LMM Engineering Inc. | TRAFFIC & PARKING CONSULTANTS

TRAFFIC IMPACT STUDY

12544 HIGHWAY 50

Service Station

Bolton, Peel Region, Ontario

Prepared for:

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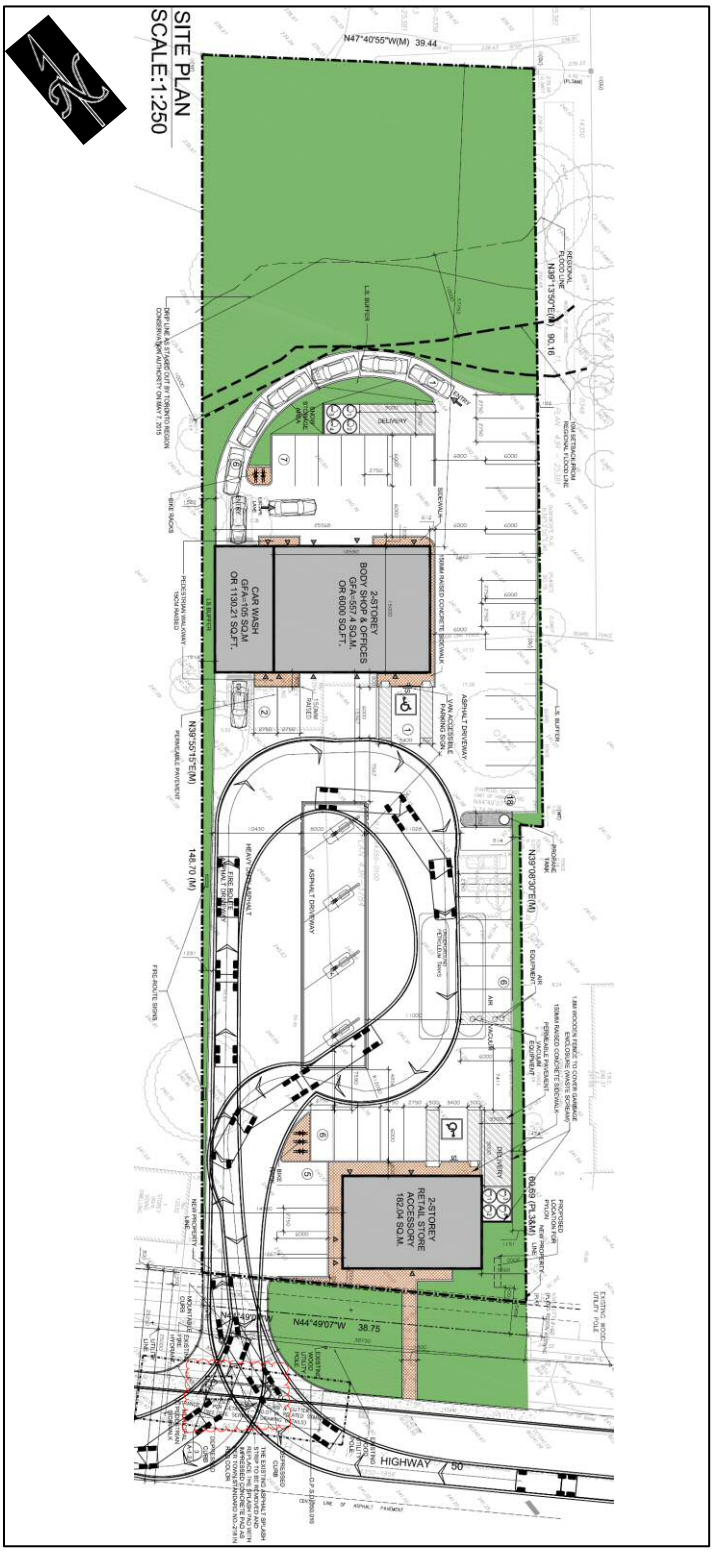
1.0 INTRODUCTION

LMM Engineering Inc. was retained by n Architecture Inc. to undertake a traffic impact study to evaluate the traffic impacts of the proposed service station development located on the northwest corner of Highway 50 / Industrial Road intersection in Bolton, Peel Region, Ontario. This study is a revision from the November 2015 submission to include the updated site plan.

The proposed development will include a gasoline station with eight (8) fuelling positions, a convenience store, a car wash, an auto-body shop and restaurant uses. One right-in/right-out entrance is proposed on Highway 50. The site location map is shown in **Figure 1-1** and the proposed site plan is shown in **Figure 1-2**.

Figure 1-1 Site Location Map

Figure 1-2 Proposed Site Plan



2.0 STUDY METHODOLOGY

2.1 STUDY AREA

In order to assess the traffic impacts of the proposed development, the Highway 50 / Industrial Road was analyzed in the Existing, Future Background, and Future Total conditions traffic operation evaluation. The proposed entrance intersection is included in the future total evaluation.

2.2 HORIZON YEAR

The typical five year and ten year horizons from the time of build out, year 2021 and 2026 were selected for the study horizon years for the future background and future total conditions analyses.

2.3 INTERSECTION CAPACITY EVALUATION METHODOLOGY

In this study, the methodology used for evaluating traffic operations at each of the subject intersections was based on the criteria set forth in the Transportation Research Board's Highway Capacity Manual, 2000 edition (HCM 2000). Synchro 9 software, which utilizes the HCM 2000 methodology, was used for the analysis.

For unsignalized intersections at which the side street or minor street is controlled by a stop sign, the criteria for evaluating traffic operations are the level of service (LOS) for the turning movements at the intersection and the level of service for the overall intersection. Level of service is based on the average controlled delay incurred at the intersection. Controlled delay for unsignalized intersections includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Several factors affect the controlled delay for unsignalized intersections, such as the availability and distribution of gaps in the conflicting traffic stream, critical gaps, and follow-up time for a vehicle in the queue. Level of service is assigned a letter designation from A through F. Level of service A indicates excellent operations with little delay to motorists, while level of service F exists when there are insufficient gaps of acceptable size to allow vehicles on the side street to cross freely, resulting long total delays and long queues. The level of service criteria for two-way stop-controlled and all-way stop-controlled (unsignalized) intersections is given in **Table 2-1**.

Table 2-1 Level of Service Criteria for Unsignalized Intersections.

Level of Service	Average Control Delay (sec/veh)
A	≤ 10
B	> 10 and ≤ 15
C	> 15 and ≤ 25
D	> 25 and ≤ 35
E	> 35 and ≤ 50
F	> 50

At unsignalized intersections, movements with a V/C ratio greater than 1.0 and/or an average controlled delay of greater than 50 seconds are defined as critical movements. For unsignalized intersections, the overall intersection operations are stated for the approach or movement with the worst level of service and highest delay.

3.0 EXISTING CONDITION

The subject site located on the northwest corner of Highway 50 / Industrial Road in Bolton, Peel Region, Ontario. The site location map is shown in Figure 1-1 and the proposed site plan is shown in Figure 1-2.

3.1 EXISTING ROAD FACILITIES

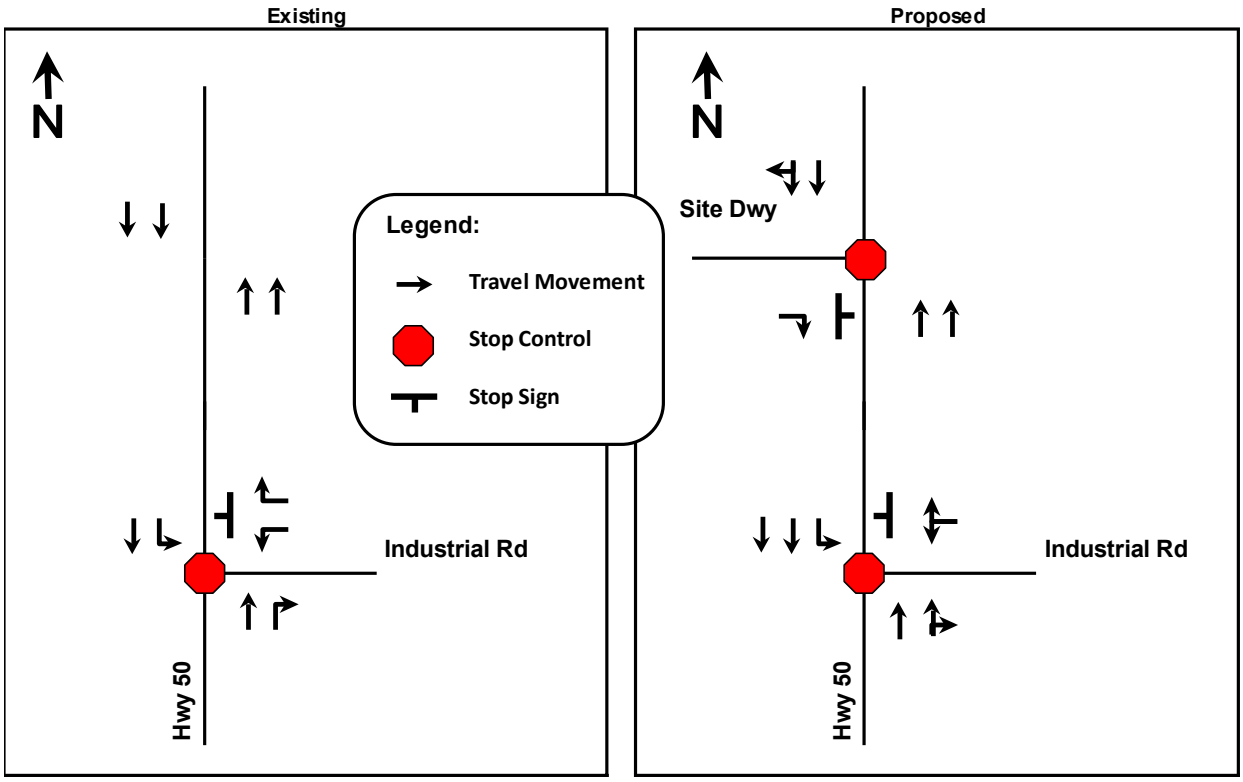
An inventory of the surrounding roads and highway facilities in the vicinity of the site was compiled and is summarized as follows:

Highway 50 is a north-south five-lane regional roadway with a posted speed limit of 60 km/h within the vicinity of the site. A two-way left-turn lane is provided at the intersection with Industrial Road.

Industrial Road is an east-west two-lane road with a posted speed limit of 50 km/hr. Industrial Road intersects Highway 50 at an unsignalized intersection with the stop-sign control on Industrial Road.

The geometric lane configuration of the study area intersections are shown in **Figure 3-1**.

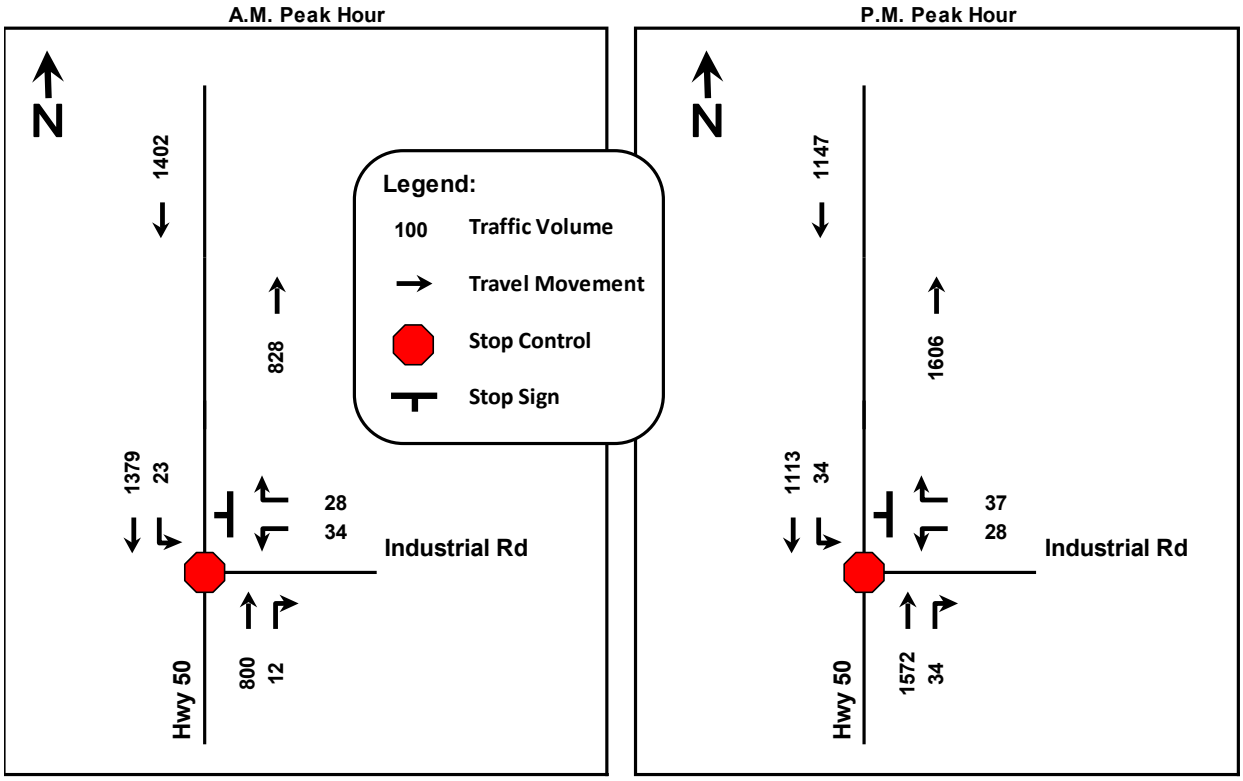
Figure 3-1 Lane Configuration



3.2 EXISTING TRAFFIC

Weekday peak hour turning movement counts were commissioned by LMM Engineering and conducted on Thursday, November 12, 2015. The turning movement count data is included in *Appendix A*. The existing weekday peak hour traffic volumes are shown in **Figure 3-2**.

Figure 3-2 Existing Peak Hour Traffic Volumes



3.3 Existing Intersection Capacity Analysis

Existing morning and afternoon peak hour traffic volumes shown in Figure 3-2 were used to analyze the key existing study intersection according to the methodology outlined in Section *2.3 Intersection Capacity Evaluation* for unsignalized and signalized intersections.

The existing intersection capacity analysis results for the key study intersections are summarized in **Table 3-2** below. Detailed existing intersection capacity analysis output is included in *Appendix B*.

Table 3-1 Existing Condition Intersection Capacity Analysis Summary

Intersection	Overall / Critical Movement	Traffic Operations (LOS, Delay (sec's), V/C Ratio)	
		A.M. Peak Hour	P.M. Peak Hour
Highway 50 / Industrial Road	Intersection	A, 4.7	F, 386.4
	Critical Movement	WB – F, 139.8, 0.89	WB – F, Err, 3.43

* For unsignalized intersections, the average intersection delay and equivalent LOS is reported.
**Err indicates that delays are too lengthy to calculate.

The results of the existing condition intersection capacity analysis indicate that the existing study intersection operates with lengthy delays for the stop-controlled westbound approach.

3.4 Existing Signal Warrant Analysis

Signal warrant analysis was conducted based on the methodology of the Ontario Traffic Manual (OTM) Book 12 for the existing traffic conditions. It was assumed that the average hourly volume over the peak eight (8) hours is approximately 75% of the AM peak hour plus the PM peak hour. The traffic signal warrant calculations are included in Appendix B.

The signal warrant analysis indicates that traffic signals are not warranted with the existing traffic.

4.0 FUTURE BACKGROUND CONDITION

4.1 FUTURE BACKGROUND CONDITIONS - 2021

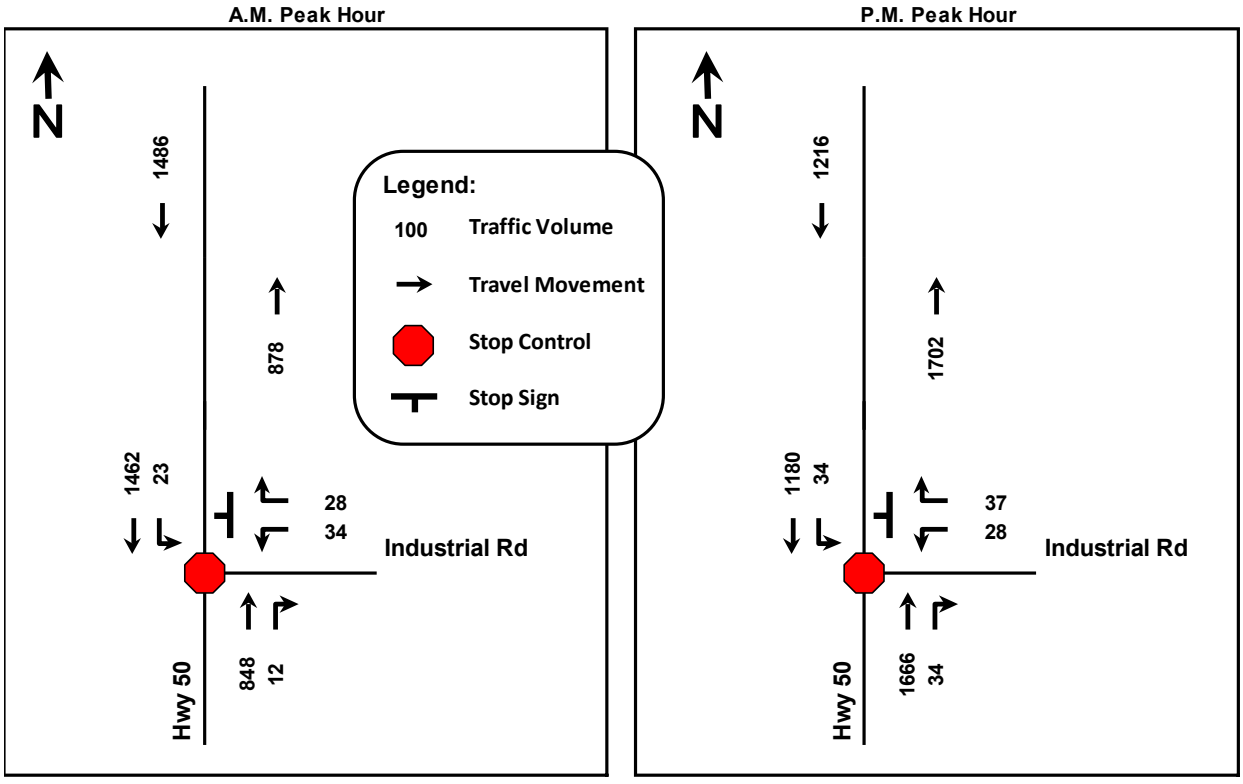
4.1.1 Future Background Traffic Volumes - 2021

In order to study the traffic conditions during the horizon, traffic volume growth projections for the year 2021 are needed. Annual growth rates applied to existing arterial traffic volumes to estimate horizon year future background arterial traffic volumes are typically used.

The Region of Peel historic average annual daily traffic (AADT) volumes for Highway 50 at Simona Drive from 1998 to 2014 were obtained from the Region of Peel website. The average annual growth rate over this time period was a 0.5% decrease in traffic. To be conservative, an annual growth rate of 1% per year was applied to the existing 2015 traffic volumes for six (6) years to forecast future growth at the 2021 horizon.

The resultant 2021 Future Background peak hour traffic volumes during the morning and afternoon peak hours are shown in **Figure 4-1**.

Figure 4-1 Future Background Peak Hour Traffic Volumes - 2021



4.1.2 Future Background Intersection Capacity Analysis - 2021

The future background morning and afternoon peak hour traffic volumes shown in Figure 4-1 were used to analyze the study intersections according to the methodology outlined in Section *2.3 Intersection Capacity Evaluation* for unsignalized intersections.

The 2021 future background intersection capacity analysis results for the study intersections are summarized in **Table 4-1** below. Detailed 2021 future background intersection capacity analysis output is included in *Appendix C*.

Table 4-1 Future Background Condition Intersection Capacity Analysis Summary - 2021

Intersection	Overall / Critical Movement	Traffic Operations (LOS, Delay (sec's), V/C Ratio)	
		A.M. Peak Hour	P.M. Peak Hour
Highway 50 / Industrial Road	Intersection	A, 6.3	F, 366.0
	Critical Movement	WB – F, 199.9, 1.04	WB – F, Err, 4.35

* For unsignalized intersections, the average intersection delay and equivalent LOS is reported.
**Err indicates that delays are too lengthy to calculate.

The results of the 2021 future background condition intersection capacity analysis indicate that, similar to the existing conditions, the intersection is expected to continue to operate with lengthy delays for the stop-controlled westbound approach.

4.1.3 Future Background Traffic Signal Warrant Analysis – 2021

Signal warrant analysis was conducted based on the methodology of the Ontario Traffic Manual (OTM) Book 12 for the future background 2021 traffic conditions. It was assumed that the average hourly volume over the peak eight (8) hours is approximately 75% of the AM peak hour plus the PM peak hour. The traffic signal warrant calculations are included in Appendix C.

The signal warrant analysis indicates that traffic signals are not warranted with the future background 2021 traffic volumes.

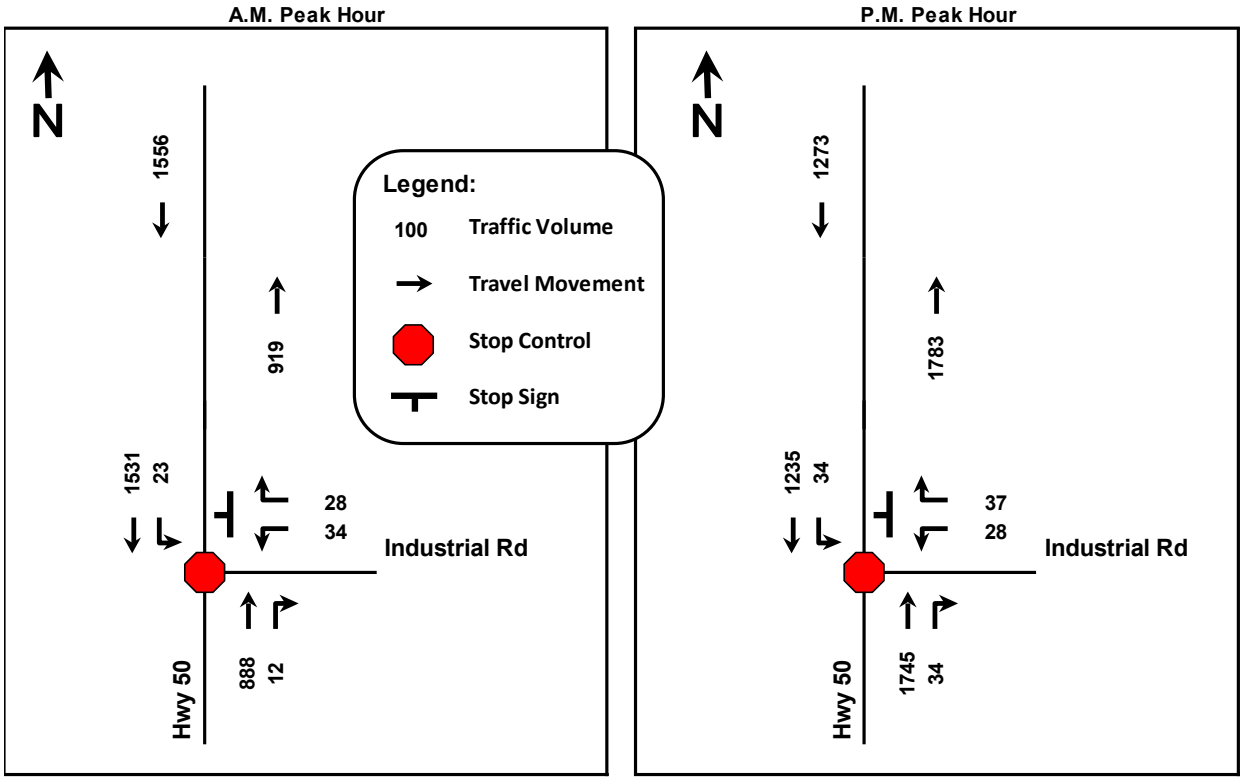
4.2 Future Background Traffic Conditions – 2026

4.2.1 Future Background Traffic Volumes – 2026

In order to study the traffic conditions during the horizon the same annual growth rate of 1% was applied to the existing traffic volumes for 11 years to estimate 2026 horizon year future background conditions.

The resultant 2026 Future Background peak hour traffic volumes during the morning and afternoon peak hours are shown in **Figure 4-2**.

Figure 4-2 Future Background Peak Hour Traffic Volumes - 2026



4.2.2 Future Background Intersection Capacity Analysis - 2026

The future background morning and afternoon peak hour traffic volumes shown in Figure 4-2 were used to analyze the study intersections according to the methodology outlined in Section *2.3 Intersection Capacity Evaluation* for unsignalized intersections.

The 2026 future background intersection capacity analysis results for the study intersections are summarized in **Table 4-1** below. Detailed 2026 future background intersection capacity analysis output is included in *Appendix D*.

Table 4-2 Future Background Condition Intersection Capacity Analysis Summary - 2026

Intersection	Overall / Critical Movement	Traffic Operations (LOS, Delay (sec's), V/C Ratio)	
		A.M. Peak Hour	P.M. Peak Hour
Highway 50 / Industrial Road	Intersection	A, 7.9	F, 350.7
	Critical Movement	WB – F, 264.9, 1.19	WB – F, Err, 5.33

* For unsignalized intersections, the average intersection delay and equivalent LOS is reported.
**Err indicates that delays are too lengthy to calculate.

The results of the 2026 future background condition intersection capacity analysis indicates that similar to the existing conditions, the westbound approach is expected to experience very lengthy delays.

4.2.3 Future Background Traffic Signal Warrant Analysis – 2026

Signal warrant analysis was conducted based on the methodology of the Ontario Traffic Manual (OTM) Book 12 for the future background 2026 traffic conditions. It was assumed that the average hourly volume over the peak eight (8) hours is approximately 75% of the AM peak hour plus the PM peak hour. The traffic signal warrant calculations are included in Appendix D.

The signal warrant analysis indicates that traffic signals are not warranted with the future background 2026 traffic volumes.

5.0 FUTURE TOTAL CONDITION

5.1 DEVELOPMENT PROPOSAL

As mentioned in section *1.0 Introduction*, the proposed development will include a gasoline station with eight(8) fuelling positions, a convenience store, a car wash, an auto-body shop, and offices on the upper floors. A right-in/right-out entrance is proposed on Highway 50 with a directional channelized median at the driveway to restrict movements. It is expected that fuel delivery trucks and emergency vehicles may need to mount the median in order to enter the site but it is expected that all other vehicles should be restricted to right-turn only. The design of the directional channelized median will be according to the Region of Peel standards. The site location map is shown in Figure 1-1 and the proposed site plan is shown in Figure 1-2.

5.2 TRIP GENERATION

In order to estimate the new vehicular trips that would be generated by the proposed facility, trip generation rates in the Institute of Transportation Engineers (ITE) Trip Generation Manual for similar uses were reviewed.

- The ITE Land Use Code 946 – Gasoline/Service Station with Convenience Market and Car Wash was used for the proposed gasoline station with 8 fuelling positions.

- The ITE Land Use Code 820 – Shopping Center was used for the proposed auto body shop because trip generation rates for this particular use is not available (278.72 m^2 / 3,000 s.f.).

- The ITE Land Use Code 710 – General Office was used for the second storey offices (460.76 m^2 or 4,960 s.f.

Traffic generation associated with commercial establishments is often derived from two sources, namely new (primary) trips and pass-by trips. Primary trips are those trips to a commercial development that are destination oriented and are new to the boundary road network. Pass-by trips are derived from the existing traffic that is already passing by the subject development site. Therefore, pass-by trips are not new trips on the boundary road network. However, pass-by trips impact the turning movements at the site entrances. Thus, the diversion of pass-by trips to the site would result in an increase of turns and a reduction of the major street through volume at the site entrances.

The derived proportion of pass-by traffic was based on a review of the data outlined in the ITE's Trip Generation Handbook – An ITE Recommended Practice. The estimated pass-by trip rates associated with the Gasoline/Service Station related trips was determined to be approximately 62% during the a.m. peak hour and 56% during the p.m. peak hour. The estimated pass-by trip rates associated with the auto body shop related trips was determined to be approximately 34% during the a.m. peak hour and 34% during the p.m. peak hour. The office site traffic was assumed to be 100% primary (new) trips.

The resultant total trip generation for the primary and pass-by related traffic associated with the proposed development uses is summarized in **Table 5-1**.

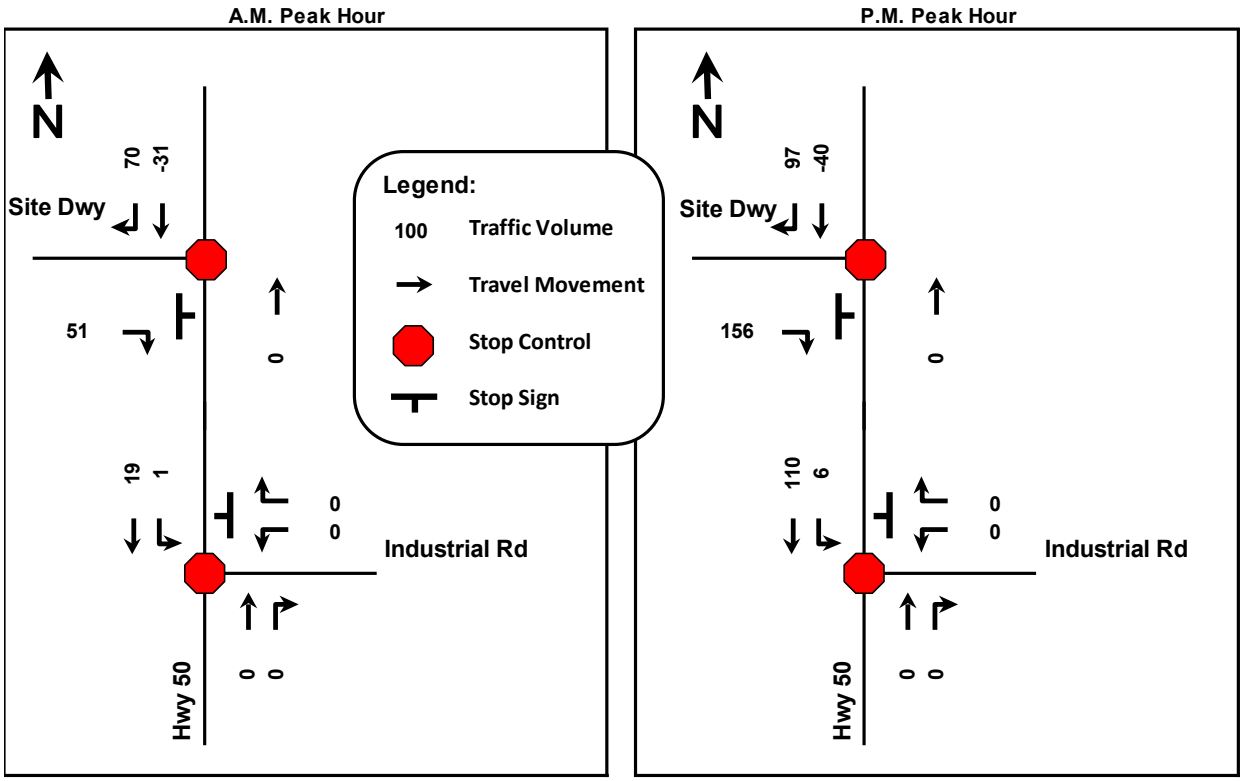
Table 5-1 Trip Generation Summary

Land Use	Size	Weekday A.M. Peak Hour			Weekday P.M. Peak Hour		
		In	Out	Total	In	Out	Total
Gasoline Station with Convenience Market and Car Wash	8 Positions	43	42	**85**	53	54	**107**
Auto Body Shop / Shopping Center	278.7 m^2 / 3,000 s.f.	12	7	**19**	30	32	**62**
Office	460.7 m^2 / 4960 s.f.	15	2	**17**	14	70	**84**
Pass-by Trips		31	31	**62**	40	40	**80**
Primary New Trips		**39**	**20**	**59**	**57**	**116**	**173**

In order to analyze the future total conditions, the estimated new peak hour vehicular trips summarized in Table 5-1 were assigned to the site driveways and study intersections. The directional route distribution of site generated traffic was based on the access configuration.

Based on the abovementioned trip distribution the estimated new trips associated with the proposed development summarized in Table 5-1 were assigned at the site driveways and study intersections accordingly. The total new assigned peak hour site generated traffic volumes with pass-by reduction are shown in **Figure 5-1**.

Figure 5-1 Total Peak Hour Proposed Site Development Related Trips

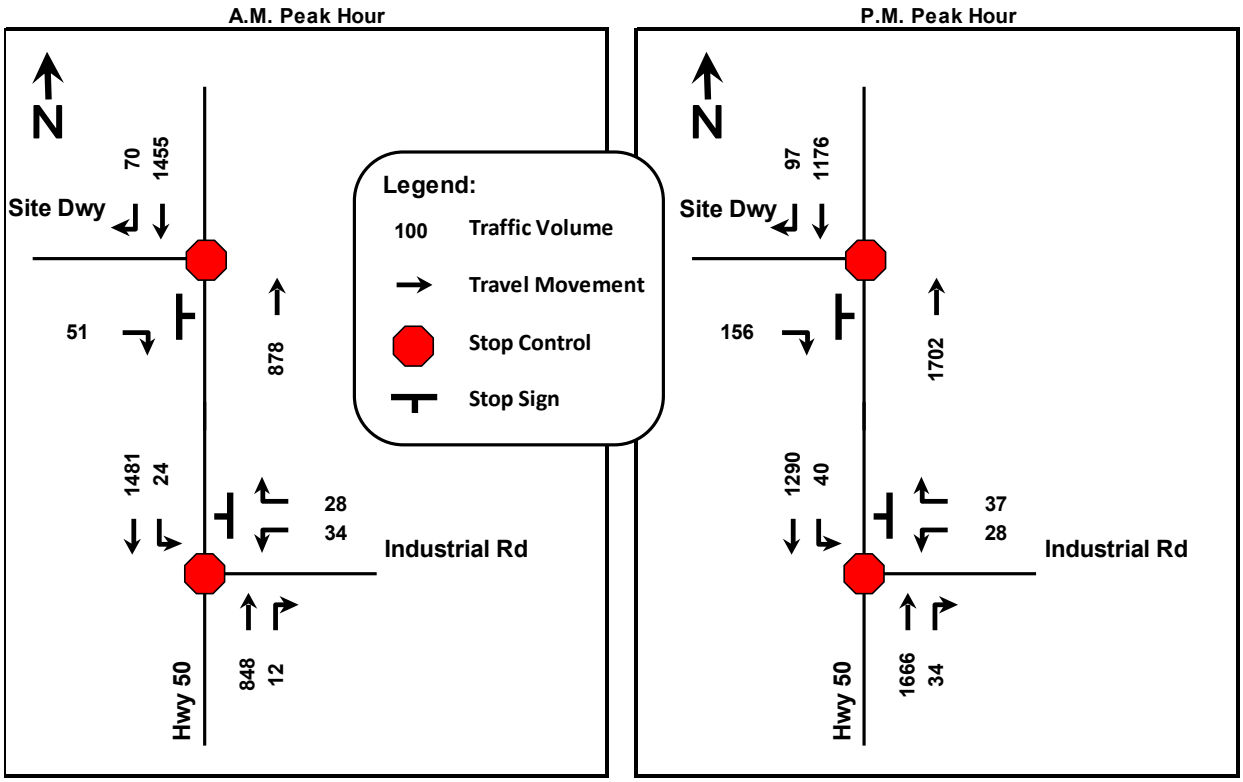


5.3 Future Total Traffic Conditions – 2021

5.3.1 Future Total Traffic Volumes - 2021

The site generated traffic volumes in Figure 5-1 were superimposed onto the 2021 Future Background Peak Hour Traffic Volumes in Figure 4-1 to obtain the 2021 Future Total Peak Hour Traffic Volumes shown in **Figure 5-2**.

Figure 5-2 Future Total Peak Hour Traffic Volumes – 2021



5.3.2 Future Total Intersection Capacity Analysis - 2021

The 2021 future total morning and afternoon peak hour traffic volumes shown in Figure 5-2 were used to analyze the study intersections according to the methodology outlined in Section *2.3 Intersection Capacity Evaluation* for unsignalized intersections.

The 2021 future total intersection capacity analysis results for the study intersections are summarized in **Table 5-2** below. Detailed 2021 future total intersection capacity analysis output is included in *Appendix E*.

Table 5-2 Future Total Condition Intersection Capacity Analysis Summary - 2021

Intersection	Overall / Critical Movement	Traffic Operations (LOS, Delay (sec's), V/C Ratio)	
		A.M. Peak Hour	P.M. Peak Hour
Highway 50 / Industrial Road	Intersection	A, 6.6	F, 352.4
	Critical Movement	WB – F, 208.6, 1.07	WB – F, Err, 5.07
Highway 50 / Site Entrance	Intersection	A, 0.4	A, 1.1
	Critical Movement	EB – C, 18.9, 0.18	EB – C, 23.1, 0.47

* For unsignalized intersections, the average intersection delay and equivalent LOS is reported.
**Err indicates that delays are too lengthy to calculate.

The results of the 2021 future total condition intersection capacity analysis indicate that the Highway 50 / Industrial Road will continue to operate with lengthy delays for the westbound stop-controlled approach, similar to the existing and future background conditions.

The analysis also indicates that the proposed site entrance would operate well by 2021.

The proposed site entrance is closely spaced to the existing Highway 50 / Industrial Road intersection. However, since the proposed site entrance is right-in/right-out only, it is not expected to impact the northbound movements on Highway 50 and cause spillback to the Highway 50 / Industrial Road intersection.

5.3.3 Future Total Traffic Signal Warrant Analysis – 2021

Signal warrant analysis was conducted based on the methodology of the Ontario Traffic Manual (OTM) Book 12 for the future total 2021 traffic conditions at the Highway 50 / Industrial Road intersection. It was assumed that the average hourly volume over the peak eight (8) hours is approximately 75% of the AM peak hour plus the PM peak hour. The traffic signal warrant calculations are included in Appendix E.

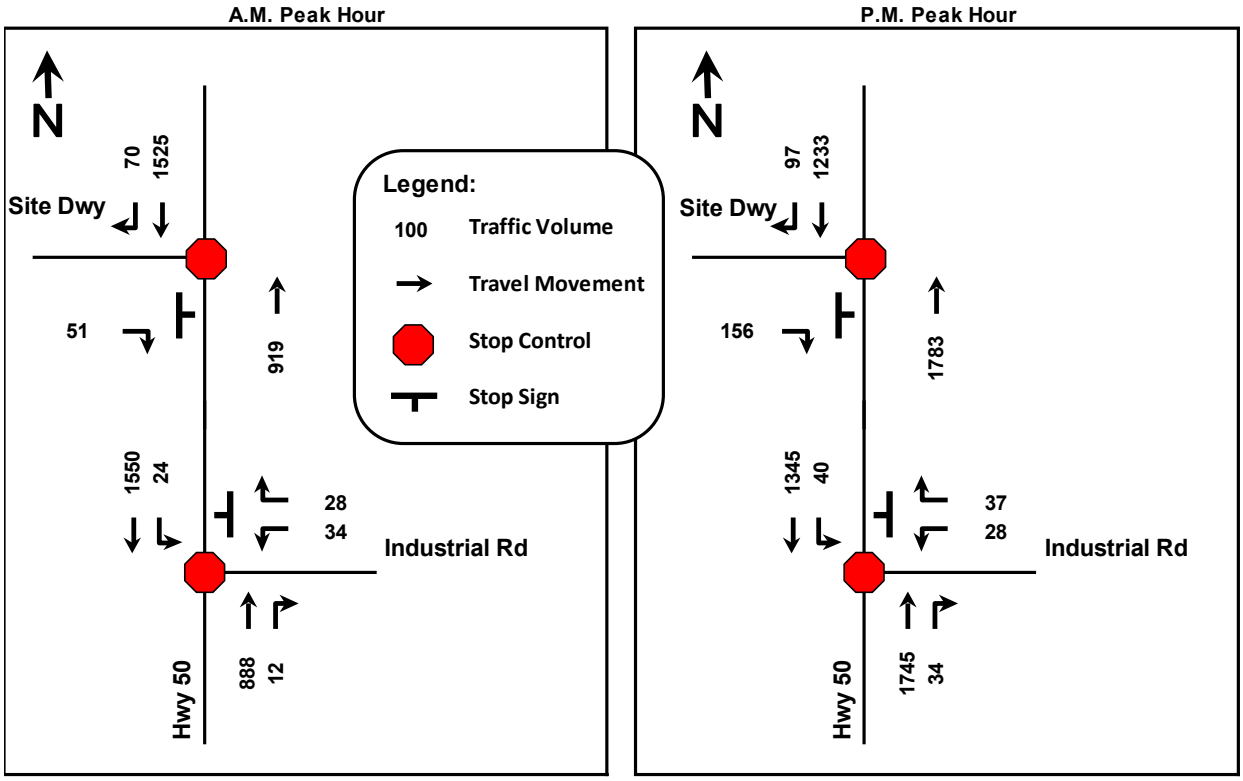
The signal warrant analysis indicates that traffic signals are not warranted with the future total 2021 traffic volumes.

5.4 Future Total Traffic Conditions - 2026

5.4.1 Future Total Traffic Volumes - 2026

The site generated traffic volumes in Figure 5-1 were superimposed onto the 2026 Future Background Peak Hour Traffic Volumes in Figure 4-2 to obtain the 2026 Future Total Peak Hour Traffic Volumes shown in **Figure 5-3**.

Figure 5-3 Future Total Peak Hour Traffic Volumes - 2026



5.4.2 Future Total Intersection Capacity Analysis - 2026

The 2026 future total morning and afternoon peak hour traffic volumes shown in Figure 5-3 were used to analyze the study intersections according to the methodology outlined in Section *2.3 Intersection Capacity Evaluation* for unsignalized intersections.

The 2026 future total intersection capacity analysis results for the study intersections are summarized in **Table 5-2** below. Detailed 2026 future total intersection capacity analysis output is included in *Appendix F*.

Table 5-3 Future Total Condition Intersection Capacity Analysis Summary - 2026

Intersection	Overall / Critical Movement	Traffic Operations (LOS, Delay (sec's), V/C Ratio)	
		A.M. Peak Hour	P.M. Peak Hour
Highway 50 / Industrial Road	Intersection	A, 8.2	F, 352.4
	Critical Movement	WB – F, 276.4, 1.22	WB – F, Err, 5.07
Highway 50 / Site Entrance	Intersection	A, 0.4	A, 1.2
	Critical Movement	EB – C, 19.9, 0.19	EB – C, 24.8, 0.49

* For unsignalized intersections, the average intersection delay and equivalent LOS is reported.
**Err indicates that delays are too lengthy to calculate.

The results of the 2026 future total condition intersection capacity analysis indicate that the Highway 50 / Industrial Road intersection will continue to operate with lengthy delays for the westbound movements similar to the existing and future background conditions.

The analysis also indicates that the proposed site entrance will operate well by the 2026 horizon.

As noted, although the proposed site entrance is closely spaced to the Highway 50 / Industrial Road intersection, since the entrance is right-turn only, it is expected to have no impact to northbound movement and will not cause any spillback to the existing intersection.

5.4.3 Future Total Traffic Signal Warrant Analysis – 2026

Signal warrant analysis was conducted based on the methodology of the Ontario Traffic Manual (OTM) Book 12 for the future total 2021 traffic conditions at the Highway 50 / Industrial Road intersection. It was assumed that the average hourly volume over the peak eight (8) hours is approximately 75% of the AM peak hour plus the PM peak hour. The traffic signal warrant calculations are included in Appendix F.

The signal warrant analysis indicates that traffic signals are not warranted with the future total 2026 traffic volumes.

6.0 Conclusions and Recommendations

LMM Engineering Inc. was retained by n Architecture Inc. to undertake a traffic impact study to evaluate the traffic impacts of the proposed service station development located on the northwest corner of Highway 50 / Industrial Road intersection in Bolton, Peel Region, Ontario.

The proposed development will include a gasoline station with eight (8) fuelling positions, a convenience store, a car wash, an auto body shop and offices. One right-in/right-out entrance is proposed on Highway 50.

6.1 Conclusions

Based on the intersection capacity analysis methodology in this report, the Highway 50 / Industrial Road intersection currently operates with the stop-controlled approach on Industrial Road at a failing level of service and will continue to do so in the future. Traffic signals are not warranted at the intersection at any horizon. The proposed development has negligible impact on the existing intersection.

The analysis also indicates that the proposed right-in/right-out site entrance will operate well in the future.

6.2 Recommendations

It is recommended that the site entrance be stop sign controlled with a stop sign and stop bar for exiting traffic. A directional channelized median is proposed at the driveway which should be designed according to the Region of Peel Engineering Standards. The directional channelized median is expected to restrict left-turns into and out of the site except for fuel delivery trucks and emergency vehicles. Appropriate traffic signage and traffic control should be implemented to provide pedestrian / vehicular accessibility safety and manoeuvrability with minimum conflicts throughout the site.

Appendix A

Turning Movement Count
Highway 50 / Industrial Road

Ontario Traffic Inc

Morning Peak Diagram

Specified Period
From: 7:00:00
To: 9:00:00

One Hour Peak
From: 7:45:00
To: 8:45:00

Municipality: Bolton
Site #: 1530000001
Intersection: Hwy 50 & Industrial Rd
TFR File #: 11
Count date: 12-Nov-15

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Hwy 50 runs N/S

North Leg Total: 2230
North Entering: 1402
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0
Trucks	89	2	91
Cars	1290	21	1311
Totals	1379	23	

Heavys	0
Trucks	70
Cars	758
Totals	828

East Leg Total: 97
East Entering: 62
East Peds: 1
Peds Cross: ⋈

Hwy 50

Cars	Trucks	Heavys	Totals
23	5	0	28
31	3	0	34
54	8	0	

N
W E
S

Industrial Rd

Cars	Trucks	Heavys	Totals
31	4	0	35

Hwy 50

Cars	1321
Trucks	92
Heavys	0
Totals	1413

Cars	735	10	745
Trucks	65	2	67
Heavys	0	0	0
Totals	800	12	

Peds Cross: ⋈
South Peds: 0
South Entering: 812
South Leg Total: 2225

Comments

Ontario Traffic Inc

Afternoon Peak Diagram

Specified Period
From: 16:00:00
To: 18:00:00

One Hour Peak
From: 16:45:00
To: 17:45:00

Municipality: Bolton
Site #: 1530000001
Intersection: Hwy 50 & Industrial Rd
TFR File #: 11
Count date: 12-Nov-15

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

Major Road: Hwy 50 runs N/S

North Leg Total: 2756
North Entering: 1147
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0
Trucks	57	0	57
Cars	1056	34	1090
Totals	1113	34	

Heavys	0
Trucks	53
Cars	1556
Totals	1609

East Leg Total: 133
East Entering: 65
East Peds: 2
Peds Cross: ⋈

Hwy 50

	Cars	Trucks	Heavys	Totals
	36	1	0	37
	24	4	0	28
	60	5	0	

N
W E
S

Industrial Rd

Cars	Trucks	Heavys	Totals
66	2	0	68

Hwy 50

Cars	1080
Trucks	61
Heavys	0
Totals	1141

Cars	1520	32	1552
Trucks	52	2	54
Heavys	0	0	0
Totals	1572	34	

Peds Cross: ⋈
South Peds: 0
South Entering: 1606
South Leg Total: 2747

Comments

Ontario Traffic Inc

Total Count Diagram

Municipality: Bolton
Site #: 1530000001
Intersection: Hwy 50 & Industrial Rd
TFR File #: 11
Count date: 12-Nov-15

Weather conditions:

Person(s) who counted:

**** Non-Signalized Intersection ****

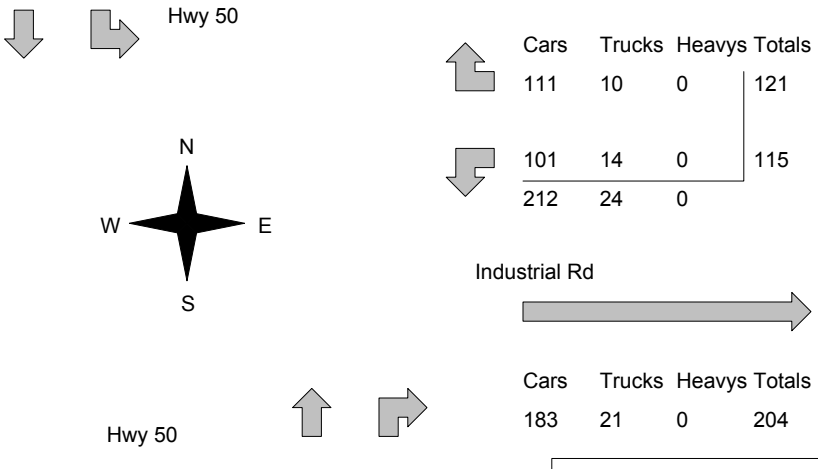
Major Road: Hwy 50 runs N/S

North Leg Total: 9527
North Entering: 4880
North Peds: 0
Peds Cross: ⋈

Heavys	0	0	0
Trucks	283	5	288
Cars	4497	95	4592
Totals	4780	100	

Heavys	0
Trucks	253
Cars	4394
Totals	4647

East Leg Total: 440
East Entering: 236
East Peds: 5
Peds Cross: ⋈



Cars	4598		
Trucks	297		
Heavys	0		
Totals	4895		

Cars	4283	88	4371
Trucks	243	16	259
Heavys	0	0	0
Totals	4526	104	

Peds Cross: ⋈
South Peds: 1
South Entering: 4630
South Leg Total: 9525

Comments

Ontario Traffic Inc
Traffic Count Summary

Intersection: Hwy 50 & Industrial Rd | **Count Date:** 12-Nov-15 | **Municipality:** Bolton

North Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches
7:00:00	0	4	0	4	0	4
8:00:00	19	1393	0	1412	0	2144
9:00:00	22	1287	0	1309	0	2078
16:00:00	1	6	0	7	0	12
17:00:00	29	1085	0	1114	0	2588
18:00:00	29	996	0	1025	0	2662
Totals:	100	4771	0	4871	0	9488

South Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	0	707	25	732	0
9:00:00	0	757	12	769	0
16:00:00	0	5	0	5	0
17:00:00	0	1440	34	1474	1
18:00:00	0	1604	33	1637	0
	0	4513	104	4617	1

East Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches
7:00:00	0	0	0	0	0	0
8:00:00	39	0	26	65	0	65
9:00:00	31	0	24	55	2	55
16:00:00	0	0	2	2	0	2
17:00:00	16	0	34	50	1	50
18:00:00	28	0	34	62	2	62
Totals:	114	0	120	234	5	234

West Approach Totals

Hour Ending	Includes Cars, Trucks, & Heavys Left	Thru	Right	Grand Total	Total Peds
7:00:00	0	0	0	0	0
8:00:00	0	0	0	0	0
9:00:00	0	0	0	0	0
16:00:00	0	0	0	0	0
17:00:00	0	0	0	0	0
18:00:00	0	0	0	0	0
	0	0	0	0	0

Calculated Values for Traffic Crossing Major Street

Hours Ending:	0:00	0:00	7:00	8:00	9:00	16:00	17:00	18:00
Crossing Values:	0	0	0	39	31	0	17	28

Ontario Traffic Inc

Count Date: 12-Nov-15 Site #: 1530000001

Interval Time	Passenger Cars - North Approach						Trucks - North Approach						Heavys - North Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		North Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	3	3	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
7:15:00	4	4	309	306	0	0	0	0	16	15	0	0	0	0	0	0	0	0	0	0
7:30:00	11	7	635	326	0	0	0	0	31	15	0	0	0	0	0	0	0	0	0	0
7:45:00	13	2	948	313	0	0	0	0	50	19	0	0	0	0	0	0	0	0	0	0
8:00:00	19	6	1326	378	0	0	0	0	71	21	0	0	0	0	0	0	0	0	0	0
8:15:00	22	3	1640	314	0	0	0	0	88	17	0	0	0	0	0	0	0	0	0	0
8:30:00	28	6	1926	286	0	0	0	0	115	27	0	0	0	0	0	0	0	0	0	0
8:45:00	34	6	2238	312	0	0	2	2	139	24	0	0	0	0	0	0	0	0	0	0
9:00:00	38	4	2524	286	0	0	3	1	160	21	0	0	0	0	0	0	0	0	0	0
9:00:29	38	0	2528	4	0	0	3	0	160	0	0	0	0	0	0	0	0	0	0	0
16:00:00	39	1	2530	2	0	0	3	0	160	0	0	0	0	0	0	0	0	0	0	0
16:15:00	45	6	2785	255	0	0	5	2	176	16	0	0	0	0	0	0	0	0	0	0
16:30:00	53	8	3011	226	0	0	5	0	198	22	0	0	0	0	0	0	0	0	0	0
16:45:00	58	5	3249	238	0	0	5	0	208	10	0	0	0	0	0	0	0	0	0	0
17:00:00	66	8	3554	305	0	0	5	0	221	13	0	0	0	0	0	0	0	0	0	0
17:15:00	72	6	3842	288	0	0	5	0	237	16	0	0	0	0	0	0	0	0	0	0
17:30:00	83	11	4071	229	0	0	5	0	247	10	0	0	0	0	0	0	0	0	0	0
17:45:00	92	9	4305	234	0	0	5	0	265	18	0	0	0	0	0	0	0	0	0	0
18:00:00	95	3	4488	183	0	0	5	0	283	18	0	0	0	0	0	0	0	0	0	0
18:00:53	95	0	4497	9	0	0	5	0	283	0	0	0	0	0	0	0	0	0	0	0

Ontario Traffic Inc

Count Date: 12-Nov-15 Site #: 1530000001

Interval Time	Passenger Cars - East Approach						Trucks - East Approach						Heavys - East Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		East Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	10	10	0	0	2	2	1	1	0	0	1	1	0	0	0	0	0	0	0	0
7:30:00	21	11	0	0	4	2	2	1	0	0	2	1	0	0	0	0	0	0	0	0
7:45:00	25	4	0	0	13	9	4	2	0	0	3	1	0	0	0	0	0	0	0	0
8:00:00	33	8	0	0	19	6	6	2	0	0	7	4	0	0	0	0	0	0	0	0
8:15:00	45	12	0	0	27	8	6	0	0	0	7	0	0	0	0	0	0	0	1	1
8:30:00	54	9	0	0	31	4	6	0	0	0	7	0	0	0	0	0	0	0	1	0
8:45:00	56	2	0	0	36	5	7	1	0	0	8	1	0	0	0	0	0	0	1	0
9:00:00	62	6	0	0	41	5	8	1	0	0	9	1	0	0	0	0	0	0	2	1
9:00:29	62	0	0	0	43	2	8	0	0	0	9	0	0	0	0	0	0	0	2	0
16:00:00	62	0	0	0	43	0	8	0	0	0	9	0	0	0	0	0	0	0	2	0
16:15:00	68	6	0	0	52	9	8	0	0	0	9	0	0	0	0	0	0	0	2	0
16:30:00	70	2	0	0	67	15	8	0	0	0	9	0	0	0	0	0	0	0	3	1
16:45:00	73	3	0	0	70	3	10	2	0	0	9	0	0	0	0	0	0	0	3	0
17:00:00	75	2	0	0	76	6	11	1	0	0	10	1	0	0	0	0	0	0	3	0
17:15:00	78	3	0	0	81	5	12	1	0	0	10	0	0	0	0	0	0	0	4	1
17:30:00	91	13	0	0	98	17	13	1	0	0	10	0	0	0	0	0	0	0	5	1
17:45:00	97	6	0	0	106	8	14	1	0	0	10	0	0	0	0	0	0	0	5	0
18:00:00	100	3	0	0	110	4	14	0	0	0	10	0	0	0	0	0	0	0	5	0
18:00:53	101	1	0	0	111	1	14	0	0	0	10	0	0	0	0	0	0	0	5	0

Ontario Traffic Inc

Count Date: 12-Nov-15 Site #: 1530000001

Interval Time	Passenger Cars - South Approach						Trucks - South Approach						Heavys - South Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		South Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	132	132	7	7	0	0	15	15	4	4	0	0	0	0	0	0	0	0
7:30:00	0	0	270	138	13	6	0	0	32	17	5	1	0	0	0	0	0	0	0	0
7:45:00	0	0	425	155	16	3	0	0	43	11	6	1	0	0	0	0	0	0	0	0
8:00:00	0	0	651	226	19	3	0	0	56	13	6	0	0	0	0	0	0	0	0	0
8:15:00	0	0	824	173	24	5	0	0	67	11	7	1	0	0	0	0	0	0	0	0
8:30:00	0	0	997	173	26	2	0	0	85	18	8	1	0	0	0	0	0	0	0	0
8:45:00	0	0	1160	163	26	0	0	0	108	23	8	0	0	0	0	0	0	0	0	0
9:00:00	0	0	1337	177	27	1	0	0	127	19	10	2	0	0	0	0	0	0	0	0
9:00:29	0	0	1341	4	27	0	0	0	127	0	10	0	0	0	0	0	0	0	0	0
16:00:00	0	0	1342	1	27	0	0	0	127	0	10	0	0	0	0	0	0	0	0	0
16:15:00	0	0	1633	291	37	10	0	0	138	11	10	0	0	0	0	0	0	0	0	0
16:30:00	0	0	1997	364	44	7	0	0	150	12	11	1	0	0	0	0	0	0	1	1
16:45:00	0	0	2365	368	53	9	0	0	173	23	14	3	0	0	0	0	0	0	1	0
17:00:00	0	0	2719	354	56	3	0	0	190	17	15	1	0	0	0	0	0	0	1	0
17:15:00	0	0	3129	410	74	18	0	0	204	14	16	1	0	0	0	0	0	0	1	0
17:30:00	0	0	3465	336	79	5	0	0	211	7	16	0	0	0	0	0	0	0	1	0
17:45:00	0	0	3885	420	85	6	0	0	225	14	16	0	0	0	0	0	0	0	1	0
18:00:00	0	0	4271	386	88	3	0	0	242	17	16	0	0	0	0	0	0	0	1	0
18:00:53	0	0	4283	12	88	0	0	0	243	1	16	0	0	0	0	0	0	0	1	0

Ontario Traffic Inc

Count Date: 12-Nov-15 Site #: 1530000001

Interval Time	Passenger Cars - West Approach						Trucks - West Approach						Heavys - West Approach						Pedestrians	
	Left		Thru		Right		Left		Thru		Right		Left		Thru		Right		West Cross	
	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr	Cum	Incr
7:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9:00:29	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18:00:53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix B

Intersection Capacity Analysis Output
Existing Condition – 2015

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	34	28	800	12	23	1379
Future Volume (Veh/h)	34	28	800	12	23	1379
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.71	0.70	0.84	0.50	0.72	0.86
Hourly flow rate (vph)	48	40	952	24	32	1603
Pedestrians	1		1			1
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	0		0			0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1832	490			977	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1832	490			977	
tC, single (s)	7.0	7.3			4.3	
tC, 2 stage (s)						
tF (s)	3.6	3.5			2.3	
p0 queue free %	19	92			95	
cM capacity (veh/h)	60	483			660	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	88	635	341	32	802	802
Volume Left	48	0	0	32	0	0
Volume Right	40	0	24	0	0	0
cSH	99	1700	1700	660	1700	1700
Volume to Capacity	0.89	0.37	0.20	0.05	0.47	0.47
Queue Length 95th (m)	40.8	0.0	0.0	1.2	0.0	0.0
Control Delay (s)	139.8	0.0	0.0	10.7	0.0	0.0
Lane LOS	F			B		
Approach Delay (s)	139.8	0.0		0.2		
Approach LOS	F					

Intersection Summary			
Average Delay	4.7		
Intersection Capacity Utilization	48.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	28	37	1572	34	34	1113
Future Volume (Veh/h)	28	37	1572	34	34	1113
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.50	0.54	0.91	0.45	0.77	0.88
Hourly flow rate (vph)	56	69	1727	76	44	1265
Pedestrians	2		2			2
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	0		0			0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2490	906			1805	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2490	906			1805	
tC, single (s)	7.1	7.0			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.2	
p0 queue free %	0	75			87	
cM capacity (veh/h)	18	276			345	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	125	1151	652	44	632	632
Volume Left	56	0	0	44	0	0
Volume Right	69	0	76	0	0	0
cSH	36	1700	1700	345	1700	1700
Volume to Capacity	3.43	0.68	0.38	0.13	0.37	0.37
Queue Length 95th (m)	Err	0.0	0.0	3.5	0.0	0.0
Control Delay (s)	Err	0.0	0.0	16.9	0.0	0.0
Lane LOS	F			C		
Approach Delay (s)	Err	0.0		0.6		
Approach LOS	F					

Intersection Summary			
Average Delay	386.4		
Intersection Capacity Utilization	55.8%	ICU Level of Service	B
Analysis Period (min)	15		

Signal Warrant Calculation

LMM Engineering Inc.

MAJOR STREET: Highway 50

MINOR STREET: Industrial Road

COMMENT Existing (2015) Traffic

NUMBER OF APPROACH LANES: 1 [ ] 2 [x]

TEE INTERSECTION CONFIGURATION YES [X] NO [ ]

FLOW CONDITIONS: FREE FLOW (RURAL) [x] RESTRICTED FLOW (URBAN) [ ]

VOLUME	AM	PM	FACTOR *	
1A - All	2,276	2,818	n/a	1,910
1B - Minor	62	65	75%	48
2A - Major	2,214	2,753	75%	1,863
2B - Crossir	34	28	75%	23

* This factor relates average of the "peak eight hours" to the average of the "am and pm peak hours"

OVERALL WARRANT

150% SATISFIED:	YES [ ]	NO [X]	Warrant for new intersection with forecast traffic
120% SATISFIED:	YES [ ]	NO [X]	Warrant for existing intersection with forecast traffic
100% SATISFIED:	YES [ ]	NO [X]	Warrant for existing intersection with existing traffic *
COMBO 80% SATISFIED:	YES [ ]	NO [X]	Warrant for existing intersection with existing traffic
80% SATISFIED:	YES [ ]	NO [X]	

* Consider full underground provisions if 100% for forecast traffic

WARRANT 1 - MINIMUM VEHICULAR VOLUME

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
ALL APPROACHES	480	720	600	900	1910
	% FULFILLED				318%

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
MINOR STREET APPROACHES	180	255	180	255	48
	% FULFILLED				26%

150% SATISFIED:	YES [ ]	NO [X]
120% SATISFIED:	YES [ ]	NO [X]
100% SATISFIED:	YES [ ]	NO [X]
80% SATISFIED:	YES [ ]	NO [X]

WARRANT 2 - DELAY TO CROSS TRAFFIC

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
MAJOR STREET APPROACHES	480	720	600	900	1863
	% FULFILLED				310%

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
TRAFFIC CROSSING MAJOR STREET	50	75	50	75	23
	% FULFILLED				47%

150% SATISFIED:	YES [ ]	NO [X]
120% SATISFIED:	YES [ ]	NO [X]
100% SATISFIED:	YES [ ]	NO [X]
80% SATISFIED:	YES [ ]	NO [X]

1A - MINIMUM VEHICULAR VOLUME: Total vehicle volume on all approaches for average day

1B - MINIMUM VEHICULAR VOLUME: Total vehicle volume on minor streets

2A - DELAY TO CROSS TRAFFIC: Total vehicle volume on major street for average day

2B - DELAY TO CROSS TRAFFIC: Total vehicle and pedestrian volume crossing major street; comprising: (1) lefts from both minor streets, (2) heaviest through from minor street, (3) 50% of heavier left turn from major street when following criteria met: (a) left turn volume >120 and (b) left turn volume plus opposing volume > 720, (4) pedestrians crossing the major street.

Appendix C

Intersection Capacity Analysis Output
Future Background Condition – 2021

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	34	28	848	12	23	1462
Future Volume (Veh/h)	34	28	848	12	23	1462
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.71	0.70	0.84	0.50	0.72	0.86
Hourly flow rate (vph)	48	40	1010	24	32	1700
Pedestrians	1		1			1
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	0		0			0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1938	519			1035	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1938	519			1035	
tC, single (s)	7.0	7.3			4.3	
tC, 2 stage (s)						
tF (s)	3.6	3.5			2.3	
p0 queue free %	4	91			95	
cM capacity (veh/h)	50	461			626	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	88	673	361	32	850	850
Volume Left	48	0	0	32	0	0
Volume Right	40	0	24	0	0	0
cSH	84	1700	1700	626	1700	1700
Volume to Capacity	1.04	0.40	0.21	0.05	0.50	0.50
Queue Length 95th (m)	47.9	0.0	0.0	1.3	0.0	0.0
Control Delay (s)	199.9	0.0	0.0	11.1	0.0	0.0
Lane LOS	F			B		
Approach Delay (s)	199.9	0.0		0.2		
Approach LOS	F					

Intersection Summary			
Average Delay	6.3		
Intersection Capacity Utilization	51.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	28	37	1666	34	34	1180
Future Volume (Veh/h)	28	37	1666	34	34	1180
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.50	0.54	0.91	0.45	0.77	0.88
Hourly flow rate (vph)	56	69	1831	76	44	1341
Pedestrians	2		2			2
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	0		0			0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2632	958			1909	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2632	958			1909	
tC, single (s)	7.1	7.0			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.2	
p0 queue free %	0	73			86	
cM capacity (veh/h)	14	255			315	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	125	1221	686	44	670	670
Volume Left	56	0	0	44	0	0
Volume Right	69	0	76	0	0	0
cSH	29	1700	1700	315	1700	1700
Volume to Capacity	4.35	0.72	0.40	0.14	0.39	0.39
Queue Length 95th (m)	Err	0.0	0.0	3.8	0.0	0.0
Control Delay (s)	Err	0.0	0.0	18.3	0.0	0.0
Lane LOS	F			C		
Approach Delay (s)	Err	0.0		0.6		
Approach LOS	F					

Intersection Summary			
Average Delay	366.0		
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		

Signal Warrant Calculation

LMM Engineering Inc.

MAJOR STREET: Highway 50

MINOR STREET: Industrial Road

COMMENT Future Background (2021) Traffic

NUMBER OF APPROACH LANES: 1 [ ] 2 [x]

TEE INTERSECTION CONFIGURATION YES [X] NO [ ]

FLOW CONDITIONS: FREE FLOW (RURAL) [x] RESTRICTED FLOW (URBAN) [ ]

VOLUME	AM	PM	FACTOR *	
1A - All	2,407	2,979	n/a	2,020
1B - Minor	62	65	75%	48
2A - Major	2,345	2,914	75%	1,972
2B - Crossir	34	28	75%	23

* This factor relates average of the "peak eight hours" to the average of the "am and pm peak hours"

OVERALL WARRANT

150% SATISFIED:	YES [ ]	NO [X]	Warrant for new intersection with forecast traffic
120% SATISFIED:	YES [ ]	NO [X]	Warrant for existing intersection with forecast traffic
100% SATISFIED:	YES [ ]	NO [X]	Warrant for existing intersection with existing traffic *
COMBO 80% SATISFIED:	YES [ ]	NO [X]	Warrant for existing intersection with existing traffic
80% SATISFIED:	YES [ ]	NO [X]	

* Consider full underground provisions if 100% for forecast traffic

WARRANT 1 - MINIMUM VEHICULAR VOLUME

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
ALL APPROACHES	480	720	600	900	2020
	% FULFILLED				337%

150% SATISFIED:	YES [ ]	NO [X]
120% SATISFIED:	YES [ ]	NO [X]
100% SATISFIED:	YES [ ]	NO [X]
80% SATISFIED:	YES [ ]	NO [X]

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
MINOR STREET APPROACHES	180	255	180	255	48
	% FULFILLED				26%

WARRANT 2 - DELAY TO CROSS TRAFFIC

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
MAJOR STREET APPROACHES	480	720	600	900	1972
	% FULFILLED				329%

150% SATISFIED:	YES [ ]	NO [X]
120% SATISFIED:	YES [ ]	NO [X]
100% SATISFIED:	YES [ ]	NO [X]
80% SATISFIED:	YES [ ]	NO [X]

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
TRAFFIC CROSSING MAJOR STREET	50	75	50	75	23
	% FULFILLED				47%

1A - MINIMUM VEHICULAR VOLUME: Total vehicle volume on all approaches for average day

1B - MINIMUM VEHICULAR VOLUME: Total vehicle volume on minor streets

2A - DELAY TO CROSS TRAFFIC: Total vehicle volume on major street for average day

2B - DELAY TO CROSS TRAFFIC: Total vehicle and pedestrian volume crossing major street; comprising: (1) lefts from both minor streets, (2) heaviest through from minor street, (3) 50% of heavier left turn from major street when following criteria met: (a) left turn volume >120 and (b) left turn volume plus opposing volume > 720, (4) pedestrians crossing the major street.

Appendix D

Intersection Capacity Analysis Output
Future Background Condition - 2026

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	34	28	888	12	23	1531
Future Volume (Veh/h)	34	28	888	12	23	1531
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.71	0.70	0.84	0.50	0.72	0.86
Hourly flow rate (vph)	48	40	1057	24	32	1780
Pedestrians	1		1			1
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	0		0			0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2025	542			1082	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2025	542			1082	
tC, single (s)	7.0	7.3			4.3	
tC, 2 stage (s)						
tF (s)	3.6	3.5			2.3	
p0 queue free %	0	91			95	
cM capacity (veh/h)	44	444			600	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	88	705	376	32	890	890
Volume Left	48	0	0	32	0	0
Volume Right	40	0	24	0	0	0
cSH	74	1700	1700	600	1700	1700
Volume to Capacity	1.19	0.41	0.22	0.05	0.52	0.52
Queue Length 95th (m)	53.6	0.0	0.0	1.3	0.0	0.0
Control Delay (s)	264.9	0.0	0.0	11.3	0.0	0.0
Lane LOS	F			B		
Approach Delay (s)	264.9	0.0		0.2		
Approach LOS	F					

Intersection Summary			
Average Delay	7.9		
Intersection Capacity Utilization	53.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	28	37	1745	34	34	1235
Future Volume (Veh/h)	28	37	1745	34	34	1235
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.50	0.54	0.91	0.45	0.77	0.88
Hourly flow rate (vph)	56	69	1918	76	44	1403
Pedestrians	2		2			2
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	0		0			0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2750	1001			1996	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2750	1001			1996	
tC, single (s)	7.1	7.0			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.2	
p0 queue free %	0	71			85	
cM capacity (veh/h)	11	239			291	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	125	1279	715	44	702	702
Volume Left	56	0	0	44	0	0
Volume Right	69	0	76	0	0	0
cSH	23	1700	1700	291	1700	1700
Volume to Capacity	5.33	0.75	0.42	0.15	0.41	0.41
Queue Length 95th (m)	Err	0.0	0.0	4.2	0.0	0.0
Control Delay (s)	Err	0.0	0.0	19.6	0.0	0.0
Lane LOS	F			C		
Approach Delay (s)	Err	0.0		0.6		
Approach LOS	F					

Intersection Summary			
Average Delay	350.7		
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
Analysis Period (min)	15		

Signal Warrant Calculation

LMM Engineering Inc.

MAJOR STREET: Highway 50

MINOR STREET: Industrial Road

COMMENT Future Background (2026) Traffic

NUMBER OF APPROACH LANES: 1 [ ] 2 [x]

TEE INTERSECTION CONFIGURATION YES [X] NO [ ]

FLOW CONDITIONS: FREE FLOW (RURAL) [x] RESTRICTED FLOW (URBAN) [ ]

VOLUME	AM	PM	FACTOR *	
1A - All	2,516	3,113	n/a	2,111
1B - Minor	62	65	75%	48
2A - Major	2,454	3,048	75%	2,063
2B - Crossir	34	28	75%	23

* This factor relates average of the "peak eight hours" to the average of the "am and pm peak hours"

OVERALL WARRANT

150% SATISFIED:	YES [ ]	NO [X]	Warrant for new intersection with forecast traffic
120% SATISFIED:	YES [ ]	NO [X]	Warrant for existing intersection with forecast traffic
100% SATISFIED:	YES [ ]	NO [X]	Warrant for existing intersection with existing traffic *
COMBO 80% SATISFIED:	YES [ ]	NO [X]	Warrant for existing intersection with existing traffic
80% SATISFIED:	YES [ ]	NO [X]	

* Consider full underground provisions if 100% for forecast traffic

WARRANT 1 - MINIMUM VEHICULAR VOLUME

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
ALL APPROACHES	480	720	600	900	2111
	% FULFILLED				352%

150% SATISFIED:	YES [ ]	NO [X]
120% SATISFIED:	YES [ ]	NO [X]
100% SATISFIED:	YES [ ]	NO [X]
80% SATISFIED:	YES [ ]	NO [X]

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
MINOR STREET APPROACHES	180	255	180	255	48
	% FULFILLED				26%

WARRANT 2 - DELAY TO CROSS TRAFFIC

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
MAJOR STREET APPROACHES	480	720	600	900	2063
	% FULFILLED				344%

150% SATISFIED:	YES [ ]	NO [X]
120% SATISFIED:	YES [ ]	NO [X]
100% SATISFIED:	YES [ ]	NO [X]
80% SATISFIED:	YES [ ]	NO [X]

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
TRAFFIC CROSSING MAJOR STREET	50	75	50	75	23
	% FULFILLED				47%

1A - MINIMUM VEHICULAR VOLUME: Total vehicle volume on all approaches for average day

1B - MINIMUM VEHICULAR VOLUME: Total vehicle volume on minor streets

2A - DELAY TO CROSS TRAFFIC: Total vehicle volume on major street for average day

2B - DELAY TO CROSS TRAFFIC: Total vehicle and pedestrian volume crossing major street; comprising: (1) lefts from both minor streets, (2) heaviest through from minor street, (3) 50% of heavier left turn from major street when following criteria met: (a) left turn volume >120 and (b) left turn volume plus opposing volume > 720, (4) pedestrians crossing the major street.

Appendix E

Intersection Capacity Analysis Output
Future Total Condition – 2021

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	51	0	878	1455	70
Future Volume (Veh/h)	0	51	0	878	1455	70
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	55	0	954	1582	76
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	2097	829	1658			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2097	829	1658			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	82	100			
cM capacity (veh/h)	45	314	385			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	55	477	477	1055	603
Volume Left	0	0	0	0	0
Volume Right	55	0	0	0	76
cSH	314	1700	1700	1700	1700
Volume to Capacity	0.18	0.28	0.28	0.62	0.35
Queue Length 95th (m)	5.0	0.0	0.0	0.0	0.0
Control Delay (s)	18.9	0.0	0.0	0.0	0.0
Lane LOS	C				
Approach Delay (s)	18.9	0.0		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	52.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	34	29	848	12	24	1481
Future Volume (Veh/h)	34	29	848	12	24	1481
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.71	0.70	0.84	0.50	0.72	0.86
Hourly flow rate (vph)	48	41	1010	24	33	1722
Pedestrians	1		1			1
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	0		0			0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	1951	519			1035	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1951	519			1035	
tC, single (s)	7.0	7.3			4.3	
tC, 2 stage (s)						
tF (s)	3.6	3.5			2.3	
p0 queue free %	2	91			95	
cM capacity (veh/h)	49	461			626	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	89	673	361	33	861	861
Volume Left	48	0	0	33	0	0
Volume Right	41	0	24	0	0	0
cSH	83	1700	1700	626	1700	1700
Volume to Capacity	1.07	0.40	0.21	0.05	0.51	0.51
Queue Length 95th (m)	49.2	0.0	0.0	1.3	0.0	0.0
Control Delay (s)	208.6	0.0	0.0	11.1	0.0	0.0
Lane LOS	F			B		
Approach Delay (s)	208.6	0.0		0.2		
Approach LOS	F					

Intersection Summary			
Average Delay	6.6		
Intersection Capacity Utilization	51.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	156	0	1702	1176	97
Future Volume (Veh/h)	0	156	0	1702	1176	97
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.91	0.91	0.88	0.88
Hourly flow rate (vph)	0	173	0	1870	1336	110
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	2326	723	1446			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2326	723	1446			
tC, single (s)	6.8	6.9	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	53	100			
cM capacity (veh/h)	31	369	460			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	173	935	935	891	555
Volume Left	0	0	0	0	0
Volume Right	173	0	0	0	110
cSH	369	1700	1700	1700	1700
Volume to Capacity	0.47	0.55	0.55	0.52	0.33
Queue Length 95th (m)	19.3	0.0	0.0	0.0	0.0
Control Delay (s)	23.1	0.0	0.0	0.0	0.0
Lane LOS	C				
Approach Delay (s)	23.1	0.0		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	28	37	1666	34	40	1290
Future Volume (Veh/h)	28	37	1666	34	40	1290
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.50	0.54	0.91	0.45	0.77	0.88
Hourly flow rate (vph)	56	69	1831	76	52	1466
Pedestrians	2		2			2
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	0		0			0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2710	958			1909	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2710	958			1909	
tC, single (s)	7.1	7.0			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.2	
p0 queue free %	0	73			83	
cM capacity (veh/h)	12	255			315	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	125	1221	686	52	733	733
Volume Left	56	0	0	52	0	0
Volume Right	69	0	76	0	0	0
cSH	25	1700	1700	315	1700	1700
Volume to Capacity	5.07	0.72	0.40	0.17	0.43	0.43
Queue Length 95th (m)	Err	0.0	0.0	4.7	0.0	0.0
Control Delay (s)	Err	0.0	0.0	18.7	0.0	0.0
Lane LOS	F			C		
Approach Delay (s)	Err	0.0		0.6		
Approach LOS	F					

Intersection Summary			
Average Delay	352.4		
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		

Signal Warrant Calculation

LMM Engineering Inc.

MAJOR STREET: Highway 50

MINOR STREET: Industrial Road

COMMENT Future Total (2021) Traffic

NUMBER OF APPROACH LANES: 1 [ ] 2 [x]

TEE INTERSECTION CONFIGURATION YES [X] NO [ ]

FLOW CONDITIONS: FREE FLOW (RURAL) [x] RESTRICTED FLOW (URBAN) [ ]

VOLUME	AM	PM	FACTOR *	
1A - All	2,426	3,095	n/a	2,070
1B - Minor	62	65	75%	48
2A - Major	2,364	3,030	75%	2,023
2B - Crossir	34	28	75%	23

* This factor relates average of the "peak eight hours" to the average of the "am and pm peak hours"

OVERALL WARRANT

150% SATISFIED:	YES [ ]	NO [X]	Warrant for new intersection with forecast traffic
120% SATISFIED:	YES [ ]	NO [X]	Warrant for existing intersection with forecast traffic
100% SATISFIED:	YES [ ]	NO [X]	Warrant for existing intersection with existing traffic *
COMBO 80% SATISFIED:	YES [ ]	NO [X]	Warrant for existing intersection with existing traffic
80% SATISFIED:	YES [ ]	NO [X]	

* Consider full underground provisions if 100% for forecast traffic

WARRANT 1 - MINIMUM VEHICULAR VOLUME

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
ALL APPROACHES	480	720	600	900	2070
	% FULFILLED				345%

150% SATISFIED:	YES [ ]	NO [X]
120% SATISFIED:	YES [ ]	NO [X]
100% SATISFIED:	YES [ ]	NO [X]
80% SATISFIED:	YES [ ]	NO [X]

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
MINOR STREET APPROACHES	180	255	180	255	48
	% FULFILLED				26%

WARRANT 2 - DELAY TO CROSS TRAFFIC

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
MAJOR STREET APPROACHES	480	720	600	900	2023
	% FULFILLED				337%

150% SATISFIED:	YES [ ]	NO [X]
120% SATISFIED:	YES [ ]	NO [X]
100% SATISFIED:	YES [ ]	NO [X]
80% SATISFIED:	YES [ ]	NO [X]

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
TRAFFIC CROSSING MAJOR STREET	50	75	50	75	23
	% FULFILLED				47%

1A - MINIMUM VEHICULAR VOLUME: Total vehicle volume on all approaches for average day

1B - MINIMUM VEHICULAR VOLUME: Total vehicle volume on minor streets

2A - DELAY TO CROSS TRAFFIC: Total vehicle volume on major street for average day

2B - DELAY TO CROSS TRAFFIC: Total vehicle and pedestrian volume crossing major street; comprising: (1) lefts from both minor streets, (2) heaviest through from minor street, (3) 50% of heavier left turn from major street when following criteria met: (a) left turn volume >120 and (b) left turn volume plus opposing volume > 720, (4) pedestrians crossing the major street.

Appendix F

Intersection Capacity Analysis Output
Future Total Condition – 2026

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	51	0	919	1525	70
Future Volume (Veh/h)	0	51	0	919	1525	70
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	55	0	999	1658	76
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	2196	867	1734			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2196	867	1734			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	81	100			
cM capacity (veh/h)	38	296	359			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	55	500	500	1105	629
Volume Left	0	0	0	0	0
Volume Right	55	0	0	0	76
cSH	296	1700	1700	1700	1700
Volume to Capacity	0.19	0.29	0.29	0.65	0.37
Queue Length 95th (m)	5.4	0.0	0.0	0.0	0.0
Control Delay (s)	19.9	0.0	0.0	0.0	0.0
Lane LOS	C				
Approach Delay (s)	19.9	0.0		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	54.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	34	28	888	12	24	1550
Future Volume (Veh/h)	34	28	888	12	24	1550
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.71	0.70	0.84	0.50	0.72	0.86
Hourly flow rate (vph)	48	40	1057	24	33	1802
Pedestrians	1		1			1
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	0		0			0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2038	542			1082	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2038	542			1082	
tC, single (s)	7.0	7.3			4.3	
tC, 2 stage (s)						
tF (s)	3.6	3.5			2.3	
p0 queue free %	0	91			95	
cM capacity (veh/h)	43	444			600	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	88	705	376	33	901	901
Volume Left	48	0	0	33	0	0
Volume Right	40	0	24	0	0	0
cSH	72	1700	1700	600	1700	1700
Volume to Capacity	1.22	0.41	0.22	0.05	0.53	0.53
Queue Length 95th (m)	54.5	0.0	0.0	1.4	0.0	0.0
Control Delay (s)	276.4	0.0	0.0	11.3	0.0	0.0
Lane LOS	F			B		
Approach Delay (s)	276.4	0.0		0.2		
Approach LOS	F					

Intersection Summary			
Average Delay	8.2		
Intersection Capacity Utilization	53.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	156	0	1783	1233	97
Future Volume (Veh/h)	0	156	0	1783	1233	97
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.91	0.91	0.88	0.88
Hourly flow rate (vph)	0	173	0	1959	1401	110
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	2436	756	1511			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2436	756	1511			
tC, single (s)	6.8	6.9	4.2			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	51	100			
cM capacity (veh/h)	26	351	434			

Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	173	980	980	934	577
Volume Left	0	0	0	0	0
Volume Right	173	0	0	0	110
cSH	351	1700	1700	1700	1700
Volume to Capacity	0.49	0.58	0.58	0.55	0.34
Queue Length 95th (m)	20.9	0.0	0.0	0.0	0.0
Control Delay (s)	24.8	0.0	0.0	0.0	0.0
Lane LOS	C				
Approach Delay (s)	24.8	0.0		0.0	
Approach LOS	C				

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	53.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	28	37	1745	34	40	1345
Future Volume (Veh/h)	28	37	1745	34	40	1345
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.50	0.54	0.91	0.45	0.77	0.88
Hourly flow rate (vph)	56	69	1918	76	52	1528
Pedestrians	2		2			2
Lane Width (m)	3.6		3.6			3.6
Walking Speed (m/s)	1.2		1.2			1.2
Percent Blockage	0		0			0
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	2828	1001			1996	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2828	1001			1996	
tC, single (s)	7.1	7.0			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.2	
p0 queue free %	0	71			82	
cM capacity (veh/h)	9	239			291	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	125	1279	715	52	764	764
Volume Left	56	0	0	52	0	0
Volume Right	69	0	76	0	0	0
cSH	20	1700	1700	291	1700	1700
Volume to Capacity	6.22	0.75	0.42	0.18	0.45	0.45
Queue Length 95th (m)	Err	0.0	0.0	5.1	0.0	0.0
Control Delay (s)	Err	0.0	0.0	20.0	0.0	0.0
Lane LOS	F			C		
Approach Delay (s)	Err	0.0		0.7		
Approach LOS	F					

Intersection Summary			
Average Delay	338.2		
Intersection Capacity Utilization	60.5%	ICU Level of Service	B
Analysis Period (min)	15		

Signal Warrant Calculation

LMM Engineering Inc.

MAJOR STREET: Highway 50

MINOR STREET: Industrial Road

COMMENT Future Total (2026) Traffic

NUMBER OF APPROACH LANES: 1 [ ] 2 [x]

TEE INTERSECTION CONFIGURATION YES [X] NO [ ]

FLOW CONDITIONS: FREE FLOW (RURAL) [x] RESTRICTED FLOW (URBAN) [ ]

VOLUME	AM	PM	FACTOR *	
1A - All	2,536	3,229	n/a	2,162
1B - Minor	62	65	75%	48
2A - Major	2,474	3,164	75%	2,114
2B - Crossir	34	28	75%	23

* This factor relates average of the "peak eight hours" to the average of the "am and pm peak hours"

OVERALL WARRANT

150% SATISFIED:	YES [ ]	NO [X]	Warrant for new intersection with forecast traffic
120% SATISFIED:	YES [ ]	NO [X]	Warrant for existing intersection with forecast traffic
100% SATISFIED:	YES [ ]	NO [X]	Warrant for existing intersection with existing traffic *
COMBO 80% SATISFIED:	YES [ ]	NO [X]	Warrant for existing intersection with existing traffic
80% SATISFIED:	YES [ ]	NO [X]	

* Consider full underground provisions if 100% for forecast traffic

WARRANT 1 - MINIMUM VEHICULAR VOLUME

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
ALL APPROACHES	480	720	600	900	2162
	% FULFILLED				360%

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
MINOR STREET APPROACHES	180	255	180	255	48
	% FULFILLED				26%

150% SATISFIED:	YES [ ]	NO [X]
120% SATISFIED:	YES [ ]	NO [X]
100% SATISFIED:	YES [ ]	NO [X]
80% SATISFIED:	YES [ ]	NO [X]

WARRANT 2 - DELAY TO CROSS TRAFFIC

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
MAJOR STREET APPROACHES	480	720	600	900	2114
	% FULFILLED				352%

APPROACH LANES	1		2 OR MORE		AVERAGE HOUR PERIOD
FLOW CONDITION	FREE FLOW	REST. FLOW	FREE FLOW	REST. FLOW	
			X		
TRAFFIC CROSSING MAJOR STREET	50	75	50	75	23
	% FULFILLED				47%

150% SATISFIED:	YES [ ]	NO [X]
120% SATISFIED:	YES [ ]	NO [X]
100% SATISFIED:	YES [ ]	NO [X]
80% SATISFIED:	YES [ ]	NO [X]

1A - MINIMUM VEHICULAR VOLUME: Total vehicle volume on all approaches for average day

1B - MINIMUM VEHICULAR VOLUME: Total vehicle volume on minor streets

2A - DELAY TO CROSS TRAFFIC: Total vehicle volume on major street for average day

2B - DELAY TO CROSS TRAFFIC: Total vehicle and pedestrian volume crossing major street; comprising: (1) lefts from both minor streets, (2) heaviest through from minor street, (3) 50% of heavier left turn from major street when following criteria met: (a) left turn volume >120 and (b) left turn volume plus opposing volume > 720, (4) pedestrians crossing the major street.