intersection Capacity Analysis

8: West Welakahao Road & South Kihei Road

2024 Scenario 3 AM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔	↔	↔		↔	↔	
Volume (vph)	29	11	11	56	11	69	3	519	47	38	459	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1759			1788	1583	1770	1840		1770	1857	
Flt Permitted		0.78			0.72	1.00	0.41	1.00		0.30	1.00	
Satd. Flow (perm)		1415			1345	1583	767	1840		551	1857	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	32	12	12	61	12	75	3	564	51	41	499	10
RTOR Reduction (vph)	0	10	0	0	0	64	0	5	0	0	1	0
Lane Group Flow (vph)	0	46	0	0	73	11	3	611	0	41	508	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		6.4			6.4	6.4	23.0	22.5		24.2	23.1	
Effective Green, g (s)		6.4			6.4	6.4	23.0	22.5		24.2	23.1	
Actuated g/C Ratio		0.14			0.14	0.14	0.51	0.50		0.54	0.51	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		201			191	225	403	920		326	953	
v/s Ratio Prot							0.00	c0.33		c0.00	0.27	
v/s Ratio Perm		0.03			c0.05	0.01	0.00			0.06		
v/c Ratio		0.23			0.38	0.05	0.01	0.66		0.13	0.53	
Uniform Delay, d1		17.1			17.5	16.7	5.5	8.4		5.5	7.3	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6			1.3	0.1	0.0	1.8		0.2	0.6	
Delay (s)		17.7			18.8	16.8	5.5	10.2		5.7	7.9	
Level of Service		B			B	B	A	B		A	A	
Approach Delay (s)		17.7			17.8			10.2			7.7	
Approach LOS		B			B			B			A	

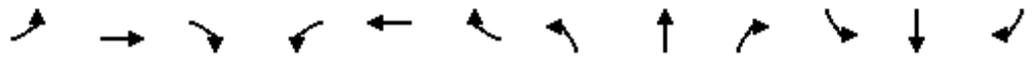
Intersection Summary

HCM Average Control Delay	10.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	50.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 11: East Lipoa Street & Pi'ilani Highway

2024 Scenario 3 AM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	269	125	118	162	60	56	124	1193	129	624	1305	407
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	4.0	6.0	6.0	5.0	6.0	6.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frbp, ped/bikes	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1541	1770	1863	1583	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1541	1770	1863	1583	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	292	136	128	176	65	61	135	1297	140	678	1418	442
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	65	0	0	130
Lane Group Flow (vph)	292	136	128	176	65	61	135	1297	75	678	1418	312
Confl. Peds. (#/hr)			50	50								
Turn Type	Prot		Free	Prot		Free	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases			Free			Free			2			6
Actuated Green, G (s)	28.1	23.9	139.2	13.0	8.8	139.2	14.3	53.2	66.2	27.1	66.0	94.1
Effective Green, g (s)	28.1	23.9	139.2	13.0	8.8	139.2	14.3	53.2	66.2	27.1	66.0	94.1
Actuated g/C Ratio	0.20	0.17	1.00	0.09	0.06	1.00	0.10	0.38	0.48	0.19	0.47	0.68
Clearance Time (s)	5.0	5.0		5.0	5.0		6.0	6.0	5.0	6.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	357	320	1541	165	118	1583	182	1353	753	668	1678	1070
v/s Ratio Prot	c0.17	0.07		c0.10	c0.03		0.08	c0.37	0.01	c0.20	0.40	0.06
v/s Ratio Perm			0.08			0.04			0.04			0.14
v/c Ratio	0.82	0.42	0.08	1.07	0.55	0.04	0.74	0.96	0.10	1.01	0.85	0.29
Uniform Delay, d1	53.1	51.5	0.0	63.1	63.3	0.0	60.7	41.9	20.1	56.0	32.1	9.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	13.5	0.9	0.1	88.9	5.5	0.0	15.0	15.5	0.1	38.6	4.1	0.2
Delay (s)	66.6	52.4	0.1	152.0	68.7	0.0	75.7	57.4	20.2	94.7	36.2	9.3
Level of Service	E	D	A	F	E	A	E	E	C	F	D	A
Approach Delay (s)		47.8			103.4			55.7			47.1	
Approach LOS		D			F			E			D	

Intersection Summary

HCM Average Control Delay	53.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	139.2	Sum of lost time (s)	22.0
Intersection Capacity Utilization	90.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
12: West Lipoa Street & South Kihei Road

2024 Scenario 3 AM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Volume (vph)	20	24	58	81	18	164	24	417	124	152	353	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1821	1583		1790	1583	1770	1863	1583	1770	1858	
Flt Permitted		0.83	1.00		0.73	1.00	0.53	1.00	1.00	0.30	1.00	
Satd. Flow (perm)		1549	1583		1365	1583	989	1863	1583	563	1858	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	26	63	88	20	178	26	453	135	165	384	7
RTOR Reduction (vph)	0	0	52	0	0	146	0	0	80	0	0	0
Lane Group Flow (vph)	0	48	11	0	108	32	26	453	55	165	391	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)		10.2	10.2		10.2	10.2	25.2	23.2	23.2	36.3	29.3	
Effective Green, g (s)		10.2	10.2		10.2	10.2	25.2	23.2	23.2	36.3	29.3	
Actuated g/C Ratio		0.18	0.18		0.18	0.18	0.45	0.41	0.41	0.64	0.52	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		280	286		246	286	469	765	650	535	964	
v/s Ratio Prot							0.00	c0.24		c0.04	c0.21	
v/s Ratio Perm		0.03	0.01		c0.08	0.02	0.02		0.04	0.15		
v/c Ratio		0.17	0.04		0.44	0.11	0.06	0.59	0.09	0.31	0.41	
Uniform Delay, d1		19.6	19.1		20.6	19.4	8.8	13.0	10.2	5.3	8.3	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.3	0.1		1.3	0.2	0.0	1.2	0.1	0.3	0.3	
Delay (s)		19.9	19.2		21.9	19.5	8.8	14.2	10.2	5.7	8.6	
Level of Service		B	B		C	B	A	B	B	A	A	
Approach Delay (s)		19.5			20.4			13.1			7.7	
Approach LOS		B			C			B			A	

Intersection Summary

HCM Average Control Delay	13.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	56.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	55.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 15: Pi'ikea Avenue & Pi'ilani Highway

2024 Scenario 3 AM

1/11/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	361	251	161	1389	2146	439
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3433	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	1770	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	392	273	175	1510	2333	477
RTOR Reduction (vph)	0	0	0	0	0	132
Lane Group Flow (vph)	392	273	175	1510	2333	345
Turn Type		Free	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Actuated Green, G (s)	21.9	146.1	18.0	113.2	89.2	89.2
Effective Green, g (s)	21.9	146.1	18.0	113.2	89.2	89.2
Actuated g/C Ratio	0.15	1.00	0.12	0.77	0.61	0.61
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	515	1583	218	2742	2161	966
v/s Ratio Prot	c0.11		c0.10	0.43	c0.66	
v/s Ratio Perm		0.17				0.22
v/c Ratio	0.76	0.17	0.80	0.55	1.08	0.36
Uniform Delay, d1	59.6	0.0	62.3	6.5	28.4	14.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.6	0.2	18.8	0.2	44.8	0.2
Delay (s)	66.1	0.2	81.2	6.7	73.3	14.4
Level of Service	E	A	F	A	E	B
Approach Delay (s)	39.1			14.4	63.3	
Approach LOS	D			B	E	

Intersection Summary

HCM Average Control Delay	44.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	146.1	Sum of lost time (s)	17.0
Intersection Capacity Utilization	92.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Pi'ikea Avenue & South Kihei Road

2024 Scenario 3 AM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↕	↕	↑	↕	↕	↕↔	
Volume (vph)	0	0	0	96	11	88	7	481	93	107	502	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt					1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected					0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1783	1583	1770	1863	1583	1770	3528	
Flt Permitted					0.96	1.00	0.44	1.00	1.00	0.31	1.00	
Satd. Flow (perm)					1783	1583	825	1863	1583	574	3528	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	104	12	96	8	523	101	116	546	12
RTOR Reduction (vph)	0	0	0	0	0	83	0	0	53	0	2	0
Lane Group Flow (vph)	0	0	0	0	116	13	8	523	48	116	556	0
Turn Type				Perm	Perm	pm+pt		Perm	pm+pt			
Protected Phases					8	5		2		1	6	
Permitted Phases				8		2			2		6	
Actuated Green, G (s)					6.6	6.6	23.7	23.2	23.2	31.1	26.9	
Effective Green, g (s)					6.6	6.6	23.7	23.2	23.2	31.1	26.9	
Actuated g/C Ratio					0.13	0.13	0.48	0.47	0.47	0.63	0.55	
Clearance Time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)					240	213	409	882	750	467	1937	
v/s Ratio Prot							0.00	c0.28		c0.02	0.16	
v/s Ratio Perm					0.07	0.01	0.01		0.03	0.14		
v/c Ratio					0.48	0.06	0.02	0.59	0.06	0.25	0.29	
Uniform Delay, d1					19.6	18.5	6.6	9.4	7.0	4.5	5.9	
Progression Factor					1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2					1.5	0.1	0.0	1.1	0.0	0.3	0.1	
Delay (s)					21.2	18.6	6.6	10.5	7.0	4.8	6.0	
Level of Service					C	B	A	B	A	A	A	
Approach Delay (s)		0.0			20.0			9.9			5.8	
Approach LOS		A			C			A			A	

Intersection Summary

HCM Average Control Delay	9.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	49.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	49.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

19: East Waipuilani Road & Pi'ilani Highway Performance by movement

Movement	EBR	WBR	NBT	NBR	SBT	SBR	All
Total Delay (hr)	0.0	0.1	0.3	0.0	0.3	0.0	0.7
Delay / Veh (s)	5.4	2.8	2.7	5.6	1.7	1.5	2.2
Total Stops	1	1	1	0	0	0	3
Travel Dist (mi)	1.0	9.9	86.4	1.5	68.9	0.9	168.6
Travel Time (hr)	0.0	0.5	2.3	0.1	1.9	0.0	4.8
Avg Speed (mph)	21	22	39	34	37	27	36
Fuel Used (gal)	0.0	0.3	2.6	0.0	2.0	0.0	5.0
HC Emissions (g)	2	2	52	0	25	0	81
CO Emissions (g)	30	87	1692	32	806	7	2654
NOx Emissions (g)	5	6	179	2	100	0	292
Vehicles Entered	5	90	403	7	655	10	1170
Vehicles Exited	5	91	402	7	654	9	1168
Hourly Exit Rate	20	364	1608	28	2616	36	4672
Input Volume	30	280	1644	49	2568	76	4647
% of Volume	67	130	98	57	102	47	101
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Total Delay (hr)	2.9
Delay / Veh (s)	9.0
Total Stops	101
Travel Dist (mi)	689.3
Travel Time (hr)	19.0
Avg Speed (mph)	37
Fuel Used (gal)	23.1
HC Emissions (g)	329
CO Emissions (g)	11947
NOx Emissions (g)	1297
Vehicles Entered	1168
Vehicles Exited	1167
Hourly Exit Rate	4668
Input Volume	13862
% of Volume	34
Denied Entry Before	1
Denied Entry After	2

HCM Signalized Intersection Capacity Analysis
 21: East Lipoa Street & Liloa Drive

2024 Scenario 3 AM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	214	30	184	217	101	50	132	103	107	148	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1828		1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.61	1.00		0.42	1.00	1.00	0.66	1.00	1.00	0.67	1.00	1.00
Satd. Flow (perm)	1140	1828		774	1863	1583	1220	1863	1583	1240	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	57	233	33	200	236	110	54	143	112	116	161	85
RTOR Reduction (vph)	0	5	0	0	0	63	0	0	87	0	0	66
Lane Group Flow (vph)	57	261	0	200	236	47	54	143	25	116	161	19
Turn Type	pm+pt			pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	16.8	14.6		28.0	20.8	20.8	10.7	10.7	10.7	10.7	10.7	10.7
Effective Green, g (s)	16.8	14.6		28.0	20.8	20.8	10.7	10.7	10.7	10.7	10.7	10.7
Actuated g/C Ratio	0.34	0.30		0.57	0.43	0.43	0.22	0.22	0.22	0.22	0.22	0.22
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	422	548		617	796	676	268	409	348	272	409	348
v/s Ratio Prot	0.01	c0.14		c0.06	0.13			0.08			0.09	
v/s Ratio Perm	0.04			0.13		0.03	0.04		0.02	c0.09		0.01
v/c Ratio	0.14	0.48		0.32	0.30	0.07	0.20	0.35	0.07	0.43	0.39	0.05
Uniform Delay, d1	10.8	13.9		5.4	9.2	8.2	15.5	16.1	15.1	16.4	16.2	15.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.7		0.3	0.2	0.0	0.4	0.5	0.1	1.1	0.6	0.1
Delay (s)	10.9	14.6		5.7	9.4	8.3	15.9	16.6	15.1	17.4	16.9	15.1
Level of Service	B	B		A	A	A	B	B	B	B	B	B
Approach Delay (s)		13.9			7.8			15.9			16.6	
Approach LOS		B			A			B			B	

Intersection Summary

HCM Average Control Delay	12.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	48.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	52.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection				
Intersection Delay, s/veh	6.1			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	97	265	172	194
Demand Flow Rate, veh/h	99	270	176	199
Vehicles Circulating, veh/h	256	128	107	295
Vehicles Exiting, veh/h	238	155	247	103
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	5.3	6.4	5.2	6.9
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	99	270	176	199
Cap Entry Lane, veh/h	875	994	1015	841
Entry HV Adj Factor	0.977	0.980	0.980	0.976
Flow Entry, veh/h	97	265	172	194
Cap Entry, veh/h	855	975	995	821
V/C Ratio	1.13	2.72	1.73	2.37
Control Delay, s/veh	5.3	6.4	5.2	6.9
LOS	A	A	A	A
95th %tile Queue, veh	0.0	0.1	0.1	0.1

HCM Signalized Intersection Capacity Analysis
 34: Kaonoulu St & Pi'ilani Highway

2024 Scenario 3 AM

1/11/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	24	69	198	81	43	83	61	1751	128	131	2174	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	75	215	88	47	90	66	1903	139	142	2363	26
RTOR Reduction (vph)	0	0	0	0	0	83	0	0	25	0	0	4
Lane Group Flow (vph)	26	75	215	88	47	7	66	1903	114	142	2363	22
Turn Type	Split		Free	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	8.5	8.5	117.6	8.6	8.6	8.6	6.8	68.3	68.3	10.2	71.7	71.7
Effective Green, g (s)	8.5	8.5	117.6	8.6	8.6	8.6	6.8	68.3	68.3	10.2	71.7	71.7
Actuated g/C Ratio	0.07	0.07	1.00	0.07	0.07	0.07	0.06	0.58	0.58	0.09	0.61	0.61
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	128	135	1583	251	136	204	102	2055	919	298	2158	965
v/s Ratio Prot	0.01	c0.04		c0.03	0.03		0.04	0.54		c0.04	c0.67	
v/s Ratio Perm			0.14			0.00			0.07			0.01
v/c Ratio	0.20	0.56	0.14	0.35	0.35	0.03	0.65	0.93	0.12	0.48	1.09	0.02
Uniform Delay, d1	51.4	52.7	0.0	51.8	51.8	50.6	54.2	22.4	11.1	51.2	22.9	9.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	4.9	0.2	0.8	1.5	0.1	13.3	7.8	0.1	1.2	50.8	0.0
Delay (s)	52.1	57.6	0.2	52.7	53.4	50.7	67.5	30.1	11.2	52.4	73.8	9.1
Level of Service	D	E	A	D	D	D	E	C	B	D	E	A
Approach Delay (s)		18.1			52.0			30.0			71.9	
Approach LOS		B			D			C			E	

Intersection Summary

HCM Average Control Delay	50.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	117.6	Sum of lost time (s)	22.0
Intersection Capacity Utilization	78.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 1: Kulanihako'i St & Pi'ilani Highway

2024 Scenario 3 PM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↖	↕	↗	↖	↕	↗
Volume (vph)	19	15	65	80	6	28	81	2577	61	25	2304	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1811	1583		1780	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.80	1.00		0.71	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1495	1583		1332	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	16	71	87	7	30	88	2801	66	27	2504	85
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	37	71	0	94	30	88	2801	66	27	2504	85
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8		Free			Free			Free
Actuated Green, G (s)		13.7	122.5		13.7	122.5	8.8	87.0	122.5	4.8	83.0	122.5
Effective Green, g (s)		13.7	122.5		13.7	122.5	8.8	87.0	122.5	4.8	83.0	122.5
Actuated g/C Ratio		0.11	1.00		0.11	1.00	0.07	0.71	1.00	0.04	0.68	1.00
Clearance Time (s)		5.0			5.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		167	1583		149	1583	127	2513	1583	69	2398	1583
v/s Ratio Prot							c0.05	c0.79		0.02	0.71	
v/s Ratio Perm		0.02	0.04		c0.07	0.02			0.04			0.05
v/c Ratio		0.22	0.04		0.63	0.02	0.69	1.11	0.04	0.39	1.04	0.05
Uniform Delay, d1		49.5	0.0		52.0	0.0	55.5	17.8	0.0	57.4	19.8	0.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.7	0.1		8.4	0.0	15.1	57.8	0.0	3.6	31.2	0.1
Delay (s)		50.2	0.1		60.4	0.0	70.6	75.5	0.0	61.1	50.9	0.1
Level of Service		D	A		E	A	E	E	A	E	D	A
Approach Delay (s)		17.2			45.8			73.7			49.4	
Approach LOS		B			D			E			D	

Intersection Summary		
HCM Average Control Delay	61.1	HCM Level of Service E
HCM Volume to Capacity ratio	1.06	
Actuated Cycle Length (s)	122.5	Sum of lost time (s) 17.0
Intersection Capacity Utilization	91.8%	ICU Level of Service F
Analysis Period (min)	15	
c Critical Lane Group		

HCM Unsignalized Intersection Capacity Analysis
 3: Old Welakahao Road & Pi'ilani Highway

2024 Scenario 3 PM
 1/11/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	3	24	1728	0	8	1455
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	26	1878	0	9	1582
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2686	939			1878	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2686	939			1878	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	81	90			97	
cM capacity (veh/h)	17	265			316	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	29	1252	626	9	791	791
Volume Left	3	0	0	9	0	0
Volume Right	26	0	0	0	0	0
cSH	102	1700	1700	316	1700	1700
Volume to Capacity	0.29	0.74	0.37	0.03	0.47	0.47
Queue Length 95th (ft)	27	0	0	2	0	0
Control Delay (s)	54.3	0.0	0.0	16.7	0.0	0.0
Lane LOS	F			C		
Approach Delay (s)	54.3	0.0		0.1		
Approach LOS	F					

Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			57.8%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 7: East Welakahao Road & Pi'ilani Highway

2024 Scenario 3 PM
 1/11/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	125	57	106	1627	1395	215
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	136	62	115	1768	1516	234
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)	6					
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2631	758	1516			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2631	758	1516			
tC, single (s)	*5.0	*5.0	*5.0			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	88	62			
cM capacity (veh/h)	46	526	304			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	198	115	884	884	758	758	234
Volume Left	136	115	0	0	0	0	0
Volume Right	62	0	0	0	0	0	234
cSH	64	304	1700	1700	1700	1700	1700
Volume to Capacity	3.07	0.38	0.52	0.52	0.45	0.45	0.14
Queue Length 95th (ft)	Err	43	0	0	0	0	0
Control Delay (s)	Err	23.9	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	C					
Approach Delay (s)	Err	1.5			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay	517.0		
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		

* User Entered Value

HCM Signalized Intersection Capacity Analysis
8: West Welakahao Road & South Kihei Road

2024 Scenario 3 PM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕	↕	↕		↕	↕	
Volume (vph)	34	7	13	110	17	59	18	817	71	44	864	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1748			1785	1583	1770	1840		1770	1853	
Flt Permitted		0.73			0.71	1.00	0.13	1.00		0.12	1.00	
Satd. Flow (perm)		1315			1327	1583	240	1840		229	1853	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	8	14	120	18	64	20	888	77	48	939	34
RTOR Reduction (vph)	0	12	0	0	0	55	0	3	0	0	1	0
Lane Group Flow (vph)	0	47	0	0	138	9	20	962	0	48	972	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		9.8			9.8	9.8	44.4	43.1		45.6	43.7	
Effective Green, g (s)		9.8			9.8	9.8	44.4	43.1		45.6	43.7	
Actuated g/C Ratio		0.14			0.14	0.14	0.64	0.62		0.65	0.63	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		185			186	222	181	1136		192	1160	
v/s Ratio Prot							0.00	0.52		c0.01	c0.52	
v/s Ratio Perm		0.04			c0.10	0.01	0.07			0.16		
v/c Ratio		0.25			0.74	0.04	0.11	0.85		0.25	0.84	
Uniform Delay, d1		26.7			28.8	25.9	9.4	10.7		9.8	10.3	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.7			14.7	0.1	0.3	6.0		0.7	5.4	
Delay (s)		27.5			43.5	26.0	9.6	16.7		10.5	15.7	
Level of Service		C			D	C	A	B		B	B	
Approach Delay (s)		27.5			38.0			16.5			15.4	
Approach LOS		C			D			B			B	

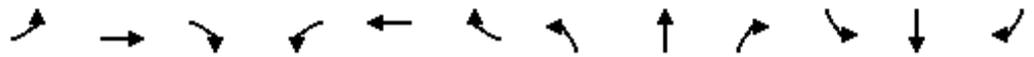
Intersection Summary

HCM Average Control Delay	18.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	69.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 11: East Lipoa Street & Pi'ilani Highway

2024 Scenario 3 PM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	271	64	72	231	107	255	221	1538	27	315	1362	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	4.0	6.0	6.0	5.0	6.0	6.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frbp, ped/bikes	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1541	1770	1863	1583	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1541	1770	1863	1583	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	295	70	78	251	116	277	240	1672	29	342	1480	217
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	9	0	0	86
Lane Group Flow (vph)	295	70	78	251	116	277	240	1672	20	342	1480	131
Confl. Peds. (#/hr)			50	50								
Turn Type	Prot		Free	Prot		Free	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases			Free			Free			2			6
Actuated Green, G (s)	27.1	17.7	135.3	24.3	14.9	135.3	21.9	55.4	79.7	15.9	49.4	76.5
Effective Green, g (s)	27.1	17.7	135.3	24.3	14.9	135.3	21.9	55.4	79.7	15.9	49.4	76.5
Actuated g/C Ratio	0.20	0.13	1.00	0.18	0.11	1.00	0.16	0.41	0.59	0.12	0.37	0.57
Clearance Time (s)	5.0	5.0		5.0	5.0		6.0	6.0	5.0	6.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	355	244	1541	318	205	1583	286	1449	932	403	1292	895
v/s Ratio Prot	c0.17	0.04		0.14	c0.06		c0.14	c0.47	0.00	0.10	0.42	0.03
v/s Ratio Perm			0.05			c0.17			0.01			0.05
v/c Ratio	0.83	0.29	0.05	0.79	0.57	0.17	0.84	1.15	0.02	0.85	1.15	0.15
Uniform Delay, d1	51.9	53.1	0.0	53.1	57.1	0.0	55.0	40.0	11.6	58.5	43.0	13.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	15.1	0.7	0.1	12.2	3.6	0.2	18.9	77.6	0.0	15.2	75.0	0.1
Delay (s)	67.0	53.8	0.1	65.3	60.7	0.2	73.9	117.5	11.6	73.7	118.0	14.0
Level of Service	E	D	A	E	E	A	E	F	B	E	F	B
Approach Delay (s)		53.1			36.5			110.5			99.5	
Approach LOS		D			D			F			F	

Intersection Summary

HCM Average Control Delay	91.7	HCM Level of Service	F
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	135.3	Sum of lost time (s)	22.0
Intersection Capacity Utilization	87.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 12: West Lipoa Street & South Kihei Road

2024 Scenario 3 PM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Volume (vph)	39	37	58	148	35	138	71	671	140	78	816	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1816	1583		1790	1583	1770	1863	1583	1770	1854	
Flt Permitted		0.76	1.00		0.71	1.00	0.10	1.00	1.00	0.24	1.00	
Satd. Flow (perm)		1411	1583		1325	1583	190	1863	1583	443	1854	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	42	40	63	161	38	150	77	729	152	85	887	30
RTOR Reduction (vph)	0	0	49	0	0	117	0	0	64	0	1	0
Lane Group Flow (vph)	0	82	14	0	199	33	77	729	88	85	916	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)		19.5	19.5		19.5	19.5	55.3	51.6	51.6	53.7	50.8	
Effective Green, g (s)		19.5	19.5		19.5	19.5	55.3	51.6	51.6	53.7	50.8	
Actuated g/C Ratio		0.22	0.22		0.22	0.22	0.62	0.58	0.58	0.60	0.57	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		309	347		290	347	184	1080	918	311	1058	
v/s Ratio Prot							c0.02	0.39		0.01	c0.49	
v/s Ratio Perm		0.06	0.01		c0.15	0.02	0.24		0.06	0.16		
v/c Ratio		0.27	0.04		0.69	0.09	0.42	0.68	0.10	0.27	0.87	
Uniform Delay, d1		28.8	27.4		31.9	27.7	14.8	12.9	8.3	9.8	16.2	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.5	0.0		6.6	0.1	1.5	1.7	0.0	0.5	7.6	
Delay (s)		29.3	27.4		38.5	27.8	16.3	14.6	8.4	10.3	23.8	
Level of Service		C	C		D	C	B	B	A	B	C	
Approach Delay (s)		28.5			33.9			13.7			22.6	
Approach LOS		C			C			B			C	

Intersection Summary

HCM Average Control Delay	21.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	89.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	77.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 15: Pi'ikea Avenue & Pi'ilani Highway

2024 Scenario 3 PM

1/11/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	505	466	459	1963	1631	622
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3433	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	1770	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	549	507	499	2134	1773	676
RTOR Reduction (vph)	0	0	0	0	0	230
Lane Group Flow (vph)	549	507	499	2134	1773	446
Turn Type		Free	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Actuated Green, G (s)	32.4	191.4	55.0	148.0	87.0	87.0
Effective Green, g (s)	32.4	191.4	55.0	148.0	87.0	87.0
Actuated g/C Ratio	0.17	1.00	0.29	0.77	0.45	0.45
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	581	1583	509	2737	1609	720
v/s Ratio Prot	c0.16		c0.28	0.60	c0.50	
v/s Ratio Perm		0.32				0.28
v/c Ratio	0.94	0.32	0.98	0.78	1.10	0.62
Uniform Delay, d1	78.6	0.0	67.7	12.4	52.2	39.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	24.3	0.5	34.7	1.5	55.8	1.6
Delay (s)	102.9	0.5	102.4	13.9	108.0	41.2
Level of Service	F	A	F	B	F	D
Approach Delay (s)	53.7			30.6	89.6	
Approach LOS	D			C	F	

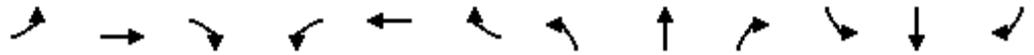
Intersection Summary

HCM Average Control Delay	58.1	HCM Level of Service	E
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	191.4	Sum of lost time (s)	17.0
Intersection Capacity Utilization	99.1%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Pi'ikea Avenue & South Kihei Road

2024 Scenario 3 PM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↗	↖	↑	↗	↖	↕	↕
Volume (vph)	0	0	0	223	63	128	19	692	197	91	578	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95
Frt					1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected					0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1793	1583	1770	1863	1583	1770	3517	
Flt Permitted					0.96	1.00	0.40	1.00	1.00	0.15	1.00	
Satd. Flow (perm)					1793	1583	744	1863	1583	279	3517	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	242	68	139	21	752	214	99	628	27
RTOR Reduction (vph)	0	0	0	0	0	104	0	0	106	0	3	0
Lane Group Flow (vph)	0	0	0	0	310	35	21	752	108	99	652	0
Turn Type				Perm	Perm	pm+pt		Perm	pm+pt			
Protected Phases					8	5		2		1	6	
Permitted Phases				8		2			2	6		
Actuated Green, G (s)					19.8	41.5		40.3	40.3	47.9	43.5	
Effective Green, g (s)					19.8	41.5		40.3	40.3	47.9	43.5	
Actuated g/C Ratio					0.25	0.52		0.51	0.51	0.60	0.55	
Clearance Time (s)					5.0	5.0		5.0	5.0	5.0	5.0	
Vehicle Extension (s)					3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)					447	394	404	944	802	251	1924	
v/s Ratio Prot							0.00	c0.40		c0.02	0.19	
v/s Ratio Perm					0.17	0.02	0.03		0.07	0.22		
v/c Ratio					0.69	0.09	0.05	0.80	0.14	0.39	0.34	
Uniform Delay, d1					27.1	22.9	9.2	16.2	10.4	11.7	10.0	
Progression Factor					1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2					4.6	0.1	0.1	4.7	0.1	1.0	0.1	
Delay (s)					31.7	23.0	9.2	20.9	10.5	12.7	10.1	
Level of Service					C	C	A	C	B	B	B	
Approach Delay (s)		0.0			29.0			18.4			10.5	
Approach LOS		A			C			B			B	

Intersection Summary

HCM Average Control Delay	17.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	79.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

19: East Waipuilani Road & Pi'ilani Highway Performance by movement

Movement	EBR	WBR	NBT	NBR	SBT	SBR	All
Total Delay (hr)	0.0	0.0	0.6	0.0	0.1	0.0	0.8
Delay / Veh (s)	1.2	2.1	3.9	6.8	0.9	1.7	2.5
Total Stops	0	0	0	0	0	0	0
Travel Dist (mi)	0.4	6.5	116.1	3.0	55.2	3.1	184.3
Travel Time (hr)	0.0	0.3	3.3	0.1	1.4	0.1	5.2
Avg Speed (mph)	23	23	37	33	40	26	37
Fuel Used (gal)	0.0	0.2	3.8	0.1	1.6	0.0	5.7
HC Emissions (g)	0	1	52	1	17	0	71
CO Emissions (g)	1	44	2036	62	580	10	2733
NOx Emissions (g)	0	3	196	3	80	1	284
Vehicles Entered	2	60	539	14	522	31	1168
Vehicles Exited	2	60	547	14	526	31	1180
Hourly Exit Rate	8	240	2188	56	2104	124	4720
Input Volume	10	228	2188	54	2047	130	4657
% of Volume	80	105	100	104	103	95	101
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Total Delay (hr)	2.4
Delay / Veh (s)	7.3
Total Stops	64
Travel Dist (mi)	696.3
Travel Time (hr)	18.6
Avg Speed (mph)	38
Fuel Used (gal)	22.2
HC Emissions (g)	262
CO Emissions (g)	10060
NOx Emissions (g)	1119
Vehicles Entered	1163
Vehicles Exited	1189
Hourly Exit Rate	4756
Input Volume	13907
% of Volume	34
Denied Entry Before	0
Denied Entry After	2

HCM Signalized Intersection Capacity Analysis
 21: East Lipoa Street & Liloa Drive

2024 Scenario 3 PM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	257	18	72	263	87	16	60	88	44	67	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1844		1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.58	1.00		0.44	1.00	1.00	0.74	1.00	1.00	0.74	1.00	1.00
Satd. Flow (perm)	1089	1844		814	1863	1583	1380	1863	1583	1380	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	279	20	78	286	95	17	65	96	48	73	122
RTOR Reduction (vph)	0	4	0	0	0	63	0	0	80	0	0	101
Lane Group Flow (vph)	92	295	0	78	286	32	17	65	16	48	73	21
Turn Type	pm+pt			pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	8.6	8.1		13.8	10.7	10.7	5.4	5.4	5.4	5.4	5.4	5.4
Effective Green, g (s)	8.6	8.1		13.8	10.7	10.7	5.4	5.4	5.4	5.4	5.4	5.4
Actuated g/C Ratio	0.27	0.26		0.44	0.34	0.34	0.17	0.17	0.17	0.17	0.17	0.17
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	307	473		449	631	536	236	318	271	236	318	271
v/s Ratio Prot	0.00	c0.16		c0.02	c0.15			0.03			c0.04	
v/s Ratio Perm	0.08			0.06		0.02	0.01		0.01	0.03		0.01
v/c Ratio	0.30	0.62		0.17	0.45	0.06	0.07	0.20	0.06	0.20	0.23	0.08
Uniform Delay, d1	8.9	10.4		5.4	8.2	7.1	11.0	11.3	11.0	11.3	11.3	11.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	2.5		0.2	0.5	0.0	0.1	0.3	0.1	0.4	0.4	0.1
Delay (s)	9.5	12.9		5.5	8.7	7.1	11.1	11.6	11.1	11.7	11.7	11.1
Level of Service	A	B		A	A	A	B	B	B	B	B	B
Approach Delay (s)		12.1			7.8			11.3			11.4	
Approach LOS		B			A			B			B	

Intersection Summary

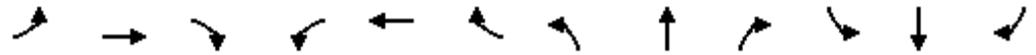
HCM Average Control Delay	10.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	31.6	Sum of lost time (s)	20.0
Intersection Capacity Utilization	40.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection				
Intersection Delay, s/veh	7.7			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	250	334	254	220
Demand Flow Rate, veh/h	255	340	259	225
Vehicles Circulating, veh/h	261	231	245	302
Vehicles Exiting, veh/h	266	273	271	269
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.4	8.5	7.3	7.4
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	255	340	259	225
Cap Entry Lane, veh/h	870	897	884	835
Entry HV Adj Factor	0.980	0.983	0.980	0.979
Flow Entry, veh/h	250	334	254	220
Cap Entry, veh/h	853	881	867	818
V/C Ratio	2.93	3.79	2.93	2.69
Control Delay, s/veh	7.4	8.5	7.3	7.4
LOS	A	A	A	A
95th %tile Queue, veh	0.1	0.2	0.1	0.1

HCM Signalized Intersection Capacity Analysis
 34: Kaonoulu St & Pi'ilani Highway

2024 Scenario 3 PM

1/11/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	155	130	513	174	522	110	2037	477	483	1764	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	168	141	558	189	567	120	2214	518	525	1917	38
RTOR Reduction (vph)	0	0	0	0	0	460	0	0	102	0	0	9
Lane Group Flow (vph)	21	168	141	558	189	107	120	2214	416	525	1917	29
Turn Type	Split		Free	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	15.2	15.2	139.2	20.0	20.0	20.0	9.0	63.0	63.0	19.0	73.0	73.0
Effective Green, g (s)	15.2	15.2	139.2	20.0	20.0	20.0	9.0	63.0	63.0	19.0	73.0	73.0
Actuated g/C Ratio	0.11	0.11	1.00	0.14	0.14	0.14	0.06	0.45	0.45	0.14	0.52	0.52
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	193	203	1583	493	268	400	114	1602	716	469	1856	830
v/s Ratio Prot	0.01	c0.09		c0.16	0.10		0.07	c0.63		c0.15	c0.54	
v/s Ratio Perm			0.09			0.04			0.26			0.02
v/c Ratio	0.11	0.83	0.09	1.13	0.71	0.27	1.05	1.38	0.58	1.12	1.03	0.04
Uniform Delay, d1	55.9	60.7	0.0	59.6	56.8	53.1	65.1	38.1	28.3	60.1	33.1	16.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	23.3	0.1	82.0	8.2	0.4	99.1	175.9	1.2	78.4	29.9	0.0
Delay (s)	56.1	84.0	0.1	141.6	65.0	53.4	164.2	214.0	29.5	138.5	63.0	16.1
Level of Service	E	F	A	F	E	D	F	F	C	F	E	B
Approach Delay (s)		46.4			92.5			178.4			78.2	
Approach LOS		D			F			F			E	

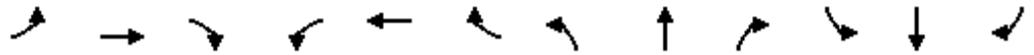
Intersection Summary

HCM Average Control Delay	120.4	HCM Level of Service	F
HCM Volume to Capacity ratio	1.30		
Actuated Cycle Length (s)	139.2	Sum of lost time (s)	28.0
Intersection Capacity Utilization	111.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 1: Kulanihako'i St & Pi'ilani Highway

2024 Scenario 4 AM

1/17/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↘	↕↕	↗	↘	↕↕	↗
Volume (vph)	47	71	56	154	12	56	46	1552	283	117	2039	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1826	1583		1780	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.67	1.00		0.58	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1252	1583		1073	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	77	61	167	13	61	50	1687	308	127	2216	35
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	128	61	0	180	61	50	1687	308	127	2216	35
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8		Free			Free			Free
Actuated Green, G (s)		25.1	128.6		25.1	128.6	6.6	73.9	128.6	12.6	79.9	128.6
Effective Green, g (s)		25.1	128.6		25.1	128.6	6.6	73.9	128.6	12.6	79.9	128.6
Actuated g/C Ratio		0.20	1.00		0.20	1.00	0.05	0.57	1.00	0.10	0.62	1.00
Clearance Time (s)		5.0			5.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		244	1583		209	1583	91	2034	1583	173	2199	1583
v/s Ratio Prot							0.03	0.48		c0.07	c0.63	
v/s Ratio Perm		0.10	0.04		c0.17	0.04			0.19			0.02
v/c Ratio		0.52	0.04		0.86	0.04	0.55	0.83	0.19	0.73	1.01	0.02
Uniform Delay, d1		46.4	0.0		50.1	0.0	59.5	22.2	0.0	56.4	24.3	0.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		2.0	0.0		28.5	0.0	6.6	2.9	0.3	14.9	21.1	0.0
Delay (s)		48.4	0.0		78.6	0.0	66.2	25.2	0.3	71.2	45.4	0.0
Level of Service		D	A		E	A	E	C	A	E	D	A
Approach Delay (s)		32.8			58.7			22.4			46.1	
Approach LOS		C			E			C			D	

Intersection Summary		
HCM Average Control Delay	36.3	HCM Level of Service D
HCM Volume to Capacity ratio	0.98	
Actuated Cycle Length (s)	128.6	Sum of lost time (s) 17.0
Intersection Capacity Utilization	89.7%	ICU Level of Service E
Analysis Period (min)	15	
c Critical Lane Group		

HCM Unsignalized Intersection Capacity Analysis
 3: Old Welakahao Road & Pi'ilani Highway

2024 Scenario 4 AM
 1/17/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	24	1107	4	33	1370
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	26	1203	4	36	1489
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2022	604			1208	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2022	604			1208	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	86	94			94	
cM capacity (veh/h)	47	442			574	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	33	802	405	36	745	745
Volume Left	7	0	0	36	0	0
Volume Right	26	0	4	0	0	0
cSH	165	1700	1700	574	1700	1700
Volume to Capacity	0.20	0.47	0.24	0.06	0.44	0.44
Queue Length 95th (ft)	18	0	0	5	0	0
Control Delay (s)	32.0	0.0	0.0	11.7	0.0	0.0
Lane LOS	D			B		
Approach Delay (s)	32.0	0.0		0.3		
Approach LOS	D					

Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			47.9%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 7: East Welakahao Road & Pi'ilani Highway

2024 Scenario 4 AM
 1/17/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	87	46	25	1104	1352	86
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	95	50	27	1200	1470	93
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)	6					
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2124	735	1470			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2124	735	1470			
tC, single (s)	*5.0	*5.0	*5.0			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	19	91	92			
cM capacity (veh/h)	116	538	320			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	145	27	600	600	735	735	93
Volume Left	95	27	0	0	0	0	0
Volume Right	50	0	0	0	0	0	93
cSH	178	320	1700	1700	1700	1700	1700
Volume to Capacity	0.81	0.08	0.35	0.35	0.43	0.43	0.05
Queue Length 95th (ft)	139	7	0	0	0	0	0
Control Delay (s)	75.1	17.3	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	C					
Approach Delay (s)	75.1	0.4			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		3.9	
Intersection Capacity Utilization	48.9%		ICU Level of Service A
Analysis Period (min)	15		

* User Entered Value

HCM Signalized Intersection Capacity Analysis

8: West Welakahao Road & South Kihei Road

2024 Scenario 4 AM

1/17/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔	↔	↔		↔	↔	
Volume (vph)	29	11	11	56	11	69	3	512	47	38	453	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1759			1788	1583	1770	1839		1770	1857	
Flt Permitted		0.78			0.72	1.00	0.42	1.00		0.30	1.00	
Satd. Flow (perm)		1415			1345	1583	778	1839		559	1857	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	32	12	12	61	12	75	3	557	51	41	492	10
RTOR Reduction (vph)	0	10	0	0	0	64	0	5	0	0	1	0
Lane Group Flow (vph)	0	46	0	0	73	11	3	603	0	41	501	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		6.4			6.4	6.4	22.8	22.3		24.0	22.9	
Effective Green, g (s)		6.4			6.4	6.4	22.8	22.3		24.0	22.9	
Actuated g/C Ratio		0.14			0.14	0.14	0.51	0.50		0.54	0.51	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		202			192	226	407	915		329	949	
v/s Ratio Prot							0.00	c0.33		c0.00	0.27	
v/s Ratio Perm		0.03			c0.05	0.01	0.00			0.06		
v/c Ratio		0.23			0.38	0.05	0.01	0.66		0.12	0.53	
Uniform Delay, d1		17.0			17.4	16.6	5.5	8.4		5.5	7.3	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6			1.3	0.1	0.0	1.7		0.2	0.5	
Delay (s)		17.6			18.7	16.7	5.5	10.1		5.7	7.9	
Level of Service		B			B	B	A	B		A	A	
Approach Delay (s)		17.6			17.6			10.1			7.7	
Approach LOS		B			B			B			A	

Intersection Summary

HCM Average Control Delay	10.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	44.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	49.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 11: East Lipoa Street & Pi'ilani Highway

2024 Scenario 4 AM

1/17/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↑	↗	↖	↑↑	↗	↖↗	↑↑	↗
Volume (vph)	212	230	94	140	119	51	99	1006	104	556	1227	326
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	4.0	6.0	6.0	5.0	6.0	6.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frbp, ped/bikes	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1541	1770	1863	1583	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1541	1770	1863	1583	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	230	250	102	152	129	55	108	1093	113	604	1334	354
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	52	0	0	139
Lane Group Flow (vph)	230	250	102	152	129	55	108	1093	61	604	1334	215
Confl. Peds. (#/hr)			50	50								
Turn Type	Prot		Free	Prot		Free	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases			Free			Free			2			6
Actuated Green, G (s)	20.7	23.2	130.6	14.8	17.3	130.6	11.8	46.3	61.1	24.3	58.8	79.5
Effective Green, g (s)	20.7	23.2	130.6	14.8	17.3	130.6	11.8	46.3	61.1	24.3	58.8	79.5
Actuated g/C Ratio	0.16	0.18	1.00	0.11	0.13	1.00	0.09	0.35	0.47	0.19	0.45	0.61
Clearance Time (s)	5.0	5.0		5.0	5.0		6.0	6.0	5.0	6.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	281	331	1541	201	247	1583	160	1255	741	639	1593	964
v/s Ratio Prot	c0.13	c0.13		0.09	0.07		0.06	0.31	0.01	c0.18	c0.38	0.04
v/s Ratio Perm			0.07			0.03			0.03			0.10
v/c Ratio	0.82	0.76	0.07	0.76	0.52	0.03	0.68	0.87	0.08	0.95	0.84	0.22
Uniform Delay, d1	53.1	51.0	0.0	56.2	52.8	0.0	57.5	39.4	19.2	52.5	31.7	11.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	16.7	9.4	0.1	14.9	2.0	0.0	10.7	6.9	0.0	22.8	4.0	0.1
Delay (s)	69.8	60.4	0.1	71.1	54.8	0.0	68.3	46.2	19.3	75.3	35.7	11.7
Level of Service	E	E	A	E	D	A	E	D	B	E	D	B
Approach Delay (s)		53.6			53.2			45.7			42.4	
Approach LOS		D			D			D			D	

Intersection Summary

HCM Average Control Delay	45.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	130.6	Sum of lost time (s)	11.0
Intersection Capacity Utilization	82.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 12: West Lipoa Street & South Kihei Road

2024 Scenario 4 AM

1/17/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Volume (vph)	20	24	58	75	18	159	24	417	117	137	353	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1821	1583		1791	1583	1770	1863	1583	1770	1858	
Flt Permitted		0.83	1.00		0.74	1.00	0.53	1.00	1.00	0.30	1.00	
Satd. Flow (perm)		1549	1583		1370	1583	989	1863	1583	566	1858	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	26	63	82	20	173	26	453	127	149	384	7
RTOR Reduction (vph)	0	0	52	0	0	142	0	0	75	0	0	0
Lane Group Flow (vph)	0	48	11	0	102	31	26	453	52	149	391	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)		9.9	9.9		9.9	9.9	24.9	22.9	22.9	35.7	28.7	
Effective Green, g (s)		9.9	9.9		9.9	9.9	24.9	22.9	22.9	35.7	28.7	
Actuated g/C Ratio		0.18	0.18		0.18	0.18	0.45	0.41	0.41	0.64	0.52	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		276	282		244	282	471	767	652	532	959	
v/s Ratio Prot							0.00	c0.24		c0.04	c0.21	
v/s Ratio Perm		0.03	0.01		c0.07	0.02	0.02		0.03	0.14		
v/c Ratio		0.17	0.04		0.42	0.11	0.06	0.59	0.08	0.28	0.41	
Uniform Delay, d1		19.4	18.9		20.3	19.2	8.6	12.7	9.9	5.2	8.2	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.3	0.1		1.2	0.2	0.0	1.2	0.1	0.3	0.3	
Delay (s)		19.7	19.0		21.5	19.3	8.7	13.9	10.0	5.5	8.5	
Level of Service		B	B		C	B	A	B	A	A	A	
Approach Delay (s)		19.3		20.1				12.9			7.7	
Approach LOS		B		C				B			A	

Intersection Summary

HCM Average Control Delay	12.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	55.6	Sum of lost time (s)	20.0
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 15: Pi'ikea Avenue & Pi'ilani Highway

2024 Scenario 4 AM

1/17/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	307	201	129	1158	1969	351
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3433	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	1770	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	334	218	140	1259	2140	382
RTOR Reduction (vph)	0	0	0	0	0	109
Lane Group Flow (vph)	334	218	140	1259	2140	273
Turn Type		Free	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Actuated Green, G (s)	19.0	141.1	15.8	111.1	89.3	89.3
Effective Green, g (s)	19.0	141.1	15.8	111.1	89.3	89.3
Actuated g/C Ratio	0.13	1.00	0.11	0.79	0.63	0.63
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	462	1583	198	2787	2240	1002
v/s Ratio Prot	c0.10		c0.08	0.36	c0.60	
v/s Ratio Perm		0.14				0.17
v/c Ratio	0.72	0.14	0.71	0.45	0.96	0.27
Uniform Delay, d1	58.5	0.0	60.4	4.9	24.0	11.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.5	0.2	10.9	0.1	10.4	0.1
Delay (s)	64.1	0.2	71.4	5.1	34.5	11.6
Level of Service	E	A	E	A	C	B
Approach Delay (s)	38.8			11.7	31.0	
Approach LOS	D			B	C	

Intersection Summary

HCM Average Control Delay	25.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	141.1	Sum of lost time (s)	17.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Pi'ikea Avenue & South Kihei Road

2024 Scenario 4 AM

1/17/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↗	↖	↑	↗	↖	↕	↕
Volume (vph)	0	0	0	96	11	88	7	476	93	107	487	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt					1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected					0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1783	1583	1770	1863	1583	1770	3527	
Flt Permitted					0.96	1.00	0.45	1.00	1.00	0.31	1.00	
Satd. Flow (perm)					1783	1583	839	1863	1583	582	3527	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	104	12	96	8	517	101	116	529	12
RTOR Reduction (vph)	0	0	0	0	0	83	0	0	53	0	2	0
Lane Group Flow (vph)	0	0	0	0	116	13	8	517	48	116	539	0
Turn Type				Perm	Perm	pm+pt		Perm	pm+pt			
Protected Phases					8	5		2		1	6	
Permitted Phases				8		2			2		6	
Actuated Green, G (s)					6.5	6.5	23.5	23.0	23.0	30.9	26.7	
Effective Green, g (s)					6.5	6.5	23.5	23.0	23.0	30.9	26.7	
Actuated g/C Ratio					0.13	0.13	0.48	0.47	0.47	0.63	0.55	
Clearance Time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)					238	211	414	880	748	472	1934	
v/s Ratio Prot							0.00	c0.28		c0.02	0.15	
v/s Ratio Perm					0.07	0.01	0.01		0.03	0.13		
v/c Ratio					0.49	0.06	0.02	0.59	0.06	0.25	0.28	
Uniform Delay, d1					19.6	18.4	6.5	9.4	7.0	4.5	5.9	
Progression Factor					1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2					1.6	0.1	0.0	1.0	0.0	0.3	0.1	
Delay (s)					21.1	18.6	6.6	10.4	7.0	4.7	5.9	
Level of Service					C	B	A	B	A	A	A	
Approach Delay (s)		0.0			20.0			9.8			5.7	
Approach LOS		A			B			A			A	

Intersection Summary

HCM Average Control Delay	9.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	48.7	Sum of lost time (s)	20.0
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

19: East Waipuilani Road & Pi'ilani Highway Performance by movement

Movement	EBR	WBR	NBT	NBR	SBT	SBR	All
Total Delay (hr)	0.0	0.0	0.2	0.0	0.2	0.0	0.4
Delay / Veh (s)	1.1	2.3	1.8	4.8	1.1	1.6	1.4
Total Stops	0	0	0	0	0	0	0
Travel Dist (mi)	0.6	7.7	75.3	1.1	61.3	1.2	147.2
Travel Time (hr)	0.0	0.3	1.9	0.0	1.5	0.0	3.9
Avg Speed (mph)	23	23	40	35	40	26	38
Fuel Used (gal)	0.0	0.2	2.2	0.0	1.8	0.0	4.2
HC Emissions (g)	2	1	36	0	24	0	63
CO Emissions (g)	30	54	1225	13	713	6	2041
NOx Emissions (g)	5	4	138	1	97	0	244
Vehicles Entered	3	69	353	5	580	12	1022
Vehicles Exited	4	71	350	5	583	12	1025
Hourly Exit Rate	16	284	1400	20	2332	48	4100
Input Volume	30	248	1391	36	2303	76	4084
% of Volume	53	115	101	56	101	63	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Total Delay (hr)	1.8
Delay / Veh (s)	6.3
Total Stops	80
Travel Dist (mi)	606.1
Travel Time (hr)	15.9
Avg Speed (mph)	39
Fuel Used (gal)	19.2
HC Emissions (g)	274
CO Emissions (g)	9482
NOx Emissions (g)	1104
Vehicles Entered	1013
Vehicles Exited	1035
Hourly Exit Rate	4140
Input Volume	12186
% of Volume	34
Denied Entry Before	0
Denied Entry After	0

HCM Signalized Intersection Capacity Analysis
 21: East Lipoa Street & Liloa Drive

2024 Scenario 4 AM
 1/17/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	192	30	222	206	133	50	407	170	167	484	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1825		1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.62	1.00		0.38	1.00	1.00	0.24	1.00	1.00	0.33	1.00	1.00
Satd. Flow (perm)	1152	1825		709	1863	1583	447	1863	1583	617	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	57	209	33	241	224	145	54	442	185	182	526	85
RTOR Reduction (vph)	0	6	0	0	0	89	0	0	85	0	0	26
Lane Group Flow (vph)	57	236	0	241	224	56	54	442	100	182	526	59
Turn Type	pm+pt			pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	19.6	17.6		34.6	27.6	27.6	27.5	27.5	27.5	27.5	27.5	27.5
Effective Green, g (s)	19.6	17.6		34.6	27.6	27.6	27.5	27.5	27.5	27.5	27.5	27.5
Actuated g/C Ratio	0.27	0.24		0.48	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	330	445		517	713	606	170	711	604	235	711	604
v/s Ratio Prot	0.00	0.13		c0.08	0.12			0.24			0.28	
v/s Ratio Perm	0.04			c0.15		0.04	0.12		0.06	c0.29		0.04
v/c Ratio	0.17	0.53		0.47	0.31	0.09	0.32	0.62	0.17	0.77	0.74	0.10
Uniform Delay, d1	19.8	23.7		11.9	15.6	14.2	15.7	18.1	14.7	19.6	19.2	14.3
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	1.2		0.7	0.3	0.1	1.1	1.7	0.1	14.7	4.0	0.1
Delay (s)	20.0	24.9		12.6	15.9	14.3	16.8	19.8	14.9	34.2	23.3	14.4
Level of Service	C	C		B	B	B	B	B	B	C	C	B
Approach Delay (s)		23.9			14.2			18.2			24.8	
Approach LOS		C			B			B			C	

Intersection Summary

HCM Average Control Delay	20.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	72.1	Sum of lost time (s)	10.0
Intersection Capacity Utilization	71.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Intersection				
Intersection Delay, s/veh	14.3			
Intersection LOS	B			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	97	265	506	624
Demand Flow Rate, veh/h	99	270	516	637
Vehicles Circulating, veh/h	694	468	107	295
Vehicles Exiting, veh/h	238	155	685	443
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	8.8	10.3	9.8	20.4
Approach LOS	A	B	A	C
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	99	270	516	637
Cap Entry Lane, veh/h	564	708	1015	841
Entry HV Adj Factor	0.977	0.980	0.980	0.979
Flow Entry, veh/h	97	265	506	624
Cap Entry, veh/h	552	694	995	824
V/C Ratio	1.75	3.82	5.08	7.57
Control Delay, s/veh	8.8	10.3	9.8	20.4
LOS	A	B	A	C
95th %tile Queue, veh	0.1	0.2	0.3	0.7

HCM Signalized Intersection Capacity Analysis
 34: Kaonoulu St & Pi'ilani Highway

2024 Scenario 4 AM

1/17/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	24	69	198	81	43	83	61	1466	128	131	1909	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	75	215	88	47	90	66	1593	139	142	2075	26
RTOR Reduction (vph)	0	0	0	0	0	83	0	0	30	0	0	4
Lane Group Flow (vph)	26	75	215	88	47	7	66	1593	109	142	2075	22
Turn Type	Split		Free	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	8.4	8.4	116.0	8.6	8.6	8.6	6.7	66.8	66.8	10.2	70.3	70.3
Effective Green, g (s)	8.4	8.4	116.0	8.6	8.6	8.6	6.7	66.8	66.8	10.2	70.3	70.3
Actuated g/C Ratio	0.07	0.07	1.00	0.07	0.07	0.07	0.06	0.58	0.58	0.09	0.61	0.61
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	128	135	1583	255	138	207	102	2038	912	302	2145	959
v/s Ratio Prot	0.01	c0.04		c0.03	0.03		0.04	0.45		c0.04	c0.59	
v/s Ratio Perm			0.14			0.00			0.07			0.01
v/c Ratio	0.20	0.56	0.14	0.35	0.34	0.03	0.65	0.78	0.12	0.47	0.97	0.02
Uniform Delay, d1	50.6	52.0	0.0	51.0	51.0	49.8	53.5	19.0	11.2	50.3	21.8	9.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	4.9	0.2	0.8	1.5	0.1	13.3	2.0	0.1	1.2	12.6	0.0
Delay (s)	51.4	56.9	0.2	51.8	52.5	49.9	66.8	21.0	11.3	51.5	34.3	9.1
Level of Service	D	E	A	D	D	D	E	C	B	D	C	A
Approach Delay (s)		17.9			51.2			21.9			35.1	
Approach LOS		B			D			C			D	

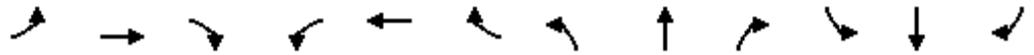
Intersection Summary

HCM Average Control Delay	29.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	116.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 1: Kulanihako'i St & Pi'ilani Highway

2024 Scenario 4 PM

1/17/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↖	↕	↗	↖	↕	↗
Volume (vph)	19	15	65	80	6	28	81	2266	61	25	2068	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1811	1583		1780	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.80	1.00		0.71	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1495	1583		1332	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	16	71	87	7	30	88	2463	66	27	2248	85
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	37	71	0	94	30	88	2463	66	27	2248	85
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8		Free			Free			Free
Actuated Green, G (s)		13.7	122.5		13.7	122.5	8.8	87.0	122.5	4.8	83.0	122.5
Effective Green, g (s)		13.7	122.5		13.7	122.5	8.8	87.0	122.5	4.8	83.0	122.5
Actuated g/C Ratio		0.11	1.00		0.11	1.00	0.07	0.71	1.00	0.04	0.68	1.00
Clearance Time (s)		5.0			5.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		167	1583		149	1583	127	2513	1583	69	2398	1583
v/s Ratio Prot							c0.05	c0.70		0.02	0.64	
v/s Ratio Perm		0.02	0.04		c0.07	0.02			0.04			0.05
v/c Ratio		0.22	0.04		0.63	0.02	0.69	0.98	0.04	0.39	0.94	0.05
Uniform Delay, d1		49.5	0.0		52.0	0.0	55.5	16.9	0.0	57.4	17.5	0.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.7	0.1		8.4	0.0	15.1	13.6	0.0	3.6	7.8	0.1
Delay (s)		50.2	0.1		60.4	0.0	70.6	30.5	0.0	61.1	25.3	0.1
Level of Service		D	A		E	A	E	C	A	E	C	A
Approach Delay (s)		17.2			45.8			31.1			24.8	
Approach LOS		B			D			C			C	

Intersection Summary

HCM Average Control Delay	28.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	122.5	Sum of lost time (s)	17.0
Intersection Capacity Utilization	87.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 3: Old Welakahao Road & Pi'ilani Highway

2024 Scenario 4 PM
 1/17/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	24	1459	0	8	1313
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	26	1586	0	9	1427
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2317	793			1586	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2317	793			1586	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	79	92			98	
cM capacity (veh/h)	31	331			410	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	33	1057	529	9	714	714
Volume Left	7	0	0	9	0	0
Volume Right	26	0	0	0	0	0
cSH	113	1700	1700	410	1700	1700
Volume to Capacity	0.29	0.62	0.31	0.02	0.42	0.42
Queue Length 95th (ft)	27	0	0	2	0	0
Control Delay (s)	49.4	0.0	0.0	14.0	0.0	0.0
Lane LOS	E			B		
Approach Delay (s)	49.4	0.0		0.1		
Approach LOS	E					

Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			50.3%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 7: East Welakahao Road & Pi'ilani Highway

2024 Scenario 4 PM
 1/17/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	99	46	85	1379	1264	172
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	108	50	92	1499	1374	187
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)	6					
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2308	687	1374			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2308	687	1374			
tC, single (s)	*5.0	*5.0	*5.0			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	91	74			
cM capacity (veh/h)	77	564	357			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	158	92	749	749	687	687	187
Volume Left	108	92	0	0	0	0	0
Volume Right	50	0	0	0	0	0	187
cSH	110	357	1700	1700	1700	1700	1700
Volume to Capacity	1.43	0.26	0.44	0.44	0.40	0.40	0.11
Queue Length 95th (ft)	280	25	0	0	0	0	0
Control Delay (s)	308.2	18.6	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	C					
Approach Delay (s)	308.2	1.1			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		15.2	
Intersection Capacity Utilization		55.1%	ICU Level of Service B
Analysis Period (min)		15	

* User Entered Value

HCM Signalized Intersection Capacity Analysis

8: West Welakahao Road & South Kihei Road

2024 Scenario 4 PM

1/17/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔	↔	↔		↔	↔	
Volume (vph)	34	7	13	110	17	59	18	813	71	44	857	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	0.99	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1748			1785	1583	1770	1840		1770	1853	
Flt Permitted		0.73			0.71	1.00	0.13	1.00		0.12	1.00	
Satd. Flow (perm)		1315			1327	1583	247	1840		232	1853	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	8	14	120	18	64	20	884	77	48	932	34
RTOR Reduction (vph)	0	12	0	0	0	55	0	3	0	0	1	0
Lane Group Flow (vph)	0	47	0	0	138	9	20	958	0	48	965	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		9.7			9.7	9.7	44.1	42.8		45.3	43.4	
Effective Green, g (s)		9.7			9.7	9.7	44.1	42.8		45.3	43.4	
Actuated g/C Ratio		0.14			0.14	0.14	0.64	0.62		0.65	0.63	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		184			185	221	185	1135		194	1159	
v/s Ratio Prot							0.00	0.52		c0.01	c0.52	
v/s Ratio Perm		0.04			c0.10	0.01	0.07			0.15		
v/c Ratio		0.26			0.75	0.04	0.11	0.84		0.25	0.83	
Uniform Delay, d1		26.6			28.7	25.8	9.1	10.6		9.6	10.2	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.7			15.0	0.1	0.3	5.9		0.7	5.2	
Delay (s)		27.4			43.7	25.9	9.4	16.5		10.3	15.4	
Level of Service		C			D	C	A	B		B	B	
Approach Delay (s)		27.4			38.1			16.4			15.2	
Approach LOS		C			D			B			B	

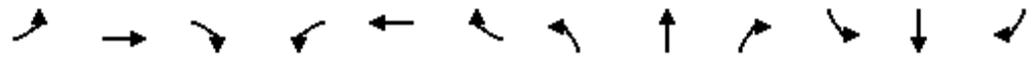
Intersection Summary

HCM Average Control Delay	18.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	69.4	Sum of lost time (s)	10.0
Intersection Capacity Utilization	66.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 11: East Lipoa Street & Pi'ilani Highway

2024 Scenario 4 PM

1/17/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	214	114	58	203	184	232	177	1305	23	282	1230	160
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	4.0	6.0	6.0	5.0	6.0	6.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frbp, ped/bikes	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1541	1770	1863	1583	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1541	1770	1863	1583	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	233	124	63	221	200	252	192	1418	25	307	1337	174
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	10	0	0	69
Lane Group Flow (vph)	233	124	63	221	200	252	192	1418	15	307	1337	105
Confl. Peds. (#/hr)			50	50								
Turn Type	Prot		Free	Prot		Free	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases			Free			Free			2			6
Actuated Green, G (s)	20.9	20.2	133.7	20.3	19.6	133.7	17.5	57.2	77.5	14.0	53.7	74.6
Effective Green, g (s)	20.9	20.2	133.7	20.3	19.6	133.7	17.5	57.2	77.5	14.0	53.7	74.6
Actuated g/C Ratio	0.16	0.15	1.00	0.15	0.15	1.00	0.13	0.43	0.58	0.10	0.40	0.56
Clearance Time (s)	5.0	5.0		5.0	5.0		6.0	6.0	5.0	6.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	277	281	1541	269	273	1583	232	1514	918	359	1421	883
v/s Ratio Prot	c0.13	0.07		0.12	c0.11		c0.11	c0.40	0.00	0.09	0.38	0.02
v/s Ratio Perm			0.04			c0.16			0.01			0.05
v/c Ratio	0.84	0.44	0.04	0.82	0.73	0.16	0.83	0.94	0.02	0.86	0.94	0.12
Uniform Delay, d1	54.8	51.6	0.0	54.9	54.5	0.0	56.6	36.5	11.9	58.9	38.5	14.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	20.0	1.1	0.0	17.9	9.7	0.2	20.9	11.2	0.0	17.7	12.4	0.1
Delay (s)	74.8	52.7	0.0	72.9	64.3	0.2	77.5	47.7	11.9	76.5	50.9	14.1
Level of Service	E	D	A	E	E	A	E	D	B	E	D	B
Approach Delay (s)		57.1			43.1			50.7			51.7	
Approach LOS		E			D			D			D	

Intersection Summary

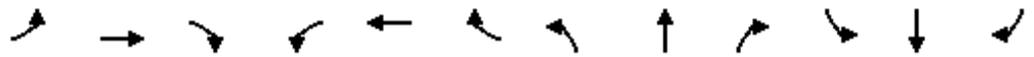
HCM Average Control Delay	50.6	HCM Level of Service	D
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	133.7	Sum of lost time (s)	22.0
Intersection Capacity Utilization	85.6%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 12: West Lipoa Street & South Kihei Road

2024 Scenario 4 PM

1/17/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Volume (vph)	39	37	58	141	35	131	71	671	136	71	816	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1816	1583		1791	1583	1770	1863	1583	1770	1854	
Flt Permitted		0.77	1.00		0.71	1.00	0.10	1.00	1.00	0.24	1.00	
Satd. Flow (perm)		1437	1583		1329	1583	191	1863	1583	445	1854	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	42	40	63	153	38	142	77	729	148	77	887	30
RTOR Reduction (vph)	0	0	49	0	0	111	0	0	62	0	1	0
Lane Group Flow (vph)	0	82	14	0	191	31	77	729	86	77	916	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)		19.0	19.0		19.0	19.0	54.7	51.0	51.0	53.1	50.2	
Effective Green, g (s)		19.0	19.0		19.0	19.0	54.7	51.0	51.0	53.1	50.2	
Actuated g/C Ratio		0.22	0.22		0.22	0.22	0.62	0.58	0.58	0.60	0.57	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		311	342		287	342	185	1081	918	313	1059	
v/s Ratio Prot							c0.02	0.39		0.01	c0.49	
v/s Ratio Perm		0.06	0.01		c0.14	0.02	0.24		0.05	0.14		
v/c Ratio		0.26	0.04		0.67	0.09	0.42	0.67	0.09	0.25	0.86	
Uniform Delay, d1		28.6	27.2		31.5	27.5	14.5	12.7	8.2	9.6	16.0	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.5	0.0		5.7	0.1	1.5	1.7	0.0	0.4	7.5	
Delay (s)		29.1	27.3		37.3	27.7	16.0	14.4	8.2	10.0	23.5	
Level of Service		C	C		D	C	B	B	A	A	C	
Approach Delay (s)		28.3			33.2			13.6			22.4	
Approach LOS		C			C			B			C	

Intersection Summary

HCM Average Control Delay	20.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	87.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	77.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 15: Pi'ikea Avenue & Pi'ilani Highway

2024 Scenario 4 PM
 1/17/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	421	373	367	1728	1519	498
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3433	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	1770	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	458	405	399	1878	1651	541
RTOR Reduction (vph)	0	0	0	0	0	183
Lane Group Flow (vph)	458	405	399	1878	1651	358
Turn Type		Free	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Actuated Green, G (s)	28.0	176.6	44.0	137.6	87.6	87.6
Effective Green, g (s)	28.0	176.6	44.0	137.6	87.6	87.6
Actuated g/C Ratio	0.16	1.00	0.25	0.78	0.50	0.50
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	544	1583	441	2757	1755	785
v/s Ratio Prot	c0.13		c0.23	0.53	c0.47	
v/s Ratio Perm		0.26				0.23
v/c Ratio	0.84	0.26	0.90	0.68	0.94	0.46
Uniform Delay, d1	72.2	0.0	64.3	9.2	42.0	29.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.3	0.4	21.6	0.7	10.5	0.4
Delay (s)	83.5	0.4	85.9	9.9	52.6	29.4
Level of Service	F	A	F	A	D	C
Approach Delay (s)	44.5			23.2	46.9	
Approach LOS	D			C	D	

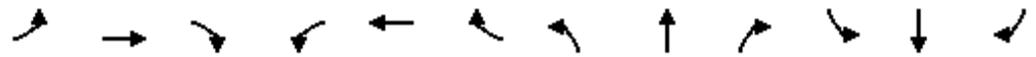
Intersection Summary

HCM Average Control Delay	36.4	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	176.6	Sum of lost time (s)	17.0
Intersection Capacity Utilization	88.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Pi'ikea Avenue & South Kihei Road

2024 Scenario 4 PM

1/17/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↗	↖	↑	↗	↖	↕	↕↔
Volume (vph)	0	0	0	223	63	128	19	685	197	91	571	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt					1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected					0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1793	1583	1770	1863	1583	1770	3517	
Flt Permitted					0.96	1.00	0.40	1.00	1.00	0.15	1.00	
Satd. Flow (perm)					1793	1583	752	1863	1583	287	3517	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	242	68	139	21	745	214	99	621	27
RTOR Reduction (vph)	0	0	0	0	0	104	0	0	106	0	3	0
Lane Group Flow (vph)	0	0	0	0	310	35	21	745	108	99	645	0
Turn Type				Perm	Perm	pm+pt		Perm	pm+pt			
Protected Phases					8	5	2		1	6		
Permitted Phases				8	8	2		2	6			
Actuated Green, G (s)					19.7	19.7	41.2	40.0	47.6	43.2		
Effective Green, g (s)					19.7	19.7	41.2	40.0	47.6	43.2		
Actuated g/C Ratio					0.25	0.25	0.52	0.51	0.60	0.55		
Clearance Time (s)					5.0	5.0	5.0	5.0	5.0	5.0		
Vehicle Extension (s)					3.0	3.0	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)					447	394	407	942	801	255	1921	
v/s Ratio Prot							0.00	c0.40		c0.02	0.18	
v/s Ratio Perm					0.17	0.02	0.03		0.07	0.21		
v/c Ratio					0.69	0.09	0.05	0.79	0.14	0.39	0.34	
Uniform Delay, d1					27.0	22.8	9.2	16.1	10.4	11.5	10.0	
Progression Factor					1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2					4.6	0.1	0.1	4.6	0.1	1.0	0.1	
Delay (s)					31.6	22.9	9.2	20.7	10.4	12.5	10.1	
Level of Service					C	C	A	C	B	B	B	
Approach Delay (s)		0.0			28.9			18.2			10.4	
Approach LOS		A			C			B			B	

Intersection Summary

HCM Average Control Delay	17.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	79.1	Sum of lost time (s)	20.0
Intersection Capacity Utilization	69.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

19: East Waipuilani Road & Pi'ilani Highway Performance by movement

Movement	EBR	WBR	NBT	NBR	SBT	SBR	All
Total Delay (hr)	0.0	0.0	0.3	0.0	0.1	0.0	0.4
Delay / Veh (s)	1.2	2.0	2.4	5.1	0.7	1.7	1.6
Total Stops	0	0	1	0	0	0	1
Travel Dist (mi)	0.4	4.6	99.1	1.7	49.6	3.4	158.8
Travel Time (hr)	0.0	0.2	2.6	0.1	1.2	0.1	4.2
Avg Speed (mph)	23	24	40	36	41	26	39
Fuel Used (gal)	0.0	0.1	3.0	0.0	1.3	0.0	4.5
HC Emissions (g)	0	1	36	0	7	1	44
CO Emissions (g)	1	26	1389	12	309	8	1745
NOx Emissions (g)	0	2	153	1	47	1	204
Vehicles Entered	2	42	455	8	471	34	1012
Vehicles Exited	2	41	464	8	473	33	1021
Hourly Exit Rate	8	164	1856	32	1892	132	4084
Input Volume	10	201	1904	40	1811	130	4096
% of Volume	80	82	97	80	104	102	100
Denied Entry Before	0	0	1	0	0	0	1
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Total Delay (hr)	1.5
Delay / Veh (s)	5.3
Total Stops	46
Travel Dist (mi)	608.4
Travel Time (hr)	15.6
Avg Speed (mph)	39
Fuel Used (gal)	18.1
HC Emissions (g)	163
CO Emissions (g)	6717
NOx Emissions (g)	813
Vehicles Entered	1014
Vehicles Exited	1029
Hourly Exit Rate	4116
Input Volume	12238
% of Volume	34
Denied Entry Before	1
Denied Entry After	0

HCM Signalized Intersection Capacity Analysis
 21: East Lipoa Street & Liloa Drive

2024 Scenario 4 PM

1/17/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	246	18	121	249	129	16	473	120	73	433	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1843		1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.59	1.00		0.36	1.00	1.00	0.28	1.00	1.00	0.28	1.00	1.00
Satd. Flow (perm)	1104	1843		664	1863	1583	514	1863	1583	514	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	267	20	132	271	140	17	514	130	79	471	122
RTOR Reduction (vph)	0	4	0	0	0	66	0	0	77	0	0	63
Lane Group Flow (vph)	92	283	0	132	271	74	17	514	53	79	471	59
Turn Type	pm+pt			pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	12.7	12.2		23.0	17.5	17.5	14.5	14.5	14.5	14.5	14.5	14.5
Effective Green, g (s)	12.7	12.2		23.0	17.5	17.5	14.5	14.5	14.5	14.5	14.5	14.5
Actuated g/C Ratio	0.27	0.26		0.48	0.37	0.37	0.31	0.31	0.31	0.31	0.31	0.31
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	302	473		457	686	583	157	569	483	157	569	483
v/s Ratio Prot	0.00	c0.15		c0.04	c0.15			c0.28			0.25	
v/s Ratio Perm	0.08			0.10		0.05	0.03		0.03	0.15		0.04
v/c Ratio	0.30	0.60		0.29	0.40	0.13	0.11	0.90	0.11	0.50	0.83	0.12
Uniform Delay, d1	13.7	15.5		7.4	11.1	9.9	11.9	15.8	11.9	13.5	15.3	11.9
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	2.0		0.4	0.4	0.1	0.3	17.7	0.1	2.5	9.6	0.1
Delay (s)	14.3	17.5		7.7	11.5	10.0	12.2	33.5	12.0	16.1	25.0	12.0
Level of Service	B	B		A	B	B	B	C	B	B	C	B
Approach Delay (s)		16.7			10.2			28.7			21.6	
Approach LOS		B			B			C			C	

Intersection Summary

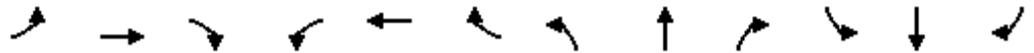
HCM Average Control Delay	20.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	47.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	66.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Intersection				
Intersection Delay, s/veh	23.4			
Intersection LOS	C			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	250	334	748	649
Demand Flow Rate, veh/h	255	340	763	662
Vehicles Circulating, veh/h	698	735	245	302
Vehicles Exiting, veh/h	266	273	708	773
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	14.1	20.6	28.2	22.9
Approach LOS	B	C	D	C
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	255	340	763	662
Cap Entry Lane, veh/h	562	542	884	835
Entry HV Adj Factor	0.980	0.983	0.980	0.980
Flow Entry, veh/h	250	334	748	649
Cap Entry, veh/h	551	532	867	819
V/C Ratio	4.54	6.28	8.63	7.92
Control Delay, s/veh	14.1	20.6	28.2	22.9
LOS	B	C	D	C
95th %tile Queue, veh	0.2	0.4	1.1	0.8

HCM Signalized Intersection Capacity Analysis
 34: Kaonoulu St & Pi'ilani Highway

2024 Scenario 4 PM

1/17/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖↗	↑	↖↗	↖	↑↑	↗	↖	↑↑	↗
Volume (vph)	19	155	130	513	174	522	110	1726	477	483	1528	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	3433	1863	2787	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	3433	1863	2787	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	168	141	558	189	567	120	1876	518	525	1661	38
RTOR Reduction (vph)	0	0	0	0	0	462	0	0	121	0	0	10
Lane Group Flow (vph)	21	168	141	558	189	105	120	1876	397	525	1661	28
Turn Type	Split		Free	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	15.2	15.2	139.2	20.0	20.0	20.0	9.0	63.0	63.0	19.0	73.0	73.0
Effective Green, g (s)	15.2	15.2	139.2	20.0	20.0	20.0	9.0	63.0	63.0	19.0	73.0	73.0
Actuated g/C Ratio	0.11	0.11	1.00	0.14	0.14	0.14	0.06	0.45	0.45	0.14	0.52	0.52
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	193	203	1583	493	268	400	114	1602	716	242	1856	830
v/s Ratio Prot	0.01	c0.09		c0.16	0.10		0.07	c0.53		c0.30	0.47	
v/s Ratio Perm			0.09			0.04			0.25			0.02
v/c Ratio	0.11	0.83	0.09	1.13	0.71	0.26	1.05	1.17	0.55	2.17	0.89	0.03
Uniform Delay, d1	55.9	60.7	0.0	59.6	56.8	53.0	65.1	38.1	27.8	60.1	29.7	16.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	23.3	0.1	82.0	8.2	0.4	99.1	84.0	0.9	539.7	6.0	0.0
Delay (s)	56.1	84.0	0.1	141.6	65.0	53.4	164.2	122.1	28.8	599.8	35.7	16.0
Level of Service	E	F	A	F	E	D	F	F	C	F	D	B
Approach Delay (s)		46.4			92.5			104.9			168.5	
Approach LOS		D			F			F			F	

Intersection Summary

HCM Average Control Delay	121.5	HCM Level of Service	F
HCM Volume to Capacity ratio	1.28		
Actuated Cycle Length (s)	139.2	Sum of lost time (s)	22.0
Intersection Capacity Utilization	115.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 1: Kulanihako'i St & Pi'ilani Highway

203 Scenario 1 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕	↕	↕	↕↕	↕	↕	↕↕	↕
Volume (vph)	47	71	56	154	12	56	46	1735	283	117	2420	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1826	1583		1780	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.67	1.00		0.57	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1242	1583		1068	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	77	61	167	13	61	50	1886	308	127	2630	35
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	128	61	0	180	61	50	1886	308	127	2630	35
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		4			8		5	2		1		6
Permitted Phases	4		Free	8		Free			Free			Free
Actuated Green, G (s)		25.4	130.8		25.4	130.8	6.7	75.7	130.8	12.7	81.7	130.8
Effective Green, g (s)		25.4	130.8		25.4	130.8	6.7	75.7	130.8	12.7	81.7	130.8
Actuated g/C Ratio		0.19	1.00		0.19	1.00	0.05	0.58	1.00	0.10	0.62	1.00
Clearance Time (s)		5.0			5.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		241	1583		207	1583	91	2048	1583	172	2211	1583
v/s Ratio Prot							0.03	0.53		c0.07	c0.74	
v/s Ratio Perm		0.10	0.04		c0.17	0.04			0.19			0.02
v/c Ratio		0.53	0.04		0.87	0.04	0.55	0.92	0.19	0.74	1.19	0.02
Uniform Delay, d1		47.3	0.0		51.1	0.0	60.6	24.8	0.0	57.4	24.6	0.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		2.2	0.0		29.8	0.0	6.6	7.4	0.3	15.2	90.1	0.0
Delay (s)		49.6	0.0		80.9	0.0	67.2	32.2	0.3	72.7	114.7	0.0
Level of Service		D	A		F	A	E	C	A	E	F	A
Approach Delay (s)		33.6			60.5			28.6			111.3	
Approach LOS		C			E			C			F	

Intersection Summary

HCM Average Control Delay	72.4	HCM Level of Service	E
HCM Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	130.8	Sum of lost time (s)	17.0
Intersection Capacity Utilization	100.2%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 3: Old Welakahao Road & Pi'ilani Highway

203 Scenario 1 AM
 1/25/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	24	1364	4	33	1537
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	26	1483	4	36	1671
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2392	743			1487	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2392	743			1487	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	75	93			92	
cM capacity (veh/h)	26	357			448	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	33	988	499	36	835	835
Volume Left	7	0	0	36	0	0
Volume Right	26	0	4	0	0	0
cSH	100	1700	1700	448	1700	1700
Volume to Capacity	0.33	0.58	0.29	0.08	0.49	0.49
Queue Length 95th (ft)	31	0	0	6	0	0
Control Delay (s)	57.3	0.0	0.0	13.7	0.0	0.0
Lane LOS	F			B		
Approach Delay (s)	57.3	0.0		0.3		
Approach LOS	F					

Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			52.5%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 7: East Welakahao Road & Pi'ilani Highway

203 Scenario 1 AM
 1/25/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	116	58	31	1354	1502	108
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	126	63	34	1472	1633	117
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)	6					
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2436	816	1633			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2436	816	1633			
tC, single (s)	*5.0	*5.0	*5.0			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	87	87			
cM capacity (veh/h)	80	497	266			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	189	34	736	736	816	816	117
Volume Left	126	34	0	0	0	0	0
Volume Right	63	0	0	0	0	0	117
cSH	114	266	1700	1700	1700	1700	1700
Volume to Capacity	1.66	0.13	0.43	0.43	0.48	0.48	0.07
Queue Length 95th (ft)	358	11	0	0	0	0	0
Control Delay (s)	398.0	20.5	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	C					
Approach Delay (s)	398.0	0.5			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay	22.1		
Intersection Capacity Utilization	54.6%	ICU Level of Service	A
Analysis Period (min)	15		

* User Entered Value

HCM Signalized Intersection Capacity Analysis

8: West Welakahao Road & South Kihei Road

203 Scenario 1 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔	↔	↔		↔	↔	
Volume (vph)	29	11	11	56	11	69	3	575	47	38	518	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1759			1788	1583	1770	1842		1770	1858	
Flt Permitted		0.78			0.72	1.00	0.36	1.00		0.26	1.00	
Satd. Flow (perm)		1415			1345	1583	678	1842		485	1858	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	32	12	12	61	12	75	3	625	51	41	563	10
RTOR Reduction (vph)	0	10	0	0	0	65	0	4	0	0	1	0
Lane Group Flow (vph)	0	46	0	0	73	10	3	672	0	41	572	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		6.6			6.6	6.6	25.5	25.0		26.7	25.6	
Effective Green, g (s)		6.6			6.6	6.6	25.5	25.0		26.7	25.6	
Actuated g/C Ratio		0.14			0.14	0.14	0.53	0.52		0.56	0.54	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		196			186	219	374	965		301	997	
v/s Ratio Prot							0.00	c0.36		c0.00	0.31	
v/s Ratio Perm		0.03			c0.05	0.01	0.00			0.07		
v/c Ratio		0.23			0.39	0.05	0.01	0.70		0.14	0.57	
Uniform Delay, d1		18.3			18.7	17.8	5.4	8.5		5.7	7.4	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6			1.4	0.1	0.0	2.2		0.2	0.8	
Delay (s)		18.9			20.1	17.9	5.4	10.7		5.9	8.2	
Level of Service		B			C	B	A	B		A	A	
Approach Delay (s)		18.9			19.0			10.7			8.0	
Approach LOS		B			B			B			A	

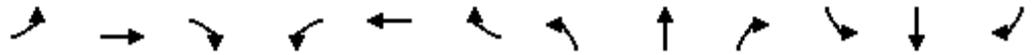
Intersection Summary

HCM Average Control Delay	10.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	47.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	53.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 11: East Lipoa Street & Pi'ilani Highway

203 Scenario 1 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↘	↕↕	↗	↘	↕↕	↗
Volume (vph)	328	13	136	6	1	14	143	1324	36	130	1510	474
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1777	1583		1785	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.95	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1777	1583		1785	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	357	14	148	7	1	15	155	1439	39	141	1641	515
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	14	0	0	153
Lane Group Flow (vph)	0	371	148	0	8	15	155	1439	25	141	1641	362
Turn Type	Split		Free	Split		Free	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1		6
Permitted Phases			Free			Free			2			6
Actuated Green, G (s)		31.2	130.3		1.3	130.3	14.5	61.9	61.9	13.9	61.3	61.3
Effective Green, g (s)		31.2	130.3		1.3	130.3	14.5	61.9	61.9	13.9	61.3	61.3
Actuated g/C Ratio		0.24	1.00		0.01	1.00	0.11	0.48	0.48	0.11	0.47	0.47
Clearance Time (s)		5.0			5.0		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		425	1583		18	1583	197	1681	752	189	1665	745
v/s Ratio Prot		c0.21			0.00		c0.09	0.41		0.08	c0.46	
v/s Ratio Perm			c0.09			0.01			0.02			0.23
v/c Ratio		0.87	0.09		0.44	0.01	0.79	0.86	0.03	0.75	0.99	0.49
Uniform Delay, d1		47.6	0.0		64.1	0.0	56.4	30.3	18.2	56.5	34.1	23.7
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		17.6	0.1		16.5	0.0	18.4	4.5	0.0	14.8	18.5	0.5
Delay (s)		65.3	0.1		80.7	0.0	74.8	34.8	18.3	71.3	52.6	24.2
Level of Service		E	A		F	A	E	C	B	E	D	C
Approach Delay (s)		46.7			28.1			38.2			47.4	
Approach LOS		D			C			D			D	

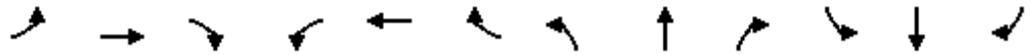
Intersection Summary

HCM Average Control Delay	43.8	HCM Level of Service	D
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	130.3	Sum of lost time (s)	17.0
Intersection Capacity Utilization	89.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 12: West Lipoa Street & South Kihei Road

203 Scenario 1 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Volume (vph)	20	24	58	70	18	148	24	483	102	122	409	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1821	1583		1792	1583	1770	1863	1583	1770	1858	
Flt Permitted		0.84	1.00		0.74	1.00	0.50	1.00	1.00	0.28	1.00	
Satd. Flow (perm)		1558	1583		1375	1583	924	1863	1583	523	1858	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	26	63	76	20	161	26	525	111	133	445	7
RTOR Reduction (vph)	0	0	51	0	0	132	0	0	61	0	0	0
Lane Group Flow (vph)	0	48	12	0	96	29	26	525	50	133	452	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)		10.2	10.2		10.2	10.2	26.8	24.9	24.9	34.4	28.7	
Effective Green, g (s)		10.2	10.2		10.2	10.2	26.8	24.9	24.9	34.4	28.7	
Actuated g/C Ratio		0.18	0.18		0.18	0.18	0.48	0.45	0.45	0.62	0.51	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		285	289		251	289	473	831	706	450	956	
v/s Ratio Prot							0.00	c0.28		c0.03	c0.24	
v/s Ratio Perm		0.03	0.01		c0.07	0.02	0.02		0.03	0.15		
v/c Ratio		0.17	0.04		0.38	0.10	0.05	0.63	0.07	0.30	0.47	
Uniform Delay, d1		19.2	18.8		20.0	19.0	7.6	11.9	8.8	5.8	8.7	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.3	0.1		1.0	0.2	0.0	1.6	0.0	0.4	0.4	
Delay (s)		19.5	18.8		21.0	19.1	7.7	13.5	8.9	6.2	9.1	
Level of Service		B	B		C	B	A	B	A	A	A	
Approach Delay (s)		19.1			19.8			12.5			8.4	
Approach LOS		B			B			B			A	

Intersection Summary

HCM Average Control Delay	12.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	55.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	56.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 15: Pi'ikea Avenue & Pi'ilani Highway

203 Scenario 1 AM

1/25/2013



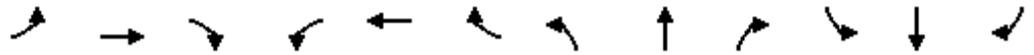
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	396	291	161	1502	1912	508
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	1770	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	430	316	175	1633	2078	552
RTOR Reduction (vph)	0	0	0	0	0	194
Lane Group Flow (vph)	430	316	175	1633	2078	358
Turn Type		Free	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Actuated Green, G (s)	29.0	159.0	15.0	119.0	98.0	98.0
Effective Green, g (s)	29.0	159.0	15.0	119.0	98.0	98.0
Actuated g/C Ratio	0.18	1.00	0.09	0.75	0.62	0.62
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	323	1583	167	2649	2181	976
v/s Ratio Prot	c0.24		c0.10	0.46	c0.59	
v/s Ratio Perm		0.20				0.23
v/c Ratio	1.33	0.20	1.05	0.62	0.95	0.37
Uniform Delay, d1	65.0	0.0	72.0	9.3	28.3	15.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	168.8	0.3	82.9	0.4	10.3	0.2
Delay (s)	233.8	0.3	154.9	9.8	38.7	15.4
Level of Service	F	A	F	A	D	B
Approach Delay (s)	134.9			23.8	33.8	
Approach LOS	F			C	C	

Intersection Summary			
HCM Average Control Delay	44.9	HCM Level of Service	D
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	159.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	97.9%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Pi'ikea Avenue & South Kihei Road

203 Scenario 1 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↗	↖	↑	↗	↖	↕	↕
Volume (vph)	0	0	0	96	11	88	7	538	93	107	546	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt					1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected					0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1783	1583	1770	1863	1583	1770	3529	
Flt Permitted					0.96	1.00	0.42	1.00	1.00	0.27	1.00	
Satd. Flow (perm)					1783	1583	788	1863	1583	511	3529	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	104	12	96	8	585	101	116	593	12
RTOR Reduction (vph)	0	0	0	0	0	83	0	0	51	0	2	0
Lane Group Flow (vph)	0	0	0	0	116	13	8	585	50	116	603	0
Turn Type				Perm	Perm	pm+pt		Perm	pm+pt			
Protected Phases					8	5	2		1	6		
Permitted Phases				8	8	2		2	6			
Actuated Green, G (s)					6.7	6.7	26.0	25.5	33.4	29.2		
Effective Green, g (s)					6.7	6.7	26.0	25.5	33.4	29.2		
Actuated g/C Ratio					0.13	0.13	0.51	0.50	0.65	0.57		
Clearance Time (s)					5.0	5.0	5.0	5.0	5.0	5.0		
Vehicle Extension (s)					3.0	3.0	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)					232	206	408	924	785	435	2005	
v/s Ratio Prot						0.00	c0.31		c0.02	0.17		
v/s Ratio Perm					0.07	0.01	0.01		0.03	0.15		
v/c Ratio					0.50	0.06	0.02	0.63	0.06	0.27	0.30	
Uniform Delay, d1					20.8	19.6	6.3	9.5	6.7	4.8	5.8	
Progression Factor					1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2					1.7	0.1	0.0	1.4	0.0	0.3	0.1	
Delay (s)					22.5	19.7	6.3	10.9	6.8	5.1	5.9	
Level of Service					C	B	A	B	A	A	A	
Approach Delay (s)		0.0			21.2			10.3			5.7	
Approach LOS		A			C			B			A	

Intersection Summary

HCM Average Control Delay	9.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	51.4	Sum of lost time (s)	20.0
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 19: East Waipuilani Road & Pi'ilani Highway

203 Scenario 1 AM

1/25/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑↑	↑↑	↗
Volume (veh/h)	0	30	0	1781	2400	76
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	33	0	1936	2609	83
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3577	1304	2609			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3577	1304	2609			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	78	100			
cM capacity (veh/h)	4	151	162			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	33	968	968	1304	1304	83
Volume Left	0	0	0	0	0	0
Volume Right	33	0	0	0	0	83
cSH	151	1700	1700	1700	1700	1700
Volume to Capacity	0.22	0.57	0.57	0.77	0.77	0.05
Queue Length 95th (ft)	20	0	0	0	0	0
Control Delay (s)	35.3	0.0	0.0	0.0	0.0	0.0
Lane LOS	E					
Approach Delay (s)	35.3	0.0		0.0		
Approach LOS	E					

Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			76.3%	ICU Level of Service		D
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
 21: East Lipoa Street & Liloa Drive

203 Scenario 1 AM
 1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	162	30	168	190	85	50	153	73	77	172	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1819		1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.63	1.00		0.45	1.00	1.00	0.64	1.00	1.00	0.65	1.00	1.00
Satd. Flow (perm)	1170	1819		840	1863	1583	1192	1863	1583	1215	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	57	176	33	183	207	92	54	166	79	84	187	85
RTOR Reduction (vph)	0	7	0	0	0	55	0	0	61	0	0	65
Lane Group Flow (vph)	57	202	0	183	207	37	54	166	18	84	187	20
Turn Type	pm+pt			pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	15.0	12.8		25.9	18.7	18.7	10.7	10.7	10.7	10.7	10.7	10.7
Effective Green, g (s)	15.0	12.8		25.9	18.7	18.7	10.7	10.7	10.7	10.7	10.7	10.7
Actuated g/C Ratio	0.32	0.27		0.56	0.40	0.40	0.23	0.23	0.23	0.23	0.23	0.23
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	405	500		629	748	635	274	428	363	279	428	363
v/s Ratio Prot	0.01	c0.11		c0.05	0.11			0.09			c0.10	
v/s Ratio Perm	0.04			0.11		0.02	0.05		0.01	0.07		0.01
v/c Ratio	0.14	0.40		0.29	0.28	0.06	0.20	0.39	0.05	0.30	0.44	0.05
Uniform Delay, d1	11.1	13.8		5.4	9.4	8.6	14.5	15.2	14.0	14.9	15.4	14.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.5		0.3	0.2	0.0	0.4	0.6	0.1	0.6	0.7	0.1
Delay (s)	11.2	14.3		5.7	9.6	8.6	14.8	15.8	14.0	15.5	16.1	14.1
Level of Service	B	B		A	A	A	B	B	B	B	B	B
Approach Delay (s)		13.7			7.9			15.1			15.5	
Approach LOS		B			A			B			B	

Intersection Summary

HCM Average Control Delay	12.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	46.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	48.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection				
Intersection Delay, s/veh	6.0			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	97	265	164	177
Demand Flow Rate, veh/h	99	270	167	181
Vehicles Circulating, veh/h	238	119	107	295
Vehicles Exiting, veh/h	238	155	229	94
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	5.2	6.3	5.2	6.7
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	99	270	167	181
Cap Entry Lane, veh/h	891	1003	1015	841
Entry HV Adj Factor	0.977	0.980	0.980	0.976
Flow Entry, veh/h	97	265	164	177
Cap Entry, veh/h	871	983	995	821
V/C Ratio	1.11	2.69	1.64	2.15
Control Delay, s/veh	5.2	6.3	5.2	6.7
LOS	A	A	A	A
95th %tile Queue, veh	0.0	0.1	0.1	0.1

HCM Signalized Intersection Capacity Analysis
34: Kaonoulu St & Pi'ilani Highway

203 Scenario 1 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖↗	↑	↖↗	↖	↑↑	↗	↖↗	↑↑	↗
Volume (vph)	24	69	198	81	43	83	61	1649	128	131	2290	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	75	215	88	47	90	66	1792	139	142	2489	26
RTOR Reduction (vph)	0	0	0	0	0	83	0	0	26	0	0	4
Lane Group Flow (vph)	26	75	215	88	47	7	66	1792	113	142	2489	22
Turn Type	Split		Free	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	8.5	8.5	117.6	8.6	8.6	8.6	6.8	68.3	68.3	10.2	71.7	71.7
Effective Green, g (s)	8.5	8.5	117.6	8.6	8.6	8.6	6.8	68.3	68.3	10.2	71.7	71.7
Actuated g/C Ratio	0.07	0.07	1.00	0.07	0.07	0.07	0.06	0.58	0.58	0.09	0.61	0.61
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	128	135	1583	251	136	204	102	2055	919	298	2158	965
v/s Ratio Prot	0.01	c0.04		c0.03	0.03		0.04	0.51		c0.04	c0.70	
v/s Ratio Perm			0.14			0.00			0.07			0.01
v/c Ratio	0.20	0.56	0.14	0.35	0.35	0.03	0.65	0.87	0.12	0.48	1.15	0.02
Uniform Delay, d1	51.4	52.7	0.0	51.8	51.8	50.6	54.2	20.9	11.1	51.2	22.9	9.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	4.9	0.2	0.8	1.5	0.1	13.3	4.4	0.1	1.2	74.8	0.0
Delay (s)	52.1	57.6	0.2	52.7	53.4	50.7	67.5	25.3	11.2	52.4	97.8	9.1
Level of Service	D	E	A	D	D	D	E	C	B	D	F	A
Approach Delay (s)		18.1			52.0			25.7			94.5	
Approach LOS		B			D			C			F	

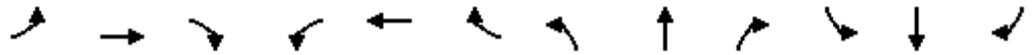
Intersection Summary

HCM Average Control Delay	61.6	HCM Level of Service	E
HCM Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	117.6	Sum of lost time (s)	22.0
Intersection Capacity Utilization	81.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 1: Kulanihako'i St & Pi'ilani Highway

2034 Scenario 1 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕	↕	↕	↕↕	↕	↕	↕↕	↕
Volume (vph)	19	15	65	80	6	28	81	2228	61	25	2160	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1811	1583		1780	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.80	1.00		0.71	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1495	1583		1332	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	16	71	87	7	30	88	2422	66	27	2348	85
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	37	71	0	94	30	88	2422	66	27	2348	85
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8		Free			Free			Free
Actuated Green, G (s)		13.7	122.5		13.7	122.5	8.8	87.0	122.5	4.8	83.0	122.5
Effective Green, g (s)		13.7	122.5		13.7	122.5	8.8	87.0	122.5	4.8	83.0	122.5
Actuated g/C Ratio		0.11	1.00		0.11	1.00	0.07	0.71	1.00	0.04	0.68	1.00
Clearance Time (s)		5.0			5.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		167	1583		149	1583	127	2513	1583	69	2398	1583
v/s Ratio Prot							c0.05	c0.68		0.02	0.66	
v/s Ratio Perm		0.02	0.04		c0.07	0.02			0.04			0.05
v/c Ratio		0.22	0.04		0.63	0.02	0.69	0.96	0.04	0.39	0.98	0.05
Uniform Delay, d1		49.5	0.0		52.0	0.0	55.5	16.3	0.0	57.4	18.9	0.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.7	0.1		8.4	0.0	15.1	10.8	0.0	3.6	13.7	0.1
Delay (s)		50.2	0.1		60.4	0.0	70.6	27.1	0.0	61.1	32.6	0.1
Level of Service		D	A		E	A	E	C	A	E	C	A
Approach Delay (s)		17.2			45.8			27.9			31.8	
Approach LOS		B			D			C			C	

Intersection Summary

HCM Average Control Delay	29.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	122.5	Sum of lost time (s)	17.0
Intersection Capacity Utilization	87.9%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

3: Old Welakahao Road & Pi'ilani Highway

2034 Scenario 1 PM

1/25/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	3	24	1920	0	8	1449
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	26	2087	0	9	1575
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2892	1043			2087	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2892	1043			2087	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	73	88			97	
cM capacity (veh/h)	12	226			262	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	29	1391	696	9	788	788
Volume Left	3	0	0	9	0	0
Volume Right	26	0	0	0	0	0
cSH	77	1700	1700	262	1700	1700
Volume to Capacity	0.38	0.82	0.41	0.03	0.46	0.46
Queue Length 95th (ft)	37	0	0	3	0	0
Control Delay (s)	78.5	0.0	0.0	19.2	0.0	0.0
Lane LOS	F			C		
Approach Delay (s)	78.5	0.0		0.1		
Approach LOS	F					

Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			63.1%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 7: East Welakahao Road & Pi'ilani Highway

2034 Scenario 1 PM
 1/25/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	132	57	106	1804	1380	215
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	143	62	115	1961	1500	234
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		6				
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2711	750	1500			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2711	750	1500			
tC, single (s)	*5.0	*5.0	*5.0			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	88	63			
cM capacity (veh/h)	42	530	309			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	205	115	980	980	750	750	234
Volume Left	143	115	0	0	0	0	0
Volume Right	62	0	0	0	0	0	234
cSH	59	309	1700	1700	1700	1700	1700
Volume to Capacity	3.49	0.37	0.58	0.58	0.44	0.44	0.14
Queue Length 95th (ft)	Err	42	0	0	0	0	0
Control Delay (s)	Err	23.4	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	C					
Approach Delay (s)	Err	1.3			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		512.3	
Intersection Capacity Utilization	63.8%		ICU Level of Service B
Analysis Period (min)	15		

* User Entered Value

HCM Signalized Intersection Capacity Analysis

8: West Welakahao Road & South Kihei Road

2034 Scenario 1 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕	↕	↕		↕	↕	
Volume (vph)	34	7	13	110	17	59	18	933	71	44	984	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1748			1785	1583	1770	1843		1770	1854	
Flt Permitted		0.69			0.76	1.00	0.08	1.00		0.08	1.00	
Satd. Flow (perm)		1238			1413	1583	148	1843		146	1854	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	8	14	120	18	64	20	1014	77	48	1070	34
RTOR Reduction (vph)	0	12	0	0	0	56	0	3	0	0	1	0
Lane Group Flow (vph)	0	47	0	0	138	8	20	1088	0	48	1103	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		10.3			10.3	10.3	51.8	50.4		53.2	51.1	
Effective Green, g (s)		10.3			10.3	10.3	51.8	50.4		53.2	51.1	
Actuated g/C Ratio		0.13			0.13	0.13	0.67	0.65		0.68	0.66	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		164			187	210	128	1194		144	1218	
v/s Ratio Prot							0.00	0.59		c0.01	c0.59	
v/s Ratio Perm		0.04			c0.10	0.01	0.10			0.22		
v/c Ratio		0.29			0.74	0.04	0.16	0.91		0.33	0.91	
Uniform Delay, d1		30.4			32.5	29.4	13.4	11.8		14.1	11.3	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.0			14.1	0.1	0.6	10.5		1.4	9.7	
Delay (s)		31.4			46.5	29.5	13.9	22.3		15.4	21.0	
Level of Service		C			D	C	B	C		B	C	
Approach Delay (s)		31.4			41.2			22.1			20.8	
Approach LOS		C			D			C			C	

Intersection Summary

HCM Average Control Delay	23.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	77.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 11: East Lipoa Street & Pi'ilani Highway

2034 Scenario 1 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↖	↕	↗	↖	↕	↗
Volume (vph)	329	10	84	28	30	63	255	1717	13	79	1576	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1777	1583		1819	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.95	1.00		0.98	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1777	1583		1819	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	358	11	91	30	33	68	277	1866	14	86	1713	251
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	4	0	0	69
Lane Group Flow (vph)	0	369	91	0	63	68	277	1866	10	86	1713	182
Turn Type	Split		Free	Split		Free	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1		6
Permitted Phases			Free			Free			2			6
Actuated Green, G (s)		35.1	159.7		9.4	159.7	25.1	81.3	81.3	11.9	68.1	68.1
Effective Green, g (s)		35.1	159.7		9.4	159.7	25.1	81.3	81.3	11.9	68.1	68.1
Actuated g/C Ratio		0.22	1.00		0.06	1.00	0.16	0.51	0.51	0.07	0.43	0.43
Clearance Time (s)		5.0			5.0		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		391	1583		107	1583	278	1802	806	132	1509	675
v/s Ratio Prot		c0.21			c0.03		c0.16	c0.53		0.05	c0.48	
v/s Ratio Perm			0.06			0.04			0.01			0.11
v/c Ratio		0.94	0.06		0.59	0.04	1.00	1.04	0.01	0.65	1.14	0.27
Uniform Delay, d1		61.3	0.0		73.3	0.0	67.3	39.2	19.4	71.9	45.8	29.7
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		31.2	0.1		8.0	0.1	52.6	31.0	0.0	11.0	69.6	0.2
Delay (s)		92.6	0.1		81.3	0.1	119.9	70.2	19.4	82.8	115.4	29.9
Level of Service		F	A		F	A	F	E	B	F	F	C
Approach Delay (s)		74.3			39.1			76.3			103.6	
Approach LOS		E			D			E			F	

Intersection Summary

HCM Average Control Delay	86.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	159.7	Sum of lost time (s)	28.0
Intersection Capacity Utilization	97.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 12: West Lipoa Street & South Kihei Road

2034 Scenario 1 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Volume (vph)	39	37	58	134	35	117	71	776	129	64	944	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1816	1583		1792	1583	1770	1863	1583	1770	1855	
Flt Permitted		0.72	1.00		0.72	1.00	0.06	1.00	1.00	0.20	1.00	
Satd. Flow (perm)		1333	1583		1333	1583	117	1863	1583	366	1855	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	42	40	63	146	38	127	77	843	140	70	1026	30
RTOR Reduction (vph)	0	0	51	0	0	102	0	0	52	0	1	0
Lane Group Flow (vph)	0	82	12	0	184	25	77	843	88	70	1055	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)		19.8	19.8		19.8	19.8	67.2	63.6	63.6	65.8	62.9	
Effective Green, g (s)		19.8	19.8		19.8	19.8	67.2	63.6	63.6	65.8	62.9	
Actuated g/C Ratio		0.20	0.20		0.20	0.20	0.66	0.63	0.63	0.65	0.62	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		261	309		261	309	136	1170	994	278	1152	
v/s Ratio Prot							c0.02	0.45		0.01	c0.57	
v/s Ratio Perm		0.06	0.01		c0.14	0.02	0.35		0.06	0.16		
v/c Ratio		0.31	0.04		0.70	0.08	0.57	0.72	0.09	0.25	0.92	
Uniform Delay, d1		34.9	33.0		38.0	33.3	20.4	12.8	7.4	10.7	16.9	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.7	0.1		8.4	0.1	5.3	2.2	0.0	0.5	11.2	
Delay (s)		35.6	33.1		46.4	33.4	25.8	15.0	7.5	11.1	28.1	
Level of Service		D	C		D	C	C	B	A	B	C	
Approach Delay (s)		34.5			41.1			14.8			27.1	
Approach LOS		C			D			B			C	

Intersection Summary

HCM Average Control Delay	24.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	101.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	83.3%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 15: Pi'ikea Avenue & Pi'ilani Highway

2034 Scenario 1 PM

1/25/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	544	531	508	1987	1614	696
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	1770	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	591	577	552	2160	1754	757
RTOR Reduction (vph)	0	0	0	0	0	226
Lane Group Flow (vph)	591	577	552	2160	1754	531
Turn Type		Free	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Actuated Green, G (s)	29.2	182.6	30.2	142.4	106.2	106.2
Effective Green, g (s)	29.2	182.6	30.2	142.4	106.2	106.2
Actuated g/C Ratio	0.16	1.00	0.17	0.78	0.58	0.58
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	283	1583	293	2760	2058	921
v/s Ratio Prot	c0.33		c0.31	0.61	c0.50	
v/s Ratio Perm		0.36				0.34
v/c Ratio	2.09	0.36	1.88	0.78	0.85	0.58
Uniform Delay, d1	76.7	0.0	76.2	11.4	31.7	24.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	501.7	0.7	410.5	1.5	3.6	0.9
Delay (s)	578.4	0.7	486.7	12.9	35.3	24.9
Level of Service	F	A	F	B	D	C
Approach Delay (s)	293.0			109.3	32.2	
Approach LOS	F			F	C	

Intersection Summary

HCM Average Control Delay	112.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.26		
Actuated Cycle Length (s)	182.6	Sum of lost time (s)	17.0
Intersection Capacity Utilization	117.1%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Pi'ikea Avenue & South Kihei Road

2034 Scenario 1 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↗	↖	↑	↗	↖	↕	↕↔
Volume (vph)	0	0	0	223	63	128	19	776	197	91	653	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95
Frt					1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected					0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1793	1583	1770	1863	1583	1770	3520	
Flt Permitted					0.96	1.00	0.35	1.00	1.00	0.11	1.00	
Satd. Flow (perm)					1793	1583	659	1863	1583	209	3520	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	242	68	139	21	843	214	99	710	27
RTOR Reduction (vph)	0	0	0	0	0	105	0	0	95	0	3	0
Lane Group Flow (vph)	0	0	0	0	310	34	21	843	119	99	734	0
Turn Type				Perm	Perm	pm+pt		Perm	pm+pt			
Protected Phases					8	5		2		1	6	
Permitted Phases				8		2			2		6	
Actuated Green, G (s)					20.8	20.8	47.4	46.1	46.1	53.4	49.1	
Effective Green, g (s)					20.8	20.8	47.4	46.1	46.1	53.4	49.1	
Actuated g/C Ratio					0.24	0.24	0.55	0.53	0.53	0.62	0.57	
Clearance Time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)					433	382	379	996	847	207	2005	
v/s Ratio Prot							0.00	c0.45		c0.02	0.21	
v/s Ratio Perm					0.17	0.02	0.03		0.07	0.27		
v/c Ratio					0.72	0.09	0.06	0.85	0.14	0.48	0.37	
Uniform Delay, d1					30.0	25.3	8.9	17.0	10.1	14.2	10.1	
Progression Factor					1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2					5.6	0.1	0.1	6.7	0.1	1.7	0.1	
Delay (s)					35.6	25.4	8.9	23.8	10.2	15.9	10.2	
Level of Service					D	C	A	C	B	B	B	
Approach Delay (s)		0.0			32.4			20.8			10.9	
Approach LOS		A			C			C			B	

Intersection Summary

HCM Average Control Delay	19.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	86.2	Sum of lost time (s)	20.0
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 19: East Waipuilani Road & Pi'ilani Highway

2034 Scenario 1 PM

1/25/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↕	↕	↘
Volume (veh/h)	0	10	0	2309	2095	130
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	11	0	2510	2277	141
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3532	1139	2277			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3532	1139	2277			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	94	100			
cM capacity (veh/h)	4	195	220			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	11	1255	1255	1139	1139	141
Volume Left	0	0	0	0	0	0
Volume Right	11	0	0	0	0	141
cSH	195	1700	1700	1700	1700	1700
Volume to Capacity	0.06	0.74	0.74	0.67	0.67	0.08
Queue Length 95th (ft)	4	0	0	0	0	0
Control Delay (s)	24.5	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	24.5	0.0		0.0		
Approach LOS	C					

Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			67.9%	ICU Level of Service		C
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
 21: East Lipoa Street & Liloa Drive

2034 Scenario 1 PM
 1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	232	18	51	228	66	16	70	74	30	78	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1842		1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.61	1.00		0.51	1.00	1.00	0.71	1.00	1.00	0.71	1.00	1.00
Satd. Flow (perm)	1127	1842		951	1863	1583	1331	1863	1583	1331	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	252	20	55	248	72	17	76	80	33	85	122
RTOR Reduction (vph)	0	5	0	0	0	49	0	0	66	0	0	100
Lane Group Flow (vph)	92	267	0	55	248	23	17	76	14	33	85	22
Turn Type	pm+pt			pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	9.3	8.8		12.1	10.2	10.2	5.6	5.6	5.6	5.6	5.6	5.6
Effective Green, g (s)	9.3	8.8		12.1	10.2	10.2	5.6	5.6	5.6	5.6	5.6	5.6
Actuated g/C Ratio	0.30	0.28		0.39	0.33	0.33	0.18	0.18	0.18	0.18	0.18	0.18
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	345	518		417	607	516	238	333	283	238	333	283
v/s Ratio Prot	0.00	c0.14		c0.01	0.13			0.04			c0.05	
v/s Ratio Perm	0.07			0.04		0.01	0.01		0.01	0.02		0.01
v/c Ratio	0.27	0.52		0.13	0.41	0.05	0.07	0.23	0.05	0.14	0.26	0.08
Uniform Delay, d1	8.2	9.5		6.1	8.2	7.2	10.7	11.0	10.6	10.8	11.1	10.7
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.9		0.1	0.4	0.0	0.1	0.4	0.1	0.3	0.4	0.1
Delay (s)	8.7	10.3		6.3	8.7	7.3	10.8	11.4	10.7	11.1	11.5	10.8
Level of Service	A	B		A	A	A	B	B	B	B	B	B
Approach Delay (s)		9.9			8.0			11.0			11.1	
Approach LOS		A			A			B			B	

Intersection Summary

HCM Average Control Delay	9.7	HCM Level of Service	A
HCM Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	31.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	37.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection				
Intersection Delay, s/veh	7.7			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	250	334	253	224
Demand Flow Rate, veh/h	255	340	258	229
Vehicles Circulating, veh/h	265	230	245	302
Vehicles Exiting, veh/h	266	273	275	268
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.5	8.4	7.3	7.4
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	255	340	258	229
Cap Entry Lane, veh/h	867	898	884	835
Entry HV Adj Factor	0.980	0.983	0.980	0.979
Flow Entry, veh/h	250	334	253	224
Cap Entry, veh/h	850	882	867	818
V/C Ratio	2.94	3.79	2.92	2.74
Control Delay, s/veh	7.5	8.4	7.3	7.4
LOS	A	A	A	A
95th %tile Queue, veh	0.1	0.2	0.1	0.1

HCM Signalized Intersection Capacity Analysis
 34: Kaonoulu St & Pi'ilani Highway

2034 Scenario 1 PM

1/25/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				 		 		 		 	 	
Volume (vph)	19	155	130	513	174	522	110	1688	477	483	1620	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	168	141	558	189	567	120	1835	518	525	1761	38
RTOR Reduction (vph)	0	0	0	0	0	462	0	0	124	0	0	10
Lane Group Flow (vph)	21	168	141	558	189	105	120	1835	394	525	1761	28
Turn Type	Split		Free	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	15.2	15.2	139.2	20.0	20.0	20.0	9.0	63.0	63.0	19.0	73.0	73.0
Effective Green, g (s)	15.2	15.2	139.2	20.0	20.0	20.0	9.0	63.0	63.0	19.0	73.0	73.0
Actuated g/C Ratio	0.11	0.11	1.00	0.14	0.14	0.14	0.06	0.45	0.45	0.14	0.52	0.52
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	193	203	1583	493	268	400	114	1602	716	469	1856	830
v/s Ratio Prot	0.01	c0.09		c0.16	0.10		0.07	c0.52		c0.15	0.50	
v/s Ratio Perm			0.09			0.04			0.25			0.02
v/c Ratio	0.11	0.83	0.09	1.13	0.71	0.26	1.05	1.15	0.55	1.12	0.95	0.03
Uniform Delay, d1	55.9	60.7	0.0	59.6	56.8	53.0	65.1	38.1	27.8	60.1	31.3	16.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	23.3	0.1	82.0	8.2	0.4	99.1	73.3	0.9	78.4	11.0	0.0
Delay (s)	56.1	84.0	0.1	141.6	65.0	53.4	164.2	111.4	28.7	138.5	42.3	16.0
Level of Service	E	F	A	F	E	D	F	F	C	F	D	B
Approach Delay (s)		46.4			92.5			96.7			63.6	
Approach LOS		D			F			F			E	

Intersection Summary

HCM Average Control Delay	81.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.10		
Actuated Cycle Length (s)	139.2	Sum of lost time (s)	22.0
Intersection Capacity Utilization	101.6%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
1: Kulanihako'i St & Pi'ilani Highway

2034 Scenario 2 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑↑	↗	↖	↑↑	↗
Volume (vph)	47	71	56	154	12	56	46	2145	283	117	3324	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1826	1583		1780	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.67	1.00		0.57	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1242	1583		1068	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	77	61	167	13	61	50	2332	308	127	3613	35
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	128	61	0	180	61	50	2332	308	127	3613	35
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8		Free			Free			Free
Actuated Green, G (s)		25.4	130.8		25.4	130.8	6.7	75.7	130.8	12.7	81.7	130.8
Effective Green, g (s)		25.4	130.8		25.4	130.8	6.7	75.7	130.8	12.7	81.7	130.8
Actuated g/C Ratio		0.19	1.00		0.19	1.00	0.05	0.58	1.00	0.10	0.62	1.00
Clearance Time (s)		5.0			5.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		241	1583		207	1583	91	2048	1583	172	2211	1583
v/s Ratio Prot							0.03	0.66		c0.07	c1.02	
v/s Ratio Perm		0.10	0.04		c0.17	0.04			0.19			0.02
v/c Ratio		0.53	0.04		0.87	0.04	0.55	1.14	0.19	0.74	1.63	0.02
Uniform Delay, d1		47.3	0.0		51.1	0.0	60.6	27.6	0.0	57.4	24.6	0.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		2.2	0.0		29.8	0.0	6.6	68.9	0.3	15.2	287.4	0.0
Delay (s)		49.6	0.0		80.9	0.0	67.2	96.5	0.3	72.7	312.0	0.0
Level of Service		D	A		F	A	E	F	A	E	F	A
Approach Delay (s)		33.6			60.5			84.9			301.0	
Approach LOS		C			E			F			F	

Intersection Summary

HCM Average Control Delay	201.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.43		
Actuated Cycle Length (s)	130.8	Sum of lost time (s)	17.0
Intersection Capacity Utilization	122.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 3: Old Welakahao Road & Pi'ilani Highway

2034 Scenario 2 AM

1/25/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	6	24	1590	94	33	1728
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	7	26	1728	102	36	1878
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2790	915			1830	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2790	915			1830	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	51	91			89	
cM capacity (veh/h)	13	275			330	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	33	1152	678	36	939	939
Volume Left	7	0	0	36	0	0
Volume Right	26	0	102	0	0	0
cSH	56	1700	1700	330	1700	1700
Volume to Capacity	0.59	0.68	0.40	0.11	0.55	0.55
Queue Length 95th (ft)	59	0	0	9	0	0
Control Delay (s)	137.2	0.0	0.0	17.2	0.0	0.0
Lane LOS	F			C		
Approach Delay (s)	137.2	0.0		0.3		
Approach LOS	F					

Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			57.8%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

7: East Welakahao Road & Pi'ilani Highway

2034 Scenario 2 AM

1/25/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	116	58	31	1580	1693	108
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	126	63	34	1717	1840	117
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)	6					
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2766	920	1840			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2766	920	1840			
tC, single (s)	*5.0	*5.0	*5.0			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	86	84			
cM capacity (veh/h)	53	448	211			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	189	34	859	859	920	920	117
Volume Left	126	34	0	0	0	0	0
Volume Right	63	0	0	0	0	0	117
cSH	77	211	1700	1700	1700	1700	1700
Volume to Capacity	2.47	0.16	0.51	0.51	0.54	0.54	0.07
Queue Length 95th (ft)	450	14	0	0	0	0	0
Control Delay (s)	785.3	25.3	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	D					
Approach Delay (s)	785.3	0.5			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		38.3	
Intersection Capacity Utilization	59.9%		ICU Level of Service B
Analysis Period (min)	15		

* User Entered Value

HCM Signalized Intersection Capacity Analysis

8: West Welakahao Road & South Kihei Road

2034 Scenario 2 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔	↔	↔		↔	↔	
Volume (vph)	29	11	11	56	11	69	3	589	47	38	525	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1759			1788	1583	1770	1842		1770	1858	
Flt Permitted		0.78			0.72	1.00	0.36	1.00		0.25	1.00	
Satd. Flow (perm)		1415			1345	1583	670	1842		471	1858	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	32	12	12	61	12	75	3	640	51	41	571	10
RTOR Reduction (vph)	0	10	0	0	0	65	0	4	0	0	1	0
Lane Group Flow (vph)	0	46	0	0	73	10	3	687	0	41	580	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		6.7			6.7	6.7	26.3	25.8		27.5	26.4	
Effective Green, g (s)		6.7			6.7	6.7	26.3	25.8		27.5	26.4	
Actuated g/C Ratio		0.14			0.14	0.14	0.54	0.53		0.57	0.54	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		195			185	218	374	978		296	1009	
v/s Ratio Prot							0.00	c0.37		c0.00	0.31	
v/s Ratio Perm		0.03			c0.05	0.01	0.00			0.08		
v/c Ratio		0.23			0.39	0.05	0.01	0.70		0.14	0.57	
Uniform Delay, d1		18.7			19.1	18.2	5.4	8.5		5.7	7.4	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6			1.4	0.1	0.0	2.3		0.2	0.8	
Delay (s)		19.3			20.5	18.3	5.4	10.8		6.0	8.2	
Level of Service		B			C	B	A	B		A	A	
Approach Delay (s)		19.3			19.4			10.8			8.0	
Approach LOS		B			B			B			A	

Intersection Summary

HCM Average Control Delay	10.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	48.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	54.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 11: East Lipoa Street & Pi'ilani Highway

2034 Scenario 2 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↕	↗	↖	↕	↗
Volume (vph)	328	296	136	197	107	424	143	1324	262	1034	1510	471
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1815	1583		1804	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.97	1.00		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1815	1583		1804	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	357	322	148	214	116	461	155	1439	285	1124	1641	512
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	117	0	0	170
Lane Group Flow (vph)	0	679	148	0	330	461	155	1439	168	1124	1641	342
Turn Type	Split		Free	Split		Free	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1		6
Permitted Phases			Free			Free			2			6
Actuated Green, G (s)		35.0	150.0		17.0	150.0	14.7	61.0	61.0	15.0	61.3	61.3
Effective Green, g (s)		35.0	150.0		17.0	150.0	14.7	61.0	61.0	15.0	61.3	61.3
Actuated g/C Ratio		0.23	1.00		0.11	1.00	0.10	0.41	0.41	0.10	0.41	0.41
Clearance Time (s)		5.0			5.0		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		424	1583		204	1583	173	1439	644	177	1446	647
v/s Ratio Prot		c0.37			c0.18		0.09	0.41		c0.64	c0.46	
v/s Ratio Perm			0.09			c0.29			0.11			0.22
v/c Ratio		1.60	0.09		1.62	0.29	0.90	1.00	0.26	6.35	1.13	0.53
Uniform Delay, d1		57.5	0.0		66.5	0.0	66.9	44.5	29.5	67.5	44.4	33.4
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		281.5	0.1		299.4	0.5	39.9	23.7	0.2	2419.6	69.8	0.8
Delay (s)		339.0	0.1		365.9	0.5	106.8	68.2	29.7	2487.1	114.1	34.2
Level of Service		F	A		F	A	F	E	C	F	F	C
Approach Delay (s)		278.4			152.9			65.6			915.6	
Approach LOS		F			F			E			F	

Intersection Summary

HCM Average Control Delay	513.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.85		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	162.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 12: West Lipoa Street & South Kihei Road

2034 Scenario 2 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Volume (vph)	20	24	58	77	18	155	24	483	116	150	409	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1821	1583		1790	1583	1770	1863	1583	1770	1858	
Flt Permitted		0.83	1.00		0.73	1.00	0.50	1.00	1.00	0.27	1.00	
Satd. Flow (perm)		1551	1583		1368	1583	935	1863	1583	494	1858	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	26	63	84	20	168	26	525	126	163	445	7
RTOR Reduction (vph)	0	0	52	0	0	139	0	0	70	0	0	0
Lane Group Flow (vph)	0	48	11	0	104	29	26	525	56	163	452	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)		10.4	10.4		10.4	10.4	28.7	26.7	26.7	39.8	32.8	
Effective Green, g (s)		10.4	10.4		10.4	10.4	28.7	26.7	26.7	39.8	32.8	
Actuated g/C Ratio		0.17	0.17		0.17	0.17	0.48	0.44	0.44	0.66	0.54	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		268	273		236	273	473	826	702	498	1012	
v/s Ratio Prot							0.00	c0.28		c0.04	c0.24	
v/s Ratio Perm		0.03	0.01		c0.08	0.02	0.02		0.04	0.17		
v/c Ratio		0.18	0.04		0.44	0.11	0.05	0.64	0.08	0.33	0.45	
Uniform Delay, d1		21.3	20.7		22.3	21.0	8.4	13.0	9.7	5.7	8.2	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.3	0.1		1.3	0.2	0.0	1.6	0.0	0.4	0.3	
Delay (s)		21.6	20.8		23.6	21.2	8.4	14.6	9.7	6.1	8.6	
Level of Service		C	C		C	C	A	B	A	A	A	
Approach Delay (s)		21.1			22.1			13.4			7.9	
Approach LOS		C			C			B			A	

Intersection Summary

HCM Average Control Delay	13.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	60.2	Sum of lost time (s)	20.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 15: Pi'ikea Avenue & Pi'ilani Highway

2034 Scenario 2 AM

1/25/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	396	291	186	1912	2816	508
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	1770	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	430	316	202	2078	3061	552
RTOR Reduction (vph)	0	0	0	0	0	132
Lane Group Flow (vph)	430	316	202	2078	3061	420
Turn Type		Free	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Actuated Green, G (s)	29.0	159.0	15.0	119.0	98.0	98.0
Effective Green, g (s)	29.0	159.0	15.0	119.0	98.0	98.0
Actuated g/C Ratio	0.18	1.00	0.09	0.75	0.62	0.62
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	323	1583	167	2649	2181	976
v/s Ratio Prot	c0.24		c0.11	0.59	c0.86	
v/s Ratio Perm		0.20				0.27
v/c Ratio	1.33	0.20	1.21	0.78	1.40	0.43
Uniform Delay, d1	65.0	0.0	72.0	12.2	30.5	15.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	168.8	0.3	137.1	1.6	184.4	0.3
Delay (s)	233.8	0.3	209.1	13.8	214.9	16.2
Level of Service	F	A	F	B	F	B
Approach Delay (s)	134.9			31.1	184.5	
Approach LOS	F			C	F	

Intersection Summary

HCM Average Control Delay	126.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.37		
Actuated Cycle Length (s)	159.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	124.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Pi'ikea Avenue & South Kihei Road

2034 Scenario 2 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↕	↕	↑	↕	↕	↕↑	
Volume (vph)	0	0	0	96	11	88	7	545	93	107	574	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt					1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected					0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1783	1583	1770	1863	1583	1770	3529	
Flt Permitted					0.96	1.00	0.41	1.00	1.00	0.27	1.00	
Satd. Flow (perm)					1783	1583	764	1863	1583	509	3529	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	104	12	96	8	592	101	116	624	12
RTOR Reduction (vph)	0	0	0	0	0	84	0	0	50	0	2	0
Lane Group Flow (vph)	0	0	0	0	116	12	8	592	51	116	634	0
Turn Type				Perm	Perm	pm+pt		Perm	pm+pt			
Protected Phases					8	5		2		1	6	
Permitted Phases				8		2			2	6		
Actuated Green, G (s)					6.7	6.7	26.5	26.0	26.0	33.7	29.6	
Effective Green, g (s)					6.7	6.7	26.5	26.0	26.0	33.7	29.6	
Actuated g/C Ratio					0.13	0.13	0.51	0.50	0.50	0.65	0.57	
Clearance Time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)					231	205	401	935	795	431	2017	
v/s Ratio Prot							0.00	c0.32		c0.02	0.18	
v/s Ratio Perm					0.07	0.01	0.01		0.03	0.15		
v/c Ratio					0.50	0.06	0.02	0.63	0.06	0.27	0.31	
Uniform Delay, d1					21.0	19.8	6.2	9.4	6.6	4.8	5.8	
Progression Factor					1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2					1.7	0.1	0.0	1.4	0.0	0.3	0.1	
Delay (s)					22.7	19.9	6.2	10.8	6.7	5.1	5.9	
Level of Service					C	B	A	B	A	A	A	
Approach Delay (s)		0.0			21.4			10.2			5.8	
Approach LOS		A			C			B			A	

Intersection Summary

HCM Average Control Delay	9.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	51.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	53.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 19: East Waipuilani Road & Pi'ilani Highway

2034 Scenario 2 AM
 1/25/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↑↑	↑↑	↗
Volume (veh/h)	0	30	0	2191	3304	76
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	33	0	2382	3591	83
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	4782	1796	3591			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4782	1796	3591			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	53	100			
cM capacity (veh/h)	1	70	65			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	33	1191	1191	1796	1796	83
Volume Left	0	0	0	0	0	0
Volume Right	33	0	0	0	0	83
cSH	70	1700	1700	1700	1700	1700
Volume to Capacity	0.47	0.70	0.70	1.06	1.06	0.05
Queue Length 95th (ft)	47	0	0	0	0	0
Control Delay (s)	95.8	0.0	0.0	0.0	0.0	0.0
Lane LOS	F					
Approach Delay (s)	95.8	0.0		0.0		
Approach LOS	F					

Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			101.3%	ICU Level of Service		G
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis

2034 Scenario 2 AM

21: East Lipoa Street & Liloa Drive

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	204	30	217	204	127	50	153	200	190	172	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1827		1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.62	1.00		0.41	1.00	1.00	0.64	1.00	1.00	0.65	1.00	1.00
Satd. Flow (perm)	1154	1827		755	1863	1583	1192	1863	1583	1215	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	57	222	33	236	222	138	54	166	217	207	187	85
RTOR Reduction (vph)	0	5	0	0	0	80	0	0	155	0	0	61
Lane Group Flow (vph)	57	250	0	236	222	58	54	166	62	207	187	24
Turn Type	pm+pt			pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	18.1	16.0		31.1	24.0	24.0	16.4	16.4	16.4	16.4	16.4	16.4
Effective Green, g (s)	18.1	16.0		31.1	24.0	24.0	16.4	16.4	16.4	16.4	16.4	16.4
Actuated g/C Ratio	0.31	0.28		0.54	0.42	0.42	0.29	0.29	0.29	0.29	0.29	0.29
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	386	508		587	778	661	340	531	451	347	531	451
v/s Ratio Prot	0.01	c0.14		c0.07	0.12			0.09			0.10	
v/s Ratio Perm	0.04			0.15		0.04	0.05		0.04	c0.17		0.02
v/c Ratio	0.15	0.49		0.40	0.29	0.09	0.16	0.31	0.14	0.60	0.35	0.05
Uniform Delay, d1	13.9	17.4		7.5	11.1	10.1	15.4	16.1	15.3	17.7	16.3	14.9
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.8		0.5	0.2	0.1	0.2	0.3	0.1	2.8	0.4	0.0
Delay (s)	14.1	18.1		8.0	11.3	10.2	15.6	16.5	15.4	20.5	16.7	15.0
Level of Service	B	B		A	B	B	B	B	B	C	B	B
Approach Delay (s)		17.4			9.7			15.8			18.0	
Approach LOS		B			A			B			B	

Intersection Summary

HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	57.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Intersection				
Intersection Delay, s/veh	7.1			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	97	265	210	300
Demand Flow Rate, veh/h	99	270	214	307
Vehicles Circulating, veh/h	364	166	107	295
Vehicles Exiting, veh/h	238	155	355	141
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	6.0	6.7	5.6	8.7
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	99	270	214	307
Cap Entry Lane, veh/h	785	957	1015	841
Entry HV Adj Factor	0.977	0.980	0.980	0.978
Flow Entry, veh/h	97	265	210	300
Cap Entry, veh/h	767	938	995	823
V/C Ratio	1.26	2.82	2.11	3.65
Control Delay, s/veh	6.0	6.7	5.6	8.7
LOS	A	A	A	A
95th %tile Queue, veh	0.0	0.1	0.1	0.2

HCM Signalized Intersection Capacity Analysis
 34: Kaonoulu St & Pi'ilani Highway

2034 Scenario 2 AM
 1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	24	69	198	81	43	83	61	2059	128	131	3194	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	75	215	88	47	90	66	2238	139	142	3472	26
RTOR Reduction (vph)	0	0	0	0	0	83	0	0	21	0	0	2
Lane Group Flow (vph)	26	75	215	88	47	7	66	2238	118	142	3472	24
Turn Type	Split		Free	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	8.5	8.5	117.6	8.6	8.6	8.6	6.8	68.3	68.3	10.2	71.7	71.7
Effective Green, g (s)	8.5	8.5	117.6	8.6	8.6	8.6	6.8	68.3	68.3	10.2	71.7	71.7
Actuated g/C Ratio	0.07	0.07	1.00	0.07	0.07	0.07	0.06	0.58	0.58	0.09	0.61	0.61
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	128	135	1583	251	136	204	102	2055	919	298	2158	965
v/s Ratio Prot	0.01	c0.04		c0.03	0.03		0.04	0.63		c0.04	c0.98	
v/s Ratio Perm			0.14			0.00			0.07			0.01
v/c Ratio	0.20	0.56	0.14	0.35	0.35	0.03	0.65	1.09	0.13	0.48	1.61	0.02
Uniform Delay, d1	51.4	52.7	0.0	51.8	51.8	50.6	54.2	24.6	11.2	51.2	22.9	9.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	4.9	0.2	0.8	1.5	0.1	13.3	48.9	0.1	1.2	276.2	0.0
Delay (s)	52.1	57.6	0.2	52.7	53.4	50.7	67.5	73.5	11.2	52.4	299.1	9.1
Level of Service	D	E	A	D	D	D	E	E	B	D	F	A
Approach Delay (s)		18.1			52.0			69.8			287.4	
Approach LOS		B			D			E			F	

Intersection Summary

HCM Average Control Delay	186.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.34		
Actuated Cycle Length (s)	117.6	Sum of lost time (s)	22.0
Intersection Capacity Utilization	106.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 1: Kulanihako'i St & Pi'ilani Highway

2034 Scenario 2 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↗	↕↕	↗	↗	↕↕	↗
Volume (vph)	19	15	65	80	6	28	81	2997	61	25	2549	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1811	1583		1780	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.80	1.00		0.71	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1495	1583		1332	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	16	71	87	7	30	88	3258	66	27	2771	85
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	37	71	0	94	30	88	3258	66	27	2771	85
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		4			8		5	2		1		6
Permitted Phases	4		Free	8		Free			Free			Free
Actuated Green, G (s)		13.7	122.5		13.7	122.5	8.8	87.0	122.5	4.8	83.0	122.5
Effective Green, g (s)		13.7	122.5		13.7	122.5	8.8	87.0	122.5	4.8	83.0	122.5
Actuated g/C Ratio		0.11	1.00		0.11	1.00	0.07	0.71	1.00	0.04	0.68	1.00
Clearance Time (s)		5.0			5.0		6.0	6.0		6.0		6.0
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0		3.0
Lane Grp Cap (vph)		167	1583		149	1583	127	2513	1583	69	2398	1583
v/s Ratio Prot							c0.05	c0.92		0.02		0.78
v/s Ratio Perm		0.02	0.04		c0.07	0.02			0.04			0.05
v/c Ratio		0.22	0.04		0.63	0.02	0.69	1.30	0.04	0.39	1.16	0.05
Uniform Delay, d1		49.5	0.0		52.0	0.0	55.5	17.8	0.0	57.4	19.8	0.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.7	0.1		8.4	0.0	15.1	136.5	0.0	3.6	75.2	0.1
Delay (s)		50.2	0.1		60.4	0.0	70.6	154.2	0.0	61.1	94.9	0.1
Level of Service		D	A		E	A	E	F	A	E	F	A
Approach Delay (s)		17.2			45.8			149.1			91.8	
Approach LOS		B			D			F			F	

Intersection Summary

HCM Average Control Delay	119.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	122.5	Sum of lost time (s)	17.0
Intersection Capacity Utilization	103.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 3: Old Welakahao Road & Pi'ilani Highway

2034 Scenario 2 PM
 1/25/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	3	24	2017	12	8	1807
Sign Control	Stop		Free		Free	Free
Grade	0%		0%		0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	26	2192	13	9	1964
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None		None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3198	1103			2205	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3198	1103			2205	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	56	87			96	
cM capacity (veh/h)	7	206			235	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	29	1462	744	9	982	982
Volume Left	3	0	0	9	0	0
Volume Right	26	0	13	0	0	0
cSH	52	1700	1700	235	1700	1700
Volume to Capacity	0.57	0.86	0.44	0.04	0.58	0.58
Queue Length 95th (ft)	55	0	0	3	0	0
Control Delay (s)	142.4	0.0	0.0	20.9	0.0	0.0
Lane LOS	F			C		
Approach Delay (s)	142.4	0.0		0.1		
Approach LOS	F					

Intersection Summary						
Average Delay			1.0			
Intersection Capacity Utilization			66.1%		ICU Level of Service	C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
 7: East Welakahao Road & Pi'ilani Highway

2034 Scenario 2 PM
 1/25/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	132	57	106	1901	1738	215
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	143	62	115	2066	1889	234
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)	6					
Median type				None	None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3153	945	1889			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3153	945	1889			
tC, single (s)	*5.0	*5.0	*5.0			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	86	42			
cM capacity (veh/h)	17	437	199			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	205	115	1033	1033	945	945	234
Volume Left	143	115	0	0	0	0	0
Volume Right	62	0	0	0	0	0	234
cSH	25	199	1700	1700	1700	1700	1700
Volume to Capacity	8.35	0.58	0.61	0.61	0.56	0.56	0.14
Queue Length 95th (ft)	Err	79	0	0	0	0	0
Control Delay (s)	Err	45.3	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	E					
Approach Delay (s)	Err	2.4			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		456.6	
Intersection Capacity Utilization		71.2%	ICU Level of Service C
Analysis Period (min)		15	

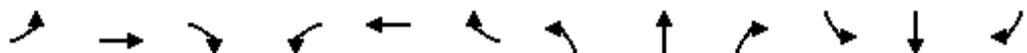
* User Entered Value

HCM Signalized Intersection Capacity Analysis

8: West Welakahao Road & South Kihei Road

2034 Scenario 2 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕	↕	↕		↕	↕	
Volume (vph)	34	7	13	110	17	59	18	939	71	44	997	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1748			1785	1583	1770	1843		1770	1854	
Flt Permitted		0.69			0.76	1.00	0.08	1.00		0.08	1.00	
Satd. Flow (perm)		1238			1413	1583	148	1843		146	1854	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	8	14	120	18	64	20	1021	77	48	1084	34
RTOR Reduction (vph)	0	12	0	0	0	56	0	3	0	0	1	0
Lane Group Flow (vph)	0	47	0	0	138	8	20	1095	0	48	1117	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		10.3			10.3	10.3	51.8	50.4		53.2	51.1	
Effective Green, g (s)		10.3			10.3	10.3	51.8	50.4		53.2	51.1	
Actuated g/C Ratio		0.13			0.13	0.13	0.67	0.65		0.68	0.66	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		164			187	210	128	1194		144	1218	
v/s Ratio Prot							0.00	0.59		c0.01	c0.60	
v/s Ratio Perm		0.04			c0.10	0.01	0.10			0.22		
v/c Ratio		0.29			0.74	0.04	0.16	0.92		0.33	0.92	
Uniform Delay, d1		30.4			32.5	29.4	14.0	11.9		14.4	11.5	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.0			14.1	0.1	0.6	11.0		1.4	10.8	
Delay (s)		31.4			46.5	29.5	14.6	22.9		15.8	22.4	
Level of Service		C			D	C	B	C		B	C	
Approach Delay (s)		31.4			41.2			22.8			22.1	
Approach LOS		C			D			C			C	

Intersection Summary

HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	77.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 11: East Lipoa Street & Pi'ilani Highway

2034 Scenario 2 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↘	↕↕	↗	↘	↕↕	↗
Volume (vph)	329	132	84	386	229	832	255	1717	110	468	1576	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1798	1583		1806	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.97	1.00		0.97	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1798	1583		1806	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	358	143	91	420	249	904	277	1866	120	509	1713	251
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	34	0	0	72
Lane Group Flow (vph)	0	501	91	0	669	904	277	1866	86	509	1713	179
Turn Type	Split		Free	Split		Free	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1		6
Permitted Phases			Free			Free			2			6
Actuated Green, G (s)		35.0	167.0		17.0	167.0	25.0	79.0	79.0	14.0	68.0	68.0
Effective Green, g (s)		35.0	167.0		17.0	167.0	25.0	79.0	79.0	14.0	68.0	68.0
Actuated g/C Ratio		0.21	1.00		0.10	1.00	0.15	0.47	0.47	0.08	0.41	0.41
Clearance Time (s)		5.0			5.0		6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		377	1583		184	1583	265	1674	749	148	1441	645
v/s Ratio Prot		c0.28			c0.37		0.16	c0.53		c0.29	c0.48	
v/s Ratio Perm			0.06			0.57			0.05			0.11
v/c Ratio		1.33	0.06		3.64	0.57	1.05	1.11	0.11	3.44	1.19	0.28
Uniform Delay, d1		66.0	0.0		75.0	0.0	71.0	44.0	24.5	76.5	49.5	33.1
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		165.3	0.1		1199.5	1.5	67.6	60.5	0.1	1114.5	92.2	0.2
Delay (s)		231.3	0.1		1274.5	1.5	138.6	104.5	24.6	1191.0	141.7	33.3
Level of Service		F	A		F	A	F	F	C	F	F	C
Approach Delay (s)		195.7			542.9			104.5			346.7	
Approach LOS		F			F			F			F	

Intersection Summary

HCM Average Control Delay	299.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.78		
Actuated Cycle Length (s)	167.0	Sum of lost time (s)	28.0
Intersection Capacity Utilization	150.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 12: West Lipoa Street & South Kihei Road

2034 Scenario 2 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Volume (vph)	39	37	58	147	35	130	71	776	135	76	944	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1816	1583		1790	1583	1770	1863	1583	1770	1855	
Flt Permitted		0.70	1.00		0.71	1.00	0.06	1.00	1.00	0.19	1.00	
Satd. Flow (perm)		1302	1583		1326	1583	116	1863	1583	358	1855	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	42	40	63	160	38	141	77	843	147	83	1026	30
RTOR Reduction (vph)	0	0	50	0	0	112	0	0	55	0	1	0
Lane Group Flow (vph)	0	82	13	0	198	29	77	843	92	83	1055	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)		20.9	20.9		20.9	20.9	67.6	64.0	64.0	66.2	63.3	
Effective Green, g (s)		20.9	20.9		20.9	20.9	67.6	64.0	64.0	66.2	63.3	
Actuated g/C Ratio		0.20	0.20		0.20	0.20	0.66	0.62	0.62	0.64	0.62	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		265	322		270	322	134	1160	986	270	1142	
v/s Ratio Prot							c0.02	0.45		0.01	c0.57	
v/s Ratio Perm		0.06	0.01		c0.15	0.02	0.36		0.06	0.19		
v/c Ratio		0.31	0.04		0.73	0.09	0.57	0.73	0.09	0.31	0.92	
Uniform Delay, d1		34.8	32.9		38.3	33.2	21.2	13.4	7.8	11.4	17.6	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.7	0.1		9.9	0.1	5.8	2.3	0.0	0.6	12.3	
Delay (s)		35.5	32.9		48.2	33.3	27.1	15.7	7.8	12.0	29.9	
Level of Service		D	C		D	C	C	B	A	B	C	
Approach Delay (s)		34.4			42.0			15.4			28.6	
Approach LOS		C			D			B			C	

Intersection Summary

HCM Average Control Delay	25.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	102.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 15: Pi'ikea Avenue & Pi'ilani Highway

2034 Scenario 2 PM

1/25/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	544	531	508	2756	2003	696
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1770	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	1770	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	591	577	552	2996	2177	757
RTOR Reduction (vph)	0	0	0	0	0	211
Lane Group Flow (vph)	591	577	552	2996	2177	546
Turn Type		Free	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Actuated Green, G (s)	29.0	192.0	30.0	152.0	116.0	116.0
Effective Green, g (s)	29.0	192.0	30.0	152.0	116.0	116.0
Actuated g/C Ratio	0.15	1.00	0.16	0.79	0.60	0.60
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	267	1583	277	2802	2138	956
v/s Ratio Prot	c0.33		c0.31	c0.85	0.62	
v/s Ratio Perm		0.36				0.35
v/c Ratio	2.21	0.36	1.99	1.07	1.02	0.57
Uniform Delay, d1	81.5	0.0	81.0	20.0	38.0	23.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	558.1	0.7	459.4	39.1	24.2	0.8
Delay (s)	639.6	0.7	540.4	59.1	62.2	23.8
Level of Service	F	A	F	E	E	C
Approach Delay (s)	324.0			134.0	52.3	
Approach LOS	F			F	D	

Intersection Summary

HCM Average Control Delay	131.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.39		
Actuated Cycle Length (s)	192.0	Sum of lost time (s)	11.0
Intersection Capacity Utilization	127.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Pi'ikea Avenue & South Kihei Road

2034 Scenario 2 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↗	↖	↑	↗	↖	↕	↕
Volume (vph)	0	0	0	223	63	128	19	789	197	91	665	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt					1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected					0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1793	1583	1770	1863	1583	1770	3520	
Flt Permitted					0.96	1.00	0.35	1.00	1.00	0.11	1.00	
Satd. Flow (perm)					1793	1583	648	1863	1583	196	3520	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	242	68	139	21	858	214	99	723	27
RTOR Reduction (vph)	0	0	0	0	0	106	0	0	93	0	3	0
Lane Group Flow (vph)	0	0	0	0	310	33	21	858	121	99	747	0
Turn Type				Perm	Perm	pm+pt		Perm	pm+pt			
Protected Phases					8	5		2		1	6	
Permitted Phases				8		8	2		2		6	
Actuated Green, G (s)					20.9	20.9	48.2	46.9	46.9	54.2	49.9	
Effective Green, g (s)					20.9	20.9	48.2	46.9	46.9	54.2	49.9	
Actuated g/C Ratio					0.24	0.24	0.55	0.54	0.54	0.62	0.57	
Clearance Time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)					430	380	375	1003	852	200	2017	
v/s Ratio Prot							0.00	c0.46		c0.02	0.21	
v/s Ratio Perm					0.17	0.02	0.03		0.08	0.28		
v/c Ratio					0.72	0.09	0.06	0.86	0.14	0.49	0.37	
Uniform Delay, d1					30.4	25.7	8.8	17.2	10.0	14.7	10.1	
Progression Factor					1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2					5.9	0.1	0.1	7.3	0.1	1.9	0.1	
Delay (s)					36.3	25.8	8.9	24.5	10.1	16.6	10.2	
Level of Service					D	C	A	C	B	B	B	
Approach Delay (s)		0.0			33.0			21.4			11.0	
Approach LOS		A			C			C			B	

Intersection Summary

HCM Average Control Delay	19.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	87.1	Sum of lost time (s)	20.0
Intersection Capacity Utilization	74.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 19: East Waipuilani Road & Pi'ilani Highway

2034 Scenario 2 PM
 1/25/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗		↕↗	↕↗	↗
Volume (veh/h)	0	10	0	3078	2484	130
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	11	0	3346	2700	141
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	4373	1350	2700			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4373	1350	2700			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	92	100			
cM capacity (veh/h)	1	140	149			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	11	1673	1673	1350	1350	141
Volume Left	0	0	0	0	0	0
Volume Right	11	0	0	0	0	141
cSH	140	1700	1700	1700	1700	1700
Volume to Capacity	0.08	0.98	0.98	0.79	0.79	0.08
Queue Length 95th (ft)	6	0	0	0	0	0
Control Delay (s)	32.8	0.0	0.0	0.0	0.0	0.0
Lane LOS	D					
Approach Delay (s)	32.8	0.0		0.0		
Approach LOS	D					

Intersection Summary						
Average Delay			0.1			
Intersection Capacity Utilization			88.4%	ICU Level of Service		E
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
 21: East Lipoa Street & Liloa Drive

2034 Scenario 2 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	250	18	144	255	146	16	70	129	79	78	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1844		1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.59	1.00		0.37	1.00	1.00	0.70	1.00	1.00	0.71	1.00	1.00
Satd. Flow (perm)	1098	1844		686	1863	1583	1307	1863	1583	1318	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	272	20	157	277	159	17	76	140	86	85	122
RTOR Reduction (vph)	0	4	0	0	0	97	0	0	115	0	0	100
Lane Group Flow (vph)	92	288	0	157	277	62	17	76	25	86	85	22
Turn Type	pm+pt			pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	9.5	9.0		19.3	13.9	13.9	6.4	6.4	6.4	6.4	6.4	6.4
Effective Green, g (s)	9.5	9.0		19.3	13.9	13.9	6.4	6.4	6.4	6.4	6.4	6.4
Actuated g/C Ratio	0.27	0.25		0.54	0.39	0.39	0.18	0.18	0.18	0.18	0.18	0.18
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	301	464		533	723	615	234	333	283	236	333	283
v/s Ratio Prot	0.00	c0.16		c0.04	0.15			0.04			0.05	
v/s Ratio Perm	0.08			0.11		0.04	0.01		0.02	c0.07		0.01
v/c Ratio	0.31	0.62		0.29	0.38	0.10	0.07	0.23	0.09	0.36	0.26	0.08
Uniform Delay, d1	10.3	11.9		4.6	7.9	7.0	12.2	12.6	12.3	12.9	12.6	12.2
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	2.5		0.3	0.3	0.1	0.1	0.4	0.1	1.0	0.4	0.1
Delay (s)	10.9	14.3		4.9	8.2	7.0	12.4	12.9	12.4	13.9	13.1	12.4
Level of Service	B	B		A	A	A	B	B	B	B	B	B
Approach Delay (s)		13.5			7.0			12.6			13.0	
Approach LOS		B			A			B			B	

Intersection Summary

HCM Average Control Delay	10.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	35.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	45.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection				
Intersection Delay, s/veh	8.7			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	250	334	339	277
Demand Flow Rate, veh/h	255	340	346	283
Vehicles Circulating, veh/h	319	318	245	302
Vehicles Exiting, veh/h	266	273	329	356
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	8.0	9.6	8.8	8.3
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	255	340	346	283
Cap Entry Lane, veh/h	821	822	884	835
Entry HV Adj Factor	0.980	0.983	0.980	0.979
Flow Entry, veh/h	250	334	339	277
Cap Entry, veh/h	805	808	867	818
V/C Ratio	3.10	4.14	3.91	3.39
Control Delay, s/veh	8.0	9.6	8.8	8.3
LOS	A	A	A	A
95th %tile Queue, veh	0.1	0.2	0.2	0.2

HCM Signalized Intersection Capacity Analysis
 34: Kaonoulu St & Pi'ilani Highway

2034 Scenario 2 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	155	130	513	174	522	110	2457	477	483	2009	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	5.0	5.0	5.0	5.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	168	141	558	189	567	120	2671	518	525	2184	38
RTOR Reduction (vph)	0	0	0	0	0	472	0	0	85	0	0	8
Lane Group Flow (vph)	21	168	141	558	189	95	120	2671	433	525	2184	30
Turn Type	Split		Free	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	15.2	15.2	139.2	20.0	20.0	20.0	10.0	64.0	64.0	19.0	73.0	73.0
Effective Green, g (s)	15.2	15.2	139.2	20.0	20.0	20.0	10.0	64.0	64.0	19.0	73.0	73.0
Actuated g/C Ratio	0.11	0.11	1.00	0.14	0.14	0.14	0.07	0.46	0.46	0.14	0.52	0.52
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	193	203	1583	493	268	400	127	1627	728	469	1856	830
v/s Ratio Prot	0.01	c0.09		c0.16	0.10		0.07	c0.75		c0.15	c0.62	
v/s Ratio Perm			0.09			0.03			0.27			0.02
v/c Ratio	0.11	0.83	0.09	1.13	0.71	0.24	0.94	1.64	0.60	1.12	1.18	0.04
Uniform Delay, d1	55.9	60.7	0.0	59.6	56.8	52.8	64.3	37.6	28.0	60.1	33.1	16.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	23.3	0.1	82.0	8.2	0.3	62.4	291.6	1.3	78.4	85.5	0.0
Delay (s)	56.1	84.0	0.1	141.6	65.0	53.2	126.8	329.2	29.3	138.5	118.6	16.1
Level of Service	E	F	A	F	E	D	F	F	C	F	F	B
Approach Delay (s)		46.4			92.4			274.9			121.0	
Approach LOS		D			F			F			F	

Intersection Summary

HCM Average Control Delay	179.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.45		
Actuated Cycle Length (s)	139.2	Sum of lost time (s)	27.0
Intersection Capacity Utilization	122.0%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 1: Kulanihako'i St & Pi'ilani Highway

2034 Scenario 3 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑↑	↗	↖	↑↑	↗
Volume (vph)	47	71	56	154	12	56	46	2145	283	117	3324	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1826	1583		1780	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.67	1.00		0.57	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1242	1583		1068	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	77	61	167	13	61	50	2332	308	127	3613	35
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	128	61	0	180	61	50	2332	308	127	3613	35
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8		Free			Free			Free
Actuated Green, G (s)		25.4	130.8		25.4	130.8	6.7	75.7	130.8	12.7	81.7	130.8
Effective Green, g (s)		25.4	130.8		25.4	130.8	6.7	75.7	130.8	12.7	81.7	130.8
Actuated g/C Ratio		0.19	1.00		0.19	1.00	0.05	0.58	1.00	0.10	0.62	1.00
Clearance Time (s)		5.0			5.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		241	1583		207	1583	91	2048	1583	172	2211	1583
v/s Ratio Prot							0.03	0.66		c0.07	c1.02	
v/s Ratio Perm		0.10	0.04		c0.17	0.04			0.19			0.02
v/c Ratio		0.53	0.04		0.87	0.04	0.55	1.14	0.19	0.74	1.63	0.02
Uniform Delay, d1		47.3	0.0		51.1	0.0	60.6	27.6	0.0	57.4	24.6	0.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		2.2	0.0		29.8	0.0	6.6	68.9	0.3	15.2	287.4	0.0
Delay (s)		49.6	0.0		80.9	0.0	67.2	96.5	0.3	72.7	312.0	0.0
Level of Service		D	A		F	A	E	F	A	E	F	A
Approach Delay (s)		33.6			60.5			84.9			301.0	
Approach LOS		C			E			F			F	

Intersection Summary

HCM Average Control Delay	201.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.43		
Actuated Cycle Length (s)	130.8	Sum of lost time (s)	17.0
Intersection Capacity Utilization	122.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

3: Old Welakahao Road & Pi'ilani Highway

2034 Scenario 3 AM

1/25/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	101	54	1500	94	504	1632
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	3539	1583	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1583	3539	1583	1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	110	59	1630	102	548	1774
RTOR Reduction (vph)	0	0	0	26	0	0
Lane Group Flow (vph)	110	59	1630	76	548	1774
Turn Type		Free		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		Free		2		
Actuated Green, G (s)	13.6	137.6	70.6	70.6	36.4	113.0
Effective Green, g (s)	13.6	137.6	70.6	70.6	36.4	113.0
Actuated g/C Ratio	0.10	1.00	0.51	0.51	0.26	0.82
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	175	1583	1816	812	468	2906
v/s Ratio Prot	c0.06		c0.46		c0.31	0.50
v/s Ratio Perm		0.04		0.05		
v/c Ratio	0.63	0.04	0.90	0.09	1.17	0.61
Uniform Delay, d1	59.6	0.0	30.2	17.1	50.6	4.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.9	0.0	6.3	0.1	97.7	0.4
Delay (s)	66.5	0.0	36.5	17.2	148.3	4.8
Level of Service	E	A	D	B	F	A
Approach Delay (s)	43.3		35.4			38.7
Approach LOS	D		D			D

Intersection Summary

HCM Average Control Delay	37.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	137.6	Sum of lost time (s)	17.0
Intersection Capacity Utilization	89.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

7: East Welakahao Road & Pi'ilani Highway

2034 Scenario 3 AM

1/25/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	116	58	31	1520	2068	108
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	126	63	34	1652	2248	117
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		6				
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				1137		
pX, platoon unblocked	0.55					
vC, conflicting volume	3141	1124	2248			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3255	1124	2248			
tC, single (s)	*5.0	*5.0	*5.0			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	83	74			
cM capacity (veh/h)	15	366	132			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	189	34	826	826	1124	1124	117
Volume Left	126	34	0	0	0	0	0
Volume Right	63	0	0	0	0	0	117
cSH	22	132	1700	1700	1700	1700	1700
Volume to Capacity	8.43	0.26	0.49	0.49	0.66	0.66	0.07
Queue Length 95th (ft)	Err	24	0	0	0	0	0
Control Delay (s)	Err	41.3	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	E					
Approach Delay (s)	Err	0.8			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		446.3	
Intersection Capacity Utilization		70.3%	ICU Level of Service C
Analysis Period (min)		15	

* User Entered Value

HCM Signalized Intersection Capacity Analysis

8: West Welakahao Road & South Kihei Road

2034 Scenario 3 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔	↔	↔		↔	↔	
Volume (vph)	29	11	11	56	11	69	3	589	47	38	525	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1759			1788	1583	1770	1842		1770	1858	
Flt Permitted		0.78			0.72	1.00	0.36	1.00		0.25	1.00	
Satd. Flow (perm)		1415			1345	1583	670	1842		471	1858	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	32	12	12	61	12	75	3	640	51	41	571	10
RTOR Reduction (vph)	0	10	0	0	0	65	0	4	0	0	1	0
Lane Group Flow (vph)	0	46	0	0	73	10	3	687	0	41	580	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		6.7			6.7	6.7	26.3	25.8		27.5	26.4	
Effective Green, g (s)		6.7			6.7	6.7	26.3	25.8		27.5	26.4	
Actuated g/C Ratio		0.14			0.14	0.14	0.54	0.53		0.57	0.54	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		195			185	218	374	978		296	1009	
v/s Ratio Prot							0.00	c0.37		c0.00	0.31	
v/s Ratio Perm		0.03			c0.05	0.01	0.00			0.08		
v/c Ratio		0.23			0.39	0.05	0.01	0.70		0.14	0.57	
Uniform Delay, d1		18.7			19.1	18.2	5.4	8.5		5.7	7.4	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6			1.4	0.1	0.0	2.3		0.2	0.8	
Delay (s)		19.3			20.5	18.3	5.4	10.8		6.0	8.2	
Level of Service		B			C	B	A	B		A	A	
Approach Delay (s)		19.3			19.4			10.8			8.0	
Approach LOS		B			B			B			A	

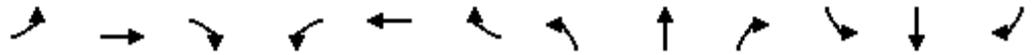
Intersection Summary

HCM Average Control Delay	10.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	48.6	Sum of lost time (s)	15.0
Intersection Capacity Utilization	54.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 11: East Lipoa Street & Pi'ilani Highway

2034 Scenario 3 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	328	183	248	101	107	75	143	1400	126	675	1869	471
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	4.0	6.0	6.0	5.0	6.0	6.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frbp, ped/bikes	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1541	1770	1863	1583	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1541	1770	1863	1583	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	357	199	270	110	116	82	155	1522	137	734	2032	512
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	57	0	0	90
Lane Group Flow (vph)	357	199	270	110	116	82	155	1522	80	734	2032	422
Confl. Peds. (#/hr)			50	50								
Turn Type	Prot		Free	Prot		Free	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases			Free			Free			2			6
Actuated Green, G (s)	29.0	31.0	145.1	12.1	14.1	145.1	15.3	53.0	65.1	27.0	64.7	93.7
Effective Green, g (s)	29.0	31.0	145.1	12.1	14.1	145.1	15.3	53.0	65.1	27.0	64.7	93.7
Actuated g/C Ratio	0.20	0.21	1.00	0.08	0.10	1.00	0.11	0.37	0.45	0.19	0.45	0.65
Clearance Time (s)	5.0	5.0		5.0	5.0		6.0	6.0	5.0	6.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	354	398	1541	148	181	1583	187	1293	710	639	1578	1022
v/s Ratio Prot	c0.20	0.11		0.06	c0.06		0.09	0.43	0.01	c0.21	c0.57	0.08
v/s Ratio Perm			0.18			0.05			0.04			0.18
v/c Ratio	1.01	0.50	0.18	0.74	0.64	0.05	0.83	1.18	0.11	1.15	1.29	0.41
Uniform Delay, d1	58.0	50.2	0.0	65.0	63.1	0.0	63.6	46.0	23.2	59.0	40.2	12.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	50.0	1.0	0.2	18.1	7.5	0.1	25.0	88.1	0.1	84.2	134.4	0.3
Delay (s)	108.0	51.2	0.2	83.1	70.6	0.1	88.7	134.1	23.3	143.2	174.6	12.7
Level of Service	F	D	A	F	E	A	F	F	C	F	F	B
Approach Delay (s)		59.1			56.3			121.9			142.3	
Approach LOS		E			E			F			F	

Intersection Summary

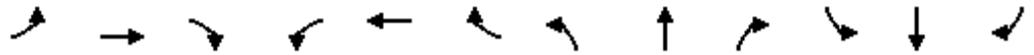
HCM Average Control Delay	121.0	HCM Level of Service	F
HCM Volume to Capacity ratio	1.16		
Actuated Cycle Length (s)	145.1	Sum of lost time (s)	22.0
Intersection Capacity Utilization	101.7%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 12: West Lipoa Street & South Kihei Road

2034 Scenario 3 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Volume (vph)	20	24	58	77	18	155	24	483	116	150	409	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1821	1583		1790	1583	1770	1863	1583	1770	1858	
Flt Permitted		0.83	1.00		0.73	1.00	0.50	1.00	1.00	0.27	1.00	
Satd. Flow (perm)		1551	1583		1368	1583	935	1863	1583	494	1858	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	26	63	84	20	168	26	525	126	163	445	7
RTOR Reduction (vph)	0	0	52	0	0	139	0	0	70	0	0	0
Lane Group Flow (vph)	0	48	11	0	104	29	26	525	56	163	452	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)		10.4	10.4		10.4	10.4	28.7	26.7	26.7	39.8	32.8	
Effective Green, g (s)		10.4	10.4		10.4	10.4	28.7	26.7	26.7	39.8	32.8	
Actuated g/C Ratio		0.17	0.17		0.17	0.17	0.48	0.44	0.44	0.66	0.54	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		268	273		236	273	473	826	702	498	1012	
v/s Ratio Prot							0.00	c0.28		c0.04	c0.24	
v/s Ratio Perm		0.03	0.01		c0.08	0.02	0.02		0.04	0.17		
v/c Ratio		0.18	0.04		0.44	0.11	0.05	0.64	0.08	0.33	0.45	
Uniform Delay, d1		21.3	20.7		22.3	21.0	8.4	13.0	9.7	5.7	8.2	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.3	0.1		1.3	0.2	0.0	1.6	0.0	0.4	0.3	
Delay (s)		21.6	20.8		23.6	21.2	8.4	14.6	9.7	6.1	8.6	
Level of Service		C	C		C	C	A	B	A	A	A	
Approach Delay (s)		21.1			22.1			13.4			7.9	
Approach LOS		C			C			B			A	

Intersection Summary

HCM Average Control Delay	13.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	60.2	Sum of lost time (s)	20.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 15: Pi'ikea Avenue & Pi'ilani Highway

2034 Scenario 3 AM
 1/25/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	396	291	186	1639	2816	508
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3433	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	1770	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	430	316	202	1782	3061	552
RTOR Reduction (vph)	0	0	0	0	0	121
Lane Group Flow (vph)	430	316	202	1782	3061	431
Turn Type		Free	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Actuated Green, G (s)	23.8	149.3	19.4	114.5	89.1	89.1
Effective Green, g (s)	23.8	149.3	19.4	114.5	89.1	89.1
Actuated g/C Ratio	0.16	1.00	0.13	0.77	0.60	0.60
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	547	1583	230	2714	2112	945
v/s Ratio Prot	c0.13		c0.11	0.50	c0.86	
v/s Ratio Perm		0.20				0.27
v/c Ratio	0.79	0.20	0.88	0.66	1.45	0.46
Uniform Delay, d1	60.3	0.0	63.8	8.2	30.1	16.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.3	0.3	29.2	0.6	204.9	0.4
Delay (s)	67.6	0.3	93.0	8.8	235.0	17.0
Level of Service	E	A	F	A	F	B
Approach Delay (s)	39.1			17.3	201.7	
Approach LOS	D			B	F	

Intersection Summary

HCM Average Control Delay	124.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.25		
Actuated Cycle Length (s)	149.3	Sum of lost time (s)	17.0
Intersection Capacity Utilization	113.6%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Pi'ikea Avenue & South Kihei Road

2034 Scenario 3 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↕	↕	↑	↕	↕	↕↔	
Volume (vph)	0	0	0	96	11	88	7	545	93	107	574	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt					1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected					0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1783	1583	1770	1863	1583	1770	3529	
Flt Permitted					0.96	1.00	0.41	1.00	1.00	0.27	1.00	
Satd. Flow (perm)					1783	1583	764	1863	1583	509	3529	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	104	12	96	8	592	101	116	624	12
RTOR Reduction (vph)	0	0	0	0	0	84	0	0	50	0	2	0
Lane Group Flow (vph)	0	0	0	0	116	12	8	592	51	116	634	0
Turn Type				Perm	Perm	pm+pt		Perm	pm+pt			
Protected Phases					8	5	2		1	6		
Permitted Phases				8	8	2		2	6			
Actuated Green, G (s)					6.7	6.7	26.5	26.0	33.7	29.6		
Effective Green, g (s)					6.7	6.7	26.5	26.0	33.7	29.6		
Actuated g/C Ratio					0.13	0.13	0.51	0.50	0.65	0.57		
Clearance Time (s)					5.0	5.0	5.0	5.0	5.0	5.0		
Vehicle Extension (s)					3.0	3.0	3.0	3.0	3.0	3.0		
Lane Grp Cap (vph)					231	205	401	935	795	431	2017	
v/s Ratio Prot							0.00	c0.32		c0.02	0.18	
v/s Ratio Perm					0.07	0.01	0.01		0.03	0.15		
v/c Ratio					0.50	0.06	0.02	0.63	0.06	0.27	0.31	
Uniform Delay, d1					21.0	19.8	6.2	9.4	6.6	4.8	5.8	
Progression Factor					1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2					1.7	0.1	0.0	1.4	0.0	0.3	0.1	
Delay (s)					22.7	19.9	6.2	10.8	6.7	5.1	5.9	
Level of Service					C	B	A	B	A	A	A	
Approach Delay (s)		0.0			21.4			10.2			5.8	
Approach LOS		A			C			B			A	

Intersection Summary

HCM Average Control Delay	9.6	HCM Level of Service	A
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	51.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	53.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

19: East Waipuilani Road & Pi'ilani Highway Performance by movement

Movement	EBR	WBR	NBT	NBR	SBT	SBR	All
Total Delay (hr)	0.0	0.1	0.2	0.0	0.8	0.0	1.0
Delay / Veh (s)	1.6	2.3	1.2	0.1	3.4	2.4	2.6
Total Stops	0	0	0	0	0	0	0
Travel Dist (mi)	2.2	10.0	24.0	0.3	83.8	1.3	121.6
Travel Time (hr)	0.1	0.4	0.7	0.0	2.6	0.1	3.9
Avg Speed (mph)	23	23	35	22	32	25	31
Fuel Used (gal)	0.1	0.3	0.7	0.0	2.6	0.0	3.7
HC Emissions (g)	0	3	9	0	30	0	43
CO Emissions (g)	4	106	327	1	839	26	1304
NOx Emissions (g)	1	9	36	0	117	1	163
Vehicles Entered	11	91	446	6	796	13	1363
Vehicles Exited	12	93	444	7	795	13	1364
Hourly Exit Rate	48	372	1776	28	3180	52	5456
Input Volume	30	319	1872	46	3304	76	5647
% of Volume	160	117	95	61	96	68	97
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Total Delay (hr)	18.8
Delay / Veh (s)	49.7
Total Stops	138
Travel Dist (mi)	805.0
Travel Time (hr)	37.5
Avg Speed (mph)	32
Fuel Used (gal)	31.6
HC Emissions (g)	353
CO Emissions (g)	12483
NOx Emissions (g)	1399
Vehicles Entered	1371
Vehicles Exited	1352
Hourly Exit Rate	5408
Input Volume	22117
% of Volume	24
Denied Entry Before	1
Denied Entry After	68

HCM Signalized Intersection Capacity Analysis
 21: East Lipoa Street & Liloa Drive

2034 Scenario 3 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	204	30	217	204	127	50	153	200	190	172	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1827		1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.62	1.00		0.41	1.00	1.00	0.64	1.00	1.00	0.65	1.00	1.00
Satd. Flow (perm)	1154	1827		755	1863	1583	1192	1863	1583	1215	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	57	222	33	236	222	138	54	166	217	207	187	85
RTOR Reduction (vph)	0	5	0	0	0	80	0	0	155	0	0	61
Lane Group Flow (vph)	57	250	0	236	222	58	54	166	62	207	187	24
Turn Type	pm+pt			pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	18.1	16.0		31.1	24.0	24.0	16.4	16.4	16.4	16.4	16.4	16.4
Effective Green, g (s)	18.1	16.0		31.1	24.0	24.0	16.4	16.4	16.4	16.4	16.4	16.4
Actuated g/C Ratio	0.31	0.28		0.54	0.42	0.42	0.29	0.29	0.29	0.29	0.29	0.29
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	386	508		587	778	661	340	531	451	347	531	451
v/s Ratio Prot	0.01	c0.14		c0.07	0.12			0.09			0.10	
v/s Ratio Perm	0.04			0.15		0.04	0.05		0.04	c0.17		0.02
v/c Ratio	0.15	0.49		0.40	0.29	0.09	0.16	0.31	0.14	0.60	0.35	0.05
Uniform Delay, d1	13.9	17.4		7.5	11.1	10.1	15.4	16.1	15.3	17.7	16.3	14.9
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.8		0.5	0.2	0.1	0.2	0.3	0.1	2.8	0.4	0.0
Delay (s)	14.1	18.1		8.0	11.3	10.2	15.6	16.5	15.4	20.5	16.7	15.0
Level of Service	B	B		A	B	B	B	B	B	C	B	B
Approach Delay (s)		17.4			9.7			15.8			18.0	
Approach LOS		B			A			B			B	

Intersection Summary

HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	57.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	59.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Intersection				
Intersection Delay, s/veh	7.1			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	97	265	210	300
Demand Flow Rate, veh/h	99	270	214	307
Vehicles Circulating, veh/h	364	166	107	295
Vehicles Exiting, veh/h	238	155	355	141
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	6.0	6.7	5.6	8.7
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	99	270	214	307
Cap Entry Lane, veh/h	785	957	1015	841
Entry HV Adj Factor	0.977	0.980	0.980	0.978
Flow Entry, veh/h	97	265	210	300
Cap Entry, veh/h	767	938	995	823
V/C Ratio	1.26	2.82	2.11	3.65
Control Delay, s/veh	6.0	6.7	5.6	8.7
LOS	A	A	A	A
95th %tile Queue, veh	0.0	0.1	0.1	0.2

HCM Signalized Intersection Capacity Analysis
 34: Kaonoulu St & Pi'ilani Highway

2034 Scenario 3 AM

1/25/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	24	69	198	81	43	83	61	2059	128	131	3194	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	75	215	88	47	90	66	2238	139	142	3472	26
RTOR Reduction (vph)	0	0	0	0	0	83	0	0	21	0	0	2
Lane Group Flow (vph)	26	75	215	88	47	7	66	2238	118	142	3472	24
Turn Type	Split		Free	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	8.5	8.5	117.6	8.6	8.6	8.6	6.8	68.3	68.3	10.2	71.7	71.7
Effective Green, g (s)	8.5	8.5	117.6	8.6	8.6	8.6	6.8	68.3	68.3	10.2	71.7	71.7
Actuated g/C Ratio	0.07	0.07	1.00	0.07	0.07	0.07	0.06	0.58	0.58	0.09	0.61	0.61
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	128	135	1583	251	136	204	102	2055	919	298	2158	965
v/s Ratio Prot	0.01	c0.04		c0.03	0.03		0.04	0.63		c0.04	c0.98	
v/s Ratio Perm			0.14			0.00			0.07			0.01
v/c Ratio	0.20	0.56	0.14	0.35	0.35	0.03	0.65	1.09	0.13	0.48	1.61	0.02
Uniform Delay, d1	51.4	52.7	0.0	51.8	51.8	50.6	54.2	24.6	11.2	51.2	22.9	9.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	4.9	0.2	0.8	1.5	0.1	13.3	48.9	0.1	1.2	276.2	0.0
Delay (s)	52.1	57.6	0.2	52.7	53.4	50.7	67.5	73.5	11.2	52.4	299.1	9.1
Level of Service	D	E	A	D	D	D	E	E	B	D	F	A
Approach Delay (s)		18.1			52.0			69.8			287.4	
Approach LOS		B			D			E			F	

Intersection Summary

HCM Average Control Delay	186.3	HCM Level of Service	F
HCM Volume to Capacity ratio	1.34		
Actuated Cycle Length (s)	117.6	Sum of lost time (s)	22.0
Intersection Capacity Utilization	106.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 1: Kulanihako'i St & Pi'ilani Highway

2034 Scenario 3 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↗	↕↕	↗	↗	↕↕	↗
Volume (vph)	19	15	65	80	6	28	81	2997	61	25	2549	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1811	1583		1780	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.80	1.00		0.71	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1495	1583		1332	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	16	71	87	7	30	88	3258	66	27	2771	85
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	37	71	0	94	30	88	3258	66	27	2771	85
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8		Free			Free			Free
Actuated Green, G (s)		13.7	122.5		13.7	122.5	8.8	87.0	122.5	4.8	83.0	122.5
Effective Green, g (s)		13.7	122.5		13.7	122.5	8.8	87.0	122.5	4.8	83.0	122.5
Actuated g/C Ratio		0.11	1.00		0.11	1.00	0.07	0.71	1.00	0.04	0.68	1.00
Clearance Time (s)		5.0			5.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		167	1583		149	1583	127	2513	1583	69	2398	1583
v/s Ratio Prot							c0.05	c0.92		0.02	0.78	
v/s Ratio Perm		0.02	0.04		c0.07	0.02			0.04			0.05
v/c Ratio		0.22	0.04		0.63	0.02	0.69	1.30	0.04	0.39	1.16	0.05
Uniform Delay, d1		49.5	0.0		52.0	0.0	55.5	17.8	0.0	57.4	19.8	0.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.7	0.1		8.4	0.0	15.1	136.5	0.0	3.6	75.2	0.1
Delay (s)		50.2	0.1		60.4	0.0	70.6	154.2	0.0	61.1	94.9	0.1
Level of Service		D	A		E	A	E	F	A	E	F	A
Approach Delay (s)		17.2			45.8			149.1			91.8	
Approach LOS		B			D			F			F	

Intersection Summary

HCM Average Control Delay	119.6	HCM Level of Service	F
HCM Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	122.5	Sum of lost time (s)	17.0
Intersection Capacity Utilization	103.4%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

3: Old Welakahao Road & Pi'ilani Highway

2034 Scenario 3 PM

1/25/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	182	162	2005	12	71	1628
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	3539	1583	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1583	3539	1583	1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	198	176	2179	13	77	1770
RTOR Reduction (vph)	0	0	0	2	0	0
Lane Group Flow (vph)	198	176	2179	11	77	1770
Turn Type		Free		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		Free		2		
Actuated Green, G (s)	20.3	149.8	103.4	103.4	9.1	118.5
Effective Green, g (s)	20.3	149.8	103.4	103.4	9.1	118.5
Actuated g/C Ratio	0.14	1.00	0.69	0.69	0.06	0.79
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	240	1583	2443	1093	108	2800
v/s Ratio Prot	c0.11		c0.62		0.04	c0.50
v/s Ratio Perm		0.11		0.01		
v/c Ratio	0.82	0.11	0.89	0.01	0.71	0.63
Uniform Delay, d1	63.0	0.0	18.7	7.2	69.1	6.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	20.1	0.1	4.6	0.0	19.9	0.5
Delay (s)	83.1	0.1	23.3	7.2	88.9	7.0
Level of Service	F	A	C	A	F	A
Approach Delay (s)	44.1		23.2			10.4
Approach LOS	D		C			B

Intersection Summary

HCM Average Control Delay	19.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	149.8	Sum of lost time (s)	17.0
Intersection Capacity Utilization	78.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 7: East Welakahao Road & Pi'ilani Highway

2034 Scenario 3 PM
 1/25/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	132	57	106	2027	1622	215
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	143	62	115	2203	1763	234
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)	6					
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)	1137					
pX, platoon unblocked	0.35					
vC, conflicting volume	3095	882	1763			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3274	882	1763			
tC, single (s)	*5.0	*5.0	*5.0			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	87	50			
cM capacity (veh/h)	6	466	230			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	205	115	1102	1102	882	882	234
Volume Left	143	115	0	0	0	0	0
Volume Right	62	0	0	0	0	0	234
cSH	9	230	1700	1700	1700	1700	1700
Volume to Capacity	23.03	0.50	0.65	0.65	0.52	0.52	0.14
Queue Length 95th (ft)	Err	64	0	0	0	0	0
Control Delay (s)	Err	35.4	0.0	0.0	0.0	0.0	0.0
Lane LOS	F	E					
Approach Delay (s)	Err	1.8			0.0		
Approach LOS	F						

Intersection Summary			
Average Delay		455.3	
Intersection Capacity Utilization		70.0%	ICU Level of Service C
Analysis Period (min)		15	

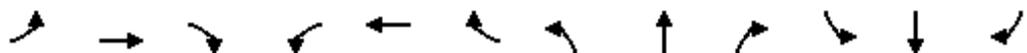
* User Entered Value

HCM Signalized Intersection Capacity Analysis

8: West Welakahao Road & South Kihei Road

2034 Scenario 3 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔	↔	↔	↔		↔	↔	
Volume (vph)	34	7	13	110	17	59	18	939	71	44	997	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1748			1785	1583	1770	1843		1770	1854	
Flt Permitted		0.69			0.76	1.00	0.08	1.00		0.08	1.00	
Satd. Flow (perm)		1238			1413	1583	148	1843		146	1854	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	8	14	120	18	64	20	1021	77	48	1084	34
RTOR Reduction (vph)	0	12	0	0	0	56	0	3	0	0	1	0
Lane Group Flow (vph)	0	47	0	0	138	8	20	1095	0	48	1117	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		10.3			10.3	10.3	51.8	50.4		53.2	51.1	
Effective Green, g (s)		10.3			10.3	10.3	51.8	50.4		53.2	51.1	
Actuated g/C Ratio		0.13			0.13	0.13	0.67	0.65		0.68	0.66	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		164			187	210	128	1194		144	1218	
v/s Ratio Prot							0.00	0.59		c0.01	c0.60	
v/s Ratio Perm		0.04			c0.10	0.01	0.10			0.22		
v/c Ratio		0.29			0.74	0.04	0.16	0.92		0.33	0.92	
Uniform Delay, d1		30.4			32.5	29.4	14.0	11.9		14.4	11.5	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.0			14.1	0.1	0.6	11.0		1.4	10.8	
Delay (s)		31.4			46.5	29.5	14.6	22.9		15.8	22.4	
Level of Service		C			D	C	B	C		B	C	
Approach Delay (s)		31.4			41.2			22.8			22.1	
Approach LOS		C			D			C			C	

Intersection Summary

HCM Average Control Delay	24.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	77.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 11: East Lipoa Street & Pi'ilani Highway

2034 Scenario 3 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↑	↗	↖	↑↑	↗	↖↗	↑↑	↗
Volume (vph)	329	119	99	207	229	340	255	1928	25	420	1624	231
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	4.0	6.0	6.0	5.0	6.0	6.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frbp, ped/bikes	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1541	1770	1863	1583	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1541	1770	1863	1583	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	358	129	108	225	249	370	277	2096	27	457	1765	251
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	8	0	0	48
Lane Group Flow (vph)	358	129	108	225	249	370	277	2096	19	457	1765	203
Confl. Peds. (#/hr)			50	50								
Turn Type	Prot		Free	Prot		Free	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases			Free			Free			2			6
Actuated Green, G (s)	32.9	32.0	146.1	21.0	20.1	146.1	24.5	55.1	76.1	16.0	46.6	79.5
Effective Green, g (s)	32.9	32.0	146.1	21.0	20.1	146.1	24.5	55.1	76.1	16.0	46.6	79.5
Actuated g/C Ratio	0.23	0.22	1.00	0.14	0.14	1.00	0.17	0.38	0.52	0.11	0.32	0.54
Clearance Time (s)	5.0	5.0		5.0	5.0		6.0	6.0	5.0	6.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	399	408	1541	254	256	1583	297	1335	825	376	1129	861
v/s Ratio Prot	c0.20	0.07		0.13	c0.13		0.16	c0.59	0.00	c0.13	0.50	0.05
v/s Ratio Perm			0.07			0.23			0.01			0.08
v/c Ratio	0.90	0.32	0.07	0.89	0.97	0.23	0.93	1.57	0.02	1.22	1.56	0.24
Uniform Delay, d1	55.0	47.9	0.0	61.4	62.7	0.0	60.0	45.5	17.0	65.0	49.8	17.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	22.0	0.4	0.1	28.6	48.3	0.3	34.7	260.2	0.0	119.0	257.8	0.1
Delay (s)	77.0	48.3	0.1	89.9	111.1	0.3	94.7	305.7	17.0	184.0	307.6	17.6
Level of Service	E	D	A	F	F	A	F	F	B	F	F	B
Approach Delay (s)		56.8			56.9			278.1			255.3	
Approach LOS		E			E			F			F	

Intersection Summary

HCM Average Control Delay	218.7	HCM Level of Service	F
HCM Volume to Capacity ratio	1.25		
Actuated Cycle Length (s)	146.1	Sum of lost time (s)	22.0
Intersection Capacity Utilization	113.9%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 12: West Lipoa Street & South Kihei Road

2034 Scenario 3 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Volume (vph)	39	37	58	147	35	130	71	776	135	76	944	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1816	1583		1790	1583	1770	1863	1583	1770	1855	
Flt Permitted		0.70	1.00		0.71	1.00	0.06	1.00	1.00	0.19	1.00	
Satd. Flow (perm)		1302	1583		1326	1583	116	1863	1583	358	1855	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	42	40	63	160	38	141	77	843	147	83	1026	30
RTOR Reduction (vph)	0	0	50	0	0	112	0	0	55	0	1	0
Lane Group Flow (vph)	0	82	13	0	198	29	77	843	92	83	1055	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)		20.9	20.9		20.9	20.9	67.6	64.0	64.0	66.2	63.3	
Effective Green, g (s)		20.9	20.9		20.9	20.9	67.6	64.0	64.0	66.2	63.3	
Actuated g/C Ratio		0.20	0.20		0.20	0.20	0.66	0.62	0.62	0.64	0.62	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		265	322		270	322	134	1160	986	270	1142	
v/s Ratio Prot							c0.02	0.45		0.01	c0.57	
v/s Ratio Perm		0.06	0.01		c0.15	0.02	0.36		0.06	0.19		
v/c Ratio		0.31	0.04		0.73	0.09	0.57	0.73	0.09	0.31	0.92	
Uniform Delay, d1		34.8	32.9		38.3	33.2	21.2	13.4	7.8	11.4	17.6	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.7	0.1		9.9	0.1	5.8	2.3	0.0	0.6	12.3	
Delay (s)		35.5	32.9		48.2	33.3	27.1	15.7	7.8	12.0	29.9	
Level of Service		D	C		D	C	C	B	A	B	C	
Approach Delay (s)		34.4			42.0			15.4			28.6	
Approach LOS		C			D			B			C	

Intersection Summary

HCM Average Control Delay	25.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	102.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 15: Pi'ikea Avenue & Pi'ilani Highway

2034 Scenario 3 PM

1/25/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	544	531	508	2475	2003	696
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3433	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	1770	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	591	577	552	2690	2177	757
RTOR Reduction (vph)	0	0	0	0	0	211
Lane Group Flow (vph)	591	577	552	2690	2177	546
Turn Type		Free	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Actuated Green, G (s)	33.0	192.0	55.0	148.0	87.0	87.0
Effective Green, g (s)	33.0	192.0	55.0	148.0	87.0	87.0
Actuated g/C Ratio	0.17	1.00	0.29	0.77	0.45	0.45
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	590	1583	507	2728	1604	717
v/s Ratio Prot	c0.17		c0.31	0.76	c0.62	
v/s Ratio Perm		0.36				0.35
v/c Ratio	1.00	0.36	1.09	0.99	1.36	0.76
Uniform Delay, d1	79.5	0.0	68.5	21.0	52.5	43.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	37.5	0.7	66.2	14.0	164.9	4.8
Delay (s)	117.0	0.7	134.7	35.0	217.4	48.7
Level of Service	F	A	F	D	F	D
Approach Delay (s)	59.5			52.0	173.9	
Approach LOS	E			D	F	

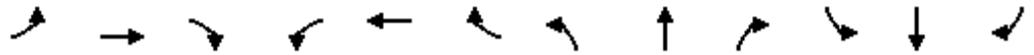
Intersection Summary

HCM Average Control Delay	101.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.21		
Actuated Cycle Length (s)	192.0	Sum of lost time (s)	17.0
Intersection Capacity Utilization	113.2%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Pi'ikea Avenue & South Kihei Road

2034 Scenario 3 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↗	↖	↑	↗	↖	↕	↕↔
Volume (vph)	0	0	0	223	63	128	19	789	197	91	665	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt					1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected					0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1793	1583	1770	1863	1583	1770	3520	
Flt Permitted					0.96	1.00	0.35	1.00	1.00	0.11	1.00	
Satd. Flow (perm)					1793	1583	648	1863	1583	196	3520	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	242	68	139	21	858	214	99	723	27
RTOR Reduction (vph)	0	0	0	0	0	106	0	0	93	0	3	0
Lane Group Flow (vph)	0	0	0	0	310	33	21	858	121	99	747	0
Turn Type				Perm	Perm	pm+pt		Perm	pm+pt			
Protected Phases					8	5		2		1	6	
Permitted Phases				8		2			2		6	
Actuated Green, G (s)					20.9	20.9	48.2	46.9	46.9	54.2	49.9	
Effective Green, g (s)					20.9	20.9	48.2	46.9	46.9	54.2	49.9	
Actuated g/C Ratio					0.24	0.24	0.55	0.54	0.54	0.62	0.57	
Clearance Time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)					430	380	375	1003	852	200	2017	
v/s Ratio Prot							0.00	c0.46		c0.02	0.21	
v/s Ratio Perm					0.17	0.02	0.03		0.08	0.28		
v/c Ratio					0.72	0.09	0.06	0.86	0.14	0.49	0.37	
Uniform Delay, d1					30.4	25.7	8.8	17.2	10.0	14.7	10.1	
Progression Factor					1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2					5.9	0.1	0.1	7.3	0.1	1.9	0.1	
Delay (s)					36.3	25.8	8.9	24.5	10.1	16.6	10.2	
Level of Service					D	C	A	C	B	B	B	
Approach Delay (s)		0.0			33.0			21.4			11.0	
Approach LOS		A			C			C			B	

Intersection Summary

HCM Average Control Delay	19.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	87.1	Sum of lost time (s)	20.0
Intersection Capacity Utilization	74.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

19: East Waipuilani Road & Pi'ilani Highway Performance by movement

Movement	EBR	WBR	NBT	NBR	SBT	SBR	All
Total Delay (hr)	0.0	0.1	4.2	0.1	0.2	0.0	4.7
Delay / Veh (s)	1.2	3.3	22.2	21.2	1.3	1.8	11.6
Total Stops	0	15	112	1	0	0	128
Travel Dist (mi)	0.2	10.9	147.2	3.7	64.4	3.0	229.5
Travel Time (hr)	0.0	0.5	7.8	0.2	1.7	0.1	10.3
Avg Speed (mph)	22	22	21	21	39	26	24
Fuel Used (gal)	0.0	0.3	4.5	0.1	1.9	0.0	6.9
HC Emissions (g)	0	3	41	1	29	0	75
CO Emissions (g)	0	112	1239	37	882	15	2286
NOx Emissions (g)	0	8	143	3	112	1	267
Vehicles Entered	1	99	681	17	611	31	1440
Vehicles Exited	1	99	691	18	610	29	1448
Hourly Exit Rate	4	396	2764	72	2440	116	5792
Input Volume	10	354	2724	73	2484	130	5775
% of Volume	40	112	101	99	98	89	100
Denied Entry Before	0	0	1	0	0	0	1
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Total Delay (hr)	9.4
Delay / Veh (s)	23.3
Total Stops	302
Travel Dist (mi)	856.7
Travel Time (hr)	29.5
Avg Speed (mph)	30
Fuel Used (gal)	30.7
HC Emissions (g)	378
CO Emissions (g)	13308
NOx Emissions (g)	1491
Vehicles Entered	1441
Vehicles Exited	1462
Hourly Exit Rate	5848
Input Volume	17242
% of Volume	34
Denied Entry Before	1
Denied Entry After	1

HCM Signalized Intersection Capacity Analysis
 21: East Lipoa Street & Liloa Drive

2034 Scenario 3 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	250	18	144	255	146	16	70	129	79	78	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1844		1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.59	1.00		0.37	1.00	1.00	0.70	1.00	1.00	0.71	1.00	1.00
Satd. Flow (perm)	1098	1844		686	1863	1583	1307	1863	1583	1318	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	272	20	157	277	159	17	76	140	86	85	122
RTOR Reduction (vph)	0	4	0	0	0	97	0	0	115	0	0	100
Lane Group Flow (vph)	92	288	0	157	277	62	17	76	25	86	85	22
Turn Type	pm+pt			pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	9.5	9.0		19.3	13.9	13.9	6.4	6.4	6.4	6.4	6.4	6.4
Effective Green, g (s)	9.5	9.0		19.3	13.9	13.9	6.4	6.4	6.4	6.4	6.4	6.4
Actuated g/C Ratio	0.27	0.25		0.54	0.39	0.39	0.18	0.18	0.18	0.18	0.18	0.18
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	301	464		533	723	615	234	333	283	236	333	283
v/s Ratio Prot	0.00	c0.16		c0.04	0.15			0.04			0.05	
v/s Ratio Perm	0.08			0.11		0.04	0.01		0.02	c0.07		0.01
v/c Ratio	0.31	0.62		0.29	0.38	0.10	0.07	0.23	0.09	0.36	0.26	0.08
Uniform Delay, d1	10.3	11.9		4.6	7.9	7.0	12.2	12.6	12.3	12.9	12.6	12.2
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	2.5		0.3	0.3	0.1	0.1	0.4	0.1	1.0	0.4	0.1
Delay (s)	10.9	14.3		4.9	8.2	7.0	12.4	12.9	12.4	13.9	13.1	12.4
Level of Service	B	B		A	A	A	B	B	B	B	B	B
Approach Delay (s)		13.5			7.0			12.6			13.0	
Approach LOS		B			A			B			B	

Intersection Summary

HCM Average Control Delay	10.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	35.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	45.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Intersection				
Intersection Delay, s/veh	8.7			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	250	334	339	277
Demand Flow Rate, veh/h	255	340	346	283
Vehicles Circulating, veh/h	319	318	245	302
Vehicles Exiting, veh/h	266	273	329	356
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	8.0	9.6	8.8	8.3
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	255	340	346	283
Cap Entry Lane, veh/h	821	822	884	835
Entry HV Adj Factor	0.980	0.983	0.980	0.979
Flow Entry, veh/h	250	334	339	277
Cap Entry, veh/h	805	808	867	818
V/C Ratio	3.10	4.14	3.91	3.39
Control Delay, s/veh	8.0	9.6	8.8	8.3
LOS	A	A	A	A
95th %tile Queue, veh	0.1	0.2	0.2	0.2

HCM Signalized Intersection Capacity Analysis
 34: Kaonoulu St & Pi'ilani Highway

2034 Scenario 3 PM

1/25/2013

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	19	155	130	513	174	522	110	2457	477	483	2009	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	168	141	558	189	567	120	2671	518	525	2184	38
RTOR Reduction (vph)	0	0	0	0	0	459	0	0	85	0	0	8
Lane Group Flow (vph)	21	168	141	558	189	108	120	2671	433	525	2184	30
Turn Type	Split		Free	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	15.2	15.2	139.2	20.0	20.0	20.0	9.0	63.0	63.0	19.0	73.0	73.0
Effective Green, g (s)	15.2	15.2	139.2	20.0	20.0	20.0	9.0	63.0	63.0	19.0	73.0	73.0
Actuated g/C Ratio	0.11	0.11	1.00	0.14	0.14	0.14	0.06	0.45	0.45	0.14	0.52	0.52
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	193	203	1583	493	268	400	114	1602	716	469	1856	830
v/s Ratio Prot	0.01	c0.09		c0.16	0.10		0.07	c0.75		c0.15	c0.62	
v/s Ratio Perm			0.09			0.04			0.27			0.02
v/c Ratio	0.11	0.83	0.09	1.13	0.71	0.27	1.05	1.67	0.60	1.12	1.18	0.04
Uniform Delay, d1	55.9	60.7	0.0	59.6	56.8	53.1	65.1	38.1	28.7	60.1	33.1	16.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	23.3	0.1	82.0	8.2	0.4	99.1	303.1	1.5	78.4	85.5	0.0
Delay (s)	56.1	84.0	0.1	141.6	65.0	53.5	164.2	341.2	30.2	138.5	118.6	16.1
Level of Service	E	F	A	F	E	D	F	F	C	F	F	B
Approach Delay (s)		46.4			92.5			286.1			121.0	
Approach LOS		D			F			F			F	

Intersection Summary

HCM Average Control Delay	183.9	HCM Level of Service	F
HCM Volume to Capacity ratio	1.47		
Actuated Cycle Length (s)	139.2	Sum of lost time (s)	28.0
Intersection Capacity Utilization	122.8%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 1: Kulanihako'i St & Pi'ilani Highway

2034 Scenario 4 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔		↔	↔	↔	↕	↔	↔	↕	↔
Volume (vph)	47	71	56	154	12	56	46	1184	283	117	2005	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1826	1583		1780	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.67	1.00		0.58	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1252	1583		1073	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	51	77	61	167	13	61	50	1287	308	127	2179	35
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	128	61	0	180	61	50	1287	308	127	2179	35
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8		Free			Free			Free
Actuated Green, G (s)		25.1	128.6		25.1	128.6	6.6	73.9	128.6	12.6	79.9	128.6
Effective Green, g (s)		25.1	128.6		25.1	128.6	6.6	73.9	128.6	12.6	79.9	128.6
Actuated g/C Ratio		0.20	1.00		0.20	1.00	0.05	0.57	1.00	0.10	0.62	1.00
Clearance Time (s)		5.0			5.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		244	1583		209	1583	91	2034	1583	173	2199	1583
v/s Ratio Prot							0.03	0.36		c0.07	c0.62	
v/s Ratio Perm		0.10	0.04		c0.17	0.04			0.19			0.02
v/c Ratio		0.52	0.04		0.86	0.04	0.55	0.63	0.19	0.73	0.99	0.02
Uniform Delay, d1		46.4	0.0		50.1	0.0	59.5	18.3	0.0	56.4	24.0	0.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		2.0	0.0		28.5	0.0	6.6	0.7	0.3	14.9	17.0	0.0
Delay (s)		48.4	0.0		78.6	0.0	66.2	18.9	0.3	71.2	41.0	0.0
Level of Service		D	A		E	A	E	B	A	E	D	A
Approach Delay (s)		32.8			58.7			16.9			42.0	
Approach LOS		C			E			B			D	

Intersection Summary		
HCM Average Control Delay	33.2	HCM Level of Service C
HCM Volume to Capacity ratio	0.97	
Actuated Cycle Length (s)	128.6	Sum of lost time (s) 17.0
Intersection Capacity Utilization	88.8%	ICU Level of Service E
Analysis Period (min)	15	
c Critical Lane Group		

HCM Signalized Intersection Capacity Analysis

3: Old Welakahao Road & Pi'ilani Highway

2034 Scenario 4 AM

1/25/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	30	31	855	26	235	1041
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	3539	1583	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1583	3539	1583	1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	33	34	929	28	255	1132
RTOR Reduction (vph)	0	0	0	15	0	0
Lane Group Flow (vph)	33	34	929	13	255	1132
Turn Type		Free		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		Free		2		
Actuated Green, G (s)	4.0	65.3	28.3	28.3	16.0	50.3
Effective Green, g (s)	4.0	65.3	28.3	28.3	16.0	50.3
Actuated g/C Ratio	0.06	1.00	0.43	0.43	0.25	0.77
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	108	1583	1534	686	434	2726
v/s Ratio Prot	c0.02		c0.26		c0.14	0.32
v/s Ratio Perm		0.02		0.01		
v/c Ratio	0.31	0.02	0.61	0.02	0.59	0.42
Uniform Delay, d1	29.3	0.0	14.2	10.6	21.7	2.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.6	0.0	0.7	0.0	2.0	0.1
Delay (s)	30.9	0.0	14.9	10.6	23.8	2.6
Level of Service	C	A	B	B	C	A
Approach Delay (s)	15.2		14.8			6.5
Approach LOS	B		B			A

Intersection Summary

HCM Average Control Delay	10.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	65.3	Sum of lost time (s)	17.0
Intersection Capacity Utilization	54.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis

7: East Welakahao Road & Pi'ilani Highway

2034 Scenario 4 AM

1/25/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	87	46	25	828	1220	86
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	95	50	27	900	1326	93
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)	6					
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)	1137					
pX, platoon unblocked	0.83					
vC, conflicting volume	1830	663	1326			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1592	663	1326			
tC, single (s)	*5.0	*5.0	*5.0			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	44	91	93			
cM capacity (veh/h)	170	577	376			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	145	27	450	450	663	663	93
Volume Left	95	27	0	0	0	0	0
Volume Right	50	0	0	0	0	0	93
cSH	260	376	1700	1700	1700	1700	1700
Volume to Capacity	0.56	0.07	0.26	0.26	0.39	0.39	0.05
Queue Length 95th (ft)	77	6	0	0	0	0	0
Control Delay (s)	36.6	15.3	0.0	0.0	0.0	0.0	0.0
Lane LOS	E	C					
Approach Delay (s)	36.6	0.4			0.0		
Approach LOS	E						

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	45.2%	ICU Level of Service	A
Analysis Period (min)	15		

* User Entered Value

HCM Signalized Intersection Capacity Analysis
8: West Welakahao Road & South Kihei Road

2034 Scenario 4 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕	↕	↕		↕	↕	
Volume (vph)	29	11	11	56	11	69	3	603	47	38	525	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1759			1788	1583	1770	1843		1770	1858	
Flt Permitted		0.78			0.72	1.00	0.36	1.00		0.25	1.00	
Satd. Flow (perm)		1415			1345	1583	674	1843		458	1858	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	32	12	12	61	12	75	3	655	51	41	571	10
RTOR Reduction (vph)	0	10	0	0	0	65	0	4	0	0	1	0
Lane Group Flow (vph)	0	46	0	0	73	10	3	702	0	41	580	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		6.7			6.7	6.7	27.0	26.5		28.2	27.1	
Effective Green, g (s)		6.7			6.7	6.7	27.0	26.5		28.2	27.1	
Actuated g/C Ratio		0.14			0.14	0.14	0.55	0.54		0.57	0.55	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		192			183	215	380	991		291	1021	
v/s Ratio Prot							0.00	c0.38		c0.00	0.31	
v/s Ratio Perm		0.03			c0.05	0.01	0.00			0.08		
v/c Ratio		0.24			0.40	0.05	0.01	0.71		0.14	0.57	
Uniform Delay, d1		19.0			19.5	18.5	5.3	8.5		5.8	7.3	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.6			1.4	0.1	0.0	2.3		0.2	0.7	
Delay (s)		19.7			20.9	18.6	5.3	10.9		6.0	8.0	
Level of Service		B			C	B	A	B		A	A	
Approach Delay (s)		19.7			19.7			10.8			7.9	
Approach LOS		B			B			B			A	

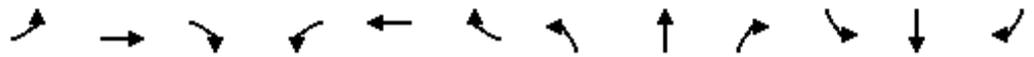
Intersection Summary

HCM Average Control Delay	10.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	49.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	54.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 11: East Lipoa Street & Pi'ilani Highway

2034 Scenario 4 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	246	184	221	30	107	29	114	776	58	266	1087	377
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	4.0	6.0	6.0	5.0	6.0	6.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frbp, ped/bikes	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1541	1770	1863	1583	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1541	1770	1863	1583	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	267	200	240	33	116	32	124	843	63	289	1182	410
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	36	0	0	118
Lane Group Flow (vph)	267	200	240	33	116	32	124	843	27	289	1182	292
Confl. Peds. (#/hr)			50	50								
Turn Type	Prot		Free	Prot		Free	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases			Free			Free			2			6
Actuated Green, G (s)	23.5	31.8	122.8	6.5	14.8	122.8	13.3	46.2	52.7	16.3	49.2	72.7
Effective Green, g (s)	23.5	31.8	122.8	6.5	14.8	122.8	13.3	46.2	52.7	16.3	49.2	72.7
Actuated g/C Ratio	0.19	0.26	1.00	0.05	0.12	1.00	0.11	0.38	0.43	0.13	0.40	0.59
Clearance Time (s)	5.0	5.0		5.0	5.0		6.0	6.0	5.0	6.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	339	482	1541	94	225	1583	192	1331	679	456	1418	937
v/s Ratio Prot	c0.15	0.11		0.02	c0.06		0.07	0.24	0.00	c0.08	c0.33	0.06
v/s Ratio Perm			c0.16			0.02			0.01			0.12
v/c Ratio	0.79	0.41	0.16	0.35	0.52	0.02	0.65	0.63	0.04	0.63	0.83	0.31
Uniform Delay, d1	47.3	37.8	0.0	56.1	50.6	0.0	52.5	31.4	20.4	50.4	33.1	12.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.5	0.6	0.2	2.3	2.0	0.0	7.3	1.0	0.0	2.9	4.4	0.2
Delay (s)	58.7	38.4	0.2	58.4	52.6	0.0	59.8	32.4	20.4	53.3	37.5	12.7
Level of Service	E	D	A	E	D	A	E	C	C	D	D	B
Approach Delay (s)		33.1			44.4			34.9			34.5	
Approach LOS		C			D			C			C	

Intersection Summary

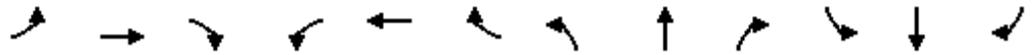
HCM Average Control Delay	34.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	122.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 12: West Lipoa Street & South Kihei Road

2034 Scenario 4 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Volume (vph)	20	24	58	77	18	155	24	483	130	150	409	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1821	1583		1790	1583	1770	1863	1583	1770	1858	
Flt Permitted		0.83	1.00		0.73	1.00	0.50	1.00	1.00	0.27	1.00	
Satd. Flow (perm)		1551	1583		1368	1583	935	1863	1583	494	1858	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	26	63	84	20	168	26	525	141	163	445	7
RTOR Reduction (vph)	0	0	52	0	0	139	0	0	78	0	0	0
Lane Group Flow (vph)	0	48	11	0	104	29	26	525	63	163	452	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)		10.4	10.4		10.4	10.4	28.7	26.7	26.7	39.8	32.8	
Effective Green, g (s)		10.4	10.4		10.4	10.4	28.7	26.7	26.7	39.8	32.8	
Actuated g/C Ratio		0.17	0.17		0.17	0.17	0.48	0.44	0.44	0.66	0.54	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		268	273		236	273	473	826	702	498	1012	
v/s Ratio Prot							0.00	c0.28		c0.04	c0.24	
v/s Ratio Perm		0.03	0.01		c0.08	0.02	0.02		0.04	0.17		
v/c Ratio		0.18	0.04		0.44	0.11	0.05	0.64	0.09	0.33	0.45	
Uniform Delay, d1		21.3	20.7		22.3	21.0	8.4	13.0	9.7	5.7	8.2	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.3	0.1		1.3	0.2	0.0	1.6	0.1	0.4	0.3	
Delay (s)		21.6	20.8		23.6	21.2	8.4	14.6	9.8	6.1	8.6	
Level of Service		C	C		C	C	A	B	A	A	A	
Approach Delay (s)		21.1			22.1			13.4			7.9	
Approach LOS		C			C			B			A	

Intersection Summary

HCM Average Control Delay	13.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	60.2	Sum of lost time (s)	20.0
Intersection Capacity Utilization	58.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 15: Pi'ikea Avenue & Pi'ilani Highway

2034 Scenario 4 AM

1/25/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	354	233	149	924	1599	406
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3433	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	1770	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	385	253	162	1004	1738	441
RTOR Reduction (vph)	0	0	0	0	0	175
Lane Group Flow (vph)	385	253	162	1004	1738	266
Turn Type		Free	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Actuated Green, G (s)	21.0	132.4	17.0	100.4	77.4	77.4
Effective Green, g (s)	21.0	132.4	17.0	100.4	77.4	77.4
Actuated g/C Ratio	0.16	1.00	0.13	0.76	0.58	0.58
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	545	1583	227	2684	2069	925
v/s Ratio Prot	c0.11		c0.09	0.28	c0.49	
v/s Ratio Perm		0.16				0.17
v/c Ratio	0.71	0.16	0.71	0.37	0.84	0.29
Uniform Delay, d1	52.8	0.0	55.4	5.4	22.4	13.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.2	0.2	10.1	0.1	3.3	0.2
Delay (s)	56.9	0.2	65.5	5.5	25.7	13.9
Level of Service	E	A	E	A	C	B
Approach Delay (s)	34.4			13.8	23.3	
Approach LOS	C			B	C	

Intersection Summary

HCM Average Control Delay	22.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	132.4	Sum of lost time (s)	17.0
Intersection Capacity Utilization	76.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Pi'ikea Avenue & South Kihei Road

2034 Scenario 4 AM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↗	↖	↑	↗	↖	↕	↕↔
Volume (vph)	0	0	0	96	11	88	7	491	93	107	519	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt					1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected					0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1783	1583	1770	1863	1583	1770	3528	
Flt Permitted					0.96	1.00	0.44	1.00	1.00	0.30	1.00	
Satd. Flow (perm)					1783	1583	811	1863	1583	565	3528	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	104	12	96	8	534	101	116	564	12
RTOR Reduction (vph)	0	0	0	0	0	83	0	0	53	0	2	0
Lane Group Flow (vph)	0	0	0	0	116	13	8	534	48	116	574	0
Turn Type				Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases					8		5	2		1	6	
Permitted Phases				8		8	2		2	6		
Actuated Green, G (s)					6.6	6.6	24.3	23.8	23.8	31.7	27.5	
Effective Green, g (s)					6.6	6.6	24.3	23.8	23.8	31.7	27.5	
Actuated g/C Ratio					0.13	0.13	0.49	0.48	0.48	0.64	0.55	
Clearance Time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)					237	211	407	894	760	463	1956	
v/s Ratio Prot							0.00	c0.29		c0.02	0.16	
v/s Ratio Perm					0.07	0.01	0.01		0.03	0.14		
v/c Ratio					0.49	0.06	0.02	0.60	0.06	0.25	0.29	
Uniform Delay, d1					19.9	18.8	6.5	9.4	6.9	4.5	5.9	
Progression Factor					1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2					1.6	0.1	0.0	1.1	0.0	0.3	0.1	
Delay (s)					21.5	18.9	6.5	10.5	7.0	4.8	6.0	
Level of Service					C	B	A	B	A	A	A	
Approach Delay (s)		0.0			20.3			9.9			5.8	
Approach LOS		A			C			A			A	

Intersection Summary

HCM Average Control Delay	9.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	49.6	Sum of lost time (s)	20.0
Intersection Capacity Utilization	50.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

19: East Waipuilani Road & Pi'ilani Highway Performance by movement

Movement	EBR	WBR	NBT	NBR	SBT	SBR	All
Total Delay (hr)	0.0	0.0	0.1	0.0	0.1	0.0	0.2
Delay / Veh (s)	1.7	1.1	0.9	4.6	0.9	1.3	0.9
Total Stops	0	0	0	0	0	0	0
Travel Dist (mi)	1.9	1.9	57.6	0.2	55.0	1.0	117.8
Travel Time (hr)	0.1	0.1	1.4	0.0	1.4	0.0	3.0
Avg Speed (mph)	22	25	42	33	40	26	40
Fuel Used (gal)	0.1	0.0	1.6	0.0	1.6	0.0	3.3
HC Emissions (g)	2	1	30	0	17	0	50
CO Emissions (g)	34	16	849	1	579	3	1481
NOx Emissions (g)	5	2	117	0	76	0	202
Vehicles Entered	11	18	271	1	524	10	835
Vehicles Exited	10	17	268	1	523	12	831
Hourly Exit Rate	40	68	1072	4	2092	48	3324
Input Volume	30	80	1150	11	1985	76	3332
% of Volume	133	85	93	36	105	63	100
Denied Entry Before	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Total Delay (hr)	1.1
Delay / Veh (s)	4.5
Total Stops	29
Travel Dist (mi)	497.7
Travel Time (hr)	12.6
Avg Speed (mph)	40
Fuel Used (gal)	14.7
HC Emissions (g)	210
CO Emissions (g)	6745
NOx Emissions (g)	868
Vehicles Entered	833
Vehicles Exited	851
Hourly Exit Rate	3404
Input Volume	9955
% of Volume	34
Denied Entry Before	0
Denied Entry After	0

HCM Signalized Intersection Capacity Analysis
 21: East Lipoa Street & Liloa Drive

2034 Scenario 4 AM
 1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	52	204	30	217	204	127	50	428	200	190	508	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1827		1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.62	1.00		0.35	1.00	1.00	0.24	1.00	1.00	0.33	1.00	1.00
Satd. Flow (perm)	1154	1827		646	1863	1583	454	1863	1583	613	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	57	222	33	236	222	138	54	465	217	207	552	85
RTOR Reduction (vph)	0	5	0	0	0	87	0	0	89	0	0	23
Lane Group Flow (vph)	57	250	0	236	222	51	54	465	128	207	552	62
Turn Type	pm+pt			pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	20.6	18.5		36.0	28.9	28.9	32.8	32.8	32.8	32.8	32.8	32.8
Effective Green, g (s)	20.6	18.5		36.0	28.9	28.9	32.8	32.8	32.8	32.8	32.8	32.8
Actuated g/C Ratio	0.26	0.23		0.46	0.37	0.37	0.42	0.42	0.42	0.42	0.42	0.42
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	318	429		473	683	581	189	775	659	255	775	659
v/s Ratio Prot	0.00	c0.14		c0.08	0.12			0.25			0.30	
v/s Ratio Perm	0.04			0.15		0.03	0.12		0.08	c0.34		0.04
v/c Ratio	0.18	0.58		0.50	0.33	0.09	0.29	0.60	0.19	0.81	0.71	0.09
Uniform Delay, d1	22.2	26.7		14.2	17.9	16.3	15.2	17.9	14.6	20.3	19.1	14.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	2.0		0.8	0.3	0.1	0.8	1.3	0.1	17.6	3.1	0.1
Delay (s)	22.5	28.7		15.0	18.2	16.4	16.1	19.2	14.7	37.8	22.2	14.0
Level of Service	C	C		B	B	B	B	B	B	D	C	B
Approach Delay (s)		27.6			16.5			17.6			25.2	
Approach LOS		C			B			B			C	

Intersection Summary

HCM Average Control Delay	21.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	78.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Intersection				
Intersection Delay, s/veh	19.9			
Intersection LOS	C			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	97	265	509	727
Demand Flow Rate, veh/h	99	270	519	742
Vehicles Circulating, veh/h	799	471	107	295
Vehicles Exiting, veh/h	238	155	790	446
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	10.0	10.3	9.9	31.6
Approach LOS	A	B	A	D
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	99	270	519	742
Cap Entry Lane, veh/h	508	706	1015	841
Entry HV Adj Factor	0.977	0.980	0.980	0.979
Flow Entry, veh/h	97	265	509	727
Cap Entry, veh/h	497	692	995	824
V/C Ratio	1.95	3.83	5.11	8.82
Control Delay, s/veh	10.0	10.3	9.9	31.6
LOS	A	B	A	D
95th %tile Queue, veh	0.1	0.2	0.3	1.2

HCM Signalized Intersection Capacity Analysis
 34: Kaonoulu St & Pi'ilani Highway

2034 Scenario 4 AM
 1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	24	89	198	310	63	103	61	933	293	151	1646	24
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	1.00	0.95	1.00	0.97	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	3433	1863	2787	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	97	215	337	68	112	66	1014	318	164	1789	26
RTOR Reduction (vph)	0	0	0	0	0	97	0	0	124	0	0	6
Lane Group Flow (vph)	26	97	215	337	68	15	66	1014	194	164	1789	20
Turn Type	Split		Free	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	12.0	12.0	127.7	17.2	17.2	17.2	6.8	65.3	65.3	11.2	69.7	69.7
Effective Green, g (s)	12.0	12.0	127.7	17.2	17.2	17.2	6.8	65.3	65.3	11.2	69.7	69.7
Actuated g/C Ratio	0.09	0.09	1.00	0.13	0.13	0.13	0.05	0.51	0.51	0.09	0.55	0.55
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	166	175	1583	462	251	375	94	1810	809	301	1932	864
v/s Ratio Prot	0.01	c0.05		c0.10	0.04		0.04	0.29		c0.05	c0.51	
v/s Ratio Perm			0.14			0.01			0.12			0.01
v/c Ratio	0.16	0.55	0.14	0.73	0.27	0.04	0.70	0.56	0.24	0.54	0.93	0.02
Uniform Delay, d1	53.2	55.3	0.0	53.0	49.6	48.1	59.5	21.4	17.4	55.8	26.6	13.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	3.8	0.2	5.7	0.6	0.0	21.1	0.4	0.2	2.0	8.2	0.0
Delay (s)	53.6	59.1	0.2	58.7	50.2	48.1	80.5	21.8	17.5	57.8	34.8	13.4
Level of Service	D	E	A	E	D	D	F	C	B	E	C	B
Approach Delay (s)		21.2			55.3			23.6			36.4	
Approach LOS		C			E			C			D	

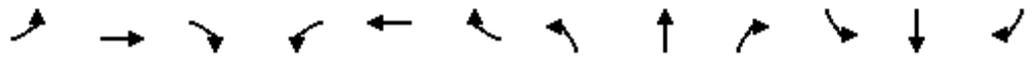
Intersection Summary

HCM Average Control Delay	33.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	127.7	Sum of lost time (s)	22.0
Intersection Capacity Utilization	78.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 1: Kulanihako'i St & Pi'ilani Highway

2034 Scenario 4 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕	↗	↗	↕↕	↗	↗	↕↕	↗
Volume (vph)	19	15	65	80	6	28	81	1598	61	25	1636	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	4.0		5.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1811	1583		1780	1583	1770	3539	1583	1770	3539	1583
Flt Permitted		0.81	1.00		0.71	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1501	1583		1332	1583	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	16	71	87	7	30	88	1737	66	27	1778	85
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	37	71	0	94	30	88	1737	66	27	1778	85
Turn Type	Perm		Free	Perm		Free	Prot		Free	Prot		Free
Protected Phases		4			8		5	2		1		6
Permitted Phases	4		Free	8		Free			Free			Free
Actuated Green, G (s)		13.4	110.7		13.4	110.7	8.9	75.8	110.7	4.5	71.4	110.7
Effective Green, g (s)		13.4	110.7		13.4	110.7	8.9	75.8	110.7	4.5	71.4	110.7
Actuated g/C Ratio		0.12	1.00		0.12	1.00	0.08	0.68	1.00	0.04	0.64	1.00
Clearance Time (s)		5.0			5.0		6.0	6.0		6.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		182	1583		161	1583	142	2423	1583	72	2283	1583
v/s Ratio Prot							c0.05	c0.49		0.02	c0.50	
v/s Ratio Perm		0.02	0.04		c0.07	0.02			0.04			0.05
v/c Ratio		0.20	0.04		0.58	0.02	0.62	0.72	0.04	0.38	0.78	0.05
Uniform Delay, d1		43.8	0.0		46.0	0.0	49.3	10.8	0.0	51.7	14.0	0.0
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.6	0.1		5.3	0.0	7.8	1.0	0.0	3.3	1.7	0.1
Delay (s)		44.4	0.1		51.3	0.0	57.1	11.8	0.0	55.0	15.8	0.1
Level of Service		D	A		D	A	E	B	A	D	B	A
Approach Delay (s)		15.2			38.9			13.5			15.6	
Approach LOS		B			D			B			B	

Intersection Summary

HCM Average Control Delay	15.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	110.7	Sum of lost time (s)	23.0
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis

3: Old Welakahao Road & Pi'ilani Highway

2034 Scenario 4 PM

1/25/2013



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	48	58	1270	3	35	967
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	3539	1583	1770	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1770	1583	3539	1583	1770	3539
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	52	63	1380	3	38	1051
RTOR Reduction (vph)	0	0	0	1	0	0
Lane Group Flow (vph)	52	63	1380	2	38	1051
Turn Type		Free		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		Free		2		
Actuated Green, G (s)	6.1	71.7	44.5	44.5	4.1	54.6
Effective Green, g (s)	6.1	71.7	44.5	44.5	4.1	54.6
Actuated g/C Ratio	0.09	1.00	0.62	0.62	0.06	0.76
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	151	1583	2196	982	101	2695
v/s Ratio Prot	c0.03		c0.39		0.02	c0.30
v/s Ratio Perm		0.04		0.00		
v/c Ratio	0.34	0.04	0.63	0.00	0.38	0.39
Uniform Delay, d1	30.9	0.0	8.5	5.2	32.6	2.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.4	0.0	0.6	0.0	2.3	0.1
Delay (s)	32.3	0.0	9.0	5.2	34.9	3.0
Level of Service	C	A	A	A	C	A
Approach Delay (s)	14.6		9.0			4.1
Approach LOS	B		A			A

Intersection Summary

HCM Average Control Delay	7.2	HCM Level of Service	A
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	71.7	Sum of lost time (s)	17.0
Intersection Capacity Utilization	47.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis
 7: East Welakahao Road & Pi'ilani Highway

2034 Scenario 4 PM

1/25/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	99	46	85	1067	936	172
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	108	50	92	1160	1017	187
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)	6					
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)	1137					
pX, platoon unblocked	0.81					
vC, conflicting volume	1782	509	1017			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1505	509	1017			
tC, single (s)	*5.0	*5.0	*5.0			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	34	93	83			
cM capacity (veh/h)	163	670	531			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	158	92	580	580	509	509	187
Volume Left	108	92	0	0	0	0	0
Volume Right	50	0	0	0	0	0	187
cSH	238	531	1700	1700	1700	1700	1700
Volume to Capacity	0.66	0.17	0.34	0.34	0.30	0.30	0.11
Queue Length 95th (ft)	104	16	0	0	0	0	0
Control Delay (s)	46.0	13.2	0.0	0.0	0.0	0.0	0.0
Lane LOS	E	B					
Approach Delay (s)	46.0	1.0			0.0		
Approach LOS	E						

Intersection Summary			
Average Delay		3.2	
Intersection Capacity Utilization	46.1%	ICU Level of Service	A
Analysis Period (min)	15		

* User Entered Value

HCM Signalized Intersection Capacity Analysis

8: West Welakahao Road & South Kihei Road

2034 Scenario 4 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕	↕	↕	↕		↕	↕	
Volume (vph)	34	7	13	110	17	59	18	945	71	44	997	31
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Lane Util. Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Frt		0.97			1.00	0.85	1.00	0.99		1.00	1.00	
Flt Protected		0.97			0.96	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1748			1785	1583	1770	1843		1770	1854	
Flt Permitted		0.69			0.76	1.00	0.08	1.00		0.08	1.00	
Satd. Flow (perm)		1238			1413	1583	148	1843		146	1854	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	37	8	14	120	18	64	20	1027	77	48	1084	34
RTOR Reduction (vph)	0	12	0	0	0	56	0	3	0	0	1	0
Lane Group Flow (vph)	0	47	0	0	138	8	20	1101	0	48	1117	0
Turn Type	Perm			Perm		Perm	pm+pt			pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8	2			6		
Actuated Green, G (s)		10.3			10.3	10.3	51.8	50.4		53.2	51.1	
Effective Green, g (s)		10.3			10.3	10.3	51.8	50.4		53.2	51.1	
Actuated g/C Ratio		0.13			0.13	0.13	0.67	0.65		0.68	0.66	
Clearance Time (s)		5.0			5.0	5.0	5.0	5.0		5.0	5.0	
Vehicle Extension (s)		3.0			3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		164			187	210	128	1194		144	1218	
v/s Ratio Prot							0.00	0.60		c0.01	c0.60	
v/s Ratio Perm		0.04			c0.10	0.01	0.10			0.22		
v/c Ratio		0.29			0.74	0.04	0.16	0.92		0.33	0.92	
Uniform Delay, d1		30.4			32.5	29.4	14.0	12.0		14.7	11.5	
Progression Factor		1.00			1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2		1.0			14.1	0.1	0.6	11.7		1.4	10.8	
Delay (s)		31.4			46.5	29.5	14.6	23.7		16.0	22.4	
Level of Service		C			D	C	B	C		B	C	
Approach Delay (s)		31.4			41.2			23.5			22.1	
Approach LOS		C			D			C			C	

Intersection Summary

HCM Average Control Delay	24.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	77.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	73.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 11: East Lipoa Street & Pi'ilani Highway

2034 Scenario 4 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	247	117	82	73	229	132	204	999	16	164	1046	185
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	4.0	6.0	6.0	5.0	6.0	6.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	1.00	0.97	0.95	1.00
Frbp, ped/bikes	1.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1541	1770	1863	1583	1770	3539	1583	3433	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1541	1770	1863	1583	1770	3539	1583	3433	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	268	127	89	79	249	143	222	1086	17	178	1137	201
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	9	0	0	96
Lane Group Flow (vph)	268	127	89	79	249	143	222	1086	8	178	1137	105
Confl. Peds. (#/hr)			50	50								
Turn Type	Prot		Free	Prot		Free	Prot		pm+ov	Prot		pm+ov
Protected Phases	7	4		3	8		5	2	3	1	6	7
Permitted Phases			Free			Free			2			6
Actuated Green, G (s)	23.8	36.0	138.3	11.5	23.7	138.3	20.5	56.8	68.3	12.0	48.3	72.1
Effective Green, g (s)	23.8	36.0	138.3	11.5	23.7	138.3	20.5	56.8	68.3	12.0	48.3	72.1
Actuated g/C Ratio	0.17	0.26	1.00	0.08	0.17	1.00	0.15	0.41	0.49	0.09	0.35	0.52
Clearance Time (s)	5.0	5.0		5.0	5.0		6.0	6.0	5.0	6.0	6.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	305	485	1541	147	319	1583	262	1453	782	298	1236	825
v/s Ratio Prot	c0.15	0.07		0.04	c0.13		c0.13	c0.31	0.00	0.05	c0.32	0.02
v/s Ratio Perm			0.06			0.09			0.00			0.04
v/c Ratio	0.88	0.26	0.06	0.54	0.78	0.09	0.85	0.75	0.01	0.60	0.92	0.13
Uniform Delay, d1	55.8	40.6	0.0	60.8	54.8	0.0	57.4	34.7	17.8	60.8	43.1	17.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	23.6	0.3	0.1	3.7	11.7	0.1	21.6	2.1	0.0	3.2	11.0	0.1
Delay (s)	79.5	40.9	0.1	64.6	66.5	0.1	79.0	36.8	17.8	64.0	54.1	17.0
Level of Service	E	D	A	E	E	A	E	D	B	E	D	B
Approach Delay (s)		54.7			46.0			43.6			50.4	
Approach LOS		D			D			D			D	

Intersection Summary

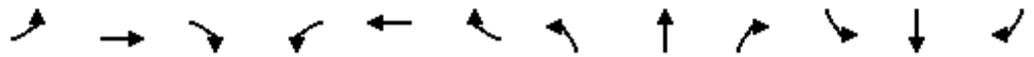
HCM Average Control Delay	48.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	138.3	Sum of lost time (s)	28.0
Intersection Capacity Utilization	84.3%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
 12: West Lipoa Street & South Kihei Road

2034 Scenario 4 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗	↖	↑	↗	↖	↗	
Volume (vph)	39	37	58	147	35	130	71	776	141	76	944	28
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.98	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1816	1583		1790	1583	1770	1863	1583	1770	1855	
Flt Permitted		0.70	1.00		0.71	1.00	0.06	1.00	1.00	0.19	1.00	
Satd. Flow (perm)		1302	1583		1326	1583	116	1863	1583	358	1855	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	42	40	63	160	38	141	77	843	153	83	1026	30
RTOR Reduction (vph)	0	0	50	0	0	112	0	0	58	0	1	0
Lane Group Flow (vph)	0	82	13	0	198	29	77	843	95	83	1055	0
Turn Type	Perm		Perm	Perm		Perm	pm+pt		Perm	pm+pt		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		
Actuated Green, G (s)		20.9	20.9		20.9	20.9	67.6	64.0	64.0	66.2	63.3	
Effective Green, g (s)		20.9	20.9		20.9	20.9	67.6	64.0	64.0	66.2	63.3	
Actuated g/C Ratio		0.20	0.20		0.20	0.20	0.66	0.62	0.62	0.64	0.62	
Clearance Time (s)		5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		265	322		270	322	134	1160	986	270	1142	
v/s Ratio Prot							c0.02	0.45		0.01	c0.57	
v/s Ratio Perm		0.06	0.01		c0.15	0.02	0.36		0.06	0.19		
v/c Ratio		0.31	0.04		0.73	0.09	0.57	0.73	0.10	0.31	0.92	
Uniform Delay, d1		34.8	32.9		38.3	33.2	21.2	13.4	7.8	11.4	17.6	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.7	0.1		9.9	0.1	5.8	2.3	0.0	0.6	12.3	
Delay (s)		35.5	32.9		48.2	33.3	27.1	15.7	7.8	12.0	29.9	
Level of Service		D	C		D	C	C	B	A	B	C	
Approach Delay (s)		34.4			42.0			15.4			28.6	
Approach LOS		C			D			B			C	

Intersection Summary

HCM Average Control Delay	25.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	102.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	84.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 15: Pi'ikea Avenue & Pi'ilani Highway

2034 Scenario 4 PM

1/25/2013



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	473	425	406	1358	1229	557
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	4.0	6.0	6.0	6.0	6.0
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	3433	1583	1770	3539	3539	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	1770	3539	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	514	462	441	1476	1336	605
RTOR Reduction (vph)	0	0	0	0	0	275
Lane Group Flow (vph)	514	462	441	1476	1336	330
Turn Type		Free	Prot			Perm
Protected Phases	4		5	2	6	
Permitted Phases		Free				6
Actuated Green, G (s)	29.9	171.2	47.5	130.3	76.8	76.8
Effective Green, g (s)	29.9	171.2	47.5	130.3	76.8	76.8
Actuated g/C Ratio	0.17	1.00	0.28	0.76	0.45	0.45
Clearance Time (s)	5.0		6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	600	1583	491	2694	1588	710
v/s Ratio Prot	c0.15		c0.25	0.42	c0.38	
v/s Ratio Perm		0.29				0.21
v/c Ratio	0.86	0.29	0.90	0.55	0.84	0.46
Uniform Delay, d1	68.6	0.0	59.5	8.4	41.8	32.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.6	0.5	18.9	0.2	4.2	0.5
Delay (s)	80.1	0.5	78.4	8.6	46.0	33.4
Level of Service	F	A	E	A	D	C
Approach Delay (s)	42.4			24.7	42.1	
Approach LOS	D			C	D	

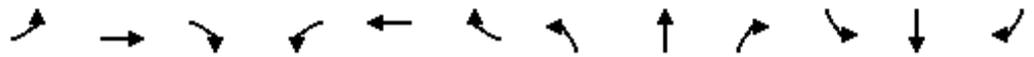
Intersection Summary

HCM Average Control Delay	35.2	HCM Level of Service	D
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	171.2	Sum of lost time (s)	17.0
Intersection Capacity Utilization	84.1%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis
 16: Pi'ikea Avenue & South Kihei Road

2034 Scenario 4 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations					↕	↗	↖	↑	↗	↖	↕	↕
Volume (vph)	0	0	0	223	63	128	19	711	197	91	600	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor					1.00	1.00	1.00	1.00	1.00	1.00	0.95	
Frt					1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected					0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)					1793	1583	1770	1863	1583	1770	3518	
Flt Permitted					0.96	1.00	0.39	1.00	1.00	0.14	1.00	
Satd. Flow (perm)					1793	1583	719	1863	1583	263	3518	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	242	68	139	21	773	214	99	652	27
RTOR Reduction (vph)	0	0	0	0	0	105	0	0	104	0	3	0
Lane Group Flow (vph)	0	0	0	0	310	34	21	773	110	99	676	0
Turn Type				Perm	Perm	pm+pt		Perm	pm+pt			
Protected Phases					8	5		2		1	6	
Permitted Phases				8		2			2	6		
Actuated Green, G (s)					20.1	20.1	43.0	41.8	41.8	49.4	45.0	
Effective Green, g (s)					20.1	20.1	43.0	41.8	41.8	49.4	45.0	
Actuated g/C Ratio					0.25	0.25	0.53	0.51	0.51	0.61	0.55	
Clearance Time (s)					5.0	5.0	5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)					3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)					443	391	396	958	814	241	1947	
v/s Ratio Prot							0.00	c0.41		c0.02	0.19	
v/s Ratio Perm					0.17	0.02	0.03		0.07	0.23		
v/c Ratio					0.70	0.09	0.05	0.81	0.14	0.41	0.35	
Uniform Delay, d1					27.9	23.5	9.1	16.4	10.3	12.2	10.0	
Progression Factor					1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2					4.8	0.1	0.1	5.0	0.1	1.1	0.1	
Delay (s)					32.6	23.6	9.2	21.4	10.4	13.4	10.1	
Level of Service					C	C	A	C	B	B	B	
Approach Delay (s)		0.0			29.9			18.8			10.6	
Approach LOS		A			C			B			B	

Intersection Summary

HCM Average Control Delay	18.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	81.3	Sum of lost time (s)	20.0
Intersection Capacity Utilization	70.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

19: East Waipuilani Road & Pi'ilani Highway Performance by movement

Movement	EBR	WBR	NBT	NBR	SBT	SBR	All
Total Delay (hr)	0.0	0.0	0.2	0.0	0.1	0.0	0.3
Delay / Veh (s)	1.2	1.3	1.7	6.7	0.6	1.6	1.2
Total Stops	0	0	0	0	0	0	0
Travel Dist (mi)	0.8	2.3	87.6	1.1	43.2	3.1	138.0
Travel Time (hr)	0.0	0.1	2.2	0.0	1.0	0.1	3.5
Avg Speed (mph)	23	24	40	33	41	26	40
Fuel Used (gal)	0.0	0.1	2.7	0.0	1.2	0.0	4.1
HC Emissions (g)	0	1	33	0	16	0	50
CO Emissions (g)	1	24	1332	21	469	9	1856
NOx Emissions (g)	0	3	143	1	70	1	217
Vehicles Entered	4	21	408	5	410	31	879
Vehicles Exited	4	22	407	5	411	31	880
Hourly Exit Rate	16	88	1628	20	1644	124	3520
Input Volume	10	88	1591	18	1571	130	3408
% of Volume	160	100	102	111	105	95	103
Denied Entry Before	0	0	1	0	0	0	1
Denied Entry After	0	0	0	0	0	0	0

Total Network Performance

Total Delay (hr)	1.0
Delay / Veh (s)	4.3
Total Stops	26
Travel Dist (mi)	523.6
Travel Time (hr)	13.2
Avg Speed (mph)	40
Fuel Used (gal)	15.5
HC Emissions (g)	194
CO Emissions (g)	6550
NOx Emissions (g)	846
Vehicles Entered	874
Vehicles Exited	882
Hourly Exit Rate	3528
Input Volume	10196
% of Volume	35
Denied Entry Before	1
Denied Entry After	0

HCM Signalized Intersection Capacity Analysis
 21: East Lipoa Street & Liloa Drive

2034 Scenario 4 PM

1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	85	250	18	144	255	146	16	483	129	79	444	112
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1844		1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.59	1.00		0.35	1.00	1.00	0.28	1.00	1.00	0.28	1.00	1.00
Satd. Flow (perm)	1098	1844		650	1863	1583	514	1863	1583	514	1863	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	92	272	20	157	277	159	17	525	140	86	483	122
RTOR Reduction (vph)	0	4	0	0	0	63	0	0	82	0	0	62
Lane Group Flow (vph)	92	288	0	157	277	97	17	525	58	86	483	60
Turn Type	pm+pt			pm+pt		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8		8	2		2	6		6
Actuated Green, G (s)	12.8	12.3		23.5	18.0	18.0	14.5	14.5	14.5	14.5	14.5	14.5
Effective Green, g (s)	12.8	12.3		23.5	18.0	18.0	14.5	14.5	14.5	14.5	14.5	14.5
Actuated g/C Ratio	0.27	0.26		0.49	0.38	0.38	0.30	0.30	0.30	0.30	0.30	0.30
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	300	473		463	699	594	155	563	478	155	563	478
v/s Ratio Prot	0.00	c0.16		c0.04	0.15			c0.28			0.26	
v/s Ratio Perm	0.08			0.12		0.06	0.03		0.04	0.17		0.04
v/c Ratio	0.31	0.61		0.34	0.40	0.16	0.11	0.93	0.12	0.55	0.86	0.13
Uniform Delay, d1	13.9	15.7		7.4	11.0	10.0	12.1	16.3	12.1	14.0	15.8	12.1
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	2.2		0.4	0.4	0.1	0.3	22.5	0.1	4.3	12.3	0.1
Delay (s)	14.5	17.9		7.9	11.4	10.1	12.4	38.8	12.3	18.3	28.1	12.3
Level of Service	B	B		A	B	B	B	D	B	B	C	B
Approach Delay (s)		17.1			10.1			32.7			24.1	
Approach LOS		B			B			C			C	

Intersection Summary

HCM Average Control Delay	21.9	HCM Level of Service	C
HCM Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	48.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	68.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Intersection				
Intersection Delay, s/veh	28.2			
Intersection LOS	D			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	250	334	788	701
Demand Flow Rate, veh/h	255	340	804	715
Vehicles Circulating, veh/h	751	776	245	302
Vehicles Exiting, veh/h	266	273	761	814
Follow-Up Headway, s	3.186	3.186	3.186	3.186
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	15.4	22.6	34.3	28.6
Approach LOS	C	C	D	D
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Critical Headway, s	5.193	5.193	5.193	5.193
Entry Flow, veh/h	255	340	804	715
Cap Entry Lane, veh/h	533	520	884	835
Entry HV Adj Factor	0.980	0.983	0.980	0.980
Flow Entry, veh/h	250	334	788	701
Cap Entry, veh/h	523	511	867	819
V/C Ratio	4.78	6.54	9.09	8.56
Control Delay, s/veh	15.4	22.6	34.3	28.6
LOS	C	C	D	D
95th %tile Queue, veh	0.3	0.5	1.3	1.0

HCM Signalized Intersection Capacity Analysis
 34: Kaonoulu St & Pi'ilani Highway

2034 Scenario 4 PM
 1/25/2013



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖↗	↑	↖↗	↖	↑↑	↗	↖	↑↑	↗
Volume (vph)	19	175	130	675	194	542	110	889	646	503	934	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	4.0	5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	0.88	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	1863	1583	3433	1863	2787	1770	3539	1583	1770	3539	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	3433	1863	2787	1770	3539	1583	1770	3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	21	190	141	734	211	589	120	966	702	547	1015	38
RTOR Reduction (vph)	0	0	0	0	0	495	0	0	294	0	0	18
Lane Group Flow (vph)	21	190	141	734	211	94	120	966	408	547	1015	20
Turn Type	Split		Free	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			Free			8			2			6
Actuated Green, G (s)	15.5	15.5	127.0	20.2	20.2	20.2	9.1	50.1	50.1	19.2	60.2	60.2
Effective Green, g (s)	15.5	15.5	127.0	20.2	20.2	20.2	9.1	50.1	50.1	19.2	60.2	60.2
Actuated g/C Ratio	0.12	0.12	1.00	0.16	0.16	0.16	0.07	0.39	0.39	0.15	0.47	0.47
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	216	227	1583	546	296	443	127	1396	624	268	1678	750
v/s Ratio Prot	0.01	c0.10		c0.21	0.11		0.07	c0.27		c0.31	0.29	
v/s Ratio Perm			0.09			0.03			0.26			0.01
v/c Ratio	0.10	0.84	0.09	1.34	0.71	0.21	0.94	0.69	0.65	2.04	0.60	0.03
Uniform Delay, d1	49.5	54.5	0.0	53.4	50.6	46.5	58.7	32.0	31.4	53.9	24.6	17.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	22.6	0.1	166.9	7.9	0.2	62.4	1.5	2.5	481.3	0.6	0.0
Delay (s)	49.7	77.2	0.1	220.3	58.5	46.7	121.1	33.5	33.8	535.2	25.3	17.8
Level of Service	D	E	A	F	E	D	F	C	C	F	C	B
Approach Delay (s)		44.7			131.4			39.5			199.4	
Approach LOS		D			F			D			F	

Intersection Summary

HCM Average Control Delay	115.1	HCM Level of Service	F
HCM Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	127.0	Sum of lost time (s)	22.0
Intersection Capacity Utilization	99.2%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Appendix D Internal Capture

The proposed MRTP Master Plan Update utilizes the principles of New Urbanism and Smart Growth to transform the current, single-use large lot research and technology campus into an integrated and vibrant mixed-use community focused around a regional knowledge-based industry employment base. The planned housing will target industries characterized by highly-skilled workers in science and research, information technology, education, healthcare and medicine, manufacturing and professional services, and similarly related knowledge-based organizations. There is a great potential for interaction between land uses within a mixed-use site like MRTP. These interactions still count as trips generated by each land use, but because they remain on-site, they do not show up on the external roadway network. These internal trips are trips generated by MRTP which remain internal to the development.

Residential

Residential development, especially development with a wide variety of unit types targeted toward workers in the park, would be an amenity, helping businesses in the park attract and retain qualified workers and reducing the barrier of the high cost of housing on the island as well as the cost of commuting.

- By providing apartments, townhouses, and single-family residences, the diversity of Housing within MRTP can accommodate the different needs of individuals and families. As one's life situation changes, additional options would be available within the MRTP community;
- The employment is the most difficult element to obtain for creation of walkable mixed use. An existing and established employment base is easier to surround with supporting amenities such as residential, commercial, and civic land uses;
- The knowledge industry within MRTP will be compatible with other land uses including residential. High skill, high paying jobs match up with potential home owners.

Because the residential component of the development will target the employees of MRTP, the need for employees to drive to and from work will be lessened. 15% of internal capture was applied to residential and office land uses conservatively.

Schools

A 102k SF elementary school is planned to be included in Phase 1. The school would be located between Ninau Street and Hookena Street within the northern half of Phase 1 of MRTP. This elementary school is primarily expected to serve MRTP for several reasons:

- The MRTP elementary school is located in the heart of MRTP and is surrounded by residential parcels. It would be easily accessible on foot and by bicycle;
- There is an established existing alternative in the vicinity of MRTP. Kihei Elementary School is located on Lipoa Street across Piilani Highway. The school was established in 1977 and has an enrollment of 818 students. Because the school is established, the new MRTP school is not expected to be attractive to students outside MRTP.
- The MRTP development will be attractive to families either with children or with future plans to have children.
- In addition, MRTP is committed to build an internal access to the planned Kihei High School. This will further decrease the shares of the homes to school vehicular trips appearing on Piilani Highway.

The planned elementary school will be built largely for MRTP. It is not anticipated that the school will generate a significant amount of external trips.

Retail commercial

100k SF worth of retail commercial is planned. It is assumed that this will include a mix of local retail and restaurants which will be primarily used by MRTP residents and employees. The retail will be located along Hookena Street and Ninau Street within the mixed use core of Phase 1. It will be accessible on foot or by bike. The retail commercial is also primarily expected to serve MRTP internally. Therefore, it is assumed that no significant amount of regional trips will be attracted for the following reasons:

- The retail commercial is located in the heart of MRTP and is surrounded by residential parcels. It would be easily accessible on foot and by bicycle. Retail will be pedestrian friendly through the use of design concepts such as setbacks, frontage, building orientation, and open space;
- The type of retail commercial provided would be planned specifically to divert trips from Piilani Highway by providing practical goods and services such as coffee

shops, restaurants, and dry cleaners. Business services will be amenities for employees of the park. The overall amount of area devoted to retail commercial is relatively small and no big boxes or anchor stores are planned.

- The retail commercial will be located well off of Piilani Highway. In fact, it will hardly be visible from Piilani Highway. It is unlikely that the retail will draw much, if any, regional traffic. More convenient retail options are located along Piikea Avenue and Liloa Drive, including Azeka Shopping Center, Piilani Village Shopping Center, and future commercial developments such as Downtown Kihei and Piilani Promenade.

Hotel

A 150-room business hotel is planned to serve visitors to the MRTTP community as part of Phase 1. The hotel would be located on the fringe of the mixed-use core. The planned hotel targets only those patrons who will have businesses such as meetings, seminars, and conferences in MRTTP.

- The hotel's location would be within walking distance of stores and restaurants;
- The hotel would cater to travelers on trips specifically to conduct business within MRTTP.
 - As such, it is likely that there would be a strong interaction between the hotel and the employment core;
 - In addition, these likely work-related trips would be made during the AM and PM commuter peaks and therefore produce more internal trips during these peak periods rather than would typically be expected from a resort hotel;
 - Because business would likely be the expected reason for staying at the hotel, fewer external trips would need to be made for tourist reasons;
- The hotel is not expected to attract tourists with no business within MRTTP. A significant number of viable alternatives are located within Kihei along South Kihei Road and also to the south in the Wailea-Makena area.

Three-tiered approach

In addition, MRTTP has consulted with HDOT on estimating the internal capture understanding that internal capture rates between different types of development are not thoroughly defined in ITE Trip Generation Manual and Hawaii's local conditions may not be consistent with the trends documented in the national researches. It was determined after a

series of consultation and discussion with HDOT that a three-tiered approach may yield the best estimates based on the assumed low, medium, and high internal capture rates for the planned school, retail, and hotel.

Low, medium, and high internal capture rates were developed to represent the internal interactions between the different land uses for Phase 1. Table D1 shows the tiers of internal capture rates for Phase 1. The Commercial and School land uses are expected to interact strongly with the Residential land use. In addition, the Business Hotel is expected to have a strong interaction with the Employment.

Table D1 Phase 1 Internal Capture Tiers

		Low	Medium	High
	Residential	41%	45%	49%
	Office	18%	19%	19%
	Commercial	42%	50%	58%
	School	37%	43%	47%
	Hotel	44%	55%	67%
	Total	32%	35%	39%

The tiers of internal capture rates for Phase 2 are shown in Table D2.

Table D2 Phase 2 Internal Capture Tiers

		Low	Medium	High
	Residential	34%	39%	42%
	Office	12%	12%	12%
	Commercial	42%	51%	58%
	School	41%	51%	56%
	Hotel	50%	63%	73%
	Total	24%	28%	30%

For the purpose of this analysis, the low internal capture that would result in highest external trips was used. Specifically,

- 220/1055 or 21% of residential trips interacted directly with the school and the Kihei High School to which MRTP will have an internal access;
- 68/1055 or 6% of residential trips interacted directly with the commercial;
- 143/1318 or 11% of employment trips interacted directly with the residential;
- 47/1318 or 4% of employment trips interacted directly with the business hotel;

Tables D3-D8 show the assumed internal trips for each pair of land uses.

Table D3 Phase 1 Internal Capture – AM Low

		To						
		Resident-ial	Office	Commer-cial	School	Hotel	External	Total
From	Residential	X	65	1	130	0	238	434
	Office	15	X	4	0	6	93	118
	Commercial	2	8	X	0	0	17	27
	School	31	0	0	X	0	177	208
	Hotel	0	13	1	0	X	12	26
	External	54	489	37	135	33	X	748
	Total	102	575	43	265	39	537	

Table D4 Phase 1 Internal Capture – PM Low

		To						
		Resident-ial	Office	Commer-cial	School	Hotel	External	Total
From	Residential	X	14	34	26	0	119	193
	Office	49	X	33	0	23	426	531
	Commercial	31	3	X	0	1	104	139
	School	33	0	0	X	0	32	65
	Hotel	0	5	17	0	X	18	40
	External	213	72	25	26	21	X	357
	Total	326	94	109	52	45	699	

Table D5 Phase 1 Internal Capture – AM Medium

		To						
		Resident -ial	Office	Commer -cial	School	Hotel	External	Total
From	Residential	X	65	3	143	0	223	434
	Office	15	X	4	0	6	93	118
	Commercial	4	8	X	0	2	13	27
	School	34	0	0	X	0	174	208
	Hotel	0	16	3	0	X	7	26
	External	49	486	33	122	31	X	721
	Total	102	575	43	265	39	510	

Table D6 Phase 1 Internal Capture – PM Medium

		To						
		Resident -ial	Office	Commer -cial	School	Hotel	External	Total
From	Residential	X	14	39	33	0	107	193
	Office	49	X	33	0	28	421	531
	Commercial	38	3	X	0	4	94	139
	School	41	0	0	X	0	24	65
	Hotel	0	5	19	0	X	16	40
	External	198	72	18	19	13	X	320
	Total	326	94	109	52	45	662	

Table D7 Phase 1 Internal Capture – AM High

		To						
		Resident -ial	Office	Commer -cial	School	Hotel	External	Total
From	Residential	X	65	6	152	0	211	434
	Office	15	X	4	0	6	93	118
	Commercial	5	8	X	0	3	11	27
	School	36	0	0	X	0	172	208
	Hotel	0	20	5	0	X	1	26
	External	46	482	28	113	30	X	699
	Total	102	575	43	265	39	488	

Table D8 Phase 1 Internal Capture – PM High

		To						
		Resident -ial	Office	Commer -cial	School	Hotel	External	Total
From	Residential	X	14	45	39	0	95	193
	Office	49	X	33	0	34	415	531
	Commercial	44	3	X	0	6	86	139
	School	49	0	0	X	0	16	65
	Hotel	0	5	21	0	X	14	40
	External	184	72	10	13	5	X	284
	Total	326	94	109	52	45	626	

Similar to Phase 1, low, medium, and high internal capture rates were developed to represent the internal interactions between the different land uses when Phase 2 is added to Phase 1. For the purpose of this analysis, the low internal capture that would result in highest external trips was used. Specifically,

- 220/1536 or 14% of residential trips interacted directly with the school;
- 68/1536 or 4% of residential trips interacted directly with the commercial
- 244/2756 or 8% of employment trips interacted directly with the residential;
- 56/1318 or 2% of employment trips interacted directly with the business hotel;

Tables D9-D14 show the assumed internal trips for each pair of land uses for Phase 2.

Table D9 Phase 2 Internal Capture – AM Low

		To						
		Resident -ial	Office	Commer -cial	School	Hotel	External	Total
From	Residential	X	79	1	133	0	312	525
	Office	26	X	4	0	10	210	250
	Commercial	2	8	X	0	0	17	27
	School	52	0	0	X	0	156	208
	Hotel	0	13	1	0	X	12	26
	External	92	1123	37	132	29	X	1413
	Total	172	1223	43	265	39	707	

Table D10 Phase 2 Internal Capture - PM Low

		To						
		Resident -ial	Office	Commer -cial	School	Hotel	External	Total
From	Residential	X	29	34	26	0	222	311
	Office	79	X	33	0	23	955	1090
	Commercial	31	3	X	0	1	104	139
	School	33	0	0	X	0	32	65
	Hotel	0	10	17	0	X	13	40
	External	385	151	25	26	21	X	608
	Total	528	193	109	52	45	1326	

Table D11 Phase 2 Internal Capture - AM Medium

		To						
		Resident -ial	Office	Commer -cial	School	Hotel	External	Total
From	Residential	X	79	3	167	0	276	525
	Office	26	X	4	0	10	210	250
	Commercial	4	8	X	0	4	11	27
	School	57	0	0	X	0	151	208
	Hotel	0	16	3	0	X	7	26
	External	85	1120	33	98	25	X	1361
	Total	172	1223	43	265	39	655	

Table D12 Phase 2 Internal Capture - PM Medium

		To						
		Resident -ial	Office	Commer -cial	School	Hotel	External	Total
From	Residential	X	29	39	33	0	210	311
	Office	79	X	33	0	28	950	1090
	Commercial	38	3	X	0	4	94	139
	School	41	0	0	X	0	24	65
	Hotel	0	10	19	0	X	11	40
	External	370	151	18	19	13	X	571
	Total	528	193	109	52	45	1289	

Table D13 Phase 2 Internal Capture – AM High

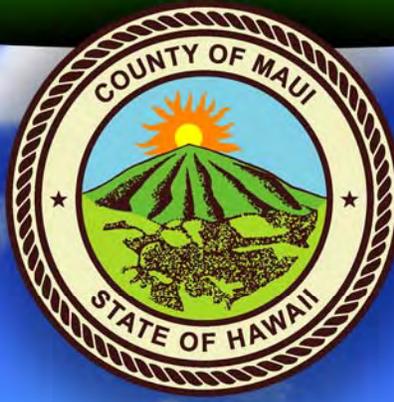
		To						
		Resident -ial	Office	Commer -cial	School	Hotel	External	Total
From	Residential	X	79	6	184	0	256	525
	Office	26	X	4	0	10	210	250
	Commercial	5	8	X	0	3	11	27
	School	60	0	0	X	0	148	208
	Hotel	0	20	5	0	X	1	26
	External	81	1116	28	81	26	X	1332
	Total	172	1223	43	265	39	626	

Table D14 Phase 2 Internal Capture – PM High

		To						
		Resident -ial	Office	Commer -cial	School	Hotel	External	Total
From	Residential	X	29	45	39	0	198	311
	Office	79	X	33	0	34	944	1090
	Commercial	44	3	X	0	6	86	139
	School	49	0	0	X	0	16	65
	Hotel	0	10	21	0	X	9	40
	External	356	151	10	13	5	X	535
	Total	528	193	109	52	45	1253	

Internal capture for local school, community shopping center, and business hotel are not clearly defined by the ITE Trip Generation Manual. The community shopping center as currently planned is not visible from Piilani Highway and will mostly serve the MRTP itself. With Kihei Elementary School nearby, other more convenient shopping centers, and plenty of hotels located makai of Piilani Highway, an internal capture rate higher than 15% rate was assumed for the planned school, community shopping center, and hotel.

Appendix E Makai Collector Supporting Documents



COUNTY OF MAUI FISCAL YEAR 2013

VOLUME II: MAYOR'S CAPITAL BUDGET PROPOSAL



Public Works

Capital Improvement Program

Project Name: North-South Collector Road

CBS No: CBS-1064

Department: Department of Public Works

District: Kihei-Makena

Project Type: Road Improvements

Anticipated Life: 30 years

Prior Years	Current Appr	Ensuing	Subsequent Years					Total
Expend/Encb	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018	6-Year
0	0	0	0	800,000	800,000	8,300,000	8,300,000	18,200,000

PROJECT DESCRIPTION

To construct two roadway segments of the North/South Collector road. Phase I will be the segment from Kaonoulu Street to Waipuilani Road and Phase II, Lokelani School to Kanani Road. Funding request sequence as follows: Phase I: FY 2015 - Design and Environmental Assessment, FY 2017 - Construction phase. Phase II: FY 2016 - Design and Environmental Assessment, FY 2018 - Construction phase.

PROJECT JUSTIFICATION

Project necessary to alleviate traffic congestion for vehicular travel in the North-South direction in South Maui. Traffic on South Kihei road is already gridlocked in morning and afternoon peak hours. Future development in the Kihei-Makena areas will add to the congestion South Maui residents are already experiencing.

STRATEGIC PLAN ALIGNMENT

Department's Strategic Plan

Countywide Priority Results

Goal #3: Identify and resolve traffic congestion, circulation and safety issues.

Objective 3.1: Address capacity and circulation issues by installing additional lanes, acceleration/deceleration lanes, install traffic control devices at major intersections and creation of new roadway systems.

- A Suitable Public Infrastructure
- A Strong, Diversified Economy
- A Prepared, Safe, and Liveable County
- A Healthy and Sustainable Community

Operating Impact Narrative

No significant impact on staffing or operations anticipated.

FUNDING DETAILS

Phase Description	Fund Code	Current Appr	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	FY 2018
Design	GB	0	0	0	800,000	800,000	0	0
New Construction	FD	0	0	0	0	0	6,000,000	6,000,000
New Construction	GB	0	0	0	0	0	1,500,000	1,500,000
Other	GB	0	0	0	0	0	800,000	800,000

Schedule of Activities

Activity	Start	End	Amount
Design	07/01/2014	07/31/2016	1,600,000
New Construction	10/01/2016	02/28/2017	15,000,000
Other	10/01/2016	02/28/2017	1,600,000
Total Capital Project Costs			18,200,000
Total O&M Costs			0
Total Capital & Operating Costs			18,200,000

Methods of Financing (Ensuing + 5 Years)	
Funding Source	Amount
Federal Fund	12,000,000
General Obligation Fund	6,200,000
Total Funding Requirements	18,200,000

Maui Research and Technology Park Meeting Minutes

Date 10-16-2012

Time: 130-245PM HST

Topic: DOT Comment Letter on the Draft EIS/ TIAR

Attendance:

DPW: David Goode/ Rowena Dagdag-Andaya/ Nolly Yagin

DOT Maui HW: Fred Cajigal/ Charlene Shibuya

M RTP: Steve Perkins

CH&P: Chris Hart/Jennifer Maydan/ Brett Davis

- Maui Public Works and State DOT Maui Highways both agree that it is not a matter of "if" the N-S Collector road will be developed, it is a matter of "when". There are many details involved, but eventually the road will be built. Best guess on timeline is 5-7 years. During that time Public Works will have to go through the environmental assessment and Special Management Area permitting process, which will include public comments. We agreed to engage in the process and advocate for the roadway at public hearings, with community groups, etc to help expedite the development of the remaining segments of the N/S collector road. David Goode noted that the Mayor is in support of the N/S collector road.
- Public works and Maui officials from Hawaii DOT supported our idea of an in-tract north south transportation network mauka of Piilani Highway. We introduced them to the concept that MRTP was building nearly a mile and a half of a N/S roadway that could be used as a mauka collector road to provide relief from Piilani Highway.
- The process of adding the roadways to the state's planning documents begins with the long-term transportation plan. We will make sure the necessary roadways are in that document, and later make sure they are advocated for inclusion in the STIP. The plan will come out in early 2013. After this plan is released, the Dept. of Public Works should start working on the south Maui regional traffic study. We pointed out to them that they had more money allocated to the study than they thought, so we'll follow up on this to make sure it stays top of mind.
- We have all the info needed from public works in preparation for our 10/29 meeting with Hawaii DOT in Honolulu.

Appendix F Mauka Collector Supporting Documents

ALAN M. ARAKAWA
Mayor

WILLIAM R. SPENCE
Director

MICHELE CHOUTEAU McLEAN
Deputy Director



RECEIVED

AUG 14 2012

CHRIS HART & PARTNERS, INC.
Landscape Architecture and Planning

cc: Brent
081132

COUNTY OF MAUI
DEPARTMENT OF PLANNING

August 13, 2012

Mr. Daniel E. Orodener, Executive Director
State of Hawaii Land Use Commission
P.O. Box 2359
Honolulu, Hawaii 96804-2359

Dear Mr. Orodener:

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT (EIS) FOR THE PROPOSED LAND USE DISTRICT BOUNDARY AMENDMENT (DBA) FOR THE MAUI RESEARCH & TECHNOLOGY PARK MASTER PLAN, AT KIHEI, MAUI, HAWAII; TMK(S): (2) 2-2-024:001-009; 014-018; 031; 032; 034; 036-046; AND (2) 2-2-002:054 (POR.) (EAC 2012/0013)

The Department of Planning (Department) is in receipt of the above-referenced document for the proposed petition to amend the land use boundary to effect a district reclassification of approximately 256.243 acres of land situated at Kihei, Maui, Hawaii, from the Agricultural District to the Urban District for the Maui Research & Technology Park. The Department understands the proposed action includes the following:

- The Applicant is Maui R&T Partners, LLC;
- The Applicant is requesting a Land Use DBA for a reclassification of approximately 256.243 acres of land from the Agricultural District to the Urban District and the land is identified by Tax Map Key (TMK) Parcel Nos. (2) 2-2-024:016 and 017 and a portion of (2) 2-2-002:054. Additionally, the project will require amendments to the conditions placed upon currently urbanized lands, comprising approximately 157.76 acres;
- The Approving Agency is the Land Use Commission of the State of Hawaii;
- The proposed project will require an amendment to the Kihei-Makena Community Plan (CPA) from Project District 6, Public/Quasi Public, and Agricultural to a District that better aligns with the Maui Research & Technology Park Master Plan strategic vision and changes of Maui County Code (MCC), Title 19.33 "Kihei Research & Technology Park District." The CPA will require approval by the Maui County Council;
- The proposed project will require a Maui County Change in Zoning (CIZ) in order to bring the entire Park site into the Research and Technology Park District, whereas portions of the Park are currently zoned Agricultural. The CIZ will require approval by the Maui County Council; and

- The CPA and anticipated "off-site" infrastructure work affecting State and County "rights-of-way" are "triggers" for the preparation of an EIS.

Based on the foregoing, the Department provides the following comments of the Draft EIS:

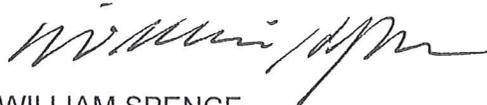
1. The Department concurs that the Petition to amend the land use district boundary of certain lands consisting of 256.243 acres from the Agricultural District to the Urban District is related to TMK Nos. (2) 2-2-024:016, and 017, and (2) 2-2-002:054 (POR.);
2. The Department concurs that the proposed CPA and anticipated use of State and County lands are "triggers" that require compliance with Chapter 343, Hawaii Revised Statutes (HRS);
3. The Department concurs that the State Land Use Commission shall be the Approving Agency for the EIS pursuant to Chapter 343, HRS;
4. On June 23, 2010, the Applicant filed a petition with the State Land Use Commission for a DBA from Agriculture to Urban for certain lands as identified;
5. The Applicant has filed a Consolidated Application for a CPA and CIZ for the Project which shall be reviewed by the Maui Planning Commission and Maui County Council;
6. The Draft EIS that looks at the Maui Research & Technology Park Master Plan Update as a whole shall include Transportation Demand Management Measures along with a Traffic Impact and Analysis Report (TIAR) for the project which shall seek to reduce or mitigate traffic impacts. Applicable and relevant updates to these reports should be provided on a timely basis at project milestones as changes in the timing and project scope may occur over the duration of the project;
7. The Draft EIS that looks at the Maui Research & Technology Park Master Plan Update as a whole shall state how the project will provide affordable housing in accordance with the County's Workforce Housing Policy as applicable and require that the Applicant coordinate with the Department of Housing and Human Concerns an appropriate affordable housing program per Maui County requirements;
8. The Department strongly recommends that this project as a whole be reviewed by the Maui County Urban Design Review Board (UDRB) to allow for a discussion of project design as it will include residential, civic, and commercial mixed-use components, along with areas of open space and parks. Review by

the UDRB may involve multiple meetings due to the scope and complexity of this project;

9. The County of Maui is currently reviewing the Draft Maui Island Plan that proposes a Directed Growth Strategy to establish urban growth boundaries and the land area under review for this Petition for a DBA from the Agricultural District to the Urban District is within the proposed urban growth boundaries of the Draft Maui Island Plan. Please include a map of the Draft Maui Island Plan Kihei-Makena growth area boundary and include the location of the Maui Research & Technology Park site; and
10. The Department concurs that the location and timing of a Kihei-Mauka North-South Collector Road is an unresolved issue as the schedule for the development of this roadway is uncertain at this time. In order to create an interconnected Kihei-Mauka transportation network in advance of the potential development of a Kihei-Mauka Collector Road, the Department strongly recommends that the Applicant consider designating and designing Ninau Street as a "complete street" with on street dedicated bicycle lanes, pedestrian facilities, median and through travel lanes, that would connect with North-South roadways of adjacent future development mauka of Pi'ilani Highway.

Thank you for the opportunity to comment. Should you require further clarification, please contact Staff Planner Kurt Wollenhaupt at kurt.wollenhaupt@mauicounty.gov or at (808) 270-1789; Staff Planner Kathleen Kern of the Long Range Division at kathleen.kern@mauicounty.gov or at (808) 270-7841; or Staff Planner Paul Critchlow of the Zoning Administration and Enforcement Division at paul.critchlow@mauicounty.gov or at (808) 270-5795.

Sincerely,



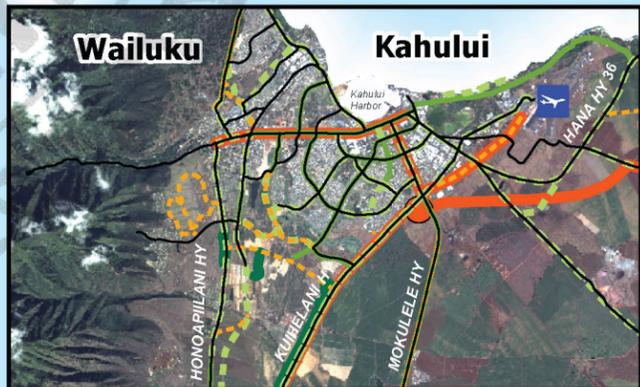
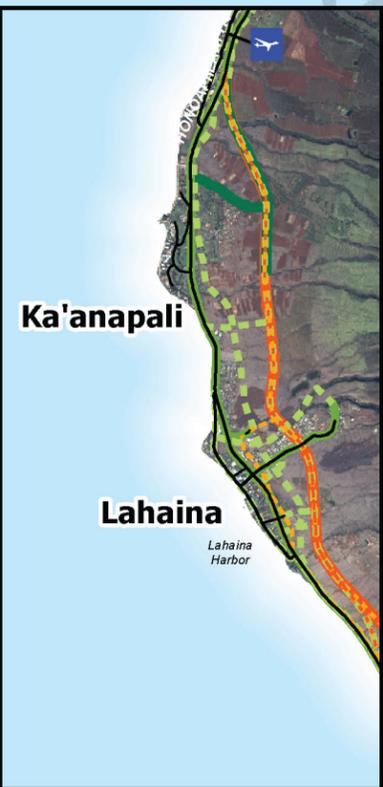
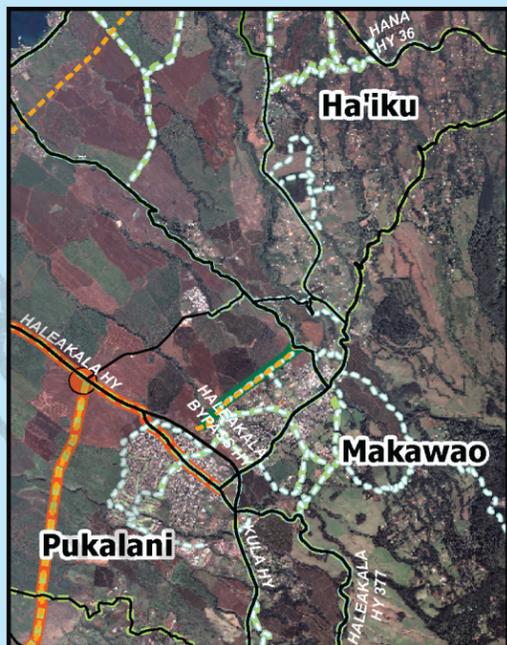
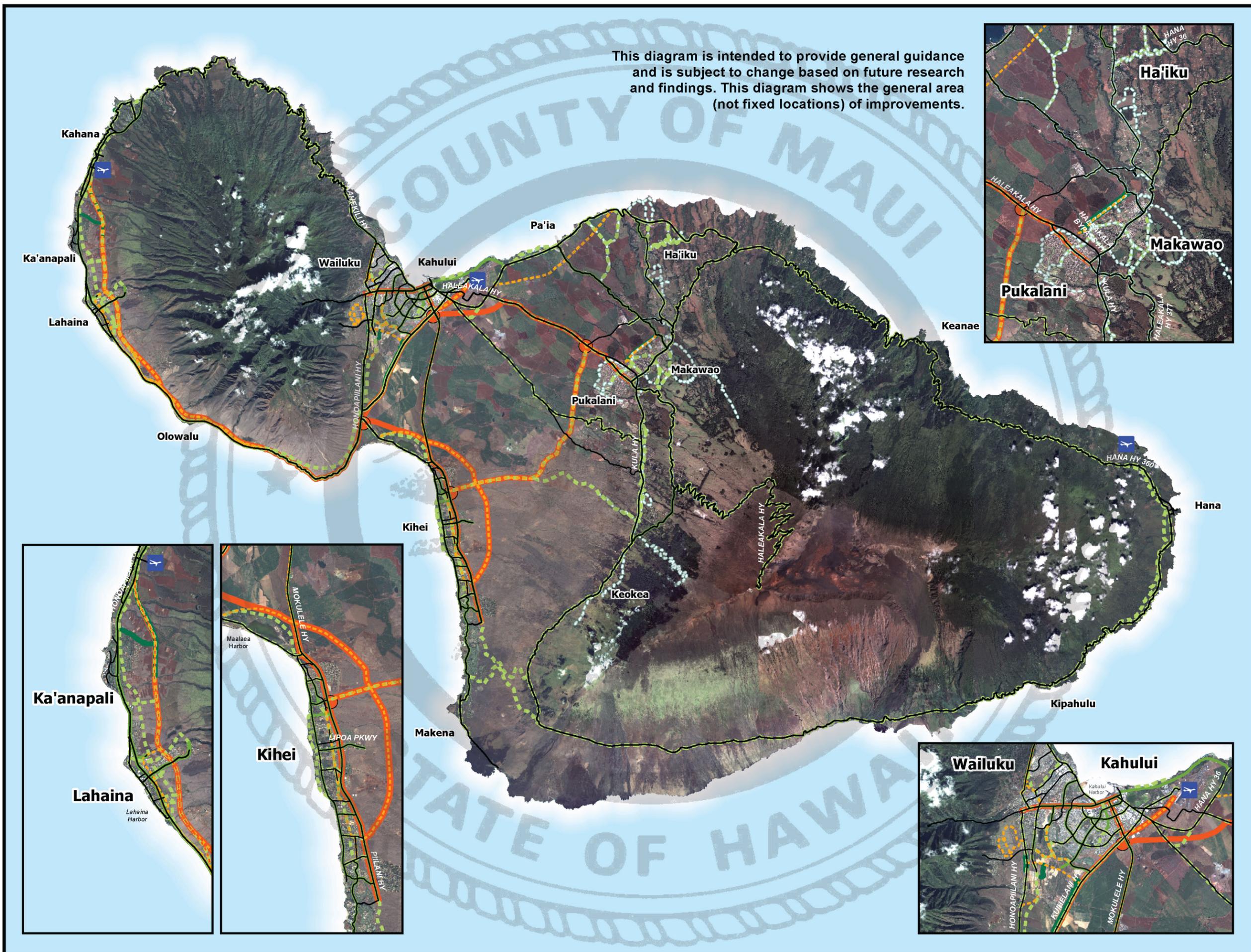
WILLIAM SPENCE
Planning Director

- xc: Clayton I. Yoshida, AICP, Planning Program Administrator (PDF)
Aaron H. Shinmoto, PE, Planning Program Administrator (PDF)
John F. Summers, Planning Program Administrator (PDF)
Kathleen Kern, Staff Planner (PDF)
Paul B. Critchlow, Staff Planner (PDF)
Kurt F. Wollenhaupt, Staff Planner (PDF)
Brett Davis, Chris Hart & Partners, Inc.
Project File
General File

WRS:KFW:cr

K:\WP_DOCS\PLANNING\EAC\2012\0013_MauiResearchPark\FinalComment.DOC

This diagram is intended to provide general guidance and is subject to change based on future research and findings. This diagram shows the general area (not fixed locations) of improvements.

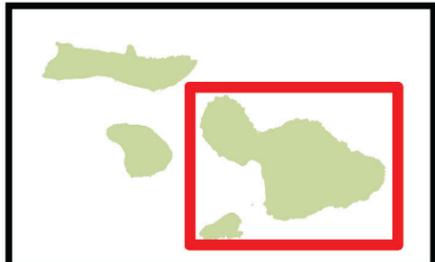


Regional Transportation Network

Island of Maui

Legend

- Primary Road
- Secondary Road
- Bike Path
- Airport
- Proposed**
- Conceptual Transit Station
- Conceptual Transit Corridor
- Lahaina Bypass
- Road or Highway
- Bike Path
- Upcountry Greenways Plan
- Maui Island Plan Greenways



Miles
0 1 2 3 4 5 6

Product Code: M-CET_20120920-m1
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This is not a zoning map. Please contact the Planning Department for Zoning confirmation.

Prepared By:
Long Range Planning Division
Department of Planning
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Diagram 6-1