



Salvation Army Barrhaven Church

102 Bill Leathem Drive

Transportation Brief



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Transportation Brief

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1. Introduction

From the information provided, it is our understanding that the Salvation Army is planning to construct a church on the southwest quadrant of the Leikin/Bill Leathem intersection in Ottawa, ON. The church, which will be on the site municipally known as 102 Bill Leathem Drive, will be built in two Phases; Phase 1 will consist of an approximate 7,000 ft² (GFA) church and Phase 2 will consist of an expansion of the church to approximately 11,000 ft² (GFA). Site access/egress is proposed via two full movement driveways to Bill Leathem Drive. With regard to timing, Phase 1 of the subject site is anticipated to be built out by 2018 and Phase 2 by 2023. The site's local context is depicted in Figure 1 and the proposed Site Plans for Phases 1 and 2 are depicted in Figures 2 and 3, respectively.

Figure 1: Local Context



As part of the Site Plan Approval process, the City of Ottawa requires submission of a formal Transportation Impact Assessment (TIA) consistent with their guidelines dated October 2006. With respect to these guidelines and for this level of development, a Transportation Brief (TB) is the appropriate type of study for the subject application.

2. Existing Conditions

2.1 Study Area Road Network

Leikin Drive, on the east side of the site, is a major collector roadway with a two-lane cross section and auxiliary turn lanes provided at major intersections. The posted speed limit is 60 km/h adjacent to the site and approximately 250 m south of the Leikin/Bill Leatham intersection, the posted speed limit transitions to 50 km/h.

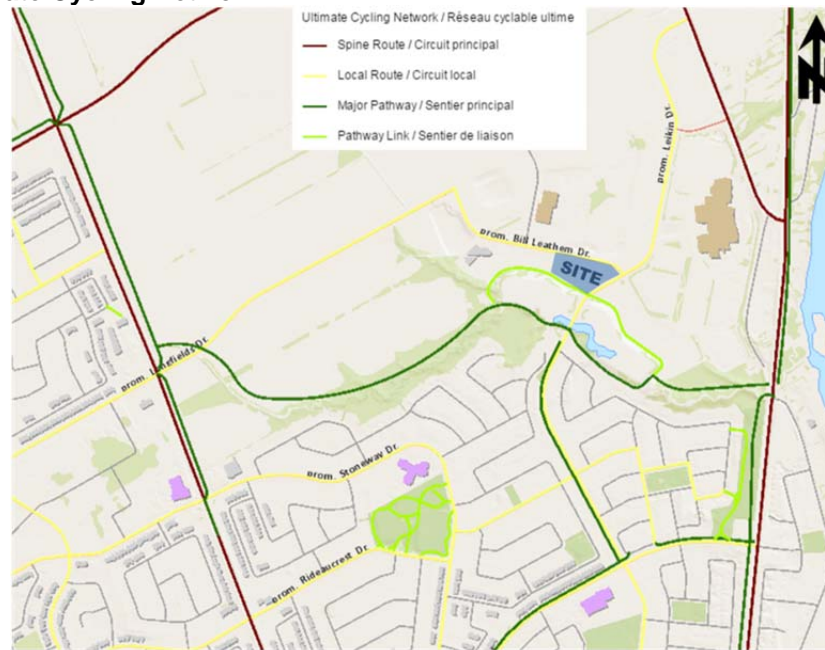
Bill Leatham Drive/Longfields Drive, on the north side of the site, is a major collector roadway. It has a two-lane cross section with auxiliary turn lanes provided at major intersections. The unposted speed limit along Bill Leatham Drive is understood to be 50 km/h and along Longfields Drive the posted speed limit is 70 km/h.

2.2 Pedestrian/Cycling Network

With respect to pedestrians, sidewalk facilities in the vicinity of the site are provided along the south/east side of Leikin Drive from Beckstead Road to Crestway Drive and along the south/west side of Bill Leatham Drive. A City multiuse pathway (MUP) currently exists along the south side of the proposed site and it continues past Leikin Drive to the east.

The cycling network, according to the Ottawa Cycling Plan, includes Merivale Road, classified as a “spine” cycling routes and Leikin Drive, Bill Leatham Drive and Longfields Drive, which are classified as “local” cycling routes. As shown in Figure 4, “major pathways” within the vicinity of the site are identified along Woodroffe Avenue, Prince of Wales Drive, and Leikin Drive south of Bill Leatham Drive. An off-road “major pathway” is identified connecting Prince of Wales Drive and Woodroffe Avenue located north of the Chapman Mills community and south of the proposed development.

Figure 4: Ultimate Cycling Network



As shown in Figure 5, bicycle lanes are currently provided along both sides of Leikin Drive. Paved shoulders are provided along Merivale Road (north of Beckstead Road) and Longfields Drive. Bill Leatham Drive is identified as a “suggested” cycling route.

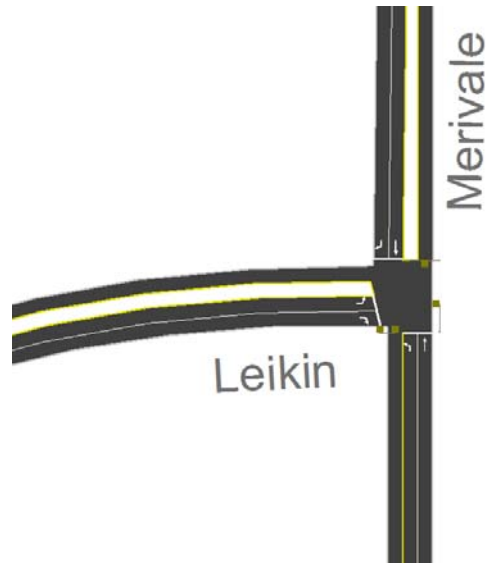
Routes #94 and 176 provide frequent all-day service and Routes #77 and 199 provide weekday morning and afternoon peak hour service only (peak direction only for Route #199). Adjacent to the site, Route #94 provides peak hour service only, however, along Woodroffe Avenue all-day service is provided for this route.

Access to the Transitway is provided by the Nepean Woods and Fallowfield Stations located approximately 3km southwest and northwest from the Leikin/Bill Leathem intersection.

3.1 Existing Study Area Intersections

Leikin/Merivale

The Leikin/Merivale intersection is a signalized 'T' intersection. The eastbound approach consists of a single left-turn lane and a single right-turn lane. The northbound approach consists of a single left-turn lane and a through lane. The southbound approach consists of a single through lane and a single right-turn lane. All movements are permitted at this location.



Leikin/Bill Leathem

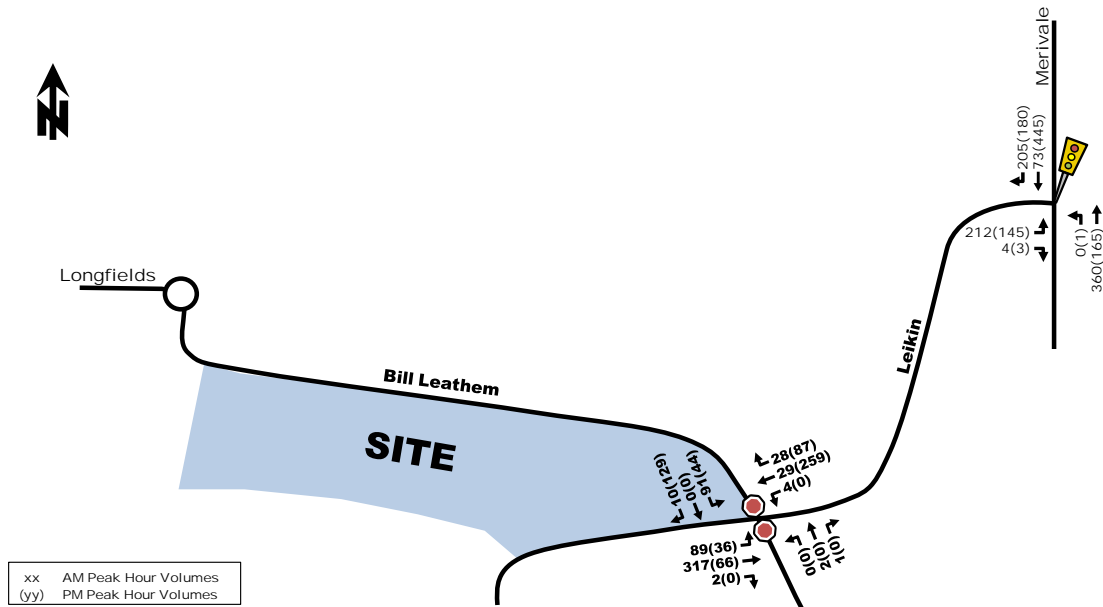
The Leikin/Bill Leathem intersection is an unsignalized four-legged intersection with STOP control on the minor approaches only (Bill Leathem Drive). The eastbound and westbound approaches consist of a single left-turn lane and a shared through/right-turn lane. The southbound and northbound approaches consist of a single full movement lane. All movements are permitted at this location.



3.2 Existing Traffic Operations

Illustrated as Figure 7, are the most recent weekday morning and afternoon peak hour traffic volumes obtained from the City of Ottawa for the Merivale/Leikin and Leikin/Bill Leathem intersections. These peak hour traffic volumes are also included as Appendix A.

Figure 7: Existing Peak Hour Traffic Volumes



The following Table 1 provides a summary of existing traffic operations at study area intersections based on the SYNCHRO (V8) traffic analysis software. The signalized study area intersection was assessed in terms of the volume-to-capacity (v/c) ratio and the corresponding Level of Service (LoS) for 'critical movements'. It was also assessed 'as a whole' based on a weighted v/c ratio and corresponding LoS. The STOP controlled study area intersection was assessed in terms of delay and the corresponding LoS. The Synchro model output of existing conditions is provided within Appendix B.

Table 1: Existing Performance at Study Area Intersections

Intersection	Weekday AM Peak (PM Peak)					
	Critical Movement			Intersection 'as a whole'		
	LoS	max. v/c or avg. delay (s)	Movement	Delay (s)	LoS	v/c
Leikin/Bill Leatham	C(B)	16.1(12.7)	SBL(SBL)	4.1(4.0)	-	-
Leikin/Merivale	B(A)	0.64(0.53)	EBL(EBL)	12.5(9.5)	A(A)	0.45(0.37)

Note: Analysis of signalized intersections assumes a PHF of 0.95 and a saturation flow rate of 1800 veh/h/lane.

As shown in Table 1, the signalized Leikin/Merivale intersection 'as a whole' is currently operating at an excellent LoS 'A' during the weekday morning and afternoon peak hours. The 'critical' southbound left-turn movement is currently operating at an LoS 'B' during the morning peak hour and LoS 'A' during the afternoon peak hour.

The unsignalized Leikin/Bill Leatham intersection is currently operating with acceptable delays of 12 to 16 seconds for the minor approaches and an overall delay of approximately 4 seconds.

4. Demand Forecasting

4.1 Site Trip Generation – Phase 1

The proposed Phase 1 development will consist of an approximate 7,000 ft² (GFA) church. The appropriate trip generation rates for the proposed land use were obtained from the 9th Edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual, which are summarized in Table 2. Given the church land use does not generate high vehicle volumes during the weekdays, the Sunday peak hour trip generation rates are also provided.

Table 2: ITE Trip Generation Rates

Land Use	Data Source	Trip Rates		
		AM Peak	PM Peak	SUN Peak
Church	ITE 560	$T = 0.56 (X)$	$T = 0.55(X);$ $T = 0.34(X) + 5.24$	$T = 12.04 (X);$ $T = 9.48(X) + 82.08$
Notes: T = Average Vehicle Trip Ends X = 1000 ft ² Gross Floor Area				

Using the above noted trip generation rates for the weekday morning, afternoon and Sunday peak hours, and assuming minimal non-auto modes, the following Table 3 summarizes the Phase 1 site trip generation.

Table 3: Phase 1 Site Generated Vehicle Trip Generation

Land Use	Area	AM Peak (veh/h)			PM Peak (veh/h)			SUN Peak (veh/h)		
		In	Out	Total	In	Out	Total	In	Out	Total
Church	7,060 ft ²	2	2	4	3	5	8	73	76	149

As shown in Table 3, the resulting number of potential ‘new’ two-way vehicle trips generated by Phase 1 of the proposed development during the weekday peak hours is approximately 4 to 8 veh/h. As this amount of vehicle traffic is considered negligible, further weekday peak hour traffic analysis is not required. The projected vehicle traffic travelling to/from the proposed Phase 1 development on a Sunday during the church’s peak hour is approximately 150 veh/h, which has little impact given it is off peak for the roadway network.

4.2 Site Trip Generation – Phase 2

As mentioned previously, Phase 2 of the development will consist of an approximate 4,000 ft² expansion of the church (total of 11,055 ft²). As such, the increased GFA could result in an increase in vehicle trips generated by the site as there will be more seating in the church. The following Table 4 summarizes the Phase 2 site trip generation based on the above-noted vehicle trip generation rates and the expansion of the church GFA.

Table 4: Phase 2 Site Generated Vehicle Trip Generation

Land Use	Area	AM Peak (veh/h)			PM Peak (veh/h)			SUN Peak (veh/h)		
		In	Out	Total	In	Out	Total	In	Out	Total
Church	11,055 ft ²	3	3	6	4	5	9	91	96	187

As shown in Table 4, the total projected vehicle traffic travelling to/from the proposed Phase 2 development on a Sunday during the peak hour is approximately 190 veh/h. Similarly, this has very little impact to the roadway network.

4.3 Traffic Distribution and Assignment

The following assumed traffic distribution was based the site’s local context and our knowledge of the surrounding area:

- 40% to/from the south;
- 30% to/from the west;
- 20% to/from the southeast; and
- 10% to/from the northeast.

The Phase 1 ‘new’ site-generated Sunday peak hour vehicle trips assigned to the proposed driveway connections and to the study area network are illustrated as Figure 8.

Figure 8: ‘New’ Phase 1 Site-Generated Traffic Volumes

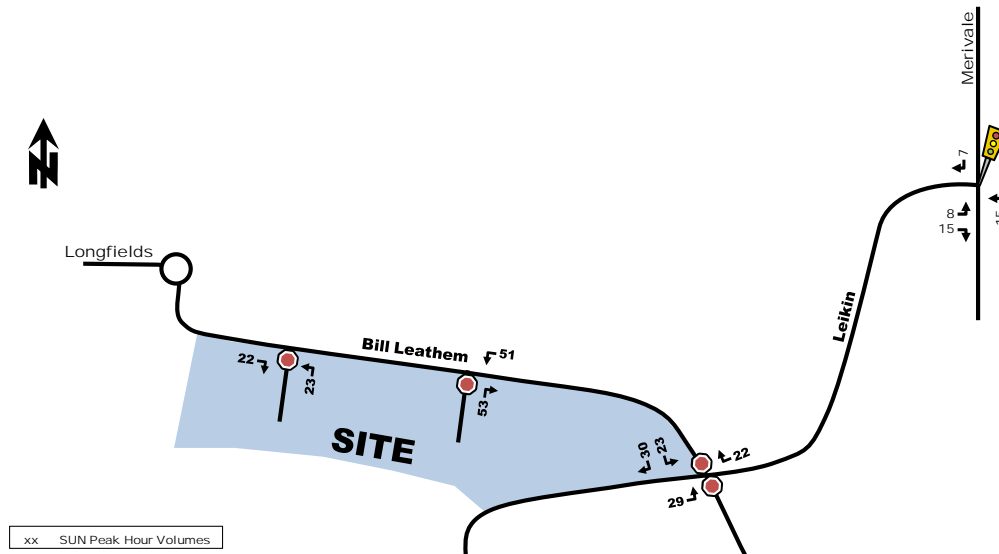
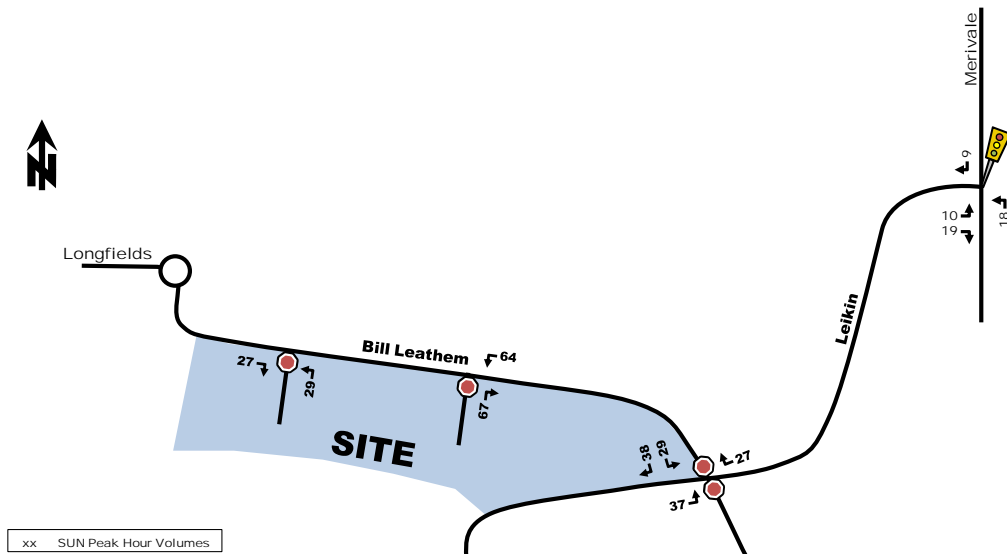


Figure 9 illustrates the proposed Phase 2 ‘new’ site-generated Sunday peak hour vehicle trips assigned to the proposed driveway connections and to the study area network.

Figure 9: ‘New’ Phase 2 Site-Generated Traffic Volumes



Based on the distribution of the site-generated traffic volumes, and given that peak traffic will be experienced on Sundays and the study area intersections are currently operating acceptably during the weekday peak hours, the proposed development will have minimal impacts on the existing transportation network.

5. Site Plan Review

This section provides an overview of site access, parking requirements, pedestrian circulation and transit accessibility. The proposed Phase 1 and Phase 2 Site Plans were previously illustrated in Figures 2 and 3.

Parking

With regard to vehicle parking, a total of 91 parking spaces are proposed for Phase 1 of the development and 124 parking spaces are proposed for Phase 2 of the development. These parking spaces were based on the Salvation Army's estimates of the number of church attendees. The City's minimum parking space requirement based on the calculated GFA is 67 spaces for Phase 1 and 103 spaces for Phase 2. As such, the amount of proposed parking meets the City's By-Law requirements.

With regard to parking space dimensions, the parking spaces are 2.6 m x 5.2 m, which satisfies the City's By-Law requirements.

Site Circulation

The proposed parking lot is well laid out such that two-way traffic can be efficiently accommodated. Drive aisle widths are noted as being a minimum of 6.7 m, which satisfies the City's By-Law requirements.

With respect to heavy vehicles, sufficient turning radii on-site and at the site driveway connections should be provided for fire, garbage and delivery truck circulation.

Access Requirements

Based on projected traffic volumes and proximity to the adjacent intersections, additional traffic control/auxiliary turn lanes are not warranted or required at the proposed driveway connections. The proposed site driveway connections to Bill Leathem Drive are satisfactory with respect to the City's Private Approach By-Law, in terms of dimensioning and location.

There is potential for a future access to an adjacent site located on the north side of Bill Leathem Drive. Given the subject site's low projected traffic volumes during the peak hours and the current low traffic volumes on Bill Leathem Drive, a site driveway located on the north side of Bill Leathem Drive will not conflict with the subject site's driveways.

Pedestrians/Transit

The majority of visitors to/from the proposed church are expected to travel by car. However, to connect pedestrians to transit service and other nearby amenities, sidewalks are provided along the south side of Bill Leathem Drive, adjacent to the site and along the east/south side of Leikin Drive. A multi-use path (MUP) is currently provided south of the proposed development that continues on the east side of Leikin Drive. A pedestrian pathway is proposed through the site connecting Bill Leathem Drive to the MUP south of the site.

Bicycles

A total of 6 bicycle parking spaces are proposed to serve the subject Phase 1 and 2 of the site and are located close to the building's main entrance, which satisfies the City's By-Law requirements.

6. Findings, Conclusions and Recommendations

Based on the foregoing analysis of the proposed development, the following transportation-related findings, conclusions and recommendations are offered:

- The existing study area intersections are currently operating at acceptable Levels of Service during the weekday morning and afternoon peak hours;
- The proposed Phase 1 development is projected to generate 'new' two-way vehicle volumes of approximately 4 to 8 veh/h during the weekday morning and afternoon peak hours. During the Sunday peak hour, the proposed Phase 1 development is projected to generate approximately 150 veh/h two-way total;
- The proposed Phase 2 development is projected to generate 'new' two-way vehicle volumes of approximately 6 to 9 veh/h during the weekday morning and afternoon peak hours. During the Sunday peak hour, the proposed Phase 1 development is projected to generate approximately 190 veh/h two-way total;
- Based on the distribution and assignment of the Sunday peak hour traffic volumes, the traffic impact from the proposed development is expected to be minimal;
- With regard to on-site circulation, the proposed Site Plan is well laid out and vehicle circulation will operate efficiently;
- The site driveway connections to Bill Leathem Drive will operate acceptably and will not conflict with adjacent site accesses given the low projected site trip-generation during the weekdays;
- The proposed amount of vehicle and bicycle parking is sufficient with respect to the City's minimum By-Law requirements; and
- A pedestrian pathway is proposed through the site to connect to the existing MUP south of the site.

Based on the foregoing, the proposed Salvation Army development is recommended from a transportation perspective.

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Appendix A

Peak Hour Traffic Volumes

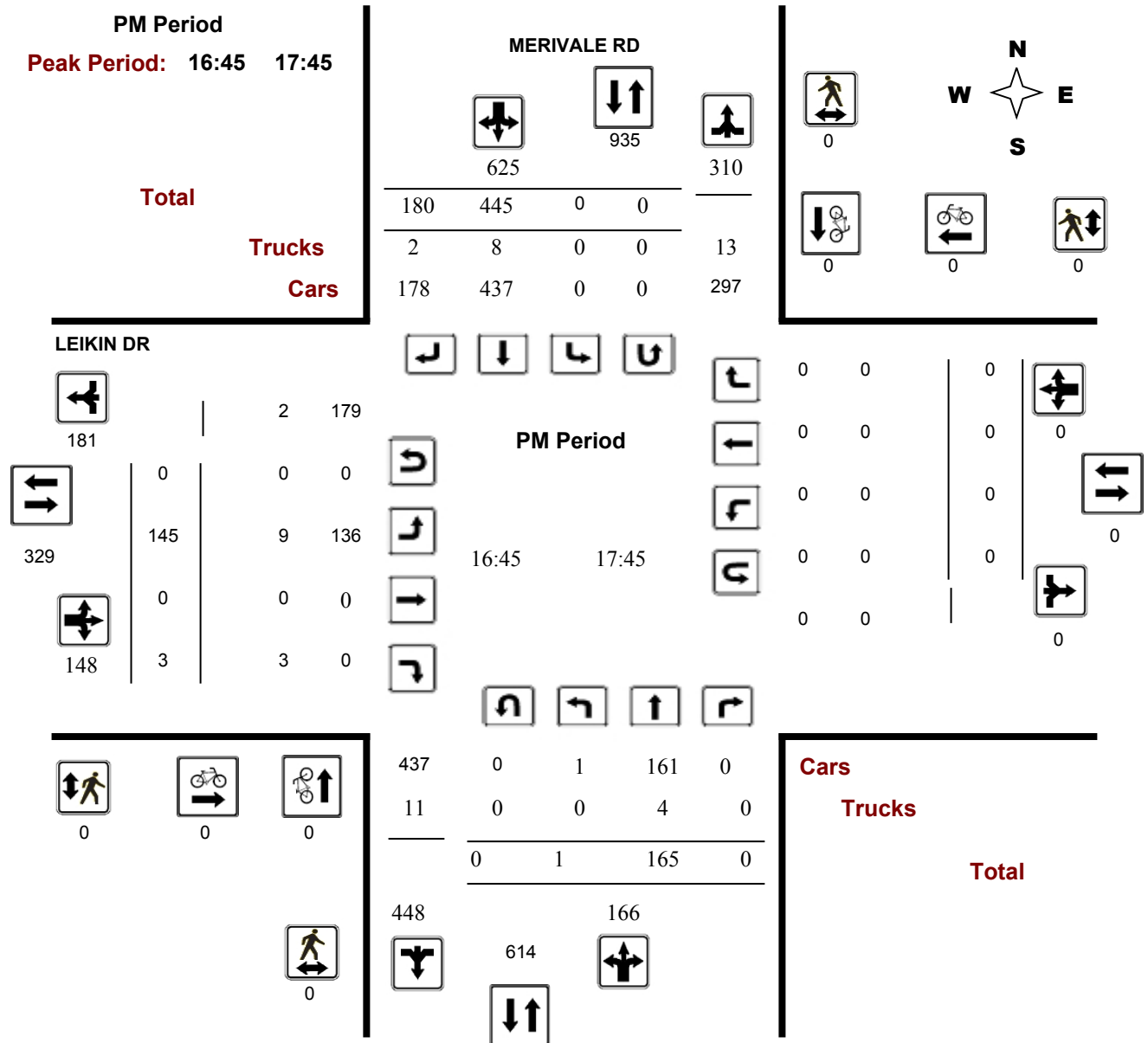
Public Works - Traffic Services

Turning Movements Count - Peak Period Diagram

LEIKIN DR @ MERIVALE RD

Survey Date: Wednesday, July 30, 2014
Start Time: 07:00

WO No: 29348
Device: Jamar Technologies, Inc



Validation Note: Road Conditions: DRY. Approved by: AF.



Public Works - Traffic Services

Turning Movements Count - Peak Period Diagram

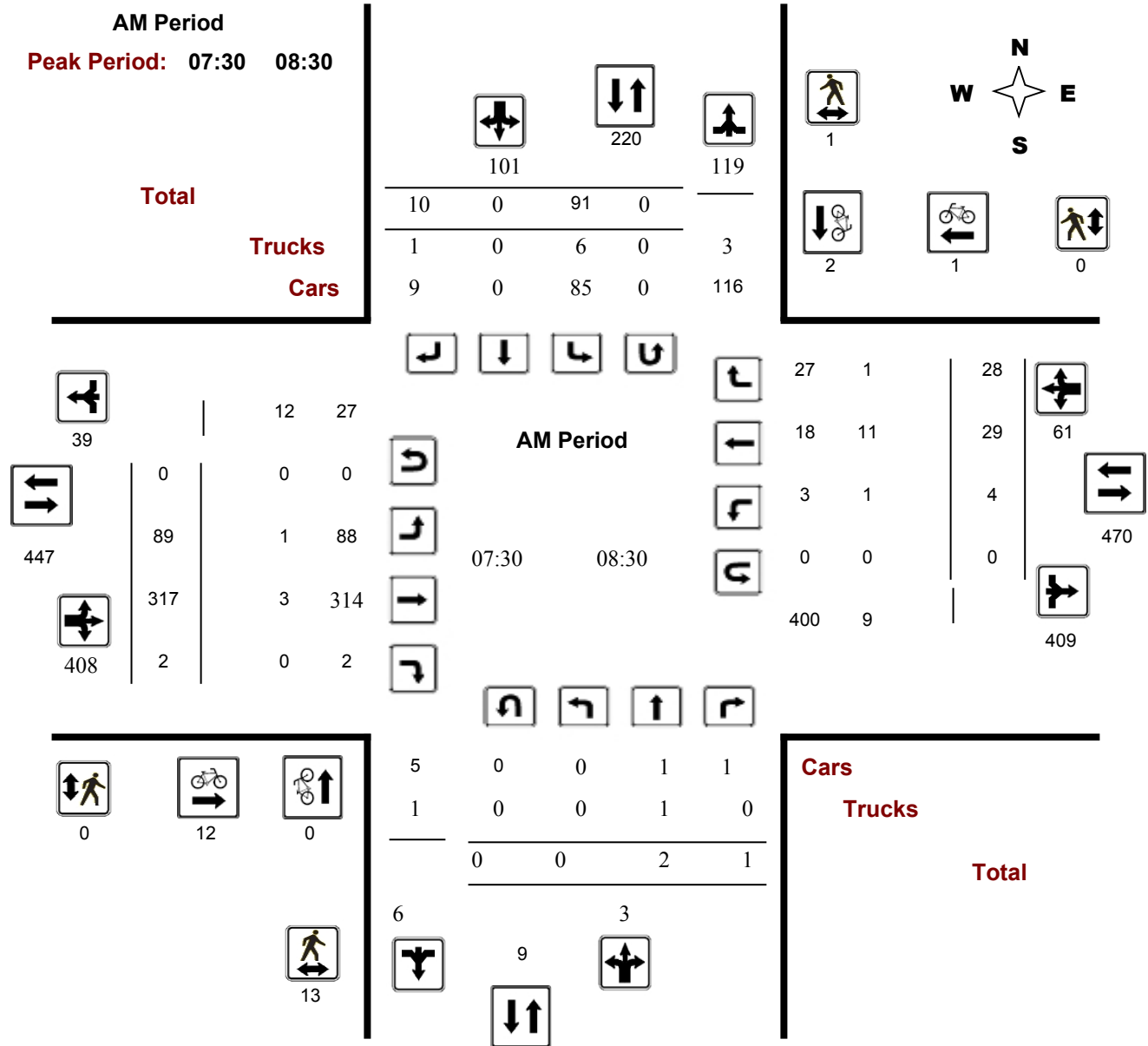
BILL LEATHEM DR @ LEIKIN DR S

Survey Date: Thursday, August 08, 2013

Start Time: 07:00

WO No: 247

Device: Miovision



Validation Note: Results generated Jul 16, 2014. All records still in violation were set to Edited.



Public Works - Traffic Services

Turning Movements Count - Peak Period Diagram

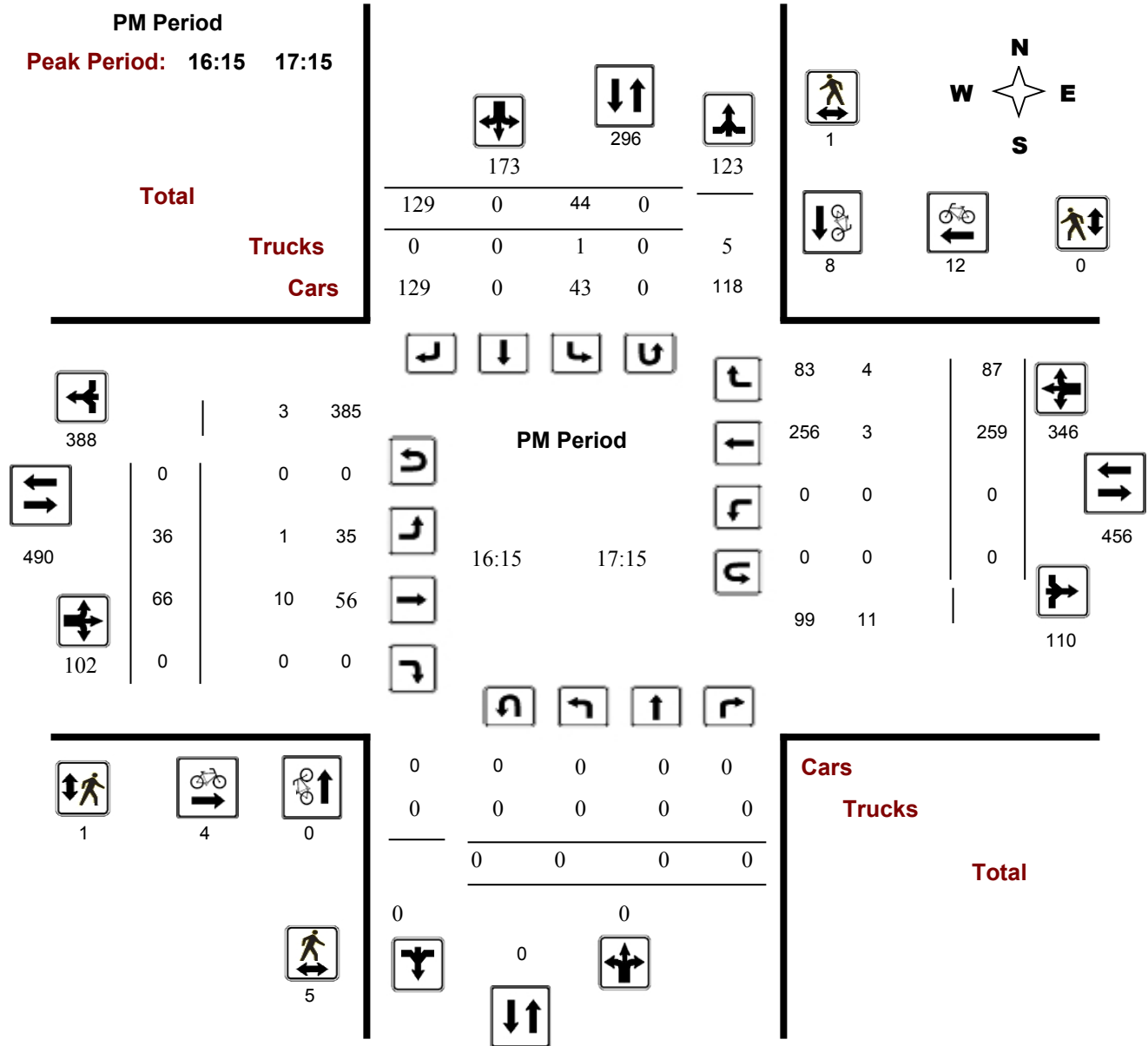
BILL LEATHEM DR @ LEIKIN DR S

Survey Date: Thursday, August 08, 2013

Start Time: 07:00

WO No: 247

Device: Miovision



Appendix B

SYNCHRO Capacity Analysis: Existing Conditions

Existing AM
2: Merivale & Leikin



Lane Group	EBL	EBR	NBT	SBT	SBR	ø3
Lane Configurations						
Volume (vph)	212	4	360	73	205	
Lane Group Flow (vph)	223	4	379	77	216	
Turn Type	Prot	Perm	NA	NA	Perm	
Protected Phases	4		2	6		3
Permitted Phases		4			6	
Detector Phase	4	4	2	6	6	
Switch Phase						
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	5.0
Minimum Split (s)	22.1	22.1	34.5	34.5	34.5	7.0
Total Split (s)	30.1	30.1	46.5	46.5	46.5	8.0
Total Split (%)	35.6%	35.6%	55.0%	55.0%	55.0%	9%
Yellow Time (s)	3.3	3.3	4.6	4.6	4.6	2.0
All-Red Time (s)	1.8	1.8	1.9	1.9	1.9	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.1	5.1	6.5	6.5	6.5	
Lead/Lag	Lag	Lag				Lead
Lead-Lag Optimize?	Yes	Yes				Yes
Recall Mode	None	None	Max	Max	Max	None
Act Effct Green (s)	14.2	14.2	42.9	42.9	42.9	
Actuated g/C Ratio	0.21	0.21	0.62	0.62	0.62	
v/c Ratio	0.64	0.01	0.34	0.07	0.21	
Control Delay	32.8	13.2	7.9	6.3	1.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	
Total Delay	32.8	13.2	7.9	6.3	1.7	
LOS	C	B	A	A	A	
Approach Delay	32.5		7.9	2.9		
Approach LOS	C		A	A		
Queue Length 50th (m)	24.8	0.0	19.5	3.3	0.0	
Queue Length 95th (m)	43.7	2.0	41.6	9.4	7.7	
Internal Link Dist (m)	923.0		685.6	339.3		
Turn Bay Length (m)		300.0			100.0	
Base Capacity (vph)	618	556	1113	1113	1007	
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	0.36	0.01	0.34	0.07	0.21	

Intersection Summary



















Cycle Length: 84.6
 Actuated Cycle Length: 68.7
 Natural Cycle: 65
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.64
 Intersection Signal Delay: 12.5
 Intersection Capacity Utilization 45.4%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service A

Splits and Phases: 2: Merivale & Leikin



Existing AM
1: Leathem & Leikin

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	89	317	2	4	29	28	0	2	1	91	0	10
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	94	334	2	4	31	29	0	2	1	96	0	11
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	60			336			572	591	335	577	577	45
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	60			336			572	591	335	577	577	45
iC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
iC, 2 stage (s)												
IF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	94			100			100	99	100	76	100	99
cM capacity (veh/h)	1544			1223			406	393	707	405	400	1024
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total	94	336	4	60	3	106						
Volume Left	94	0	4	0	0	96						
Volume Right	0	2	0	29	1	11						
cSH	1544	1700	1223	1700	461	430						
Volume to Capacity	0.06	0.20	0.00	0.04	0.01	0.25						
Queue Length 95th (m)	1.5	0.0	0.1	0.0	0.2	7.3						
Control Delay (s)	7.5	0.0	8.0	0.0	12.9	16.1						
Lane LOS	A		A		B	C						
Approach Delay (s)	1.6		0.5		12.9	16.1						
Approach LOS					B	C						
Intersection Summary												
Average Delay			4.1									
Intersection Capacity Utilization			37.0%		ICU Level of Service				A			
Analysis Period (min)			15									

Existing PM
2: Merivale & Leikin



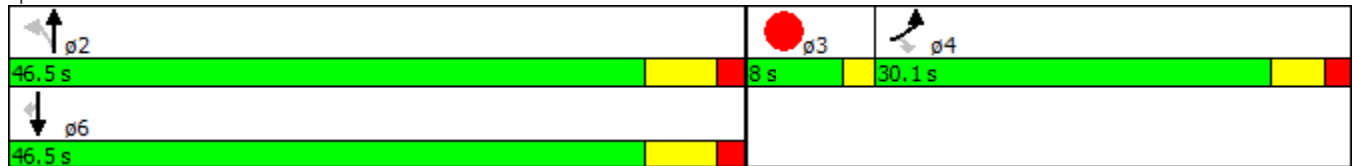
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR	ø3
Lane Configurations							
Volume (vph)	145	3	1	165	445	180	
Lane Group Flow (vph)	153	3	1	174	468	189	
Turn Type	Prot	Perm	Perm	NA	NA	Perm	
Protected Phases	4			2	6		3
Permitted Phases		4	2			6	
Detector Phase	4	4	2	2	6	6	
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	5.0
Minimum Split (s)	23.4	23.4	34.5	34.5	24.5	24.5	7.0
Total Split (s)	30.1	30.1	46.5	46.5	46.5	46.5	8.0
Total Split (%)	35.6%	35.6%	55.0%	55.0%	55.0%	55.0%	9%
Yellow Time (s)	3.3	3.3	4.6	4.6	4.6	4.6	2.0
All-Red Time (s)	1.8	1.8	1.9	1.9	1.9	1.9	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	5.1	5.1	6.5	6.5	6.5	6.5	
Lead/Lag	Lag	Lag					Lead
Lead-Lag Optimize?	Yes	Yes					Yes
Recall Mode	None	None	Max	Max	Max	Max	None
Act Effct Green (s)	11.9	11.9	45.5	45.5	45.5	45.5	
Actuated g/C Ratio	0.17	0.17	0.66	0.66	0.66	0.66	
v/c Ratio	0.53	0.01	0.00	0.15	0.40	0.18	
Control Delay	31.5	14.7	5.0	5.3	7.2	1.4	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	31.5	14.7	5.0	5.3	7.2	1.4	
LOS	C	B	A	A	A	A	
Approach Delay	31.2			5.3	5.5		
Approach LOS	C			A	A		
Queue Length 50th (m)	17.4	0.0	0.0	6.9	22.6	0.0	
Queue Length 95th (m)	31.2	1.9	0.5	15.7	45.5	6.3	
Internal Link Dist (m)	923.0			685.6	339.3		
Turn Bay Length (m)		300.0	100.0			100.0	
Base Capacity (vph)	616	553	558	1175	1175	1064	
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	0.25	0.01	0.00	0.15	0.40	0.18	

Intersection Summary

Cycle Length: 84.6
 Actuated Cycle Length: 69
 Natural Cycle: 65
 Control Type: Actuated-Uncoordinated
 Maximum v/c Ratio: 0.53
 Intersection Signal Delay: 9.5
 Intersection Capacity Utilization 42.9%
 Analysis Period (min) 15

Intersection LOS: A
 ICU Level of Service A

Splits and Phases: 2: Merivale & Leikin



Existing PM
1: Leathem & Leikin

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	36	66	0	0	259	87	0	0	0	44	0	129
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	38	69	0	0	273	92	0	0	0	46	0	136
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	364			69			554	509	69	464	464	318
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	364			69			554	509	69	464	464	318
iC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
iC, 2 stage (s)												
IF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	97			100			100	100	100	91	100	81
cM capacity (veh/h)	1194			1531			351	452	993	496	480	722
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	SB 1						
Volume Total	38	69	0	364	0	182						
Volume Left	38	0	0	0	0	46						
Volume Right	0	0	0	92	0	136						
cSH	1194	1700	1700	1700	1700	647						
Volume to Capacity	0.03	0.04	0.00	0.21	0.00	0.28						
Queue Length 95th (m)	0.7	0.0	0.0	0.0	0.0	8.8						
Control Delay (s)	8.1	0.0	0.0	0.0	0.0	12.7						
Lane LOS	A				A	B						
Approach Delay (s)	2.9		0.0		0.0	12.7						
Approach LOS					A	B						
Intersection Summary												
Average Delay				4.0								
Intersection Capacity Utilization			44.3%		ICU Level of Service				A			
Analysis Period (min)			15									