

REPORT TO
KICKING HORSE MOUNTAIN RESORT
FOR
DRAFT TRAFFIC IMPACT STUDY:
PLANNED RESORT EXPANSION

YEAR 2008 - 2048

GOLDEN, BC

2111 02500-0

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1.0 INTRODUCTION

The Kicking Horse Mountain Resort (KHMR) has a plan to expand their current operations with the addition of accommodation units in forms of condominiums, townhouses, and single-family dwellings. The proposed expansion will be located in their current site vicinity which is on the west side of the Town of Golden, BC.

McElhanney Consulting Services Ltd. was commissioned to prepare a traffic impact study to assess potential traffic impacts to adjacent roadways and intersections in the project vicinity.

1.1 STUDY PURPOSE AND OBJECTIVE

The objectives of this study are to:

- Determine the number of trips generated by the proposed expansions and its corresponding traffic distribution pattern;
- Review the potential impacts of the following three study intersections and a one-lane bridge which will have added development traffic:
 - Highway 1 and 10 Avenue connector intersection
 - Highway 1 On/Off Ramps and 10 Avenue N intersection
 - 10 Avenue N and 7th Street intersection
 - One-Lane Bridge on resort access road;
- Analyze the following planning horizons with associated phased development expansion:
 - 2008 Existing Conditions
 - 2018 Phase 1
 - 2028 Phase 2
 - 2038 Phase 3
 - 2048 Phase 4

2.0 PROPOSED DEVELOPMENT

2.1 LOCATION

Golden is situated approximately 700 kilometres east of Vancouver and 250 kilometres west of Calgary. As previously noted, the site is located on the west side of the Town of Golden.

The proposed site location is shown in **Figure 2-1** below.

Figure 2-1 Site Location Map

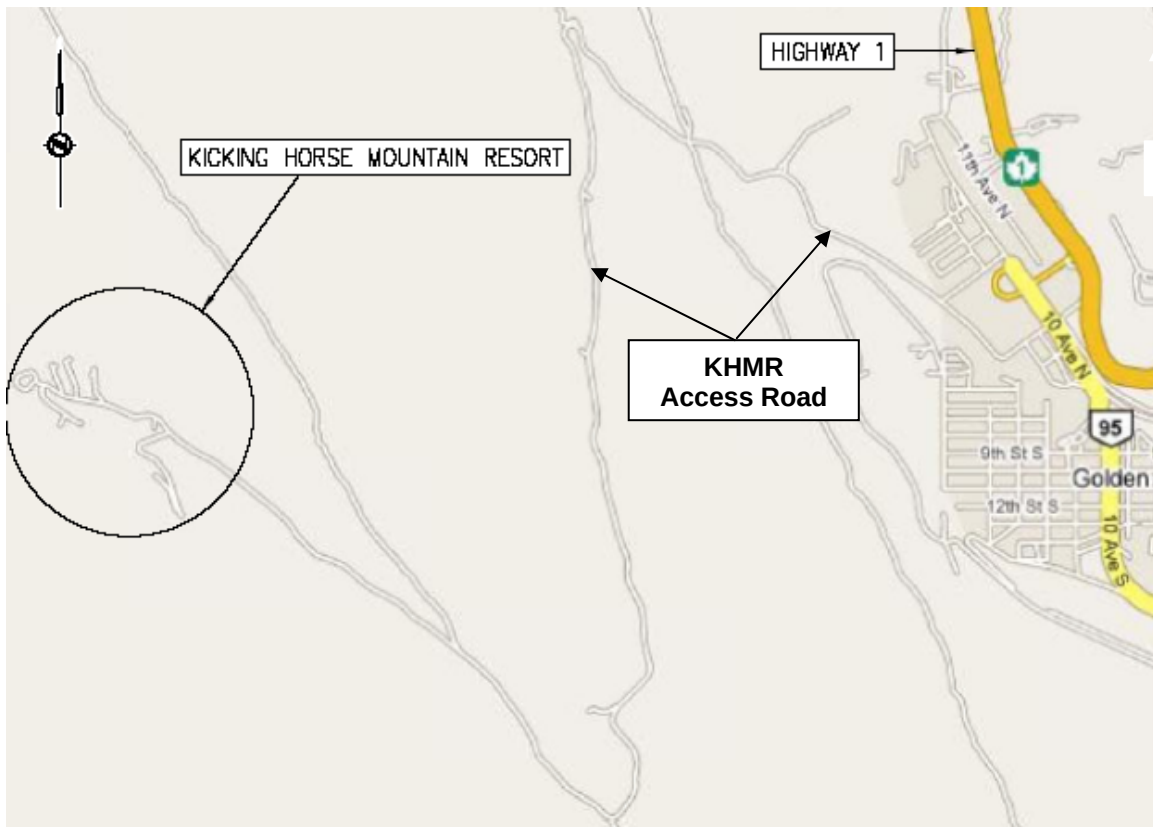


2.2 DEVELOPMENT DESCRIPTION

The proposed resort expansion includes a combination of condominiums, townhouses, and single-family units, which will be built over a time span of 40 years beginning from 2009. By 2018, it is anticipated that the resort will have an additional 4102 bed units. By 2028, the total number of bed units will be increased by another 4226. By 2038, the total number of bed units will be increased by another 6682. Finally, the full build-out will be reached in 2048 which will have an additional 3566 bed units, for a total of 20,152 bed units.

The development currently is served by only one access through a one-lane bridge across the Columbia River, which then leads to 7th Street and 10 Avenue and finally reaching Highway 1 to the east.

The proposed preliminary site layout plan is shown in **Figure 2-2** below.

Figure 2-2 Local Road Network Plan

2.3 ANTICIPATED GROWTH AND FUTURE DEVELOPMENT

The growth rate within the vicinity of the development is anticipated to be 3.0% per annum based on the growing trend of traffic counts collected by the Ministry of Transportation (MoT) for the last five years.

2.4 SITE ACCESSIBILITY

2.4.1 Existing Area Roadway System

The existing roadways that will serve as primary access routes to the site area are as follows:

- Highway 1 (Trans-Canada Highway);
- 10 Avenue N; and
- 7th Street N.

Highway 1

Highway 1 is a major two-lane east-west rural arterial that provides external access to the Town of Golden.

10 Avenue N

10 Avenue N, also known as Highway 95, is a two-lane north-south arterial that links local communities to Highway 1.

7th Street N

7th Street is a two-lane local street that provides main access to the Kicking Horse Mountain Resort.

2.5 EXISTING TRAFFIC VOLUMES AND CONDITIONS

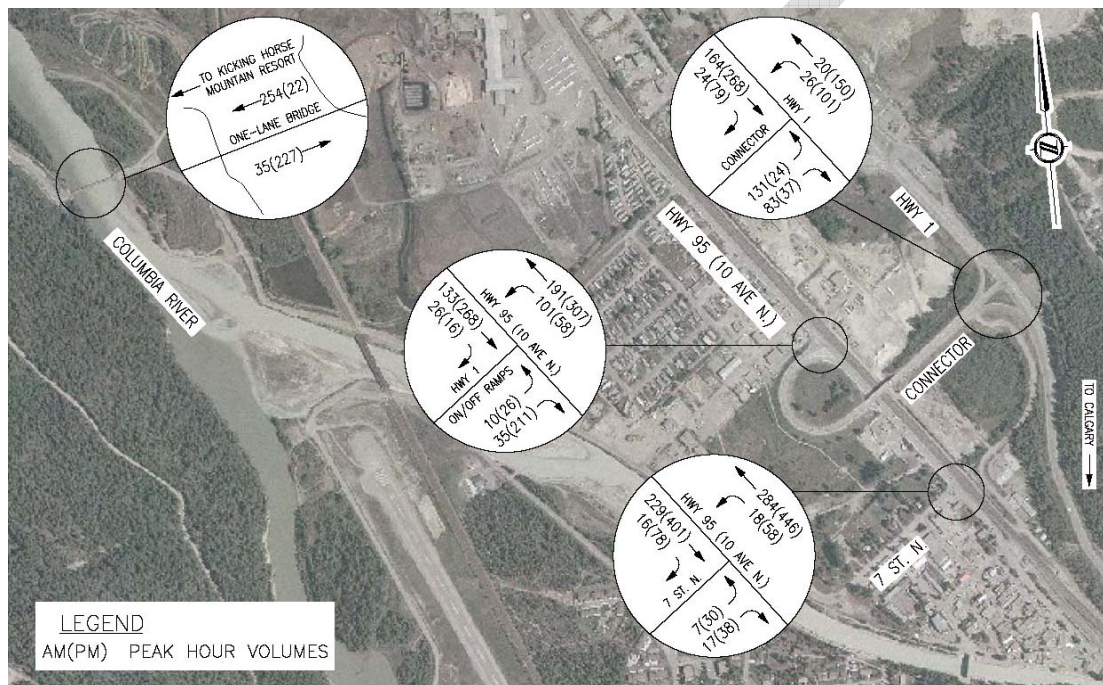
2.5.1 Existing Traffic Volumes

Existing traffic counts were undertaken by the KHMR staff at the study intersections during the AM (7 – 9 a.m.) and PM (3 - 6 p.m.) peak hour on March 1st, 2008 (Saturday) and March 2nd, 2008 (Sunday). The days of data collection coincide with a long-weekend statutory holiday which is expected to capture one of the highest traffic peaks of the season for the resort. In order to adjust for the increase of background traffic volumes in the area during the peak winter months, background adjustment factors of 2.0 for highways and 1.2 for local roads, which were based on historical counts from the MoT, were applied to the traffic counts for Highway 1 and 10 Avenue / 7th Street, respectively. Summary traffic count sheets are attached in **Appendix A**.

Since the Saturday traffic counts exhibit a higher level of traffic volumes than that of Sunday's, the Saturday counts were used to develop the background traffic volumes for the planning horizons for traffic analysis.

Figures 2-3 illustrates Background Traffic Volumes for 2008.

Figure 2-3 2008 Background Traffic Volumes



3.0 PROJECTED TRAFFIC

3.1 REGIONAL GROWTH

As noted in Section 2.3, it is assumed that the average annual growth in background traffic will be approximately 3%. **Figures 3-1 through 3-4** show Background Traffic Volumes for 2018, 2028, 2038 and 2048 Planning Horizons.

Figure 3-1 2018 Background Traffic Volumes

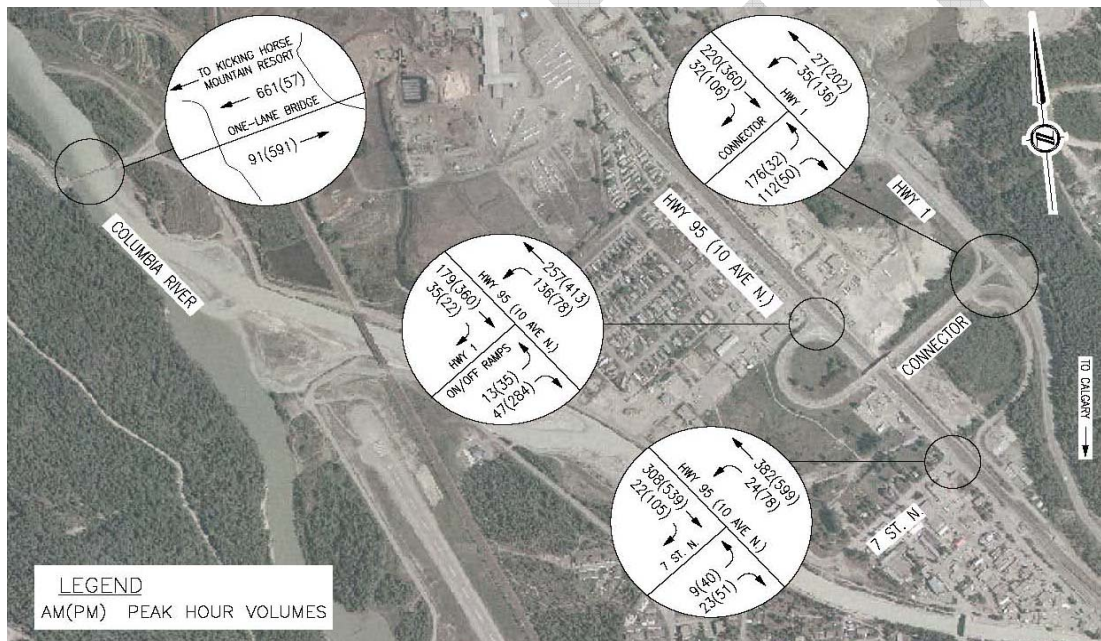


Figure 3-2 2028 Background Traffic Volumes

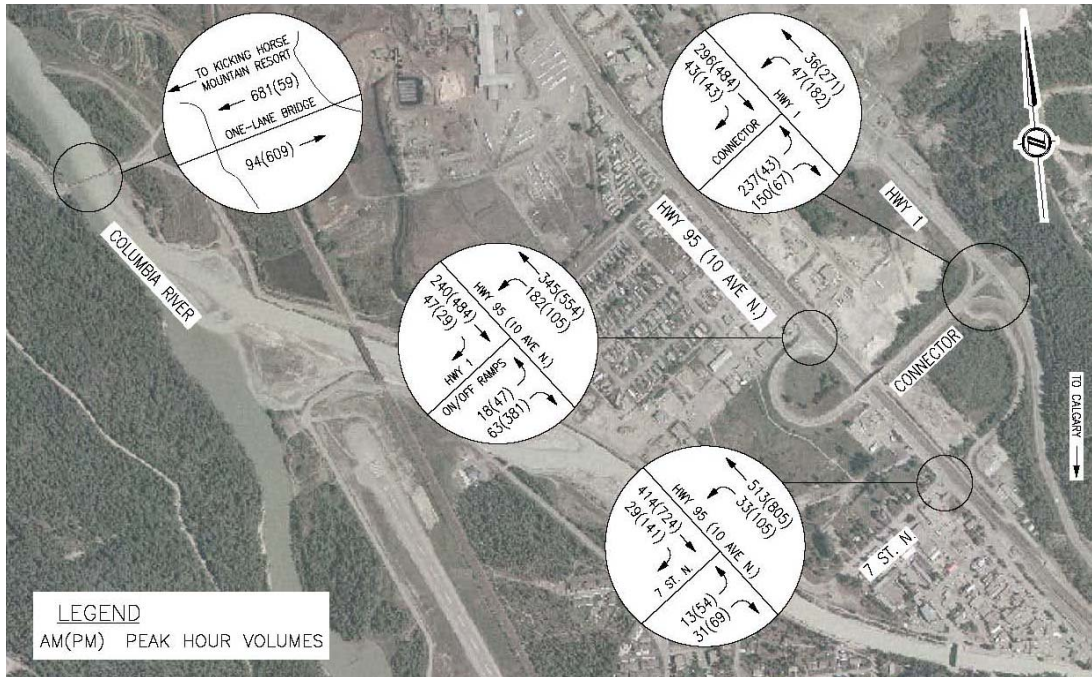


Figure 3-3 2038 Background Traffic Volumes

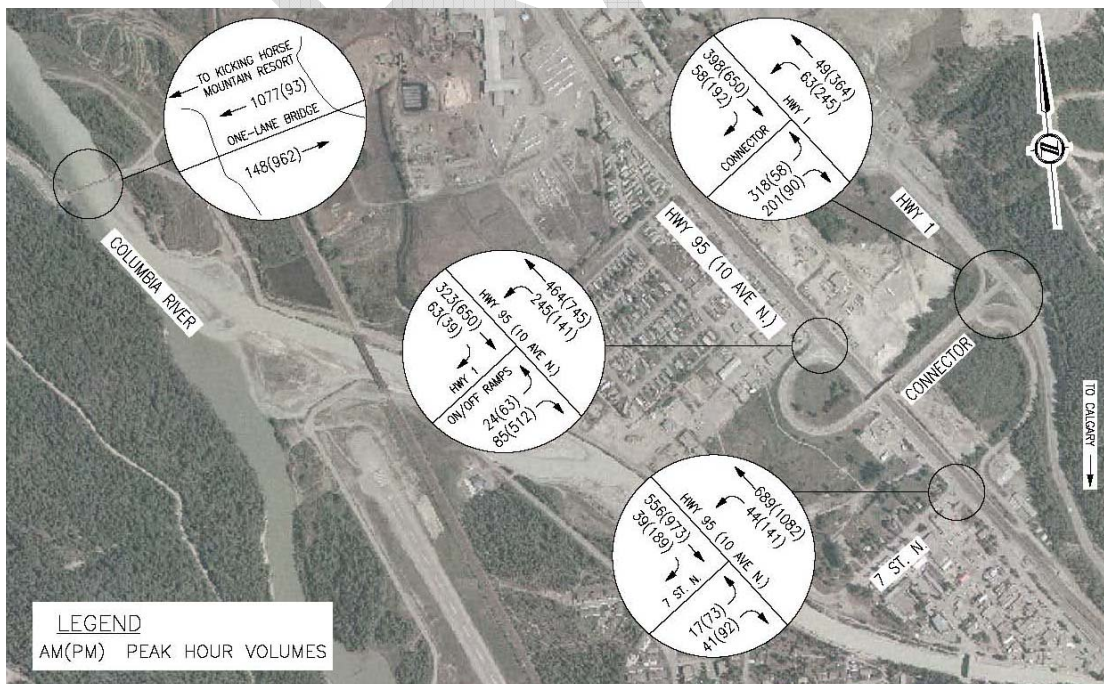
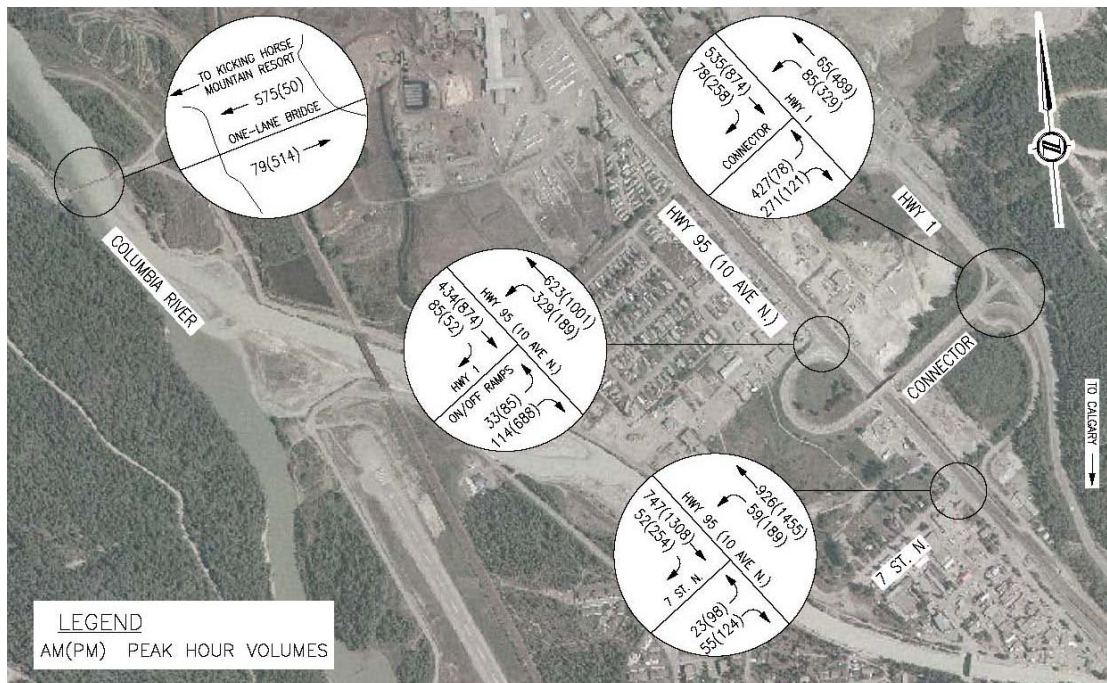


Figure 3-4 2048 Background Traffic Volumes

3.2 TRIP GENERATION

Since no resort trip generation rates are available from the ITE Trip Generation, 7th Edition publication and the MoT Trip Generation Rates Manual, and the fact that each individual resort development has its own trip generation characteristics, a site-specific approach was used to determine the quantity of development trips generated from the proposed resort expansion.

Development trips generated by the resort expansion were estimated by comparing the existing number of bed units with the additional bed units created by the expansion. Since the one-lane bridge serves only resort-bound traffic, the resort inbound and outbound traffic can be obtained from the traffic counts collected at the one-lane bridge at the west end of 7th Street across the Columbia River. The existing traffic counts were then projected based on the increase in bed-units to arrive at the approximate development trips for each planning horizon.

As illustrated in the ITE Trip Generation Manual, under the category of low-rise residential condominium/townhouse, the relationship between the number of dwelling units and number of vehicular trips do not exactly follow a linear equation. As the number of dwelling units increases, the rate of trip generation begins to diminish. Since this study uses a linear ratio to project the development traffic, it is considered to be a more conservative approach.

Table 3-1 on the next page shows the trip generations during AM and PM peak periods for 2018, 2028, 2038, and 2048 planning horizons.

Table 3-1 Development Trip Generation

Horizon Year	No. of bed units	Inbound Traffic (vph)		Outbound Traffic (vph)		Total
		AM Peak	PM Peak	AM Peak	PM Peak	
2008 (Existing)	1576	254	22	35	227	538
	No. of bed units added	No. of vehicular trip-ends added				
2008 - 2018	4102	661	57	91	591	1400
2018 - 2028	4226	681	59	94	609	1443
2028 - 2038	6682	1077	93	148	962	2280
2038 - 2048	3566	575	50	79	514	1218
	Accumulated total no. of bed units	Total no. of vehicular trip-ends				
2018 Accumulated	5678	915	79	126	818	1400
2028 Accumulated	9904	1596	138	220	1427	1443
2038 Accumulated	16586	2673	231	368	2389	2280
2048 Accumulated	20152	3248	281	447	2903	1218

From 2008 to 2018, the resort expansion will generate in the order of 661 inbound and 91 outbound vehicular trip-ends during the AM peak period and in the order of 57 inbound and 591 outbound vehicular trip-ends during the PM peak period.

Between 2018 and 2028, the resort expansion will generate in the order of additional 681 inbound and 94 outbound vehicular trip-ends during the AM peak period and in the order of additional 59 inbound and 609 outbound vehicular trip-ends during the PM peak period.

By 2038, the resort expansion will accumulate in the order of 1077 inbound and 148 outbound vehicular trip-ends during the AM peak period and in the order of 93 inbound and 962 outbound vehicular trip-ends during the PM peak period.

By 2048, the resort expansion will accumulate in the order of 575 inbound and 79 outbound vehicular trip-ends during the AM peak period and in the order of 50 inbound and 514 outbound vehicular trip-ends during the PM peak period.

3.3 TRIP DISTRIBUTION AND ASSIGNMENT

The development is served by one access through 7th Street only. Majority of traffic will be coming from Highway 1 which then exits at the 10th Avenue Connector. Following the overpass and the loop ramp, proper signage will direct traffic to turn right at 10 Ave and then turn right again at the 7th Street intersection. **Figures 3-5 through 3-8** show the development generated trips for 2018, 2028, 2038 and 2048 planning horizons.

Figure 3-5 2018 Development Trips and Distributions

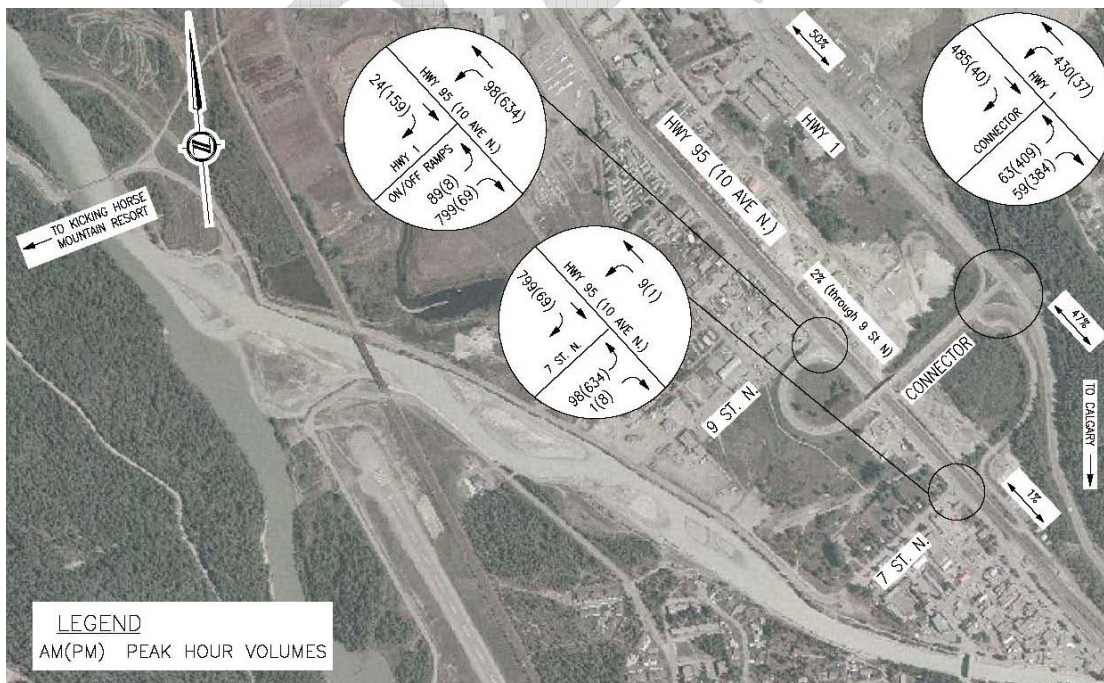


Figure 3-6 2028 Development Trips and Distributions

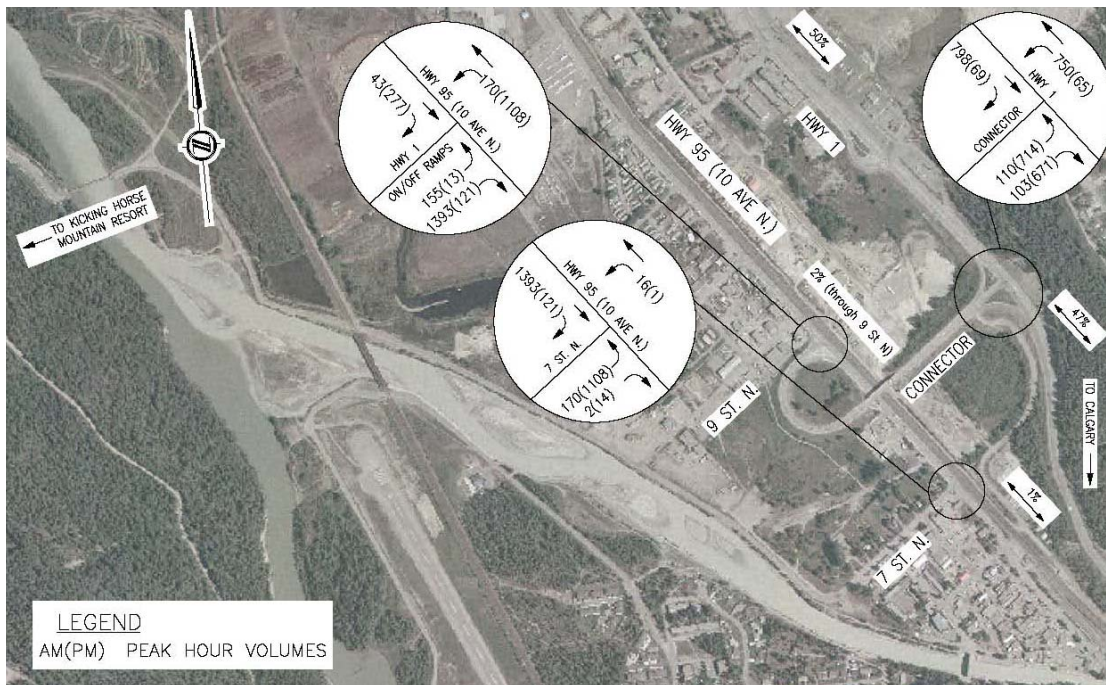


Figure 3-7 2038 Development Trips and Distributions

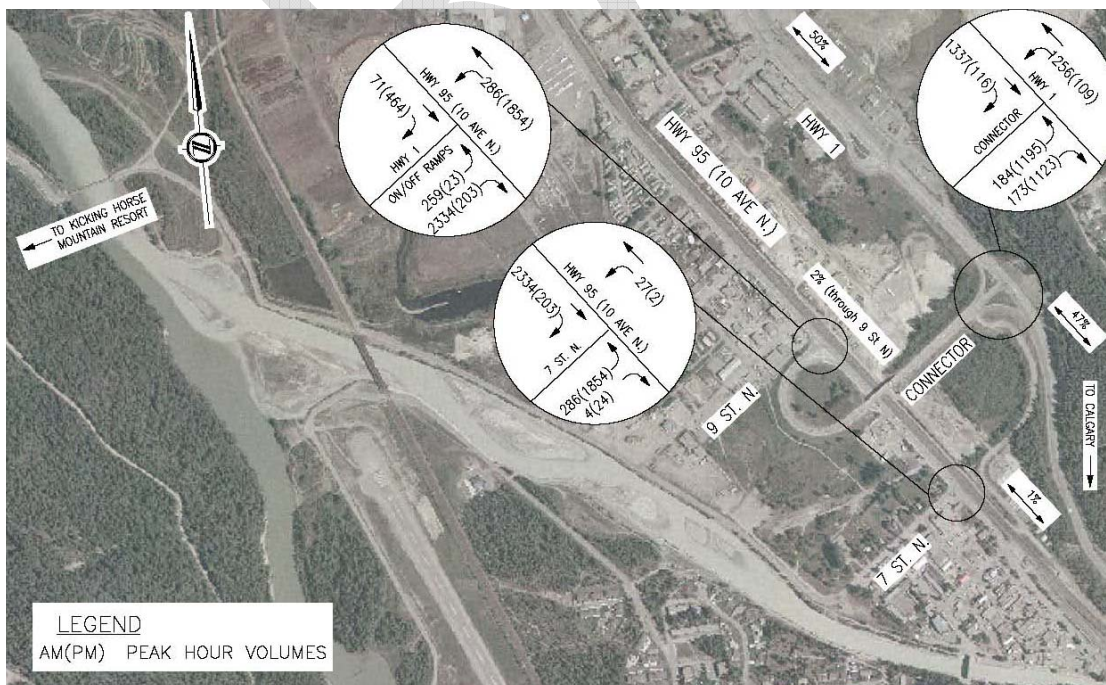
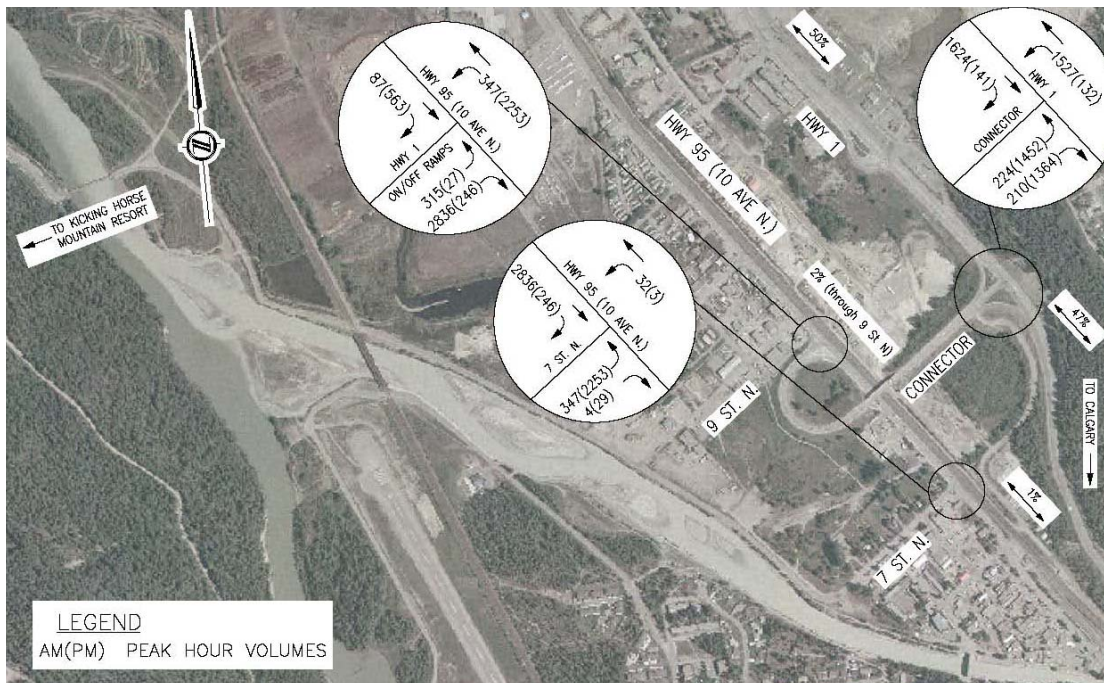


Figure 3-8 2048 Development Trips and Distributions

3.4 COMBINED TRAFFIC

Background 2018, 2028, 2038 and 2048 traffic volumes were added to the corresponding accumulated resort expansion generated trips to arrive at the combined traffic volumes for the four planning horizons, respectively.

Figures 3-9 through 3-12 below summarize the 2018, 2028, 2038 and 2048 background plus development traffic volumes.

Figure 3-9 2018 Combined Traffic Volumes

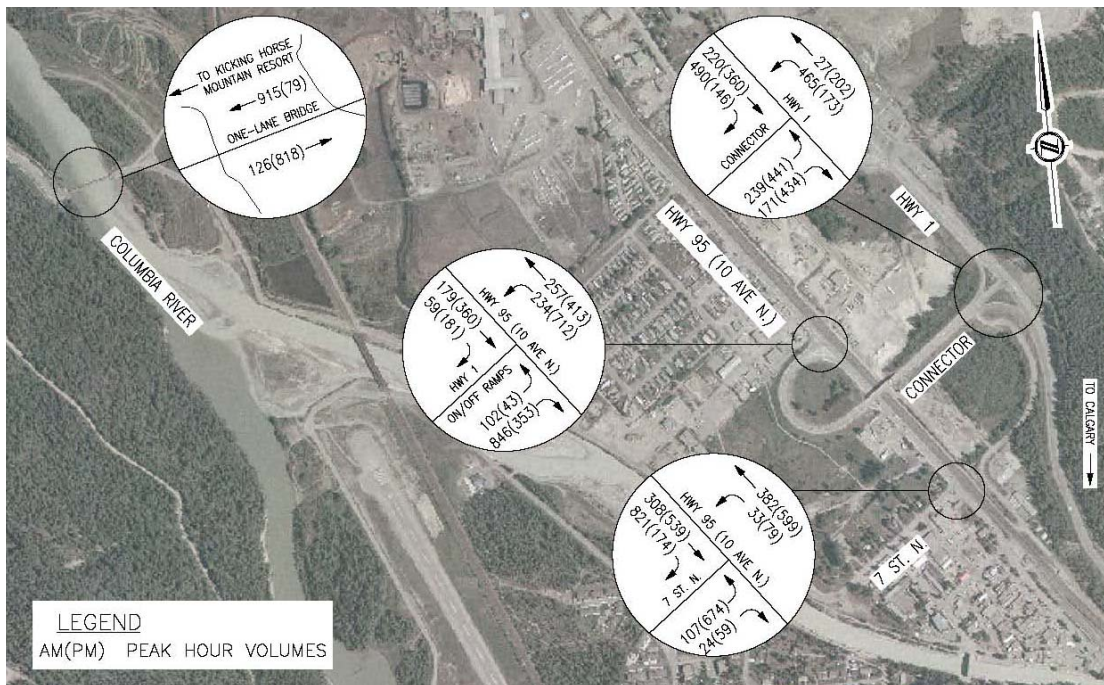


Figure 3-10 2028 Combined Traffic Volumes

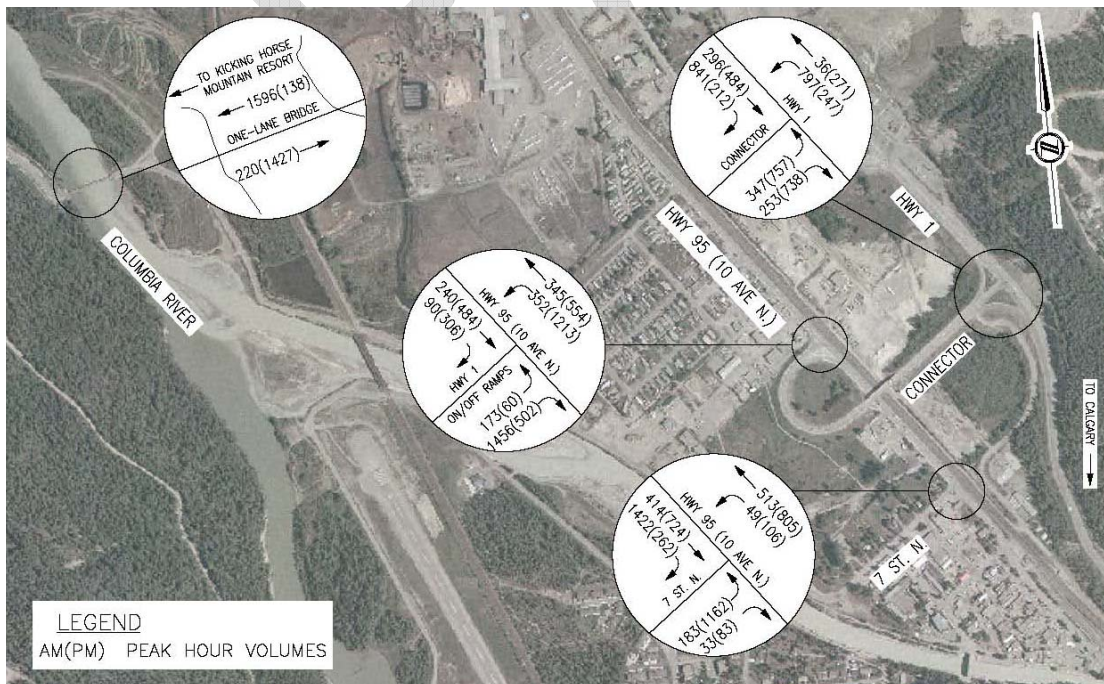


Figure 3-11 2038 Combined Traffic Volumes

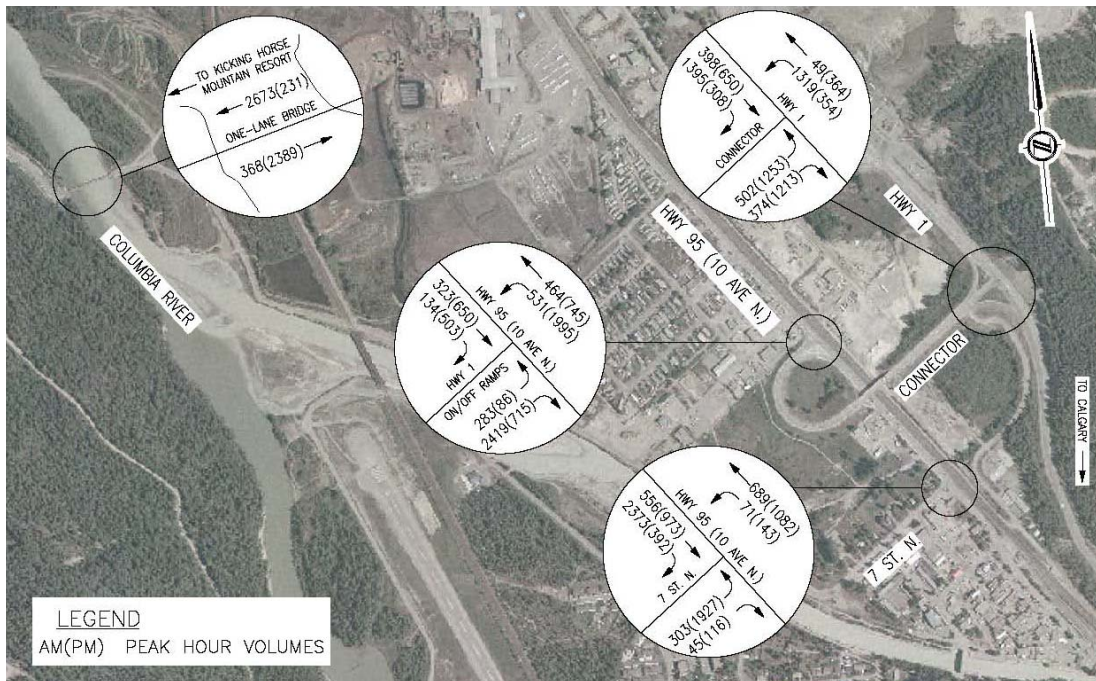
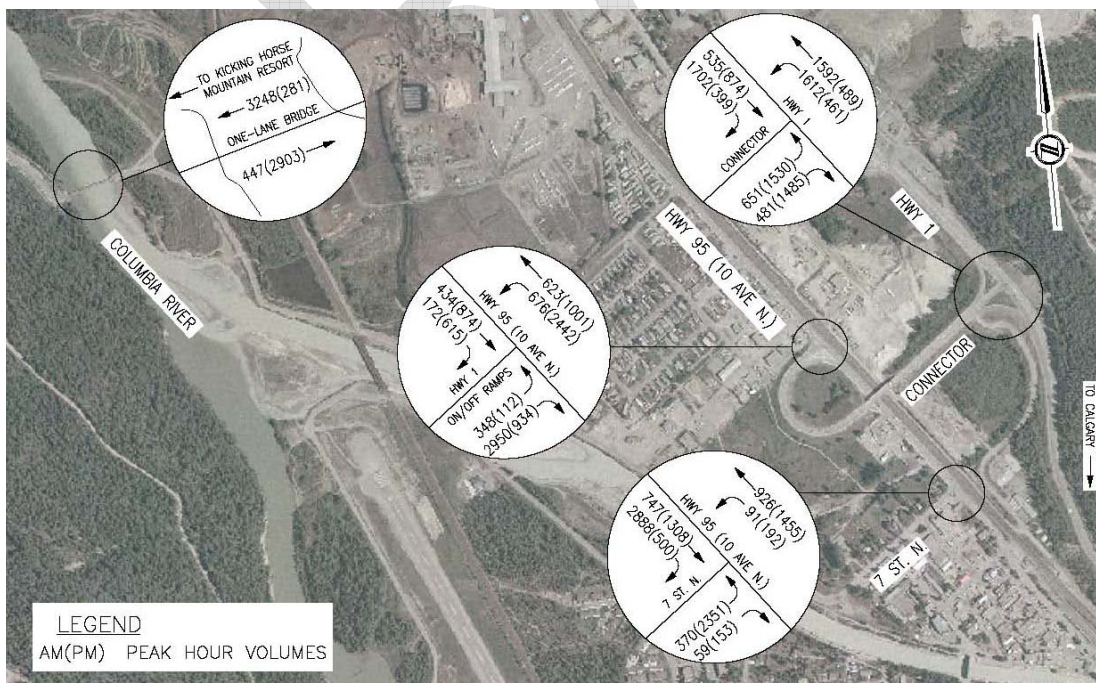


Figure 3-12 2048 Combined Traffic Volumes



4.0 TRAFFIC ANALYSIS

4.1 INTERSECTION PERFORMANCE

The Level of Service (LOS) is a commonly used measure of the quality of traffic conditions experienced along a roadway or at an intersection. The LOS is typically measured as a function of the delay and defined as indicated in **Table 4-1**. The critical LOS at un-signalized intersections is generally a function of the delay experienced by the minor road and left-turn movements.

Table 4-1 Level of Service and Delay Criteria

LOS	Delay Criteria (sec/veh)		Description
	Signalized	Unsignalized	
A	<10	<10	Excellent
B	>10 and <20	>10 and <15	Very Good
C	>20 and <35	>15 and <25	Good
D	>35 and <55	>25 and <35	Acceptable
E	>55 and <80	>35 and <50	Near Capacity
F	>80	>50	Poor

The LOS ranges from 'A' to 'F', with LOS 'D' generally considered as the minimum acceptable condition for urban areas. LOS 'C' is usually preferred in rural areas.

The study intersections – Highway 1 and 10 Avenue connector, 10th Avenue and Highway 1 On/Off Ramps, and 10th Avenue and 7th Street - were analyzed in detail using Synchro version 6.0, which incorporates the Highway Capacity Manual (HCM) 2000 methodologies. The Synchro output sheets are included in **Appendix B**.

4.2 TRAFFIC ANALYSIS RESULTS

Capacity analysis for the AM and PM peak hour volumes for the study intersections was conducted for the combined traffic volumes under the four planning horizons. The following four scenarios were analyzed in this study:

- *2008 Existing Scenario* – Background 2008 Traffic (Including trips generated by existing resort operations);
- *2018 Project Scenario* – Background 2018 Traffic + Accumulated Development Trips up to 2018;
- *2028 Project Scenario* – Background 2028 Traffic + Accumulated Development Trips up to 2028; and
- *2038 Project Scenario* – Background 2038 Traffic + Accumulated Development Trips up to 2038
- *2048 Project Scenario* – Background 2048 Traffic + Accumulated Development Trips up to 2048.

During the preliminary data analysis it was revealed and confirmed through Synchro results, that the projected combined volumes in Phase 3 (2038 scenario) and Phase 4 (2048 scenario) are so heavy that it is beyond the capacity of signalised intersections to handle the traffic with LOS D or above, even with significant upgrades. Therefore it is decided to treat Phase 1 and 2 separately from Phase 3 and 4 for analysis purpose.

The following section describes the analysis findings.

4.2.1 Highway 1 and 10 Avenue Connector Intersection

This T-intersection serves as a primary access point for the Town of Golden to Highway 1. The intersection is currently stop-controlled on the Connector approach with the following lane layouts:

- The northbound Highway 1 approach consists of one through lane and one left turn lane with channelization;
- The southbound approach consists of two through lanes and one right turn lane, and
- The eastbound 10 Avenue connector approach consists of one left turn lane and one right turn lane with channelization. The left turn lane has an acceleration lane in the median area before merging onto Highway 1.

Under the 2008, 2018 and 2028 Background scenarios, all intersection approaches achieve acceptable LOS B or above. However, under the 2018 and 2028 Combined Scenarios, the left turn movement on the Connector approach will operate at LOS F with existing lane conditions during both peak periods. Eastbound right approach also fails on 10 Avenue Connector approach during 2028 combined scenario. See **Table 4-2** below.

**Table 4-2 Summary of LOS and Delay with Existing Laning Conditions
(Highway 1 and 10 Ave Connector)**

Highway 1 and 10 Avenue Connector								
		Peak Period	NB Left (Highway 1)		EB Left (10 Avenue Connector)		EB Right (10 Avenue Connector)	
			LOS	Delay sec/veh	LOS	Delay sec/veh	LOS	Delay sec/veh
2008	Existing	AM	A	7.6	B	11.1	A	8.8
		PM	A	7.7	B	11.0	A	9.5
2018	Background	AM	A	7.8	B	11.2	A	9.6
		PM	A	8.5	B	13.0	A	9.7
	Combined	AM	A	9.4	F	254.4	A	10.0
		PM	A	8.7	F	112.3	C	15.4
2028	Background	AM	A	8.0	B	13.1	B	10.2
		PM	A	9.3	C	16.3	B	10.4
	Combined	AM	B	14.4	F	N/A	B	11.2
		PM	A	9.7	F	880.9	F	83.4

In order to bring the intersection to an acceptable LOS D or above, intersection improvements are needed to address capacity deficiencies.

By 2018, in order to maintain acceptable LOS D or above for all intersection approaches, signalization is needed at the Highway 1 and 10th Avenue Connector intersection by 2018.

With the proposed signalization and maintaining existing lane configuration, the intersection of Highway 1 and 10th Avenue connector achieved acceptable LOS D or above under 2018 and 2028 Combined Scenarios. See **Table 4-3** below:

Table 4-3 Summary of LOS and Delay with Signalization (Highway 1 /10 Ave Connector)

Highway 1 and 10 Avenue Connector				
		Peak Period	Signalized Intersection	
			LOS	Delay sec/veh
2018	Combined	AM	A	9.9
		PM	A	8.6
2028	Combined	AM	D	48.2
		PM	C	25.0

4.2.2 Highway 1 On/Off Ramps and 10 Avenue Intersection

This on/off ramp T-intersection provides access for Highway 1. The intersection is currently stop-controlled on the Highway 1 off-ramp approach with the following lane layouts:

- The northbound 10th Avenue approach consists of one through lane and one left turn lane.
- The southbound approach consists of one through lane and one right turn lane with channelization.
- The off ramp approach consists of one left turn lane and one right turn lane with channelization.

A summary of the capacity analysis is shown in **Table 4-4** for the critical movements.

Table 4-4 Summary of LOS and Delay (Highway 1 On/Off Ramps and 10 Ave)

Highway 1 On/Off Ramps and 10 Avenue								
		Peak Period	NB Left (10 Avenue)		EB Left (Highway 1 On/Off Ramps)		EB Right (Highway 1 On/Off Ramps)	
			LOS	Delay sec/veh	LOS	Delay sec/veh	LOS	Delay sec/veh
2008	Existing	AM	A	7.8	B	15.0	B	10.3
		PM	A	7.9	C	15.8	B	11.9
2018	Background	AM	A	7.9	B	12.8	A	9.6
		PM	A	8.3	C	22.1	C	15.1
	Combined	AM	A	8.1	C	19.6	F	82.7
		PM	B	13.2	F	318.7	C	21.3
2028	Background	AM	A	8.2	C	15.3	B	10.2
		PM	A	8.8	C	17.4	D	27.6
	Combined	AM	A	8.8	F	77.8	F	512.4
		PM	F	122.0	F	N/A	F	128.4

Under the 2018 Combined Scenario, the EB stop-controlled approach achieved unacceptable LOS F in operational performance with existing intersection laning. Under the 2028 Combined Scenarios, majority of the movements will operate at LOS F during both AM and PM peak periods.

By 2018, in order to maintain acceptable LOS D or above for the eastbound connector approach, signalization is needed at the Highway 1 On/Off Ramps and 10th Avenue intersection. Also dual left turn lanes on northbound 10 Avenue approach will be required by 2028. See **Table 4-5** below for a summary of level of service and delay results.

Table 4-5 Summary of LOS and Delay with Improvements (Highway 1 On/Off Ramps and 10 Ave)

Highway 1 On/Off Ramp and 10 Avenue				
		Peak Period	Signalized Intersection	
			LOS	Delay
				sec/veh
2018	Combined	AM	B	16.1
		PM	B	18.5
2028	Combined	AM	B	12.9
		PM	B	17.4

The following **Table 4-6** shows an intersection improvement summary for the 2018, and 2028 planning horizons.

Table 4-6 Summary of Intersection Improvements (Highway 1 On/Off Ramp and 10 Avenue)

Highway 1 On/Off Ramp and 10 Avenue	
Planning Horizon	Improvement Description
2018	Signalization with existing lane configuration to remain
2028	Install dual left turn lanes on northbound 10 Avenue approach Widen the loop on-ramp to two lanes and merge back to one lane before the overpass to adapt to the newly added dual northbound left turn lanes.

4.2.3 10 Avenue and 7th Street Intersection

This T-intersection provides primary access for the Kicking Horse Mountain Resort site. At present, the intersection is stop-controlled on the 7th Street approach. The lane layout is as follows:

- The northbound 10th Avenue approach consists of one through lane and one left turn lane;
- The southbound approach consists of one through lane and one shared through/right turn lane; and

- The 7th Street approach consists of one left turn lane and one right turn lane with channelization.

A summary of the intersection LOS analysis is shown in **Table 4-7**. The Synchro output sheets are included in **Appendix B**.

Table 4-7 Summary of LOS and Delay (10 Ave/ 7th St)

10 Avenue and 7 th Street								
		Peak Period	NB Left (10 Avenue)		EB Left (7 th Street)		EB Right (7 th Street)	
			LOS	Delay	LOS	Delay	LOS	Delay
				sec/veh		sec/veh		sec/veh
2008	Existing	AM	A	8.0	C	15.0	A	9.1
		PM	A	8.7	C	22.0	B	10.2
2018	Background	AM	A	8.1	B	12.2	A	9.5
		PM	A	9.5	D	32.2	B	11.1
	Combined	AM	B	11.8	C	20.4	B	13.8
		PM	A	9.8	F	726.5	B	11.6
2028	Background	AM	A	8.5	B	14.2	A	10.0
		PM	B	10.9	D	30.8	B	12.7
	Combined	AM	C	20.6	F	106.0	C	22.4
		PM	B	11.8	F	N/A	B	14.0

Under the 2018 and 2028 Combined Scenarios, the EB left turn approach operates at unacceptable LOS F with existing intersection laning.

By 2018, signalization is needed at the intersection in order to maintain acceptable LOS C or above for the eastbound approach. On the 7th Street approach, one dedicated left turn lane and one shared left/right lane are needed at the intersection by 2028. See **Table 4-8** below for a summary of level of service and delay results.

Table 4-8 Summary of LOS and Delay with Improvements (10 Ave / 7th St)

10 Avenue and 7 th Street				
		Peak Period	Signalized Intersection	
			LOS	Delay sec/veh
2018	Combined	AM	A	4.9
		PM	C	20.8
2028	Combined	AM	A	7.5
		PM	C	32.1

The following **Table 4-9** shows an intersection improvement summary for the 2018 and 2028 planning horizons.

Table 4-9 Summary of Intersection Improvements (10 Ave and 7th St)

10 Avenue and 7 th Street	
Planning Horizon	Improvement Description
2018	Signalization with existing lane configuration to remain.
2028	On the 7 th Street approach, one dedicated left turn lane and one shared left/right lane are needed at the intersection. Two receiving lanes are required for these dual left turn on 10 Ave, which then merge back to one lane after about 150 meters

4.2.4 Phase 3 and Phase 4 Analysis

As discussed in section 4.2, the projected increase in volumes after the completion of Phase 3 (2038) and Phase 4 (2048) are so significant that it is beyond the capacity of signalized intersections to operate the traffic at LOS D or above, even with significant improvements. Therefore it is decided to analyze Phase 1 and 2 separately from phase 3 and 4. This section deals with the proposed changes, required to the area road network in order to operate the traffic at an acceptable LOS.

Beyond 2028 it is anticipated that all the three intersections will fail in one or both peak periods. Following changes are recommended:

An interchange can be introduced by 2038 at Highway 1 and 10th Avenue Connector intersection to separate the heavy inbound/outbound Resort traffic from the through traffic on Highway 1 during the peak hours.

The connector may be extended to merge with the KHMR access road, bypassing the intersection at 10 Avenue and 10 Avenue/ 7th Street intersection. **Fig 4-1** illustrates these concepts.

Figure 4-1 Phase 3/ Phase 4 Road Network Concept



4.2.5 One-Lane Bridge on KHMR Access Road at Columbia River

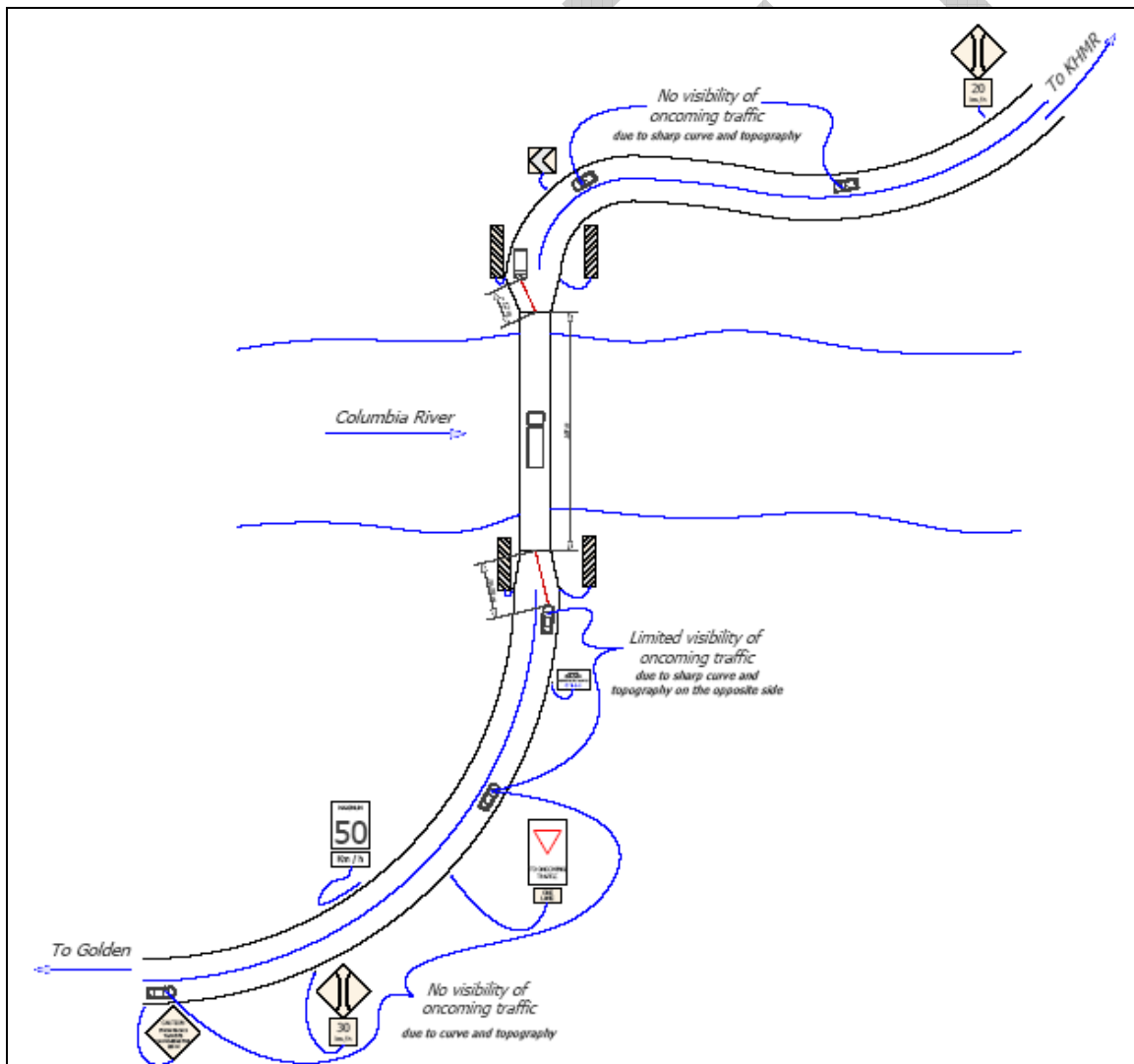
This one-lane bridge crossing the Columbia River serves as the one and only access to the KHMR site. The traffic control on the bridge uses a first-come-first-serve based

4.2.5 One-Lane Bridge on KHMR Access Road at Columbia River

This one-lane bridge crossing the Columbia River serves as the one and only access to the KHMR site. The traffic control on the bridge uses a first-come-first-serve based operation. Traffic arriving at both ends of the bridge would yield to vehicles already on the bridge deck and whichever arrived prior.

The posted speed limit in the vicinity of the bridge is 50 km/h. Visibility is limited due to the presence of sharp curves and existing steep topography on both approaches to the bridge. **Figure 4-1** illustrates the layout of the one-lane bridge.

Figure 4-2 One-Lane Bridge Layout Plan



A summary of the queuing and delay analysis is shown in **Table 4-10** for the approaches to the bridge.

Table 4-10 Summary of Queue Length and Delay

One-Lane Bridge Access to KHMR						
		Peak Period	WB (Inbound)		EB (Outbound)	
			Queue Length (m)	Delay sec/veh	Queue Length (m)	Delay sec/veh
2008	Existing	AM	29.0	4.8	6.5	6.3
		PM	6.6	8.5	46.7	4.5
2018	Combined	AM	276.3	28.5	46.8	40.4
		PM	22.3	26.3	193.2	17.2
2028	Combined	AM	282.6	29.4	193.2	335.6
		PM	156.2	146.4	197.2	20.5
2038	Combined	AM	280.5	112.8	193.1	458.8
		PM	263.1	195.9	193.4	27.5
2048	Combined	AM	276.5	91.8	193.2	969
		PM	276.3	121.5	193.2	29.9

Under the 2018 Combined Scenarios, both approaches on the one-lane bridge operate at acceptable LOS D based on the 35-second delay unsignalized control threshold. However, in 2018 and beyond, the approach delays will exceed 35 seconds and the queue lengths will approach 300 metres (approximately 40 vehicles).

Two alternatives are recommended to alleviate the excessive delays and queuing at the bridge approaches before 2018:

1. Widen the existing bridge deck to accommodate two lanes for two-way traffic operations.
2. Install traffic signals with a two-phase operation at both ends of the one-lane bridge to assign right-of-way to either approach alternatively based on current traffic demand detected by loop detectors.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 GENERAL

1. This Study evaluates the combined traffic impacts of the proposed Kicking Horse Mountain Resort expansion, which includes additional condominiums, townhouses, and single-family housing units on the west side of the Town of Golden, BC.
2. The proposed resort expansion will be phased from 2008 to 2048 based on an annual absorption rate. By 2048, the resort will generate in the order of 3248 trips and 2903 trips during the AM and PM weekend peak periods, respectively.

5.2 Highway 1 and 10 Avenue Connector Intersection

1. Under the 2008 Existing, 2018 and 2028 Background scenarios, all intersection approaches achieve acceptable LOS B or above. However, under the 2018 and 2028 Combined Scenarios, the left turn movement on the Connector approach will operate at LOS F with existing lane conditions during both peak periods. Eastbound right approach also fails on 10 Avenue Connector approach during 2028 combined scenario.
2. In order to bring the intersection to an acceptable LOS D or above, for 2018 and 2028 combined scenarios intersection signalization is needed by 2018.

5.3 Highway 1 On/Off Ramps and 10 Avenue Intersection

1. Under the 2018 Combined Scenario, the EB stop-controlled approach achieved unacceptable LOS F in operational performance with existing intersection laning. Under the 2028 Combined Scenarios, the almost all movements will operate at LOS F during both AM and PM peak periods.

2. In order to maintain acceptable LOS D or above for the eastbound connector approach, intersection improvements, as described in the following table, are needed to address capacity deficiencies.

Highway 1 On/Off Ramp and 10 Avenue	
Planning Horizon	Improvement Description
2018	Signalization with existing lane configuration to remain
2028	Install dual left turn lanes on northbound 10 Avenue approach Widen the loop on-ramp to two lanes and merge back to one lane before the overpass to adapt to the newly added dual northbound left turn lanes.

5.4 10 Avenue and 7th Street Intersection

1. Under the 2018 and 2028 Combined Scenarios, the EB left turn approach operates at unacceptable LOS F with existing intersection laning.
2. By 2018, signalization is needed at the intersection in order to maintain acceptable LOS D or above for the eastbound approach. The following intersection improvements are needed to mitigate the traffic impacts at the intersection.

10 Avenue and 7 th Street	
Planning Horizon	Improvement Description
2018	Signalization with existing lane configuration to remain.
2028	On the 7 th Street approach, one dedicated left turn lane and one shared left/right lane are needed at the intersection. Two receiving lanes are required for these dual left turn on 10 Ave, which then merge back to one lane after about 150 meters

5.5 Phase 3 and Phase 4 Analysis

The projected increase in volumes after the completion of Phase 3 (2038) and Phase 4 (2048) are so significant that it is beyond the capacity of signalised intersections to operate the traffic at LOS D or above, even with significant improvements.

Beyond 2028 it is anticipated that all the three intersections will fail in one or both peak periods. Following changes are recommended:

1. An interchange can be introduced by 2038 at Highway 1 and 10th Avenue Connector intersection to separate the heavy inbound/outbound Resort traffic from the through traffic on Highway 1 during the peak hours.
2. The connector may be extended to merge with the KHMR access road, bypassing the intersection at 10 Avenue and 10 Avenue/ 7th Street intersection

5.6 One-Lane Bridge On Khmr Access Road

3. Under the 2018 Combined Scenarios, both approaches on the one-lane bridge operate at acceptable LOS D based on the 35-second delay unsignalized control threshold. However, in 2018 and beyond, the approach delays will exceed 35 seconds and the queue lengths will approach 300 metres (approximately 40 vehicles).
4. Two alternatives are recommended to alleviate the excessive delays and queuing at the bridge approaches:
 - Widen the existing bridge deck to accommodate two lanes for two-way traffic operations; and
 - Install traffic signals with a two-phase operation at both ends of the one-lane bridge to assign right-of-way to either approach alternatively based on real-time traffic demand detected by loop detectors.

DRAFT

APPENDIX A

Traffic Count Sheets

TRAFFIC COUNT SHEET				Location:			Job # 2111-02500-0							Bikes per hour:				
McElhanney Consulting Services Ltd. Tel 596-0391, Fax 596-8853				Highway 1 Connector Golden, BC			Date: Saturday 2008-March-01							Weather: Wet			AM PM	
ALL VEHICLES -Including all trucks & buses																	N leg	
																	S leg	
												W leg						
														E leg				
														PEDESTRIANS Across approach S N E W				
Time	Northbound			Southbound			Westbound			Eastbound			15min Totals	1 hour Totals				
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right						
AM																		
8:30 - 8:45	34		28				64					42	168					
- 9:00													0					
- 9:15	33		27				44					58	162					
- 9:30													0	330				
9:30 - 9:45	60		38				63					53	214					
- 10:00													0					
- 10:15	49		31				46					48	174	388				
- 10:30													0	388				
Mid-day																		
													0					
													0					
11:30 - 11:45	37		32				37					28	134					
- 12:00													0	134				
12:00 - 12:15	55		72				78					69	274					
- 12:30													0					
- 12:45													0	274				
- 1:00													0	274				
PM																		
													0					
3:15 - 3:30	54		65				54					67	240					
- 3:45													0					
- 4:00													0	240				
4:00 - 4:15	98		154				84					66	402					
- 4:30													0	402				
- 4:45													0	402				
- 5:00													0	402				
5:00 - 5:15	24		39				21					17	101	101				
													0	101				
													0	101				
													0	101				
PEAK HOUR SUMMARY																		
													Hourly Traffic	Hourly Ped Volumes				
AM peak hour	109	0	69	0	0	0	109	10	0	0	82	101	480					
Mid-day peak hour	55	0	72	0	0	0	78	50	0	0	108	69	432					
PM peak hour	98	0	154	0	0	0	84	75	0	0	134	66	611					

TRAFFIC COUNT SHEET				Location:			Job #						Bikes per hour:					
TRUCK VOLUMES ONLY - Single unit trucks (3+ axles) - Semi-trailer vehicles				Highway 1 Connector Golden, BC			Date: Saturday 2008-March-01 Weather: Wet						AM PM					
													N leg S leg W leg E leg					
													PEDESTRIANS					
Time	Northbound			Southbound			Westbound			Eastbound			15min	1 hour	Across approach			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Totals	Totals	S	N	E	W
AM																		
8:30 - 8:45													0					
- 9:00													0					
- 9:15													0					
- 9:30													0	0				
9:30 - 9:45													0	0				
- 10:00													0	0				
- 10:15													0	0				
- 10:30													0	0				
Mid-day																		
													0					
													0					
11:30 - 11:45													0					
- 12:00													0	0				
12:00 - 12:15													0	0				
- 12:30													0	0				
- 12:45													0	0				
- 1:00													0	0				
PM																		
													0					
3:15 - 3:30													0					
- 3:45													0					
- 4:00													0	0				
4:00 - 4:15							2					1	3	3				
- 4:30													0	3				
- 4:45													0	3				
- 5:00													0	3				
5:00 - 5:15													0	0				
													0	0				
													0	0				
													0	0				
PEAK HOUR SUMMARY																		
													Hourly Traffic		Hourly Ped Volumes			
AM peak hour	0	0	0	0	0	0	0	0	0	0	0	0	0					
Mid-day Peak hour	0	0	0	0	0	0	0	0	0	0	0	0	0					
PM peak hour	0	0	0	0	0	0	2	0	0	0	0	1	3					

TRAFFIC COUNT SHEET				Location:			Job # 2111-02500-0								Bikes per hour:					
TRUCK PERCENTAGES - Single unit trucks (3+ axles) - Semi-trailer vehicles				Highway 1 Connector Golden, BC			Date: Saturday 2008-March-01			Weather: Wet					AM: PHF = MID: PHF = PM: PHF =					
															PEDESTRIANS Across approach S N E W					
Time	Northbound			Southbound			Westbound			Eastbound			15min Totals	1 hour Totals						
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right								
AM																				
8:30 - 8:45	0%	-	0%	-	-	-	0%	-	-	-	-	0%	0%	-						
- 9:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
- 9:15	0%	-	0%	-	-	-	0%	-	-	-	-	0%	0%	-						
- 9:30	-	-	-	-	-	-	-	-	-	-	-	-	-	0%						
9:30 - 9:45	0%	-	0%	-	-	-	0%	-	-	-	-	0%	0%	-						
- 10:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
- 10:15	0%	-	0%	-	-	-	0%	-	-	-	-	0%	0%	0%						
- 10:30	-	-	-	-	-	-	-	-	-	-	-	-	-	0%						
Mid-day																				
	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
11:30 - 11:45	0%	-	0%	-	-	-	0%	-	-	-	-	0%	0%	-						
- 12:00	-	-	-	-	-	-	-	-	-	-	-	-	-	0%						
12:00 - 12:15	0%	-	0%	-	-	-	0%	-	-	-	-	0%	0%	-						
- 12:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
- 12:45	-	-	-	-	-	-	-	-	-	-	-	-	-	0%						
- 1:00	-	-	-	-	-	-	-	-	-	-	-	-	-	0%						
PM																				
	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
3:15 - 3:30	0%	-	0%	-	-	-	0%	-	-	-	-	0%	0%	-						
- 3:45	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
- 4:00	-	-	-	-	-	-	-	-	-	-	-	-	-	0%						
4:00 - 4:15	0%	-	0%	-	-	-	2%	-	-	-	-	2%	1%	-						
- 4:30	-	-	-	-	-	-	-	-	-	-	-	-	-	1%						
- 4:45	-	-	-	-	-	-	-	-	-	-	-	-	-	1%						
- 5:00	-	-	-	-	-	-	-	-	-	-	-	-	-	1%						
5:00 - 5:15	0%	-	0%	-	-	-	0%	-	-	-	-	0%	0%	0%						
	-	-	-	-	-	-	-	-	-	-	-	-	-	0%						
	-	-	-	-	-	-	-	-	-	-	-	-	-	0%						
	-	-	-	-	-	-	-	-	-	-	-	-	-	0%						
PEAK HOUR SUMMARY													Hourly Traffic		Hourly Ped Volumes					
AM peak hour	0%	-	0%	-	-	-	0%	0%	-	-	0%	0%	0%							
Mid-day peak hour	0%	-	0%	-	-	-	0%	0%	-	-	0%	0%	0%							
PM peak hour	0%	-	0%	-	-	-	2%	0%	-	-	0%	2%	0%							

TRAFFIC COUNT SHEET				Location:			Job #			Date:			Weather:		North		Bikes per hour:	
McElhanney Consulting Services Ltd. Tel 596-0391, Fax 596-8853				10 Ave and Hwy 1 On/Off Ramps			2111-02500-0			Saturday 2008-March-01			Wet				AM PM N leg S leg W leg E leg	
ALL VEHICLES -Including all trucks & buses				Golden, BC														
Time	Northbound			Southbound			Westbound			Eastbound			15min Totals	1 hour Totals	PEDESTRIANS Across approach			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right			S	N	E	W
AM																		
8:30 - 8:45													0					
- 9:00													0					
- 9:15	14		48				20	54			39	18	193					
- 9:30													0	193				
9:30 - 9:45	19		55				37	55			53	7	226	419				
- 10:00	8		45				12	34			24	3	126	545				
- 10:15	15		46				35	70			34	12	212	564				
- 10:30													0	564				
Mid-day																		
11:00 - 11:15													0					
11:30													0					
11:45	9		34				40	47			37	4	171					
- 12:00	7		29				24	53			57	1	171	342				
12:00 - 12:15	9		46				44	67			49	7	222	564				
- 12:30	10		39				24	56			51	5	185	749				
- 12:45	13		24				23	54			65	3	182	760				
- 1:00													0	589				
PM																		
3:00 - 3:15	5		17				20	38			20	7	107					
- 3:30	3		8				12	25			35	6	89					
- 3:45	3		23				42	47			54	14	183					
- 4:00	6		52				52	60			61	10	241	620				
4:00 - 4:15	3		39				58	64			37	23	224	737				
- 4:30	4		54				65	53			64	17	257	905				
- 4:45	9		31				66	79			61	15	261	983				
- 5:00													0	742				
5:00 - 5:15													0	518				
													0	261				
													0	0				
													0	0				
PEAK HOUR SUMMARY																		
													Hourly Traffic		Hourly Ped Volumes			
AM peak hour	42	0	146	0	0	0	84	159	0	0	111	22	564					
Mid-day peak hour	39	0	138	0	0	0	115	230	0	0	222	16	760					
PM peak hour	22	0	176	0	0	0	241	256	0	0	223	65	983					

TRAFFIC COUNT SHEET				Location:			Job #						Bikes per hour:																							
TRUCK VOLUMES ONLY - Single unit trucks (3+ axles) - Semi-trailer vehicles				10 Ave and Hwy 1 On/Off Ramps Golden, BC			Date: Saturday 2008-March-01						AM PM																							
													N leg S leg W leg E leg																							
Weather:													PEDESTRIANS																							
													15min		1 hour		Across approach																			
													Totals		Totals		S N E W																			
AM																																				
8:30 - 8:45													0																							
- 9:00													0																							
- 9:15				1			3			1			4			2		2		13																
- 9:30																0		13																		
9:30 - 9:45													2			3		16																		
- 10:00																0		16																		
- 10:15				1									2			4		7																		
- 10:30																0		7																		
Mid-day																																				
11:00 - 11:15													0																							
11:30													0																							
11:45							1						2		1		4																			
- 12:00							3						1				4		8																	
12:00 - 12:15										1			1			2		10																		
- 12:30													1			1		11																		
- 12:45													5			5		12																		
- 1:00																0		8																		
PM																																				
3:00 - 3:15													0																							
- 3:30													0																							
- 3:45							2										2																			
- 4:00							1			1			1			3		5																		
4:00 - 4:15							1									1		6																		
- 4:30										1						1		7																		
- 4:45				1			1						2			1			5		10															
- 5:00																0		7																		
5:00 - 5:15																0		6																		
																	0		5																	
																	0		0																	
																	0		0																	
PEAK HOUR SUMMARY																																				
AM peak hour				1			0			0			0			1			1			0			0		4		0		7		Hourly Traffic		Hourly Ped Volumes	
Mid-day Peak hour				0			0			0			0			1			1			0			0		6		0		8					
PM peak hour				1			0			2			0			1			2			0			0		1		0		7					

TRAFFIC COUNT SHEET				Location:			Job # 2111-02500-0						Bikes per hour:						
TRUCK PERCENTAGES - Single unit trucks (3+ axles) - Semi-trailer vehicles				10 Ave and Hwy 1 On/Off Ramps Golden, BC			Date: Saturday 2008-March-01						Weather: Wet			AM PM			
																N leg			
																S leg			
													W leg E leg						
																PEDESTRIANS Across approach S N E W			
Time	Northbound			Southbound			Westbound			Eastbound			15min Totals	1 hour Totals					
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right							
AM																			
8:30 - 8:45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
- 9:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
- 9:15	7%	-	6%	-	-	-	5%	7%	-	-	5%	11%	7%	-	-				
- 9:30	-	-	-	-	-	-	-	-	-	-	-	-	-	7%	-				
9:30 - 9:45	0%	-	0%	-	-	-	3%	0%	-	-	4%	0%	1%	4%	-				
- 10:00	0%	-	0%	-	-	-	0%	0%	-	-	0%	0%	0%	3%	-				
- 10:15	7%	-	0%	-	-	-	0%	1%	-	-	6%	0%	2%	1%	-				
- 10:30	-	-	-	-	-	-	-	-	-	-	-	-	-	1%	-				
Mid-day																			
11:00 - 11:15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
11:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
11:45	0%	-	3%	-	-	-	0%	0%	-	-	5%	25%	2%	-	-				
- 12:00	0%	-	10%	-	-	-	0%	0%	-	-	2%	0%	2%	2%	-				
12:00 - 12:15	0%	-	0%	-	-	-	2%	1%	-	-	0%	0%	1%	2%	-				
- 12:30	0%	-	0%	-	-	-	0%	0%	-	-	2%	0%	1%	1%	-				
- 12:45	0%	-	0%	-	-	-	0%	0%	-	-	8%	0%	3%	2%	-				
- 1:00	-	-	-	-	-	-	-	-	-	-	-	-	-	1%	-				
PM																			
3:00 - 3:15	0%	-	0%	-	-	-	0%	0%	-	-	0%	0%	0%	-	-				
- 3:30	0%	-	0%	-	-	-	0%	0%	-	-	0%	0%	0%	-	-				
- 3:45	0%	-	9%	-	-	-	0%	0%	-	-	0%	0%	1%	-	-				
- 4:00	0%	-	2%	-	-	-	2%	0%	-	-	0%	10%	1%	1%	-				
4:00 - 4:15	0%	-	3%	-	-	-	0%	0%	-	-	0%	0%	0%	1%	-				
- 4:30	0%	-	0%	-	-	-	2%	0%	-	-	0%	0%	0%	1%	-				
- 4:45	11%	-	3%	-	-	-	0%	3%	-	-	2%	0%	2%	1%	-				
- 5:00	-	-	-	-	-	-	-	-	-	-	-	-	-	1%	-				
5:00 - 5:15	-	-	-	-	-	-	-	-	-	-	-	-	-	1%	-				
	-	-	-	-	-	-	-	-	-	-	-	-	-	2%	-				
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
PEAK HOUR SUMMARY													Hourly Traffic		Hourly Ped Volumes				
AM peak hour	2%	-	0%	-	-	-	1%	1%	-	-	4%	0%	1%						
Mid-day peak hour	0%	-	0%	-	-	-	1%	0%	-	-	3%	0%	1%						
PM peak hour	5%	-	1%	-	-	-	0%	1%	-	-	0%	0%	1%						

TRAFFIC COUNT SHEET				Location:			Job # 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TRAFFIC COUNT SHEET				Location:			Job # 2111-02500-0							Bikes per hour:				
McElhanney Consulting Services Ltd. Tel 596-0391, Fax 596-8853				10 Ave and 7th Street Golden, BC			Date:							AM PM				
TRUCK VOLUMES ONLY - Single unit trucks (3+ axles) - Semi-trailer vehicles							Saturday 2008-March-01							N leg S leg W leg E leg				
							Weather:											
				Wet									PEDESTRIANS					
Time	Northbound			Southbound			Westbound			Eastbound			15min	1 hour	Across approach			
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Totals	Totals	S	N	E	W
AM																		
8:30 - 8:45												1	1					
- 9:00											1		1					
- 9:15							1				2		3					
- 9:30											1		1	6				
9:30 - 9:45													0	5				
- 10:00											1		1	5				
- 10:15													0	2				
- 10:30													0	1				
Mid-day																		
12:00 - 12:15													0					
12:30											1		1					
12:45													0					
- 1:00											1		1	2				
1:00 - 1:15													0	2				
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PM																		
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- 4:45													0	3				
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5:00 - 5:15													0	1				
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													0	0				
													0	0				
PEAK HOUR SUMMARY																		
													Hourly Traffic		Hourly Ped Volumes			
AM peak hour	0	0	0	0	0	0	0	0	0	0	1	0	1					
Mid-day Peak hour	0	0	0	0	0	0	0	0	0	0	2	0	2					
PM peak hour	0	0	0	0	0	0	1	0	0	0	2	0	3					

TRAFFIC COUNT SHEET				Location: 10 Ave and 7th Street Golden, BC			Job # 2111-02500-0 Date: Saturday 2008-March-01 Weather: Wet			<div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div><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TRAFFIC COUNT SHEET				Location:			Job #			Date:			Weather:			Bikes per hour:						
ALL VEHICLES -Including all trucks & buses				One Lane Bridge Golden, BC			2111-02500-0			Saturday 2008-March-01			Wet			North Bridge Columbia River AM: PHF = 0.94 MID: PHF = 0.82 PM: PHF = 0.75			AM PM N leg S leg W leg E leg			
Time	Northbound			Southbound			Westbound			Eastbound			15min	1 hour	PEDESTRIANS							
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Totals	Totals	Across approach							
																S	N	E	W			
AM																						
8:30 - 8:45								57			2		59									
- 9:00								61			5		66									
- 9:15								68			9		77									
- 9:30								63			9		72		274							
9:30 - 9:45								62			12		74		289							
- 10:00								41			12		53		276							
- 10:15								47			11		58		257							
- 10:30								18			5		23		208							
Mid-day																						
12:00 - 12:15								16			14		30									
12:30								15			5		20									
12:45								15			13		28									
- 1:00								9			4		13		91							
1:00 - 1:15								17			9		26		87							
- 1:30								10			21		31		98							
- 1:45								6			17		23		93							
- 2:00								12			10		22		102							
PM																						
3:00 - 3:15													0									
- 3:30													0									
- 3:45								7			48		55									
- 4:00								7			36		43		98							
4:00 - 4:15								2			59		61		159							
- 4:30								5			38		43		202							
- 4:45								9			74		83		230							
- 5:00								6			56		62		249							
5:00 - 5:15													0		188							
													0		145							
													0		62							
													0		0							
PEAK HOUR SUMMARY																						
													Hourly Traffic		Hourly Ped Volumes							
AM peak hour	0	0	0	0	0	0	0	254	0	0	35	0	289									
Mid-day peak hour	0	0	0	0	0	0	0	45	0	0	57	0	102									
PM peak hour	0	0	0	0	0	0	0	22	0	0	227	0	249									

TRAFFIC COUNT SHEET				Location:			Job #						Bikes per hour:								
TRUCK VOLUMES ONLY - Single unit trucks (3+ axles) - Semi-trailer vehicles				One Lane Bridge Golden, BC			Date: Saturday 2008-March-01						AM PM								
													N leg								
													S leg								
										W leg											
										E leg											
													PEDESTRIANS								
													Across approach								
															S N E W						
AM																					
8:30 - 8:45														2		2					
- 9:00																0					
- 9:15																0					
- 9:30																0	2				
9:30 - 9:45																0	0				
- 10:00																0	0				
- 10:15																0	0				
- 10:30																0	0				
Mid-day																					
12:00 - 12:15																0					
12:30																0					
12:45									1							1					
- 1:00																0	1				
1:00 - 1:15																0	1				
- 1:30																0	1				
- 1:45									1			1				2	2				
- 2:00																0	2				
PM																					
3:00 - 3:15																0					
- 3:30																0					
- 3:45																0					
- 4:00																0	0				
4:00 - 4:15																0	0				
- 4:30																0	0				
- 4:45																0	0				
- 5:00																0	0				
5:00 - 5:15																0	0				
																0	0				
																0	0				
																0	0				
PEAK HOUR SUMMARY																					
													Hourly Traffic		Hourly Ped Volumes						
AM peak hour				0	0	0	0	0	0	0	0	0	0	0	0	0					
Mid-day Peak hour				0	0	0	0	0	0	0	1	0	0	1	0	2					
PM peak hour				0	0	0	0	0	0	0	0	0	0	0	0	0					

TRAFFIC COUNT SHEET				Location:			Job # 2111-02500-0								Bikes per hour:							
TRUCK PERCENTAGES - Single unit trucks (3+ axles) - Semi-trailer vehicles				One Lane Bridge Golden, BC			Date: Saturday 2008-March-01								AM PM							
															N leg S leg W leg E leg							
Time				Northbound			Southbound			Westbound			Eastbound			15min	1 hour	PEDESTRIANS				
				Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right	Totals	Totals	Across approach				
																		S	N	E	W	
AM																						
8:30 - 8:45				-	-	-	-	-	-	-	0%	-	-	100%	-	-	3%	-				
- 9:00				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%	-				
- 9:15				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%	-				
- 9:30				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%	1%				
9:30 - 9:45				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%	0%				
- 10:00				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%	0%				
- 10:15				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%	0%				
- 10:30				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%	0%				
Mid-day																						
12:00 - 12:15				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%	-				
12:30				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%	-				
12:45				-	-	-	-	-	-	-	7%	-	-	0%	-	-	4%	-				
- 1:00				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%	1%				
1:00 - 1:15				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%	1%				
- 1:30				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%	1%				
- 1:45				-	-	-	-	-	-	-	17%	-	-	6%	-	-	9%	2%				
- 2:00				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%	2%				
PM																						
3:00 - 3:15				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
- 3:30				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
- 3:45				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%	-				
- 4:00				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%	0%				
4:00 - 4:15				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%	0%				
- 4:30				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%	0%				
- 4:45				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%	0%				
- 5:00				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%	0%				
5:00 - 5:15				-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%				
				-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%				
				-	-	-	-	-	-	-	-	-	-	-	-	-	-	0%				
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				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
PEAK HOUR SUMMARY																						
																	Hourly Traffic		Hourly Ped Volumes			
AM peak hour				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%					
Mid-day peak hour				-	-	-	-	-	-	-	2%	-	-	2%	-	-	2%					
PM peak hour				-	-	-	-	-	-	-	0%	-	-	0%	-	-	0%					

APPENDIX B

Synchro Output Calculation Sheets

HCM Unsignalized Intersection Capacity Analysis

1: Highway 1 & Hwy 1 Connector

2008 Background SAT AM
8/21/2008

							
Movement	NBL	NBT	SBT	SBR	NEL	NER	
Lane Configurations							
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Volume (veh/h)	109	10	82	101	109	69	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	118	11	89	110	118	75	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type					TWLT		
Median storage (veh)					5		
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	89				337	45	
vC1, stage 1 conf vol					89		
vC2, stage 2 conf vol					248		
vCu, unblocked vol	89				337	45	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)					5.8		
tF (s)	2.2				3.5	3.3	
p0 queue free %	92				83	93	
cM capacity (veh/h)	1504				709	1016	
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NE 1	NE 2
Volume Total	118	11	45	45	110	118	75
Volume Left	118	0	0	0	0	118	0
Volume Right	0	0	0	0	110	0	75
cSH	1504	1700	1700	1700	1700	709	1016
Volume to Capacity	0.08	0.01	0.03	0.03	0.06	0.17	0.07
Queue Length 95th (m)	1.9	0.0	0.0	0.0	0.0	4.5	1.8
Control Delay (s)	7.6	0.0	0.0	0.0	0.0	11.1	8.8
Lane LOS	A					B	A
Approach Delay (s)	7.0		0.0			10.2	
Approach LOS						B	
Intersection Summary							
Average Delay			5.5				
Intersection Capacity Utilization		25.4%			ICU Level of Service		A
Analysis Period (min)		15					



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	42	146	111	22	84	159
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73
Hourly flow rate (vph)	58	200	152	30	115	218
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage (veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	615	167			152	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	615	167			152	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	86	77			92	
cM capacity (veh/h)	418	882			1417	
Direction, Lane #	EB 1	EB 2	SE 1	NW 1	NW 2	
Volume Total	58	200	182	115	218	
Volume Left	58	0	0	115	0	
Volume Right	0	200	30	0	0	
cSH	418	882	1700	1417	1700	
Volume to Capacity	0.14	0.23	0.11	0.08	0.13	
Queue Length 95th (m)	3.6	6.6	0.0	2.0	0.0	
Control Delay (s)	15.0	10.3	0.0	7.8	0.0	
Lane LOS	B	B		A		
Approach Delay (s)	11.3		0.0	2.7		
Approach LOS	B					
Intersection Summary						
Average Delay			4.9			
Intersection Capacity Utilization			25.2%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
7: 10th Avenue N & 7th Street N

2008 Background SAT AM
8/21/2008

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		↵	↑	↵	↵
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	191	66	77	237	6	14
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	208	72	84	258	7	15
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			279		668	140
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			279		668	140
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		98	98
cM capacity (veh/h)			1280		366	883
Direction, Lane #	SE 1	SE 2	NW 1	NW 2	NE 1	NE 2
Volume Total	138	141	84	258	7	15
Volume Left	0	0	84	0	7	0
Volume Right	0	72	0	0	0	15
cSH	1700	1700	1280	1700	366	883
Volume to Capacity	0.08	0.08	0.07	0.15	0.02	0.02
Queue Length 95th (m)	0.0	0.0	1.6	0.0	0.4	0.4
Control Delay (s)	0.0	0.0	8.0	0.0	15.0	9.1
Lane LOS			A		C	A
Approach Delay (s)	0.0		2.0		10.9	
Approach LOS					B	
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization			25.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Highway 1 & Hwy 1 Connector

2008 Background SAT PM
8/21/2008

							
Movement	NBL	NBT	SBT	SBR	NEL	NER	
Lane Configurations							
Sign Control	Free		Free		Stop		
Grade	0%		0%		0%		
Volume (veh/h)	84	75	134	66	98	154	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	91	82	146	72	107	167	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	TWLTL						
Median storage veh)	5						
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	146				410	73	
vC1, stage 1 conf vol					146		
vC2, stage 2 conf vol					264		
vCu, unblocked vol	146				410	73	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)					5.8		
tF (s)	2.2				3.5	3.3	
p0 queue free %	94				85	83	
cM capacity (veh/h)	1434				704	974	
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NE 1	NE 2
Volume Total	91	82	73	73	72	107	167
Volume Left	91	0	0	0	0	107	0
Volume Right	0	0	0	0	72	0	167
cSH	1434	1700	1700	1700	1700	704	974
Volume to Capacity	0.06	0.05	0.04	0.04	0.04	0.15	0.17
Queue Length 95th (m)	1.5	0.0	0.0	0.0	0.0	4.0	4.7
Control Delay (s)	7.7	0.0	0.0	0.0	0.0	11.0	9.5
Lane LOS	A					B	A
Approach Delay (s)	4.1	0.0				10.1	
Approach LOS					B		
Intersection Summary							
Average Delay			5.2				
Intersection Capacity Utilization	23.8%				ICU Level of Service		A
Analysis Period (min)			15				



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Volume (veh/h)	26	211	268	16	58	307
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	28	224	285	17	62	327
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	744	294			285	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	744	294			285	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	92	70			95	
cM capacity (veh/h)	360	748			1289	
Direction, Lane #	EB 1	EB 2	SE 1	NW 1	NW 2	
Volume Total	28	224	302	62	327	
Volume Left	28	0	0	62	0	
Volume Right	0	224	17	0	0	
cSH	360	748	1700	1289	1700	
Volume to Capacity	0.08	0.30	0.18	0.05	0.19	
Queue Length 95th (m)	1.9	9.6	0.0	1.1	0.0	
Control Delay (s)	15.8	11.9	0.0	7.9	0.0	
Lane LOS	C	B		A		
Approach Delay (s)	12.3		0.0	1.3		
Approach LOS	B					
Intersection Summary						
Average Delay			3.8			
Intersection Capacity Utilization			34.8%		ICU Level of Service	A
Analysis Period (min)			15			

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		↑	↑	↑	↑
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	401	78	58	446	30	38
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	436	85	63	485	33	41
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh					0	
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			521		1089	260
vC1, stage 1 conf vol					478	
vC2, stage 2 conf vol					611	
vCu, unblocked vol			521		1089	260
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			94		87	94
cM capacity (veh/h)			1042		244	738
Direction, Lane #	SE 1	SE 2	NW 1	NW 2	NE 1	NE 2
Volume Total	291	230	63	485	33	41
Volume Left	0	0	63	0	33	0
Volume Right	0	85	0	0	0	41
cSH	1700	1700	1042	1700	244	738
Volume to Capacity	0.17	0.14	0.06	0.29	0.13	0.06
Queue Length 95th (m)	0.0	0.0	1.5	0.0	3.5	1.3
Control Delay (s)	0.0	0.0	8.7	0.0	22.0	10.2
Lane LOS			A		C	B
Approach Delay (s)	0.0		1.0		15.4	
Approach LOS					C	
Intersection Summary						
Average Delay			1.5			
Intersection Capacity Utilization			33.5%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Highway 1 & Hwy 1 Connector

2018 Background SAT AM
8/21/2008

							
Movement	NBL	NBT	SBT	SBR	NEL	NER	
Lane Configurations							
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Volume (veh/h)	35	27	220	32	176	112	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	38	29	239	35	191	122	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type					TWLT		
Median storage (veh)					5		
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	239				345	120	
vC1, stage 1 conf vol					239		
vC2, stage 2 conf vol					105		
vCu, unblocked vol	239				345	120	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)					5.8		
tF (s)	2.2				3.5	3.3	
p0 queue free %	97				75	87	
cM capacity (veh/h)	1325				771	909	
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NE 1	NE 2
Volume Total	38	29	120	120	35	191	122
Volume Left	38	0	0	0	0	191	0
Volume Right	0	0	0	0	35	0	122
cSH	1325	1700	1700	1700	1700	771	909
Volume to Capacity	0.03	0.02	0.07	0.07	0.02	0.25	0.13
Queue Length 95th (m)	0.7	0.0	0.0	0.0	0.0	7.4	3.5
Control Delay (s)	7.8	0.0	0.0	0.0	0.0	11.2	9.6
Lane LOS	A					B	A
Approach Delay (s)	4.4		0.0			10.6	
Approach LOS						B	
Intersection Summary							
Average Delay			5.5				
Intersection Capacity Utilization			29.2%		ICU Level of Service		A
Analysis Period (min)			15				



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	13	47	179	35	136	257
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	14	50	190	37	145	273
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh	2					
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	772	209			190	
vC1, stage 1 conf vol	209					
vC2, stage 2 conf vol	563					
vCu, unblocked vol	772	209			190	
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 %	97	94			90	
cM capacity (veh/h)	478	834			1395	
Direction, Lane #	EB 1	EB 2	SE 1	NW 1	NW 2	
Volume Total	14	50	228	145	273	
Volume Left	14	0	0	145	0	
Volume Right	0	50	37	0	0	
cSH	478	834	1700	1395	1700	
Volume to Capacity	0.03	0.06	0.13	0.10	0.16	
Queue Length 95th (m)	0.7	1.5	0.0	2.6	0.0	
Control Delay (s)	12.8	9.6	0.0	7.9	0.0	
Lane LOS	B	A		A		
Approach Delay (s)	10.3		0.0	2.7		
Approach LOS	B					
Intersection Summary						
Average Delay			2.5			
Intersection Capacity Utilization			32.4%		ICU Level of Service	A
Analysis Period (min)			15			

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		↑	↑	↑	↑
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	308	22	24	382	9	23
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	335	24	26	415	10	25
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh					2	
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			359		814	179
vC1, stage 1 conf vol					347	
vC2, stage 2 conf vol					467	
vCu, unblocked vol			359		814	179
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			98		98	97
cM capacity (veh/h)			1197		507	833
Direction, Lane #	SE 1	SE 2	NW 1	NW 2	NE 1	NE 2
Volume Total	223	136	26	415	10	25
Volume Left	0	0	26	0	10	0
Volume Right	0	24	0	0	0	25
cSH	1700	1700	1197	1700	507	833
Volume to Capacity	0.13	0.08	0.02	0.24	0.02	0.03
Queue Length 95th (m)	0.0	0.0	0.5	0.0	0.4	0.7
Control Delay (s)	0.0	0.0	8.1	0.0	12.2	9.5
Lane LOS			A		B	A
Approach Delay (s)	0.0		0.5		10.2	
Approach LOS					B	
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			30.1%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Highway 1 & Hwy 1 Connector

2018 Background SAT PM
8/21/2008

							
Movement	NBL	NBT	SBT	SBR	NEL	NER	
Lane Configurations							
Sign Control	Free		Free		Stop		
Grade	0%		0%		0%		
Volume (veh/h)	136	202	360	106	32	50	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	148	220	391	115	35	54	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	TWLTL						
Median storage veh	5						
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	391					907	196
vC1, stage 1 conf vol						391	
vC2, stage 2 conf vol						515	
vCu, unblocked vol	391					907	196
tC, single (s)	4.1					6.8	6.9
tC, 2 stage (s)						5.8	
tF (s)	2.2					3.5	3.3
p0 queue free %	87					93	93
cM capacity (veh/h)	1164					484	813
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NE 1	NE 2
Volume Total	148	220	196	196	115	35	54
Volume Left	148	0	0	0	0	35	0
Volume Right	0	0	0	0	115	0	54
cSH	1164	1700	1700	1700	1700	484	813
Volume to Capacity	0.13	0.13	0.12	0.12	0.07	0.07	0.07
Queue Length 95th (m)	3.3	0.0	0.0	0.0	0.0	1.8	1.6
Control Delay (s)	8.5	0.0	0.0	0.0	0.0	13.0	9.7
Lane LOS	A					B	A
Approach Delay (s)	3.4	0.0		11.0			
Approach LOS							B
Intersection Summary							
Average Delay			2.3				
Intersection Capacity Utilization	30.8%		ICU Level of Service			A	
Analysis Period (min)			15				



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	35	284	360	22	78	413
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	37	302	383	23	83	439
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1000	395			383	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1000	395			383	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	85	54			93	
cM capacity (veh/h)	247	657			1187	
Direction, Lane #	EB 1	EB 2	SE 1	NW 1	NW 2	
Volume Total	37	302	406	83	439	
Volume Left	37	0	0	83	0	
Volume Right	0	302	23	0	0	
cSH	247	657	1700	1187	1700	
Volume to Capacity	0.15	0.46	0.24	0.07	0.26	
Queue Length 95th (m)	4.0	18.4	0.0	1.7	0.0	
Control Delay (s)	22.1	15.1	0.0	8.3	0.0	
Lane LOS	C	C		A		
Approach Delay (s)	15.8		0.0	1.3		
Approach LOS	C					
Intersection Summary						
Average Delay			4.8			
Intersection Capacity Utilization			44.5%		ICU Level of Service	A
Analysis Period (min)			15			

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		↑	↑	↑	↑
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	539	105	78	599	40	51
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	586	114	85	651	43	55
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				TWLTL		
Median storage veh				0		
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			700		1464	350
vC1, stage 1 conf vol					643	
vC2, stage 2 conf vol					821	
vCu, unblocked vol			700		1464	350
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			91		75	91
cM capacity (veh/h)			893		175	646
Direction, Lane #	SE 1	SE 2	NW 1	NW 2	NE 1	NE 2
Volume Total	391	309	85	651	43	55
Volume Left	0	0	85	0	43	0
Volume Right	0	114	0	0	0	55
cSH	1700	1700	893	1700	175	646
Volume to Capacity	0.23	0.18	0.09	0.38	0.25	0.09
Queue Length 95th (m)	0.0	0.0	2.4	0.0	7.1	2.1
Control Delay (s)	0.0	0.0	9.5	0.0	32.2	11.1
Lane LOS			A		D	B
Approach Delay (s)	0.0		1.1		20.4	
Approach LOS					C	
Intersection Summary						
Average Delay			1.8			
Intersection Capacity Utilization			41.5%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Highway 1 & Hwy 1 Connector

2028 Background SAT AM
8/21/2008

							
Movement	NBL	NBT	SBT	SBR	NEL	NER	
Lane Configurations			 				
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Volume (veh/h)	47	36	296	43	237	150	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	51	39	322	47	258	163	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type					TWLT		
Median storage (veh)					5		
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	322				463	161	
vC1, stage 1 conf vol					322		
vC2, stage 2 conf vol					141		
vCu, unblocked vol	322				463	161	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)					5.8		
tF (s)	2.2				3.5	3.3	
p0 queue free %	96				63	81	
cM capacity (veh/h)	1235				700	856	
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NE 1	NE 2
Volume Total	51	39	161	161	47	258	163
Volume Left	51	0	0	0	0	258	0
Volume Right	0	0	0	0	47	0	163
cSH	1235	1700	1700	1700	1700	700	856
Volume to Capacity	0.04	0.02	0.09	0.09	0.03	0.37	0.19
Queue Length 95th (m)	1.0	0.0	0.0	0.0	0.0	12.9	5.3
Control Delay (s)	8.0	0.0	0.0	0.0	0.0	13.1	10.2
Lane LOS	A					B	B
Approach Delay (s)	4.6		0.0			12.0	
Approach LOS						B	
Intersection Summary							
Average Delay			6.2				
Intersection Capacity Utilization			34.6%		ICU Level of Service		A
Analysis Period (min)			15				



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Sign Control	Stop		Free		Free	Free
Grade	0%		0%		0%	0%
Volume (veh/h)	18	63	240	47	182	345
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	19	67	255	50	194	367
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh	2					
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1035	280			255	
vC1, stage 1 conf vol	280					
vC2, stage 2 conf vol	754					
vCu, unblocked vol	1035	280			255	
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 %	95	91			85	
cM capacity (veh/h)	370	761			1321	
Direction, Lane #	EB 1	EB 2	SE 1	NW 1	NW 2	
Volume Total	19	67	305	194	367	
Volume Left	19	0	0	194	0	
Volume Right	0	67	50	0	0	
cSH	370	761	1700	1321	1700	
Volume to Capacity	0.05	0.09	0.18	0.15	0.22	
Queue Length 95th (m)	1.2	2.2	0.0	3.9	0.0	
Control Delay (s)	15.3	10.2	0.0	8.2	0.0	
Lane LOS	C	B		A		
Approach Delay (s)	11.3		0.0	2.8		
Approach LOS	B					
Intersection Summary						
Average Delay			2.7			
Intersection Capacity Utilization			38.9%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
7: 10th Avenue N & 7th Street N

2028 Background SAT AM
8/21/2008

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		↑	↑	↑	↑
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	414	29	33	513	13	31
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	450	32	36	558	14	34
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh					2	
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			482		1095	241
vC1, stage 1 conf vol					466	
vC2, stage 2 conf vol					629	
vCu, unblocked vol			482		1095	241
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			97		97	96
cM capacity (veh/h)			1077		406	760
Direction, Lane #	SE 1	SE 2	NW 1	NW 2	NE 1	NE 2
Volume Total	300	182	36	558	14	34
Volume Left	0	0	36	0	14	0
Volume Right	0	32	0	0	0	34
cSH	1700	1700	1077	1700	406	760
Volume to Capacity	0.18	0.11	0.03	0.33	0.03	0.04
Queue Length 95th (m)	0.0	0.0	0.8	0.0	0.8	1.1
Control Delay (s)	0.0	0.0	8.5	0.0	14.2	10.0
Lane LOS			A		B	A
Approach Delay (s)	0.0		0.5		11.2	
Approach LOS					B	
Intersection Summary						
Average Delay			0.7			
Intersection Capacity Utilization			37.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Highway 1 & Hwy 1 Connector

2028 Background SAT PM
8/21/2008

							
Movement	NBL	NBT	SBT	SBR	NEL	NER	
Lane Configurations			 				
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Volume (veh/h)	182	271	484	143	43	67	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	198	295	526	155	47	73	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type					TWLT		
Median storage veh)					5		
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	526				1216	263	
vC1, stage 1 conf vol					526		
vC2, stage 2 conf vol					690		
vCu, unblocked vol	526				1216	263	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)					5.8		
tF (s)	2.2				3.5	3.3	
p0 queue free %	81				87	90	
cM capacity (veh/h)	1037				366	735	
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NE 1	NE 2
Volume Total	198	295	263	263	155	47	73
Volume Left	198	0	0	0	0	47	0
Volume Right	0	0	0	0	155	0	73
cSH	1037	1700	1700	1700	1700	366	735
Volume to Capacity	0.19	0.17	0.15	0.15	0.09	0.13	0.10
Queue Length 95th (m)	5.3	0.0	0.0	0.0	0.0	3.3	2.5
Control Delay (s)	9.3	0.0	0.0	0.0	0.0	16.3	10.4
Lane LOS	A					C	B
Approach Delay (s)	3.7		0.0			12.7	
Approach LOS						B	
Intersection Summary							
Average Delay			2.6				
Intersection Capacity Utilization			36.8%		ICU Level of Service		A
Analysis Period (min)			15				

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		↑	↑	↑	↑
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	724	141	105	805	54	69
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	787	153	114	875	59	75
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh					2	
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			940		1967	470
vC1, stage 1 conf vol					864	
vC2, stage 2 conf vol					1103	
vCu, unblocked vol			940		1967	470
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			84		70	86
cM capacity (veh/h)			725		197	540
Direction, Lane #	SE 1	SE 2	NW 1	NW 2	NE 1	NE 2
Volume Total	525	416	114	875	59	75
Volume Left	0	0	114	0	59	0
Volume Right	0	153	0	0	0	75
cSH	1700	1700	725	1700	197	540
Volume to Capacity	0.31	0.24	0.16	0.51	0.30	0.14
Queue Length 95th (m)	0.0	0.0	4.2	0.0	9.0	3.6
Control Delay (s)	0.0	0.0	10.9	0.0	30.8	12.7
Lane LOS			B		D	B
Approach Delay (s)	0.0		1.3		20.7	
Approach LOS					C	
Intersection Summary						
Average Delay			1.9			
Intersection Capacity Utilization			52.4%		ICU Level of Service	A
Analysis Period (min)			15			



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Sign Control	Stop		Free		Free	Free
Grade	0%		0%		0%	0%
Volume (veh/h)	47	381	484	29	105	554
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	50	405	515	31	112	589
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage (veh)	2					
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1343	530			515	
vC1, stage 1 conf vol	530					
vC2, stage 2 conf vol	813					
vCu, unblocked vol	1343	530			515	
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 %	85	26			89	
cM capacity (veh/h)	339	551			1061	
Direction, Lane #	EB 1	EB 2	SE 1	NW 1	NW 2	
Volume Total	50	405	546	112	589	
Volume Left	50	0	0	112	0	
Volume Right	0	405	31	0	0	
cSH	339	551	1700	1061	1700	
Volume to Capacity	0.15	0.74	0.32	0.11	0.35	
Queue Length 95th (m)	3.9	47.4	0.0	2.7	0.0	
Control Delay (s)	17.4	27.6	0.0	8.8	0.0	
Lane LOS	C	D		A		
Approach Delay (s)	26.5		0.0	1.4		
Approach LOS	D					
Intersection Summary						
Average Delay			7.7			
Intersection Capacity Utilization			57.5%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis
1: Highway 1 & Hwy 1 Connector

2018 Combined SAT AM
8/21/2008

							
Movement	NBL	NBT	SBT	SBR	NEL	NER	
Lane Configurations							
Sign Control	Free		Free		Stop		
Grade	0%		0%		0%		
Volume (veh/h)	465	27	220	490	239	171	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	505	29	239	533	260	186	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type	TWLTL						
Median storage veh)	5						
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	239					1279	120
vC1, stage 1 conf vol	239						
vC2, stage 2 conf vol	1040						
vCu, unblocked vol	239					1279	120
tC, single (s)	4.1					6.8	6.9
tC, 2 stage (s)	5.8						
tF (s)	2.2					3.5	3.3
p0 queue free %	62					0	80
cM capacity (veh/h)	1325					186	909
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NE 1	NE 2
Volume Total	505	29	120	120	533	260	186
Volume Left	505	0	0	0	0	260	0
Volume Right	0	0	0	0	533	0	186
cSH	1325	1700	1700	1700	1700	186	909
Volume to Capacity	0.38	0.02	0.07	0.07	0.31	1.39	0.20
Queue Length 95th (m)	13.8	0.0	0.0	0.0	0.0	117.6	5.8
Control Delay (s)	9.4	0.0	0.0	0.0	0.0	254.4	10.0
Lane LOS	A					F	A
Approach Delay (s)	8.9	0.0		152.4			
Approach LOS	F						
Intersection Summary							
Average Delay	41.5						
Intersection Capacity Utilization	62.8%			ICU Level of Service			B
Analysis Period (min)	15						



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	102	846	179	59	234	257
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	109	900	190	63	249	273
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage (veh)	2					
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	993	222			190	
vC1, stage 1 conf vol	222					
vC2, stage 2 conf vol	771					
vCu, unblocked vol	993	222			190	
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 %	69	0			82	
cM capacity (veh/h)	354	820			1395	
Direction, Lane #	EB 1	EB 2	SE 1	NW 1	NW 2	
Volume Total	109	900	253	249	273	
Volume Left	109	0	0	249	0	
Volume Right	0	900	63	0	0	
cSH	354	820	1700	1395	1700	
Volume to Capacity	0.31	1.10	0.15	0.18	0.16	
Queue Length 95th (m)	9.7	182.5	0.0	4.9	0.0	
Control Delay (s)	19.6	82.7	0.0	8.1	0.0	
Lane LOS	C	F		A		
Approach Delay (s)	75.9		0.0	3.9		
Approach LOS	F					
Intersection Summary						
Average Delay			44.0			
Intersection Capacity Utilization			72.1%		ICU Level of Service	C
Analysis Period (min)			15			

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		↑	↑	↑	↑
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	308	821	33	382	107	24
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	335	892	36	415	116	26
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh					2	
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			1227		1268	614
vC1, stage 1 conf vol					781	
vC2, stage 2 conf vol					487	
vCu, unblocked vol			1227		1268	614
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			94		67	94
cM capacity (veh/h)			564		349	435
Direction, Lane #	SE 1	SE 2	NW 1	NW 2	NE 1	NE 2
Volume Total	223	1004	36	415	116	26
Volume Left	0	0	36	0	116	0
Volume Right	0	892	0	0	0	26
cSH	1700	1700	564	1700	349	435
Volume to Capacity	0.13	0.59	0.06	0.24	0.33	0.06
Queue Length 95th (m)	0.0	0.0	1.5	0.0	10.9	1.4
Control Delay (s)	0.0	0.0	11.8	0.0	20.4	13.8
Lane LOS			B		C	B
Approach Delay (s)	0.0		0.9		19.2	
Approach LOS					C	
Intersection Summary						
Average Delay			1.7			
Intersection Capacity Utilization			47.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Highway 1 & Hwy 1 Connector

2018 Combined SAT PM
8/21/2008

							
Movement	NBL	NBT	SBT	SBR	NEL	NER	
Lane Configurations							
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Volume (veh/h)	173	202	360	146	441	434	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	188	220	391	159	479	472	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type					TWLT		
Median storage veh					5		
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	391				987	196	
vC1, stage 1 conf vol					391		
vC2, stage 2 conf vol					596		
vCu, unblocked vol	391				987	196	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)					5.8		
tF (s)	2.2				3.5	3.3	
p0 queue free %	84				0	42	
cM capacity (veh/h)	1164				427	813	
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NE 1	NE 2
Volume Total	188	220	196	196	159	479	472
Volume Left	188	0	0	0	0	479	0
Volume Right	0	0	0	0	159	0	472
cSH	1164	1700	1700	1700	1700	427	813
Volume to Capacity	0.16	0.13	0.12	0.12	0.09	1.12	0.58
Queue Length 95th (m)	4.4	0.0	0.0	0.0	0.0	130.0	29.0
Control Delay (s)	8.7	0.0	0.0	0.0	0.0	112.3	15.4
Lane LOS	A					F	C
Approach Delay (s)	4.0		0.0			64.2	
Approach LOS						F	
Intersection Summary							
Average Delay		32.9					
Intersection Capacity Utilization		54.0%			ICU Level of Service		A
Analysis Period (min)		15					



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Sign Control	Stop		Free		Free	Free
Grade	0%		0%		0%	0%
Volume (veh/h)	43	353	360	181	712	413
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	46	376	383	193	757	439
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh	2					
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2434	479			383	
vC1, stage 1 conf vol	479					
vC2, stage 2 conf vol	1954					
vCu, unblocked vol	2434	479			383	
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 %	0	36			36	
cM capacity (veh/h)	42	588			1187	
Direction, Lane #	EB 1	EB 2	SE 1	NW 1	NW 2	
Volume Total	46	376	576	757	439	
Volume Left	46	0	0	757	0	
Volume Right	0	376	193	0	0	
cSH	42	588	1700	1187	1700	
Volume to Capacity	1.09	0.64	0.34	0.64	0.26	
Queue Length 95th (m)	33.4	34.4	0.0	36.9	0.0	
Control Delay (s)	318.7	21.3	0.0	13.2	0.0	
Lane LOS	F	C		B		
Approach Delay (s)	53.6		0.0	8.4		
Approach LOS	F					
Intersection Summary						
Average Delay			14.9			
Intersection Capacity Utilization			82.8%		ICU Level of Service	E
Analysis Period (min)			15			

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		↵	↑	↵	↵
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	539	174	79	599	674	59
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	586	189	86	651	733	64
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh					2	
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			775		1503	388
vC1, stage 1 conf vol					680	
vC2, stage 2 conf vol					823	
vCu, unblocked vol			775		1503	388
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			90		0	90
cM capacity (veh/h)			837		289	611
Direction, Lane #	SE 1	SE 2	NW 1	NW 2	NE 1	NE 2
Volume Total	391	384	86	651	733	64
Volume Left	0	0	86	0	733	0
Volume Right	0	189	0	0	0	64
cSH	1700	1700	837	1700	289	611
Volume to Capacity	0.23	0.23	0.10	0.38	2.53	0.10
Queue Length 95th (m)	0.0	0.0	2.6	0.0	455.8	2.7
Control Delay (s)	0.0	0.0	9.8	0.0	726.5	11.6
Lane LOS			A		F	B
Approach Delay (s)	0.0		1.1		668.9	
Approach LOS					F	
Intersection Summary						
Average Delay			231.2			
Intersection Capacity Utilization			75.5%		ICU Level of Service	D
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Highway 1 & Hwy 1 Connector

2028 Combined SAT AM
8/21/2008

							
Movement	NBL	NBT	SBT	SBR	NEL	NER	
Lane Configurations							
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Volume (veh/h)	797	36	296	841	347	253	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	866	39	322	914	377	275	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type					TWLTL		
Median storage veh					5		
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	322				2093	161	
vC1, stage 1 conf vol					322		
vC2, stage 2 conf vol					1772		
vCu, unblocked vol	322				2093	161	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)					5.8		
tF (s)	2.2				3.5	3.3	
p0 queue free %	30				0	68	
cM capacity (veh/h)	1235				36	856	
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NE 1	NE 2
Volume Total	866	39	161	161	914	377	275
Volume Left	866	0	0	0	0	377	0
Volume Right	0	0	0	0	914	0	275
cSH	1235	1700	1700	1700	1700	36	856
Volume to Capacity	0.70	0.02	0.09	0.09	0.54	10.40	0.32
Queue Length 95th (m)	47.2	0.0	0.0	0.0	0.0	Err	10.6
Control Delay (s)	14.4	0.0	0.0	0.0	0.0	Err	11.2
Lane LOS	B					F	B
Approach Delay (s)	13.8		0.0			5787.5	
Approach LOS						F	
Intersection Summary							
Average Delay		1355.6					
Intersection Capacity Utilization		102.9%			ICU Level of Service		G
Analysis Period (min)		15					



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Sign Control	Stop		Free		Free	Free
Grade	0%		0%		0%	0%
Volume (veh/h)	173	1456	240	90	352	345
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	184	1549	255	96	374	367
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh	2					
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1419	303			255	
vC1, stage 1 conf vol	303					
vC2, stage 2 conf vol	1116					
vCu, unblocked vol	1419	303			255	
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 %	14	0			72	
cM capacity (veh/h)	213	739			1321	
Direction, Lane #	EB 1	EB 2	SE 1	NW 1	NW 2	
Volume Total	184	1549	351	374	367	
Volume Left	184	0	0	374	0	
Volume Right	0	1549	96	0	0	
cSH	213	739	1700	1321	1700	
Volume to Capacity	0.86	2.10	0.21	0.28	0.22	
Queue Length 95th (m)	50.8	810.9	0.0	8.9	0.0	
Control Delay (s)	77.8	512.4	0.0	8.8	0.0	
Lane LOS	F	F		A		
Approach Delay (s)	466.2		0.0	4.4		
Approach LOS	F					
Intersection Summary						
Average Delay		287.1				
Intersection Capacity Utilization		114.9%		ICU Level of Service		H
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis
7: 10th Avenue N & 7th Street N

2028 Combined SAT AM
8/21/2008

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		↑	↑	↑	↑
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	414	1422	49	513	183	33
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	450	1546	53	558	199	36
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh					2	
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			1996		1887	998
vC1, stage 1 conf vol					1223	
vC2, stage 2 conf vol					664	
vCu, unblocked vol			1996		1887	998
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			81		2	85
cM capacity (veh/h)			284		203	242
Direction, Lane #	SE 1	SE 2	NW 1	NW 2	NE 1	NE 2
Volume Total	300	1696	53	558	199	36
Volume Left	0	0	53	0	199	0
Volume Right	0	1546	0	0	0	36
cSH	1700	1700	284	1700	203	242
Volume to Capacity	0.18	1.00	0.19	0.33	0.98	0.15
Queue Length 95th (m)	0.0	0.0	5.1	0.0	63.5	3.9
Control Delay (s)	0.0	0.0	20.6	0.0	106.0	22.4
Lane LOS			C		F	C
Approach Delay (s)	0.0		1.8		93.2	
Approach LOS					F	
Intersection Summary						
Average Delay			8.1			
Intersection Capacity Utilization			74.2%		ICU Level of Service	D
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

1: Highway 1 & Hwy 1 Connector

2028 Combined SAT PM
8/21/2008

							
Movement	NBL	NBT	SBT	SBR	NEL	NER	
Lane Configurations							
Sign Control		Free	Free		Stop		
Grade		0%	0%		0%		
Volume (veh/h)	247	271	484	212	757	738	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	268	295	526	230	823	802	
Pedestrians							
Lane Width (m)							
Walking Speed (m/s)							
Percent Blockage							
Right turn flare (veh)							
Median type					TWLTL		
Median storage veh					5		
Upstream signal (m)							
pX, platoon unblocked							
vC, conflicting volume	526				1358	263	
vC1, stage 1 conf vol					526		
vC2, stage 2 conf vol					832		
vCu, unblocked vol	526				1358	263	
tC, single (s)	4.1				6.8	6.9	
tC, 2 stage (s)					5.8		
tF (s)	2.2				3.5	3.3	
p0 queue free %	74				0	0	
cM capacity (veh/h)	1037				286	735	
Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NE 1	NE 2
Volume Total	268	295	263	263	230	823	802
Volume Left	268	0	0	0	0	823	0
Volume Right	0	0	0	0	230	0	802
cSH	1037	1700	1700	1700	1700	286	735
Volume to Capacity	0.26	0.17	0.15	0.15	0.14	2.88	1.09
Queue Length 95th (m)	7.9	0.0	0.0	0.0	0.0	542.8	167.3
Control Delay (s)	9.7	0.0	0.0	0.0	0.0	880.9	83.4
Lane LOS	A					F	F
Approach Delay (s)	4.6		0.0			487.2	
Approach LOS						F	
Intersection Summary							
Average Delay			269.8				
Intersection Capacity Utilization			79.0%		ICU Level of Service		D
Analysis Period (min)			15				



Movement	EBL	EBR	SET	SER	NWL	NWT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	60	502	484	306	1213	554
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	64	534	515	326	1290	589
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh	2					
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	3848	678			515	
vC1, stage 1 conf vol	678					
vC2, stage 2 conf vol	3170					
vCu, unblocked vol	3848	678			515	
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 %	0	0			0	
cM capacity (veh/h)	0	454			1061	
Direction, Lane #	EB 1	EB 2	SE 1	NW 1	NW 2	
Volume Total	64	534	840	1290	589	
Volume Left	64	0	0	1290	0	
Volume Right	0	534	326	0	0	
cSH	0	454	1700	1061	1700	
Volume to Capacity	Err	1.18	0.49	1.22	0.35	
Queue Length 95th (m)	Err	152.0	0.0	308.5	0.0	
Control Delay (s)	Err	128.4	0.0	122.0	0.0	
Lane LOS	F	F		F		
Approach Delay (s)	Err		0.0	83.8		
Approach LOS	F					
Intersection Summary						
Average Delay			Err			
Intersection Capacity Utilization		124.7%		ICU Level of Service		H
Analysis Period (min)		15				

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		↑	↑	↑	↑
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	724	262	106	805	1162	83
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	787	285	115	875	1263	90
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					TWLTL	
Median storage veh					2	
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			1072		2035	536
vC1, stage 1 conf vol					929	
vC2, stage 2 conf vol					1105	
vCu, unblocked vol			1072		2035	536
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			82		0	82
cM capacity (veh/h)			646		188	489
Direction, Lane #	SE 1	SE 2	NW 1	NW 2	NE 1	NE 2
Volume Total	525	547	115	875	1263	90
Volume Left	0	0	115	0	1263	0
Volume Right	0	285	0	0	0	90
cSH	1700	1700	646	1700	188	489
Volume to Capacity	0.31	0.32	0.18	0.51	6.71	0.18
Queue Length 95th (m)	0.0	0.0	4.9	0.0	Err	5.1
Control Delay (s)	0.0	0.0	11.8	0.0	Err	14.0
Lane LOS			B		F	B
Approach Delay (s)	0.0		1.4		9333.3	
Approach LOS					F	
Intersection Summary						
Average Delay			3698.7			
Intersection Capacity Utilization			113.4%		ICU Level of Service	H
Analysis Period (min)			15			

						
Movement	NBL	NBT	SBT	SBR	NEL	NER
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	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1883	3579	1601	1789	1601
Flt Permitted	0.60	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1136	1883	3579	1601	1789	1601
Volume (vph)	465	27	220	490	239	171
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	505	29	239	533	260	186
RTOR Reduction (vph)	0	0	0	217	0	141
Lane Group Flow (vph)	505	29	239	316	260	45
Turn Type	Perm			Perm		Perm
Protected Phases		2	6		4	
Permitted Phases	2			6		4
Actuated Green, G (s)	28.5	28.5	28.5	28.5	11.6	11.6
Effective Green, g (s)	28.5	28.5	28.5	28.5	11.6	11.6
Actuated g/C Ratio	0.59	0.59	0.59	0.59	0.24	0.24
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)	673	1116	2121	949	431	386
v/s Ratio Prot		0.02	0.07		c0.15	
v/s Ratio Perm	c0.44			0.20		0.03
v/c Ratio	0.75	0.03	0.11	0.33	0.60	0.12
Uniform Delay, d1	7.2	4.1	4.3	5.0	16.2	14.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.7	0.0	0.0	0.2	2.4	0.1
Delay (s)	11.9	4.1	4.3	5.2	18.6	14.4
Level of Service	B	A	A	A	B	B
Approach Delay (s)		11.5	4.9		16.8	
Approach LOS		B	A		B	
Intersection Summary						
HCM Average Control Delay		9.9		HCM Level of Service		A
HCM Volume to Capacity ratio		0.71				
Actuated Cycle Length (s)		48.1		Sum of lost time (s)		8.0
Intersection Capacity Utilization		62.8%		ICU Level of Service		B
Analysis Period (min)		15				
c Critical Lane Group						



Movement	EBL	EBR	SET	SER	NWL	NWT
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
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.97		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1738	1617	1852		1825	1921
Flt Permitted	0.95	1.00	1.00		0.38	1.00
Satd. Flow (perm)	1738	1617	1852		737	1921
Volume (vph)	102	846	179	59	234	257
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	109	900	190	63	249	273
RTOR Reduction (vph)	0	347	23	0	0	0
Lane Group Flow (vph)	109	553	230	0	249	273
Heavy Vehicles (%)	5%	1%	0%	1%	0%	0%
Turn Type	Perm			pm+pt		
Protected Phases	4		6		5	2
Permitted Phases		4			2	
Actuated Green, G (s)	18.4	18.4	11.0		17.9	17.9
Effective Green, g (s)	18.4	18.4	11.0		17.9	17.9
Actuated g/C Ratio	0.42	0.42	0.25		0.40	0.40
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)	722	672	460		369	776
v/s Ratio Prot	0.06		0.12		c0.04	0.14
v/s Ratio Perm		c0.34			c0.23	
v/c Ratio	0.15	0.82	0.50		0.67	0.35
Uniform Delay, d1	8.1	11.5	14.3		10.9	9.2
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.1	8.0	0.9		4.8	0.3
Delay (s)	8.2	19.5	15.1		15.7	9.4
Level of Service	A	B	B		B	A
Approach Delay (s)	18.3		15.1			12.4
Approach LOS	B		B			B
Intersection Summary						
HCM Average Control Delay			16.1		HCM Level of Service	B
HCM Volume to Capacity ratio			0.73			
Actuated Cycle Length (s)			44.3		Sum of lost time (s)	8.0
Intersection Capacity Utilization			72.1%		ICU Level of Service	C
Analysis Period (min)			15			
c Critical Lane Group						

						
Movement	SET	SER	NWL	NWT	NEL	NER
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
Lane Util. Factor	0.95		1.00	1.00	1.00	1.00
Frt	0.89		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3188		1789	1883	1789	1601
Flt Permitted	1.00		0.20	1.00	0.95	1.00
Satd. Flow (perm)	3188		373	1883	1789	1601
Volume (vph)	308	821	33	382	107	24
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	335	892	36	415	116	26
RTOR Reduction (vph)	266	0	0	0	0	22
Lane Group Flow (vph)	961	0	36	415	116	4
Turn Type			Perm		Perm	
Protected Phases	6			2	4	
Permitted Phases			2			4
Actuated Green, G (s)	37.8		37.8	37.8	8.1	8.1
Effective Green, g (s)	37.8		37.8	37.8	8.1	8.1
Actuated g/C Ratio	0.70		0.70	0.70	0.15	0.15
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)	2236		262	1321	269	241
v/s Ratio Prot	c0.30			0.22	c0.06	
v/s Ratio Perm			0.10			0.00
v/c Ratio	0.43		0.14	0.31	0.43	0.02
Uniform Delay, d1	3.4		2.7	3.1	20.8	19.5
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.1		0.2	0.1	1.1	0.0
Delay (s)	3.6		2.9	3.2	21.9	19.5
Level of Service	A		A	A	C	B
Approach Delay (s)	3.6			3.2	21.5	
Approach LOS	A			A	C	
Intersection Summary						
HCM Average Control Delay			4.9		HCM Level of Service	A
HCM Volume to Capacity ratio			0.43			
Actuated Cycle Length (s)			53.9		Sum of lost time (s)	8.0
Intersection Capacity Utilization			47.6%		ICU Level of Service	A
Analysis Period (min)			15			
c Critical Lane Group						

							
Movement	NBL	NBT	SBT	SBR	NEL	NER	
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	1.00	
Frt	1.00	1.00	1.00	0.85	1.00	0.85	
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1789	1883	3579	1601	1789	1601	
Flt Permitted	0.52	1.00	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	981	1883	3579	1601	1789	1601	
Volume (vph)	173	202	360	146	441	434	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	188	220	391	159	479	472	
RTOR Reduction (vph)	0	0	0	104	0	181	
Lane Group Flow (vph)	188	220	391	55	479	291	
Turn Type	Perm		Perm		Perm		
Protected Phases	2		6		4		
Permitted Phases	2		6		4		
Actuated Green, G (s)	11.2	11.2	11.2	11.2	13.4	13.4	
Effective Green, g (s)	11.2	11.2	11.2	11.2	13.4	13.4	
Actuated g/C Ratio	0.34	0.34	0.34	0.34	0.41	0.41	
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)	337	647	1230	550	735	658	
v/s Ratio Prot	0.12		0.11		c0.27		
v/s Ratio Perm	c0.19		0.03		0.18		
v/c Ratio	0.56	0.34	0.32	0.10	0.65	0.44	
Uniform Delay, d1	8.7	8.0	7.9	7.3	7.7	6.9	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.0	0.3	0.1	0.1	2.1	0.5	
Delay (s)	10.7	8.3	8.0	7.4	9.8	7.4	
Level of Service	B	A	A	A	A	A	
Approach Delay (s)	9.4		7.8		8.6		
Approach LOS	A		A		A		
Intersection Summary							
HCM Average Control Delay			8.6		HCM Level of Service		A
HCM Volume to Capacity ratio			0.61				
Actuated Cycle Length (s)			32.6		Sum of lost time (s)		8.0
Intersection Capacity Utilization			54.0%		ICU Level of Service		A
Analysis Period (min)			15				
c Critical Lane Group							



Movement	EBL	EBR	SET	SER	NWL	NWT
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
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.95		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1738	1617	1828		1825	1921
Flt Permitted	0.95	1.00	1.00		0.13	1.00
Satd. Flow (perm)	1738	1617	1828		247	1921
Volume (vph)	43	353	360	181	712	413
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	46	376	383	193	757	439
RTOR Reduction (vph)	0	0	19	0	0	0
Lane Group Flow (vph)	46	376	557	0	757	439
Heavy Vehicles (%)	5%	1%	0%	1%	0%	0%
Turn Type	Free		pm+pt			
Protected Phases	4		6		5	2
Permitted Phases	Free		2			
Actuated Green, G (s)	4.8	76.8	27.1		64.0	64.0
Effective Green, g (s)	4.8	76.8	27.1		64.0	64.0
Actuated g/C Ratio	0.06	1.00	0.35		0.83	0.83
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)	109	1617	645		882	1601
v/s Ratio Prot	0.03		0.30		c0.37	0.23
v/s Ratio Perm		c0.23			c0.35	
v/c Ratio	0.42	0.23	0.86		0.86	0.27
Uniform Delay, d1	34.7	0.0	23.1		15.6	1.4
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	2.6	0.3	11.6		8.3	0.1
Delay (s)	37.3	0.3	34.7		23.9	1.5
Level of Service	D	A	C		C	A
Approach Delay (s)	4.4		34.7			15.7
Approach LOS	A		C			B
Intersection Summary						
HCM Average Control Delay			18.5		HCM Level of Service	B
HCM Volume to Capacity ratio			0.77			
Actuated Cycle Length (s)			76.8		Sum of lost time (s)	4.0
Intersection Capacity Utilization			82.8%		ICU Level of Service	E
Analysis Period (min)			15			

c Critical Lane Group

						
Movement	SET	SER	NWL	NWT	NEL	NER
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
Lane Util. Factor	0.95		1.00	1.00	1.00	1.00
Frt	0.96		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3448		1789	1883	1789	1601
Flt Permitted	1.00		0.27	1.00	0.95	1.00
Satd. Flow (perm)	3448		504	1883	1789	1601
Volume (vph)	539	174	79	599	674	59
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	586	189	86	651	733	64
RTOR Reduction (vph)	57	0	0	0	0	35
Lane Group Flow (vph)	718	0	86	651	733	29
Turn Type			Perm			Perm
Protected Phases	6			2	4	
Permitted Phases			2			4
Actuated Green, G (s)	20.1		20.1	20.1	23.0	23.0
Effective Green, g (s)	20.1		20.1	20.1	23.0	23.0
Actuated g/C Ratio	0.39		0.39	0.39	0.45	0.45
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)	1356		198	741	805	721
v/s Ratio Prot	0.21			c0.35	c0.41	
v/s Ratio Perm			0.17			0.02
v/c Ratio	0.53		0.43	0.88	0.91	0.04
Uniform Delay, d1	11.9		11.3	14.4	13.1	7.9
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4		1.5	11.5	14.4	0.0
Delay (s)	12.3		12.9	25.9	27.5	7.9
Level of Service	B		B	C	C	A
Approach Delay (s)	12.3			24.3	25.9	
Approach LOS	B			C	C	
Intersection Summary						
HCM Average Control Delay			20.8		HCM Level of Service	C
HCM Volume to Capacity ratio			0.90			
Actuated Cycle Length (s)			51.1		Sum of lost time (s)	8.0
Intersection Capacity Utilization			75.5%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						

HCM Signalized Intersection Capacity Analysis 2028 Combined SAT AM with Improvements

1: Highway 1 & Hwy 1 Connector

8/21/2008

						
Movement	NBL	NBT	SBT	SBR	NEL	NER
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	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1883	3579	1601	1789	1601
Flt Permitted	0.46	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	863	1883	3579	1601	1789	1601
Volume (vph)	797	36	296	841	347	253
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	866	39	322	914	377	275
RTOR Reduction (vph)	0	0	0	375	0	209
Lane Group Flow (vph)	866	39	322	539	377	66
Turn Type	pm+pt		Perm		Perm	
Protected Phases	5	2	6		4	
Permitted Phases	2			6		4
Actuated Green, G (s)	59.1	59.1	30.1	30.1	21.2	21.2
Effective Green, g (s)	59.1	59.1	30.1	30.1	21.2	21.2
Actuated g/C Ratio	0.67	0.67	0.34	0.34	0.24	0.24
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)	840	1260	1220	546	430	384
v/s Ratio Prot	c0.29	0.02	0.09		c0.21	
v/s Ratio Perm	c0.40			0.34		0.04
v/c Ratio	1.03	0.03	0.26	0.99	0.88	0.17
Uniform Delay, d1	10.5	4.9	21.1	28.9	32.3	26.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	39.3	0.0	0.1	34.9	17.8	0.2
Delay (s)	49.7	4.9	21.2	63.8	50.1	26.8
Level of Service	D	A	C	E	D	C
Approach Delay (s)		47.8	52.7		40.3	
Approach LOS		D	D		D	
Intersection Summary						
HCM Average Control Delay			48.2		HCM Level of Service	D
HCM Volume to Capacity ratio			0.98			
Actuated Cycle Length (s)			88.3		Sum of lost time (s)	8.0
Intersection Capacity Utilization		102.9%			ICU Level of Service	G
Analysis Period (min)			15			
c Critical Lane Group						



Movement	EBL	EBR	SET	SER	NWL	NWT
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	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1738	1617	1921	1617	3541	1921
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1738	1617	1921	1617	3541	1921
Volume (vph)	173	1456	240	90	352	345
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	184	1549	255	96	374	367
RTOR Reduction (vph)	0	0	0	65	0	0
Lane Group Flow (vph)	184	1549	255	31	374	367
Heavy Vehicles (%)	5%	1%	0%	1%	0%	0%
Turn Type	Free		Perm		Prot	
Protected Phases	4		6		5	2
Permitted Phases	Free		6			
Actuated Green, G (s)	7.6	38.0	12.1	12.1	6.3	22.4
Effective Green, g (s)	7.6	38.0	12.1	12.1	6.3	22.4
Actuated g/C Ratio	0.20	1.00	0.32	0.32	0.17	0.59
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)	348	1617	612	515	587	1132
v/s Ratio Prot	0.11		0.13		0.11	0.19
v/s Ratio Perm	c0.96		0.02			
v/c Ratio	0.53	0.96	0.42	0.06	0.64	0.32
Uniform Delay, d1	13.6	0.0	10.2	9.0	14.8	4.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.5	14.4	0.5	0.0	2.3	0.2
Delay (s)	15.1	14.4	10.6	9.0	17.1	4.1
Level of Service	B	B	B	A	B	A
Approach Delay (s)	14.5		10.2			10.7
Approach LOS	B		B			B
Intersection Summary						
HCM Average Control Delay			12.9	HCM Level of Service		B
HCM Volume to Capacity ratio			0.96			
Actuated Cycle Length (s)			38.0	Sum of lost time (s)		0.0
Intersection Capacity Utilization			42.3%	ICU Level of Service		A
Analysis Period (min)			15			

c Critical Lane Group



Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		↵	↑	↵↵↵	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	0.95		1.00	1.00	0.97	
Frt	0.88		1.00	1.00	0.98	
Flt Protected	1.00		0.95	1.00	0.96	
Satd. Flow (prot)	3163		1789	1883	3425	
Flt Permitted	1.00		0.11	1.00	0.96	
Satd. Flow (perm)	3163		211	1883	3425	
Volume (vph)	414	1422	49	513	183	33
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	450	1546	53	558	199	36
RTOR Reduction (vph)	343	0	0	0	29	0
Lane Group Flow (vph)	1653	0	53	558	206	0
Turn Type	Perm					
Protected Phases	6			2	4	
Permitted Phases			2			
Actuated Green, G (s)	35.7		35.7	35.7	8.4	
Effective Green, g (s)	35.7		35.7	35.7	8.4	
Actuated g/C Ratio	0.69		0.69	0.69	0.16	
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)	2167		145	1290	552	
v/s Ratio Prot	c0.52			0.30	c0.06	
v/s Ratio Perm			0.25			
v/c Ratio	1.06dr		0.37	0.43	0.37	
Uniform Delay, d1	5.4		3.4	3.7	19.5	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	1.6		1.6	0.2	0.4	
Delay (s)	7.0		5.0	3.9	19.9	
Level of Service	A		A	A	B	
Approach Delay (s)	7.0			4.0	19.9	
Approach LOS	A			A	B	

Intersection Summary

HCM Average Control Delay	7.5	HCM Level of Service	A
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	52.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	70.3%	ICU Level of Service	C
Analysis Period (min)	15		
dr Defacto Right Lane. Recode with 1 though lane as a right lane.			
c Critical Lane Group			

HCM Signalized Intersection Capacity Analysis 2028 Combined SAT PM with Improvements

1: Highway 1 & Hwy 1 Connector

8/21/2008

						
Movement	NBL	NBT	SBT	SBR	NEL	NER
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	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1789	1883	3579	1601	1789	1601
Flt Permitted	0.22	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	407	1883	3579	1601	1789	1601
Volume (vph)	247	271	484	212	757	738
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	268	295	526	230	823	802
RTOR Reduction (vph)	0	0	0	185	0	216
Lane Group Flow (vph)	268	295	526	45	823	586
Turn Type	pm+pt		Perm		Perm	
Protected Phases	5	2	6		4	
Permitted Phases	2			6		4
Actuated Green, G (s)	28.7	28.7	14.5	14.5	38.0	38.0
Effective Green, g (s)	28.7	28.7	14.5	14.5	38.0	38.0
Actuated g/C Ratio	0.38	0.38	0.19	0.19	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)	345	723	695	311	910	814
v/s Ratio Prot	c0.11	0.16	0.15		c0.46	
v/s Ratio Perm	c0.19			0.03		0.37
v/c Ratio	0.78	0.41	0.76	0.14	0.90	0.72
Uniform Delay, d1	17.8	16.8	28.4	25.0	16.7	14.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.5	0.4	4.7	0.2	12.2	3.2
Delay (s)	28.2	17.2	33.1	25.2	28.9	17.4
Level of Service	C	B	C	C	C	B
Approach Delay (s)		22.4	30.7		23.2	
Approach LOS		C	C		C	
Intersection Summary						
HCM Average Control Delay			25.0		HCM Level of Service	C
HCM Volume to Capacity ratio			0.84			
Actuated Cycle Length (s)			74.7		Sum of lost time (s)	8.0
Intersection Capacity Utilization			79.0%		ICU Level of Service	D
Analysis Period (min)			15			
c Critical Lane Group						



Movement	EBL	EBR	SET	SER	NWL	NWT
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	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1738	1617	1921	1617	3541	1921
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1738	1617	1921	1617	3541	1921
Volume (vph)	60	502	484	306	1213	554
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	64	534	515	326	1290	589
RTOR Reduction (vph)	0	0	0	153	0	0
Lane Group Flow (vph)	64	534	515	173	1290	589
Heavy Vehicles (%)	5%	1%	0%	1%	0%	0%
Turn Type	Free		Perm		Prot	
Protected Phases	4		6		5	2
Permitted Phases	Free		6			
Actuated Green, G (s)	6.5	74.4	24.2	24.2	31.7	59.9
Effective Green, g (s)	6.5	74.4	24.2	24.2	31.7	59.9
Actuated g/C Ratio	0.09	1.00	0.33	0.33	0.43	0.81
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)	152	1617	625	526	1509	1547
v/s Ratio Prot	0.04		c0.27		c0.36	0.31
v/s Ratio Perm		c0.33		0.11		
v/c Ratio	0.42	0.33	0.82	0.33	0.85	0.38
Uniform Delay, d1	32.2	0.0	23.1	19.0	19.3	2.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9	0.5	8.7	0.4	5.0	0.2
Delay (s)	34.0	0.5	31.8	19.3	24.2	2.2
Level of Service	C	A	C	B	C	A
Approach Delay (s)	4.1		27.0			17.3
Approach LOS	A		C			B
Intersection Summary						
HCM Average Control Delay			17.4	HCM Level of Service		B
HCM Volume to Capacity ratio			0.76			
Actuated Cycle Length (s)			74.4	Sum of lost time (s)		8.0
Intersection Capacity Utilization			73.4%	ICU Level of Service		D
Analysis Period (min)			15			
c Critical Lane Group						

						
Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑		↰	↑	↰↰↰	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0		4.0	4.0	4.0	
Lane Util. Factor	0.95		1.00	1.00	0.97	
Frt	0.96		1.00	1.00	0.99	
Flt Protected	1.00		0.95	1.00	0.96	
Satd. Flow (prot)	3436		1789	1883	3456	
Flt Permitted	1.00		0.12	1.00	0.96	
Satd. Flow (perm)	3436		226	1883	3456	
Volume (vph)	724	262	106	805	1162	83
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	787	285	115	875	1263	90
RTOR Reduction (vph)	48	0	0	0	7	0
Lane Group Flow (vph)	1024	0	115	875	1346	0
Turn Type			pm+pt			
Protected Phases	6		5	2	4	
Permitted Phases			2			
Actuated Green, G (s)	29.4		36.5	36.5	30.0	
Effective Green, g (s)	29.4		36.5	36.5	30.0	
Actuated g/C Ratio	0.39		0.49	0.49	0.40	
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)	1356		176	923	1392	
v/s Ratio Prot	0.30		0.03	c0.46	c0.39	
v/s Ratio Perm			0.29			
v/c Ratio	0.75		0.65	0.95	0.97	
Uniform Delay, d1	19.4		13.9	18.1	21.8	
Progression Factor	1.00		1.00	1.00	1.00	
Incremental Delay, d2	2.4		8.4	18.1	16.7	
Delay (s)	21.9		22.3	36.2	38.4	
Level of Service	C		C	D	D	
Approach Delay (s)	21.9			34.6	38.4	
Approach LOS	C			C	D	
Intersection Summary						
HCM Average Control Delay			32.1		HCM Level of Service	C
HCM Volume to Capacity ratio			0.96			
Actuated Cycle Length (s)			74.5		Sum of lost time (s)	8.0
Intersection Capacity Utilization			84.8%		ICU Level of Service	E
Analysis Period (min)			15			
c Critical Lane Group						