Caledon 410 Developments Ltd.

Town of Caledon

Draft Plan of Subdivision

TRANSPORTATION IMPACT STUDY

18200/200 November 2017

TABLE OF CONTENTS

Page

LIST OF APPENDICES

LIST OF FIGURES

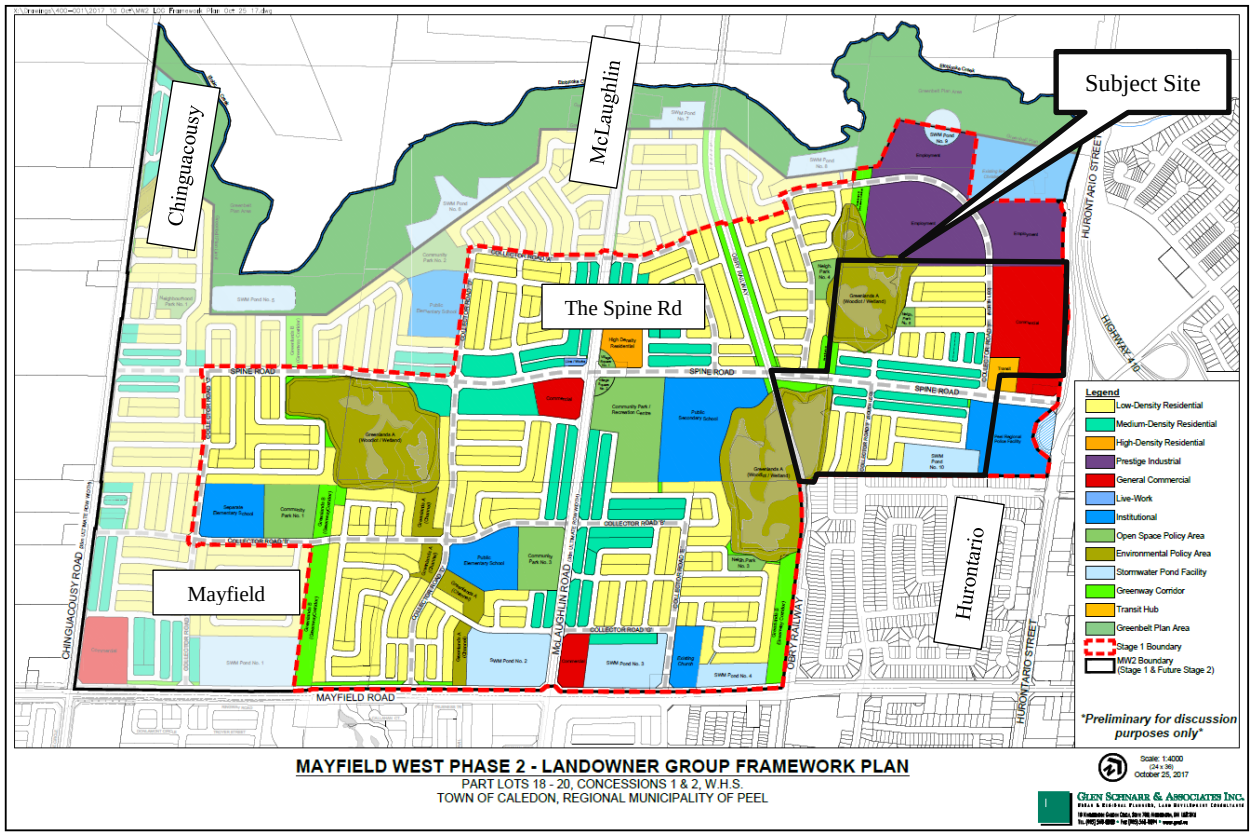
Page

LIST OF TABLES

Page

1.0 INTRODUCTION

LEA Consulting Ltd. ("LEA") has been retained by The Caledon 410 Developments Ltd. to prepare a Transportation Impact Study ("TIS") in support of a Draft Plan of Subdivision application for the property known as Caledon 410 Developments Ltd. in the Mayfield West Phase 2 ("MW2") Secondary Plan area, Town of Caledon, Ontario. **Figure** 1.1 shows the subject site and the Landowner Group Framework Plan (compiled draft plans) for MW2. The subject site is within the approved Stage 1 area of the MW2 Secondary Plan.



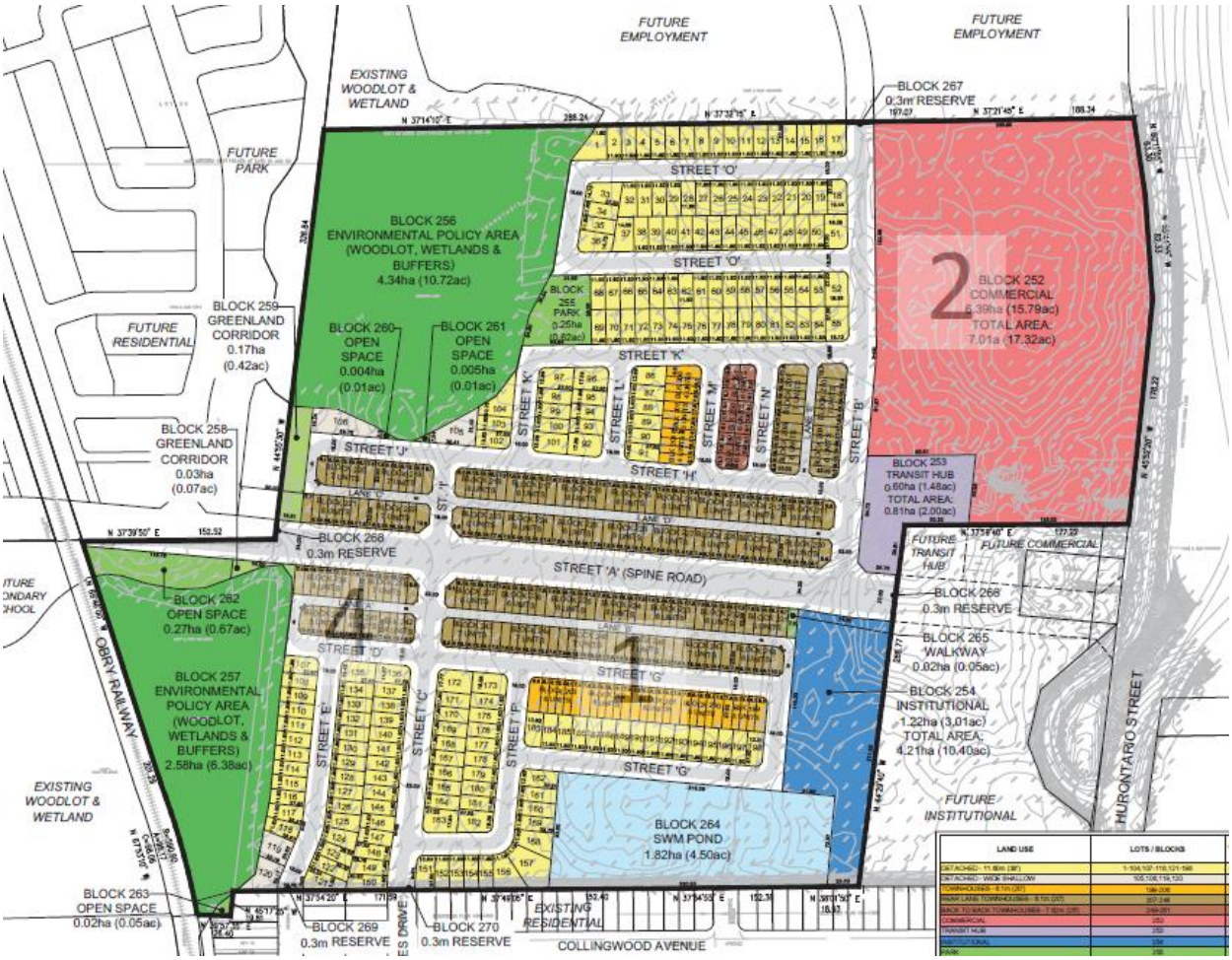
Source: Glen Schnarr, October 25, 2017

Figure 1.1: Subject Site – Caledon 410 Developments Ltd., Town of Caledon, Ontario

LEA developed a mesoscopic transportation model in March 2015 using Aimsun traffic modeling software to assess the impacts of the developments in the MW2 Secondary Plan area ("study area") on the surrounding road network and the Hurontario Street/ Highway 410 interchange. The results of that analysis have been utilized as a supplement to the MW2 Transportation Master Plan ("MW2 TMP") as a part of the preparation of the Secondary Plan for the Mayfield West Phase 2 development adopted by the Town of Caledon Council on December 20, 2016. This supplemental work demonstrates that MW2 Stage 1 can proceed without any additional road network improvements other than those planned for the planning horizon of 2031 in the MW2 TMP, which include the planned widening of Mayfield Road from two to six lanes. The analysis shows that further development could also occur beyond Stage 1, with critical movements remaining within the planned capacity of the road network, and with a functional operating future connection from The Spine Road to Hurontario Street.

Since the March 2015 analysis supplement to the MW2 TMP demonstrated that all key intersections in the study area surrounding MW2 operate adequately, the purpose of the current study is to assess in further detail the operations of existing and future intersections directly affected by Caledon 410 Developments Ltd. ("Caledon 410"). This detailed assessment will therefore focus on McLaughlin Road, north of Mayfield Road, Mayfield Road east of McLaughlin Road and the Spine Road connecting to Hurontario Street.

The proposed development, as illustrated in **Figure 1.2**, will include approximately 198 single-detached houses, 312 townhouses and a 6.39 ha commercial area.



Source: Glen Schnarr, September 12, 2017

Figure 1.2: Proposed Draft Plan – Fieldgate Developments, Town of Caledon, Ontario

2.0 EXISTING TRAFFIC CONDITIONS

2.1 ROAD NETWORK

The Mayfield West area is bounded by Chinguacousy Road, Mayfield Road, Hurontario Road/Highway 10, and the Etobicoke Creek:

- Mayfield Road is a regional road which has a two-lane cross-section west of Heart Lake Road with a posted speed of 60 km/h, and has a four-lane cross-section east of Heart Lake Road with a posted speed of 70 km/h;
- McLaughlin Road is a collector road under the jurisdiction of the Town of Caledon with a two-lane cross-section and a posted speed of 60 km/h; and
- Chinguacousy Road is a collector road under the jurisdiction of the Town of Caledon with a two-lane cross-section and a posted speed of 70 km/h. South of Wanless Drive, the road widens to a four-lane cross-section.

The study area includes the following existing intersections with the existing lane configurations illustrated in **Figure** 2.1:

- Old School Road and McLaughlin Road;
- Mayfield Road and McLaughlin Road.

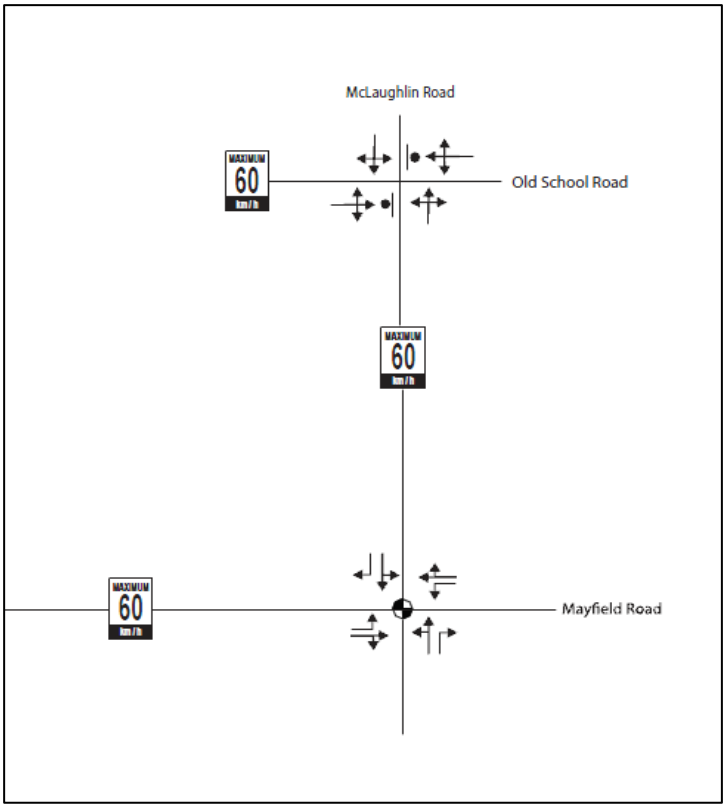


Figure 2.1: Study Area - Existing Lane Configurations

2.2 TRANSIT

The study area is currently serviced by the Brampton Transit Route 24, which extends north of Mayfield Road on Robertson Davies Drive, and loops back south on Hurontario Street via Collingwood Avenue. Additionally, GO Transit operates the Orangeville-Brampton GO Bus along Hurontario Street/Highway 10, with a stop at Heart Lake Town Centre. The transit coverage servicing the study area is illustrated in **Figure** 2.2.

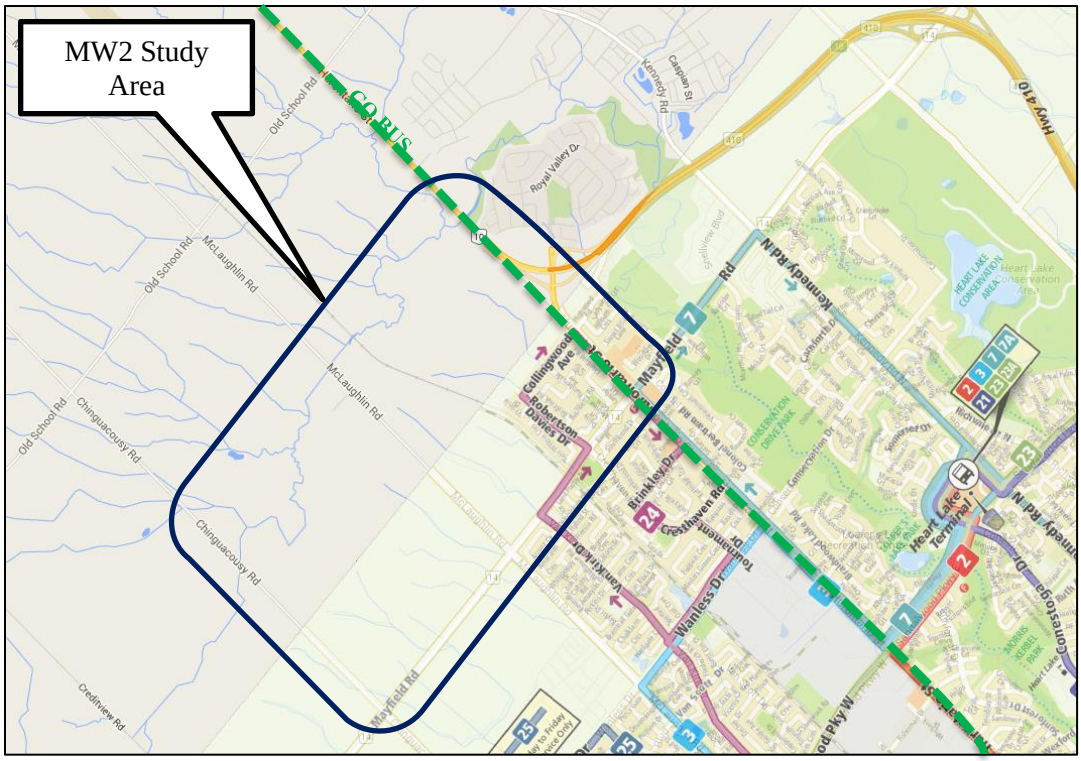


Figure 2.2: MW2 Study Area - Transit Services

2.3 INTERSECTION CAPACITY ANALYSIS

As part of the supplemental work to the **MW2 TMP**, LEA collected updated turning movement counts ("TMC") and produced a comprehensive analysis of existing travel patterns in the extended study area identified in the MW2 TMP. **Figure 2.3** shows the location of the Caledon 410 lands within MW2 and the extended study area considered for the MW2 TMP study, which is edged by Chinguacousy Road to the west, Old School Road to the north, Dixie Road to the east and Sandalwood Parkway to the south.

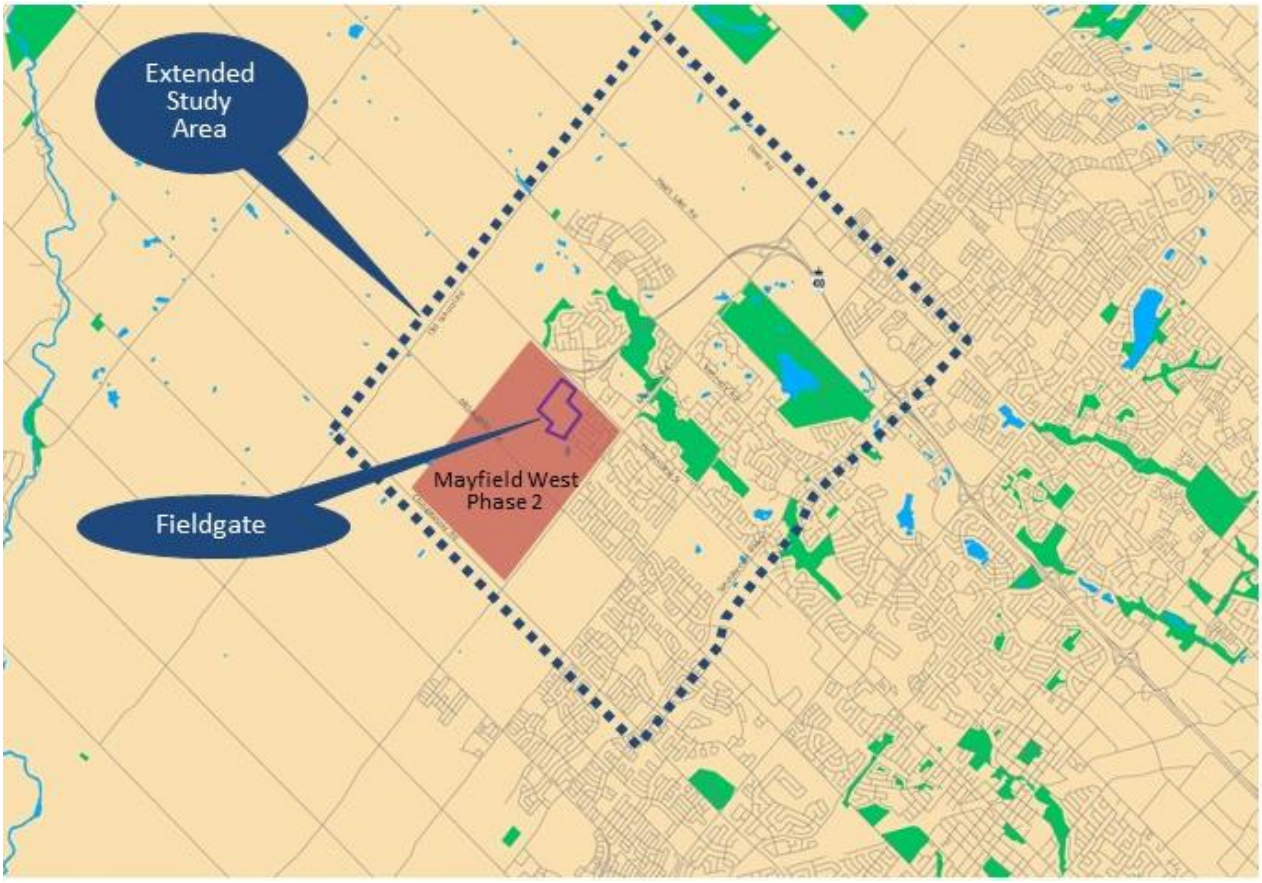


Figure 2.3: Extended Study Area (*Source: MW2 TMP Appendix D*)

Intersection capacity analyses at the signalized intersections within the extended study area demonstrated that there is some residual capacity in the study area road network around MW2.

The 2016 traffic volumes at the intersections within the study area are presented in **Figure** 2.4**.**

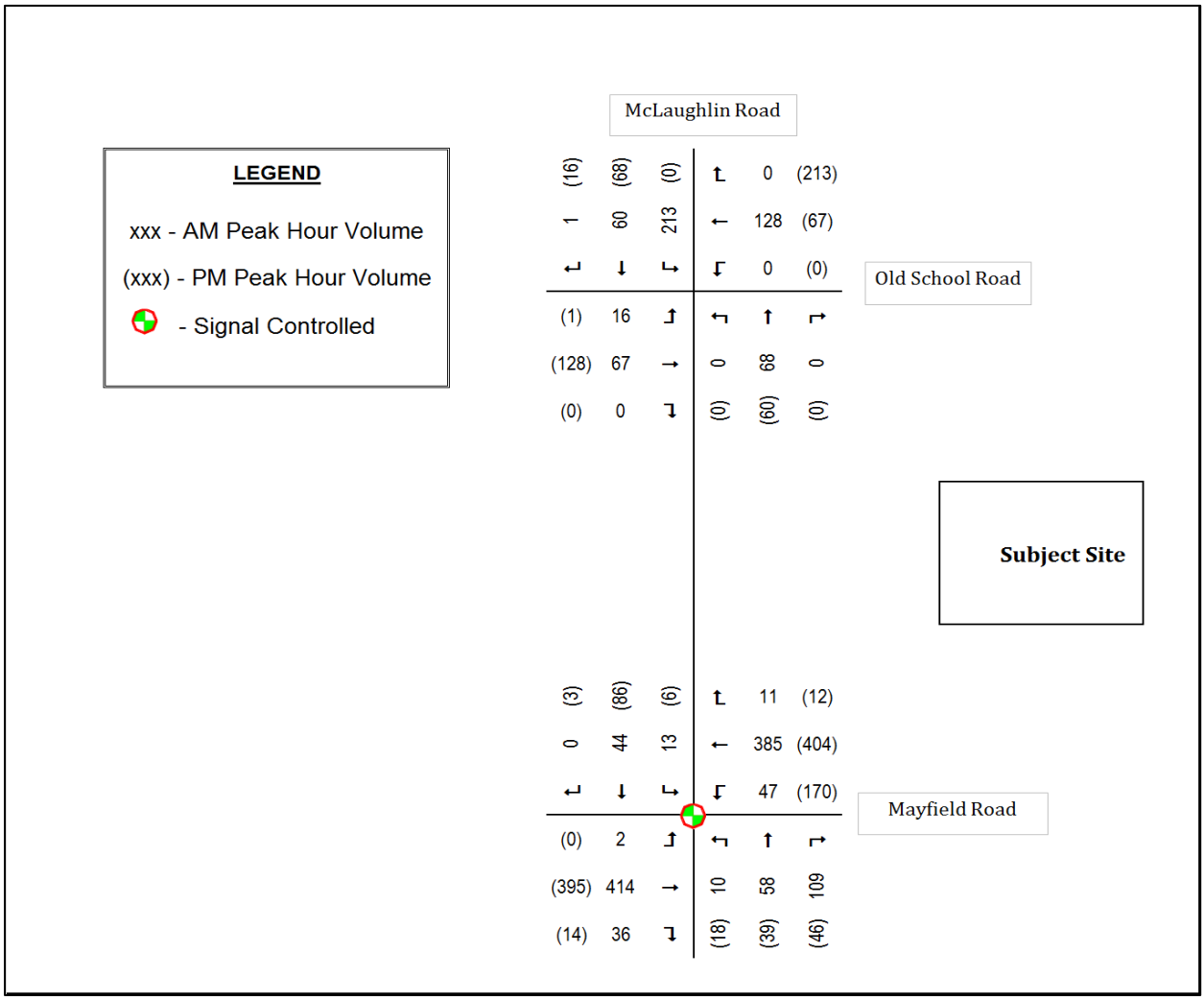


Figure 2.4: Caledon 410 Study Area - Existing Traffic Volumes

Intersection capacity analyses were undertaken for the signalized McLaughlin/Mayfield intersection, and the unsignalized Old School/McLaughlin intersection, as the two intersections most likely to be affected by Caledon 410. The results are summarized in **Table** 2.1 and **Table** 2.2 for the signalized and unsignalized intersections, respectively. Detailed capacity analysis outputs are provided in **Appendix A**.

Intersection	AM Peak Hour									PM Peak Hour									
	Overall			Movement of Interest				Queue (m)		Overall			Movement of Interest				Queue (m)		
	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	50th	95th	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	50th	95th
McLaughlin Road & Mayfield Road	0.32	17.8	B	EBL	0.00	4.2	A	0.2	m0.0	0.46	37.8	D	EBL	0	0	0	0	0
				EBTR	0.31	10.6	B	78.1	98.7				EBTR	0.32	7.8	A	54.2	81.9
				WBL	0.06	10.6	A	3.0	10.9				WBL	0.22	11.7	B	27.0	48.6
				WBTR	0.27	7.5	A	27.5	68.4				WBTR	0.29	13.3	B	80.8	106.9
				NBTL	0.42	53.4	D	15.4	28.9				NBTL	0.34	51.2	D	12.7	25.0
				NBR	0.07	50.2	D	0.0	16.3				NBR	0.03	48.6	D	0.0	1.0
				SBTL	0.38	53.0	D	12.9	25.5				SBTL	0.49	53.0	D	20.8	36.1

Table 2.1: Existing Signalized Intersection LOS

Intersection	Move-ment	AM Peak Hour						Move-ment	PMPeak Hour					
		Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS		Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS
MacLaughlin Road & Old School Road	EBTL	83	350	18.4	0.24	6.90	C	EBTL	129	750	10.8	0.17	4.70	B
	WBT	128	379	19.3	0.34	11.10	C	WBTR	280	929	0.3	0.30	9.70	B
	NBT	68	1542	0.0	0.00	0.40	A	NBT	60	1513	0.0	0.00	0.00	-
	SBTLR	274	1533	6.3	0.14	3.70	A	SBTLR	84	1544	0.0	0.00	0.00	-

Table 2.2: Existing Unsignalized Intersection LOS

During both the AM and PM peak hours, the McLaughlin/Mayfield intersection operates (**Table 2.1**) with acceptable overall LOS and with reserve capacity (v/c ratios of below 1.0). The unsignalized intersection at MacLaughlin Road/Old School Road (**Table 2.2**) also operates well during both AM and PM peak hours. East-west movements experience longer delays than north-south traffic.

3.0 FUTURE TRAFFIC CONDITIONS

3.1 METHODOLOGICAL APPROACH

To ascertain the traffic impacts of developing Caledon 410, LEA analyzed the operation of the MW2 road network under two future total development scenarios:

- 2019 Opening Day: corresponding with the assumed Opening Day of Caledon 410 before Full Build-Out of MW2 Stage 1; and
- 2021 Full Build-Out of MW2 Stage 1.

This study generally follows the methodology set out in the LEA March 2015 *Transportation Assessment Study: Proposed Interchange Modifications & Responses to MTO/Peel Region Comments*, which developed a mesoscopic Aimsun traffic model to test the proposed road network of the Stage 1 and Stage 2 development of the MW2 community including a connection of the Spine Road to the Hurontario Street along with modifications of the Highway 10/410 interchange. The present methodology refines the MW2 zonal system used in the earlier model and expands on the trip generation assumptions.

The key intersections most likely to be affected by Caledon 410 were analyzed using Synchro 9 intersection capacity analysis software. This analysis follows the methodology of the Highway Capacity Manual 2000, and provides a microscopic assessment of operations at signalized and unsignalized intersections. The analysis forms the basis of our assessment of the impacts associated with the Caledon 410.

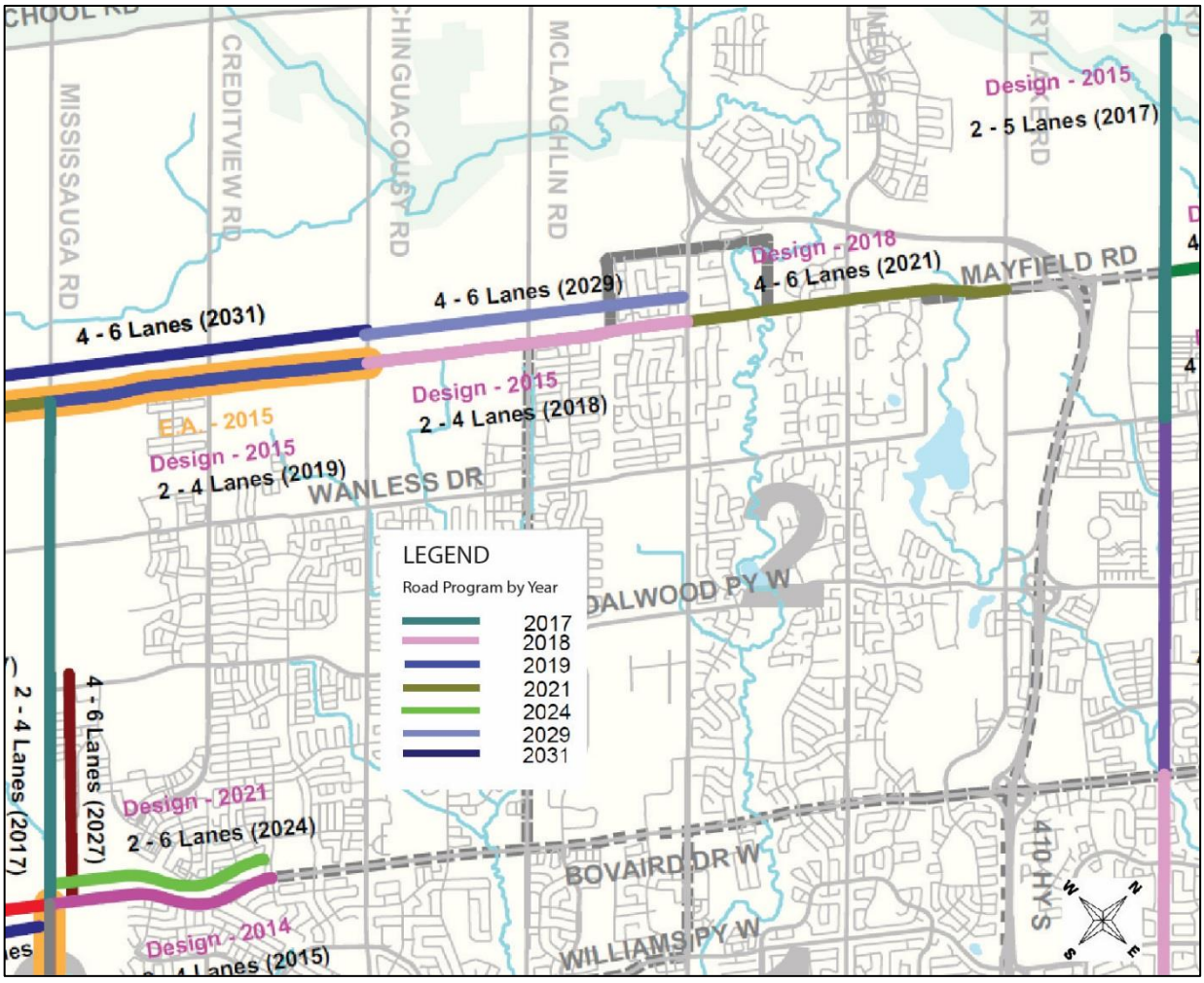
3.2 PLANNED ROAD IMPROVEMENTS

3.2.1 2019 Opening Day

Mayfield Road is currently being widened from two to four/six lanes between Hurontario Street and McLaughlin Road. Widening from two to four was initially expected prior to 2019 (see **Figure** 3.1) and four to six by 2029, however it is being widened directly to six lanes expectedly completing by 2022. Accordingly, for Opening Day a sensitivity analysis with two lane Mayfield Road has also been provided (see **Section 3.4.3**) in addition to traffic analysis with four lane configurations.

3.2.2 2021 Full Build-Out of MW2 Stage 1

Review of planned road improvements suggests that Mayfield Road is planned for widening from four to six lanes east of Hurontario Street by 2021. At the same time, widening from two to four/six lanes will continue west of McLaughlin Road to Chinguacousy Road (see **Figure** 3.1).



Source: Region of Peel Funding Program, January 2015

Figure 3.1: Planned Road Improvements by Year 2017 - 2031

LEA's March 2015 supplemental work for the MW2 TMP assumed that the proposed east-west Spine Road through the MW2 community would terminate at an intersection near the Hurontario Street/Highway 10 and the Highway 410 interchange. The current analysis has been carried out under the assumption that this intersection would be completed by the 2021 horizon year.

3.3 TRIP GENERATION

3.3.1 Residential Trip Generation

While consistent with LEA's March 2015 supplemental modeling work, this study deviates from the earlier methodology to the extent that the trip generation follows the trip forecasting methodology employed by Paradigm Consulting for the MW2 TMP. The rationale is explained below.

LEA's March 2015 analysis was based on Peel Region's Regional EMME transportation model, which uses population and employment forecasts to estimate existing and future travel demand across the Greater Toronto Area ("GTA"). The model is calibrated to the 2011 Transportation Tomorrow Survey travel information data, and its replication of existing travel patterns throughout the GTA is well accepted by Peel Region and other public-sector authorities like the Ontario Ministry of Transportation. It was therefore considered to be the most applicable model for regional transportation analysis.

Paradigm's approach to the MW2 TMP relied on trip generation rates for different land uses, as published by the Institute of Transportation Engineers (ITE) Trip Generation Manual. Those trip generation rates are based on a series of surveys conducted regularly across the United States, which report the number of trips generated to the size of the surveyed land use in terms of units, square footage, or number of employees. While they cover a broad range of different land uses and provide an accepted estimate of their trip generation, the ITE rates are subject to travel patterns and behaviour in parts of the United States with a more suburban, auto-centric character. The results of those surveys cover a very wide range, occasionally with very high standard deviations and relatively poor correlations between the size of the land use and its trip generation.

In comparing the two trip forecasting methods, we found that ITE approach may overestimate the number of trips generated by MW2 when compared to LEA's regionally-calibrated model. Specifically, the average ITE auto trip generation rates for residential uses are higher than LEA's auto trip production based on population. The trip forecasts produced for the MW2 TMP may therefore be an overestimation of the actual number of trips likely to be produced in the context of Caledon. Nonetheless, for this analysis, Paradigm's ITE trip generation approach was used to represent a worst-case scenario. Furthermore, compliance with the MW2 TMP trip generation method will ensure closer correspondence with past and future studies undertaken in the MW2 context.

The LEA Aimsun model is a weekday AM peak period model. To review operations in a future weekday PM peak hour, the "mirror effect" was assumed where the afternoon traffic takes the opposite route of the morning traffic.

As per Paradigm's methodology in the MW2 TMP, the trip rates from the ITE Land Use Code 210 (Single/Semi-Family Detached) and 230 (Townhouse) were used. A 5% modal split reduction was also applied, accounting for the typically lower auto-mode split observed in Ontario. The trip generation for the residential component of the Caledon 410 is summarized in **Table** 3.1 below.

The proposed development is expected to produce a total of 309 new trips (65 in, 244 out) during the weekday AM peak hour, and 380 new trips (247 in, 133 out) during the weekday PM peak hour.

Land Use		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Single/Semi-Family Detached (268 units) LUC 210	Trip Rate	0.16	0.47		0.51	0.29	
	New Trips	42	125	167	136	79	215
	Modal Split (5%)	-3	-5	-8	-7	-4	-11
	Net Trips	39	120	159	129	75	204
Townhouse/High Density (409 units) LUC 230	Trip Rate	0.07	0.32		0.30	0.15	
	New Trips	28	131	159	124	61	185
	Modal Split (5%)	-2	-7	-9	-6	-3	-9
	Net Trips	26	124	150	118	58	176
TOTAL NEW TRIPS	-	**65**	**244**	**309**	**247**	**133**	**380**

Table 3.1: Residential Trip Forecasts for Caledon 410

3.3.2 Commercial Trip Generation

The retail component (687,814 ft²) will be located at the northeast corner of the subdivision (**Figure** 1.2). Commercial visitor parking is also proposed to be provided within the same block. It is assumed that full movement access will be provided at the intersection of Street "B" and the Spine Road.

The traffic volumes generated by the proposed retail component, using ITE Land Use Code 820 (Shopping Centre) are summarized in **Table** 3.2

As explained previously to review operations in a future weekday PM peak hour, the "mirror effect" was assumed where the afternoon traffic takes the opposite route of the morning traffic. However, it is assumed that the "mirror effect" underestimates travel demand in an area with significant commercial activities, therefore additional volumes were added in the 2021 horizon to the PM volumes initially forecasted through mirror effect. The added trips consist of the residual commercial trips between the weekday PM peak hour trip generation and the mirrored weekday PM peak hour trips. The added trips were distributed on the road network under the 2021 scenario according to existing turning movement volumes during the weekday PM peak hour.

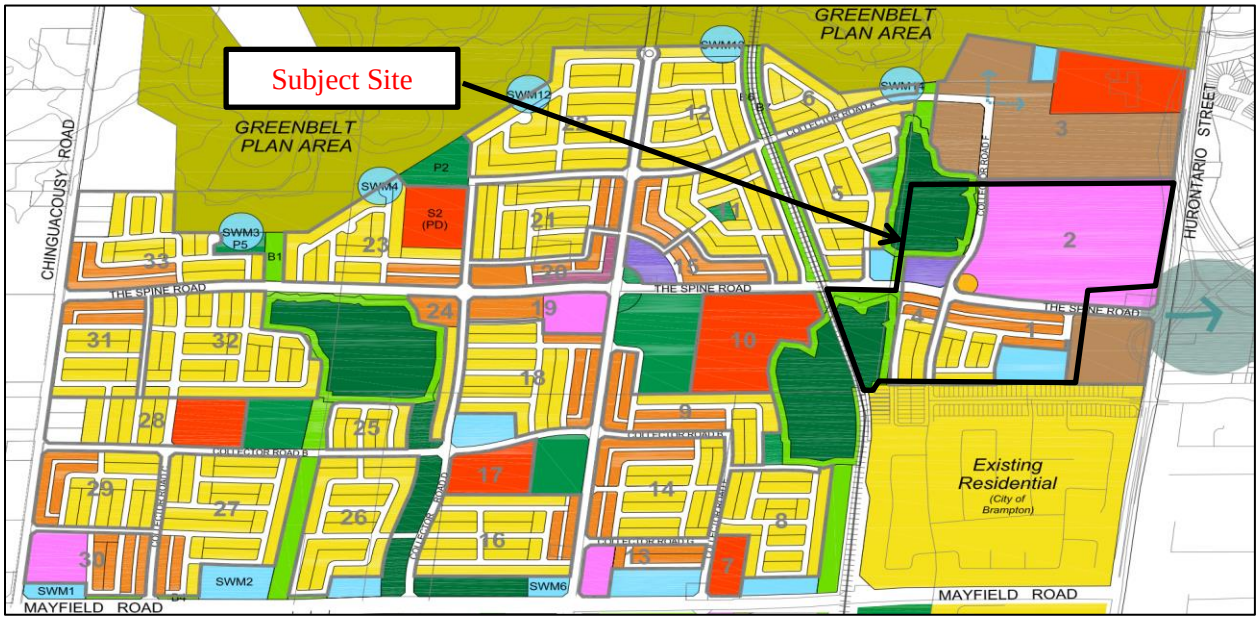
	AM Peak Hour			PM Peak Hour		
	In	Out	Total	In	Out	Total
Retail Component Trips (687,814 ft²)	313	192	505	1,047	1,134	2,181
Pass-by Reduction (35% PM)	0	0	0	-366	-397	-763
5% Transit Mode Split	-16	-10	-25	-52	-57	-109
Net New Car Trips (a)	**297**	**182**	**480**	**629**	**680**	**1,309**
Retail Car Trips included in Model (AM Peak Hour)	297	182	480	-	-	-
Mirrored PM Peak Hour Trips (b)	-	-	-	182	297	480
Residual Trips Added to PM Peak Hour Forecast (a-b)	-	-	-	**447**	**383**	**829**

Table 3.2: Commercial Trip Forecasts for Caledon 410 Retail Component

The assumptions presented above are conservative, as the trip generation may overestimate the forecasted travel demand, particularly during the weekday PM peak hour. This overestimation is nonetheless considered acceptable, as it implies assessment of a worst-case scenario.

3.3.3 Traffic Zone System

The model iteration refined for this analysis was developed to assess different development scenarios for MW2. The model's MW2 area was refined to 33 zones, as per Nak Design's community plan (see **Figure** 3.2). These zones correspond to the major development blocks, as outlined by the MW2 area proposed major road network and natural features. Caledon 410 is represented by Zones 1, 2, and 4.



Source: Nak Design, August 29, 2013

Figure 3.2: MW2 Traffic Analysis Zone System

The zonal map in **Figure** 3.2 was prepared on August 29, 2013 utilizing the Council endorsed Framework Plan. Since then, the Framework Plan and individual draft plans have changed, however, the traffic zones remain consistent**.**

3.4 FUTURE TOTAL TRAFFIC CONDITIONS

3.4.1 2019 Opening Day Intersection Capacity Analysis

The Aimsun mesoscopic analysis of the 2019 Opening Day scenario demonstrates that site traffic associated with Caledon 410 will flow roughly north and south on McLaughlin Road, ultimately destined east on Mayfield Road and south on Highway 410 (see **Figure** 3.3). This pattern demonstrates the draw of regional employment centres in Bolton, Brampton, and Mississauga.

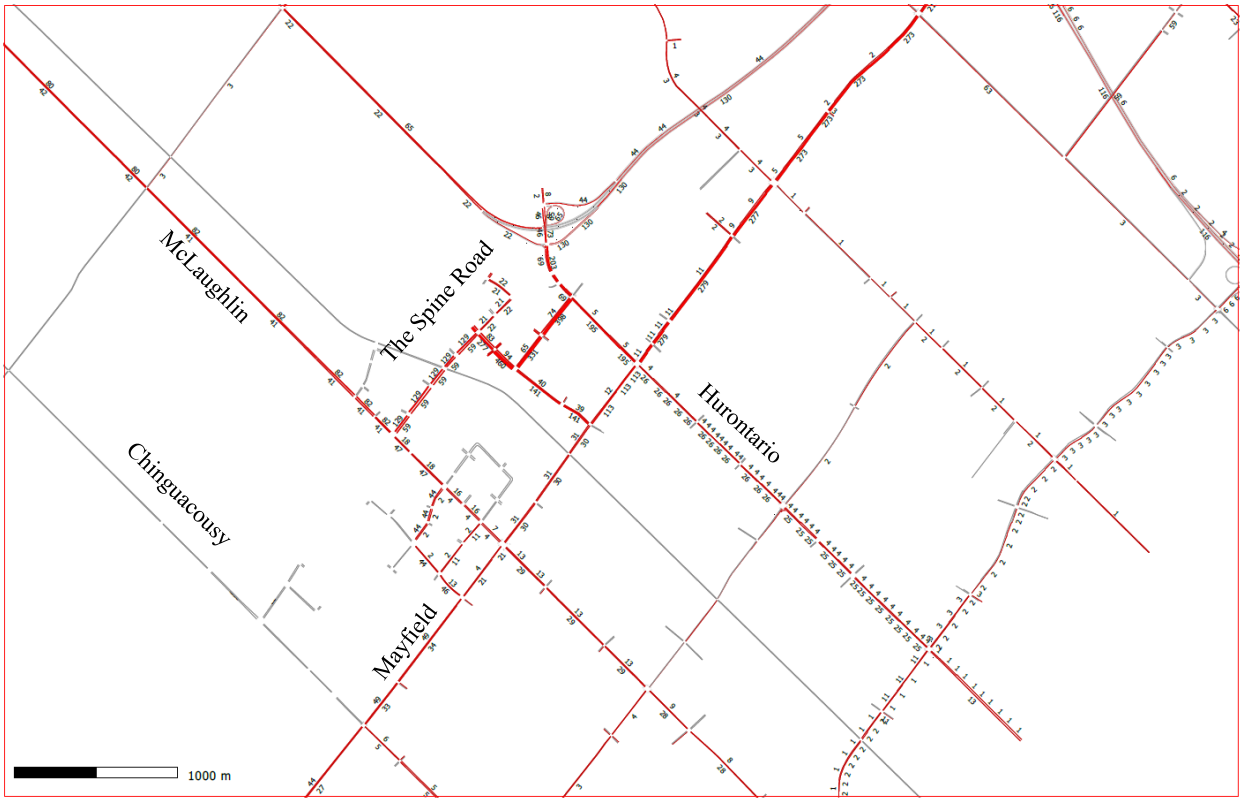


Figure 3.3: Site Trip Assignment - 2019 Opening Day Scenario - Weekday AM Three-Hour Volumes

The trip assignment resulting from the Aimsun mesoscopic model suggests that impacts associated with Caledon 410 will be localized along McLaughlin Road and Mayfield Road with access provided via The Spine Road. Synchro capacity analysis will therefore focus on the following intersections:

- Old School Road and McLaughlin Road;
- Mayfield Road and McLaughlin Road;
- The Spine Road and Street 'C'/Street 'I';
- The Spine Road and Street 'B';

The lane configurations and traffic volumes at the above-noted intersections under Opening Day conditions are illustrated in **Figure 3.4** and **Figure** 3.5, respectively.

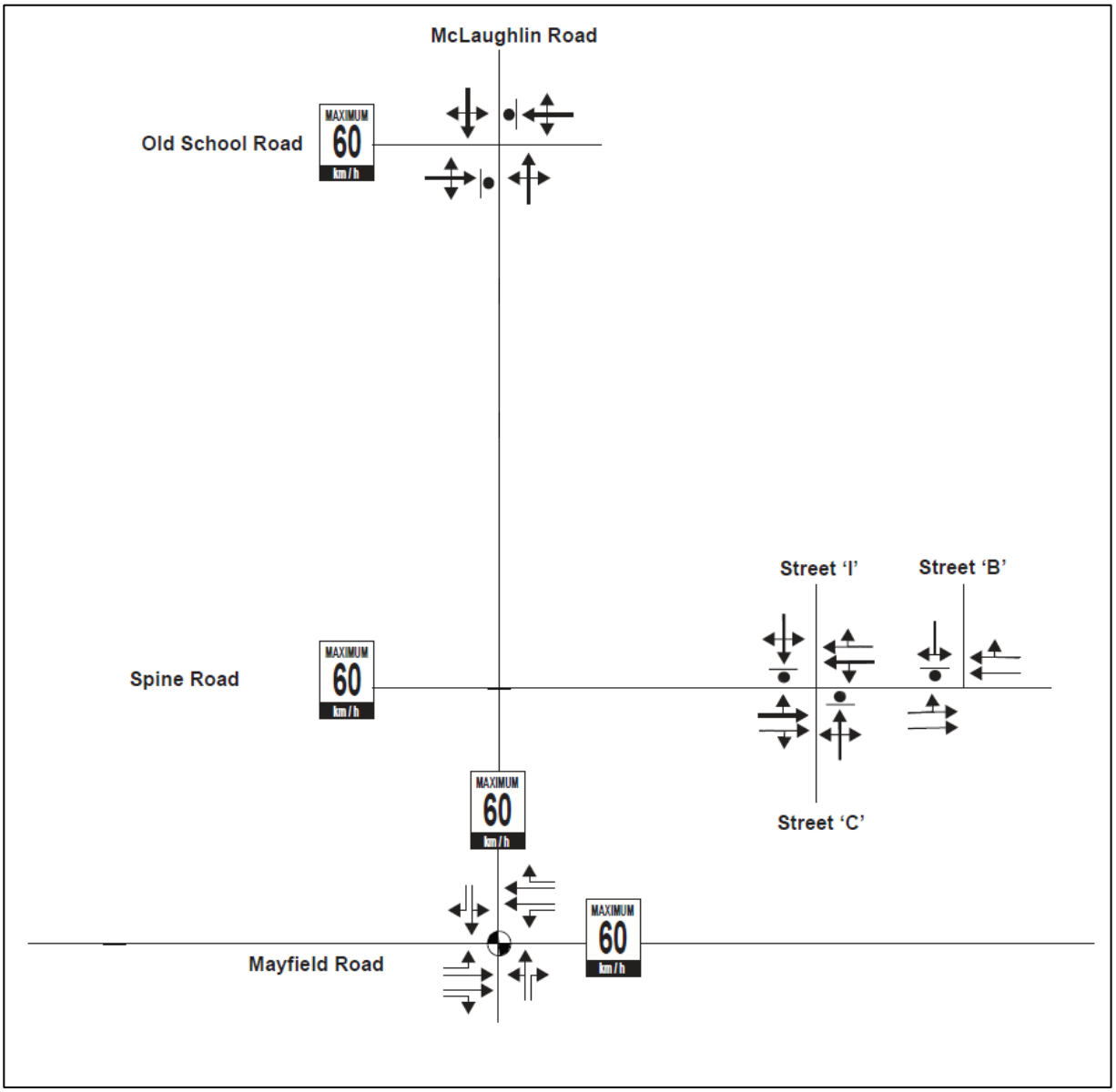


Figure 3.4: 2019 Opening Day Lane Configuration

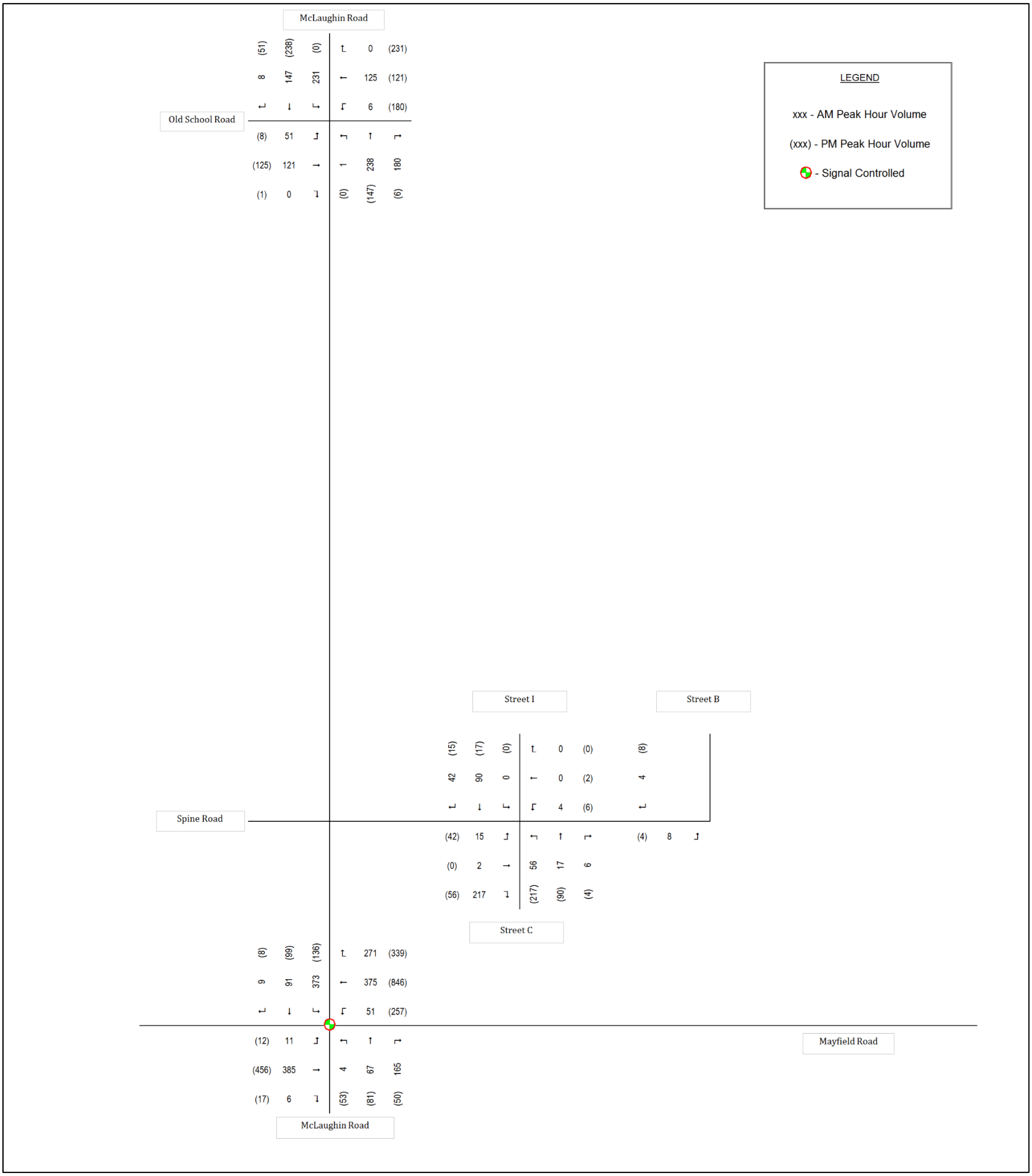


Figure 3.5: 2019 Opening Day Traffic Volumes

An intersection capacity analysis was completed for future traffic conditions under the 2019 Opening Day scenario for the AM and PM peak hours, for the signalized and unsignalized intersections summarized in **Table** 3.3 and **Table** 3.4, respectively. Detailed outputs are provided in **Appendix C**.

Intersection	Weekday AM Peak Hour									Weekday PM Peak Hour								
	Overall			Movement of Interest				Queue (m)		Overall			Movement of Interest				Queue (m)	
	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	50th	95th	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	50th	95th
McLaughlin Road & Mayfield Road	0.66	77.1	E	EBL	0.01	7.6	A	0.0	1.8	0.51	39.0	D	EBL	0.03	3.6	A	0.3	0.9
				EBT	0.37	11.2	B	51.1	58.1				EBT	0.18	6.5	A	10.6	15.8
				EBR	0.07	14.3	B	2.6	7.6				EBR	0.00	8.7	A	0.0	0.0
				WBL	0.13	12.6	B	4.2	14.0				WBL	0.34	11.5	B	33.0	48.0
				WBT	0.16	10.7	B	16.4	33.0				WBT	0.35	15.1	B	63.4	83.0
				WBR	0.18	45.8	D	6.9	32.8				WBR	0.23	55.7	E	22.8	40.4
				NBLT	0.29	39.2	D	13.9	27.6				NBLT	0.91	97.2	F	31.3	68.7
				NBR	0.11	37.1	D	0.0	17.2				NBR	0.03	41.1	D	0.0	2.4
				SBLT	1.56	315.4	F	154.5	217.2				SBLT	1.14	153.2	F	64.4	113.9
				SBR	0.01	36.1	D	0.0	0.9				SBR	0.01	40.9	D	0.0	0.0

Table 3.3: 2019 Opening Day Signalized Intersection LOS Summary

Intersection	Move-ment	Weekday AM Peak Hour						Move-ment	Weekday PM Peak Hour					
		Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS		Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS
MacLaughlin Road & Old School Road	EBTL	172	147	187.1	1.17	74.00	F	EBTL	134	485	15.2	0.28	8.50	C
	WBTL	131	196	53.8	0.67	30.60	F	WBTL	532	568	50.7	0.94	91.60	F
	NBTR	419	1425	0.0	0.29	0.00	A	NBTR	153	1273	0.0	0.12	0.00	-
	SBTLR	386	1141	6.2	0.20	5.70	A	SBTLR	289	1428	0.0	0.20	0.00	-
Spine Road & Street C/Street I	EBTL	18	1622	6.8	0.01	0.2	A	EBTL	47	1619	7.3	0.03	0.7	A
	EBTR	242	1700	0.0	0.14	0.0	-	EBTR	62	1700	0.0	0.04	0.0	A
	WBTL	4	1320	7.7	0.00	0.1	A	WBTL	8	1539	6.4	0.00	0.1	A
	NBTLR	88	603	12.0	0.15	3.9	B	NBTLR	345	734	14.2	0.47	19.2	B
	SBTLR	147	713	11.4	0.21	5.9	B	SBTLR	36	837	9.5	0.04	9.5	A

Table 3.4: 2019 Opening Day Unsignalized Intersection LOS Summary

The analysis demonstrates that signalized McLaughlin/Mayfield intersection is expected to operate at acceptable LOS under Opening Day traffic conditions during the AM and PM peak hours with minimal delays except for the northbound through-left movement in PM peak hour and the southbound through-left movement in both AM and PM peak hours. Both unsignalized intersections are also expected to operate at good to acceptable LOS under Opening Day traffic conditions during the AM and PM peak hours with minimal delays except for the eastbound approach at the Old School Road/McLaughlin intersection in the AM peak hour and westbound approach in both AM and PM Peak hour.

LEA's March 2015 supplemental modeling results demonstrated that all key intersections surrounding MW2 operates well and MW2 Stage 1 could proceed without the need for any additional road network improvements beyond those planned for 2031. As discussed in **Section 3.3.1**, to be consistent with other studies related to MW2, this TIS uses the ITE trip generation approach, which overestimates the number of trips representing the worst-case scenario. The improvements suggested in the following sections demonstrate that road network upgrades planned up to 2031 are sufficient to absorb the worst-case scenario.

3.4.2 2019 Opening Day Recommended Intersection Improvements

To improve operations at the Mayfield/McLaughlin signalized intersection in the AM and PM peak hour, we recommend optimizing the signal timing plan. **Table** 3.5 summarizes the effects of improvements. Detailed outputs are provided in **Appendix D.**

For the unsignalized intersection of McLaughlin and Old School Road, the addition of turn lanes is recommended for the 2021 Full Build-Out scenario (**Section 3.4.5**). These same changes would be beneficial for the volumes analysed for 2019. However, since 2019 Opening day is an assumed analysis horizon year with a conservative estimate for the number of development completions the traffic volume at McLaughlin/Old School intersection during 2019 may not reach a level resulting in LOS 'F' for east/westbound approaches. It is therefore, recommended that the traffic at this intersection be monitored to determine if the turn lanes addition recommended for 2021 is required to be implemented at some earlier date.

Intersection	Weekday AM Peak Hour								
	Overall			Movement of Interest					
	V/C	Delay (s)	LOS	Movement	V/C	Delay (s)	LOS	Queue (m)	
								50th	95th
McLaughlin Rd & Mayfield	0.76	15.4	B	SBLT	0.87	28.5	C	34.7	80
Intersection	**Weekday PM Peak Hour**								
	Overall			**Movement of Interest**					
	V/C	**Delay (s)**	**LOS**	**Movement**	**V/C**	**Delay (s)**	**LOS**	**Queue (m)**	
								50th	**95th**
McLaughlin Rd & Mayfield	0.57	12.2	B	NBLT	0.35	17.1	B	10.5	21.2
				SBLT	0.66	22.5	C	37.4	159.7

Table 3.5: 2019 Signalized Intersection LOS Summary – With Improvements

3.4.3 2019 Opening Day Sensitivity Analysis

According to the Region of Peel's Transportation – Public Works Road Program Funding 2015-2031 dated January 23, 2015, Mayfield Road is scheduled to be widened from two to four lanes by 2018 and from four to six lanes by 2029 (**Figure** 3.1). However, the Region is moving directly from two to six lanes by 2021.

Accordingly, a sensitivity analysis was conducted to examine the impact of delaying the Mayfield Road lane widening project to 2021, with the reassigned traffic volumes provided in **Figure** 3.6. The results of the intersection capacity analysis for the signalized and unsignalized intersections are provided in **Table** 3.6 and **Table** 3.7, respectively. Detailed outputs are provided in **Appendix E**.

Intersection	Weekday AM Peak Hour									Weekday PM Peak Hour								
	Overall			Movement of Interest				Queue (m)		Overall			Movement of Interest				Queue (m)	
	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	50th	95th	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	50th	95th
McLaughlin Road & Mayfield Road	0.52	51.0	D	EBL	0.00	6.9	A	0.2	0.4	0.44	26.3	C	EBL	-	-	-	-	-
				EBT	0.28	9.6	A	37.7	41.0				EBT	0.19	5.5	A	11.8	17.5
				EBR	0.08	11.4	B	2.3	7.0				EBR	0.01	7.9	A	0.0	0.0
				WBL	0.13	12.0	B	5.1	15.8				WBL	0.35	12.0	B	38.5	55.5
				WBT	0.17	10.8	B	17.4	34.8				WBT	0.24	11.2	B	50.0	62.2
				WBR	0.07	29.6	C	2.3	15.2				WBR	0.18	48.3	D	21.6	38.3
				NBLT	0.29	39.2	D	16.5	31.2				NBLT	0.84	78.7	E	32.1	63.2
				NBR	0.11	37.1	D	0.0	17.4				NBR	0.04	43.0	D	0.0	5.4
				SBLT	1.28	196.1	F	114.3	173.1				SBLT	0.83	73.9	E	37.0	69.1
				SBR	-	-	-	-	-				SBR	0.00	42.7	D	0.0	0.0

Table 3.6: 2019 Opening Day Sensitivity Analysis – Signalized Intersection LOS Summary

Intersection	Weekday AM Peak Hour							Weekday PM Peak Hour						
	Move-ment	Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS	Move-ment	Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS
Maclaughlin Road & Old School Road	EBTL	282	134	575.3	2.10	175.40	F	EBTL	180	465	17.6	0.39	13.70	C
	WBTLR	194	0	Err	Err	Err	F	WBTLR	645	515	153.7	1.25	195.30	F
	NBTR	426	1419	0.0	0.30	0.00	A	NBTR	175	1274	0.0	0.13	0.00	-
	SBTLR	386	1134	6.1	0.20	5.60	A	SBTR	288	1401	0.0	0.20	0.00	-
Spine Road & Street C/Street I	EBTL	18	1622	7.0	0.01	0.2	A	EBTL	48	1620	7.3	0.03	0.7	A
	EBTR	286	1700	0.0	0.17	0.0	-	EBTR	80	1700	0.0	0.05	0.0	-
	WBTL	19	1272	7.9	0.01	0.0	-	WBTL	8	1516	7.0	0.01	0.1	A
	NBTLR	107	555	13.0	0.19	5.4	B	NBTLR	389	728	15.5	0.53	0.7	C
	SBTLR	132	672	11.7	0.20	5.5	B	SBTLR	36	823	9.6	0.04	1.0	A

Table 3.7: 2019 Opening Day Sensitivity Analysis – Unsignalized Intersection LOS Summary

These results are not very different from those of the Opening Day analysis presented in **Section 3.4.1,** and the recommended improvements provided in **Section 3.4.2** will alleviate capacity issues at the intersections.

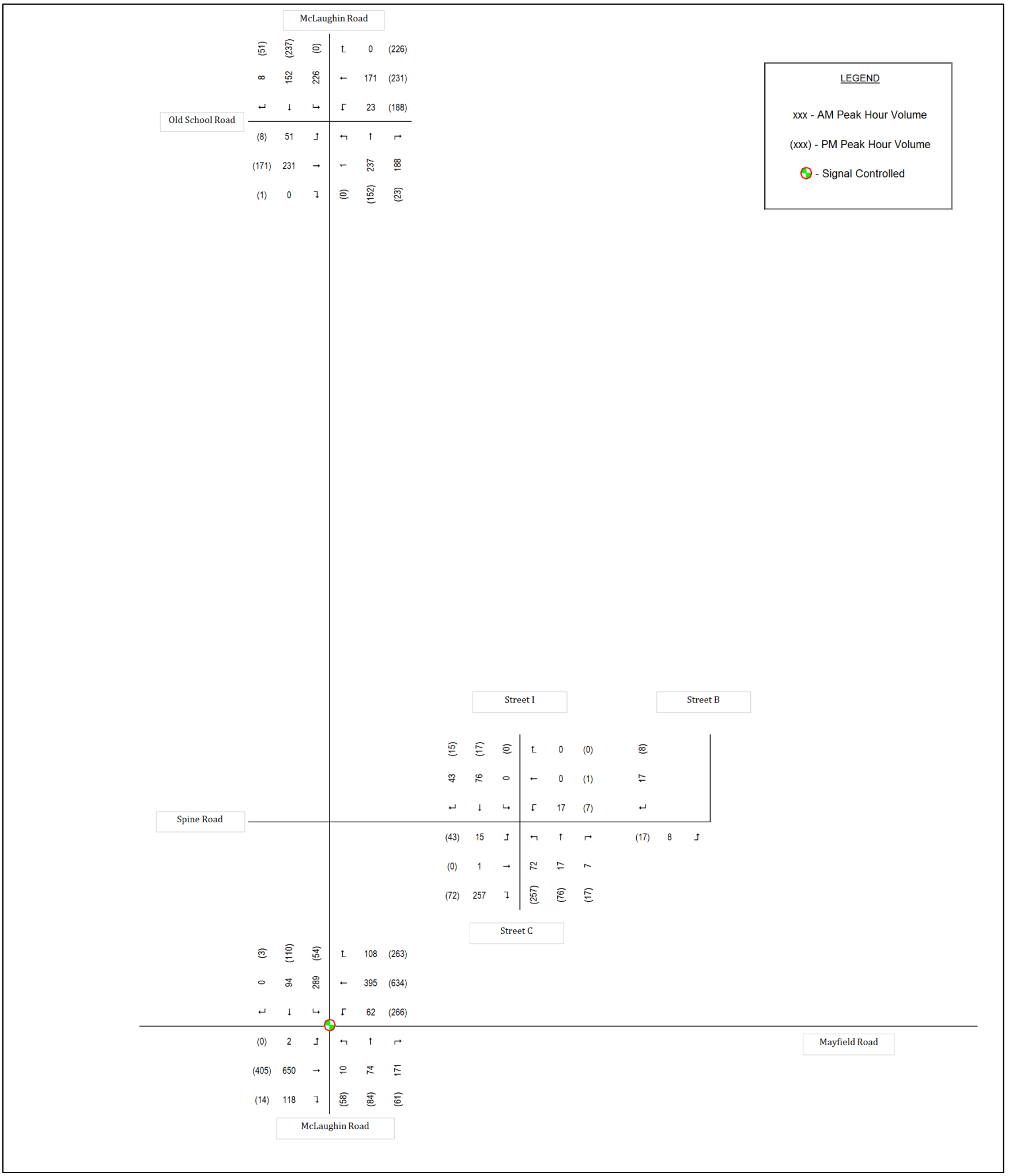


Figure 3.6: 2019 Opening Day Sensitivity Analysis – Traffic Volumes

3.4.4 2021 Full Build-Out of MW2 Stage 1 Intersection Capacity Analysis

Under the 2021 Full Build-Out scenario, the Aimsun mesoscopic traffic modeling demonstrates that the travel patterns observed under the 2019 scenario will persist with some redistribution through MW2. Specifically, a higher proportion of trips destined to Highway 410 will increasingly use The Spine Road through MW2, whereas previously they routed north via Old School Road (see **Figure** 3.7).

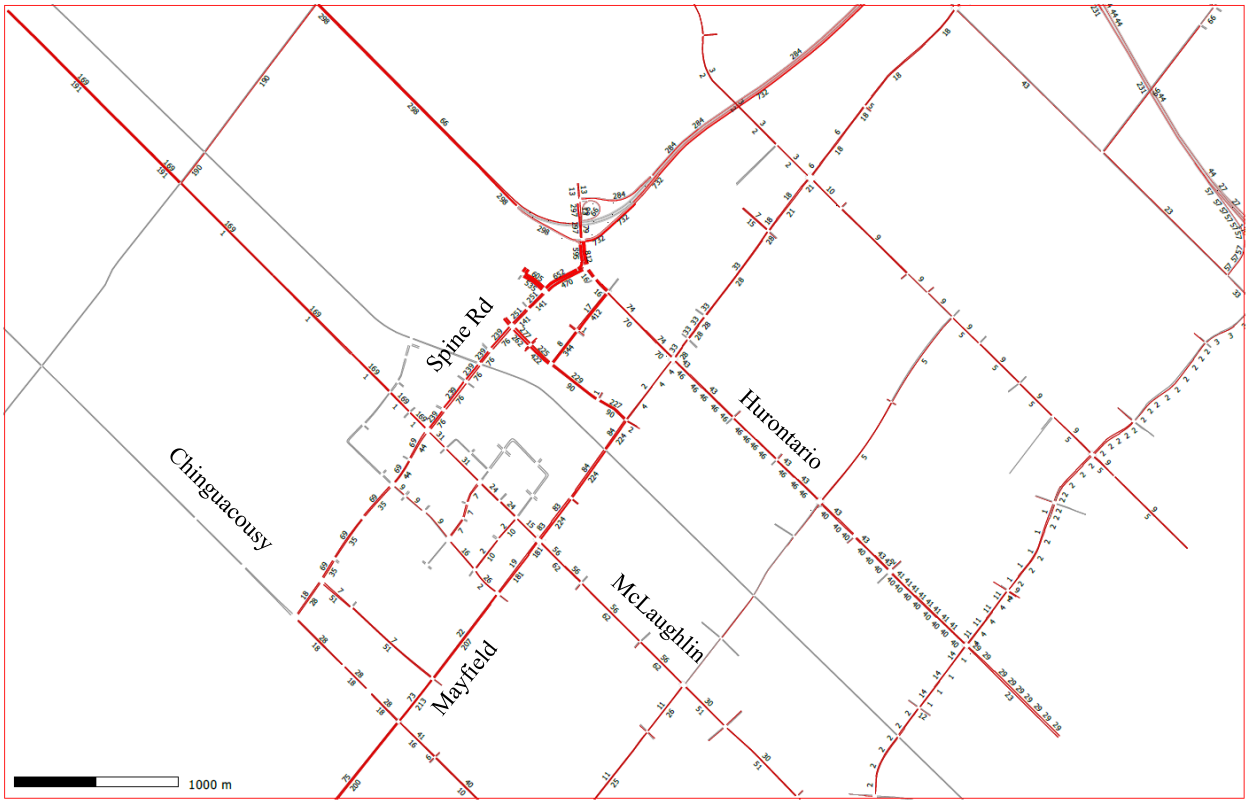


Figure 3.7: Site Trip Assignment - 2021 Full Build-Out Scenario - Weekday AM Three-Hour Volumes

Based on the trip assignment illustrated above, the Synchro intersection capacity analysis for this scenario will assess operations at the following intersections:

- Old School Road and McLaughlin Road;
- Mayfield Road and McLaughlin Road;
- Spine Road and Hurontario Street;
- Spine Road and Street ‘C’/Street ‘I’;
- Spine Road and Street ‘B’;

The lane configurations and traffic volumes at the above-noted intersections under Full Build-Out conditions are illustrated in **Figure** 3.8 and **Figure** 3.9, respectively. The Environmental Assessment Study for Spine Road & Hurontario/Highway 410 intersection is ongoing, therefore for this TIS Spine Road was assumed to be connecting with existing alignment of Hurontario Street.

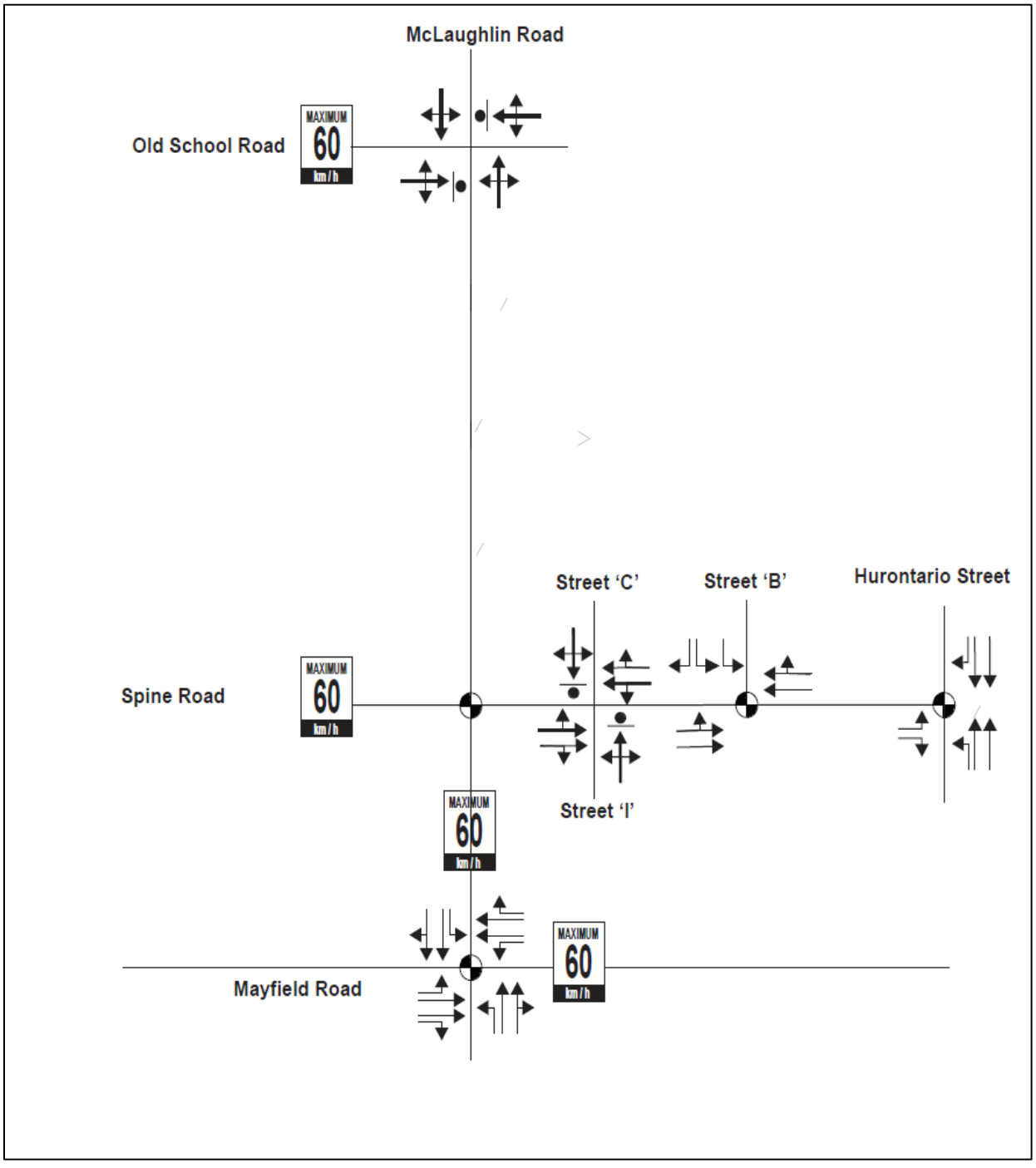


Figure 3.8: 2021 Full Build-Out Lane Configurations

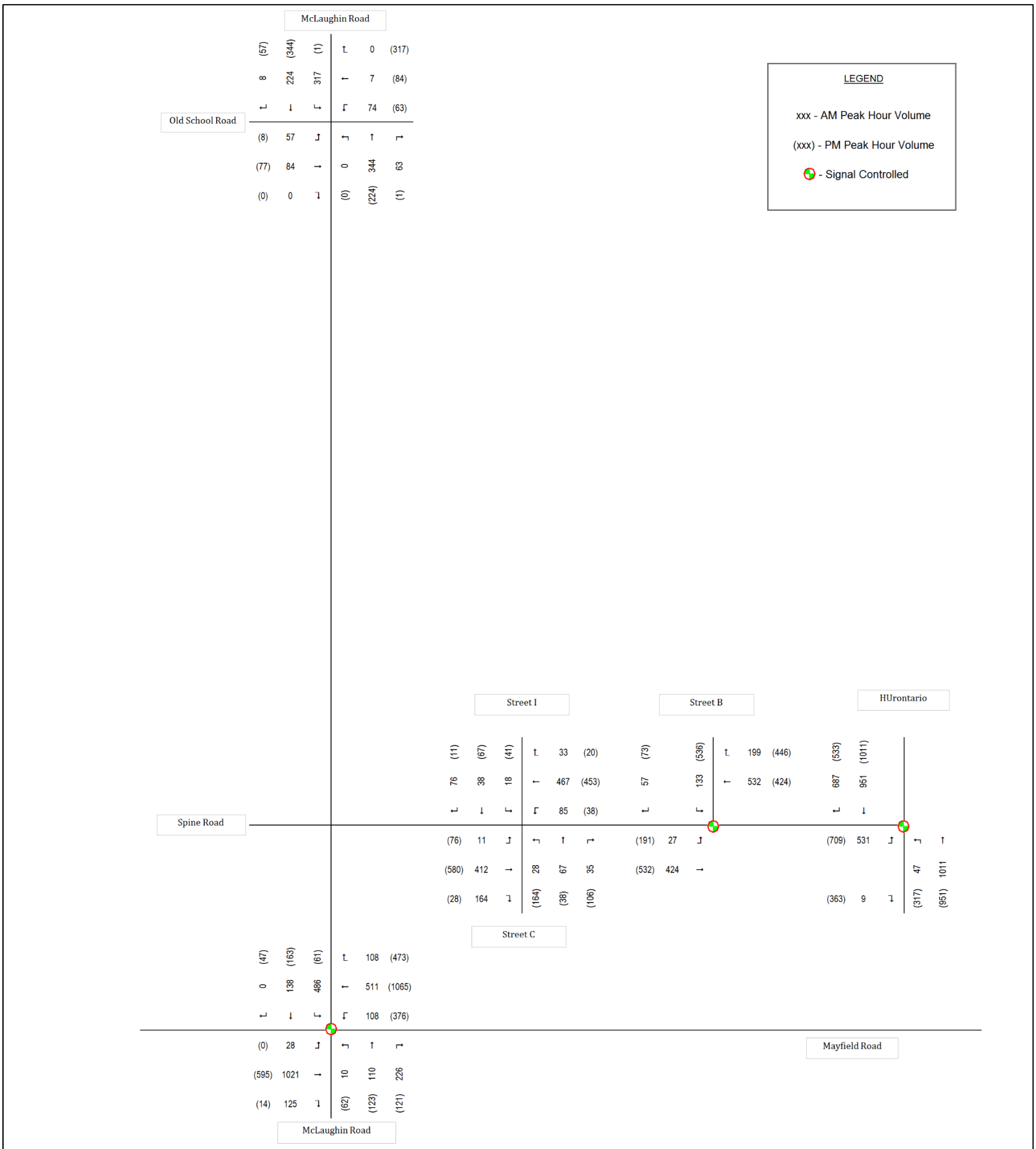


Figure 3.9: 2021 Full Build-Out Traffic Volumes

An intersection capacity analysis was completed for future traffic conditions under the Full Build-Out scenario for the AM and PM peak hours, for the signalized and unsignalized intersections summarized in **Table** 3.8 and **Table** 3.9, respectively. Detailed capacity analysis outputs can be found in **Appendix F**.

The analysis demonstrates that traffic associated with the Full Build-Out of Caledon 410 will be well accommodated by the road network. All signalized intersections are expected to operate at good to acceptable LOS during the AM and PM peak hours except for the eastbound left movement at Spine/Street 'B' intersection in the PM peak hour, which is the result of the increased commercial trips during PM peak hour.

Analysis of operations at the unsignalized intersection (**Table** 3.9**)** of Old School/McLaughlin revealed operational issues with future traffic volumes in the AM peak hour, due to increased north-south through and east-west left turning volumes because of the broader development of MW2. North-south approach at unsignalized Spine/Street 'C' & Street 'I' intersection is also shown to have similar issue due to increased east-west movement on Spine Road under full Build-Out conditions.

To improve operations at the above-noted intersections under Full Build-Out traffic conditions, intersection improvements have been recommended and the impacts have been analysed in **Section 3.4.5**.

Intersection	Weekday AM Peak Hour									Weekday PM Peak Hour								
	Overall			Movement of Interest						Overall			Movement of Interest					
	V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	Queue (m)		V/C	Delay (s)	LOS	Move-ment	V/C	Delay (s)	LOS	Queue (m)	
								50th	95th								50th	95th
McLaughlin Road & Mayfield Road	0.77	29.1	C	EBL	0.10	17.8	B	4.0	5.8	55.00	22.5	C	EBL	-	-	-	-	-
				EBT	0.90	36.5	D	124.2	115.2				EBT	0.81	51.8	D	72.7	84.8
				EBR	0.09	11.2	B	5.6	1.5				EBR	0.01	36.9	D	0.0	0.0
				WBL	0.31	7.7	A	1.8	16.4				WBL	0.43	14.6	B	25.9	54.0
				WBT	0.29	5.9	A	4.8	65.6				WBT	0.43	3.5	A	15.7	31.0
				WBR	0.07	3.8	A	0.0	7.9				WBR	0.32	0.6	A	0.0	0.0
				NBL	0.09	50.4	D	2.2	7.2				NBL	0.34	47.7	D	12.2	22.8
				NBT	0.33	51.7	D	13.1	20.8				NBT	0.36	51.5	D	14.6	23.8
				NBR	0.19	51.1	D	1.3	23.7				NBR	0.08	49.7	D	0.0	5.4
				SBL	0.82	39.8	D	90.7	113.3				SBL	0.45	55.2	E	13.8	26.6
				SBT	0.10	23.1	C	10.4	15.1				SBT	0.39	49.7	D	19.0	28.0
				SBR	-	-	-	-	-				SBR	0.03	47.1	D	0.0	0.0
Hurontario Street & Spine Road	0.63	18.0	B	EBL	0.85	46.4	D	113.5	143.1	0.98	34.7	C	EBL	0.95	48.6	D	136.7	227.1
				EBR	0.01	25.4	C	0.0	3.2				EBR	0.29	23.5	C	8.0	28.6
				NBL	0.19	14.3	B	5.2	14.4				NBL	0.96	73.9	E	58.4	113.3
				NBT	0.50	16.6	B	73.3	103.9				NBT	0.53	21.6	C	79.2	97.8
				SBT	0.47	16.1	B	67.3	96.0				SBT	0.87	47.0	D	119.0	154.8
				SBR	0.43	0.8	A	0.0	0.0				SBR	0.33	6.0	A	0.0	0.0
Spine Road & Street B	0.33	11.9	B	SBL	0.10	7.7	A	1.4	5.1	0.70	20.6	C	SBL	0.45	15.0	B	25.0	43.0
				SBR	0.04	7.5	A	0.5	4.2				SBR	0.05	11.9	B	0.0	7.9
				EBTL	0.46	11.8	B	0.5	6.5				EBTL	1.18	27.8	C	45.2	57.0
				WBTR	0.61	13.0	B	0.0	0.9				WBTR	0.46	18.8	B	46.3	55.9

Table 3.8: 2021 Full Build-Out – Signalized Intersections LOS Summary

Intersection	Move-ment	Weekday AM Peak Hour						Move-ment	Weekday PM Peak Hour					
		Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS		Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS
Maclaughlin Road & Old School Road	EBTL	141	86	418.9	1.64	90.90	F	EBTL	85	338	19.2	0.25	7.40	C
	WBTLR	79	126	72.9	0.63	26.20	F	WBTLR	464	589	30.1	0.79	57.20	D
	NBTR	407	1336	0.0	0.00	0.30	-	NBTR	225	1158	0.0	0.19	0.00	-
	SBTLR	549	1152	6.6	0.28	8.60	A	SBTLR	402	1344	0.0	0.29	0.00	-
Spine Road & Street C/Street I	EBTL	241	1011	0.5	0.01	0.3	A	EBTL	406	1038	2.5	0.08	2.0	A
	EBTR	411	1700	0.0	0.24	0.0	-	EBTR	353	1700	2.5	0.21	0.0	-
	WBTL	354	940	3.3	0.10	2.5	A	WBTL	294	912	1.7	0.05	1.1	A
	WBTR	296	1700	0.0	0.17	0.0	-	WBTR	274	1700	0.0	0.16	0.0	-
	NBTLR	144	158	106.9	0.91	49.7	F	NBTLR	342	96	Err	3.55	Err	F
	SBTLR	146	217	49.9	0.91	31.7	E	SBTLR	132	102	264.8	1.36	69.6	F

Table 3.9: 2021 Full Build-Out – Unsignalized Intersections LOS Summary

3.4.5 2021 Full Build-Out Recommended Intersection Improvements

To accommodate the traffic volumes associated with the MW2 development, the following intersection improvements are recommended:

- McLaughlin Road and Old School Road:
  - Exclusive left-turn and shared through-right lanes for the eastbound and westbound approaches;
  - Shared through-right lanes for the northbound and southbound approaches; and
  - Two-way-left-turn lane along McLaughlin Road for this intersection only to allow for two-stage left turns from the east and west approaches.
- The Spine Road and Street "B":
  - Eastbound left turn lane to accommodate increased commercial trips heading northbound to commercial area having "pm+pt" left turn phase.

The above-mentioned recommended intersection improvements will significantly enhance future operations as shown in **Table 3.10** (signalized intersections) and **Table 3.11** (unsignalized intersections). Detailed outputs are provided in **Appendix H.**

Intersection	Weekday PM Peak Hour								
	Overall			Movement of Interest				Queue (m)	
	V/C	Delay (s)	LOS	Movement	V/C	Delay (s)	LOS	50th	95th
Spine Road & Street B	0.60	16.8	B	EBL	0.63	15	B	13.7	21.1
				EBT	0.35	8.8	A	23.0	27.0

Table 3.10: 2021 Signalized Intersection LOS Summary – With Improvements

Intersection	Movement of Interest	AM Peak Hour					
		Flow Rate (vph)	Capacity (vph)	Control Delay (s)	95th Queue (m)	V/C	LOS
McLaughlin Rd & Old School Rd	EBL	57	191	31.7	9.1	0.30	D
	EBTR	84	218	31.4	12.9	0.38	D
	WBTR	78	256	25.1	9.5	0.31	D

Table 3.11: 2021 Unsignalized Intersection LOS Summary – With Improvements

The north-south through movement at the Spine Road and Street 'C'/Street 'I' intersection is minimal but due to increased east-west traffic on the Spine Road, the intersection is shown to have constrained conditions during peak hours. It is expected that if delays become significant a portion of north-south through traffic at this intersection will shift to the nearby signalized Spine Road/Street 'B' intersection which will have sufficient residual capacity under 2021 full Build-Out conditions, or will find another alternate route. Additionally, it was discussed in **Section 3.3.2** that a conservative approach was adopted for commercial trip generation in the evening that may overestimate the travel demand and hence the increased east-west traffic on Spine Road. These conservative demand estimates represent the worst-case scenario and as demonstrated, road network upgrades planned up to 2031 are sufficient to absorb the worst-case conditions. As such no improvements are recommended for this intersection.

4.0 CONCLUSIONS

LEA was retained by The Caledon 410 Developments Ltd. to prepare a TIS in support of a Draft Plan of Subdivision application for the property known as Fieldgate Developments (Mayfield West) in the MW2 Secondary Plan area, Town of Caledon, Ontario. The Caledon 410 property is located west of Hurontario Street adjacent to the Hurontario/Highway 410 interchange. It will include approximately 198 single-detached houses, 312 townhouses and a 6.39 ha commercial area.

Under existing conditions, all signalized and unsignalized intersections in the study area are currently operating with good overall LOS and reserve capacity during both weekday AM and PM peak hours, with very short overall delays.

Overall, the proposed development is expected to generate new residential trips to a total of 309 trips (65 in, 244 out) during the weekday AM peak hour, and 380 trips (247 in, 133 out) during the weekday PM peak hour. New commercial trips amount to 480 trips (297 in, 182 out) during AM peak hour and 1309 trips (629 in, 680 out) during PM peak hour. The commercial component will be functional under 2021 full Build-Out conditions.

The analyses of future traffic associated with Caledon 410 demonstrate that under the 2019 Opening Day and 2021 Full Build-Out scenario, the key intersections most affected by site traffic will operate at acceptable LOS during both the weekday AM and PM peak hours with the recommended intersection improvements.

A sensitivity analysis was conducted to analyze the impact of the delay of the Mayfield Road lane widening on traffic operations under the 2019 Opening Day scenario, which was determined to be minimal at the signalized intersections. However, the results indicate that the unsignalized Old School/McLaughlin intersection will experience capacity constraints at the east/westbound approach during the AM peak hour and the westbound approach during the PM peak hour.

By 2021, Mayfield Road will be widened to six lanes west of Hurontario Street. The regional growth will quickly expend the increased capacity, which is already occurring under existing conditions. The development of MW2 Stage 1 will therefore be met with some capacity constraints on the eastbound and westbound movements on Mayfield Road, with indirect impacts to movements to and from MW2. Despite this, the analysis demonstrates that the traffic associated with Caledon 410 can be accommodated on the surrounding road network. The site traffic will be accommodated on the road network throughout the development of MW2 Stage 1. The only recommendations are following;

- McLaughlin Road and Old School Road:
    - Exclusive left-turn and shared through-right lanes for the eastbound and westbound approaches;
    - Shared through-right lanes for the northbound and southbound approaches; and
    - Two-way-left-turn lane along McLaughlin Road for this intersection only to allow for two-stage left turns from the east and west approaches.
- The Spine Road and Street “B”:
    - Eastbound left turn lane to accommodate increased commercial trips heading northbound to commercial area having “pm+pt” left turn phase.

APPENDIX A

Intersection Capacity Analysis- Existing Traffic Conditions

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	16	67	0	0	128	0	0	68	0	213	60	1
Future Volume (Veh/h)	16	67	0	0	128	0	0	68	0	213	60	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	16	67	0	0	128	0	0	68	0	213	60	1
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	618	554	60	588	555	68	61			68		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	618	554	60	588	555	68	61			68		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	94	82	100	100	66	100	100			86		
cM capacity (veh/h)	266	379	1005	326	379	995	1542			1533		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	83	128	68	274
Volume Left	16	0	0	213
Volume Right	0	0	0	1
cSH	350	379	1542	1533
Volume to Capacity	0.24	0.34	0.00	0.14
Queue Length 95th (m)	6.9	11.1	0.0	3.7
Control Delay (s)	18.4	19.3	0.0	6.3
Lane LOS	C	C		A
Approach Delay (s)	18.4	19.3	0.0	6.3
Approach LOS	C	C		

Intersection Summary				
Average Delay	10.3			
Intersection Capacity Utilization	42.8%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	2	414	47	385	10	58	109	13	44
Future Volume (vph)	2	414	47	385	10	58	109	13	44
Lane Group Flow (vph)	2	450	47	396	0	68	109	0	57
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	NA
Protected Phases		4		8		2			6
Permitted Phases	4		8		2		2	6	
Detector Phase	4	4	8	8	2	2	2	6	6
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	88.0	88.0	88.0	88.0	32.0	32.0	32.0	32.0	32.0
Total Split (%)	73.3%	73.3%	73.3%	73.3%	26.7%	26.7%	26.7%	26.7%	26.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0		-1.0	-1.0		-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0		5.0	5.0		5.0
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None
v/c Ratio	0.00	0.31	0.06	0.27		0.42	0.46		0.38
Control Delay	5.5	11.5	6.4	8.3		58.8	15.5		57.6
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Delay	5.5	11.5	6.4	8.3		58.8	15.5		57.6
Queue Length 50th (m)	0.2	78.1	3.0	27.5		15.4	0.0		12.9
Queue Length 95th (m)	m0.0	98.7	10.9	68.4		28.9	16.3		25.5
Internal Link Dist (m)		1373.7		866.8		1234.6			475.2
Turn Bay Length (m)	60.0		60.0				30.0		
Base Capacity (vph)	770	1468	753	1478		405	431		380
Starvation Cap Reductn	0	0	0	0		0	0		0
Spillback Cap Reductn	0	0	0	0		0	0		0
Storage Cap Reductn	0	0	0	0		0	0		0
Reduced v/c Ratio	0.00	0.31	0.06	0.27		0.17	0.25		0.15

Intersection Summary

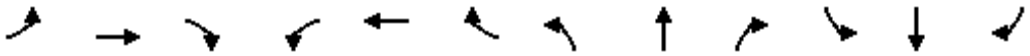
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 45
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: McLaughlin Rd & Mayfield

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	414	36	47	385	11	10	58	109	13	44	0
Future Volume (vph)	2	414	36	47	385	11	10	58	109	13	44	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	
Frt	1.00	0.99		1.00	1.00			1.00	0.85		1.00	
Flt Protected	0.95	1.00		0.95	1.00			0.99	1.00		0.99	
Satd. Flow (prot)	1690	1775		1755	1787			1893	1543		1836	
Flt Permitted	0.52	1.00		0.49	1.00			0.94	1.00		0.91	
Satd. Flow (perm)	932	1775		911	1787			1801	1543		1689	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	414	36	47	385	11	10	58	109	13	44	0
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	99	0	0	0
Lane Group Flow (vph)	2	449	0	47	395	0	0	68	10	0	57	0
Heavy Vehicles (%)	8%	7%	6%	4%	7%	8%	5%	0%	5%	5%	3%	8%
Bus Blockages (#/hr)	0	0	2	0	0	2	0	0	2	0	0	2
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	98.2	98.2		98.2	98.2			9.8	9.8		9.8	
Effective Green, g (s)	99.2	99.2		99.2	99.2			10.8	10.8		10.8	
Actuated g/C Ratio	0.83	0.83		0.83	0.83			0.09	0.09		0.09	
Clearance Time (s)	6.0	6.0		6.0	6.0			6.0	6.0		6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	
Lane Grp Cap (vph)	770	1467		753	1477			162	138		152	
v/s Ratio Prot		c0.25			0.22							
v/s Ratio Perm	0.00			0.05				c0.04	0.01		0.03	
v/c Ratio	0.00	0.31		0.06	0.27			0.42	0.07		0.38	
Uniform Delay, d1	1.8	2.4		1.9	2.3			51.6	50.0		51.4	
Progression Factor	2.34	4.18		2.68	3.07			1.00	1.00		1.00	
Incremental Delay, d2	0.0	0.5		0.2	0.4			1.8	0.2		1.6	
Delay (s)	4.2	10.6		5.2	7.5			53.4	50.2		53.0	
Level of Service	A	B		A	A			D	D		D	
Approach Delay (s)		10.6			7.3			51.4			53.0	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	17.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.32		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	50.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	128	0	0	67	213	0	60	0	0	68	16
Future Volume (Veh/h)	1	128	0	0	67	213	0	60	0	0	68	16
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1	128	0	0	67	213	0	60	0	0	68	16
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	382	136	76	200	144	60	84			60		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	382	136	76	200	144	60	84			60		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	83	100	100	91	79	100			100		
cM capacity (veh/h)	423	755	985	660	747	1005	1513			1544		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	129	280	60	84
Volume Left	1	0	0	0
Volume Right	0	213	0	16
cSH	750	929	1513	1544
Volume to Capacity	0.17	0.30	0.00	0.00
Queue Length 95th (m)	4.7	9.7	0.0	0.0
Control Delay (s)	10.8	10.5	0.0	0.0
Lane LOS	B	B		
Approach Delay (s)	10.8	10.5	0.0	0.0
Approach LOS	B	B		

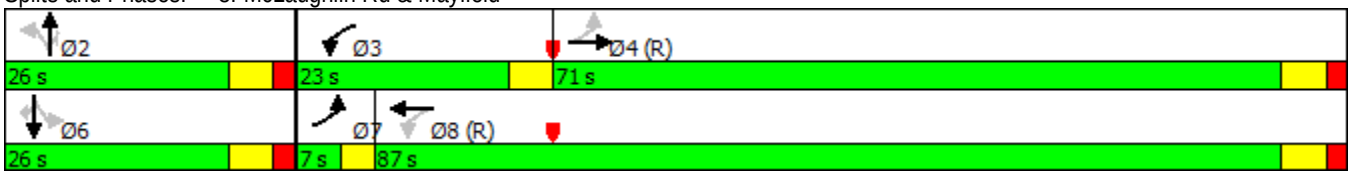
Intersection Summary				
Average Delay	7.9			
Intersection Capacity Utilization	27.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR	Ø7
Lane Configurations										
Traffic Volume (vph)	395	170	404	18	39	46	6	86	3	
Future Volume (vph)	395	170	404	18	39	46	6	86	3	
Lane Group Flow (vph)	409	170	416	0	57	46	0	92	3	
Turn Type	NA	pm+pt	NA	Perm	NA	Perm	Perm	NA	Perm	
Protected Phases	4	3	8		2			6		7
Permitted Phases		8		2		2	6		6	
Detector Phase	4	3	8	2	2	2	6	6	6	
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	10.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	7.0
Total Split (s)	71.0	23.0	87.0	26.0	26.0	26.0	26.0	26.0	26.0	7.0
Total Split (%)	59.2%	19.2%	72.5%	21.7%	21.7%	21.7%	21.7%	21.7%	21.7%	6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0
All-Red Time (s)	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)	5.0	3.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lag	Lead	Lag							Lead
Lead-Lag Optimize?	Yes	Yes	Yes							Yes
Recall Mode	C-Max	None	C-Max	None	None	None	None	None	None	None
v/c Ratio	0.32	0.21	0.29		0.34	0.19		0.49	0.01	
Control Delay	8.6	10.3	14.7		54.4	2.4		59.2	0.0	
Queue Delay	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	8.6	10.3	14.7		54.4	2.4		59.2	0.0	
Queue Length 50th (m)	54.6	27.0	80.8		12.7	0.0		20.8	0.0	
Queue Length 95th (m)	82.7	48.6	106.9		25.0	1.0		36.1	0.0	
Internal Link Dist (m)	1373.7		866.8		1234.6			159.7		
Turn Bay Length (m)		85.0				80.0				
Base Capacity (vph)	1279	874	1456		288	345		319	337	
Starvation Cap Reductn	0	0	0		0	0		0	0	
Spillback Cap Reductn	0	0	0		0	0		0	0	
Storage Cap Reductn	0	0	0		0	0		0	0	
Reduced v/c Ratio	0.32	0.19	0.29		0.20	0.13		0.29	0.01	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Splits and Phases: 8: McLaughlin Rd & Mayfield



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	395	14	170	404	12	18	39	46	6	86	3
Future Volume (vph)	0	395	14	170	404	12	18	39	46	6	86	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		3.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor		1.00		1.00	1.00			1.00	1.00		1.00	1.00
Frt		0.99		1.00	1.00			1.00	0.85		1.00	0.85
Flt Protected		1.00		0.95	1.00			0.98	1.00		1.00	1.00
Satd. Flow (prot)		1787		1755	1787			1862	1543		1857	1500
Flt Permitted		1.00		0.48	1.00			0.87	1.00		0.98	1.00
Satd. Flow (perm)		1787		877	1787			1649	1543		1823	1500
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	395	14	170	404	12	18	39	46	6	86	3
RTOR Reduction (vph)	0	1	0	0	1	0	0	0	41	0	0	3
Lane Group Flow (vph)	0	408	0	170	415	0	0	57	5	0	92	0
Heavy Vehicles (%)	8%	7%	6%	4%	7%	8%	5%	0%	5%	5%	3%	8%
Bus Blockages (#/hr)	0	0	2	0	0	2	0	0	2	0	0	2
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)		84.9		96.7	96.7			11.3	11.3		11.3	11.3
Effective Green, g (s)		85.9		97.7	97.7			12.3	12.3		12.3	12.3
Actuated g/C Ratio		0.72		0.81	0.81			0.10	0.10		0.10	0.10
Clearance Time (s)		6.0		4.0	6.0			6.0	6.0		6.0	6.0
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)		1279		778	1454			169	158		186	153
v/s Ratio Prot		c0.23		0.02	c0.23							
v/s Ratio Perm				0.16				0.03	0.00		c0.05	0.00
v/c Ratio		0.32		0.22	0.29			0.34	0.03		0.49	0.00
Uniform Delay, d1		6.3		2.6	2.7			50.1	48.5		50.9	48.3
Progression Factor		1.14		4.41	4.73			1.00	1.00		1.00	1.00
Incremental Delay, d2		0.6		0.1	0.5			1.2	0.1		2.1	0.0
Delay (s)		7.8		11.7	13.3			51.2	48.6		53.0	48.3
Level of Service		A		B	B			D	D		D	D
Approach Delay (s)		7.8			12.8			50.0			52.8	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	17.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.34		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	52.4%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX B

Intersection Capacity Analysis – 2019 Opening Day Horizon

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	51	121	0	6	125	0	1	238	180	231	147	8
Future Volume (Veh/h)	51	121	0	6	125	0	1	238	180	231	147	8
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	51	121	0	6	125	0	1	238	180	231	147	8
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	1006	1033	151	1004	947	328	155			418		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1006	1033	151	1004	947	328	155			418		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	48	35	100	93	40	100	100			80		
cM capacity (veh/h)	99	185	895	91	208	713	1425			1141		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	172	131	419	386
Volume Left	51	6	1	231
Volume Right	0	0	180	8
cSH	147	196	1425	1141
Volume to Capacity	1.17	0.67	0.00	0.20
Queue Length 95th (m)	74.0	30.6	0.0	5.7
Control Delay (s)	187.1	53.8	0.0	6.2
Lane LOS	F	F	A	A
Approach Delay (s)	187.1	53.8	0.0	6.2
Approach LOS	F	F		

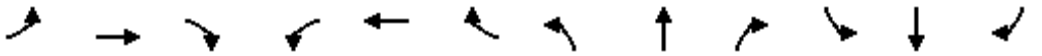
Intersection Summary			
Average Delay	37.6		
Intersection Capacity Utilization	74.0%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	868	108	51	375	271	4	67	165	373	91	9
Future Volume (vph)	5	868	108	51	375	271	4	67	165	373	91	9
Lane Group Flow (vph)	5	868	108	51	375	271	0	71	165	0	464	9
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	88.0	88.0	88.0	88.0	88.0	88.0	32.0	32.0	32.0	32.0	32.0	32.0
Total Split (%)	73.3%	73.3%	73.3%	73.3%	73.3%	73.3%	26.7%	26.7%	26.7%	26.7%	26.7%	26.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None	None
v/c Ratio	0.01	0.37	0.10	0.13	0.16	0.24		0.29	0.35		1.56	0.03
Control Delay	7.6	11.4	2.9	13.1	10.8	5.7		42.4	7.9		301.7	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	7.6	11.4	2.9	13.1	10.8	5.7		42.4	7.9		301.7	2.0
Queue Length 50th (m)	0.0	51.1	2.6	4.2	16.4	6.9		13.9	0.0		~154.5	0.0
Queue Length 95th (m)	m1.8	58.1	7.6	14.0	33.0	32.8		27.6	17.2		#217.2	0.9
Internal Link Dist (m)		72.5			866.8			1234.6			159.7	
Turn Bay Length (m)	60.0		60.0	60.0		60.0			30.0			30.0
Base Capacity (vph)	650	2359	1090	379	2359	1121		246	475		297	358
Starvation Cap Reductn	0	0	0	0	0	0		0	0		0	0
Spillback Cap Reductn	0	0	0	0	0	0		0	0		0	0
Storage Cap Reductn	0	0	0	0	0	0		0	0		0	0
Reduced v/c Ratio	0.01	0.37	0.10	0.13	0.16	0.24		0.29	0.35		1.56	0.03

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: McLaughlin Rd & Mayfield



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	868	108	51	375	271	4	67	165	373	91	9
Future Volume (vph)	5	868	108	51	375	271	4	67	165	373	91	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		1.00	1.00		0.96	1.00
Satd. Flow (prot)	1690	3411	1528	1755	3411	1500		1910	1543		1766	1500
Flt Permitted	0.53	1.00	1.00	0.30	1.00	1.00		0.57	1.00		0.72	1.00
Satd. Flow (perm)	941	3411	1528	548	3411	1500		1093	1543		1322	1500
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	868	108	51	375	271	4	67	165	373	91	9
RTOR Reduction (vph)	0	0	33	0	0	84	0	0	128	0	0	7
Lane Group Flow (vph)	5	868	75	51	375	187	0	71	37	0	464	2
Heavy Vehicles (%)	8%	7%	6%	4%	7%	8%	5%	0%	5%	5%	3%	8%
Bus Blockages (#/hr)	0	0	2	0	0	2	0	0	2	0	0	2
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	82.0	82.0	82.0	82.0	82.0	82.0		26.0	26.0		26.0	26.0
Effective Green, g (s)	83.0	83.0	83.0	83.0	83.0	83.0		27.0	27.0		27.0	27.0
Actuated g/C Ratio	0.69	0.69	0.69	0.69	0.69	0.69		0.22	0.22		0.22	0.22
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	650	2359	1056	379	2359	1037		245	347		297	337
v/s Ratio Prot		c0.25			0.11							
v/s Ratio Perm	0.01		0.05	0.09		0.12		0.06	0.02		c0.35	0.00
v/c Ratio	0.01	0.37	0.07	0.13	0.16	0.18		0.29	0.11		1.56	0.01
Uniform Delay, d1	5.7	7.7	6.0	6.3	6.4	6.5		38.6	36.9		46.5	36.1
Progression Factor	1.32	1.41	2.37	1.88	1.65	6.97		1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	0.4	0.1	0.7	0.1	0.4		0.7	0.1		268.9	0.0
Delay (s)	7.6	11.2	14.3	12.6	10.7	45.8		39.2	37.1		315.4	36.1
Level of Service	A	B	B	B	B	D		D	D		F	D
Approach Delay (s)		11.6			24.5			37.7			310.1	
Approach LOS		B			C			D			F	

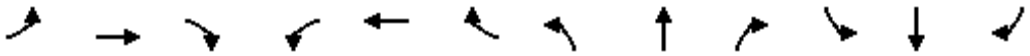
Intersection Summary			
HCM 2000 Control Delay	77.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	72.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	0	90	42	56	17	6	15	2	217	4	0	0
Future Volume (Veh/h)	0	90	42	56	17	6	15	2	217	4	0	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	100	47	62	19	7	17	2	241	4	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)											301	
pX, platoon unblocked												
vC, conflicting volume	60	285	0	262	164	122	0			243		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	60	285	0	262	164	122	0			243		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	84	96	89	97	99	99			100		
cM capacity (veh/h)	894	615	1084	555	717	907	1622			1320		

Direction, Lane #	SE 1	NW 1	NE 1	NE 2	SW 1	SW 2
Volume Total	147	88	18	242	4	0
Volume Left	0	62	17	0	4	0
Volume Right	47	7	0	241	0	0
cSH	713	603	1622	1700	1320	1700
Volume to Capacity	0.21	0.15	0.01	0.14	0.00	0.00
Queue Length 95th (m)	5.9	3.9	0.2	0.0	0.1	0.0
Control Delay (s)	11.4	12.0	6.8	0.0	7.7	0.0
Lane LOS	B	B	A		A	
Approach Delay (s)	11.4	12.0	0.5		7.7	
Approach LOS	B	B				

Intersection Summary				
Average Delay	5.8			
Intersection Capacity Utilization	32.6%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	125	1	180	121	231	0	147	6	0	238	51
Future Volume (Veh/h)	8	125	1	180	121	231	0	147	6	0	238	51
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	8	125	1	180	121	231	0	147	6	0	238	51
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	705	416	264	477	439	150	289			153		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	705	416	264	477	439	150	289			153		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	76	100	56	76	74	100			100		
cM capacity (veh/h)	213	527	775	407	512	896	1273			1428		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	134	532	153	289
Volume Left	8	180	0	0
Volume Right	1	231	6	51
cSH	485	568	1273	1428
Volume to Capacity	0.28	0.94	0.00	0.00
Queue Length 95th (m)	8.5	91.6	0.0	0.0
Control Delay (s)	15.2	50.7	0.0	0.0
Lane LOS	C	F		
Approach Delay (s)	15.2	50.7	0.0	0.0
Approach LOS	C	F		

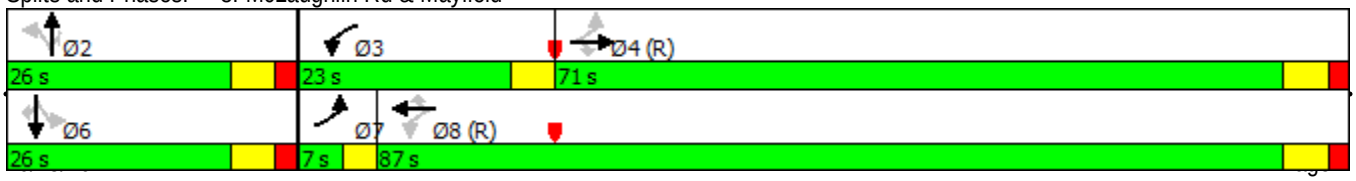
Intersection Summary				
Average Delay	26.2			
Intersection Capacity Utilization	63.2%	ICU Level of Service	B	
Analysis Period (min)	15			

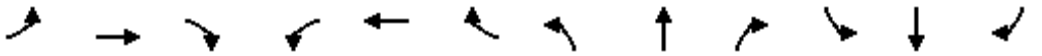
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	385	6	257	846	339	53	81	50	136	99	8
Future Volume (vph)	11	385	6	257	846	339	53	81	50	136	99	8
Lane Group Flow (vph)	11	385	6	257	846	339	0	134	50	0	235	8
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	7.0	22.0	22.0	10.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	7.0	71.0	71.0	23.0	87.0	87.0	26.0	26.0	26.0	26.0	26.0	26.0
Total Split (%)	5.8%	59.2%	59.2%	19.2%	72.5%	72.5%	21.7%	21.7%	21.7%	21.7%	21.7%	21.7%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	2.0	5.0	5.0	3.0	5.0	5.0		5.0	5.0		5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
v/c Ratio	0.02	0.18	0.01	0.33	0.34	0.29		0.91	0.14		1.14	0.02
Control Delay	1.8	6.7	0.0	11.0	13.7	6.5		103.4	2.4		148.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	1.8	6.7	0.0	11.0	13.7	6.5		103.4	2.4		148.7	0.1
Queue Length 50th (m)	0.3	10.6	0.0	33.0	63.4	22.8		31.3	0.0		~64.4	0.0
Queue Length 95th (m)	m0.9	15.8	m0.0	48.0	83.0	40.4		#68.7	2.4		#113.9	0.0
Internal Link Dist (m)		72.5			866.8			1234.6			159.7	
Turn Bay Length (m)	60.0		60.0	60.0		60.0			30.0			30.0
Base Capacity (vph)	454	2117	983	836	2489	1186		147	345		207	337
Starvation Cap Reductn	0	0	0	0	0	0		0	0		0	0
Spillback Cap Reductn	0	0	0	0	0	0		0	0		0	0
Storage Cap Reductn	0	0	0	0	0	0		0	0		0	0
Reduced v/c Ratio	0.02	0.18	0.01	0.31	0.34	0.29		0.91	0.14		1.14	0.02

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: McLaughlin Rd & Mayfield





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	385	6	257	846	339	53	81	50	136	99	8
Future Volume (vph)	11	385	6	257	846	339	53	81	50	136	99	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	5.0	5.0	3.0	5.0	5.0		5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.98	1.00		0.97	1.00
Satd. Flow (prot)	1690	3411	1528	1755	3411	1500		1847	1543		1793	1500
Flt Permitted	0.33	1.00	1.00	0.50	1.00	1.00		0.45	1.00		0.64	1.00
Satd. Flow (perm)	594	3411	1528	921	3411	1500		844	1543		1183	1500
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	11	385	6	257	846	339	53	81	50	136	99	8
RTOR Reduction (vph)	0	0	2	0	0	98	0	0	41	0	0	7
Lane Group Flow (vph)	11	385	4	257	846	241	0	134	9	0	235	1
Heavy Vehicles (%)	8%	7%	6%	4%	7%	8%	5%	0%	5%	5%	3%	8%
Bus Blockages (#/hr)	0	0	2	0	0	2	0	0	2	0	0	2
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	74.3	73.5	73.5	88.0	84.2	84.2		20.0	20.0		20.0	20.0
Effective Green, g (s)	76.3	74.5	74.5	89.0	85.2	85.2		21.0	21.0		21.0	21.0
Actuated g/C Ratio	0.64	0.62	0.62	0.74	0.71	0.71		0.18	0.18		0.18	0.18
Clearance Time (s)	3.0	6.0	6.0	4.0	6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	394	2117	948	763	2421	1065		147	270		207	262
v/s Ratio Prot	0.00	0.11		c0.03	c0.25							
v/s Ratio Perm	0.02		0.00	0.22		0.16		0.16	0.01		c0.20	0.00
v/c Ratio	0.03	0.18	0.00	0.34	0.35	0.23		0.91	0.03		1.14	0.01
Uniform Delay, d1	8.0	9.7	8.6	4.8	6.7	6.0		48.6	41.1		49.5	40.9
Progression Factor	0.45	0.65	1.00	2.36	2.18	9.19		1.00	1.00		1.00	1.00
Incremental Delay, d2	0.0	0.2	0.0	0.3	0.4	0.5		48.6	0.0		103.7	0.0
Delay (s)	3.6	6.5	8.7	11.5	15.1	55.7		97.2	41.1		153.2	40.9
Level of Service	A	A	A	B	B	E		F	D		F	D
Approach Delay (s)		6.4			24.0			82.0			149.5	
Approach LOS		A			C			F			F	

Intersection Summary			
HCM 2000 Control Delay	39.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	57.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	0	17	15	217	90	4	42	0	56	6	2	0
Future Volume (Veh/h)	0	17	15	217	90	4	42	0	56	6	2	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	19	17	241	100	4	47	0	62	7	2	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)											301	
pX, platoon unblocked												
vC, conflicting volume	164	172	1	166	141	31	2			62		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	164	172	1	166	141	31	2			62		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	97	98	67	86	100	97			100		
cM capacity (veh/h)	682	696	1083	734	724	1036	1619			1539		

Direction, Lane #	SE 1	NW 1	NE 1	NE 2	SW 1	SW 2
Volume Total	36	345	47	62	8	1
Volume Left	0	241	47	0	7	0
Volume Right	17	4	0	62	0	0
cSH	837	734	1619	1700	1539	1700
Volume to Capacity	0.04	0.47	0.03	0.04	0.00	0.00
Queue Length 95th (m)	1.0	19.2	0.7	0.0	0.1	0.0
Control Delay (s)	9.5	14.2	7.3	0.0	6.4	0.0
Lane LOS	A	B	A		A	
Approach Delay (s)	9.5	14.2	3.1		5.7	
Approach LOS	A	B				

Intersection Summary				
Average Delay	11.3			
Intersection Capacity Utilization	39.3%	ICU Level of Service		A
Analysis Period (min)	15			

APPENDIX C

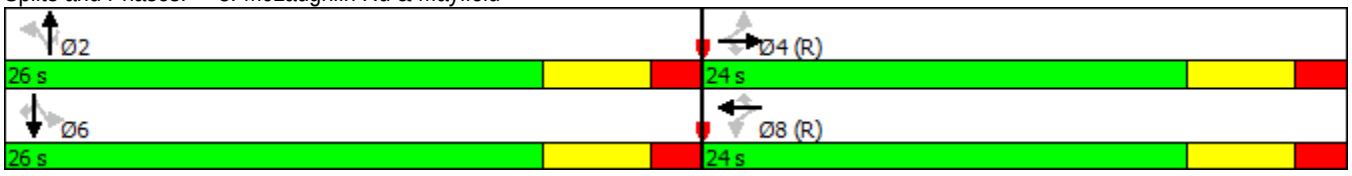
Intersection Capacity Analysis – 2019 Opening Day – With Improvements

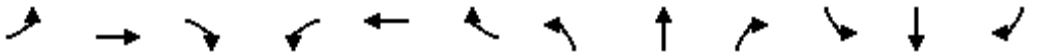
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	868	108	51	375	271	4	67	165	373	91	9
Future Volume (vph)	5	868	108	51	375	271	4	67	165	373	91	9
Lane Group Flow (vph)	5	868	108	51	375	271	0	71	165	0	464	9
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	4	4	4	8	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	26.0	26.0	26.0	26.0	26.0	26.0
Total Split (%)	48.0%	48.0%	48.0%	48.0%	48.0%	48.0%	52.0%	52.0%	52.0%	52.0%	52.0%	52.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None	None
v/c Ratio	0.01	0.64	0.16	0.29	0.28	0.36		0.09	0.25		0.87	0.01
Control Delay	9.8	15.2	3.5	16.4	11.3	3.3		9.2	7.2		34.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	9.8	15.2	3.5	16.4	11.3	3.3		9.2	7.2		34.1	0.0
Queue Length 50th (m)	0.3	32.3	0.0	3.1	11.7	0.0		3.6	5.2		34.7	0.0
Queue Length 95th (m)	1.8	48.2	6.9	10.4	19.4	10.8		9.1	14.1		#80.0	0.0
Internal Link Dist (m)		72.5			866.8			1234.6			159.7	
Turn Bay Length (m)	60.0		60.0	60.0		60.0			30.0			30.0
Base Capacity (vph)	373	1355	671	177	1355	759		782	685		555	667
Starvation Cap Reductn	0	0	0	0	0	0		0	0		0	0
Spillback Cap Reductn	0	0	0	0	0	0		0	0		0	0
Storage Cap Reductn	0	0	0	0	0	0		0	0		0	0
Reduced v/c Ratio	0.01	0.64	0.16	0.29	0.28	0.36		0.09	0.24		0.84	0.01

Intersection Summary

Cycle Length: 50
Actuated Cycle Length: 50
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 50
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: McLaughlin Rd & Mayfield





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	868	108	51	375	271	4	67	165	373	91	9
Future Volume (vph)	5	868	108	51	375	271	4	67	165	373	91	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		1.00	1.00		0.96	1.00
Satd. Flow (prot)	1690	3411	1528	1755	3411	1500		1910	1543		1766	1500
Flt Permitted	0.53	1.00	1.00	0.24	1.00	1.00		0.97	1.00		0.72	1.00
Satd. Flow (perm)	941	3411	1528	445	3411	1500		1864	1543		1322	1500
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	868	108	51	375	271	4	67	165	373	91	9
RTOR Reduction (vph)	0	0	65	0	0	163	0	0	39	0	0	5
Lane Group Flow (vph)	5	868	43	51	375	108	0	71	126	0	464	4
Heavy Vehicles (%)	8%	7%	6%	4%	7%	8%	5%	0%	5%	5%	3%	8%
Bus Blockages (#/hr)	0	0	2	0	0	2	0	0	2	0	0	2
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	18.9	18.9	18.9	18.9	18.9	18.9		19.1	19.1		19.1	19.1
Effective Green, g (s)	19.9	19.9	19.9	19.9	19.9	19.9		20.1	20.1		20.1	20.1
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40	0.40		0.40	0.40		0.40	0.40
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	374	1357	608	177	1357	597		749	620		531	603
v/s Ratio Prot		c0.25			0.11							
v/s Ratio Perm	0.01		0.03	0.11		0.07		0.04	0.08		c0.35	0.00
v/c Ratio	0.01	0.64	0.07	0.29	0.28	0.18		0.09	0.20		0.87	0.01
Uniform Delay, d1	9.1	12.2	9.3	10.2	10.2	9.8		9.3	9.7		13.8	9.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2	0.1	2.3	0.2	4.1	0.5	0.7		0.1	0.2		14.8	0.0
Delay (s)	9.2	14.5	9.5	14.3	10.7	10.4		9.3	9.9		28.5	9.0
Level of Service	A	B	A	B	B	B		A	A		C	A
Approach Delay (s)		13.9			10.8			9.7			28.2	
Approach LOS		B			B			A			C	

Intersection Summary			
HCM 2000 Control Delay	15.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	50.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	72.2%	ICU Level of Service	C
Analysis Period (min)	15		

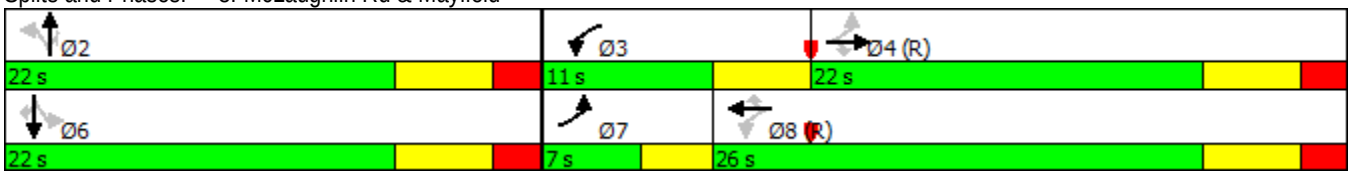
c Critical Lane Group

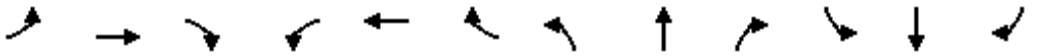
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	385	6	257	846	339	53	81	50	136	99	8
Future Volume (vph)	11	385	6	257	846	339	53	81	50	136	99	8
Lane Group Flow (vph)	11	385	6	257	846	339	0	134	50	0	235	8
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Detector Phase	7	4	4	3	8	8	2	2	2	6	6	6
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	7.0	22.0	22.0	10.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	7.0	22.0	22.0	11.0	26.0	26.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (%)	12.7%	40.0%	40.0%	20.0%	47.3%	47.3%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	2.0	5.0	5.0	3.0	5.0	5.0		5.0	5.0		5.0	5.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None
v/c Ratio	0.03	0.32	0.01	0.40	0.47	0.35		0.35	0.10		0.65	0.02
Control Delay	5.7	14.9	0.0	8.1	10.4	2.8		18.2	0.6		26.8	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	5.7	14.9	0.0	8.1	10.4	2.8		18.2	0.6		26.8	0.1
Queue Length 50th (m)	0.4	15.4	0.0	11.1	24.3	0.0		10.5	0.0		20.1	0.0
Queue Length 95th (m)	2.0	24.9	0.0	22.4	51.2	12.7		21.2	0.8		37.4	0.0
Internal Link Dist (m)		72.5			866.8			1234.6			159.7	
Turn Bay Length (m)	60.0		60.0	60.0		60.0			30.0			30.0
Base Capacity (vph)	422	1194	612	639	1814	956		459	559		425	545
Starvation Cap Reductn	0	0	0	0	0	0		0	0		0	0
Spillback Cap Reductn	0	0	0	0	0	0		0	0		0	0
Storage Cap Reductn	0	0	0	0	0	0		0	0		0	0
Reduced v/c Ratio	0.03	0.32	0.01	0.40	0.47	0.35		0.29	0.09		0.55	0.01

Intersection Summary

Cycle Length: 55
Actuated Cycle Length: 55
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Splits and Phases: 8: McLaughlin Rd & Mayfield





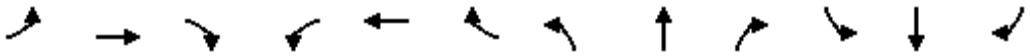
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	385	6	257	846	339	53	81	50	136	99	8
Future Volume (vph)	11	385	6	257	846	339	53	81	50	136	99	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	5.0	5.0	3.0	5.0	5.0		5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.98	1.00		0.97	1.00
Satd. Flow (prot)	1690	3411	1528	1755	3411	1500		1847	1543		1793	1500
Flt Permitted	0.33	1.00	1.00	0.45	1.00	1.00		0.79	1.00		0.75	1.00
Satd. Flow (perm)	594	3411	1528	838	3411	1500		1487	1543		1378	1500
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	11	385	6	257	846	339	53	81	50	136	99	8
RTOR Reduction (vph)	0	0	4	0	0	173	0	0	37	0	0	6
Lane Group Flow (vph)	11	385	2	257	846	166	0	134	13	0	235	2
Heavy Vehicles (%)	8%	7%	6%	4%	7%	8%	5%	0%	5%	5%	3%	8%
Bus Blockages (#/hr)	0	0	2	0	0	2	0	0	2	0	0	2
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	19.1	18.3	18.3	29.7	25.9	25.9		13.3	13.3		13.3	13.3
Effective Green, g (s)	21.1	19.3	19.3	30.7	26.9	26.9		14.3	14.3		14.3	14.3
Actuated g/C Ratio	0.38	0.35	0.35	0.56	0.49	0.49		0.26	0.26		0.26	0.26
Clearance Time (s)	3.0	6.0	6.0	4.0	6.0	6.0		6.0	6.0		6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	263	1196	536	607	1668	733		386	401		358	390
v/s Ratio Prot	0.00	0.11		c0.06	c0.25							
v/s Ratio Perm	0.01		0.00	0.17		0.11		0.09	0.01		c0.17	0.00
v/c Ratio	0.04	0.32	0.00	0.42	0.51	0.23		0.35	0.03		0.66	0.01
Uniform Delay, d1	10.5	13.1	11.6	6.4	9.5	8.1		16.6	15.2		18.2	15.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00
Incremental Delay, d2	0.1	0.7	0.0	0.5	1.1	0.7		0.5	0.0		4.3	0.0
Delay (s)	10.6	13.8	11.6	6.9	10.7	8.8		17.1	15.2		22.5	15.1
Level of Service	B	B	B	A	B	A		B	B		C	B
Approach Delay (s)		13.7			9.5			16.6			22.2	
Approach LOS		B			A			B			C	

Intersection Summary			
HCM 2000 Control Delay	12.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	55.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	57.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX D

Intersection Capacity Analysis – 2019 Opening Day
Sensitivity Analysis



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	51	231	0	23	171	0	1	237	188	226	152	8
Future Volume (Veh/h)	51	231	0	23	171	0	1	237	188	226	152	8
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	51	231	0	23	171	0	1	237	188	226	152	8
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	1026	1035	156	1056	945	331	160			425		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1026	1035	156	1056	945	331	160			425		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	14	0	100	0	18	100	100			80		
cM capacity (veh/h)	59	186	890	0	210	711	1419			1134		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	282	194	426	386
Volume Left	51	23	1	226
Volume Right	0	0	188	8
cSH	134	0	1419	1134
Volume to Capacity	2.10	Err	0.00	0.20
Queue Length 95th (m)	175.4	Err	0.0	5.6
Control Delay (s)	575.3	Err	0.0	6.1
Lane LOS	F	F	A	A
Approach Delay (s)	575.3	Err	0.0	6.1
Approach LOS	F	F		

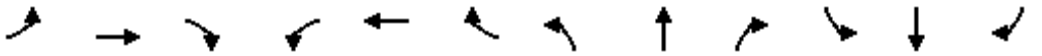
Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	78.2%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	2	650	118	62	395	108	10	74	171	289	94
Future Volume (vph)	2	650	118	62	395	108	10	74	171	289	94
Lane Group Flow (vph)	2	650	118	62	395	108	0	84	171	0	383
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA
Protected Phases		4			8			2			6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	4	4	4	8	8	8	2	2	2	6	6
Switch Phase											
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0
Total Split (s)	88.0	88.0	88.0	88.0	88.0	88.0	32.0	32.0	32.0	32.0	32.0
Total Split (%)	73.3%	73.3%	73.3%	73.3%	73.3%	73.3%	26.7%	26.7%	26.7%	26.7%	26.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0		-1.0	-1.0		-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0
Lead/Lag											
Lead-Lag Optimize?											
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None
v/c Ratio	0.00	0.28	0.11	0.13	0.17	0.10		0.29	0.36		1.28
Control Delay	7.0	9.7	2.2	12.4	10.9	5.8		42.0	7.9		188.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Total Delay	7.0	9.7	2.2	12.4	10.9	5.8		42.0	7.9		188.3
Queue Length 50th (m)	0.2	37.7	2.3	5.1	17.4	2.3		16.5	0.0		~114.3
Queue Length 95th (m)	m0.4	41.0	7.0	15.8	34.8	15.2		31.2	17.4		#173.1
Internal Link Dist (m)		72.5			866.8			1234.6			159.7
Turn Bay Length (m)	60.0		60.0	60.0		60.0			30.0		
Base Capacity (vph)	638	2359	1093	494	2359	1070		286	479		299
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	0.00	0.28	0.11	0.13	0.17	0.10		0.29	0.36		1.28

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 45
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: McLaughlin Rd & Mayfield



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	2	650	118	62	395	108	10	74	171	289	94	0
Future Volume (vph)	2	650	118	62	395	108	10	74	171	289	94	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	5.0		5.0	5.0		5.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00		1.00	1.00		1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00		0.99	1.00		0.96	
Satd. Flow (prot)	1690	3411	1528	1755	3411	1500		1898	1543		1771	
Flt Permitted	0.52	1.00	1.00	0.39	1.00	1.00		0.67	1.00		0.72	
Satd. Flow (perm)	923	3411	1528	715	3411	1500		1273	1543		1332	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	2	650	118	62	395	108	10	74	171	289	94	0
RTOR Reduction (vph)	0	0	36	0	0	33	0	0	133	0	0	0
Lane Group Flow (vph)	2	650	82	62	395	75	0	84	38	0	383	0
Heavy Vehicles (%)	8%	7%	6%	4%	7%	8%	5%	0%	5%	5%	3%	8%
Bus Blockages (#/hr)	0	0	2	0	0	2	0	0	2	0	0	2
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases		4			8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	82.0	82.0	82.0	82.0	82.0	82.0		26.0	26.0		26.0	
Effective Green, g (s)	83.0	83.0	83.0	83.0	83.0	83.0		27.0	27.0		27.0	
Actuated g/C Ratio	0.69	0.69	0.69	0.69	0.69	0.69		0.22	0.22		0.22	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	6.0		6.0	6.0		6.0	
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)	638	2359	1056	494	2359	1037		286	347		299	
v/s Ratio Prot		c0.19			0.12							
v/s Ratio Perm	0.00		0.05	0.09		0.05		0.07	0.02		c0.29	
v/c Ratio	0.00	0.28	0.08	0.13	0.17	0.07		0.29	0.11		1.28	
Uniform Delay, d1	5.7	7.0	6.0	6.2	6.5	6.0		38.6	37.0		46.5	
Progression Factor	1.21	1.33	1.87	1.84	1.65	4.91		1.00	1.00		1.00	
Incremental Delay, d2	0.0	0.3	0.1	0.5	0.2	0.1		0.6	0.1		149.6	
Delay (s)	6.9	9.6	11.4	12.0	10.8	29.6		39.2	37.1		196.1	
Level of Service	A	A	B	B	B	C		D	D		F	
Approach Delay (s)		9.9			14.5			37.8			196.1	
Approach LOS		A			B			D			F	

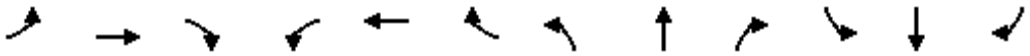
Intersection Summary			
HCM 2000 Control Delay	51.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	62.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	0	76	43	72	17	7	15	1	257	17	0	0
Future Volume (Veh/h)	0	76	43	72	17	7	15	1	257	17	0	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	84	48	80	19	8	17	1	286	19	0	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)											301	
pX, platoon unblocked												
vC, conflicting volume	90	359	0	306	216	144	0			287		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	90	359	0	306	216	144	0			287		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	85	96	85	97	99	99			99		
cM capacity (veh/h)	841	552	1084	516	664	878	1622			1272		

Direction, Lane #	SE 1	NW 1	NE 1	NE 2	SW 1	SW 2
Volume Total	132	107	18	286	19	0
Volume Left	0	80	17	0	19	0
Volume Right	48	8	0	286	0	0
cSH	672	555	1622	1700	1272	1700
Volume to Capacity	0.20	0.19	0.01	0.17	0.01	0.00
Queue Length 95th (m)	5.5	5.4	0.2	0.0	0.3	0.0
Control Delay (s)	11.7	13.0	7.0	0.0	7.9	0.0
Lane LOS	B	B	A		A	
Approach Delay (s)	11.7	13.0	0.4		7.9	
Approach LOS	B	B				

Intersection Summary				
Average Delay	5.7			
Intersection Capacity Utilization	33.5%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	171	1	188	231	226	0	152	23	0	237	51
Future Volume (Veh/h)	8	171	1	188	231	226	0	152	23	0	237	51
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	8	171	1	188	231	226	0	152	23	0	237	51
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	768	438	262	512	452	164	288			175		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	768	438	262	512	452	164	288			175		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	67	100	46	54	74	100			100		
cM capacity (veh/h)	152	513	776	350	504	881	1274			1401		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	180	645	175	288
Volume Left	8	188	0	0
Volume Right	1	226	23	51
cSH	465	515	1274	1401
Volume to Capacity	0.39	1.25	0.00	0.00
Queue Length 95th (m)	13.7	195.3	0.0	0.0
Control Delay (s)	17.6	153.7	0.0	0.0
Lane LOS	C	F		
Approach Delay (s)	17.6	153.7	0.0	0.0
Approach LOS	C	F		

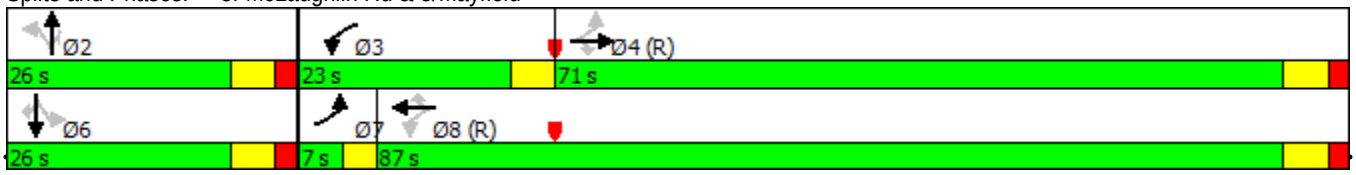
Intersection Summary				
Average Delay	79.4			
Intersection Capacity Utilization	71.4%	ICU Level of Service	C	
Analysis Period (min)	15			

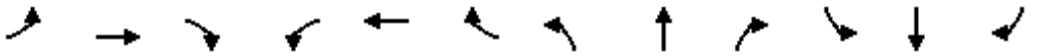
Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Ø7
Lane Configurations												
Traffic Volume (vph)	405	14	266	634	263	58	84	61	54	110	3	
Future Volume (vph)	405	14	266	634	263	58	84	61	54	110	3	
Lane Group Flow (vph)	405	14	266	634	263	0	142	61	0	164	3	
Turn Type	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	
Protected Phases	4		3	8			2			6		7
Permitted Phases		4	8		8	2		2	6		6	
Detector Phase	4	4	3	8	8	2	2	2	6	6	6	
Switch Phase												
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	10.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	22.0	7.0
Total Split (s)	71.0	71.0	23.0	87.0	87.0	26.0	26.0	26.0	26.0	26.0	26.0	7.0
Total Split (%)	59.2%	59.2%	19.2%	72.5%	72.5%	21.7%	21.7%	21.7%	21.7%	21.7%	21.7%	6%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.0
All-Red Time (s)	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0		-1.0	-1.0		-1.0	-1.0	
Total Lost Time (s)	5.0	5.0	3.0	5.0	5.0		5.0	5.0		5.0	5.0	
Lead/Lag	Lag	Lag	Lead	Lag	Lag							Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes							Yes
Recall Mode	C-Max	C-Max	None	C-Max	C-Max	None	None	None	None	None	None	None
v/c Ratio	0.19	0.01	0.34	0.24	0.22		0.84	0.19		0.83	0.01	
Control Delay	5.9	0.0	12.0	11.9	6.8		85.3	4.7		81.1	0.0	
Queue Delay	0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	5.9	0.0	12.0	11.9	6.8		85.3	4.7		81.1	0.0	
Queue Length 50th (m)	11.8	0.0	38.5	50.0	21.6		32.1	0.0		37.0	0.0	
Queue Length 95th (m)	17.5	m0.0	55.5	62.2	38.3		#63.2	5.4		#69.1	0.0	
Internal Link Dist (m)	72.5			866.8			1234.6			159.7		
Turn Bay Length (m)		60.0	60.0		60.0			30.0			30.0	
Base Capacity (vph)	2181	1009	843	2592	1203		190	345		220	337	
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	0.19	0.01	0.32	0.24	0.22		0.75	0.18		0.75	0.01	

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: McLaughlin Rd & 3/Mayfield





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	405	14	266	634	263	58	84	61	54	110	3
Future Volume (vph)	0	405	14	266	634	263	58	84	61	54	110	3
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	3.0	5.0	5.0		5.0	5.0		5.0	5.0
Lane Util. Factor		0.95	1.00	1.00	0.95	1.00		1.00	1.00		1.00	1.00
Frt		1.00	0.85	1.00	1.00	0.85		1.00	0.85		1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00	1.00		0.98	1.00		0.98	1.00
Satd. Flow (prot)		3411	1528	1755	3411	1500		1845	1543		1823	1500
Flt Permitted		1.00	1.00	0.49	1.00	1.00		0.58	1.00		0.68	1.00
Satd. Flow (perm)		3411	1528	904	3411	1500		1085	1543		1259	1500
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	405	14	266	634	263	58	84	61	54	110	3
RTOR Reduction (vph)	0	0	5	0	0	63	0	0	51	0	0	3
Lane Group Flow (vph)	0	405	9	266	634	200	0	142	10	0	164	0
Heavy Vehicles (%)	8%	7%	6%	4%	7%	8%	5%	0%	5%	5%	3%	8%
Bus Blockages (#/hr)	0	0	2	0	0	2	0	0	2	0	0	2
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)		75.7	75.7	90.2	90.2	90.2		17.8	17.8		17.8	17.8
Effective Green, g (s)		76.7	76.7	91.2	91.2	91.2		18.8	18.8		18.8	18.8
Actuated g/C Ratio		0.64	0.64	0.76	0.76	0.76		0.16	0.16		0.16	0.16
Clearance Time (s)		6.0	6.0	4.0	6.0	6.0		6.0	6.0		6.0	6.0
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)		2180	976	768	2592	1140		169	241		197	235
v/s Ratio Prot		0.12		c0.03	0.19							
v/s Ratio Perm			0.01	c0.23		0.13		c0.13	0.01		0.13	0.00
v/c Ratio		0.19	0.01	0.35	0.24	0.18		0.84	0.04		0.83	0.00
Uniform Delay, d1		8.9	7.9	4.2	4.2	4.0		49.1	42.9		49.1	42.7
Progression Factor		0.60	1.00	2.81	2.59	12.03		1.00	1.00		1.00	1.00
Incremental Delay, d2		0.2	0.0	0.3	0.2	0.3		29.5	0.1		24.9	0.0
Delay (s)		5.5	7.9	12.0	11.2	48.3		78.7	43.0		73.9	42.7
Level of Service		A	A	B	B	D		E	D		E	D
Approach Delay (s)		5.6			19.8			68.0			73.4	
Approach LOS		A			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	26.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	53.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

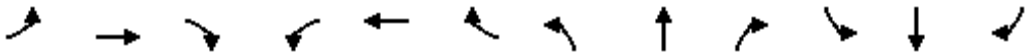
Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	0	17	15	257	76	17	43	0	72	7	1	0
Future Volume (Veh/h)	0	17	15	257	76	17	43	0	72	7	1	0
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	0	19	17	286	84	19	48	0	80	8	1	0
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)											301	
pX, platoon unblocked												
vC, conflicting volume	174	193	0	179	153	40	1			80		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	174	193	0	179	153	40	1			80		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	97	98	60	88	98	97			99		
cM capacity (veh/h)	672	677	1084	719	712	1022	1620			1516		

Direction, Lane #	SE 1	NW 1	NE 1	NE 2	SW 1	SW 2
Volume Total	36	389	48	80	8	0
Volume Left	0	286	48	0	8	0
Volume Right	17	19	0	80	0	0
cSH	823	728	1620	1700	1516	1700
Volume to Capacity	0.04	0.53	0.03	0.05	0.01	0.00
Queue Length 95th (m)	1.0	24.3	0.7	0.0	0.1	0.0
Control Delay (s)	9.6	15.5	7.3	0.0	7.0	0.0
Lane LOS	A	C	A		A	
Approach Delay (s)	9.6	15.5	2.7		6.6	
Approach LOS	A	C				

Intersection Summary				
Average Delay	12.1			
Intersection Capacity Utilization	41.6%	ICU Level of Service	A	
Analysis Period (min)	15			

APPENDIX E

Intersection Capacity Analysis – 2021 Full Build-Out Horizon



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	57	84	0	1	77	1	0	344	63	317	224	8
Future Volume (Veh/h)	57	84	0	1	77	1	0	344	63	317	224	8
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	57	84	0	1	77	1	0	344	63	317	224	8
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	1277	1269	228	1280	1242	376	232			407		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1277	1269	228	1280	1242	376	232			407		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	5	31	100	98	39	100	100			72		
cM capacity (veh/h)	60	122	811	52	127	671	1336			1152		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	141	79	407	549
Volume Left	57	1	0	317
Volume Right	0	1	63	8
cSH	86	126	1336	1152
Volume to Capacity	1.64	0.63	0.00	0.28
Queue Length 95th (m)	87.3	24.8	0.0	8.6
Control Delay (s)	418.9	72.9	0.0	6.6
Lane LOS	F	F		A
Approach Delay (s)	418.9	72.9	0.0	6.6
Approach LOS	F	F		

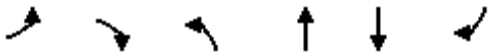
Intersection Summary				
Average Delay	58.2			
Intersection Capacity Utilization	76.0%	ICU Level of Service	D	
Analysis Period (min)	15			

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	531	9	47	1011	951	687
Future Volume (vph)	531	9	47	1011	951	687
Lane Group Flow (vph)	531	9	47	1011	951	687
Turn Type	Prot	Perm	Perm	NA	NA	Free
Protected Phases	4			2	6	
Permitted Phases		4	2			Free
Detector Phase	4	4	2	2	6	
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0	
Total Split (s)	55.0	55.0	65.0	65.0	65.0	
Total Split (%)	45.8%	45.8%	54.2%	54.2%	54.2%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	C-Max	C-Max	C-Max	
v/c Ratio	0.85	0.02	0.19	0.50	0.47	0.43
Control Delay	49.1	11.2	17.6	17.8	17.3	0.8
Queue Delay	0.0	0.0	0.0	0.0	0.5	0.0
Total Delay	49.1	11.2	17.6	17.8	17.7	0.8
Queue Length 50th (m)	113.5	0.0	5.2	73.3	67.3	0.0
Queue Length 95th (m)	143.1	3.2	14.4	103.9	96.0	0.0
Internal Link Dist (m)	163.0			71.2	21.2	
Turn Bay Length (m)			30.0			
Base Capacity (vph)	745	672	249	2029	2029	1601
Starvation Cap Reductn	0	0	0	0	569	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.71	0.01	0.19	0.50	0.65	0.43

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 45
Control Type: Actuated-Coordinated

Splits and Phases: 6: Hurontario St & Spine Road



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	531	9	47	1011	951	687
Future Volume (vph)	531	9	47	1011	951	687
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	5.0	5.0	3.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1789	1601	1789	3579	3579	1601
Flt Permitted	0.95	1.00	0.23	1.00	1.00	1.00
Satd. Flow (perm)	1789	1601	441	3579	3579	1601
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	531	9	47	1011	951	687
RTOR Reduction (vph)	0	6	0	0	0	0
Lane Group Flow (vph)	531	3	47	1011	951	687
Turn Type	Prot	Perm	Perm	NA	NA	Free
Protected Phases	4			2	6	
Permitted Phases		4	2			Free
Actuated Green, G (s)	41.0	41.0	67.0	67.0	67.0	120.0
Effective Green, g (s)	42.0	42.0	68.0	68.0	68.0	120.0
Actuated g/C Ratio	0.35	0.35	0.57	0.57	0.57	1.00
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	626	560	249	2028	2028	1601
v/s Ratio Prot	c0.30			c0.28	0.27	
v/s Ratio Perm		0.00	0.11			0.43
v/c Ratio	0.85	0.01	0.19	0.50	0.47	0.43
Uniform Delay, d1	36.1	25.4	12.6	15.7	15.3	0.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	10.4	0.0	1.7	0.9	0.8	0.8
Delay (s)	46.4	25.4	14.3	16.6	16.1	0.8
Level of Service	D	C	B	B	B	A
Approach Delay (s)	46.1			16.5	9.7	
Approach LOS	D			B	A	

Intersection Summary			
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	71.5%	ICU Level of Service	C
Analysis Period (min)	15		

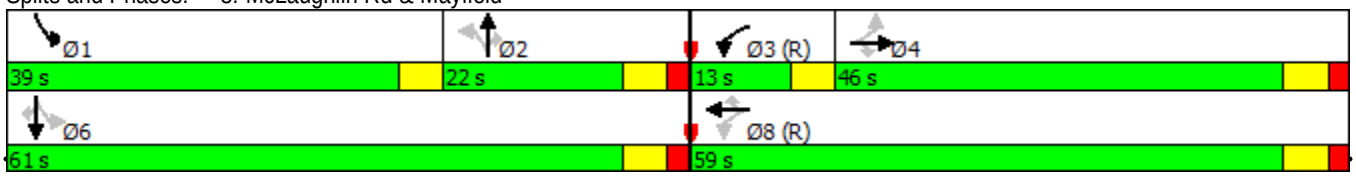
c Critical Lane Group

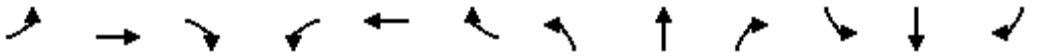
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations											
Traffic Volume (vph)	28	1021	125	108	511	108	10	110	226	486	138
Future Volume (vph)	28	1021	125	108	511	108	10	110	226	486	138
Lane Group Flow (vph)	28	1021	125	108	511	108	10	110	226	486	138
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA
Protected Phases		4		3	8			2		1	6
Permitted Phases	4		4	8		8	2		2	6	
Detector Phase	4	4	4	3	8	8	2	2	2	1	6
Switch Phase											
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	10.0	22.0	22.0	22.0	22.0	22.0	10.0	22.0
Total Split (s)	46.0	46.0	46.0	13.0	59.0	59.0	22.0	22.0	22.0	39.0	61.0
Total Split (%)	38.3%	38.3%	38.3%	10.8%	49.2%	49.2%	18.3%	18.3%	18.3%	32.5%	50.8%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0	5.0	3.0	5.0
Lead/Lag	Lag	Lag	Lag	Lead			Lag	Lag	Lag	Lead	
Lead-Lag Optimize?	Yes	Yes	Yes	Yes			Yes	Yes	Yes	Yes	
Recall Mode	Min	Min	Min	C-Max	C-Min	C-Min	None	None	None	Min	Min
v/c Ratio	0.10	0.90	0.21	0.30	0.29	0.13	0.09	0.33	0.66	0.80	0.10
Control Delay	18.3	38.4	2.9	6.6	6.3	1.2	49.5	52.9	17.2	39.0	21.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0
Total Delay	18.3	38.4	2.9	6.6	6.3	1.2	49.5	52.9	17.2	40.0	21.9
Queue Length 50th (m)	4.0	124.2	5.6	1.8	4.8	0.0	2.2	13.1	1.3	90.7	10.4
Queue Length 95th (m)	m5.8	#115.2	1.5	16.4	65.6	7.9	7.2	20.8	23.7	113.3	15.1
Internal Link Dist (m)		388.2			866.8			1234.6			159.7
Turn Bay Length (m)	80.0		80.0	80.0		80.0	80.0		80.0	80.0	
Base Capacity (vph)	281	1165	602	355	1790	838	172	517	407	627	1653
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	33	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.88	0.21	0.30	0.29	0.13	0.06	0.21	0.56	0.82	0.08

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 113 (94%), Referenced to phase 3:WBL and 8:WBTL, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: McLaughlin Rd & Mayfield





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	28	1021	125	108	511	108	10	110	226	486	138	0
Future Volume (vph)	28	1021	125	108	511	108	10	110	226	486	138	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0	3.0	5.0	5.0	5.0	5.0	5.0	3.0	5.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1690	3411	1528	1755	3411	1500	1738	3650	1543	1738	3544	
Flt Permitted	0.46	1.00	1.00	0.09	1.00	1.00	0.66	1.00	1.00	0.54	1.00	
Satd. Flow (perm)	825	3411	1528	171	3411	1500	1216	3650	1543	979	3544	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	28	1021	125	108	511	108	10	110	226	486	138	0
RTOR Reduction (vph)	0	0	81	0	0	51	0	0	200	0	0	0
Lane Group Flow (vph)	28	1021	44	108	511	57	10	110	26	486	138	0
Heavy Vehicles (%)	8%	7%	6%	4%	7%	8%	5%	0%	5%	5%	3%	8%
Bus Blockages (#/hr)	0	0	2	0	0	2	0	0	2	0	0	2
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	Perm	NA	Perm	pm+pt	NA	Perm
Protected Phases		4		3	8			2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	39.1	39.1	39.1	62.0	62.0	62.0	9.9	9.9	9.9	46.0	46.0	
Effective Green, g (s)	40.1	40.1	40.1	63.0	63.0	63.0	10.9	10.9	10.9	47.0	47.0	
Actuated g/C Ratio	0.33	0.33	0.33	0.52	0.52	0.52	0.09	0.09	0.09	0.39	0.39	
Clearance Time (s)	6.0	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	275	1139	510	352	1790	787	110	331	140	592	1388	
v/s Ratio Prot		c0.30		c0.05	0.15			0.03		c0.23	0.04	
v/s Ratio Perm	0.03		0.03	0.11		0.04	0.01		0.02	c0.09		
v/c Ratio	0.10	0.90	0.09	0.31	0.29	0.07	0.09	0.33	0.19	0.82	0.10	
Uniform Delay, d1	27.5	38.0	27.4	19.5	15.9	14.1	50.0	51.1	50.4	30.9	23.1	
Progression Factor	0.64	0.73	0.41	0.28	0.34	0.26	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	8.7	0.1	2.2	0.4	0.2	0.4	0.6	0.6	8.9	0.0	
Delay (s)	17.8	36.5	11.2	7.7	5.9	3.8	50.4	51.7	51.1	39.8	23.1	
Level of Service	B	D	B	A	A	A	D	D	D	D	C	
Approach Delay (s)		33.3			5.8			51.3			36.1	
Approach LOS		C			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	29.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	80.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	18	38	76	28	67	35	11	412	164	85	467	33
Future Volume (Veh/h)	18	38	76	28	67	35	11	412	164	85	467	33
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	20	42	84	31	74	39	12	458	182	94	519	37
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)											301	
pX, platoon unblocked												
vC, conflicting volume	1054	1390	278	1126	1317	320	556			640		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1054	1390	278	1126	1317	320	556			640		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	78	67	88	68	47	94	99			90		
cM capacity (veh/h)	91	126	719	96	139	676	1011			940		

Direction, Lane #	SE 1	NW 1	NE 1	NE 2	SW 1	SW 2
Volume Total	146	144	241	411	354	296
Volume Left	20	31	12	0	94	0
Volume Right	84	39	0	182	0	37
cSH	217	158	1011	1700	940	1700
Volume to Capacity	0.67	0.91	0.01	0.24	0.10	0.17
Queue Length 95th (m)	31.7	49.7	0.3	0.0	2.5	0.0
Control Delay (s)	49.9	106.9	0.5	0.0	3.3	0.0
Lane LOS	E	F	A		A	
Approach Delay (s)	49.9	106.9	0.2		1.8	
Approach LOS	E	F				

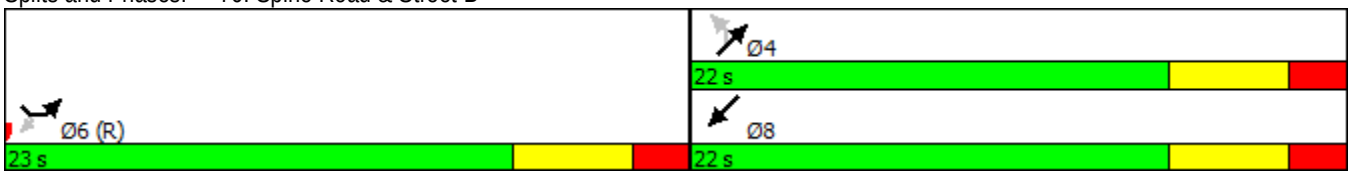
Intersection Summary				
Average Delay	15.1			
Intersection Capacity Utilization	54.8%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	SEL	SER	NEL	NET	SWT
Lane Configurations					
Traffic Volume (vph)	133	57	27	424	532
Future Volume (vph)	133	57	27	424	532
Lane Group Flow (vph)	148	63	0	501	812
Turn Type	Prot	Perm	Perm	NA	NA
Protected Phases	6			4	8
Permitted Phases		6	4		
Detector Phase	6	6	4	4	8
Switch Phase					
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0
Total Split (s)	23.0	23.0	22.0	22.0	22.0
Total Split (%)	51.1%	51.1%	48.9%	48.9%	48.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	5.0	5.0		5.0	5.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	C-Max	C-Max	None	None	None
v/c Ratio	0.10	0.09		0.46	0.64
Control Delay	8.6	3.4		12.7	12.4
Queue Delay	0.0	0.0		0.0	0.0
Total Delay	8.6	3.4		12.7	12.4
Queue Length 50th (m)	3.5	0.0		14.6	20.5
Queue Length 95th (m)	7.3	4.7		24.0	33.6
Internal Link Dist (m)	84.7			277.1	62.9
Turn Bay Length (m)	60.0				
Base Capacity (vph)	1497	726		1177	1382
Starvation Cap Reductn	0	0		0	0
Spillback Cap Reductn	0	0		0	0
Storage Cap Reductn	0	0		0	0
Reduced v/c Ratio	0.10	0.09		0.43	0.59

Intersection Summary

Cycle Length: 45
Actuated Cycle Length: 45
Offset: 0 (0%), Referenced to phase 2: and 6:SEL, Start of Green
Natural Cycle: 45
Control Type: Actuated-Coordinated

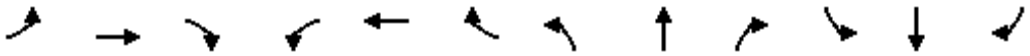
Splits and Phases: 76: Spine Road & Street B



Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	133	57	27	424	532	199
Future Volume (vph)	133	57	27	424	532	199
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	0.97	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	0.96	
Flt Protected	0.95	1.00		1.00	1.00	
Satd. Flow (prot)	3471	1601		3568	3432	
Flt Permitted	0.95	1.00		0.87	1.00	
Satd. Flow (perm)	3471	1601		3116	3432	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	148	63	30	471	591	221
RTOR Reduction (vph)	0	36	0	0	90	0
Lane Group Flow (vph)	148	27	0	501	722	0
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	6			4	8	
Permitted Phases		6	4			
Actuated Green, G (s)	18.4	18.4		14.6	14.6	
Effective Green, g (s)	19.4	19.4		15.6	15.6	
Actuated g/C Ratio	0.43	0.43		0.35	0.35	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	1496	690		1080	1189	
v/s Ratio Prot	c0.04				c0.21	
v/s Ratio Perm		0.02		0.16		
v/c Ratio	0.10	0.04		0.46	0.61	
Uniform Delay, d1	7.6	7.4		11.4	12.2	
Progression Factor	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.1	0.1		0.3	0.9	
Delay (s)	7.7	7.5		11.8	13.0	
Level of Service	A	A		B	B	
Approach Delay (s)	7.7			11.8	13.0	
Approach LOS	A			B	B	

Intersection Summary			
HCM 2000 Control Delay	11.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	45.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	44.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	77	0	63	84	317	0	224	1	1	344	57
Future Volume (Veh/h)	8	77	0	63	84	317	0	224	1	1	344	57
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	8	77	0	63	84	317	0	224	1	1	344	57
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	958	600	372	638	628	224	401			225		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	958	600	372	638	628	224	401			225		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	93	81	100	81	79	61	100			100		
cM capacity (veh/h)	121	415	673	334	400	815	1158			1344		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	85	464	225	402
Volume Left	8	63	0	1
Volume Right	0	317	1	57
cSH	338	589	1158	1344
Volume to Capacity	0.25	0.79	0.00	0.00
Queue Length 95th (m)	7.4	57.2	0.0	0.0
Control Delay (s)	19.2	30.1	0.0	0.0
Lane LOS	C	D		A
Approach Delay (s)	19.2	30.1	0.0	0.0
Approach LOS	C	D		

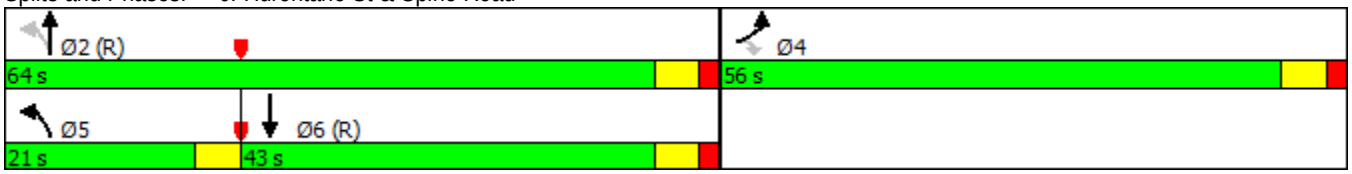
Intersection Summary				
Average Delay	13.3			
Intersection Capacity Utilization	63.1%	ICU Level of Service	B	
Analysis Period (min)	15			

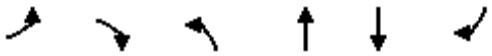
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	709	363	317	951	1011	533
Future Volume (vph)	709	363	317	951	1011	533
Lane Group Flow (vph)	709	363	317	951	1011	533
Turn Type	Prot	Perm	pm+pt	NA	NA	Free
Protected Phases	4		5	2	6	
Permitted Phases		4	2			Free
Detector Phase	4	4	5	2	6	
Switch Phase						
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	
Minimum Split (s)	22.0	22.0	10.0	22.0	22.0	
Total Split (s)	56.0	56.0	21.0	64.0	43.0	
Total Split (%)	46.7%	46.7%	17.5%	53.3%	35.8%	
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0	0.0	2.0	2.0	
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	
Total Lost Time (s)	5.0	5.0	3.0	5.0	5.0	
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None	None	None	C-Max	C-Max	
v/c Ratio	0.95	0.43	0.95	0.53	0.87	0.33
Control Delay	50.5	6.4	71.1	22.0	47.7	0.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.5	6.4	71.1	22.0	47.7	0.6
Queue Length 50th (m)	136.7	8.0	58.4	79.2	119.0	0.0
Queue Length 95th (m)	#227.1	28.6	#113.3	97.8	#154.8	0.0
Internal Link Dist (m)	163.0			71.2	21.2	
Turn Bay Length (m)			30.0			
Base Capacity (vph)	760	849	333	1789	1163	1601
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	0.93	0.43	0.95	0.53	0.87	0.33

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Hurontario St & Spine Road





Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	709	363	317	951	1011	533
Future Volume (vph)	709	363	317	951	1011	533
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	3.0	5.0	5.0	3.0
Lane Util. Factor	1.00	1.00	1.00	0.95	0.95	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1789	1601	1789	3579	3579	1601
Flt Permitted	0.95	1.00	0.10	1.00	1.00	1.00
Satd. Flow (perm)	1789	1601	179	3579	3579	1601
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	709	363	317	951	1011	533
RTOR Reduction (vph)	0	172	0	0	0	0
Lane Group Flow (vph)	709	192	317	951	1011	533
Turn Type	Prot	Perm	pm+pt	NA	NA	Free
Protected Phases	4		5	2	6	
Permitted Phases		4	2			Free
Actuated Green, G (s)	49.0	49.0	59.0	59.0	38.0	120.0
Effective Green, g (s)	50.0	50.0	60.0	60.0	39.0	120.0
Actuated g/C Ratio	0.42	0.42	0.50	0.50	0.32	1.00
Clearance Time (s)	6.0	6.0	4.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	745	667	331	1789	1163	1601
v/s Ratio Prot	c0.40		c0.14	0.27	0.28	
v/s Ratio Perm		0.12	c0.33			0.33
v/c Ratio	0.95	0.29	0.96	0.53	0.87	0.33
Uniform Delay, d1	33.8	23.2	36.0	20.4	38.1	0.0
Progression Factor	0.88	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	18.8	0.2	37.9	1.1	8.9	0.6
Delay (s)	48.6	23.5	73.9	21.6	47.0	0.6
Level of Service	D	C	E	C	D	A
Approach Delay (s)	40.1			34.6	31.0	
Approach LOS	D			C	C	

Intersection Summary			
HCM 2000 Control Delay	34.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	96.5%	ICU Level of Service	F
Analysis Period (min)	15		

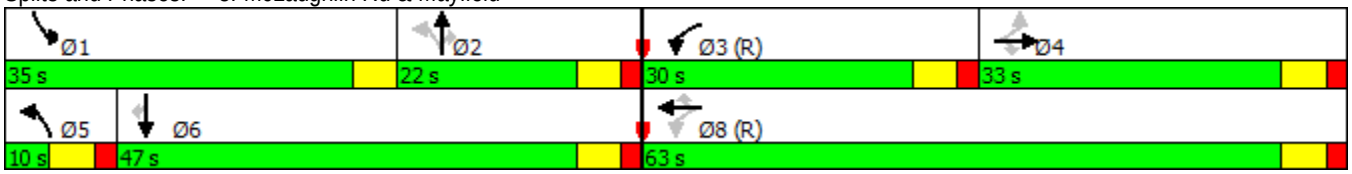
c Critical Lane Group

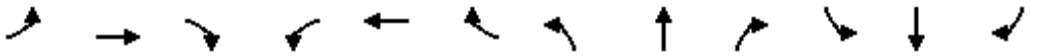
Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	595	14	376	1065	473	62	123	121	61	163	47
Future Volume (vph)	595	14	376	1065	473	62	123	121	61	163	47
Lane Group Flow (vph)	595	14	376	1065	473	62	123	121	61	163	47
Turn Type	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm
Protected Phases	4		3	8		5	2		1	6	
Permitted Phases		4	8		8	2		2			6
Detector Phase	4	4	3	8	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	10.0	22.0	22.0	10.0	22.0	22.0	10.0	22.0	22.0
Total Split (s)	33.0	33.0	30.0	63.0	63.0	10.0	22.0	22.0	35.0	47.0	47.0
Total Split (%)	27.5%	27.5%	25.0%	52.5%	52.5%	8.3%	18.3%	18.3%	29.2%	39.2%	39.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	3.0	5.0	5.0
Lead/Lag	Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes			Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	Min	Min	C-Max	C-Min	C-Min	None	None	None	None	None	None
v/c Ratio	0.81	0.03	0.42	0.43	0.39	0.34	0.37	0.41	0.40	0.39	0.16
Control Delay	54.1	0.1	14.6	3.7	0.8	44.7	54.2	6.1	58.4	50.8	1.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	54.1	0.1	14.6	3.7	0.8	44.7	54.2	6.1	58.4	50.8	1.1
Queue Length 50th (m)	72.7	0.0	25.9	15.7	0.0	12.2	14.6	0.0	13.8	19.0	0.0
Queue Length 95th (m)	m84.8	m0.0	54.0	31.0	0.0	22.8	23.8	5.4	26.6	28.0	0.0
Internal Link Dist (m)	388.2			866.8			1234.6			159.7	
Turn Bay Length (m)		80.0	80.0		80.0	80.0		80.0	80.0		80.0
Base Capacity (vph)	795	489	897	2484	1221	181	517	367	463	1240	613
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.75	0.03	0.42	0.43	0.39	0.34	0.24	0.33	0.13	0.13	0.08

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 120
Offset: 43 (36%), Referenced to phase 3:WBL and 8:WBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: McLaughlin Rd & Mayfield





Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	595	14	376	1065	473	62	123	121	61	163	47
Future Volume (vph)	0	595	14	376	1065	473	62	123	121	61	163	47
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	3.0	5.0	5.0
Lane Util. Factor		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		3411	1528	1755	3411	1500	1738	3650	1543	1738	3544	1500
Flt Permitted		1.00	1.00	0.15	1.00	1.00	0.65	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		3411	1528	285	3411	1500	1187	3650	1543	1738	3544	1500
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	595	14	376	1065	473	62	123	121	61	163	47
RTOR Reduction (vph)	0	0	11	0	0	133	0	0	110	0	0	42
Lane Group Flow (vph)	0	595	3	376	1065	340	62	123	11	61	163	5
Heavy Vehicles (%)	8%	7%	6%	4%	7%	8%	5%	0%	5%	5%	3%	8%
Bus Blockages (#/hr)	0	0	2	0	0	2	0	0	2	0	0	2
Turn Type	Perm	NA	Perm	pm+pt	NA	Perm	pm+pt	NA	Perm	Prot	NA	Perm
Protected Phases		4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2			6
Actuated Green, G (s)		25.0	25.0	85.2	85.2	85.2	14.2	10.4	10.4	8.4	13.0	13.0
Effective Green, g (s)		26.0	26.0	86.2	86.2	86.2	16.2	11.4	11.4	9.4	14.0	14.0
Actuated g/C Ratio		0.22	0.22	0.72	0.72	0.72	0.13	0.10	0.10	0.08	0.12	0.12
Clearance Time (s)		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		739	331	880	2450	1077	182	346	146	136	413	175
v/s Ratio Prot		c0.17		0.20	c0.31		0.01	0.03		c0.04	c0.05	
v/s Ratio Perm			0.00	0.11		0.23	0.03		0.01			0.00
v/c Ratio		0.81	0.01	0.43	0.43	0.32	0.34	0.36	0.08	0.45	0.39	0.03
Uniform Delay, d1		44.6	36.9	11.7	6.9	6.2	46.6	50.9	49.5	52.8	49.1	47.0
Progression Factor		1.04	1.00	1.14	0.44	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		5.6	0.0	1.2	0.5	0.6	1.1	0.6	0.2	2.3	0.6	0.1
Delay (s)		51.8	36.9	14.6	3.5	0.6	47.7	51.5	49.7	55.2	49.7	47.1
Level of Service		D	D	B	A	A	D	D	D	E	D	D
Approach Delay (s)		51.5			5.0			50.0			50.5	
Approach LOS		D			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	22.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	61.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Traffic Volume (veh/h)	41	67	11	164	38	106	76	580	28	38	453	20
Future Volume (Veh/h)	41	67	11	164	38	106	76	580	28	38	453	20
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	46	74	12	182	42	118	84	644	31	42	503	22
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)											301	
pX, platoon unblocked												
vC, conflicting volume	1227	1441	262	1212	1436	338	525			675		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1227	1441	262	1212	1436	338	525			675		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	36	36	98	0	64	82	92			95		
cM capacity (veh/h)	72	115	736	60	116	658	1038			912		

Direction, Lane #	SE 1	NW 1	NE 1	NE 2	SW 1	SW 2
Volume Total	132	342	406	353	294	274
Volume Left	46	182	84	0	42	0
Volume Right	12	118	0	31	0	22
cSH	102	96	1038	1700	912	1700
Volume to Capacity	1.30	3.55	0.08	0.21	0.05	0.16
Queue Length 95th (m)	69.6	Err	2.0	0.0	1.1	0.0
Control Delay (s)	264.8	Err	2.5	0.0	1.7	0.0
Lane LOS	F	F	A		A	
Approach Delay (s)	264.8	Err	1.3		0.9	
Approach LOS	F	F				

Intersection Summary				
Average Delay	1920.1			
Intersection Capacity Utilization	67.6%	ICU Level of Service	C	
Analysis Period (min)	15			

Lane Group	SEL	SER	NEL	NET	SWT
Lane Configurations					
Traffic Volume (vph)	536	73	191	532	424
Future Volume (vph)	536	73	191	532	424
Lane Group Flow (vph)	596	81	0	803	967
Turn Type	Prot	Perm	Perm	NA	NA
Protected Phases	6			4	8
Permitted Phases		6	4		
Detector Phase	6	6	4	4	8
Switch Phase					
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	22.0	22.0	22.0
Total Split (s)	22.0	22.0	38.0	38.0	38.0
Total Split (%)	36.7%	36.7%	63.3%	63.3%	63.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0		-1.0	-1.0
Total Lost Time (s)	5.0	5.0		5.0	5.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	C-Max	C-Max	None	None	None
v/c Ratio	0.45	0.12		1.18dl	0.55
Control Delay	16.7	5.2		29.1	9.1
Queue Delay	0.0	0.0		0.0	0.0
Total Delay	16.7	5.2		29.1	9.1
Queue Length 50th (m)	25.0	0.0		45.2	46.3
Queue Length 95th (m)	43.0	7.9		57.0	m55.9
Internal Link Dist (m)	84.7			277.1	62.9
Turn Bay Length (m)	60.0				
Base Capacity (vph)	1316	657		1074	2039
Starvation Cap Reductn	0	0		0	0
Spillback Cap Reductn	0	0		0	0
Storage Cap Reductn	0	0		0	0
Reduced v/c Ratio	0.45	0.12		0.75	0.47

Intersection Summary

Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 2: and 6:SEL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.
dl Defacto Left Lane. Recode with 1 though lane as a left lane.

Splits and Phases: 76: Spine Road & Street B

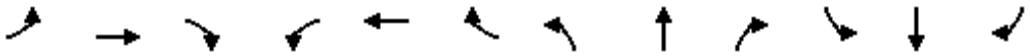
Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	536	73	191	532	424	446
Future Volume (vph)	536	73	191	532	424	446
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	
Lane Util. Factor	0.97	1.00		0.95	0.95	
Frt	1.00	0.85		1.00	0.92	
Flt Protected	0.95	1.00		0.99	1.00	
Satd. Flow (prot)	3471	1601		3532	3303	
Flt Permitted	0.95	1.00		0.55	1.00	
Satd. Flow (perm)	3471	1601		1954	3303	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	596	81	212	591	471	496
RTOR Reduction (vph)	0	50	0	0	271	0
Lane Group Flow (vph)	596	31	0	803	696	0
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	6			4	8	
Permitted Phases		6	4			
Actuated Green, G (s)	21.8	21.8		26.2	26.2	
Effective Green, g (s)	22.8	22.8		27.2	27.2	
Actuated g/C Ratio	0.38	0.38		0.45	0.45	
Clearance Time (s)	6.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	1318	608		885	1497	
v/s Ratio Prot	c0.17				0.21	
v/s Ratio Perm		0.02		c0.41		
v/c Ratio	0.45	0.05		1.18dl	0.46	
Uniform Delay, d1	13.9	11.8		15.2	11.4	
Progression Factor	1.00	1.00		1.00	1.63	
Incremental Delay, d2	1.1	0.2		12.6	0.2	
Delay (s)	15.0	11.9		27.8	18.8	
Level of Service	B	B		C	B	
Approach Delay (s)	14.7			27.8	18.8	
Approach LOS	B			C	B	

Intersection Summary			
HCM 2000 Control Delay	20.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	74.1%	ICU Level of Service	D
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

APPENDIX F

Intersection Capacity Analysis – 2021 Full Build-Out – With Improvements



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	57	84	0	1	77	1	0	344	63	317	224	8
Future Volume (Veh/h)	57	84	0	1	77	1	0	344	63	317	224	8
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	57	84	0	1	77	1	0	344	63	317	224	8
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1246	1269	228	1276	1242	376	232			407		
vC1, stage 1 conf vol	862	862		376	376							
vC2, stage 2 conf vol	384	407		900	866							
vCu, unblocked vol	1246	1269	228	1276	1242	376	232			407		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	70	62	100	99	70	100	100			72		
cM capacity (veh/h)	191	218	811	161	254	671	1336			1152		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	57	84	1	78	0	407	317	232
Volume Left	57	0	1	0	0	0	317	0
Volume Right	0	0	0	1	0	63	0	8
cSH	191	218	161	256	1700	1700	1152	1700
Volume to Capacity	0.30	0.38	0.01	0.31	0.00	0.24	0.28	0.14
Queue Length 95th (m)	9.1	12.9	0.1	9.5	0.0	0.0	8.6	0.0
Control Delay (s)	31.7	31.4	27.6	25.1	0.0	0.0	9.3	0.0
Lane LOS	D	D	D	D			A	
Approach Delay (s)	31.5		25.2		0.0		5.4	
Approach LOS	D		D					

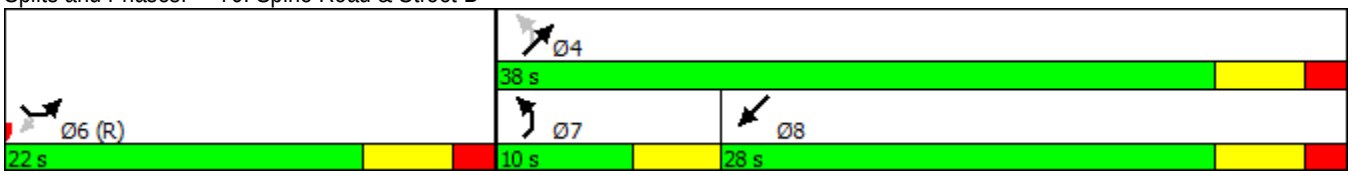
Intersection Summary				
Average Delay	8.0			
Intersection Capacity Utilization	59.3%	ICU Level of Service		B
Analysis Period (min)	15			

Lane Group	SEL	SER	NEL	NET	SWT
Lane Configurations					
Traffic Volume (vph)	536	73	191	532	424
Future Volume (vph)	536	73	191	532	424
Lane Group Flow (vph)	596	81	212	591	967
Turn Type	Prot	Perm	pm+pt	NA	NA
Protected Phases	6		7	4	8
Permitted Phases		6	4		
Detector Phase	6	6	7	4	8
Switch Phase					
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	22.0	22.0	10.0	22.0	22.0
Total Split (s)	22.0	22.0	10.0	38.0	28.0
Total Split (%)	36.7%	36.7%	16.7%	63.3%	46.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	0.0	2.0	2.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	-1.0
Total Lost Time (s)	5.0	5.0	3.0	5.0	5.0
Lead/Lag			Lead		Lag
Lead-Lag Optimize?			Yes		Yes
Recall Mode	C-Max	C-Max	None	None	None
v/c Ratio	0.48	0.13	0.61	0.35	0.71
Control Delay	17.9	5.4	15.2	8.9	12.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	17.9	5.4	15.2	8.9	12.7
Queue Length 50th (m)	26.2	0.0	13.7	23.0	34.4
Queue Length 95th (m)	43.0	7.9	21.1	27.0	47.8
Internal Link Dist (m)	84.7			277.1	62.2
Turn Bay Length (m)	60.0		30.0		
Base Capacity (vph)	1233	620	345	1968	1572
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	0.48	0.13	0.61	0.30	0.62

Intersection Summary

Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 2: and 6:SEL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Splits and Phases: 76: Spine Road & Street B



Movement	SEL	SER	NEL	NET	SWT	SWR
Lane Configurations						
Traffic Volume (vph)	536	73	191	532	424	446
Future Volume (vph)	536	73	191	532	424	446
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	3.0	5.0	5.0	
Lane Util. Factor	0.97	1.00	1.00	0.95	0.95	
Frt	1.00	0.85	1.00	1.00	0.92	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	3471	1601	1789	3579	3303	
Flt Permitted	0.95	1.00	0.18	1.00	1.00	
Satd. Flow (perm)	3471	1601	347	3579	3303	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	596	81	212	591	471	496
RTOR Reduction (vph)	0	52	0	0	341	0
Lane Group Flow (vph)	596	29	212	591	626	0
Turn Type	Prot	Perm	pm+pt	NA	NA	
Protected Phases	6		7	4	8	
Permitted Phases		6	4			
Actuated Green, G (s)	20.3	20.3	27.7	27.7	17.7	
Effective Green, g (s)	21.3	21.3	28.7	28.7	18.7	
Actuated g/C Ratio	0.36	0.36	0.48	0.48	0.31	
Clearance Time (s)	6.0	6.0	4.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	1232	568	334	1711	1029	
v/s Ratio Prot	c0.17		c0.07	0.17	0.19	
v/s Ratio Perm		0.02	c0.23			
v/c Ratio	0.48	0.05	0.63	0.35	0.61	
Uniform Delay, d1	15.1	12.7	11.4	9.8	17.5	
Progression Factor	1.00	1.00	0.98	0.89	1.24	
Incremental Delay, d2	1.4	0.2	3.8	0.1	0.9	
Delay (s)	16.4	12.9	15.0	8.8	22.7	
Level of Service	B	B	B	A	C	
Approach Delay (s)	16.0			10.4	22.7	
Approach LOS	B			B	C	

Intersection Summary			
HCM 2000 Control Delay	16.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group