



Caledon Development LP

TRANSPORTATION IMPACT STUDY

DRAFT PLAN OF SUBDIVISION

12502 MCLAUGHLIN ROAD

TOWN OF CALEDON

FILE NO.: 21T-20005C

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December 11, 2020

Reference Number: 17099/220

Mr. Frank Filippo
Caledon Development LP
137 Bowes Road
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Dear Mr. Filippo:

RE: Transportation Impact Study
Caledon Development LP, Draft Plan of Subdivision
12502 McLaughlin Road, Town of Caledon

LEA Consulting Ltd. (LEA) is pleased to present the findings of our Transportation Impact Study for the Draft Plan of Subdivision application for the property municipally known as 12502 McLaughlin Road located in the Town of Caledon, owned by Caledon Development LP. The property is within the Stage 2 of the Mayfield West Phase 2 (MW2) Secondary Plan Area.

This report concludes that the traffic associated with the planned development maintains acceptable conditions for the road network in the surrounding area, and minor changes for the planned full build-out year of the subdivision does not change the recommendations from the 2018 Transportation Master Plan by Paradigm Consulting.

Should you have any questions regarding this Transportation Impact Study, please do not hesitate to contact the undersigned.

Yours truly,
LEA CONSULTING LTD.

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Encl.

TABLE OF CONTENTS

1	INTRODUCTION	1
2	TRAFFIC CONDITIONS	1
2.1	Existing Road Network	1
2.2	Planned Improvements	2
2.3	Site Trips	2
2.4	Future Total Traffic Conditions	5
2.4.1	2026 Horizon	5
2.4.2	2031 Horizon	7
2.4.3	2041 Horizon	8
3	SIGNAL WARRANT ANALYSES	11
3.1	OTM Signal Warrant	11
3.2	Delay Signal Warrant	11
4	PARKING REVIEW	13
5	CONCLUSIONS AND RECOMMENDATIONS	14

LIST OF APPENDICES

APPENDIX A	2018 TRANSPORTATION MASTER PLAN TRAFFIC DATA
APPENDIX B	2016 TRANSPORTATION TOMORROW SURVEY DATA RESULTS
APPENDIX C	INTERSECTION CAPACITY ANALYSIS RESULTS – Future Total Condition (2026)
APPENDIX D	INTERSECTION CAPACITY ANALYSIS RESULTS – Future Total Condition (2031)
APPENDIX E	INTERSECTION CAPACITY ANALYSIS RESULTS – Future Total Condition (2041)
APPENDIX F	SIGNAL WARRANT SHEETS
APPENDIX G	DELAY SIGNAL WARRANT
APPENDIX H	PARKING PLAN

LIST OF FIGURES

Figure 1-1: Subject Site	1
Figure 1-2: Proposed Draft Plan	2
Figure 2-1: Existing Traffic Volumes	1
Figure 2-2: Planned Road Network Configuration	2
Figure 2-3: Site Traffic.....	4
Figure 2-4: 2026 Future Total Traffic Volumes	5
Figure 2-5: 2031 Future Total Traffic Volumes	7
Figure 2-6: 2041 Future Total Traffic Volumes	9

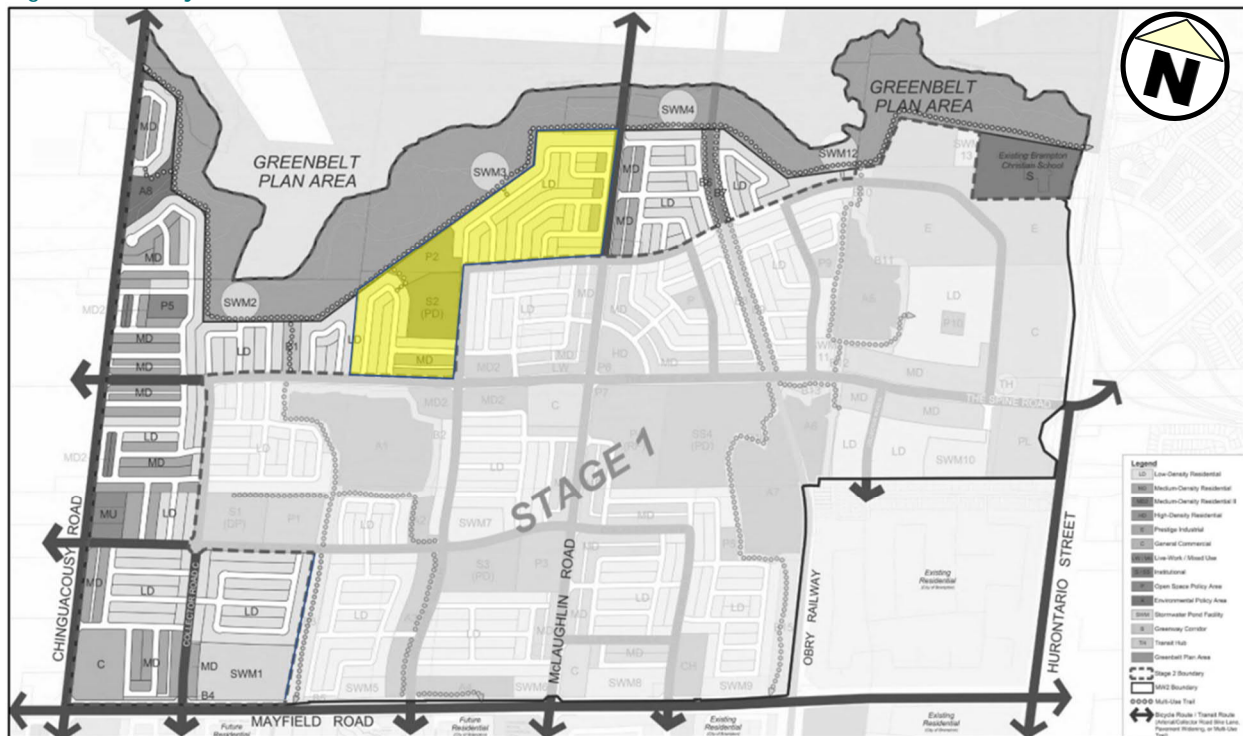
LIST OF TABLES

Table 1-1: Net Change in Subject Site Density	2
Table 2-1: Trip Generation Comparison	3
Table 2-2: Trip Distribution Data.....	4
Table 2-3: 2026 Future Total Signalized Intersection Capacity Analysis Results	6
Table 2-4: 2026 Future Total Unsignalized Intersection Capacity Analysis Results	6
Table 2-5: 2031 Future Total Signalized Intersection Capacity Analysis Results	7
Table 2-6: 2031 Future Total Unsignalized Intersection Capacity Analysis Results	8
Table 2-7: 2041 Future Total Signalized Intersection Capacity Analysis Results	9
Table 2-8: 2041 Future Total Unsignalized Intersection Capacity Analysis Results	10
Table 3-1: Signal Warrant Analyses Results.....	11
Table 3-2: Two-Way Stop Capacity Analysis Results	11
Table 3-3: All-Way Stop Capacity Analysis Results.....	12
Table 4-1: Required Parking Ratios	13
Table 4-2: Vehicle Ownership (2016 TTS) `	13

1 INTRODUCTION

LEA Consulting Ltd. (LEA) has been retained to undertake a Transportation Impact Study (TIS) in support of a Draft Plan of Subdivision application for the property municipally known as 12502 McLaughlin Road located in the Town of Caledon, owned by Caledon Development LP (herein referred to as “subject site”). The property is within the Stage 2 of the Mayfield West Phase 2 (MW2) Secondary Plan Area. Figure 1-1 illustrates the location of the subject site (highlighted in yellow) within the approved Stage 2 area of the MW2 Secondary Plan. The remainder of the property will be developed in a future phase as part of future Draft Plan Application processes.

Figure 1-1: Subject Site



In November 2018, Paradigm Transportation Solutions Limited (Paradigm) completed the Mayfield West Phase 2 Stage 2 Transportation Assessment (herein referred to as “2018 TMP”). There has been some minor intensification to the subdivision lands. As such, this Transportation Impact Study aims to reassess the transportation demands on the network and confirm if the conclusions found in the 2018 TMP still hold true.

The proposed development, as illustrated in Figure 1-2 will include approximately 393 residential units, consisting of 316 single-detached houses and 77 townhouse units, 50 of which are rear-lane townhouse units. An elementary school is planned within the proposed development, with capacity for 850 students. Table 1-1 summarizes the changes between the 2018 TMP and the current 2020 Updated Draft Plan.

Figure 1-2: Proposed Draft Plan

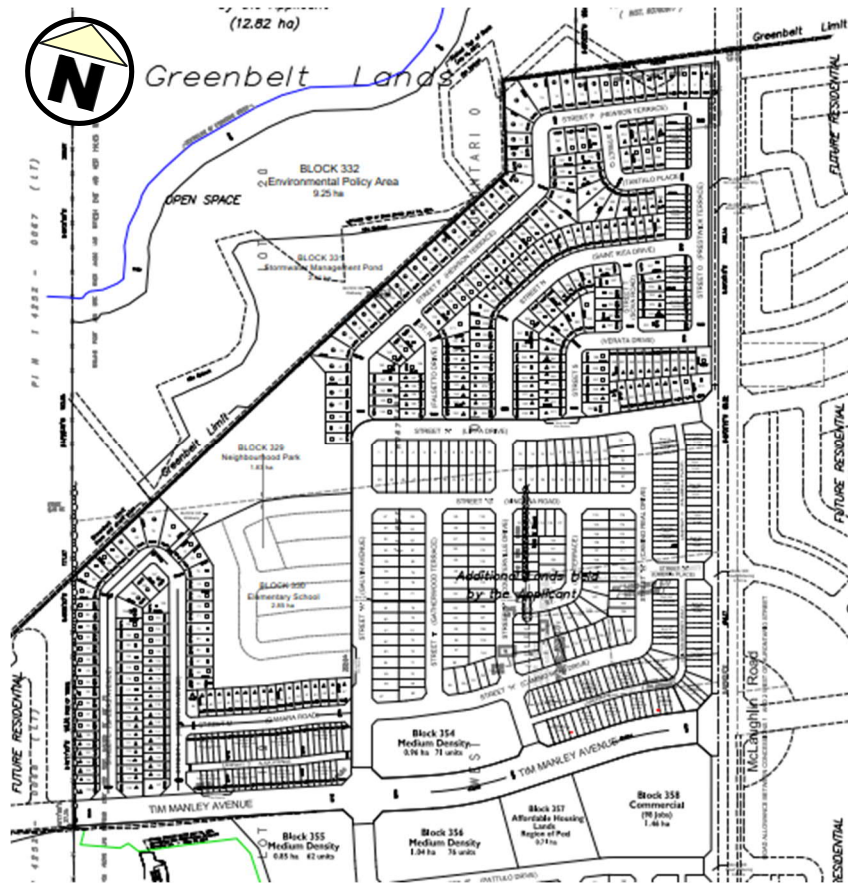


Table 1-1: Net Change in Subject Site Density

Plans	Number of Single-Family Detached Houses	Number of Townhouse Units	Number of Students at Elementary School
2018 TMP	407 Units	99 Units	850 Students
2020 Updated Draft Plan	316 Units	77 Units	850 Students
Net Change	- 91 Units	- 22 Units	-
Overall	- 113 Units		

Overall, the Updated Draft Plan would result in 113 less units than the 2018 TMP. However, to be conservative, the trip generation from the 2018 TMP will be maintained for the analysis in this TIS.

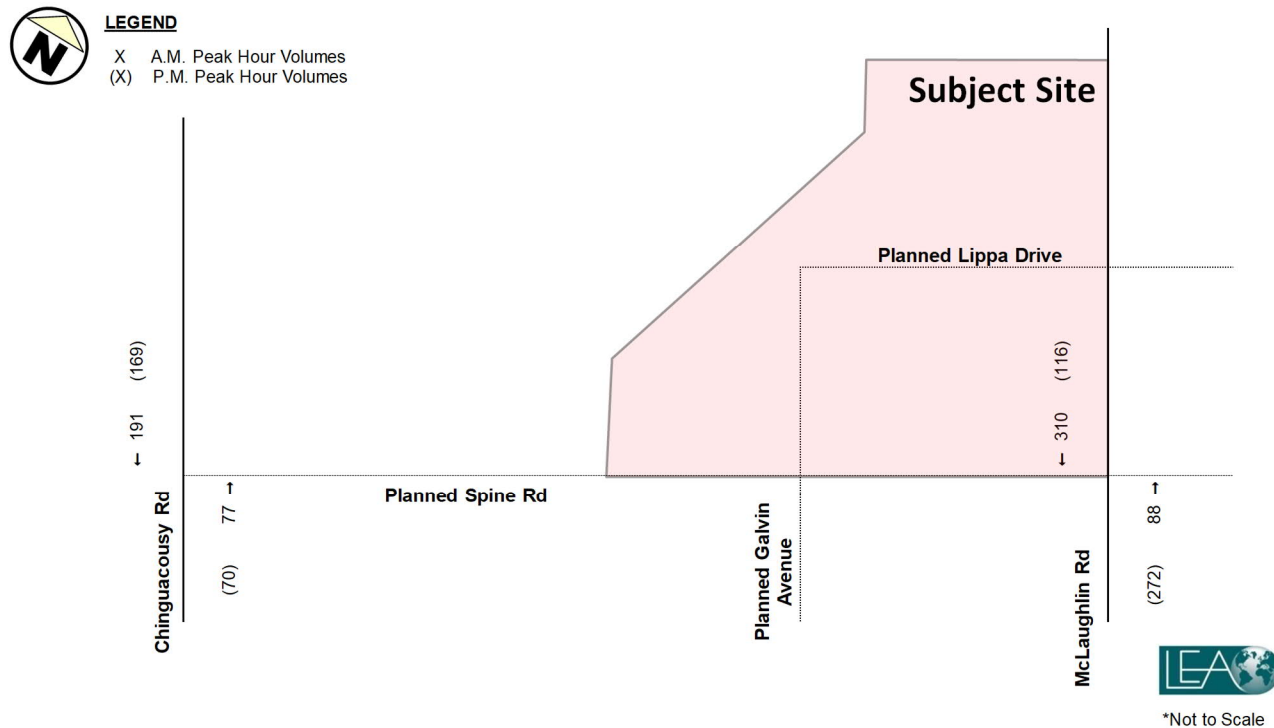
2 TRAFFIC CONDITIONS

2.1 EXISTING ROAD NETWORK

The study area, west of Chinguacousy Road, is currently comprised on undeveloped lands/farmlands. On the east side of Chinguacousy Road, where the subject site is located, construction is commencing in Stage 1 of Mayfield West Phase (2 to the south); however, the adjacent property along Chinguacousy Road remain undeveloped as they are part of Stage 2. Chinguacousy Road is currently a two-lane road (one lane per direction) with a rural cross-section. McLaughlin Road has very similar characteristics, with an existing two-lane rural cross-section (one lane per direction), but will be urbanized by the Town in the future.

Turning movement counts (TMCs) for the intersections within the study area were obtained from the 2018 Transportation Master Plan by Paradigm. Existing traffic volumes are illustrated in Figure 2-1. The obtained traffic data are enclosed in Appendix A.

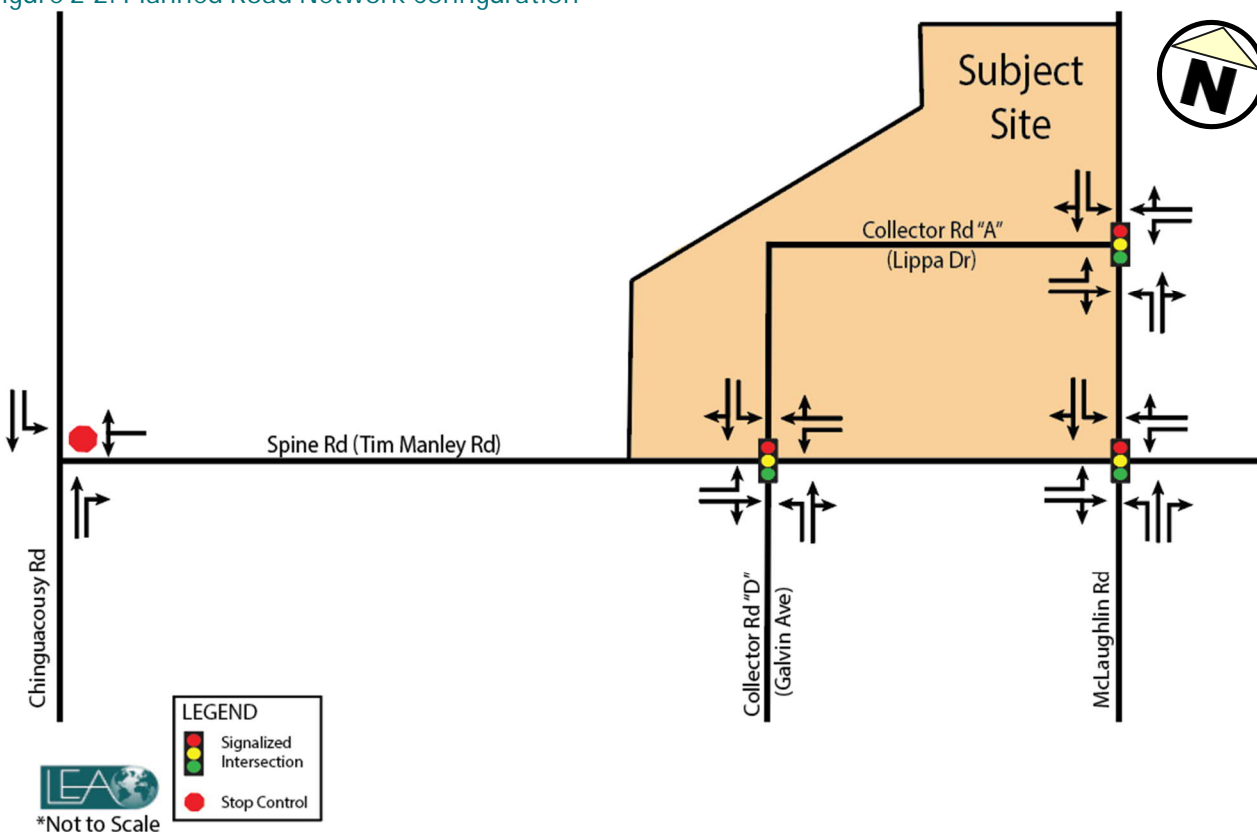
Figure 2-1: Existing Traffic Volumes



2.2 PLANNED IMPROVEMENTS

Several improvements are planned within the study area to better accommodate the planned subdivision. The planned road network and lane configurations are illustrated in Figure 2-2. Please note that Spine Road has recently been renamed to Tim Manley Road. For this report, this road will continue to be referred as the Spine Road.

Figure 2-2: Planned Road Network Configuration



2.3 SITE TRIPS

Trip generation for the development was based on the ITE Trip Generation Manual 10th Edition. Given the proposed uses, LUC 210 – Single Family Detached (Low Density Residential), LUC 220 – Multifamily Housing (Low-Rise), and LUC 520 – Elementary School was used for the development. Table 2-1 summarizes the trip generation comparisons of the subject site for 2018 TMP site statistics and existing site statistics from the 2020 Draft Plan.

Table 2-1: Trip Generation Comparison

Land Use		AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
2018 TMP							
Single Family Detached (Low Density Residential)	407 Units	0.20	0.56	0.76	0.64	0.36	1.00
Modal Split		5%					
Trips Generated		76	218	294	247	140	386
Multifamily Housing (Low-Rise)	99 Units	0.16	0.40	0.56	0.39	0.27	0.67
Modal Split		5%					
Trips Generated		14	38	52	37	26	62
Elementary School	850 Students	0.36	0.31	0.67	0.08	0.09	0.17
Modal Split		5%					
Trips Generated		293	249	541	67	71	137
Total Trips		383	505	887	351	237	585
2020 Draft Plan							
Single Family Detached (Low Density Residential)	316 Units	0.20	0.56	0.76	0.64	0.36	1.00
Modal Split		5%					
Trips Generated		59	169	228	192	108	300
Multifamily Housing (Low-Rise)	77 Units	0.16	0.40	0.56	0.39	0.27	0.67
Modal Split		5%					
Trips Generated		11	29	41	29	20	49
Elementary School	850 Students	0.36	0.31	0.67	0.08	0.09	0.17
Modal Split		5%					
Trips Generated		293	249	541	67	71	137
Total Trips		363	447	810	288	199	486
Net Trips		-20	-58	-77	-63	-38	-99

A 5% modal split reduction was applied to the trip generation. This is consistent with the 2018 TMP.

In comparison with the 2018 TMP trip generation, there would be about 77-99 less two-way trips during both peak hours, which means that site trips are lower than initially expected. However, to be conservative, trip generated rates from the 2018 TMP will be used.

Directional trip distribution of the site traffic from the 2018 TMP was derived using Transportation Tomorrow Survey (TTS) 2011 data. The site traffic was assigned to the road network based on trip patterns in the study area, location and configuration of the site access, and the route providing the shortest travel times. These values were extracted from the 2018 TMP and compared to 2016 TTS data, and are outlined in Table 2-2.

Table 2-2: Trip Distribution Data

Origin/Destination	2011 TTS Data				2016 TTS Data			
	AM		PM		AM		PM	
	In	Out	In	Out	In	Out	In	Out
York & Toronto	11%	23%	27%	6%	10%	25%	33%	6%
Simcoe & Barrie	4%	1%	3%	0%	4%	2%	3%	1%
Dufferin & Orangeville	7%	3%	4%	2%	4%	2%	3%	3%
Waterloo, Wellington & Guelph	1%	0%	0%	0%	1%	1%	2%	0%
Brantford, Hamilton, Halton & Niagara	2%	3%	3%	1%	4%	2%	4%	1%
Caledon	54%	43%	36%	83%	51%	41%	26%	81%
Brampton	18%	15%	16%	6%	24%	18%	19%	6%
Mississauga	3%	11%	11%	2%	2%	9%	10%	1%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%

When comparing the 2011 TTS Trip Distribution to the 2016 TTS Trip Distribution, the trip distributions are similar. Thus, the trip distribution and assignment from the 2018 TMP is still applicable.

The site traffic volumes were extracted from the 2018 TMP and include site traffic generated from all units in the Mayfield West Plan during the weekday AM and PM peak hours. These volumes are illustrated in Figure 2-3.

Figure 2-3: Site Traffic

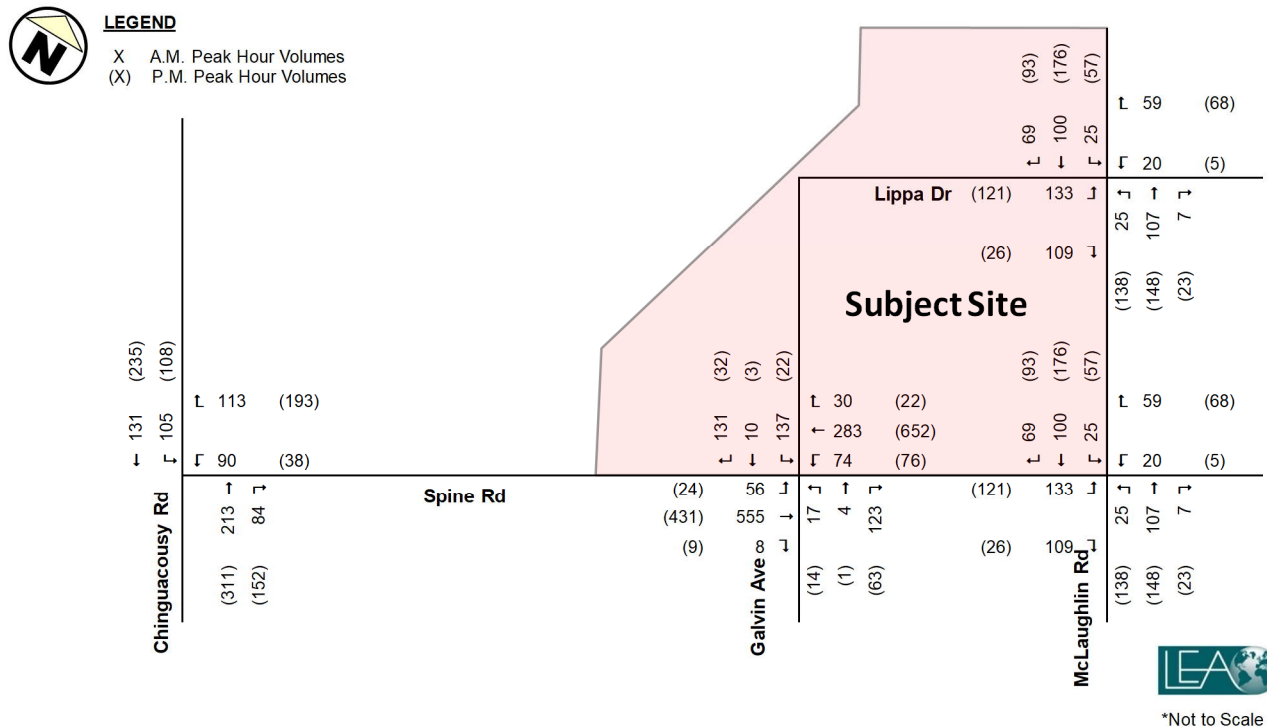


Table 2-3: 2026 Future Total Signalized Intersection Capacity Analysis Results

Intersection	Peak Hour	Overall: V/C / Delay / LOS	Movement of Interest	LOS / Delay (s)	95th Queue (m)	V/C
Galvin Ave & Spine Rd	AM	0.51 / 10 / B	-	-	-	-
	PM	0.47 / 5 / A	-	-	-	-
McLaughlin Rd & Lippa Dr	AM	0.48 / 11 / B	-	-	-	-
	PM	0.44 / 9 / A	-	-	-	-
McLaughlin Rd & Spine Rd	AM	0.95 / 45 / D	EBT	D / 46	292	0.95
			WBL	D / 51	54	0.79
			NBL	D / 38	13	0.20
			NBT	D / 46	55	0.54
			SBL	F / 128	70	1.04
			SBT	D / 50	86	0.64
	PM	0.93 / 43 / D	WBT	D / 51	326	0.99
			NBL	D / 36	36	0.45
			NBT	E / 58	107	0.85
			SBL	D / 46	19	0.34
			SBT	E / 55	38	0.32

The intersections of Galvin Avenue at Spine Road and McLaughlin Road at Lippa Drive are expected to operate below capacity and within acceptable levels of service (LOS) during the studied peak hours for the 2026 study horizon. For the intersection of McLaughlin Road at Spine Road, while the movements summarized above are all expected to operate at a LOS of "D" or worse, they are expected to operate under acceptable conditions under the traffic signal control. Longer delays are expected for several movements that have ample residual capacity. This is reasonable given the cycle length of 120 seconds at this intersection. The southbound left-turn movement during the AM peak period is expected to operate at a LOS of "F". However, the 95th queue length can be accommodated by the storage length of the lane, meaning that the queue will not impede through-moving traffic. Detailed Synchro Analysis results can be found in Appendix C.

Table 2-4: 2026 Future Total Unsignalized Intersection Capacity Analysis Results

Intersection	Movement	Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS
Weekday AM Peak Hour							
Chinguacousy Rd & Spine Rd	WBLTR	98	262	27	0.37	13	D
	WBRTR	123	712	11	0.17	5	B
	SBLTR	114	1139	9	0.10	3	A
Weekday PM Peak Hour							
Chinguacousy Rd & Spine Rd	WBLTR	41	198	27.9	0.21	6	D
	WBRTR	210	628	13.6	0.33	11	B
	SBLTR	117	984	9.2	0.12	3	A

In both peak periods, the intersection of Chinguacousy Road at Spine Road operates at acceptable conditions, with all movements operating at a LOS of "D" or better.

2.4.2 2031 Horizon

The 2031 future total volumes are illustrated in Figure 2-4, while the summarized capacity analysis results for the signalized and unsignalized intersections with optimizing signal timings are shown in Table 2-5 and Table 2-6.

Figure 2-5: 2031 Future Total Traffic Volumes

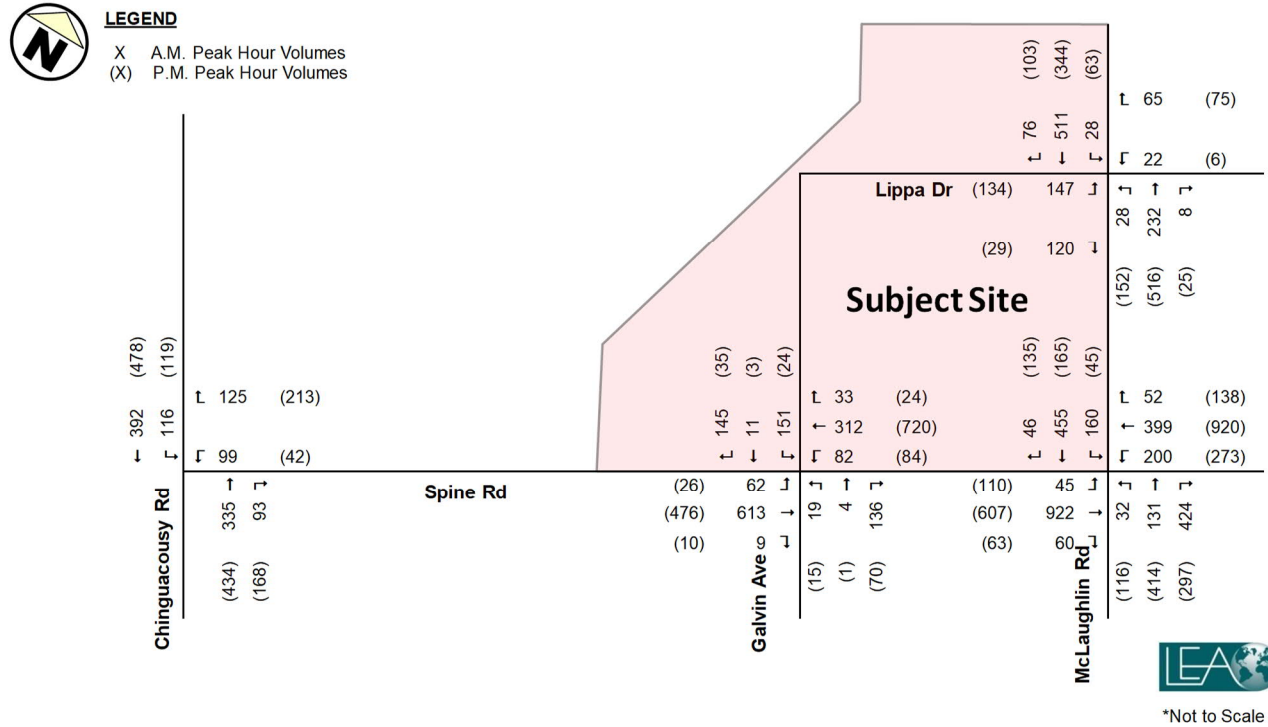


Table 2-5: 2031 Future Total Signalized Intersection Capacity Analysis Results

Intersection	Peak Hour	Overall: V/C / Delay / LOS	Movement of Interest	LOS / Delay (s)	95th Queue (m)	V/C
Galvin Ave & Spine Rd	AM	0.57 / 11 / B	-	-	-	-
	PM	0.52 / 6 / A	-	-	-	-
McLaughlin Rd & Lippa Dr	AM	0.53 / 11 / B	-	-	-	-
	PM	0.49 / 9 / A	-	-	-	-
McLaughlin Rd & Spine Rd	AM	1.05 / 58 / E	EBT	E / 74	335	1.06
			WBL	E / 57	68	0.83
			NBL	D / 38	14	0.25
			NBT	D / 49	67	0.95
			SBL	F / 161	81	1.14
	PM	1.03 / 58 / E	WBT	F / 82	382	1.09
			NBL	D / 38	39	0.53
			NBT	E / 72	127	0.96
			SBL	D / 46	20	0.37
			SBT	E / 55	42	0.35

The intersections of Galvin Avenue at Spine Road and McLaughlin Road at Lippa Drive are expected to operate below capacity and within acceptable levels of service (LOS) during the studied peak hours for the 2031 study horizon. In the AM peak hour, the eastbound through movement and the southbound left-turn movement are both expected to be above capacity.

For the intersection of McLaughlin Road at Spine Road, the overall LOS for the intersection is above capacity, with a v/c ratio of 1.05 in the AM peak hour and 1.03 in the PM peak hour, and LOS of "E". Most movements are expected to operate with ample residual capacity, with delays due to the cycle length of 120 seconds at the intersection. The eastbound through movement during the AM peak hour and the westbound through movement during the PM peak hour operates at above capacity. However, the queues should not impact the upstream intersection of Spine Road and Galvin Avenue. The southbound left-turn movement during the AM peak hour operates at a LOS of "F", with a v/c ratio of 1.14. It is conceivable that travel behaviour will change over time, and these operational concerns may not be as significant. Traffic conditions should be monitored at this intersection.

Detailed Synchro Analysis results can be found in Appendix D.

Table 2-6: 2031 Future Total Unsignalized Intersection Capacity Analysis Results

Intersection	Movement	Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS
Weekday AM Peak Hour							
Chinguacousy Rd & Spine Rd	WBLTR	108	225	35	0.48	18	D
	WBRTR	136	681	12	0.20	6	B
	SBLTR	126	1096	9	0.11	3	A
Weekday PM Peak Hour							
Chinguacousy Rd & Spine Rd	WBLTR	46	164	35.2	0.28	8	E
	WBRTR	232	592	14.9	0.39	14	B
	SBLTR	129	932	9.5	0.14	4	A

In both peak periods, the intersection of Chinguacousy Road at Spine Road operates at acceptable conditions, with all movements operating at a LOS of "D" or better.

2.4.3 2041 Horizon

The 2041 future total volumes are illustrated in Figure 2-4, while the summarized capacity analysis results for the signalized and unsignalized intersections with optimizing signal timings are shown in Table 2-7 and Table 2-8.

Figure 2-6: 2041 Future Total Traffic Volumes

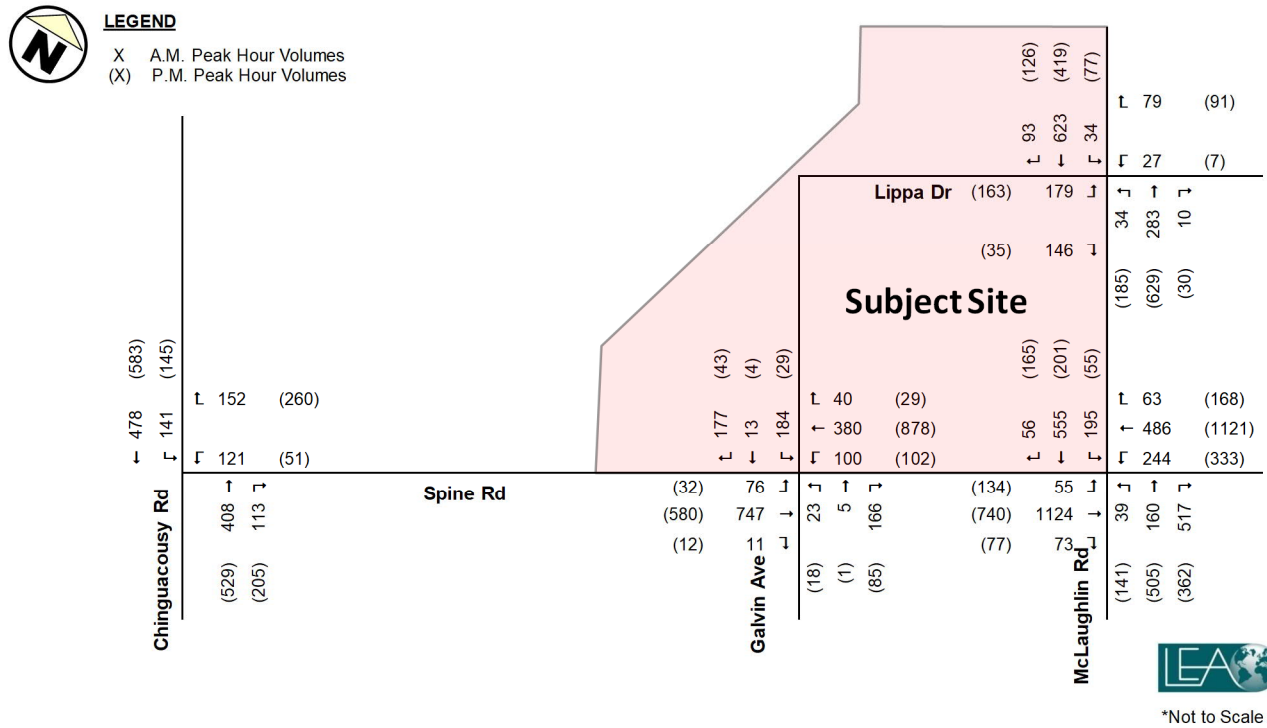


Table 2-7: 2041 Future Total Signalized Intersection Capacity Analysis Results

Intersection	Peak Hour	Overall: V/C / Delay / LOS	Movement of Interest	LOS / Delay (s)	95th Queue (m)	V/C
Galvin Ave & Spine Rd	AM	0.71 / 14 / B	-	-	-	-
	PM	0.63 / 8 / A	SBT	D / 41	7	0.05
McLaughlin Rd & Lippa Dr	AM	0.65 / 18 / B	EBT	E / 68	10	0.07
	PM	0.60 / 12 / B	-	-	-	-
McLaughlin Rd & Spine Rd	AM	1.25 / 104 / F	EBT	F / 175	448	1.31
			EBR	D / 48	1	0.05
			WBL	E / 76	95	0.94
			NBL	D / 38	16	0.27
			NBT	E / 69	109	1.21
			SBL	F / 254	99	1.39
			SBT	E / 71	134	0.95
	PM	1.30 / 122 / F	EBL	D / 50	51	0.81
			EBT	D / 36	230	0.87
			EBR	D / 50	4	0.05
			WBL	F / 173	146	1.24
			WBT	F / 182	508	1.33
			NBL	D / 47	53	0.72
			NBT	F / 150	173	1.20
SBL	D / 45	20	0.45			
SBT	E / 56	53	0.47			

The intersections of Galvin Avenue at Spine Road and McLaughlin Road at Lippa Drive are expected to operate below capacity and within acceptable levels of service (LOS) during the studied peak hours for the 2041 study horizon. The movements of interest with LOS below “D” both operate with low v/c ratios, and 95th queue lengths that are considered acceptable, and are due to delays. These delays can be attributed to the cycle length of 120 seconds at this intersection, and are therefore considered acceptable.

In the AM Peak Hour, the intersections of Galvin Avenue at Spine Road and McLaughlin Road at Lippa Drive both operate at acceptable conditions, with LOS of “B” and “C”, respectively.

The intersection of McLaughlin Road at Spine Road operates at a LOS of “F” during the studied peak hours. These findings are slightly worse than the findings from the 2018 TMP for this intersection, however these traffic conditions are still comparable. It is conceivable that travel behaviour will change over time, and these operational concerns may not be as significant. Additionally, the 2% growth rate per year is considered very conservative and may not accurately represent the growth rate of the study area at the 2041 horizon year.

Table 2-8: 2041 Future Total Unsignalized Intersection Capacity Analysis Results

Intersection	Movement	Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS
Weekday AM Peak Hour							
Chinguacousy Rd & Spine Rd	WBLTR	132	158	91	0.84	43	F
	WBRTR	165	615	13	0.27	8	B
	SBLTR	153	1006	9	0.15	4	A
Weekday PM Peak Hour							
Chinguacousy Rd & Spine Rd	WBLTR	55	105	72.2	0.52	18	F
	WBRTR	283	518	20.0	0.55	25	C
	SBLTR	158	824	10.4	0.19	5	B

In both peak periods, the westbound right-turn and southbound left-turn movements operate at acceptable conditions with the movements operating at a LOS of “C” or better. However, the westbound left-turn operates at a LOS of “F” during the AM and PM peak period. This is due to the average delay of 55 seconds for westbound left-turning traffic. The v/c ratio for the movement is still considered acceptable, with a v/c of 0.65 and 0.40 in the AM and PM peak periods, respectively. The intersection will be analyzed in Section 3 of this TIS to determine the need for signalization to improve traffic conditions.

The remainder of the movements at the intersection operate at acceptable conditions, with a LOS of “C” or better. Detailed Synchro Analysis results can be found in Appendix E.

3 SIGNAL WARRANT ANALYSES

3.1 OTM SIGNAL WARRANT

Traffic signal warrant analyses were conducted based on the methodologies outlined in Ontario Traffic Manual (OTM) Book 12: Traffic Signals for all three horizon years. Appendix F contains the detailed warrant calculation sheets. Table 3-1 summarizes the results of the signal warrants.

Table 3-1: Signal Warrant Analyses Results

Intersection	Horizon Year		
	2026	2031	2041
Chinguacousy Road and Spine Road	Not Warranted	Not Warranted	Not Warranted
Spine Road and Galvin Avenue	Not Warranted	Not Warranted	Not Warranted
McLaughlin Road and Spine Road	Warranted	Warranted	Warranted
Lippa Drive and McLaughlin Road	Not Warranted	Not Warranted	Not Warranted

The 2018 TMP recommended two-way stop control for the east leg of the intersection of Spine Road and Chinguacousy Road. The signal warrant analysis results in this TIS confirm this recommendation.

The intersection of McLaughlin Road at Spine Road was recommended to operate under traffic signals in the 2018 TMP. This recommendation still holds true.

For the intersections of Spine Road at Galvin Avenue and Lippa Drive at McLaughlin Road, the 2018 TMP recommended traffic signals for the 2031 and 2041 horizon years. Based on the signal warrant analyses conducted, traffic signals are not warranted for the two intersections.

3.2 DELAY SIGNAL WARRANT

Further analysis was conducted in Synchro 9.0 to assess the delays for the intersections of Spine Road at Galvin Avenue and Lippa Drive at McLaughlin Road under two-way and all-way stop control for the 2041 horizon year (Appendix G). The results are shown in Table 3-2 and Table 3-3.

Table 3-2: Two-Way Stop Capacity Analysis Results

Intersection	Movement	Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS
Weekday AM Peak Hour							
Galvin Ave & Spine Rd	NBL	23	37	206	0.63	17	F
	SBL	184	31	Err	5.85	Err	F
McLaughlin Rd & Lippa Dr	EBL	179	145	211	1.23	80	F
	WBL	27	106	50	0.25	7	F
Weekday PM Peak Hour							
Galvin Ave & Spine Rd	NBL	18	11	968	1.61	23	F
	SBL	29	10	1643	2.96	36	F
	SBTR	47	158	37	0.30	9	E
McLaughlin Rd & Lippa Dr	EBL	163	34	Err	4.85	Err	F
	WBL	7	48	93	0.15	4	F

Under two-way stop control for the minor roads (Galvin Avenue and Lippa Drive), the left-turning movements operate with a LOS of F. This is due to control delays due to the high volumes of through traffic along Spine Road and McLaughlin Road.

Table 3-3: All-Way Stop Capacity Analysis Results

Intersection	Movement	Flow Rate (vph)	Capacity (vph)	Control Delay (s)	Vol/Cap Ratio (v/c)	Queue Length 95th (m)	LOS
Weekday AM Peak Hour							
Galvin Ave & Spine Rd	EBTR	758	486	286	1.57	-	F
	WBTR	420	475	42	0.87	-	E
McLaughlin Rd & Lippa Dr	SBTR	716	571	155	1.27	-	F
Weekday PM Peak Hour							
Galvin Ave & Spine Rd	EBTR	595	592	57	0.99	-	F
	WBTR	907	615	243	1.49	-	F
McLaughlin Rd & Lippa Dr	NBTR	659	553	129	1.20	-	F
	SBTR	545	545	62	1.00	-	F

Under all-way stop control, the through/right-turning lanes for the major roads (Spine Road and McLaughlin Road) operate with a LOS of E or F. This is due to the high volumes of traffic for the major roads, and results in significant delays.

In summary, traffic signals may still be desirable for the 2041 horizon, to improve circulation, safety, and delay within the subdivision.

4 PARKING REVIEW

Visitor parking ratios for both on-site (off-street) parking and on-street parking for residential units were recommended in the 2018 TMP. These parking requirements are summarized in Table 4-1 below.

Table 4-1: Required Parking Ratios

Source	Land Use/Units	Parking Rate		Total Minimum Requirements	
		On-Site	On-Street	On-Site	On-Street
2018 TMP	Detached 316 Units	2 spaces per unit	1 space per unit	632	316
	Townhouse 77 Units	2 spaces per unit	0.5 spaces per unit	154	39
Total				786	355

Based on the latest parking plans received (attached in Appendix H), a total of 1,208 on-site parking spaces and 213 on-street parking spaces are proposed within the subject site. It is noted that the total number of parking spaces proposed exceeds the requirements specified in the 2018 TMP, although the on-street parking supply is deficient of 142 spaces. As such, vehicle ownership trends were analyzed from 2016 Transportation Tomorrow Survey (TTS) data in the existing neighborhoods surrounding the subject site to understand how the on-site parking supply can satisfy the visitor demand. These results are summarized in Table 4-2 below.

Table 4-2: Vehicle Ownership (2016 TTS)

Number of Vehicles	Percentage of Households
1	28%
2	50%
3+	21%

The 2016 TTS data shows that the majority of households own two or less vehicles. Given the information, households with more than 2 parking spaces (including garage space) would have surplus to serve some of the visitor parking requirements. Based on this assumption, the latest parking plans indicate that a total of 1,208 on-site (off-street) parking spaces will be provided for the subject site. This is a surplus of 422 on-site parking spaces, when compared to the minimum requirement.

When considering the surplus with the on-street parking proposed for the subject site, a total of 635 spaces would be provided for visitors. This would be considered sufficient in meeting the on-street visitors parking requirements.

5 CONCLUSIONS AND RECOMMENDATIONS

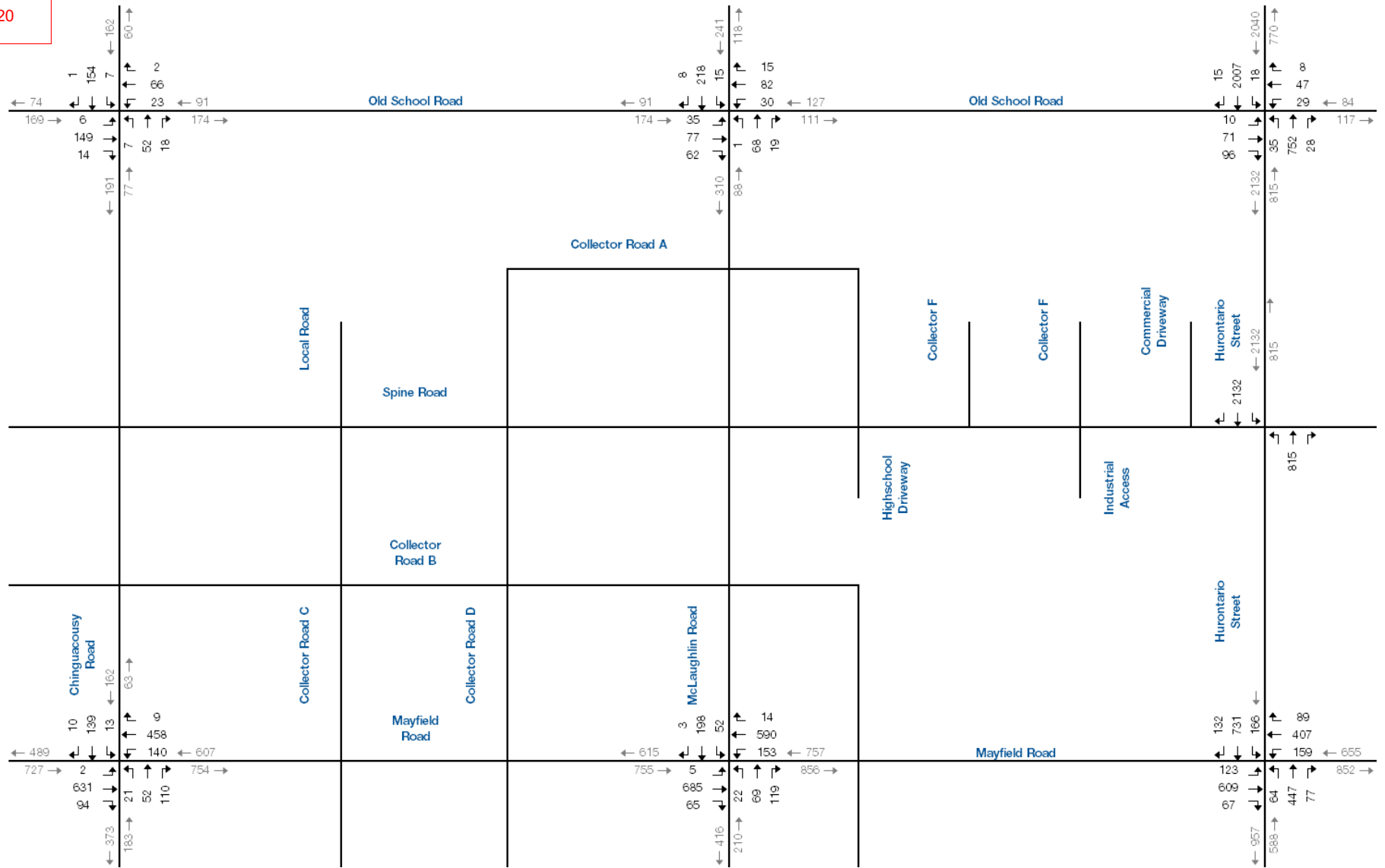
The updated Draft Plan being submitted by Caledon Developments LP for the Town of Caledon (part of the Mayfield West Phase 2 area) has a mix of low-density and medium-density housing, providing a total of 393 residential units, as well as an elementary school for 850 students. Compared to the 2018 TMP, there is a net reduction of 113 residential units. The trip generation resulting from the subject site would be lower than the trip generation originally calculated, meaning that the overall traffic analysis is more conservative.

The 2018 TMP recommends that the intersection of Chinguacousy Road at Spine Road should operate under two-way stop-control. The findings in this report are consistent with the findings from the TMP. The intersections of McLaughlin Road at Spine Road is recommended to operate under traffic signal control. Traffic signals may be installed for the intersections of Galvin Avenue at Spine Road and Lippa Drive at McLaughlin Road to improve delays within the subdivision. The TIS found that traffic conditions are acceptable to 2031, and traffic conditions should continue to be monitored past 2041.

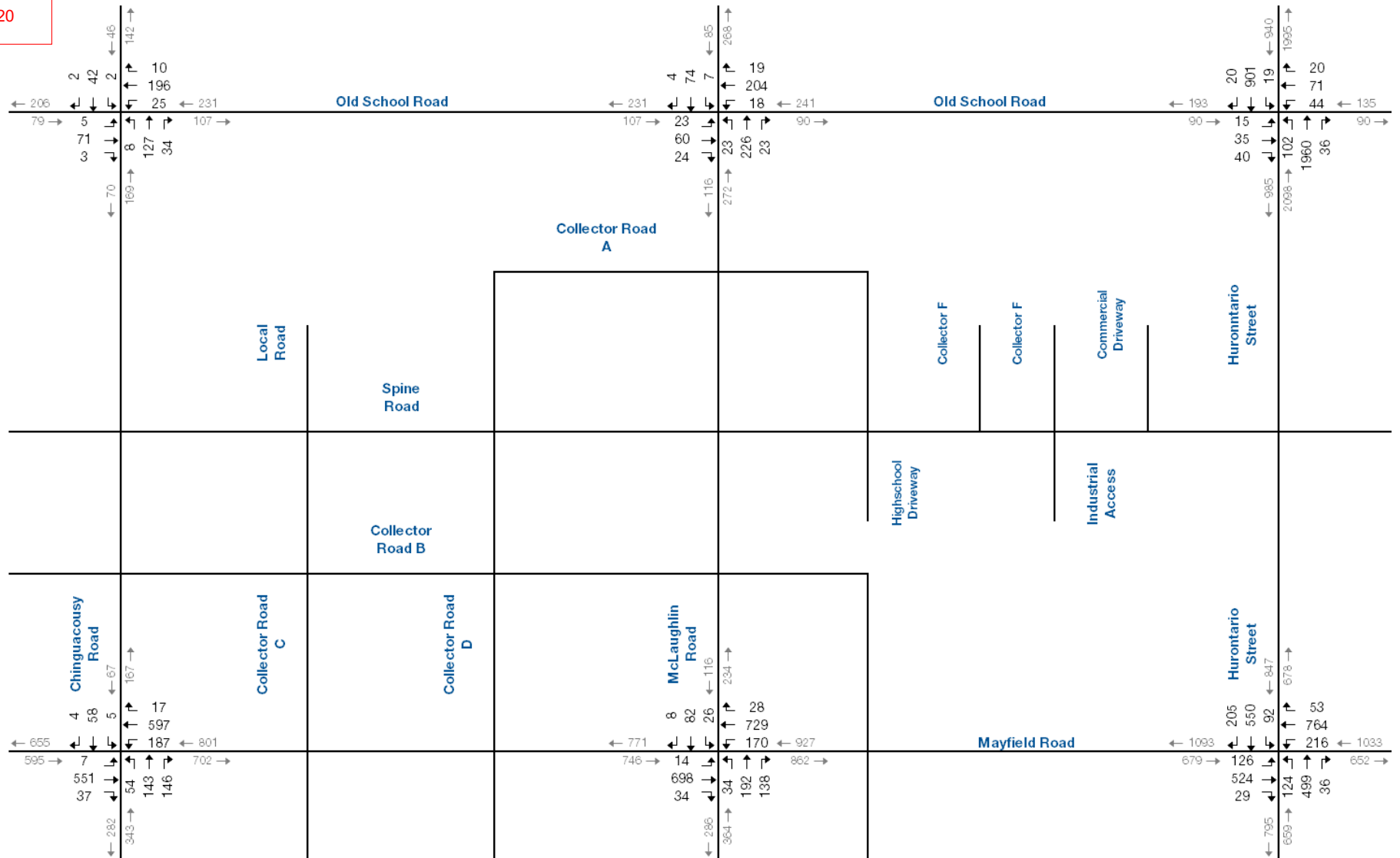
A total of 1,421 parking spaces are proposed for the subject site. This exceeds the required number of parking spaces by 280 spaces. While there is a deficiency of 142 on-street parking spaces proposed, vehicle ownership trends in the surrounding areas indicate that there will be parking spaces available to serve visitor parking in the subdivision.

APPENDIX A

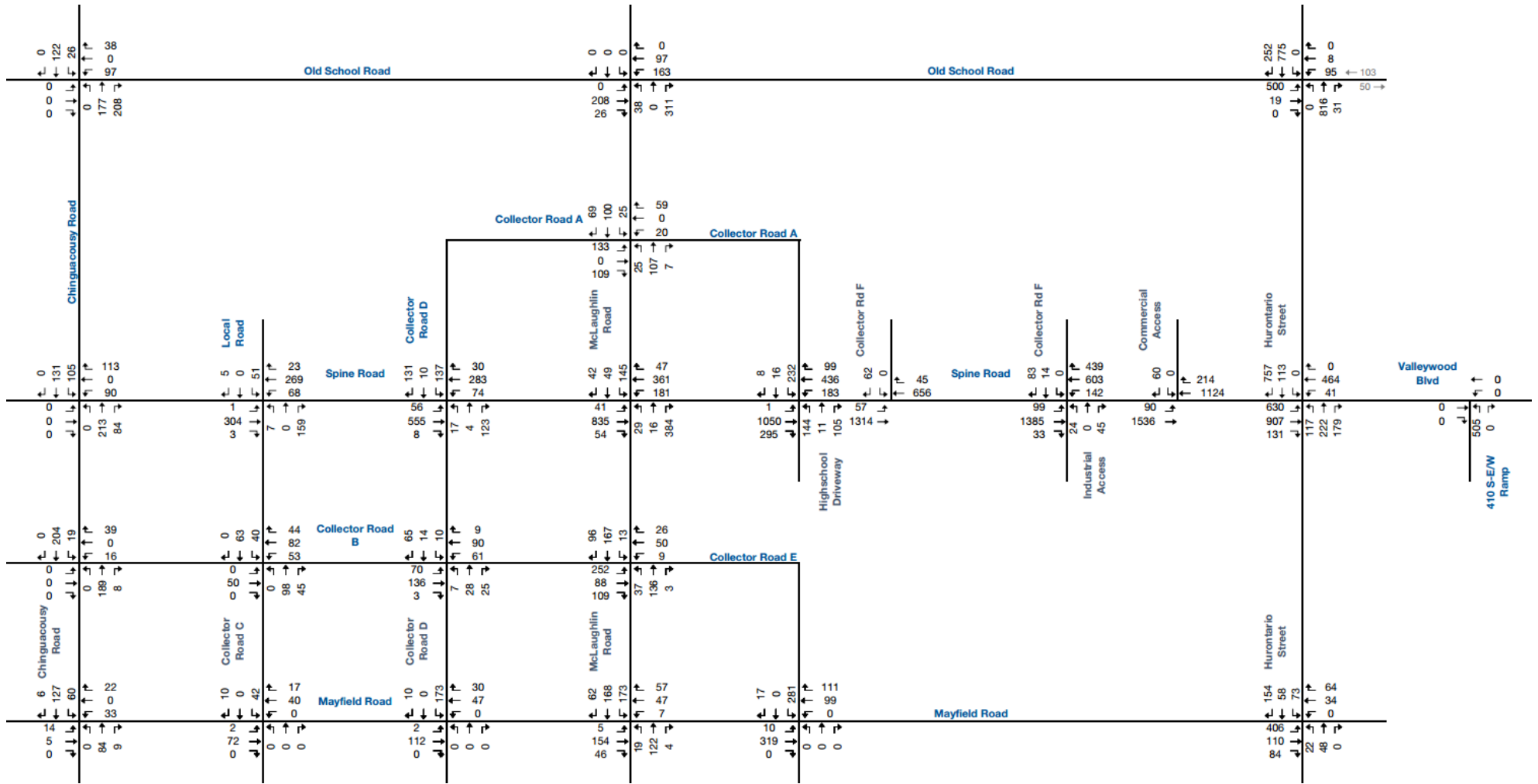
2018 Transportation Master Plan Traffic Data



Existing Traffic – AM Peak Hour

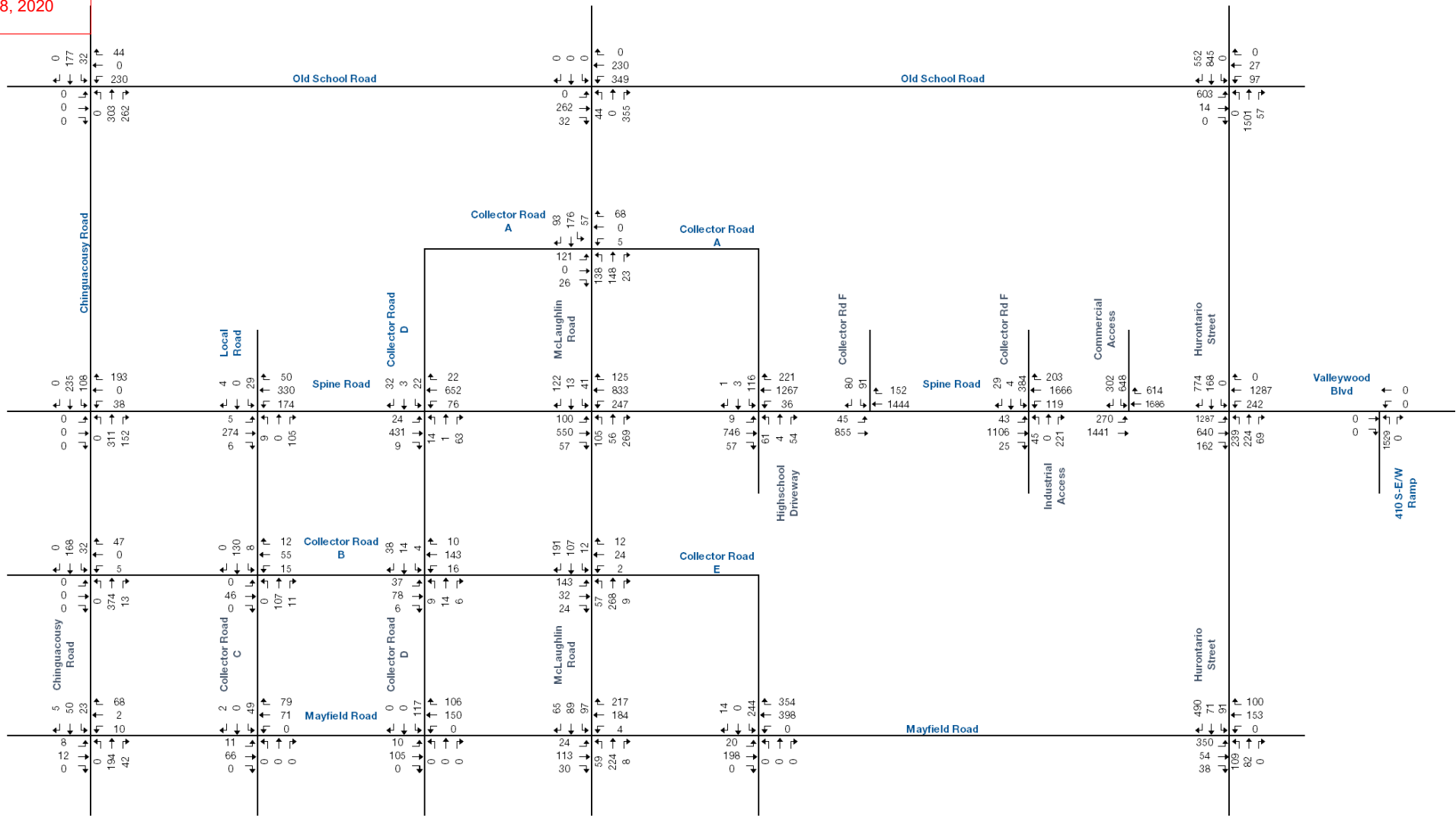


Existing Traffic – PM Peak Hour



Site Trip Assignment – AM Peak Hour

Figure 2.4



Site Trip Assignment – PM Peak Hour

APPENDIX B

2016 Transportation Tomorrow Survey Data

Inbound AM - Caledon, Brampton, Mississauga

Thu Sep 10 2020 10:10:12 GMT-0400 (Eastern Daylight Time) - Run Time: 2118ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of origin - pd_orig
Column: Planning district of destination - pd_dest

Filters:
Planning district of destination - pd_dest In 34
and
Planning district of origin - pd_orig In 34 35 36
and
Start time of trip - start_time In 0700-0859

Trip 2016
Table:

	Caledon	
Caledon	10737	
Brampton	5063	
Mississauga	426	

Inbound AM - Regional

Thu Sep 10 2020 10:08:54 GMT-0400 (Eastern Daylight Time) - Run Time: 2668ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Regional municipality of origin - region_orig
Column: Planning district of destination - pd_dest

Filters:
Planning district of destination - pd_dest In 34
and
Start time of trip - start_time In 0700-0859

Trip 2016
Table:

	Caledon
Toronto	780
Durham	21
York	1270
Peel	16227
Halton	781
Hamilton	11
Niagara	9
Guelph	86
Wellington	178
Orangeville	530
Barrie	45
Simcoe	707
Orillia	28
Dufferin	304

Inbound PM - Caledon, Brampton, Mississauga

Thu Sep 10 2020 10:10:40 GMT-0400 (Eastern Daylight Time) - Run Time: 2137ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of origin - pd_orig
Column: Planning district of destination - pd_dest

Filters:
Planning district of destination - pd_dest In 34
and
Planning district of origin - pd_orig In 34
and
Start time of trip - start_time In 1600-1759

Trip 2016
Table:

	Caledon	
Caledon	5343	
Brampton	3901	
Mississauga	2024	

Inbound PM - Regional

Thu Sep 10 2020 10:09:27 GMT-0400 (Eastern Daylight Time) - Run Time: 2089ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Regional municipality of origin - region_orig
Column: Planning district of destination - pd_dest

Filters:
Planning district of destination - pd_dest In 34
and
Start time of trip - start_time In 1600-1759

Trip 2016
Table:

	Caledon
Toronto	3833
Durham	64
York	2959
Peel	11268
Halton	722
Hamilton	37
Niagara	21
Waterloo	101
Guelph	103
Wellington	179
Orangeville	383
Barrie	29
Simcoe	598
Dufferin	208

Outbound AM - Caledon, Brampton, Mississauga

Thu Sep 10 2020 10:07:15 GMT-0400 (Eastern Daylight Time) - Run Time: 2178ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of household - pd_hhld
Column: Planning district of destination - pd_dest

Filters:

Planning district of household - pd_hhld In 34
and

Planning district of destination - pd_dest In 34 35 36
and

Start time of trip - start_time In 0700-0859

Trip 2016

Table:

	Caledon	Brampton	Mississauga
Caledon	11026	4871	2346

Outbound AM - Regional

Thu Sep 10 2020 10:04:43 GMT-0400 (Eastern Daylight Time) - Run Time: 2293ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of household - pd_hhld

Column: Regional municipality of destination - region_dest

Filters:

Planning district of household - pd_hhld In 34

and

Start time of trip - start_time In 0700-0859

Trip 2016

Table:

	Toronto	Durham	York	Peel	Halton	Hamilton	Waterloo	Guelph	Wellington	Orangeville	Barrie	Simcoe	Dufferin	External
Caledon	3331	34	3294	18243	479	95	30	56	195	462	120	372	77	29

Outbound PM - Caledon, Brampton, Mississauga

Thu Sep 10 2020 10:07:52 GMT-0400 (Eastern Daylight Time) - Run Time: 2403ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of household - pd_hhld

Column: Planning district of destination - pd_dest

Filters:

Planning district of household - pd_hhld In 34

and

Planning d 35 36

and

Start time of trip - start_time In 1600-1759

Trip 2016

Table:

	Caledon	Brampton	Mississauga
Caledon	18995	1314	325

Outbound PM - Regional

Thu Sep 10 2020 10:06:01 GMT-0400 (Eastern Daylight Time) - Run Time: 2116ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Planning district of household - pd_hhld

Column: Regional municipality of destination - region_dest

Filters:

Planning district of household - pd_hhld In 34

and

Start time of trip - start_time In 1600-1759

Trip 2016

Table:

	Toronto	Durham	York	Peel	Halton	Waterloo	Wellington	Orangeville	Simcoe	Dufferin	External
Caledon	693	10	733	20634	177	21	88	536	269	146	73

APPENDIX C

Intersection Capacity Analysis Results –
Future Total Condition (2026)

ICM Unsignalized Intersection Capacity Analysis

09/14/2020

1: Chinguacousy Rd & Spine Rd



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	↶	↷	↶	↷	↶	↶
Traffic Volume (veh/h)	90	113	303	84	105	355
Future Volume (Veh/h)	90	113	303	84	105	355
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	98	123	329	91	114	386
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	943	329			420	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	943	329			420	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	63	83			90	
cM capacity (veh/h)	262	712			1139	

Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	98	123	329	91	114	386
Volume Left	98	0	0	0	114	0
Volume Right	0	123	0	91	0	0
cSH	262	712	1700	1700	1139	1700
Volume to Capacity	0.37	0.17	0.19	0.05	0.10	0.23
Queue Length 95th (m)	12.6	4.7	0.0	0.0	2.5	0.0
Control Delay (s)	26.7	11.1	0.0	0.0	8.5	0.0
Lane LOS	D	B			A	
Approach Delay (s)	18.0		0.0		1.9	
Approach LOS	C					

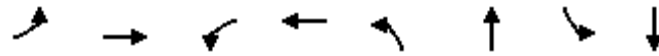
Intersection Summary						
Average Delay			4.3			
Intersection Capacity Utilization			36.8%		ICU Level of Service	A
Analysis Period (min)			15			

Dec 18, 2020

Queues

2: Galvin Ave & Spine Rd

09/14/2020



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	61	612	80	341	18	138	149	153
v/c Ratio	0.10	0.52	0.20	0.29	0.06	0.28	0.50	0.31
Control Delay	6.3	9.2	9.7	9.3	15.7	5.3	22.9	3.8
Queue Delay	0.0	0.2	0.0	0.0	0.0	0.7	4.6	0.0
Total Delay	6.3	9.4	9.7	9.3	15.7	6.1	27.6	3.8
Queue Length 50th (m)	2.2	31.1	9.2	41.4	1.5	0.3	12.5	0.3
Queue Length 95th (m)	7.9	69.5	m20.0	65.0	4.9	9.8	16.5	4.7
Internal Link Dist (m)		382.8		119.3		165.0		103.6
Turn Bay Length (m)	15.0		20.0		15.0		15.0	
Base Capacity (vph)	636	1181	410	1170	406	625	420	635
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	134	0	0	0	274	204	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.58	0.20	0.29	0.04	0.39	0.69	0.24

Intersection Summary

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

Dec 18, 2019

HCM Signalized Intersection Capacity Analysis

2: Galvin Ave & Spine Rd

09/14/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Volume (vph)	56	555	8	74	283	30	17	4	123	137	10	131
Future Volume (vph)	56	555	8	74	283	30	17	4	123	137	10	131
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1879		1789	1856		1789	1609		1789	1621	
Flt Permitted	0.54	1.00		0.35	1.00		0.65	1.00		0.67	1.00	
Satd. Flow (perm)	1013	1879		653	1856		1221	1609		1260	1621	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	61	603	9	80	308	33	18	4	134	149	11	142
RTOR Reduction (vph)	0	1	0	0	5	0	0	102	0	0	108	0
Lane Group Flow (vph)	61	611	0	80	336	0	18	36	0	149	45	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	35.7	35.7		35.7	35.7		12.3	12.3		12.3	12.3	
Effective Green, g (s)	37.7	37.7		37.7	37.7		14.3	14.3		14.3	14.3	
Actuated g/C Ratio	0.63	0.63		0.63	0.63		0.24	0.24		0.24	0.24	
Clearance Time (s)	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	
Lane Grp Cap (vph)	636	1180		410	1166		291	383		300	386	
v/s Ratio Prot		c0.33			0.18			0.02			0.03	
v/s Ratio Perm	0.06			0.12			0.01			c0.12		
v/c Ratio	0.10	0.52		0.20	0.29		0.06	0.09		0.50	0.12	
Uniform Delay, d1	4.4	6.1		4.7	5.1		17.7	17.8		19.7	17.9	
Progression Factor	1.00	1.00		1.42	1.55		1.00	1.00		0.91	0.69	
Incremental Delay, d2	0.3	1.6		1.0	0.6		0.1	0.1		1.3	0.1	
Delay (s)	4.7	7.8		7.7	8.4		17.8	17.9		19.3	12.6	
Level of Service	A	A		A	A		B	B		B	B	
Approach Delay (s)		7.5			8.3			17.9			15.9	
Approach LOS		A			A			B			B	

Intersection Summary

HCM 2000 Control Delay	10.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		

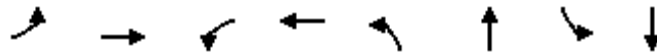
c Critical Lane Group

Dec 18, 2020

Queues

3: McLaughlin Rd & Lipa Dr

09/14/2020



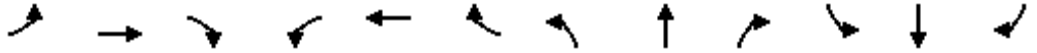
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	145	118	22	64	27	236	27	578
v/c Ratio	0.47	0.20	0.08	0.08	0.05	0.18	0.03	0.45
Control Delay	28.6	1.2	16.4	0.2	6.2	5.8	5.7	7.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.6	1.2	16.4	0.2	6.2	5.8	5.7	7.7
Queue Length 50th (m)	16.6	0.0	1.9	0.0	1.3	16.1	0.9	26.7
Queue Length 95th (m)	25.3	0.0	5.7	0.0	m4.1	33.4	4.1	62.1
Internal Link Dist (m)		126.1		83.2		116.9		176.0
Turn Bay Length (m)	20.0		15.0				15.0	
Base Capacity (vph)	493	773	470	972	496	1296	796	1282
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.15	0.05	0.07	0.05	0.18	0.03	0.45

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
 3: McLaughlin Rd & Lipa Dr

09/14/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Volume (vph)	133	0	109	20	0	59	25	210	7	25	463	69
Future Volume (vph)	133	0	109	20	0	59	25	210	7	25	463	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1601		1789	1601		1789	1874		1789	1847	
Flt Permitted	0.72	1.00		0.68	1.00		0.38	1.00		0.61	1.00	
Satd. Flow (perm)	1347	1601		1283	1601		720	1874		1152	1847	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	145	0	118	22	0	64	27	228	8	27	503	75
RTOR Reduction (vph)	0	93	0	0	51	0	0	1	0	0	6	0
Lane Group Flow (vph)	145	25	0	22	13	0	27	235	0	27	572	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	10.5	10.5		10.5	10.5		37.5	37.5		37.5	37.5	
Effective Green, g (s)	12.5	12.5		12.5	12.5		39.5	39.5		39.5	39.5	
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.66	0.66		0.66	0.66	
Clearance Time (s)	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	
Lane Grp Cap (vph)	280	333		267	333		474	1233		758	1215	
v/s Ratio Prot		0.02			0.01			0.13			c0.31	
v/s Ratio Perm	c0.11			0.02			0.04			0.02		
v/c Ratio	0.52	0.07		0.08	0.04		0.06	0.19		0.04	0.47	
Uniform Delay, d1	21.1	19.1		19.1	19.0		3.6	4.0		3.6	5.1	
Progression Factor	1.24	1.00		1.00	1.00		1.08	1.11		1.00	1.00	
Incremental Delay, d2	1.6	0.1		0.1	0.0		0.2	0.3		0.1	1.3	
Delay (s)	27.9	19.2		19.3	19.0		4.1	4.8		3.7	6.4	
Level of Service	C	B		B	B		A	A		A	A	
Approach Delay (s)		24.0			19.1			4.7			6.3	
Approach LOS		C			B			A			A	

Intersection Summary			
HCM 2000 Control Delay	10.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.3%	ICU Level of Service	A
Analysis Period (min)	15		

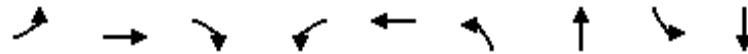
c Critical Lane Group

Dec 18, 2020

Queues

4: McLaughlin Rd & Spine Rd

09/14/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	45	908	59	197	443	32	546	158	494
v/c Ratio	0.08	0.93	0.07	0.77	0.40	0.16	0.68	1.05	0.64
Control Delay	6.4	42.0	0.6	46.3	14.7	34.3	29.4	126.1	50.5
Queue Delay	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.4	45.1	0.6	46.3	14.7	34.3	29.4	126.1	50.5
Queue Length 50th (m)	3.4	205.2	0.0	28.1	54.1	5.6	35.2	~35.8	62.7
Queue Length 95th (m)	m4.9	#291.6	m1.3	#54.0	77.0	13.4	54.5	#69.5	#86.2
Internal Link Dist (m)		119.3			568.4		364.3		116.9
Turn Bay Length (m)	20.0		15.0	50.0		35.0		45.0	
Base Capacity (vph)	588	978	860	288	1099	223	802	151	766
Starvation Cap Reductn	0	32	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	0.08	0.96	0.07	0.68	0.40	0.14	0.68	1.05	0.64

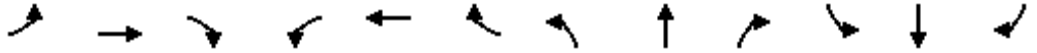
Intersection Summary

- ~ 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.

HCM Signalized Intersection Capacity Analysis

4: McLaughlin Rd & Spine Rd

09/14/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	41	835	54	181	361	47	29	119	384	145	412	42
Future Volume (vph)	41	835	54	181	361	47	29	119	384	145	412	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	4.0	7.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.89		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1883	1601	1789	1851		1789	3169		1789	3529	
Flt Permitted	0.46	1.00	1.00	0.06	1.00		0.25	1.00		0.17	1.00	
Satd. Flow (perm)	875	1883	1601	120	1851		467	3169		317	3529	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	45	908	59	197	392	51	32	129	417	158	448	46
RTOR Reduction (vph)	0	0	31	0	4	0	0	192	0	0	6	0
Lane Group Flow (vph)	45	908	28	197	439	0	32	354	0	158	488	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	63.6	58.8	58.8	75.4	66.6		27.4	22.6		29.8	23.8	
Effective Green, g (s)	67.6	60.8	57.8	75.4	68.6		27.4	24.6		29.8	25.8	
Actuated g/C Ratio	0.56	0.51	0.48	0.63	0.57		0.23	0.21		0.25	0.22	
Clearance Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	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	
Lane Grp Cap (vph)	544	954	771	250	1058		159	649		152	758	
v/s Ratio Prot	0.00	c0.48		c0.08	0.24		0.01	0.11		c0.05	0.14	
v/s Ratio Perm	0.04		0.02	0.41			0.04			c0.21		
v/c Ratio	0.08	0.95	0.04	0.79	0.42		0.20	0.54		1.04	0.64	
Uniform Delay, d1	11.8	28.2	16.4	35.7	14.4		36.9	42.7		42.5	42.9	
Progression Factor	0.87	0.95	1.00	1.00	1.00		1.00	1.00		1.09	1.06	
Incremental Delay, d2	0.1	18.7	0.1	15.1	1.2		0.6	3.3		81.7	3.9	
Delay (s)	10.3	45.5	16.5	50.7	15.6		37.5	46.0		128.0	49.6	
Level of Service	B	D	B	D	B		D	D		F	D	
Approach Delay (s)		42.2			26.4			45.5			68.6	
Approach LOS		D			C			D			E	

Intersection Summary			
HCM 2000 Control Delay	45.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	91.0%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis

1: Chinguacousy Rd & Spine Rd

09/14/2020



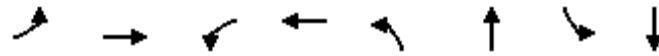
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	38	193	393	152	108	433
Future Volume (Veh/h)	38	193	393	152	108	433
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	41	210	427	165	117	471
Pedestrians						
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	1132	427			592	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1132	427			592	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	79	67			88	
cM capacity (veh/h)	198	628			984	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	41	210	427	165	117	471
Volume Left	41	0	0	0	117	0
Volume Right	0	210	0	165	0	0
cSH	198	628	1700	1700	984	1700
Volume to Capacity	0.21	0.33	0.25	0.10	0.12	0.28
Queue Length 95th (m)	5.7	11.2	0.0	0.0	3.1	0.0
Control Delay (s)	27.9	13.6	0.0	0.0	9.2	0.0
Lane LOS	D	B			A	
Approach Delay (s)	15.9	0.0		1.8		
Approach LOS	C					
Intersection Summary						
Average Delay			3.5			
Intersection Capacity Utilization			40.0%	ICU Level of Service		A
Analysis Period (min)			15			

Dec 18, 2020

Queues

2: Galvin Ave & Spine Rd

09/14/2020



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	26	478	83	733	15	69	24	38
v/c Ratio	0.05	0.31	0.11	0.47	0.08	0.24	0.12	0.14
Control Delay	3.0	3.3	2.5	3.8	22.3	9.1	21.6	9.2
Queue Delay	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0
Total Delay	3.0	3.3	2.5	4.0	22.3	9.2	21.7	9.2
Queue Length 50th (m)	0.6	14.1	3.1	33.0	1.5	0.1	1.2	0.3
Queue Length 95th (m)	2.5	28.4	m4.4	m42.5	5.5	8.7	6.3	6.5
Internal Link Dist (m)		382.8		119.3		165.0		103.6
Turn Bay Length (m)	15.0		20.0		15.0		15.0	
Base Capacity (vph)	522	1550	741	1547	459	580	447	564
Starvation Cap Reductn	0	0	0	240	0	0	0	0
Spillback Cap Reductn	0	29	0	0	0	73	61	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.31	0.11	0.56	0.03	0.14	0.06	0.07

Intersection Summary

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

Dec 18, 2014

HCM Signalized Intersection Capacity Analysis

2: Galvin Ave & Spine Rd

09/14/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔		↔	↔	
Traffic Volume (vph)	24	431	9	76	652	22	14	1	63	22	3	32
Future Volume (vph)	24	431	9	76	652	22	14	1	63	22	3	32
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1878		1789	1874		1789	1605		1789	1623	
Flt Permitted	0.34	1.00		0.48	1.00		0.73	1.00		0.71	1.00	
Satd. Flow (perm)	633	1878		898	1874		1379	1605		1341	1623	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	26	468	10	83	709	24	15	1	68	24	3	35
RTOR Reduction (vph)	0	1	0	0	1	0	0	61	0	0	31	0
Lane Group Flow (vph)	26	477	0	83	732	0	15	8	0	24	7	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	43.5	43.5		43.5	43.5		4.5	4.5		4.5	4.5	
Effective Green, g (s)	45.5	45.5		45.5	45.5		6.5	6.5		6.5	6.5	
Actuated g/C Ratio	0.76	0.76		0.76	0.76		0.11	0.11		0.11	0.11	
Clearance Time (s)	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	
Lane Grp Cap (vph)	480	1424		680	1421		149	173		145	175	
v/s Ratio Prot		0.25			c0.39			0.01			0.00	
v/s Ratio Perm	0.04			0.09			0.01			c0.02		
v/c Ratio	0.05	0.34		0.12	0.52		0.10	0.05		0.17	0.04	
Uniform Delay, d1	1.8	2.3		1.9	2.9		24.1	24.0		24.3	24.0	
Progression Factor	1.00	1.00		0.97	1.07		1.00	1.00		0.93	1.06	
Incremental Delay, d2	0.2	0.6		0.2	0.6		0.3	0.1		0.5	0.1	
Delay (s)	2.0	3.0		2.0	3.7		24.4	24.1		23.2	25.6	
Level of Service	A	A		A	A		C	C		C	C	
Approach Delay (s)		2.9			3.5			24.2			24.6	
Approach LOS		A			A			C			C	

Intersection Summary

HCM 2000 Control Delay	5.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		

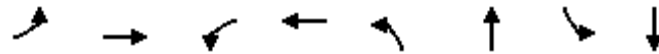
c Critical Lane Group

Dec 18, 2020

Queues

3: McLaughlin Rd & Lipa Dr

09/14/2020



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	132	28	5	74	150	533	62	440
v/c Ratio	0.45	0.04	0.02	0.13	0.24	0.41	0.11	0.34
Control Delay	25.9	0.1	16.0	0.5	6.5	8.1	5.9	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.9	0.1	16.0	0.5	6.5	8.1	5.9	5.9
Queue Length 50th (m)	14.1	0.0	0.5	0.0	10.1	70.9	2.2	16.6
Queue Length 95th (m)	20.6	m0.0	2.3	0.0	m24.2	m100.7	7.6	38.5
Internal Link Dist (m)		126.1		83.2		116.9		176.0
Turn Bay Length (m)	20.0		15.0				15.0	
Base Capacity (vph)	489	875	510	771	630	1314	548	1287
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.03	0.01	0.10	0.24	0.41	0.11	0.34

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis

3: McLaughlin Rd & Lipa Dr

09/14/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Volume (vph)	121	0	26	5	0	68	138	467	23	57	312	93
Future Volume (vph)	121	0	26	5	0	68	138	467	23	57	312	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.99		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1601		1789	1601		1789	1870		1789	1819	
Flt Permitted	0.71	1.00		0.74	1.00		0.48	1.00		0.41	1.00	
Satd. Flow (perm)	1335	1601		1392	1601		898	1870		782	1819	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	132	0	28	5	0	74	150	508	25	62	339	101
RTOR Reduction (vph)	0	22	0	0	59	0	0	2	0	0	12	0
Lane Group Flow (vph)	132	6	0	5	15	0	150	531	0	62	428	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	9.9	9.9		9.9	9.9		38.1	38.1		38.1	38.1	
Effective Green, g (s)	11.9	11.9		11.9	11.9		40.1	40.1		40.1	40.1	
Actuated g/C Ratio	0.20	0.20		0.20	0.20		0.67	0.67		0.67	0.67	
Clearance Time (s)	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	
Lane Grp Cap (vph)	264	317		276	317		600	1249		522	1215	
v/s Ratio Prot		0.00			0.01			c0.28			0.24	
v/s Ratio Perm	c0.10			0.00			0.17			0.08		
v/c Ratio	0.50	0.02		0.02	0.05		0.25	0.43		0.12	0.35	
Uniform Delay, d1	21.4	19.3		19.3	19.5		4.0	4.6		3.6	4.3	
Progression Factor	1.07	1.00		1.00	1.00		1.15	1.38		1.00	1.00	
Incremental Delay, d2	1.5	0.0		0.0	0.1		0.6	0.6		0.5	0.8	
Delay (s)	24.5	19.4		19.4	19.5		5.1	6.9		4.0	5.1	
Level of Service	C	B		B	B		A	A		A	A	
Approach Delay (s)		23.6			19.5			6.5			5.0	
Approach LOS		C			B			A			A	

Intersection Summary

HCM 2000 Control Delay	8.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.1%	ICU Level of Service	A
Analysis Period (min)	15		

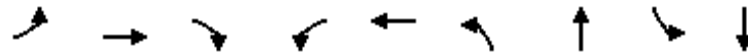
c Critical Lane Group

Dec 18, 2020

Queues

4: McLaughlin Rd & Spine Rd

09/14/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	109	598	62	268	1041	114	700	45	295
v/c Ratio	0.59	0.61	0.07	0.62	0.98	0.45	0.87	0.29	0.44
Control Delay	31.0	23.2	0.9	14.8	47.8	39.8	50.3	41.1	32.6
Queue Delay	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	31.0	24.3	0.9	14.8	47.8	39.8	50.3	41.1	32.6
Queue Length 50th (m)	9.2	87.5	0.0	23.3	224.2	20.8	71.1	8.9	22.2
Queue Length 95th (m)	#28.3	120.0	1.1	34.9	#326.2	36.2	#106.7	19.2	38.0
Internal Link Dist (m)		119.3			287.3		364.3		116.9
Turn Bay Length (m)	20.0		15.0	50.0		35.0		45.0	
Base Capacity (vph)	185	981	862	463	1066	258	804	156	675
Starvation Cap Reductn	0	184	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	0.59	0.75	0.07	0.58	0.98	0.44	0.87	0.29	0.44

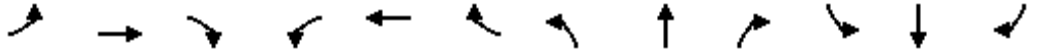
Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

4: McLaughlin Rd & Spine Rd

09/14/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	550	57	247	833	125	105	375	269	41	149	122
Future Volume (vph)	100	550	57	247	833	125	105	375	269	41	149	122
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	4.0	7.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.94		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1883	1601	1789	1847		1789	3355		1789	3337	
Flt Permitted	0.06	1.00	1.00	0.24	1.00		0.34	1.00		0.21	1.00	
Satd. Flow (perm)	122	1883	1601	450	1847		644	3355		394	3337	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	109	598	62	268	905	136	114	408	292	45	162	133
RTOR Reduction (vph)	0	0	32	0	5	0	0	106	0	0	110	0
Lane Group Flow (vph)	109	598	30	268	1036	0	114	594	0	45	185	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	65.7	59.7	59.7	76.2	66.2		31.7	23.0		23.9	19.1	
Effective Green, g (s)	69.7	61.7	58.7	76.2	68.2		31.7	25.0		23.9	21.1	
Actuated g/C Ratio	0.58	0.51	0.49	0.64	0.57		0.26	0.21		0.20	0.18	
Clearance Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	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	
Lane Grp Cap (vph)	181	968	783	425	1049		253	698		134	586	
v/s Ratio Prot	0.04	0.32		c0.07	c0.56		c0.03	c0.18		0.01	0.06	
v/s Ratio Perm	0.31		0.02	0.33			0.09			0.05		
v/c Ratio	0.60	0.62	0.04	0.63	0.99		0.45	0.85		0.34	0.32	
Uniform Delay, d1	26.0	20.8	16.0	14.6	25.5		35.1	45.7		40.4	43.2	
Progression Factor	0.95	0.97	1.00	1.00	1.00		1.00	1.00		1.11	1.25	
Incremental Delay, d2	5.5	2.9	0.1	3.0	25.0		1.3	12.4		1.4	1.4	
Delay (s)	30.1	23.0	16.1	17.6	50.5		36.4	58.1		46.2	55.4	
Level of Service	C	C	B	B	D		D	E		D	E	
Approach Delay (s)		23.4			43.8			55.1			54.2	
Approach LOS		C			D			E			D	

Intersection Summary		
HCM 2000 Control Delay	42.9	HCM 2000 Level of Service D
HCM 2000 Volume to Capacity ratio	0.93	
Actuated Cycle Length (s)	120.0	Sum of lost time (s) 16.0
Intersection Capacity Utilization	92.6%	ICU Level of Service F
Analysis Period (min)	15	

c Critical Lane Group

APPENDIX D

Intersection Capacity Analysis Results –
Future Total Condition (2031)

ICM Unsignalized Intersection Capacity Analysis

09/14/2020

1: Chinguacousy Rd & Spine Rd



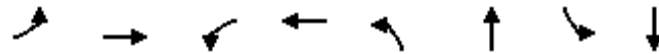
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	99	125	335	93	116	392
Future Volume (Veh/h)	99	125	335	93	116	392
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	108	136	364	101	126	426
Pedestrians						
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	1042	364			465	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1042	364			465	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	52	80			89	
cM capacity (veh/h)	225	681			1096	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	108	136	364	101	126	426
Volume Left	108	0	0	0	126	0
Volume Right	0	136	0	101	0	0
cSH	225	681	1700	1700	1096	1700
Volume to Capacity	0.48	0.20	0.21	0.06	0.11	0.25
Queue Length 95th (m)	18.1	5.6	0.0	0.0	3.0	0.0
Control Delay (s)	34.9	11.6	0.0	0.0	8.7	0.0
Lane LOS	D	B			A	
Approach Delay (s)	21.9		0.0		2.0	
Approach LOS	C					
Intersection Summary						
Average Delay			5.1			
Intersection Capacity Utilization			39.5%		ICU Level of Service	A
Analysis Period (min)			15			

Dec 18, 2020

Queues

2: Galvin Ave & Spine Rd

09/14/2020



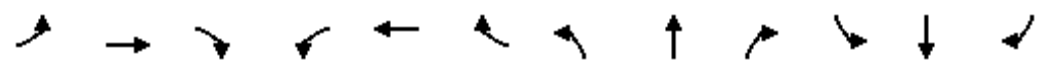
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	67	676	89	375	21	152	164	170
v/c Ratio	0.11	0.58	0.26	0.33	0.07	0.30	0.54	0.33
Control Delay	6.7	10.5	11.0	9.8	15.6	5.1	23.8	3.8
Queue Delay	0.0	0.7	0.0	0.0	0.0	0.9	8.7	0.0
Total Delay	6.7	11.2	11.0	9.8	15.6	6.0	32.5	3.8
Queue Length 50th (m)	2.6	38.1	10.8	47.2	1.8	0.3	13.3	0.3
Queue Length 95th (m)	8.5	81.1	m23.0	72.3	5.4	10.2	18.8	5.4
Internal Link Dist (m)		382.8		119.3		165.0		103.6
Turn Bay Length (m)	15.0		20.0		15.0		15.0	
Base Capacity (vph)	593	1163	349	1153	388	634	410	646
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	212	0	0	0	288	205	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.71	0.26	0.33	0.05	0.44	0.80	0.26

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
 2: Galvin Ave & Spine Rd

09/14/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔		↔	↔	
Traffic Volume (vph)	62	613	9	82	312	33	19	4	136	151	11	145
Future Volume (vph)	62	613	9	82	312	33	19	4	136	151	11	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1879		1789	1856		1789	1608		1789	1621	
Flt Permitted	0.51	1.00		0.30	1.00		0.62	1.00		0.65	1.00	
Satd. Flow (perm)	959	1879		566	1856		1166	1608		1231	1621	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	67	666	10	89	339	36	21	4	148	164	12	158
RTOR Reduction (vph)	0	1	0	0	5	0	0	111	0	0	119	0
Lane Group Flow (vph)	67	675	0	89	370	0	21	41	0	164	51	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	35.1	35.1		35.1	35.1		12.9	12.9		12.9	12.9	
Effective Green, g (s)	37.1	37.1		37.1	37.1		14.9	14.9		14.9	14.9	
Actuated g/C Ratio	0.62	0.62		0.62	0.62		0.25	0.25		0.25	0.25	
Clearance Time (s)	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	
Lane Grp Cap (vph)	592	1161		349	1147		289	399		305	402	
v/s Ratio Prot		c0.36			0.20			0.03			0.03	
v/s Ratio Perm	0.07			0.16			0.02			c0.13		
v/c Ratio	0.11	0.58		0.26	0.32		0.07	0.10		0.54	0.13	
Uniform Delay, d1	4.7	6.8		5.2	5.5		17.3	17.4		19.6	17.5	
Progression Factor	1.00	1.00		1.42	1.51		1.00	1.00		0.92	0.74	
Incremental Delay, d2	0.4	2.1		1.6	0.7		0.1	0.1		1.8	0.1	
Delay (s)	5.1	9.0		9.0	8.9		17.4	17.5		19.7	13.0	
Level of Service	A	A		A	A		B	B		B	B	
Approach Delay (s)		8.6			8.9			17.5			16.3	
Approach LOS		A			A			B			B	

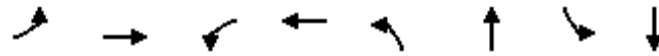
Intersection Summary			
HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	67.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Queues

3: McLaughlin Rd & Lipa Dr

09/14/2020



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	160	130	24	71	30	261	30	638
v/c Ratio	0.50	0.22	0.08	0.09	0.08	0.22	0.04	0.55
Control Delay	28.7	2.1	15.8	0.2	6.7	6.6	6.1	9.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.7	2.1	15.8	0.2	6.7	6.6	6.1	9.6
Queue Length 50th (m)	18.4	0.0	2.1	0.0	1.5	18.1	1.1	32.5
Queue Length 95th (m)	27.3	3.4	5.8	0.0	m4.2	m36.9	4.6	75.3
Internal Link Dist (m)		126.1		83.2		116.9		176.0
Turn Bay Length (m)	20.0		15.0				15.0	
Base Capacity (vph)	490	749	465	949	386	1172	703	1160
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.33	0.17	0.05	0.07	0.08	0.22	0.04	0.55

Intersection Summary

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

Dec 18, 2019

HCM Signalized Intersection Capacity Analysis

3: McLaughlin Rd & Lipa Dr

09/14/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	147	0	120	22	0	65	28	232	8	28	511	76
Future Volume (vph)	147	0	120	22	0	65	28	232	8	28	511	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1601		1789	1601		1789	1874		1789	1847	
Flt Permitted	0.71	1.00		0.67	1.00		0.33	1.00		0.60	1.00	
Satd. Flow (perm)	1339	1601		1269	1601		619	1874		1126	1847	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	160	0	130	24	0	71	30	252	9	30	555	83
RTOR Reduction (vph)	0	99	0	0	54	0	0	2	0	0	7	0
Lane Group Flow (vph)	160	31	0	24	17	0	30	260	0	30	631	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	12.5	12.5		12.5	12.5		35.5	35.5		35.5	35.5	
Effective Green, g (s)	14.5	14.5		14.5	14.5		37.5	37.5		37.5	37.5	
Actuated g/C Ratio	0.24	0.24		0.24	0.24		0.62	0.62		0.62	0.62	
Clearance Time (s)	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	
Lane Grp Cap (vph)	323	386		306	386		386	1171		703	1154	
v/s Ratio Prot		0.02			0.01			0.14			c0.34	
v/s Ratio Perm	c0.12			0.02			0.05			0.03		
v/c Ratio	0.50	0.08		0.08	0.04		0.08	0.22		0.04	0.55	
Uniform Delay, d1	19.6	17.6		17.6	17.4		4.4	4.9		4.3	6.4	
Progression Factor	1.25	1.00		1.00	1.00		1.06	1.11		1.00	1.00	
Incremental Delay, d2	1.2	0.1		0.1	0.0		0.4	0.4		0.1	1.9	
Delay (s)	25.7	17.7		17.7	17.5		5.0	5.8		4.4	8.3	
Level of Service	C	B		B	B		A	A		A	A	
Approach Delay (s)		22.1			17.5			5.7			8.1	
Approach LOS		C			B			A			A	

Intersection Summary

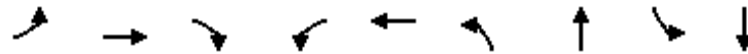
HCM 2000 Control Delay	11.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	53.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Queues

4: McLaughlin Rd & Spine Rd

09/14/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	49	1002	65	217	491	35	603	174	545
v/c Ratio	0.09	1.04	0.08	0.82	0.45	0.20	0.95dr	1.15	0.71
Control Delay	6.2	65.5	0.6	52.2	15.4	35.1	35.8	155.3	52.7
Queue Delay	0.0	10.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.2	76.4	0.6	52.2	15.4	35.1	35.8	155.3	52.7
Queue Length 50th (m)	3.4	~262.6	0.0	33.0	62.1	6.1	45.6	~38.8	69.5
Queue Length 95th (m)	m4.8	#335.4	m1.2	#67.6	87.6	14.1	66.6	#81.0	#100.8
Internal Link Dist (m)		119.3			568.4		364.3		116.9
Turn Bay Length (m)	20.0		15.0	50.0		35.0		45.0	
Base Capacity (vph)	549	968	852	288	1099	204	787	151	763
Starvation Cap Reductn	0	27	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	0.09	1.06	0.08	0.75	0.45	0.17	0.77	1.15	0.71

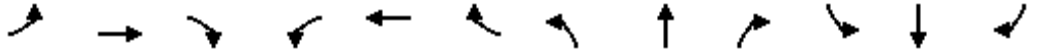
Intersection Summary

- ~ 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.
- dr Defacto Right Lane. Recode with 1 though lane as a right lane.

HCM Signalized Intersection Capacity Analysis

4: McLaughlin Rd & Spine Rd

09/14/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↗		↖	↕		↖	↕	
Traffic Volume (vph)	45	922	60	200	399	52	32	131	424	160	455	46
Future Volume (vph)	45	922	60	200	399	52	32	131	424	160	455	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	4.0	7.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.89		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1883	1601	1789	1851		1789	3168		1789	3529	
Flt Permitted	0.43	1.00	1.00	0.06	1.00		0.19	1.00		0.17	1.00	
Satd. Flow (perm)	809	1883	1601	121	1851		367	3168		318	3529	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	1002	65	217	434	57	35	142	461	174	495	50
RTOR Reduction (vph)	0	0	34	0	4	0	0	177	0	0	6	0
Lane Group Flow (vph)	49	1002	31	217	487	0	35	426	0	174	539	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	62.9	58.1	58.1	75.4	66.6		27.5	22.6		29.7	23.7	
Effective Green, g (s)	66.9	60.1	57.1	75.4	68.6		27.5	24.6		29.7	25.7	
Actuated g/C Ratio	0.56	0.50	0.48	0.63	0.57		0.23	0.21		0.25	0.21	
Clearance Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	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	
Lane Grp Cap (vph)	506	943	761	260	1058		142	649		152	755	
v/s Ratio Prot	0.01	c0.53		c0.09	0.26		0.01	0.13		c0.06	0.15	
v/s Ratio Perm	0.05		0.02	0.43			0.05			c0.23		
v/c Ratio	0.10	1.06	0.04	0.83	0.46		0.25	0.95dr		1.14	0.71	
Uniform Delay, d1	12.3	29.9	16.8	36.9	14.9		37.1	43.8		43.0	43.7	
Progression Factor	0.83	0.93	1.00	1.00	1.00		1.00	1.00		1.09	1.07	
Incremental Delay, d2	0.1	46.2	0.1	20.0	1.4		0.9	5.1		113.7	5.2	
Delay (s)	10.3	74.2	16.9	57.0	16.4		38.0	48.9		160.5	51.9	
Level of Service	B	E	B	E	B		D	D		F	D	
Approach Delay (s)		68.0			28.8			48.3			78.2	
Approach LOS		E			C			D			E	

Intersection Summary			
HCM 2000 Control Delay	57.7	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.05		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	99.1%	ICU Level of Service	F
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.
 c Critical Lane Group

ICM Unsignalized Intersection Capacity Analysis

09/14/2020

1: Chinguacousy Rd & Spine Rd



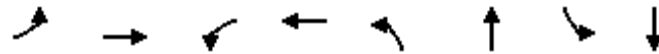
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	42	213	434	168	119	478
Future Volume (Veh/h)	42	213	434	168	119	478
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	46	232	472	183	129	520
Pedestrians						
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	1250	472			655	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1250	472			655	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	72	61			86	
cM capacity (veh/h)	164	592			932	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	46	232	472	183	129	520
Volume Left	46	0	0	0	129	0
Volume Right	0	232	0	183	0	0
cSH	164	592	1700	1700	932	1700
Volume to Capacity	0.28	0.39	0.28	0.11	0.14	0.31
Queue Length 95th (m)	8.3	14.1	0.0	0.0	3.6	0.0
Control Delay (s)	35.2	14.9	0.0	0.0	9.5	0.0
Lane LOS	E	B			A	
Approach Delay (s)	18.3		0.0		1.9	
Approach LOS	C					
Intersection Summary						
Average Delay			4.0			
Intersection Capacity Utilization			42.8%		ICU Level of Service	A
Analysis Period (min)			15			

Dec 18, 2020

Queues

2: Galvin Ave & Spine Rd

09/14/2020



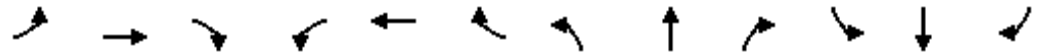
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	28	528	91	809	16	77	26	41
v/c Ratio	0.06	0.34	0.13	0.52	0.08	0.26	0.13	0.15
Control Delay	3.2	3.5	2.6	4.2	22.2	8.9	23.3	10.4
Queue Delay	0.0	0.0	0.0	0.3	0.0	0.1	0.0	0.0
Total Delay	3.2	3.5	2.6	4.5	22.2	9.0	23.3	10.4
Queue Length 50th (m)	0.7	16.3	3.4	41.7	1.6	0.1	1.6	0.0
Queue Length 95th (m)	2.8	32.7	m4.5	m43.8	5.7	9.1	7.4	7.8
Internal Link Dist (m)		382.8		119.3		165.0		103.6
Turn Bay Length (m)	15.0		20.0		15.0		15.0	
Base Capacity (vph)	460	1547	693	1544	458	585	444	566
Starvation Cap Reductn	0	0	0	233	0	0	0	0
Spillback Cap Reductn	0	59	0	0	0	114	94	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.35	0.13	0.62	0.03	0.16	0.07	0.07

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
 2: Galvin Ave & Spine Rd

09/14/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔		↔	↔	
Traffic Volume (vph)	26	476	10	84	720	24	15	1	70	24	3	35
Future Volume (vph)	26	476	10	84	720	24	15	1	70	24	3	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1878		1789	1874		1789	1605		1789	1622	
Flt Permitted	0.30	1.00		0.45	1.00		0.73	1.00		0.71	1.00	
Satd. Flow (perm)	560	1878		841	1874		1376	1605		1331	1622	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	28	517	11	91	783	26	16	1	76	26	3	38
RTOR Reduction (vph)	0	1	0	0	1	0	0	68	0	0	34	0
Lane Group Flow (vph)	28	527	0	91	808	0	16	9	0	26	7	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	43.4	43.4		43.4	43.4		4.6	4.6		4.6	4.6	
Effective Green, g (s)	45.4	45.4		45.4	45.4		6.6	6.6		6.6	6.6	
Actuated g/C Ratio	0.76	0.76		0.76	0.76		0.11	0.11		0.11	0.11	
Clearance Time (s)	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	
Lane Grp Cap (vph)	423	1421		636	1417		151	176		146	178	
v/s Ratio Prot		0.28			c0.43			0.01			0.00	
v/s Ratio Perm	0.05			0.11			0.01			c0.02		
v/c Ratio	0.07	0.37		0.14	0.57		0.11	0.05		0.18	0.04	
Uniform Delay, d1	1.9	2.5		2.0	3.1		24.0	23.9		24.2	23.9	
Progression Factor	1.00	1.00		0.98	1.10		1.00	1.00		1.01	1.27	
Incremental Delay, d2	0.3	0.7		0.1	0.5		0.3	0.1		0.6	0.1	
Delay (s)	2.2	3.2		2.1	4.0		24.4	24.0		25.0	30.5	
Level of Service	A	A		A	A		C	C		C	C	
Approach Delay (s)		3.2			3.8			24.1			28.4	
Approach LOS		A			A			C			C	

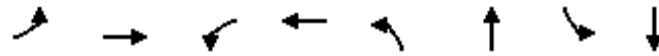
Intersection Summary			
HCM 2000 Control Delay	5.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	60.7%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Queues

3: McLaughlin Rd & Lipa Dr

09/14/2020



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	146	32	7	82	165	588	68	486
v/c Ratio	0.48	0.05	0.02	0.15	0.29	0.45	0.14	0.38
Control Delay	25.6	0.1	15.5	0.6	7.6	9.4	6.6	6.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	25.6	0.1	15.5	0.6	7.6	9.4	6.6	6.7
Queue Length 50th (m)	15.2	0.0	0.6	0.0	13.0	79.8	2.5	20.0
Queue Length 95th (m)	21.9	m0.0	2.8	0.0	m25.0	m103.0	8.9	46.1
Internal Link Dist (m)		126.1		83.2		116.9		176.0
Turn Bay Length (m)	20.0		15.0				15.0	
Base Capacity (vph)	486	850	508	747	575	1295	489	1268
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.04	0.01	0.11	0.29	0.45	0.14	0.38

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis

3: McLaughlin Rd & Lipa Dr

09/14/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷		↶	↷		↶	↷		↶	↷	
Traffic Volume (vph)	134	0	29	6	0	75	152	516	25	63	344	103
Future Volume (vph)	134	0	29	6	0	75	152	516	25	63	344	103
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.99		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1601		1789	1601		1789	1870		1789	1818	
Flt Permitted	0.70	1.00		0.74	1.00		0.44	1.00		0.38	1.00	
Satd. Flow (perm)	1325	1601		1387	1601		833	1870		708	1818	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	146	0	32	7	0	82	165	561	27	68	374	112
RTOR Reduction (vph)	0	25	0	0	65	0	0	2	0	0	12	0
Lane Group Flow (vph)	146	7	0	7	17	0	165	586	0	68	474	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	10.5	10.5		10.5	10.5		37.5	37.5		37.5	37.5	
Effective Green, g (s)	12.5	12.5		12.5	12.5		39.5	39.5		39.5	39.5	
Actuated g/C Ratio	0.21	0.21		0.21	0.21		0.66	0.66		0.66	0.66	
Clearance Time (s)	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	
Lane Grp Cap (vph)	276	333		288	333		548	1231		466	1196	
v/s Ratio Prot		0.00			0.01			c0.31			0.26	
v/s Ratio Perm	c0.11			0.01			0.20			0.10		
v/c Ratio	0.53	0.02		0.02	0.05		0.30	0.48		0.15	0.40	
Uniform Delay, d1	21.1	18.9		18.9	19.0		4.4	5.1		3.9	4.7	
Progression Factor	1.06	1.00		1.00	1.00		1.21	1.45		1.00	1.00	
Incremental Delay, d2	1.8	0.0		0.0	0.1		0.6	0.6		0.7	1.0	
Delay (s)	24.3	18.9		18.9	19.1		5.9	8.0		4.5	5.7	
Level of Service	C	B		B	B		A	A		A	A	
Approach Delay (s)		23.3			19.1			7.5			5.6	
Approach LOS		C			B			A			A	

Intersection Summary

HCM 2000 Control Delay	9.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		

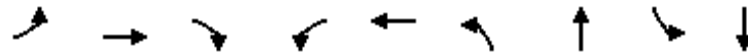
c Critical Lane Group

Dec 18, 2020

Queues

4: McLaughlin Rd & Spine Rd

09/14/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	120	660	68	297	1150	126	773	49	326
v/c Ratio	0.65	0.68	0.08	0.76	1.08	0.52	0.96	0.32	0.48
Control Delay	35.9	25.9	1.1	23.3	77.4	42.5	63.4	40.9	32.6
Queue Delay	0.0	1.4	0.0	0.0	4.2	0.0	0.0	0.0	0.0
Total Delay	35.9	27.2	1.1	23.3	81.5	42.5	63.4	40.9	32.6
Queue Length 50th (m)	11.1	99.1	0.1	26.3	~301.8	23.2	~88.3	9.8	24.9
Queue Length 95th (m)	#35.5	165.9	1.5	47.8	#381.5	39.4	#127.4	19.5	41.6
Internal Link Dist (m)		119.3			784.6		364.3		116.9
Turn Bay Length (m)	20.0		15.0	50.0		35.0		45.0	
Base Capacity (vph)	185	968	852	413	1066	244	804	156	684
Starvation Cap Reductn	0	144	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	10	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.80	0.08	0.72	1.09	0.52	0.96	0.31	0.48

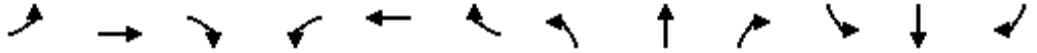
Intersection Summary

- ~ 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.

HCM Signalized Intersection Capacity Analysis

4: McLaughlin Rd & Spine Rd

09/14/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↗		↖	↕		↖	↕	
Traffic Volume (vph)	110	607	63	273	920	138	116	414	297	45	165	135
Future Volume (vph)	110	607	63	273	920	138	116	414	297	45	165	135
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	4.0	7.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.94		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1883	1601	1789	1847		1789	3354		1789	3336	
Flt Permitted	0.07	1.00	1.00	0.19	1.00		0.30	1.00		0.21	1.00	
Satd. Flow (perm)	124	1883	1601	356	1847		571	3354		397	3336	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	120	660	68	297	1000	150	126	450	323	49	179	147
RTOR Reduction (vph)	0	0	35	0	5	0	0	105	0	0	121	0
Lane Group Flow (vph)	120	660	33	297	1145	0	126	668	0	49	205	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	64.9	58.9	58.9	76.2	66.2		31.8	23.0		23.8	19.0	
Effective Green, g (s)	68.9	60.9	57.9	76.2	68.2		31.8	25.0		23.8	21.0	
Actuated g/C Ratio	0.57	0.51	0.48	0.64	0.57		0.27	0.21		0.20	0.18	
Clearance Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	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	
Lane Grp Cap (vph)	182	955	772	384	1049		240	698		134	583	
v/s Ratio Prot	0.04	0.35		c0.09	c0.62		c0.04	c0.20		0.01	0.06	
v/s Ratio Perm	0.34		0.02	0.40			0.10			0.06		
v/c Ratio	0.66	0.69	0.04	0.77	1.09		0.53	0.96		0.37	0.35	
Uniform Delay, d1	26.1	22.4	16.4	17.5	25.9		35.4	47.0		40.6	43.5	
Progression Factor	0.93	0.97	1.00	1.00	1.00		1.00	1.00		1.08	1.24	
Incremental Delay, d2	8.2	4.0	0.1	9.4	56.3		2.1	25.0		1.6	1.6	
Delay (s)	32.5	25.7	16.5	26.8	82.2		37.5	71.9		45.5	55.4	
Level of Service	C	C	B	C	F		D	E		D	E	
Approach Delay (s)		25.9			70.8			67.1			54.1	
Approach LOS		C			E			E			D	

Intersection Summary		
HCM 2000 Control Delay	57.5	HCM 2000 Level of Service E
HCM 2000 Volume to Capacity ratio	1.03	
Actuated Cycle Length (s)	120.0	Sum of lost time (s) 16.0
Intersection Capacity Utilization	100.5%	ICU Level of Service G
Analysis Period (min)	15	

c Critical Lane Group

APPENDIX E

Intersection Capacity Results –
Future Total Condition (2041)

ICM Unsignalized Intersection Capacity Analysis

09/14/2020

1: Chinguacousy Rd & Spine Rd



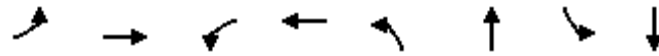
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	121	152	408	113	141	478
Future Volume (Veh/h)	121	152	408	113	141	478
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	132	165	443	123	153	520
Pedestrians						
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	1269	443			566	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1269	443			566	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	16	73			85	
cM capacity (veh/h)	158	615			1006	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	132	165	443	123	153	520
Volume Left	132	0	0	0	153	0
Volume Right	0	165	0	123	0	0
cSH	158	615	1700	1700	1006	1700
Volume to Capacity	0.84	0.27	0.26	0.07	0.15	0.31
Queue Length 95th (m)	42.7	8.2	0.0	0.0	4.1	0.0
Control Delay (s)	91.1	13.0	0.0	0.0	9.2	0.0
Lane LOS	F	B			A	
Approach Delay (s)	47.7		0.0		2.1	
Approach LOS	E					
Intersection Summary						
Average Delay			10.1			
Intersection Capacity Utilization			46.0%		ICU Level of Service	A
Analysis Period (min)			15			

Dec 18, 2020

Queues

2: Galvin Ave & Spine Rd

09/14/2020



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	83	824	109	456	25	185	200	206
v/c Ratio	0.17	0.74	0.51	0.41	0.09	0.34	0.65	0.35
Control Delay	7.9	15.9	24.5	11.1	15.1	6.6	27.0	3.9
Queue Delay	0.0	24.7	0.0	0.0	0.0	1.6	50.6	0.0
Total Delay	7.9	40.6	24.5	11.1	15.1	8.2	77.6	3.9
Queue Length 50th (m)	3.8	59.7	16.1	62.6	2.0	3.0	14.9	0.3
Queue Length 95th (m)	10.6	#135.1	m34.4	m88.3	6.2	14.1	m23.8	m6.5
Internal Link Dist (m)		382.8		119.3		165.0		103.6
Turn Bay Length (m)	15.0		20.0		15.0		15.0	
Base Capacity (vph)	491	1115	212	1105	355	634	378	668
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	316	0	0	0	298	189	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	1.03	0.51	0.41	0.07	0.55	1.06	0.31

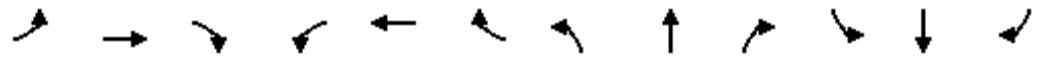
Intersection Summary

- # 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.

HCM Signalized Intersection Capacity Analysis

2: Galvin Ave & Spine Rd

09/14/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔		↔	↔	
Traffic Volume (vph)	76	747	11	100	380	40	23	5	166	184	13	177
Future Volume (vph)	76	747	11	100	380	40	23	5	166	184	13	177
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	0.99		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1879		1789	1857		1789	1609		1789	1620	
Flt Permitted	0.44	1.00		0.19	1.00		0.57	1.00		0.60	1.00	
Satd. Flow (perm)	829	1879		357	1857		1066	1609		1134	1620	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	83	812	12	109	413	43	25	5	180	200	14	192
RTOR Reduction (vph)	0	1	0	0	5	0	0	107	0	0	140	0
Lane Group Flow (vph)	83	823	0	109	451	0	25	78	0	200	66	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	33.6	33.6		33.6	33.6		14.4	14.4		14.4	14.4	
Effective Green, g (s)	35.6	35.6		35.6	35.6		16.4	16.4		16.4	16.4	
Actuated g/C Ratio	0.59	0.59		0.59	0.59		0.27	0.27		0.27	0.27	
Clearance Time (s)	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	
Lane Grp Cap (vph)	491	1114		211	1101		291	439		309	442	
v/s Ratio Prot		c0.44			0.24			0.05			0.04	
v/s Ratio Perm	0.10			0.31			0.02			c0.18		
v/c Ratio	0.17	0.74		0.52	0.41		0.09	0.18		0.65	0.15	
Uniform Delay, d1	5.5	8.8		7.2	6.6		16.2	16.7		19.2	16.5	
Progression Factor	1.00	1.00		1.78	1.42		1.00	1.00		0.92	0.87	
Incremental Delay, d2	0.7	4.4		7.4	0.9		0.1	0.2		4.6	0.2	
Delay (s)	6.3	13.2		20.1	10.2		16.4	16.8		22.3	14.5	
Level of Service	A	B		C	B		B	B		C	B	
Approach Delay (s)		12.6			12.1			16.8			18.4	
Approach LOS		B			B			B			B	

Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	79.6%	ICU Level of Service	D
Analysis Period (min)	15		

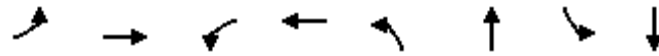
c Critical Lane Group

Dec 18, 2020

Queues

3: McLaughlin Rd & Lipa Dr

09/14/2020



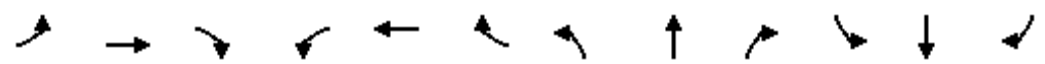
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	195	159	29	86	37	319	37	778
v/c Ratio	0.56	0.28	0.09	0.11	0.15	0.28	0.06	0.70
Control Delay	29.2	6.1	15.0	0.3	8.6	7.6	7.0	14.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.2	6.1	15.0	0.3	8.6	7.6	7.0	14.5
Queue Length 50th (m)	22.4	2.9	2.4	0.0	2.0	22.2	1.5	49.3
Queue Length 95th (m)	32.1	10.3	6.4	0.0	m5.9	m43.1	5.9	#130.6
Internal Link Dist (m)		126.1		83.2		116.9		176.0
Turn Bay Length (m)	20.0		15.0				15.0	
Base Capacity (vph)	484	704	445	899	255	1130	622	1119
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.23	0.07	0.10	0.15	0.28	0.06	0.70

Intersection Summary

- # 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.

HCM Signalized Intersection Capacity Analysis
 3: McLaughlin Rd & Lipa Dr

09/14/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔		↔	↔	
Traffic Volume (vph)	179	0	146	27	0	79	34	283	10	34	623	93
Future Volume (vph)	179	0	146	27	0	79	34	283	10	34	623	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.99		1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1601		1789	1601		1789	1874		1789	1847	
Flt Permitted	0.70	1.00		0.64	1.00		0.23	1.00		0.55	1.00	
Satd. Flow (perm)	1321	1601		1215	1601		424	1874		1034	1847	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	195	0	159	29	0	86	37	308	11	37	677	101
RTOR Reduction (vph)	0	117	0	0	63	0	0	2	0	0	7	0
Lane Group Flow (vph)	195	42	0	29	23	0	37	317	0	37	771	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	13.9	13.9		13.9	13.9		34.1	34.1		34.1	34.1	
Effective Green, g (s)	15.9	15.9		15.9	15.9		36.1	36.1		36.1	36.1	
Actuated g/C Ratio	0.27	0.27		0.27	0.27		0.60	0.60		0.60	0.60	
Clearance Time (s)	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	
Lane Grp Cap (vph)	350	424		321	424		255	1127		622	1111	
v/s Ratio Prot		0.03			0.01			0.17			c0.42	
v/s Ratio Perm	c0.15			0.02			0.09			0.04		
v/c Ratio	0.56	0.10		0.09	0.05		0.15	0.28		0.06	0.69	
Uniform Delay, d1	19.0	16.6		16.6	16.4		5.2	5.7		4.9	8.2	
Progression Factor	1.26	4.10		1.00	1.00		1.07	1.08		1.00	1.00	
Incremental Delay, d2	1.9	0.1		0.1	0.1		1.0	0.5		0.2	3.6	
Delay (s)	25.8	68.4		16.7	16.5		6.5	6.7		5.1	11.7	
Level of Service	C	E		B	B		A	A		A	B	
Approach Delay (s)		44.9			16.6			6.7			11.4	
Approach LOS		D			B			A			B	

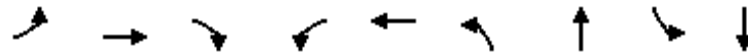
Intersection Summary			
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	63.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Queues

4: McLaughlin Rd & Spine Rd

09/14/2020



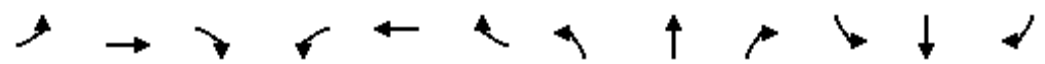
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	60	1222	79	265	596	42	736	212	664
v/c Ratio	0.13	1.29	0.09	0.93	0.54	0.24	1.21dr	1.38	0.95
Control Delay	6.5	165.7	0.8	70.9	17.3	35.9	60.7	232.6	71.1
Queue Delay	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	6.5	165.9	0.8	70.9	17.3	35.9	60.7	232.6	71.1
Queue Length 50th (m)	3.5	~372.5	0.1	45.7	82.1	7.4	69.7	~51.7	~90.5
Queue Length 95th (m)	m5.4	#448.2	m1.0	#95.3	114.1	16.2	#108.5	m#98.6	#134.2
Internal Link Dist (m)		119.3			568.4		364.3		116.9
Turn Bay Length (m)	20.0		15.0	50.0		35.0		45.0	
Base Capacity (vph)	468	945	834	288	1099	200	763	154	696
Starvation Cap Reductn	0	28	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	0.13	1.33	0.09	0.92	0.54	0.21	0.96	1.38	0.95

Intersection Summary

- ~ 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.
- dr Defacto Right Lane. Recode with 1 though lane as a right lane.

HCM Signalized Intersection Capacity Analysis
 4: McLaughlin Rd & Spine Rd

09/14/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↑	↗	↖	↗		↖	↑↗		↖	↑↗	
Traffic Volume (vph)	55	1124	73	244	486	63	39	160	517	195	555	56
Future Volume (vph)	55	1124	73	244	486	63	39	160	517	195	555	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	4.0	7.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.89		1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1883	1601	1789	1851		1789	3169		1789	3529	
Flt Permitted	0.36	1.00	1.00	0.07	1.00		0.18	1.00		0.19	1.00	
Satd. Flow (perm)	674	1883	1601	123	1851		346	3169		350	3529	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	60	1222	79	265	528	68	42	174	562	212	603	61
RTOR Reduction (vph)	0	0	42	0	4	0	0	156	0	0	6	0
Lane Group Flow (vph)	60	1222	37	265	592	0	42	580	0	212	658	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	62.2	57.4	57.4	76.2	67.4		28.1	21.8		27.5	21.5	
Effective Green, g (s)	66.2	59.4	56.4	76.2	69.4		28.1	23.8		27.5	23.5	
Actuated g/C Ratio	0.55	0.49	0.47	0.64	0.58		0.23	0.20		0.23	0.20	
Clearance Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	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	
Lane Grp Cap (vph)	435	932	752	283	1070		156	628		152	691	
v/s Ratio Prot	0.01	c0.65		c0.12	0.32		0.01	0.18		c0.07	0.19	
v/s Ratio Perm	0.07		0.02	0.48			0.05			c0.25		
v/c Ratio	0.14	1.31	0.05	0.94	0.55		0.27	1.21dr		1.39	0.95	
Uniform Delay, d1	13.0	30.3	17.3	39.5	15.7		37.4	47.2		44.8	47.7	
Progression Factor	0.83	0.92	2.77	1.00	1.00		1.00	1.00		1.05	1.04	
Incremental Delay, d2	0.1	146.5	0.1	36.5	2.1		0.9	21.5		207.1	21.3	
Delay (s)	10.9	174.5	47.8	76.1	17.8		38.3	68.7		253.9	70.8	
Level of Service	B	F	D	E	B		D	E		F	E	
Approach Delay (s)		160.0			35.7			67.0			115.1	
Approach LOS		F			D			E			F	

Intersection Summary			
HCM 2000 Control Delay	103.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.25		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	117.9%	ICU Level of Service	H
Analysis Period (min)	15		
dr Defacto Right Lane. Recode with 1 though lane as a right lane.			
c Critical Lane Group			

ICM Unsignalized Intersection Capacity Analysis

09/14/2020

1: Chinguacousy Rd & Spine Rd



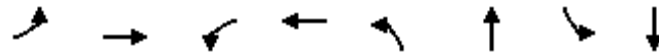
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	51	260	529	205	145	583
Future Volume (Veh/h)	51	260	529	205	145	583
Sign Control	Stop		Free		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	55	283	575	223	158	634
Pedestrians						
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	1525	575			798	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1525	575			798	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	48	45			81	
cM capacity (veh/h)	105	518			824	
Direction, Lane #	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	55	283	575	223	158	634
Volume Left	55	0	0	0	158	0
Volume Right	0	283	0	223	0	0
cSH	105	518	1700	1700	824	1700
Volume to Capacity	0.52	0.55	0.34	0.13	0.19	0.37
Queue Length 95th (m)	18.2	24.8	0.0	0.0	5.4	0.0
Control Delay (s)	72.2	20.0	0.0	0.0	10.4	0.0
Lane LOS	F	C			B	
Approach Delay (s)	28.5		0.0		2.1	
Approach LOS	D					
Intersection Summary						
Average Delay			5.9			
Intersection Capacity Utilization			50.6%		ICU Level of Service A	
Analysis Period (min)			15			

Dec 18, 2020

Queues

2: Galvin Ave & Spine Rd

09/14/2020



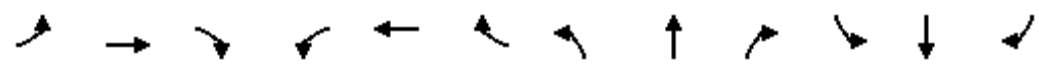
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	35	643	111	986	20	93	32	51
v/c Ratio	0.12	0.45	0.21	0.69	0.10	0.29	0.16	0.18
Control Delay	4.3	4.9	3.2	7.4	22.2	8.5	27.8	13.4
Queue Delay	0.0	0.1	0.0	1.1	0.0	0.5	0.3	0.0
Total Delay	4.3	5.0	3.2	8.5	22.2	9.0	28.1	13.4
Queue Length 50th (m)	0.9	22.2	4.6	66.4	1.9	0.1	2.9	1.3
Queue Length 95th (m)	3.8	45.3	m4.9	m47.9	6.5	9.8	m6.4	m6.6
Internal Link Dist (m)		382.8		119.3		165.0		103.6
Turn Bay Length (m)	15.0		20.0		15.0		15.0	
Base Capacity (vph)	288	1441	540	1439	454	596	437	572
Starvation Cap Reductn	0	0	0	231	0	0	0	0
Spillback Cap Reductn	0	164	0	0	0	261	210	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.12	0.50	0.21	0.82	0.04	0.28	0.14	0.09

Intersection Summary

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

HCM Signalized Intersection Capacity Analysis
 2: Galvin Ave & Spine Rd

09/14/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔	↔		↔	↔		↔	↔		↔	↔	
Traffic Volume (vph)	32	580	12	102	878	29	18	1	85	29	4	43
Future Volume (vph)	32	580	12	102	878	29	18	1	85	29	4	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.85		1.00	0.86	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1878		1789	1874		1789	1604		1789	1623	
Flt Permitted	0.20	1.00		0.37	1.00		0.72	1.00		0.70	1.00	
Satd. Flow (perm)	374	1878		704	1874		1363	1604		1312	1623	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	35	630	13	111	954	32	20	1	92	32	4	47
RTOR Reduction (vph)	0	1	0	0	1	0	0	80	0	0	41	0
Lane Group Flow (vph)	35	642	0	111	985	0	20	13	0	32	10	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	42.0	42.0		42.0	42.0		6.0	6.0		6.0	6.0	
Effective Green, g (s)	44.0	44.0		44.0	44.0		8.0	8.0		8.0	8.0	
Actuated g/C Ratio	0.73	0.73		0.73	0.73		0.13	0.13		0.13	0.13	
Clearance Time (s)	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	
Lane Grp Cap (vph)	274	1377		516	1374		181	213		174	216	
v/s Ratio Prot		0.34			c0.53			0.01			0.01	
v/s Ratio Perm	0.09			0.16			0.01			c0.02		
v/c Ratio	0.13	0.47		0.22	0.72		0.11	0.06		0.18	0.05	
Uniform Delay, d1	2.4	3.2		2.5	4.5		22.9	22.7		23.1	22.7	
Progression Factor	1.00	1.00		0.98	1.38		1.00	1.00		1.22	1.81	
Incremental Delay, d2	1.0	1.1		0.1	0.3		0.3	0.1		0.4	0.1	
Delay (s)	3.3	4.4		2.6	6.5		23.1	22.8		28.5	41.0	
Level of Service	A	A		A	A		C	C		C	D	
Approach Delay (s)		4.3			6.1			22.9			36.2	
Approach LOS		A			A			C			D	

Intersection Summary			
HCM 2000 Control Delay	7.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		

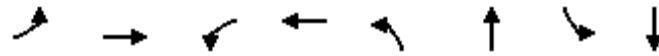
c Critical Lane Group

Dec 18, 2020

Queues

3: McLaughlin Rd & Lipa Dr

09/14/2020



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	177	38	8	99	201	717	84	592
v/c Ratio	0.54	0.06	0.02	0.18	0.49	0.62	0.27	0.52
Control Delay	26.1	0.2	14.4	1.2	13.4	14.8	9.9	9.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0
Total Delay	26.1	0.2	14.4	1.2	13.4	15.5	9.9	9.3
Queue Length 50th (m)	18.2	0.0	0.7	0.0	27.4	115.6	3.6	29.3
Queue Length 95th (m)	m23.9	m0.0	2.9	1.6	m30.1	m109.6	13.5	66.8
Internal Link Dist (m)		126.1		83.2		116.9		176.0
Turn Bay Length (m)	20.0		15.0				15.0	
Base Capacity (vph)	478	799	505	701	409	1151	314	1130
Starvation Cap Reductn	0	0	0	0	0	158	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.37	0.05	0.02	0.14	0.49	0.72	0.27	0.52

Intersection Summary

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

Dec 18, 2019

HCM Signalized Intersection Capacity Analysis

3: McLaughlin Rd & Lipa Dr

09/14/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	163	0	35	7	0	91	185	629	30	77	419	126
Future Volume (vph)	163	0	35	7	0	91	185	629	30	77	419	126
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.85		1.00	0.85		1.00	0.99		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1601		1789	1601		1789	1870		1789	1818	
Flt Permitted	0.69	1.00		0.73	1.00		0.35	1.00		0.27	1.00	
Satd. Flow (perm)	1305	1601		1379	1601		666	1870		513	1818	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	177	0	38	8	0	99	201	684	33	84	455	137
RTOR Reduction (vph)	0	28	0	0	74	0	0	2	0	0	14	0
Lane Group Flow (vph)	177	10	0	8	25	0	201	715	0	84	578	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	13.1	13.1		13.1	13.1		34.9	34.9		34.9	34.9	
Effective Green, g (s)	15.1	15.1		15.1	15.1		36.9	36.9		36.9	36.9	
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.61	0.61		0.61	0.61	
Clearance Time (s)	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	
Lane Grp Cap (vph)	328	402		347	402		409	1150		315	1118	
v/s Ratio Prot		0.01			0.02			c0.38			0.32	
v/s Ratio Perm	c0.14			0.01			0.30			0.16		
v/c Ratio	0.54	0.02		0.02	0.06		0.49	0.62		0.27	0.52	
Uniform Delay, d1	19.4	16.9		16.9	17.1		6.4	7.2		5.3	6.5	
Progression Factor	1.07	1.00		1.00	1.00		1.60	1.76		1.00	1.00	
Incremental Delay, d2	1.7	0.0		0.0	0.1		0.4	0.2		2.1	1.7	
Delay (s)	22.5	16.9		16.9	17.1		10.6	12.9		7.4	8.2	
Level of Service	C	B		B	B		B	B		A	A	
Approach Delay (s)		21.5			17.1			12.4			8.1	
Approach LOS		C			B			B			A	

Intersection Summary

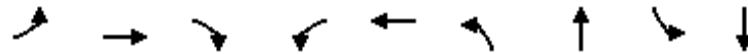
HCM 2000 Control Delay	12.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	65.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Queues

4: McLaughlin Rd & Spine Rd

09/14/2020



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	146	804	84	362	1401	153	942	60	397
v/c Ratio	0.79	0.85	0.10	1.22	1.31	0.71	1.17	0.39	0.58
Control Delay	50.8	35.3	1.6	157.7	173.7	54.7	126.9	41.4	37.5
Queue Delay	21.4	2.5	0.0	0.0	0.2	0.0	0.1	0.0	0.0
Total Delay	72.2	37.8	1.6	157.7	173.9	54.7	127.0	41.4	37.5
Queue Length 50th (m)	17.6	163.0	0.3	-87.0	-426.9	28.6	-132.4	12.1	34.7
Queue Length 95th (m)	#50.6	#229.7	3.9	#145.8	#508.1	#53.4	#173.1	m20.4	52.7
Internal Link Dist (m)		119.3			784.6		364.3		116.9
Turn Bay Length (m)	20.0		15.0	50.0		35.0		45.0	
Base Capacity (vph)	185	941	831	296	1066	215	804	156	681
Starvation Cap Reductn	0	62	0	0	0	0	0	0	0
Spillback Cap Reductn	33	0	0	0	52	0	14	0	1
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.96	0.91	0.10	1.22	1.38	0.71	1.19	0.38	0.58

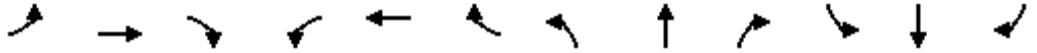
Intersection Summary

- ~ 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.

HCM Signalized Intersection Capacity Analysis

4: McLaughlin Rd & Spine Rd

09/14/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	134	740	77	333	1121	168	141	505	362	55	201	165
Future Volume (vph)	134	740	77	333	1121	168	141	505	362	55	201	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	2.0	4.0	7.0	4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.94		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1789	1883	1601	1789	1847		1789	3355		1789	3337	
Flt Permitted	0.07	1.00	1.00	0.07	1.00		0.22	1.00		0.21	1.00	
Satd. Flow (perm)	127	1883	1601	135	1847		418	3355		401	3337	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	146	804	84	362	1218	183	153	549	393	60	218	179
RTOR Reduction (vph)	0	0	45	0	5	0	0	106	0	0	124	0
Lane Group Flow (vph)	146	804	39	362	1396	0	153	836	0	60	273	0
Turn Type	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	63.2	57.2	57.2	76.2	66.2		31.8	23.0		23.6	18.8	
Effective Green, g (s)	67.2	59.2	56.2	76.2	68.2		31.8	25.0		23.6	20.8	
Actuated g/C Ratio	0.56	0.49	0.47	0.64	0.57		0.27	0.21		0.20	0.17	
Clearance Time (s)	4.0	6.0	6.0	4.0	6.0		4.0	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	
Lane Grp Cap (vph)	181	928	749	292	1049		213	698		134	578	
v/s Ratio Prot	0.05	0.43		c0.15	c0.76		c0.05	c0.25		0.02	0.08	
v/s Ratio Perm	0.40		0.02	0.63			0.14			0.07		
v/c Ratio	0.81	0.87	0.05	1.24	1.33		0.72	1.20		0.45	0.47	
Uniform Delay, d1	30.1	26.9	17.4	39.0	25.9		36.3	47.5		41.0	44.7	
Progression Factor	0.92	0.95	2.88	1.00	1.00		1.00	1.00		1.05	1.20	
Incremental Delay, d2	21.9	10.4	0.1	133.6	155.6		11.0	102.5		2.1	2.5	
Delay (s)	49.5	36.0	50.1	172.6	181.5		47.3	150.0		45.2	56.2	
Level of Service	D	D	D	F	F		D	F		D	E	
Approach Delay (s)		39.0			179.6			135.6			54.7	
Approach LOS		D			F			F			D	

Intersection Summary			
HCM 2000 Control Delay	122.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.30		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	118.9%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX F

Signal Warrant Sheets

M.T.O. MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNAL FOR NEW INTERSECTION WITH PROPOSED DEVELOPMENT

PROJECT: 17099.000
 LOCATION: Chinguacousy Road/Spine Road
 MUNICIPALITY: Town of Caledon
 TIME OF ANALYSIS: Weekday

AT: Chinguacousy Road/Spine Road
 COMMENT: Future Total Traffic - 2026
 ANALYSIS PREPARED BY: JL on December 11, 2020
 AREA TYPE: (RURAL or URBAN) Urban 1:59 PM

Warrant 1- Minimum Vehicular Volume

	Minimum Requirement	Volume Expansion	=	
A. Requirement =	720	150%	=	1080
AM+PM PK HR/4 =				592
Compliance				55%
B. Requirement =	225	225%	=	506
AM+PM PK HR/4 =				109
Compliance				21%
<u>Conclusion Warrant 1:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO

Warrant 2- Delay to Cross Traffic

A. Requirement =	720	150%	=	1080
AM+PM PK HR/4 =				483
Compliance				45%
B. Requirement =	75	150%	=	113
AM+PM PK HR/4 =				32
Compliance				28%
<u>Conclusion Warrant 2:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO

WARRANT MET--> NO

TIME	MINOR APPROACH (EB)			MAJOR APPROACH (NB)			MINOR APPROACH (WB)			MAJOR APPROACH (SB)			Ped. cross- ing major approach
	Spine Road			Chinguacousy Road			Spine Road			Chinguacousy Road			
	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	
AM	0	0	0	0	303	84	90	0	113	105	355	0	
PM	0	0	0	0	393	152	38	0	193	108	433	0	
AM&PM	0	0	0	0	696	236	128	0	306	213	788	0	
Average Hourly Volume	0	0	0	0	174	59	32	0	77	53	197	0	0

M.T.O. MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNAL FOR NEW INTERSECTION WITH PROPOSED DEVELOPMENT

PROJECT: 17099.000
 LOCATION: Chinguacousy Road/Spine Road
 MUNICIPALITY: Town of Caledon
 TIME OF ANALYSIS: Weekday

AT: Chinguacousy Road/Spine Road
 COMMENT: Future Total Traffic - 2031
 ANALYSIS PREPARED BY: JL on December 11, 2020
 AREA TYPE: (RURAL or URBAN) Urban 1:59 PM

Warrant 1- Minimum Vehicular Volume

	Minimum Requirement	Volume Expansion	=	
A. Requirement =	720	150%	=	1080
AM+PM PK HR/4 =				654
Compliance				61%
B. Requirement =	225	225%	=	506
AM+PM PK HR/4 =				120
Compliance				24%
<u>Conclusion Warrant 1:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO

Warrant 2- Delay to Cross Traffic

A. Requirement =	720	150%	=	1080
AM+PM PK HR/4 =				534
Compliance				49%
B. Requirement =	75	150%	=	113
AM+PM PK HR/4 =				35
Compliance				31%
<u>Conclusion Warrant 2:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO

WARRANT MET--> NO

TIME	MINOR APPROACH (EB)			MAJOR APPROACH (NB)			MINOR APPROACH (WB)			MAJOR APPROACH (SB)			Ped. cross- ing major approach
	Spine Road			Chinguacousy Road			Spine Road			Chinguacousy Road			
	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	
AM	0	0	0	0	335	93	99	0	125	116	392	0	
PM	0	0	0	0	434	168	42	0	213	119	478	0	
AM&PM	0	0	0	0	769	261	141	0	338	235	870	0	
Average Hourly	0	0	0	0	192	65	35	0	85	59	218	0	0

M.T.O. MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNAL FOR NEW INTERSECTION WITH PROPOSED DEVELOPMENT

PROJECT: 17099.000
 LOCATION: Chinguacousy Road/Spine Road
 MUNICIPALITY: Town of Caledon
 TIME OF ANALYSIS: Weekday

AT: Chinguacousy Road/Spine Road
 COMMENT: Future Total Traffic - 2041
 ANALYSIS PREPARED BY: JL on December 11, 2020
 AREA TYPE: (RURAL or URBAN) Urban 1:59 PM

Warrant 1- Minimum Vehicular Volume

	Minimum Requirement	Volume Expansion			
A. Requirement =	720	150%	=		1080
AM+PM PK HR/4 =					797
Compliance					74%
B. Requirement =	225	225%	=		506
AM+PM PK HR/4 =					146
Compliance					29%
<u>Conclusion Warrant 1:</u>					
				100% Satisfied-->	NO
				80% Satisfied-->	NO

Warrant 2- Delay to Cross Traffic

A. Requirement =	720	150%	=		1080
AM+PM PK HR/4 =					651
Compliance					60%
B. Requirement =	75	150%	=		113
AM+PM PK HR/4 =					43
Compliance					38%
<u>Conclusion Warrant 2:</u>					
				100% Satisfied-->	NO
				80% Satisfied-->	NO

WARRANT MET--> NO

TIME	MINOR APPROACH (EB)			MAJOR APPROACH (NB)			MINOR APPROACH (WB)			MAJOR APPROACH (SB)			Ped. cross- ing major approach
	Spine Road			Chinguacousy Road			Spine Road			Chinguacousy Road			
	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	
AM	0	0	0	0	408	113	121	0	152	141	478	0	
PM	0	0	0	0	529	205	51	0	260	145	583	0	
AM&PM	0	0	0	0	937	318	172	0	412	286	1061	0	
Average Hourly	0	0	0	0	234	80	43	0	103	72	265	0	0

M.T.O. MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNAL FOR NEW INTERSECTION WITH PROPOSED DEVELOPMENT

PROJECT: 17099.000
 LOCATION: Spine Road/Galvin Ave
 MUNICIPALITY: Town of Caledon
 TIME OF ANALYSIS: Weekday

AT: Spine Road/Galvin Ave
 COMMENT: Future Total Traffic - 2026
 ANALYSIS PREPARED BY: JL on December 11, 2020
 AREA TYPE: (RURAL or URBAN) Urban 1:59 PM

Warrant 1- Minimum Vehicular Volume

	Minimum Requirement	Volume Expansion			
A. Requirement =	720	150%	=		1080
AM+PM PK HR/4 =					694
Compliance					64%
B. Requirement =	170	150%	=		255
AM+PM PK HR/4 =					139
Compliance					55%
<u>Conclusion Warrant 1:</u>					
				100% Satisfied-->	NO
				80% Satisfied-->	NO

Warrant 2- Delay to Cross Traffic

A. Requirement =	720	150%	=		1080
AM+PM PK HR/4 =					555
Compliance					51%
B. Requirement =	75	150%	=		113
AM+PM PK HR/4 =					51
Compliance					45%
<u>Conclusion Warrant 2:</u>					
				100% Satisfied-->	NO
				80% Satisfied-->	NO

WARRANT MET--> NO

TIME	MINOR APPROACH (NB)			MAJOR APPROACH (EB)			MINOR APPROACH (SB)			MAJOR APPROACH (WB)			Ped. cross- ing major approach
	Galvin Ave			Spine Rd			Galvin Ave			Spine Rd			
	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	
AM	17	4	123	56	555	8	137	10	131	74	283	30	
PM	14	1	63	24	431	9	22	3	32	76	652	22	
AM&PM	31	5	186	80	986	17	159	13	163	150	935	52	
Average Hourly	8	1	47	20	247	4	40	3	41	38	234	13	0

M.T.O. MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNAL FOR NEW INTERSECTION WITH PROPOSED DEVELOPMENT

PROJECT: 17099.000
 LOCATION: Spine Road/Galvin Ave
 MUNICIPALITY: Town of Caledon
 TIME OF ANALYSIS: Weekday

AT: Spine Road/Galvin Ave
 COMMENT: Future Total Traffic - 2031
 ANALYSIS PREPARED BY: JL on December 11, 2020
 AREA TYPE: (RURAL or URBAN) Urban 1:59 PM

Warrant 1- Minimum Vehicular Volume

	Minimum Requirement	Volume Expansion		
A. Requirement =	720	150%	=	1080
AM+PM PK HR/4 =				766
Compliance				71%
B. Requirement =	170	150%	=	255
AM+PM PK HR/4 =				154
Compliance				60%
<u>Conclusion Warrant 1:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO

Warrant 2- Delay to Cross Traffic

A. Requirement =	720	150%	=	1080
AM+PM PK HR/4 =				613
Compliance				57%
B. Requirement =	75	150%	=	113
AM+PM PK HR/4 =				57
Compliance				50%
<u>Conclusion Warrant 2:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO

WARRANT MET--> NO

TIME	MINOR APPROACH (NB)			MAJOR APPROACH (EB)			MINOR APPROACH (SB)			MAJOR APPROACH (WB)			Ped. cross- ing major approach
	Galvin Ave			Spine Rd			Galvin Ave			Spine Rd			
	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	
AM	19	4	136	62	613	9	151	11	145	82	312	33	
PM	15	1	70	26	476	10	24	3	35	84	720	24	
AM&PM	34	5	206	88	1089	19	175	14	180	166	1032	57	
Average Hourly	9	1	52	22	272	5	44	4	45	42	258	14	0

M.T.O. MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNAL FOR NEW INTERSECTION WITH PROPOSED DEVELOPMENT

PROJECT: 17099.000
 LOCATION: Spine Road/Galvin Ave
 MUNICIPALITY: Town of Caledon
 TIME OF ANALYSIS: Weekday

AT: Spine Road/Galvin Ave
 COMMENT: Future Total Traffic - 2041
 ANALYSIS PREPARED BY: JL on December 11, 2020
 AREA TYPE: (RURAL or URBAN) Urban 1:59 PM

Warrant 1- Minimum Vehicular Volume

	Minimum Requirement	Volume Expansion		
A. Requirement =	720	150%	=	1080
AM+PM PK HR/4 =				934
Compliance				86%
B. Requirement =	170	150%	=	255
AM+PM PK HR/4 =				187
Compliance				73%
<u>Conclusion Warrant 1:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO

Warrant 2- Delay to Cross Traffic

A. Requirement =	720	150%	=	1080
AM+PM PK HR/4 =				747
Compliance				69%
B. Requirement =	75	150%	=	113
AM+PM PK HR/4 =				67
Compliance				59%
<u>Conclusion Warrant 2:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO

WARRANT MET--> NO

TIME	MINOR APPROACH (NB)			MAJOR APPROACH (EB)			MINOR APPROACH (SB)			MAJOR APPROACH (WB)			Ped. cross- ing major approach
	Galvin Ave			Spine Rd			Galvin Ave			Spine Rd			
	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	
AM	23	5	166	76	747	11	184	13	177	100	380	40	
PM	18	1	85	32	580	12	29	4	43	102	878	29	
AM&PM	41	6	251	108	1327	23	213	17	220	202	1258	69	
Average Hourly	10	2	63	27	332	6	53	4	55	51	315	17	0

M.T.O. MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNAL FOR NEW INTERSECTION WITH PROPOSED DEVELOPMENT

PROJECT: 17099.000
 LOCATION: Chinguacousy Road/McLaughlin Road
 MUNICIPALITY: Town of Caledon
 TIME OF ANALYSIS: Weekday

AT: Chinguacousy Road/McLaughlin Road
 COMMENT: Future Total Traffic - 2026
 ANALYSIS PREPARED BY: JL on December 11, 2020
 AREA TYPE: (RURAL or URBAN) Urban 1:59 PM

Warrant 1- Minimum Vehicular Volume

	Minimum Requirement	Volume Expansion	=	
A. Requirement =	900	150%	=	1350
AM+PM PK HR/4 =				1406
Compliance				100%
B. Requirement =	170	150%	=	255
AM+PM PK HR/4 =				858
Compliance				100%
<u>Conclusion Warrant 1:</u>				
			100% Satisfied-->	YES
			80% Satisfied-->	YES

Warrant 2- Delay to Cross Traffic

	Minimum Requirement	Volume Expansion	=	
A. Requirement =	900	150%	=	1350
AM+PM PK HR/4 =				548
Compliance				41%
B. Requirement =	170	150%	=	255
AM+PM PK HR/4 =				488
Compliance				100%
<u>Conclusion Warrant 2:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO
<u>WARRANT MET--></u>				YES

TIME	MINOR APPROACH (EB)			MAJOR APPROACH (NB)			MINOR APPROACH (WB)			MAJOR APPROACH (SB)			Ped. cross- ing major approach
	Spine Road			McLaughlin			Spine Road			McLaughlin			
	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	
AM	41	835	54	29	119	384	181	361	47	145	412	42	
PM	100	550	57	105	375	269	247	833	125	41	149	122	
AM&PM	141	1385	111	134	494	653	428	1194	172	186	561	164	
Average Hourly	35	346	28	34	124	163	107	299	43	47	140	41	0

M.T.O. MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNAL FOR NEW INTERSECTION WITH PROPOSED DEVELOPMENT

PROJECT: 17099.000
 LOCATION: Chinguacousy Road/McLaughlin Road
 MUNICIPALITY: Town of Caledon
 TIME OF ANALYSIS: Weekday

AT: Chinguacousy Road/McLaughlin Road
 COMMENT: Future Total Traffic - 2031
 ANALYSIS PREPARED BY: JL on December 11, 2020
 AREA TYPE: (RURAL or URBAN) Urban 1:59 PM

Warrant 1- Minimum Vehicular Volume

	Minimum Requirement	Volume Expansion		
A. Requirement =	900	150%	=	1350
AM+PM PK HR/4 =				1552
Compliance				100%
 B. Requirement =	 170	 150%	 =	 255
AM+PM PK HR/4 =				947
Compliance				100%
 <u>Conclusion Warrant 1:</u>				
			100% Satisfied-->	YES
			80% Satisfied-->	YES

Warrant 2- Delay to Cross Traffic

A. Requirement =	900	150%	=	1350
AM+PM PK HR/4 =				605
Compliance				45%
 B. Requirement =	 170	 150%	 =	 255
AM+PM PK HR/4 =				613
Compliance				100%
 <u>Conclusion Warrant 2:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO
 WARRANT MET-->				 YES

TIME	MINOR APPROACH (EB)			MAJOR APPROACH (NB)			MINOR APPROACH (WB)			MAJOR APPROACH (SB)			Ped. cross- ing major approach
	Spine Road			McLaughlin			Spine Road			McLaughlin			
	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	
AM	45	922	60	32	131	424	200	399	52	160	455	46	
PM	110	607	63	116	414	297	273	920	138	45	165	135	
AM&PM	155	1529	123	148	545	721	473	1319	190	205	620	181	
Average Hourly	39	382	31	37	136	180	118	330	48	51	155	45	0

M.T.O. MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNAL FOR NEW INTERSECTION WITH PROPOSED DEVELOPMENT

PROJECT: 17099.000
 LOCATION: Chinguacousy Road/McLaughlin Road
 MUNICIPALITY: Town of Caledon
 TIME OF ANALYSIS: Weekday

AT: Chinguacousy Road/McLaughlin Road
 COMMENT: Future Total Traffic - 2041
 ANALYSIS PREPARED BY: JL on December 11, 2020
 AREA TYPE: (RURAL or URBAN) Urban 1:59 PM

Warrant 1- Minimum Vehicular Volume

	Minimum Requirement	Volume Expansion	=	
A. Requirement =	900	150%	=	1350
AM+PM PK HR/4 =				1892
Compliance				100%
B. Requirement =	170	150%	=	255
AM+PM PK HR/4 =				1155
Compliance				100%
<u>Conclusion Warrant 1:</u>				
			100% Satisfied-->	YES
			80% Satisfied-->	YES

Warrant 2- Delay to Cross Traffic

	Minimum Requirement	Volume Expansion	=	
A. Requirement =	900	150%	=	1350
AM+PM PK HR/4 =				738
Compliance				55%
B. Requirement =	170	150%	=	255
AM+PM PK HR/4 =				747
Compliance				100%
<u>Conclusion Warrant 2:</u>				
			100% Satisfied-->	NO
			80% Satisfied-->	NO
<u>WARRANT MET--></u>				YES

TIME	MINOR APPROACH (EB)			MAJOR APPROACH (NB)			MINOR APPROACH (WB)			MAJOR APPROACH (SB)			Ped. cross- ing major approach
	Spine Road			McLaughlin			Spine Road			McLaughlin			
	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	
AM	55	1124	73	39	160	517	244	486	63	195	555	56	
PM	134	740	77	141	505	362	333	1121	168	55	201	165	
AM&PM	189	1864	150	180	665	879	577	1607	231	250	756	221	
Average Hourly	47	466	38	45	166	220	144	402	58	63	189	55	0

M.T.O. MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNAL FOR NEW INTERSECTION WITH PROPOSED DEVELOPMENT

PROJECT: 17099.000
 LOCATION: McLaughlin Road/Lippa Drive
 MUNICIPALITY: Town of Caledon
 TIME OF ANALYSIS: Weekday

AT: McLaughlin Road/Lippa Drive
 COMMENT: Future Total Traffic - 2026
 ANALYSIS PREPARED BY: JL on December 11, 2020
 AREA TYPE: (RURAL or URBAN) Urban 1:59 PM

Warrant 1- Minimum Vehicular Volume

	Minimum Requirement	Volume Expansion			
A. Requirement =	720	150%	=		1080
AM+PM PK HR/4 =					608
Compliance					56%
B. Requirement =	170	150%	=		255
AM+PM PK HR/4 =					135
Compliance					53%
<u>Conclusion Warrant 1:</u>					
				100% Satisfied-->	NO
				80% Satisfied-->	NO

Warrant 2- Delay to Cross Traffic

A. Requirement =	720	150%	=		1080
AM+PM PK HR/4 =					472
Compliance					44%
B. Requirement =	75	150%	=		113
AM+PM PK HR/4 =					152
Compliance					100%
<u>Conclusion Warrant 2:</u>					
				100% Satisfied-->	NO
				80% Satisfied-->	NO

WARRANT MET--> NO

TIME	MINOR APPROACH (EB)			MAJOR APPROACH (NB)			MINOR APPROACH (WB)			MAJOR APPROACH (SB)			Ped. cross- ing major approach
	Lippa Dr			McLaughlin Rd			Lippa Dr			McLaughlin Rd			
	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	
AM	133		109	25	210	7	20	0	59	25	463	69	
PM	121		26	138	467	23	5	0	68	57	312	93	
AM&PM	254	0	135	163	677	30	25	0	127	82	775	162	
Average Hourly	64	0	34	41	169	8	6	0	32	21	194	41	0

M.T.O. MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNAL FOR NEW INTERSECTION WITH PROPOSED DEVELOPMENT

PROJECT: 17099.000
 LOCATION: McLaughlin Road/Lippa Drive
 MUNICIPALITY: Town of Caledon
 TIME OF ANALYSIS: Weekday

AT: McLaughlin Road/Lippa Drive
 COMMENT: Future Total Traffic - 2031
 ANALYSIS PREPARED BY: JL on December 11, 2020
 AREA TYPE: (RURAL or URBAN) Urban 1:59 PM

Warrant 1- Minimum Vehicular Volume

	Minimum Requirement	Volume Expansion			
A. Requirement =	720	150%	=		1080
AM+PM PK HR/4 =					671
Compliance					62%
B. Requirement =	170	150%	=		255
AM+PM PK HR/4 =					150
Compliance					59%
<u>Conclusion Warrant 1:</u>					
				100% Satisfied-->	NO
				80% Satisfied-->	NO

Warrant 2- Delay to Cross Traffic

A. Requirement =	720	150%	=		1080
AM+PM PK HR/4 =					522
Compliance					48%
B. Requirement =	75	150%	=		113
AM+PM PK HR/4 =					167
Compliance					100%
<u>Conclusion Warrant 2:</u>					
				100% Satisfied-->	NO
				80% Satisfied-->	NO

WARRANT MET--> NO

TIME	MINOR APPROACH (EB)			MAJOR APPROACH (NB)			MINOR APPROACH (WB)			MAJOR APPROACH (SB)			Ped. cross- ing major approach
	Lippa Dr			McLaughlin Rd			Lippa Dr			McLaughlin Rd			
	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	
AM	147	0	120	28	232	8	22	0	65	28	511	76	
PM	134	0	29	152	516	25	6	0	75	63	344	103	
AM&PM	281	0	149	180	748	33	28	0	140	91	855	179	
Average Hourly	70	0	37	45	187	8	7	0	35	23	214	45	0

M.T.O. MINIMUM REQUIREMENTS FOR INSTALLATION OF TRAFFIC SIGNAL FOR NEW INTERSECTION WITH PROPOSED DEVELOPMENT

PROJECT: 17099.000
 LOCATION: McLaughlin Road/Lippa Drive
 MUNICIPALITY: Town of Caledon
 TIME OF ANALYSIS: Weekday

AT: McLaughlin Road/Lippa Drive
 COMMENT: Future Total Traffic - 2041
 ANALYSIS PREPARED BY: JL on December 11, 2020
 AREA TYPE: (RURAL or URBAN) Urban 1:59 PM

Warrant 1- Minimum Vehicular Volume

	Minimum Requirement	Volume Expansion			
A. Requirement =	720	150%	=		1080
AM+PM PK HR/4 =					797
Compliance					74%
B. Requirement =	170	150%	=		255
AM+PM PK HR/4 =					146
Compliance					57%
<u>Conclusion Warrant 1:</u>					
				100% Satisfied-->	NO
				80% Satisfied-->	NO

Warrant 2- Delay to Cross Traffic

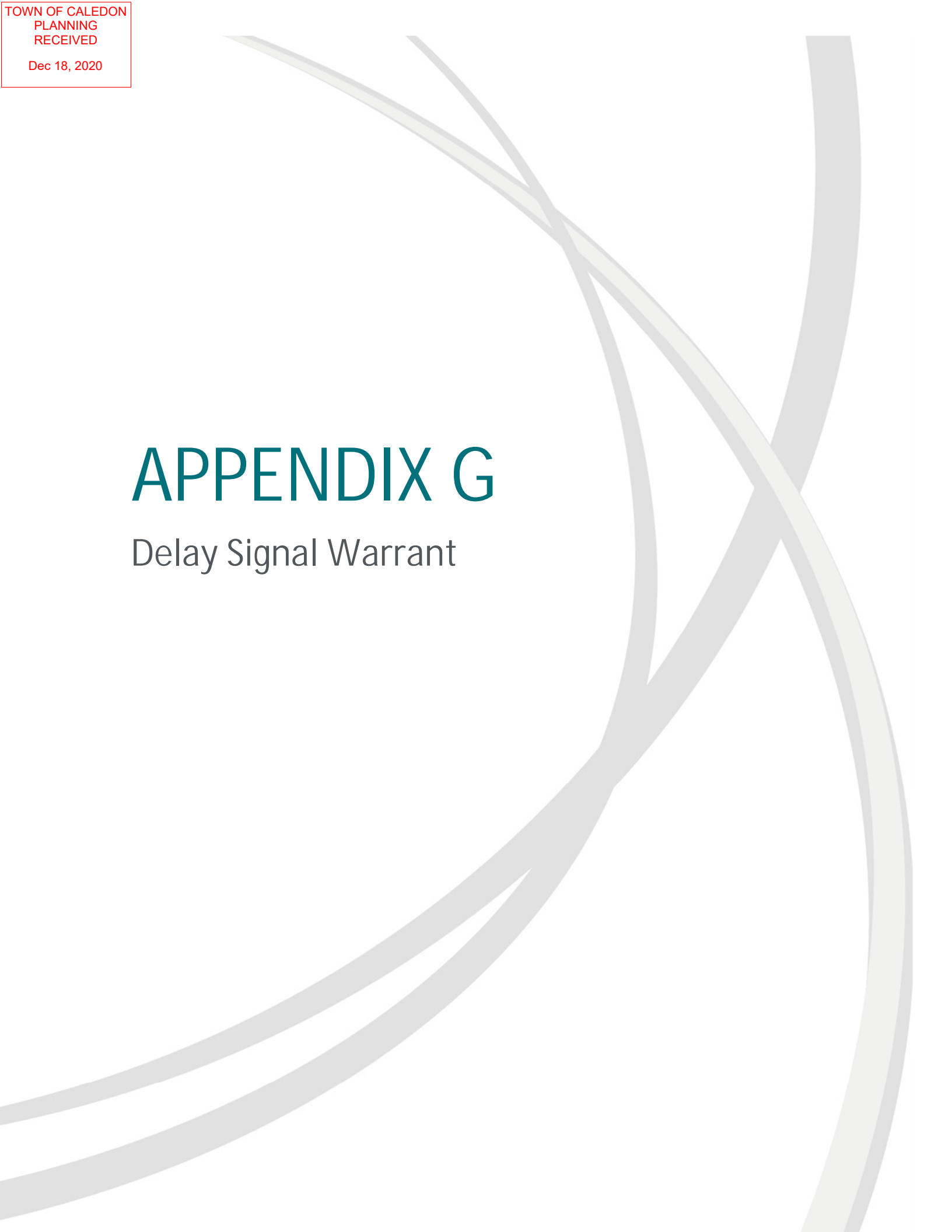
A. Requirement =	720	150%	=		1080
AM+PM PK HR/4 =					651
Compliance					60%
B. Requirement =	75	150%	=		113
AM+PM PK HR/4 =					43
Compliance					38%
<u>Conclusion Warrant 2:</u>					
				100% Satisfied-->	NO
				80% Satisfied-->	NO

WARRANT MET--> NO

TIME	MINOR APPROACH (EB)			MAJOR APPROACH (NB)			MINOR APPROACH (WB)			MAJOR APPROACH (SB)			Ped. cross- ing major approach
	Lippa Dr			McLaughlin Rd			Lippa Dr			McLaughlin Rd			
	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	LEFT	THRO'	RIGHT	
AM	0	0	0	0	408	113	121	0	152	141	478	0	
PM	0	0	0	0	529	205	51	0	260	145	583	0	
AM&PM	0	0	0	0	937	318	172	0	412	286	1061	0	
Average Hourly	0	0	0	0	234	80	43	0	103	72	265	0	0

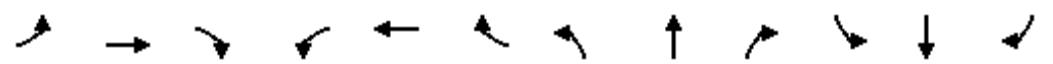
APPENDIX G

Delay Signal Warrant



HCM Unsignalized Intersection Capacity Analysis
 2: Galvin Ave & Spine Rd

12/11/2020



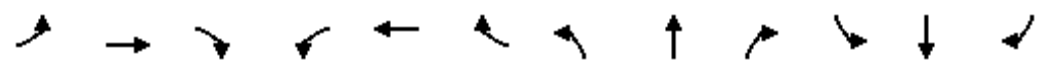
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	76	747	11	100	380	40	23	5	166	184	13	177
Future Volume (Veh/h)	76	747	11	100	380	40	23	5	166	184	13	177
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	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)	76	747	11	100	380	40	23	5	166	184	13	177
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)					143							
pX, platoon unblocked	0.87						0.87	0.87		0.87	0.87	0.87
vC, conflicting volume	420			758			1668	1524	752	1668	1510	400
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	257			758			1693	1528	752	1693	1512	234
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	93			88			37	94	60	0	85	75
cM capacity (veh/h)	1136			853			37	84	410	31	86	700

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	76	758	100	420	23	171	184	190
Volume Left	76	0	100	0	23	0	184	0
Volume Right	0	11	0	40	0	166	0	177
cSH	1136	1700	853	1700	37	368	31	470
Volume to Capacity	0.07	0.45	0.12	0.25	0.63	0.46	5.85	0.40
Queue Length 95th (m)	1.6	0.0	3.0	0.0	16.8	18.0	Err	14.7
Control Delay (s)	8.4	0.0	9.8	0.0	206.3	23.0	Err	17.8
Lane LOS	A		A		F	C	F	C
Approach Delay (s)	0.8		1.9		44.7		4928.3	
Approach LOS					E		F	

Intersection Summary	
Average Delay	964.4
Intersection Capacity Utilization	79.6%
ICU Level of Service	D
Analysis Period (min)	15

ICM Unsignalized Intersection Capacity Analysis
 3: McLaughlin Rd & Lipa Dr

12/11/2020



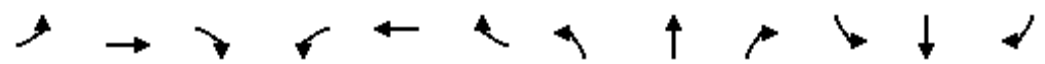
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷		↶	↷		↶	↷		↶	↷	
Traffic Volume (veh/h)	179	0	146	27	0	79	34	283	10	34	623	93
Future Volume (Veh/h)	179	0	146	27	0	79	34	283	10	34	623	93
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	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)	179	0	146	27	0	79	34	283	10	34	623	93
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1168	1098	670	1193	1140	288	716			293		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1168	1098	670	1193	1140	288	716			293		
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 %	0	100	68	75	100	89	96			97		
cM capacity (veh/h)	145	199	457	106	188	751	885			1269		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	179	146	27	79	34	293	34	716
Volume Left	179	0	27	0	34	0	34	0
Volume Right	0	146	0	79	0	10	0	93
cSH	145	457	106	751	885	1700	1269	1700
Volume to Capacity	1.23	0.32	0.25	0.11	0.04	0.17	0.03	0.42
Queue Length 95th (m)	80.4	10.3	7.1	2.7	0.9	0.0	0.6	0.0
Control Delay (s)	211.2	16.5	50.2	10.4	9.2	0.0	7.9	0.0
Lane LOS	F	C	F	B	A		A	
Approach Delay (s)	123.7		20.5		1.0		0.4	
Approach LOS	F		C					

Intersection Summary		
Average Delay		28.5
Intersection Capacity Utilization	63.2%	ICU Level of Service
Analysis Period (min)	15	B

ICM Unsignalized Intersection Capacity Analysis
 2: Galvin Ave & Spine Rd

12/11/2020



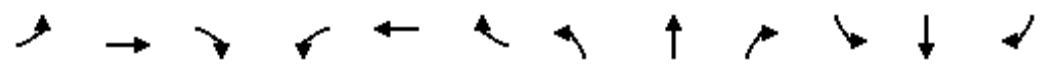
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗		↖	↗		↖	↗	
Traffic Volume (veh/h)	32	580	12	102	878	29	18	1	85	29	4	43
Future Volume (Veh/h)	32	580	12	102	878	29	18	1	85	29	4	43
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	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)	32	580	12	102	878	29	18	1	85	29	4	43
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (m)					143							
pX, platoon unblocked	0.45						0.45	0.45		0.45	0.45	0.45
vC, conflicting volume	907			592			1777	1761	586	1826	1752	892
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	178			592			2118	2082	586	2227	2063	145
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	95			90			0	95	83	0	81	89
cM capacity (veh/h)	627			984			11	20	510	10	21	404

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	32	592	102	907	18	86	29	47
Volume Left	32	0	102	0	18	0	29	0
Volume Right	0	12	0	29	0	85	0	43
cSH	627	1700	984	1700	11	398	10	158
Volume to Capacity	0.05	0.35	0.10	0.53	1.61	0.22	2.96	0.30
Queue Length 95th (m)	1.2	0.0	2.6	0.0	23.3	6.2	35.8	8.9
Control Delay (s)	11.0	0.0	9.1	0.0	968.1	16.5	1643.1	37.3
Lane LOS	B		A		F	C	F	E
Approach Delay (s)	0.6		0.9		181.2		650.0	
Approach LOS					F		F	

Intersection Summary		
Average Delay		38.3
Intersection Capacity Utilization	69.6%	ICU Level of Service C
Analysis Period (min)		15

ICM Unsignalized Intersection Capacity Analysis
 3: McLaughlin Rd & Lipa Dr

12/11/2020



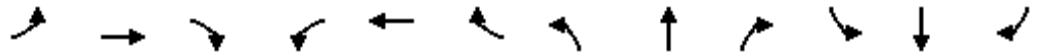
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	163	0	35	7	0	91	185	629	30	77	419	126
Future Volume (Veh/h)	163	0	35	7	0	91	185	629	30	77	419	126
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	163	0	35	7	0	91	185	629	30	77	419	126
Pedestrians												
Lane Width (m)												
Walking Speed (m/s)												
Percent Blockage												
Right turn flare (veh)												
Median type												
Median storage veh												
Upstream signal (m)												
pX, platoon unblocked	0.80	0.80		0.80	0.80	0.80		141		0.80		
vC, conflicting volume	1726	1665	482	1622	1713	644	545			659		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1782	1706	482	1652	1766	431	545			450		
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 %	0	100	94	85	100	82	82			91		
cM capacity (veh/h)	34	55	584	48	50	500	1024			889		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	163	35	7	91	185	659	77	545
Volume Left	163	0	7	0	185	0	77	0
Volume Right	0	35	0	91	0	30	0	126
cSH	34	584	48	500	1024	1700	889	1700
Volume to Capacity	4.85	0.06	0.15	0.18	0.18	0.39	0.09	0.32
Queue Length 95th (m)	Err	1.4	3.6	5.0	5.0	0.0	2.2	0.0
Control Delay (s)	Err	11.6	93.1	13.8	9.3	0.0	9.4	0.0
Lane LOS	F	B	F	B	A		A	
Approach Delay (s)	8233.5		19.5		2.0		1.2	
Approach LOS	F		C					

Intersection Summary		
Average Delay		927.7
Intersection Capacity Utilization	65.7%	ICU Level of Service C
Analysis Period (min)		15

ICM Unsignalized Intersection Capacity Analysis
 2: Galvin Ave & Spine Rd

12/11/2020



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↶	↷		↶	↷		↶	↷		↶	↷	
Sign Control	Stop		Stop		Stop		Stop		Stop		Stop	
Traffic Volume (vph)	76	747	11	100	380	40	23	5	166	184	13	177
Future Volume (vph)	76	747	11	100	380	40	23	5	166	184	13	177
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)	76	747	11	100	380	40	23	5	166	184	13	177





















Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	76	758	100	420	23	171	184	190
Volume Left (vph)	76	0	100	0	23	0	184	0
Volume Right (vph)	0	11	0	40	0	166	0	177
Hadj (s)	0.53	0.02	0.53	-0.03	0.53	-0.65	0.53	-0.62
Departure Headway (s)	8.0	7.5	8.0	7.5	9.0	7.8	8.6	7.5
Degree Utilization, x	0.17	1.57	0.22	0.87	0.06	0.37	0.44	0.39
Capacity (veh/h)	437	486	439	475	370	428	408	469
Control Delay (s)	11.4	286.0	12.2	42.2	11.3	14.2	16.9	14.0
Approach Delay (s)	261.0		36.4		13.9		15.4	
Approach LOS	F		E		B		C	

Intersection Summary

Delay	127.5
Level of Service	F
Intersection Capacity Utilization	79.6%
ICU Level of Service	D
Analysis Period (min)	15

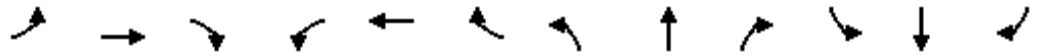
ICM Unsignalized Intersection Capacity Analysis
 3: McLaughlin Rd & Lipa Dr

12/11/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Stop			Stop		
Traffic Volume (vph)	179	0	146	27	0	79	34	283	10	34	623	93
Future Volume (vph)	179	0	146	27	0	79	34	283	10	34	623	93
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)	179	0	146	27	0	79	34	283	10	34	623	93
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2				
Volume Total (vph)	179	146	27	79	34	293	34	716				
Volume Left (vph)	179	0	27	0	34	0	34	0				
Volume Right (vph)	0	146	0	79	0	10	0	93				
Hadj (s)	0.53	-0.67	0.53	-0.67	0.53	0.01	0.53	-0.06				
Departure Headway (s)	7.8	6.6	8.3	7.2	7.4	6.8	7.0	6.4				
Degree Utilization, x	0.39	0.27	0.06	0.16	0.07	0.56	0.07	1.27				
Capacity (veh/h)	449	525	411	477	475	515	499	571				
Control Delay (s)	14.5	10.9	10.7	10.3	9.7	16.9	9.3	155.0				
Approach Delay (s)	12.9		10.4		16.2		148.4					
Approach LOS	B		B		C		F					
Intersection Summary												
Delay			80.8									
Level of Service			F									
Intersection Capacity Utilization			63.2%		ICU Level of Service		B					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis
 2: Galvin Ave & Spine Rd

12/11/2020























Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Stop			Stop		
Traffic Volume (vph)	32	580	12	102	878	29	18	1	85	29	4	43
Future Volume (vph)	32	580	12	102	878	29	18	1	85	29	4	43
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)	32	580	12	102	878	29	18	1	85	29	4	43

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total (vph)	32	592	102	907	18	86	29	47
Volume Left (vph)	32	0	102	0	18	0	29	0
Volume Right (vph)	0	12	0	29	0	85	0	43
Hadj (s)	0.53	0.02	0.53	0.01	0.53	-0.66	0.53	-0.61
Departure Headway (s)	6.5	6.0	6.4	5.9	8.2	7.1	8.3	7.2
Degree Utilization, x	0.06	0.99	0.18	1.49	0.04	0.17	0.07	0.09
Capacity (veh/h)	534	592	548	615	421	489	413	479
Control Delay (s)	8.7	57.0	9.6	243.3	10.4	10.3	10.7	9.7
Approach Delay (s)	54.5		219.7		10.3		10.1	
Approach LOS	F		F		B		B	

Intersection Summary	
Delay	142.1
Level of Service	F
Intersection Capacity Utilization	69.6%
ICU Level of Service	C
Analysis Period (min)	15

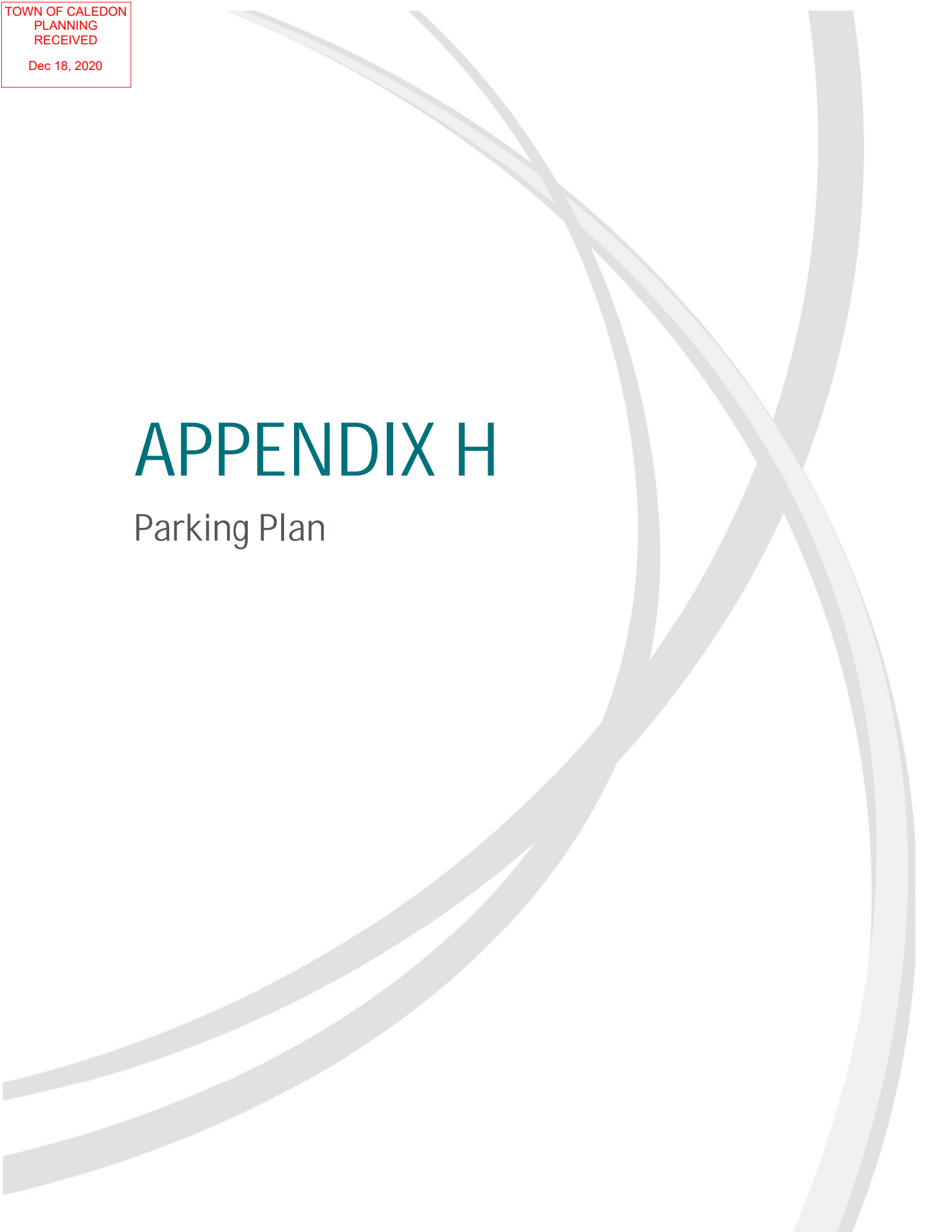
ICM Unsignalized Intersection Capacity Analysis
 3: McLaughlin Rd & Lipa Dr

12/11/2020

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control	Stop			Stop			Stop			Stop		
Traffic Volume (vph)	163	0	35	7	0	91	185	629	30	77	419	126
Future Volume (vph)	163	0	35	7	0	91	185	629	30	77	419	126
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)	163	0	35	7	0	91	185	629	30	77	419	126
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2				
Volume Total (vph)	163	35	7	91	185	659	77	545				
Volume Left (vph)	163	0	7	0	185	0	77	0				
Volume Right (vph)	0	35	0	91	0	30	0	126				
Hadj (s)	0.53	-0.67	0.53	-0.67	0.53	0.00	0.53	-0.13				
Departure Headway (s)	8.4	7.2	8.7	7.6	7.1	6.6	7.2	6.6				
Degree Utilization, x	0.38	0.07	0.02	0.19	0.36	1.20	0.15	1.00				
Capacity (veh/h)	413	477	391	453	498	553	485	545				
Control Delay (s)	15.3	9.6	10.7	11.2	12.9	129.1	10.4	61.8				
Approach Delay (s)	14.3		11.1		103.6		55.5					
Approach LOS	B		B		F		F					
Intersection Summary												
Delay			71.4									
Level of Service			F									
Intersection Capacity Utilization			65.7%		ICU Level of Service			C				
Analysis Period (min)			15									

APPENDIX H

Parking Plan



Parking Plan - Stage 2

21T-XXXXXX

Part of Lots 19 & 20, Concession 2 WHS (Chinguacousy), designated as Part 1 on 43R-36993, Town of Caledon
Regional Municipality of Peel,
Part of Lot 19, Concession 2 WHS (Chinguacousy), designated as Part 2 on 43R-36993, Town of Caledon
Regional Municipality of Peel,
Part of Lot 19, Concession 2 WHS (Chinguacousy), designated as Part 1 on 43R-37536, Town of Caledon
Regional Municipality of Peel

Key Plan



PARKING STATISTICS

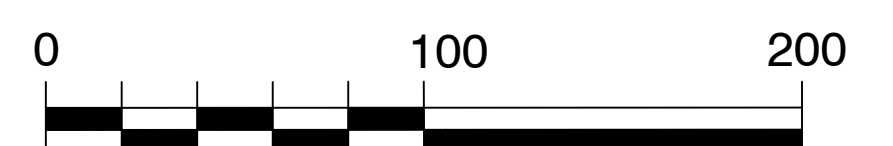
	Single Detached 2 Car Garage - 161 Units
Required 3 spaces / unit	483
Provided 4 spaces / unit (2 garage & 2 driveway)	644
Surplus	+161
	Townhouse 2 Car Garage - 50 Units
Required 2.5 spaces / unit	125
Provided 2.5 spaces / unit (2 in garage and 2 on driveway under deck)	200
Surplus	+75
	Townhouse 1 Car Garage - 27 Units
Required 2.5 spaces / unit	68
Provided 2 spaces / unit (1 in garage and 1 on driveway)	54
Provided on-street parking (1 space / unit) - Street 'O'	36
Surplus	+22
	Single Detached 1 Car Garage - 155 Units
Required 3 spaces / unit	465
Provided 2 spaces / unit (1 garage & 1 driveway)	310
Provided on-street parking (1 space / unit) - remaining streets	177
Surplus	+22

DRAFT

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140 Renfrew Drive, Suite 201
Markham, Ontario, L3R 6B3
Tel. (905) 513-0170
Fax. (905) 513-0177

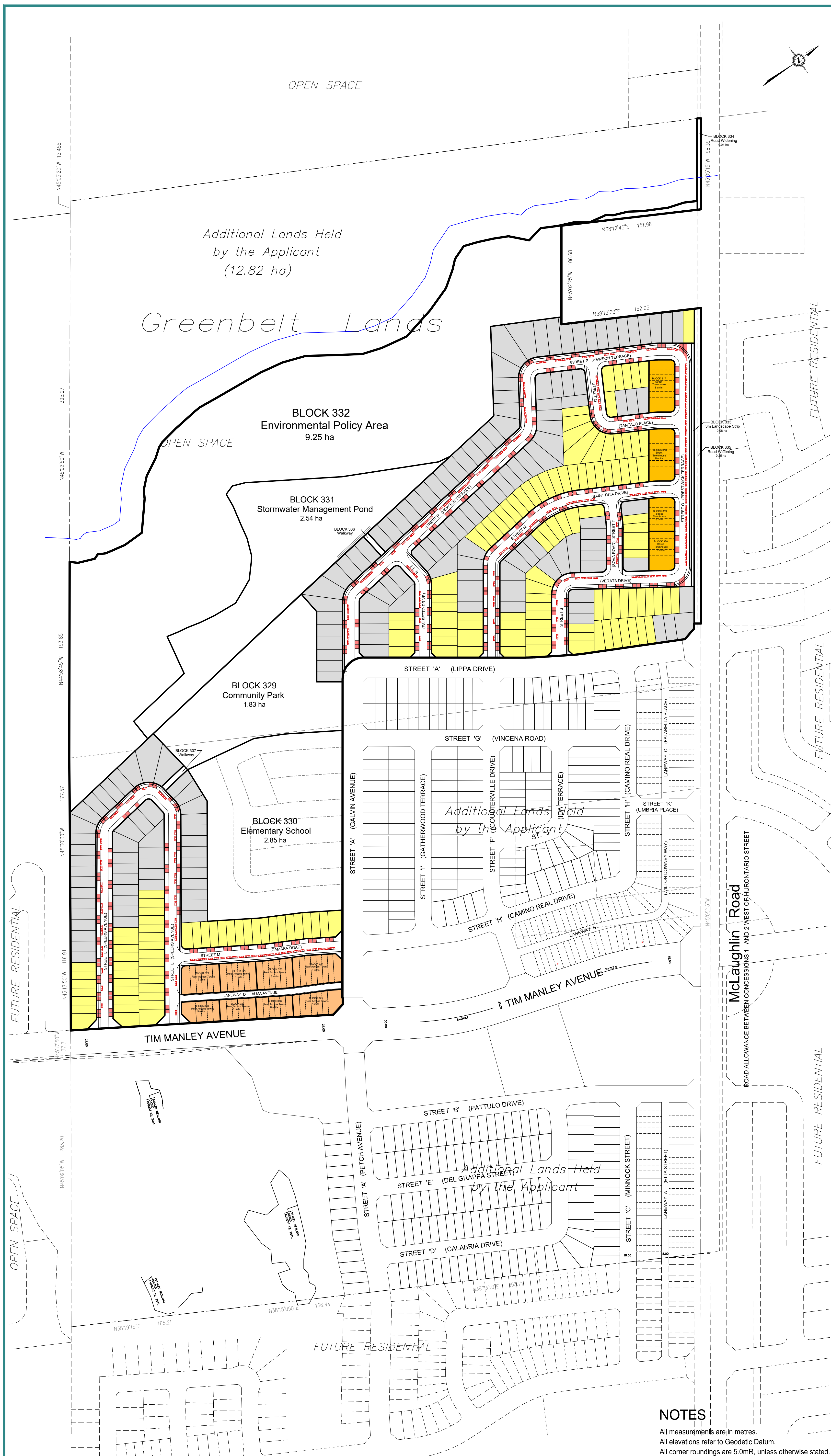
Project No. 20-2872
Date: December 1, 2020
Revised:

Scale:



NOTES

All measurements are in metres.
All elevations refer to Geodetic Datum.
All corner roundings are 5.0mR, unless otherwise stated.



TOWN OF CALEDON
PLANNING
RECEIVED
Dec 18, 2020

