

Appendix K

**Traffic Impact Study for Kaloko Makai
KOA Corporation
September 12, 2012**

Traffic Impact Study for Kaloko Makai in Kona, Hawaii

Prepared For:



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September 12, 2012



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September 12, 2012

Ms. Cathy Leong
Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
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Subject: Traffic Impact Study for Kaloko Makai in Kona, Hawaii

Dear Ms. Leong:

KOA Corporation is pleased to present the traffic impact study for the proposed Kaloko Makai project in Kona, Hawaii on Big Island. It is recommended that the traffic study be updated periodically every 5 years to monitor the actual traffic growth and provide appropriate mitigation.

It has been a pleasure to provide this traffic impact study to you. Please contact me if you have any questions about the report, or if you need additional information. If there are any comments or revisions that require my response, please notify me as soon as possible for prompt attention.

Sincerely,

A handwritten signature in black ink, likely belonging to Min Zhou.

Min Zhou, PE
Vice President

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LOS ANGELES | ONTARIO | ORANGE | SAN DIEGO | SOUTH BAY

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I. Introduction

The purpose of this report is to assess the traffic impact of the proposed Kaloko Makai project on the existing and future roadway network in vicinity of the project site. This report documents the existing and future years (2025, 2035 and 2045) roadway conditions and operation performance, forecast traffic volumes, methodologies used in roadway segment and intersection Level of Service (LOS) analysis, and recommendations for roadway improvement.

1.1 Project Description

The project site is located east of Queen Kaahumanu Highway (State Route 19) and along the north and south sides of Hina Lani Street in Kona on the Island of Hawaii. The project vicinity map is shown in Figure 1.

The proposed Kaloko Makai project is a 1,139-acre mixed-use development consists of over 20 different types of land uses. Conceptual land use plan is shown in Figure 2. Additional details for the proposed land use are included in Appendix A of this report. The proposed mixed-use project includes the following land uses:

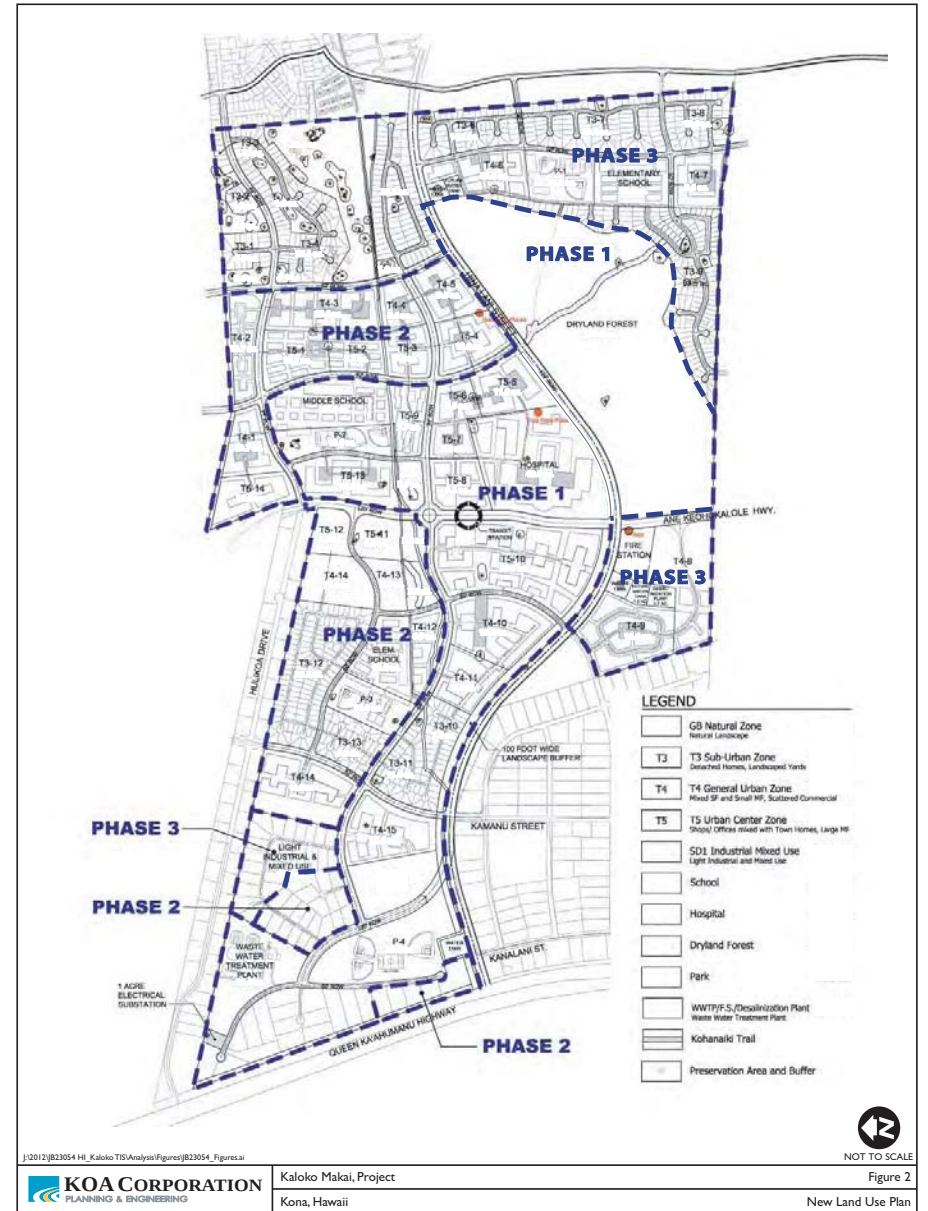
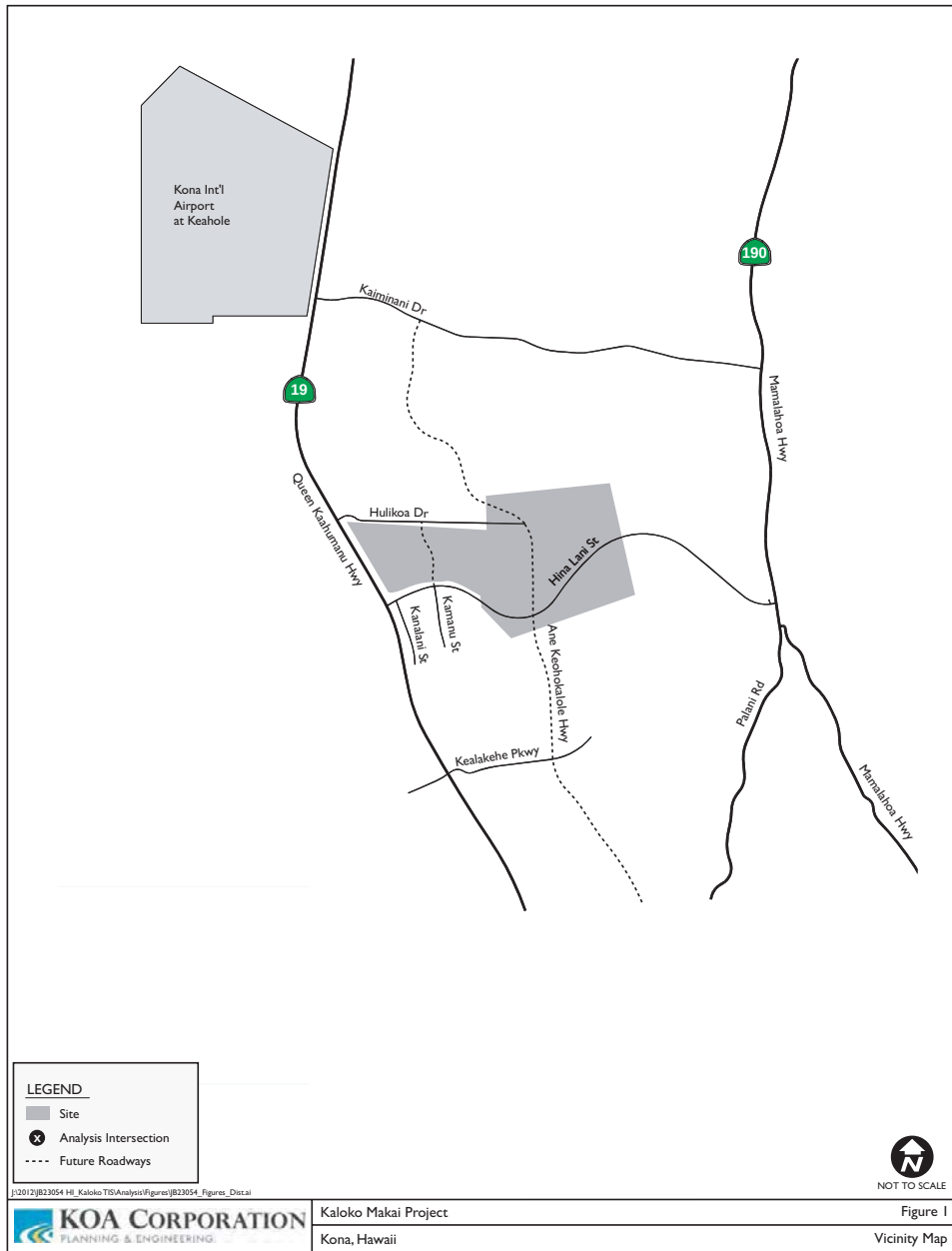
- Transit station
- Light industrial
- Waste water treatment plant
- Single-family detached housing
- Affordable multi-family
- Market multi-family
- Multi-family market senior
- Multi-family affordable senior
- Live-work units
- Lodge (hotel)
- District park, TOD park
- Elementary school, middle school
- Hospital/medical center
- Long-term care facility
- Legal office, retail-office
- Urgent care/clinic, medical office
- Judiciary (government) building
- Fire station
- Police sub-station
- Retail, shopping center

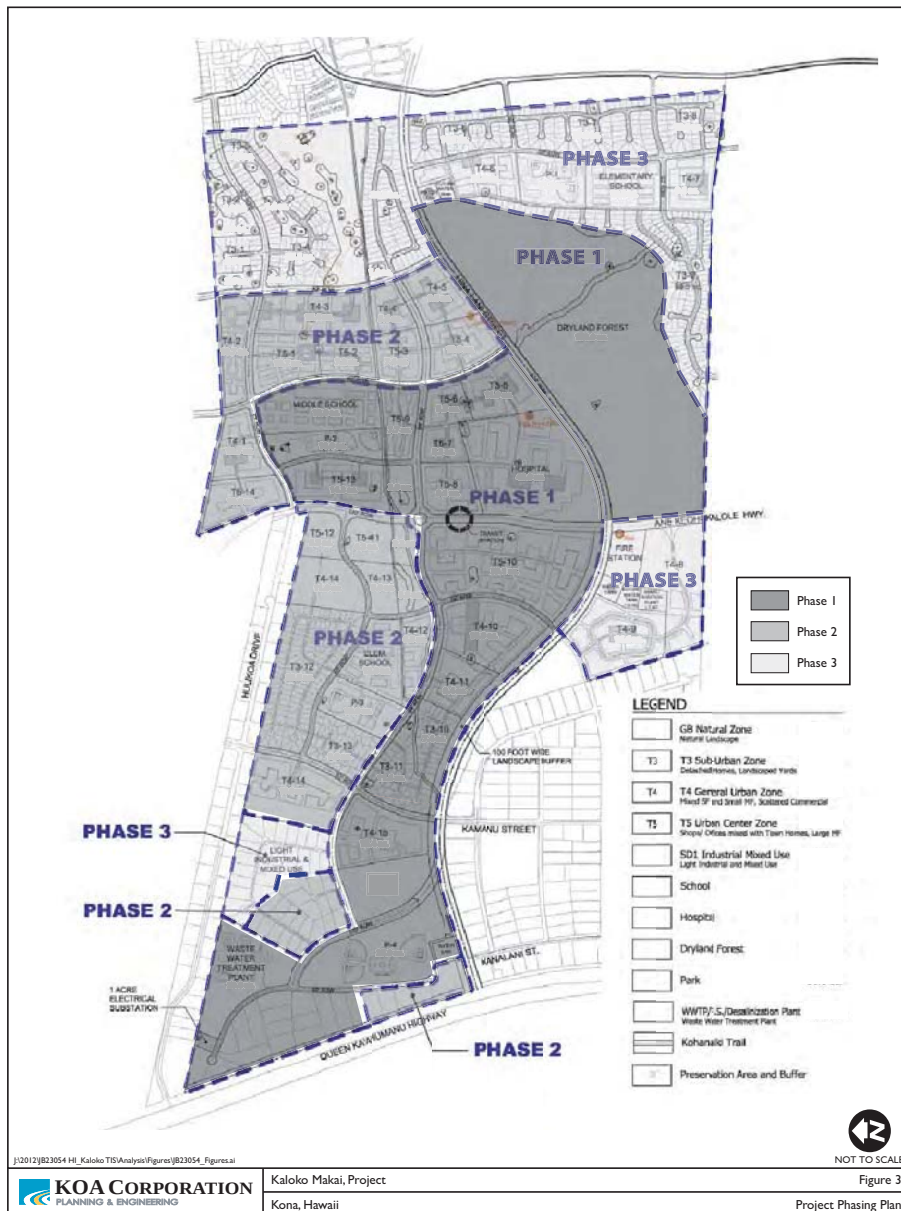
1.2 Project Phasing

The project is expected to be developed in 3 phases. The project construction will start in 2015 with 10-year development increments. The horizon years for the phases are conservatively assessed at the end of each 10-year increment, but the improvements are assumed to be implemented at the start of each phase. As such, the study horizon years assessed for each phase are as follows:

- Phase 1 – 2025
- Phase 2 – 2035
- Phase 3 – 2045

The project phasing plan is shown in Figure 3.





2. Traffic Operations Analysis Methodology

This section documents the methodologies and assumptions used to conduct the traffic operations analysis for the project site. The following background information is included:

- Study scenarios
- Study area description
- Capacity analysis methodologies

2.1 Study Scenarios

This report presents an analysis of the intersection operating conditions during the AM and PM peak hours for the following anticipated timeframes:

- Existing Condition
- 2025 without Project Condition
- 2035 without Project Condition
- 2045 without Project Condition
- 2025 with Project Phase 1 Condition
- 2035 with Project Phase 2 Condition
- 2045 with Project Phase 3 Condition

2.2 Project Study Area

The study area consists of the following eight intersections:

- Queen Kaahumanu Highway at Kaiminani Drive
- Queen Kaahumanu Highway at Hulikoa Drive
- Queen Kaahumanu Highway at Hina Lani Street
- Kamanu Street at Hina Lani Street
- Ane Keohokalole Highway at Hina Lani Street
- Mamalahoa Highway at Hina Lani Street
- Queen Kaahumanu Highway at Kealakehe Parkway

2.3 Intersection Analysis Methodologies

Street system operating conditions are typically described in terms of level of service (LOS). Level of service is a report-card scale used to indicate the quality of traffic flow on roadway segments and at intersections. Levels of service range from Level A (free flow, little congestion) to Level F (forced flow, extreme congestion).

Intersection level of service analysis was conducted using Synchro software which applies the principles or the specific analysis methods contained in the *Highway Capacity Manual, 2000 Edition (HCM)*, a publication of the Transportation Research Board, a research agency affiliated with the Federal Government. Chapter 9 of the *HCM* is devoted to analysis of signalized intersections and Chapter 10 is devoted to the analysis of unsignalized intersections. The methodology in the *HCM* for signalized intersections is based upon measurements or forecasts of control delay for traffic utilizing all approaches to the intersection. Intersection average delay and poorest movement delay are reported for all unsignalized intersections. Table 1 defines the level of service and control delay ranges for signalized and unsignalized intersections.

Table 1 – Levels of Service for Intersections

Level of Service	Signalized Intersection Control Delay (seconds/vehicle)	Unsignalized Intersection Control Delay (seconds/vehicle)
A	0 to 10	0 to 10
B	10.1 to 20	10 to 15
C	20.1 to 35	15 to 25
D	35.1 to 55	25 to 35
E	55.1 to 80	35 to 50
F	More than 80	More than 50

Source: Highway Capacity Manual, 2000.

A lane capacity of 1,900 vehicles per hour per lane and a 2 second loss time per phase were used for this study. Unsignalized intersections were analyzed using the *HCM 2000* method for unsignalized intersections.

3. Existing Conditions

This section documents existing conditions in the study area at the time when the traffic counts were taken in 2010. The topics of discussion include local land uses, roadway characteristics, and intersection operation performance. The discussion presented here is limited to specific roadways and study area intersections in the project vicinity.

3.1 Existing Land Use

The project site is currently vacant. The surrounding area is also mostly vacant. There is an industrial park located south of Hina Lani Street between Queen Kaahumanu Highway and Kamanu Street.

3.2 Existing Roadway Network

Queen Kaahumanu Highway and Mamalahoa Highway currently provide regional access to the project site, and they both runs in a north-south direction. Hina Lani Street runs in an east-west direction through the project site, and Hina Lani Street connects to Queen Kaahumanu Highway to the west and Mamalahoa Highway to the east. Other local streets include Kaiminani Drive, Hulikoa Drive, Kanalani Street, Kamanu Street, Kealakehe Parkway, and Palani Road. Figure 4 shows the existing roadway and intersection lane configurations in the vicinity of the study roadway network.

3.3 Future Planned Roadway Network

Queen Kaahumanu Highway was a two-lane roadway when the traffic counts were taken in 2010, and as such the existing conditions reflect this. However, since then Queen Kaahumanu Highway has been widened to four lanes from Kealakehe Parkway to the south. It is anticipated that Queen Kaahumanu Highway north of Kealakehe Parkway will be widening to a four-lane roadway prior to Year 2025. The planned roadway widening along Queen Kaahumanu Highway will provide an additional northbound and southbound travel lane to the study area intersections along Queen Kaahumanu Highway from north of Kealakehe Parkway to Kaiminani Drive.

The future Ane Keohokalole Highway will be a two-lane Mid-Level Road that is planned to be constructed in a north-south direction between Queen Kaahumanu Highway and Mamalahoa Highway. By the first horizon year of this traffic study (Year 2025), Ane Keohokalole Highway is anticipated to be completed between Hulikoa Drive and Palani Road to the south. As of June 2012, Ane Keohokalole Highway has been completed between Hina Lani Street and Kealakehe Parkway. The northerly extension of Ane Keohokalole Highway to Kaiminani Drive will be completed by 2028 (or near the beginning of Project Phase 2). The completion of Ane Keohokalole Highway will serve as a parallel corridor to relief traffic congestion on Queen Kaahumanu Highway and Mamalahoa Highway.

3.4 Traffic Count Data

Figures 5 and 6 show the existing AM and PM peak hour traffic volumes for the study intersections. The AM and PM peak hour counts were conducted on Tuesday, September 21, and Wednesday, September 22 in Year 2010. Traffic count data sheets are included in Appendix B of this report. The AM and PM peak periods for the count data are from 6:00 AM to 9:00 AM and from 3:00 PM to 6:00 PM, respectively.

3.5 Existing Transit Service

The County of Hawaii Mass Transit Agency provides an island-wide public bus transit system, called Hele-On Bus. The Hele-On Bus currently provides bus service along Queen Kaahumanu Highway (State Route 19) in the study area. The Hele-On Bus route map and schedule are included in Appendix C.

3.6 Level of Service Analysis of Existing Conditions

Intersection Level of Service (LOS) analysis was conducted using Synchro software based on the analysis methodologies mentioned in Section 2 on this report. Table 2 below shows the existing intersection LOS for both AM and PM peak hours. Appendix D contains the Synchro level of service analysis worksheets for the Existing Conditions. As shown in the Table 2, all of the study area intersections are currently operating at Level of Service C or better during AM and PM peak hours.

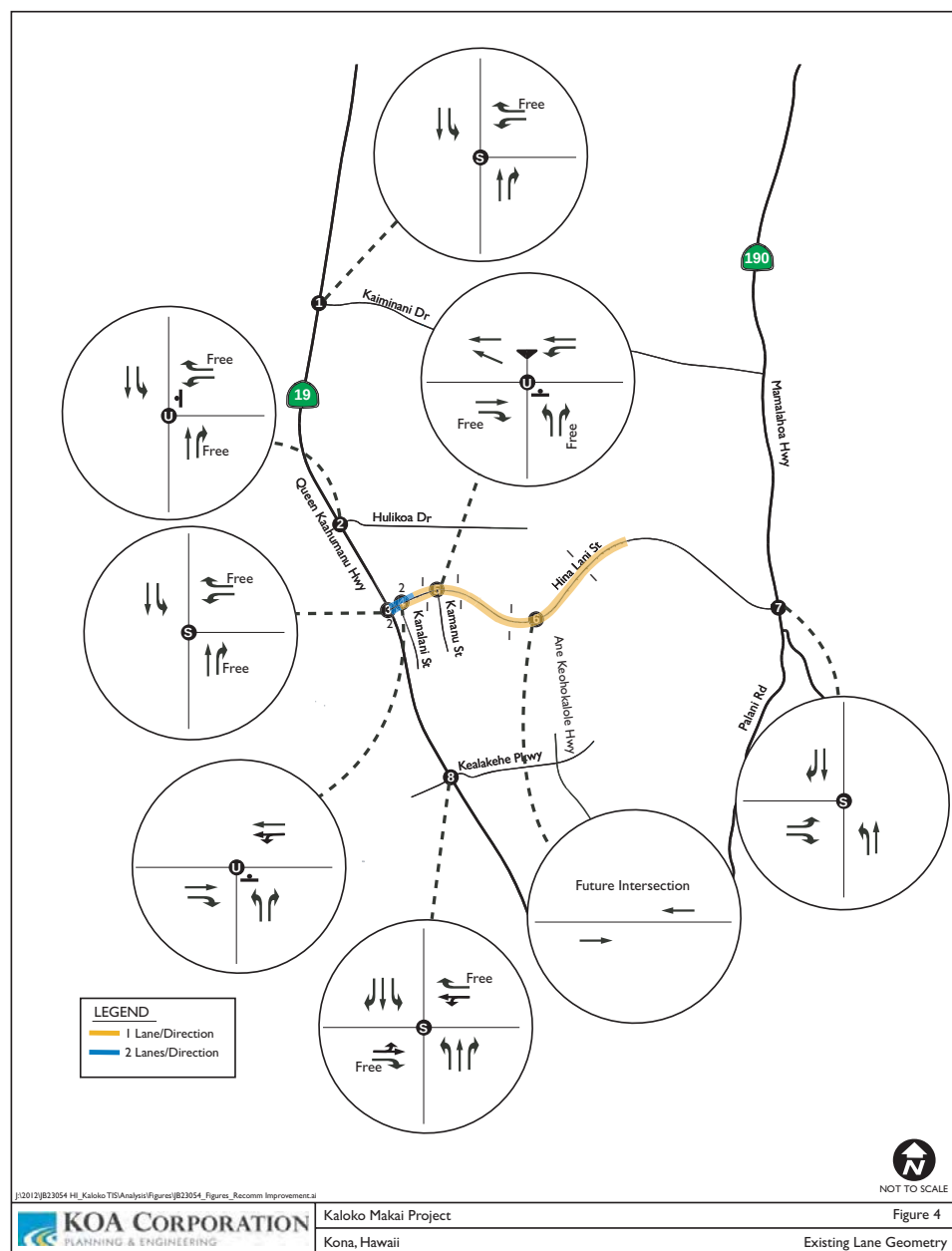


Table 2 - Existing Conditions
Intersection Level of Service Analysis Summary

No.	Intersection	Peak Hour	EXISTING		
			Delay (Sec)	V / C	LOS
1	Queen Kaahumanu Hwy at Kaiminani Dr	AM	16.9	0.85	B
		PM	8.6	0.65	A
2	Queen Kaahumanu Hwy at Hulikoa Dr[1]	AM	25.2	0.50	C
		PM	52.1	0.85	C
3	Queen Kaahumanu Hwy at Hina Lani St	AM	11.1	0.65	B
		PM	15.7	0.82	C
4	Kanalani St at Hina Lani St[1]	AM	19.2	0.36	B
		PM	22.8	0.58	C
5	Kamanu St at Hina Lani St[1]	AM	10.7	0.25	B
		PM	14.1	0.40	B
6	Ane Keohokalole Hwy at Hina Lani St[2]	AM	--	--	--
		PM	--	--	--
7	Mamalahoa Hwy at Hina Lani St	AM	44.8	1.01	B
		PM	22.2	0.55	A
8	Queen Kaahumanu Hwy at Kealahou Pkwy	AM	15.7	0.79	B
		PM	26.5	0.92	C

[1] Non-signalized. The delay is for the most constrained stop-controlled approach.

[2] Intersection does not currently exist at the time of data collection.

4. Future Traffic Forecast Methodology

This section documents the methodologies and assumptions used to forecast the future traffic volumes for the project vicinity. The following background information is included:

- Existing traffic count data
- Trip generation rates
- Pass-by trip reduction
- Internal trip capture
- Transit trip discount
- Project traffic generation
- Project trip distribution patterns
- Other cumulative development traffic
- Ambient background growth

It should be noted that the overall future traffic forecast is a worst-case scenario because this analysis utilized a conservative approach in the overall traffic projection. The project trip reduction adjustments, such as pass-by trips and transit discounts that are used in this analysis are conservatively low. In addition to accounting for cumulative development traffic in the vicinity of the project site, a conservatively-high ambient background growth factor is also used to assess other unidentified projects and general population growth traffic that may contribute to overall traffic growth.

4.1 Existing Traffic Count Data

Wilson Okamoto Corporation conducted traffic counts at existing study area intersections on Tuesday, September 21, and Wednesday, Sept 22, 2010. The AM and PM peak hour counts were conducted from 6:00 AM to 9:00 AM and from 3:00 PM to 6:00 PM, respectively. Existing traffic counts are summarized in Table 3.

Since the connectivity of the Mid-Level Road (Ane Keohokalole Highway) will be completed by 2028 (or near the beginning of Phase 2), the existing traffic patterns for Years 2035 and 2045 will be different than that of 2025. It is anticipated that a portion of the existing northbound and southbound through traffic along Mamalahoa Highway will be diverted to the future Ane Keohokalole Highway. Future traffic diversion calculations for the existing background traffic are included in Appendix E of this report. As shown on Appendix E, the following traffic volumes on Mamalahoa Highway are diverted to Ane Keohokalole Highway for 2035 and 2045 conditions:

- AM Peak Hour – 100 Northbound vehicles; 300 Southbound vehicles
- PM Peak Hour – 150 Northbound vehicles; 100 Southbound vehicles

Table 3 - Existing Conditions Peak Hour Intersection Volumes

Int.	Intersection Name	Peak Hr.	Northbound			Southbound			Eastbound			Westbound			Total
			NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
1	Queen Kaahumanu Hwy./Kaiminani Dr.	AM	0	562	102	25	374	0	0	0	0	480	0	221	1,764
		PM	0	497	380	200	623	0	0	0	0	180	0	69	1,949
2	Queen Kaahumanu Hwy./Huliko Dr.	AM	0	590	141	77	679	0	0	0	0	79	0	103	1,669
		PM	0	719	65	57	891	0	0	0	0	120	0	85	1,937
3	Queen Kaahumanu Hwy./Hina Lani St.	AM	0	472	373	159	680	0	0	0	0	217	0	198	2,099
		PM	0	584	527	214	704	0	0	0	0	469	0	275	2,773
4	Kanalani St./ Hina Lani St.	AM	225	0	13	0	0	0	0	137	363	13	210	0	961
		PM	200	0	56	0	0	0	0	202	489	6	456	0	1,409
5	Kamanu St./ Hina Lani St.	AM	112	0	54	0	0	0	0	47	90	100	120	0	523
		PM	373	0	223	0	0	0	0	116	94	94	66	0	966
6	Ane Keohokalole Hwy./Hina Lani St.	AM	0	0	0	0	0	0	0	101	0	0	220	0	321
		PM	0	0	0	0	0	0	0	339	0	0	160	0	499
7	Mamalahoa Hwy./ Hina Lani St.	AM	119	274	0	0	956	131	57	0	79	0	0	0	1,616
		PM	77	511	0	0	391	86	190	0	210	0	0	0	1,465
8	Queen Kaahumanu Hwy./Kealahou Pkwy.	AM	68	628	294	158	619	48	17	7	24	229	18	138	2,248
		PM	60	851	156	52	991	44	59	19	71	210	20	54	2,587

4.2 Trip Generation Rates

This study used the nationally recognized trip rates, published by the Institute of Transportation Engineers (ITE), 8th Edition, to determine the site-only traffic volumes generated by the proposed Kaloko Makai project. Based on the proposed land use plan, the following ITE trip rates are used for the project land uses as listed in Table 4:

- Park-and-Ride Lot with Bus Service (ITE Code 090): Transit station; TOD square
- General Light Industrial (ITE Code 110): Light industrial
- Utilities (ITE Code 170): Waste water treatment plant; electrical substation
- Single-Family Detached Housing (ITE Code 210)
- Apartments (ITE Code 220): Affordable and regular multi-family (>10 DU/acre)
- Residential Condominium/Townhouse (ITE Code 230): Live-work units; affordable and regular multi-family (<10 DU/acre)
- Senior Adult Housing-Attached (ITE Code 252): Senior
- Hotel (ITE Code 310): Lodge
- County park (ITE Code 412): District-sized park; drainage retention
- Elementary School (ITE Code 520): Elementary school
- Middle School/Junior High School (ITE Code 522): Middle school
- Hospital (ITE Code 610): Hospital
- Nursing Home (ITE Code 620): Long term care
- General Office Building (ITE 710): Legal office; office
- Medical-Dental Office Building (ITE Code 720): Medical office
- Government Office Building (ITE 730): Fire station
- Business Park (ITE 770): Business center
- Shopping Center (ITE Code 820): Retail, shopping center

Trip reduction adjustment has been made to the overall project traffic generation to account for pass-by trips, internal capture and transit trip discount. The reduction percentage assumption has been based on past experience for this type of development and the reference information obtained from other studies in the area.

4.3 Pass-By Trip Reduction

Pass-by trip is a portion of traffic generated by retail uses already on the road stopping at a secondary destination on its way to an ultimate destination. For instance, a driver that got off from work at an off-site location on his way home may stop by a retail center along his travel route to do some shopping, and his shopping trip is considered a pass-by trip already on the road because it is not a new trip generated by the retail center impacting the external roadway network. The average pass-by percentage for shopping center is approximately 34% based on the ITE [Trip Generation Handbook](#). In other references, pass-by percentages for community and neighborhood shopping centers are between 30% and 40%, as suggested in the [San Diego Trip Generators](#) published by San Diego Association of Governments (SANDAG). However, this traffic study uses a conservatively-low 15% pass-by trip discount factor to reduce the project retail trips for the PM peak hour and daily traffic conditions.

Table 4 - Trip Generation Rates

No.	Land Use	ITE ¹ Code	Unit ²	Daily	AM Peak Hour			PM Peak Hour		
					Total	In	Out	Total	In	Out
1	Park-and-Ride Lot with Bus Service	90	AC	372.32	48.81	39.54	9.27	43.75	10.06	33.69
2	General Light Industrial	110	AC	51.80	7.51	6.23	1.28	7.26	1.60	5.66
3	Utilities ³	170	AC	13.36	2.49	1.57	0.92	1.32	0.59	0.73
4	Single-Family Detached Housing	210	DU	9.57	0.75	0.19	0.56	1.01	0.64	0.37
5	Apartment	220	DU	6.65	0.51	0.10	0.41	0.62	0.40	0.22
6	Residential Condo/Townhouse	230	DU	5.81	0.44	0.07	0.37	0.52	0.35	0.17
7	Senior Adult Housing-Attached	252	DU	3.48	0.13	0.05	0.08	0.16	0.10	0.06
8	Hotel	310	RM	8.17	0.56	0.34	0.22	0.59	0.31	0.28
9	County Park	412	AC	2.28	0.01	0.01	-	0.06	0.02	0.04
10	Elementary School	520	STU	1.29	0.45	0.25	0.20	0.15	0.07	0.08
11	Middle School/Junior High School	522	STU	1.62	0.54	0.30	0.24	0.16	0.08	0.08
12	Hospital	610	BEDS	11.81	1.14	0.81	0.33	1.31	0.47	0.84
13	Nursing Home	620	BEDS	2.37	0.17	0.12	0.05	0.22	0.07	0.15
14	General Office Building	710	TSF	11.01	1.55	1.36	0.19	1.49	0.25	1.24
15	Medical-Dental Office Building	720	TSF	36.13	2.30	1.82	0.48	3.46	0.93	2.53
16	Government Office Building	730	TSF	68.93	5.88	4.94	0.94	1.21	0.38	0.83
17	Business Park	770	TSF	12.76	1.43	1.20	0.23	1.29	0.30	0.99
18	Shopping Center	820	TSF	42.94	1.00	0.61	0.39	3.73	1.83	1.90

** See Table 5 for project traffic generation summary and Appendix G for detailed calculations.

Footnote

- ¹ Institute of Transportation Engineer (ITE) Trip Generation Handbook, 8th Edition, Regression Equation
- ² AC = Acre; DU = Dwelling Units; RM = Room; STU = Student; TSF = Thousand Square Feet
- ³ Trip rate for daily is not available in ITE Trip Generation. The daily to AM/PM peak hours ratio for general light industrial use was applied to the AM plus PM peak hour rates to estimate the daily trip rate for utilities use.

4.4 Internal Trip Capture

Internal capture is a portion of traffic that visits multiple uses within the project boundary on a single trip. An example may be a patient that visits the medical clinic and then goes shopping afterwards at an adjacent retail center without driving out of the project boundary. His shopping trip would be considered an internal trip already accounted for by his medical office trip. Internal capture trip discount factors have been estimated based on the Multi-Use Development trip generation methodology stated in the ITE Trip Generation Handbook. Internal capture factors are based on the interactions for the residential, office and commercial retail uses within the same Traffic Analysis Zones (TAZ). For the purpose of this traffic analysis, the project land use plan is divided into 11 TAZ's, and internal capture trip discount factors have been calculated within each TAZ for AM peak hour, PM peak hour and daily traffic conditions. The project TAZ boundary is shown in Figure 7. The internal capture trip calculation worksheets are included in Appendix F of this report.

4.5 Transit Trip Discount

Transit trip is a portion of traffic that utilizes public transportation or vanpool opportunities instead of driving alone in personal vehicles to their destinations. For instance, a driver may drive from his residence to a near-by park-and-ride facility to ride a vanpool to go to work at a further destination. Transit discount factor is assessed based on the available transit-oriented development and opportunities in the surrounding community. The County of Hawaii Mass Transit Agency provides an island-wide public bus transit system, called Hele-On Bus. The Hele-On Bus currently provides bus service along Queen Kaahumanu Highway (State Route 19) in the study area. It should be noted that in accordance with the Kona Community Development Plan (KCDP), Ane Keohokalole Highway (Mid-Level Road) is eventually expected to be a transit corridor with dedicated transit lanes and transit oriented developments along its proposed alignment. In the future, this Mid-Level Roadway is expected to extend further north and new transit routes are expected to be established along its alignment. At that time, transit may have a more significant effect on reducing vehicular trips generated by the proposed project. Based on a review of the available transit opportunities for the project site, this study has included a conservatively-low 5% transit trip discount factor to account for traffic utilizing transit-oriented opportunities.

4.6 Project Traffic Generation

Table 5 summarizes the project traffic generation for the proposed Kaloko Makai project. As shown in Table 5, the proposed project is anticipated to generate 57,672 daily trips with 5,023 AM peak hour trips and 5,834 PM peak hour trips, with pass-by, internal capture and transit trip discount adjustments. Detailed calculation for the project traffic generation is included in Appendix G of this report.

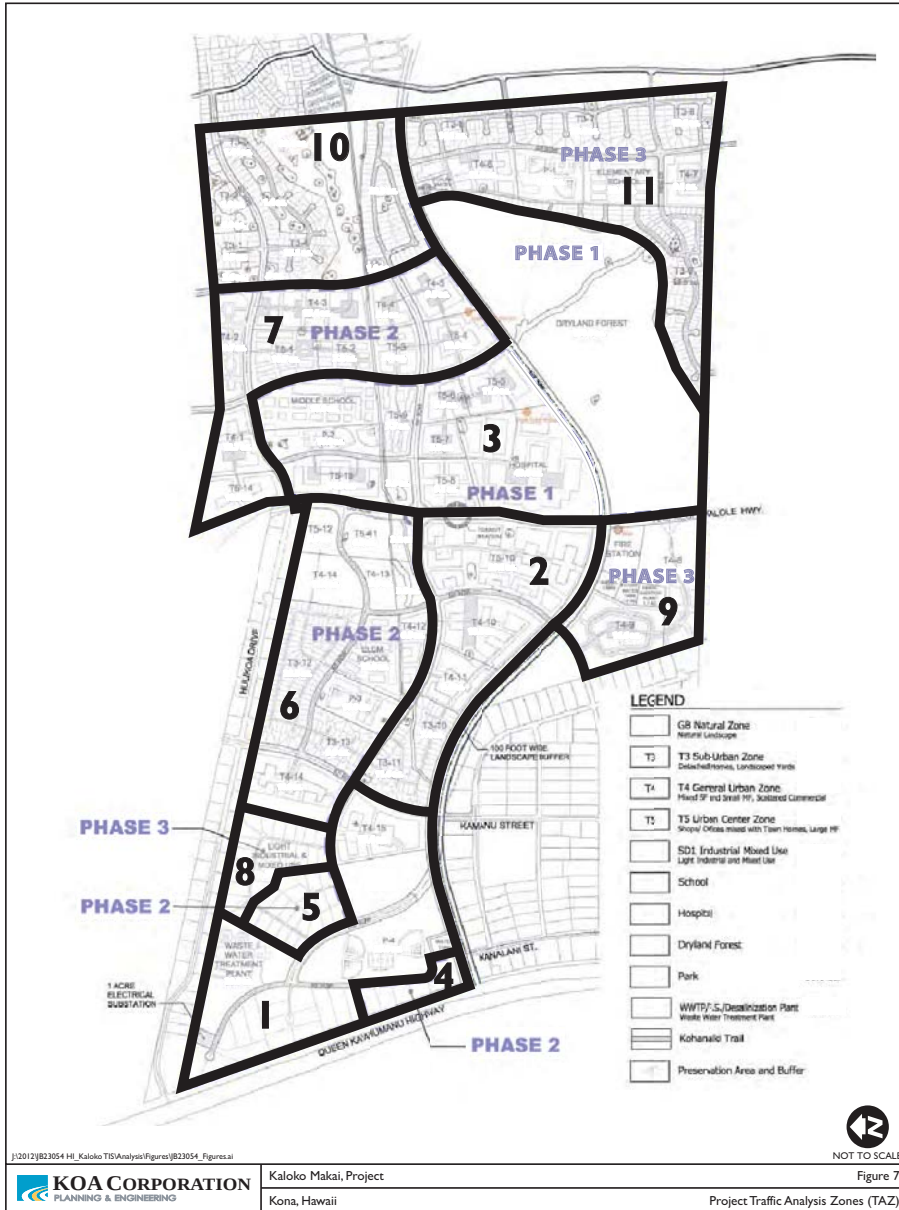


Table 5 (1 of 2) - Project Traffic Generation Summary

Project Phasing	Traffic Analysis Zone (TAZ)	Traffic Componentes	Daily Trips	AM Peak Hour			PM Peak Hour		
				Total	In	Out	Total	In	Out
Phase I	TAZ 1	Total without Trip Discount	4,412	440	251	190	494	221	273
		Trip Discount	-481	-30	-16	-14	-48	-22	-26
		Total with Trip Discount	3,931	410	235	176	446	199	247
	TAZ 2	Total without Trip Discount	10,355	671	269	402	1,015	543	472
		Trip Discount	-2,004	-60	-25	-35	-183	-95	-88
		Total with Trip Discount	8,351	611	244	367	832	448	384
	TAZ 3	Total without Trip Discount	15,513	1,165	691	473	1,429	620	809
		Trip Discount	-2,936	-91	-55	-36	-253	-113	-140
		Total with Trip Discount	12,577	1,074	636	437	1,176	507	669
	Phase I Subtotal	Total without Trip Discount	30,280	2,276	1,211	1,065	2,938	1,384	1,554
Trip Discount		-5,421	-181	-96	-85	-484	-230	-254	
Total with Trip Discount		24,859	2,095	1,115	980	2,454	1,154	1,300	
Phase 2	TAZ 4	Total without Trip Discount	518	75	62	13	73	16	57
		Trip Discount	-26	-4	-3	-1	-4	-1	-3
		Total with Trip Discount	492	71	59	12	69	15	54
	TAZ 5	Total without Trip Discount	777	113	93	19	109	24	85
		Trip Discount	-39	-6	-5	-1	-5	-1	-4
		Total with Trip Discount	738	107	88	18	104	23	81
	TAZ 6	Total without Trip Discount	8,931	797	297	500	907	527	381
		Trip Discount	-287	12	-5	16	-24	-7	-17
		Total with Trip Discount	8,644	809	292	516	884	520	364
	TAZ 7	Total without Trip Discount	10,737	693	184	508	1,007	609	399
		Trip Discount	-1,393	-42	-11	-31	-128	-74	-54
		Total with Trip Discount	9,344	651	173	477	879	535	345
	Phase 2 Subtotal	Total without Trip Discount	20,963	1,678	637	1,041	2,096	1,176	921
		Trip Discount	-1,745	-40	-24	-17	-161	-83	-78
		Total with Trip Discount	19,218	1,637	614	1,024	1,936	1,093	843

Table 5 (2 of 2) - Project Traffic Generation Summary

Project Phasing	Traffic Analysis Zone (TAZ)	Traffic Component	Daily Trips	AM Peak Hour			PM Peak Hour		
				Total	In	Out	Total	In	Out
Phase 3	TAZ 8	Total without Trip Discount	1,295	188	156	32	182	40	142
		Trip Discount	-65	-9	-8	-1	-9	-2	-7
		Total with Trip Discount	1,230	179	148	31	173	38	135
	TAZ 9	Total without Trip Discount	4,642	341	113	228	450	267	184
		Trip Discount	-496	-20	-6	-14	-44	-25	-19
		Total with Trip Discount	4,146	321	107	214	406	242	165
	TAZ 10	Total without Trip Discount	2,067	162	41	121	218	138	80
		Trip Discount	-103	-8	-2	-6	-11	-7	-4
		Total with Trip Discount	1,964	154	39	115	207	131	76
	TAZ 11	Total without Trip Discount	6,585	670	228	442	692	429	264
		Trip Discount	-329	-33	-12	-21	-34	-22	-12
		Total with Trip Discount	6,256	637	216	421	658	407	252
	Phase 3 Subtotal	Total without Trip Discount	14,589	1,360	538	822	1,542	874	669
		Trip Discount	-993	-70	-28	-42	-98	-56	-42
		Total with Trip Discount	13,596	1,290	510	780	1,444	818	627
Project Total		Total without Trip Discount	65,832	5,314	2,386	2,928	6,577	3,433	3,144
		Trip Discount	-8,159	-291	-148	-144	-743	-369	-374
		Total with Trip Discount	57,672	5,023	2,239	2,784	5,834	3,064	2,770

** See Appendix G for detailed project traffic generation calculations.

4.7 Project Trip Distribution Patterns

Trip distribution is the process of identifying the probable destination, direction or traffic routes that will be utilized by project traffic. The potential interaction between the proposed land use and surrounding regional access routes are considered when identifying the route where the project traffic will distribute. Approved and proposed roadway improvements and programs have been reviewed to determine the study area roadway network for the 3 different analysis phasing years (2025, 2035 and 2045) being analyzed in the traffic impact analysis.

Queen Kaahumanu Highway is currently a two-lane roadway, and it is anticipated to be widening to a four-lane roadway prior to Year 2025. The planned roadway widening along Queen Kaahumanu Highway will provide an additional northbound and southbound travel lane to the study area intersections along Queen Kaahumanu Highway. Additional capacity along Queen Kaahumanu Highway will attract more traffic.

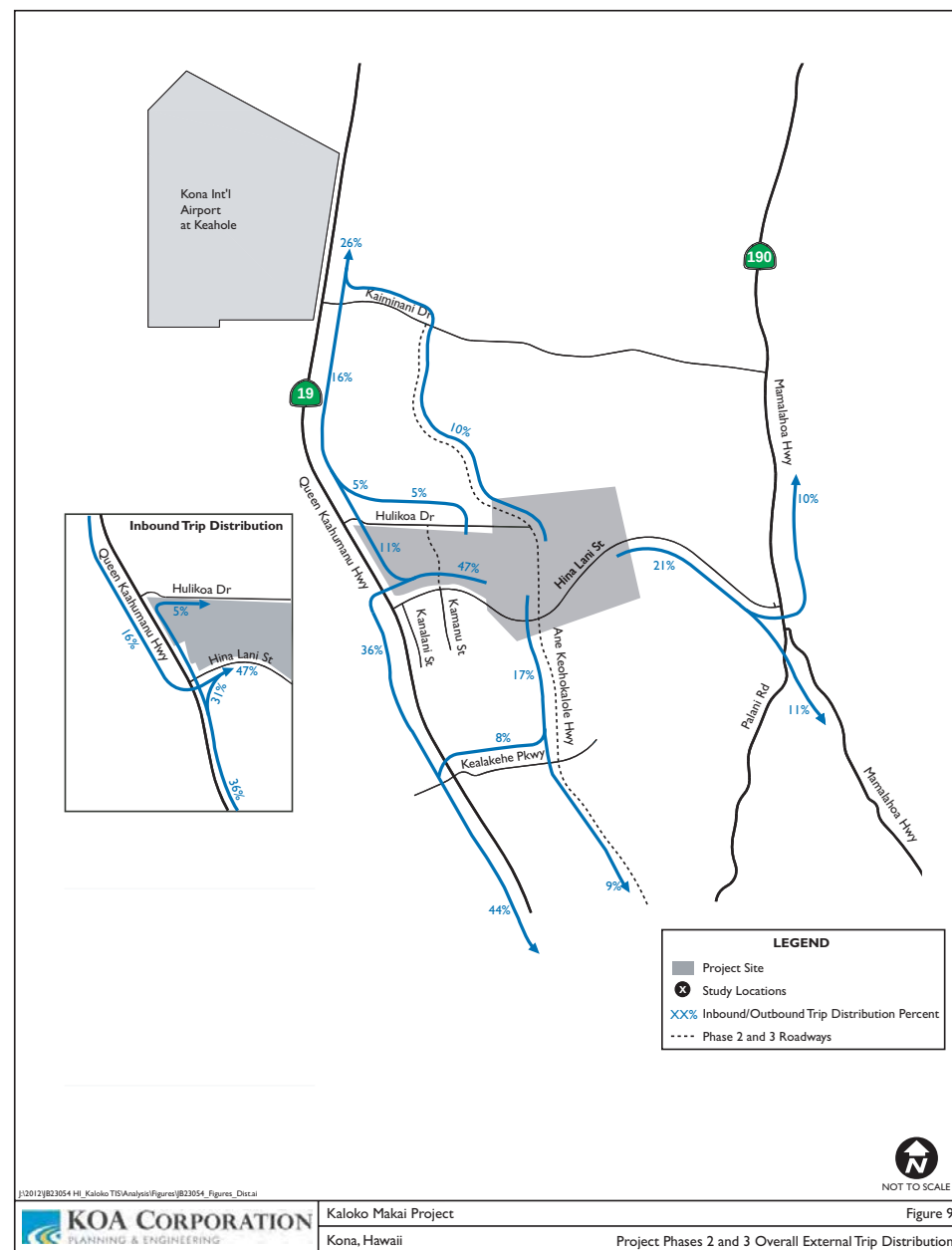
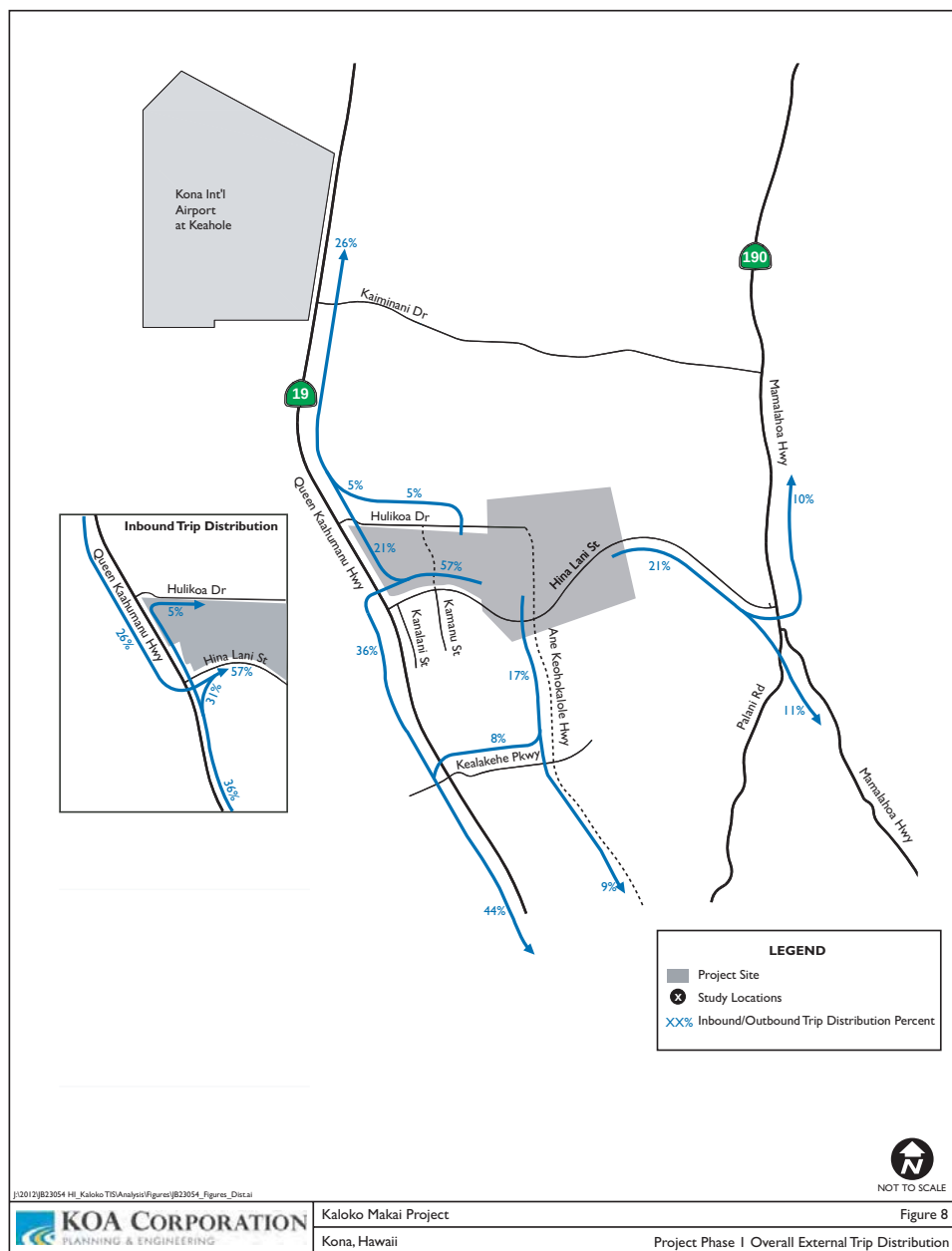
The future Ane Keohokalole Highway will be a two-lane Mid-Level Road that is planned to be constructed in a north-south direction between Queen Kaahumanu Highway and Mamalahoa Highway. By the first horizon year of this traffic (Year 2025), Ane Keohokalole Highway is anticipated to be completed between Huliko Drive and Palani Road to the south. As of June 2012, Ane Keohokalole Highway has been completed between Hina Lani Street and Kealakehe Parkway. The northerly extension of Ane Keohokalole Highway to Kaiminani Drive will be completed by 2028 (or near the beginning of Project Phase 2). The completion of Ane Keohokalole Highway will serve as a parallel corridor to relief traffic congestion on Queen Kaahumanu Highway and Mamalahoa Highway.

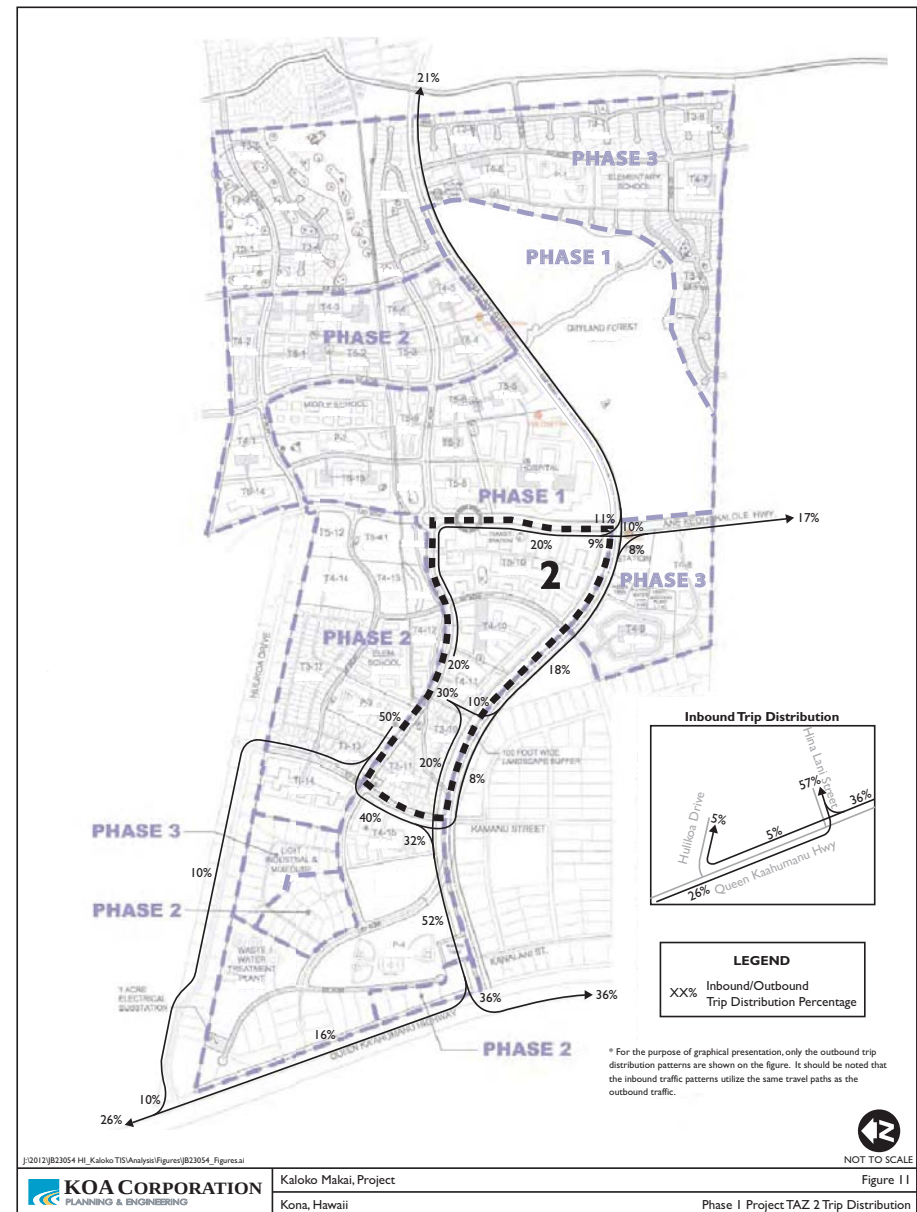
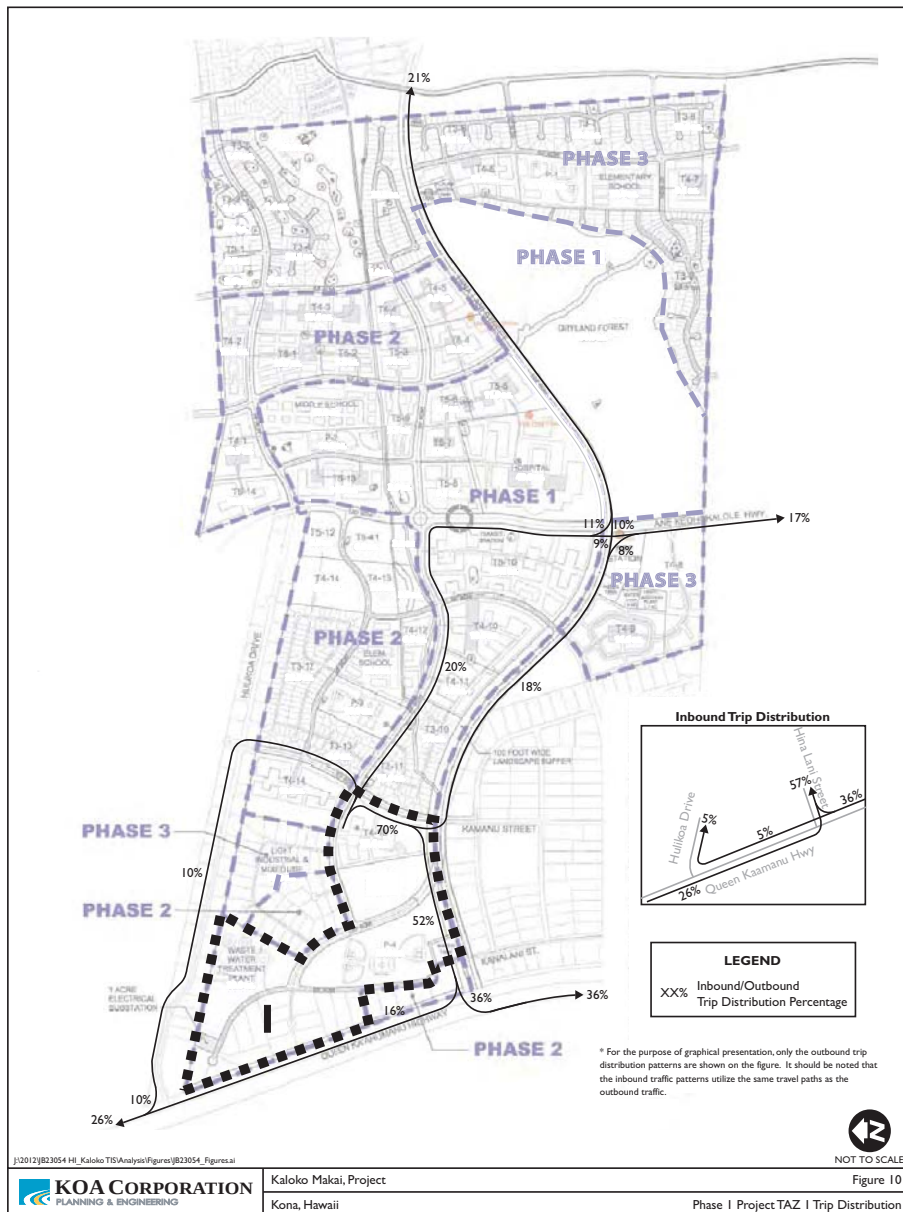
The project's overall external trip distribution patterns for Phase 1 of the proposed Kaloko Makai project are shown in Figure 8. Since the connectivity of the Mid-Level Road (Ane Keohokalole Highway) will be completed by 2028 (or near the beginning of Phase 2), the project distribution patterns for Phases 2 and 3 will be different than that of Phase 1. The project's overall external trip distribution patterns for Phases 2 and 3 of the proposed Kaloko Makai project are shown in Figure 9, which includes the northerly extension of Ane Keohokalole Highway to Kaiminani Drive. The Project Phase 1 trip distribution patterns for the first 3 TAZ's are shown in Figures 10 through 12. The Phases 2 and 3 trip distribution patterns for the 11 project TAZ's are shown in Figures 13 through 23.

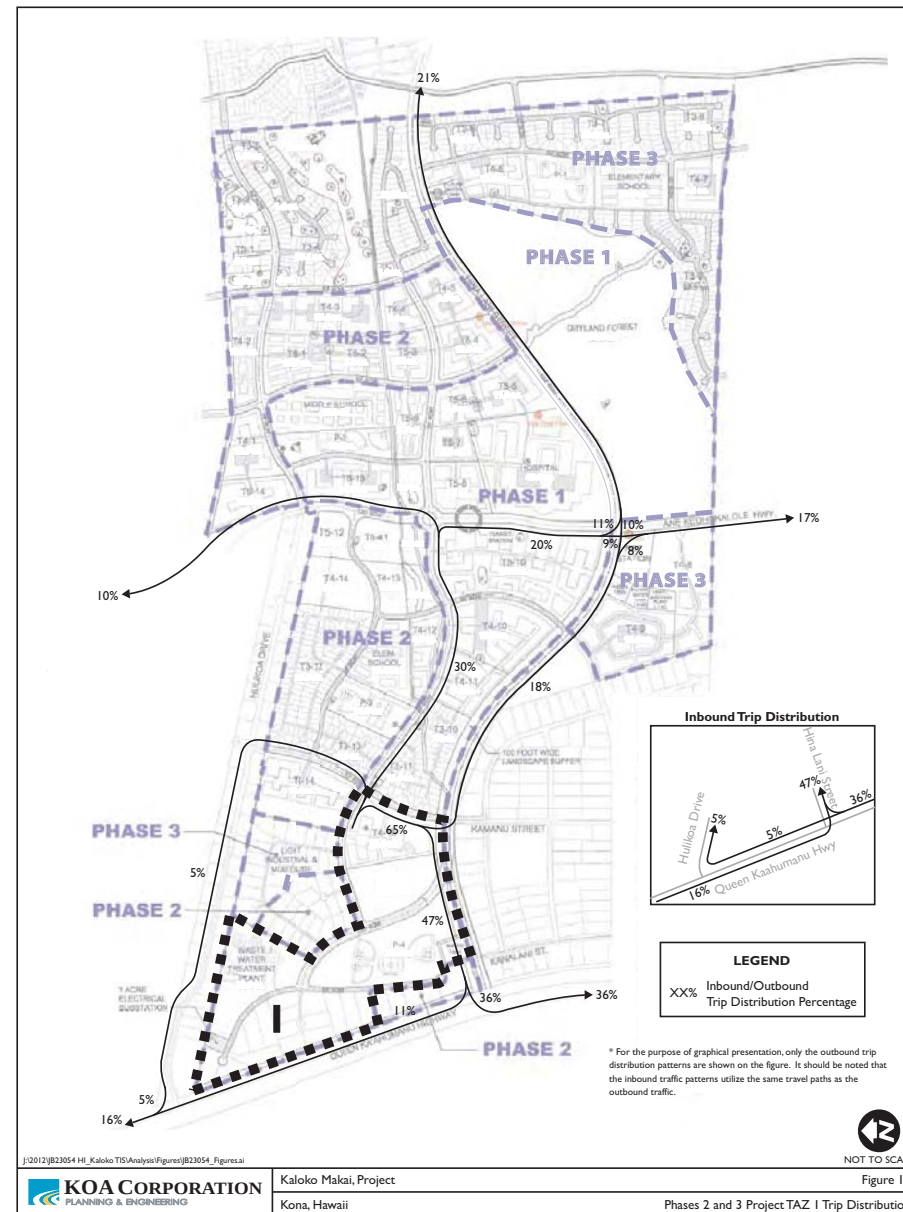
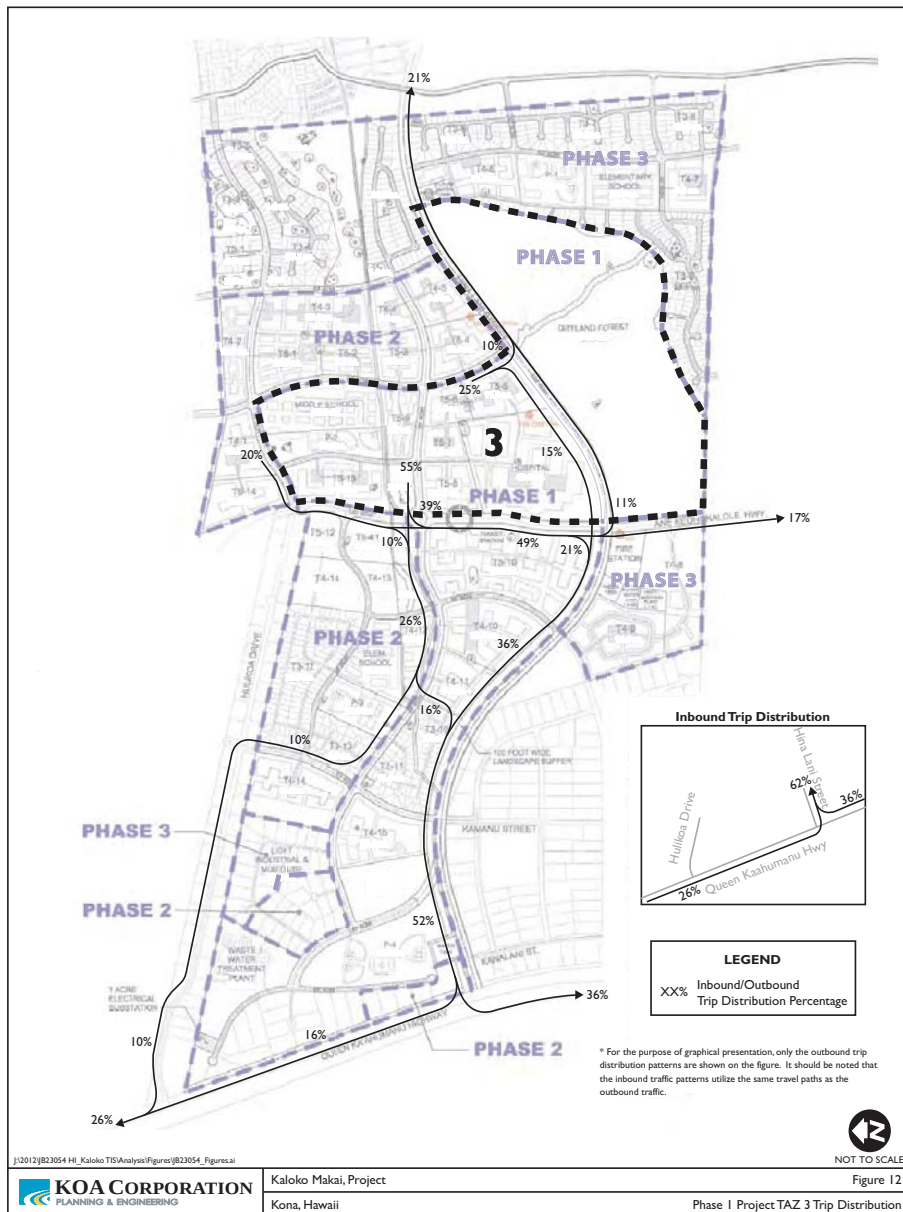
4.8 Project Trip Assignment

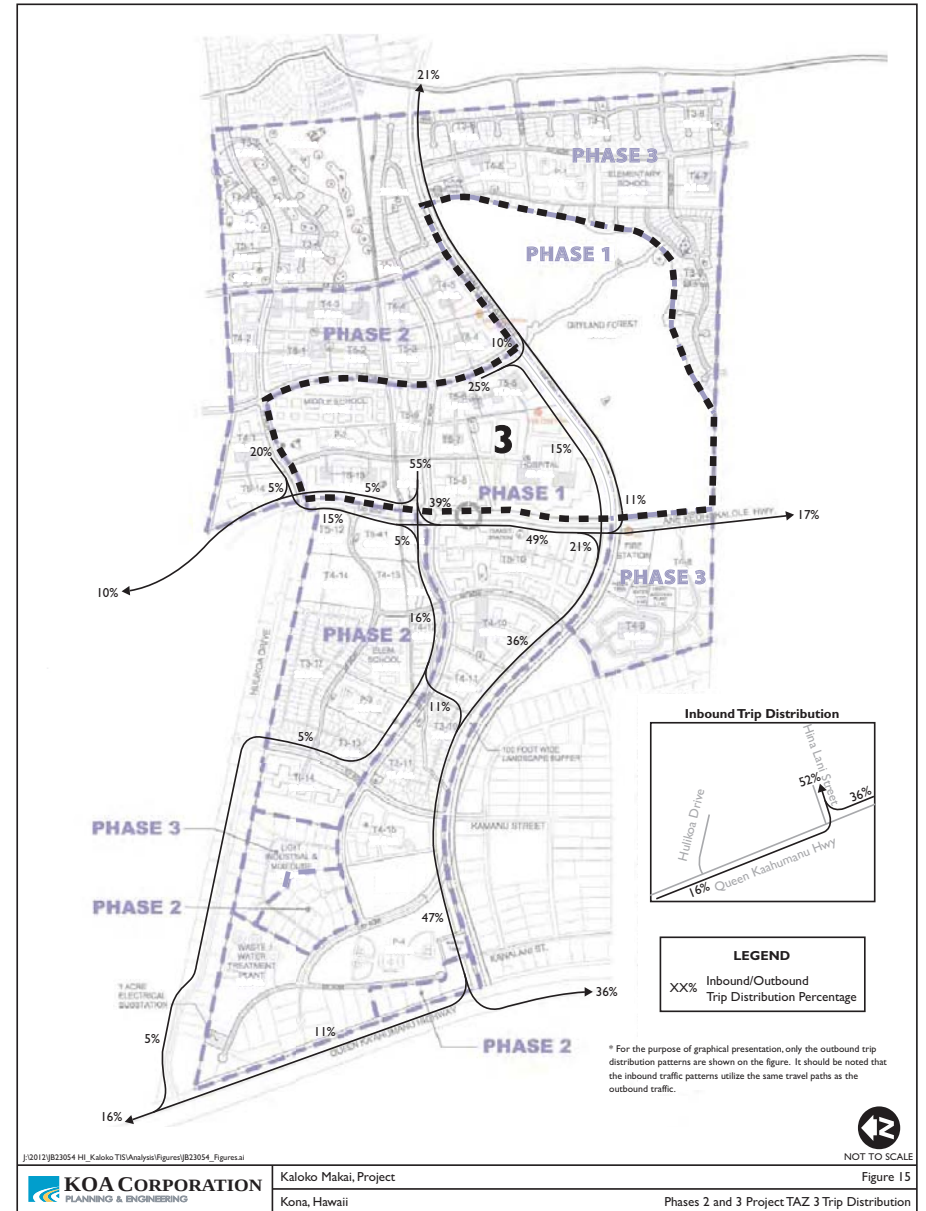
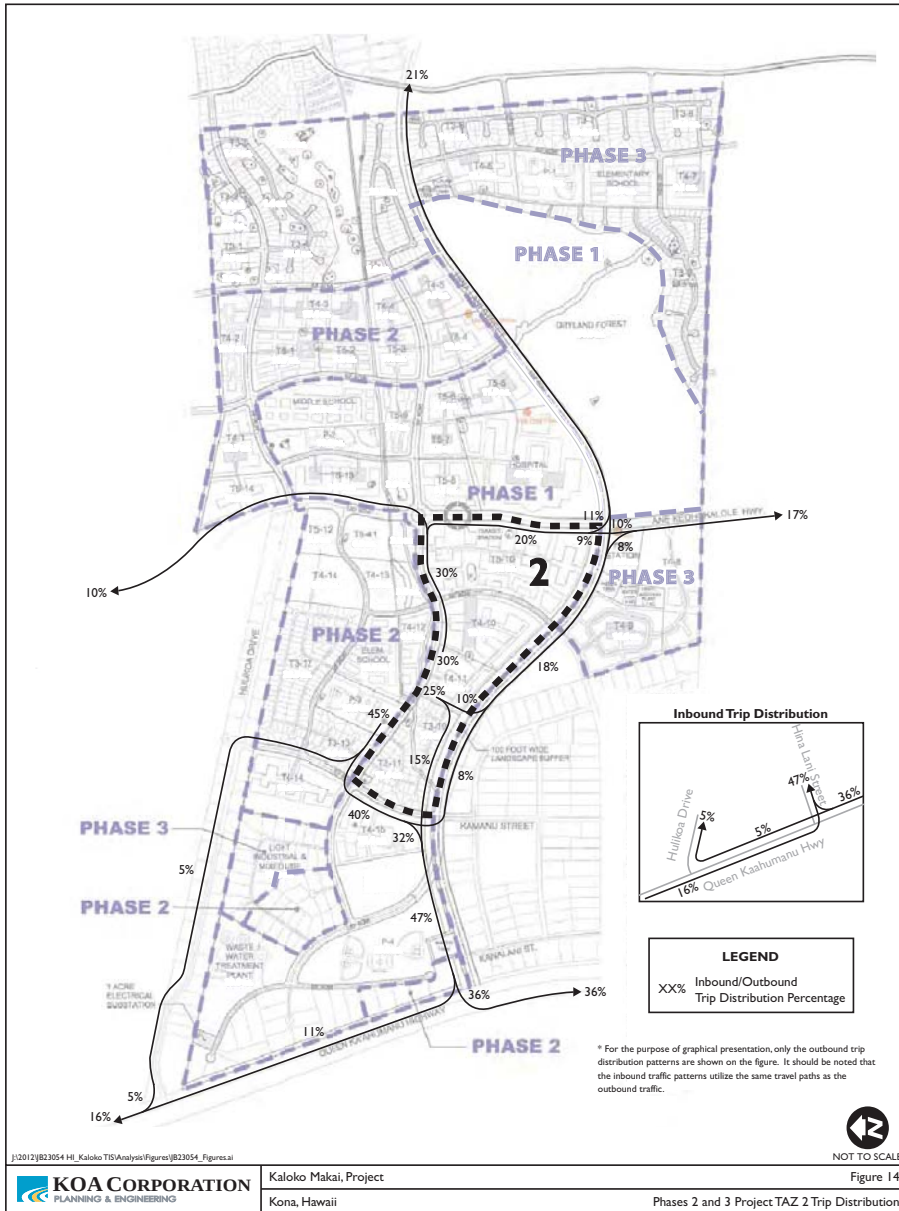
Based on the traffic generation and trip distribution patterns presented above, project-only traffic volumes are shown in the following tables and figures for the 3 project phases:

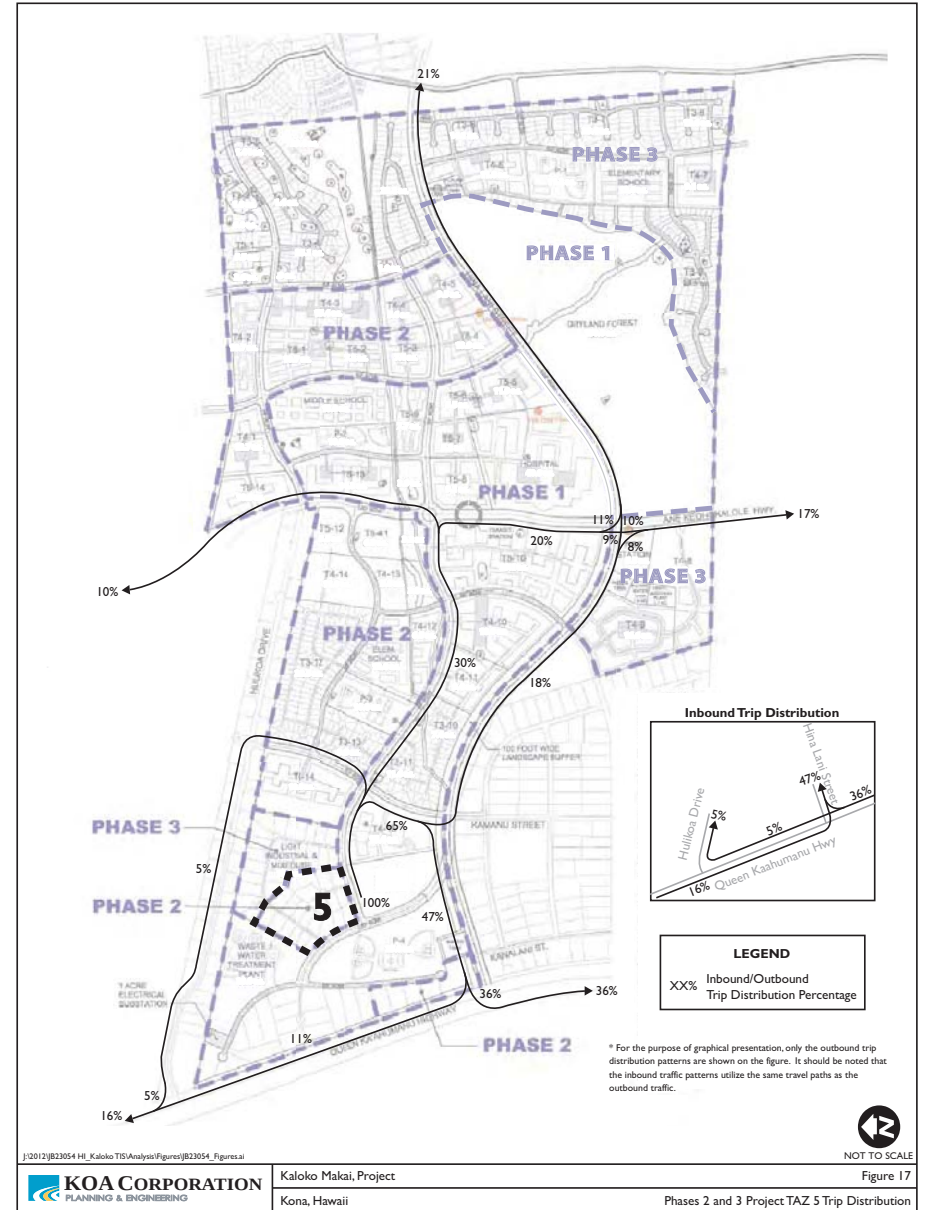
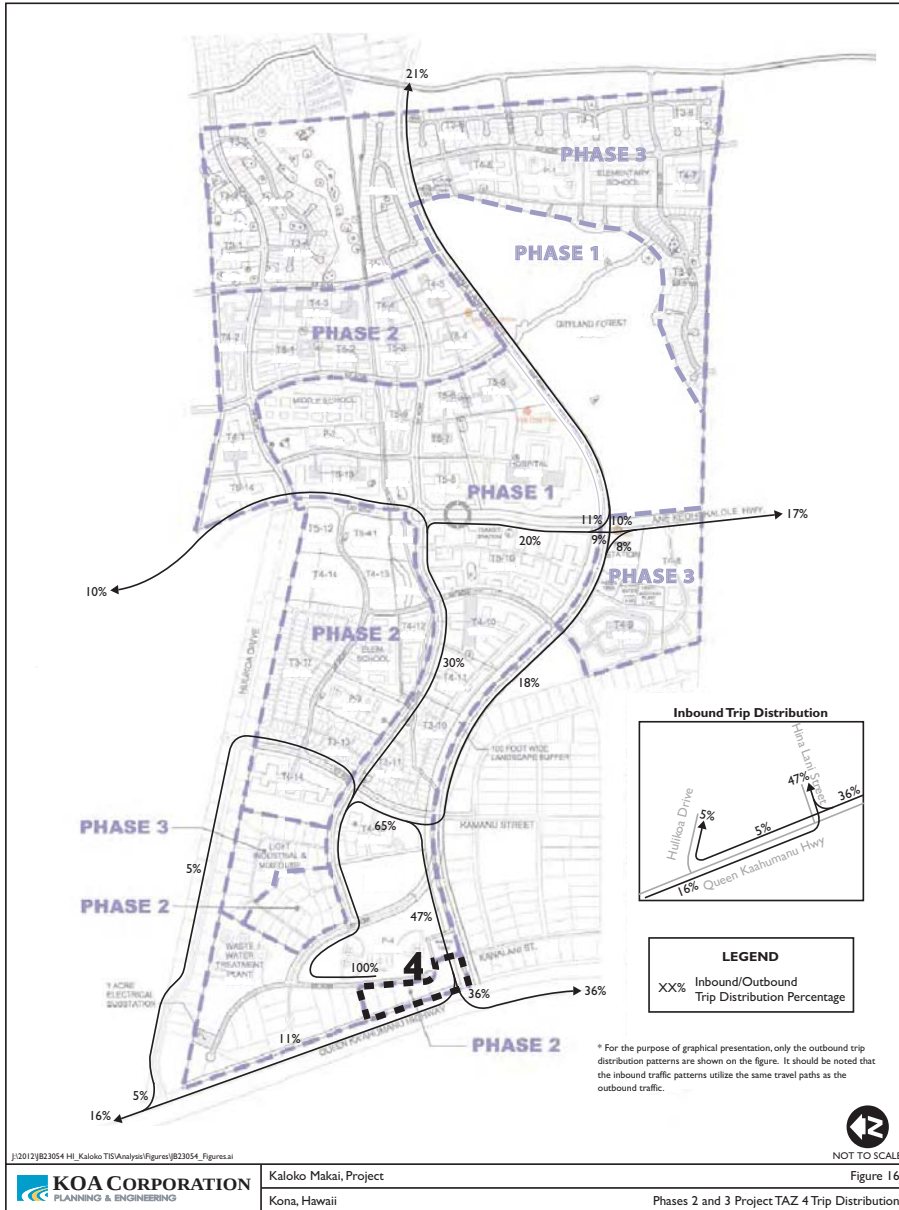
- Table 6, and Figures 24 and 25: Total Project Phase 1 Traffic
- Table 7, and Figures 26 and 27: Total Project Phase 2 Traffic
- Table 8, and Figures 28 and 29: Total Project Phase 3 Traffic

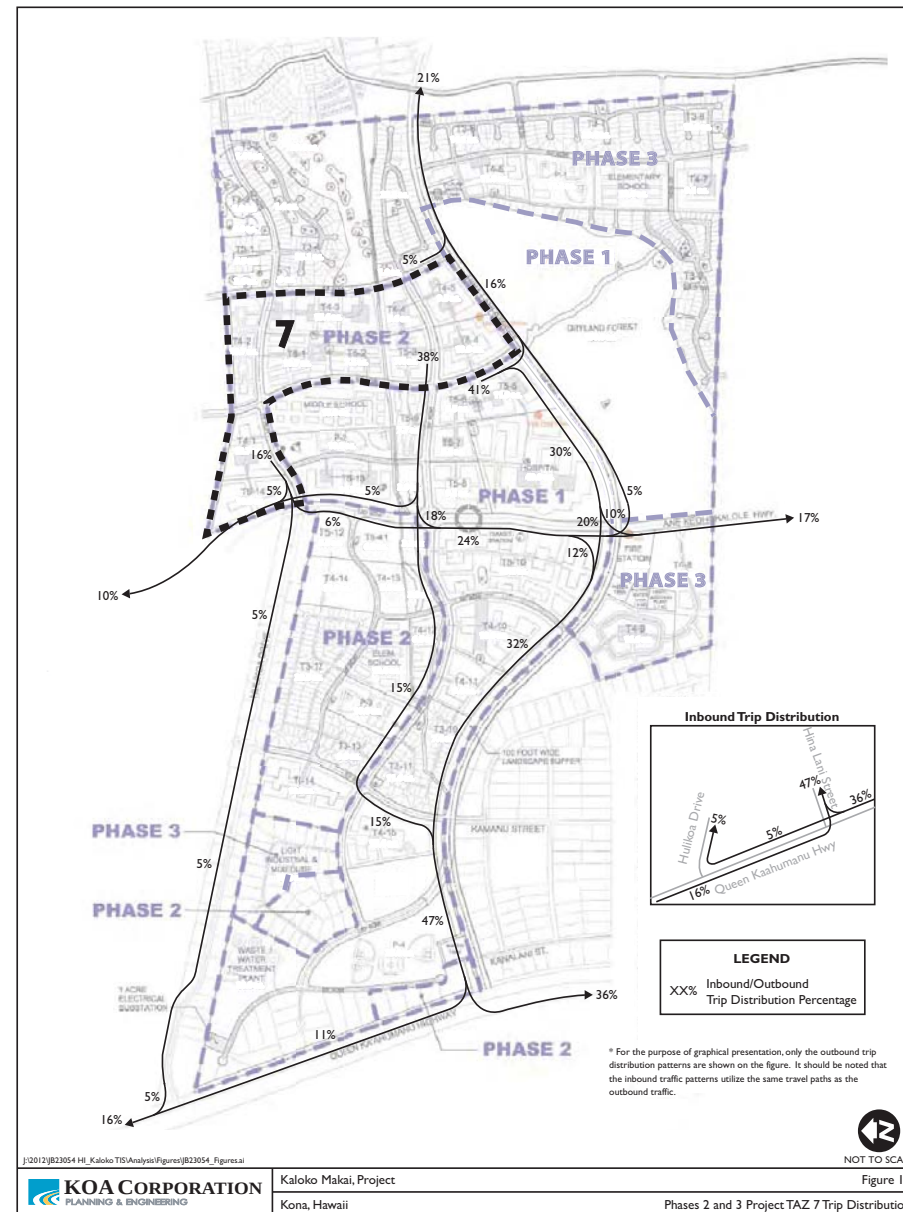
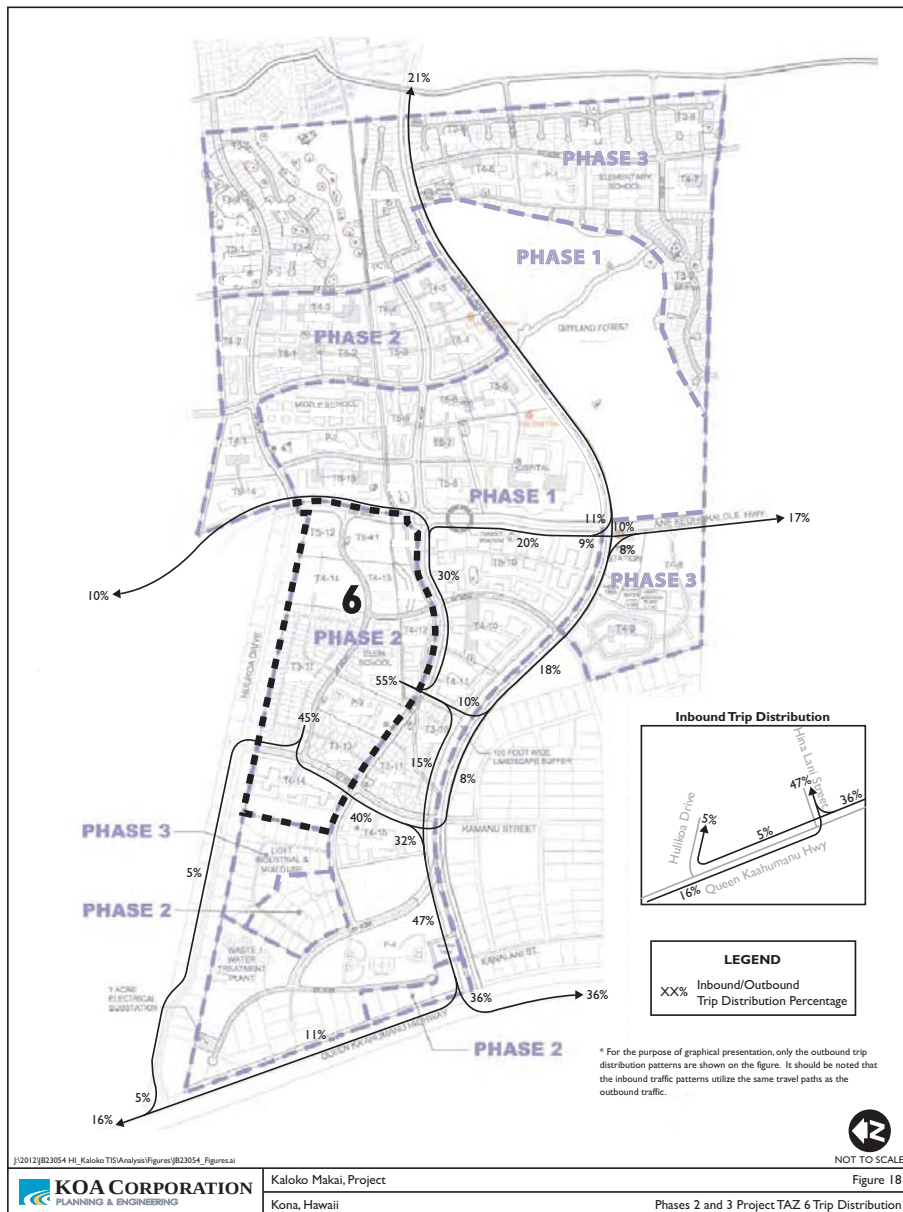


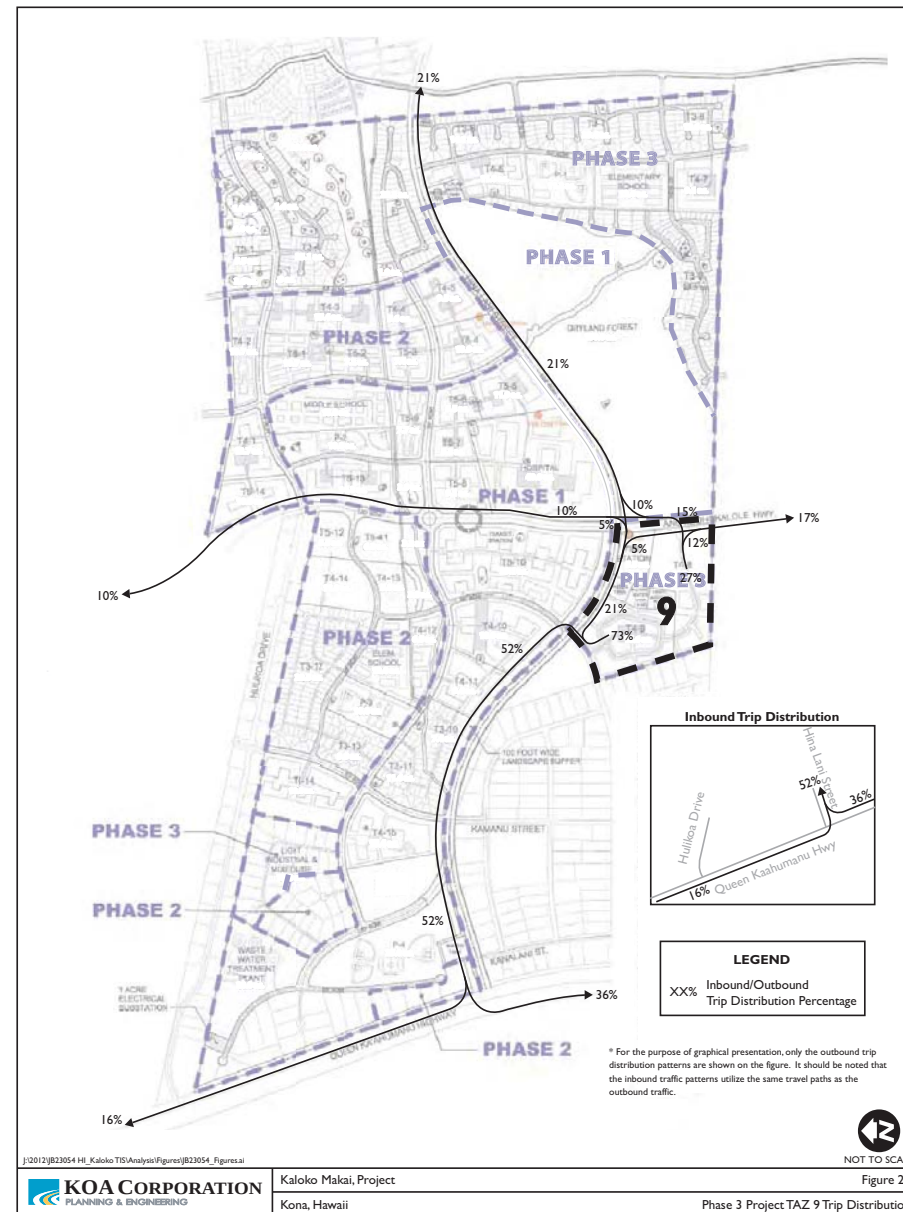
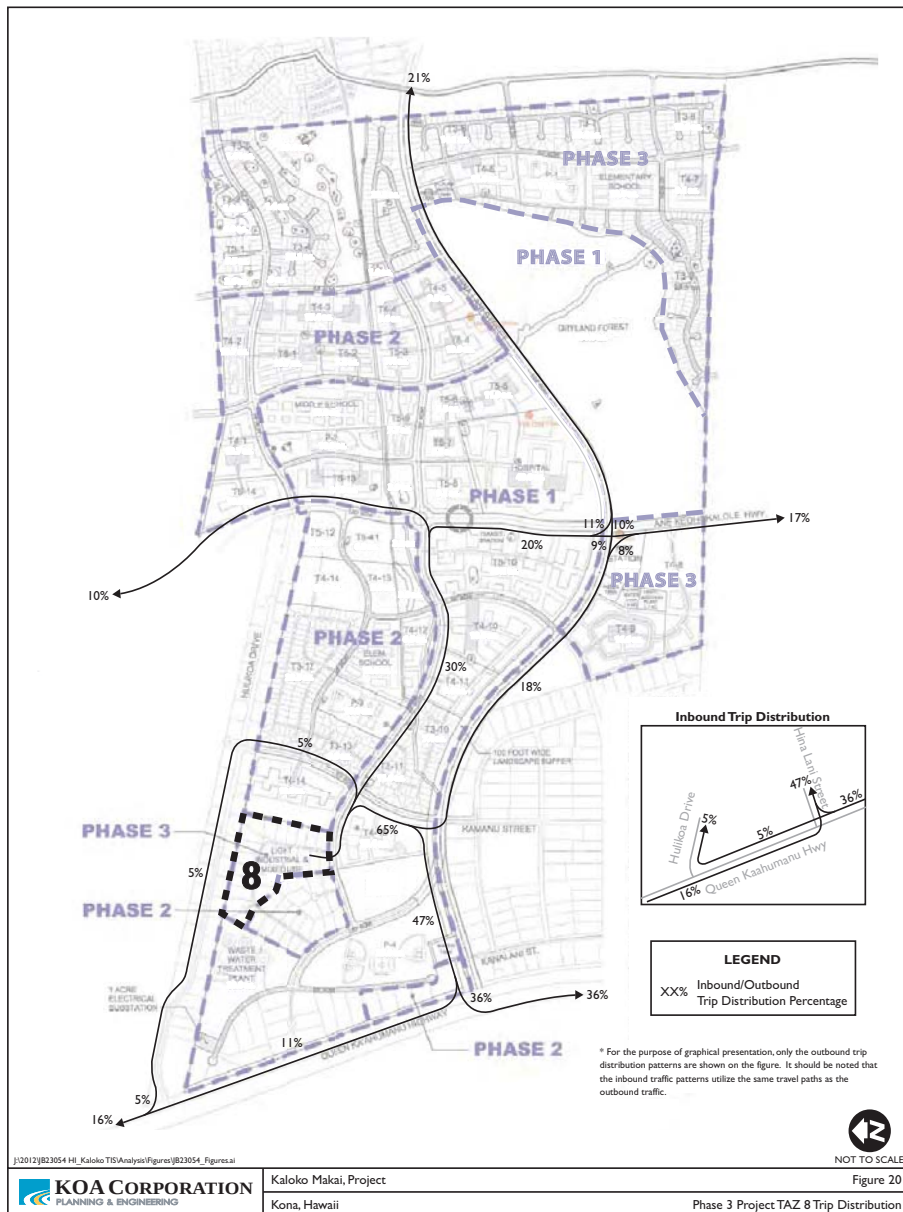












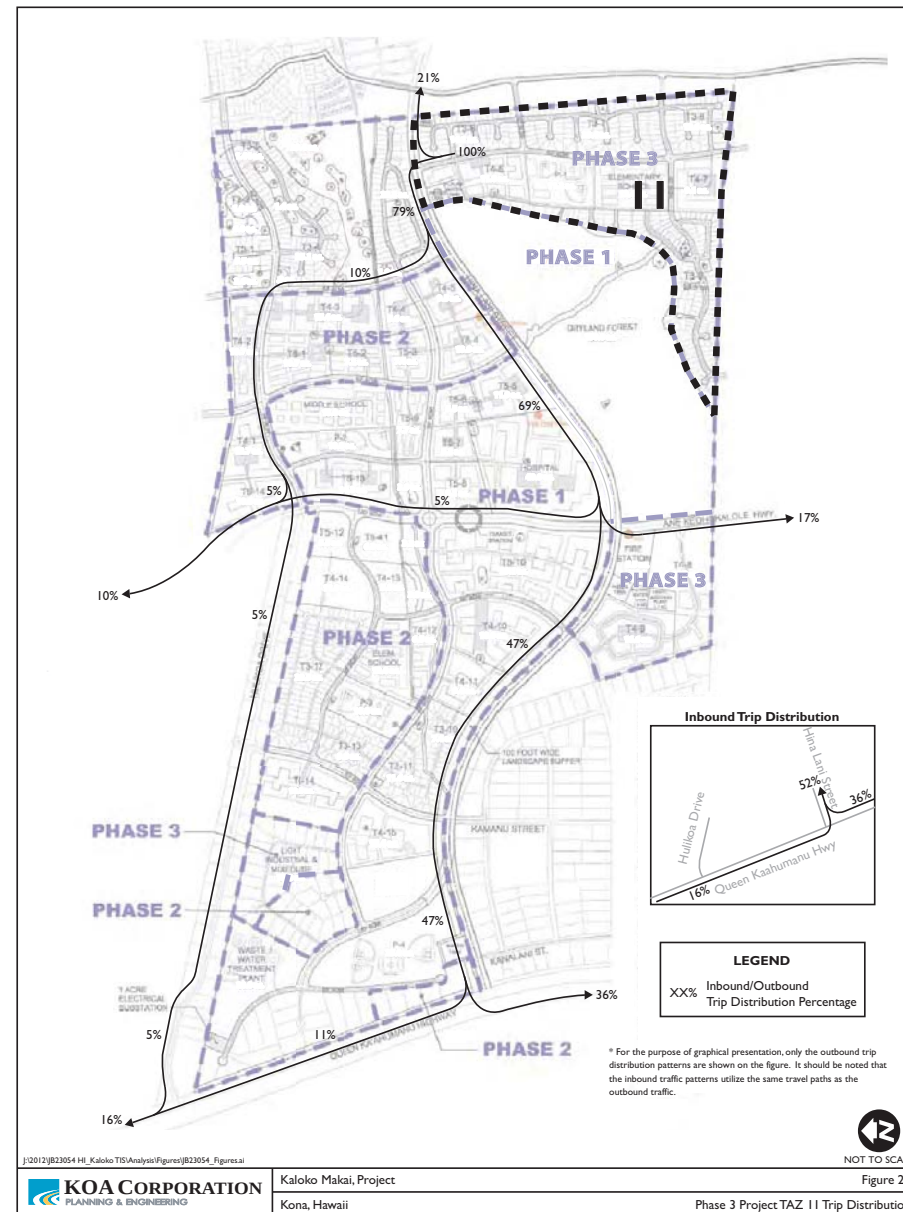
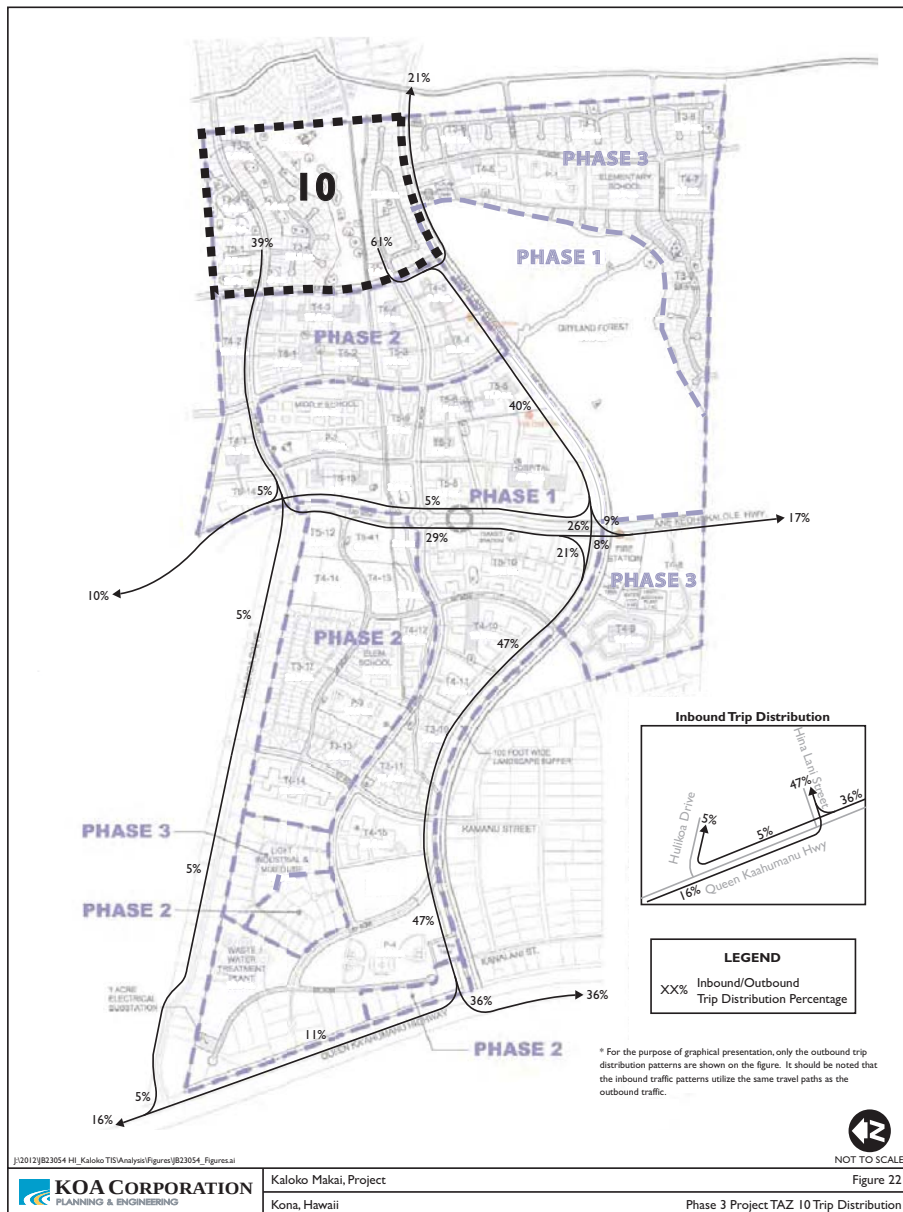
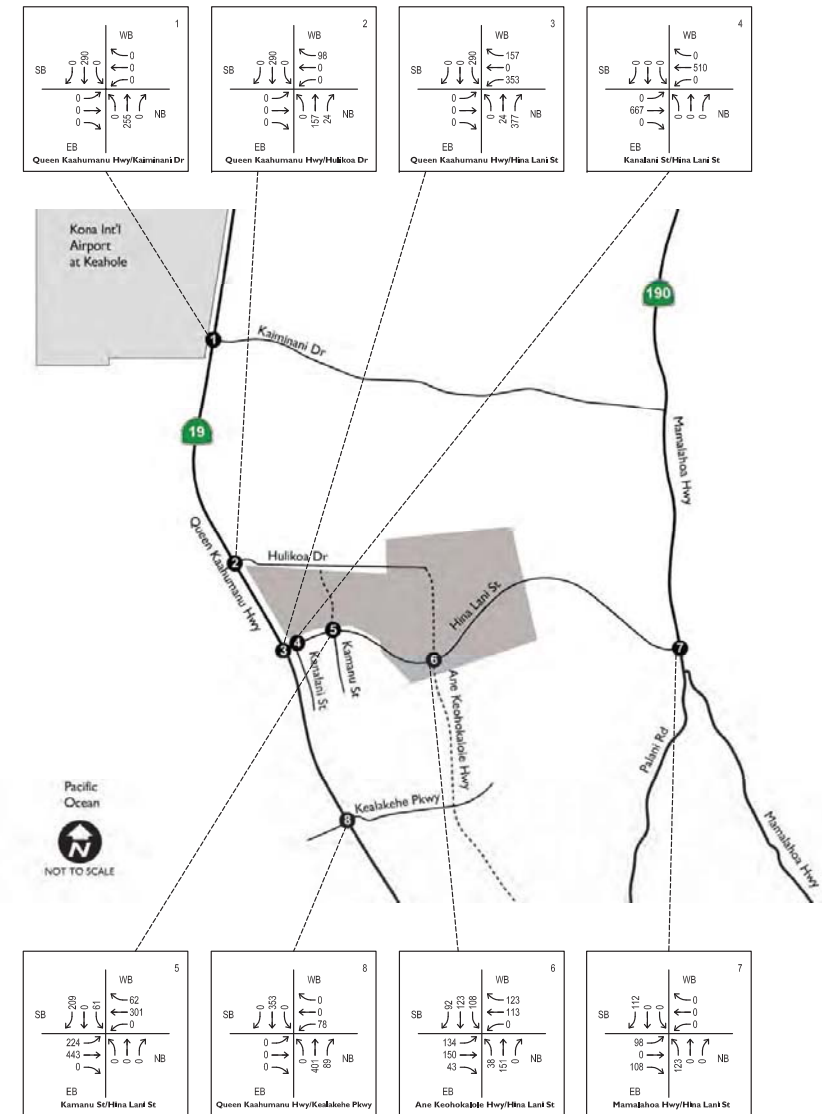


Table 6 - Phase I Project-Only Conditions Peak Hour Intersection Volumes

Int.	Intersection Name	Peak Hr.	Northbound			Southbound			Eastbound			Westbound			Total
			NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
1	Queen Kaahumanu Hwy./Kaiminani Dr.	AM	0	255	0	0	290	0	0	0	0	0	0	0	545
		PM	0	338	0	0	300	0	0	0	0	0	0	0	638
2	Queen Kaahumanu Hwy./Huliko Dr.	AM	0	157	24	0	290	0	0	0	0	0	0	98	569
		PM	0	208	32	0	300	0	0	0	0	0	0	130	670
3	Queen Kaahumanu Hwy./Hina Lani St.	AM	0	24	377	290	0	0	0	0	0	353	0	157	1,201
		PM	0	32	383	300	0	0	0	0	0	468	0	208	1,391
4	Kanalani St./Hina Lani St.	AM	0	0	0	0	0	0	0	667	0	0	510	0	1,177
		PM	0	0	0	0	0	0	0	683	0	0	676	0	1,359
5	Kamanu St./Hina Lani St.	AM	0	0	0	61	0	209	224	443	0	0	301	62	1,300
		PM	0	0	0	75	0	251	279	404	0	0	425	72	1,506
6	Ane Keohokalole Hwy./Hina Lani St.	AM	38	151	0	108	123	92	134	150	43	0	113	123	1,075
		PM	52	144	0	143	171	140	106	139	50	0	165	127	1,237
7	Mamalahoa Hwy./Hina Lani St.	AM	123	0	0	0	0	112	98	0	108	0	0	0	441
		PM	127	0	0	0	0	115	130	0	143	0	0	0	515
8	Queen Kaahumanu Hwy./Kealahou Pkwy.	AM	0	401	89	0	353	0	0	0	0	78	0	0	921
		PM	0	415	92	0	468	0	0	0	0	104	0	0	1,079



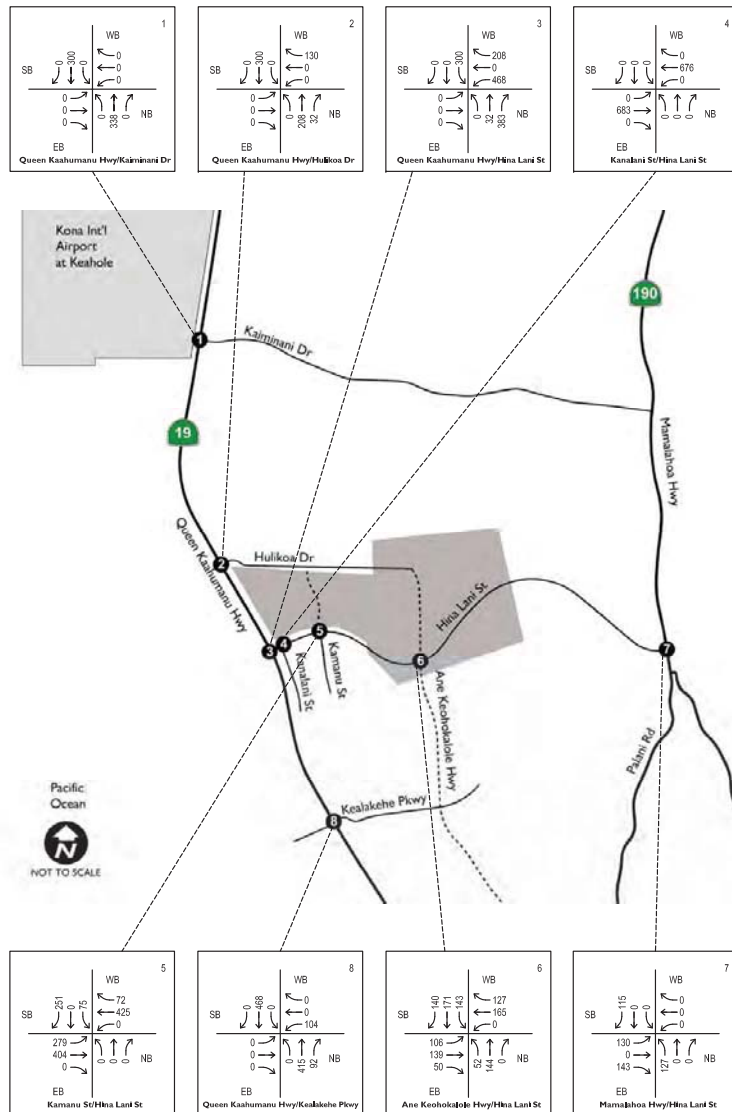


Table 7 - Phase 2 Project-Only Conditions Peak Hour Intersection Volumes

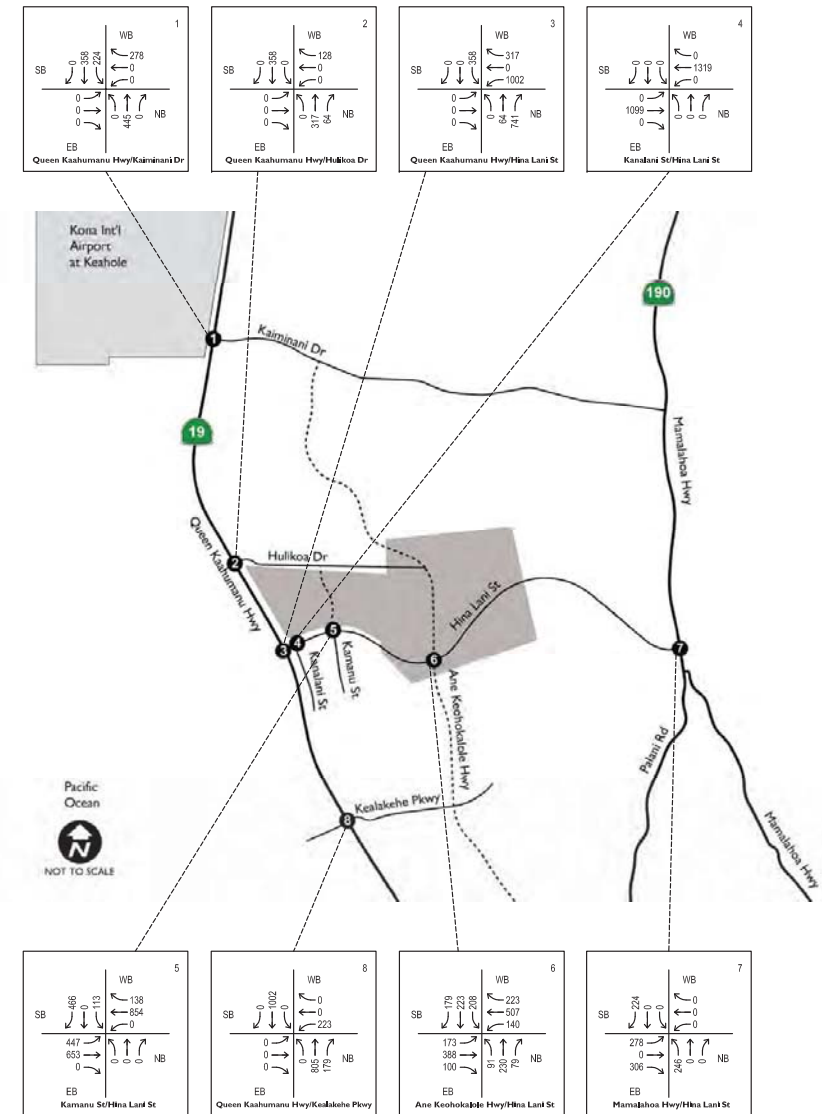
Int.	Intersection Name	Peak Hr.	Northbound			Southbound			Eastbound			Westbound			Total
			NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
1	Queen Kaahumanu Hwy./Kailani Dr.	AM	0	320	0	173	276	0	0	0	0	0	0	200	969
		PM	0	343	0	225	360	0	0	0	0	0	0	214	1,142
2	Queen Kaahumanu Hwy./Hulioka Dr.	AM	0	220	55	0	276	0	0	0	0	0	0	100	651
		PM	0	236	87	0	360	0	0	0	0	0	0	107	790
3	Queen Kaahumanu Hwy./Hina Lani St.	AM	0	55	567	276	0	0	0	0	0	721	0	220	1,839
		PM	0	87	722	360	0	0	0	0	0	772	0	236	2,177
4	Kailani St./Hina Lani St.	AM	0	0	0	0	0	0	0	843	0	0	941	0	1,784
		PM	0	0	0	0	0	0	0	1,081	0	0	1,008	0	2,089
5	Kailani St./Hina Lani St.	AM	0	0	0	108	0	451	377	466	0	0	491	112	2,005
		PM	0	0	0	129	0	471	501	580	0	0	537	120	2,338
6	Ane Keohokalole Hwy./Hina Lani St.	AM	73	203	17	192	206	149	154	239	87	48	253	180	1,801
		PM	96	232	53	215	240	182	171	296	90	34	290	215	2,114
7	Mamalahoe Hwy./Hina Lani St.	AM	190	0	0	0	0	173	200	0	220	0	0	0	783
		PM	247	0	0	0	0	225	214	0	236	0	0	0	922
8	Queen Kaahumanu Hwy./Kealahke Pkwy.	AM	0	622	138	0	721	0	0	0	0	160	0	0	1,641
		PM	0	809	180	0	772	0	0	0	0	172	0	0	1,933

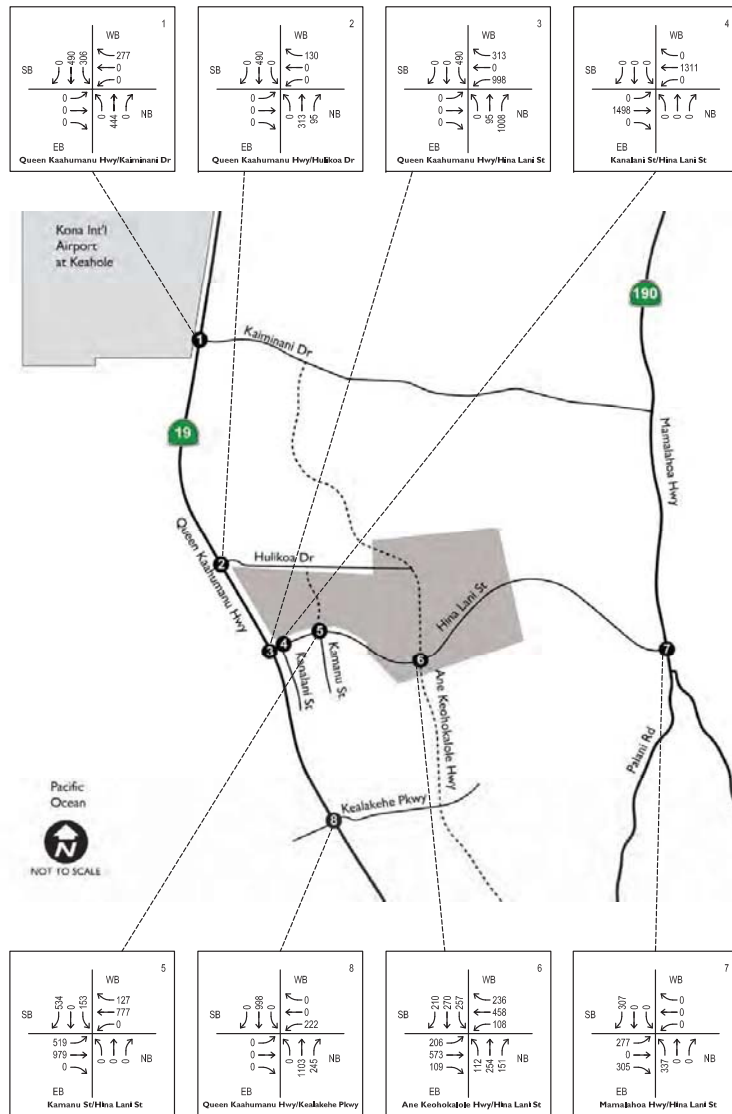
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Table 8 - Phase 3 Project-Only Conditions Peak Hour Intersection Volumes

Int.	Intersection Name	Peak Hr.	Northbound			Southbound			Eastbound			Westbound			Total
			NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
1	Queen Kaahumanu Hwy./Kaiminani Dr.	AM	0	445	0	224	358	0	0	0	0	0	0	278	1,305
		PM	0	444	0	306	490	0	0	0	0	0	0	277	1,517
2	Queen Kaahumanu Hwy./Huliko Dr.	AM	0	317	64	0	358	0	0	0	0	0	0	128	867
		PM	0	313	95	0	490	0	0	0	0	0	0	130	1,028
3	Queen Kaahumanu Hwy./Hina Lani St.	AM	0	64	741	358	0	0	0	0	0	1,002	0	317	2,482
		PM	0	95	1,008	490	0	0	0	0	0	998	0	313	2,904
4	Kanalani St./Hina Lani St.	AM	0	0	0	0	0	0	0	1,099	0	0	1,319	0	2,418
		PM	0	0	0	0	0	0	0	1,498	0	0	1,311	0	2,809
5	Kamanu St./Hina Lani St.	AM	0	0	0	113	0	466	447	653	0	0	854	138	2,671
		PM	0	0	0	153	0	534	519	979	0	0	777	127	3,089
6	Ane Keohokalole Hwy./Hina Lani St.	AM	91	230	79	208	223	179	173	388	100	140	507	223	2,541
		PM	112	254	151	257	270	210	206	573	109	108	458	236	2,944
7	Mamalahoe Hwy./Hina Lani St.	AM	246	0	0	0	0	224	278	0	306	0	0	0	1,054
		PM	337	0	0	0	0	307	277	0	305	0	0	0	1,226
8	Queen Kaahumanu Hwy./Kealahou Pkwy.	AM	0	805	179	0	1,002	0	0	0	0	223	0	0	2,209
		PM	0	1,103	245	0	998	0	0	0	0	222	0	0	2,568





4.9 Other Cumulative Development Traffic

Future traffic increases consider additional traffic that are generated by other cumulative developments that either are under construction, approved, planned, or proposed for development near the study area based on the available information obtained by the project team. Estimated trips from the cumulative developments have been assigned to the study area roadway system based on their anticipated travel patterns. This study includes the following 5 other cumulative developments in the vicinity of the project site, as shown in Figure 30:

- Kaloko Heights – 300 dwelling units of single-family detached housing
- Kule Nei – 270 dwelling units of single-family detached housing
- West Hawaii Business Park – Mixed use development
- Kohanaiki Business Park – A business park development
- Kaloko Industrial Park Phases 3 (2015) and Phase 4 (2025) – A 100-acre industrial park.

The cumulative development trip generation summary is shown in Table 9. The trip distribution patterns for the cumulative developments are included in Appendix H of this report. It should be noted that although there may be other projects planned in the Kona region, the development plan and implementation schedule for these projects are not known at this time. As such, for the purpose of this report, the cumulative effect of these other future projects is assumed to be captured by ambient growth traffic in the vicinity.

4.10 Ambient Background Growth

In addition to cumulative development traffic, other unidentified projects and general population growth will contribute to ambient background traffic growth. Ambient growth is calculated as an annual growth percentage increase from existing traffic count volumes.

Based on a comparison of the historic traffic count data from 1996 through 2010 for the segment of Queen Kaahumanu Highway north of OTEC Access Road (Station T8M), an average annual growth rate of 1.74% is calculated as shown in Appendix I of this report. KOA has reviewed available traffic data and other similar traffic studies in the surrounding area, and it appears that an annual growth rate of 1.74% is comparable and consistent to other available data. Therefore, this study utilized a 1.74% ambient growth rate to assess future traffic conditions. The total ambient growth rates for the 3 analysis horizon years are as follow:

- Phase 1 (2025) – 29.6%
- Phase 2 (2035) – 54.0%
- Phase 3 (2045) – 83.1%

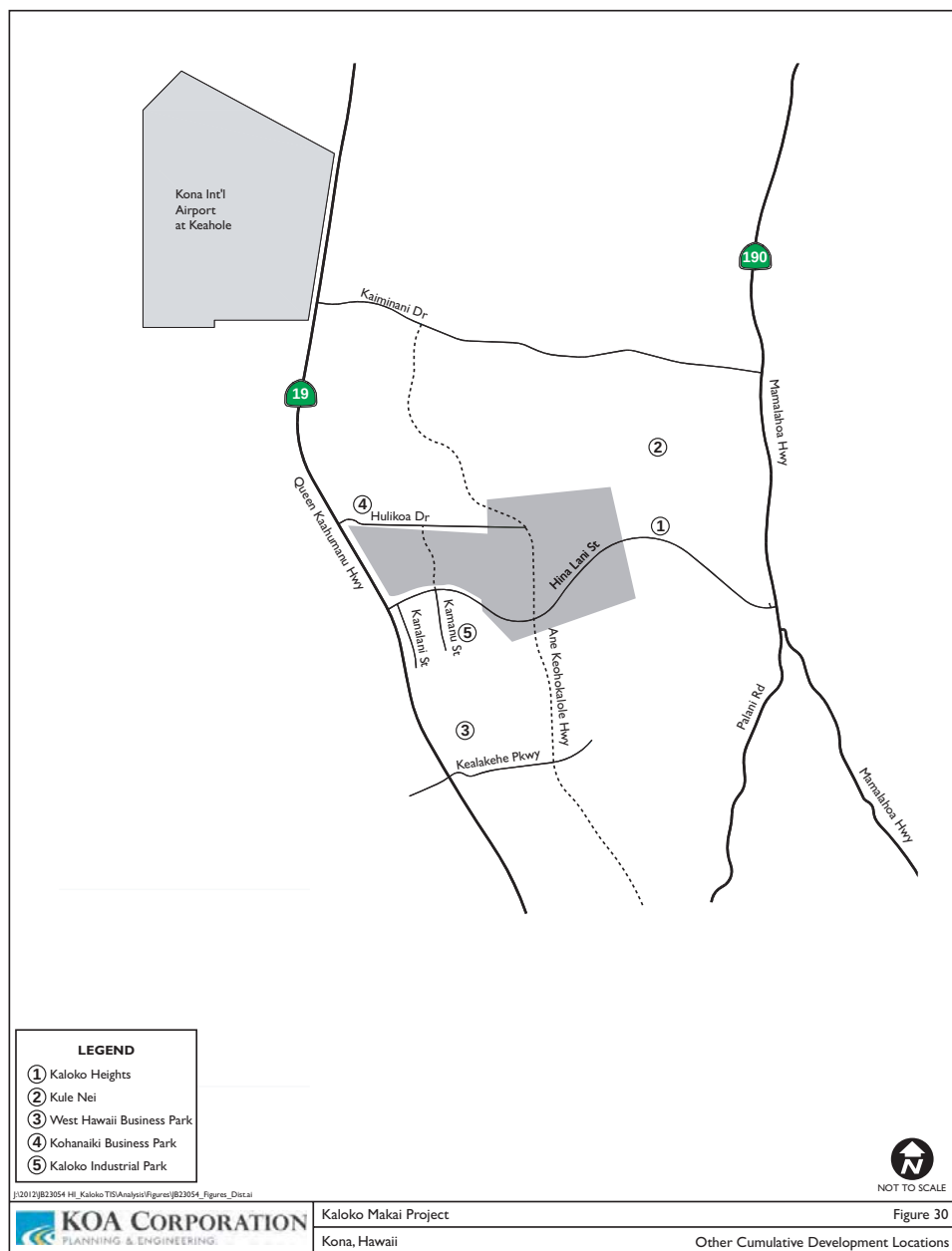


Table 9 - Other Cumulative Development Traffic Generation

No.	Name	Year	Land Use	Quantity	Daily Trips	AM Peak Hour			PM Peak Hour		
						Total	In	Out	Total	In	Out
1	Kaloko Heights	2015	Single-Family Housing	300 DU	2,871	225	57	168	303	192	111
2	Kule Nei	2015	Single-Family Housing	270 DU	2,584	202	51	151	273	173	100
3	West Hawaii Business Park	2015	Mixed-Use	n/a	22,691	1,098	822	276	2,294	911	1,383
4	Kohanaiki Business Park	2015	Business Park	n/a	1,197	146	81	65	121	52	69
5	Kaloko Industrial Park	2025	Industrial Park	60.7 AC	3,831	519	431	88	537	113	424
Total Cumulative 2025 Traffic					33,174	2,190	1,442	748	3,528	1,441	2,087

The 1.74% ambient growth rate is applied to the north-south directional through traffic along major highways to account for regional growth in the study area, including Queen Kaahumanu Highway, Mamalahoa Highway, and the intersection of Queen Kaahumanu Highway at Kaiminani Drive. Other intersection traffic movements not covered by the 1.74% north-south regional growth will be assessed by the traffic volumes generated by other cumulative developments in the study area. The ambient growth rate calculations are included in Appendix I of this report.

4.11 Future Traffic Volumes

Based on the traffic forecast methodologies mentioned above, the future traffic volumes for the study area intersections and analysis years assessed in this traffic study are shown in the following tables:

- Table 10 – 2025 Without Project Traffic
- Table 11 – 2025 With Project Phase 1 Traffic
- Table 12 – 2035 Without Project Traffic
- Table 13 – 2035 With Project Phase 2 Traffic
- Table 14 – 2045 Without Project Traffic
- Table 15 – 2045 With Project Phase 3 Traffic

Table 10 - 2025 Without Project Conditions Peak Hour Intersection Volumes

Int.	Intersection Name	Peak Hr.	Northbound			Southbound			Eastbound			Westbound			Total
			NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
1	Queen Kaahumanu Hwy./Kaiminani Dr.	AM	0	869	109	33	830	0	0	0	0	480	0	244	2,565
		PM	0	1,135	387	226	1,114	0	0	0	0	180	0	84	3,126
2	Queen Kaahumanu Hwy./Hulikoa Dr.	AM	0	881	299	0	1,333	0	0	0	0	0	0	247	2,760
		PM	0	1,340	174	0	1,604	0	0	0	0	0	0	274	3,392
3	Queen Kaahumanu Hwy./Hina Lani St.	AM	0	752	433	382	1,032	0	0	0	0	275	0	270	3,144
		PM	0	1,105	594	358	1,154	0	0	0	0	544	0	414	4,169
4	Kanalani St./ Hina Lani St.	AM	225	0	18	0	0	0	0	322	363	29	339	0	1,296
		PM	200	0	74	0	0	0	0	343	489	17	669	0	1,792
5	Kamanu St./ Hina Lani St.	AM	134	0	77	0	0	0	0	130	198	202	243	0	984
		PM	479	0	326	0	0	0	0	247	122	127	184	0	1,485
6	Ane Keohokalole Hwy./Hina Lani St.	AM	129	9	64	0	11	0	0	164	26	189	437	0	1,029
		PM	34	7	282	0	9	0	0	561	127	180	269	0	1,469
7	Mamalahoa Hwy./ Hina Lani St.	AM	150	378	0	0	1,307	270	110	0	103	0	0	0	2,318
		PM	104	740	0	0	552	213	382	0	246	0	0	0	2,237
8	Queen Kaahumanu Hwy./Kealahoe Pkwy.	AM	68	1,063	441	240	878	48	17	7	24	270	18	166	3,240
		PM	60	1,276	264	143	1,564	44	59	19	71	412	20	192	4,124

Table 11 - 2025 With Project Phase I Conditions Peak Hour Intersection Volumes

Int.	Intersection Name	Peak Hr.	Northbound			Southbound			Eastbound			Westbound			Total
			NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
1	Queen Kaahumanu Hwy./Kaiminani Dr.	AM	0	1,124	109	33	1,120	0	0	0	0	480	0	244	3,110
		PM	0	1,473	387	226	1,414	0	0	0	0	180	0	84	3,764
2	Queen Kaahumanu Hwy./Huliko Dr.	AM	0	1,037	323	0	1,623	0	0	0	0	0	0	345	3,328
		PM	0	1,548	206	0	1,904	0	0	0	0	0	0	404	4,062
3	Queen Kaahumanu Hwy./Hina Lani St.	AM	0	775	810	672	1,032	0	0	0	0	627	0	427	4,343
		PM	0	1,138	977	658	1,154	0	0	0	0	1,012	0	622	5,561
4	Kanalani St./ Hina Lani St.	AM	225	0	18	0	0	0	0	990	363	29	849	0	2,474
		PM	200	0	74	0	0	0	0	1,026	489	17	1,345	0	3,151
5	Kamanu St./ Hina Lani St.	AM	134	0	77	61	0	209	224	573	198	202	544	62	2,284
		PM	479	0	326	75	0	251	279	651	122	127	608	72	2,990
6	Ane Keohokalole Hwy./Hina Lani St.	AM	168	160	64	108	134	92	134	313	70	189	550	123	2,105
		PM	86	151	282	143	180	140	106	700	178	180	434	127	2,707
7	Mamalahoa Hwy./ Hina Lani St.	AM	273	378	0	0	1,307	382	208	0	211	0	0	0	2,759
		PM	231	740	0	0	552	328	512	0	389	0	0	0	2,752
8	Queen Kaahumanu Hwy./Kealahou Pkwy.	AM	68	1,464	530	240	1,231	48	17	7	24	348	18	166	4,161
		PM	60	1,691	356	143	2,032	44	59	19	71	516	20	192	5,203

Table 12 - 2035 Without Project Conditions Peak Hour Intersection Volumes

Int.	Intersection Name	Peak Hr.	Northbound			Southbound			Eastbound			Westbound			Total
			NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
1	Queen Kaahumanu Hwy./Kaiminani Dr.	AM	0	941	109	188	766	0	0	0	0	480	0	310	2,794
		PM	0	1,038	387	363	1,131	0	0	0	0	180	0	303	3,402
2	Queen Kaahumanu Hwy./Huliko Dr.	AM	0	953	299	0	1,268	0	0	0	0	0	0	247	2,767
		PM	0	1,242	174	0	1,621	0	0	0	0	0	0	274	3,311
3	Queen Kaahumanu Hwy./Hina Lani St.	AM	0	862	433	308	1,041	0	0	0	0	275	0	231	3,150
		PM	0	1,088	594	312	1,216	0	0	0	0	544	0	333	4,087
4	Kanalani St./ Hina Lani St.	AM	225	0	18	0	0	0	0	249	363	29	301	0	1,185
		PM	200	0	74	0	0	0	0	297	489	17	589	0	1,666
5	Kamanu St./ Hina Lani St.	AM	121	0	81	0	0	0	0	121	133	224	218	0	898
		PM	415	0	347	0	0	0	0	218	105	133	167	0	1,385
6	Ane Keohokalole Hwy./Hina Lani St.	AM	129	121	141	9	334	65	13	155	26	420	411	25	1,849
		PM	34	266	398	29	184	17	64	532	127	257	252	17	2,177
7	Mamalahoa Hwy./ Hina Lani St.	AM	150	291	0	0	1,078	501	187	0	103	0	0	0	2,310
		PM	104	634	0	0	493	290	498	0	246	0	0	0	2,265
8	Queen Kaahumanu Hwy./Kealahou Pkwy.	AM	68	1,201	441	199	969	48	17	7	24	270	18	152	3,414
		PM	60	1,397	264	98	1,717	44	59	19	71	412	20	123	4,284

Table 13 - 2035 With Project Phase 2 Conditions Peak Hour Intersection Volumes

Int.	Intersection Name	Peak Hr.	Northbound			Southbound			Eastbound			Westbound			Total
			NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
1	Queen Kaahumanu Hwy./Kaiminani Dr.	AM	0	1,261	109	361	1,042	0	0	0	0	480	0	510	3,763
		PM	0	1,381	387	587	1,490	0	0	0	0	180	0	517	4,542
2	Queen Kaahumanu Hwy./Huliko Dr.	AM	0	1,173	353	0	1,545	0	0	0	0	0	0	347	3,418
		PM	0	1,478	261	0	1,980	0	0	0	0	0	0	381	4,100
3	Queen Kaahumanu Hwy./Hina Lani St.	AM	0	916	1,000	585	1,041	0	0	0	0	996	0	452	4,990
		PM	0	1,175	1,316	671	1,216	0	0	0	0	1,315	0	569	6,262
4	Kanalani St./Hina Lani St.	AM	225	0	18	0	0	0	0	1,093	363	29	1,242	0	2,970
		PM	200	0	74	0	0	0	0	1,378	489	17	1,597	0	3,755
5	Kamanu St./Hina Lani St.	AM	121	0	81	108	0	451	377	588	133	224	709	112	2,904
		PM	415	0	347	129	0	471	501	798	105	133	704	120	3,723
6	Ane Keohokalole Hwy./Hina Lani St.	AM	203	323	158	200	540	214	168	394	114	467	664	205	3,650
		PM	130	498	452	244	424	199	234	829	218	291	542	232	4,293
7	Mamalahoa Hwy./Hina Lani St.	AM	340	291	0	0	1,078	674	388	0	324	0	0	0	3,095
		PM	352	634	0	0	493	515	712	0	482	0	0	0	3,188
8	Queen Kaahumanu Hwy./Kealahoe Pkwy.	AM	68	1,822	579	199	1,691	48	17	7	24	430	18	152	5,055
		PM	60	2,206	444	98	2,489	44	59	19	71	583	20	123	6,216

Table 14 - 2045 Without Project Conditions Peak Hour Intersection Volumes

Int.	Intersection Name	Peak Hr.	Northbound			Southbound			Eastbound			Westbound			Total
			NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
1	Queen Kaahumanu Hwy./Kaiminani Dr.	AM	0	1,104	109	188	875	0	0	0	0	480	0	310	3,066
		PM	0	1,183	387	363	1,312	0	0	0	0	180	0	303	3,728
2	Queen Kaahumanu Hwy./Huliko Dr.	AM	0	1,116	299	0	1,377	0	0	0	0	0	0	247	3,039
		PM	0	1,387	174	0	1,802	0	0	0	0	0	0	274	3,637
3	Queen Kaahumanu Hwy./Hina Lani St.	AM	0	1,025	433	308	1,150	0	0	0	0	275	0	231	3,422
		PM	0	1,233	594	312	1,397	0	0	0	0	544	0	333	4,413
4	Kanalani St./Hina Lani St.	AM	225	0	18	0	0	0	0	249	363	29	301	0	1,185
		PM	200	0	74	0	0	0	0	297	489	17	589	0	1,666
5	Kamanu St./Hina Lani St.	AM	121	0	81	0	0	0	0	121	133	224	218	0	898
		PM	415	0	347	0	0	0	0	218	105	133	167	0	1,385
6	Ane Keohokalole Hwy./Hina Lani St.	AM	129	144	156	9	388	65	13	155	26	464	411	25	1,985
		PM	34	294	419	29	207	17	64	532	127	272	252	17	2,264
7	Mamalahoa Hwy./Hina Lani St.	AM	150	342	0	0	1,269	545	202	0	103	0	0	0	2,611
		PM	104	739	0	0	578	305	519	0	246	0	0	0	2,491
8	Queen Kaahumanu Hwy./Kealahoe Pkwy.	AM	68	1,364	441	199	1,078	48	17	7	24	270	18	152	3,686
		PM	60	1,542	264	98	1,898	44	59	19	71	412	20	123	4,610

Table 15 - 2045 With Project Phase 3 Conditions Peak Hour Intersection Volumes

Int.	Intersection Name	Peak Hr.	Northbound			Southbound			Eastbound			Westbound			Total
			NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
1	Queen Kaahumanu Hwy./Kaiminani Dr.	AM	0	1,549	109	412	1,232	0	0	0	0	480	0	588	4,370
		PM	0	1,626	387	669	1,802	0	0	0	0	180	0	580	5,244
2	Queen Kaahumanu Hwy./Hulikoa Dr.	AM	0	1,433	363	0	1,735	0	0	0	0	0	0	375	3,906
		PM	0	1,701	269	0	2,292	0	0	0	0	0	0	404	4,666
3	Queen Kaahumanu Hwy./Hina Lani St.	AM	0	1,089	1,174	666	1,150	0	0	0	0	1,277	0	548	5,904
		PM	0	1,328	1,602	802	1,397	0	0	0	0	1,542	0	647	7,318
4	Kanalani St./ Hina Lani St.	AM	225	0	18	0	0	0	0	1,348	363	29	1,620	0	3,603
		PM	200	0	74	0	0	0	0	1,795	489	17	1,900	0	4,475
5	Kamanu St./ Hina Lani St.	AM	121	0	81	113	0	466	447	774	133	224	1,072	138	3,569
		PM	415	0	347	153	0	534	519	1,197	105	133	944	127	4,474
6	Ane Keohokalole Hwy./Hina Lani St.	AM	220	374	235	216	611	243	186	543	127	604	919	248	4,526
		PM	145	549	570	286	477	227	270	1,106	237	380	710	252	5,209
7	Mamalaho Hwy./ Hina Lani St.	AM	396	342	0	0	1,269	769	481	0	410	0	0	0	3,667
		PM	442	739	0	0	578	611	796	0	551	0	0	0	3,717
8	Queen Kaahumanu Hwy./Kealahke Pkwy.	AM	68	2,169	620	199	2,081	48	17	7	24	492	18	152	5,895
		PM	60	2,645	509	98	2,896	44	59	19	71	634	20	123	7,178

5. 2025 WITHOUT PROJECT TRAFFIC CONDITIONS

5.1 Future Traffic Volumes for 2025 Without Project Conditions

Future AM and PM peak hour intersection traffic volumes for 2025 Without Project Conditions are shown in Figures 31 and 32. The future traffic forecast is estimated based on the methodologies are presented in Section 4.

5.2 Future Planned Improvements

For 2025 Without Project Conditions, there are some planned improvements that will implemented in the future which include the widening of Queen Kaahumanu Highway and the new construction of a Mid-Level Road (Ane Keohokalole Highway) that will run in a north-south direction between Queen Kaahumanu Highway and Mamalahoa Highway.

Queen Kaahumanu Highway is currently a two-lane roadway, and it is anticipated to be widening to a four-lane roadway prior to Year 2025. The planned roadway widening along Queen Kaahumanu Highway will provide additional northbound and southbound travel lane improvements to the following study area intersections:

Queen Kaahumanu Highway at Kaiminani Drive (#1)

- Add a Second Northbound Through Lane
- Add a Second Southbound Through Lane

Queen Kaahumanu Highway at Hulikoa Drive (#2)

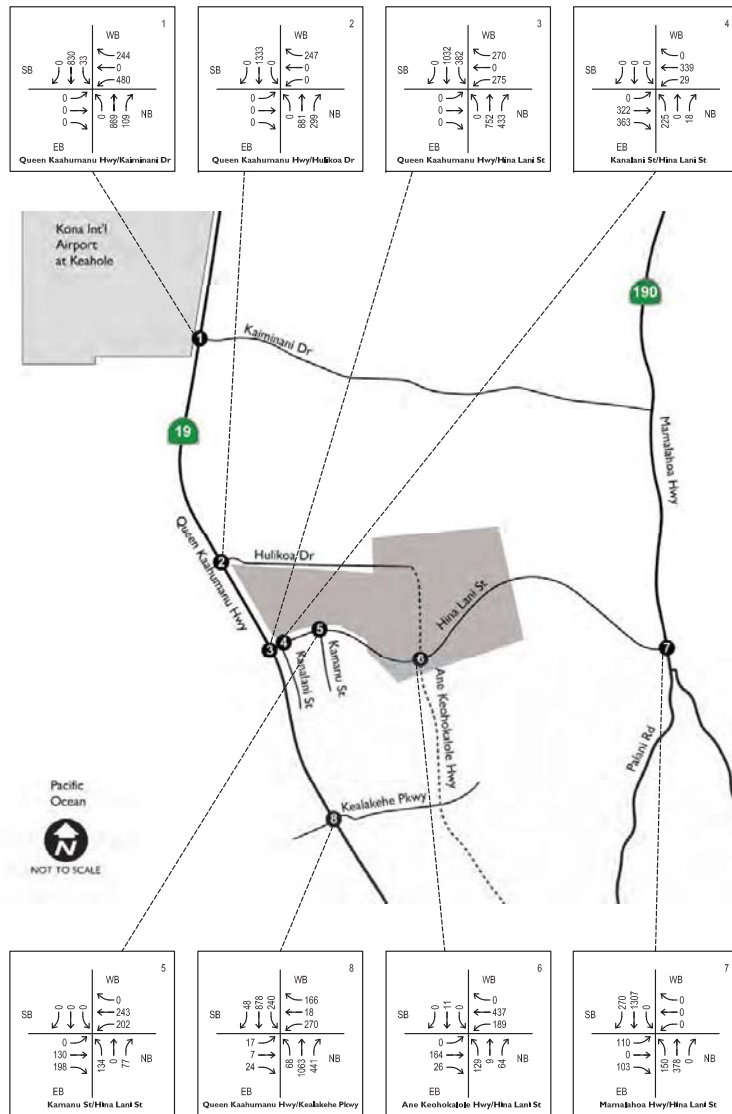
- Add a Second Northbound Through Lane
- Add a Second Southbound Through Lane
- Restrict southbound and westbound left turn movements – this intersection is anticipated to remain unsignalized

Queen Kaahumanu Highway at Hina Lani Street (#3)

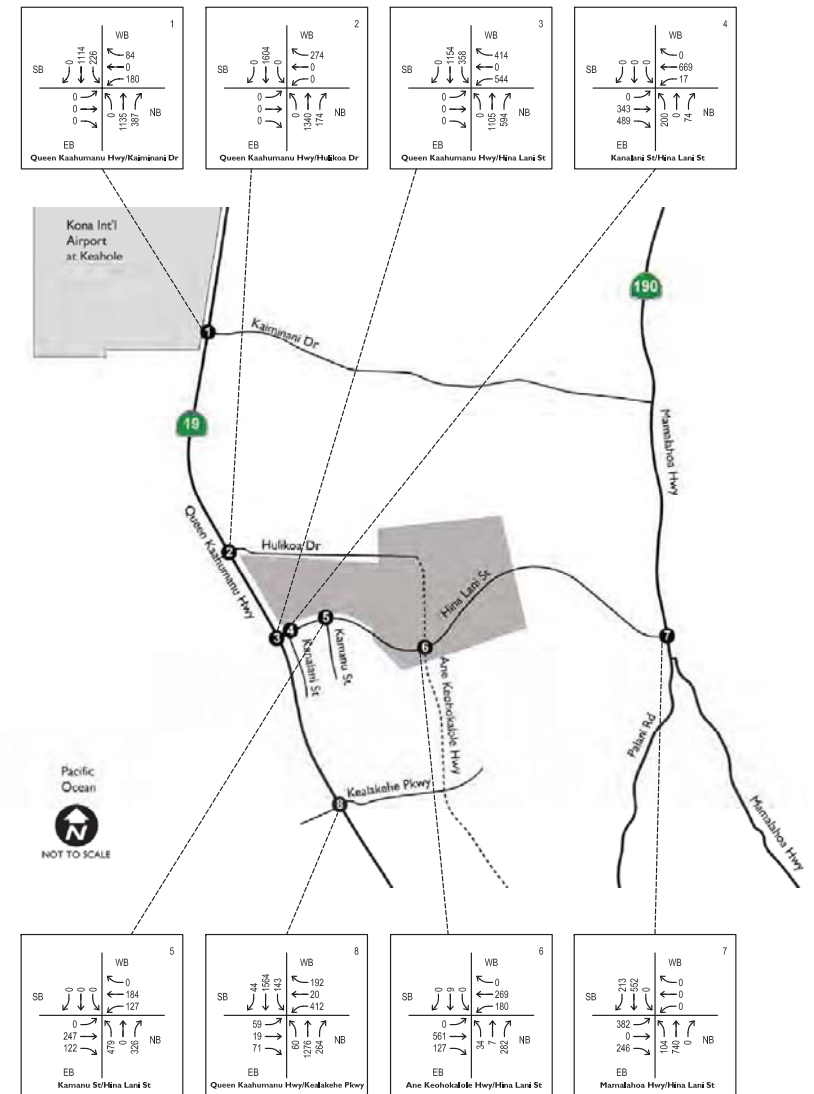
- Add a Second Northbound Through Lane
- Add a Second Southbound Through Lane
- Add a Second Southbound Left-Turn Lane
- Add a second Westbound Left-Turn Lane

Queen Kaahumanu Highway at Kealahke Parkway (#8)

- Add a Second Northbound Through Lane
- Convert Southbound Right-Turn Lane to a shared (Second) Through/Right-Turn Lane



1/20/21/2025 H_Kaloko T10/Andriana/T10/



1/20/21/2025 H_Kaloko T10/Andriana/T10/

The future Ane Keohokalole Highway will be a two-lane Mid-Level Road that is planned to be constructed in a north-south direction between Queen Kaahumanu Highway and Mamalahoa Highway. By the first horizon year of this traffic study (Year 2025), Ane Keohokalole Highway is anticipated to be completed between Hulikoa Drive and Palani Road to the south. As of June 2012, Ane Keohokalole Highway has been completed between Hina Lani Street and Kealakehe Parkway. The northerly extension of Ane Keohokalole Highway to Kaiminani Drive will be completed by 2028 (or near the beginning of Project Phase 2). The completion of Ane Keohokalole Highway will serve as a parallel corridor to relief traffic congestion on Queen Kaahumanu Highway and Mamalahoa Highway. The planned Mid-Level Road will provide lane improvements to the following study area intersection:

Ane Keohokalole Highway at Hina Lani Street (#6)

- Ane Keohokalole Highway will be constructed as a new Mid-Level Road, and it will run in a generally north-south direction through the project site.
- Construct new intersection: Provide Left-Turn, Through, and Right-Turn for all approaches
- Install a new traffic signal

By 2025, there are additional planned improvements to the study area intersections that will be implemented by other surrounding developments to accommodate the overall traffic growth due to background ambient growth and new cumulative developments. The following planned intersection improvements are anticipated:

Kamanu Street at Hina Lani Street (#5)

- Install a New Traffic Signal
- Add a Second Northbound Left-Turn Lane

5.3 Level of Service Analysis for 2025 Without Project Conditions

Synchro software was used to conduct intersection level of service analysis. Table 16 summarizes the results for the 2025 Without Project Conditions intersection level of service analysis, with existing geometry and planned improvements. As shown in Table 16, the following study area intersection is projected to operate at Level of Service "E" or worse for 2025 Without Project Conditions during the peak hours, with existing lane geometry and planned improvements:

- Queen Kaahumanu Highway at Hulikoa Drive (#2)

Appendix J contains the analysis worksheets for 2025 Without Project Conditions, with existing geometry and planned improvements.

**Table 16 - 2025 Without Project Conditions
Intersection Level of Service Analysis Summary**

No.	Intersection	Peak Hour	WITHOUT PROJECT				WITHOUT PROJECT PLUS MITIGATION			
			Delay (Sec)	V/C	LOS	Cum. Impact	Delay (Sec)	V/C	LOS	Cum. Impact
1	Queen Kaahumanu Hwy at Kaiminani Dr	AM	14.0	0.79	B	NO	14.0	0.79	B	NO
		PM	9.7	0.68	A	NO	9.7	0.68	A	NO
2	Queen Kaahumanu Hwy at Hulikoa Dr	AM	18.4	0.50	C	NO	0.1	0.01	A	NO
		PM	46.2	0.81	E	YES	0.1	0.01	A	NO
3	Queen Kaahumanu Hwy at Hina Lani St	AM	10.6	0.59	B	NO	10.6	0.59	B	NO
		PM	14.8	0.79	B	NO	14.8	0.79	B	NO
4	Kanalani St at Hina Lani St	AM	24.2	0.59	C	NO	24.2	0.59	C	NO
		PM	29.2	0.67	D	NO	29.2	0.67	D	NO
5	Kamanu St at Hina Lani St	AM	4.1	0.30	A	NO	4.1	0.30	A	NO
		PM	4.6	0.46	A	NO	4.6	0.46	A	NO
6	Ane Keohokalole Hwy at Hina Lani St	AM	9.3	0.47	A	NO	9.3	0.47	A	NO
		PM	15.4	0.65	B	NO	15.4	0.65	B	NO
7	Mamalahoa Hwy at Hina Lani St	AM	40.7	0.98	D	NO	40.7	0.98	D	NO
		PM	15.9	0.79	B	NO	15.9	0.79	B	NO
8	Queen Kaahumanu Hwy at Kealakehe Pkwy	AM	17.5	0.79	B	NO	17.5	0.79	B	NO
		PM	43.3	1.00	D	NO	43.3	1.00	D	NO

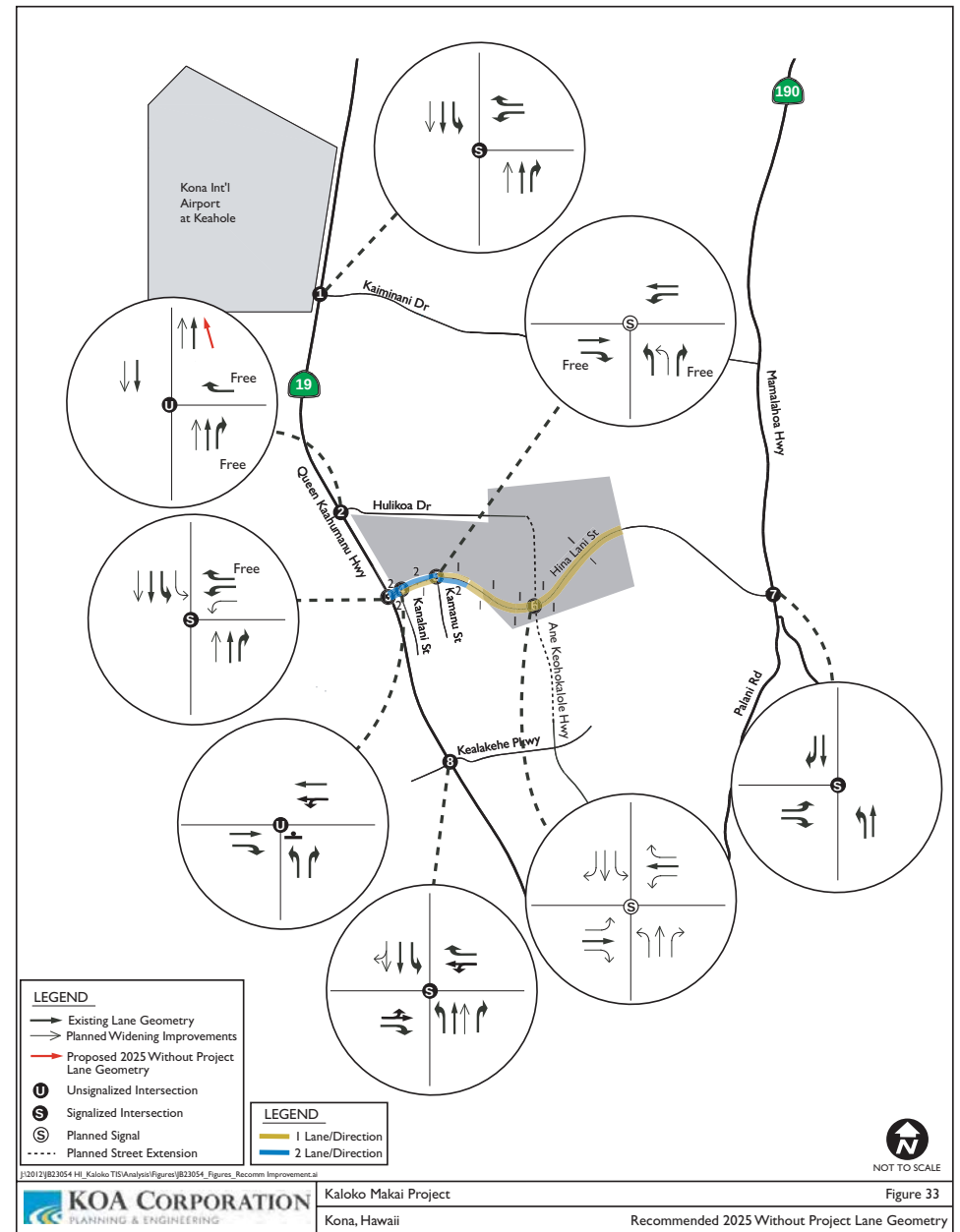
5.4 Recommended Improvements for Year 2025 Without Project Conditions

Figure 33 shows the recommended roadway network and intersection lane geometry for 2025 Without Project Conditions to mitigate the traffic impact. In addition to the planned improvements that are mentioned in Section 5.2, the following additional improvement is recommended to accommodate 2025 Without Project Conditions:

Queen Kaahumanu Highway at Hulikoa Drive (#2)

- Retain westbound free-right turn lane along with the roadway widening on Queen Kaahumanu Highway

With recommended 2025 Without Project intersection lane improvements, the study area intersections are projected to be mitigated to Level of Service "D" or better during the peak hours. The intersection operations analysis worksheets for 2025 Without Project Conditions, with recommended mitigation measures, are included in Appendix K of this report.



6. 2035 WITHOUT PROJECT TRAFFIC CONDITIONS

6.1 Future Traffic Volumes for 2035 Without Project Conditions

Future AM and PM peak hour intersection traffic volumes for 2035 Without Project Conditions are shown in Figures 34 and 35. The future traffic forecast is estimated based on the methodologies are presented in Section 4.

6.2 Future Planned Improvements

It should be be noted that the 2035 Without Project Conditions have the same planned improvements as the 2025 Without Project Conditions which were listed in previous Section 5.2 of this report. The planned improvements include the widening of Queen Kaahumanu Highway and the new construction of a Mid-Level Road (Ane Keohokalole Highway) that will run in a north-south direction between Queen Kaahumanu Highway and Mamalahoa Highway.

6.3 Level of Service Analysis for 2035 Without Project Conditions

Table 17 summarizes the results for the 2035 Without Project Conditions intersection level of service analysis, with existing geometry and planned improvements. As shown in Table 17, the following study area intersection is projected to operate at Level of Service "E" or worse for 2035 Without Project Conditions during the peak hours, with existing lane geometry and planned improvements:

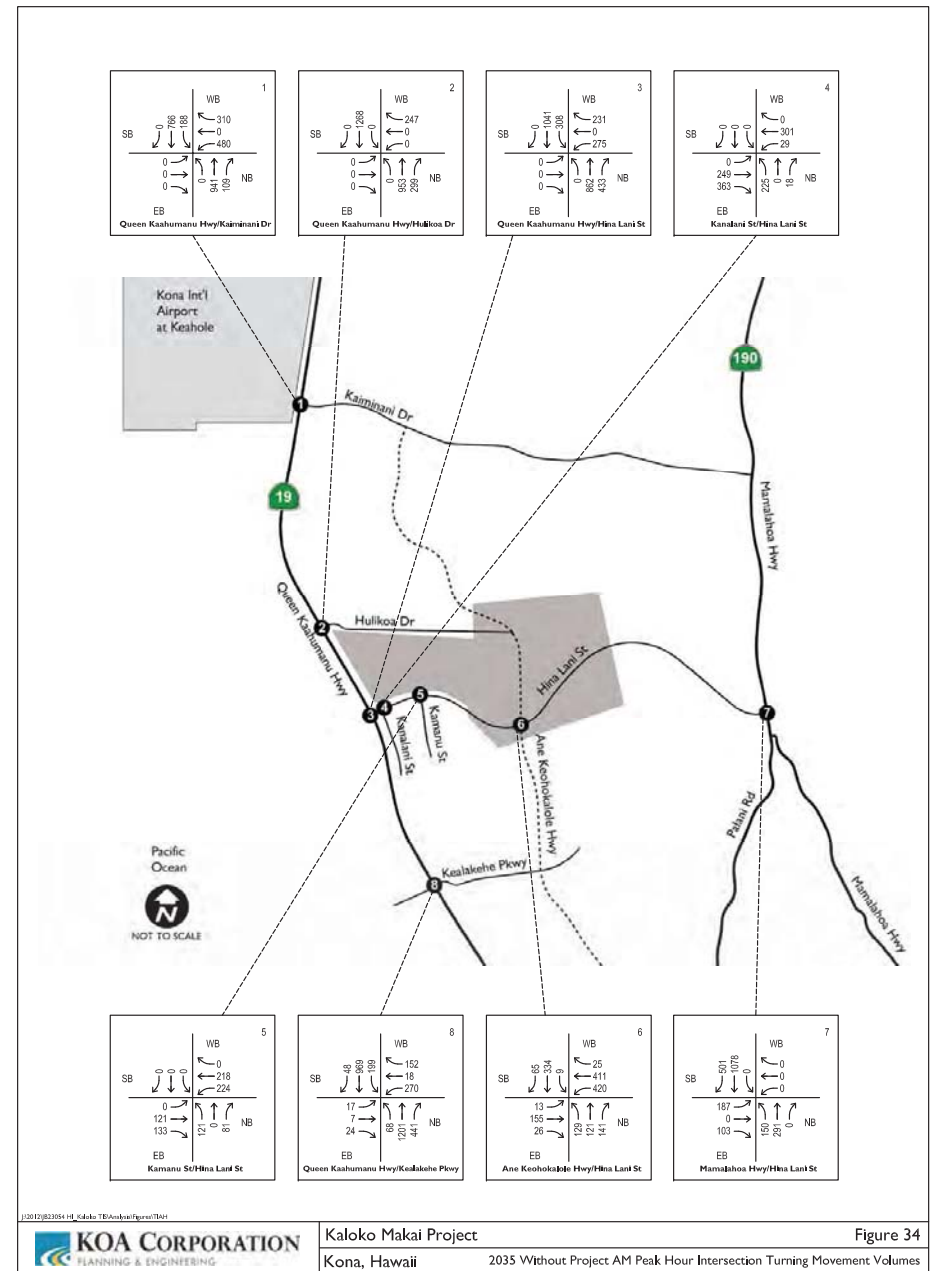
- Queen Kaahumanu Highway at Huliko Drive (#2)

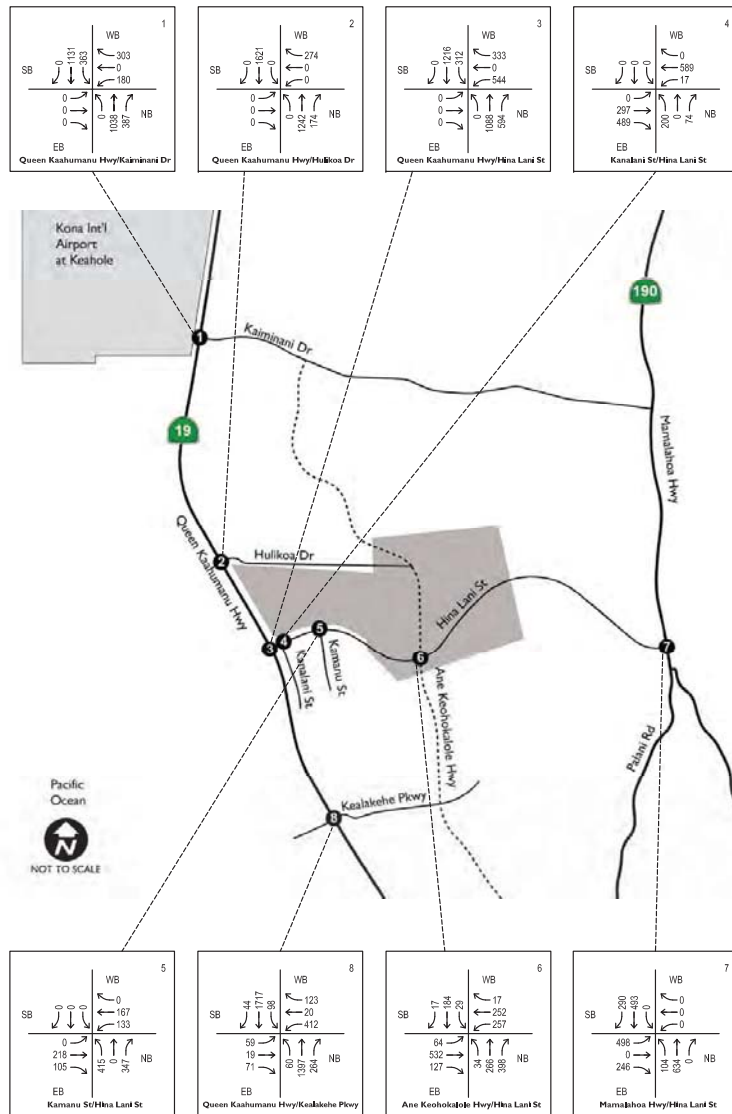
Appendix L contains the analysis worksheets for 2035 Without Project Conditions, with existing geometry and planned improvements.

6.4 Recommended Improvements for Year 2035 Without Project Conditions

Figure 36 shows the recommended roadway network and intersection lane geometry for 2035 Without Project Conditions to mitigate the traffic impact. The recommended lane improvements for 2035 Without Project Conditions are same as the ones previously listed in Section 5.4 and shown in Figure 35 for 2025 Without Project Conditions.

With recommended 2035 Without Project intersection lane improvements, the study area intersections are projected to be mitigated to Level of Service "D" or better during the peak hours. The intersection operations analysis worksheets for 2035 Without Project Conditions, with recommended mitigation measures, are included in Appendix M of this report.

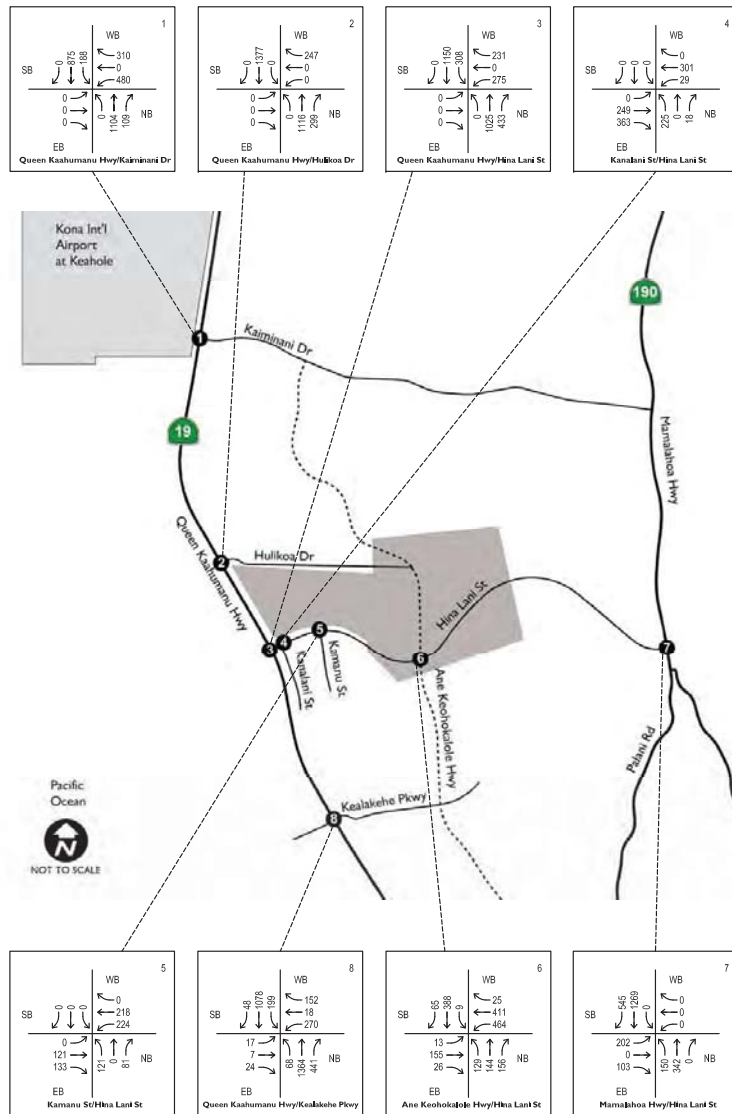




**Table 17 - 2035 Without Project Conditions
Intersection Level of Service Analysis Summary**

No.	Intersection	Peak Hour	WITHOUT PROJECT				WITHOUT PROJECT PLUS MITIGATION			
			Delay (Sec)	V/C	LOS	Cum. Impact	Delay (Sec)	V/C	LOS	Cum. Impact
1	Queen Kaahumanu Hwy at Kaiminani Dr	AM	17.1	0.77	B	NO	17.1	0.77	B	NO
		PM	14.5	0.73	B	NO	14.5	0.73	B	NO
2	Queen Kaahumanu Hwy at Hulikoia Dr	AM	20.1	0.53	C	NO	0.1	0.01	A	NO
		PM	36.9	0.75	E	YES	0.1	0.01	A	NO
3	Queen Kaahumanu Hwy at Hina Lani St	AM	10.6	0.59	B	NO	10.6	0.59	B	NO
		PM	14.2	0.77	B	NO	14.2	0.77	B	NO
4	Kanalani St at Hina Lani St	AM	19.2	0.51	C	NO	19.2	0.51	C	NO
		PM	22.8	0.58	C	NO	22.8	0.58	C	NO
5	Kamanu St at Hina Lani St	AM	3.7	0.42	A	NO	3.7	0.42	A	NO
		PM	4.3	0.4	A	NO	4.3	0.4	A	NO
6	Ane Keohokalani Hwy at Hina Lani St	AM	25.9	0.71	C	NO	25.9	0.71	C	NO
		PM	22.6	0.79	C	NO	22.6	0.79	C	NO
7	Mamalahou Hwy at Hina Lani St	AM	26.7	0.92	C	NO	26.7	0.92	C	NO
		PM	18.2	0.8	B	NO	18.2	0.8	B	NO
8	Queen Kaahumanu Hwy at Kealahou Pkwy	AM	17.8	0.92	B	NO	17.8	0.92	B	NO
		PM	50.4	1.04	D	NO	50.4	1.04	D	NO

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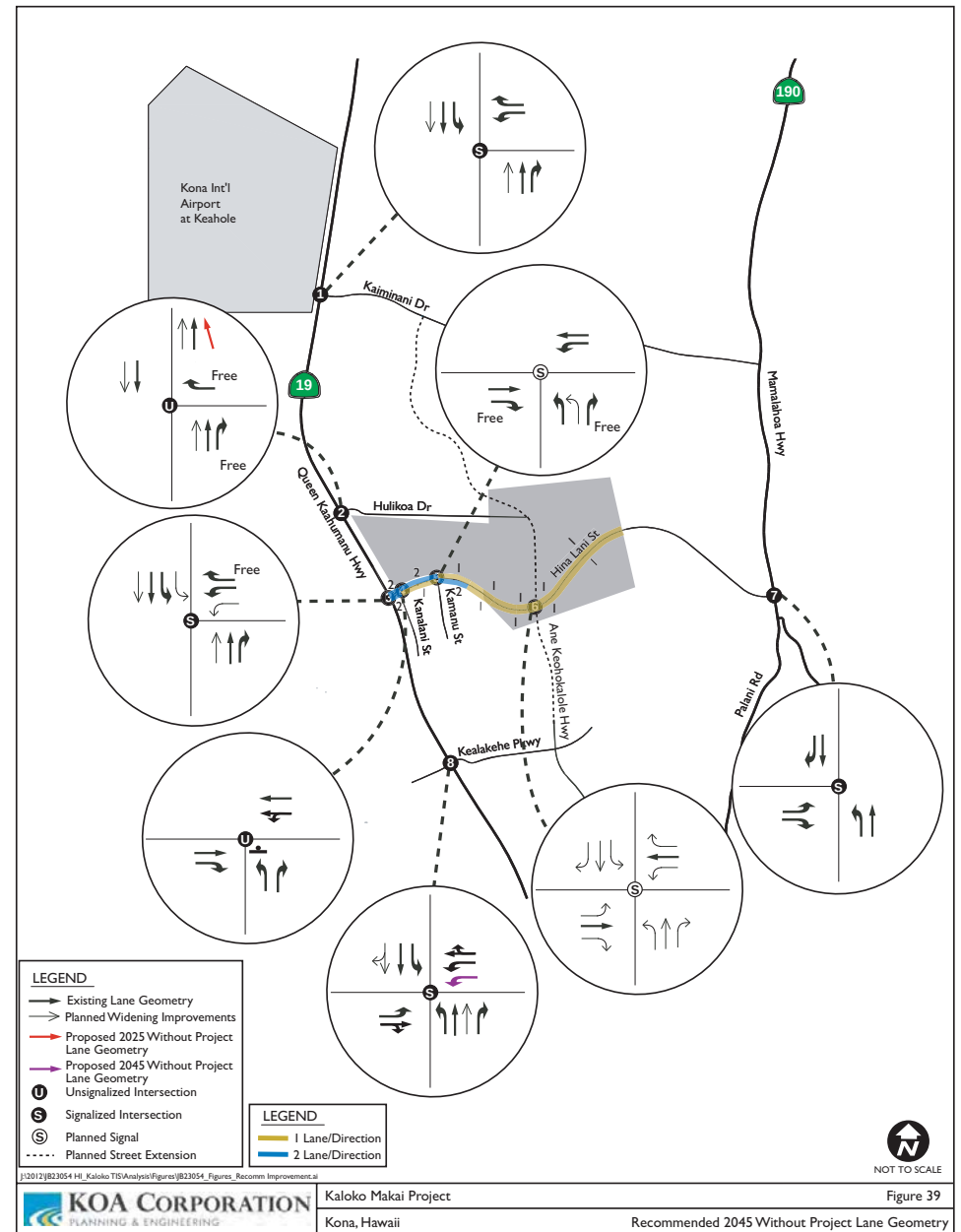
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12082782054 H_Kaloka T04Ankaifigures/704

**Table 18 - 2045 Without Project Conditions
Intersection Level of Service Analysis Summary**

No.	Intersection	Peak Hour	WITHOUT PROJECT				WITHOUT PROJECT PLUS MITIGATION			
			Delay (Sec)	V/C	LOS	Cum. Impact	Delay (Sec)	V/C	LOS	Cum. Impact
1	Queen Kaahumanu Hwy at Kaiminani Dr	AM	20.0	0.87	C	NO	20.0	0.87	C	NO
		PM	15.9	0.76	B	NO	15.9	0.76	B	NO
2	Queen Kaahumanu Hwy at Hulikoia Dr	AM	25.2	0.61	D	NO	0.1	0.01	A	NO
		PM	52.1	0.85	F	YES	0.1	0.01	A	NO
3	Queen Kaahumanu Hwy at Hina Lani St	AM	11.1	0.65	B	NO	11.1	0.65	B	NO
		PM	15.7	0.82	B	NO	15.7	0.82	B	NO
4	Kanalani St at Hina Lani St	AM	19.2	0.51	C	NO	19.2	0.51	C	NO
		PM	22.8	0.58	C	NO	22.8	0.58	C	NO
5	Kamanu St at Hina Lani St	AM	3.7	0.42	A	NO	3.7	0.42	A	NO
		PM	4.3	0.40	A	NO	4.3	0.40	A	NO
6	Ane Keohokalole Hwy at Hina Lani St	AM	24.5	0.74	C	NO	24.5	0.74	C	NO
		PM	24.3	0.81	C	NO	24.3	0.81	C	NO
7	Mamalahoa Hwy at Hina Lani St	AM	44.8	1.01	D	NO	44.8	1.01	D	NO
		PM	22.2	0.86	C	NO	22.2	0.86	C	NO
8	Queen Kaahumanu Hwy at Kealahou Pkwy	AM	19.7	0.90	B	NO	23.7	0.76	C	NO
		PM	63.2	1.11	E	YES	37.2	0.87	D	NO



8. 2025 WITH PROJECT PHASE I TRAFFIC CONDITIONS

8.1 Future Traffic Volumes for 2025 With Project Phase I Conditions

Future AM and PM peak hour intersection traffic volumes for 2025 With Project Phase I Conditions are shown in Figures 40 and 41. The future traffic forecast is estimated based on the methodologies are presented in Section 4. It should be noted that in addition to the project-only traffic, the 2025 With Project Phase I Conditions also includes cumulative development traffic in the vicinity of the project site as well as ambient background growth to account for other unidentified projects and general population growth. The project is only one of the many contributors to the overall traffic growth.

8.2 Future Planned Improvements

It should be noted that the 2025 With Project Phase I Conditions have the same planned improvements as the 2025 Without Project Conditions which were listed in previous Section 5.2 of this report.

8.3 Level of Service Analysis for 2025 With Project Phase I Conditions

Table 19 summarizes the results for the 2025 With Project Phase I Conditions intersection level of service analysis, with existing geometry and planned improvements. As shown in Table 19, the following study area intersections are projected to operate at Level of Service "E" or worse for 2025 With Project Phase I Conditions during the peak hours, with existing lane geometry and planned improvements:

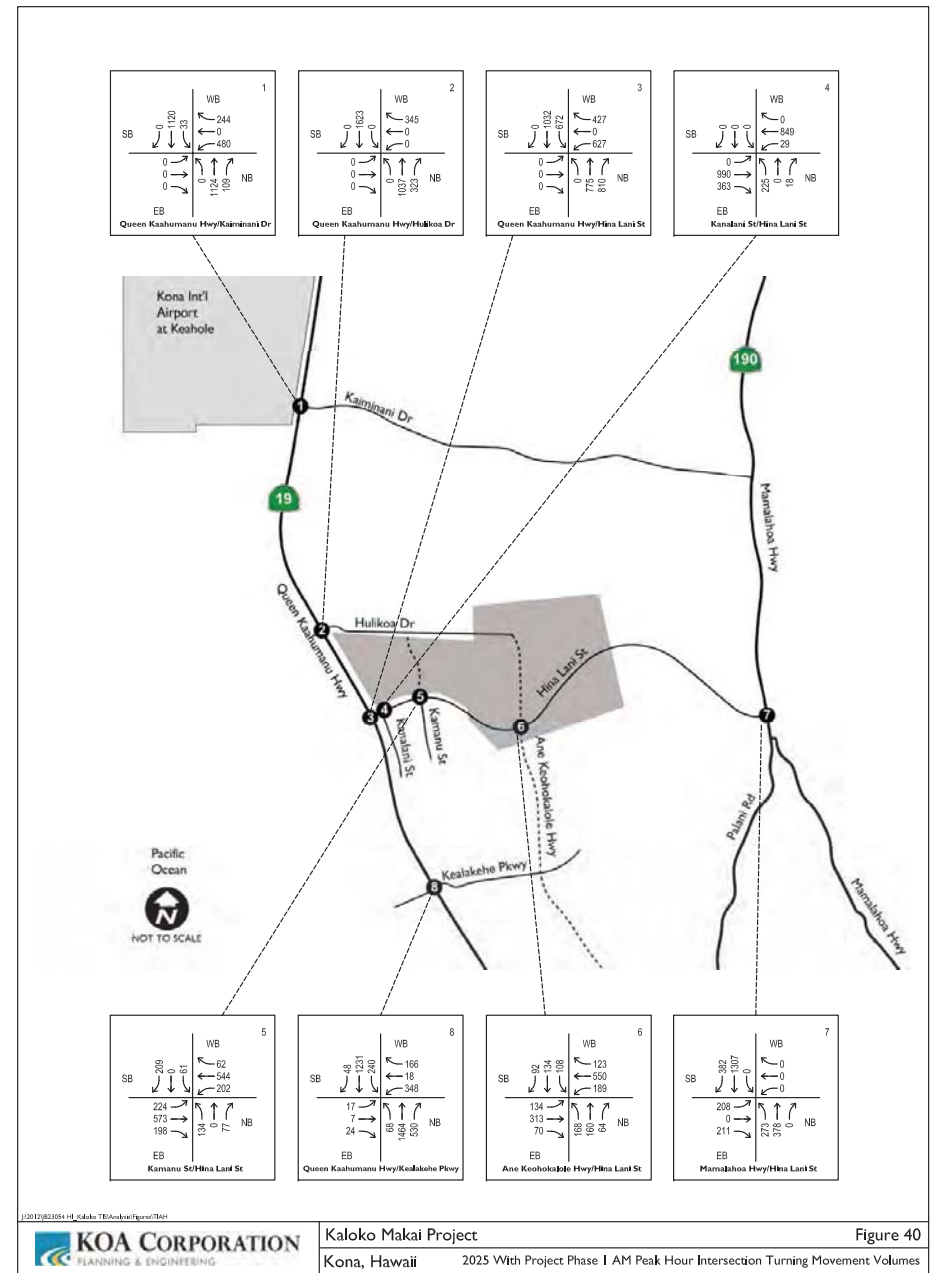
- Queen Kaahumanu Highway at Huliko Drive (#2)
- Kananani Street at Hina Lani Street (#4)
- Mamalahoa Highway at Hina Lani Street (#7)
- Queen Kaahumanu Highway at Kealahou Parkway (#8)

Appendix P contains the analysis worksheets for 2025 With Project Phase I Conditions, with existing lane geometry and planned improvements.

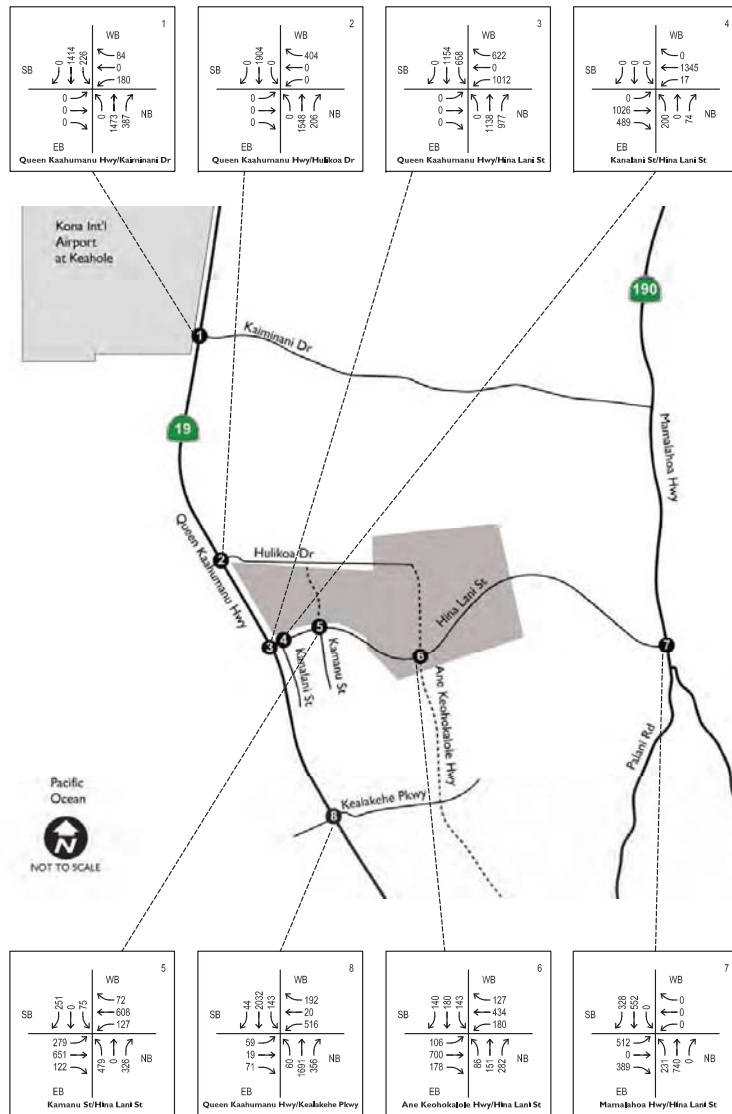
8.4 Recommended Improvements for Year 2025 With Project Phase I Conditions

Figure 42 shows the recommended roadway network and intersection lane geometry for 2025 With Project Phase I Conditions to mitigate the traffic impact. In addition to the recommended 2025 Without Project improvements previously listed in Section 5.4, the following additional improvement is recommended to accommodate 2025 With Project Phase I Conditions:

- Kananani Street at Hina Lani Street (#4)**
- Restrict Northbound Left-Turn Movement



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**Table 19 - 2025 With Project Phase I Conditions
Intersection Level of Service Analysis Summary**

No.	Intersection	Peak Hour	WITH PROJECT				WITH PROJECT PLUS MITIGATION			
			Delay (Sec)	V / C	LOS	Project Impact	Delay (Sec)	V / C	LOS	Project Impact
1	Queen Kaahumanu Hwy at Kaimanani Dr	AM	16.7	0.87	B	NO	16.7	0.87	B	NO
		PM	12.8	0.81	B	NO	12.8	0.81	B	NO
2	Queen Kaahumanu Hwy at Huliko Dr	AM	36.8	0.80	E	YES	0.1	0.01	A	NO
		PM	>100	1.43	F	YES	0.1	0.01	A	NO
3	Queen Kaahumanu Hwy at Hina Lani St	AM	24.6	0.91	C	NO	24.6	0.91	C	NO
		PM	53.9	1.07	D	NO	53.9	1.07	D	NO
4	Kaimanani St at Hina Lani St	AM	>100	>2	F	YES	23.5	0.09	C	NO
		PM	>100	>2	F	YES	34.3	0.40	D	NO
5	Kama St at Hina Lani St	AM	13.5	0.55	B	NO	32.5	0.70	C	NO
		PM	35.7	0.85	D	NO	40.8	0.78	D	NO
6	Ane Keohokalole Hwy at Hina Lani St	AM	19.0	0.7	B	NO	19.0	0.70	B	NO
		PM	21.8	0.80	C	NO	21.8	0.80	C	NO
7	Mamalahou Hwy at Hina Lani St	AM	74.9	1.14	E	YES	47.6	1.00	D	NO
		PM	25.5	0.90	C	NO	15.1	0.78	B	NO
8	Queen Kaahumanu Hwy at Kealahou Pkwy	AM	32.3	0.98	C	NO	29.8	0.82	C	NO
		PM	>100	1.27	F	YES	54.0	0.94	D	NO

- With recommended 2025 With Project Phase I intersection lane improvements, the study area intersections are projected to be mitigated to Level of Service "D" or better during the peak hours. The intersection operations analysis worksheets for 2025 With Project Phase I Conditions, with recommended mitigation measures, are included in Appendix Q of this report.

9. 2035 With Project Phase 2 Traffic Conditions

9.1 Future Traffic Volumes for 2035 With Project Phase 2 Conditions

Future AM and PM peak hour intersection traffic volumes for 2035 With Project Phase 2 Conditions are shown in Figures 43 and 44. The future traffic forecast is estimated based on the methodologies are presented in Section 4. It should be noted that in addition to the project-only traffic, the 2035 With Project Phase 2 Conditions also includes cumulative development traffic in the vicinity of the project site as well as ambient background growth to account for other unidentified projects and general population growth. The project is only one of the many contributors to the overall traffic growth.

9.2 Future Planned Improvements

It should be noted that the 2035 With Project Phase 2 Conditions have the same planned improvements as the 2025 Without Project Conditions which were listed in previous Section 5.2 of this report.

9.3 Level of Service Analysis for 2035 With Project Phase 2 Conditions

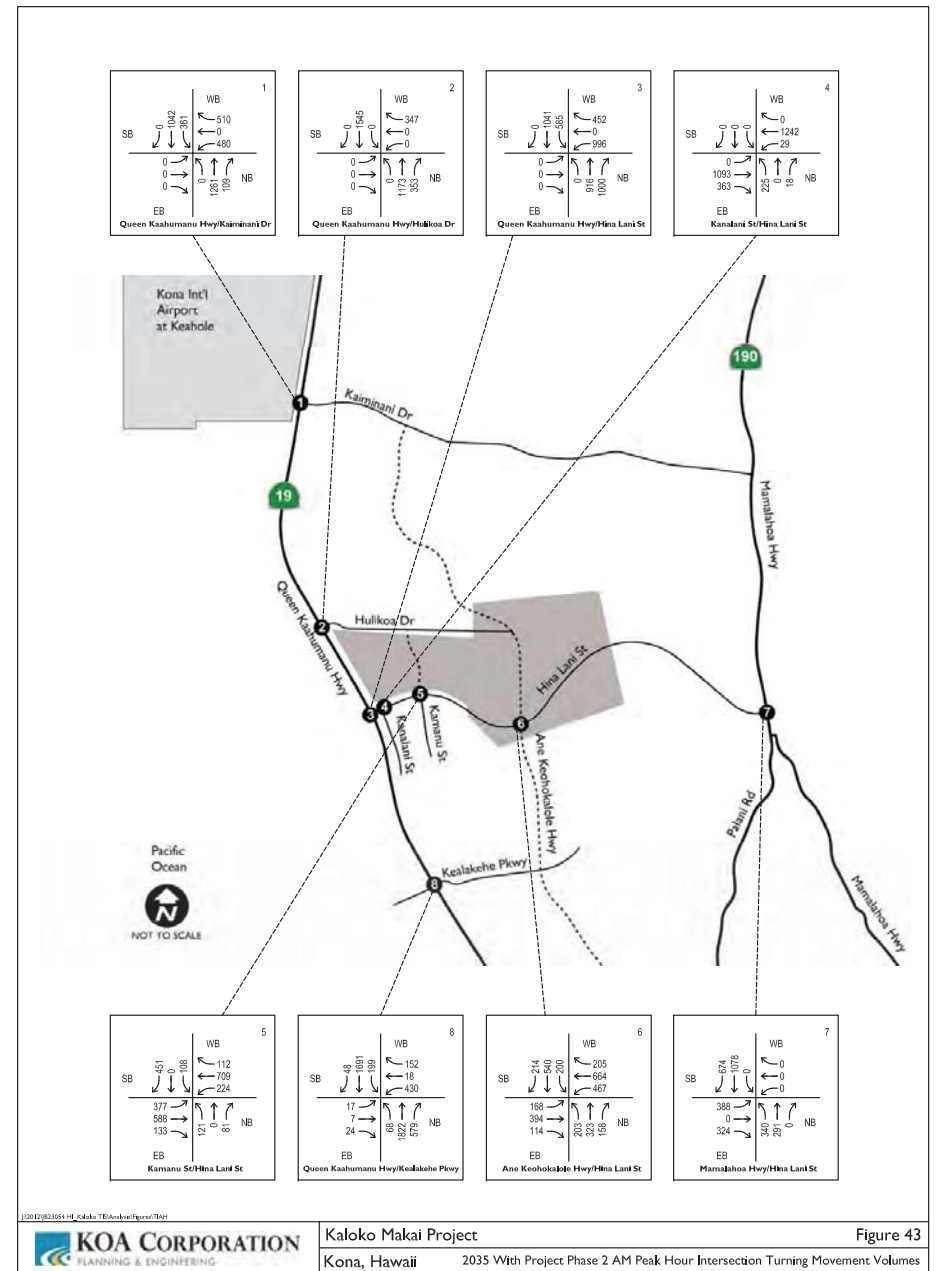
Table 20 summarizes the results for the 2035 With Project Phase 2 Conditions intersection level of service analysis, with existing geometry and planned improvements. As shown in Table 20, the following study area intersections are projected to operate at Level of Service "E" or worse for 2035 With Project Phase 2 Conditions during the peak hours, with existing lane geometry and planned improvements:

- Queen Kaahumanu Highway at Huliko Drive (#2)
- Queen Kaahumanu Highway at Hina Lani Street (#3)
- Kana Lani Street at Hina Lani Street (#4)
- Kama Lani Street at Hina Lani Street (#5)
- Ane Keohokalole Highway at Hina Lani Street (#6)
- Mamalahoe Highway at Hina Lani Street (#7)
- Queen Kaahumanu Highway at Kealahou Parkway (#8)

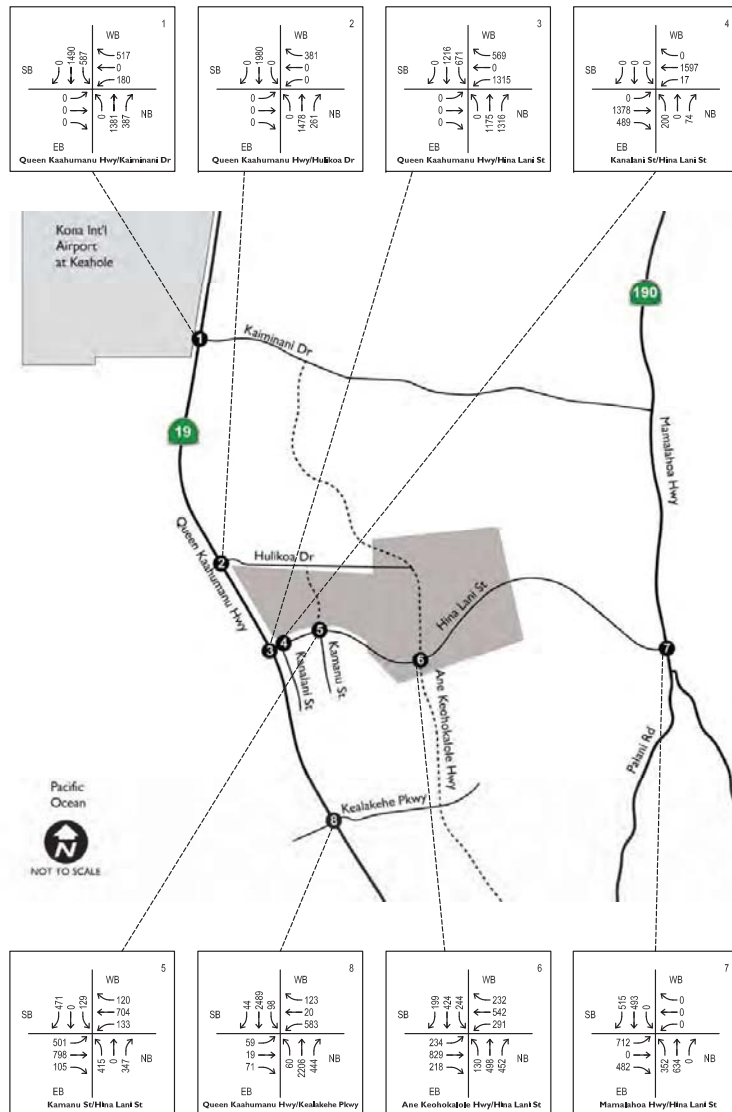
Appendix R contains the analysis worksheets for 2035 With Project Phase 2 Conditions, with existing lane geometry and planned improvements.

9.4 Recommended Improvements for Year 2035 With Project Phase 2 Conditions

Figure 45 shows the recommended roadway network and intersection lane geometry for 2035 With Project Phase 2 Conditions to mitigate the traffic impact. In addition to the recommended 2025 With Project Phase 1 improvements previously listed in Section 8.4, the following additional improvements are recommended to accommodate 2035 With Project Phase 2 Conditions:

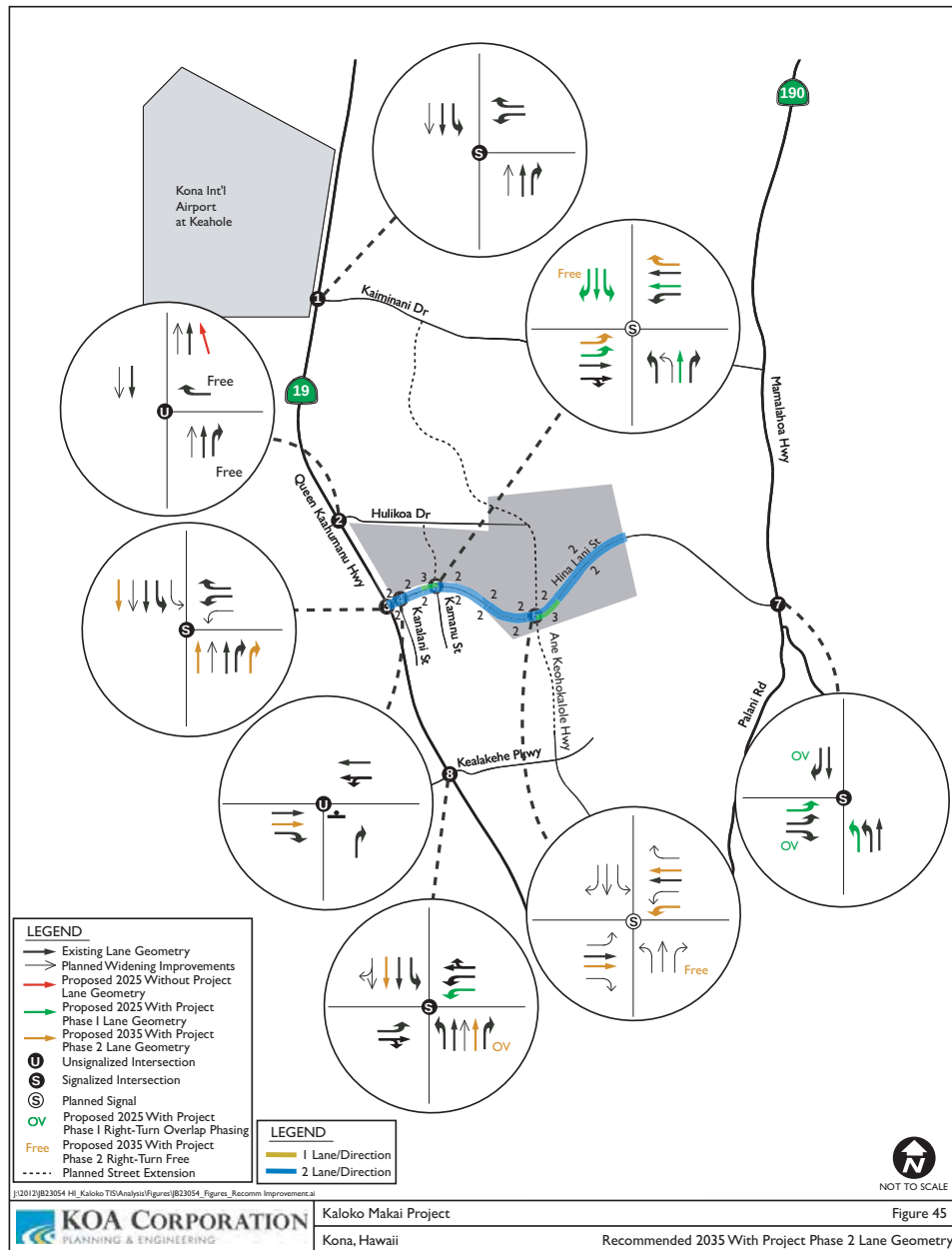


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**Table 20 - 2035 With Project Phase 2 Conditions
Intersection Level of Service Analysis Summary**

No.	Intersection	Peak Hour	WITH PROJECT				WITH PROJECT PLUS MITIGATION			
			Delay (Sec)	V / C	LOS	Project Impact	Delay (Sec)	V / C	LOS	Project Impact
1	Queen Kaahumanu Hwy at Kaiminani Dr	AM	37.6	1.01	D	NO	37.6	1.01	D	NO
		PM	36.2	0.96	D	NO	36.2	0.96	D	NO
2	Queen Kaahumanu Hwy at Hulihoa Dr	AM	54.0	0.90	F	YES	0.1	0.01	A	NO
		PM	>100	1.27	F	YES	0.1	0.01	A	NO
3	Queen Kaahumanu Hwy at Hina Lani St	AM	50.2	1.07	D	NO	22.7	0.85	C	NO
		PM	>100	1.42	F	YES	43.2	1.00	D	NO
4	Kanalani St at Hina Lani St	AM	>100	>2.00	F	YES	13.4	0.04	B	NO
		PM	>100	>2.00	F	YES	18.2	0.23	C	NO
5	Kamanu St at Hina Lani St	AM	83.7	1.42	F	YES	21.7	0.63	C	NO
		PM	>100	>2.00	F	YES	26.0	0.70	C	NO
6	Ane Keohokalole Hwy at Hina Lani St	AM	78.3	1.35	E	YES	43.3	0.89	D	NO
		PM	>100	1.46	F	YES	44.7	1.02	D	NO
7	Mamalahou Hwy at Hina Lani St	AM	81.2	1.17	F	YES	38.7	0.98	D	NO
		PM	47.9	1.04	D	NO	16.7	0.82	B	NO
8	Queen Kaahumanu Hwy at Kealahou Pkwy	AM	66.1	1.16	E	YES	24.4	0.78	C	NO
		PM	>100	1.46	F	YES	36.8	0.88	D	NO



Queen Kaahumanu Highway at Hina Lani Street (#3)

- Add a Third Northbound Through Lane
- Add a Second Northbound Right-Turn Lane
- Add a Third Southbound Through Lane

Kalanani Street at Hina Lani Street (#4)

- Add a Second Eastbound Through Lane

Kamanu Street at Hina Lani Street (#5)

- Add a Southbound Free-Right Turn Lane
- Add a Second Eastbound Left-Turn Lane
- Add a Westbound Right-Turn Lane

Ane Keohokalale Highway at Hina Lani Street (#6)

- Add a Northbound Free-Right Turn Lane
- Add a Second Eastbound Through Lane
- Add a Second Westbound Through Lane
- Add a Second Westbound Left-Turn Lane

Queen Kaahumanu Highway at Kealahou Parkway (#8)

- Add a Third Northbound Through Lane
- Provide Northbound Right-Turn Overlap Signal Phasing
- Add a Third Southbound Through Lane

With recommended 2035 With Project Phase 2 intersection lane improvements, the study area intersections are projected to be mitigated to Level of Service "D" or better during the peak hours. The intersection operations analysis worksheets for 2035 With Project Phase 2 Conditions, with recommended mitigation measures, are included in Appendix S of this report.

10. 2045 With Project Phase 3 Traffic Conditions

10.1 Future Traffic Volumes for 2045 With Project Phase 3 Conditions

Future AM and PM peak hour intersection traffic volumes for 2045 With Project Phase 3 Conditions are shown in Figures 46 and 47. The future traffic forecast is estimated based on the methodologies are presented in Section 4. It should be noted that in addition to the project-only traffic, the 2045 With Project Phase 3 Conditions also includes cumulative development traffic in the vicinity of the project site as well as ambient background growth to account for other unidentified projects and general population growth. The project is only one of the many contributors to the overall traffic growth.

10.2 Future Planned Improvements

It should be noted that the 2045 With Project Phase 3 Conditions have the same planned improvements as the 2025 Without Project Conditions which were listed in previous Section 5.2 of this report.

10.3 Level of Service Analysis for 2045 With Project Phase 3 Conditions

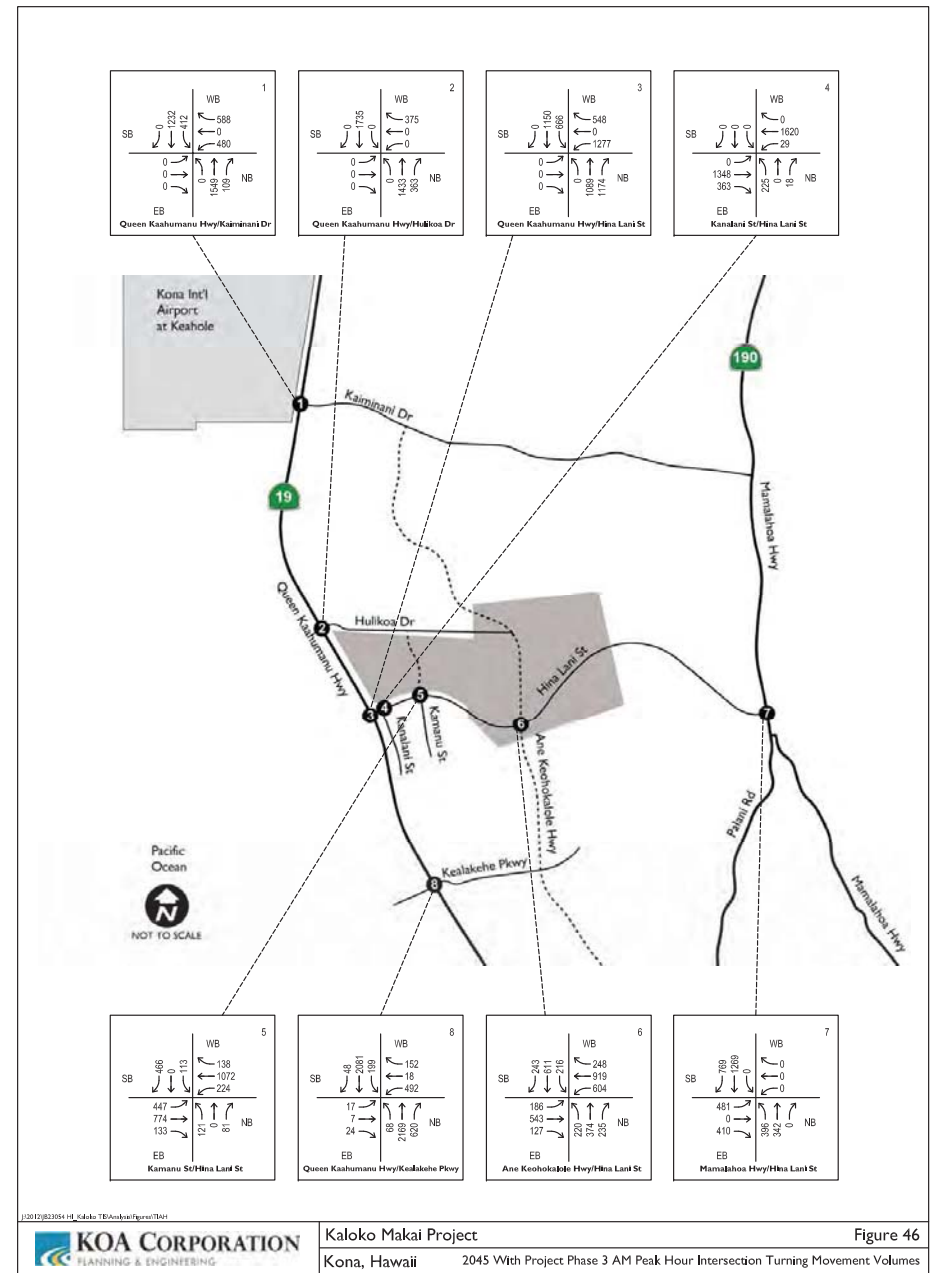
Table 21 summarizes the results for the 2045 With Project Phase 3 Conditions intersection level of service analysis, with existing geometry and planned improvements. As shown in Table 21, the following study area intersections are projected to operate at Level of Service "E" or worse for 2045 With Project Phase 3 Conditions during the peak hours, with existing lane geometry and planned improvements:

- Queen Kaahumanu Highway at Kaiminani Drive (#1)
- Queen Kaahumanu Highway at Huliko Drive (#2)
- Queen Kaahumanu Highway at Hina Lani Street (#3)
- Kanaani Street at Hina Lani Street (#4)
- Kamaanu Street at Hina Lani Street (#5)
- Ane Keohokalole Highway at Hina Lani Street (#6)
- Mamalahoa Highway at Hina Lani Street (#7)
- Queen Kaahumanu Highway at Kealahou Parkway (#8)

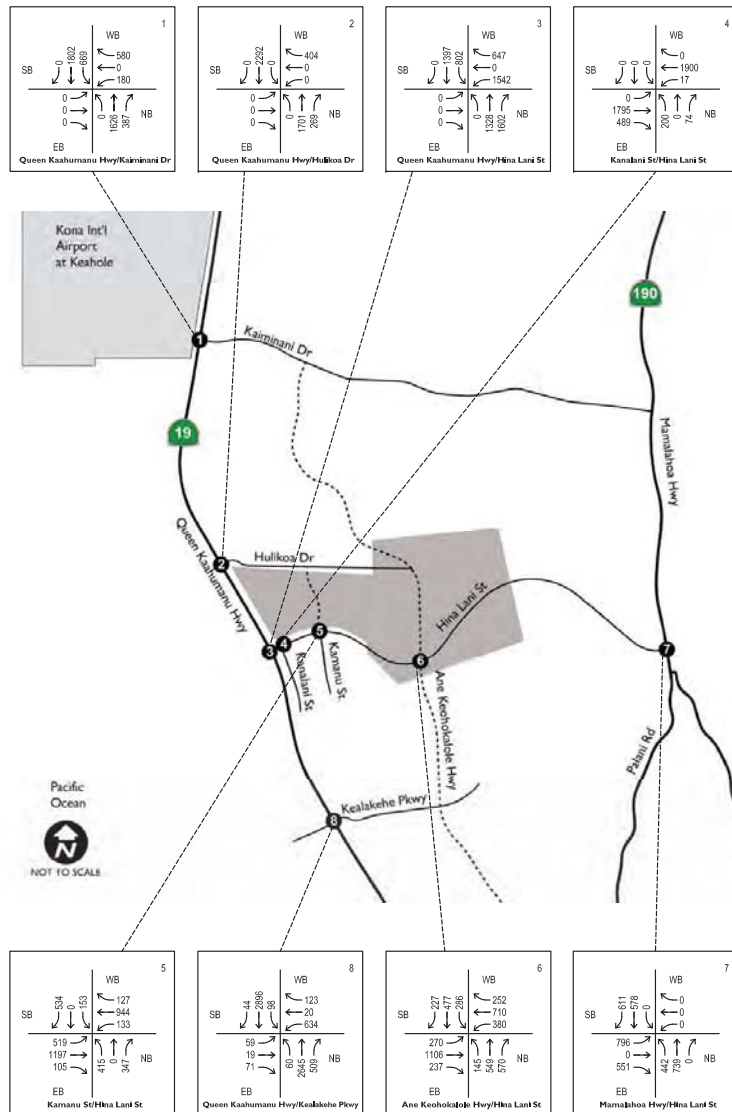
Appendix T contains the analysis worksheets for 2045 With Project Phase 3 Conditions, with existing lane geometry and planned improvements.

10.4 Recommended Improvements for Year 2045 With Project Phase 3 Conditions

Figure 48 shows the recommended roadway network and intersection lane geometry for 2045 With Project Phase 3 Conditions to mitigate the traffic impact. In addition to the recommended 2035 With Project Phase 2 improvements previously listed in Section 9.4, the following additional improvements are recommended to accommodate 2045 With Project Phase 3 Conditions:



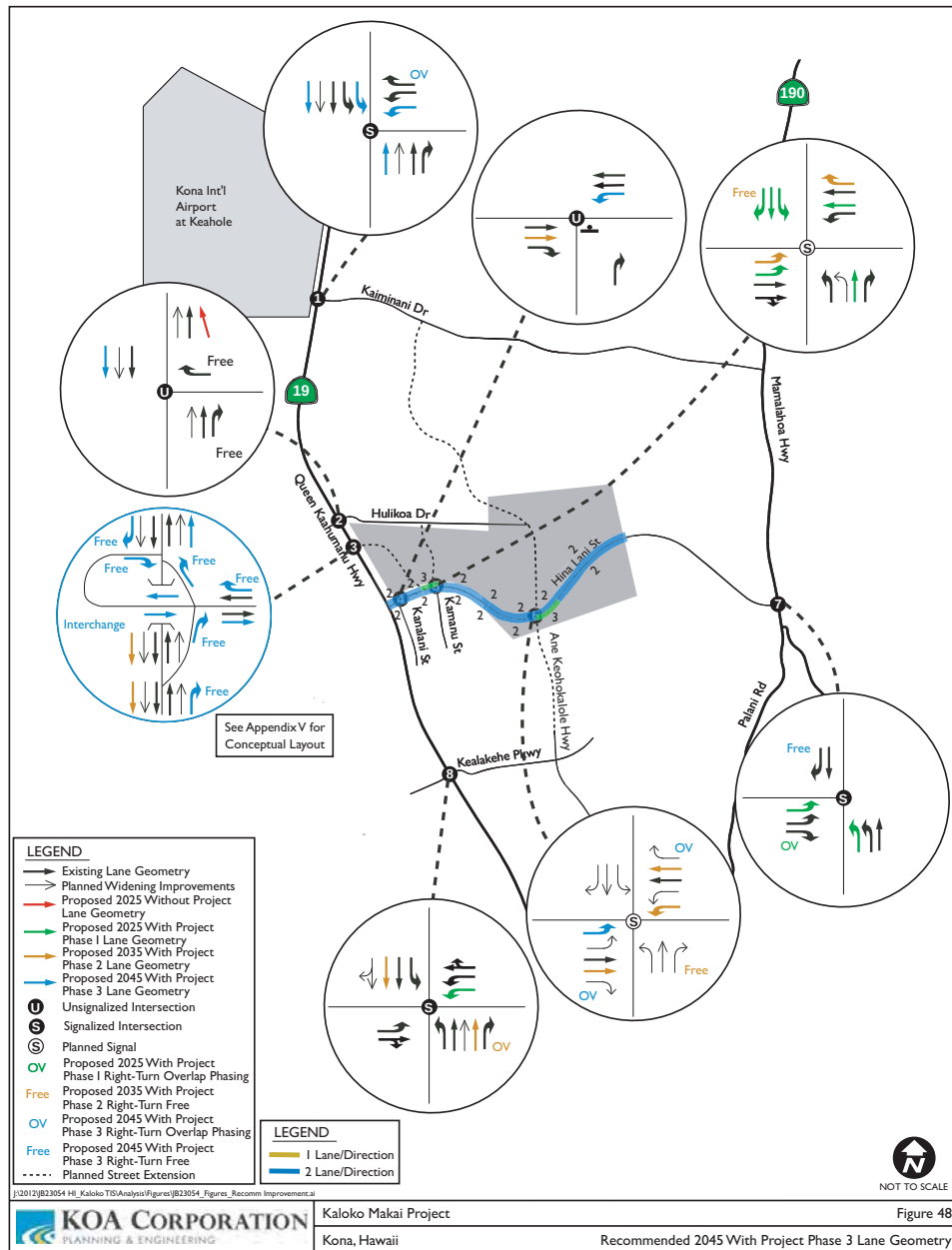
12012182054-H_Kaloko-TD-Anaika-Figure 46



**Table 21 - 2045 With Project Phase 3 Conditions
Intersection Level of Service Analysis Summary**

No.	Intersection	Peak Hour	WITH PROJECT				WITH PROJECT PLUS MITIGATION			
			Delay (Sec)	V / C	LOS	Project Impact	Delay (Sec)	V / C	LOS	Project Impact
1	Queen Kaahumanu Hwy at Kaiminani Dr	AM	65.9	1.13	E	YES	17.6	0.84	B	NO
		PM	69.9	1.11	E	YES	16.2	0.85	B	NO
2	Queen Kaahumanu Hwy at Huliko Dr	AM	>100	1.20	F	YES	0.1	0.01	A	NO
		PM	>100	1.62	F	YES	0.1	0.01	A	NO
3	Queen Kaahumanu Hwy at Hina Lani St	AM	>100	1.29	F	YES	Interchange			
		PM	>100	1.76	F	YES				
4	Kaiminani St at Hina Lani St	AM	>100	>2.00	F	YES	15.5	0.05	C	NO
		PM	>100	>2.00	F	YES	26.1	0.32	D	NO
5	Kamanu St at Hina Lani St	AM	>100	>2.00	F	YES	26.5	0.72	C	NO
		PM	>100	>2.00	F	YES	37.3	0.80	D	NO
6	Ane Keohokalohe Hwy at Hina Lani St	AM	>100	1.96	F	YES	46.5	0.89	D	NO
		PM	>100	>2.00	F	YES	54.4	0.99	D	NO
7	Mamoahoa Hwy at Hina Lani St	AM	>100	1.35	F	YES	51.5	1.03	D	NO
		PM	86.3	1.23	F	YES	22.2	0.90	C	NO
8	Queen Kaahumanu Hwy at Kealahke Pkwy	AM	>100	1.28	F	YES	30.5	0.85	C	NO
		PM	>100	1.64	F	YES	41.7	0.93	D	NO

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Queen Kaahumanu Highway at Kaimani Drive (#1)

- Add a Third Northbound Through Lane
- Add a Second Southbound Left-Turn Lane
- Add a Third Southbound Through Lane
- Add a Second Westbound Left-Turn Lane
- Provide Westbound Right-Turn Overlap Signal Phasing

Queen Kaahumanu Highway at Hulikoa Drive (#2)

- Add a Third Southbound Through Lane

Queen Kaahumanu Highway at Hina Lani Street (#3)

- Construct a grade-separated interchange

Kanalani Street at Hina Lani Street (#4)

- Add a Westbound Left-Turn Lane

Ane Keohokalale Highway at Hina Lani Street (#6)

- Add a Second Eastbound Left-Turn Lane
- Provide Eastbound Right-Turn Overlap Signal Phasing
- Provide Westbound Right-Turn Overlap Signal Phasing

Mamalahoe Highway at Hina Lani Street (#7)

- Add a Southbound Free Right-Turn Lane

With recommended 2045 With Project Phase 3 intersection lane improvements, the study area intersections are projected to be mitigated to Level of Service "D" or better during the peak hours. The intersection operations analysis worksheets for 2045 With Project Phase 3 Conditions, with recommended mitigation measures, are included in Appendix U of this report.

II. RECOMMENDED IMPROVEMENTS

Under future traffic scenarios, the study area intersections are expected to have poor levels of service. Improvement measures have been evaluated for all future with project scenarios. The purpose of the recommended improvements is to improve traffic operations for the study area intersections. It should be noted that the recommended improvements for each horizon year are needed to serve overall traffic growth which includes the project-only traffic and cumulative development traffic as well as ambient background traffic growth. This accounts for other unidentified projects and general population growth. The project is only one of the many contributors to the overall traffic growth.

It is recommended that the traffic study be updated periodically every 5 years to monitor the actual traffic growth and provide appropriate mitigation measures.

Recommended improvement measures and intersection operation performance improvements are reported in this section. Figure 49 summarizes the recommended intersection lane geometry to mitigate the traffic impact for the following analysis conditions:

- 2025 Without Project conditions, with existing lane geometry and planned widening
- 2035 Without Project conditions, with existing lane geometry and planned widening
- 2045 Without Project conditions, with recommended intersection improvements
- 2025 With Project Phase 1 conditions, with recommended intersection improvements
- 2035 With Project Phase 2 conditions, with recommended intersection improvements
- 2045 With Project Phase 3 conditions, with recommended intersection improvements

Table 22 summarizes the intersection level of service analysis results with existing lane geometry and planned improvements. Table 23 summarizes the expected levels of service for the study area intersections with additional mitigation measures in place.

II.1 Year 2025 and 2035 Without Project Improvements

It should be noted that the two "Without Project" scenarios for 2025 and 2035 conditions have the same recommended improvements.

For 2025 and 2035 Without Project Conditions, the list of recommended improvements includes planned improvements that are anticipated to be completed by agencies and other cumulative developments. The planned improvements include the widening of Queen Kaahumanu Highway and the new construction of a Mid-Level Road (Ane Keohokalole Highway) that will run in a north-south direction between Queen Kaahumanu Highway and Mamalahoa Highway. Figures 33 and 36 illustrate the recommended roadway network and intersection lane geometry for the 2025 and 2035 Without Project Conditions.

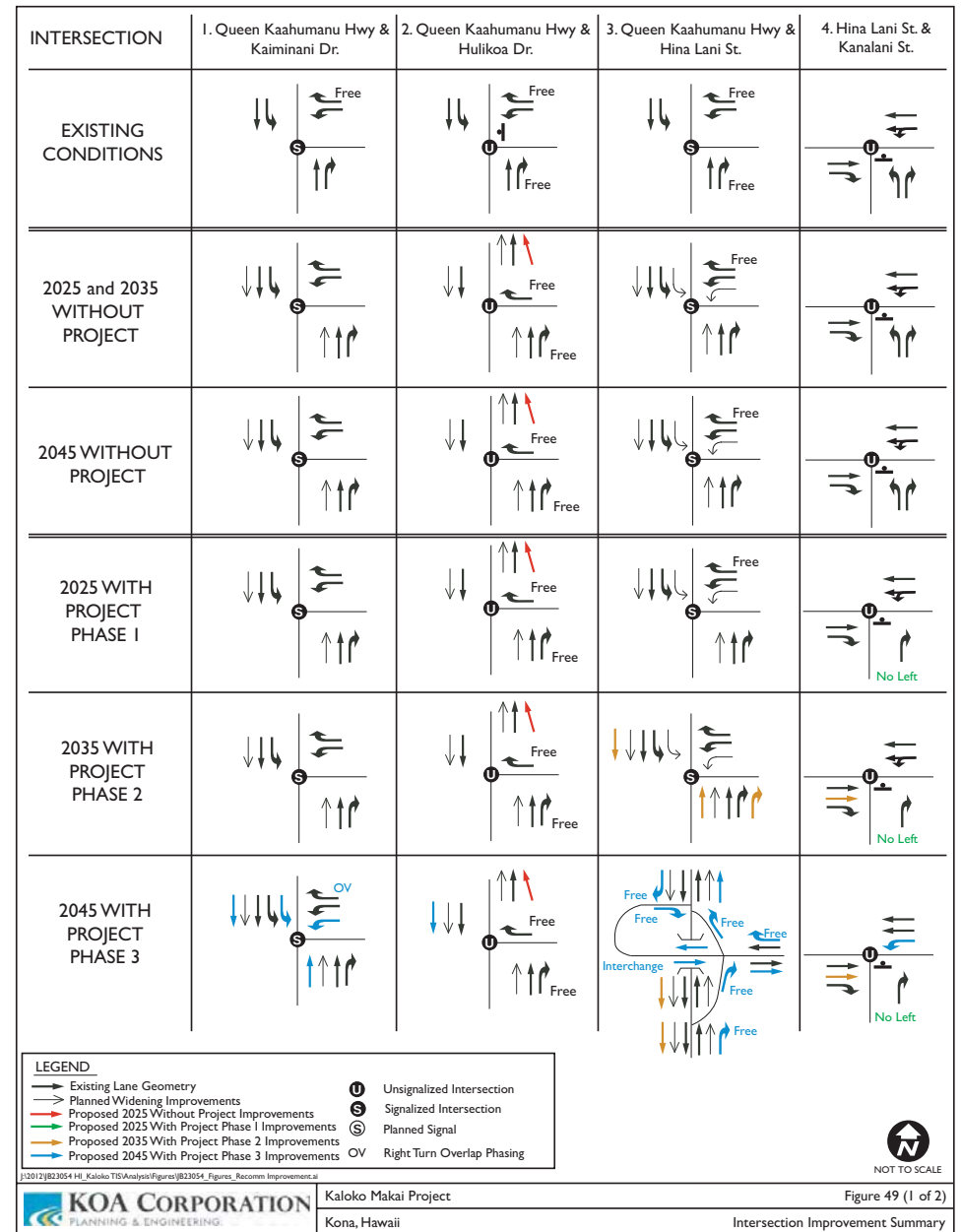
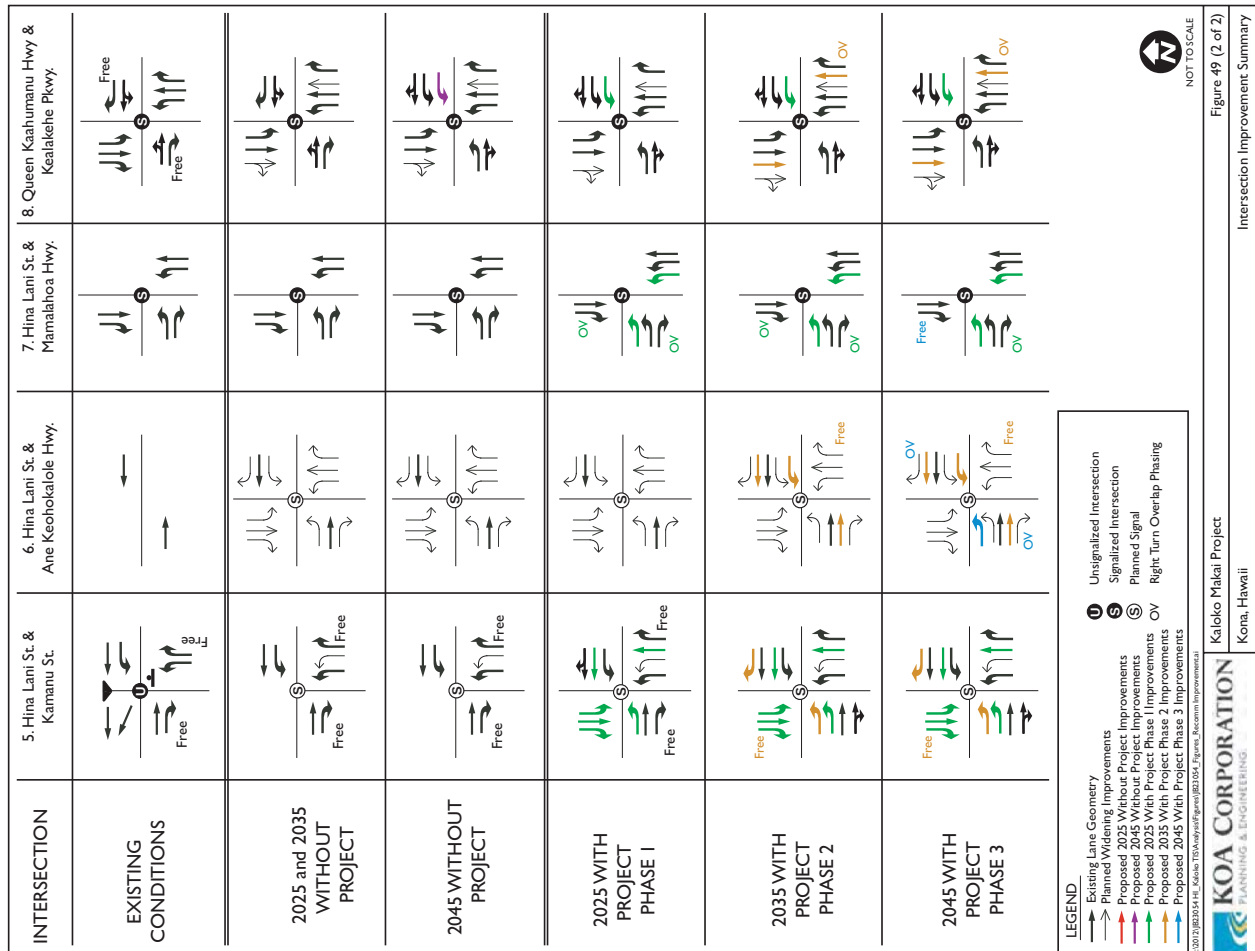


Table 22 - Intersection Level of Service Analysis Summary, Without Recommended Mitigations

No.	Intersection	Peak Hour	Existing		2025 Without Project		2035 Without Project		2045 Without Project		2025 With Project Phase 1		2035 With Project Phase 2		2045 With Project Phase 3	
			Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS
1	Queen Kaahumanu Hwy at Kaiminani Dr	AM	16.9	B	14.0	B	17.1	B	20.0	C	16.7	B	37.6	D	65.9	E
		PM	8.6	A	9.7	A	14.5	B	15.9	B	12.8	B	36.2	D	69.9	E
2	Queen Kaahumanu Hwy at Huliko Dr	AM	25.2	C	18.4	C	20.1	C	25.2	D	36.8	E	54.0	F	>100	F
		PM	52.1	C	46.2	E	36.9	E	52.1	F	>100	F	>100	F	>100	F
3	Queen Kaahumanu Hwy at Hina Lani St	AM	11.1	B	10.6	B	10.6	B	11.1	B	24.6	C	50.2	D	>100	F
		PM	15.7	C	14.8	B	14.2	B	15.7	B	53.9	D	>100	F	>100	F
4	Kanalani St at Hina Lani St	AM	19.2	B	24.2	C	19.2	C	19.2	C	>100	F	>100	F	>100	F
		PM	22.8	C	29.2	D	22.8	C	22.8	C	>100	F	>100	F	>100	F
5	Kamanu St at Hina Lani St	AM	10.7	B	4.1	A	3.7	A	3.7	A	13.5	B	83.7	F	>100	F
		PM	14.1	B	4.6	A	4.3	A	4.3	A	35.7	D	>100	F	>100	F
6	Ane Keohokalole Hwy at Hina Lani St	AM	--	--	9.3	A	25.9	C	24.5	C	19.0	B	78.3	E	>100	F
		PM	--	--	15.4	B	22.6	C	24.3	C	21.8	C	>100	F	>100	F
7	Mamalahoa Hwy at Hina Lani St	AM	44.8	B	40.7	D	26.7	C	44.8	D	74.9	E	81.2	F	>100	F
		PM	22.2	A	15.9	B	18.2	B	22.2	C	25.5	C	47.9	D	86.3	F
8	Queen Kaahumanu Hwy at Kealakehe Pkwy	AM	15.7	B	17.5	B	17.8	B	19.7	B	32.3	C	66.1	E	>100	F
		PM	26.5	C	43.3	D	50.4	D	63.2	E	>100	F	>100	F	>100	F



11.1.1 Planned Roadway Widening Along Queen Kaahumanu Highway

Queen Kaahumanu Highway is currently a two-lane roadway, and it is anticipated to be widening to a four-lane roadway prior to Year 2025. The planned roadway widening along Queen Kaahumanu Highway will provide additional northbound and southbound travel lane improvements to the following study area intersections:

Queen Kaahumanu Highway at Kaiminani Drive (#1)

- Add a Second Northbound Through Lane
- Add a Second Southbound Through Lane

Queen Kaahumanu Highway at Hulikoa Drive (#2)

- Add a Second Northbound Through Lane
- Add a Second Southbound Through Lane
- Restrict southbound and westbound left turn movements – this intersection is anticipated to remain unsignalized

Queen Kaahumanu Highway at Hina Lani Street (#3)

- Add a Second Northbound Through Lane
- Add a Second Southbound Through Lane
- Add a Second Southbound Left-Turn Lane
- Add a second Westbound Left-Turn Lane

Queen Kaahumanu Highway at Kealakehe Parkway (#8)

- Add a Second Northbound Through Lane
- Convert Southbound Right-Turn Lane to a shared (Second) Through/Right-Turn Lane

11.1.2 Planned Mid-Level Road (Ane Keohokalole Highway)

The future Ane Keohokalole Highway will be a two-lane Mid-Level Road that is planned to be constructed in a north-south direction between Queen Kaahumanu Highway and Mamalahoa Highway. By the first horizon year of this traffic study (Year 2025), Ane Keohokalole Highway is anticipated to be completed between Hulikoa Drive and Palani Road to the south. As of June 2012, Ane Keohokalole Highway has been completed between Hina Lani Street and Kealakehe Parkway. The northerly extension of Ane Keohokalole Highway to Kaiminani Drive will be completed by 2028 (or near the beginning of Project Phase 2). The completion of Ane Keohokalole Highway will serve as a parallel corridor to relief traffic congestion on Queen Kaahumanu Highway and Mamalahoa Highway. The planned Mid-Level Road will provide lane improvements to the following study area intersection:

Table 23 - Intersection Level of Service Analysis Summary, With Recommended Mitigations

No.	Intersection	Peak Hour	2025 Without Project		2035 Without Project		2045 Without Project		2025 With Project Phase 1		2035 With Project Phase 2		2045 With Project Phase 3	
			Delay (Sic)	LOS	Delay (Sic)	LOS	Delay (Sic)	LOS	Delay (Sic)	LOS	Delay (Sic)	LOS	Delay (Sic)	LOS
1	Queen Kaahumanu Hwy at Kaiminani Dr	AM	14.0	B	17.1	B	20.0	C	16.7	B	37.6	D	17.6	B
		PM	9.7	A	14.5	B	15.9	B	12.8	B	36.2	D	16.2	B
2	Queen Kaahumanu Hwy at Hulikoa Dr	AM	0.1	A	0.1	A	0.1	A	0.1	A	0.1	A	0.1	A
		PM	0.1	A	0.1	A	0.1	A	0.1	A	0.1	A	0.1	A
3	Queen Kaahumanu Hwy at Hina Lani St	AM	10.6	B	10.6	B	11.1	B	24.6	C	22.7	C	Interchange	
		PM	14.8	B	14.2	B	15.7	B	53.9	D	43.2	D		
		AM	24.2	C	19.2	C	19.2	C	23.5	C	13.4	B	15.5	C
4	Kaiminani St at Hina Lani St	PM	29.2	D	22.8	C	22.8	C	34.3	D	18.2	C	26.1	D
		AM	4.1	A	3.7	A	3.7	A	32.5	C	21.7	C	26.5	C
5	Kamahu St at Hina Lani St	PM	4.6	A	4.3	A	4.3	A	40.8	D	26.0	C	37.3	D
		AM	9.3	A	25.9	C	24.5	C	19.0	B	43.3	D	46.5	D
6	Ane Keohokalole Hwy at Hina Lani St	PM	15.4	B	22.6	C	24.3	C	21.8	C	44.7	D	54.4	D
		AM	40.7	D	26.7	C	44.8	D	47.6	D	38.7	D	51.5	D
7	Mamalahoa Hwy at Hina Lani St	PM	15.9	B	18.2	B	22.2	C	15.1	B	16.7	B	22.2	C
		AM	17.5	B	17.8	B	23.7	C	29.8	C	24.4	C	30.5	C
8	Queen Kaahumanu Hwy at Kealakehe Pkwy	PM	43.3	D	50.4	D	37.2	D	54.0	D	36.8	D	41.7	D

Ane Keohokalole Highway at Hina Lani Street (#6)

- Ane Keohokalole Highway will be constructed as a new Mid-Level Road, and it will run in a generally north-south direction through the project site.
- Construct new intersection: Provide Left-Turn, Through, and Right-Turn for all approaches
- Install a new traffic signal

11.1.3 Additional Planned Intersection Improvements by Other Cumulative Developments

By 2025, there are planned improvements to the study area intersections that will be implemented by other surrounding developments to accommodate the overall traffic growth due to background ambient growth and new cumulative developments. The following planned intersection improvements are anticipated:

Kamanu Street at Hina Lani Street (#5)

- Install a New Traffic Signal
- Add a Northbound Left-Turn Lane

11.2 Year 2045 Without Project Improvements

In addition to the planned improvements mentioned in Section 11.1, the following additional improvement is recommended to accommodate 2045 Without Project Conditions:

Queen Kaahumanu Highway at Kealakehe Parkway (#8)

- Add a Second Westbound Left-Turn Lane

Figure 39 illustrates the recommended roadway network and intersection lane geometry for the 2045 Without Project Conditions.

11.3 Year 2025 With Project Phase I Improvements

Four study area intersections are expected to experience significant traffic impacts from the Kaloko Makai project in Year 2025. These intersections are expected to have poor levels of service due to the combination of background traffic growth and traffic generated by the project. The following intersections are expected to be impacted by the project. Recommended mitigation measures are described for each intersection. Figure 42 illustrates the recommended roadway network and intersection lane geometry for the 2025 With Project Phase I Conditions, showing the recommended improvement measures designed to mitigate the traffic impacts at the study intersections.

11.3.1 Kanalani Street at Hina Lani Street (#4)

The intersection of Kanalani Street at Hina Lani Street is expected to have a poor level of service (LOS F) due to long delays and queues for the northbound left movement. The number of vehicles making this move is relatively high (225 PM peak hour vehicles). The intersection is located too close to the

intersection of Queen Kaahumanu Highway at Hina Lani Street to be signalized. It is therefore recommended that the northbound left turn movement be restricted, either through signage and striping, or by installation of a "pork-chop" island. The northbound left turn traffic will be diverted to the adjacent Kamanu Street. The intersection of Kanalani Street at Hina Lani Street will remain stop-controlled for the northbound approach, and the following improvements are recommended:

- Restrict Northbound Left-Turn Movement

11.3.2 Kamanu Street at Hina Lani Street (#5)

The addition of project traffic to/from the north leg of the intersection of Kamanu Street at Hina Lani Street will result in the need for improvements at this intersection. In particular, the intersection must be improved for the eastbound left turn, northbound through, westbound through and all southbound movements. The following improvement measures are therefore recommended to accommodate Project Phase I traffic at this intersection:

- Add a Northbound Through Lane
- Add Southbound Left-Turn, Through, and Right-Turn Lanes
- Add an Eastbound Left-Turn Lane
- Add a Second Westbound Through Lane

11.3.3 Mamalahoa Highway at Hina Lani Street (#7)

The intersection of Mamalahoa Highway at Hina Lani Street currently experiences Level of Service B or better during the AM and PM peak hours. For 2025 conditions, a combination of additional traffic from the proposed project and background traffic growth will result in a decline in level of service at this intersection to Level of Service E during the AM peak hour. The Project Phase I impact at this intersection can be mitigated by increasing intersection capacity through a combination of overlap signal phasing and two additional left-turn lanes:

- Add a Second Northbound Left-Turn Lane
- Provide Southbound Right-Turn Overlap Signal Phasing
- Add a Second Eastbound Left-Turn Lane
- Provide Eastbound Right-Turn Overlap Signal Phasing

11.3.4 Queen Kaahumanu Highway at Kealakehe Parkway (#8)

The intersection of Queen Kaahumanu Highway at Kealakehe Parkway is currently operating at Level of Service C or better during the AM and PM peak hours. For 2025 conditions, level of service is expected to decline to LOS F during the PM peak hour due to increases in north-south traffic and westbound left

turn traffic from the proposed project and background traffic growth. The following improvement measures for this intersection are recommended to mitigate the 2025 Project Phase 1 impacts:

- Add a Second Westbound Left-Turn Lane

11.4 Year 2035 With Project Phase 2 Improvements

Four study area intersections are expected to experience significant traffic impacts from the Kaloko Makai project in Year 2035. These intersections are expected to have poor levels of service due to the combination of traffic generated by the proposed project and area background traffic growth. The following intersections are expected to be impacted by the project in 2035. Recommended mitigation measures are described for each intersection. Figure 45 shows the recommended roadway network and intersection lane geometry for the 2035 With Project Phase 2 Conditions to mitigate the traffic impact at the study intersections.

11.4.1 Queen Kaahumanu Highway at Hina Lani Street (#3)

The intersection of Queen Kaahumanu Highway at Hina Lani Street is expected to have moderate increases in traffic from the proposed project and from background traffic in 2035, particularly for the northbound right turn and westbound left turn movements. An additional northbound right-turn lane and additional eastbound and westbound through lanes will be required to accommodate the expected increase in traffic volume and mitigate project impacts. The following improvement measure for this intersection is therefore recommended to mitigate the Project Phase 2 impacts in 2035:

- Add a Third Northbound Through Lane
- Add a Second Northbound Right-Turn Lane
- Add a Third Southbound Through Lane

11.4.2 Kanalani Street at Hina Lani Street (#4)

The intersection of Kanalani Street at Hina Lani Street will experience a significant increase in east-west through traffic by 2035. Intersection LOS will decline to Level F, due primarily to increases in Project Phase 2 traffic. It is recommended that the project traffic impact be mitigated by the addition of an eastbound through lane:

- Add a Second Eastbound Through Lane

11.4.3 Kamanu Street at Hina Lani Street (#5)

The intersection of Kamanu Street at Hina Lani Street will have additional project traffic impacts due to Phase 2 of the proposed project. Additional project traffic to/from the north leg of the intersection is expected to result in the need for additional improvements. In particular, capacity must be increased

for the eastbound left turn and westbound right turn movements. The following improvements are recommended to accommodate the additional project traffic:

- Add a Southbound Free-Right Turn Lane
- Add a Second Eastbound Left-Turn Lane
- Add a Westbound Right-Turn Lane

11.4.4 Ane Keohokalole Highway at Hina Lani Street (#6)

Phase 2 of the project will require improvements to this intersection. Project traffic increases will be primarily to east-west through traffic, and traffic between the east leg and south leg of the intersection. Level of service is expected to decline to LOS F due to these traffic increases. The project impact at this intersection can be mitigated through a combination of increasing east-west through capacity and improving the northbound right-turn lane. The recommended improvements are:

- Add a Northbound Free-Right Turn Lane
- Add a Second Eastbound Through Lane
- Add a Second Westbound Through Lane
- Add a Second Westbound Left-Turn Lane

11.4.5 Queen Kaahumanu Highway at Kealakehe Parkway (#8)

The intersection of Queen Kaahumanu Highway at Kealakehe Parkway is currently operating at Level of Service C or better during the AM and PM peak hours. For 2035 conditions, level of service is expected to decline to LOS F during the PM peak hour due to increases in north-south traffic from the proposed project and background traffic growth. Additional north-south through traffic capacity is therefore required to return the intersection to desirable operating conditions. The following improvement measures for this intersection are recommended to mitigate the 2035 Project Phase 2 impacts:

- Add a Third Northbound Through Lane
- Provide Northbound Right-Turn Overlap Signal Phasing
- Add a Third Southbound Through Lane

11.5 Year 2045 With Project Phase 3 Improvements

Six study area intersections are expected to require additional improvements by 2045 to accommodate the combination of traffic generated by the proposed Project Phase 3 and background traffic growth. The following traffic mitigation measures are required for these intersections to accommodate these traffic increases. Figure 48 shows the recommended roadway network and intersection lane geometry for the 2045 With Project Phase 3 Conditions to mitigate the traffic impact within the study area. The most significant improvement to the area roadway network will be the grade-separated interchange recommended for the intersection of Queen Kaahumanu Highway at Hina Lani Street to mitigate traffic

impacts. A conceptual configuration of the grade-separated interchange is included in Appendix V of this report. The interchange will be located north of Hina Lani Street because it needs additional space to accommodate the ramps. The intersection of Hina Lani Street with Queen Kaahumanu Highway will be moved north to a location where the interchange will not conflict with any existing development.

11.5.1 Queen Kaahumanu Highway at Kaiminani Drive (#1)

The intersection of Queen Kaahumanu Highway at Kaiminani Drive currently operates at Level of Service B or better during the AM and PM peak hours. Level of Service is expected to decline to Level E with the addition of project traffic and background traffic growth. All legs of the intersection must be improved to accommodate the anticipated growth. The following improvement measures are recommended to accommodate project traffic growth at this intersection:

- Add a Third Northbound Through Lane
- Add a Second Southbound Left-Turn Lane
- Add a Third Southbound Through Lane
- Add a Second Westbound Left-Turn Lane
- Provide Westbound Right-Turn Overlap Signal Phasing

11.5.2 Queen Kaahumanu Highway at Hulikoa Drive (#2)

Phase 3 of the project will require lane improvements at this intersection. Project traffic increases will be primarily to north-south through traffic. Level of service is expected to decline to Level F due to these traffic increases. The Project Phase 3 impact at this intersection can be mitigated by increasing southbound through capacity with the following recommended improvements:

- Add a Third Southbound Through Lane

11.5.3 Queen Kaahumanu Highway at Hina Lani Street (#3)

The intersection of Queen Kaahumanu Highway at Hina Lani Street is expected to have significant increases in traffic from the proposed project and from background traffic by 2045. These increases will be for all approaches. A grade-separated interchange is proposed to accommodate the projected traffic volume increases and mitigate impacts from Phase 3 of the project. The grade separation will be constructed north of the current intersection location, and it will include free right-turn lanes (ramps) for all three approaches. Additional north-south through lanes will be added to accommodate traffic increases for those movements. The grade separation will configure the intersection with Hina Lani Street as the overpass street and Queen Kaahumanu Highway as the underpass street. A conceptual layout of the grade-separated interchange is included in Appendix V of this report. The interchange will be located north of Hina Lani Street because it needs additional space to accommodate the ramps. The intersection of Hina Lani Street with Queen Kaahumanu Highway will be moved north to a location where the interchange will not conflict with any existing development.

11.5.4 Kanalani Street at Hina Lani Street (#4)

Increases in east-west traffic volumes will require improvements at the intersection of Kanalani Street at Hina Lani Street by 2045. Intersection LOS will decline to Level F, due primarily to increases in Project Phase 3 traffic. Additional westbound left-turn capacity is required to mitigate project impacts at this intersection. It is therefore recommended that the project traffic impact be mitigated by the following improvement:

- Add a Westbound Left-Turn Lane

11.5.5 Ane Keohokalole Highway at Hina Lani Street (#6)

Phase 3 of the project will require additional improvements to the intersection of Ane Keohokalole Highway at Hina Lani Street. Level of service is expected to decline to LOS F due to project traffic increases, primarily to the eastbound left and westbound right movements. The project impact at this intersection can be mitigated through a combination of increasing eastbound left capacity and improving existing traffic signal phasing. The recommended improvements are as follows:

- Add a Second Eastbound Left-Turn Lane
- Provide Eastbound Right-Turn Overlap Signal Phasing
- Provide Westbound Right-Turn Overlap Signal Phasing

11.5.6 Mamalahoa Highway at Hina Lani Street (#7)

Additional traffic to/from the west leg of the Mamalahoa Highway/Hina Lani Street intersection will require improvements to the north leg of the intersection to accommodate the southbound right-turn movement. The recommended improvement is to convert the southbound right-turn lane to a free-right lane, eliminating the conflict between this movement and the northbound left-turn movement. This improvement will mitigate project impacts at this intersection.

- Add a Southbound Free Right-Turn Lane

Table 24 (1 of 2) - Intersection Mitigation Summary

12. Conclusions

The purpose of this study is to assess the overall traffic impact of the proposed Kaloko Makai project, which will be developed in 3 phases, for 2025, 2035 and 2045 conditions.

This study used the existing traffic volumes and the surrounding land use and geographic conditions to determine the project trip distribution patterns. ITE trip rates are used to estimate the site-only project traffic volumes, and trip reduction adjustments have been made to the overall project traffic generation to account for pass-by trips, internal trip capture and transit trip discount. The reduction percentage assumptions have been based on past experience for this type of development and other reference information.

Future traffic increases also consider additional traffic that are generated by other cumulative developments that either are under construction, approved, planned, or proposed for development near the study area based on the available information obtained by the project team. In addition to cumulative development traffic, other unidentified projects and general population growth contribute to ambient background traffic growth. Ambient growth is calculated as an annual growth percentage increase from existing traffic count volumes, based on a comparison of the historic traffic count data from 1996 through 2010 for the segment of Queen Kaahumanu Highway north of OTEC Access Road (Station T8M), at which an average annual growth rate of 1.74% is calculated as shown in Appendix H.

Synchro models were developed to conduct intersection level of service analyses. Analysis methodologies and parameters are presented in Section 2 of this report.

The document presents the recommended mitigation improvements to the study area intersections. Figure 49 graphically summarizes the recommended roadway network and intersection lane geometry for the various analysis scenarios. Table 24 summarizes the recommended intersection improvements in a tabular format. The recommended intersection improvements are described in previous Section 11 of this report.

It is recommended that the traffic study be updated periodically every 5 years to monitor the actual traffic growth and provide appropriate mitigation.

Intersection	Recommended Intersection Improvements				
	2025 & 2035 Without Project	2045 Without Project	Year 2025 Project Phase 1	Year 2035 Project Phase 2	Year 2045 Project Phase 3
1 Queen Kaahumanu Hwy at Kaiminani Dr	- Add a 2nd NB Thru Lane - Add a 2nd SB Thru Lane	No additional improvements	No additional improvements	No additional improvements	- Add a 3rd NB Thru Lane - Add a 2nd SB Left-Turn Lane - Add a 3rd SB Thru Lane - Add a 2nd WB Left-Turn Lane - Provide WB Right-Turn Overlap Signal Phasing
2 Queen Kaahumanu Hwy at Hulikoa Dr	- Add a 2nd NB Thru Lane - Add a 2nd SB Thru Lane - Retain WB Free Right-Turn Lane - Restrict SB and WB Left-Turn Movements	No additional improvements	No additional improvements	No additional improvements	Add a 3rd SB Thru Lane
3 Queen Kaahumanu Hwy at Hina Lani St	- Add a 2nd NB Thru Lane - Add a 2nd SB Thru Lane - Add a 2nd SB Left-Turn Lane - Add a 2nd WB Left-Turn Lane	No additional improvements	No additional improvements	- Add a 3rd NB Thru Lane - Add a 2nd NB Right-Turn Lane - Add a 3rd SB Thru Lane	Construct a Grade Separation (See Appendix V for conceptual layout)
4 Kanalani St at Hina Lani St	No additional improvements	No additional improvements	Restrict NB Left-Turn Movement	Add a 2nd EB Thru Lane	Add a WB Left-Turn Lane
5 Kamanu St at Hina Lani Street	- Install a New Traffic Signal - Add a 2nd NB Left-Turn Lane	No additional improvements	- Add a NB Thru Lane - Add SB Left-Turn, Thru, and Right-Turn Lanes - Add an EB Left-Turn Lane - Add a 2nd WB Thru Lane	- Add a SB Free-Right Turn Lane - Add a 2nd EB Left-Turn Lane - Add a WB Right-Turn Lane	No additional improvements

Table 24 (2 of 2) - Intersection Mitigation Summary

Intersection	Recommended Intersection Improvements				
	2025 & 2035 Without Project	2045 Without Project	Year 2025 Project Phase 1	Year 2035 Project Phase 2	Year 2045 Project Phase 3
6 Ane Keohokalole Hwy at Hina Lani St	- Provide Left-Turn, Thru, and Right-Turn for all approaches - Install a new traffic signal	No additional improvements	No additional improvements	- Add a NB Free-Right Turn Lane - Add a 2nd EB Thru Lane - Add a 2nd WB Thru Lane - Add a 2nd WB Left-Turn Lane	- Add a 2nd EB Left-Turn Lane - Provide EB Right-Turn Overlap Signal Phasing - Provide WB Right-Turn Overlap Signal Phasing
7 Mamalahoa Hwy at Hina Lani St	No additional improvements	No additional improvements	- Add a 2nd NB Left-Turn Lane - Provide SB Right-Turn Overlap Signal Phasing - Add a 2nd EB Left-Turn Lane - Provide EB Right-Turn Overlap Signal Phasing	No additional improvements	Add a SB Free Right-Turn Lane
8 Queen Kaahumanu Hwy at Kealakehe Pkwy	- Add a 2nd NB Thru Lane - Convert SB Right-Turn Lane to a shared (2nd) Thru/Right-Turn Lane	Add a 2nd WB Left-Turn Lane	Add a 2nd WB Left-Turn Lane	- Add a 3rd NB Thru Lane - Provide NB Right-Turn Overlap Signal Phasing - Add a 3rd SB Thru Lane	No additional improvements

KALOKE MAKAI - LAND USE SUMMARY

Parcel I.D.	Land Use	Land Use Description	Parcel Size (Acres)	Density of Parcel (D.U./Acre)	Maximum Density (D.U./Acre)	# of Units	SF Units	MF Units	# of Aff. Units	# of Aff. Units (lower AMI's)	Retail Space	Office Space
PHASE 1												
INDUSTRIAL	Industrial	Light Industrial	25.0									
WWTP	WWTP	Waste Water Treatment Plant	20.0									
ELEC. SUB	ESS	Electrical Substation	1.0									
P-4	Park	District Sized Park & Drainage Retention	25.0									
T4-16	Res./MU	MF, Affordable Housing	13.1	9.0	12	118	88	30	118	118		
T4-15	Res./MU	Live-Work, MF, & SF	15.4	9.0	12	139	104	35	139	139	10,000	10,000
T3-11	SF	Single Family	11.6	5.0	6	58	58	0				
T3-10	SF	Single Family	7.4	5.0	6	37	37	0				
T4-11	Res./MU	Mixed SF and MF	9.4	9.0	12	85	63	22				
T4-10	Res./MU	Live-Work, MF, & SF	18.0	9.0	12	162	121	41			7,500	7,500
T5-10	Res./MU	Shopping Center, Legal Offices, MF, Transit Station, Senior Independent Living	39.1	10.8	30	423	0	423			75,000	80,000
T5-13	Res./MU	Mixed Use, Aff. Housing, Retail, Office,	14.3	15.0	30	215	0	215	100	50	45,000	15,000
P-2	Park		10.0			0	0	0				
SCHOOL	School		18.0			0	0	0				
T5-9	Res./MU	Mixed Use, MF	7.7	15.0	30	116	0	116			20,000	
T5-5	Res.	Long Term Care, Medical Offices	11.9	15.0	30	179	0	179			15,000	15,000
T5-6	Res.	Long Term Care	5.5	15.0	30	83	0	83			15,000	15,000
T5-7	Res./MU	Lodge, Business Center, Medical Offices	5.3	0.0	30	0	0	0			10,000	30,000
T5-8	Res./MU	Transit Station, TOD Square, Medical Offices, MF, Senior	9.1	15.0	30	137	0	137			20,000	40,000
HOSPITAL	Medical		40.0									
TOTAL PHASE 1 UNITS			306.8			1752	471	1281	357	307	217,500	212,500
										20%	18%	
PHASE 2												
INDUSTRIAL	Industrial	Light Industrial	25.0									
T4-14	Res./MU	MF, Live-Work, Affordable	18.8	9.0	12	170	127	43	50	25	7,500	7,500
T3-12	SF	Single Family	28.5	6.0	6	171	171	0				
T3-13	SF	Single Family	9.9	6.0	6	60	60	0				
P-3	Park		10.0			0						
SCHOOL	School		12.0			0						
T4-12	Res.	Multi Family & Single Family	6.5	8.0	12	52	39	13				
T4-13	Res.	Multi Family & Single Family	17.1	8.0	12	137	102	35			7,500	7,500
T5-11	Res./MU	MF, Senior, Live-Work	6.0	15.0	30	90	0	90	90	90	7,500	7,500
T5-12	Res./MU	Mixed Use	6.7	15.0	30	101	0	101	100	75	10,000	10,000
T5-14	Res./MU	Mixed Use, Affordable Housing	10.6	14.6	30	155	0	155	73	73	10,000	10,000
T4-1	Res./MU	Mixed SF and MF	12.7	8.0	12	102	76	26	70	30		
T4-2	Res./MU	Mixed SF and MF	10.7	8.0	12	86	64	22				
T4-3	Res./MU	Mixed SF and MF	15.4	8.0	12	124	93	31				

A - 2

Appendix A - Project Land Use Description

Kona, HI / Kaloko Makai
Traffic Impact Study



A - 1

Appendix B - Traffic Count Data Sheets

KALOKE MAKAI - LAND USE SUMMARY

Parcel I.D.	Land Use	Land Use Description	Parcel Size (Acres)	Density of Parcel (D.U./Acre)	Maximum Density (D.U./Acre)	# of Units	SF Units	MF Units	# of Aff. Units	# of Aff. Units (lower AMI's)	Retail Space	Office Space
T4-4	Res./MU	Mixed SF and MF	5.6	8.0	12	45	33	12				
T4-5	Res./MU	Mixed SF and MF	9.5	9.0	12	86	64	22			20,000	
T5-1	Res./MU	Mixed Use	10.7	15.0	30	161	0	161				
T5-2	Res./MU	Mixed Use	7.2	16.0	30	116	0	116				
T5-3	Res./MU	MF, Senior	7.4	16.0	30	119	0	119				
T5-4	Res./MU	Multi Family	10.9	16.0	30	175	0	175			25,000	
TOTAL PHASE 2 UNITS			241.2			1950	829	1121	383	293	87,500	42,500
										20%	15%	
PHASE 3												
INDUSTRIAL	Industrial	Light Industrial	25.0									
T3-1	SF	Large Lot Single Family	5.5	3.0	6	17	17	0				
T3-2	SF	Large Lot Single Family	1.8	3.0	6	6	6	0				
T3-3	SF	Large Lot Single Family	1.4	3.0	6	5	5	0				
T3-4	SF	Large Lot Single Family	25.1	3.0	6	76	76	0				
T3-5	SF	Single Family	22.3	5.0	6	112	112	0				
T3-6	SF	Single Family	14.1	5.0	6	71	71	0				
T3-7	SF	Single Family	23.4	5.0	6	117	117	0				
T3-8	SF	Single Family	12.6	5.0	6	63	63	0				
T4-6	Res./MU	Mixed SF and MF	11.8	10.0	12	118	83	35			15,000	
P-1	Park		11.2			0						
SCHOOL	School		12.0			0						
T4-7	Res./MU	Mixed SF and MF	9.1	10.0	12	91	54	37				
T3-9	SF	Single Family	38.5	5.0	6	193	193	0				
T4-8	Res./MU	Mixed Use, MF, Affordable	20.3	11.0	12	224	134	90	100	50		
T4-9	Res./MU	Live-Work & Affordable	18.6	11.0	12	205	123	82	160	50	15,000	10,000
FIRE STATION	Fire	Fire Station	5.5									
DESAL. PLANT	Desa Facility	Desalinization Plant	1.7									
TOTAL PHASE 3 UNITS			234.9			1298	1054	244	260	100	30,000	10,000
										20%	9%	
DRY FOREST	OS	Dryland Forest	150.0									
OPEN SPACE	OS	Open Space	72.2									
ROADWAYS	Roads	Roadways & Buffers	107.7									
TOTAL ALL 3 PHASES			1112.8			5000	2354	2646	1000	700	335,000	265,000
COMMERCIAL COMPONENT TOTAL											600,000	
T3			202.1									
T4			212.0									
T5			152.4									

Wilson Okamoto Corporation1907 S. Beretania Street Suite 400
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Groups Printed- Unshifted

Start Time	Queen Kaahumanu Highway Southbound					Kaiminani Drive Westbound					Queen Kaahumanu Highway Northbound					Eastbound	Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	
03:00 PM	23	133	0	0	156	56	0	12	0	68	0	129	47	0	176	0	400
03:15 PM	33	176	0	0	209	44	0	19	0	63	0	113	66	0	179	0	451
03:30 PM	55	156	0	0	211	51	0	15	0	66	0	127	102	0	229	0	506
03:45 PM	47	163	0	0	210	33	0	17	0	50	0	137	84	0	221	0	481
Total	158	628	0	0	786	184	0	63	0	247	0	506	299	0	805	0	1838
04:00 PM	47	156	0	0	203	43	0	17	0	60	0	105	82	0	187	0	450
04:15 PM	51	148	0	0	199	53	0	20	0	73	0	128	112	0	240	0	512
04:30 PM	30	132	0	0	162	39	0	11	0	50	0	126	97	0	223	0	435
04:45 PM	43	161	0	0	204	40	0	22	0	62	0	141	97	0	238	0	504
Total	171	597	0	0	768	175	0	70	0	245	0	500	388	0	888	0	1901
05:00 PM	28	120	0	0	148	39	0	23	0	62	0	122	95	0	217	0	427
05:15 PM	32	121	0	0	153	32	0	11	0	43	0	124	93	0	217	0	413
05:30 PM	27	118	0	0	145	36	0	20	0	56	0	115	98	0	213	0	414
05:45 PM	29	107	0	0	136	35	0	10	0	45	0	134	91	0	225	0	406
Total	116	466	0	0	582	142	0	64	0	206	0	495	377	0	872	0	1660
Grand Total	445	1691	0	0	2136	501	0	197	0	698	0	1501	1064	0	2565	0	5399
Apprch %	20.8	79.2	0	0		71.8	0	28.2	0		0	58.5	41.5	0		0	
Total %	8.2	31.3	0	0	39.6	9.3	0	3.6	0	12.9	0	27.8	19.7	0	47.5	0	

	Queen Kaahumanu Highway Southbound				Kaiminani Drive Westbound				Queen Kaahumanu Highway Northbound				Eastbound	
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 03:30 PM														
03:30 PM	55	156	0	211	51	0	15	66	0	127	102	229	0	506
03:45 PM	47	163	0	210	33	0	17	50	0	137	84	221	0	481
04:00 PM	47	156	0	203	43	0	17	60	0	105	82	187	0	450
04:15 PM	51	148	0	199	53	0	20	73	0	128	112	240	0	512
Total Volume	200	823	0	823	180	0	69	249	0	497	380	877	0	1949
% App. Total	24.3	75.7	0		72.3	0	27.7		0	56.7	43.3		0	
PHF	.909	.956	.000	.975	.849	.000	.863	.853	.000	.907	.848	.914	.000	.952

Wilson Okamoto Corporation1907 S. Beretania Street Suite 400
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Groups Printed- Unshifted

Start Time	Queen Kaahumanu Highway Southbound					Kaiminani drive Westbound					Queen Kaahumanu Highway Northbound					Eastbound	Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	
06:00 AM	3	56	0	0	59	42	0	29	0	71	0	73	16	0	89	0	219
06:15 AM	6	46	0	0	52	69	0	40	0	109	0	88	21	0	109	0	270
06:30 AM	8	77	0	0	85	81	0	50	0	131	0	116	34	0	150	0	366
06:45 AM	7	86	0	0	93	122	0	68	0	190	0	134	21	0	155	0	438
Total	24	265	0	0	289	314	0	187	0	501	0	411	92	0	503	0	1293
07:00 AM	8	86	0	0	94	106	0	58	0	164	0	150	24	0	174	0	432
07:15 AM	4	96	0	0	100	127	0	59	0	186	0	137	27	0	164	0	450
07:30 AM	6	106	0	0	112	125	0	36	0	161	0	141	30	0	171	0	444
07:45 AM	6	113	0	0	119	114	0	56	0	170	0	105	31	0	136	0	425
Total	24	401	0	0	425	472	0	209	0	681	0	533	112	0	645	0	1751
08:00 AM	13	91	0	0	104	86	0	31	0	117	0	103	40	0	143	0	364
08:15 AM	4	109	0	0	113	61	0	23	0	84	0	134	36	0	170	0	367
08:30 AM	9	130	0	0	139	59	0	31	0	90	0	118	25	0	143	0	372
08:45 AM	10	125	0	0	135	68	0	28	0	96	0	148	30	0	178	0	409
Total	36	455	0	0	491	274	0	113	0	387	0	503	131	0	634	0	1512
Grand Total	84	1121	0	0	1205	1060	0	509	0	1569	0	1447	335	0	1782	0	4556
Apprch %	7	93	0	0		67.6	0	32.4	0		0	81.2	18.8	0		0	
Total %	1.8	24.6	0	0	26.4	23.3	0	11.2	0	34.4	0	31.8	7.4	0	39.1	0	

Start Time	Queen Kaahumanu Highway Southbound				Kaiminani drive Westbound				Queen Kaahumanu Highway Northbound				Eastbound	Int. Total	
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total		
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1															
Peak Hour for Entire Intersection Begins at 06:45 AM															
06:45 AM	7	86	0	93	122	0	68	190	0	134	21	155	0	438	
07:00 AM	8	86	0	94	106	0	58	164	0	150	24	174	0	432	
07:15 AM	4	96	0	100	127	0	59	186	0	137	27	164	0	450	
07:30 AM	6	106	0	112	125	0	36	161	0	141	30	171	0	444	
Total Volume	25	374	0	399	480	0	221	701	0	562	102	664	0	1764	
% App. Total	6.3	93.7	0		68.5	0	31.5		0	84.6	15.4		0		
PHF	.781	.882	.000	.891	.945	.000	.813	.922	.000	.937	.850	.954	.000	.960	

Wilson Okamoto Corporation1907 S. Beretania Street Suite 400
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Groups Printed- Unshifted

Start Time	Queen Kaahumanu Highway Southbound					Hulikoa Drive Westbound					Queen Kaahumanu Highway Northbound					Eastbound	Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	
03:00 PM	17	236	0	0	253	20	0	22	0	42	0	148	12	0	160	0	455
03:15 PM	8	236	0	0	244	20	0	20	0	40	0	154	24	0	178	0	462
03:30 PM	17	206	0	3	226	23	0	26	0	49	0	167	19	0	186	0	461
03:45 PM	16	173	0	1	190	27	0	28	0	55	0	166	24	0	190	0	435
Total	58	851	0	4	913	90	0	96	0	186	0	635	79	0	714	0	1813
04:00 PM	17	216	0	0	233	31	0	30	0	61	0	159	15	0	174	0	468
04:15 PM	19	233	0	0	252	32	0	24	0	56	0	176	18	0	194	0	502
04:30 PM	7	226	0	0	233	27	0	20	0	47	0	197	17	0	214	0	494
04:45 PM	14	216	0	0	230	30	0	11	0	41	0	187	15	0	202	0	473
Total	57	891	0	0	948	120	0	85	0	205	0	719	65	0	784	0	1937
05:00 PM	18	180	0	0	198	14	0	28	0	42	0	191	14	0	205	0	445
05:15 PM	11	168	0	0	179	19	0	30	0	49	0	171	13	0	184	0	412
05:30 PM	17	169	0	0	186	13	0	11	0	24	0	213	10	0	223	0	433
05:45 PM	8	173	0	0	181	15	0	14	0	29	0	183	12	0	195	0	405
Total	54	690	0	0	744	61	0	83	0	144	0	758	49	0	807	0	1695
Grand Total	169	2432	0	4	2605	271	0	264	0	535	0	2112	193	0	2305	0	5445
Apprch %	6.5	93.4	0	0.2		50.7	0	49.3	0		0	91.6	8.4	0			
Total %	3.1	44.7	0	0.1	47.8	5	0	4.8	0	9.8	0	38.8	3.5	0	42.3	0	

Start Time	Queen Kaahumanu Highway Southbound					Hulikoa Drive Westbound					Queen Kaahumanu Highway Northbound					Eastbound	Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:00 PM																	
04:00 PM	17	216	0	0	233	31	0	30	0	61	0	159	15	0	174	0	468
04:15 PM	19	233	0	0	252	32	0	24	0	56	0	176	18	0	194	0	502
04:30 PM	7	226	0	0	233	27	0	20	0	47	0	197	17	0	214	0	494
04:45 PM	14	216	0	0	230	30	0	11	0	41	0	187	15	0	202	0	473
Total Volume	57	891	0	0	948	120	0	85	0	205	0	719	65	0	784	0	1937
% App. Total	6	94	0	0		58.5	0	41.5	0	205	0	91.7	8.3	0			
PHF	.750	.956	.000	.000	.940	.938	.000	.708	.840	.840	.000	.912	.903	.016	.000	.000	.965

Wilson Okamoto Corporation1907 S. Beretania Street Suite 400
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Groups Printed- Unshifted

Start Time	Queen Kaahumanu Highway Southbound					Hulikoa Drive Westbound					Queen Kaahumanu Highway Northbound					Eastbound	Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	
06:00 AM	14	76	0	0	90	3	0	8	1	12	0	89	19	0	108	0	210
06:15 AM	22	88	0	0	110	5	0	20	1	26	0	125	15	0	140	0	276
06:30 AM	15	132	0	0	147	2	0	18	0	20	0	130	53	0	183	0	350
06:45 AM	30	160	0	0	190	6	0	25	0	31	0	160	44	0	204	0	425
Total	81	456	0	0	537	16	0	71	2	89	0	504	131	0	635	0	1261
07:00 AM	18	151	0	0	169	32	0	32	0	64	0	135	36	0	171	0	404
07:15 AM	18	150	0	0	168	19	0	22	0	41	0	154	29	0	183	0	392
07:30 AM	11	218	0	0	229	22	0	24	0	46	0	141	32	0	173	0	448
07:45 AM	10	195	0	0	205	18	0	25	0	43	0	134	31	0	165	0	413
Total	57	714	0	0	771	91	0	103	0	194	0	564	128	0	692	0	1657
08:00 AM	17	145	0	0	162	20	0	21	0	41	0	152	32	0	184	0	387
08:15 AM	22	146	0	0	168	16	0	28	0	44	0	145	37	0	182	0	394
08:30 AM	36	147	0	0	183	22	0	24	0	46	0	130	22	0	152	0	381
08:45 AM	24	171	0	0	195	27	0	25	0	52	0	147	34	0	181	0	428
Total	99	609	0	0	708	85	0	98	0	183	0	574	125	0	699	0	1590
Grand Total	237	1779	0	0	2016	192	0	272	2	466	0	1642	384	0	2026	0	4508
Apprch %	11.8	88.2	0	0		41.2	0	58.4	0.4		0	81	19	0			
Total %	5.3	39.5	0	0	44.7	4.3	0	6	0	10.3	0	36.4	8.5	0	44.9	0	

Start Time	Queen Kaahumanu Highway Southbound					Hulikoa Drive Westbound					Queen Kaahumanu Highway Northbound					Eastbound	Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 06:45 AM																	
06:45 AM	30	160	0	0	190	6	0	25	0	31	0	160	44	0	204	0	425
07:00 AM	18	151	0	0	169	32	0	32	0	64	0	135	36	0	171	0	404
07:15 AM	18	150	0	0	168	19	0	22	0	41	0	154	29	0	183	0	392
07:30 AM	11	218	0	0	229	22	0	24	0	46	0	141	32	0	173	0	448
Total Volume	77	679	0	0	756	79	0	103	0	182	0	590	141	0	731	0	1669
% App. Total	10.2	89.8	0	0		43.4	0	56.6	0		0	80.7	19.3	0			
PHF	.642	.779	.000	.000	.825	.617	.000	.805	.711	.711	.000	.922	.801	.096	.000	.000	.931

Wilson Okamoto Corporation1907 S. Beretania Street Suite 400
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Queen Kaahumanu Highway Southbound						Hina Lani Street Westbound					Queen Kaahumanu Highway Northbound					Eastbound					Int. Total
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
03:00 PM	62	173	0	0	235	145	0	65	1	211	0	120	124	0	244	0	0	0	0	0	690
03:15 PM	62	188	0	3	253	116	0	61	2	179	0	140	143	0	283	0	0	0	0	0	715
03:30 PM	59	174	0	3	236	112	0	42	5	159	0	163	130	4	297	0	0	0	0	0	692
03:45 PM	50	185	0	4	239	106	0	62	7	175	0	156	124	3	283	0	0	0	0	0	697
Total	233	720	0	10	963	479	0	230	15	724	0	579	521	7	1107	0	0	0	0	0	2794
04:00 PM	45	183	0	3	231	113	0	69	8	190	0	111	136	1	248	0	0	0	0	0	669
04:15 PM	44	183	0	2	229	128	0	75	0	203	0	157	120	0	277	0	0	0	0	0	709
04:30 PM	61	166	0	2	229	115	0	70	8	193	0	166	130	0	296	0	0	0	0	0	718
04:45 PM	64	172	0	4	240	113	0	61	4	178	0	150	141	0	291	0	0	0	0	0	709
Total	214	704	0	11	929	469	0	275	20	764	0	584	527	1	1112	0	0	0	0	0	2805
05:00 PM	35	152	0	0	187	100	0	47	0	147	0	161	108	0	269	0	0	0	0	0	603
05:15 PM	35	130	0	5	170	114	0	67	1	182	0	132	97	0	229	0	0	0	0	0	581
05:30 PM	34	129	0	0	163	104	0	54	1	159	0	158	93	0	251	0	0	0	0	0	573
05:45 PM	50	118	0	0	168	78	0	49	1	128	0	132	67	1	200	0	0	0	0	0	496
Total	154	529	0	5	688	396	0	217	3	616	0	583	365	1	949	0	0	0	0	0	2253
Grand Total	601	1953	0	26	2580	1344	0	722	38	2104	0	1746	1413	9	3168	0	0	0	0	0	7852
Apprch %	23.3	75.7	0	1	63.9	0	34.3	1.8	0	55.1	44.6	0.3	0	0	0	0	0	0	0	0	0
Total %	7.7	24.9	0	0.3	32.9	17.1	0	9.2	0.5	26.8	0	22.2	18	0.1	40.3	0	0	0	0	0	0

Queen Kaahumanu Highway Southbound						Hina Lani Street Westbound					Queen Kaahumanu Highway Northbound					Eastbound					Int. Total
Start Time	Left	Thru	Right	Peds	App.Total	Left	Thru	Right	Peds	App.Total	Left	Thru	Right	Peds	App.Total	Left	Thru	Right	Peds	App.Total	
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:00 PM																					
04:00 PM	45	183	0	3	231	113	0	69	8	190	0	111	136	1	248	0	0	0	0	0	669
04:15 PM	44	183	0	2	229	128	0	75	0	203	0	157	120	0	277	0	0	0	0	0	709
04:30 PM	61	166	0	2	229	115	0	70	8	193	0	166	130	0	296	0	0	0	0	0	718
04:45 PM	64	172	0	4	240	113	0	61	4	178	0	150	141	0	291	0	0	0	0	0	709
Total Volume	214	704	0	11	929	469	0	275	20	764	0	584	527	1	1112	0	0	0	0	0	2805
% App. Total	23	75.8	0	1.2		61.4	0	36	2.6		0	52.5	47.4	0.1		0	0	0	0	0	
PHF	.836	.962	.000	.688	.968	.916	.000	.917	.625	.941	.000	.880	.934	.250	.939	.000	.000	.000	.000	.000	.977

Wilson Okamoto Corporation1907 S. Beretania Street Suite 400
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Queen Kaahumanu Highway Southbound						Hina Lani Street Westbound					Queen Kaahumanu Highway Northbound					Eastbound					Int. Total
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
06:00 AM	17	71	0	1	89	28	0	18	1	47	0	83	29	2	114	0	0	0	0	0	250
06:15 AM	16	77	0	0	93	23	0	40	0	63	0	111	31	0	142	0	0	0	0	0	298
06:30 AM	29	109	0	0	138	34	0	49	10	93	0	143	57	0	200	0	0	0	0	0	431
06:45 AM	26	117	0	0	143	34	0	54	3	91	0	161	82	0	243	0	0	0	0	0	477
Total	88	374	0	1	463	119	0	161	14	294	0	498	199	2	699	0	0	0	0	0	1456
07:00 AM	48	159	0	0	207	37	0	41	5	83	0	123	67	1	191	0	0	0	0	0	481
07:15 AM	37	174	0	0	211	53	0	47	5	105	0	121	67	2	190	0	0	0	0	0	506
07:30 AM	32	198	0	1	231	50	0	44	2	96	0	126	84	2	212	0	0	0	0	0	539
07:45 AM	50	188	0	0	238	46	0	40	9	95	0	102	96	1	199	0	0	0	0	0	532
Total	167	719	0	1	887	186	0	172	21	379	0	472	314	6	792	0	0	0	0	0	2058
08:00 AM	41	148	0	0	189	61	0	51	2	114	0	116	109	2	227	0	0	0	0	0	530
08:15 AM	36	146	0	0	182	60	0	63	1	124	0	128	84	3	215	0	0	0	0	0	521
08:30 AM	39	140	0	0	179	78	0	47	0	125	0	125	69	2	196	0	0	0	0	0	500
08:45 AM	55	154	0	0	209	58	0	47	0	105	0	141	95	0	236	0	0	0	0	0	550
Total	171	588	0	0	759	257	0	208	3	468	0	510	357	7	874	0	0	0	0	0	2101
Grand Total	426	1681	0	2	2109	562	0	541	38	1141	0	1480	870	15	2365	0	0	0	0	0	5615
Apprch %	20.2	79.7	0	0.1	49.3	0	47.4	3.3	0	62.6	36.8	0.6	0	0	0	0	0	0	0	0	0
Total %	7.6	29.9	0	0	37.6	10	0	9.6	0.7	20.3	0	26.4	15.5	0.3	42.1	0	0	0	0	0	0

Start Time	Queen Kaahumanu Highway Southbound					Hina Lani Street Westbound					Queen Kaahumanu Highway Northbound					Eastbound		Int. Total
	Left	Thru	Right	App. Total		Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	App. Total				
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																		
Peak Hour for Entire Intersection Begins at 07:30 AM																		
07:30 AM	32	198	0	230	50	0	44	94	0	126	84	210	0	534				
07:45 AM	50	188	0	238	46	0	40	86	0	102	96	198	0	522				
08:00 AM	41	148	0	189	61	0	51	112	0	116	109	225	0	526				
08:15 AM	36	146	0	182	60	0	63	123	0	128	84	212	0	517				
Total Volume	159	680	0	839	217	0	198	415	0	472	373	845	0	2099				
% App. Total	19	81	0	52.3	0	47.7	0	55.9	44.1	0	0	0	0	0				
PHF	.795	.859	.000	.881	.889	.000	.786	.843	.000	.922	.856	.939	.000	.963				

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, HI 96826

Counter:D4-5671, D4-5672
Counted By:PL, SP
Weather:Clear

File Name : HinKan PM
Site Code : 00000005
Start Date : 9/21/2010
Page No : 1

Groups Printed- Unshifted

Start Time	Southbound App. Total	Hina Lani Street Westbound					Kanalani Street Northbound					Hina Lani Street Eastbound					Int. Total
		Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
03:00 PM	0	3	113	0	0	116	52	0	10	0	62	0	54	122	0	176	354
03:15 PM	0	0	116	0	2	118	43	0	9	0	52	0	58	109	0	167	337
03:30 PM	0	1	110	0	0	111	56	0	15	0	71	0	42	139	1	182	364
03:45 PM	0	0	110	0	0	110	47	0	13	0	60	0	49	120	0	169	339
Total	0	4	449	0	2	455	198	0	47	0	245	0	203	490	1	694	1394
04:00 PM	0	5	120	0	0	125	54	0	19	0	73	0	53	121	3	177	375
04:15 PM	0	5	98	0	0	103	59	0	10	0	69	0	52	103	0	155	327
04:30 PM	0	7	102	0	1	110	42	0	19	0	61	0	33	124	0	157	328
04:45 PM	0	7	78	0	0	85	41	0	10	0	51	0	78	116	1	195	331
Total	0	24	398	0	1	423	196	0	58	0	254	0	216	464	4	684	1361
05:00 PM	0	3	83	0	0	86	55	0	12	0	67	0	40	99	0	139	292
05:15 PM	0	3	80	0	0	83	28	0	10	0	38	0	31	88	0	119	240
05:30 PM	0	2	71	0	0	73	56	0	6	0	62	0	45	82	0	127	262
05:45 PM	0	1	59	0	0	60	39	0	2	0	41	0	34	75	0	109	210
Total	0	9	293	0	0	302	178	0	30	0	208	0	150	344	0	494	1004
Grand Total	0	37	1140	0	3	1180	572	0	135	0	707	0	569	1298	5	1872	3759
Apprch %		3.1	96.6	0	0.3		80.9	0	19.1	0		0	30.4	69.3	0.3		
Total %		1	30.3	0	0.1	31.4	15.2	0	3.6	0	18.8	0	15.1	34.5	0.1	49.8	

	Southbound		Hina Lani Street Westbound				Kanalani Street Northbound				Hina Lani Street Eastbound				
Start Time	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total	
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1															
Peak Hour for Entire Intersection Begins at 03:15 PM															
03:15 PM	0	0	116	0	116	43	0	9	52	0	58	109	167	335	
03:30 PM	0	1	110	0	111	56	0	15	71	0	42	139	181	363	
03:45 PM	0	0	110	0	110	47	0	13	60	0	49	120	169	339	
04:00 PM	0	5	120	0	125	54	0	19	73	0	53	121	174	372	
Total Volume	0	6	456	0	462	200	0	56	256	0	202	489	691	1409	
% App. Total		1.3	98.7	0		78.1	0	21.9		0	29.2	70.8			
PHF	.000	.300	.950	.000	.924	.893	.000	.737	.877	.000	.871	.879	.954	.947	

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, HI 96826

Counter: D4-5671, D4-5672
Counted By:PL, SP
Weather:Clear

File Name : HinKan AM
Site Code : 00000005
Start Date : 9/21/2010
Page No : 1

Groups Printed- Unshifted

Start Time	Southbound App. Total	Hina Lani Street Westbound					Kanalani Street Northbound					Hina Lani Street Eastbound					Int. Total
		Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
06:00 AM	0	6	19	0	1	26	27	0	2	0	29	0	12	35	0	47	102
06:15 AM	0	4	35	0	0	39	30	0	4	0	34	0	12	36	0	48	121
06:30 AM	0	7	53	0	0	60	31	0	3	0	34	0	9	76	0	85	179
06:45 AM	0	11	59	0	0	70	27	0	2	0	29	0	18	87	0	105	204
Total	0	28	166	0	1	195	115	0	11	0	126	0	51	234	0	285	606
07:00 AM	0	9	47	0	0	56	46	0	1	0	47	0	20	94	1	115	218
07:15 AM	0	5	48	0	1	54	45	0	2	0	47	0	33	70	6	109	210
07:30 AM	0	6	49	0	0	55	46	0	3	0	49	0	32	85	0	117	221
07:45 AM	0	11	45	0	1	57	44	0	3	0	47	0	33	101	1	135	239
Total	0	31	189	0	2	222	181	0	9	0	190	0	116	350	8	476	888
08:00 AM	0	8	53	0	0	61	59	0	4	0	63	0	33	105	0	138	262
08:15 AM	0	1	58	0	0	59	50	0	5	0	55	0	35	81	0	116	230
08:30 AM	0	4	50	0	0	54	63	0	1	0	64	0	32	66	2	100	218
08:45 AM	0	0	49	0	0	49	53	0	3	0	56	0	37	111	0	148	253
Total	0	13	210	0	0	223	225	0	13	0	238	0	137	363	2	502	963
Grand Total	0	72	565	0	3	640	521	0	33	0	554	0	306	947	10	1263	2457
Apprch %		11.2	88.3	0	0.5		21.2	0	6	0		0	24.2	75	0.8		
Total %		2.9	23	0	0.1	26	21.2	0	1.3	0	22.5	0	12.5	38.5	0.4	51.4	

Start Time	Southbound	Hina Lani Street Westbound				Kanalani Street Northbound				Hina Lani Street Eastbound				Int. Total	
	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total		
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1															
Peak Hour for Entire Intersection Begins at 08:00 AM															
08:00 AM	0	8	53	0	61	59	0	4	63	0	33	105	138	262	
08:15 AM	0	1	58	0	59	50	0	5	55	0	35	81	116	230	
08:30 AM	0	4	50	0	54	63	0	1	64	0	32	66	98	216	
08:45 AM	0	0	49	0	49	53	0	3	56	0	37	111	148	253	
Total Volume	0	13	210	0	223	225	0	13	238	0	137	363	500	961	
% App. Total		5.8	94.2	0		94.5	0	5.5		0	27.4	72.6			
PHF	.000	.406	.905	.000	.914	.893	.000	.650	.930	.000	.926	.818	.845	.917	

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, HI 96826

Counter:D4-5674, D4-5675
Counted By:CN, JM
Weather:Clear

File Name : HinKam PM
Site Code : 00000006
Start Date : 9/21/2010
Page No : 1

Groups Printed- Unshifted

Start Time	Southbound	Hina Lani Street Westbound					Kamanu Street Northbound					Hina Lani Street Eastbound					Int. Total
		App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	
03:00 PM	0	0	26	12	0	0	36	97	0	46	0	143	0	13	25	0	38
03:15 PM	0	0	18	11	0	0	29	95	0	48	0	143	0	20	27	0	47
03:30 PM	0	0	26	19	0	0	45	94	0	52	0	146	0	26	26	0	52
03:45 PM	0	0	23	22	0	0	45	77	0	52	0	129	0	26	20	0	46
Total	0	0	93	64	0	0	157	363	0	198	0	561	0	85	98	0	183
04:00 PM	0	0	25	11	0	0	36	108	0	57	0	165	0	32	21	0	53
04:15 PM	0	0	20	14	0	0	34	94	0	62	0	156	0	32	27	0	59
04:30 PM	0	0	23	19	0	0	42	90	0	52	0	142	0	19	15	0	34
04:45 PM	0	0	15	8	0	0	23	73	0	49	0	122	0	37	34	0	71
Total	0	0	83	52	0	0	135	365	0	220	0	585	0	120	97	0	217
05:00 PM	0	0	19	12	0	0	31	76	0	46	1	123	0	25	20	0	45
05:15 PM	0	0	24	14	0	0	38	77	0	47	0	124	0	16	22	0	38
05:30 PM	0	0	15	9	0	0	24	62	0	34	0	96	0	26	25	0	51
05:45 PM	0	0	15	10	0	0	25	42	0	32	0	74	0	18	10	0	28
Total	0	0	73	45	0	0	118	257	0	159	1	417	0	85	77	0	162
Grand Total	0	0	249	161	0	0	410	985	0	577	1	1563	0	290	272	0	562
Apprch %	0	0	60.7	39.3	0	0	63	63	0	36.9	0.1	61.7	0	51.6	48.4	0	2535
Total %	0	0	9.8	6.4	0	0	16.2	38.9	0	22.8	0	61.7	0	11.4	10.7	0	22.2

Start Time	Southbound	Hina Lani Street Westbound					Kamanu Street Northbound					Hina Lani Street Eastbound					Int. Total
		App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	
03:30 PM	0	0	26	19	0	0	45	94	0	52	0	146	0	26	26	0	52
03:45 PM	0	0	23	22	0	0	45	77	0	52	0	129	0	26	20	0	46
04:00 PM	0	0	25	11	0	0	36	108	0	57	0	165	0	32	21	0	53
04:15 PM	0	0	20	14	0	0	34	94	0	62	0	156	0	32	27	0	59
Total Volume	0	0	94	66	0	0	160	373	0	223	0	586	0	116	94	0	210
% App. Total	0	0	58.8	41.2	0	0	62.6	62.6	0	37.4	0	59.6	0	55.2	44.8	0	966
PHF	.000	.000	.904	.750	.000	.000	.889	.863	.000	.899	.000	.903	.000	.906	.870	.890	.951

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, HI 96826

Counter:D4-5674, D4-5675
Counted By:CN, JM
Weather:Clear

File Name : HinKam AM
Site Code : 00000006
Start Date : 9/21/2010
Page No : 1

Groups Printed- Unshifted

Start Time	Southbound	Hina Lani Street Westbound					Kamanu Street Northbound					Hina Lani Street Eastbound					Int. Total
		App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	
06:00 AM	0	0	14	16	0	0	30	5	0	2	0	7	0	7	7	0	14
06:15 AM	0	0	14	31	0	0	45	5	0	1	1	7	0	4	7	0	11
06:30 AM	0	0	22	47	0	0	69	13	0	6	0	19	0	6	5	1	12
06:45 AM	0	0	32	57	0	0	89	14	0	3	0	17	0	4	12	0	16
Total	0	0	82	151	0	0	233	37	0	12	1	50	0	21	31	1	53
07:00 AM	0	0	19	31	0	0	50	20	0	9	0	29	0	7	15	0	22
07:15 AM	0	0	28	35	0	0	63	18	0	4	0	22	0	15	19	0	34
07:30 AM	0	0	21	28	0	0	49	20	0	10	0	30	0	13	11	0	24
07:45 AM	0	0	29	37	0	0	66	20	0	12	0	32	0	12	20	0	32
Total	0	0	97	131	0	0	228	78	0	35	0	113	0	47	65	0	112
08:00 AM	0	0	39	34	0	0	73	30	0	11	0	41	0	9	25	0	34
08:15 AM	0	0	13	27	0	0	40	37	0	16	0	53	0	14	27	0	41
08:30 AM	0	0	19	22	0	0	41	25	0	15	0	40	0	12	18	0	30
08:45 AM	0	0	26	21	0	0	47	29	0	6	0	35	0	12	27	0	39
Total	0	0	97	104	0	0	201	121	0	48	0	169	0	47	97	0	144
Grand Total	0	0	276	386	0	0	662	236	0	95	1	332	0	115	193	1	309
Apprch %	0	0	41.7	58.3	0	0	71.1	71.1	0	28.6	0.3	25.5	0	37.2	62.5	0.3	1303
Total %	0	0	21.2	29.6	0	0	50.8	18.1	0	7.3	0.1	25.5	0	8.8	14.8	0.1	23.7

Start Time	Southbound	Hina Lani Street Westbound					Kamanu Street Northbound					Hina Lani Street Eastbound					Int. Total
		App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	
07:45 AM	0	0	29	37	0	0	66	20	0	12	0	32	0	12	20	0	32
08:00 AM	0	0	39	34	0	0	73	30	0	11	0	41	0	9	25	0	34
08:15 AM	0	0	13	27	0	0	40	37	0	16	0	53	0	14	27	0	41
08:30 AM	0	0	19	22	0	0	41	25	0	15	0	40	0	12	18	0	30
Total Volume	0	0	100	120	0	0	220	112	0	54	0	166	0	47	90	0	137
% App. Total	0	0	45.5	54.5	0	0	67.5	67.5	0	32.5	0	59.6	0	34.3	65.7	0	523
PHF	.000	.000	.641	.811	.000	.000	.753	.757	.000	.844	.000	.783	.000	.839	.833	.835	.883

Wilson Okamoto Corporation1907 S. Beretania Street Suite 400
Honolulu, HI 96826Counter:D4-5671, D4-5672
Counted By:PL, SP
Weather:ClearFile Name : MamHin PM
Site Code : 00000012
Start Date : 9/22/2010
Page No : 1

Groups Printed- Unshifted

Start Time	Mamalahoa Highway Southbound					Westbound App. Total	Mamalahoa Highway Northbound					Hina Lani Street Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total		Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
03:00 PM	0	117	12	0	129	0	29	105	0	0	134	47	0	36	0	83	346
03:15 PM	0	94	13	0	107	0	20	112	0	0	132	48	0	41	0	89	328
03:30 PM	0	85	27	0	112	0	20	132	0	0	152	50	0	54	0	104	368
03:45 PM	0	92	25	0	117	0	26	122	0	0	148	42	0	52	0	94	359
Total	0	388	77	0	465	0	95	471	0	0	566	187	0	183	0	370	1401
04:00 PM	0	92	10	0	102	0	23	132	0	0	155	43	0	42	0	85	342
04:15 PM	0	122	24	0	146	0	8	125	0	0	133	55	0	62	0	117	396
04:30 PM	0	110	11	0	121	0	13	136	0	0	149	49	0	35	0	84	354
04:45 PM	0	100	8	0	108	0	20	131	0	0	151	42	0	49	0	91	350
Total	0	424	53	0	477	0	64	524	0	0	588	189	0	188	0	377	1442
05:00 PM	0	85	15	0	100	0	13	115	0	0	128	53	0	51	0	104	332
05:15 PM	0	118	12	0	130	0	11	128	0	0	139	40	0	24	0	64	333
05:30 PM	0	95	6	0	101	0	17	142	0	0	159	43	0	16	0	59	319
05:45 PM	0	101	14	0	115	0	9	113	0	0	122	40	0	16	0	56	293
Total	0	399	47	0	446	0	50	498	0	0	548	176	0	107	0	283	1277
Grand Total	0	1211	177	0	1388	0	209	1493	0	0	1702	552	0	478	0	1030	4120
Apprch %	0	87.2	12.8	0		0	12.3	87.7	0	0		53.6	0	46.4	0		
Total %	0	29.4	4.3	0	33.7	0	5.1	36.2	0	0	41.3	13.4	0	11.6	0	25	

Start Time	Mamalahoa Highway Southbound				Westbound App. Total	Mamalahoa Highway Northbound				Hina Lani Street Eastbound				Int. Total
	Left	Thru	Right	App. Total		Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 03:30 PM														
03:30 PM	0	85	27	112	0	20	132	0	152	50	0	54	104	368
03:45 PM	0	92	25	117	0	26	122	0	148	42	0	52	94	359
04:00 PM	0	92	10	102	0	23	132	0	155	43	0	42	85	342
04:15 PM	0	122	24	146	0	8	125	0	133	55	0	62	117	396
Total Volume	0	391	86	477	0	77	511	0	588	190	0	210	400	1465
% App. Total	0	82	18			13.1	86.9			47.5	0	52.5		
PHF	.000	.801	.796	.817	.000	.740	.968	.000	.948	.864	.000	.847	.855	.925

Wilson Okamoto Corporation1907 S. Beretania Street Suite 400
Honolulu, HI 96826Counter:D4-5671, D4-5672
Counted By:PL, SP
Weather:ClearFile Name : MamHin AM
Site Code : 00000012
Start Date : 9/22/2010
Page No : 1

Groups Printed- Unshifted

Start Time	Mamalahoa Highway Southbound					Westbound App. Total	Mamalahoa Highway Northbound					Hina Lani Street Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total		Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
06:00 AM	0	53	17	0	70	0	20	35	0	0	55	5	0	4	0	9	134
06:15 AM	0	85	19	0	104	0	20	44	0	0	64	12	0	3	0	15	183
06:30 AM	0	107	32	0	139	0	19	46	0	0	65	7	0	4	0	11	215
06:45 AM	0	192	53	0	245	0	29	56	0	0	85	3	0	13	0	16	346
Total	0	437	121	0	558	0	88	181	0	0	269	27	0	24	0	51	878
07:00 AM	0	241	29	0	270	0	22	66	0	0	88	7	0	14	0	21	379
07:15 AM	0	249	36	0	285	0	36	61	0	0	97	6	0	27	0	33	415
07:30 AM	0	244	25	0	269	0	23	62	0	0	85	22	0	22	0	44	398
07:45 AM	0	222	41	0	263	0	38	85	0	0	123	22	0	16	0	38	424
Total	0	956	131	0	1087	0	119	274	0	0	393	57	0	79	0	136	1616
08:00 AM	0	155	31	0	186	0	33	98	0	0	131	14	0	19	0	33	350
08:15 AM	0	115	25	0	140	0	27	89	0	0	116	14	0	10	0	24	280
08:30 AM	0	104	27	0	131	0	16	67	0	0	83	16	0	18	0	34	248
08:45 AM	0	99	36	0	135	0	19	60	0	0	79	17	0	6	0	23	237
Total	0	473	119	0	592	0	95	314	0	0	409	61	0	53	0	114	1115
Grand Total	0	1866	371	0	2237	0	302	769	0	0	1071	145	0	156	0	301	3609
Apprch %	0	83.4	16.6	0		0	28.2	71.8	0	0		48.2	0	51.8	0		
Total %	0	51.7	10.3	0	62	0	8.4	21.3	0	0	29.7	4	0	4.3	0	8.3	

	Mamalahoa Highway Southbound				Westbound	Mamalahoa Highway Northbound				Hina Lani Street Eastbound				
Start Time	Left	Thru	Right	App. Total	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1														
Peak Hour for Entire Intersection Begins at 07:00 AM														
07:00 AM	0	241	29	270	0	22	66	0	88	7	0	14	21	379
07:15 AM	0	249	36	285	0	36	61	0	97	6	0	27	33	415
07:30 AM	0	244	25	269	0	23	62	0	85	22	0	22	44	398
07:45 AM	0	222	41	263	0	38	85	0	123	22	0	16	38	424
Total Volume	0	956	131	1087	0	119	274	0	393	57	0	79	136	1616
% App. Total	0	87.9	12.1			30.3	69.7	0		41.9	0	58.1		
PHF	.000	.960	.799	.954	.000	.783	.806	.000	.799	.648	.000	.731	.773	.953

Wilson Okamoto Corporation

1907 S. Beretania Street Suite 400
Honolulu, HI 96826

Counter:D4-3891, D4-0768
Counted By:PP, JK
Weather:Clear

File Name : QueKea PM
Site Code : 00000007
Start Date : 9/21/2010
Page No : 1

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Groups Printed- Unshifted																					
Queen Kaahumanu Highway Southbound						Kealahoe Parkway Westbound					Queen Kaahumanu Highway Northbound					Kealahoe Parkway Eastbound					Int. Total
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
03:00 PM	23	224	20	0	267	18	1	14	0	33	15	206	72	0	293	12	4	18	0	34	627
03:15 PM	19	235	16	0	270	68	3	13	0	84	11	180	46	0	237	16	3	9	0	28	619
03:30 PM	15	221	11	0	247	83	5	13	0	101	16	193	50	0	259	6	4	12	0	22	629
03:45 PM	10	248	10	0	268	41	4	21	0	66	18	214	41	0	273	25	2	21	0	48	655
Total	67	928	57	0	1052	210	13	61	0	284	60	793	209	0	1062	59	13	60	0	132	2530
04:00 PM	12	255	13	0	280	46	5	15	0	66	14	219	38	0	271	19	6	26	0	51	668
04:15 PM	15	267	10	0	292	40	6	5	0	51	12	225	27	0	264	9	7	12	0	28	635
04:30 PM	23	226	11	0	260	31	7	12	0	50	18	235	23	0	276	15	3	16	0	34	620
04:45 PM	16	206	14	0	236	36	0	17	0	53	5	204	26	0	235	12	3	25	0	40	564
Total	66	954	48	0	1068	153	18	49	0	220	49	883	114	0	1046	55	19	79	0	153	2487
05:00 PM	17	211	9	0	237	15	0	17	0	32	16	215	50	0	281	13	2	7	0	22	572
05:15 PM	15	176	14	0	205	33	4	11	0	48	18	179	46	0	243	14	4	13	0	31	527
05:30 PM	15	195	7	0	217	36	4	13	1	54	10	188	32	0	230	19	3	15	0	37	538
05:45 PM	9	170	6	0	185	29	6	16	0	51	5	164	28	0	197	16	5	8	1	30	463
Total	56	752	36	0	844	113	14	57	1	185	49	746	156	0	951	62	14	43	1	120	2100
Grand Total	189	2634	141	0	2964	476	45	167	1	689	158	2422	479	0	3059	176	46	182	1	405	7117
Approch %	6.4	88.9	4.8	0		69.1	6.5	24.2	0.1		5.2	79.2	15.7	0		43.5	11.4	44.9	0.2		
Total %	2.7	37	2	0	41.6	6.7	0.6	2.3	0	9.7	2.2	34	6.7	0	43	2.5	0.6	2.6	0	5.7	

Queen Kaahumanu Highway Southbound					Kealahoe Parkway Westbound					Queen Kaahumanu Highway Northbound					Kealahoe Parkway Eastbound					
Start Time	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Int. Total			
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																				
Peak Hour for Entire Intersection Begins at 03:30 PM																				
03:30 PM	15	221	11	247	83	5	13	101	16	193	50	259	6	4	12	22	629			
03:45 PM	10	248	10	268	41	4	21	66	18	214	41	273	25	2	21	48	655			
04:00 PM	12	255	13	280	46	5	15	68	14	219	38	271	19	6	26	51	668			
04:15 PM	15	267	10	292	40	6	5	51	12	225	27	264	9	7	12	28	635			
Total Volume	52	991	44	1087	210	20	54	284	60	851	156	1067	59	19	71	149	2587			
% App. Total	4.8	91.2	4		73.9	7	19		5.6	79.8	14.6		39.6	12.8	47.7					
PHF	.867	.928	.846	.931	.633	.833	.643	.703	.833	.946	.780	.977	.590	.679	.683	.730	.968			

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Wilson Okamoto Corporation

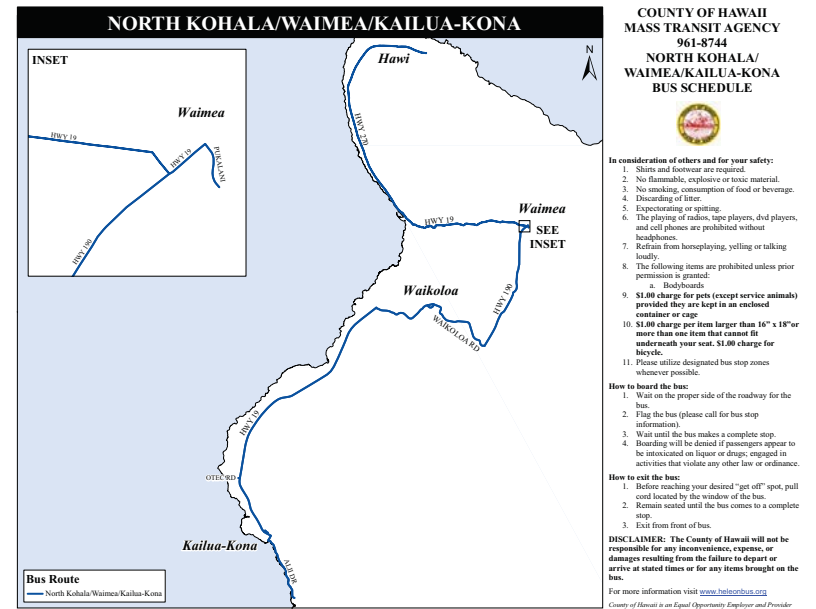
1907 S. Beretania Street Suite 400
Honolulu, HI 96826

Counter:D4-3891, D4-0768
Counted By:PP, JK
Weather:Clear

File Name : QueKea AM
Site Code : 00000007
Start Date : 9/21/2010
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Groups Printed- Unshifted																					
Start Time	Queen Kaahumanu Highway Southbound					Kealahoe Parkway Westbound					Queen Kaahumanu Highway Northbound					Kealahoe Parkway Eastbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
06:00 AM	9	50	21	1	81	8	2	15	0	25	7	128	10	0	145	2	2	7	0	11	262
06:15 AM	10	71	9	0	90	14	2	19	0	35	5	143	16	2	166	0	1	6	0	7	298
06:30 AM	19	84	8	1	112	17	3	28	0	48	15	170	31	0	216	5	0	2	0	7	383
06:45 AM	16	97	14	0	127	27	2	27	0	56	15	207	47	1	270	5	2	1	0	8	461
Total	54	302	52	2	410	66	9	89	0	164	42	648	104	3	797	12	5	16	0	33	1404
07:00 AM	25	137	6	0	168	28	2	23	0	53	11	169	39	0	219	3	0	3	0	6	446
07:15 AM	34	155	12	1	202	38	1	48	0	87	13	157	54	0	224	6	2	1	0	9	522
07:30 AM	40	166	13	1	220	55	7	25	0	87	17	153	66	0	236	4	1	11	0	16	559
07:45 AM	45	167	11	0	223	64	3	27	0	94	24	165	90	0	279	2	2	9	0	13	609
Total	144	625	42	2	813	185	13	123	0	321	65	644	249	0	958	15	5	24	0	44	2136
08:00 AM	39	131	12	0	182	72	7	38	0	117	14	153	84	2	253	5	2	3	0	10	562
08:15 AM	16	156	14	0	186	51	5	26	0	82	10	165	11	0	186	6	3	11	0	20	474
08:30 AM	7	178	8	0	193	21	0	14	0	35	27	175	24	0	226	1	4	13	0	18	472
08:45 AM	12	172	22	0	206	18	4	16	0	38	27	193	23	0	243	7	1	14	0	22	509
Total	74	637	56	0	767	162	16	94	0	272	78	686	142	2	908	19	10	41	0	70	2017
Grand Total	272	1564	150	4	1990	413	38	306	0	757	185	1978	495	5	2683	46	20	81	0	147	5557
Approch %	13.7	78.6	7.5	0.2		54.6	5	40.4	0		6.9	74.3	18.6	0.2		31.3	13.6	55.1	0		
Total %	4.9	28.1	2.7	0.1	35.8	7.4	0.7	5.5	0	13.6	3.3	35.6	8.9	0.1	47.9	0.8	0.4	1.5	0	2.6	

Queen Kaahumanu Highway Southbound						Kealahoe Parkway Westbound					Queen Kaahumanu Highway Northbound					Kealahoe Parkway Eastbound						
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	In Total	
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																						
Peak Hour for Entire Intersection Begins at 07:15 AM																						
07:15 AM	34	155	12	1	202	38	1	48	0	87	13	157	54	0	224	6	2	1	0	9	522	
07:30 AM	40	166	13	1	220	55	7	25	0	87	17	153	66	0	236	4	1	11	0	16	559	
07:45 AM	45	167	11	0	223	64	3	27	0	94	24	165	90	0	279	2	2	9	0	13	609	
08:00 AM	39	131	12	0	182	72	7	38	0	117	14	153	84	2	253	5	2	3	0	10	562	
Total Volume	158	619	48	2	827	229	18	138	0	385	68	628	294	2	992	17	7	24	0	48	2252	
% App. Total	19.1	74.8	5.8	0.2		59.5	4.7	35.8	0		6.9	63.3	29.6	0.2		35.4	14.6	50	0			
PHF	.878	.927	.923	.500	.927	.795	.643	.719	.000	.823	.708	.952	.817	.250	.889	.708	.875	.545	.000	.750	.924	

[illegible]

Appendix D – Intersection Operations Analysis Worksheets for Existing Traffic Conditions

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

Existing AM
6/27/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	1863	1583	1770	1863
Flt Permitted	0.95	1.00	1.00	1.00	0.17	1.00
Satd. Flow (perm)	1770	1583	1863	1583	317	1863
Volume (vph)	480	221	562	102	25	374
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	522	240	611	111	27	407
RTOR Reduction (vph)	0	0	0	68	0	0
Lane Group Flow (vph)	522	240	611	43	27	407
Turn Type	Free		Perm pm+pt			
Protected Phases	8		2		1 6	
Permitted Phases	Free		2 6			
Actuated Green, G (s)	17.9	50.7	19.5	19.5	24.8	24.8
Effective Green, g (s)	17.9	50.7	19.5	19.5	24.8	24.8
Actuated g/C Ratio	0.35	1.00	0.38	0.38	0.49	0.49
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	625	1583	717	609	192	911
v/s Ratio Prot	c0.29		c0.33		0.00 c0.22	
v/s Ratio Perm	0.15		0.03 0.07			
v/c Ratio	0.84	0.15	0.85	0.07	0.14	0.45
Uniform Delay, d1	15.0	0.0	14.3	9.9	9.3	8.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.4	0.2	9.6	0.0	0.3	0.4
Delay (s)	24.5	0.2	23.9	9.9	9.7	8.8
Level of Service	C	A	C	A	A	A
Approach Delay (s)	16.8		21.7		8.9	
Approach LOS	B		C		A	
Intersection Summary						
HCM Average Control Delay			16.9		HCM Level of Service B	
HCM Volume to Capacity ratio			0.85			
Actuated Cycle Length (s)			50.7		Sum of lost time (s) 12.0	
Intersection Capacity Utilization			62.8%		ICU Level of Service B	
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
2: Hulikoa Drive & Queen Kaahumanu Highway

Existing AM
6/27/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↰	↱	↰	↱
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	79	103	590	141	77	679
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	86	112	641	153	84	738
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		20				
Median type	TWLT					
Median storage (veh)	5					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1547	641			641	
vC1, stage 1 conf vol	641					
vC2, stage 2 conf vol	905					
vCu, unblocked vol	1547	641			641	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	76	76			91	
cM capacity (veh/h)	351	475			943	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	198	641	153	84	738	
Volume Left	86	0	0	84	0	
Volume Right	112	0	153	0	0	
cSH	810	1700	1700	943	1700	
Volume to Capacity	0.24	0.38	0.09	0.09	0.43	
Queue Length 95th (ft)	24	0	0	7	0	
Control Delay (s)	16.5	0.0	0.0	9.2	0.0	
Lane LOS	C			A		
Approach Delay (s)	16.5	0.0		0.9		
Approach LOS	C					
Intersection Summary						
Average Delay		2.2				
Intersection Capacity Utilization		49.7%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

Existing AM
6/27/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↰	↱	↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1546	1863	1534	1768	1863
Flt Permitted	0.95	1.00	1.00	1.00	0.28	1.00
Satd. Flow (perm)	1770	1546	1863	1534	524	1863
Volume (vph)	217	198	472	373	159	680
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	236	215	513	405	173	739
RTOR Reduction (vph)	0	174	0	223	0	0
Lane Group Flow (vph)	236	41	513	182	173	739
Confl. Peds. (#/hr)		14		8		8
Turn Type		Perm		Perm	pm+pt	
Protected Phases	8		2		1	6
Permitted Phases		8		2		6
Actuated Green, G (s)	8.6	8.6	20.2	20.2	28.3	28.3
Effective Green, g (s)	8.6	8.6	20.2	20.2	28.3	28.3
Actuated g/C Ratio	0.19	0.19	0.45	0.45	0.63	0.63
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	339	296	838	690	444	1174
v/s Ratio Prot	c0.13		0.28		0.04	c0.40
v/s Ratio Perm		0.03		0.12	0.21	
v/c Ratio	0.70	0.14	0.61	0.26	0.39	0.63
Uniform Delay, d1	16.9	15.1	9.4	7.7	4.7	5.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.1	0.2	1.3	0.2	0.6	1.1
Delay (s)	23.0	15.3	10.7	7.9	5.3	6.2
Level of Service	C	B	B	A	A	A
Approach Delay (s)	19.3		9.5			6.0
Approach LOS	B		A			A
Intersection Summary						
HCM Average Control Delay		10.0		HCM Level of Service	B	
HCM Volume to Capacity ratio		0.64				
Actuated Cycle Length (s)		44.9		Sum of lost time (s)	8.0	
Intersection Capacity Utilization		56.2%		ICU Level of Service	B	
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kanalani Street

Existing AM
6/27/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↔	↔	↑	↑
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	137	363	13	210	225	13
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	149	395	14	228	245	14
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			545		293	151
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			545		293	151
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		63	98
cM capacity (veh/h)			1018		663	867
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	149	395	90	152	259	
Volume Left	0	0	14	0	245	
Volume Right	0	395	0	0	14	
cSH	1700	1700	1018	1700	702	
Volume to Capacity	0.09	0.23	0.01	0.09	0.37	
Queue Length 95th (ft)	0	0	1	0	42	
Control Delay (s)	0.0	0.0	1.4	0.0	13.3	
Lane LOS			A		B	
Approach Delay (s)	0.0		0.5		13.3	
Approach LOS					B	
Intersection Summary						
Average Delay			3.4			
Intersection Capacity Utilization			35.5%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

Existing AM
6/27/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↔	↔	↑	↑
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	47	90	100	120	112	54
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	51	98	109	130	122	59
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						14
Median type					TWLT	
Median storage (veh)					5	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			51		399	51
vC1, stage 1 conf vol						51
vC2, stage 2 conf vol						348
vCu, unblocked vol			51		399	51
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			93		82	94
cM capacity (veh/h)			1555		665	1017
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	51	98	109	130	180	
Volume Left	0	0	109	0	122	
Volume Right	0	98	0	0	59	
cSH	1700	1700	1555	1700	985	
Volume to Capacity	0.03	0.06	0.07	0.08	0.18	
Queue Length 95th (ft)	0	0	6	0	17	
Control Delay (s)	0.0	0.0	7.5	0.0	10.7	
Lane LOS			A		B	
Approach Delay (s)	0.0		3.4		10.7	
Approach LOS					B	
Intersection Summary						
Average Delay			4.8			
Intersection Capacity Utilization			25.1%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

Existing AM
6/27/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.11	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	202	1863	1863	1583
Volume (vph)	57	79	119	274	956	131
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	62	86	129	298	1039	142
RTOR Reduction (vph)	0	78	0	0	0	25
Lane Group Flow (vph)	62	8	129	298	1039	117
Turn Type	Perm pm+pt		Perm		Perm	
Protected Phases	4		5	2	6	
Permitted Phases		4	2		6	
Actuated Green, G (s)	5.9	5.9	50.1	50.1	42.6	42.6
Effective Green, g (s)	5.9	5.9	50.1	50.1	42.6	42.6
Actuated g/C Ratio	0.09	0.09	0.78	0.78	0.67	0.67
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	163	146	244	1458	1240	1054
v/s Ratio Prot	c0.04		c0.03	0.16	c0.56	
v/s Ratio Perm		0.01	0.39		0.07	
v/c Ratio	0.38	0.05	0.53	0.20	0.84	0.11
Uniform Delay, d1	27.3	26.5	10.4	1.8	8.1	3.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.5	0.2	2.1	0.1	5.1	0.0
Delay (s)	28.8	26.7	12.5	1.9	13.2	3.9
Level of Service	C	C	B	A	B	A
Approach Delay (s)	27.6			5.1	12.1	
Approach LOS	C			A	B	
Intersection Summary						
HCM Average Control Delay		11.7		HCM Level of Service		B
HCM Volume to Capacity ratio		0.77				
Actuated Cycle Length (s)		64.0		Sum of lost time (s)	12.0	
Intersection Capacity Utilization		70.2%		ICU Level of Service	C	
Analysis Period (min)		15				
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

Existing AM
6/27/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR			
Lane Configurations															
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900			
Total Lost time (s)		4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0			
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			
Frbp, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00	0.98	1.00	1.00	0.98			
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			
Frt	1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	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	1.00			
Satd. Flow (prot)	1800	1583		1780	1583	1769	1863	1548	1770	1863	1548	1548			
Flt Permitted	0.78	1.00		0.72	1.00	0.21	1.00	1.00	0.16	1.00	1.00	1.00			
Satd. Flow (perm)	1458	1583		1347	1583	398	1863	1548	298	1863	1548	1548			
Volume (vph)	17	7	24	229	18	138	68	628	294	158	619	48			
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)	18	8	26	249	20	150	74	683	320	172	673	52			
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	178	0	0	27			
Lane Group Flow (vph)	0	26	26	0	269	150	74	683	142	172	673	25			
Confl. Peds. (#/hr)							2		2	2		2			
Turn Type	Perm		Free	Perm		Free pm+pt		Perm	pm+pt		Perm				
Protected Phases		4			8		5	2		1	6				
Permitted Phases	4		Free	8		Free	2		2	6		6			
Actuated Green, G (s)	13.9	53.0		13.9	53.0	25.6	23.5	23.5	28.6	25.0	25.0				
Effective Green, g (s)	13.9	53.0		13.9	53.0	25.6	23.5	23.5	28.6	25.0	25.0				
Actuated g/C Ratio	0.26	1.00		0.26	1.00	0.48	0.44	0.44	0.54	0.47	0.47				
Clearance Time (s)	4.0			4.0		4.0	4.0	4.0	4.0	4.0	4.0				
Vehicle Extension (s)	3.0			3.0		3.0	3.0	3.0	3.0	3.0	3.0				
Lane Grp Cap (vph)	382	1583		353	1583	247	826	686	261	879	730				
v/s Ratio Prot						0.01	c0.37		c0.04	0.36					
v/s Ratio Perm	0.02	0.02		c0.20	c0.09	0.13		0.09	0.31		0.02				
v/c Ratio	0.07	0.02		0.76	0.09	0.30	0.83	0.21	0.66	0.77	0.03				
Uniform Delay, d1	14.7	0.0		18.0	0.0	8.7	13.0	9.0	9.1	11.6	7.5				
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	0.1	0.0		9.4	0.1	0.7	6.8	0.2	5.9	4.0	0.0				
Delay (s)	14.8	0.0		27.4	0.1	9.4	19.8	9.2	15.0	15.6	7.5				
Level of Service	B	A		C	A	A	B	A	B	B	A				
Approach Delay (s)	7.4			17.6			15.9			15.0					
Approach LOS	A			B			B			B					
Intersection Summary															
HCM Average Control Delay		15.7		HCM Level of Service					B						
HCM Volume to Capacity ratio		0.79													
Actuated Cycle Length (s)		53.0		Sum of lost time (s)				12.0							
Intersection Capacity Utilization		72.1%		ICU Level of Service				C							
Analysis Period (min)		15													
c Critical Lane Group															

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

Existing PM
6/27/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↩	↩	↩	↩	↩	↩
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1583	1863	1583	1770	1863
Flt Permitted	0.95	1.00	1.00	1.00	0.26	1.00
Satd. Flow (perm)	1770	1583	1863	1583	483	1863
Volume (vph)	180	69	497	380	200	623
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	75	540	413	217	677
RTOR Reduction (vph)	0	0	0	228	0	0
Lane Group Flow (vph)	196	75	540	185	217	677
Turn Type	Free		Perm pm+pt			
Protected Phases	8		2		1	6
Permitted Phases		Free		2		6
Actuated Green, G (s)	8.0	45.0	20.2	20.2	29.0	29.0
Effective Green, g (s)	8.0	45.0	20.2	20.2	29.0	29.0
Actuated g/C Ratio	0.18	1.00	0.45	0.45	0.64	0.64
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	315	1583	836	711	449	1201
v/s Ratio Prot	c0.11		c0.29		0.05	c0.36
v/s Ratio Perm		0.05		0.12	0.26	
v/c Ratio	0.62	0.05	0.65	0.26	0.48	0.56
Uniform Delay, d1	17.1	0.0	9.6	7.7	4.9	4.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.8	0.1	1.7	0.2	0.8	0.6
Delay (s)	20.9	0.1	11.3	7.9	5.7	5.1
Level of Service	C	A	B	A	A	A
Approach Delay (s)	15.1		9.9			5.2
Approach LOS	B		A			A
Intersection Summary						
HCM Average Control Delay			8.6		HCM Level of Service	A
HCM Volume to Capacity ratio			0.65			
Actuated Cycle Length (s)			45.0		Sum of lost time (s)	12.0
Intersection Capacity Utilization			57.2%		ICU Level of Service	B
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
2: Hulikoa Drive & Queen Kaahumanu Highway

Existing PM
6/27/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↩	↩	↩	↩	↩	↩
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	120	85	719	65	57	891
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	130	92	782	71	62	968
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		20				
Median type	TWLTL					
Median storage (veh)	5					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1874	782			782	
vC1, stage 1 conf vol	782					
vC2, stage 2 conf vol	1092					
vCu, unblocked vol	1874	782			782	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	55	77			93	
cM capacity (veh/h)	290	395			836	
Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	
Volume Total	223	782	71	62	968	
Volume Left	130	0	0	62	0	
Volume Right	92	0	71	0	0	
cSH	496	1700	1700	836	1700	
Volume to Capacity	0.45	0.46	0.04	0.07	0.57	
Queue Length 95th (ft)	57	0	0	6	0	
Control Delay (s)	22.9	0.0	0.0	9.6	0.0	
Lane LOS	C			A		
Approach Delay (s)	22.9	0.0		0.6		
Approach LOS	C					
Intersection Summary						
Average Delay			2.7			
Intersection Capacity Utilization			60.2%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

Existing PM
6/27/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↩	↩	↩	↩	↩	↩
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	0.96	1.00	0.98	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1770	1526	1863	1548	1770	1863
Flt Permitted	0.95	1.00	1.00	1.00	0.13	1.00
Satd. Flow (perm)	1770	1526	1863	1548	251	1863
Volume (vph)	469	275	584	527	214	704
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	510	299	635	573	233	765
RTOR Reduction (vph)	0	203	0	350	0	0
Lane Group Flow (vph)	510	96	635	223	233	765
Confl. Peds. (#/hr)	20			1	1	
Turn Type	Perm		Perm	pm+pt		
Protected Phases	8		2		1	6
Permitted Phases	8		2		6	
Actuated Green, G (s)	21.2	21.2	25.7	25.7	36.8	36.8
Effective Green, g (s)	21.2	21.2	25.7	25.7	36.8	36.8
Actuated g/C Ratio	0.32	0.32	0.39	0.39	0.56	0.56
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	569	490	725	603	303	1039
v/s Ratio Prot	c0.29		c0.34		0.08	c0.41
v/s Ratio Perm		0.06		0.14	0.35	
v/c Ratio	0.90	0.20	0.88	0.37	0.77	0.74
Uniform Delay, d1	21.4	16.2	18.7	14.4	12.3	11.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	16.6	0.2	11.5	0.4	11.1	2.8
Delay (s)	38.0	16.4	30.2	14.8	23.4	13.7
Level of Service	D	B	C	B	C	B
Approach Delay (s)	30.0		22.9		16.0	
Approach LOS	C		C		B	
Intersection Summary						
HCM Average Control Delay		22.5		HCM Level of Service	C	
HCM Volume to Capacity ratio		0.89				
Actuated Cycle Length (s)		66.0		Sum of lost time (s)	12.0	
Intersection Capacity Utilization		78.6%		ICU Level of Service	D	
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kanalani Street

Existing PM
6/27/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩	↩	↩	↩	↩	↩
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	202	489	6	456	200	56
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	220	532	7	496	217	61
Pedestrians					4	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			755		484	224
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			755		484	224
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		57	92
cM capacity (veh/h)			848		506	777
Direction, Lane #						
	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	220	532	172	330	278	
Volume Left	0	0	7	0	217	
Volume Right	0	532	0	0	61	
cSH	1700	1700	848	1700	647	
Volume to Capacity	0.13	0.31	0.01	0.19	0.43	
Queue Length 95th (ft)	0	0	1	0	54	
Control Delay (s)	0.0	0.0	0.4	0.0	15.8	
Lane LOS			A		C	
Approach Delay (s)	0.0		0.1		15.8	
Approach LOS					C	
Intersection Summary						
Average Delay		2.9				
Intersection Capacity Utilization		50.2%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

Existing PM
6/27/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	Free	Free	Free	Free	Stop	Stop
Sign Control	Free	Free	Free	Free	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Volume (veh/h)	116	94	94	66	373	223
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	126	102	102	72	405	242
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						14
Median type				TWLT		
Median storage (veh)				5		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			126		402	126
vC1, stage 1 conf vol					126	
vC2, stage 2 conf vol					276	
vCu, unblocked vol			126		402	126
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			93		43	74
cM capacity (veh/h)			1460		715	924
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	126	102	102	72	648	
Volume Left	0	0	102	0	405	
Volume Right	0	102	0	0	242	
cSH	1700	1700	1460	1700	1142	
Volume to Capacity	0.07	0.06	0.07	0.04	0.57	
Queue Length 95th (ft)	0	0	6	0	93	
Control Delay (s)	0.0	0.0	7.7	0.0	14.1	
Lane LOS			A		B	
Approach Delay (s)	0.0		4.5		14.1	
Approach LOS					B	
Intersection Summary						
Average Delay			9.5			
Intersection Capacity Utilization			39.2%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

Existing PM
6/27/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	Free	Free	Free	Free	Free	Free
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.28	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	521	1863	1863	1583
Volume (vph)	190	210	77	511	391	86
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	207	228	84	555	425	93
RTOR Reduction (vph)	0	174	0	0	0	62
Lane Group Flow (vph)	207	54	84	555	425	31
Turn Type	Perm pm+pt			Perm		
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	7.6	7.6	16.3	16.3	10.5	10.5
Effective Green, g (s)	7.6	7.6	16.3	16.3	10.5	10.5
Actuated g/C Ratio	0.24	0.24	0.51	0.51	0.33	0.33
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	422	377	337	952	613	521
v/s Ratio Prot	c0.12		0.01	c0.30	0.23	
v/s Ratio Perm		0.03	0.11			0.02
v/c Ratio	0.49	0.14	0.25	0.58	0.69	0.06
Uniform Delay, d1	10.5	9.6	4.8	5.4	9.3	7.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.9	0.2	0.4	0.9	3.4	0.0
Delay (s)	11.4	9.8	5.1	6.3	12.7	7.4
Level of Service	B	A	A	A	B	A
Approach Delay (s)	10.5			6.2	11.7	
Approach LOS	B			A	B	
Intersection Summary						
HCM Average Control Delay			9.2		HCM Level of Service	A
HCM Volume to Capacity ratio			0.55			
Actuated Cycle Length (s)			31.9		Sum of lost time (s)	8.0
Intersection Capacity Utilization			45.4%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

Existing PM
6/27/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗	↘		↗	↘	↗	↘	↗	↘	↗	↘
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt		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		0.96	1.00	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)		1795	1583		1782	1583	1770	1863	1583	1770	1863	1583
Flt Permitted		0.52	1.00		0.68	1.00	0.08	1.00	1.00	0.12	1.00	1.00
Satd. Flow (perm)		964	1583		1275	1583	151	1863	1583	228	1863	1583
Volume (vph)	59	19	71	210	20	54	60	851	156	52	991	44
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)	64	21	77	228	22	59	65	925	170	57	1077	48
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	68	0	0	19
Lane Group Flow (vph)	0	85	77	0	250	59	65	925	102	57	1077	29
Turn Type	Perm	Free	Free	Perm	Free	pm+pt	Free	pm+pt	Perm	pm+pt	Perm	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8		Free	2		2	6		6
Actuated Green, G (s)	18.0	82.4		18.0	82.4	52.4	49.5	49.5	52.4	49.5	49.5	49.5
Effective Green, g (s)	18.0	82.4		18.0	82.4	52.4	49.5	49.5	52.4	49.5	49.5	49.5
Actuated g/C Ratio	0.22	1.00		0.22	1.00	0.64	0.60	0.60	0.64	0.60	0.60	0.60
Clearance Time (s)	4.0			4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0
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)	211	1583		279	1583	153	1119	951	199	1119	951	
v/s Ratio Prot						c0.01	0.50		0.01	c0.58		
v/s Ratio Perm	0.09	0.05		c0.20	0.04	0.26		0.06	0.17		0.02	
v/c Ratio	0.40	0.05		0.90	0.04	0.42	0.83	0.11	0.29	0.96	0.03	
Uniform Delay, d1	27.6	0.0		31.3	0.0	18.5	13.0	7.0	12.0	15.6	6.7	
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	1.3	0.1		28.5	0.0	1.9	5.1	0.1	0.8	18.5	0.0	
Delay (s)	28.9	0.1		59.8	0.0	20.4	18.2	7.1	12.8	34.0	6.7	
Level of Service	C	A		E	A	C	B	A	B	C	A	
Approach Delay (s)	15.2			48.4			16.7			31.9		
Approach LOS	B			D			B			C		
Intersection Summary												
HCM Average Control Delay		26.5				HCM Level of Service			C			
HCM Volume to Capacity ratio		0.92										
Actuated Cycle Length (s)		82.4				Sum of lost time (s)		12.0				
Intersection Capacity Utilization		78.2%				ICU Level of Service		D				
Analysis Period (min)		15										
c Critical Lane Group												

Appendix E – Future Diversion for Existing Background Traffic

Table E1 - Diversion Traffic Volumes

Int.	Intersection Name	Peak Hr.	Northbound			Southbound			Eastbound			Westbound			Total
			NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
1	Queen Kaahumanu Hwy./Kaiminani Dr.	AM	0	0	0	0	0	0	0	0	0	0	0	0	0
		PM	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Queen Kaahumanu Hwy./Hulikoa Dr.	AM	0	0	77	-77	156	0	0	0	0	-79	0	79	156
		PM	0	0	57	-57	177	0	0	0	0	-120	0	120	177
3	Queen Kaahumanu Hwy./Hina Lani St.	AM	0	0	0	77	0	0	0	0	0	0	0	0	77
		PM	0	0	0	57	0	0	0	0	0	0	0	0	57
4	Kanalani St./ Hina Lani St.	AM	0	0	0	0	0	0	0	0	0	0	0	0	0
		PM	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Kamanu St./ Hina Lani St.	AM	0	0	0	0	0	0	0	0	0	0	0	0	0
		PM	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Ane Keohokalole Hwy./Hina Lani St.	AM	0	50	50	0	150	0	0	0	0	150	0	0	400
		PM	0	75	75	0	50	0	0	0	0	50	0	0	250
7	Mamalahoa Hwy./ Hina Lani St.	AM	0	-100	0	0	-300	150	50	0	0	0	0	0	-200
		PM	0	-150	0	0	-100	50	75	0	0	0	0	0	-125
8	Queen Kaahumanu Hwy./Kealahke Pkwy.	AM	0	0	0	0	0	0	0	0	0	0	0	0	0
		PM	0	0	0	0	0	0	0	0	0	0	0	0	0

Table E2 - Diverted Conditions Peak Hour Intersection Volumes

Int.	Intersection Name	Peak Hr.	Northbound			Southbound			Eastbound			Westbound			Total
			NL	NT	NR	SL	ST	SR	EL	ET	ER	WL	WT	WR	
1	Queen Kaahumanu Hwy./Kaiminani Dr.	AM	0	562	102	25	374	0	0	0	0	480	0	221	1,764
		PM	0	497	380	200	623	0	0	0	0	180	0	69	1,949
2	Queen Kaahumanu Hwy./Hulikoa Dr.	AM	0	590	218	0	835	0	0	0	0	0	0	182	1,825
		PM	0	719	122	0	1,068	0	0	0	0	0	0	205	2,114
3	Queen Kaahumanu Hwy./Hina Lani St.	AM	0	472	373	236	680	0	0	0	0	217	0	198	2,176
		PM	0	584	527	271	704	0	0	0	0	469	0	275	2,830
4	Kanalani St./ Hina Lani St.	AM	225	0	13	0	0	0	0	137	363	13	210	0	961
		PM	200	0	56	0	0	0	0	202	489	6	456	0	1,409
5	Kamanu St./ Hina Lani St.	AM	112	0	54	0	0	0	0	47	90	100	120	0	523
		PM	373	0	223	0	0	0	0	116	94	94	66	0	966
6	Ane Keohokalole Hwy./Hina Lani St.	AM	0	50	50	0	150	0	0	101	0	150	220	0	721
		PM	0	75	75	0	50	0	0	339	0	50	160	0	749
7	Mamalahoa Hwy./ Hina Lani St.	AM	119	174	0	0	656	281	107	0	79	0	0	0	1,416
		PM	77	361	0	0	291	136	265	0	210	0	0	0	1,340
8	Queen Kaahumanu Hwy./Kealahke Pkwy.	AM	68	628	294	158	619	48	17	7	24	229	18	138	2,248
		PM	60	851	156	52	991	44	59	19	71	210	20	54	2,587

Appendix F – Internal Trip Capture Calculation Worksheets



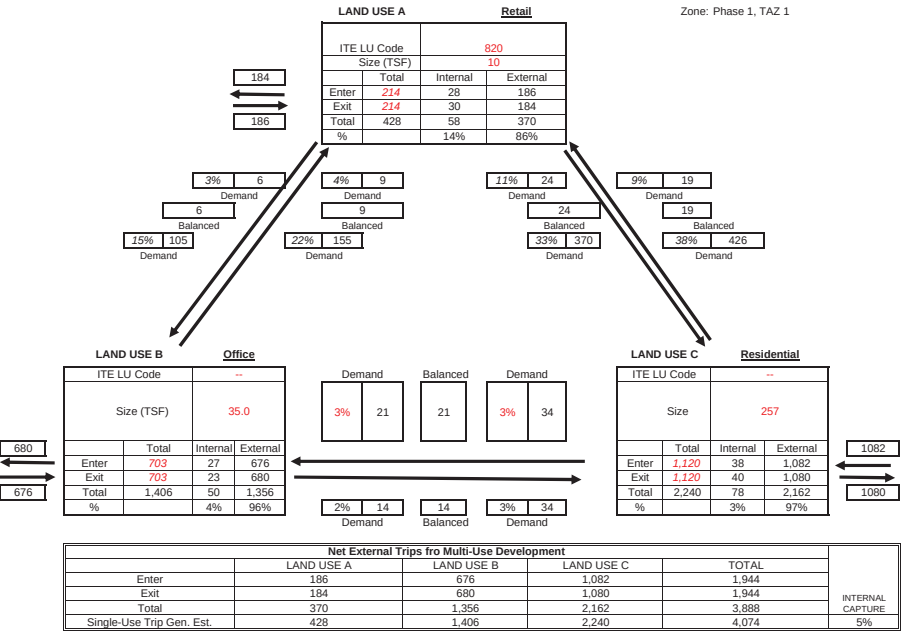
Analyst JX
Date 5/24/2012

TABLE C - 32
MULTI-USE DEVELOPMENT
TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY (DAILY)

Project Name: Kaloko Makai Village Project

PN: JB23054
Time Period: Daily

Zone: Phase 1, TAZ 1



Input data
Source: ITE Trip Generation Handbook, Chapter 7 - Multi-Use Development

J:\2012\JB23054 HI_Kaloko TIS\Analysis\Trip Generation\Internal Capture\JB23054 Internalcapture_Phase_1_TAZ1.xlsJT -1-1.Daily

TABLE C - 33

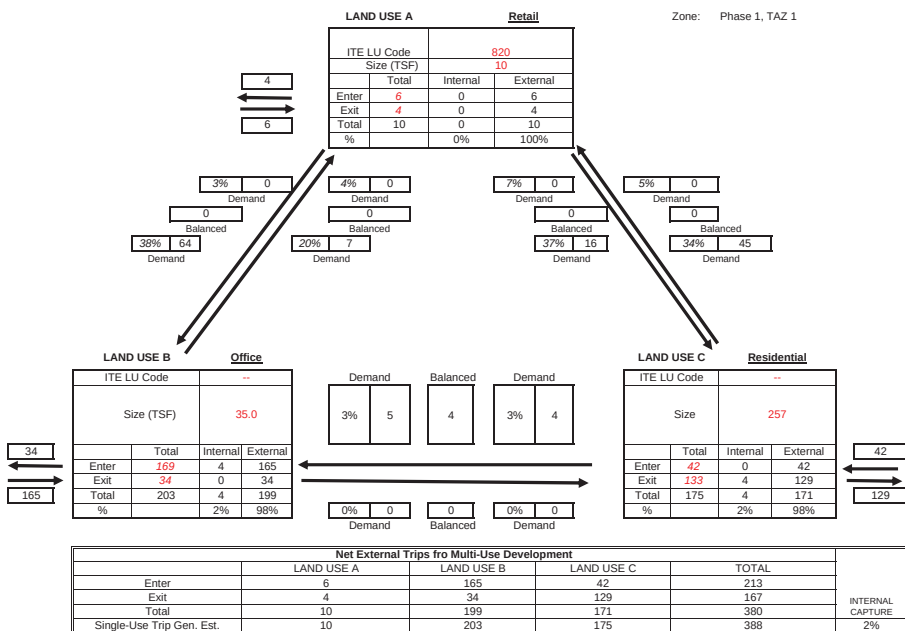
MULTI-USE DEVELOPMENT

Project Name: Kaloko Makai Village Project

Analyst JX
Date 5/24/2012

TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY (AM)

PN: JB23054
Time Period: AM Peak Hour
Zone: Phase 1, TAZ 1



Input data Internal Capture 0% 2% 2%

Source: ITE Trip Generation Handbook, Chapter 7 - Multi-Use Development

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TABLE C - 34

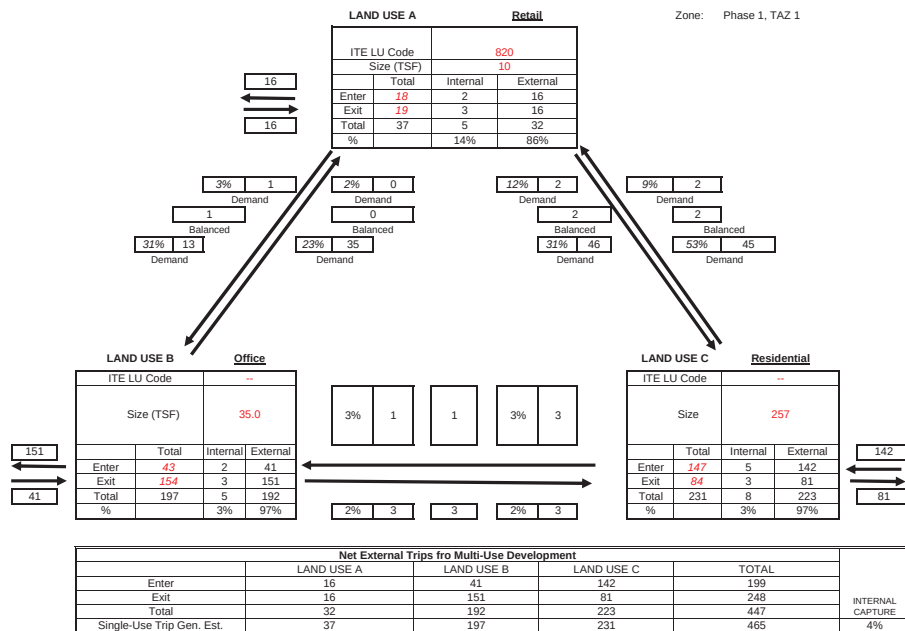
MULTI-USE DEVELOPMENT

Project Name: Kaloko Makai Village Project

Analyst JX
Date 5/24/2012

TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY (PM)

PN: JB23054
Time Period: PM Peak Hour
Zone: Phase 1, TAZ 1



Input data Internal Capture 14% 3% 3%

Source: ITE Trip Generation Handbook, Chapter 7 - Multi-Use Development

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TABLE C - 32

MULTI-USE DEVELOPMENT

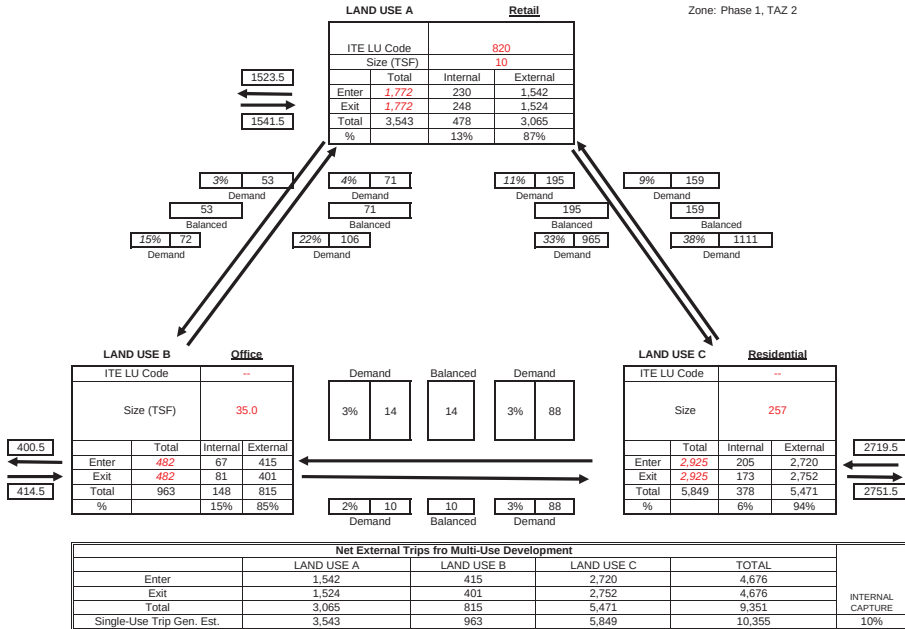
Project Name: Kaloko Makai Village Project

Analyst: JX
Date: 5/24/2012

TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY (DAILY)

PN: JB23054
Time Period: Daily

Zone: Phase 1, TAZ 2



Input data
Source: ITE Trip Generation Handbook, Chapter 7 - Multi-Use Development

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TABLE C - 33

MULTI-USE DEVELOPMENT

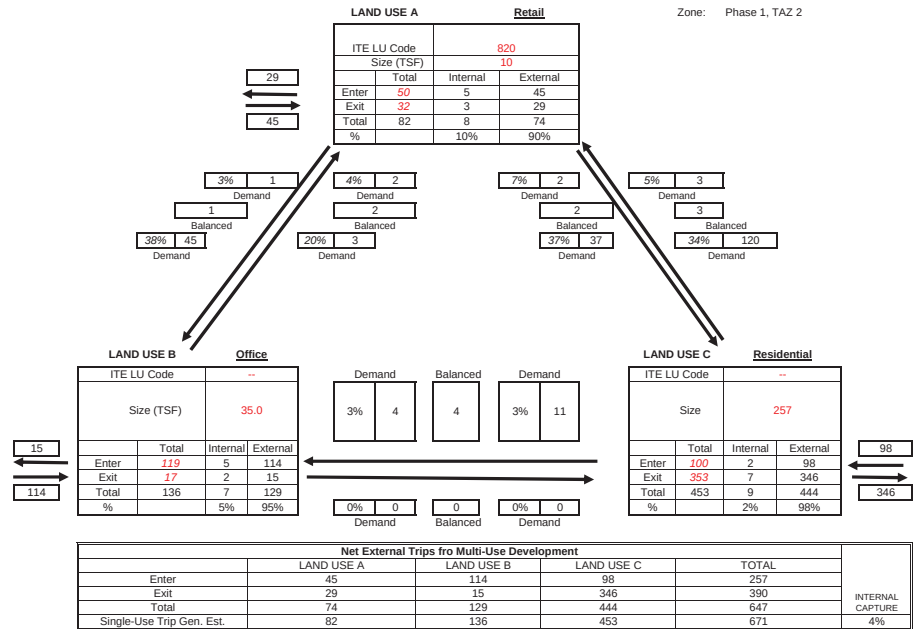
Project Name: Kaloko Makai Village Project

Analyst: JX
Date: 5/24/2012

TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY (AM)

PN: JB23054
Time Period: AM Peak Hour

Zone: Phase 1, TAZ 2



Input data
Source: ITE Trip Generation Handbook, Chapter 7 - Multi-Use Development

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TABLE C - 34

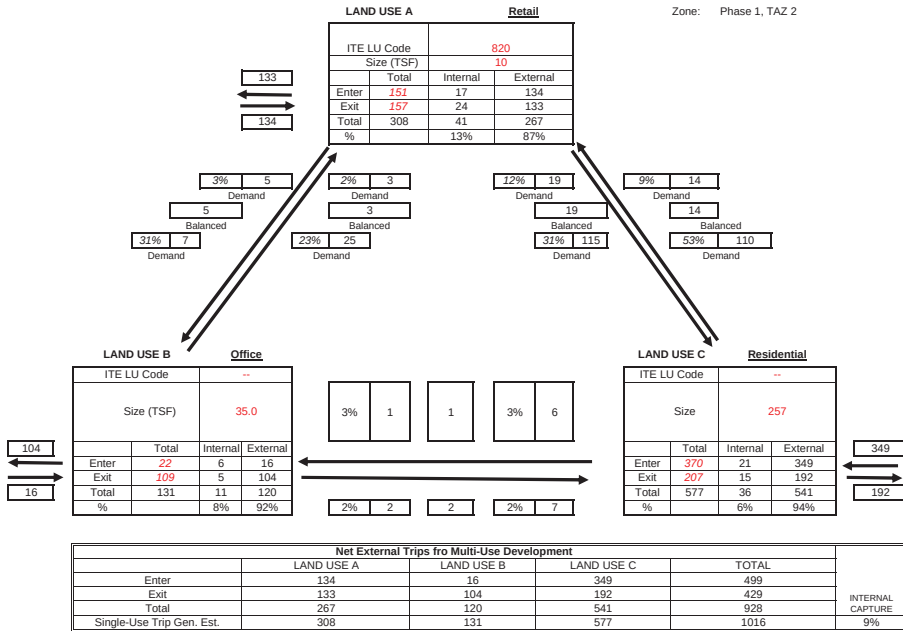
MULTI-USE DEVELOPMENT

Project Name: Kaloko Makai Village Project

Analyst: JX
Date: 5/24/2012

TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY (PM)

PN: JB23054
Time Period: PM Peak Hour
Zone: Phase 1, TAZ 2



Input data
Source: ITE Trip Generation Handbook, Chapter 7 - Multi-Use Development

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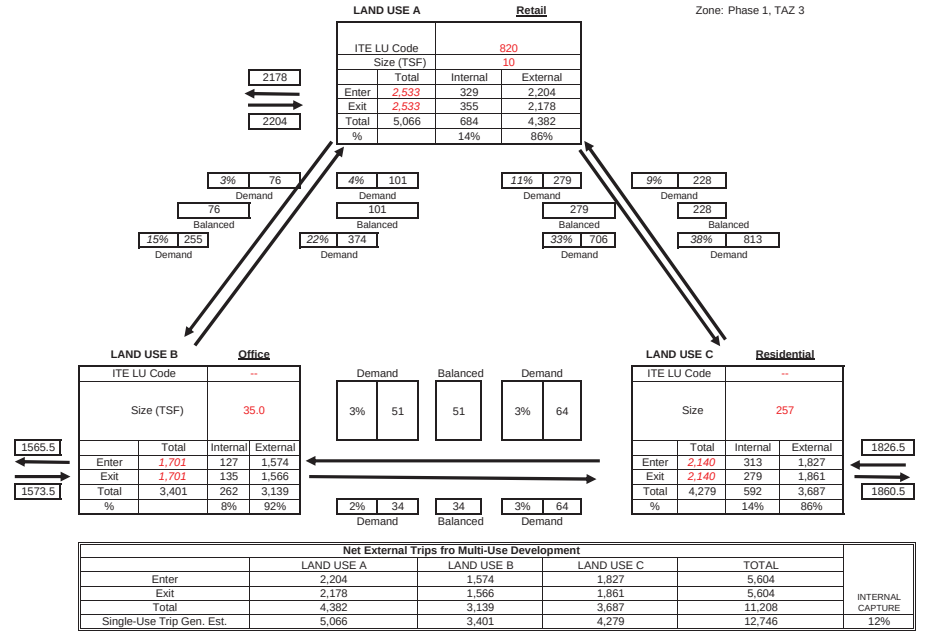
MULTI-USE DEVELOPMENT

Project Name: Kaloko Makai Village Project

Analyst: JX
Date: 5/24/2012

TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY (DAILY)

PN: JB23054
Time Period: Daily
Zone: Phase 1, TAZ 3



Input data
Source: ITE Trip Generation Handbook, Chapter 7 - Multi-Use Development

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TABLE C - 33

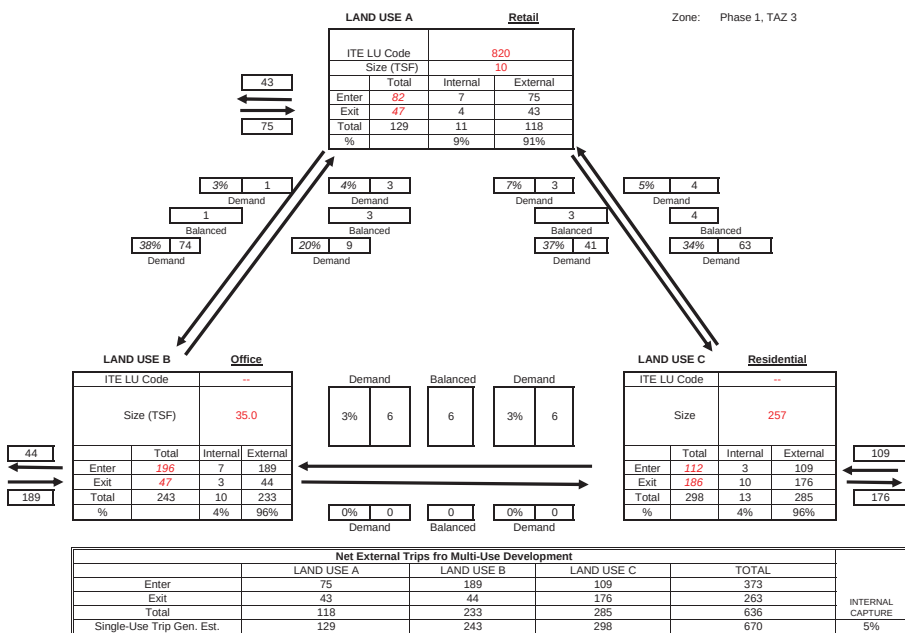
MULTI-USE DEVELOPMENT

Project Name: Kaloko Makai Village Project

Analyst: JX
Date: 5/24/2012

TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY (AM)

PN: JB23054
Time Period: AM Peak Hour
Zone: Phase 1, TAZ 3



Input data
Source: ITE Trip Generation Handbook, Chapter 7 - Multi-Use Development

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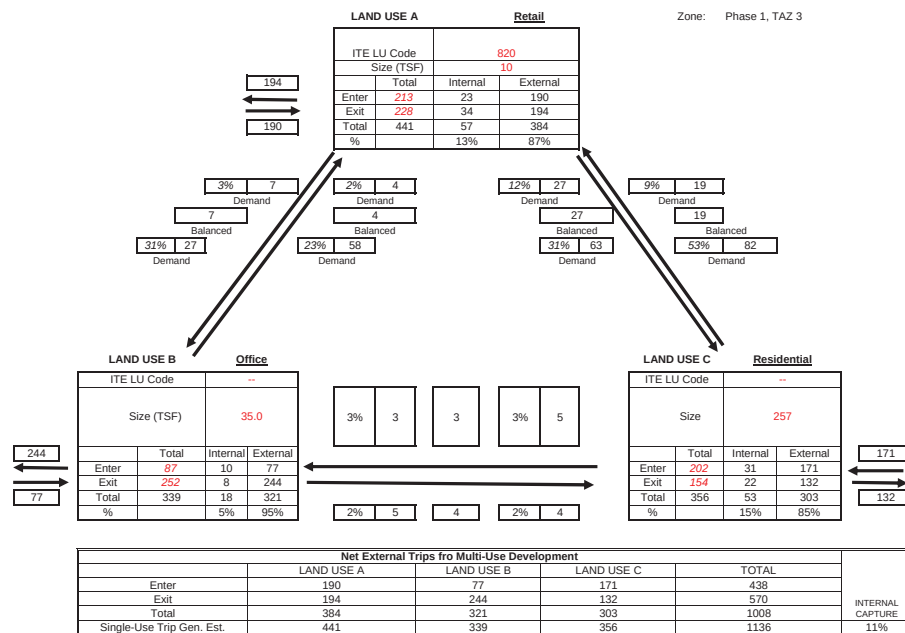
MULTI-USE DEVELOPMENT

Project Name: Kaloko Makai Village Project

Analyst: JX
Date: 5/24/2012

TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY (PM)

PN: JB23054
Time Period: PM Peak Hour
Zone: Phase 1, TAZ 3



Input data
Source: ITE Trip Generation Handbook, Chapter 7 - Multi-Use Development

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TABLE C - 32

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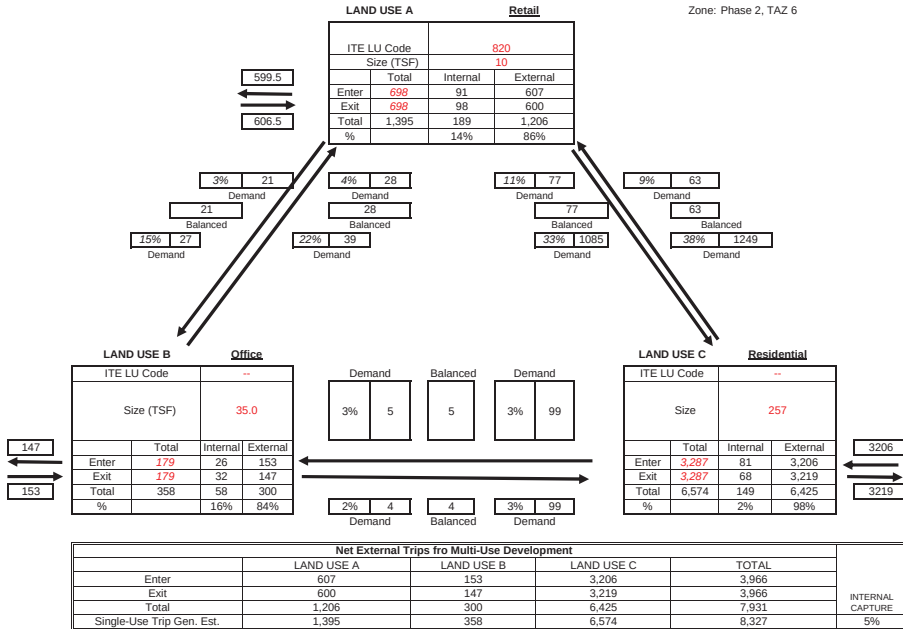
Project Name: Kaloko Makai Village Project

Analyst: JX
Date: 5/24/2012

TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY (DAILY)

PN: JB23054
Time Period: Daily

Zone: Phase 2, TAZ 6



Input data
Source: ITE Trip Generation Handbook, Chapter 7 - Multi-Use Development

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TABLE C - 33

MULTI-USE DEVELOPMENT

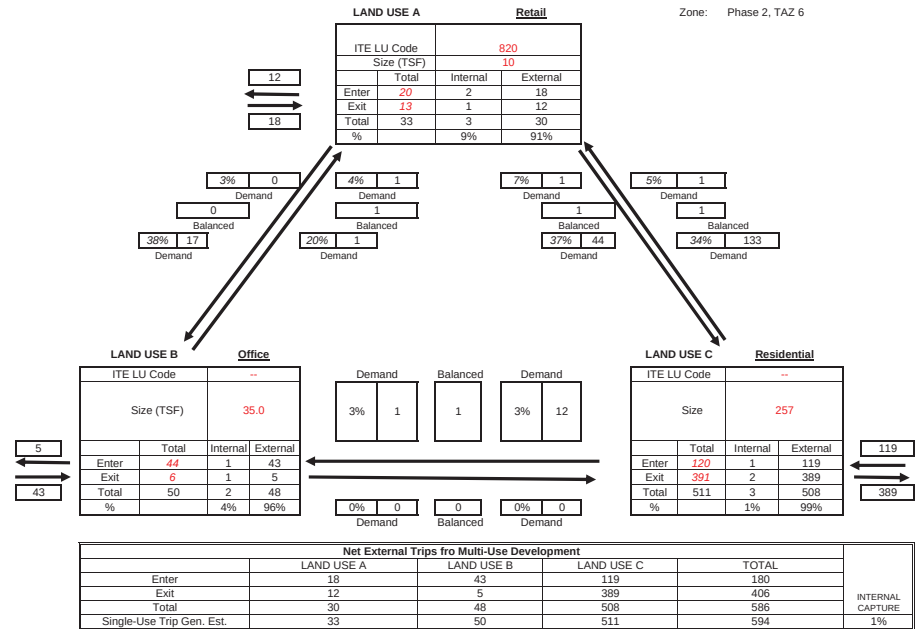
Project Name: Kaloko Makai Village Project

Analyst: JX
Date: 5/24/2012

TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY (AM)

PN: JB23054
Time Period: AM Peak Hour

Zone: Phase 2, TAZ 6



Input data
Source: ITE Trip Generation Handbook, Chapter 7 - Multi-Use Development

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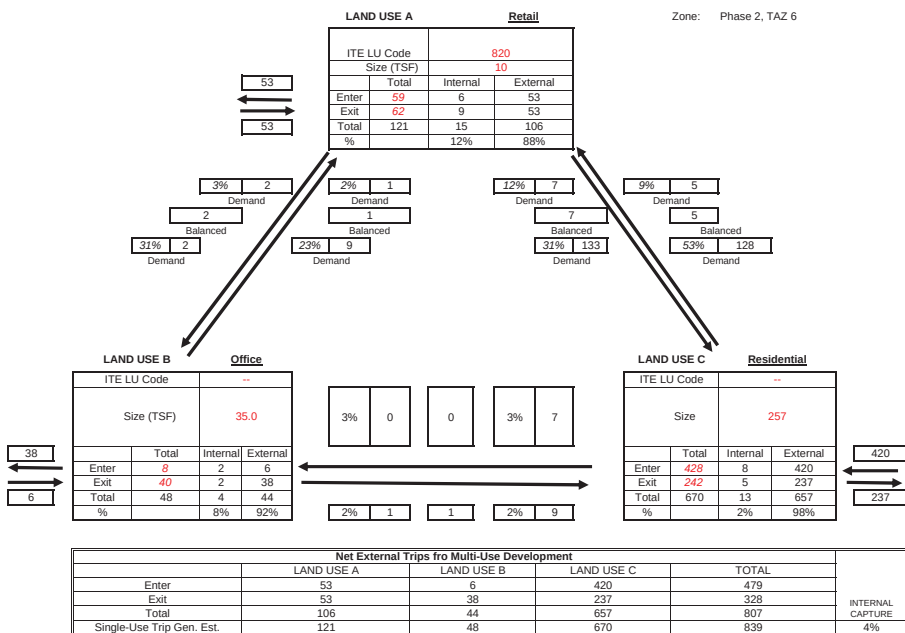
MULTI-USE DEVELOPMENT

Project Name: Kaloko Makai Village Project

Analyst: JX
Date: 5/24/2012

TRIP GENERATION
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PN: JB23054
Time Period: PM Peak Hour
Zone: Phase 2, TAZ 6



Input data
Source: ITE Trip Generation Handbook, Chapter 7 - Multi-Use Development

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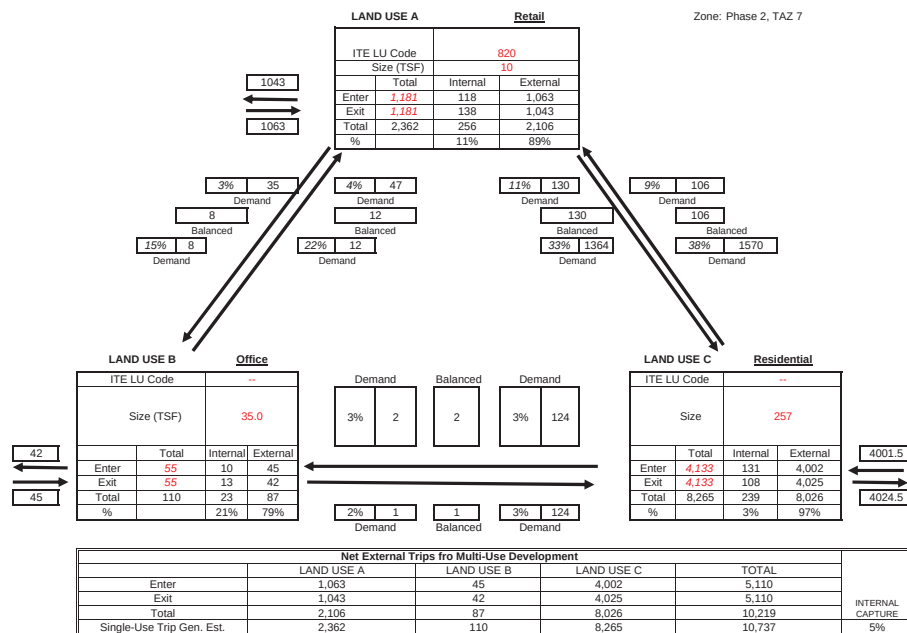
MULTI-USE DEVELOPMENT

Project Name: Kaloko Makai Village Project

Analyst: JX
Date: 5/24/2012

TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY (DAILY)

PN: JB023054
Time Period: Daily
Zone: Phase 2, TAZ 7



Input data
Source: ITE Trip Generation Handbook, Chapter 7 - Multi-Use Development

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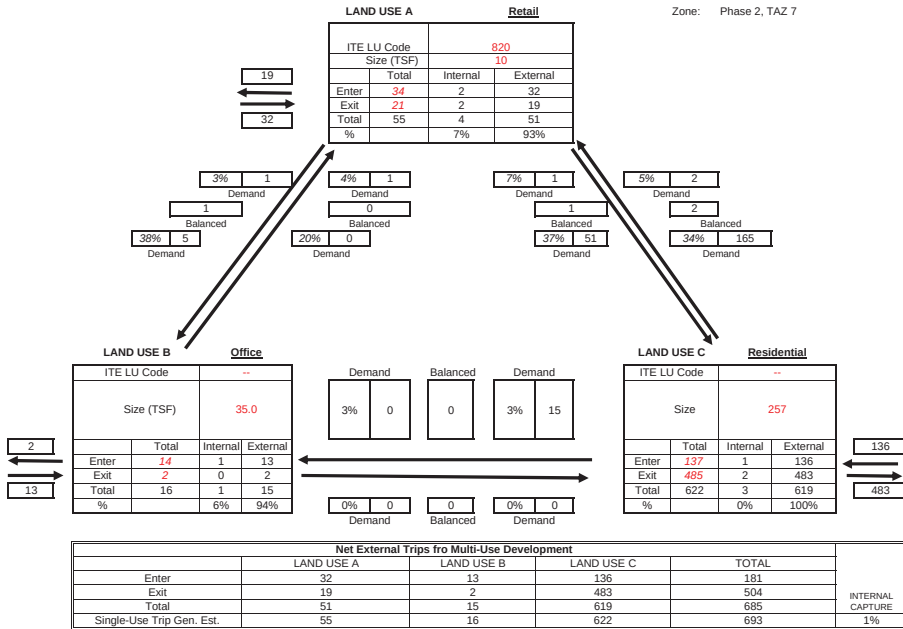
MULTI-USE DEVELOPMENT

Project Name: Kaloko Makai Village Project

Analyst: JX
Date: 5/24/2012

TRIP GENERATION
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PN: JB023054
Time Period: AM Peak Hour
Zone: Phase 2, TAZ 7



Input data
Source: ITE Trip Generation Handbook, Chapter 7 - Multi-Use Development

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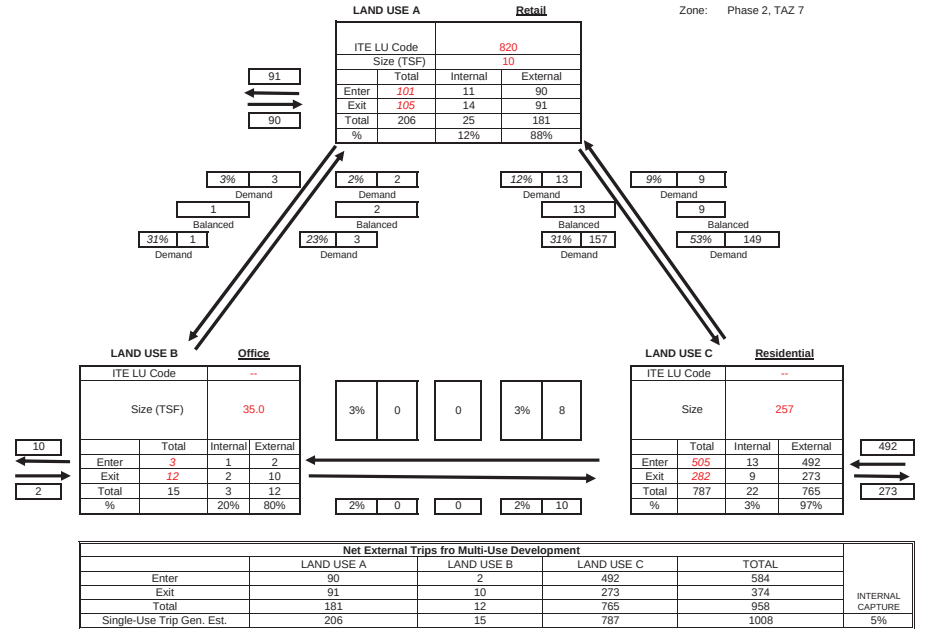
MULTI-USE DEVELOPMENT

Project Name: Kaloko Makai Village Project

Analyst: JX
Date: 5/24/2012

TRIP GENERATION
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Time Period: PM Peak Hour
Zone: Phase 2, TAZ 7



Input data
Source: ITE Trip Generation Handbook, Chapter 7 - Multi-Use Development

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TABLE C - 32

MULTI-USE DEVELOPMENT

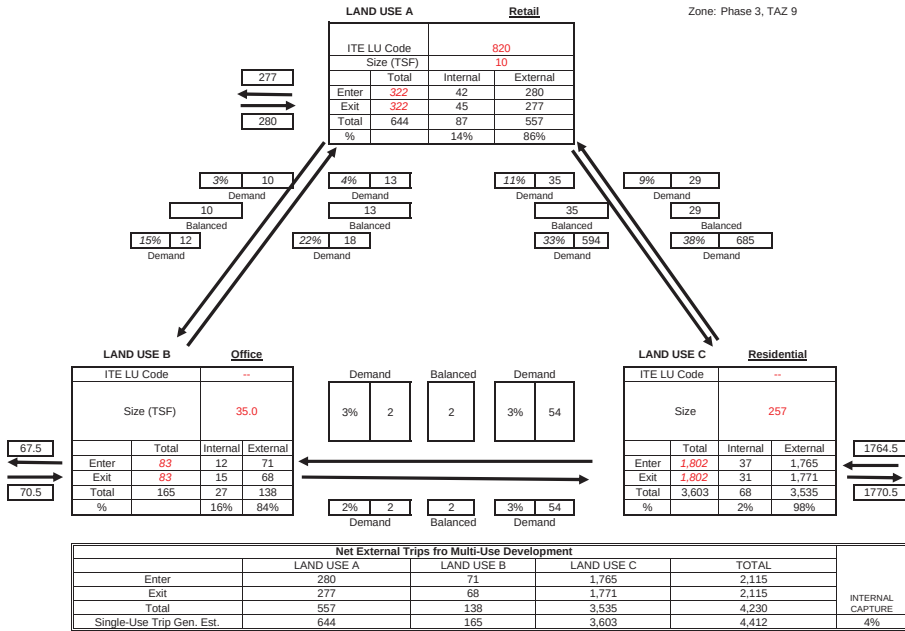
Project Name: Kaloko Makai Village Project

Analyst JX
Date 5/24/2012

TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY (DAILY)

PN: JB23054
Time Period: Daily

Zone: Phase 3, TAZ 9



Input data
Source: ITE Trip Generation Handbook, Chapter 7 - Multi-Use Development

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TABLE C - 33

MULTI-USE DEVELOPMENT

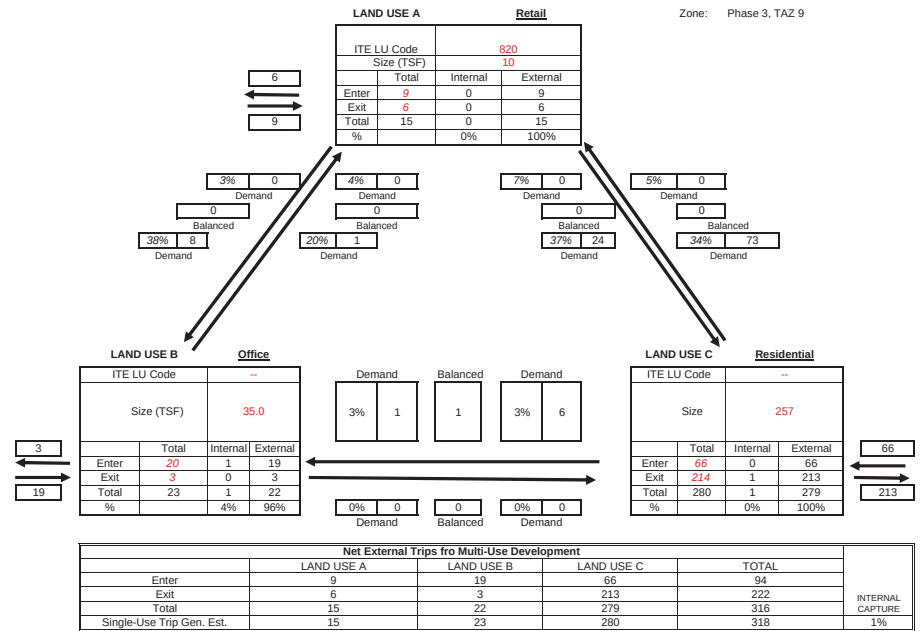
Project Name: Kaloko Makai Village Project

Analyst JX
Date 5/24/2012

TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY (AM)

PN: JB23054
Time Period: AM Peak Hour

Zone: Phase 3, TAZ 9



Input data
Source: ITE Trip Generation Handbook, Chapter 7 - Multi-Use Development

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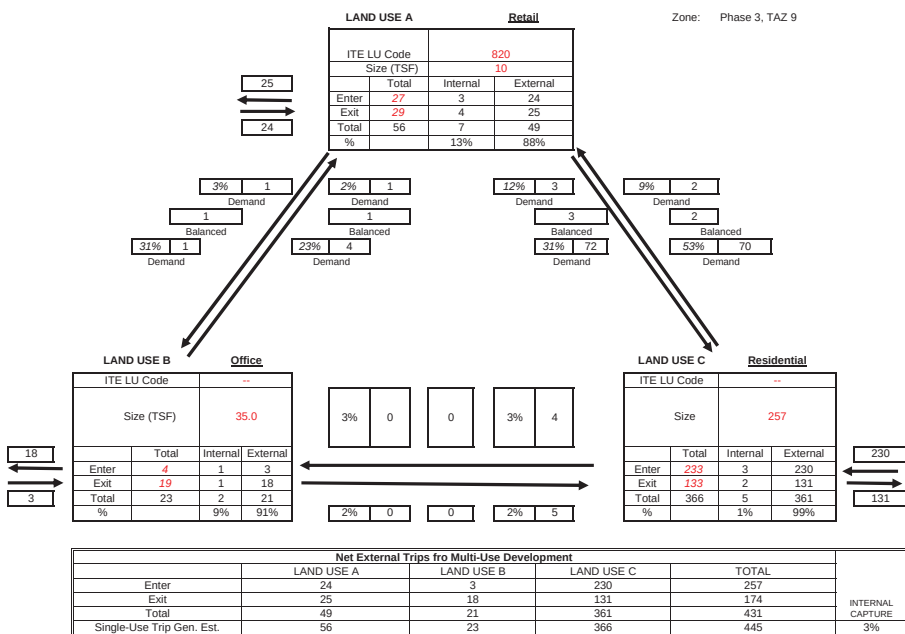
MULTI-USE DEVELOPMENT

Project Name: Kaloko Makai Village Project

Analyst: JX
Date: 5/24/2012

**TRIP GENERATION
AND INTERNAL CAPTURE SUMMARY (PM)**

PN: JB23054
Time Period: PM Peak Hour
Zone: Phase 3, TAZ 9



Input data
Source: ITE Trip Generation Handbook, Chapter 7 - Multi-Use Development

J:\2012\JB23054 HI_Kaloko TIS\Analysis\Trip Generation\Internal Capture\JB23054 Internalcapture_Phase_3_TAZ9.xls\T 1:9-PM

Appendix G – Detailed Project Traffic Generation Calculations

Appendix G (1 of 8) - Detailed Project Traffic Generation Calculations

TRIP GENERATION RATES

ITE Code	ITE Description	Unit	AM Peak Hour				PM Peak Hour			
			Daily	Total	In	Out	Total	In	Out	
90	Park-and-Ride Lot with Bus Service	AC	372.32	48.81	39.54	9.27	43.75	10.06	33.69	
110	General Light Industrial	AC	51.80	7.51	6.23	1.28	7.26	1.60	5.66	
170	Utilities [1]	AC	13.36	2.49	1.57	0.92	1.32	0.59	0.73	
210	Single-Family Detached Housing	DU	9.57	0.75	0.19	0.56	1.01	0.64	0.37	
220	Apartment	DU	6.65	0.51	0.10	0.41	0.62	0.40	0.22	
230	Residential Condo/Townhouse	DU	5.81	0.44	0.07	0.37	0.52	0.35	0.17	
252	Senior Adult Housing-Attached	DU	3.48	0.13	0.05	0.08	0.16	0.10	0.06	
310	Hotel	RM	8.17	0.56	0.34	0.22	0.59	0.31	0.28	
412	County Park	AC	2.28	0.01	0.01	0.00	0.06	0.02	0.04	
520	Elementary School	STU	1.29	0.45	0.25	0.20	0.15	0.07	0.08	
522	Middle School/Junior High School	STU	1.62	0.54	0.30	0.24	0.16	0.08	0.08	
610	Hospital	BEDS	11.81	1.14	0.81	0.33	1.31	0.47	0.84	
620	Nursing Home	BEDS	2.37	0.17	0.12	0.05	0.22	0.07	0.15	
710	General Office Building	TSF	11.01	1.55	1.36	0.19	1.49	0.25	1.24	
720	Medical-Dental Office Building	TSF	36.13	2.30	1.82	0.48	3.46	0.93	2.53	
730	Government Office Building	TSF	68.93	5.88	4.94	0.94	1.21	0.38	0.83	
770	Business Park	TSF	12.76	1.43	1.20	0.23	1.29	0.30	0.99	
820	Shopping Center	TSF	42.94	1.00	0.61	0.39	3.73	1.83	1.90	

Source: ITE (Institute of Transportation Engineers) Trip Generation Manual, 8th Edition, 2008.

[1] Trip rate for daily is not available in ITE Trip Generation. The daily to AM/PM peak hours ratio for general light industrial use was applied to the AM plus PM peak hour rates to estimate the daily trip rate for utilities use.

PROJECT TRAFFIC GENERATION

Project Description	Parcel I.D.	TAZ	Code	ITE Description	Quantity	Daily	Total	In	Out	Total	In	Out
Project Phase 1												
Phase 1, TAZ 1												
District Sized Park &Drainage Retention	P-4	I	412	County Park	25 AC	57	0	0	-	2	1	1
Waste Water Treatment Plant	WWTP	I	170	Utilities [1]	20 AC	267	50	31	18	26	12	15
Electrical Substation	ELEC. SUB	I	170	Utilities [1]	1 AC	13	2	2	1	1	1	1
				Subtotal	46	338	53	33	19	29	13	16
				Transit Trip Discount	5%	-17	-3	-2	-1	-1	-1	-
				Total (less Internal/Transit Trips)		321	50	31	18	28	12	16
Affordable Single Family	T4-15	I	210	Single-Family Detached Housing	104 DU	995	78	20	58	105	67	38
Affordable Multi Family	T4-15	I	230	Residential Condo/Townhouse	35 DU	203	15	2	13	18	12	6
Affordable Single Family	T4-16	I	210	Single-Family Detached Housing	88 DU	842	66	17	49	89	56	33
Affordable Multi Family	T4-16	I	220	Apartment	30 DU	200	15	3	12	19	12	7
				Subtotal	257	2,240	175	42	133	231	147	84
				Internal Capture (5% Daily, 2% AM, 4% PM)		-112	-3	-1	-2	-9	-6	-3
				Transit Trip Discount	5%	-112	-9	-2	-7	-12	-7	-5
				Total (less Internal/Transit Trips)		2,016	163	39	124	210	134	76
Retail	T4-15	I	820	Shopping Center	10 TSF	429	10	6	4	37	18	19
				Subtotal	10 TSF	429	10	6	4	37	18	19
				Internal Capture (5% Daily, 2% AM, 4% PM)		-21	-	-	-	-1	-1	-
				Transit Trip Discount	5%	-21	-1	-	-1	-2	-1	-1
				Total (less Internal/Transit Trips)		387	9	6	3	34	16	18
				Pass-by Trip Discount	15%	-58	-	-	-	-5	-2	-3
				Total (less Internal/Transit/Pass-by Trips)		329	9	6	3	29	14	15
Light Industrial	INDUSTRIAL	I	110	General Light Industrial	25 AC	1,295	188	156	32	182	40	142
Office	T4-15	I	710	General Office Building	10 TSF	110	16	14	2	15	3	12
				Subtotal	35	1,405	203	169	34	196	43	154
				Internal Capture (5% Daily, 2% AM, 4% PM)		-70	-4	-3	-1	-8	-2	-6
				Transit Trip Discount	5%	-70	-10	-8	-2	-10	-2	-8
				Total (less Internal/Transit Trips)		1,265	189	158	31	178	39	140
		I		Total without Trip Discount		4,412	440	251	190	494	221	273
		I		Total with Trip Discount		3,931	410	235	176	446	199	247

Appendix G (2 of 8) - Detailed Project Traffic Generation Calculations

PROJECT TRAFFIC GENERATION

Project Description	Parcel I.D.	TAZ	Code	ITE Description	Quantity	Daily	Total	In	Out	Total	In	Out
Phase 1, TAZ 2												
Single Family	T3-10	2	210	Single-Family Detached Housing	37 DU	354	28	7	21	37	24	14
Single Family	T3-11	2	210	Single-Family Detached Housing	58 DU	555	44	11	32	59	37	21
Live-Work, SF	T4-10	2	210	Single-Family Detached Housing	121 DU	1,158	91	23	68	122	77	45
Multi Family	T4-10	2	230	Residential Condo/Townhouse	41 DU	238	18	3	15	21	14	7
Single Family	T4-11	2	210	Single-Family Detached Housing	63 DU	603	47	12	35	64	40	23
Multi Family	T4-11	2	230	Residential Condo/Townhouse	22 DU	128	10	2	8	11	8	4
Multi Family	T5-10	2	220	Apartment	423 DU	2,813	216	42	173	262	169	93
				Subtotal	765	5,849	453	100	353	577	370	207
				Internal Capture (10% Daily, 4% AM, 9% PM)		-585	-18	-4	-14	-52	-33	-19
				Transit Trip Discount	5%	-292	-23	-5	-18	-29	-18	-11
				Total (less Internal/Transit Trips)		4,972	412	91	321	496	319	177
Retail	T4-10	2	820	Shopping Center	7.5 TSF	322	8	5	3	28	14	14
Retail	T5-10	2	820	Shopping Center	75 TSF	3,221	75	46	29	280	137	143
				Subtotal	83	3,543	83	50	32	308	151	157
				Internal Capture (10% Daily, 4% AM, 9% PM)		-354	-3	-2	-1	-28	-14	-14
				Transit Trip Discount	5%	-177	-4	-3	-1	-15	-8	-7
				Total (less Internal/Transit Trips)		3,012	76	45	30	265	129	136
				Pass-by Trip Discount	15%	-452	-	-	-	-40	-19	-21
				Total (less Internal/Transit/Pass-by Trips)		2,560	76	45	30	225	110	115
Office	T4-10	2	710	General Office Building	7.5 TSF	83	12	10	1	11	2	9
Office	T5-10	2	710	General Office Building	80 TSF	881	124	109	15	119	20	99
				Subtotal	88	963	136	119	17	130	22	109
				Internal Capture (10% Daily, 4% AM, 9% PM)		-96	-5	-5	-	-12	-2	-10
				Transit Trip Discount	5%	-48	-7	-6	-1	-7	-1	-6
				Total (less Internal/Transit Trips)		819	124	108	16	111	19	93
				Total without Trip Discount		10,355	671	269	402	1,015	543	472
				Total with Trip Discount		8,351	611	244	367	832	448	384

Appendix G (3 of 8) - Detailed Project Traffic Generation Calculations

PROJECT TRAFFIC GENERATION				ITE				AM Peak Hour				PM Peak Hour			
Project Description	Parcel I.D.	TAZ	Code	ITE Description	Quantity	Daily	Total	In	Out	Total	In	Out	Total	In	Out
Phase 1, TAZ 3															
Park	P-2	3	412	County Park	10 AC	23	0	0	-	1	0	0			
School	SCHOOL	3	522	Middle School/Junior High School	600 STU	972	324	180	144	96	48	48			
Hospital	HOSPITAL	3	610	Hospital	150 BEDS	1,772	171	122	50	197	71	126			
				Subtotal	760	2,766	495	302	194	293	119	174			
				Transit Trip Discount	5%	-138	-25	-15	-10	-15	-6	-9			
				Total (less Internal/Transit Trips)		2,628	470	287	184	278	113	165			
Long Term Care	T5-5	3	620	Nursing Home	179 BEDS	424	30	21	9	39	13	27			
Long Term Care	T5-6	3	620	Nursing Home	83 BEDS	197	14	10	4	18	6	12			
Lodge	T5-7	3	310	Hotel	120 RM	980	67	41	26	71	37	34			
Senior Adult Housing	T5-8	3	252	Senior Adult Housing-Attached	137 DU	477	18	7	11	22	14	8			
Multi Family	T5-9	3	220	Apartment	116 DU	771	59	12	48	72	46	26			
Affordable Multi Family	T5-13	3	220	Apartment	100 DU	665	51	10	41	62	40	22			
Multi Family	T5-13	3	220	Apartment	115 DU	765	59	12	47	71	46	25			
				Subtotal	850	4,279	298	112	186	356	202	154			
				Internal Capture (12% Daily, 5% AM, 11% PM)		-514	-15	-6	-9	-39	-22	-17			
				Transit Trip Discount	5%	-214	-15	-6	-9	-18	-10	-8			
				Total (less Internal/Transit Trips)		3,551	268	100	168	299	170	129			
Retail	T5-5	3	820	Shopping Center	15 TSF	644	15	9	6	56	27	29			
Retail	T5-6	3	820	Shopping Center	15 TSF	644	15	9	6	56	27	29			
Business Center	T5-7	3	770	Business Park	10 TSF	128	14	12	2	13	3	10			
Transit Station, TOD Square	T5-8	3	820	Shopping Center	20 TSF	859	20	12	8	75	37	38			
Retail	T5-9	3	820	Shopping Center	20 TSF	859	20	12	8	75	37	38			
Retail	T5-13	3	820	Shopping Center	45 TSF	1,932	45	27	18	168	82	86			
				Subtotal	125	5,066	129	82	47	442	213	228			
				Internal Capture (13% Daily, 5% AM, 12% PM)		-608	-6	-4	-2	-49	-23	-26			
				Transit Trip Discount	5%	-253	-6	-4	-2	-22	-11	-11			
				Total (less Internal/Transit Trips)		4,205	117	74	43	371	179	191			
				Pass-by Trip Discount	15%	-631	-	-	-	-56	-27	-29			
				Total (less Internal/Transit/Pass-by Trips)		3,574	117	74	43	315	152	162			
Medical Offices	T5-5	3	720	Medical-Dental Office Building	15 TSF	542	35	27	7	52	14	38			
Office	T5-6	3	710	General Office Building	15 TSF	165	23	20	3	22	4	19			
Medical Offices	T5-7	3	720	Medical-Dental Office Building	30 TSF	1,084	69	55	14	104	28	76			
Medical Offices	T5-8	3	720	Medical-Dental Office Building	40 TSF	1,445	92	73	19	138	37	101			
Office	T5-13	3	710	General Office Building	15 TSF	165	23	20	3	22	4	19			
				Subtotal	115	3,401	242	196	47	339	87	252			
				Internal Capture (13% Daily, 5% AM, 12% PM)		-408	-12	-10	-2	-37	-10	-27			
				Transit Trip Discount	5%	-170	-12	-10	-2	-17	-4	-13			
				Total (less Internal/Transit Trips)		2,823	218	176	43	285	73	212			
				3 Total without Trip Discount		15,513	1,165	691	473	1,429	620	809			
				3 Total with Trip Discount		12,577	1,074	636	437	1,176	507	669			

Project Phase 2

Phase 2, TAZ 4															
Light Industrial	INDUSTRIAL	4	110	General Light Industrial	10 AC	518	75	62	13	73	16	57			
				Subtotal	10	518	75	62	13	73	16	57			
				Transit Trip Discount	5%	-26	-4	-3	-1	-4	-1	-3			
				Total (less Internal/Transit Trips)		492	71	59	12	69	15	54			
				4 Total without Trip Discount		518	75	62	13	73	16	57			
				4 Total with Trip Discount		492	71	59	12	69	15	54			

Appendix G (4 of 8) - Detailed Project Traffic Generation Calculations

PROJECT TRAFFIC GENERATION				ITE				AM Peak Hour				PM Peak Hour			
Project Description	Parcel I.D.	TAZ	Code	ITE Description	Quantity	Daily	Total	In	Out	Total	In	Out	Total	In	Out
Phase 2, TAZ 5															
Light Industrial	INDUSTRIAL	5	110	General Light Industrial	15 AC	777	113	93	19	109	24	85			
				Subtotal	15	777	113	93	19	109	24	85			
				Transit Trip Discount	5%	-39	-6	-5	-1	-5	-1	-4			
				Total (less Internal/Transit Trips)		738	107	88	18	104	23	81			
				5 Total without Trip Discount		777	113	93	19	109	24	85			
				5 Total with Trip Discount		738	107	88	18	104	23	81			
Phase 2, TAZ 6															
Park	P-3	6	412	County Park	10 AC	23	0	0	-	1	0	0			
School	SCHOOL	6	520	Elementary School	450 STU	581	203	113	90	68	32	36			
				Subtotal	460	603	203	113	90	68	32	36			
				Transit Trip Discount	5%	-30	-10	-6	-4	-3	-2	-1			
				Total (less Internal/Transit Trips)		573	193	107	86	65	30	35			
Single Family	T3-12	6	210	Single-Family Detached Housing	171 DU	1,636	128	32	96	173	109	63			
Single Family	T3-13	6	210	Single-Family Detached Housing	60 DU	574	45	11	34	61	38	22			
Single Family	T4-12	6	210	Single-Family Detached Housing	39 DU	373	29	7	22	39	25	14			
Multi Family	T4-12	6	230	Residential Condo/Townhouse	13 DU	76	6	1	5	7	5	2			
Single Family	T4-13	6	210	Single-Family Detached Housing	102 DU	976	77	19	57	103	65	38			
Multi Family	T4-13	6	230	Residential Condo/Townhouse	35 DU	203	15	2	13	18	12	6			
Affordable Single Family	T4-14	6	210	Single-Family Detached Housing	37 DU	354	28	7	21	37	24	14			
Single Family	T4-14	6	210	Single-Family Detached Housing	90 DU	861	68	17	50	91	58	33			
Affordable Multi Family	T4-14	6	230	Residential Condo/Townhouse	13 DU	76	6	1	5	7	5	2			
Multi Family	T4-14	6	230	Residential Condo/Townhouse	30 DU	174	13	2	11	16	11	5			
Affordable Multi Family	T5-11	6	220	Apartment	90 DU	599	46	9	37	56	36	20			
Multi Family	T5-12	6	220	Apartment	1 DU	7	1	0	0	1	0	0			
Affordable Multi Family	T5-12	6	220	Apartment	100 DU	665	51	10	41	62	40	22			
				Subtotal	781	6,574	512	120	391	670	428	242			
				Internal Capture (5% Daily, 1% AM, 4% PM)		-329	-5	-1	-4	-27	-17	-10			
				Transit Trip Discount	5%	-329	-26	-6	-20	-33	-21	-12			
				Total (less Internal/Transit Trips)		5,916	481	113	367	610	390	220			
Retail	T4-13	6	820	Shopping Center	7.5 TSF	322	8	5	3	28	14	14			
Retail	T4-14	6	820	Shopping Center	7.5 TSF	322	8	5	3	28	14	14			
Retail	T5-11	6	820	Shopping Center	7.5 TSF	322	8	5	3	28	14	14			
Retail	T5-12	6	820	Shopping Center	10 TSF	429	10	6	4	37	18	19			
				Subtotal	32.5	1,396	33	20	13	121	59	62			
				Internal Capture (5% Daily, 1% AM, 4% PM)		-70	-	-	-	-5	-2	-3			
				Transit Trip Discount	5%	-70	-2	-1	-1	-6	-3	-3			
				Total (less Internal/Transit Trips)		1,256	31	19	12	110	54	56			
				Pass-by Trip Discount	15%	-188	-	-	-	-17	-8	-9			
				Total (less Internal/Transit/Pass-by Trips)		1,068	31	19	12	93	46	47			
Office	T4-13	6	710	General Office Building	7.5 TSF	83	12	10	1	11	2	9			
Office	T4-14	6	710	General Office Building	7.5 TSF	83	12	10	1	11	2	9			
Office	T5-11	6	710	General Office Building	7.5 TSF	83	12	10	1	11	2	9			
Office	T5-12	6	710	General Office Building	10 TSF	110	16	14	2	15	3	12			
				Subtotal	32.5	358	50	44	6	48	8	40			
				Internal Capture (5% Daily, 1% AM, 4% PM)		-18	-1	-	-1	-2	-	-2			
				Transit Trip Discount	5%	-18	-3	-2	-1	-2	-	-2			
				Total (less Internal/Transit Trips)		322	46	42	4	44	8	36			
				6 Total without Trip Discount		8,931	797	297	500	907	527	381			
				6 Total with Trip Discount		8,644	809	292	516	884	520	364			

Appendix G (5 of 8) - Detailed Project Traffic Generation Calculations

PROJECT TRAFFIC GENERATION				ITE				AM Peak Hour				PM Peak Hour			
Project Description	Parcel I.D.	TAZ	Code	ITE Description	Quantity	Daily	Total	In	Out	Total	In	Out	Total	In	Out
Phase 2, TAZ 7															
Affordable Single Family	T4-1	7	210	Single-Family Detached Housing	52 DU	498	39	10	29	53	33	19			
Single Family	T4-1	7	210	Single-Family Detached Housing	24 DU	230	18	5	13	24	15	9			
Affordable Multi Family	T4-1	7	230	Residential Condo/Townhouse	18 DU	105	8	1	7	9	6	3			
Multi Family	T4-1	7	230	Residential Condo/Townhouse	8 DU	46	4	1	3	4	3	1			
Single Family	T4-2	7	210	Single-Family Detached Housing	64 DU	612	48	12	36	65	41	24			
Multi Family	T4-2	7	230	Residential Condo/Townhouse	22 DU	128	10	2	8	11	8	4			
Single Family	T4-3	7	210	Single-Family Detached Housing	93 DU	890	70	18	52	94	60	34			
Multi Family	T4-3	7	230	Residential Condo/Townhouse	31 DU	180	14	2	11	16	11	5			
Single Family	T4-4	7	210	Single-Family Detached Housing	33 DU	316	25	6	18	33	21	12			
Multi Family	T4-4	7	230	Residential Condo/Townhouse	12 DU	70	5	1	4	6	4	2			
Single Family	T4-5	7	210	Single-Family Detached Housing	64 DU	612	48	12	36	65	41	24			
Multi Family	T4-5	7	230	Residential Condo/Townhouse	22 DU	128	10	2	8	11	8	4			
Multi Family	T5-1	7	220	Apartment	161 DU	1,071	82	16	66	100	64	35			
Multi Family	T5-2	7	220	Apartment	116 DU	771	59	12	48	72	46	26			
Senior Adult Housing	T5-3	7	252	Senior Adult Housing-Attached	119 DU	414	15	6	10	19	12	7			
Multi Family	T5-4	7	220	Apartment	175 DU	1,164	89	18	72	109	70	39			
Multi Family	T5-14	7	220	Apartment	82 DU	545	42	8	34	51	33	18			
Affordable Multi Family	T5-14	7	220	Apartment	73 DU	485	37	7	30	45	29	16			
				Subtotal	1169	8,265	622	137	485	787	505	282			
				Internal Capture (5% Daily, 1% AM, 5% PM)		-413	-6	-1	-5	-39	-25	-14			
				Transit Trip Discount	5%	-413	-31	-7	-24	-39	-25	-14			
				Total (less Internal/Transit Trips)		7,439	585	129	456	709	455	254			
Retail	T4-5	7	820	Shopping Center	20 TSF	859	20	12	8	75	37	38			
Retail	T5-4	7	820	Shopping Center	25 TSF	1,074	25	15	10	93	46	48			
Mixed Use, Retail	T5-14	7	820	Shopping Center	10 TSF	429	10	6	4	37	18	19			
				Subtotal	55	2,362	55	34	21	205	101	105			
				Internal Capture (5% Daily, 1% AM, 5% PM)		-118	-1	-	-1	-10	-5	-5			
				Transit Trip Discount	5%	-118	-3	-2	-1	-10	-5	-5			
				Total (less Internal/Transit Trips)		2,126	51	32	19	185	91	95			
				Pass-by Trip Discount	15%	-319	-	-	-	-28	-14	-14			
				Total (less Internal/Transit/Pass-by Trips)		1,807	51	32	19	157	77	81			
Mixed Use, Office	T5-14	7	710	General Office Building	10 TSF	110	16	14	2	15	3	12			
				Subtotal	10	110	16	14	2	15	3	12			
				Internal Capture (5% Daily, 1% AM, 5% PM)		-6	-	-	-	-1	-	-1			
				Transit Trip Discount	5%	-6	-1	-1	-	-1	-	-1			
				Total (less Internal/Transit Trips)		98	15	13	2	13	3	10			
				7	Total without Trip Discount	10,737	693	184	508	1,007	609	399			
				7	Total with Trip Discount	9,344	651	173	477	879	535	345			

Project Phase 3

Phase 3, TAZ 8															
Light Industrial	INDUSTRIAL	8	110	General Light Industrial	25 AC	1,295	188	156	32	182	40	142			
				Subtotal	25	1,295	188	156	32	182	40	142			
				Transit Trip Discount	5%	-65	-9	-8	-1	-9	-2	-7			
				Total (less Internal/Transit Trips)		1,230	179	148	31	173	38	135			
				8	Total without Trip Discount	1,295	188	156	32	182	40	142			
				8	Total with Trip Discount	1,230	179	148	31	173	38	135			

Appendix G (6 of 8) - Detailed Project Traffic Generation Calculations

PROJECT TRAFFIC GENERATION				ITE				AM Peak Hour				PM Peak Hour			
Project Description	Parcel I.D.	TAZ	Code	ITE Description	Quantity	Daily	Total	In	Out	Total	In	Out	Total	In	Out
Phase 3, TAZ 9															
Fire Station	FIRE STATION	9	730	Government Office Building	3 TSF	207	18	15	3	4	1	2			
Desalinization Plant	DESAL PLANT	9	170	Utilities [1]	1.7 AC	23	4	3	2	2	1	1			
				Subtotal	5	230	22	17	4	6	2	4			
				Transit Trip Discount	5%	-11	-1	-1	-	-	-	-			
				Total (less Internal/Transit Trips)		219	21	16	4	6	2	4			
Affordable Single Family	T4-8	9	210	Single-Family Detached Housing	60 DU	574	45	11	34	61	38	22			
Single Family	T4-8	9	210	Single-Family Detached Housing	74 DU	708	56	14	41	75	47	27			
Affordable Multi Family	T4-8	9	220	Apartment	40 DU	266	20	4	16	25	16	9			
Multi Family	T4-8	9	220	Apartment	50 DU	333	26	5	21	31	20	11			
Affordable Single Family	T4-9	9	210	Single-Family Detached Housing	96 DU	919	72	18	54	97	61	36			
Single Family	T4-9	9	210	Single-Family Detached Housing	27 DU	258	20	5	15	27	17	10			
Affordable Multi Family	T4-9	9	220	Apartment	64 DU	426	33	6	26	40	26	14			
Multi Family	T4-9	9	220	Apartment	18 DU	120	9	2	7	11	7	4			
				Subtotal	429	3,603	280	66	214	366	233	133			
				Internal Capture (4% Daily, 1% AM, 3% PM)		-144	-3	-1	-2	-11	-7	-4			
				Transit Trip Discount	5%	-180	-14	-3	-11	-18	-12	-6			
				Total (less Internal/Transit Trips)		3,279	263	62	201	337	214	123			
Retail	T4-9	9	820	Shopping Center	15 TSF	644	15	9	6	56	27	29			
				Subtotal	15	644	15	9	6	56	27	29			
				Internal Capture (4% Daily, 1% AM, 3% PM)		-26	-	-	-	-2	-1	-1			
				Transit Trip Discount	5%	-32	-1	-	-1	-3	-1	-2			
				Total (less Internal/Transit Trips)		586	14	9	5	51	25	26			
				Pass-by Trip Discount	15%	-88	-	-	-	-8	-4	-4			
				Total (less Internal/Transit/Pass-by Trips)		498	14	9	5	43	21	22			
Office	T4-9	9	710	General Office Building	15 TSF	165	23	20	3	22	4	19			
				Subtotal	15	165	23	20	3	22	4	19			
				Internal Capture (4% Daily, 1% AM, 3% PM)		-7	-	-	-	-1	-	-1			
				Transit Trip Discount	5%	-8	-1	-1	-	-1	-	-1			
				Total (less Internal/Transit Trips)		150	22	19	3	20	4	17			
				9	Total without Trip Discount	4,642	341	113	228	450	267	184			
				9	Total with Trip Discount	4,146	321	107	214	406	242	165			
Phase 3, TAZ 10															
Large Lot Single Family	T3-1	10	210	Single-Family Detached Housing	17 DU	163	13	3	10	17	11	6			
Large Lot Single Family	T3-2	10	210	Single-Family Detached Housing	6 DU	57	5	1	3	6	4	2			
Large Lot Single Family	T3-3	10	210	Single-Family Detached Housing	5 DU	48	4	1	3	5	3	2			
Large Lot Single Family	T3-4	10	210	Single-Family Detached Housing	76 DU	727	57	14	43	77	49	28			
Single Family	T3-5	10	210	Single-Family Detached Housing	112 DU	1,072	84	21	63	113	72	41			
				Subtotal	216	2,067	162	41	121	218	138	80			
				Transit Trip Discount	5%	-103	-8	-2	-6	-11	-7	-4			
				Total (less Internal/Transit Trips)		1,964	154	39	115	207	131	76			
				10	Total without Trip Discount	2,067	162	41	121	218	138	80			
				10	Total with Trip Discount	1,964	154	39	115	207	131	76			

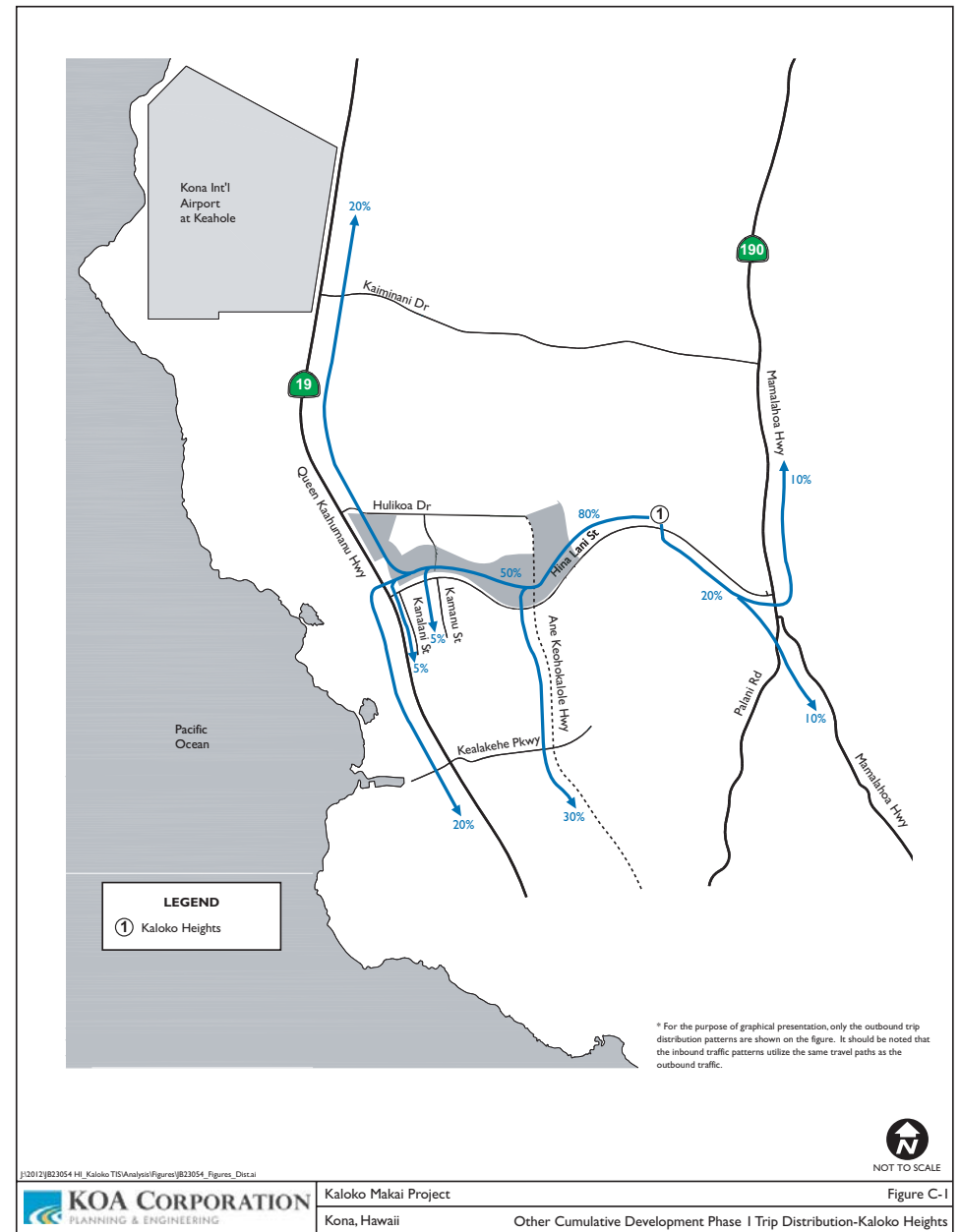
Appendix G (7 of 8) - Detailed Project Traffic Generation Calculations

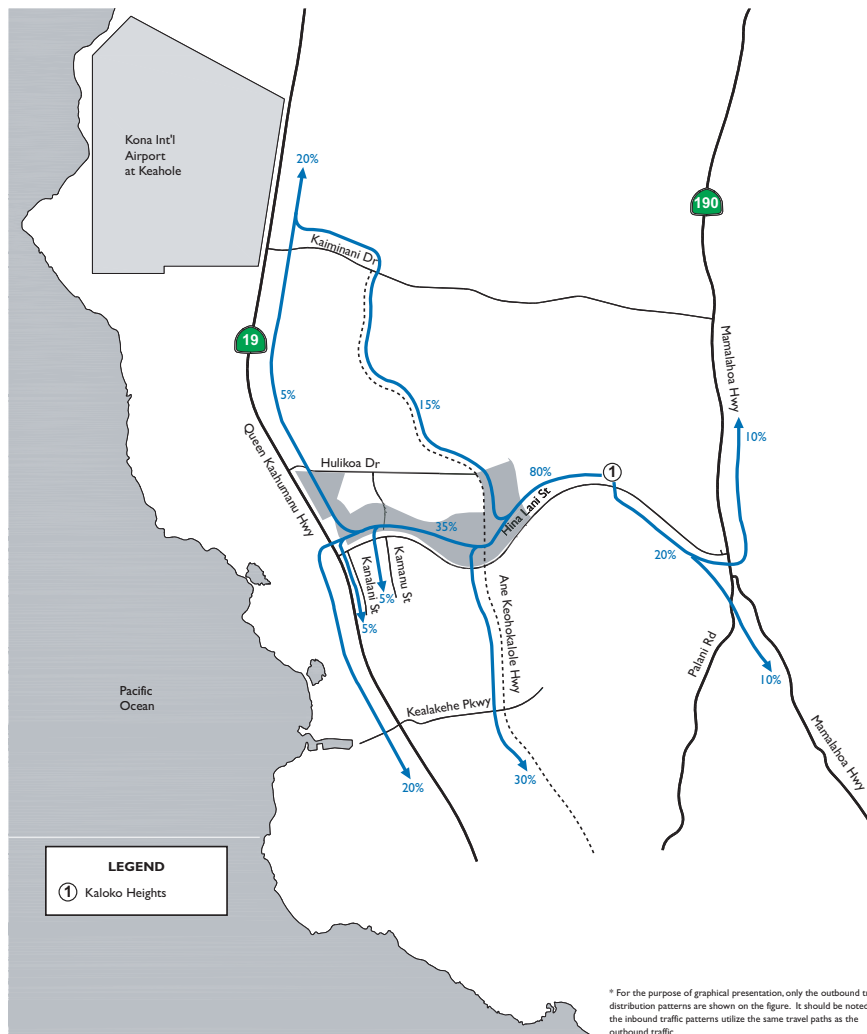
PROJECT TRAFFIC GENERATION					AM Peak Hour				PM Peak Hour			
Project Description	Parcel I.D.	TAZ	ITE Code	ITE Description	Quantity	Daily	Total	In	Out	Total	In	Out
Phase 3, TAZ 11												
Park	P-1	11	412	County Park	11.2 AC	26	0	0	-	1	0	0
School	SCHOOL	11	520	Elementary School	450 STU	581	203	113	90	68	32	36
				Subtotal	461	606	203	113	90	68	32	36
				Transit Trip Discount	5%	-30	-10	-6	-4	-3	-2	-1
				Total (less Internal/Transit Trips)		576	193	107	86	65	30	35
Single Family	T3-6	11	210	Single-Family Detached Housing	71 DU	679	53	13	40	72	45	26
Single Family	T3-7	11	210	Single-Family Detached Housing	117 DU	1,120	88	22	66	118	75	43
Single Family	T3-8	11	210	Single-Family Detached Housing	63 DU	603	47	12	35	64	40	23
Single Family	T3-9	11	210	Single-Family Detached Housing	193 DU	1,847	145	37	108	195	124	71
Single Family	T4-6	11	210	Single-Family Detached Housing	83 DU	794	62	16	46	84	53	31
Multi Family	T4-6	11	230	Residential Condo/Townhouse	35 DU	203	15	2	13	18	12	6
Single Family	T4-7	11	210	Single-Family Detached Housing	54 DU	517	41	10	30	55	35	20
Multi Family	T4-7	11	230	Residential Condo/Townhouse	37 DU	215	16	3	14	19	13	6
				Subtotal	653	5,978	467	115	352	624	397	227
				Transit Trip Discount	5%	-299	-23	-6	-17	-31	-20	-11
				Total (less Internal/Transit Trips)		5,679	444	109	335	593	377	216
		11		Total without Trip Discount		6,585	670	228	442	692	429	264
		11		Total with Trip Discount		6,256	637	216	421	658	407	252

Appendix G (8 of 8) - Detailed Project Traffic Generation Calculations

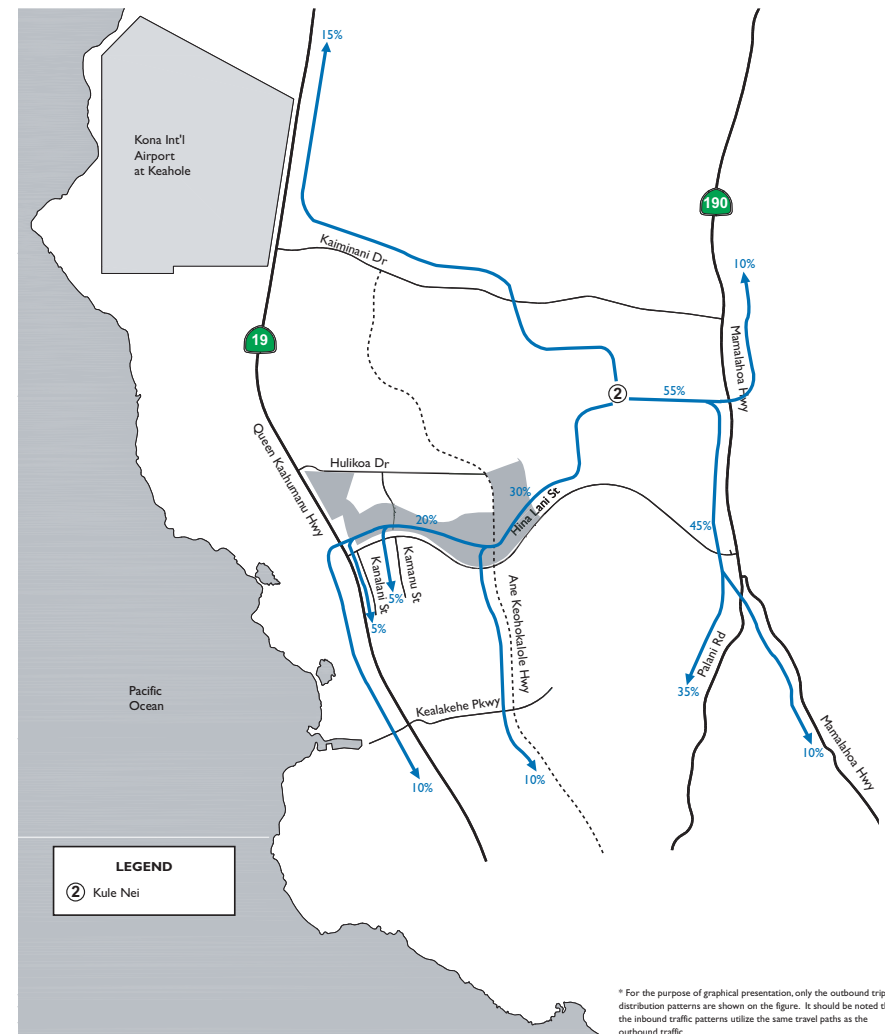
PROJECT TRAFFIC GENERATION					AM Peak Hour				PM Peak Hour			
Project Description	Parcel I.D.	TAZ	ITE Code	ITE Description	Quantity	Daily	Total	In	Out	Total	In	Out
SUMMARY												
Phase 1												
		TAZ 1		Total without Trip Discount		4,412	440	251	190	494	221	273
		TAZ 1		Total with Trip Discount		3,931	410	235	176	446	199	247
		TAZ 2		Total without Trip Discount		10,355	671	269	402	1,015	543	472
		TAZ 2		Total with Trip Discount		8,351	611	244	367	832	448	384
		TAZ 3		Total without Trip Discount		15,513	1,165	691	473	1,429	620	809
		TAZ 3		Total with Trip Discount		12,577	1,074	636	437	1,176	507	669
				Phase 1 Total without Trip Discount		30,280	2,276	1,211	1,065	2,938	1,384	1,554
				Phase 1 Trip Discount		-5,421	-181	-96	-85	-484	-230	-254
				Phase 1 Total with Trip Discount		24,859	2,095	1,115	980	2,454	1,154	1,300
Phase 2												
		TAZ 4		Total without Trip Discount		518	75	62	13	73	16	57
		TAZ 4		Total with Trip Discount		492	71	59	12	69	15	54
		TAZ 5		Total without Trip Discount		777	113	93	19	109	24	85
		TAZ 5		Total with Trip Discount		738	107	88	18	104	23	81
		TAZ 6		Total without Trip Discount		8,931	797	297	500	907	527	381
		TAZ 6		Total with Trip Discount		8,644	809	292	516	884	520	364
		TAZ 7		Total without Trip Discount		10,737	693	184	508	1,007	609	399
		TAZ 7		Total with Trip Discount		9,344	651	173	477	879	535	345
				Phase 2 Total without Trip Discount		20,963	1,678	637	1,041	2,096	1,176	921
				Phase 2 Trip Discount		-1,745	-40	-24	-17	-161	-83	-78
				Phase 2 Total with Trip Discount		19,218	1,637	614	1,024	1,936	1,093	843
Phase 3												
		TAZ 8		Total without Trip Discount		1,295	188	156	32	182	40	142
		TAZ 8		Total with Trip Discount		1,230	179	148	31	173	38	135
		TAZ 9		Total without Trip Discount		4,642	341	113	228	450	267	184
		TAZ 9		Total with Trip Discount		4,146	321	107	214	406	242	165
		TAZ 10		Total without Trip Discount		2,067	162	41	121	218	138	80
		TAZ 10		Total with Trip Discount		1,964	154	39	115	207	131	76
		TAZ 11		Total without Trip Discount		6,585	670	228	442	692	429	264
		TAZ 11		Total with Trip Discount		6,256	637	216	421	658	407	252
				Phase 3 Total without Trip Discount		14,589	1,360	538	822	1,542	874	669
				Phase 3 Trip Discount		-993	-70	-28	-42	-98	-56	-42
				Phase 3 Total with Trip Discount		13,596	1,290	510	780	1,444	818	627
Kaloko Makai Project												
				Total without Trip Discount		65,832	5,314	2,386	2,928	6,577	3,433	3,144
				Trip Discount		-8,159	-291	-148	-144	-743	-369	-374
				Total with Trip Discount		57,672	5,023	2,239	2,784	5,834	3,064	2,770

Appendix H – Cumulative Development Trip Distribution

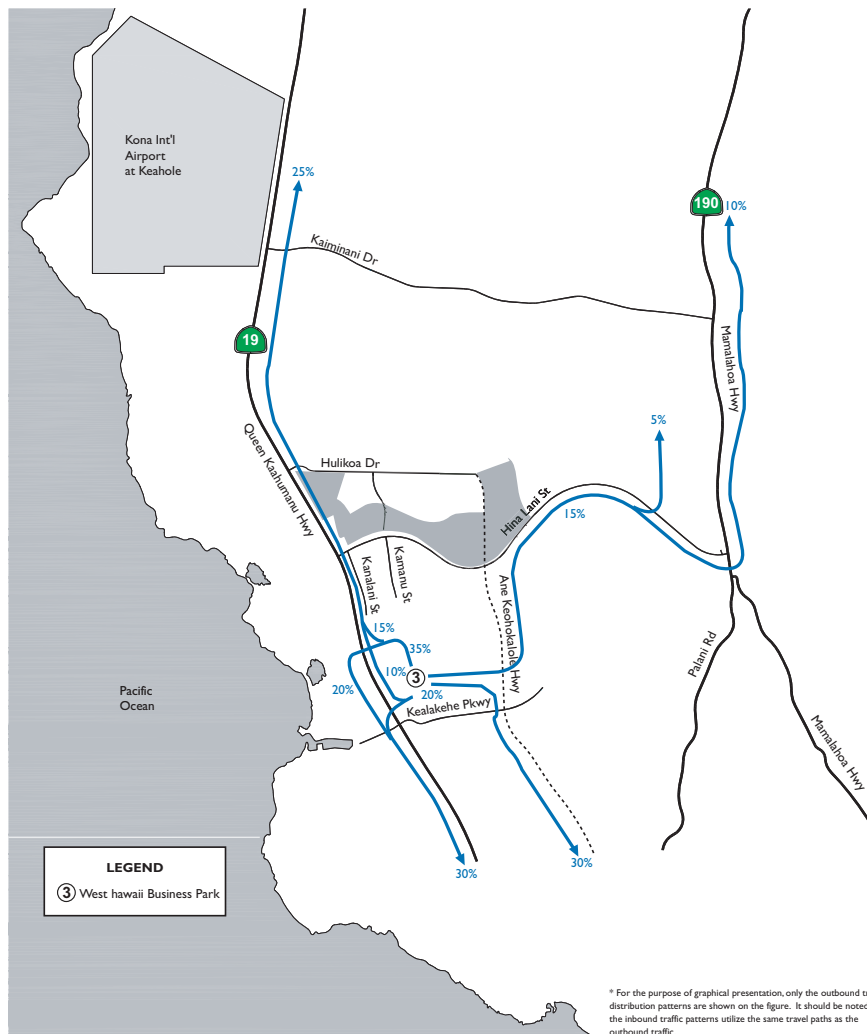




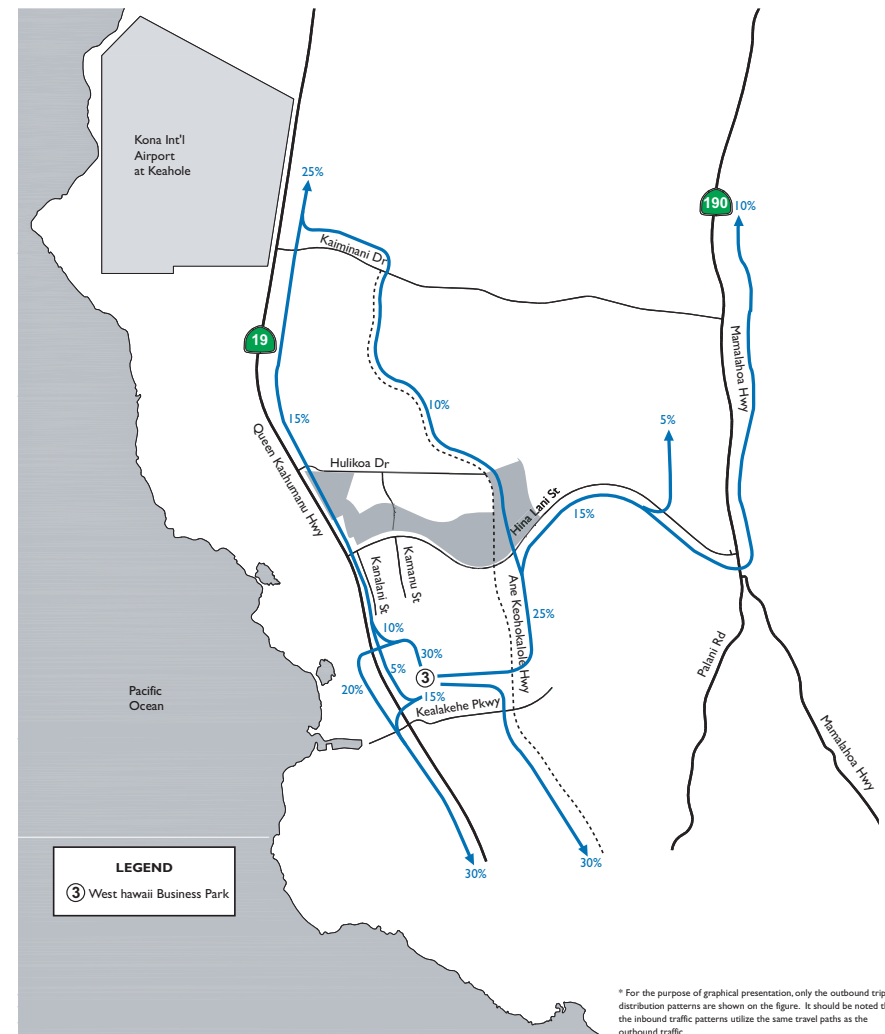
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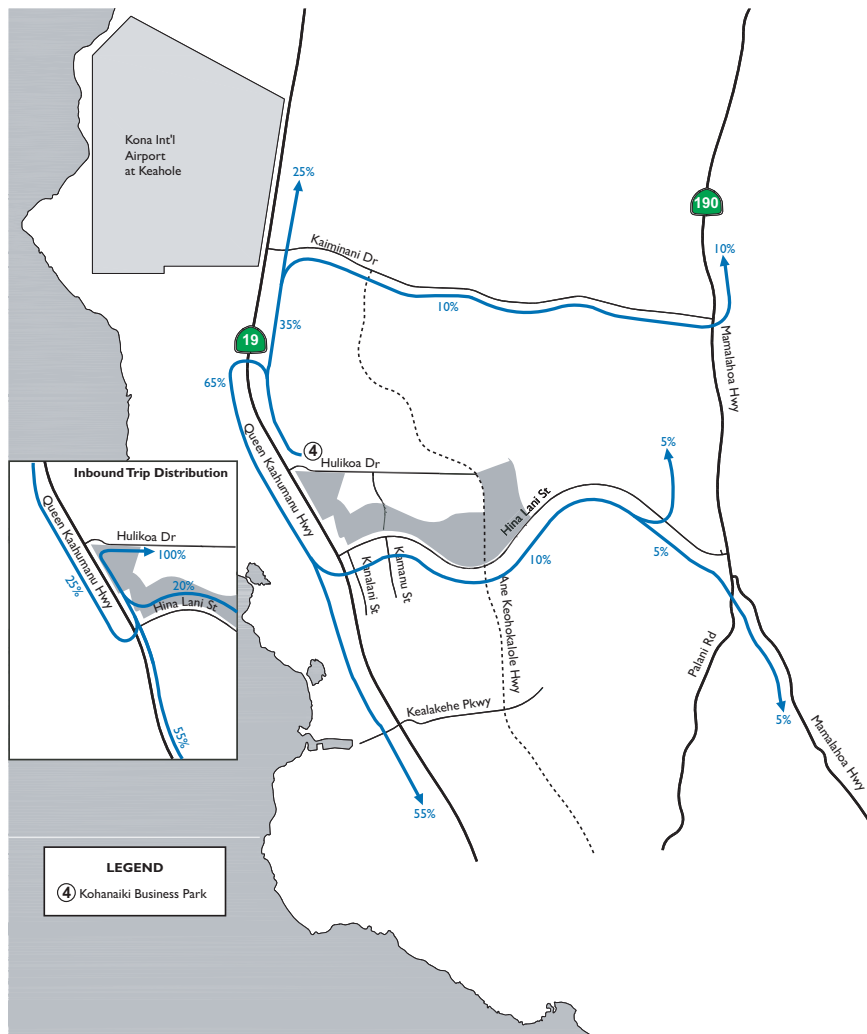
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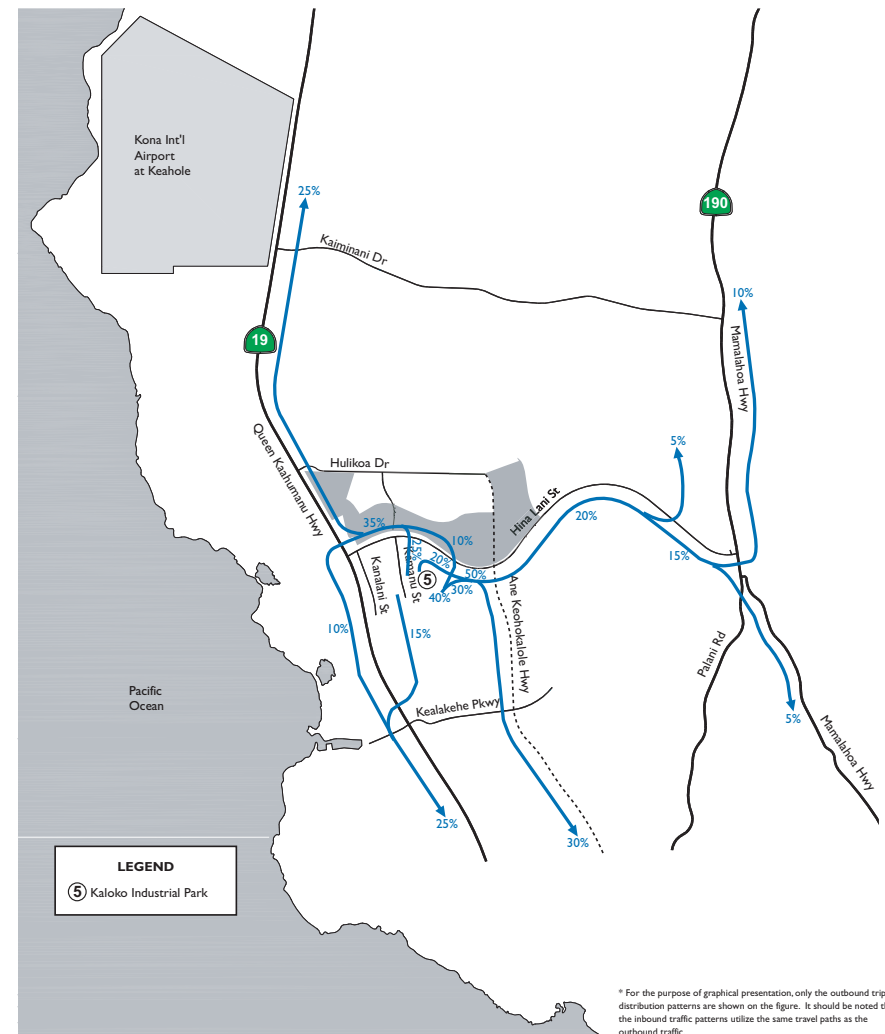
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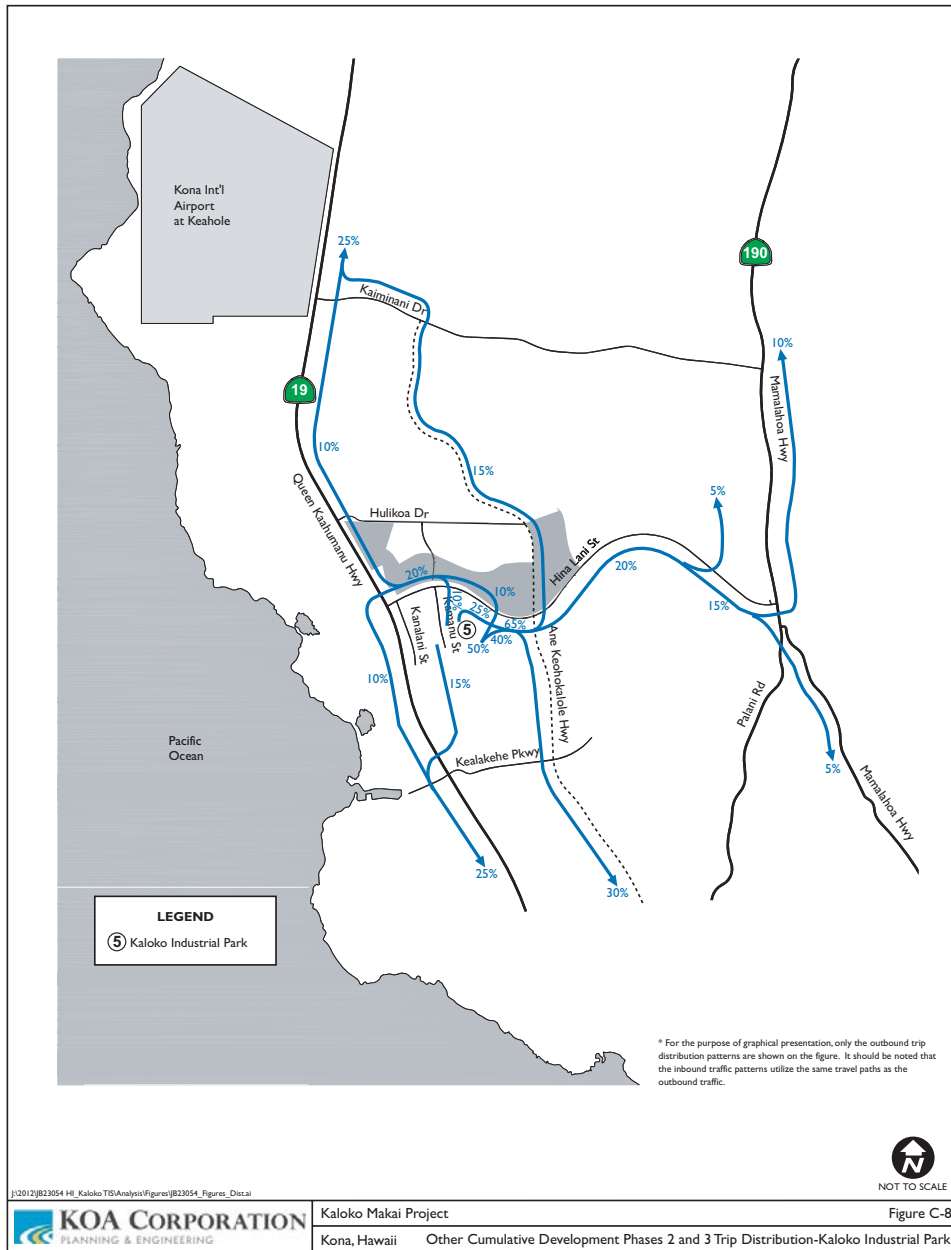


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* For the purpose of graphical presentation, only the outbound trip distribution patterns are shown on the figure. It should be noted that the inbound traffic patterns utilize the same travel paths as the outbound traffic.



Appendix I – Ambient Background Growth Calculation Worksheets

Appendix I-1

**Historic Average Daily Traffic (ADT) Volume Comparisons
on Queen Kaahumanu Highway, North of OTEC Access Road (Station T8M)**

DOT ¹ Data		Year-to-Year Growth		
Count Year	ADT Volume	Duration (Years)	Volume Change	One Year Growth
1996	15,709	2	1,805	5.6%
1998	17,514	2	1,528	4.3%
2000	19,042	2	636	1.7%
2002	19,678	2	3,119	7.6%
2004	22,797	2	-37	-0.1%
2006	22,760	1	548	2.4%
2007	23,308	1	-1,330	-5.7%
2008	21,978	1	-1,140	-5.2%
2009	20,838	1	1,063	5.1%
2010	21,901	0	0	0.0%
Average				1.74%

Footnote:

¹ Hawaii State Department of Transportation, 24-Hour Traffic Count, Queen Kaahumanu Highway North of OTEC Road (Palani Road / Kuhio Wharf / Nelha), Station Number T8M.

Growth Rate Calculations

Phase	Analysis Year	Years of Growth	Total Growth
Existing	2010	n/a	n/a
1	2015 - 2025	15	29.6%
2	2025 - 2035	25	54.0%
3	2035 - 2045	35	83.1%

Appendix I-2

Regional Ambient Growth Traffic on Highways

Highway	Year	Ambient	AM Peak Hour		PM Peak Hour	
			Northbound (In)	Southbound (Out)	Northbound (In)	Southbound (Out)
SR-19 Queen Kaahumanu Hwy.	2010	Existing	562	374	497	623
	2025	29.6%	166	111	147	184
	2035	54.0%	304	202	268	337
	2045	83.1%	467	311	413	518
SR-190 Mamalahoa Hwy. NBT/GBT	2010	Existing	274	956	511	391
	2025	29.6%	81	283	151	116
	Post 2035	Diverted	174	656	361	291
	2035	54.0%	94	354	195	157
	2045	83.1%	145	545	300	242
Ane Keohokalole Hwy. NBT/GBT	2010	Existing	29	38	23	29
	2025	29.6%	9	11	7	9
	Post 2035	Diverted	79	188	98	79
	2035	54.0%	43	102	53	43
	2045	83.1%	66	156	81	66
Hina Lani 6NR -> 7EL 7SR -> 6VWL	Post 2035	Diverted	50	150	75	50
	2035	54.0%	27	81	41	27
	2045	83.1%	42	125	62	42
Total Volume	2010		865	1368	1031	1043
	2025		256	405	305	309
	2035		468	739	557	564
	2045		720	1137	856	868

Appendix J – Intersection Operations Analysis Worksheets for 2025 Without Project Conditions, with Existing Geometry and Planned Improvements

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

2025 AM Without Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.19	1.00
Satd. Flow (perm)	1770	1583	3539	1583	351	3539
Volume (vph)	480	244	869	109	33	830
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	522	265	945	118	36	902
RTOR Reduction (vph)	0	125	0	76	0	0
Lane Group Flow (vph)	522	140	945	42	36	902
Turn Type	Perm		Perm pm+pt			
Protected Phases	8		2		1	
Permitted Phases	8		2		6	
Actuated Green, G (s)	17.7	17.7	17.2	17.2	22.4	22.4
Effective Green, g (s)	17.7	17.7	17.2	17.2	22.4	22.4
Actuated g/C Ratio	0.37	0.37	0.36	0.36	0.47	0.47
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	651	583	1266	566	199	1648
v/s Ratio Prot	c0.29		c0.27		0.00	
v/s Ratio Perm	0.17		0.07		0.08	
v/c Ratio	0.80	0.24	0.75	0.07	0.18	0.55
Uniform Delay, d1	13.6	10.5	13.5	10.2	8.5	9.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.1	0.2	2.4	0.1	0.4	0.4
Delay (s)	20.7	10.8	16.0	10.3	9.0	9.6
Level of Service	C		B		A	
Approach Delay (s)	17.3		15.3		9.6	
Approach LOS	B		B		A	
Intersection Summary						
HCM Average Control Delay			14.0		HCM Level of Service	
HCM Volume to Capacity ratio			0.79		B	
Actuated Cycle Length (s)			48.1		Sum of lost time (s)	
Intersection Capacity Utilization			60.7%		ICU Level of Service	
Analysis Period (min)			15		B	
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
2: Hulioa Drive & Queen Kaahumanu Highway

2025 AM Without Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Yield		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	247	881	299	0	1333
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	268	958	325	0	1449
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage (veh)	5					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1682	479			958	
vC1, stage 1 conf vol	958					
vC2, stage 2 conf vol	724					
vCu, unblocked vol	1682	479			958	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	50			100	
cM capacity (veh/h)	319	533			714	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	268	479	479	325	724	724
Volume Left	0	0	0	0	0	0
Volume Right	268	0	0	325	0	0
cSH	533	1700	1700	1700	1700	1700
Volume to Capacity	0.50	0.28	0.28	0.19	0.43	0.43
Queue Length (ft)	70	0	0	0	0	0
Control Delay (s)	18.4	0.0	0.0	0.0	0.0	0.0
Lane LOS	C					
Approach Delay (s)	18.4	0.0			0.0	
Approach LOS	C					
Intersection Summary						
Average Delay	1.6					
Intersection Capacity Utilization	46.3%		ICU Level of Service		A	
Analysis Period (min)	15					

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2025 AM Without Project
7/25/2012

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Flpb, ped/bikes	1.00	0.98	1.00	0.98	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1553	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1553	3433	3539
Volume (vph)	275	270	752	433	382	1032
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	299	293	817	471	415	1122
RTOR Reduction (vph)	0	0	0	309	0	0
Lane Group Flow (vph)	299	293	817	162	415	1122
Confl. Peds. (#/hr)	14		8		8	
Turn Type	Free		Perm		Prot	
Protected Phases	8		2		1	
Permitted Phases	Free		2			
Actuated Green, G (s)	9.9	46.8	16.1	16.1	8.8	28.9
Effective Green, g (s)	9.9	46.8	16.1	16.1	8.8	28.9
Actuated g/C Ratio	0.21	1.00	0.34	0.34	0.19	0.62
Clearance Time (s)	4.0		4.0		4.0	
Vehicle Extension (s)	3.0		3.0		3.0	
Lane Grp Cap (vph)	726	1558	1217	534	646	2185
v/s Ratio Prot	c0.09		0.23		c0.12	
v/s Ratio Perm	0.19		0.30			
v/c Ratio	0.41	0.19	0.67	0.30	0.64	0.51
Uniform Delay, d1	15.9	0.0	13.1	11.2	17.5	5.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.3	1.5	0.3	2.2	0.2
Delay (s)	16.3	0.3	14.6	11.6	19.7	5.2
Level of Service	B	A	B	B	B	A
Approach Delay (s)	8.4		13.5		9.1	
Approach LOS	A		B		A	
Intersection Summary						
HCM Average Control Delay			10.6		HCM Level of Service	
HCM Volume to Capacity ratio			0.69		B	
Actuated Cycle Length (s)			46.8		Sum of lost time (s)	
Intersection Capacity Utilization			51.6%		12.0	
ICU Level of Service			A			
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kanalani Street

2025 AM Without Project
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↔	↔	↔	↔
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	322	363	29	339	225	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	350	395	32	368	245	20
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			747		599	352
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			747		599	352
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		41	97
cM capacity (veh/h)			856		416	643
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	350	395	154	246	264	
Volume Left	0	0	32	0	245	
Volume Right	0	395	0	0	20	
cSH	1700	1700	856	1700	449	
Volume to Capacity	0.21	0.23	0.04	0.14	0.59	
Queue Length (ft)	0	0	3	0	92	
Control Delay (s)	0.0	0.0	2.2	0.0	24.2	
Lane LOS			A		C	
Approach Delay (s)	0.0		0.9		24.2	
Approach LOS					C	
Intersection Summary						
Average Delay		4.8				
Intersection Capacity Utilization		49.6%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2025 AM Without Project
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	3433	1583
Flt Permitted	1.00	1.00	0.67	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1243	1863	3433	1583
Volume (vph)	130	198	202	243	134	77
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	141	215	220	264	146	84
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	141	215	220	264	146	84
Turn Type	Free		Perm		Free	
Protected Phases	4			8	2	
Permitted Phases		Free	8			Free
Actuated Green, G (s)	6.2	18.9	6.2	6.2	4.7	18.9
Effective Green, g (s)	6.2	18.9	6.2	6.2	4.7	18.9
Actuated g/C Ratio	0.33	1.00	0.33	0.33	0.25	1.00
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	611	1583	408	611	854	1583
v/s Ratio Prot	0.08			0.14	0.04	
v/s Ratio Perm		0.14	c0.18			0.05
v/c Ratio	0.23	0.14	0.54	0.43	0.17	0.05
Uniform Delay, d1	4.6	0.0	5.2	5.0	5.6	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.2	1.4	0.5	0.1	0.1
Delay (s)	4.8	0.2	6.6	5.5	5.7	0.1
Level of Service	A	A	A	A	A	A
Approach Delay (s)	2.0			6.0	3.6	
Approach LOS	A			A	A	
Intersection Summary						
HCM Average Control Delay		4.1		HCM Level of Service	A	
HCM Volume to Capacity ratio		0.30				
Actuated Cycle Length (s)		18.9		Sum of lost time (s)	4.0	
Intersection Capacity Utilization		31.9%		ICU Level of Service	A	
Analysis Period (min)		15				
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokalole Hwy.

2025 AM Without Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	1.00
Frt	1.00	0.85	1.00	1.00	1.00	1.00	1.00	0.85	1.00	1.00	1.00	1.00
Flt Protected	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1863	1583	1770	1863	1770	1863	1583	1863	1770	1863	1583	1863
Flt Permitted	1.00	1.00	0.95	1.00	1.00	0.75	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	1863	1583	1770	1863	1397	1863	1583	1863	1770	1863	1583	1863
Volume (vph)	0	164	26	189	437	0	129	9	64	0	11	0
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	178	28	205	475	0	140	10	70	0	12	0
RTOR Reduction (vph)	0	0	22	0	0	0	0	0	55	0	0	0
Lane Group Flow (vph)	0	178	6	205	475	0	140	10	15	0	12	0
Turn Type	Prot	Perm	Prot	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm
Protected Phases	7	4	3	8	2	2	6	6	6	6	6	6
Permitted Phases	7.3	7.3	6.8	18.1	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3
Actuated Green, G (s)	7.3	7.3	6.8	18.1	7.3	7.3	7.3	7.3	7.3	7.3	7.3	7.3
Effective Green, g (s)	0.22	0.22	0.20	0.54	0.22	0.22	0.22	0.22	0.22	0.22	0.22	0.22
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	3.0
Lane Grp Cap (vph)	407	346	360	1010	305	407	346	407	346	407	346	407
v/s Ratio Prot	0.10	0.10	0.12	c0.26	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10
v/s Ratio Perm	0.44	0.02	0.57	0.47	0.46	0.02	0.04	0.04	0.04	0.04	0.04	0.04
v/c Ratio	11.3	10.2	12.0	4.7	11.3	10.3	10.3	10.3	10.3	10.3	10.3	10.3
Uniform Delay, d1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Progression Factor	0.8	0.0	2.1	0.3	1.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0
Incremental Delay, d2	12.0	10.3	14.0	5.1	12.4	10.3	10.4	10.3	10.3	10.3	10.3	10.3
Delay (s)	B	B	B	A	B	B	B	B	B	B	B	B
Level of Service	11.8	11.8	11.8	7.8	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7
Approach Delay (s)	B	B	B	A	B	B	B	B	B	B	B	B
Approach LOS	B	B	B	A	B	B	B	B	B	B	B	B
Intersection Summary												
HCM Average Control Delay	9.3	9.3	9.3	HCM Level of Service	A	A	A	A	A	A	A	A
HCM Volume to Capacity ratio	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47	0.47
Actuated Cycle Length (s)	33.4	33.4	33.4	Sum of lost time (s)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Intersection Capacity Utilization	50.1%	50.1%	50.1%	ICU Level of Service	A	A	A	A	A	A	A	A
Analysis Period (min)	15	15	15	15	15	15	15	15	15	15	15	15
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2025 AM Without Project
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.04	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	70	1863	1863	1583
Volume (vph)	110	103	150	378	1307	270
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	120	112	163	411	1421	293
RTOR Reduction (vph)	0	101	0	0	0	25
Lane Group Flow (vph)	120	11	163	411	1421	268
Turn Type	Perm	pm+pt	Perm	Perm	Perm	Perm
Protected Phases	4	5	2	6	6	6
Permitted Phases	13.5	13.5	116.0	103.0	103.0	103.0
Actuated Green, G (s)	13.5	13.5	116.0	103.0	103.0	103.0
Effective Green, g (s)	0.10	0.10	0.84	0.84	0.75	0.75
Actuated g/C Ratio	4.0	4.0	4.0	4.0	4.0	4.0
Clearance Time (s)	3.0	3.0	3.0	3.0	3.0	3.0
Vehicle Extension (s)	174	155	170	1572	1396	1186
Lane Grp Cap (vph)	0.07	0.07	0.75	0.22	c0.76	0.19
v/s Ratio Prot	0.69	0.07	0.96	0.26	1.02	0.23
v/s Ratio Perm	60.0	56.3	66.1	2.2	17.2	5.2
Uniform Delay, d1	1.00	1.00	1.00	1.00	1.00	1.00
Progression Factor	10.8	0.2	56.2	0.1	28.7	0.1
Incremental Delay, d2	70.8	56.5	122.4	2.2	45.9	5.3
Delay (s)	E	E	F	A	D	A
Level of Service	63.9	63.9	36.4	39.0	39.0	39.0
Approach Delay (s)	E	E	D	D	D	D
Approach LOS	E	E	D	D	D	D
Intersection Summary						
HCM Average Control Delay	40.7	40.7	40.7	HCM Level of Service	D	D
HCM Volume to Capacity ratio	0.98	0.98	0.98	0.98	0.98	0.98
Actuated Cycle Length (s)	137.5	137.5	137.5	Sum of lost time (s)	12.0	12.0
Intersection Capacity Utilization	93.2%	93.2%	93.2%	ICU Level of Service	F	F
Analysis Period (min)	15	15	15	15	15	15
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2025 AM Without Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↖	↗		↖	↗		↖	↗		↖	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00		0.95	1.00		1.00	0.95
Frpb, ped/bikes		1.00	1.00		1.00	1.00		1.00	0.98		1.00	1.00
Flpb, ped/bikes		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	0.85		1.00	0.99
Flt Protected		0.97	1.00		0.96	1.00		0.95	1.00		0.95	1.00
Satd. Flow (prot)		1800	1583		1779	1583		1769	3539		1770	3508
Flt Permitted		0.77	1.00		0.72	1.00		0.23	1.00		0.14	1.00
Satd. Flow (perm)		1443	1583		1342	1583		432	3539		261	3508
Volume (vph)	17	7	24	270	18	166	68	1063	441	240	878	48
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)	18	8	26	293	20	180	74	1155	479	261	954	52
RTOR Reduction (vph)	0	0	19	0	0	132	0	0	281	0	6	0
Lane Group Flow (vph)	0	26	7	0	313	48	74	1155	198	261	1000	0
Confl. Peds. (#/hr)							2		2		2	
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)		15.7	15.7		15.7	15.7	27.4	24.5	24.5	35.6	28.7	
Effective Green, g (s)		15.7	15.7		15.7	15.7	27.4	24.5	24.5	35.6	28.7	
Actuated g/C Ratio		0.26	0.26		0.26	0.26	0.46	0.41	0.41	0.60	0.48	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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)		382	419		355	419	265	1462	640	337	1698	
v/s Ratio Prot							0.01	0.33		c0.09	0.29	
v/s Ratio Perm		0.02	0.02		c0.23	0.11	0.12		0.31	c0.37		
v/c Ratio		0.07	0.02		0.88	0.11	0.28	0.79	0.31	0.77	0.59	
Uniform Delay, d1		16.3	16.1		20.9	16.5	9.2	15.2	11.7	9.8	11.0	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.1	0.0		21.7	0.1	0.6	3.0	0.3	10.6	0.5	
Delay (s)		16.4	16.1		42.6	16.6	9.7	18.1	12.0	20.4	11.6	
Level of Service		B	B		D	B	A	B	B	C	B	
Approach Delay (s)		16.3			33.1			16.1			13.4	
Approach LOS		B			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)		59.3			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		75.3%			ICU Level of Service			D				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

2025 PM Without Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↖	↗	↖	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.15	1.00
Satd. Flow (perm)	1770	1583	3539	1583	272	3539
Volume (vph)	180	84	1135	387	226	1114
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	91	1234	421	246	1211
RTOR Reduction (vph)	0	75	0	221	0	0
Lane Group Flow (vph)	196	16	1234	200	246	1211
Turn Type	Perm		Perm	pm+pt		
Protected Phases	8		2		1	6
Permitted Phases		8		2		6
Actuated Green, G (s)	8.4	8.4	23.4	23.4	32.8	32.8
Effective Green, g (s)	8.4	8.4	23.4	23.4	32.8	32.8
Actuated g/C Ratio	0.17	0.17	0.48	0.48	0.67	0.67
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	302	270	1683	753	346	2359
v/s Ratio Prot	c0.11		0.35		c0.08	0.34
v/s Ratio Perm		0.06		0.27	c0.40	
v/c Ratio	0.65	0.06	0.73	0.27	0.71	0.51
Uniform Delay, d1	19.0	17.1	10.4	7.7	6.9	4.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.8	0.1	1.7	0.2	6.7	0.2
Delay (s)	23.8	17.2	12.1	7.9	13.7	4.3
Level of Service	C	B	B	A	B	A
Approach Delay (s)	21.7		11.0			5.9
Approach LOS	C		B			A
Intersection Summary						
HCM Average Control Delay		9.7			HCM Level of Service	A
HCM Volume to Capacity ratio		0.68				
Actuated Cycle Length (s)		49.2			Sum of lost time (s)	8.0
Intersection Capacity Utilization		63.9%			ICU Level of Service	B
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
2: Hulikoa Drive & Queen Kaahumanu Highway

2025 PM Without Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Yield		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	274	1340	174	0	1604
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	298	1457	189	0	1743
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLT					
Median storage (veh)	5					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2328	728			1457	
vC1, stage 1 conf vol	1457					
vC2, stage 2 conf vol	872					
vCu, unblocked vol	2328	728			1457	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	19			100	
cM capacity (veh/h)	179	366			460	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	298	728	728	189	872	872
Volume Left	0	0	0	0	0	0
Volume Right	298	0	0	189	0	0
cSH	366	1700	1700	1700	1700	1700
Volume to Capacity	0.81	0.43	0.43	0.11	0.51	0.51
Queue Length (ft)	179	0	0	0	0	0
Control Delay (s)	46.2	0.0	0.0	0.0	0.0	0.0
Lane LOS	E					
Approach Delay (s)	46.2	0.0			0.0	
Approach LOS	E					
Intersection Summary						
Average Delay		3.7				
Intersection Capacity Utilization		60.7%		ICU Level of Service	B	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2025 PM Without Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Frbp, ped/bikes	1.00	0.98	1.00	0.98	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1551	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1551	3433	3539
Volume (vph)	544	414	1105	594	358	1154
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	591	450	1201	646	389	1254
RTOR Reduction (vph)	0	0	0	383	0	0
Lane Group Flow (vph)	591	450	1201	263	389	1254
Confl. Peds. (#/hr)	14			8	8	
Turn Type	Free			Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases	Free			2		
Actuated Green, G (s)	14.0	57.3	23.3	23.3	8.0	35.3
Effective Green, g (s)	14.0	57.3	23.3	23.3	8.0	35.3
Actuated g/C Ratio	0.24	1.00	0.41	0.41	0.14	0.62
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	839	1558	1439	631	479	2180
v/s Ratio Prot	c0.17		0.34		c0.11	0.35
v/s Ratio Perm		0.29		0.42		
v/c Ratio	0.70	0.29	0.83	0.42	0.81	0.58
Uniform Delay, d1	19.8	0.0	15.3	12.1	23.9	6.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.7	0.5	4.3	0.4	10.1	0.4
Delay (s)	22.5	0.5	19.6	12.6	34.0	6.9
Level of Service	C	A	B	B	C	A
Approach Delay (s)	13.0		17.2			13.3
Approach LOS	B		B			B
Intersection Summary						
HCM Average Control Delay		14.8			HCM Level of Service	B
HCM Volume to Capacity ratio		0.89				
Actuated Cycle Length (s)		57.3			Sum of lost time (s)	12.0
Intersection Capacity Utilization		66.3%			ICU Level of Service	C
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kananani Street

2025 PM Without Project
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↔	↔	↔	↔
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	343	489	17	669	200	74
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	373	532	18	727	217	80
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			906		775	375
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			906		775	375
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			98		33	87
cM capacity (veh/h)			745		326	622
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	373	532	261	485	298	
Volume Left	0	0	18	0	217	
Volume Right	0	532	0	0	80	
cSH	1700	1700	745	1700	446	
Volume to Capacity	0.22	0.31	0.02	0.29	0.67	
Queue Length (ft)	0	0	2	0	120	
Control Delay (s)	0.0	0.0	1.0	0.0	29.2	
Lane LOS			A		D	
Approach Delay (s)	0.0		0.3		29.2	
Approach LOS					D	
Intersection Summary						
Average Delay		4.6				
Intersection Capacity Utilization		56.2%		ICU Level of Service	B	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2025 PM Without Project
7/25/2012

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations					 	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	3433	1583
Flt Permitted	1.00	1.00	0.59	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1107	1863	3433	1583
Volume (vph)	247	122	127	184	479	326
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	268	133	138	200	521	354
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	268	133	138	200	521	354
Turn Type	Free		Perm		Free	
Protected Phases	4		8		2	
Permitted Phases	Free		8		Free	
Actuated Green, G (s)	7.3	22.8	7.3	7.3	7.5	22.8
Effective Green, g (s)	7.3	22.8	7.3	7.3	7.5	22.8
Actuated g/C Ratio	0.32	1.00	0.32	0.32	0.33	1.00
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	596	1583	354	596	1129	1583
v/s Ratio Prot	c0.14		0.11		c0.15	
v/s Ratio Perm	0.08		0.12		0.22	
v/c Ratio	0.45	0.08	0.39	0.34	0.46	0.22
Uniform Delay, d1	6.2	0.0	6.0	5.9	6.1	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.1	0.7	0.3	0.3	0.3
Delay (s)	6.7	0.1	6.7	6.2	6.4	0.3
Level of Service	A	A	A	A	A	A
Approach Delay (s)	4.5		6.4		3.9	
Approach LOS	A		A		A	
Intersection Summary						
HCM Average Control Delay			4.6	HCM Level of Service		A
HCM Volume to Capacity ratio			0.46			
Actuated Cycle Length (s)			22.8	Sum of lost time (s)		8.0
Intersection Capacity Utilization			43.7%	ICU Level of Service		A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokalole Hwy.

2025 PM Without Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑	↱	↰	↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt		1.00	0.85	1.00	1.00		1.00	1.00	0.85		1.00	
Flt Protected		1.00	1.00	0.95	1.00		0.95	1.00	1.00		1.00	
Satd. Flow (prot)		1863	1583	1770	1863		1770	1863	1583		1863	
Flt Permitted		1.00	1.00	0.95	1.00		0.75	1.00	1.00		1.00	
Satd. Flow (perm)		1863	1583	1770	1863		1399	1863	1583		1863	
Volume (vph)	0	561	127	180	269	0	34	7	282	0	9	0
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	610	138	196	292	0	37	8	307	0	10	0
RTOR Reduction (vph)	0	0	81	0	0	0	0	0	227	0	0	0
Lane Group Flow (vph)	0	610	57	196	292	0	37	8	80	0	10	0
Turn Type	Prot	Perm		Prot	Perm		Perm	Perm		Perm	Perm	
Protected Phases	7	4		3	8		2			6		
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	19.8	19.8	8.0	31.8		8.4	8.4	8.4		8.4		
Effective Green, g (s)	19.8	19.8	8.0	31.8		8.4	8.4	8.4		8.4		
Actuated g/C Ratio	0.41	0.41	0.17	0.66		0.17	0.17	0.17		0.17		
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0		
Vehicle Extension (s)	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0		
Lane Grp Cap (vph)	765	650	294	1229		244	325	276		325		
v/s Ratio Prot	c0.33		c0.11	0.16			0.03			0.01		
v/s Ratio Perm		0.09					0.15	0.02	0.19		0.15	
v/c Ratio	0.80	0.09	0.67	0.24		0.15	0.02	0.29		0.03		
Uniform Delay, d1	12.4	8.7	18.8	3.3		16.9	16.5	17.3		16.5		
Progression Factor	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00		
Incremental Delay, d2	5.8	0.1	5.6	0.1		0.3	0.0	0.6		0.0		
Delay (s)	18.2	8.7	24.5	3.4		17.2	16.5	17.9		16.6		
Level of Service	B	A	C	A		B	B	B		B		
Approach Delay (s)	16.5			11.9			17.8			16.6		
Approach LOS	B			B			B			B		
Intersection Summary												
HCM Average Control Delay		15.4			HCM Level of Service		B					
HCM Volume to Capacity ratio		0.84										
Actuated Cycle Length (s)		48.2			Sum of lost time (s)		12.0					
Intersection Capacity Utilization		58.0%			ICU Level of Service		B					
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2025 PM Without Project
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱	↰	↑	↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.18	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	331	1863	1863	1583
Volume (vph)	382	246	104	740	552	213
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	415	267	113	804	600	232
RTOR Reduction (vph)	0	187	0	0	0	120
Lane Group Flow (vph)	415	80	113	804	600	112
Turn Type	Perm		pm+pt		Perm	
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	15.5	15.5	28.5	28.5	21.6	21.6
Effective Green, g (s)	15.5	15.5	28.5	28.5	21.6	21.6
Actuated g/C Ratio	0.30	0.30	0.55	0.55	0.42	0.42
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	528	472	262	1021	774	658
v/s Ratio Prot	c0.23		0.02	c0.43	0.32	
v/s Ratio Perm		0.17	0.21			0.15
v/c Ratio	0.79	0.17	0.43	0.79	0.78	0.17
Uniform Delay, d1	16.7	13.5	8.3	9.3	13.1	9.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.6	0.2	1.1	4.1	4.9	0.1
Delay (s)	24.3	13.7	9.4	13.4	18.0	9.7
Level of Service	C	B	A	B	B	A
Approach Delay (s)	20.1			12.9	15.7	
Approach LOS	C			B	B	
Intersection Summary						
HCM Average Control Delay		15.9			HCM Level of Service	B
HCM Volume to Capacity ratio		0.79				
Actuated Cycle Length (s)		52.0			Sum of lost time (s)	8.0
Intersection Capacity Utilization		66.8%			ICU Level of Service	C
Analysis Period (min)		15				
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2025 PM Without Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔		↔	↔	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.98	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	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00		0.95	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1795	1583		1778	1583	1770	3539	1548	1770	3523	
Flt Permitted		0.41	1.00		0.67	1.00	0.07	1.00	1.00	0.07	1.00	
Satd. Flow (perm)		770	1583		1257	1583	139	3539	1548	129	3523	
Volume (vph)	59	19	71	412	20	192	60	1276	264	143	1564	44
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)	64	21	77	448	22	209	65	1387	287	155	1700	48
RTOR Reduction (vph)	0	0	49	0	0	66	0	0	158	0	1	0
Lane Group Flow (vph)	0	85	28	0	470	143	65	1387	129	155	1747	0
Confl. Peds. (#/hr)							2		2		2	
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)		44.0	44.0		44.0	44.0	56.9	53.7	53.7	67.2	60.0	
Effective Green, g (s)		44.0	44.0		44.0	44.0	56.9	53.7	53.7	67.2	60.0	
Actuated g/C Ratio		0.37	0.37		0.37	0.37	0.48	0.45	0.45	0.56	0.50	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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)		284	584		464	584	110	1594	697	204	1773	
v/s Ratio Prot							0.02	0.39		c0.06	c0.50	
v/s Ratio Perm		0.11	0.05		c0.37	0.13	0.27		0.19	0.37		
v/c Ratio		0.30	0.05		1.01	0.24	0.59	0.87	0.19	0.76	0.99	
Uniform Delay, d1		26.7	24.2		37.6	26.1	28.3	29.6	19.6	28.4	29.2	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.6	0.0		45.1	0.2	8.2	5.5	0.1	15.0	17.8	
Delay (s)		27.3	24.2		82.7	26.3	36.5	35.1	19.8	43.4	46.9	
Level of Service		C	C		F	C	D	D	B	D	D	
Approach Delay (s)		25.8			65.3			32.6			46.6	
Approach LOS		C			E			C			D	
Intersection Summary												
HCM Average Control Delay		43.3										
HCM Volume to Capacity ratio		1.00										
Actuated Cycle Length (s)		119.2										
Intersection Capacity Utilization		88.5%										
Analysis Period (min)		15										
c Critical Lane Group												

Appendix K – Intersection Operations Analysis Worksheets for 2025 Without
Project Conditions, with Mitigation Measures

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

2025 AM Without Project+Mit
7/25/2012

	↖	↗	↖	↗	↖	↗
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↖	↗	↖	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.19	1.00
Satd. Flow (perm)	1770	1583	3539	1583	351	3539
Volume (vph)	480	244	869	109	33	830
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	522	265	945	118	36	902
RTOR Reduction (vph)	0	125	0	76	0	0
Lane Group Flow (vph)	522	140	945	42	36	902
Turn Type	Perm		Perm pm+pt			
Protected Phases	8		2		1	
Permitted Phases	8		2		6	
Actuated Green, G (s)	17.7	17.7	17.2	17.2	22.4	22.4
Effective Green, g (s)	17.7	17.7	17.2	17.2	22.4	22.4
Actuated g/C Ratio	0.37	0.37	0.36	0.36	0.47	0.47
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	651	583	1266	566	199	1648
v/s Ratio Prot	c0.29		c0.27		0.00	
v/s Ratio Perm	0.17		0.07		0.08	
v/c Ratio	0.80	0.24	0.75	0.07	0.18	0.55
Uniform Delay, d1	13.6	10.5	13.5	10.2	8.5	9.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.1	0.2	2.4	0.1	0.4	0.4
Delay (s)	20.7	10.8	16.0	10.3	9.0	9.6
Level of Service	C	B	B	B	A	A
Approach Delay (s)	17.3		15.3		9.6	
Approach LOS	B		B		A	
Intersection Summary						
HCM Average Control Delay			14.0		HCM Level of Service	
HCM Volume to Capacity ratio			0.79		B	
Actuated Cycle Length (s)			48.1		Sum of lost time (s)	
Intersection Capacity Utilization			60.7%		12.0	
ICU Level of Service			B			
Analysis Period (min)			15			
c Critical Lane Group						

AM (2025NP)	Thu Jul 26, 2012 10:19:30	Page 3-1
JB23054 - Kaloko Makai Kona, Hawaii 2025 Without Project Conditions With Mitigations		
Level Of Service Computation Report 2000 HCM Unsignalized Method (Future Volume Alternative)		
Intersection #2 Queen Kaahumanu Hwy. @ Hulikoa Dr.		
Average Delay (sec/veh): 0.0 Worst Case Level Of Service: A[7.2]		
Approach:	North Bound	South Bound
Movement:	L - T - R	L - T - R
Control:	Uncontrolled	Uncontrolled
Rights:	Include	Include
Lanes:	0 0 2 0 1	0 1 1 0 0
Volume Module:		
Base Vol:	0 590 218	0 835 0
Growth Adj:	1.00 1.00 1.00	1.00 1.00 1.00
Initial Bse:	0 590 218	0 835 0
Added Vol:	0 291 61	20 436 0
PasserByVol:	0 0 20	-20 62 0
Initial Fut:	0 881 299	0 1333 0
User Adj:	1.00 1.00 1.00	1.00 1.00 1.00
PHF Adj:	1.00 1.00 1.00	1.00 1.00 1.00
PHF Volume:	0 881 299	0 1333 0
Reduct Vol:	0 0 0	0 0 0
FinalVolume:	0 881 299	0 1333 0
Critical Gap Module:		
Critical Gp:	xxxx xxxx xxxx	xxxx xxxx xxxx
FollowUpTim:	xxxx xxxx xxxx	xxxx xxxx xxxx
Capacity Module:		
Cnflct Vol:	xxxx xxxx xxxx	xxxx xxxx xxxx
Potent Cap.:	xxxx xxxx xxxx	xxxx xxxx xxxx
Move Cap.:	xxxx xxxx xxxx	xxxx xxxx xxxx
Volume/Cap:	xxxx xxxx xxxx	xxxx xxxx xxxx
Level Of Service Module:		
2Way95thQ:	xxxx xxxx xxxx	xxxx xxxx xxxx
Control Del:	xxxx xxxx xxxx	xxxx xxxx xxxx
LOS by Move:	* * *	* * *
Movement:	LT - LTR - RT	LT - LTR - RT
Shared Cap.:	xxxx xxxx xxxx	xxxx xxxx xxxx
SharedQueue:	xxxx xxxx xxxx	xxxx xxxx xxxx
Shrd ConDel:	xxxx xxxx xxxx	xxxx xxxx xxxx
Shared LOS:	* * *	* * *
ApproachDel:	xxxxxx	xxxxxx
ApproachLOS:	*	*
Note: Queue reported is the number of cars per lane.		

Traffic 8.0.0715 (c) 2008 Dowling Assoc. Licensed to KOA CORP, MONTEREY PK

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2025 AM Without Project+Mit
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↕	↕	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Frpb, ped/bikes	1.00	0.98	1.00	0.98	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1553	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1553	3433	3539
Volume (vph)	275	270	752	433	382	1032
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	299	293	817	471	415	1122
RTOR Reduction (vph)	0	0	0	309	0	0
Lane Group Flow (vph)	299	293	817	162	415	1122
Confl. Peds. (#/hr)	14			8	8	
Turn Type	Free		Perm	Prot		
Protected Phases	8		2		1	6
Permitted Phases	Free			2		
Actuated Green, G (s)	9.9	46.8	16.1	16.1	8.8	28.9
Effective Green, g (s)	9.9	46.8	16.1	16.1	8.8	28.9
Actuated g/C Ratio	0.21	1.00	0.34	0.34	0.19	0.62
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	726	1558	1217	534	646	2185
v/s Ratio Prot	c0.09		0.23		c0.12	0.32
v/s Ratio Perm		0.19		0.30		
v/c Ratio	0.41	0.19	0.67	0.30	0.64	0.51
Uniform Delay, d1	15.9	0.0	13.1	11.2	17.5	5.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.3	1.5	0.3	2.2	0.2
Delay (s)	16.3	0.3	14.6	11.6	19.7	5.2
Level of Service	B	A	B	B	B	A
Approach Delay (s)	8.4		13.5		9.1	
Approach LOS	A		B		A	
Intersection Summary						
HCM Average Control Delay		10.6		HCM Level of Service		B
HCM Volume to Capacity ratio		0.69				
Actuated Cycle Length (s)		46.8		Sum of lost time (s)		12.0
Intersection Capacity Utilization		51.6%		ICU Level of Service		A
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kanalani Street

2025 AM Without Project+Mit
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	322	363	29	339	225	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	350	395	32	368	245	20
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			747		599	352
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			747		599	352
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		41	97
cM capacity (veh/h)			856		416	643
Direction, Lane #						
	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	350	395	154	246	264	
Volume Left	0	0	32	0	245	
Volume Right	0	395	0	0	20	
cSH	1700	1700	856	1700	449	
Volume to Capacity	0.21	0.23	0.04	0.14	0.59	
Queue Length (ft)	0	0	3	0	92	
Control Delay (s)	0.0	0.0	2.2	0.0	24.2	
Lane LOS			A		C	
Approach Delay (s)	0.0		0.9		24.2	
Approach LOS					C	
Intersection Summary						
Average Delay		4.8				
Intersection Capacity Utilization		49.6%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2025 AM Without Project+Mit
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations					 	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	3433	1583
Flt Permitted	1.00	1.00	0.67	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1243	1863	3433	1583
Volume (vph)	130	198	202	243	134	77
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	141	215	220	264	146	84
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	141	215	220	264	146	84
Turn Type	Free		Perm		Free	
Protected Phases	4		8		2	
Permitted Phases	Free		8		Free	
Actuated Green, G (s)	6.2	18.9	6.2	6.2	4.7	18.9
Effective Green, g (s)	6.2	18.9	6.2	6.2	4.7	18.9
Actuated g/C Ratio	0.33	1.00	0.33	0.33	0.25	1.00
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	611	1583	408	611	854	1583
v/s Ratio Prot	0.08			0.14	0.04	
v/s Ratio Perm		0.14	c0.18			0.05
v/c Ratio	0.23	0.14	0.54	0.43	0.17	0.05
Uniform Delay, d1	4.6	0.0	5.2	5.0	5.6	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.2	1.4	0.5	0.1	0.1
Delay (s)	4.8	0.2	6.6	5.5	5.7	0.1
Level of Service	A	A	A	A	A	A
Approach Delay (s)	2.0		6.0		3.6	
Approach LOS	A		A		A	
Intersection Summary						
HCM Average Control Delay			4.1	HCM Level of Service		A
HCM Volume to Capacity ratio			0.30			
Actuated Cycle Length (s)			18.9	Sum of lost time (s)		4.0
Intersection Capacity Utilization			31.9%	ICU Level of Service		A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokalole Hwy.

2025 AM Without Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Lane Util. Factor		1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Frt		1.00	0.85	1.00	1.00		1.00	1.00	0.85		1.00	
Flt Protected		1.00	1.00	0.95	1.00		0.95	1.00	1.00		1.00	
Satd. Flow (prot)		1863	1583	1770	1863		1770	1863	1583		1863	
Flt Permitted		1.00	1.00	0.95	1.00		0.75	1.00	1.00		1.00	
Satd. Flow (perm)		1863	1583	1770	1863		1397	1863	1583		1863	
Volume (vph)	0	164	26	189	437	0	129	9	64	0	11	0
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	178	28	205	475	0	140	10	70	0	12	0
RTOR Reduction (vph)	0	0	22	0	0	0	0	0	55	0	0	0
Lane Group Flow (vph)	0	178	6	205	475	0	140	10	15	0	12	0
Turn Type	Prot	Perm		Prot	Perm		Perm	Perm	Perm	Perm	Perm	Perm
Protected Phases	7	4		3	8			2		6	6	
Permitted Phases		4			8			2		2	6	
Actuated Green, G (s)		7.3	7.3	6.8	18.1		7.3	7.3	7.3		7.3	
Effective Green, g (s)		7.3	7.3	6.8	18.1		7.3	7.3	7.3		7.3	
Actuated g/C Ratio		0.22	0.22	0.20	0.54		0.22	0.22	0.22		0.22	
Clearance Time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	
Lane Grp Cap (vph)		407	346	360	1010		305	407	346		407	
v/s Ratio Prot		0.10		0.12	c0.26			0.01			0.01	
v/s Ratio Perm			0.02				c0.10		0.04			
v/c Ratio		0.44	0.02	0.57	0.47		0.46	0.02	0.04		0.03	
Uniform Delay, d1		11.3	10.2	12.0	4.7		11.3	10.3	10.3		10.3	
Progression Factor		1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	
Incremental Delay, d2		0.8	0.0	2.1	0.3		1.1	0.0	0.1		0.0	
Delay (s)		12.0	10.3	14.0	5.1		12.4	10.3	10.4		10.3	
Level of Service		B	B	B	A		B	B	B		B	
Approach Delay (s)		11.8		7.8			11.7		10.3			
Approach LOS		B		A			B		B			
Intersection Summary												
HCM Average Control Delay	9.3			HCM Level of Service					A			
HCM Volume to Capacity ratio	0.47											
Actuated Cycle Length (s)	33.4			Sum of lost time (s)					8.0			
Intersection Capacity Utilization	50.1%			ICU Level of Service					A			
Analysis Period (min)	15											
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2025 AM Without Project+Mit
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.04	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	70	1863	1863	1583
Volume (vph)	110	103	150	378	1307	270
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	120	112	163	411	1421	293
RTOR Reduction (vph)	0	101	0	0	0	25
Lane Group Flow (vph)	120	11	163	411	1421	268
Turn Type	Perm pm+pt		Perm		Perm	
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	13.5	13.5	116.0	116.0	103.0	103.0
Effective Green, g (s)	13.5	13.5	116.0	116.0	103.0	103.0
Actuated g/C Ratio	0.10	0.10	0.84	0.84	0.75	0.75
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	174	155	170	1572	1396	1186
v/s Ratio Prot	0.07		c0.06	0.22	c0.76	
v/s Ratio Perm		0.07	0.75			0.19
v/c Ratio	0.69	0.07	0.96	0.26	1.02	0.23
Uniform Delay, d1	60.0	56.3	66.1	2.2	17.2	5.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.8	0.2	56.2	0.1	28.7	0.1
Delay (s)	70.8	56.5	122.4	2.2	45.9	5.3
Level of Service	E	E	F	A	D	A
Approach Delay (s)	63.9			36.4	39.0	
Approach LOS	E			D	D	
Intersection Summary						
HCM Average Control Delay			40.7		HCM Level of Service	D
HCM Volume to Capacity ratio			0.98			
Actuated Cycle Length (s)			137.5		Sum of lost time (s)	12.0
Intersection Capacity Utilization			93.2%		ICU Level of Service	F
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2025 AM Without Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95
Frbp, ped/bikes		1.00	1.00		1.00	1.00		1.00	0.98		1.00	1.00
Flpb, ped/bikes		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	0.85		1.00	0.99
Flt Protected		0.97	1.00		0.96	1.00		0.95	1.00		0.95	1.00
Satd. Flow (prot)		1800	1583		1779	1583		1769	3539		1548	1770
Flt Permitted		0.77	1.00		0.72	1.00		0.23	1.00		0.14	1.00
Satd. Flow (perm)		1443	1583		1342	1583		432	3539		1548	3508
Volume (vph)	17	7	24	270	18	166	68	1063	441	240	878	48
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)	18	8	26	293	20	180	74	1155	479	261	954	52
RTOR Reduction (vph)	0	0	19	0	0	132	0	0	281	0	6	0
Lane Group Flow (vph)	0	26	7	0	313	48	74	1155	198	261	1000	0
Confl. Peds. (#/hr)							2		2		2	2
Turn Type	Perm	Perm	Perm	Perm	Perm	pm+pt	Perm	pm+pt	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)		15.7	15.7		15.7	15.7	27.4	24.5	24.5	35.6	28.7	
Effective Green, g (s)		15.7	15.7		15.7	15.7	27.4	24.5	24.5	35.6	28.7	
Actuated g/C Ratio		0.26	0.26		0.26	0.26	0.46	0.41	0.41	0.60	0.48	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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)		382	419		355	419	265	1462	640	337	1698	
v/s Ratio Prot							0.01	0.33		c0.09	0.29	
v/s Ratio Perm		0.02	0.02		c0.23	0.11	0.12		0.31	c0.37		
v/c Ratio		0.07	0.02		0.88	0.11	0.28	0.79	0.31	0.77	0.59	
Uniform Delay, d1		16.3	16.1		20.9	16.5	9.2	15.2	11.7	9.8	11.0	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.1	0.0		21.7	0.1	0.6	3.0	0.3	10.6	0.5	
Delay (s)		16.4	16.1		42.6	16.6	9.7	18.1	12.0	20.4	11.6	
Level of Service		B	B		D	B	A	B	B	C	B	
Approach Delay (s)		16.3			33.1			16.1			13.4	
Approach LOS		B			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)			59.3		Sum of lost time (s)			8.0				
Intersection Capacity Utilization			75.3%		ICU Level of Service			D				
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

2025 PM Without Project+Mit
7/25/2012

	↖	↗	↖	↗	↖	↗
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↖	↗	↖	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.15	1.00
Satd. Flow (perm)	1770	1583	3539	1583	272	3539
Volume (vph)	180	84	1135	387	226	1114
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	91	1234	421	246	1211
RTOR Reduction (vph)	0	75	0	221	0	0
Lane Group Flow (vph)	196	16	1234	200	246	1211
Turn Type	Perm		Perm		pm+pt	
Protected Phases	8		2		1	
Permitted Phases	8		2		6	
Actuated Green, G (s)	8.4	8.4	23.4	23.4	32.8	32.8
Effective Green, g (s)	8.4	8.4	23.4	23.4	32.8	32.8
Actuated g/C Ratio	0.17	0.17	0.48	0.48	0.67	0.67
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	302	270	1683	753	346	2359
v/s Ratio Prot	c0.11		0.35		c0.08	
v/s Ratio Perm	0.06		0.27		c0.40	
v/c Ratio	0.65	0.06	0.73	0.27	0.71	0.51
Uniform Delay, d1	19.0	17.1	10.4	7.7	6.9	4.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.8	0.1	1.7	0.2	6.7	0.2
Delay (s)	23.8	17.2	12.1	7.9	13.7	4.3
Level of Service	C		B		A	
Approach Delay (s)	21.7		11.0		5.9	
Approach LOS	C		B		A	
Intersection Summary						
HCM Average Control Delay			9.7	HCM Level of Service		A
HCM Volume to Capacity ratio			0.68			
Actuated Cycle Length (s)			49.2	Sum of lost time (s)		8.0
Intersection Capacity Utilization			63.9%	ICU Level of Service		B
Analysis Period (min)			15			
c Critical Lane Group						

PM (2025nP)	Thu Jul 26, 2012 10:20:00	Page 3-1
JB23054 - Kaloko Makai Kona, Hawaii 2025 Without Project Conditions With Mitigations		
Level Of Service Computation Report 2000 HCM Unsignalized Method (Future Volume Alternative)		
Intersection #2 Queen Kaahumanu Hwy. @ Hulikoa Dr.		
Average Delay (sec/veh): 0.0 Worst Case Level Of Service: A[7.2]		
Approach:	North Bound	South Bound
Movement:	L - T - R	L - T - R
Control:	Uncontrolled	Uncontrolled
Rights:	Include	Include
Lanes:	0 0 2 0 1	0 1 1 0 0
Volume Module:		
Base Vol:	0 719 122	0 1068 0
Growth Adj:	1.00 1.00 1.00	1.00 1.00 1.00
Initial Bse:	0 719 122	0 1068 0
Added Vol:	0 621 39	13 478 0
PasserByVol:	0 0 13	-13 58 0
Initial Fut:	0 1340 174	0 1604 0
User Adj:	1.00 1.00 1.00	1.00 1.00 1.00
PHF Adj:	1.00 1.00 1.00	1.00 1.00 1.00
PHF Volume:	0 1340 174	0 1604 0
Reduct Vol:	0 0 0	0 0 0
FinalVolume:	0 1340 174	0 1604 0
Critical Gap Module:		
Critical Gp:	xxxx xxxx xxxx	xxxx xxxx xxxx
FollowUpTim:	xxxx xxxx xxxx	xxxx xxxx xxxx
Capacity Module:		
Cnflct Vol:	xxxx xxxx xxxx	xxxx xxxx xxxx
Potent Cap.:	xxxx xxxx xxxx	xxxx xxxx xxxx
Move Cap.:	xxxx xxxx xxxx	xxxx xxxx xxxx
Volume/Cap:	xxxx xxxx xxxx	xxxx xxxx xxxx
Level Of Service Module:		
2Way95thQ:	xxxx xxxx xxxx	xxxx xxxx xxxx
Control Del:	xxxx xxxx xxxx	xxxx xxxx xxxx
LOS by Move:	*	*
Movement:	LT - LTR - RT	LT - LTR - RT
Shared Cap.:	xxxx xxxx xxxx	xxxx xxxx xxxx
SharedQueue:	xxxx xxxx xxxx	xxxx xxxx xxxx
Shrd ConDel:	xxxx xxxx xxxx	xxxx xxxx xxxx
Shared LOS:	*	*
ApproachDel:	xxxxxx	xxxxxx
ApproachLOS:	*	*
Note: Queue reported is the number of cars per lane.		

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HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2025 PM Without Project+Mit
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Frpb, ped/bikes	1.00	0.98	1.00	0.98	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1551	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1551	3433	3539
Volume (vph)	544	414	1105	594	358	1154
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	591	450	1201	646	389	1254
RTOR Reduction (vph)	0	0	0	383	0	0
Lane Group Flow (vph)	591	450	1201	263	389	1254
Confl. Peds. (#/hr)	14			8	8	
Turn Type	Free		Perm	Prot		
Protected Phases	8		2		1	6
Permitted Phases	Free			2		
Actuated Green, G (s)	14.0	57.3	23.3	23.3	8.0	35.3
Effective Green, g (s)	14.0	57.3	23.3	23.3	8.0	35.3
Actuated g/C Ratio	0.24	1.00	0.41	0.41	0.14	0.62
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	839	1558	1439	631	479	2180
v/s Ratio Prot	c0.17		0.34		c0.11	0.35
v/s Ratio Perm		0.29		0.42		
v/c Ratio	0.70	0.29	0.83	0.42	0.81	0.58
Uniform Delay, d1	19.8	0.0	15.3	12.1	23.9	6.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.7	0.5	4.3	0.4	10.1	0.4
Delay (s)	22.5	0.5	19.6	12.6	34.0	6.9
Level of Service	C	A	B	B	C	A
Approach Delay (s)	13.0		17.2		13.3	
Approach LOS	B		B		B	
Intersection Summary						
HCM Average Control Delay		14.8			HCM Level of Service	B
HCM Volume to Capacity ratio		0.89				
Actuated Cycle Length (s)		57.3			Sum of lost time (s)	12.0
Intersection Capacity Utilization		66.3%			ICU Level of Service	C
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kanalani Street

2025 PM Without Project+Mit
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	343	489	17	669	200	74
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	373	532	18	727	217	80
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			906		775	375
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			906		775	375
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		33	87
cM capacity (veh/h)			745		326	622
Direction, Lane #						
	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	373	532	261	485	298	
Volume Left	0	0	18	0	217	
Volume Right	0	532	0	0	80	
cSH	1700	1700	745	1700	446	
Volume to Capacity	0.22	0.31	0.02	0.29	0.67	
Queue Length (ft)	0	0	2	0	120	
Control Delay (s)	0.0	0.0	1.0	0.0	29.2	
Lane LOS			A		D	
Approach Delay (s)	0.0		0.3		29.2	
Approach LOS					D	
Intersection Summary						
Average Delay			4.6			
Intersection Capacity Utilization		56.2%			ICU Level of Service	B
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2025 PM Without Project+Mit
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations					 	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	3433	1583
Flt Permitted	1.00	1.00	0.59	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1107	1863	3433	1583
Volume (vph)	247	122	127	184	479	326
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	268	133	138	200	521	354
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	268	133	138	200	521	354
Turn Type	Free		Perm		Free	
Protected Phases	4		8		2	
Permitted Phases	Free		8		Free	
Actuated Green, G (s)	7.3	22.8	7.3	7.3	7.5	22.8
Effective Green, g (s)	7.3	22.8	7.3	7.3	7.5	22.8
Actuated g/C Ratio	0.32	1.00	0.32	0.32	0.33	1.00
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	596	1583	354	596	1129	1583
v/s Ratio Prot	c0.14		0.11		c0.15	
v/s Ratio Perm	0.08		0.12		0.22	
v/c Ratio	0.45	0.08	0.39	0.34	0.46	0.22
Uniform Delay, d1	6.2	0.0	6.0	5.9	6.1	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.1	0.7	0.3	0.3	0.3
Delay (s)	6.7	0.1	6.7	6.2	6.4	0.3
Level of Service	A	A	A	A	A	A
Approach Delay (s)	4.5		6.4		3.9	
Approach LOS	A		A		A	
Intersection Summary						
HCM Average Control Delay			4.6	HCM Level of Service		A
HCM Volume to Capacity ratio			0.46			
Actuated Cycle Length (s)			22.8	Sum of lost time (s)		8.0
Intersection Capacity Utilization			43.7%	ICU Level of Service		A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokalole Hwy.

2025 PM Without Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0		4.0	4.0
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	1.00		1.00	1.00	0.85		1.00	1.00
Flt Protected		1.00	1.00	0.95	1.00		0.95	1.00	1.00		1.00	1.00
Satd. Flow (prot)		1863	1583	1770	1863		1770	1863	1583		1863	1863
Flt Permitted		1.00	1.00	0.95	1.00		0.75	1.00	1.00		1.00	1.00
Satd. Flow (perm)		1863	1583	1770	1863		1399	1863	1583		1863	1863
Volume (vph)	0	561	127	180	269	0	34	7	282	0	9	0
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	610	138	196	292	0	37	8	307	0	10	0
RTOR Reduction (vph)	0	0	81	0	0	0	0	0	227	0	0	0
Lane Group Flow (vph)	0	610	57	196	292	0	37	8	80	0	10	0
Turn Type	Prot	Perm		Prot	Perm		Perm	Perm		Perm	Perm	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases		4			8		2	2		6		6
Actuated Green, G (s)	19.8	19.8	8.0	31.8		8.4	8.4	8.4	8.4		8.4	
Effective Green, g (s)	19.8	19.8	8.0	31.8		8.4	8.4	8.4	8.4		8.4	
Actuated g/C Ratio	0.41	0.41	0.17	0.66		0.17	0.17	0.17	0.17		0.17	
Clearance Time (s)	4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0		4.0	
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)	765	650	294	1229		244	325	276	325		325	
v/s Ratio Prot	c0.33	c0.11		0.16			0.00				0.01	
v/s Ratio Perm		0.09				0.03	0.19					
v/c Ratio	0.80	0.09	0.67	0.24		0.15	0.02	0.29			0.03	
Uniform Delay, d1	12.4	8.7	18.8	3.3		16.9	16.5	17.3			16.5	
Progression Factor	1.00	1.00	1.00	1.00		1.00	1.00	1.00			1.00	
Incremental Delay, d2	5.8	0.1	5.6	0.1		0.3	0.0	0.6			0.0	
Delay (s)	18.2	8.7	24.5	3.4		17.2	16.5	17.9			16.6	
Level of Service	B	A	C	A		B	B	B			B	
Approach Delay (s)	16.5		11.9			17.8		16.6			16.6	
Approach LOS	B		B			B		B			B	
Intersection Summary												
HCM Average Control Delay			15.4		HCM Level of Service				B			
HCM Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			48.2		Sum of lost time (s)				12.0			
Intersection Capacity Utilization			58.0%		ICU Level of Service				B			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2025 PM Without Project+Mit
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.18	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	331	1863	1863	1583
Volume (vph)	382	246	104	740	552	213
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	415	267	113	804	600	232
RTOR Reduction (vph)	0	187	0	0	0	120
Lane Group Flow (vph)	415	80	113	804	600	112
Turn Type	Perm pm+pt			Perm		
Protected Phases	4			5		
Permitted Phases	4			2		
Actuated Green, G (s)	15.5	15.5	28.5	28.5	21.6	21.6
Effective Green, g (s)	15.5	15.5	28.5	28.5	21.6	21.6
Actuated g/C Ratio	0.30	0.30	0.55	0.55	0.42	0.42
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	528	472	262	1021	774	658
v/s Ratio Prot	c0.23		0.02	c0.43		0.32
v/s Ratio Perm	0.17		0.21	0.15		
v/c Ratio	0.79	0.17	0.43	0.79	0.78	0.17
Uniform Delay, d1	16.7	13.5	8.3	9.3	13.1	9.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.6	0.2	1.1	4.1	4.9	0.1
Delay (s)	24.3	13.7	9.4	13.4	18.0	9.7
Level of Service	C	B	A	B	B	A
Approach Delay (s)	20.1		12.9		15.7	
Approach LOS	C		B		B	
Intersection Summary						
HCM Average Control Delay			15.9		HCM Level of Service	
HCM Volume to Capacity ratio			0.79		B	
Actuated Cycle Length (s)			52.0		Sum of lost time (s)	
Intersection Capacity Utilization			66.8%		8.0	
ICU Level of Service			C			
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2025 PM Without Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.98	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	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	1.00
Flt Protected		0.96	1.00		0.95	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1795	1583		1778	1583	1770	3539	1548	1770	3523	
Flt Permitted		0.41	1.00		0.67	1.00	0.07	1.00	1.00	0.07	1.00	
Satd. Flow (perm)		770	1583		1257	1583	139	3539	1548	129	3523	
Volume (vph)	59	19	71	412	20	192	60	1276	264	143	1564	44
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)	64	21	77	448	22	209	65	1387	287	155	1700	48
RTOR Reduction (vph)	0	0	49	0	0	66	0	0	158	0	1	0
Lane Group Flow (vph)	0	85	28	0	470	143	65	1387	129	155	1747	0
Confl. Peds. (#/hr)	2						2		2		2	
Turn Type	Perm		Perm		Perm		pm+pt		Perm		pm+pt	
Protected Phases	4		8		5		2		1		6	
Permitted Phases	4		8		8		2		2		6	
Actuated Green, G (s)	44.0	44.0		44.0	44.0	56.9	53.7	53.7	67.2	60.0		
Effective Green, g (s)	44.0	44.0		44.0	44.0	56.9	53.7	53.7	67.2	60.0		
Actuated g/C Ratio	0.37	0.37		0.37	0.37	0.48	0.45	0.45	0.56	0.50		
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0		
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)	284	584		464	584	110	1594	697	204	1773		
v/s Ratio Prot					0.02		0.39		c0.06		c0.50	
v/s Ratio Perm	0.11	0.05	c0.37		0.13	0.27			0.19	0.37		
v/c Ratio	0.30	0.05	1.01		0.24	0.59	0.87	0.19		0.76	0.99	
Uniform Delay, d1	26.7	24.2	37.6		26.1	28.3	29.6	19.6	28.4	29.2		
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	0.0	45.1		0.2	8.2	5.5	0.1	15.0	17.8		
Delay (s)	27.3	24.2	82.7		26.3	36.5	35.1	19.8	43.4	46.9		
Level of Service	C	C	F		C	D	D	B	D	D	D	
Approach Delay (s)	25.8			65.3			32.6			46.6		
Approach LOS	C			E			C			D		
Intersection Summary												
HCM Average Control Delay	43.3		HCM Level of Service				D					
HCM Volume to Capacity ratio	1.00											
Actuated Cycle Length (s)	119.2		Sum of lost time (s)				12.0					
Intersection Capacity Utilization	88.5%		ICU Level of Service				E					
Analysis Period (min)	15											
c Critical Lane Group												

**Appendix L – Intersection Operations Analysis Worksheets for 2035 Without
Project Conditions, with Existing Geometry**

**HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway**

2035 AM Without Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.18	1.00
Satd. Flow (perm)	1770	1583	3539	1583	327	3539
Volume (vph)	480	310	941	109	188	766
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	522	337	1023	118	204	833
RTOR Reduction (vph)	0	134	0	76	0	0
Lane Group Flow (vph)	522	203	1023	42	204	833
Turn Type	Perm		Perm		pm+pt	
Protected Phases	8		2		1	
Permitted Phases	8		2		6	
Actuated Green, G (s)	17.7	17.7	18.8	18.8	26.8	26.8
Effective Green, g (s)	17.7	17.7	18.8	18.8	26.8	26.8
Actuated g/C Ratio	0.34	0.34	0.36	0.36	0.51	0.51
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	597	534	1267	567	277	1807
v/s Ratio Prot	c0.29		0.29		c0.06	
v/s Ratio Perm	0.21		0.07		c0.32	
v/c Ratio	0.87	0.38	0.81	0.07	0.74	0.46
Uniform Delay, d1	16.4	13.2	15.2	11.1	9.7	8.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	13.4	0.5	3.9	0.1	9.8	0.2
Delay (s)	29.8	13.7	19.1	11.2	19.4	8.4
Level of Service	C		B		B	
Approach Delay (s)	23.5		18.3		10.6	
Approach LOS	C		B		B	
Intersection Summary						
HCM Average Control Delay			17.1		HCM Level of Service	
HCM Volume to Capacity ratio			0.77		B	
Actuated Cycle Length (s)			52.5		Sum of lost time (s)	
Intersection Capacity Utilization			73.0%		ICU Level of Service	
Analysis Period (min)			15		D	
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
2: Hulioa Drive & Queen Kaahumanu Highway

2035 AM Without Project
7/25/2012

							
Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Sign Control	Yield		Free			Free	
Grade	0%		0%			0%	
Volume (veh/h)	0	247	953	299	0	1268	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	0	268	1036	325	0	1378	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	TWLTL						
Median storage (veh)	5						
Upstream signal (ft)							
pX, platoon unblocked							
vC, conflicting volume	1725	518			1036		
vC1, stage 1 conf vol	1036						
vC2, stage 2 conf vol	689						
vCu, unblocked vol	1725	518			1036		
tC, single (s)	6.8	6.9			4.1		
tC, 2 stage (s)	5.8						
tF (s)	3.5	3.3			2.2		
p0 queue free %	100	47			100		
cM capacity (veh/h)	296	503			667		
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	
Volume Total	268	518	518	325	689	689	
Volume Left	0	0	0	0	0	0	
Volume Right	268	0	0	325	0	0	
cSH	503	1700	1700	1700	1700	1700	
Volume to Capacity	0.53	0.30	0.30	0.19	0.41	0.41	
Queue Length (ft)	78	0	0	0	0	0	
Control Delay (s)	20.1	0.0	0.0	0.0	0.0	0.0	
Lane LOS	C						
Approach Delay (s)	20.1	0.0			0.0		
Approach LOS	C						
Intersection Summary							
Average Delay	1.8						
Intersection Capacity Utilization	48.3%			ICU Level of Service		A	
Analysis Period (min)	15						

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2035 AM Without Project
7/25/2012

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Flpb, ped/bikes	1.00	0.98	1.00	0.98	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1553	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1553	3433	3539
Volume (vph)	275	231	862	433	308	1041
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	299	251	937	471	335	1132
RTOR Reduction (vph)	0	0	0	287	0	0
Lane Group Flow (vph)	299	251	937	184	335	1132
Confl. Peds. (#/hr)	14		8		8	
Turn Type	Free		Perm		Prot	
Protected Phases	8		2		1	
Permitted Phases	Free		2			
Actuated Green, G (s)	10.1	50.2	19.6	19.6	8.5	32.1
Effective Green, g (s)	10.1	50.2	19.6	19.6	8.5	32.1
Actuated g/C Ratio	0.20	1.00	0.39	0.39	0.17	0.64
Clearance Time (s)	4.0		4.0		4.0	
Vehicle Extension (s)	3.0		3.0		3.0	
Lane Grp Cap (vph)	691	1558	1382	606	581	2263
v/s Ratio Prot	c0.09		0.26		0.10	
v/s Ratio Perm	0.16		0.30			
v/c Ratio	0.43	0.16	0.68	0.30	0.58	0.50
Uniform Delay, d1	17.5	0.0	12.7	10.6	19.2	4.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.2	1.3	0.3	1.4	0.2
Delay (s)	18.0	0.2	14.0	10.9	20.6	5.0
Level of Service	B	A	B	B	C	A
Approach Delay (s)	9.9		13.0		8.5	
Approach LOS	A		B		A	
Intersection Summary						
HCM Average Control Delay	10.6		HCM Level of Service		B	
HCM Volume to Capacity ratio	0.64					
Actuated Cycle Length (s)	50.2		Sum of lost time (s)		12.0	
Intersection Capacity Utilization	52.5%		ICU Level of Service		A	
Analysis Period (min)	15					
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kanalani Street

2035 AM Without Project
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↔	↔	↔	↔
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	249	363	29	301	225	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	271	395	32	327	245	20
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			667		499	273
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			667		499	273
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		49	97
cM capacity (veh/h)			917		483	724
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	271	395	141	218	264	
Volume Left	0	0	32	0	245	
Volume Right	0	395	0	0	20	
cSH	1700	1700	917	1700	521	
Volume to Capacity	0.16	0.23	0.03	0.13	0.51	
Queue Length (ft)	0	0	3	0	71	
Control Delay (s)	0.0	0.0	2.3	0.0	19.2	
Lane LOS			A		C	
Approach Delay (s)	0.0		0.9		19.2	
Approach LOS					C	
Intersection Summary						
Average Delay		4.2				
Intersection Capacity Utilization		44.7%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2035 AM Without Project
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	3433	1583
Flt Permitted	1.00	1.00	0.67	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1253	1863	3433	1583
Volume (vph)	121	133	224	218	121	81
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	132	145	243	237	132	88
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	132	145	243	237	132	88
Turn Type	Free		Perm		Free	
Protected Phases	4			8	2	
Permitted Phases		Free		8		Free
Actuated Green, G (s)	6.9	17.9	6.9	6.9	3.0	17.9
Effective Green, g (s)	6.9	17.9	6.9	6.9	3.0	17.9
Actuated g/C Ratio	0.39	1.00	0.39	0.39	0.17	1.00
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	718	1583	483	718	575	1583
v/s Ratio Prot	0.07			0.13	c0.04	
v/s Ratio Perm		0.09	c0.19			0.06
v/c Ratio	0.18	0.09	0.50	0.33	0.23	0.06
Uniform Delay, d1	3.6	0.0	4.2	3.9	6.4	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.1	0.8	0.3	0.2	0.1
Delay (s)	3.8	0.1	5.0	4.1	6.7	0.1
Level of Service	A	A	A	A	A	A
Approach Delay (s)	1.9			4.6	4.0	
Approach LOS	A			A	A	
Intersection Summary						
HCM Average Control Delay		3.7		HCM Level of Service	A	
HCM Volume to Capacity ratio		0.42				
Actuated Cycle Length (s)		17.9		Sum of lost time (s)	8.0	
Intersection Capacity Utilization		32.2%		ICU Level of Service	A	
Analysis Period (min)		15				
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokaloale Hwy.

2035 AM Without Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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	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	1770	1863	1583	1770	1863	1583	1770	1863	1583	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.30	1.00	1.00	0.67	1.00	1.00	
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	564	1863	1583	1253	1863	1583	
Volume (vph)	13	155	26	420	411	25	129	121	141	9	334	65	
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)	14	168	28	457	447	27	140	132	153	10	363	71	
RTOR Reduction (vph)	0	0	23	0	0	12	0	0	117	0	0	54	
Lane Group Flow (vph)	14	168	5	457	447	15	140	132	36	10	363	17	
Turn Type	Prot	Perm		Prot	Perm		Perm	Perm	Perm	Perm	Perm		
Protected Phases	7	4		3	8			2			6		
Permitted Phases			4			8	2		2	6		6	
Actuated Green, G (s)	0.6	10.2	10.2	20.5	30.1	30.1	13.2	13.2	13.2	13.2	13.2	13.2	
Effective Green, g (s)	0.6	10.2	10.2	20.5	30.1	30.1	13.2	13.2	13.2	13.2	13.2	13.2	
Actuated g/C Ratio	0.01	0.18	0.18	0.37	0.54	0.54	0.24	0.24	0.24	0.24	0.24	0.24	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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	3.0	
Lane Grp Cap (vph)	19	340	289	649	1003	852	133	440	374	296	440	374	
v/s Ratio Prot	0.01	0.09		c0.26	c0.24			0.07			0.19		
v/s Ratio Perm			0.02			0.02	c0.25		0.10	0.01		0.04	
v/c Ratio	0.74	0.49	0.02	0.70	0.45	0.02	1.05	0.30	0.10	0.03	0.82	0.04	
Uniform Delay, d1	27.6	20.5	18.7	15.1	7.8	6.0	21.4	17.6	16.7	16.4	20.3	16.5	
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	88.4	1.1	0.0	3.5	0.3	0.0	92.8	0.4	0.1	0.0	11.9	0.0	
Delay (s)	116.0	21.7	18.8	18.6	8.2	6.0	114.1	17.9	16.8	16.5	32.2	16.5	
Level of Service	F	C	B	B	A	A	F	B	B	B	C	B	
Approach Delay (s)	27.6			13.2			49.2			29.3			
Approach LOS	C			B			D			C			
Intersection Summary													
HCM Average Control Delay	25.9			HCM Level of Service					C				
HCM Volume to Capacity ratio	0.71												
Actuated Cycle Length (s)	55.9			Sum of lost time (s)					8.0				
Intersection Capacity Utilization	69.5%			ICU Level of Service					C				
Analysis Period (min)	15												
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2035 AM Without Project
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.07	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	122	1863	1863	1583
Volume (vph)	187	103	150	291	1078	501
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	203	112	163	316	1172	545
RTOR Reduction (vph)	0	94	0	0	0	89
Lane Group Flow (vph)	203	18	163	316	1172	456
Turn Type	Perm		pm+pt	Perm		
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	13.8	13.8	66.1	66.1	57.1	57.1
Effective Green, g (s)	13.8	13.8	66.1	66.1	57.1	57.1
Actuated g/C Ratio	0.16	0.16	0.75	0.75	0.65	0.65
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	278	249	185	1401	1210	1028
v/s Ratio Prot	c0.11		c0.05	0.17	c0.63	
v/s Ratio Perm		0.07	0.61			0.34
v/c Ratio	0.73	0.07	0.88	0.23	0.97	0.44
Uniform Delay, d1	35.3	31.6	27.6	3.3	14.6	7.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.5	0.1	35.2	0.1	18.6	0.3
Delay (s)	44.7	31.7	62.8	3.3	33.1	7.9
Level of Service	D	C	E	A	C	A
Approach Delay (s)	40.1			23.6	25.1	
Approach LOS	D			C	C	
Intersection Summary						
HCM Average Control Delay			26.7	HCM Level of Service		C
HCM Volume to Capacity ratio			0.92			
Actuated Cycle Length (s)			87.9	Sum of lost time (s)		12.0
Intersection Capacity Utilization			85.4%	ICU Level of Service		E
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2035 AM Without Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔		↔	↔	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.98	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	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1800	1583		1779	1583	1770	3539	1548	1770	3511	
Flt Permitted		0.77	1.00		0.72	1.00	0.19	1.00	1.00	0.14	1.00	
Satd. Flow (perm)		1443	1583		1342	1583	357	3539	1548	252	3511	
Volume (vph)	17	7	24	270	18	152	68	1201	441	199	969	48
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)	18	8	26	293	20	165	74	1305	479	216	1053	52
RTOR Reduction (vph)	0	0	19	0	0	120	0	0	271	0	6	0
Lane Group Flow (vph)	0	26	7	0	313	45	74	1305	208	216	1099	0
Confl. Peds. (#/hr)							2	2	2			2
Turn Type	Perm	Perm	Perm	Perm	pm+pt	pm+pt	Perm	pm+pt	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)		15.8	15.8		15.8	15.8	28.2	25.9	25.9	35.6	29.6	
Effective Green, g (s)		15.8	15.8		15.8	15.8	28.2	25.9	25.9	35.6	29.6	
Actuated g/C Ratio		0.26	0.26		0.26	0.26	0.47	0.43	0.43	0.60	0.50	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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)		382	419		355	419	223	1535	672	303	1741	
v/s Ratio Prot							0.01	c0.37		c0.07	0.31	
v/s Ratio Perm		0.02	0.02		c0.23	0.10	0.14		0.31	0.35		
v/c Ratio		0.07	0.02		0.88	0.11	0.33	0.85	0.31	0.71	0.63	
Uniform Delay, d1		16.4	16.2		21.1	16.6	9.1	15.2	11.1	10.3	11.0	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.1	0.0		21.7	0.1	0.9	4.7	0.3	7.7	0.8	
Delay (s)		16.5	16.2		42.7	16.7	10.0	19.9	11.3	18.0	11.8	
Level of Service		B	B		D	B	A	B	B	B	B	
Approach Delay (s)		16.4			33.8			17.3			12.8	
Approach LOS		B			C			B			B	
Intersection Summary												
HCM Average Control Delay		17.8			HCM Level of Service			B				
HCM Volume to Capacity ratio		0.92										
Actuated Cycle Length (s)		59.7			Sum of lost time (s)			16.0				
Intersection Capacity Utilization		76.8%			ICU Level of Service			D				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

2035 PM Without Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.15	1.00
Satd. Flow (perm)	1770	1583	3539	1583	281	3539
Volume (vph)	180	303	1038	387	363	1131
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	329	1128	421	395	1229
RTOR Reduction (vph)	0	264	0	257	0	0
Lane Group Flow (vph)	196	65	1128	164	395	1229
Turn Type	Perm	Perm	pm+pt	Perm	pm+pt	Perm
Protected Phases	8		2		1	6
Permitted Phases		8		2		6
Actuated Green, G (s)	11.5	11.5	22.5	22.5	38.4	38.4
Effective Green, g (s)	11.5	11.5	22.5	22.5	38.4	38.4
Actuated g/C Ratio	0.20	0.20	0.39	0.39	0.66	0.66
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	352	314	1375	615	492	2347
v/s Ratio Prot	0.11		0.32		c0.16	0.35
v/s Ratio Perm		0.21		0.27	c0.37	
v/c Ratio	0.56	0.21	0.82	0.27	0.80	0.52
Uniform Delay, d1	20.9	19.4	15.9	12.1	12.3	5.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9	0.3	4.1	0.2	9.2	0.2
Delay (s)	22.8	19.7	19.9	12.3	21.4	5.2
Level of Service	C	B	B	B	C	A
Approach Delay (s)	20.9		17.9			9.2
Approach LOS	C		B			A
Intersection Summary						
HCM Average Control Delay		14.5			HCM Level of Service	B
HCM Volume to Capacity ratio		0.84				
Actuated Cycle Length (s)		57.9			Sum of lost time (s)	8.0
Intersection Capacity Utilization		68.8%			ICU Level of Service	C
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
2: Hulioa Drive & Queen Kaahumanu Highway

2035 PM Without Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Yield		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	274	1242	174	0	1621
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	298	1350	189	0	1762
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLT					
Median storage (veh)	5					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2231	675			1350	
vC1, stage 1 conf vol	1350					
vC2, stage 2 conf vol	881					
vCu, unblocked vol	2231	675			1350	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
pO queue free %	100	25			100	
cM capacity (veh/h)	203	396			506	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	298	675	675	189	881	881
Volume Left	0	0	0	0	0	0
Volume Right	298	0	0	189	0	0
cSH	396	1700	1700	1700	1700	1700
Volume to Capacity	0.75	0.40	0.40	0.11	0.52	0.52
Queue Length (ft)	152	0	0	0	0	0
Control Delay (s)	36.9	0.0	0.0	0.0	0.0	0.0
Lane LOS	E					
Approach Delay (s)	36.9	0.0			0.0	
Approach LOS	E					
Intersection Summary						
Average Delay		3.1				
Intersection Capacity Utilization		58.0%		ICU Level of Service	B	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2035 PM Without Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Flpb, ped/bikes	1.00	0.98	1.00	0.98	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1551	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1551	3433	3539
Volume (vph)	544	333	1088	594	312	1216
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	591	362	1183	646	339	1322
RTOR Reduction (vph)	0	0	0	385	0	0
Lane Group Flow (vph)	591	362	1183	261	339	1322
Confl. Peds. (#/hr)	14			8		8
Turn Type	Free			Perm		Prot
Protected Phases	8		2		1	6
Permitted Phases		Free		2		
Actuated Green, G (s)	13.9	56.7	22.9	22.9	7.9	34.8
Effective Green, g (s)	13.9	56.7	22.9	22.9	7.9	34.8
Actuated g/C Ratio	0.25	1.00	0.40	0.40	0.14	0.61
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	842	1558	1429	626	478	2172
v/s Ratio Prot	c0.17		0.33		0.10	c0.37
v/s Ratio Perm		0.23		0.42		
v/c Ratio	0.70	0.23	0.83	0.42	0.71	0.61
Uniform Delay, d1	19.5	0.0	15.1	12.1	23.3	6.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.7	0.3	4.1	0.5	4.8	0.5
Delay (s)	22.2	0.3	19.2	12.6	28.1	7.2
Level of Service	C	A	B	B	C	A
Approach Delay (s)	13.9		16.9			11.5
Approach LOS	B		B			B
Intersection Summary						
HCM Average Control Delay		14.2			HCM Level of Service	B
HCM Volume to Capacity ratio		0.87				
Actuated Cycle Length (s)		56.7			Sum of lost time (s)	12.0
Intersection Capacity Utilization		64.5%			ICU Level of Service	C
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kanalani Street

2035 PM Without Project
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↔	↔	↔	↔
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	297	489	17	589	200	74
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	323	532	18	640	217	80
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			856		682	325
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			856		682	325
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		42	88
cM capacity (veh/h)			778		374	670
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	323	532	232	427	298	
Volume Left	0	0	18	0	217	
Volume Right	0	532	0	0	80	
cSH	1700	1700	778	1700	512	
Volume to Capacity	0.19	0.31	0.02	0.25	0.58	
Queue Length (ft)	0	0	2	0	92	
Control Delay (s)	0.0	0.0	1.0	0.0	22.8	
Lane LOS			A		C	
Approach Delay (s)	0.0		0.4		22.8	
Approach LOS					C	
Intersection Summary						
Average Delay		3.9				
Intersection Capacity Utilization		53.9%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2035 PM Without Project
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	3433	1583
Flt Permitted	1.00	1.00	0.61	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1139	1863	3433	1583
Volume (vph)	218	105	133	167	415	347
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	237	114	145	182	451	377
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	237	114	145	182	451	377
Turn Type	Free		Perm		Free	
Protected Phases	4			8	2	
Permitted Phases		Free	8			Free
Actuated Green, G (s)	7.1	22.2	7.1	7.1	7.1	22.2
Effective Green, g (s)	7.1	22.2	7.1	7.1	7.1	22.2
Actuated g/C Ratio	0.32	1.00	0.32	0.32	0.32	1.00
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	596	1583	364	596	1098	1583
v/s Ratio Prot	0.13			0.10	c0.13	
v/s Ratio Perm		0.07	c0.13			0.24
v/c Ratio	0.40	0.07	0.40	0.31	0.41	0.24
Uniform Delay, d1	5.9	0.0	5.9	5.7	5.9	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.1	0.7	0.3	0.3	0.4
Delay (s)	6.3	0.1	6.6	6.0	6.2	0.4
Level of Service	A	A	A	A	A	A
Approach Delay (s)	4.3			6.3	3.5	
Approach LOS	A			A	A	
Intersection Summary						
HCM Average Control Delay		4.3		HCM Level of Service	A	
HCM Volume to Capacity ratio		0.40				
Actuated Cycle Length (s)		22.2		Sum of lost time (s)	8.0	
Intersection Capacity Utilization		40.7%		ICU Level of Service	A	
Analysis Period (min)		15				
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokaloale Hwy.

2035 PM Without Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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	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	1770	1863	1583	1770	1863	1583	1770	1863	1583	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.56	1.00	1.00	0.39	1.00	1.00	
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1048	1863	1583	730	1863	1583	
Volume (vph)	64	532	127	257	252	17	34	266	398	29	184	17	
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)	70	578	138	279	274	18	37	289	433	32	200	18	
RTOR Reduction (vph)	0	0	87	0	0	9	0	0	279	0	0	14	
Lane Group Flow (vph)	70	578	51	279	274	9	37	289	154	32	200	4	
Turn Type	Prot	Perm		Prot	Perm		Perm	Perm	Perm	Perm	Perm		
Protected Phases	7	4		3	8			2			6		
Permitted Phases			4			8	2		2	6		6	
Actuated Green, G (s)	3.4	21.0	21.0	10.7	28.3	28.3	13.3	13.3	13.3	13.3	13.3	13.3	
Effective Green, g (s)	3.4	21.0	21.0	10.7	28.3	28.3	13.3	13.3	13.3	13.3	13.3	13.3	
Actuated g/C Ratio	0.06	0.37	0.37	0.19	0.50	0.50	0.23	0.23	0.23	0.23	0.23	0.23	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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	3.0	
Lane Grp Cap (vph)	106	686	583	332	925	786	245	435	369	170	435	369	
v/s Ratio Prot	0.04	c0.31		c0.16	0.15		0.16			0.11			
v/s Ratio Perm			0.09			0.01	0.04		0.27	0.04		0.01	
v/c Ratio	0.66	0.84	0.09	0.84	0.30	0.01	0.15	0.66	0.42	0.19	0.46	0.01	
Uniform Delay, d1	26.2	16.5	11.7	22.3	8.5	7.3	17.4	19.8	18.6	17.5	18.8	16.8	
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	14.4	9.2	0.1	17.1	0.2	0.0	0.3	3.8	0.8	0.5	0.8	0.0	
Delay (s)	40.6	25.7	11.8	39.5	8.7	7.3	17.7	23.6	19.3	18.1	19.5	16.8	
Level of Service	D	C	B	D	A	A	B	C	B	B	B	B	
Approach Delay (s)	24.6			23.7			20.9			19.2			
Approach LOS	C			C			C			B			
Intersection Summary													
HCM Average Control Delay	22.6			HCM Level of Service					C				
HCM Volume to Capacity ratio	0.94												
Actuated Cycle Length (s)	57.0			Sum of lost time (s)					12.0				
Intersection Capacity Utilization	72.9%			ICU Level of Service					C				
Analysis Period (min)	15												
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2035 PM Without Project
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.19	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	345	1863	1863	1583
Volume (vph)	498	246	104	634	493	290
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	541	267	113	689	536	315
RTOR Reduction (vph)	0	171	0	0	0	192
Lane Group Flow (vph)	541	96	113	689	536	123
Turn Type	Perm		pm+pt		Perm	
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	18.1	18.1	24.5	24.5	17.6	17.6
Effective Green, g (s)	18.1	18.1	24.5	24.5	17.6	17.6
Actuated g/C Ratio	0.36	0.36	0.48	0.48	0.35	0.35
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	633	566	249	902	648	551
v/s Ratio Prot	c0.31		0.03	c0.37	0.29	
v/s Ratio Perm		0.17	0.19			0.20
v/c Ratio	0.85	0.17	0.45	0.76	0.83	0.22
Uniform Delay, d1	15.0	11.1	9.4	10.7	15.1	11.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.9	0.1	1.3	3.9	8.5	0.2
Delay (s)	25.9	11.2	10.7	14.6	23.6	11.9
Level of Service	C	B	B	B	C	B
Approach Delay (s)	21.1			14.0	19.3	
Approach LOS	C			B	B	
Intersection Summary						
HCM Average Control Delay	18.2		HCM Level of Service			B
HCM Volume to Capacity ratio	0.80					
Actuated Cycle Length (s)	50.6		Sum of lost time (s)			8.0
Intersection Capacity Utilization	69.3%		ICU Level of Service			C
Analysis Period (min)	15					
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2035 PM Without Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔		↔	↔	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.98	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	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00		0.95	1.00	0.95	1.00	0.95	1.00		
Satd. Flow (prot)		1795	1583		1778	1583	1770	3539	1549	1770	3524	
Flt Permitted		0.38	1.00		0.67	1.00	0.06	1.00	1.00	0.06	1.00	
Satd. Flow (perm)		707	1583		1253	1583	116	3539	1549	110	3524	
Volume (vph)	59	19	71	412	20	123	60	1397	264	98	1717	44
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)	64	21	77	448	22	134	65	1518	287	107	1866	48
RTOR Reduction (vph)	0	0	46	0	0	39	0	0	144	0	1	0
Lane Group Flow (vph)	0	85	31	0	470	95	65	1518	143	107	1913	0
Confl. Peds. (#/hr)							2		2		2	
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)		46.0	46.0		46.0	46.0	67.4	64.2	64.2	75.0	68.0	
Effective Green, g (s)		46.0	46.0		46.0	46.0	67.4	64.2	64.2	75.0	68.0	
Actuated g/C Ratio		0.36	0.36		0.36	0.36	0.52	0.50	0.50	0.58	0.53	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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)		252	564		446	564	101	1759	770	154	1855	
v/s Ratio Prot							0.02	0.43		c0.04	c0.54	
v/s Ratio Perm		0.12	0.05		c0.37	0.08	0.32		0.19	0.37		
v/c Ratio		0.34	0.06		1.05	0.17	0.64	0.86	0.19	0.69	1.03	
Uniform Delay, d1		30.4	27.3		41.6	28.5	63.8	28.6	18.0	25.6	30.6	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.8	0.0		57.5	0.1	13.2	4.7	0.1	12.8	29.3	
Delay (s)		31.2	27.4		99.1	28.6	77.0	33.3	18.1	38.4	59.9	
Level of Service		C	C		F	C	E	C	B	D	E	
Approach Delay (s)		29.4			83.5			32.5			58.8	
Approach LOS		C			F			C			E	
Intersection Summary												
HCM Average Control Delay		50.4			HCM Level of Service				D			
HCM Volume to Capacity ratio		1.04										
Actuated Cycle Length (s)		129.2			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		92.7%			ICU Level of Service			F				
Analysis Period (min)		15										

c Critical Lane Group

Appendix M – Intersection Operations Analysis Worksheets for 2035 Without
Project Conditions, with Mitigation Measures

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

2035 AM Without Project+Mit
7/25/2012

	↖	↗	↖	↗	↖	↗
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↖	↗	↖	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.18	1.00
Satd. Flow (perm)	1770	1583	3539	1583	327	3539
Volume (vph)	480	310	941	109	188	766
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	522	337	1023	118	204	833
RTOR Reduction (vph)	0	134	0	76	0	0
Lane Group Flow (vph)	522	203	1023	42	204	833
Turn Type	Perm		Perm pm+pt			
Protected Phases	8		2		1 6	
Permitted Phases	8		2		6	
Actuated Green, G (s)	17.7	17.7	18.8	18.8	26.8	26.8
Effective Green, g (s)	17.7	17.7	18.8	18.8	26.8	26.8
Actuated g/C Ratio	0.34	0.34	0.36	0.36	0.51	0.51
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	597	534	1267	567	277	1807
v/s Ratio Prot	c0.29		0.29		c0.06 0.24	
v/s Ratio Perm	0.21		0.07		c0.32	
v/c Ratio	0.87	0.38	0.81	0.07	0.74	0.46
Uniform Delay, d1	16.4	13.2	15.2	11.1	9.7	8.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	13.4	0.5	3.9	0.1	9.8	0.2
Delay (s)	29.8	13.7	19.1	11.2	19.4	8.4
Level of Service	C B		B B		B A	
Approach Delay (s)	23.5		18.3		10.6	
Approach LOS	C		B		B	
Intersection Summary						
HCM Average Control Delay			17.1		HCM Level of Service B	
HCM Volume to Capacity ratio			0.77			
Actuated Cycle Length (s)			52.5		Sum of lost time (s) 8.0	
Intersection Capacity Utilization			73.0%		ICU Level of Service D	
Analysis Period (min)			15			
c Critical Lane Group						

AM (2035nP)	Thu Jul 26, 2012 10:21:12	Page 3-1
JB23054 - Kaloko Makai Kona, Hawaii 2035 Without Project Conditions		
Level Of Service Computation Report 2000 HCM Unsignalized Method (Future Volume Alternative)		
Intersection #2 Queen Kaahumanu Hwy. @ Hulikoa Dr.		
Average Delay (sec/veh): 0.0 Worst Case Level Of Service: A[7.2]		
Approach:	North Bound	South Bound
Movement:	L - T - R	L - T - R
Control:	Uncontrolled	Uncontrolled
Rights:	Include	Include
Lanes:	0 0 2 0 1	0 1 1 0 0
Volume Module:		
Base Vol:	0 590 218	0 835 0
Growth Adj:	1.00 1.00 1.00	1.00 1.00 1.00
Initial Bse:	0 590 218	0 835 0
Added Vol:	0 363 61	20 371 0
PasserByVol:	0 0 20	-20 62 0
Initial Fut:	0 953 299	0 1268 0
User Adj:	1.00 1.00 1.00	1.00 1.00 1.00
PHF Adj:	1.00 1.00 1.00	1.00 1.00 1.00
PHF Volume:	0 953 299	0 1268 0
Reduct Vol:	0 0 0	0 0 0
FinalVolume:	0 953 299	0 1268 0
Critical Gap Module:		
Critical Gp:	xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	6.8 6.5 6.9
FollowUpTim:	xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	3.5 4.0 3.3
Capacity Module:		
Cnflct Vol:	xxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	1587 2221 477
Potent Cap.:	xxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	101 44 540
Move Cap.:	xxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	101 44 540
Volume/Cap:	xxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	0.00 0.00 0.00
Level Of Service Module:		
2Way95thQ:	xxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	xxxx xxxxx xxxxx
Control Del:	xxxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	xxxxxx xxxxx xxxxx
LOS by Move:	* * *	* * *
Movement:	LT - LTR - RT	LT - LTR - RT
Shared Cap.:	xxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	xxxx 0 xxxxx
SharedQueue:	xxxxxx xxxxx xxxxx 0.0 xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	xxxxxx xxxxx xxxxx
Shrd ConDel:	xxxxxx xxxxx xxxxx 7.2 xxxxx xxxxx xxxxx xxxxx xxxxx	xxxxxx xxxxx xxxxx
Shared LOS:	* * *	* * *
ApproachDel:	xxxxxx xxxxx xxxxx	xxxxxx
ApproachLOS:	*	*
Note: Queue reported is the number of cars per lane.		

Traffic 8.0.0715 (c) 2008 Dowling Assoc. Licensed to KOA CORP, MONTEREY PK

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2035 AM Without Project+Mit
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Frpb, ped/bikes	1.00	0.98	1.00	0.98	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1553	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1553	3433	3539
Volume (vph)	275	231	862	433	308	1041
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	299	251	937	471	335	1132
RTOR Reduction (vph)	0	0	0	287	0	0
Lane Group Flow (vph)	299	251	937	184	335	1132
Confl. Peds. (#/hr)	14			8		8
Turn Type	Free		Perm	Prot		
Protected Phases	8		2		1	6
Permitted Phases	Free			2		
Actuated Green, G (s)	10.1	50.2	19.6	19.6	8.5	32.1
Effective Green, g (s)	10.1	50.2	19.6	19.6	8.5	32.1
Actuated g/C Ratio	0.20	1.00	0.39	0.39	0.17	0.64
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	691	1558	1382	606	581	2263
v/s Ratio Prot	c0.09		0.26		0.10	c0.32
v/s Ratio Perm		0.16		0.30		
v/c Ratio	0.43	0.16	0.68	0.30	0.58	0.50
Uniform Delay, d1	17.5	0.0	12.7	10.6	19.2	4.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.2	1.3	0.3	1.4	0.2
Delay (s)	18.0	0.2	14.0	10.9	20.6	5.0
Level of Service	B	A	B	B	C	A
Approach Delay (s)	9.9		13.0		8.5	
Approach LOS	A		B		A	
Intersection Summary						
HCM Average Control Delay		10.6		HCM Level of Service		B
HCM Volume to Capacity ratio		0.64				
Actuated Cycle Length (s)		50.2		Sum of lost time (s)		12.0
Intersection Capacity Utilization		52.5%		ICU Level of Service		A
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kanalani Street

2035 AM Without Project+Mit
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	249	363	29	301	225	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	271	395	32	327	245	20
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			667		499	273
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			667		499	273
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		49	97
cM capacity (veh/h)			917		483	724
Direction, Lane #						
	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	271	395	141	218	264	
Volume Left	0	0	32	0	245	
Volume Right	0	395	0	0	20	
cSH	1700	1700	917	1700	521	
Volume to Capacity	0.16	0.23	0.03	0.13	0.51	
Queue Length (ft)	0	0	3	0	71	
Control Delay (s)	0.0	0.0	2.3	0.0	19.2	
Lane LOS			A		C	
Approach Delay (s)	0.0		0.9		19.2	
Approach LOS					C	
Intersection Summary						
Average Delay			4.2			
Intersection Capacity Utilization		44.7%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2035 AM Without Project+Mit
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↑	↑	↑	↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	3433	1583
Flt Permitted	1.00	1.00	0.67	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1253	1863	3433	1583
Volume (vph)	121	133	224	218	121	81
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	132	145	243	237	132	88
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	132	145	243	237	132	88
Turn Type	Free		Perm		Free	
Protected Phases	4		8		2	
Permitted Phases	Free		8		Free	
Actuated Green, G (s)	6.9	17.9	6.9	6.9	3.0	17.9
Effective Green, g (s)	6.9	17.9	6.9	6.9	3.0	17.9
Actuated g/C Ratio	0.39	1.00	0.39	0.39	0.17	1.00
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	718	1583	483	718	575	1583
v/s Ratio Prot	0.07			0.13	c0.04	
v/s Ratio Perm		0.09	c0.19			0.06
v/c Ratio	0.18	0.09	0.50	0.33	0.23	0.06
Uniform Delay, d1	3.6	0.0	4.2	3.9	6.4	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.1	0.8	0.3	0.2	0.1
Delay (s)	3.8	0.1	5.0	4.1	6.7	0.1
Level of Service	A	A	A	A	A	A
Approach Delay (s)	1.9			4.6	4.0	
Approach LOS	A			A	A	
Intersection Summary						
HCM Average Control Delay			3.7		HCM Level of Service	A
HCM Volume to Capacity ratio			0.42			
Actuated Cycle Length (s)			17.9		Sum of lost time (s)	8.0
Intersection Capacity Utilization			32.2%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokaloale Hwy.

2035 AM Without Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	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	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.30	1.00	1.00	0.67	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	564	1863	1583	1253	1863	1583
Volume (vph)	13	155	26	420	411	25	129	121	141	9	334	65
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)	14	168	28	457	447	27	140	132	153	10	363	71
RTOR Reduction (vph)	0	0	23	0	0	12	0	0	117	0	0	54
Lane Group Flow (vph)	14	168	5	457	447	15	140	132	36	10	363	17
Turn Type	Prot		Perm		Prot		Perm		Perm		Perm	
Protected Phases	7		4		3		8		2		6	
Permitted Phases	4		8		2		8		2		6	
Actuated Green, G (s)	0.6	10.2	10.2	20.5	30.1	30.1	13.2	13.2	13.2	13.2	13.2	13.2
Effective Green, g (s)	0.6	10.2	10.2	20.5	30.1	30.1	13.2	13.2	13.2	13.2	13.2	13.2
Actuated g/C Ratio	0.01	0.18	0.18	0.37	0.54	0.54	0.24	0.24	0.24	0.24	0.24	0.24
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	3.0
Lane Grp Cap (vph)	19	340	289	649	1003	852	133	440	374	296	440	374
v/s Ratio Prot	0.01	0.09		c0.26	c0.24			0.07			0.19	
v/s Ratio Perm			0.02			0.02	c0.25		0.10	0.01		0.04
v/c Ratio	0.74	0.49	0.02	0.70	0.45	0.02	1.05	0.30	0.10	0.03	0.82	0.04
Uniform Delay, d1	27.6	20.5	18.7	15.1	7.8	6.0	21.4	17.6	16.7	16.4	20.3	16.5
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	88.4	1.1	0.0	3.5	0.3	0.0	92.8	0.4	0.1	0.0	11.9	0.0
Delay (s)	116.0	21.7	18.8	18.6	8.2	6.0	114.1	17.9	16.8	16.5	32.2	16.5
Level of Service	F	C	B	B	A	A	F	B	B	B	C	B
Approach Delay (s)	27.6			13.2			49.2		29.3			
Approach LOS	C			B			D		C			
Intersection Summary												
HCM Average Control Delay			25.9				HCM Level of Service		C			
HCM Volume to Capacity ratio			0.71									
Actuated Cycle Length (s)			55.9				Sum of lost time (s)		8.0			
Intersection Capacity Utilization			69.5%				ICU Level of Service		C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2035 AM Without Project+Mit
7/25/2012

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.07	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	122	1863	1863	1583
Volume (vph)	187	103	150	291	1078	501
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	203	112	163	316	1172	545
RTOR Reduction (vph)	0	94	0	0	0	89
Lane Group Flow (vph)	203	18	163	316	1172	456
Turn Type	Perm		pm+pt			Perm
Protected Phases	4		5	2		6
Permitted Phases	4		2			6
Actuated Green, G (s)	13.8	13.8	66.1	66.1	57.1	57.1
Effective Green, g (s)	13.8	13.8	66.1	66.1	57.1	57.1
Actuated g/C Ratio	0.16	0.16	0.75	0.75	0.65	0.65
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	278	249	185	1401	1210	1028
v/s Ratio Prot	c0.11		c0.05		c0.63	
v/s Ratio Perm	0.07		0.61		0.34	
v/c Ratio	0.73	0.07	0.88	0.23	0.97	0.44
Uniform Delay, d1	35.3	31.6	27.6	3.3	14.6	7.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	9.5	0.1	35.2	0.1	18.6	0.3
Delay (s)	44.7	31.7	62.8	3.3	33.1	7.9
Level of Service	D	C	E	A	C	A
Approach Delay (s)	40.1		23.6		25.1	
Approach LOS	D		C		C	
Intersection Summary						
HCM Average Control Delay			26.7		HCM Level of Service	
HCM Volume to Capacity ratio			0.92		C	
Actuated Cycle Length (s)			87.9		Sum of lost time (s)	
Intersection Capacity Utilization			85.4%		12.0	
ICU Level of Service			E			
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2035 AM Without Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕	↕	↕	↕↕	↕	↕	↕↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.98	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	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	0.99	
Flt Protected		0.97	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1800	1583		1779	1583	1770	3539	1548	1770	3511	
Flt Permitted		0.77	1.00		0.72	1.00	0.19	1.00	1.00	0.14	1.00	
Satd. Flow (perm)		1443	1583		1342	1583	357	3539	1548	252	3511	
Volume (vph)	17	7	24	270	18	152	68	1201	441	199	969	48
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)	18	8	26	293	20	165	74	1305	479	216	1053	52
RTOR Reduction (vph)	0	0	19	0	0	120	0	0	271	0	6	0
Lane Group Flow (vph)	0	26	7	0	313	45	74	1305	208	216	1099	0
Confl. Peds. (#/hr)							2	2		2	2	
Turn Type	Perm		Perm	Perm	Perm pm+pt			Perm pm+pt		Perm pm+pt		
Protected Phases	4		8		5			2		1		6
Permitted Phases	4		8		8			2		2		6
Actuated Green, G (s)	15.8		15.8		15.8		15.8	28.2	25.9	25.9	35.6	29.6
Effective Green, g (s)	15.8		15.8		15.8		15.8	28.2	25.9	25.9	35.6	29.6
Actuated g/C Ratio	0.26		0.26		0.26		0.26	0.43	0.43	0.43	0.60	0.50
Clearance Time (s)	4.0		4.0		4.0		4.0	4.0	4.0	4.0	4.0	4.0
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)	382		419		355		419	223	1535	672	303	1741
v/s Ratio Prot								0.01	c0.37	c0.07		0.31
v/s Ratio Perm	0.02		0.02		c0.23		0.10	0.14	0.31		0.35	
v/c Ratio	0.07		0.02		0.88		0.11	0.33	0.85	0.31	0.71	0.63
Uniform Delay, d1	16.4		16.2		21.1		16.6	9.1	15.2	11.1	10.3	11.0
Progression Factor	1.00		1.00		1.00		1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1		0.0		21.7		0.1	0.9	4.7	0.3	7.7	0.8
Delay (s)	16.5		16.2		42.7		16.7	10.0	19.9	11.3	18.0	11.8
Level of Service	B		B		D		B	A	B	B	B	B
Approach Delay (s)	16.4				33.8				17.3			12.8
Approach LOS	B				C				B			B
Intersection Summary												
HCM Average Control Delay			17.8		HCM Level of Service				B			
HCM Volume to Capacity ratio			0.92									
Actuated Cycle Length (s)			59.7		Sum of lost time (s)				16.0			
Intersection Capacity Utilization			76.8%		ICU Level of Service				D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

2035 PM Without Project+Mit
7/25/2012

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.15	1.00
Satd. Flow (perm)	1770	1583	3539	1583	281	3539
Volume (vph)	180	303	1038	387	363	1131
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	329	1128	421	395	1229
RTOR Reduction (vph)	0	264	0	257	0	0
Lane Group Flow (vph)	196	65	1128	164	395	1229
Turn Type	Perm		Perm pm+pt			
Protected Phases	8		2		1	
Permitted Phases	8		2		6	
Actuated Green, G (s)	11.5	11.5	22.5	22.5	38.4	38.4
Effective Green, g (s)	11.5	11.5	22.5	22.5	38.4	38.4
Actuated g/C Ratio	0.20	0.20	0.39	0.39	0.66	0.66
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	352	314	1375	615	492	2347
v/s Ratio Prot	0.11		0.32		c0.16	0.35
v/s Ratio Perm		0.21		0.27	c0.37	
v/c Ratio	0.56	0.21	0.82	0.27	0.80	0.52
Uniform Delay, d1	20.9	19.4	15.9	12.1	12.3	5.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9	0.3	4.1	0.2	9.2	0.2
Delay (s)	22.8	19.7	19.9	12.3	21.4	5.2
Level of Service	C	B	B	B	C	A
Approach Delay (s)	20.9		17.9			9.2
Approach LOS	C		B			A
Intersection Summary						
HCM Average Control Delay			14.5	HCM Level of Service		B
HCM Volume to Capacity ratio			0.84			
Actuated Cycle Length (s)			57.9	Sum of lost time (s)		8.0
Intersection Capacity Utilization			68.8%	ICU Level of Service		C
Analysis Period (min)	15					
c Critical Lane Group						

PM (2035nP)	Thu Jul 26, 2012 10:21:50	Page 3-1
JB23054 - Kaloko Makai Kona, Hawaii 2035 Without Project Conditions		
Level Of Service Computation Report 2000 HCM Unsignalized Method (Future Volume Alternative)		
Intersection #2 Queen Kaahumanu Hwy. @ Hulikoa Dr.		
Average Delay (sec/veh): 0.0 Worst Case Level Of Service: A[7.2]		
Approach:	North Bound	South Bound
Movement:	L - T - R	L - T - R
Control:	Uncontrolled	Uncontrolled
Rights:	Include	Include
Lanes:	0 0 2 0 1	0 1 1 0 0
Volume Module:		
Base Vol:	0 719 122	0 1068 0
Growth Adj:	1.00 1.00 1.00	1.00 1.00 1.00
Initial Bse:	0 719 122	0 1068 0
Added Vol:	0 523 39	13 495 0
PasserByVol:	0 0 13	-13 58 0
Initial Fut:	0 1242 174	0 1621 0
User Adj:	1.00 1.00 1.00	1.00 1.00 1.00
PHF Adj:	1.00 1.00 1.00	1.00 1.00 1.00
PHF Volume:	0 1242 174	0 1621 0
Reduct Vol:	0 0 0	0 0 0
FinalVolume:	0 1242 174	0 1621 0
Critical Gap Module:		
Critical Gp:	xxxx xxxx xxxx	xxxx xxxx xxxx
FollowUpTim:	xxxx xxxx xxxx	xxxx xxxx xxxx
Capacity Module:		
Cnflct Vol:	xxxx xxxx xxxx	xxxx xxxx xxxx
Potent Cap.:	xxxx xxxx xxxx	xxxx xxxx xxxx
Move Cap.:	xxxx xxxx xxxx	xxxx xxxx xxxx
Volume/Cap:	xxxx xxxx xxxx	xxxx xxxx xxxx
Level Of Service Module:		
2Way95thQ:	xxxx xxxx xxxx	xxxx xxxx xxxx
Control Del:	xxxx xxxx xxxx	xxxx xxxx xxxx
LOS by Move:	*	*
Movement:	LT - LTR - RT	LT - LTR - RT
Shared Cap.:	xxxx xxxx xxxx	xxxx xxxx xxxx
SharedQueue:	xxxx xxxx xxxx	xxxx xxxx xxxx
Shrd ConDel:	xxxx xxxx xxxx	xxxx xxxx xxxx
Shared LOS:	*	*
ApproachDel:	xxxxxx	xxxxxx
ApproachLOS:	*	*
Note: Queue reported is the number of cars per lane.		

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HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2035 PM Without Project+Mit
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Frpb, ped/bikes	1.00	0.98	1.00	0.98	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1551	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1551	3433	3539
Volume (vph)	544	333	1088	594	312	1216
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	591	362	1183	646	339	1322
RTOR Reduction (vph)	0	0	0	385	0	0
Lane Group Flow (vph)	591	362	1183	261	339	1322
Confl. Peds. (#/hr)	14			8	8	
Turn Type	Free		Perm	Prot		
Protected Phases	8		2		1	6
Permitted Phases	Free			2		
Actuated Green, G (s)	13.9	56.7	22.9	22.9	7.9	34.8
Effective Green, g (s)	13.9	56.7	22.9	22.9	7.9	34.8
Actuated g/C Ratio	0.25	1.00	0.40	0.40	0.14	0.61
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	842	1558	1429	626	478	2172
v/s Ratio Prot	c0.17		0.33		0.10	c0.37
v/s Ratio Perm		0.23		0.42		
v/c Ratio	0.70	0.23	0.83	0.42	0.71	0.61
Uniform Delay, d1	19.5	0.0	15.1	12.1	23.3	6.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.7	0.3	4.1	0.5	4.8	0.5
Delay (s)	22.2	0.3	19.2	12.6	28.1	7.2
Level of Service	C	A	B	B	C	A
Approach Delay (s)	13.9		16.9		11.5	
Approach LOS	B		B		B	
Intersection Summary						
HCM Average Control Delay		14.2			HCM Level of Service	B
HCM Volume to Capacity ratio		0.87				
Actuated Cycle Length (s)		56.7			Sum of lost time (s)	12.0
Intersection Capacity Utilization		64.5%			ICU Level of Service	C
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kanalani Street

2035 PM Without Project+Mit
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	297	489	17	589	200	74
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	323	532	18	640	217	80
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			856		682	325
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			856		682	325
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		42	88
cM capacity (veh/h)			778		374	670
Direction, Lane #						
	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	323	532	232	427	298	
Volume Left	0	0	18	0	217	
Volume Right	0	532	0	0	80	
cSH	1700	1700	778	1700	512	
Volume to Capacity	0.19	0.31	0.02	0.25	0.58	
Queue Length (ft)	0	0	2	0	92	
Control Delay (s)	0.0	0.0	1.0	0.0	22.8	
Lane LOS			A		C	
Approach Delay (s)	0.0		0.4		22.8	
Approach LOS					C	
Intersection Summary						
Average Delay			3.9			
Intersection Capacity Utilization		53.9%			ICU Level of Service	A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2035 PM Without Project+Mit
7/25/2012

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations					 	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	3433	1583
Flt Permitted	1.00	1.00	0.61	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1139	1863	3433	1583
Volume (vph)	218	105	133	167	415	347
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	237	114	145	182	451	377
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	237	114	145	182	451	377
Turn Type	Free		Perm		Free	
Protected Phases	4		8		2	
Permitted Phases	Free		8		Free	
Actuated Green, G (s)	7.1	22.2	7.1	7.1	7.1	22.2
Effective Green, g (s)	7.1	22.2	7.1	7.1	7.1	22.2
Actuated g/C Ratio	0.32	1.00	0.32	0.32	0.32	1.00
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	596	1583	364	596	1098	1583
v/s Ratio Prot	0.13			0.10	c0.13	
v/s Ratio Perm		0.07	c0.13			0.24
v/c Ratio	0.40	0.07	0.40	0.31	0.41	0.24
Uniform Delay, d1	5.9	0.0	5.9	5.7	5.9	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.1	0.7	0.3	0.3	0.4
Delay (s)	6.3	0.1	6.6	6.0	6.2	0.4
Level of Service	A	A	A	A	A	A
Approach Delay (s)	4.3			6.3	3.5	
Approach LOS	A			A	A	
Intersection Summary						
HCM Average Control Delay			4.3	HCM Level of Service		A
HCM Volume to Capacity ratio			0.40			
Actuated Cycle Length (s)			22.2	Sum of lost time (s)		8.0
Intersection Capacity Utilization			40.7%	ICU Level of Service		A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokalole Hwy.

2035 PM Without Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	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	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.56	1.00	1.00	0.39	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1048	1863	1583	730	1863	1583
Volume (vph)	64	532	127	257	252	17	34	266	398	29	184	17
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)	70	578	138	279	274	18	37	289	433	32	200	18
RTOR Reduction (vph)	0	0	87	0	0	9	0	0	279	0	0	14
Lane Group Flow (vph)	70	578	51	279	274	9	37	289	154	32	200	4
Turn Type	Prot	Perm		Prot	Perm		Perm	Perm		Perm	Perm	
Protected Phases	7	4	3		8	2		6		6		
Permitted Phases	4		8		2		2		6		6	
Actuated Green, G (s)	3.4	21.0	21.0	10.7	28.3	28.3	13.3	13.3	13.3	13.3	13.3	13.3
Effective Green, g (s)	3.4	21.0	21.0	10.7	28.3	28.3	13.3	13.3	13.3	13.3	13.3	13.3
Actuated g/C Ratio	0.06	0.37	0.37	0.19	0.50	0.50	0.23	0.23	0.23	0.23	0.23	0.23
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	3.0
Lane Grp Cap (vph)	106	686	583	332	925	786	245	435	369	170	435	369
v/s Ratio Prot	0.04	c0.31	c0.16		0.15	0.16		0.11		0.11		
v/s Ratio Perm	0.09		0.01		0.04	0.27		0.04	0.01			
v/c Ratio	0.66	0.84	0.09	0.84	0.30	0.01	0.15	0.66	0.42	0.19	0.46	0.01
Uniform Delay, d1	26.2	16.5	11.7	22.3	8.5	7.3	17.4	19.8	18.6	17.5	18.8	16.8
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	14.4	9.2	0.1	17.1	0.2	0.0	0.3	3.8	0.8	0.5	0.8	0.0
Delay (s)	40.6	25.7	11.8	39.5	8.7	7.3	17.7	23.6	19.3	18.1	19.5	16.8
Level of Service	D	C	B	D	A	A	B	C	B	B	B	B
Approach Delay (s)	24.6		23.7		20.9		19.2					
Approach LOS	C		C		C		B					
Intersection Summary												
HCM Average Control Delay			22.6		HCM Level of Service				C			
HCM Volume to Capacity ratio			0.94									
Actuated Cycle Length (s)			57.0		Sum of lost time (s)				12.0			
Intersection Capacity Utilization			72.9%		ICU Level of Service				C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2035 PM Without Project+Mit
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.19	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	345	1863	1863	1583
Volume (vph)	498	246	104	634	493	290
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	541	267	113	689	536	315
RTOR Reduction (vph)	0	171	0	0	0	192
Lane Group Flow (vph)	541	96	113	689	536	123
Turn Type	Perm pm+pt			Perm		
Protected Phases	4			5		
Permitted Phases	4			2		
Actuated Green, G (s)	18.1	18.1	24.5	24.5	17.6	17.6
Effective Green, g (s)	18.1	18.1	24.5	24.5	17.6	17.6
Actuated g/C Ratio	0.36	0.36	0.48	0.48	0.35	0.35
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	633	566	249	902	648	551
v/s Ratio Prot	c0.31		0.03	c0.37	0.29	
v/s Ratio Perm		0.17	0.19			0.20
v/c Ratio	0.85	0.17	0.45	0.76	0.83	0.22
Uniform Delay, d1	15.0	11.1	9.4	10.7	15.1	11.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.9	0.1	1.3	3.9	8.5	0.2
Delay (s)	25.9	11.2	10.7	14.6	23.6	11.9
Level of Service	C	B	B	B	C	B
Approach Delay (s)	21.1		14.0		19.3	
Approach LOS	C		B		B	
Intersection Summary						
HCM Average Control Delay			18.2		HCM Level of Service	
HCM Volume to Capacity ratio			0.80		B	
Actuated Cycle Length (s)			50.6		Sum of lost time (s)	
Intersection Capacity Utilization			69.3%		8.0	
ICU Level of Service			C			
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2035 PM Without Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕	↕	↕	↕↕	↕	↕	↕↕	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.98	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	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	1.00
Flt Protected		0.96	1.00		0.95	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1795	1583		1778	1583	1770	3539	1549	1770	3524	
Flt Permitted		0.38	1.00		0.67	1.00	0.06	1.00	1.00	0.06	1.00	
Satd. Flow (perm)		707	1583		1253	1583	116	3539	1549	110	3524	
Volume (vph)	59	19	71	412	20	123	60	1397	264	98	1717	44
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)	64	21	77	448	22	134	65	1518	287	107	1866	48
RTOR Reduction (vph)	0	0	46	0	0	39	0	0	144	0	1	0
Lane Group Flow (vph)	0	85	31	0	470	95	65	1518	143	107	1913	0
Confl. Peds. (#/hr)	2						2		2		2	
Turn Type	Perm		Perm		Perm		pm+pt		Perm		pm+pt	
Protected Phases	4		8		8		5		2		1	
Permitted Phases	4		8		8		2		2		6	
Actuated Green, G (s)	46.0	46.0		46.0	46.0	67.4	64.2	64.2	75.0	68.0		
Effective Green, g (s)	46.0	46.0		46.0	46.0	67.4	64.2	64.2	75.0	68.0		
Actuated g/C Ratio	0.36	0.36		0.36	0.36	0.52	0.50	0.50	0.58	0.53		
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0		
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)	252	564		446	564	101	1759	770	154	1855		
v/s Ratio Prot							0.02	0.43		c0.04	c0.54	
v/s Ratio Perm	0.12	0.05		c0.37	0.08	0.32		0.19	0.37			
v/c Ratio	0.34	0.06		1.05	0.17	0.64	0.86	0.19	0.69	1.03		
Uniform Delay, d1	30.4	27.3		41.6	28.5	63.8	28.6	18.0	25.6	30.6		
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Incremental Delay, d2	0.8	0.0		57.5	0.1	13.2	4.7	0.1	12.8	29.3		
Delay (s)	31.2	27.4		99.1	28.6	77.0	33.3	18.1	38.4	59.9		
Level of Service	C	C		F	C	E	C	B	D	E		
Approach Delay (s)	29.4			83.5			32.5			58.8		
Approach LOS	C			F			C			E		
Intersection Summary												
HCM Average Control Delay	50.4			HCM Level of Service					D			
HCM Volume to Capacity ratio	1.04											
Actuated Cycle Length (s)	129.2			Sum of lost time (s)					12.0			
Intersection Capacity Utilization	92.7%			ICU Level of Service					F			
Analysis Period (min)	15											
c Critical Lane Group												

Appendix N - Intersection Operations Analysis Worksheets for 2045 Without Project Conditions, with Existing Geometry and Planned Improvements

**HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway**

2045 AM Without Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.14	1.00
Satd. Flow (perm)	1770	1583	3539	1583	264	3539
Volume (vph)	480	310	1104	109	188	875
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	522	337	1200	118	204	951
RTOR Reduction (vph)	0	128	0	72	0	0
Lane Group Flow (vph)	522	209	1200	46	204	951
Turn Type	Perm		Perm		pm+pt	
Protected Phases	8		2		1	
Permitted Phases	8		2		6	
Actuated Green, G (s)	20.4	20.4	24.2	24.2	33.3	33.3
Effective Green, g (s)	20.4	20.4	24.2	24.2	33.3	33.3
Actuated g/C Ratio	0.33	0.33	0.39	0.39	0.54	0.54
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	585	523	1388	621	267	1910
v/s Ratio Prot	c0.29		c0.34		c0.06	
v/s Ratio Perm	0.21		0.07		0.35	
v/c Ratio	0.89	0.40	0.86	0.07	0.76	0.50
Uniform Delay, d1	19.6	15.9	17.2	11.7	11.6	8.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	15.8	0.5	5.9	0.1	12.2	0.2
Delay (s)	35.4	16.4	23.1	11.8	23.9	9.1
Level of Service	D		C		A	
Approach Delay (s)	28.0		22.1		11.7	
Approach LOS	C		C		B	
Intersection Summary						
HCM Average Control Delay			20.0		HCM Level of Service	
HCM Volume to Capacity ratio			0.87		C	
Actuated Cycle Length (s)			61.7		Sum of lost time (s)	
Intersection Capacity Utilization			77.5%		12.0	
ICU Level of Service			D			
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
2: Hulioa Drive & Queen Kaahumanu Highway

2045 AM Without Project
7/25/2012

							
Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Sign Control	Yield		Free			Free	
Grade	0%		0%			0%	
Volume (veh/h)	0	247	1116	299	0	1377	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	0	268	1213	325	0	1497	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	TWLTL						
Median storage (veh)	5						
Upstream signal (ft)							
pX, platoon unblocked							
vC, conflicting volume	1961	607			1213		
vC1, stage 1 conf vol	1213						
vC2, stage 2 conf vol	748						
vCu, unblocked vol	1961	607			1213		
tC, single (s)	6.8	6.9			4.1		
tC, 2 stage (s)	5.8						
tF (s)	3.5	3.3			2.2		
p0 queue free %	100	39			100		
cM capacity (veh/h)	241	440			571		
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	
Volume Total	268	607	607	325	748	748	
Volume Left	0	0	0	0	0	0	
Volume Right	268	0	0	325	0	0	
cSH	440	1700	1700	1700	1700	1700	
Volume to Capacity	0.61	0.36	0.36	0.19	0.44	0.44	
Queue Length (ft)	99	0	0	0	0	0	
Control Delay (s)	25.2	0.0	0.0	0.0	0.0	0.0	
Lane LOS	D						
Approach Delay (s)	25.2	0.0			0.0		
Approach LOS	D						
Intersection Summary							
Average Delay	2.0						
Intersection Capacity Utilization	52.8%			ICU Level of Service		A	
Analysis Period (min)	15						

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2045 AM Without Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		 		 	 
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Flpb, ped/bikes	1.00	0.98	1.00	0.98	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1552	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1552	3433	3539
Volume (vph)	275	231	1025	433	308	1150
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	299	251	1114	471	335	1250
RTOR Reduction (vph)	0	0	0	274	0	0
Lane Group Flow (vph)	299	251	1114	197	335	1250
Confl. Peds. (#/hr)	14		8		8	
Turn Type	Free		Perm		Prot	
Protected Phases	8		2		1	
Permitted Phases	Free		2			
Actuated Green, G (s)	10.2	51.8	21.7	21.7	7.9	33.6
Effective Green, g (s)	10.2	51.8	21.7	21.7	7.9	33.6
Actuated g/C Ratio	0.20	1.00	0.42	0.42	0.15	0.65
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	676	1558	1483	650	524	2296
v/s Ratio Prot	c0.09		c0.31		0.10	c0.35
v/s Ratio Perm		0.16		0.30		
v/c Ratio	0.44	0.16	0.75	0.30	0.64	0.54
Uniform Delay, d1	18.3	0.0	12.8	10.0	20.6	4.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.2	2.2	0.3	2.6	0.3
Delay (s)	18.8	0.2	15.0	10.3	23.2	5.2
Level of Service	B	A	B	B	C	A
Approach Delay (s)	10.3		13.6			9.0
Approach LOS	B		B			A
Intersection Summary						
HCM Average Control Delay	11.1		HCM Level of Service		B	
HCM Volume to Capacity ratio	0.65					
Actuated Cycle Length (s)	51.8		Sum of lost time (s)		12.0	
Intersection Capacity Utilization	57.0%		ICU Level of Service		B	
Analysis Period (min)	15					
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kanalani Street

2045 AM Without Project
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↔	↔	↔	↔
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	249	363	29	301	225	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	271	395	32	327	245	20
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			667		499	273
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			667		499	273
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		49	97
cM capacity (veh/h)			917		483	724
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	271	395	141	218	264	
Volume Left	0	0	32	0	245	
Volume Right	0	395	0	0	20	
cSH	1700	1700	917	1700	521	
Volume to Capacity	0.16	0.23	0.03	0.13	0.51	
Queue Length (ft)	0	0	3	0	71	
Control Delay (s)	0.0	0.0	2.3	0.0	19.2	
Lane LOS			A		C	
Approach Delay (s)	0.0		0.9		19.2	
Approach LOS					C	
Intersection Summary						
Average Delay		4.2				
Intersection Capacity Utilization		44.7%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2045 AM Without Project
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	3433	1583
Flt Permitted	1.00	1.00	0.67	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1253	1863	3433	1583
Volume (vph)	121	133	224	218	121	81
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	132	145	243	237	132	88
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	132	145	243	237	132	88
Turn Type	Free		Perm		Free	
Protected Phases	4		8		2	
Permitted Phases	Free		8		Free	
Actuated Green, G (s)	6.9	17.9	6.9	6.9	3.0	17.9
Effective Green, g (s)	6.9	17.9	6.9	6.9	3.0	17.9
Actuated g/C Ratio	0.39	1.00	0.39	0.39	0.17	1.00
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	718	1583	483	718	575	1583
v/s Ratio Prot	0.07			0.13	c0.04	
v/s Ratio Perm		0.09	c0.19			0.06
v/c Ratio	0.18	0.09	0.50	0.33	0.23	0.06
Uniform Delay, d1	3.6	0.0	4.2	3.9	6.4	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.1	0.8	0.3	0.2	0.1
Delay (s)	3.8	0.1	5.0	4.1	6.7	0.1
Level of Service	A	A	A	A	A	A
Approach Delay (s)	1.9			4.6	4.0	
Approach LOS	A			A	A	
Intersection Summary						
HCM Average Control Delay		3.7		HCM Level of Service	A	
HCM Volume to Capacity ratio		0.42				
Actuated Cycle Length (s)		17.9		Sum of lost time (s)	8.0	
Intersection Capacity Utilization		32.2%		ICU Level of Service	A	
Analysis Period (min)		15				
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokalo Hwy.

2045 AM Without Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	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	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.28	1.00	1.00	0.65	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	520	1863	1583	1204	1863	1583
Volume (vph)	13	155	26	464	411	25	129	144	156	9	388	65
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)	14	168	28	504	447	27	140	157	170	10	422	71
RTOR Reduction (vph)	0	0	23	0	0	14	0	0	115	0	0	48
Lane Group Flow (vph)	14	168	5	504	447	13	140	157	55	10	422	23
Turn Type	Prot	Perm		Prot	Perm		Perm	Perm	Perm	Perm	Perm	
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	0.7	11.2	11.2	22.5	33.0	33.0	21.8	21.8	21.8	21.8	21.8	21.8
Effective Green, g (s)	0.7	11.2	11.2	22.5	33.0	33.0	21.8	21.8	21.8	21.8	21.8	21.8
Actuated g/C Ratio	0.01	0.17	0.17	0.33	0.49	0.49	0.32	0.32	0.32	0.32	0.32	0.32
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	3.0
Lane Grp Cap (vph)	18	309	263	590	911	774	168	602	511	389	602	511
v/s Ratio Prot	0.01	0.09		c0.28	c0.24			0.08			0.23	
v/s Ratio Perm			0.02			0.02	c0.27		0.11	0.01		0.04
v/c Ratio	0.78	0.54	0.02	0.85	0.49	0.02	0.83	0.26	0.11	0.03	0.70	0.04
Uniform Delay, d1	33.3	25.8	23.5	21.0	11.6	8.9	21.2	16.9	16.0	15.6	20.0	15.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	107.6	2.0	0.0	11.6	0.4	0.0	28.3	0.2	0.1	0.0	3.7	0.0
Delay (s)	140.9	27.8	23.6	32.5	12.0	8.9	49.5	17.1	16.1	15.6	23.7	15.7
Level of Service	F	C	C	C	B	A	D	B	B	B	C	B
Approach Delay (s)	34.7			22.5			26.5			22.4		
Approach LOS	C			C			C			C		
Intersection Summary												
HCM Average Control Delay	24.5			HCM Level of Service					C			
HCM Volume to Capacity ratio	0.74											
Actuated Cycle Length (s)	67.5			Sum of lost time (s)					8.0			
Intersection Capacity Utilization	74.8%			ICU Level of Service					D			
Analysis Period (min)	15											
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2045 AM Without Project
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.04	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	70	1863	1863	1583
Volume (vph)	202	103	150	342	1269	545
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	220	112	163	372	1379	592
RTOR Reduction (vph)	0	98	0	0	0	55
Lane Group Flow (vph)	220	14	163	372	1379	537
Turn Type	Perm		pm+pt	Perm		
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	17.0	17.0	115.0	115.0	102.0	102.0
Effective Green, g (s)	17.0	17.0	115.0	115.0	102.0	102.0
Actuated g/C Ratio	0.12	0.12	0.82	0.82	0.73	0.73
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	215	192	167	1530	1357	1153
v/s Ratio Prot	c0.12		c0.06	0.20	c0.74	
v/s Ratio Perm		0.07	0.74			0.37
v/c Ratio	1.02	0.07	0.98	0.24	1.02	0.47
Uniform Delay, d1	61.5	54.5	67.5	2.8	19.0	7.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	67.5	0.2	62.0	0.1	28.5	0.3
Delay (s)	129.0	54.7	129.5	2.9	47.5	8.1
Level of Service	F	D	F	A	D	A
Approach Delay (s)	103.9			41.4	35.7	
Approach LOS	F			D	D	
Intersection Summary						
HCM Average Control Delay	44.8		HCM Level of Service			D
HCM Volume to Capacity ratio	1.01					
Actuated Cycle Length (s)	140.0		Sum of lost time (s)			12.0
Intersection Capacity Utilization	96.3%		ICU Level of Service			F
Analysis Period (min)	15					
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2045 AM Without Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Fltpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.98	1.00	1.00	
Fltpb, ped/bikes		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		0.97	1.00		0.96	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1800	1583		1779	1583	1770	3539	1548	1770	3513	
Flt Permitted		0.77	1.00		0.72	1.00	0.14	1.00	1.00	0.12	1.00	
Satd. Flow (perm)		1440	1583		1342	1583	266	3539	1548	226	3513	
Volume (vph)	17	7	24	270	18	152	68	1364	441	199	1078	48
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)	18	8	26	293	20	165	74	1483	479	216	1172	52
RTOR Reduction (vph)	0	0	19	0	0	103	0	0	248	0	5	0
Lane Group Flow (vph)	0	26	7	0	313	62	74	1483	231	216	1219	0
Confl. Peds. (#/hr)							2	2	2			2
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)		16.4	16.4		16.4	16.4	34.1	31.0	31.0	37.9	32.9	
Effective Green, g (s)		16.4	16.4		16.4	16.4	34.1	31.0	31.0	37.9	32.9	
Actuated g/C Ratio		0.25	0.25		0.25	0.25	0.53	0.48	0.48	0.59	0.51	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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)		367	403		342	403	213	1704	745	253	1795	
v/s Ratio Prot							0.02	0.42		c0.07	0.35	
v/s Ratio Perm		0.02	0.02		c0.23	0.10	0.17		0.31	c0.44		
v/c Ratio		0.07	0.02		0.92	0.15	0.35	0.87	0.31	0.85	0.68	
Uniform Delay, d1		18.2	18.0		23.3	18.6	8.7	14.9	10.2	12.1	11.8	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.1	0.0		28.0	0.2	1.0	5.2	0.2	23.3	1.0	
Delay (s)		18.3	18.0		51.4	18.8	9.7	20.1	10.4	35.4	12.8	
Level of Service		B	B		D	B	A	C	B	D	B	
Approach Delay (s)		18.1			40.1			17.4			16.2	
Approach LOS		B			D			B			B	
Intersection Summary												
HCM Average Control Delay		19.7										
HCM Volume to Capacity ratio		0.90										
Actuated Cycle Length (s)		64.4						12.0				
Intersection Capacity Utilization		81.3%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

2045 PM Without Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.12	1.00
Satd. Flow (perm)	1770	1583	3539	1583	227	3539
Volume (vph)	180	303	1183	387	363	1312
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	329	1286	421	395	1426
RTOR Reduction (vph)	0	269	0	239	0	0
Lane Group Flow (vph)	196	60	1286	182	395	1426
Turn Type	Perm		Perm	pm+pt		
Protected Phases	8		2		1	6
Permitted Phases		8		2		6
Actuated Green, G (s)	12.1	12.1	28.8	28.8	46.7	46.7
Effective Green, g (s)	12.1	12.1	28.8	28.8	46.7	46.7
Actuated g/C Ratio	0.18	0.18	0.43	0.43	0.70	0.70
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	321	287	1526	682	480	2474
v/s Ratio Prot	0.11		0.36		c0.17	0.40
v/s Ratio Perm		0.21		0.27	c0.40	
v/c Ratio	0.61	0.21	0.84	0.27	0.82	0.58
Uniform Delay, d1	25.2	23.3	17.0	12.2	16.4	5.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.4	0.4	4.4	0.2	10.9	0.3
Delay (s)	28.6	23.6	21.4	12.4	27.3	5.4
Level of Service	C	C	C	B	C	A
Approach Delay (s)	25.5		19.2			10.1
Approach LOS	C		B			B
Intersection Summary						
HCM Average Control Delay		15.9			HCM Level of Service	B
HCM Volume to Capacity ratio		0.87				
Actuated Cycle Length (s)		66.8			Sum of lost time (s)	8.0
Intersection Capacity Utilization		72.8%			ICU Level of Service	C
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
2: Hulioa Drive & Queen Kaahumanu Highway

2045 PM Without Project
7/25/2012

	↖	↗	↖	↗	↖	↗
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↖	↖	↖	↖	↖
Sign Control	Yield		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	274	1387	174	0	1802
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	298	1508	189	0	1959
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage (veh)	5					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2487	754			1508	
vC1, stage 1 conf vol	1508					
vC2, stage 2 conf vol	979					
vCu, unblocked vol	2487	754			1508	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	15			100	
cM capacity (veh/h)	167	352			440	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	298	754	754	189	979	979
Volume Left	0	0	0	0	0	0
Volume Right	298	0	0	189	0	0
cSH	352	1700	1700	1700	1700	1700
Volume to Capacity	0.85	0.44	0.44	0.11	0.58	0.58
Queue Length (ft)	193	0	0	0	0	0
Control Delay (s)	52.1	0.0	0.0	0.0	0.0	0.0
Lane LOS	F					
Approach Delay (s)	52.1	0.0			0.0	
Approach LOS	F					
Intersection Summary						
Average Delay		3.9				
Intersection Capacity Utilization		62.0%		ICU Level of Service	B	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2045 PM Without Project
7/25/2012

	↖	↗	↖	↗	↖	↗
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↖	↖	↖	↖	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Flpb, ped/bikes	1.00	0.98	1.00	0.98	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1551	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1551	3433	3539
Volume (vph)	544	333	1233	594	312	1397
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	591	362	1340	646	339	1518
RTOR Reduction (vph)	0	0	0	369	0	0
Lane Group Flow (vph)	591	362	1340	277	339	1518
Confl. Peds. (#/hr)		14		8		8
Turn Type		Free		Perm		Prot
Protected Phases	8		2		1	6
Permitted Phases		Free		2		
Actuated Green, G (s)	14.1	58.0	24.9	24.9	7.0	35.9
Effective Green, g (s)	14.1	58.0	24.9	24.9	7.0	35.9
Actuated g/C Ratio	0.24	1.00	0.43	0.43	0.12	0.62
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	835	1558	1519	666	414	2191
v/s Ratio Prot	c0.17		0.38		0.10	c0.43
v/s Ratio Perm		0.23		0.42		
v/c Ratio	0.71	0.23	0.88	0.42	0.82	0.69
Uniform Delay, d1	20.1	0.0	15.2	11.5	24.9	7.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.8	0.3	6.4	0.4	11.9	1.0
Delay (s)	22.8	0.3	21.6	11.9	36.8	8.3
Level of Service	C	A	C	B	D	A
Approach Delay (s)	14.3		18.5			13.5
Approach LOS	B		B			B
Intersection Summary						
HCM Average Control Delay		15.7		HCM Level of Service	B	
HCM Volume to Capacity ratio		0.87				
Actuated Cycle Length (s)		58.0		Sum of lost time (s)	12.0	
Intersection Capacity Utilization		68.5%		ICU Level of Service	C	
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kanalani Street

2045 PM Without Project
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↔	↔	↔	↔
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	297	489	17	589	200	74
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	323	532	18	640	217	80
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			856		682	325
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			856		682	325
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		42	88
cM capacity (veh/h)			778		374	670
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	323	532	232	427	298	
Volume Left	0	0	18	0	217	
Volume Right	0	532	0	0	80	
cSH	1700	1700	778	1700	512	
Volume to Capacity	0.19	0.31	0.02	0.25	0.58	
Queue Length (ft)	0	0	2	0	92	
Control Delay (s)	0.0	0.0	1.0	0.0	22.8	
Lane LOS			A		C	
Approach Delay (s)	0.0		0.4		22.8	
Approach LOS					C	
Intersection Summary						
Average Delay		3.9				
Intersection Capacity Utilization		53.9%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2045 PM Without Project
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	3433	1583
Flt Permitted	1.00	1.00	0.61	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1139	1863	3433	1583
Volume (vph)	218	105	133	167	415	347
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	237	114	145	182	451	377
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	237	114	145	182	451	377
Turn Type	Free		Perm		Free	
Protected Phases	4		8		2	
Permitted Phases	Free		8		Free	
Actuated Green, G (s)	7.1	22.2	7.1	7.1	7.1	22.2
Effective Green, g (s)	7.1	22.2	7.1	7.1	7.1	22.2
Actuated g/C Ratio	0.32	1.00	0.32	0.32	0.32	1.00
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	596	1583	364	596	1098	1583
v/s Ratio Prot	0.13			0.10	c0.13	
v/s Ratio Perm		0.07	c0.13			0.24
v/c Ratio	0.40	0.07	0.40	0.31	0.41	0.24
Uniform Delay, d1	5.9	0.0	5.9	5.7	5.9	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.1	0.7	0.3	0.3	0.4
Delay (s)	6.3	0.1	6.6	6.0	6.2	0.4
Level of Service	A	A	A	A	A	A
Approach Delay (s)	4.3			6.3	3.5	
Approach LOS	A			A	A	
Intersection Summary						
HCM Average Control Delay		4.3		HCM Level of Service	A	
HCM Volume to Capacity ratio		0.40				
Actuated Cycle Length (s)		22.2		Sum of lost time (s)	8.0	
Intersection Capacity Utilization		40.7%		ICU Level of Service	A	
Analysis Period (min)		15				
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokalole Hwy.

2045 PM Without Project
7/25/2012

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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	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	1770	1863	1583	1770	1863	1583	1770	1863	1583	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.50	1.00	1.00	0.32	1.00	1.00	
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	933	1863	1583	602	1863	1583	
Volume (vph)	64	532	127	272	252	17	34	294	419	29	207	17	
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)	70	578	138	296	274	18	37	320	455	32	225	18	
RTOR Reduction (vph)	0	0	87	0	0	9	0	0	305	0	0	14	
Lane Group Flow (vph)	70	578	51	296	274	9	37	320	150	32	225	4	
Turn Type	Prot	Perm		Prot	Perm		Perm	Perm	Perm	Perm	Perm		
Protected Phases	7	4		3	8			2			6		
Permitted Phases			4			8	2		2	6		6	
Actuated Green, G (s)	3.3	22.9	22.9	12.2	31.8	31.8	14.4	14.4	14.4	14.4	14.4	14.4	
Effective Green, g (s)	3.3	22.9	22.9	12.2	31.8	31.8	14.4	14.4	14.4	14.4	14.4	14.4	
Actuated g/C Ratio	0.05	0.37	0.37	0.20	0.52	0.52	0.23	0.23	0.23	0.23	0.23	0.23	
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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	3.0	
Lane Grp Cap (vph)	95	694	589	351	963	819	218	436	371	141	436	371	
v/s Ratio Prot	0.04	c0.31		c0.17	0.15			0.17			0.12		
v/s Ratio Perm			0.09			0.01	0.04		0.29	0.05		0.01	
v/c Ratio	0.74	0.83	0.09	0.84	0.28	0.01	0.17	0.73	0.40	0.23	0.52	0.01	
Uniform Delay, d1	28.7	17.6	12.5	23.7	8.4	7.2	18.8	21.8	19.9	19.0	20.5	18.1	
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	25.4	8.5	0.1	16.6	0.2	0.0	0.4	6.3	0.7	0.8	1.0	0.0	
Delay (s)	54.1	26.0	12.6	40.3	8.6	7.2	19.2	28.1	20.6	19.9	21.5	18.1	
Level of Service	D	C	B	D	A	A	B	C	C	B	C	B	
Approach Delay (s)	26.2			24.5			23.5			21.1			
Approach LOS	C			C			C			C			
Intersection Summary													
HCM Average Control Delay	24.3			HCM Level of Service						C			
HCM Volume to Capacity ratio	0.95												
Actuated Cycle Length (s)	61.5			Sum of lost time (s)						12.0			
Intersection Capacity Utilization	75.2%			ICU Level of Service						D			
Analysis Period (min)	15												
c Critical Lane Group													

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2045 PM Without Project
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.14	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	259	1863	1863	1583
Volume (vph)	519	246	104	739	578	305
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	564	267	113	803	628	332
RTOR Reduction (vph)	0	163	0	0	0	137
Lane Group Flow (vph)	564	104	113	803	628	195
Turn Type	Perm		pm+pt		Perm	
Protected Phases	4		5		6	
Permitted Phases	4		2		6	
Actuated Green, G (s)	22.8	22.8	31.7	31.7	24.8	24.8
Effective Green, g (s)	22.8	22.8	31.7	31.7	24.8	24.8
Actuated g/C Ratio	0.36	0.36	0.51	0.51	0.40	0.40
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	646	577	201	945	739	628
v/s Ratio Prot	c0.32		0.03		c0.43	
v/s Ratio Perm	0.17		0.26		0.21	
v/c Ratio	0.87	0.18	0.56	0.85	0.85	0.31
Uniform Delay, d1	18.5	13.5	11.9	13.3	17.2	13.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	12.5	0.2	3.6	7.2	9.0	0.3
Delay (s)	31.0	13.6	15.4	20.6	26.2	13.3
Level of Service	C	B	B	C	C	B
Approach Delay (s)	25.4		19.9		21.7	
Approach LOS	C		B		C	
Intersection Summary						
HCM Average Control Delay	22.2		HCM Level of Service			C
HCM Volume to Capacity ratio	0.86					
Actuated Cycle Length (s)	62.5		Sum of lost time (s)			8.0
Intersection Capacity Utilization	74.9%		ICU Level of Service			D
Analysis Period (min)	15					
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2045 PM Without Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↗	↘		↗	↘	↗	↘	↗	↘	↗	↘
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.98	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	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00		0.95	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1795	1583		1778	1583	1770	3539	1549	1770	3525	
Flt Permitted		0.35	1.00		0.67	1.00	0.06	1.00	1.00	0.06	1.00	
Satd. Flow (perm)		660	1583		1250	1583	109	3539	1549	106	3525	
Volume (vph)	59	19	71	412	20	123	60	1542	264	98	1898	44
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)	64	21	77	448	22	134	65	1676	287	107	2063	48
RTOR Reduction (vph)	0	0	43	0	0	40	0	0	136	0	1	0
Lane Group Flow (vph)	0	85	34	0	470	94	65	1676	151	107	2110	0
Confl. Peds. (#/hr)							2		2		2	
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)		44.0	44.0		44.0	44.0	71.4	68.2	68.2	75.0	70.0	
Effective Green, g (s)		44.0	44.0		44.0	44.0	71.4	68.2	68.2	75.0	70.0	
Actuated g/C Ratio		0.34	0.34		0.34	0.34	0.55	0.53	0.53	0.58	0.54	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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)		225	539		426	539	101	1868	818	126	1910	
v/s Ratio Prot							0.02	0.47		c0.03	c0.60	
v/s Ratio Perm		0.13	0.05		c0.38	0.08	0.34		0.19	0.46		
v/c Ratio		0.38	0.06		1.10	0.18	0.64	0.90	0.19	0.85	1.10	
Uniform Delay, d1		32.2	28.7		42.6	29.9	63.8	27.4	16.0	27.6	29.6	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		1.1	0.0		74.6	0.2	13.2	6.1	0.1	38.3	55.5	
Delay (s)		33.3	28.8		117.2	30.0	77.0	33.5	16.1	65.8	85.1	
Level of Service		C	C		F	C	E	C	B	E	F	
Approach Delay (s)		31.1			97.9			32.4			84.1	
Approach LOS		C			F			C			F	
Intersection Summary												
HCM Average Control Delay		63.2										
HCM Volume to Capacity ratio		1.11										
Actuated Cycle Length (s)		129.2										
Intersection Capacity Utilization		97.7%										
Analysis Period (min)		15										

c Critical Lane Group

Appendix O – Intersection Operations Analysis Worksheets for 2045 Without
Project Conditions, with Mitigation Measures

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

2045 AM Without Project+Mit
7/25/2012

	↖	↗	↖	↗	↖	↗
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↖	↗	↖	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.14	1.00
Satd. Flow (perm)	1770	1583	3539	1583	264	3539
Volume (vph)	480	310	1104	109	188	875
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	522	337	1200	118	204	951
RTOR Reduction (vph)	0	128	0	72	0	0
Lane Group Flow (vph)	522	209	1200	46	204	951
Turn Type	Perm		Perm		pm+pt	
Protected Phases	8		2		1	
Permitted Phases	8		2		6	
Actuated Green, G (s)	20.4	20.4	24.2	24.2	33.3	33.3
Effective Green, g (s)	20.4	20.4	24.2	24.2	33.3	33.3
Actuated g/C Ratio	0.33	0.33	0.39	0.39	0.54	0.54
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	585	523	1388	621	267	1910
v/s Ratio Prot	c0.29		c0.34		c0.06	
v/s Ratio Perm	0.21		0.07		0.35	
v/c Ratio	0.89	0.40	0.86	0.07	0.76	0.50
Uniform Delay, d1	19.6	15.9	17.2	11.7	11.6	8.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	15.8	0.5	5.9	0.1	12.2	0.2
Delay (s)	35.4	16.4	23.1	11.8	23.9	9.1
Level of Service	D	B	C	B	C	A
Approach Delay (s)	28.0		22.1		11.7	
Approach LOS	C		C		B	
Intersection Summary						
HCM Average Control Delay			20.0		HCM Level of Service	
HCM Volume to Capacity ratio			0.87		C	
Actuated Cycle Length (s)			61.7		Sum of lost time (s)	
Intersection Capacity Utilization			77.5%		12.0	
ICU Level of Service			D			
Analysis Period (min)			15			
c Critical Lane Group						

AM (2045NP)	Thu Jul 26, 2012 10:22:39	Page 3-1
JB23054 - Kaloko Makai Kona, Hawaii 2045 Without Project Conditions		
Level Of Service Computation Report 2000 HCM Unsignalized Method (Future Volume Alternative)		
Intersection #2 Queen Kaahumanu Hwy. @ Hulikoa Dr.		
Average Delay (sec/veh): 0.0 Worst Case Level Of Service: A[7.2]		
Approach:	North Bound	South Bound
Movement:	L - T - R	L - T - R
Control:	Uncontrolled	Uncontrolled
Rights:	Include	Include
Lanes:	0 0 2 0 1	0 1 1 0 0
Volume Module:		
Base Vol:	0 590 218	0 835 0
Growth Adj:	1.00 1.00 1.00	1.00 1.00 1.00
Initial Bse:	0 590 218	0 835 0
Added Vol:	0 526 61	20 480 0
PasserByVol:	0 0 20	-20 62 0
Initial Fut:	0 1116 299	0 1377 0
User Adj:	1.00 1.00 1.00	1.00 1.00 1.00
PHF Adj:	1.00 1.00 1.00	1.00 1.00 1.00
PHF Volume:	0 1116 299	0 1377 0
Reduct Vol:	0 0 0	0 0 0
FinalVolume:	0 1116 299	0 1377 0
Critical Gap Module:		
Critical Gp:	xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	6.8 6.5 6.9
FollowUpTim:	xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	3.5 4.0 3.3
Capacity Module:		
Cnflct Vol:	xxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	1805 2493 558
Potent Cap.:	xxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	72 30 478
Move Cap.:	xxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	72 30 478
Volume/Cap:	xxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	0.00 0.00 0.00
Level of Service Module:		
2Way95thQ:	xxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	xxxx xxxxx xxxxx
Control Del:	xxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	xxxx xxxxx xxxxx
LOS by Move:	* * *	* * *
Movement:	LT - LTR - RT	LT - LTR - RT
Shared Cap.:	xxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	xxxx 0 xxxxx
SharedQueue:	xxxx xxxxx xxxxx 0.0 xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx	xxxx xxxxx xxxxx
Shrd ConDel:	xxxx xxxxx xxxxx 7.2 xxxxx xxxxx xxxxx xxxxx xxxxx	xxxx xxxxx xxxxx
Shared LOS:	* * *	* * *
ApproachDel:	xxxxxx xxxxxx xxxxxx	xxxxxx
ApproachLOS:	*	*
Note: Queue reported is the number of cars per lane.		

Traffic 8.0.0715 (c) 2008 Dowling Assoc. Licensed to KOA CORP, MONTEREY PK

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2045 AM Without Project+Mit
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Flpb, ped/bikes	1.00	0.98	1.00	0.98	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1552	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1552	3433	3539
Volume (vph)	275	231	1025	433	308	1150
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	299	251	1114	471	335	1250
RTOR Reduction (vph)	0	0	0	274	0	0
Lane Group Flow (vph)	299	251	1114	197	335	1250
Confl. Peds. (#/hr)	14			8	8	
Turn Type	Free		Perm	Prot		
Protected Phases	8		2		1	6
Permitted Phases	Free			2		
Actuated Green, G (s)	10.2	51.8	21.7	21.7	7.9	33.6
Effective Green, g (s)	10.2	51.8	21.7	21.7	7.9	33.6
Actuated g/C Ratio	0.20	1.00	0.42	0.42	0.15	0.65
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	676	1558	1483	650	524	2296
v/s Ratio Prot	c0.09		c0.31		0.10	c0.35
v/s Ratio Perm		0.16		0.30		
v/c Ratio	0.44	0.16	0.75	0.30	0.64	0.54
Uniform Delay, d1	18.3	0.0	12.8	10.0	20.6	4.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.2	2.2	0.3	2.6	0.3
Delay (s)	18.8	0.2	15.0	10.3	23.2	5.2
Level of Service	B	A	B	B	C	A
Approach Delay (s)	10.3		13.6			9.0
Approach LOS	B		B			A
Intersection Summary						
HCM Average Control Delay		11.1			HCM Level of Service	B
HCM Volume to Capacity ratio		0.65				
Actuated Cycle Length (s)		51.8			Sum of lost time (s)	12.0
Intersection Capacity Utilization		57.0%			ICU Level of Service	B
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kanalani Street

2045 AM Without Project+Mit
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	249	363	29	301	225	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	271	395	32	327	245	20
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			667		499	273
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			667		499	273
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		49	97
cM capacity (veh/h)			917		483	724
Direction, Lane #						
	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	271	395	141	218	264	
Volume Left	0	0	32	0	245	
Volume Right	0	395	0	0	20	
cSH	1700	1700	917	1700	521	
Volume to Capacity	0.16	0.23	0.03	0.13	0.51	
Queue Length (ft)	0	0	3	0	71	
Control Delay (s)	0.0	0.0	2.3	0.0	19.2	
Lane LOS			A		C	
Approach Delay (s)	0.0		0.9		19.2	
Approach LOS					C	
Intersection Summary						
Average Delay			4.2			
Intersection Capacity Utilization		44.7%			ICU Level of Service	A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2045 AM Without Project+Mit
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↑	↑	↑	↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	3433	1583
Flt Permitted	1.00	1.00	0.67	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1253	1863	3433	1583
Volume (vph)	121	133	224	218	121	81
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	132	145	243	237	132	88
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	132	145	243	237	132	88
Turn Type	Free		Perm		Free	
Protected Phases	4		8		2	
Permitted Phases	Free		8		Free	
Actuated Green, G (s)	6.9	17.9	6.9	6.9	3.0	17.9
Effective Green, g (s)	6.9	17.9	6.9	6.9	3.0	17.9
Actuated g/C Ratio	0.39	1.00	0.39	0.39	0.17	1.00
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	718	1583	483	718	575	1583
v/s Ratio Prot	0.07			0.13	c0.04	
v/s Ratio Perm		0.09	c0.19			0.06
v/c Ratio	0.18	0.09	0.50	0.33	0.23	0.06
Uniform Delay, d1	3.6	0.0	4.2	3.9	6.4	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1	0.1	0.8	0.3	0.2	0.1
Delay (s)	3.8	0.1	5.0	4.1	6.7	0.1
Level of Service	A	A	A	A	A	A
Approach Delay (s)	1.9			4.6	4.0	
Approach LOS	A			A	A	
Intersection Summary						
HCM Average Control Delay			3.7		HCM Level of Service	A
HCM Volume to Capacity ratio			0.42			
Actuated Cycle Length (s)			17.9		Sum of lost time (s)	8.0
Intersection Capacity Utilization			32.2%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokaloale Hwy.

2045 AM Without Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	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	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.28	1.00	1.00	0.65	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	520	1863	1583	1204	1863	1583
Volume (vph)	13	155	26	464	411	25	129	144	156	9	388	65
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)	14	168	28	504	447	27	140	157	170	10	422	71
RTOR Reduction (vph)	0	0	23	0	0	14	0	0	115	0	0	48
Lane Group Flow (vph)	14	168	5	504	447	13	140	157	55	10	422	23
Turn Type	Prot		Perm		Prot		Perm		Perm		Perm	
Protected Phases	7		4		3		8		2		6	
Permitted Phases	4		8		2		2		6		6	
Actuated Green, G (s)	0.7	11.2	11.2	22.5	33.0	33.0	21.8	21.8	21.8	21.8	21.8	21.8
Effective Green, g (s)	0.7	11.2	11.2	22.5	33.0	33.0	21.8	21.8	21.8	21.8	21.8	21.8
Actuated g/C Ratio	0.01	0.17	0.17	0.33	0.49	0.49	0.32	0.32	0.32	0.32	0.32	0.32
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	3.0
Lane Grp Cap (vph)	18	309	263	590	911	774	168	602	511	389	602	511
v/s Ratio Prot	0.01	0.09		c0.28	c0.24			0.08			0.23	
v/s Ratio Perm			0.02			0.02	c0.27		0.11	0.01		0.04
v/c Ratio	0.78	0.54	0.02	0.85	0.49	0.02	0.83	0.26	0.11	0.03	0.70	0.04
Uniform Delay, d1	33.3	25.8	23.5	21.0	11.6	8.9	21.2	16.9	16.0	15.6	20.0	15.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	107.6	2.0	0.0	11.6	0.4	0.0	28.3	0.2	0.1	0.0	3.7	0.0
Delay (s)	140.9	27.8	23.6	32.5	12.0	8.9	49.5	17.1	16.1	15.6	23.7	15.7
Level of Service	F	C	C	C	B	A	D	B	B	B	C	B
Approach Delay (s)	34.7			22.5			26.5		22.4			
Approach LOS	C			C			C		C			
Intersection Summary												
HCM Average Control Delay			24.5		HCM Level of Service		C					
HCM Volume to Capacity ratio			0.74									
Actuated Cycle Length (s)			67.5		Sum of lost time (s)		8.0					
Intersection Capacity Utilization			74.8%		ICU Level of Service		D					
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2045 AM Without Project+Mit
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.04	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	70	1863	1863	1583
Volume (vph)	202	103	150	342	1269	545
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	220	112	163	372	1379	592
RTOR Reduction (vph)	0	98	0	0	0	55
Lane Group Flow (vph)	220	14	163	372	1379	537
Turn Type	Perm pm+pt			Perm		
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	17.0	17.0	115.0	115.0	102.0	102.0
Effective Green, g (s)	17.0	17.0	115.0	115.0	102.0	102.0
Actuated g/C Ratio	0.12	0.12	0.82	0.82	0.73	0.73
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	215	192	167	1530	1357	1153
v/s Ratio Prot	c0.12		c0.06	0.20	c0.74	
v/s Ratio Perm		0.07	0.74			0.37
v/c Ratio	1.02	0.07	0.98	0.24	1.02	0.47
Uniform Delay, d1	61.5	54.5	67.5	2.8	19.0	7.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	67.5	0.2	62.0	0.1	28.5	0.3
Delay (s)	129.0	54.7	129.5	2.9	47.5	8.1
Level of Service	F	D	F	A	D	A
Approach Delay (s)	103.9			41.4	35.7	
Approach LOS	F			D	D	
Intersection Summary						
HCM Average Control Delay			44.8	HCM Level of Service		D
HCM Volume to Capacity ratio			1.01			
Actuated Cycle Length (s)			140.0	Sum of lost time (s)		12.0
Intersection Capacity Utilization			96.3%	ICU Level of Service		F
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2045 AM Without Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.97	1.00		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.98	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	
Frt	1.00	0.89		1.00	0.87		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1649		3433	1614		1770	3539	1548	1770	3513	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1649		3433	1614		1770	3539	1548	1770	3513	
Volume (vph)	17	7	24	270	18	152	68	1364	441	199	1078	48
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)	18	8	26	293	20	165	74	1483	479	216	1172	52
RTOR Reduction (vph)	0	24	0	0	140	0	0	0	248	0	3	0
Lane Group Flow (vph)	18	10	0	293	45	0	74	1483	231	216	1221	0
Confl. Peds. (#/hr)							2		2	2		2
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	1.5	5.7		8.1	12.3		6.5	38.9	38.9	11.9	44.3	
Effective Green, g (s)	1.5	5.7		8.1	12.3		6.5	38.9	38.9	11.9	44.3	
Actuated g/C Ratio	0.02	0.07		0.10	0.15		0.08	0.48	0.48	0.15	0.55	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
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)	33	117		345	246		143	1708	747	261	1931	
v/s Ratio Prot	0.01	0.02		c0.09	c0.11		0.04	c0.42		c0.12	0.35	
v/s Ratio Perm									0.31			
v/c Ratio	0.55	0.08		0.85	0.18		0.52	0.87	0.31	0.83	0.63	
Uniform Delay, d1	39.2	35.0		35.6	29.8		35.5	18.6	12.7	33.4	12.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	17.2	0.3		17.4	0.4		3.1	5.0	0.2	18.9	0.7	
Delay (s)	56.4	35.3		53.1	30.1		38.7	23.5	12.9	52.3	13.2	
Level of Service	E	D		D	C		D	C	B	D	B	
Approach Delay (s)		42.6			44.2			21.6			19.1	
Approach LOS		D			D			C			B	
Intersection Summary												
HCM Average Control Delay		23.7		HCM Level of Service					C			
HCM Volume to Capacity ratio		0.83										
Actuated Cycle Length (s)		80.6		Sum of lost time (s)				12.0				
Intersection Capacity Utilization		73.1%		ICU Level of Service				D				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

2045 PM Without Project+Mit
7/25/2012

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.12	1.00
Satd. Flow (perm)	1770	1583	3539	1583	227	3539
Volume (vph)	180	303	1183	387	363	1312
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	329	1286	421	395	1426
RTOR Reduction (vph)	0	269	0	239	0	0
Lane Group Flow (vph)	196	60	1286	182	395	1426
Turn Type	Perm		Perm		pm+pt	
Protected Phases	8		2		1	
Permitted Phases	8		2		6	
Actuated Green, G (s)	12.1	12.1	28.8	28.8	46.7	46.7
Effective Green, g (s)	12.1	12.1	28.8	28.8	46.7	46.7
Actuated g/C Ratio	0.18	0.18	0.43	0.43	0.70	0.70
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	321	287	1526	682	480	2474
v/s Ratio Prot	0.11		0.36		c0.17	0.40
v/s Ratio Perm		0.21		0.27	c0.40	
v/c Ratio	0.61	0.21	0.84	0.27	0.82	0.58
Uniform Delay, d1	25.2	23.3	17.0	12.2	16.4	5.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.4	0.4	4.4	0.2	10.9	0.3
Delay (s)	28.6	23.6	21.4	12.4	27.3	5.4
Level of Service	C	C	C	B	C	A
Approach Delay (s)	25.5		19.2		10.1	
Approach LOS	C		B		B	
Intersection Summary						
HCM Average Control Delay			15.9		HCM Level of Service	
HCM Volume to Capacity ratio			0.87		B	
Actuated Cycle Length (s)			66.8		Sum of lost time (s)	
Intersection Capacity Utilization			72.8%		8.0	
ICU Level of Service			C			
Analysis Period (min)			15			
c Critical Lane Group						

PM (2045NP)	Thu Jul 26, 2012 10:23:50	Page 3-1
JB23054 - Kaloko Makai Kona, Hawaii 2045 Without Project Conditions		
Level Of Service Computation Report 2000 HCM Unsignalized Method (Future Volume Alternative)		
Intersection #2 Queen Kaahumanu Hwy. @ Hulikoa Dr.		
Average Delay (sec/veh): 0.0 Worst Case Level Of Service: A[7.2]		
Approach:	North Bound	South Bound
Movement:	L - T - R	L - T - R
Control:	Uncontrolled	Uncontrolled
Rights:	Include	Include
Lanes:	0 0 2 0 1	0 1 1 0 0
Volume Module:		
Base Vol:	0 719 122	0 1068 0
Growth Adj:	1.00 1.00 1.00	1.00 1.00 1.00
Initial Bse:	0 719 122	0 1068 0
Added Vol:	0 668 39	13 676 0
PasserByVol:	0 0 13	-13 58 0
Initial Fut:	0 1387 174	0 1802 0
User Adj:	1.00 1.00 1.00	1.00 1.00 1.00
PHF Adj:	1.00 1.00 1.00	1.00 1.00 1.00
PHF Volume:	0 1387 174	0 1802 0
Reduct Vol:	0 0 0	0 0 0
FinalVolume:	0 1387 174	0 1802 0
Critical Gap Module:		
Critical Gp:	xxxx xxx xxxxx xxxxx xxx xxx xxx xxx xxx xxx	6.8 6.5 6.9
FollowUpTim:	xxxx xxx xxxxx xxxxx xxx xxx xxx xxx xxx xxx	3.5 4.0 3.3
Capacity Module:		
Cnflct Vol:	xxxx xxx xxxxx xxx xxx xxx xxx xxx xxx xxx	2288 3189 694
Potent Cap.:	xxxx xxx xxxxx xxx xxx xxx xxx xxx xxx xxx	34 10 390
Move Cap.:	xxxx xxx xxxxx xxx xxx xxx xxx xxx xxx xxx	34 10 390
Volume/Cap:	xxxx xxx xxxxx xxx xxx xxx xxx xxx xxx xxx	0.00 0.00 0.00
Level of Service Module:		
2Way95thQ:	xxxx xxx xxxxx xxx xxx xxx xxx xxx xxx xxx	xxxx xxx xxxxx
Control Del:	xxxx xxx xxxxx xxx xxx xxx xxx xxx xxx xxx	xxxx xxx xxxxx
LOS by Move:	*	*
Movement:	LT - LTR - RT	LT - LTR - RT
Shared Cap.:	xxxx xxx xxxxx xxx xxx xxx xxx xxx xxx xxx	xxxx 0 xxxxx
SharedQueue:	xxxx xxx xxxxx 0.0 xxx xxxxx xxx xxx xxx xxx xxx xxx	xxxx xxx xxxxx
Shrd ConDel:	xxxx xxx xxxxx 7.2 xxx xxxxx xxx xxx xxx xxx xxx xxx	xxxx xxx xxxxx
Shared LOS:	*	*
ApproachDel:	xxxxxx	xxxxxx
ApproachLOS:	*	*
Note: Queue reported is the number of cars per lane.		

Traffic 8.0.0715 (c) 2008 Dowling Assoc. Licensed to KOA CORP, MONTEREY PK

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2045 PM Without Project+Mit
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↕	↕	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Flpb, ped/bikes	1.00	0.98	1.00	0.98	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1551	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1551	3433	3539
Volume (vph)	544	333	1233	594	312	1397
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	591	362	1340	646	339	1518
RTOR Reduction (vph)	0	0	0	369	0	0
Lane Group Flow (vph)	591	362	1340	277	339	1518
Confl. Peds. (#/hr)	14			8	8	
Turn Type	Free		Perm	Prot		
Protected Phases	8		2		1	6
Permitted Phases	Free		2			
Actuated Green, G (s)	14.1	58.0	24.9	24.9	7.0	35.9
Effective Green, g (s)	14.1	58.0	24.9	24.9	7.0	35.9
Actuated g/C Ratio	0.24	1.00	0.43	0.43	0.12	0.62
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	835	1558	1519	666	414	2191
v/s Ratio Prot	c0.17		0.38		0.10	c0.43
v/s Ratio Perm		0.23		0.42		
v/c Ratio	0.71	0.23	0.88	0.42	0.82	0.69
Uniform Delay, d1	20.1	0.0	15.2	11.5	24.9	7.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.8	0.3	6.4	0.4	11.9	1.0
Delay (s)	22.8	0.3	21.6	11.9	36.8	8.3
Level of Service	C	A	C	B	D	A
Approach Delay (s)	14.3		18.5		13.5	
Approach LOS	B		B		B	
Intersection Summary						
HCM Average Control Delay		15.7			HCM Level of Service	B
HCM Volume to Capacity ratio		0.87				
Actuated Cycle Length (s)		58.0			Sum of lost time (s)	12.0
Intersection Capacity Utilization		68.5%			ICU Level of Service	C
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kanalani Street

2045 PM Without Project+Mit
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	297	489	17	589	200	74
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	323	532	18	640	217	80
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			856		682	325
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			856		682	325
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		42	88
cM capacity (veh/h)			778		374	670
Direction, Lane #						
	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	323	532	232	427	298	
Volume Left	0	0	18	0	217	
Volume Right	0	532	0	0	80	
cSH	1700	1700	778	1700	512	
Volume to Capacity	0.19	0.31	0.02	0.25	0.58	
Queue Length (ft)	0	0	2	0	92	
Control Delay (s)	0.0	0.0	1.0	0.0	22.8	
Lane LOS			A		C	
Approach Delay (s)	0.0		0.4		22.8	
Approach LOS					C	
Intersection Summary						
Average Delay			3.9			
Intersection Capacity Utilization		53.9%			ICU Level of Service	A
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2045 PM Without Project+Mit
7/25/2012

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations					 	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.97	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1583	1770	1863	3433	1583
Flt Permitted	1.00	1.00	0.61	1.00	0.95	1.00
Satd. Flow (perm)	1863	1583	1139	1863	3433	1583
Volume (vph)	218	105	133	167	415	347
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	237	114	145	182	451	377
RTOR Reduction (vph)	0	0	0	0	0	0
Lane Group Flow (vph)	237	114	145	182	451	377
Turn Type	Free		Perm		Free	
Protected Phases	4		8		2	
Permitted Phases	Free		8		Free	
Actuated Green, G (s)	7.1	22.2	7.1	7.1	7.1	22.2
Effective Green, g (s)	7.1	22.2	7.1	7.1	7.1	22.2
Actuated g/C Ratio	0.32	1.00	0.32	0.32	0.32	1.00
Clearance Time (s)	4.0		4.0	4.0	4.0	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	
Lane Grp Cap (vph)	596	1583	364	596	1098	1583
v/s Ratio Prot	0.13			0.10	c0.13	
v/s Ratio Perm		0.07	c0.13			0.24
v/c Ratio	0.40	0.07	0.40	0.31	0.41	0.24
Uniform Delay, d1	5.9	0.0	5.9	5.7	5.9	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.1	0.7	0.3	0.3	0.4
Delay (s)	6.3	0.1	6.6	6.0	6.2	0.4
Level of Service	A	A	A	A	A	A
Approach Delay (s)	4.3			6.3	3.5	
Approach LOS	A			A	A	
Intersection Summary						
HCM Average Control Delay			4.3	HCM Level of Service		A
HCM Volume to Capacity ratio			0.40			
Actuated Cycle Length (s)			22.2	Sum of lost time (s)		8.0
Intersection Capacity Utilization			40.7%	ICU Level of Service		A
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokalole Hwy.

2045 PM Without Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	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	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.50	1.00	1.00	0.32	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	933	1863	1583	602	1863	1583
Volume (vph)	64	532	127	272	252	17	34	294	419	29	207	17
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)	70	578	138	296	274	18	37	320	455	32	225	18
RTOR Reduction (vph)	0	0	87	0	0	9	0	0	305	0	0	14
Lane Group Flow (vph)	70	578	51	296	274	9	37	320	150	32	225	4
Turn Type	Prot		Perm		Prot		Perm		Perm		Perm	
Protected Phases	7		4		3		8		2		6	
Permitted Phases	4		8		2		6		2		6	
Actuated Green, G (s)	3.3	22.9	22.9	12.2	31.8	31.8	14.4	14.4	14.4	14.4	14.4	14.4
Effective Green, g (s)	3.3	22.9	22.9	12.2	31.8	31.8	14.4	14.4	14.4	14.4	14.4	14.4
Actuated g/C Ratio	0.05	0.37	0.37	0.20	0.52	0.52	0.23	0.23	0.23	0.23	0.23	0.23
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	3.0
Lane Grp Cap (vph)	95	694	589	351	963	819	218	436	371	141	436	371
v/s Ratio Prot	0.04	c0.31		c0.17	0.15			0.17			0.12	
v/s Ratio Perm			0.09			0.01	0.04		0.29	0.05		0.01
v/c Ratio	0.74	0.83	0.09	0.84	0.28	0.01	0.17	0.73	0.40	0.23	0.52	0.01
Uniform Delay, d1	28.7	17.6	12.5	23.7	8.4	7.2	18.8	21.8	19.9	19.0	20.5	18.1
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	25.4	8.5	0.1	16.6	0.2	0.0	0.4	6.3	0.7	0.8	1.0	0.0
Delay (s)	54.1	26.0	12.6	40.3	8.6	7.2	19.2	28.1	20.6	19.9	21.5	18.1
Level of Service	D	C	B	D	A	A	B	C	C	B	C	B
Approach Delay (s)	26.2		24.5		23.5		21.1					
Approach LOS	C		C		C		C		C			
Intersection Summary												
HCM Average Control Delay			24.3		HCM Level of Service				C			
HCM Volume to Capacity ratio			0.95									
Actuated Cycle Length (s)			61.5		Sum of lost time (s)				12.0			
Intersection Capacity Utilization			75.2%		ICU Level of Service				D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2045 PM Without Project+Mit
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.14	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	259	1863	1863	1583
Volume (vph)	519	246	104	739	578	305
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	564	267	113	803	628	332
RTOR Reduction (vph)	0	163	0	0	0	137
Lane Group Flow (vph)	564	104	113	803	628	195
Turn Type	Perm pm+pt			Perm		
Protected Phases	4		5	2	6	
Permitted Phases		4		2		6
Actuated Green, G (s)	22.8	22.8	31.7	31.7	24.8	24.8
Effective Green, g (s)	22.8	22.8	31.7	31.7	24.8	24.8
Actuated g/C Ratio	0.36	0.36	0.51	0.51	0.40	0.40
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	646	577	201	945	739	628
v/s Ratio Prot	c0.32		0.03	c0.43	0.34	
v/s Ratio Perm		0.17	0.26		0.21	
v/c Ratio	0.87	0.18	0.56	0.85	0.85	0.31
Uniform Delay, d1	18.5	13.5	11.9	13.3	17.2	13.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	12.5	0.2	3.6	7.2	9.0	0.3
Delay (s)	31.0	13.6	15.4	20.6	26.2	13.3
Level of Service	C	B	B	C	C	B
Approach Delay (s)	25.4			19.9	21.7	
Approach LOS	C			B	C	
Intersection Summary						
HCM Average Control Delay		22.2		HCM Level of Service	C	
HCM Volume to Capacity ratio		0.86				
Actuated Cycle Length (s)		62.5		Sum of lost time (s)	8.0	
Intersection Capacity Utilization		74.9%		ICU Level of Service	D	
Analysis Period (min)		15				
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2045 PM Without Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.97	1.00		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.98	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	
Frt	1.00	0.88		1.00	0.87		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1643		3433	1623		1770	3539	1549	1770	3525	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1643		3433	1623		1770	3539	1549	1770	3525	
Volume (vph)	59	19	71	412	20	123	60	1542	264	98	1898	44
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)	64	21	77	448	22	134	65	1676	287	107	2063	48
RTOR Reduction (vph)	0	59	0	0	111	0	0	0	118	0	1	0
Lane Group Flow (vph)	64	39	0	448	45	0	65	1676	169	107	2110	0
Confl. Peds. (#/hr)							2		2	2		2
Turn Type	Prot			Prot			Prot		Perm	Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases									2			
Actuated Green, G (s)	7.6	9.7		18.0	20.1		5.0	77.9	77.9	10.5	83.4	
Effective Green, g (s)	7.6	9.7		18.0	20.1		5.0	77.9	77.9	10.5	83.4	
Actuated g/C Ratio	0.06	0.07		0.14	0.15		0.04	0.59	0.59	0.08	0.63	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
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)	102	121		468	247		67	2087	913	141	2225	
v/s Ratio Prot	0.04	c0.06		c0.13	0.10		0.04	0.47		c0.06	c0.60	
v/s Ratio Perm									0.19			
v/c Ratio	0.63	0.32		0.96	0.18		0.97	0.80	0.19	0.76	0.95	
Uniform Delay, d1	60.9	58.1		56.7	48.8		63.5	21.1	12.5	59.6	22.4	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	11.5	1.5		30.6	0.4		99.2	2.3	0.1	20.6	9.5	
Delay (s)	72.3	59.6		87.3	49.2		162.6	23.5	12.6	80.2	31.9	
Level of Service	E	E		F	D		F	C	B	F	C	
Approach Delay (s)		64.6			77.4			26.4			34.2	
Approach LOS		E			E			C			C	
Intersection Summary												
HCM Average Control Delay		37.2		HCM Level of Service	D							
HCM Volume to Capacity ratio		0.91										
Actuated Cycle Length (s)		132.1		Sum of lost time (s)				12.0				
Intersection Capacity Utilization		87.7%		ICU Level of Service	E							
Analysis Period (min)		15										
c Critical Lane Group												

**Appendix P – Intersection Operations Analysis Worksheets for 2025 With Project
Phase I Conditions, with Existing Geometry and Planned Improvements**

**HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway**

2025 AM With Project
7/25/2012

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.15	1.00
Satd. Flow (perm)	1770	1583	3539	1583	287	3539
Volume (vph)	480	244	1124	109	33	1120
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	522	265	1222	118	36	1217
RTOR Reduction (vph)	0	112	0	70	0	0
Lane Group Flow (vph)	522	153	1222	48	36	1217
Turn Type	Perm		Perm pm+pt			
Protected Phases	8		2		1	
Permitted Phases	8		2		6	
Actuated Green, G (s)	18.3	18.3	22.0	22.0	27.4	27.4
Effective Green, g (s)	18.3	18.3	22.0	22.0	27.4	27.4
Actuated g/C Ratio	0.34	0.34	0.41	0.41	0.51	0.51
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	603	539	1450	649	185	1806
v/s Ratio Prot	c0.29		c0.35		0.01	
v/s Ratio Perm	0.17		0.07		0.09	
v/c Ratio	0.87	0.28	0.84	0.07	0.19	0.67
Uniform Delay, d1	16.6	12.9	14.3	9.7	9.6	9.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	12.4	0.3	4.6	0.0	0.5	1.0
Delay (s)	28.9	13.2	18.9	9.7	10.1	10.8
Level of Service	C		B		B	
Approach Delay (s)	23.6		18.1		10.8	
Approach LOS	C		B		B	
Intersection Summary						
HCM Average Control Delay			16.7	HCM Level of Service		B
HCM Volume to Capacity ratio			0.87			
Actuated Cycle Length (s)			53.7	Sum of lost time (s)		12.0
Intersection Capacity Utilization			64.3%	ICU Level of Service		C
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
2: Hulikoa Drive & Queen Kaahumanu Highway

2025 AM With Project
7/25/2012

							
Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Sign Control	Yield		Free			Free	
Grade	0%		0%			0%	
Volume (veh/h)	0	345	1037	323	0	1623	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	0	375	1127	351	0	1764	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	TWLTL						
Median storage (veh)	5						
Upstream signal (ft)							
pX, platoon unblocked							
vC, conflicting volume	2009	564			1127		
vC1, stage 1 conf vol	1127						
vC2, stage 2 conf vol	882						
vCu, unblocked vol	2009	564			1127		
tC, single (s)	6.8	6.9			4.1		
tC, 2 stage (s)	5.8						
tF (s)	3.5	3.3			2.2		
p0 queue free %	100	20			100		
cM capacity (veh/h)	258	469			615		
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	
Volume Total	375	564	564	351	882	882	
Volume Left	0	0	0	0	0	0	
Volume Right	375	0	0	351	0	0	
cSH	469	1700	1700	1700	1700	1700	
Volume to Capacity	0.80	0.33	0.33	0.21	0.52	0.52	
Queue Length (ft)	184	0	0	0	0	0	
Control Delay (s)	36.8	0.0	0.0	0.0	0.0	0.0	
Lane LOS	E						
Approach Delay (s)	36.8	0.0			0.0		
Approach LOS	E						
Intersection Summary							
Average Delay	3.8						
Intersection Capacity Utilization	56.7%			ICU Level of Service		B	
Analysis Period (min)	15						

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2025 AM With Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		 		 	 
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Frpb, ped/bikes	1.00	0.98	1.00	0.98	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1548	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1548	3433	3539
Volume (vph)	627	427	775	810	672	1032
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	682	464	842	880	730	1122
RTOR Reduction (vph)	0	0	0	347	0	0
Lane Group Flow (vph)	682	464	842	533	730	1122
Confl. Peds. (#/hr)	14		8		8	
Turn Type	Free		Perm		Prot	
Protected Phases	8		2		1	
Permitted Phases	Free		2			
Actuated Green, G (s)	16.2	71.4	26.5	26.5	16.7	47.2
Effective Green, g (s)	16.2	71.4	26.5	26.5	16.7	47.2
Actuated g/C Ratio	0.23	1.00	0.37	0.37	0.23	0.66
Clearance Time (s)	4.0		4.0		4.0	
Vehicle Extension (s)	3.0		3.0		3.0	
Lane Grp Cap (vph)	779	1558	1313	575	803	2340
v/s Ratio Prot	c0.20		0.24		c0.21	
v/s Ratio Perm	0.30		0.57			
v/c Ratio	0.88	0.30	0.64	0.93	0.91	0.48
Uniform Delay, d1	26.6	0.0	18.5	21.5	26.6	6.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.8	0.5	1.1	21.1	14.0	0.2
Delay (s)	37.4	0.5	19.6	42.6	40.6	6.2
Level of Service	D	A	B	D	D	A
Approach Delay (s)	22.5		31.4		19.7	
Approach LOS	C		C		B	
Intersection Summary						
HCM Average Control Delay	24.6		HCM Level of Service		C	
HCM Volume to Capacity ratio	1.18					
Actuated Cycle Length (s)	71.4		Sum of lost time (s)		12.0	
Intersection Capacity Utilization	76.8%		ICU Level of Service		D	
Analysis Period (min)	15					
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kananani Street

2025 AM With Project
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↔	↔	↔	↔
Sign Control	Free	Free	Free	Free	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Volume (veh/h)	990	363	29	849	225	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1076	395	32	923	245	20
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			1473		1603	1078
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1473		1603	1078
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			93		0	91
cM capacity (veh/h)			453		90	214
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	1076	395	339	615	264	
Volume Left	0	0	32	0	245	
Volume Right	0	395	0	0	20	
cSH	1700	1700	453	1700	94	
Volume to Capacity	0.63	0.23	0.07	0.36	2.81	
Queue Length (ft)	0	0	6	0	630	
Control Delay (s)	0.0	0.0	2.3	0.0	915.0	
Lane LOS			A		F	
Approach Delay (s)	0.0		0.8		915.0	
Approach LOS					F	
Intersection Summary						
Average Delay			90.2			
Intersection Capacity Utilization			71.2%		ICU Level of Service	C
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2025 AM With Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↑	↑	↔	↑	↑	↔	↑	↑	↔	↑	↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0		4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		0.97	1.00		1.00		1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.85		1.00		0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95		1.00
Satd. Flow (prot)	1770	1863	1583	1770	1834		3433	1583		1770		1583
Flt Permitted	0.31	1.00	1.00	0.33	1.00		0.95	1.00		0.95		1.00
Satd. Flow (perm)	573	1863	1583	615	1834		3433	1583		1770		1583
Volume (vph)	224	573	198	202	544	62	134	0	77	61	0	209
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)	243	623	215	220	591	67	146	0	84	66	0	227
RTOR Reduction (vph)	0	0	0	0	3	0	0	71	0	0	0	202
Lane Group Flow (vph)	243	623	215	220	655	0	146	13	0	66	0	25
Turn Type	Perm	Perm	Free	Perm	Perm		Prot	Prot		Prot		Perm
Protected Phases			4		8		5	2		1		6
Permitted Phases	4		Free	8								6
Actuated Green, G (s)	46.8	46.8	74.7	46.8	46.8		7.7	11.4		4.5		8.2
Effective Green, g (s)	46.8	46.8	74.7	46.8	46.8		7.7	11.4		4.5		8.2
Actuated g/C Ratio	0.63	0.63	1.00	0.63	0.63		0.10	0.15		0.06		0.11
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0		4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0		3.0
Lane Grp Cap (vph)	359	1167	1583	385	1149		354	242		107		174
v/s Ratio Prot		0.33			0.36		0.04	0.05		c0.04		
v/s Ratio Perm	c0.42		0.14	0.36			0.41	0.05		0.62		0.14
v/c Ratio	0.68	0.53	0.14	0.57	0.57		0.41	0.05		0.62		0.14
Uniform Delay, d1	9.0	7.8	0.0	8.1	8.1		31.4	27.0		34.3		30.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00		1.00
Incremental Delay, d2	5.0	0.5	0.2	2.0	0.7		0.8	0.1		10.1		0.4
Delay (s)	14.0	8.3	0.2	10.2	8.8		32.2	27.1		44.4		30.5
Level of Service	B	A	A	B	A		C	C		D		C
Approach Delay (s)		8.0			9.1			30.3				33.6
Approach LOS		A			A			C				C
Intersection Summary												
HCM Average Control Delay			13.5				HCM Level of Service			B		
HCM Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			74.7				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			65.3%				ICU Level of Service			C		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokaloale Hwy.

2025 AM With Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	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	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.66	1.00	1.00	0.64	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1237	1863	1583	1200	1863	1583
Volume (vph)	134	313	70	189	550	123	168	160	64	108	134	92
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)	146	340	76	205	598	134	183	174	70	117	146	100
RTOR Reduction (vph)	0	0	45	0	0	74	0	0	56	0	0	80
Lane Group Flow (vph)	146	340	31	205	598	60	183	174	14	117	146	20
Turn Type	Prot		Perm	Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	4.8	19.1	19.1	6.7	21.0	21.0	9.4	9.4	9.4	9.4	9.4	9.4
Effective Green, g (s)	4.8	19.1	19.1	6.7	21.0	21.0	9.4	9.4	9.4	9.4	9.4	9.4
Actuated g/C Ratio	0.10	0.40	0.40	0.14	0.44	0.44	0.20	0.20	0.20	0.20	0.20	0.20
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	3.0
Lane Grp Cap (vph)	180	754	641	251	829	704	246	371	315	239	371	315
v/s Ratio Prot	0.08	0.18		c0.12	c0.32			0.09			0.08	
v/s Ratio Perm			0.05			0.08	c0.15		0.04	0.10		0.06
v/c Ratio	0.81	0.45	0.05	0.82	0.72	0.08	0.74	0.47	0.04	0.49	0.39	0.06
Uniform Delay, d1	20.8	10.2	8.5	19.7	10.7	7.6	17.8	16.7	15.3	16.8	16.4	15.3
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	23.4	0.4	0.0	18.2	3.1	0.1	11.5	0.9	0.1	1.6	0.7	0.1
Delay (s)	44.2	10.7	8.6	37.9	13.8	7.6	29.3	17.6	15.3	18.3	17.1	15.4
Level of Service	D	B	A	D	B	A	C	B	B	B	B	B
Approach Delay (s)	19.1			18.2			22.2			17.0		
Approach LOS	B			B			C			B		
Intersection Summary												
HCM Average Control Delay	19.0			HCM Level of Service					B			
HCM Volume to Capacity ratio	0.70											
Actuated Cycle Length (s)	47.2			Sum of lost time (s)					8.0			
Intersection Capacity Utilization	66.1%			ICU Level of Service					C			
Analysis Period (min)	15											
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2025 AM With Project
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.04	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	75	1863	1863	1583
Volume (vph)	208	211	273	378	1307	382
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	226	229	297	411	1421	415
RTOR Reduction (vph)	0	190	0	0	0	37
Lane Group Flow (vph)	226	39	297	411	1421	378
Turn Type	Perm		pm+pt		Perm	
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	16.0	16.0	116.0	116.0	96.0	96.0
Effective Green, g (s)	16.0	16.0	116.0	116.0	96.0	96.0
Actuated g/C Ratio	0.11	0.11	0.83	0.83	0.69	0.69
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	202	181	256	1544	1277	1085
v/s Ratio Prot	0.13		c0.13	0.22	0.76	
v/s Ratio Perm		0.14	c0.83			0.26
v/c Ratio	1.12	0.21	1.16	0.27	1.11	0.35
Uniform Delay, d1	62.0	56.3	64.2	2.6	22.0	9.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	98.9	0.6	106.5	0.1	62.1	0.2
Delay (s)	160.9	56.9	170.7	2.7	84.1	9.3
Level of Service	F	E	F	A	F	A
Approach Delay (s)	108.5		73.2		67.2	
Approach LOS	F		E		E	
Intersection Summary						
HCM Average Control Delay	74.9		HCM Level of Service		E	
HCM Volume to Capacity ratio	1.16					
Actuated Cycle Length (s)	140.0		Sum of lost time (s)		8.0	
Intersection Capacity Utilization	105.4%		ICU Level of Service		G	
Analysis Period (min)	15					
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2025 AM With Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.98	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	
Frt		1.00	0.85		1.00	0.85	1.00	0.85	1.00	0.99		
Flt Protected		0.97	1.00		0.95	1.00	0.95	1.00	0.95	1.00		
Satd. Flow (prot)		1800	1583		1778	1583	1770	3539	1548	1770	3516	
Flt Permitted		0.70	1.00		0.72	1.00	0.11	1.00	1.00	0.10	1.00	
Satd. Flow (perm)		1313	1583		1337	1583	197	3539	1548	178	3516	
Volume (vph)	17	7	24	348	18	166	68	1464	530	240	1231	48
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)	18	8	26	378	20	180	74	1591	576	261	1338	52
RTOR Reduction (vph)	0	0	19	0	0	82	0	0	307	0	3	0
Lane Group Flow (vph)	0	26	7	0	398	98	74	1591	269	261	1387	0
Confl. Peds. (#/hr)							2	2	2			2
Turn Type	Perm	Perm	Perm	Perm	pm+pt	pm+pt	Perm	pm+pt	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)		23.0	23.0		23.0	23.0	41.0	37.8	37.8	49.8	42.6	
Effective Green, g (s)		23.0	23.0		23.0	23.0	41.0	37.8	37.8	49.8	42.6	
Actuated g/C Ratio		0.28	0.28		0.28	0.28	0.51	0.47	0.47	0.62	0.53	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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)		374	451		381	451	162	1656	724	267	1854	
v/s Ratio Prot							0.02	0.45		c0.10	0.40	
v/s Ratio Perm		0.02	0.02		c0.30	0.11	0.21		0.37	c0.50		
v/c Ratio		0.07	0.02		1.04	0.22	0.46	0.96	0.37	0.98	0.75	
Uniform Delay, d1		21.1	20.8		28.9	22.0	12.6	20.8	13.9	23.2	14.9	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.1	0.0		58.2	0.2	2.0	13.9	0.3	48.3	1.7	
Delay (s)		21.2	20.8		87.1	22.3	14.6	34.7	14.2	71.5	16.6	
Level of Service		C	C		F	C	B	C	B	E	B	
Approach Delay (s)		21.0			66.9			28.8			25.3	
Approach LOS		C			E			C			C	
Intersection Summary												
HCM Average Control Delay		32.3			HCM Level of Service			C				
HCM Volume to Capacity ratio		0.98										
Actuated Cycle Length (s)		80.8			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		90.7%			ICU Level of Service			E				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

2025 PM With Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.10	1.00
Satd. Flow (perm)	1770	1583	3539	1583	192	3539
Volume (vph)	180	84	1473	387	226	1414
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	91	1601	421	246	1537
RTOR Reduction (vph)	0	77	0	197	0	0
Lane Group Flow (vph)	196	14	1601	224	246	1537
Turn Type	Perm	Perm	pm+pt	Perm	pm+pt	Perm
Protected Phases	8		2		1	6
Permitted Phases		8		2		6
Actuated Green, G (s)	9.8	9.8	34.8	34.8	47.7	47.7
Effective Green, g (s)	9.8	9.8	34.8	34.8	47.7	47.7
Actuated g/C Ratio	0.15	0.15	0.53	0.53	0.73	0.73
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	265	237	1880	841	354	2577
v/s Ratio Prot	c0.11		c0.45		c0.09	0.43
v/s Ratio Perm		0.06		0.27	0.41	
v/c Ratio	0.74	0.06	0.85	0.27	0.69	0.60
Uniform Delay, d1	26.6	23.9	13.1	8.4	14.4	4.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.3	0.1	3.9	0.2	5.8	0.4
Delay (s)	37.0	24.0	17.1	8.5	20.2	4.7
Level of Service	D	C	B	A	C	A
Approach Delay (s)	32.8		15.3			6.8
Approach LOS	C		B			A
Intersection Summary						
HCM Average Control Delay		12.8			HCM Level of Service	B
HCM Volume to Capacity ratio		0.81				
Actuated Cycle Length (s)		65.5			Sum of lost time (s)	12.0
Intersection Capacity Utilization		73.2%			ICU Level of Service	D
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
2: Hulikoa Drive & Queen Kaahumanu Highway

2025 PM With Project
7/25/2012

							
Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Sign Control	Yield		Free				Free
Grade	0%		0%				0%
Volume (veh/h)	0	404	1548	206	0	1904	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	0	439	1683	224	0	2070	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	TWLTL						
Median storage (veh)	5						
Upstream signal (ft)							
pX, platoon unblocked							
vC, conflicting volume	2717	841			1683		
vC1, stage 1 conf vol	1683						
vC2, stage 2 conf vol	1035						
vCu, unblocked vol	2717	841			1683		
tC, single (s)	6.8	6.9			4.1		
tC, 2 stage (s)	5.8						
tF (s)	3.5	3.3			2.2		
p0 queue free %	100	0			100		
cM capacity (veh/h)	135	308			376		
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	
Volume Total	439	841	841	224	1035	1035	
Volume Left	0	0	0	0	0	0	
Volume Right	439	0	0	224	0	0	
cSH	308	1700	1700	1700	1700	1700	
Volume to Capacity	1.43	0.49	0.49	0.13	0.61	0.61	
Queue Length (ft)	586	0	0	0	0	0	
Control Delay (s)	241.8	0.0	0.0	0.0	0.0	0.0	
Lane LOS	F						
Approach Delay (s)	241.8	0.0			0.0		
Approach LOS	F						
Intersection Summary							
Average Delay	24.0						
Intersection Capacity Utilization	74.5%			ICU Level of Service		D	
Analysis Period (min)	15						

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2025 PM With Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		 		 	 
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1541	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1541	3433	3539
Volume (vph)	1012	622	1138	977	658	1154
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1100	676	1237	1062	715	1254
RTOR Reduction (vph)	0	0	0	420	0	0
Lane Group Flow (vph)	1100	676	1237	642	715	1254
Confl. Peds. (#/hr)	14		8		8	
Turn Type	Free		Perm		Prot	
Protected Phases	8		2		1	
Permitted Phases	Free		2			
Actuated Green, G (s)	31.0	100.0	37.0	37.0	20.0	61.0
Effective Green, g (s)	31.0	100.0	37.0	37.0	20.0	61.0
Actuated g/C Ratio	0.31	1.00	0.37	0.37	0.20	0.61
Clearance Time (s)	4.0		4.0		4.0	
Vehicle Extension (s)	3.0		3.0		3.0	
Lane Grp Cap (vph)	1064	1558	1309	570	687	2159
v/s Ratio Prot	c0.32		0.35		c0.21	
v/s Ratio Perm	0.43		0.69			
v/c Ratio	1.03	0.43	0.94	1.13	1.04	0.58
Uniform Delay, d1	34.5	0.0	30.5	31.5	40.0	11.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	36.7	0.9	13.7	77.8	45.4	0.4
Delay (s)	71.2	0.9	44.2	109.3	85.4	12.2
Level of Service	E	A	D	F	F	B
Approach Delay (s)	44.4		74.3		38.8	
Approach LOS	D		E		D	
Intersection Summary						
HCM Average Control Delay			53.9		HCM Level of Service	
HCM Volume to Capacity ratio			1.38		D	
Actuated Cycle Length (s)			100.0		Sum of lost time (s)	
Intersection Capacity Utilization			89.1%		ICU Level of Service	
Analysis Period (min)			15		E	
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kananani Street

2025 PM With Project
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↔	↔	↔	↔
Sign Control	Free	Free	Free	Free	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Volume (veh/h)	1026	489	17	1345	200	74
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1115	532	18	1462	217	80
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			1649		1885	1117
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1649		1885	1117
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		0	60
cM capacity (veh/h)			387		59	201
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	1115	532	506	975	298	
Volume Left	0	0	18	0	217	
Volume Right	0	532	0	0	80	
cSH	1700	1700	387	1700	74	
Volume to Capacity	0.66	0.31	0.05	0.57	4.04	
Queue Length (ft)	0	0	4	0	Err	
Control Delay (s)	0.0	0.0	1.5	0.0	Err	
Lane LOS			A		F	
Approach Delay (s)	0.0		0.5		Err	
Approach LOS					F	
Intersection Summary						
Average Delay			869.7			
Intersection Capacity Utilization			74.8%		ICU Level of Service	D
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2025 PM With Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↑	↑	↔	↑	↑	↔	↑	↑	↔	↑	↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0		4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		0.97	1.00		1.00		1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.85		1.00		0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95		1.00
Satd. Flow (prot)	1770	1863	1583	1770	1833		3433	1583		1770		1583
Flt Permitted	0.27	1.00	1.00	0.29	1.00		0.95	1.00		0.95		1.00
Satd. Flow (perm)	511	1863	1583	543	1833		3433	1583		1770		1583
Volume (vph)	279	651	122	127	608	72	479	0	326	75	0	251
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)	303	708	133	138	661	78	521	0	354	82	0	273
RTOR Reduction (vph)	0	0	0	0	3	0	0	213	0	0	0	224
Lane Group Flow (vph)	303	708	133	138	736	0	521	141	0	82	0	49
Turn Type	Perm	Perm	Free	Perm	Perm		Prot	Prot		Prot		Perm
Protected Phases			4			8		5	2		1	6
Permitted Phases	4		Free	8								6
Actuated Green, G (s)	90.1	90.1	132.9	90.1	90.1		21.0	22.1		8.7		9.8
Effective Green, g (s)	90.1	90.1	132.9	90.1	90.1		21.0	22.1		8.7		9.8
Actuated g/C Ratio	0.68	0.68	1.00	0.68	0.68		0.16	0.17		0.07		0.07
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0		4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0		3.0
Lane Grp Cap (vph)	346	1263	1583	368	1243		542	263		116		117
v/s Ratio Prot			0.38		0.40		c0.15	c0.22		0.05		
v/s Ratio Perm	c0.59			0.08	0.25							0.17
v/c Ratio	0.88	0.56	0.08	0.38	0.59		0.96	0.54		0.71		0.42
Uniform Delay, d1	17.0	11.1	0.0	9.2	11.5		55.5	50.7		60.9		58.8
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00		1.00
Incremental Delay, d2	21.1	0.6	0.1	0.6	0.8		29.0	2.1		17.8		2.4
Delay (s)	38.0	11.7	0.1	9.9	12.3		84.5	52.8		78.7		61.2
Level of Service	D	B	A	A	B		F	D		E		E
Approach Delay (s)		17.3			11.9			71.7				65.3
Approach LOS		B			B			E				E
Intersection Summary												
HCM Average Control Delay			35.7			HCM Level of Service				D		
HCM Volume to Capacity ratio			1.07									
Actuated Cycle Length (s)			132.9			Sum of lost time (s)		16.0				
Intersection Capacity Utilization			89.5%			ICU Level of Service		E				
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokalole Hwy.

2025 PM With Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	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	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.53	1.00	1.00	0.60	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	983	1863	1583	1118	1863	1583
Volume (vph)	106	700	178	180	434	127	86	151	282	143	180	140
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)	115	761	193	196	472	138	93	164	307	155	196	152
RTOR Reduction (vph)	0	0	103	0	0	69	0	0	245	0	0	121
Lane Group Flow (vph)	115	761	90	196	472	69	93	164	62	155	196	31
Turn Type	Prot	Perm		Prot	Perm		Perm	Perm	Perm	Perm	Perm	
Protected Phases	7	4		3	8		2				6	
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	6.9	29.2	29.2	9.0	31.3	31.3	12.7	12.7	12.7	12.7	12.7	12.7
Effective Green, g (s)	6.9	29.2	29.2	9.0	31.3	31.3	12.7	12.7	12.7	12.7	12.7	12.7
Actuated g/C Ratio	0.11	0.46	0.46	0.14	0.50	0.50	0.20	0.20	0.20	0.20	0.20	0.20
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	3.0
Lane Grp Cap (vph)	194	865	735	253	927	788	198	376	320	226	376	320
v/s Ratio Prot	0.06	c0.41		c0.11	0.25			0.09			0.11	
v/s Ratio Perm			0.12			0.09	0.09		0.19	0.14		0.10
v/c Ratio	0.59	0.88	0.12	0.77	0.51	0.09	0.47	0.44	0.19	0.69	0.52	0.10
Uniform Delay, d1	26.7	15.3	9.6	26.0	10.6	8.3	22.1	22.0	20.8	23.3	22.4	20.4
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	4.8	10.2	0.1	13.7	0.4	0.0	1.8	0.8	0.3	8.3	1.3	0.1
Delay (s)	31.5	25.4	9.6	39.7	11.1	8.3	23.9	22.8	21.1	31.6	23.7	20.6
Level of Service	C	C	A	D	B	A	C	C	C	C	C	C
Approach Delay (s)	23.2			17.6			22.1			25.2		
Approach LOS	C			B			C			C		
Intersection Summary												
HCM Average Control Delay			21.8		HCM Level of Service				C			
HCM Volume to Capacity ratio			0.87									
Actuated Cycle Length (s)			62.9		Sum of lost time (s)				12.0			
Intersection Capacity Utilization			76.0%		ICU Level of Service				D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2025 PM With Project
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.14	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	253	1863	1863	1583
Volume (vph)	512	389	231	740	552	328
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	557	423	251	804	600	357
RTOR Reduction (vph)	0	227	0	0	0	148
Lane Group Flow (vph)	557	196	251	804	600	209
Turn Type	Perm		pm+pt	Perm		
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	24.0	24.0	37.6	37.6	25.4	25.4
Effective Green, g (s)	24.0	24.0	37.6	37.6	25.4	25.4
Actuated g/C Ratio	0.34	0.34	0.54	0.54	0.36	0.36
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	610	546	315	1006	680	578
v/s Ratio Prot	c0.31		0.09	c0.43	c0.32	
v/s Ratio Perm		0.27	0.34			0.23
v/c Ratio	0.91	0.36	0.80	0.80	0.88	0.36
Uniform Delay, d1	21.8	17.1	13.2	12.9	20.7	16.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	18.1	0.4	13.1	4.5	12.9	0.4
Delay (s)	39.9	17.5	26.3	17.5	33.6	16.6
Level of Service	D	B	C	B	C	B
Approach Delay (s)	30.2		19.6		27.2	
Approach LOS	C		B		C	
Intersection Summary						
HCM Average Control Delay			25.5		HCM Level of Service C	
HCM Volume to Capacity ratio			0.90			
Actuated Cycle Length (s)			69.6		Sum of lost time (s) 12.0	
Intersection Capacity Utilization			80.2%		ICU Level of Service D	
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2025 PM With Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔		↔	↔	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.98	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	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00		0.95	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1795	1583		1777	1583	1770	3539	1548	1770	3526	
Flt Permitted		0.27	1.00		0.67	1.00	0.06	1.00	1.00	0.06	1.00	
Satd. Flow (perm)		502	1583		1250	1583	117	3539	1548	110	3526	
Volume (vph)	59	19	71	516	20	192	60	1691	356	143	2032	44
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)	64	21	77	561	22	209	65	1838	387	155	2209	48
RTOR Reduction (vph)	0	0	42	0	0	44	0	0	198	0	1	0
Lane Group Flow (vph)	0	85	35	0	583	165	65	1838	189	155	2256	0
Confl. Peds. (#/hr)							2		2		2	
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)		48.0	48.0		48.0	48.0	67.0	63.8	63.8	74.6	67.6	
Effective Green, g (s)		48.0	48.0		48.0	48.0	67.0	63.8	63.8	74.6	67.6	
Actuated g/C Ratio		0.37	0.37		0.37	0.37	0.51	0.49	0.49	0.57	0.52	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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)		184	581		459	581	100	1726	755	152	1822	
v/s Ratio Prot							0.02	0.52		c0.05	c0.64	
v/s Ratio Perm		0.17	0.05		c0.47	0.13	0.32		0.25	0.53		
v/c Ratio		0.46	0.06		1.27	0.28	0.65	1.06	0.25	1.02	1.24	
Uniform Delay, d1		31.6	26.8		41.4	29.2	64.6	33.5	19.5	64.1	31.6	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		1.8	0.0		137.8	0.3	14.1	41.3	0.2	78.3	112.1	
Delay (s)		33.4	26.8		179.2	29.5	78.7	74.8	19.7	142.4	143.7	
Level of Service		C	C		F	C	E	E	B	F	F	
Approach Delay (s)		30.3			139.7			65.6			143.6	
Approach LOS		C			F			E			F	
Intersection Summary												
HCM Average Control Delay		108.2										
HCM Volume to Capacity ratio		1.27										
Actuated Cycle Length (s)		130.8										
Intersection Capacity Utilization		107.2%										
Analysis Period (min)		15										
c Critical Lane Group												

Appendix Q – Intersection Operations Analysis Worksheets for 2025 With Project
Phase I Conditions, with Mitigation Measures

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

2025 AM With Project+Mit
7/25/2012

	↖	↗	↖	↗	↖	↗
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↖	↗	↖	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.15	1.00
Satd. Flow (perm)	1770	1583	3539	1583	287	3539
Volume (vph)	480	244	1124	109	33	1120
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	522	265	1222	118	36	1217
RTOR Reduction (vph)	0	112	0	70	0	0
Lane Group Flow (vph)	522	153	1222	48	36	1217
Turn Type	Perm		Perm		pm+pt	
Protected Phases	8		2		1	
Permitted Phases	8		2		6	
Actuated Green, G (s)	18.3	18.3	22.0	22.0	27.4	27.4
Effective Green, g (s)	18.3	18.3	22.0	22.0	27.4	27.4
Actuated g/C Ratio	0.34	0.34	0.41	0.41	0.51	0.51
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	603	539	1450	649	185	1806
v/s Ratio Prot	c0.29		c0.35		0.01	
v/s Ratio Perm	0.17		0.07		0.09	
v/c Ratio	0.87	0.28	0.84	0.07	0.19	0.67
Uniform Delay, d1	16.6	12.9	14.3	9.7	9.6	9.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	12.4	0.3	4.6	0.0	0.5	1.0
Delay (s)	28.9	13.2	18.9	9.7	10.1	10.8
Level of Service	C		B		B	
Approach Delay (s)	23.6		18.1		10.8	
Approach LOS	C		B		B	
Intersection Summary						
HCM Average Control Delay			16.7		HCM Level of Service	
HCM Volume to Capacity ratio			0.87		B	
Actuated Cycle Length (s)			53.7		Sum of lost time (s)	
Intersection Capacity Utilization			64.3%		12.0	
ICU Level of Service			C			
Analysis Period (min)			15			
c Critical Lane Group						

AM (2025+P1)	Thu Jul 26, 2012 10:24:38	Page 3-1
JB23054 - Kaloko Makai		
Kona, Hawaii		
2015 With Project Phase 1 Conditions		
Level Of Service Computation Report		
2000 HCM Unsignalized Method (Future Volume Alternative)		
Intersection #2 Queen Kaahumanu Hwy. @ Hulikoa Dr.		
Average Delay (sec/veh): 0.0 Worst Case Level Of Service: A[7.2]		
Approach: North Bound South Bound East Bound West Bound		
Movement: L - T - R L - T - R L - T - R L - T - R		
Control: Uncontrolled Uncontrolled Yield Sign Yield Sign		
Rights: Include Include Include Ignore		
Lanes: 0 0 2 0 1 0 1 1 0 0 0 0 0 0 1 0 0		
Volume Module:		
Base Vol: 0 590 218 0 835 0 0 0 0 0 0 0 182		
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00		
Initial Bse: 0 590 218 0 835 0 0 0 0 0 0 0 182		
Added Vol: 0 447 85 20 726 0 0 0 0 0 42 0 121		
PasserByVol: 0 0 20 -20 62 0 0 0 0 0 -42 0 42		
Initial Fut: 0 1037 323 0 1623 0 0 0 0 0 0 0 345		
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 0.00		
PHF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 0.00		
PHF Volume: 0 1037 323 0 1623 0 0 0 0 0 0 0 0		
Reduct Vol: 0 0 0 0 0 0 0 0 0 0 0 0 0		
FinalVolume: 0 1037 323 0 1623 0 0 0 0 0 0 0 0		
Critical Gap Module:		
Critical Gap:xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx 6.8 6.5 6.9		
FollowUpTim:xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx 3.5 4.0 3.3		
Capacity Module:		
Cnflct Vol: xxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx 1849 2660 519		
Potent Cap.: xxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx 67 23 507		
Move Cap.: xxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx 67 23 507		
Volume/Cap: xxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx 0.00 0.00 0.00		
Level Of Service Module:		
2Way95thQ: xxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxxx xxxxx		
Control Del:xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxxx xxxxx		
LOS by Move: *		
Movement: LT - LTR - RT LT - LTR - RT LT - LTR - RT LT - LTR - RT		
Shared Cap.: xxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx 0 xxxxx		
SharedQueue:xxxxx xxxx xxxxx 0.0 xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx		
Shrd ConDel:xxxxx xxxx xxxxx 7.2 xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx		
Shared LOS: * * * * * A * * * * * * * * * * * * * * * *		
ApproachDel: xxxxxx xxxxxx xxxxxx xxxxxx		
ApproachLOS: * * * * *		
Note: Queue reported is the number of cars per lane.		

Traffic 8.0.0715 (c) 2008 Dowling Assoc. Licensed to KOA CORP, MONTEREY PK

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2025 AM With Project+Mit
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔	↔↔	↔↔	↔↔	↔↔	↔↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Frpb, ped/bikes	1.00	0.98	1.00	0.98	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1548	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1548	3433	3539
Volume (vph)	627	427	775	810	672	1032
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	682	464	842	880	730	1122
RTOR Reduction (vph)	0	0	0	347	0	0
Lane Group Flow (vph)	682	464	842	533	730	1122
Confl. Peds. (#/hr)	14			8	8	
Turn Type	Free		Perm	Prot		
Protected Phases	8		2		1	6
Permitted Phases	Free			2		
Actuated Green, G (s)	16.2	71.4	26.5	26.5	16.7	47.2
Effective Green, g (s)	16.2	71.4	26.5	26.5	16.7	47.2
Actuated g/C Ratio	0.23	1.00	0.37	0.37	0.23	0.66
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	779	1558	1313	575	803	2340
v/s Ratio Prot	c0.20		0.24		c0.21	0.32
v/s Ratio Perm		0.30		0.57		
v/c Ratio	0.88	0.30	0.64	0.93	0.91	0.48
Uniform Delay, d1	26.6	0.0	18.5	21.5	26.6	6.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.8	0.5	1.1	21.1	14.0	0.2
Delay (s)	37.4	0.5	19.6	42.6	40.6	6.2
Level of Service	D	A	B	D	D	A
Approach Delay (s)	22.5		31.4		19.7	
Approach LOS	C		C		B	
Intersection Summary						
HCM Average Control Delay		24.6			HCM Level of Service	C
HCM Volume to Capacity ratio		1.18				
Actuated Cycle Length (s)		71.4			Sum of lost time (s)	12.0
Intersection Capacity Utilization		76.8%			ICU Level of Service	D
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kanalani Street

2025 AM With Project+Mit
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔	↔	↔↔	↔↔	↔	↔
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	990	363	29	849	0	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1076	395	32	923	0	20
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			1473		1603	1078
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1473		1603	1078
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		100	91
cM capacity (veh/h)			453		90	214
Direction, Lane #						
	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	1076	395	339	615	20	
Volume Left	0	0	32	0	0	
Volume Right	0	395	0	0	20	
cSH	1700	1700	453	1700	214	
Volume to Capacity	0.63	0.23	0.07	0.36	0.09	
Queue Length (ft)	0	0	6	0	7	
Control Delay (s)	0.0	0.0	2.3	0.0	23.5	
Lane LOS			A		C	
Approach Delay (s)	0.0		0.8		23.5	
Approach LOS					C	
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization		62.1%			ICU Level of Service	B
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2025 AM With Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		0.97		1.00	1.00		1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00		0.85	1.00		0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95		1.00	0.95		1.00
Satd. Flow (prot)	1770	1863	1583	1770	3485		3433		1583	1770		1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95		1.00	0.95		1.00
Satd. Flow (perm)	1770	1863	1583	1770	3485		3433		1583	1770		1583
Volume (vph)	224	573	198	202	544	62	359	0	77	61	0	209
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)	243	623	215	220	591	67	390	0	84	66	0	227
RTOR Reduction (vph)	0	0	0	0	9	0	0	0	0	0	0	197
Lane Group Flow (vph)	243	623	215	220	649	0	390	0	84	66	0	30
Turn Type	Prot		Free	Prot			Prot		Free	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			Free						Free			6
Actuated Green, G (s)	14.3	30.2	81.4	11.1	27.0		13.4		81.4	15.7		10.7
Effective Green, g (s)	14.3	30.2	81.4	11.1	27.0		13.4		81.4	15.7		10.7
Actuated g/C Ratio	0.18	0.37	1.00	0.14	0.33		0.16		1.00	0.19		0.13
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0		4.0			4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0		3.0			3.0
Lane Grp Cap (vph)	311	691	1583	241	1156		565		1583	341		208
v/s Ratio Prot	0.14	c0.33		c0.12	0.19		c0.11			0.04		
v/s Ratio Perm			0.14						0.05			0.14
v/c Ratio	0.78	0.90	0.14	0.91	0.56		0.69		0.05	0.19		0.14
Uniform Delay, d1	32.1	24.2	0.0	34.7	22.3		32.0		0.0	27.5		31.3
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00		1.00	1.00		1.00
Incremental Delay, d2	12.0	15.0	0.2	35.3	0.6		3.6		0.1	0.3		0.3
Delay (s)	44.1	39.2	0.2	69.9	23.0		35.7		0.1	27.8		31.6
Level of Service	D	D	A	E	C		D		A	C		C
Approach Delay (s)	32.5			34.7			29.4			30.8		
Approach LOS	C			C			C			C		
Intersection Summary												
HCM Average Control Delay			32.5			HCM Level of Service			C			
HCM Volume to Capacity ratio			0.84									
Actuated Cycle Length (s)			81.4			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			68.3%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokalole Hwy.

2025 AM With Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	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	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	0.66	1.00	0.66	1.00	1.00	0.64	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	1237	1863	1583	1200	1863	1583
Volume (vph)	134	313	70	189	550	123	168	160	64	108	134	92
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)	146	340	76	205	598	134	183	174	70	117	146	100
RTOR Reduction (vph)	0	0	45	0	0	74	0	0	56	0	0	80
Lane Group Flow (vph)	146	340	31	205	598	60	183	174	14	117	146	20
Turn Type	Prot		Perm	Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	4.8	19.1	19.1	6.7	21.0	21.0	9.4	9.4	9.4	9.4	9.4	9.4
Effective Green, g (s)	4.8	19.1	19.1	6.7	21.0	21.0	9.4	9.4	9.4	9.4	9.4	9.4
Actuated g/C Ratio	0.10	0.40	0.40	0.14	0.44	0.44	0.20	0.20	0.20	0.20	0.20	0.20
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	3.0
Lane Grp Cap (vph)	180	754	641	251	829	704	246	371	315	239	371	315
v/s Ratio Prot	0.08	0.18		c0.12	c0.32			0.09			0.08	
v/s Ratio Perm			0.05			0.08	c0.15		0.04	0.10		0.06
v/c Ratio	0.81	0.45	0.05	0.82	0.72	0.08	0.74	0.47	0.04	0.49	0.39	0.06
Uniform Delay, d1	20.8	10.2	8.5	19.7	10.7	7.6	17.8	16.7	15.3	16.8	16.4	15.3
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	23.4	0.4	0.0	18.2	3.1	0.1	11.5	0.9	0.1	1.6	0.7	0.1
Delay (s)	44.2	10.7	8.6	37.9	13.8	7.6	29.3	17.6	15.3	18.3	17.1	15.4
Level of Service	D	B	A	D	B	A	C	B	B	B	B	B
Approach Delay (s)	19.1			18.2			22.2			17.0		
Approach LOS	B			B			C			B		
Intersection Summary												
HCM Average Control Delay			19.0		HCM Level of Service				B			
HCM Volume to Capacity ratio			0.70									
Actuated Cycle Length (s)			47.2		Sum of lost time (s)				8.0			
Intersection Capacity Utilization			66.1%		ICU Level of Service				C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2025 AM With Project+Mit
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.97	1.00	1.00	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	3433	1863	1863	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	3433	1863	1863	1583
Volume (vph)	208	211	273	378	1307	382
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	226	229	297	411	1421	415
RTOR Reduction (vph)	0	66	0	0	0	2
Lane Group Flow (vph)	226	163	297	411	1421	413
Turn Type	pm+ov		Prot		pm+ov	
Protected Phases	4	5	5	2	6	4
Permitted Phases	4				6	
Actuated Green, G (s)	14.4	27.4	13.0	126.0	109.0	123.4
Effective Green, g (s)	14.4	27.4	13.0	126.0	109.0	123.4
Actuated g/C Ratio	0.10	0.18	0.09	0.85	0.73	0.83
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	333	335	301	1582	1368	1359
v/s Ratio Prot	0.07	c0.06	c0.09	0.22	c0.76	0.03
v/s Ratio Perm	0.08				0.23	
v/c Ratio	0.68	0.49	0.99	0.26	1.04	0.30
Uniform Delay, d1	64.8	54.2	67.6	2.2	19.7	2.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.4	1.1	47.8	0.1	35.0	0.1
Delay (s)	70.2	55.3	115.4	2.3	54.7	2.9
Level of Service	E	E	F	A	D	A
Approach Delay (s)	62.7		49.7		43.0	
Approach LOS	E		D		D	
Intersection Summary						
HCM Average Control Delay			47.6		HCM Level of Service D	
HCM Volume to Capacity ratio			1.00			
Actuated Cycle Length (s)			148.4		Sum of lost time (s) 12.0	
Intersection Capacity Utilization			92.5%		ICU Level of Service F	
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2025 AM With Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.97	1.00		1.00	0.95	1.00	1.00	0.95	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.98	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	
Frt	1.00	0.89		1.00	0.86		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1649		3433	1611		1770	3539	1549	1770	3517	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1649		3433	1611		1770	3539	1549	1770	3517	
Volume (vph)	17	7	24	348	18	166	68	1464	530	240	1231	48
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)	18	8	26	378	20	180	74	1591	576	261	1338	52
RTOR Reduction (vph)	0	25	0	0	151	0	0	0	286	0	2	0
Lane Group Flow (vph)	18	9	0	378	49	0	74	1591	290	261	1388	0
Confl. Peds. (#/hr)							2	2		2	2	
Turn Type	Prot		Prot		Prot		Perm		Prot			
Protected Phases	7	4	3		8	5		2	1		6	
Permitted Phases	2											
Actuated Green, G (s)	1.9	5.8	12.1		16.0	7.2		50.6	50.6	16.1	59.5	
Effective Green, g (s)	1.9	5.8	12.1		16.0	7.2		50.6	50.6	16.1	59.5	
Actuated g/C Ratio	0.02	0.06	0.12		0.16	0.07		0.50	0.50	0.16	0.59	
Clearance Time (s)	4.0	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	
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)	33	95	413		256	127		1780	779	283	2080	
v/s Ratio Prot	0.01	0.02	c0.11		c0.12	0.04		c0.45	c0.15		0.40	
v/s Ratio Perm	0.37											
v/c Ratio	0.55	0.10	0.92		0.19	0.58		0.89	0.37	0.92	0.67	
Uniform Delay, d1	48.9	44.9	43.7		36.7	45.2		22.6	15.3	41.6	13.9	
Progression Factor	1.00	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	17.2	0.5	24.5		0.4	6.7		6.2	0.3	33.6	0.8	
Delay (s)	66.1	45.4	68.3		37.0	51.9		28.8	15.6	75.2	14.7	
Level of Service	E	D	E		D	D		C	B	E	B	
Approach Delay (s)	52.5		57.5		26.2				24.3			
Approach LOS	D		E		C				C			
Intersection Summary												
HCM Average Control Delay	29.8		HCM Level of Service				C					
HCM Volume to Capacity ratio	0.88											
Actuated Cycle Length (s)	100.6		Sum of lost time (s)				12.0					
Intersection Capacity Utilization	80.4%		ICU Level of Service				D					
Analysis Period (min)	15											
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

2025 PM With Project+Mit
7/25/2012

	↖	↗	↖	↗	↖	↗
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↖	↗	↖	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.10	1.00
Satd. Flow (perm)	1770	1583	3539	1583	192	3539
Volume (vph)	180	84	1473	387	226	1414
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	91	1601	421	246	1537
RTOR Reduction (vph)	0	77	0	197	0	0
Lane Group Flow (vph)	196	14	1601	224	246	1537
Turn Type	Perm		Perm		pm+pt	
Protected Phases	8		2		1	
Permitted Phases	8		2		6	
Actuated Green, G (s)	9.8	9.8	34.8	34.8	47.7	47.7
Effective Green, g (s)	9.8	9.8	34.8	34.8	47.7	47.7
Actuated g/C Ratio	0.15	0.15	0.53	0.53	0.73	0.73
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	265	237	1880	841	354	2577
v/s Ratio Prot	c0.11		c0.45		c0.09	
v/s Ratio Perm	0.06		0.27		0.41	
v/c Ratio	0.74	0.06	0.85	0.27	0.69	0.60
Uniform Delay, d1	26.6	23.9	13.1	8.4	14.4	4.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.3	0.1	3.9	0.2	5.8	0.4
Delay (s)	37.0	24.0	17.1	8.5	20.2	4.7
Level of Service	D	C	B	A	C	A
Approach Delay (s)	32.8		15.3		6.8	
Approach LOS	C		B		A	
Intersection Summary						
HCM Average Control Delay			12.8	HCM Level of Service		B
HCM Volume to Capacity ratio			0.81			
Actuated Cycle Length (s)			65.5	Sum of lost time (s)		12.0
Intersection Capacity Utilization			73.2%	ICU Level of Service		D
Analysis Period (min)			15			
c Critical Lane Group						

PM (2025+P1)	Thu Jul 26, 2012 10:25:55	Page 3-1
JB23054 - Kaloko Makai		
Kona, Hawaii		
2015 With Project Phase 1 Conditions		
Level Of Service Computation Report		
2000 HCM Unsignalized Method (Future Volume Alternative)		
Intersection #2 Queen Kaahumanu Hwy. @ Hulikoa Dr.		
Average Delay (sec/veh): 0.0 Worst Case Level Of Service: A[7.2]		
Approach: North Bound South Bound East Bound West Bound		
Movement: L - T - R L - T - R L - T - R L - T - R		
Control: Uncontrolled Uncontrolled Yield Sign Yield Sign		
Rights: Include Include Include Ignore		
Lanes: 0 0 2 0 1 0 1 1 0 0 0 0 0 0 1 0 0		
Volume Module:		
Base Vol: 0 719 122 0 1068 0 0 0 0 0 0 205		
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00		
Initial Bse: 0 719 122 0 1068 0 0 0 0 0 0 205		
Added Vol: 0 829 71 13 778 0 0 0 0 45 0 154		
PasserByVol: 0 0 13 -13 58 0 0 0 0 -45 0 45		
Initial Fut: 0 1548 206 0 1904 0 0 0 0 0 0 404		
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 0.00		
PHF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 0.00		
PHF Volume: 0 1548 206 0 1904 0 0 0 0 0 0 0		
Reduct Vol: 0 0 0 0 0 0 0 0 0 0 0 0		
FinalVolume: 0 1548 206 0 1904 0 0 0 0 0 0 0		
Critical Gap Module:		
Critical Gap:xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx 6.8 6.5 6.9		
FollowUpTim:xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx 3.5 4.0 3.3		
Capacity Module:		
Cnflct Vol: xxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx 2500 3452 774		
Potent Cap.: xxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx 24 7 346		
Move Cap.: xxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx 24 7 346		
Volume/Cap: xxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx 0.00 0.00 0.00		
Level of Service Module:		
2Way95thQ: xxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxxx xxxxx		
Control Del:xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxxx xxxxx		
LOS by Move: *		
Movement: LT - LTR - RT LT - LTR - RT LT - LTR - RT LT - LTR - RT		
Shared Cap.: xxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx 0 xxxxx		
SharedQueue:xxxxx xxxx xxxxx 0.0 xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx		
Shrd ConDel:xxxxx xxxx xxxxx 7.2 xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx		
Shared LOS: * * * * * A * * * * * * * * * * * * * * * *		
ApproachDel: xxxxxx xxxxxx xxxxxx xxxxxx		
ApproachLOS: * * * * *		
Note: Queue reported is the number of cars per lane.		

Traffic 8.0.0715 (c) 2008 Dowling Assoc. Licensed to KOA CORP, MONTEREY PK

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2025 PM With Project+Mit
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔↔	↔	↕↕	↕	↔↔	↔↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1541	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1541	3433	3539
Volume (vph)	1012	622	1138	977	658	1154
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1100	676	1237	1062	715	1254
RTOR Reduction (vph)	0	0	0	420	0	0
Lane Group Flow (vph)	1100	676	1237	642	715	1254
Confl. Peds. (#/hr)	14			8	8	
Turn Type	Free		Perm	Prot		
Protected Phases	8		2		1	6
Permitted Phases	Free			2		
Actuated Green, G (s)	31.0	100.0	37.0	37.0	20.0	61.0
Effective Green, g (s)	31.0	100.0	37.0	37.0	20.0	61.0
Actuated g/C Ratio	0.31	1.00	0.37	0.37	0.20	0.61
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1064	1558	1309	570	687	2159
v/s Ratio Prot	c0.32		0.35		c0.21	0.35
v/s Ratio Perm		0.43		0.69		
v/c Ratio	1.03	0.43	0.94	1.13	1.04	0.58
Uniform Delay, d1	34.5	0.0	30.5	31.5	40.0	11.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	36.7	0.9	13.7	77.8	45.4	0.4
Delay (s)	71.2	0.9	44.2	109.3	85.4	12.2
Level of Service	E	A	D	F	F	B
Approach Delay (s)	44.4		74.3			38.8
Approach LOS	D		E			D
Intersection Summary						
HCM Average Control Delay		53.9			HCM Level of Service	D
HCM Volume to Capacity ratio		1.38				
Actuated Cycle Length (s)		100.0			Sum of lost time (s)	12.0
Intersection Capacity Utilization		89.1%			ICU Level of Service	E
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kanalani Street

2025 PM With Project+Mit
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔	↔	↔↔	↔↔	↔	↔
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1026	489	17	1345	0	74
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1115	532	18	1462	0	80
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			1649		1885	1117
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1649		1885	1117
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			95		100	60
cM capacity (veh/h)			387		59	201
Direction, Lane #						
	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	1115	532	506	975	80	
Volume Left	0	0	18	0	0	
Volume Right	0	532	0	0	80	
cSH	1700	1700	387	1700	201	
Volume to Capacity	0.66	0.31	0.05	0.57	0.40	
Queue Length (ft)	0	0	4	0	45	
Control Delay (s)	0.0	0.0	1.5	0.0	34.3	
Lane LOS			A		D	
Approach Delay (s)	0.0		0.5		34.3	
Approach LOS					D	
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization		74.8%			ICU Level of Service	D
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2025 PM With Project+Mit
7/25/2012

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0		4.0	4.0		4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95		0.97		1.00	1.00		1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00		0.85	1.00		0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95		1.00	0.95		1.00
Satd. Flow (prot)	1770	1863	1583	1770	3483		3433		1583	1770		1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95		1.00	0.95		1.00
Satd. Flow (perm)	1770	1863	1583	1770	3483		3433		1583	1770		1583
Volume (vph)	279	651	122	127	608	72	679	0	326	75	0	251
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)	303	708	133	138	661	78	738	0	354	82	0	273
RTOR Reduction (vph)	0	0	0	0	9	0	0	0	0	0	0	242
Lane Group Flow (vph)	303	708	133	138	730	0	738	0	354	82	0	31
Turn Type	Prot		Free	Prot			Prot		Free	Prot		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			Free						Free			6
Actuated Green, G (s)	19.0	38.1	93.9	8.0	27.1		21.0		93.9	20.6		10.8
Effective Green, g (s)	19.0	38.1	93.9	8.0	27.1		21.0		93.9	20.6		10.8
Actuated g/C Ratio	0.20	0.41	1.00	0.09	0.29		0.22		1.00	0.22		0.12
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0			4.0		4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0			3.0		3.0
Lane Grp Cap (vph)	358	756	1583	151	1005		768		1583	388		182
v/s Ratio Prot	c0.17	c0.38		0.08	0.21		c0.21			0.05		
v/s Ratio Perm			0.08						0.22			0.17
v/c Ratio	0.85	0.94	0.08	0.91	0.73		0.96		0.22	0.21		0.17
Uniform Delay, d1	36.0	26.7	0.0	42.6	30.1		36.0		0.0	30.0		37.5
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00		1.00	1.00		1.00
Incremental Delay, d2	16.6	18.8	0.1	48.2	2.6		23.2		0.3	0.3		0.5
Delay (s)	52.7	45.5	0.1	90.9	32.7		59.3		0.3	30.3		38.0
Level of Service	D	D	A	F	C		E		A	C		D
Approach Delay (s)	42.1			41.9			40.2		36.2			
Approach LOS	D			D			D		D			
Intersection Summary												
HCM Average Control Delay	40.8			HCM Level of Service					D			
HCM Volume to Capacity ratio	0.98											
Actuated Cycle Length (s)	93.9			Sum of lost time (s)					12.0			
Intersection Capacity Utilization	77.3%			ICU Level of Service					D			
Analysis Period (min)	15											
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokalole Hwy.

2025 PM With Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	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	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	0.53	1.00	0.53	1.00	1.00	0.60	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	983	1863	1583	1118	1863	1583
Volume (vph)	106	700	178	180	434	127	86	151	282	143	180	140
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)	115	761	193	196	472	138	93	164	307	155	196	152
RTOR Reduction (vph)	0	0	103	0	0	69	0	0	245	0	0	121
Lane Group Flow (vph)	115	761	90	196	472	69	93	164	62	155	196	31
Turn Type	Prot		Perm	Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8			2		6		6
Permitted Phases			4			8	2		2		6	
Actuated Green, G (s)	6.9	29.2	29.2	9.0	31.3	31.3	12.7	12.7	12.7	12.7	12.7	12.7
Effective Green, g (s)	6.9	29.2	29.2	9.0	31.3	31.3	12.7	12.7	12.7	12.7	12.7	12.7
Actuated g/C Ratio	0.11	0.46	0.46	0.14	0.50	0.50	0.20	0.20	0.20	0.20	0.20	0.20
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	3.0
Lane Grp Cap (vph)	194	865	735	253	927	788	198	376	320	226	376	320
v/s Ratio Prot	0.06	c0.41		c0.11	0.25		0.09		0.09		0.11	
v/s Ratio Perm			0.12		0.09	0.09		0.19	0.14			0.10
v/c Ratio	0.59	0.88	0.12	0.77	0.51	0.09	0.47	0.44	0.19	0.69	0.52	0.10
Uniform Delay, d1	26.7	15.3	9.6	26.0	10.6	8.3	22.1	22.0	20.8	23.3	22.4	20.4
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	4.8	10.2	0.1	13.7	0.4	0.0	1.8	0.8	0.3	8.3	1.3	0.1
Delay (s)	31.5	25.4	9.6	39.7	11.1	8.3	23.9	22.8	21.1	31.6	23.7	20.6
Level of Service	C	C	A	D	B	A	C	C	C	C	C	C
Approach Delay (s)	23.2			17.6			22.1		25.2			
Approach LOS	C			B			C		C			
Intersection Summary												
HCM Average Control Delay			21.8		HCM Level of Service				C			
HCM Volume to Capacity ratio			0.87									
Actuated Cycle Length (s)			62.9		Sum of lost time (s)				12.0			
Intersection Capacity Utilization			76.0%		ICU Level of Service				D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2025 PM With Project+Mit
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.97	1.00	1.00	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	3433	1863	1863	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	3433	1863	1863	1583
Volume (vph)	512	389	231	740	552	328
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	557	423	251	804	600	357
RTOR Reduction (vph)	0	101	0	0	0	22
Lane Group Flow (vph)	557	322	251	804	600	335
Turn Type	pm+ov		Prot		pm+ov	
Protected Phases	4	5	5	2	6	4
Permitted Phases	4				6	
Actuated Green, G (s)	13.6	20.6	7.0	31.6	20.6	34.2
Effective Green, g (s)	13.6	20.6	7.0	31.6	20.6	34.2
Actuated g/C Ratio	0.26	0.39	0.13	0.59	0.39	0.64
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	878	732	452	1107	721	1137
v/s Ratio Prot	0.16	c0.08	0.07	c0.43	c0.32	0.08
v/s Ratio Perm	0.19				0.15	
v/c Ratio	0.63	0.44	0.56	0.73	0.83	0.29
Uniform Delay, d1	17.6	12.0	21.6	7.7	14.7	4.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.5	0.4	1.5	2.4	8.1	0.1
Delay (s)	19.1	12.5	23.1	10.1	22.9	4.3
Level of Service	B	B	C	B	C	A
Approach Delay (s)	16.2		13.2		16.0	
Approach LOS	B		B		B	
Intersection Summary						
HCM Average Control Delay			15.1	HCM Level of Service		B
HCM Volume to Capacity ratio			0.78			
Actuated Cycle Length (s)			53.2	Sum of lost time (s)		12.0
Intersection Capacity Utilization			60.2%	ICU Level of Service		B
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2025 PM With Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations														
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0			
Lane Util. Factor	1.00	1.00		0.97	1.00		1.00	0.95	1.00	1.00	0.95			
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.98	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			
Frt	1.00	0.88		1.00	0.86		1.00	1.00	0.85	1.00	1.00			
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00			
Satd. Flow (prot)	1770	1643		3433	1610		1770	3539	1549	1770	3526			
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00			
Satd. Flow (perm)	1770	1643		3433	1610		1770	3539	1549	1770	3526			
Volume (vph)	59	19	71	516	20	192	60	1691	356	143	2032	44		
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)	64	21	77	561	22	209	65	1838	387	155	2209	48		
RTOR Reduction (vph)	0	62	0	0	127	0	0	0	169	0	1	0		
Lane Group Flow (vph)	64	36	0	561	104	0	65	1838	218	155	2256	0		
Confl. Peds. (#/hr)					2		2		2		2			
Turn Type	Prot		Prot		Prot		Perm		Prot					
Protected Phases	7	4		3	8		5	2		1	6			
Permitted Phases							2							
Actuated Green, G (s)	8.2	9.7		23.0	24.5		6.0	81.0	81.0	14.0	89.0			
Effective Green, g (s)	8.2	9.7		23.0	24.5		6.0	81.0	81.0	14.0	89.0			
Actuated g/C Ratio	0.06	0.07		0.16	0.17		0.04	0.56	0.56	0.10	0.62			
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0			
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)	101	111		549	274		74	1995	873	172	2184			
v/s Ratio Prot	0.04	0.06		c0.16	c0.14		0.04	0.52		c0.09	c0.64			
v/s Ratio Perm							0.25							
v/c Ratio	0.63	0.33		1.02	0.38		0.88	0.92	0.25	0.90	1.03			
Uniform Delay, d1	66.3	63.9		60.4	52.9		68.5	28.5	15.9	64.2	27.3			
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00			
Incremental Delay, d2	12.3	1.7		44.1	0.9		64.1	7.6	0.2	41.5	28.4			
Delay (s)	78.6	65.6		104.4	53.7		132.6	36.0	16.1	105.6	55.7			
Level of Service	E	E		F	D		F	D	B	F	E			
Approach Delay (s)	70.7		89.6		35.4		58.9							
Approach LOS	E		F		D		E							
Intersection Summary														
HCM Average Control Delay	54.0		HCM Level of Service		D									
HCM Volume to Capacity ratio	0.98													
Actuated Cycle Length (s)	143.7		Sum of lost time (s)		8.0									
Intersection Capacity Utilization	94.3%		ICU Level of Service		F									
Analysis Period (min)	15													
c Critical Lane Group														

**Appendix R – Intersection Operations Analysis Worksheets for 2035 With Project
Phase 2 Conditions, with Existing Geometry and Planned Improvements**

**HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway**

2035 AM With Project
7/25/2012

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.11	1.00
Satd. Flow (perm)	1770	1583	3539	1583	207	3539
Volume (vph)	480	510	1261	109	361	1042
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	522	554	1371	118	392	1133
RTOR Reduction (vph)	0	229	0	71	0	0
Lane Group Flow (vph)	522	325	1371	47	392	1133
Turn Type	Perm		Perm pm+pt			
Protected Phases	8		2		1 6	
Permitted Phases	8		2		6	
Actuated Green, G (s)	23.0	23.0	32.0	32.0	49.0	49.0
Effective Green, g (s)	23.0	23.0	32.0	32.0	49.0	49.0
Actuated g/C Ratio	0.29	0.29	0.40	0.40	0.61	0.61
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	509	455	1416	633	381	2168
v/s Ratio Prot	0.29		0.39		c0.17 0.32	
v/s Ratio Perm	0.35		0.07		c0.46	
v/c Ratio	1.03	0.71	0.97	0.07	1.03	0.52
Uniform Delay, d1	28.5	25.5	23.5	14.8	23.9	8.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	46.6	5.2	16.7	0.1	53.7	0.2
Delay (s)	75.1	30.8	40.2	14.9	77.6	9.1
Level of Service	E C		D B		E A	
Approach Delay (s)	52.3		38.2		26.7	
Approach LOS	D		D		C	
Intersection Summary						
HCM Average Control Delay			37.6		HCM Level of Service D	
HCM Volume to Capacity ratio			1.07			
Actuated Cycle Length (s)			80.0		Sum of lost time (s) 8.0	
Intersection Capacity Utilization			91.5%		ICU Level of Service F	
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
2: Hulikoa Drive & Queen Kaahumanu Highway

2035 AM With Project
7/25/2012

	↖	↗	↖	↗	↖	↗
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations		↖	↖	↖	↖	↖
Sign Control	Yield		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	347	1173	353	0	1545
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	377	1275	384	0	1679
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage (veh)	5					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2115	638			1275	
vC1, stage 1 conf vol	1275					
vC2, stage 2 conf vol	840					
vCu, unblocked vol	2115	638			1275	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	10			100	
cM capacity (veh/h)	222	420			540	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	377	638	638	384	840	840
Volume Left	0	0	0	0	0	0
Volume Right	377	0	0	384	0	0
cSH	420	1700	1700	1700	1700	1700
Volume to Capacity	0.90	0.38	0.38	0.23	0.49	0.49
Queue Length (ft)	238	0	0	0	0	0
Control Delay (s)	54.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	F					
Approach Delay (s)	54.0	0.0			0.0	
Approach LOS	F					
Intersection Summary						
Average Delay		5.5				
Intersection Capacity Utilization		60.6%		ICU Level of Service	B	
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2035 AM With Project
7/25/2012

	↖	↗	↖	↗	↖	↗
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↖	↖	↖	↖	↖
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Flpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1543	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1543	3433	3539
Volume (vph)	996	452	916	1000	585	1041
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1083	491	996	1087	636	1132
RTOR Reduction (vph)	0	0	0	434	0	0
Lane Group Flow (vph)	1083	491	996	653	636	1132
Confl. Peds. (#/hr)	14		8		8	
Turn Type	Free		Perm		Prot	
Protected Phases	8		2		1	
Permitted Phases	Free		2			
Actuated Green, G (s)	28.0	90.0	34.0	34.0	16.0	54.0
Effective Green, g (s)	28.0	90.0	34.0	34.0	16.0	54.0
Actuated g/C Ratio	0.31	1.00	0.38	0.38	0.18	0.60
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1068	1558	1337	583	610	2123
v/s Ratio Prot	c0.32		0.28		c0.19	0.32
v/s Ratio Perm		0.32		0.70		
v/c Ratio	1.01	0.32	0.74	1.12	1.04	0.53
Uniform Delay, d1	31.0	0.0	24.2	28.0	37.0	10.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	31.1	0.5	2.3	75.0	48.0	0.3
Delay (s)	62.1	0.5	26.5	103.0	85.0	10.8
Level of Service	E	A	C	F	F	B
Approach Delay (s)	42.9		66.5			37.5
Approach LOS	D		E			D
Intersection Summary						
HCM Average Control Delay		50.2		HCM Level of Service	D	
HCM Volume to Capacity ratio		1.39				
Actuated Cycle Length (s)		90.0		Sum of lost time (s)	12.0	
Intersection Capacity Utilization		86.1%		ICU Level of Service	E	
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kananani Street

2035 AM With Project
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↔	↔	↔	↔
Sign Control	Free	Free	Free	Free	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Volume (veh/h)	1093	363	29	1242	225	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1188	395	32	1350	245	20
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			1585		1928	1190
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1585		1928	1190
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		0	89
cM capacity (veh/h)			410		54	180
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	1188	395	482	900	264	
Volume Left	0	0	32	0	245	
Volume Right	0	395	0	0	20	
cSH	1700	1700	410	1700	57	
Volume to Capacity	0.70	0.23	0.08	0.53	4.66	
Queue Length (ft)	0	0	6	0	Err	
Control Delay (s)	0.0	0.0	2.4	0.0	Err	
Lane LOS			A		F	
Approach Delay (s)	0.0		0.8		Err	
Approach LOS					F	
Intersection Summary						
Average Delay			818.5			
Intersection Capacity Utilization			76.7%		ICU Level of Service	D
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2035 AM With Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↑	↑	↔	↔	↔	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0		4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		0.97	1.00		1.00		1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.85		1.00		0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95		1.00
Satd. Flow (prot)	1770	1863	1583	1770	1825		3433	1583		1770		1583
Flt Permitted	0.21	1.00	1.00	0.34	1.00		0.95	1.00		0.95		1.00
Satd. Flow (perm)	385	1863	1583	634	1825		3433	1583		1770		1583
Volume (vph)	377	588	133	224	709	112	121	0	81	108	0	451
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)	410	639	145	243	771	122	132	0	88	117	0	490
RTOR Reduction (vph)	0	0	0	0	4	0	0	78	0	0	0	210
Lane Group Flow (vph)	410	639	145	243	889	0	132	10	0	117	0	280
Turn Type	Perm	Perm	Free	Perm	Perm		Prot	Perm		Prot	Perm	Perm
Protected Phases			4			8		5	2		1	6
Permitted Phases	4		Free	8								6
Actuated Green, G (s)	102.0	102.0	145.3	102.0	102.0		11.3	17.0		14.3		20.0
Effective Green, g (s)	102.0	102.0	145.3	102.0	102.0		11.3	17.0		14.3		20.0
Actuated g/C Ratio	0.70	0.70	1.00	0.70	0.70		0.08	0.12		0.10		0.14
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0		4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0		3.0
Lane Grp Cap (vph)	270	1308	1583	445	1281		267	185		174		218
v/s Ratio Prot			0.34		0.49		0.04	0.06		c0.07		
v/s Ratio Perm	c1.06		0.09	0.38			0.49	0.06		0.67		0.31
v/c Ratio	1.52	0.49	0.09	0.55	0.69		0.49	0.06		0.67		1.28
Uniform Delay, d1	21.7	9.8	0.0	10.5	12.6		64.3	57.0		63.2		62.6
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00		1.00
Incremental Delay, d2	251.5	0.3	0.1	1.4	1.7		1.4	0.1		9.8		157.4
Delay (s)	273.1	10.1	0.1	11.8	14.2		65.7	57.1		73.0		220.1
Level of Service	F	B	A	B	B		E	E		E		F
Approach Delay (s)		99.2			13.7			62.3				191.7
Approach LOS		F			B			E				F
Intersection Summary												
HCM Average Control Delay			83.7				HCM Level of Service			F		
HCM Volume to Capacity ratio			1.56									
Actuated Cycle Length (s)			145.3				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			87.6%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokalole Hwy.

2035 AM With Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑	↱	↰	↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	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	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.17	1.00	1.00	0.41	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	309	1863	1583	756	1863	1583
Volume (vph)	168	394	114	467	664	205	203	323	158	200	540	214
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)	183	428	124	508	722	223	221	351	172	217	587	233
RTOR Reduction (vph)	0	0	98	0	0	122	0	0	103	0	0	140
Lane Group Flow (vph)	183	428	26	508	722	101	221	351	69	217	587	93
Turn Type	Prot		Perm	Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8		2		2	6		6
Permitted Phases			4			8	2		2		6	6
Actuated Green, G (s)	10.0	21.0	21.0	27.0	38.0	38.0	40.0	40.0	40.0	40.0	40.0	40.0
Effective Green, g (s)	10.0	21.0	21.0	27.0	38.0	38.0	40.0	40.0	40.0	40.0	40.0	40.0
Actuated g/C Ratio	0.10	0.21	0.21	0.27	0.38	0.38	0.40	0.40	0.40	0.40	0.40	0.40
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	3.0
Lane Grp Cap (vph)	177	391	332	478	708	602	124	745	633	302	745	633
v/s Ratio Prot	0.10	0.23		c0.29	c0.39			0.19			0.32	
v/s Ratio Perm			0.08			0.14	c0.72		0.11	0.29		0.15
v/c Ratio	1.03	1.09	0.08	1.06	1.02	0.17	1.78	0.47	0.11	0.72	0.79	0.15
Uniform Delay, d1	45.0	39.5	31.7	36.5	31.0	20.5	30.0	22.2	18.8	25.3	26.3	19.1
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	76.8	73.5	0.1	58.8	38.9	0.1	382.5	0.5	0.1	7.9	5.5	0.1
Delay (s)	121.8	113.0	31.8	95.3	69.9	20.7	412.5	22.7	18.9	33.2	31.8	19.2
Level of Service	F	F	C	F	E	C	F	C	B	C	C	B
Approach Delay (s)		101.5			71.2			137.6			29.3	
Approach LOS		F			E			F			C	
Intersection Summary												
HCM Average Control Delay		78.3				HCM Level of Service		E				
HCM Volume to Capacity ratio		1.35										
Actuated Cycle Length (s)		100.0				Sum of lost time (s)		8.0				
Intersection Capacity Utilization		99.6%				ICU Level of Service		F				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2035 AM With Project
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱	↰	↑	↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.06	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	116	1863	1863	1583
Volume (vph)	388	324	340	291	1078	674
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	422	352	370	316	1172	733
RTOR Reduction (vph)	0	212	0	0	0	102
Lane Group Flow (vph)	422	140	370	316	1172	631
Turn Type		Perm	pm+pt			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	23.0	23.0	79.0	79.0	60.0	60.0
Effective Green, g (s)	23.0	23.0	79.0	79.0	60.0	60.0
Actuated g/C Ratio	0.21	0.21	0.72	0.72	0.55	0.55
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	370	331	309	1338	1016	863
v/s Ratio Prot	c0.24		c0.16	0.17	0.63	
v/s Ratio Perm		0.22	c0.69			0.46
v/c Ratio	1.14	0.42	1.20	0.24	1.15	0.73
Uniform Delay, d1	43.5	37.7	49.7	5.3	25.0	18.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	90.8	0.9	115.9	0.1	80.5	3.2
Delay (s)	134.3	38.6	165.6	5.4	105.5	22.1
Level of Service	F	D	F	A	F	C
Approach Delay (s)	90.8			91.8	73.4	
Approach LOS	F			F	E	
Intersection Summary						
HCM Average Control Delay		81.2			HCM Level of Service	F
HCM Volume to Capacity ratio		1.17				
Actuated Cycle Length (s)		110.0			Sum of lost time (s)	8.0
Intersection Capacity Utilization		107.1%			ICU Level of Service	G
Analysis Period (min)		15				
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2035 AM With Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔		↔	↔	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.98	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	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.97	1.00		0.95	1.00	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)		1800	1583		1778	1583	1770	3539	1549	1770	3522	
Flt Permitted		0.59	1.00		0.72	1.00	0.06	1.00	1.00	0.06	1.00	
Satd. Flow (perm)		1105	1583		1333	1583	111	3539	1549	105	3522	
Volume (vph)	17	7	24	430	18	152	68	1822	579	199	1691	48
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)	18	8	26	467	20	165	74	1980	629	216	1838	52
RTOR Reduction (vph)	0	0	18	0	0	47	0	0	305	0	1	0
Lane Group Flow (vph)	0	26	8	0	487	118	74	1980	324	216	1889	0
Confl. Peds. (#/hr)							2	2	2			2
Turn Type	Perm	Perm	Perm	Perm	pm+pt	pm+pt	Perm	pm+pt	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)		42.0	42.0		42.0	42.0	71.0	67.0	67.0	80.0	72.0	
Effective Green, g (s)		42.0	42.0		42.0	42.0	71.0	67.0	67.0	80.0	72.0	
Actuated g/C Ratio		0.32	0.32		0.32	0.32	0.55	0.52	0.52	0.62	0.55	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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)		357	511		431	511	112	1824	798	180	1951	
v/s Ratio Prot							0.02	0.56		c0.08	0.54	
v/s Ratio Perm		0.02	0.02		c0.37	0.10	0.34		0.41	c0.66		
v/c Ratio		0.07	0.02		1.13	0.23	0.66	1.09	0.41	1.20	0.97	
Uniform Delay, d1		30.5	29.9		44.0	32.2	29.7	31.5	19.3	62.7	27.9	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.1	0.0		83.8	0.2	13.7	48.4	0.3	131.2	13.5	
Delay (s)		30.6	30.0		127.8	32.4	43.4	79.9	19.6	193.9	41.4	
Level of Service		C	C		F	C	D	E	B	F	D	
Approach Delay (s)		30.3			103.7			64.8			57.0	
Approach LOS		C			F			E			E	
Intersection Summary												
HCM Average Control Delay		66.1			HCM Level of Service			E				
HCM Volume to Capacity ratio		1.16										
Actuated Cycle Length (s)		130.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		102.8%			ICU Level of Service			G				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

2035 PM With Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.08	1.00
Satd. Flow (perm)	1770	1583	3539	1583	146	3539
Volume (vph)	180	517	1381	387	587	1490
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	562	1501	421	638	1620
RTOR Reduction (vph)	0	406	0	235	0	0
Lane Group Flow (vph)	196	156	1501	186	638	1620
Turn Type	Perm	Perm	Perm	pm+pt	Perm	pm+pt
Protected Phases	8		2		1	6
Permitted Phases		8		2		6
Actuated Green, G (s)	15.1	15.1	47.0	47.0	86.0	86.0
Effective Green, g (s)	15.1	15.1	47.0	47.0	86.0	86.0
Actuated g/C Ratio	0.14	0.14	0.43	0.43	0.79	0.79
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	245	219	1525	682	636	2790
v/s Ratio Prot	0.11		0.42		c0.32	0.46
v/s Ratio Perm		0.35		0.27	c0.47	
v/c Ratio	0.80	0.71	0.98	0.27	1.00	0.58
Uniform Delay, d1	45.5	44.9	30.7	20.0	32.6	4.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	16.8	10.5	19.2	0.2	36.5	0.3
Delay (s)	62.4	55.4	49.9	20.3	69.0	4.8
Level of Service	E	E	D	C	E	A
Approach Delay (s)	57.2		43.4			23.0
Approach LOS	E		D			C
Intersection Summary						
HCM Average Control Delay		36.2			HCM Level of Service	D
HCM Volume to Capacity ratio		1.22				
Actuated Cycle Length (s)		109.1			Sum of lost time (s)	8.0
Intersection Capacity Utilization		90.7%			ICU Level of Service	E
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
2: Hulioa Drive & Queen Kaahumanu Highway

2035 PM With Project
7/25/2012

							
Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Sign Control	Yield		Free			Free	
Grade	0%		0%			0%	
Volume (veh/h)	0	381	1478	261	0	1980	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	0	414	1607	284	0	2152	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	TWLTL						
Median storage (veh)	5						
Upstream signal (ft)							
pX, platoon unblocked							
vC, conflicting volume	2683	803			1607		
vC1, stage 1 conf vol	1607						
vC2, stage 2 conf vol	1076						
vCu, unblocked vol	2683	803			1607		
tC, single (s)	6.8	6.9			4.1		
tC, 2 stage (s)	5.8						
tF (s)	3.5	3.3			2.2		
p0 queue free %	100	0			100		
cM capacity (veh/h)	148	326			403		
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	
Volume Total	414	803	803	284	1076	1076	
Volume Left	0	0	0	0	0	0	
Volume Right	414	0	0	284	0	0	
cSH	326	1700	1700	1700	1700	1700	
Volume to Capacity	1.27	0.47	0.47	0.17	0.63	0.63	
Queue Length (ft)	478	0	0	0	0	0	
Control Delay (s)	176.4	0.0	0.0	0.0	0.0	0.0	
Lane LOS	F						
Approach Delay (s)	176.4	0.0			0.0		
Approach LOS	F						
Intersection Summary							
Average Delay	16.4						
Intersection Capacity Utilization	71.1%			ICU Level of Service		C	
Analysis Period (min)	15						

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2035 PM With Project
7/25/2012

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1536	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1536	3433	3539
Volume (vph)	1315	569	1175	1316	671	1216
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1429	618	1277	1430	729	1322
RTOR Reduction (vph)	0	0	0	428	0	0
Lane Group Flow (vph)	1429	618	1277	1002	729	1322
Confl. Peds. (#/hr)	14		8		8	
Turn Type	Free		Perm		Prot	
Protected Phases	8		2		1	
Permitted Phases	Free		2			
Actuated Green, G (s)	39.0	120.0	50.0	50.0	19.0	73.0
Effective Green, g (s)	39.0	120.0	50.0	50.0	19.0	73.0
Actuated g/C Ratio	0.32	1.00	0.42	0.42	0.16	0.61
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1116	1558	1475	640	544	2153
v/s Ratio Prot	c0.42		0.36		c0.21	
v/s Ratio Perm	0.40		0.93			
v/c Ratio	1.28	0.40	0.87	1.57	1.34	0.61
Uniform Delay, d1	40.5	0.0	31.9	35.0	50.5	14.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	133.2	0.8	5.6	262.0	165.1	0.5
Delay (s)	173.7	0.8	37.5	297.0	215.6	15.2
Level of Service	F	A	D	F	F	B
Approach Delay (s)	121.5		174.6			86.4
Approach LOS	F		F			F
Intersection Summary						
HCM Average Control Delay	132.0		HCM Level of Service		F	
HCM Volume to Capacity ratio	1.73					
Actuated Cycle Length (s)	120.0		Sum of lost time (s)		12.0	
Intersection Capacity Utilization	108.1%		ICU Level of Service		G	
Analysis Period (min)	15					
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kananani Street

2035 PM With Project
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↔	↔	↔	↔
Sign Control	Free	Free	Free	Free	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Volume (veh/h)	1378	489	17	1597	200	74
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1498	532	18	1736	217	80
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			2031		2405	1500
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			2031		2405	1500
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		0	27
cM capacity (veh/h)			275		26	111
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	1498	532	597	1157	298	
Volume Left	0	0	18	0	217	
Volume Right	0	532	0	0	80	
cSH	1700	1700	275	1700	32	
Volume to Capacity	0.88	0.31	0.07	0.68	9.18	
Queue Length (ft)	0	0	5	0	Err	
Control Delay (s)	0.0	0.0	2.5	0.0	Err	
Lane LOS			A		F	
Approach Delay (s)	0.0		0.8		Err	
Approach LOS					F	
Intersection Summary						
Average Delay			730.0			
Intersection Capacity Utilization			90.3%		ICU Level of Service	E
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2035 PM With Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↑	↑	↔	↔	↔	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0		4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		0.97	1.00		1.00		1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.85		1.00		0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95		1.00
Satd. Flow (prot)	1770	1863	1583	1770	1822		3433	1583		1770		1583
Flt Permitted	0.17	1.00	1.00	0.19	1.00		0.95	1.00		0.95		1.00
Satd. Flow (perm)	320	1863	1583	348	1822		3433	1583		1770		1583
Volume (vph)	501	798	105	133	704	120	415	0	347	129	0	471
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)	545	867	114	145	765	130	451	0	377	140	0	512
RTOR Reduction (vph)	0	0	0	0	4	0	0	149	0	0	0	178
Lane Group Flow (vph)	545	867	114	145	891	0	451	228	0	140	0	334
Turn Type	Perm	Perm	Free	Perm	Perm		Prot	Prot		Prot	Perm	Perm
Protected Phases			4		8		5	2		1	6	
Permitted Phases	4		Free	8								6
Actuated Green, G (s)	98.0	98.0	150.0	98.0	98.0		17.0	28.0		12.0		23.0
Effective Green, g (s)	98.0	98.0	150.0	98.0	98.0		17.0	28.0		12.0		23.0
Actuated g/C Ratio	0.65	0.65	1.00	0.65	0.65		0.11	0.19		0.08		0.15
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0		4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0		3.0
Lane Grp Cap (vph)	209	1217	1583	227	1190		389	295		142		243
v/s Ratio Prot		0.47			0.49		0.13	0.24		0.08		
v/s Ratio Perm	c1.71		0.07	0.42								0.32
v/c Ratio	2.61	0.71	0.07	0.64	0.75		1.16	0.77		0.99		1.38
Uniform Delay, d1	26.0	16.9	0.0	15.5	17.6		66.5	58.0		68.9		63.5
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00		1.00
Incremental Delay, d2	737.2	2.0	0.1	5.8	2.6		96.7	11.9		70.7		192.7
Delay (s)	763.2	18.9	0.1	21.3	20.3		163.2	69.9		139.6		256.2
Level of Service	F	B	A	C	C		F	E		F		F
Approach Delay (s)		283.3			20.4			120.7				231.1
Approach LOS		F			C			F				F
Intersection Summary												
HCM Average Control Delay			174.0				HCM Level of Service			F		
HCM Volume to Capacity ratio			2.35									
Actuated Cycle Length (s)			150.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			114.1%				ICU Level of Service			H		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokaloale Hwy.

2035 PM With Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	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	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.28	1.00	1.00	0.20	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	520	1863	1583	372	1863	1583
Volume (vph)	234	829	218	291	542	232	130	498	452	244	424	199
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)	254	901	237	316	589	252	141	541	491	265	461	216
RTOR Reduction (vph)	0	0	80	0	0	107	0	0	193	0	0	130
Lane Group Flow (vph)	254	901	157	316	589	145	141	541	298	265	461	86
Turn Type	Prot	Perm		Prot	Perm		Perm	Perm	Perm	Perm	Perm	
Protected Phases	7	4		3	8			2			6	
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	19.0	49.0	49.0	17.0	47.0	47.0	52.0	52.0	52.0	52.0	52.0	52.0
Effective Green, g (s)	19.0	49.0	49.0	17.0	47.0	47.0	52.0	52.0	52.0	52.0	52.0	52.0
Actuated g/C Ratio	0.15	0.38	0.38	0.13	0.36	0.36	0.40	0.40	0.40	0.40	0.40	0.40
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	3.0
Lane Grp Cap (vph)	259	702	597	231	674	572	208	745	633	149	745	633
v/s Ratio Prot	0.14	c0.48		c0.18		0.32	0.29		0.25			
v/s Ratio Perm	0.15			0.16			0.27	0.31		c0.71	0.14	
v/c Ratio	0.98	1.28	0.26	1.37	0.87	0.25	0.68	0.73	0.47	1.78	0.62	0.14
Uniform Delay, d1	55.3	40.5	28.0	56.5	38.7	29.2	32.1	33.0	28.8	39.0	31.1	24.8
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	50.3	138.3	0.2	190.7	12.1	0.2	8.5	3.5	0.6	376.0	1.5	0.1
Delay (s)	105.6	178.8	28.2	247.2	50.8	29.4	40.6	36.5	29.4	415.0	32.6	24.9
Level of Service	F	F	C	F	D	C	D	D	C	F	C	C
Approach Delay (s)	139.8			99.8			34.0			138.4		
Approach LOS	F			F			C			F		
Intersection Summary												
HCM Average Control Delay	103.0			HCM Level of Service					F			
HCM Volume to Capacity ratio	1.46											
Actuated Cycle Length (s)	130.0			Sum of lost time (s)					8.0			
Intersection Capacity Utilization	112.8%			ICU Level of Service					H			
Analysis Period (min)	15											
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2035 PM With Project
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.16	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	298	1863	1863	1583
Volume (vph)	712	482	352	634	493	515
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	774	524	383	689	536	560
RTOR Reduction (vph)	0	253	0	0	0	251
Lane Group Flow (vph)	774	271	383	689	536	309
Turn Type	Perm		pm+pt		Perm	
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	31.0	31.0	36.0	36.0	21.0	21.0
Effective Green, g (s)	31.0	31.0	36.0	36.0	21.0	21.0
Actuated g/C Ratio	0.41	0.41	0.48	0.48	0.28	0.28
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	732	654	359	894	522	443
v/s Ratio Prot	c0.44		c0.16	0.37	0.29	
v/s Ratio Perm		0.33	0.36			0.35
v/c Ratio	1.06	0.41	1.07	0.77	1.03	0.70
Uniform Delay, d1	22.0	15.6	19.4	16.1	27.0	24.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	49.5	0.4	66.4	4.2	46.4	4.8
Delay (s)	71.5	16.0	85.8	20.2	73.4	28.9
Level of Service	E	B	F	C	E	C
Approach Delay (s)	49.1			43.6	50.7	
Approach LOS	D			D	D	
Intersection Summary						
HCM Average Control Delay	47.9		HCM Level of Service		D	
HCM Volume to Capacity ratio	1.13					
Actuated Cycle Length (s)	75.0		Sum of lost time (s)		12.0	
Intersection Capacity Utilization	94.9%		ICU Level of Service		F	
Analysis Period (min)	15					
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2035 PM With Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔		↔	↔	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Flt Protected		1.00	1.00		1.00	1.00	1.00	1.00	0.98	1.00	1.00	
Flt Permitted		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Satd. Flow (prot)		1795	1583		1777	1583	1770	3539	1549	1770	3529	
Satd. Flow (perm)		0.17	1.00		0.66	1.00	0.05	1.00	1.00	0.05	1.00	
Volume (vph)	59	19	71	583	20	123	60	2206	444	98	2489	44
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)	64	21	77	634	22	134	65	2398	483	107	2705	48
RTOR Reduction (vph)	0	0	34	0	0	25	0	211	0	1	0	0
Lane Group Flow (vph)	0	85	43	0	656	109	65	2398	272	107	2752	0
Confl. Peds. (#/hr)							2		2		2	
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)		55.0	55.0		55.0	55.0	83.0	79.0	79.0	83.0	79.0	
Effective Green, g (s)		55.0	55.0		55.0	55.0	83.0	79.0	79.0	83.0	79.0	
Actuated g/C Ratio		0.37	0.37		0.37	0.37	0.55	0.53	0.53	0.55	0.53	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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)		114	580		453	580	97	1864	816	97	1859	
v/s Ratio Prot							0.02	0.68		c0.03	c0.78	
v/s Ratio Perm		0.27	0.05		c0.53	0.08	0.35		0.31	0.58		
v/c Ratio		0.75	0.07		1.45	0.19	0.67	1.29	0.33	1.10	1.48	
Uniform Delay, d1		41.4	30.9		47.5	32.3	73.8	35.5	20.4	75.2	35.5	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		23.0	0.1		213.8	0.2	16.7	133.1	0.2	121.9	219.1	
Delay (s)		64.4	31.0		261.3	32.5	90.4	168.6	20.6	197.1	254.6	
Level of Service		E	C		F	C	F	F	C	F	F	
Approach Delay (s)		48.5			222.5			142.6			252.5	
Approach LOS		D			F			F			F	
Intersection Summary												
HCM Average Control Delay		196.2			HCM Level of Service				F			
HCM Volume to Capacity ratio		1.46										
Actuated Cycle Length (s)		150.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		123.6%			ICU Level of Service			H				
Analysis Period (min)		15										

c Critical Lane Group

Appendix S – Intersection Operations Analysis Worksheets for 2035 With Project
Phase 2 Conditions, with Mitigation Measures

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

2035 AM With Project+Mit
7/25/2012

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.11	1.00
Satd. Flow (perm)	1770	1583	3539	1583	207	3539
Volume (vph)	480	510	1261	109	361	1042
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	522	554	1371	118	392	1133
RTOR Reduction (vph)	0	229	0	71	0	0
Lane Group Flow (vph)	522	325	1371	47	392	1133
Turn Type	Perm		Perm pm+pt			
Protected Phases	8		2		1	
Permitted Phases	8		2		6	
Actuated Green, G (s)	23.0	23.0	32.0	32.0	49.0	49.0
Effective Green, g (s)	23.0	23.0	32.0	32.0	49.0	49.0
Actuated g/C Ratio	0.29	0.29	0.40	0.40	0.61	0.61
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	509	455	1416	633	381	2168
v/s Ratio Prot	0.29		0.39		c0.17	
v/s Ratio Perm	0.35		0.07		c0.46	
v/c Ratio	1.03	0.71	0.97	0.07	1.03	0.52
Uniform Delay, d1	28.5	25.5	23.5	14.8	23.9	8.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	46.6	5.2	16.7	0.1	53.7	0.2
Delay (s)	75.1	30.8	40.2	14.9	77.6	9.1
Level of Service	E	C	D	B	E	A
Approach Delay (s)	52.3		38.2		26.7	
Approach LOS	D		D		C	
Intersection Summary						
HCM Average Control Delay			37.6		HCM Level of Service	
HCM Volume to Capacity ratio			1.07		D	
Actuated Cycle Length (s)			80.0		Sum of lost time (s)	
Intersection Capacity Utilization			91.5%		8.0	
ICU Level of Service			F			
Analysis Period (min)			15			
c Critical Lane Group						

AM (2035+P2)	Thu Jul 26, 2012 10:26:37	Page 3-1
JB23054 - Kaloko Makai		
Kona, Hawaii		
2025 With Project Phase 2 Conditions		
Level Of Service Computation Report		
2000 HCM Unsignalized Method (Future Volume Alternative)		
Intersection #2 Queen Kaahumanu Hwy. @ Hulikoa Dr.		
Average Delay (sec/veh): 0.0 Worst Case Level Of Service: A[7.2]		
Approach: North Bound South Bound East Bound West Bound		
Movement: L - T - R L - T - R L - T - R L - T - R		
Control: Uncontrolled Uncontrolled Yield Sign Yield Sign		
Rights: Include Include Include Ignore		
Lanes: 0 0 2 0 1 0 1 1 0 0 0 0 0 0 1 0 0		
Volume Module:		
Base Vol: 0 590 218 0 835 0 0 0 0 0 0 0 182		
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00		
Initial Bse: 0 590 218 0 835 0 0 0 0 0 0 0 182		
Added Vol: 0 583 115 20 648 0 0 0 0 0 42 0 123		
PasserByVol: 0 0 20 -20 62 0 0 0 0 0 -42 0 42		
Initial Fut: 0 1173 353 0 1545 0 0 0 0 0 0 0 347		
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 0.00		
PHF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 0.00		
PHF Volume: 0 1173 353 0 1545 0 0 0 0 0 0 0 0		
Reduct Vol: 0 0 0 0 0 0 0 0 0 0 0 0 0		
FinalVolume: 0 1173 353 0 1545 0 0 0 0 0 0 0 0		
Critical Gap Module:		
Critical Gp:xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx 6.8 6.5 6.9		
FollowUpTim:xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx 3.5 4.0 3.3		
Capacity Module:		
Cnflct Vol: xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx 1946 2718 587		
Potent Cap.: xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx 58 21 458		
Move Cap.: xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx 58 21 458		
Volume/Cap: xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx 0.00 0.00 0.00		
Level Of Service Module:		
2Way95thQ: xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx		
Control Del:xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx		
LOS by Move: *		
Movement: LT - LTR - RT LT - LTR - RT LT - LTR - RT LT - LTR - RT		
Shared Cap.: xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx 0 xxxxx		
SharedQueue:xxxxx xxxxx xxxxx 0.0 xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx		
Shrd ConDel:xxxxx xxxxx xxxxx 7.2 xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx		
Shared LOS: * * * * * A * * * * * * * * * * * *		
ApproachDel: xxxxxx xxxxxx xxxxxx xxxxxx		
ApproachLOS: * * * * *		
Note: Queue reported is the number of cars per lane.		

Traffic 8.0.0715 (c) 2008 Dowling Assoc. Licensed to KOA CORP, MONTEREY PK

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2035 AM With Project+Mit
7/25/2012

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		  	 	 	  
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.91	0.88	0.97	0.91
Frpb, ped/bikes	1.00	0.97	1.00	0.96	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1538	5085	2687	3433	5085
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1538	5085	2687	3433	5085
Volume (vph)	996	452	916	1000	585	1041
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1083	491	996	1087	636	1132
RTOR Reduction (vph)	0	325	0	802	0	0
Lane Group Flow (vph)	1083	166	996	285	636	1132
Confl. Peds. (#/hr)	14		8		8	
Turn Type	Perm		Perm		Prot	
Protected Phases	8		2		1	
Permitted Phases	8		2			
Actuated Green, G (s)	22.0	22.0	17.0	17.0	13.9	34.9
Effective Green, g (s)	22.0	22.0	17.0	17.0	13.9	34.9
Actuated g/C Ratio	0.34	0.34	0.26	0.26	0.21	0.54
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1164	521	1332	704	735	2734
v/s Ratio Prot	0.32		0.20		c0.19	0.22
v/s Ratio Perm		0.32		0.40		
v/c Ratio	0.93	0.32	0.75	0.40	0.87	0.41
Uniform Delay, d1	20.7	15.9	22.0	19.8	24.6	8.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	13.0	0.4	2.3	0.4	10.4	0.1
Delay (s)	33.7	16.3	24.3	20.2	35.0	9.0
Level of Service	C	B	C	C	D	A
Approach Delay (s)	28.3		22.1		18.4	
Approach LOS	C		C		B	
Intersection Summary						
HCM Average Control Delay			22.7	HCM Level of Service		C
HCM Volume to Capacity ratio			1.12			
Actuated Cycle Length (s)			64.9	Sum of lost time (s)		12.0
Intersection Capacity Utilization			72.8%	ICU Level of Service		C
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kanalani Street

2035 AM With Project+Mit
7/25/2012

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑	↗		↖↑		↗
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1093	363	29	1242	0	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1188	395	32	1350	0	20
Pedestrians						2
Lane Width (ft)						12.0
Walking Speed (ft/s)						4.0
Percent Blockage						0
Right turn flare (veh)						
Median type						None
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			1585		1928	596
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1585		1928	596
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			92		100	96
cM capacity (veh/h)			410		54	446
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1
Volume Total	594	594	395	482	900	20
Volume Left	0	0	0	32	0	0
Volume Right	0	0	395	0	0	20
cSH	1700	1700	1700	410	1700	446
Volume to Capacity	0.35	0.35	0.23	0.08	0.53	0.04
Queue Length (ft)	0	0	0	6	0	3
Control Delay (s)	0.0	0.0	0.0	2.4	0.0	13.4
Lane LOS				A	B	
Approach Delay (s)	0.0			0.8		13.4
Approach LOS				B		
Intersection Summary						
Average Delay	0.5					
Intersection Capacity Utilization	64.5%		ICU Level of Service			C
Analysis Period (min)	15					

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2035 AM With Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0		4.0
Lane Util. Factor	0.97	0.95		1.00	0.95	1.00	0.97		1.00	1.00		1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00		0.85	1.00		0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (prot)	3433	3441		1770	3539	1583	3433		1583	1770		1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (perm)	3433	3441		1770	3539	1583	3433		1583	1770		1583
Volume (vph)	377	588	133	224	709	112	346	0	81	108	0	451
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)	410	639	145	243	771	122	376	0	88	117	0	490
RTOR Reduction (vph)	0	23	0	0	0	85	0	0	73	0	0	0
Lane Group Flow (vph)	410	761	0	243	771	37	376	0	15	117	0	490
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8			2			Free
Actuated Green, G (s)	10.4	17.8		11.8	19.2	19.2	15.7		11.0	7.2		63.8
Effective Green, g (s)	10.4	17.8		11.8	19.2	19.2	15.7		11.0	7.2		63.8
Actuated g/C Ratio	0.16	0.28		0.18	0.30	0.30	0.25		0.17	0.11		1.00
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0		
Lane Grp Cap (vph)	560	960		327	1065	476	845		273	200		1583
v/s Ratio Prot	0.12	c0.23		c0.14	0.22		c0.11		c0.07			
v/s Ratio Perm					0.08		0.06		0.58			0.31
v/c Ratio	0.73	0.79		0.74	0.72	0.08	0.44		0.06	0.58		0.31
Uniform Delay, d1	25.4	21.3		24.6	19.9	16.0	20.4		22.1	26.9		0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		1.00
Incremental Delay, d2	4.9	4.6		8.8	2.5	0.1	0.4		0.1	4.3		0.5
Delay (s)	30.3	25.8		33.4	22.4	16.0	20.7		22.1	31.2		0.5
Level of Service	C	C		C	B	C		C	C		A	
Approach Delay (s)	27.4			24.1			21.0			6.4		
Approach LOS	C			C			C			A		
Intersection Summary												
HCM Average Control Delay		21.7					HCM Level of Service		C			
HCM Volume to Capacity ratio		0.64										
Actuated Cycle Length (s)		63.8				Sum of lost time (s)		12.0				
Intersection Capacity Utilization		59.4%				ICU Level of Service		B				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokalole Hwy.

2035 AM With Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	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	3539	1583	3433	3539	1583	1770	1863	1583	1770	1863	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	3539	1583	3433	3539	1583	1770	1863	1583	1770	1863	1583
Volume (vph)	168	394	114	467	664	205	203	323	158	200	540	214
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)	183	428	124	508	722	223	221	351	172	217	587	233
RTOR Reduction (vph)	0	0	102	0	0	173	0	0	0	0	0	153
Lane Group Flow (vph)	183	428	22	508	722	50	221	351	172	217	587	80
Turn Type	Prot			Perm	Prot		Perm	Prot		Free	Prot	Perm
Protected Phases	7	4		3	8		5	2			1	6
Permitted Phases			4			8			Free			6
Actuated Green, G (s)	10.0	15.5	15.5	14.0	19.5	19.5	12.0	28.9	87.6	13.2	30.1	30.1
Effective Green, g (s)	10.0	15.5	15.5	14.0	19.5	19.5	12.0	28.9	87.6	13.2	30.1	30.1
Actuated g/C Ratio	0.11	0.18	0.18	0.16	0.22	0.22	0.14	0.33	1.00	0.15	0.34	0.34
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	3.0
Lane Grp Cap (vph)	202	626	280	549	788	352	242	615	1583	267	640	544
v/s Ratio Prot	0.10	0.12		c0.15	c0.20		c0.12	0.19		0.12	c0.32	
v/s Ratio Perm			0.08		0.14			0.11				0.15
v/c Ratio	0.91	0.68	0.08	0.93	0.92	0.14	0.91	0.57	0.11	0.81	0.92	0.15
Uniform Delay, d1	38.3	33.8	30.1	36.3	33.3	27.3	37.3	24.2	0.0	36.0	27.6	19.9
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	38.0	3.1	0.1	21.6	15.2	0.2	35.2	1.3	0.1	17.0	18.0	0.1
Delay (s)	76.3	36.8	30.2	57.9	48.5	27.5	72.5	25.5	0.1	53.0	45.5	20.0
Level of Service	E	D	C	E	D	C	E	C	A	D	D	C
Approach Delay (s)	45.6			48.5			33.6			41.4		
Approach LOS	D			D			C			D		
Intersection Summary												
HCM Average Control Delay		43.3					HCM Level of Service		D			
HCM Volume to Capacity ratio		0.89										
Actuated Cycle Length (s)		87.6				Sum of lost time (s)		12.0				
Intersection Capacity Utilization		80.7%				ICU Level of Service		D				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2035 AM With Project+Mit
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.97	1.00	1.00	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	3433	1863	1863	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	3433	1863	1863	1583
Volume (vph)	388	324	340	291	1078	674
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	422	352	370	316	1172	733
RTOR Reduction (vph)	0	62	0	0	0	3
Lane Group Flow (vph)	422	290	370	316	1172	730
Turn Type	pm+ov		Prot		pm+ov	
Protected Phases	4	5	5	2	6	4
Permitted Phases	4		6		6	
Actuated Green, G (s)	15.6	26.6	11.0	76.0	61.0	76.6
Effective Green, g (s)	15.6	26.6	11.0	76.0	61.0	76.6
Actuated g/C Ratio	0.16	0.27	0.11	0.76	0.61	0.77
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	538	486	379	1422	1141	1281
v/s Ratio Prot	0.12	c0.08	c0.11	0.17	c0.63	0.09
v/s Ratio Perm	0.14		0.37		0.37	
v/c Ratio	0.78	0.60	0.98	0.22	1.03	0.57
Uniform Delay, d1	40.4	31.8	44.2	3.4	19.3	4.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.4	2.0	39.5	0.1	33.8	0.6
Delay (s)	47.8	33.8	83.7	3.4	53.1	5.3
Level of Service	D	C	F	A	D	A
Approach Delay (s)	41.4		46.7		34.7	
Approach LOS	D		D		C	
Intersection Summary						
HCM Average Control Delay			38.7		HCM Level of Service	
HCM Volume to Capacity ratio			0.98		D	
Actuated Cycle Length (s)			99.6		Sum of lost time (s)	
Intersection Capacity Utilization			87.5%		12.0	
Analysis Period (min)			15		ICU Level of Service	
c Critical Lane Group					E	

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2035 AM With Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.97	1.00		1.00	0.91	1.00	1.00	0.91	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.98	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	
Frt	1.00	0.89		1.00	0.87		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1649		3433	1614		1770	5085	1558	1770	5061	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1649		3433	1614		1770	5085	1558	1770	5061	
Volume (vph)	17	7	24	430	18	152	68	1822	579	199	1691	48
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)	18	8	26	467	20	165	74	1980	629	216	1838	52
RTOR Reduction (vph)	0	24	0	0	132	0	0	0	255	0	3	0
Lane Group Flow (vph)	18	10	0	467	53	0	74	1980	374	216	1887	0
Confl. Peds. (#/hr)					2		2		2		2	
Turn Type	Prot		Prot		Prot		pm+ov		Prot			
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases							2					
Actuated Green, G (s)	1.5	5.7		12.1	16.3		4.7	36.1	48.2	11.1	42.5	
Effective Green, g (s)	1.5	5.7		12.1	16.3		4.7	36.1	48.2	11.1	42.5	
Actuated g/C Ratio	0.02	0.07		0.15	0.20		0.06	0.45	0.60	0.14	0.52	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
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)	33	116		513	325		103	2266	1004	243	2655	
v/s Ratio Prot	0.01	0.02		c0.14	c0.11		0.04	c0.39	c0.09	c0.12	0.37	
v/s Ratio Perm					0.31							
v/c Ratio	0.55	0.08		0.91	0.16		0.72	0.87	0.37	0.89	0.71	
Uniform Delay, d1	39.4	35.2		33.9	26.7		37.5	20.4	8.5	34.3	14.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	17.2	0.3		20.3	0.2		21.2	4.1	0.2	29.9	0.9	
Delay (s)	56.6	35.5		54.2	27.0		58.7	24.4	8.8	64.3	15.5	
Level of Service	E	D		D	C		E	C	A	E	B	
Approach Delay (s)	42.8		46.5		21.7		20.5					
Approach LOS	D		D		C		C					
Intersection Summary												
HCM Average Control Delay	24.4		HCM Level of Service		C							
HCM Volume to Capacity ratio	0.79											
Actuated Cycle Length (s)	81.0		Sum of lost time (s)		8.0							
Intersection Capacity Utilization	75.2%		ICU Level of Service		D							
Analysis Period (min)	15											
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

2035 PM With Project+Mit
7/25/2012

	↖	↗	↖	↗	↖	↗
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↖	↗	↖	↗	↖	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.08	1.00
Satd. Flow (perm)	1770	1583	3539	1583	146	3539
Volume (vph)	180	517	1381	387	587	1490
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	562	1501	421	638	1620
RTOR Reduction (vph)	0	406	0	235	0	0
Lane Group Flow (vph)	196	156	1501	186	638	1620
Turn Type	Perm		Perm		pm+pt	
Protected Phases	8		2		1	
Permitted Phases	8		2		6	
Actuated Green, G (s)	15.1	15.1	47.0	47.0	86.0	86.0
Effective Green, g (s)	15.1	15.1	47.0	47.0	86.0	86.0
Actuated g/C Ratio	0.14	0.14	0.43	0.43	0.79	0.79
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	245	219	1525	682	636	2790
v/s Ratio Prot	0.11		0.42		c0.32	0.46
v/s Ratio Perm		0.35		0.27	c0.47	
v/c Ratio	0.80	0.71	0.98	0.27	1.00	0.58
Uniform Delay, d1	45.5	44.9	30.7	20.0	32.6	4.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	16.8	10.5	19.2	0.2	36.5	0.3
Delay (s)	62.4	55.4	49.9	20.3	69.0	4.8
Level of Service	E	E	D	C	E	A
Approach Delay (s)	57.2		43.4		23.0	
Approach LOS	E		D		C	
Intersection Summary						
HCM Average Control Delay		36.2		HCM Level of Service		D
HCM Volume to Capacity ratio		1.22				
Actuated Cycle Length (s)		109.1		Sum of lost time (s)		8.0
Intersection Capacity Utilization		90.7%		ICU Level of Service		E
Analysis Period (min)		15				
c Critical Lane Group						

PM (2035+P2)	Thu Jul 26, 2012 10:27:31	Page 3-1
JB23054 - Kaloko Makai		
Kona, Hawaii		
2025 With Project Phase 2 Conditions		
Level Of Service Computation Report		
2000 HCM Unsignalized Method (Future Volume Alternative)		
Intersection #2 Queen Kaahumanu Hwy. @ Hulikoa Dr.		
Average Delay (sec/veh): 0.0 Worst Case Level Of Service: A[7.2]		
Approach: North Bound South Bound East Bound West Bound		
Movement: L - T - R L - T - R L - T - R L - T - R		
Control: Uncontrolled Uncontrolled Yield Sign Yield Sign		
Rights: Include Include Include Ignore		
Lanes: 0 0 2 0 1 0 1 1 0 0 0 0 0 0 1 0 0		
Volume Module:		
Base Vol: 0 719 122 0 1068 0 0 0 0 0 0 0 205		
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00		
Initial Bse: 0 719 122 0 1068 0 0 0 0 0 0 0 205		
Added Vol: 0 759 126 13 854 0 0 0 0 45 0 131		
PasserByVol: 0 0 13 -13 58 0 0 0 0 -45 0 45		
Initial Fut: 0 1478 261 0 1980 0 0 0 0 0 0 381		
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00		
PHF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00		
PHF Volume: 0 1478 261 0 1980 0 0 0 0 0 0 0		
Reduct Vol: 0 0 0 0 0 0 0 0 0 0 0 0		
FinalVolume: 0 1478 261 0 1980 0 0 0 0 0 0 0		
Critical Gap Module:		
Critical Gp:xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx 6.8 6.5 6.9		
FollowUpTim:xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx 3.5 4.0 3.3		
Capacity Module:		
Cnflct Vol: xxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx 2468 3458 739		
Potent Cap.: xxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx 26 7 364		
Move Cap.: xxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx 26 7 364		
Volume/Cap: xxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx 0.00 0.00 0.00		
Level Of Service Module:		
2Way95thQ: xxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxxx xxxxx		
Control Del:xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxxx xxxxx		
LOS by Move: *		
Movement: LT - LTR - RT LT - LTR - RT LT - LTR - RT LT - LTR - RT		
Shared Cap.: xxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx xxxx xxxxx xxxxx 0 xxxxx		
SharedQueue:xxxxx xxxx xxxxx 0.0 xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx		
Shrd ConDel:xxxxx xxxx xxxxx 7.2 xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx		
Shared LOS: * * * * * A * * * * * * * * * * * * * * * *		
ApproachDel: xxxxxx xxxxxx xxxxxx xxxxxx		
ApproachLOS: * * * * *		
Note: Queue reported is the number of cars per lane.		

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HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2035 PM With Project+Mit
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.91	0.88	0.97	0.91
Flpb, ped/bikes	1.00	0.96	1.00	0.96	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1524	5085	2663	3433	5085
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1524	5085	2663	3433	5085
Volume (vph)	1315	569	1175	1316	671	1216
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1429	618	1277	1430	729	1322
RTOR Reduction (vph)	0	288	0	944	0	0
Lane Group Flow (vph)	1429	330	1277	487	729	1322
Confl. Peds. (#/hr)	14		8		8	
Turn Type	Perm	Perm	Perm	Prot	Prot	Prot
Protected Phases	8		2		1	6
Permitted Phases	8		2			
Actuated Green, G (s)	41.0	41.0	26.0	26.0	21.0	51.0
Effective Green, g (s)	41.0	41.0	26.0	26.0	21.0	51.0
Actuated g/C Ratio	0.41	0.41	0.26	0.26	0.21	0.51
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1408	625	1322	692	721	2593
v/s Ratio Prot	c0.42		0.25		c0.21	0.26
v/s Ratio Perm		0.41		0.54		
v/c Ratio	1.01	0.53	0.97	0.70	1.01	0.51
Uniform Delay, d1	29.5	22.2	36.6	33.5	39.5	16.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	27.8	0.8	17.1	3.2	36.3	0.2
Delay (s)	57.3	23.0	53.7	36.8	75.8	16.4
Level of Service	E	C	D	D	E	B
Approach Delay (s)	46.9		44.7		37.5	
Approach LOS	D		D		D	
Intersection Summary						
HCM Average Control Delay		43.2			HCM Level of Service	D
HCM Volume to Capacity ratio		1.32				
Actuated Cycle Length (s)		100.0			Sum of lost time (s)	12.0
Intersection Capacity Utilization		89.4%			ICU Level of Service	E
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kanalani Street

2035 PM With Project+Mit
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1378	489	17	1597	0	74
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1498	532	18	1736	0	80
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			2031		2405	751
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			2031		2405	751
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		100	77
cM capacity (veh/h)			275		26	353
Direction, Lane #						
	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1
Volume Total	749	749	532	597	1157	80
Volume Left	0	0	0	18	0	0
Volume Right	0	0	532	0	0	80
cSH	1700	1700	1700	275	1700	353
Volume to Capacity	0.44	0.44	0.31	0.07	0.68	0.23
Queue Length (ft)	0	0	0	5	0	22
Control Delay (s)	0.0	0.0	0.0	2.5	0.0	18.2
Lane LOS				A		C
Approach Delay (s)	0.0			0.8		18.2
Approach LOS						C
Intersection Summary						
Average Delay			0.8			
Intersection Capacity Utilization		81.8%			ICU Level of Service	D
Analysis Period (min)		15				

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2035 PM With Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0		4.0
Lane Util. Factor	0.97	0.95		1.00	0.95	1.00	0.97		1.00	1.00		1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00		0.85	1.00		0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (prot)	3433	3478		1770	3539	1583	3433		1583	1770		1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (perm)	3433	3478		1770	3539	1583	3433		1583	1770		1583
Volume (vph)	501	798	105	133	704	120	615	0	347	129	0	471
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)	545	867	114	145	765	130	668	0	377	140	0	512
RTOR Reduction (vph)	0	10	0	0	0	96	0	0	228	0	0	0
Lane Group Flow (vph)	545	971	0	145	765	34	668	0	149	140	0	512
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8			2			Free
Actuated Green, G (s)	14.9	25.4		8.8	19.3	19.3	20.6		15.9	7.3		73.4
Effective Green, g (s)	14.9	25.4		8.8	19.3	19.3	20.6		15.9	7.3		73.4
Actuated g/C Ratio	0.20	0.35		0.12	0.26	0.26	0.28		0.22	0.10		1.00
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0		
Lane Grp Cap (vph)	697	1204		212	931	416	963		343	176		1583
v/s Ratio Prot	c0.16	c0.28		0.08	0.22		c0.19		0.08			
v/s Ratio Perm						0.08			0.24			0.32
v/c Ratio	0.78	0.81		0.68	0.82	0.08	0.69		0.43	0.80		0.32
Uniform Delay, d1	27.7	21.8		31.0	25.4	20.4	23.6		24.9	32.3		0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		1.00
Incremental Delay, d2	5.7	4.0		8.8	5.9	0.1	2.2		0.9	21.5		0.5
Delay (s)	33.4	25.8		39.8	31.3	20.5	25.8		25.7	53.8		0.5
Level of Service	C	C		D	C	C	C		C	D		A
Approach Delay (s)	28.5			31.2			25.8			12.0		
Approach LOS	C			C			C			B		
Intersection Summary												
HCM Average Control Delay		26.0					HCM Level of Service		C			
HCM Volume to Capacity ratio		0.86										
Actuated Cycle Length (s)		73.4					Sum of lost time (s)		12.0			
Intersection Capacity Utilization		68.0%					ICU Level of Service		C			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokalole Hwy.

2035 PM With Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95	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	3539	1583	3433	3539	1583	1770	1863	1583	1770	1863	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	3539	1583	3433	3539	1583	1770	1863	1583	1770	1863	1583
Volume (vph)	234	829	218	291	542	232	130	498	452	244	424	199
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)	254	901	237	316	589	252	141	541	491	265	461	216
RTOR Reduction (vph)	0	0	174	0	0	198	0	0	0	0	0	149
Lane Group Flow (vph)	254	901	63	316	589	54	141	541	491	265	461	67
Turn Type	Prot			Perm	Prot		Perm	Prot		Free	Prot	Perm
Protected Phases	7	4		3	8		5	2			1	6
Permitted Phases			4			8			Free			6
Actuated Green, G (s)	11.0	20.0	20.0	7.0	16.0	16.0	8.6	21.0	75.0	11.0	23.4	23.4
Effective Green, g (s)	11.0	20.0	20.0	7.0	16.0	16.0	8.6	21.0	75.0	11.0	23.4	23.4
Actuated g/C Ratio	0.15	0.27	0.27	0.09	0.21	0.21	0.11	0.28	1.00	0.15	0.31	0.31
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	3.0
Lane Grp Cap (vph)	260	944	422	320	755	338	203	522	1583	260	581	494
v/s Ratio Prot	c0.14	c0.25		0.09	0.17		0.08	c0.29		c0.15	0.25	
v/s Ratio Perm			0.15		0.16				0.31			0.14
v/c Ratio	0.98	0.95	0.15	0.99	0.78	0.16	0.69	1.04	0.31	1.02	0.79	0.14
Uniform Delay, d1	31.9	27.1	21.0	34.0	27.8	24.0	31.9	27.0	0.0	32.0	23.6	18.5
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	48.9	19.1	0.2	46.5	5.2	0.2	9.9	49.1	0.5	60.8	7.3	0.1
Delay (s)	80.8	46.1	21.2	80.4	33.1	24.2	41.8	76.1	0.5	92.8	30.9	18.7
Level of Service	F	D	C	F	C	C	D	E	A	F	C	B
Approach Delay (s)	48.2			44.1			40.3			45.5		
Approach LOS	D			D			D			D		
Intersection Summary												
HCM Average Control Delay		44.7					HCM Level of Service		D			
HCM Volume to Capacity ratio		1.02										
Actuated Cycle Length (s)		75.0					Sum of lost time (s)		16.0			
Intersection Capacity Utilization		84.3%					ICU Level of Service		E			
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2035 PM With Project+Mit
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.97	1.00	1.00	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	3433	1863	1863	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	3433	1863	1863	1583
Volume (vph)	712	482	352	634	493	515
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	774	524	383	689	536	560
RTOR Reduction (vph)	0	79	0	0	0	12
Lane Group Flow (vph)	774	445	383	689	536	548
Turn Type	pm+ov		Prot		pm+ov	
Protected Phases	4	5	5	2	6	4
Permitted Phases	4				6	
Actuated Green, G (s)	15.2	23.2	8.0	29.7	17.7	32.9
Effective Green, g (s)	15.2	23.2	8.0	29.7	17.7	32.9
Actuated g/C Ratio	0.29	0.44	0.15	0.56	0.33	0.62
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	986	814	519	1046	623	1104
v/s Ratio Prot	c0.23	c0.10	0.11	0.37	c0.29	0.15
v/s Ratio Perm	0.23				0.21	
v/c Ratio	0.78	0.55	0.74	0.66	0.86	0.50
Uniform Delay, d1	17.3	11.0	21.4	8.1	16.4	5.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.2	0.8	5.4	1.5	11.7	0.4
Delay (s)	21.5	11.7	26.9	9.6	28.1	5.8
Level of Service	C	B	C	A	C	A
Approach Delay (s)	17.6		15.8		16.7	
Approach LOS	B		B		B	
Intersection Summary						
HCM Average Control Delay			16.7		HCM Level of Service	
HCM Volume to Capacity ratio			0.76		B	
Actuated Cycle Length (s)			52.9		Sum of lost time (s)	
Intersection Capacity Utilization			66.3%		8.0	
ICU Level of Service			C			
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2035 PM With Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.97	1.00		1.00	0.91	1.00	1.00	0.91	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.98	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	
Frt	1.00	0.88		1.00	0.87		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1643		3433	1623		1770	5085	1558	1770	5070	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1643		3433	1623		1770	5085	1558	1770	5070	
Volume (vph)	59	19	71	583	20	123	60	2206	444	98	2489	44
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)	64	21	77	634	22	134	65	2398	483	107	2705	48
RTOR Reduction (vph)	0	53	0	0	119	0	0	0	123	0	1	0
Lane Group Flow (vph)	64	45	0	634	37	0	65	2398	360	107	2752	0
Confl. Peds. (#/hr)					2		2		2		2	
Turn Type	Prot		Prot		Prot		pm+ov		Prot			
Protected Phases	7	4	3		8		5	2	3	1	6	
Permitted Phases							2					
Actuated Green, G (s)	20.4	9.2	25.9		14.7		5.0	74.0	99.9	9.0	78.0	
Effective Green, g (s)	20.4	9.2	25.9		14.7		5.0	74.0	99.9	9.0	78.0	
Actuated g/C Ratio	0.15	0.07	0.19		0.11		0.04	0.55	0.74	0.07	0.58	
Clearance Time (s)	4.0	4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	
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)	269	113	663		178		66	2806	1161	119	2949	
v/s Ratio Prot	0.04	0.06	c0.18		c0.10		0.04	c0.47	0.08	0.06	c0.54	
v/s Ratio Perm							0.23					
v/c Ratio	0.24	0.40	0.96		0.21		0.98	0.85	0.31	0.90	0.93	
Uniform Delay, d1	50.0	59.8	53.5		54.4		64.5	25.5	5.7	62.1	25.7	
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	2.3	24.4		0.6		104.8	2.7	0.2	51.9	6.3	
Delay (s)	50.5	62.1	77.9		55.0		169.3	28.2	5.8	114.0	31.9	
Level of Service	D	E	E		D		F	C	A	F	C	
Approach Delay (s)	57.5		73.4		27.7		35.0					
Approach LOS	E		E		C		C					
Intersection Summary												
HCM Average Control Delay			36.8		HCM Level of Service				D			
HCM Volume to Capacity ratio			0.90									
Actuated Cycle Length (s)			134.1		Sum of lost time (s)				8.0			
Intersection Capacity Utilization			87.7%		ICU Level of Service				E			
Analysis Period (min)			15									
c Critical Lane Group												

**Appendix T – Intersection Operations Analysis Worksheets for 2045 With Project
Phase 3 Conditions, with Existing Geometry and Planned Improvements**

**HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway**

2045 AM With Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.08	1.00
Satd. Flow (perm)	1770	1583	3539	1583	141	3539
Volume (vph)	480	588	1549	109	412	1232
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	522	639	1684	118	448	1339
RTOR Reduction (vph)	0	236	0	65	0	0
Lane Group Flow (vph)	522	403	1684	53	448	1339
Turn Type	Perm		Perm		pm+pt	
Protected Phases	8		2		1	
Permitted Phases	8		2		6	
Actuated Green, G (s)	29.0	29.0	49.0	49.0	73.0	73.0
Effective Green, g (s)	29.0	29.0	49.0	49.0	73.0	73.0
Actuated g/C Ratio	0.26	0.26	0.45	0.45	0.66	0.66
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	467	417	1576	705	390	2349
v/s Ratio Prot	0.29		0.48		c0.21	
v/s Ratio Perm	0.40		0.07		c0.56	
v/c Ratio	1.12	0.97	1.07	0.07	1.15	0.57
Uniform Delay, d1	40.5	40.0	30.5	17.5	47.2	10.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	77.9	35.2	43.5	0.0	92.7	0.3
Delay (s)	118.4	75.3	74.0	17.5	139.9	10.3
Level of Service	F	E	E	B	F	B
Approach Delay (s)	94.6		70.3		42.8	
Approach LOS	F		E		D	
Intersection Summary						
HCM Average Control Delay	65.9		HCM Level of Service		E	
HCM Volume to Capacity ratio	1.24					
Actuated Cycle Length (s)	110.0		Sum of lost time (s)		8.0	
Intersection Capacity Utilization	102.2%		ICU Level of Service		G	
Analysis Period (min)	15					
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
2: Hulioa Drive & Queen Kaahumanu Highway

2045 AM With Project
7/25/2012

							
Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Sign Control	Yield		Free			Free	
Grade	0%		0%			0%	
Volume (veh/h)	0	375	1433	363	0	1735	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	0	408	1558	395	0	1886	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	TWLTL						
Median storage (veh)	5						
Upstream signal (ft)							
pX, platoon unblocked							
vC, conflicting volume	2501	779			1558		
vC1, stage 1 conf vol	1558						
vC2, stage 2 conf vol	943						
vCu, unblocked vol	2501	779			1558		
tC, single (s)	6.8	6.9			4.1		
tC, 2 stage (s)	5.8						
tF (s)	3.5	3.3			2.2		
p0 queue free %	100	0			100		
cM capacity (veh/h)	158	339			421		
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	
Volume Total	408	779	779	395	943	943	
Volume Left	0	0	0	0	0	0	
Volume Right	408	0	0	395	0	0	
cSH	339	1700	1700	1700	1700	1700	
Volume to Capacity	1.20	0.46	0.46	0.23	0.55	0.55	
Queue Length (ft)	435	0	0	0	0	0	
Control Delay (s)	150.0	0.0	0.0	0.0	0.0	0.0	
Lane LOS	F						
Approach Delay (s)	150.0	0.0			0.0		
Approach LOS	F						
Intersection Summary							
Average Delay	14.4						
Intersection Capacity Utilization	69.5%			ICU Level of Service		C	
Analysis Period (min)	15						

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2045 AM With Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		 		 	 
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1539	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1539	3433	3539
Volume (vph)	1277	548	1089	1174	666	1150
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1388	596	1184	1276	724	1250
RTOR Reduction (vph)	0	0	0	448	0	0
Lane Group Flow (vph)	1388	596	1184	828	724	1250
Confl. Peds. (#/hr)	14		8		8	
Turn Type	Free		Perm		Prot	
Protected Phases	8		2		1	
Permitted Phases	Free		2			
Actuated Green, G (s)	37.0	110.0	43.0	43.0	18.0	65.0
Effective Green, g (s)	37.0	110.0	43.0	43.0	18.0	65.0
Actuated g/C Ratio	0.34	1.00	0.39	0.39	0.16	0.59
Clearance Time (s)	4.0		4.0		4.0	
Vehicle Extension (s)	3.0		3.0		3.0	
Lane Grp Cap (vph)	1155	1558	1383	602	562	2091
v/s Ratio Prot	c0.40		0.33		c0.21	
v/s Ratio Perm	0.38		0.83			
v/c Ratio	1.20	0.38	0.86	1.38	1.29	0.60
Uniform Delay, d1	36.5	0.0	30.7	33.5	46.0	14.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	99.3	0.7	5.4	179.5	142.7	0.5
Delay (s)	135.8	0.7	36.1	213.0	188.7	14.7
Level of Service	F	A	D	F	F	B
Approach Delay (s)	95.2		127.9			78.5
Approach LOS	F		F			E
Intersection Summary						
HCM Average Control Delay			102.6	HCM Level of Service		F
HCM Volume to Capacity ratio			1.62			
Actuated Cycle Length (s)			110.0	Sum of lost time (s)		12.0
Intersection Capacity Utilization			99.2%	ICU Level of Service		F
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kananani Street

2045 AM With Project
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↔	↔	↔	↔
Sign Control	Free	Free	Free	Free	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Volume (veh/h)	1348	363	29	1620	225	18
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1465	395	32	1761	245	20
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			1862		2411	1467
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1862		2411	1467
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			90		0	83
cM capacity (veh/h)			320		25	117
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	1465	395	618	1174	264	
Volume Left	0	0	32	0	245	
Volume Right	0	395	0	0	20	
cSH	1700	1700	320	1700	26	
Volume to Capacity	0.86	0.23	0.10	0.69	10.12	
Queue Length (ft)	0	0	8	0	Err	
Control Delay (s)	0.0	0.0	3.4	0.0	Err	
Lane LOS			A		F	
Approach Delay (s)	0.0		1.2		Err	
Approach LOS					F	
Intersection Summary						
Average Delay			674.9			
Intersection Capacity Utilization			90.1%		ICU Level of Service	E
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2045 AM With Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↑	↑	↔	↑	↑	↔	↑	↑	↔	↑	↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0		4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		0.97	1.00		1.00		1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.85		1.00		0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95		1.00
Satd. Flow (prot)	1770	1863	1583	1770	1831		3433	1583		1770		1583
Flt Permitted	0.13	1.00	1.00	0.13	1.00		0.95	1.00		0.95		1.00
Satd. Flow (perm)	238	1863	1583	238	1831		3433	1583		1770		1583
Volume (vph)	447	774	133	224	1072	138	121	0	81	113	0	466
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)	486	841	145	243	1165	150	132	0	88	123	0	507
RTOR Reduction (vph)	0	0	0	0	6	0	0	67	0	0	0	118
Lane Group Flow (vph)	486	841	145	243	1309	0	132	21	0	123	0	389
Turn Type	Perm	Perm	Free	Perm	Perm		Prot	Prot		Prot		Perm
Protected Phases			4			8		5	2		1	6
Permitted Phases	4		Free	8								6
Actuated Green, G (s)	31.3	31.3	67.0	31.3	31.3		7.5	16.0		7.7		16.2
Effective Green, g (s)	31.3	31.3	67.0	31.3	31.3		7.5	16.0		7.7		16.2
Actuated g/C Ratio	0.47	0.47	1.00	0.47	0.47		0.11	0.24		0.11		0.24
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0		4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0		3.0
Lane Grp Cap (vph)	111	870	1583	111	855		384	378		203		383
v/s Ratio Prot			0.45		0.72		0.04	0.06		c0.07		
v/s Ratio Perm	c2.04		0.09	1.02			0.34	0.06		0.61		0.32
v/c Ratio	4.38	0.97	0.09	2.19	1.53		0.34	0.06		0.61		1.02
Uniform Delay, d1	17.8	17.3	0.0	17.8	17.8		27.5	19.7		28.2		25.4
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00		1.00
Incremental Delay, d2	1541.0	22.5	0.1	563.5	244.9		0.5	0.1		5.0		50.3
Delay (s)	1558.9	39.8	0.1	581.3	262.8		28.0	19.7		33.2		75.7
Level of Service	F	D	A	F	F		C	B		C		E
Approach Delay (s)		537.4			312.5			24.7				67.4
Approach LOS		F			F			C				E
Intersection Summary												
HCM Average Control Delay			341.7			HCM Level of Service				F		
HCM Volume to Capacity ratio			2.76									
Actuated Cycle Length (s)			67.0			Sum of lost time (s)				8.0		
Intersection Capacity Utilization			112.5%			ICU Level of Service				H		
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokalole Hwy.

2045 AM With Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	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	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.11	1.00	1.00	0.35	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	212	1863	1583	657	1863	1583
Volume (vph)	186	543	127	604	919	248	220	374	235	216	611	243
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)	202	590	138	657	999	270	239	407	255	235	664	264
RTOR Reduction (vph)	0	0	72	0	0	82	0	0	147	0	0	121
Lane Group Flow (vph)	202	590	66	657	999	188	239	407	108	235	664	143
Turn Type	Prot		Perm	Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8		2			6		
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	11.0	31.0	31.0	32.0	52.0	52.0	55.0	55.0	55.0	55.0	55.0	55.0
Effective Green, g (s)	11.0	31.0	31.0	32.0	52.0	52.0	55.0	55.0	55.0	55.0	55.0	55.0
Actuated g/C Ratio	0.08	0.24	0.24	0.25	0.40	0.40	0.42	0.42	0.42	0.42	0.42	0.42
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	3.0
Lane Grp Cap (vph)	150	444	377	436	745	633	90	788	670	278	788	670
v/s Ratio Prot	0.11	0.32		c0.37	c0.54			0.22			0.36	
v/s Ratio Perm			0.09			0.17	c1.13		0.16	0.36		0.17
v/c Ratio	1.35	1.33	0.18	1.51	1.34	0.30	2.66	0.52	0.16	0.85	0.84	0.21
Uniform Delay, d1	59.5	49.5	39.3	49.0	39.0	26.6	37.5	27.7	23.2	33.7	33.6	23.8
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	193.6	162.9	0.2	239.8	162.4	0.3	775.8	0.6	0.1	20.4	8.2	0.2
Delay (s)	253.1	212.4	39.6	288.8	201.4	26.8	813.3	28.3	23.3	54.0	41.8	23.9
Level of Service	F	F	D	F	F	C	F	C	C	D	D	C
Approach Delay (s)		195.6			206.7			235.1			40.2	
Approach LOS		F			F			F			D	
Intersection Summary												
HCM Average Control Delay		170.5			HCM Level of Service			F				
HCM Volume to Capacity ratio		1.96										
Actuated Cycle Length (s)		130.0			Sum of lost time (s)		8.0					
Intersection Capacity Utilization		119.7%			ICU Level of Service		H					
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2045 AM With Project
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.05	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	87	1863	1863	1583
Volume (vph)	481	410	396	342	1269	769
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	523	446	430	372	1379	836
RTOR Reduction (vph)	0	200	0	0	0	73
Lane Group Flow (vph)	523	246	430	372	1379	763
Turn Type		Perm	pm+pt			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	34.0	34.0	108.0	108.0	82.0	82.0
Effective Green, g (s)	34.0	34.0	108.0	108.0	82.0	82.0
Actuated g/C Ratio	0.23	0.23	0.72	0.72	0.55	0.55
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	401	359	309	1341	1018	865
v/s Ratio Prot	c0.30		c0.20	0.20	0.74	
v/s Ratio Perm		0.28	c0.80			0.53
v/c Ratio	1.30	0.68	1.39	0.28	1.35	0.88
Uniform Delay, d1	58.0	53.1	66.2	7.3	34.0	29.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	154.0	5.3	194.9	0.1	166.1	10.5
Delay (s)	212.0	58.4	261.1	7.5	200.1	40.3
Level of Service	F	E	F	A	F	D
Approach Delay (s)	141.3			143.4	139.8	
Approach LOS	F			F	F	
Intersection Summary						
HCM Average Control Delay		140.9			HCM Level of Service	F
HCM Volume to Capacity ratio		1.35				
Actuated Cycle Length (s)		150.0			Sum of lost time (s)	8.0
Intersection Capacity Utilization		125.4%			ICU Level of Service	H
Analysis Period (min)		15				
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2045 AM With Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.98	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	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.97	1.00		0.95	1.00	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)		1800	1583		1777	1583	1770	3539	1549	1770	3526	
Flt Permitted		0.50	1.00		0.71	1.00	0.06	1.00	1.00	0.06	1.00	
Satd. Flow (perm)		940	1583		1331	1583	110	3539	1549	103	3526	
Volume (vph)	17	7	24	492	18	152	68	2169	620	199	2081	48
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)	18	8	26	535	20	165	74	2358	674	216	2262	52
RTOR Reduction (vph)	0	0	18	0	0	41	0	0	321	0	1	0
Lane Group Flow (vph)	0	26	8	0	555	124	74	2358	353	216	2313	0
Confl. Peds. (#/hr)							2	2	2			2
Turn Type	Perm	Perm	Perm	Perm	pm+pt	pm+pt	Perm	pm+pt	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)		42.0	42.0		42.0	42.0	72.0	68.0	68.0	80.0	72.0	
Effective Green, g (s)		42.0	42.0		42.0	42.0	72.0	68.0	68.0	80.0	72.0	
Actuated g/C Ratio		0.32	0.32		0.32	0.32	0.55	0.52	0.52	0.62	0.55	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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)		304	511		430	511	112	1851	810	166	1953	
v/s Ratio Prot							0.02	0.67		c0.08	0.66	
v/s Ratio Perm		0.03	0.02		c0.42	0.10	0.35		0.44	c0.72		
v/c Ratio		0.09	0.02		1.29	0.24	0.66	1.27	0.44	1.30	1.18	
Uniform Delay, d1		30.6	29.9		44.0	32.3	63.7	31.0	19.1	63.2	29.0	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.1	0.0		147.3	0.2	13.7	127.6	0.4	172.4	88.4	
Delay (s)		30.8	30.0		191.3	32.6	77.4	158.6	19.5	235.5	117.4	
Level of Service		C	C		F	C	E	F	B	F	F	
Approach Delay (s)		30.4			154.9			126.5			127.5	
Approach LOS		C			F			F			F	
Intersection Summary												
HCM Average Control Delay		129.3			HCM Level of Service			F				
HCM Volume to Capacity ratio		1.28										
Actuated Cycle Length (s)		130.0			Sum of lost time (s)			8.0				
Intersection Capacity Utilization		115.9%			ICU Level of Service			H				
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

2045 PM With Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
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	0.06	1.00
Satd. Flow (perm)	1770	1583	3539	1583	110	3539
Volume (vph)	180	580	1626	387	669	1802
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	630	1767	421	727	1959
RTOR Reduction (vph)	0	409	0	188	0	0
Lane Group Flow (vph)	196	221	1767	233	727	1959
Turn Type	Perm	Perm	Perm	pm+pt	Perm	pm+pt
Protected Phases	8		2		1	6
Permitted Phases		8		2		6
Actuated Green, G (s)	17.0	17.0	64.0	64.0	115.0	115.0
Effective Green, g (s)	17.0	17.0	64.0	64.0	115.0	115.0
Actuated g/C Ratio	0.12	0.12	0.46	0.46	0.82	0.82
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	215	192	1618	724	648	2907
v/s Ratio Prot	0.11		0.50		c0.38	0.55
v/s Ratio Perm		0.40		0.27	c0.55	
v/c Ratio	0.91	1.15	1.09	0.32	1.12	0.67
Uniform Delay, d1	60.8	61.5	38.0	24.2	48.7	5.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	37.9	112.4	52.0	0.3	73.9	0.6
Delay (s)	98.6	173.9	90.0	24.4	122.6	5.6
Level of Service	F	F	F	C	F	A
Approach Delay (s)	156.0		77.4			37.3
Approach LOS	F		E			D
Intersection Summary						
HCM Average Control Delay		69.9			HCM Level of Service	E
HCM Volume to Capacity ratio		1.39				
Actuated Cycle Length (s)		140.0			Sum of lost time (s)	8.0
Intersection Capacity Utilization		102.0%			ICU Level of Service	G
Analysis Period (min)		15				
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
2: Hulikoa Drive & Queen Kaahumanu Highway

2045 PM With Project
7/25/2012

							
Movement	WBL	WBR	NBT	NBR	SBL	SBT	
Lane Configurations							
Sign Control	Yield		Free			Free	
Grade	0%		0%			0%	
Volume (veh/h)	0	404	1701	269	0	2292	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	0	439	1849	292	0	2491	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	TWLTL						
Median storage (veh)	5						
Upstream signal (ft)							
pX, platoon unblocked							
vC, conflicting volume	3095	924			1849		
vC1, stage 1 conf vol	1849						
vC2, stage 2 conf vol	1246						
vCu, unblocked vol	3095	924			1849		
tC, single (s)	6.8	6.9			4.1		
tC, 2 stage (s)	5.8						
tF (s)	3.5	3.3			2.2		
p0 queue free %	100	0			100		
cM capacity (veh/h)	109	271			324		
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	
Volume Total	439	924	924	292	1246	1246	
Volume Left	0	0	0	0	0	0	
Volume Right	439	0	0	292	0	0	
cSH	271	1700	1700	1700	1700	1700	
Volume to Capacity	1.62	0.54	0.54	0.17	0.73	0.73	
Queue Length (ft)	677	0	0	0	0	0	
Control Delay (s)	328.2	0.0	0.0	0.0	0.0	0.0	
Lane LOS	F						
Approach Delay (s)	328.2	0.0			0.0		
Approach LOS	F						
Intersection Summary							
Average Delay	28.4						
Intersection Capacity Utilization	78.7%			ICU Level of Service		D	
Analysis Period (min)	15						

HCM Signalized Intersection Capacity Analysis
3: Hina Lani Street & Queen Kaahumanu Highway

2045 PM With Project
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	 		 		 	 
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	0.97	0.95
Frpb, ped/bikes	1.00	0.98	1.00	0.97	1.00	1.00
Flpb, ped/bikes	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
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3433	1558	3539	1532	3433	3539
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1558	3539	1532	3433	3539
Volume (vph)	1542	647	1328	1602	802	1397
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1676	703	1443	1741	872	1518
RTOR Reduction (vph)	0	0	0	414	0	0
Lane Group Flow (vph)	1676	703	1443	1327	872	1518
Confl. Peds. (#/hr)	14		8		8	
Turn Type	Free		Perm		Prot	
Protected Phases	8		2		1	
Permitted Phases	Free		2			
Actuated Green, G (s)	45.0	140.0	61.0	61.0	22.0	87.0
Effective Green, g (s)	45.0	140.0	61.0	61.0	22.0	87.0
Actuated g/C Ratio	0.32	1.00	0.44	0.44	0.16	0.62
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	1103	1558	1542	668	539	2199
v/s Ratio Prot	c0.49		0.41		c0.25	
v/s Ratio Perm	0.45		1.14			
v/c Ratio	1.52	0.45	0.94	1.99	1.62	0.69
Uniform Delay, d1	47.5	0.0	37.6	39.5	59.0	17.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	238.5	0.9	11.0	449.6	286.5	0.9
Delay (s)	286.0	0.9	48.6	489.1	345.5	18.5
Level of Service	F	A	D	F	F	B
Approach Delay (s)	201.7		289.4			137.8
Approach LOS	F		F			F
Intersection Summary						
HCM Average Control Delay			217.6	HCM Level of Service		F
HCM Volume to Capacity ratio			2.05			
Actuated Cycle Length (s)			140.0	Sum of lost time (s)		12.0
Intersection Capacity Utilization			129.6%	ICU Level of Service		H
Analysis Period (min)			15			
c Critical Lane Group						

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani Street & Kanalani Street

2045 PM With Project
7/25/2012

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↑	↑↑	↑↑	↑	↑
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1795	489	17	1900	200	74
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1951	532	18	2065	217	80
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					4.0	
Percent Blockage					0	
Right turn flare (veh)						6
Median type					None	
Median storage (veh)						
Upstream signal (ft)	475					
pX, platoon unblocked						
vC, conflicting volume			2485		3023	1953
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			2485		3023	1953
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
IF (s)			2.2		3.5	3.3
p0 queue free %			90		0	0
cM capacity (veh/h)			182		9	54
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	1951	532	707	1377	298	
Volume Left	0	0	18	0	217	
Volume Right	0	532	0	0	80	
cSH	1700	1700	182	1700	12	
Volume to Capacity	1.15	0.31	0.10	0.81	25.19	
Queue Length (ft)	0	0	8	0	Err	
Control Delay (s)	0.0	0.0	5.2	0.0	Err	
Lane LOS			A		F	
Approach Delay (s)	0.0		1.8		Err	
Approach LOS					F	
Intersection Summary						
Average Delay			613.0			
Intersection Capacity Utilization			112.2%		ICU Level of Service	H
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis
5: Hina Lani Street & Kamanu Street

2045 PM With Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0		4.0		4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		0.97	1.00		1.00		1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.85		1.00		0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95		1.00
Satd. Flow (prot)	1770	1863	1583	1770	1830		3433	1583		1770		1583
Flt Permitted	0.12	1.00	1.00	0.12	1.00		0.95	1.00		0.95		1.00
Satd. Flow (perm)	226	1863	1583	226	1830		3433	1583		1770		1583
Volume (vph)	519	1197	105	133	944	127	415	0	347	153	0	534
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)	564	1301	114	145	1026	138	451	0	377	166	0	580
RTOR Reduction (vph)	0	0	0	0	6	0	0	39	0	0	0	32
Lane Group Flow (vph)	564	1301	114	145	1158	0	451	338	0	166	0	548
Turn Type	Perm		Free	Perm			Prot			Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		Free	8								6
Actuated Green, G (s)	33.0	33.0	78.4	33.0	33.0		14.4	23.7		9.7		19.0
Effective Green, g (s)	33.0	33.0	78.4	33.0	33.0		14.4	23.7		9.7		19.0
Actuated g/C Ratio	0.42	0.42	1.00	0.42	0.42		0.18	0.30		0.12		0.24
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0		4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0		3.0
Lane Grp Cap (vph)	95	784	1583	95	770		631	479		219		384
v/s Ratio Prot		0.70			0.64		0.13	0.24		0.09		
v/s Ratio Perm	c2.50		0.07	0.64								0.37
v/c Ratio	5.94	1.66	0.07	1.53	1.50		0.71	0.71		0.76		1.43
Uniform Delay, d1	22.7	22.7	0.0	22.7	22.7		30.1	24.3		33.2		29.7
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00		1.00
Incremental Delay, d2	2244.1	302.4	0.1	282.9	233.6		3.8	4.7		13.9		206.9
Delay (s)	2266.8	325.1	0.1	305.6	256.3		33.9	28.9		47.1		236.6
Level of Service	F	F	A	F	F		C	C		D		F
Approach Delay (s)		859.8			261.8			31.7				194.5
Approach LOS		F			F			C				F
Intersection Summary												
HCM Average Control Delay			455.7			HCM Level of Service				F		
HCM Volume to Capacity ratio			3.53									
Actuated Cycle Length (s)			78.4			Sum of lost time (s)		12.0				
Intersection Capacity Utilization			129.4%			ICU Level of Service		H				
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
6: Hina Lani Street & Ane Keahokaloale Hwy.

2045 PM With Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑	↱	↰	↑	↱	↰	↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	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	1770	1863	1583	1770	1863	1583	1770	1863	1583
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.25	1.00	1.00	0.17	1.00	1.00
Satd. Flow (perm)	1770	1863	1583	1770	1863	1583	459	1863	1583	324	1863	1583
Volume (vph)	270	1106	237	380	710	252	145	549	570	286	477	227
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)	293	1202	258	413	772	274	158	597	620	311	518	247
RTOR Reduction (vph)	0	0	65	0	0	87	0	0	133	0	0	143
Lane Group Flow (vph)	293	1202	193	413	772	187	158	597	487	311	518	105
Turn Type	Prot		Perm	Prot		Perm	Perm		Perm	Perm		Perm
Protected Phases	7	4		3	8		2			6		
Permitted Phases			4			8	2		2	6		6
Actuated Green, G (s)	12.0	47.0	47.0	16.0	51.0	51.0	55.0	55.0	55.0	55.0	55.0	55.0
Effective Green, g (s)	12.0	47.0	47.0	16.0	51.0	51.0	55.0	55.0	55.0	55.0	55.0	55.0
Actuated g/C Ratio	0.09	0.36	0.36	0.12	0.39	0.39	0.42	0.42	0.42	0.42	0.42	0.42
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
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	3.0
Lane Grp Cap (vph)	163	674	572	218	731	621	194	788	670	137	788	670
v/s Ratio Prot	0.17	c0.65		c0.23	c0.41		0.32			0.28		
v/s Ratio Perm			0.16			0.17	0.34		0.39	c0.96		0.16
v/c Ratio	1.80	1.78	0.34	1.89	1.06	0.30	0.81	0.76	0.73	2.27	0.66	0.16
Uniform Delay, d1	59.0	41.5	30.2	57.0	39.5	27.2	33.0	31.8	31.2	37.5	30.0	23.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	382.3	358.5	0.4	419.3	49.1	0.3	22.4	4.2	3.9	594.1	2.0	0.1
Delay (s)	441.3	400.0	30.5	476.3	88.6	27.5	55.4	36.0	35.2	631.6	32.0	23.3
Level of Service	F	F	C	F	F	C	E	D	D	F	C	C
Approach Delay (s)		352.5			186.9			37.9			203.3	
Approach LOS		F			F			D			F	
Intersection Summary												
HCM Average Control Delay		205.1										
HCM Volume to Capacity ratio		2.07										
Actuated Cycle Length (s)		130.0						16.0				
Intersection Capacity Utilization		137.3%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani Street & Mamalahoa Highway

2045 PM With Project
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱	↰	↑	↑	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	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	1863	1863	1583
Flt Permitted	0.95	1.00	0.13	1.00	1.00	1.00
Satd. Flow (perm)	1770	1583	240	1863	1863	1583
Volume (vph)	796	551	442	739	578	611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	865	599	480	803	628	664
RTOR Reduction (vph)	0	260	0	0	0	211
Lane Group Flow (vph)	865	339	480	803	628	453
Turn Type		Perm	pm+pt			Perm
Protected Phases	4		5	2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	36.0	36.0	46.0	46.0	27.0	27.0
Effective Green, g (s)	36.0	36.0	46.0	46.0	27.0	27.0
Actuated g/C Ratio	0.40	0.40	0.51	0.51	0.30	0.30
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	708	633	378	952	559	475
v/s Ratio Prot	c0.49		c0.21	0.43	0.34	
v/s Ratio Perm		0.38	0.44			0.42
v/c Ratio	1.22	0.54	1.27	0.84	1.12	0.95
Uniform Delay, d1	27.0	20.6	39.7	18.9	31.5	30.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	112.2	0.9	140.8	6.9	76.8	29.5
Delay (s)	139.2	21.5	180.5	25.8	108.3	60.4
Level of Service	F	C	F	C	F	E
Approach Delay (s)	91.1			83.7	83.6	
Approach LOS	F			F	F	
Intersection Summary						
HCM Average Control Delay		86.3				F
HCM Volume to Capacity ratio		1.30				
Actuated Cycle Length (s)		90.0				12.0
Intersection Capacity Utilization		109.0%				H
Analysis Period (min)		15				
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2045 PM With Project
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔		↔	↔	↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	0.95	
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00	1.00	0.98	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	
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected		0.96	1.00		0.95	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		1795	1583		1777	1583	1770	3539	1549	1770	3530	
Flt Permitted		0.13	1.00		0.66	1.00	0.05	1.00	1.00	0.05	1.00	
Satd. Flow (perm)		238	1583		1231	1583	92	3539	1549	92	3530	
Volume (vph)	59	19	71	634	20	123	60	2645	509	98	2896	44
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)	64	21	77	689	22	134	65	2875	553	107	3148	48
RTOR Reduction (vph)	0	0	34	0	0	23	0	0	202	0	1	0
Lane Group Flow (vph)	0	85	43	0	711	111	65	2875	351	107	3195	0
Confl. Peds. (#/hr)							2		2		2	
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)		53.0	53.0		53.0	53.0	85.0	81.0	81.0	85.0	81.0	
Effective Green, g (s)		53.0	53.0		53.0	53.0	85.0	81.0	81.0	85.0	81.0	
Actuated g/C Ratio		0.35	0.35		0.35	0.35	0.57	0.54	0.54	0.57	0.54	
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	
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)		84	559		435	559	97	1911	836	97	1906	
v/s Ratio Prot							0.02	0.81		c0.03	c0.91	
v/s Ratio Perm		0.36	0.05		c0.58	0.08	0.36		0.36	0.60		
v/c Ratio		1.01	0.08		1.63	0.20	0.67	1.50	0.42	1.10	1.68	
Uniform Delay, d1		48.5	32.2		48.5	33.7	73.8	34.5	20.5	75.2	34.5	
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		101.5	0.1		295.8	0.2	16.7	229.8	0.3	121.9	306.7	
Delay (s)		150.0	32.3		344.3	33.9	90.4	264.3	20.9	197.1	341.2	
Level of Service		F	C		F	C	F	F	C	F	F	
Approach Delay (s)		94.1			295.1			222.5			336.5	
Approach LOS		F			F			F			F	
Intersection Summary												
HCM Average Control Delay		276.0			HCM Level of Service			F				
HCM Volume to Capacity ratio		1.64										
Actuated Cycle Length (s)		150.0			Sum of lost time (s)			12.0				
Intersection Capacity Utilization		132.0%			ICU Level of Service			H				
Analysis Period (min)		15										

c Critical Lane Group

Appendix U – Intersection Operations Analysis Worksheets for 2045 With Project
Phase 3 Conditions, with Mitigation Measures

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

2045 AM With Project+Mit
7/25/2012

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.91	1.00	0.97	0.91
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)	3433	1583	5085	1583	3433	5085
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1583	5085	1583	3433	5085
Volume (vph)	480	588	1549	109	412	1232
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	522	639	1684	118	448	1339
RTOR Reduction (vph)	0	1	0	73	0	0
Lane Group Flow (vph)	522	638	1684	45	448	1339
Turn Type	pm+ov		Perm		Prot	
Protected Phases	8	1	2		1	6
Permitted Phases	8		2			
Actuated Green, G (s)	13.7	25.8	23.5	23.5	12.1	39.6
Effective Green, g (s)	13.7	25.8	23.5	23.5	12.1	39.6
Actuated g/C Ratio	0.22	0.42	0.38	0.38	0.20	0.65
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	767	770	1949	607	678	3285
v/s Ratio Prot	0.15	c0.16	c0.33		0.13	0.26
v/s Ratio Perm	0.24		0.07			
v/c Ratio	0.68	0.83	0.86	0.07	0.66	0.41
Uniform Delay, d1	21.8	15.8	17.4	12.0	22.7	5.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.5	7.3	4.3	0.1	2.4	0.1
Delay (s)	24.3	23.1	21.7	12.0	25.1	5.3
Level of Service	C	C	C	B	C	A
Approach Delay (s)	23.6		21.1		10.3	
Approach LOS	C		C		B	
Intersection Summary						
HCM Average Control Delay			17.6	HCM Level of Service		B
HCM Volume to Capacity ratio			0.85			
Actuated Cycle Length (s)			61.3	Sum of lost time (s)		8.0
Intersection Capacity Utilization			73.0%	ICU Level of Service		D
Analysis Period (min)			15			
c Critical Lane Group						

AM (2045+P3)	Thu Jul 26, 2012 10:29:10	Page 3-1
JB23054 - Kaloko Makai		
Kona, Hawaii		
2035 With Project Phase 3 Conditions		
Level Of Service Computation Report		
2000 HCM Unsignalized Method (Future Volume Alternative)		
Intersection #2 Queen Kaahumanu Hwy. @ Hulikoa Dr.		
Average Delay (sec/veh): 0.0 Worst Case Level Of Service: A[7.2]		
Approach: North Bound South Bound East Bound West Bound		
Movement: L - T - R L - T - R L - T - R L - T - R		
Control: Uncontrolled Uncontrolled Yield Sign Yield Sign		
Rights: Include Include Include Ignore		
Lanes: 0 0 2 0 1 0 1 2 0 0 0 0 0 0 1 0 0		
Volume Module:		
Base Vol: 0 590 218 0 835 0 0 0 0 0 0 0 182		
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00		
Initial Bse: 0 590 218 0 835 0 0 0 0 0 0 0 182		
Added Vol: 0 843 125 20 838 0 0 0 0 0 42 0 151		
PasserByVol: 0 0 20 -20 62 0 0 0 0 -42 0 42		
Initial Fut: 0 1433 363 0 1735 0 0 0 0 0 0 0 375		
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 0.00		
PHF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 0.00		
PHF Volume: 0 1433 363 0 1735 0 0 0 0 0 0 0 0		
Reduct Vol: 0 0 0 0 0 0 0 0 0 0 0 0 0		
FinalVolume: 0 1433 363 0 1735 0 0 0 0 0 0 0 0		
Critical Gap Module:		
Critical Gp:xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx 6.8 6.5 6.9		
FollowUpTim:xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx 3.5 4.0 3.3		
Capacity Module:		
Cnflct Vol: xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx 2011 3168 717		
Potent Cap.: xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx 52 11 377		
Move Cap.: xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx 52 11 377		
Volume/Cap: xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx 0.00 0.00 0.00		
Level of Service Module:		
2Way95thQ: xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx		
Control Del:xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx		
LOS by Move: *		
Movement: LT - LTR - RT LT - LTR - RT LT - LTR - RT LT - LTR - RT		
Shared Cap.: xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx 0 xxxxx		
SharedQueue:xxxxx xxxxx xxxxx 0.0 xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx		
Shrd ConDel:xxxxx xxxxx xxxxx 7.2 xxxxx xxxxx xxxxx xxxxx xxxxx xxxxx		
Shared LOS: * * * * * A * * * * * * * * * * * *		
ApproachDel: xxxxxx xxxxxx xxxxxx xxxxxx		
ApproachLOS: * * * * *		
Note: Queue reported is the number of cars per lane.		

Traffic 8.0.0715 (c) 2008 Dowling Assoc. Licensed to KOA CORP, MONTEREY PK

HCM Unsignalized Intersection Capacity Analysis
4: Hina Lani St. & Kananani Street

2045 AM With Project+Mit
7/25/2012

							
Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	↕↕	↕	↕	↕↕	Stop	↕	
Sign Control	Free			Free			
Grade	0%			0%	0%		
Volume (veh/h)	1348	363	29	1620	0	18	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	1465	395	32	1761	0	20	
Pedestrians					2		
Lane Width (ft)					12.0		
Walking Speed (ft/s)					4.0		
Percent Blockage					0		
Right turn flare (veh)							
Median type					None		
Median storage (veh)							
Upstream signal (ft)							
pX, platoon unblocked							
vC, conflicting volume			1862		2411	735	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			1862		2411	735	
tC, single (s)			4.1		6.8	6.9	
tC, 2 stage (s)							
tF (s)			2.2		3.5	3.3	
p0 queue free %			90		100	95	
cM capacity (veh/h)			320		25	362	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	733	733	395	32	880	880	20
Volume Left	0	0	0	32	0	0	0
Volume Right	0	0	395	0	0	0	20
cSH	1700	1700	1700	320	1700	1700	362
Volume to Capacity	0.43	0.43	0.23	0.10	0.52	0.52	0.05
Queue Length (ft)	0	0	0	8	0	0	4
Control Delay (s)	0.0	0.0	0.0	17.5	0.0	0.0	15.5
Lane LOS				C			C
Approach Delay (s)	0.0			0.3			15.5
Approach LOS							C
Intersection Summary							
Average Delay			0.2				
Intersection Capacity Utilization			48.1%		ICU Level of Service		A
Analysis Period (min)			15				

HCM Signalized Intersection Capacity Analysis
5: Hina Lani St. & Kamanu Street

2045 AM With Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↔↔		↔	↔↔	↔↔	↔↔	↔	↔	↔	↔	↔
Ideal Flow (vphpl)	1900	1900		1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0		4.0
Lane Util. Factor	0.97	0.95		1.00	0.95	1.00	0.97		1.00	1.00		1.00
Frt	1.00	0.98		1.00	1.00	0.85	1.00		0.85	1.00		0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (prot)	3433	3461		1770	3539	1583	3433		1583	1770		1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (perm)	3433	3461		1770	3539	1583	3433		1583	1770		1583
Volume (vph)	447	774		133	224	1072	138		346	0		81
Peak-hour factor, PHF	0.92	0.92		0.92	0.92	0.92	0.92		0.92	0.92		0.92
Adj. Flow (vph)	486	841		145	243	1165	150		376	0		88
RTOR Reduction (vph)	0	14		0	0	81	0		0	76		0
Lane Group Flow (vph)	486	972		243	1165	69	376		0	12		123
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		Free
Protected Phases	7	4		3	8		5		2			1
Permitted Phases						8			2			
Actuated Green, G (s)	13.2	29.6		13.0	29.4	29.4	16.8		10.5	9.0		78.1
Effective Green, g (s)	13.2	29.6		13.0	29.4	29.4	16.8		10.5	9.0		78.1
Actuated g/C Ratio	0.17	0.38		0.17	0.38	0.38	0.22		0.13	0.12		1.00
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0		4.0
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)	580	1312		295	1332	596	738		213	204		1583
v/s Ratio Prot	c0.14	0.28		0.14	c0.33		c0.11			c0.07		
v/s Ratio Perm						0.09			0.06			0.32
v/c Ratio	0.84	0.74		0.82	0.87	0.12	0.51		0.06	0.60		0.32
Uniform Delay, d1	31.4	20.9		31.4	22.6	15.9	27.0		29.5	32.9		0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		1.00
Incremental Delay, d2	10.2	2.3		16.8	6.7	0.1	0.6		0.1	5.0		0.5
Delay (s)	41.7	23.2		48.2	29.3	16.0	27.6		29.6	37.8		0.5
Level of Service	D	C		D	C	B	C		C	D		A
Approach Delay (s)		29.3			31.0				28.0			7.8
Approach LOS		C			C				C			A
Intersection Summary												
HCM Average Control Delay			26.5			HCM Level of Service			C			
HCM Volume to Capacity ratio			0.72									
Actuated Cycle Length (s)			78.1			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			68.9%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
6: Hina Lani St. & Ane Keohokalole Hwy

2045 AM With Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱	↱	↰	↱	↱	↰	↱	↱	↰	↱	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt pb, ped/bikes	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98
Flt pb, 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)	3433	3539	1565	3433	3539	1562	1770	1863	1562	1770	1863	1551
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)	3433	3539	1565	3433	3539	1562	1770	1863	1562	1770	1863	1551
Volume (vph)	186	543	127	604	919	248	220	374	235	216	611	243
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	186	543	127	604	919	248	220	374	235	216	611	243
RTOR Reduction (vph)	0	0	46	0	0	103	0	0	0	0	0	122
Lane Group Flow (vph)	186	543	81	604	919	145	220	374	235	216	611	121
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		Free	Prot		Perm
Protected Phases	7	4	5	3	8	1	5	2		1	6	
Permitted Phases			4			8			Free			6
Actuated Green, G (s)	5.0	15.8	27.8	16.0	26.8	40.2	12.0	28.6	89.8	13.4	30.0	30.0
Effective Green, g (s)	5.0	15.8	27.8	16.0	26.8	40.2	12.0	28.6	89.8	13.4	30.0	30.0
Actuated g/C Ratio	0.06	0.18	0.31	0.18	0.30	0.45	0.13	0.32	1.00	0.15	0.33	0.33
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
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)	191	623	554	612	1056	769	237	593	1562	264	622	518
v/s Ratio Prot	0.05	0.15	0.03	c0.18	c0.26	0.05	c0.12	0.20		0.12	c0.33	
v/s Ratio Perm			0.05			0.11			0.15			0.16
v/c Ratio	0.97	0.87	0.15	0.99	0.87	0.19	0.93	0.63	0.15	0.82	0.98	0.23
Uniform Delay, d1	42.3	36.0	22.4	36.8	29.9	15.0	38.5	26.1	0.0	37.0	29.6	21.6
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	57.1	12.7	0.1	32.7	8.0	0.1	38.9	2.2	0.2	17.6	31.4	0.2
Delay (s)	99.4	48.7	22.5	69.5	37.8	15.1	77.4	28.3	0.2	54.6	61.1	21.8
Level of Service	F	D	C	E	D	B	E	C	A	D	E	C
Approach Delay (s)		55.9			45.5			33.3			50.9	
Approach LOS		E			D			C			D	
Intersection Summary												
HCM Average Control Delay		46.5										
HCM Volume to Capacity ratio		0.89										
Actuated Cycle Length (s)		89.8										
Intersection Capacity Utilization		89.9%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani St. & Mamalahoa Highway

2045 AM With Project+Mit
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱	↰	↱	↱	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.97	1.00	1.00	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	3433	1863	1863	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	3433	1863	1863	1583
Volume (vph)	481	410	396	342	1269	769
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	481	410	396	342	1269	769
RTOR Reduction (vph)	0	62	0	0	0	0
Lane Group Flow (vph)	481	348	396	342	1269	769
Turn Type		pm+ov		Prot		Free
Protected Phases	4	5		5	2	6
Permitted Phases			4			Free
Actuated Green, G (s)	18.0	33.0		15.0	104.0	85.0
Effective Green, g (s)	18.0	33.0		15.0	104.0	85.0
Actuated g/C Ratio	0.14	0.25		0.12	0.80	0.65
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)	475	451		396	1490	1218
v/s Ratio Prot	c0.14	c0.10		0.12	0.18	c0.68
v/s Ratio Perm		0.15				0.49
v/c Ratio	1.01	0.77		1.00	0.23	1.04
Uniform Delay, d1	56.0	45.0		57.5	3.2	22.5
Progression Factor	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	44.5	8.0		45.2	0.1	37.4
Delay (s)	100.5	53.0		102.7	3.3	59.9
Level of Service	F	D		F	A	E
Approach Delay (s)	78.6			56.6	37.7	
Approach LOS	E			E	D	
Intersection Summary						
HCM Average Control Delay		51.5			HCM Level of Service	D
HCM Volume to Capacity ratio		1.01				
Actuated Cycle Length (s)		130.0			Sum of lost time (s)	8.0
Intersection Capacity Utilization		101.8%			ICU Level of Service	G
Analysis Period (min)		15				
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealakehe Parkway & Queen Kaahumanu Highway

2045 AM With Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱		↰	↱		↰	↱	↱	↰	↱	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.97	1.00		1.00	0.91	1.00	1.00	0.91	
Flt pb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.98	1.00	1.00	
Flt pb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.89		1.00	0.87		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1649		3433	1614		1770	5085	1558	1770	5066	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1649		3433	1614		1770	5085	1558	1770	5066	
Volume (vph)	17	7	24	492	18	152	68	2169	620	199	2081	48
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)	18	8	26	535	20	165	74	2358	674	216	2262	52
RTOR Reduction (vph)	0	25	0	0	132	0	0	0	213	0	2	0
Lane Group Flow (vph)	18	9	0	535	53	0	74	2358	461	216	2312	0
Confl. Peds. (#/hr)							2	2	2			2
Turn Type	Prot			Prot			Prot	pm+ov	Prot			
Protected Phases	7	4		3	8		5	2	3	1	6	
Permitted Phases									2			
Actuated Green, G (s)	1.9	5.9		18.1	22.1		5.5	57.0	75.1	14.1	65.6	
Effective Green, g (s)	1.9	5.9		18.1	22.1		5.5	57.0	75.1	14.1	65.6	
Actuated g/C Ratio	0.02	0.05		0.16	0.20		0.05	0.51	0.68	0.13	0.59	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
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)	30	88		559	321		88	2609	1109	225	2991	
v/s Ratio Prot	0.01	0.02		c0.16	c0.11		0.04	c0.46	c0.10	c0.12	0.46	
v/s Ratio Perm									0.33			
v/c Ratio	0.60	0.11		0.96	0.16		0.84	0.90	0.42	0.96	0.77	
Uniform Delay, d1	54.2	50.1		46.1	36.9		52.4	24.6	8.1	48.2	17.1	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	29.4	0.5		27.3	0.2		48.1	4.9	0.3	48.6	1.3	
Delay (s)	83.6	50.6		73.5	37.1		100.5	29.5	8.4	96.8	18.4	
Level of Service	F	D		E	D		F	C	A	F	B	
Approach Delay (s)		62.0			64.1			26.6			25.1	
Approach LOS		E			E			C			C	
Intersection Summary												
HCM Average Control Delay		30.5										
HCM Volume to Capacity ratio		0.85										
Actuated Cycle Length (s)		111.1										
Intersection Capacity Utilization		83.6%										
Analysis Period (min)		15										
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
1: Kaiminani Drive & Queen Kaahumanu Highway

2045 PM With Project+Mit
7/25/2012

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↰	↱	↱	↱	↰	↱
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.91	1.00	0.97	0.91
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)	3433	1583	5085	1583	3433	5085
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3433	1583	5085	1583	3433	5085
Volume (vph)	180	580	1626	387	669	1802
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	196	630	1767	421	727	1959
RTOR Reduction (vph)	0	1	0	242	0	0
Lane Group Flow (vph)	196	629	1767	179	727	1959
Turn Type	pm+ov			Perm	Prot	
Protected Phases	8	1	2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	9.1	26.7	28.7	28.7	17.6	50.3
Effective Green, g (s)	9.1	26.7	28.7	28.7	17.6	50.3
Actuated g/C Ratio	0.14	0.40	0.43	0.43	0.26	0.75
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	464	721	2165	674	896	3795
v/s Ratio Prot	0.06	c0.23	c0.35		0.21	0.39
v/s Ratio Perm		0.17		0.27		
v/c Ratio	0.42	0.87	0.82	0.27	0.81	0.52
Uniform Delay, d1	26.7	18.8	17.0	12.5	23.3	3.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	11.3	2.5	0.2	5.6	0.1
Delay (s)	27.4	30.0	19.5	12.7	29.0	3.6
Level of Service	C	C	B	B	C	A
Approach Delay (s)	29.4		18.2			10.5
Approach LOS	C		B			B
Intersection Summary						
HCM Average Control Delay		16.2			HCM Level of Service	B
HCM Volume to Capacity ratio		0.85				
Actuated Cycle Length (s)		67.4			Sum of lost time (s)	8.0
Intersection Capacity Utilization		74.0%			ICU Level of Service	D
Analysis Period (min)		15				
c Critical Lane Group						

PM (2045+P3) Thu Jul 26, 2012 10:30:04 Page 3-1

JB23054 - Kaloko Makai
Kona, Hawaii
2035 With Project Phase 3 Conditions

Level Of Service Computation Report
2000 HCM Unsignalized Method (Future Volume Alternative)

Intersection #2 Queen Kaahumanu Hwy. @ Hulikoa Dr.

Average Delay (sec/veh): 0.0 Worst Case Level Of Service: A[7.2]

Approach: North Bound South Bound East Bound West Bound
Movement: L - T - R L - T - R L - T - R L - T - R

Control: Uncontrolled Uncontrolled Yield Sign Yield Sign
Rights: Include Include Include Ignore
Lanes: 0 0 2 0 1 0 1 2 0 0 0 0 0 0 1 0 0

Volume Module:
Base Vol: 0 719 122 0 1068 0 0 0 0 0 0 205
Growth Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00
Initial Bse: 0 719 122 0 1068 0 0 0 0 0 0 205
Added Vol: 0 982 134 13 1166 0 0 0 0 45 0 154
PasserByVol: 0 0 13 -13 58 0 0 0 0 -45 0 45
Initial Fut: 0 1701 269 0 2292 0 0 0 0 0 0 404
User Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 0.00
PHF Adj: 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00 0.00
PHF Volume: 0 1701 269 0 2292 0 0 0 0 0 0 0
Reduct Vol: 0 0 0 0 0 0 0 0 0 0 0 0
FinalVolume: 0 1701 269 0 2292 0 0 0 0 0 0 0

Critical Gap Module:
Critical Gap: 6.8 6.5 6.9
FollowUpTim: 3.5 4.0 3.3

Capacity Module:
Cnflct Vol: 2465 3993 851
Potent Cap.: 26 3 308
Move Cap.: 26 3 308
Volume/Cap: 0.00 0.00 0.00

Level of Service Module:
2Way95thQ: 0.0
Control Del: 7.2
LOS by Move: A

Note: Queue reported is the number of cars per lane.

Traffic 8.0.0715 (c) 2008 Dowling Assoc. Licensed to KOA CORP, MONTEREY PK

HCM Unsignalized Intersection Capacity Analysis 4: Hina Lani St. & Kanalanani Street

2045 PM With Project+Mit
7/25/2012

	→	↘	↙	←	↖	↗	
Movement	EBT	EBR	WBL	WBT	NBL	NBR	
Lane Configurations	↕↕	↘	↙	↕↕		↗	
Sign Control	Free			Free	Stop		
Grade	0%			0%	0%		
Volume (veh/h)	1795	489	17	1900	0	74	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	1951	532	18	2065	0	80	
Pedestrians					2		
Lane Width (ft)					12.0		
Walking Speed (ft/s)					4.0		
Percent Blockage					0		
Right turn flare (veh)							
Median type					None		
Median storage (veh)							
Upstream signal (ft)							
pX, platoon unblocked							
vC, conflicting volume			2485		3023	978	
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol			2485		3023	978	
tC, single (s)			4.1		6.8	6.9	
tC, 2 stage (s)							
tF (s)			2.2		3.5	3.3	
p0 queue free %			90		100	68	
cM capacity (veh/h)			182		9	250	
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1
Volume Total	976	976	532	18	1033	1033	80
Volume Left	0	0	0	18	0	0	0
Volume Right	0	0	532	0	0	0	80
cSH	1700	1700	1700	182	1700	1700	250
Volume to Capacity	0.57	0.57	0.31	0.10	0.61	0.61	0.32
Queue Length (ft)	0	0	0	8	0	0	34
Control Delay (s)	0.0	0.0	0.0	27.0	0.0	0.0	26.1
Lane LOS				D			D
Approach Delay (s)	0.0			0.2			26.1
Approach LOS							D
Intersection Summary							
Average Delay	0.6						
Intersection Capacity Utilization	60.9%			ICU Level of Service		B	
Analysis Period (min)	15						

HCM Signalized Intersection Capacity Analysis
5: Hina Lani St. & Kamanu Street

2045 PM With Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0		4.0
Lane Util. Factor	0.97	0.95		1.00	0.95	1.00	0.97		1.00	1.00		1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00		0.85	1.00		0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (prot)	3433	3496		1770	3539	1583	3433		1583	1770		1583
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95		1.00	0.95		1.00
Satd. Flow (perm)	3433	3496		1770	3539	1583	3433		1583	1770		1583
Volume (vph)	519	1197	105	133	944	127	615	0	347	153	0	534
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)	564	1301	114	145	1026	138	668	0	377	166	0	580
RTOR Reduction (vph)	0	6	0	0	0	80	0	0	186	0	0	0
Lane Group Flow (vph)	564	1409	0	145	1026	58	668	0	191	166	0	580
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		Free
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases						8			2			Free
Actuated Green, G (s)	17.0	40.3		8.1	31.4	31.4	27.5		17.8	12.8		95.0
Effective Green, g (s)	17.0	40.3		8.1	31.4	31.4	27.5		17.8	12.8		95.0
Actuated g/C Ratio	0.18	0.42		0.09	0.33	0.33	0.29		0.19	0.13		1.00
Clearance Time (s)	4.0	4.0		4.0	4.0	4.0	4.0		4.0	4.0		
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0		3.0	3.0		
Lane Grp Cap (vph)	614	1483		151	1170	523	994		297	238		1583
v/s Ratio Prot	c0.16	c0.40		0.08	0.29		c0.19		0.24	0.09		0.37
v/s Ratio Perm					0.09				0.64	0.70		0.37
v/c Ratio	0.92	0.95		0.96	0.88	0.11	0.67		0.64	0.70		0.37
Uniform Delay, d1	38.3	26.4		43.3	30.0	22.1	29.8		35.7	39.3		0.0
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00		1.00	1.00		1.00
Incremental Delay, d2	18.7	13.1		61.1	7.6	0.1	1.8		4.7	8.6		0.7
Delay (s)	57.1	39.5		104.4	37.6	22.2	31.6		40.4	47.8		0.7
Level of Service	E	D		F	D	C	C		D	D		A
Approach Delay (s)	44.5			43.4			34.7			11.2		
Approach LOS	D			D			C			B		
Intersection Summary												
HCM Average Control Delay			37.3			HCM Level of Service			D			
HCM Volume to Capacity ratio			0.97									
Actuated Cycle Length (s)			95.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			78.0%			ICU Level of Service			D			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
6: Hina Lani St. & Ane Keohokalole Hwy

2045 PM With Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔↔	↕↕	↗	↔↔	↕↕	↗	↔	↕	↗	↔	↕	↗
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frbp, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	0.98
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)	3433	3539	1557	3433	3539	1560	1770	1863	1562	1770	1863	1548
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)	3433	3539	1557	3433	3539	1560	1770	1863	1562	1770	1863	1548
Volume (vph)	270	1106	237	380	710	252	145	549	570	286	477	227
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	270	1106	237	380	710	252	145	549	570	286	477	227
RTOR Reduction (vph)	0	0	73	0	0	44	0	0	0	0	0	150
Lane Group Flow (vph)	270	1106	164	380	710	208	145	549	570	286	477	77
Confl. Peds. (#/hr)	5		5	5		5	5		5	5		5
Turn Type	Prot		pm+ov	Prot		pm+ov	Prot		Free	Prot		Perm
Protected Phases	7	4	5	3	8	1	5	2		1	6	
Permitted Phases			4			8			Free			6
Actuated Green, G (s)	12.9	33.0	44.5	12.0	32.1	49.1	11.5	32.0	110.0	17.0	37.5	37.5
Effective Green, g (s)	12.9	33.0	44.5	12.0	32.1	49.1	11.5	32.0	110.0	17.0	37.5	37.5
Actuated g/C Ratio	0.12	0.30	0.40	0.11	0.29	0.45	0.10	0.29	1.00	0.15	0.34	0.34
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
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)	403	1062	686	375	1033	753	185	542	1562	274	635	528
v/s Ratio Prot	0.08	c0.31	0.04	c0.11	0.20	0.05	0.08	c0.29		c0.16	0.26	
v/s Ratio Perm			0.12			0.11			0.36			0.15
v/c Ratio	0.67	1.04	0.24	1.01	0.69	0.28	0.78	1.01	0.36	1.04	0.75	0.15
Uniform Delay, d1	46.5	38.5	21.6	49.0	34.5	19.2	48.0	39.0	0.0	46.5	32.1	25.1
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	4.2	39.0	0.2	49.9	1.9	0.2	19.2	41.9	0.7	66.3	5.0	0.1
Delay (s)	50.7	77.5	21.8	98.9	36.4	19.4	67.2	80.9	0.7	112.8	37.1	25.3
Level of Service	D	E	C	F	D	B	E	F	A	F	D	C
Approach Delay (s)	64.8			50.9			43.2			56.3		
Approach LOS	E			D			D			E		
Intersection Summary												
HCM Average Control Delay			54.4			HCM Level of Service			D			
HCM Volume to Capacity ratio			0.99									
Actuated Cycle Length (s)			110.0			Sum of lost time (s)			12.0			
Intersection Capacity Utilization			99.5%			ICU Level of Service			F			
Analysis Period (min)			15									
c Critical Lane Group												

HCM Signalized Intersection Capacity Analysis
7: Hina Lani St. & Mamalahoa Highway

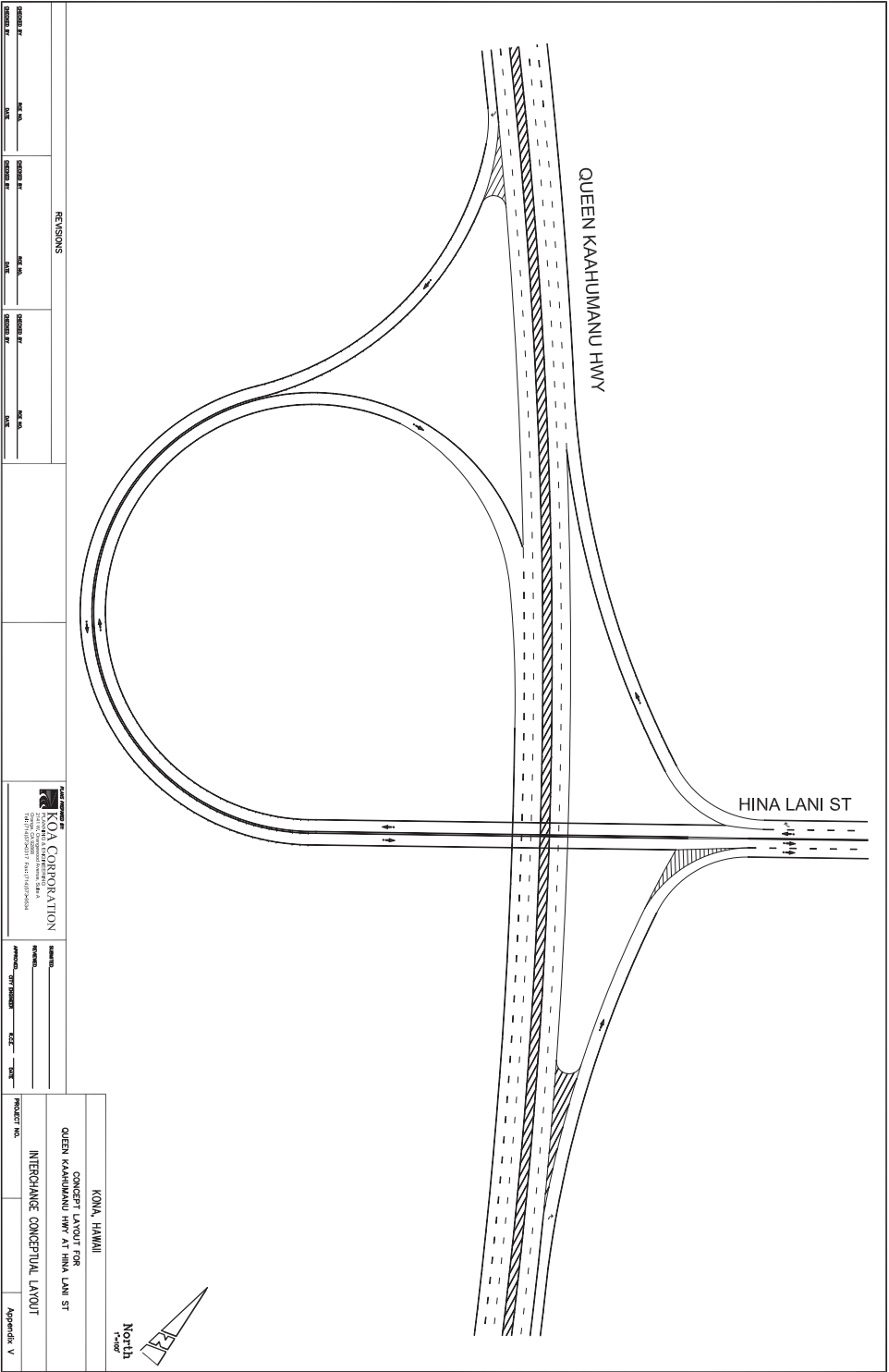
2045 PM With Project+Mit
7/25/2012

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.97	1.00	1.00	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	3433	1863	1863	1583
Flt Permitted	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (perm)	3433	1583	3433	1863	1863	1583
Volume (vph)	796	551	442	739	578	611
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	865	599	480	803	628	664
RTOR Reduction (vph)	0	63	0	0	0	0
Lane Group Flow (vph)	865	536	480	803	628	664
Turn Type	pm+ov		Prot		Free	
Protected Phases	4	5	5	2	6	
Permitted Phases	4				Free	
Actuated Green, G (s)	17.6	28.6	11.0	38.1	23.1	63.7
Effective Green, g (s)	17.6	28.6	11.0	38.1	23.1	63.7
Actuated g/C Ratio	0.28	0.45	0.17	0.60	0.36	1.00
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	949	810	593	1114	676	1583
v/s Ratio Prot	c0.25	c0.13	0.14	0.43	c0.34	
v/s Ratio Perm	0.25				0.42	
v/c Ratio	0.91	0.66	0.81	0.72	0.93	0.42
Uniform Delay, d1	22.3	13.8	25.3	9.0	19.5	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	12.7	2.0	8.0	2.3	19.0	0.8
Delay (s)	35.0	15.8	33.4	11.4	38.5	0.8
Level of Service	C	B	C	B	D	A
Approach Delay (s)	27.1		19.6		19.2	
Approach LOS	C		B		B	
Intersection Summary						
HCM Average Control Delay			22.2		HCM Level of Service	
HCM Volume to Capacity ratio			0.85		C	
Actuated Cycle Length (s)			63.7		Sum of lost time (s)	
Intersection Capacity Utilization			75.7%		8.0	
ICU Level of Service			D			
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis
8: Kealahoe Parkway & Queen Kaahumanu Highway

2045 PM With Project+Mit
7/25/2012

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00		0.97	1.00		1.00	0.91	1.00	1.00	0.91	
Frbp, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	0.98	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	
Frt	1.00	0.88		1.00	0.87		1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1642		3433	1622		1770	5085	1547	1770	5072	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1642		3433	1622		1770	5085	1547	1770	5072	
Volume (vph)	59	19	71	634	20	123	60	2645	509	98	2896	44
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	59	19	71	634	20	123	60	2645	509	98	2896	44
RTOR Reduction (vph)	0	48	0	0	99	0	0	0	124	0	1	0
Lane Group Flow (vph)	59	42	0	634	44	0	60	2645	385	98	2939	0
Confl. Peds. (#/hr)							2	2		2	2	
Turn Type	Prot		Prot		Prot		pm+ov		Prot			
Protected Phases	7	4	3		8		5	2	3	1	6	
Permitted Phases	2											
Actuated Green, G (s)	8.9	10.1	27.0		28.2		5.0	82.0	109.0	9.0	86.0	
Effective Green, g (s)	8.9	10.1	27.0		28.2		5.0	82.0	109.0	9.0	86.0	
Actuated g/C Ratio	0.06	0.07	0.19		0.20		0.03	0.57	0.76	0.06	0.60	
Clearance Time (s)	4.0	4.0	4.0		4.0		4.0	4.0	4.0	4.0	4.0	
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)	109	115	643		317		61	2894	1213	111	3027	
v/s Ratio Prot	0.03	c0.05	c0.18		0.09		0.03	0.52	0.08	c0.06	c0.58	
v/s Ratio Perm	0.25											
v/c Ratio	0.54	0.36	0.99		0.14		0.98	0.91	0.32	0.88	0.97	
Uniform Delay, d1	65.6	63.9	58.4		47.9		69.5	27.9	5.6	67.0	27.9	
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	5.4	1.9	31.7		0.2		108.8	5.0	0.2	50.5	10.5	
Delay (s)	71.0	65.9	90.0		48.1		178.3	32.9	5.8	117.5	38.4	
Level of Service	E	E	F		D		F	C	A	F	D	
Approach Delay (s)	67.9				82.3		31.3				40.9	
Approach LOS	E				F		C				D	
Intersection Summary												
HCM Average Control Delay	41.7		HCM Level of Service				D					
HCM Volume to Capacity ratio	0.97											
Actuated Cycle Length (s)	144.1		Sum of lost time (s)				16.0					
Intersection Capacity Utilization	97.1%		ICU Level of Service				F					
Analysis Period (min)	15											
c Critical Lane Group												



Appendix V – Grade-Separated Interchange Conceptual Configuration