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April 16, 2015 Project #: 18394

Gene Martin
Canyon Road Investors, LLC
PO Box 862
Ellensburg, WA 98926

RE: Proposed Lakeside Development Transportation Impact Analysis – Ellensburg, Washington

Dear Gene,

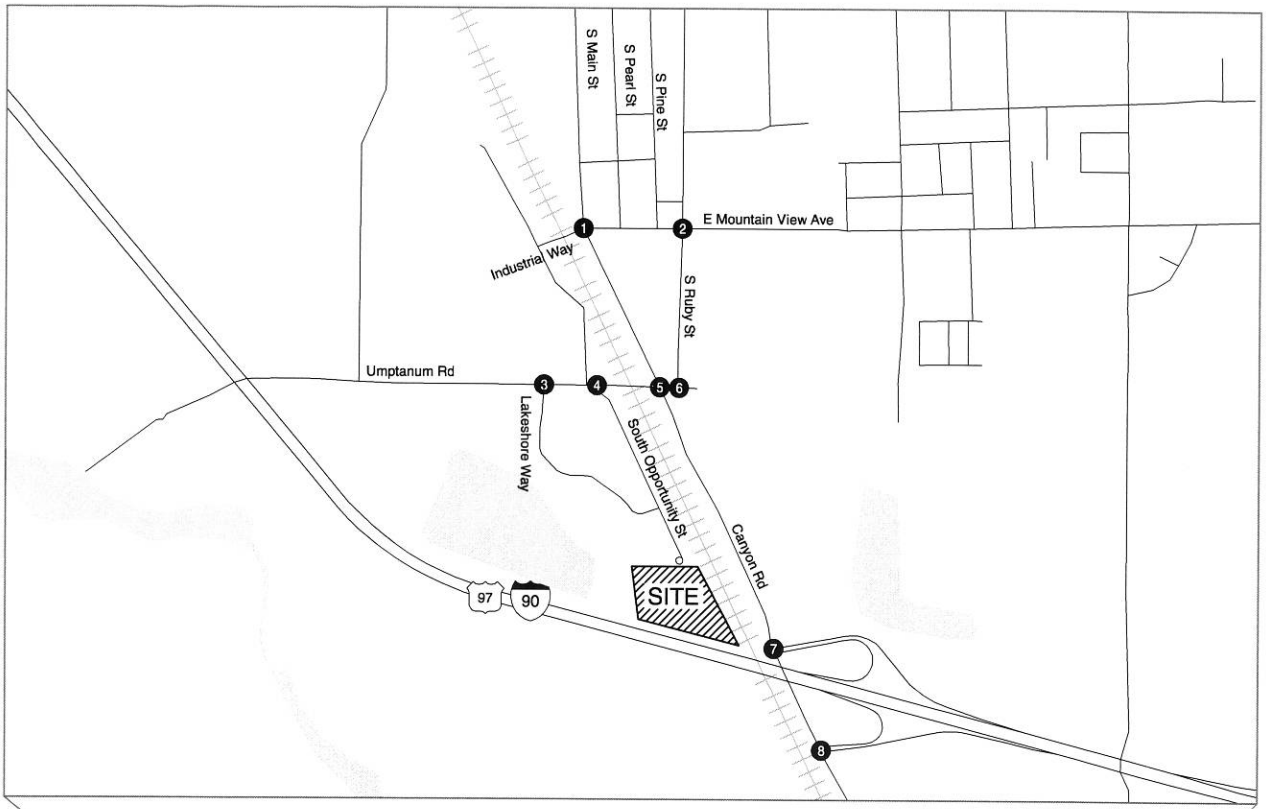
This letter presents the results of the transportation impact analysis for the proposed Lakeside Development, which includes a 90,000 square foot indoor water park and affiliated hotel complex in Ellensburg, Washington. This study concludes that the proposed development can be developed while maintaining acceptable traffic operations on the surrounding street system. Additional details of the methodology, findings, and recommendations are provided herein.

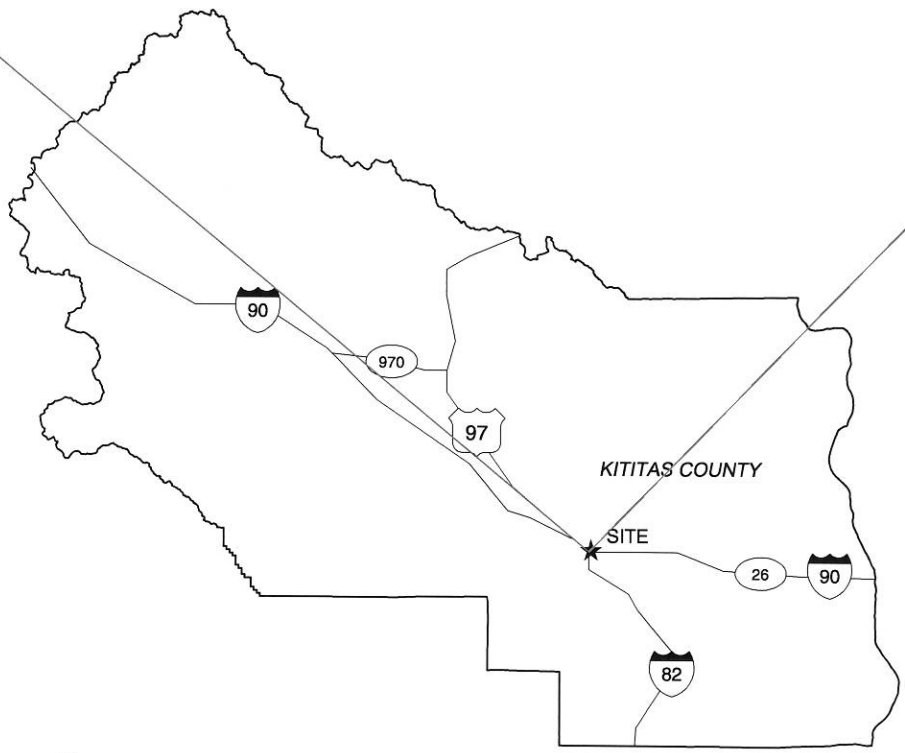
INTRODUCTION

Canyon Road Investors proposes to construct a 90,000 square foot indoor water park. In addition to the waterpark, the project includes an affiliated 404-room attached hotel, restaurant, meeting space complex. The project site is located in the northwest quadrant of the I-90/Canyon Road interchange. A site vicinity map is shown in Figure 1. Figure 2 illustrates the proposed site plan.

METHODOLOGY

This analysis determines the transportation-related impacts associated with the proposed Lakeside Development and was prepared in accordance with direction from City of Ellensburg staff. The study scope and overall study area for this project were selected based on a review of the local transportation system and direction provided by City staff.





- Study Intersections

SITE VICINITY MAP
ELLENSBURG, WASHINGTON

Figure
1

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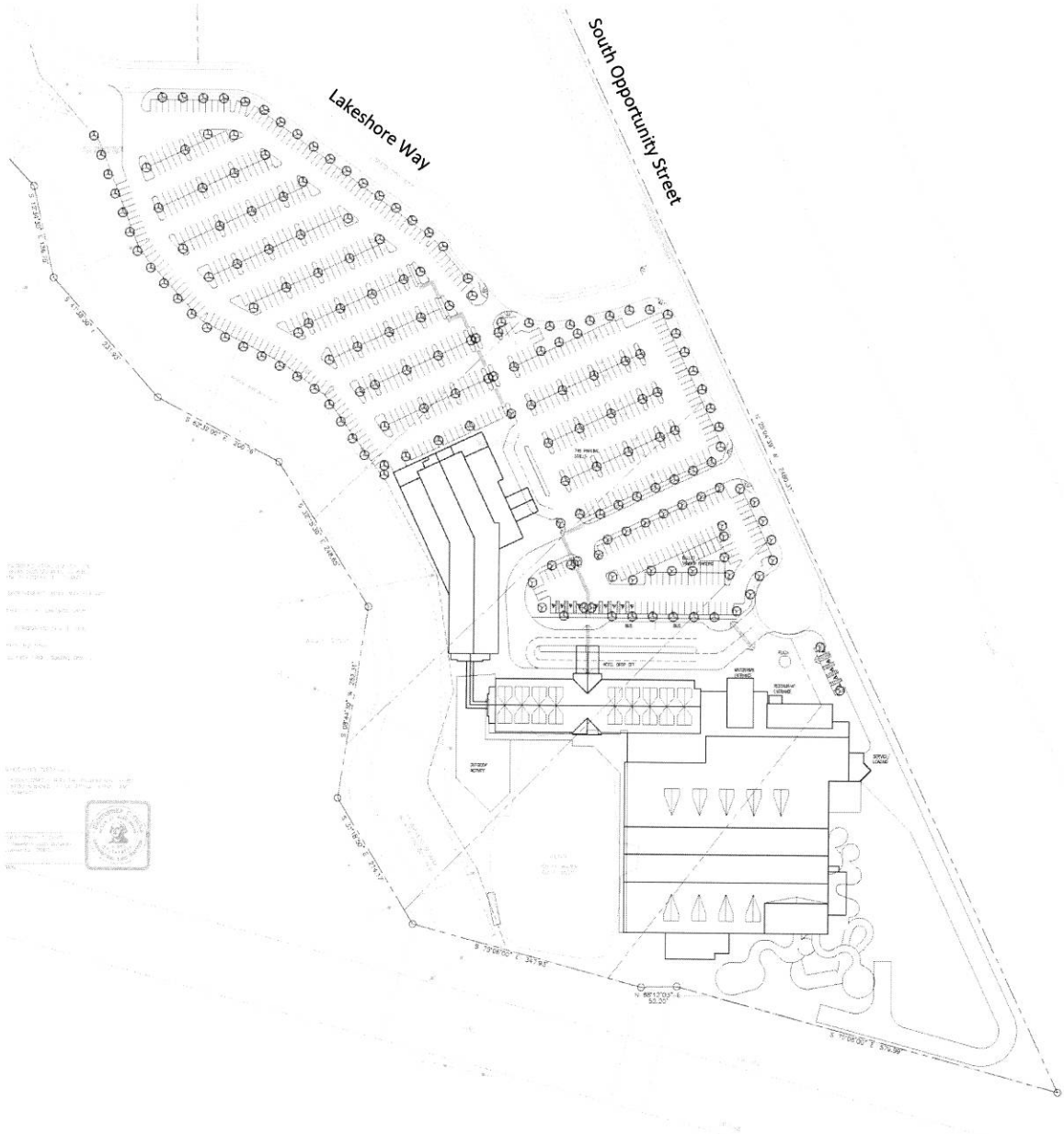
Figure 2 – Proposed Site Plan (as supplied by Canyon Road Investors 3/25/15)



This transportation impact study was prepared to address the following:

- Existing land use and transportation system conditions within the site vicinity during the weekday p.m. peak hour;
- Planned developments and transportation improvements in the study area;
- Forecast year 2016 background traffic conditions at the study intersections during the weekday p.m. peak hour;
- Trip generation and distribution estimates for the proposed development;
- Forecast year 2016 total traffic conditions at the study intersections during the weekday p.m. peak hour, assuming full build-out of the site as proposed; and,

Operational analyses were performed at the following intersections in the site vicinity:

- Canyon Road/East Mountain View Avenue
- East Mountain View Avenue/Ruby Street
- Umptanum Road/Lakeshore Way
- Umptanum Road/South Opportunity Street
- Umptanum Road/Canyon Road
- Umptanum Road/Ruby Street
- Canyon Road/I-90 Eastbound Ramp Terminal
- Canyon Road/I-90 Westbound Ramp Terminal

Applicable Operating Standards and Analysis Methodology

Per the City of Ellensburg Comprehensive Plan, LOS C applies to all of the study intersections with the exception of the Canyon Road/I-90 Eastbound and Westbound ramp terminals which are expected to operate at LOS D per WSDOT standards for intersections in urban areas.

All level-of-service analyses described in this report were performed in accordance with the procedures stated in the *2000 Highway Capacity Manual* (2000 HCM, Reference 1). The analysis herein evaluates the peak 15-minute flow rate during the peak hour analysis period. For this reason, the analyses reflect conditions that are only likely to occur for 15-minutes out of each average peak hour and will likely operate more efficiently during the other times of day.

The study intersections were analyzed using the Synchro8 software package. Level of service for signalized intersections in this report was based on a weighted average vehicle control delay for the intersection while the analyses for two-way stop-controlled intersections were based on the intersection's ability to accommodate the most difficult, or critical, approach or movement as overall intersection level of service is not defined by the 2000 HCM.

EXISTING CONDITIONS

The existing conditions analysis identifies site conditions and the current operational and geometric characteristics of roadways within the study area. The purpose of this section is to set the stage for a basis of comparison to future conditions.

Kittelson & Associates, Inc. (KAI) staff visited and inventoried the proposed development site and surrounding study area in November 2014. At that time, information was collected regarding site conditions, adjacent land uses, existing traffic operations, and transportation facilities in the study area.

Transportation Facilities

Table 1 summarizes the existing transportation characteristics of the key roadways located within the general study area. Figure 3 illustrates the existing lane configurations and traffic control devices in place at the study intersections.

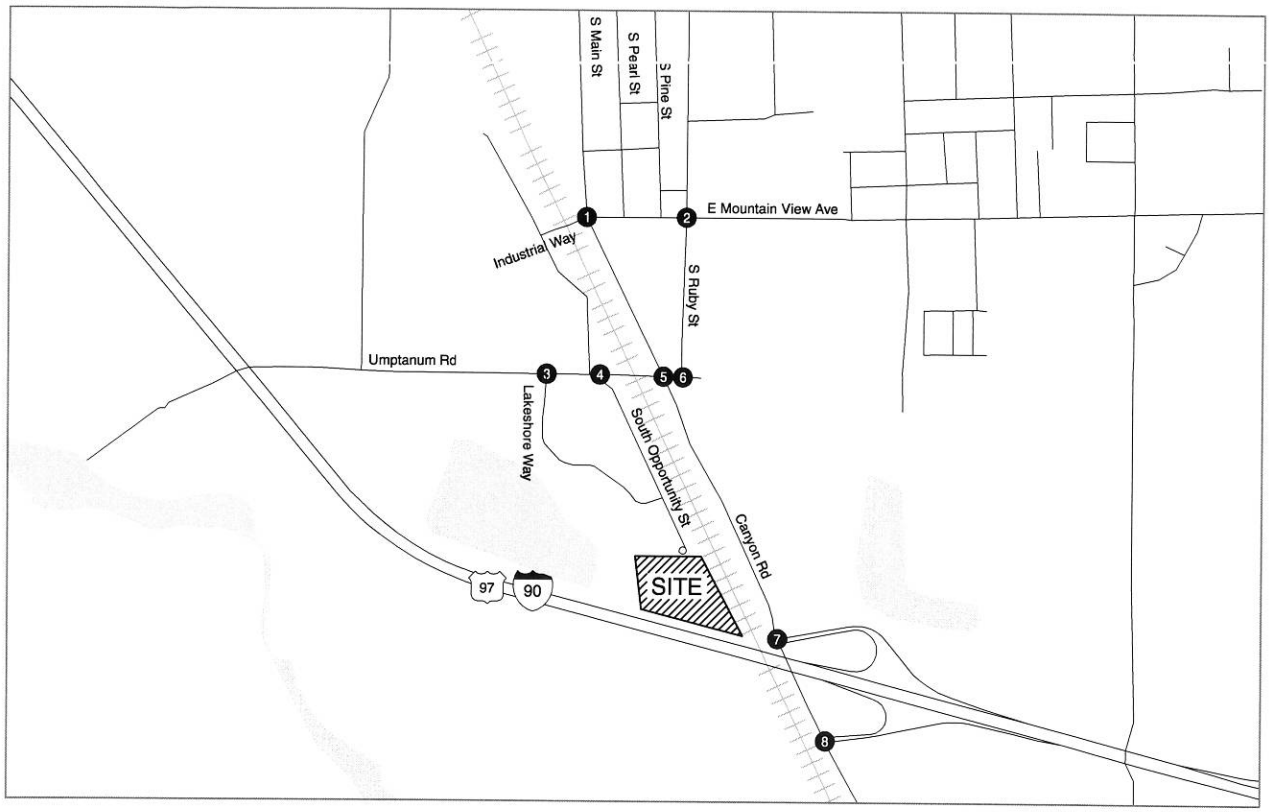
Table 1 - Existing Transportation Facilities

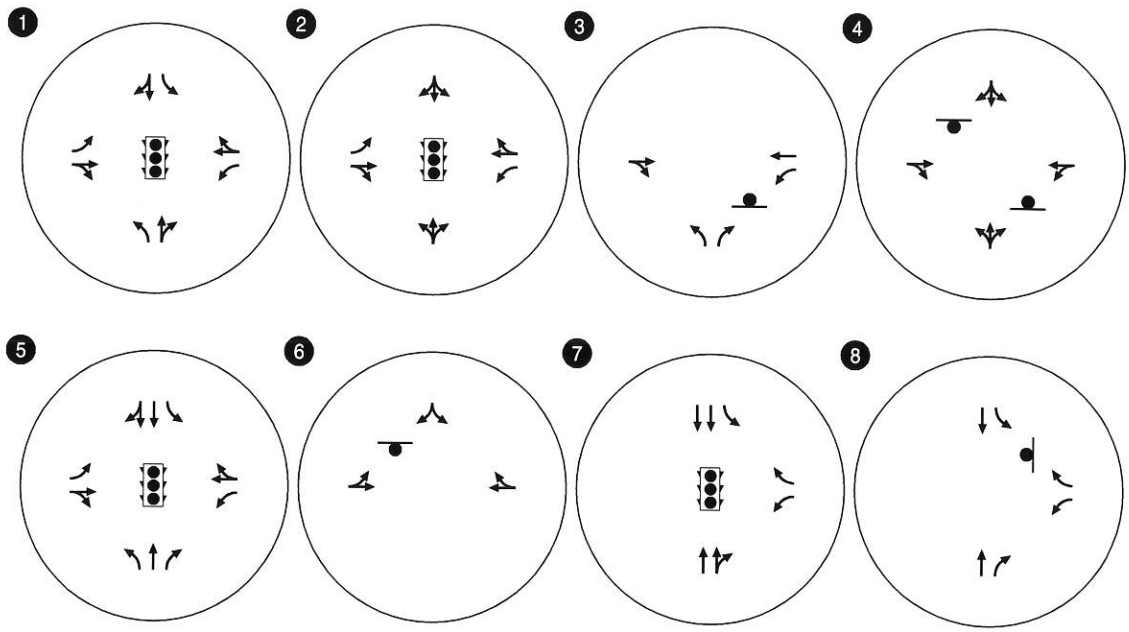
Roadway	Classification	Cross Section	Speed Limit (mph)	Sidewalks	Bicycle Lanes	Median	On-street parking
Canyon Road	Urban Principal Arterial	3-5 lanes	35	Yes	No	TWLTL[1]	No
Mountain View Avenue	Urban Minor Arterial	3 lanes	25	Yes	Yes	TWLTL	No
Umptanum Road	Urban Minor Arterial	3 lanes	25	Yes	No	TWLTL	No
Ruby Street	Urban Collector	2 lanes	25	Yes	Yes	None	No
Lakeshore Way	Local	2 lanes	Not posted	Yes	No	None	Yes
South Opportunity Street	Local	2 lanes	Not posted	Yes	No	None	No

[1]TWLTL: Two-way left-turn lane

Pedestrian and Bicycle Facilities

All streets in the site vicinity have sidewalks on both sides of the road with the exception of a short segment of Umptanum Road between Canyon Road and South Opportunity Street. Bicycle lanes are striped on both sides of Mountain View Avenue and Ruby Street. However, bicycle lanes are not striped on either side of Canyon Road or Umptanum Road. Both Lakeshore Way and South Opportunity Street are classified as local streets and as such do not require bike lanes.





- STOP SIGN
- TRAFFIC SIGNAL

EXISTING LANE CONFIGURATIONS AND TRAFFIC CONTROL DEVICES ELLENSBURG, WASHINGTON

Figure **3**

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Existing Traffic Volumes and Peak Hour Operations

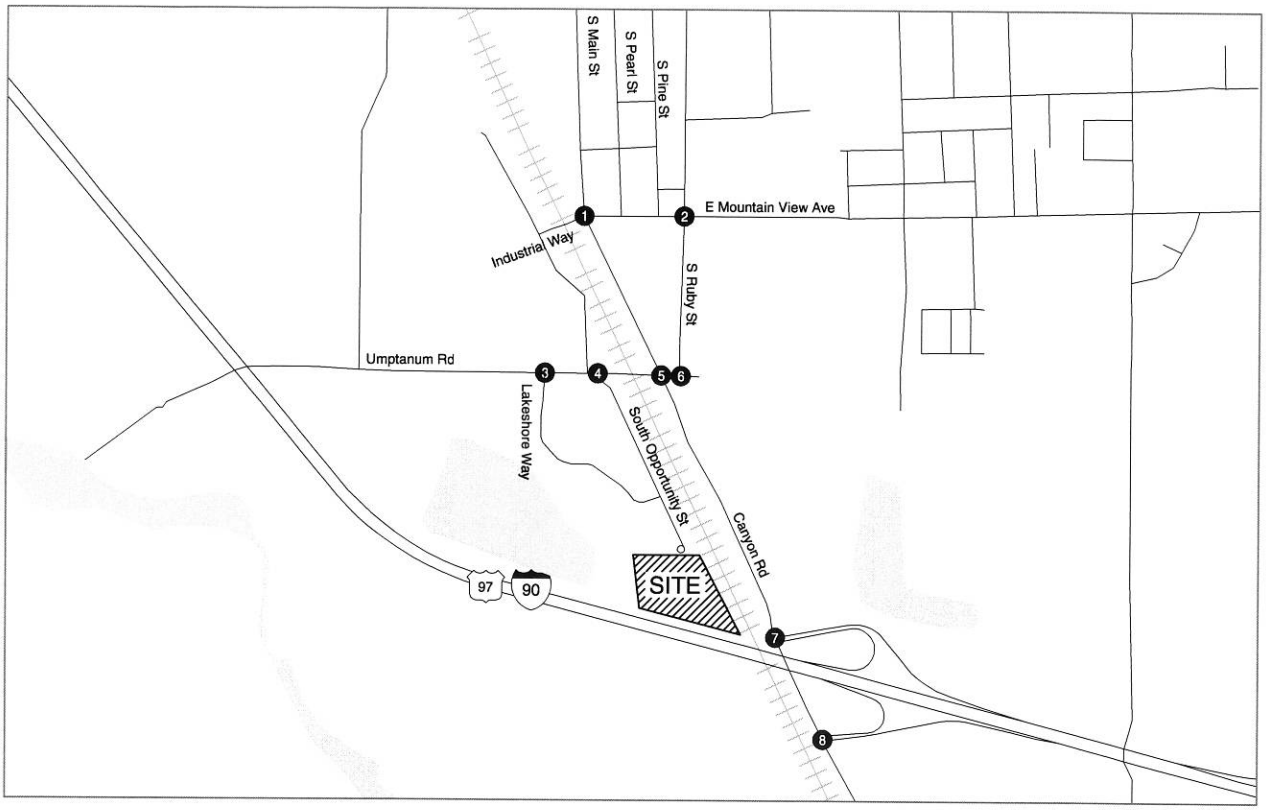
Manual turning movement counts were conducted at the study intersections in November 2014 *(Appendix "A" includes the traffic count data used in this study)*. Per conversations with City of Ellensburg staff, traffic counts were conducted during the weekday evening (4:00 – 6:00 p.m.) peak time period. The local system evening peak hour was found to occur between 4:30 p.m. and 5:30 p.m. Figure 4 provides a summary of the existing turning movement counts at each of the study intersections during the weekday p.m. peak hour. As shown in Figure 4, all of the study intersections are operating at level of service (LOS) "B" during the weekday p.m. peak hour, thereby meeting City and State standards. *Appendix "B" includes the Existing Conditions Analysis Worksheets.*

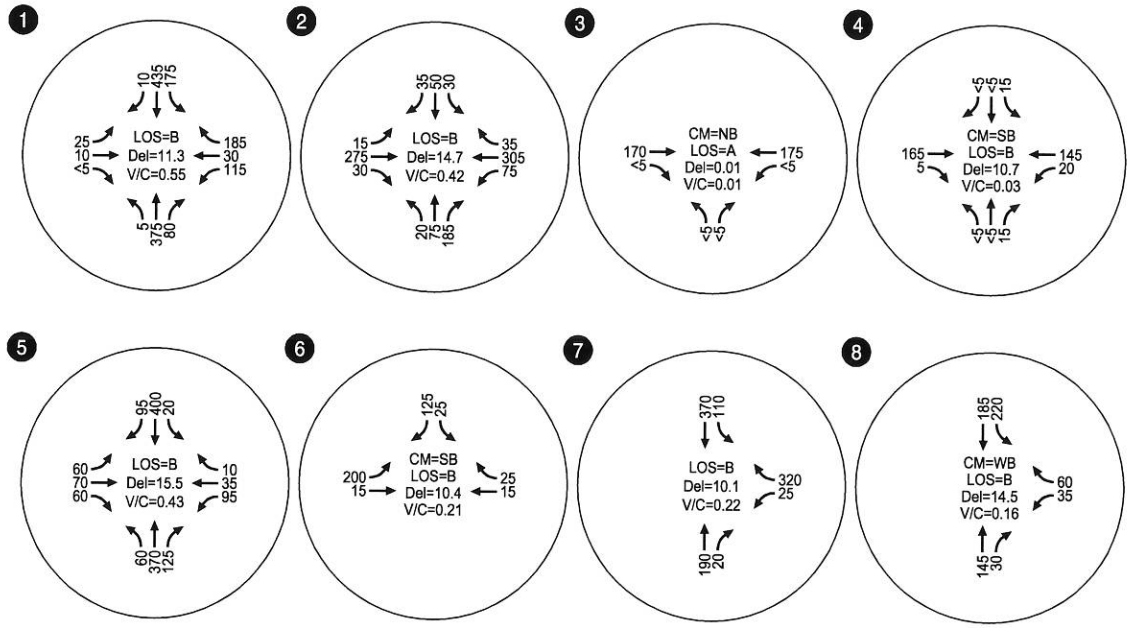
Umptanum Road/Ruby Street Intersection

Although the Umptanum Road/Ruby Street intersection is operating at LOS B, field observations noted instances of queues extending east to Ruby Street from the Umptanum Road/Canyon Road intersection. This queue spillback periodically occurs during the PM Peak hour, thereby restricting the southbound right-turn movement from Ruby Street onto Umptanum Road. However, the frequency of this queue spillback is sporadic during the weekday p.m. peak hour and the vehicle queue was observed to consistently clear on every signal cycle. Further, there is sufficient queue storage for southbound vehicles on Ruby Street to avoid any impacts to additional intersections to the north.

Umptanum Road/Canyon Road Intersection

The eastbound approach at the Umptanum Road/Canyon Road intersection is currently striped to include a separate left-turn lane and a shared through/right-turn lane. The amount of vehicle storage available for this approach is constrained by two factors. First, there is an existing BNSF railroad line that crosses Umptanum Road approximately 100 feet west of the Umptanum Road/Canyon Road intersection. This crossing effectively reduces the amount of storage in the left-turn lane to approximately 75 feet. Second, the south side of Umptanum Road is currently unimproved between Canyon Road and South Opportunity Street, resulting in the overall Umptanum Road cross section being reduced to single travel lanes in each direction with no ability to extend the eastbound left-turn stacking beyond the railroad crossing. Although existing traffic volumes are relatively low today, field observations noted that on occasion, large trucks and short temporal spikes in traffic demand can sometimes result in longer eastbound left-turn vehicle queues that can extend beyond the railroad crossing. These queues clear quickly and do not seem to materially affect operations at this intersection or intersections to the west along Umptanum road.





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EXISTING CONDITIONS
WEEKDAY PM PEAK HOUR
ELLENSBURG, WASHINGTON

Figure **4**

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TRANSPORTATION IMPACT ANALYSIS

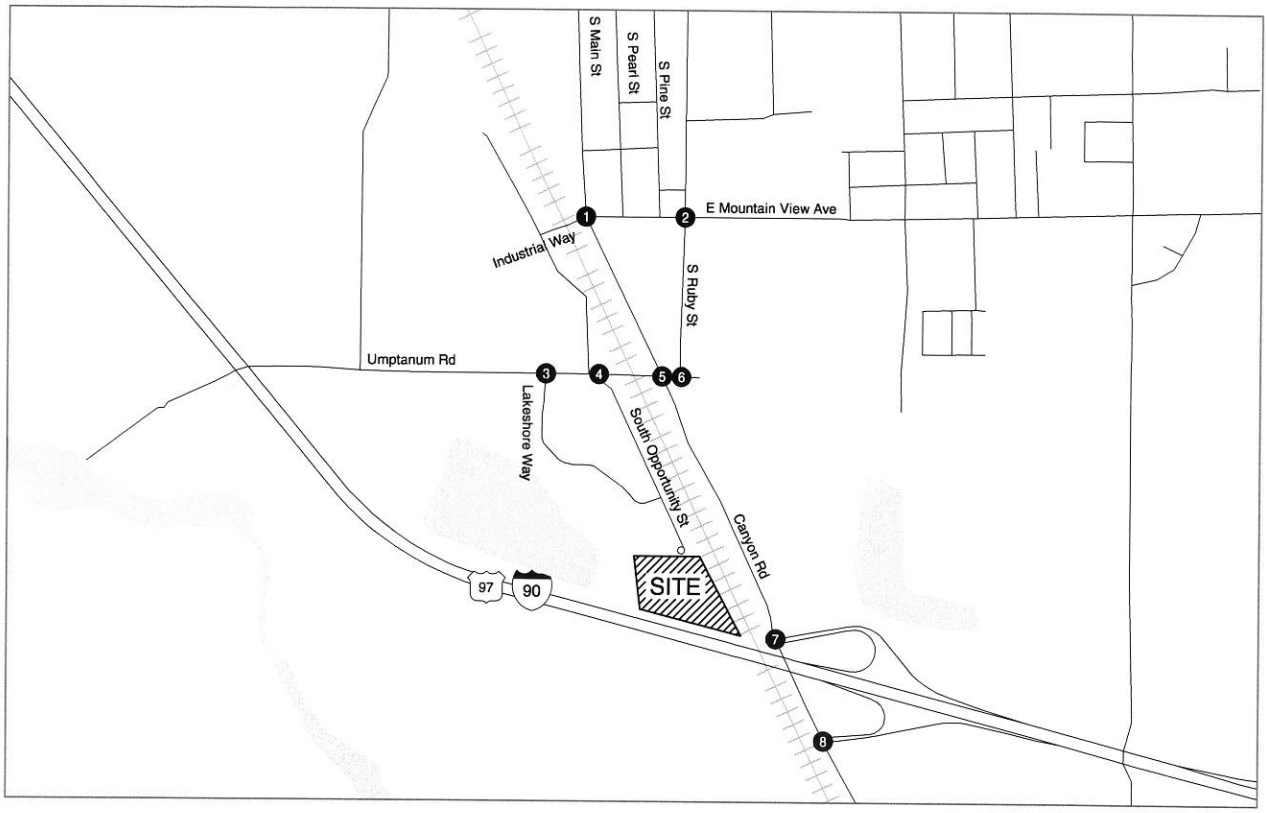
The transportation impact analysis identifies how the study area's transportation system will operate in the year 2016 when the proposed Lakeside Development is expected to be fully built. The impact of site-generated traffic generated during the typical weekday p.m. peak hour was examined as follows:

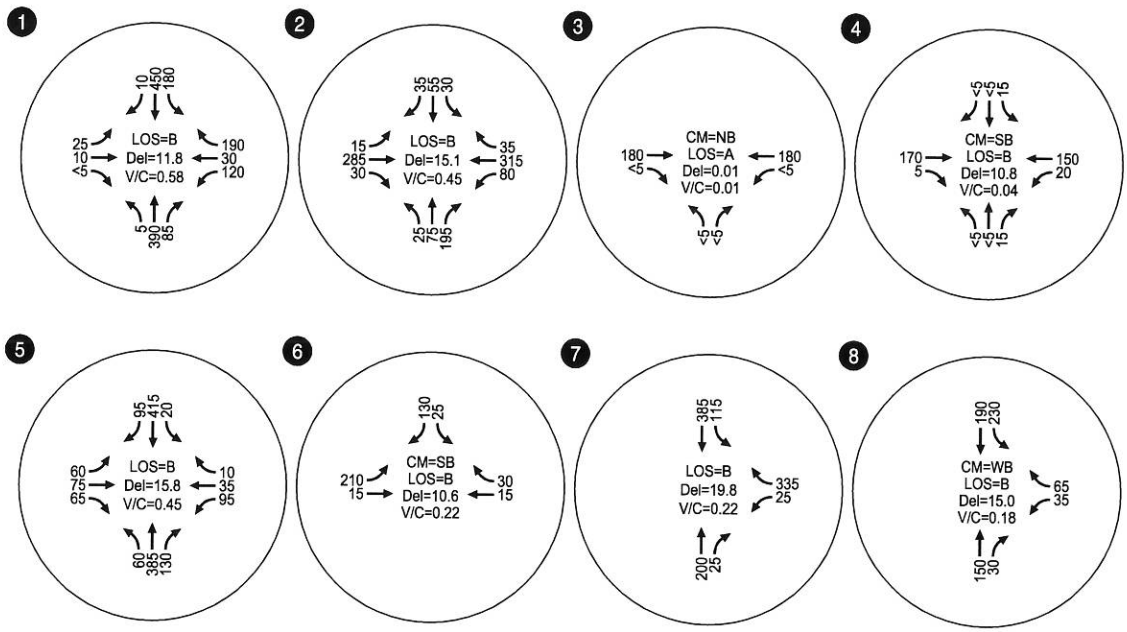
- Background weekday p.m. peak hour traffic conditions for year 2016 were analyzed at each of the study intersections;
- Site-generated trips were estimated for build-out of the site;
- Site trip distribution patterns were derived based on existing travel patterns on the study area roadways, and;
- Year 2016 (build-out year) total traffic conditions were analyzed at each of the study intersections during the weekday p.m. peak hour.

2016 Background Traffic Conditions

The background traffic analysis identifies how the study area's transportation system will operate in the year the proposed Lakeside Development is expected to open (2016). No funded transportation improvement projects were identified in the analysis that would affect the study intersections or access to and from the proposed development site. To account for general traffic growth in the site vicinity, a two percent annual growth rate was assumed and applied to the existing traffic volumes.

Figure 5 illustrates the resulting forecast 2016 background traffic volumes at the study intersections during the weekday p.m. peak hour. As shown in Figure 5, all study intersections are forecast to continue to operate acceptably during the weekday p.m. peak hour. *Appendix "C" contains the year 2016 Background Traffic Conditions Analysis Worksheets.*





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2016 BACKGROUND CONDITIONS
WEEKDAY PM PEAK HOUR
ELLENSBURG, WASHINGTON

Figure **5**

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Proposed Development Plan

Canyon Road Investors is proposing to construct a new 90,000 square foot indoor water park and affiliated hotel complex. The hotel will have a total of 404 rooms that are proposed to be marketed and reserved directly for waterpark guests. Other on-site amenities will include an affiliated arcade, 16,000 square feet of multi-purpose meeting rooms, kids' activity facilities, and a restaurant for water park/hotel guests that will seat approximately 200 people. Access to the site is proposed via driveways located off of Lakeshore Way and South Opportunity Street. Depending on the development review, approval, and construction timeline, a buildout year of 2016 was assumed for traffic analysis purposes.

Trip Generation Estimate

To estimate the trip generation potential of the proposed indoor waterpark/hotel complex, the Institute of Transportation Engineers (ITE) reference *Trip Generation, 9th Edition* (Reference 2) was first consulted. Within this document, a limited-site trip generation study was performed at three indoor water parks in Pennsylvania and Ohio. Using the peak hour of the generator trip rate from these studies (2.03 trips/1,000 sq. ft for the weekday p.m. peak hour and 3.58 trips/1,000 sq. ft. for the Saturday peak hour), Table 2 summarizes the weekday p.m. peak hour trip generation estimate for the proposed 90,000 square-foot water park and indicates that the complex could generate approximately 185 weekday p.m. peak hour trips and 320 Saturday peak hour trips.

Table 2 –*Trip Generation, 9th Edition* Trip Generation Estimate

Land Use	ITE Code	Size (sq. ft.)	Weekday PM Peak Hour			Saturday Peak Hour		
			Total	In	Out	Total	In	Out
Water Slide Park	414	90,000	185	90	95	320	220	100

In recognition of the uniqueness of the proposed indoor waterpark/hotel complex and the lack of detail associated with the limited study ITE trip generation data, a second trip generation estimate was developed. Based on conversations with the development team, the proposed indoor water park/hotel is proposed to be marketed in two distinct ways. First, with the attached hotel, the waterpark will be run primarily as a destination attraction for multiple day/overnight guests from the larger northwest market base. To accommodate the local customer base, it will be secondarily marketed as a day use attraction. It is not known whether the three study sites referenced in the ITE *Trip Generation* have similar characteristics. For this reason, it was determined that a trip generation estimate based on observed travel patterns at a regionally known and understood waterpark/hotel complex would provide a more defensible trip generation estimate.

A review of existing regional facilities revealed that the Great Wolf Lodge in Grand Mound, WA comes close to matching the proposed scale, general business model, and geographic proximity of the proposed waterpark/hotel complex in Ellensburg. The Great Wolf Lodge is marketed as a destination attraction, has a similar sized waterpark, and a comparable 398-room attached hotel. Given the similarities, weekday and Saturday traffic counts were conducted at the Great Wolf Lodge site access

driveways on March 26th and March 28th, 2015[1]. The traffic count detail summary sheets are provided in Appendix A. Based on this observed data and the comparable number of hotel rooms, a trip generation rate of 0.67 trips per room was calculated for the weekday p.m. peak hour and a trip generation rate of 1.03 trips per room was calculated during the Saturday peak hour of the generator. Using these rates, Table 3 estimates the weekday p.m. and Saturday peak hour trip generation estimate for the proposed waterpark/hotel complex.

Table 3 - Trip Generation Estimate

Land Use	Rate (trips/room)	Size (# of rooms)	Weekday PM Peak Hour			Saturday Peak Hour		
			Total	In	Out	Total	In	Out
Hotel and Waterpark	0.67 (Weekday PM Peak Hour) 1.03 (Saturday Peak Hour of the Generator)	404	271	144	127	415	246	169

As shown in Table 3, the proposed 404-room waterpark/hotel is estimated to generate approximately 270 weekday p.m. peak hour trips and 415 Saturday peak hour trips.

Trip Distribution/Assignment

The distribution of the Table 3 site-generated trips onto the study area roadway system was based primarily off of the project's detailed marketing plan. This plan is projecting that the majority of the water park customer base is expected to be oriented to points west of Ellensburg (the Seattle market) and points south of Ellensburg (the Yakima/Tri-Cities market) The resulting trip distribution pattern and assignment of site-generated traffic during the weekday p.m. peak hour is shown in Figure 6.

2016 Total Traffic Conditions

The total traffic conditions analysis forecasts how the study area's transportation system will operate with the inclusion of traffic from the proposed water park/hotel. The 2016 background traffic volumes for the weekday p.m. peak hour shown in Figure 5 were added to the estimated site-generated traffic shown in Figure 6 to arrive at the total traffic volumes shown in Figure 7.

As shown in Figure 7, all of the study intersections are forecast to continue to operate acceptably during the weekday p.m. peak hour analysis period. While the intersection of Umptanum Road and Canyon Road operates acceptably overall, the westbound approach is forecast to operate at a LOS "F" under these conditions. Additional detail regarding this intersection is provided in the following section. *Appendix "D" contains the year 2016 Total Traffic Conditions Analysis Worksheets.*

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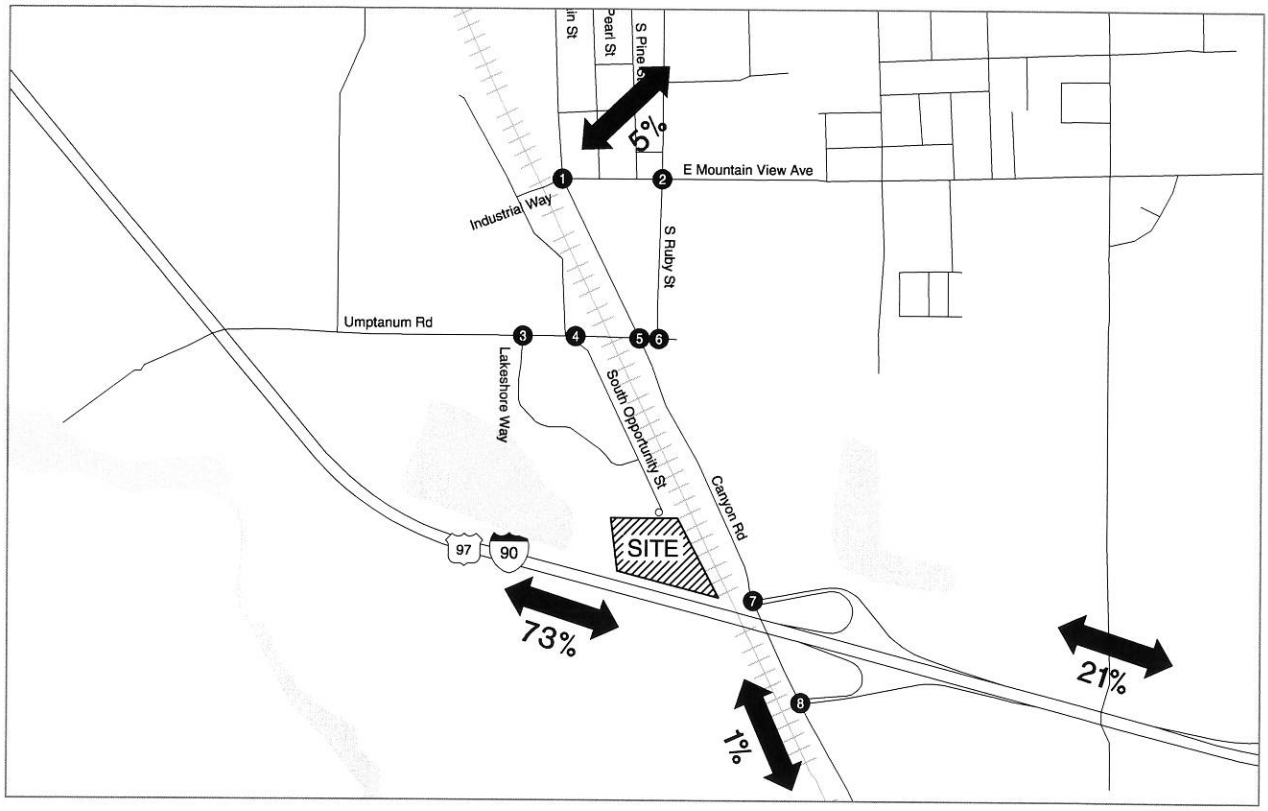
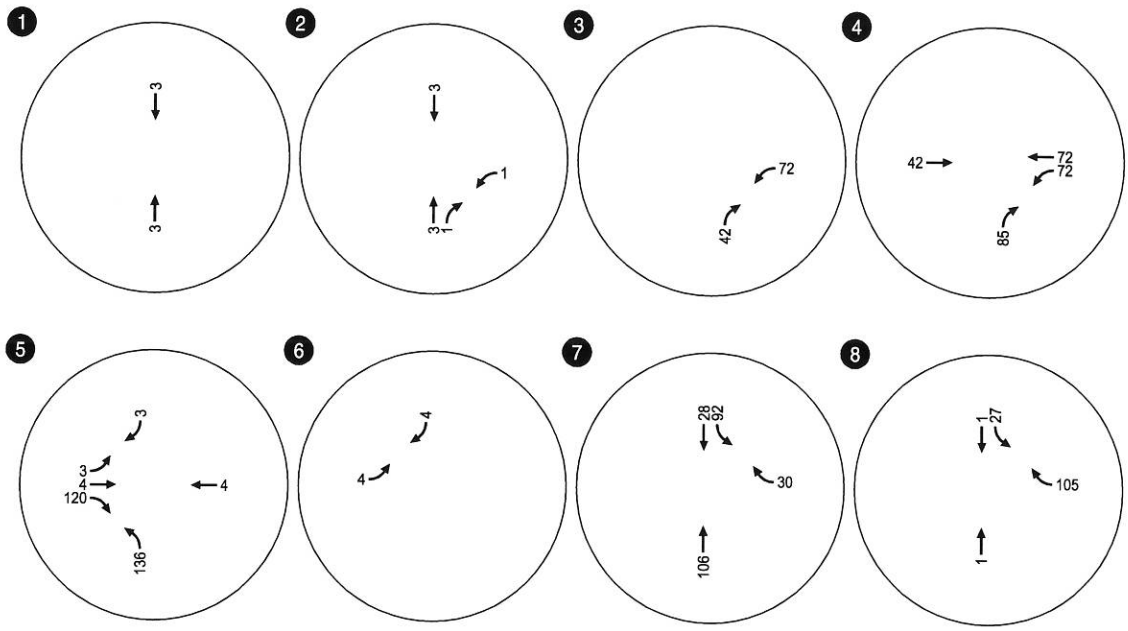
[1] It should be noted that both March 26th and March 28th were within the Spring Break period for most Oregon school districts and a few Washington school districts. As such, these traffic counts are likely to be higher than other times of the year and therefore should be considered conservative.





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SITE GENERATED TRIPS
WEEKDAY PM PEAK HOUR
ELLENSBURG, WASHINGTON

Figure **6**

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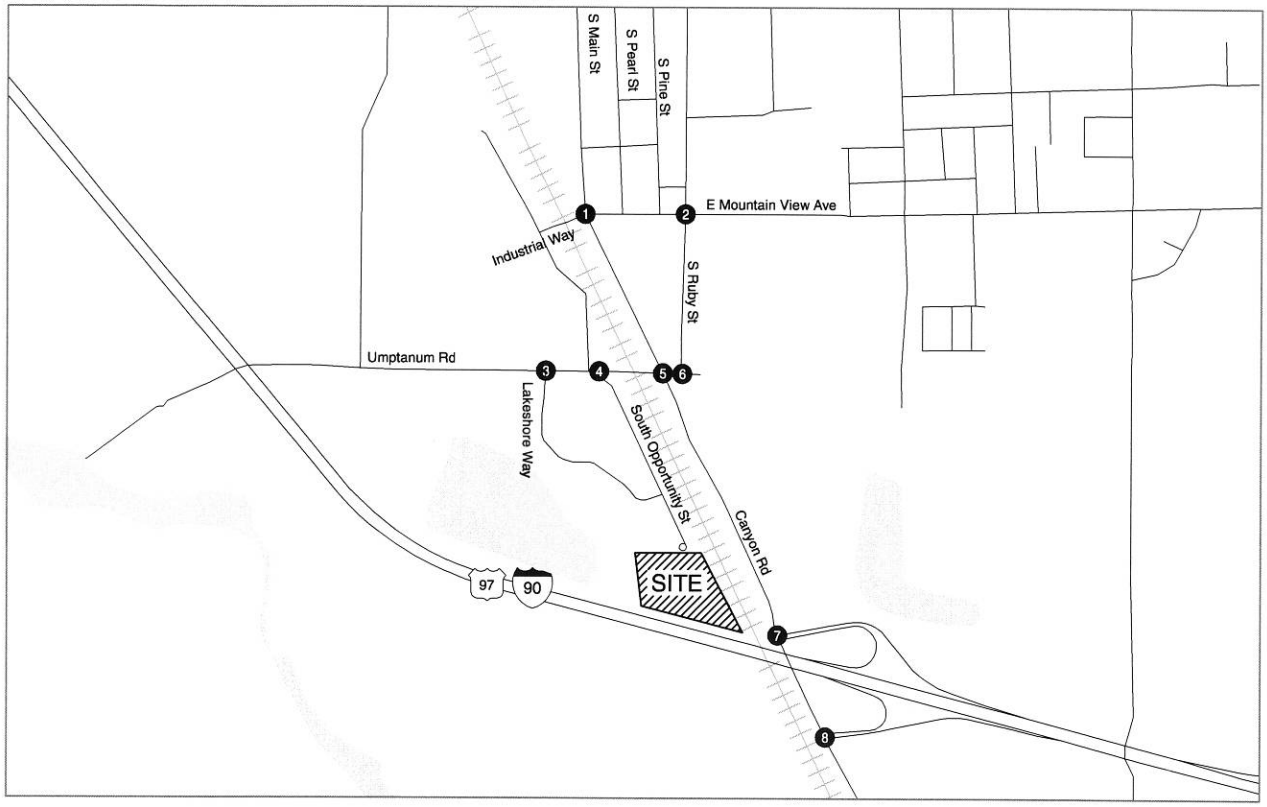

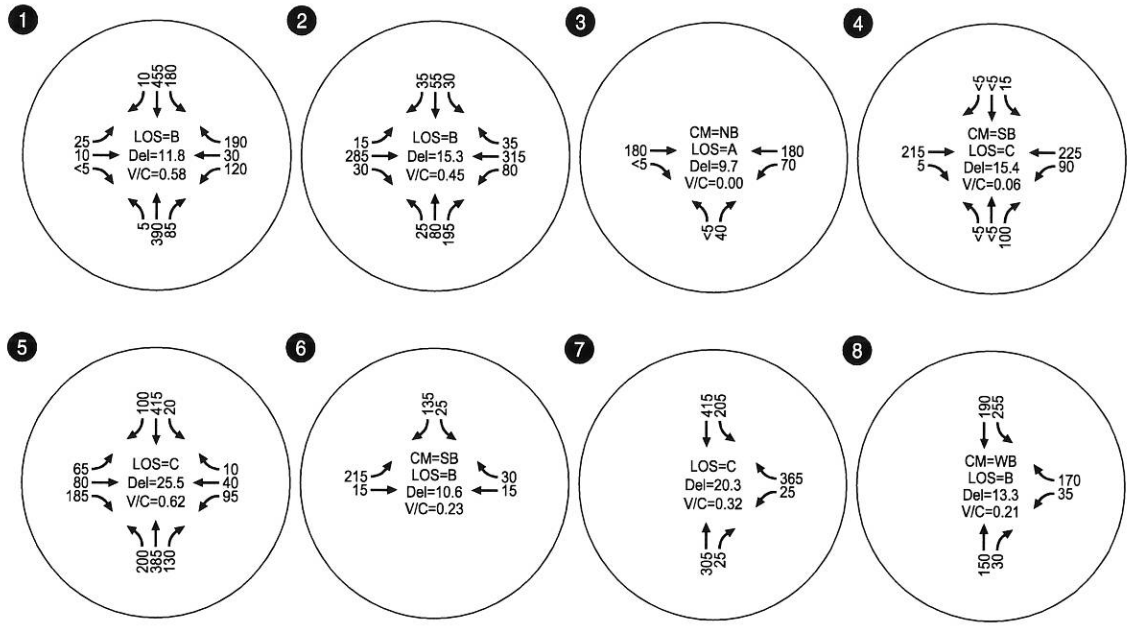

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2016 TOTAL CONDITIONS
WEEKDAY PM PEAK HOUR
ELLENSBURG, WASHINGTON

Figure **7**

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Umptanum Road/Canyon Road Intersection Mitigation

Under total traffic conditions, the Umptanum Road/Canyon Road intersection as a whole is forecast to operate at LOS C conditions. However, the westbound left-turn movement is forecast to operate at LOS F conditions. The high levels of delay can be attributed to the existing permissive east-west signal phasing and the additional traffic being generated by the proposed waterpark/hotel on the eastbound approach. Following a detailed review of the existing signal timing, it was determined that one form of mitigation for these conditions is to actuate the coordinated phases along Canyon Road. This signal timing modification would then allow excess green time to be reallocated to the east and west Umptanum Road approaches[2]. Table 4 summarizes the impact of actuating the coordinated phase along Canyon Road and shows the westbound left-turn movement would operate at LOS D conditions. *Appendix "E" contains the year 2016 Total Traffic Conditions Analysis Worksheets under the proposed mitigated conditions.*

Table 4 - Mitigated PM Peak Hour Operations

Scenario	Intersection			Westbound Movement		
	LOS	Delay	V/C	LOS	Delay	V/C
Existing Timing	C	25.5	0.62	F	88.4	1.03
Revised Timing	C	20.7	0.58	D	36.2	0.75

Queuing Analysis at the Umptanum Road/Canyon Road Intersection

As previously noted, the existing eastbound approach to the Umptanum Road/Canyon Road intersection is currently striped to include a short eastbound left-turn lane and a shared eastbound through/right-turn lane. The length of the eastbound left-turn lane is limited by the adjacent railroad crossing and the fact that Umptanum Road is not fully improved along the south side between Canyon Road and South Opportunity Street. In recognition of this condition and the fact that this approach provides the primary egress from the proposed water park/hotel, a detailed vehicle queuing analysis was prepared using SimTraffic software with the revised signal timing. The resulting queuing analysis is summarized in Table 5.

[2] It is recognized that actuating the coordinated phases along Canyon Road may also require modifications at other upstream coordinated signals along the Canyon Road corridor.

Table 5 - 95th Percentile Queue Estimates – Umptanum Road/Canyon Road Intersection

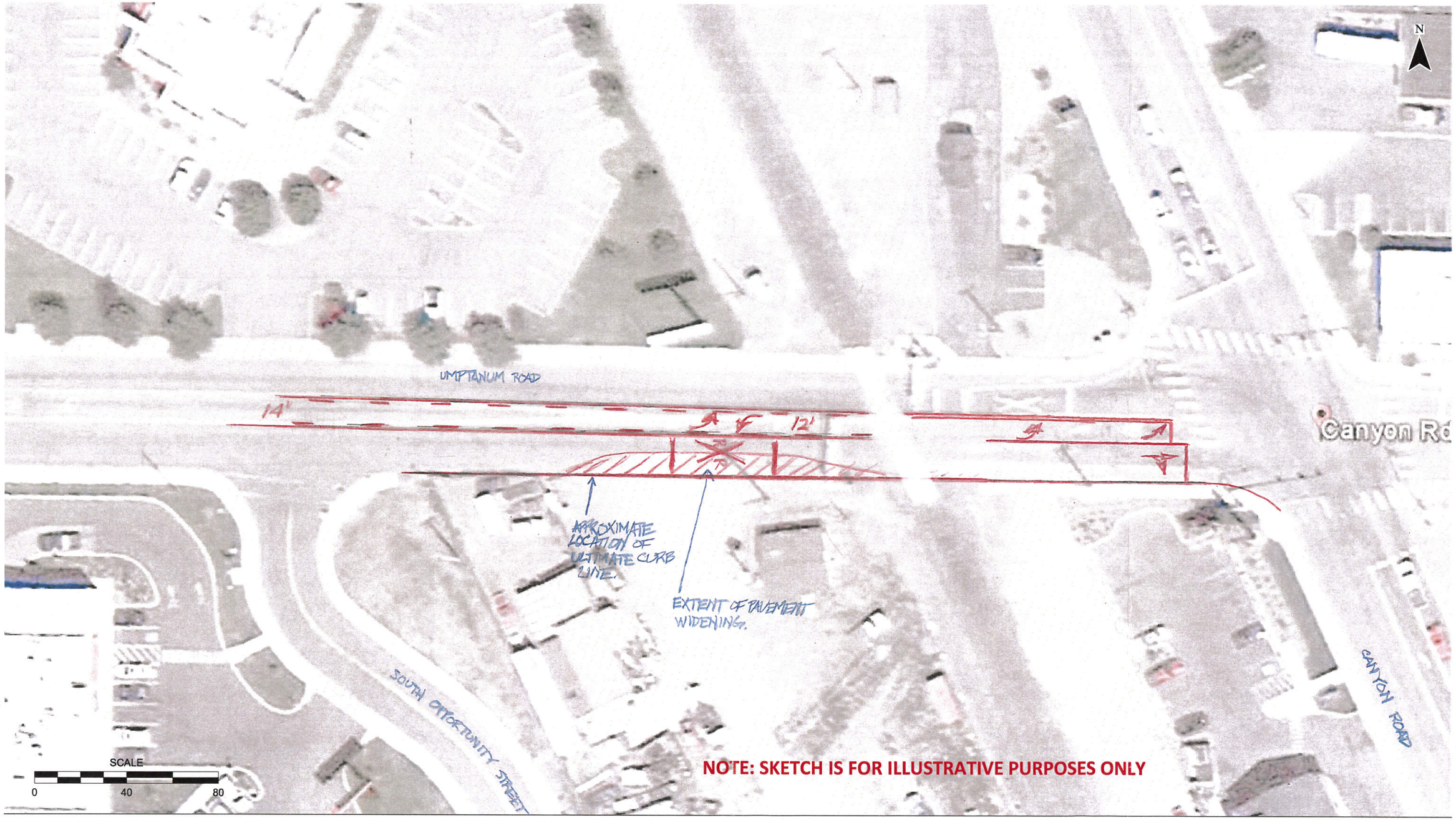
Approach	Movement	Available Storage (feet)	95th Percentile Queue (feet)
Eastbound	Left-turn	75	**100[1]**
	Through/Right-Turn Lane	300	**200[2]**
Northbound	Left-turn	250	**225**

[1]The location of the adjacent railroad crossing along Umptanum Road is close enough to the Canyon Road intersection such that it effectively lengthens the estimated vehicle queue lengths along the eastbound approach. Factoring in the area where vehicles are encouraged to not stop on the tracks, the 95th percentile eastbound left-turn vehicle queue is likely in excess of 100 feet.

[2] Factoring in the area where vehicles are encouraged to not stop on the tracks, the 95th percentile eastbound through/right-turn vehicle queue is likely in excess of 200 feet.

As shown in Table 5, the 95th percentile vehicle queue for the eastbound through/right-turn lane is estimated to be approximately 200 feet long (250 feet long when accounting for the lost storage from the railroad crossing) while the eastbound left-turn queue is estimated to be approximately 100 feet long (150 feet long when accounting for the lost storage from the railroad crossing). As a result of these findings, the eastbound through/right-turn vehicle queue is estimated to block access to the eastbound left-turn lane, thereby increasing the delay on this approach. To mitigate these conditions, it is recommended that Umptanum Road be widened to include a full three-lane cross section between Canyon Road and South Opportunity Street. This widening will provide for a full width center lane between Canyon Road and South Opportunity Street, thereby better accommodating access to the eastbound left-turn lane at the Umptanum Road/Canyon Road intersection. A concept sketch of this improvement and the recommended lane striping is shown in Figure 8.

As shown in Figure 8, the proposed widening will extend the edge of pavement along the south side of Umptanum Road up to the existing right-of-way line. Although a formal survey has not been completed, preliminary research suggests that the existing right-of-way line is at the approximate location of the ultimate future curb line. In recognition that the adjacent property is not owned by the proposed development, it is recommended that the associated curb and sidewalk improvements be constructed at a future date when the adjacent property redevelops.



UMPTANIUM ROAD IMPROVEMENT CONCEPT SKETCH
ELLENSBURG, WASHINGTON

Figure **8**

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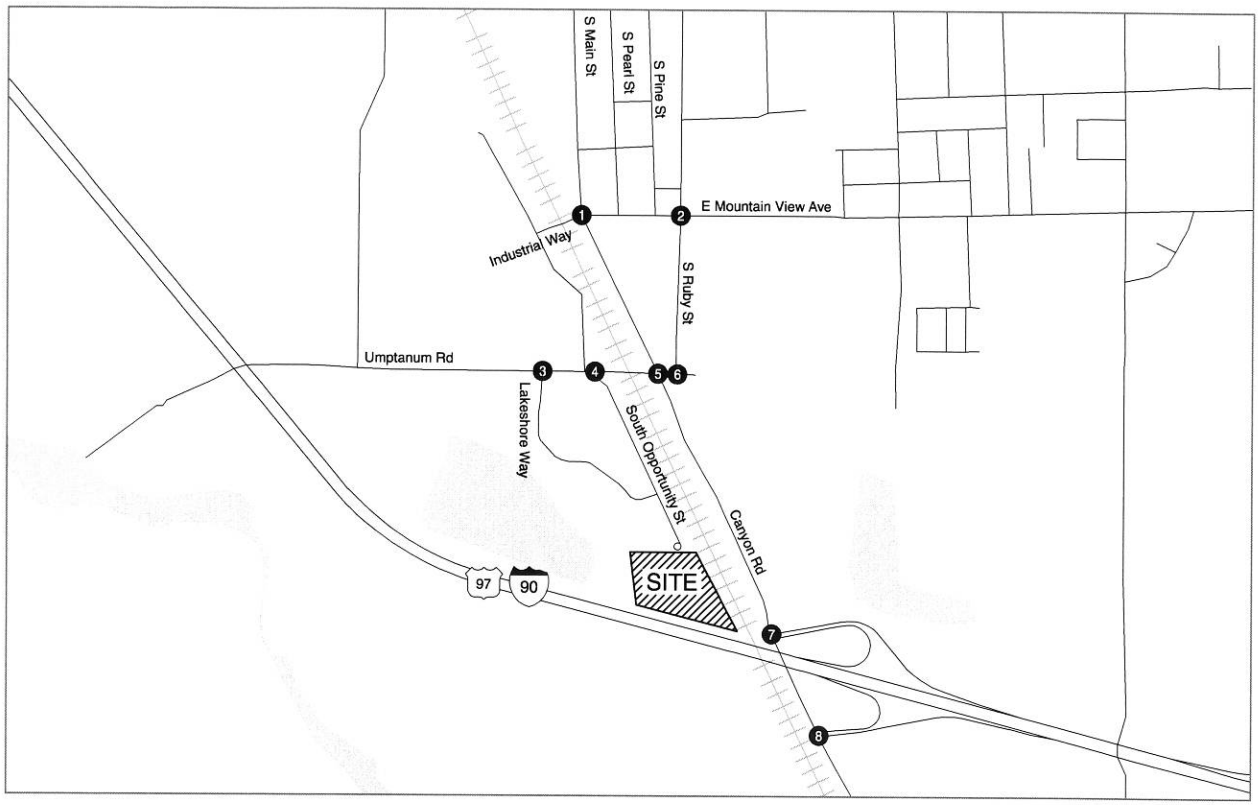
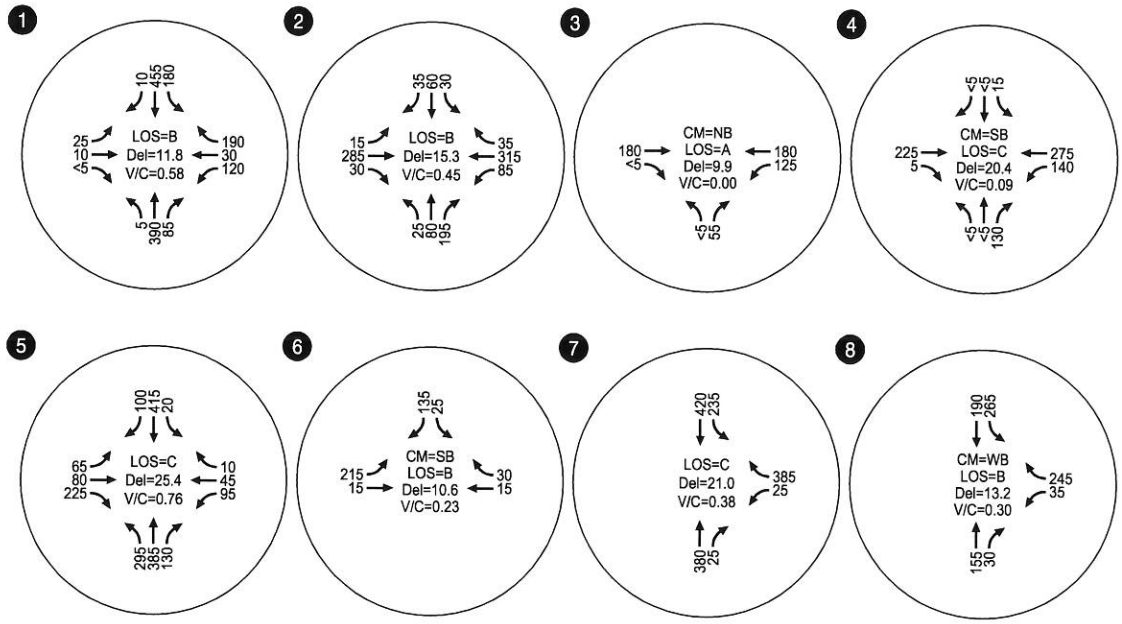
It is also assumed based on field measurements that the recommended pavement widening will not impact the existing railroad crossing arms on the south side of Umptanum Road. However, with the pavement widening, it is recommended (pending concurrence from BNSF) that a temporary flexible barrier be constructed around the railroad crossing arms similar to the barrier that was constructed around the crossing arms on the north side of Umptanum Road.

Saturday Total Traffic Conditions

At the request of the City of Ellensburg, a Saturday peak hour analysis was performed at the study intersections. Unfortunately by the time this request was made, all of the intersection turning movement counts had been performed. As such, the Saturday peak hour trip generation rate summarized in Table 3 was distributed onto the 2016 background weekday p.m. peak hour volumes. Given that the weekday p.m. peak hour volumes are likely to be significantly higher than the actual Saturday peak hour volumes, this methodology represents an ultra-conservative estimate of Saturday peak hour operations. The results of the Saturday peak hour operations are summarized in Figure 9 and illustrate that all of the study intersections are forecast to likely operate at acceptable levels with the revised signal timing. *Appendix "E" contains the year 2016 Total Saturday Traffic Conditions Analysis Worksheets.*





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Del = INTERSECTION AVERAGE CONTROL DELAY (SIGNALIZED)/CRITICAL MOVEMENT CONTROL DELAY (UNSIGNALIZED)
V/C = CRITICAL CRITICAL VOLUME-TO-CAPACITY RATIO

2016 TOTAL CONDITIONS (REVISED SIGNAL TIMING)
SATURDAY PEAK HOUR
ELLENSBURG, WASHINGTON

Figure **11**

K:\H_Portland\proj\file\18394 - Lakeside Development\dwgs\figs\18394_figure_001Rev.dwg Apr 16, 2015 - 9:11am - jminer Layout Tab: Fig 11 - 2016 Saturday Total Revised Timing

FINDINGS AND RECOMMENDATIONS

Based on the results of this transportation impact analysis, the proposed Lakeside Development can be developed while maintaining acceptable levels of service at the study intersections. The primary findings and recommendations of this study are summarized below.

Findings

Existing Conditions

- All of the study intersections currently operate acceptably during the weekday p.m. peak hour.

2016 Background Conditions

- All of the study intersections are forecast to continue to operate acceptably during the 2016 weekday p.m. peak hour.

Proposed Development

- The proposed Lakeside Development is estimated to generate approximately 185 trips during the weekday p.m. peak hour using a more conservative trip generation rate from ITE's *Trip Generation*.

2016 Total Traffic Conditions

- All of the study intersections are forecast to operate acceptably during the weekday p.m. peak hour. However, However, the westbound left-turn movement is forecast to operate at LOS F conditions. The high levels of delay can be attributed to the existing permissive east-west signal phasing and the additional traffic being generated by the proposed waterpark/hotel on the eastbound approach. A potential mitigation for this condition is noted in the following Recommendations section.
- Vehicle storage lengths are limited along the eastbound approach to the Umptanum Road/Canyon Road intersection due to the railroad tracks and lack of a full three-lane section between Canyon Road and South Opportunity Street. The estimated 95th percentile vehicle queues are forecast to exceed the available storage lengths on this approach during the weekday p.m. peak hour. A potential mitigation for this condition is noted in the following Recommendations section.

Recommendations

Based on the results of the analysis summarized in this report, the following improvements are recommended in conjunction with site development.

- Following a detailed review of the existing signal timing, it was determined that one form of mitigation for these conditions is to actuate the coordinated phases along Canyon Road. This signal timing modification would then allow excess green time to be reallocated to the east and west Umptanum Road approaches. With this modification, the weekday p.m. peak hour would operate at LOS D conditions which matches the forecast 2016 Background traffic conditions. Before implementing this modification, additional coordination will be needed with City staff to determine if there are any other signal system modifications needed along the Canyon Road corridor.
- Extend the edge of pavement along the south side of Umptanum Road up to the existing right-of-way line. Modify the roadway striping in order to establish a full three-lane cross section between Canyon Road and South Opportunity Street. Construct a temporary barrier to protect the existing railroad crossing arms along the south side of Umptanum Road.

We trust that this letter adequately addresses the traffic impacts associated with the proposed Lakeside Development in Ellensburg, Washington. Please contact us if you have any questions or comments regarding the contents of this report or the analyses performed.

Sincerely,
KITTELSON & ASSOCIATES, INC.

Matt Hughart, AICP
Associate Planner

Senior Principal Engineer

REFERENCES

1. Transportation Research Board. Highway Capacity Manual. 2000.
2. Institute of Transportation Engineers. *Trip Generation, 9th Edition.* 2012.

APPENDICES

A. Traffic Count Data
B. Existing Traffic Operations
C. Year 2016 Background Traffic Operations Worksheets
D. Year 2016 Total Traffic Operations Worksheets
E. Great Wolf Lodge Driveway Traffic Count Data

Appendix A
Traffic Count Data

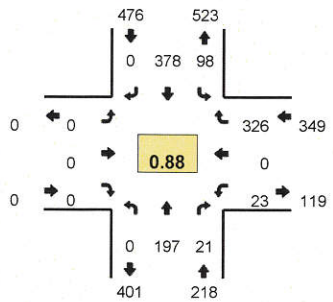
Type of peak hour being reported: Intersection Peak

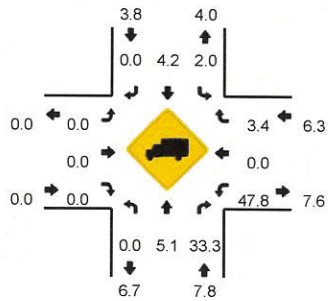
Method for determining peak hour: Total Entering Volume

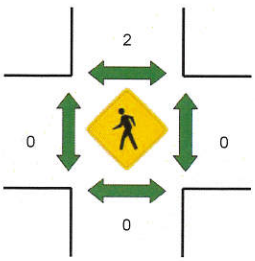
LOCATION: Canyon Rd -- I-90 WB Ramps
CITY/STATE: Ellensburg, WA

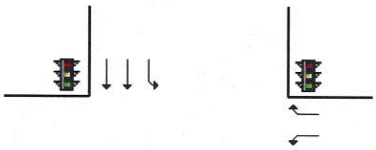
QC JOB #: 13134801
DATE: Wed, Nov 05 2014

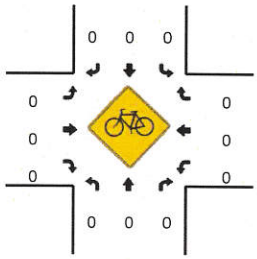
Peak-Hour: 4:20 PM -- 5:20 PM
Peak 15-Min: 5:00 PM -- 5:15 PM

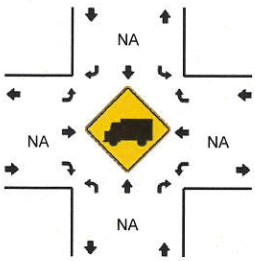


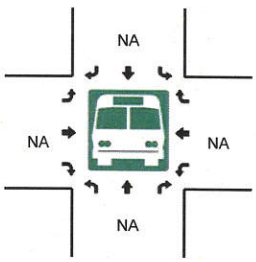












5-Min Count Period Beginning At	Canyon Rd (Northbound)				Canyon Rd (Southbound)				I-90 WB Ramps (Eastbound)				I-90 WB Ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	13	1	0	2	31	0	0	0	0	0	0	1	0	26	0	74	
4:05 PM	0	16	0	0	5	30	0	0	0	0	0	0	0	0	27	0	78	
4:10 PM	0	16	3	0	8	26	0	0	0	0	0	0	1	0	18	0	72	
4:15 PM	0	13	1	0	12	32	0	0	0	0	0	0	5	0	23	0	86	
4:20 PM	0	18	2	0	4	32	0	0	0	0	0	0	3	0	30	0	89	
4:25 PM	0	22	1	0	8	29	0	0	0	0	0	0	0	0	16	0	76	
4:30 PM	0	19	1	0	4	34	0	0	0	0	0	0	1	0	23	0	82	
4:35 PM	0	13	4	0	8	27	0	0	0	0	0	0	2	0	24	0	78	
4:40 PM	0	19	1	0	9	33	0	0	0	0	0	0	3	0	31	0	96	
4:45 PM	0	20	0	0	6	35	0	0	0	0	0	0	2	0	24	0	87	
4:50 PM	0	11	0	0	11	26	0	0	0	0	0	0	2	0	26	0	76	
4:55 PM	0	9	0	0	11	31	0	0	0	0	0	0	2	0	23	0	76	970
5:00 PM	0	19	2	0	10	27	0	0	0	0	0	0	2	0	38	0	98	994
5:05 PM	0	18	3	0	7	31	0	0	0	0	0	0	3	0	31	0	93	1009
5:10 PM	0	10	2	0	14	45	0	0	0	0	0	0	0	0	34	0	105	1042
5:15 PM	0	19	5	0	6	28	0	0	0	0	0	0	3	0	26	0	87	1043
5:20 PM	0	17	1	0	9	28	0	0	0	0	0	0	4	0	21	0	80	1034
5:25 PM	0	18	3	0	14	25	0	0	0	0	0	0	2	0	21	0	83	1041
5:30 PM	0	8	3	0	12	37	0	0	0	0	0	0	1	0	19	0	80	1039
5:35 PM	0	17	0	0	9	28	0	0	0	0	0	0	2	0	15	0	71	1032
5:40 PM	0	16	3	0	14	32	0	0	0	0	0	0	4	0	17	0	86	1022
5:45 PM	0	11	2	0	1	32	0	0	0	0	0	0	1	0	24	0	71	1006
5:50 PM	0	14	0	0	7	24	0	0	0	0	0	0	2	0	13	0	60	990
5:55 PM	0	12	1	0	6	23	0	0	0	0	0	0	3	0	26	0	71	985

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	188	28	0	124	412	0	0	0	0	0	0	20	0	412	0	1184
Heavy Trucks	0	4	8		8	24	0		0	0	0		8	0	20		72
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 12/9/2014 12:17 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

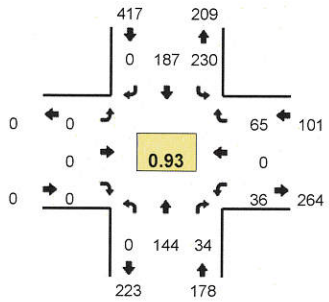
Type of peak hour being reported: Intersection Peak

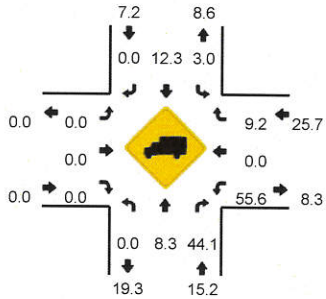
Method for determining peak hour: Total Entering Volume

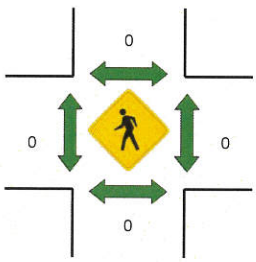
LOCATION: Canyon Rd -- I-90 EB Ramps
CITY/STATE: Ellensburg, WA

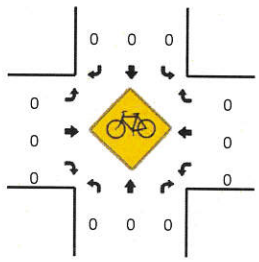
QC JOB #: 13134802
DATE: Wed, Nov 05 2014

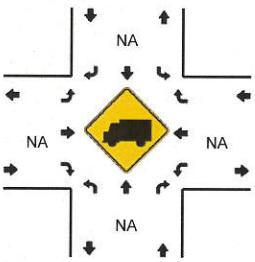
Peak-Hour: 4:20 PM -- 5:20 PM
Peak 15-Min: 4:20 PM -- 4:35 PM

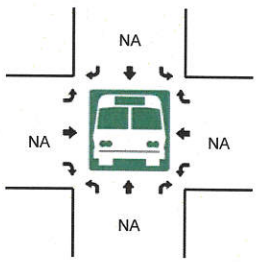












5-Min Count Period Beginning At	Canyon Rd (Northbound)				Canyon Rd (Southbound)				I-90 EB Ramps (Eastbound)				I-90 EB Ramps (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	9	3	0	15	21	0	0	0	0	0	0	2	0	3	0	53	
4:05 PM	0	12	3	0	19	12	0	0	0	0	0	0	7	0	3	0	56	
4:10 PM	0	17	4	0	16	11	0	0	0	0	0	0	1	0	3	0	52	
4:15 PM	0	7	2	0	20	18	0	0	0	0	0	0	4	0	8	0	59	
4:20 PM	0	9	5	0	25	11	0	0	0	0	0	0	3	0	8	0	61	
4:25 PM	0	14	3	0	14	18	0	0	0	0	0	0	3	0	8	0	60	
4:30 PM	0	16	5	0	21	19	0	0	0	0	0	0	2	0	3	0	66	
4:35 PM	0	15	4	0	15	14	0	0	0	0	0	0	2	0	1	0	51	
4:40 PM	0	13	2	0	16	18	0	0	0	0	0	0	4	0	9	0	62	
4:45 PM	0	9	3	0	20	15	0	0	0	0	0	0	2	0	9	0	58	
4:50 PM	0	6	2	0	16	14	0	0	0	0	0	0	6	0	6	0	50	
4:55 PM	0	5	2	0	18	13	0	0	0	0	0	0	2	0	3	0	43	671
5:00 PM	0	20	3	0	20	13	0	0	0	0	0	0	1	0	6	0	63	681
5:05 PM	0	12	1	0	22	12	0	0	0	0	0	0	5	0	1	0	53	678
5:10 PM	0	9	3	0	25	20	0	0	0	0	0	0	1	0	5	0	63	689
5:15 PM	0	16	1	0	18	20	0	0	0	0	0	0	5	0	6	0	66	696
5:20 PM	0	14	1	0	20	12	0	0	0	0	0	0	0	0	5	0	52	687
5:25 PM	0	10	2	0	10	13	0	0	0	0	0	0	6	0	7	0	48	675
5:30 PM	0	7	3	0	24	17	0	0	0	0	0	0	2	0	3	0	56	665
5:35 PM	0	18	3	0	22	9	0	0	0	0	0	0	3	0	2	0	57	671
5:40 PM	0	7	1	0	20	20	0	0	0	0	0	0	2	0	6	0	56	665
5:45 PM	0	11	5	0	14	18	0	0	0	0	0	0	1	0	4	0	53	660
5:50 PM	0	9	2	0	14	10	0	0	0	0	0	0	2	0	1	0	38	648
5:55 PM	0	8	1	0	12	9	0	0	0	0	0	0	4	0	5	0	39	644

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	156	52	0	240	192	0	0	0	0	0	0	32	0	76	0	748
Heavy Trucks	0	4	20		4	16	0		0	0	0		24	0	4		72
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 12/9/2014 12:17 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

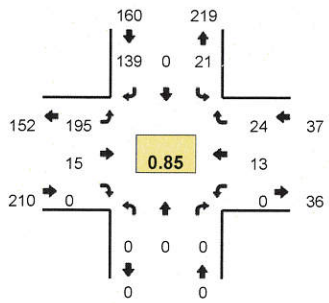
Type of peak hour being reported: Intersection Peak

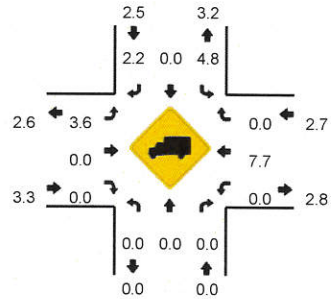
Method for determining peak hour: Total Entering Volume

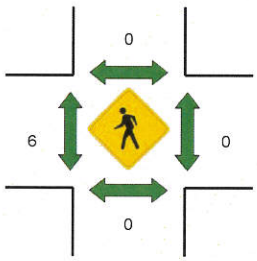
LOCATION: S Ruby St -- E Umptanum Rd
CITY/STATE: Ellensburg, WA

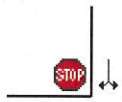
QC JOB #: 13134803
DATE: Wed, Nov 05 2014

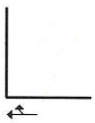
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 4:55 PM -- 5:10 PM

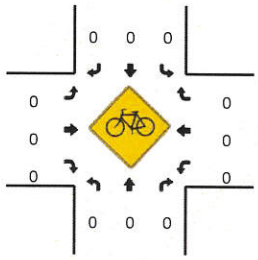


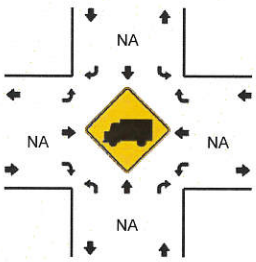


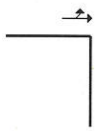


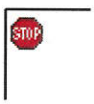


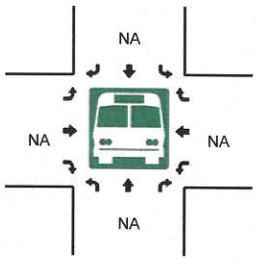












5-Min Count Period Beginning At	S Ruby St (Northbound)				S Ruby St (Southbound)				E Umptanum Rd (Eastbound)				E Umptanum Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	1	0	5	0	6	0	0	0	0	2	0	0	14	
4:05 PM	0	0	0	0	4	0	14	0	17	1	0	0	0	0	2	0	38	
4:10 PM	0	0	0	0	1	0	7	0	13	3	0	0	0	0	1	0	25	
4:15 PM	0	0	0	0	0	0	8	0	11	2	0	0	0	2	1	0	24	
4:20 PM	0	0	0	0	1	0	12	0	12	2	0	0	0	0	3	0	30	
4:25 PM	0	0	0	0	3	0	7	0	11	4	0	0	0	1	0	0	26	
4:30 PM	0	0	0	0	1	0	8	0	16	2	0	0	0	2	1	0	30	
4:35 PM	0	0	0	0	3	0	9	0	18	1	0	0	0	0	4	0	35	
4:40 PM	0	0	0	0	1	0	1	0	13	0	0	0	0	1	2	0	18	
4:45 PM	0	0	0	0	1	0	9	0	17	1	0	0	0	0	3	0	31	
4:50 PM	0	0	0	0	3	0	10	0	15	1	0	0	0	1	4	0	34	
4:55 PM	0	0	0	0	2	0	15	0	16	1	0	0	0	1	4	0	39	344
5:00 PM	0	0	0	0	3	0	13	0	21	1	0	0	0	0	2	0	40	370
5:05 PM	0	0	0	0	0	0	14	0	19	2	0	0	0	3	3	0	41	373
5:10 PM	0	0	0	0	3	0	15	0	12	1	0	0	0	0	2	0	33	381
5:15 PM	0	0	0	0	2	0	7	0	24	1	0	0	0	2	0	0	36	393
5:20 PM	0	0	0	0	0	0	12	0	18	1	0	0	0	1	2	0	34	397
5:25 PM	0	0	0	0	5	0	12	0	13	2	0	0	0	2	0	0	34	405
5:30 PM	0	0	0	0	1	0	12	0	12	1	0	0	0	1	1	0	28	403
5:35 PM	0	0	0	0	1	0	9	0	14	2	0	0	0	0	2	0	28	396
5:40 PM	0	0	0	0	0	0	11	0	14	1	0	0	0	2	1	0	29	407
5:45 PM	0	0	0	0	2	0	4	0	19	2	0	0	0	1	2	0	30	406
5:50 PM	0	0	0	0	2	0	10	0	13	5	0	0	0	0	1	0	31	403
5:55 PM	0	0	0	0	2	0	7	0	11	0	0	0	0	1	1	0	22	386

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	20	0	168	0	224	16	0	0	0	16	36	0	480
Heavy Trucks	0	0	0		0	0	4		4	0	0		0	0	0		8
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 12/9/2014 12:17 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

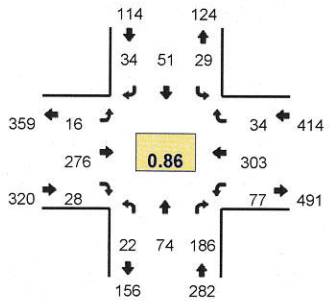
Type of peak hour being reported: Intersection Peak

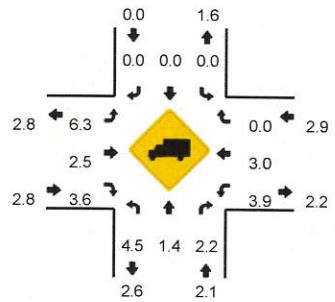
Method for determining peak hour: Total Entering Volume

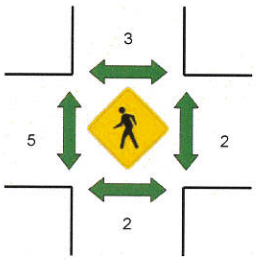
LOCATION: S Ruby St -- E Mountain View Ave
CITY/STATE: Ellensburg, WA

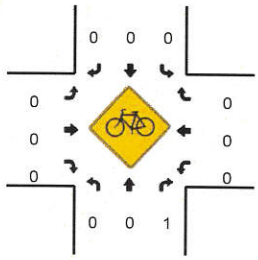
QC JOB #: 13134804
DATE: Wed, Nov 05 2014

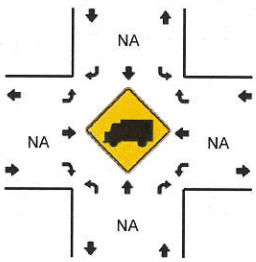
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 5:10 PM -- 5:25 PM

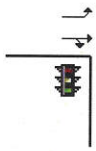


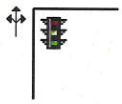


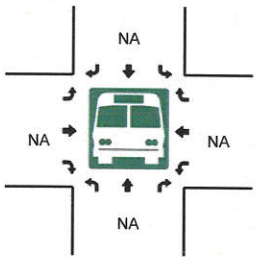












5-Min Count Period Beginning At	S Ruby St (Northbound)				S Ruby St (Southbound)				E Mountain View Ave (Eastbound)				E Mountain View Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	1	2	5	0	2	4	2	0	0	22	2	0	2	20	6	0	68	
4:05 PM	0	8	13	0	2	6	2	0	2	28	5	0	8	27	3	0	104	
4:10 PM	4	5	9	0	2	4	2	0	2	23	1	0	4	26	0	0	82	
4:15 PM	2	4	8	0	1	3	1	0	3	32	3	0	1	21	2	0	81	
4:20 PM	2	6	9	0	0	5	3	0	4	17	1	0	5	22	2	0	76	
4:25 PM	0	1	12	0	1	1	0	0	0	22	1	0	9	29	2	0	78	
4:30 PM	4	6	13	0	3	5	2	0	1	27	2	0	4	24	1	0	92	
4:35 PM	1	4	22	0	5	3	6	0	2	28	1	0	7	27	6	0	112	
4:40 PM	2	5	13	0	0	1	0	0	0	21	1	0	3	27	1	0	74	
4:45 PM	1	9	13	0	4	5	3	0	1	21	2	0	6	21	0	0	86	
4:50 PM	3	5	14	0	4	4	1	0	1	19	2	0	7	21	5	0	86	
4:55 PM	3	8	12	0	1	6	1	0	4	14	2	0	5	17	4	0	77	1016
5:00 PM	0	9	13	0	2	2	1	0	1	16	3	0	13	26	2	0	88	1036
5:05 PM	2	4	20	0	1	5	5	0	3	24	3	0	7	26	4	0	104	1036
5:10 PM	1	6	14	0	1	6	7	0	0	33	1	0	7	33	1	0	110	1064
5:15 PM	1	3	24	0	2	3	3	0	2	22	7	0	4	29	3	0	103	1086
5:20 PM	2	9	14	0	5	6	4	0	1	31	2	0	8	28	4	0	114	1124
5:25 PM	2	6	14	0	1	5	1	0	0	20	2	0	6	24	3	0	84	1130
5:30 PM	1	1	9	0	0	6	3	0	1	17	1	0	7	23	5	0	74	1112
5:35 PM	1	5	12	0	2	2	1	0	1	26	3	0	4	20	1	0	78	1078
5:40 PM	2	1	11	0	2	4	0	0	2	17	0	0	6	21	1	0	67	1071
5:45 PM	0	1	24	0	0	4	4	0	1	15	2	0	5	20	2	0	78	1063
5:50 PM	0	4	11	0	1	2	1	0	3	20	1	0	7	17	2	0	69	1046
5:55 PM	1	3	9	0	0	0	0	0	0	9	0	0	7	21	0	0	50	1019

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	16	72	208	0	32	60	56	0	12	344	40	0	76	360	32	0	1308
Heavy Trucks	4	0	8		0	0	0		0	8	4		4	4	0		32
Pedestrians		4				0				0				4			8
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 12/9/2014 12:17 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

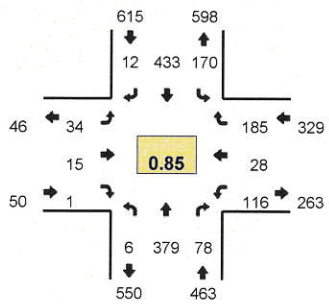
Type of peak hour being reported: Intersection Peak

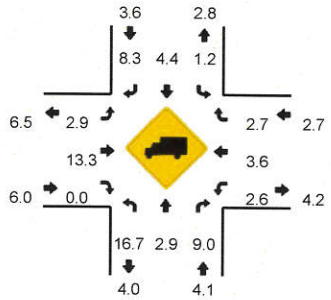
Method for determining peak hour: Total Entering Volume

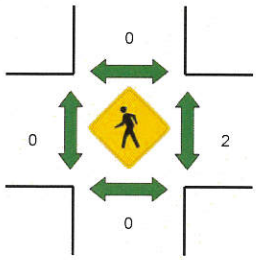
LOCATION: S Main St -- W Mountain View Ave
CITY/STATE: Ellensburg, WA

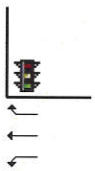
QC JOB #: 13134805
DATE: Wed, Nov 05 2014

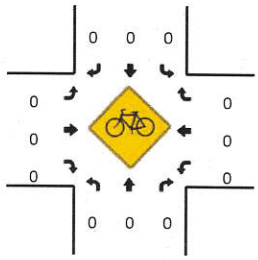
Peak-Hour: 4:25 PM -- 5:25 PM
Peak 15-Min: 5:05 PM -- 5:20 PM

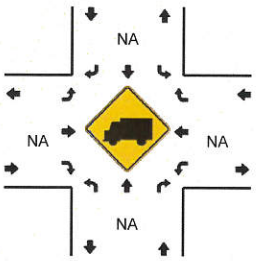


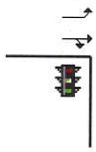


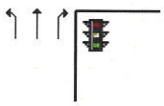


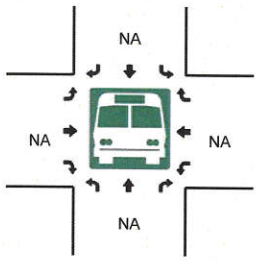












5-Min Count Period Beginning At	S Main St (Northbound)				S Main St (Southbound)				W Mountain View Ave (Eastbound)				W Mountain View Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	30	5	0	17	34	3	0	10	2	2	0	7	0	0	0	110	
4:05 PM	1	37	5	0	24	30	3	0	1	3	0	0	9	2	8	0	123	
4:10 PM	0	33	4	0	13	36	0	0	3	5	0	0	9	5	14	0	122	
4:15 PM	1	28	6	0	16	32	6	0	4	3	1	0	10	2	13	0	122	
4:20 PM	0	27	4	0	11	31	1	0	2	3	0	0	7	3	21	0	110	
4:25 PM	1	24	3	0	9	36	0	0	10	4	0	0	8	4	19	0	118	
4:30 PM	0	30	6	0	16	33	1	0	2	1	0	0	11	1	12	0	113	
4:35 PM	1	25	8	0	20	35	2	0	4	0	0	0	8	2	12	0	117	
4:40 PM	0	27	4	0	17	33	3	0	3	0	0	0	14	3	15	0	119	
4:45 PM	1	40	10	0	6	33	3	0	2	2	0	0	5	0	17	0	119	
4:50 PM	1	17	10	0	15	24	0	0	0	0	0	0	9	0	19	0	95	
4:55 PM	0	30	3	0	11	38	0	0	2	0	1	0	9	2	10	0	106	1374
5:00 PM	0	30	6	0	10	34	1	0	5	2	0	0	2	4	19	0	113	1377
5:05 PM	1	51	5	0	14	55	1	0	2	2	0	0	9	5	10	0	155	1409
5:10 PM	0	35	10	0	14	43	1	0	3	2	0	0	12	2	22	0	144	1431
5:15 PM	1	33	10	0	18	36	0	0	1	0	0	0	16	3	14	0	132	1441
5:20 PM	0	37	3	0	20	33	0	0	0	2	0	0	13	2	16	0	126	1457
5:25 PM	0	18	5	0	13	36	0	0	0	0	0	0	8	4	17	0	101	1440
5:30 PM	1	17	7	0	8	26	4	0	0	0	0	0	9	0	14	0	86	1413
5:35 PM	0	23	7	0	13	37	0	0	1	1	0	0	13	2	10	0	107	1403
5:40 PM	0	29	6	0	10	26	0	0	0	0	0	0	10	4	10	0	95	1379
5:45 PM	0	20	1	0	6	31	0	0	0	0	0	0	16	2	8	0	84	1344
5:50 PM	0	31	3	0	10	36	0	0	1	0	0	0	8	2	12	0	103	1352
5:55 PM	0	27	4	0	5	20	0	0	0	1	0	0	10	0	9	0	76	1322

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	8	476	100	0	184	536	8	0	24	16	0	0	148	40	184	0	1724
Heavy Trucks	4	24	8		0	24	0		0	0	0		4	0	4		68
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 12/9/2014 12:17 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

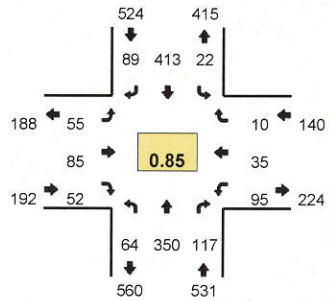
Type of peak hour being reported: Intersection Peak

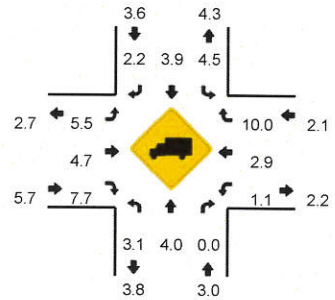
Method for determining peak hour: Total Entering Volume

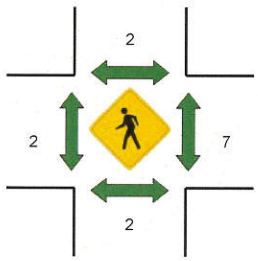
LOCATION: Canyon Rd -- E Umptanum Rd
CITY/STATE: Ellensburg, WA

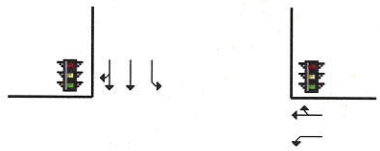
QC JOB #: 13134806
DATE: Wed, Nov 05 2014

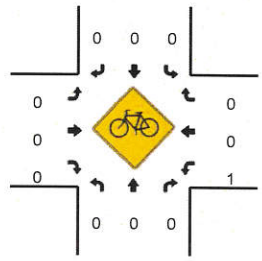
Peak-Hour: 4:55 PM -- 5:55 PM
Peak 15-Min: 5:05 PM -- 5:20 PM

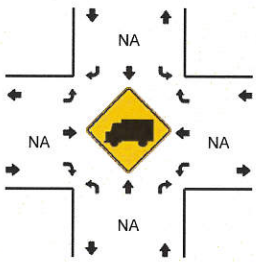


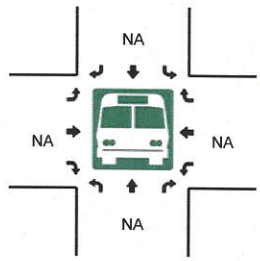












5-Min Count Period Beginning At	Canyon Rd (Northbound)				Canyon Rd (Southbound)				E Umptanum Rd (Eastbound)				E Umptanum Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	3	17	2	0	2	20	8	0	6	14	4	0	7	12	0	0	95	
4:05 PM	1	37	7	0	1	27	5	0	4	7	4	0	8	3	0	0	104	
4:10 PM	8	30	7	0	3	23	9	0	5	4	5	0	3	3	0	0	100	
4:15 PM	0	24	6	0	2	36	3	0	3	3	5	0	5	3	1	0	91	
4:20 PM	5	22	8	0	3	26	4	0	7	2	3	0	5	5	0	0	90	
4:25 PM	1	18	10	0	4	30	5	0	8	0	7	0	8	2	0	0	93	
4:30 PM	4	25	12	0	3	28	10	0	6	2	8	0	4	2	0	0	104	
4:35 PM	2	37	11	0	0	27	3	0	2	7	6	0	4	1	0	0	100	
4:40 PM	5	29	8	0	1	31	10	0	3	3	11	0	3	2	0	0	106	
4:45 PM	4	29	14	0	2	33	6	0	3	2	5	0	4	1	2	0	105	
4:50 PM	2	19	12	0	0	22	3	0	6	4	4	0	9	4	0	0	85	
4:55 PM	3	40	9	0	1	35	10	0	4	7	4	0	11	2	0	0	126	1199
5:00 PM	2	31	14	0	1	32	6	0	7	7	1	0	9	6	0	0	116	1220
5:05 PM	7	45	12	0	2	35	6	0	7	7	6	0	10	4	2	0	143	1259
5:10 PM	8	32	2	0	2	50	11	0	7	7	3	0	8	3	0	0	133	1292
5:15 PM	9	32	10	0	1	32	8	0	7	15	5	0	3	3	5	0	130	1331
5:20 PM	5	30	10	0	2	41	9	0	3	5	4	0	10	1	1	0	121	1362
5:25 PM	6	22	9	0	3	33	6	0	3	3	3	0	11	2	0	0	101	1370
5:30 PM	3	24	11	0	1	25	9	0	3	7	10	0	11	3	0	0	107	1373
5:35 PM	2	24	12	0	1	34	9	0	3	4	7	0	5	2	1	0	104	1377
5:40 PM	4	25	9	0	1	34	3	0	3	8	4	0	8	8	0	0	107	1378
5:45 PM	3	18	8	0	3	32	4	0	4	11	2	0	4	0	1	0	90	1363
5:50 PM	12	27	11	0	4	30	8	0	4	4	3	0	5	1	0	0	109	1387
5:55 PM	6	29	5	0	0	17	8	0	2	5	4	0	8	2	0	0	86	1347

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	96	436	96	0	20	468	100	0	84	116	56	0	84	40	28	0	1624
Heavy Trucks	4	20	0		4	28	8		8	8	0		4	0	4		88
Pedestrians		8				0				4				8			20
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 12/9/2014 12:17 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

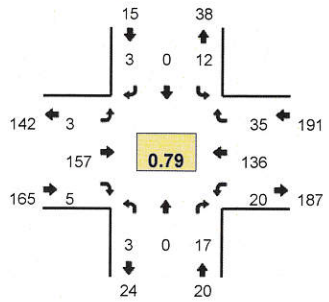
Type of peak hour being reported: Intersection Peak

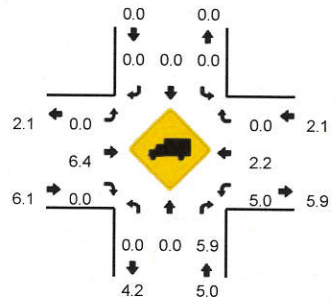
Method for determining peak hour: Total Entering Volume

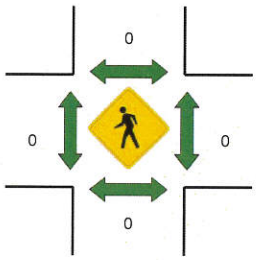
LOCATION: S Opportunity St -- E Umptanum Rd
CITY/STATE: Ellensburg, WA

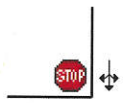
QC JOB #: 13134807
DATE: Wed, Nov 05 2014

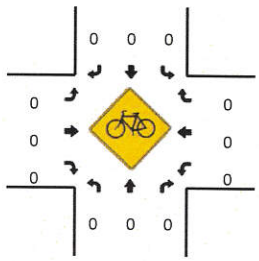
Peak-Hour: 4:55 PM -- 5:55 PM
Peak 15-Min: 5:05 PM -- 5:20 PM

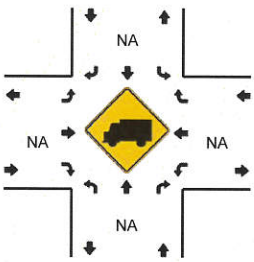


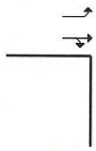


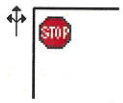


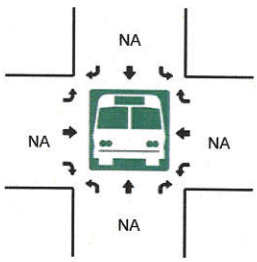












5-Min Count Period Beginning At	S Opportunity St (Northbound)				S Opportunity St (Southbound)				E Umptanum Rd (Eastbound)				E Umptanum Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	0	0	0	0	0	13	0	0	1	12	0	0	26	
4:05 PM	1	0	0	0	0	0	0	0	0	14	0	0	2	9	0	0	26	
4:10 PM	1	0	3	0	3	0	0	0	1	17	1	0	4	19	1	0	50	
4:15 PM	1	0	1	0	0	0	0	0	0	13	0	0	3	5	0	0	23	
4:20 PM	0	0	3	0	1	0	0	0	0	8	1	0	2	11	1	0	27	
4:25 PM	2	0	3	0	1	0	0	0	0	8	0	0	0	6	1	0	21	
4:30 PM	0	0	3	0	1	0	1	0	0	13	0	0	3	14	3	0	38	
4:35 PM	0	0	1	0	4	0	0	0	0	18	0	0	0	10	0	0	33	
4:40 PM	0	0	1	0	2	0	0	0	0	14	0	0	0	13	0	0	30	
4:45 PM	0	0	0	0	1	0	0	0	0	10	0	0	1	11	2	0	25	
4:50 PM	0	0	0	0	1	0	0	0	0	10	0	0	1	8	0	0	20	
4:55 PM	0	0	1	0	0	0	0	0	2	13	0	0	2	9	4	0	31	350
5:00 PM	0	0	2	0	1	0	1	0	0	11	1	0	1	17	1	0	35	359
5:05 PM	1	0	1	0	0	0	0	0	0	19	1	0	0	16	1	0	39	372
5:10 PM	1	0	2	0	0	0	0	0	0	17	0	0	1	14	6	1	42	364
5:15 PM	0	0	0	0	1	0	0	0	0	23	1	0	4	13	1	0	43	384
5:20 PM	0	0	0	0	2	0	0	0	1	9	1	0	1	11	3	0	28	385
5:25 PM	0	0	3	0	2	0	0	0	0	7	0	0	3	9	2	0	26	390
5:30 PM	0	0	2	0	0	0	0	0	0	10	0	0	1	10	3	0	26	378
5:35 PM	0	0	2	0	2	0	1	0	0	13	0	0	1	9	5	0	33	378
5:40 PM	0	0	1	0	3	0	0	0	0	9	0	0	0	13	1	0	27	375
5:45 PM	0	0	3	0	0	0	1	0	0	17	1	0	1	7	0	0	30	380
5:50 PM	1	0	0	0	1	0	0	0	0	9	0	0	4	8	8	0	31	391
5:55 PM	0	0	0	0	2	0	0	0	0	9	0	0	4	10	2	0	27	387

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	8	0	12	0	4	0	0	0	0	236	8	0	20	172	32	4	496
Heavy Trucks	0	0	0		0	0	0		0	12	0		0	4	0		16
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 12/9/2014 12:17 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

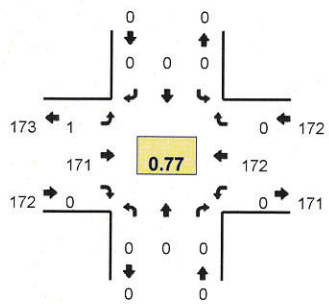
Type of peak hour being reported: Intersection Peak

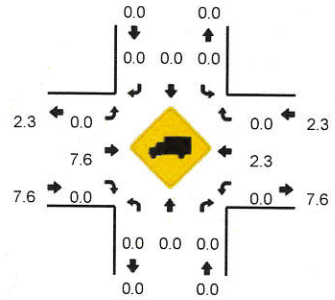
Method for determining peak hour: Total Entering Volume

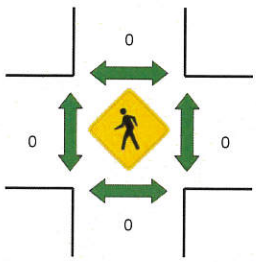
LOCATION: Lakeshore Way -- E Umptanum Rd
CITY/STATE: Ellensburg, WA

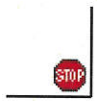
QC JOB #: 13134808
DATE: Wed, Nov 05 2014

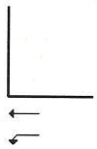
Peak-Hour: 4:25 PM -- 5:25 PM
Peak 15-Min: 5:05 PM -- 5:20 PM

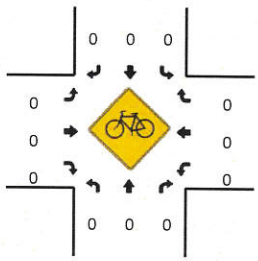


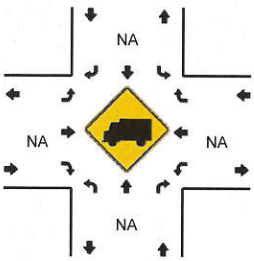


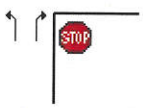


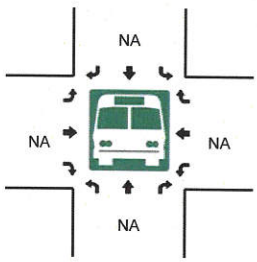












5-Min Count Period Beginning At	Lakeshore Way (Northbound)				Lakeshore Way (Southbound)				E Umptanum Rd (Eastbound)				E Umptanum Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	0	0	0	0	0	13	0	0	0	20	0	0	33	
4:05 PM	0	0	0	0	0	0	0	0	0	14	0	0	0	13	0	0	27	
4:10 PM	0	0	0	0	0	0	0	0	0	12	0	0	0	17	0	0	29	
4:15 PM	0	0	0	0	0	0	0	0	0	15	0	0	0	12	0	0	27	
4:20 PM	0	0	0	0	0	0	0	0	0	9	0	0	0	10	0	0	19	
4:25 PM	0	0	0	0	0	0	0	0	0	10	0	0	0	11	0	0	21	
4:30 PM	0	0	0	0	0	0	0	0	0	15	0	1	0	20	0	0	36	
4:35 PM	0	0	0	0	0	0	0	0	0	18	0	0	0	10	0	0	28	
4:40 PM	0	0	0	0	0	0	0	0	0	15	0	0	0	12	0	0	27	
4:45 PM	0	0	0	0	0	0	0	0	0	9	0	0	0	17	0	0	26	
4:50 PM	0	0	0	0	0	0	0	0	0	9	0	0	0	8	0	0	17	
4:55 PM	0	0	0	0	0	0	0	0	0	16	0	0	0	10	0	0	26	316
5:00 PM	0	0	0	0	0	0	0	0	0	13	0	0	0	18	0	0	31	314
5:05 PM	0	0	0	0	0	0	0	0	0	17	0	0	0	20	0	0	37	324
5:10 PM	0	0	0	0	0	0	0	0	0	17	0	0	0	20	0	0	37	332
5:15 PM	0	0	0	0	0	0	0	0	0	21	0	0	0	16	0	0	37	342
5:20 PM	0	0	0	0	0	0	0	0	0	11	0	0	0	10	0	0	21	344
5:25 PM	0	0	0	0	0	0	0	0	0	7	0	0	0	13	0	0	20	343
5:30 PM	0	0	0	0	0	0	0	0	0	8	0	0	0	12	0	0	20	327
5:35 PM	0	0	0	0	0	0	0	0	0	10	0	0	0	13	0	0	23	322
5:40 PM	0	0	0	0	0	0	0	0	0	8	0	0	0	17	0	0	25	320
5:45 PM	0	0	0	0	0	0	0	0	0	17	0	0	0	12	0	0	29	323
5:50 PM	0	0	0	0	0	0	0	0	0	9	0	0	0	9	0	0	18	324
5:55 PM	0	0	0	0	0	0	0	0	0	10	0	0	0	10	0	0	20	318

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	0	0	0	0	0	220	0	0	0	224	0	0	444
Heavy Trucks	0	0	0		0	0	0		0	12	0		0	8	0		20
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 12/9/2014 12:17 PM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Quality Counts
TRANSPORTATION DATA COLLECTION SERVICES

7409 SW Tech Center Dr, Ste B150
Tigard, OR 97223
971-223-0003
www.qualitycounts.net

Order Number: 133400
Location: Great Wolf Lodge
Date: 3/26/2015

	13340001	
	North Dwy to/from gas station	
Time	In	Out
6:00	81	43
7:00	24	22
7:15	16	12
7:30	32	21
7:45	26	10
8:00	26	12
8:15	31	18
8:30	29	20
8:45	21	14
9:00	90	78
10:00	91	78
11:00	100	79
12:00	85	93
13:00	106	106
14:00	115	105
15:00	143	103
16:00	30	23
16:15	33	23
16:30	26	31
16:45	35	20
17:00	33	27
17:15	29	15
17:30	28	30
17:45	29	34
18:00	116	91
19:00	104	85
20:00	86	68
21:00	69	58
Totals	1634	1319

	13340001	
	North Dwy to/from Great Wolf Lodge	
Time	In	Out
6:00	25	5
7:00	8	2
7:15	6	0
7:30	6	2
7:45	2	0
8:00	4	0
8:15	15	1
8:30	5	0
8:45	10	3
9:00	30	17
10:00	57	19
11:00	87	51
12:00	97	26
13:00	85	9
14:00	89	30
15:00	68	20
16:00	16	5
16:15	20	7
16:30	23	11
16:45	20	14
17:00	16	11
17:15	20	20
17:30	21	2
17:45	15	6
18:00	35	15
19:00	37	15
20:00	15	11
21:00	7	1
Totals	839	303

	13340003	
	Center Dwy	
Time	In	Out
6:00	1	2
7:00	0	0
7:15	1	1
7:30	3	1
7:45	0	1
8:00	0	0
8:15	1	3
8:30	1	1
8:45	1	2
9:00	12	13
10:00	10	11
11:00	13	20
12:00	33	18
13:00	41	28
14:00	27	28
15:00	26	13
16:00	4	2
16:15	5	1
16:30	7	3
16:45	7	2
17:00	3	9
17:15	6	3
17:30	4	5
17:45	3	3
18:00	24	8
19:00	20	13
20:00	14	7
21:00	8	11
Totals	275	209

	13340004	
	South Dwy	
Time	In	Out
6:00	13	2
7:00	0	0
7:15	5	1
7:30	17	1
7:45	8	3
8:00	6	1
8:15	7	3
8:30	5	1
8:45	5	3
9:00	46	10
10:00	18	17
11:00	8	18
12:00	10	25
13:00	20	16
14:00	25	24
15:00	28	36
16:00	3	13
16:15	7	17
16:30	21	14
16:45	11	7
17:00	1	14
17:15	3	17
17:30	2	15
17:45	6	6
18:00	4	17
19:00	6	16
20:00	7	9
21:00	12	24
Totals	304	330

Quality Counts
TRANSPORTATION DATA COLLECTION SERVICES

7409 SW Tech Center Dr, Ste B150
Tigard, OR 97223
971-223-0003
www.qualitycounts.net

Order Number: 133400
Location: Great Wolf Lodge
Date: 3/28/2015

	13340002	
	North Dwy to/from gas station	
Time	In	Out
6:00	46	29
7:00	15	12
7:15	13	8
7:30	20	11
7:45	18	9
8:00	23	18
8:15	30	17
8:30	28	23
8:45	31	15
9:00	113	91
10:00	135	93
11:00	128	99
12:00	106	89
13:00	127	105
14:00	106	109
15:00	113	104
16:00	16	19
16:15	27	21
16:30	35	19
16:45	28	35
17:00	33	37
17:15	18	21
17:30	28	12
17:45	22	26
18:00	81	60
19:00	61	43
20:00	68	86
21:00	46	53
Totals	1515	1264

	13340002	
	North Dwy to/from Great Wolf Lodge	
Time	In	Out
6:00	9	1
7:00	3	0
7:15	0	1
7:30	3	2
7:45	3	0
8:00	3	0
8:15	3	3
8:30	3	0
8:45	3	0
9:00	30	6
10:00	43	14
11:00	77	26
12:00	130	31
13:00	124	32
14:00	80	18
15:00	75	20
16:00	15	11
16:15	23	13
16:30	19	8
16:45	69	13
17:00	43	4
17:15	18	9
17:30	27	1
17:45	25	16
18:00	120	28
19:00	59	42
20:00	32	55
21:00	35	16
Totals	1074	370

	13340005	
	Center Dwy	
Time	In	Out
6:00	1	0
7:00	2	0
7:15	1	0
7:30	2	0
7:45	0	0
8:00	2	1
8:15	2	2
8:30	2	2
8:45	1	1
9:00	6	8
10:00	24	16
11:00	20	33
12:00	54	29
13:00	64	35
14:00	40	31
15:00	23	30
16:00	4	5
16:15	14	7
16:30	5	1
16:45	10	5
17:00	10	9
17:15	10	8
17:30	3	3
17:45	6	3
18:00	42	17
19:00	14	8
20:00	22	19
21:00	3	14
Totals	387	287

	13340008	
	South Dwy	
Time	In	Out
6:00	7	4
7:00	1	1
7:15	8	2
7:30	11	2
7:45	8	3
8:00	9	2
8:15	16	5
8:30	8	5
8:45	6	2
9:00	49	16
10:00	24	14
11:00	14	25
12:00	9	26
13:00	21	25
14:00	33	22
15:00	25	31
16:00	9	6
16:15	11	19
16:30	14	19
16:45	22	23
17:00	2	30
17:15	11	35
17:30	2	13
17:45	6	6
18:00	4	20
19:00	7	18
20:00	7	10
21:00	13	25
Totals	357	409

Appendix B
Existing Traffic Operations
Level-of-Service Worksheets

Queues

1: Kittias Hwy/Mountain View Ave & Canyon Road

2/10/2015

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	29	14	138	251	6	539	207	529
v/c Ratio	0.24	0.05	0.55	0.53	0.02	0.57	0.38	0.41
Control Delay	26.9	19.8	27.2	7.2	11.2	15.8	6.5	6.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.9	19.8	27.2	7.2	11.2	15.8	6.5	6.4
Queue Length 50th (ft)	11	5	56	32	1	136	23	73
Queue Length 95th (ft)	27	15	39	12	7	263	56	156
Internal Link Dist (ft)		439		758		1366		747
Turn Bay Length (ft)	75		75		75		75	
Base Capacity (vph)	198	491	420	643	388	939	553	1275
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.15	0.03	0.33	0.39	0.02	0.57	0.37	0.41

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	24	11	1	116	28	183	5	373	80	174	433	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.87		1.00	0.97		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	1610		1752	1616		1504	1770		1787	1818	
Flt Permitted	0.36	1.00		0.75	1.00		0.47	1.00		0.30	1.00	
Satd. Flow (perm)	653	1610		1380	1616		740	1770		569	1818	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	29	13	1	138	33	218	6	444	95	207	515	14
RTOR Reduction (vph)	0	1	0	0	178	0	0	9	0	0	1	0
Lane Group Flow (vph)	29	13	0	138	73	0	6	530	0	207	528	0
Confl. Peds. (#/hr)									2	2		
Heavy Vehicles (%)	4%	18%	0%	3%	4%	2%	20%	3%	9%	1%	4%	8%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		8			4			6		5	2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)	12.6	12.6		12.6	12.6		36.3	36.3		48.4	48.4	
Effective Green, g (s)	12.6	12.6		12.6	12.6		36.3	36.3		48.4	48.4	
Actuated g/C Ratio	0.18	0.18		0.18	0.18		0.53	0.53		0.70	0.70	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	119	294		252	295		389	931		542	1275	
v/s Ratio Prot		0.01			0.05			c0.30		0.04	c0.29	
v/s Ratio Perm	0.04			c0.10			0.01			0.22		
v/c Ratio	0.24	0.04		0.55	0.25		0.02	0.57		0.38	0.41	
Uniform Delay, d1	24.1	23.2		25.6	24.1		7.8	11.1		5.3	4.3	
Progression Factor	1.00	1.00		0.80	0.61		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	0.1		2.3	0.4		0.1	2.5		0.5	1.0	
Delay (s)	25.2	23.3		22.7	15.2		7.9	13.6		5.8	5.3	
Level of Service	C	C		C	B		A	B		A	A	
Approach Delay (s)		24.6			17.9			13.5			5.5	
Approach LOS		C			B			B			A	

Intersection Summary			
HCM Average Control Delay	11.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	69.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	19	354	90	392	328	133
v/c Ratio	0.03	0.35	0.14	0.33	0.75	0.48
Control Delay	4.8	8.6	5.6	8.4	24.6	22.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.8	8.6	5.6	8.4	24.6	22.8
Queue Length 50th (ft)	2	35	10	53	71	38
Queue Length 95th (ft)	m6	141	31	175	124	70
Internal Link Dist (ft)		758		2281	1334	382
Turn Bay Length (ft)	75		100			
Base Capacity (vph)	704	1016	660	1194	593	410
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.35	0.14	0.33	0.55	0.32

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	16	276	28	77	303	34	22	74	186	29	51	34
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.98			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.98			0.91			0.96	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.99	
Satd. Flow (prot)	1699	1813		1734	1817			1662			1782	
Flt Permitted	0.53	1.00		0.45	1.00			0.97			0.71	
Satd. Flow (perm)	948	1813		818	1817			1618			1274	
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	19	321	33	90	352	40	26	86	216	34	59	40
RTOR Reduction (vph)	0	4	0	0	4	0	0	116	0	0	26	0
Lane Group Flow (vph)	19	350	0	90	388	0	0	212	0	0	107	0
Confl. Peds. (#/hr)	3		2	2		3	5		2	2		5
Heavy Vehicles (%)	6%	3%	4%	4%	3%	0%	5%	1%	2%	0%	0%	0%
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	39.0	37.7		47.3	42.0			13.7			13.7	
Effective Green, g (s)	39.0	37.7		47.3	42.0			13.7			13.7	
Actuated g/C Ratio	0.57	0.55		0.69	0.61			0.20			0.20	
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)	550	991		635	1106			321			253	
v/s Ratio Prot	0.00	0.19		c0.01	c0.21							
v/s Ratio Perm	0.02			0.09				c0.13			0.08	
v/c Ratio	0.03	0.35		0.14	0.35			0.66			0.42	
Uniform Delay, d1	6.6	8.8		4.1	6.7			25.5			24.2	
Progression Factor	0.87	0.70		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.0	0.9		0.1	0.9			4.8			1.1	
Delay (s)	5.8	7.1		4.2	7.6			30.3			25.3	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		7.1			7.0			30.3			25.3	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	14.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	69.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	50.9%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	171	0	0	174	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77
Hourly flow rate (vph)	222	0	0	226	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			TWLTL		
Median storage veh)				2		
Upstream signal (ft)				960		
pX, platoon unblocked						
vC, conflicting volume			222		448	222
vC1, stage 1 conf vol					222	
vC2, stage 2 conf vol					226	
vCu, unblocked vol			222		448	222
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1359		719	823

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2
Volume Total	222	0	226	0	0
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	1700
Volume to Capacity	0.13	0.00	0.13	0.00	0.00
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS				A	A
Approach Delay (s)	0.0	0.0		0.0	
Approach LOS				A	

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	12.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	3	164	4	18	146	23	2	0	14	15	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	4	208	5	23	185	29	3	0	18	19	0	3
Pedestrians											1	
Lane Width (ft)											12.0	
Walking Speed (ft/s)											4.0	
Percent Blockage											0	
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)					460							
pX, platoon unblocked												
vC, conflicting volume	215			213			465	478	210	481	466	200
vC1, stage 1 conf vol							218	218		246	246	
vC2, stage 2 conf vol							247	260		235	220	
vCu, unblocked vol	215			213			465	478	210	481	466	200
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			98			100	100	98	97	100	100
cM capacity (veh/h)	1366			1306			659	611	835	637	612	845

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	216	237	20	22
Volume Left	4	23	3	19
Volume Right	5	29	18	3
cSH	1366	1306	808	656
Volume to Capacity	0.00	0.02	0.03	0.03
Queue Length 95th (ft)	0	1	2	3
Control Delay (s)	0.2	0.9	9.6	10.7
Lane LOS	A	A	A	B
Approach Delay (s)	0.2	0.9	9.6	10.7
Approach LOS			A	B

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	30.5%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	71	159	111	53	71	442	151	21	586
v/c Ratio	0.35	0.50	0.63	0.18	0.36	0.37	0.14	0.14	0.33
Control Delay	30.9	22.2	44.0	21.0	34.6	9.2	2.3	32.8	11.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.9	22.2	44.0	21.0	34.6	9.2	2.3	32.8	11.8
Queue Length 50th (ft)	29	40	48	16	31	59	0	9	73
Queue Length 95th (ft)	56	77	83	38	60	189	22	27	125
Internal Link Dist (ft)		380		139		2535			1366
Turn Bay Length (ft)	75		100		215			200	
Base Capacity (vph)	423	592	360	609	279	1192	1085	184	1796
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.27	0.31	0.09	0.25	0.37	0.14	0.11	0.33

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	60	71	62	93	34	11	60	371	127	18	399	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.0	4.0		4.0	4.5	4.5	4.0	8.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00	0.97	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.93		1.00	0.96		1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1683	1661		1762	1777		1719	1810	1568	1703	3346	
Flt Permitted	0.72	1.00		0.57	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1280	1661		1064	1777		1719	1810	1568	1703	3346	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	71	85	74	111	40	13	71	442	151	21	475	111
RTOR Reduction (vph)	0	53	0	0	11	0	0	0	57	0	18	0
Lane Group Flow (vph)	71	106	0	111	42	0	71	442	94	21	568	0
Confl. Peds. (#/hr)	1		4	4		1	1		4	4		1
Heavy Vehicles (%)	7%	6%	5%	2%	0%	10%	5%	5%	0%	6%	4%	6%
Turn Type	Perm			Perm			Prot		Perm	Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			
Actuated Green, G (s)	11.7	11.7		12.2	12.2		7.3	46.3	46.3	3.0	38.5	
Effective Green, g (s)	11.7	11.7		12.2	12.2		7.3	46.3	46.3	3.0	38.5	
Actuated g/C Ratio	0.16	0.16		0.16	0.16		0.10	0.63	0.63	0.04	0.52	
Clearance Time (s)	4.5	4.5		4.0	4.0		4.0	4.5	4.5	4.0	8.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	202	263		175	293		170	1132	981	69	1741	
v/s Ratio Prot		0.06			0.02		c0.04	c0.24		0.01	0.17	
v/s Ratio Perm	0.06			c0.10					0.06			
v/c Ratio	0.35	0.40		0.63	0.14		0.42	0.39	0.10	0.30	0.33	
Uniform Delay, d1	27.8	28.0		28.8	26.4		31.4	6.9	5.5	34.5	10.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.1	1.0		7.3	0.2		1.7	1.0	0.2	2.5	0.5	
Delay (s)	28.8	29.0		36.1	26.7		33.0	7.9	5.7	37.0	10.8	
Level of Service	C	C		D	C		C	A	A	D	B	
Approach Delay (s)		29.0			33.1			10.1			11.7	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	15.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	74.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	202	14	13	27	24	125
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	240	17	15	32	29	149
Pedestrians		4				
Lane Width (ft)		12.0				
Walking Speed (ft/s)		4.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		219				
pX, platoon unblocked						
vC, conflicting volume	48				529	36
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	48				529	36
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	84				93	86
cM capacity (veh/h)	1547				428	1031

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	257	48	177
Volume Left	240	0	29
Volume Right	0	32	149
cSH	1547	1700	840
Volume to Capacity	0.16	0.03	0.21
Queue Length 95th (ft)	14	0	20
Control Delay (s)	7.3	0.0	10.4
Lane LOS	A		B
Approach Delay (s)	7.3	0.0	10.4
Approach LOS			B

Intersection Summary			
Average Delay	7.7		
Intersection Capacity Utilization	35.2%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	30	366	243	124	420
v/c Ratio	0.12	0.62	0.22	0.20	0.22
Control Delay	17.8	7.8	12.3	5.5	5.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	17.8	7.8	12.3	5.5	5.4
Queue Length 50th (ft)	7	0	23	12	23
Queue Length 95th (ft)	24	51	50	33	46
Internal Link Dist (ft)	678		878		2535
Turn Bay Length (ft)	545	545		115	
Base Capacity (vph)	922	1235	2951	902	3438
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.03	0.30	0.08	0.14	0.12

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	26	322	192	22	109	370
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.9	5.9	5.4		5.1	5.4
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.99	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.98		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1236	1533	3258		1752	3438
Flt Permitted	0.95	1.00	1.00		0.45	1.00
Satd. Flow (perm)	1236	1533	3258		831	3438
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	30	366	218	25	124	420
RTOR Reduction (vph)	0	296	9	0	0	0
Lane Group Flow (vph)	30	70	234	0	124	420
Confl. Peds. (#/hr)		2				
Heavy Vehicles (%)	46%	4%	6%	36%	3%	5%
Turn Type		Perm			pm+pt	
Protected Phases	8		2		1	6
Permitted Phases		8			6	
Actuated Green, G (s)	8.8	8.8	15.3		26.0	26.0
Effective Green, g (s)	8.8	8.8	15.3		26.0	26.0
Actuated g/C Ratio	0.19	0.19	0.33		0.56	0.56
Clearance Time (s)	5.9	5.9	5.4		5.1	5.4
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	236	293	1081		581	1939
v/s Ratio Prot	0.02		0.07		0.03	c0.12
v/s Ratio Perm		c0.05			0.09	
v/c Ratio	0.13	0.24	0.22		0.21	0.22
Uniform Delay, d1	15.5	15.8	11.1		5.0	5.0
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.2	0.4	0.1		0.2	0.1
Delay (s)	15.7	16.2	11.2		5.2	5.0
Level of Service	B	B	B		A	A
Approach Delay (s)	16.2		11.2			5.1
Approach LOS	B		B			A

Intersection Summary			
HCM Average Control Delay	10.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	46.1	Sum of lost time (s)	11.3
Intersection Capacity Utilization	42.5%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	36	61	145	29	221	183
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	39	66	156	31	238	197
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		10				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						958
pX, platoon unblocked						
vC, conflicting volume	828	156			156	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	828	156			156	
tC, single (s)	6.9	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.9	3.4			2.2	
p0 queue free %	84	92			83	
cM capacity (veh/h)	239	874			1418	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	104	156	31	238	197
Volume Left	39	0	0	238	0
Volume Right	66	0	31	0	0
cSH	644	1700	1700	1418	1700
Volume to Capacity	0.16	0.09	0.02	0.17	0.12
Queue Length 95th (ft)	14	0	0	15	0
Control Delay (s)	14.5	0.0	0.0	8.0	0.0
Lane LOS	B			A	
Approach Delay (s)	14.5	0.0		4.4	
Approach LOS	B				

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	33.2%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix C
Year 2016 Background Traffic Operations Level-of-Service Worksheets

Queues
1: Kittias Hwy/Mountain View Ave & Canyon Road

2/5/2015

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	30	14	144	261	6	561	215	550
v/c Ratio	0.26	0.05	0.56	0.54	0.02	0.60	0.41	0.43
Control Delay	27.2	19.5	27.2	7.2	11.4	16.9	7.0	6.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.2	19.5	27.2	7.2	11.4	16.9	7.0	6.8
Queue Length 50th (ft)	11	5	58	34	1	146	25	79
Queue Length 95th (ft)	28	15	41	14	7	277	60	167
Internal Link Dist (ft)		439		758		1366		747
Turn Bay Length (ft)	75		75		75		75	
Base Capacity (vph)	190	491	420	649	377	930	529	1267
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.03	0.34	0.40	0.02	0.60	0.41	0.43

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	11	1	121	29	190	5	388	83	181	450	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.87		1.00	0.97		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	1610		1752	1617		1504	1770		1787	1818	
Flt Permitted	0.34	1.00		0.75	1.00		0.46	1.00		0.28	1.00	
Satd. Flow (perm)	625	1610		1380	1617		726	1770		533	1818	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	30	13	1	144	35	226	6	462	99	215	536	14
RTOR Reduction (vph)	0	1	0	0	184	0	0	9	0	0	1	0
Lane Group Flow (vph)	30	13	0	144	77	0	6	552	0	215	549	0
Confl. Peds. (#/hr)									2	2		
Heavy Vehicles (%)	4%	18%	0%	3%	4%	2%	20%	3%	9%	1%	4%	8%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		8			4			6		5	2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)	12.9	12.9		12.9	12.9		35.9	35.9		48.1	48.1	
Effective Green, g (s)	12.9	12.9		12.9	12.9		35.9	35.9		48.1	48.1	
Actuated g/C Ratio	0.19	0.19		0.19	0.19		0.52	0.52		0.70	0.70	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	117	301		258	302		378	921		521	1267	
v/s Ratio Prot		0.01			0.05			c0.31		0.05	c0.30	
v/s Ratio Perm	0.05			c0.10			0.01			0.24		
v/c Ratio	0.26	0.04		0.56	0.26		0.02	0.60		0.41	0.43	
Uniform Delay, d1	24.0	23.0		25.5	24.0		8.0	11.5		5.8	4.5	
Progression Factor	1.00	1.00		0.79	0.63		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	0.1		2.5	0.4		0.1	2.9		0.5	1.1	
Delay (s)	25.1	23.1		22.7	15.5		8.1	14.4		6.3	5.6	
Level of Service	C	C		C	B		A	B		A	A	
Approach Delay (s)		24.5			18.0			14.3			5.8	
Approach LOS		C			B			B			A	

Intersection Summary			
HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	69.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBT	SBT
Lane Group Flow (vph)	20	368	93	407	343	138
v/c Ratio	0.03	0.37	0.15	0.34	0.77	0.48
Control Delay	4.8	8.9	5.7	8.7	25.5	22.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.8	8.9	5.7	8.7	25.5	22.6
Queue Length 50th (ft)	2	37	11	58	77	39
Queue Length 95th (ft)	m6	146	32	183	133	73
Internal Link Dist (ft)		758		2281	1334	382
Turn Bay Length (ft)	75		100			
Base Capacity (vph)	690	1000	640	1180	593	409
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.03	0.37	0.15	0.34	0.58	0.34

Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	287	29	80	315	35	23	77	194	30	53	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.98			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.98			0.91			0.96	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.99	
Satd. Flow (prot)	1699	1813		1734	1817			1662			1783	
Flt Permitted	0.52	1.00		0.43	1.00			0.97			0.70	
Satd. Flow (perm)	936	1813		792	1817			1617			1272	
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	20	334	34	93	366	41	27	90	226	35	62	41
RTOR Reduction (vph)	0	4	0	0	4	0	0	115	0	0	25	0
Lane Group Flow (vph)	20	364	0	93	403	0	0	228	0	0	113	0
Confl. Peds. (#/hr)	3		2	2		3	5		2	2		5
Heavy Vehicles (%)	6%	3%	4%	4%	3%	0%	5%	1%	2%	0%	0%	0%
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	38.4	37.1		46.8	41.5			14.2			14.2	
Effective Green, g (s)	38.4	37.1		46.8	41.5			14.2			14.2	
Actuated g/C Ratio	0.56	0.54		0.68	0.60			0.21			0.21	
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)	535	975		615	1093			333			262	
v/s Ratio Prot	0.00	0.20		c0.01	c0.22							
v/s Ratio Perm	0.02			0.09				c0.14			0.09	
v/c Ratio	0.04	0.37		0.15	0.37			0.68			0.43	
Uniform Delay, d1	6.9	9.2		4.3	7.0			25.3			23.9	
Progression Factor	0.86	0.70		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.0	1.0		0.1	1.0			5.7			1.1	
Delay (s)	5.9	7.5		4.4	8.0			31.0			25.0	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		7.4			7.3			31.0			25.0	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	15.1	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	69.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	52.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	178	0	0	181	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77
Hourly flow rate (vph)	231	0	0	235	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			TWLTL		
Median storage veh)				2		
Upstream signal (ft)				960		
pX, platoon unblocked						
vC, conflicting volume			231		466	231
vC1, stage 1 conf vol					231	
vC2, stage 2 conf vol					235	
vCu, unblocked vol			231		466	231
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1349		709	813

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2
Volume Total	231	0	235	0	0
Volume Left	0	0	0	0	0
Volume Right	0	0	0	0	0
cSH	1700	1700	1700	1700	1700
Volume to Capacity	0.14	0.00	0.14	0.00	0.00
Queue Length 95th (ft)	0	0	0	0	0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0
Lane LOS				A	A
Approach Delay (s)	0.0	0.0		0.0	
Approach LOS				A	

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	12.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	3	171	4	19	152	24	2	0	15	16	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	4	216	5	24	192	30	3	0	19	20	0	3
Pedestrians											1	
Lane Width (ft)											12.0	
Walking Speed (ft/s)											4.0	
Percent Blockage											0	
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)					460							
pX, platoon unblocked												
vC, conflicting volume	224			222			485	498	219	502	486	209
vC1, stage 1 conf vol							227	227		257	257	
vC2, stage 2 conf vol							258	272		246	229	
vCu, unblocked vol	224			222			485	498	219	502	486	209
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			98			100	100	98	97	100	100
cM capacity (veh/h)	1356			1296			647	602	826	625	602	836

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	225	247	22	23
Volume Left	4	24	3	20
Volume Right	5	30	19	3
cSH	1356	1296	800	643
Volume to Capacity	0.00	0.02	0.03	0.04
Queue Length 95th (ft)	0	1	2	3
Control Delay (s)	0.2	0.9	9.6	10.8
Lane LOS	A	A	A	B
Approach Delay (s)	0.2	0.9	9.6	10.8
Approach LOS			A	B

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	32.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	74	165	115	55	74	460	157	23	609
v/c Ratio	0.36	0.51	0.65	0.18	0.37	0.39	0.15	0.15	0.34
Control Delay	30.7	22.1	45.1	20.8	34.7	9.7	2.4	32.8	12.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.7	22.1	45.1	20.8	34.7	9.7	2.4	32.8	12.2
Queue Length 50th (ft)	31	42	50	17	32	64	0	10	78
Queue Length 95th (ft)	57	79	85	38	62	203	24	29	133
Internal Link Dist (ft)		380		139		2535			1366
Turn Bay Length (ft)	100		100		215			200	
Base Capacity (vph)	423	593	351	611	279	1182	1078	185	1776
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.28	0.33	0.09	0.27	0.39	0.15	0.12	0.34

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	62	74	65	97	35	11	62	386	132	19	415	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.0	4.0		4.0	4.5	4.5	4.0	8.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	0.99		1.00	1.00	0.97	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.93		1.00	0.96		1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1683	1661		1762	1781		1719	1810	1568	1703	3346	
Flt Permitted	0.72	1.00		0.56	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1278	1661		1040	1781		1719	1810	1568	1703	3346	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	74	88	77	115	42	13	74	460	157	23	494	115
RTOR Reduction (vph)	0	54	0	0	11	0	0	0	60	0	18	0
Lane Group Flow (vph)	74	111	0	115	44	0	74	460	97	23	591	0
Confl. Peds. (#/hr)	1		4	4		1	1		4	4		1
Heavy Vehicles (%)	7%	6%	5%	2%	0%	10%	5%	5%	0%	6%	4%	6%
Turn Type	Perm			Perm			Prot		Perm	Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			
Actuated Green, G (s)	12.0	12.0		12.5	12.5		7.4	45.9	45.9	3.1	38.1	
Effective Green, g (s)	12.0	12.0		12.5	12.5		7.4	45.9	45.9	3.1	38.1	
Actuated g/C Ratio	0.16	0.16		0.17	0.17		0.10	0.62	0.62	0.04	0.51	
Clearance Time (s)	4.5	4.5		4.0	4.0		4.0	4.5	4.5	4.0	8.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	207	269		176	301		172	1123	973	71	1723	
v/s Ratio Prot		0.07			0.02		c0.04	c0.25		0.01	0.18	
v/s Ratio Perm	0.06			c0.11					0.06			
v/c Ratio	0.36	0.41		0.65	0.15		0.43	0.41	0.10	0.32	0.34	
Uniform Delay, d1	27.6	27.8		28.7	26.2		31.3	7.2	5.7	34.4	10.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.1	1.0		8.4	0.2		1.7	1.1	0.2	2.6	0.5	
Delay (s)	28.6	28.9		37.1	26.4		33.0	8.3	5.9	37.1	11.1	
Level of Service	C	C		D	C		C	A	A	D	B	
Approach Delay (s)		28.8			33.7			10.4			12.1	
Approach LOS		C			C			B			B	

Intersection Summary			
HCM Average Control Delay	15.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	74.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	210	15	14	28	25	130
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	250	18	17	33	30	155
Pedestrians		4				
Lane Width (ft)		12.0				
Walking Speed (ft/s)		4.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		219				
pX, platoon unblocked						
vC, conflicting volume	50				551	37
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	50				551	37
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	84				93	85
cM capacity (veh/h)	1544				412	1029

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	268	50	185
Volume Left	250	0	30
Volume Right	0	33	155
cSH	1544	1700	829
Volume to Capacity	0.16	0.03	0.22
Queue Length 95th (ft)	14	0	21
Control Delay (s)	7.3	0.0	10.6
Lane LOS	A		B
Approach Delay (s)	7.3	0.0	10.6
Approach LOS			B

Intersection Summary			
Average Delay	7.8		
Intersection Capacity Utilization	36.0%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	WBL	WBR	NBT	SBL	SBT
Lane Group Flow (vph)	31	381	253	128	438
v/c Ratio	0.08	0.52	0.20	0.18	0.21
Control Delay	28.9	5.9	22.7	10.0	10.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	28.9	5.9	22.7	10.0	10.4
Queue Length 50th (ft)	16	0	60	36	70
Queue Length 95th (ft)	39	62	88	62	93
Internal Link Dist (ft)	678		878		2535
Turn Bay Length (ft)	545	545		115	
Base Capacity (vph)	372	727	1237	730	2071
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.08	0.52	0.20	0.18	0.21

Intersection Summary

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	27	335	200	23	113	385
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.4	5.4	5.4		5.1	5.4
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.99	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.98		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1236	1531	3258		1752	3438
Flt Permitted	0.95	1.00	1.00		0.53	1.00
Satd. Flow (perm)	1236	1531	3258		976	3438
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	31	381	227	26	128	438
RTOR Reduction (vph)	0	266	8	0	0	0
Lane Group Flow (vph)	31	115	245	0	128	438
Confl. Peds. (#/hr)		2				
Heavy Vehicles (%)	46%	4%	6%	36%	3%	5%
Turn Type		Perm			pm+pt	
Protected Phases	8		2		1	6
Permitted Phases		8			6	
Actuated Green, G (s)	33.5	33.5	42.0		67.1	67.1
Effective Green, g (s)	33.5	33.5	42.0		67.1	67.1
Actuated g/C Ratio	0.30	0.30	0.38		0.60	0.60
Clearance Time (s)	5.4	5.4	5.4		5.1	5.4
Lane Grp Cap (vph)	372	460	1228		727	2071
v/s Ratio Prot	0.03		0.08		0.03	c0.13
v/s Ratio Perm		c0.07			0.07	
v/c Ratio	0.08	0.25	0.20		0.18	0.21
Uniform Delay, d1	27.9	29.4	23.4		9.6	10.1
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.4	1.3	0.4		0.5	0.2
Delay (s)	28.4	30.7	23.7		10.2	10.3
Level of Service	C	C	C		B	B
Approach Delay (s)	30.6		23.7			10.3
Approach LOS	C		C			B

Intersection Summary			
HCM Average Control Delay	19.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.22		
Actuated Cycle Length (s)	111.4	Sum of lost time (s)	10.8
Intersection Capacity Utilization	59.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	37	63	151	30	230	190
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	40	68	162	32	247	204
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		10				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						958
pX, platoon unblocked						
vC, conflicting volume	861	162			162	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	861	162			162	
tC, single (s)	6.9	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.9	3.4			2.2	
p0 queue free %	82	92			82	
cM capacity (veh/h)	225	867			1410	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	108	162	32	247	204
Volume Left	40	0	0	247	0
Volume Right	68	0	32	0	0
cSH	609	1700	1700	1410	1700
Volume to Capacity	0.18	0.10	0.02	0.18	0.12
Queue Length 95th (ft)	16	0	0	16	0
Control Delay (s)	15.0	0.0	0.0	8.1	0.0
Lane LOS	B			A	
Approach Delay (s)	15.0	0.0		4.4	
Approach LOS	B				

Intersection Summary			
Average Delay	4.8		
Intersection Capacity Utilization	34.0%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix D
Year 2016 Total Traffic Operations Level-of-Service Worksheets

HCM Signalized Intersection Capacity Analysis
1: Kittias Hwy/Mountain View Ave & Canyon Road

4/16/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	11	1	121	29	190	5	391	83	181	453	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.87		1.00	0.97		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	1610		1752	1617		1504	1770		1787	1818	
Flt Permitted	0.34	1.00		0.75	1.00		0.46	1.00		0.28	1.00	
Satd. Flow (perm)	625	1610		1380	1617		724	1770		529	1818	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	30	13	1	144	35	226	6	465	99	215	539	14
RTOR Reduction (vph)	0	1	0	0	184	0	0	9	0	0	1	0
Lane Group Flow (vph)	30	13	0	144	77	0	6	555	0	215	552	0
Confl. Peds. (#/hr)									2	2		
Heavy Vehicles (%)	4%	18%	0%	3%	4%	2%	20%	3%	9%	1%	4%	8%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		8			4			6		5	2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)	12.9	12.9		12.9	12.9		35.9	35.9		48.1	48.1	
Effective Green, g (s)	12.9	12.9		12.9	12.9		35.9	35.9		48.1	48.1	
Actuated g/C Ratio	0.19	0.19		0.19	0.19		0.52	0.52		0.70	0.70	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	117	301		258	302		377	921		518	1267	
v/s Ratio Prot		0.01			0.05			c0.31		0.05	c0.30	
v/s Ratio Perm	0.05			c0.10			0.01			0.24		
v/c Ratio	0.26	0.04		0.56	0.26		0.02	0.60		0.42	0.44	
Uniform Delay, d1	24.0	23.0		25.5	24.0		8.0	11.6		5.8	4.5	
Progression Factor	1.00	1.00		0.79	0.62		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	0.1		2.5	0.4		0.1	2.9		0.5	1.1	
Delay (s)	25.1	23.1		22.7	15.3		8.1	14.5		6.4	5.6	
Level of Service	C	C		C	B		A	B		A	A	
Approach Delay (s)		24.5			17.9			14.4			5.8	
Approach LOS		C			B			B			A	

Intersection Summary			
HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	69.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	287	29	81	315	35	23	80	195	30	56	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.98			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.98			0.91			0.96	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.99	
Satd. Flow (prot)	1699	1813		1734	1817			1664			1786	
Flt Permitted	0.52	1.00		0.43	1.00			0.97			0.71	
Satd. Flow (perm)	936	1813		790	1817			1619			1286	
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	20	334	34	94	366	41	27	93	227	35	65	41
RTOR Reduction (vph)	0	4	0	0	4	0	0	112	0	0	25	0
Lane Group Flow (vph)	20	364	0	94	403	0	0	235	0	0	116	0
Confl. Peds. (#/hr)	3		2	2		3	5		2	2		5
Heavy Vehicles (%)	6%	3%	4%	4%	3%	0%	5%	1%	2%	0%	0%	0%
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	38.2	36.9		46.6	41.3			14.4			14.4	
Effective Green, g (s)	38.2	36.9		46.6	41.3			14.4			14.4	
Actuated g/C Ratio	0.55	0.53		0.68	0.60			0.21			0.21	
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)	533	970		612	1088			338			268	
v/s Ratio Prot	0.00	0.20		c0.01	c0.22							
v/s Ratio Perm	0.02			0.09				c0.14			0.09	
v/c Ratio	0.04	0.38		0.15	0.37			0.69			0.43	
Uniform Delay, d1	7.0	9.3		4.4	7.1			25.3			23.8	
Progression Factor	0.86	0.70		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.0	1.0		0.1	1.0			6.1			1.1	
Delay (s)	6.0	7.6		4.5	8.1			31.3			24.9	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		7.5			7.4			31.3			24.9	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	15.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	69.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	178	0	72	181	0	42
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77
Hourly flow rate (vph)	231	0	94	235	0	55
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			TWLTL		
Median storage veh)				2		
Upstream signal (ft)				960		
pX, platoon unblocked						
vC, conflicting volume			231		653	231
vC1, stage 1 conf vol					231	
vC2, stage 2 conf vol					422	
vCu, unblocked vol			231		653	231
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			93		100	93
cM capacity (veh/h)			1349		573	813

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2
Volume Total	231	94	235	0	55
Volume Left	0	94	0	0	0
Volume Right	0	0	0	0	55
cSH	1700	1349	1700	1700	813
Volume to Capacity	0.14	0.07	0.14	0.00	0.07
Queue Length 95th (ft)	0	6	0	0	5
Control Delay (s)	0.0	7.9	0.0	0.0	9.7
Lane LOS		A		A	A
Approach Delay (s)	0.0	2.2		9.7	
Approach LOS				A	

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	20.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
4: Umptanum Road & South Opportunity Street

4/16/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	3	213	4	90	223	24	2	0	100	16	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	4	270	5	114	282	30	3	0	127	20	0	3
Pedestrians											1	
Lane Width (ft)											12.0	
Walking Speed (ft/s)											4.0	
Percent Blockage											0	
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)					460							
pX, platoon unblocked												
vC, conflicting volume	314			275			808	821	272	933	809	298
vC1, stage 1 conf vol							280	280		526	526	
vC2, stage 2 conf vol							528	542		406	282	
vCu, unblocked vol	314			275			808	821	272	933	809	298
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			91			99	100	84	94	100	100
cM capacity (veh/h)	1257			1238			447	436	771	349	428	745

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	278	427	129	23
Volume Left	4	114	3	20
Volume Right	5	30	127	3
cSH	1257	1238	761	371
Volume to Capacity	0.00	0.09	0.17	0.06
Queue Length 95th (ft)	0	8	15	5
Control Delay (s)	0.1	2.9	10.7	15.4
Lane LOS	A	A	B	C
Approach Delay (s)	0.1	2.9	10.7	15.4
Approach LOS			B	C

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	47.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Signalized Intersection Capacity Analysis
5: Umptanum Road & Canyon Road

4/16/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	65	78	185	97	39	11	198	386	132	19	415	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.0	4.0		4.0	4.5	4.5	4.0	8.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00	0.97	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.89		1.00	0.97		1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1683	1594		1765	1789		1719	1810	1568	1703	3343	
Flt Permitted	0.72	1.00		0.28	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1273	1594		528	1789		1719	1810	1568	1703	3343	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	77	93	220	115	46	13	236	460	157	23	494	119
RTOR Reduction (vph)	0	137	0	0	10	0	0	0	66	0	25	0
Lane Group Flow (vph)	77	176	0	115	49	0	236	460	91	23	588	0
Confl. Peds. (#/hr)	1		4	4		1	1		4	4		1
Heavy Vehicles (%)	7%	6%	5%	2%	0%	10%	5%	5%	0%	6%	4%	6%
Turn Type	Perm			Perm			Prot		Perm	Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			
Actuated Green, G (s)	15.2	15.2		15.7	15.7		14.5	42.7	42.7	3.1	27.8	
Effective Green, g (s)	15.2	15.2		15.7	15.7		14.5	42.7	42.7	3.1	27.8	
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.20	0.58	0.58	0.04	0.38	
Clearance Time (s)	4.5	4.5		4.0	4.0		4.0	4.5	4.5	4.0	8.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	261	327		112	380		337	1044	905	71	1256	
v/s Ratio Prot		0.11			0.03		c0.14	c0.25		0.01	0.18	
v/s Ratio Perm	0.06			c0.22					0.06			
v/c Ratio	0.30	0.54		1.03	0.13		0.70	0.44	0.10	0.32	0.47	
Uniform Delay, d1	24.9	26.3		29.1	23.6		27.7	8.9	7.0	34.4	17.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.6	1.7		92.4	0.2		6.4	1.4	0.2	2.6	1.3	
Delay (s)	25.5	28.0		121.6	23.8		34.2	10.2	7.2	37.1	18.8	
Level of Service	C	C		F	C		C	B	A	D	B	
Approach Delay (s)		27.5			88.4			16.3			19.4	
Approach LOS		C			F			B			B	

Intersection Summary			
HCM Average Control Delay	25.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	74.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	214	15	14	28	25	134
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	255	18	17	33	30	160
Pedestrians		4				
Lane Width (ft)		12.0				
Walking Speed (ft/s)		4.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		219				
pX, platoon unblocked						
vC, conflicting volume	50				561	37
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	50				561	37
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	83				93	84
cM capacity (veh/h)	1544				405	1029

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	273	50	189
Volume Left	255	0	30
Volume Right	0	33	160
cSH	1544	1700	828
Volume to Capacity	0.17	0.03	0.23
Queue Length 95th (ft)	15	0	22
Control Delay (s)	7.4	0.0	10.6
Lane LOS	A		B
Approach Delay (s)	7.4	0.0	10.6
Approach LOS			B

Intersection Summary			
Average Delay	7.9		
Intersection Capacity Utilization	36.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	27	365	306	23	205	413
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.4	5.4	5.4		5.1	5.4
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.99	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1236	1531	3305		1752	3438
Flt Permitted	0.95	1.00	1.00		0.44	1.00
Satd. Flow (perm)	1236	1531	3305		806	3438
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	31	415	348	26	233	469
RTOR Reduction (vph)	0	290	5	0	0	0
Lane Group Flow (vph)	31	125	369	0	233	469
Confl. Peds. (#/hr)		2				
Heavy Vehicles (%)	46%	4%	6%	36%	3%	5%
Turn Type		Perm			pm+pt	
Protected Phases	8		2		1	6
Permitted Phases		8			6	
Actuated Green, G (s)	33.5	33.5	42.0		67.1	67.1
Effective Green, g (s)	33.5	33.5	42.0		67.1	67.1
Actuated g/C Ratio	0.30	0.30	0.38		0.60	0.60
Clearance Time (s)	5.4	5.4	5.4		5.1	5.4
Lane Grp Cap (vph)	372	460	1246		655	2071
v/s Ratio Prot	0.03		0.11		c0.06	0.14
v/s Ratio Perm		c0.08			c0.15	
v/c Ratio	0.08	0.27	0.30		0.36	0.23
Uniform Delay, d1	27.9	29.7	24.3		10.6	10.2
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.4	1.5	0.6		1.5	0.3
Delay (s)	28.4	31.1	24.9		12.1	10.5
Level of Service	C	C	C		B	B
Approach Delay (s)	30.9		24.9			11.0
Approach LOS	C		C			B

Intersection Summary			
HCM Average Control Delay	20.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	111.4	Sum of lost time (s)	10.5
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	37	168	152	30	257	191
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	40	181	163	32	276	205
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		10				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						958
pX, platoon unblocked						
vC, conflicting volume	922	163			163	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	922	163			163	
tC, single (s)	6.9	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.9	3.4			2.2	
p0 queue free %	80	79			80	
cM capacity (veh/h)	201	866			1409	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	220	163	32	276	205
Volume Left	40	0	0	276	0
Volume Right	181	0	32	0	0
cSH	1056	1700	1700	1409	1700
Volume to Capacity	0.21	0.10	0.02	0.20	0.12
Queue Length 95th (ft)	20	0	0	18	0
Control Delay (s)	13.3	0.0	0.0	8.2	0.0
Lane LOS	B			A	
Approach Delay (s)	13.3	0.0		4.7	
Approach LOS	B				

Intersection Summary			
Average Delay	5.8		
Intersection Capacity Utilization	35.6%	ICU Level of Service	A
Analysis Period (min)	15		

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:30	4:30	4:30	4:30	4:30	4:30
End Time	5:40	5:40	5:40	5:40	5:40	5:40
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	3	3	3	3	3	3
# of Recorded Intvls	2	2	2	2	2	2
Vehs Entered	2710	2759	2596	2591	2610	2647
Vehs Exited	2742	2790	2608	2642	2653	2688
Starting Vehs	149	162	136	160	160	153
Ending Vehs	117	131	124	109	117	117
Denied Entry Before	2	2	1	1	3	0
Denied Entry After	5	1	0	4	0	2
Travel Distance (mi)	2635	2728	2502	2543	2549	2592
Travel Time (hr)	126.0	133.9	118.4	120.5	123.0	124.4
Total Delay (hr)	29.6	34.5	27.0	27.7	29.5	29.7
Total Stops	3703	4105	3492	3540	3736	3714
Fuel Used (gal)	94.2	98.2	89.0	90.5	91.0	92.6

Interval #0 Information Seeding

Start Time	4:30
End Time	4:40
Total Time (min)	10

Volumes adjusted by PHF, Growth Factors.
No data recorded this interval.

Interval #1 Information Recording

Start Time	4:40
End Time	4:55
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	1	2	3	4	5	Avg
Vehs Entered	787	824	742	767	743	771
Vehs Exited	790	849	741	779	762	784
Starting Vehs	149	162	136	160	160	153
Ending Vehs	146	137	137	148	141	143
Denied Entry Before	2	2	1	1	3	0
Denied Entry After	3	1	3	1	1	2
Travel Distance (mi)	749	822	698	759	712	748
Travel Time (hr)	36.7	43.3	33.4	37.6	35.5	37.3
Total Delay (hr)	9.2	13.2	7.9	9.7	9.3	9.9
Total Stops	1136	1486	1028	1198	1172	1204
Fuel Used (gal)	27.0	30.7	25.4	27.7	25.9	27.4

Interval #2 Information

Start Time	4:55
End Time	5:40
Total Time (min)	45

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	1	2	3	4	5	Avg
Vehs Entered	1923	1935	1854	1824	1867	1881
Vehs Exited	1952	1941	1867	1863	1891	1904
Starting Vehs	146	137	137	148	141	143
Ending Vehs	117	131	124	109	117	117
Denied Entry Before	3	1	3	1	1	2
Denied Entry After	5	1	0	4	0	2
Travel Distance (mi)	1886	1906	1804	1784	1837	1843
Travel Time (hr)	89.3	90.6	85.0	82.9	87.5	87.1
Total Delay (hr)	20.4	21.3	19.1	18.0	20.2	19.8
Total Stops	2567	2619	2464	2342	2564	2509
Fuel Used (gal)	67.1	67.4	63.7	62.7	65.1	65.2

Intersection: 1: Kittias Hwy/Mountain View Ave & Canyon Road, Interval #1

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	42	43	100	234	62	378	98	300
Average Queue (ft)	23	11	74	91	8	211	69	147
95th Queue (ft)	51	46	120	245	48	467	109	289
Link Distance (ft)		1083		771		1353		791
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	75		75		75		75	
Storage Blk Time (%)		1	15	4		23	8	11
Queuing Penalty (veh)		0	39	5		1	43	24

Intersection: 1: Kittias Hwy/Mountain View Ave & Canyon Road, Interval #2

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	51	46	99	190	57	304	100	252
Average Queue (ft)	19	9	53	46	6	105	54	87
95th Queue (ft)	49	35	100	146	31	225	95	190
Link Distance (ft)		1083		771		1353		791
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	75		75		75		75	
Storage Blk Time (%)		0	7	2		11	2	6
Queuing Penalty (veh)		0	14	2		1	9	11

Intersection: 1: Kittias Hwy/Mountain View Ave & Canyon Road, All Intervals

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	51	60	100	266	80	391	100	307
Average Queue (ft)	20	9	58	57	6	130	57	101
95th Queue (ft)	49	38	107	177	36	310	100	223
Link Distance (ft)		1083		771		1353		791
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	75		75		75		75	
Storage Blk Time (%)		0	9	2		14	4	7
Queuing Penalty (veh)		0	21	3		1	18	14

Intersection: 2: Kittias Hwy/Mountain View Ave & Ruby Street, Interval #1

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	57	191	105	196	230	118
Average Queue (ft)	14	108	52	111	150	74
95th Queue (ft)	54	191	107	193	243	146
Link Distance (ft)		771		2333	1342	721
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	75		100			
Storage Blk Time (%)		13	0	6		
Queuing Penalty (veh)		3	1	6		

Intersection: 2: Kittias Hwy/Mountain View Ave & Ruby Street, Interval #2

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	50	162	101	218	263	135
Average Queue (ft)	9	70	34	83	118	61
95th Queue (ft)	35	136	82	177	218	116
Link Distance (ft)		771		2333	1342	721
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	75		100			
Storage Blk Time (%)		7	0	4		
Queuing Penalty (veh)		1	0	3		

Intersection: 2: Kittias Hwy/Mountain View Ave & Ruby Street, All Intervals

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	79	191	115	238	272	148
Average Queue (ft)	10	79	38	90	126	64
95th Queue (ft)	40	154	90	183	227	124
Link Distance (ft)		771		2333	1342	721
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	75		100			
Storage Blk Time (%)		8	0	4		
Queuing Penalty (veh)		1	0	4		

Intersection: 3: Umptanum Road & Lakeshore Way, Interval #1

Movement	WB	NB
Directions Served	L	R
Maximum Queue (ft)	44	36
Average Queue (ft)	15	26
95th Queue (ft)	46	47
Link Distance (ft)		668
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	100	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Umptanum Road & Lakeshore Way, Interval #2

Movement	WB	NB
Directions Served	L	R
Maximum Queue (ft)	36	36
Average Queue (ft)	8	22
95th Queue (ft)	31	46
Link Distance (ft)		668
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	100	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Umptanum Road & Lakeshore Way, All Intervals

Movement	WB	NB
Directions Served	L	R
Maximum Queue (ft)	49	40
Average Queue (ft)	10	23
95th Queue (ft)	36	46
Link Distance (ft)		668
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	100	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Umptanum Road & South Opportunity Street, Interval #1

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LR	LR
Maximum Queue (ft)	32	115	54	40
Average Queue (ft)	5	36	34	21
95th Queue (ft)	35	107	59	48
Link Distance (ft)	436	344	651	324
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Umptanum Road & South Opportunity Street, Interval #2

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LR	LR
Maximum Queue (ft)	18	65	63	35
Average Queue (ft)	1	12	34	14
95th Queue (ft)	9	43	58	39
Link Distance (ft)	436	344	651	324
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Umptanum Road & South Opportunity Street, All Intervals

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LR	LR
Maximum Queue (ft)	45	116	71	40
Average Queue (ft)	2	18	34	16
95th Queue (ft)	19	65	59	42
Link Distance (ft)	436	344	651	324
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Umptanum Road & Canyon Road, Interval #1

Movement	EB	EB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	L	T	TR
Maximum Queue (ft)	86	211	107	70	215	356	22	185	181
Average Queue (ft)	39	96	64	34	142	198	7	116	117
95th Queue (ft)	92	208	114	72	224	432	20	188	182
Link Distance (ft)		344		150		2540		1353	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	100		100		215		200		200
Storage Blk Time (%)		7	3	0	5	1		0	1
Queuing Penalty (veh)		6	2	0	22	3		1	2

Intersection: 5: Umptanum Road & Canyon Road, Interval #2

Movement	EB	EB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	L	T	TR
Maximum Queue (ft)	114	205	109	78	229	286	44	137	149
Average Queue (ft)	37	77	52	25	114	106	7	66	78
95th Queue (ft)	87	171	100	64	202	219	27	114	135
Link Distance (ft)		344		150		2540		1353	
Upstream Blk Time (%)				0					
Queuing Penalty (veh)				0					
Storage Bay Dist (ft)	100		100		215		200		200
Storage Blk Time (%)	0	6	1		1	0			0
Queuing Penalty (veh)	0	3	1		3	1			0

Intersection: 5: Umptanum Road & Canyon Road, All Intervals

Movement	EB	EB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	L	T	TR
Maximum Queue (ft)	116	242	118	91	232	384	44	186	190
Average Queue (ft)	37	82	55	27	121	128	7	78	88
95th Queue (ft)	89	181	104	66	210	293	25	144	153
Link Distance (ft)		344		150		2540		1353	
Upstream Blk Time (%)				0					
Queuing Penalty (veh)				0					
Storage Bay Dist (ft)	100		100		215		200		200
Storage Blk Time (%)	0	6	2	0	2	1		0	0
Queuing Penalty (veh)	0	4	1	0	8	1		0	0

Intersection: 6: Umptanum Road & Ruby Street, Interval #1

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	66	80
Average Queue (ft)	17	50
95th Queue (ft)	60	81
Link Distance (ft)	150	1342
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Umptanum Road & Ruby Street, Interval #2

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	76	88
Average Queue (ft)	14	47
95th Queue (ft)	56	74
Link Distance (ft)	150	1342
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Umptanum Road & Ruby Street, All Intervals

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	83	89
Average Queue (ft)	15	48
95th Queue (ft)	57	76
Link Distance (ft)	150	1342
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: I-90 WB Ramps & Canyon Road, Interval #1

Movement	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	R	T	TR	L	T	T
Maximum Queue (ft)	77	148	146	125	127	155	127
Average Queue (ft)	29	71	104	95	78	78	69
95th Queue (ft)	77	136	153	144	128	159	131
Link Distance (ft)	1421		900	900		2540	2540
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)		545			115		
Storage Blk Time (%)					2	2	
Queuing Penalty (veh)					5	4	

Intersection: 7: I-90 WB Ramps & Canyon Road, Interval #2

Movement	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	R	T	TR	L	T	T
Maximum Queue (ft)	94	174	156	149	139	177	124
Average Queue (ft)	24	65	90	84	76	71	52
95th Queue (ft)	73	124	148	139	134	145	111
Link Distance (ft)	1421		900	900		2540	2540
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)		545			115		
Storage Blk Time (%)					3	1	
Queuing Penalty (veh)					5	3	

Intersection: 7: I-90 WB Ramps & Canyon Road, All Intervals

Movement	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	R	T	TR	L	T	T
Maximum Queue (ft)	94	179	163	154	139	196	142
Average Queue (ft)	25	67	94	86	76	73	56
95th Queue (ft)	74	127	150	141	133	149	117
Link Distance (ft)	1421		900	900		2540	2540
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)		545			115		
Storage Blk Time (%)					3	1	
Queuing Penalty (veh)					5	3	

Intersection: 8: I-90 EB Ramps & Canyon Road, Interval #1

Movement	WB	WB	SB
Directions Served	L	R	L
Maximum Queue (ft)	86	22	90
Average Queue (ft)	46	3	36
95th Queue (ft)	104	24	81
Link Distance (ft)	995		900
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		250	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 8: I-90 EB Ramps & Canyon Road, Interval #2

Movement	WB	WB	SB
Directions Served	L	R	L
Maximum Queue (ft)	107	37	85
Average Queue (ft)	38	3	26
95th Queue (ft)	88	20	69
Link Distance (ft)	995		900
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		250	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 8: I-90 EB Ramps & Canyon Road, All Intervals

Movement	WB	WB	SB
Directions Served	L	R	L
Maximum Queue (ft)	114	53	98
Average Queue (ft)	40	3	29
95th Queue (ft)	92	21	72
Link Distance (ft)	995		900
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		250	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Network Summary

Network wide Queuing Penalty, Interval #1: 166
Network wide Queuing Penalty, Interval #2: 57
Network wide Queuing Penalty, All Intervals: 84

Appendix E
Year 2016 Total Traffic Mitigated Operations Level of Service Worksheets

HCM Signalized Intersection Capacity Analysis
1: Kittias Hwy/Mountain View Ave & Canyon Road

4/16/2015

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	25	11	1	121	29	190	5	391	83	181	453	12
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.87		1.00	0.97		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1736	1610		1752	1617		1504	1770		1787	1818	
Flt Permitted	0.34	1.00		0.75	1.00		0.46	1.00		0.28	1.00	
Satd. Flow (perm)	625	1610		1380	1617		724	1770		529	1818	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	30	13	1	144	35	226	6	465	99	215	539	14
RTOR Reduction (vph)	0	1	0	0	184	0	0	9	0	0	1	0
Lane Group Flow (vph)	30	13	0	144	77	0	6	555	0	215	552	0
Confl. Peds. (#/hr)									2	2		
Heavy Vehicles (%)	4%	18%	0%	3%	4%	2%	20%	3%	9%	1%	4%	8%
Turn Type	Perm			Perm			Perm			pm+pt		
Protected Phases		8			4			6		5	2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)	12.9	12.9		12.9	12.9		35.9	35.9		48.1	48.1	
Effective Green, g (s)	12.9	12.9		12.9	12.9		35.9	35.9		48.1	48.1	
Actuated g/C Ratio	0.19	0.19		0.19	0.19		0.52	0.52		0.70	0.70	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	117	301		258	302		377	921		518	1267	
v/s Ratio Prot		0.01			0.05			c0.31		0.05	c0.30	
v/s Ratio Perm	0.05			c0.10			0.01			0.24		
v/c Ratio	0.26	0.04		0.56	0.26		0.02	0.60		0.42	0.44	
Uniform Delay, d1	24.0	23.0		25.5	24.0		8.0	11.6		5.8	4.5	
Progression Factor	1.00	1.00		0.79	0.62		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.2	0.1		2.5	0.4		0.1	2.9		0.5	1.1	
Delay (s)	25.1	23.1		22.7	15.3		8.1	14.5		6.4	5.6	
Level of Service	C	C		C	B		A	B		A	A	
Approach Delay (s)		24.5			17.9			14.4			5.8	
Approach LOS		C			B			B			A	

Intersection Summary			
HCM Average Control Delay	11.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	69.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	17	287	29	81	315	35	23	80	195	30	56	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0			4.0			4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.98			0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	0.98			0.91			0.96	
Flt Protected	0.95	1.00		0.95	1.00			1.00			0.99	
Satd. Flow (prot)	1699	1813		1734	1817			1664			1786	
Flt Permitted	0.52	1.00		0.43	1.00			0.97			0.71	
Satd. Flow (perm)	936	1813		790	1817			1619			1286	
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Adj. Flow (vph)	20	334	34	94	366	41	27	93	227	35	65	41
RTOR Reduction (vph)	0	4	0	0	4	0	0	112	0	0	25	0
Lane Group Flow (vph)	20	364	0	94	403	0	0	235	0	0	116	0
Confl. Peds. (#/hr)	3		2	2		3	5		2	2		5
Heavy Vehicles (%)	6%	3%	4%	4%	3%	0%	5%	1%	2%	0%	0%	0%
Turn Type	pm+pt			pm+pt			Perm			Perm		
Protected Phases	1	6		5	2			4			8	
Permitted Phases	6			2			4			8		
Actuated Green, G (s)	38.2	36.9		46.6	41.3			14.4			14.4	
Effective Green, g (s)	38.2	36.9		46.6	41.3			14.4			14.4	
Actuated g/C Ratio	0.55	0.53		0.68	0.60			0.21			0.21	
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)	533	970		612	1088			338			268	
v/s Ratio Prot	0.00	0.20		c0.01	c0.22							
v/s Ratio Perm	0.02			0.09				c0.14			0.09	
v/c Ratio	0.04	0.38		0.15	0.37			0.69			0.43	
Uniform Delay, d1	7.0	9.3		4.4	7.1			25.3			23.8	
Progression Factor	0.86	0.70		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.0	1.0		0.1	1.0			6.1			1.1	
Delay (s)	6.0	7.6		4.5	8.1			31.3			24.9	
Level of Service	A	A		A	A			C			C	
Approach Delay (s)		7.5			7.4			31.3			24.9	
Approach LOS		A			A			C			C	

Intersection Summary			
HCM Average Control Delay	15.3	HCM Level of Service	B
HCM Volume to Capacity ratio	0.45		
Actuated Cycle Length (s)	69.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	52.6%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	178	0	72	181	0	42
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.77	0.77	0.77	0.77	0.77	0.77
Hourly flow rate (vph)	231	0	94	235	0	55
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			TWLTL		
Median storage veh)				2		
Upstream signal (ft)				960		
pX, platoon unblocked						
vC, conflicting volume			231		653	231
vC1, stage 1 conf vol					231	
vC2, stage 2 conf vol					422	
vCu, unblocked vol			231		653	231
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			93		100	93
cM capacity (veh/h)			1349		573	813

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2
Volume Total	231	94	235	0	55
Volume Left	0	94	0	0	0
Volume Right	0	0	0	0	55
cSH	1700	1349	1700	1700	813
Volume to Capacity	0.14	0.07	0.14	0.00	0.07
Queue Length 95th (ft)	0	6	0	0	5
Control Delay (s)	0.0	7.9	0.0	0.0	9.7
Lane LOS		A		A	A
Approach Delay (s)	0.0	2.2		9.7	
Approach LOS				A	

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	20.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	3	213	4	90	223	24	2	0	100	16	0	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	4	270	5	114	282	30	3	0	127	20	0	3
Pedestrians											1	
Lane Width (ft)											12.0	
Walking Speed (ft/s)											4.0	
Percent Blockage											0	
Right turn flare (veh)												
Median type		TWLTL			None							
Median storage veh)		2										
Upstream signal (ft)					460							
pX, platoon unblocked												
vC, conflicting volume	314			275			808	821	272	933	809	298
vC1, stage 1 conf vol							280	280		526	526	
vC2, stage 2 conf vol							528	542		406	282	
vCu, unblocked vol	314			275			808	821	272	933	809	298
tC, single (s)	4.1			4.2			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)							6.1	5.5		6.1	5.5	
tF (s)	2.2			2.3			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			91			99	100	84	94	100	100
cM capacity (veh/h)	1257			1238			447	436	771	349	428	745

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	278	427	129	23
Volume Left	4	114	3	20
Volume Right	5	30	127	3
cSH	1257	1238	761	371
Volume to Capacity	0.00	0.09	0.17	0.06
Queue Length 95th (ft)	0	8	15	5
Control Delay (s)	0.1	2.9	10.7	15.4
Lane LOS	A	A	B	C
Approach Delay (s)	0.1	2.9	10.7	15.4
Approach LOS			B	C

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	47.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	65	78	185	97	39	11	198	386	132	19	415	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.0	4.0		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	0.95	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	1.00	0.97	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.89		1.00	0.97		1.00	1.00	0.85	1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1683	1594		1765	1789		1719	1810	1568	1703	3343	
Flt Permitted	0.72	1.00		0.34	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1273	1594		628	1789		1719	1810	1568	1703	3343	
Peak-hour factor, PHF	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	77	93	220	115	46	13	236	460	157	23	494	119
RTOR Reduction (vph)	0	131	0	0	10	0	0	0	71	0	26	0
Lane Group Flow (vph)	77	182	0	115	49	0	236	460	86	23	587	0
Confl. Peds. (#/hr)	1		4	4		1	1		4	4		1
Heavy Vehicles (%)	7%	6%	5%	2%	0%	10%	5%	5%	0%	6%	4%	6%
Turn Type	Perm			Perm			Prot		Perm	Prot		
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8					2			
Actuated Green, G (s)	17.6	17.6		18.1	18.1		14.4	40.4	40.4	3.0	29.0	
Effective Green, g (s)	17.6	17.6		18.1	18.1		14.4	40.4	40.4	3.0	29.0	
Actuated g/C Ratio	0.24	0.24		0.24	0.24		0.19	0.55	0.55	0.04	0.39	
Clearance Time (s)	4.5	4.5		4.0	4.0		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	303	379		154	438		335	988	856	69	1310	
v/s Ratio Prot		0.11			0.03		c0.14	c0.25		0.01	0.18	
v/s Ratio Perm	0.06			c0.18					0.05			
v/c Ratio	0.25	0.48		0.75	0.11		0.70	0.47	0.10	0.33	0.45	
Uniform Delay, d1	22.9	24.3		25.8	21.7		27.8	10.2	8.1	34.5	16.6	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.4	1.0		17.8	0.1		6.6	1.6	0.2	2.8	1.1	
Delay (s)	23.3	25.2		43.6	21.8		34.4	11.8	8.3	37.4	17.7	
Level of Service	C	C		D	C		C	B	A	D	B	
Approach Delay (s)		24.8			36.2			17.4			18.4	
Approach LOS		C			D			B			B	

Intersection Summary			
HCM Average Control Delay	20.7	HCM Level of Service	C
HCM Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	74.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.0%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	214	15	14	28	25	134
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	255	18	17	33	30	160
Pedestrians		4				
Lane Width (ft)		12.0				
Walking Speed (ft/s)		4.0				
Percent Blockage		0				
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		219				
pX, platoon unblocked						
vC, conflicting volume	50				561	37
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	50				561	37
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	83				93	84
cM capacity (veh/h)	1544				405	1029

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	273	50	189
Volume Left	255	0	30
Volume Right	0	33	160
cSH	1544	1700	828
Volume to Capacity	0.17	0.03	0.23
Queue Length 95th (ft)	15	0	22
Control Delay (s)	7.4	0.0	10.6
Lane LOS	A		B
Approach Delay (s)	7.4	0.0	10.6
Approach LOS			B

Intersection Summary			
Average Delay	7.9		
Intersection Capacity Utilization	36.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	27	365	306	23	205	413
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.4	5.4	5.4		5.1	5.4
Lane Util. Factor	1.00	1.00	0.95		1.00	0.95
Frpb, ped/bikes	1.00	0.99	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	0.85	0.99		1.00	1.00
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1236	1531	3305		1752	3438
Flt Permitted	0.95	1.00	1.00		0.44	1.00
Satd. Flow (perm)	1236	1531	3305		806	3438
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	31	415	348	26	233	469
RTOR Reduction (vph)	0	290	5	0	0	0
Lane Group Flow (vph)	31	125	369	0	233	469
Confl. Peds. (#/hr)		2				
Heavy Vehicles (%)	46%	4%	6%	36%	3%	5%
Turn Type		Perm			pm+pt	
Protected Phases	8		2		1	6
Permitted Phases		8			6	
Actuated Green, G (s)	33.5	33.5	42.0		67.1	67.1
Effective Green, g (s)	33.5	33.5	42.0		67.1	67.1
Actuated g/C Ratio	0.30	0.30	0.38		0.60	0.60
Clearance Time (s)	5.4	5.4	5.4		5.1	5.4
Lane Grp Cap (vph)	372	460	1246		655	2071
v/s Ratio Prot	0.03		0.11		c0.06	0.14
v/s Ratio Perm		c0.08			c0.15	
v/c Ratio	0.08	0.27	0.30		0.36	0.23
Uniform Delay, d1	27.9	29.7	24.3		10.6	10.2
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.4	1.5	0.6		1.5	0.3
Delay (s)	28.4	31.1	24.9		12.1	10.5
Level of Service	C	C	C		B	B
Approach Delay (s)	30.9		24.9			11.0
Approach LOS	C		C			B

Intersection Summary			
HCM Average Control Delay	20.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	111.4	Sum of lost time (s)	10.5
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	37	168	152	30	257	191
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	40	181	163	32	276	205
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)		10				
Median type			None			None
Median storage veh)						
Upstream signal (ft)						958
pX, platoon unblocked						
vC, conflicting volume	922	163			163	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	922	163			163	
tC, single (s)	6.9	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.9	3.4			2.2	
p0 queue free %	80	79			80	
cM capacity (veh/h)	201	866			1409	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	220	163	32	276	205
Volume Left	40	0	0	276	0
Volume Right	181	0	32	0	0
cSH	1056	1700	1700	1409	1700
Volume to Capacity	0.21	0.10	0.02	0.20	0.12
Queue Length 95th (ft)	20	0	0	18	0
Control Delay (s)	13.3	0.0	0.0	8.2	0.0
Lane LOS	B			A	
Approach Delay (s)	13.3	0.0		4.7	
Approach LOS	B				

Intersection Summary			
Average Delay	5.8		
Intersection Capacity Utilization	35.6%	ICU Level of Service	A
Analysis Period (min)	15		

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:30	4:30	4:30	4:30	4:30	4:30
End Time	5:40	5:40	5:40	5:40	5:40	5:40
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	3	3	3	3	3	3
# of Recorded Intvls	2	2	2	2	2	2
Vehs Entered	2726	2776	2639	2621	2574	2669
Vehs Exited	2769	2816	2657	2681	2624	2709
Starting Vehs	159	166	135	175	161	159
Ending Vehs	116	126	117	115	111	114
Denied Entry Before	2	2	1	2	3	0
Denied Entry After	4	1	0	3	2	1
Travel Distance (mi)	2653	2735	2561	2556	2538	2609
Travel Time (hr)	127.5	133.9	121.3	122.1	122.3	125.4
Total Delay (hr)	30.5	34.4	27.9	28.9	29.6	30.2
Total Stops	3813	4135	3572	3699	3654	3776
Fuel Used (gal)	95.5	98.7	90.9	91.2	90.4	93.3

Interval #0 Information Seeding

Start Time	4:30
End Time	4:40
Total Time (min)	10

Volumes adjusted by PHF, Growth Factors.
No data recorded this interval.

Interval #1 Information Recording

Start Time	4:40
End Time	4:55
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	1	2	3	4	5	Avg
Vehs Entered	791	818	744	781	739	771
Vehs Exited	802	853	743	820	762	795
Starting Vehs	159	166	135	175	161	159
Ending Vehs	148	131	136	136	138	133
Denied Entry Before	2	2	1	2	3	0
Denied Entry After	2	1	4	2	1	1
Travel Distance (mi)	762	813	699	760	711	749
Travel Time (hr)	38.0	43.2	34.1	38.1	35.9	37.8
Total Delay (hr)	10.1	13.5	8.5	10.2	9.7	10.4
Total Stops	1197	1489	1059	1280	1132	1228
Fuel Used (gal)	27.7	30.6	25.3	28.0	25.8	27.5

Interval #2 Information

Start Time	4:55
End Time	5:40
Total Time (min)	45

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	1	2	3	4	5	Avg
Vehs Entered	1935	1958	1895	1840	1835	1890
Vehs Exited	1967	1963	1914	1861	1862	1912
Starting Vehs	148	131	136	136	138	133
Ending Vehs	116	126	117	115	111	114
Denied Entry Before	2	1	4	2	1	1
Denied Entry After	4	1	0	3	2	1
Travel Distance (mi)	1892	1921	1862	1796	1827	1860
Travel Time (hr)	89.5	90.7	87.2	84.1	86.4	87.6
Total Delay (hr)	20.4	20.9	19.4	18.7	19.8	19.8
Total Stops	2616	2646	2513	2419	2522	2543
Fuel Used (gal)	67.9	68.1	65.6	63.2	64.6	65.9

Intersection: 1: Kittias Hwy/Mountain View Ave & Canyon Road, Interval #1

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	51	30	98	228	36	392	99	302
Average Queue (ft)	26	5	67	59	5	200	73	172
95th Queue (ft)	56	27	109	198	34	472	116	321
Link Distance (ft)		1083		771		1353		791
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	75		75		75		75	
Storage Blk Time (%)	0	0	12	2		20	12	13
Queuing Penalty (veh)	0	0	30	3		1	68	28

Intersection: 1: Kittias Hwy/Mountain View Ave & Canyon Road, Interval #2

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	51	44	99	276	71	324	99	274
Average Queue (ft)	19	7	57	53	6	119	54	92
95th Queue (ft)	48	31	104	176	37	254	95	205
Link Distance (ft)		1083		771		1353		791
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	75		75		75		75	
Storage Blk Time (%)		0	7	3		13	2	6
Queuing Penalty (veh)		0	13	3		1	10	10

Intersection: 1: Kittias Hwy/Mountain View Ave & Canyon Road, All Intervals

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	56	52	100	291	72	434	99	332
Average Queue (ft)	21	6	59	55	6	139	58	111
95th Queue (ft)	50	30	106	182	36	326	102	246
Link Distance (ft)		1083		771		1353		791
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	75		75		75		75	
Storage Blk Time (%)	0	0	8	3		15	5	8
Queuing Penalty (veh)	0	0	18	3		1	24	14

Intersection: 2: Kittias Hwy/Mountain View Ave & Ruby Street, Interval #1

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	57	211	102	200	272	122
Average Queue (ft)	10	116	51	108	161	67
95th Queue (ft)	50	203	107	193	294	128
Link Distance (ft)		771		2333	1342	721
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	75		100			
Storage Blk Time (%)		17	0	7		
Queuing Penalty (veh)		3	1	6		

Intersection: 2: Kittias Hwy/Mountain View Ave & Ruby Street, Interval #2

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	46	171	91	229	255	120
Average Queue (ft)	8	71	32	85	114	58
95th Queue (ft)	33	138	77	181	211	111
Link Distance (ft)		771		2333	1342	721
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	75		100			
Storage Blk Time (%)	0	6		4		
Queuing Penalty (veh)	0	1		3		

Intersection: 2: Kittias Hwy/Mountain View Ave & Ruby Street, All Intervals

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	LTR	LTR
Maximum Queue (ft)	62	228	114	233	329	135
Average Queue (ft)	9	81	36	90	125	60
95th Queue (ft)	38	161	86	185	237	116
Link Distance (ft)		771		2333	1342	721
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	75		100			
Storage Blk Time (%)	0	9	0	5		
Queuing Penalty (veh)	0	2	0	4		

Intersection: 3: Umptanum Road & Lakeshore Way, Interval #1

Movement	WB	NB
Directions Served	L	R
Maximum Queue (ft)	35	36
Average Queue (ft)	16	25
95th Queue (ft)	42	47
Link Distance (ft)		668
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	100	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Umptanum Road & Lakeshore Way, Interval #2

Movement	WB	NB
Directions Served	L	R
Maximum Queue (ft)	35	36
Average Queue (ft)	9	21
95th Queue (ft)	34	45
Link Distance (ft)		668
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	100	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Umptanum Road & Lakeshore Way, All Intervals

Movement	WB	NB
Directions Served	L	R
Maximum Queue (ft)	40	40
Average Queue (ft)	11	22
95th Queue (ft)	36	46
Link Distance (ft)		668
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	100	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 4: Umptanum Road & South Opportunity Street, Interval #1

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LR	LR
Maximum Queue (ft)	40	92	49	36
Average Queue (ft)	6	31	34	18
95th Queue (ft)	38	89	55	43
Link Distance (ft)	436	344	651	324
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Umptanum Road & South Opportunity Street, Interval #2

Movement	WB	NB	SB
Directions Served	LTR	LR	LR
Maximum Queue (ft)	91	63	35
Average Queue (ft)	13	32	17
95th Queue (ft)	51	56	42
Link Distance (ft)	344	651	324
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Umptanum Road & South Opportunity Street, All Intervals

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LR	LR
Maximum Queue (ft)	40	116	63	40
Average Queue (ft)	2	17	33	17
95th Queue (ft)	18	63	55	42
Link Distance (ft)	436	344	651	324
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Umptanum Road & Canyon Road, Interval #1

Movement	EB	EB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	L	T	TR
Maximum Queue (ft)	83	201	92	70	208	476	22	153	170
Average Queue (ft)	39	127	57	31	146	221	8	112	125
95th Queue (ft)	96	234	103	75	239	558	23	165	180
Link Distance (ft)		344		150		2540		1353	
Upstream Blk Time (%)				0					
Queuing Penalty (veh)				0					
Storage Bay Dist (ft)	100		100		215		200		200
Storage Blk Time (%)		10	1	0	6	2			0
Queuing Penalty (veh)		8	0	0	28	5			0

Intersection: 5: Umptanum Road & Canyon Road, Interval #2

Movement	EB	EB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	L	T	TR
Maximum Queue (ft)	106	220	107	62	217	328	47	129	150
Average Queue (ft)	35	79	49	25	106	127	8	72	81
95th Queue (ft)	82	173	97	56	191	258	30	126	138
Link Distance (ft)		344		150		2540		1353	
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	100		100		215		200		200
Storage Blk Time (%)	0	4	2	0	1	1			0
Queuing Penalty (veh)	0	3	1	0	5	1			0

Intersection: 5: Umptanum Road & Canyon Road, All Intervals

Movement	EB	EB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	TR	L	TR	L	T	L	T	TR
Maximum Queue (ft)	114	255	116	75	234	489	47	160	170
Average Queue (ft)	36	91	51	26	115	149	8	82	92
95th Queue (ft)	86	193	99	61	207	362	29	142	156
Link Distance (ft)		344		150		2540		1353	
Upstream Blk Time (%)				0					
Queuing Penalty (veh)				0					
Storage Bay Dist (ft)	100		100		215		200		200
Storage Blk Time (%)	0	6	2	0	2	1			0
Queuing Penalty (veh)	0	4	1	0	10	2			0

Intersection: 6: Umptanum Road & Ruby Street, Interval #1

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	66	81
Average Queue (ft)	17	53
95th Queue (ft)	64	90
Link Distance (ft)	150	1342
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Umptanum Road & Ruby Street, Interval #2

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	79	92
Average Queue (ft)	12	45
95th Queue (ft)	52	75
Link Distance (ft)	150	1342
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Umptanum Road & Ruby Street, All Intervals

Movement	EB	SB
Directions Served	LT	LR
Maximum Queue (ft)	97	101
Average Queue (ft)	13	47
95th Queue (ft)	55	79
Link Distance (ft)	150	1342
Upstream Blk Time (%)	0	
Queuing Penalty (veh)	0	
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: I-90 WB Ramps & Canyon Road, Interval #1

Movement	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	R	T	TR	L	T	T
Maximum Queue (ft)	75	130	169	159	139	167	132
Average Queue (ft)	29	70	106	95	84	99	73
95th Queue (ft)	72	130	171	165	144	177	148
Link Distance (ft)	1421		900	900		2540	2540
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)		545			115		
Storage Blk Time (%)					3	3	
Queuing Penalty (veh)					7	7	

Intersection: 7: I-90 WB Ramps & Canyon Road, Interval #2

Movement	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	R	T	TR	L	T	T
Maximum Queue (ft)	92	181	158	148	139	168	146
Average Queue (ft)	24	68	90	81	75	70	52
95th Queue (ft)	67	133	149	137	136	145	116
Link Distance (ft)	1421		900	900		2540	2540
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)		545			115		
Storage Blk Time (%)					1	1	
Queuing Penalty (veh)					3	2	

Intersection: 7: I-90 WB Ramps & Canyon Road, All Intervals

Movement	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	R	T	TR	L	T	T
Maximum Queue (ft)	92	181	181	173	139	191	161
Average Queue (ft)	25	69	93	84	77	77	57
95th Queue (ft)	68	132	155	145	138	155	125
Link Distance (ft)	1421		900	900		2540	2540
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)		545			115		
Storage Blk Time (%)					2	2	
Queuing Penalty (veh)					4	3	

Intersection: 8: I-90 EB Ramps & Canyon Road, Interval #1

Movement	WB	WB	SB
Directions Served	L	R	L
Maximum Queue (ft)	92	27	76
Average Queue (ft)	43	5	34
95th Queue (ft)	98	27	78
Link Distance (ft)	995		900
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)		250	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 8: I-90 EB Ramps & Canyon Road, Interval #2

Movement	WB	WB	NB	SB
Directions Served	L	R	T	L
Maximum Queue (ft)	98	29	4	70
Average Queue (ft)	36	1	0	24
95th Queue (ft)	86	12	3	62
Link Distance (ft)	995		709	900
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		250		
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 8: I-90 EB Ramps & Canyon Road, All Intervals

Movement	WB	WB	NB	SB
Directions Served	L	R	T	L
Maximum Queue (ft)	111	41	4	84
Average Queue (ft)	38	2	0	26
95th Queue (ft)	89	17	3	67
Link Distance (ft)	995		709	900
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		250		
Storage Blk Time (%)				
Queuing Penalty (veh)				

Network Summary

Network wide Queuing Penalty, Interval #1: 197
Network wide Queuing Penalty, Interval #2: 56
Network wide Queuing Penalty, All Intervals: 92