Appendix A

Water

CONTENTS

WATER MAINS, RESERVOIRS AND BOOSTER STATIONS

RESERVOIR LOCATION 1 - NORTHWEST		UNIT COST ($/m)	INSTALLED COST ($)	Annual O&M
Diameter	*Total Length (m)*			
150 mm	11.2	$800	$8,920	$ 44.60
200 mm	299.7	$1,130	$338,606	$ 1,693.03
300 mm	17770.9	$1,250	$22,213,617	$ 111,068.09
400 mm	537.1	$1,400	$751,968	$ 3,759.84
600 mm	2191.9	$1,800	$3,945,393	$ 19,726.97
	20,810.70	**Total Cost**	**$27,258,505**	**$136,293**
RESERVOIR LOCATION 3 - EAST				
Diameter	*Total Length (m)*			
300 mm	17549.6	$1,250	$21,937,013	$ 109,685.07
600 mm	5168.4	$1,800	$9,303,124	$ 46,515.62
	22718.0	**Total Cost**	**$31,240,137**	**$156,201**
RESERVOIR LOCATION 2 - CENTRAL (PREFERRED)				
Diameter	*Total Length (m)*			
300 mm	17497.9	$1,250	$21,872,371	$ 109,361.86
600 mm	3274.1	$1,800	$5,893,348	$ 29,466.74
	20772.0	**Total Cost**	**$27,765,719**	**$138,829**

Property Costs

Water (Assume 5m easement required when outside of public ROW):			
All alternatives:	m2	Unit rate per m2	Cost
Watermain Easement: 3,000m length x 5m easement =	15000	0.2	$ 3,000
Elevated Storage: (property purchase)			
Location 1, 2, 3, : 50x50m lot = 2500m2	2500	198	$ 495,000
Underground Tank:			
Location 1, 2, 3 :100m x 60m = 6000m2	6000	198	$ 1,188,000

Source: Tendered Costs for City of Guelph Projects. Please refer to the "Benchmarking" Tab. The tendered costs are for 150 and 200 mm diameter pipes. Other pipe unit costs were estimated taking the 150 mm and 200 mm pipes as reference.

Property Costs =	$ 800,000	per acre	=	$ 197.68	per m2	Source: Watson & Associates
Easement costs =	$ 2,000.00	per hectare (10,000 sq.m.)		$ 0.20	per m2	

Watermain O&M	0.50%	of Capital

Water Summary by Reservoir Location

	1A	1B	1C	2A	2B	2C
Property Costs	$495,000	$495,000	$495,000	$1,188,000	$1,188,000	$1,188,000
O&M Costs	$250,293	$276,079	$293,451	$243,293	$269,079	$286,451
Distribution Cost ($M)	23.3	21.9	21.9	23.3	21.9	21.9
Inline Booster		0.5	0.5		0.5	0.5
Storage Cost ($M)	5.7	5.7	5.7	3.4	3.4	3.4
Transmission Cost ($M)	3.9	5.9	9.3	3.9	5.9	9.3
Property Costs - From above ($M)	0.5	0.5	0.5	1.2	1.2	1.2
Total ($M)	**33.4**	**34.5**	**37.9**	**31.8**	**32.9**	**36.3**

WATER STORAGE RESERVOIRS

Volume of Storage Reservoir - 5ML

	Estimated Cost ($)	Annual O&M
In-ground Reservoir	**1.4 Million**	$ 7,000.00
Booster PS for In-ground Reservoir	**2.0 Million**	$ 100,000
Inline Booster for locations 2 and 3	**0.5 Million**	$ 23,250
Overhead Service Reservoir	**5.7 Million**	$ 114,000

Ref. AWWA M42, 2013, Chapter 5

ELEVATED TANK

Estimated cost for a 1.9 ML Elevated Tank is $1 Million (2013)
Therefore, estimated cost for a 5 ML Elevated Tank is $2.6 Million (2013)
Assuming Inflation of 3.5%, estimated cost for a 5 ML Elevated Tank is 3.3 Million (2020)
City indicated reccent tenderd values suggest $5.7M would bean appropriate price

IN-GROUND RESERVOIR

Estimated cost for a 1.9 ML Elevated Tank is $0.4 Million (2013)
Therefore, estimated cost for a 5 ML In-ground Reservoir is $1.1 Million (2013)
Assuming Inflation of 3.5%, estimated cost for a 5 ML In-ground Reservoir is $1.4 Million (2020)

Ref. USEPA, 1999

BOOSTER-PUMP STATION

Unit cost per m3/d is $68 (1999)
Assuming Inflation of 3.5%, unit cost per m3/d is $140 (2020)
Cost for a Booster Pump Station Capacity of 170 L/s is $2 Million (2020)

O&M Costs - Water

In ground reservoir	0.50%	of Capital Cost
Booster pumping station	5%	of Capital Cost
Overhead reservoir	2%	of Capital Cost

Memo

To: Rajan Sawhney (Wood)

From: Ali Aamir (Wood)

Date: June 10, 2020

File: N/A

cc: Steve Chipps, Ron Scheckenberger (Wood)

Re: **Clair Maltby Servicing - Water Model Setup and Preferred Alternative**

1.0 Introduction

The Clair Maltby Secondary Plan (CMSP) Lands water modelling has been developed using the existing City hydraulic modelling as a base, with revised modelling as developed by Wood representing the proposed servicing for the Clair Maltby Secondary Plan Lands. Three alternatives have been proposed, each at different locations, considering above ground storage via elevated tanks. The hydraulic modelling assessment consisted of assessing these locations while being connected to City servicing, as supplied by the Clair Gordon booster pump station. This memorandum provides a brief overview of the development of the water modelling for the preferred alternative.

2.0 Model Development

The hydraulic model has been created using InfoWater, and has been built upon the existing City of Guelph hydraulic model, with the connection point at Clair Gordon booster pumping station. A 600 mm diameter transmission main has been proposed to be connected to the Clair Gordon booster pumping station, which will provide a supply to the proposed elevated tank in the preferred alternative. Internal servicing of watermains within the CMSP lands consist of 300 mm diameter supply mains which will follow proposed grading within CMSP.

The proposed elevated tank will have a capacity of 5 ML, and will be situated at an elevation of 382 m, consisting of a low water level (LWL) at an elevation of 390 m, and a high water level (HWL) at an elevation of 394 m, which will be sufficient to supply an adequate amount of water for future devleopments within the CMSP area, while meeting necessary pressure and flow requirements.

Flow allocation has been based upon a predicted population of approximately 27,324, which consists of the total CMSP population of 23,759, and an additional population loading of 3,471 (consisting of 15% of the primary CMSP population) from potential additional Zone 3 lands outside of the CMSP area. This population has been used to estimate the required demands for the CMSP lands.

The population has been distributed based upon the land use plan information provided by Brook McIllroy in August, 2019. Demands have been split between several land use types, including residential, commercial, and mixed use. While the land use is not expected to drastically change over the course of development, it should be noted that the demand allocation will have to be revised should there be any change in either the overall population, or the land use within CMSP lands. This will also include the population estimates attributed to any potential additional Zone 3 lands outside of the CMSP area.

The C3W memorandum outlining potential changes to the water model have been assessed within this iteration of the model as well, with updated peaking factors applied, in addition to other adjustments within the model (addition of check valves etc.). It should be noted that within the existing City water modelling, a City node (valve V8056) prevented the ADD and PHD scenarios from running to completion for a 24-hour duration. Based upon Wood's communication with Innovyze Support, extending the trial time, increasing the error tolerance, and allowing pumps to run in parallel allowed the model to run through the full 24 hour duration. However, should a steady state model be used instead, there is minimal change expected within overall pressures and flows.

3.0 Preferred Alternative

The preferred water servicing alternative is the above ground storage (via an elevated tank), at location 2. This location would be more central to the CMSP development as compared with the other two locations identified. Additionally, this location for the reservoir would be close to a large commercial centre and would facilitate in meeting the fire flow requirements.

3.1 Discussion of the Preferred Alternative

The following scenarios were modelled for the preferred alternative:

- Average Day Demand (ADD);
- Max Day Demand plus Fire (MDD + Fire); and,
- Peak Hour Demand (PHD).

Figure 1 through 3 show the pressure and flow breakdown at certain locations across the CMSP area.

Average Day Demand (ADD)

The average day demand scenario is presented in **Figure 1**. The pressures range from a maximum of 517 kPa to a minimum of 347 kPa, which are within the acceptable range.

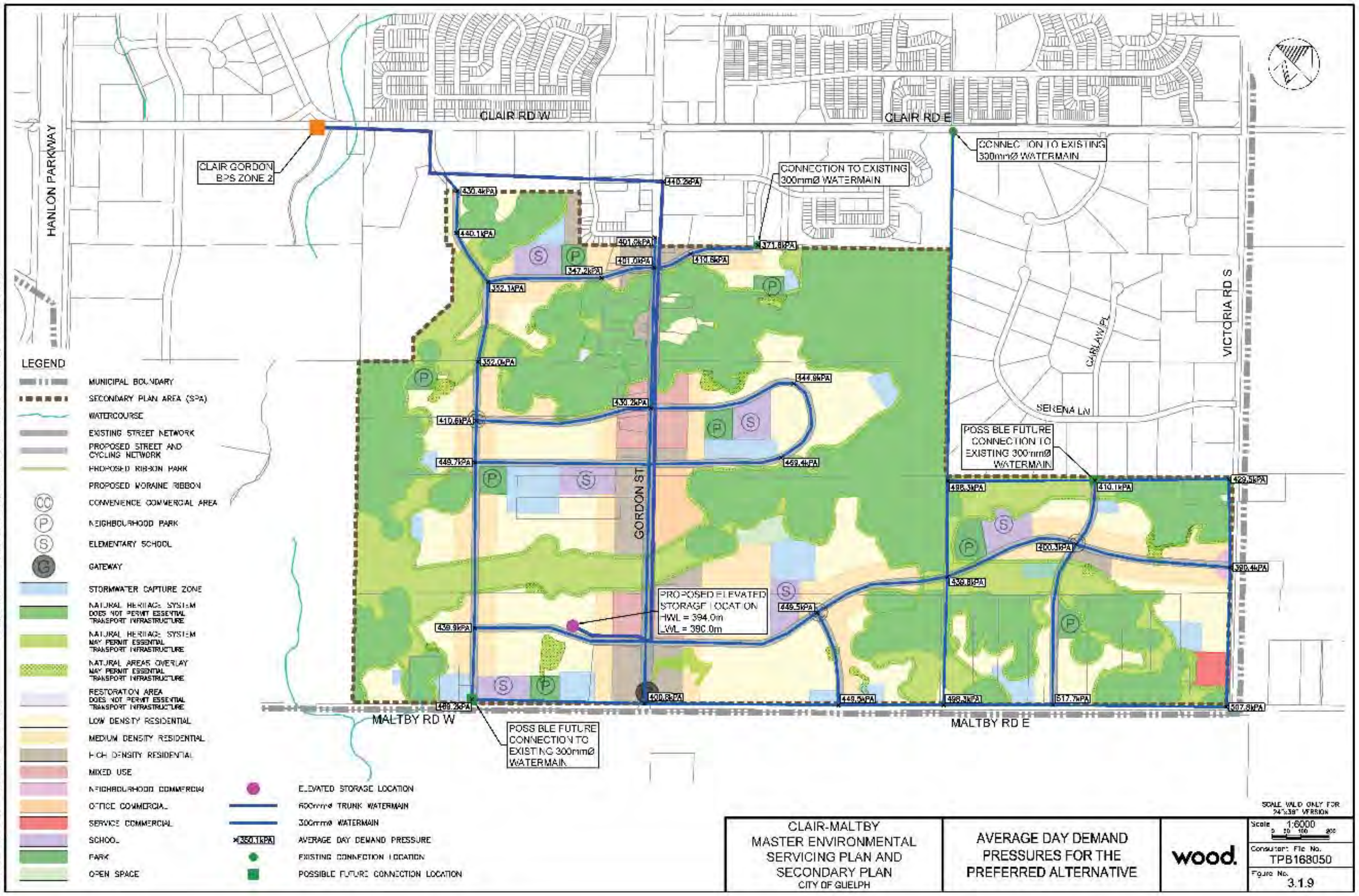


Figure 1 Average Day Demand – Pressures for the Preferred Alternative

City of Guelph
June 10, 2020

Max Day Demand plus Fire (MDD + Fire)

The max day demand + fire flow scenario is presented in **Figure 2**. This figure presents the fire flows available at various junctions while max day demand is exercised at all the junctions in the backdrop. All this was modelled while keeping the pressures within the acceptable range. The fire flows predicted by the model meet the fire flow requirements established in section 3.1.3.2 of this report.

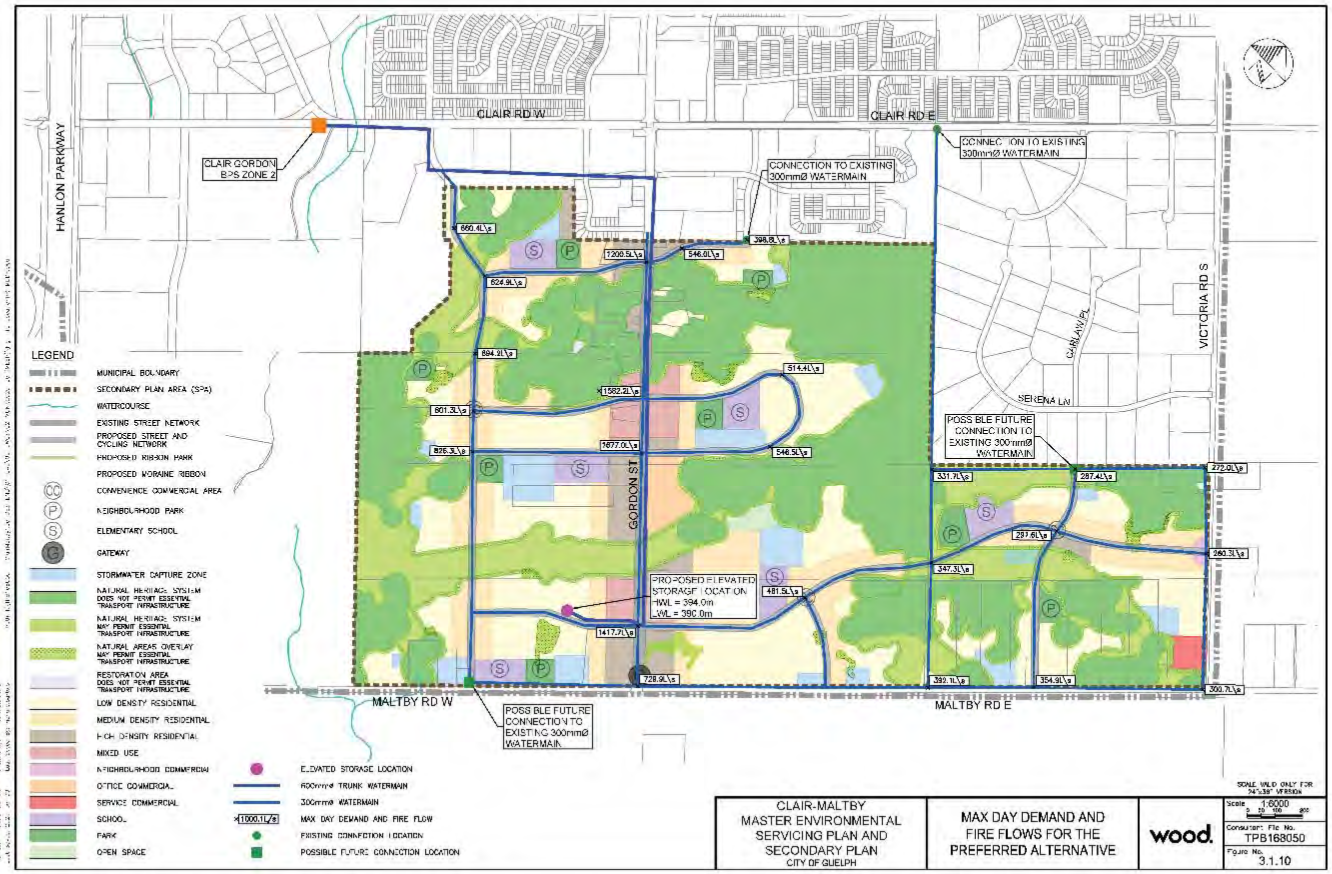


Figure 2 Max Day Demand + Fire – Fire Flows for the Preferred Alternative

City of Guelph
June 10, 2020

Peak Hour Demand (PHD)

The peak hour demand scenario is presented in **Figure 3**. The pressures range from a maximum of 561 kPa to a minimum of 391 kPa, which are within acceptable range.

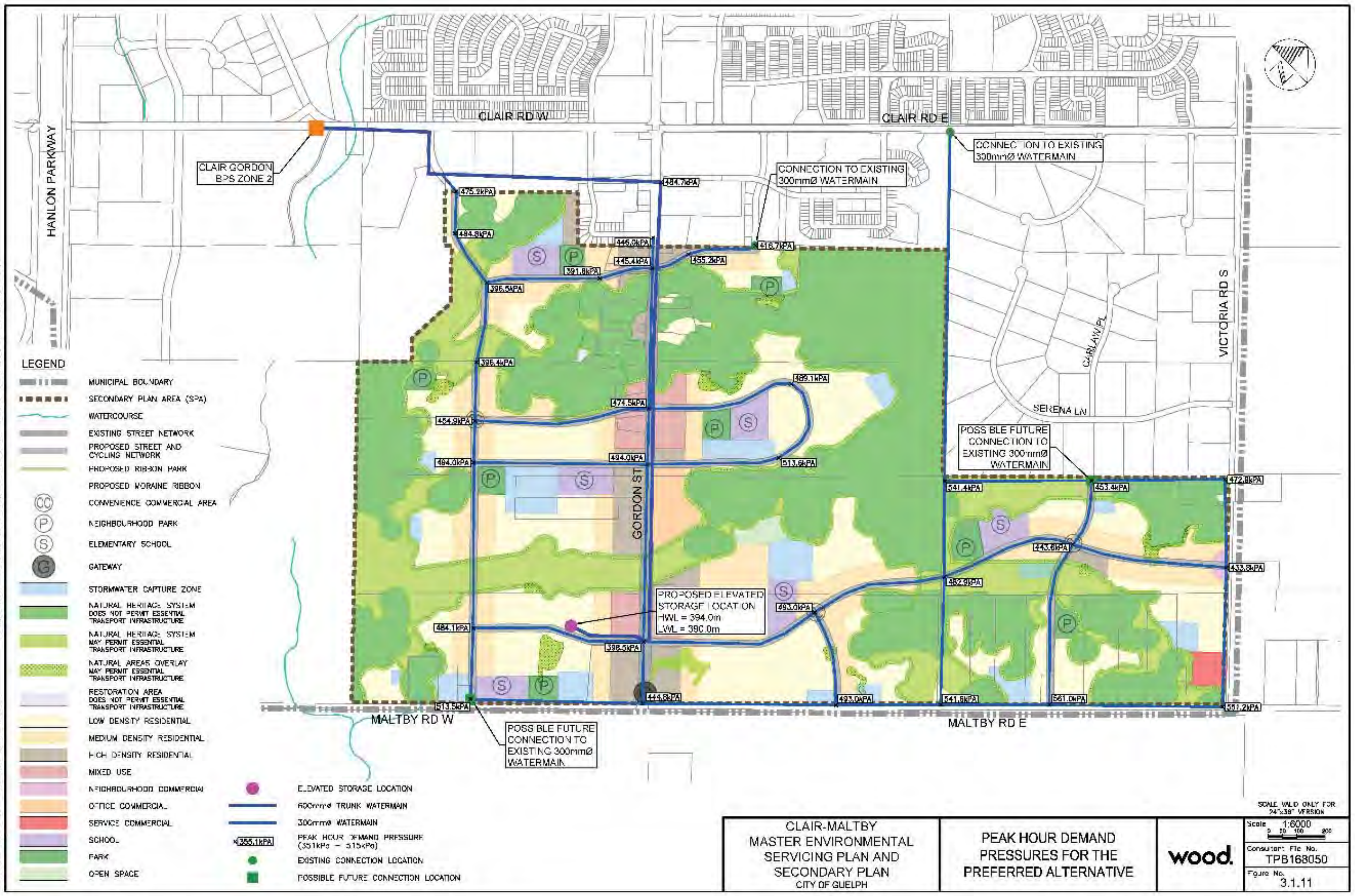


Figure 3 Peak Hour Demand – Pressures for the Preferred Alternative

Appendix B

Wastewater

CONTENTS

Southgate Hanlon

Depth (m)	200	Unit Cost ($/m)	Cost ($)	300	Unit Cost ($/m)	Cost ($)	375	Unit Cost ($/m)	Cost ($)	525	Unit Cost ($	Cost ($)	600	Unit Cost ($	Cost ($)	825	Unit Cost ($/m)	Cost ($)
2.25	184.537	$ 231.81	$ 42,776.89															
2.75													144.822	$ 561.74	$ 81,352.78			
3	295.459	$ 303.77	$ 89,752.75							1432	511.08773	$ 731,877.63						
3.25							481.208	$ 492.88	$ 237,176.45				458.319	$ 595.30	$ 272,837.99			
3.5	177.651	$ 387.11	$ 68,771.01	1801.873	$ 434.19	$ 782,355.20	555.609	$ 540.43	$ 300,268.52									
3.75				518.575	$ 481.11	$ 249,490.55	694.724	$ 594.27	$ 412,852.05				904.733	$ 722.54	$ 653,702.76			
4							382.408	$ 594.27	$ 227,252.73	917	717.92439	$ 658,336.66	201.668	$ 780.99	$ 157,499.75	1406	$ 1,026.00	$ 1,442,556.00
4.25	166.016	$ 482.70	$ 80,135.66															
4.75	269.011	$ 590.69	$ 158,901.90	320.404	$ 644.53	$ 206,508.58	354.988	$ 767.39	$ 272,413.20							1406	1225	$ 1,722,350.00
5				267.878	$ 702.97	$ 188,311.34	283.203	$ 767.39	$ 217,326.32									
5.15				278.187	$ 702.97	$ 195,558.30												
5.25				967.545	$ 767.78	$ 742,866.21												
5.5				100.948	$ 832.60	$ 84,048.81	170.502	$ 1,042.93	$ 177,821.77									
6.25				324.549	$ 974.14	$ 316,157.52	456.948	$ 1,042.93	$ 476,565.10									
6.3							25	$ 1,042.93	$ 26,073.27									
6.35							230.408	$ 1,199.08	$ 276,278.37									
6.85							458.678	$ 1,199.08	$ 549,993.10									
7							232.112	$ 1,455.12	$ 337,750.11									
7.6335				82.709	$ 1,381.37	$ 114,251.92												
7.75	126.18																	
8				180.285	$ 1,471.77	$ 265,338.13												
8.75							141.468											
9	138.184																	
9.45				155.312	$ 1,969.16	$ 305,834.26												
11	286.616																	
11.5	56.006																	
12.65				165.696	$ 3,190.94	$ 528,725.35												
12.85				34.096	$ 3,329.76	$ 113,531.50												
Grand Total	1699.66		$ 397,561.31	5198.057		$ 4,092,977.68	4467.256		$ 3,511,770.96	1709.542		$ 1,390,214.29	1709.542		$ 1,165,393.27	1709.542		$ 3,164,906.00

TOTAL COST FOR SOUTHGATE HANLON SEWERS $ 13,722,823.51

Southgate Industrial

Depth (m)	200	Unit Cost ($/m)	Cost ($)	300	Unit Cost ($/m)	Cost ($)	375	Unit Cost ($/m)	Cost ($)	525	Unit Cost ($	Cost ($)	450	Unit Cost ($	Cost ($)	600	Unit Cost ($	Cost ($)	825	Unit Cost ($/m	Cost ($)
2.25	184.537	$ 231.81	$ 42,776.89																		
2.75																144.822	$ 561.74	$ 81,352.78			
3	295.459	$ 303.77	$ 89,752.75							1432	511.08773	$ 731,877.63									
3.25							481.208	$ 492.88	$ 237,176.45							458.319	$ 595.30	$ 272,837.99			
3.5	177.651	$ 387.11	$ 68,771.01	1801.873	$ 434.19	$ 782,355.20	555.609	$ 540.43	$ 300,268.52				360	675.93678	$ 243,337.24						
3.75				518.575	$ 481.11	$ 249,490.55	694.724	$ 594.27	$ 412,852.05							1811.733	$ 722.54	$ 1,309,043.51			
4							382.408	$ 594.27	$ 227,252.73	917	717.92439	$ 658,336.66				201.668	$ 780.99	$ 157,499.75	1406	$ 1,026.00	$ 1,442,556.00
4.25	166.016	$ 482.70	$ 80,135.66																		
4.75	269.011	$ 590.69	$ 158,901.90	320.404	$ 644.53	$ 206,508.58	354.988	$ 767.39	$ 272,413.20										1406	1225	$ 1,722,350.00
5				267.878	$ 702.97	$ 188,311.34	283.203	$ 767.39	$ 217,326.32												
5.15				278.187	$ 702.97	$ 195,558.30															
5.25				967.545	$ 767.78	$ 742,866.21															
5.5				100.948	$ 832.60	$ 84,048.81	170.502	$ 1,042.93	$ 177,821.77												
6.25				324.549	$ 974.14	$ 316,157.52	456.948	$ 1,042.93	$ 476,565.10												
6.3							25	$ 1,042.93	$ 26,073.27												
6.35							230.408	$ 1,199.08	$ 276,278.37												
6.85							458.678	$ 1,199.08	$ 549,993.10												
7							232.112	$ 1,455.12	$ 337,750.11												
7.6335				82.709	$ 1,381.37	$ 114,251.92															
7.75	126.18																				
8				180.285	$ 1,471.77	$ 265,338.13															
8.75							141.468														
9	138.184																				
9.45				155.312	$ 1,969.16	$ 305,834.26															
11	286.616																				
11.5	56.006																				
12.65				165.696	$ 3,190.94	$ 528,725.35															
12.85				34.096	$ 3,329.76	$ 113,531.50															
Grand Total	**1699.66**		$ 397,561.31	**5198.057**		$ 4,092,977.68	**4467.256**		$ 3,511,770.96	1709.542		$ 1,390,214.29	**1709.542**		$ 243,337.24	**1709.542**		$ 1,820,734.03	1709.542		$ 3,164,906.00

TOTAL COST FOR SOUTHGATE INDUSTRIAL SEWERS $ 14,621,501.51

Clain Gordon

Depth (m)	200	Unit Cost ($/m)	Cost ($)	250	Unit Cost ($/m)	Cost ($)	300	Unit Cost ($/m)	Cost ($)	375	Unit Cost ($/m)	Cost ($)	450	Unit Cost ($/m)	Cost ($)	600	Unit Cost ($/m)	Cost ($)	675	Unit Cost ($/m)	Cost ($)
3.448			23262.56				42.00	$ 553.87	$ 23,262.56												
3.483	51.00	$ 503.61	$ 25,684.25																		
3.7855	14.50	$ 555.06	$ 8,048.42																		
3.789	41.30	$ 555.06	$ 22,924.12																		
3.942							**50.60**	$ 607.55	$ 30,741.92												
4.2175	68.10	$ 612.32	$ 41,698.94																		
4.779							97.50	$ 794.82	$ 77,495.16												
4.813				36.06	$ 766.35	$ 27,634.70															
5.1965	54.20	$ 875.54	$ 47,454.10																		
5.235													6.50	$ 1,071.16	$ 6,962.55						
5.434				14.20	$ 905.60	$ 12,859.47															
5.575							35.50	$ 1,006.75	$ 35,739.56												
5.5795													76.00	$ 1,144.32	$ 86,968.41						
5.6175													19.30	$ 1,144.32	$ 22,085.40						
5.641													95.50	$ 1,144.32	$ 109,282.68						
5.6475																39.50	$ 1,291.52	$ 51,014.90			
5.7125													83.60	$ 1,144.32	$ 95,665.25						
5.7625													95.30	$ 1,144.32	$ 109,053.81						
5.795							18.10	$ 1,084.28	$ 19,625.51												
5.865										47.00	$ 1,154.26	$ 54,250.29									
5.905							28.00	$ 1,084.28	$ 30,359.90												
5.9775																97.70	$ 1,374.06	$ 134,245.68			
6.16										50.70	$ 1,232.99	$ 62,512.50									
6.255																			226.70	$ 1,533.02	$ 347,536.68
6.283																			76.80	$ 1,533.02	$ 117,736.29
6.29																			6.20	$ 1,533.02	$ 9,504.75
6.3505													95.00	$ 1,304.16	$ 123,895.24						
6.501																			90.80	$ 1,622.00	$ 147,277.25
6.598																			120.90	$ 1,622.00	$ 196,099.34
6.7175																			97.20	$ 1,712.69	$ 166,473.64
6.7525							57.90	$ 1,329.31	$ 76,966.96												
6.7625																12.10	$ 1,635.33	$ 19,787.49			
6.795										32.80	$ 1,402.30	$ 45,995.55									
6.8585																			81.90	$ 1,712.69	$ 140,269.46
7.083													90.00	$ 1,564.98	$ 140,848.25						
7.205										83.50	$ 1,490.72	$ 124,474.77									
7.331										39.00	$ 1,581.89	$ 61,693.56									
7.395																45.60	$ 1,823.95	$ 83,172.17			
7.5325																43.50	$ 1,823.95	$ 79,341.87			
7.542										67.70	$ 1,581.89	$ 107,093.69									
7.675							21.40	$ 1,599.92	$ 34,238.26												
7.765							19.80	$ 1,599.92	$ 31,678.39												
7.77							59.40	$ 1,599.92	$ 95,035.16												
7.8305																51.90	$ 1,922.44	$ 99,774.83			
7.95																108.10	$ 2,023.72	$ 218,764.62			
8.1155										80.40	$ 1,772.50	$ 142,509.02									
8.13							81.50	$ 1,695.67	$ 138,197.31												
8.1575													46.60	$ 1,849.90	$ 86,205.22						
8.1655													48.50	$ 1,849.90	$ 89,720.03						
8.2105																42.00	$ 2,023.72	$ 84,996.43			
8.235													48.40	$ 1,950.37	$ 94,397.88						
8.377													68.10	$ 1,950.37	$ 132,820.16						
8.4045																72.10	$ 2,127.79	$ 153,413.90			
8.4175							82.40	$ 1,794.20	$ 147,842.23												
8.4225	86.30	$ 1,717.87	$ 148,252.07																		
8.537													84.50	$ 2,053.59	$ 173,528.47						
8.566																41.40	$ 2,234.65	$ 92,514.52			
8.601										30.10	$ 1,974.15	$ 59,421.79									
8.6865													42.00	$ 2,053.59	$ 86,250.84						
8.7755							84.00	$ 1,895.51	$ 159,222.54												
8.82																88.70	$ 2,234.65	$ 198,213.47			
8.8915	20.70	$ 1,919.89	$ 39,741.81																		
8.898							20.00	$ 1,999.59	$ 39,991.73												
8.9745										50.70	$ 2,079.11	$ 105,410.63									
8.992																45.00	$ 2,344.30	$ 105,493.28			
9.0545																81.40	$ 2,344.30	$ 190,825.62			
9.19																83.60	$ 2,456.73	$ 205,382.46			
9.1955							97.60	$ 2,106.44	$ 205,588.71												
9.3865																118.00	$ 2,456.73	$ 289,893.91			
9.4945																17.90	$ 2,571.95	$ 46,037.89			
9.6275										84.70	$ 2,297.30	$ 194,581.11									
9.667	21.30	$ 2,133.00	$ 45,432.81																		
9.679																17.10	$ 2,571.95	$ 43,980.33			
9.692													85.30	$ 2,379.76	$ 202,993.21						
9.6955																75.60	$ 2,571.95	$ 194,439.34			
9.745																30.90	$ 2,571.95	$ 79,473.22			
10.016																57.40	$ 2,689.96	$ 154,403.59			
10.056													20.60	$ 2,493.98	$ 51,375.94						
10.12																9.10	$ 2,810.76	$ 25,577.87			
10.16																89.40	$ 2,810.76	$ 251,281.50			
10.294													20.20	$ 2,610.95	$ 52,741.17						
Grand Total	357.40		$ **402,499.07**	50.26		$ **40,494.17**	795.70		$ **1,145,985.89**	566.60		$ **957,942.90**	1025.40		$ **1,664,794.51**	1268.00		$ **2,802,028.89**			$ **1,124,897.42**
															TOTAL COST FOR CLAIR GORDON TWINNING OF EXISTING SEWERS						$ **8,138,642.85**

Southend Valleyland

Depth (m)	200	Unit Cost ($/m)	Cost ($)	300	Unit Cost ($/m)	Cost ($)	375	Unit Cost ($/m)	Cost ($)	450	Unit Cost ($/m)	Cost ($)	525	Unit Cost ($/m)	Cost ($)	600	Unit Cost ($/m)	Cost ($)
2.75				144.822	$ 347.11	$ 50,269.66				141.468	$ 460.43	$ 65,136.43						
3	295.459	$ 303.77	$ 89,752.75										324.549	$ 511.09	$ 165,873.01			
3.25				458.319	$ 387.27	$ 177,494.12												
3.5							1886.76	$ 492.88	$ 929,940.98									
3.65							701.708	$ 492.88	$ 345,855.87									
3.75				286.758	$ 481.11	$ 137,961.55	574.427	$ 540.43	$ 310,438.35									
4				584.076	$ 533.59	$ 311,658.54	361.467	$ 594.27	$ 214,808.17									
4.15							197.018	$ 594.27	$ 117,081.44									
4.25	166.016	$ 482.70	$ 80,135.66				489.502	$ 594.27	$ 290,895.24									
4.75	268.181	$ 590.69	$ 158,411.63															
5													258.298	$ 1,007.23	$ 260,164.29			
5.5										607.943	$ 965.40	$ 586,906.21	714.518	$ 1,036.57	$ 740,647.17			
7							30.013	$ 1,199.08	$ 35,988.08									
7.6335				82.709	$ 1,381.37	$ 114,251.92												
7.75	126.18	$ 1,309.53	$ 165,236.36															
8.5							170.502	$ 1,640.87	$ 279,771.20									
8.75							865.006	$ 1,738.26	$ 1,503,606.46	456.948	$ 1,812.49	$ 828,214.54						
9	138.184	$ 1,681.08	$ 232,298.06							232.112	$ 1,913.58	$ 444,164.93						
9.25																482.951	$ 2,239.66	$ 1,081,644.54
9.45				155.312	$ 1,969.16	$ 305,834.26												$ -
10.5													317.071	$ 2,553.97	$ 809,789.07	4100	$ 2,849.50	$ 11,682,929.55
11	286.616	$ 2,446.77	$ 701,283.97															
11.5	56.006	$ 2,568.16	$ 143,832.09															
12.65				165.696	$ 3,190.94	$ 528,725.35												
12.75													143.534	$ 3,429.27	$ 492,217.34			
12.85				34.096	$ 3,329.76	$ 113,531.50												
13.75										100.948	$ 3,937.20	$ 397,452.92						
14.75																69.333	$ 4,816.17	$ 333,919.44
15.5													295.101	$ 4,750.49	$ 1,401,874.09			
15.75													323.768	$ 4,910.89	$ 1,589,988.92			
Grand Total	1336.642		**$ 1,570,950.51**	1911.788		**$ 1,739,726.90**	5276.403		**$ 4,028,385.79**	1539.419		**$ 2,321,875.03**	2376.839		**$ 5,460,553.89**	552.284		**$ 13,098,493.53**
												TOTAL COST FOR SOUTHEND VALLEYLAND SEWERS						**$ 28,219,985.65**

Victoria Road

Depth (m)	200 mm	Unit Cost ($/m)	Cost ($)	300 mm	Unit Cost ($/m)	Cost ($)	375 mm	Unit Cost ($/m)	Cost ($)
2.25	184.537	$ 231.81	$ 42,777.52						
2.75							144.822	$ 403.81	$ 58,480.57
3	295.459	$ 348.70	$ 103,026.55						
3.25							939.527	$ 470.00	$ 441,577.69
3.5	1071.179	$ 387.11	$ 414,664.10	1463.954	$ 434.19	$ 635,634.19			
3.75	82.083	$ 431.80	$ 35,443.44	518.575	$ 481.11	$ 249,491.62	1517.374	$ 540.43	$ 820,034.43
4				382.408	$ 533.59	$ 204,049.08	201.668	$ 594.27	$ 119,845.24
4.25	166.016	$ 533.59	$ 88,584.48						
4.75	269.011	$ 590.69	$ 158,902.11	323.768	$ 702.97	$ 227,599.19	354.988	$ 707.75	$ 251,242.76
5				267.878	$ 767.78	$ 205,671.37	283.203	$ 767.39	$ 217,327.15
5.15				278.187	$ 767.78	$ 213,586.41			
5.25				967.545	$ 767.78	$ 742,861.70			
5.5				100.948	$ 832.60	$ 84,049.30	170.502	$ 899.00	$ 153,281.30
6.25				324.549	$ 1,020.00	$ 331,039.98	456.948	$ 1,042.93	$ 476,564.78
6.3							25	$ 1,042.93	$ 26,073.25
6.35							230.408	$ 1,119.76	$ 258,001.66
6.85							458.678	$ 1,199.08	$ 549,991.62
7							232.112	$ 1,281.42	$ 297,432.96
7.63				82.709	$ 1,381.37	$ 114,251.73			
7.75	126.18	1309.53	$ 165,236.50						
8				180.285	$ 1,471.77	$ 265,338.05			
8.75							141.468	$ 1,738.26	$ 245,908.17
9	138.184	1781.46	$ 246,169.27						
9.45				155.312	$ 1,969.16	$ 305,834.18			
11	286.616	2446.77	$ 701,283.43						
11.5	56.006	2692.54	$ 150,798.40						
12.65				165.696	$ 3,190.94	$ 528,725.99			
12.85				34.096	$ 3,329.76	$ 113,531.50			
Grand Total	**2675.271**		**$ 2,106,885.79**	**5245.91**		**$ 4,221,664.31**	**5156.698**		**$ 3,915,761.57**

TOTAL COST FOR VICTORIA ROAD AND CLAIR GORDON SEWERS **$ 10,244,311.67**

Valley / Southgate Hanlon

Depth (m)	200	Unit Cost ($/m)	Cost ($)	300	Unit Cost ($/m)	Cost ($)	375	Unit Cost ($/m)	Cost ($)	450	Unit Cost ($/m)	Cost ($)	600	Unit Cost ($/m)	Cost ($)	750	Unit Cost ($/m)	Cost ($)
3.5	332	$ 387.11	$ 128,521.51				1378	$ 540.43	$ 744,714.39									
3.8				144	$ 481.11	$ 69,279.54	574	$ 594.27	$ 341,109.67									
4	146	$ 482.70	$ 70,473.96	621	$ 533.59	$ 331,360.91	361	$ 594.27	$ 214,530.65									
4.15				471	$ 533.59	$ 251,322.04												
4.25	460	$ 482.70	$ 222,041.26	108	$ 533.59	$ 57,627.98	490	$ 648.10	$ 317,571.01									
4.5				202	$ 586.08	$ 118,387.54												
5.7	142	$ 774.15	$ 109,928.79	338	$ 832.60	$ 281,417.14				622	$ 965.40	$ 600,476.79						
6	380	$ 843.57	$ 320,556.26	292	$ 903.37	$ 263,783.93												
6.5				780	$ 1,050.05	$ 819,035.51												
6.75				295	$ 1,128.34	$ 332,859.50												
7	145	$ 1,062.36	$ 154,042.59				5	$ 1,281.42	$ 6,407.08									
7.25				824	$ 1,209.66	$ 996,756.28												
7.5				602	$ 1,294.00	$ 778,988.40										2806	$ 1,615.34	$ 4,532,642.39
8	544	$ 1,397.92	$ 760,466.74															
8.25	126	$ 1,489.30	$ 187,652.33	263	$ 1,565.20	$ 411,646.35												
8.75										433	$ 1,812.49	$ 784,808.99						
9				324	$ 1,761.12	$ 570,604.39							198	2010.341917	$ 398,047.70			
9.5													825	2219.632937	$ 1,831,197.17			
9.7	124	$ 1,884.85	$ 233,721.37															
10.25				258	$ 2,189.30	$ 564,840.12							145	2439.802984	$ 353,771.43			
10.5				155	$ 2,303.91	$ 357,106.64												
11				325	$ 2,542.22	$ 826,220.12							242	2790.456233	$ 675,290.41			
11.75													291	3037.82385	$ 884,006.74			
12	287	$ 2,819.92	$ 809,317.04										69	3165.587294	$ 218,425.52			
12.25													433	3296.070494	$ 1,427,198.52			
12.5													530	3429.273452	$ 1,817,514.93			
12.85	56	$ 3,220.06	$ 180,323.60															
13.25							141	$ 1,738.26	$ 245,094.84									
13.5							29	$ 1,738.26	$ 50,409.58									
13.65				166	$ 3,616.49	$ 600,336.95												
13.85				34	$ 3,764.39	$ 127,989.31												
Grand Total	2742		$ 3,177,045.44	6202		$ 7,759,562.65	2978		$ 1,919,837.21	1055		$ 1,385,285.78	2733		$ 7,605,452.43	2806		$ 4,532,642.39

TOTAL COST FOR VALLEY / SOUTHGATE HANLON SEWERS $ 26,379,825.91

Gordon / Southgate Hanlon

Depth (m)	200	Unit Cost ($/m)	Cost ($)	300	Unit Cost ($/m)	Cost ($)	375	Unit Cost ($/m)	Cost ($)
3.25							482	$ 492.88	$ 237,566.81
3.5	328	$ 387.11	$ 126,973.06	1985	$ 434.19	$ 861,867.11			
3.75	144	$ 431.80	$ 62,179.82	1010	$ 481.11	$ 485,919.03	613	$ 594.27	$ 364,286.11
4				459	$ 533.59	$ 244,918.93			
4.25	126	$ 482.70	$ 60,820.00	556	$ 533.59	$ 296,677.40			
4.5	302	$ 533.59	$ 161,144.92						
4.75	320	$ 590.69	$ 189,020.55	268	$ 644.53	$ 172,732.86			
5	396	$ 647.71	$ 256,491.77	278	$ 702.97	$ 195,426.84	355	$ 833.23	$ 295,797.09
5.35	381	$ 710.93	$ 270,862.98				513	$ 1,042.93	$ 535,023.45
6.1				82	$ 974.14	$ 79,879.82			
6.3				325	$ 974.14	$ 316,596.86	482	$ 1,042.93	$ 502,692.60
6.4									
6.75				217	$ 1,128.34	$ 244,849.19			
7.65				249	$ 1,381.37	$ 343,961.69			
7.75				899	$ 1,381.37	$ 1,241,853.65			
8.2				155	$ 1,471.77	$ 228,124.42			
8.4									
8.75							141	$ 1,738.26	$ 245,094.84
10.1				34	$ 2,189.30	$ 74,436.29			
10.35									
10.75							17	$ 1,738.26	$ 29,550.44
11.2				116	$ 2,542.22	$ 294,897.03			
12	138	$ 2,819.92	$ 389,148.96						
Grand Total	2135		$ 1,516,642.05	6633		$ 5,082,141.14	2603		$ 2,210,011.34

Depth (m)	450	Unit Cost ($/m)	Cost ($)	600	Unit Cost ($/m)	Cost ($)	750	Unit Cost ($/m)	Cost ($)	900	Unit Cost ($/m)	Cost ($)
3.25												
3.5												
3.75												
4				287	$ 1,100.00	$ 315,700.00						
4.25												
4.5												
4.75							823	$ 1,400.00	$ 1,152,200.00			
5							1007	$ 1,500.00	$ 1,510,500.00	2812	$ 1,800.00	$ 5,061,600.00
5.35	163	$ 1,200.00	$ 195,600.00	202	$ 1,300.00	$ 262,600.00						
6.1												
6.3												
6.4	173	$ 1,300.00	$ 224,900.00									
6.75												
7.65												
7.75												
8.2												
8.4				810	$ 2,100.00	$ 1,701,000.00						
8.75												
10.1												
10.35				185	$ 2,300.00	$ 425,500.00						
10.75												
11.2												
12												
Grand Total	336		$ 420,500.00	1484		$ 2,704,800.00	1830		$ 2,662,700.00	2812		$ 5,061,600.00

TOTAL COST FOR SOUTHGATE HANLON SEWERS **TOTAL COST FOR SOUTHGATE HANLON SEWERS** **$ 19,658,394.53**

Sanitary Forcemains

EAST CONNECTION - VICTORIA ROAD TRUNK ALTERNATIVE			UNIT COST ($/m)	INSTALLED COST ($)
Name	*Diameter (mm)*	*Total Length (m)*		
Forcemain 1	125	915	$700	$640,500
Forcemain 2	450	6975	$1,500	$10,462,500
Forcemain 3	200	1035	$800	$828,000
			Total Cost	**$11,931,000**
CENTRAL CONNECTION - CLAIR GORDON TRUNK ALTERNATIVE				
Name	*Diameter (mm)*	*Total Length (m)*		
Forcemain 1	125	1480	$700	$1,036,000
Forcemain 2	300	1945	$1,250	$2,431,250
Forcemain 3	450	1175	$1,500	$1,762,500
			Total Cost	**$5,229,750**
WEST CONNECTION - SOUTHGATE HANLON TRUNK ALTERNATIVE				
Name	*Diameter (mm)*	*Total Length (m)*		
Forcemain 1	125	1480	$700	$1,036,000
Forcemain 2	300	1945	$1,250	$2,431,250
Forcemain 3	450	1175	$1,500	$1,762,500
			Total Cost	**$5,229,750**
WEST CONNECTION - SOUTHEND PARK AND VALLEY LAND TRUNK ALTERNATIVE				
Name	*Diameter (mm)*	*Total Length (m)*		
Forcemain 1	100	555	$650	$360,750
Forcemain 2	200	17	$800	$13,600
Forcemain 3	150	635	$700	$444,500
			Total Cost	**$818,850**
WEST CONNECTION - SOUTHGATE INDUSTRIAL ALTERNATIVE				
Name	*Diameter (mm)*	*Total Length (m)*		
Forcemain 1	125	1525	$700	$1,067,500
Forcemain 2	300	1945	$1,250	$2,431,250
Forcemain 3	450	1175	$1,500	$1,762,500
			Total Cost	**$5,261,250**
VALLEY LANDS / SOUTHGATE HANLON				
Name	*Diameter (mm)*	*Total Length (m)*		
Forcemain 1	150	700	$700	$490,000
Forcemain 2	300	2100	$1,250	$2,625,000
Forcemain 3	100	300	$650	$195,000
			Total Cost	**$3,310,000**
GORDON / SOUTHGATE HANLON				
Name	*Diameter (mm)*	*Total Length (m)*		
Forcemain 1	150	1100	$700	$770,000
Forcemain 2	300	1600	$1,250	$2,000,000
Forcemain 3	150	400	$700	$280,000
			Total Cost	**$3,050,000**

Source: Tendered Costs for City of Guelph Projects. Please refer to the "Benchmarking" Tab. The tendered costs are for 150 and 200 mm diameter watermain pipes. Other pipe unit costs were estimated taking the 150 mm and 200 mm pipes as reference. It has been assumed that wastewater forcemains will be associated with similar costs.

Sanitary Pump Stations

Pump Station	Capacity in L/s	Estimated Cost ($) in 2020	Capacity in MGD	Cost in $ (2008)	Cost in $ (2020) *Assuming 3.5% Annual Inflation*	Including Emergency Overflow
EAST CONNECTION - VICTORIA ROAD TRUNK ALTERNATIVE						
Pump Station	*Capacity in L/s*	*Estimated Cost ($) in 2020*				
SPS-1	19	$ 0.7 Million	0.43	$373,198	$563,929	$663,929
SPS-2	195	$ 4.7 Million	4.38	$3,035,953	$4,587,533	$4,687,533
SPS-3	56	$ 1.6 Million	1.26	$987,472	$1,492,138	$1,592,138
CENTRAL CONNECTION - CLAIR GORDON TRUNK ALTERNATIVE						
Pump Station	*Capacity in L/s*	*Estimated Cost ($) in 2020*				
SPS-1	19	$ 0.7 Million	0.43	$373,198	$563,929	$663,929
SPS-2	123	$ 3.1 Million	2.76	$2,005,111	$3,029,861	$3,129,861
SPS-3	198	$ 4.8 Million	4.45	$3,077,966	$4,651,019	$4,751,019
WEST CONNECTION - SOUTHGATE HANLON TRUNK ALTERNATIVE						
Pump Station	*Capacity in L/s*	*Estimated Cost ($) in 2020*				
SPS-1	19	$ 0.7 Million	0.43	$373,198	$563,929	$663,929
SPS-2	123	$ 3.1 Million	2.76	$2,005,111	$3,029,861	$3,129,861
SPS-3	197	$ 4.7 Million	4.43	$3,063,969	$4,629,868	$4,729,868
WEST CONNECTION - SOUTHGATE INDUSTRIAL						
Pump Station	*Capacity in L/s*	*Estimated Cost ($) in 2020*				
SPS-1	19	$ 0.7 Million	0.43	$373,198	$563,929	$663,929
SPS-2	123	$ 3.1 Million	2.76	$2,005,111	$3,029,861	$3,129,861
SPS-3	180	$ 4.4 Million	4.04	$2,824,894	$4,268,609	$4,368,609
WEST CONNECTION - SOUTHEND PARK AND VALLEYLAND TRUNK ALTERNATIVE						
Pump Station	*Capacity in L/s*	*Estimated Cost ($) in 2020*				
SPS-1	1.5	$ 0.2 Million	0.03	$37,960	$57,360	$157,360
SPS-2	42	$ 1.3 Million	0.94	$762,175	$1,151,699	$1,251,699
SPS-3	26	$ 0.8 Million	0.58	$494,954	$747,910	$847,910
VALLEY LANDS / SOUTHGATE HANLON TRUNK						
Pump Station	*Capacity in L/s*	*Estimated Cost ($) in 2020*				
SPS-1	24	$ 0.8 Million	0.54	$460,545	$695,915	$795,915
SPS-2	126	$ 3.2 Million	2.83	$2,049,083	$3,096,304	$3,196,304
SPS-3	9	$ 0.4 Million	0.20	$190,465	$287,806	$387,806
GORDON / SOUTHGATE HANLON TRUNK						
Pump Station	*Capacity in L/s*	*Estimated Cost ($) in 2020*				
SPS-1	19	$ 0.7 Million	0.43	$373,198	$563,929	$663,929
SPS-2	113	$ 2.9 Million	2.54	$1,857,749	$2,807,187	$2,907,187
SPS-3	21	$ 0.7 Million	0.47	$408,383	$617,095	$717,095

SOURCE OF COST CURVES: Pumping Station Design (Third Edition, 2006) - R. Sanks

Emergency Overflows	Unit rate	Unit	Quantity	
Shallow Bury piping	$ 400.00	m	150	$ 60,000.00
Valving and controls	$ 7,500.00	each	2	$ 15,000.00
Forebay lining	$ 25,000.00	ls	1	$ 25,000.00
				$ 100,000.00

Property Costs		
30mx30m lot for each (3) pump station: 2700m2		
2700	$ 198.00	$ 534,600.00

Summary of Costs - Wastewater

	Victoria Road $ M	Clair Gordon $ M	Southgate Hanlon $ M	Southgate Industrial* $ M	Southend Park Valley Land $ M	Valley Lands / Southgate Hanlon $ M	Gordon / Southgate Hanlon $ M
Internal Sewers	$ 10.20	$ 10.20	$ 13.72	$ 14.60	$ 16.50	$ 26.38	$ 19.66
Twinning/Trunk	$ -	$ 8.10	$ -	$ -	$ 11.70	$ -	$ -
SPS1	$ 0.70	$ 0.70	$ 0.70	$ 0.70	$ 0.20	$ 0.80	$ 0.66
SPS2	$ 4.70	$ 3.10	$ 3.10	$ 3.10	$ 1.30	$ 3.20	$ 2.91
SPS3	$ 1.60	$ 4.80	$ 4.80	$ 4.40	$ 0.80	$ 0.39	$ 0.72
FM1	$ 0.60	$ 1.00	$ 1.00	$ 1.10	$ 0.40	$ 0.49	$ 0.77
FM2	$ 10.40	$ 2.40	$ 2.40	$ 2.40	$ 0.10	$ 2.63	$ 2.00
FM3	$ 0.80	$ 1.80	$ 1.80	$ 1.80	$ 0.40	$ 0.20	$ 0.28
Property	$ 1.60	$ 1.60	$ 1.60	$ 1.60	$ 1.60	$ 1.60	$ 1.60
Total in $M	**$ 30.6**	**$ 33.7**	**$ 29.1**	**$ 29.7**	**$ 33.0**	**$ 35.7**	**$ 28.6**
O&M	**$ 0.506**	**$ 0.787**	**$ 0.720**	**$ 0.687**	**$ 0.575**	**$ 0.470**	**$ 0.314**

*Capital and O&M Costs include increased pumping station size to accommodate Industrial Park expansion

Technical note:
Clair Maltby Wastewater Modelling

1. Introduction

Wood Environment & Infrastructure Solutions Canada (Wood Canada) is to develop a Water and Wastewater Servicing Plan for the Clair Maltby Master Environmental Servicing Plan and Secondary Plan for the City of Guelph, Ontario. This will provide a long-term strategy for the servicing of the Clair Maltby Secondary Plan. The Servicing Plan will support the long-term growth scenarios envisioned by the City.

As part of this, Wood Canada have requested modelling support associated with the sanitary system from Wood Environment & Infrastructure Solutions UK (Wood UK) to enable the assessment of existing and future sanitary system capacity and the impact on the future sanitary system from the Clair Maltby Lands.

The basis of all modelling undertaken is the existing Guelph InfoSWMM sanitary model which has been converted to an InfoWorks ICM model.

The scope of this report involves the following:

- Review of Existing InfoSWMM Model;
- Model Conversion to InfoWorks ICM & comparison with InfoSWMM outputs for confidence;
- Baseline constraint analysis for current and future time horizons to identify existing capacity constraints;
- Modelling of the Clair Maltby Lands to three potential connection points;
- Constraint analysis to identify capacity issues introduced by the inclusion of the Clair Maltby Lands; and,
- Development phasing analysis to identify the percentage of the Clair Maltby Lands that can connect to the existing sanitary sewer system without causing capacity constraints and the need for sewer upgrades.

1.1 Model Background

In 2013, AECOM utilised an existing wastewater model, which was calibrated as part of the "2008 W/WW Master Plan" in 2008, to carry out extensive model upgrades. This incorporated the following:

- New sewers;
- Inspection manholes;
- Pipe invert elevations; and
- Ground elevations.

The work undertaken by AECOM is detailed in "Hydraulic Modeling Update for the 2013 Guelph DC Study (Final)" report. The updated AECOM 2013 model reflects the City of Guelph's current sanitary system. It is noted that although the current 2013 model was calibrated in 2008; with updates implemented for the 2013 study, the model is considered to be acceptable for master planning purposes by the City of Guelph.

The Wastewater model database which has been used for this study was named "2013-11-21-Guelph_Sanitary_Model-60298422". This was provided by the City of Guelph in InfoSWMM (Innovyze) format.

1.2 Existing InfoSWMM Model

The "2013-11-21- Guelph_Sanitary_Model-60298422" InfoSWMM model was converted by AMECFW Canada to EPA SWMM5 text files for import into InfoWorks ICM (Innovyze). Each scenario in the InfoSWMM model was then converted as a separate SWMM5 text file. The baseline model for this analysis (representing 2013) is based on the InfoSWMM scenario "2012_WEXSTING". This model is deemed to be correct for use as the "Baseline Model" and is an accurate representation of the City's current sewer system. Wood do not provide any warranty for the model.

2. InfoWorks ICM Model

This section details the conversion of the InfoSWMM model to InfoWorks ICM, the model review and connectivity check undertaken, and the setting up of the baseline 2013 and 2031 model scenarios.

Table 2.1 highlights the files provided by Wood Canada which have been used to produce the InfoWorks ICM model scenarios for use in the baseline constraint analysis:

Table 2.1 Baseline ICM Model and Ancillary Files

	File Name	Comments
SWMM5 Network File	2012_WExisting.inp	SWMM 5 .inp file imported into a blank InfoWorks ICM model network named "Guelph Wastewater Model".
Subcatchments	N/A	Due to differences in application of flows to model nodes in InfoSWMM and InfoWorks ICM, dummy subcatchments were created in ICM to allow application of dry weather and II flows. The subcatchments were sized based on a dummy area of 0.1ha where no RDII flows were applied, or the corresponding RDII Sewershed Area (hc).
2012 Dry Weather Flows	2012_WEXISTING.xlsx	DWF's were imported to relevant InfoWorks ICM Sanitary Subcatchments. Baseflow allocations were applied as ICM "Baseflow". Allocations for SOUHTH, SOUTH, Fut_Res, Fut_ICI, Fut_II, RES, ICI and ROCKWOOD were combined per junction/subcatchment and applied as ICM "Additional Foul Flow". Relevant Time Pattern ID was applied to each subcatchment as a corresponding "Wastewater Profile" (See Time Patterns below)
2031 Dry Weather Flows	2031_175K_EXPIPE_2013UPD.xlsx	Applied as 2012 DWFs above.
Rainfall Derived Inflows and Infiltration (RDII)	Node RDII - 2012 WExisting.xlsx	RDII flows imported to relevant InfoWorks ICM Subcatchments as contributing areas (Sewershed Area (hc)) and associated RDII Hydrograph profiles.
Time Patterns	Time Patters for 2012 WExisting.xlsx	Time Patterns applied to a InfoWorks ICM "WasteWater" ancillary file named "2012_WEXISTING Waste water". Time Patter ID 1 from the InfoSWMM model was applied as a Weekday profile and Time Pattern ID 2 as a weekend profile. The following ICM Wastewater profiles were created:

File Name	Comments
	1: FM_1 2: FM_2 3: FM_3 4: FM_4 5: FM_5 6: FM_6 7: FM_7 8: FM_8 9: FM_B 10: PEAK2 11: PEAK2.8

2.1 Connectivity and Model Review

The following steps were completed as part of the model review and connectivity check:

- Imported existing InfoSWMM model "2012_Wexisting.inp" to InfoWorks ICM v8.5.7.
- InfoWorks ICM Model Network named "Guelph Wastewater Model".
- Connectivity in ICM model was reviewed and compared with InfoSWMM and found to be comparable.
- The model was "flagged" in ICM to identify data which has come from the original InfoSWMM model. The data flag used for this was "SWMM - Value imported from InfoSWMM model".
- The imported InfoSWMM model was subject to an engineering validation in InfoWorks ICM. Several errors were noted which were resolved. A number of "warnings" also identified locations in the model where pipes had "invert levels above ground level" or "soffit above ground level". No changes were made to the model with regards to these warnings, apart from where these caused an instability in the InfoWorks ICM model. Details of changes made to the ICM model to gain successful model validation and resolve model instabilities can be found in the document "Guelph_Wastewater_Model_Validation_Log.pdf", located in **Appendix A**. Any changes to the model to obtain engineering validation have been flagged "WOOD - Value adjusted by Wood Environmental & Infrastructure Solutions".

2.2 InfoWorks ICM 2012 Baseline Model

- Dummy subcatchments were created in the InfoWorks ICM model to allow application of DWF's and RDII. These were set to 0.1ha in size for junctions with DWF only, or to the relevant "Sewershed area" for nodes with RDII. The subcatchments were also set to apply inflows to associated junctions in the model.
- DWF & RDII were applied to relevant subcatchments based on files provided from the InfoSWMM model (see table 2.1).
- Time patterns were set up within an InfoWorks ICM Wastewater file and associated time patterns applied to relevant subcatchments (see table 2.1).
- "Base" scenario within the model network represents the 2013 wastewater network and flows.

- The resulting ICM flow/depths from key locations from 1 in 25-year design storm were reviewed with InfoSWMM outputs to ensure that results were comparable. Flows were found to be generally within ±10% at all locations throughout the catchment, apart from in locations with level errors in the InfoSWMM model which had been rectified in ICM.

2.3 InfoWorks ICM 2031 Baseline Model

- Additional Dummy subcatchments were created in the InfoWorks ICM model to allow application of future 2031 DWF's and RDII. These were set to 0.1ha in size for junctions with DWF only, or to the relevant "Sewershed area" for nodes with RDII. The subcatchments were also set to apply inflows to associated junctions in the model.
- 2031 DWF & RDII were applied to relevant subcatchments based on files provided from the InfoSWMM model (see table 2.1).
- Time patterns were set up within an InfoWorks ICM Wastewater file and associated time patterns applied to relevant subcatchments (see table 2.1).
- Future infrastructure associated with two planned projects included in the Master Plan framework of the City of Guelph have been added to the 2031 model after confirmation from the City of Guelph that these are partially constructed and will be completed by 2020. The infrastructure projects are "WW-I-1 Twinning and replacement of existing York Trunk from east of Hanlon to Victoria" & "WW-I-1A Add parallel pipe on Wellington St W" as detailed in Appendix H of "Hydraulic Modeling Update for the 2013 Guelph DC Study (Final)" report. Details of the new infrastructure were taken from InfoSWMM network "2031_175k_EXPIPE_2013UPD" and can be seen highlighted in green in Figure 2.1 below.
- "2031 Network 2031 Flows" scenario within the model network represents the 2031 wastewater network and flows.

Figure 2.1 2031 Additional Assets Associated with Infrastructure Projects WW-I-1 & WW-I-1A

3. Baseline Constraints Analysis

3.1 Introduction

There are 3 potential connection points for flows from the proposed Clair Maltby Lands to discharge to the existing sewer system. The connection points and associated downstream network (highlighted green) are detailed in figures 3.2 to 3.4 below:

Figure 3.1 Clair Maltby Lands Connection Point – Clair Gordon

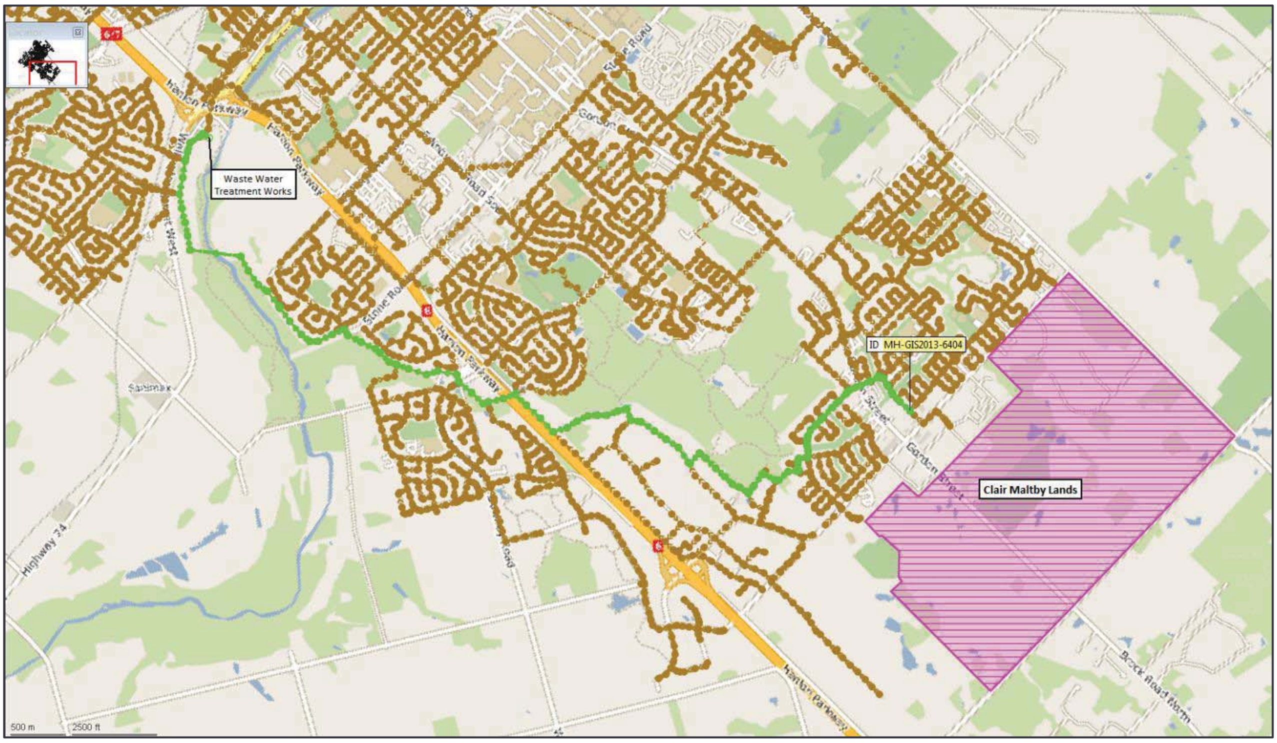
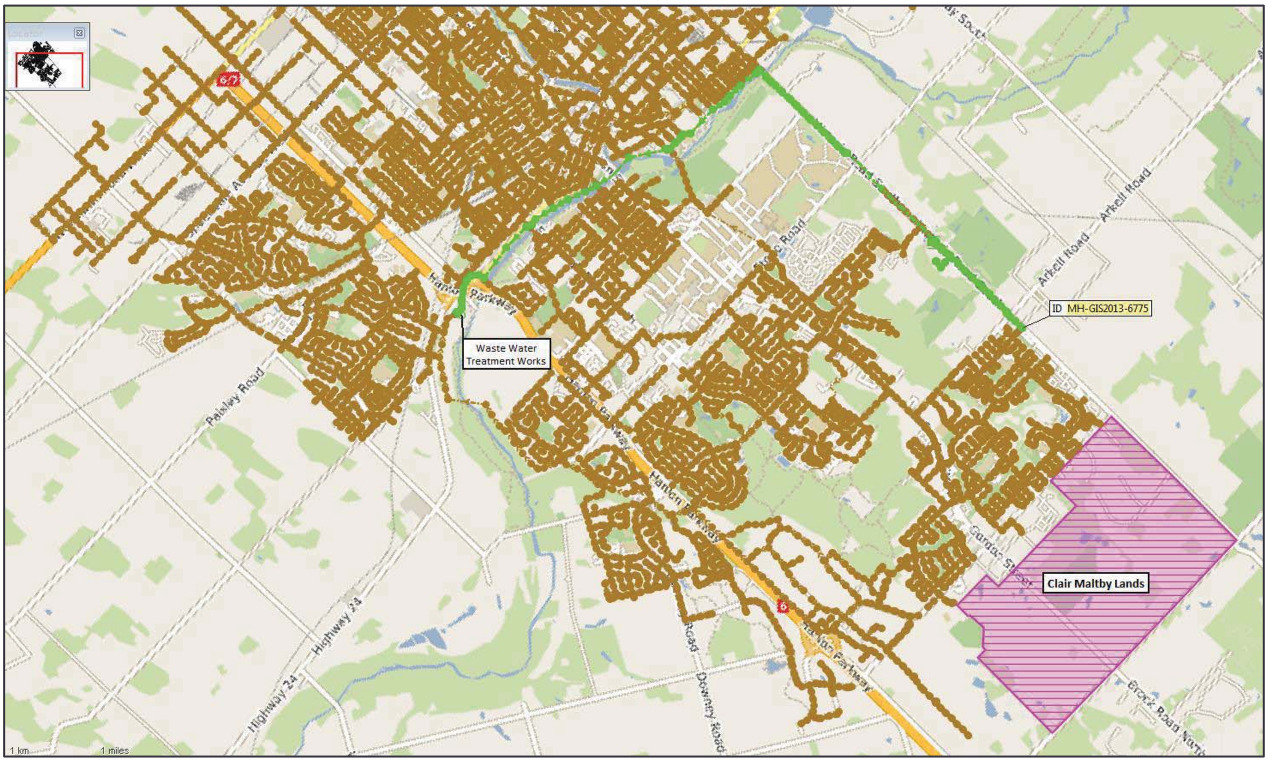


Figure 3.2 Clair Maltby Lands Connection Point – Southgate-Hanlon

Figure 3.3 Clair Maltby Lands Connection Point – Victoria Road



Model simulations were carried out with a 1 in 25yr design storm to gain an understanding of existing capacity constraints within the sewer network downstream of the potential connection points of the Clair Maltby Lands. This exercise was carried out for two flow time horizons, 2012 & 2031, on the corresponding baseline model scenarios. For the baseline constraints analysis, no flows from the Clair Maltby Lands are included in the model.

A constraint is defined as a surcharged pipe with a "Max Surcharge State" of >=1.0 from the ICM simulation results as described in figure 3.5:

Figure 3.4 Surcharge State Definition

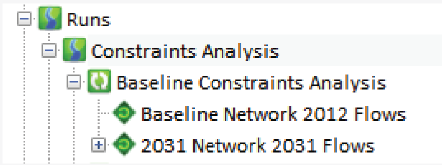
Max surcharge state	Indicates whether the flow rate in the system exceeded the capacity of the drainage network to the extent that levels rose within manholes at any time during the simulation. Maximum surcharge state can be one of the following values: See Surcharge Rate for more details.

Value	Description
<1	Not surcharged Where the ratio of water depth (max_depth) to pipe height (conduit_height) is 0 or less than 1
1	Surcharged by depth
2	Surcharged by flow

Table 3.1 below details the simulation parameters and input files used for this analysis:

Table 3.1 Baseline Constraints Analysis – Model Simulation Parameters

	Details	Comments
ICM Model Scenario	Base 2031 Network 2031 Flows	Base scenario represents 2012 network and flows (see section 2.2) Represents 2031 network with 2031 flows (see section 2.3)
Rainfall	M25 Design storm (25YRCHICDES)	25-year return period design storm taken directly from InfoSWMM model.

WasteWater	2012_WEXISTING Waste water	See "Time Patterns" in table 2.1 above.
Simulation Start Date/Time	01/05/2007 @ 00:00	As per InfoSWMM simulations
Simulation Finish Date/Time	03/05/2007 @ 23:45	As per InfoSWMM simulations
Simulation Timestep	20 seconds	As per InfoSWMM simulations
Results Timestep	900 seconds	As per InfoSWMM simulations
Simulation Name	Baseline Constraints Analysis	

Model results from the baseline constraints analysis are presented below and have also been provided for the entire catchment in ArcGIS shape file format in **Appendix B & C**.

3.2 2012 Baseline Scenario Constraints

From the corresponding model simulation, Tables 3.2 to 3.4 identifies the existing downstream constraints from each of the potential three connection points of the Clair Maltby Lands with 2012 flows applied to the baseline sewerage network. The model results for all pipes from the connection points downstream to the Wastewater Treatment Works (WwTW) can be found in **Appendix B** alongside model longsections and plans showing the location of identified constraints.

Table 3.2 2012 Baseline Constraints – Clair Gordon Connection Point

Asset ID	Max Surcharge State	Comments
SIP0000017	1.0	Pipes have capacity but are surcharged by depth. These are triple inverted Siphon pipes under the Speed River so are designed to be surcharged.
SIP0000018	1.0	
SIP0000019	1.0	

Table 3.3 2012 Baseline Constraints – Southgate-Hanlon Connection Point

Asset ID	Max Surcharge State	Comments
SIP0000017	1.0	Pipes have capacity but are surcharged by depth. These are triple inverted Siphon pipes under the Speed River so are designed to be surcharged.
SIP0000018	1.0	
SIP0000019	1.0	

Table 3.4 2012 Baseline Constraints – Victoria Road Connection Point

Asset ID	Max Surcharge State	Comments
SED0001845	2	Trunk sewer along North bank of the Speed River. Pipe is under capacity, max flow 781.68l/s against PFC of 605l/s.
SED0001897	2	Trunk sewer along North bank of the Speed River. Pipe is under capacity, max flow 859.02l/s against PFC of 476l/s.
SED0001999	2	Trunk sewer along North bank of the Speed River. Pipe is under capacity, max flow 784.79l/s against PFC of 617l/s.
SED0002949	2	Trunk sewer along North bank of the Speed River. Pipe is under capacity, max flow 860.17l/s against PFC of 694l/s.
SED0002950	2	Trunk sewer along North bank of the Speed River. Pipe is under capacity, max flow 861.48l/s against PFC of 565l/s.
SED0005877	2	Trunk sewer along North bank of the Speed River. Pipe is under capacity, max flow 866.96l/s against PFC of 769l/s.
SED01960-2	2	Trunk sewer along North bank of the Speed River. Pipe is under capacity, max flow 778.13l/s against PFC of 593l/s.
SED0004477	2	Trunk sewer along North bank of the Speed River. Pipe is under capacity, max flow 426.69l/s against PFC of 330l/s.
SED0004259	2	Trunk sewer along North bank of the Speed River. Pipe is under capacity, max flow 277.36l/s against PFC of 197l/s.
SED0004292	2	Trunk sewer along North bank of the Speed River. Pipe is under capacity, max flow 271.87l/s against PFC of 118l/s.
SED0004392	2	Trunk sewer along North bank of the Speed River. Pipe is under capacity, max flow 518.47l/s against PFC of 338l/s.
SED0004412	2	Trunk sewer along North bank of the Speed River. Pipe is under capacity, max flow 428.16l/s against PFC of 227l/s.
SED0004413	2	Trunk sewer along North bank of the Speed River. Pipe is under capacity, max flow 427.91l/s against PFC of 401l/s.
SED0004414	2	Trunk sewer along North bank of the Speed River. Pipe is under capacity, max flow 427.92l/s against PFC of 218l/s.
SED0004426	2	Trunk sewer along North bank of the Speed River. Pipe is under capacity, max flow 427.85l/s against PFC of 216l/s.
CN-GIS2013-7436	1	Pipe has capacity but is surcharged by depth. This is the Force Main for Kortright East Sewage Pumping Station so is designed to be surcharged.
CN-GIS2013-7416	1	Pipes have capacity but are surcharge by depth due to downstream trunk sewer incapacity (see above pipes).
SED0001960	1	
SED0004285	1	
SED0004312	1	
SED0004415	1	
SED0004420	1	

3.3 2031 Baseline Scenario Constraints

From the corresponding model simulations, Tables 3.5 to 3.7 identifies the downstream constraints from each of the 3 potential connection points of the Clair Maltby Lands with 2031 flows applied to the 2031 sewerage network. The model results for all pipes from the connection points downstream to the Wastewater Treatment Works (WwTW) can be found in **Appendix C** alongside model longsections and plans showing the location of identified constraints.

Table 3.5 2031 Baseline Constraints – Clair Gordon Connection Point

Asset ID	Max Surcharge State	Comments
SIP0000017	1.0	Pipes have capacity but are surcharged by depth. These are triple inverted Siphon pipes under the Speed River so are designed to be surcharged.
SIP0000018	1.0	
SIP0000019	1.0	

Table 3.6 2031 Baseline Constraints – Southgate-Hanlon Connection Point

Asset ID	Max Surcharge State	Comments
SIP0000017	1.0	Pipes have capacity but are surcharged by depth. These are triple inverted Siphon pipes under the Speed River so are designed to be surcharged.
SIP0000018	1.0	
SIP0000019	1.0	

Table 3.7 2031 Baseline Constraints – Victoria Road Connection Point

Asset ID	Max Surcharge State	Comments
CN-GIS2013-7436	1	Pipe has capacity but is surcharged by depth. This is the Force Main for Kortright East Sewage Pumping Station so is designed to be surcharged.

3.4 Baseline Constraint Analysis Conclusions

The baseline constraints analysis has identified that in general the existing sewer system has capacity for both 2012 and 2031 flows with few pipes in the downstream network from the potential connection points showing a capacity constraint.

The Clair Gordon and Southgate-Hanlon connection points have no downstream capacity constraints identified by the analysis apart from the triple inverted syphon pipes under the Speed River which are designed to be surcharged.

The Victoria Road connection point has a number of existing downstream capacity constraints for the baseline 2012 scenario (see table 3.4). The model simulation has identified under capacity and surcharging in the main trunk sewer running along the North bank of the Speed River to the WwTW. However, the inclusion of infrastructure projects WW-I-1 & WW-I-1A in the 2031 baseline scenario (see section 2.3 above) resolves the identified constraints (see table 3.7). Upgrade of the existing Kortright East Sewage Pumping Station (model node PS-KRSPS-1) may however be required if flows were to be connected to Victoria Road.

4. Clair Maltby Lands Constraints Analysis

4.1 Introduction

Model simulations were carried out to gain an understanding of capacity constraints within the sewer network downstream of the 3 potential connection points with the Clair Maltby Lands and associated flows included. This exercise was carried out using the 2031-time horizon network and flows.

A constraint is defined as a surcharged pipe with a "Max Surcharge State" of >=1.0 from the ICM simulation results as described in Figure 3.4 above.

4.2 Clair Maltby Lands – Model Input

The model was updated by adding an additional subcatchment to represent the Clair Maltby Lands and the associated population and II flows. This has applied to the three connection points using three separate modelled scenarios.

Details of the modelled subcatchment can be found in Table 4.1. All population and flow figures were provided by Wood Canada.

Table 4.1 Clair Maltby Lands - Modelled Subcatchment Details

	Clair Gordon Connection Point	Southgate-Hanlon Connection Point	Victoria Road Connection Point	Comments
Subcatchment ID	Clair Maltby Lands	Clair Maltby Lands	Clair Maltby Lands	
System Type	Sanitary	Sanitary	Sanitary	
Drains to Node ID	MH-GIS2013-6404	MH-GIS2013-6995	MH-GIS2013-6775	Most appropriate existing connection manhole for each scenario.
Total Area (ha)	538.105	538.105	538.105	
Developable Area (ha)	245.9	245.9	245.9	
Wastewater Profile	PEAK2	PEAK2	PEAK2	Uses consumption rate of 300l/h/d with an associated diurnal profile with a maximum multiplier of 2xDWF
Population	21,668	21,668	21,668	
Baseflow II (l/s)	68.852	68.852	68.852	Infiltration & Inflow has been applied as a constant baseflow based on the total developable lands area of 245.9ha @ 0.28l/s/ha
RDII	N/A	N/A	N/A	No RDII has been applied to the Clair Maltby Lands subcatchment.

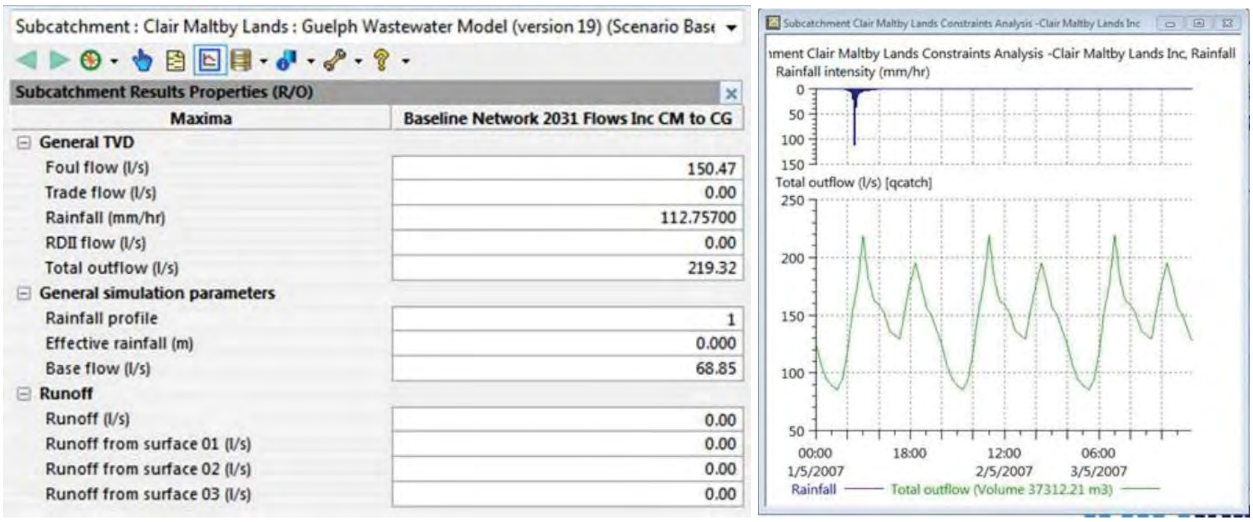
Table 4.2 below details the simulation parameters and input files used for the Clair Maltby Lands constraints analysis:

Table 4.2 Clair Maltby Lands Constraints Analysis – Model Simulation Parameters

	Details	Comments
ICM Model Scenario	- 2031 Network 2031 Flows Inc CM to CG - 2031 Network 2031 Flows Inc CM to SH - 2031 Network 2031 Flows Inc CM to VR	Three model scenarios representing different connection points for Clair Maltby Lands flows.
Rainfall	M25 Design storm (25YRCHICDES)	25-year return period design storm taken directly from InfoSWMM model.
WasteWater	Clair Maltby Lands Waste Water	As "2012_WEXISTING Waste water" wastewater file put with 300l/h/d consumption rate added to profile 10 "PEAK2" so Clair Maltby Lands could be modelled as a population rather than a flow rate.
Simulation Start Date/Time	01/05/2007 @ 00:00	As per InfoSWMM & Baseline Constraints Analysis simulations
Simulation Finish Date/Time	03/05/2007 @ 23:45	As per InfoSWMM & Baseline Constraints Analysis simulations
Simulation Timestep	20 seconds	As per InfoSWMM & Baseline Constraints Analysis simulations
Results Timestep	900 seconds	As per InfoSWMM & Baseline Constraints Analysis simulations
Simulation Name	Constraints Analysis -Clair Maltby Lands Inc	Runs Constraints Analysis Baseline Constraints Analysis Constraints Analysis -Clair Maltby Lands Inc 2031 Network 2031 Flows Inc CM to CG 2031 Network 2031 Flows Inc CM to SH 2031 Network 2031 Flows Inc CM to VR

When running the model with the above simulation parameters and inputs associated with the Clair Maltby Lands, the model subcatchment representing the development generates a peak total flow rate of circa 220l/s. Figure 4.1 below gives more detailed breakdown of flow rates predicted by the model:

Figure 4.1 Clair Maltby Lands – Predicted Model Flows



4.3 Clair Maltby Lands Constraints – Clair Gordon Connection Point

From the corresponding model simulation, Figure 4.2 and Table 4.3 identifies the downstream constraints from the modelled Clair Gordon connection point with 2031 flows applied to the 2031 sewerage network. The model results for all pipes from the connection point downstream to the Wastewater Treatment Works (WwTW) can be found in **Appendix D** alongside model longsections and plans showing the location of identified constraints.

Figure 4.2 Clair Maltby Lands Constraints – Clair Gordon Connection Point

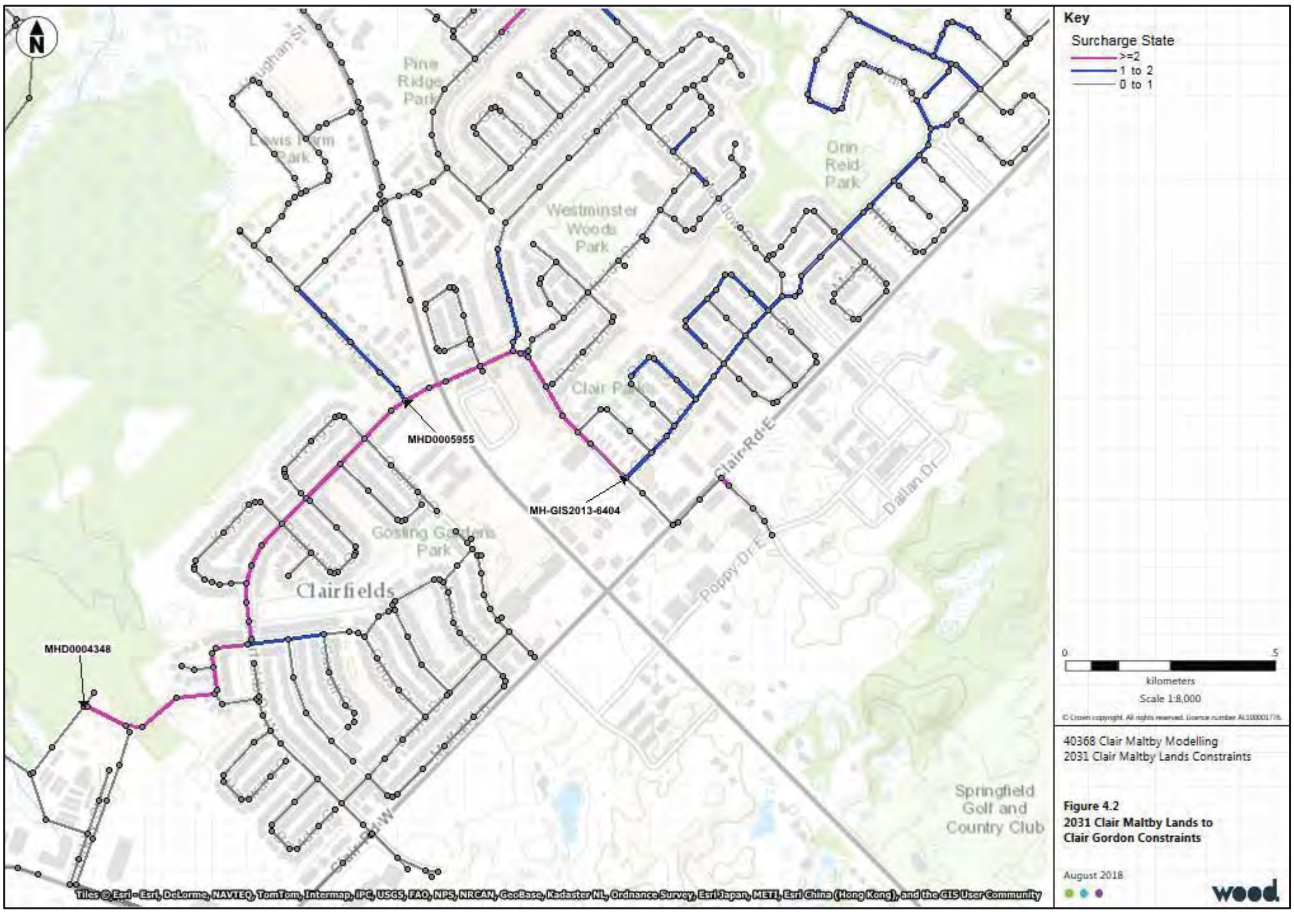


Table 4.3 Clair Maltby Lands Constraints – Clair Gordon Connection Point

Asset ID	Max Surcharge State	Max Flow (l/s)	Pipe Full Capacity (l/s)	Comments
CN-GIS2013-7027	2.0	254.87	116	Sewer downstream of development connection point. Pipe is now under capacity.
CN-GIS2013-7028	2.0	254.29	173	Sewer downstream of development connection point. Pipe is now under capacity.
CN-GIS2013-7029	2.0	253.98	139	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005977	2.0	344.02	290	Sewer downstream of development connection point. Pipe is now under capacity.

Asset ID	Max Surcharge State	Max Flow (l/s)	Pipe Full Capacity (l/s)	Comments
SED0005979	2.0	343.96	275	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005980	2.0	355.98	300	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005981	2.0	356.07	297	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005982	2.0	356.17	296	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005984	2.0	356.68	325	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005985	2.0	356.72	322	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005986	2.0	389.98	305	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005990	2.0	390.32	310	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005991	2.0	390.46	207	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005992	2.0	392.25	323	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005993	2.0	392.28	330	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006515	2.0	335.76	300	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006516	2.0	343.66	327	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006517	2.0	343.81	314	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006518	2.0	331.48	323	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006519	2.0	333.51	309	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006520	2.0	335.31	315	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006521	2.0	327.45	305	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006522	2.0	327.83	303	Sewer downstream of development connection point. Pipe is now under capacity.

Asset ID	Max Surcharge State	Max Flow (l/s)	Pipe Full Capacity (l/s)	Comments
SED0006523	2.0	330.34	304	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006532	2.0	264.92	144	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006533	2.0	266.96	128	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006534	2.0	266.98	150	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006535	2.0	267.09	117	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006553	2.0	260.54	218	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006554	2.0	255.03	133	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006555	2.0	255.04	150	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006556	2.0	254.94	114	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006621	2.0	335.56	300	Sewer downstream of development connection point. Pipe is now under capacity.
SIP0000017	1.0	271.83	1309	Pipes have capacity but are surcharged by depth. These are triple inverted Siphon pipes under the Speed River so are designed to be surcharged.
SIP0000018	1.0	64.61	114	
SIP0000019	1.0	585.82	1850	

From the above figure and table, the addition of the flows from the Clair Maltby Lands to the proposed Clair Gordon connection point has resulted in several downstream constraints. With the Clair Maltby Lands flows applied to MH MH-GIS2013-6404, a section of sewer between the connection point and MH MHD0004348, approximately 1,950m downstream, becomes under capacity resulting in surcharge to the system (top water level above pipe soffit/overt). The capacity restraint caused by the additional flows also results in backing up and surcharge to the upstream system (see dark blue pipes on figure 4.2). Downstream of MH MHD0004348 no further surcharge is predicted by the model and the existing sewers have sufficient capacity to accommodate the additional flows.

Although the additional flows from the Clair Maltby Lands produce significant surcharge in the existing sewer system, no flooding is predicted by the model in the vicinity of the Claire Gordon or at any point downstream to the treatment works, i.e. top water levels do not exceed ground level.

4.4 Clair Maltby Lands Constraint – Southgate-Hanlon Connection Point

From the corresponding model simulation, Figure 4.3 and Table 4.4 identifies the downstream constraints from the modelled Southgate-Hanlon connection point with 2031 flows applied to the 2031 sewerage network. The model results for all pipes from the connection point downstream to the Wastewater Treatment Works (WwTW) can be found in **Appendix E** alongside model longsections and plans showing the location of identified constraints.

Figure 4.3 Clair Maltby Lands Constraints– Southgate-Hanlon Connection Point

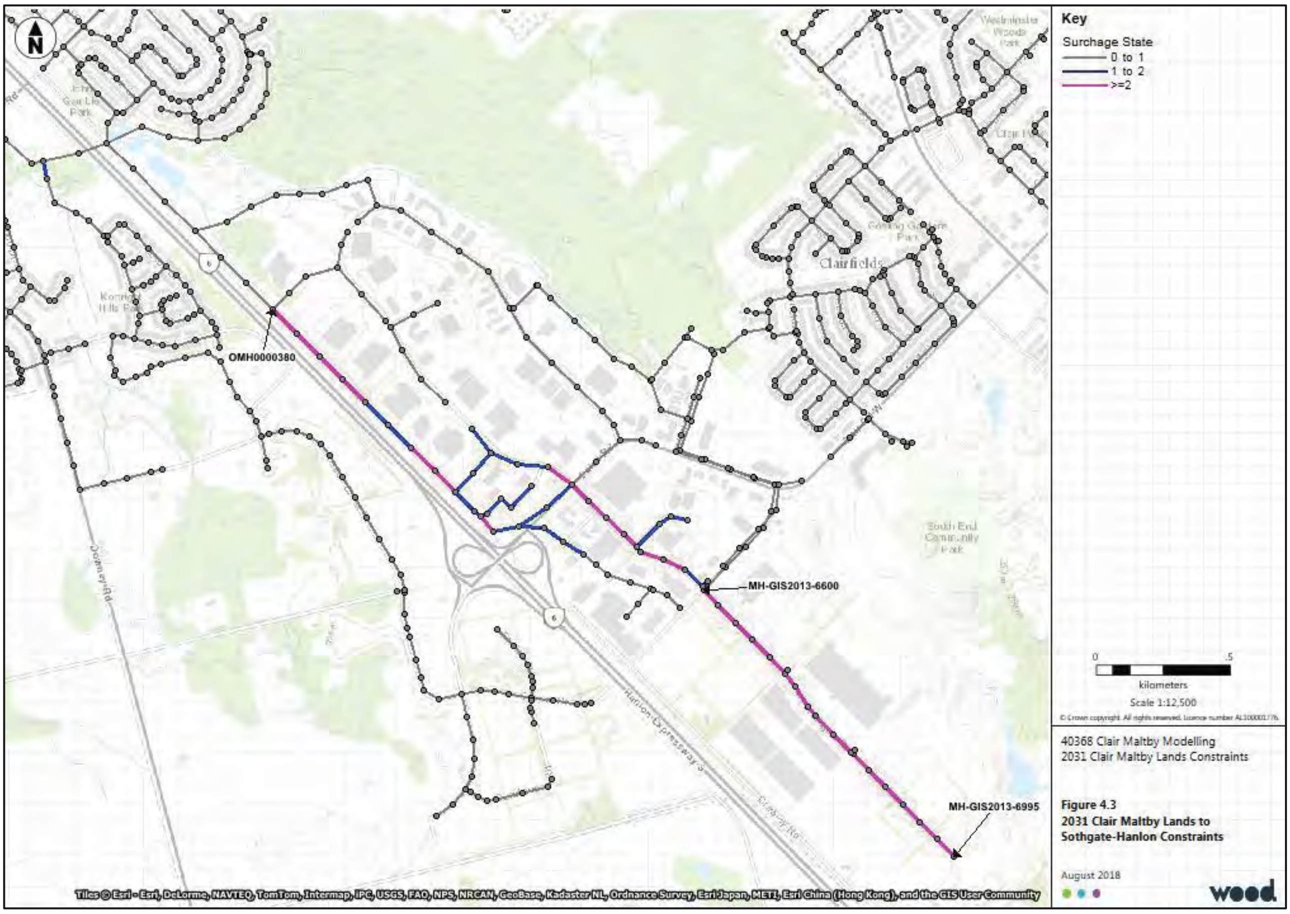


Table 4.4 Clair Maltby Lands Constraints– Clair Gordon Connection Point

Asset ID	Max Surcharge State	Max Flow (l/s)	Pipe Full Capacity (l/s)	Comments
CN-GIS2013-7275	2.0	246.39	188	Sewer downstream of development connection point. Pipe is now under capacity.
CN-GIS2013-7027	2.0	244.55	170	Sewer downstream of development connection point. Pipe is now under capacity.
CN-GIS2013-7028	2.0	243.19	174	Sewer downstream of development connection point. Pipe is now under capacity.

Asset ID	Max Surcharge State	Max Flow (l/s)	Pipe Full Capacity (l/s)	Comments
CN-GIS2013-7029	2.0	241.81	172	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005977	2.0	240.77	165	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005979	2.0	238.63	178	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005980	2.0	237.97	172	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005981	2.0	237.06	186	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005982	2.0	236.18	172	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005984	2.0	235.26	181	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005985	2.0	232.89	163	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005986	2.0	233.12	162	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005990	2.0	232.92	155	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005991	2.0	232.11	180	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005992	2.0	231.3	168	Sewer downstream of development connection point. Pipe is now under capacity.
SED0005993	2.0	230.74	169	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006515	2.0	230.43	171	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006516	2.0	54.41	37	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006517	2.0	121.78	83	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006518	2.0	122.22	84	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006519	2.0	123.67	123	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006520	2.0	124.11	112	Sewer downstream of development connection point. Pipe is now under capacity.

Asset ID	Max Surcharge State	Max Flow (l/s)	Pipe Full Capacity (l/s)	Comments
SED0006521	2.0	125.66	110	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006522	2.0	70	67	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006523	2.0	96.91	71	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006532	2.0	98.58	60	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006533	2.0	99.79	89	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006534	2.0	94.39	71	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006535	2.0	94.54	61	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006553	2.0	94.57	84	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006554	2.0	95.85	57	Sewer downstream of development connection point. Pipe is now under capacity.
SED0006555	2.0	126.11	113	Sewer downstream of development connection point. Pipe is now under capacity.
CN-GIS2013-7274	1.0	93.96	318	Pipes have capacity but are surcharge by depth due to downstream sewer incapacity (see above pipes).
CN-GIS2013-7495	1.0	70.16	104	
SED0004677	1.0	55	82	
SED0004679	1.0	55.36	83	
SED0004683	1.0	56.47	95	
SED0004684	1.0	56.84	98	
SED0004702	1.0	56.44	88	
SED0004704	1.0	57.29	80	
SED0004727	1.0	122.71	132	
SED0004728	1.0	123.18	124	
SED0004732	1.0	69.87	93	
SED0004734	1.0	70.29	84	

Asset ID	Max Surcharge State	Max Flow (l/s)	Pipe Full Capacity (l/s)	Comments
SED0004742	1.0	94.25	171	
SIP0000017	1.0	277.65	1309	Pipes have capacity but are surcharged by depth. These are triple inverted Siphon pipes under the Speed River so are designed to be surcharged.
SIP0000018	1.0	64.62	114	
SIP0000019	1.0	597.91	1850	

From the above figure and table, the addition of the flows from the Clair Maltby Lands to the proposed Southgate-Hanlon connection point has resulted in several downstream constraints. With the Clair Maltby Lands flows applied to MH MH-GIS2013-6995, sections of sewer between the connection point and MH OMH0000380, approximately 3,500m downstream, become under capacity resulting in surcharge to the system (top water level above pipe soffit/overt). Downstream of MH OMH0000380 no further surcharge is predicted by the model and the existing sewers have sufficient capacity to accommodate the additional flows.

Although the additional flows from the Clair Maltby Lands produce significant surcharge in the existing sewer system, no flooding is predicted by the model in the vicinity of the Southgate-Hanlon or at any point downstream to the treatment works, i.e. top water levels do not exceed ground level.

4.5 Clair Maltby Lands Constraint – Victoria Road Connection Point

From the corresponding model simulation, Figure 4.4 and Table 4.5 identifies the downstream constraints from the modelled Victoria Road connection point with 2031 flows applied to the 2031 sewerage network. The model results for all pipes from the connection point downstream to the Wastewater Treatment Works (WwTW) can be found in **Appendix F** alongside model longsections and plans showing the location of identified constraints.

Figure 4.4 Clair Maltby Lands Constraints– Victoria Road Connection Point

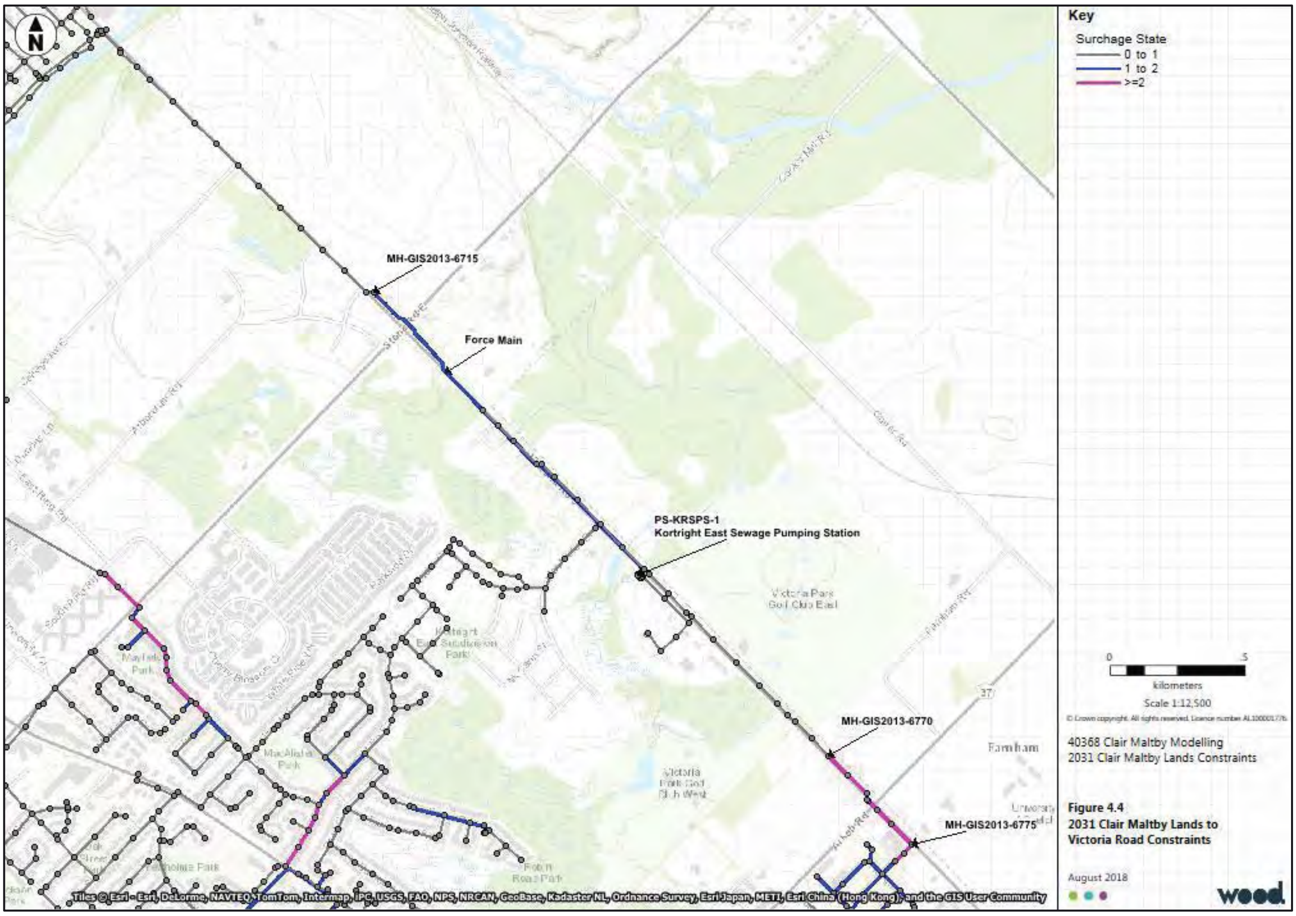


Table 4.5 Clair Maltby Lands Constraints– Victoria Road Connection Point

Asset ID	Max Surcharge State	Max Flow (l/s)	Pipe Full Capacity (l/s)	Comments
CN-GIS2013-7459	2.0	76.68	67	Sewer downstream of development connection point. Pipe is now under capacity.
CN-GIS2013-7461	2.0	73.33	32	Sewer downstream of development connection point. Pipe is now under capacity.
CN-GIS2013-7462	2.0	76.68	27	Sewer downstream of development connection point. Pipe is now under capacity.
CN-GIS2013-7463	2.0	76.68	32	Sewer downstream of development connection point. Pipe is now under capacity.
CN-GIS2013-7464	2.0	73.19	32	Sewer downstream of development connection point. Pipe is now under capacity.
CN-GIS2013-7465	2.0	73.21	32	Sewer downstream of development connection point. Pipe is now under capacity.

CN-GIS2013-7466	2.0	73.26	32	Sewer downstream of development connection point. Pipe is now under capacity.
CN-GIS2013-7436	1.0	196.39	161	Pipe has capacity but is surcharged by depth. This is the Force Main for Kortright East Sewage Pumping Station so is designed to be surcharged.

From the above figure and table, the addition of the flows from the Clair Maltby Lands to the proposed Victoria Road connection point has resulted in downstream constraints close to the connection point itself. With the Clair Maltby Lands flows applied to MH MH-GIS2013-6775 the section of sewer between the connection point and MH MH-GIS2013-6770, approximately 450m downstream, becomes significantly under capacity resulting in surcharge to the system (top water level above pipe soffit/overt). Downstream of MH MH-GIS2013-6770 no further surcharge is predicted by the model and the existing sewers have sufficient capacity to accommodate the additional flows. However, the additional flows from the Clair Maltby Lands to MH MH-GIS2013-6775 are likely to have an impact on the capacity and operation of Kortright East Sewage Pumping Station (model node PS-KRSPS-1) which may need to be investigated further if this connection point is taken forward.

In addition to surcharge, top water levels are also exceeding ground level at points on the network in the vicinity of the Victoria Road connection point. The model predicts significant new flooding in a number of locations as a direct impact of the inclusion of the developments flows to MH MH-GIS2013-6775. Figure 4.5 and Table 4.6 below highlight the locations of the sewer flooding predicted by the model:

Figure 4.5 Clair Maltby Lands Constraints Analysis 2031 Flows – Victoria Road Flooding

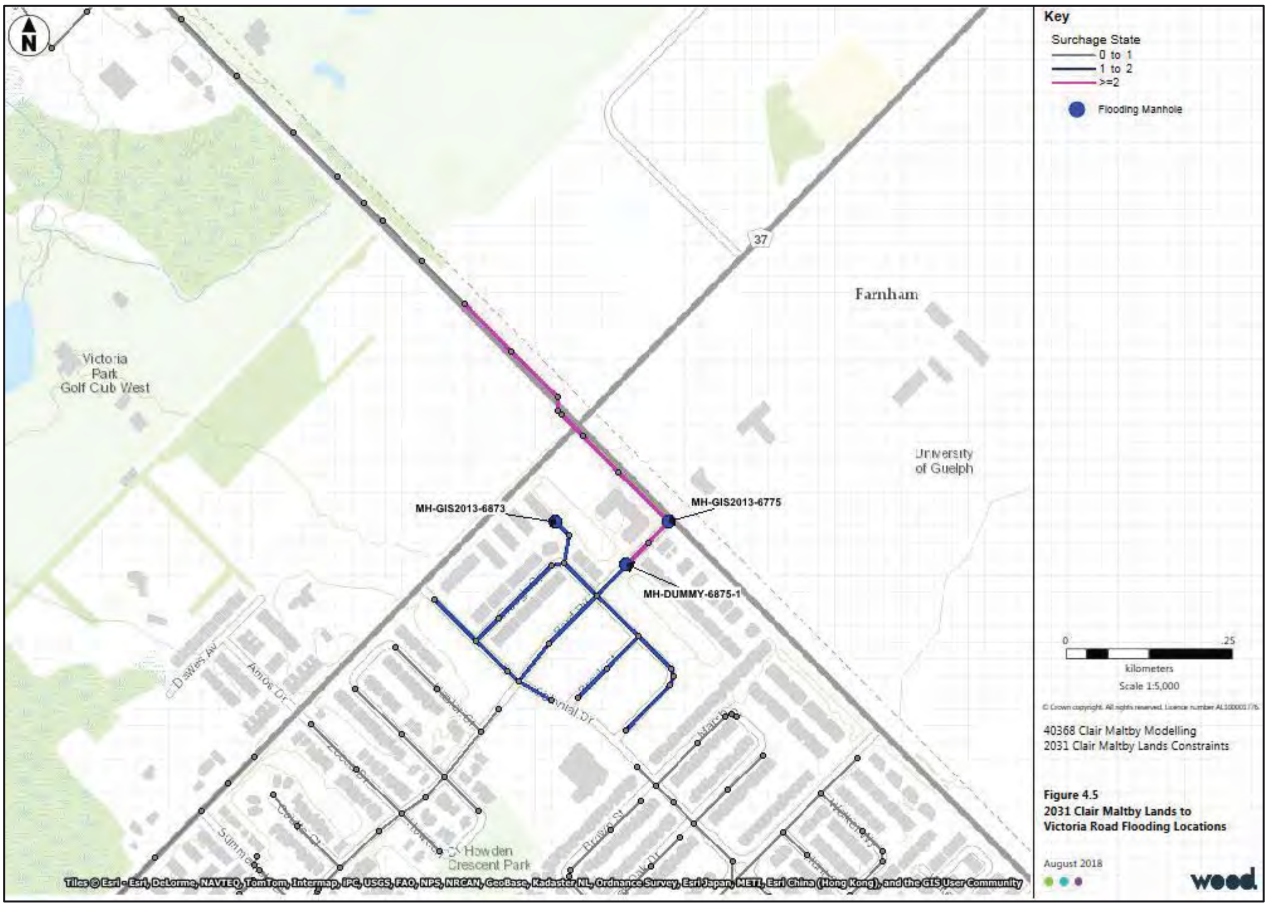


Table 4.6 Clair Maltby Lands Constraints Analysis 2031 Flows – Victoria Road Flooding

Manhole ID	2031 Network 2031 Flows Flood/Lost Volume (m^3)	2031 Network 2031 Flows – Clair Maltby to Victoria Road Flood/Lost Volume (m^3)
MH-DUMMY-6875-1	0	9076.5
MH-GIS2013-6775	0	7936.8
MH-GIS2013-6873	0	2351.3

5. Development Phasing

The constraints analysis for all three potential connection points for the entire Clair Maltby Lands resulted in the identification of significant capacity constraints in the downstream system. Further model analysis was therefore undertaken to identify the percentage of the lands (population and II flows) that could be connected to each point without causing downstream surcharge. This therefore provides an indication of the amount of the lands that can be developed without the need to upgrade the existing sewer system. Alternative connection points for the remaining phases of development, as well as a connection point for the full development, have also been identified.

5.1 Development Phasing - Clair Gordon Connection Point

Model analysis showed that 40% of the Clair Maltby Lands can be accommodated without any detrimental effect on the downstream system. This equates to a population of 8,667 and II of 27.54l/s.

Further analysis showed that if an alternative connection point at MH MHD0005955 is utilised, the system can accommodate 60% of the Clair Maltby Lands. This equates to 13,000 population and 44.75l/s II. There is no predicted downstream surcharge due to an increase in pipe size at this point from 450mm to 600mm diameter.

Alternatively, 100% of the developable lands could be connected to MH MHD0004348 as the system downstream of this point is able to accommodate all of the development flows. There are no predicted constraints in the system downstream to the treatment works.

Figure 4.2 above identifies the three potential connection points on the Clair Gordon system.

5.2 Development Phasing – Southgate-Hanlon Connection Point

Model analysis showed that only 10% of the Clair Maltby Lands can be accommodated without any detrimental effect on the downstream system. This equates to a population of 2,167 and II of 6.88l/s.

Further analysis showed that 100% of the developable lands could be connected to an alternative location, MH OMH0000380, where the downstream system is able to accommodate the development flows.

Figure 4.3 above identifies the two potential connection points on the Southgate-Hanlon system.

5.3 Development Phasing – Victoria Road Connection Point

Model analysis showed that only 10% of the Clair Maltby Lands can be accommodated without any detrimental effect on the downstream system. This equates to a population of 2,167 and II of 6.88l/s.

Further analysis showed that is an alternative connection point at MH MH-GIS2013-6770 is used, the model predicts that 40% of the Clair Maltby Lands can be accommodated. This is due to the increase in pipe diameter from 250mm to 375mm resulting in an increased pipe full capacity at this point. The 40% equates to a population of 8,867 and a II flow of 27.54l/s.

Alternatively, 100% of the developable lands could be connected to MH MH-GIS2013-6715 which is situated at the discharge location of the Kortright East Sewage Pumping Station Force Main. The model predicts no detriment to the system. In addition, this would remove the need to upgrade the pumping station to accommodate the additional flows from the Clair Maltby Lands.

Figure 4.4 above identifies the three potential connection points on the Victoria Road system.

Author

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Alistair Dalton

Reviewer

…………………………………………………………

Iris Isaksen

Appendix A
Model Validation log

Refer to digital folder “Appendix A - Model Validation log”

Appendix B
Constraints Analysis 2012 Network 2012 Flows

Refer to digital folder "Appendix B - Constraints Analysis 2012 Network 2012 Flows"

Appendix C
Constraints Analysis 2031 Network 2031 Flows

Refer to digital folder “Appendix C - Constraints Analysis 2031 Network 2031 Flows”

Appendix D
Constraints Analysis Clair Gordon Connection Point

Refer to digital folder "Appendix D - Constraints Analysis Clair Gordon Connection Point"

Appendix E
Constraints Analysis Southgate-Hanlon Connection Point

Refer to digital folder "Appendix E - Constraints Analysis Southgate-Hanlon Connection Point"

Appendix F
Constraints Analysis Victoria Road Connection Point

Refer to digital folder “Appendix F - Constraints Analysis Victoria Road Connection Point“

Appendix G
Clair Maltby InfoWorks ICM Model

Refer to digital folder "Appendix G - InfoWorks ICM Model"

Memo

To: Rajan Sawhney (Wood)

From: Ali Aamir (Wood)

Date: June 24, 2020

File: N/A

cc: Steve Chipps, Ron Scheckenberger (Wood)

Re: **Clair Maltby Servicing - Wastewater Model Setup**

1.0 Introduction:

The Clair Maltby Secondary Plan (CMSP) Lands wastewater modelling has been developed using Civica Infrastructure's sanitary model as a base, with revised modelling as developed by Wood representing the proposed wastewater servicing for the Clair Maltby Secondary Plan Lands.

Four alternatives have been assessed for the sanitary modelling, each with different proposed outlet locations for the sanitary sewer connection to the City of Guelph from CMSP lands. Wood produced alternatives consist of the Victoria Trunk connection, the Clair Gordon Trunk connection, and the Southgate Hanlon Trunk connection. Wood also assessed an additional alternative as proposed by MTE Consultants (the Southend Park and Valleyland Trunk connection), to determine its veracity. Based upon Wood's assessment, the Southend Park and Valleyland Trunk sewer connection as proposed by MTE Consultants is currently the preferred alternative.

This memorandum provides a brief overview of the development of the wastewater modelling for the CMSP lands by providing an outline of all alternatives.

2.0 Model Development

The sanitary models for CMSP lands have been generated using PCSWMM 7.2 (running on SWM engine 5.1.013), and are an extension of the sanitary model as provided by Civica Infrastructure, which has been calibrated based upon the latest flow monitoring information for the lands immediately north of CMSP (Clairfield Subdivision).

Wood was also provided with the City of Guelph sanitary model which consisted of the entirety of the City of Guelph's wastewater infrastructure. This model was used to provide additional information for certain nodes within Wood's sanitary modelling.

Flow allocation has been based upon a predicted population of approximately 27,324, which consists of the total CMSP population of 23,759, and an additional population loading of 3,471 (consisting of 15% of the primary CMSP population) from potential additional Zone 3 lands outside of the CMSP area. This population has been used to estimate the required demands for the CMSP lands.

The population has been distributed based upon the land use plan information provided by Brook McIllroy in August, 2019. Demands have been split between several land use types, including residential, commercial, and mixed use. While the land use is not expected to drastically change over the course of development, it should be noted that the demand allocation will have to be revised should there be any change in either the overall population, or the land use within CMSP lands. This will also include the population estimates attributed to any potential additional Zone 3 lands outside of the CMSP area.

The dry weather flow (DWF) has been based upon an average demand of 300 L/s, which has been split based upon the aforementioned population and land use types. Infiltration and inflow (I/I) have also been addressed within the modelling and form the baseline demand at each demand node within the sanitary model. The I/I values are based upon a factor of 0.28 L/s-ha, and have been split based upon the contributing sanitary drainage area as per the land use plan and available contours.

The CMSP lands have been split into five (5) catchments which will have flow generation from a combination of DWF and I/I. These catchments have been further subdivided based upon the land use plan and available contours to provide some granularity in terms of flow allocation, which subsequently allowed further refinement for the modelling in terms of sewer sizing and pumping capacities.

To maintain consistency with the Civica model, the most conservative time pattern (FM02Q) has been borrowed from the Civica model and applied to all DWF nodes in the CMSP lands. This allows similar peaking times and values for CMSP lands as it does for the area already modelled by Civica. In a similar fashion, hydrograph FM-02_1 has also been applied throughout the CMSP lands as well.

As Wood's initial wastewater modelling consisted of the base City model, this revised model is based on Civica Infrastructure's calibrated model for the Clairfields Subdivision. As the calibrated model is more conservative compared to the existing City model, the alternatives presented in Wood's sanitary analysis result in a different set of results compared to the pre-existing modelling as performed by Wood's UK group. This is discussed within the main reporting.

3.0 Alternatives

Four alternatives have been developed by Wood, as follows:

- Victoria Road Trunk – East Connection

  Under this alternative, the wastewater from CMSP will be conveyed to the Victoria Road trunk sewer system. As the outlet for this alternative was outside the limits of Civica Infrastructure's modelling, Wood used the provided City model to add in appropriate elevations for the outlet point in an effort to assess this alternative.

- Clair Gordon Trunk – Central Connection

  Under this alternative, the wastewater from CMSP will be conveyed to the Clair Gordon trunk sewer system.

- Southgate Hanlon Trunk – West Connection

  Under this alternative, the wastewater from CMSP will be conveyed to the Southgate Drive trunk sewer system.

- Southend Park and Valley Land – West Connection (based upon MTE Consulting's planning)

  Under this alternative, the wastewater from CMSP will be conveyed to the Southgate Drive trunk sewer system and will eventually flow into the Hanlon trunk system. Wood matched MTE's layout for the outletting gravity sewer to its connection point. Based upon Wood's assessment, this is the preferred alternative.

The following figures (1 through 4) show the junction locations used for each alternative, as well as overall sanitary sewer (conduits), forcemains, and gravity main servicing. These points have been extracted from the sanitary PCSWMM model and overlaid on a GIS mapping base to show proximate junction locations and overall servicing for each alternative.

Figure 1 - Victoria Trunk Alternative

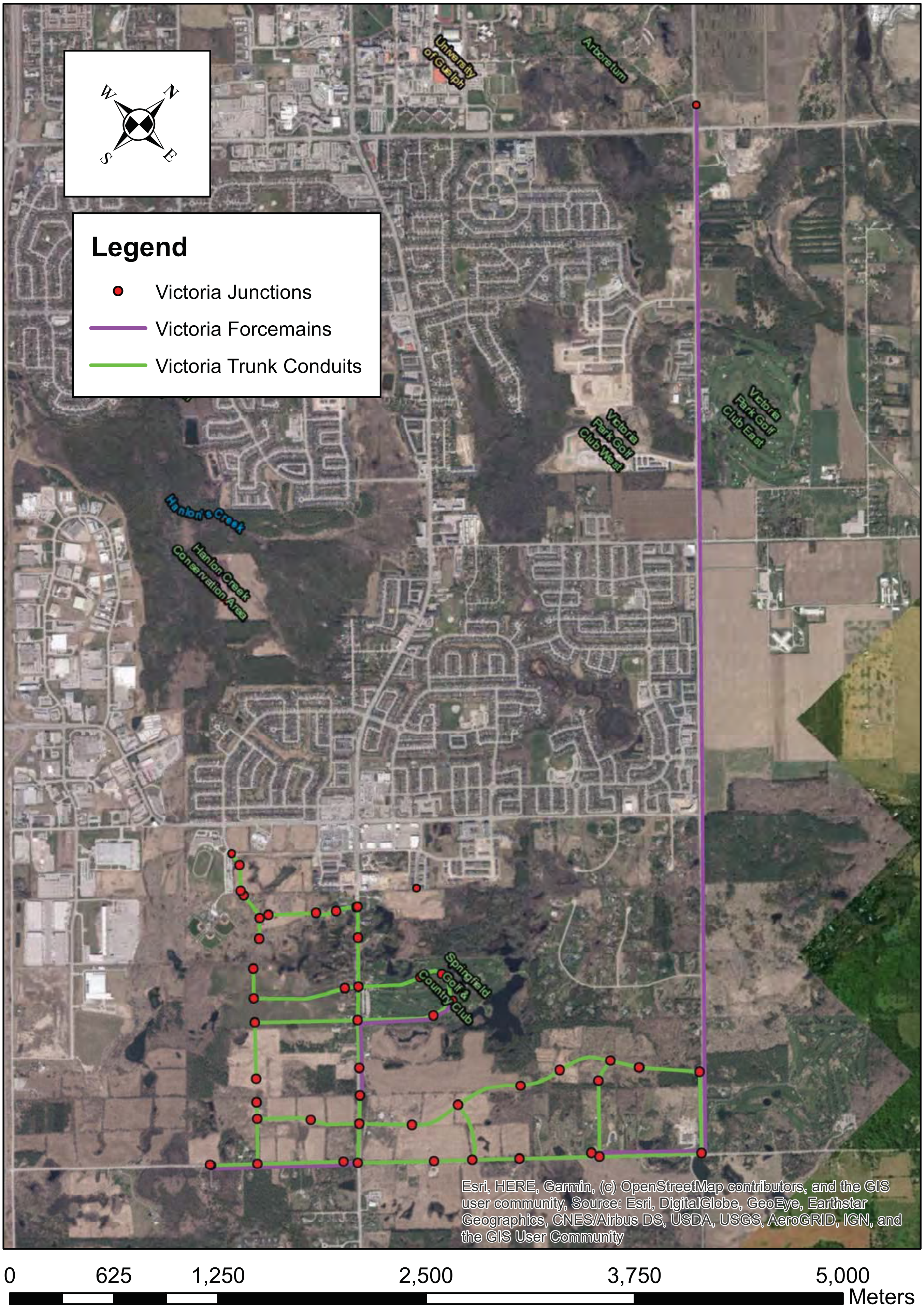


Figure 2 - Clair Gordon Trunk Alternative

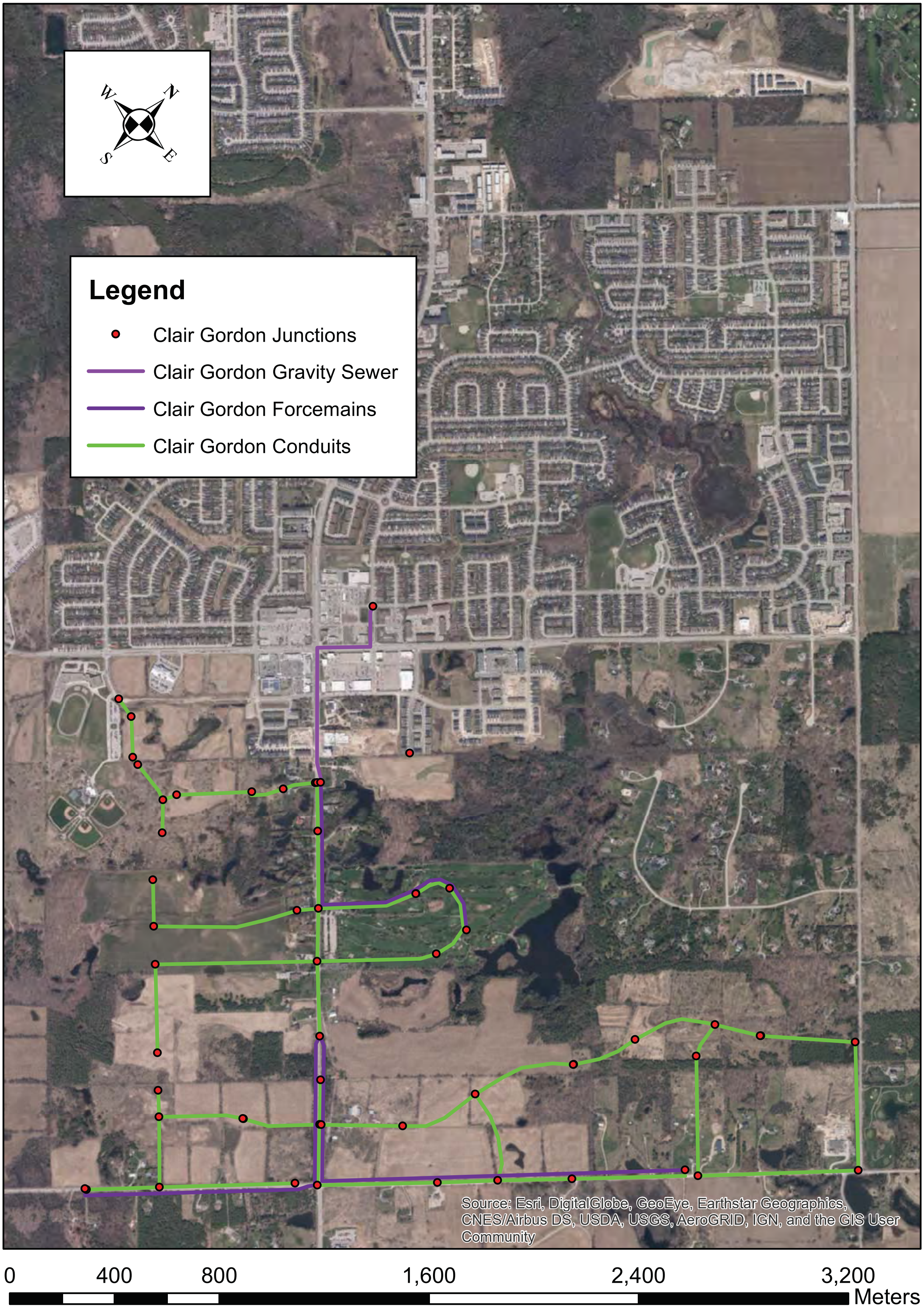


Figure 3 - Southgate Hanlon Trunk Alternative

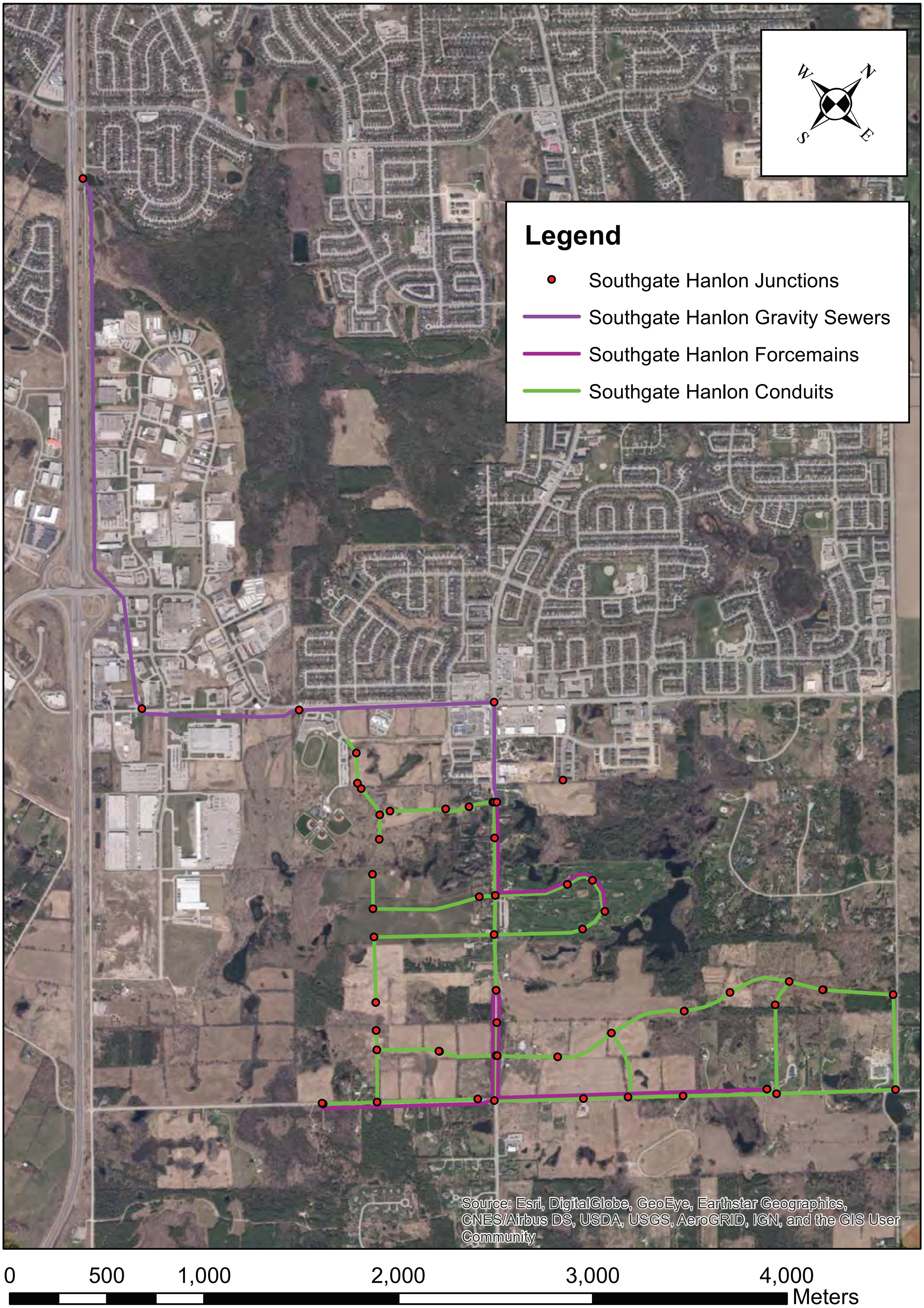
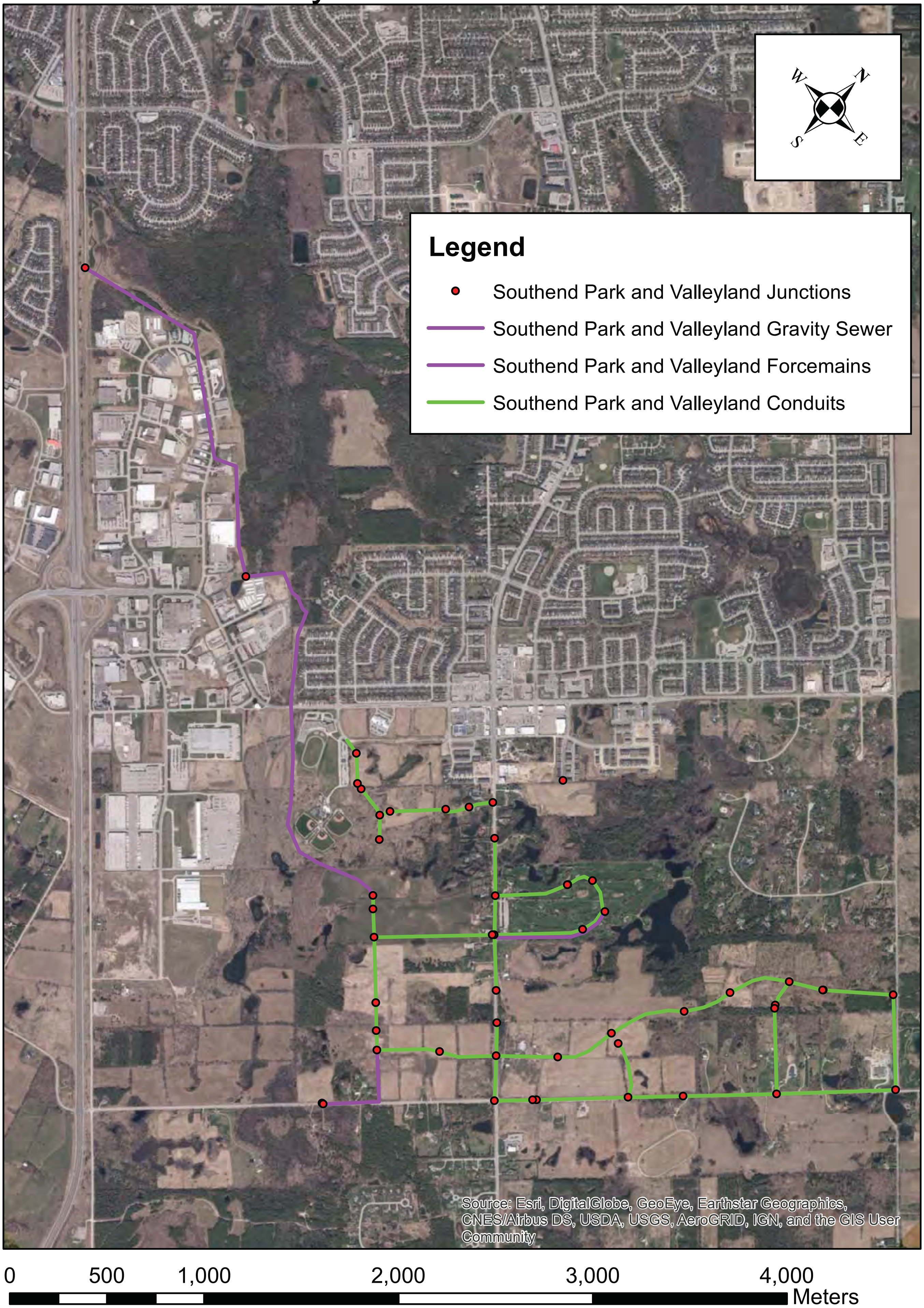
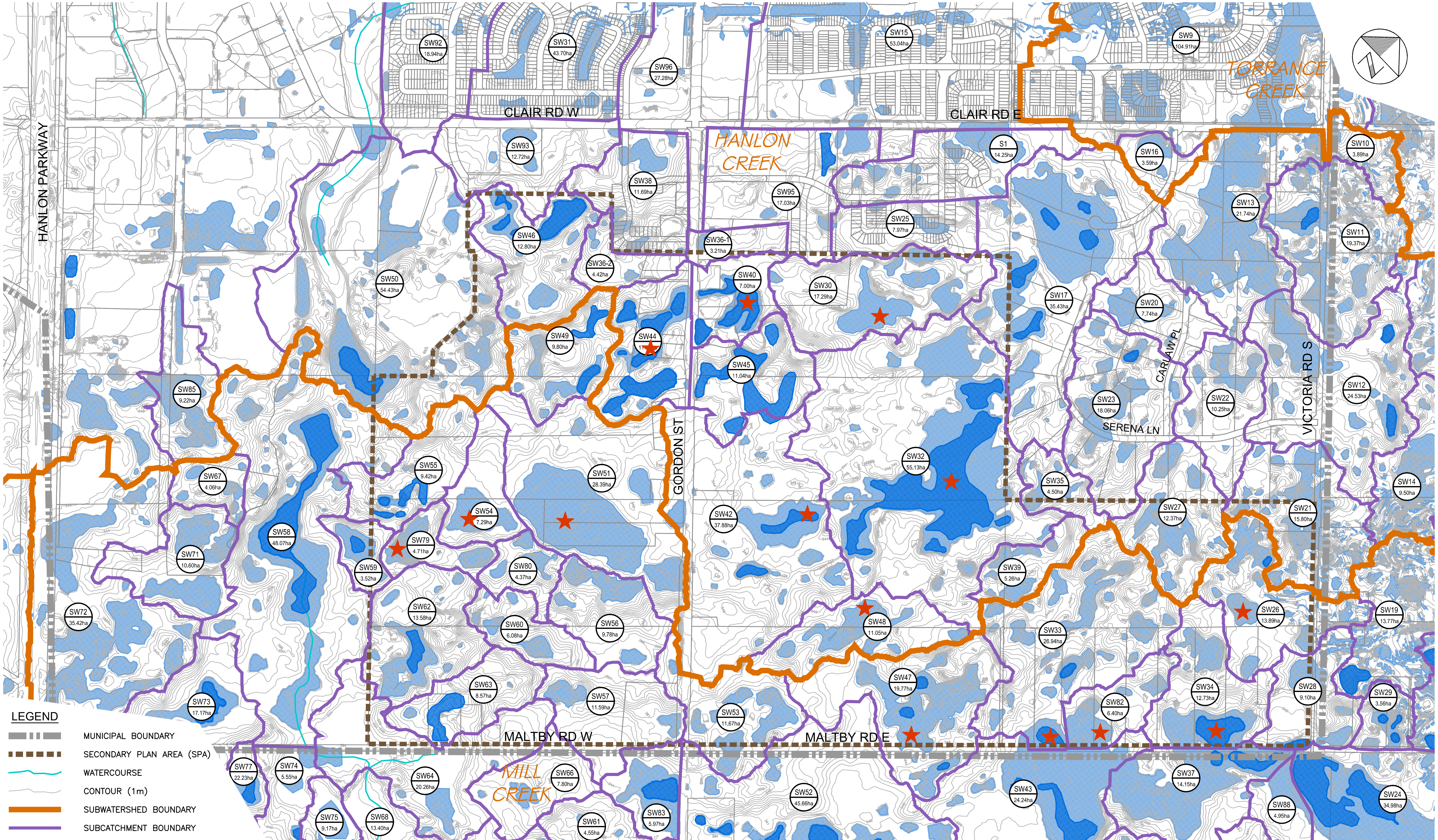


Figure 4 - Southend Park and Valleyland Trunk Alternative



Appendix C

Stormwater



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Last Saved: 2019-01-25 Last Saved By: richard.bartolo

SCALE VALID ONLY FOR 24"x36" VERSION

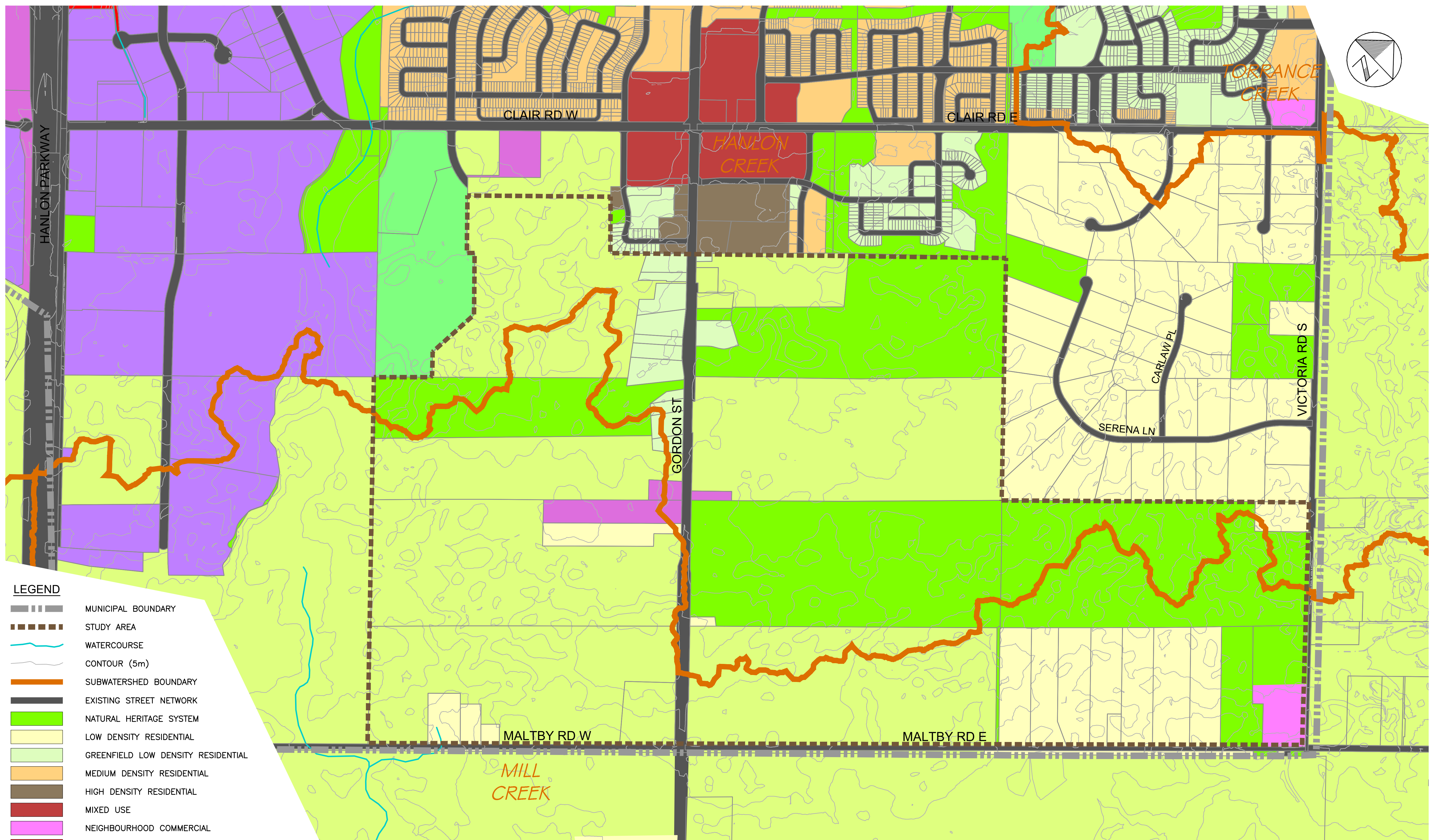
CLAIR-MALTBY MASTER ENVIRONMENTAL SERVICING PLAN AND SECONDARY PLAN
CITY OF GUELPH

LOCAL SCALE DRAINAGE BOUNDARY PLAN
(EXISTING CONDITION)

Scale 1:6000
0 50 100 200

Consultant File No. TPB168050

Figure No. HYD1



SCALE VALID ONLY FOR 24"x36" VERSION

CLAIR-MALTBY
MASTER ENVIRONMENTAL SERVICING PLAN AND SECONDARY PLAN
CITY OF GUELPH

EXISTING LAND USE PLAN

wood.

Scale 1:6000 (0 50 100 200)

Consultant File No. TPB168050

Figure No. HYD3

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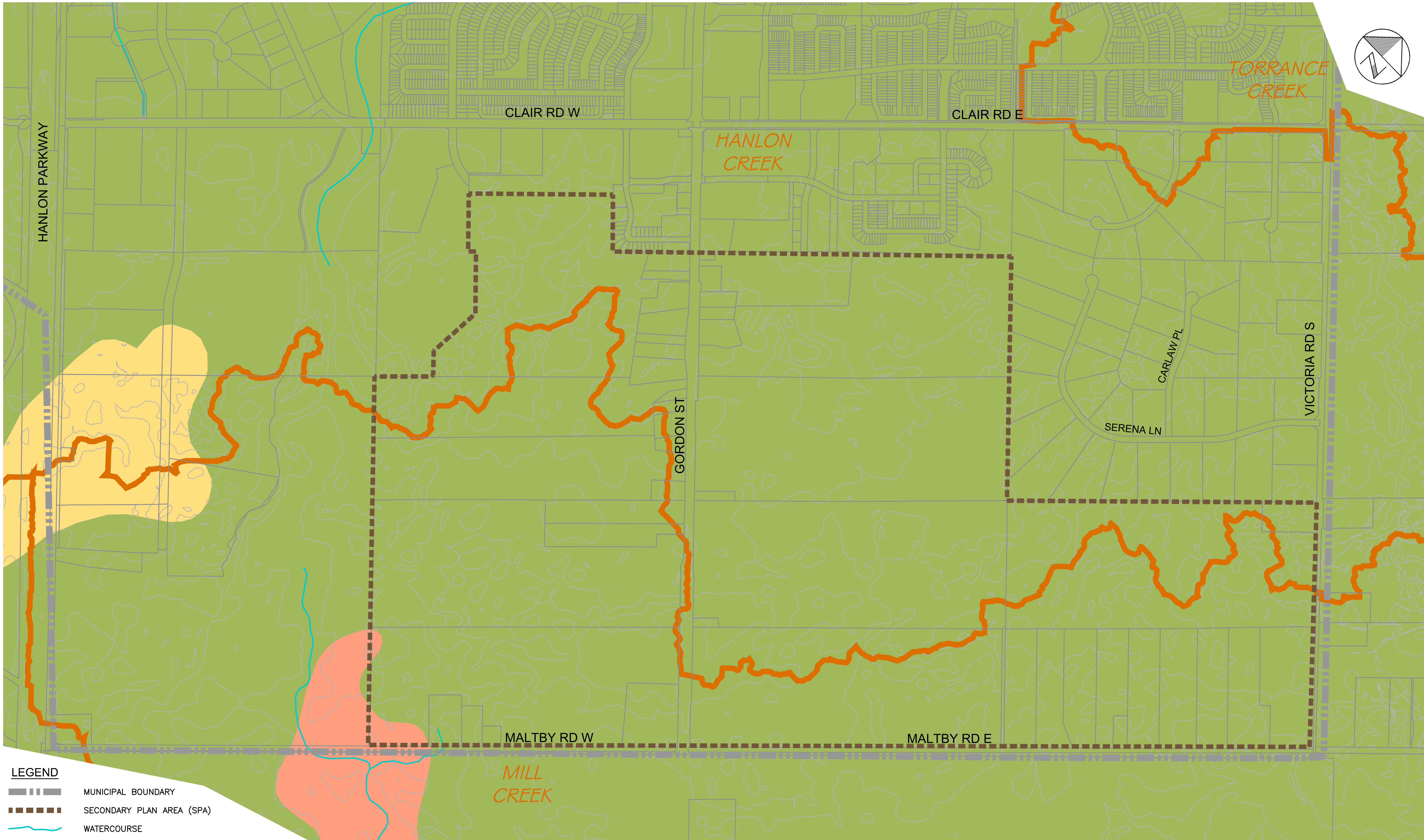

SCALE VALID ONLY FOR 24"x36" VERSION

CLAIR-MALTBY MASTER ENVIRONMENTAL SERVICING PLAN AND SECONDARY PLAN CITY OF GUELPH	EXISTING SOILS CLASSIFICATION PLAN	wood.	Scale 1:6000 (0 50 100 200) Consultant File No. TPB168050 Figure No. HYD4

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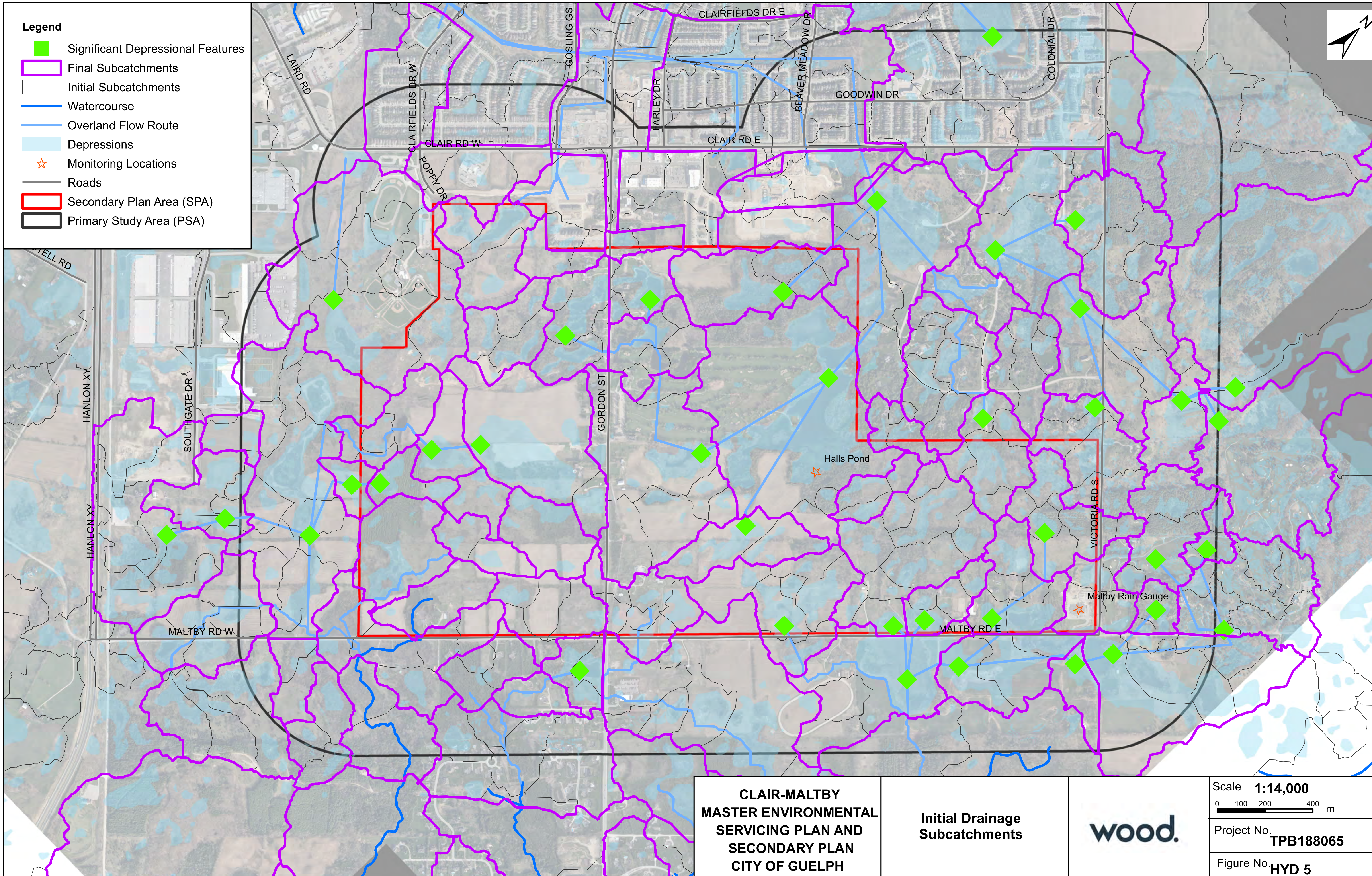


CLAIR-MALTBY
MASTER ENVIRONMENTAL
SERVICING PLAN AND
SECONDARY PLAN
CITY OF GUELPH

Initial Drainage Subcatchments

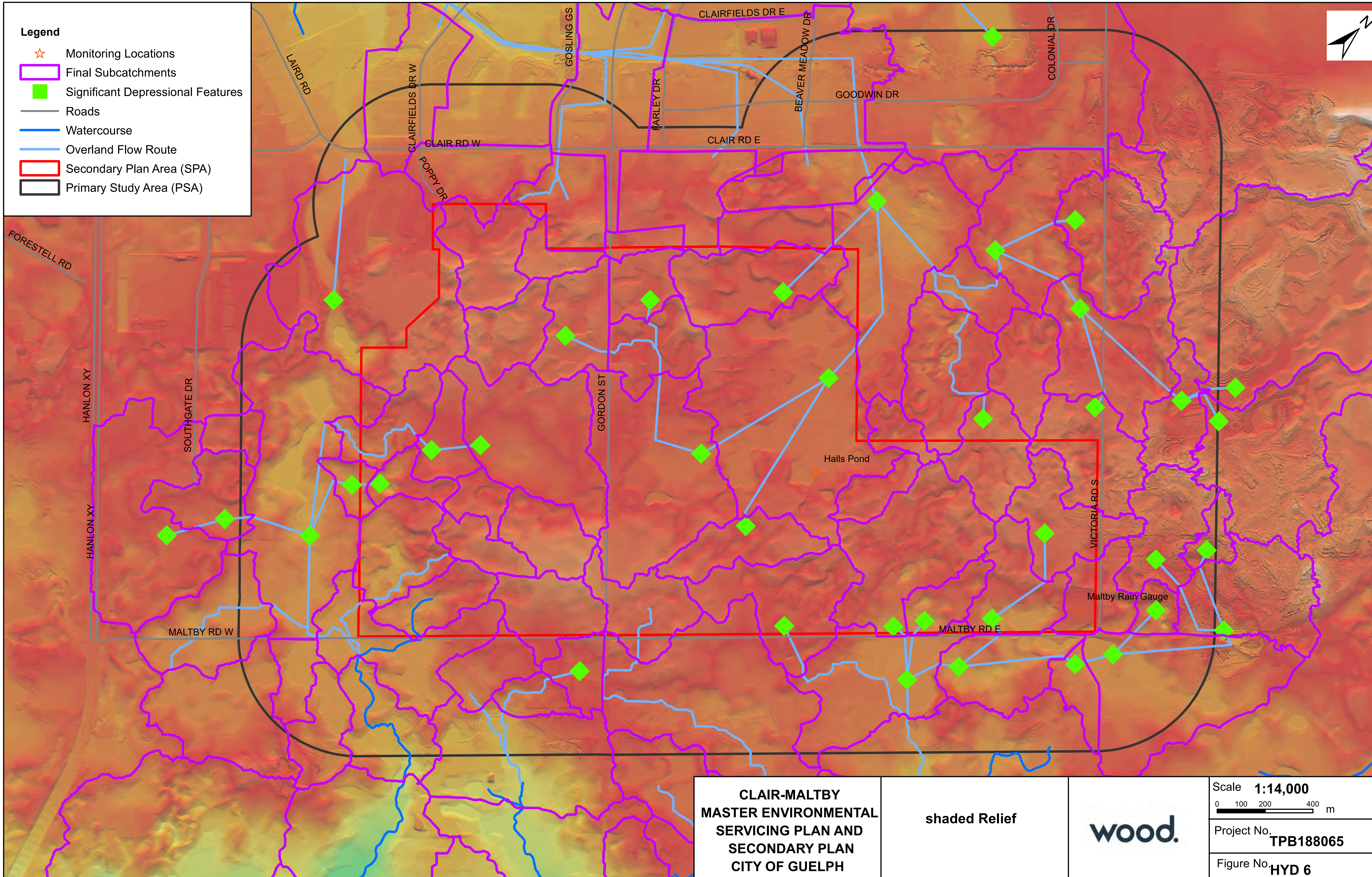
wood.

Scale 1:14,000

0 100 200 400 m

Project No. TPB188065

Figure No. HYD 5



Legend
Monitoring Locations
Final Subcatchments
Significant Depressional Features
Roads
Watercourse
Overland Flow Route
Secondary Plan Area (SPA)
Primary Study Area (PSA)
LAIRD RD
CLAIRFIELDS DR W
GOSLING GS
CLAIRFIELDS DR E
BEAVER MEADOW DR
COLONIAL DR
GOODWIN DR
FARLEY DR
CLAIR RD W
CLAIR RD E
POPPY DR
FORESTELL RD
HANLON XY
SOUTHGATE DR
GORDON ST
Halls Pond
VICTORIA RD S
Maltby Rain Gauge
MALTBY RD W
MALTBY RD E
CLAIR-MALTBY
MASTER ENVIRONMENTAL
SERVICING PLAN AND
SECONDARY PLAN
CITY OF GUELPH
shaded Relief
wood.
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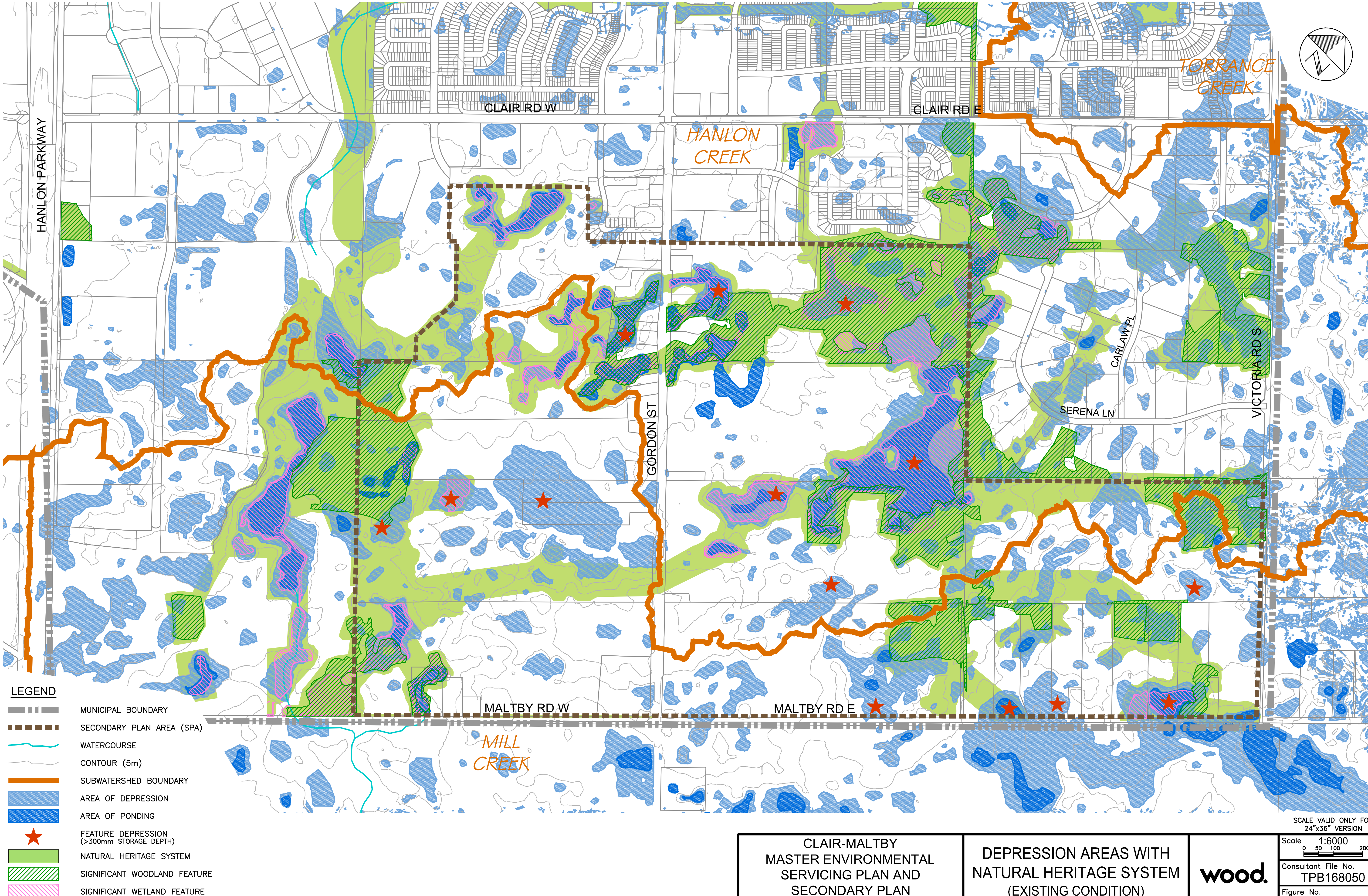
Project No. TPB188065
Figure No. HYD 6



SCALE VALID ONLY FOR 24"x36" VERSION

CLAIR-MALTBY MASTER ENVIRONMENTAL SERVICING PLAN AND SECONDARY PLAN CITY OF GUELPH	DEPRESSION AREAS WITH NATURAL HERITAGE SYSTEM (EXISTING CONDITION)	wood.	Scale 1:6000 (0 50 100 200) Consultant File No. TPB168050 Figure No. HYD7

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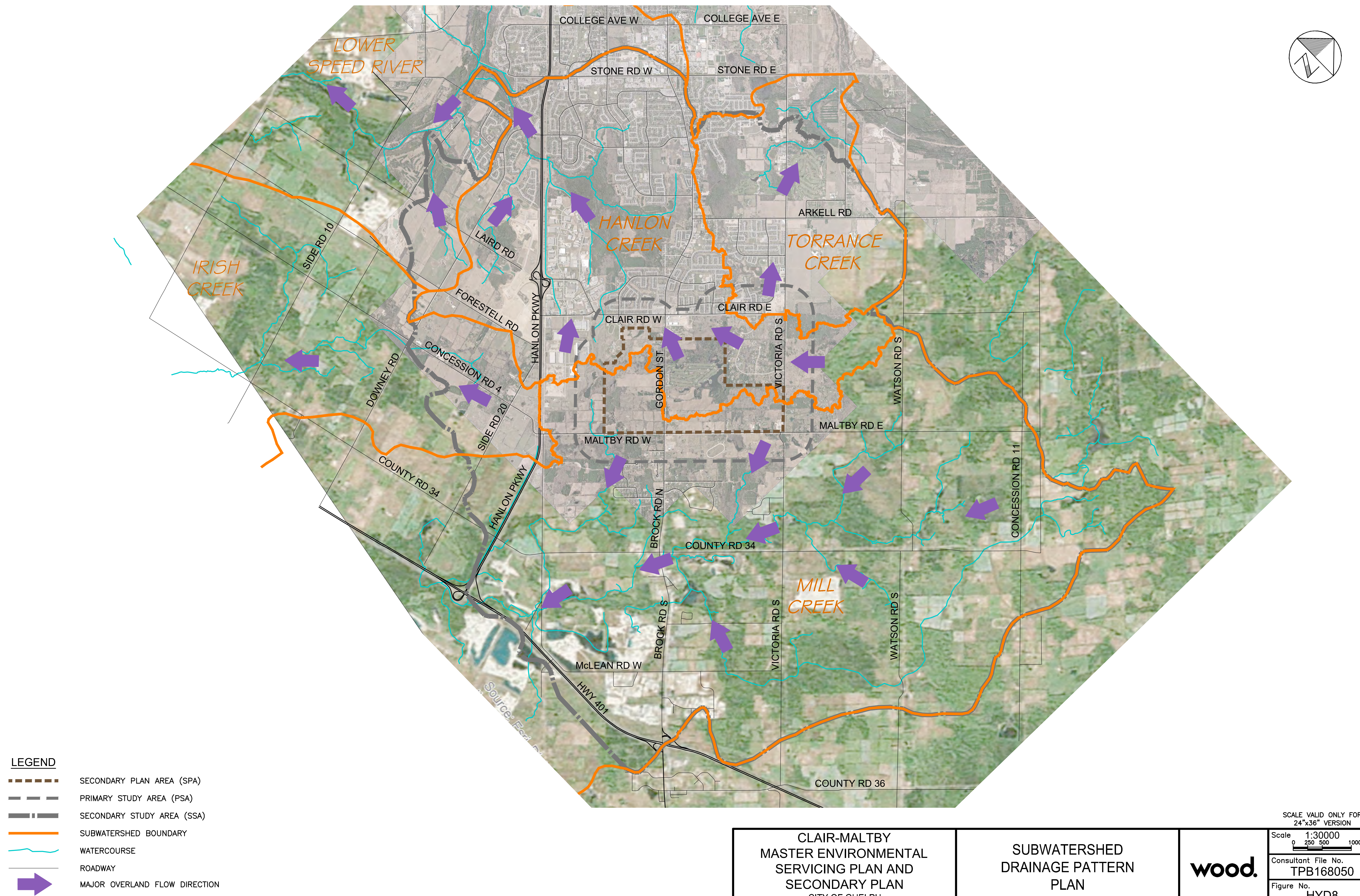

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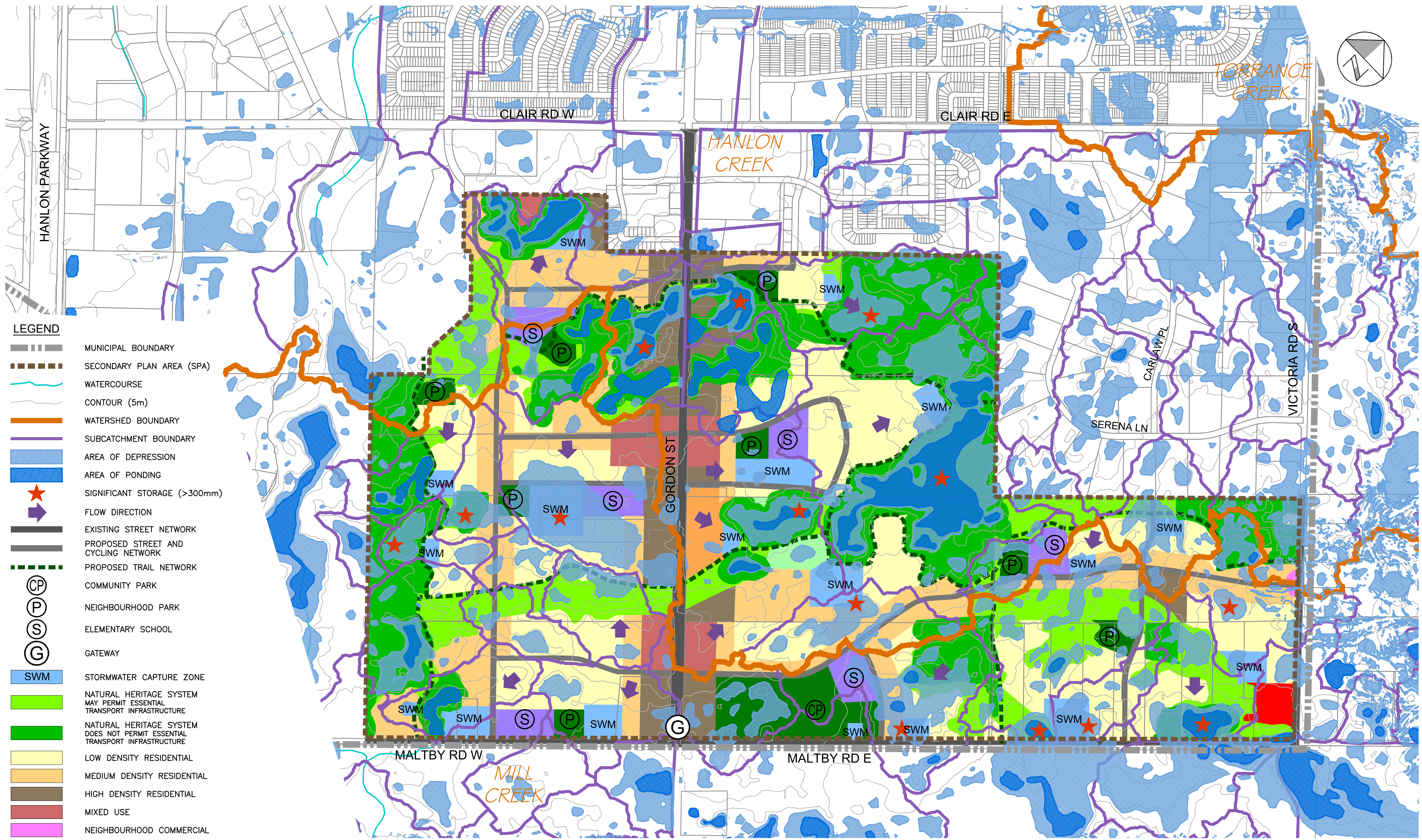
CLAIR-MALTBY MASTER ENVIRONMENTAL SERVICING PLAN AND SECONDARY PLAN CITY OF GUELPH	SUBWATERSHED DRAINAGE PATTERN PLAN	wood.	Scale 1:30000 0 250 500 1000 Consultant File No. TPB168050 Figure No. HYD8



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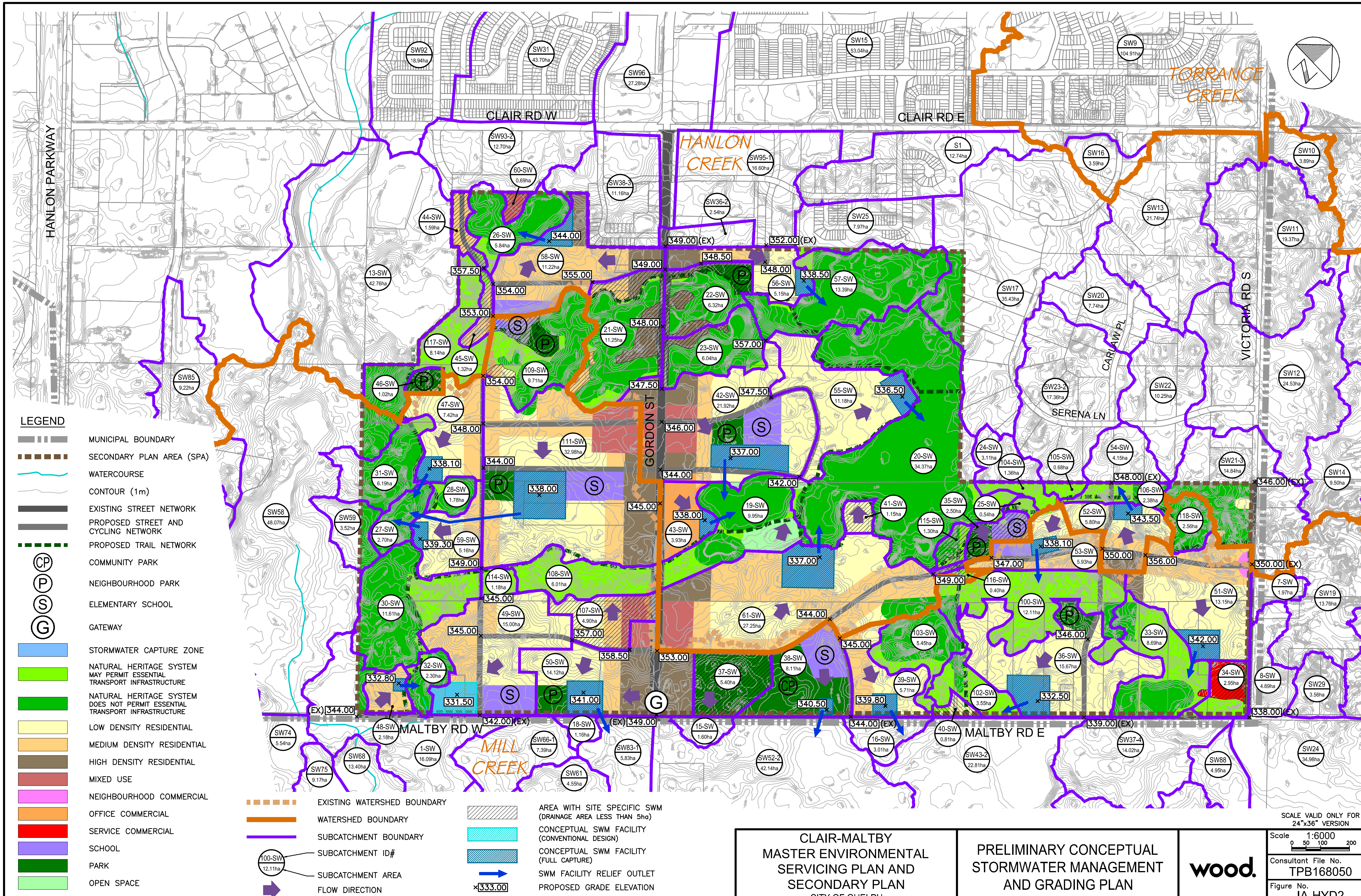
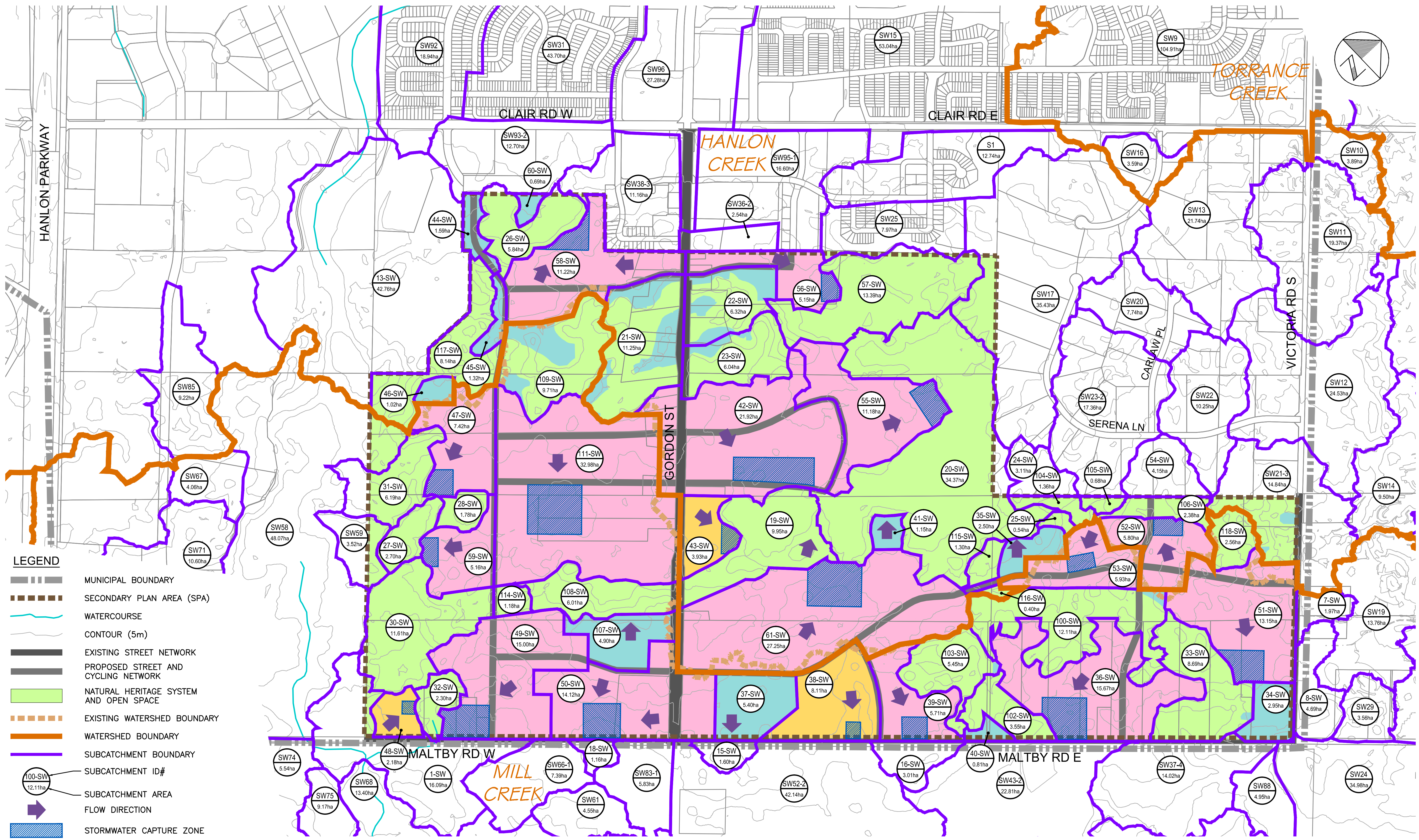
SCALE VALID ONLY FOR 24"x36" VERSION

CLAIR-MALTBY MASTER ENVIRONMENTAL SERVICING PLAN AND SECONDARY PLAN CITY OF GUELPH	EXISTING DRAINAGE FEATURES AND CONCEPTUAL LAND USE PLAN	wood.	Scale 1:6000 (0 50 100 200) Consultant File No. TPB168050 Figure No. IA-HYD1



CLAIR-MALTBY
MASTER ENVIRONMENTAL SERVICING PLAN AND SECONDARY PLAN
CITY OF GUELPH

PRELIMINARY CONCEPTUAL STORMWATER MANAGEMENT AND GRADING PLAN



LEGEND

- MUNICIPAL BOUNDARY
- SECONDARY PLAN AREA (SPA)
- WATERCOURSE
- CONTOUR (5m)
- EXISTING STREET NETWORK
- PROPOSED STREET AND CYCLING NETWORK
- NATURAL HERITAGE SYSTEM AND OPEN SPACE
- EXISTING WATERSHED BOUNDARY
- WATERSHED BOUNDARY
- SUBCATCHMENT BOUNDARY
- 100-SW — SUBCATCHMENT ID#
- 12.11ha — SUBCATCHMENT AREA
- FLOW DIRECTION
- STORMWATER CAPTURE ZONE

SURFACE WATER CAPTURE

- 27mm
- 27mm + 88mm (100 YEAR)
- 27mm + 285mm (REGIONAL)

SCALE VALID ONLY FOR 24"x36" VERSION

CLAIR-MALTBY MASTER ENVIRONMENTAL SERVICING PLAN AND SECONDARY PLAN CITY OF GUELPH	SURFACE WATER CAPTURE	wood.	Scale 1:6000 (0 50 100 200) Consultant File No. TPB168050 Figure No. IA-HYD3

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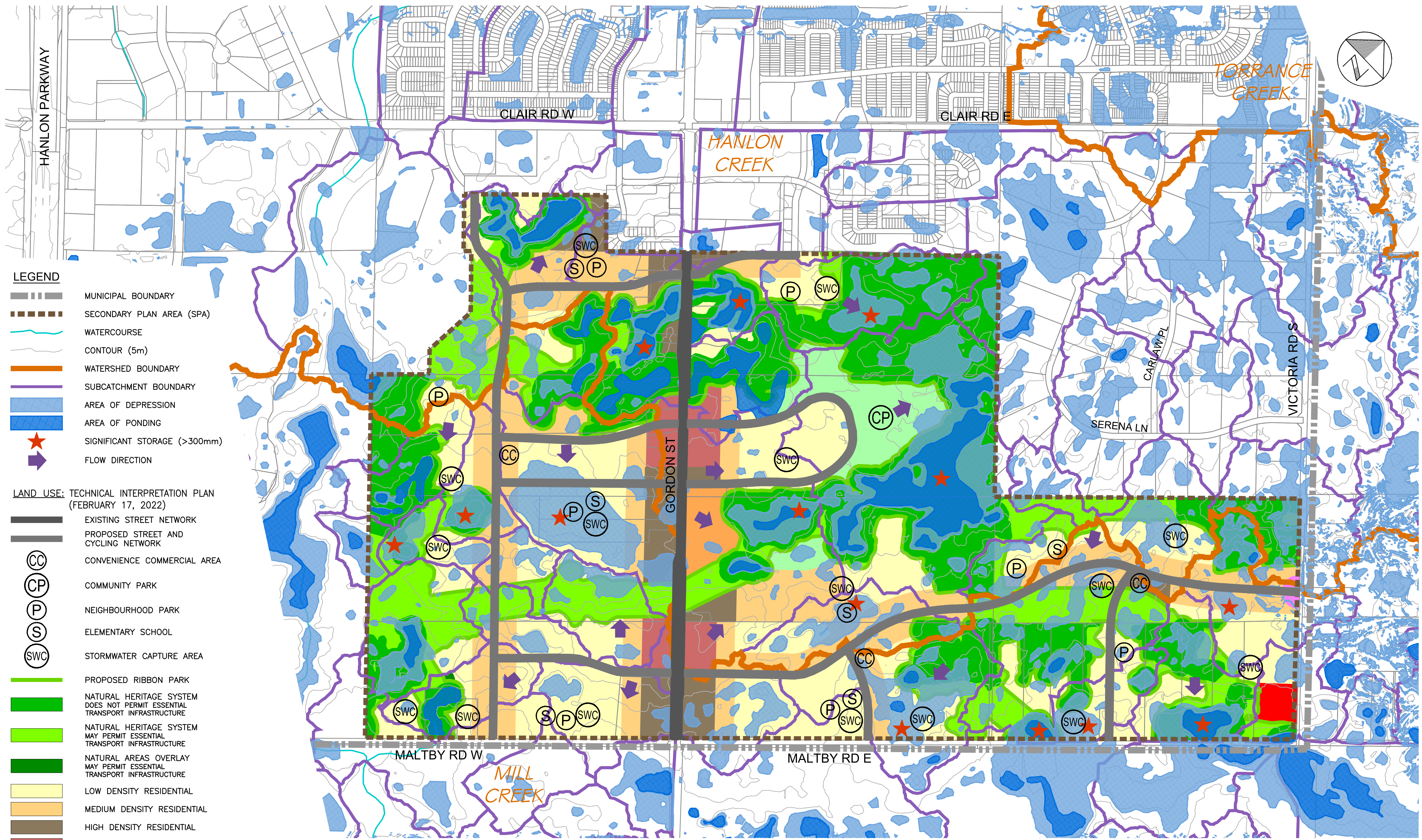

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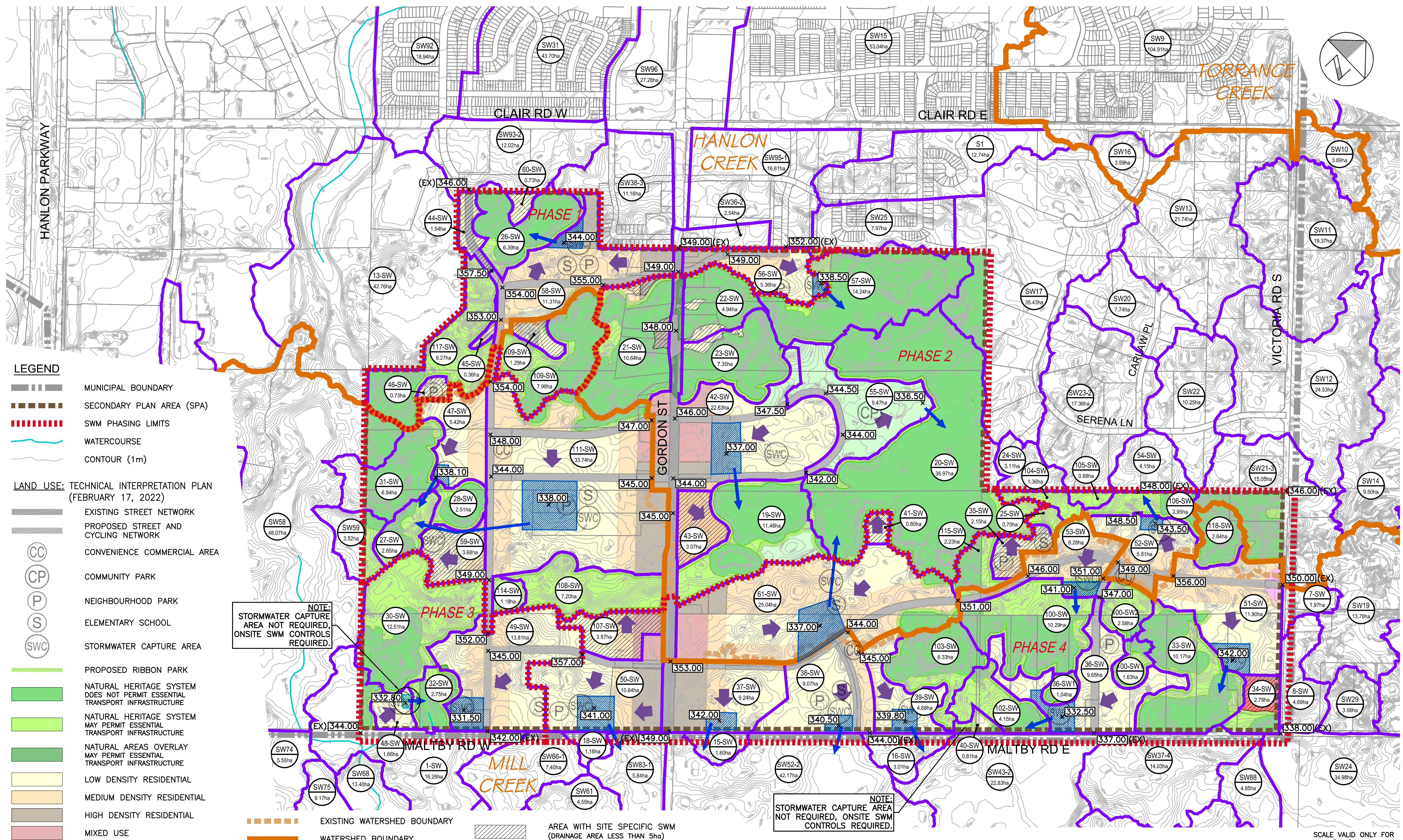
CLAIR-MALTBY MASTER ENVIRONMENTAL SERVICING PLAN AND SECONDARY PLAN CITY OF GUELPH	EXISTING DRAINAGE FEATURES AND UPDATED PREFERRED COMMUNITY STRUCTURE	wood.	Scale 1:6000 (0 50 100 200) Consultant File No. TPB168050 Figure No. IA2-HYD1



SCALE VALID ONLY FOR 24"x36" VERSION

CLAIR-MALTBY MASTER ENVIRONMENTAL SERVICING PLAN AND SECONDARY PLAN CITY OF GUELPH	UPDATED PREFERRED COMMUNITY STRUCTURE STORMWATER MANAGEMENT AND GRADING PLAN	wood.	Scale 1:6000 Consultant File No. TPB168050 Figure No. IA2-HYD2

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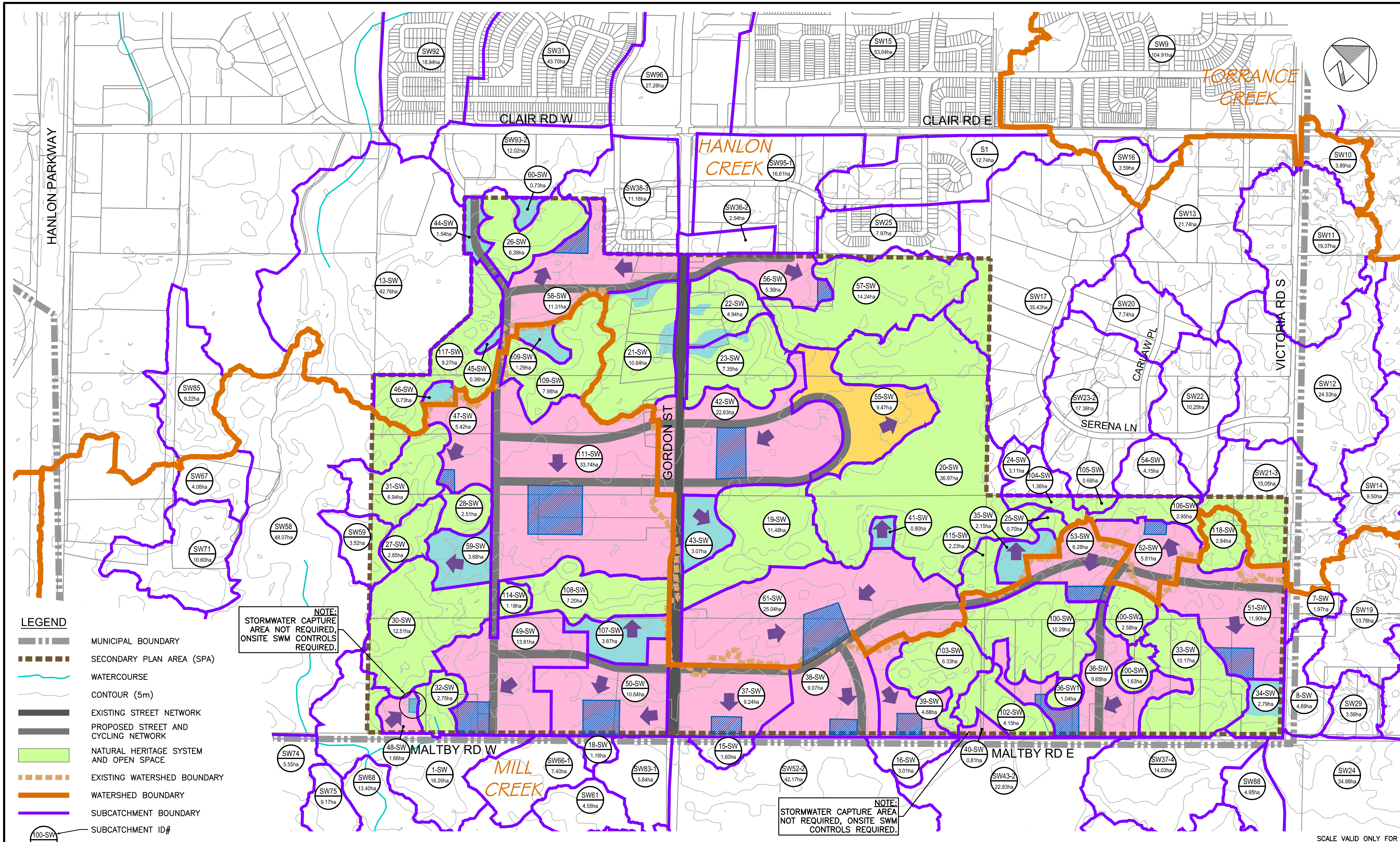

CLAIR-MALTBY
MASTER ENVIRONMENTAL SERVICING PLAN AND SECONDARY PLAN
CITY OF GUELPH

UPDATED PREFERRED COMMUNITY STRUCTURE SURFACE WATER CAPTURE

wood.

Consultant File No. TPB168050

Figure No. IA2-HYD3

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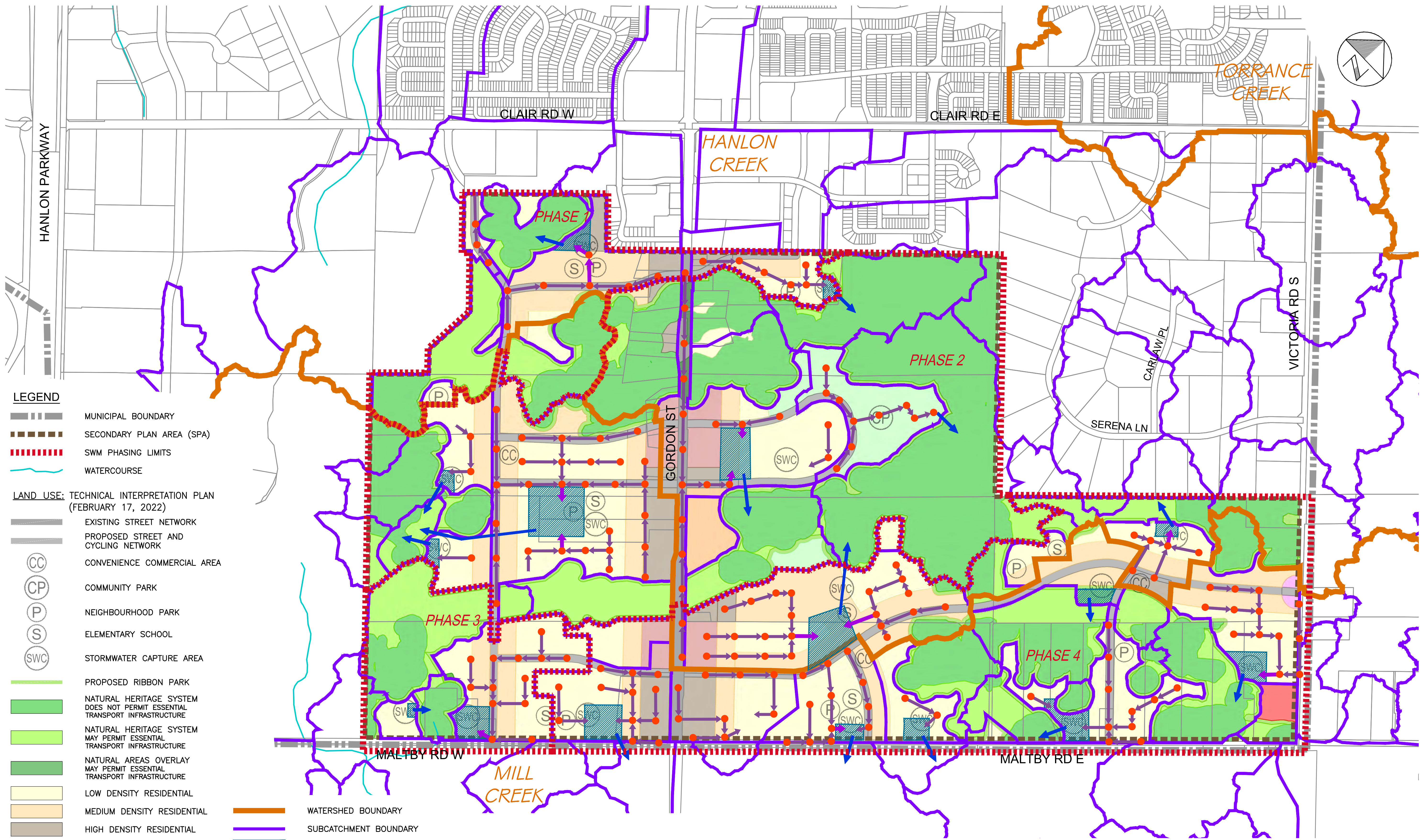
Plotted: 2023-09-15
Last Saved: 2023-09-15



SCALE VALID ONLY FOR 24"x36" VERSION

CLAIR-MALTBY MASTER ENVIRONMENTAL SERVICING PLAN AND SECONDARY PLAN CITY OF GUELPH	UPDATED PREFERRED COMMUNITY STRUCTURE CONCEPTUAL STORM SEWER LAYOUT	wood.	Scale 1:6000 (0 50 100 200) Consultant File No. TPB168050 Figure No. A2-HYD4

Mill Creek Monitoring Site Frequency Analysis

Year	Max Flow (m^3/s)
1950	0.06008
1951	0.05490
1952	0.04537
1953	0.04277
1954	0.28147
1955	0.05323
1956	0.09178
1957	0.06633
1958	0.05228
1959	0.04100
1960	0.04513
1961	0.06354
1962	0.04256
1963	0.04158
1964	0.07204
1965	0.03595
1966	0.05635
1967	0.06064
1968	0.48457
1969	0.04942
1970	0.05240
1971	0.05786
1972	0.03552
1973	0.04440
1974	0.05768
1975	0.07809
1976	0.03562
1977	0.04394
1978	0.04484
1979	0.04952
1980	0.03480
1981	0.03501
1982	0.11608
1983	0.03405
1984	0.04321
1985	0.05449
1986	0.05800
1987	0.04559
1988	0.08438
1989	0.03367
1990	0.05583
1991	0.05601
1992	0.04999
1993	0.04138
1994	0.03912
1995	0.05775
1996	0.03162
1997	0.03891
1998	0.04228
1999	0.05726
2000	0.04525
2001	0.05656
2002	0.04231
2003	0.03092
2004	0.03960
2005	0.71300
2006	0.07239
2007	0.03357
2008	0.06628
2009	0.07378
2010	0.05405
2011	0.03486
2012	0.05318
2013	0.06071
2014	0.06623
2015	0.04898
2016	0.07995
2017	0.03146

Log Pearson Type III Distribution

DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: CFA

SOLUTION OBTAINED VIA MOMENTS

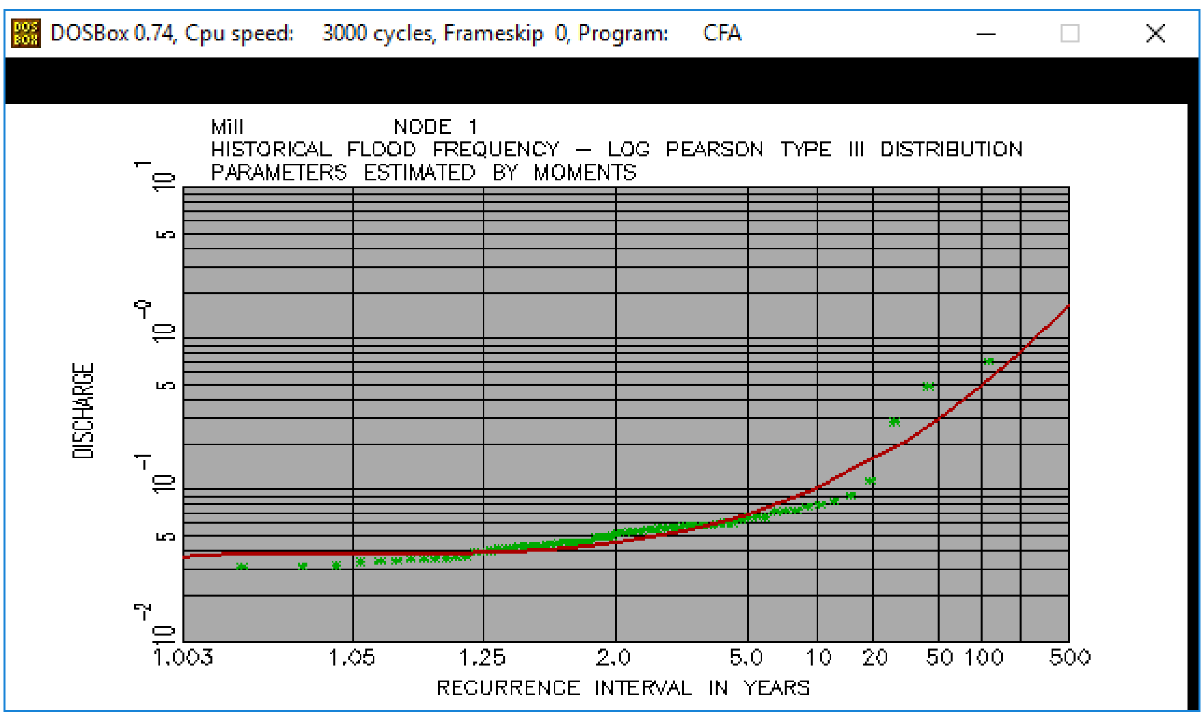
LP3 PARAMETERS: A= 0.7989 B= 0.4615 LOG(M)= -3.270

M = 0.3801E-01

FLOOD FREQUENCY REGIME

RETURN PERIOD	EXCEEDANCE PROBABILITY	FLOOD
1.003	0.997	0.035
1.050	0.952	0.038
1.250	0.800	0.039
2.000	0.500	0.045
5.000	0.200	0.069
10.000	0.100	0.100
20.000	0.050	0.160
50.000	0.020	0.290
100.000	0.010	0.480
200.000	0.005	0.810
500.000	0.002	1.66

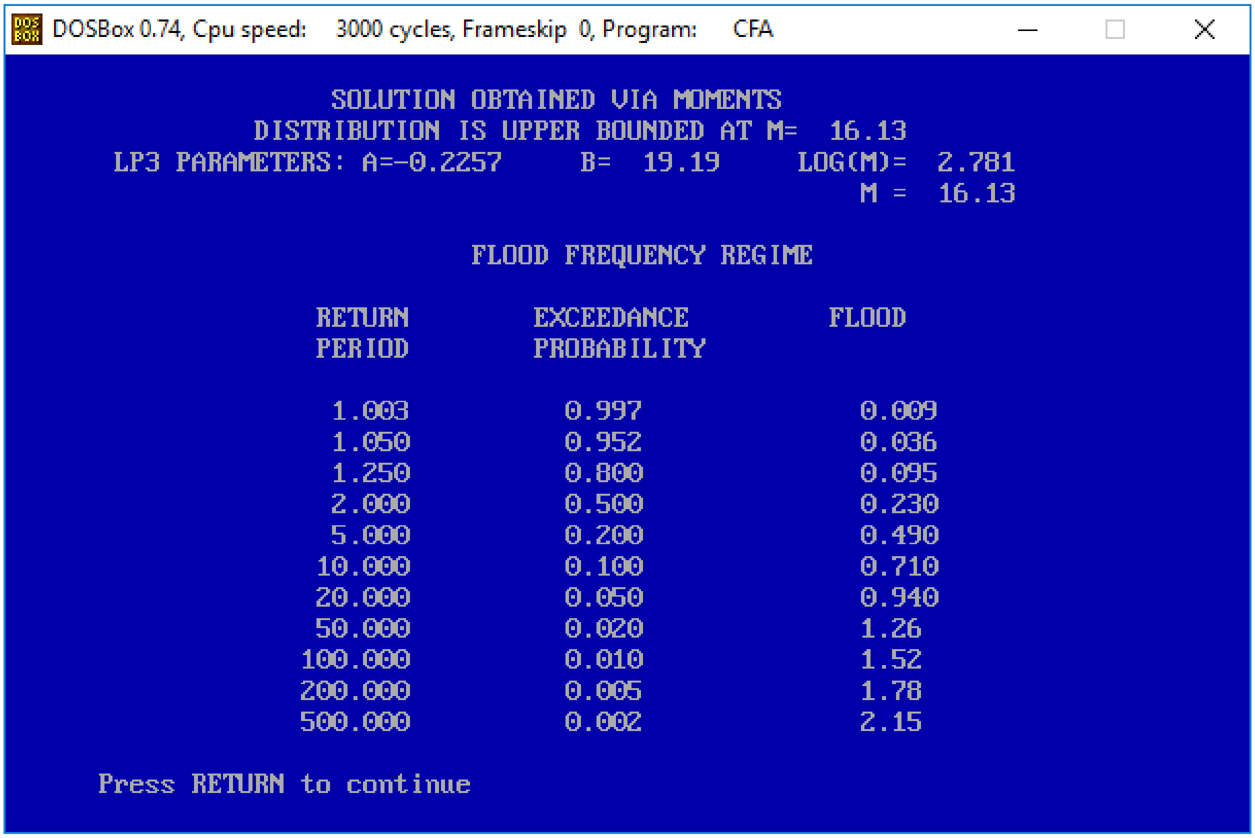
Press RETURN to continue_



Hanlon Creek Monitoring Site Frequency Analysis

Year	Max Flow (m^3/s)
1950	0.30880
1951	0.35954
1952	0.28508
1953	0.07880
1954	0.66395
1955	0.26176
1956	0.66996
1957	0.63376
1958	0.58056
1959	0.03000
1960	0.13584
1961	0.61061
1962	0.19401
1963	0.12565
1964	0.65846
1965	0.11393
1966	0.29947
1967	0.47191
1968	0.70607
1969	0.18552
1970	0.15778
1971	0.32171
1972	0.05959
1973	0.10688
1974	0.34056
1975	0.64533
1976	0.02999
1977	0.07467
1978	0.33147
1979	0.14364
1980	0.10834
1981	0.05322
1982	0.67437
1983	0.03138
1984	0.14545
1985	0.61988
1986	0.56686
1987	0.14245
1988	0.64103
1989	0.02999
1990	0.28338
1991	0.37399
1992	0.15241
1993	0.05950
1994	0.11887
1995	0.37938
1996	0.09420
1997	0.06026
1998	0.20639
1999	0.57473
2000	0.23711
2001	0.18584
2002	0.25667
2003	0.04987
2004	0.03982
2005	0.68234
2006	0.61254
2007	0.03543
2008	0.63278
2009	0.66241
2010	0.59457
2011	0.11139
2012	0.10872
2013	0.61320
2014	0.60294
2015	0.28419
2016	0.65530
2017	0.07005

Log Pearson Type III Distribution



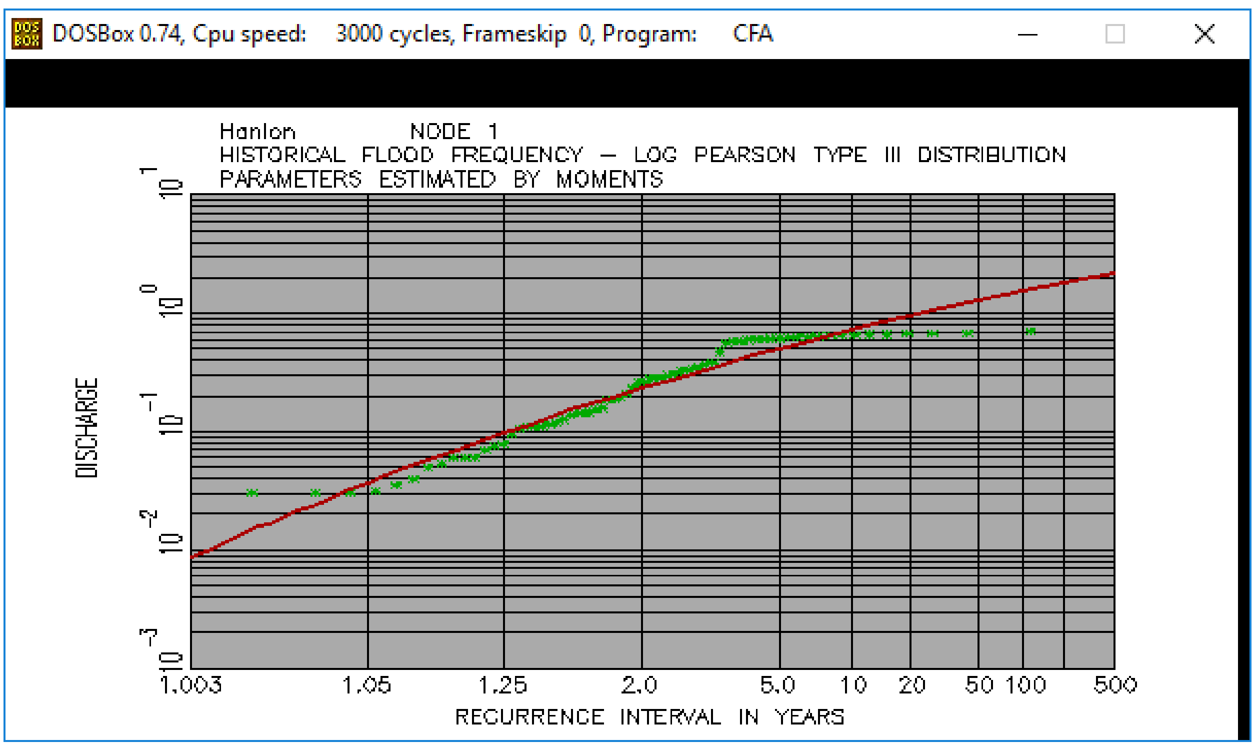
DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip 0, Program: CFA

SOLUTION OBTAINED VIA MOMENTS
DISTRIBUTION IS UPPER BOUNDED AT M= 16.13
LP3 PARAMETERS: A=-0.2257 B= 19.19 LOG(M)= 2.781
M = 16.13

FLOOD FREQUENCY REGIME

RETURN PERIOD	EXCEEDANCE PROBABILITY	FLOOD
1.003	0.997	0.009
1.050	0.952	0.036
1.250	0.800	0.095
2.000	0.500	0.230
5.000	0.200	0.490
10.000	0.100	0.710
20.000	0.050	0.940
50.000	0.020	1.26
100.000	0.010	1.52
200.000	0.005	1.78
500.000	0.002	2.15

Press RETURN to continue



Hanlon Subwatershed Annual Water Balance Under Future Land Use Conditions

Year	Precipitation (mm)	Baseflow (mm)	Starting Snow Depth (mm)	Infiltration (mm)	Evaporation (mm)	Ending Snow Depth (mm)	Outflow (mm)	Net (mm)	% Error
1950	1,001.10	115.20	0.00	894.10	31.84	85.80	115.21	-10.65	-1.06%
1951	962.01	115.21	85.80	937.76	38.46	79.20	115.18	-7.58	-0.79%
1952	739.31	115.53	79.29	813.45	31.76	0.00	115.49	-26.57	-3.59%
1953	857.80	115.21	0.00	824.96	38.32	0.00	114.90	-5.15	-0.60%
1954	1,032.11	115.21	0.00	1,004.02	37.19	11.77	117.92	-23.58	-2.28%
1955	812.01	115.21	11.77	764.71	30.99	36.50	115.04	-8.25	-1.02%
1956	977.02	115.53	36.60	979.65	45.02	9.78	117.13	-22.43	-2.30%
1957	897.11	115.21	10.21	904.18	33.83	0.00	116.01	-31.48	-3.51%
1958	728.02	115.21	0.00	647.69	29.12	67.42	115.42	-16.42	-2.26%
1959	845.30	115.21	67.62	860.53	36.64	25.50	114.87	-9.40	-1.11%
1960	760.49	115.53	25.50	767.37	27.40	2.09	115.34	-10.68	-1.40%
1961	770.10	115.21	2.09	746.85	28.80	10.52	115.28	-14.05	-1.82%
1962	685.39	115.21	10.60	681.52	26.98	0.00	114.99	-12.29	-1.79%
1963	564.79	115.21	0.00	549.52	22.59	0.00	114.91	-7.03	-1.24%
1964	825.89	115.53	0.61	839.06	25.19	0.00	115.93	-38.15	-4.62%
1965	925.29	115.21	0.32	900.85	30.01	0.00	114.92	-4.96	-0.54%
1966	760.60	115.21	0.00	699.61	29.54	38.18	115.09	-6.60	-0.87%
1967	880.40	115.21	38.18	891.52	30.92	18.05	115.27	-21.98	-2.50%
1968	1,022.39	115.53	18.12	1,059.92	28.25	34.06	120.49	-86.69	-8.48%
1969	781.09	115.21	34.40	759.22	24.32	36.55	114.99	-4.38	-0.56%
1970	846.09	115.21	36.66	805.71	27.58	63.57	115.13	-14.02	-1.66%
1971	774.99	115.21	63.58	806.33	29.86	23.89	115.33	-21.62	-2.79%
1972	930.59	115.53	23.91	876.50	29.69	51.78	115.25	-3.18	-0.34%
1973	846.59	115.21	52.08	841.00	28.17	40.20	114.91	-10.39	-1.23%
1974	779.31	115.21	40.28	791.22	29.90	12.33	115.17	-13.82	-1.77%
1975	895.31	115.21	12.51	855.22	26.48	33.67	116.20	-8.54	-0.95%
1976	889.40	115.53	33.67	876.18	33.14	22.15	115.26	-8.13	-0.91%
1977	1,091.59	115.21	22.34	1,009.17	29.00	72.30	114.94	3.73	0.34%
1978	790.00	115.21	72.66	848.19	29.89	4.22	115.14	-19.57	-2.48%
1979	953.00	115.21	4.19	930.72	30.28	6.79	114.94	-10.34	-1.09%
1980	866.10	115.53	6.79	824.68	28.22	28.60	115.27	-8.36	-0.97%
1981	876.50	115.21	28.85	859.36	34.09	15.67	114.90	-3.45	-0.39%
1982	1,094.30	115.21	16.27	1,104.86	34.46	0.00	117.43	-30.97	-2.83%
1983	943.00	115.21	0.00	802.68	30.90	103.60	114.86	6.16	0.65%
1984	895.79	115.53	103.72	975.97	36.23	1.56	115.29	-14.01	-1.56%
1985	1,137.70	115.21	1.56	1,080.03	35.01	51.89	115.46	-27.91	-2.45%
1986	1,118.39	115.21	51.89	1,132.83	36.83	48.02	117.02	-49.20	-4.40%
1987	790.30	115.21	48.23	819.50	32.14	3.93	114.96	-16.79	-2.12%
1988	843.11	115.53	3.95	827.88	32.14	7.08	115.86	-20.38	-2.42%
1989	740.01	115.21	7.08	708.27	36.05	0.00	114.87	3.11	0.42%
1990	1,055.60	115.21	0.00	1,034.66	39.53	2.76	115.34	-21.47	-2.03%
1991	924.50	115.21	2.76	881.48	36.23	17.17	115.12	-7.52	-0.81%
1992	1,126.49	115.53	17.17	1,107.87	43.40	0.00	115.33	-7.41	-0.66%
1993	834.10	115.21	0.00	797.06	39.12	0.00	114.89	-1.76	-0.21%
1994	763.20	115.21	0.00	721.91	36.25	4.19	114.92	1.15	0.15%
1995	868.19	115.21	4.69	846.83	28.70	35.07	115.67	-38.18	-4.40%
1996	1,021.60	115.53	35.09	1,011.00	41.54	12.16	115.23	-7.71	-0.75%
1997	849.60	115.21	12.31	814.91	32.09	19.01	114.91	-3.81	-0.45%
1998	668.30	115.21	19.02	665.55	25.42	6.56	115.06	-10.05	-1.50%
1999	862.69	115.21	6.61	868.05	30.15	0.00	115.44	-29.12	-3.38%
2000	883.30	115.53	0.00	795.57	35.61	62.74	115.52	-10.62	-1.20%
2001	770.80	115.21	62.74	814.02	29.25	0.00	115.60	-10.11	-1.31%
2002	763.40	115.21	0.00	750.66	31.24	2.10	115.20	-20.58	-2.70%
2003	773.19	115.21	2.20	751.97	26.55	0.00	114.89	-2.80	-0.36%
2004	779.01	115.53	0.00	733.62	36.02	6.53	115.21	3.16	0.41%
2005	797.00	115.21	6.47	760.54	33.56	35.70	118.62	-29.73	-3.73%
2006	931.60	115.21	35.79	950.70	33.81	2.25	115.33	-19.49	-2.09%
2007	543.18	115.21	6.03	528.72	23.60	2.49	114.82	-5.21	-0.96%
2008	991.09	115.53	3.54	984.82	33.50	2.00	116.12	-26.28	-2.65%
2009	792.89	115.21	2.00	794.58	29.14	8.72	115.57	-37.91	-4.78%
2010	761.79	115.21	8.72	765.63	28.12	0.00	115.37	-23.40	-3.07%
2011	900.60	115.21	0.00	866.99	28.16	9.20	114.92	-3.46	-0.38%
2012	638.40	115.53	9.19	616.24	23.24	14.63	115.20	-6.19	-0.97%
2013	945.70	115.21	14.63	920.16	29.26	34.04	115.46	-23.38	-2.47%
2014	696.00	115.21	34.05	717.54	26.78	0.00	115.52	-14.57	-2.09%
2015	787.70	115.21	0.00	799.56	24.28	9.16	115.45	-45.54	-5.78%
2016	769.40	115.53	9.16	769.84	34.44	8.02	115.99	-34.20	-4.45%
2017	809.50	115.21	8.02	788.60	33.08	6.30	114.87	-10.12	-1.25%

Hanlon Subwatershed Annual Water Balance Under Future Land Use Conditions Summary									
	Precipitation (mm)	**Baseflow (mm)**	**Starting Snow Depth (mm)**	**Infiltration (mm)**	**Evaporation (mm)**	**Ending Snow Depth (mm)**	**Outflow (mm)**	**Net (mm)**	**% Error**
Mean	856.46	115.29	19.88	840.62	31.61	19.82	115.50	-15.92	-1.84%
Median	846.34	115.21	9.18	824.82	30.91	9.18	115.25	-10.67	-1.45%
Min	543.18	115.20	0.00	528.72	22.59	0.00	114.82	-86.69	-8.48%
Max	1137.70	115.53	103.72	1132.83	45.02	103.60	120.49	6.16	0.65%
Std Dev.	126.26	0.14	24.30	124.34	4.78	24.26	0.94	14.77	1.59%

Mill Creek Subwatershed Annual Water Balance Under Future Land Use Conditions									
Year	Precipitation (mm)	Baseflow (mm)	Starting Snow Depth (mm)	Infiltration (mm)	Evaporation (mm)	Ending Snow Depth (mm)	Outflow (mm)	Net (mm)	% Error
1950	1,001.10	24.73	0.00	898.50	17.34	85.80	35.08	-10.89	-1.09%
1951	962.01	24.73	85.80	939.43	20.72	79.20	34.52	-1.32	-0.14%
1952	739.31	24.80	79.29	815.93	17.07	0.00	32.71	-22.32	-3.02%
1953	857.80	24.73	0.00	830.34	20.30	0.00	32.09	-0.19	-0.02%
1954	1,032.11	24.73	0.00	1,002.70	20.20	11.77	41.03	-18.87	-1.83%
1955	812.01	24.73	11.77	767.68	16.62	36.50	32.10	-4.40	-0.54%
1956	977.02	24.80	36.60	984.54	24.31	9.78	37.25	-17.46	-1.79%
1957	897.11	24.73	10.21	903.58	18.31	0.00	36.28	-26.12	-2.91%
1958	728.02	24.73	0.00	653.36	15.66	67.42	31.02	-14.71	-2.02%
1959	845.30	24.73	67.62	865.90	19.38	25.50	32.50	-5.63	-0.67%
1960	760.49	24.80	25.50	775.61	14.70	2.09	32.32	-13.92	-1.83%
1961	770.10	24.73	2.09	749.60	15.24	10.52	31.36	-9.80	-1.27%
1962	685.39	24.73	10.60	685.28	14.32	0.00	30.57	-9.44	-1.38%
1963	564.79	24.73	0.00	552.52	11.99	0.00	29.40	-4.40	-0.78%
1964	825.89	24.80	0.61	835.25	13.63	0.00	33.65	-31.23	-3.78%
1965	925.29	24.73	0.32	901.94	15.92	0.00	33.44	-0.96	-0.10%
1966	760.60	24.73	0.00	703.31	15.66	38.18	31.79	-3.61	-0.47%
1967	880.40	24.73	38.18	891.30	16.62	18.05	34.26	-16.91	-1.92%
1968	1,022.39	24.80	18.12	1,042.75	15.68	34.06	44.17	-71.36	-6.98%
1969	781.09	24.73	34.40	758.58	13.02	36.55	32.44	-0.38	-0.05%
1970	846.09	24.73	36.66	804.77	14.57	63.57	32.50	-7.92	-0.94%
1971	774.99	24.73	63.58	810.46	16.11	23.89	33.16	-20.31	-2.62%
1972	930.59	24.80	23.91	877.92	15.80	51.78	33.34	0.48	0.05%
1973	846.59	24.73	52.08	840.67	14.81	40.20	33.17	-5.44	-0.64%
1974	779.31	24.73	40.28	793.39	15.80	12.33	32.55	-9.75	-1.25%
1975	895.31	24.73	12.51	849.69	14.19	33.67	34.75	0.25	0.03%
1976	889.40	24.80	33.67	878.08	17.24	22.15	32.83	-2.43	-0.27%
1977	1,091.59	24.73	22.34	1,006.53	15.17	72.30	35.65	9.01	0.83%
1978	790.00	24.73	72.66	845.32	15.70	4.22	32.45	-10.30	-1.30%
1979	953.00	24.73	4.19	928.99	15.85	6.79	34.40	-4.11	-0.43%
1980	866.10	24.80	6.79	826.06	14.70	28.60	32.52	-4.20	-0.48%
1981	876.50	24.73	28.85	861.65	17.77	15.67	32.26	2.73	0.31%
1982	1,094.30	24.73	16.27	1,099.01	18.70	0.00	39.74	-22.15	-2.02%
1983	943.00	24.73	0.00	804.90	16.39	103.60	31.79	11.05	1.17%
1984	895.79	24.80	103.72	976.48	19.36	1.56	34.35	-7.44	-0.83%
1985	1,137.70	24.73	1.56	1,077.90	19.01	51.89	37.20	-22.01	-1.93%
1986	1,118.39	24.73	51.89	1,132.05	20.35	48.02	38.54	-43.94	-3.93%
1987	790.30	24.73	48.23	820.52	17.06	3.93	32.10	-10.35	-1.31%
1988	843.11	24.80	3.95	831.69	17.06	7.08	32.97	-16.94	-2.01%
1989	740.01	24.73	7.08	715.53	19.04	0.00	30.45	6.80	0.92%
1990	1,055.60	24.73	0.00	1,040.39	21.14	2.76	34.97	-18.93	-1.79%
1991	924.50	24.73	2.76	884.87	19.50	17.17	33.89	-3.43	-0.37%
1992	1,126.49	24.80	17.17	1,109.88	22.95	0.00	35.35	0.28	0.03%
1993	834.10	24.73	0.00	803.72	20.59	0.00	31.69	2.83	0.34%
1994	763.20	24.73	0.00	727.60	19.26	4.19	30.45	6.43	0.84%
1995	868.19	24.73	4.69	851.52	15.59	35.07	34.01	-38.56	-4.44%
1996	1,021.60	24.80	35.09	1,016.83	21.95	12.16	33.95	-3.40	-0.33%
1997	849.60	24.73	12.31	816.98	17.10	19.01	32.46	1.08	0.13%
1998	668.30	24.73	19.02	669.30	13.56	6.56	30.79	-8.15	-1.22%
1999	862.69	24.73	6.61	867.82	16.36	0.00	33.89	-24.04	-2.79%
2000	883.30	24.80	0.00	802.88	19.04	62.74	32.21	-8.78	-0.99%
2001	770.80	24.73	62.74	811.77	15.70	0.00	33.29	-2.48	-0.32%
2002	763.40	24.73	0.00	755.96	16.81	2.10	32.06	-18.80	-2.46%
2003	773.19	24.73	2.20	754.00	14.14	0.00	31.47	0.51	0.07%
2004	779.01	24.80	0.00	737.79	19.05	6.53	30.95	9.48	1.22%
2005	797.00	24.73	6.47	747.66	18.62	35.70	40.40	-14.17	-1.78%
2006	931.60	24.73	35.79	951.17	17.99	2.25	35.41	-14.70	-1.58%
2007	543.18	24.73	6.03	534.96	11.96	2.49	28.64	-4.10	-0.75%
2008	991.09	24.80	3.54	984.50	17.98	2.00	34.82	-19.86	-2.00%
2009	792.89	24.73	2.00	793.70	15.40	8.72	32.93	-31.13	-3.93%
2010	761.79	24.73	8.72	763.97	15.25	0.00	32.74	-16.72	-2.19%
2011	900.60	24.73	0.00	862.83	14.32	9.20	32.80	6.18	0.69%
2012	638.40	24.80	9.19	618.05	12.21	14.63	30.01	-2.50	-0.39%
2013	945.70	24.73	14.63	917.15	15.46	34.04	34.20	-15.79	-1.67%
2014	696.00	24.73	34.05	718.25	14.22	0.00	32.10	-9.79	-1.41%
2015	787.70	24.73	0.00	798.46	13.20	9.16	32.30	-40.69	-5.17%
2016	769.40	24.80	9.16	772.59	18.61	8.02	32.08	-27.93	-3.63%
2017	809.50	24.73	8.02	796.45	17.37	6.30	31.61	-9.49	-1.17%

Mill Creek Subwatershed Annual Water Balance Under Future Land Use Conditions Summary									
	Precipitation (mm)	**Baseflow (mm)**	**Starting Snow Depth (mm)**	**Infiltration (mm)**	**Evaporation (mm)**	**Ending Snow Depth (mm)**	**Outflow (mm)**	**Net (mm)**	**% Error**
Mean	856.46	24.75	19.88	841.92	16.86	19.82	33.47	-10.99	-1.27%
Median	846.34	24.73	9.18	828.20	16.50	9.18	32.77	-9.11	-1.13%
Min	543.18	24.73	0.00	534.96	11.96	0.00	28.64	-71.36	-6.98%
Max	1137.70	24.80	103.72	1132.05	24.31	103.60	44.17	11.05	1.22%
Std Dev.	126.26	0.03	24.30	122.80	2.60	24.26	2.69	13.94	1.53%

Torrance Creek Subwatershed Annual Water Balance Under Future Land Use Conditions									
Year	Precipitation (mm)	Baseflow (mm)	Starting Snow Depth (mm)	Infiltration (mm)	Evaporation (mm)	Ending Snow Depth (mm)	Outflow (mm)	Net (mm)	% Error
1950	1,001.10	0.00	0.00	855.66	41.75	85.80	34.18	-16.30	-1.63%
1951	962.01	0.00	85.80	896.87	50.01	79.20	31.65	-9.91	-1.03%
1952	739.31	0.00	79.29	777.79	41.15	0.00	27.51	-27.86	-3.77%
1953	857.80	0.00	0.00	795.25	50.52	0.00	23.43	-11.39	-1.33%
1954	1,032.11	0.00	0.00	929.39	48.18	11.77	52.93	-10.16	-0.98%
1955	812.01	0.00	11.77	729.09	39.84	36.50	24.40	-6.06	-0.75%
1956	977.02	0.00	36.60	920.04	58.40	9.78	42.34	-16.94	-1.73%
1957	897.11	0.00	10.21	853.30	44.31	0.00	38.44	-28.72	-3.20%
1958	728.02	0.00	0.00	620.69	37.82	67.42	20.98	-18.90	-2.60%
1959	845.30	0.00	67.62	827.24	47.70	25.50	24.57	-12.08	-1.43%
1960	760.49	0.00	25.50	748.27	36.41	2.09	25.18	-25.95	-3.41%
1961	770.10	0.00	2.09	714.62	38.21	10.52	22.98	-14.14	-1.84%
1962	685.39	0.00	10.60	655.30	35.41	0.00	20.04	-14.75	-2.15%
1963	564.79	0.00	0.00	533.64	30.07	0.00	16.04	-14.95	-2.65%
1964	825.89	0.00	0.61	791.01	33.19	0.00	32.21	-29.91	-3.62%
1965	925.29	0.00	0.32	871.68	39.14	0.00	27.17	-12.38	-1.34%
1966	760.60	0.00	0.00	665.82	38.59	38.18	23.78	-5.76	-0.76%
1967	880.40	0.00	38.18	850.67	40.98	18.05	33.45	-24.56	-2.79%
1968	1,022.39	0.00	18.12	958.84	37.07	34.06	59.22	-48.68	-4.76%
1969	781.09	0.00	34.40	723.85	31.85	36.55	24.68	-1.44	-0.18%
1970	846.09	0.00	36.66	779.85	37.06	63.57	24.84	-22.57	-2.67%
1971	774.99	0.00	63.58	777.40	39.26	23.89	28.94	-30.92	-3.99%
1972	930.59	0.00	23.91	843.05	39.21	51.78	27.64	-7.17	-0.77%
1973	846.59	0.00	52.08	817.08	37.51	40.20	26.17	-22.29	-2.63%
1974	779.31	0.00	40.28	758.36	39.94	12.33	27.97	-19.02	-2.44%
1975	895.31	0.00	12.51	812.53	35.54	33.67	36.88	-10.80	-1.21%
1976	889.40	0.00	33.67	853.20	44.26	22.15	24.15	-20.68	-2.33%
1977	1,091.59	0.00	22.34	981.43	39.61	72.30	31.62	-11.03	-1.01%
1978	790.00	0.00	72.66	812.33	39.81	4.22	26.95	-20.66	-2.62%
1979	953.00	0.00	4.19	897.71	40.87	6.79	30.20	-18.38	-1.93%
1980	866.10	0.00	6.79	809.95	38.22	28.60	23.80	-27.69	-3.20%
1981	876.50	0.00	28.85	833.32	45.80	15.67	23.39	-12.82	-1.46%
1982	1,094.30	0.00	16.27	1,051.46	46.09	0.00	49.99	-36.98	-3.38%
1983	943.00	0.00	0.00	773.57	40.41	103.60	21.95	3.46	0.37%
1984	895.79	0.00	103.72	949.47	47.69	1.56	30.63	-29.83	-3.33%
1985	1,137.70	0.00	1.56	1,028.69	46.30	51.89	40.93	-28.54	-2.51%
1986	1,118.39	0.00	51.89	1,057.66	48.58	48.02	49.91	-33.89	-3.03%
1987	790.30	0.00	48.23	787.01	42.88	3.93	24.50	-19.80	-2.50%
1988	843.11	0.00	3.95	793.88	43.22	7.08	27.66	-24.79	-2.94%
1989	740.01	0.00	7.08	685.18	47.52	0.00	18.38	-4.00	-0.54%
1990	1,055.60	0.00	0.00	986.21	51.70	2.76	33.46	-18.53	-1.75%
1991	924.50	0.00	2.76	847.34	48.05	17.17	30.46	-15.76	-1.70%
1992	1,126.49	0.00	17.17	1,069.55	57.39	0.00	34.75	-18.03	-1.60%
1993	834.10	0.00	0.00	769.29	51.65	0.00	21.12	-7.97	-0.96%
1994	763.20	0.00	0.00	698.49	47.35	4.19	18.93	-5.75	-0.75%
1995	868.19	0.00	4.69	798.34	38.17	35.07	34.41	-33.11	-3.81%
1996	1,021.60	0.00	35.09	979.24	54.22	12.16	28.76	-17.68	-1.73%
1997	849.60	0.00	12.31	791.22	41.82	19.01	23.42	-13.57	-1.60%
1998	668.30	0.00	19.02	643.07	33.33	6.56	21.13	-16.77	-2.51%
1999	862.69	0.00	6.61	821.24	39.79	0.00	33.86	-25.59	-2.97%
2000	883.30	0.00	0.00	770.54	47.28	62.74	26.48	-23.75	-2.69%
2001	770.80	0.00	62.74	776.37	37.98	0.00	29.91	-10.72	-1.39%
2002	763.40	0.00	0.00	722.57	40.47	2.10	23.06	-24.80	-3.25%
2003	773.19	0.00	2.20	727.54	34.57	0.00	21.69	-8.41	-1.09%
2004	779.01	0.00	0.00	710.07	47.10	6.53	20.01	-4.70	-0.60%
2005	797.00	0.00	6.47	687.43	43.49	35.70	49.23	-12.36	-1.55%
2006	931.60	0.00	35.79	905.76	44.70	2.25	32.58	-17.90	-1.92%
2007	543.18	0.00	6.03	507.78	32.67	2.49	13.18	-6.91	-1.27%
2008	991.09	0.00	3.54	944.10	44.38	2.00	33.65	-29.49	-2.98%
2009	792.89	0.00	2.00	748.96	39.15	8.72	29.25	-31.19	-3.93%
2010	761.79	0.00	8.72	722.53	37.20	0.00	28.32	-17.54	-2.30%
2011	900.60	0.00	0.00	851.56	38.94	9.20	24.65	-23.74	-2.64%
2012	638.40	0.00	9.19	600.82	31.10	14.63	16.18	-15.13	-2.37%
2013	945.70	0.00	14.63	885.30	39.48	34.04	30.44	-28.93	-3.06%
2014	696.00	0.00	34.05	683.90	35.61	0.00	24.76	-14.22	-2.04%
2015	787.70	0.00	0.00	756.89	32.16	9.16	27.63	-38.14	-4.84%
2016	769.40	0.00	9.16	725.04	44.63	8.02	28.18	-27.31	-3.55%
2017	809.50	0.00	8.02	761.98	43.84	6.30	21.79	-16.40	-2.03%

Torrance Creek Subwatershed Annual Water Balance Under Future Land Use Conditions Summary									
	Precipitation (mm)	**Baseflow (mm)**	**Starting Snow Depth (mm)**	**Infiltration (mm)**	**Evaporation (mm)**	**Ending Snow Depth (mm)**	**Outflow (mm)**	**Net (mm)**	**% Error**
Mean	856.46	0.00	19.88	804.64	41.74	19.82	28.87	-18.73	-2.19%
Median	846.34	0.00	9.18	792.55	40.44	9.18	27.57	-17.79	-2.23%
Min	543.18	0.00	0.00	507.78	30.07	0.00	13.18	-48.68	-4.84%
Max	1137.70	0.00	103.72	1069.55	58.40	103.60	59.22	3.46	0.37%
Std Dev.	126.26	0.00	24.30	116.42	6.10	24.26	8.73	9.73	1.09%

Side slope for SWM 5:1 **SWCA Sizing**

WS Name	SWM Name	Imperviousness (%)	Routed through Pervious (%)	Total Drainage Area (ha)	SWM Area including 5m Roads (ha)	SWM Top Area(m2)	SWM Base Area(m2)	Sizing Storm	Total Volume of the SWM	Regional Storm		
										Maximum Storage Volume(m3)	Depth(m)	Wier Flow (cms)
38_SW	38STN	62.5	35.0	9.07	0.80	7118	3411	Regional	13160	11640	2.28	0
48_SW	48STN	65.0	45.1	1.66	Onsite Control	2200	447	Regional	3309	2962	2.34	0
36_SW	36STN	54.9	40.0	9.65	1.08	7900	4073	Regional	14966	11370	2.02	0
39_SW	39STN	60.2	42.1	4.68	0.51	4069	1492	Regional	6951	5754	2.19	0
42_SW	42STN	65.9	21.8	22.53	2.01	17973	10502	Regional	35593	30960	2.24	0
47_SW	47STN	63.3	40.2	5.42	0.58	4600	1751	Regional	7939	6889	2.27	0
49_SW	49STN	61.4	37.7	13.81	1.20	10720	6167	Regional	21108	17330	2.14	0
50_SW	50STN	58.8	31.0	10.64	1.05	8978	4858	Regional	17295	13290	2.03	0
51_SW	51STN	61.5	38.3	11.90	1.13	9187	5018	Regional	17757	14940	2.19	0
52_SW	52STN	64.3	29.6	5.81	0.60	5000	2030	Regional	8788	7705	2.28	0
53_SW	53STN	55.5	37.8	6.28	0.66	5123	1860	Regional	8729	7567	2.27	0
55_SW	55STN	60.2	39.9	9.47	1.01	7989	3928	Regional	14896	11680	2.08	0
56_SW	56STN	58.9	27.9	5.45	0.60	4500	1683	Regional	7729	6838	2.30	0
58_SW	58STN	61.8	25.5	11.31	1.14	9162	4858	Regional	17525	14800	2.19	0
59_SW	59STN	66.5	37.0	3.68	NO SWM							
61_SW	61STN	60.4	39.1	25.04	2.27	19717	13313	Regional	41287	30740	1.95	0
111_SW	111STN	57.1	36.6	33.74	3.02	25000	17706	Regional	53383	40710	1.98	0
37_SW	37STN	65.0	26.0	9.24	0.92	7785	3997	Regional	14728	12390	2.19	0
43_SW	43STN	85.0	0.0	3.07	NO SWM							

Subcatchment				LID Storages - 20mm	
Name	Outlet	Area (m2)	Imperv.(%)	Volume (m3)	coeficient (m2)
36_SW	36STN	96529	54.9	1059	3530.0
37_SW	37STN	92362	65.0	1201	4002.3
38_SW	38STN	90718	62.5	1134	3780.1
39_SW	39STN	46795	60.2	563	1877.3
42_SW	42STN	226284	65.9	2983	9943.1
47_SW	47STN	54179	63.3	686	2288.1
49_SW	49STN	138126	61.4	1696	5652.9
50_SW	50STN	106386	58.8	1250	4167.6
51_SW	51STN	119038	61.5	1464	4878.5
52_SW	52STN	58074	64.3	747	2489.4
53_SW	53STN	62811	55.5	698	2325.3
55_SW	55STN	94668	60.2	1140	3801.1
56_SW	56STN	53552	58.9	631	2103.4
58_SW	58STN	113058	61.8	1398	4660.6
61_SW	61STN	250425	60.4	3026	10088.1
111_SW	111STN	337437	57.1	3857	12855.9
21_SW	21STN	106392	30.1	94	314.5
22_SW	22STN	49369	33.1	123	410.9
23_SW	23STN	73537	23.1	107	355.3
34_SW	34STN	27929	55.7	311	1036.7
35_SW	35STN	21516	36.9	159	529.3
40_SW	40STN	8110	46.5	75	251.6
41_SW	41STN	8016	64.2	103	343.3
43_SW	43STN	30739	85.0	522	1741.3
44_SW	44STN	15438	64.4	199	663.3
46_SW	46STN	7258	19.8	29	96.0
59_SW	59STN	36790	66.5	489	1631.0
60_SW	60STN	7253	65.0	94	314.3
107_SW	107STN	38669	72.5	561	1869.4
45_SW	45STN	3569	65.8	47	156.5
109_SW1	109STN	12948	65.4	169	564.1
48_SW	48STN	16580	65.0	216	718.5

Stormwater Capture Area Costing

WS Name	Regional Storm Vol (m3) + 10%	Area Available for Ponding	Access Road Area	Overflow Length 1200 mm pipe assumed	**Earth Removal Costs**	**Inlet and Outlet**	**Access Road**	**Landscaping**	**Overflow Costing**	**Subtotal Cost**	**Contingency 10%**	**Design and Eng**	**Total Cost**	**Cost /m3**
					$30		$150	$10	$3,300		$0.20	$0.15		
38_SW	12804	7117.52	920.67	100	$384,120	$50,000	$138,101	$71,175	$355,000.00	$998,396	$199,679	$149,759	**$1,347,835**	$105
48_SW	0	0.00	0.00	0	$0	$0	$0	$0	$0.00	$0	$0	$0	**$0**	$0
36_SW	12430	8552.32	2220.68	100	$372,900	$50,000	$333,102	$85,523	$355,000.00	$1,196,526	$239,305	$179,479	**$1,615,310**	$130
39_SW	4615	4068.51	1045.66	100	$138,435	$50,000	$156,849	$40,685	$355,000.00	$740,969	$148,194	$111,145	**$1,000,309**	$217
42_SW	34056	17973.00	2086.28	100	$1,021,680	$50,000	$312,943	$179,730	$355,000.00	$1,919,353	$383,871	$287,903	**$2,591,126**	$76
47_SW	7612	4253.70	1562.20	100	$228,360	$50,000	$234,330	$42,537	$355,000.00	$910,227	$182,045	$136,534	**$1,228,806**	$161
49_SW	19063	10719.89	1247.61	100	$571,890	$50,000	$187,141	$107,199	$355,000.00	$1,271,230	$254,246	$190,685	**$1,716,161**	$90
50_SW	14619	8977.55	1511.18	100	$438,570	$50,000	$226,677	$89,776	$355,000.00	$1,160,022	$232,004	$174,003	**$1,566,030**	$107
51_SW	16434	9187.44	2128.13	100	$493,020	$50,000	$319,219	$91,874	$355,000.00	$1,309,113	$261,823	$196,367	**$1,767,303**	$108
52_SW	8503	4759.86	1253.29	100	$255,090	$50,000	$187,993	$47,599	$355,000.00	$895,682	$179,136	$134,352	**$1,209,170**	$142
53_SW	8324	5123.32	1499.21	100	$249,711	$50,000	$224,881	$51,233	$355,000.00	$930,825	$186,165	$139,624	**$1,256,614**	$151
55_SW	0	0.00	0.00	0	$0	$50,000	$0	$0	$0.00	$50,000	$0	$7,500	**$57,500**	$0
56_SW	7537	4368.64	1583.64	100	$226,116	$50,000	$237,545	$43,686	$355,000.00	$912,348	$182,470	$136,852	**$1,231,670**	$163
58_SW	16280	9162.14	2195.09	100	$488,400	$50,000	$329,264	$91,621	$355,000.00	$1,314,285	$262,857	$197,143	**$1,774,285**	$109
59_SW	0	0.00	0.00	0	$0	$0	$0	$0	$0.00	$0	$0	$0	**$0**	$0
61_SW	33814	19716.52	3018.95	100	$1,014,420	$50,000	$452,843	$197,165	$355,000.00	$2,069,428	$413,886	$310,414	**$2,793,728**	$83
111_SW	44396	27620.80	2559.70	255	$1,331,880	$50,000	$383,955	$276,208	$886,500.00	$2,928,543	$585,709	$439,282	**$3,953,534**	$89
37_SW	13629	7784.92	1451.23	100.00	$408,870	$50,000	$217,685	$77,849	$355,000.00	$1,109,404	$221,881	$166,411	**$1,497,695**	$110
43_SW	0	0	0	0	$0	$0	$0	$0	$0.00	$0	$0	$0	**$0**	$0
	254115				**$7,623,462**	**$800,000**	**$3,942,529**	**$1,493,861**	**$5,856,500**	**$19,716,352**	**$3,933,270**	**$2,957,453**	**$26,607,075**	**$105**

NAME	Watershed Type	Land Use	Imp. (%)	PerRoute (%)	Area_ha	IMP (ha)	IMP (m³)	LID IMP (m³)	Costs ($)	LID Capture (mm	Unit Cost ($/m³)
107_SW	Developed_Catchments	Low Density	65	40	1.835	0.596	5962	119	$36,555	20	$307
107_SW	Developed_Catchments	Medium Density	70	30	0.966	0.270	2704	54	$16,578		
107_SW	Developed_Catchments	Mixed Use	88	0	1.060		0	0	$0		
109_SW1	Developed_Catchments	Low Density	65	40	1.110	0.361	3609	72	$22,128		
109_SW1	Developed_Catchments	Medium Density	70	30	0.177	0.050	496	10	$3,042		
111_SW	Developed_Catchments	Future Road	65	0	5.331	3.465	34654	693	$212,472		
111_SW	Developed_Catchments	High Density	80	0	3.370		0	0	$0		
111_SW	Developed_Catchments	Low Density	65	40	9.889	3.214	32141	643	$197,060		
111_SW	Developed_Catchments	Medium Density	70	30	6.104	1.709	17092	342	$104,794		
111_SW	Developed_Catchments	Mixed Use	88	0	0.640		0	0	$0		
111_SW	Developed_Catchments	NHS No Dev.	5	100	1.698		0	0	$0		
111_SW	Developed_Catchments	Park	20	25	0.950		0	0	$0		
111_SW	Developed_Catchments	Ribbon Park	5	100	0.827	0.041	413	8	$2,535		
111_SW	Developed_Catchments	School	65	40	1.895		0	0	$0		
111_SW	Developed_Catchments	SWM	10	100	3.018	0.302	3018	60	$18,504		
21_SW	Developed_Catchments	High Density	80	0	0.701		0	0	$0		
21_SW	Developed_Catchments	Medium Density	70	30	0.141	0.040	395	8	$2,423		
21_SW	Developed_Catchments	NHS No Dev.	5	100	8.936		0	0	$0		
21_SW	Developed_Catchments	NHS Yes Dev.	5	100	0.238		0	0	$0		
21_SW	Developed_Catchments	Restoration Areas	5	100	0.168		0	0	$0		
21_SW	Developed_Catchments	Ribbon Park	5	100	0.117	0.006	59	1	$359		
21_SW	Developed_Catchments	Ribbon Park	5	100	0.313	0.016	157	3	$960		
22_SW	Developed_Catchments	Low Density	65	40	0.616	0.200	2001	40	$12,269		
22_SW	Developed_Catchments	NHS No Dev.	5	100	3.986		0	0	$0		
22_SW	Developed_Catchments	Ribbon Park	5	100	0.321	0.016	160	3	$984		
23_SW	Developed_Catchments	Low Density	65	40	0.537	0.175	1745	35	$10,700		
23_SW	Developed_Catchments	NHS No Dev.	5	100	6.045		0	0	$0		
23_SW	Developed_Catchments	Ribbon Park	5	100	0.763	0.038	381	8	$2,338		
34_SW	Developed_Catchments	NHS No Dev.	5	100	0.565		0	0	$0		
34_SW	Developed_Catchments	NHS Yes Dev.	5	100	0.514		0	0	$0		
34_SW	Developed_Catchments	Ribbon Park	5	100	0.177	0.009	89	2	$543		
34_SW	Developed_Catchments	Service Commercial	85	0	1.463		0	0	$0		
35_SW	Developed_Catchments	Park	20	25	1.329	0.266	2658	53	$16,294		
35_SW	Developed_Catchments	School	65	40	0.813		0	0	$0		
36_SW	Developed_Catchments	Future Road	65	0	1.156	0.752	7516	150	$46,079		
36_SW	Developed_Catchments	Low Density	65	40	6.322	2.055	20547	411	$125,980		
36_SW	Developed_Catchments	Park	20	25	0.830	0.166	1660	33	$10,175		
36_SW	Developed_Catchments	Ribbon Park	5	100	0.057	0.003	28	1	$174		
36_SW	Developed_Catchments	SWM	10	100	1.066	0.107	1066	21	$6,533		
37_SW	Developed_Catchments	Existing Roads	75	0	0.972	0.729	7290	146	$44,697		
37_SW	Developed_Catchments	Future Road	65	0	0.943	0.613	6130	123	$37,583		
37_SW	Developed_Catchments	High Density	80	0	2.225		0	0	$0		
37_SW	Developed_Catchments	Low Density	65	40	3.586	1.165	11654	233	$71,455		
37_SW	Developed_Catchments	Medium Density	70	30	1.242	0.348	3479	70	$21,329		
38_SW	Developed_Catchments	Future Road	65	0	1.503	0.977	9772	195	$59,911		
38_SW	Developed_Catchments	Low Density	65	40	6.735	2.189	21888	438	$134,198		
38_SW	Developed_Catchments	SWM	10	100	0.479	0.048	479	10	$2,935		
39_SW	Developed_Catchments	Low Density	65	40	2.146	0.698	6976	140	$42,771		
39_SW	Developed_Catchments	Medium Density	70	30	1.686	0.472	4720	94	$28,938		
39_SW	Developed_Catchments	SWM	10	100	0.591	0.059	591	12	$3,622		
40_SW	Developed_Catchments	Low Density	65	40	0.431	0.140	1399	28	$8,580		
40_SW	Developed_Catchments	NHS No Dev.	5	100	0.091		0	0	$0		
40_SW	Developed_Catchments	NHS Yes Dev.	5	100	0.128		0	0	$0		
40_SW	Developed_Catchments	Ribbon Park	5	100	0.049	0.002	24	0	$150		
41_SW	Developed_Catchments	Low Density	65	40	0.794	0.258	2582	52	$15,829		
42_SW	Developed_Catchments	Existing Roads	75	0	5.018	3.763	37633	753	$230,734		
42_SW	Developed_Catchments	Future Road	65	0	2.372	1.542	15419	308	$94,538		
42_SW	Developed_Catchments	High Density	80	0	0.876		0	0	$0		
42_SW	Developed_Catchments	Low Density	65	40	4.172	1.356	13559	271	$83,130		
42_SW	Developed_Catchments	Medium Density	70	30	1.755	0.491	4913	98	$30,121		
42_SW	Developed_Catchments	Mixed Use	88	0	3.543		0	0	$0		
42_SW	Developed_Catchments	Office Commercial	85	0	0.333		0	0	$0		
42_SW	Developed_Catchments	Park	20	25	1.009	0.202	2017	40	$12,369		
42_SW	Developed_Catchments	Ribbon Park	5	100	0.022	0.001	11	0	$67		
42_SW	Developed_Catchments	School	65	40	1.846		0	0	$0		
42_SW	Developed_Catchments	SWM	10	100	1.674	0.167	1674	33	$10,266		
43_SW	Developed_Catchments	Office Commercial	85	0	3.072		0	0	$0		
44_SW	Developed_Catchments	Future Road	65	0	0.749	0.487	4868	97	$29,844		
44_SW	Developed_Catchments	Low Density	65	40	0.773	0.251	2511	50	$15,394		
45_SW	Developed_Catchments	Medium Density	70	30	0.332	0.093	930	19	$5,703		
45_SW	Developed_Catchments	Ribbon Park	5	100	0.016	0.001	8	0	$49		
46_SW	Developed_Catchments	Park	20	25	0.719	0.144	1438	29	$8,817		
47_SW	Developed_Catchments	Low Density	65	40	3.220	1.046	10464	209	$64,158		
47_SW	Developed_Catchments	Medium Density	70	30	1.863	0.522	5216	104	$31,981		
47_SW	Developed_Catchments	Ribbon Park	5	100	0.018	0.001	9	0	$56		
47_SW	Developed_Catchments	SWM	10	100	0.309	0.031	309	6	$1,896		
48_SW	Developed_Catchments	Low Density	65	40	1.512	0.491	4912	98	$30,119		
48_SW	Developed_Catchments	Ribbon Park	5	100	0.013	0.001	7	0	$41		
48_SW	Developed_Catchments	SWM	10	100	0.131	0.013	131	3	$802		
49_SW	Developed_Catchments	Future Road	65	0	1.629	1.059	10588	212	$64,916		
49_SW	Developed_Catchments	Low Density	65	40	5.810	1.888	18882	378	$115,767		
49_SW	Developed_Catchments	Medium Density	70	30	3.108	0.870	8703	174	$53,358		
49_SW	Developed_Catchments	Ribbon Park	5	100	0.026	0.001	13	0	$80		
49_SW	Developed_Catchments	School	65	40	1.798		0	0	$0		
49_SW	Developed_Catchments	SWM	10	100	1.188	0.119	1188	24	$7,285		
50_SW	Developed_Catchments	Future Road	65	0	0.708	0.460	4600	92	$28,201		
50_SW	Developed_Catchments	High Density	80	0	2.086		0	0	$0		
50_SW	Developed_Catchments	Low Density	65	40	3.179	1.033	10333	207	$63,355		
50_SW	Developed_Catchments	Medium Density	70	30	1.258	0.352	3521	70	$21,589		
50_SW	Developed_Catchments	Mixed Use	88	0	0.615		0	0	$0		
50_SW	Developed_Catchments	Park	20	25	1.008	0.202	2016	40	$12,363		
50_SW	Developed_Catchments	School	65	40	0.046		0	0	$0		
50_SW	Developed_Catchments	SWM	10	100	1.373	0.137	1373	27	$8,420		
51_SW	Developed_Catchments	Future Road	65	0	0.958	0.622	6224	124	$38,160		
51_SW	Developed_Catchments	Low Density	65	40	5.070	1.648	16478	330	$101,032		
51_SW	Developed_Catchments	Medium Density	70	30	4.203	1.177	11768	235	$72,154		
51_SW	Developed_Catchments	Neighbourhood Commercial	85	0	0.397		0	0	$0		
51_SW	Developed_Catchments	NHS No Dev.	5	100	0.080		0	0	$0		
51_SW	Developed_Catchments	Ribbon Park	5	100	0.162	0.008	81	2	$498		
51_SW	Developed_Catchments	SWM	10	100	1.023	0.102	1023	20	$6,271		
52_SW	Developed_Catchments	Future Road	65	0	1.115	0.725	7250	145	$44,448		
52_SW	Developed_Catchments	High Density	80	0	0.678		0	0	$0		
52_SW	Developed_Catchments	Low Density	65	40	2.759	0.897	8965	179	$54,967		
52_SW	Developed_Catchments	Medium Density	70	30	0.908	0.254	2542	51	$15,586		
52_SW	Developed_Catchments	Ribbon Park	5	100	0.011	0.001	6	0	$35		
52_SW	Developed_Catchments	SWM	10	100	0.336	0.034	336	7	$2,058		
53_SW	Developed_Catchments	Future Road	65	0	1.631	1.060	10604	212	$65,015		
53_SW	Developed_Catchments	Low Density	65	40	0.273	0.089	888	18	$5,442		
53_SW	Developed_Catchments	Medium Density	70	30	2.143	0.600	6000	120	$36,789		
53_SW	Developed_Catchments	NHS No Dev.	5	100	0.050		0	0	$0		
53_SW	Developed_Catchments	NHS Yes Dev.	5	100	0.244		0	0	$0		
53_SW	Developed_Catchments	Ribbon Park	5	100	0.309	0.015	155	3	$949		
53_SW	Developed_Catchments	School	65	40	1.012	0.658	6577	132	$40,323		
53_SW	Developed_Catchments	SWM	10	100	0.607	0.061	607	12	$3,721		
55_SW	Developed_Catchments	Future Road	65	0	1.243	0.808	8077	162	$49,520		
55_SW	Developed_Catchments	Low Density	65	40	7.406	2.407	24071	481	$147,584		
55_SW	Developed_Catchments	Ribbon Park	5	100	0.013	0.001	6	0	$40		
55_SW	Developed_Catchments	SWM	10	100	0.805	0.080	805	16	$4,934		
56_SW	Developed_Catchments	Future Road	65	0	0.981	0.637	6374	127	$39,078		
56_SW	Developed_Catchments	High Density	80	0	0.505		0	0	$0		
56_SW	Developed_Catchments	Low Density	65	40	1.509	0.490	4904	98	$30,068		
56_SW	Developed_Catchments	Medium Density	70	30	1.308	0.366	3661	73	$22,448		
56_SW	Developed_Catchments	Park	20	25	0.659	0.132	1318	26	$8,083		
56_SW	Developed_Catchments	Ribbon Park	5	100	0.018	0.001	9	0	$54		
56_SW	Developed_Catchments	SWM	10	100	0.318	0.032	318	6	$1,952		
58_SW	Developed_Catchments	Future Road	65	0	2.183	1.419	14191	284	$87,010		
58_SW	Developed_Catchments	High Density	80	0	1.693		0	0	$0		
58_SW	Developed_Catchments	Low Density	65	40	0.447	0.145	1453	29	$8,907		
58_SW	Developed_Catchments	Medium Density	70	30	3.566	0.998	9984	200	$61,214		
58_SW	Developed_Catchments	Park	20	25	0.924	0.185	1847	37	$11,324		
58_SW	Developed_Catchments	Ribbon Park	5	100	0.017	0.001	9	0	$54		
58_SW	Developed_Catchments	School	65	40	1.802		0	0	$0		
58_SW	Developed_Catchments	SWM	10	100	0.648	0.065	648	13	$3,970		
59_SW	Developed_Catchments	Low Density	65	40	2.228	0.724	7241	145	$44,395		
59_SW	Developed_Catchments	Medium Density	70	30	1.090	0.305	3051	61	$18,705		
59_SW	Developed_Catchments	Ribbon Park	5	100	0.016	0.001	8	0	$48		
59_SW	Developed_Catchments	SWM	10	100	0.345	0.035	345	7	$2,116		
60_SW	Developed_Catchments	Low Density	65	40	0.706	0.230	2296	46	$14,074		
61_SW	Developed_Catchments	Future Road	65	0	1.015	0.660	6599	132	$40,460		
61_SW	Developed_Catchments	High Density	80	0	1.091		0	0	$0		
61_SW	Developed_Catchments	Low Density	65	40	5.588	1.816	18162	363	$111,352		
61_SW	Developed_Catchments	Medium Density	70	30	2.734	0.765	7654	153	$46,930		
61_SW	Developed_Catchments	Medium Density	70	30	7.290	2.041	20411	408	$125,141		
61_SW	Developed_Catchments	Mixed Use	88	0	1.693		0	0	$0		
61_SW	Developed_Catchments	NHS No Dev.	5	100	1.279		0	0	$0		
61_SW	Developed_Catchments	NHS Yes Dev.	5	100	0.021		0	0	$0		
61_SW	Developed_Catchments	Ribbon Park	5	100	0.416	0.021	208	4	$1,274		
61_SW	Developed_Catchments	School	65	40	1.791		0	0	$0		
61_SW	Developed_Catchments	SWM	10	100	2.121	0.212	2121	42	$13,002		
100_SW	NHS WS	Low Density	65	40	0.012	**60.805**	**608054**	**12161**	**$3,728,085**		

Land Use	Land Use Imp (%)	Road Imp. (%) of Land Use Imp (%)	Actual Road Imp (%)
Low Density	65	50	32.5
Med Density	70	40	28.0
Mixed Use	88	0	0
Future Road	65	100	65
High Density	80	0	0
Ribbon Park	5	100	5
SWM	10	100	10
Service Commercial	85	0	0
Existing Roads	75	100	75
Office Commercial	85	0	0
Neighbourhood Commercial	85	0	0

(Only 107 and 111 Catchments with Med Density not fronting Roads)

Costs based on EPA #s
$307 /m3
$16.00 /ft3

www3.epa.gov/region1/npdes/stormwater/ma/green-infrastructure-stormwater-bmp-cost-estimation.pdf

Methodolgy for developing cost estimates for Opti-Tool 4 / 8

A. Storage Volume and Proposed Cost Estimate Values

As highlighted above, the general cost function formula used in the Opti-Tool consists of 3 factors: the BMP storage volume, the proposed BMP storage volume cost estimate, and the adjustment factor. The first two factors will be covered together in this memo because they are so closely linked. Table 1 below summarizes the proposed BMP cost estimates for the Opti-Tool.

Table 1: Proposed BMP Cost Estimates for Opti-Tool

BMP (From Opti-Tool)	Cost ($/ft³) [1]	Cost ($/ft³) – 2016 dollars[4]
Bioretention (Includes rain garden)	13.37 [2,4]	15.46
Dry Pond or detention basin	5.88 [2,4]	6.80
Enhanced Bioretention (aka-Bio-filtration Practice)	13.5 [2,3]	15.61
Infiltration Basin (or other Surface Infiltration Practice)	5.4 [2,3]	6.24
Infiltration Trench	10.8 [2,3]	12.49
Porous Pavement - Porous Asphalt Pavement	4.60 [2,4]	5.32
Porous Pavement - Pervious Concrete	15.63 [2,4]	18.07
Sand Filter	15.51 [2,4]	17.94
Gravel Wetland System (aka-subsurface gravel wetland)	7.59 [2,4]	8.78
Wet Pond or wet detention basin	5.88 [2,4]	6.80
Subsurface Infiltration/Detention System (aka-Infiltration Chamber)	54.54[3]	67.85

[1] Footnote: Includes 35% add on for design engineering and contingencies

[2] Costs in 2010 dollars

[3] From CRWA Cost Estimates

[4] From UNHSC Cost Estimates; Most of original costs were from 2004 and converted to 2010 dollars using U.S. Department of Labor (USDOL). (2012). Bureau of Labor Statistics consumer price index inflation calculator. http://www.bls.gov/data/inflation_calculator.htm

Memo

To: Arun Hindupur (Arun.Hindupur@guelph.ca)

From: Greg Junnor, A.Sc.T..

Date: March 13, 2020

File: TPB168050 Clair Maltby Cross-Section Study

cc: Stacey Laughlin, Mary Angelo, Jennifer Juste, Ron Scheckenberger (Wood), John McGill (Wood), Lachlan Fraser (Wood)

Re: **Comments Received and Actions on Evaluation Criteria for Selection of Preferred Cross-Section Designs**

Arun,

Please find below the following:

1. Summary of comments received on the preliminary evaluation criteria and indicators to be used for short-listing the long list (EXCEL) of alternative cross-sections as part of the Clair Maltby Area-Specific Cross-Section study
2. Our responses to those comments
3. Revised evaluation criteria based on comments and responses
4. Clarifications regarding weighting of criteria and scoring of sub-criteria
5. Summary of comments received on the long list of alternative cross-sections, the typical figures depicting them, and our responses to those comments
6. Completed scoring of all alternatives and identification of preferred alternative within each roadway classification (Attachment 1)

Background

The preliminary list of evaluation criteria was sent out by Wood to receive input and feedback. The list was split into 7 categories (Cost, Operations and Maintenance, Safety, Social Environment, Land Use Planning, Natural Environment, and Technical). Each category was further divided into criteria which had different indicators for effectiveness. Wood clarified that the indicators fall in line with typical class EA standards.

Comments were received from all participants.

Summary

Cost

Evaluation criteria capture the impacts of variances in cross-sectional design on the capital costs for linear transportation infrastructure and subsurface utilities (initial construction, rehabilitation, and reconstruction costs) over their intended lifecycle, along with operating and maintenance costs related to ensuring functionality, lifecycle preservation, fitness for use, and adequate safety.

Initial construction

Sub-criteria related to establishing the impacts of variances in cross-sectional design on the cost linear infrastructure and subsurface utilities in a green-field setting.

Operations

Sub-criteria related to the impacts of variances in cross-sectional design on the provision of year-round (patrolling, refuse collection, lighting energy and maintenance), summer (mowing, sweeping, catch basin cleaning, and preservation-management type activities such as crack-sealing) and winter (winter control of snow and ice through plowing, salting / sanding) activities specifically related to linear transportation infrastructure, that keep these facilities adequately safe and fit-to-purpose.

1. Comment: (Proposed edit to title) Annual or other time period Operations (including but not limited to mowing, pruning, and snow removal - (depends on the infrastructure). i.e. LID may not require annual maintenance but may require maintenance every 5 years.

   Response: Agreed. Resolved via clarification. Sub-criteria are intended to capture all operational activities whether they occur frequently, infrequently or once within the lifecycle of the linear transportation infrastructure.

2. Comment: If new maintenance equipment is required, then those costs need to be captured somewhere.

   Response: Agreed. Additions to the maintenance fleet and more operating staff may be required to address additional kilometres of roadway under City jurisdiction represented by the Clair Maltby Secondary Plan. However, for the purposes of this comparative analysis, unless variances in cross-section impact the number and type of units required and / or the number of additional staff needed to operate them, then the costs are the same for all alternatives and need not be evaluated. Impacts of variances in cross-section on fleet size, equipment requirements and operating staff are captured under Operations and Maintenance.

Utility rehabilitation

Sub-criteria related to the impacts of variances in cross-sectional design the difficulties associated with lifecycle replacement and / or upgrading of underground infrastructure, the potential for disruption of use of linear transportation infrastructure (i.e. closure of roads, lanes, cycle tracks, sidewalks or driveway accesses to allow for excavation); and restoration requirements (road, bikeway sidewalk reinstatement; impact on landscape elements such as street trees; or collateral impacts to other subsurface utilities where conflicts exist).

1. Comment: When going through the cost category at the October touch-point meeting, City of Guelph asked if the utility rehabilitation criteria considered a frequency of rehabilitation in the overall life cycle. The City clarified that rehabilitation generally occurs once every 10 years and that they can give Wood a more accurate number at a later point. The City also raised concerns over analyzing and capturing social costs that occur when rehabilitation occurs. As an example, the City defined capturing the social cost of rehabilitating utilities under a sidewalk which leaves the sidewalk inaccessible to all ages and abilities.

   Response: Variance in ROW cross-section has no impact on the lifecycle of underground utilities. Some will need rehabilitation or expansion more of then that others in any case.

   Cross-section, and the placement of underground utilities relative to surface elements of linear transportation infrastructure however, can have a major impact on the degree of difficulty associated with rehabilitation works, the amount of disruption experienced by road users, and the extent of restoration required once utilities are upgraded.

   For example, placing utilities which will require more frequent rehabilitation than the roadway itself (e.g. telecommunications plant) under roadway elements (i.e. the travelled portion, cycle tracks or sidewalks) means that these facilities will be necessarily be damaged and users disrupted to accomplish the works, relative to what might occur were the utilities placed within the boulevard or to the outside of the sidewalk. Generally, costs associated with user disruption and restoration of surface elements, landscape, etc. will be significantly higher in more constrained cross-sections or in cases where utility placement remains ill-considered, relative to less constrained and / or well-considered cross-sections.

2. Comment: (Proposed edit to title) Utility rehabilitation (cost to access and reinstate and add additional/new utilities in the future).

   Response: Agreed. Addressed via clarification

3. We need to somewhere and somehow capture the community cost of tree loss if a tree needs to be removed because it conflicts with a utility vs. no tree loss of the tree and utility are separated from each other. And we need to capture the cost of impact to the community when a sidewalk/MUP needs to be closed for a time period while the utility underneath the sidewalk/MUP is repaired vs. no impact to the community if the utility is not located underneath the sidewalk/MUP. And we need to capture the cost to the community when a sidewalk is repaired it becomes a trip hazard vs. no sidewalk cut then no trip hazard.

   Response: Agreed. Addressed via clarification

Lifecycle renewal of linear transportation infrastructure

Sub-criteria related to the impacts of variances in cross-sectional design on capital cost of ownership: e.g. periodic resurfacing and eventual reconstruction of roads, curbs, boulevards, cycle tracks, sidewalks, and illumination.

1. Comment: Is a 25-year lifecycle for infrastructure renewal (reconstruction) reasonable (Jesse to confirm)

   Response: A 25-year lifecycle is typically considered when addressing the major elements of linear transportation infrastructure. Granted, certain elements (e.g. bridges, culverts) may be designed to last much longer, and low-volume local roads may not age or deteriorate as quickly as heavily travelled arterial roads supporting transit and goods movement.

   The key here is not so much to define an actual lifecycle but to assume a common lifecycle across all alternatives, and then to assess whether variances in cross-section have a material impact on the relative cost of renewal. For example, a roadway with a wider travelled portion will cost more to renew that one which is narrower curb-to-curb. Additional facilities such as sidewalks on both sides of the road, cycle tracks, multi-use paths, or specialized or aesthetic materials are likely to increase renewal costs relative to facilities where these elements are not included.

2. Just 25 years?

   Response: See response above.

Operations and Maintenance

Evaluation criteria capture how well the cross-sectional design of the linear transportation infrastructure supports safe, efficient and cost-effective operations and maintenance activities.

Adequacy of boulevard space for snow storage

Sub-criteria related to the impacts of variances in cross-sectional design on the capacity of the boulevard (the area directly behind the curb face of the roadway) to store snow windrowed from the roadway, and shovelled from driveways by residents, without spillover (either back onto the roadway, or onto cycle tracks or pedestrian facilities to the outside of the boulevard).

1. Comment: At the October touch-point meeting, a question was raised by the City for the adequacy of boulevard space for snow storage criteria. They wanted to clarify that more than adequate space for snow storage does not necessarily meet the excellent indicator, as too much space can be a hinderance as well. The City also clarified that right-of-way (ROW) requirements for snow removal on cycle tracks and sidewalks should be ranked lower. They requested that the indicators should specify if equipment for snow removal of the specified ROW's exists, and not if the City already owns it.

   Response: Agreed. "Sufficient" should be the highest-rated category. Implications for equipment, methods and operator requirements related to winter control are addressed in via the next sub-criteria.

2. 1.0 m is the minimum requirement; 1.5 m fully meets requirements.

   Response: See response above.

3. Modify this – 'more than adequate space' would actually be 'poor' – the appropriate amount of space to adequately store snow would be 'excellent'

   Response: See response above.

Impact on snow clearing operations on the roadway

Sub-criteria related to the impacts of variances in cross-sectional design on how well the design of the roadway supports safe, efficient and cost-effective winter control of the driving surface using commercially available equipment and one-pass methods. For example, if the design includes numerous horizontal traffic calming features (i.e. bump-outs), around which plows must navigate, or which require multiple passes to fully clear the roadway, then productivity in terms of kilometers cleared per hour per plow will be reduced, and winter control costs will be increased, relative to roadways which allow for uninterrupted operations.

1. Comment: Should be weighted less. Equipment might exist in 5 years when this is implemented; should reword to make sure design can be cleared using standardized equipment in one pass

   Response: Agreed. Addressed via clarification. Weighting of all criteria and sub-criteria remains equal.

2. Modify – we will need new equipment to service this area (and existing equipment will likely be replaced before this area is developed) – so this should clearly refer to equipment that is available for purchase but not necessarily equipment that the City already owns

   Response: See response above.

Impact on snow clearing operations for cycle tracks and sidewalks

Typically, smaller equipment is used separately to clear cycle-tracks and sidewalks. Sub-criteria relate to the impacts of variances in cross-sectional design on how well the design of the roadway facilitates the safe, efficient and cost-effective delivery of winter control measures on these facilities (i.e. lateral space, risk of damage to adjacent infrastructure elements or private property) using commercially available equipment and a one-pass operation.

1. Comment: Should be weighted less. Equipment might exist in 5 years when this is implemented; should reword to make sure design can be cleared using standardized equipment in one pass

   Response: Agreed. Addressed via clarification. Weighting of all criteria and sub-criteria remains equal.

2. Comment: Modify – we will need new equipment to service this area (and existing equipment will likely be replaced before this area is developed) – so this should clearly refer to equipment that is available for purchase but not necessarily equipment that the City already owns

   Response: See response above.

Impact on general maintenance (new sub-sets – year-round, summer, and winter activities)

Sub-criteria related to the impacts of variances in cross-sectional design on the provision of year-round (patrolling, sign replacement, refuse collection, lighting energy and maintenance), summer (mowing, sweeping, line-painting, catch basin cleaning, and preservation-management type activities such as crack-sealing) and winter (winter control of snow and ice through plowing, salting / sanding) activities specifically related to linear transportation infrastructure, that keep these facilities adequately safe and fit-to-purpose. Impacts in terms of equipment, methods and staffing are judged in terms of being more-costly, equally costly or less costly within each subset.

1. Comment: At the October touch-point meeting there was discussion about breaking up the "General maintenance" criteria into sub-sections for clarity. This could include Summer and Winter maintenance criteria. The City also wanted to include criteria for median maintenance depending on the selected short list cross sections.

   Response: Agreed. Addressed via clarification, introduction of sub-sets and modification to range of indicators.

2. There's a lot that could fit into this: pavement markings, sweeping, signage repair, mowing? Median.

   Response: See response above.

Safety

Evaluation criteria capture the impacts of variances in cross-sectional design on how attribute of linear transportation infrastructure contributes to the safety of all road users by reducing exposure to hazards, the likelihood of harm and the consequences of collisions or other adverse occurrences (e.g. slips and falls, "dooring" of cyclists).

1. Comment: At the October touch-point meeting, in the safety category, the City pointed out that speed criteria were missing from the list. They requested that Wood include a criteria and way to capture the effect the cross sections have on speeding.

Response: New sub-criteria regarding speed management introduced. These sub-criteria specifically address how cross-sectional elements may impact the choice of speed by drivers midblock.

2. Can this include tighter turning radius, narrower travel lanes/perceived corridor width; impacts on speed.

   Response: Sub-criteria specifically addresses midblock cross-sectional elements, and not intersections design (e.g. curb radii).

Speed management (new)

Sub-criteria related to the impacts of variances in cross-sectional design on the operating speed of vehicular traffic, and its corresponding effects on crash frequency and severity outcomes.

Emergency vehicle access

Sub-criteria related to the impacts of variances in cross-sectional design on how quickly emergency vehicles can navigate to incident scenes and perform necessary activities. Incident response times have a direct bearing on the chances of success in mitigating the severity outcomes of injuries.

1. Modify this – 'more than adequate space' would actually be 'poor' wide lanes and overbuilt roads can be a safety hazard and create more emergencies as they encourage drivers to speed – the appropriate amount of space to adequately accommodate emergency vehicle access would be 'excellent'

   Response: Agreed. Indicators modified to address insufficient, sufficient or excessive space, with sufficient receiving the highest score.

Adequacy of physical separation between vehicular traffic and vulnerable road users (new)

Sub-criteria related to the impacts of variances in cross-sectional design on whether vulnerable road users are separated from vehicular traffic, and if so, to what degree. Offset between facilities intended for motorized and non-motorized (walking, cycling) modes has a direct influence on the likelihood and severity outcomes of crashes involving roadway departures.

Note: Indicators modified to address insufficient, sufficient or excessive separation, with sufficient receiving the highest score.

Adequacy of physical separation between vehicular traffic and roadside hazards

Sub-criteria related to the impacts of variances in cross-sectional design on how fixed roadside hazards are placed relative to the travel lanes. Offset between the roadway and fixed object hazards has a direct influence on the likelihood and severity outcomes of crashes involving roadway departures.

Note: Indicators modified to address insufficient, sufficient or excessive separation, with sufficient receiving the highest score.

Addresses 'Vision Zero' objectives

The Vision Zero (VZ) concept is a multi-faceted strategy to eliminate all traffic fatalities and severe injuries, while increasing safe, healthy, equitable mobility for all. Engineering of infrastructure, along with education, enforcement, emergency services and ergonomics (the understanding of human factors), are all key elements of this strategy.

Sub-criteria related to the impacts of variances in cross-sectional design on how the goal of eliminating fatalities and injuries to road users is furthered. Cross-sectional designs which control speed, provide separation between modes, eliminate roadside hazards, and incorporate positive guidance elements (those which respect the capabilities, limitations, expectations and information needs of road users) further VZ objectives.

1. Comment: Not sure if this captures "VZ" – what width implications does it have?

   Response: Agreed. Addressed via clarification and modifications

2. Comment: Re-word this – the full intent of 'vision zero' isn't being captured through the indicators being included here

   Response: See response above.

Impact on safety of right-of-way maintenance staff

Sub-criteria related to the impacts of variances in cross-sectional design on how right-of-way maintenance staff can establish work zones and manage traffic to improve their safety, and that of road users.

1. Comment: Should this be combined with category below?

   Response: The activities involved in maintaining the ROW and those involved in maintaining sub-surface utilities have some commonalities. However, depending on the arrangement of surface and sub-surface elements, a greater proportion of utility maintenance may take place off the travelled way, and therefore away from the risks associated with motor vehicle traffic. For this reason, we see value in keeping the two separation as evaluation sub-criteria.

Impact on safety of utility personnel completing maintenance activities

Sub-criteria related to the impacts of variances in cross-sectional design on how right-of-way utility maintenance staff can establish work zones and manage traffic to improve their safety, and that of road users.

1. Should this be combined with category above? Safety of people working near the portion of the road used by cars is very important, however, including this in two categories feels like 'double-counting' the issue

   Response: See response above.

Social Environment

Evaluation criteria related to the impacts of variances in cross-sectional design on the immediate physical and cultural setting in which people live or in which something happens or develops. It includes the society that the individual was educated or lives in, and the people and institutions with whom they interact. The social environment has direct impacts on the health of individuals and communities.

1. Comment: At the October touch-point meeting, for the Social Environment, the City requested that Wood use the terms "All Ages and Abilities" when discussing accessibility. The City also asked Wood about the locations of proposed bus shelters. Wood did not have a definitive answer at the time. The City suggested that they may be placed between trees in the landscape zone. The accessibility of the bus shelters should also be captured in the evaluation criteria.

   Response: Bus shelter placement will vary along with variances in cross-section. Where the boulevard is sufficiently wide, bus shelters may be located there. Where sufficient space is available to the outside of the sidewalk (and further from the travelled portion of the roadway), this location is preferred, as it places transit users further from traffic hazards and the splash zone.

2. Comment: Can we capture a way of inconveniencing the public when there are disruptions to using a section of infrastructure, e.g. a detour route is required?

   Response: The degree of disruption associated with variances in cross-section and the corresponding placement of subsurface utilities may include impacts to pedestrians, cyclists and drivers. Where maintenance and / or rehabilitation activities must take place within the travelled portion, narrower cross-sections may preclude maintaining two-lane, two-way traffic and require either alternating right-of-way within a single lane or road closures and detours. Similarly, utilities under or close to cycle tracks and sidewalks may require their closure, and detours, to allow for the establishment of safe work zones.

   We have included two new sub-criteria titled "maintenance of access" which provides a relative indication of how well or poorly a cross-section accommodates maintenance and / or rehabilitation activities while avoiding disruptions in service to a) drivers and b) pedestrians, cyclists and transit users.

Accessible to all ages and abilities

Sub-criteria related to the impacts of variances in cross-sectional design on accessibility within the ROW (e.g. getting into / out of vehicles; using mobility devices; walking, cycling, and waiting for / taking transit).

Cross-section elements flow naturally into surrounding land uses

Sub-criteria related to the impacts of variances in cross-sectional design on how well the cross-section of the roadway integrates with the built form outside of the ROW.

1. Comment: How is this being evaluated?

   Response: These sub-criteria is somewhat subjective. However, the main indicator is how well the cross-section fits within the concept of complete streets, and a seamless and integrated harmony between ROW and adjacent land use.

Transit supportive

Sub-criteria related to the impacts of variances in cross-sectional design on the safe and efficient operation of transit vehicles (including specialized transit) and the accessibility of transit facilities and vehicles for people of all ages and abilities.

1. Comment: Planning wants to know / understand where the bus shelters are going in the context of bump outs, other features?

   Response: Refer to the response under the Social Environment heading above.

2. Comment: How are the bus shelters locations being determined without a plan view of the streets?

   Response: See response above.

Aesthetics

Sub-criteria related to the impacts of variances in cross-sectional design on the aesthetics of the ROW.

1. Comment (relates to the indicators identified in the evaluation table): ? paving stones, different treatments unacceptable?

   Response: The original indicator was: "Majority of ROW is hard-surfaced." This has been changed to "Majority of ROW is impermeable." This is not intended to preclude different treatments and textures, but to differentiate between cross-sections which are stark and utilitarian and those which incorporate natural elements and are thus more pleasing.

Land Use Planning

Evaluation criteria related to the impacts of variances in cross-sectional design on the degree to which the highest and best use of adjacent lands is supported.

1. Comment: At the October touch-point meeting, under the Land Use Planning category, the City also requested clarification of the "Compatibility with Guelph Transportation Master Plan" criteria. Wood clarified that they would discuss with the City to properly assess how the cross-sections correspond to the TMP core values.

   Response: This section has been extensively reworked and expanded to address compatibility with the core values, vision and goals being incorporated into the TMP. See sub-criteria pertaining to the TMP below.

2. Comment: Stacey to provide input on what is considered “excellent” for each of the guiding principles.

   Response: This will be discussed at the next workshop.

Impact on total developable land base within secondary plan area

Sub-criteria related to the impacts of variances in cross-sectional design on how much of the developable land base is consumed by ROW. In this instance, wider ROWs would score lower in this category, but higher in others related to ROW safety, functionality, and serviceability.

1. Comment: This should be tied into the actual number of roads anticipated within the SP area as the actual width may not have a statistically significant impact.

   Response: Assuming the same length of arterial, collector and local roadways in all cases, it stands to reason that wider cross-sections will result in less developable land area. Notwithstanding the increased desirability of the remaining land area associated with wider cross-sections and their additional amenities, a calculation was made of the total land area consumed by each cross-section under each classification. The incremental consumption was then compared to the total developable area of the SP and expressed as a percentage.

The following Table quantifies the incremental amount of developable land consumed (as a percentage) under each scenario, when compared to existing standard cross-sections as a base case.

Clair Maltby Secondary Plan Area Incremental Consumption of Developable Land through Changes in Roadway Cross-section						
Developable Area (Hectares)	**491**					
	Proposed Length (m)	Cross-sectional Width (m)	Developable Area Consumed (m^2)	Developable Area Consumed (Hectares)	Percentage of Developable Area Consumed	**Incremental Percentage of Developable Area Consumed (Relative to Existing Standard)**
Arterial Roadways	5,546					
Existing Standard		30.0	166,380	16.64	3.4%	
Alternative 1 - Design Charet		30.0	166,380	16.64	3.4%	
Alternative 2 - Stakeholder Wish List		38.2	211,857	21.19	4.3%	**0.9%**
Alternative 3 - Design Hybrid		33.8	187,455	18.75	3.8%	**0.4%**
Collector Roadways	9,378					
Existing Standard		26.0	243,828	24.38	5.0%	
Alternative 1 - Design Charet		26.0	243,828	24.38	5.0%	
Alternative 2 - Stakeholder Wish List		32.4	303,847	30.38	6.2%	**1.2%**
Alternative 3 - Design Hybrid		32.4	303,847	30.38	6.2%	**1.2%**
Local Roadways (Estimated as Three Times Collector Roadways Length)	12,134					
Existing Standard		18.0	218,412	21.84	4.4%	
Alternative 1 - Design Charet		18.0	218,412	21.84	4.4%	
Alternative 2 - Stakeholder Wish List		20.0	242,680	24.27	4.9%	**0.5%**
Alternative 3 - Design Hybrid		18.0	218,412	21.84	4.4%	

1 Hectare = 10,000 m^2

The Clair-Maltby Secondary Plan Area encompasses 491 hectares. 5,546 linear metres of Arterial Roadways and 9,378 linear metres of Collector Roadways are proposed. To estimate the likely linear metres of Local Roadways required to service the land area, the length of the Collector Roadways was multiplied by a factor of three (3), resulting in28,134 linear metres of local roadways.

Total cross-section width was obtained for each scenario (Existing Standard, Alternative 1 - Design Charet, Alternative 2 - Stakeholder Wish List and Alternative 3 - Design Hybrid) under each roadway classification (Arterial, Collector and Local). Total developable area consumed was first expressed in metres squared, then converted to Hectares. This was compared to the total developable area and expressed as a percentage.

To examine the incremental increase in consumption of developable land, the existing standard for cross-sections under each roadway classification was taken as the base case. The consumption under alternative scenario was then compared to the base case and expressed as a percentage.

From the Table it can be seen that, worst case, the alternative cross-sections under the three roadway classifications (Arterial, Collector and Local) will consume an additional 0.9%, 1.2% and 0.5% of developable land, respectively.

Compatibility with Clair Maltby Secondary Plan Guiding Principal 1: Green and Resilient

Sub-criteria related to the impacts of variances in cross-sectional design on opportunities to protect, maintain, restore, and where possible, improve water resources and the Natural Heritage System, and support resiliency and environmental sustainability through measures such as energy efficiency, water conservation and green infrastructure.

Compatibility with Clair Maltby Secondary Plan Guiding Principal 2: Healthy and Sustainable

Sub-criteria related to the impacts of variances in cross-sectional design on opportunities to design the community for healthy, active living by providing a mix of land uses including a diversity of housing choices at appropriate densities with appropriate municipal services to ensure long-term sustainable development which is fiscally responsible.

Compatibility with Clair Maltby Secondary Plan Guiding Principal 3: Vibrant and Urban

Sub-criteria related to the impacts of variances in cross-sectional design on opportunities to create identifiable urban neighbourhoods that are pedestrian oriented and human-scaled, promoting forward-thinking and innovative design that integrates new development into the rolling topography, while conserving significant cultural heritage resources.

Compatibility with Clair Maltby Secondary Plan Guiding Principal 4: Interconnected and Interwoven

Sub-criteria related to the impacts of variances in cross-sectional design on opportunities to establish a multi-modal mobility network that provides choice and connects neighbourhoods to each other and the rest of the city, by creating a network of parks, open spaces and trails to provide opportunities for active and passive recreation, as well as active transportation choices.

Compatibility with Clair Maltby Secondary Plan Guiding Principal 5: Balanced and Liveable

Sub-criteria related to the impacts of variances in cross-sectional design on opportunities to create and sustain a valued and livable community which reflects the right balance between protecting the environment and fostering a healthy, equitable and complete community.

Compatibility with Guelph Transportation Master Plan (TMP)

Sub-criteria related to how variances in cross-sectional design align with TMP core values, vision and goals, as follows:

Six core values that will guide the work of the TMP update, which are:
- Safety for all road users
- Equitable access to jobs, services and housing, regardless of the chosen mode of transportation
- Multi-modal connectivity to ensure all areas of the city are connected by diverse forms of transportation
- Environmental sustainability to respect the natural environment and achieve a net-zero carbon future by 2050
- Tied to land use to put people and jobs where there are choices for transportation
- Financially sustainable to respect taxpayers and allocate resources responsibly

These core values and community engagement input now reflected in the draft vision and goals that have been framed for the TMP update. Goals are high-level aspirations that reflect the core values and vision of the TMP. These goals are also aligned to the City's Strategic Plan goals for Navigating Our Future. The draft goals include the following:

1. People of all ages and abilities will be able to travel safely using any transportation mode that they choose.
2. Guelph's transportation system will be easy-to-use, reliable and give people and businesses the options they want when they need them.
3. Transit service will provide travel times and traveler convenience at levels that are competitive with travel by car.
4. The carbon footprint from the transportation sector will aim for net zero by 2050.
5. Guelph's streets, trails, and rail networks will align with the City's land use objectives.

6. Investment decisions will be made considering the asset lifecycle costs.

1. Comment: Don't want to double count elements that are covered elsewhere…

   Response: We do not believe this represents double counting, as it reflects the specific core values, vision and goals expressed under the development of the TMP.

Cross-Sections Incorporate Trees on both Sides of the Roadway.

Sub-criteria related to the impacts of variances in cross-sectional design on whether trees are incorporated into both sides of the roadway.

   Note: The indicators have been revised to reflect a yes or no response, with scoring accordingly.

Natural Environment

Evaluation criteria related to the impacts of variances in cross-sectional design on living species, climate, weather, and natural resources such as air and water.

Impact of proposed cross-section on groundwater quantity

Sub-criteria related to the impacts of variances in cross-sectional design on groundwater recharge, primarily based upon how stormwater accumulation on hard surfaces is managed and the degree to which permeable surfaces and vegetation are employed.

Impact of proposed cross-section on water quality

Sub-criteria related to the impacts of variances in cross-sectional design on stormwater quality and the degree to which natural infiltration and reuse is employed as an alternative to piped solutions.

Impact of proposed cross-section on climate change

1. Comment: At the October touch-point meeting, for the Natural Environment category, the City commented on the "Impact of proposed cross-sections on climate change". They suggested that these criteria should be divided into smaller overall categories and that it should capture people's ability to move in carbon free modes. Wood commented that they will discuss with their Climate Change team to expand upon the climate change criteria.

Response: Revised sub-criteria / clarification developed as follows:

Sub-criteria related to the impacts of variances in cross-sectional design contributes towards a net-zero carbon future. Considerations included: Ratio of permeable to impermeable surfaces; inclusion of street trees; degree of encouragement / facilities available to promote non-motorized travel (i.e. walking, cycling; and degree of speed management (lower speeds equate to relatively better fuel economy.

Technical

Evaluation criteria related to the impacts of variances in cross-sectional design on conformance to legislated requirements, beat-practice standards, applicable guidelines and provides flexibility to physically accommodate future innovations in transportation (e.g. electric vehicle charging, bike-sharing, autonomous and connected vehicles), along with innovations in utility services (e.g. 5G connectivity, greater electrical demand, two-way grid to accommodate localized power generation through rooftop solar).

1. Comment: At the October touch-point meeting, the City had one concern over the Technical category. For the vertical and horizontal clearance criteria, the City asked that the range of indicators be removed for these criteria and instead be replaced with either a pass or fail indicator which specifies that the utility clearance requirements are either met or not.

   Response: Range of indicators for items with legislative or standards-based requirements revised to reflect either a compliant or a non-compliant response.

2. Comment: If these are requirements, then there shouldn't be option for "poor".

   Response: See response above.

Provides flexibility in available space to incorporate innovative features in the future

Sub-criteria related to the impacts of variances in cross-sectional design on the accommodation of emerging transportation solutions such as bike-share facilities, transit as a service, and autonomous and connected vehicles, along with the anticipated evolution of connectivity solutions and smart electrical grids.

Surficial facility widths meet applicable design standards (AODA, TAC, MTO)

Sub-criteria related to the impacts of variances in cross-sectional design on compliance with current and anticipated, future legislated requirements, beat-practice standards and applicable guidelines pertaining to the design of linear transportation infrastructure.

1. If a legislated standard or requirement is not being met (and is clearly required by legislation) then that cross-section cannot be considered a viable option. This needs to be clarified.

   Response: See response above.

2. Comment: Clarify what is being considered a 'standard'.

   Response: A technical standard is an established norm or requirement. Providing relatively more leeway that a legislative requirement, a standard sets the benchmark against which a design or operational decision may be measured. While meeting or exceeding a standard does not guarantee optimum or even nominal outcomes and failing to meet a standard does not automatically render a design inadequate from an operational or safety perspective, non-compliance may be challenged. Failing to meet a standard must be justified as an outcome of the application of reasoned engineering judgement.

Lane widths support goods movement and transit

Sub-criteria related to the impacts of variances in cross-sectional design on lane widths, and by extension, the accommodation of transit vehicles and trucks in the essential movement of people and goods.

1. Comment: Please clarify why goods movement is being used as criteria for all streets? We don't want to encourage goods movement on all streets (i.e. local)

   Response: References to lane width adequacy for goods movement and transit revised to be "where applicable". Lane widths of 3.3 m may not be the desirable minimum in all applications, such as on local roads without transit routes (served by specialized transit only), and goods movement is infrequent and for the purposes of local deliveries only.

2. If this is the width that accommodates transit/goods movement (and therefore I assume emergency vehicle access) why do we need to question the lane width? Wouldn't we just set it at 3.3m – or is there a significant benefit to having wider lanes? (Refers to explanation of "Poor" in table)

   Response: See response above.

3. Modify this – 'exceed' would actually be 'poor' wide lanes and overbuilt roads can be a safety hazard and create more emergencies as they encourage drivers to speed – the appropriate amount of space to adequately accommodate design vehicles (transit and trucks) given the function of the road without encouraging speeding for all other vehicles would be 'excellent'. (Refers to explanation of "Excellent" in table)

   Response: Agreed. Modified as suggested.

Vertical and horizontal clearance requirements for gas infrastructure met within ROW

Sub-criteria related to the impacts of variances in cross-sectional design on the ability to provide necessary separation between natural gas and other utilities as a matter of safety (when excavating) and ease of access with minimal disruption to traffic (including non-vehicular modes) or other services.

Vertical and horizontal clearance requirements for telecommunications and electrical infrastructure met within ROW

Sub-criteria related to the impacts of variances in cross-sectional design on the ability to provide necessary separation between telecommunications and electrical infrastructur and other utilities as a matter of safety (when excavating) and ease of access with minimal disruption to traffic (including non-vehicular modes) or other services.

1. Comment: Shouldn't this category and the one above be combined (utilities in ROW)? Not clear why they've been separated.

   Response: Specific concerns were raised by stakeholders from the gas utility about the requirement to meet standards. This is not to suggest that meeting gas utility standards are any more or less important than those applicable to other utilities. It was broken out only to reflect the input received.

Weighting of Individual Evaluation Criteria

No differential weighting is applied to the evaluation criteria. All cross-sectional attributes are given equal weighting in the scoring matrix.

Scoring of Sub-criteria

By default, cross-sections are scored on sub-criteria based upon the following indicators:

- Poor Score: 0 Cross-section <u>does not</u> meet objectives
- Fair Score: 2 Cross-section <u>meets a minority</u> of objectives
- Satisfactory Score: 5 Cross-section <u>meets a majority</u> of objectives
- Good Score: 7 Cross-section <u>meets practically all</u> objectives
- Excellent Score 10 Cross-section <u>fully meets all</u> objectives

Under certain sub-criteria, an abbreviated set of indicators may be used, as shown at the bottom of Attachment 1 at the back of this memo.

Comments Related to Cross-section Typical Drawings

1. Comment: At the October touch-point meeting, the City asked that 4m lane widths not be included in any of the cross-section.

   Response: Applicable revisions were made to the cross-section typical drawings.

2. Comment: Cross section drawings don't match with the excel tables

   Response: Applicable revisions were made to the tables and the cross-section typical drawings to ensure consistency.

3. Comment: 4.0 m outside lane is too wide and would not be entertained moving forward.

   Response: Noted. Cross-section typical drawings will be revised accordingly.

4. Comment: Lane widths of 3.5 m still meets the requirements of bus and emergency vehicle operations as well as heavy trucks.

   Response: Acknowledged. Lanes 3.5 m or wider do meet these requirements. However, lanes narrower than 3.5 m may be appropriate where speed management is desired, buses and goods movement are not considerations, and only emergency vehicles and specialized transit need be accommodated.

Long-list of Cross-section Alternatives (EXCEL)

At the October touch-point meeting, Wood introduced the long list of cross-section alternatives in an EXCEL format. This EXCEL sheet was broken up into 3 tabs, one for each of the roadway classifications (Arterial, Collector, Local). Each tab included various alternatives, showing the width of surface (cross-sectional) elements along with the proposed location of underground utilities.

Wood classified the alternatives under 4 main categories (Typical, Standard, Wish-list, Hybrid). The typical cross-sections were derived from the cross-section standards developed at the design charette. The standard cross-sections use the existing City of Guelph standards as a base. The wish-list versions reflect the feedback received during Workshop #1. Finally, the hybrids combine elements from the wish-list and typical cross-sections.

Attachment 1 reformats this original presentation, updates the indicators, includes scoring for each, and presents our completed evaluation of each of the four cross-section alternatives under each of the three roadway classifications, and the identifies the preferred alternative for each.

Short-listing Results

Scoring for each roadway classification is presenting in the following three Tables.

Arterial			
Existing Standard	Alternative 1 - Design Charet	Alternative 2 - Stakeholder Wish List	Alternative 3 - Design Hybrid
237	273	266	280

Within the Arterial Roadway classification, Alternative 1, a product of the Design Charet, and Alternative 3, a Hybrid of Alternatives 1 and 2 scored the highest, and will be carried forward to the shortlist.

Collector			
Existing Standard	Alternative 1 - Design Charet	Alternative 2 - Stakeholder Wish List	Alternative 3 - Design Hybrid
215	272	275	275

Within the Collector Roadway classification, Alternative 2, a product of the Stakeholder Wish List, and Alternative 3, a Hybrid of Alternatives 1 and 2, scored equally high and will be carried forward to the shortlist.

Local			
Existing Standard	Alternative 1 - Design Charet	Alternative 2 - Stakeholder Wish List	Alternative 3 - Design Hybrid
215	240	232	225

Within the Local Roadway classification, Alternative 1, a product of the Design Charet and Alternative 2, a product of the Stakeholder Wish List scored the highest and will be carried forward to the shortlist.

Note that each of the shortlisted cross-sections may offer minor opportunities for fine-tuning in terms of the lateral placement of subsurface utilities relative to above ground elements to minimize disruption to road users and restoration costs when their expansion / rehabilitation becomes necessary.

The full scoring matrix follows, as Attachment 1.

Regards,
Greg

Attachment 1 – Scoring and Ranking of Alternatives

Category	Evaluation Criteria	Indicators		Score	Arterial				Collector				Local			
					Existing Standard	Alternative 1 - Design Charet	Alternative 2 - Stakeholder Wish List	Alternative 3 - Design Hybrid	Existing Standard	Alternative 1 - Design Charet	Alternative 2 - Stakeholder Wish List	Alternative 3 - Design Hybrid	Existing Standard	Alternative 1 - Design Charet	Alternative 2 - Stakeholder Wish List	Alternative 3 - Design Hybrid
Cost	Initial Construction	Poor	Most costly of the alternatives	0	10	7	0	5	10	5	0	0	10	5	5	5
		Fair		2												
		Satisfactory		5												
		Good		7												
		Excellent	Least costly of the alternatives	10												
	Operations	Poor	Most costly of the alternatives	0	10	5	5	5	10	5	2	2	10	5	5	5
		Fair		2												
		Satisfactory		5												
		Good		7												
		Excellent	Least costly of the alternatives	10												
	Utility rehabilitation	Poor	Most costly of the alternatives	0	5	2	10	7	7	10	2	2	10	5	5	5
		Fair		2												
		Satisfactory		5												
		Good		7												
		Excellent	Least costly of the alternatives	10												
	Lifecycle renewal	Poor	Most costly of the alternatives	0	10	5	2	2	10	2	0	0	10	5	5	5
		Fair		2												
		Satisfactory		5												
		Good		7												
		Excellent	Least costly of the alternatives	10												
Operations and Maintenance	Adequacy of boulevard space for snow storage	Absent	No space for snow storage.	0	5	2	10	2	10	2	2	2	10	10	5	10
		Inadequate	Not enough space for snow storage	2												
		Sufficient	Adequate space for snow storage	10												
		Excessive	More space for snow storage than is necessary	5												
	Impact on snow clearing operations for roadway.	Poor	Specialized equipment AND multiple passes required to meet winter control standards	0	10	10	10	10	10	5	5	5	10	5	5	5
		Fair	Specialized equipment OR multiple passes required to meet winter control standards	5												
		Satisfactory	Commercially available equipment and one-pass methods may be used to meet winter control standards	10												
	Impact on snow clearing operations for cycle track and sidewalk.	Poor	Specialized equipment AND multiple passes required to meet winter control standards	0	10	5	5	5	10	5	5	5	10	5	5	5
		Fair	Specialized equipment OR multiple passes required to meet winter control standards	5												
		Satisfactory	Commercially available equipment and one-pass methods may be used to meet winter control standards	10												
	Impact on general maintenance – year around	More costly	Specialized equipment, less-efficient methods to achieve same outcomes and / or more staff time to accomplish	0	10	5	5	5	10	0	0	0	10	5	5	5
		About the same cost	Equal requirements relative to other options	5												
		Less costly	Opportunities for cost-efficiencies relative to other options	10												
	Impact on general maintenance - summer	More costly	Specialized equipment, less-efficient methods to achieve same outcomes and / or more staff time to accomplish	0	5	5	5	5	10	5	5	5	5	5	5	5
		About the same cost	Equal requirements relative to other options	5												
		Less costly	Opportunities for cost-efficiencies relative to other options	10												

	Impact on general maintenance - winter	More costly	Specialized equipment, less-efficient methods to achieve same outcomes and / or more staff time to accomplish	0	10	0	0	0	10	5	0	0	10	5	5	5
		About the same cost	Equal requirements relative to other options	5												
		Less costly	Opportunities for cost-efficiencies relative to other options	10												
Safety	Speed management	Insufficient	Cross-section encourages higher than intended speeds	0	5	5	0	0	0	10	10	10	0	10	10	5
		Satisfactory	Cross-section supports intended speeds	10												
		Excessive	Cross-section permits only lower than intended speeds	5												
	Emergency vehicle access	Insufficient	Cross-section does not provide adequate access	0	10	10	10	10	5	10	10	10	5	10	10	0
		Satisfactory	Cross-section provides adequate access	10												
		Excessive	Cross-section wider than required for access	5												
	Adequacy of physical separation between vehicular traffic and roadside hazards.	Insufficient	Cross-section does not provide adequate offset	0	5	10	10	10	10	10	10	10	10	10	10	10
		Satisfactory	Cross-section provides adequate offset	10												
		Excessive	Cross-section wider than required for offset	5												
	Addresses 'Vision Zero' objectives	Poor	Cross-section does not address objectives	0	0	5	10	10	5	10	10	10	5	10	10	10
		Fair	Cross-section partially addresses objectives	5												
		Satisfactory	Cross-section fully addresses objectives	10												
	Impact on safety of right-of-way maintenance staff.	Much less-safe	All work within or immediately adjacent to traffic	0	10	5	5	5	2	5	10	10	5	5	5	5
		Less-safe	Most work within or immediately adjacent to traffic	2												
		Safer	Some work within or immediately adjacent to traffic	5												
		Safest	Least possible work within or immediately adjacent to traffic	10												
	Impact on safety of utility personnel completing maintenance activities.	Much less-safe	All work within or immediately adjacent to traffic	0	5	10	10	10	2	10	5	5	5	5	5	5
		Less-safe	Most work within or immediately adjacent to traffic	2												
		Safer	Some work within or immediately adjacent to traffic	5												
		Safest	Least possible work within or immediately adjacent to traffic	10												
	Minimizes disruptions to users during maintenance and rehabilitation - drivers	Poor	Does not minimize disruptions	0	10	10	10	10	0	5	10	10	0	10	10	10
		Fair	Results in fewer disruptions	5												
		Satisfactory	Minimizes disruptions to greatest practical degree	10												
	Minimizes disruptions to users during maintenance and rehabilitation – pedestrians, cyclists and transit users	Poor	Does not minimize disruptions	0	5	5	10	5	5	0	10	10	10	5	5	5
		Fair	Results in fewer disruptions	5												
		Satisfactory	Minimizes disruptions to greatest practical degree	10												
	Accessible to users of all ages and abilities	Poor	Safe operating environment only for vehicles.	0	5	7	10	10	2	10	10	10	2	5	5	5
		Fair		2												
		Satisfactory		5												
		Good		7												
		Excellent	Safety operating environment for all modes, and users of all ages and abilities.	10												

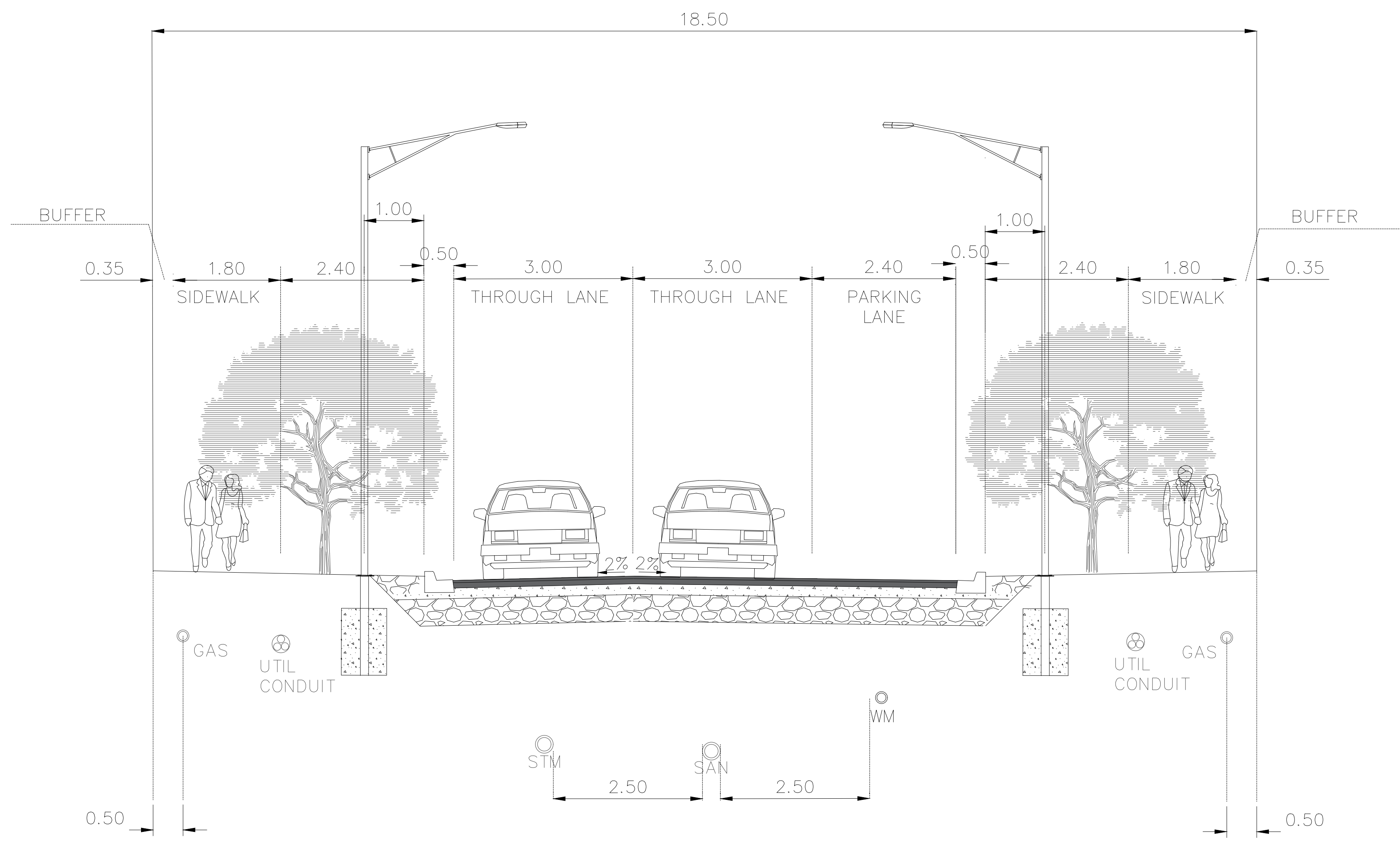
Social Environment	Cross-section elements flow naturally into surrounding land uses.	Poor	No continuity between road ROW and adjacent property (i.e. surfaces do not match or are not reflective of planned uses).	0	5	10	10	10	5	10	10	10	5	5	5	5
		Fair		2												
		Satisfactory		5												
		Good		7												
		Excellent	Road ROW is fully complementary to the adjacent land uses.	10												
	Transit supportive.	Poor	Lack of active transportation connectivity and space for bus shelters.	0	5	10	10	10	5	10	10	10	N/A	N/A	N/A	N/A
		Fair		2												
		Satisfactory		5												
		Good		7												
		Excellent	High quality active transportation connectivity and adequate space for bus shelters.	10												
	Aesthetics	Poor	Majority of ROW is impermeable.	0	5	7	7	7	7	10	10	10	5	7	7	7
		Fair		2												
		Satisfactory		5												
		Good		7												
		Excellent	Adequate space is provided for landscape elements and/or use of alternative, visually appealing materials.	10												
Land Use Planning	Impact on total developable land base within Secondary Plan Area	Poor	Widest right-of-way width.	0	7	7	0	5	7	7	0	0	7	7	0	7
		Fair		2												
		Satisfactory		5												
		Good		7												
		Excellent	Minimum functional right-of-way width.	10												
	Compatibility with Clair Maltby Secondary Plan Guiding Principal 1: Green and Resilient	Poor	Incompatible	0	5	7	7	7	2	7	10	10	2	7	7	7
		Fair		2												
		Satisfactory		5												
		Good		7												
		Excellent	Entirely compatible	10												
	Compatibility with Clair Maltby Secondary Plan Guiding Principal 2: Healthy and Sustainable	Poor	Incompatible	0	5	7	10	10	2	7	10	10	2	7	7	7
		Fair		2												
		Satisfactory		5												
		Good		7												
		Excellent	Entirely compatible	10												
	Compatibility with Clair Maltby Secondary Plan Guiding Principal 3: Vibrant and Urban	Poor	Incompatible	0	2	7	7	7	2	7	10	10	2	7	7	7
		Fair		2												
		Satisfactory		5												
		Good		7												
		Excellent	Entirely compatible	10												
	Compatibility with Clair Maltby Secondary Plan Guiding Principal 4: Interconnected and Interwoven	Poor	Incompatible	0	2	7	7	7	2	7	10	10	2	7	7	7
		Fair		2												
		Satisfactory		5												
		Good		7												
		Excellent	Entirely compatible	10												
	Compatibility with Clair Maltby Secondary Plan Guiding Principal 5: Balanced and Liveable	Poor	Incompatible	0	5	7	7	7	2	7	10	10	2	7	7	7
		Fair		2												
		Satisfactory		5												
		Good		7												
		Excellent	Entirely compatible	10												
	Compatibility with Guelph Transportation Master Plan	Poor	Incompatible	0	5	10	10	10	2	7	10	10	2	7	7	7
		Fair		2												
		Satisfactory		5												
		Good		7												
		Excellent	Entirely compatible	10												
	Cross-Sections incorporate trees on both sides of the roadway.	No	Inadequate space for trees on either side of the roadway.	0	0	10	10	10	0	10	10	10	10	10	10	10
		Excellent	Adequate space for trees is provided on both sides of the roadway.	10												
	Impact of proposed cross-section on groundwater recharge (water balance)	Poor	Significant adverse impact	0	2	7	10	10	2	5	7	7	7	7	7	7
		Fair		2												
		Satisfactory		5												
		Good		7												
		Excellent	Significant positive impact	10												

Natural Environment	Impact of proposed cross-section on water quality	Poor	Significant adverse impact	0	5	7	7	7	5	10	10	10	5	7	7	7
		Fair		2												
		Satisfactory		5												
		Good		7												
		Excellent	Significant positive impact	10												
	Impact of proposed cross-section on climate change	Poor	Significant adverse impact	0	2	7	7	7	2	7	5	5	2	5	7	5
		Fair		2												
		Satisfactory		5												
		Good		7												
		Excellent	Significant positive impact	10												
Technical	Provides flexibility in available space to incorporate innovative features in the future (i.e. bike share parking).	Poor	All available above and below grade space is utilized for essential infrastructure. Very limited flexibility.	0	2	10	10	10	2	7	7	7	5	5	7	5
		Fair		2												
		Satisfactory		5												
		Good		7												
		Excellent	Adequate space exists in the proposed ROW to accommodate potential future needs. Space is flexible without being excessive.	10												
	Surficial facility widths meet applicable design standards (AODA, TAC,MTO)	Non-compliant	Legislative or standards-based requirements are not met	0	10	10	10	10	10	10	10	10	10	10	10	10
		Compliant	All legislative or standards-based requirements are met	10												
	Lane widths, where applicable, support goods movement and / or transit.	Non-compliant	Minimum lane widths for transit and / or goods movement not met	0	10	10	10	10	10	10	10	10	N/A	N/A	N/A	N/A
		Compliant	Minimum lane widths for transit and / or goods movement are met	10												
	Vertical and horizontal clearance requirements for gas infrastructure met within ROW.	Non-compliant	Insufficient cover and horizontal separation between the property line and adjacent utilities to meet CSA guidelines.	0	10	10	0	10	10	10	10	10	10	10	10	10
		Compliant	Vertical and horizontal clearances meet/exceed minimums and provide adequate buffers to perform maintenance activities without impacting other utilities.	10												
	Vertical and horizontal clearance requirements for telecommunications and electrical infrastructure met within ROW.	Non-compliant	Insufficient cover and horizontal separation to other utilities or transportation infrastructure.	0	10	10	0	10	10	10	10	10	0	0	0	0
		Compliant	Vertical and horizontal clearances meet or exceed minimums and provide adequate space to allow for maintenance operations within impact to other facilities within the ROW.	10												

Summary	Arterial				Collector				Local			
	Existing Standard	Alternative 1 - Design Charet	Alternative 2 - Stakeholder Wish List	Alternative 3 - Design Hybrid	Existing Standard	Alternative 1 - Design Charet	Alternative 2 - Stakeholder Wish List	Alternative 3 - Design Hybrid	Existing Standard	Alternative 1 - Design Charet	Alternative 2 - Stakeholder Wish List	Alternative 3 - Design Hybrid
	237	273	266	280	215	272	275	275	215	240	232	225

Key

Indicator		Score
· Poor	Cross-section does not meet objectives	Score: 0
· Fair	Cross-section meets a minority of objectives	Score: 2
· Satisfactory	Cross-section meets a majority of objectives	Score: 5
· Good	Cross-section meets practically all objectives	Score: 7
· Excellent	Cross-section fully meets all objectives	Score 10



NOTES

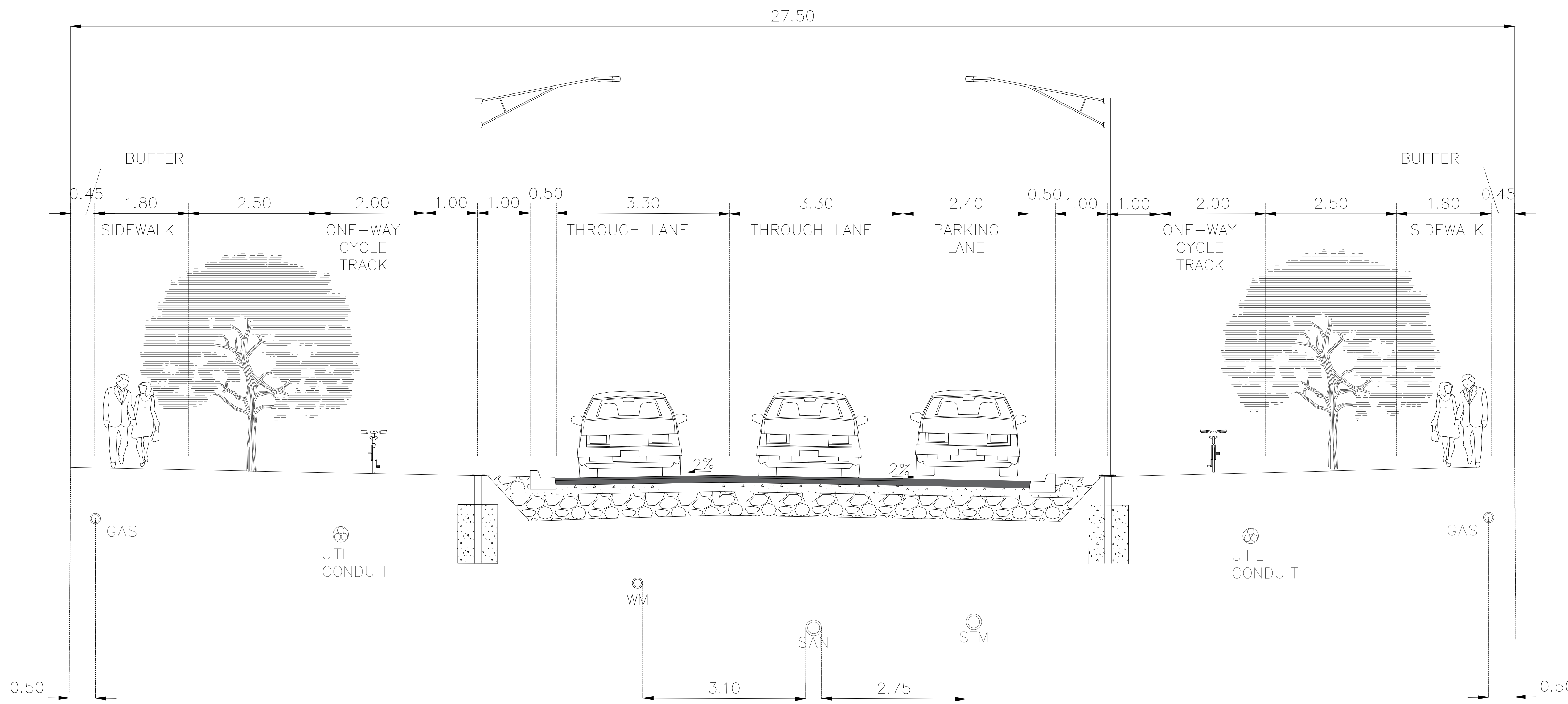
Tree Species to be selected as per CoG Tree Technical Manual
Light standards may be dual–sided to gid with pedestrian visibility.
For vertical clearance of pipes and utilities, refer to CoG DEM section 5.0

CLAIR MALTBY
CROSS-SECTION STUDY
CITY OF GUELPH
SHORTLIST DESIGN
LOCAL ROADWAY

wood.

Project No.	TPB168050
Date	JUNE. 2020
Scale	1:100
Drawing No.	3

Path: C:\Users\Mahsa.Mirhosseini\OneDrive – Wood PLC\Assigments\Lachlan\08–28–20 Revised Clair Maltby Cross Sections.dwg
Plotted By: mahsa.mirhosseini
Last Saved By: mahsa.mirhosseini
Plotted: 2021–04–26
Last Saved: 2020–08–31



NOTES

Tree Species to be selected as per CoG Tree Technical Manual
Light standards may be dual-sided to gid with pedestrian visibility.
For vertical clearance of pipes and utilities, refer to CoG DEM section 5.0

CLAIR MALTBY CROSS-SECTION STUDY

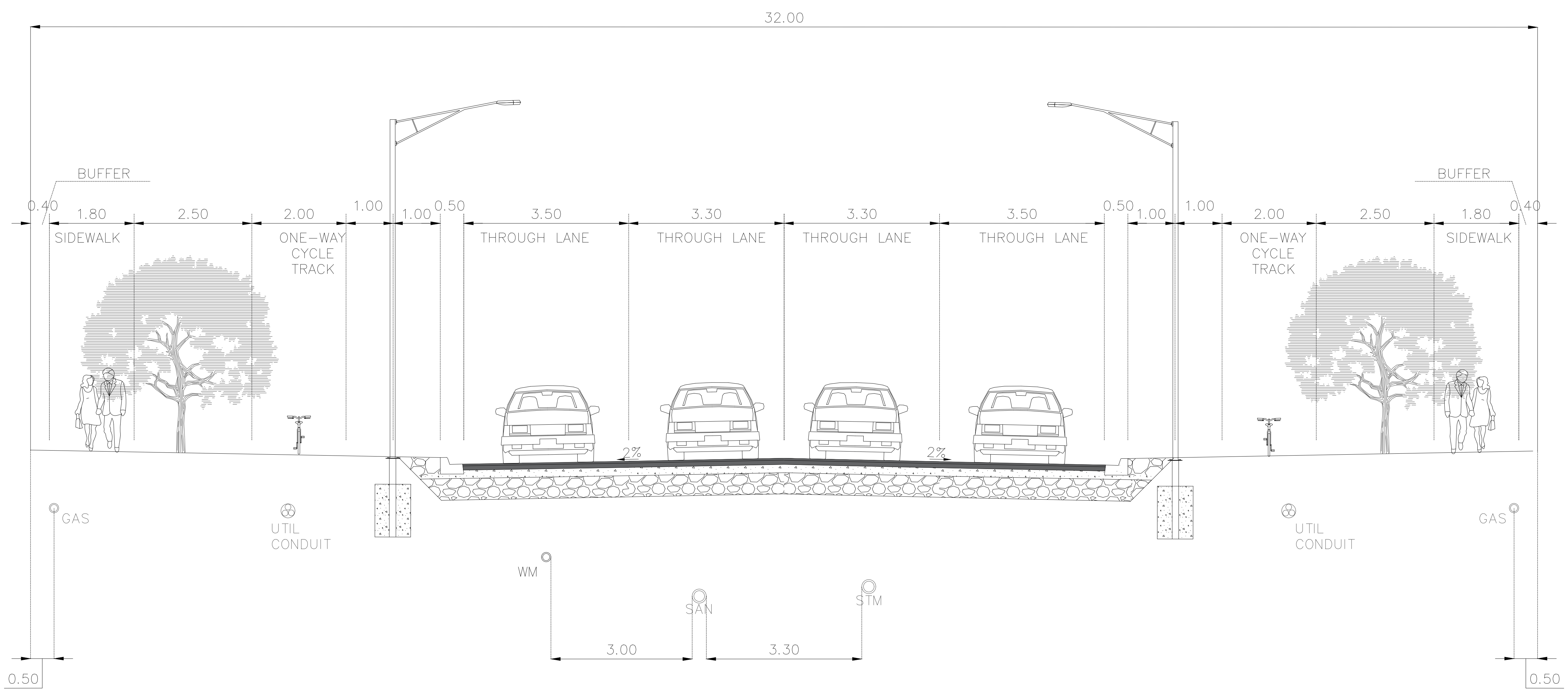
CITY OF GUELPH

SHORTLIST DESIGN

COLLECTOR ROADWAY

wood.

Project No.	TPB168050
Date	JUNE. 2020
Scale	1:100
Drawing No.	2



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Revised Clair Maltby Cross Sections.dwg

Plotted By: mahsa.mirhosseini
Last Saved By: mahsa.mirhosseini

Plotted: 2021-04-26
Last Saved: 2020-08-31

NOTES

Tree Species to be selected as per CoG Tree Technical Manual
Light standards may be dual-sided to aid with pedestrian visibility.
For vertical clearance of pipes and utilities, refer to CoG DEM section 5.0

CLAIR MALTBY CROSS-SECTION STUDY

CITY OF GUELPH

SHORTLIST DESIGN

ARTERIAL ROADWAY

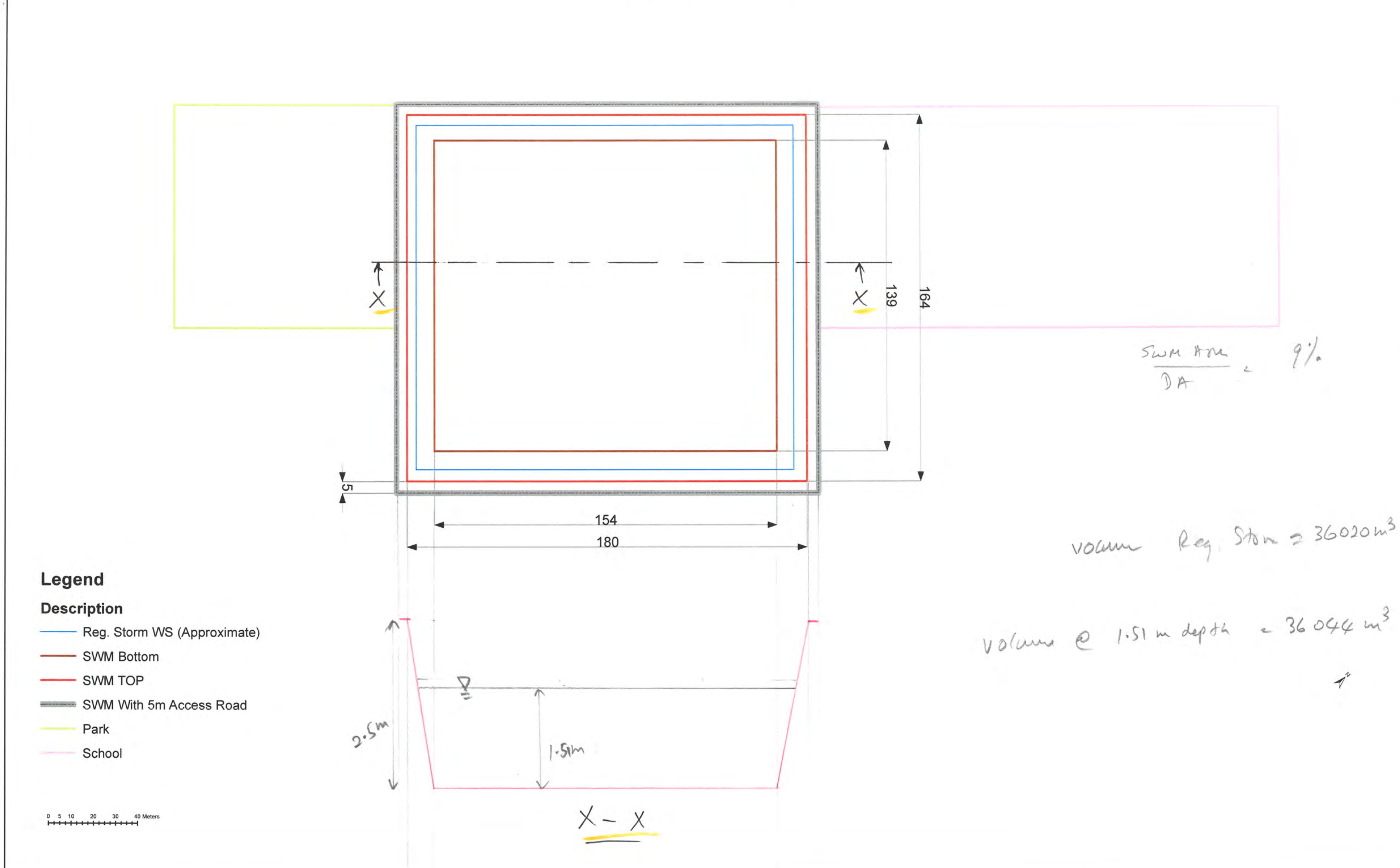
wood.

Project No.	TPB168050
Date	JUNE. 2020
Scale	1:100
Drawing No.	1

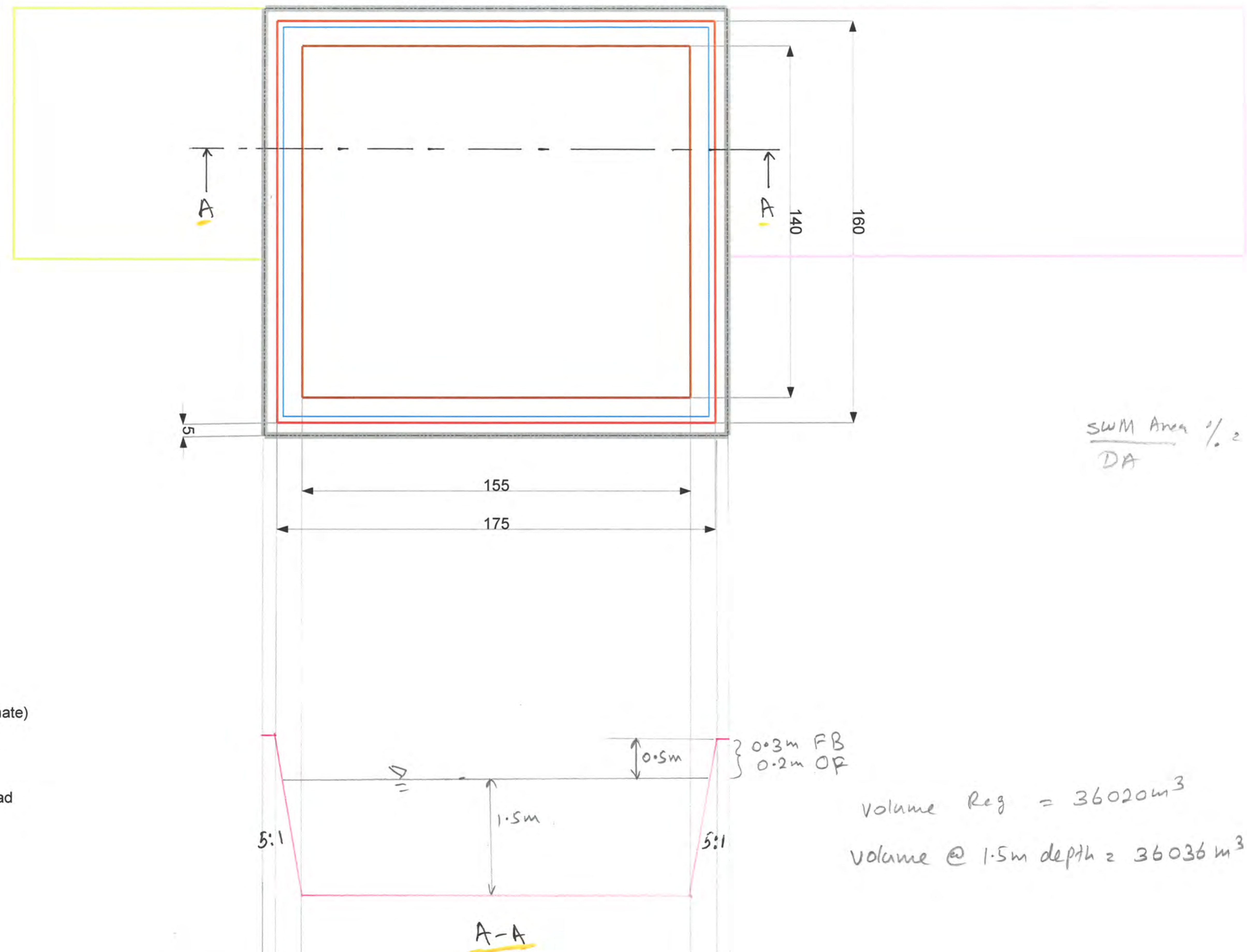
SWM #	111_SW						
Drainage Area Area (ha)	32.98						
Return Period	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	Regional Storm
Required Volume	0	2,112	4,662	7,889	10510	13,330	36,020

Case #	**Depth (m)**	**Area(m2)**		**Volume (m3)**	**SWM Area (ha)**	**SWM area /DA**	
		Top	**Bottom**				
Case 1 (Initial)	1.51	26334	21406	36044			> Regional Storm
	2.5	29520	21406	63658	2.95	9.0%	
Case 2	1.5	26349	21699	36036			> Regional Storm
	2.0	28000	21699	49699	2.80	8.5%	
Case 3							
	1.56	25438	20757	36032			> Regional Storm
	2.00	25438	20757	46551	2.89	8.8%	
Case 4	0.50	23109	21255	11091			> 50 Year Storm
	1.50	25694	21255	36283			> Regional Storm
	2.00	27339	21255	51257	3.20	9.7%	
Case 5	0.50	23431	20665	11024			> 50 Year Storm
	1.50	26184	20665	36208			> Regional Storm
	2.00	27689	20665	51017	3.23	9.8%	
Case 6	0.20	13049	13049	2610			> 5 Year Storm
	0.90	19549	17603	15613			> 50 Year Storm
	1.50	34532	31885	36610			> Regional Storm
	2.00	36282	34532	56456	4.09	12.4%	

CASE 1 (Initial)



CASE 2



SWM Area % = 8.5%
DA

Volume Reg = 36020 m^3

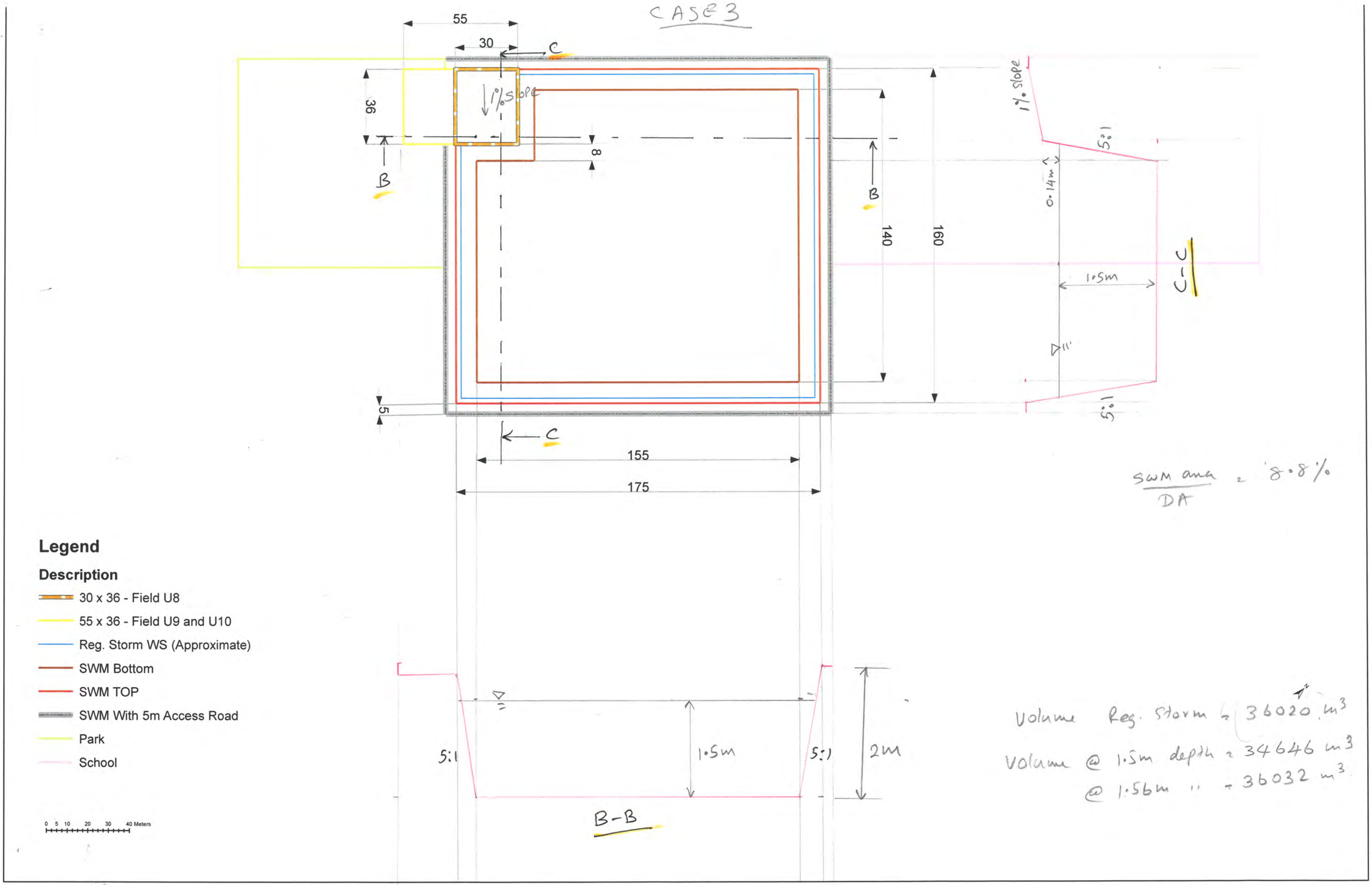
Volume @ 1.5m depth = 36036 m^3

Legend

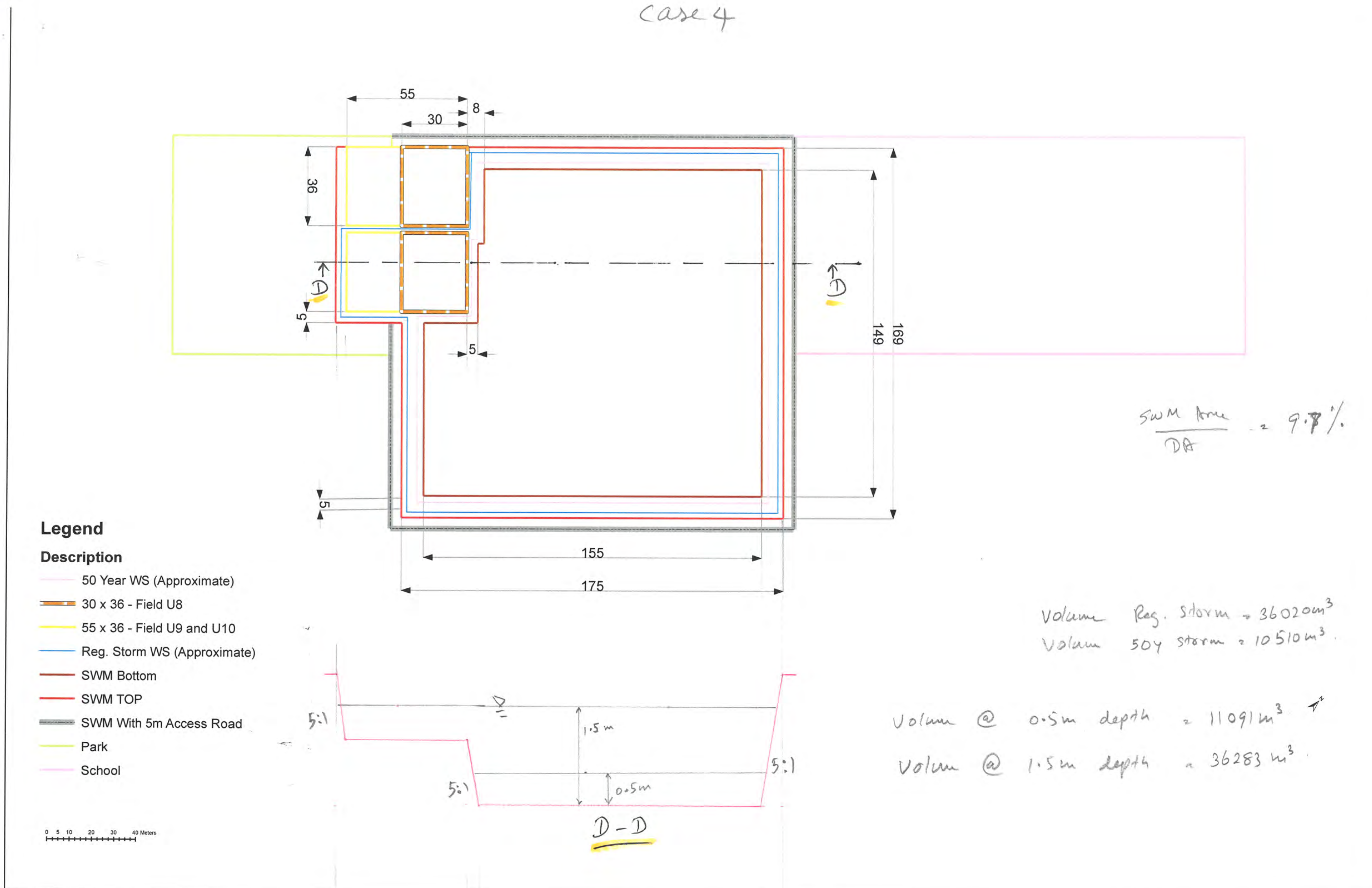
Description

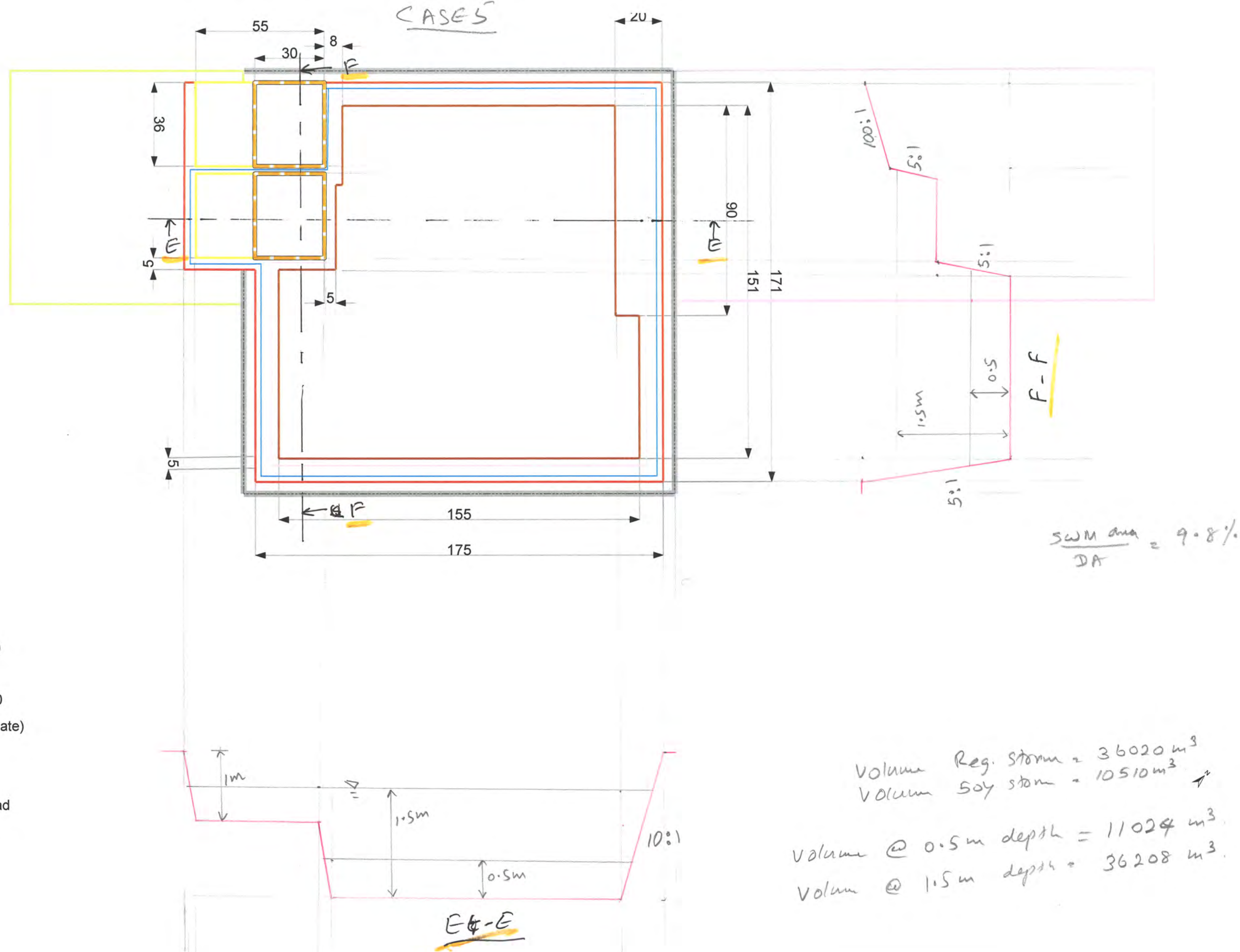
- Reg. Storm WS (Approximate)
- SWM Bottom
- SWM TOP
- SWM With 5m Access Road
- Park
- School

0 5 10 20 30 40 Meters



CASE 3
55
30
C
36
1% slope
8
B
140
160
5
155
175
5:1
0.14m
1.5m
C-C
SWM area / DA = 8.8%
Legend
Description
30 x 36 - Field U8
55 x 36 - Field U9 and U10
Reg. Storm WS (Approximate)
SWM Bottom
SWM TOP
SWM With 5m Access Road
Park
School
0 5 10 20 30 40 Meters
5:1
1.5m
5:1
2m
B-B
Volume Reg. Storm = 36020 m3
Volume @ 1.5m depth = 34646 m3
@ 1.56m " = 36032 m3


Case 4
55
30
8
36
5
5
5
149
169
155
175
D
D
Legend
Description
50 Year WS (Approximate)
30 x 36 - Field U8
55 x 36 - Field U9 and U10
Reg. Storm WS (Approximate)
SWM Bottom
SWM TOP
SWM With 5m Access Road
Park
School
0 5 10 20 30 40 Meters
SWM Area / DA = 9.8%
Volume Reg. Storm = 36020 m3
Volume 50Y storm = 10510 m3
5:1
1.5 m
5:1
5:1
0.5 m
D – D
Volume @ 0.5m depth = 11091 m3
Volume @ 1.5m depth = 36283 m3



Legend

Description

- 50 Year WS (Approximate)
- 30 x 36 - Field U8
- 55 x 36 - Field U9 and U10
- Reg. Storm WS (Approximate)
- SWM Bottom
- SWM TOP
- SWM With 5m Access Road
- Park
- School

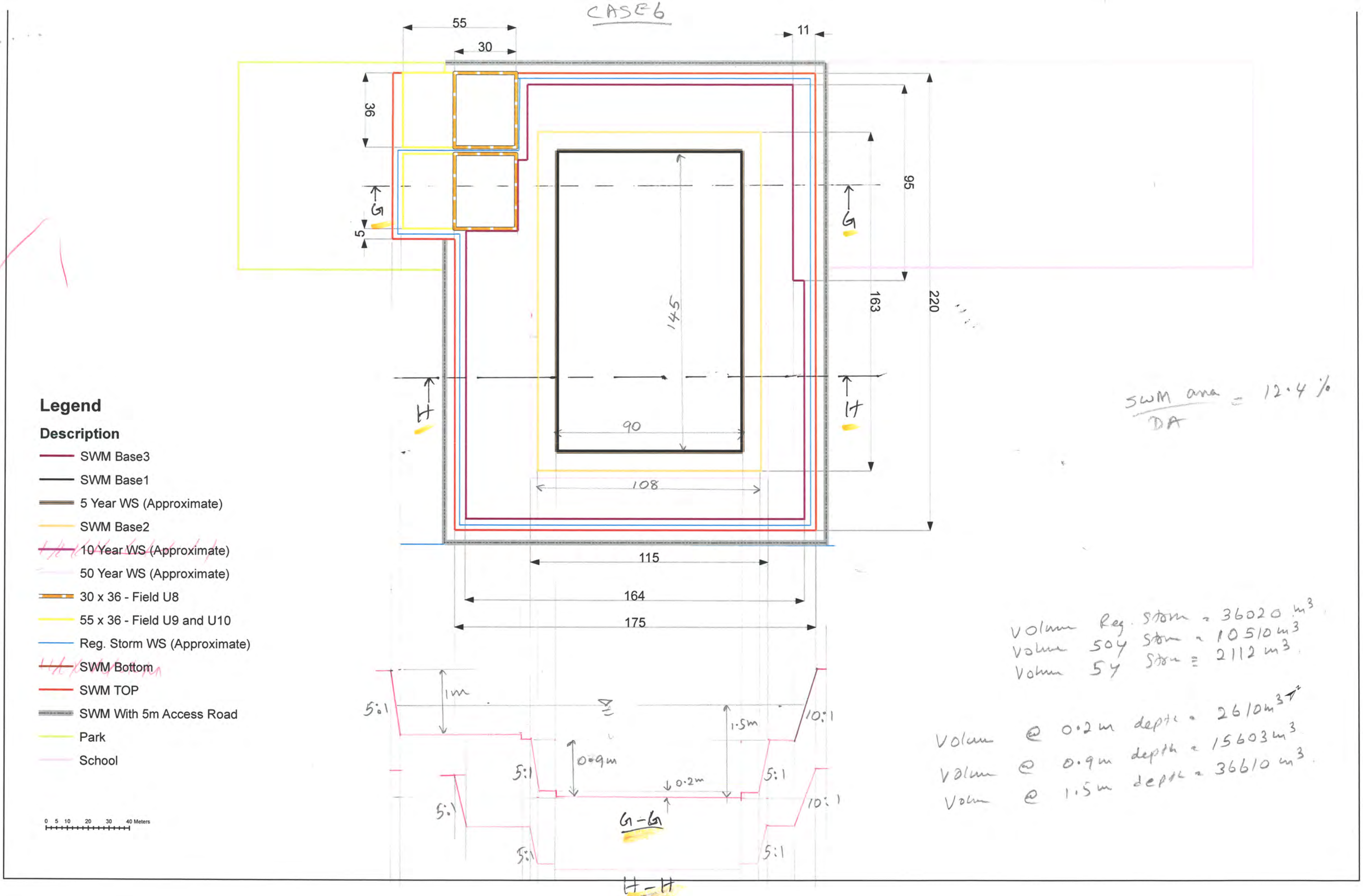
0 5 10 20 30 40 Meters

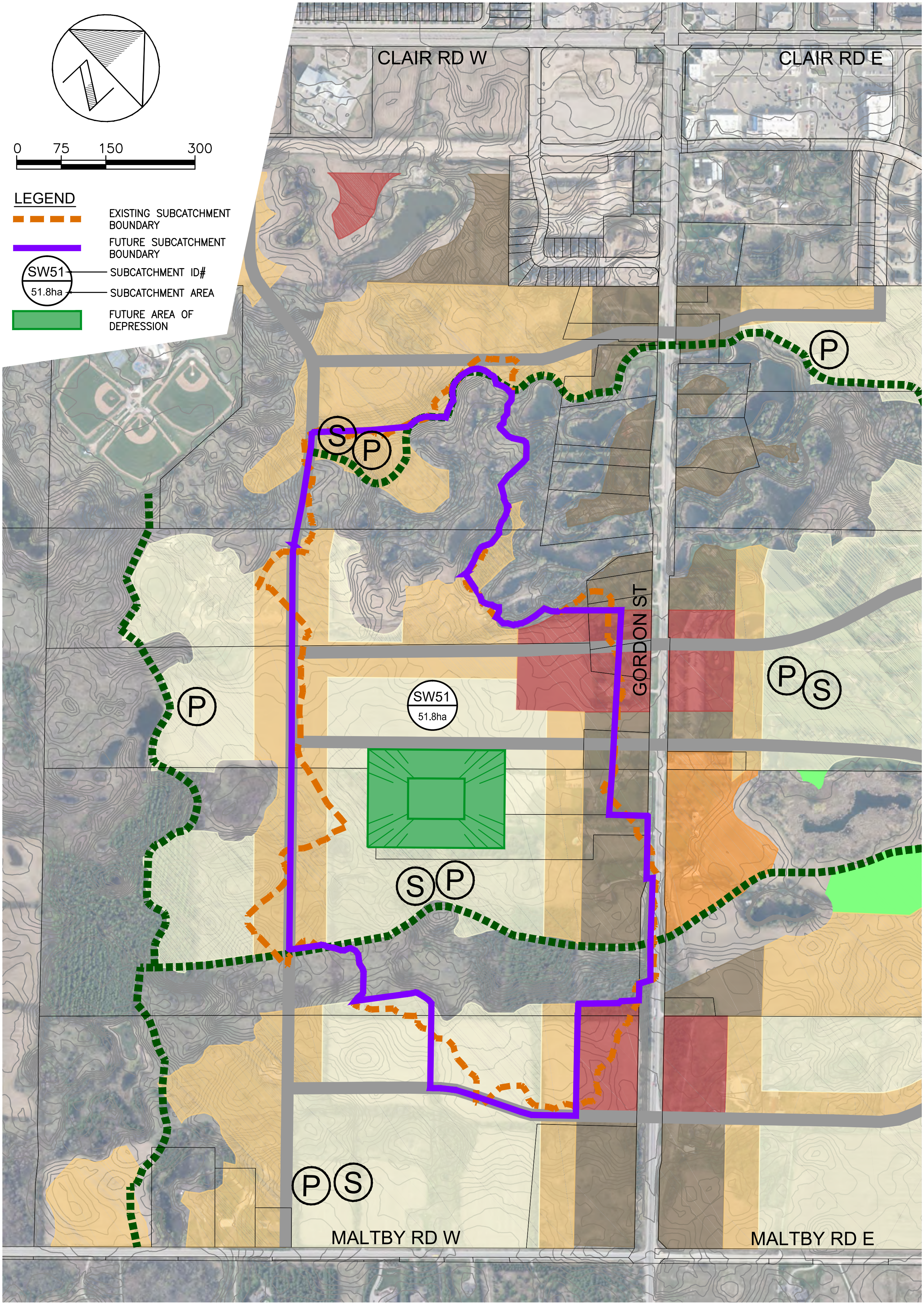
Volume Reg. Storm = 36020 m^3

Volume 50y storm = 10510 m^3

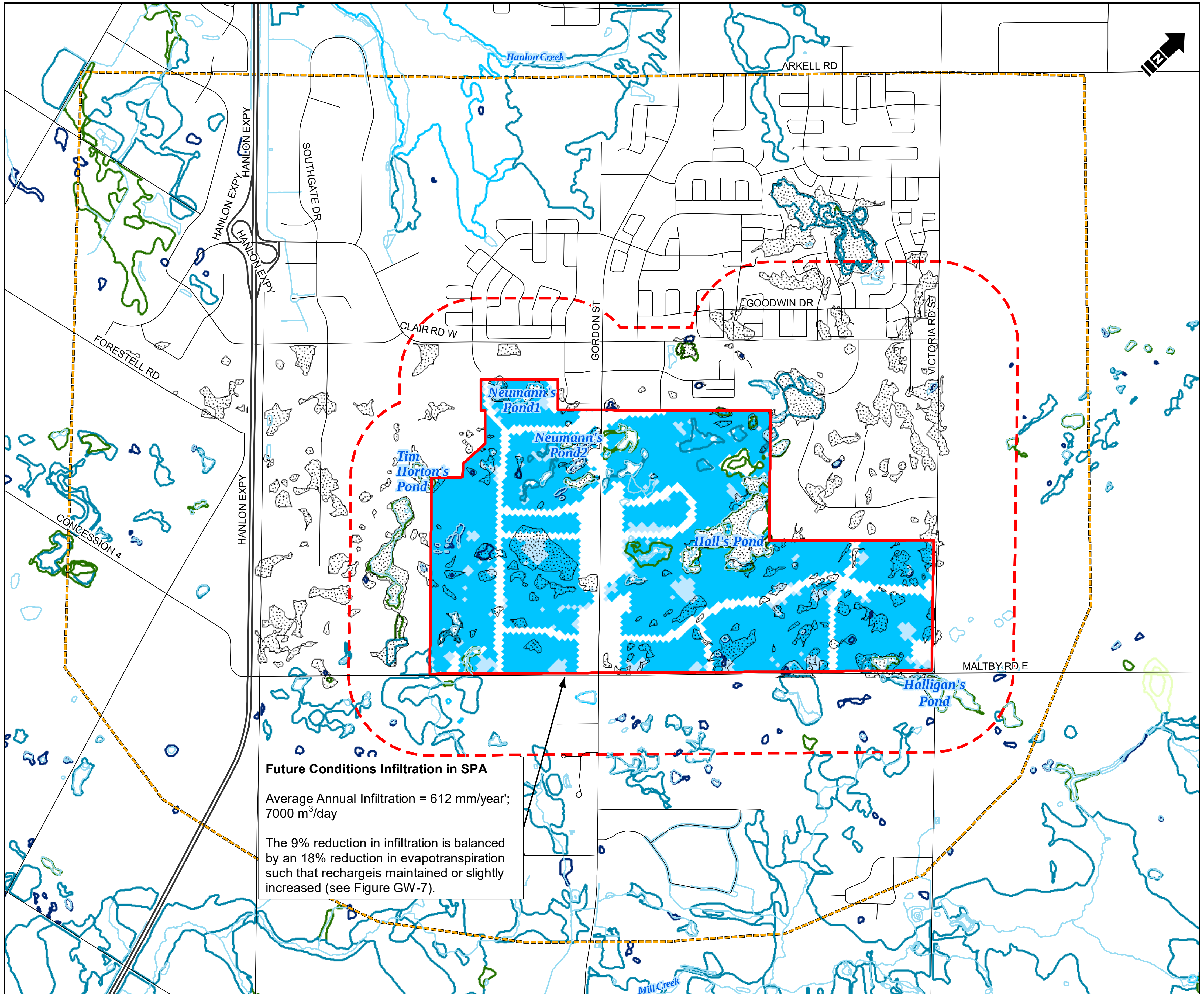
Volume @ 0.5m depth = 11024 m^3

Volume @ 1.5m depth = 36208 m^3


CASE 6
55
30
11
36
5
95
163
220
145
90
108
115
164
175
G
H
Legend
Description
SWM Base3
SWM Base1
5 Year WS (Approximate)
SWM Base2
10 Year WS (Approximate)
50 Year WS (Approximate)
30 x 36 - Field U8
55 x 36 - Field U9 and U10
Reg. Storm WS (Approximate)
SWM Bottom
SWM TOP
SWM With 5m Access Road
Park
School
0 5 10 20 30 40 Meters
SWM area / DA = 12.4 %
Volume Reg. Storm = 36020 m3
Volume 50y Storm = 10510 m3
Volume 5y Storm = 2112 m3
Volume @ 0.2m depth = 2610 m3
Volume @ 0.9m depth = 15603 m3
Volume @ 1.5m depth = 36610 m3
1m
1.5m
0.9m
0.2m
5:1
10:1
G-G
H-H



0
75
150
300
LEGEND
EXISTING SUBCATCHMENT BOUNDARY
FUTURE SUBCATCHMENT BOUNDARY
SW51
51.8ha
SUBCATCHMENT ID#
SUBCATCHMENT AREA
FUTURE AREA OF DEPRESSION
CLAIR RD W
CLAIR RD E
GORDON ST
MALTBY RD W
MALTBY RD E
P
S



- Primary Study Area Boundary
- Secondary Plan Area Boundary
- MIKE SHE Model Domain
- Closed Depression
- Fen
- Bog
- Swamp
- Marsh
- Open Water
- Unknown Wetland
- Water Body
- Watercourse
- Highway
- Road

Average Annual Infiltration (mm/year)

- 0 - 250
- 250 - 800
- > 800

Infiltration Definition:

INFIL=P-RO-E - △S

Infiltration (INFIL) is the portion of Precipitation (P) that enters the subsurface after losses to Runoff (RO) at the ground surface. Net infiltration and Evaporation (E) from ground surface and change in surface water storage (△S).

1:25,000 metres
250 0 250 500
NAD 1983 UTM Zone 17N

Reference: Data provided by the City of Guelph, Geo Base® and Province of Ontario used under license.

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

City of Guelph
Clair- Maltby Comprehensive Environmental Impact Study
Phase 3 Impact Assessment Report

Simulated Infiltration Future Conditions (2003 to 2017 Existing Conditions)

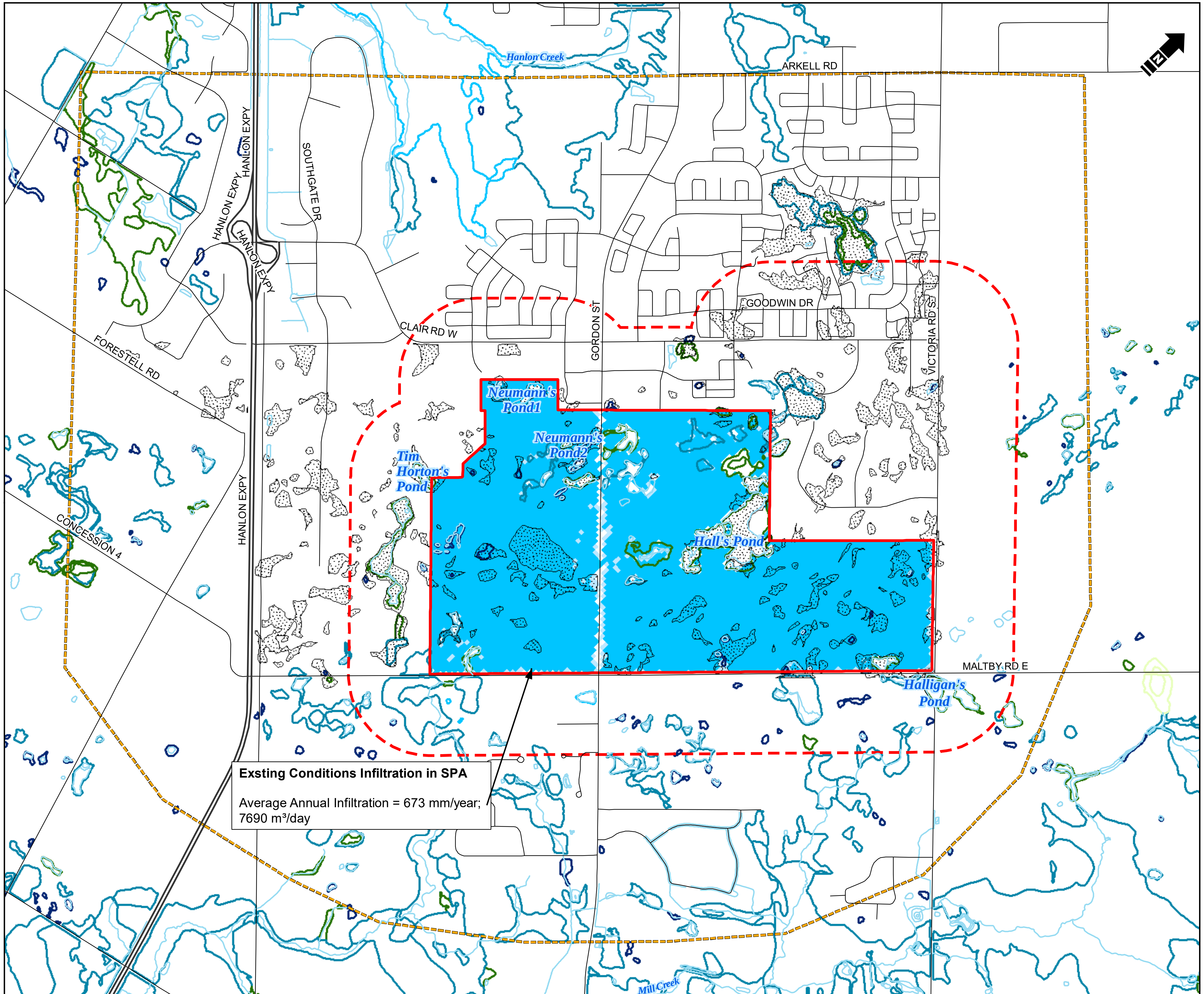
DRAFT

Date:	Project:	Submitter:	Reviewer:
March 2020	23089	S. Murray	D. Abbey

Figure
GW-9

I:\City\Guelph\23089\Figures\and\Tables\GHG\2020\Report\Phase3_Impact_Assessment\Figure-GW-9-Simulated_Infiltration_Future_Conditions_2003_2017_Climate_Data.mxd - Tabloid_L - 02-Mar-20, 11:21 AM - Imwright - TID005

Simulated InfiltrationExisting Conditions (2003 to 2017 Climate Data)



- Primary Study Area Boundary
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- Watercourse
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Average Annual Infiltration (mm/year)

- 0 - 250
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Infiltration Definition:

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Infiltration (INFIL) is the portion of Precipitation (P) that enters the subsurface after losses to Runoff (RO) at the ground surface. Net infiltration and Evaporation (E) from ground surface and change in surface water storage (△S).

1:25,000 metres
250 0 250 500
NAD 1983 UTM Zone 17N

Reference: Data provided by the City of Guelph, Geo Base® and Province of Ontario used under license.

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

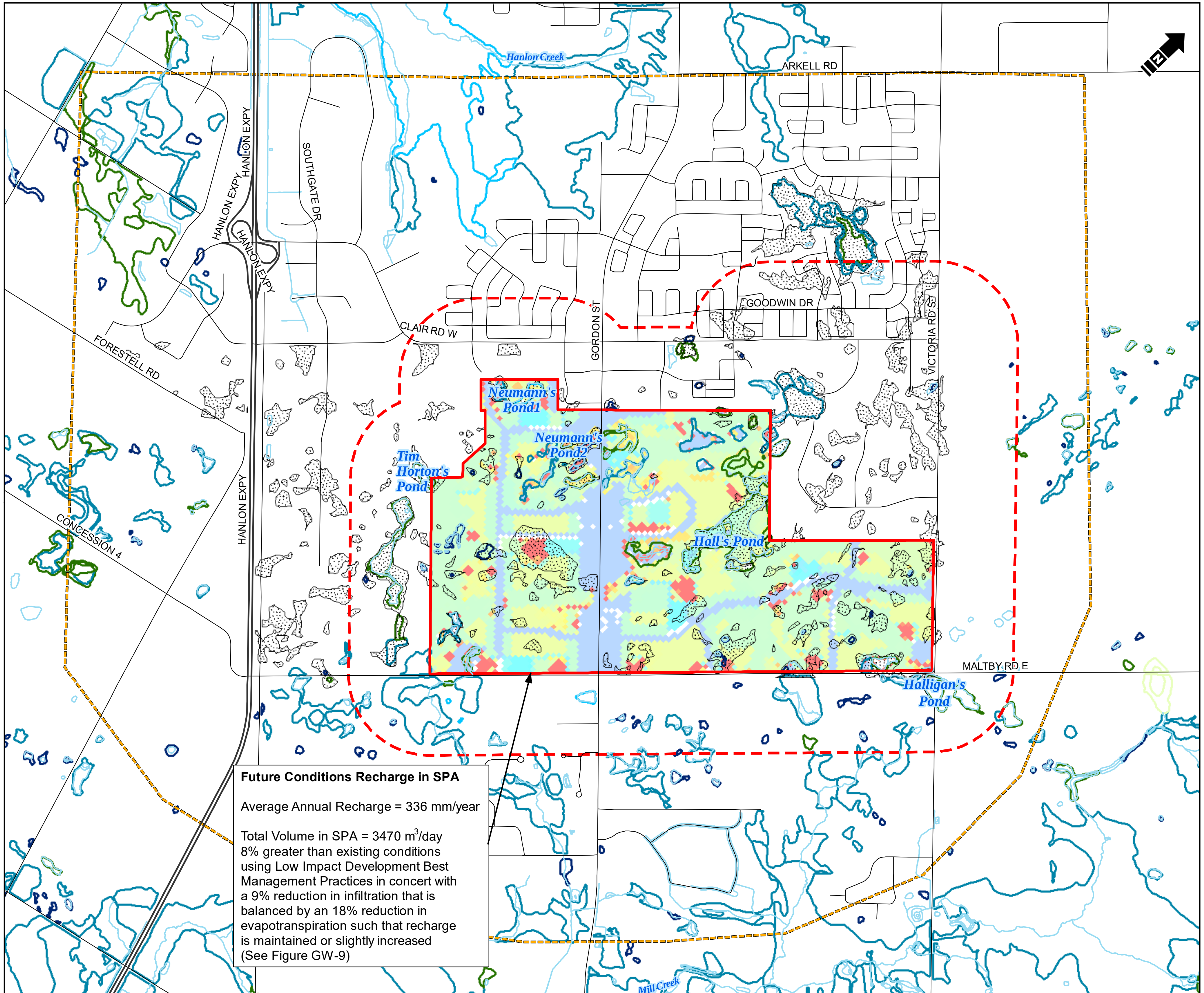
City of Guelph
Clair- Maltby Comprehensive Environmental Impact Study
Phase 3 Impact Assessment Report

Simulated InfiltrationExisting Conditions (2003 to 2017 Climate Data)

DRAFT

Date:	Project:	Submitter:	Reviewer:
March 2020	23089	S. Murray	D. Abbey

Figure GW-8



Future Conditions Recharge in SPA

Average Annual Recharge = 336 mm/year

Total Volume in SPA = 3470 m^3/day
8% greater than existing conditions using Low Impact Development Best Management Practices in concert with a 9% reduction in infiltration that is balanced by an 18% reduction in evapotranspiration such that recharge is maintained or slightly increased (See Figure GW-9)

- Primary Study Area Boundary
- Secondary Plan Area Boundary
- MIKE SHE Model Domain
- Closed Depression
- Fen
- Bog
- Swamp
- Marsh
- Open Water
- Unknown Wetland
- Water Body
- Watercourse
- Highway
- Road

Average Annual Groundwater Recharge (mm/year)

> 500

< 100

Recharge Definition:

R=P-RO-ET -$\triangle S_s$

Recharge (R) is the portion of Precipitation (P) that infiltrates (INFIL) into the ground and reaches the water table; after losses to Runoff (RO) at the ground surface and Evapotranspiration (ET) from surfaces and the root zone and change in soil moisture storage ($\triangle S_s$).

1:25,000 metres
250 0 250 500
NAD 1983 UTM Zone 17N

Reference: Data provided by the City of Guelph, Geo Base® and Province of Ontario used under license.

Matrix Solutions Inc.
ENVIRONMENT & ENGINEERING

City of Guelph
Clair- Maltby Comprehensive Environmental Impact Study
Phase 3 Impact Assessment Report

Simulated Groundwater Recharge Future Conditions (2003 to 2017 Climate Data)

DRAFT

Date:	Project:	Submitter:	Reviewer:
March 2020	23089	S. Murray	D. Abbey

Figure GW-7

Appendix D

Mobility

BA Group

Clair - Maltby Secondary Plan

Transportation Master Plan Study

City of Guelph

Prepared For: City of Guelph

March 6, 2019; Revised February 2021

45 St. Clair Avenue West, Suite 300
Toronto, ON M4V 1K9
www.bagroup.com

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1.0 TRANSPORTATION REPORT SUMMARY

This Transportation Master Plan Study is prepared in support of the Clair-Maltby Secondary Plan and Master Environmental Servicing Plan (MESP) Study being undertaken by the City of Guelph. This report firstly comprises Phase 1 Mobility Study documentation, including a review of existing transportation conditions and planning context for the Clair-Maltby study area. The remaining sections of this report review the Preferred Community Structure Plan, supportive transportation policies and objectives, and future conditions transportation analysis to inform potential transportation network improvements and high-level transportation infrastructure requirements and options.

The Mobility Study Transportation Report specifically includes:

1. an introduction and overview of the transportation study, including the objective of the Phase 1 study (June 2018), and subsequent transportation direction and analysis included herein;
2. an overview of the existing Secondary Plan area context and transportation elements;
3. a review of existing travel patterns, traffic operations, and collision history based on available data within the study area;
4. a review of relevant standards, active development applications, policies, and general planning framework based on available planning and transportation studies and reports;
5. a summary of key challenges and opportunities for the Secondary Plan, from a transportation perspective, which highlights key objectives sought through directive policies;
6. an overview of the planning processes and events undertaken over the course of the MESP study to review community structure options and achieve a Preferred Community Structure plan;
7. a review of the Clair-Maltby Secondary Plan Preferred Community Structure and associated transportation network elements and attributes;
8. an overview of general parking standards and best practice policies;
9. an overview of general transportation demand management (TDM) standards, policy objectives, and best practices;
10. a discussion of potential traffic calming measures most applicable to local streets planned as part of Secondary Plan development;
11. multi-modal travel demand forecasting for development associated with the Clair-Maltby Secondary Plan, based on the highest (most dense) land use budget developed in support of the MESP;
12. an assessment of forecast transit rider demands associated with development of the Secondary Plan; and
13. an assessment of forecast traffic resulting from development of the Secondary Plan, and summary of potential transportation improvements to accommodate anticipated traffic demands.

Background and Objectives

The Clair-Maltby Secondary Planning Area is located in the south end of the City of Guelph. It is bounded generally by Clair Road, Poppy Drive, development lands, and existing neighbourhoods to the north, Victoria Road (City Boundary) to the east, Maltby Road (City Boundary) to the south and the eastern limits of the Southgate Business Park to the west. It has an area of approximately 520 hectares which is currently comprised primarily of rural and agricultural land uses.

The study process for these lands in preparation of the Clair-Maltby Secondary Plan and Master Environmental Servicing Plan (MESP) Study, includes:

- Phase 1: includes the preparation of a background report outlining the results of the above-noted review of existing conditions, background documents, and opportunities/challenges for the study area. This background document also includes a technical work plan for the Phase 2 study.

- Phase 2: includes a Community Visioning Exercise, technical analysis work, design matters, and determining an appropriate street network.

- Phase 3: includes finalizing the Transportation Master Plan Study once a preferred Community Structure alternative is determined through the Design Charrette at the end of Phase 2. Additional refinement in support of Secondary Plan will also be dealt with in Phase 3, as required. The final study will meet the requirements of a Phase 1 and 2 Transportation Master Plan study under the Municipal Engineers Association Class EA process.

All material from the above-noted phases are comprehensively included herein as part of this final Transportation Master Plan Study.

Existing Transportation Facilities

The Clair-Maltby Secondary Plan area is served by a series of rural and urbanized roads. The area road system, under existing conditions is generally defined by three north-south routes: Gordon Street, Victoria Road, and Southgate Drive; and two east-west routes: Clair Road and Maltby Road. Additionally, Highway 6 (the Hanlon Parkway) operates in a north-south direction west of the secondary plan area.

Gordon Street is a major north-south corridor linking the City of Guelph with Highway 401 in the south, providing an important alternative (Highway 6 being the primary route) link for commuters connecting between Highway 401 and the City of Guelph.

Existing transit routes do not serve the Secondary Plan area except along a section of Clair Road west of Gordon Street. There are currently no transit services along Gordon Street (south of Clair Road), Victoria Road, Maltby Road, or Clair Road (east of Gordon Street). A number of transit routes located just north Clair Road provide connections to the University Centre hub, which is located approximately 5 kilometres north of the subject lands. One route connects directly to Guelph Central Station in the downtown. Frequency of buses along these routes varies from two to four vehicles per hour during peak morning activity.

The City of Guelph has actively pursued plans detailing future active transportation networks. A city-wide cycling network plan was established as part of the City's Transportation Master Plan.

Pedestrian sidewalks and bicycle lanes are currently provided along Clair Road and Gordon Street within the Secondary Plan area. Sidewalks are also provided along sections of new streets southeast of the Gordon Street / Clair Road intersection.

Existing Travel Patterns and Traffic Conditions

Weekday peak period trips to / from the South Guelph Area are predominately made by automobile (72% driver; 10% passenger), while small proportions are made by school bus, transit, or active means. The most common orientation for all trips to / from the South Guelph area are made within the City of Guelph (70% to 75%). Travel behaviour, by orientation, related to existing trips during the weekday peak hours in the South Guelph area is summarized in the following:

- 54% of trips are made within the local area - generally south of the Eramosa and Speed Rivers.
- Excluding of the aforementioned “local area”, another 20% of trips to / from the South Guelph Area are made within the City of Guelph – including 5% to / from the Downtown
- 10% of trips to / from the South Guelph Area are oriented / destined for Waterloo Region.
- 7% of trips to / from the South Guelph Area are oriented / destined for Halton / Peel Regions.
- 4% of trips to / from the South Guelph Area are oriented / destined for Wellington County.
- 1% of trips to / from the South Guelph Area are oriented / destined for the City of Toronto.

Existing trips to / from the South Guelph Area are made using the following modes of transportation during weekday peak travel periods:

- 21% of local trips within the local area are undertaken using transit and active transportation modes, most notably by transit (10%); 8% and 3% of trips are made by walking or cycling, respectively.
- For trips within Guelph, but outside the local area, approximately 94% of trips are made by car (81% driver; 13% vehicle passenger), and only 3% are made by transit.
- Trips made between the South Guelph Area and Halton, Peel and Waterloo Regions, are made by automobile to a greater extent than trips to other areas. Virtually all travel to / from Halton, Peel and Waterloo is undertaken within an automobile.
- The City of Toronto comprises a small proportion of overall travel (1%) to / from the South Guelph Area. These trips are predominately undertaken by car; however, transit mode share is greater for these trips than for trips between the South Guelph Area and other areas analyzed herein.

Existing traffic conditions were reviewed for the weekday afternoon peak hour. The signalized intersection traffic analysis indicates that all study area intersections perform acceptably, and without any traffic capacity constraints for any individual traffic movements. Overall signalized intersection traffic operations are good under existing conditions, and are generally reflective of new infrastructure (updated and widened roads) and limited area development.

A total of 134 collisions were reported at study area intersections within a 63 month period from 2012 to 2017. Of the total volume of collisions, 21 (16%) resulted in a non-fatal injury, while 42 collisions (31%) report property damage only (no injury). All other collisions were non-reported or “non-reportable”. No “fatal” collisions were reported. A total of 3 collisions involved vulnerable road users – in all instances, a cyclist.

Policy and Planning Framework and Active Applications

A number of policies and plans were reviewed to inform the existing transportation planning framework for the Clair-Maltby Secondary Plan area. These policies and plans establish direction for planning work to be undertaken in future phases, and provide a foundation for defining a Secondary Plan area transportation structure and multi-modal network. Specifically, the set of polices reviewed include:

- Provincial Policy Statement
- Places to Grow: Growth Plan for the Greater Golden Horseshoe
- City of Guelph Official Plan
- Official Plan Amendment 48
- City of Guelph Official Plan – Section 8: Transportation
- South Guelph Secondary Plan
- South Gordon Secondary Plan
- Guelph – Wellington Transportation Study (Transportation Master Plan)
- Gordon Street (Wellington Road 46) Class EA Environmental Study Report
- Clair Road Class EA Environmental Study Report
- Victoria Road (Clair Road to York Road) Class EA Study
- City of Guelph Transit Growth Strategy
- Moving Guelph Forward: Guelph Transit Growth Opportunities
- Guelph Trails Master Plan
- City of Guelph Cycling Master Plan
- City of Guelph Active Transportation Network Study
- Wellington County Active Transportation Plan

Summaries of planned road, transit, trail, cycling and pedestrian infrastructure, are detailed as part of this review. These plans provide an understanding of future infrastructure provisions for assessing future transportation impacts.

The overview of existing transportation plans, policies, and standards, as detailed in the documents noted above, provide a foundation on which to establish an area transportation plan, and to inform a future transportation structure and network for the study area lands.

Design Guidelines

City of Guelph Engineering and Capital Infrastructure Services prepared their Development Engineering Manual (DEM, Fall 2016) to guide engineering related aspects of development related work, including established Engineering Design Criteria and Standards intended to be used by developers, residents and the City to inform engineering design and related review and discussion. The DEM recognizes that the outlined standards may not be compatible to all scenarios, and engineering judgement should be used in such cases.

The DEM establishes geometric road standards, subdivision road standards, sight triangles, parking standards, and access design standards. It should be noted that road standards do not differentiate the use of pavement for passenger vehicles, transit, cyclists or otherwise and should be updated for the Clair-Maltby Secondary Plan area to include multi-modal uses where appropriate.

Review of Existing Transportation Network: Key Challenges and Opportunities

There are a series of challenges and opportunities for the Clair-Maltby Secondary Plan area. Challenges and opportunities are derived from the review of existing conditions, and informed by a review of various policies, standards, and plans.

Roadways

- The City of Guelph has a set of standard road cross-sections that guides design of the right-of-way, boulevard, and pavement width standards for municipal roadways. There is potential to update the road / design standards specifically for the Clair-Maltby Secondary Plan area to permit further programming within the pavement or boulevard spaces to include multi-modal uses where appropriate or to account for variations in natural landscape where a context sensitive standard may be most suitable.

- The Clair Maltby Secondary Plan area is challenged by natural heritage and land use constraints that are barriers to providing a 'grid like' network of local and collector roadways. The Secondary Plan develops a fine grained network within the geographical limits of the study to support suitable access, reasonable traffic capacity, and reasonably developable parcels to facilitate future development.

- Existing travel mode splits are heavily auto-oriented. Achieving a balance of successful development and adequate roadway capacity for this study area will require thoughtful integration of non-auto methods of travel – via infrastructure planning as well as programming and maintenance.

Cycling and Trails

- While achieving lower auto-mode shares will be a challenge, there is opportunity to provide strong connections within the Secondary Plan area through the provision of on and off-street bicycle facilities and trail system.

- Improving accessibility and connectivity within the study area and to / from major community nodes for non-auto modes of transportation (i.e. walking and cycling) will help to ensure mobility choice.

- Improving first and last mile active transportation connections to public transit will increase the ease of access and encourage multi-modal trips.

Transit

- Transit is limited under existing conditions within the study area. Providing frequent and efficient transit routing opportunities through the Secondary Plan area will provide mobility choice and could logically feed into the intensification corridor along Gordon Street and community node planned for the Gordon Street / Clair Road intersection.

- The Secondary Plan appropriately spaces collector streets so as to support the location of transit stops within a short distance of typical start / end of trip locations, and allows transit stops to be integrated with the trail network and / or sidewalk system to ensure pedestrian connectivity to transit facilities.

- There are opportunities to plan and accommodate "*first / last mile*" connections from future transit services. There is a substantial opportunity create links between multi-modal trip making, including the use of active transportation modes to connect transit service provisions to origins and destinations within the Secondary Plan area.

The Clair-Maltby Secondary Plan "Preferred Community Structure"

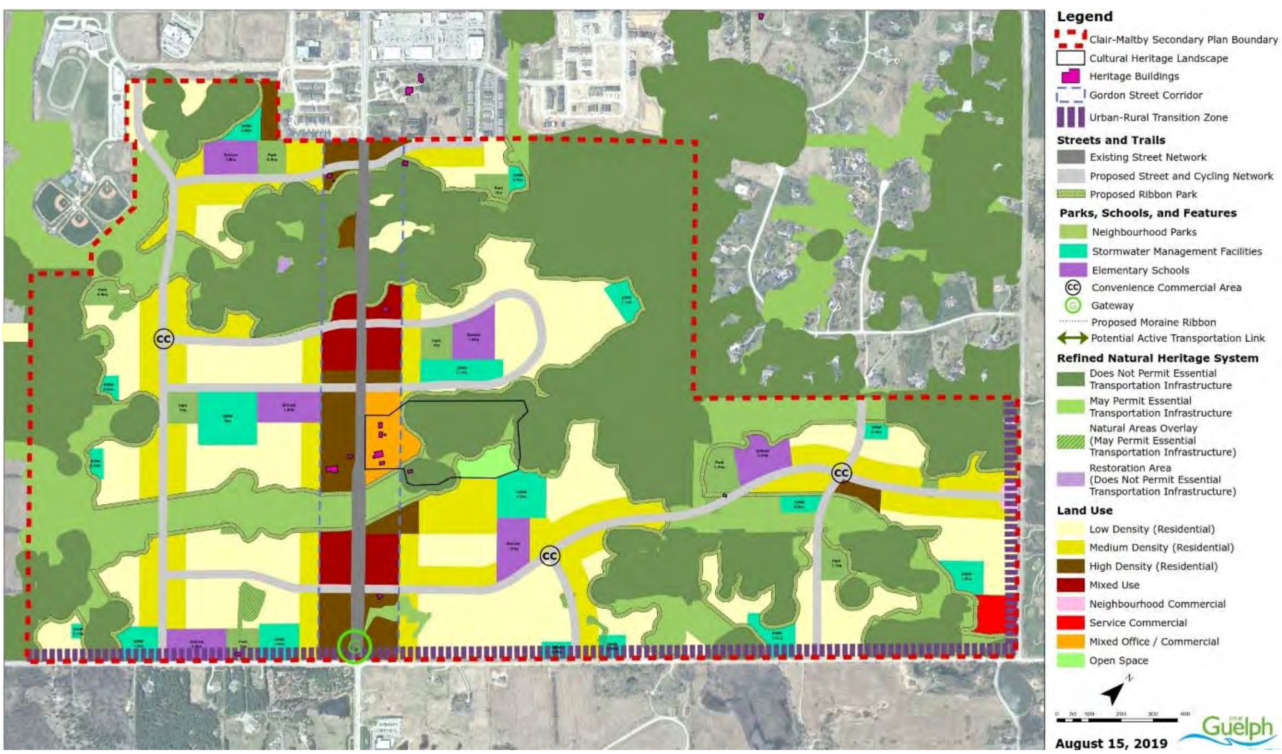
The Planning Process:

A Community Visioning Workshop was undertaken in September 2017 to assist in establishing a Conceptual Community Structure, which was carried-forward as part of meetings with a Community Working Group and Technical Advisory Group.

The Conceptual Community Structure was used in the development of three (3) Community Structure Alternatives, which formed the discussion of a 5-day planning and design charrette held in April 2018. The charrette was undertaken in order to develop a Preliminary Preferred Community Structure.

A "Preferred Community Structure" was developed as a planning objective for the future development of the Clair-Maltby Secondary Plan, and utilized as a basis for detailed technical analysis – including the transportation analysis prepared herein.

The Preferred Community Structure provides a general layout of land use, connective elements (arterial / collector streets and trails), community facilities, potential locations for storm water management facilities, existing cultural heritage recourses, and wetlands. The Preferred Community Structure is illustrated below.



Street Network:
A system of connected arterial and collector streets was advanced as part of the Preferred Community Structure, to support development of the Secondary Plan area, while respecting the Natural Heritage System and existing topography. The street network represents a modified grid system, which is intended to allow for frequent and robust routing for all street users, while respecting the important environmental features of the area.

A total of four (4) east-west oriented collector streets are proposed to cross Gordon Street between Gosling Gardens in the north and Maltby Road in the south. One (1) north-south oriented collector street is proposed to extend between Poppy Road in the north and Maltby Road in the south (west of Gordon Street). Two (2) additional north-south collector streets are illustrated in the south-eastern portions of the Secondary Plan area in order to establish a robust street-network grid in this location. The planned network of streets (and trails) are intended to achieve safe, convenient and comfortable travel and access for all street-users, with priority given to pedestrians, cyclists, and transit operations, to provide mobility choice and support city policy and modal-split objectives. Vehicular movement will be accommodated, but is not prioritized, and will be subject to levels-of-service which are more constrained then typical in new-build areas within the City.

The City of Guelph undertook a transportation modelling assessment of the anticipated future traffic conditions within the Secondary Plan area pending the introduction of a second north-south oriented collector street extending between Clair Road and Maltby Road (located east of Gordon Street). This assessment demonstrated that Gordon Street would be able to accommodate future traffic demands without a north-south collector street on the easterly side of Gordon Street. This modelling allowed a general understanding of the potential impacts that a collector street would have on the existing Natural Heritage System in two locations, as well as on an identified Cultural Heritage Landscape, and resulted in the removal of this collector road where it crosses these features, as part of the Secondary Plan.

The design of all collector streets and existing arterial streets is intended to allow for the operation of buses, to provide several opportunities and flexibility for transit vehicle routing throughout the Clair-Maltby Secondary Plan.

Gordon Street Main Street:
The Gordon Street corridor is a central element in the local transportation network, connects the area with the wider City and County, provides an opportunity for transit priority, and is envisioned as a main street / village core destination.

The Gordon Street right-of-way is intended to accommodate all street users through the delivery of multi-modal infrastructure. Its design will support the efficient and effective routing of transit services, the comfortable movement of cyclists and pedestrians, and accommodate for automobile travel.

A 4-lane Gordon Street cross-section is anticipated to appropriately accommodate traffic demands along the corridor given optimized signal timing and coordination, and the inclusion of ancillary turn lanes where necessary. Separate left-turn lanes should be provided at all junctions where left-turns are permitted, which may further support the introduction of a continuous left-turn / centre median lane along the extent of Gordon Street within the Secondary Plan area.

The Clair-Maltby Secondary Plan encourages dense, mixed-use development along the Gordon Street corridor to support the deployment of transit services. Transit priority measures can be potentially introduced along the Gordon Street corridor to increase the proportional uptake of transit use, and can include physical design elements to reduce transit vehicle delays and provide amenity and convenience to perspective riders, and policy measures to make transit more appealing, affordable and competitive with other travel modes.

Trail Network:
Trail locations are identified within the Master Environmental Service Plan for the Clair-Maltby Secondary Plan area, and are generally located along the edges of the Natural Heritage System. The function of the Trail Network is to provide additional pedestrian and cycling facilities throughout the Secondary Plan area in order to accommodate commuter and utilitarian pedestrian and cycling circulation and connectivity; provide recreational amenity and active transportation use; and augment the wider pedestrian and cycling networks in the southern parts of the City of Guelph.

Trail links are strategically located to compensate for limitations in the Secondary Plan street network (understanding the limitations of new road construction on the Natural Heritage System), and to provide the most direct and convenient pedestrian and cycling connections between residential areas and community facilities and commercial developments.

Opportunities for Transportation Demand Management

A Transportation Demand Management (TDM) framework will be pursued to establish a foundation for managing future travel demands upon development of the secondary plan area, to ensure that measures to promote transit and active transportation are implemented by way of the transportation amenities provided, as well as the built form of the community.

Upon review of existing policy statements in the Guelph Official Plan and the Guelph-Wellington Transportation Study relating to TDM, and a review of best practices in TDM policy in Ontario, it is recommended that the Clair-Maltby Secondary Plan incorporate a robust TDM framework requiring future development to pursue TDM measures.

Vehicle Parking Considerations

The Clair-Maltby Secondary Plan has the opportunity to develop vehicle parking standards that would provide parking supply to meet demands, where appropriate, and still encourage active transportation to support transit, the Gordon Street Main Street concept, and public realm.

There are a variety of factors influencing the development of parking requirements and standards, which are affected by population density, layout of the municipality, transit accessibility, location of the development and adjacent land uses.

Parking demands and supply can be managed through a combination of strategies implemented to guide overall development through the Clair-Maltby Secondary Plan area. The parking review and assessment provided herein includes a review of the in-force City of Guelph parking standards, a comparative review of other municipal parking standards, and various parking management strategies to affect supply and demand.

A number of policies can be implemented in support of reducing parking demands, and would provide a positive contribution towards the City's approach to parking management, including flexible area based parking standards, maximum and minimum parking standards, shared parking guidelines, parking reduction permissions, cash-in-lieu of parking policies, consolidated public parking strategies, on-street parking provisions, car-share parking provisions, TDM policies, public realm improvements, and unbundling of parking from the sale of residential units.

Traffic Calming Considerations

Particular attention may be directed to street segments in adjacency to schools or high-pedestrian areas, as well as other street segments where the propensity of vulnerable road users is more acute.

Community traffic calming strategies are primarily intended to address problems that include excessive speed, infiltration and congestion. A variety of measures are summarized herein, that are identified as Level I or Level II measures. Level I measures include minor changes to the roadway, that are generally lower cost and relatively straightforward, such as pavement markings, textures pavement/crossings and signage. Level II measures are generally more significant, more costly and require physical changes to the roadway.

Consultation with the various City stakeholders including Emergency Services, Guelph Transit, and Transportation Engineering is essential in reviewing and approving any mitigation solution. Community involvement is also a key part in determining the type of measures, if any, should be installed.

Multi-Modal Travel Demand Forecasting

Travel demand forecasts have been developed for residential and office land uses, understanding that new development is anticipated to be prominently residential, and that other retail and mixed-use development would result in relatively small travel demands, would often be internal to the Secondary Plan area, and could be considered ancillary to overall development travel demands.

Travel demand forecasts for development anticipated within the Clair-Maltby Secondary Plan have been developed for all travel modes based on existing area travel characteristics and those of proxy area developments, and to the extent that transit services and active transportation infrastructure is pursued as part of the Secondary Plan.

Travel demands for the Secondary Plan have been developed based on the most conservative (highest density) assumptions outlined in the "Land Development Budget" prepared by the project team. For the purposes of the analysis herein, a total of 10,125 residential units and 333 jobs were assessed.

The Clair-Maltby Secondary Plan would be anticipated to result in the order of 5,155 and 6,935 two-way trips during the weekday morning and weekday afternoon peak hours, respectively. Total trips include those trips that utilize "other" travel modes, including those using school buses, taxis, or ride-share services.

Approximately 3,770 and 5,785 two-way person trips are anticipated to be undertaken in a personal vehicle (as a driver or passenger), comprising approximately 73% to 83% of all trips during weekday morning and afternoon peak hours.

In the order of 455 and 555 two-way person trips are anticipated to be undertaken as a transit rider, comprising approximately 8% of all trips during weekday peak hours.

In the order of 615 and 345 two-way person trips are anticipated to be undertaken as a pedestrian or cyclists during the weekday morning and afternoon peak hours, respectively, comprising approximately 12% and 5% of all trips during the respective weekday peak hours.

Future Conditions Transit Assessment

A transit assessment was undertaken assuming improved transit provisions within the planning horizon (year 2031) of this study. It is anticipated that the local transit network will continue to evolve in sequence with development of the Secondary Plan area.

The Preferred Community Structure Plan has been advanced anticipating the introduction of frequent transit provisions on Gordon Street between Clair Road and Maltby Road, and the option for additional or expanded services routing along arterial and collector streets within the Secondary Plan area.

Person-based transit trips have been forecast and assigned to the area transit network in order to evaluate future transit demands.

A total of 455 and 555 new transit trips are forecast during the weekday morning and weekday afternoon peak hours, respectively. The majority of these transit trips are anticipated to route outbound during the weekday morning peak hour, and inbound during the weekday afternoon peak hour given the prevailing residential-related travel demands associated with the Secondary Plan.

It is expected that most transit trips to the Clair-Maltby Secondary Plan area will be captured by local transit services. Clair-Maltby Secondary Plan transit trips are predominantly anticipated to be oriented north of the Secondary Plan area, as transit riders tend to route to / from the downtown area, the University area, and central GO Transit Station. In the order of 370 and 450 two-way transit trips are anticipated to route to / from these areas during the weekday morning and weekday afternoon peak hours respectively.

Development contemplated as part of the Clair-Maltby Secondary Plan can be reasonably accommodated by transit services, given the introduction of new transit routes or the expansion of existing services operating within the Secondary Plan area, over the course of weekday peak hours.

Future Conditions Traffic Analysis

Future Background Traffic Scenario:

- Revisions to the local street network are planned within the 2031 planning year horizon, including planned improvements to Gordon Street and the extension of Southgate Drive to Maltby Road.

- Future background traffic operations analyses assess forecast future traffic demands resulting from general traffic growth and other site-specific background developments.

- Traffic patterns in the study area were reviewed over the past 10 years to provide an understanding of overall traffic growth trends on key street segments within the Secondary Plan area. Understanding the prevailing traffic growth trends associated with key arterial roads within the Secondary Plan area, traffic growth was applied to the 2031 planning horizon year.

- Area background developments provide an understanding of current changes within the vicinity of the Clair-Maltby Secondary Plan area. Traffic volumes associated with each of the identified background developments is assigned to the area road network.

Future Background Traffic Analysis:

- Overall signalized intersection traffic operations are generally acceptable under future background traffic conditions and are similar to those observed under existing traffic conditions, although longer delays and higher volume-to-capacity ratios are observed at the key Gordon Street / Clair Road and Victoria Road / Clair Road intersections relative to the existing conditions.

- The key Gordon Street / Clair Road intersection is anticipated to operate acceptably under future background traffic conditions, with an overall intersection v/c ratio 0.87 during the weekday afternoon peak hour. Relative to the existing condition, overall intersection v/c ratios increase by 32% during the weekday afternoon peak hour, which is generally the result of anticipated increases in through traffic volumes along Gordon Street and Clair Road, site-specific development traffic, and an increase in eastbound left-turn traffic volumes resulting from specific area developments.

- The future background traffic analysis indicates that the Victoria Road / Clair Road intersection generally operates acceptably, despite an increase in traffic delay and volume-to-capacity ratios. Relative to the existing condition, overall intersection v/c ratios increase by 25% during the weekday afternoon peak hour, which is generally the result of anticipated increases in southbound right-turn and eastbound left-turn traffic volumes resulting from area-specific background developments.

- Traffic operations at unsignalized intersections within the study area are anticipated to continue to operate similar to existing conditions.

Future Total Traffic Scenario:

- Revisions to the local street network are planned within the 2031 planning year horizon, as identified within the future background traffic scenario. Additionally, new streets contemplated as part of the Clair-Maltby Secondary Plan are included as part of the future total analysis scenario.

- Future Total traffic volumes are the sum of future background traffic volumes and traffic volumes resulting from development of the Clair-Maltby Secondary Plan area. Future Total traffic volumes have been forecast for existing study area intersections, as well as future collector road intersections as outlined within the Preferred Community Structure plan.

- Traffic forecast for Clair-Maltby Secondary Plan area development is based on the most conservative (highest density) Land Use Budget circulated for the purposes of this analysis.

Future Total Traffic Analysis:

- Future total traffic analysis is undertaken for a "base" scenario without improvements to existing intersections, and with a "recommended" scenario with suggested improvements to existing intersections.

- It is important to understand that the recommended intersection improvements are based on the modelling exercise undertaken herein, and that changes to the wider street network, improvements to regional corridors, and changes to travel behaviour and patterns can alter these recommendations.

- Traffic signal adjustments have been made as part of the analysis herein to accommodate for changes in traffic demands and patterns.

  Traffic signal timing along the Gordon Street corridor has been set to 110 second cycle lengths during the weekday afternoon peak hour. Signal timing cycle lengths have been made consistent along the Gordon Street corridor to allow for optimization of traffic signal off-sets and permit signal timing synchronization in order to best limit traffic delays, reduce transit vehicle delays, and manage vehicle queuing.

- A total of eleven (11) new traffic signals are considered as part of the analysis herein, to accommodate future traffic demands and facilitate pedestrian movement across busy traffic corridors.

  It is further recommended that two (2) existing STOP-controlled intersections be considered for signalization as development occurs within the Secondary Plan area.

- Recommended improvements are not intended to retain existing levels-of-service for motorists. However, improvements are intended to accommodate new traffic resulting from background traffic growth, current developments planned and under construction, and new traffic resulting from the development of the Clair-Maltby Secondary Plan.

- The improvements outlined in the following are in addition to signal timing adjustments. Improvements identified below relate to changes in the intersection lane configurations.

  Gordon Street / Clair Road Intersection:
    - Introduction of a northbound separate right-turn lane
    - Introduction of a southbound separate right-turn lane
    - Introduction of an eastbound separate right-turn lane

  Clair Road / Clairfields Drive Intersection
    - Introduction of a northbound separate left-turn lane
    - Introduction of an eastbound separate right-turn lane
    - Pavement restriping to accommodate a southbound separate left-turn lane

  Gordon Street / Poppy Road Intersection
    - Introduction of an eastbound separate left-turn lane
    - Introduction of an westbound separate left-turn lane

Laird Road / Clair Road West Intersection

- Introduction of a northbound separate right-turn lane

Future Victoria Road / Street E Intersection

- Introduction of a southbound separate right-turn lane

- The signalized intersection traffic analysis indicates that most study area intersections perform acceptably during the prevailing weekday afternoon peak hour, and without any traffic capacity constraints for any individual traffic movements, except for certain movements at the key Gordon Street / Clair Road, Victoria Road / Clair Road, and Clairfields Drive / Clairfields Extension / Clair Road intersections. Assuming the introduction of the recommended intersection improvements, the following movements are anticipated to operate with longer delays and near theoretical capacity during the weekday afternoon peak hour.

Gordon Street / Clair Road

- Eastbound left-turn 0.95
- Westbound left turn 1.02
- Westbound through / right-turn 0.95
- Northbound left-turn 0.99
- Southbound through 0.94

Victoria Road / Clair Road

- Eastbound left-turn 0.96
- Northbound left-turn 0.92
- Southbound through 0.93

Clairfields Drive / Clair Road

- Northbound left-turn 0.93

The above noted intersections are anticipated to operate with overall intersections v/c ratios of 0.92 to 1.01 during the weekday afternoon peak hour.

- Traffic operations at the Gordon Street / Clair Road intersection may be further mitigated through improvements to the Hanlon Parkway corridor, on-going improvements to the street network in the vicinity of the Gordon Street / Clair Road intersection, and the ability for motorists to respond to traffic delays at this intersection and utilize other streets in the local vicinity.

- Overall signalized intersection traffic operations within the Secondary Plan area are anticipated to be acceptable under future conditions, and are accommodated by the Preferred Community Structure street network plan.

- Traffic operations at the Gordon Street / Maltby Road and Clair Road West / Laird Road unsignalized intersections are anticipated of operate poorly under future total traffic conditions, and as such may warrant signalization.

- Five (5) new unsignalized intersections were reviewed within the future total traffic analysis scenario. These intersections are identified as new junctions within the Preferred Community Structure street network plan, and are recommended to operate under STOP-control.

- All other movements at unsignalized intersections within the study area are shown to operate at LOS C or better during the weekday afternoon peak hour, which is acceptable.

- A typical 4-lane street section is anticipated to sufficiently accommodate forecast traffic demands along the Gordon Street corridor, understanding the need for ancillary turn lanes – specifically separate left-turn lanes at all intersections where left-turns are permitted. Pending the frequency of separate left-turn lanes, a continuous left-turn / centre median lane along the extent, or portions of, Gordon Street within the Secondary Plan area may be warranted.

Gordon Street / Maltby Road Roundabout Analysis:

- The intersection of Gordon Street and Maltby Road is considered for the introduction of a roundabout. A roundabout, at this junction, may be appropriate considering:
  - its location as a gateway to / from the City of Guelph,
  - its boundary character between urban Guelph and rural Wellington County, and
  - the opportunity provided by a roundabout to accommodate transit vehicle loop functions as an alternative to an off-street turnaround facility or around-the-block routing.

- Understanding the opportunity for a roundabout at the junction of Gordon Street and Maltby Road, roundabout traffic analysis was completed under the future total traffic scenario, assuming typical roundabout geometry for a 2-lane traffic circle.

- Should a traffic roundabout be pursued for the junction of Gordon Street and Maltby Road, traffic operations are anticipated to be acceptable. Further consideration would be required as to it functional design and ability to appropriately accommodate pedestrian crossings and transit vehicle and articulated truck routing.

2.0 INTRODUCTION

2.1 CLAIR-MALTBY SECONDARY PLAN AND MESP STUDY

The City of Guelph is undertaking the Clair-Maltby Secondary Plan and Master Environmental Servicing Plan (MESP) Study to comprehensively plan for the development of the area of Guelph located south of Clair Road and north of Maltby Road - the Clair-Maltby Secondary Planning Area. The lands are being considered for development to accommodate population and employment growth for the City in accordance with the requirements of Provincial policy, in particular Places to Grow: Growth Plan for the Greater Golden Horseshoe.

The MESP and Secondary Plan are being undertaken concurrently as part of the process approved by City Council which is designed to address the complexity of planning for development in the Clair-Maltby Secondary Planning Area. The MESP offers an integrated approach that coordinates the requirements of both the *Environmental Assessment Act* and the *Planning Act*.

2.1.1 Study Process

The Study Process will be undertaken in three phases:

- Phase 1 – Background;
- Phase 2 – Community Structure; and,
- Phase 3 – Secondary Plan and MESP.

2.2 PRIOR SUBMISSION: PHASE 1 MOBILITY STUDY BACKGROUND REPORT

A Mobility Study Background Report was prepared and submitted to the City of Guelph in June 2018. The background reporting and findings of that study are further incorporated into this current report to provide a comprehensive review of transportation considerations related to the Secondary Plan.

The purpose of the Phase 1 Mobility Study Background Report was to review available background information, as well as the details and conditions of supporting studies as part of the basis for the Secondary Plan. The Background Report was compiled to provide an overview of existing transportation conditions, plans, policies, and standards on which to establish an area transportation plan, and to inform a future transportation structure and network for the study area lands. Specifically this report considered the following.

Technical Overview of Phase 2 Analysis Work

A discussion of the final transportation study including community consultation and visioning exercises, detailed technical analysis, and considering multi-modal transportation networks for the secondary plan area. Phase 2 analysis work is included herein as part of this comprehensive Transportation Master Plan Study.

Review of Background Studies
A review of relevant existing background planning and transportation studies and reports, as well as any other documents determined to be relevant to informing the planning of development within the subject lands. For example, a review of existing City of Guelph road standards were included, with a view to identifying options for dealing with multi-modal transportation needs.

A review of background studies also provides a basis for documentation of the planned transportation network, and a summary of the transportation planning context and key policy objectives.

Review of Available Data
Available traffic data in the vicinity of the Clair-Maltby Secondary Plan area in the southern part of Guelph was obtained and reviewed. This data includes road network utilization counts (traffic counts), traffic accident data, and data from the most recent (2016) Transportation Tomorrow Survey (TTS). Existing travel data is summarized herein to document existing travel patterns and traffic operations, and to review collision frequency and trends.

A Summary of Challenges and Opportunities
A summary of area challenges and opportunities, from a transportation perspective, have been made available to provide direction on meeting performance measures – such as target travel mode splits, walkability, cycling connectivity and traffic operations.

2.3 PHASE 2 MOBILITY STUDY TRANSPORTATION REPORT

A work plan was established for Phase 2 of the Mobility Study, which included a community visioning exercise, technical analysis work, design matters, and determining an appropriate street network. Key components of Phase 2 of the Mobility Study are included herein and described briefly in the following.

Community Visioning Exercise
Information from the Phase 1 Background Report was provided to inform a community visioning exercise. Key inputs to this exercise were to include an overview of the existing and planned transportation network (including roads, transit, and active transportation infrastructure), the identification of existing transportation network constraints (related to natural features and/or capacity), and existing road standards that are available to address multi-modal mobility objectives. A Conceptual Community Structure was derived from the community visioning exercise to provide the basis for the development of three (3) community structure alternatives.

Close attention was paid to special designations and considerations derived from the community visioning exercise, including such concepts as a Main Street / Transit Spine designation for Gordon Street, street cross-sections supportive of multi-modal travel, traffic management and safety, and vehicle parking considerations.

Preferred Transportation Network
Using input from the CEIS and the parallel MESP studies, the constraints to developing an internal (collector) road network were identified and documented. Alternative conceptual transportation networks were prepared understanding the need to minimize impacts to the natural heritage system while providing an appropriate level of mobility for future residents, employees and visitors of the Secondary Plan area. A key priority of the preferred transportation network is to prioritize the needs of active transportation and transit users so as to create a transportation network that promotes these alternative modes.

Plans were developed to illustrate the alternative conceptual internal community road networks, and their connectivity with external transportation elements, adjacent neighborhoods and communities, and existing and proposed community services (such as recreational facilities and schools). All travel modes addressed in these plans, namely roadways, transit routing and nodes, cycling routes and trails, and pedestrian facilities.

The preferred transportation network formed the basis of transportation planning and analysis work undertaken herein.

Technical Analysis
On the basis of the preferred transportation network, and in consultation with City staff, a multi-modal Transportation Impact Study (TIS) was undertaken. This work was undertaken in conformity with the City of Guelph's "Traffic Impact Study Guidelines", and comprised a standard four-step analysis (trip generation, distribution, mode choice, and assignment). The scope and horizon years for this work was developed in coordination with City staff.

Upon establishing an analysis scope and planning horizon, analyses was conducted by BA Group with supporting data provided by the City to establish base future background travel demands on an existing and planned transportation network. A multi-modal travel demand forecasting exercise and subsequent distribution and assessment of various travel modes was undertaken. Directional distribution information was extracted from the Transportation Tomorrow Survey (2016 TTD Data Set).

The results of the technical analyses is used to compile a specific set of recommendations as they relate to the preferred transportation network, with respect to road widenings, intersection control (signalized or unsignalized), intersection turn lane configurations, and roundabout configurations (if appropriate).

A quantitative and qualitative assessment of the intersections within the scope of the Clair-Maltby Secondary Plan was undertaken with a view to ensuring that the following are provided for:

- adequate vehicular capacity,
- appropriate and safe active transportation features and facilities; and,
- transit priority where feasible.

This assessment included a review of the potential for the implementation of a roundabout located at junction of Gordon Street and Maltby Road. This pragmatic review accounts for the needs of all travel modes, particularly transit and emergency vehicles, cyclists, and pedestrians.

School Zones
Special consideration was given to traffic management elements and features in the vicinity of schools so as to ensure that the needs of pedestrians are prioritized. Traffic calming measures and processes are identified, and may be considered as part of future development of the lands and in consultation with stakeholders.

Vehicle and Bicycle Parking
A review of City of Guelph parking standards was undertaken, and a parking plan was developed for the community. This plan provides direction for addressing on street and off street parking provisions, and strategies to effectively reduce overall parking demands and efficiently accommodate resulting parking demands through consolidated and shared parking supplies.

Consideration is given to flexible design of parking facilities so that they can be adapted to other uses or combined with other uses if demand evolves over time.

Recreational Trails
The community transportation network concept includes a concept trail plan. This trail plan was developed in concert with the CEIS work so as to ensure that the trail system does not impinge on natural heritage features. The system is conceptually arranged with a view to connecting with, expanding and enhancing the active transportation elements in street rights-of-way. Off road trail standards are designated so as to meet appropriate standards (AODA and FADM), and are developed in conjunction with the parallel MESP studies so as to ensure that environmental and storm water considerations are dealt with.

Transportation Demand Management Framework
A Transportation Demand Management (TDM) framework is pursued to establish a foundation for managing future travel demands upon development of the Secondary Plan area, to ensure that measures to promote transit and active transportation are implemented by way of the transportation amenities provided, as well as the built form of the community. Target mode shares and viable options for achieving these targets are established for future development.

2.3.1 Report Format

The Transportation Master Plan Study is intended to address the requirements of the Secondary Plan process, appropriately suggest transportation policy directions for future development of Clair-Maltby Secondary Plan area, and advise on the technical specifications of planned development.

This report combines elements of the June 2018 Mobility Study with transportation analysis and discussion of various transportation design and policy considerations.

It should be noted that material from the June 2018 Mobility Study has been updated herein to account for changes in background documents and travel behaviour data where appropriate. Derived from the June 2018 Mobility Study, and included herein is:

- an overview of the existing transportation network;
- a review of existing travel behaviours and prevailing travel demands on the area transportation network;
- a summary of historical collision data;
- an overview of the area planning context from a transportation perspective; and
- a review and summary of relevant transportation policies, plans, and design guidelines.

This report builds upon the existing context description and relevant transportation data, polices, and guidelines outlined in the June 2018 Mobility Study to inform and guide the development of a preferred community structure plan for the Clair-Maltby Secondary Plan area and then test the plan through technical analysis. In addition to the elements listed above, this report:

- summarizes the planning process and community engagement undertaken in deriving a “Preferred Community Structure” plan for the subject lands;
- outlines the Preferred Community Structure mobility network, conceptual street plan and trail plan, and the role of Gordon Street within this network;
- provides an outline of Transportation Demand Management (TDM) measures and strategies that that can be pursued to support mobility choice for perspective residents, employees, and visitors of new development with the Clair-Maltby Secondary Plan area;
- a summary of vehicle parking requirements and parking management strategies that can be implemented to efficiently accommodate, and reduce to the extent practical, vehicle parking demands;
- a summary of traffic calming objectives and strategies to be implemented, if warranted, in appropriate locations of the Clair-Maltby Secondary Plan street network;
- forecasting of multi-modal travel demands resulting from conservative (most dense) land use budgets prepared to estimate development potential of Clair-Maltby Secondary Plan area;
- an assessment of resulting transit rider demands resulting from conservative (most dense) land use budgets prepared to estimate development potential of Clair-Maltby Secondary Plan area;
- an assessment of resulting traffic operations on the study area street network as a result of conservative (most dense) land use budgets prepared to estimate development potential of Clair-Maltby Secondary Plan area; and
- a summary of street network improvements recommended to accommodate potential traffic demands within a future total development scenario.

3.0 EXISTING TRANSPORTATION CONTEXT

3.1.1 The Clair-Maltby Secondary Plan Area

The Secondary Planning Area is located in the south end of the City of Guelph. It is bounded by Clair Road to the north, Victoria Road (City Boundary) to the east, Maltby Road (City Boundary) to the south and the eastern limits of the Southgate Business Park to the west. It has an area of more than 520 hectares which is currently primarily rural and agricultural in nature. The study area is illustrated in Figure 1.

3.1.2 Existing Transportation Elements

3.1.2.1 Existing Road Network

The secondary plan area is served by a series of rural and urbanized roads. Clair Road to the north of the study area, and Gordon Street north of Poppy Drive have been urbanized and widened to accommodate 2 to 4 travel lanes (plus auxiliary turn lanes), curbs and sidewalks. Other major roads in the area, including Gordon Street south of Poppy Drive have typical rural cross-sections and are have 2 travel lanes.

The area road system, under existing conditions is generally defined by three north-south routes: Gordon Street, Victoria Road, and Southgate Drive; and two east-west routes: Clair Road and Maltby Road. Additionally, Highway 6 (the Hanlon Parkway) operates in a north-south direction just west of the secondary plan area.

Gordon Street is a major north-south corridor that becomes Brock Road beyond the City boundary and I the City of Guelph with Highway 401 in the south, providing an important alternative (Highway 6 being the primary route) link for commuters connecting between Highway 401 and the City.

The existing local street network, including intersection lane configuration and traffic controls, is illustrated in Figure 21.

An overview of the surrounding municipal street network highways and key roadways is provided below.

Highway 6 (Hanlon Parkway) is a provincially-owned and maintained limited access highway (in the Guelph area) operating in a north-south direction west of the Secondary Plan area. Although the highway has limited access, and operates with a fully grade-separated interchange at Laird Road, it intersects with Maltby Road at an unsignalized intersection (east-west STOP-control). The highway operates with an 80 km/h. posted speed limit and two travel lanes in both the northbound and southbound directions. Northbound and southbound travel lanes are generally separated by a grassed median.

Highway 6 is a major traffic route linking the City of Guelph with the wider region and specifically with Highway 401 in the south. The highway begins at Highway 403 in the City of Hamilton (Dundurn) in the south and extends north through the City of Guelph to Tobermory at the northern end of the Bruce Peninsula.

Highway 6 includes a full interchange at its crossing with Laird Drive, which becomes Clair Road through the study area. The highway also intersects at an unsignalized intersection with Maltby Road, whereby eastbound / westbound traffic movements on Maltby Road operate under STOP-control.

Gordon Street is a two-way arterial road running north-south through the City of Guelph. Gordon Street becomes Brock Road south of the City Boundary at Maltby Road. The street extends south of Highway 401 as Highway 6, and north of Waterloo Avenue in Downtown Guelph as Norfolk Street, Woolwich Street, and then Highway 6 north of Woodlawn Road.

In the site vicinity, it has a 4-lane urban cross-section north of Poppy Drive and a 2-lane rural cross-section south of Poppy Drive. The roadway includes separate left-turn lanes at signalized intersections and bicycle lanes in both directions within the City limits. The street has an existing speed limit of 60 km/h. in its urban section, and a 70 km/h. speed limit in its rural section south of Poppy Drive.

Victoria Road is a north-south direction roadway stretching through the City of Guelph from Wellington County Road 36 in the south (at Highway 401) to Highway 6 in the in the north. In the site vicinity, Victoria Road has a basic 2-lane rural cross section, with a separate north left-turn lane at Clair Road. Victoria Road intersects with Maltby Road in two separate T-intersections, with the section of Victoria Road north of Maltby Road extends from a point approximately 55 metres east of where the section of Victoria Road south of Maltby Road terminates.

Southgate Drive services industrial and employment areas in the southwest area of Guelph east of Highway 6 and north and south of Laird Road. Southgate Drive is a two-way roadway with a 50 km/h. speed limit and a basic 2-lane cross section and auxiliary left-turn lanes at it intersections with Laird Road and Clair Road. The street loops north of Laird Road, intersecting with Laird Road at two points, and extends south of Laird Road (at its western intersection) before terminating in a cul-de-sac approximately 1.4 kilometres south of Clair Road.

Clair Road is a two-way road running east-west between Hanlon Road / Crawley Road in the west (just east of Highway 6) and Victoria Road in the east. It generally operates with a 2-lane cross section except for the “urbanized” portion of the street which extends from 225 metres east of Laird Road to approximately 140 metres east of Beaver Meadow Drive – where the street generally has a 4-lane urban cross section. Within the street’s urban portion, auxiliary left-turn lanes are provided at all intersections, as well as bicycle lanes in both directions adjacent to the curb. Clair Road has a speed limit of 60 km/h.

Laird Road is a two-way road oriented generally in an east-west direction between Clair Road in the east and the street’s termination approximately 175 metres west of Quaterman Road. It generally operates with a 4-lane cross section west of the street’s signalized intersection with Southgate Drive, and a 2-lane cross section between this point and Clair Road in the east. West of the street’s signalized intersection with Southgate Drive to Cooper Drive, bicycle lanes are also provided in both directions adjacent to the curb. The street intersects with Highway 6 as a grade-separated interchange, providing a high-capacity traffic connection to Highway 6 in the Secondary Plan area. Laird Road has a speed limit of 50 km/h.

Maltby Road is a two-way rural road oriented generally in an east-west direction between Nassagaweya-Puslinch Townline in the east and Highway 6 in the west. West of Highway 6, Maltby Road continues as Concession Road 4 to Roszell Road near the Town of Hespeler. It operates with a 2-lane cross section and has a speed limit of 50 km/h.

Date Plotted: March 5, 2019 Filename: \\bafp02\data\WP\59\76\06 Clair Maltby SP\Graphics\Fig01-03-SC.dwg

STUDY SCOPE LOCATION AND CONTEXT

BA Group

Clair Maltby Secondary Plan
5976-06 March 2019

Figure 1

3.1.2.2 Planned Road Network Improvements

A planned future public road network for the south Guelph area is discussed further in Section 4.3.2, while previously conducted environmental assessments for road widenings and improvements is detailed in Section 5.0 of this report.

3.1.3 Existing Transit Services

Guelph Transit is responsible for transit service in the vicinity of the Secondary Plan area, and provides services within the City of Guelph generally. Guelph Transit also connects the City of Guelph with major transit terminals in the Downtown area, including the University of Guelph and Guelph Central Station which provide connections to regional and inter-city transit services – including GO Transit, Greyhound and VIA Rail.

Transit routes do not currently service the Secondary Plan area except for a section of Clair Road west of Gordon Street, as the existing land uses are predominately rural and sections of Clair Road and Gordon Street were recently urbanized. There are currently no Guelph Transit services on Gordon Street, Victoria Road or Maltby Road. With build-out of the Secondary Plan area, it is anticipated that transit services will be introduced southwards with in the City of Guelph.

A number of service transit bus routes currently operate north and west of the Secondary Plan area on Clair Road, Laird Road and Southgate Drive to service existing residential areas north of Clair Road and employment areas along Southgate Drive. These routes operate north of Clair Road serving Hanlon Industrial Park (Route 16), the University of Guelph (Routes 5 and 99), and the Guelph Central Station (Route 99) – which is located approximately 7.2 kilometres north of the subject lands. These routes are identified in Table 1, and may be revised to extend or reroute to the subject site area.

TABLE 1 EXISTING TRANSIT SERVICE FREQUENCY – MONDAY TO FRIDAY

Transit Route	Transit Type	Serviced Road	Morning Peak Hour	Afternoon Peak Hour
Route 5	Bus	Gordon St. / Farley Dr. / Goodwin Dr. / Victoria Rd.	20 min headway	2 to 3 buses in pk. hr. (variable headways)
Route 16	Bus	Gordon St. / Clairfields Dr. / Clair Rd. / Laird Rd. / Southgate Dr.	30 min headway	30 min headway
Route 99 (Mainline)	Bus	Gordon St. / Clair Rd. / Gosling Gdns. / Clairfields Dr.	10 min headway	10 min headway

Notes:
Bus route and schedule information effective January 7th, 2018.

Details related to future plans and transit-related policies, that will impact the future transit network in the Secondary Plan area, are summarized in Sections 4.6 and 7.0 of this report.

3.1.4 Pedestrians and Cyclists

Cycling and pedestrian facilities in the Secondary Plan area are limited under existing conditions, owing to the rural character of existing lands.

However, pedestrian sidewalks and bicycle lanes are currently provided along urbanized sections of Clair Road and Gordon Street within the Secondary Plan area. Bicycle lanes are provided on Gordon Street to the City limit, including within the rural section of the street south of Poppy Drive. Sidewalks are also provided along sections of new streets southeast of the Gordon Street / Clair Road intersection.

The City of Guelph has actively pursued plans detailing future active transportation networks. A city-wide cycling network plan was established as part of the City's Transportation Master Plan – detailed in Section 4.6, while additional trail and active transportation plans are summarized in Section 8 of this report.

3.2 EXISTING AREA TRAVEL CHARACTERISTICS

The Secondary Plan area is located in the south portion of the City of Guelph in a largely rural area with few existing transit and cycling / pedestrian facilities. These facilities will be pursued as part of the Clair-Maltby Secondary Plan, and would be anticipated to build on the sustainable transportation infrastructure and services made available to more established and recently developed areas in the south portion of the City.

A review of the travel characteristics information provided by the Transportation Tomorrow Survey (TTS) for trips made in the areas immediately north of the Secondary Plan area (herein referred to as the "South Guelph Area") confirms, unsurprisingly given the site location, that a majority of trips are undertaken in a private automobile either as a driver or passenger. However, a proportion of travel is undertaken using non-auto means, specifically for peak direction travel during peak travel periods.

A review of the TTS travel characteristics of trips being made to / from the South Guelph Area during the weekday peak periods is provided in the following sections. The weekday peak travel periods analyzed include trips starting during the weekday morning peak period from 7:00 a.m. to 9:00 a.m. and during the weekday afternoon peak period from 4:00 p.m. to 6:00 p.m. The study area reviewed generally consists of the residential neighbourhoods east and west of Gordon Street between Kortright Road in the north and Clair Road in the south (2006 TTS Zones 8062, 8064, 8067-8076, 8078-8081). TTS data is reflective of the 2016 survey set, and has been updated relative to the June 2018 Mobility Study prepared as part of the Phase 1 work plan.

TTS data collection efforts have not, to date, surveyed travel patterns for weekend trips, limiting available data for the weekday periods.

3.2.1 Modal Share

Travel behaviour characteristics for trips to from the South Guelph Area during the weekday morning and afternoon peak periods are summarized in Table 2. Detailed TTS data calculations are included in **Appendix A.**

TABLE 2 MODAL SPLIT (TTS – 2016, SOUTH GUELPH AREA)

Mode	Morning Peak Period Inbound	Morning Peak Period Outbound	Afternoon Peak Period Inbound	Afternoon Peak Period Outbound	Total Peak Period Travel
Auto Driver [4]	67%	67%	76%	76%	**72%**
Auto Passenger [5]	7%	8%	9%	21%	**10%**
Transit	2%	8%	9%	2%	**6%**
Walk	17%	6%	1%	1%	**5%**
Cycle	3%	2%	2%	0%	**2%**
Other [6]	4%	9%	3%	0%	**5%**
Total	100%	100%	100%	100%	**100%**

Notes:
1. Based on 2016 TTS results for morning (7:00 a.m. – 9:00 a.m.) and afternoon (4:00 p.m. – 6:00 p.m.) peak traffic periods.
2. Statistics specific to 2006 GTA Zones 8062, 8064, 8067-8076, and 8078-8081.
3. Trips represent an expanded value based on a sample of persons surveyed in the study area.
4. Auto driver trips (includes auto drivers and motorcycles).
5. Auto passenger trips (includes auto passenger trips only).
6. Other trips include school bus and taxi trips, consistent with The City's model document.

The proportion of people in the South Guelph Area who chose to drive a car during the morning and afternoon peak weekday periods is in the order of 70% to 75%. The balance of travel is undertaken, significantly, as a vehicle passenger (10%), while a small portion of travel is undertaken using transit or by walking / cycling (approximately 2% to 6%).

It should be noted that "other" trips during the weekday peak periods comprise of school bus trips – and that these represent approximately 4% to 9% of trips during the morning peak period. School bus trips comprise a smaller proportion of weekday afternoon peak period trips as they tend to occur before the afternoon peak travel period (before 4:00 p.m.).

The proportion of travel undertaken as a pedestrian, using a bicycle and by transit generally represents 7% of all trips, which is a small proportion of all trips and should be improved as part of new development planned within the Secondary Plan area.

It should be noted that the South Guelph Area (as reviewed in the above) comprises a low-density, suburban residential typology characterized by single detached dwelling units, considerable vehicle parking provisions and amenities, and a fragmented curvilinear street patterns. These features effectively discourage active transportation options, reduce transit efficiency and supportive densities, and prioritize automotive travel.

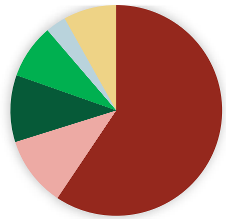
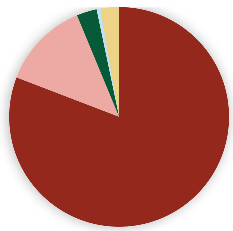
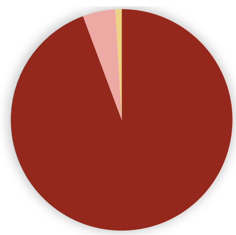
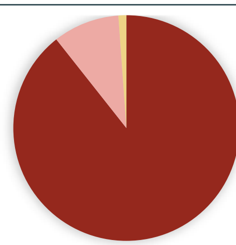
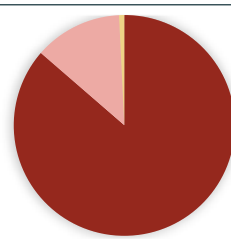
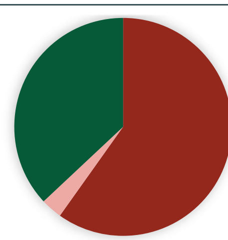
3.2.2 Trip Distribution Patterns

To understand the current travel distribution patterns of persons oriented to / from the South Guelph Area, TTS data was reviewed for weekday morning and afternoon peak period trips for all modes of travel. The study area reviewed consists of the South Guelph Area previously defined and illustrated in **Appendix A.**

The TTS data reveals that trips to / from the South Guelph Area during the weekday peak periods are predominately (74%) undertaken within the City of Guelph boundaries, and that many of these trips (54% of all trips) are "local" – south of the Eramosa and Speed Rivers. It is also important to note that a notable portion of trips are also oriented to / from Waterloo Region (10%), Halton and Peel Regions (7%), Wellington County (4%), and the City of Toronto (1%). Another 4% of trips were dispersed to other areas – notably the City of Hamilton and surrounding area.

A summary of existing resident travel characteristics including travel mode by certain areas of distribution is provided in Table 3. Detailed TTS data calculations are included in **Appendix A.**

TABLE 3 SOUTH GUELPH AREA: PEAK PERIOD TRIP DISTRIBUTION BY TRAVEL MODE

Destination Area	Proportion of All Trips	Mode Split	Legend
Local Area [1]	**54%**		Travel Mode: Auto Driver, Auto Passenger, Transit, Walk, Cycle, Other
Rest of Guelph	**20%** (5% Downtown)		
Waterloo Region	**10%**		
Halton / Peel Regions	**7%**		
Wellington County	**4%**		
City of Toronto	**1%**		

Note:
1. "Local area" consists of areas within the City of Guelph south of the Eramosa and Speed Rivers.
2. Another 4% of trips are oriented to "other" areas in the region.

A summary of weekday peak period (7:00 a.m. to 9:00 a.m. and 4:00 p.m. to 6:00 p.m.) travel behaviour and distribution to / from the South Guelph Area is derived from Table 3, and is provided in the following.

- It is notable that approximately 54% of existing peak period trips to / from the South Guelph Area are made “locally”. The majority of these trips are undertaken in a private automobile as a driver (59%) or passenger (11%). Many of these trips are also undertaken on a school bus, which one can conclude are “school trips” (7%). Approximately 21% of trips to / from the South Guelph Area are undertaken by transit and active transportation modes, most notably as transit riders (10%) or pedestrians (8%).

- Most commonly, trips to / from the South Guelph Area are made from within the City of Guelph itself. Approximately 74% of trips to / from the South Guelph Area during the weekday peak periods are made within Guelph, including approximately 50% locally (noted above), approximately 5% to the Downtown, and 19% in the rest of Guelph (north of the Eramosa and Speed Rivers). For trips within Guelph, but outside the local area as defined above, approximately 94% of trips are made by car (81% driver; 13% vehicle passenger), and only 3% are made by transit.

- After the City of Guelph itself, Waterloo Region represents the second largest jurisdiction for trips to / from the South Guelph Area. Approximately 10% of trips to / from the South Guelph Area are to / from Waterloo Region. TTS data indicates that trips are made by automobile (94% driver; 5% passenger; 1% school bus or taxi / rideshare).

- Approximately 7% of trips to / from the South Guelph Area are to / from Halton / Peel Regions. Trips between the South Guelph Area and Halton and Peel Regions are made by automobile (89% driver; 10% passenger; 1% school bus or taxi / rideshare).

- Approximately 4% of trips to / from the South Guelph Area are to / from Wellington County. Trips between the South Guelph Area and Wellington County are made predominately by automobile (86% driver; 13% passenger; 1% school bus or taxi / rideshare).

- A small proportion - approximately 1% of trips to / from the South Guelph Area are made to / from the City of Toronto. Relative to trips to / from other areas, trips to / from Toronto are more likely to be made by transit. A greater proportion of all trips to / from Toronto are taken by transit (37%), but it is still predominantly car-based travel (63%).

- In summary, trips made “local” to the South Guelph Area are more likely to be undertaken by sustainable transportation means (transit, walking, cycling) relative to trips made within the City of Guelph generally, or to trips made between the South Guelph Area and neighbouring Waterloo, Halton, and Peel Regions. During weekday peak travel periods, approximately 11% of “local” trips are made by walking or cycling, while another 10% is made by transit.

  During weekday peak travel periods, trips oriented within the City of Guelph (outside of the “local” area) and to neighbouring regions (Halton, Peel, Waterloo, Wellington County) are predominately and overwhelming undertaken in a private vehicle (see Table 3). During weekday peak travel periods, trips to / from the City of Toronto comprise a small proportion of overall travel (1%). Although trips to / from Toronto are still predominately undertaken by car, the transit mode share is greater than trips between the South Guelph Area and other areas analyzed herein.

3.3 COLLISION HISTORY

Collision data was made available for the 5-year time period from January 1st 2012 to March 31st, 2017, at a number of intersections within the study area, including:

- Clair Road at Gordon Street
- Clair Road West at Laird Road
- Clair Road West at Clairfields Drive West
- Clair Road East at Farley Drive
- Clair Road East at Beaver Meadow Drive
- Clair Road East at Victoria Road South
- Gordon Street at Maltby Road
- Gordon Street at Poppy Drive
- Victoria Road South at Maltby Road

Detailed collision reports are included in **Appendix B**.

A brief summary of collisions for the 2012 to 2017 (end March 2017) period, for each of the above-mentioned intersections, is provided in Table 4.

3.3.1 Collision Data Summary

A total of 134 collisions were report at the above-mentioned intersections within the identified time frame (63 month period from 2012 to 2017). Of the total volume of collisions, 21 (16%) resulted in a non-fatal injury, while 42 collisions (31%) report property damage only (no injury). All other collisions were non-reported or "non-reportable". No "fatal" collisions were reported.

Within the collision data scope, approximately 51% of the collisions recorded have occurred at the Gordon Street and Clair Road intersection. Most (greater than half) of these collisions were either "rear-end" collisions often resulting from following too closely or improper speed for road conditions, or "turning movement" collisions often resulting from left-turn traffic not yielding to on-coming traffic. Measures to reduce rear-end collisions include safety campaigns targeted at poor-weather vehicle operation, and greater enforcement. The introduction of protected left-turn phases at this intersection may have an impact on reducing turning movement collisions.

A total of 3 collisions involving vulnerable road users were recorded – in all instances involving cyclists. Two of this collisions occurred at the Gordon Street and Clair Road intersection, and one other at the Clair Road and Farley Drive intersection. Cycling facilities and pavement markings (including pedestrian crossings) should be highly visible and well-marked. Consideration may be made to reducing vehicle speeds and / or providing physical separation (bollards / buffers) between cycling facilities and vehicle travel lanes. It is noted that Gordon Street is planned to be upgraded to accommodate fully protected cycling infrastructure.

It should be noted that a total of 15 collisions were recorded at the Victoria Road South and Maltby Road intersection. This intersection is currently configured as two separate intersections (back to back T-intersections). This unusual configuration, which requires northbound / southbound traffic to conduct a right-turn then left-turn in short succession to continue in the same direction, may explain the rate of rear-end collisions at this intersection.

TABLE 4 COLLISION DATA SUMMARY

Intersection	Total Collisions (2012 to 2017)[1]	Average Collisions per Month	Impact Type	Classification	Collisions Involving Vulnerable Road Users
Clair Road / Gordon Street	69	1.1	• 31 rear-end • 12 turning movement • 8 angle • 10 single motor vehicle • 6 sideswipe • 1 approaching • 1 other	• 12 non-fatal injury • 22 property damage only • 35 non-reportable	• 2 involving cyclists
Clair Road West / Laird Road	4	0.1	• 2 rear-end • 1 single motor vehicle • 1 sideswipe	• 2 property damage only • 2 non-reportable	• 0 vulnerable road users
Clair Road West / Clairfields Drive West	13	0.2	• 7 rear-end • 1 turning movement • 2 angle • 3 sideswipe	• 13 non-reportable	• 0 vulnerable road users
Clair Road East / Farley Drive	13	0.2	• 1 rear-end • 7 turning movement (primarily east-west left turns) • 3 angle • 2 single motor vehicle	• 3 non-fatal injury • 5 property damage only • 5 non-reportable	• 1 involving cyclists
Clair Road East / Beaver Meadow Dr.	1	-	• 1 single motor vehicle	• 1 non-fatal injury	• 0 vulnerable road users
Clair Road East / Victoria Road South	12	0.2	• 3 rear-end • 5 angle • 3 single motor vehicle • 1 approaching	• 1 non-fatal injury • 6 property damage only • 5 non-reportable	• 0 vulnerable road users
Gordon Street / Maltby Road	5	0.1	• 2 angle • 3 single motor vehicle	• 2 non-fatal injury • 2 property damage only • 1 non-reportable	• 0 vulnerable road users
Gordon St. / Poppy Dr.	2	-	• 2 angle	• 1 non-fatal injury • 1 non-reportable	• 0 vulnerable road users
Victoria Road South / Maltby Road	15	0.2	• 7 rear-end • 2 turning movement • 6 single motor vehicle	• 1 non-fatal injury • 5 property damage only • 9 non-reportable	• 0 vulnerable road users
All Locations	**134**	**2.1**	• **51 rear-end** • **22 turning movement** • **22 angle** • **26 single motor vehicle** • **10 sideswipe** • **2 approaching** • **1 other**	• **21 non-fatal injury** • **42 property damage** • **71 non-reportable**	• **3 involving vulnerable road users**

Notes:
1. Data collection to end of March 2017

4.0 POLICY AND REGULATORY PLANNING FRAMEWORK

The Clair-Maltby Secondary Plan transportation elements are guided by the policies and plans set out in the policies outlined below.

4.1 THE PROVINCIAL POLICY STATEMENT (PPS)

The **Provincial Policy Statement (PPS)** was enacted in 2005 and the most recent version came into effect on May 1, 2020. The PPS provides policy direction on land use planning, development and transportation matters. All planning decisions must be consistent with the PPS. The PPS is based on the principles of "maintaining strong communities, a clean and healthy environment and a strong economy" (Part IV Vision). The PPS supports:

- connectivity within and among multimodal transportation systems, including across jurisdictional boundaries;
- safe and efficient movement of people and goods, appropriately addressing projected needs;
- density and a mix of uses to support the planning and development of alternative transportation modes and limit the length and need of vehicle trips and support current and future use of transit and
- active transportation;
- public streets that meet the needs of pedestrians and facilitate active transportation and community connectivity;
- efficient use of existing and planned infrastructure, including through Transportation Demand Management (TDM) strategies, where feasible;
- protection of rights-of-way for infrastructure including transportation and transit to meet current and project needs; and,
- protecting for long term goods movement facilities and corridors.

In addition, the PPS promotes planning decisions including intensification, redevelopment, accounting for existing building stock, promoting various types of housings, making efficient use of existing infrastructure, etc.

4.2 PLACES TO GROW

"A Place to Grow" - the Growth Plan for the Greater Golden Horseshoe was initially prepared by the Provincial government in 2006 and should be read in conjunction with the PPS.

All decisions made by municipalities with respect to planning matters must conform to the Growth Plan. The Places to Grow Growth Plan has been recently updated. In May 2019, the Government of Ontario released A Place to Grow: Growth Plan for the Greater Golden Horseshoe (APTG), and Amendment 1 to APTG was approved with an effective date of August 28, 2020. APTG and Amendment 1 replace the Growth Plan for the Greater Golden Horseshoe, 2006 that initially took effect on June 16, 2006 and guides growth and development within the Greater Golden Horseshoe over the next 30 years.

The Growth Plan provides a vision and a framework for managing growth. It requires all municipalities to implement policies to achieve intensification and higher-densities to make efficient use of land and infrastructure and support transit viability, and directs growth to *urban growth centres* and *transit corridors and* *stations areas*. The plan also calls for the consideration of climate change in planning for future growth that supports moving towards low-carbon communities and approaches to reduce greenhouse gas emissions. In these areas, the Growth Plan demands increased residential and employment densities to support existing and planned transit services, a mix of land uses, and designed access for various transportation modes to the transit facility including pedestrian and cycling infrastructure.

The Growth Plan requires land use planning to be coordinated with transportation planning and investment. The Plan states that transportation investments and the wider transportation system:

1. provide connectivity among transportation modes for moving people and for moving goods;
2. offer a balance of transportation choices that reduces reliance upon the automobile and promotes transit and *active transportation;*
3. be sustainable and reduce greenhouse gas emissions by encouraging the most financially and environmentally appropriate mode for trip-making and supporting the use of zero- and low-emission vehicles;
4. offer *multimodal* access to jobs, housing, schools, cultural and recreational opportunities, and goods and services;
5. accommodate agricultural vehicles and equipment, as appropriate; and
6. provide for the safety of system users.

The Growth Plan indicates that the design of new facilities and redesign of existing streets will adopt a complete-streets approach that will ensure the needs of all street users are accommodated; however, public transit will be the first priority for transportation infrastructure planning and major transportation investments. Supported by the implementation of complete street policies, municipalities will ensure that active transportation networks are comprehensive and integrated into transportation planning. The Growth Plan states that Municipalities will develop and implement transportation demand management policies in official plans or other planning documents or programs to:

1. reduce trip distance and time;
2. increase the modal share of alternatives to the automobile, which may include setting modal share targets;
3. prioritize active transportation, transit, and goods movement over single-occupant automobiles;
4. expand infrastructure to support active transportation; and
5. consider the needs of major trip generators.

The Growth Plan also speaks to accommodating goods movement, through linking international gateways and employment areas by appropriate transportation facilities / infrastructure, and that municipalities establish priority routes for goods movement.

4.3 CITY OF GUELPH OFFICIAL PLAN

The City of Guelph Official Plan is currently undergoing a statutory five year review. The Plan was established in 2001. The current Plan is a consolidation of the Official Plan policies in effect as of December 2014.

4.3.1 Official Plan Amendment 48

The City of Guelph Official Plan Amendment 48 was approved by City Council in June 2012, as the third and final phase in updating the City's Official Plan to ensure that its goals, objectives and policies conform and are consistent with provincial plans, polices and legislation.

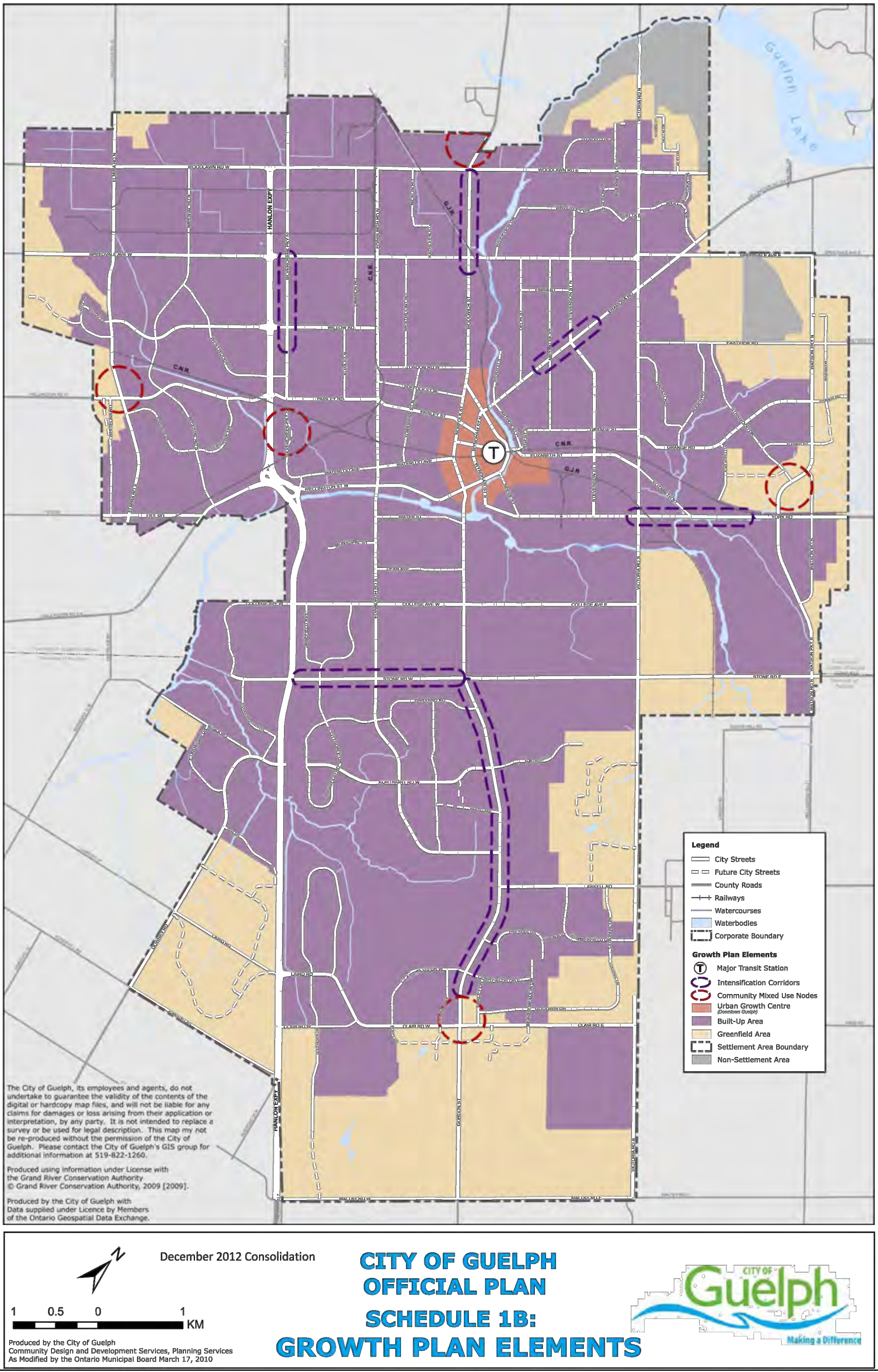
Transportation policies and objectives outlined in Amendment 48 are generally consistent with the initial Official Plan policies, and are described as part of the Current Official Plan in the following.

The City of Guelph Official Plan follows the policies laid out in the PPS and Growth Plan, and establishes a strategic vision, policies, actions and framework to support a healthy natural ecosystem, community services and facilities, education and employment opportunities, infrastructure that is supportive of alternative forms of transportation, community safety, and vibrant neighbourhoods and downtown.

Emphasis in the City of Guelph Official Plan is on maintaining quality of life, safety and stability of the community, and accommodating compact future development that avoids sprawl and is supported by existing infrastructure and services that can be supported by the efficient use of public expenditures. These objectives include developing a ***safe, efficient and convenient transportation system that provides for all modes of travel and supports the land use patterns of the City***.

The Official Plan identifies (in Figure 2) the Clair-Maltby Secondary Plan area as predominately a "greenfield area", while the Clair Road / Gordon Street junction is identified as a "community mixed-use node" (OP Schedule 1B). These areas are further noted as "reserve", "industrial" and "commercial" lands in OP Amendment 48 Schedule 2 (Figure 3).

In regards to development in new "greenfield" areas, the Official Pan directs new development to provide for a diverse mix of land uses at transit supportive densities (50 residents / jobs per hectare) that supports a multi-modal transportation network and efficient public transit that links to the City's Urban Growth Centre and surrounding communities. Transit, along with walking and cycling, are to be supported by new development for everyday travel. The identified community mixed-use node at Clair Road / Gordon Street, is an area identified for higher density and mixed-use development that serve the wider community. The node is intended to be well served by transit and facilitate pedestrian and cycling travel.



SCHEDULE 1B
CITY OF GUELPH OFFICIAL PLAN
- GROWTH PLAN ELEMENTS

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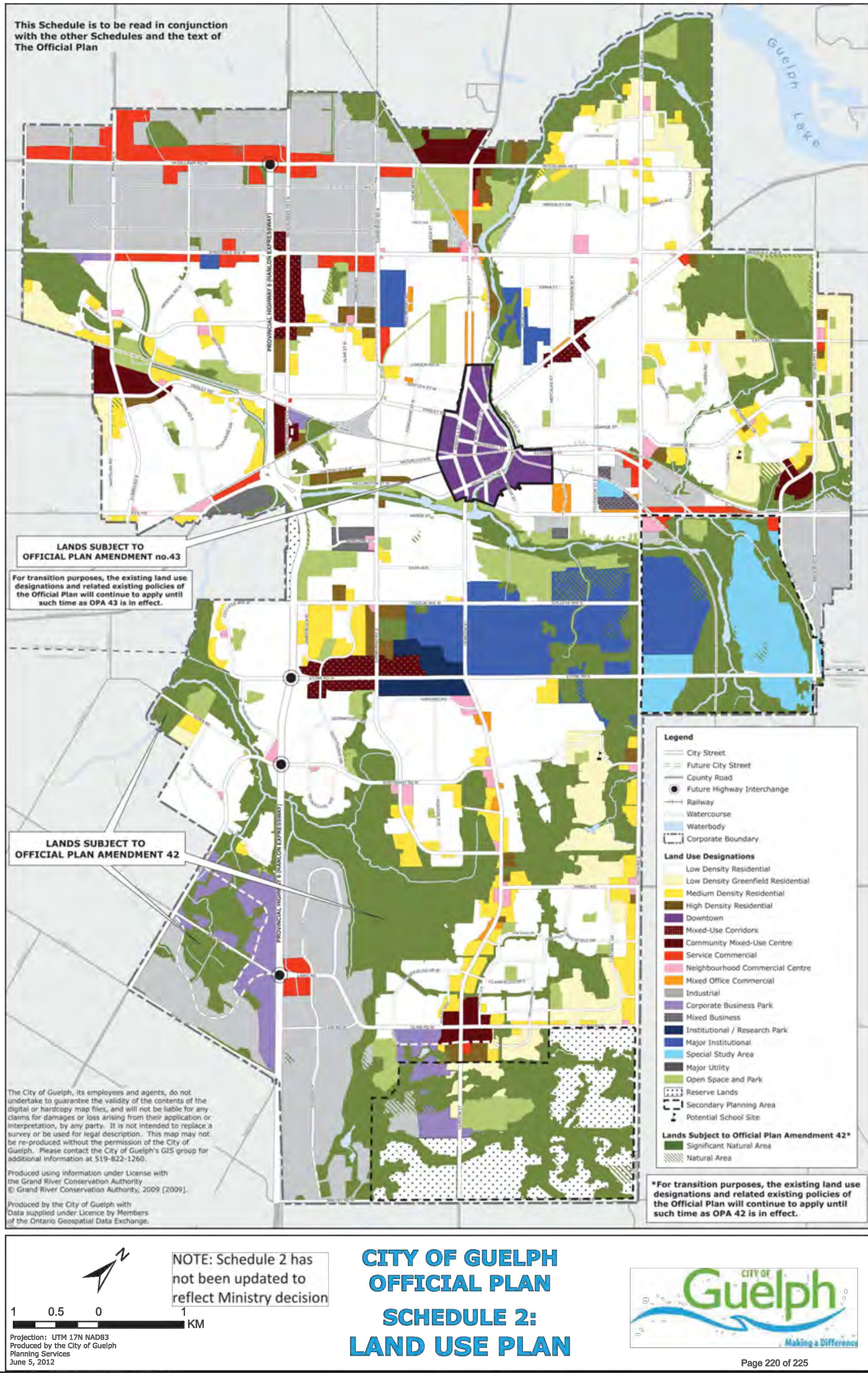
Clair Maltby Secondary Plan
5976-06 March 2019

Figure 2



SCHEDULE 2
CITY OF GUELPH OFFICIAL PLAN AMENDMENT 48 - LAND USE PLAN

Clair Maltby Secondary Plan
5976-06 March 2019

Figure 3

Transportation policies are established within the Official Plan, which plans and manages the City's transportation system to accommodate the following:

a) provide connectivity among transportation modes for moving people and goods;

b) offer a balance of transportation choices that reduces reliance upon any single mode and promotes transit, cycling and walking;

c) be sustainable, by encouraging the most financially and environmentally appropriate mode for trip-making;

d) offer *multi-modal* access to jobs, housing, schools, cultural and recreational opportunities, and goods and services;

e) provide for the safety of system users; and

f) ensure coordination between transportation system planning, land use planning, and transportation investment.

In planning for new - or reconfiguring existing - transportation infrastructure, the Official Plan dictates that proponents consider separation of travel modes within transportation corridors, use transit infrastructure to shape growth, place priority on increasing the capacity of existing transit systems, expand transit services to areas that are planned to achieved transit supportive densities, facilitate improved linages to / from Downtown Guelph and other intensification areas, and increase mode share of transit. In all cases, and consistent with provincial directives, public transit will be the first priority for transportation infrastructure planning.

In addition to prioritizing transit, the City is directed to develop transportation demand management (TDM) policies, and pedestrian and cycling networks to be utilized by planned new development.

4.3.2 City of Guelph Official Plan: Transportation

This section of the Official Plan generally defines the transportation policy for the City. The planning and design of the City Transportation system should meet the following objectives:

a) To derive a transportation system, involving all forms of transport modes, to move people and goods in an environmentally efficient and effective manner.

b) To ensure that the transportation system is financially feasible and has received an acceptable level of public approval.

c) To implement programs to facilitate and encourage greater and safer use of the bicycle as a mode of transport.

d) To support measures to improve the pedestrian environment and system.

e) To encourage the use and expansion of the public transit system to all parts of the City.

f) To work towards achieving a transit "*modal split*" of at least 10 per cent of the average daily City trips which represents more than a doubling of the existing transit ridership in the community.

g) To develop an appropriate hierarchy of roads to ensure the desired movement of residential, commercial, industrial and institutional traffic within and through the City.

h) To outline a proposed road network that will be subject to environmental review processes, either through the City's *development* planning approval process and/or through the Environmental Assessment Act.

i) To work in co-operation with the Provincial Ministry of Transportation and other local governments, to create a road network that can accommodate current and anticipated traffic movement volumes.

j) To work towards minimizing road/rail conflicts by relocating minor or underutilized railway lines and removal of at-grade railroad crossings where feasible.

k) To encourage the maintenance of adequate passenger and freight rail services.

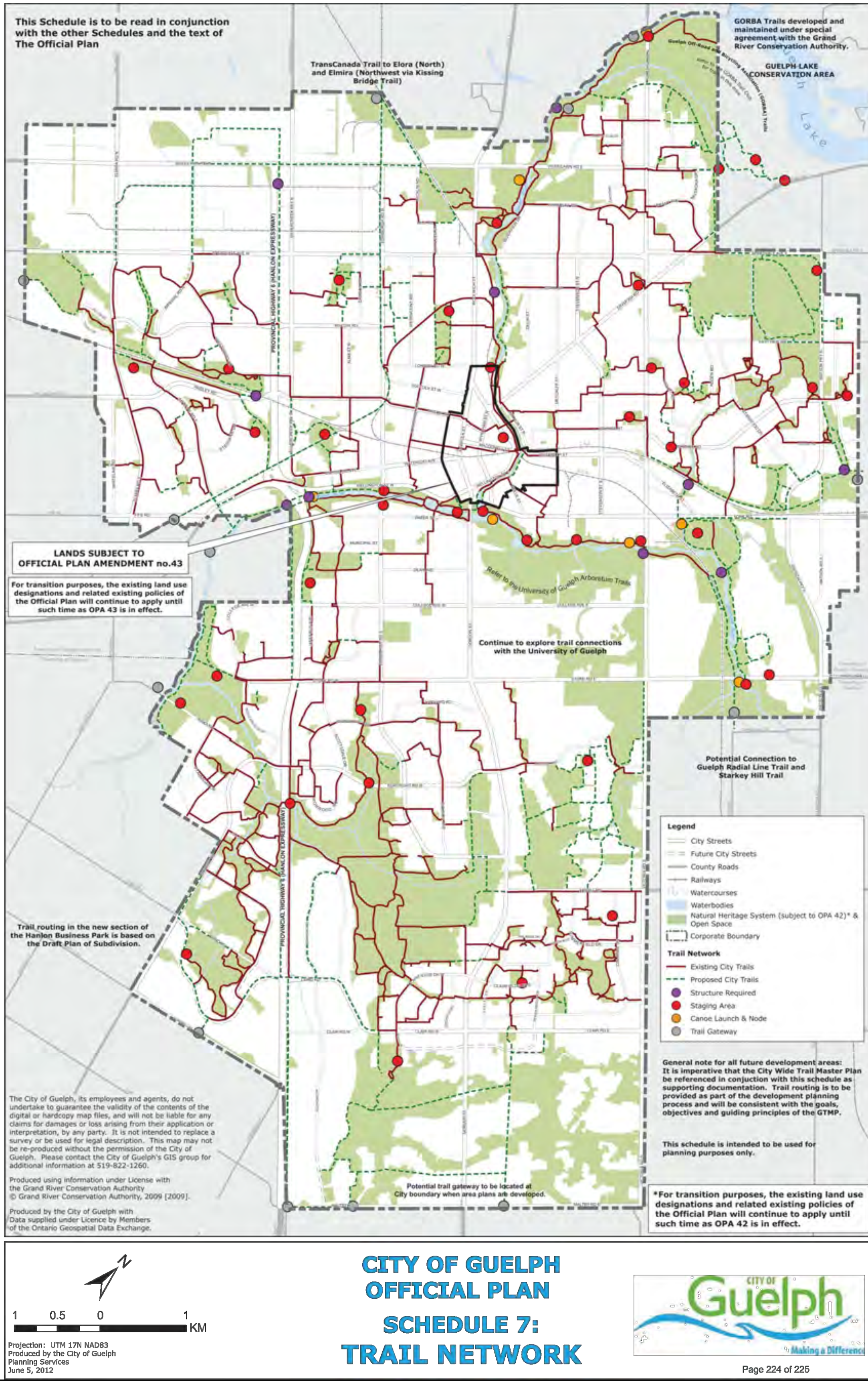
l) To ensure that adequate parking facilities are provided throughout the City.

m) To develop a transportation system that minimizes impact on the environment and aesthetic character of the City.

Furthermore, the Official Plan establishes plans and objects related to pedestrian and bicycle movement (bicycle network plan – Schedule 9C), public transport, roads, new / reconfigured road design, transportation and related urban environment, railways, and parking.

Key Pedestrian and Bicycle Policies
The City, through policies and standards, will support the creation of programs and facilities that will encourage walk and greater use of bicycles, through the integration of safe and convenient bike and pedestrian components into the design of new streets including shade trees, street furniture, lighting, street crossing and other traffic control. Additionally, all new development will provide for bicycle / pedestrian linkages and street sidewalks, and convenient and accessible bicycle parking facilities at major employment / shopping nodes and transportation terminals. New developments should provide conveniently located bicycle parking in close proximity to building entrances, and sheltered bicycle parking should be integrated into the built form.

The City, through policies established in the Official Plan, developed a Bicycle Network Plan that directs expansion of bicycle facilities in Guelph, including the Clair-Maltby Secondary Plan area. This network plan was updated as part of OPA 48 – Schedule 7 – and is complemented by the City Trail Network Plan, which is illustrated in Figure 4, and by the City of Guelph Active Transportation Network, 2017 (Figure 5).



SCHEDULE 7
CITY OF GUELPH OFFICIAL PLAN AMENDMENT 48 - TRAIL NETWORK PLAN

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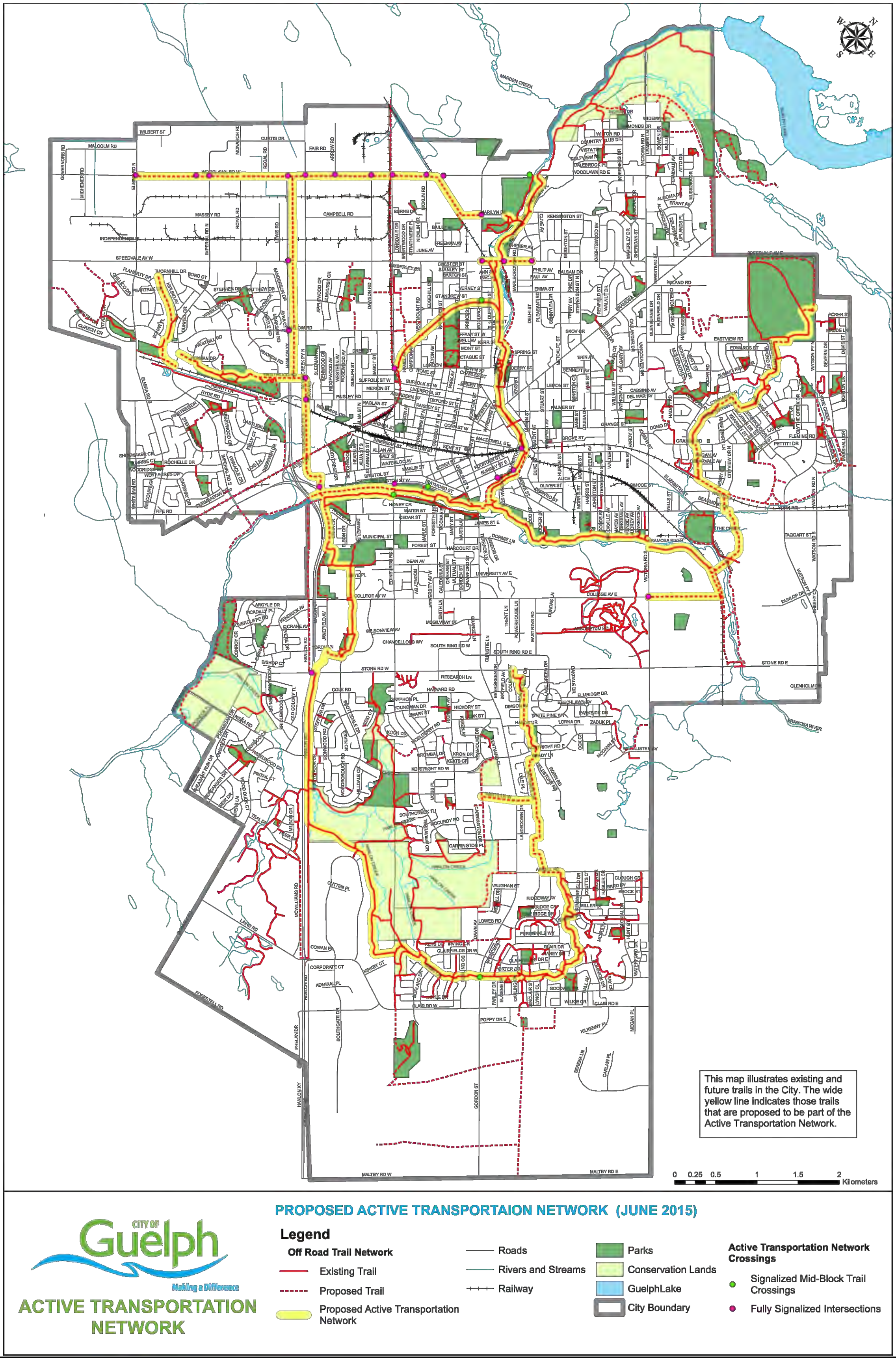
Clair Maltby Secondary Plan
5976-06 March 2019

Figure 4



CITY OF GUELPH
PROPOSED ACTIVE TRANSPORTATION NETWORK, JUNE 2015

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Clair Maltby Secondary Plan
5976-06 March 2019

Figure 5

Key Transit Policies
Important in maintaining and expanding transit services in the City of Guelph, the Official Plan cites developing a compact urban form with a mix of land uses, ensuring the creation of a street network that permits the location of transit stops within a reasonable walking distance of a significant majority of residents, jobs and other activities, and staging urban expansion to include the provision of transit service.

Within new development, transit facilities should be detailed in land use / development plans, and bus stops should be provided at regular intervals.

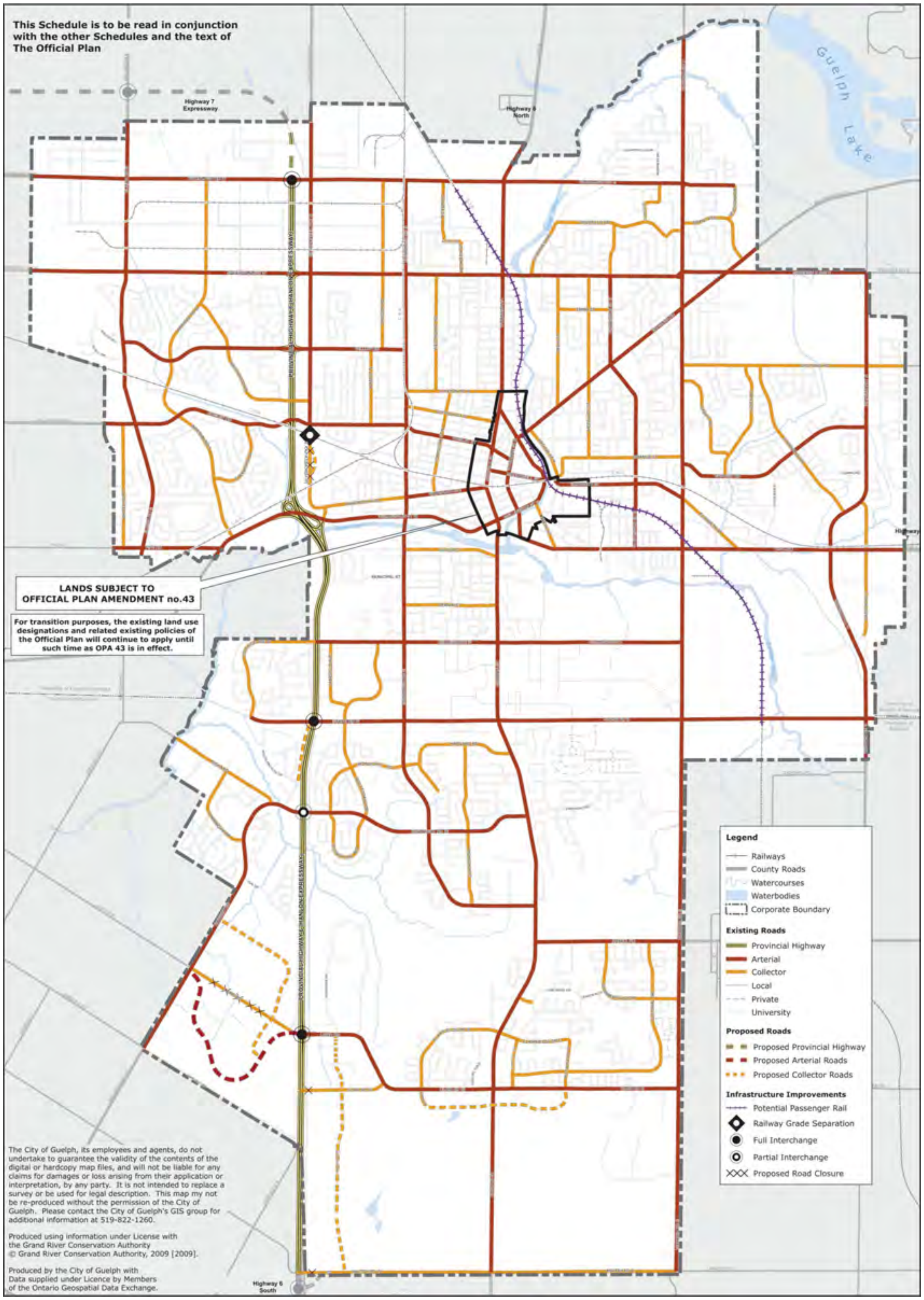
Roads and Road Design
The City of Guelph Official Plan recognizes that private automobiles will continue to represent the primary mode in meeting the travel need of residents and businesses in the City, and lays out a hierarchy of public street facilities and their intended purposes / permissions: expressways, arterials, collects and locals.

The main elements of the road network are identified in Schedule 7 of OP Amendment 48, which is included in Figure 6.

In regards to new public streets and street design, the Official Plan promotes the creation of an arterial – collector grid system in new development areas to assist in the dispersion of traffic and to provide a reasonable walking distance to transit services. A series of public street widenings and "Ultimate Widths" are also identified in the Official Plan (Tables 8.1 and 8.2).

Key street widenings as they related to the Clair-Maltby Secondary Plan area include:

- Clair Road – 30 metre "ultimate width" (5 metre widening on both sides)
- Gordon Street - 30 metre "ultimate width" between Clair Road and Maltby Road (5 metre widening on both sides)
- Maltby Road – 30 metre "ultimate width" (5 metre widening on both sides)
- Victoria Road - 36 metre "ultimate width" between Stone Road and South City Limit (8 metre widening on both sides)
- Clair Road and Laird Road (potential widening to accommodate intersections improvements)
- Clair Road and Crawley Road (potential widening to accommodate intersections improvements)
- Gordon Street and Maltby Road (potential widening to accommodate intersections improvements)
- Maltby Road and Crawley Road (potential widening to accommodate intersections improvements)
- Victoria Road and Clair Road (potential widening to accommodate intersections improvements)
- Victoria Road and Maltby Road (potential widening to accommodate intersections improvements)



1 0.5 0 1 KM

Projection: UTM 17N NAD83
Produced by the City of Guelph
Planning Services
June 5, 2012

CITY OF GUELPH
OFFICIAL PLAN

SCHEDULE 6:
ROAD & RAIL NETWORK

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SCHEDULE 6
CITY OF GUELPH OFFICIAL PLAN AMENDMENT 48 - ROAD AND RAIL NETWORK

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Clair Maltby Secondary Plan
5976-06 March 2019

Figure 6

Urban Environment
The City of Guelph Official Plan establishes policies as they relate to the impact of transportation facilities on urban neighbourhoods and design. These policies include minimizing the impact of trucks upon residential areas, maintain and enhance the streetscape (tree planting), minimize land use conflicts between major transportation routes and residential areas, and noise and vibration mitigation.

Railways
The City recognizes the importance of rail facilities to support freight service and passenger rail service, and to minimize road / rail conflicts through a program of grade-separated under / over passes.

Parking
The City of Guelph Official Plan, through the application of the City Zoning By-law, can establish minimum and maximum vehicle parking requirements and permit shared parking, for all types of land uses to ensure parking demands are met. Off-site parking areas and facilities can be provided through zoning and the City of Guelph Office Plan, and can be acquired, developed and operated by the City.

Reduced parking requirements may be considered as part of a Parking Study, particularly within Downtown, Community Mixed-use Nodes and Intensification Corridors, or for affordable housing, or where high levels of transit exist or are planned. The City may encourage managing the supply of parking as a TDM measure.

Key Transportation Demand Management (TDM) Policies
The City has established, within the Official Plan, that transportation demand management (TDM) is an essential part of an integrated and sustainable transportation system. TDM policies will be developed and implemented to reduce trip distance and time, and to increase the modal share of alternatives to the automobile. Suggested TDM measures include the following:

- including provisions for active transportation in association with development and capital projects including secure bicycle storage facilities and pedestrian and cycling access to the road network;

- supporting transit through reduced parking standards for some land uses or locations, where appropriate, and making provisions for parking spaces for car share vehicles through the development approval process where appropriate; and

- encouraging carpooling programs, preferential parking for carpoolers, transit pass initiatives and flexible working hours.

In addition, a Transportation Demand Management Plan is listed among the type of transportation studies that the City may require as part of a development application.

4.4 SOUTH GUELPH SECONDARY PLAN

The purpose of the South Guelph Secondary Plan is to introduce new planning policies for southern areas that were annexed by the City of Guelph, to establish planning direction for the guidance of City Council and Staff, and to provide information for the public, landowners, development and other stakeholders.

The South Guelph plan was complete in 1998 and comprised a new section to the City of Guelph Official Plan that contains Secondary Plan policies that introduce goals, objectives and policies for lands in the South Guelph area including transportation policies. The South Guelph Secondary Plan comprises the areas generally south of Stone Road, north of Maltby Road, west of Victoria Road, and east of Downey Road / Forestell Road.

The plan identifies the “Gateway” character of the South Guelph area, and identifies Gordon Street and the Hanlon Expressway corridors as key locations to express this character. The plan specifies that development along the Gordon Street corridor should provide detailed planting and landscaping plans, and accommodate setbacks and built form such that new building are located behind the parkway belt of required landscaping and planting. Design controls on entrances off Gordon Street and on parking and loading within the Gordon Street corridor should be developed.

For the Clair-Maltby Secondary Plan area, the South Guelph plan specifies that a system of arterial and collector roads be planned to serve the study area. This road network is enhanced through the road widenings protected for under the City of Guelph OPA 48 document and previously described.

4.5 SOUTH GORDON SECONDARY PLAN

The South Gordon Secondary Plan does not include the lands defined within this study, but rather the lands immediately north of the Clair-Maltby Secondary Plan area (north of Clair Road). However, this 1999 document may provide some policy direction for the development of the subject lands.

Consistent with the South Guelph Secondary Plan, the South Gordon Secondary Plan identifies Gordon Street as a “Gateway” corridor into the City, and describes treating Gordon Street with appropriate landscaping,

From a transportation perspective the South Gordon Secondary Plan specifies that neighbourhoods should be connected to each other and to the rest of the city by roads, pedestrian paths, bicycle linkages, and transit routes to create a more accessible, convenient, safe and energy efficient environment. This objective includes measures to promote pedestrian safety and comfort (providing clearly defined public realm and reducing walking distances between origins and destinations) and the introduction of walking and bicycle paths that are visible, accessible, and aligned along routinely used public spaces. New trails are encouraged to be provided within trail corridors up to 15 metres in width. Bicycle lanes, routes and trails are intended to provide for utilitarian and recreational travel within the community and along the arterial road network.

The South Gordon Secondary Plan specifies that internal road networks should be designed to evenly distribute traffic throughout the neighbourhood along collector roads while discouraging through-traffic on local streets. Collector roads should also be deigned to accommodate public transit bus routing – that would be routed to provide transit stops within 400 metres of 90% of residents. Roadways should also include special control measures to reduce vehicle speeds in appropriate locations, including locations that accommodate wildlife crossings.

Of note, the plan specifies that new development in the area provide for both on-street and off-street parking adjacent to parks with active recreational facilities, and to make use of shared parking arrangements between school sites and neighbouring parks.

4.6 GUELPH – WELLINGTON TRANSPORTATION STUDY (TRANSPORTATION MASTER PLAN)

The Guelph – Wellington Transportation Study was undertaken by a consortium of planning and engineering consultants on behalf of the City of Guelph and finalized in July 2005, in an effort to address long-term transportation needs and improvements in accordance with the Official Plan policies and City's Transportation Strategy and SmartGuelph Principles. The study has 5 main objectives:

1. Identify transportation needs and recommend practical improvements;
2. Recommend Transportation Demand Management (TDM) measures;
3. Identify improvements to City and County roadways;
4. Review Provincial highway initiatives affecting Guelph and Wellington County; and
5. Review inter-regional travel between Guelph, the Region of Waterloo, and the GTA and identify opportunities for transit initiatives to serve this need.

The Master Plan provides direction on the City's existing and planned cycling network, truck route network (Figure 7), and transit node and corridor framework which is intended to support transit routes and the potential removal of reduced / removed parking standards. These planned networks include components related to existing road facilities in the Clair-Maltby Secondary Plan area.

The Guelph – Wellington Transportation Study also reviews existing transportation behavior and forecasts future travel demands based on existing travel and demographic trends. The study concludes that travel demands are 2 to 3 times higher during weekday peak periods than typical weekday midday periods and that 83% of trips within the study area are undertaken in a private automobile, and since the mid-1990s - travel demands have generally increased and average persons per vehicle have reduced. It is also important to note that a significant and increase amount of work travel is occurring between the Waterloo Region and Guelph areas.

Given the aforementioned trends, there is anticipated to be considerable road network deficiencies and traffic congestion in the long term, assuming no new infrastructure improvements, particularly in the South Guelph area. To accommodate increased traffic demand in the South Guelph area, the study identifies a number of improvements, including:

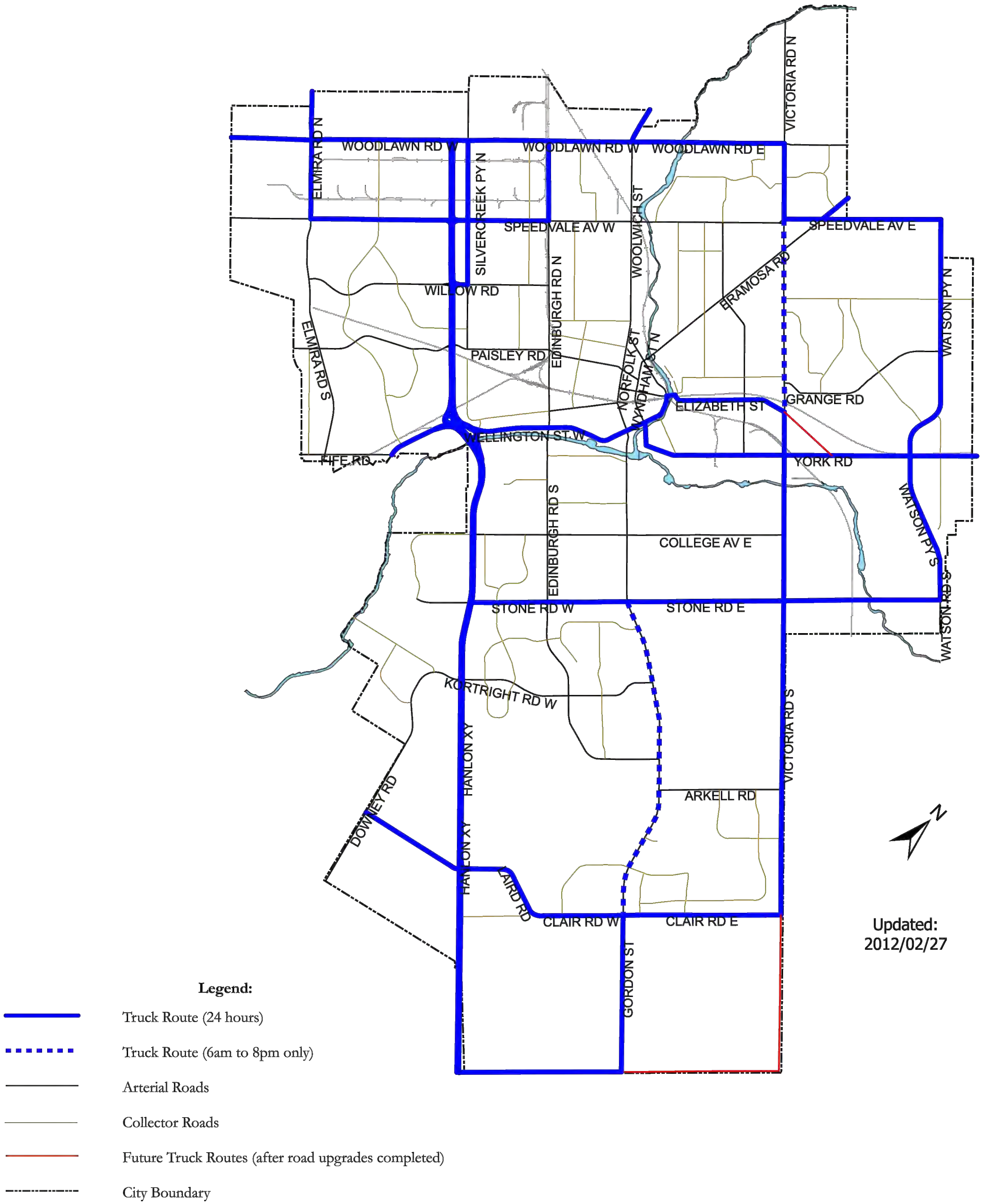
- Widening of Gordon Street from 2 to 4 lanes (approved 2001 EA) from Kortright Road to Wellington Road 34;
- Widening of Clair Road from 2 to 4 lanes (approved 2003 EA) - COMPLETE
- Southerly extension of Southgate Drive to Maltby Road; and
- Development of an internal collector road system within the Clair-Maltby Secondary Plan area connecting to Gordon Street and Maltby Road.

Of note, the forecasting model does not indicate the need to widen Victoria Road south of Clair Road, or widen Maltby Road between Victoria Road and the Hanlon Express to be widened; however, both roads require upgrading.

The recommendation of TDM measures to reduce automobile use and increase use of alternative modes of transportation is identified as one of five primary study objectives in the Guelph-Wellington Transportation Study. The Study makes a connection between land use, urban form, density, neighbourhood design, and the transportation choices made by people making use of the network.

Ultimately, the document assesses an assortment of TDM measures and their practicality in Guelph; the following table (Table 4.1 in the Guelph-Wellington Transportation Study) is included identifying TDM measures that either encourage alternative transportation modes or discourage automobile use:

Strategy		Practical	Limitations/Barriers
Encourage Walking, Cycling, Transit and Ridesharing	Urban Form	Yes	Long term effectiveness, market barriers
	Increased Density	Yes	Community acceptance, political commitment
	Mixed Uses	Yes	Development specialization, economics
	Neighbourhood Design	Yes	Some increase in private and public cost
	Car Pool/Van Pool Programs	Yes	Large employers, longer distance trips
	Guaranteed Ride Home	Yes	Part of a TDM program - not stand alone
	Parking Supply Management	Yes	Large employers and downtown
	HOV Lanes	No	Road right of way restrictions
	Cycling Routes and Facilities	Yes	Climate, fitness level, cost, trip length
	Pedestrian Trails and Walkways	Yes	Climate, fitness level, cost, trip length
	Increased Transit Service and Routes	Yes	Budget constraints, bus shelters, traffic congestion
	Transit Fare Strategies	Yes	Lack of tax incentives, cost
	Preferential Transit Facilites	Yes	Right of way constraints, traffic congestion
	Improved Inter-City Transit	Yes	Inter-city licensing, reduced fare
Programs to Discourage Auto Use	Telecommunting	Yes	Type of work, lack of supervision, security issues
	Alternative Work Schedules	Yes	Many in use - benefits may be minimal
	Vehicle Use Restrictions	No	Public acceptance and economic development issues
	Increasing Traffic Congestion	No	Emissions, emergency service, neighbourhood infiltration
	Congestion Pricing	No	Public acceptance and economic development issues
	Increase Driving Cost	No	Legislation changes, economic development issues
	Parking Pricing and Supply Management	Yes	Limited to downtown and University, economic development issues



GUELPH-WELLINGTON TRANSPORTATION STUDY
TRUCK ROUTE NETWORK

BA Group

Clair Maltby Secondary Plan
5976-06   March 2019

Figure 7

4.7 ADDITIONAL GUELPH TRANSPORTATION DEMAND MANAGEMENT POLICY

Additional policy documents in the City of Guelph provide basis for the advancement of TDM.

The Downtown Guelph Secondary Plan includes TDM policy in support of the promotion of alternatives to automobile use. Policy tools that are mandated or suggested include working with transit providers, developers, and businesses to promote TDM, requiring large-scale developments to complete a TDM plan describing facilities and programs intended to reduce single occupancy vehicle trips, minimize parking and promote alternative travel modes, and finally, suggests the City may permit reduced parking supplies if a TDM plan proves that reduced parking is appropriate.

The Guelph Innovation District Secondary Plan promoted the implementation of TDM measures, through working with developers and businesses to reduce vehicular trips and to promote alternative travel modes.

The City of Guelph Community Energy Plan makes the connection between environmental and energy related goals and the need to reduce energy use and greenhouse gas emissions generated by transportation. A stated goal is to reduce transportation energy use by 25% (while accommodating Guelph’s growing transport requirements) using sensitive urban design, effective alternative transport options (i.e. through TDM and a focused attention on competitive mass transit), and encouraging vehicle efficiencies.

5.0 AREA ROAD ENVIRONMENTAL ASSESSMENTS

5.1 GORDON STREET (WELLINGTON ROAD 46) CLASS EA ENVIRONMENTAL STUDY REPORT

The Gordon Street Class EA was undertaken by the City of Guelph and County of Wellington in December 2000 for the section of Gordon Street between Wellington Road 34 in the south and Lansdown Drive in the north.

The EA study utilizes three other previous transportation reports to judge the transportation impacts of new residential and commercial development along the Gordon Street corridor, and reconfirms the need for traffic capacity within this section of the street. In addition to traffic capacity and operation issues, the EA also identified other public concerns related to truck traffic volumes and roadway deficiencies, including a lack of sidewalks, bicycle lanes, and transit-related infrastructure.

At the time of the study, Gordon Street had a basic two-lane cross-section within the study area. The resulting EA concluded that Alternative 4 (basic improvements plus the widening of Gordon Street) was the preferred solution, and that widening of Gordon Street north of Clair Road would begin by 2002, while widening between Clair Road and Maltby Road would be dependent on the occurrence of development activity.

Upon the adoption of the Gordon Street EA, road widening has been undertaken from just south of Clair Road to Lansdowne Drive. Gordon Street has not been widened from just south of Poppy Drive to Wellington Road 34 under existing conditions. This section is planned to be widened symmetrically from the road centreline except for a 500 metre section in the vicinity of the Mill Creek crossing where widening will occur on the west side only. The EA specified that rural drainage (ditches) be provided on both sides of the road, but did not specify sidewalk / bicycle lane provisions.

5.2 CLAIR ROAD CLASS EA ENVIRONMENTAL STUDY REPORT

The Clair Road Class EA was undertaken on behalf of the City of Guelph in September 2003 for the section of Clair Road and Laird Road between Southgate Drive in the west and Victoria Road in the east.

The EA concluded that Clair Road (at the time of study) will not provide the level of service necessary to avoid traffic congestion, frequent delays, and unsafe driving conditions, given the predicated traffic volumes, and that the road itself is in poor physical condition and lacks sidewalk and bicycle facilities to accommodate these travel modes. Given the prevailing conditions, the EA advanced four alternative planning solutions:

1. Do nothing.
2. Non-structural solutions (increase use of alternative modes; traffic diversion).
3. Construct a new road.
4. Improve the existing road.

In summary, from transportation, natural, social and physical environment perspective, the preferred alternative was the improvement of Clair Road from Victoria Road in the east to the Hanlon Business Park in the west. Improvements include the introduction of an “urban” cross-section with curbs and sidewalks, a landscaped median in the South Guelph District and adjacent to Bishop Macdonell High School and South End Community Park, provision of sidewalks on both sides of the street, and bicycle lanes within the road surface area.

The EA considered 2 and 4 traffic lane cross-sections, and determined that the western portion of the street (west of Beaver Meadow Drive) would include 4 travel lanes, while the eastern section (east of Beaver Meadow Drive) would include 2 travel lanes – one in either direction. This lane configuration has been implemented from Victoria Road in the east to approximately 200 metres west of Poppy Drive in the west. Bicycle lanes have also been introduced along this section of the street. Sidewalks are provided on both sides of the street west of Hawkins Drive, but are often interrupted (discontinuous) in sections east of this point.

5.3 VICTORIA ROAD (CLAIR ROAD TO YORK ROAD) CLASS EA STUDY

The Victoria Road Class EA was undertaken on behalf of the City of Guelph in December 2005 for the section of Victoria Road between York Road in the north and Clair Road in the south. The extent of the study area is generally north of Clair Road and does not include the section of Victoria Road adjacent to the Clair-Maltby Secondary Plan area (south of Clair Road).

The outcomes of the EA provided cross-section alignments of the street within the study area, including for Victoria Road immediately north of Clair Road. In this location, the EA identified a 3-lane cross-section with one travel lane in either direction and a continuous left-turn / median lane, bicycle lanes, and improvements at the Clair Road / Victoria Road intersection. These intersection improvements include installing traffic signal control and separate eastbound turn lanes and a northbound left-turn lane that have already been implemented.

6.0 ENGINEERING DESIGN CRITERIA AND STANDARDS

6.1 DEVELOPMENT ENGINEERING MANUAL, VERSION 1.0 (2016)

City of Guelph Engineering and Capital Infrastructure Services prepared their Development Engineering Manual (DEM, Fall 2016) to guide engineering related aspects of development related work, including established Engineering Design Criteria and Standards intended to be used by developers, residents and the City to inform engineering design and related review and discussion. The DEM recognizes that the outlined standards may not be compatible to all scenarios, and engineering judgement should be used in such cases.

The key objectives of the DEM are to:

- *Document existing process information related to the engineering submission of a development application;*
- *Outline requirements and standards for the engineering design of new developments within the City;*
- *Provide guidance and framework for applicants submitting engineering designs and reports in support of development applications;*
- *Provide guidance to City staff when reviewing and commenting on engineering aspects of a development application; and*
- *Identify the role and involvement of City departments and external agencies as part of the development engineering review and approval process.*

The DEM is complemented by Part B Specs (Linear Infrastructure Standards, 2017) that provides, in detail the City's standard specifications.

6.1.1 Road Standards

The DEM, outlines a range of pavement widths, typical AADT volumes, right-of-way widths, and maximum allowable grades for local and collector roadways. Subdivision Geometric Design Criteria for local and collector roadways are presented in Table 5 and Table 6..

TABLE 5 SUBDIVISION GEOMETRIC DESIGN CRITERIA, PART 1

Road Classification	A.A.D.T.	Pavement Width	Allowable Grade	Minimum Centerline Radius	Min SSSD	Minimum Tangent @ Intersection
Local	<1,000	8.4, 8.8, 10	0.5-8.0	18 (b)	65	10
Collector	<12,000	10	0.5-6.0	140	85	25

TABLE 6 SUBDIVISION GEOMETRIC DESIGN CRITERIA, PART 2

Road Classification	Minimum Tangent Between Curves	Property Line Radius @ Intersection	Right-of-Way Width (m)
Local	15	8	17, 18, 20
Collector	30	8	20

6.1.2 Sight Triangles

The use of Transportation Association of Canada (TAC) Stopping Sight Distance (3-second rule) for evaluation of sight triangles at intersections and access points for new developments is adopted by the City of Guelph. The DEM notes that reduction of a sight triangle may be considered for areas located in an "Urban Growth Centre" and the specific locations identified in the Clair Maltby study area below. Reductions to sight triangles still need to be reviewed by a professional engineer for the recommended design and should not create a condition prone to collisions. Adequate space should also continue to be provided for utility/traffic signal equipment and the final dimensions are also subject to minimum requirements set out in the City's bylaw.

Intersections subject to further consideration for sight triangle in the Secondary Plan area include:

- Victoria Road and Clair Road
- Gordon Street and Clair Road
- Gordon and Poppy Drive

6.1.3 Parking

Off-street parking is outlined in the City's comprehensive bylaw and repeated in the DEM for surface parking.

According to the DEM, on-street parallel parking should have a minimum of 15 m setback from the near side of an intersection, and a minimum of 9 m setback from the far side of the intersection (measured from the end of curb return), unless the minimum setback needs to be increased to address sight distance or operating speed.

6.1.4 Access Design

The DEM outlines design guidelines for throat width, lane width, radius, and spacing for access to/from residential/commercial/institutional areas and the public road network as summarized in Table 7 and Table 8.

TABLE 7 LAYOUT OF ACCESSES

Access Classification	Roadway Classification	Throat Width, W or Land Width, LW (m)	Radius, R (m)	Distance Between Accesses, S (m)
Multi-Residential	Local/Collector	6.0	6.0	7
	Arterial	7.5		25
Low Volume Commercial and Institutional	Local/Collector	7.5	9.0	23-30
	Arterial	8.0		60
High Volume Commercial and Institutional	Collector	8.0	12.0	60
	Collector (divided access)	3.0 m left 3.6 m through 3.6 m right 1.2 m island	12.0	60
	Arterial	9.0	12.0	100
	Arterial (divided access)	3.0 m left 3.6 m through 3.6 m right 1.2 m island	12.0	100
Industrial	Collector	9.0 (max 15.0)	12.0	40-60
	Arterial			

TABLE 8 NUMBER AND LOCATION OF ACCESSES

Access Classification	Roadway Classification	Distance from Non-Signalized Intersection (m)	Distance from Signalized Intersection (m)
Multi-Residential	Local / Collector	15	30[1]
	Arterial	30	60[2]
Low Volume Commercial and Institutional (2-way access)	Local / Collector	30	30
	Arterial	60	60[3]
High Volume Commercial and Institutional	Collector / Arterial	60	60[3]
Industrial	Collector / Arterial	30	60[3]

Notes:
1. Multi-Residential of up to 30 units
2. Multi-Residential of over 30 units
3. Full movement accesses will not be allowed within 100 m of a signalized intersection on arterial roadways. Site specific turning movement restrictions will be determined by City staff upon application.
4. Should a site require a right in/out access, the layout shall be approved by traffic engineering staff and conform to the most current TAC specifications.

The City's Access Details Figures from the DEM are attached in **Appendix C.**

7.0 EXISTING TRANSIT FRAMEWORK

7.1 TRANSIT GROWTH STRATEGY AND PLAN

The “Guelph Transit Growth Strategy and Plan and Mobility Service Review” was prepared in 2010, and was prepared to assess the transit market, estimate future travel demand (ridership forecasts), outline mobility service and higher-order transit opportunities, and detail associated capital and revenue implications associated with service recommendations. It should be noted that the plan is now seven years old and, at the time of the study, did not forecast any substantial development within the Clair-Maltby Secondary Plan area within the 2031 horizon year period.

Of the report’s key recommendations, that implicates development of the South Guelph area, include:

1. Establish the Gordon / Norfolk / Woolwich spine as a Bus Rapid Transit priority corridor, starting with the implementation of queue jump lanes, traffic signal priority. and express bus services, and additional infrastructure as demand increases (dedicated bus / HOV lanes). Specifically, the report recommends that as transit demand increases, a dedicated transit / HOV lane be provided in each direction of Gordon Street, firstly between Stone Road and Clair Road, and eventually on Gordon Street south of Clair Road. Transit service improvements along the Gordon Street corridor should include improved passenger amenities at transit stops.

2. Introduction of train service on the Guelph Junction Railway, including the introduction of up to 4 stations including a station servicing the Guelph Innovation District (northeast of the Clair-Maltby area) and the downtown.

3. Establish new inter-city / inter-regional bus and rail transit connections, most notably to Kitchener, Waterloo, Cambridge, and potentially, Georgetown, Brampton, Milton, Mississauga, and Hamilton.

4. Work with property owners to establish a 4 to 6 bay bus terminal within the South End Node (Gordon Street and Clair Road).

Recommendations 1 and 2 above establish a transit structure for the City by connecting key existing and emerging nodes via priority corridors.

7.2 MOVING GUELPH FORWARD: GUELPH TRANSIT GROWTH OPPORTUNITIES

This report identifies immediate and recommended route service changes while highlighting potential long-term areas of growth related to service enhancements and infrastructure. The report was released in 2016 and outlines existing trends and service standards, and potential opportunities to make transit more attractive and increase ridership.

The report includes a summary of rider survey data, which indicates among other items, that transit riders are evenly satisfied / dissatisfied with service frequency and on-time arrival, and generally dissatisfied with local service connections to GO (regional service) facilities.

Moving Guelph Forward also describs recommended service changes and future measures that are intended to increase ridership and achieve a 15% transit mode share – consistent with policy objectives of OPA 48 and the Guelph – Wellington Transportation Study. Recommended service changes, in the vicinity of the Clair-Maltby Secondary Plan area include minor alterations to the #5 Clair and #56 Victoria Express bus routes, which will potentially be altered again given the development of the Clair-Maltby precinct. Transit priority measures, to be potentially integrated within the Maltby Secondary Plan area to increase ridership, include:

- Queue jump lanes,
- Reversible lanes,
- Roundabouts,
- Transit signal priority, and
- Reserved bus lanes.

8.0 EXISTING CYCLING AND TRAILS FRAMEWORK

8.1 GUELPH TRAILS MASTER PLAN (2005)

The Guelph Trail Master Plan (GTMP, Fall 2005) was established to provide an overall vision to the developing trail system.

The Goal of the GTMP is to:

"develop a cohesive city wide trail system that will connect people and places through a network that is off-road wherever possible and supported by on-road links where necessary"

The GTMP outlines the following areas of recommendations:

- Establishing the Need for Trails;
- Understanding the Resources;
- Planning for Trails;
- Building Trails; and,
- Supporting Trails.

The GTMP outlines a hierarchy of trail types: Primary, Secondary, Tertiary, and Water Routes for canoeists and kayakers.

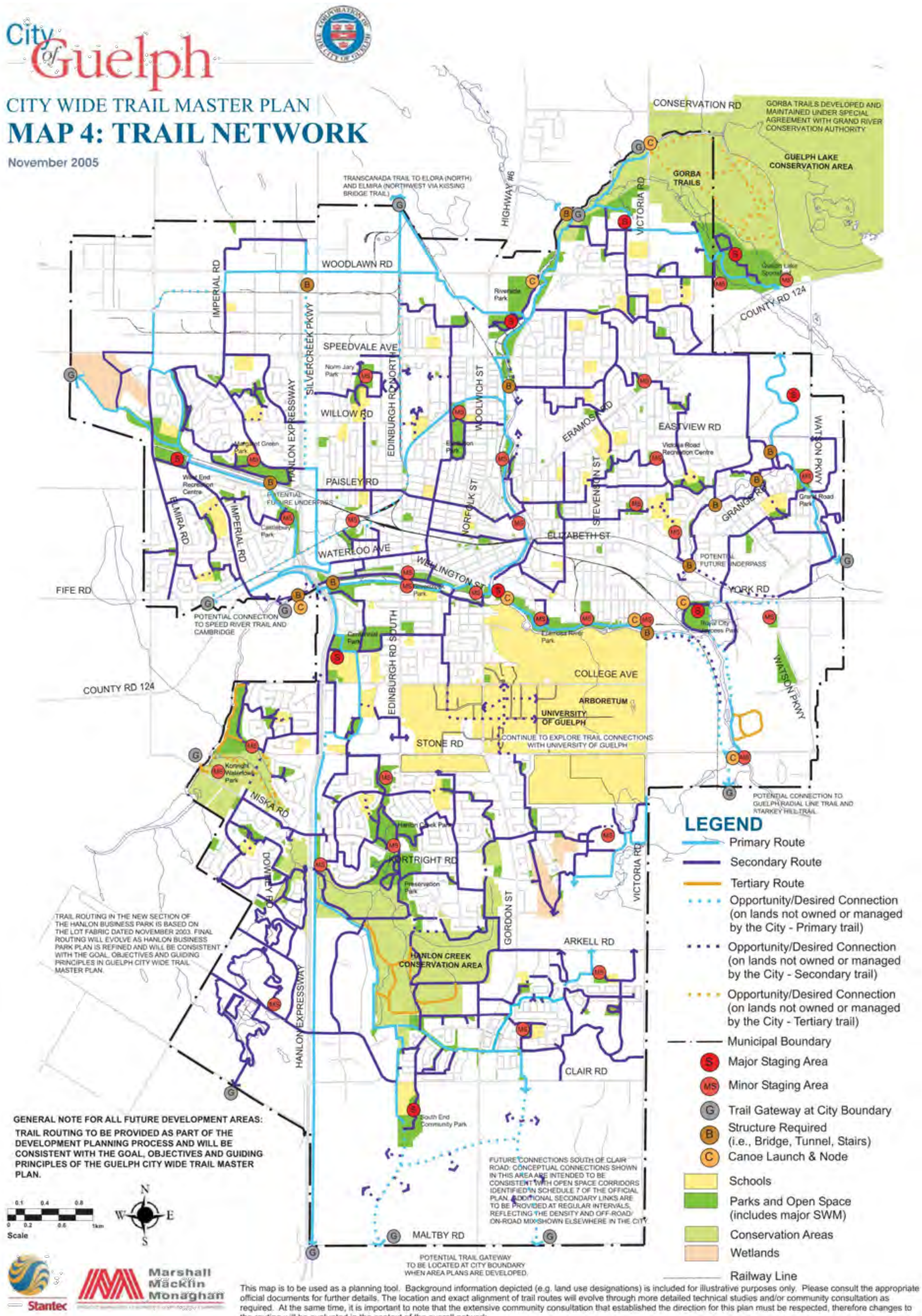
8.1.1 The GTMP Trail Network

The GTMP Trail Network, outlining the hierarchy of trail routes including desire lines for the Clair Maltby study area is presented in Figure 8.

The GTMP Trail Network identifies conceptual connections through the Clair Maltby study area that are generally consistent with the Open Space Corridors outlined in the Citys Official Plan. There are two north-south Primary conceptual connections through the Clair Maltby study area and one east-west Primary conceptual connection crossing Gordon Street midblock between Clair Road and Maltby Road. The north-south connections provide an opportunity to connect to the primary trail network north of Clair Road and also to connect with potential Trail Gateways at the Maltby Road City Boundary. Conceptual secondary connections are shown at regular intervals south of Clair Road.

8.1.2 The GTMP Trail Network – On and Off-Road

The GTMP Trail Network, outlining the On and Off-Road Breakdown of trails, is presented in Figure 9**.** The primary trails identified in the Clair Maltby study area are largely intended to be off-road routes, with some local connections secondary connections intended to be on and off-road and located at regular intervals.



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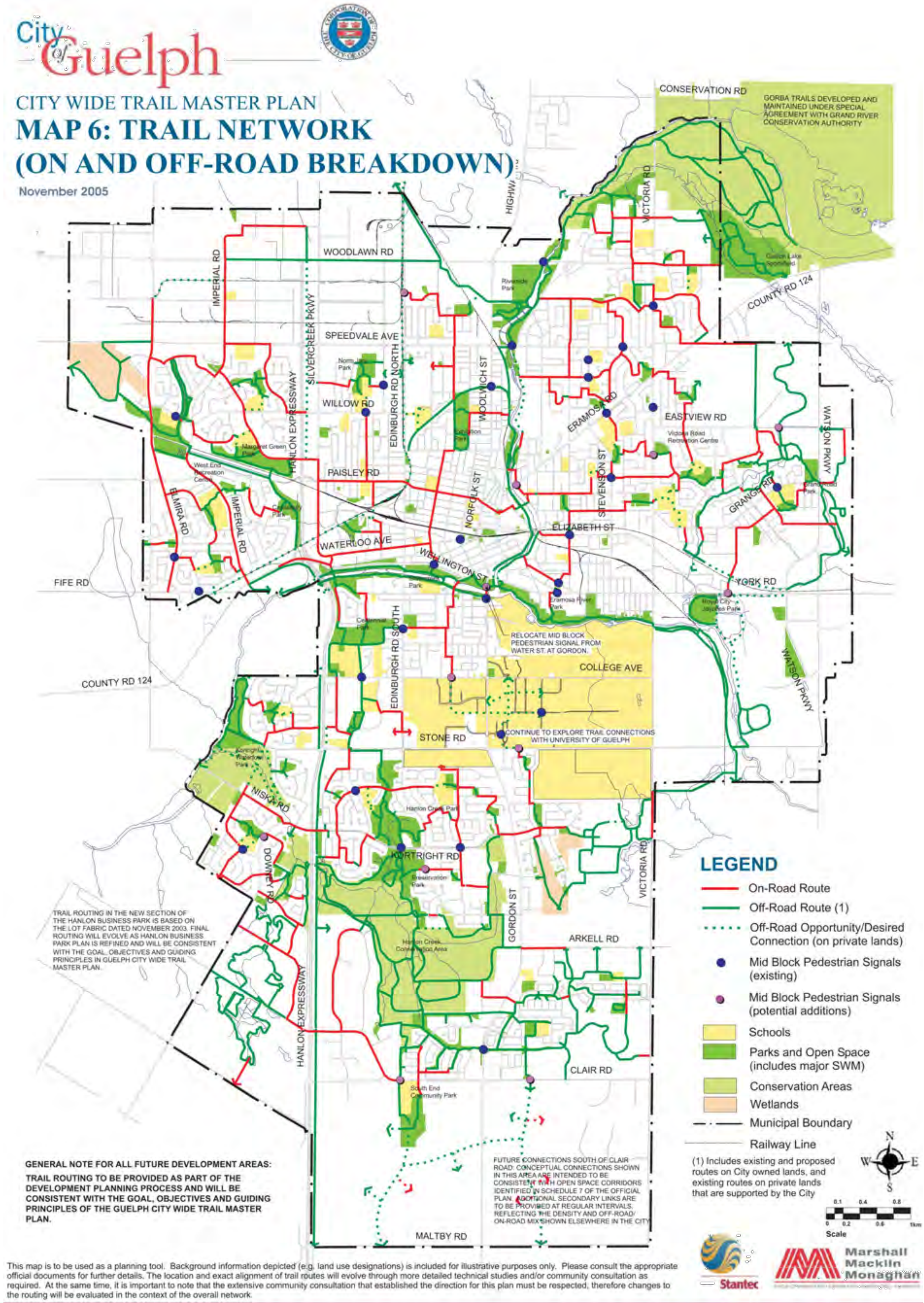
CITY WIDE TRAIL MASTER PLAN:
TRAIL NETWORK



CITY WIDE TRAIL MASTER PLAN:
TRAIL NETWORK (ON AND OFF-ROAD BREAKDOWN)

8.1.3 The GTMP Trail Network – On-Road Cycling Linkages

The GTMP Trail Network, outlining the potential On -Road Cycling Linkages, is presented in Figure 10. The arterial roadways in the Clair Maltby study area, including Clair Road, Maltby Road, Gordon Street, and Victoria Road are all identified as On-Road Bicycle Network linkages. A potential connection south of the City is also identified on this figure at Maltby Road / Victoria Road.

8.1.4 The GTMP Trail Network – Timing of Priorities

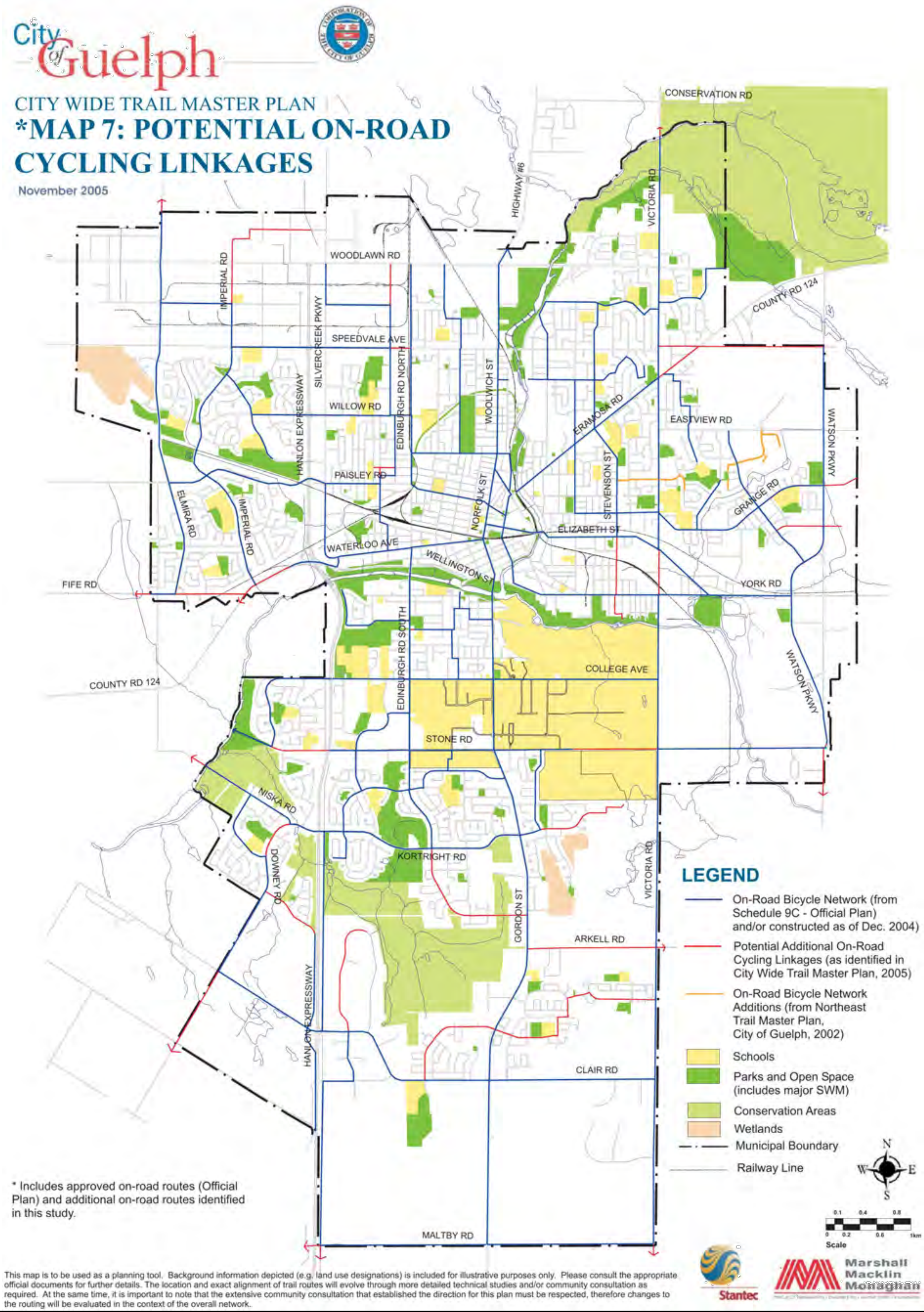
The GTMP Trail Network recommends three timeline phases:

- Short Term (0 to 5 years - 2005-2010)
- Medium Term (5 to 15 years – 2011 to 2021)
- Long Term (beyond year 15 – beyond 2021)

The trail network proposed for the Clair Maltby study area is identified as a "Medium Term" priority, as illustrated in Figure 11.

8.1.5 Building and Supporting Trails

The GTMP outlines available resources for design guidelines and construction details applicable to the trail network. Recommendations are also made for promoting, encouraging trail use, educating users, maintaining, managing, and monitoring trails.



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CITY WIDE TRAIL MASTER PLAN: POTENTIAL ON-ROAD CYCLING LINKAGES

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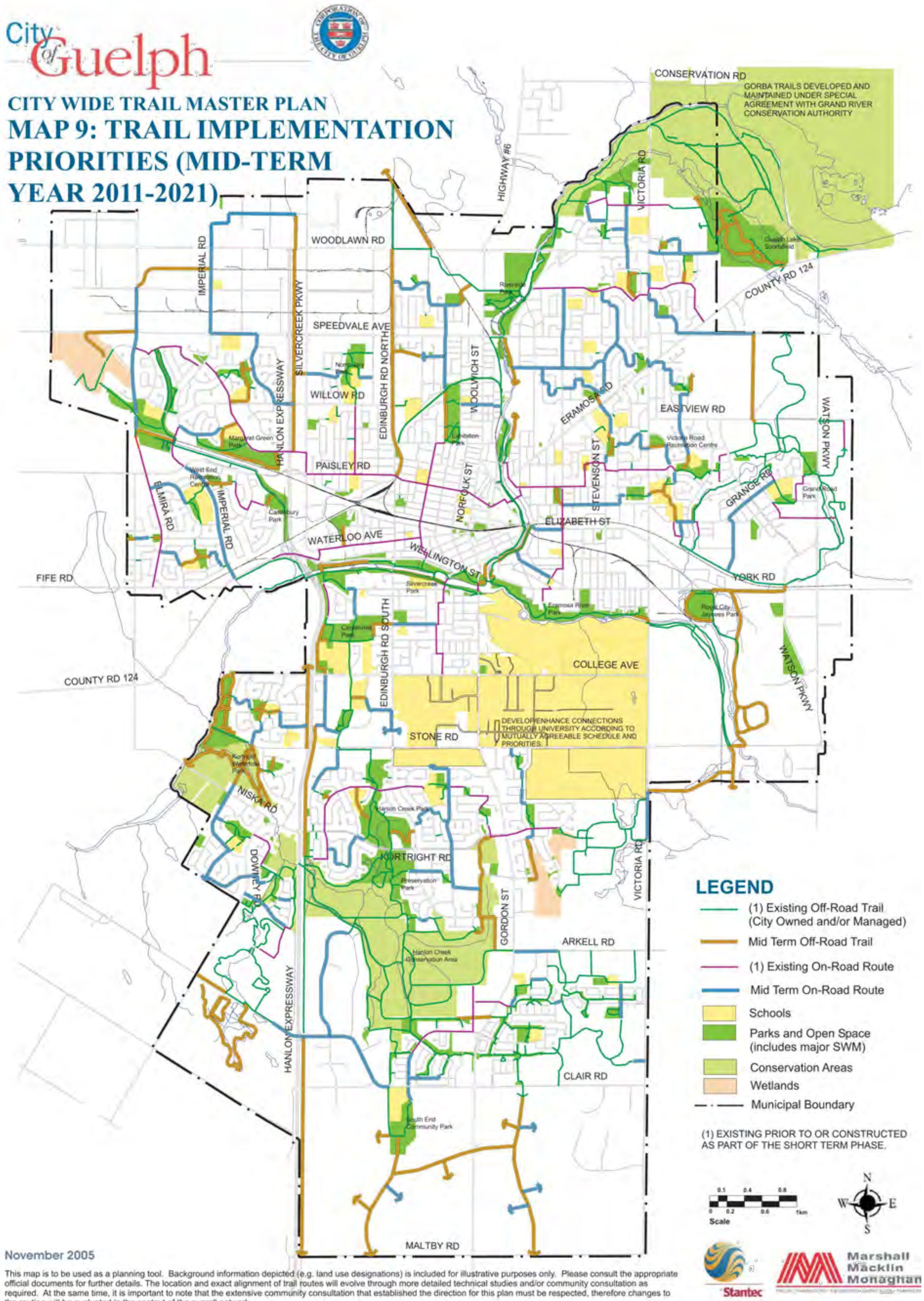


CITY WIDE TRAIL MASTER PLAN:
TRAIL IMPLEMENTATIONS PRIORITIES
(MID-TERM YEAR 2011-2021)

8.2 CYCLING MASTER PLAN – BICYCLE FRIENDLY GUELPH (2012)

The City's Cycling Master Plan (February 2012), is directed by the City's Office Plan, and provides recommendations and strategies that aim to operationalize the visions of the Bicycle-Friendly Guelph Initiative formed by the City.

The City's vision for becoming one of Canada's most bicycle-friendly communities includes 1) more people cycling, 2) a safer and more connected network, 3) strong culture of cycling, and 4) measured improvements.

The Cycling Master Plan developed the following seven principles:

1. Cycling and safety are not mutually exclusive.
2. Cycling is an essential transportation mode for Guelph.
3. Every street is a cycling street and bicycles are vehicles.
4. Bicycles are unlike other vehicles that share the road.
5. Cycling is for everyone to enjoy.
6. A successful cycling network is a product of a well-integrated transportation network.
7. Transportation choices create opportunities for everyone to get to their destination.

The Cycling Master Plan addresses both physical and social infrastructure needs within the context of the 5E's:

1. Engineering: Enhance the Bikeway Network
2. Education & 3. Encouragement: Promote a bicycle-friendly city
4. Enforcement: Protect a cycling-friendly environment
5. Evaluation: Monitor progress in achieving targets and goals; and

The Cycling Master Plan provides 22 actionable recommendations within the 5E's for City staff, stakeholders, and residents to achieve implementation of the City's visons.

8.2.1 Engineering Principles

The Cycling Master Plan's recommendations for Safe and Continuous Infrastructure (Engineering) outlines tools for selecting types of bikeways relative to vehicular volume, vehicular speed, and local context that influence cyclist safety and comfort levels relative to other on-street facilities and vehicles.

Bikeway Treatments

The Cycling Master Plan identifies several types of bikeway treatments for consideration by the City of Guelph:

- Signed Routes
- Bicycle Boulevards
- Shared-Use Lanes (Sharrows)
- Advisory or Suggested Lanes
- Bike Lanes and Paved Shoulders
- Multi-Use Boulevard Trails, and,
- Cycle Tracks / Physically-Separated Bike Lanes

Intersection Treatments

The plan also recommends that the design of intersections should also take into account the many possible movements of cyclists at intersections including:

- General intersection guidelines to address visibility where there is a higher presence of conflicts between cyclists, motorists, and pedestrians;
- Accommodating Left Turns at signalized and unsignalized intersections; and,
- Specific cases where two arterial roads intersect and all intersections with multi-use boulevard trails.

Cycling Network Plan

The recommended Cycling Network Plan from the Cycling Master Plan is provided in Figure 12.

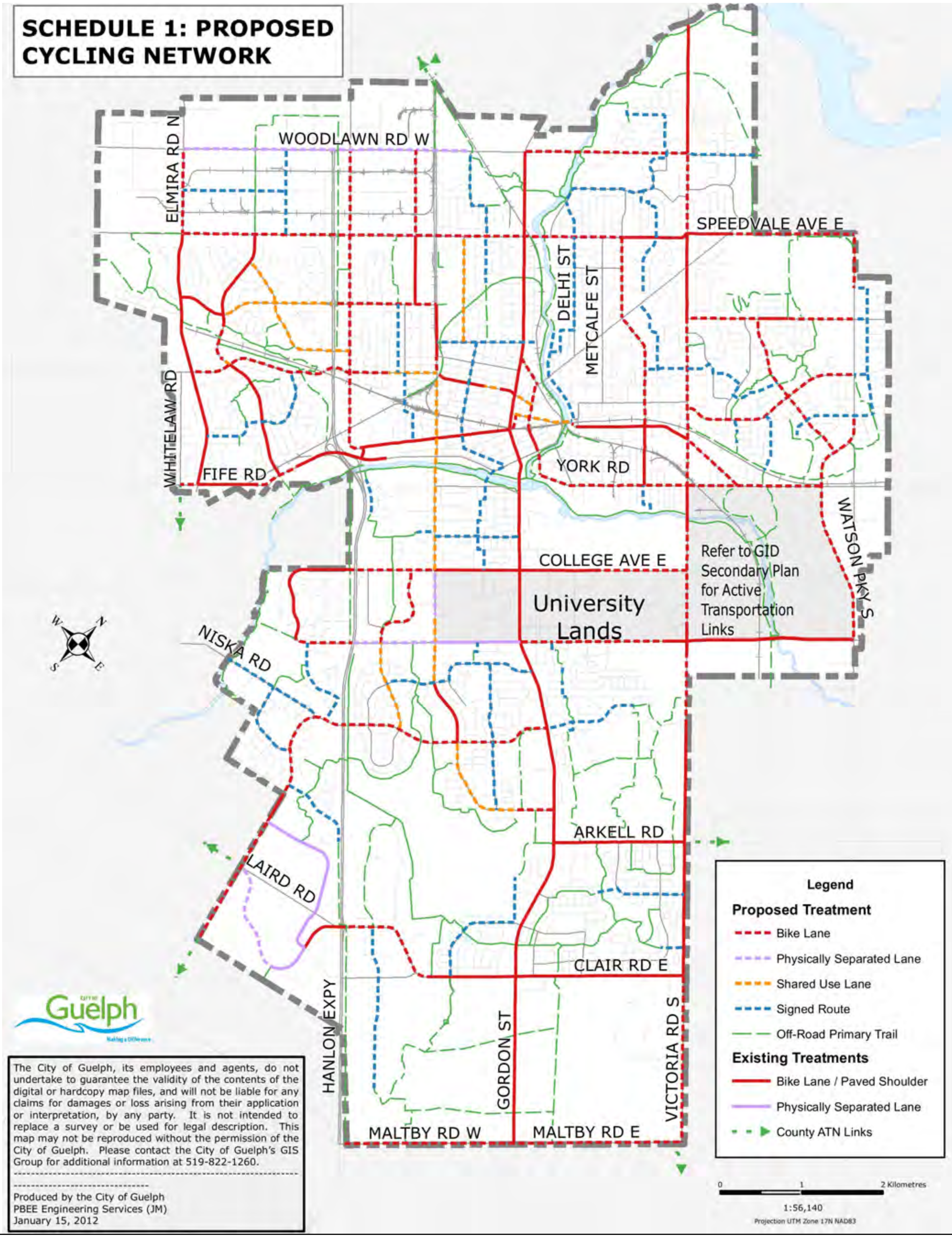
This Cycling Network Plan identifies several existing and proposed surface treatments for the Clair Maltby study area. Existing and proposed cycling treatments within the study area include:

- **Existing Bike Lanes / Paved Shoulder** are identified along both Clair Road East and Gordon Street within the study area.

- **Proposed 1 metre Paved Shoulder** is proposed along east-west Maltby Road and along north-south Victoria Road South (between Clair Road and Maltby Road)

- **Off-Road Primary Trails** are proposed at two locations running east-west across Gordon Street that will make connections to the proposed north-south signed routes along Southgate Drive. North-south off-road trails are also proposed within the study area that will connect to proposed signed routes along Clairfields Drive West, existing trails north of Clair Road, as well as at two locations potentially crossing Maltby Road to the south.

- **County ATN Links** are proposed at the southeast corner of the study area at the intersection of Maltby Road East and Victoria Road South.



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PROPOSED CYCLING NETWORK
- 2013 GUELPH CYCLING MASTER PLAN

End-of-Trip Facilities Recommendations

The Cycling Master Plan outlines guidelines for providing end-of-trip facilities (bike parking facilities). They have identified two classes of bicycle parking as follows:

- Class One: Long-term bicycle parking
- Class Two: Short-term bicycle parking
- Additional Class: Artistic bicycle parking

The Cycling Master Plan outlines recommended Bicycles Parking Requirements for each Class of parking, by type of land use. Recommendations for General Rack Spacing and Rack Spacing within the Public Right-of-Way are also recommended as part of this section of the Cycling Master Plan.

8.2.2 Education and Encouragement

The Cycling Master Plan recommends complementing the guidelines for providing a safe cycling environment with complementary encouragement and education with a set of recommended objectives and actions.

8.2.3 Enforcement

The Cycling Master Plan recommends continued and improved actions to cycling enforcement as a means to reduce incidents and provide front-line education to both drivers and cyclists.

8.2.4 Evaluation

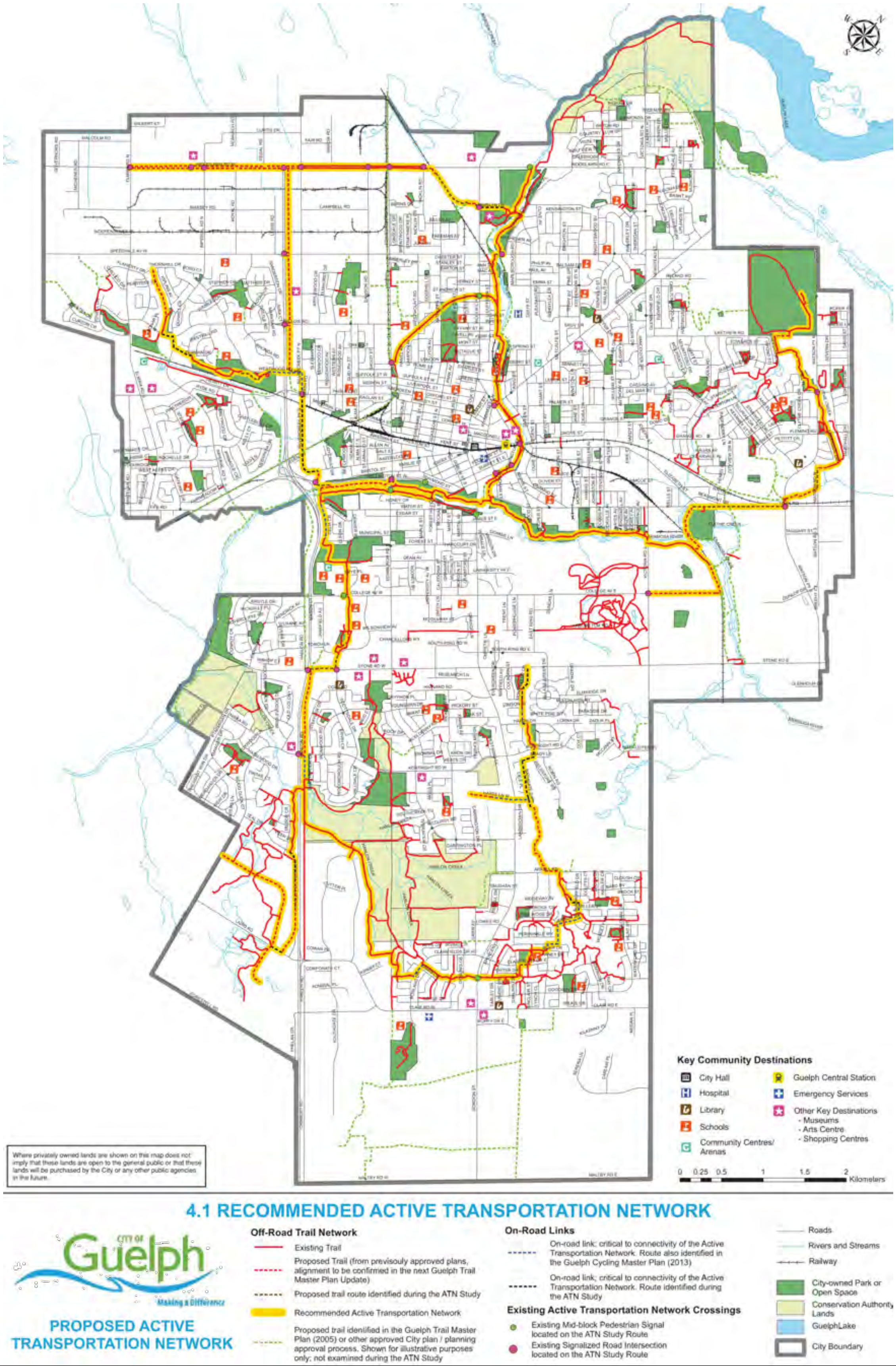
The Cycling Master Plan recommends actions to monitor and measure success in order to guide future planning and policy decisions.

8.3 ACTIVE TRANSPORTATION NETWORK STUDY (2017)

The Active Transportation Network Study (ATN Study, January 2017) builds on the Primary Trails system of the Guelph Trails Master Plan (2005) and the infrastructure (Engineering) objectives of the Cycling Master Plan (2012).

The ATN Study was prepared by MMM Group / Paradigm Transportation Solutions on behalf of the City of Guelph to assess the feasibility of upgrading and maintaining existing and proposed Primary Trails in Guelph – notably the trail network identified in the City’s Draft Proposed Active Transportation Network (ATN).

The ATN’s Recommended Active Transportation Network is presented in Figure 13. However, given that the ATN largely reviewed the primary trail system identified by the Trail Master Plan and Cycling Master Plan, the planned trails identified in the Clair Maltby study were outside of the scope of the ATN.



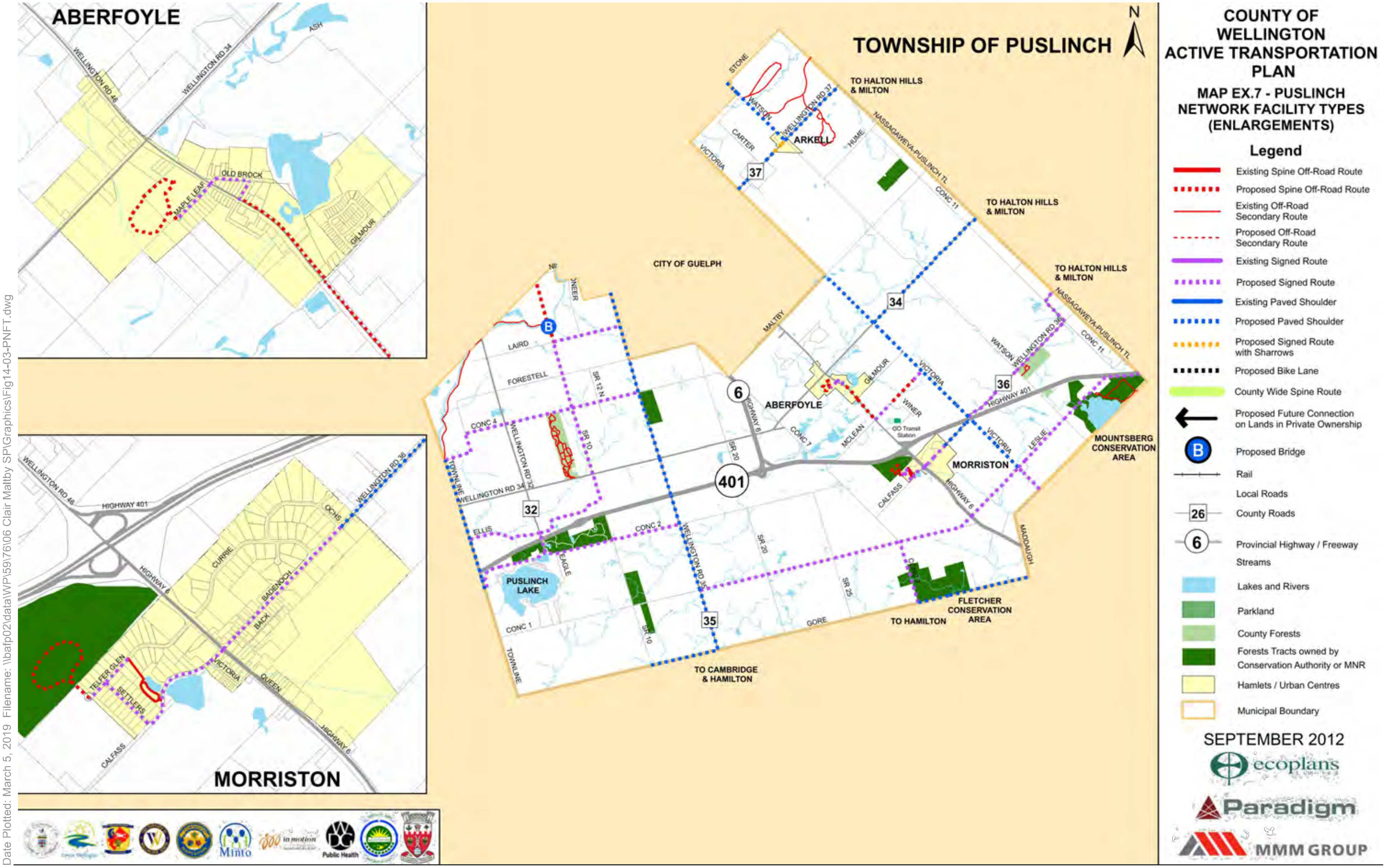
RECOMMENDED ACTIVE TRANSPORTATION NETWORK

8.4 WELLINGTON COUNTY ACTIVE TRANSPORTATION PLAN

The Wellington County Active Transportation Plan (ATP, September 2012) provides guidelines and strategies that aim to meet the County's goals in fostering a healthy and more sustainably community, notably including an Active Transportation Network (ATN) that connects the County's communities.

The Township of Puslinch, within Wellington County, is directly adjacent to the Clair Maltby study area.

The County of Wellington Active Transportation Plan for Puslinch is illustrated in Figure 14. A proposed paved shoulder condition is recommended along Victoria Road, connecting with the southeast corner of the Clair Maltby study area.



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COUNTY OF WELLINGTON ACTIVE TRANSPORTATION PLAN:
MAP EX. 7 PUSLINCH NETWORK FACILITY TYPES (ENLARGEMENTS)

BA Group

9.0 CLAIR-MALTBY SECONDARY PLAN

9.1 COMMUNITY VISIONING EXERCISE AND CHARRETTE

A Community Visioning Workshop was undertaken in September 2017 to assist in establishing a Conceptual Community Structure, which was carried-forward as part of meetings with a Community Working Group and Technical Advisory Group.

The Conceptual Community Structure was used in the development of three (3) Community Structure Alternatives, which formed the discussion of a 5-day planning and design charrette held in April 2018. The charrette was a multi-disciplinary, intensive, and collaborative design and planning workshop, and was undertaken in order to develop a Preliminary Preferred Community Structure – which was presented for information purposes on April 9, 2018.

9.2 PREFERRED COMMUNITY STRUCTURE

A "Preferred Community Structure" has been pursued as a planning objective for the future development of the Clair-Maltby Secondary Plan, and utilized as a basis for detailed technical analysis – including the transportation analysis prepared herein. The Preferred Community Structure was advanced through modifications to the Preliminary Preferred Community Structure developed as part of the April 2018 design and planning workshop. These modifications to the community structure plan included adjustments to the Secondary Plan boundary, the removal of a conceptual north-south direction collector street aligned east of Gordon Street, changes to the location of high-density residential development, and the identification of cultural heritage resources and existing wetlands.

The Preferred Community Structure provides a general layout of land use, connective elements (arterial / collector streets and trails), community facilities, potential locations for storm water management facilities, existing cultural heritage recourses, and wetlands.

The Clair-Maltby Secondary Plan Preferred Community Structure advances an urban village concept comprised of the Gordon Street Corridor, surrounding neighbourhoods and the Natural Heritage System. The Plan indicates that the area will be primarily residential in character with a full range and mix of housing types and a variety of other uses that meet the needs of all residents. The Natural Heritage System and the Paris Moraine, together with a system of parks and open spaces, provide a framework for the balanced development of interconnected and sustainable neighbourhoods. The Natural Heritage System further informs the opportunities for transportation infrastructure including a network of development-supportive collector streets.

9.3 MOBILITY NETWORK

A system of connected arterial and collector streets was advanced as part of the Preferred Community Structure to support development of the Secondary Plan area, while respecting the Natural Heritage System and existing topography. The street network represents a modified grid system, which is intended to allow for frequent and robust routing for all street users, while respecting the important environmental features of the area.

A total of four (4) east-west oriented collector streets are proposed to cross Gordon Street between Gosling Gardens in the north and Maltby Road in the south. One (1) north-south oriented collector street is proposed to extend between Poppy Road in the north and Maltby Road in the south, and will be located in the western portion of the Secondary Plan area (west of Gordon Street). Two (2) additional north-south collector streets are illustrated in the south-eastern portions of the Secondary Plan area in order to establish a robust street-network grid in this location. All collector streets, as well as existing arterial streets, are intended to appropriately integrate cycling and pedestrian facilities to ensure multi-modal mobility and accessibility.

The design of all collector streets and existing arterial streets is intended to allow for the operation of buses, to provide several opportunities and flexibility for transit vehicle routing throughout the Clair-Maltby Secondary Plan. Transit services are intended to route throughout the Secondary Plan area, allowing for bus stops to be provided at regular intervals within 400 metres of 90 percent of residents. Additional transit provisions may also be made along the Gordon Street corridor to allow for convenient service transfers, and infrastructure to support the efficient and reliable routing of transit vehicles (discussed further in Section 9.5).

The planned network of streets (and trails – as discussed in Section 9.4) are intended to achieve safe, convenient and comfortable travel and access for all street-users, with priority given to pedestrians, cyclists, and transit operations, to provide mobility choice and support city policy and modal-split objectives. Vehicular movement will be accommodated, but is not prioritized, and will be subject to levels-of-service which are more constrained then typical in new-build areas within the City.

Following the planning and design charrette, the City of Guelph undertook a transportation modelling assessment of the anticipated future traffic conditions within the Secondary Plan area pending the introduction of a second north-south oriented collector street extending between Clair Road and Maltby Road (located east of Gordon Street). This assessment demonstrated that Gordon Street would be able to accommodate future traffic demands without a north-south collector street on the easterly side of Gordon Street. This modelling allowed a general understanding of the potential impacts that a collector street would have on the existing Natural Heritage System in two locations, as well as on an identified Cultural Heritage Landscape, and resulted in the removal of this collector road where it crosses these features as part of the Secondary Plan. The analysis undertaken herein supports this conclusion, understanding certain traffic movements are anticipated to operate near theoretical capacity during weekday peak hours at the key Gordon Street / Clair Road intersection north of the Secondary Plan area.

The Preferred Community Structure, and associated Mobility Network, are illustrated in Figure 15.

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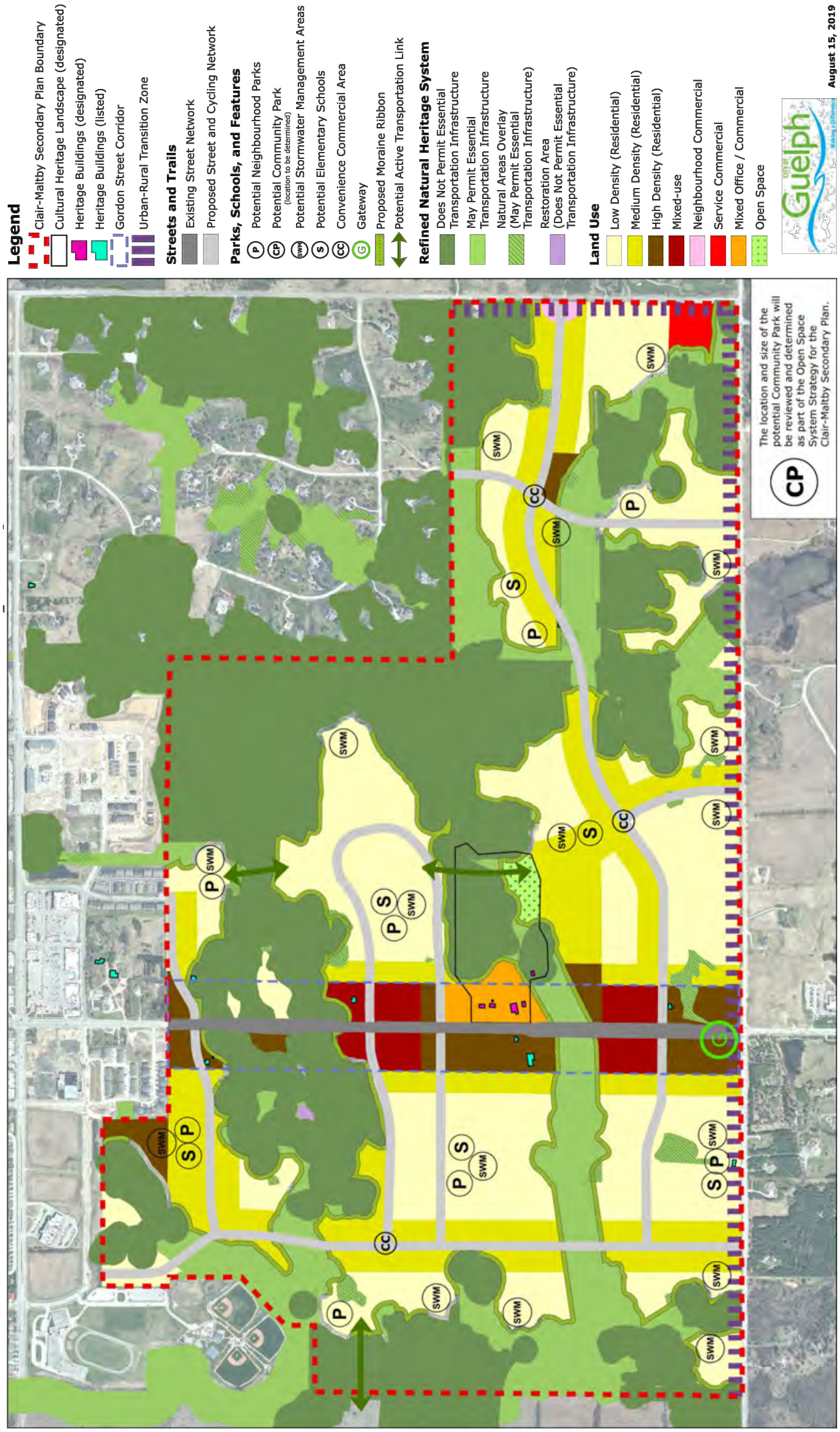


PREFERRED COMMUNITY STRUCTURE PLAN

BA Group

9.3.1 Concept Public Right-of-Way Cross Sections

Conceptual right-of-way cross-sections have been developed for collector streets contemplated as part off the Clair-Maltby Secondary Plan, as well as existing arterial streets and future local streets within the area.

A series of conceptual cross-sections are developed for different types of streets, which are appropriately designed to accommodate a diverse mix of users and respond to the urban design, land use, and public realm contexts. Cross-sections are intended to be understood in conjunction with City of Guelph construction standards and guidelines, and should be flexible enough to meet context specific limitations and servicing / utility requirements and will be designed in detailed plan and section view as part of future area development.

Cross sections prepared in support of the Clair-Maltby Secondary Plan intend the design and delivery of complete streets, which include pedestrian and cycling infrastructure, support transit service routing, street trees and landscaping, and utility / service delivery. Vehicle travel lanes are reduced to an appropriate level, to accommodate vehicle movement while not prioritizing vehicles over other street users.

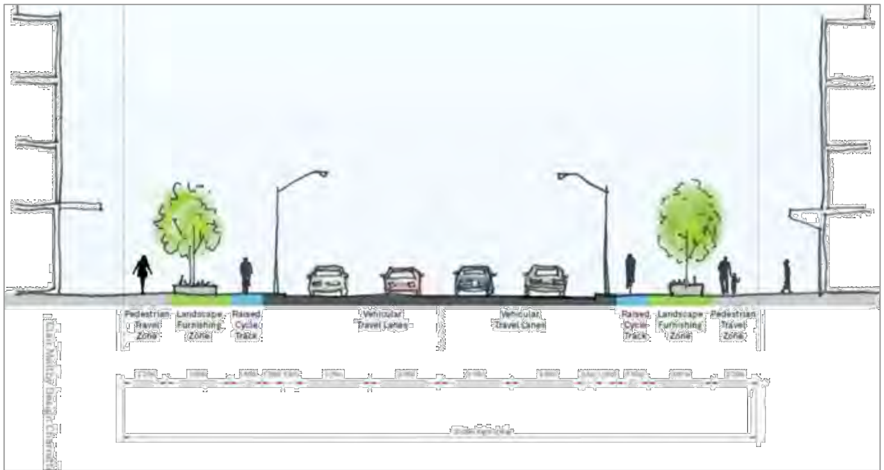
In the design of public right-of-ways, the City will balance the provision of safe, functional and attractive pedestrian-oriented, cyclist friendly and transit-supportive environments while accommodating for an acceptably level of vehicular traffic and operation.

Different public right-of-way cross-sections have been developed for unique circumstances that accommodate for differences in adjacent land uses and the types of demands these uses can place on a typical street. For example, three-lane collector street cross-sections may be more appropriate for corridors with frequent transit service, larger (heavy) turning vehicles, intended to accommodate a greater number of “through” traffic, or frequent driveway connections. Wider pavement areas, or off-centre median lane designs, may also be pursued in instances where on-street parking will be accommodated. Similarly, wider right-of-ways may be pursued in instances where other infrastructure are required such as major trunk utilities, municipal service corridors, or overland flow routes.

The narrowest public right-of-ways are typically reserved for local streets intended to provide property access, accommodate local traffic and relatively low volumes of street users, and serve low and medium density development.

Cross sections will be advanced as part of detailed design of new streets within the Secondary Plan, and would reflect the policies and requirements of the City. Additional right-of-way space may be required for separate vehicle turn lanes (i.e. separate left-turn lanes along Gordon Street), transit-supportive infrastructure, higher-order off-street cycling infrastructure, landscape / public realm objectives, or other utility or service infrastructure.

Concept street cross-sections, developed as part of the Clair-Maltby Secondary Plan, are included in Exhibit 1.

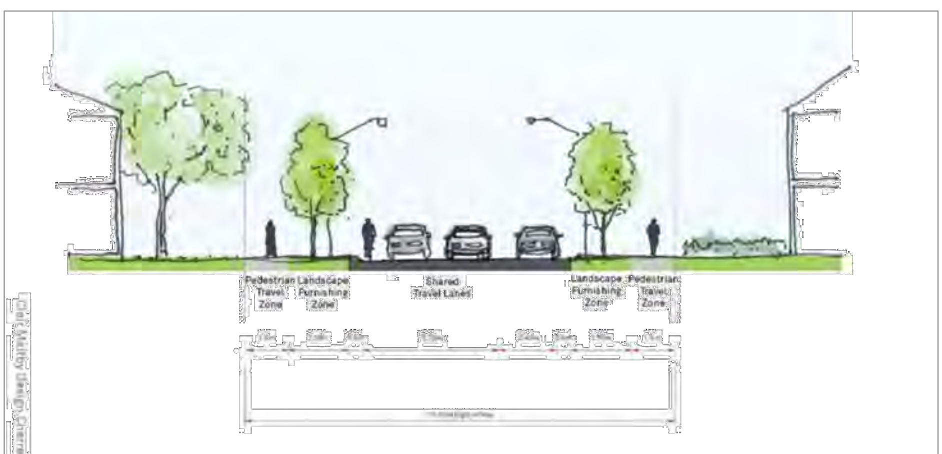


Gordon Street Arterial Road
30 m ROW - Raised Cycle Track

Clair-Maltby Secondary Plan
Scale 1:150
BrookMcIlroy

Collector Road
26 m ROW – Parking Lane and Raised Cycle Track

Clair-Maltby Secondary Plan
Scale 1:150
BrookMcIlroy



Local Road
18 m ROW - Shared Travel Lanes and On Street Parking

Clair-Maltby Secondary Plan
Scale 1:150
BrookMcIlroy

CLAIR-MALTBY SECONDARY PLAN CONCEPTUAL CROSS SECTIONS

BA Group

Clair Maltby Secondary Plan
5976-06 March 2019

Exhibit 1

9.4 CLAIR-MALTBY SECONDARY PLAN TRAIL NETWORK

Trail locations are identified within the Master Environmental Service Plan for the Clair-Maltby Secondary Plan area, and are generally located along the edges of the Natural Heritage System. The function of the Trail Network is to provide additional pedestrian and cycling facilities throughout the Secondary Plan area in order to:

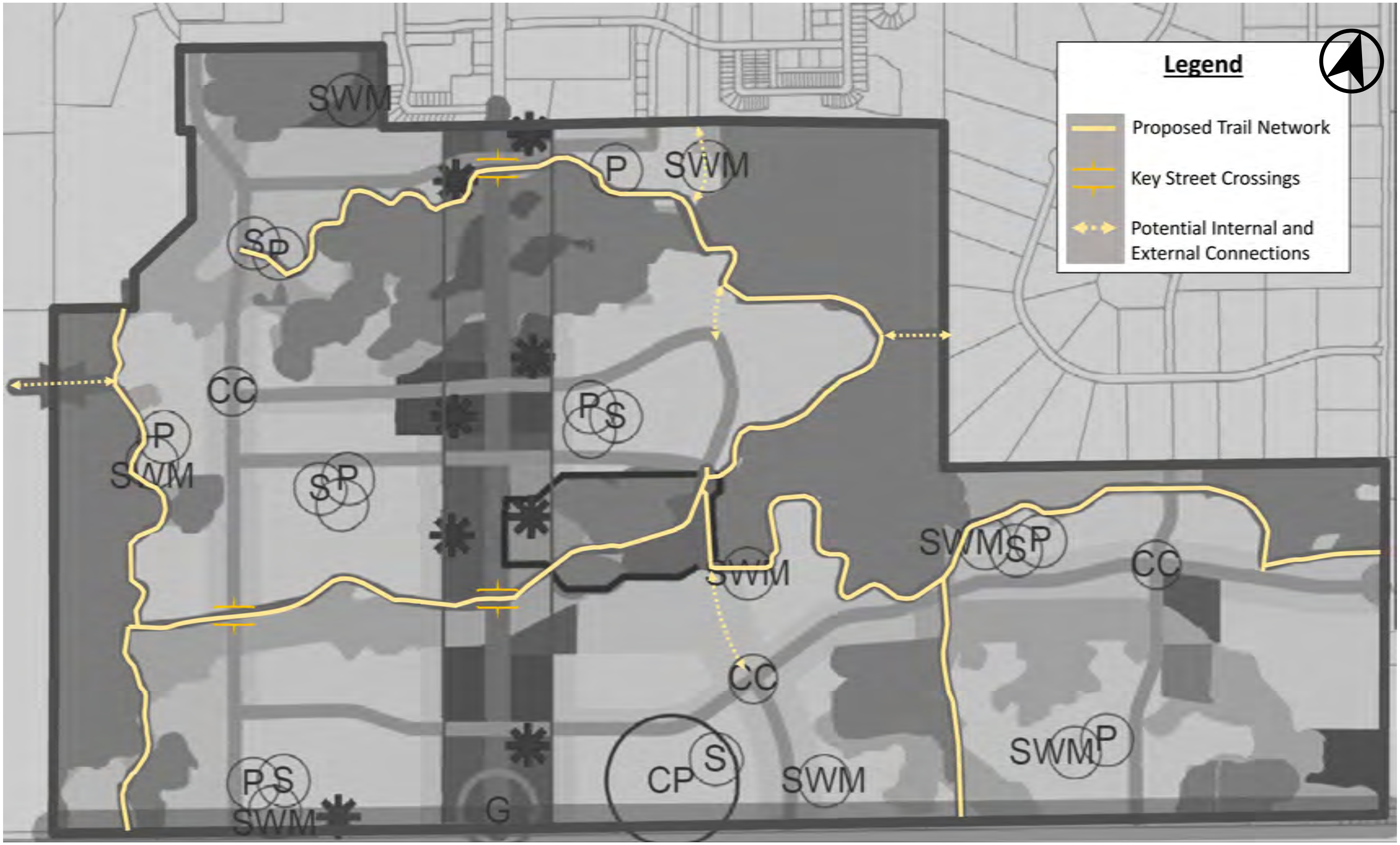
- accommodate commuter and practical pedestrian and cycling circulation and connectivity;
- provide recreational amenity and active transportation use;
- augment the wider trail network in the southern parts of the City of Guelph; and
- augment the collector street network prepared as part of the Preferred Community Structure plan.

The Clair-Maltby Secondary Plan creates a linked trail system for both recreational and utilitarian users, and is intended to accommodate and prioritize active transportation travel modes. Trail links are strategically located to compensate for limitations in the Secondary Plan street network (understanding the limitations of new road construction on the Natural Heritage System), and to provide the most direct and convenient pedestrian and cycling connections between residential areas and community facilities and commercial developments.

East of Gordon Street, important elements of the Trail Network are proposed to cross the Natural Heritage System to continue to allow for pedestrian and cycling connectivity where typical street right-of-ways would otherwise not be permitted. Future studies will be required to demonstrate that active transportation links are compatible with natural and cultural heritage attributes in these areas.

Potential trail sections are also identified, which are intended to support utilitarian access to the trail system itself, and provide more direct linkages within the wider mobility network identified as part of the Preferred Community Structure plan. Potential linkages are also identified conceptually to extend beyond the Clair-Maltby Secondary Plan area and connect with the wider trail network and adjacent neighbourhoods.

The proposed trail network is illustrated on the Preferred Community Structure Plan and outlined in Figure 16. Detailed trail and path design guidelines are discussed in Section 8.0, herein, and detailed in in the City of Guelph Active Transportation Network Study Plan (2017).



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CLAIR-MALTBY SECONDARY PLAN TRAIL NETWORK

BA Group

Clair Maltby Secondary Plan
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Figure 16

9.5 GORDON STREET MAIN STREET CONCEPT

Gordon Street plays and important role in accommodating development within the Clair-Maltby Secondary Plan area. The Gordon Street corridor is a central element in the local transportation network, connects the area with the wider City and County, provides an opportunity for transit priority, and is envisioned as a main street / village core destination.

The Gordon Street corridor is intended to be designed to highlight and celebrate the public realm, cultural and natural heritage features, and otherwise be framed by a continuous urban built form with building facades fronting onto the street. Given the variety of land uses and cultural / public facilities anticipated along the Gordon Street corridor, the public right-of-way is required to accommodate all street users through the delivery of multi-modal infrastructure. Its design will support the efficient and effective routing of transit services, the comfortable movement of cyclists and pedestrians, and accommodate for automobile travel.

Vehicle parking is not intended to separate the Gordon Street right-of-way from private buildings. Vehicle parking should generally be located underground, in structures, or to the rear or sides of buildings, and designed in a manner such that it does not have a direct impact on the street.

9.5.1 Traffic Operations

Gordon Street is intended to be a multi-modal travel corridor, prioritizing transit, cycling and walking. However, the corridor is also anticipated to accommodate considerable traffic volumes given its role as a regional traffic corridor, its interchange with Highway 401 to the south, and the extent of north / south vehicular routes planned within the Secondary Plan area.

Understanding this, important improvements should be advanced to allow for additional traffic routing in the northbound and southbound directions, including planned improvements to Hanlon Parkway, the extension of Southgate Drive to Maltby Road, and new north-south oriented collector roads outlined in the Preferred Community Structure Plan.

To improve traffic flow along the corridor, Gordon Street itself can also be optimized through appropriate signal timing and coordination, and the inclusion of ancillary turn lanes when necessary. Separate left-turn lanes should be provided at all junctions where left-turns are permitted, which may further support the introduction of a continuous left-turn / centre median lane along the extent of Gordon Street within the Secondary Plan area. The location of ancillary turn lanes and traffic signal control for intersections along the Gordon Street corridor are further detailed in Section 15.5.

Traffic signal coordination can process estimated future traffic volumes through the corridor, limit traffic queue impacts and decrease associated traffic delays. It may also be appropriate that traffic signal timing prioritize traffic movement northbound and southbound along the Gordon Street corridor in lieu of eastbound and westbound movements across the corridor.

A 4-lane Gordon Street cross-section is anticipated to appropriately accommodate traffic demands along the corridor, but will also require the inclusion of ancillary turn lanes at signalized intersections. Separate left-turn lanes are appropriate at all signalized intersections along the corridor. Separate right-turn lanes may be supported in certain instances when traffic demands warrant them or longer transit-stop dwell times are expected – specifically at the Gordon Street / Clair Road intersection.

9.5.2 Transit-Support Elements

The Clair-Maltby Secondary Plan encourages dense, mixed-use development along the Gordon Street corridor to support the deployment of transit services currently operating along Gordon Street and anticipated to be extended along the corridor through the Secondary Plan area. The provision of frequent transit service along the Gordon Street corridor also supports the urban development of the corridor, provides mobility choice for area residents, employees, and visitors, and establishes a multi-modal and public amenity framework for the corridor.

Transit priority measures, to be potentially integrated within the Maltby Secondary Plan area to increase transit mode split and the proportional uptake of transit use, can include physical design elements to reduce transit vehicle delays and provide amenity and convenience to perspective riders, and policy measures to make transit more appealing, affordable and competitive with other travel modes.

A variety of measures can be introduced within the Secondary Plan area to support Gordon Street as a *Transit Spine*, are summarized in Table 9 and segmented into three primary categories:

1. Transit vehicle priority,
2. Transit policy and operations, and
3. Transit amenity.

The measures outlined in Table 9 provide a high-level summary of potential infrastructure and policies to prioritize transit service delivery within the Clair-Maltby Secondary Plan area and specifically along the Gordon Street corridor. Other measures can be pursued for the area, or for the City overall, to better deliver transit. The detailed design and location of transit services, as well as operational provisions, are to be developed in consultation with Guelph Transit.

The ability for Gordon Street to respond to traffic demands, reduce traffic queue impacts, and minimize traffic delay will also have an impact on transit vehicles routing along the corridor. Where traffic delays persist, additional measures can be implemented to prioritize transit vehicle travel. These measures should be given greater consideration when planning for key transit terminals or transfer points, which typically are associated with higher transit vehicle volumes and tend to be located in more densely-populated locations. The addition of traffic signals to facilitate specific transit vehicle movements at the location of transit terminals should also be considered. Within the context of the Secondary Plan, it may be appropriate to locate a bus terminal near the intersections of Gordon Street / Street B or Gordon Street / Street C, to accommodate intra and inter-city transit services.

The location and design of transit stops will impact the attractiveness of transit in a variety of ways. Transit stops and stations should be designed to be universally accessible, safe and amenity-rich. Transit stops should be clear of clutter and obstructions, well-lit, have boarding / alighting areas, and appropriate shelter and convenience items (transit information, seating, etc.). The location of transit stops should reflect the local pedestrian and cycling networks, and further be supported by these networks. Transit stops must also be appropriately spaced to service new development while not incurring induced delay to transit vehicles and their riders. The spacing of transit stops depends on the type of service provided, whereas local bus services would have higher stop frequencies then express bus or other higher-order transit services.

Potential Transit Terminal

Opportunity may existing to pursue the development of a transit terminal in the area of the Clair-Maltby Secondary Plan to achieve a number of objectives, including:

1) Support dense, mixed-use urban development;
2) Support and encourage Transit Oriented Development;
3) Support transit service operations;
4) Encourage transit use; and
5) Take advantage of the strategic urban boundary location of the Clair-Maltby Secondary Plan to support interaction and transfers between local and regional transit services.

The introduction of a transit (bus) terminal is also supported in the City's Transit Growth Strategy and Plan (2010) which specifies that the City work with property owners to establish a 4 to 6 bay bus terminal within the South End Node (Gordon Street and Clair Road intersection).

Transit terminals are supported by robust active transportation connections, an appropriate mix of commercial uses, and higher density residential and employment uses. Metrolinx highlights six important aspects of Transit Oriented Development, which support the creation of transit hubs and transit terminals:

i) Multi-modal transportation allowing transportation choice;
ii) Urban density and use intensity;
iii) High levels of pedestrian priority, including spaces designed for pedestrian priority;
iv) Embedded technology (i.e. access to real time transit information, internet, and seamless transfers between transportation modes);
v) Economic vitality and competitiveness, consisting of significant development potential and strong economic anchors; and
vi) A strong sense of place – a vibrant and vital place to support the transportation experience.

Within the context of the Clair-Maltby Secondary Plan, it may be appropriate to locate a bus terminal in a location that accommodates intra and inter-city transit services and associated transfer activity, in proximity to public amenity, and high density and mixed land uses.

Conceptually, a transit terminal may be located in vicinity of the Gordon Street / Clair Road intersection (as noted within the Transit Growth Strategy and Plan), or within higher-density mixed-use areas of the Secondary Plan (as preferred by Guelph Transit), such as in proximity to the intersections of Gordon Street / Street B or Gordon Street / Street C. A transit terminal near the south extent of the Clair-Maltby Secondary Plan area would support mixed-use and high-density residential development planned in this area, and allow for a logical southern terminus for local transit routes that could, potentially, connect with existing GO Transit bus routes routing along Gordon Street from Highway 401.

A transit terminal facility, should it be pursued, would be developed in consultation with Guelph Transit, Metrolinx, and other potential private and public transit service providers, in order to appropriately design and locate a desirable facility.

TABLE 9 POTENTIAL TRANSIT-SUPPORTIVE MEASURES

Transit-Supportive Policy	Potential Implementation Measure	Description	Examples
Transit Vehicle Priority	Transit Priority Signal (TPS)	Traffic signals can be calibrated with bus detection technology, extending traffic signal *green-time* for transit vehicles.	Saskatoon Transit 3rd Avenue and Broadway Avenue BRT Transport for London Selective Vehicle Detection Technology
	Transit Queue Jump Lanes	Right-turn lanes paired with a transit stop can be extend beyond typical traffic queue lengths to accommodate transit vehicles.	City of Toronto Complete Streets Guidelines
	Transit Vehicle Priority Turning Lanes	Designated transit-only turning lanes to accommodate transit routes with turns or transit vehicles routing to key transit terminals / stations. These can effectively reduced transit delays associated with typical left-turn movements.	Millway Avenue at Vaughan Metropolitan Centre Station (Toronto Transit Commission) Albany Highway / Nicholson Road, Perth, Australia (Western Australia PTA)
	Designated Transit-Only Lanes	Designated transit-only travel lanes or transit lanes within a separated right-of-way. Transit lanes can be separated by traffic lanes by physical barriers or appropriate pavement markings.	Express Bus Lanes (XBL) Network in New York City Bus Rapid Transit Network, Bogota, Colombia
Transit Policy and Operations	Free-Transit Use	To encourage transit use, transit fares can be removed on days with higher pollution levels, adverse weather, or for certain / designated trips.	Free Fare for Clean Air Program, Prince George, B.C.
	Pre-paid boarding	Provide options / services for fare payment before boarding a vehicle to reduce transit vehicle dwell times at transit stops.	Transport For London Fare Policy
	All-door boarding / alighting	Allow transit vehicle boarding and alighting at all transit vehicle doors to reduce transit vehicle dwell times at transit stops.	Toronto Transit Commission Streetcar Boarding / Alighting
	Minimum Service Standards	Provide a minimum service frequency (15-minutes or less), all-day, along designed corridors.	Toronto Transit Commission (Ridership Growth Strategy; Express Bus Network)
	Express Service	Provide supplementary express transit service operating with fewer stops, in addition to local frequent stop service.	
Transit Amenity	Provision of Transit Stop Amenities	Inclusion of transit stop shelters, furniture, lighting, landscape, public art, "next-bus" real-time information, and boarding / alighting pads.	City of Toronto Complete Street Guidelines
	Accommodate Transfers	Reduce the space between bus route transfers, or consolidate transfers within designated stops / stations. It may be appropriate to locate a bus terminal near the intersection of Gordon Street / Street B to accommodate intra and inter-city transit services transfers. Prioritize pedestrian movement allowing for safe, convenient walking spaces between transit stops where transfers are anticipated.	
	Incorporate "last-mile" Facilities	Transit stops should be well connected to area pedestrian and cycling infrastructure, include bicycle parking, wayfinding, and fare payment options.	
	Universal Accessibility	Design transit stops / stations to accommodate for all ages and users.	

10.0 MOBILITY PLAN FRAMEWORK: TRANSPORTATION DEMAND MANAGEMENT (TDM)

10.1 SECONDARY PLAN APPROACH TO TRANSPORTATION PLANNING

A Transportation Demand Management (TDM) framework will be pursued to:

- establish a foundation for managing future travel demands with development of the Secondary Plan area, and

- ensure that measures to promote transit and active transportation are implemented by way of the transportation amenities provided, as well as the built form of the community.

It is recommended that policy statements pertaining to TDM be included within the Clair-Maltby Secondary Plan. Within this section, a best practice review of municipal policy documents in southwestern Ontario and the Greater Toronto & Hamilton Area is outlined. The purpose of the review is to identify policy themes that could be included within the Clair-Maltby Secondary Plan, building upon TDM-related policy statements currently included in the City of Guelph Official Plan and the Guelph-Wellington Transportation Study.

10.2 APPLICABLE TRANSPORTATION DEMAND MANAGEMENT POLICY

The City of Guelph Official Plan contains policy statements relating to TDM, referring to it as an essential part of the City's integrated sustainable transportation system. TDM measures are suggested to increase the modal share of automobile travel alternatives, including bicycle infrastructure, providing support for transit, allocating car-share parking spaces, and other initiatives, all of which are expected to be considered as part of future development applications.

The Guelph-Wellington Transportation Study identifies TDM strategies, which partly accommodates forecast future travel demands through reductions in vehicular travel demands. These TDM measures include:

- a supportive land use and urban design practices (as outlined in the Official Plan);
- ridesharing, cycling and walking;
- alternative measures for reducing auto use (parking pricing / supply management, telecommuting, alternative work schedules, congestion pricing); and
- TDM programs (alternative strategies, education, etc.).

More detail relating to TDM policy found within the City of Guelph Official Plan and the Guelph-Wellington Transportation Study is included in Section 4.3.2 and Section 4.6, respectively, and additional policy documents making reference to TDM policy goals, including the Downtown Guelph Secondary Plan, Guelph Innovation District Secondary Plan, and City of Guelph Community Energy Plan, are included in Section 4.7.

10.2.1 Comparative Review of Transportation Demand Management Policy

BA Group has conducted a review of TDM policies found within the Official Plans, Secondary Plans, and Transportation Master Plans of municipalities in the Greater Toronto & Hamilton Area and Southwestern Ontario. The purpose of the review is to identify best practices that can inform the development of TDM policy that can be included in the Clair-Maltby Secondary Plan.

A complete set of researched TDM policy can be read in **Appendix D**. Within this section, a thematic review of TDM policies is provided, identifying the general purpose of the examined policy, comparable examples, and a list of Official Plans and Secondary Plans where similar TDM policy is present.

Policy Theme #1: Require a Transportation Demand Management Plan as part of Development Applications.

Several policy documents either stated that a TDM Plan would be a requirement as part of development applications, or indicated that a TDM Plan may be required.

Rationale:

Ensure that development applications not only take into consideration the vehicular traffic that the future development will generate, but to develop a strategy for mitigating vehicular trip generation through infrastructure improvements, marketing efforts, and the development of partnerships, each of which promote alternatives to automobile travel among residents or tenants.

Examples:

Section 6.11 of the Cambridge West Lands Secondary Plan states the following:

> *The implementation of Transportation Demand Management measures shall be considered as part of every application for new development or redevelopment within the Secondary Plan area.*

In some cases, the requirement for a TDM Plan is stipulated based upon the scale of the proposed development, as is the case with Section 7.7.2.3.(b) of the North Oakville East Secondary Plan:

> *The Town will encourage any development which contains more than 3,000 square metres of office use or 9,290 square metres of industrial use to establish with the Town a travel demand management plan and implementation strategy for the specific development.*

The following policy documents include similar policy statements:

- Downtown Guelph Secondary Plan, City of Kitchener Official Plan, City of Mississauga Official Plan, Port Credit Local Area Plan (Mississauga), City of London Official Plan, City of Vaughan Official Plan, Town of Aurora Official Plan, Newmarket Urban Centres Secondary Plan, Town of Oakville Official Plan, North Oakville West Secondary Plan, Town of Milton Official Plan

Policy Theme #2: Indicate that vehicular parking standards may be reduced with the implementation of Transportation Demand Management Measures.

Several municipalities indicate that either a TDM plan or a commitment to the implementation of TDM measures will be considered as justification for a reduction to vehicular parking requirements.

Rationale:
Sensible vehicular parking management and the provision of an extensive suite of TDM measures are mutually supportive. If vehicular parking is oversupplied, future residents, tenants, or visitors to a development would have less incentive to utilize the alternative transportation options that are available to them. Likewise, a modest parking supply without appropriate TDM measures would negatively affect local traffic and place undue parking demand on the surrounding area. Therefore, it is sensible to permit reductions to vehicular parking requirements if appropriate TDM measures are proposed as part of a development application.

Examples:
Section 13.C.8.2 of the City of Kitchener Official Plan states the following:

> *The City may consider adjustments to parking requirements for properties within an area or areas, where the City is satisfied that adequate alternative parking facilities are available, where developments adopt transportation demand management (TDM) measures or where sufficient transit exists or is to be provided.*

Similarly, Section 11.1.4.1.4 of the Downtown Guelph Secondary Plan states the following:

> *The City may permit reduced parking standards for developments which demonstrate through a TDM plan and implementation strategy that a reduction in parking standards is appropriate.*

The following policy documents include similar policy statements:

- City of Cambridge Official Plan, City of Waterloo Official Plan, Region of Waterloo Official Plan, City of London Official Plan, Newmarket Urban Centres Secondary Plan, Town of Oakville Official Plan, North Oakville East Secondary Plan, North Oakville West Secondary Plan, Sheppard Lansing Secondary Plan (Toronto)

Policy Theme #3: Provide a list of recommended or suggested Transportation Demand Management Measures or Initiatives.

It is common practice to include a list of suggested TDM measures to be included as part of a TDM Plan within the examined policy documents.

Rationale:
Generally, providing a list of suggested TDM measures serves to help the community gain a better understanding of what TDM is; it is generally not a well understood concept outside of the development community. Further, naming specific TDM measures sets expectations as to the kind of infrastructure can be expected in the community (i.e. car-share vehicles or preferential carpool spaces). As it relates to development applications, providing a suggestive list provides guidance to the type of TDM measures the municipality will favour.

Examples:
Section 9.3.5(iv) of the Newmarket Urban Centres Secondary Plan states the following:

> *TDM strategies should be designed to decrease single occupancy vehicle use, reduce peak period demands, especially discretionary trips in the afternoon peak period, promote active transportation and transit use, and to increase vehicle occupancy during peak periods and should include, but not be limited to:*
> *a) provision for car share opportunities in major residential developments;*
> *b) secure indoor bicycle parking and showers in conjunction with major office and commercial uses, institutional and civic uses;*
> *c) preferential parking for carpool and electric vehicles in non-residential developments;*
> *d) provision for bicycle parking in close proximity to building entrances and transit stations;*
> *e) transit incentive programs, including subsidized transit fares; and*
> *f) incorporating paid parking requirements with non-residential development.*

The following policy documents include similar policy statements:

- City of Cambridge Official Plan, City of Kitchener Official Plan, City of Mississauga Official Plan, City of Vaughan Official Plan, City of Markham Official Plan, Town of Oakville Official Plan, Downsview Area Secondary Plan (Toronto), North York Centre Secondary Plan (Toronto)

Policy Theme #4: Pledge to promote Transportation Demand Management initiatives through Transportation Management Associations and associated marketing efforts or through programming.
In municipalities with existing Transportation Management Associations (TMA), several policy documents indicate that the municipality will continue to work with the TMA to promote TDM initiatives. In other cases, the document pledges to promote TDM measures and implement monitoring programs to measure the success of TDM programming.

Rationale:
Generally, a TMA is a non-profit organization that provides transportation services within a geographically defined area. Normally, it is member-controlled and focussed upon employment areas; they are generally public-private partnerships. The presence of a TMA is a significant advantage to the promotion of TDM programs, measures, and initiatives, given that it is an organization that exists to serve that purpose. The inclusion of policy statements indicating support for TMA's further strengthens TDM efforts.

Examples:
Section 8.5.3 of the Mississauga Official Plan indicates broad support for TDM programming:

> *Mississauga will encourage employers to implement TDM programs.*

Section 5.4.1 of the Kitchener Transportation Master Plan specifically indicates support for the local TMA:

> *Expand employer TDM programs in Kitchener through existing TDM tools and services. This can begin with the City"s membership in the TravelWise TMA to adopt carpool ridematching, subsidized transit passes, guaranteed-ride home and outreach programs to encourage its staff to choose sustainable modes of travel to and from work. Given TravelWise is a well-establish program in the Region, TDM efforts and outreach should be expanded beyond City staff and beyond the downtown area to encourage major employers throughout the City to adopt these services.*

The following policy documents include similar policy statements:

- Region of Waterloo Official Plan, City of Vaughan Official Plan, City of Markham Official Plan, Newmarket Urban Centres Secondary Plan, Town of Oakville Official Plan, Sheppard Lansing Secondary Plan (Toronto), Downsview Area Secondary Plan (Toronto)

Policy Theme #5: Indicate that a Transportation Demand Checklist will be created (or exists) to assess development applications.

In **Appendix D**, a selection of existing TDM checklists is provided; the intent of the documents are to assess development applications. In some cases, the TDM checklist is notified as a policy implementation instrument in the examined policy.

<u>Rationale</u>:

The utilization of a TDM checklist by a municipality (potentially within a Secondary Plan area) provides a streamlined instrument to review development applications. Further, it indicates the expectations of the municipality in regards to TDM, showing what needs to be included in development proposals for them to be acceptable from a TDM perspective.

<u>Examples</u>:

Section 5.4.4 of the Kitchener Transportation Master Plan states the following:

> *The City should develop a TDM checklist to help review and evaluate development applications, City of Kitchener transportation-related projects and projects of the Region and Province. This checklist would assign points and provide a rating, similar to the Region of Waterloo"s Travel Demand Management Implementation Checklist. Another example of a TDM checklist was developed in the study "TDM Supportive Guidelines for Development Approvals" prepared by the Association for Commuter Transportation in Canada.*
>
> *Part of this TDM checklist can include a requirement to prepare TDM plans as part of transportation impact studies for new developments and major transportation projects.*

Policy Theme #6: Enable the inclusion of a Transportation Demand Management Plan as part of the rationale for increases to land density.

Several policy documents enable TDM initiatives (or a plan) to be included as part of the rationale to increases density permissions.

Rationale:
A policy statement indicating added leniency to density permissions if a TDM Plan (or initiatives) is proposed greatly enhances the appeal of TDM to a development proponent, and is likely to improve the TDM measures proposed as part of a project. Further, the City of Guelph can pledge, within the policy statement, to work with development proponents to cater appropriate TDM measures to the development proposal, as part of this effort.

Examples:
Section 11.1.38(5), which is a specific area provision, of the City of Waterloo Official Plan states the following:

> *The determination of appropriate increases in density for areas designated high density, shall be considered based on the ability of the project to meet one or more of the following objectives and shall be specified on a site by site basis, in the implementing zoning:*
> *(i) To encourage improvements suggested by a Transportation Demand Management Plan, where appropriate;*

The following policy documents include similar policy statements:

- City of Kitchener Official Plan, Port Credit Local Area Plan (Mississauga)

Additional Policy Themes
In addition to the aforementioned policy themes that appear in many policy documents in the study area, there are policy statements that are unique. These policy themes generally involve connecting TDM to other policy areas, including the following:

- The City of Kitchener Official Plan (Section 6.C.1.2) indicates that a Health Impact Assessment may be required as part of development applications, and indicates that it may be evaluated based upon the proposals support for physical activity, which could be connected to reducing automobile dependency and TDM measures.
- The City of Kitchener Official Plan (Section 7.C.7) makes a direct connection between air quality and TDM, as a policy goal.
- Similarly, the City of Waterloo Official Plan (Section 8.5.3(1)) makes a direct connection between energy conservation and TDM.
- The Region of Waterloo Official Plan (Section 3.C.3) specifies that when a development applicant agrees to implement TDM measures, the Region may consider granting reductions to the level of road improvement that would otherwise be required, associated with the proposed development.
- The City of Vaughan Official Plan (Section 4.3.3.5) pledges to work with developers to provide new homebuyers with information on multi-modal transportation options.

10.2.2 Land Use Planning and Transportation Demand Management Integration

In addition to the aforementioned policy statements identified from outside of Guelph, the City should consider including a policy statement highlighting the importance of the relationship between land use planning and transportation demand management. Land use planning decisions should be evaluated on the basis of their ability to facilitate and encourage shorter trip distances between typical weekday needs, including access to commuter services, amenities, routine errands/purchases, and schools.

10.3 TRANSPORTATION DEMAND MANAGEMENT FRAMEWORK

Upon review of existing policy statements in the Guelph Official Plan and the Guelph-Wellington Transportation Study relating to TDM, and a review of best practices in TDM policy in southwestern Ontario and the Greater Toronto & Hamilton Area, it is recommended that the Clair-Maltby Secondary Plan provide a robust framework of requirements ensuring that the development being pursued in the area meets a strict TDM standard.

The following policy themes, outlined in Table 10, are recommended for inclusion in the Clair-Maltby Secondary Plan.

TABLE 10 CLAIR-MALTBY SECONDARY PLAN RECOMMENDED TDM FRAMEWORK

Policy Theme Recommended for Inclusion	Best Practice Examples	Additional Notes
Policy Theme #1: Require a TDM Plan with Development Applications.	Cambridge West Lands Secondary Plan, North Oakville East Secondary Plan	Already included in Guelph Official Plan.
Policy Theme #2: Encourage TDM provision to reduce vehicular parking standards.	City of Kitchener Official Plan, Downtown Guelph Secondary Plan	Currently suggested in Guelph Official Plan; can be made more specific in Clair-Maltby Secondary Plan.
Policy Theme #3: Provide suggested TDM Measures list.	Newmarket Urban Centres Secondary Plan	Already in Guelph Official Plan, list can be expanded in Clair-Maltby Secondary Plan.
Policy Theme #4: Work with TMA's to promote TDM initiatives and programming.	Mississauga Official Plan, Kitchener Transportation Master Plan	This would advocate the creation of a TMA in Guelph.
Policy Theme #5: Utilize TDM checklist to assess development applications.	Kitchener Transportation Master Plan	A selection of existing TDM Checklists in neighbouring municipalities is included in **Appendix D**.
Policy Theme #6: TDM Plan to rationalize increases to land density.	City of Waterloo Official Plan	Enable developers to propose a robust TDM Plan as a means of procuring additional density permissions.
Policy Theme #7: Support the integration of land use planning and transportation demand management decision making.	City of Mississauga Official Plan	Land use planning can be a TDM measure if it facilitates shorter trip distances.

11.0 VEHICLE PARKING CONSIDERATIONS

As the City of Guelph develops policies for the Clair-Maltby Secondary Plan and eventually, an area specific Zoning By-law, the challenge will be the development of standards that would provide parking supply to meet demands, where appropriate, while supporting sustainable transportation options and public realm objectives.

Parking within this section is reviewed from two (2) perspectives:

1. The first perspective is policy based and influences the overall required parking supply. Parking standards are is set out within the applicable Zoning By-law, which outlines the ratios and provides regulations governing the number of spaces and the location of these spaces based upon land use, unit type, and floor area.

2. The second perspective influences the use of the parking infrastructure – parking demand. Parking demands are influenced by the type of unit, ownership, location, demographic of the area, surrounding land uses, transit accessibility and pedestrian environment.

Both of these perspectives are discussed within this chapter. It is important to note the difference between 1) parking supply, and 2) parking demand particularly as management strategies.

The parking review and assessment is organized into four (4) key topic areas – as outlined in the following.

1. Review of the in-force City of Guelph parking standards based on land use to understand the variables and measurements (i.e. type of unit, floor area) used to calculate parking requirements.

2. A comparative review of parking regulations within neighbouring and comparable municipalities across southern Ontario to establish the range of parking requirements based upon type of land use.

3. Identification and discussion of effective parking management strategies to influence supply and demand.

4. A discussion of the appropriate parking management techniques which could be implemented to influence parking behaviour within the new Clair-Maltby Secondary Plan area.

There are a variety of factors influencing the development of parking requirements and standards. These factors (i.e. vehicular use, trip generation and travel choices) are affected by population density, layout of the municipality, transit accessibility, location of the development and adjacent land uses.

The purpose of this comparative parking standards review is to provide an understanding of the existing parking standards with the City of Guelph, how they compare relative to other neighbouring and similar municipalities, and how they might apply to the Clair-Maltby Secondary Plan area.

11.1 COMPARATIVE REVIEW OF PARKING REQUIREMENTS

11.1.1 Methodology

BA Group has completed a high-level comparative review of general parking requirements, which include common types of residential and non-residential uses that would likely be developed within the Clair-Maltby Secondary Plan area.

The purpose of this review is to understand the variations in minimum parking requirements for common land uses and to provide the City of Guelph with a range of standards, which can be used generally, to understand the current parking standards as they compare to other similar municipalities. The intent of this section is provide a foundation to guide discussions related to parking requirements, the approval process, and strategies that may be implemented to guide development within the Secondary Plan area.

We note that this high-level review is not meant to provide a set of parking regulations to be implemented. It is important to understand that each municipality exhibits their own unique characteristics and has implemented parking standards based upon development and approval patterns, reflective of parking demands and trends that may be occurring.

The parking standards, based upon land use, that have been selected for comparative review include common types of uses for residential and non-residential uses, as noted below:

- **Residential Uses:**
  Includes single family dwelling units, multiple dwelling units, visitors to apartment buildings, mixed-use buildings and live-work units

- **Non-Residential Uses:**
  Includes retail uses, service uses, office uses (exclusive of medical office uses), community uses, hospitality uses and restaurant uses

11.1.2 Understanding the Current Parking Context

Proposed developments located within the City of Guelph are required to review parking standards outlined within the applicable Zoning By-law. These standards are used to calculate the minimum number of parking spaces required based upon land use and location. The two applicable Zoning By-laws for proposed developments are:

- Downtown Zoning By-law (2017)-20187
- City of Guelph Comprehensive Zoning By-law 1995-14864

We understand that the City of Guelph has recently initiated a review of the in-force Zoning By-law. It is our understanding that the Clair-Maltby Secondary Plan parking requirements will align with the overall vision that the City of Guelph has towards its growth and development.

BA Group has generally reviewed the applicable parking standards for residential and non-residential uses based upon the in-force Zoning By-laws. Parking requirements for residential and non-residential uses are further discussed and summarized in Section 11.1.3.

11.1.2.1 Parking Reduction Permissions

Parking reductions are typically permitted within the Zoning By-law, depending on a number of factors, not limited to land use compatibility (i.e. shared parking) or other development restrictive factors (i.e. heritage buildings).

The City of Guelph currently permits parking reductions for proposed development sites, notably for Designated Structures. In these applications, *a reduction of 20% of the required parking spaces are permitted, however, in no case shall the reduction be greater than 5 parking spaces.*

11.1.3 Parking Requirements Based Upon Land Use

11.1.3.1 Residential Uses

Residential land uses include a variety of dwelling unit types ranging from single family dwelling units (i.e. single-detached housing) to multiple dwelling units (i.e. apartment buildings or townhouses). We also note that the layout of multiple dwelling units can also result in varying standards depending upon the municipal interpretation and understanding of the urban form. To clarify, multiple dwelling units can refer to apartment buildings (i.e. units stacked on top of each other) or townhouses (i.e. units that are divided vertically and are side-by-side, sharing a common wall).

The layout of multiple dwelling units has resulted in varying standards within municipalities depending on the layout (i.e. units stacked on top of each other or units side by side). The City of Guelph has not differentiated between the two layouts. Multiple dwelling units have the same parking requirement whether they are stacked on top of each other or sharing a common wall horizontally. Parking requirements for this type of use are calculated based upon the number of dwelling units. A summary of the residential parking standards can be found in Table 11.

11.1.3.2 Non-Residential Uses

Non-residential land uses include retail, office, service, restaurant, and hospitality (i.e. hotel) land uses. These are the most common types of commercial units that are likely to be developed within the Clair-Maltby Secondary Plan area. Parking requirements for this type of unit are calculated based upon gross floor area (GFA). The City of Guelph has defined the GFA within the Zoning By-law as, *the total floor area of a building measured from the centre line of the partition walls and the exterior face of outside walls, but does not include any floor area of a basement, cellar, attic, garage, porch or any floor area used for parking or any floor area which does not have a clear floor to ceiling height of 2.15 metres.*

TABLE 11 GUELPH ZONING BY-LAW REVIEW– RESIDENTIAL USES

Municipality	Apartment Building / Multiple Dwelling Unit	Visitors to Apartment Buildings	Mixed-Use or Live-Work Unit
Guelph Downtown	1 per residential dwelling unit	See below for D1 and D2 zones	In addition to the non-residential parking requirement, 1 parking space per residential dwelling unit is required.
Guelph Special Downtown Zones (D1/D2)	1 per residential dwelling unit	0.05 spaces per dwelling units reserved for exclusive use of visitors, for 10+ dwelling units	Parking is required for residential uses only
Guelph General By-law Standard	For the first 20 units: 1.5 spaces per unit, and for each unit in excess of 20: 1.25 per unit	--	--
Burlington (Zoning By-law 2020)	1-Bed: 1.25 spaces per unit 2-bed: 1.50 spaces per unit 3+bed: 1.75 spaces per unit	0.35 spaces per unit	--
Burlington (Zoning By-law 2020) *(townhouse dwelling)*	2 occupant spaces per unit	0.50 spaces per unit	--
Cambridge (Zoning By-law 150-85) *(apartment house, maisonette, mixed terrace or cluster attached duplexes)*	1 space per dwelling unit;	plus 1 space for each 4 dwelling units for visitors only.	--
Cambridge (Zoning By-law 150-85) *(cluster row housing)*	1 space for the first 4 bedrooms per dwelling unit; plus 1 space for each additional 2 bedrooms	Plus 1 space for each 2 dwelling units for visitors only	--
Hamilton (Comprehensive Zoning By-law 05-200)	1 space per unit OR 0.3 spaces per unit[4]	--	--
Kitchener (UGC Zones) (Final Draft Zoning By-law, April 2018)	0.8 spaces per dwelling unit	0 spaces per dwelling unit	--
Kitchener (MIX Zones) (Final Draft Zoning By-law, April 2018)	0.9 spaces per dwelling unit	0.1 spaces per dwelling unit only where 5 or more dwelling units are on a lot	--
Kitchener (All Other Zones) (Final Draft Zoning By-law, April 2018)	1 space per dwelling unit	0.1 spaces per dwelling unit only where 5 or more dwelling units are on a lot	--
London (Zoning By-law Z-1)	1.25 spaces per unit OR 1 space per unit OR Zero parking[1]	--	--

Municipality	Apartment Building / Multiple Dwelling Unit	Visitors to Apartment Buildings	Mixed-Use or Live-Work Unit
Mississauga (Zoning By-law 0225-2007): Downtown Apartment (within CC1 to CC4 zones)	1 space per unit	0.15 spaces per unit	1.25 spaces per unit (dwelling units located above a commercial development with a maximum height of 3 storeys)
Oshawa (Zoning By-law 60-94)	1.45 spaces per unit OR 1 space per unit OR 0.87 spaces per unit[2]	0.3 spaces per unit OR 0.33 spaces per unit	--
Toronto (Zoning By-law 569-2013): Policy Area 3	Bachelor: 0.6 spaces per unit 1-Bed: 0.7 spaces per unit 2-Bed: 0.9 spaces per unit 3+ Bed: 1.5 spaces per unit	0.1 spaces per unit	Bachelor: 0.6 spaces per unit 1-Bed: 0.7 spaces per unit 2-Bed: 0.9 spaces per unit 3+ Bed: 1.5 spaces per unit
Toronto (Zoning By-law 569-2013): Policy Area 4 (Areas with Surface Transit)	Bachelor: 0.7 spaces per unit 1-Bed: 0.8 spaces per unit 2-Bed: 0.9 spaces per unit 3+Bed: 1.1 spaces per unit	0.15 spaces per unit	Bachelor: 0.7 spaces per unit 1-Bed: 0.8 spaces per unit 2-bed: 0.9 spaces per unit 3+bed: 1.1 spaces per unit
Toronto (Zoning By-law 569-2013): All Other Areas	Bachelor: 0.8 spaces per unit 1-Bed: 0.9 spaces per unit 2-bed: 1 space per unit 3+bed: 1.2 spaces per unit	0.2 spaces per unit	Bachelor: 0.8 spaces per unit 1-Bed: 0.9 spaces per unit 2-bed: 1 space per unit 3+bed: 1.2 spaces per unit
Waterloo (Zoning By-law 1108)	1.5 spaces per unit	--	1 space per dwelling unit
Waterloo (Zoning By-law 1418)	1.5 spaces per unit	--	1 space per dwelling unit

Notes:

1. 1.25 spaces / unit is for Parking Areas 2 & 3 (PA2 & PA3); 1 space / unit is for Parking Area 1 (PA1); for all lands zoned “Downtown” in PA1, zero parking is required.
2. 1.45 spaces / unit applies to condominium apartments; 1 space per unit applies to rental apartments; 0.87 spaces per unit for “Apartment Building – Rental for student accommodation only” in MU-B(1) zones (Mixed Use Zones)

TABLE 12 GUELPH ZONING BY-LAW REVIEW – COMMERCIAL USES

Municipality	Retail Uses	Service Uses	Office Uses	Restaurant Uses	Hotel Uses
Guelph Downtown	1 per 100 m^2 of GFA	1 per 100 m^2 of GFA	1 per 67 m^2 of GFA	--	0.75 spaces per guest room + 1 parking space per 10 m^2 of GFA open to the public, exclusive of corridors, lobbies or foyers
Guelph Special Downtown Zones (D1/D2)	No off-street parking is required	No off-street parking is required	No off-street parking is required	No off-street parking is required	No off-street parking is required
Guelph General By-law Standard	1 per 16.5 m^2 of GFA	--	1 per 33 m^2 of GFA	1 per 7.5 m^2 of GFA (tavern) 1 per 9 m^2 of GFA (take-out)	1 per guest room plus 1 per 10 m^2 of GFA open to the public excluding corridors, lobbies or foyers
Burlington (Zoning By-law 2020)	4 spaces per 100 m^2 of GFA	4 spaces per 100 m^2 of GFA	3.5 spaces per 100 m^2 of GFA	1 space per 4 persons capacity (standard restaurant) 1 space per 4 persons capacity or 25 spaces per 100 m^2 of GFA, whichever is greater.	1 space per guest room or suite
Cambridge (Zoning By-law 150-85)	2.5 spaces per 100 m^2 of GLCFA[1]	2.5 spaces per 100 m^2 of GLCFA	2.5 spaces per 100 m^2 of GLCFA	12 spaces per 100 m^2 of GFA	1 space per guest room or suite; plus parking required for any other retail or other service commercial or commercial-recreational establishment provided in the hotel or motel
Hamilton (Comprehensive Zoning By-law 05-200)	1 space per 20 m^2 of GFA	1 space per 16 m^2 of GFA (personal services)	1 space per 50 m^2 of GFA in excess of 450 m^2, which accommodates such use	1 space per 8.0 m^2 of GFA	1 space per guest room
Kitchener (UGC Zones) (Final Draft Zoning By-law, April 2018)	1 per 95 m^2 of GFA	1 per 95 m^2 of GFA	1 per 50 m^2 of GFA	1 per 19 m^2 of GFA	0.7 spaces per guest room

Municipality	Retail Uses	Service Uses	Office Uses	Restaurant Uses	Hotel Uses
Kitchener (MIX Zones) (Final Draft Zoning By-law, April 2018)	1 per 40 m^2 of GFA	1 per 40 m^2 of GFA	1 per 33 m^2 of GFA	1 per 7.5 m^2 of GFA, or for a restaurant within a mixed use building, mixed use development, multi-unit building, or multi-unit development, a rate of 1 per 19 m^2 GFA shall apply to the first 750 m^2 of restaurant, and a rate of 1 per 7.5 m^2 shall apply thereafter.	1 space per guest room
Kitchener (All Other Zones) (Final Draft Zoning By-law, April 2018)	1 space per 33 m^2 of GFA	1 space per 33 m^2 of GFA	1 space per 33 m^2 of GFA	1 space per 7.5 m^2 of GFA, or for a restaurant within a mixed use building, mixed use development, multi-unit building, or multi-unit development, a rate of 1 per 19 m^2 GFA shall apply to the first 750 m^2 of restaurant, and a rate of 1 per 7.5 m^2 shall apply thereafter.	1 space per guest room
London (Zoning By-law Z-1)	1 space per 25 m^2	1 space per 15 m^2 (personal services)	1 space per 40 m^2	1 space per 15 m^2 (eat-in) 1 per 8 m^2 (take-out)	1.25 spaces per unit
Mississauga (Zoning By-law 0225-2007): Downtown Apartment (within CC1 to CC4 zones)	5.4 spaces per 100 m^2 of GFA 4.0 spaces per 100 m^2 of GFA in a C4 zone 4.3 spaces per 100 m^2 of GFA in a CC2 to CC4 zones	1 space per 100 m^2 of GFA	3.2 spaces per 100 m^2 of GFA	16.0 spaces per 100 m^2 of GFA 6.0 spaces per 100 m^2 of GFA (take-out) 9.0 spaces per 100 m^2 of GFA (in a C4 zone)	0.8 spaces per guest room; plus 10.0 spaces per 100 m^2 of GFA - non-residential used for public use areas including meeting rooms, conference rooms, recreational facilities, dining and lounge areas and other commercial facilities, but excluding bedrooms, kitchens, laundry rooms, washrooms, lobbies, hallways, elevators, stairways and recreational facilities directly related to the function of the overnight accommodation

Municipality	Retail Uses	Service Uses	Office Uses	Restaurant Uses	Hotel Uses
Oshawa (Zoning By-law 60-94)	1 space per 24 m^2	--	1 space per 28 m^2	1 space per 11 m^2	1 space per suite
Toronto (Zoning By-law 569-2013): Policy Area 3	1 space per 100 m^2 of GFA	1 space per 100 m^2 of GFA (personal services)	1 space per 100 m^2 of GFA	0 spaces per unit (if GFA < 200 m^2)	0.2 spaces per 100 m^2 of GFA
Toronto (Zoning By-law 569-2013): Policy Area 4 (Areas with Surface Transit)	1 space per 100 m^2 of GFA	1 space per 100 m^2 of GFA (personal services)	1 space per 100 m^2 of GFA	0 spaces unit (if GFA < 200 m^2)	0.2 spaces per 100 m^2 of GFA
Toronto (Zoning By-law 569-2013): All Other Areas	1.5 spaces per 100 m^2 of GFA (if 10,000 m^2 > GFA > 200 m^2) 3 spaces per 100 m^2 of GFA (if 20,000 m^2 > GFA > 10,000 m^2) 6 spaces per 100 m^2 of GFA (if GFA > 20,000 m^2) 0 spaces if GFA < OR = 200 m^2)	1.5 spaces per 100 m^2 of GFA (personal services)	1.5 spaces per 100 m^2 of GFA	3 spaces per 100 m^2 of GFA (if 500 m^2 > GFA > 200 m^2) 5 spaces per 100 m^2 of GFA (if GFA > 500 m^2)	1 space per guest room
Waterloo (Zoning By-law 1108 (within C4 and C5 zones)	5 spaces per 100 m^2 of Gross Retail Commercial Space (in zone C5)	4.5 spaces per 100 m^2 of building floor area (personal services in zone C4) 5 spaces per 100 m^2 of building floor area (personal services in zone C5)	3 spaces per 100 m^2 of building floor area where office space is on ground floor) 1 space per 100 m^2 of building floor area where office space is greater than 10 % but less than 50% of the total Gross Leasable Retail Commercial Space 3 spaces per 100 m^2 of building floor area which the Office space is 50% or greater of the Gross Leasable Retail Commercial Space (in zone C5)	1 space per 4 seats 15 spaces per 100 m^2 of building floor area (take-out) (in zone C4 where the total building floor area is < 1000 m^2)	1 space per guest room plus 5 spaces per 100 m^2 of all other building floor area (in zone C5)

Municipality	Retail Uses	Service Uses	Office Uses	Restaurant Uses	Hotel Uses
Waterloo (Zoning By-law 1418) (within C4 and C5 zones)	5 spaces per 100 m^2 of Gross Retail Commercial Space (in zone C5)	5 spaces per 100 m^2 of building floor area (personal services in zone C5)	3 spaces per 100 m^2 of building floor area where office space is on ground floor) 1 space per 100 m^2 of building floor area where office space is greater than 10 % but less than 50% of the total Gross Leasable Retail Commercial Space 3 spaces per 100 m^2 of building floor area which the Office space is 50% or greater of the Gross Leasable Retail Commercial Space (in zone C5)	1 space per 4 seats 15 spaces per 100 m^2 of building floor area (take-out) (in zone C4 where the total building floor area is < 1000 m^2)	1 space per guest room plus 5 spaces per 100 m^2 of all other building floor area (in zone C5)

Notes:
1. GLCFA = gross leasable commercial floor area.
2. City of Waterloo, C4= Commercial Zone 4, C5= Commercial Zone 5

11.2 PARKING MANAGEMENT STRATEGIES

The Clair-Maltby Secondary Plan area is the City's last unplanned greenfield area, currently undergoing a comprehensive planning process to establish policies to guide development towards the realization of an urban village – a sustainable community which provides a full range and mix of residential housing, commercial and employment uses.

One of the key guiding principles established within the Clair-Maltby Secondary Plan, includes the careful consideration of connections to other areas of the City. The ability to integrate the Clair-Maltby Secondary Plan area into adjacent neighbourhoods is reliant upon a multi-modal mobility network which provides alternative transportation choices and connections to other neighbourhoods, the Downtown and surrounding employment areas.

Key to the realization of this vision is the appropriate consideration and management of vehicular parking. Parking supply and demand are two (2) facets which influence transportation choice in new and emerging neighbourhoods. Establishing the parking requirements and understanding parking demands will encourage active transportation and transit use in multi-modal supportive communities and discourage unnecessary auto use.

In order for parking management strategies to be successful in guiding development, they must be applied in conjunction with other strategies. The purpose of this section is to outline a variety of strategies and discuss methods for implementation to affect both parking supply and demand.

11.2.1 Parking Management Strategies to Affect Supply

Development within the City of Guelph is governed by the in-force Zoning By-law, which outlines where development can happen, the number of parking spaces associated with the land use and the location of these parking spaces relative to the primary pedestrian accesses. It is important to understand that while municipal policies govern parking space provisions, the use of parking spaces inform the user experience with a proposed development. Societal perceptions and user experience regarding these parking facilities directly affect transportation choices.

11.2.1.1 Flexible Area Based Parking Standards

Land use and transportation need to be well integrated to ensure the success of a development plan. One of the driving components behind a successful transportation plan is the development of an appropriate land use plan which recognizes mixed-uses and land use compatibility. Land use adjacencies influence the transportation choices that are made by users to the site. Generally speaking, parking requirements have typically been established recognizing variables which affect the supply and demand (i.e. location and access to transit services, density of use, mixed land uses, population ages and abilities, car-share provisions, cycling facilities and infrastructure, and walkability).

Municipalities have established parking requirements which vary based upon land use adjacencies and the vision of growth for the area. The City of Guelph already recognizes the difference between areas and incorporates these within their Zoning By-law. The Downtown parking requirements, for example, have lower minimum ratios per unit type to encourage growth, the use of public parking facilities and transit services which are typically more prevalent and frequent in urban cores. By comparison, the in-force Zoning By-law outlines a different requirement for other areas of the City, recognizing the auto-oriented nature of some areas.

The Clair-Maltby Community Structure includes three (3) neighbourhood “theme” areas which will independently define the mix of land uses and residential character to meet the needs of residents and will also direct growth in an organized manner to support the proposed transit and natural heritage system connections.

1. **Gordon Street Corridor**
   The Gordon Street Corridor, running in a north-south direction, forms the transit “spine” for the Clair-Maltby area and includes a mix of land uses and residential developments that will be developed with transit-supportive densities. Within the Clair-Maltby Secondary Plan area, the highest density will occur along this spine.

2. **Urban Village Core**
   The Urban Village Core is the central focus of the Clair-Maltby secondary plan and includes the intersection of the Gordon Street corridor and the Main Street which runs in an east-west direction. The Core is intended to be pedestrian oriented with mixed-use buildings, high quality signature and landmark buildings.

3. **Residential Neighbourhoods**
   There are eight (8) residential neighbourhoods where low and medium density residential uses will be directed. These neighbourhoods will be walkable, with each one anchored by a focal point (i.e. neighbourhood-scale mixed use development, commercial development, park or other community facility).

Parking requirements within these areas should be established recognizing the unique characteristics of each area. These nuances can help create a neighbourhood where residents, patrons and visitors prefer to live, work and play in. Ultimately, variations within parking requirements will affect transit use and travel mode choices.

Areas that are intended for higher density developments (i.e. Gordon Street Corridor and Urban Village Core) should have parking standards that encourage transit use and discourage non-essential parking. Limiting parking supply and offering viable transportation alternatives at the site ensures that other parking management strategies (i.e. shared parking, cash-in-lieu of parking, and consolidated parking) will also be effective at managing and mitigating parking demands as they arise.

Areas which are intended to be pedestrian oriented can also include locational requirements, in addition to the parking standards. The specification of location for parking provisions (i.e. to the rear of building or underground) also reinforces urban design principles and guidelines in developing the pedestrian realm.

11.2.1.2 Minimum and Maximum Parking Requirements

Minimum and maximum parking requirements control the amount of parking provided on a development site, based upon the type of use, the floor area or unit, and the standard being applied. Minimum parking standards outline the lowest number of parking spaces that must be provided from a municipality's perspective. A maximum parking standard outlines the highest number of parking spaces that are allowed to be located on a development site.

There are a variety of approaches which various municipalities have applied, depending on the nuances and characteristics that are specific and unique to them. Most commonly, minimum parking standards have been outlined within Zoning By-laws with some Zoning By-laws including maximum parking standards. The application of these standards can also be location specific (i.e. minimum and maximum parking standards along transit corridors) to influence the type of development and to encourage the use of active transportation modes.

Parking minimums are typically established based upon an understanding of the number of parking spaces that are considered to be necessary to enable the success of a development. However, as parking demands and traffic patterns shift and change over time, these minimum standards can become antiquated. For example, as transit services improve and traffic congestion increases, travel behaviour and associated mode choice shifts to more active modes (i.e. walking and cycling).

Maximum parking requirements have also been outlined within Zoning By-law regulations to limit the oversupply of parking which can occasionally occur for a number of reasons, including developer perceptions of parking and to fulfill certain tenant requirements. Parking maximums are not considered to be difficult to include within Zoning By-laws; however, the implication and impact of parking maximums should be considered with the decision to include or exclude them.

Use of parking maximums within transit corridors or transit station areas encourages use of alternative modes of transportation and the development of a public realm where pedestrians are prioritized. However, implementation of parking maximums should be carefully considered to avoid being overly restrictive – this could result in a potential spillover of parking into neighbourhoods or adjacent areas if it results in an undersupply.

It is recommended that the application of parking minimums and maximums be implemented with other parking management strategies to control parking demands in areas to encourage transit use and active transportation, densification and design policies to improve the public realm.

11.2.1.3 Shared Parking (Temporal Characteristics)

Consideration of shared parking opportunities is common and becoming more prevalent through Zoning By-law reviews. The concept of shared parking reflects the variations in usage levels of different land uses by time of day and day of week. Shared parking principles recognize that not all land uses will be at their peak parking demand at the same time throughout the day. This allows for the derivation of efficiencies in the overall parking supply requirements through a permissive sharing of a common pool of parking to support a range of planned uses at different times. The efficiency also unlocks development potential across the site by limiting the parking infrastructure to be built. Space that would have otherwise been utilized for parking can be re-allocated for building or program purposes.

The focus of a shared parking strategy within mixed-use development or master planned communities is to reduce the overall amount of parking infrastructure to be provided, which would allow for a mixed-use, multi-faceted proposals, such as the Clair-Maltby Secondary Plan area, to avoid, to the extent practical, the permanent and unnecessary allocation of parking to specific uses and users.

When considering the allocation of parking to certain uses given specific needs, the exclusive use and allocation of parking for some uses is appropriate, for instance, parking for residential uses (i.e. residents), given the usage patterns of such spaces and that parking spaces are privately and individually owned or rented.

Shared parking calculations utilize a range of "occupancy rates" that reflect the typical variation in parking demand over the course of a weekday or weekend (by hour). The occupancy rate is expressed as a percentage of the peak demand generated by a particular land use on a typical weekday or weekend day. These occupancy rates are recommended based upon industry resources and similar municipal by-laws that permit shared parking.

11.2.1.4 Parking Reduction Permissions

Municipalities are recognizing the impact of parking and its effect on changing travel behaviours. Parking reductions within Zoning By-laws or through the development approval process (i.e. Development Application Checklists) have become more prevalent recently.

Permissions for parking reductions can be implemented through physical infrastructure provisions stated within the Zoning By-law (i.e. City of Toronto permits parking reductions for extra bicycle parking spaces on-site, located in a conspicuous area) or with input from the municipality through a development application checklist which permits parking reductions in exchange for a variety of design improvements (i.e. City of Kitchener's Development Application Checklist).

The inclusion of parking reduction permissions should be considered as they provide additional flexibility for the municipality to vary parking requirements and can result in urban design or program elements which also shift travel behaviour from auto usage to alternative modes.

11.2.1.5 Cash-in-Lieu

Cash-in-Lieu of parking is also known as payment-in-lieu of parking. This parking management strategy allows developers to seek a parking reduction (approved by Committee of Adjustment and City Staff) in exchange for a cost that is paid to the municipality. Cash-in-lieu of parking applications are evaluated on a project-by-project basis. The cost that is paid is typically associated with the cost of a parking space. The municipality then uses these funds to plan, operate or maintain a public parking facility which is intended to accommodate parking demands in the area.

Cash-in-lieu of parking is typically calculated on a per space basis and can be applied to residential or commercial land uses. It is noted that the municipality can outline tiers or levels where different formulae are applied based on the location. For example, the City of Toronto has specified a per space rate for areas of low transit service compared to a formula which accounts for land value within areas of higher density and transit accessibility (i.e. Downtown).

11.2.1.6 Consolidated Public Parking Facilities

Consolidation of private or public parking facilities provides a common pool of parking within an urban area which can be used by the general public. Public facilities are typically operated by the municipal parking authority and support underlying urban design principles by minimizing impacts of smaller individual parking lots through the consolidation of parking infrastructure into one structure or facility. It also encourages pedestrian activity through the area as parking is no longer located at a “front door”.

Consolidated public parking facilities inherently adhere to shared parking principles, recognizing that adjacent land uses will peak at varying times. For example, a parking facility within the downtown can accommodate business employees and visitors during the day and recreational facility users in the evening when businesses are closed. The surrounding land uses and proximity to activity centres, nodes or hubs must be considered when determining the appropriate location for a consolidated facility. Additionally, the parking pricing model must be considered to encourage use of the facility.

The City of Guelph can also consider longer-term impacts to land acquisition for a consolidated parking facility. As the area is developed, land values are likely to increase. The City could consider divesting the property at a later time or continue to provide public parking, allowing development in the area to provide a reduced parking supply. This however, would require further in-depth study.

11.2.1.7 On-Street Parking Permissions

Curbside space is often overlooked relative to its ability to accommodate a range of activity that would otherwise need dedicated space within a development site. While curbside is a physical infrastructure provision, it is also important to recognize that it is also a programmable space, which can be managed by the City of Guelph.

The functions of curbside space can contribute to the overall design and operations in the area, provided that there is enough pavement width for vehicular through movements. These programs can range from temporary events (i.e. parking space to a parkette in the summer) to pilot projects (i.e. signage permitting taxi ranks) and physical infrastructure provisions (i.e. EV charging stations).

Similar to consolidated public parking facilities, these spaces can also be managed by the municipality through signage or permits (i.e. 1 hour free parking in main corridors during certain periods of time or paid overnight visitor parking permits). These spaces, in fact, provide additional flexibility to accommodate parking demands – signage and operations can be changed based upon use.

The allowance of on-street parking capitalizes on the infrastructure that is built as part of the neighbourhood. It also provides additional parking spaces for the general public, to be utilized when land uses are at their peak. It also encourages better urban design and supports the pedestrian realm by providing a buffer to pedestrians from traffic and slowing down traffic speeds by activating the travel lane next to traffic and providing drivers with a visual cue to slow down.

11.2.2 Parking Management Strategies to Affect Demand

Parking demand can be influenced through a number of ways to change behaviour and perspectives towards non-single occupancy vehicle use or alternative modes of transportation. These strategies rely upon the implementation of parking management strategies / infrastructure which affect the supply. Changing travel behaviours and mindsets without the limiting parking supply will be near impossible if an easier alternative is ever present.

A key component in affecting parking demand is the implementation of a Transportation Demand Management (TDM) plan. TDM, as generally described below, includes a range of options both physical and operational, to influence these demands. Inclusion of TDM policies to support parking management will contribute significantly to the achievement of mobility goals outlined in the Clair-Maltby Secondary Plan.

11.2.2.1 Transportation Demand Management Plans

As specified in the previous section, Transportation Demand Management (TDM) strategies seek to increase the efficiency of a transportation system by influencing travel behaviour. This goal can be achieved through development of physical infrastructure or implementation of programs/operational measures. Often, a TDM or Mobility Plan can be required by municipalities as part of the development application process. This plan should outline the measures or programs to be implemented with the goal of reducing single occupancy vehicle use or shift travel behaviours to reduce congestion (i.e. encourage transit use, encourage bicycle use, etc). Implementation of TDM and Parking Strategies are most successful when implemented in conjunction with the other. The provision of TDM strategies encourages a shift to other modes of transportation and parking strategies often consider limiting or constraining the supply so that discretionary drivers are more likely to utilize other options.

11.2.2.2 Transit Oriented Development

Transit oriented development is a term which identifies areas where transit infrastructure or investment is located. It endeavours to leverage the transit investment through careful consideration of specific parking requirements for areas easily accessible by the BRT. The Gordon Street Corridor within the Clair-Maltby Secondary Plan area, is one example.

To ensure that developments around transit station areas are successful, municipalities have typically established policy guidelines with the goal of mixing complementary land uses, recognizing that these land uses are complementary to each other and provide a level of convenience where day-to-day activities can be accomplished without a vehicle.

Another method to ensure that transit oriented developments are successful, is the limitation of parking within areas easily accessible by the BRT. When the ability to use a vehicle is limited, transit use becomes a more attractive and viable option. Often, these policy guidelines also focus on design and include housing typologies to support a transit friendly development. Vehicle sharing programs (i.e. car-share) are also introduced to reduce overall vehicle ownership.

11.2.2.3 Car-Share

Car-sharing programs have evolved into common practice. The low-commitment and growing fleet size has created an alternative mode for automobile ownership and, in urban areas, further reduced the appeal of automobile use and person vehicle ownership. Car-share programs are becoming an increasingly relevant factor in the determination of minimum required parking standards. Where the private automobile ownership model requires a space for each user expected to own a car in a residential development, the car-share ownership model would only require a space for the number of users expected to use a car at the same time. Since the period of use does not necessarily overlap between users, more users are able to leverage the same parking space.

Car-share systems operate on a self-serve platform, where members may rent a vehicle from any car-share lot across the company's service area. Time-based user rates apply and a subscription to the service is generally based on a fixed membership fee. Car-share programs have become prevalent by locating vehicles within private developments or within municipal lots. This logistical dexterity enables program expansion. As vehicles become further dispersed and used increasingly, so too does the convenience and reliability for its users.

Car-share programs have been studied to understand their impact on vehicle ownership and to establish a standard that could be applied to developments which allow car-share to be located on-site. Review of car-share program impacts could be considered as a strategy to provide parking reductions.

For example, the City of Toronto permits a reduction of up to 4 vehicular parking spaces (net 3 spaces) for the provision of a car-share vehicle. This is based upon a study commissioned by the City (*Parking Standards Review: Examination of Potential Options and Impacts of Car Share Programs on Parking Standards, IBI Group, March 2009)* and is predicated on survey results which indicated the likelihood of a car owner to rely on a fleet vehicle instead of a personal vehicle, if the option were available.

Other municipalities have also recognized the positive impacts of car-share and the associated potential reduction of vehicular ownership. As such, an increasing number of municipalities are adopting car-share policies to encourage use of other modes of transportation, as summarized below in Table 13.

Table 13 Municipalities With Car-Share Policies

Municipality	Approval Mechanism	Policy Statement / Vehicular Allowance
City of Toronto	City Staff review	For any apartment of condominium development, the minimum parking requirement should be reduced by up to 4 parking spaces for each dedicated car-share stall. The limit on this parking reduction is calculated as the greater of: • 4 * (Total number of units / 60), rounded down to the nearest whole number; or • 1 space
City of Kitchener	Part of TDM Checklist	Commercial Uses: Provide car-share spaces equivalent to 2% of building occupants
Town of Newmarket	Recommendation for Urban Centres Secondary Plan	For any apartment (freehold or condominium) development, the minimum parking requirement should be reduced by up to 3 parking spaces for each dedicated car-share stall. The limit on this parking reduction is calculated as the greater of: • 4 * (Total number of units / 60), rounded down to the nearest whole number; or • 1 space
City of Richmond	Zoning By-law	The minimum on-site parking requirements may be reduced by up to a maximum of 10% where: a) The City implements transportation demand management measures, including the use of car cooperatives, transit passes, private shuttles, carpools, or enhanced end-of-trip cycling facilities; and b) The minimum on-site parking requirements are substantiated by a parking study that is prepared by a registered professional engineer and is subject to review and approval of the City.
City of Kelowna	Draft Policy Recommendation	Amend the parking and loading section of the Zoning By-law to provide a reduction of five parking spaces for every classic car-share vehicle and parking space provided to a maximum 10% of the total number of required spaces provided.

11.2.2.4 Improved Public Realm

Parking demands can be reduced as the user experience through a street or corridor improves. The easier or more pleasant the trip, the more likely it is that a member of the public would choose to walk or cycle instead of drive. There are varying methods to improve the public realm with most of these strategies typically outlined within an “Urban Design Guideline”.

These include consideration of the location of parking (i.e. towards the rear of the building instead of abutting a sidewalk), encouragement of underground parking facilities, screening of loading spaces and the location of visible, bicycle racks to encourage cycling use.

Amenities can range in costs as well from those easy to implement (i.e. benches, street furniture) to those that are higher in cost (i.e. transit plaza).

Establishing urban design principles that developments are required to adhere to will influence the overall corridor and area as buildings are built over time. It will also provide guidance towards the overall character of the neighbourhood and ensure that the vision for the area is achieved.

11.2.2.5 Unbundled Parking

Unbundled parking refers to the separation of the cost of a parking space with the rental or purchase price of a unit. When costs are not separated, the use of a vehicle is encouraged since the perception is that the unit comes with the parking space. However, if the costs were to be separated, this would ensure that owners or tenants are aware of the cost of parking. The pricing then affects trip making decisions by influencing whether or not a vehicle is needed / warranted over time. It can also encourage the exploration of other alternative modes or the use of car-share for the occasional trip where a vehicle is necessary.

Unbundled parking is a policy that can be suggested and implemented within a Secondary Plan. The concept should be discussed by municipal staff and developers to ensure that it is understood and properly implemented.

11.3 REVIEW & MONITORING

As part of the development of the Clair-Maltby Secondary Plan area, any implementation of parking management strategies should include review and monitoring of these strategies to understand their impacts on parking demand and supply. It is likely that parking demands will fluctuate and vary year to year as new residents move in, businesses change and transit services evolve to meet demands.

It is recommended that a review and monitoring plan be established to help provide flexibility to the City of Guelph as the area changes and matures. These reviews can be completed on an annual basis or every other year, depending on the progress of development. This will ensure that the necessary parking demands can be accommodated and provide information to help shift travel behaviour changes.

Future-proofing parking facilities are an important consideration as well, as buildings become more dynamic and the transportation landscape changes based upon technological advancements (i.e Autonomous Vehicles). A further in-depth study to understand and maximize a structure's full potential and capability for adaptive re-use is also recommended.

11.4 SUMMARY OF PARKING MANAGEMENT STRATEGIES

Parking demands and supply can be managed through a combination of strategies implemented to guide overall development through the Clair-Maltby Secondary Plan area. This urban village is envisioned to be a walkable, sustainable development supported by a transit "spine" along Gordon Road.

BA Group's parking review and assessment includes a review of the in-force City of Guelph parking standards, a comparative review of other municipal parking standards, and various parking management strategies to affect both supply and demand.

We understand that parking demands will fluctuate and vary over time, as the Clair-Maltby Secondary Plan area develops and matures. The opportunities discussed and summarized in Table 14, in our opinion, form the basis for applicable parking policies to be considered for inclusion within the Clair-Maltby Zoning By-law. These policies will likely have the most impact and would be a significant, positive contribution towards the City's approach to parking management.

TABLE 14 OPPORTUNITIES FOR PARKING MANAGEMENT STRATEGIES

Strategy	Potential Impact	Implementation Tool / Partner
Flexible Area Based Parking Standards	• Accounts for variability in parking standards based upon land use, proximity to transit and overall character of the neighbourhood	Zoning By-law
Minimum and Maximum Parking Standards	• Controls parking supply • Limits overbuilding of parking within transit oriented areas	Zoning By-law
Shared Parking	• Recognizes efficiencies that could be made between complementary land uses • Acknowledges that parking demands will peak at varying times	Zoning By-law
Parking Reduction Permissions	• Provides flexibility to the municipality to reduce parking supply based upon the provision of TDM measures or other vehicle ownership reduction measures	Zoning By-law
Cash-in-Lieu of Parking	• Reduces parking requirements on a case-by-case basis • Provides municipality with funds to operate, manage and maintain public parking infrastructure	Municipal Operations / Cash-in-Lieu Parking Policy
Consolidated Public Parking	• Location of a common pool / supply of parking limits the impact of small individual parking lots • Allows for better urban design and encourages pedestrian activity	Municipal Operations / Private Sector
On-Street Parking	• Flexibly increases parking supply • Allows the municipality to operate paid parking / parking permits • Utilizes existing infrastructure to accommodate temporary and temporal needs	Municipal Operations
TDM Plan Requirement as part of Development Application	• Encourages developer to think about ways to reduce parking and single occupancy travel • Physical infrastructure and program elements contribute to the shift in overall travel behaviour	Zoning By-law / Special Municipal Policy
Car-Share Parking Reductions	• Provides an alternative to vehicle ownership	Zoning By-law / Special Municipal Policy
Public Realm Improvements	• Encourages active transportation within core areas • Reduces overall vehicle use	Urban Design Guidelines
Unbundled Parking	• Allows for the real cost of parking to be distributed to those who use the facilities • Reduces parking requirements	Private Sector / Developer

12.0 TRAFFIC CALMING CONSIDERATIONS

12.1 COMMUNITY ROAD SAFETY STRATEGY

The Community Road Safety Strategy (CRSS) is a high-level road safety plan for the City of Guelph. The CRSS provides a range of holistic road safety measures, such as education campaigns, enforcement strategies and infrastructure modifications for roads that meet the thresholds for road safety measures set out in the Traffic Calming policy. As part of this project, the City also plans to update the Traffic Calming policy to address road safety concerns across Guelph in a fair and consistent way.

12.2 TRAFFIC CALMING OBJECTIVES

Community traffic calming strategies are primarily intended to address problems that include excessive speed, infiltration and congestion. It involves a range of measures, devices and techniques that include:

Engineering	- traffic control, speed limits, signs and markings, physical changes to the road.
Education	- speed monitoring, public information, 'Road Watch' type programs
Enforcement	- speed enforcement, turn restrictions, community safety zones

The ultimate goal of traffic calming is to increase the safety and liveability of the community by reducing speeding and excessive traffic volumes, while accommodating local traffic, transit and emergency vehicles. This objective is in keeping with the City of Guelph's own "Neighbourhood Traffic Management Policy", intended to outline the procedures for initiating, reviewing and implementing neighbourhood traffic management plans to address traffic safety concerns related to speeding and high volumes.

Managing motorist speeds supports active travel modes, and helps to ensure a right to safe mobility for those who are unable to use a vehicle or choose not to. It also prioritizes place and the livability of residents who live along a street over motorists who are 'passing through'.

12.3 TRAFFIC CALMING OPPORTUNITIES

The Clair-Maltby Secondary Plan area includes provisions for local schools, recreation facilities, and mixed-use retail areas. Although certain traffic calming strategies may be applicable for all new street segments within the Secondary Plan area, particular attention may be directed to street segments in adjacency to the aforementioned land uses, as well as other street segments where the propensity of vulnerable road users is more acute.

With regards to potential community traffic calming measures that might be implemented along segments of new local streets and collector streets planned as part of the Clair-Maltby Secondary Plan, it is generally recommended that a pro-active approach be taken so as to implement traffic calming in sequence with new development. This strategy establishes a degree of expectation for motorists and other road users, and ascertains the priority of pedestrians and cyclists within the prevailing urban design context.

Traffic calming measures are identified as Level I or Level II measures. Level I measures include minor changes to the roadway, that are generally lower cost and relatively straightforward, such as pavement markings, textures pavement / crossings and signage. Level II measures are generally more significant, more costly and require physical changes to the roadway. Some Level II examples include raised crosswalks, curb extensions, roundabouts and road closures.

THE FOLLOWING TABLES AND FIGURES IDENTIFY AND DESCRIBE A VARIETY TRAFFIC CALMING MEASURES THAT MAY BE APPROPRIATE FOR CERTAIN LOCAL STREET AND / OR COLLECTOR STREET SEGMENTS WITHIN THE CLAIR-MALTBY SECONDARY PLAN AREA. THEY TAKE INTO CONSIDERATION FACTORS SUCH AS ROAD WIDTH, RIGHT-OF-WAY AVAILABILITY, PROXIMITY TO SCHOOLS, AND STREET PARKING PROVISIONS. POTENTIAL LEVEL I TRAFFIC CALMING MEASURES ARE IDENTIFIED IN

Table 15, while several Level II measures are identified in Table 16. Conceptual and basic curb extension and median design examples are also provided in Figure 17, and would need to be designed in detail to reflect intersection traffic control, pedestrian crossing facilities, accommodation of specific vehicles, and street context. In addition to the potential measures summarized below, the “Canadian Guide to Neighbourhood Traffic Calming” lists 25 traffic calming measures available for consideration

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FIGURE 17 TYPICAL CURB EXTENSIONS AND CENTER MEDIAN

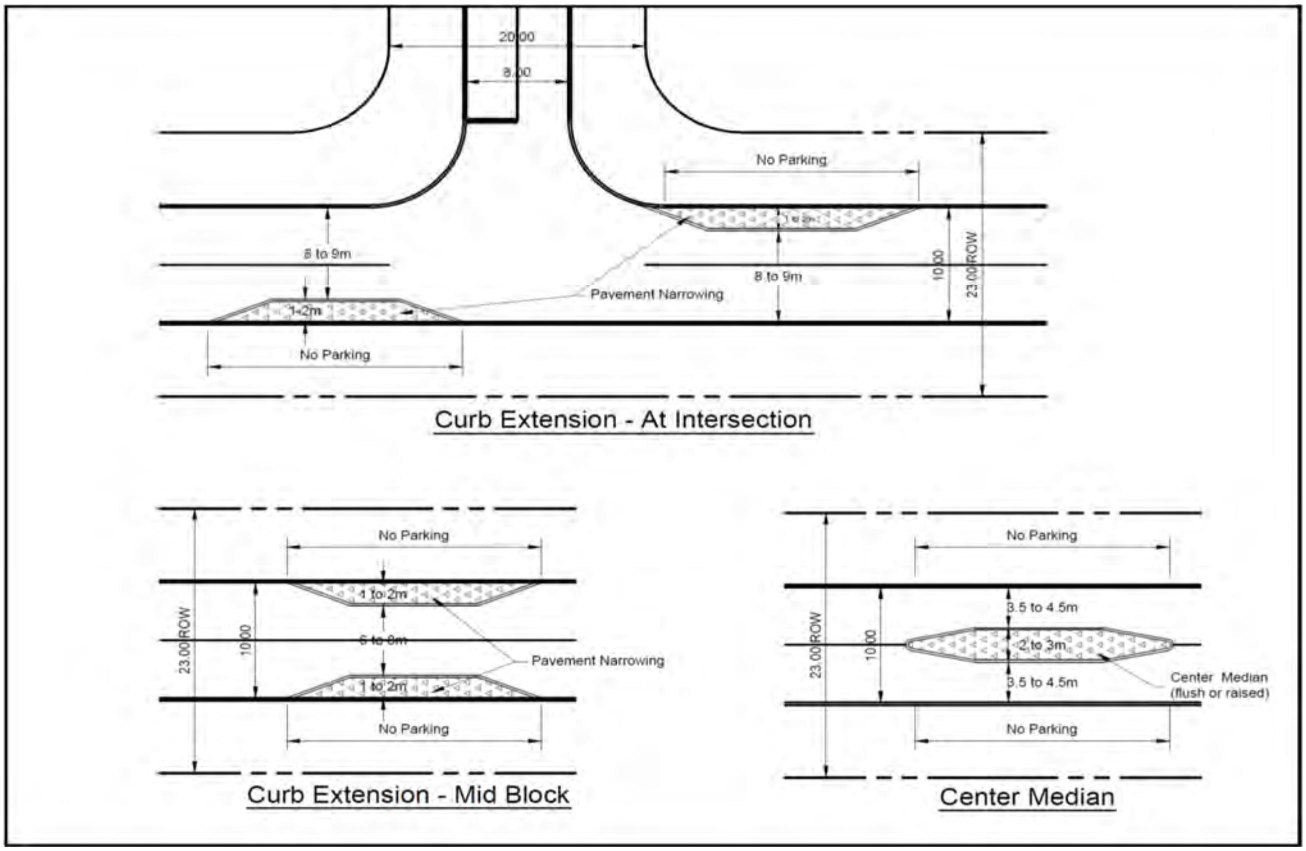


TABLE 15 LEVEL I TRAFFIC CALMING MEASURING

Mitigation Measure	Description	Implementation
Traffic Control Signage and Pavement Markings	Relatively inexpensive and easy to implement, but is not an enforcement tool in its own right.	
Through Traffic / Turn Traffic Restrictions	Regulatory control measure that restricts specific traffic movements at intersections.	Certain movements could be restricted during peak travel periods. Good level of compliance even without direct enforcement. Disadvantage is that restrictions generally conflict with legitimate school or local-based trips into and out of specified areas. Implementation can be done at any time.
Pavement Markings / Lane Narrowing	Pavement markings can be implemented that visually 'narrow; the traffic lane width in order to reduce speeds.	Pavement widths could be painted to formally define parking lanes or traffic lanes. Implementation can be done at any time.

Table 16 Level II Traffic Calming Measuring

Mitigation Measure	Description	Implementation
Physical Measures	Generally a more expensive option that entails engineering and reconfiguring the road to implement physical changes that lead to reduced speeds and traffic volumes.	
Median Islands (Flush or Raised)	Medians can be implemented to narrow the width travel lanes with the goal to reduce speeds. Medians can also be implemented in conjunction with pedestrian crossing facilities to allow for reduced pedestrian crossing distances.	A 1.5m to 2.5m wide median can allow for 3.0m to 3.5m travel lanes on either side within a local street context. Disadvantage would be loss of on-street parking and possible restricted access to driveways. Raised medians may be too restrictive for emergency, transit, and / or maintenance vehicles.
Curb Extensions	A horizontal extrusion of the curb into the roadway with the effect of reducing the travel width and reduce speeds. Additional benefits of intersection curb extensions relates to reducing pedestrian crossing distances and increasing pedestrian visibility.	Minimum street width adjacent to an intersection (throat width) opening of 6.0m with a wider opening at intersections to accommodate turning vehicles. Disadvantage would be loss of on-street parking Curb extensions may be too restrictive for certain transit, and / or maintenance vehicles.
Roundabout / Traffic Circle	A road junction in which traffic streams circulate around a central island. Roundabouts are intended to reduce vehicle speeds and reduce vehicle conflicts by virtue of their design.	Provide for continuous, managed-speed vehicle flow, lower vehicle emissions, and do not require traffic signal infrastructure. Roundabouts require more land than a typical intersection, which makes it difficult to retrofit into an existing urban built form. Some jurisdictions have taken the position that roundabouts should not be placed in proximity to school sites due to concerns related to pedestrian crossing facilities. Certain transit authorities have commented that they generally do not support the inclusion of traffic circles or roundabouts on collector roads designated as transit routes for a number of operational and customer service reasons.
Raised Intersection (with All-Way Stop Control)	A speed control device that consists of a raised section of roadway that cause drivers to slow down, prior to and as the cross over them.	Appropriate use is at a limited number of key intersections in the vicinity of schools where there are a substantial number students crossing the road All-way Stop control is not a recommended method for speed control, and is not supported by the City's "Neighbourhood Traffic Management Policy"
Speed Humps	A speed control device that consists of raised sections of roadway that cause drivers to slow down, prior to and as the cross over them.	Effective tool to slow vehicle speeds. Disadvantages include delay to emergency services and transit, and general inconvenience for local road users.

12.4 MONITORING AND CONSULTATION

Many communities manage a Neighbourhood Traffic Monitoring program that reviews and identifies municipal streets that may qualify for traffic calming and management measures. These programs specifically tend to monitor the level of traffic infiltration (i.e. through traffic not local to the area), overall traffic volumes, traffic speeds, and the volume of pedestrians and cyclists.

If there are any expressed concerns from the community as it relates to traffic during or after solutions are implemented, further mitigation measures are then typically pursued by the municipality through this type of program.

Consultation with the various City stakeholders including Emergency Services, Guelph Transit, and Transportation Engineering is essential in reviewing and approving any mitigation solution. Community involvement is also a key part in determining the type of measures, if any, that should be implemented. The public is to be advised and allowed to offer feedback, comments and participate in the process through public meetings or working groups.

The City of Guelph's "Neighbourhood Traffic Management Policy" further identifies monitoring principles that specify the undertaking of a follow-up review after implementation of any specific traffic management measures. A review includes a comparison of traffic volumes, speed data, collision data, and feedback from emergency services, residents and other stakeholders.

13.0 MULTI-MODAL TRAVEL FORECASTING

The Clair-Maltby Secondary Plan area is located at the southern extent of the City of Guelph within a greenfield development area. As part of this study BA Group has established travel demand forecasts for auto-based and non-auto-based trips for the Secondary Plan area, understanding the travel characteristics in the southern portions of the City of Guelph, and travel behaviour associated with other new development areas in the Greater Toronto and Hamilton area that exhibit contemporary planning methods. Further details are provided in the following sections.

13.1 APPROACH AND BASELINE PARAMETERS

Travel demand forecasts have been developed for residential and office land uses, understanding that new development is anticipated to be prominently residential, and that other retail and mixed-use development would result in relatively small travel demands, would often be internal to the Secondary Plan area, and could be considered ancillary to overall development travel demands.

Travel demand forecasts for residential and office land uses have been developed by applying traffic generation rates as derived from the *Institute of Transportation Engineers (ITE) Trip Generation Manual, 10th Edition*, and factoring prevailing non-automobile trips based on selected travel mode splits anticipated for residential and office development in the Secondary Plan area. Modal split information has been obtained from the Transportation Tomorrow Survey (TTS) while total traffic generation rates and direction of travel has been obtained from information provided in the ITE Trip Generation Manual (10th Edition).

Travel demand forecasts for the Clair-Maltby Secondary Plan area development have been developed to reflect pedestrian, cycling and transit usage that is reflective of the existing travel characteristics of the area, and to the extent that transit services and active transportation infrastructure is pursued as part of the Secondary Plan. The addition of mixed-use zones within the Clair-Maltby Secondary Plan area further supports sustainable and short trip making, particular during weekday peak travel periods, and is considered in travel demand forecasting in mixed-use development zones.

13.2 MODE SHARE ASSUMPTIONS

For the purpose of this analysis, travel demands to and from the Clair-Maltby Secondary Plan area have been developed for residential and office land uses by applying modal share information, which is based on a review of data retrieved from the 2016 Transportation Tomorrow Survey (TTS). A combination of study area travel information, and proxy development information was utilized in selecting an appropriate travel mode split for Secondary Plan residential development.

13.2.1 Resident-Based Trips – South Guelph

For the purposes of this analysis, future Clair-Maltby Secondary Plan resident-related trips are assumed, conservatively, to have mode shares similar to the existing condition. Existing resident-related mode share for weekday morning and weekday afternoon peak periods in the southern portions of the City of Guelph are summarized in Table 17.

TABLE 17 RESIDENT-RELATED TRIPS: TRAVEL MODE SPLITS

Travel Mode	Weekday Morning Peak Hour		Weekday Afternoon Peak Hour	
	Inbound	*Outbound*	*Inbound*	*Outbound*
Auto Driver [4]	83%	65%	75%	64%
Auto Passenger [5]	2%	8%	9%	32%
Transit	5%	9%	10%	4%
Walk	10%	5%	1%	0%
Cycle	0%	3%	2%	0%
Other [6]	0%	10%	3%	0%

Notes:
Notes:
1. Based on 2016 TTS results for morning (7:00 a.m. – 9:00 a.m.) and afternoon (4:00 p.m. – 6:00 p.m.) peak traffic periods.
2. Statistics specific to 2006 GTA Zones 8062, 8064, 8067-8076, and 8078-8081. TTS data included in **Appendix E.** [1] 2016 TTS data was used to determine existing mode split for home-based trips during the morning and afternoon peak hours in the vicinity of the Secondary Plan area. The selected study area (proxy zone) is bounded generally by Kortnight Road to the north, Clair Road to the south, Victoria Road to the east and Preservation Park to the west).
3. Trips represent an expanded value based on a sample of persons surveyed in the study area.
4. Auto driver trips (includes auto drivers and motorcycles).
5. Auto passenger trips (includes auto passenger trips only).
6. Other trips include school bus and taxi trips, consistent with The City's model document.

For key outbound trips during the weekday morning peak travel period and inbound trips during the weekday afternoon peak travel period, approximately 65% to 75% of resident-related trips are undertaken as an auto drivers, 8% to 9% are undertaken as an auto passenger, and 9% to 10% are undertaken by transit. The remaining proportion of priority outbound trips in the morning and inbound trips in the afternoon, are undertaken by walking, cycling and other modes (i.e. taxi and school bus).

For the purposes of this study, existing travel mode share in the southern portions of the City of Guelph (as summarized in Table 17) are compared with other proxy area developments that are summarized in the following.

13.2.2 Resident-Based Trips – Proxy Development Areas

A number of proxy development areas were reviewed using 2016 TTS data to understand general mode split for resident-related travel. A total of three (3) development areas were reviewed, all of which comprise relatively recent construction and best practices in planning, and include:

(i) Cornell in Markham, Ontario;
(ii) Oak Park (Uptown Core) in Oakville, Ontario; and
(iii) Orchard Park in Burlington, Ontario.

The Clair-Maltby Secondary Plan is located within a similar suburban land use and transportation context as the proxy development areas chosen, and would be anticipated to exhibit similar transportation behaviour given the anticipated level of transit services provided within the secondary plan area, the land uses and residential density mixes proposed, and the greenfield development context. All proxy development areas generally adhere to contemporary planning design principles, and are relatively recent greenfield residential developments, are provided basic transit service provisions, and are located near the edge of the built-up areas of municipalities in the Greater Toronto and Hamilton area.

TTS data was reviewed for the 2016 survey year, to understand resident-related travel mode split in the inbound and outbound directions during weekday peak travel periods. Data was also summarized based on the type of residential dwelling unit (house, townhouse, or apartment). Noted in the TTS survey data, amongst the proxy development areas reviewed, is that there is no sustained difference in travel mode split between low-density and medium to high-density residential development. Proxy development area travel mode split data is included in **Appendix F**.

An average mode split for inbound and outbound resident-related travel during weekday peak travel periods, amongst the proxy development areas reviewed, is summarized in Table 18.

TABLE 18 RESIDENT-RELATED TRIPS: PROXY DEVELOPMENT AREA AVERAGE MODE SPLITS

Travel Mode	Weekday Morning Peak Hour		Weekday Afternoon Peak Hour	
	Inbound	*Outbound*	*Inbound*	*Outbound*
Auto Driver [4]	86%	60%	72%	65%
Auto Passenger [5]	1%	15%	10%	26%
Transit	0%	10%	13%	5%
Walk	13%	9%	2%	3%
Cycle	0%	1%	1%	1%
Other [6]	0%	6%	2%	0%

Notes:
1. Based on 2016 TTS results for morning (7:00 a.m. – 9:00 a.m.) and afternoon (4:00 p.m. – 6:00 p.m.) peak traffic periods.
2. Statistics specific to 2006 GTA Zones associated with the identified proxy development areas. TTS data included in **Appendix F.**
3. Trips represent an expanded value based on a sample of persons surveyed in the study area.
4. Auto driver trips (includes auto drivers and motorcycles).
5. Auto passenger trips (includes auto passenger trips only).
6. Other trips include school bus and taxi trips, consistent with The City’s model document.

Overall travel mode splits for the proxy development areas are generally shown to be similar to travel mode splits observed for the southern portions of the City of Guelph (as summarized in Table 17).

On average, for key outbound trips during the weekday morning peak travel period, approximately 60% resident-related trips are undertaken as an auto drivers, 15% are undertaken as an auto passenger, 10% are undertaken by transit, 9% are undertaken by walking and 1% are undertaken by cycling. The remaining proportion of priority outbound trips in the morning are undertaken by other modes (i.e. taxi and school bus). For key inbound trips during the weekday afternoon peak travel period, on average, approximately 72% of resident-related trips are undertaken as an auto drivers, 10% are undertaken as an auto passenger, 13% are undertaken by transit, 2% are undertaken by walking and 1% are undertaken by cycling. The remaining proportion of priority inbound trips in the afternoon are undertaken by other modes (i.e. taxi and school bus).

13.2.3 Employee (Office)-Based Trips – South Guelph

Clair-Maltby Secondary Plan area employee-related trips are assumed, conservatively, to have mode shares similar to the existing conditions in the southern portions of the City of Guelph. Existing employee-related mode share for weekday morning and weekday afternoon peak periods in the southern portions of the City of Guelph are summarized in Table 17.

TABLE 19 EMPLOYEE-RELATED TRIPS: TRAVEL MODE SPLITS

Travel Mode	Weekday Morning Peak Hour	Weekday Afternoon Peak Hour
	Inbound	*Outbound*
Auto Driver [4]	93%	86%
Auto Passenger [5]	0%	4%
Transit	3%	6%
Walk	2%	4%
Cycle	2%	0%

Notes:
1. Based on 2016 TTS results for morning (6:00 a.m. – 9:00 a.m.) and afternoon (3:00 p.m. – 6:00 p.m.) peak traffic periods.
2. Statistics specific to 2006 GTA Zones 8062, 8064, 8067-8076, and 8078-8081. TTS data included in **Appendix G.**
3. Trips represent an expanded value based on a sample of persons surveyed in the study area.
4. Auto driver trips (includes auto drivers and motorcycles).
5. Auto passenger trips (includes auto passenger trips only).-

For key inbound trips during the weekday morning peak travel period and outbound trips during the weekday afternoon peak travel period, approximately 90% to 93% of employee-related trips are undertaken as an auto driver or passenger, and 3% to 6% are undertaken by transit. The remaining proportion of priority inbound trips in the morning and outbound trips in the afternoon, are undertaken by walking and cycling (in the order of 4%).

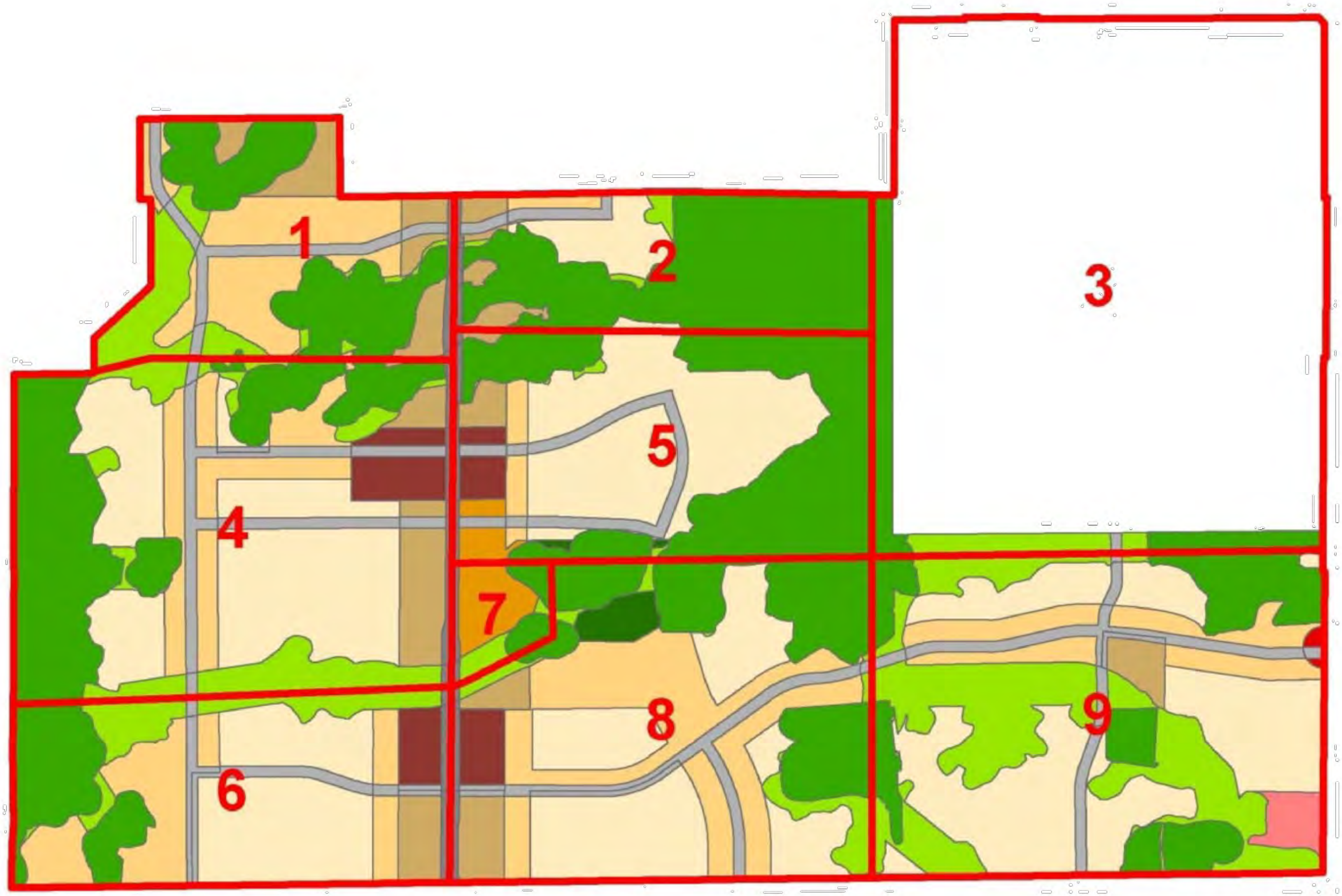
13.3 SECONDARY PLAN MULTI-MODAL TRAVEL DEMAND FORECASTS

Travel demands for development anticipated within the Secondary Plan area are summarized in the following, and have been developed based on the most conservative (highest density) assumptions outlined in the "Land Development Budget" prepared by the project team – dated August 27, 2018. For the purposes of the analysis herein, a total of 10,125 residential units and 333 jobs were assessed.

Travel demands are developed for nine (9) individual "Traffic Zones" that comprise the Secondary Plan area, to provide appropriately-sized areas to assign travel demands on the area transportation network and assess the overall transportation impacts of Secondary Plan development.

Traffic zones were established based for segmented areas within the overall Preferred Community Structure Plan, and generally comprise zones east and west of Gordon Street. Travel demands for each zone are forecast and assigned individually on the area transportation network.

The nine identified Clair-Maltby Secondary Plan Traffic Zones are illustrated Figure 18.



SECONDARY PLAN AREA TRAFFIC ZONES

13.3.1 Selected Mode Splits

As previously noted, Clair-Maltby Secondary Plan area travel demands have been developed for residential and office land uses by applying modal share information derived from the south Guelph area and the selected proxy development areas. A "selected" mode split was utilized for the purposes of forecasting Clair-Maltby Secondary Plan development traffic, and then forecasting multi-modal (non-traffic) trips.

The "selected" travel mode split is informed by the travel mode split characteristics summarized in Section 13.2, and would be considered achievable given reasonable expansion of transit services into the Clair-Maltby Secondary Plan area, the development of a comprehensive cycling network as identified in the Preferred Community Structure, and the extent of mixed-use land development contemplated. The selected travel mode splits generally reflect a higher degree of transit use and active transportation travel relative to what is currently observed in the south portions of the City of Guelph, and results in a lower degree of automobile use relative to other areas of the City.

The "selected" travel mode split for new development associated with the Clair-Maltby Secondary Plan, for resident-related and employee-related travel during weekday morning and afternoon peak hours, is summarized in Table 20

Table 20 Selected Clair-Maltby Secondary Plan Travel Mode Splits

Travel Mode	Weekday Morning Peak Hour		Weekday Afternoon Peak Hour	
	Inbound	*Outbound*	*Inbound*	*Outbound*
Resident Travel				
Auto Driver [1]	85%	60%	72%	65%
Auto Passenger [2]	2%	10%	10%	25%
Transit	5%	10%	10%	5%
Walk	8%	10%	3%	3%
Cycle	0%	3%	2%	2%
Other [3]	0%	7%	3%	0%
Employee Travel [4]				
Auto Driver [1]	90%		90%	
Auto Passenger [2]	2%		2%	
Transit	4%		4%	
Walk	2%		2%	
Cycle	2%		2%	

Notes:
1. Auto driver trips (includes auto drivers and motorcycles).
2. Auto passenger trips (includes auto passenger trips only).
3. Other trips include school bus and taxi trips, consistent with The City's model document.
4. Employee-based mode share is summarized for the key inbound movement during the weekday morning peak period, and the key outbound movement during the weekday afternoon peak hour.

13.3.2 Traffic Forecasts

Residential and office employee traffic forecasts for the Clair-Maltby Secondary Plan have been developed using Institute of Transportation Engineers (ITE) Trip Generation Manual (10th Edition) traffic generation rates, combined with TTS data on residential and employee travel characteristics in the vicinity of the Secondary Plan area[1].

Residential Traffic Volumes

For residential related traffic volumes, ITE Trip Generation Manual traffic generation rates were derived for Single-Family Detached Housing (ITE Code 210) and applied to low-density housing; for Multi-Family Housing - Mid-Rise (ITE Code 221) and applied to medium density housing; and Multi-Family Housing – High-Rise (ITE Code 222) and applied to high-density housing. In all instances, traffic generation is based on:

- the proposed number of units for each housing type (trips / unit);
- reflects peak travel periods adjacent to the generator of traffic; and
- derived from ITE data reflecting general urban / suburban contexts.

A fitted-curve equation (rather then average) trip generation rate was utilized and applied to development contemplated for each individual traffic zone.

Office Traffic Volumes

For office related traffic volumes, ITE Trip Generation Manual traffic generation rates were derived for General Office (ITE Code 710) and applied to traffic zones with anticipated office-related employment. Office traffic generation is based on:

- the anticipated number of employees (trips / employee);
- reflects peak travel periods adjacent to the generator of traffic; and
- derived from ITE data reflecting general urban / suburban contexts.

A fitted-curve equation (rather then average) trip generation rate was utilized and applied to employment contemplated for each individual traffic zone.

Retail and Mixed-Use Traffic Volumes

Retail and mixed-use development is anticipated to result in relatively small amounts of "external" traffic, would often be internal to the Secondary Plan area, and could be considered ancillary to overall development travel demands. As such, traffic demands are not forecast for retail uses contemplated as part of mixed-use.

[1] 2016 TTS data was used to determine existing mode split for home-based trips during the morning and afternoon peak hours in the vicinity of the Secondary Plan area. The selected study area (proxy zone) is bounded generally by Kortnight Road to the north, Clair Road to the south, Victoria Road to the east and Preservation Park to the west).

Overall Traffic Volumes
ITE Trip Generation Manual traffic generation rates are factored for the selected travel mode splits, as summarized in Section 13.3.1. Traffic generation rates are factored from an assumed 95% auto mode share to a more appropriate level of automobile use for residential trips: 75% during the weekday morning peak hour, and 85% during the weekday afternoon peak hour. Given that employee-related trips currently are in the order of 90% to 95% undertaken by automobile, traffic generation rates are not factored for greater non-auto use for work-related trips.

Forecast residential and office traffic volumes for each traffic zone in the Clair-Maltby Secondary Plan area are summarized in Table 21.

Assuming the most conservative land use budget comprising 10,125 residential units and 333 employment positions, provided for the purposes of this analysis, the Clair-Maltby Secondary Plan would be anticipated to generate in the order of 3,350 and 4,700 two-way traffic trips during the weekday morning and weekday afternoon peak hours, respectively. The resulting vehicle trip rates are 0.33 trips per unit during the weekday morning peak hour, and 0.46 trips per unit in the weekday afternoon peak hour.

TABLE 21 CLAIR-MALTY TRAFFIC GENERATION SUMMARY

Land Use	Units / Employees	AM Peak Hour			PM Peak Hour		
		In	Out	2-Way	In	Out	2-Way
Traffic Zone 1							
Medium density residential	492 units	33	96	129	111	72	183
High density residential	804 units	45	143	188	154	98	252
Total (rounded to nearest 5):	**80 units**	**80**	**240**	**315**	**265**	**170**	**435**
Traffic Zone 2							
Low density residential	56 units	9	27	36	33	19	52
Medium density residential	44 units	3	9	12	11	7	18
High density residential	284 units	17	55	73	57	37	94
Total (rounded to nearest 5):	**384 units**	**30**	**90**	**120**	**100**	**65**	**165**
Traffic Zone 3							
n/a							
Traffic Zone 4							
Low density residential	584 units	83	248	331	311	183	495
Medium density residential	659 units	44	127	171	148	95	242
High density residential	1,113 units	62	195	257	211	135	346
Total (rounded to nearest 5):	**2,356 units**	**190**	**570**	**760**	**670**	**415**	**1,085**

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Traffic Zone 5							
Low density residential	441 units	63	188	251	238	140	378
Medium density residential	120 units	9	24	32	29	19	47
High density residential	373 units	22	70	92	73	47	121
Office	114 emp.	44	9	53	11	43	54
Total (rounded to nearest 5):	**934 units; 114 emp.**	**140**	**290**	**430**	**350**	**250**	**600**
Traffic Zone 6							
Low density residential	294 units	43	126	169	161	95	256
Medium density residential	743 units	50	143	193	166	106	272
High density residential	516 units	30	94	124	100	64	164
Total (rounded to nearest 5):	**1,553 units**	**125**	**365**	**485**	**425**	**265**	**690**
Traffic Zone 7							
Office	219 emp.	71	14	85	17	66	83
Traffic Zone 8							
Low density residential	114 units	17	51	68	64	38	103
Medium density residential	1,309 units	88	249	336	385	183	468
High density residential	719 units	40	129	167	138	89	226
Total (rounded to nearest 5):	**2,142 units**	**145**	**430**	**570**	**585**	**310**	**795**
Traffic Zone 9							
Low density residential	663 units	94	282	376	352	207	558
Medium density residential	558 units	38	108	146	126	81	207
High density residential	239 units	15	48	63	49	31	81
Total (rounded to nearest 5):	**1,460 units**	**145**	**440**	**585**	**525**	**320**	**845**
Clair-Maltby Secondary Plan Maximum Density Scenario							
Low density residential	2,152 units	310	920	1,230	1,160	680	1,840
Medium density residential	3,925 units	265	755	1,020	975	565	1,435
High density residential	4,048 units	230	735	965	780	500	1,285
Office	333 emp.	115	25	140	30	110	135
Total (rounded to nearest 5):	**10,125 units; 333 emp**	**925**	**2,440**	**3,350**	**2,935**	**1,860**	**4,700**

Notes:
1. Residential unit and employee positions derived from "*Clair-Maltby Secondary Plan Study Area Population and Employment*": August 27, 2018. For the purposes of the analysis herein, maximum density allocations are assumed.
2. Total trips rounded to nearest 5.

13.3.3 Multi-Modal Forecasts

A proportion of residential and office travel to / from the Secondary Plan area will be made by sustainable transportation modes – including transit, walking and cycling. The uptake of transit and active transportation modes for residents, employees and visitors of the Secondary Plan area is anticipated to reflect the existing transportation context and travel behaviour present in the southern portions of the City of Guelph and other similar proxy development areas (as summarized in Section 13.2.2).

Multi-modal travel forecasts are derived by factoring forecast traffic volumes for selected mode splits. Transit and active transportation trips are estimated for each established Traffic Zone, so as to appropriately assign trips on the local transportation network, and understand the extent of travel demands for specific sections of the Secondary Plan area.

Forecast multi-modal travel demand for residential and office trips to / from the Secondary Plan area during the weekday morning and weekday afternoon peak hours is summarized in Table 21. Auto driver, auto passenger, transit, and active transportation trips are summarized, while “other” trips (i.e. school bus and taxi) are not included in the following summary.

Detailed calculations for multi-modal travel demands, including associated person trip generation rates, are attached in **Appendix H.**

TABLE 22 CLAIR-MALTY MULTI-MODAL TRAVEL DEMAND SUMMARY

Travel Mode	Units / Employees	AM Peak Hour			PM Peak Hour		
		In	Out	2-Way	In	Out	2-Way
Traffic Zone 1							
Auto Driver Trips (Traffic)	1,296 units	80	240	315	265	170	435
Auto Passenger Trips		0	40	40	35	65	100
Transit Trips		5	40	45	35	15	50
Active Trips		10	50	60	20	15	35
Total Trips:		**95**	**400**	**495**	**370**	**260**	**630**
Traffic Zone 2							
Auto Driver Trips (Traffic)	384 units	30	90	120	100	65	165
Auto Passenger Trips		0	15	15	15	25	40
Transit Trips		0	15	15	15	5	20
Active Trips		5	20	25	5	5	100
Total Trips:		**35**	**150**	**185**	**140**	**100**	**240**
Traffic Zone 3							
n/a							
Traffic Zone 4							
Auto Driver Trips (Traffic)	2,356 units	190	570	760	670	415	1,085
Auto Passenger Trips		5	95	100	95	160	255
Transit Trips		10	95	105	95	30	125
Active Trips		20	125	145	45	30	75
Total Trips:		**225**	**950**	**1,175**	**930**	**640**	**1,570**
Traffic Zone 5							
Auto Driver Trips (Traffic)	934 units; 114 employees.	140	290	430	350	250	600
Auto Passenger Trips		0	45	45	45	80	125
Transit Trips		10	45	55	45	25	70
Active Trips		10	60	70	25	20	45
Total Trips:		**165**	**480**	**645**	**485**	**385**	**870**
Traffic Zone 6							
Auto Driver Trips (Traffic)	1,553 units	125	365	485	425	265	690
Auto Passenger Trips		5	60	65	60	105	165
Transit Trips		5	60	65	60	20	80
Active Trips		10	80	90	30	20	50
Total Trips:		**145**	**610**	**755**	**590**	**410**	**1,000**

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Traffic Zone 7							
Auto Driver Trips (Traffic)	219 employees	70	15	85	15	65	80
Auto Passenger Trips		0	0	0	0	0	0
Transit Trips		5	0	5	0	5	5
Active Trips		5	0	5	0	5	5
Total Trips:		**80**	**15**	**95**	**15**	**75**	**90**
Traffic Zone 8							
Auto Driver Trips (Traffic)	2,142 units	145	430	570	585	310	795
Auto Passenger Trips		5	70	75	80	120	200
Transit Trips		10	70	80	80	25	105
Active Trips		15	95	110	40	25	65
Total Trips:		**170**	**715**	**885**	**815**	**475**	**1,290**
Traffic Zone 9							
Auto Driver Trips (Traffic)	1,460 units	145	440	585	525	320	845
Auto Passenger Trips		5	75	80	75	125	200
Transit Trips		10	75	85	75	25	100
Active Trips		15	95	110	35	25	60
Total Trips:		**170**	**735**	**905**	**730**	**490**	**1,220**
Clair-Maltby Secondary Plan Maximum Density Scenario Travel Demands							
Auto Driver Trips (Traffic)	10,125 units; 333 employees	925	2,440	3,350	2,935	1,860	4,700
Auto Passenger Trips		20	400	420	405	680	1,085
Transit Trips		55	400	455	405	150	555
Active Trips		90	525	615	200	145	345
Total Trips:		**1,090**	**4,065**	**5,155**	**4,075**	**2,860**	**6,935**

Notes:
1. Residential unit and employee positions derived from "*Clair-Maltby Secondary Plan Study Area Population and Employment*": August 27, 2018. For the purposes of the analysis herein, maximum density allocations are assumed.
2. Trips rounded to nearest 5.

Assuming the most conservative land use budget comprising 10,125 residential units and 333 employee positions, provided for the purposes of this analysis, the Clair-Maltby Secondary Plan would be anticipated to result in the order of 5,155 and 6,935 two-way trips during the weekday morning and weekday afternoon peak hours, respectively. Total trips include those trips that utilize "other" travel modes, including those using school buses, taxis, or ride-share services, despite these travel modes not being explicitly identified in the above summary.

Overall, approximately 3,770 and 5,785 two-way person trips are anticipated to be undertaken in a personal vehicle (as a driver or passenger), comprising approximately 73% to 83% of all trips during weekday morning and afternoon peak hours. In the order of 455 and 555 two-way person trips are anticipated to be undertaken as a transit rider, comprising approximately 8% of all trips during weekday peak hours. Comparatively, in the order of 615 and 345 two-way person trips are anticipated to be undertaken as a pedestrian or cyclists during the weekday morning and afternoon peak hours, respectively, comprising approximately 12% and 5% of all trips during the respective weekday peak hours.

14.0 TRANSIT ASSESSMENT

14.1 AREA TRANSIT CONTEXT

14.1.1 Existing Context

The Secondary Plan area is not currently served by local or regional transit. Generally, the area transit network is limited to Guelph Transit local bus services operating along and north of Clair Road. GO Transit regional bus services route along Gordon Street within the Secondary Plan, but do not service the area.

14.1.2 Planned Transit Improvements

This transit assessment considers improved transit provisions within the planning horizon (year 2031) of this study, including potential new bus services routing along Secondary Plan arterial and collector streets.

The “Moving Guelph Forward” Transit Plan describes recommended service changes and future measures that are intended to increase ridership and achieve a 15% transit mode share – consistent with policy objectives of OPA 48 and the Guelph – Wellington Transportation Study. Implemented service improvements, in the vicinity of the Clair-Maltby Secondary Plan area include minor alterations to the #5 Clair and #56 Victoria Express bus routes, which will potentially be altered again given the development of the Clair-Maltby precinct.

It is anticipated that the local transit network will continue to evolve in sequence with development of the Secondary Plan area, and as part of on-going service reviews conducted by Guelph Transit. The Preferred Community Structure Plan has been advanced anticipating the introduction of frequent transit provisions on Gordon Street between Clair Road and Maltby Road, and the option for additional or expanded services routing along arterial and collector streets within the Secondary Plan area.

New transit services would be anticipated to offer more robust connections for future area transit riders and encourage greater transit use as a proportion of overall mode share in keeping with the policy objectives of the Moving Guelph Forward Transit Plan.

14.2 EVALUATION APPROACH

Person-based transit trips have been forecast and assigned to the area transit network in order to evaluate future transit demands.

Transit trips are derived from the analysis undertaken in Section 13.3, which then forms the basis for assigning transit rider trips by orientation. Assignment of transit trips is based on a review of origin and destination data collected as part of the 2016 Transportation Tomorrow Survey (TTS) for the southern parts of the City of Guelph.

Clair-Maltby Secondary Plan transit trips are assigned to general directions, and would be captured by local transit services. Additional opportunities to explore regional transit connectivity and demands are discussed in the later portions of this chapter.

14.3 TRANSIT RIDER DEMANDS

Transit trips resulting from development contemplated within the Clair-Maltby Secondary Plan area are forecast for planned residential and office land uses, based on the trip forecasting methods outlined in Section 13.3**.** Transit trip forecasts are based on the most conservative (highest density) "Land Use Budget" circulated in support of planning for Secondary Plan development. Forecast new transit trips to / from each Secondary Plan "Traffic Zone" during analyzed peak hours is summarized in Table 23.

TABLE 23 FORECAST SECONDARY PLAN TRANSIT TRIPS

Transit Trips	Weekday Morning Peak Hour			Weekday Afternoon Peak Hour		
	Inbound	Outbound	2-Way	Inbound	Outbound	2-Way
Traffic Zone 1	5	40	45	35	15	50
Traffic Zone 2	0	15	15	15	5	20
Traffic Zone 3	n/a					
Traffic Zone 4	10	95	105	95	30	125
Traffic Zone 5	10	45	55	45	25	70
Traffic Zone 6	5	60	65	60	20	80
Traffic Zone 7	5	0	5	0	5	5
Traffic Zone 8	10	70	80	80	25	105
Traffic Zone 9	10	75	85	75	25	100
Total:	**55**	**400**	**455**	**405**	**150**	**555**

Notes
1. Trips Rounded to the nearest 5

The majority of transit trips are anticipated to route outbound during the weekday morning peak hour, and inbound during the weekday afternoon peak hour given the prevailing residential-related travel demands associated with the Secondary Plan.

A total of 455 and 555 new transit trips are forecast during the weekday morning and weekday afternoon peak hours, respectively.

14.4 TRANSIT DISTRIBUTION AND ASSIGNMENT

14.4.1 Distribution of Site Transit Trips

A review of TTS data was undertaken to understand the existing distribution and type of transit service utilized for resident-based trips to / from the southern parts of the City of Guelph (TTS Zones: 8062, 8064, 8067-8076, and 8078-8081). Work-related trips were not reviewed given the relative small number of forecast employee transit trips (in the order of 10 inbound trips during the weekday morning peak hour, and 10 outbound trips during the weekday afternoon peak hour).

The distribution of forecast transit trips generated by development within the Clair-Maltby Secondary Plan area is based upon existing transit distribution data made available in the TTS data set. A wider data area was established to accommodate a sizable base of data points, and reflect general transit distribution for resident based transit trips in the southern parts of the City of Guelph.

The review of resident-based area transit trips indicated that the majority of transit trips were undertaken exclusively by local transit services - in the order of 85% to 90%, while a smaller proportion of trips utilized regional GO Transit services to access other parts of the region. TTS transit distribution analysis data is included in **Appendix I.**

It is expected that most transit trips to the Clair-Maltby Secondary Plan area will be captured by local transit services, which is anticipated to continue to evolve in sequence with development of the Secondary Plan area, and as part of on-going service reviews conducted by Guelph Transit.

The anticipated distribution of transit trips and resulting number transit trips, based on the TTS transit distribution and forecast transit rider volumes, are summarized in Table 24. Forecast transit rider volumes are summarized based on the type of service riders would be anticipated to utilize (local or regional), and general directional orientation those riders would travel. Detailed transit rider assignment calculations for the Clair-Maltby Secondary Plan area, are included in **Appendix J.**

TABLE 24 RESULTING NEW TRANSIT TRIPS BY ORIENTATION AND SERVICE

Orientation	Orientation of Transit Trips	Two-way Transit Trips		
		Distribution	AM	PM
Regional Transit Services (GO Transit)				
East	Kitchener GO Line (Guelph Station); Aberfoyle GO Park and Ride Bus Stop	14%	65	75
Local Transit Services (Guelph Transit)				
North	Old Guelph (Downtown) Area; University of Guelph Area	81%	370	450
Northeast	Northeast areas of Guelph	2%	10	15
Northwest	Northwest and West areas of Guelph	3%	10	15

Notes:
1. Trips Rounded to the Nearest 5.

Clair-Maltby Secondary Plan area transit trips are predominantly anticipated to be oriented north of the Secondary Plan area, as transit riders tend to route to / from the downtown area, the University area, and central GO Transit Station. In the order of 370 and 450 two-way transit trips are anticipated to route to / from these areas during the weekday morning and weekday afternoon peak hours respectively.

In the order of 65 and 75 two-way transit trips are anticipated to route to / from GO Transit service stops during the weekday morning and weekday afternoon peak hours respectively, including the Guelph GO Station, as well as the existing GO Transit Bus Services routing through Aberfoyle GO Park and Ride.

A small number of transit trips are expected to route to other employment areas in the east and west portions of the City. However, as employment growth is anticipated in the Laird / Highway 6 area, opportunity to capture more trips via transit may exist given the proximity of this employment area to the Clair-Maltby Secondary Plan area, and relative direct options for transit routing.

Transit rider volumes related to development anticipated with the Clair-Maltby Secondary Plan are illustrated by general direction in Figure 19.

14.5 TRANSIT CAPACITY CONSIDERATIONS

Transit trips associated with development of the Clair-Maltby Secondary Plan area are analyzed for the prevailing directions in each of the key weekday morning and afternoon peak hours. Given that most new transit trips are resident-based, prevailing transit impacts are outbound during the weekday morning peak hour, and inbound during the weekday afternoon peak hour.

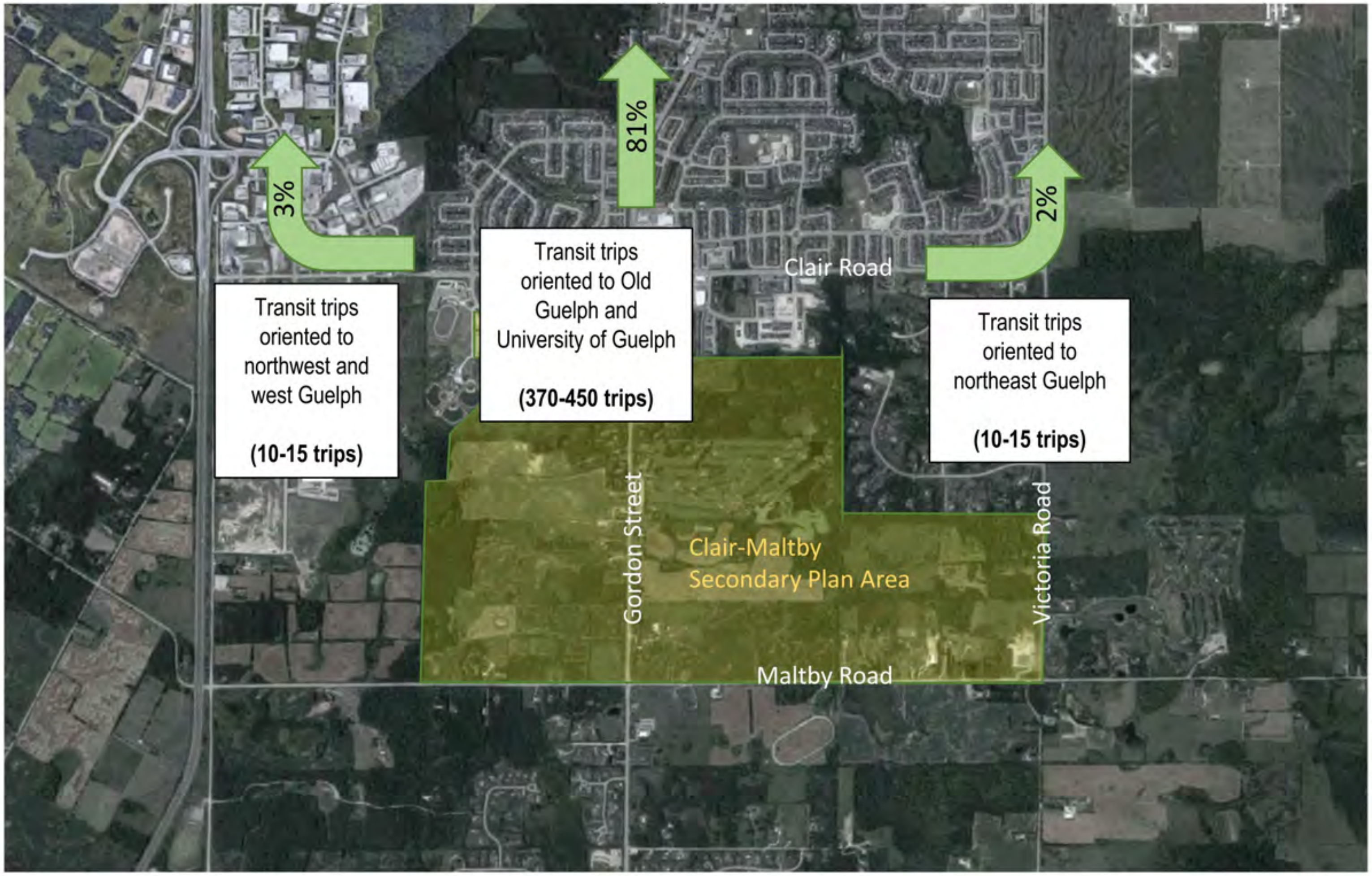
Understanding transit rider forecasts are based on the most conservative (highest density) “Land Use Budget” circulated in support of planning for Secondary Plan development, up to 400 outbound transit trips can be anticipated during the weekday morning peak hour, and 405 inbound trips can be anticipated during the weekday afternoon peak hour. In the order of 90% to 95% of these trips can be expected (conservatively) to be oriented north of the Secondary Plan area to / from the University and Downtown areas. Therefore, up to 385 peak direction transit trips can be expected between the Secondary Plan area and central areas of the City during weekday peak hours.

Guelph Transit currently utilizes Nova Bus LFS 40-foot buses, which have a total passenger capacity of 50 to 60 persons per vehicle.[2] As such, in the order of 7 buses would be required to accommodate peak direction, peak time transit ridership demands associated with travel between the Clair-Maltby Secondary Plan area and central Guelph areas. However, transit service provisions would also have to accommodate for existing (and future) down-stream transit rider demands associated with existing developed areas north of the Secondary Plan.

The requirement for a minimum of 5 new buses (per hour) in excess of existing services, operating between the Secondary Plan area and the central areas of the City to accommodate development associated with the Secondary Plan area, can be accommodated through the provision of various routes, express-only services, or frequent services routing along the Gordon Street spine and supporting collector roads.

Based on the foregoing, development contemplated as part of the Clair-Maltby Secondary Plan can be reasonably accommodated by local and regional transit services, given the introduction of new transit services or the expansion of existing services operating within the Secondary Plan area, over the course of the weekday morning and afternoon peak hours

[2] Bus capacity provided by Guelph Transit.



* Remaining percentage of transit rider trips (approx. 14%) are anticipated to utilize regional transit services (GO Transit) only via Guelph Station or Aberfoyle GO Park and Ride.

WEEKDAY PEAK HOUR FORECAST TRANSIT RIDER TRIPS

15.0 TRAFFIC OPERATIONS ANAYLSIS

15.1 METHODOLOGY

15.1.1 Analysis Scope

Traffic operations analyses have been undertaken for a number of intersections within the Clair-Maltby Secondary Plan area in order to understand existing and future traffic conditions and demands. Traffic conditions have been reviewed at the following intersections under both existing and future traffic scenarios:

Signalized Intersections:

- Gordon Street and Clair Road;
- Gordon Street and Poppy Drive;
- Gordon Street and Gosling Gardens;
- Clair Road and Poppy Drive;
- Clair Road and Farley Drive;
- Clair Road and Beaver Meadow Drive;
- Clair Road and Victoria Road;
- Laird Road and Highway 6 northbound off-ramp; and
- Laird Road and Highway 6 southbound off-ramp.

Unsignalized Intersections:

- Laird Road and Clair Road West;
- Gordon Street and Maltby Road;
- Victoria Road and Maltby Road (east intersection); and
- Victoria Road and Maltby Road (west intersection).

The free traffic movements associated with the existing Highway 6 access ramps to / from Laird Road East are not analyzed as part of the traffic analysis herein.

Additional intersections are analyzed as part of the Future Total Traffic Operations Analysis, reflecting the introduction of new intersections associated with the build-out of the Preferred Community Structure plan. New intersections include:

- Gordon Street and Collector Street B;
- Gordon Street and Collector Street C;
- Gordon Street and Collector Street D;
- Gordon Street and Collector Street E;
- Clairfields Extension (Street A) and Poppy Road;
- Clairfields Extension (Street A) and Collector Street B;
- Clairfields Extension (Street A) and Collector Street C;
- Clairfields Extension (Street A) and Collector Street D;
- Clairfields Extension (Street A) and Collector Street E;
- Clairfields Extension(Street A) and Maltby Road;
- Collector Street E and Collector Street F;
- Maltby Road and Collector Street F
- Maltby Road and Collector Street G; and
- Victoria Road and Collector Street E.

15.1.2 Analysis Scenarios

Traffic operations analyses have been undertaken during the prevailing weekday afternoon street peak hour under the following traffic conditions:

1. Existing traffic scenario: reflecting existing traffic volumes, lane configurations and traffic controls.

2. Future Background traffic scenario: reflecting traffic volumes projected to the year 2031 planning horizon that are not associated with the development of the Clair-Maltby Secondary Plan area, planned future lane configurations, planned future traffic controls, and planned new street elements (such as the southward extension of Southgate Drive to Maltby Road).

3. Future Total traffic scenario: reflecting traffic volumes projected to the year 2031 planning horizon including those associated with the development of the Clair-Maltby Secondary Plan area, planned future lane configurations, planned future traffic controls, and planned new street elements (such as new collector streets proposed as part of the Preferred Community Structure plan).

15.1.3 Analysis Assumptions

15.1.3.1 Intersection Capacity Analysis Methodology

Traffic operations analyses have been undertaken at study area intersections using standard capacity analysis procedures as follows.

The traffic operations analysis for signalized and unsignalized intersections was undertaken using *Synchro Version 10* software, adhering to the analysis methodology outlined in the *Highway Capacity Manual 2000*. Key performance indicators utilized for the signalized and unsignalized analyses are volume-to-capacity (v/c) ratios, delay times, and level-of-service (LOS).

Input parameters for the analyses are based on data acquired from traffic surveys. Peak hour factors and heavy traffic percentage parameters were calculated based on the traffic data acquired where appropriate. Bus blockages were estimated based on transit service frequency during prevailing traffic volume peak hours.

15.1.3.2 Calibration

Vehicle delay surveys were undertaken for the eastbound and westbound traffic movements at the Gordon Street and Maltby Road intersection so as to ensure that the traffic model appropriately reflects existing traffic delays for the eastbound and westbound movements. The existing traffic analysis herein is calibrated to reflect existing delay results observed during updated data collection and traffic delay surveys. Parameters calibrated under existing traffic conditions is carried forward as part of future analysis traffic scenarios.

Vehicle delay surveys are included in **Appendix K.**

15.2 EXISTING TRAFFIC OPERATIONS ANALYSIS

Existing traffic operations analysis contemplate existing traffic volumes and existing street network configurations and traffic control.

15.2.1.1 Traffic Volume Data

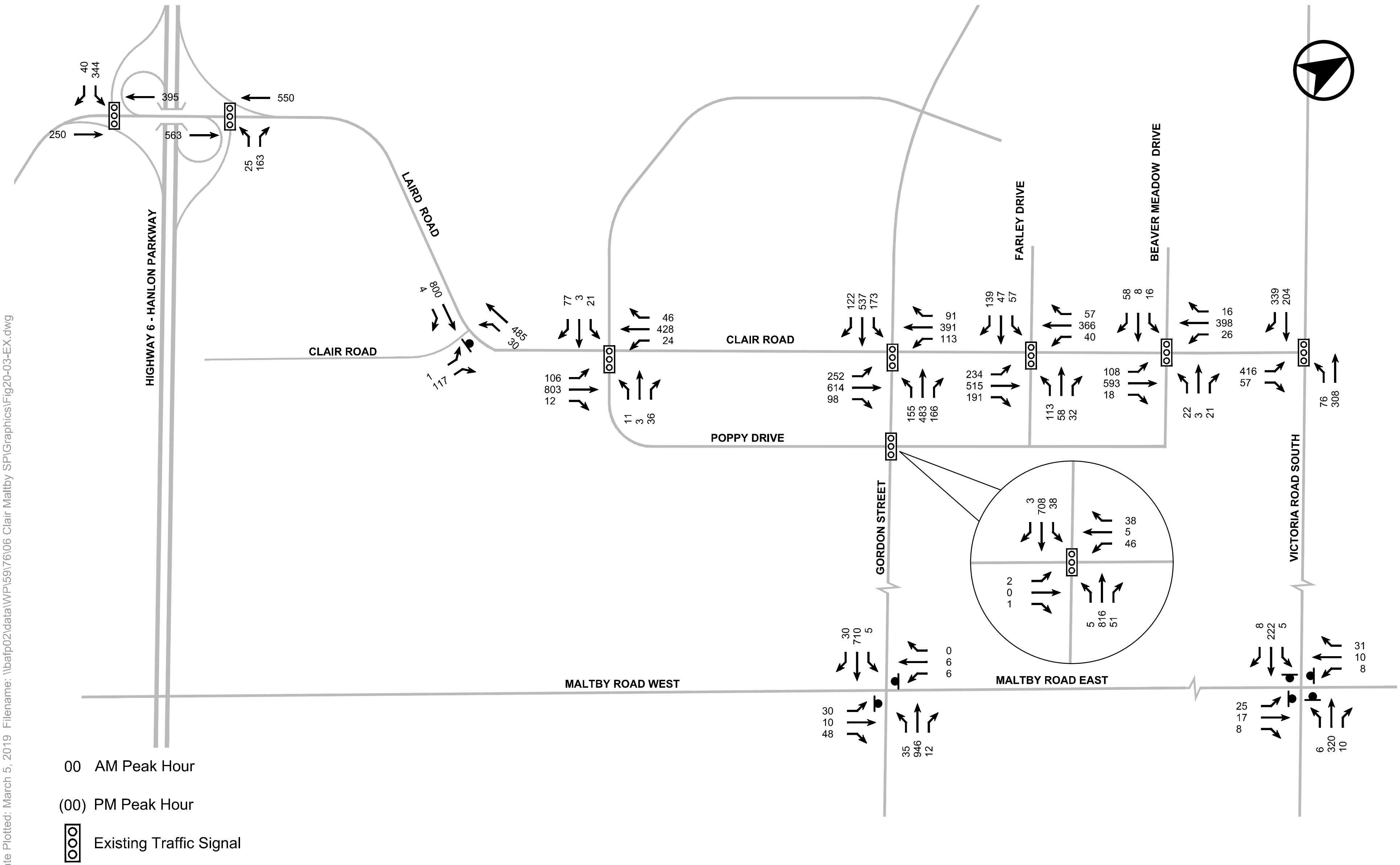
Existing traffic volume data were obtained for all study area intersections from the City of Guelph and / or traffic counts collected by Spectrum Traffic Data Inc. on behalf of BA Group.

Traffic volume data was collected for the period 2012 to 2017 for key intersections in the study area, as well as older traffic volume data for use as reference. Traffic volumes were reviewed against historical data (TMCs and ATRs) to verify general trends and understand potential inconsistencies. Generally, the most recent intersection counts (those from 2015 to 2017) were selected at key study area intersections, and utilized as the basis for analysis. Existing area traffic volumes utilized in assessing current traffic operations are illustrated in Figure 20. Traffic count data utilized in the traffic analysis prepared herein, are included in **Appendix L.**

Traffic signal timing plans were provided by the Ministry of Transportation and the City of Guelph for signalized intersection included as part of the analysis.

15.2.1.2 Existing Transportation Network

Existing lane configurations on the public area road network reflect existing lane configurations and traffic controls. Existing traffic lane configurations and traffic controls are illustrated in Figure 21.



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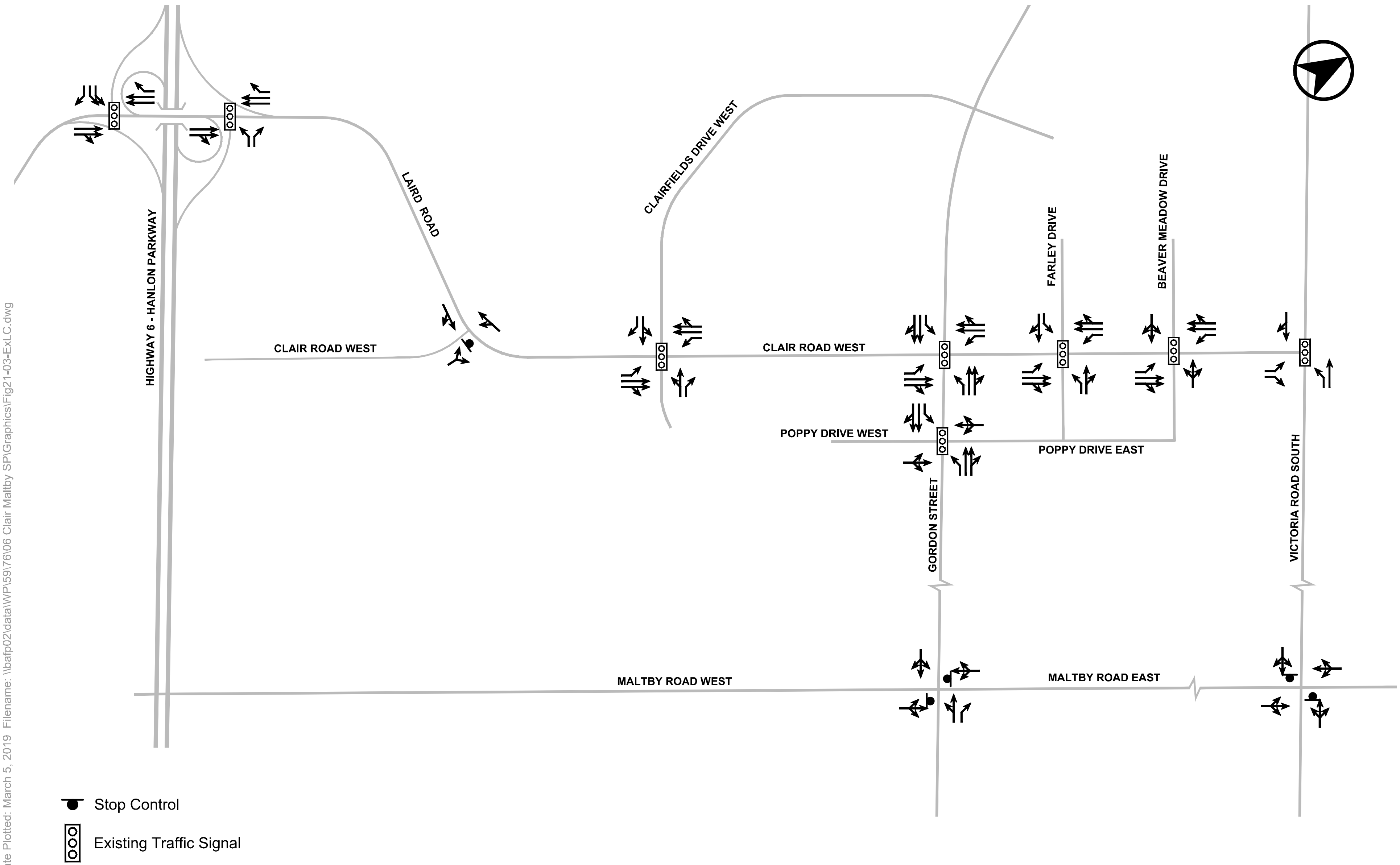
EXISTING WEEKDAY AFTERNOON PEAK HOUR TRAFFIC VOLUMES

BA Group

Clair Maltby Secondary Plan
5976-06 March 2019

Figure 20



EXISTING TRAFFIC LANE CONFIGURATIONS AND CONTROLS

15.2.2 Signalized Intersection Analysis Results

Detailed results of the Synchro analysis of signalized intersections within the study area under existing traffic conditions are included in **Appendix M.** A discussion of the traffic analysis findings follows.

A summary of existing signalized and unsignalized traffic operations at key existing study area intersections is provided in Figure 22.

15.2.2.1 General Findings

The traffic operations analyses outlined herein reflect traffic operations at the key intersections in the study area without explicitly considering the downstream congestion extending beyond study area intersections.

Individual movement and overall volume-to-capacity ratios for each of the signalized intersections within the study area are summarized in Table 25.

The signalized intersection traffic analysis indicates that all study area intersections perform acceptably, and without any traffic capacity constraints for any individual traffic movements. During the weekday afternoon peak hour, overall intersection v/c ratios are shown to be 0.70 or less, while individual traffic movements are shown to all operate with a v/c ratio of 0.73 or less.

Overall signalized intersection traffic operations are good under existing conditions, and are generally reflective of new infrastructure (updated and widened roads) and limited area development. Existing delay and capacity results are acceptable.

The key Gordon Street and Clair Road intersection operates acceptably under existing traffic conditions, with an overall intersection v/c ratio of 0.63 during the weekday afternoon peak hour. Traffic volumes and resulting traffic operations are reflective of the commercial land uses prevalent in each of the intersection's four quadrants.

The intersection of Clair Road East and Victoria Road was recently signalized. The signalized intersection analysis indicates that this intersection generally operates acceptably.

TABLE 25 EXISTING CONDITIONS SIGNALIZED INTERSECTIONS ANALYSIS SUMMARY: WEEKDAY AFTERNOON PEAK HOUR

Intersection	Traffic Movement	Volume to Capacity (v/c) Ratio
Gordon Street and Clair Road	EB L	0.65
	EB TR	0.60
	WB L	0.47
	WB TR	0.42
	NB L	0.52
	NB TR	0.57
	SB L	0.56
	SB TR	0.59
	Overall	**0.63**
Gordon Street and Poppy Drive	EB LTR	0.00
	WB LTR	0.41
	NB L	0.01
	NB TR	0.37
	SB L	0.09
	SB TR	0.29
	Overall	**0.36**
Clair Road West and Poppy Drive West / Clairfields Drive	EB L	0.21
	EB TR	0.46
	WB L	0.08
	WB TR	0.29
	NB LT	0.03
	NB R	0.02
	SB LT	0.05
	SB R	0.05
	Overall	**0.31**
Clair Road East and Farley Drive	EB L	0.44
	EB TR	0.37
	WB L	0.13
	WB TR	0.28
	NB LT	0.32
	NB R	0.12
	SB LT	0.14
	SB R	0.17
	Overall	**0.41**

Clair Road East and Beaver Meadow Drive	EB L	0.20
	EB TR	0.35
	WB L	0.06
	WB TR	0.25
	NB LTR	0.07
	SB LT	0.04
	SB R	0.06
	Overall	**0.25**
Clair Road East and Victoria Road	EB L	0.68
	EB R	0.06
	NB L	0.38
	NB T	0.46
	SB T	0.73
	Overall	**0.70**
Laird Road and Highway 6 Northbound Off-Ramp	EB T	0.47
	WB T	0.46
	NB L	0.03
	NB R	0.15
	Overall	**0.29**
Laird Road and Highway 6 Southbound Off-Ramp	EB T	0.21
	WB T	0.32
	NB L	0.22
	NB R	0.03
	Overall	**0.26**

15.2.3 Unsignalized Intersection Analysis Results

The results of the capacity analysis performed for unsignalized intersections in the study area are summarized in Table 26.

Detailed Synchro analysis output sheets are included in **Appendix M.** A summary of existing signalized and unsignalized traffic operations at key existing study area intersections is provided in Figure 22.

Table 26 Existing Conditions Unsignalized Intersections Analysis Summary: Weekday Afternoon Peak Hour

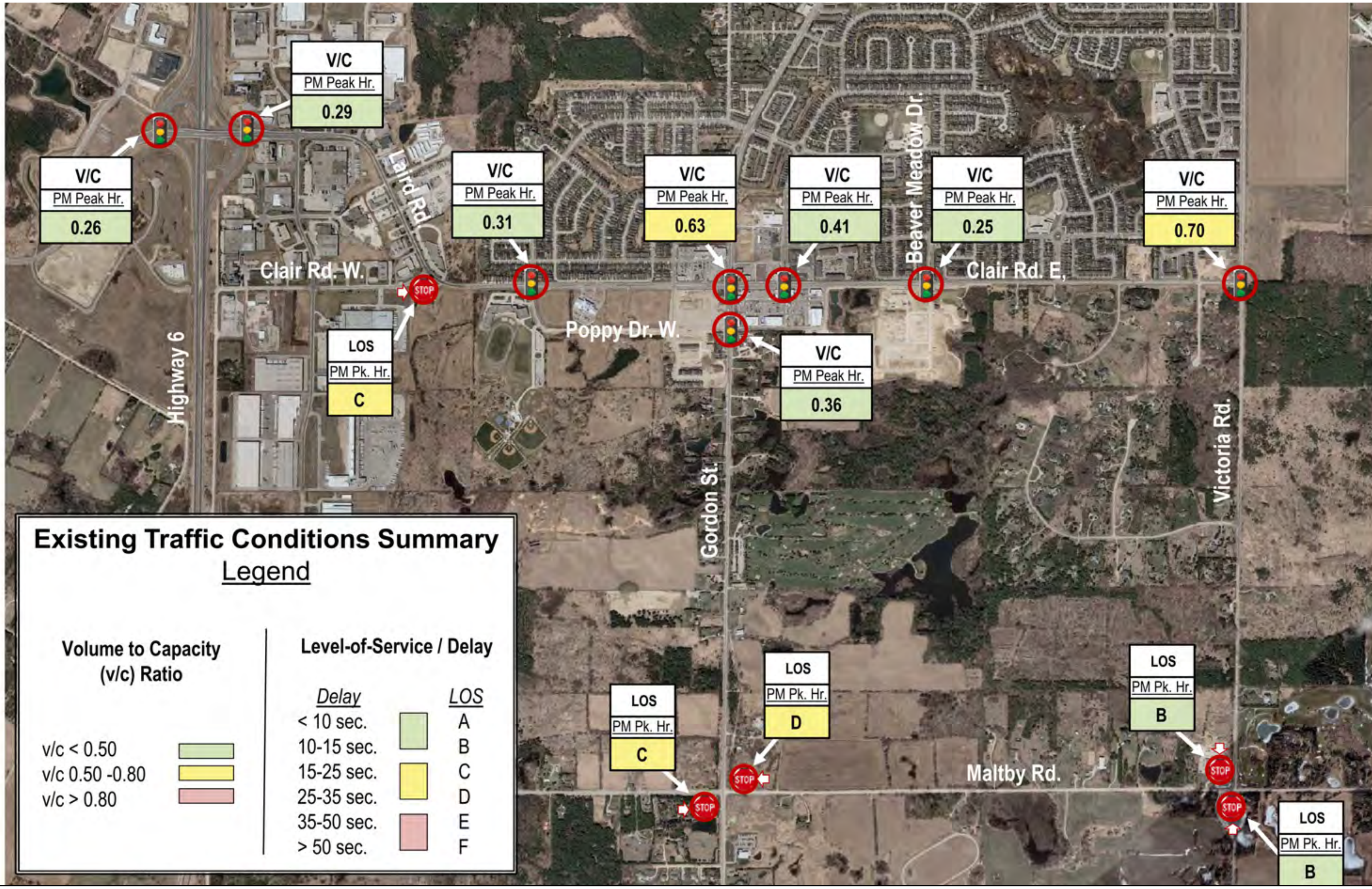
Intersection	Movement of Interest	Existing Traffic Conditions	
		Delay (s)	LOS
Clair Road West and Laird Road	WB L	1.0	A
	NB (Clair Rd.) LR	18.6	C
Gordon Street and Maltby Road	EB LTR	19.6	C
	WB LTR	33.1	D
	NB LTR	1.2	A
	SB LTR	0.2	A
Victoria Road and Maltby Road (west intersection)	WB LT	7.1	A
	NB LR	10.3	B
Victoria Road and Maltby Road (east intersection)	EB LT	7.7	A
	SB LR	11.8	B

Existing Unsignalized Intersections

A total of four (4) unsignalized intersections were reviewed within the unsignalized intersection analysis. Traffic operations at unsignalized intersections within the study area operate acceptably, except for the following:

Gordon Street and Maltby Road:
The existing conditions traffic analysis indicates the that eastbound and westbound STOP-control movements at the Gordon Street and Maltby Road intersection operate with longer delays and fewer gap opportunities. The unsignalized traffic analysis indicates that the eastbound movement operates with LOS C during the weekday afternoon peak hour, while the westbound movement operates with LOS D during the weekday afternoon peak hour. Signalization of this intersection may be considered in the longer-term given anticipated traffic growth along both streets. This intersection can be monitored, and will be considered more closely in the future traffic analysis to be completed as part of traffic analyses in forthcoming sections of this report.

All other movements at unsignalized intersections within the study area are shown to operate at LOS C or better during the weekday afternoon peak hour, which is acceptable.



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SUMMARY OF EXISTING TRAFFIC OPERATIONS ANALYSIS

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Figure 22

15.3 FUTURE BACKGROUND TRAFFIC CONSIDERATIONS

15.3.1 Future Background Scenario Road Network Assumptions

Future lane configurations on the area street network reflect the following planned improvements that are assumed as part of the future traffic analysis scenarios:

- Widening of Gordon Street from 2 to 4 lanes (approved 2001 EA) from Kortright Road to Wellington Road 34;
- Widening of Clair Road from 2 to 4 lanes (approved 2003 EA) – COMPLETE; and
- Southerly extension of Southgate Drive to Maltby Road.

15.3.2 General Corridor Growth

BA Group has undertaken a review of traffic patterns in the study area over the past 10 years (2008 to 2018) to provide an understanding of overall traffic growth trends on key street segments within the Secondary Plan area.

Traffic volumes were reviewed for the following street segments to provide an indication of prevailing trends in vehicle activity along the arterial road corridors of Gordon Street, Clair Road, and Victoria Road within this period.

1. Gordon Street south of Clair Road,
2. Gordon Street north of Maltby Road,
3. Clair Road east of Gordon Street,
4. Clair Road west of Gordon Street, and
5. Victoria Road south of Clair Road.

It should be noted that traffic volumes were also reviewed for segments of Maltby Road east of Gordon Street; however, the infrequency of historical data and generally small traffic volumes could not produce a reflective traffic growth rate. Traffic volumes on Maltby Road were shown to be relatively small, and variable from count to count.

Traffic corridor review observations are outlined in the following and are summarized in **Appendix N**.

- In the **northbound and southbound directions on Gordon Street**. Traffic volumes on the street segment south of Clair Road and on the street segment north of Maltby Road illustrate consistent traffic patterns for the entire Gordon Street segment through the Secondary Plan area. Two-way traffic volumes are shown to have increased in the order of +0.4% to +0.7% during the weekday afternoon peak hour.

  During the weekday afternoon peak hour, northbound traffic is shown to have increased by +0.5% to +0.6% per annum over the last 10-year period, while southbound traffic is shown to have increased between +0.3% to +0.8% per annum over the same period.

- In the **eastbound and westbound directions on Clair Road**. Over the previous 10-year period, two-way traffic volumes on Clair Road are shown to have increased in the order of +3% to +4% annually during the weekday afternoon peak hour west of Gordon Street, and in the order of +4% to +5% annually during the weekday afternoon peak hour east of Gordon Street.

- In the **northbound and southbound directions on Victoria Road**. It is important to note that the rate of traffic growth on Victoria Road (percentage change) is somewhat misleading for the following reasons:

    - Victoria Road traffic volumes are relatively low, and despite higher rates of vehicle growth, the absolute volume of new traffic is less than those observed on Clair Road.
    - Historical traffic volume data indicates that most of the increase in traffic volumes on Victoria Road occurred between 2013 and 2014, and that traffic volumes after 2014 are shown to be more consistent.

  Understanding this, two-way traffic volumes on Victoria Road south of Clair Road are shown to have increased by +16% to +18% annually during the weekday afternoon peak hour.

The general weekday afternoon corridor growth rates observed as part of the corridor analysis review are summarized in Table 27.

TABLE 27 CORRIDOR TRAFFIC GROWTH SUMMARY

Street	Direction	Observed Annual Growth Rate
Gordon Street Two-way Traffic	Northbound / Southbound	+0.4% to +0.7%
Clair Road Two-way Traffic	Eastbound / Westbound	+3.7% to +4.7%
Victoria Street Two-way Traffic	Northbound / Southbound	+18%

Understanding the prevailing traffic growth trends associated with key arterial roads within the Secondary Plan area (Gordon Street, Victoria Road and Clair Road), traffic growth was assumed for these corridors. Corridor traffic growth was carried through the study area, and in the case of Clair Road, assigned to terminal ramps at the Highway 6 / Laird Road interchange based on existing turning movement proportions. Corridor growth rates were applied over a 14-year period to the 2031 planning horizon year, to account for the 2017 date of traffic data collection associated with this project.

Application of Background Corridor Growth Rates:
An average annual corridor growth rate of 0.5% was applied to Gordon Street during the weekday afternoon peak hour.

Higher traffic growth rates along Victoria Road and Clair Road are expected to result from recent development along these corridors; however, this growth would not be expected to be maintained over the long-term without the introduction of new site-specific developments (accounted for the in the following section). As such, a corridor growth rate of 1.5% per annum was applied to these corridors, which is generally consistent with growth rates applied by the City in traffic planning modelling exercises.

Traffic volumes resulting from the application of corridor growth rates outlined herein, are summarized in **Appendix O**.

15.3.3 Site Specific Background Developments

Future background traffic operations will be forecast and assessed, understanding general traffic growth trends (corridor growth assessed in the foregoing), and other area site-specific background developments – which are summarized in Table 28.

Area background developments also provide an understanding of current changes within the vicinity of the Clair-Maltby Secondary Plan area, and the existing development context that will be considered as part of future planning for the subject lands.

Traffic volumes associated with each of the developments outlined in Table 28 is assigned to the area road network.

It should be noted that traffic related to the proposed development comprising the Dallan Residential Subdivision (161, 205, and 253 Clair Road East) would be somewhat captured as part of existing traffic volumes given the initial occupancy of this development. For the purposes of the traffic analysis herein, traffic volumes associated with this development are reduced by 25% to account for existing occupancy.

Traffic volumes related to the Dallan, Neumann and Bird Subdivisions were slightly adjusted as part of the analysis herein to account for the introduction of Poppy Road, which was not utilized in the assignment of site specific trips within Transportation Studies prepared for these developments.

Traffic volumes resulting from the introduction of the site-specific developments cited herein, are summarized in **Appendix O**.

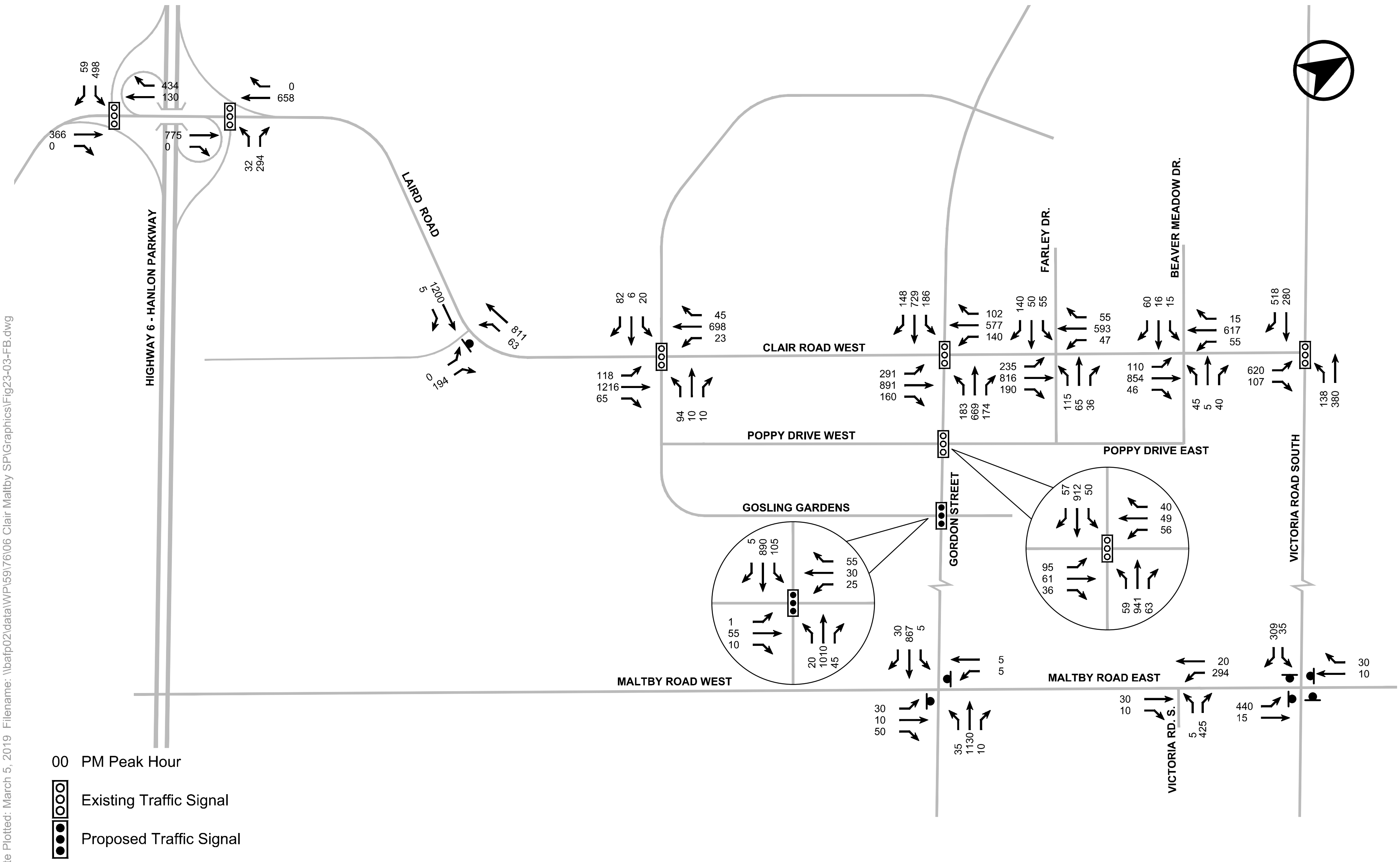
TABLE 28 AREA DEVELOPMENT APPLICATIONS

Development	Residential Units	Non-Residential GFA	Two-Way Site Traffic[1] AM (PM)	Transportation Study / Analysis
1888 Gordon Street (Tricar Developments Inc.)	460 Apartment Units	6,350 sq. ft. non-residential GFA	297 (329)	*1888 Gordon Street Traffic Impact Study*, September 22, 2017, Stantec.
Neumann Subdivision (Coldwell Banker Neumann REB Ltd.)	Stacked townhouses and apartments (permitted use). Number of units unspecified.	3.22 ha Corporate Business Park 0.98 ha Commercial 4.2 ha	205 (203)	*Neumann Subdivision Guelph, ON Transportation Impact Study*, October 2014, Paradigm Transportation Solutions Ltd.
Bird Subdivision (Thomasfield Homes Ltd.)	21 Single Family Units 36 Townhouse Units 249 Apartment Units 306 Total Units	0.04 ha Future Development	107 (137)	*Bird Residential Subdivision Traffic Impact Study*, October 2010, Paradigm Transportation Solutions Ltd.
Southwest Corner of Gordon Street / Clair Road (Fieldgate)	-	7,408 sq. m. Retail	515[2]	*Gordon Street and Clair Road* October 2015, LEA Consulting Ltd.
Southgate Business Park (Industrial Equities)	-	27,870 sq. m. Manufacturing 122,632 sq. m. Warehouse	476 (450)	*Southgate Business Park Transportation Impact Study* June 2012, IBI Group
Hanlon Creek Business Park	--	--	--	--
Dallan Residential Subdivision 161, 205 & 253 Clair Road East	409 residential units (Mix of densities)	--	--	1888 Gordon TIS assumed 105 units. ±400 units were previously proposed. Unclear what's currently being built…
South End Centre	-	13,935 sq.m. (150,000 sq.ft.) Recreation Centre	308 (411)	No TIS. Traffic referenced from 1888 Gordon TIS.
Westminster Woods Victoria Road South & Clair Road East	101 residential apartment units	745 sq. m. Commercial	70 (149)	*Kingsbury C Westminister Woods Traffic Impact Study*. March 2015, Stantec.

Notes:
1. Two-Way Site Traffic based on individual TIS reports.
2. 515 total PM trips, 340 net new PM trip

15.3.4 Future Background Traffic Analysis Results

Future Background traffic volumes, which is the sum of existing traffic volumes, corridor growth traffic volumes, and site-specific background development traffic volumes, is illustrated in Figure 23.



FUTURE BACKGROUND TRAFFIC VOLUMES

BA Group

Clair Maltby Secondary Plan
5976-06 March 2019

Figure 23

15.3.5 Signalized Intersection Analysis Results

Detailed results of the Synchro analysis of signalized intersections within the study area under future background traffic conditions are included in **Appendix P.** A discussion of the traffic analysis findings follows.

A summary of future background signalized and unsignalized traffic operations at key existing study area intersections is provided in Figure 24.

15.3.5.1 General Findings

The traffic operations analyses outlined herein reflect traffic operations at the key intersections in the Secondary Plan analysis scope without explicitly considering the downstream congestion extending beyond study area intersections.

Individual movement and overall volume-to-capacity ratios for each of the signalized intersections within the study area are summarized in Table 29.

The signalized intersection traffic analysis indicates that all study area intersections are anticipated to perform acceptably under future background traffic conditions. During the weekday afternoon peak hour, overall intersection v/c ratios are shown to be 0.87 or less, while individual traffic movements are shown to all operate with a v/c ratio of 0.87 or less.

Overall signalized intersection traffic operations are generally good under future background traffic conditions and are similar to those observed under existing traffic conditions, although longer delays and higher volume-to-capacity ratios are observed at the key Gordon Street / Clair Road and Victoria Road / Clair Road intersections relative to the existing conditions.

The key Gordon Street / Clair Road intersection is anticipated to operate acceptably under future background traffic conditions, with an overall intersection v/c ratio of 0.87 during the weekday afternoon peak hour. Relative to the existing condition, overall intersection v/c ratios increase by 32% during the weekday afternoon peak hour, which is generally the result of anticipated increases in through traffic volumes along Gordon Street and Clair Road, site-specific development traffic, and an increase in eastbound left-turn traffic volumes resulting from specific area developments.

The future background traffic analysis indicates that the Victoria Road / Clair Road intersection generally operates acceptably, despite an increase in traffic delay and volume-to-capacity ratios. Relative to the existing condition, overall intersection v/c ratios increase by 25% during the weekday afternoon peak hour, which is generally the result of anticipated increases in southbound right-turn and eastbound left-turn traffic volumes resulting from area-specific background developments.

TABLE 29 FUTURE BACKGROUND CONDITIONS SIGNALIZED INTERSECTIONS ANALYSIS SUMMARY: WEEKDAY AFTERNOON PEAK HOUR

Intersection	Traffic Movement	Volume to Capacity (v/c) Ratio
Gordon Street and Clair Road	EB L	0.87
	EB TR	0.84
	WB L	0.70
	WB TR	0.54
	NB L	0.86
	NB TR	0.87
	SB L	0.83
	SB TR	0.87
	Overall	**0.87**
Gordon Street and Poppy Drive	EB LTR	0.67
	WB LTR	0.47
	NB L	0.17
	NB TR	0.50
	SB L	0.15
	SB TR	0.48
	Overall	**0.52**
Gordon Street and Gosling Gardens	EB LTR	0.15
	WB LTR	0.21
	NB L	0.06
	NB TR	0.46
	SB L	0.37
	SB TR	0.39
	Overall	**0.40**
Clair Road West and Poppy Drive West / Clairfields Drive	EB L	0.31
	EB TR	0.72
	WB L	0.16
	WB TR	0.46
	NB LT	0.26
	NB R	0.01
	SB LT	0.06
	SB R	0.05
	Overall	**0.54**

Clair Road East and Farley Drive	EB L	0.56
	EB TR	0.53
	WB L	0.20
	WB TR	0.43
	NB L	0.31
	NB TR	0.14
	SB L	0.14
	SB TR	0.18
	Overall	**0.48**
Clair Road East and Beaver Meadow Drive	EB L	0.26
	EB TR	0.53
	WB L	0.18
	WB TR	0.37
	NB LTR	0.14
	SB L	0.04
	SB TR	0.07
	Overall	**0.37**
Clair Road East and Victoria Road	EB L	0.82
	EB R	0.11
	NB L	0.41
	NB T	0.67
	SB T	0.48
	SB R	0.34
	Overall	**0.76**
Laird Road and Highway 6 Northbound Off-Ramp	EB T	0.64
	WB T	0.55
	NB L	0.03
	NB R	0.40
	Overall	**0.50**
Laird Road and Highway 6 Southbound Off-Ramp	EB T	0.30
	WB T	0.35
	SB L	0.31
	SB R	0.04
	Overall	**0.33**

15.3.6 Unsignalized Intersection Analysis Results

The results of the capacity analysis performed for unsignalized intersections in the study area are summarized in Table 30.

Detailed Synchro analysis output sheets are included in **Appendix P.** A summary of existing signalized and unsignalized traffic operations at key existing study area intersections is provided in Figure 24.

TABLE 30 FUTURE BACKGROUND CONDITIONS UNSIGNALIZED INTERSECTION ANALYSIS SUMMARY: WEEKDAY AFTERNOON PEAK HOUR

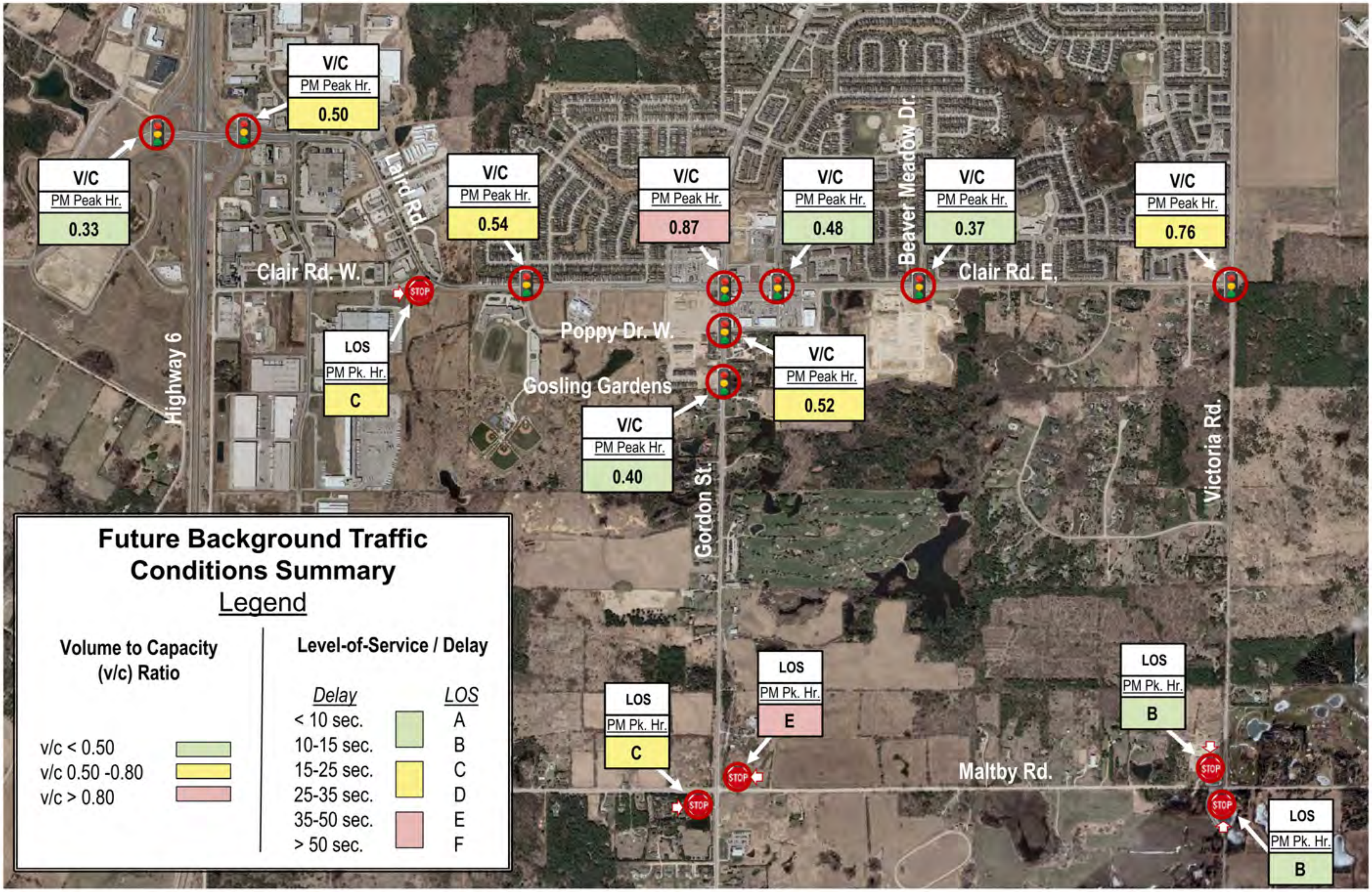
Intersection	Movement of Interest	Existing Traffic Conditions	
		Delay (s)	LOS
Clair Road West and Laird Road	WB L	12.1	C
	NB (Clair Rd.) LR	20.2	C
Gordon Street and Maltby Road	EB LTR	17.7	C
	WB LTR	36.3	E
	NB L	10.1	B
	SB L	12.1	B
Victoria Road and Maltby Road (west intersection)	WB LT	7.4	A
	NB LR	11.2	B
Victoria Road and Maltby Road (east intersection)	EB LT	8.0	A
	SB LR	13.8	B

Future Background Unsignalized Intersections

A total of four (4) unsignalized intersections were reviewed within the future background traffic conditions unsignalized intersection analysis. Traffic operations at unsignalized intersections within the study area are anticipated to continue to operate similar to existing conditions, and overall acceptably except for the Gordon Street / Maltby Road intersection.

The widening of Gordon Street at its intersection with Maltby Road is anticipated to somewhat off-set the delay implications of additional northbound / southbound traffic for eastbound and westbound STOP-controlled traffic. The future background conditions traffic analysis indicates the that eastbound and westbound STOP-control movements at the Gordon Street and Maltby Road intersection will continue operate with longer delays and fewer gap opportunities, similar to conditions summarized as part of the existing traffic analysis . Signalization of this intersection may be considered in the longer-term given anticipated traffic growth along both streets.

All other movements at unsignalized intersections within the study area are shown to operate at LOS C or better during the weekday afternoon peak hour, which is acceptable.



SUMMARY OF FUTURE BACKGROUND WEEKDAY AFTERNOON TRAFFIC OPERATIONS

15.4 FORECAST CLAIR-MALTBY SECONDARY PLAN TRAFFIC

15.4.1 Existing Secondary Plan Traffic

Traffic volumes generated by the existing buildings within the Secondary Plan area are expected to be small, and generally represent individual households, small businesses, an existing golf course, and general rural activities.

A marginal volume of traffic results from existing operations and activities within the Secondary Plan area relative to the planned redevelopment of these lands. For the purposes of the traffic analysis conducted herein, existing Secondary Plan area traffic was conservatively retained on the area street network. Reductions to future forecast Clair-Maltby Secondary Plan traffic were not made to account for existing traffic resulting from current development within the subject lands.

15.4.2 Future Site Traffic Generation

Peak hour traffic volume forecasts for the Clair-Maltby Secondary Plan area are based upon the trip forecasting strategies outlined in Section 13, and have been developed based on the most conservative (highest density) assumptions outlined in the "Land Development Budget" prepared by the project team – dated August 27, 2018. For the purposes of the analysis herein, a total of 10,125 residential units and 333 jobs have been assessed to understand the traffic impacts on the area street network.

A summary of forecast traffic volumes, resulting from development of the Clair-Maltby Secondary Plan area, by land use and traffic zone, are summarized in Table 31.

TABLE 31 FORECAST CLAIR-MALTBY SECONDARY PLAN TRAFFIC GENERATION

Vehicle Trips	Weekday Morning Peak Hour			Weekday Afternoon Peak Hour		
	Inbound	Outbound	2-Way	Inbound	Outbound	2-Way
Traffic Zone 1	80	240	**315**	265	170	**435**
Traffic Zone 2	30	90	**120**	100	65	**165**
Traffic Zone 3	n/a					
Traffic Zone 4	190	570	**760**	670	415	**1,085**
Traffic Zone 5 (Residential)	95	280	**375**	340	205	**545**
Traffic Zone 5 (Employment)	45	10	**55**	10	45	**55**
Traffic Zone 6	125	365	**485**	425	265	**690**
Traffic Zone 7 (Employment)	70	15	**85**	15	65	**80**
Traffic Zone 8	145	430	**570**	585	310	**795**
Traffic Zone 9	145	440	**585**	525	320	**845**
Total:	**925**	**2,440**	**3,350**	**2,935**	**1,860**	**4,700**

Notes:
1. All trips rounded to the nearest 5.

The most dense land use scenario, as identified in the Clair-Maltby Secondary Plan Land Use Budget, would be anticipated to generate in the order of 3,350 and 4,700 two-way vehicle trips during the weekday morning and afternoon peak hours, respectively.

15.4.3 Clair-Maltby Secondary Plan Traffic Distribution and Assignment

The directional distribution of vehicle trips made to and from the Clair-Maltby Secondary Plan area has been based upon a review of information obtained from the 2016 Transportation Tomorrow Survey (TTS).

Residential and employment-related traffic distribution patterns have been developed based upon a review of 2016 TTS survey data for the 2006 TTS traffic zones 8062, 8064, 8067-8076, and 8078-8081, which generally comprises the area north of the Secondary Plan and would be identified as the southern portions of the City of Guelph. This local proxy area was chosen because it is anticipated that traffic resulting from the development of the Secondary Plan area would exhibit similar auto travel characteristics to existing residential and employment buildings in the identified area.

Travel patterns for traffic generated by the residential and employments uses planned within the Secondary Plan area are based upon a review of the following:

- Travel destination information provided in the 2016 Transportation Tomorrow Survey (TTS). A comprehensive series of surveys were conducted in the development of the TTS database that describes, among other information, the travel behaviour of motorists of a specific area during the street peak periods;

- Capacity constraints on turning movements at area intersections that would, because of the extent of the delays that may be experienced, influence motorists to choose alternate routes while travelling to and from the proposed building; and

- The introduction of planned new roads and road improvements within the vicinity of the Secondary Plan, advanced through City and County transportation planning and / or site-specific development.

For destinations within the City of Guelph, forecast site traffic is routed along both local (collector) and regional transportation corridors depending on their distance to / from the Secondary Plan area. At the regional level, a greater reliance on regional corridors such as Highway 6 - the Hanlon Parkway and Gordon Street is expected as many drivers would take advantage of highway and higher-order roads to travel greater distances across the region and connect with Highway 401 to the south.

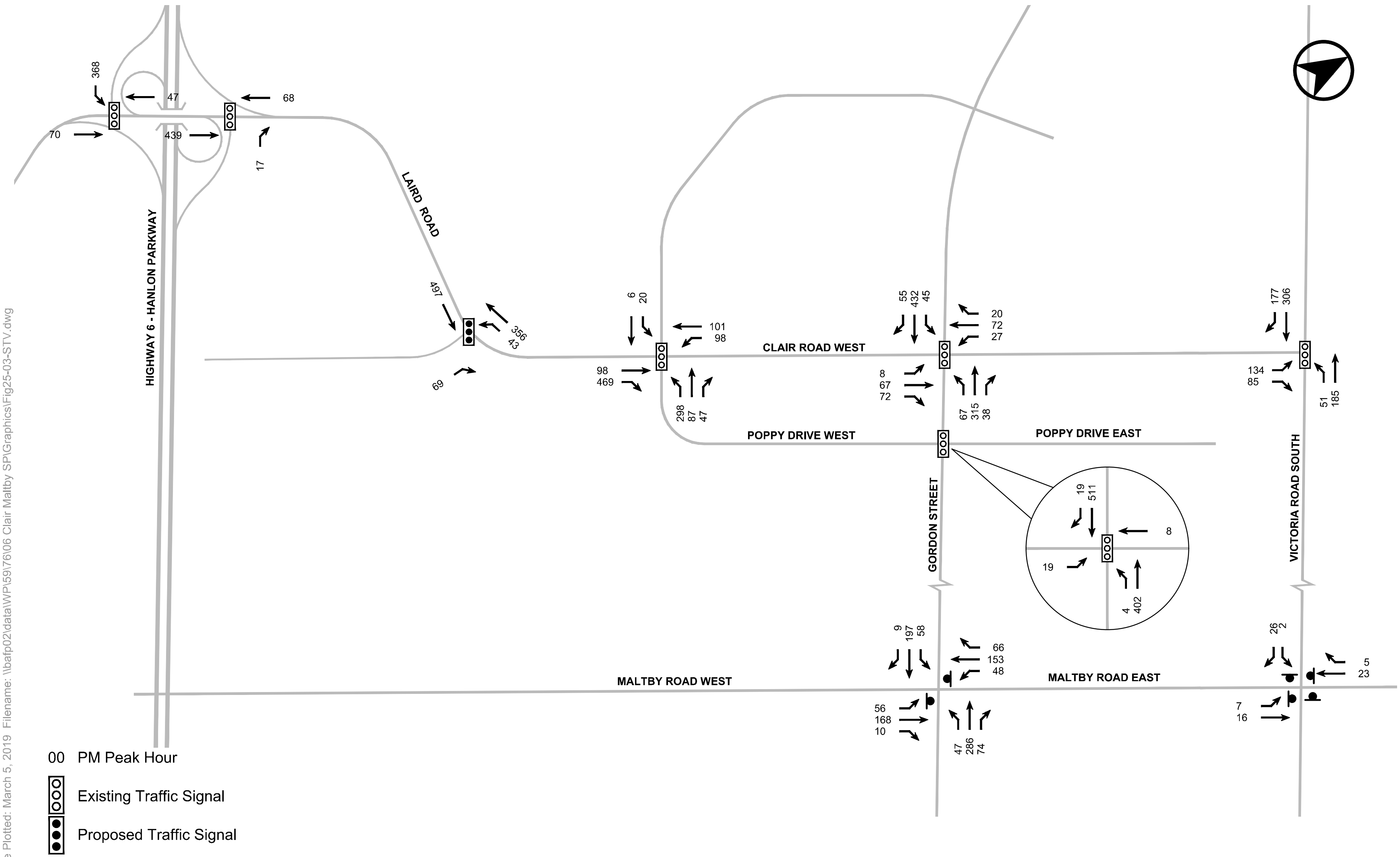
Overall traffic distribution assumptions are applied to individual Traffic Zones, identified within the Secondary Plan area, to appropriately assign traffic volumes related to specific development areas within the overall Plan. As such, deviation from the general distribution of traffic can be anticipated given the variability in routing options for motorists from different traffic zones within the Secondary Plan area. For example, motorist in Traffic Zones 6 or 8 may utilize Gordon Street to travel north into the central portions of the City of Guelph given that these areas are bounded by Gordon Street, more so then motorists resulting from Traffic Zone 9 development which is located adjacent to Victoria Road – a viable north-south direction arterial to Gordon Street.

Table 32 summarizes the general directional distribution for traffic routing to / from the Clair-Maltby Secondary Plan area. Residential and employment-related Secondary Plan traffic volumes assignment calculations are summarized in **Appendix Q.** Forecast new Secondary Plan traffic volumes on the area street network are illustrated in Figure 25.

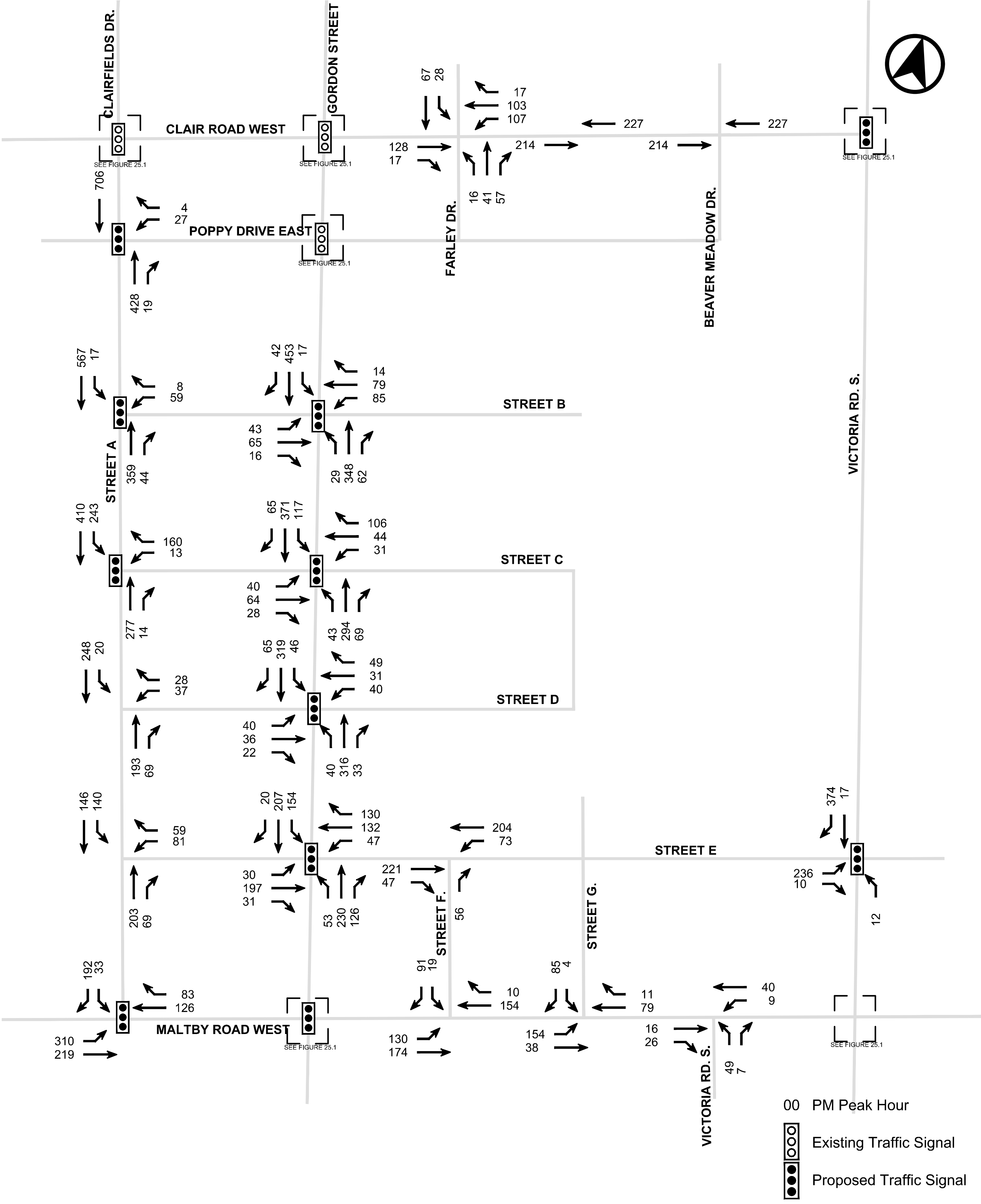
TABLE 32 CLAIR-MALTBY SECONDARY PLAN TRAFFIC ASSIGNMENT

Direction (Route)	Orientation to / from Clair-Maltby Secondary Plan Area	General Distribution Proportion
Residential Trips		
Highway 401 (via Gordon St. or Hanlon Pkwy.)	East	11%
Highway 401 (via Gordon St. or Hanlon Pkwy.)	West	10%
Hanlon Parkway	North	17%
Gordon Street	North	26%
Gordon Street (south of Hwy. 401)	South	2%
Victoria Road	North	14%
Victoria Road	South	2%
Clair Road / Laird Road	West	9%
Maltby Road	East	1%
Maltby Road	West	2%
Southgate Drive (business area)	West	2%
Farley Drive / Beaver Meadow Drive	North	3%
Clairfields Drive	North	1%
Total		**100%**
Employment Trips		
Highway 401 (via Gordon St. or Hanlon Pkwy.)	East	3%
Highway 401 (via Gordon St. or Hanlon Pkwy.)	West	12%
Hanlon Parkway	North	34%
Gordon Street	North	5%
Gordon Street (south of Hwy. 401)	South	18%
Victoria Road	North	17%
Clair Road / Laird Road	West	4%
Farley Drive / Beaver Meadow Drive	North	3%
Clairfields Drive	North	4%
Total		**100%**

Notes:
1. Residential unit and employee positions derived from "*Clair-Maltby Secondary Plan Study Area Population and Employment*": August 27, 2018. For the purposes of the analysis herein, maximum density allocations are assumed.
2. Residential and employee trip distribution based on 2016 TTS data for home-based and work-based vehicle trips to and from 2006 TTS zones 8062, 8064, 8067-8076, and 8078-8081 during the morning and afternoon peak hours



CLAIR-MALTBY SECONDARY PLAN TRAFFIC VOLUMES



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CLAIR-MALTBY SECONDARY PLAN TRAFFIC VOLUMES

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Clair Maltby Secondary Plan
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Figure 25.2

15.5 FUTURE TOTAL TRAFFIC ANALYSIS

15.5.1 Future Total Scenario Road Network Assumptions

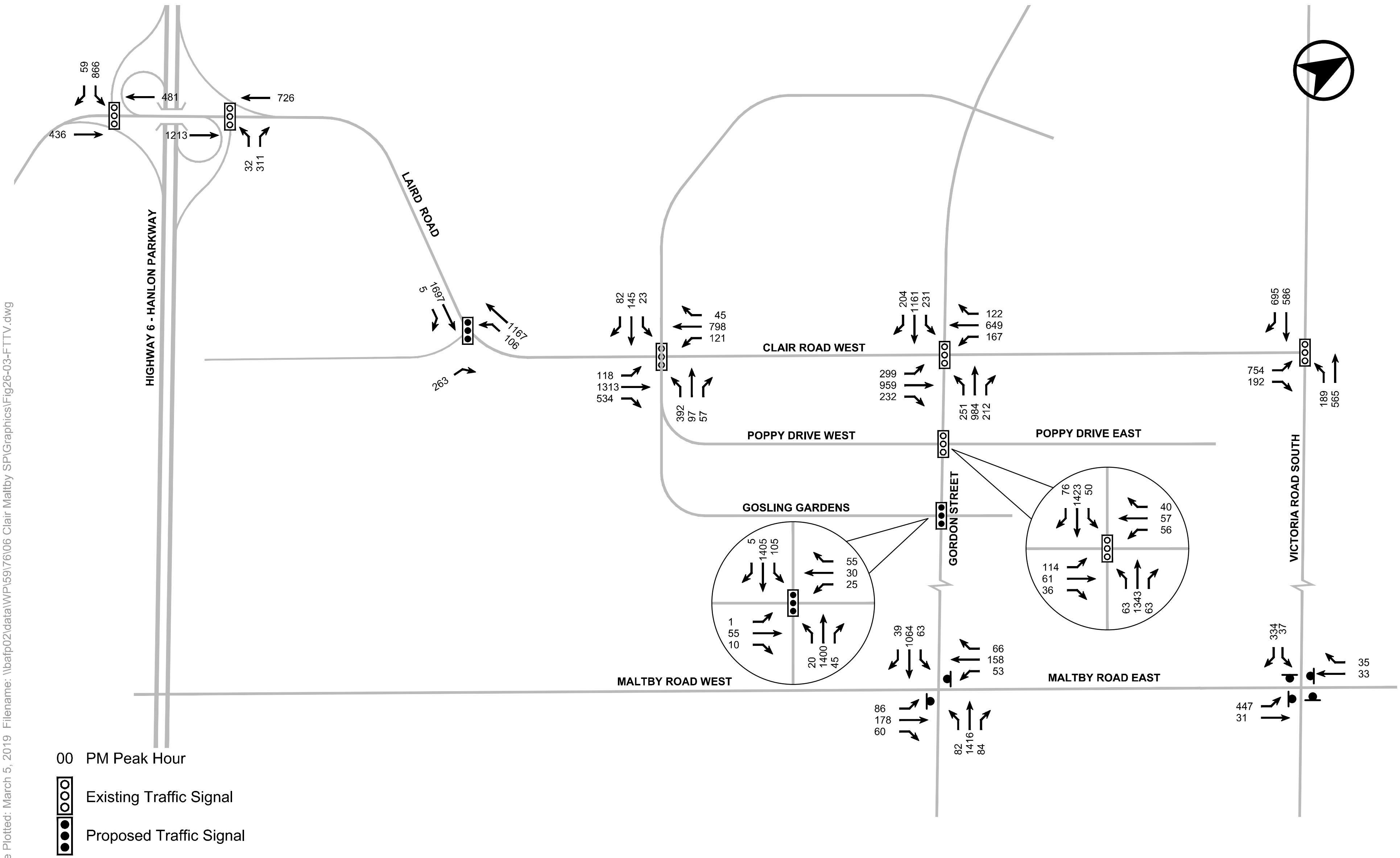
Future total traffic scenario lane configurations on the area street network reflect the following planned improvements that are assumed as part of the future traffic analysis scenarios:

- Widening of Gordon Street from 2 to 4 lanes (approved 2001 EA) from Kortright Road to Wellington Road 34;
- Widening of Clair Road from 2 to 4 lanes (approved 2003 EA) – COMPLETE;
- Southerly extension of Southgate Drive to Maltby Road; and
- Clair-Maltby Secondary Plan collector road network as outlined in the preferred “Community Structure”.

Future Total traffic volumes, which is the sum of future background traffic volumes and traffic volumes resulting from development of the Clair-Maltby Secondary Plan area, are illustrated in Figure 26. Future total traffic volumes also include minor adjustments to existing traffic volumes associated with Bishop Macdonell Catholic Secondary School and South End Community Park, which would be anticipated to utilize Poppy Drive upon completion of this street between Gordon Street and Clair Road West rather than being required to route through the Poppy Drive West / Clair Road West intersection.

Future Total traffic volumes have been forecast for existing study area intersections, as well as future collector road intersections as outlined within the Preferred Community Structure plan. The base future traffic lane configurations and traffic controls are illustrated in Figure 27, as are general street names for reference purposes.

Clair-Maltby Secondary Plan forecast traffic volumes are assigned based on the Traffic Zones identified in Figure 18. Understanding that local streets have not been identified within the Preferred Community Structure, forecast traffic volumes have been assigned generally to collector roads. As such, collector road traffic volumes will not balance along collector street corridors.



FUTURE TOTAL TRAFFIC VOLUMES

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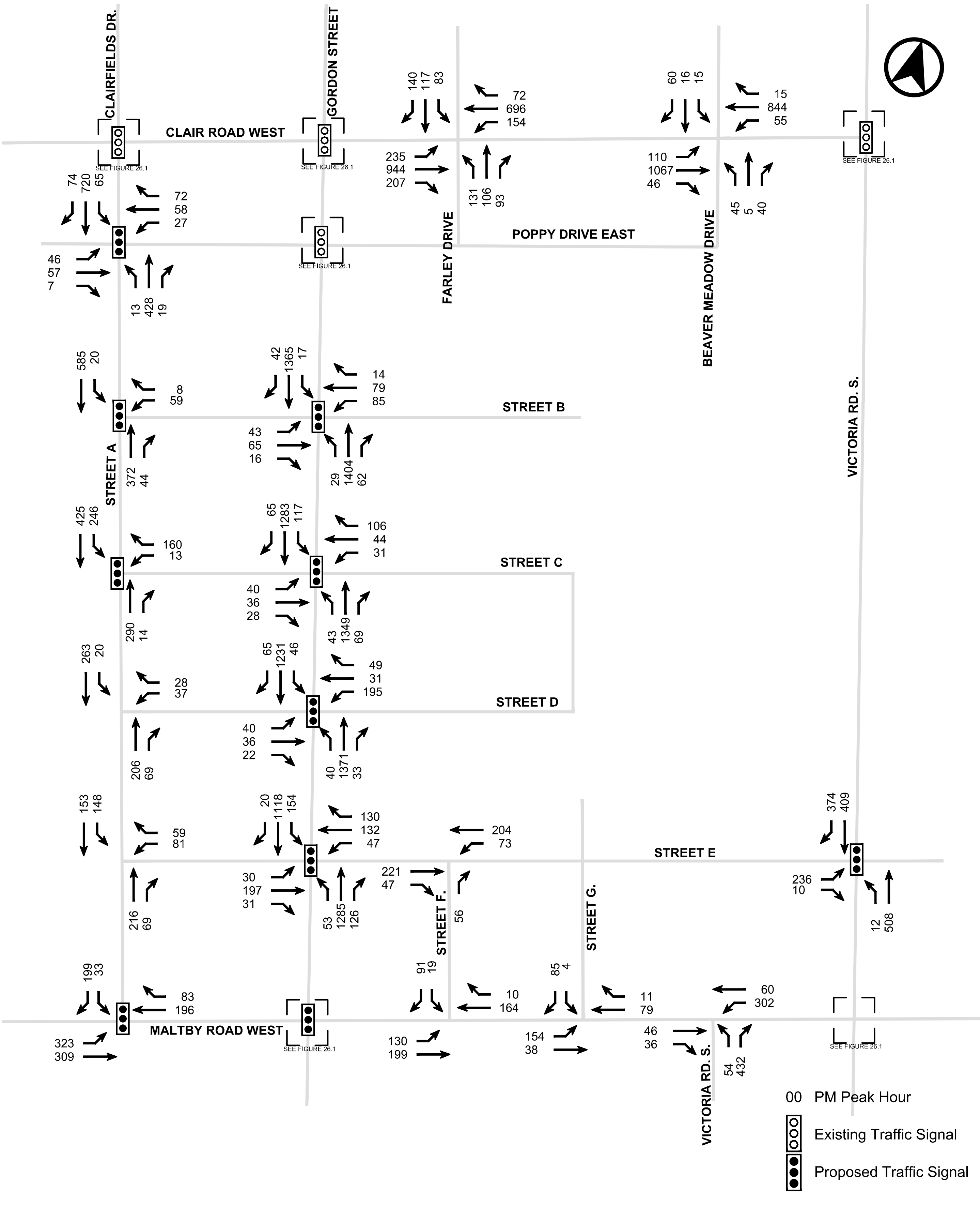
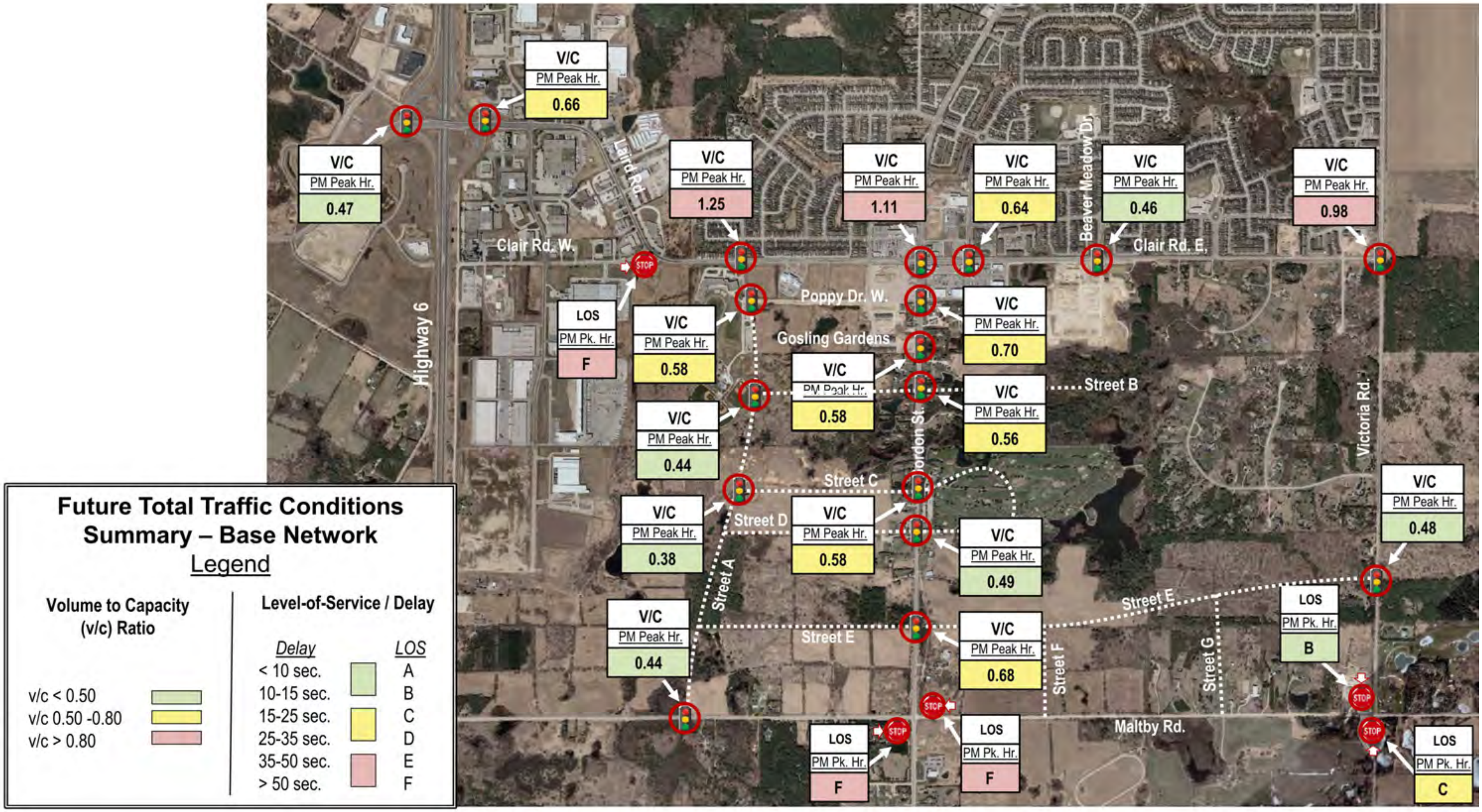
Figure 26.1



FUTURE TOTAL TRAFFIC VOLUMES



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SUMMARY OF FUTURE TOTAL WEEKDAY AFTERNOON TRAFFIC OPERATIONS - BASE FUTURE TRAFFIC NETWORK

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Figure 27

15.5.2 Signalized Intersection Analysis Results

Detailed results of the Synchro analysis of signalized intersections within the study area under future total traffic conditions are included in **Appendix R.** A discussion of the traffic analysis findings follows.

15.5.2.1 General Findings

The traffic operations analyses outlined herein reflect traffic operations at the key intersections in the Secondary Plan area without explicitly considering the downstream congestion extending beyond study area intersections.

Base Future Total Street Network
Individual movement and overall volume-to-capacity ratios for each of the signalized intersections within the study area, under the future total traffic scenario, are summarized in Table 33.

Base future street network assumptions are analyzed for all signalized intersections.

A summary of future total signalized and unsignalized traffic operations at key study area intersections under base future total street network conditions is provided in Figure 28.

Recommended Future Total Street Network
Additional analysis is undertaken with recommended intersection improvements (as summarized in Section 15.5.4), at certain signalized intersections within the study area. Recommended improvements specifically imply physical improvements to existing intersection configurations (additional traffic lanes), or traffic control (signalization). Traffic analysis results with recommended improvements are also summarized in Table 33.

Assuming the introduction of the recommended intersection improvements (as outlined in Section 15.5.4), traffic operations at signalized and unsignalized intersections are anticipate to be acceptable, except for certain capacity constraints expected for specific traffic movements at key study area intersections.

A summary of future total signalized and unsignalized traffic operations at key study area intersections under recommended future total street network conditions is provided in Figure 30.

TABLE 33 STUDY AREA SIGNALIZED INTERSECTIONS OVERALL V/C RATIOS: WEEKDAY AFTERNOON PEAK HOUR

Intersection	Traffic Movement	Volume to Capacity (v/c) Ratio	
		Base Future Street Network	Base Future Street Network with Recommended Improvements
Gordon Street and Clair Road	EB L	0.97	0.97
	EB T(R)	1.01	0.88
	EB R	--	0.30
	WB L	1.06	1.02
	WB TR	0.84	0.95
	NB L	1.05	0.99
	NB T(R)	1.03	0.78
	NB R	--	0.22
	SB L	0.95	0.85
	SB T(R)	1.19	0.94
	SB R	--	0.24
	Overall	**1.11**	**1.01**
Gordon Street and Poppy Drive	EB L	--	0.41
	EB (L)TR	0.72	0.20
	WB L	--	0.20
	WB (L)TR	0.45	0.19
	NB L	0.31	0.29
	NB TR	0.70	0.70
	SB L	0.22	0.22
	SB T(R)	0.74	0.74
	Overall	**0.70**	**0.63**
Gordon Street and Gosling Gardens	EB LTR	0.17	--
	WB LTR	0.24	--
	NB L	0.11	--
	NB TR	0.69	--
	SB L	0.45	--
	SB TR	0.58	--
	Overall	**0.58**	--

Gordon Street and Maltby Road	EB L	Unsignalized	0.45
	EB TR		0.52
	WB L		0.29
	WB TR		0.49
	NB L		0.32
	NB TR		0.66
	SB L		0.53
	SB TR		0.49
	Overall		**0.62**
Clair Road West and Clairfields Drive / Clairfields Extension	EB L	0.40	0.43
	EB T(R)	1.21	0.88
	EB R	--	0.40
	WB L	0.92	0.74
	WB TR	0.60	0.57
	NB L	--	0.93
	NB (L)TR	1.32	0.20
	SB L	--	0.09
	SB (L)T(R)	0.38	0.54
	Overall	**1.25**	**0.92**
Clair Road East and Farley Drive	EB L	0.56	--
	EB TR	0.69	--
	WB L	0.56	--
	WB TR	0.46	--
	NB L	0.56	--
	NB TR	0.36	--
	SB L	0.31	--
	SB TR	0.46	--
	Overall	**0.64**	--
Clair Road East and Beaver Meadow Drive	EB L	0.31	--
	EB TR	0.63	--
	WB L	0.21	--
	WB TR	0.49	--
	NB LTR	0.16	--
	SB L	0.04	--
	SB TR	0.07	--
	Overall	**0.46**	--

Clair Road East and Victoria Road	EB L	0.96	--
	EB R	0.14	--
	NB L	0.92	--
	NB T	0.70	--
	SB T	0.93	--
	SB R	0.53	--
	Overall	**0.97**	**--**
Laird Road and Highway 6 Northbound Off-Ramp	EB T	0.73	--
	WB T	0.44	--
	NB L	0.05	--
	NB R	0.58	--
	Overall	**0.66**	--
Laird Road and Highway 6 Southbound Off-Ramp	EB T	0.42	--
	WB T	0.45	--
	NB L	0.48	--
	NB R	0.04	--
	Overall	**0.47**	--
Clair Road West and Laird Road	EB TR	Unsignalized	0.82
	WB L		0.38
	WB T		0.45
	NB L		0.01
	NB R		0.86
	Overall		**0.83**
New Intersections Resulting from the Development of the Secondary Plan (Preferred Community Structure)			
Gordon Street and Street B	EB L	0.18	--
	EB TR	0.19	--
	WB L	0.33	--
	WB TR	0.23	--
	NB L	0.17	--
	NB TR	0.63	--
	SB L	0.09	--
	SB TR	0.60	--
	Overall	**0.56**	--

Gordon Street and Street C	EB L	0.16	--
	EB TR	0.21	--
	WB L	0.11	--
	WB TR	0.20	--
	NB L	0.24	--
	NB TR	0.72	--
	SB L	0.46	--
	SB TR	0.58	--
	Overall	**0.58**	--
Gordon Street and Street D	EB L	0.14	--
	EB TR	0.10	--
	WB L	0.14	--
	WB TR	0.11	--
	NB L	0.19	--
	NB TR	0.60	--
	SB L	0.26	--
	SB TR	0.55	--
	Overall	**0.49**	--
Gordon Street and Street E	EB L	0.19	--
	EB TR	0.56	--
	WB L	0.25	--
	WB TR	0.61	--
	NB L	0.21	--
	NB TR	0.72	--
	SB L	0.62	--
	SB TR	0.49	--
	Overall	**0.68**	--
Clairfields Extension (Street A) and Poppy Drive West	EB LTR	0.31	--
	WB L	0.10	--
	WB TR	0.25	--
	NB L	0.05	--
	NB TR	0.37	--
	SB L	0.01	--
	SB TR	0.65	--
	Overall	**0.58**	--

Clairfields Extension (Street A) and Street B	WB LR	0.12	--
	NB TR	0.46	--
	SB L	0.05	--
	SB T	0.64	--
	Overall	**0.44**	--
Clairfields Extension (Street A) and Street C	WB LR	0.14	--
	NB TR	0.50	--
	SB L	0.48	--
	SB T	0.46	--
	Overall	**0.38**	--
Maltby Road and Clairfields Extension (Street A)	EB L	0.56	--
	EB T	0.30	--
	WB TR	0.37	--
	SB L	0.07	--
	SB R	0.14	--
	Overall	**0.44**	--
Victoria Road and Street E	EB L	0.41	--
	EB R	0.01	--
	NB L	0.02	--
	NB T	0.53	--
	SB T	0.42	--
	SB R	0.24	--
	Overall	**0.48**	--

Notes:
1. Reference Figure 27 for new collector street names.

The signalized intersection traffic analysis indicates that most study area intersections perform acceptably, and without any traffic capacity constraints for any individual traffic movements, except for certain movements at the key Gordon Street / Clair Road; Victoria Road / Clair Road; and Clairfields Drive / Clairfields Extension / Clair Road intersections. The following movements are anticipated to operate with longer delays and / or near theoretical capacity during weekday peak hours.

Gordon Street / Clair Road

- Eastbound left-turn 0.95
- Westbound left turn 1.02
- Westbound through / right-turn 0.95
- Northbound left-turn 0.99
- Southbound through 0.94

Victoria Road / Clair Road

- Eastbound left-turn 0.96
- Northbound left-turn 0.92
- Southbound through 0.93

Clairfields Drive / Clair Road

- Northbound left-turn 0.93

The above noted intersections are anticipated to operate with overall intersections v/c ratios of 0.92 to 1.01 during the prevailing weekday afternoon peak hour, assuming the introduction of street network improvements outlined in Section 15.5.5.

During the weekday afternoon peak hour, all other signalized intersections within the study area are anticipated to operate with overall intersection v/c ratios of 0.83 or less, while individual traffic movements are shown to all operate with a v/c ratio of 0.86 or less (i.e. intersection of Laird Road / Clair Road).

Overall signalized intersection traffic operations within the Secondary Plan area are anticipated to be acceptable under future total conditions, and are accommodated by the Preferred Community Structure street network plan understanding that specific traffic movements are anticipated to operate at or near capacity during the prevailing weekday afternoon peak hour.

15.5.2.2 Gordon Street and Clair Road

The key Gordon Street and Clair Road intersection is anticipated to operate at theoretical capacity during the weekday afternoon peak hour under future total traffic conditions – even when accounting for the recommended intersection improvements at this location. This intersection, given its location within the wider street network and surrounding retail development pattern, would be anticipated to operate under busy conditions during weekday peak hours.

Specifically, during the weekday afternoon peak hour, left-turn movements, the westbound through / right-turn movement, and the southbound through movement are anticipated to operate with v/c ratios of 0.90 or greater, resulting in longer traffic queues and delay relative to the existing conditions.

Recommended improvements are not intended to retain existing levels-of-service for motorists. However, improvements (as recommended in Section 15.5.5) are intended to accommodate new traffic resulting from background traffic growth, current developments planned and under construction, and new traffic resulting from the development of the Clair-Maltby Secondary Plan area.

As noted previously, traffic forecast for Secondary Plan area development is based on the most conservative (highest density) Land Use Budget circulated for the purposes of this analysis. As such, the identified improvements outlined in Section 15.5.5 may not be warranted should a less-dense development programme be realized.

Traffic operations at the Gordon Street / Clair Road intersection may be further mitigated through improvements to the Hanlon Parkway corridor which may redirect some existing Gordon Street traffic volumes to this corridor. Other, on-going improvements to the street network in the vicinity of the Gordon Street / Clair

Road intersection will also further improve conditions at this intersection and provide viable routing alternative for motorists. The ability for motorists to respond to traffic delays at this intersection, and utilize other streets in the local vicinity also provides an imperative to monitor traffic operations at this intersection over the long-term to assess changes in the local and regional road network.

15.5.3 Unsignalized Intersection Analysis Results

The results of the future total traffic conditions capacity analysis performed for unsignalized intersections in the study area are summarized in Table 34.

Detailed Synchro analysis output sheets are included in **Appendix R.** A summary of future total traffic conditions signalized and unsignalized traffic operations at key study area intersections is provided in Figure 28 (base future condition) and Figure 29 (with recommended improvements).

Future Total Unsignalized Intersections

A total of four (4) existing unsignalized intersections were reviewed within the unsignalized intersection analysis, of which two (2) are recommended to be signalized in the future. Traffic operations at the Gordon Street / Maltby Road and Clair Road West / Laird Road intersections is anticipated of operate poorly under future total traffic conditions, and as such may warrant signalization.

Five (5) new unsignalized intersections were reviewed within the future total traffic analysis scenario. These intersections are identified as new junctions within the Preferred Community Structure street network plan, and are recommended to operate under STOP-control.

The new intersections of Clairfields Drive extension (Street A) / Street D; Clairfields Drive extension (Street A) / Street E; and Street E / Street F are proposed to operate with all-way STOP-control. The intersections of Maltby Road / Street F and Maltby Road / Street G are proposed to operate with one-way STOP-control in the southbound direction.

All other movements at unsignalized intersections within the study area are shown to operate at LOS C or better during weekday peak hours, which is acceptable.

Victoria Road / Maltby Road Intersections

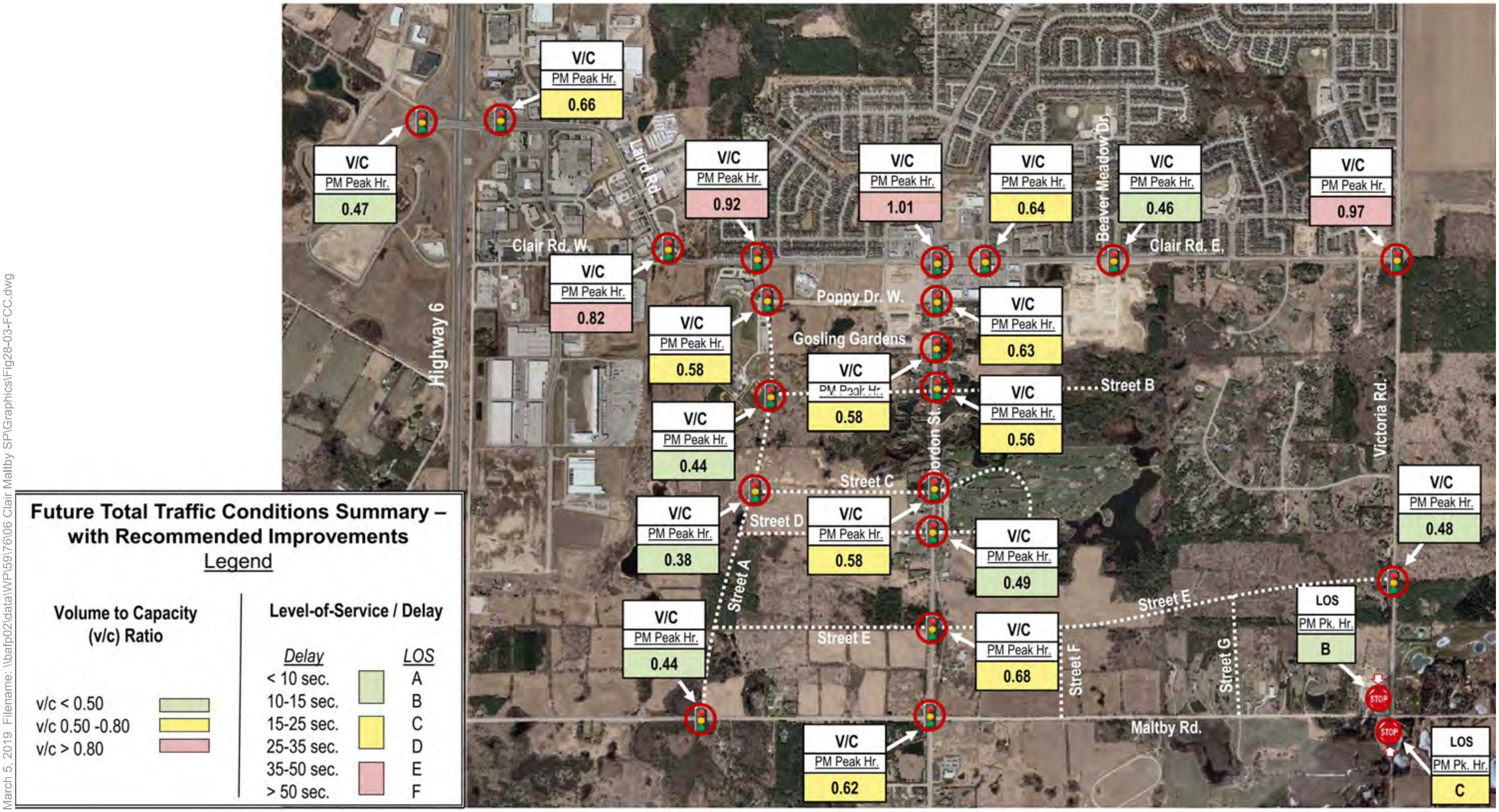
The intersections of Victoria Road and Maltby Road are anticipated to continue to operate acceptably under future total traffic conditions. From a traffic capacity perspective, this intersection is not anticipated to warrant improvements.

Further consideration may be given to this intersection to accommodate for traffic control or alignment alterations to improve safety or mitigate traffic speeds.

TABLE 34 UNSIGNALIZED INTERSECTION ANALYSIS RESULTS SUMMARY

Intersection	Movement of Interest	Future Total Traffic Conditions	
		Delay (s)	LOS
Clair Road West and Laird Road [1]	WB L	18.5	C
	NB (Clair Rd.) LR	76.1	F
Gordon Street and Maltby Road [1]	EB LTR	>120	F
	WB LTR	>120	F
	NB L	11.4	B
	SB L	18.4	C
Victoria Road and Maltby Road (west intersection)	WB LT	6.9	A
	NB LR	17.1	C
Victoria Road and Maltby Road (east intersection)	EB LT	7.9	A
	SB LR	14.7	B
New Intersections Resulting from the Development of the Secondary Plan (Preferred Community Structure)			
Clairfields Extension (Street A) and Street D	WB LR	8.5	A
	NB TR	9.3	A
	SB LT	9.7	A
Clairfields Extension (Street A) and Street E	WB LR	9.4	A
	NB TR	10.1	B
	SB LT	10.9	B
Maltby Road and Street F	EB L	7.8	A
	SB LR	10.9	B
Maltby Road and Street G	EB L	7.7	A
	SB LR	9.3	A
Street E and Street F	EB TR	9.2	A
	WB LT	9.7	A
	NB LR	8.0	A

Notes:
1. Recommended to be signalized under future total traffic conditions.



SUMMARY OF FUTURE TOTAL WEEKDAY AFTERNOON TRAFFIC OPERATIONS - WITH RECOMMENDED TRAFFIC NETWORK IMPROVEMENTS

BA Group

Clair Maltby Secondary Plan
5976-06 March 2019

Figure 28

15.5.4 Traffic Signal Timing Considerations

Traffic Signal Optimization

Traffic signal adjustments have been made as part of the analysis herein to accommodate for changes in traffic demands and patterns.

To accommodate an increase in traffic demands in the northbound and southbound directions along Gordon Street, and eastbound and westbound along Clair Road west of Gordon Street, traffic signal cycle lengths have been increased during the weekday afternoon peak hour.

Traffic signal timing along the Gordon Street corridor has been set to 110 second cycle lengths during the weekday afternoon peak hour. Signal timing cycle lengths have been made consistent along the Gordon Street corridor to allow for optimization of traffic signal off-sets and permit signal timing synchronization in order to best limit traffic delays, reduce transit vehicle delays, and manage vehicle queuing.

New Traffic Signal Controls

A total of eleven (11) new traffic signals are considered as part of the analysis herein, to accommodate future traffic demands and facilitate pedestrian movement across busy traffic corridors.

It is recommended that two (2) existing STOP-controlled intersections be considered for signalization as development occurs within the Secondary Plan area. The following existing unsignalized intersections are expected to warrant the introduction of traffic signals:

- Gordon Street / Maltby Road
- Clair Road West / Laird Road

A number of new arterial / collector street junctures are anticipated with the application of the Preferred Community Structure street network plan, including a total of four (4) new collector street intersections with Gordon Street between Gosling Gardens and Maltby Road.

It is recommended that all new east-west oriented collector streets include traffic signal control at their juncture with Gordon Street, to allow for acceptable levels-of-service for minor street traffic approaches, and accommodate pedestrian movement across Gordon Street.

In addition traffic signals recommended for new collector street intersections with Gordon Street, additional traffic signals may be warranted for intersections along the Clairfields Drive extension (Street A) and Victoria Road.

In addition to the two existing intersections noted above, the following new intersections are anticipated to warrant traffic signal control, or should be signalized to strategically allow for controlled pedestrian crossing. The expectation for these intersections to operate under traffic signal control has been informed by the analysis herein, and have subsequently been analyzed assuming traffic signal control under future total traffic conditions.

- Gordon Street / Street B
- Gordon Street / Street C
- Gordon Street / Street D
- Gordon Street / Street E
- Maltby Road West / Clarifields Drive extension (Street A)
- Victoria Road / Street E
- Clarifields Drive extension (Street A) and Poppy Road West
- Clarifields Drive extension (Street A) / Street B
- Clarifields Drive extension (Street A) / Street C

15.5.5 Recommended Intersection Traffic Capacity Improvements

It is important to understand that the recommended intersection improvements are based on the modelling exercise undertaken herein, and that changes to the wider street network, improvements to regional corridors, and changes in travel behaviour and patterns can alter these recommendations. Therefore, updated traffic analysis will be required in sequence with development in the Clair-Maltby Secondary Plan area to justify the recommended improvements, and / or indicate further or alternative improvements.

The improvements outlined in the following are in addition to signal timing adjustments identified in Section 15.5.4. Improvements identified below relate to changes in the intersection lane configurations, intersection approach configuration, or traffic control.

Gordon Street / Clair Road Intersection

The intersection of Gordon Street / Clair Road in most impacted by forecast future traffic volume demands, and is anticipated to require changes to accommodate these future demands. Right-turn lanes are recommended for most intersection approaches to accommodate for increased through traffic demands, turning traffic demands (specifically for the eastbound approach leg), and transit vehicle layby. The following improvements are recommended based on the analysis herein:

- Introduction of a northbound separate right-turn lane
- Introduction of a southbound separate right-turn lane
- Introduction of an eastbound separate right-turn lane

Clair Road / Clairfields Drive Intersection

The intersection of Clair Road / Clairfields Drive is anticipated to be impacted by forecast Clair-Maltby Secondary Plan development-related traffic volumes as motorists route to / from the Hanlon Parkway via Clair Road and Laird Road. Changes to the eastbound, northbound and southbound approach legs of the intersection are recommended to accommodate these future demands. Separate left-turn lanes are recommended for the northbound and southbound approaches, and a separate right-turn lane is recommended in the eastbound direction. These improvements are suggested to accommodate the key northbound to westbound and eastbound to southbound traffic demands resulting from development of the Clair-Maltby Secondary Plan. Considerations should also be given to the length of the northbound separate left-turn lane, understanding relatively high number of traffic volumes anticipated for this movement.

The following improvements for this intersection are recommended based on the analysis herein:

- Introduction of a northbound separate left-turn lane
- Introduction of an eastbound separate right-turn lane
- Pavement restriping to accommodate a southbound separate left-turn lane

Gordon Street / Poppy Road Intersection

The intersection of Gordon Street / Poppy Road is anticipated to be impacted by forecast future traffic volumes – specifically as they relate to background site-specific developments. Changes to the eastbound and westbound approach legs of the intersection are recommended to better accommodate turning movement demands. Separate left-turn lanes are recommended for the eastbound and westbound approaches. These improvements are suggested to accommodate a good level-of-service for traffic anticipated to route along Poppy Road.

The following improvements for this intersection are recommended based on the analysis herein:

- Introduction of an eastbound separate left-turn lane
- Introduction of an westbound separate left-turn lane

Laird Road / Clair Road West Intersection

The intersection of Laird Road / Clair Road West is anticipated to warrant the introduction of traffic signal control under future total traffic conditions. In addition to this improvement, the introduction of a northbound right-turn lane (Clair Road approach) is recommended to accommodate northbound right-turn movements that may otherwise be blocked by the occasional motorists making a northbound left-turn.

The following improvements for this intersection are recommended based on the analysis herein:

- Introduction of a northbound separate right-turn lane

Future Victoria Road / Street E Intersection

The intersection of Victoria Road / Street E is anticipated to operate acceptably under future total traffic conditions. However, unlike other new collector street intersections as outlined in the Preferred Community Structure street network plan, this intersection is anticipated to accommodate a notable volume of southbound right-turn traffic – specifically during the weekday afternoon peak hour. As such, a separate southbound right-turn lane is advised in this location.

The following improvements for this intersection are recommended based on the analysis herein:

- Introduction of a southbound separate right-turn lane

Summary of Recommended Improvements

The improvements outlined above are summarized in Figure 29.

A summary of future total traffic conditions at signalized and unsignalized traffic operations at key study area intersections assuming the introduction of the recommended improvements is provided in Figure 30.

As previously noted, this traffic analysis reflects the highest density land use scenario advanced for the purposes of the Clair-Maltby Secondary Planning study and should, in itself, illustrate the conservative nature of the analysis herein. Furthermore, various changes in the transportation network, the introduction and advancement of TDM and Transit-Oriented Development (TOD), can collectively work to potentially change travel behaviour and improve traffic capacity concerns as they are identified herein.

Therefore, updated traffic analysis will be required in sequence with development in the Clair-Maltby Secondary Plan area to justify the recommended improvements, and / or indicate further or alternative improvements.

15.5.6 North-South Collector Road West of Gordon Street

The transportation modelling undertaken herein indicates that a second north-south oriented street is required to connect to Clair Road to accommodate the land budget considered as part of the planning process (approx. 10,125 units). In absence of a second street connection between the Secondary Plan area and Clair Road, considerable improvements are required to the Gordon Street / Clair Road and Victoria Road / Clair Road intersections, beyond those already recommended herein.

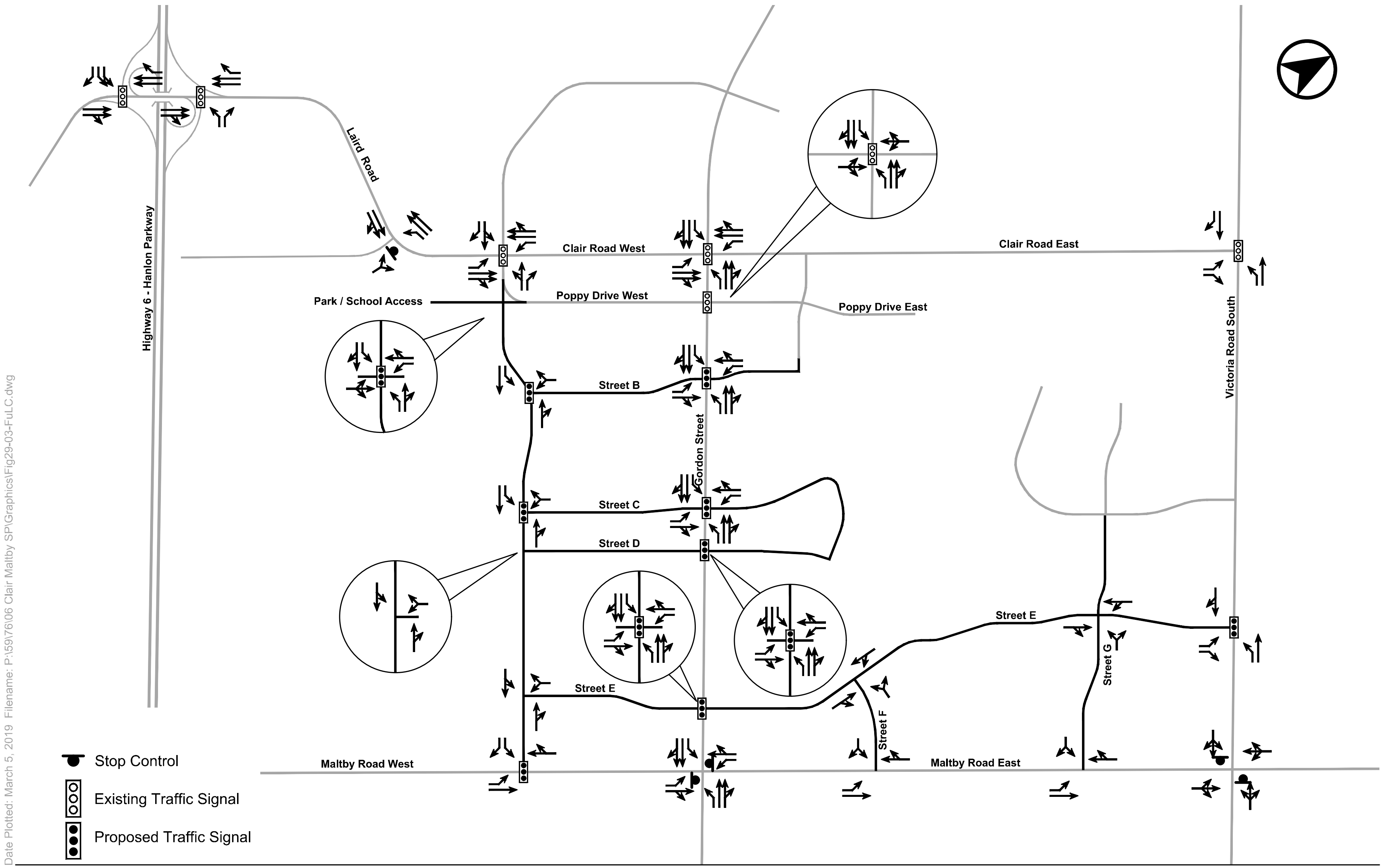
This collector street (west of Gordon Street) also provides important connectivity between Secondary Plan development and recreational and institutional uses in the area of Clair Road / Poppy Drive West. A more robust, resilient street network is also provided that can better distribute traffic, accommodate transit vehicle routing, and provide more direct access to Secondary Plan area development (including for emergency vehicles).

15.5.7 Additional North-South Collector Road East of Gordon Street

The transportation modelling undertaken herein demonstrates that traffic volumes resulting from background traffic and traffic related to the development of the Clair-Maltby Secondary Plan area, can be accommodated by Gordon Street as planned (i.e. with four though-traffic lanes), understanding that certain traffic movements at the Gordon Street / Clair Road intersection will operate under busy conditions during the prevailing weekday afternoon peak hour. Specifically, southbound through movements and left-turn movements in the weekday afternoon peak hour are anticipated to operate near theoretical capacity, with v/c ratios between 0.90 and 1.00, assuming the highest density Land Budget development scenario tested herein.

The macro-model analysis undertaken by the City of Guelph, and supported through the traffic analysis and forecasts undertaken herein, support the implementation of 4 through-traffic lanes along Gordon Street within the Clair-Maltby Secondary Plan area. Traffic capacity constraints, should they develop during prevailing weekday peak travel periods, may be anticipated at the key Gordon Street / Clair Road intersection, but are otherwise not anticipated for link segments of Gordon Street. Improvements, by way of ancillary turn lanes, are recommended herein to mitigate traffic capacity constraints at the Gordon Street / Clair Road intersection.

A typical 4-lane street section is anticipated to sufficiently accommodate forecast traffic demands along the Gordon Street corridor, understanding the need for ancillary turn lanes – specifically separate left-turn lanes at all intersections where left-turns are permitted. Pending the frequency of separate left-turn lanes, a continuous left-turn / centre median lane along the extent, or portions of, Gordon Street within the Secondary Plan area may be warranted.



FUTURE BASE TRAFFIC LANE CONFIGURATIONS AND CONTROLS

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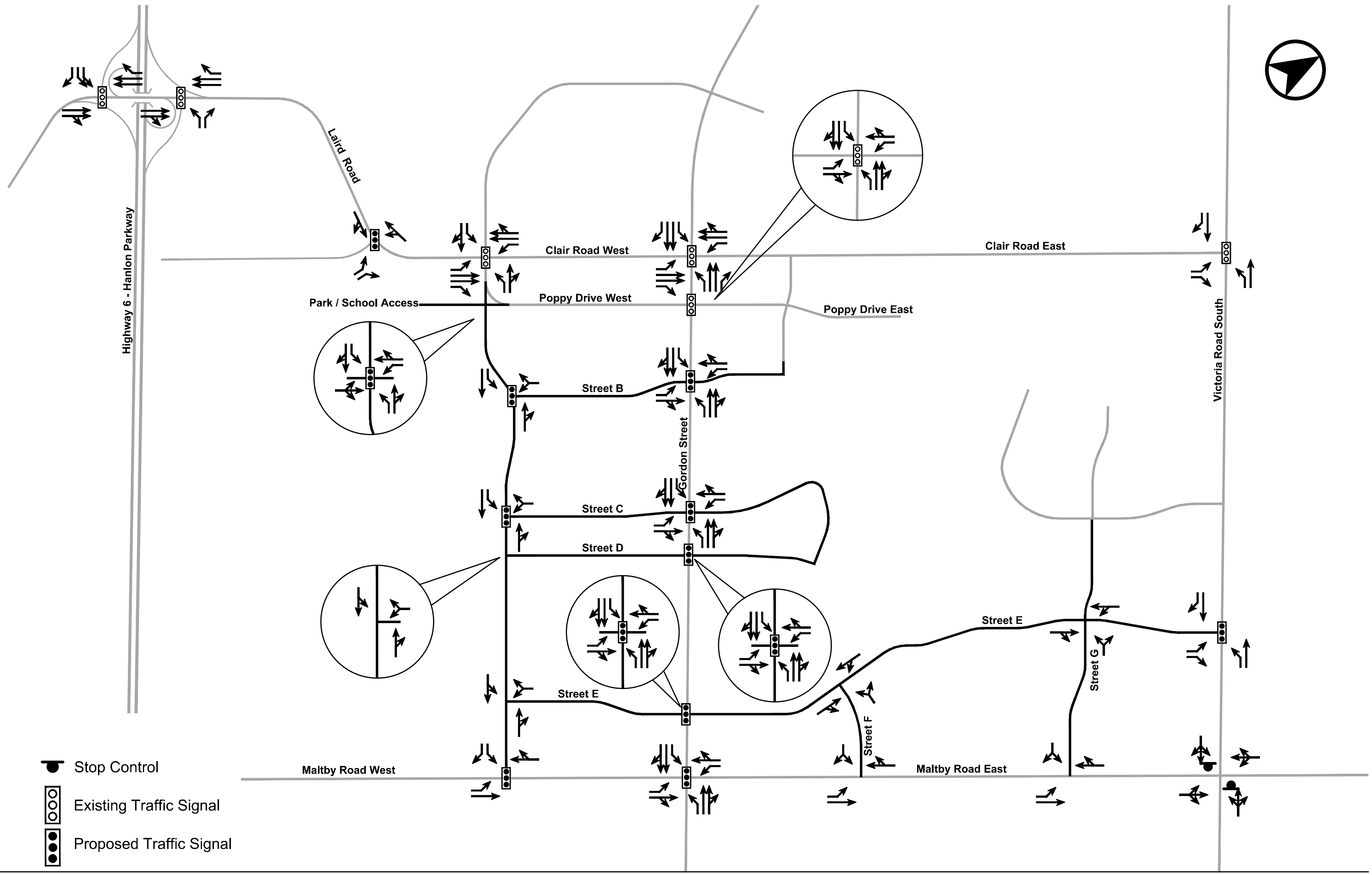
Clair Maltby Secondary Plan
5976-06 March 2019

Figure 29



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RECOMMENDED FUTURE TRAFFIC LANE CONFIGURATIONS AND CONTROLS

BA Group

Clair Maltby Secondary Plan
5976-06 March 2019

Figure 30

15.5.8 Gordon / Maltby Roundabout

The intersection of Gordon Street and Maltby Road is considered for the introduction of a roundabout, as an alternative to recommended signalization. A roundabout, at this junction, may be appropriate considering:

- its location as a gateway to / from the City of Guelph,
- its boundary character between urban Guelph and rural Wellington County, and
- the opportunity provided by a roundabout to accommodate transit vehicle loop functions as an alternative to an off-street transit terminal facility.

With regards to the first two points noted above, a roundabout may be appropriate as an option to reduce vehicle speeds on approach to the City of Guelph in transition from rural highway to urban arterial.

Understanding the opportunity for a roundabout at the junction of Gordon Street and Maltby Road, roundabout traffic analysis was completed for the future total traffic scenario.

15.5.8.1 Analysis Methodology

Future total traffic volumes were developed herein, and utilized in conducting the future total roundabout analysis. Traffic analysis was conducted for the weekday afternoon peak hour, consistent with the methodology pursued herein.

Roundabouts were analyzed using ARCADY 9 with no capacity adjustment and without y-intercept adjustments to account for downstream traffic platoons.

Key performance indicators cited in the roundabout analysis, and summarized for each approach leg, are volume-to-capacity (v/c) ratios, average delay, and level-of-service (LOS).

Roundabout geometries, for purposes of this roundabout analysis, are based generally on the functional design of planned 2-lane roundabouts in the City of Waterloo set within an approximate 60 metre diameter. The proposed roundabout design assumes a two-lane roundabout. The northbound and southbound approaches (Gordon Street) assumes two traffic lanes in either direction, and two roundabout entry lanes in either direction. The eastbound and westbound approaches (Maltby Road) assumes one traffic lane in either direction, which widen on approach to the roundabout to accommodate two roundabout entry lanes.

15.5.8.2 Analysis Results

ARCADY 9 traffic analysis results for the analyzed roundabout under future traffic conditions are summarized in Table 35. Detailed results analysis outputs are included in **Appendix S.**

TABLE 35 ROUNDABOUT ANALYSIS SUMMARY

Intersection	Approach Leg	Future Total Traffic Conditions		
		V/C Ratio	Average Delay (sec)	LOS
Gordon Street and Maltby Road	WB	0.56	17.12	C
	SB	0.60	4.13	A
	EB	0.39	6.53	A
	NB	0.81	9.01	A
	Overall	**--**	**7.74**	**A**

Notes:
1. Overall intersection capacity indicated as "residual" capacity.

Overall roundabout delay for the Gordon Street / Maltby Road junction is anticipated to be 7.74 seconds, reflecting an overall level-of-service 'A'. Generally, eastbound and westbound traffic approaches are anticipated to operate with a level-of-service of 'A' to 'C' during the weekday afternoon peak hour, while northbound and southbound traffic movements are anticipated to operate with a level-of-service of 'A'. Generally, short average delays are anticipated for northbound, southbound and eastbound motorists (less then 10 seconds). Generally acceptable average delays are anticipated for westbound motorists (approximately 17 seconds).

Should a traffic roundabout be pursued for the junction of Gordon Street and Maltby Road, traffic operations are anticipated to be acceptable. Further consideration would be required as to its functional design and ability to appropriately accommodate pedestrian crossings, cyclists, transit vehicles and articulated trucks.

Appendix A – Transportation Tomorrow Survey (TTS) Details: Local Travel Behaviour

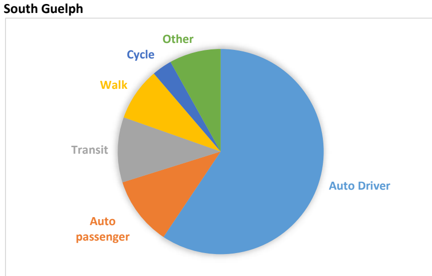
TWO-WAY PEAK PERIOD TRIP DISTIBUTION

Orientation to / from South Guelph	*Transit excluding GO rail*	*Cycle*	*Auto driver*	*GO rail only*	*Joint GO rail and local transit*	*Auto passenger*	*School bus & Taxi*	*Walk*	*Total Trips from TTS Zone*	
Local Area	1304	401	7536	0	0	1367	1027	1057	12692	53.9%
	10%	*3%*	*59%*	*0%*	*0%*	*11%*	*8%*	*8%*		
Old City (Downtown)	61	0	905	0	0	275	43	0	1284	5.4%
	5%	*0%*	*70%*	*0%*	*0%*	*21%*	*3%*	*0%*		
Rest of Guelph	77	27	2873	0	0	329	84	0	3390	14.4%
	2%	*1%*	*85%*	*0%*	*0%*	*10%*	*2%*	*0%*		
Waterloo Region	0	0	2225	0	0	112	22	0	2359	10.0%
	0%	*0%*	*94%*	*0%*	*0%*	*5%*	*1%*	*0%*		
Peel / Halton Regions	0	0	1512	0	0	161	19	0	1692	7.2%
	0%	*0%*	*89%*	*0%*	*0%*	*10%*	*1%*	*0%*		
City of Toronto	52	0	170	53	0	9	0	0	284	1.2%
	18%	*0%*	*60%*	*19%*	*0%*	*3%*	*0%*	*0%*		
Wellington County	0	0	901	0	0	134	8	0	1043	4.4%
	0%	*0%*	*86%*	*0%*	*0%*	*13%*	*1%*	*0%*		
Other	0	0	736	0	0	84	0	0	820	3.5%
	0%	*0%*	*90%*	*0%*	*0%*	*10%*	*0%*	*0%*		

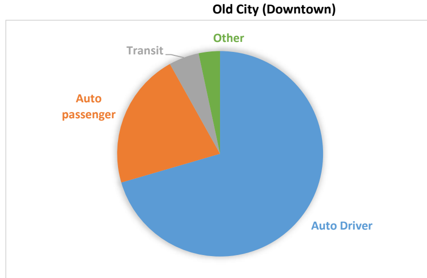
	Auto Driver	Auto passenger	Transit	Walk	Cycle	Other
	59%	11%	10%	8%	3%	8%
	70%	21%	5%	0%	0%	3%
	85%	10%	2%	0%	1%	2%
	94%	5%	0%	0%	0%	1%
	89%	10%	0%	0%	0%	1%
	60%	3%	37%	0%	0%	0%
	86%	13%	0%	0%	0%	1%
	90%	10%	0%	0%	0%	0%
check:	14815	14815				
	81%	13%	3%	0%	1%	3%

	1494	428	16858	53	0	2471	1203	1057	23564	20%
Total Check:	1494	428	16858	53	0	2471	1203	1057	23564	
	6%	2%	72%	0%	0%	10%	5%	4%		
	138	27	3778	0	0	604	127	0	4674	
	3%	1%	81%	0%	0%	13%	3%	0%		

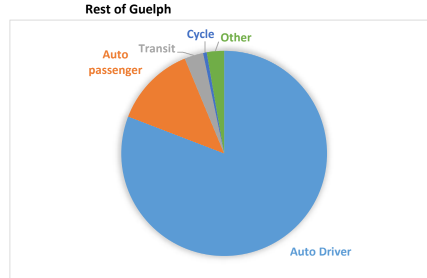
South Guelph



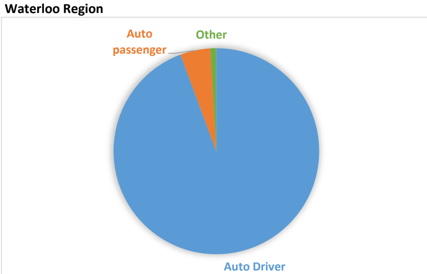
Old City (Downtown)



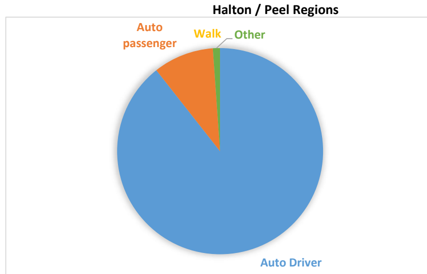
Rest of Guelph



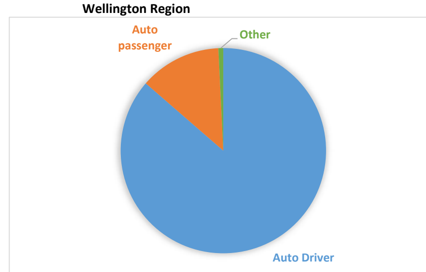
Waterloo Region



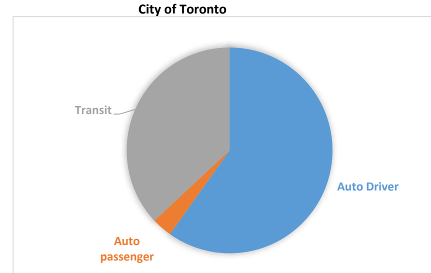
Halton / Peel Regions



Wellington Region



City of Toronto



Thu Dec 27 2018 18:20:11 GMT-0500 (Eastern Standard Time)

Frequency Distribution Query Form - Trip - 2016 v1.1

Field: Primary travel mode of trip - mode_prime

Filters:
Start time of trip - start_time In 700-900
and
2006 GTA z 8078-8081 8062 8064 8068 8067

Table: Trip 2016

Row:	Count:	Expanded:
Transit exc	2	45
Cycle	3	69
Auto driver	81	1712
Auto passe	9	186
School bus	4	96
Walk	23	440
Total:	122	2549

Thu Dec 27 2018 18:19:52 GMT-0500 (Eastern Standard Time)

Frequency Distribution Query Form - Trip - 2016 v1.1

Field: Primary travel mode of trip - mode_prime

Filters:
Start time of trip - start_time In 700-900
and
2006 GTA z 8078-8081 8062 8064 8068 8067

Table: Trip 2016

Row:	Count:	Expanded:
Transit exc	27	699
Cycle	8	215
Auto driver	277	5948
Auto passe	30	670
School bus	31	848
Walk	26	518
Total:	399	8897

Thu Dec 27 2018 18:20:33 GMT-0500 (Eastern Standard Time)

Frequency Distribution Query Form - Trip - 2016 v1.1

Field: Primary travel mode of trip - mode_prime

Filters:
Start time of trip - start_time In 1600-1800
and
2006 GTA z 8078-8081 8062 8064 8068 8067

Table: Trip 2016

Row:	Count:	Expanded:
Transit exc	26	669
Cycle	6	142
Auto driver	307	6200
GO rail only	3	53
Auto passe	37	751
School bus	9	211
Taxi passer	1	43
Walk	5	86
Total:	394	8157

Thu Dec 27 2018 18:18:57 GMT-0500 (Eastern Standard Time)

Frequency Distribution Query Form - Trip - 2016 v1.1

Field: Primary travel mode of trip - mode_prime

Filters:
Start time of trip - start_time In 1600-1800
and
2006 GTA z 8078-8081 8062 8064 8068 8067

Table: Trip 2016

Row:	Count:	Expanded:
Transit exc	2	82
Auto driver	145	2990
Auto passe	38	846
School bus	1	4
Walk	2	30
Total:	188	3951

Travel Mode	All Trips Travel Mode Split									
	Weekday AM Inbound		Weekday AM Outbound		Weekday PM Inbound		Weekday PM Outbound		Overall	
	Count	***Proportion***	***Count***	***Proportion***	***Count***	***Proportion***	***Count***	***Proportion***	***Count***	***Proportion***
Transit excluding GO rail	45	2%	699	8%	669	8%	82	2%	1495	6%
Cycle	69	3%	215	2%	142	2%		0%	426	2%
Auto driver	1712	67%	5948	67%	6200	76%	2990	76%	16850	72%
GO rail only		0%		0%	53	1%		0%	53	0%
Auto passenger	186	7%	670	8%	751	9%	846	21%	2453	10%
School bus	96	4%	848	10%	211	3%	4	0%	1159	5%
Taxi passenger		0%		0%	43	1%		0%	43	0%
Walk	440	17%	518	6%	86	1%	30	1%	1074	5%
Total:	2548	1	8898	1	8155	1	3952	1	23553	1

Appendix B – Detailed Collision Data

Collision Details Report

From: January 1, 2012 **To:** March 31, 2017

Location .... CLAIR RD W @ GORDON ST **Municipality........** GUELPH

Traffic Control.... Traffic signal **Total Collisions....** 69

Collision ID	Date/Day/Time	Environment	Impact Type	Classification	Direction	Surface Cond'n	Vehicle Manoeuver	Vehicle type	First Event	Driver Action	No. Ped
12-03079	2012-Jan-18, Wed,09:00	Clear	Rear end	Non-fatal injury	North	Dry	Slowing or stopping	Automobile, station wagon	Other motor vehicle	Following too close	
Comments:					North		Stopped	Passenger van	Other motor vehicle	Driving properly	Daylight
12-12101	2012-Mar-04, Sun,23:35	Clear	Angle	P.D. only	South	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Other	
Comments:					East	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Other	Dark, artificial
12-501569641S	2012-Mar-09, Fri,08:25	Snow	Rear end		South	Loose snow	Slowing or stopping	Automobile, station wagon	Other motor vehicle	Following too close	
Comments:					South	Loose snow	Stopped	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
12-501587590S	2012-May-17, Thu,14:30	Clear	Rear end		South	Dry	Stopped	Automobile, station wagon	Other motor vehicle	Driving properly	
Comments:					South	Dry	Slowing or stopping	Automobile, station wagon	Other motor vehicle	Following too close	Daylight
12-501595303S	2012-Jun-12, Tue,17:15	Clear	SMV other		South	Dry	Stopped	Automobile, station wagon	Cyclist	Driving properly	
Comments:											Daylight
12-501605073S	2012-Jul-13, Fri,12:15	Clear	Rear end		East	Dry	Turning right	Automobile, station wagon	Other motor vehicle	Following too close	
Comments:					East	Dry	Stopped	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
12-47925	2012-Sep-09, Sun,11:09	Clear	Angle	Non-fatal injury	West	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	
Comments:					North	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Disobeyed traffic control	Daylight
12-501620497S	2012-Sep-09, Sun,14:00	Clear	Turning movement		South	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	
Comments:					North	Dry	Turning left	Pick-up truck	Other motor vehicle	Failed to yield right-of-way	Daylight
12-54333	2012-Oct-12, Fri,05:19	Clear	Turning movement	P.D. only	West	Dry	Going ahead	Pick-up truck	Other motor vehicle	Driving properly	
Comments:					East	Dry	Turning left	Automobile, station wagon	Other motor vehicle	Failed to yield right-of-way	Dark

Collision ID	Date/Day/Time	Environment	Impact Type	Classification	Direction	Surface Cond'n	Vehicle Manoeuver	Vehicle type	First Event	Driver Action	No. Ped
12-64639	2012-Dec-11, Tue,09:35	Snow	Angle	P.D. only	North	Wet	Going ahead	Truck - closed	Other motor vehicle	Disobeyed traffic control	
Comments:					West	Wet	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
1313233	2013-Mar-22, Fri,18:52	Clear	Rear end	P.D. only	North	Dry	Stopped	Automobile, station wagon	Other motor vehicle	Driving properly	
Comments:	Road #1: GORDON ST	Road #2: CLAIR RD E			North	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Speed too fast for condition	Dusk
13-501691571s	2013-Apr-19, Fri,17:00	Clear	Rear end		South	Dry	Slowing or stopping	Automobile, station wagon	Other motor vehicle	Other	
Comments:					South	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
13-501708279s	2013-Jun-10, Mon,00:00	Clear	Rear end		West	Dry	Stopped	Automobile, station wagon	Other motor vehicle	Driving properly	
Comments:					West	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Following too close	Daylight
501708279	2013-Jun-10, Mon,16:00	Clear	Rear end	Non-reportable	West	Dry	Stopped	Automobile, station wagon	Other motor vehicle		
Comments:	Road #1: CLAIR ROAD E	Road #2: CLAIR ROAD E			West	Dry	Going ahead	Automobile, station wagon	Other motor vehicle		Daylight
13-13233 **	2013-Jun-22, Sat,18:52	Clear	Rear end	P.D. only	North	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Speed too fast for condition	
Comments:	CHARGED: D1 HTA 130 POT #1197527B				North	Dry	Stopped	Automobile, station wagon	Other motor vehicle	Driving properly	Dusk
501713459	2013-Jun-25, Tue,06:45	Clear	Rear end	Non-reportable	South	Wet	Stopped	Passenger van	Other motor vehicle		
Comments:	Road #1: GORDON ST	Road #2: GORDON ST			South	Wet	Slowing or stopping	Automobile, station wagon	Other motor vehicle		Daylight
1336985	2013-Aug-07, Wed,19:15	Clear	Sideswipe	P.D. only	North	Dry	Turning right	Automobile, station wagon	Cyclist	Driving properly	
Comments:	Road #1: GORDON ST	Road #2: CLAIR ROAD E			North	Dry	Going ahead	Bicycle	Other motor vehicle	Failed to yield right-of-way	Daylight
13-36985	2013-Aug-07, Wed,19:15	Clear	SMV other	Non-fatal injury	North	Dry	Going ahead	Bicycle		Failed to yield right-of-way	
Comments:	LINE 31 - V1 HAD NO REAR BRAKE (CABLE UNHOOKED) CHARGED: D1 PON #2775027B SEC. 139 (1) HTA				North	Dry		Automobile, station wagon	Cyclist	Driving properly	Daylight
13-501728773s	2013-Aug-08, Thu,17:30	Clear	Rear end		North	Dry	Slowing or stopping	Automobile, station wagon	Other motor vehicle	Other	
Comments:					North	Dry	Stopped	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
501731387	2013-Aug-15, Thu,02:00	Clear	Rear end	Non-reportable	North	Dry	Slowing or stopping	Automobile, station wagon	Other motor vehicle		
Comments:	Road #1: GORDON ST	Road #2: GORDON ST			North	Dry	Slowing or stopping	Passenger van	Other motor vehicle		Dark, artificial

13-42655**	2013-Sep-09, Mon,05:38	Clear	SMV other	P.D. only	South	Dry	Pulling onto shoulder or toward curb	Automobile, station wagon	Ran off road	Lost control	
Comments:	CHARGED: D1 32(1) HTA, 2(1)(A) C.A.I.A TELEPHONE POLE, GUIDE WIRE RIPPED OFF										Dark
1344314	2013-Sep-16, Mon,20:30	Clear	SMV unattended vehicle	Non-reportable	West	Dry	Stopped	Automobile, station wagon	Other motor vehicle		
Comments:	Road #1: CLAIR RD E Road #2: CLAIR RD E										Dark, artificial
13-501742645s	2013-Sep-16, Mon,20:30	Clear	Rear end		West	Dry	Stopped	Automobile, station wagon	Other motor vehicle	Driving properly	
Comments:					West		Going ahead	Unknown		Following too close	Dark
1349516	2013-Oct-13, Sun,05:03	Rain	SMV unattended vehicle	P.D. only	North	Wet	Turning right	Automobile, station wagon	Skidding/sliding	Improper turn	
Comments:	Road #1: GORDON ST Road #2: CLAIR RD E					Wet					Dark
13-49516	2013-Oct-13, Sun,05:03	Rain	SMV other	P.D. only	North	Wet	Turning right	Automobile, station wagon	Skidding/sliding	Improper turn	
Comments:	CHARGED: D1 SEC 130 HTA PON#2775625B										Dark
1356784	2013-Nov-24, Sun,10:30	Snow	Rear end	Non-reportable	North	Ice	Stopped	Automobile, station wagon	Other motor vehicle		
Comments:	Road #1: GORDON ST Road #2: GORDON ST				North	Ice	Slowing or stopping	Automobile, station wagon	Skidding/sliding		Daylight
14254	2014-Jan-02, Thu,18:21	Clear	Turning movement	P.D. only	South	Wet	Turning left	Pick-up truck	Other motor vehicle	Failed to yield right-of-way	
Comments:	Road #1: GORDON ST Road #2: CLAIR RD W				North	Wet	Going ahead	Pick-up truck	Other motor vehicle	Driving properly	Dark, artificial
142012	2014-Jan-13, Mon,07:57	Clear	Turning movement	Non-reportable	West	Wet	Going ahead	Automobile, station wagon	Other motor vehicle		
Comments:	Road #1: CLAIR RD W Road #2: CLAIR RD W				West	Wet	Turning right	Automobile, station wagon	Other motor vehicle		Daylight
14004254	2014-Jan-26, Sun,09:57	Clear	Approaching	P.D. only	North	Slush	Going ahead	Automobile, station wagon	Pole (utility, power)	Driving properly	
Comments:	Road #1: GORDON ST Road #2: CLAIR RD E				South	Slush	Turning left	Automobile, station wagon	Other	Improper turn	Daylight
14004386	2014-Jan-27, Mon,10:00	Clear	Angle	P.D. only	South	Loose snow	Going ahead	Automobile, station wagon	Other motor vehicle	Disobeyed traffic control	
Comments:	Road #1: GORDON ST Road #2: CLAIR RD E				West	Loose snow	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
501801711	2014-Feb-01, Sat,12:40	Snow	Rear end	Non-reportable	North	Wet	Stopped	Passenger van	Other motor vehicle		
Comments:	Road #1: GORDON ST Road #2: GORDON ST				North	Wet					Daylight
14005368	2014-Feb-01, Sat,13:00	Snow	SMV other	P.D. only	North	Loose snow	Slowing or stopping	Automobile, station wagon	Pole (sign, parking meter)	Speed too fast for condition	
Comments:	Road #1: GORDON ST Road #2: CLAIR RD W					Loose snow					Daylight

14010272	2014-Mar-03, Mon,14:00	Clear	Angle	Non-reportable	North	Dry	Turning left	Ambulance	Other motor vehicle		
Comments:	Road #1: CLAIR RD E Road #2: CLAIR RD E				West	Dry	Going ahead	Automobile, station wagon	Other motor vehicle		Daylight
501820599	2014-Mar-10, Mon,15:00	Clear	Rear end	Non-reportable	North	Dry	Stopped	Automobile, station wagon	Other motor vehicle		
Comments:	Road #1: GORDON ST Road #2: GORDON ST				North	Dry	Slowing or stopping	Automobile, station wagon	Other motor vehicle		Daylight
14011646	2014-Mar-12, Wed,09:59	Snow	SMV other	P.D. only	North	Loose snow	Turning right	Passenger van	Other	Speed too fast for condition	
Comments:	Road #1: CLAIR RD E Road #2: GORDON ST					Loose snow					Daylight
14015614	2014-Apr-03, Thu,15:18	Clear	Turning movement	Non-fatal injury	North	Dry	Turning left	Automobile, station wagon	Other motor vehicle	Failed to yield right-of-way	
Comments:	Road #1: GORDON ST Road #2: CLAIR RD W				South	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
501837595	2014-Apr-17, Thu,17:30	Clear	Sideswipe	Non-reportable	North	Dry	Going ahead	Automobile, station wagon	Other motor vehicle		
Comments:	Road #1: GORDON ST Road #2: GORDON ST				North	Dry	Changing lanes	Automobile, station wagon	Other motor vehicle		Daylight
14030787	2014-Jun-23, Mon,18:18	Rain	Turning movement	P.D. only	East	Wet	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	
Comments:	Road #1: CLAIR RD E Road #2: GORDON ST				West	Wet	Turning left	Automobile, station wagon	Other motor vehicle	Improper turn	Daylight
14030806	2014-Jun-23, Mon,20:12	Rain	SMV other	P.D. only	West	Wet	Turning right	Truck - tractor	Pole (sign, parking meter)	Improper turn	
Comments:	Road #1: CLAIR RD E Road #2: GORDON ST					Wet					Daylight
14044011	2014-Sep-04, Thu,17:45	Clear	Rear end	Non-reportable	South	Dry	Stopped	Automobile, station wagon	Other motor vehicle		
Comments:	Road #1: GORDON ST Road #2: GORDON ST				South	Dry	Going ahead	Automobile, station wagon	Other motor vehicle		Daylight
14045068	2014-Sep-09, Tue,17:17	Clear	Sideswipe	P.D. only	East	Dry	Stopped	Automobile, station wagon	Other motor vehicle	Driving properly	
Comments:	Road #1: CLAIR RD W Road #2: GORDON ST				East	Dry	Changing lanes	Truck - tractor	Other motor vehicle	Improper lane change	Daylight
501906850	2014-Oct-22, Wed,17:00	Clear	Rear end	Non-reportable	North	Dry	Stopped	Passenger van	Other motor vehicle		
Comments:	Road #1: GORDON ST Road #2: GORDON ST				North	Dry					Daylight
501923890	2014-Nov-27, Thu,20:00	Snow	Rear end	Non-reportable	West	Ice	Stopped	Automobile, station wagon	Other motor vehicle		
Comments:	Road #1: CLAIR RD W Road #2: CLAIR RD W				West	Ice					Dark, artificial
14063021	2014-Dec-24, Wed,05:26	Rain	Angle	Non-fatal injury	West	Wet	Going ahead	Pick-up truck	Other motor vehicle	Driving properly	
Comments:	Road #1: GORDON ST Road #2: CLAIR RD E				South	Wet	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	Dark, artificial

501958335	2015-Feb-12, Thu,15:45	Clear	Sideswipe	Non-reportable	North	Dry	Slowing or stopping	Passenger van	Other motor vehicle		
Comments:	Road #1: GORDON ST	Road #2: GORDON ST			North	Dry					Daylight
501959344	2015-Feb-14, Sat,13:00	Clear	Sideswipe	Non-reportable	North	Dry	Going ahead	Automobile, station wagon	Other motor vehicle		
Comments:	Road #1: GORDON ST	Road #2: GORDON ST			North	Dry	Going ahead	Automobile, station wagon	Other motor vehicle		Daylight
15008007	2015-Feb-20, Fri,18:10	Clear	Turning movement	Non-fatal injury	East	Dry	Turning left	Automobile, station wagon	Other motor vehicle	Other	
Comments:	d1 charged				West	Dry	Going ahead	Passenger van	Other motor vehicle	Driving properly	Dusk
15016262	2015-Apr-13, Mon,18:00	Rain	Sideswipe	Non-reportable	East	Wet	Going ahead	Pick-up truck	Other motor vehicle		
Comments:	Road #1: CLAIR RD E	Road #2: CLAIR RD E			East	Wet	Changing lanes	Automobile, station wagon	Other motor vehicle		Daylight
15021903A	2015-May-15, Fri,19:31	Clear	Turning movement	Non-fatal injury	North	Dry	Turning left	Automobile, station wagon	Other motor vehicle	Failed to yield right-of-way	
Comments:	d1 charged				South	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
15021903	2015-May-15, Fri,19:31	Clear	Turning movement	Non-fatal injury	North	Dry	Turning left	Automobile, station wagon	Other motor vehicle	Failed to yield right-of-way	
Comments:	d1 charged				South	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
502002088A	2015-May-25, Mon,12:15	Clear	Rear end	Non-reportable	East	Dry	Stopped	Automobile, station wagon	Other motor vehicle		
Comments:					East	Dry	Going ahead	Automobile, station wagon	Other motor vehicle		Daylight
502002088	2015-May-25, Mon,12:15	Clear	Rear end	Non-reportable	East	Dry	Stopped	Automobile, station wagon	Other motor vehicle		
Comments:					East	Dry	Going ahead	Automobile, station wagon	Other motor vehicle		Daylight
502006645	2015-Jun-04, Thu,06:00	Clear	Rear end	Non-reportable	East	Dry	Stopped	Automobile, station wagon	Other motor vehicle		
Comments:					East	Dry					Daylight
15043305	2015-Sep-14, Mon,08:58	Clear	Rear end	P.D. only	North	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Following too close	
Comments:	d1 charged				North	Dry	Slowing or stopping	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
15044486	2015-Sep-19, Sat,15:10	Clear	Rear end	P.D. only	West	Wet	Going ahead	Automobile, station wagon	Other motor vehicle		
Comments:					West	Wet	Going ahead	Automobile, station wagon	Other motor vehicle		Daylight

502064738	2015-Oct-30, Fri,17:00	Clear	Rear end	Non-reportable	North	Dry	Stopped	Pick-up truck	Other motor vehicle		
Comments:					North	Dry	Stopped	Automobile, station wagon	Other motor vehicle		Daylight
15051958	2015-Nov-01, Sun,15:31	Clear	Angle	Non-fatal injury	South	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Disobeyed traffic control	
Comments:	d1 charged				West	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
15053891	2015-Nov-13, Fri,18:45	Rain	Turning movement	P.D. only	West	Wet	Turning left	Passenger van	Other motor vehicle	Driving properly	
Comments:	d1 charged				West	Wet	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	Dark, artificial
15056451	2015-Nov-29, Sun,01:25	Clear	SMV other	P.D. only	West	Dry	Going ahead	Automobile, station wagon	Pole (utility, power)	Other	
Comments:	d1 charged					Dry					Dark
15057350	2015-Dec-04, Fri,16:39	Clear	Angle	Non-fatal injury	West	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Disobeyed traffic control	
Comments:	d1 charged			d2 charged	North	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	Dusk
15057465	2015-Dec-05, Sat,08:45	Fog, mist, smoke, dust	Rear end	Non-fatal injury	North	Wet	Changing lanes	Automobile, station wagon	Other motor vehicle	Improper lane change	
Comments:					North	Wet	Slowing or stopping	Automobile, station wagon	Other motor vehicle	Other	Daylight
502093430	2016-Jan-10, Sun,18:30	Snow	Rear end	Non-reportable	East	Ice	Slowing or stopping	Automobile, station wagon	Other motor vehicle		
Comments:					East	Ice	Going ahead	Automobile, station wagon	Other motor vehicle		Dark, artificial
16003885	2016-Jan-25, Mon,13:35	Clear	Rear end	Non-fatal injury	South	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Following too close	
Comments:	d1-charged				South	Wet	Stopped	Passenger van	Other motor vehicle	Driving properly	Daylight
16013848	2016-Mar-23, Wed,21:08	Clear	Turning movement	P.D. only	East	Dry	Turning left	Automobile, station wagon	Other motor vehicle	Failed to yield right-of-way	
Comments:					West	Dry	Going ahead	Passenger van	Other motor vehicle	Driving properly	Dark, artificial
502129547	2016-Apr-10, Sun,20:00	Freezing Rain	Rear end		North	Ice	Slowing or stopping	Automobile, station wagon	Other motor vehicle		
Comments:					North	Ice	Stopped	Automobile, station wagon	Other motor vehicle		Dark, artificial
502204755	2016-Oct-14, Fri,17:30	Clear	Rear end	Non-reportable	South	Dry	Stopped	Automobile, station wagon	Other motor vehicle		
Comments:					South	Dry					Daylight

Collision ID	Date/Day/Time	Environment	Impact Type	Classification	Direction	Surface Cond'n	Vehicle Manoeuver	Vehicle type	First Event	Driver Action	No. Ped
502209067	2016-Oct-22, Sat,20:00	Clear	Rear end	Non-reportable	West	Dry	Slowing or stopping	Automobile, station wagon	Other motor vehicle		
Comments:					West	Dry	Stopped	Automobile, station wagon	Other motor vehicle		Dark, artificial
502219191	2016-Nov-16, Wed,12:30	Clear	Other	Non-reportable	West	Dry	Reversing	Automobile, station wagon	Other motor vehicle		
Comments:					East	Dry	Stopped	Automobile, station wagon	Other motor vehicle		Daylight
16061845	2016-Dec-12, Mon,19:00	Clear	Turning movement	Non-reportable	South	Wet	Turning left	Automobile, station wagon	Other motor vehicle		
Comments:	d1 charged				North	Wet	Going ahead	Automobile, station wagon	Other motor vehicle		Dark, artificial

Collision Details Report

From: January 1, 2012 **To:** March 31, 2017

Location .... CLAIR RD W @ LAIRD RD **Municipality........** GUELPH

Traffic Control.... Stop sign **Total Collisions....** 4

Collision ID	Date/Day/Time	Environment	Impact Type	Classification	Direction	Surface Cond'n	Vehicle Manoeuver	Vehicle type	First Event	Driver Action	No. Ped
12-501609147S	2012-Jul-30, Mon,12:32	Clear	Rear end		East	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Following too close	
Comments:					East	Dry	Stopped	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
13-12702	2013-Mar-19, Tue,10:06	Snow	SMV other	P.D. only	East	Loose snow	Slowing or stopping	Automobile, station wagon	Pole (utility, power)	Speed too fast for condition	
Comments:						Loose snow					Daylight
13-18565	2013-Apr-23, Tue,20:28	Clear	Sideswipe	P.D. only	North	Dry	Turning right	Tow truck	Other motor vehicle	Improper lane change	
Comments:	CHARGED: JOHN HALL - START FROM STOPPED POSITION NOT IN SAFETY, 142(2) HTA				North	Dry	Slowing or stopping	Automobile, station wagon	Other motor vehicle	Driving properly	Dusk
13-501713749s	2013-Jun-25, Tue,19:30	Rain	Rear end		East	Wet	Going ahead	Automobile, station wagon	Other motor vehicle	Following too close	
Comments:					East	Wet	Stopped	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight

Collision Details Report

From: January 1, 2012 **To:** March 31, 2017

Location .... CLAIR RD E @ FARLEY DR **Municipality........** GUELPH

Traffic Control.... Traffic signal **Total Collisions....** 13

Collision ID	Date/Day/Time	Environment	Impact Type	Classification	Direction	Surface Cond'n	Vehicle Manoeuver	Vehicle type	First Event	Driver Action	No. Ped
12-42187	2012-Aug-11, Sat,15:30	Rain	Angle	Non-fatal injury	East	Wet	Going ahead	Automobile, station wagon	Other motor vehicle	Disobeyed traffic control	
Comments:					North	Wet	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
1356588	2013-Nov-23, Sat,09:45	Snow	SMV other	Non-reportable	West	Slush	Going ahead	Passenger van	Skidding/sliding	Speed too fast for condition	
Comments: Road #1: CLAIR RD E	Road #2: FARLEY DR					Slush					Daylight
1357139	2013-Nov-23, Sat,09:50	Snow	SMV unattended vehicle	Non-reportable	North	Ice	Stopped	Automobile, station wagon	Other motor vehicle		
Comments: Road #1: CLAIR RD E	Road #2: CLAIR RD E					Ice					Daylight
501836603	2014-Apr-16, Wed,09:00	Clear	Rear end	Non-reportable	South	Dry	Turning right	Automobile, station wagon	Other motor vehicle		
Comments: Road #1: FARLEY DR	Road #2: FARLEY DR				South	Dry	Stopped	Automobile, station wagon	Other motor vehicle		Daylight
14048226	2014-Sep-25, Thu,06:39	Clear	Angle	P.D. only	East	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Disobeyed traffic control	
Comments: Road #1: CLAIR RD E	Road #2: FARLEY DR				South	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	Dawn
15041370	2015-Sep-04, Fri,16:50	Clear	Turning movement	P.D. only	East	Dry	Turning left	Automobile, station wagon	Other motor vehicle	Failed to yield right-of-way	
Comments:					West	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
16009138	2016-Feb-20, Sat,13:00	Clear	Turning movement	P.D. only	West	Dry	Turning left	Automobile, station wagon	Other motor vehicle	Driving properly	
Comments: d2-charged					East	Dry	Turning left	Automobile, station wagon	Other motor vehicle	Failed to yield right-of-way	Daylight
16012219	2016-Mar-15, Tue,13:22	Clear	Turning movement	P.D. only	East	Dry	Turning left	Pick-up truck	Other motor vehicle	Failed to yield right-of-way	
Comments: d1-charged					West	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
16040747	2016-Aug-24, Wed,08:30	Clear	Angle	Non-fatal injury	South	Dry	Going ahead	Bicycle	Other motor vehicle	Disobeyed traffic control	
Comments:					East	Dry	Going ahead	Automobile, station wagon	Cyclist	Driving properly	Daylight

Collision ID	Date/Day/Time	Environment	Impact Type	Classification	Direction	Surface Cond'n	Vehicle Manoeuver	Vehicle type	First Event	Driver Action	No. Ped
502190116	2016-Sep-10, Sat,13:27	Clear	Turning movement	Non-reportable	North	Dry	Going ahead	Automobile, station wagon	Other motor vehicle		
Comments:					West	Dry	Turning left	Automobile, station wagon	Other motor vehicle		Daylight
16053945	2016-Nov-02, Wed,21:55	Clear	Turning movement	Non-fatal injury	East	Wet	Turning left	Automobile, station wagon	Other motor vehicle	Other	
Comments: d1 charged					West	Wet	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	Dark, artificial
16055850	2016-Nov-14, Mon,15:28	Clear	Turning movement	P.D. only	East	Dry	Turning left	Automobile, station wagon	Other motor vehicle	Failed to yield right-of-way	
Comments: d1 charged					West	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
17001674	2016-Dec-19, Mon,14:30	Clear	Turning movement	Non-reportable	West	Dry	Going ahead	Passenger van	Other motor vehicle		
Comments: d2 charged					West	Dry	Changing lanes	Automobile, station wagon	Other motor vehicle		Daylight

Collision Details Report

From: January 1, 2012 **To:** March 31, 2017

Location .... CLAIR RD E @ VICTORIA RD S **Municipality........** GUELPH

Traffic Control.... Stop sign **Total Collisions....** 12

Collision ID	Date/Day/Time	Environment	Impact Type	Classification	Direction	Surface Cond'n	Vehicle Manoeuver	Vehicle type	First Event	Driver Action	No. Ped
12-501575422S	2012-Apr-01, Sun,10:20	Clear	Angle		South	Wet	Turning right	Automobile, station wagon	Other motor vehicle	Speed too fast for condition	
Comments:					East	Wet	Slowing or stopping	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
13-07923	2013-Feb-16, Sat,15:45	Clear	Angle	P.D. only	South	Wet	Turning right	Automobile, station wagon	Other motor vehicle	Speed too fast for condition	
Comments:					East	Wet	Stopped	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
13-501690910s	2013-Apr-17, Wed,08:30	Clear	Rear end		South	Dry	Going ahead	Unknown		Driving properly	
Comments:					South	Dry	Stopped	Automobile, station wagon	Other motor vehicle	Following too close	Daylight
13-41575	2013-Jul-04, Thu,15:15	Clear	Angle	P.D. only	South	Dry	Turning right	Automobile, station wagon	Other motor vehicle	Improper turn	
Comments:	CHARGED: D1 S.141 (2) HTA PON# 1195626B				East	Dry	Slowing or stopping	Pick-up truck	Other motor vehicle	Driving properly	Daylight
1354335	2013-Nov-10, Sun,03:40	Rain	SMV other	P.D. only	East	Wet	Slowing or stopping	Automobile, station wagon	Steel guide rail	Speed too fast for condition	
Comments:	Road #1: CLAIR RD E, GUELP		Road #2: VICTORIA RD S			Wet					Dark, artificial
13-54335	2013-Nov-10, Sun,03:40	Rain	SMV other	Non-fatal injury	East	Wet	Slowing or stopping	Automobile, station wagon	Curb	Speed too fast for condition	
Comments:											Dark, artificial
141081	2014-Jan-07, Tue,14:10	Clear	Rear end	Non-reportable	South	Ice	Slowing or stopping	Automobile, station wagon	Other motor vehicle		
Comments:	Road #1: VICTORIA RD S & CLAIR RD E GUELPH VICTORIA RD S & CLAIR RD E GUELPH			Road #2:	South	Ice	Stopped	Automobile, station wagon	Other motor vehicle		Daylight
50185889	2014-Jun-15, Sun,16:50	Clear	Angle	Non-reportable	South	Dry	Going ahead	Motorcycle	Other motor vehicle		
Comments:	Road #1: VICTORIA RD S		Road #2: VICTORIA RD S		East	Dry	Turning left	Automobile, station wagon	Other motor vehicle		Daylight
14030788	2014-Jun-23, Mon,16:19	Rain	Approaching	P.D. only	East	Wet	Stopped	Automobile, station wagon	Other motor vehicle	Driving properly	
Comments:	Road #1: CLAIR RD E		Road #2: VICTORIA RD S		West	Wet	Turning right	Automobile, station wagon	Other motor vehicle	Speed too fast for condition	Daylight

Collision ID	Date/Day/Time	Environment	Impact Type	Classification	Direction	Surface Cond'n	Vehicle Manoeuver	Vehicle type	First Event	Driver Action	No. Ped
14054348	2014-Oct-31, Fri,14:45	Rain	Angle	P.D. only	East	Wet	Turning left	Automobile, station wagon	Other motor vehicle	Failed to yield right-of-way	
Comments:	Road #1: CLAIR RD E		Road #2: VICTORIA RD S		South	Wet	Going ahead	Pick-up truck	Other motor vehicle	Driving properly	Daylight
15039629	2015-Aug-25, Tue,23:20	Clear	SMV other	P.D. only	East	Dry	Going ahead	Automobile, station wagon	Steel guide rail	Other	
Comments:	d1 charged					Dry					Dark
502055091	2015-Oct-06, Tue,17:00	Clear	Rear end	Non-reportable	East	Dry	Stopped	Passenger van	Other motor vehicle		
Comments:					East	Dry	Going ahead	Truck - closed	Other motor vehicle		Daylight

Collision Details Report

From: January 1, 2012 **To:** March 31, 2017

Location .... CLAIR RD W @ CLAIRFIELDS DR W **Municipality........** GUELPH

Traffic Control.... Traffic signal **Total Collisions....** 13

Collision ID	Date/Day/Time	Environment	Impact Type	Classification	Direction	Surface Cond'n	Vehicle Manoeuver	Vehicle type	First Event	Driver Action	No. Ped
12-501561016S	2012-Feb-08, Wed,08:15	Clear	Rear end		West	Dry	Slowing or stopping	Automobile, station wagon	Other motor vehicle	Following too close	
Comments:					West	Dry	Stopped	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
13-501696443s	2013-May-06, Mon,07:40	Clear	Rear end		South	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Following too close	
Comments:					South	Dry	Stopped	Unknown	Other motor vehicle	Driving properly	Daylight
501696443	2013-May-06, Mon,07:40	Clear	Rear end	Non-reportable	South	Dry	Going ahead	Automobile, station wagon	Other motor vehicle		
Comments:	Road #1: CLAIRFIELDS DR		Road #2: CLAIRFIELDS DR		South	Dry	Stopped		Other motor vehicle		Daylight
1359695	2013-Dec-11, Wed,12:00	Snow	Angle	Non-reportable	East	Loose snow	Slowing or stopping	Passenger van	Skidding/sliding		
Comments:	Road #1: CLAIR RD W		Road #2: CLAIR RD W		North	Slush	Stopped	School bus	Other motor vehicle		Daylight
501970219	2015-Mar-05, Thu,15:25	Clear	Sideswipe	Non-reportable	West	Dry	Going ahead	Automobile, station wagon	Other motor vehicle		
Comments:	Road #1: CLAIR RD W		Road #2: CLAIR RD W		West	Dry	Changing lanes	Automobile, station wagon	Other motor vehicle		Daylight
501996511	2015-May-13, Wed,15:05	Clear	Sideswipe	Non-reportable	West	Dry	Stopped	Pick-up truck	Other motor vehicle		
Comments:					West	Dry	Turning left	School bus	Other motor vehicle		Daylight
502039616	2015-Aug-27, Thu,16:35	Clear	Rear end	Non-reportable	West	Dry	Stopped	Automobile, station wagon	Other motor vehicle		
Comments:					West	Dry	Slowing or stopping	Automobile, station wagon	Other motor vehicle		Daylight
502070671	2015-Nov-13, Fri,17:35	Clear	Angle	Non-reportable	West	Dry	Going ahead	Automobile, station wagon	Skidding/sliding		
Comments:					South	Dry	Stopped	Automobile, station wagon	Other motor vehicle		Dark, artificial
502072008	2015-Nov-17, Tue,05:45	Clear	Rear end	Non-reportable	West	Dry	Stopped	Automobile, station wagon	Other motor vehicle		
Comments:					West	Dry					Dark, artificial
502093617	2016-Jan-10, Sun,17:45	Strong wind	Rear end	Non-reportable	East	Ice	Stopped	Automobile, station wagon	Other motor vehicle		
Comments:					East	Ice					Dark
502094098	2016-Jan-12, Tue,12:40	Snow	Rear end	Non-reportable	East	Ice	Slowing or stopping	Automobile, station wagon	Other motor vehicle		
Comments:					East	Packed snow	Stopped	Automobile, station wagon	Other motor vehicle		Daylight
502101937	2016-Jan-29, Fri,11:00	Clear	Turning movement	Non-reportable	North	Dry	Turning right	Automobile, station wagon	Other motor vehicle		
Comments:					East	Dry	Going ahead	Automobile, station wagon	Other motor vehicle		Daylight
16062009	2016-Dec-12, Mon,08:15	Clear	Sideswipe	Non-reportable	West	Loose snow	Going ahead	Truck - closed	Other motor vehicle		
Comments:	d2 charged				West	Wet	Going ahead	Automobile, station wagon	Other motor vehicle		Daylight

Collision Details Report

From: January 1, 2012 **To:** March 31, 2017

Location .... BEAVER MEADOW DR @ CLAIR RD E **Municipality........** GUELPH

Traffic Control.... **Total Collisions....** 1

Collision ID	Date/Day/Time	Environment	Impact Type	Classification	Direction	Surface Cond'n	Vehicle Manoeuver	Vehicle type	First Event	Driver Action	No. Ped
12-21783	2012-Apr-23, Mon,11:22	Clear	SMV other	Non-fatal injury	East	Dry	Going ahead	Automobile, station wagon	Pole (utility, power)	Failed to yield right-of-way	
Comments:						Dry					Daylight

Collision Details Report

From: January 1, 2012 **To:** March 31, 2017

Location .... GORDON ST @ MALTBY RD E **Municipality........** GUELPH

Traffic Control.... **Total Collisions....** 5

Collision ID	Date/Day/Time	Environment	Impact Type	Classification	Direction	Surface Cond'n	Vehicle Manoeuver	Vehicle type	First Event	Driver Action	No. Ped
1356949	2013-Nov-23, Sat,12:00	Snow	SMV other	Non-reportable	East	Ice	Going ahead	Automobile, station wagon	Skidding/sliding		
Comments:	Road #1: MALTBY RD E	Road #2: MALTBY RD E				Ice					Daylight
14007199	2014-Feb-12, Wed,17:00	Clear	SMV other	P.D. only	West	Packed snow	Slowing or stopping	Passenger van	Pole (sign, parking meter)	Lost control	
Comments:	Road #1: MALTBY RD E	Road #2: GORDON ST				Dry					Daylight
14051130	2014-Oct-11, Sat,17:55	Clear	Angle	Non-fatal injury	South	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	
Comments:	Road #1: GORDON ST	Road #2: MALTBY RD E			East	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Disobeyed traffic control	Daylight
15059744	2015-Dec-19, Sat,08:04	Clear	Angle	Non-fatal injury	East	Wet	Going ahead	Automobile, station wagon	Other motor vehicle	Disobeyed traffic control	
Comments:	d1-charged				North	Wet	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
16001977	2016-Jan-14, Thu,01:30	Snow	SMV other	P.D. only	East	Loose snow	Slowing or stopping	Pick-up truck	Ran off road	Speed too fast for condition	
Comments:						Ice					Dark

Collision Details Report

From: January 1, 2012 **To:** March 31, 2017

Location .... GORDON ST @ POPPY DR **Municipality........** GUELPH

Traffic Control.... Traffic signal **Total Collisions....** 2

Collision ID	Date/Day/Time	Environment	Impact Type	Classification	Direction	Surface Cond'n	Vehicle Manoeuver	Vehicle type	First Event	Driver Action	No. Ped
12-20170	2012-Apr-15, Sun,11:27	Rain	Angle	Non-fatal injury	North	Wet	Going ahead	Automobile, station wagon	Other motor vehicle	Disobeyed traffic control	
Comments: D1 CHARGED: SECTION 144(18) HTA PON# 8242161A					West	Wet	Turning left	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
12-501647502s	2012-Dec-01, Sat,09:00	Clear	Angle		West	Packed snow	Stopped	Automobile, station wagon	Other motor vehicle	Driving properly	
Comments:					North	Packed snow	Going ahead	Automobile, station wagon			Daylight

Collision Details Report

From: January 1, 2012 **To:** March 31, 2017

Location .... VICTORIA RD S @ MALTBY RD E **Municipality........** GUELPH

Traffic Control.... Stop sign **Total Collisions....** 15

Collision ID	Date/Day/Time	Environment	Impact Type	Classification	Direction	Surface Cond'n	Vehicle Manoeuver	Vehicle type	First Event	Driver Action	No. Ped
12-501578669S	2012-Apr-14, Sat,09:30	Clear	Rear end		South	Wet	Going ahead	Automobile, station wagon	Other motor vehicle	Following too close	
Comments:					South	Dry	Stopped	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
1352809	2013-Nov-01, Fri,09:00	Clear	Rear end	Non-reportable	South	Dry	Stopped	Automobile, station wagon	Other motor vehicle		
Comments: Road #1: VICTORIA RD S Road #2: VICTORIA RD S					South						Daylight
15005190	2015-Feb-04, Wed,22:33	Snow	SMV other	P.D. only	South	Loose snow	Going ahead	Automobile, station wagon	Steel guide rail	Speed too fast for condition	
Comments: Road #1: VICTORIA RD S Road #2: MALTBY RD E						Loose snow					Dark
502043335	2015-Sep-08, Tue,08:15	Rain	SMV other	Non-reportable	South	Wet	Slowing or stopping	Automobile, station wagon			
Comments:						Wet					Daylight
15047987	2015-Oct-08, Thu,16:30	Clear	Turning movement	Non-fatal injury	South	Dry	Turning right	Automobile, station wagon	Other motor vehicle	Other	
Comments: d1 charged					South	Dry	Slowing or stopping	Automobile, station wagon	Other motor vehicle	Driving properly	Daylight
15049840	2015-Oct-20, Tue,11:18	Clear	Turning movement	P.D. only	West	Dry	Going ahead	Automobile, station wagon	Other motor vehicle	Driving properly	
Comments: d2 charged					South	Dry	Turning left	Automobile, station wagon	Other motor vehicle	Improper turn	Daylight
502082229	2015-Dec-11, Fri,10:00	Clear	Rear end	Non-reportable	South	Dry	Stopped	Automobile, station wagon	Other motor vehicle		
Comments:					South	Dry	Going ahead	Pick-up truck	Other motor vehicle		Daylight
502098039	2016-Jan-14, Thu,16:30	Clear	Rear end	Non-reportable	South	Dry	Going ahead	Automobile, station wagon	Other motor vehicle		
Comments:					South	Dry	Stopped	Automobile, station wagon	Other motor vehicle		Daylight
16008748	2016-Feb-24, Wed,09:45	Snow	SMV other	P.D. only	South	Packed snow	Slowing or stopping	Automobile, station wagon	Steel guide rail	Speed too fast for condition	
Comments:						Packed snow					Daylight

502136435	2016-Apr-29, Fri,09:00	Clear	Rear end		North	Dry	Stopped	Automobile, station wagon	Other motor vehicle		
Comments:					North	Dry	Slowing or stopping	Automobile, station wagon	Other motor vehicle		Daylight
502155172	2016-Jun-15, Wed,07:15	Clear	Rear end	Non-reportable	East	Dry	Going ahead	Automobile, station wagon	Other motor vehicle		
Comments:					East	Dry					Daylight
502159487	2016-Jun-25, Sat,09:00	Clear	Rear end	Non-reportable	South	Dry	Stopped	Automobile, station wagon	Other motor vehicle		
Comments:					South	Dry					Daylight
16057677	2016-Nov-23, Wed,19:45	Snow	SMV other	Non-reportable	South	Loose snow	Slowing or stopping	Automobile, station wagon	Skidding/sliding		
Comments: metal guide rail						Loose snow					Dark
16057381	2016-Nov-23, Wed,21:45	Freezing Rain	SMV other	P.D. only	South	Ice	Slowing or stopping	Automobile, station wagon	Skidding/sliding	Speed too fast for condition	
Comments:						Ice					Dark, artificial
16057382	2016-Nov-23, Wed,23:55	Freezing Rain	SMV other	P.D. only	South	Ice	Going ahead	Automobile, station wagon	Skidding/sliding	Speed too fast for condition	
Comments:						Ice					Dark, artificial

Appendix C – City of Guelph Access Design Guidelines

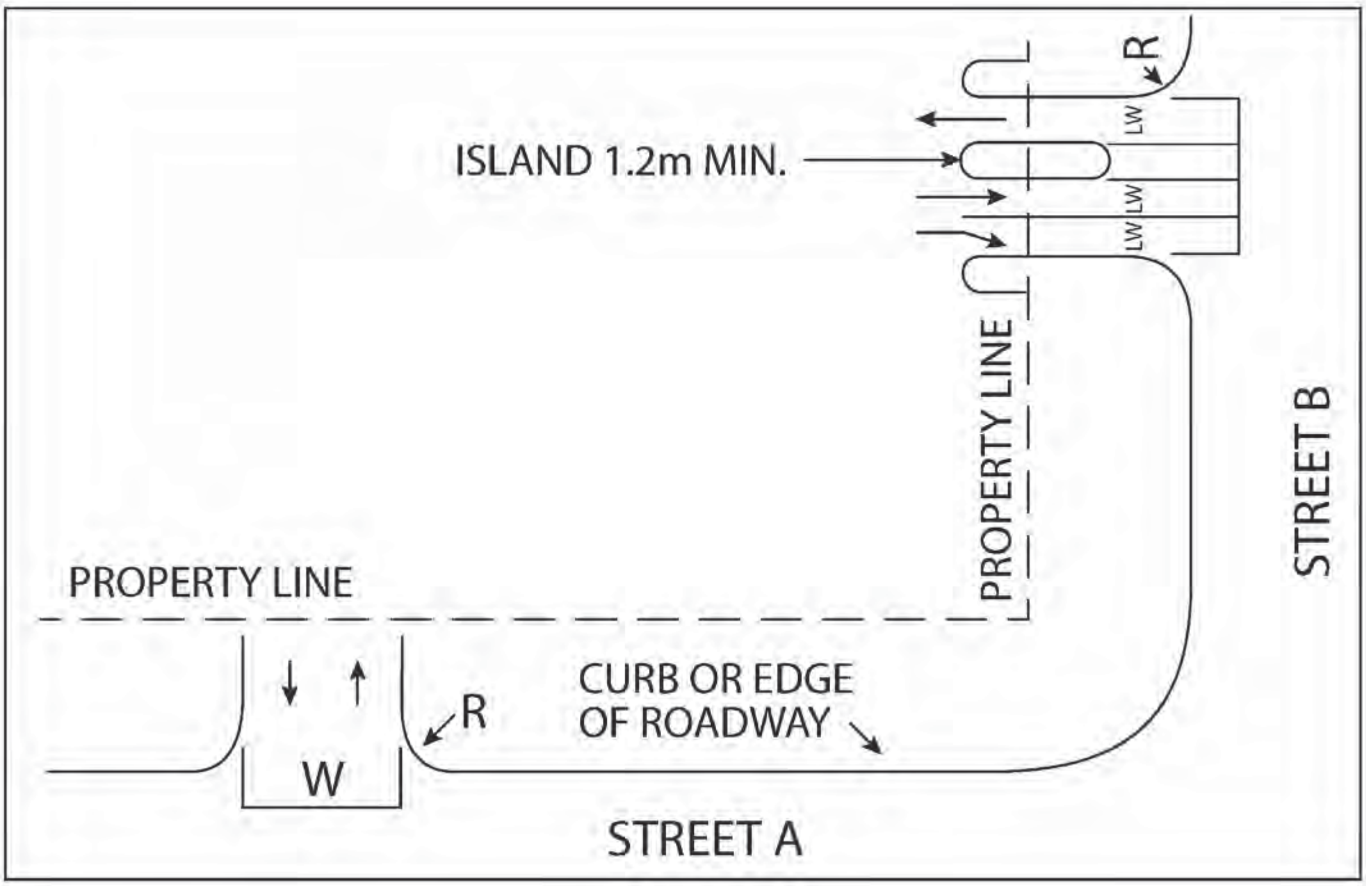


Figure 8

Access Details 1

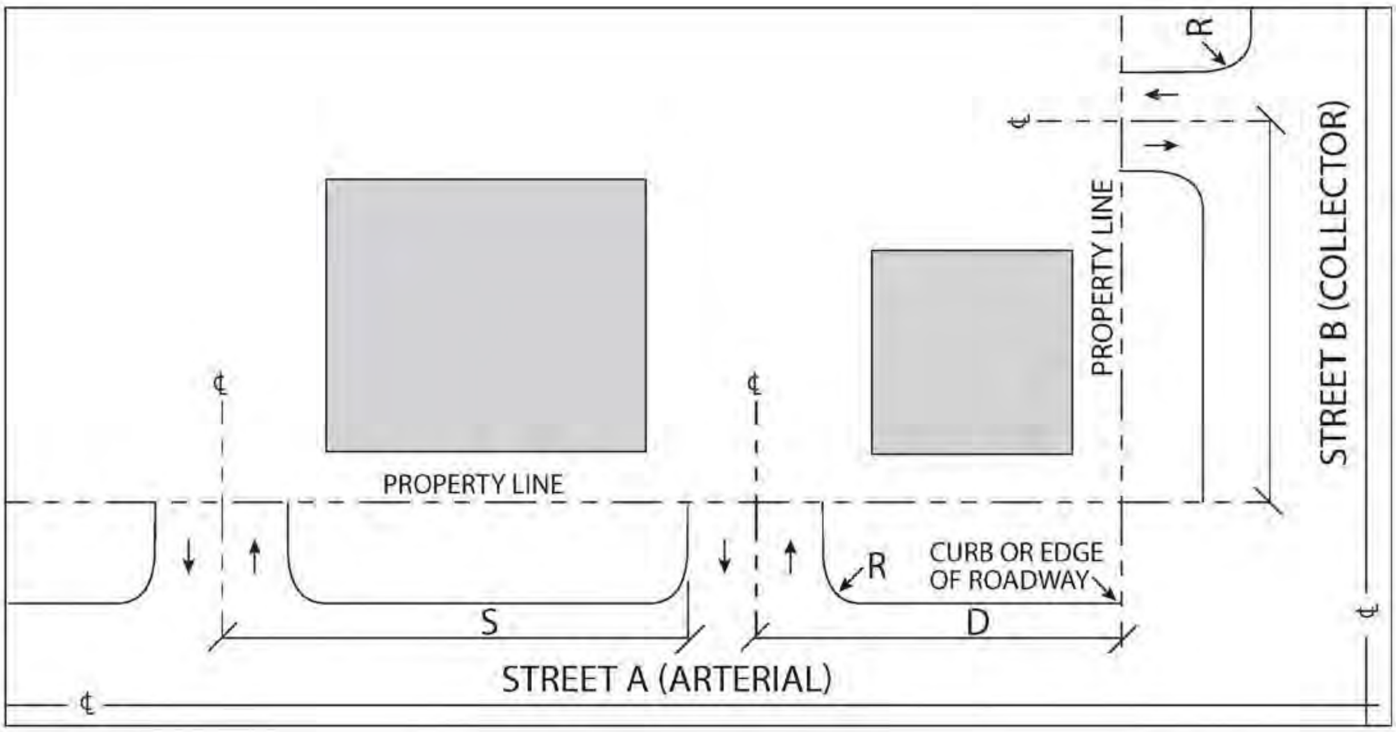


Figure 9
Access Details 2

Appendix D – TDM Policy Examples / Best Practices

Municipality	Province	Type of Plan/Policy	Year	Under Appeal?	Section	Text	Link
Guelph	Ontario	Downtown Guelph Secondary Plan	2012 (2016 Consolidation)	No	11.1.4.1.4	Transportation demand management (TDM) will be critical to achieving a transportation system Downtown that provides and promotes attractive alternatives to the automobile. The City shall work with transit providers, developers and businesses Downtown to develop and implement TDM measures that promote the use of transit, walking, cycling and carpooling. The City may require large-scale development or businesses to complete a TDM plan. TDM plans will describe facilities and programs intended to discourage single occupancy vehicle trips, minimize parking and promote transit use, cycling, car sharing and/or carpooling. The City may permit reduced parking standards for developments which demonstrate through a TDM plan and implementation strategy that a reduction in parking standards is appropriate.	https://guelph.ca/wp-content/uploads/Official-Plan-Consolidation-March-2018.pdf
Guelph	Ontario	Guelph Innovation District Secondary Plan	2014 (2017 Office Consolidation)	No	11.2.4.2.2	The City shall work with transit providers, developers and businesses within the University-Downtown-GID trinity area to develop and implement TDM measures that aim to reduce motorized vehicular trips and promote the use of active transportation modes, public transit, car-sharing and/or carpooling.	
Cambridge	Ontario	Official Plan	2012 (2018 Consolidation)	Yes, but only five sections, none of which are related to TDM	5.11.3	Shared parking arrangements between adjacent uses and reduced parking requirements may be considered through the development review process including transportation demand management measures as described in Section 6.15.	https://www.cambridge.ca/en/learn-about/resources/Official-Plan/Cambridge-2018-Official-Plan-Consolidation-AODA-2018-09-25.pdf
					6.10.4	Measures to encourage and/or support transit oriented development, existing and planned high frequency transit services, such as reductions in the amount of required parking, limiting the amount of surplus parking and considering transportation demand management programs as a community benefit under Section 10.16 of this Plan, may also be used	
					6.15.1	In order to maximize the efficiency of the transportation system through transportation demand management, the City will encourage the private and public sectors to implement measures, such as walking, cycling transit, car pooling, car sharing and flexible working hours, where feasible. Transportation demand management measures will be considered in evaluating development proposals	
					6.15.2	A comprehensive transportation demand management plan, including implementation measures, may be considered a component in justifying a reduction in the required amount of parking for a development or redevelopment, based on Section 10.11 of this Plan.	
					6.15.3	The City may prepare a city wide transportation demand management plan, which could be part of a future Master Transportation Plan.	
					10.11.2(f)	A reduction or exemption in required parking facilities may be considered where, in the opinion of the City, any of the following circumstances prevail f) the development is part of a comprehensive transportation demand management plan in accordance with the provisions of Section 6.15	
					10.16.1(xviii)	Development standards may be incorporated into a Zoning By-law to permit bonusing through an increase in height and/or density of development where such increase provides public benefits, and the increase: xviii) parking demand reduction measures as part of an approved transportation demand management plan, such as measures to increase access to public transit and/or participation in a formal car share program.	
Cambridge	Ontario	Secondary Plan: Cambridge West Lands	2016	No	6.11	The implementation of Transportation Demand Management measures shall be considered as part of every application for new development or redevelopment within the Secondary Plan area.	https://www.cambridge.ca/en/learn-about/resources/Cambridge-West-Draft-Plans/0800A_Cambridge-West-Secondary-Plan_June-2016---Copy.pdf
Cambridge	Ontario	Secondary Plan: Main Street and Dundas Street Area	2016	No	4.4.1.15	The implementing Zoning By-law may require the provision of secure bicycle parking facilities in a conspicuous location, long-term bike parking areas within buildings and on-site shower facilities and lockers for employees who bike to work. The City may allow for the reduction in the number of required parking spaces where bicycle parking facilities are provided	https://www.cambridge.ca/en/learn-about/resources/Main-and-Dundas-Draft-Secondary-Plan.pdf
					4.4.1.16	Council may require that development applications include a Transportation Demand Management (TDM) Plan, prepared to the satisfaction of the City of Cambridge. The intent of the TDM Plan shall be to implement and promote measures to reduce the use of low-occupancy automobiles for trips and to increase transit use, cycling and walking.	
Kitchener	Ontario	Official Plan	2014 (2018 Consolidation)	Yes	3.C.2.19 c)	Station Area Plans will include, but not be limited to, the following: c) a parking management and transportation demand management strategy for land uses within the station area to maximize intensification opportunities, minimize surface parking areas, to encourage large mixed use development and discourage auto-oriented land uses. Such strategies may include reduced parking requirements, shared parking, development of structured or underground parking facilities, parking pricing and other appropriate strategies;	https://www.kitchener.ca/en/resourcesGeneral/Documents/DSD_PLAN_New-Official-Plan---CONSOLIDATED-Version-Modifications-Deferrals--Appeals.pdf
					6.C.1.2(b)(iv)	The City may require a Health Impact Assessment in support of a development application or as part of an Environmental Assessment to ensure the proposal supports a complete and healthy community. The contents of a Health Impact Assessment will be outlined in a Terms of Reference. In general, the contents of a Health Impact Assessment may include, but not be limited to addressing the following: b) whether and how the proposal supports physical activity having regard for: iv) reducing the dependency on the automobile and encouraging active transportation and transportation demand management measures.	
					7.C.7(Preamble)	Clean air is essential for healthy, strong, liveable communities. Many day-to-day activities such as driving, home heating and industrial activities diminish air quality by producing a variety of harmful emissions and are a major source of pollution. One of the most effective strategies to ensure air quality is to encourage and achieve a complete and healthy community with a compact urban form and promote active modes of transportation such as walking, cycling and public transit and Transportation Demand Management (TDM) measures. The policies of this Plan seek to improve air quality in the city.	
					7.C.7.7	Transportation Demand Management (TDM) measures will be used in accordance with the policies in Section 13.C.7 to reduce the use of single occupancy vehicles and encourage increased transit ridership, walking and cycling	
					13.C.1	The City will implement the recommendations of Regional and/or City Transportation Master Plans, Transportation Demand Management Plans, Cycling Master Plans, Multi-Use Pathways and Trails Master Plans and Pedestrian Charters through the development review process, infrastructure projects and public realm improvements.	
					13.C.7 (entire section)	Objectives 13.7.1. To support and enhance sustainable transportation choices and discourage single occupant vehicle trips. 13.7.2. To reduce traffic congestion, parking supply needs, and demand for parking spaces by encouraging various modes of travel. Policies 13.C.7.1. The City will support the Region's Transportation Demand Management Policies and initiatives to reduce automobile dependency, make alternative travel modes more attractive, and influence people to adopt sustainable trip behaviours and practices. 13.C.7.2. The City will implement a comprehensive Transportation Demand Management program as recommended in the City of Kitchener Transportation Demand Management Plan which may include, but not limited to: a) community-wide, area-specific or site-specific practices or initiatives; b) employer programs that support and enhance sustainable transportation choices; and, c) requirements for features such as: car sharing, bike sharing facilities, van and carpool spaces, electric vehicle charging stations, shared parking, bicycle parking, transit waiting areas, and pedestrian facilities. 13.C.7.3. The City may require the incorporation of Transportation Demand Management measures. 13.C.7.4. The City will consider reduced parking requirements for development and/or redevelopment in accordance with Policy 13.C.8.2 where a comprehensive Transportation Demand Management Report is submitted to the satisfaction of the City.	
					13.C.8.2	The City may consider adjustments to parking requirements for properties within an area or areas, where the City is satisfied that adequate alternative parking facilities are available, where developments adopt transportation demand management (TDM) measures or where sufficient transit exists or is to be provided	
					15.D.2.22(b) (Urban Growth Centre - Downtown)	Where new parking spaces are proposed to be developed in combination with all new development or redevelopment, the City will: b) encourage owners/applicants to utilize Transportation Demand Management (TDM) measures	
					17.E.17.2(b) (Bonusing)	Community benefits may include: b) incorporation of Transportation Demand Management (TDM) strategies	
		Transportation			5.4.1	Expand employer TDM programs in Kitchener through existing TDM tools and services. This can begin with the City's membership in the TravelWise TMA to adopt carpool ridematching, subsidized transit passes, guaranteed-ride home and outreach programs to encourage its staff to choose sustainable modes of travel to and from work. Given TravelWise is a well-establish program in the Region, TDM efforts and outreach should be expanded beyond City staff and beyond the downtown area to encourage major employers throughout the City to adopt these services	https://www.kitchener.ca/en/resourcesGener
					5.4.2	Have the city's TDM coordinator work closely with the Region and employers, especially in downtown Kitchener, to adopt TravelWise programs, help implement other TDM strategies such as telework and carbon tracking, and provide guidance on TDM-friendly site design of developments.	
					5.4.3	Support carsharing in the City through outreach and promotional events to increase awareness, and provisions for preferred parking for carsharing vehicles to promote these services, facilitate their growth and aid their long-term viability in the City and the Region.	

Kitchener	Ontario	Transportation Master Plan	2013	No	5.4.4	Integrate TDM strategies into site planning and development approval processes to provide for TDM-supportive measures in developments and encourage sustainable transportation choices. The City should develop a TDM checklist to help review and evaluate development applications, City of Kitchener transportation-related projects and projects of the Region and Province. This checklist would assign points and provide a rating similar to the Region of Waterloo"s Travel Demand Management Implementation Checklist. Another example of a TDM checklist was developed in the study "TDM Supportive Guidelines for Development Approvals" prepared by the Association for Commuter Transportation in Canada. Part of this TDM checklist can include a requirement to prepare TDM plans as part of transportation impact studies for new developments and major transportation projects.	al/Documents/DSD_TRANSPORT_Transportation_Master_Plan_2013.pdf
					5.4.5	Work with Region and local partners to engage residents through individualized marketing to promote and encourage sustainable modes of transportation for all types of trips. As highlighted in the 2010 TDM plan, individualized marketing is aimed at targeted populations or groups and tailors the TDM strategies and programs based on the needs, opportunities and willingness to use other modes of travel.	
Waterloo (City)	Ontario	Official Plan	2012 (2018 Consolidation)	Yes	6.1.5(4)	To support transit and measures relating to transportation demand management through restrictions on parking supply, where appropriate.	https://www.waterloo.ca/en/government/resources/Documents/Cityadministration/Official-plan/Official-Plan-Consolidated-August-2018.pdf
					6.4(1)	A Transportation Impact Study to assess the transportation demands, impacts and opportunities of a proposed development may form part of a development application. Applications for site plan approval may require a Transportation Impact Study if requested by the Ministry of Transportation. While the scope of the Transportation Impact Study will vary depending on the nature of the development application, the purpose of the Study will generally be to introduce appropriate transportation demand management measures and identify and implement mitigation measures or transportation improvements to accommodate travel generated by the development.	
					6.6.1(4)	The City will plan for the development of public and/or private parking facilities to meet parking needs while promoting the more efficient use of parking resources. In addition to establishing parking requirements through the Zoning By-Law, the City may use a range of mechanisms to require or facilitate the provision of such parking, including: (e) Pricing parking to cover some or all facility costs and to help fund Transportation Demand Management strategies	
					7.7.1(2)(g)	Post-secondary educational institutions are encouraged to create campus master plans in consultation with the City, surrounding neighbourhoods, and other stakeholders, provided further that campus master plans should: (g) Promote transportation demand management strategies for staff, faculty, and students	
					8.5.3(1)	The City will encourage energy conservation in the community by (c) promoting increased reliance on public transit and pedestrian and bicycle travel and a reduced reliance on motor vehicles through measures such as enhanced physical infrastructure for transit, pedestrians and cyclists and supporting transportation demand management initiatives	
					10.1.1(12)	Development applications proposing to redesignate lands to the MixedUse Medium Density Residential designation, Mixed-Use Medium High Density Residential designation, or Mixed-Use High Density Residential designation may be contemplated based on the following: (h) The proposal identifies and implements any required transportation improvements, with a particular focus on transportation demand management measures	
					11.1.34(3) (Specific Provision Area 34 - University Expansion Area)	It shall be a policy of Council that creative parking strategies shall be encouraged, including: (b) Permitting reduced parking standards, subject to a Zoning By-Law Amendment. The review of such amendments will consider issues such as: (iv)Whether transportation demand management techniques are incorporated into the development.	
					11.1.38(5) (Specific Provision Area 38 - 247 and 253 King Street North)	The determination of appropriate increases in density for areas designated high density, shall be considered based on the ability of the project to meet one or more of the following objectives and shall be specified on a site by site basis, in the implementing zoning: (i) To encourage improvements suggested by a Transportation Demand Management Plan, where appropriate;	
Waterloo (City)	Ontario	Transportation Master Plan	2011	No	16.1.1 (Short Term Planning Horizon - 0-5 Years)	Land Use and Transportation Integration 1. Create a standardized list of TDM initiatives, based on real world experience, to enable developers to reduce auto trip numbers and parking spaces; 2. Establish maximum parking requirements for residential, commercial, industrial and institutional sites; 3. Require road networks to be transit friendly (i.e. grid structure); 4. Review development staging in new communities to ensure high density is contained in initial phasing; 5. Use tress and other green infrastructure to provide shelter, aesthetic value, shade and separation from motorized traffic; and 6. Pursue changes to Leadership in Energy and Environmental Design (LEED) rating systems transportation and parking credits (see more below in Section 16.1). Transportation Supply 7. Develop an incident detection and management system (IMS) for motorized vehicles that informs drivers of traffic congestion and alternative routes; 8. Expansion of a privately operated shared vehicle program (i.e. Grand River Car Share); and 9. Implement a bicycle sharing program (such as that being promoted at the University of Waterloo). Education Promotion and Outreach 10. Develop separate web based trip planners for cycling and walking, and provide on-route signage and maps	https://www.waterloo.ca/en/government/resources/Documents/Cityadministration/TransportationMasterPlan/Transportation-Master-Plan---PDF-Version.pdf
					16.1.2 (Long Term Planning Horizon - Recommended for Further Study)	Travel Incentives and Disincentives 11. Study the use of Transportation Pricing: - Road tolls, Congestion pricing, Area specific tolls, Distance-based auto insurance, High Occupancy Toll (HOT) Lanes, Vehicle user fees, Road space rationing, Emission fees, Fuel tax increases, Parking Program, Distance based fees	
Waterloo (Region)	Ontario	Official Plan	2009 (2015 Consolidation)	No, but there are deferrals	3.C.1	The Region, in collaboration with Area Municipalities, will implement a comprehensive Transportation Demand Management program as part of its efforts to reduce automobile dependency. This program will involve independent action as well as partnerships with the private sector, other levels of government and non-governmental organizations including educational institutions and community groups. It will also seek to make alternatives to driving more attractive, build a positive public attitude toward them, and provide information and incentives that encourage individuals to reduce automobile use. The Transportation Demand Management program will include, but not limited to: (a) community-wide and area-specific Transportation Demand Management programs; (b) employer Transportation Demand Management programs that support and enhance sustainable transportation choices to public and private sector employees and major institutions for such actions as walking, cycling, transit, carpooling, car sharing, teleworking, shuttle buses and ride-sharing programs, bicycle storage facilities and showers; and (c) increasing transportation system efficiency by encouraging van and carpooling, preferential parking for car and van pools, shared parking, bicycle parking facilities, indoor bus waiting areas, queue-jumping lanes for transit buses, smart cards and high-occupancy vehicle lanes.	https://www.regionofwaterloo.ca/en/resources/Regional-Official-Plan/Chapter_3_consolidated_rop_2015-access.pdf
					3.C.2	The Region will operate a commuter options program for Regional employees that supports and enhances sustainable transportation options for such actions as walking, cycling, transit, carpooling, car sharing, shuttle buses and ride-sharing programs, bicycle storage facilities and showers. Sustainable transportation options will also be supported and enhanced for commuter and business trave	
					3.C.3	Where an owner/applicant agrees to implement, and can appropriately secure, the transportation demand management strategies recommended in a Transportation Impact Study prepared in accordance with Policy 5.A.25, the Region may consider granting reductions in the level of road improvement that would otherwise be required to support the development.	
					3.C.4	Area Municipalities are encouraged to provide reduced parking standards for development applications where the owner/applicant agrees to incorporate transportation demand management strategies as part of the proposed development.	
					8.1.8	To better utilize existing infrastructure, Mississauga will encourage the application of transportation demand management (TDM) techniques, such as car-pooling, alternative work arrangements and shared parking.	
					8.4.1	Off-street parking facilities for vehicles and other modes of travel, such as bicycles, will be provided in conjunction with new development and will c. support transportation demand management (TDM) initiatives.	
					8.4.7	Within Intensification Areas, Mississauga will give consideration to: f. coordinating parking initiatives with transportation demand management (TDM) programs in order to effectively link transit planning, parking and other related issues in a comprehensive manner	
					8.5.1	Mississauga will encourage TDM strategies that promote transit use and active transportation, and reduce vehicle dependency, single occupant vehicle travel, trip distance and time and peak period congestion.	
					8.5.2	Mississauga will work with other levels of government, agencies and the private sector to encourage TDM measures.	
					8.5.3	Mississauga will encourage employers to implement TDM programs.	
					8.5.4	Mississauga will manage parking in Intensification Areas to encourage the use of alternative modes of transportation and the reduction of vehicular congestion.	
					8.5.5	Mississauga will encourage land uses permitted by this Plan that make efficient use of the transportation system and parking facilities during offpeak hours.	
					8.5.6	In appropriate areas, Mississauga will encourage a fee for parking and the separation of parking costs from other costs, such as transit fares, building occupancy and residential unit prices.	

Mississauga	Ontario	Official Plan	2010 (2018 Office Consolidation)	Yes	8.5.7	Prior to approval of development applications, particularly those that will generate significant employment opportunities, a TDM plan may be required that demonstrates, among other things, the following a. building orientation that supports transit service; b. minimize distance between main building entrances and transit stations/stops; c. development that is integrated into the surrounding pedestrian and cycling network; d. parking facilities designed to provide safe and efficient access for pedestrians and cyclists emanating from the surrounding transit and active transportation network; e. secure, conveniently located, weather protected, on-site bicycle storage facilities, and associated amenities such as showers, change rooms and clothing lockers; f. reserved, priority car-pool parking spaces and, where applicable, car-share spaces and taxi stands; g. parking spaces for scooters, motorcycles and other similar motorized vehicles; h. techniques to manage the supply of on-site parking; and i. measures that: ● increase the proportion of employee trips made by transit, walking and cycling; ● increase the average car occupancy rate; ● reduce the demand for vehicular travel; and ● shift travel times from peak to off-peak periods	http://www6.mississauga.ca/onlinemaps/planbldg/MOP/Chapter8-Create_a_Multi-Modal_City.pdf
					8.5.8	Car-pooling will be encouraged through the provision of High Occupancy Vehicle Lanes, priority parking, and other measures as appropriate.	
					8.5.9	Further TDM policies may be identified through a Transportation Master Plan.	
Mississauga	Ontario	Port Credit Local Area Plan	2016	unknown	9.1.14	Development applications will be accompanied by transportation and traffic studies. Studies will address, among other things, strategies for limiting impacts on the transportation network, where appropriate, including measures such as: - transportation demand management	http://www6.mississauga.ca/onlinemaps/planbldg/MOP/PortCredit_LAP.pdf
					9.1.15	Due to capacity constraints on the Port Credit transportation network, development applications requesting increases in density and height, over and above what is currently permitted in the Port Credit Local Area Plan will be discouraged unless it can be demonstrated, to the City's satisfaction, that the proposed development has included measures to limit the amount of additional vehicular demand	
					9.2.1	Reduced parking requirements and maximum parking standards may be considered within a. the Community Node, particularly in proximity to the GO Station and future LRT stops; and b. the Mainstreet Neighbourhood Precinct.	
					9.2.3	The City will encourage Transportation Demand Management measures, where appropriate, within the Community Node and as part of any significant redevelopment projects outside of the node.	
London	Ontario	Official Plan	2016 (2018 Consolidation)	Yes, but sections copied here not under appeal	362_	Municipal commuter parking facilities will be established at strategic locations, to connect with other mobility choices and service surrounding communities.	http://www.london.ca/business/Planning-Development/Official-Plan/Documents/2018-London-Plan/The-London-Plan-Policies-In-Effect-August-2018-reduced.pdf
					363_	Commuter parking facilities integrated with transit will be directed to Transit Villages and transit station areas. These facilities will be designed to fit within the context of the surrounding area and should, where possible, be incorporated with other structures/buildings in the area	
					364_	Improvements to the mobility network will be planned with an emphasis on active mobility, improved transit services, and Transportation Demand Management (TDM) targets.	
					365_	A Transportation Demand Management Program may be provided as part of a complete planning and development application in support of lowered parking requirements or a Bonus Zone. The Transportation Demand Management Program may: 1. Be integrated with required transportation impact assessments submitted to support the proposed development. 2. Identify design and/or programmatic means to reduce single occupancy vehicle uses. 3. Identify the roles and responsibilities of the property owner with respect to each recommended program and its implementation. 4. Identify the operational and financial roles and responsibilities of the property owner including, but not limited to, program development, implementation and ongoing management and operations of the transportation demand management plan and/or program.	
					368_	Parking requirements may be reduced for developments that provide associated carshare and bikeshare services.	
Vaughan	Ontario	Official Plan	2010 (2017 Office Consolidation)	Yes, but sections copied here not under appeal	4.3.3	As Vaughan's population and travel needs grow, travel demand management will be increasingly necessary to promote efficient movement. A variety of travel demand management strategies at a number of scales ranging from building-specific efforts to regional initiatives such as the existing Smart Commute program and Metrolinx's proposed Mobility Hubs, will assist in reducing single-occupant vehicle travel and reducing congestion as a whole. It is the policy of Council:	https://www.vaughan.ca/projects/policy_planning_projects/General%20Documents/Official%20Plan%20Vol%201/VOP%202010%20Volume%201%202017%20Office%20Consolidation/VOP%202010_Volume%201%20Policies%20January%202017%20Consolidation(OPA%2013%20add%20Rev%20Oct%2012%202017lm%20PDF).pdf
					4.3.3.1	To encourage and support City-wide and local travel demand management programs that reduce single-occupant vehicle travel.	
					4.3.3.2	To initiate a travel demand management program for City of Vaughan employees.	
					4.3.3.3	To work with York Region, Metrolinx and other stakeholders to support Smart Commute and other travel demand management organizations.	
					4.3.3.4	To work with school boards, the police department and residents to implement a Safe Routes to School program in all elementary schools to encourage children to walk to school, rather than relying upon auto transportation.	
					4.3.3.5	To work with developers to provide all new homebuyers with information on available pedestrian, cycling and transit facilities and carpooling options within the community, including local transit routes and schedules.	
					4.3.3.6	To facilitate choice and flexibility in mobility options by: a. encouraging, through the implementation of this Plan, the viability of pedestrian, bicycle and transit infrastructure and services as alternatives to driving; b. encouraging alternatives to peak period commuting, including telecommuting, hotelling work environments, zoning permissions for live-work units where appropriate, variable work start times and other means; c. supporting carpooling and ridesharing programs; and, d. adopting a recognition and/or awards program to highlight successful travel demand management initiatives and best practices in Vaughan.	
					4.3.3.7	To facilitate seamless connections between different modes of travel, where appropriate. The City will support a. park-and-ride lots and passenger pick-up and drop-off facilities at existing and future rapid transit and GO stations; b. working with the Region and the private sector to pursue shared use opportunities for park-and-ride facilities related to the Spadina subway. c. convenient bicycle and pedestrian access to transit stations and stops and appropriate bicycle parking facilities; d. carpool parking and coordination areas; and e. well-designed and convenient transfer stations and areas for transit users.	
					4.3.3.8	To require the preparation and implementation of a travel demand management program for all Site Plan approval applications for office uses greater than 2,000 square metres or residential apartment or mixed use buildings with greater than 50 residential units. The travel demand management program shall: a. be integrated with required transportation impact assessments submitted to support the proposed development; b. identify design and/or programmatic means to reduce single occupancy vehicle use; c. identify the roles and responsibilities of the landowner with respect to each recommended program and its implementation; and d. identify the operational and financial roles and responsibilities of the landowner including, but not limited to, program development, implementation and ongoing management and operations of the travel demand management plan and/or program.	
					4.3.3.9	To support the development of car-sharing and bike-sharing programs in Vaughan and to recognize car-sharing as an effective means for reducing parking demand.	

Markham	Ontario	Official Plan	2014 (2018 Consolidation)	Yes, TDM section specifically appealed	7.1.4.1	To provide leadership in the development, implementation and promotion of transportation demand management policies, programs and measures as an effective means of slowing the rate of growth in vehicle trips and managing peak-period congestion in the pursuit of a more environmentally sustainable future by: a) requiring that new significant development applications include a transportation demand management strategy; b) encouraging the inclusion of "travel plans" in the required transportation demand management strategies for non-residential development applications referred to in Section 7.1.4.1 a), in accordance with the Markham Transportation Strategic Plan; c) placing priority on the needs of pedestrians, cyclists and transit riders through the preparation of "mobility plans" in the 'Future Urban Area', as required by the Regional Official Plan; d) continuing to support and work with "Smart Commute Markham – Richmond Hill Transportation Management Association" to expand and strengthen the range of services offered to local workplaces; e) committing to support the continued provision of transportation demand management services and programs for Markham employees; f) supporting transportation demand management pilot projects as a strategic means to gain experience, develop best practices, build partnerships and demonstrate successful sustainable transportation initiatives; and g) continuing to work with the School Boards and the educational sector, and York Region to develop travel plans and to provide alternatives to car travel by developing safer and more attractive conditions for students to come to school by bicycle or on foot.	https://www.markham.ca/wps/wcm/connect/markham/d260f4ec-7547-4031-9b8e-53de79faa225/Official-Plan-Chapter-7-20180409.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=ROOTWORKSPACE.Z18_2QD4H901OGV160QC8BLCRJ1001-d260f4ec-7547-4031-9b8e-53de79faa225-msj7Z4m
					7.1.4.2	To support walking and cycling throughout Markham as competitive mobility choices for everyday activities such as work, school, shopping, business and leisure by: a) creating a more pedestrian-friendly environment that is interconnected by a network of safe, direct, comfortable and convenient pedestrian routes that are suitable for year-round walking; b) designing, constructing and integrating new streets and retrofitting existing streets, where appropriate, to focus on the needs of pedestrians, cyclists and persons with disabilities and ensuring safety, accessibility, convenience, and comfort of all street users are considered; c) to work with York Region to ensure that sidewalks and street lighting are provided on all streets served by transit; d) supporting the provision of accessible, grade-separated crossings, where feasible and environmentally acceptable, at barrier points where major roads, highways, rail lines, and natural features such as ravines and waterways present a significant disruption to the movement of pedestrians and cyclists; e) promoting a safe and comprehensive network of signed bike routes, bike lanes, cycling trails and multi-use paths for cyclists of all ages and abilities generally as identified in Appendix D – Cycling Facilities based on the Markham and York Region Cycling Master Plans; f) implementing segregated bicycle lanes and/or off-road bicycle paths along arterial roads and major and minor collector roads where cycling safety is a foremost concern; g) enhancing and integrating convenient and secure public bicycle parking within: i. inter-modal locations such as rail stations and transit stops; ii. major trip attractors such as sports venues, entertainment centres, shopping complexes and community service centres; and iii. the right-of-ways of streets in new mixed-use neighbourhoods and intensification areas; h) updating the zoning by-law to include bicycle parking standards and requirements for shower and change facilities in major non-residential developments; i) supporting the implementation of Markham's Pathways and Trails Master Plan to create a connected network of off-road trails through natural areas and hydro corridors for use by pedestrians and cyclists; j) considering the introduction of a bike-share program for residents and visitors to Markham; and k) partnering with the Region and organizations in the local cycling community to support on-going promotional, safety and educational programs for pedestrians and cyclists.	
					7.1.5.3	To support the inclusion of preferential parking measures for carpool vehicles, car-share vehicles and low-emission vehicles as part of transportation demand management strategies and to secure such arrangements through an appropriate agreement.	
Aurora	Ontario	Official Plan	2010	No	14.2.1(f)	Travel Demand Management (TDM) measures shall be identified and developed as part of any major development or redevelopment in order to reduce the single-occupant vehicle usage and to promote other modes of transportation such as walking, cycling, and public transit.	https://www.aurora.ca/TownHall/Documents/Planning%20Services/REVISED%202015%20Official%20Plan_Full%20Document.pdf
Newmarket	Ontario	Newmarket Urban Centres Secondary Plan	2014 (2016 Office Consolidation)	Yes	9.2	Transportation and mobility in the Urban Centres will be planned to f) include an active transportation network that connects the Urban Centresinternally and that links the Urban Centres to the surrounding community	https://www.newmarket.ca/LivingHere/Documents/Planning%20Department/Secondary%20Plan/Urban%20Centres%20Secondary%20Plan%20-%20October%2025%202016%20Consolidation.pdf
					9.3.4(iii)	Developments will be required to facilitate and promote connectivity to the Town-wide Active Transportation Network identified on Schedule D of the Official Plan through urban design and Transportation Demand Measures.	
					9.3.5(iii)	In addition to all studies that may be required in accordance with Newmarket Official Plan, all non-residential development in the Urban Centres and all residential development in the Urban Centres proposing 10 or more residential units shall be required to prepare a Transportation Demand Management Strategy as part of its Traffic Impact Report. The TDM strategy will describe actions intended to discourage single-occupancy vehicle trips, alternative parking standards, minimize parking, and promote transit use, cycling, car and bike sharing, carpooling, and other measures	
					9.3.5(iv)	TDM strategies should be designed to decrease single occupancy vehicle use, reduce peak period demands, especially discretionary trips in the afternoon peak period, promote active transportation and transit use and to increase vehicle occupancy during peak periods and should include, but not be limited to: a) provision for car share opportunities in major residential developments; b) secure indoor bicycle parking and showers in conjunction with major office and commercial uses, institutional and civic uses; c) preferential parking for carpool and electric vehicles in non-residential developments; d) provision for bicycle parking in close proximity to building entrances and transit stations; e) transit incentive programs, including subsidized transit fares; and f) incorporating paid parking requirements with non-residential development.	
					9.3.6(i)	The Town will establish appropriate parking standards for the Urban Centres in the Zoning By-law. Parking requirements will seek to reduce the parking standards in order to encourage a shift toward non-auto modes of transportation\ and reflect the walking distance to transit and complementary uses	
					9.3.6(ii)	Parking facilities shall be designed to accommodate bicycle parking as well as reserved spaces for drivers of car-share or car pool vehicles and electric cars.	
					9.3.6(vi)	All commercial, office, institutional, mixed use and multi-unit residential buildings, excluding townhouses and stacked townhouses, shall include secure bicycle parking and storage facilities, preferably indoors.	
					9.3.6(vii)	The implementing by-law shall establish minimum requirements for bicycle parking. Major office developments and major institutional employers shall be encouraged to include change rooms, showers and lockers for bicycle commuters.	
					14.2.2(ii)	The pace of development will be coordinated to ensure that development will be permitted where it is supported by the appropriate level of infrastructure including, where applicable c) Transportation Demand Management measures;	
Oakville	Ontario	Official Plan	2009 (2017 Office Consolidation)	No	8.14.1	Through the development process, the Town will encourage opportunities for developing transportation demand management (TDM) measures to reduce single occupancy motor vehicle use, especially during peak travel periods. TDM measures include, but are not limited to, carpooling programs, preferential parking for carpool members, transit pass incentives, cycling initiatives, telecommuting, flex hours, provision of private shuttles, and walking programs.	https://www.oakville.ca/assets/2011%20planning/2017-04-04%20Livable%20Oakville%20-%20Office%20Consolidation.pdf
					8.14.2	TDM will be used to reduce the use of single occupancy vehicles and encourage increased transit ridership, walking and cycling.	
					8.14.3	As an incentive to encourage TDM, the Town may permit reduced parking standards for developments which demonstrate, through a TDM plan and implementation strategy, that a reduction in parking standards is appropriate.	
					8.15.3	Reduced surface parking may be considered as part of a TDM plan.	
Oakville	Ontario	North Oakville East Secondary Plan	2008	No	7.7.2.3(a)	The Town recognizes the role of Travel Demand Management in promoting more efficient use of transportation infrastructure, making the use of private vehicles more sustainable and encouraging increased transit use. The Town shall encourage businesses and/or organizations to prepare and administer special transportation demand management strategies which promote more efficient use of existing road facilities including staggered work hours, car pooling and High Occupancy Vehicle (HOV) lanes and other similar approaches.	https://www.oakville.ca/assets/2011%20planning/nco-EastPlan.pdf
					7.7.2.3(b)	The Town will encourage any development which contains more than 3,000 square metres of office use or 9,290 square metres of industrial use to establish with the Town a travel demand management plan and implementation strategy for the specific development. Priority shall be given to measures which are not capital intensive (e.g. flexible working hours, priority parking for car pool vehicles) and which are feasible given the scale, ultimate occupant/user and location of the development.	
					7.7.2.3(c)	As an incentive to encourage travel demand management as set out in Subsection a) and b), the Town will permit reduced parking standards for developments which demonstrate through a travel demand management plan and implementation strategy that a reduction in parking standards is appropriate. A reduction in parking standards will also be considered where mixed use development is permitted, where there is significant density of development and good accessibility to transit, such as in the Urban Core Area designation.	
					6.4.1	Reduction of vehicle parking will be considered on the basis of the mix of uses, contributions to the installation and implementation of travel demand measures and other sustainable mobility options and facilities or services.	

Toronto	Ontario	Sheppard Lansing Secondary Plan	2017	Yes, completely	6.5.1	A Transportation Demand Management Program will be required for all applications to amend the zoning by-law and will: a. Be integrated with required transportation impact assessments submitted to support the proposed development; b. Identify design and/or programmatic means to reduce single occupancy vehicle use and encourage transit use, cycling and walking; c. Identify the roles and responsibilities of the property owner with respect to each recommended program and its implementation; and d. Identify the operational and financial roles and responsibilities of the property owner including, but not limited to, program development, implementation and ongoing management and operations of the transportation demand management plan and/or program.	https://www.toronto.ca/legdocs/bylaws/2017/law0123.pdf
					6.5.2	Developments will provide transit supportive infrastructure, such as pavement markings at key stops, seating, street furniture and security features, to improve transit users' experience as part of the travel demand management strategies.	
Toronto	Ontario	Downsview Area Secondary Plan	1999 (updated in 2011)	No	2.3.20	Office and other employment development proponents will be encouraged to develop and implement appropriate travel demand management strategies to reduce peak period automobile trips, and facilitate non-auto modes of travel such as transit, walking and cycling. In addition, measures to support transit use such as maximum parking standards, shared parking arrangements, public parking structures and payment-in-lieu of parking may be considered on sites within walking distances of rapid transit stations	https://www.toronto.ca/wp-content/uploads/2017/11/902d-cp-official-plan-SP-7-Downsview.pdf
					7.2.1	A transportation monitoring program will be developed with stakeholders to monitor the development levels and trends and associated travel characteristics. The monitoring program will address g) the results of Transportation Demand Management measures and the extent to which the objectives of the Downsview Area Secondary Plan Transportation Master Plan are being achieved	
Toronto	Ontario	North York Centre Secondary Plan	N/A	No	4.7(a)	It is a basic objective of this Secondary Plan to encourage the use of public transit and establish a high transit modal split in the North York Centre. This is desirable to make the best use of the available capacity of the existing and planned transportation network, and to minimize the environmental effects from automobile traffic. The City will actively work with developers, owners and tenants in the North York Centre to develop, implement, facilitate and promote measures to increase the use of transit, cycling and walking, and reduce the use of low-occupancy automobiles for trips, particularly work trips, to and from the North York Centre." These measures include: i. promoting the use of public transit by employees; ii. promoting the use of bicycles by employees, residents and visitors for business and recreational trips; iii. promoting measures to foster higher vehicle occupancy; iv. assisting in organizing and promoting car pooling; v. giving priority parking space assignments and/or reduced rates for car pools; vi. varying hours of work to reduce peak hour loads; vii. participating in a Transportation Management Association; viii.giving priority parking space assignments or reduced rates for non-polluting motor vehicles, such as electric cars, as they become available to the general market; and ix. other measures that may be identified	https://www.toronto.ca/wp-content/uploads/2017/11/8fe9-cp-official-plan-SP-8-North-York-Centre.pdf

Appendix E – Transportation Tomorrow Survey (TTS) Details: Residential Travel Mode Split (South Guelph)

Thu Dec 27 2018 18:16:16 GMT-0500 (Eastern Standard Time)

Frequency Distribution Query Form - Trip - 2016 v1.1

Field: Primary travel mode of trip - mode_prime

Filters:
Start time of trip - start_time In 700-900
and
2006 GTA zone of destination - gt 8078-8081 8062 8064 8068 8067
and
Trip purpose of destination - purp

Table: Trip 2016

Row:	Count:	Expanded:
Transit excluding GO rail	1	19
Auto driver	16	332
Auto passenger	1	8
Walk	2	42
Total:	20	401

Thu Dec 27 2018 18:15:33 GMT-0500 (Eastern Standard Time)

Frequency Distribution Query Form - Trip - 2016 v1.1

Field: Primary travel mode of trip - mode_prime

Filters:
Start time of trip - start_time In 700-900
and

2006 GTA zone of origi	8078-8081	8062	8064	8068	8067

and
Trip purpose of origin -

Table: Trip 2016

Row:	Count:	Expanded:
Transit excluding GO ra	27	699
Cycle	8	215
Auto driver	250	5310
Auto passenger	29	657
School bus	31	848
Walk	22	449
Total:	367	8177

Thu Dec 27 2018 18:17:00 GMT-0500 (Eastern Standard Time)

Frequency Distribution Query Form - Trip - 2016 v1.1

Field: Primary travel mode of trip - mode_prime

Filters:
Start time of trip - start_time In 1600-1800
and

2006 GTA z	8078-8081	8062	8064	8068	8067

and
Trip purpos

Table: Trip 2016

Row:	Count:	Expanded:
Transit exc	24	581
Cycle	6	142
Auto driver	243	4994
GO rail only	3	53
Auto passe	28	539
School bus	9	211
Taxi passer	1	43
Walk	5	86
Total:	319	6649

Thu Dec 27 2018 18:17:27 GMT-0500 (Eastern Standard Time)

Frequency Distribution Query Form - Trip - 2016 v1.1

Field: Primary travel mode of trip - mode_prime

Filters:
Start time of trip - start_time In 1600-1800
and

2006 GTA z	8078-8081	8062	8064	8068	8067

and
Trip purpos

Table: Trip 2016

Row:	Count:	Expanded:
Transit exc	2	82
Auto driver	59	1249
Auto passe	28	627
Total:	89	1958

Travel Mode	Resident Travel Mode Split									
	Weekday AM Inbound		Weekday AM Outbound		Weekday PM Inbound		Weekday PM Outbound		Overall	
	Count	*Proportion*	*Count*	*Proportion*	*Count*	*Proportion*	*Count*	*Proportion*	*Count*	*Proportion*
Transit excluding GO rail	19	5%	699	9%	581	9%	82	4%	1381	8%
Cycle		0%	215	3%	142	2%		0%	357	2%
Auto driver	332	83%	5310	65%	4994	75%	1249	64%	11885	69%
GO rail only		0%		0%	53	1%		0%	53	0%
Auto passenger	8	2%	657	8%	539	8%	627	32%	1831	11%
School bus		0%	848	10%	211	3%		0%	1059	6%
Taxi passenger		0%		0%	43	1%		0%	43	0%
Walk	42	10%	449	5%	86	1%		0%	577	3%
Total:	401	1	8178	1	6649	1	1958	1	17186	1

Travel Mode	Resident Travel Mode Split			
	Weekday AM Total		Weekday PM Total	
	Count	*Proportion*	*Count*	*Proportion*
Transit excluding GO rail	718	8%	663	8%
Cycle	215	3%	142	2%
Auto driver	5642	66%	6243	73%
GO rail only	0	0%	53	1%
Auto passenger	665	8%	1166	14%
School bus	848	10%	211	2%
Taxi passenger	0	0%	43	0%
Walk	491	6%	86	1%
Total:	8579	1	8607	1

Auto	74%	86%
Transit	8%	8%
Walk	6%	1%
Cycle	3%	2%
Other	10%	3%

Appendix F – Transportation Tomorrow Survey (TTS) Details: Residential Travel Mode Split (Proxy Area Data)

Cornell, Markham

Mon Jan 07 2019 11:18:59 GMT-0500 (Eastern Standard Time) - Run Time: 1648ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of origin - gta06_orig

Filters:
2006 GTA zone of origin - gta 2457
and
Start time of trip - start_time In 700-900
and
Trip purpose of origin - purp
and
Type of dwelling unit - dwell_type In 1

Trip 2016
Table:

	2453	2454	2455	2457	Total
Transit excluding GO rail	22	410	73	128	633
Cycle	0	19	0	9	28
Auto driver	177	1545	1029	517	3268
GO rail only	19	55	18	0	92
Joint GO rail and local transit	0	28	27	5	60
Auto passenger	32	587	102	313	1034
School bus	147	52	46	10	255
Walk	0	175	60	62	297
					5667

Travel Mode	**Trips**	**Proportion**
Auto Driver	3268	58%
Auto Passenger	1034	18%
Transit	785	14%
Walk	297	5%
Cycle	28	0%
Other	255	4%
	5667	

Mon Jan 07 2019 14:11:58 GMT-0500 (Eastern Standard Time) - Run Time: 1985ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of destination - gta06_dest

Filters:
2006 GTA zone of destinatio 2457
and
Start time of trip - start_time In 700-900
and
Trip purpose of destination -
and
Type of dwelling unit - dwell

Trip 2016
Table:

	2454	2455	2457	Total
Auto driver	193	103	58	354
Auto passenger	0	26	0	26
Walk	0	42	16	58
				0
				0
				0
				0
				0
				438

Travel Mode	**Trips**	**Proportion**
Auto Driver	354	81%
Auto Passenger	26	6%
Transit	0	0%
Walk	58	13%
Cycle	0	0%
Other	0	0%
	438	

Mon Jan 07 2019 11:21:18 GMT-0500 (Eastern Standard Time) - Run Time: 1678ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of origin - gta06_orig

Filters:
2006 GTA zone of origin - gta06 2457
and
Start time of trip - start_time In 700-900
and
Trip purpose of origin - purp_o
and
Type of dwelling unit - dwell_type In 2-3

Trip 2016
Table:

	2453	2454	2455	2457	Total
Transit excluding GO rail	0	282	36	7	325
Auto driver	20	911	271	179	1381
GO rail only	0	66	15	0	81
Joint GO rail and local transit	0	9	0	0	9
Auto passenger	0	230	208	5	443
School bus	0	0	0	12	12
Walk	0	92	16	0	108
					0
					2359

Travel Mode	**Trips**	**Proportion**
Auto Driver	1381	59%
Auto Passenger	443	19%
Transit	415	18%
Walk	108	5%
Cycle		0%
Other	12	1%
	2359	

Mon Jan 07 2019 14:12:59 GMT-0500 (Eastern Standard Time) - Run Time: 2328ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of destination - gta06_dest

Filters:
2006 GTA zone of destination - 2457
and
Start time of trip - start_time In 700-900
and
Trip purpose of destination - pu
and
Type of dwelling unit - dwell_ty 3

Trip 2016
Table:

	2454	2455	Total
Auto driver	159	75	234
Walk	18	0	18
			0
			0
			0
			0
			0
			0
			252

Travel Mode	**Trips**	**Proportion**
Auto Driver	234	93%
Auto Passenger	0	0%
Transit	0	0%
Walk	18	7%
Cycle	0	0%
Other	0	0%
	252	

Mon Jan 07 2019 11:13:23 GMT-0500 (Eastern Standard Time) - Run Time: 2404ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of destination - gta06_dest

Filters:
2006 GTA zone of dest 2457
and
Start time of trip - start_time In 1600-1800
and
Trip purpose of destin
and
Type of dwelling unit - dwell_type In 1

Trip 2016
Table:

	2453	2454	2455	2457	Total
Transit excluding GO r	22	271	198	121	612
Cycle	0	39	0	0	39
Auto driver	278	1287	979	582	3126
GO rail only	9	90	42	49	190
Joint GO rail and local	0	43	35	8	86
Auto passenger	32	232	114	40	418
School bus	58	0	23	0	81
Walk	0	14	18	0	32
					4584

Travel Mode	**Trips**	**Proportion**
Auto Driver	3126	68%
Auto Passenger	418	9%
Transit	888	19%
Walk	32	1%
Cycle	39	1%
Other	81	2%
	4584	

Mon Jan 07 2019 14:21:32 GMT-0500 (Eastern Standard Time) - Run Time: 1965ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of origin - gta06_orig

Filters:
2006 GTA zone of orig 2457
and
Start time of trip - start_time In 1600-1800
and
Trip purpose of origin
and
Type of dwelling unit -

Trip 2016
Table:

	2453	2454	2455	2457	Total
Transit excluding GO r	0	0	28	0	28
Cycle	0	38	0	0	38
Auto driver	53	307	277	91	728
Auto passenger	32	128	85	16	261
					0
					0
					0
					0
					1055

Travel Mode	**Trips**	**Proportion**
Auto Driver	728	69%
Auto Passenger	261	25%
Transit	28	3%
Walk	0	0%
Cycle	38	4%
Other	0	0%
	1055	

Mon Jan 07 2019 11:12:53 GMT-0500 (Eastern Standard Time) - Run Time: 2227ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of destination - gta06_dest

Filters:
2006 GTA zone of destina 2457
and
Start time of trip - start_time In 1600-1800
and
Trip purpose of destinatic
and
Type of dwelling unit - dwell_type In 2-3

Trip 2016
Table:

	2454	2455	2457	Total
Transit excluding GO rail	134	45	0	179
Auto driver	937	305	140	1382
GO rail only	59	22	12	93
Joint GO rail and local trai	25	6	7	38
Auto passenger	168	161	0	329
Taxi passenger	0	16	0	16
Walk	0	21	0	21
				0
				2058

Travel Mode	**Trips**	**Proportion**
Auto Driver	1382	67%
Auto Passenger	345	17%
Transit	310	15%
Walk	21	1%
Cycle		0%
Other	0	0%
	2058	

Mon Jan 07 2019 14:21:05 GMT-0500 (Eastern Standard Time) - Run Time: 2178ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of origin - gta06_orig

Filters:
2006 GTA zone of origin - 2457
and
Start time of trip - start_time In 1600-1800
and
Trip purpose of origin - pu
and
Type of dwelling unit - dw 3

Trip 2016
Table:

	2453	2454	2455	2457	Total
Transit excluding GO rail	0	0	64	0	64
Auto driver	20	166	90	43	319
Auto passenger	0	39	0	0	39
Walk	0	47	0	0	47
					0
					0
					0
					0
					469

Travel Mode	**Trips**	**Proportion**
Auto Driver	319	68%
Auto Passenger	39	8%
Transit	64	14%
Walk	47	10%
Cycle	0	0%
Other	0	0%
	469	

Oak Park, Oakville

Mon Jan 07 2019 11:28:16 GMT-0500 (Eastern Standard Time) - Run Time: 1996ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of origin - gta06_orig

Filters:
2006 GTA zone of origin - gta06_orig In 4034-4036
and
Start time of trip - start_time In 700-900
and
Trip purpose of origin
and
Type of dwelling unit - dwell_type In 1

Trip 2016
Table:

	4034	4035	4036	Total
Transit excluding GO	0	9	35	44
Cycle	28	0	0	28
Auto driver	502	356	630	1488
GO rail only	39	10	17	66
Joint GO rail and local	0	0	19	19
Auto passenger	234	103	246	583
School bus	162	40	0	202
Walk	0	20	176	196
				2626

Travel Mode	**Trips**	**Proportion**
Auto Driver	1488	57%
Auto Passenger	583	22%
Transit	129	5%
Walk	196	7%
Cycle	28	1%
Other	202	8%
	2626	

Mon Jan 07 2019 14:32:49 GMT-0500 (Eastern Standard Time) - Run Time: 1855ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of destination - gta06_dest

Filters:
2006 GTA zone of destination - gta06_dest In 4034-4036
and
Start time of trip - start_time In 700-900
and
Trip purpose of destir
and
Type of dwelling unit

Trip 2016
Table:

	4034	4035	4036	Total
Auto driver	108	72	90	270
Walk	0	0	44	44
				0
				0
				0
				0
				0
				0
				314

Travel Mode	**Trips**	**Proportion**
Auto Driver	270	86%
Auto Passenger	0	0%
Transit	0	0%
Walk	44	14%
Cycle	0	0%
Other	0	0%
	314	

Mon Jan 07 2019 11:28:37 GMT-0500 (Eastern Standard Time) - Run Time: 2053ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of origin - gta06_orig

Filters:
2006 GTA zone of origin - gta06_orig In 4034-4036
and
Start time of trip - start_time In 700-900
and
Trip purpose of origin -
and
Type of dwelling unit - 3

Trip 2016
Table:

	4034	4035	4036	Total
Transit excluding GO ra	0	28	49	77
Auto driver	306	483	388	1177
GO rail only	10	38	36	84
Joint GO rail and local t	0	15	23	38
Auto passenger	69	54	43	166
School bus	71	0	0	71
Walk	0	32	68	100
				0
				1713

Travel Mode	**Trips**	**Proportion**
Auto Driver	1177	69%
Auto Passenger	166	10%
Transit	199	12%
Walk	100	6%
Cycle	0	0%
Other	71	4%
	1713	

Mon Jan 07 2019 14:32:27 GMT-0500 (Eastern Standard Time) - Run Time: 2302ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of destination - gta06_dest

Filters:
2006 GTA zone of destination - gta06_dest In 4034-4036
and
Start time of trip - start_time In 700-900
and
Trip purpose of destina
and
Type of dwelling unit - 3

Trip 2016
Table:

	4034	4035	4036	Total
Auto driver	86	26	32	144
Walk	0	0	22	22
				0
				0
				0
				0
				0
				0
				166

Travel Mode	**Trips**	**Proportion**
Auto Driver	144	87%
Auto Passenger	0	0%
Transit	0	0%
Walk	22	13%
Cycle	0	0%
Other	0	0%
	166	

Mon Jan 07 2019 11:29:46 GMT-0500 (Eastern Standard Time) - Run Time: 2094ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of destination - gta06_dest

Filters:
2006 GTA zone of destination - gta06_dest In 4034-4036
and
Start time of trip - start_time In 1600-1800
and
Trip purpose of destir
and
Type of dwelling unit - dwell_type In 1

Trip 2016
Table:

	4034	4035	4036	Total
Transit excluding GO	0	0	37	37
Cycle	28	0	23	51
Auto driver	420	369	506	1295
GO rail only	39	23	48	110
Joint GO rail and local	0	0	19	19
Auto passenger	13	14	105	132
Paid rideshare	23	0	0	23
Walk	0	0	23	23
				1690

Travel Mode	**Trips**	**Proportion**
Auto Driver	1295	77%
Auto Passenger	132	8%
Transit	166	10%
Walk	23	1%
Cycle	51	3%
Other	23	1%
	1690	

Mon Jan 07 2019 14:31:10 GMT-0500 (Eastern Standard Time) - Run Time: 1961ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of origin - gta06_orig

Filters:
2006 GTA zone of origin - gta06_orig In 4034-4036
and
Start time of trip - start_time In 1600-1800
and
Trip purpose of origin
and
Type of dwelling unit

Trip 2016
Table:

	4034	4035	4036	Total
Auto driver	33	52	169	254
GO rail only	0	0	35	35
Auto passenger	47	0	29	76
				0
				0
				0
				0
				0
				365

Travel Mode	**Trips**	**Proportion**
Auto Driver	254	70%
Auto Passenger	76	21%
Transit	35	10%
Walk	0	0%
Cycle	0	0%
Other	0	0%
	365	

Mon Jan 07 2019 11:29:27 GMT-0500 (Eastern Standard Time) - Run Time: 1996ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of destination - gta06_dest

Filters:
2006 GTA zone of destination - gta06_dest In 4034-4036
and
Start time of trip - start_time In 1600-1800
and
Trip purpose of destina
and
Type of dwelling unit - 3

Trip 2016
Table:

	4034	4035	4036	Total
Transit excluding GO ra	0	10	14	24
Cycle	0	17	0	17
Auto driver	199	356	274	829
GO rail only	10	18	14	42
Joint GO rail and local t	0	25	0	25
Auto passenger	58	36	43	137
Walk	0	0	23	23
				0
				1097

Travel Mode	**Trips**	**Proportion**
Auto Driver	829	76%
Auto Passenger	137	12%
Transit	91	8%
Walk	23	2%
Cycle	17	2%
Other	0	0%
	1097	

Mon Jan 07 2019 14:31:41 GMT-0500 (Eastern Standard Time) - Run Time: 1969ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of origin - gta06_orig

Filters:
2006 GTA zone of origin - gta06_orig In 4034-4036
and
Start time of trip - start_time In 1600-1800
and
Trip purpose of origin -
and
Type of dwelling unit - 3

Trip 2016
Table:

	4034	4035	4036	Total
Auto driver	0	28	31	59
Auto passenger	0	10	49	59
Taxi passenger	14	0	0	14
Walk	0	10	0	10
				0
				0
				0
				0
				142

Travel Mode	**Trips**	**Proportion**
Auto Driver	59	42%
Auto Passenger	73	51%
Transit	0	0%
Walk	10	7%
Cycle	0	0%
Other	0	0%
	142	

Orchard, Burlington

Mon Jan 07 2019 11:46:00 GMT-0500 (Eastern Standard Time) - Run Time: 2228ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of origin - gta06_orig

Filters:
2006 GTA zone of orig 4189
and
Start time of trip - start_time In 700-900
and
Trip purpose of origin
and
Type of dwelling unit

Trip 2016
Table:

	4079	4189	Total
Transit excluding GO	130	223	353
Cycle	19	50	69
Auto driver	2947	2675	5622
GO rail only	125	22	147
Joint GO rail and local	104	70	174
Auto passenger	559	373	932
School bus	360	502	862
Walk	783	785	1568
			9727

Travel Mode	**Trips**	**Proportion**
Auto Driver	5622	58%
Auto Passenger	932	10%
Transit	674	7%
Walk	1568	16%
Cycle	69	1%
Other	862	9%
	9727	

Mon Jan 07 2019 15:32:35 GMT-0500 (Eastern Standard Time) - Run Time: 2400ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of destination - gta06_dest

Filters:
2006 GTA zone of des 4189
and
Start time of trip - start_time In 700-900
and
Trip purpose of destir
and
Type of dwelling unit

Trip 2016
Table:

	4079	4189	Total
Auto driver	400	132	532
Walk	28	76	104
			0
			0
			0
			0
			0
			0
			636

Travel Mode	**Trips**	**Proportion**
Auto Driver	532	84%
Auto Passenger	0	0%
Transit	0	0%
Walk	104	16%
Cycle	0	0%
Other	0	0%
	636	

Mon Jan 07 2019 11:45:39 GMT-0500 (Eastern Standard Time) - Run Time: 2071ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of origin - gta06_orig

Filters:
2006 GTA zone of orig 4189
and
Start time of trip - start_time In 700-900
and
Trip purpose of origin
and
Type of dwelling unit 3

Trip 2016
Table:

	4079	4189	Total
Transit excluding GO	53	0	53
Auto driver	784	313	1097
GO rail only	0	16	16
Joint GO rail and local	22	0	22
Auto passenger	89	47	136
School bus	25	0	25
Walk	60	0	60
			0
			1409

Travel Mode	**Trips**	**Proportion**
Auto Driver	1097	78%
Auto Passenger	136	10%
Transit	91	6%
Walk	60	4%
Cycle	0	0%
Other	25	2%
	1409	

Mon Jan 07 2019 15:33:00 GMT-0500 (Eastern Standard Time) - Run Time: 2528ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of destination - gta06_dest

Filters:
2006 GTA zone of des 4189
and
Start time of trip - start_time In 700-900
and
Trip purpose of destir
and
Type of dwelling unit 3

Trip 2016
Table:

	4079	4189	Total
Auto driver	80	16	96
Auto driver			0
GO rail only			0
Joint GO rail and local transit			0
Auto passenger			0
School bus			0
Walk			0
			0
			96

Travel Mode	**Trips**	**Proportion**
Auto Driver	96	100%
Auto Passenger	0	0%
Transit	0	0%
Walk	0	0%
Cycle	0	0%
Other	0	0%
	96	

Mon Jan 07 2019 11:43:49 GMT-0500 (Eastern Standard Time) - Run Time: 2464ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of destination - gta06_dest

Filters:
2006 GTA zone of des 4189
and
Start time of trip - start_time In 1600-1800
and
Trip purpose of destir
and
Type of dwelling unit - dwell_type In 1

Trip 2016
Table:

	4079	4189	Total
Transit excluding GO	55	170	225
Auto driver	2584	2321	4905
GO rail only	247	20	267
Joint GO rail and local	104	142	246
Auto passenger	201	390	591
School bus	51	213	264
Taxi passenger	0	17	17
Walk	23	220	243
			6758

Travel Mode	**Trips**	**Proportion**
Auto Driver	4905	73%
Auto Passenger	608	9%
Transit	738	11%
Walk	243	4%
Cycle	0	0%
Other	264	4%
	6758	

Mon Jan 07 2019 15:34:01 GMT-0500 (Eastern Standard Time) - Run Time: 2187ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of origin - gta06_orig

Filters:
2006 GTA zone of orig 4189
and
Start time of trip - start_time In 1600-1800
and
Trip purpose of origin
and
Type of dwelling unit

Trip 2016
Table:

	4079	4189	Total
Auto driver	732	514	1246
Auto passenger	329	272	601
Walk	0	28	28
			0
			0
			0
			0
			0
			1875

Travel Mode	**Trips**	**Proportion**
Auto Driver	1246	66%
Auto Passenger	601	32%
Transit	0	0%
Walk	28	1%
Cycle	0	0%
Other	0	0%
	1875	

Mon Jan 07 2019 11:44:39 GMT-0500 (Eastern Standard Time) - Run Time: 2392ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of destination - gta06_dest

Filters:
2006 GTA zone of des 4189
and
Start time of trip - start_time In 1600-1800
and
Trip purpose of destir
and
Type of dwelling unit 3

Trip 2016
Table:

	4079	4189	Total
Transit excluding GO	53	0	53
Auto driver	698	394	1092
GO rail only	61	0	61
Joint GO rail and local	22	18	40
Auto passenger	128	40	168
Walk	44	0	44
			0
			0
			1458

Travel Mode	**Trips**	**Proportion**
Auto Driver	1092	75%
Auto Passenger	168	12%
Transit	154	11%
Walk	44	3%
Cycle	0	0%
Other	0	0%
	1458	

Mon Jan 07 2019 15:33:43 GMT-0500 (Eastern Standard Time) - Run Time: 1937ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of origin - gta06_orig

Filters:
2006 GTA zone of orig 4189
and
Start time of trip - start_time In 1600-1800
and
Trip purpose of origin
and
Type of dwelling unit 3

Trip 2016
Table:

	4079	4189	Total
Auto driver	134	31	165
GO rail only	21	0	21
Auto passenger	35	0	35
Walk	44	0	44
			0
			0
			0
			0
			265

Travel Mode	**Trips**	**Proportion**
Auto Driver	165	62%
Auto Passenger	35	13%
Transit	21	8%
Walk	44	17%
Cycle	0	0%
Other	0	0%
	265	

Summary

Proxy Development Area (Single Houses)

Travel Mode	Cornell, Markham				Oak Park, Oakville				Orchard, Burlington				Average			
	AM		*PM*		*AM*		*PM*		*AM*		*PM*		*AM*		*PM*	
	Inbound	***Outbound***	***Inbound***	***Outbound***	***Inbound***	***Outbound***	***Inbound***	***Outbound***	***Inbound***	***Outbound***	***Inbound***	***Outbound***	***Inbound***	***Outbound***	***Inbound***	***Outbound***
Auto Driver	81%	58%	68%	69%	86%	57%	77%	70%	84%	58%	73%	66%	83%	57%	72%	68%
Auto Passenger	6%	18%	9%	25%	0%	22%	8%	21%	0%	10%	9%	32%	2%	17%	9%	26%
Transit	0%	14%	19%	3%	0%	5%	10%	10%	0%	7%	11%	0%	0%	9%	13%	4%
Walk	13%	5%	1%	0%	14%	7%	1%	0%	16%	16%	4%	1%	15%	10%	2%	0%
Cycle	0%	0%	1%	4%	0%	1%	3%	0%	0%	1%	0%	0%	0%	1%	1%	1%
Other	0%	4%	2%	0%	0%	8%	1%	0%	0%	9%	4%	0%	0%	7%	2%	0%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Proxy Development Area (Apartments and Townhouses)

Travel Mode	Cornell, Markham				Oak Park, Oakville				Orchard, Burlington				Average			
	AM		*PM*		*AM*		*PM*		*AM*		*PM*		*AM*		*PM*	
	Inbound	***Outbound***	***Inbound***	***Outbound***	***Inbound***	***Outbound***	***Inbound***	***Outbound***	***Inbound***	***Outbound***	***Inbound***	***Outbound***	***Inbound***	***Outbound***	***Inbound***	***Outbound***
Auto Driver	93%	59%	67%	68%	87%	69%	76%	42%	100%	78%	75%	62%	93%	68%	73%	57%
Auto Passenger	0%	19%	17%	8%	0%	10%	12%	51%	0%	10%	12%	13%	0%	13%	14%	24%
Transit	0%	18%	15%	14%	0%	12%	8%	0%	0%	6%	11%	8%	0%	12%	11%	7%
Walk	7%	5%	1%	10%	13%	6%	2%	7%	0%	4%	3%	17%	7%	5%	2%	11%
Cycle	0%	0%	0%	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	1%	0%
Other	0%	1%	0%	0%	0%	4%	0%	0%	0%	2%	0%	0%	0%	2%	0%	0%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Proxy Development Area (All Dwelling Units)

Travel Mode	Cornell, Markham				Oak Park, Oakville				Orchard, Burlington				Average			
	AM		*PM*		*AM*		*PM*		*AM*		*PM*		*AM*		*PM*	
	Inbound	***Outbound***	***Inbound***	***Outbound***	***Inbound***	***Outbound***	***Inbound***	***Outbound***	***Inbound***	***Outbound***	***Inbound***	***Outbound***	***Inbound***	***Outbound***	***Inbound***	***Outbound***
Auto Driver	85%	58%	68%	69%	86%	61%	76%	62%	86%	60%	73%	66%	86%	60%	72%	65%
Auto Passenger	4%	18%	11%	20%	0%	17%	10%	29%	0%	10%	9%	30%	1%	15%	10%	26%
Transit	0%	15%	18%	6%	0%	8%	9%	7%	0%	7%	11%	1%	0%	10%	13%	5%
Walk	11%	5%	1%	3%	14%	7%	2%	2%	14%	15%	3%	3%	13%	9%	2%	3%
Cycle	0%	0%	1%	2%	0%	1%	2%	0%	0%	1%	0%	0%	0%	1%	1%	1%
Other	0%	3%	1%	0%	0%	6%	1%	0%	0%	8%	3%	0%	0%	6%	2%	0%
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Appendix G – Transportation Tomorrow Survey (TTS) Details: Employee (Office) Travel Mode Split

Mon Jan 14 2019 15:47:19 GMT-0500 (Eastern Standard Time) - Run Time: 2210ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of destination - gta06_dest

Filters:
2006 GTA zone of 8064 8067-8076 8078-8081
and
Trip purpose of d
and
Start time of trip - start_time In 600-900

Trip 2016
Table:

	8062	8064	8069	8070	8071	8072	8073	8074	8075	8079	
Transit excluding	0	0	0	0	26	0	0	0	0	0	26
Cycle	0	0	0	0	0	0	0	0	0	19	19
Auto driver	57	27	104	112	29	43	144	16	62	205	799
Walk	0	0	15	0	0	0	0	0	0	0	15
											859

Travel Mode	**Trips**	**Propotion**
Auto Driver	799	**93%**
Auto Pass	0	**0%**
Transit	26	**3%**
Walk	15	**2%**
Cycle	19	**2%**
	859	

Mon Jan 14 2019 15:45:57 GMT-0500 (Eastern Standard Time) - Run Time: 1854ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: Primary travel mode of trip - mode_prime
Column: 2006 GTA zone of origin - gta06_orig

Filters:
2006 GTA zone c 8064 8067-8076 8078-8081
and
Trip purpose of c
and
Start time of trip - start_time In 1500-1600

Trip 2016
Table:

	8069	8070	8071	8072	8073	8075	8079	8080	
Transit excluding	0	0	26	0	0	0	0	0	26
Auto driver	51	23	0	11	110	88	54	18	355
Auto passenger	0	0	0	0	0	16	0	0	16
Walk	0	0	15	0	0	0	0	0	15
									0
									412

Travel Mode	Trips	Propotion
Auto Driver	355	**86%**
Auto Pass	16	**4%**
Transit	26	**6%**
Walk	15	**4%**
Cycle	0	**0%**
	412	

Appendix H – Multi-Modal Trip Forecast Calculations

Proposed Development Statistics

Land Use	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9		
Low Density Res.	0	56	--	584	441	294	--	114	663	2152	1298
Med. Desnity Res.	492	44	--	659	120	743	--	1309	558	3925	
High Density Res.	804	284	--	764	196	312	--	503	239	3102	
Mixed-Use Res.	0	0	--	349	177	204	--	216	0	946	
Office Jobs	--	--	--	--	114	--	219	--	--	333	
Employees											
Residential Units	1296	384	0	2356	934	1553	0	2142	1460	10125	

Forecast Development Traffic - Zone 1

Land Use: Residential
ITE Trip Gen. Manual Volume 10

				Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Single-Family Detached Housing		E Fitted Curve Calc.:	Equation: T = 0.71(X) + 4.80	**1**	**4**	**5**	Equation: Ln(T) = 0.96 Ln(X) + 0.20	**#NUM!**	**#NUM!**	**#NUM!**	uation: T = 0.84(X) + 17	**10**	**8**	**18**
ITE Code:	210			Rate: Trips / Dwelling Unit	#DIV/0!	#DIV/0!	#DIV/0!	Rate: Trips / Dwelling Unit	#NUM!	#NUM!	#NUM!	ate: Trips / Dwelling U	#DIV/0!	#DIV/0!	#DIV/0!
Peak Hour:	Adjacent Street (Sat. Generator)			Auto Mode Split:	1	3	4	Auto Mode Split:	#NUM!	#NUM!	#NUM!	Auto Mode Split:	8	6	14
Notes:	General Urban / Suburban		Transit Factor:	75%				85%				95%			
Sq. ft. GFA		Units		Rate: Trips / Dwelling Unit	#DIV/0!	#DIV/0!	#DIV/0!	Rate: Trips / Dwelling Unit	#NUM!	#NUM!	#NUM!	ate: Trips / Dwelling U	#DIV/0!	#DIV/0!	#DIV/0!

				Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Multi-Family Housing (MID-RISE)		E Fitted Curve Calc.:	Equation: Ln(T) = 0.98 Ln(X) - 0.98	**42**	**121**	**163**	Equation: Ln(T) = 0.96 Ln(X) - 0.63	**124**	**80**	**204**	uation: T = 0.42(X) + 6	**104**	**109**	**213**
ITE Code:	221			Rate: Trips / Dwelling Unit	0.09	0.25	0.33	Rate: Trips / Dwelling Unit	0.25	0.16	0.41	ate: Trips / Dwelling U	0.21	0.22	0.43
Peak Hour:	Adjacent Street (Sat. Generator)			Auto Mode Split:	33	96	129	Auto Mode Split:	111	72	183	Auto Mode Split:	104	109	213
Notes:	General Urban / Suburban		Transit Factor:	75%				85%				95%			
Sq. ft. GFA	492	Units		Rate: Trips / Dwelling Unit	0.07	0.19	0.26	Rate: Trips / Dwelling Unit	0.23	0.15	0.37	ate: Trips / Dwelling U	0.21	0.22	0.43

				Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Multi-Family Housing (HIGH-RISE)		E Fitted Curve Calc.:	Equation: T = 0.28(X) + 12.86	**57**	**181**	**238**	Equation: T = 0.34(X) + 8.56	**172**	**110**	**282**	uation: T = 0.31(X) + 24	**150**	**123**	**273**
ITE Code:	222			Rate: Trips / Dwelling Unit	0.07	0.23	0.30	Rate: Trips / Dwelling Unit	0.21	0.14	0.35	ate: Trips / Dwelling U	0.19	0.15	0.34
Peak Hour:	Adjacent Street (Sat. Generator)			Auto Mode Split:	45	143	188	Auto Mode Split:	154	98	252	Auto Mode Split:	134	110	244
Notes:	General Urban / Suburban		Transit Factor:	75%				85%				95%			
Sq. ft. GFA	804	Units		Rate: Trips / Dwelling Unit	0.06	0.18	0.23	Rate: Trips / Dwelling Unit	0.19	0.12	0.31	ate: Trips / Dwelling U	0.17	0.14	0.30
Forecast Total Residential Trips					79	242	321		#NUM!	#NUM!	#NUM!		246	225	471

				Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Office		E Fitted Curve Calc.:	Equation: Ln(T) = 0.72 Ln(X) + 0.56	**#NUM!**	**#NUM!**	**#NUM!**	Equation: T = 0.27 (X) + 23.67	**5**	**19**	**24**	mited Data (Average Ra	0	0	0
ITE Code:	710			Rate: Trips / Employee	#NUM!	#NUM!	#NUM!	Rate: Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	#DIV/0!	Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	0.53
Peak Hour:	Adjacent Street			Auto Mode Split:	#NUM!	#NUM!	#NUM!	Auto Mode Split:	5	19	24	Auto Mode Split:	0	0	0
Notes:	General Urban / Suburban		Transit Factor:	95%				95%				95%			
Employees		em.		Rate: Trips / Employee	#NUM!	#NUM!	#NUM!	Rate: Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	#DIV/0!	Rate: Trips / 1,000 sq. ft	#DIV/0!	#DIV/0!	#DIV/0!
Forecast Total Office Trips					#NUM!	#NUM!	#NUM!		5	19	24		0	0	0

Proposed Development Statistics

Land Use	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9		
Low Density Res.	0	56	--	584	441	294	--	114	663	2152	1298
Med. Desnity Res.	492	44	--	659	120	743	--	1309	558	3925	
High Density Res.	804	284	--	764	196	312	--	503	239	3102	
Mixed-Use Res.	0	0	--	349	177	204	--	216	0	946	
Office Jobs	--	--	--	--	114	--	219	--	--	333	
Employees											
Residential Units	1296	384	0	2356	934	1553	0	2142	1460	10125	

Forecast Development Traffic - Zone 2

Land Use: Residential
ITE Trip Gen. Manual Volume 10

			Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Single-Family Detached Housing	E Fitted Curve Calc.:	Equation: T = 0.71(X) + 4.80	9	28	37	Equation: Ln(T) = 0.96 Ln(X) + 0.20	30	18	48	uation: T = 0.84(X) + 17	31	26	57
ITE Code:	210		Rate: Trips / Dwelling Unit	0.20	0.61	0.80	Rate: Trips / Dwelling Unit	0.65	0.39	1.04	ate: Trips / Dwelling Un	0.67	0.57	1.24
Peak Hour:	Adjacent Street (Sat. Generator)		Auto Mode Split:	7	22	29	Auto Mode Split:	27	16	43	Auto Mode Split:	24	21	45
Notes:	General Urban / Suburban	Transit Factor:	75%				85%				95%			
Sq. ft. GFA	46 Units		Rate: Trips / Dwelling Unit	0.15	0.48	0.64	Rate: Trips / Dwelling Unit	0.58	0.35	0.93	ate: Trips / Dwelling Un	0.53	0.45	0.98

			Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Multi-Family Housing (MID-RISE)	E Fitted Curve Calc.:	Equation: Ln(T) = 0.98 Ln(X) - 0.98	4	11	15	Equation: Ln(T) = 0.96 Ln(X) - 0.63	12	8	20	uation: T = 0.42(X) + 6	12	13	25
ITE Code:	221		Rate: Trips / Dwelling Unit	0.09	0.25	0.34	Rate: Trips / Dwelling Unit	0.27	0.18	0.45	ate: Trips / Dwelling Un	0.27	0.30	0.57
Peak Hour:	Adjacent Street (Sat. Generator)		Auto Mode Split:	3	9	12	Auto Mode Split:	11	7	18	Auto Mode Split:	12	13	25
Notes:	General Urban / Suburban	Transit Factor:	75%				85%				95%			
Sq. ft. GFA	44 Units		Rate: Trips / Dwelling Unit	0.07	0.20	0.27	Rate: Trips / Dwelling Unit	0.24	0.16	0.41	ate: Trips / Dwelling Un	0.27	0.30	0.57

			Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Multi-Family Housing (HIGH-RISE)	E Fitted Curve Calc.:	Equation: T = 0.28(X) + 12.86	22	70	92	Equation: T = 0.34(X) + 8.56	64	41	105	uation: T = 0.31(X) + 24	62	50	112
ITE Code:	222		Rate: Trips / Dwelling Unit	0.08	0.25	0.32	Rate: Trips / Dwelling Unit	0.23	0.14	0.37	ate: Trips / Dwelling Un	0.22	0.18	0.39
Peak Hour:	Adjacent Street (Sat. Generator)		Auto Mode Split:	17	55	73	Auto Mode Split:	57	37	94	Auto Mode Split:	55	45	100
Notes:	General Urban / Suburban	Transit Factor:	75%				85%				95%			
Sq. ft. GFA	284 Units		Rate: Trips / Dwelling Unit	0.06	0.19	0.26	Rate: Trips / Dwelling Unit	0.20	0.13	0.33	ate: Trips / Dwelling Un	0.20	0.16	0.35

Forecast Total Residential Trips	28	86	114	95	60	155	92	78	170

			Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Office	E Fitted Curve Calc.:	Equation: Ln(T) = 0.72 Ln(X) + 0.56	#NUM!	#NUM!	#NUM!	Equation: T = 0.27 (X) + 23.67	5	19	24	nited Data (Average Ra	0	0	0
ITE Code:	710		Rate: Trips / Employee	#NUM!	#NUM!	#NUM!	Rate: Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	#DIV/0!	Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	0.53
Peak Hour:	Adjacent Street		Auto Mode Split:	#NUM!	#NUM!	#NUM!	Auto Mode Split:	5	19	24	Auto Mode Split:	0	0	0
Notes:	General Urban / Suburban	Transit Factor:	95%				95%				95%			
Employees	em.		Rate: Trips / Employee	#NUM!	#NUM!	#NUM!	Rate: Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	#DIV/0!	Rate: Trips / 1,000 sq. ft	#DIV/0!	#DIV/0!	#DIV/0!

Forecast Total Office Trips	#NUM!	#NUM!	#NUM!	5	19	24	0	0	0

Proposed Development Statistics

Land Use	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9		
Low Density Res.	0	56	--	584	441	294	--	114	663	2152	1298
Med. Desnity Res.	492	44	--	659	120	743	--	1309	558	3925	
High Density Res.	804	284	--	764	196	312	--	503	239	3102	
Mixed-Use Res.	0	0	--	349	177	204	--	216	0	946	
Office Jobs	--	--	--	--	114	--	219	--	--	333	
Employees											
Residential Units	1296	384	0	2356	934	1553	0	2142	1460	10125	

Forecast Development Traffic - Zone 4

Land Use:	**Residential**
ITE Trip Gen. Manual Volume 10	

			Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Single-Family Detached Housing	**E Fitted Curve Calc.:**	Equation: T = 0.71(X) + 4.80	**105**	**314**	**419**	Equation: Ln(T) = 0.96 Ln(X) + 0.20	**348**	**205**	**553**	uation: T = 0.84(X) + 17	**275**	**234**	**509**
ITE Code:	210		Rate: Trips / Dwelling Unit	0.18	0.54	0.72	Rate: Trips / Dwelling Unit	0.60	0.35	0.95	ate: Trips / Dwelling Ur	0.47	0.40	0.87
Peak Hour:	Adjacent Street (Sat. Generator)		Auto Mode Split:	83	248	331	Auto Mode Split:	311	183	495	Auto Mode Split:	217	185	402
Notes:	General Urban / Suburban	**Transit Factor:**	75%				85%				95%			
Sq. ft. GFA	584 Units		Rate: Trips / Dwelling Unit	0.14	0.42	0.57	Rate: Trips / Dwelling Unit	0.53	0.31	0.85	ate: Trips / Dwelling Ur	0.37	0.32	0.69

			Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Multi-Family Housing (MID-RISE)	**E Fitted Curve Calc.:**	Equation: Ln(T) = 0.98 Ln(X) - 0.98	**56**	**161**	**217**	Equation: Ln(T) = 0.96 Ln(X) - 0.63	**165**	**106**	**271**	uation: T = 0.42(X) + 6	**139**	**145**	**284**
ITE Code:	221		Rate: Trips / Dwelling Unit	0.08	0.24	0.33	Rate: Trips / Dwelling Unit	0.25	0.16	0.41	ate: Trips / Dwelling Ur	0.21	0.22	0.43
Peak Hour:	Adjacent Street (Sat. Generator)		Auto Mode Split:	44	127	171	Auto Mode Split:	148	95	242	Auto Mode Split:	139	145	284
Notes:	General Urban / Suburban	**Transit Factor:**	75%				85%				95%			
Sq. ft. GFA	659 Units		Rate: Trips / Dwelling Unit	0.07	0.19	0.26	Rate: Trips / Dwelling Unit	0.22	0.14	0.37	ate: Trips / Dwelling Ur	0.21	0.22	0.43

			Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Multi-Family Housing (HIGH-RISE)	**E Fitted Curve Calc.:**	Equation: T = 0.28(X) + 12.86	**78**	**247**	**325**	Equation: T = 0.34(X) + 8.56	**236**	**151**	**387**	uation: T = 0.31(X) + 24	**203**	**166**	**369**
ITE Code:	222		Rate: Trips / Dwelling Unit	0.07	0.22	0.29	Rate: Trips / Dwelling Unit	0.21	0.14	0.35	ate: Trips / Dwelling Ur	0.18	0.15	0.33
Peak Hour:	Adjacent Street (Sat. Generator)		Auto Mode Split:	62	195	257	Auto Mode Split:	211	135	346	Auto Mode Split:	182	149	330
Notes:	General Urban / Suburban	**Transit Factor:**	75%				85%				95%			
Sq. ft. GFA	1113 Units		Rate: Trips / Dwelling Unit	0.06	0.18	0.23	Rate: Trips / Dwelling Unit	0.19	0.12	0.31	ate: Trips / Dwelling Ur	0.16	0.13	0.30
Forecast Total Residential Trips				189	570	759		670	413	1084		538	478	1016

			Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Office	**E Fitted Curve Calc.:**	Equation: Ln(T) = 0.72 Ln(X) + 0.56	**#NUM!**	**#NUM!**	**#NUM!**	Equation: T = 0.27 (X) + 23.67	**5**	**19**	**24**	nited Data (Average Ra	0	0	0
ITE Code:	710		Rate: Trips / Employee	#NUM!	#NUM!	#NUM!	Rate: Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	#DIV/0!	Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	0.53
Peak Hour:	Adjacent Street		Auto Mode Split:	#NUM!	#NUM!	#NUM!	Auto Mode Split:	5	19	24	Auto Mode Split:	0	0	0
Notes:	General Urban / Suburban	**Transit Factor:**	95%				95%				95%			
Employees	em.		Rate: Trips / Employee	#NUM!	#NUM!	#NUM!	Rate: Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	#DIV/0!	Rate: Trips / 1,000 sq. ft	#DIV/0!	#DIV/0!	#DIV/0!
Forecast Total Office Trips				#NUM!	#NUM!	#NUM!		5	19	24		0	0	0

Proposed Development Statistics

Land Use	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9		
Low Density Res.	0	56	--	584	441	294	--	114	663	2152	1298
Med. Desnity Res.	492	44	--	659	120	743	--	1309	558	3925	
High Density Res.	804	284	--	764	196	312	--	503	239	3102	
Mixed-Use Res.	0	0	--	349	177	204	--	216	0	946	
Office Jobs	--	--	--	--	114	--	219	--	--	333	
Employees											
Residential Units	1296	384	0	2356	934	1553	0	2142	1460	10125	

Forecast Development Traffic - Zone 5

Land Use:	**Residential**
ITE Trip Gen. Manual Volume 10	

				Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Single-Family Detached Housing		E Fitted Curve Calc.:	Equation: T = 0.71(X) + 4.80	**80**	**238**	**318**	Equation: Ln(T) = 0.96 Ln(X) + 0.20	**266**	**156**	**422**	uation: T = 0.84(X) + 17	**210**	**178**	**388**
ITE Code:	210			Rate: Trips / Dwelling Unit	0.18	0.54	0.72	Rate: Trips / Dwelling Unit	0.60	0.35	0.96	ate: Trips / Dwelling Ui	0.48	0.40	0.88
Peak Hour:	Adjacent Street (Sat. Generator)			Auto Mode Split:	63	188	251	Auto Mode Split:	238	140	378	Auto Mode Split:	166	141	306
Notes:	General Urban / Suburban		**Transit Factor:**	75%				85%				95%			
Sq. ft. GFA	441	Units		Rate: Trips / Dwelling Unit	0.14	0.43	0.57	Rate: Trips / Dwelling Unit	0.54	0.32	0.86	ate: Trips / Dwelling Ui	0.38	0.32	0.69

				Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Multi-Family Housing (MID-RISE)		E Fitted Curve Calc.:	Equation: Ln(T) = 0.98 Ln(X) - 0.98	**11**	**30**	**41**	Equation: Ln(T) = 0.96 Ln(X) - 0.63	**32**	**21**	**53**	uation: T = 0.42(X) + 6	**28**	**29**	**57**
ITE Code:	221			Rate: Trips / Dwelling Unit	0.09	0.25	0.34	Rate: Trips / Dwelling Unit	0.27	0.18	0.44	ate: Trips / Dwelling Ui	0.23	0.24	0.48
Peak Hour:	Adjacent Street (Sat. Generator)			Auto Mode Split:	9	24	32	Auto Mode Split:	29	19	47	Auto Mode Split:	28	29	57
Notes:	General Urban / Suburban		**Transit Factor:**	75%				85%				95%			
Sq. ft. GFA	120	Units		Rate: Trips / Dwelling Unit	0.07	0.20	0.27	Rate: Trips / Dwelling Unit	0.24	0.16	0.40	ate: Trips / Dwelling Ui	0.23	0.24	0.48

				Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Multi-Family Housing (HIGH-RISE)		E Fitted Curve Calc.:	Equation: T = 0.28(X) + 12.86	**28**	**89**	**117**	Equation: T = 0.34(X) + 8.56	**82**	**53**	**135**	uation: T = 0.31(X) + 24	**77**	**63**	**140**
ITE Code:	222			Rate: Trips / Dwelling Unit	0.08	0.24	0.31	Rate: Trips / Dwelling Unit	0.22	0.14	0.36	ate: Trips / Dwelling Ui	0.21	0.17	0.38
Peak Hour:	Adjacent Street (Sat. Generator)			Auto Mode Split:	22	70	92	Auto Mode Split:	73	47	121	Auto Mode Split:	69	56	125
Notes:	General Urban / Suburban		**Transit Factor:**	75%				85%				95%			
Sq. ft. GFA	373	Units		Rate: Trips / Dwelling Unit	0.06	0.19	0.25	Rate: Trips / Dwelling Unit	0.20	0.13	0.32	ate: Trips / Dwelling Ui	0.18	0.15	0.34
Forecast Total Residential Trips					94	282	376		340	206	546		263	226	489

				Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Office		E Fitted Curve Calc.:	Equation: Ln(T) = 0.72 Ln(X) + 0.56	**44**	**9**	**53**	Equation: T = 0.27 (X) + 23.67	**11**	**43**	**54**	nited Data (Average Ra	0	0	0
ITE Code:	710			Rate: Trips / Employee	0.39	0.08	0.46	Rate: Trips / 1,000 sq. ft.	0.10	0.38	0.47	Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	0.53
Peak Hour:	Adjacent Street			Auto Mode Split:	44	9	53	Auto Mode Split:	11	43	54	Auto Mode Split:	0	0	0
Notes:	General Urban / Suburban		**Transit Factor:**	95%				95%				95%			
Employees	114	em.		Rate: Trips / Employee	#DIV/0!	#DIV/0!	#DIV/0!	Rate: Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	#DIV/0!	Rate: Trips / 1,000 sq. ft	#DIV/0!	#DIV/0!	#DIV/0!
Forecast Total Office Trips					44	9	53		11	43	54		0	0	0

Proposed Development Statistics

Land Use	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9		
Low Density Res.	0	56	--	584	441	294	--	114	663	2152	1298
Med. Desnity Res.	492	44	--	659	120	743	--	1309	558	3925	
High Density Res.	804	284	--	764	196	312	--	503	239	3102	
Mixed-Use Res.	0	0	--	349	177	204	--	216	0	946	
Office Jobs	--	--	--	--	114	--	219	--	--	333	
Employees											
Residential Units	1296	384	0	2356	934	1553	0	2142	1460	10125	

Forecast Development Traffic - Zone 6

Land Use: Residential
ITE Trip Gen. Manual Volume 10

				Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Single-Family Detached Housing		E Fitted Curve Calc.:	Equation: T = 0.71(X) + 4.80	**54**	**160**	**214**	Equation: Ln(T) = 0.96 Ln(X) + 0.20	**180**	**106**	**286**	uation: T = 0.84(X) + 17	**143**	**122**	**265**
ITE Code:	210			Rate: Trips / Dwelling Unit	0.18	0.54	0.73	Rate: Trips / Dwelling Unit	0.61	0.36	0.97	ate: Trips / Dwelling Ur	0.49	0.41	0.90
Peak Hour:	Adjacent Street (Sat. Generator)			Auto Mode Split:	43	126	169	Auto Mode Split:	161	95	256	Auto Mode Split:	113	96	209
Notes:	General Urban / Suburban		Transit Factor:	75%				85%				95%			
Sq. ft. GFA	294	Units		Rate: Trips / Dwelling Unit	0.15	0.43	0.57	Rate: Trips / Dwelling Unit	0.55	0.32	0.87	ate: Trips / Dwelling Ur	0.38	0.33	0.71

				Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Multi-Family Housing (MID-RISE)		E Fitted Curve Calc.:	Equation: Ln(T) = 0.98 Ln(X) - 0.98	**63**	**181**	**244**	Equation: Ln(T) = 0.96 Ln(X) - 0.63	**185**	**119**	**304**	uation: T = 0.42(X) + 6	**156**	**163**	**319**
ITE Code:	221			Rate: Trips / Dwelling Unit	0.08	0.24	0.33	Rate: Trips / Dwelling Unit	0.25	0.16	0.41	ate: Trips / Dwelling Ur	0.21	0.22	0.43
Peak Hour:	Adjacent Street (Sat. Generator)			Auto Mode Split:	50	143	193	Auto Mode Split:	166	106	272	Auto Mode Split:	156	163	319
Notes:	General Urban / Suburban		Transit Factor:	75%				85%				95%			
Sq. ft. GFA	743	Units		Rate: Trips / Dwelling Unit	0.07	0.19	0.26	Rate: Trips / Dwelling Unit	0.22	0.14	0.37	ate: Trips / Dwelling Ur	0.21	0.22	0.43

				Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Multi-Family Housing (HIGH-RISE)		E Fitted Curve Calc.:	Equation: T = 0.28(X) + 12.86	**38**	**119**	**157**	Equation: T = 0.34(X) + 8.56	**112**	**72**	**184**	uation: T = 0.31(X) + 24	**101**	**83**	**184**
ITE Code:	222			Rate: Trips / Dwelling Unit	0.07	0.23	0.30	Rate: Trips / Dwelling Unit	0.22	0.14	0.36	ate: Trips / Dwelling Ur	0.20	0.16	0.36
Peak Hour:	Adjacent Street (Sat. Generator)			Auto Mode Split:	30	94	124	Auto Mode Split:	100	64	165	Auto Mode Split:	90	74	165
Notes:	General Urban / Suburban		Transit Factor:	75%				85%				95%			
Sq. ft. GFA	516	Units		Rate: Trips / Dwelling Unit	0.06	0.18	0.24	Rate: Trips / Dwelling Unit	0.19	0.12	0.32	ate: Trips / Dwelling Ur	0.18	0.14	0.32

Forecast Total Residential Trips	122	363	486		427	266	693		359	334	693

				Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Office		E Fitted Curve Calc.:	Equation: Ln(T) = 0.72 Ln(X) + 0.56	**#NUM!**	**#NUM!**	**#NUM!**	Equation: T = 0.27 (X) + 23.67	**5**	**19**	**24**	mited Data (Average Ra	0	0	0
ITE Code:	710			Rate: Trips / Employee	#NUM!	#NUM!	#NUM!	Rate: Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	#DIV/0!	Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	0.53
Peak Hour:	Adjacent Street			Auto Mode Split:	#NUM!	#NUM!	#NUM!	Auto Mode Split:	5	19	24	Auto Mode Split:	0	0	0
Notes:	General Urban / Suburban		Transit Factor:	95%				95%				95%			
Employees		em.		Rate: Trips / Employee	#NUM!	#NUM!	#NUM!	Rate: Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	#DIV/0!	Rate: Trips / 1,000 sq. ft	#DIV/0!	#DIV/0!	#DIV/0!

Forecast Total Office Trips	#NUM!	#NUM!	#NUM!		5	19	24		0	0	0

Proposed Development Statistics

Land Use	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9		
Low Density Res.	0	56	--	584	441	294	--	114	663	2152	1298
Med. Desnity Res.	492	44	--	659	120	743	--	1309	558	3925	
High Density Res.	804	284	--	764	196	312	--	503	239	3102	
Mixed-Use Res.	0	0	--	349	177	204	--	216	0	946	
Office Jobs	--	--	--	--	114	--	219	--	--	333	
Employees											
Residential Units	1296	384	0	2356	934	1553	0	2142	1460	10125	

Forecast Development Traffic - Zone 7

Land Use: Residential
ITE Trip Gen. Manual Volume 10

			Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Single-Family Detached Housing	E Fitted Curve Calc.:	Equation: T = 0.71(X) + 4.80	**1**	**4**	**5**	Equation: Ln(T) = 0.96 Ln(X) + 0.20	**#NUM!**	**#NUM!**	**#NUM!**	uation: T = 0.84(X) + 17	**10**	**8**	**18**
ITE Code:	210		Rate: Trips / Dwelling Unit	#DIV/0!	#DIV/0!	#DIV/0!	Rate: Trips / Dwelling Unit	#NUM!	#NUM!	#NUM!	ate: Trips / Dwelling U	#DIV/0!	#DIV/0!	#DIV/0!
Peak Hour:	Adjacent Street (Sat. Generator)		Auto Mode Split:	1	3	4	Auto Mode Split:	#NUM!	#NUM!	#NUM!	Auto Mode Split:	8	6	14
Notes:	General Urban / Suburban	Transit Factor:	75%				85%				95%			
Sq. ft. GFA	Units		Rate: Trips / Dwelling Unit	#DIV/0!	#DIV/0!	#DIV/0!	Rate: Trips / Dwelling Unit	#NUM!	#NUM!	#NUM!	ate: Trips / Dwelling U	#DIV/0!	#DIV/0!	#DIV/0!

			Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Multi-Family Housing (MID-RISE)	E Fitted Curve Calc.:	Equation: Ln(T) = 0.98 Ln(X) - 0.98	**#NUM!**	**#NUM!**	**#NUM!**	Equation: Ln(T) = 0.96 Ln(X) - 0.63	**#NUM!**	**#NUM!**	**#NUM!**	uation: T = 0.42(X) + 6	**3**	**4**	**7**
ITE Code:	221		Rate: Trips / Dwelling Unit	#NUM!	#NUM!	#NUM!	Rate: Trips / Dwelling Unit	#NUM!	#NUM!	#NUM!	ate: Trips / Dwelling U	#DIV/0!	#DIV/0!	#DIV/0!
Peak Hour:	Adjacent Street (Sat. Generator)		Auto Mode Split:	#NUM!	#NUM!	#NUM!	Auto Mode Split:	#NUM!	#NUM!	#NUM!	Auto Mode Split:	3	4	7
Notes:	General Urban / Suburban	Transit Factor:	75%				85%				95%			
Sq. ft. GFA	Units		Rate: Trips / Dwelling Unit	#NUM!	#NUM!	#NUM!	Rate: Trips / Dwelling Unit	#NUM!	#NUM!	#NUM!	ate: Trips / Dwelling U	#DIV/0!	#DIV/0!	#DIV/0!

			Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Multi-Family Housing (HIGH-RISE)	E Fitted Curve Calc.:	Equation: T = 0.28(X) + 12.86	**3**	**10**	**13**	Equation: T = 0.34(X) + 8.56	**5**	**4**	**9**	uation: T = 0.31(X) + 24	**13**	**11**	**24**
ITE Code:	222		Rate: Trips / Dwelling Unit	#DIV/0!	#DIV/0!	#DIV/0!	Rate: Trips / Dwelling Unit	#DIV/0!	#DIV/0!	#DIV/0!	ate: Trips / Dwelling U	#DIV/0!	#DIV/0!	#DIV/0!
Peak Hour:	Adjacent Street (Sat. Generator)		Auto Mode Split:	2	8	10	Auto Mode Split:	4	4	8	Auto Mode Split:	12	10	21
Notes:	General Urban / Suburban	Transit Factor:	75%				85%				95%			
Sq. ft. GFA	Units		Rate: Trips / Dwelling Unit	#DIV/0!	#DIV/0!	#DIV/0!	Rate: Trips / Dwelling Unit	#DIV/0!	#DIV/0!	#DIV/0!	ate: Trips / Dwelling U	#DIV/0!	#DIV/0!	#DIV/0!
Forecast Total Residential Trips				#NUM!	#NUM!	#NUM!		#NUM!	#NUM!	#NUM!		23	20	43

			Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Office	E Fitted Curve Calc.:	Equation: Ln(T) = 0.72 Ln(X) + 0.56	**71**	**14**	**85**	Equation: T = 0.27 (X) + 23.67	**17**	**66**	**83**	nited Data (Average Ra	0	0	0
ITE Code:	710		Rate: Trips / Employee	0.32	0.06	0.39	Rate: Trips / 1,000 sq. ft.	0.08	0.30	0.38	Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	0.53
Peak Hour:	Adjacent Street		Auto Mode Split:	71	14	85	Auto Mode Split:	17	66	83	Auto Mode Split:	0	0	0
Notes:	General Urban / Suburban	Transit Factor:	95%				95%				95%			
Employees	219 em.		Rate: Trips / Employee	#DIV/0!	#DIV/0!	#DIV/0!	Rate: Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	#DIV/0!	Rate: Trips / 1,000 sq. ft	#DIV/0!	#DIV/0!	#DIV/0!
Forecast Total Office Trips				71	14	85		17	66	83		0	0	0

Proposed Development Statistics

Land Use	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9		
Low Density Res.	0	56	--	584	441	294	--	114	663	2152	1298
Med. Desnity Res.	492	44	--	659	120	743	--	1309	558	3925	
High Density Res.	804	284	--	764	196	312	--	503	239	3102	
Mixed-Use Res.	0	0	--	349	177	204	--	216	0	946	
Office Jobs	--	--	--	--	114	--	219	--	--	333	
Employees											
Residential Units	1296	384	0	2356	934	1553	0	2142	1460	10125	

Forecast Development Traffic - Zone 8

Land Use: Residential

ITE Trip Gen. Manual Volume 10

			Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Single-Family Detached Housing	**E Fitted Curve Calc.:**	Equation: T = 0.71(X) + 4.80	**22**	**64**	**86**	Equation: Ln(T) = 0.96 Ln(X) + 0.20	**72**	**43**	**115**	uation: T = 0.84(X) + 17	**62**	**52**	**114**
ITE Code:	210		Rate: Trips / Dwelling Unit	0.19	0.56	0.75	Rate: Trips / Dwelling Unit	0.63	0.38	1.01	ate: Trips / Dwelling Ur	0.54	0.46	1.00
Peak Hour:	Adjacent Street (Sat. Generator)		Auto Mode Split:	17	51	68	Auto Mode Split:	64	38	103	Auto Mode Split:	49	41	90
Notes:	General Urban / Suburban	**Transit Factor:**	75%				85%				95%			
Sq. ft. GFA	114 Units		Rate: Trips / Dwelling Unit	0.15	0.44	0.60	Rate: Trips / Dwelling Unit	0.57	0.34	0.90	ate: Trips / Dwelling Ur	0.43	0.36	0.79

			Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Multi-Family Housing (MID-RISE)	**E Fitted Curve Calc.:**	Equation: Ln(T) = 0.98 Ln(X) - 0.98	**111**	**315**	**426**	Equation: Ln(T) = 0.96 Ln(X) - 0.63	**319**	**204**	**523**	uation: T = 0.42(X) + 6	**273**	**284**	**557**
ITE Code:	221		Rate: Trips / Dwelling Unit	0.08	0.24	0.33	Rate: Trips / Dwelling Unit	0.24	0.16	0.40	ate: Trips / Dwelling Ur	0.21	0.22	0.43
Peak Hour:	Adjacent Street (Sat. Generator)		Auto Mode Split:	88	249	336	Auto Mode Split:	285	183	468	Auto Mode Split:	273	284	557
Notes:	General Urban / Suburban	**Transit Factor:**	75%				85%				95%			
Sq. ft. GFA	1309 Units		Rate: Trips / Dwelling Unit	0.07	0.19	0.26	Rate: Trips / Dwelling Unit	0.22	0.14	0.36	ate: Trips / Dwelling Ur	0.21	0.22	0.43

			Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Multi-Family Housing (HIGH-RISE)	**E Fitted Curve Calc.:**	Equation: T = 0.28(X) + 12.86	**51**	**163**	**214**	Equation: T = 0.34(X) + 8.56	**154**	**99**	**253**	uation: T = 0.31(X) + 24	**136**	**111**	**247**
ITE Code:	222		Rate: Trips / Dwelling Unit	0.07	0.23	0.30	Rate: Trips / Dwelling Unit	0.21	0.14	0.35	ate: Trips / Dwelling Ur	0.19	0.15	0.34
Peak Hour:	Adjacent Street (Sat. Generator)		Auto Mode Split:	40	129	169	Auto Mode Split:	138	89	226	Auto Mode Split:	122	99	221
Notes:	General Urban / Suburban	**Transit Factor:**	75%				85%				95%			
Sq. ft. GFA	719 Units		Rate: Trips / Dwelling Unit	0.06	0.18	0.23	Rate: Trips / Dwelling Unit	0.19	0.12	0.31	ate: Trips / Dwelling Ur	0.17	0.14	0.31
Forecast Total Residential Trips				145	428	573		488	310	797		444	424	868

			Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Office	**E Fitted Curve Calc.:**	Equation: Ln(T) = 0.72 Ln(X) + 0.56	**#NUM!**	**#NUM!**	**#NUM!**	Equation: T = 0.27 (X) + 23.67	**5**	**19**	**24**	nited Data (Average Ra	0	0	0
ITE Code:	710		Rate: Trips / Employee	#NUM!	#NUM!	#NUM!	Rate: Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	#DIV/0!	Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	0.53
Peak Hour:	Adjacent Street		Auto Mode Split:	#NUM!	#NUM!	#NUM!	Auto Mode Split:	5	19	24	Auto Mode Split:	0	0	0
Notes:	General Urban / Suburban	**Transit Factor:**	95%				95%				95%			
Employees	em.		Rate: Trips / Employee	#NUM!	#NUM!	#NUM!	Rate: Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	#DIV/0!	Rate: Trips / 1,000 sq. ft	#DIV/0!	#DIV/0!	#DIV/0!
Forecast Total Office Trips				#NUM!	#NUM!	#NUM!		5	19	24		0	0	0

Proposed Development Statistics

Land Use	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7	Zone 8	Zone 9		
Low Density Res.	0	56	--	584	441	294	--	114	663	2152	1298
Med. Desnity Res.	492	44	--	659	120	743	--	1309	558	3925	
High Density Res.	804	284	--	764	196	312	--	503	239	3102	
Mixed-Use Res.	0	0	--	349	177	204	--	216	0	946	
Office Jobs	--	--	--	--	114	--	219	--	--	333	
Employees											
Residential Units	1296	384	0	2356	934	1553	0	2142	1460	10125	

Forecast Development Traffic - Zone 9

Land Use: Residential
ITE Trip Gen. Manual Volume 10

				Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Single-Family Detached Housing		E Fitted Curve Calc.:	Equation: T = 0.71(X) + 4.80	**119**	**357**	**476**	Equation: Ln(T) = 0.96 Ln(X) + 0.20	**393**	**231**	**624**	uation: T = 0.84(X) + 17	**311**	**264**	**575**
ITE Code:	210			Rate: Trips / Dwelling Unit	0.18	0.54	0.72	Rate: Trips / Dwelling Unit	0.59	0.35	0.94	ate: Trips / Dwelling Ur	0.47	0.40	0.87
Peak Hour:	Adjacent Street (Sat. Generator)			Auto Mode Split:	94	282	376	Auto Mode Split:	352	207	558	Auto Mode Split:	246	208	454
Notes:	General Urban / Suburban		**Transit Factor:**	75%				85%				95%			
Sq. ft. GFA	663	Units		Rate: Trips / Dwelling Unit	0.14	0.43	0.57	Rate: Trips / Dwelling Unit	0.53	0.31	0.84	ate: Trips / Dwelling Ur	0.37	0.31	0.68

				Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Multi-Family Housing (MID-RISE)		E Fitted Curve Calc.:	Equation: Ln(T) = 0.98 Ln(X) - 0.98	**48**	**137**	**185**	Equation: Ln(T) = 0.96 Ln(X) - 0.63	**141**	**90**	**231**	uation: T = 0.42(X) + 6	**118**	**123**	**241**
ITE Code:	221			Rate: Trips / Dwelling Unit	0.09	0.25	0.33	Rate: Trips / Dwelling Unit	0.25	0.16	0.41	ate: Trips / Dwelling Ur	0.21	0.22	0.43
Peak Hour:	Adjacent Street (Sat. Generator)			Auto Mode Split:	38	108	146	Auto Mode Split:	126	81	207	Auto Mode Split:	118	123	241
Notes:	General Urban / Suburban		**Transit Factor:**	75%				85%				95%			
Sq. ft. GFA	558	Units		Rate: Trips / Dwelling Unit	0.07	0.19	0.26	Rate: Trips / Dwelling Unit	0.23	0.14	0.37	ate: Trips / Dwelling Ur	0.21	0.22	0.43

				Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Multi-Family Housing (HIGH-RISE)		E Fitted Curve Calc.:	Equation: T = 0.28(X) + 12.86	**19**	**61**	**80**	Equation: T = 0.34(X) + 8.56	**55**	**35**	**90**	uation: T = 0.31(X) + 24	**54**	**44**	**98**
ITE Code:	222			Rate: Trips / Dwelling Unit	0.08	0.26	0.33	Rate: Trips / Dwelling Unit	0.23	0.15	0.38	ate: Trips / Dwelling Ur	0.23	0.18	0.41
Peak Hour:	Adjacent Street (Sat. Generator)			Auto Mode Split:	15	48	63	Auto Mode Split:	49	31	81	Auto Mode Split:	48	39	88
Notes:	General Urban / Suburban		**Transit Factor:**	75%				85%				95%			
Sq. ft. GFA	239	Units		Rate: Trips / Dwelling Unit	0.06	0.20	0.26	Rate: Trips / Dwelling Unit	0.21	0.13	0.34	ate: Trips / Dwelling Ur	0.20	0.16	0.37

Forecast Total Residential Trips	147	438	585	527	319	846	412	371	783

				Weekday AM Peak Hour				Weekday PM Peak Hour				Saturday Peak Hour			
Land Use:	Office		E Fitted Curve Calc.:	Equation: Ln(T) = 0.72 Ln(X) + 0.56	**#NUM!**	**#NUM!**	**#NUM!**	Equation: T = 0.27 (X) + 23.67	**5**	**19**	**24**	mited Data (Average Ra	0	0	0
ITE Code:	710			Rate: Trips / Employee	#NUM!	#NUM!	#NUM!	Rate: Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	#DIV/0!	Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	0.53
Peak Hour:	Adjacent Street			Auto Mode Split:	#NUM!	#NUM!	#NUM!	Auto Mode Split:	5	19	24	Auto Mode Split:	0	0	0
Notes:	General Urban / Suburban		**Transit Factor:**	95%				95%				95%			
Employees		em.		Rate: Trips / Employee	#NUM!	#NUM!	#NUM!	Rate: Trips / 1,000 sq. ft.	#DIV/0!	#DIV/0!	#DIV/0!	Rate: Trips / 1,000 sq. ft	#DIV/0!	#DIV/0!	#DIV/0!

Forecast Total Office Trips	#NUM!	#NUM!	#NUM!	5	19	24	0	0	0

TRAVEL DEMANDS

Travel Mode	Units / Employees	AM Peak Hour			PM Peak Hour		
		In	Out	2-Way	In	Out	2-Way
Traffic Zone 1							
Auto Driver Trips (Traffic)	1,296 units	80	240	315	265	170	435
Auto Passenger Trips		0	40	40	35	65	100
Transit Trips		5	40	45	35	15	50
Active Trips		10	50	60	20	15	35
Total Trips:		**95**	**400**	**495**	**370**	**260**	**630**
Traffic Zone 2							
Auto Driver Trips (Traffic)	384 units	30	90	120	100	65	165
Auto Passenger Trips		0	15	15	15	25	40
Transit Trips		0	15	15	15	5	20
Active Trips		5	20	25	5	5	10
Total Trips:		**35**	**150**	**185**	**140**	**100**	**240**
Traffic Zone 3							
n/a							
Traffic Zone 4							
Auto Driver Trips (Traffic)	2,356 units	190	570	760	670	415	1,085
Auto Passenger Trips		5	95	100	95	160	255
Transit Trips		10	95	105	95	30	125
Active Trips		20	125	145	45	30	75
Total Trips:		**225**	**950**	**1175**	**930**	**640**	**1570**
Traffic Zone 5							
Auto Driver Trips (Traffic)	934 units;	95	280	375	340	205	545
Auto Passenger Trips		0	45	45	45	80	125
Transit Trips		5	45	50	45	15	60
Active Trips		10	60	70	25	15	40
Total Trips:		**110**	**465**	**575**	**470**	**315**	**785**
Traffic Zone 5							
Auto Driver Trips (Traffic)	114 employees.	45	10	55	10	45	55
Auto Passenger Trips		0	0	0	0	0	0
Transit Trips		5	0	5	0	10	10
Active Trips		0	0	0	0	5	5
Total Trips:		**55**	**15**	**70**	**15**	**70**	**85**
Traffic Zone 6							
Auto Driver Trips (Traffic)	1,553 units	125	365	485	425	265	690
Auto Passenger Trips		5	60	65	60	105	165
Transit Trips		5	60	65	60	20	80
Active Trips		10	80	90	30	20	50
Total Trips:		**145**	**610**	**755**	**590**	**410**	**1000**
Traffic Zone 7							
Auto Driver Trips (Traffic)	219 employees	70	15	85	15	65	80
Auto Passenger Trips		0	0	0	0	0	0
Transit Trips		5	0	5	0	5	5
Active Trips		5	0	5	0	5	5
Total Trips:		**80**	**15**	**95**	**15**	**70**	**85**
Traffic Zone 8							
Auto Driver Trips (Traffic)	2,142 units	145	430	570	585	310	795
Auto Passenger Trips		5	70	75	80	120	200
Transit Trips		10	70	80	80	25	105
Active Trips		15	95	110	40	25	65
Total Trips:		**170**	**715**	**885**	**815**	**475**	**1290**
Traffic Zone 9							
Auto Driver Trips (Traffic)	1,460 units	145	440	585	525	320	845
Auto Passenger Trips		5	75	80	75	125	200
Transit Trips		10	75	85	75	25	100
Active Trips		15	95	110	35	25	60
Total Trips:		**170**	**735**	**905**	**730**	**490**	**1220**
Clair-Maltby Secondary Plan Maximum Density Scenario Travel Demands							
Auto Driver Trips (Traffic)	10,125 units;	925	2,440	3,350	2,935	1,860	4,700
Auto Passenger Trips	333 employees	20	400	420	405	680	1085
Transit Trips		55	400	455	405	150	555
Active Trips		90	525	615	200	145	345
Total Trips (less "other" trips):		**1090**	**4065**	**5155**	**4075**	**2860**	**6935**

MODE SPLITS used in Calculation

	Residential AM Peak Hour In	Out	2-Way	Residential PM Peak Hour In	Out	2-Way	Office AM Peak Hour In	Out	2-Way	Office PM Peak Hour In	Out	2-Way
Auto Driver	85%	60%		72%	65%		90%	90%		90%	90%	
Auto Pass	2%	10%		10%	25%		2%	2%		2%	2%	
Transit	5%	10%		10%	5%		4%	4%		4%	4%	
Active	8%	13%		5%	5%		4%	4%		4%	4%	
Total												
Other	0%	7%		3%	0%							

Traffic Zone 5 Total

Travel Mode	AM Peak Hour			PM Peak Hour		
	In	Out	2-Way	In	Out	2-Way
Auto Driver Trips	140	290	430	350	250	600
Auto Passenger Trips	0	45	45	45	80	125
Transit Trips	10	45	55	45	25	70
Active Trips	10	60	70	25	20	45
Total Trips:	165	480	645	485	385	870

Appendix I – Transportation Tomorrow Survey (TTS): Transit Trip Distribution Data

Fri Jan 18 2019 18:03:05 GMT-0500 (Eastern Standard Time) - Run Time: 3092ms

Cross Tabulation Query Form - Trip - 2016 v1.1

Row: 2006 GTA zone of destination - gta06_dest
Column: 2006 GTA zone of origin - gta06_orig

Filters:
2006 GTA zone of 8064 8067-8(8078-8081
and
Trip purpose - trip_purp In 1-3
and
Start time of trip - start_time In 600-900
and
Primary travel mo J G
and
2006 GTA zone of destination - gta06_dest In 1-9999

Trip 2016
Table:

	Origin Zone													Orientation / Assignment of Transit Trip			
Destination Zone	8062	8069	8071	8072	8073	8074	8076	8078	8079	8080	8081	**Total**	Destination Area	GO to Toronto	North to University and Downtown	NE via Victoria	NW via other
51	0	0	0	0	0	0	0	26	0	0	0	**26**	Toronto	26			
55	0	0	0	0	0	0	10	0	0	0	0	**10**	Toronto	10			
63	0	0	0	0	0	0	0	0	0	0	18	**18**	Toronto	18			
65	0	0	0	0	0	27	0	0	0	0	0	**27**	Toronto	27			
66	0	0	0	0	0	0	0	0	0	26	0	**26**	Toronto	26			
67	17	0	0	0	0	0	0	0	0	0	0	**17**	Toronto	17			
8008	0	0	0	0	0	0	16	0	0	0	0	**16**	East Guelph			16	
8056	0	0	25	0	0	0	0	0	0	0	0	**25**	University		25		
8057	0	53	0	39	139	83	0	13	133	51	141	**652**	University		652		
8123	0	0	0	26	0	0	0	0	0	0	0	**26**	Old Guelph		26		
8129	0	0	0	0	0	0	0	0	16	0	0	**16**	Old Guelph		16		
8175	0	0	0	0	0	0	25	0	0	0	0	**25**	Northwest Guelph				25
												884		124	719	16	25
														14%	81%	2%	3%

Appendix J – CMSP Future Development Transit Trip Assignment Calculations

Distribution of Clair-Maltby Secondary Plan Area

Forecast Transit Riders

Weekday Morning Peak Hour		**Weekday Afternoon Peak Hour**	
Inbound	***Outbound***	***Inbound***	***Outbound***
55	400	405	150

Distribution		**Weekday Morning Peak Hour**			**Weekday Afternoon Peak Hour**		
		Inbound	***Outbound***	***2-way***	***Inbound***	***Outbound***	***2-way***
Regional GO	14%	10	55	65	55	20	75
Local North	81%	45	325	370	330	120	450
Local Northwest	3%	0	10	10	10	5	15
Local Northeast	2%	0	10	10	10	5	15
Total		**55**	**400**	**455**	**405**	**150**	**555**

Appendix K – Vehicle Delay Survey Data

Project No: 5976-06
Project: Clair Maltby Secondary Plan
Study Location: Maltby Rd EB to Gordon St
Municipality: City of Guelph
Study Date: Wednesday November 22, 2017
Study Time: 7:00-9:00 & 16:00-18:00

Delay Study

	Overall Delay (sec)	Left Turn Delay (sec)	Through Delay (sec)	Right Turn Delay (sec)	Courtesy Gap (sec)			2-Stage Gap (sec)		
					Left Turn	Through	Right Turn	Left Turn	Through	Right Turn
2-HR Period 07:00-00:30										
Minimum Delay	0	0	0	0	0	0	0	0	0	0
Average Delay	21	27	30	8	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
85th Percentile	46	54	79	15	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
95th Percentile	78	74	105	23	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
Maximum Delay	122	122	111	44	0	0	0	0	0	0
Total Vehicles Measured	105	45	23	37	0	0	0	0	0	0
Total from Traffic Count	105	46	23	36	n/a	n/a	n/a	n/a	n/a	n/a
Sample	100%	98%	100%	103%	n/a	n/a	n/a	n/a	n/a	n/a
AM Peak Hour 7:45 - 8:45										
Minimum Delay	0	0	4	0	0	0	0	0	0	0
Average Delay	29	35	47	10	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
85th Percentile	62	62	100	19	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
95th Percentile	101	79	108	35	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
Maximum Delay	122	122	111	44	0	0	0	0	0	0
Total Vehicles Measured	55	22	13	20	0	0	0	0	0	0
Total from Traffic Count	55	23	13	19	n/a	n/a	n/a	n/a	n/a	n/a
Sample	100%	96%	100%	105%	n/a	n/a	n/a	n/a	n/a	n/a
2-HR Period 16:00-18:00										
Minimum Delay	0	0	0	0	0	0	0	0	0	0
Average Delay	27	39	34	16	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
85th Percentile	53	74	62	33	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
95th Percentile	81	89	87	48	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
Maximum Delay	164	164	162	125	0	0	0	0	0	0
Total Vehicles Measured	164	62	18	84	0	0	0	0	0	0
Total from Traffic Count	162	61	18	83	n/a	n/a	n/a	n/a	n/a	n/a
Sample	101%	102%	100%	101%	n/a	n/a	n/a	n/a	n/a	n/a
PM Peak Hour 16:30 - 17:30										
Minimum Delay	0	3	6	0	0	0	0	0	0	0
Average Delay	24	32	39	16	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
85th Percentile	43	59	57	27	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
95th Percentile	64	77	118	41	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
Maximum Delay	164	164	162	106	0	0	0	0	0	0
Total Vehicles Measured	89	31	10	48	0	0	0	0	0	0
Total from Traffic Count	89	31	10	48	n/a	n/a	n/a	n/a	n/a	n/a
Sample	100%	100%	100%	100%	n/a	n/a	n/a	n/a	n/a	n/a

Project No: 5976-06
Project: Clair Maltby Secondary Plan
Study Location: Maltby Rd WB to Gordon St
Municipality: City of Guelph
Study Date: Wednesday November 22, 2017
Study Time: 7:00-9:00 & 16:00-18:00

Delay Study

	Overall Delay (sec)	Left Turn Delay (sec)	Through Delay (sec)	Right Turn Delay (sec)	Courtesy Gap (sec) Left Turn	Courtesy Gap (sec) Through	Courtesy Gap (sec) Right Turn	2-Stage Gap (sec) Left Turn	2-Stage Gap (sec) Through	2-Stage Gap (sec) Right Turn
2-HR Period 07:30-09:30										
Minimum Delay	0	6	0	0	0	0	0	0	0	0
Average Delay	17	29	15	10	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
85th Percentile	30	46	26	21	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
95th Percentile	43	47	30	25	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
Maximum Delay	47	47	30	27	0	0	0	0	0	0
Total Vehicles Measured	24	6	11	7	0	0	0	0	0	0
Total from Traffic Count	24	6	11	7	n/a	n/a	n/a	n/a	n/a	n/a
Sample	100%	100%	100%	100%	n/a	n/a	n/a	n/a	n/a	n/a
AM Peak Hour 7:45 - 8:45										
Minimum Delay	0	6	7	0	0	0	0	0	0	0
Average Delay	20	29	19	10	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
85th Percentile	34	46	26	20	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
95th Percentile	46	47	28	25	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
Maximum Delay	47	47	29	27	0	0	0	0	0	0
Total Vehicles Measured	15	6	4	5	0	0	0	0	0	0
Total from Traffic Count	15	6	4	5	n/a	n/a	n/a	n/a	n/a	n/a
Sample	100%	100%	100%	100%	n/a	n/a	n/a	n/a	n/a	n/a
2-HR Period 16:00-18:00										
Minimum Delay	0	0	2	0	0	0	0	0	0	0
Average Delay	37	32	46	4	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
85th Percentile	70	58	92	8	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
95th Percentile	108	68	121	11	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
Maximum Delay	150	74	150	12	0	0	0	0	0	0
Total Vehicles Measured	30	10	17	3	0	0	0	0	0	0
Total from Traffic Count	27	10	14	3	n/a	n/a	n/a	n/a	n/a	n/a
Sample	111%	100%	121%	100%	n/a	n/a	n/a	n/a	n/a	n/a
PM Peak Hour 16:30 - 17:30										
Minimum Delay	0	0	5	-	0	0	0	0	0	0
Average Delay	41	27	51	-	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
85th Percentile	73	41	93	-	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
95th Percentile	116	63	130	-	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!	#NUM!
Maximum Delay	150	74	150	-	0	0	0	0	0	0
Total Vehicles Measured	15	6	9	0	0	0	0	0	0	0
Total from Traffic Count	12	6	6	0	n/a	n/a	n/a	n/a	n/a	n/a
Sample	125%	100%	150%	#DIV/0!	n/a	n/a	n/a	n/a	n/a	n/a

Appendix L – Existing Traffic Count Data

BA Group
45 St. Clair Avenue West, Suite 300
Toronto ON, CANADA, M4V 1K9

Turning Movement Count (3 . CLAIR RD & GORDON ST)

Start Time	E Approach CLAIR RD						S Approach GORDON ST						W Approach CLAIR RD						N Approach GORDON ST						Int. Total (15 min)	Int. Total (1 hr)
	Right E:N	Thru E:W	Left E:S	U-Turn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	U-Turn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	U-Turn W:W	Peds W:	Approach Total	Right N:W	Thru N:S	Left N:E	U-Turn N:N	Peds N:	Approach Total		
07:00:00	3	76	48	0	2	127	9	47	15	0	1	71	26	38	21	0	0	85	39	111	4	0	2	154	437	
07:15:00	4	108	56	0	2	168	13	63	28	0	0	104	30	37	23	0	0	90	53	93	11	0	3	157	519	
07:30:00	7	126	65	0	0	198	15	67	28	0	0	110	24	41	26	0	1	91	52	102	5	0	1	159	558	
07:45:00	14	161	58	0	0	233	25	76	24	0	0	125	30	58	21	0	0	109	53	112	11	0	3	176	643	2157
08:00:00	15	128	46	0	2	189	13	112	30	0	2	155	15	63	34	0	1	112	45	84	12	0	3	141	597	2317
08:15:00	7	134	41	0	0	182	25	128	18	0	0	171	23	66	23	0	0	112	51	82	15	0	5	148	613	2411
08:30:00	22	185	49	0	1	256	15	103	40	0	1	158	32	83	34	0	1	149	65	101	13	0	1	179	742	2595
08:45:00	10	133	42	0	0	185	16	135	21	0	2	172	19	81	54	0	1	154	65	94	33	0	1	192	703	2655
BREAK																										
16:00:00	18	86	24	0	0	128	35	128	30	0	3	193	28	147	60	0	2	235	22	119	42	0	1	183	739	
16:15:00	26	106	34	0	2	166	31	132	25	1	0	189	23	163	43	0	0	229	29	122	40	0	4	191	775	
16:30:00	20	80	26	0	6	126	45	132	36	0	1	213	23	168	60	0	0	251	37	135	46	0	6	218	808	
16:45:00	27	97	30	0	1	154	37	167	54	0	0	258	21	134	60	0	0	215	24	139	29	1	2	193	820	3142
17:00:00	19	115	26	0	2	160	42	149	35	0	5	226	27	174	74	0	2	275	31	129	46	0	3	206	867	3270
17:15:00	25	99	31	0	2	155	42	135	30	0	1	207	27	138	58	0	0	223	30	134	52	1	6	217	802	3297
17:30:00	15	116	26	0	3	157	44	135	30	0	3	209	20	156	63	0	4	239	21	124	38	0	7	183	788	3277
17:45:00	19	82	28	0	3	129	38	131	34	0	7	203	10	115	47	0	5	172	27	129	42	0	2	198	702	3159
Grand Total	251	1832	630	0	26	2713	445	1840	478	1	26	2764	378	1662	701	0	17	2741	644	1810	439	2	50	2895	**11113**	-
Approach%	9.3%	67.5%	23.2%	0%		-	16.1%	66.6%	17.3%	0%		-	13.8%	60.6%	25.6%	0%		-	22.2%	62.5%	15.2%	0.1%		-	-	-
Totals %	2.3%	16.5%	5.7%	0%		24.4%	4%	16.6%	4.3%	0%		24.9%	3.4%	15%	6.3%	0%		24.7%	5.8%	16.3%	4%	0%		26.1%	-	-
Heavy	6	45	66	0		-	66	49	25	0		-	32	59	21	0		-	43	35	5	0		-	-	-
Heavy %	2.4%	2.5%	10.5%	0%		-	14.8%	2.7%	5.2%	0%		-	8.5%	3.5%	3%	0%		-	6.7%	1.9%	1.1%	0%		-	-	-
Bicycles	0	1	0	0		-	0	3	0	0		-	0	0	0	0		-	0	0	0	0		-	-	-
Bicycle %	0%	0.1%	0%	0%		-	0%	0.2%	0%	0%		-	0%	0%	0%	0%		-	0%	0%	0%	0%		-	-	-

Spectrum

Turning Movement Count
Location Name: CLAIR RD & GORDON ST
Date: Wed, Nov 22, 2017 Deployment Lead: Theo Daglis

BA Group
45 St. Clair Avenue West, Suite 300
Toronto ON, CANADA, M4V 1K9

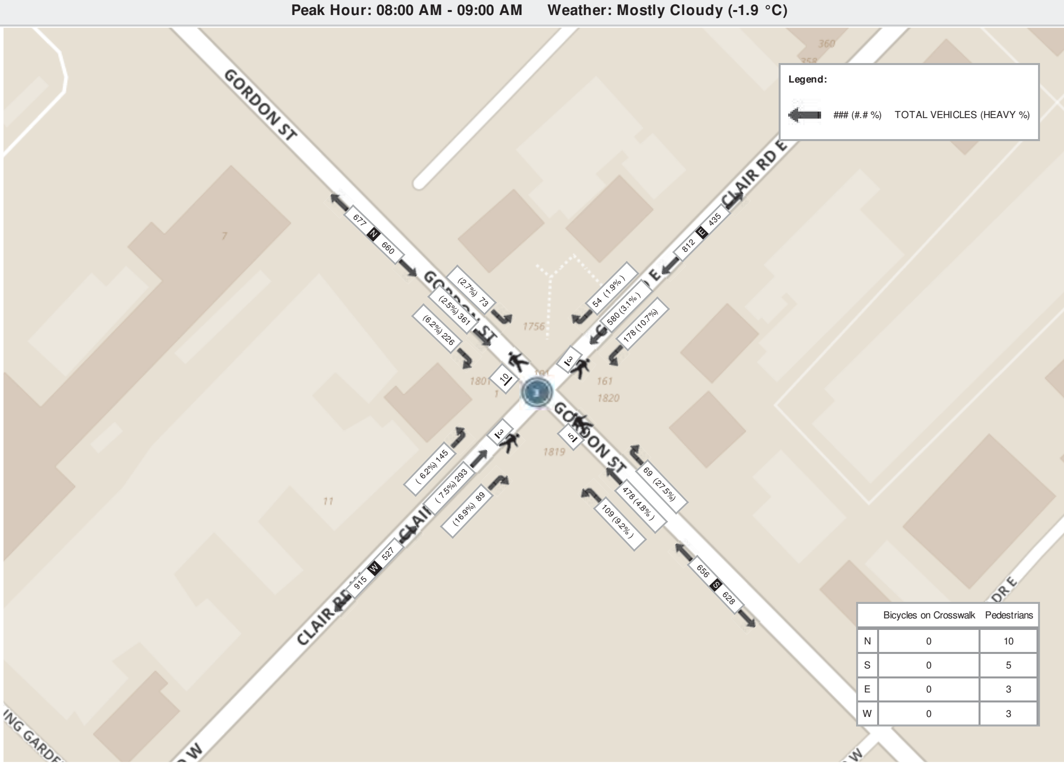
Peak Hour: 08:00 AM - 09:00 AM Weather: Mostly Cloudy (-1.9 °C)

Start Time	E Approach CLAIR RD						S Approach GORDON ST						W Approach CLAIR RD						N Approach GORDON ST						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
08:00:00	15	128	46	0	2	189	13	112	30	0	2	155	15	63	34	0	1	112	45	84	12	0	3	141	597
08:15:00	7	134	41	0	0	182	25	128	18	0	0	171	23	66	23	0	0	112	51	82	15	0	5	148	613
08:30:00	22	185	49	0	1	256	15	103	40	0	1	158	32	83	34	0	1	149	65	101	13	0	1	179	742
08:45:00	10	133	42	0	0	185	16	135	21	0	2	172	19	81	54	0	1	154	65	94	33	0	1	192	703
Grand Total	54	580	178	0	3	812	69	478	109	0	5	656	89	293	145	0	3	527	226	361	73	0	10	660	**2655**
Approach%	6.7%	71.4%	21.9%	0%		-	10.5%	72.9%	16.6%	0%		-	16.9%	55.6%	27.5%	0%		-	34.2%	54.7%	11.1%	0%		-	-
Totals %	2%	21.8%	6.7%	0%		30.6%	2.6%	18%	4.1%	0%		24.7%	3.4%	11%	5.5%	0%		19.8%	8.5%	13.6%	2.7%	0%		24.9%	-
PHF	0.61	0.78	0.91	0		0.79	0.69	0.89	0.68	0		0.95	0.7	0.88	0.67	0		0.86	0.87	0.89	0.55	0		0.86	-
Heavy	1	18	19	0		38	19	23	10	0		52	15	22	9	0		46	14	9	2	0		25	-
Heavy %	1.9%	3.1%	10.7%	0%		4.7%	27.5%	4.8%	9.2%	0%		7.9%	16.9%	7.5%	6.2%	0%		8.7%	6.2%	2.5%	2.7%	0%		3.8%	-
Lights	53	562	159	0		774	50	455	99	0		604	74	271	136	0		481	212	352	71	0		635	-
Lights %	98.1%	96.9%	89.3%	0%		95.3%	72.5%	95.2%	90.8%	0%		92.1%	83.1%	92.5%	93.8%	0%		91.3%	93.8%	97.5%	97.3%	0%		96.2%	-
Single-Unit Trucks	0	0	14	0		14	10	10	0	0		20	9	10	0	0		19	0	0	2	0		2	-
Single-Unit Trucks %	0%	0%	7.9%	0%		1.7%	14.5%	2.1%	0%	0%		3%	10.1%	3.4%	0%	0%		3.6%	0%	0%	2.7%	0%		0.3%	-
Buses	1	17	1	0		19	2	11	6	0		19	0	7	6	0		13	11	9	0	0		20	-
Buses %	1.9%	2.9%	0.6%	0%		2.3%	2.9%	2.3%	5.5%	0%		2.9%	0%	2.4%	4.1%	0%		2.5%	4.9%	2.5%	0%	0%		3%	-
Articulated Trucks	0	1	4	0		5	7	2	4	0		13	6	5	3	0		14	3	0	0	0		3	-
Articulated Trucks %	0%	0.2%	2.2%	0%		0.6%	10.1%	0.4%	3.7%	0%		2%	6.7%	1.7%	2.1%	0%		2.7%	1.3%	0%	0%	0%		0.5%	-
Pedestrians	-	-	-	-	3	-	-	-	-	-	5	-	-	-	-	-	3	-	-	-	-	-	10	-	-
Pedestrians%	-	-	-	-	14.3%		-	-	-	-	23.8%		-	-	-	-	14.3%		-	-	-	-	47.6%		-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
Bicycles on Crosswalk%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-
Bicycles on Road	0	1	0	0	0	-	0	1	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	-
Bicycles on Road%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-

Peak Hour: 04:30 PM - 05:30 PM   Weather: Partly Cloudy (-3 °C)

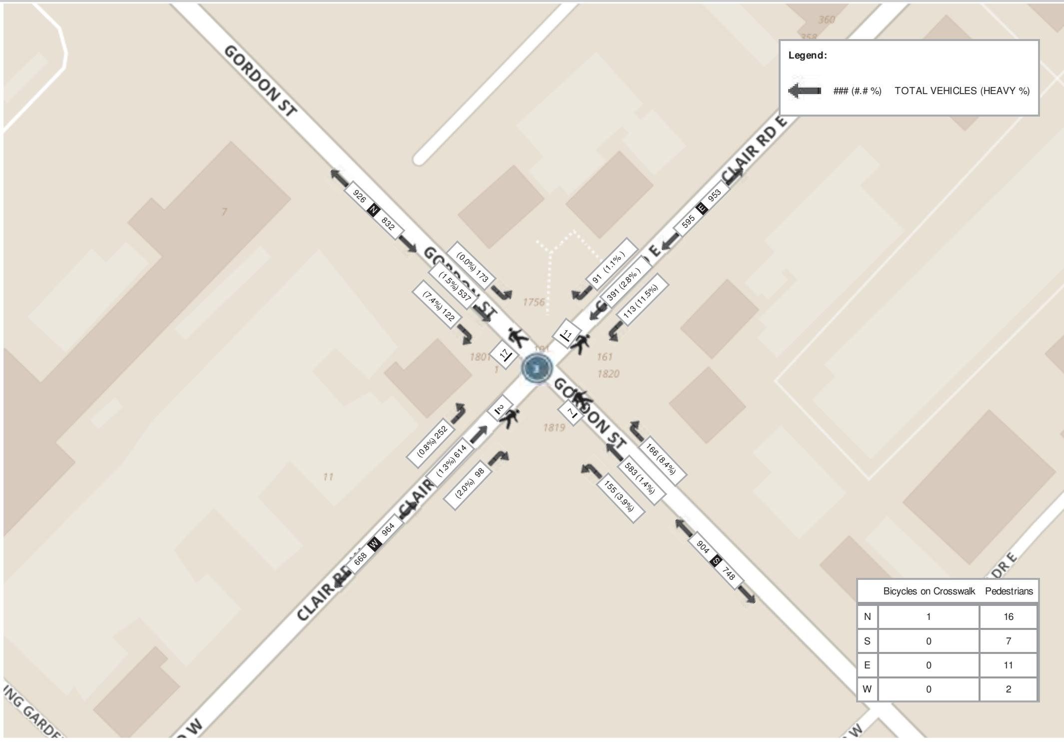
Start Time	E Approach CLAIR RD						S Approach GORDON ST						W Approach CLAIR RD						N Approach GORDON ST						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
16:30:00	20	80	26	0	6	126	45	132	36	0	1	213	23	168	60	0	0	251	37	135	46	0	6	218	808
16:45:00	27	97	30	0	1	154	37	167	54	0	0	258	21	134	60	0	0	215	24	139	29	1	2	193	820
17:00:00	19	115	26	0	2	160	42	149	35	0	5	226	27	174	74	0	2	275	31	129	46	0	3	206	867
17:15:00	25	99	31	0	2	155	42	135	30	0	1	207	27	138	58	0	0	223	30	134	52	1	6	217	802
Grand Total	91	391	113	0	11	595	166	583	155	0	7	904	98	614	252	0	2	964	122	537	173	2	17	834	**3297**
Approach%	15.3%	65.7%	19%	0%		-	18.4%	64.5%	17.1%	0%		-	10.2%	63.7%	26.1%	0%		-	14.6%	64.4%	20.7%	0.2%		-	-
Totals %	2.8%	11.9%	3.4%	0%		18%	5%	17.7%	4.7%	0%		27.4%	3%	18.6%	7.6%	0%		29.2%	3.7%	16.3%	5.2%	0.1%		25.3%	-
PHF	0.84	0.85	0.91	0		0.93	0.92	0.87	0.72	0		0.88	0.91	0.88	0.85	0		0.88	0.82	0.97	0.83	0.5		0.96	-
Heavy	1	11	13	0		25	14	8	6	0		28	2	8	2	0		12	9	8	0	0		17	-
Heavy %	1.1%	2.8%	11.5%	0%		4.2%	8.4%	1.4%	3.9%	0%		3.1%	2%	1.3%	0.8%	0%		1.2%	7.4%	1.5%	0%	0%		2%	-
Lights	90	380	100	0		570	152	575	149	0		876	96	606	250	0		952	113	529	173	2		817	-
Lights %	98.9%	97.2%	88.5%	0%		95.8%	91.6%	98.6%	96.1%	0%		96.9%	98%	98.7%	99.2%	0%		98.8%	92.6%	98.5%	100%	100%		98%	-
Single-Unit Trucks	1	9	8	0		18	5	3	3	0		11	2	7	1	0		10	1	4	0	0		5	-
Single-Unit Trucks %	1.1%	2.3%	7.1%	0%		3%	3%	0.5%	1.9%	0%		1.2%	2%	1.1%	0.4%	0%		1%	0.8%	0.7%	0%	0%		0.6%	-
Buses	0	0	1	0		1	1	4	1	0		6	0	1	0	0		1	8	4	0	0		12	-
Buses %	0%	0%	0.9%	0%		0.2%	0.6%	0.7%	0.6%	0%		0.7%	0%	0.2%	0%	0%		0.1%	6.6%	0.7%	0%	0%		1.4%	-
Articulated Trucks	0	2	4	0		6	8	1	2	0		11	0	0	1	0		1	0	0	0	0		0	-
Articulated Trucks %	0%	0.5%	3.5%	0%		1%	4.8%	0.2%	1.3%	0%		1.2%	0%	0%	0.4%	0%		0.1%	0%	0%	0%	0%		0%	-
Pedestrians	-	-	-	-	11	-	-	-	-	-	7	-	-	-	-	-	2	-	-	-	-	-	16	-	-
Pedestrians%	-	-	-	-	29.7%		-	-	-	-	18.9%		-	-	-	-	5.4%		-	-	-	-	43.2%		-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	1	-	-
Bicycles on Crosswalk%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	2.7%		-
Bicycles on Road	0	0	0	0	0	-	0	1	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	-
Bicycles on Road%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-

Peak Hour: 08:00 AM - 09:00 AM   Weather: Mostly Cloudy (-1.9 °C)



BA Group
45 St. Clair Avenue West, Suite 300
Toronto ON, CANADA, M4V 1K9

Peak Hour: 04:30 PM - 05:30 PM Weather: Partly Cloudy (-3 °C)



BA Group
45 St. Clair Avenue West, Suite 300
Toronto ON, CANADA, M4V 1K9

Turning Movement Count (2 . LAIRD RD & HANLON PKWY NB OFF RAMP)

Start Time	W Approach				SW Approach	S Approach				N Approach		E Approach			
	Bear Right W:SW	Thru W:E	Peds W:	Approach Total	Approach Total	Left S:W	Right S:E	Peds S:	Approach Total	Peds N:	Approach Total	Thru E:W	Right E:N	Peds E:	Approach Total
07:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BREAK															
16:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach%	0%	0%		-	-	0%	0%		-		-	0%	0%		-
Totals %	0%	0%		0%	0%	0%	0%		0%		0%	0%	0%		0%
Heavy	0	0		-	-	0	0		-		-	0	0		-
Heavy %	0%	0%		-	-	0%	0%		-		-	0%	0%		-
Bicycles	0	0		-	-	0	0		-		-	0	0		-
Bicycle %	0%	0%		-	-	0%	0%		-		-	0%	0%		-

Start Time	N Approach HANLON PKWY NB ON RAMP (FROM WB LAIRD)							E Approach LAIRD RD							S Approach HANLON PKWY NB OFF RAMP						
	Right N:W	Bear Right N:SW	Thru N:S	Left N:E	U-Turn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Bear Left E:SW	Left E:S	U-Turn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	Hard Left S:SW	U-Turn S:S	Peds S:	Approach Total
07:00:00	0	0	0	0	0	0	0	69	81	0	0	0	0	150	59	0	10	0	0	0	69
07:15:00	0	0	0	0	0	0	0	46	91	0	0	0	0	137	53	0	7	0	0	0	60
07:30:00	0	0	0	0	0	0	0	94	115	0	0	0	0	209	71	0	14	0	0	0	85
07:45:00	0	0	0	0	0	0	0	67	120	0	0	0	0	187	90	0	11	0	0	0	101
08:00:00	0	0	0	0	0	0	0	67	88	0	0	0	0	155	74	0	11	0	0	0	85
08:15:00	0	0	0	0	0	0	0	73	73	0	0	0	0	146	69	0	7	0	0	0	76
08:30:00	0	0	0	0	0	0	0	89	86	0	0	0	0	175	89	0	8	0	0	0	97
08:45:00	0	0	0	0	0	0	0	89	80	0	0	0	0	169	77	0	3	0	0	0	80
BREAK																					
16:00:00	0	0	0	0	0	0	0	162	164	0	0	0	0	326	38	0	5	0	0	1	43
16:15:00	0	0	0	0	0	0	0	124	156	0	0	0	0	280	35	0	7	0	0	0	42
16:30:00	0	0	0	0	0	0	0	178	183	0	0	0	0	361	43	0	4	0	0	0	47
16:45:00	0	0	0	0	0	0	0	128	132	0	0	0	0	260	33	0	8	0	0	0	41
17:00:00	0	0	0	0	0	0	0	175	193	0	0	0	0	368	52	0	6	0	0	0	58
17:15:00	0	0	0	0	0	0	0	134	99	0	0	0	0	233	42	0	7	0	0	0	49
17:30:00	0	0	0	0	0	0	0	102	101	0	0	0	0	203	53	0	7	0	0	0	60
17:45:00	0	0	0	0	0	0	0	96	77	0	0	0	0	173	35	0	6	0	0	0	41
Grand Total	0	0	0	0	0	0	0	1693	1839	0	0	0	0	3532	913	0	121	0	0	1	1034
Approach%	0%	0%	0%	0%	0%		-	47.9%	52.1%	0%	0%	0%		-	88.3%	0%	11.7%	0%	0%		-
Totals %	0%	0%	0%	0%	0%		0%	24.6%	26.7%	0%	0%	0%		51.3%	13.3%	0%	1.8%	0%	0%		15%
Heavy	0	0	0	0	0		-	69	152	0	0	0		-	137	0	12	0	0		-
Heavy %	0%	0%	0%	0%	0%		-	4.1%	8.3%	0%	0%	0%		-	15%	0%	9.9%	0%	0%		-
Bicycles	0	0	0	0	0		-	0	1	0	0	0		-	0	0	0	0	0		-
Bicycle %	0%	0%	0%	0%	0%		-	0%	0.1%	0%	0%	0%		-	0%	0%	0%	0%	0%		-

Start Time	SW Approach HANLON PKWY NB ON RAMP (FROM EB LAIRD)							W Approach LAIRD RD							Int. Total (15 min)	Int. Total (1 hr)
	Hard Right SW:S	Bear Right SW:E	Bear Left SW:N	Hard Left SW:W	U-Turn SW:SW	Peds SW:	Approach Total	Hard Right W:SW	Right W:S	Thru W:E	Left W:N	U-Turn W:W	Peds W:	Approach Total		
07:00:00	0	0	0	0	0	0	0	1	0	106	0	0	0	107	326	
07:15:00	0	0	0	0	0	0	0	2	0	122	0	0	0	124	321	
07:30:00	0	0	0	0	0	0	0	4	0	149	0	0	0	153	447	
07:45:00	0	0	0	0	0	0	0	1	0	183	0	0	0	184	472	1566
08:00:00	0	0	0	0	0	0	0	2	0	137	0	0	0	139	379	1619
08:15:00	0	0	0	0	0	0	0	3	0	177	0	0	0	180	402	1700
08:30:00	0	0	0	0	0	0	0	1	0	143	0	0	0	144	416	1669
08:45:00	0	0	0	0	0	0	0	3	0	170	0	0	0	173	422	1619
BREAK																
16:00:00	0	0	0	0	0	0	0	5	0	95	0	0	0	100	469	
16:15:00	0	0	0	0	0	0	0	3	0	140	0	0	0	143	465	
16:30:00	0	0	0	0	0	0	0	14	0	145	0	0	0	159	567	
16:45:00	0	0	0	0	0	0	0	3	0	145	0	0	0	148	449	1950
17:00:00	0	0	0	0	0	0	0	8	0	133	0	0	0	141	567	2048
17:15:00	0	0	0	0	0	0	0	10	0	129	0	0	0	139	421	2004
17:30:00	0	0	0	0	0	0	0	7	0	159	0	0	0	166	429	1866
17:45:00	0	0	0	0	0	0	0	3	0	118	0	0	0	121	335	1752
Grand Total	0	0	0	0	0	0	0	70	0	2251	0	0	0	2321	**6887**	-
Approach%	0%	0%	0%	0%	0%		-	3%	0%	97%	0%	0%		-	-	-
Totals %	0%	0%	0%	0%	0%		0%	1%	0%	32.7%	0%	0%		33.7%	-	-
Heavy	0	0	0	0	0		-	4	0	98	0	0		-	-	-
Heavy %	0%	0%	0%	0%	0%		-	5.7%	0%	4.4%	0%	0%		-	-	-
Bicycles	0	0	0	0	0		-	0	0	0	0	0		-	-	-
Bicycle %	0%	0%	0%	0%	0%		-	0%	0%	0%	0%	0%		-	-	-

Turning Movement Count
Location Name: LAIRD RD & HANLON PKWY NB OFF RAMP
Date: Wed, Nov 22, 2017 Deployment Lead: Theo Daglis

BA Group
45 St. Clair Avenue West, Suite 300
Toronto ON, CANADA, M4V 1K9

Peak Hour: 07:30 AM - 08:30 AM Weather: Mostly Cloudy (-1.9 °C)

Start Time	W Approach				SW Approach	S Approach				N Approach		E Approach			
	Bear Right	Thru	Peds	Approach Total	Approach Total	Left	Right	Peds	Approach Total	Peds	Approach Total	Thru	Right	Peds	Approach Total
07:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach%	0%	0%		-	-	0%	0%		-		-	0%	0%		-
Totals %	0%	0%		0%	0%	0%	0%		0%		0%	0%	0%		0%
PHF	0	0		0	0	0	0		0		0	0	0		0
Heavy	0	0		0	0	0	0		0		0	0	0		0
Heavy %	0%	0%		0%	0%	0%	0%		0%		0%	0%	0%		0%
Lights	0	0		0	0	0	0		0		0	0	0		0
Lights %	0%	0%		0%	0%	0%	0%		0%		0%	0%	0%		0%
Single-Unit Trucks	0	0		0	0	0	0		0		0	0	0		0
Single-Unit Trucks %	0%	0%		0%	0%	0%	0%		0%		0%	0%	0%		0%
Buses	0	0		0	0	0	0		0		0	0	0		0
Buses %	0%	0%		0%	0%	0%	0%		0%		0%	0%	0%		0%
Articulated Trucks	0	0		0	0	0	0		0		0	0	0		0
Articulated Trucks %	0%	0%		0%	0%	0%	0%		0%		0%	0%	0%		0%
Pedestrians	-	-	0	-	-	-	-	0	-	0	-	-	-	0	-
Pedestrians%	-	-	0%			-	-	0%		0%		-	-	0%	
Bicycles on Road	0	0	0	-	-	0	0	0	-	0	-	0	0	0	-
Bicycles on Road%	-	-	0%			-	-	0%		0%		-	-	0%	

Start Time	N Approach HANLON PKWY NB ON RAMP (FROM WB LAIRD)							E Approach LAIRD RD						
	Right	Bear Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Bear Left	Left	U-Turn	Peds	Approach Total
07:30:00	0	0	0	0	0	0	0	94	115	0	0	0	0	209
07:45:00	0	0	0	0	0	0	0	67	120	0	0	0	0	187
08:00:00	0	0	0	0	0	0	0	67	88	0	0	0	0	155
08:15:00	0	0	0	0	0	0	0	73	73	0	0	0	0	146
Grand Total	0	0	0	0	0	0	0	301	396	0	0	0	0	697
Approach%	0%	0%	0%	0%	0%		-	43.2%	56.8%	0%	0%	0%		-
Totals %	0%	0%	0%	0%	0%		0%	17.7%	23.3%	0%	0%	0%		41%
PHF	0	0	0	0	0		0	0.8	0.83	0	0	0		0.83
Heavy	0	0	0	0	0		0	23	41	0	0	0		64
Heavy %	0%	0%	0%	0%	0%		0%	7.6%	10.4%	0%	0%	0%		9.2%
Lights	0	0	0	0	0		0	278	355	0	0	0		633
Lights %	0%	0%	0%	0%	0%		0%	92.4%	89.6%	0%	0%	0%		90.8%
Single-Unit Trucks	0	0	0	0	0		0	12	11	0	0	0		23
Single-Unit Trucks %	0%	0%	0%	0%	0%		0%	4%	2.8%	0%	0%	0%		3.3%
Buses	0	0	0	0	0		0	5	7	0	0	0		12
Buses %	0%	0%	0%	0%	0%		0%	1.7%	1.8%	0%	0%	0%		1.7%
Articulated Trucks	0	0	0	0	0		0	6	23	0	0	0		29
Articulated Trucks %	0%	0%	0%	0%	0%		0%	2%	5.8%	0%	0%	0%		4.2%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	-	0	-
Pedestrians%	-	-	-	-	-	0%		-	-	-	-	-	0%	
Bicycles on Road	0	0	0	0	0	0	-	0	0	0	0	0	0	-
Bicycles on Road%	-	-	-	-	-	0%		-	-	-	-	-	0%	

Start Time	S Approach HANLON PKWY NB OFF RAMP							SW Approach HANLON PKWY NB ON RAMP (FROM EB LAIRD)						
	Right	Thru	Left	Hard Left	U-Turn	Peds	Approach Total	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	Peds	Approach Total
07:30:00	71	0	14	0	0	0	85	0	0	0	0	0	0	0
07:45:00	90	0	11	0	0	0	101	0	0	0	0	0	0	0
08:00:00	74	0	11	0	0	0	85	0	0	0	0	0	0	0
08:15:00	69	0	7	0	0	0	76	0	0	0	0	0	0	0
Grand Total	304	0	43	0	0	0	347	0	0	0	0	0	0	0
Approach%	87.6%	0%	12.4%	0%	0%		-	0%	0%	0%	0%	0%		-
Totals %	17.9%	0%	2.5%	0%	0%		20.4%	0%	0%	0%	0%	0%		0%
PHF	0.84	0	0.77	0	0		0.86	0	0	0	0	0		0
Heavy	36	0	9	0	0		45	0	0	0	0	0		0
Heavy %	11.8%	0%	20.9%	0%	0%		13%	0%	0%	0%	0%	0%		0%
Lights	268	0	34	0	0		302	0	0	0	0	0		0
Lights %	88.2%	0%	79.1%	0%	0%		87%	0%	0%	0%	0%	0%		0%
Single-Unit Trucks	8	0	5	0	0		13	0	0	0	0	0		0
Single-Unit Trucks %	2.6%	0%	11.6%	0%	0%		3.7%	0%	0%	0%	0%	0%		0%
Buses	0	0	1	0	0		1	0	0	0	0	0		0
Buses %	0%	0%	2.3%	0%	0%		0.3%	0%	0%	0%	0%	0%		0%
Articulated Trucks	28	0	3	0	0		31	0	0	0	0	0		0
Articulated Trucks %	9.2%	0%	7%	0%	0%		8.9%	0%	0%	0%	0%	0%		0%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	-	0	-
Pedestrians%	-	-	-	-	-	0%		-	-	-	-	-	0%	
Bicycles on Road	0	0	0	0	0	0	-	0	0	0	0	0	0	-
Bicycles on Road%	-	-	-	-	-	0%		-	-	-	-	-	0%	

Start Time	W Approach LAIRD RD							Int. Total (15 min)
	Hard Right	Right	Thru	Left	U-Turn	Peds	Approach Total	
07:30:00	4	0	149	0	0	0	153	447
07:45:00	1	0	183	0	0	0	184	472
08:00:00	2	0	137	0	0	0	139	379
08:15:00	3	0	177	0	0	0	180	402
Grand Total	10	0	646	0	0	0	656	1700
Approach%	1.5%	0%	98.5%	0%	0%		-	-
Totals %	0.6%	0%	38%	0%	0%		38.6%	-
PHF	0.63	0	0.88	0	0		0.89	-
Heavy	0	0	25	0	0		25	-
Heavy %	0%	0%	3.9%	0%	0%		3.8%	-
Lights	10	0	621	0	0		631	-
Lights %	100%	0%	96.1%	0%	0%		96.2%	-
Single-Unit Trucks	0	0	12	0	0		12	-
Single-Unit Trucks %	0%	0%	1.9%	0%	0%		1.8%	-
Buses	0	0	6	0	0		6	-
Buses %	0%	0%	0.9%	0%	0%		0.9%	-
Articulated Trucks	0	0	7	0	0		7	-
Articulated Trucks %	0%	0%	1.1%	0%	0%		1.1%	-
Pedestrians	-	-	-	-	-	0	-	-
Pedestrians%	-	-	-	-	-	0%		-
Bicycles on Road	0	0	0	0	0	0	-	-
Bicycles on Road%	-	-	-	-	-	0%		-

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Peak Hour: 04:15 PM - 05:15 PM Weather: Partly Cloudy (-3 °C)

Start Time	W Approach				SW Approach	S Approach				N Approach		E Approach			
	Bear Right	Thru	Peds	Approach Total	Approach Total	Left	Right	Peds	Approach Total	Peds	Approach Total	Thru	Right	Peds	Approach Total
16:15:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach%	0%	0%		-	-	0%	0%		-		-	0%	0%		-
Totals %	0%	0%		0%	0%	0%	0%		0%		0%	0%	0%		0%
PHF	0	0		0	0	0	0		0		0	0	0		0
Heavy	0	0		0	0	0	0		0		0	0	0		0
Heavy %	0%	0%		0%	0%	0%	0%		0%		0%	0%	0%		0%
Lights	0	0		0	0	0	0		0		0	0	0		0
Lights %	0%	0%		0%	0%	0%	0%		0%		0%	0%	0%		0%
Single-Unit Trucks	0	0		0	0	0	0		0		0	0	0		0
Single-Unit Trucks %	0%	0%		0%	0%	0%	0%		0%		0%	0%	0%		0%
Buses	0	0		0	0	0	0		0		0	0	0		0
Buses %	0%	0%		0%	0%	0%	0%		0%		0%	0%	0%		0%
Articulated Trucks	0	0		0	0	0	0		0		0	0	0		0
Articulated Trucks %	0%	0%		0%	0%	0%	0%		0%		0%	0%	0%		0%
Pedestrians	-	-	0	-	-	-	-	0	-	0	-	-	-	0	-
Pedestrians%	-	-	0%			-	-	0%		0%		-	-	0%	
Bicycles on Road	0	0	0	-	-	0	0	0	-	0	-	0	0	0	-
Bicycles on Road%	-	-	0%			-	-	0%		0%		-	-	0%	

Start Time	N Approach HANLON PKWY NB ON RAMP (FROM WB LAIRD)							E Approach LAIRD RD						
	Right	Bear Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Bear Left	Left	U-Turn	Peds	Approach Total
16:15:00	0	0	0	0	0	0	0	124	156	0	0	0	0	280
16:30:00	0	0	0	0	0	0	0	178	183	0	0	0	0	361
16:45:00	0	0	0	0	0	0	0	128	132	0	0	0	0	260
17:00:00	0	0	0	0	0	0	0	175	193	0	0	0	0	368
Grand Total	0	0	0	0	0	0	0	605	664	0	0	0	0	1269
Approach%	0%	0%	0%	0%	0%		-	47.7%	52.3%	0%	0%	0%		-
Totals %	0%	0%	0%	0%	0%		0%	29.5%	32.4%	0%	0%	0%		62%
PHF	0	0	0	0	0		0	0.85	0.86	0	0	0		0.86
Heavy	0	0	0	0	0		0	13	35	0	0	0		48
Heavy %	0%	0%	0%	0%	0%		0%	2.1%	5.3%	0%	0%	0%		3.8%
Lights	0	0	0	0	0		0	592	629	0	0	0		1221
Lights %	0%	0%	0%	0%	0%		0%	97.9%	94.7%	0%	0%	0%		96.2%
Single-Unit Trucks	0	0	0	0	0		0	7	17	0	0	0		24
Single-Unit Trucks %	0%	0%	0%	0%	0%		0%	1.2%	2.6%	0%	0%	0%		1.9%
Buses	0	0	0	0	0		0	1	0	0	0	0		1
Buses %	0%	0%	0%	0%	0%		0%	0.2%	0%	0%	0%	0%		0.1%
Articulated Trucks	0	0	0	0	0		0	5	18	0	0	0		23
Articulated Trucks %	0%	0%	0%	0%	0%		0%	0.8%	2.7%	0%	0%	0%		1.8%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	-	0	-
Pedestrians%	-	-	-	-	-	0%		-	-	-	-	-	0%	
Bicycles on Road	0	0	0	0	0	0	-	0	0	0	0	0	0	-
Bicycles on Road%	-	-	-	-	-	0%		-	-	-	-	-	0%	

Start Time	S Approach HANLON PKWY NB OFF RAMP							SW Approach HANLON PKWY NB ON RAMP (FROM EB LAIRD)						
	Right	Thru	Left	Hard Left	U-Turn	Peds	Approach Total	Hard Right	Bear Right	Bear Left	Hard Left	U-Turn	Peds	Approach Total
16:15:00	35	0	7	0	0	0	42	0	0	0	0	0	0	0
16:30:00	43	0	4	0	0	0	47	0	0	0	0	0	0	0
16:45:00	33	0	8	0	0	0	41	0	0	0	0	0	0	0
17:00:00	52	0	6	0	0	0	58	0	0	0	0	0	0	0
Grand Total	163	0	25	0	0	0	188	0	0	0	0	0	0	0
Approach%	86.7%	0%	13.3%	0%	0%		-	0%	0%	0%	0%	0%		-
Totals %	8%	0%	1.2%	0%	0%		9.2%	0%	0%	0%	0%	0%		0%
PHF	0.78	0	0.78	0	0		0.81	0	0	0	0	0		0
Heavy	30	0	0	0	0		30	0	0	0	0	0		0
Heavy %	18.4%	0%	0%	0%	0%		16%	0%	0%	0%	0%	0%		0%
Lights	133	0	25	0	0		158	0	0	0	0	0		0
Lights %	81.6%	0%	100%	0%	0%		84%	0%	0%	0%	0%	0%		0%
Single-Unit Trucks	8	0	0	0	0		8	0	0	0	0	0		0
Single-Unit Trucks %	4.9%	0%	0%	0%	0%		4.3%	0%	0%	0%	0%	0%		0%
Buses	1	0	0	0	0		1	0	0	0	0	0		0
Buses %	0.6%	0%	0%	0%	0%		0.5%	0%	0%	0%	0%	0%		0%
Articulated Trucks	21	0	0	0	0		21	0	0	0	0	0		0
Articulated Trucks %	12.9%	0%	0%	0%	0%		11.2%	0%	0%	0%	0%	0%		0%
Pedestrians	-	-	-	-	-	0	-	-	-	-	-	-	0	-
Pedestrians%	-	-	-	-	-	0%		-	-	-	-	-	0%	
Bicycles on Road	0	0	0	0	0	0	-	0	0	0	0	0	0	-
Bicycles on Road%	-	-	-	-	-	0%		-	-	-	-	-	0%	

Start Time	W Approach LAIRD RD							Int. Total (15 min)
	Hard Right	Right	Thru	Left	U-Turn	Peds	Approach Total	
16:15:00	3	0	140	0	0	0	143	465
16:30:00	14	0	145	0	0	0	159	567
16:45:00	3	0	145	0	0	0	148	449
17:00:00	8	0	133	0	0	0	141	567
Grand Total	28	0	563	0	0	0	591	2048
Approach%	4.7%	0%	95.3%	0%	0%		-	-
Totals %	1.4%	0%	27.5%	0%	0%		28.9%	-
PHF	0.5	0	0.97	0	0		0.93	-
Heavy	1	0	26	0	0		27	-
Heavy %	3.6%	0%	4.6%	0%	0%		4.6%	-
Lights	27	0	537	0	0		564	-
Lights %	96.4%	0%	95.4%	0%	0%		95.4%	-
Single-Unit Trucks	1	0	15	0	0		16	-
Single-Unit Trucks %	3.6%	0%	2.7%	0%	0%		2.7%	-
Buses	0	0	4	0	0		4	-
Buses %	0%	0%	0.7%	0%	0%		0.7%	-
Articulated Trucks	0	0	7	0	0		7	-
Articulated Trucks %	0%	0%	1.2%	0%	0%		1.2%	-
Pedestrians	-	-	-	-	-	0	-	-
Pedestrians%	-	-	-	-	-	0%		-
Bicycles on Road	0	0	0	0	0	0	-	-
Bicycles on Road%	-	-	-	-	-	0%		-

Spectrum

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Turning Movement Count (2 . LAIRD RD & HANLON PKWY BF O)) RAMPS

Start Time	W Approach				B Approach		NE Approach	N Approach				E Approach				N Approach HANLON PKWY BROMM(AF P							NE Approach HANLON PKWY BRON (AF PIM(OF WRLAD) E							E Approach LAD) ( )							B Approach HANLON PKWY BRON (AF PIM(OF eRLAD) E							W Approach LAD) ( )							Int. Total (21 minS	Int. Total (2 hrS
	(aig WIB	ti:S Wle	PTud Wh	Ass:poci tpgl	PTud Bh	Ass:poci tpgl	Ass:poci tpgl	(aig NIW	LTfg Nle	PTud Nh	Ass:poci tpgl	ti:S elW	RTo: (aig elNe	PTud eh	Ass:poci tpgl	(aig NIW	ti:S NIB	LTfg Nle	Ho:u LTfg NINe	U- tS:n NIN	PTud Nh	Ass:poci tpgl	Ho:u (aig NelN	RTo: (aig NelW	RTo: LTfg NelB	Ho:u LTfg Nele	U- tS:n NelNe	PTud Neh	Ass:poci tpgl	Ho:u (aig elNe	(aig elN	ti:S elW	LTfg elB	U- tS:n ele	PTud eh	Ass:poci tpgl	(aig Ble	RTo: (aig BINe	ti:S BIN	LTfg BIW	U- tS:n BIB	PTud Bh	Ass:poci tpgl	(aig WIB	ti:S Wle	RTo: LTfg WINe	LTfg WIN	U- tS:n WIW	PTud Wh	Ass:poci tpgl		
07I00I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	98	0	0	0	91	0	0	0	0	0	0	0	88	0	89	0	0	0	10	0	0	0	0	0	0	0	9	51	0	0	0	0	86	308	
07I26I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	40	0	0	0	47	0	0	0	0	0	0	0	90	0	57	0	0	0	17	0	0	0	0	0	0	0	6	81	0	0	0	0	68	354	
07I50I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	209	0	0	2	225	0	0	0	0	0	0	0	99	0	66	0	0	0	232	0	0	0	0	0	0	0	9	63	0	0	0	0	64	313	
07I86I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	251	0	0	0	260	0	0	0	0	0	0	0	68	0	40	0	0	0	258	0	0	0	0	0	0	0	23	87	0	0	0	0	61	585	2077
04I00I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	43	0	0	0	10	0	0	0	0	0	0	0	59	0	98	0	0	0	200	0	0	0	0	0	0	0	9	66	0	0	0	0	92	362	2238
04I26I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	203	0	0	0	225	0	0	0	0	0	0	0	80	0	83	0	0	0	43	0	0	0	0	0	0	0	5	74	0	0	0	0	42	379	2293
04I50I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	0	206	0	0	0	224	0	0	0	0	0	0	0	55	0	92	0	0	0	18	0	0	0	0	0	0	0	8	59	0	0	0	0	80	363	2233
04I86I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0	230	0	0	0	258	0	0	0	0	0	0	0	55	0	89	0	0	0	71	0	0	0	0	0	0	0	0	67	0	0	0	0	67	370	2081
R(eAK																																																				
29I00I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	61	0	0	0	92	0	0	0	0	0	0	0	12	0	48	0	0	0	276	0	0	0	0	0	0	0	6	86	0	0	0	0	60	349	
29I26I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	13	0	0	0	203	0	0	0	0	0	0	0	79	0	13	0	0	0	294	0	0	0	0	0	0	0	4	60	0	0	0	0	64	534	
29I50I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	0	48	0	0	0	19	0	0	0	0	0	0	0	77	0	209	0	0	0	245	0	0	0	0	0	0	0	29	78	0	0	0	0	10	591	
29I86I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	10	0	0	0	11	0	0	0	0	0	0	0	63	0	48	0	0	0	259	0	0	0	0	0	0	0	6	64	0	0	0	0	95	314	2342
27I00I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	74	0	0	0	47	0	0	0	0	0	0	0	46	0	225	0	0	0	214	0	0	0	0	0	0	0	20	94	0	0	0	0	74	595	2564
27I26I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	40	0	0	0	44	0	0	0	0	0	0	0	62	0	96	0	0	0	229	0	0	0	0	0	0	0	1	94	0	0	0	0	77	342	2522
27I50I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0	19	0	0	0	11	0	0	0	0	0	0	0	87	0	92	0	0	0	204	0	0	0	0	0	0	0	1	70	0	0	0	0	71	349	2334
27I86I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20	0	71	0	0	0	41	0	0	0	0	0	0	0	80	0	84	0	0	0	44	0	0	0	0	0	0	0	2	80	0	0	0	0	82	324	2284
5 ranG Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	251	0	2869	0	0	2	2616	0	0	0	0	0	0	0	446	0	2048	0	0	0	2191	0	0	0	0	0	0	0	206	449	0	0	0	0	112	d111	-
Approach6	0%	0%		-		-	-	0%	0%		-	0%	0%		-	4.7%	0%	12.5%	0%	0%		-	0%	0%	0%	0%	0%		-	88.1%	0%	66.2%	0%	0%		-	0%	0%	0%	0%	0%		-	20.9%	41.8%	0%	0%	0%		-	8	-
Total7 6	0%	0%		0%		0%	0%	0%	0%		0%	0%	0%		0%	5.2%	0%	53%	0%	0%		56%	0%	0%	0%	0%	0%		0%	21.8%	0%	35.4%	0%	0%		85.3%	0%	0%	0%	0%	0%		0%	3.5%	21.6%	0%	0%	0%		32.4%	8	-
Heav%	0	0		-		-	-	0	0		-	0	0		-	8	0	72	0	0		-	0	0	0	0	0		-	224	0	88	0	0		-	0	0	0	0	0		-	7	50	0	0	0		-	8	-
Heav%6	0%	0%		-		-	-	0%	0%		-	0%	0%		-	3.1%	0%	8.1%	0%	0%		-	0%	0%	0%	0%	0%		-	25.5%	0%	8.2%	0%	0%		-	0%	0%	0%	0%	0%		-	9.7%	5.8%	0%	0%	0%		-	8	-
Fic%cle7	0	0		-		-	-	0	0		-	0	0		-	0	0	0	0	0		-	0	0	0	0	0		-	0	0	2	0	0		-	0	0	0	0	0		-	0	0	0	0	0		-	8	-
Fic%cle6	0%	0%		-		-	-	0%	0%		-	0%	0%		-	0%	0%	0%	0%	0%		-	0%	0%	0%	0%	0%		-	0%	0%	0.2%	0%	0%		-	0%	0%	0%	0%	0%		-	0%	0%	0%	0%	0%		-	8	-

Pea- Hoursyks: y AM 8y0s: y AM   WeathersMo7tl%ClouG%(82.3 9CS

Start Time	W Approach				B Approach		NE Approach	N Approach				E Approach				N Approach HANLON PKWY BROMM(AF P							NE Approach HANLON PKWY BRON (AF PIM(OF WRLAD) E							E Approach LAD) ( )							B Approach HANLON PKWY BRON (AF PIM(OF eRLAD) E							W Approach LAD) ( )							Int. Total (21 minS
	(aig	ti:S	PTud	Ass:poci tpgl	PTud	Ass:poci tpgl	Ass:poci tpgl	(aig	LTfg	PTud	Ass:poci tpgl	ti:S	RTo: (aig	PTud	Ass:poci tpgl	(aig	ti:S	LTfg	Ho:u LTfg	U- tS:n	PTud	Ass:poci tpgl	Ho:u (aig	RTo: (aig	RTo: LTfg	Ho:u LTfg	U- tS:n	PTud	Ass:poci tpgl	Ho:u (aig	(aig	ti:S	LTfg	U- tS:n	PTud	Ass:poci tpgl	(aig	RTo: (aig	ti:S	LTfg	U- tS:n	PTud	Ass:poci tpgl	(aig	ti:S	RTo: LTfg	LTfg	U- tS:n	PTud	Ass:poci tpgl	
07I50I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	209	0	0	2	225	0	0	0	0	0	0	0	99	0	66	0	0	0	232	0	0	0	0	0	0	0	9	63	0	0	0	0	64	313
07I86I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	251	0	0	0	260	0	0	0	0	0	0	0	68	0	40	0	0	0	258	0	0	0	0	0	0	0	23	87	0	0	0	0	61	585
04I00I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	43	0	0	0	10	0	0	0	0	0	0	0	59	0	98	0	0	0	200	0	0	0	0	0	0	0	9	66	0	0	0	0	92	362
04I26I00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	203	0	0	0	225	0	0	0	0	0	0	0	80	0	83	0	0	0	43	0	0	0	0	0	0	0	5	74	0	0	0	0	42	379
5 ranGTotal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	57	0	831	0	0	2	899	0	0	0	0	0	0	0	219	0	382	0	0	0	857	0	0	0	0	0	0	0	37	353	0	0	0	0	361	22°U
Approach6	0%	0%		-		-	-	0%	0%		-	0%	0%		-	7.1%	0%	13.2%	0%	0%		-	0%	0%	0%	0%	0%		-	88.1%	0%	66.2%	0%	0%		-	0%	0%	0%	0%	0%		-	20.8%	41.9%	0%	0%	0%		-	8
Total7 6	0%	0%		0%		0%	0%	0%	0%		0%	0%	0%		0%	5.3%	0%	59.1%	0%	0%		80.2%	0%	0%	0%	0%	0%		0%	29.1%	0%	30.7%	0%	0%		57.9%	0%	0%	0%	0%	0%		0%	3.5%	30%	0%	0%	0%		33.5%	8
PH)	0	0		0		0	0	0	0		0	0	0		0	0.48	0	0.77	0	0		0.74	0	0	0	0	0		0	0.78	0	0.76	0	0		0.43	0	0	0	0	0		0	0.69	0.78	0	0	0		0.4	8
Heav%	0	0		0		0	0	0	0		0	0	0		0	2	0	30	0	0		32	0	0	0	0	0		0	53	0	27	0	0		81	0	0	0	0	0		0	0	7	0	0	0		7	8
Heav%6	0%	0%		0%		0%	0%	0%	0%		0%	0%	0%		0%	3.7%	0%	8.7%	0%	0%		8.6%	0%	0%	0%	0%	0%		0%	29.5%	0%	7.2%	0%	0%		22.3%	0%	0%	0%	0%	0%		0%	0%	5%	0%	0%	0%		3.7%	8
Light7	0	0		0		0	0	0	0		0	0	0		0	59	0	801	0	0		886	0	0	0	0	0		0	298	0	338	0	0		544	0	0	0	0	0		0	37	336	0	0	0		363	8
Light7 6	0%	0%		0%		0%	0%	0%	0%		0%	0%	0%		0%	17.5%	0%	16.5%	0%	0%		16.6%	0%	0%	0%	0%	0%		0%	45.7%	0%	13.1%	0%	0%		44.4%	0%	0%	0%	0%	0%		0%	200%	17%	0%	0%	0%		17.5%	8
Bingle84 nit Truc- 7	0	0		0		0	0	0	0		0	0	0		0	2	0	1	0	0		20	0	0	0	0	0		0	4	0	4	0	0		29	0	0	0	0	0		0	0	6	0	0	0		6	8
Bingle84 nit Truc- 7 6	0%	0%		0%		0%	0%	0%	0%		0%	0%	0%		0%	3.7%	0%	3.2%	0%	0%		3.2%	0%	0%	0%	0%	0%		0%	8.2%	0%	5.5%	0%	0%		5.7%	0%	0%	0%	0%	0%		0%	0%	3.3%	0%	0%	0%		2.1%	8
Fu7e7	0	0		0		0	0	0	0		0	0	0		0	0	0	9	0	0		9	0	0	0	0	0		0	3	0	9	0	0		4	0	0	0	0	0		0	0	0	0	0	0		0	8
Fu7e7 6	0%	0%		0%		0%	0%	0%	0%		0%	0%	0%		0%	0%	0%	2.8%	0%	0%		2.5%	0%	0%	0%	0%	0%		0%	2%	0%	3.6%	0%	0%		2.4%	0%	0%	0%	0%	0%		0%	0%	0%	0%	0%	0%		0%	8
ArticulateGTruc- 7	0	0		0		0	0	0	0		0	0	0		0	0	0	6	0	0		6	0	0	0	0	0		0	33	0	5	0	0		36	0	0	0	0	0		0	0	3	0	0	0		3	8
ArticulateGTruc- 7 6	0%	0%		0%		0%	0%	0%	0%		0%	0%	0%		0%	0%	0%	2.3%	0%	0%		2.2%	0%	0%	0%	0%	0%		0%	22.3%	0%	2.3%	0%	0%		6.7%	0%	0%	0%	0%	0%		0%	0%	0.1%	0%	0%	0%		0.4%	8
PeGe7trian7	-	-	0	-	0	-	-	-	-	0	-	-	-	0	-	-	-	-	-	-	2	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	8
PeGe7trian76	-	-	0%		0%			-	-	0%		-	-	0%		-	-	-	-	-	200%		-	-	-	-	-	0%		-	-	-	-	-	0%		-	-	-	-	-	0%		-	-	-	-	-	0%		8
Fic%cle7 on RoaG	0	0	0	-	0	-	-	0	0	0	-	0	0	0	-	0	0	0	0	0	0	-	0	0	0	0	0	0	-	0	0	0	0	0	0	-	0	0	0	0	0	0	-	0	0	0	0	0	0	-	8
Fic%cle7 on RoaG6	-	-	0%		0%			-	-	0%		-	-	0%		-	-	-	-	-	0%		-	-	-	-	-	0%		-	-	-	-	-	0%		-	-	-	-	-	0%		-	-	-	-	-	0%		8

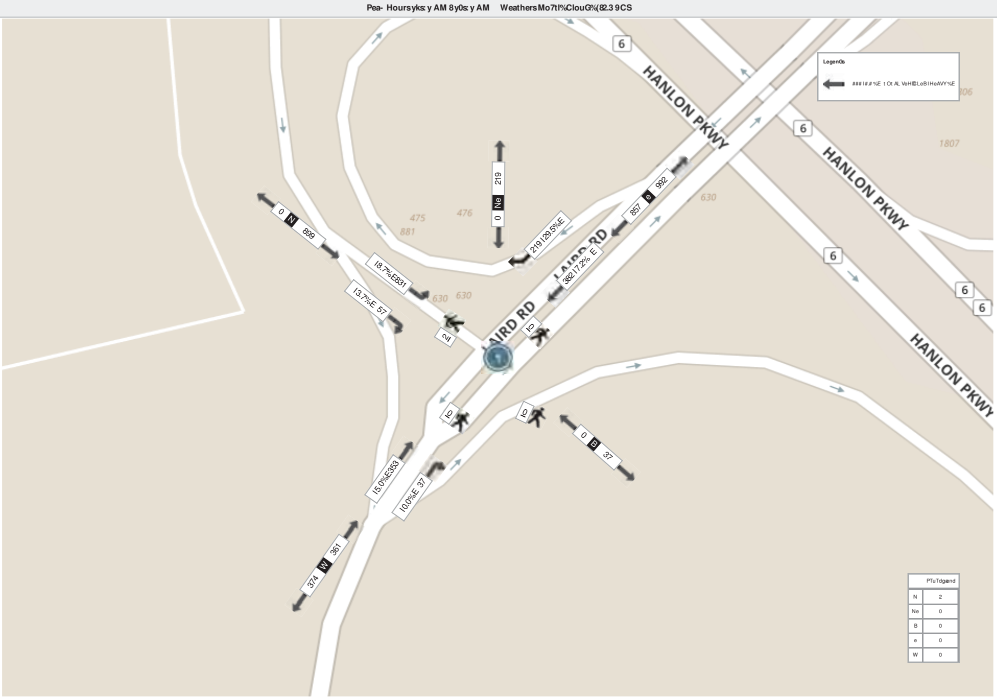
Pea- Hoursyds21 PM 8y1s21 PM Weathers Partl%ClouG%(8: 9CS

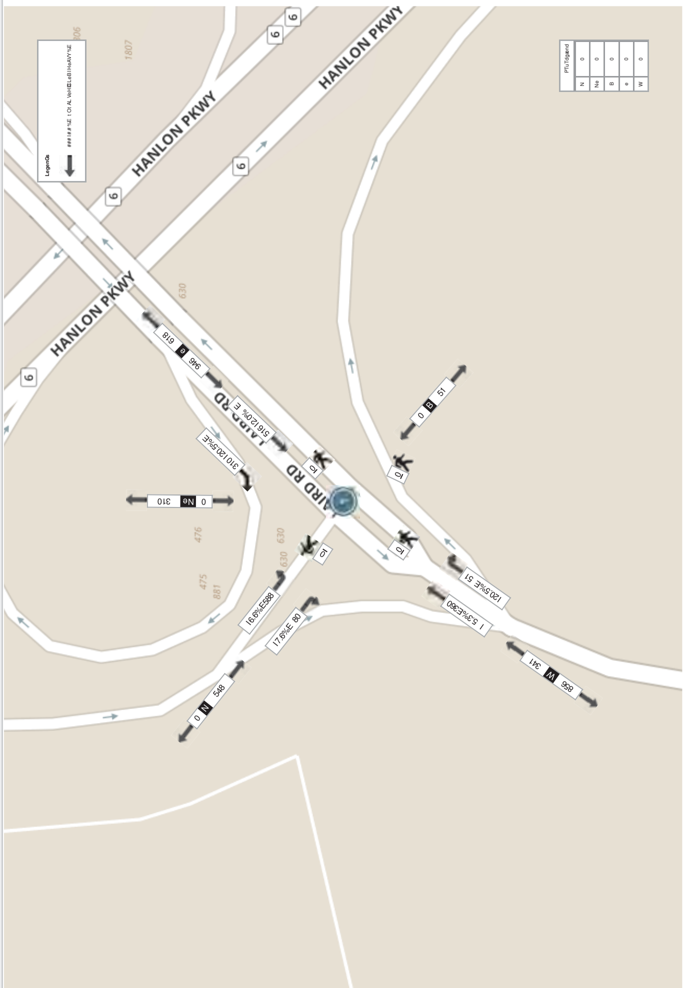
Start Time	W Approach (aig	W Approach ti:S	W Approach PTud	W Approach Ass:poci tpgl	B Approach PTud	B Approach Ass:poci tpgl	NE Approach Ass:poci tpgl	N Approach (aig	N Approach LTfg	N Approach PTud	N Approach Ass:poci tpgl	E Approach ti:S	E Approach RTo: (aig	E Approach PTud	E Approach Ass:poci tpgl
29l26l00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29l50l00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29l86l00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27l00l00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 ranGTotal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach6	0%	0%		-		-	-	0%	0%		-	0%	0%		-
Total7 6	0%	0%		0%		0%	0%	0%	0%		0%	0%	0%		0%
PH)	0	0		0		0	0	0	0		0	0	0		0
Heav%	0	0		0		0	0	0	0		0	0	0		0
Heav%6	0%	0%		0%		0%	0%	0%	0%		0%	0%	0%		0%
Light7	0	0		0		0	0	0	0		0	0	0		0
Light7 6	0%	0%		0%		0%	0%	0%	0%		0%	0%	0%		0%
Bingle84 nit Truc- 7	0	0		0		0	0	0	0		0	0	0		0
Bingle84 nit Truc- 7 6	0%	0%		0%		0%	0%	0%	0%		0%	0%	0%		0%
F u7e7	0	0		0		0	0	0	0		0	0	0		0
F u7e7 6	0%	0%		0%		0%	0%	0%	0%		0%	0%	0%		0%
ArticulateGTruc- 7	0	0		0		0	0	0	0		0	0	0		0
ArticulateGTruc- 7 6	0%	0%		0%		0%	0%	0%	0%		0%	0%	0%		0%
PeGe7trian7	-	-	0	-	0	-	-	-	-	0	-	-	-	0	-
PeGe7trian76	-	-	0%		0%			-	-	0%		-	-	0%	
F ic%cle7 on RoaG	0	0	0	-	0	-	-	0	0	0	-	0	0	0	-
F ic%cle7 on RoaG6	-	-	0%		0%			-	-	0%		-	-	0%	

Start Time	N Approach HANLON PKWY BROMM(AF P (aig	ti:S	LTfg	Ho:u LTfg	U-tS:n	PTud	Ass:poci tpgl	NE Approach HANLON PKWY BRON (AF P IM(OF WRLAD) E Ho:u (aig	RTo: (aig	RTo: LTfg	Ho:u LTfg	U-tS:n	PTud	Ass:poci tpgl
29l26l00	20	0	13	0	0	0	203	0	0	0	0	0	0	0
29l50l00	23	0	48	0	0	0	19	0	0	0	0	0	0	0
29l86l00	1	0	10	0	0	0	11	0	0	0	0	0	0	0
27l00l00	1	0	74	0	0	0	47	0	0	0	0	0	0	0
5 ranGTotal	80	0	588	0	0	0	548	0	0	0	0	0	0	0
Approach6	20.8%	0%	41.9%	0%	0%		-	0%	0%	0%	0%	0%		-
Total7 6	3.1%	0%	36.5%	0%	0%		34.5%	0%	0%	0%	0%	0%		0%
PH)	0.45	0	0.15	0	0		0.18	0	0	0	0	0		0
Heav%	5	0	21	0	0		33	0	0	0	0	0		0
Heav%6	7.6%	0%	6.6%	0%	0%		6.7%	0%	0%	0%	0%	0%		0%
Light7	57	0	536	0	0		593	0	0	0	0	0		0
Light7 6	13.6%	0%	18.6%	0%	0%		18.5%	0%	0%	0%	0%	0%		0%
Bingle84 nit Truc- 7	3	0	20	0	0		23	0	0	0	0	0		0
Bingle84 nit Truc- 7 6	6%	0%	3.1%	0%	0%		5.2%	0%	0%	0%	0%	0%		0%
F u7e7	0	0	3	0	0		3	0	0	0	0	0		0
F u7e7 6	0%	0%	0.9%	0%	0%		0.6%	0%	0%	0%	0%	0%		0%
ArticulateGTruc- 7	2	0	7	0	0		4	0	0	0	0	0		0
ArticulateGTruc- 7 6	3.6%	0%	3%	0%	0%		3.2%	0%	0%	0%	0%	0%		0%
PeGe7trian7	-	-	-	-	-	0	-	-	-	-	-	-	0	-
PeGe7trian76	-	-	-	-	-	0%		-	-	-	-	-	0%	
F ic%cle7 on RoaG	0	0	0	0	0	0	-	0	0	0	0	0	0	-
F ic%cle7 on RoaG6	-	-	-	-	-	0%		-	-	-	-	-	0%	

Start Time	E Approach LAD) ( ) Ho:u (aig	(aig	ti:S	LTfg	U-tS:n	PTud	Ass:poci tpgl	B Approach HANLON PKWY BRON (AF P IM(OF eRLAD) E (aig	RTo: (aig	ti:S	LTfg	U-tS:n	PTud	Ass:poci tpgl	W Approach LAD) ( ) (aig	ti:S	RTo: LTfg	LTfg	U-tS:n	PTud	Ass:poci tpgl	Int. Total (21 minS
29l26l00	79	0	13	0	0	0	294	0	0	0	0	0	0	0	4	60	0	0	0	0	64	534
29l50l00	77	0	209	0	0	0	245	0	0	0	0	0	0	0	29	78	0	0	0	0	10	591
29l86l00	63	0	48	0	0	0	259	0	0	0	0	0	0	0	6	64	0	0	0	0	95	314
27l00l00	46	0	225	0	0	0	214	0	0	0	0	0	0	0	20	94	0	0	0	0	74	595
5 ranGTotal	310	0	516	0	0	0	946	0	0	0	0	0	0	0	51	360	0	0	0	0	341	2: 10
Approach6	83.5%	0%	67.7%	0%	0%		-	0%	0%	0%	0%	0%		-	25.6%	49.6%	0%	0%	0%		-	8
Total7 6	32.8%	0%	31.2%	0%	0%		60.8%	0%	0%	0%	0%	0%		0%	3.1%	24.8%	0%	0%	0%		32.5%	8
PH)	0.46	0	0.47	0	0		0.49	0	0	0	0	0		0	0.92	0.48	0	0	0		0.4	8
Heav%	50	0	8	0	0		58	0	0	0	0	0		0	8	4	0	0	0		23	8
Heav%6	20.5%	0%	2%	0%	0%		6%	0%	0%	0%	0%	0%		0%	20.5%	5.3%	0%	0%	0%		8.3%	8
Light7	390	0	512	0	0		962	0	0	0	0	0		0	56	383	0	0	0		377	8
Light7 6	41.7%	0%	11%	0%	0%		16%	0%	0%	0%	0%	0%		0%	41.7%	19.4%	0%	0%	0%		16.4%	8
Bingle84 nit Truc- 7	22	0	8	0	0		26	0	0	0	0	0		0	2	9	0	0	0		7	8
Bingle84 nit Truc- 7 6	5.4%	0%	2%	0%	0%		3.3%	0%	0%	0%	0%	0%		0%	3.9%	3.8%	0%	0%	0%		3.8%	8
F u7e7	0	0	0	0	0		0	0	0	0	0	0		0	0	3	0	0	0		3	8
F u7e7 6	0%	0%	0%	0%	0%		0%	0%	0%	0%	0%	0%		0%	0%	0.4%	0%	0%	0%		0.7%	8
ArticulateGTruc- 7	21	0	0	0	0		21	0	0	0	0	0		0	5	0	0	0	0		5	8
ArticulateGTruc- 7 6	9.9%	0%	0%	0%	0%		3.4%	0%	0%	0%	0%	0%		0%	7.7%	0%	0%	0%	0%		2%	8
PeGe7trian7	-	-	-	-	-	0	-	-	-	-	-	-	0	-	-	-	-	-	-	0	-	8
PeGe7trian76	-	-	-	-	-	0%		-	-	-	-	-	0%		-	-	-	-	-	0%		8
F ic%cle7 on RoaG	0	0	0	0	0	0	-	0	0	0	0	0	0	-	0	0	0	0	0	0	-	8
F ic%cle7 on RoaG6	-	-	-	-	-	0%		-	-	-	-	-	0%		-	-	-	-	-	0%		8

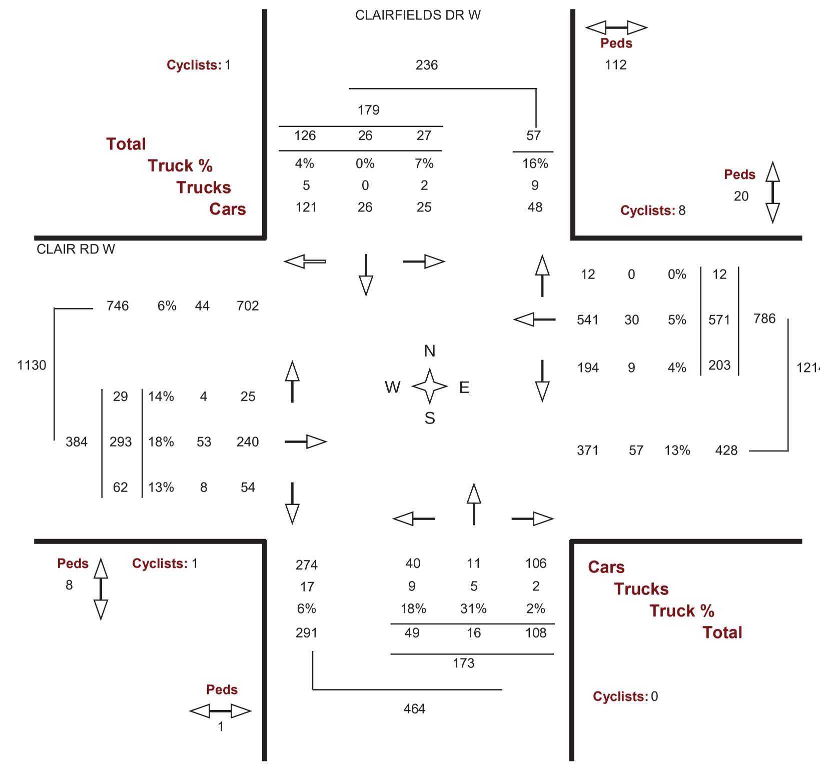
Pea- Hoursyks: y AM 8y0s: y AM Weathers Mo7tl%ClouG%(82.3 9CS





Turning Movements Report - AM Period

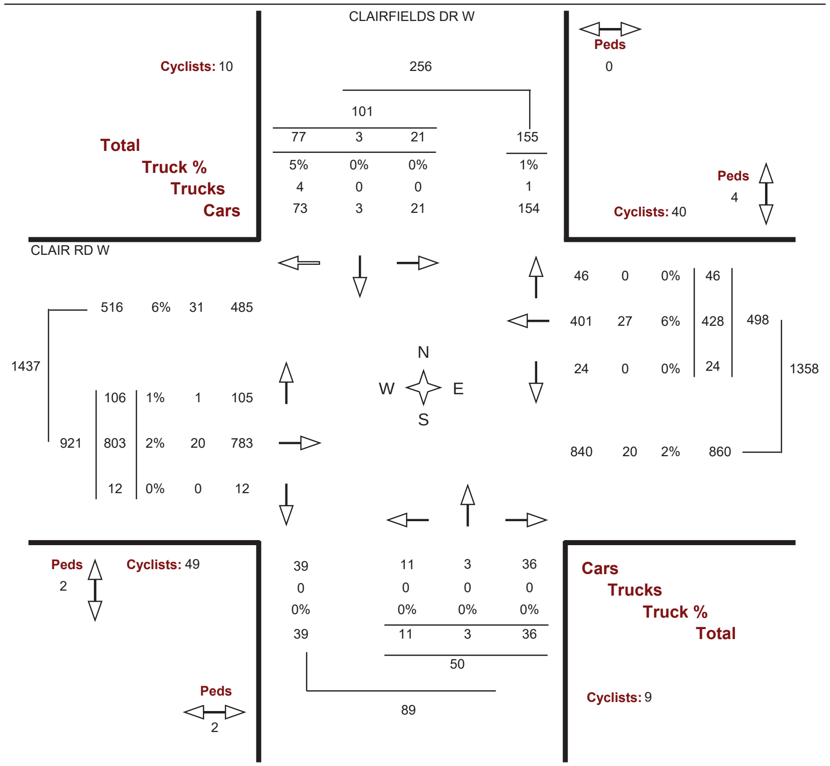
Location.......	CLAIR RD W @ CLAIRFIELDS DR W	**GeoID.......**	I730
Municipality.	GUELPH	**Count Date.**	Thursday, 17 September, 2015
Traffic Cont.		**Count Time.**	07:00 AM — 09:00 AM
Major Dir.....	None	**Peak Hour..**	08:00 AM — 09:00 AM



Turning Movements Report - Full Study

Location....... CLAIR RD W @ CLAIRFIELDS DR W
Municipality. GUELPH
Traffic Cont.
Major Dir..... None

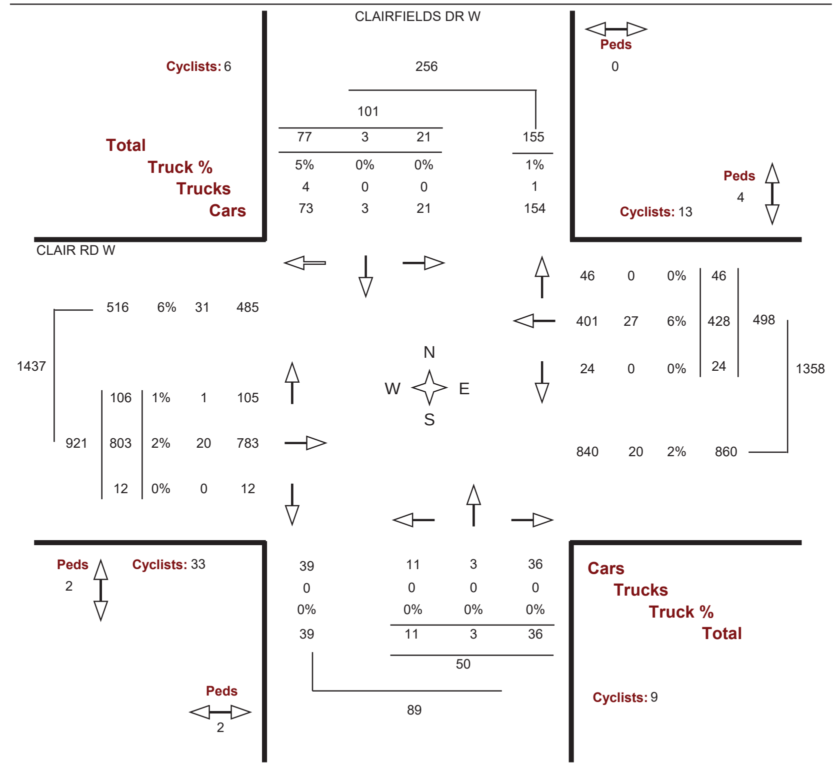
GeoID....... I730
Count Date. Thursday, 17 September, 2015
Count Time. 07:00 AM — 06:00 PM
Peak Hour.. 04:30 PM — 05:30 PM



Turning Movements Report - PM Period

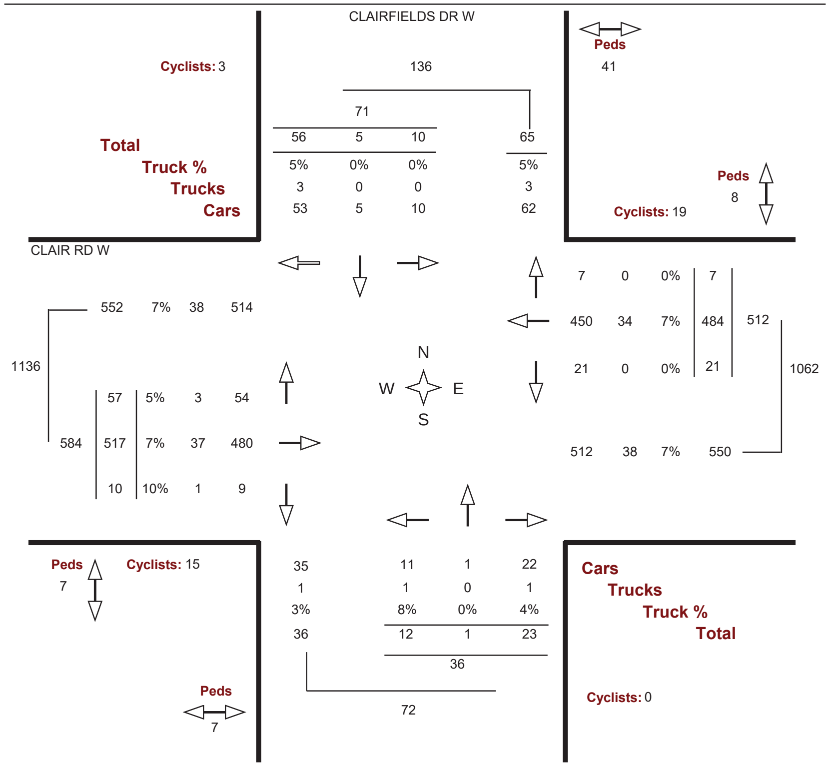
Location....... CLAIR RD W @ CLAIRFIELDS DR W
Municipality. GUELPH
Traffic Cont.
Major Dir..... None

GeoID....... I730
Count Date. Thursday, 17 September, 2015
Count Time. 03:00 PM — 06:00 PM
Peak Hour.. 04:30 PM — 05:30 PM



Turning Movements Report - MD Period

Location....... CLAIR RD W @ CLAIRFIELDS DR W
GeoID....... I730
Municipality. GUELPH
Count Date. Thursday, 17 September, 2015
Traffic Cont.
Count Time. 11:00 AM — 02:00 PM
Major Dir..... None
Peak Hour.. 12:00 PM — 01:00 PM



Poppy Dr & Gordon St

Morning Peak Diagram

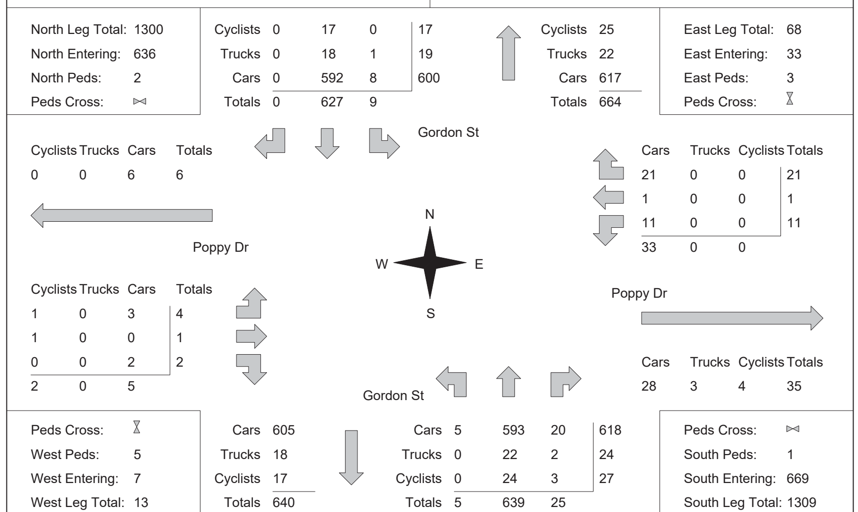
Specified Period		One Hour Peak	
From:	6:30:00	From:	7:45:00
To:	9:30:00	To:	8:45:00

Municipality: Guelph
Site #: 0000006804
Intersection: Gordon St & Poppy Dr
TFR File #: 1
Count date: 13-Sep-2016

Weather conditions:
Clear
Person(s) who counted:
Lena

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

Major Road: Gordon St runs N/S



Comments

Poppy Dr & Gordon St

Mid-day Peak Diagram

Specified Period
From: 11:30:00
To: 13:30:00

One Hour Peak
From: 12:15:00
To: 13:15:00

Municipality: Guelph
Site #: 0000006804
Intersection: Gordon St & Poppy Dr
TFR File #: 1
Count date: 13-Sep-2016

Weather conditions:
Clear

Person(s) who counted:
Lena

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

Major Road: Gordon St runs N/S

North Leg Total: 1055
North Entering: 511
North Peds: 0
Peds Cross: ⋈

Cyclists	0	21	0	21
Trucks	0	12	1	13
Cars	2	442	33	477
Totals	2	475	34	

Cyclists	21
Trucks	15
Cars	508
Totals	544

East Leg Total: 171
East Entering: 99
East Peds: 1
Peds Cross: ⧗

Gordon St

Cyclists	Trucks	Cars	Totals
0	0	6	6

Poppy Dr

Cars	Trucks	Cyclists	Totals
60	2	0	62
4	0	0	4
33	0	0	33
97	2	0	

N W E S

Cyclists	Trucks	Cars	Totals
0	0	0	0
0	0	1	1
0	0	4	4
0	0	5	

Poppy Dr

Cars	Trucks	Cyclists	Totals
69	2	1	72

Gordon St

Peds Cross: ⧗
West Peds: 0
West Entering: 5
West Leg Total: 11

Cars	479
Trucks	12
Cyclists	21
Totals	512

Cars	0	448	35	483
Trucks	0	13	1	14
Cyclists	0	21	1	22
Totals	0	482	37	

Peds Cross: ⋈
South Peds: 0
South Entering: 519
South Leg Total: 1031

Comments

Poppy Dr & Gordon St

Afternoon Peak Diagram

Specified Period
From: 15:00:00
To: 18:00:00

One Hour Peak
From: 16:30:00
To: 17:30:00

Municipality: Guelph
Site #: 0000006804
Intersection: Gordon St & Poppy Dr
TFR File #: 1
Count date: 13-Sep-2016

Weather conditions:
Clear

Person(s) who counted:
Lena

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

Major Road: Gordon St runs N/S

North Leg Total: 1605
North Entering: 749
North Peds: 0
Peds Cross: ⋈

Cyclists	0	13	0	13
Trucks	0	14	0	14
Cars	3	681	38	722
Totals	3	708	38	

Cyclists	18
Trucks	6
Cars	832
Totals	856

East Leg Total: 178
East Entering: 89
East Peds: 2
Peds Cross: ⧗

Gordon St

Cyclists	Trucks	Cars	Totals
0	0	8	8

Poppy Dr

Cars	Trucks	Cyclists	Totals
38	0	0	38
5	0	0	5
45	1	0	46
88	1	0	

N W E S

Cyclists	Trucks	Cars	Totals
0	1	1	2
0	0	0	0
0	0	1	1
0	1	2	

Poppy Dr

Cars	Trucks	Cyclists	Totals
89	0	0	89

Gordon St

Peds Cross: ⧗
West Peds: 0
West Entering: 3
West Leg Total: 11

Cars	727
Trucks	15
Cyclists	13
Totals	755

Cars	0	793	51	844
Trucks	0	5	0	5
Cyclists	0	18	0	18
Totals	0	816	51	

Peds Cross: ⋈
South Peds: 0
South Entering: 867
South Leg Total: 1622

Comments

Poppy Dr & Gordon St

Total Count Diagram

Municipality: Guelph
Site #: 0000006804
Intersection: Gordon St & Poppy Dr
TFR File #: 1
Count date: 13-Sep-2016

Weather conditions:
Clear
Person(s) who counted:
Lena

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

Major Road: Gordon St runs N/S

North Leg Total: 9726
North Entering: 4917
North Peds: 15
Peds Cross: ⋈

Cyclists	1	133	0	134
Trucks	1	110	5	116
Cars	19	4445	203	4667
Totals	21	4688	208	

Cyclists	146
Trucks	118
Cars	4545
Totals	4809

East Leg Total: 1025
East Entering: 534
East Peds: 12
Peds Cross: ⧗

Gordon St

Cyclists	Trucks	Cars	Totals
2	1	54	57

Poppy Dr

Cars	Trucks	Cyclists	Totals
269	15	2	286
17	0	0	17
222	4	5	231
508	19	7	

N
W E
S

Cyclists	Trucks	Cars	Totals
2	2	10	14
2	0	12	14
1	1	17	19
5	3	39	

Poppy Dr

Cars	Trucks	Cyclists	Totals
473	10	8	491

Gordon St

Peds Cross: ⧗
West Peds: 23
West Entering: 47
West Leg Total: 104

Cars	4684
Trucks	115
Cyclists	139
Totals	4938

Cars	18	4266	258	4542
Trucks	0	101	5	106
Cyclists	1	142	6	149
Totals	19	4509	269	

Peds Cross: ⋈
South Peds: 3
South Entering: 4797
South Leg Total: 9735

Comments

Poppy Dr & Gordon St

Traffic Count Summary

Intersection: Gordon St & Poppy Dr | Count Date: 13-Sep-2016 | Municipality: Guelph

	North Approach Totals (Includes Cars, Trucks, & Cyclists)						South Approach Totals (Includes Cars, Trucks, & Cyclists)					
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	North/South Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	6	276	0	282	1	433	7:00:00	1	137	13	151	1
8:00:00	5	671	4	680	0	1127	8:00:00	6	430	11	447	0
9:00:00	12	607	1	620	3	1259	9:00:00	3	610	26	639	1
12:00:00	20	487	3	510	1	981	12:00:00	2	444	25	471	0
13:00:00	42	460	6	508	7	1022	13:00:00	0	472	42	514	0
15:00:00	14	237	1	252	0	521	15:00:00	1	248	20	269	0
16:00:00	35	573	2	610	1	1292	16:00:00	1	640	41	682	0
17:00:00	30	675	3	708	0	1505	17:00:00	2	760	35	797	1
18:00:00	44	702	1	747	2	1574	18:00:00	3	768	56	827	0
Totals:	208	4688	21	4917	15	9714		19	4509	269	4797	3

	East Approach Totals (Includes Cars, Trucks, & Cyclists)						West Approach Totals (Includes Cars, Trucks, & Cyclists)					
Hour Ending	Left	Thru	Right	Grand Total	Total Peds	East/West Total Approaches	Hour Ending	Left	Thru	Right	Grand Total	Total Peds
7:00:00	7	0	6	13	0	14	7:00:00	0	0	1	1	1
8:00:00	10	0	17	27	2	33	8:00:00	3	0	3	6	6
9:00:00	15	1	24	40	4	44	9:00:00	2	1	1	4	2
12:00:00	26	2	26	54	1	59	12:00:00	1	2	2	5	2
13:00:00	34	4	61	99	1	109	13:00:00	0	3	7	10	0
15:00:00	22	1	29	52	0	52	15:00:00	0	0	0	0	0
16:00:00	31	3	33	67	1	73	16:00:00	1	4	1	6	4
17:00:00	51	3	41	95	3	105	17:00:00	5	2	3	10	2
18:00:00	35	3	49	87	0	92	18:00:00	2	2	1	5	6
Totals:	231	17	286	534	12	581		14	14	19	47	23

Calculated Values for Traffic Crossing Major Street

Hours Ending:	8:00	9:00	12:00	13:00	15:00	16:00	17:00	18:00
Crossing Values:	13	22	30	45	23	37	60	42

BA Group
45 St. Clair Avenue West, Suite 300
Toronto ON, CANADA, M4V 1K9

Turning Movement Count (1 . CLAIR RD & FARLEY DR)

Start Time	N Approach FARLEY DR						E Approach CLAIR RD						S Approach FARLEY DR						W Approach CLAIR RD						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	U-Turn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	U-Turn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	U-Turn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	U-Turn W:W	Peds W:	Approach Total		
07:00:00	29	0	5	0	0	34	7	86	1	0	0	94	0	4	2	0	0	6	5	32	6	0	0	43	177	
07:15:00	38	3	6	0	0	47	5	103	2	0	0	110	2	2	4	0	0	8	10	35	6	0	0	51	216	
07:30:00	44	2	9	0	0	55	27	126	0	0	0	153	3	2	5	0	1	10	1	46	13	0	2	60	278	
07:45:00	47	1	7	0	1	55	22	153	4	0	0	179	2	2	4	0	0	8	9	37	22	0	0	68	310	981
08:00:00	27	1	9	0	0	37	10	127	3	0	0	140	0	3	6	0	1	9	8	72	16	0	0	96	282	1086
08:15:00	30	5	6	0	1	41	14	131	6	0	0	151	1	3	5	0	1	9	9	69	24	0	1	102	303	1173
08:30:00	43	3	3	0	1	49	20	195	9	0	0	224	3	3	7	0	0	13	9	75	25	0	0	109	395	1290
08:45:00	45	11	7	0	1	63	17	140	9	0	1	166	2	4	12	0	0	18	20	75	36	0	1	131	378	1358
BREAK																										
16:00:00	40	12	10	0	1	62	11	54	7	0	1	72	9	14	28	0	0	51	40	144	52	0	1	236	421	
16:15:00	32	17	10	0	1	59	17	79	4	0	0	100	14	18	28	0	1	60	43	110	55	0	1	208	427	
16:30:00	27	20	16	0	2	63	12	74	6	0	5	92	7	15	25	0	2	47	63	136	54	0	6	253	455	
16:45:00	38	21	5	0	1	64	14	85	15	0	3	114	12	27	23	0	3	62	58	119	50	0	4	227	467	1770
17:00:00	42	20	18	0	1	80	27	78	10	0	2	115	7	28	22	0	0	57	44	129	51	0	5	224	476	1825
17:15:00	27	20	13	0	0	60	12	71	12	0	4	95	8	27	35	0	1	70	57	148	57	0	2	262	487	1885
17:30:00	44	12	20	0	4	76	22	71	11	0	6	104	10	24	31	0	4	65	61	131	74	0	5	266	511	1941
17:45:00	27	18	13	0	3	58	10	65	11	0	7	86	10	22	29	0	3	61	67	107	51	0	1	225	430	1904
Grand Total	580	166	157	0	17	903	247	1638	110	0	29	1995	90	198	266	0	17	554	504	1465	592	0	29	2561	**6013**	-
Approach%	64.2%	18.4%	17.4%	0%		-	12.4%	82.1%	5.5%	0%		-	16.2%	35.7%	48%	0%		-	19.7%	57.2%	23.1%	0%		-	-	-
Totals %	9.6%	2.8%	2.6%	0%		15%	4.1%	27.2%	1.8%	0%		33.2%	1.5%	3.3%	4.4%	0%		9.2%	8.4%	24.4%	9.8%	0%		42.6%	-	-
Heavy	3	0	2	0		-	2	93	0	0		-	2	2	5	0		-	8	87	11	0		-	-	-
Heavy %	0.5%	0%	1.3%	0%		-	0.8%	5.7%	0%	0%		-	2.2%	1%	1.9%	0%		-	1.6%	5.9%	1.9%	0%		-	-	-
Bicycles	0	0	0	0		-	0	0	0	0		-	0	1	0	0		-	0	1	0	0		-	-	-
Bicycle %	0%	0%	0%	0%		-	0%	0%	0%	0%		-	0%	0.5%	0%	0%		-	0%	0.1%	0%	0%		-	-	-

BA Group
45 St. Clair Avenue West, Suite 300
Toronto ON, CANADA, M4V 1K9

Peak Hour: 08:00 AM - 09:00 AM Weather: Overcast (2.1 °C)

Start Time	N Approach FARLEY DR						E Approach CLAIR RD						S Approach FARLEY DR						W Approach CLAIR RD						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
08:00:00	27	1	9	0	0	37	10	127	3	0	0	140	0	3	6	0	1	9	8	72	16	0	0	96	282
08:15:00	30	5	6	0	1	41	14	131	6	0	0	151	1	3	5	0	1	9	9	69	24	0	1	102	303
08:30:00	43	3	3	0	1	49	20	195	9	0	0	224	3	3	7	0	0	13	9	75	25	0	0	109	395
08:45:00	45	11	7	0	1	63	17	140	9	0	1	166	2	4	12	0	0	18	20	75	36	0	1	131	378
Grand Total	145	20	25	0	3	190	61	593	27	0	1	681	6	13	30	0	2	49	46	291	101	0	2	438	**1358**
Approach%	76.3%	10.5%	13.2%	0%		-	9%	87.1%	4%	0%		-	12.2%	26.5%	61.2%	0%		-	10.5%	66.4%	23.1%	0%		-	-
Totals %	10.7%	1.5%	1.8%	0%		14%	4.5%	43.7%	2%	0%		50.1%	0.4%	1%	2.2%	0%		3.6%	3.4%	21.4%	7.4%	0%		32.3%	-
PHF	0.81	0.45	0.69	0		0.75	0.76	0.76	0.75	0		0.76	0.5	0.81	0.63	0		0.68	0.58	0.97	0.7	0		0.84	-
Heavy	1	0	0	0		1	0	33	0	0		33	1	1	0	0		2	3	31	3	0		37	-
Heavy %	0.7%	0%	0%	0%		0.5%	0%	5.6%	0%	0%		4.8%	16.7%	7.7%	0%	0%		4.1%	6.5%	10.7%	3%	0%		8.4%	-
Lights	144	20	25	0		189	61	560	27	0		648	5	12	30	0		47	43	260	98	0		401	-
Lights %	99.3%	100%	100%	0%		99.5%	100%	94.4%	100%	0%		95.2%	83.3%	92.3%	100%	0%		95.9%	93.5%	89.3%	97%	0%		91.6%	-
Single-Unit Trucks	1	0	0	0		1	0	8	0	0		8	1	1	0	0		2	3	14	1	0		18	-
Single-Unit Trucks %	0.7%	0%	0%	0%		0.5%	0%	1.3%	0%	0%		1.2%	16.7%	7.7%	0%	0%		4.1%	6.5%	4.8%	1%	0%		4.1%	-
Buses	0	0	0	0		0	0	7	0	0		7	0	0	0	0		0	0	8	2	0		10	-
Buses %	0%	0%	0%	0%		0%	0%	1.2%	0%	0%		1%	0%	0%	0%	0%		0%	0%	2.7%	2%	0%		2.3%	-
Articulated Trucks	0	0	0	0		0	0	18	0	0		18	0	0	0	0		0	0	9	0	0		9	-
Articulated Trucks %	0%	0%	0%	0%		0%	0%	3%	0%	0%		2.6%	0%	0%	0%	0%		0%	0%	3.1%	0%	0%		2.1%	-
Pedestrians	-	-	-	-	3	-	-	-	-	-	1	-	-	-	-	-	2	-	-	-	-	-	2	-	-
Pedestrians%	-	-	-	-	37.5%		-	-	-	-	12.5%		-	-	-	-	25%		-	-	-	-	25%		-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
Bicycles on Crosswalk%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	-
Bicycles on Road%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-

BA Group
45 St. Clair Avenue West, Suite 300
Toronto ON, CANADA, M4V 1K9

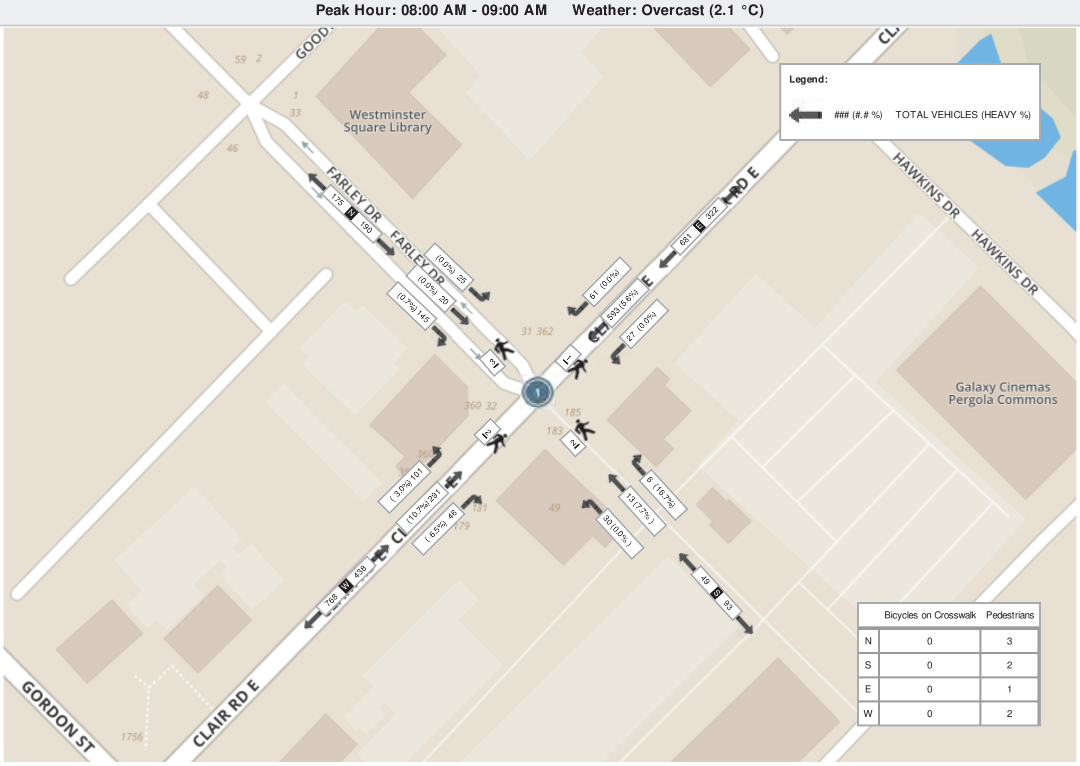
Peak Hour: 04:45 PM - 05:45 PM Weather: Mostly Cloudy (2.8 °C)

Start Time	N Approach FARLEY DR						E Approach CLAIR RD						S Approach FARLEY DR						W Approach CLAIR RD						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
16:45:00	38	21	5	0	1	64	14	85	15	0	3	114	12	27	23	0	3	62	58	119	50	0	4	227	467
17:00:00	42	20	18	0	1	80	27	78	10	0	2	115	7	28	22	0	0	57	44	129	51	0	5	224	476
17:15:00	27	20	13	0	0	60	12	71	12	0	4	95	8	27	35	0	1	70	57	148	57	0	2	262	487
17:30:00	44	12	20	0	4	76	22	71	11	0	6	104	10	24	31	0	4	65	61	131	74	0	5	266	511
Grand Total	151	73	56	0	6	280	75	305	48	0	15	428	37	106	111	0	8	254	220	527	232	0	16	979	**1941**
Approach%	53.9%	26.1%	20%	0%		-	17.5%	71.3%	11.2%	0%		-	14.6%	41.7%	43.7%	0%		-	22.5%	53.8%	23.7%	0%		-	-
Totals %	7.8%	3.8%	2.9%	0%		14.4%	3.9%	15.7%	2.5%	0%		22.1%	1.9%	5.5%	5.7%	0%		13.1%	11.3%	27.2%	12%	0%		50.4%	-
PHF	0.86	0.87	0.7	0		0.88	0.69	0.9	0.8	0		0.93	0.77	0.95	0.79	0		0.91	0.9	0.89	0.78	0		0.92	-
Heavy	0	0	2	0		2	0	12	0	0		12	0	0	2	0		2	1	16	1	0		18	-
Heavy %	0%	0%	3.6%	0%		0.7%	0%	3.9%	0%	0%		2.8%	0%	0%	1.8%	0%		0.8%	0.5%	3%	0.4%	0%		1.8%	-
Lights	151	73	54	0		278	75	293	48	0		416	37	106	109	0		252	219	511	231	0		961	-
Lights %	100%	100%	96.4%	0%		99.3%	100%	96.1%	100%	0%		97.2%	100%	100%	98.2%	0%		99.2%	99.5%	97%	99.6%	0%		98.2%	-
Single-Unit Trucks	0	0	2	0		2	0	6	0	0		6	0	0	2	0		2	1	2	1	0		4	-
Single-Unit Trucks %	0%	0%	3.6%	0%		0.7%	0%	2%	0%	0%		1.4%	0%	0%	1.8%	0%		0.8%	0.5%	0.4%	0.4%	0%		0.4%	-
Buses	0	0	0	0		0	0	0	0	0		0	0	0	0	0		0	0	2	0	0		2	-
Buses %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0.4%	0%	0%		0.2%	-
Articulated Trucks	0	0	0	0		0	0	6	0	0		6	0	0	0	0		0	0	12	0	0		12	-
Articulated Trucks %	0%	0%	0%	0%		0%	0%	2%	0%	0%		1.4%	0%	0%	0%	0%		0%	0%	2.3%	0%	0%		1.2%	-
Pedestrians	-	-	-	-	6	-	-	-	-	-	14	-	-	-	-	-	7	-	-	-	-	-	15	-	-
Pedestrians%	-	-	-	-	13.3%		-	-	-	-	31.1%		-	-	-	-	15.6%		-	-	-	-	33.3%		-
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	1	-	-
Bicycles on Crosswalk%	-	-	-	-	0%		-	-	-	-	2.2%		-	-	-	-	2.2%		-	-	-	-	2.2%		-
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-	0	1	0	0	0	-	0	0	0	0	0	-	-
Bicycles on Road%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-

Turning Movement Count
Location Name: CLAIR RD & FARLEY DR
Date: Tue, Dec 19, 2017 Deployment Lead: Theo Daglis

BA Group
45 St. Clair Avenue West, Suite 300
Toronto ON, CANADA, M4V 1K9

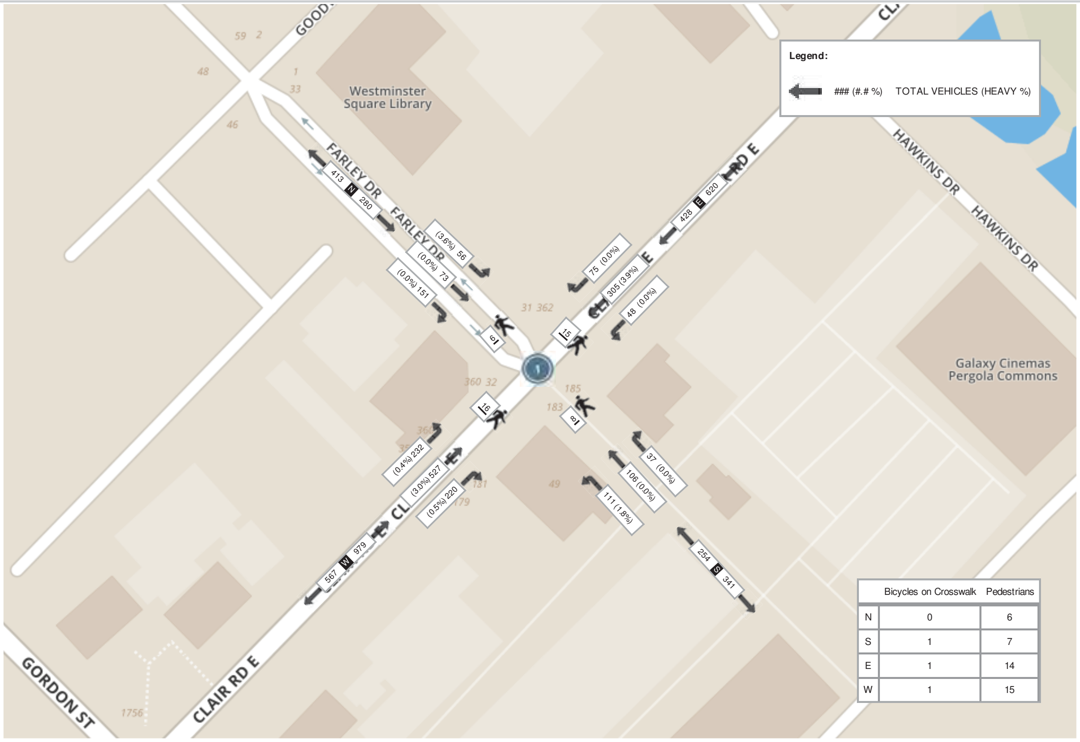
Peak Hour: 08:00 AM - 09:00 AM Weather: Overcast (2.1 °C)



	Bicycles on Crosswalk	Pedestrians
N	0	3
S	0	2
E	0	1
W	0	2

BA Group
45 St. Clair Avenue West, Suite 300
Toronto ON, CANADA, M4V 1K9

Peak Hour: 04:45 PM - 05:45 PM Weather: Mostly Cloudy (2.8 °C)



	Bicycles on Crosswalk	Pedestrians
N	0	6
S	1	7
E	1	14
W	1	15

BA Group
45 St. Clair Avenue West, Suite 300
Toronto ON, CANADA, M4V 1K9

Turning Movement Count (2 . CLAIR RD & BEAVER MEADOW DR)

Start Time	N Approach BEAVER MEADOW DR						E Approach CLAIR RD						S Approach BEAVER MEADOW DR						W Approach CLAIR RD						Int. Total (15 min)	Int. Total (1 hr)
	Right N:W	Thru N:S	Left N:E	U-Turn N:N	Peds N:	Approach Total	Right E:N	Thru E:W	Left E:S	U-Turn E:E	Peds E:	Approach Total	Right S:E	Thru S:N	Left S:W	U-Turn S:S	Peds S:	Approach Total	Right W:S	Thru W:E	Left W:N	U-Turn W:W	Peds W:	Approach Total		
07:00:00	24	0	2	0	0	26	1	69	3	0	1	73	2	1	1	0	0	4	2	30	5	0	0	37	140	
07:15:00	18	0	4	0	0	22	0	94	5	0	0	99	4	1	6	0	0	11	0	38	4	0	0	42	174	
07:30:00	20	2	0	0	0	22	4	137	4	0	0	145	4	2	3	0	0	9	4	51	12	0	0	67	243	
07:45:00	25	0	6	0	0	31	2	148	3	1	0	154	5	1	4	0	0	10	2	41	4	0	0	47	242	799
08:00:00	17	1	9	0	0	27	1	120	3	0	0	124	6	3	5	0	0	14	5	63	10	0	0	78	243	902
08:15:00	27	1	11	0	0	39	6	124	3	0	2	133	8	6	12	0	1	26	6	63	17	0	0	86	284	1012
08:30:00	35	2	2	0	0	39	8	197	7	0	0	212	7	1	3	0	0	11	4	61	20	0	0	85	347	1116
08:45:00	17	2	5	0	2	24	9	137	2	0	0	148	6	1	4	0	0	11	5	66	15	0	0	86	269	1143
BREAK																										
16:00:00	10	1	5	0	0	16	3	70	3	0	1	76	5	2	2	0	0	9	6	141	20	1	0	168	269	
16:15:00	10	0	2	0	0	12	3	92	6	0	1	101	9	1	5	0	0	15	5	141	18	0	0	164	292	
16:30:00	13	2	5	0	1	20	8	87	5	0	0	100	6	1	6	0	0	13	5	161	21	0	0	187	320	
16:45:00	12	4	5	0	1	21	5	106	4	0	0	115	2	0	6	0	0	8	6	131	29	0	0	166	310	1191
17:00:00	24	1	3	0	0	28	8	105	2	0	3	115	6	2	4	0	0	12	5	145	28	0	0	178	333	1255
17:15:00	9	1	3	0	0	13	5	100	5	0	0	110	7	0	6	0	1	13	2	156	30	1	3	189	325	1288
17:30:00	13	2	5	0	0	20	4	97	6	0	0	107	3	1	4	0	0	8	3	158	22	1	0	184	319	1287
17:45:00	4	1	2	0	0	7	3	95	3	0	0	101	2	1	2	0	0	5	8	118	23	1	0	150	263	1240
Grand Total	278	20	69	0	4	367	70	1778	64	1	8	1913	82	24	73	0	2	179	68	1564	278	4	3	1914	**4373**	-
Approach%	75.7%	5.4%	18.8%	0%		-	3.7%	92.9%	3.3%	0.1%		-	45.8%	13.4%	40.8%	0%		-	3.6%	81.7%	14.5%	0.2%		-	-	-
Totals %	6.4%	0.5%	1.6%	0%		8.4%	1.6%	40.7%	1.5%	0%		43.7%	1.9%	0.5%	1.7%	0%		4.1%	1.6%	35.8%	6.4%	0.1%		43.8%	-	-
Heavy	4	0	4	0		-	2	97	5	0		-	5	1	1	0		-	2	92	4	0		-	-	-
Heavy %	1.4%	0%	5.8%	0%		-	2.9%	5.5%	7.8%	0%		-	6.1%	4.2%	1.4%	0%		-	2.9%	5.9%	1.4%	0%		-	-	-
Bicycles	0	0	0	0		-	0	2	0	0		-	0	0	0	0		-	1	1	0	0		-	-	-
Bicycle %	0%	0%	0%	0%		-	0%	0.1%	0%	0%		-	0%	0%	0%	0%		-	1.5%	0.1%	0%	0%		-	-	-

BA Group
45 St. Clair Avenue West, Suite 300
Toronto ON, CANADA, M4V 1K9

Peak Hour: 08:00 AM - 09:00 AM Weather: Overcast (2.1 °C)

Start Time	N Approach BEAVER MEADOW DR						E Approach CLAIR RD						S Approach BEAVER MEADOW DR						W Approach CLAIR RD						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
08:00:00	17	1	9	0	0	27	1	120	3	0	0	124	6	3	5	0	0	14	5	63	10	0	0	78	243
08:15:00	27	1	11	0	0	39	6	124	3	0	2	133	8	6	12	0	1	26	6	63	17	0	0	86	284
08:30:00	35	2	2	0	0	39	8	197	7	0	0	212	7	1	3	0	0	11	4	61	20	0	0	85	347
08:45:00	17	2	5	0	2	24	9	137	2	0	0	148	6	1	4	0	0	11	5	66	15	0	0	86	269
Grand Total	96	6	27	0	2	129	24	578	15	0	2	617	27	11	24	0	1	62	20	253	62	0	0	335	**1143**
Approach%	74.4%	4.7%	20.9%	0%		-	3.9%	93.7%	2.4%	0%		-	43.5%	17.7%	38.7%	0%		-	6%	75.5%	18.5%	0%		-	-
Totals %	8.4%	0.5%	2.4%	0%		11.3%	2.1%	50.6%	1.3%	0%		54%	2.4%	1%	2.1%	0%		5.4%	1.7%	22.1%	5.4%	0%		29.3%	-
PHF	0.69	0.75	0.61	0		0.83	0.67	0.73	0.54	0		0.73	0.84	0.46	0.5	0		0.6	0.83	0.96	0.78	0		0.97	-
Heavy	2	0	0	0		2	2	38	3	0		43	3	1	0	0		4	1	34	2	0		37	-
Heavy %	2.1%	0%	0%	0%		1.6%	8.3%	6.6%	20%	0%		7%	11.1%	9.1%	0%	0%		6.5%	5%	13.4%	3.2%	0%		11%	-
Lights	94	6	27	0		127	22	540	12	0		574	24	10	24	0		58	19	219	60	0		298	-
Lights %	97.9%	100%	100%	0%		98.4%	91.7%	93.4%	80%	0%		93%	88.9%	90.9%	100%	0%		93.5%	95%	86.6%	96.8%	0%		89%	-
Single-Unit Trucks	0	0	0	0		0	0	8	2	0		10	1	0	0	0		1	0	16	0	0		16	-
Single-Unit Trucks %	0%	0%	0%	0%		0%	0%	1.4%	13.3%	0%		1.6%	3.7%	0%	0%	0%		1.6%	0%	6.3%	0%	0%		4.8%	-
Buses	2	0	0	0		2	2	9	1	0		12	1	1	0	0		2	0	9	2	0		11	-
Buses %	2.1%	0%	0%	0%		1.6%	8.3%	1.6%	6.7%	0%		1.9%	3.7%	9.1%	0%	0%		3.2%	0%	3.6%	3.2%	0%		3.3%	-
Articulated Trucks	0	0	0	0		0	0	21	0	0		21	1	0	0	0		1	1	9	0	0		10	-
Articulated Trucks %	0%	0%	0%	0%		0%	0%	3.6%	0%	0%		3.4%	3.7%	0%	0%	0%		1.6%	5%	3.6%	0%	0%		3%	-
Pedestrians	-	-	-	-	2	-	-	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	0	-	-
Pedestrians%	-	-	-	-	40%		-	-	-	-	40%		-	-	-	-	20%		-	-	-	-	0%		-
Bicycles on Road	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	-
Bicycles on Road%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-

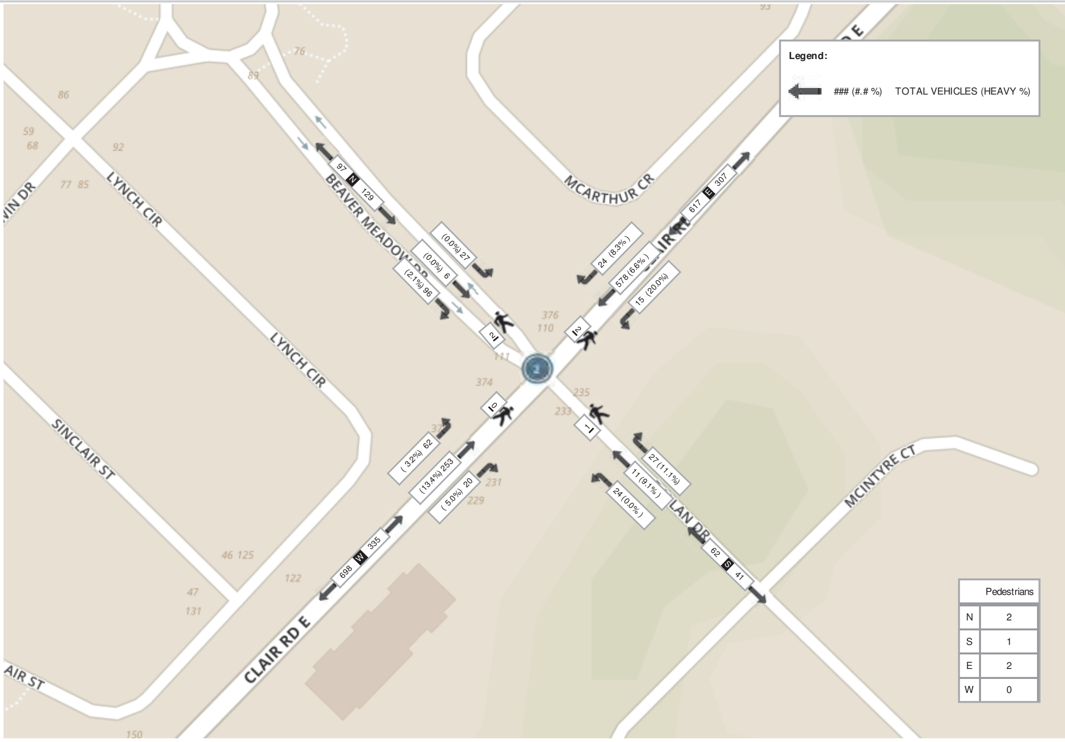
BA Group
45 St. Clair Avenue West, Suite 300
Toronto ON, CANADA, M4V 1K9

Peak Hour: 04:30 PM - 05:30 PM Weather: Mostly Cloudy (2.8 °C)

Start Time	N Approach BEAVER MEADOW DR						E Approach CLAIR RD						S Approach BEAVER MEADOW DR						W Approach CLAIR RD						Int. Total (15 min)
	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	Right	Thru	Left	U-Turn	Peds	Approach Total	
16:30:00	13	2	5	0	1	20	8	87	5	0	0	100	6	1	6	0	0	13	5	161	21	0	0	187	320
16:45:00	12	4	5	0	1	21	5	106	4	0	0	115	2	0	6	0	0	8	6	131	29	0	0	166	310
17:00:00	24	1	3	0	0	28	8	105	2	0	3	115	6	2	4	0	0	12	5	145	28	0	0	178	333
17:15:00	9	1	3	0	0	13	5	100	5	0	0	110	7	0	6	0	1	13	2	156	30	1	3	189	325
Grand Total	58	8	16	0	2	82	26	398	16	0	3	440	21	3	22	0	1	46	18	593	108	1	3	720	**1288**
Approach%	70.7%	9.8%	19.5%	0%		-	5.9%	90.5%	3.6%	0%		-	45.7%	6.5%	47.8%	0%		-	2.5%	82.4%	15%	0.1%		-	-
Totals %	4.5%	0.6%	1.2%	0%		6.4%	2%	30.9%	1.2%	0%		34.2%	1.6%	0.2%	1.7%	0%		3.6%	1.4%	46%	8.4%	0.1%		55.9%	-
PHF	0.6	0.5	0.8	0		0.73	0.81	0.94	0.8	0		0.96	0.75	0.38	0.92	0		0.88	0.75	0.92	0.9	0.25		0.95	-
Heavy	1	0	0	0		1	0	13	1	0		14	1	0	0	0		1	0	18	1	0		19	-
Heavy %	1.7%	0%	0%	0%		1.2%	0%	3.3%	6.3%	0%		3.2%	4.8%	0%	0%	0%		2.2%	0%	3%	0.9%	0%		2.6%	-
Lights	57	8	16	0		81	26	385	15	0		426	20	3	22	0		45	18	575	107	1		701	-
Lights %	98.3%	100%	100%	0%		98.8%	100%	96.7%	93.8%	0%		96.8%	95.2%	100%	100%	0%		97.8%	100%	97%	99.1%	100%		97.4%	-
Single-Unit Trucks	1	0	0	0		1	0	7	1	0		8	0	0	0	0		0	0	5	1	0		6	-
Single-Unit Trucks %	1.7%	0%	0%	0%		1.2%	0%	1.8%	6.3%	0%		1.8%	0%	0%	0%	0%		0%	0%	0.8%	0.9%	0%		0.8%	-
Buses	0	0	0	0		0	0	0	0	0		0	1	0	0	0		1	0	3	0	0		3	-
Buses %	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	4.8%	0%	0%	0%		2.2%	0%	0.5%	0%	0%		0.4%	-
Articulated Trucks	0	0	0	0		0	0	6	0	0		6	0	0	0	0		0	0	10	0	0		10	-
Articulated Trucks %	0%	0%	0%	0%		0%	0%	1.5%	0%	0%		1.4%	0%	0%	0%	0%		0%	0%	1.7%	0%	0%		1.4%	-
Pedestrians	-	-	-	-	2	-	-	-	-	-	3	-	-	-	-	-	1	-	-	-	-	-	3	-	-
Pedestrians%	-	-	-	-	22.2%		-	-	-	-	33.3%		-	-	-	-	11.1%		-	-	-	-	33.3%		-
Bicycles on Road	0	0	0	0	0	-	0	2	0	0	0	-	0	0	0	0	0	-	0	1	0	0	0	-	-
Bicycles on Road%	-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-	-	-	-	0%		-

BA Group
45 St. Clair Avenue West, Suite 300
Toronto ON, CANADA, M4V 1K9

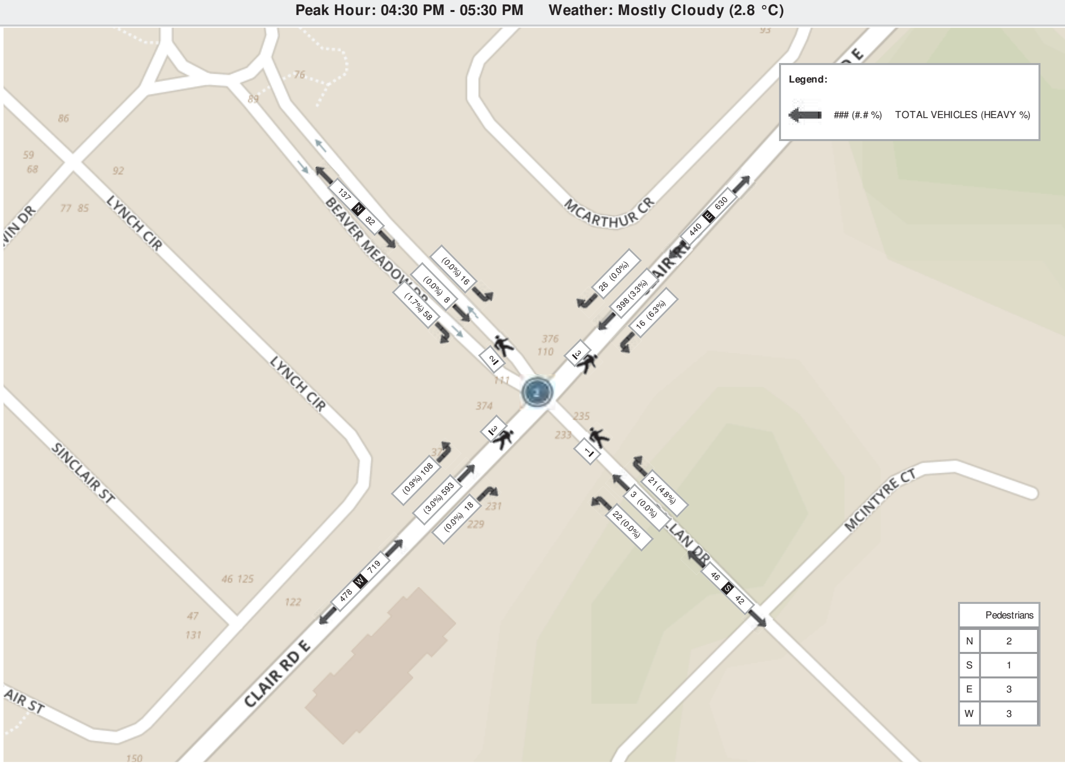
Peak Hour: 08:00 AM - 09:00 AM Weather: Overcast (2.1 °C)



Turning Movement Count
Location Name: CLAIR RD & BEAVER MEADOW DR
Date: Tue, Dec 19, 2017 Deployment Lead: Theo Daglis

BA Group
45 St. Clair Avenue West, Suite 300
Toronto ON, CANADA, M4V 1K9

Peak Hour: 04:30 PM - 05:30 PM Weather: Mostly Cloudy (2.8 °C)



Turning Movement Count (6 . CLAIR ROAD E & VICTORIA RD S)

Start Time	S Approach VICTORIA RD S					W Approach CLAIR ROAD E					N Approach VICTORIA RD S					Int. Total (15 min)	Int. Total (1 hr)
	Thru S:N	Left S:W	U-Turn S:S	Peds S:	Approach Total	Right W:S	Left W:N	U-Turn W:W	Peds W:	Approach Total	Right N:W	Thru N:S	U-Turn N:N	Peds N:	Approach Total		
07:00:00	16	4	0	0	20	12	33	0	0	45	47	59	0	0	106	171	
07:15:00	23	8	0	0	31	19	33	0	0	52	86	63	0	0	149	232	
07:30:00	41	15	0	0	56	13	34	0	0	47	93	73	0	0	166	269	
07:45:00	50	10	0	0	60	15	61	0	0	76	135	75	0	0	210	346	1018
08:00:00	52	10	0	0	62	9	59	0	0	68	84	56	0	0	140	270	1117
08:15:00	67	11	0	0	78	8	57	0	0	65	107	51	0	0	158	301	1186
08:30:00	57	8	0	0	65	8	51	0	0	59	107	48	0	0	155	279	1196
08:45:00	48	19	0	0	67	11	50	0	0	61	91	60	0	0	151	279	1129
BREAK																	
16:00:00	62	10	0	0	72	14	86	0	0	100	68	38	0	0	106	278	
16:15:00	66	12	0	0	78	13	109	0	0	122	81	56	0	0	137	337	
16:30:00	77	15	0	0	92	18	105	0	0	123	66	61	0	0	127	342	
16:45:00	78	18	0	0	96	11	103	0	0	114	76	47	0	0	123	333	1290
17:00:00	79	21	0	0	100	13	99	0	0	112	96	50	0	0	146	358	1370
17:15:00	74	22	0	0	96	15	109	0	0	124	101	46	0	0	147	367	1400
17:30:00	58	12	0	0	70	15	91	0	0	106	81	43	0	0	124	300	1358
17:45:00	70	16	0	0	86	11	70	0	0	81	64	28	0	0	92	259	1284
Grand Total	918	211	0	0	1129	205	1150	0	0	1355	1383	854	0	0	2237	**4721**	-
Approach%	81.3%	18.7%	0%		-	15.1%	84.9%	0%		-	61.8%	38.2%	0%		-	-	-
Totals %	19.4%	4.5%	0%		23.9%	4.3%	24.4%	0%		28.7%	29.3%	18.1%	0%		47.4%	-	-
Heavy	39	7	0		-	5	104	0		-	87	27	0		-	-	-
Heavy %	4.2%	3.3%	0%		-	2.4%	9%	0%		-	6.3%	3.2%	0%		-	-	-
Bicycles	-	-	-		-	-	-	-		-	-	-	-		-	-	-
Bicycle %	-	-	-		-	-	-	-		-	-	-	-		-	-	-

Peak Hour: 07:45 AM - 08:45 AM Weather: Mostly Cloudy (-1.9 °C)

Start Time	S Approach VICTORIA RD S					W Approach CLAIR ROAD E					N Approach VICTORIA RD S					Int. Total (15 min)
	Thru	Left	U-Turn	Peds	Approach Total	Right	Left	U-Turn	Peds	Approach Total	Right	Thru	U-Turn	Peds	Approach Total	
07:45:00	50	10	0	0	60	15	61	0	0	76	135	75	0	0	210	346
08:00:00	52	10	0	0	62	9	59	0	0	68	84	56	0	0	140	270
08:15:00	67	11	0	0	78	8	57	0	0	65	107	51	0	0	158	301
08:30:00	57	8	0	0	65	8	51	0	0	59	107	48	0	0	155	279
Grand Total	226	39	0	0	265	40	228	0	0	268	433	230	0	0	663	**1196**
Approach%	85.3%	14.7%	0%		-	14.9%	85.1%	0%		-	65.3%	34.7%	0%		-	-
Totals %	18.9%	3.3%	0%		22.2%	3.3%	19.1%	0%		22.4%	36.2%	19.2%	0%		55.4%	-
PHF	0.84	0.89	0		0.85	0.67	0.93	0		0.88	0.8	0.77	0		0.79	-
Heavy	11	4	0		15	1	29	0		30	22	5	0		27	-
Heavy %	4.9%	10.3%	0%		5.7%	2.5%	12.7%	0%		11.2%	5.1%	2.2%	0%		4.1%	-
Lights	215	35	0		250	39	199	0		238	411	225	0		636	-
Lights %	95.1%	89.7%	0%		94.3%	97.5%	87.3%	0%		88.8%	94.9%	97.8%	0%		95.9%	-
Single-Unit Trucks	5	0	0		5	0	14	0		14	15	2	0		17	-
Single-Unit Trucks %	2.2%	0%	0%		1.9%	0%	6.1%	0%		5.2%	3.5%	0.9%	0%		2.6%	-
Buses	6	4	0		10	1	2	0		3	5	2	0		7	-
Buses %	2.7%	10.3%	0%		3.8%	2.5%	0.9%	0%		1.1%	1.2%	0.9%	0%		1.1%	-
Articulated Trucks	0	0	0		0	0	13	0		13	2	1	0		3	-
Articulated Trucks %	0%	0%	0%		0%	0%	5.7%	0%		4.9%	0.5%	0.4%	0%		0.5%	-

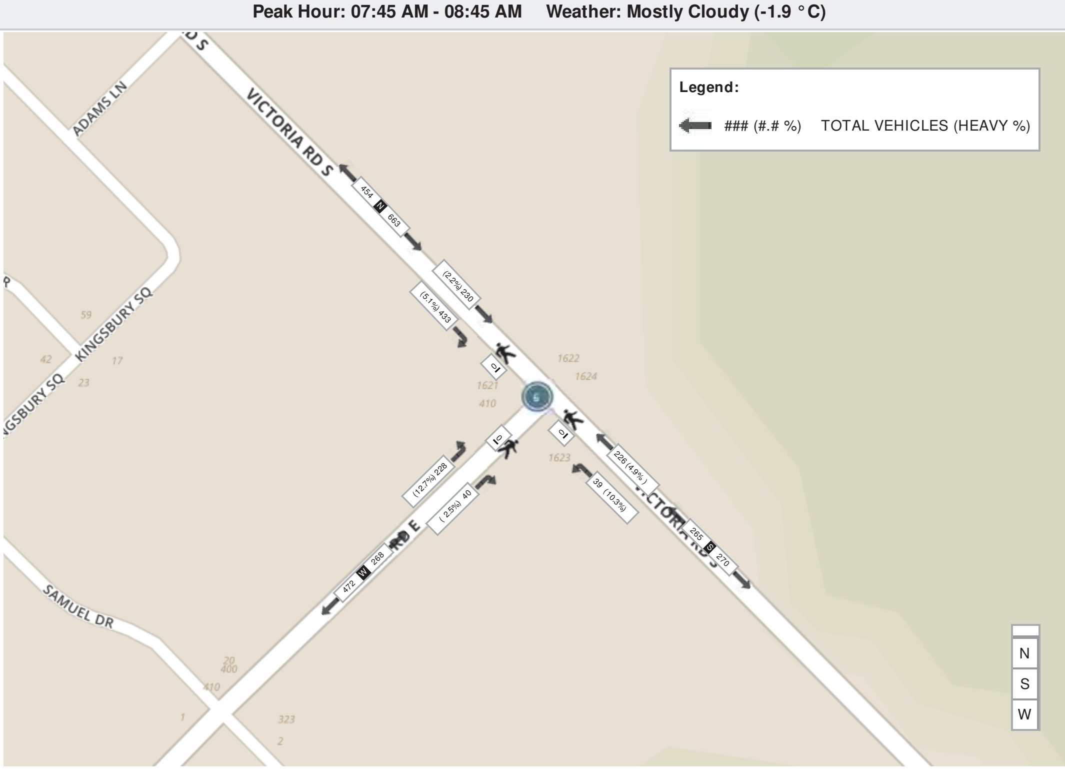
BA Group
45 St. Clair Avenue West, Suite 300
Toronto ON, CANADA, M4V 1K9

Peak Hour: 04:30 PM - 05:30 PM Weather: Partly Cloudy (-3 °C)

Start Time	S Approach VICTORIA RD S					W Approach CLAIR ROAD E					N Approach VICTORIA RD S					Int. Total (15 min)
	Thru	Left	U-Turn	Peds	Approach Total	Right	Left	U-Turn	Peds	Approach Total	Right	Thru	U-Turn	Peds	Approach Total	
16:30:00	77	15	0	0	92	18	105	0	0	123	66	61	0	0	127	342
16:45:00	78	18	0	0	96	11	103	0	0	114	76	47	0	0	123	333
17:00:00	79	21	0	0	100	13	99	0	0	112	96	50	0	0	146	358
17:15:00	74	22	0	0	96	15	109	0	0	124	101	46	0	0	147	367
Grand Total	308	76	0	0	384	57	416	0	0	473	339	204	0	0	543	**1400**
Approach%	80.2%	19.8%	0%		-	12.1%	87.9%	0%		-	62.4%	37.6%	0%		-	-
Totals %	22%	5.4%	0%		27.4%	4.1%	29.7%	0%		33.8%	24.2%	14.6%	0%		38.8%	-
PHF	0.97	0.86	0		0.96	0.79	0.95	0		0.95	0.84	0.84	0		0.92	-
Heavy	12	0	0		12	0	23	0		23	25	3	0		28	-
Heavy %	3.9%	0%	0%		3.1%	0%	5.5%	0%		4.9%	7.4%	1.5%	0%		5.2%	-
Lights	296	76	0		372	57	393	0		450	314	201	0		515	-
Lights %	96.1%	100%	0%		96.9%	100%	94.5%	0%		95.1%	92.6%	98.5%	0%		94.8%	-
Single-Unit Trucks	5	0	0		5	0	14	0		14	17	2	0		19	-
Single-Unit Trucks %	1.6%	0%	0%		1.3%	0%	3.4%	0%		3%	5%	1%	0%		3.5%	-
Buses	6	0	0		6	0	2	0		2	0	1	0		1	-
Buses %	1.9%	0%	0%		1.6%	0%	0.5%	0%		0.4%	0%	0.5%	0%		0.2%	-
Articulated Trucks	1	0	0		1	0	7	0		7	8	0	0		8	-
Articulated Trucks %	0.3%	0%	0%		0.3%	0%	1.7%	0%		1.5%	2.4%	0%	0%		1.5%	-

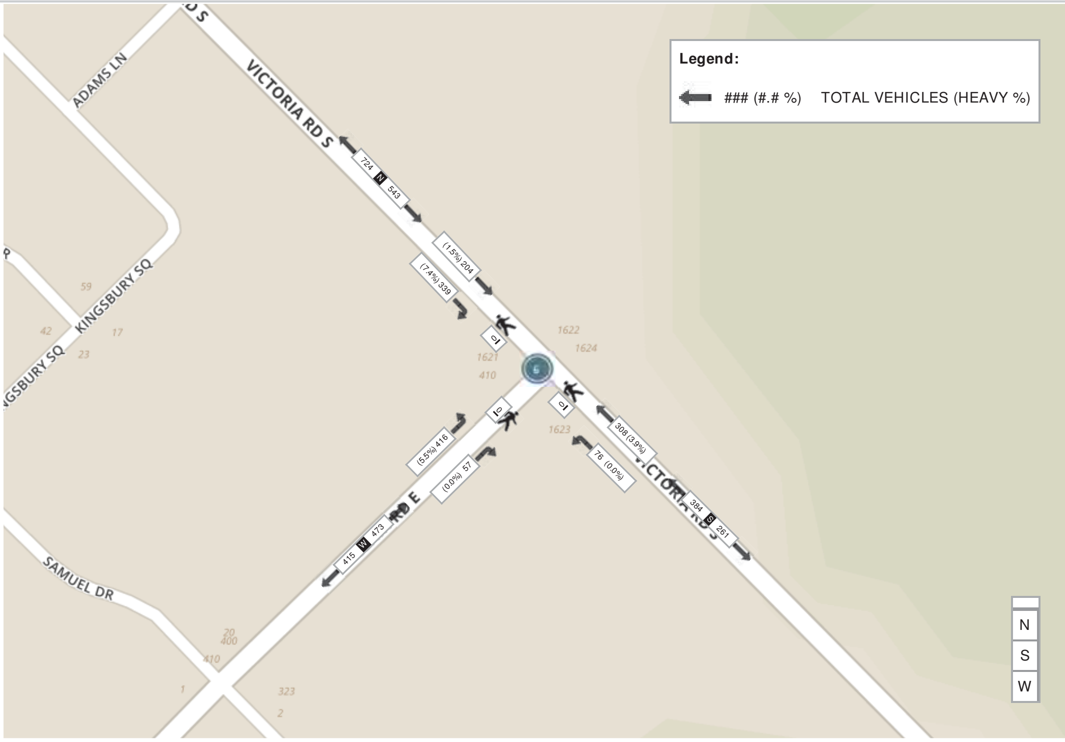
BA Group
45 St. Clair Avenue West, Suite 300
Toronto ON, CANADA, M4V 1K9

Peak Hour: 07:45 AM - 08:45 AM Weather: Mostly Cloudy (-1.9 °C)



BA Group
45 St. Clair Avenue West, Suite 300
Toronto ON, CANADA, M4V 1K9

Peak Hour: 04:30 PM - 05:30 PM Weather: Partly Cloudy (-3 °C)



REMWTpr s
62MtM%oiTMEGS-r SM SdtWMritSMl l
VpTp-tpMCL W%EL EOEWM 6, M* 9

Turning Movement Count (7 . MALTBY RD & GORDON ST)

Start Time	E Approach BEAVR MDO						S Approach WCDOCLMIV						W Approach BEAVR MDO						N Approach WCDOCLMIV						Int. Total (15 min)	Int. Total (1 hr)
	Dight N:L	VhTr N:u	ASat N:l	f UVrT- N:N	nSPd N:	EssTpoahlWptoc	Dight l :N	VhTr l :L	ASat l :u	f UVrT- l :l	nSPd l :	EssTpoahlWptoc	Dight u :l	VhTr u :N	ASat u :L	f UVrT- u :u	nSPd u :	EssTpoahlWptoc	Dight L:u	VhTr L:l	ASat L:N	f UVrT- L:L	nSPd L:	EssTpoahlWptoc		
l 0:l l :l l	l	l	l	l	l	l	7	02	0	l	l	46	1	7	7	l	l	2	4	10l	1	l	l	109	734	
l 0:12:l l	l	7	l	l	l	7	l	92	1l	l	l	1l 2	5	5	5	l	l	9	7l	130	l	l	l	140	5l 5	
l 0:5l :l l	7	7	l	l	l	6	7	95	2	l	l	1l l	4	7	4	l	l	14	75	131	l	l	l	146	5l 3	
l 0:62:l l	1	5	l	l	l	6	5	170	6	l	l	156	4	1	2	l	l	16	10	149	7	l	l	7l 4	53l	1750
l 4:l l :l l	7	1	1	l	l	6	2	135	15	l	l	141	3	6	3	1	l	10	4	165	l	l	l	121	525	1577
l 4:12:l l	l	l	5	l	l	5	1	126	9	l	l	136	6	6	2	l	l	15	4	152	1	l	l	166	576	1565
l 4:5l :l l	7	l	7	l	l	6	1	101	1l	l	l	147	1	6	0	7	l	16	12	136	l	l	l	109	509	1613
l 4:62:l l	l	5	l	l	l	5	l	154	7	l	l	16l	2	5	1l	l	l	14	11	150	1	l	l	169	51l	1533
888RDNE* 888																										
13:l l :l l	1	l	1	l	l	7	5	7l 0	0	l	l	710	1l	7	6	l	l	13	11	160	5	1	l	137	590	
13:12:l l	l	7	1	l	l	5	7	143	9	l	l	190	1l	5	9	l	l	77	6	103	7	l	l	147	6l 6	
13:5l :l l	l	1	7	l	l	5	5	773	11	l	l	76l	11	1	4	l	l	7l	2	14l	1	l	l	143	669	
13:62:l l	l	l	7	l	l	7	2	706	1l	l	l	749	9	5	2	l	l	10	6	149	1	l	l	196	2l 7	1027
10:l l :l l	l	5	l	l	l	5	l	774	17	l	l	76l	16	5	2	l	l	77	11	10l	7	l	l	145	664	14l 5
10:12:l l	l	7	7	l	l	6	6	714	7	l	l	776	16	5	15	l	l	5l	1l	101	1	l	l	147	66l	1459
10:5l :l l	7	1	1	l	l	6	1	753	1l	l	l	760	9	1	0	l	l	10	9	123	l	l	l	132	655	1475
10:62:l l	l	2	1	l	l	3	l	192	5	l	l	194	3	7	1l	l	l	14	5	129	5	l	l	132	540	10l 4
Grand Total	1l	72	13	l	l	21	57	7043	176	l	l	7967	119	61	1l 0	5	l	70l	130	7316	14	1	l	74l l	**6063**	U
Approach%	19K3.	69.	51K6.	l .		U	1K1.	96K0.	6K7.	l .		U	66K1.	12K7.	59K3.	1K1.		U	3.	95K6.	l K3.	l .		U	-	U
Totals %	l K7.	l K6.	l K5.	l .		l K4.	l K2.	63.	7.	l .		64K2.	7.	l K0.	1K4.	l .		6K2.	7K4.	65K1.	l K6.	l .		63K7.	-	U
Heavy	7	1	1	l		U	2	156	7	l		U	6	3	3	l		U	5	17l	2	l		U	-	U
Heavy %	7l .	6.	3K5.	l .		U	12K3.	6K4.	1K3.	l .		U	5K6.	16K3.	2K3.	l .		U	1K4.	6K3.	70K4.	l .		U	-	U
Bicycles	l	l	l	l		U	l	l	l	l		U	l	1	l	l		U	l	l	l	l		U	-	U
Bicycle %	l .	l .	l .	l .		U	l .	l .	l .	l .		U	l .	7K6.	l .	l .		U	l .	l .	l .	l .		U	-	U

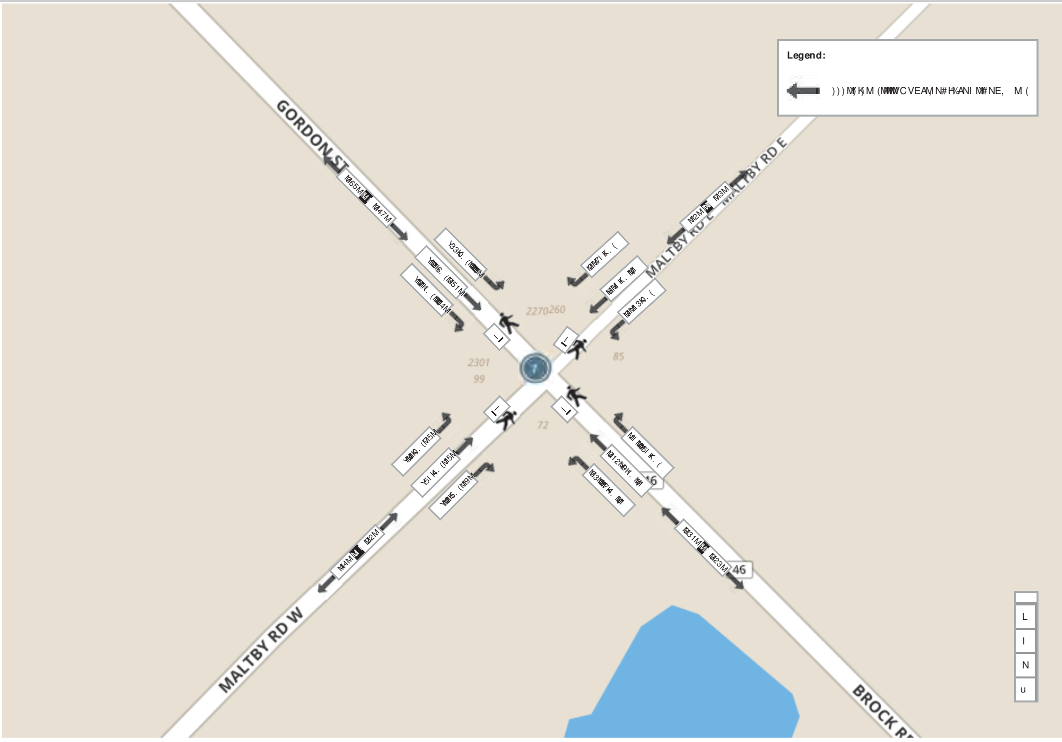
Peak Hour: 07:45 AM - 08:45 AMMMMMWeather: Mostly Cloudy (-1.9 °C)

Start Time	E Approach BEAVR MDO						S Approach WCDOCLMIV						W Approach BEAVR MDO						N Approach WCDOCLMIV						Int. Total (15 min)
	Dight	VhTr	ASet	f UVr T-	n SPd	Ess TpoahMWptoc	Dight	VhTr	ASet	f UVr T-	n SPd	Ess TpoahMWptoc	Dight	VhTr	ASet	f UVr T-	n SPd	Ess TpoahMWptoc	Dight	VhTr	ASet	f UVr T-	n SPd	Ess TpoahMWptoc	
I 0:62:I I	1	5	I	I	I	6	5	170	6	I	I	156	4	1	2	I	I	16	10	149	7	I	I	7I 4	53I
I 4:I I :I I	7	1	1	I	I	6	2	135	15	I	I	141	3	6	3	1	I	10	4	165	I	I	I	121	525
I 4:12:I I	I	I	5	I	I	5	1	126	9	I	I	136	6	6	2	I	I	15	4	152	1	I	I	166	576
I 4:5I :I I	7	I	7	I	I	6	1	101	1I	I	I	147	1	6	0	7	I	16	12	136	I	I	I	109	509
Grand Total	2	6	3	I	I	12	1I	312	53	I	I	331	19	15	75	5	I	24	64	351	5	I	I	347	**1416**
Approach%	55K5.	73K0.	6I .	I .		U	1K2.	95.	2K6.	I .		U	57K4.	77K6.	59K0.	2K7.		U	0.	97K2.	I K6.	I .		U	-
Totals %	I K6.	I K5.	I K6.	I .		1K1.	I K0.	65K6.	7K2.	I .		63K0.	1K5.	I K9.	1K3.	I K7.		6K1.	5K6.	66K3.	I K7.	I .		64K7.	-
PHF	I K35	I K55	I K2	I		I K96	I K2	I K9	I K39	I		I K91	I K29	I K41	I K47	I K54		I K42	I K01	I K45	I K54	I		I K47	-
Heavy	1	I	1	I		7	5	23	1	I		3I	1	6	7	I		0	1	56	7	I		50	-
Heavy %	7I .	I .	13K0.	I .		15K5.	5I .	9K1.	7K4.	I .		9K1.	2K5.	5I K4.	4K0.	I .		17K1.	7K1.	2K6.	33K0.	I .		2K6.	-
Lights	6	6	2	I		15	0	229	52	I		3I 1	14	9	71	5		21	60	290	1	I		362	-
Lights %	4I .	1I I .	45K5.	I .		43K0.	0I .	9I K9.	90K7.	I .		9I K9.	96K0.	39K7.	91K5.	1I I .		40K9.	90K9.	96K3.	55K5.	I .		96K3.	-
Single-Unit Trucks	I	I	1	I		1	5	71	I	I		76	I	5	7	I		2	1	10	I	I		14	-
Single-Unit Trucks %	I .	I .	13K0.	I .		3K0.	5I .	5K6.	I .	I .		5K3.	I .	75K1.	4K0.	I .		4K3.	7K1.	7K0.	I .	I .		7K3.	-
Buses	1	I	I	I		1	I	7I	I	I		7I	1	1	I	I		7	I	3	7	I		4	-
Buses %	7I .	I .	I .	I .		3K0.	I .	5K5.	I .	I .		5.	2K5.	0K0.	I .	I .		5K6.	I .	1.	33K0.	I .		1K7.	-
Articulated Trucks	I	I	I	I		I	I	12	1	I		13	I	I	I	I		I	I	11	I	I		11	-
Articulated Trucks %	I .	I .	I .	I .		I .	I .	7K6.	7K4.	I .		7K6.	I .	I .	I .	I .		I .	I .	1K0.	I .	I .		1K3.	-
Bicycles on Road	I	I	I	I	I	U	I	I	I	I	I	U	I	I	I	I	I	U	I	I	I	I	I	U	-
Bicycles on Road%	U	U	U	U	.	M	U	U	U	U	.	M	U	U	U	U	.	M	U	U	U	U	.	M	-

Peak Hour: 04:30 PM - 05:30 PMMMMMWeather: Partly Cloudy (-3 °C)

Start Time	E Approach BEAVR MDO						S Approach WCDOCLMIV						W Approach BEAVR MDO						N Approach WCDOCLMIV						Int. Total (15 min)
	Dight	VhTr	ASet	f UVr T-	n SPd	Ess TpoahMWptoc	Dight	VhTr	ASet	f UVr T-	n SPd	Ess TpoahMWptoc	Dight	VhTr	ASet	f UVr T-	n SPd	Ess TpoahMWptoc	Dight	VhTr	ASet	f UVr T-	n SPd	Ess TpoahMWptoc	
13:5I :I I	I	1	7	I	I	5	5	773	11	I	I	76I	11	1	4	I	I	7I	2	14I	1	I	I	143	669
13:62:I I	I	I	7	I	I	7	2	706	1I	I	I	749	9	5	2	I	I	10	6	149	1	I	I	196	2I 7
10:I I :I I	I	5	I	I	I	5	I	774	17	I	I	76I	16	5	2	I	I	77	11	10I	7	I	I	145	664
10:12:I I	I	7	7	I	I	6	6	714	7	I	I	776	16	5	15	I	I	5I	1I	101	1	I	I	147	66I
Grand Total	I	3	3	I	I	17	17	963	52	I	I	995	64	1I	51	I	I	49	5I	01I	2	I	I	062	**1839**
Approach%	I .	2I .	2I .	I .		U	1K7.	92K5.	5K2.	I .		U	25K9.	11K7.	56K4.	I .		U	6.	92K5.	I K0.	I .		U	-
Totals %	I .	I K5.	I K5.	I .		I K0.	I K0.	21K6.	1K9.	I .		26.	7K3.	I K2.	1K0.	I .		6K4.	1K3.	54K3.	I K5.	I .		6I K2.	-
PHF	I	I K2	I K02	I		I K02	I K3	I K43	I K05	I		I K43	I K43	I K45	I K3	I		I K06	I K34	I K96	I K35	I		I K93	-
Heavy	I	I	I	I		I	1	70	1	I		79	7	I	5	I		2	1	73	1	I		74	-
Heavy %	I .	I .	I .	I .		I .	4K5.	7K9.	7K9.	I .		7K9.	6K7.	I .	9K0.	I .		2K3.	5K5.	5K0.	7I .	I .		5K4.	-
Lights	I	3	3	I		17	11	919	56	I		936	63	1I	74	I		46	79	346	6	I		010	-
Lights %	I .	1I I .	1I I .	I .		1I I .	91K0.	90K1.	90K1.	I .		90K1.	92K4.	1I I .	9I K5.	I .		96K6.	93K0.	93K5.	4I .	I .		93K7.	-
Single-Unit Trucks	I	I	I	I		I	I	9	1	I		1I	7	I	I	I		7	1	13	1	I		14	-
Single-Unit Trucks %	I .	I .	I .	I .		I .	I .	1.	7K9.	I .		1.	6K7.	I .	I .	I .		7K7.	5K5.	7K5.	7I .	I .		7K6.	-
Buses	I	I	I	I		I	I	3	I	I		3	I	I	5	I		5	I	2	I	I		2	-
Buses %	I .	I .	I .	I .		I .	I .	I K3.	I .	I .		I K3.	I .	I .	9K0.	I .		5K6.	I .	I K0.	I .	I .		I K0.	-
Articulated Trucks	I	I	I	I		I	1	17	I	I		15	I	I	I	I		I	I	2	I	I		2	-
Articulated Trucks %	I .	I .	I .	I .		I .	4K5.	1K5.	I .	I .		1K5.	I .	I .	I .	I .		I .	I .	I K0.	I .	I .		I K0.	-
Bicycles on Road	I	I	I	I	I	U	I	I	I	I	I	U	I	I	I	I	I	U	I	I	I	I	I	U	-
Bicycles on Road%	U	U	U	U	.	M	U	U	U	U	.	M	U	U	U	U	.	M	U	U	U	U	.	M	-

Peak Hour: 07:45 AM - 08:45 AM Weather: Mostly Cloudy (-1.9 °C)



Spectrum

Vr T- i- gl\M pGSmS- tl\M-pr - t
Apaotip- M omS:M EAVR M OM MCDOCL M V
OotS:M SPW pGM7V7I 10M OSscpymS- tMSoP:MhSpMogdd

REM Tpr s
62M tM cioiT GS- r SM SdtM ritSM I
VpTp- tp CL M EL EOEM 6, M" 9

Peak Hour: 04:30 PM - 05:30 PM Weather: Partly Cloudy (-3 °C)

Turning Movement Count (8 . MALTBY RD & VICTORIA RD S (NORTH LEG))

Start Time	N Approach VICTORIA RD S LEORTh ru: N					E Approach e ArTf t RD					W Approach e ArTf t RD					Int. Total (15 min)	Int. Total (1 hr)
	RW-n ERd	rspm ERu	oaTcli EPE	gs07 EP	A11l642- T6m43	RW-n uPE	T-lc uRd	oaTcli uRu	gs07 uP	A11l642- T6m43	T-lc d Ru	rspm d PE	oaTcli d Rd	gs07 d P	A11l642- T6m43		
59P55P55	89	9	5	5	9*	B	K	5	5	.	B	B%	5	5	BK	%5B	
59P% P55	9%	%B	5	5	GK	.	K	5	5	G	%	B9	5	5	BG	%8v	
59PK5P55	G5	.	5	5	G	8	.	5	5	%%	K	*K	5	5	*8	%*B	
59P* . P55	95	v	5	5	9v	.	B	5	5	9	B	.*	5	5	.8	%*B	.5.
5GP55P55	8.	K	5	5	8G	*	8	5	5	%5	*	8v	5	5	9K	%%	..*
5GP% P55	8%	%	5	5	8B	9	%	5	5	G	B	.v	5	5	8%	%K%	.88
5GPK5P55	*8	%	5	5	*9	*	%	5	5	.	B	.8	5	5	.G	%85	.K*
5GP* . P55	85	%8	5	5	98	v	K	5	5	%B	K	*v	5	5	.B	%*5	.KB
,,,f RuAM,,,																	
%8P55P55	*%	G	5	5	*v	%5	B	5	5	%B	*	9G	5	5	GB	%*K	
%8P% P55	.K	9	5	5	85	.	K	5	5	G	B	.G	5	5	85	%BG	
%8PK5P55	8v	%5	5	5	9v	%%	5	5	5	%%	*	G%	5	5	G	%9.	
%8P* . P55	..	v	5	%	8*	B	.	5	5	9	.	v%	5	5	v8	%89	8%K
%9P55P55	.B	%5	5	5	8B	v	%	5	5	%5	*	v%	5	5	v.	%89	8K9
%9P% P55	.*	8	5	5	85	v	*	5	5	%K	*	GB	5	5	G8	%v	88G
%9PK5P55	*v	*	5	5	.K	.	K	5	5	G	*	8K	5	5	89	%BG	8B%
%9P* . P55	K%	.	5	5	K8	9	*	5	5	%%	B	9.	5	5	99	%B*	.9G
Grand Total	vB*	%8K	5	%	%5K9	%55	*8	5	5	%*8	*G	vv9	5	5	%5*.	**2228**	a
Approach%	Gvm%&	%5mv&	5&		a	8Gm&	K%m&	5&		a	*m6&	v.m*&	5&		a	-	a
Totals %	*%m&	.m%&	5&		*8m&	*m&	Bm%&	5&		8m6&	BmB&	**m9&	5&		*8mv&	-	a
Heavy	B.	%5	5		a	.	8	5		a	K	*B	5		a	-	a
Heavy %	Bm9&	GmG&	5&		a	.&	%K&	5&		a	8mK&	*mB&	5&		a	-	a
Bicycles	5	5	5		a	5	5	5		a	%	5	5		a	-	a
Bicycle %	5&	5&	5&		a	5&	5&	5&		a	Bm%&	5&	5&		a	-	a

Tcli WUe 6ys(si nC6ci n
r624nW E4(sPe ArTf t RD) VICTORIA RD S LEORTh ru: N
D4nsPd s0YE 6y BBYB5%9 Ds136#(si nr s40PT- s6 D4U37

f A : l6c1
*. SmC34WAysi cs d s7nYScWs K55
T6l6i n6 OEYCAEADAYe *V %Mv

Peak Hour: 07:30 AM - 08:30 AM Weather: Mostly Cloudy (-1.9 °C)

Start Time	N Approach VICTORIA RD S LEORTh ru: N					E Approach e ArTf t RD					W Approach e ArTf t RD					Int. Total (15 min)
	RW-n	rspm	oaTcli	gs07	A11l642- T6m43	RW-n	T-lc	oaTcli	gs07	A11l642- T6m43	T-lc	rspm	oaTcli	gs07	A11l642- T6m43	
59PK5P55	G5	.	5	5	G	8	.	5	5	%%	K	*K	5	5	*8	%*B
59P* . P55	95	v	5	5	9v	.	B	5	5	9	B	.*	5	5	.8	%*B
5GP55P55	8.	K	5	5	8G	*	8	5	5	%5	*	8v	5	5	9K	%%
5GP% P55	8%	%	5	5	8B	9	%	5	5	G	B	.v	5	5	8%	%K%
Grand Total	B98	%G	5	5	Bv*	BB	%*	5	5	K8	%%	BB.	5	5	BK8	**566**
Approach%	vKmv&	8m%&	5&		a	8%m%&	KGmv&	5&		a	*m9&	v.mK&	5&		a	-
Totals %	*GmG&	KmB&	5&		.%mv&	Kmv&	Bm&	5&		8m*&	%mv&	KvmG&	5&		*%m9&	-
PHF	5mG8	5m	5		5mG8	5m9v	5mG	5		5mGB	5m8v	5mGB	5		5mG%	-
Heavy	9	*	5		%%	K	K	5		8	B	%9	5		%v	-
Heavy %	Bm&	BBmB&	5&		Km9&	%Km8&	B%m*&	5&		%8m9&	%GmB&	9m8&	5&		Gm%&	-
Lights	B8v	%*	5		BGK	%v	%%	5		K5	v	B5G	5		B%9	-
Lights %	v9m&	99mG&	5&		v8mK&	G8m*&	9Gm8&	5&		GKmK&	G%mG&	vBm*&	5&		v%mv&	-
Single-Unit Trucks	*	5	5		*	5	%	5		%	%	v	5		%5	-
Single-Unit Trucks %	%m*&	5&	5&		%m*&	5&	9m%&	5&		BmG&	vm%&	*&	5&		*mB&	-
Buses	B	*	5		8	K	B	5		.	%	G	5		v	-
Buses %	5m9&	BBmB&	5&		B&	%Km8&	%*mK&	5&		%Kmv&	vm%&	Km8&	5&		KmG&	-
Articulated Trucks	%	5	5		%	5	5	5		5	5	5	5		5	-
Articulated Trucks %	5m*&	5&	5&		5mK&	5&	5&	5&		5&	5&	5&	5&		5&	-
Pedestrians	a	a	a	5	a	a	a	a	5	a	a	a	a	5	a	-
Pedestrians%	a	a	a	5&		a	a	a	5&		a	a	a	5&		-
Bicycles on Road	5	5	5	5	a	5	5	5	5	a	5	5	5	5	a	-
Bicycles on Road%	a	a	a	5&		a	a	a	5&		a	a	a	5&		-

Peak Hour: 04:30 PM - 05:30 PM Weather: Partly Cloudy (-3 °C)

Start Time	N Approach VICTORIA RD S LEORTh r u: N					E Approach e ArTf t RD					W Approach e ArTf t RD					Int. Total (15 min)
	RW-n	rspn	oaTcli	gs07	A11l642- T6n43	RW-n	T-lc	oaTcli	gs07	A11l642- T6n43	T-lc	rspn	oaTcli	gs07	A11l642- T6n43	
%8PK5P55	8v	%5	5	5	9v	%%	5	5	5	%%	*	G%	5	5	G	%9.
%8P*. P55	. .	v	5	%	8*	B	.	5	5	9	.	v%	5	5	v8	%89
%9P55P55	. B	%5	5	5	8B	v	%	5	5	%5	*	v%	5	5	v.	%89
%9P% P55	. *	8	5	5	85	v	*	5	5	%K	*	GB	5	5	G8	% v
Grand Total	BK5	K.	5	%	B8.	K%	%5	5	5	* %	%9	K*.	5	5	K8B	**668**
Approach%	G8mG&	%KmB&	5&		a	9. m6&	B* m*&	5&		a	* m9&	v. mK&	5&		a	-
Totals %	K* m*&	. mB&	5&		Kvm9&	* m6&	%m&	5&		8m%&	Bm&	. %m6&	5&		. * mB&	-
PHF	5mGK	5mGG	5		5mG*	5m9	5m	5		5m9v	5mG	5mv.	5		5mv*	-
Heavy	.	%	5		8	%	5	5		%	5	%%	5		%%	-
Heavy %	BmB&	Bmv&	5&		BmK&	KmB&	5&	5&		Bm*&	5&	KmB&	5&		K&	-
Lights	BB.	K*	5		B. v	K5	%5	5		* 5	%9	KK*	5		K. %	-
Lights %	v9mG&	v9m%&	5&		v9m9&	v8mG&	%55&	5&		v9m6&	%55&	v8mG&	5&		v9&	-
Single-Unit Trucks	*	5	5		*	5	5	5		5	5	.	5		.	-
Single-Unit Trucks %	%m9&	5&	5&		%m&	5&	5&	5&		5&	5&	%m*&	5&		%m*&	-
Buses	5	%	5		%	%	5	5		%	5	.	5		.	-
Buses %	5&	Bmv&	5&		5m*&	KmB&	5&	5&		Bm*&	5&	%m*&	5&		%m*&	-
Articulated Trucks	%	5	5		%	5	5	5		5	5	%	5		%	-
Articulated Trucks %	5m*&	5&	5&		5m*&	5&	5&	5&		5&	5&	5mK&	5&		5mK&	-
Pedestrians	a	a	a	%	a	a	a	a	5	a	a	a	a	5	a	-
Pedestrians%	a	a	a	%55&		a	a	a	5&		a	a	a	5&		-
Bicycles on Road	5	5	5	5	a	5	5	5	5	a	%	5	5	5	a	-
Bicycles on Road%	a	a	a	5&		a	a	a	5&		a	a	a	5&		-

Peak Hour: 07:30 AM - 08:30 AM Weather: Mostly Cloudy (-1.9 °C)

Peak Hour: 04:30 PM - 05:30 PM Weather: Partly Cloudy (-3 °C)

Turning Movement Count (9 . MALTBY RD & VICTORIA RD S (SOUTH LEG))

Start Time	W Approach				S Approach				E Approach				Int. Total (15 min)	Int. Total (1 hr)
	VICTO RA	DTSL RAE	hru: RA	NeeS t WUDf O-	nrRO AR	VICTO AE	hru: A	NeeS t WUDf O-	DTSL EAR	nrRO EA	hru: EA	NeeS t WUDf O-		
dsAddAdd	p	o	d	a	p	cl	d	pc	o	ai	d	al	l a	
dsAci Add	d	i	d	i	d	po	d	po	i	ag	d	s0	cdp	
dsA0dAdd	c	l	d	cd	c	0g	d	0l	o	ss	d	gc	c0d	
dsAoi Add	p	s	d	l	c	i 0	d	i o	s	a0	d	sd	c00	oac
dgAddAdd	i	s	d	cp	p	aa	d	ag	s	i l	d	aa	coa	i cc
dgAci Add	d	s	d	s	d	i o	d	i o	i	i s	d	ap	cp0	i 0p
dgA0dAdd	0	g	d	cc	p	i d	d	i p	p	os	d	ol	ccp	i co
dgAoi Add	0	o	d	s	c	i p	d	i 0	i	i a	d	ac	cpc	i dp
7771 VEN6 777														
caAddAdd	d	g	d	g	d	si	d	si	o	0s	d	oc	cpo	
caAci Add	0	i	d	g	d	i o	d	i o	o	i p	d	i a	ccg	
caA0dAdd	p	l	d	cc	c	ss	d	sg	i	ao	d	al	ci g	
caAoi Add	p	cd	d	cp	o	gs	d	l c	i	i 0	d	i g	cac	i ac
csAddAdd	c	g	d	l	c	gi	c	ga	o	os	d	i c	coa	i g0
csAci Add	0	i	d	g	d	gc	d	gc	o	i p	d	i a	coi	acd
csA0dAdd	d	a	d	a	d	ap	d	ap	a	oa	d	i p	cpd	i sp
csAoi Add	0	0	d	a	0	so	d	ss	o	0c	d	0i	ccg	i pl
Grand Total	0d	cdi	d	c0i	cg	l i c	c	l al	si	gso	d	l ol	**2053**	4
Approach%	pp2p3	ss2g3		4	c2 3	l g2c3		4	s2 3	l p2c3		4	-	4
Totals %	c2 3	i 2c3		a2a3	d2 3	oa203		os2p3	02s3	op2a3		oa2p3	-	4
Heavy	0	i		4	p	pp		4	o	pd		4	-	4
Heavy %	cd3	o2g3		4	cc2c3	p203		4	i 203	p203		4	-	4
Bicycles	d	c		4	d	d		4	d	d		4	-	4
Bicycle %	d3	c3		4	d3	d3		4	d3	d3		4	-	4

Peak Hour: 07:30 AM - 08:30 AMUUUWeather: Mostly Cloudy (-1.9 °C)

Start Time	W Approach				S Approach				E Approach				Int. Total (15 min)
	VICTO	DTSL	hru:	NeeS t WTUDf O-	nrPO	VICTO	hru:	NeeS t WTUDf O-	DTSL	nrPO	hru:	NeeS t WTUDf O-	
dsA0dAdd	c	l	d	cd	c	0g	d	0l	o	ss	d	gc	c0d
dsAoi Add	p	s	d	l	c	i 0	d	i o	s	a0	d	sd	c00
dgAddAdd	i	s	d	cp	p	aa	d	ag	s	i l	d	aa	coa
dgAci Add	d	s	d	s	d	i o	d	i o	i	i s	d	ap	cp0
Grand Total	g	0d	d	0g	o	pcc	d	pci	p0	pi a	d	psl	**532**
Approach%	pc2c3	sg2 3		4	c2 3	l g2c3		4	g2p3	l c2g3		4	-
Totals %	c2 3	i 2a3		s2c3	d2g3	0l 2s3		od2o3	o2 03	og2c3		i p2o3	-
PHF	d2o	d2g0		d2sl	d2	d2g		d2sl	d2gp	d2g0		d2ga	-
Heavy	p	c		0	d	a		a	d	p		p	-
Heavy %	pi 3	0203		s2 3	d3	p2g3		p2g3	d3	d2g3		d2s3	-
Lights	a	pl		0i	o	pdi		pdl	p0	pi o		pss	-
Lights %	si 3	l a2s3		l p2c3	cdd3	l s2p3		l s2p3	cdd3	l l 2p3		l l 203	-
Single-Unit Trucks	d	d		d	d	d		d	d	d		d	-
Single-Unit Trucks %	d3	d3		d3	d3	d3		d3	d3	d3		d3	-
Buses	p	c		0	d	a		a	d	p		p	-
Buses %	pi 3	0203		s2 3	d3	p2g3		p2g3	d3	d2g3		d2s3	-
Articulated Trucks	d	d		d	d	d		d	d	d		d	-
Articulated Trucks %	d3	d3		d3	d3	d3		d3	d3	d3		d3	-
Pedestrians	4	4	d	4	4	4	d	4	4	4	d	4	-
Pedestrians%	4	4	d3	U	4	4	d3	U	4	4	d3	U	-
Bicycles on Road	d	d	d	4	d	d	d	4	d	d	d	4	-
Bicycles on Road%	4	4	d3	U	4	4	d3	U	4	4	d3	U	-

Peak Hour: 04:30 PM - 05:30 PMUUUWeather: Partly Cloudy (-3 °C)

Start Time	W Approach				S Approach				E Approach				Int. Total (15 min)
	VICTO	DTSL	hru:	NeeS t WTUDf O-	nrPO	VICTO	hru:	NeeS t WTUDf O-	DTSL	nrPO	hru:	NeeS t WTUDf O-	
caA0dAdd	p	l	d	cc	c	ss	d	sg	i	ao	d	al	ci g
caAoi Add	p	cd	d	cp	o	gs	d	l c	i	i 0	d	i g	cac
csAddAdd	c	g	d	l	c	gi	c	ga	o	os	d	i c	coa
csAci Add	0	i	d	g	d	gc	d	gc	o	i p	d	i a	coi
Grand Total	g	0p	d	od	a	00d	c	00a	cg	pca	d	p0o	**610**
Approach%	pd3	gd3		4	c2g3	l g2p3		4	s2s3	l p203		4	-
Totals %	c203	i 2p3		a2a3	c3	i o2c3		i i 2c3	03	0i 2o3		0g2o3	-
PHF	d2as	d2g		d2g0	d20g	d2 i		d2 p	d2	d2go		d2gi	-
Heavy	c	c		p	p	cc		c0	p	0		i	-
Heavy %	cp2 3	02c3		i 3	00203	0203		02 3	cc2c3	c2o3		p2c3	-
Lights	s	0c		0g	o	0cl		0p0	ca	pc0		ppl	-
Lights %	gs2 3	l a2 3		l i 3	aa2s3	l a2s3		l a2c3	gg2 3	l g2a3		l s2 3	-
Single-Unit Trucks	d	d		d	p	a		g	p	0		i	-
Single-Unit Trucks %	d3	d3		d3	00203	c2g3		p2o3	cc2c3	c2o3		p2c3	-
Buses	c	d		c	d	i		i	d	d		d	-
Buses %	cp2 3	d3		p2 3	d3	c2 3		c2 3	d3	d3		d3	-
Articulated Trucks	d	c		c	d	d		d	d	d		d	-
Articulated Trucks %	d3	02c3		p2 3	d3	d3		d3	d3	d3		d3	-
Pedestrians	4	4	d	4	4	4	c	4	4	4	d	4	-
Pedestrians%	4	4	d3	U	4	4	cdd3	U	4	4	d3	U	-
Bicycles on Road	d	c	d	4	d	d	d	4	d	d	d	4	-
Bicycles on Road%	4	4	d3	U	4	4	d3	U	4	4	d3	U	-

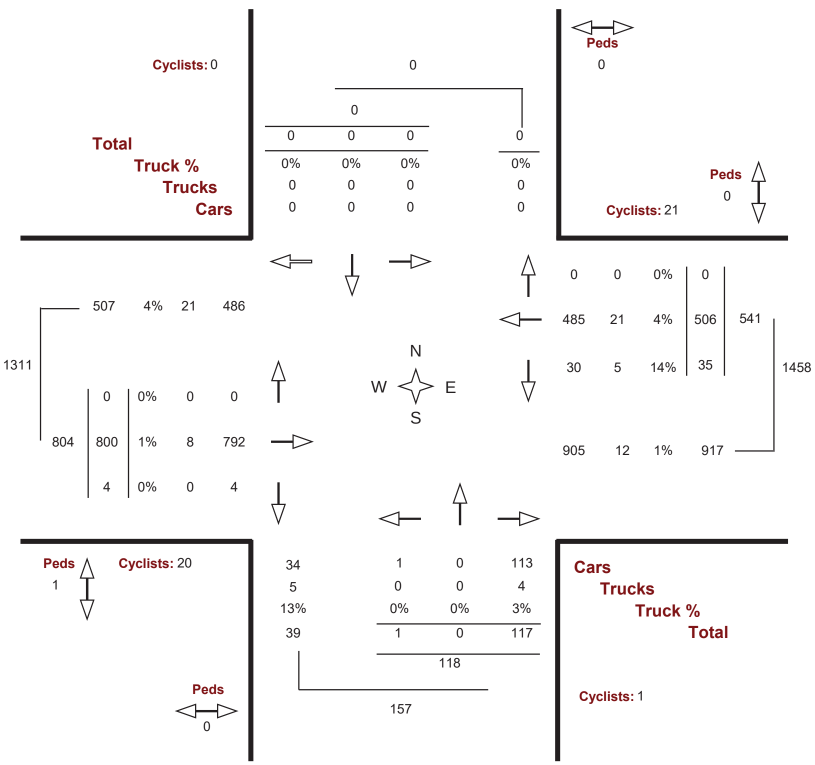
Peak Hour: 07:30 AM - 08:30 AM Weather: Mostly Cloudy (-1.9 °C)

Spectrum
DLS'I*OLG f 8r, r*OB f L*O
nf W0I*U t, rAG NnD1 MLY%Ldu 8 DKV&NLY%U Ly KYD(U E5)
%t OAR ruB U f 8Ldp B dcs UUUU%r e-f #, r*O Ur t uAD Tr f U%t CI:
1 NU5 S Le
oi U C29 -t ISLN 8r*Lr U R r: OB U LIO Udd
Df S*O K. B9 N. N%NB G ov Ud6I

Peak Hour: 04:30 PM - 05:30 PM Weather: Partly Cloudy (-3 °C)

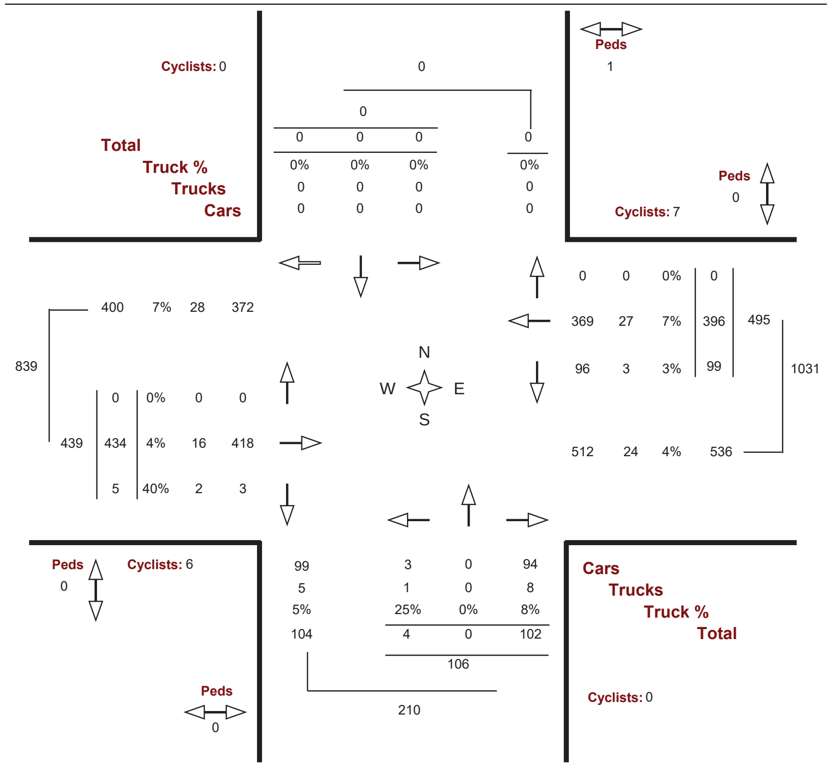
Turning Movements Report - Full Study

Location....... CLAIR RD W @ LAIRD RD
GeoID....... I725
Municipality. GUELPH
Count Date. Thursday, 08 October, 2015
Traffic Cont.
Count Time. 07:00 AM — 06:00 PM
Major Dir..... None
Peak Hour.. 04:30 PM — 05:30 PM



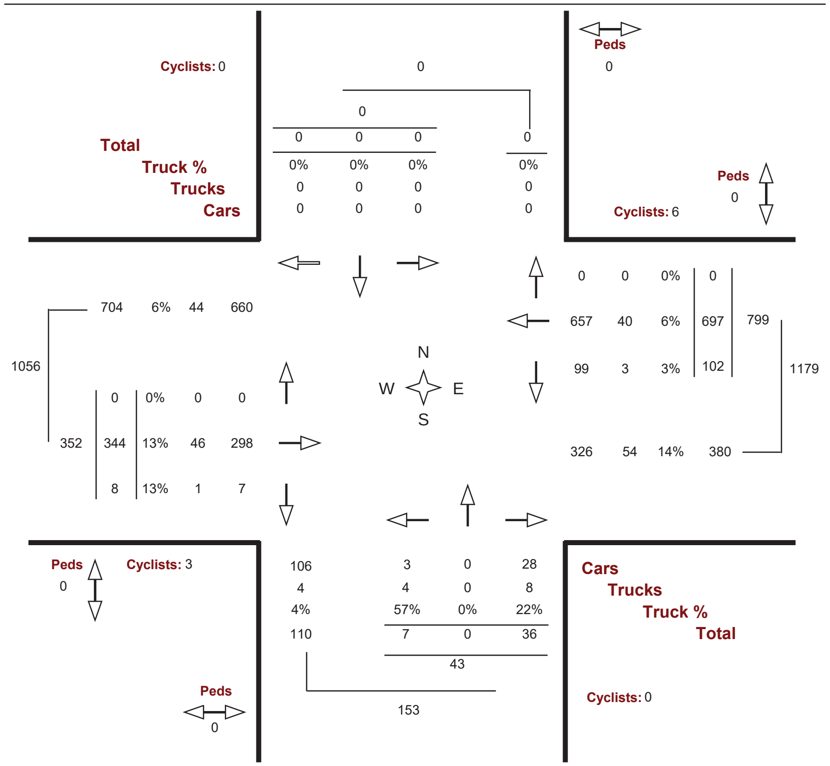
Turning Movements Report - MD Period

Location....... CLAIR RD W @ LAIRD RD
GeoID....... I725
Municipality. GUELPH
Count Date. Thursday, 08 October, 2015
Traffic Cont.
Count Time. 11:00 AM — 02:00 PM
Major Dir..... None
Peak Hour.. 12:00 PM — 01:00 PM



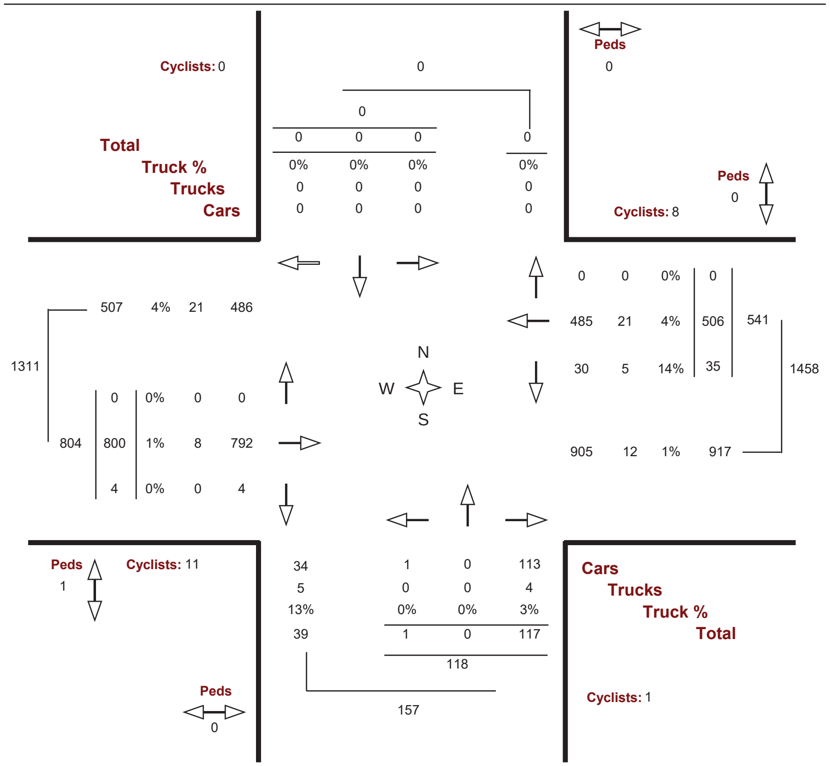
Turning Movements Report - AM Period

Location.......	CLAIR RD W @ LAIRD RD	**GeoID.......**	I725
Municipality.	GUELPH	**Count Date.**	Thursday, 08 October, 2015
Traffic Cont.		**Count Time.**	07:00 AM — 09:00 AM
Major Dir.....	None	**Peak Hour..**	08:00 AM — 09:00 AM



Turning Movements Report - PM Period

Location.......	CLAIR RD W @ LAIRD RD	**GeoID.......**	I725
Municipality.	GUELPH	**Count Date.**	Thursday, 08 October, 2015
Traffic Cont.		**Count Time.**	03:00 PM — 06:00 PM
Major Dir.....	None	**Peak Hour..**	04:30 PM — 05:30 PM



Appendix M – Synchro Analysis Results: Existing Traffic Conditions

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	250	615	115	390	155	485	175	535
Future Volume (vph)	250	615	115	390	155	485	175	535
Lane Group Flow (vph)	250	715	115	480	155	650	175	655
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	24.0	9.5	24.0	9.5	24.0	9.5	24.0
Total Split (s)	10.0	35.0	10.0	35.0	10.0	35.0	10.0	35.0
Total Split (%)	11.1%	38.9%	11.1%	38.9%	11.1%	38.9%	11.1%	38.9%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	0.0	2.0	0.0	2.0	0.0	2.0	0.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	C-Max	None	Max	None	Max
v/c Ratio	0.63	0.60	0.41	0.43	0.49	0.59	0.53	0.59
Control Delay	39.6	41.4	15.4	20.8	20.1	25.8	21.0	26.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.6	41.4	15.4	20.8	20.1	25.8	21.0	26.9
Queue Length 50th (m)	46.0	71.4	14.4	34.5	15.9	47.2	18.2	49.6
Queue Length 95th (m)	69.9	90.4	24.7	47.7	28.3	65.3	31.3	67.8
Internal Link Dist (m)		775.0		194.1		153.6		314.0
Turn Bay Length (m)	75.0		25.0		50.0		140.0	
Base Capacity (vph)	399	1200	284	1104	316	1106	330	1105
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	0.63	0.60	0.40	0.43	0.49	0.59	0.53	0.59

Intersection Summary

Cycle Length: 90

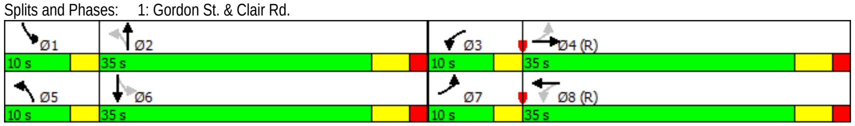
Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green, Master Intersection

Natural Cycle: 70

Control Type: Actuated-Coordinated

Splits and Phases: 1: Gordon St. & Clair Rd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	250	615	100	115	390	90	155	485	165	175	535	120
Future Volume (vph)	250	615	100	115	390	90	155	485	165	175	535	120
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		3.0	6.0		3.0	6.0		3.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.97		1.00	0.96		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)	1760	3445		1593	3357		1716	3317		1783	3364	
Flt Permitted	0.39	1.00		0.27	1.00		0.29	1.00		0.29	1.00	
Satd. Flow (perm)	729	3445		453	3357		516	3317		542	3364	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	250	615	100	115	390	90	155	485	165	175	535	120
RTOR Reduction (vph)	0	14	0	0	22	0	0	37	0	0	21	0
Lane Group Flow (vph)	250	701	0	115	458	0	155	613	0	175	634	0
Confl. Peds. (#/hr)	17		7	7		17	2		11	11		2
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	1%	1%	2%	12%	3%	1%	4%	1%	8%	0%	2%	7%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	37.4	30.4		34.6	29.0		36.0	29.0		36.0	29.0	
Effective Green, g (s)	37.4	30.4		34.6	29.0		36.0	29.0		36.0	29.0	
Actuated g/C Ratio	0.42	0.34		0.38	0.32		0.40	0.32		0.40	0.32	
Clearance Time (s)	3.0	6.0		3.0	6.0		3.0	6.0		3.0	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)	383	1163		245	1081		299	1068		313	1083	
v/s Ratio Prot	c0.05	0.20		0.03	0.14		0.04	0.18		c0.04	c0.19	
v/s Ratio Perm	c0.22			0.15			0.17			0.18		
v/c Ratio	0.65	0.60		0.47	0.42		0.52	0.57		0.56	0.59	
Uniform Delay, d1	19.1	24.8		18.9	23.9		18.3	25.4		18.5	25.5	
Progression Factor	1.94	1.60		0.79	0.87		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.7	2.2		1.4	1.2		1.5	2.2		2.2	2.3	
Delay (s)	40.8	41.8		16.3	22.0		19.8	27.6		20.6	27.8	
Level of Service	D	D		B	C		B	C		C	C	
Approach Delay (s)		41.6			20.9			26.1			26.3	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM 2000 Control Delay	29.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	74.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	WBT	NBL	NBT	SBL	SBT	Ø4
Lane Configurations							
Traffic Volume (vph)	45	5	5	815	40	710	
Future Volume (vph)	45	5	5	815	40	710	
Lane Group Flow (vph)	0	90	5	865	40	715	
Turn Type	Perm	NA	pm+pt	NA	pm+pt	NA	
Protected Phases		8	5	2	1	6	4
Permitted Phases	8		2		6		
Detector Phase	8	8	5	2	1	6	
Switch Phase							
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	9.5	24.0	9.5	24.0	24.0
Total Split (s)	30.0	30.0	10.0	50.0	10.0	50.0	30.0
Total Split (%)	33.3%	33.3%	11.1%	55.6%	11.1%	55.6%	33%
Yellow Time (s)	4.0	4.0	3.0	4.0	3.0	4.0	4.0
All-Red Time (s)	2.0	2.0	0.0	2.0	0.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)		6.0	3.0	6.0	3.0	6.0	
Lead/Lag			Lead	Lag	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	Yes	
Recall Mode	None	None	None	Max	None	Max	None
v/c Ratio		0.45	0.01	0.35	0.08	0.27	
Control Delay		26.9	2.8	7.1	2.8	4.8	
Queue Delay		0.0	0.0	0.0	0.0	0.0	
Total Delay		26.9	2.8	7.1	2.8	4.8	
Queue Length 50th (m)		6.8	0.2	30.1	1.0	14.6	
Queue Length 95th (m)		19.9	0.9	49.8	3.6	38.6	
Internal Link Dist (m)		256.4		1837.2		153.6	
Turn Bay Length (m)			65.0		27.0		
Base Capacity (vph)		505	648	2447	549	2642	
Starvation Cap Reductn		0	0	0	0	0	
Spillback Cap Reductn		0	0	0	0	0	
Storage Cap Reductn		0	0	0	0	0	
Reduced v/c Ratio		0.18	0.01	0.35	0.07	0.27	

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 73.5
Natural Cycle: 60
Control Type: Actuated-Uncoordinated

Splits and Phases: 2: Gordon St. & Poppy Dr.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	45	5	40	5	815	50	40	710	5
Future Volume (vph)	0	0	0	45	5	40	5	815	50	40	710	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)					6.0		3.0	6.0		3.0	6.0	
Lane Util. Factor					1.00		1.00	0.95		1.00	0.95	
Frt					0.94		1.00	0.99		1.00	1.00	
Flt Protected					0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)					1689		1750	3470		1750	3496	
Flt Permitted					0.84		0.38	1.00		0.30	1.00	
Satd. Flow (perm)					1457		700	3470		546	3496	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	0	45	5	40	5	815	50	40	710	5
RTOR Reduction (vph)	0	0	0	0	36	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	0	0	0	54	0	5	862	0	40	715	0
Turn Type				Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)					7.0		52.8	51.7		57.8	54.2	
Effective Green, g (s)					7.0		52.8	51.7		57.8	54.2	
Actuated g/C Ratio					0.09		0.68	0.67		0.75	0.70	
Clearance Time (s)					6.0		3.0	6.0		3.0	6.0	
Vehicle Extension (s)					3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)					131		493	2320		464	2451	
v/s Ratio Prot							0.00	c0.25		c0.00	0.20	
v/s Ratio Perm					c0.04		0.01			0.06		
v/c Ratio					0.41		0.01	0.37		0.09	0.29	
Uniform Delay, d1					33.2		3.9	5.6		2.7	4.3	
Progression Factor					1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2					2.1		0.0	0.5		0.1	0.3	
Delay (s)					35.3		3.9	6.1		2.8	4.6	
Level of Service					D		A	A		A	A	
Approach Delay (s)		0.0			35.3			6.1			4.5	
Approach LOS		A			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	6.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.36		
Actuated Cycle Length (s)	77.3	Sum of lost time (s)	15.0
Intersection Capacity Utilization	46.8%	ICU Level of Service	A
Analysis Period (min)	15		

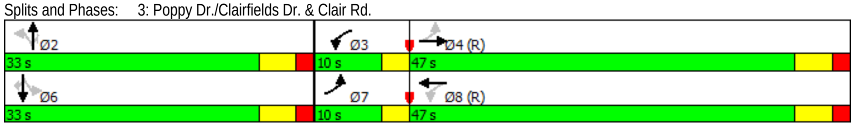
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	105	805	25	430	10	5	35	20	5	75
Future Volume (vph)	105	805	25	430	10	5	35	20	5	75
Lane Group Flow (vph)	105	815	25	475	0	15	35	0	25	75
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4	3	8		2			6	
Permitted Phases	4		8		2		2	6		6
Detector Phase	7	4	3	8	2	2	2	6	6	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	24.0	9.5	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Total Split (s)	10.0	47.0	10.0	47.0	33.0	33.0	33.0	33.0	33.0	33.0
Total Split (%)	11.1%	52.2%	11.1%	52.2%	36.7%	36.7%	36.7%	36.7%	36.7%	36.7%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Total Lost Time (s)	3.0	6.0	3.0	6.0		6.0	6.0		6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	None	C-Max	Max	Max	Max	Max	Max	Max
v/c Ratio	0.19	0.45	0.06	0.29		0.03	0.07		0.05	0.14
Control Delay	8.6	15.1	11.7	19.4		22.6	1.4		23.0	6.6
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	8.6	15.1	11.7	19.4		22.6	1.4		23.0	6.6
Queue Length 50th (m)	7.4	40.9	2.6	34.8		1.9	0.0		3.2	0.0
Queue Length 95th (m)	14.3	70.3	m5.6	45.7		6.5	1.8		9.1	9.9
Internal Link Dist (m)		186.5		775.0		114.2			150.9	
Turn Bay Length (m)	55.0		45.0				20.0			20.0
Base Capacity (vph)	541	1831	413	1656		490	520		465	522
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	0.19	0.45	0.06	0.29		0.03	0.07		0.05	0.14

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 86.4 (96%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Poppy Dr./Clairfields Dr. & Clair Rd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	105	805	10	25	430	45	10	5	35	20	5	75
Future Volume (vph)	105	805	10	25	430	45	10	5	35	20	5	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		3.0	6.0			6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	1.00
Frt	1.00	1.00		1.00	0.99			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.96	1.00
Satd. Flow (prot)	1750	3493		1750	3450			1783	1566		1771	1566
Flt Permitted	0.43	1.00		0.30	1.00			0.89	1.00		0.84	1.00
Satd. Flow (perm)	793	3493		560	3450			1634	1566		1554	1566
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	105	805	10	25	430	45	10	5	35	20	5	75
RTOR Reduction (vph)	0	1	0	0	8	0	0	0	25	0	0	53
Lane Group Flow (vph)	105	814	0	25	467	0	0	15	11	0	25	23
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	51.0	45.4		45.0	42.4			27.0	27.0		27.0	27.0
Effective Green, g (s)	51.0	45.4		45.0	42.4			27.0	27.0		27.0	27.0
Actuated g/C Ratio	0.57	0.50		0.50	0.47			0.30	0.30		0.30	0.30
Clearance Time (s)	3.0	6.0		3.0	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)	508	1762		314	1625			490	469		466	469
v/s Ratio Prot	c0.01	c0.23		0.00	0.14							
v/s Ratio Perm	0.10			0.04				0.01	0.01		c0.02	0.01
v/c Ratio	0.21	0.46		0.08	0.29			0.03	0.02		0.05	0.05
Uniform Delay, d1	9.1	14.4		11.6	14.6			22.3	22.2		22.4	22.4
Progression Factor	1.00	1.00		1.53	1.32			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.2	0.9		0.1	0.4			0.1	0.1		0.2	0.2
Delay (s)	9.3	15.3		17.7	19.6			22.4	22.3		22.6	22.6
Level of Service	A	B		B	B			C	C		C	C
Approach Delay (s)		14.6			19.5			22.3			22.6	
Approach LOS		B			B			C			C	

Intersection Summary

HCM 2000 Control Delay	16.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.31		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	48.1%	ICU Level of Service	A
Analysis Period (min)	15		

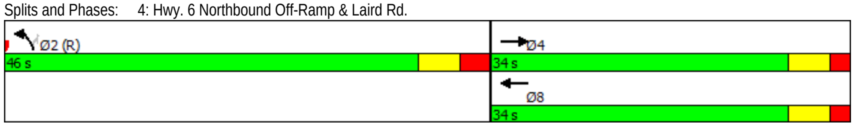
c Critical Lane Group

Lane Group	EBT	WBT	NBL	NBR
Lane Configurations				
Traffic Volume (vph)	565	550	25	165
Future Volume (vph)	565	550	25	165
Lane Group Flow (vph)	565	550	25	165
Turn Type	NA	NA	Prot	Perm
Protected Phases	4	8	2	
Permitted Phases				2
Minimum Split (s)	24.0	24.0	25.0	25.0
Total Split (s)	34.0	34.0	46.0	46.0
Total Split (%)	42.5%	42.5%	57.5%	57.5%
Yellow Time (s)	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	7.0	7.0
Lead/Lag				
Lead-Lag Optimize?				
v/c Ratio	0.47	0.46	0.03	0.23
Control Delay	17.6	21.7	10.9	4.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	17.6	21.7	10.9	4.4
Queue Length 50th (m)	31.8	35.3	2.0	2.8
Queue Length 95th (m)	45.0	49.8	5.9	12.7
Internal Link Dist (m)	282.0	205.6	157.0	
Turn Bay Length (m)				100.0
Base Capacity (vph)	1190	1190	870	726
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.47	0.46	0.03	0.23

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green
Natural Cycle: 50
Control Type: Pretimed

Splits and Phases: 4: Hwy. 6 Northbound Off-Ramp & Laird Rd.



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	565	0	0	550	25	165
Future Volume (vph)	565	0	0	550	25	165
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0			6.0	7.0	7.0
Lane Util. Factor	0.95			0.95	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3400			3400	1785	1353
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	3400			3400	1785	1353
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	565	0	0	550	25	165
RTOR Reduction (vph)	0	0	0	0	0	67
Lane Group Flow (vph)	565	0	0	550	25	98
Heavy Vehicles (%)	5%	2%	2%	5%	0%	18%
Turn Type	NA			NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases						2
Actuated Green, G (s)	28.0			28.0	39.0	39.0
Effective Green, g (s)	28.0			28.0	39.0	39.0
Actuated g/C Ratio	0.35			0.35	0.49	0.49
Clearance Time (s)	6.0			6.0	7.0	7.0
Lane Grp Cap (vph)	1190			1190	870	659
v/s Ratio Prot	c0.17			0.16	0.01	
v/s Ratio Perm						c0.07
v/c Ratio	0.47			0.46	0.03	0.15
Uniform Delay, d1	20.3			20.2	10.7	11.3
Progression Factor	0.79			1.00	1.00	1.00
Incremental Delay, d2	1.3			1.3	0.1	0.5
Delay (s)	17.4			21.5	10.7	11.8
Level of Service	B			C	B	B
Approach Delay (s)	17.4			21.5	11.7	
Approach LOS	B			C	B	

Intersection Summary			
HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.29		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	36.7%	ICU Level of Service	A
Analysis Period (min)	15		

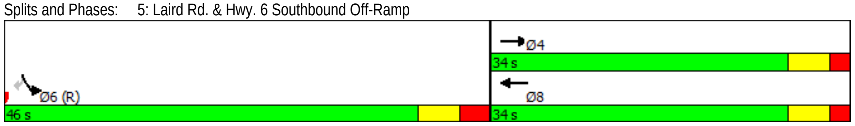
c Critical Lane Group

Lane Group	EBT	WBT	SBL	SBR
Lane Configurations				
Traffic Volume (vph)	250	395	345	40
Future Volume (vph)	250	395	345	40
Lane Group Flow (vph)	250	395	345	40
Turn Type	NA	NA	Prot	Perm
Protected Phases	4	8	6	
Permitted Phases				6
Minimum Split (s)	24.0	24.0	25.0	25.0
Total Split (s)	34.0	34.0	46.0	46.0
Total Split (%)	42.5%	42.5%	57.5%	57.5%
Yellow Time (s)	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	7.0	7.0
Lead/Lag				
Lead-Lag Optimize?				
v/c Ratio	0.21	0.32	0.22	0.05
Control Delay	18.8	26.3	12.2	4.0
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	18.8	26.3	12.2	4.0
Queue Length 50th (m)	14.4	20.2	15.4	0.0
Queue Length 95th (m)	23.1	34.5	23.4	4.8
Internal Link Dist (m)	199.6	282.0	265.0	
Turn Bay Length (m)				40.0
Base Capacity (vph)	1213	1237	1592	741
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.21	0.32	0.22	0.05

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 2: and 6:SBL, Start of Green
Natural Cycle: 50
Control Type: Pretimed

Splits and Phases: 5: Laird Rd. & Hwy. 6 Southbound Off-Ramp



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	250	395	0	345	40
Future Volume (vph)	0	250	395	0	345	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		7.0	7.0
Lane Util. Factor		0.95	0.95		0.97	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3466	3535		3267	1479
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		3466	3535		3267	1479
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	250	395	0	345	40
RTOR Reduction (vph)	0	0	0	0	0	21
Lane Group Flow (vph)	0	250	395	0	345	20
Heavy Vehicles (%)	2%	3%	1%	2%	6%	8%
Turn Type		NA	NA		Prot	Perm
Protected Phases		4	8		6	
Permitted Phases						6
Actuated Green, G (s)		28.0	28.0		39.0	39.0
Effective Green, g (s)		28.0	28.0		39.0	39.0
Actuated g/C Ratio		0.35	0.35		0.49	0.49
Clearance Time (s)		6.0	6.0		7.0	7.0
Lane Grp Cap (vph)		1213	1237		1592	721
v/s Ratio Prot		0.07	c0.11		c0.11	
v/s Ratio Perm						0.01
v/c Ratio		0.21	0.32		0.22	0.03
Uniform Delay, d1		18.2	19.0		11.7	10.6
Progression Factor		1.00	1.33		1.00	1.00
Incremental Delay, d2		0.4	0.6		0.3	0.1
Delay (s)		18.6	26.0		12.1	10.7
Level of Service		B	C		B	B
Approach Delay (s)		18.6	26.0		11.9	
Approach LOS		B	C		B	

Intersection Summary			
HCM 2000 Control Delay	18.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.26		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	36.7%	ICU Level of Service	A
Analysis Period (min)	15		

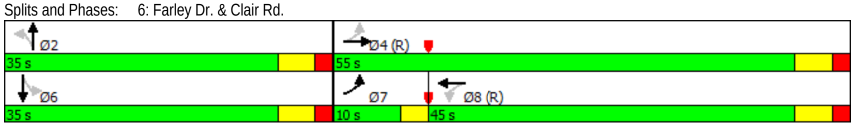
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	235	515	40	365	115	60	55	45
Future Volume (vph)	235	515	40	365	115	60	55	45
Lane Group Flow (vph)	235	705	40	420	115	90	55	185
Turn Type	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	7	4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Total Split (s)	10.0	55.0	45.0	45.0	35.0	35.0	35.0	35.0
Total Split (%)	11.1%	61.1%	50.0%	50.0%	38.9%	38.9%	38.9%	38.9%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead		Lag	Lag				
Lead-Lag Optimize?	Yes		Yes	Yes				
Recall Mode	None	C-Max	C-Max	C-Max	Max	Max	Max	Max
v/c Ratio	0.42	0.38	0.13	0.29	0.32	0.15	0.14	0.30
Control Delay	16.9	15.8	13.3	13.7	26.1	16.0	22.9	8.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.9	15.8	13.3	13.7	26.1	16.0	22.9	8.3
Queue Length 50th (m)	30.0	44.7	5.3	30.3	15.7	7.6	7.0	5.7
Queue Length 95th (m)	45.6	58.2	13.3	41.8	30.5	18.6	16.1	20.8
Internal Link Dist (m)		194.1		563.0		111.7		152.1
Turn Bay Length (m)	125.0		50.0		45.0		20.0	
Base Capacity (vph)	564	1843	310	1471	360	588	398	616
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	0.42	0.38	0.13	0.29	0.32	0.15	0.14	0.30

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 50.4 (56%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 6: Farley Dr. & Clair Rd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	235	515	190	40	365	55	115	60	30	55	45	140
Future Volume (vph)	235	515	190	40	365	55	115	60	30	55	45	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.99		1.00	0.97	
Flpb, ped/bikes	1.00	1.00		0.99	1.00		0.98	1.00		0.98	1.00	
Frt	1.00	0.96		1.00	0.98		1.00	0.95		1.00	0.89	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1779	3308		1772	3367		1718	1764		1682	1621	
Flt Permitted	0.46	1.00		0.38	1.00		0.62	1.00		0.70	1.00	
Satd. Flow (perm)	855	3308		715	3367		1120	1764		1237	1621	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	235	515	190	40	365	55	115	60	30	55	45	140
RTOR Reduction (vph)	0	42	0	0	13	0	0	20	0	0	95	0
Lane Group Flow (vph)	235	663	0	40	407	0	115	70	0	55	90	0
Confl. Peds. (#/hr)	6		8	8		6	16		15	15		16
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	3%	1%	0%	4%	0%	2%	0%	0%	4%	0%	0%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	49.0	49.0		39.0	39.0		29.0	29.0		29.0	29.0	
Effective Green, g (s)	49.0	49.0		39.0	39.0		29.0	29.0		29.0	29.0	
Actuated g/C Ratio	0.54	0.54		0.43	0.43		0.32	0.32		0.32	0.32	
Clearance Time (s)	3.0	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)	537	1801		309	1459		360	568		398	522	
v/s Ratio Prot	c0.03	0.20			0.12			0.04			0.06	
v/s Ratio Perm	c0.20			0.06			c0.10			0.04		
v/c Ratio	0.44	0.37		0.13	0.28		0.32	0.12		0.14	0.17	
Uniform Delay, d1	10.9	11.7		15.3	16.4		23.0	21.5		21.6	21.9	
Progression Factor	1.58	1.50		0.78	0.84		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	0.5		0.9	0.5		2.3	0.4		0.7	0.7	
Delay (s)	17.6	18.0		12.8	14.3		25.4	22.0		22.4	22.6	
Level of Service	B	B		B	B		C	C		C	C	
Approach Delay (s)		17.9			14.2			23.9			22.6	
Approach LOS		B			B			C			C	

Intersection Summary

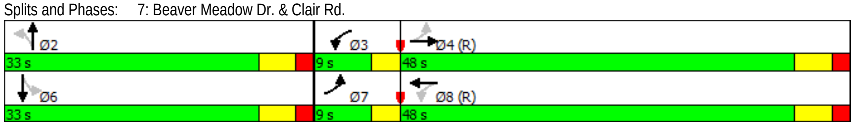
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.41		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	67.7%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	110	595	25	400	20	5	15	10
Future Volume (vph)	110	595	25	400	20	5	15	10
Lane Group Flow (vph)	110	615	25	415	0	45	15	70
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	7	4	3	8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	3	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	24.0	9.5	24.0	24.0	24.0	24.0	24.0
Total Split (s)	9.0	48.0	9.0	48.0	33.0	33.0	33.0	33.0
Total Split (%)	10.0%	53.3%	10.0%	53.3%	36.7%	36.7%	36.7%	36.7%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0	3.0	6.0		6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	Max	Max	Max	Max
v/c Ratio	0.19	0.34	0.05	0.24		0.10	0.04	0.14
Control Delay	5.6	10.7	7.6	14.3		15.5	22.8	8.8
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	5.6	10.7	7.6	14.3		15.5	22.8	8.8
Queue Length 50th (m)	3.8	13.3	1.7	22.7		3.2	1.9	1.3
Queue Length 95th (m)	7.2	63.5	4.8	32.6		11.3	6.6	10.8
Internal Link Dist (m)		563.0		1233.2		183.8		182.6
Turn Bay Length (m)	55.0		30.0					
Base Capacity (vph)	571	1835	495	1696		467	399	516
Starvation Cap Reductn	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0		0	0	0
Reduced v/c Ratio	0.19	0.34	0.05	0.24		0.10	0.04	0.14

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 86.4 (96%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 7: Beaver Meadow Dr. & Clair Rd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	595	20	25	400	15	20	5	20	15	10	60
Future Volume (vph)	110	595	20	25	400	15	20	5	20	15	10	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		3.0	6.0			6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		0.99	1.00	
Frt	1.00	1.00		1.00	0.99			0.94		1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00			0.98		0.95	1.00	
Satd. Flow (prot)	1748	3480		1749	3478			1670		1738	1583	
Flt Permitted	0.48	1.00		0.41	1.00			0.89		0.73	1.00	
Satd. Flow (perm)	878	3480		748	3478			1512		1331	1583	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	110	595	20	25	400	15	20	5	20	15	10	60
RTOR Reduction (vph)	0	2	0	0	3	0	0	14	0	0	42	0
Lane Group Flow (vph)	110	613	0	25	412	0	0	31	0	15	28	0
Confl. Peds. (#/hr)	2		1	1		2	3		3	3		3
Confl. Bikes (#/hr)			1			2						
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	50.4	45.6		45.6	43.2			27.0		27.0	27.0	
Effective Green, g (s)	50.4	45.6		45.6	43.2			27.0		27.0	27.0	
Actuated g/C Ratio	0.56	0.51		0.51	0.48			0.30		0.30	0.30	
Clearance Time (s)	3.0	6.0		3.0	6.0			6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	538	1763		405	1669			453		399	474	
v/s Ratio Prot	c0.01	c0.18		0.00	0.12						0.02	
v/s Ratio Perm	0.10			0.03				c0.02		0.01		
v/c Ratio	0.20	0.35		0.06	0.25			0.07		0.04	0.06	
Uniform Delay, d1	9.3	13.3		11.1	13.8			22.5		22.3	22.4	
Progression Factor	0.62	0.78		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.5		0.1	0.4			0.3		0.2	0.2	
Delay (s)	6.0	11.0		11.2	14.2			22.8		22.5	22.7	
Level of Service	A	B		B	B			C		C	C	
Approach Delay (s)		10.2			14.0			22.8			22.6	
Approach LOS		B			B			C			C	

Intersection Summary

HCM 2000 Control Delay	12.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.25		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	49.6%	ICU Level of Service	A
Analysis Period (min)	15		

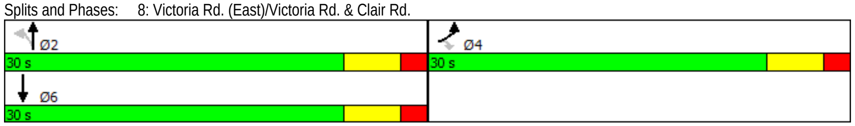
c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT
Lane Configurations					
Traffic Volume (vph)	415	55	75	310	205
Future Volume (vph)	415	55	75	310	205
Lane Group Flow (vph)	415	55	75	310	545
Turn Type	Prot	Perm	Perm	NA	NA
Protected Phases	4			2	6
Permitted Phases		4	2		
Detector Phase	4	4	2	2	6
Switch Phase					
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0
Total Split (s)	30.0	30.0	30.0	30.0	30.0
Total Split (%)	50.0%	50.0%	50.0%	50.0%	50.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0
Lead/Lag					
Lead-Lag Optimize?					
Recall Mode	None	None	Min	Min	Min
v/c Ratio	0.69	0.09	0.38	0.47	0.78
Control Delay	20.2	7.3	18.6	14.5	18.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	20.2	7.3	18.6	14.5	18.4
Queue Length 50th (m)	28.2	1.3	4.3	18.6	25.0
Queue Length 95th (m)	63.4	7.4	16.2	43.7	#70.5
Internal Link Dist (m)	1233.2			2005.5	465.2
Turn Bay Length (m)		10.0	65.0		
Base Capacity (vph)	939	904	299	1008	986
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.44	0.06	0.25	0.31	0.55

Intersection Summary

Cycle Length: 60
Actuated Cycle Length: 45.9
Natural Cycle: 50
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Victoria Rd. (East)/Victoria Rd. & Clair Rd.



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	415	55	75	310	205	340
Future Volume (vph)	415	55	75	310	205	340
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.85	1.00	1.00	0.92	
Flt Protected	0.95	1.00	0.95	1.00	1.00	
Satd. Flow (prot)	1684	1597	1785	1807	1637	
Flt Permitted	0.95	1.00	0.29	1.00	1.00	
Satd. Flow (perm)	1684	1597	537	1807	1637	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	415	55	75	310	205	340
RTOR Reduction (vph)	0	19	0	0	105	0
Lane Group Flow (vph)	415	36	75	310	440	0
Heavy Vehicles (%)	6%	0%	0%	4%	2%	7%
Turn Type	Prot	Perm	Perm	NA	NA	
Protected Phases	4			2	6	
Permitted Phases		4	2			
Actuated Green, G (s)	16.4	16.4	16.7	16.7	16.7	
Effective Green, g (s)	16.4	16.4	16.7	16.7	16.7	
Actuated g/C Ratio	0.36	0.36	0.37	0.37	0.37	
Clearance Time (s)	6.0	6.0	6.0	6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	612	580	198	669	606	
v/s Ratio Prot	c0.25			0.17	c0.27	
v/s Ratio Perm		0.02	0.14			
v/c Ratio	0.68	0.06	0.38	0.46	0.73	
Uniform Delay, d1	12.1	9.3	10.4	10.8	12.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.0	0.0	1.2	0.5	4.3	
Delay (s)	15.1	9.4	11.6	11.3	16.6	
Level of Service	B	A	B	B	B	
Approach Delay (s)	14.4			11.4	16.6	
Approach LOS	B			B	B	

Intersection Summary

HCM 2000 Control Delay	14.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	45.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

9: Clair Rd. & Laird Rd.

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	800	5	30	485	1	115
Future Volume (Veh/h)	800	5	30	485	1	115
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	800	5	30	485	1	115
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			805		1348	802
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			805		1348	802
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		99	70
cM capacity (veh/h)			819		160	384

Direction, Lane #	EB 1	WB 1	NE 1
Volume Total	805	515	116
Volume Left	0	30	1
Volume Right	5	0	115
cSH	1700	819	379
Volume to Capacity	0.47	0.04	0.31
Queue Length 95th (m)	0.0	0.9	10.2
Control Delay (s)	0.0	1.0	18.6
Lane LOS		A	C
Approach Delay (s)	0.0	1.0	18.6
Approach LOS			C

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

10: Gordon St. & Maltby Rd.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	10	50	5	5	0	35	945	10	5	710	30
Future Volume (Veh/h)	30	10	50	5	5	0	35	945	10	5	710	30
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)	30	10	50	5	5	0	35	945	10	5	710	30
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	1752	1760	725	1805	1765	945	740			955		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1752	1760	725	1805	1765	945	740			955		
tC, single (s)	*4.8	*4.6	*4.4	*5.6	*5.0	6.2	4.1			4.3		
tC, 2 stage (s)												
tF (s)	*3.2	*3.0	*3.0	3.5	*3.5	3.3	2.2			2.4		
p0 queue free %	85	96	92	96	97	100	96			99		
cM capacity (veh/h)	202	230	659	113	177	320	862			652		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total	90	10	980	10	745
Volume Left	30	5	35	0	5
Volume Right	50	0	0	10	30
cSH	336	138	862	1700	652
Volume to Capacity	0.27	0.07	0.04	0.01	0.01
Queue Length 95th (m)	8.5	1.8	1.0	0.0	0.2
Control Delay (s)	19.6	33.1	1.2	0.0	0.2
Lane LOS	C	D	A		A
Approach Delay (s)	19.6	33.1	1.1		0.2
Approach LOS	C	D			

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	86.0%	ICU Level of Service	E
Analysis Period (min)	15		

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis
11: Victoria Rd. (West) & Maltby Rd.

Existing Traffic Conditions
Weekday Afternoon Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	30	10	215	20	5	330
Future Volume (Veh/h)	30	10	215	20	5	330
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	30	10	215	20	5	330
Pedestrians					1	
Lane Width (m)					3.5	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			41		486	36
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			41		486	36
tC, single (s)			4.1		6.7	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.8	3.3
p0 queue free %			86		99	68
cM capacity (veh/h)			1574		421	1033

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	40	235	335
Volume Left	0	215	5
Volume Right	10	0	330
cSH	1700	1574	1011
Volume to Capacity	0.02	0.14	0.33
Queue Length 95th (m)	0.0	3.8	11.7
Control Delay (s)	0.0	7.1	10.3
Lane LOS		A	B
Approach Delay (s)	0.0	7.1	10.3
Approach LOS			B

Intersection Summary			
Average Delay	8.4		
Intersection Capacity Utilization	47.0%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis
12: Maltby Rd. & Victoria Rd. (East)

Existing Traffic Conditions
Weekday Afternoon Peak Hour

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	345	15	10	30	35	230
Future Volume (Veh/h)	345	15	10	30	35	230
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	345	15	10	30	35	230
Pedestrians					1	
Lane Width (m)					3.5	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	41				731	26
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	41				731	26
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	78				88	78
cM capacity (veh/h)	1561				301	1049

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	360	40	265
Volume Left	345	0	35
Volume Right	0	30	230
cSH	1561	1700	790
Volume to Capacity	0.22	0.02	0.34
Queue Length 95th (m)	6.8	0.0	11.8
Control Delay (s)	7.7	0.0	11.8
Lane LOS	A		B
Approach Delay (s)	7.7	0.0	11.8
Approach LOS			B

Intersection Summary			
Average Delay	8.9		
Intersection Capacity Utilization	49.4%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix N – Corridor Growth Traffic Analysis Calculations

Background Traffic Growth/Decline Summary

Location: **Gordon Street Background Growth, South of Clair Road**
Time Period: **2008** to **2017**
Analyst: **IFC**

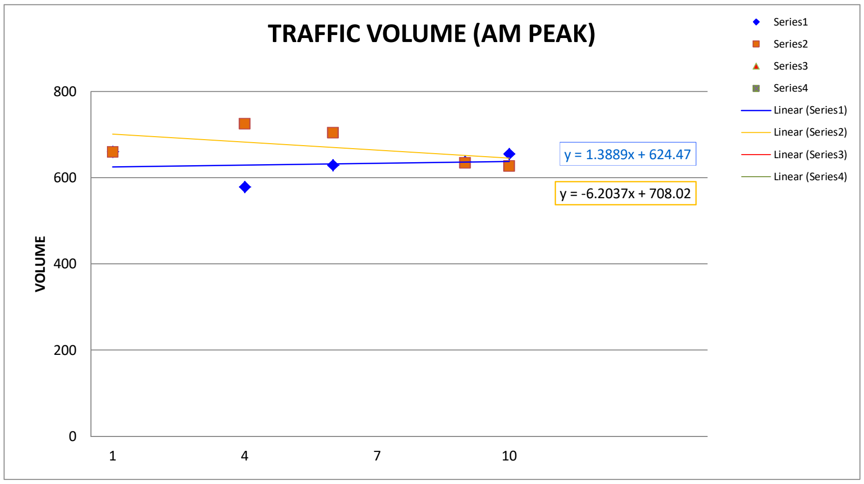
Weekday AM Peak Hour	
Direction	***Percent Change***
Northbound	0.20%
Southbound	-0.80%
Eastbound	0.00%
Westbound	0.00%

Weekday PM Peak Hour	
Direction	***Percent Change***
Northbound	0.62%
Southbound	0.80%
Eastbound	0.00%
Westbound	0.00%

Gordon Street Background Growth, South of Clair Road

Gordon Street Background Growth, South of Clair Road

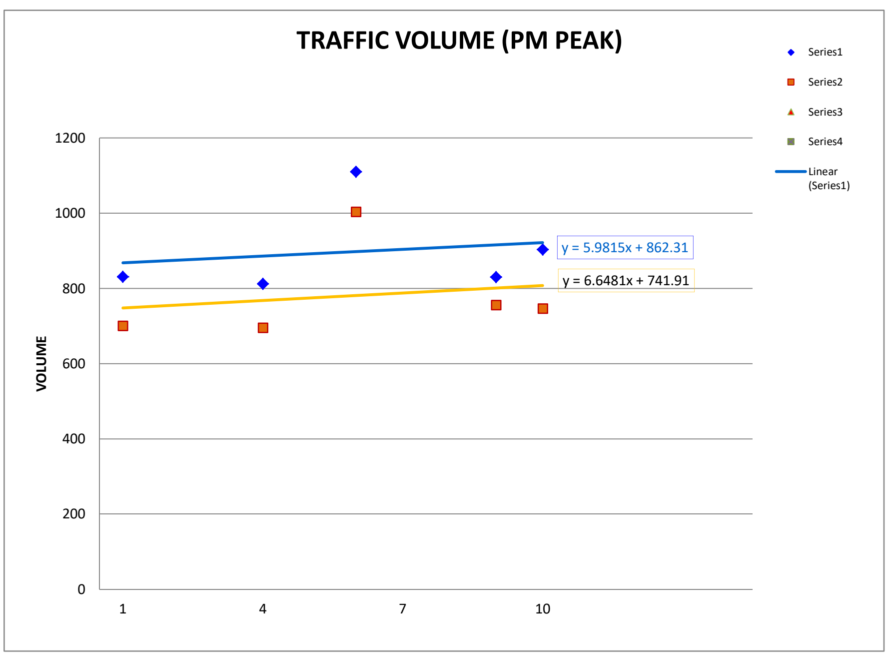
Movement	1		4		6		9		10	
	2008		2011		2013		2016		2017	
	am	pm	am	pm	am	pm	am	pm	am	pm
NBT	661	832	579	813	630	1111	638	831	656	904
SBT	660	702	726	697	705	1005	635	757	628	748



Year	X	Y
2008	1	626
2017	10	638
Year	**X**	**Y**
2008	1	702
2017	10	646

Growth/year NB	
1	0.20%
Growth/year SB	
-6	-0.80%

N-S Average	-0.3%



Year	X	Y
2008	1	868
2017	10	922
Year	**X**	**Y**
2008	1	749
2017	10	808

Growth/year NB	
5	0.62%
Growth/year SB	
6	0.80%

N-S Average	0.7%
E-W Average	0.0%
Total Average	0.4%

Background Traffic Growth/Decline Summary

Location: **Gordon Street Background Growth, North of Maltby Road**
Time Period: **2008** to **2017**
Analyst: **IFC**

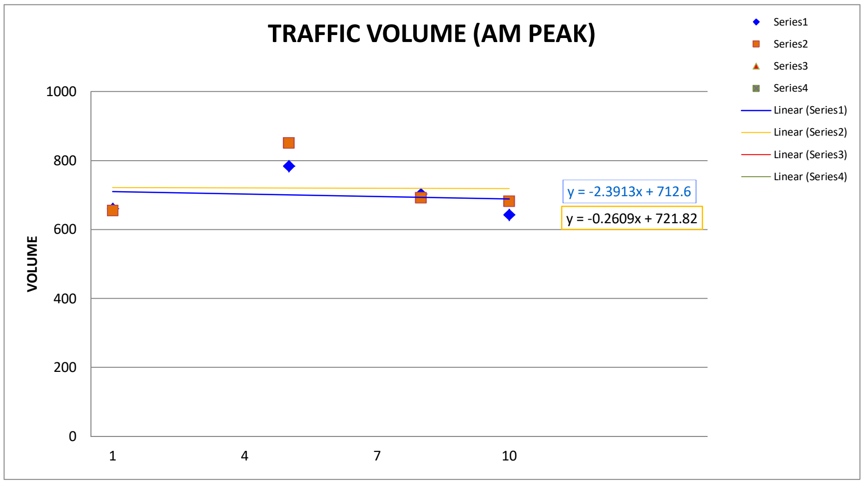
Weekday AM Peak Hour	
Direction	***Percent Change***
Northbound	-0.30%
Southbound	-0.03%
Eastbound	0.00%
Westbound	0.00%

Weekday PM Peak Hour	
Direction	***Percent Change***
Northbound	0.47%
Southbound	0.27%
Eastbound	0.00%
Westbound	0.00%

Gordon Street Background Growth, North of Maltby Road

Gordon Street Background Growth, North of Maltby Road

Movement	1		5		8		10		10	
	2008		2012		2015		2017			
	am	pm	am	pm	am	pm	am	pm	am	pm
NBT	661	1074	785	1019	704	1371	643	977		
SBT	655	845	851	852	693	1109	682	745		

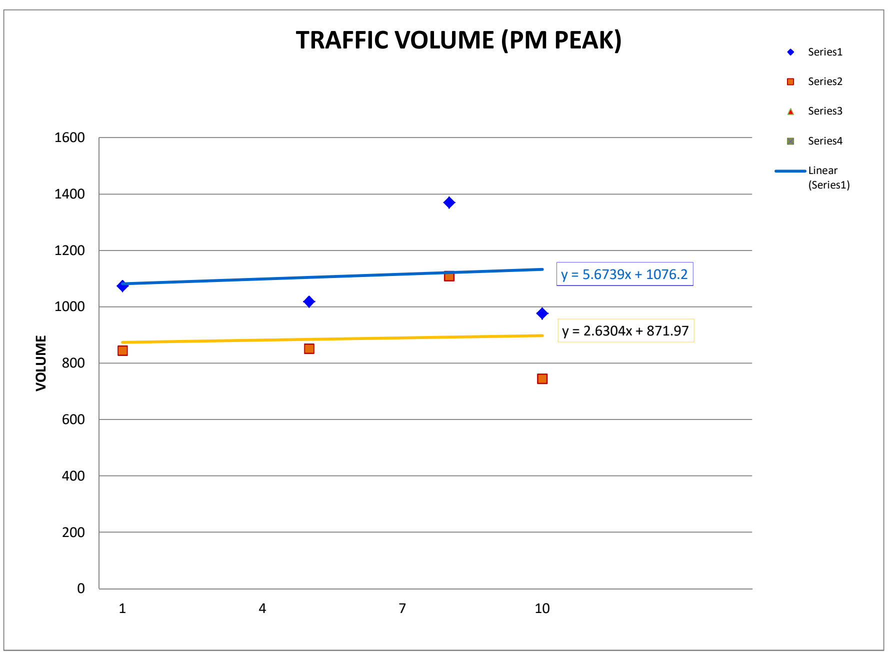


Year	X	Y
2008	1	710
2017	10	689
Year	**X**	**Y**
2008	1	722
2017	10	719

Growth/year NB	
-2	-0.30%

Growth/year SB	
0	-0.03%

N-S Average	0%



Year	X	Y
2008	1	1082
2017	10	1133
Year	**X**	**Y**
2008	1	875
2017	10	898

Growth/year NB	
5	0.47%

Growth/year SB	
2	0.27%

N-S Average	0%
E-W Average	0%
Total Average	0%

Background Traffic Growth/Decline Summary

Location: **Clair Road Background Growth, East of Gordon Street**
Time Period: **2008** to **2017**
Analyst: **IFC**

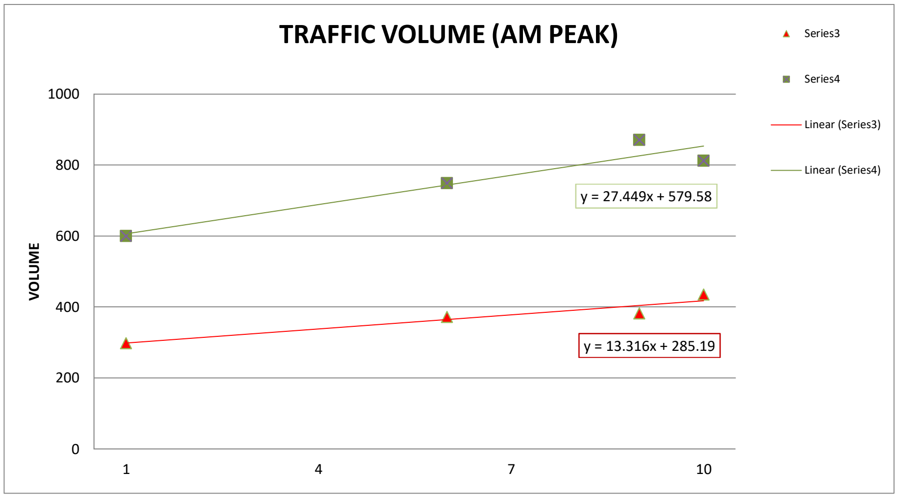
Weekday AM Peak Hour	
Direction	***Percent Change***
Northbound	0.00%
Southbound	0.00%
Eastbound	4.01%
Westbound	4.07%

Weekday PM Peak Hour	
Direction	***Percent Change***
Northbound	0.00%
Southbound	0.00%
Eastbound	4.07%
Westbound	5.37%

Clair Road Background Growth, East of Gordon Street

Clair Road Background Growth, East of Gordon Street

Movement	1		6		9		10		10	
	2008		2013		2016		2017			
	am	pm	am	pm	am	pm	am	pm	am	pm
EBT	298	662	372	1049	382	978	435	953		
WBT	600	370	749	639	871	592	812	595		

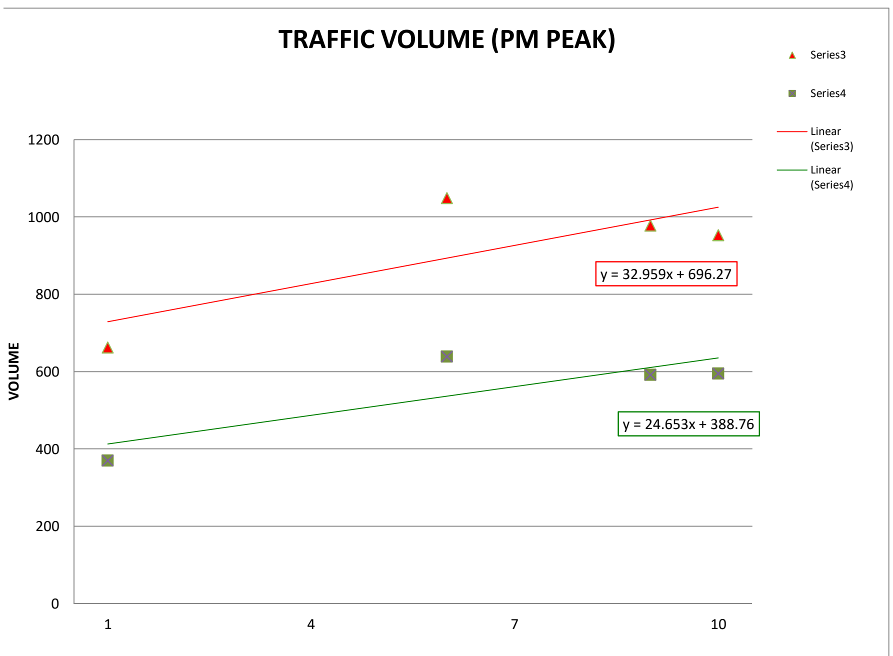


Year	X	Y
2008	1	299
2017	10	418
Year	X	Y
2008	1	607
2017	10	854

Growth/year EB	
12	4.01%

Growth/year WB	
25	4.07%

E-W Average	4.0%



Year	X	Y
2008	1	729
2017	10	1026
Year	X	Y
2008	1	413
2017	10	635

Growth/year EB	
30	4.07%

Growth/year WB	
22	5.37%

E-W Average	4.7%

Background Traffic Growth/Decline Summary

Location: **Clair Road Background Growth, West of Gordon Street**
Time Period: **2008** to **2017**
Analyst: **IFC**

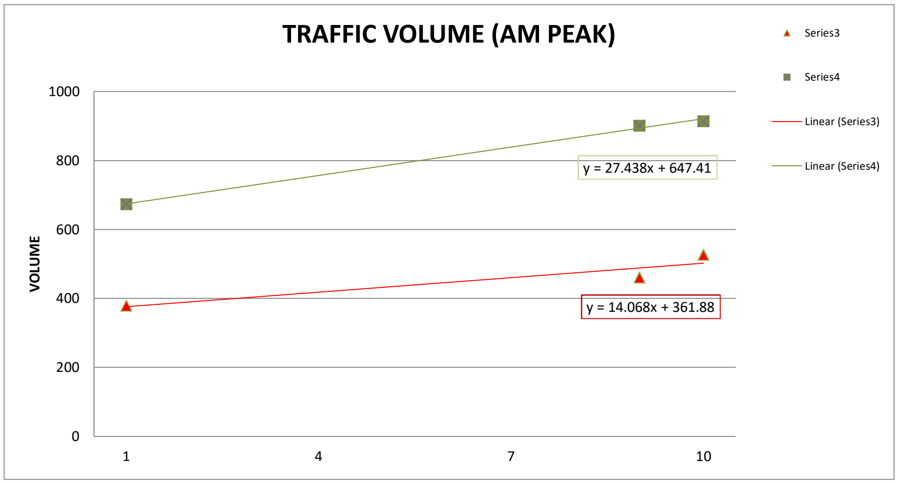
Weekday AM Peak Hour	
Direction	***Percent Change***
Northbound	0.00%
Southbound	0.00%
Eastbound	3.51%
Westbound	3.66%

Weekday PM Peak Hour	
Direction	***Percent Change***
Northbound	0.00%
Southbound	0.00%
Eastbound	3.39%
Westbound	3.97%

Clair Road Background Growth, West of Gordon Street

Clair Road Background Growth, West of Gordon Street

Movement	1		6		9		10		10	
	2008		2013		2016		2017			
	am	pm	am	pm	am	pm	am	pm	am	pm
EBT	379	726			461	957	527	964		
WBT	674	465			902	600	915	668		

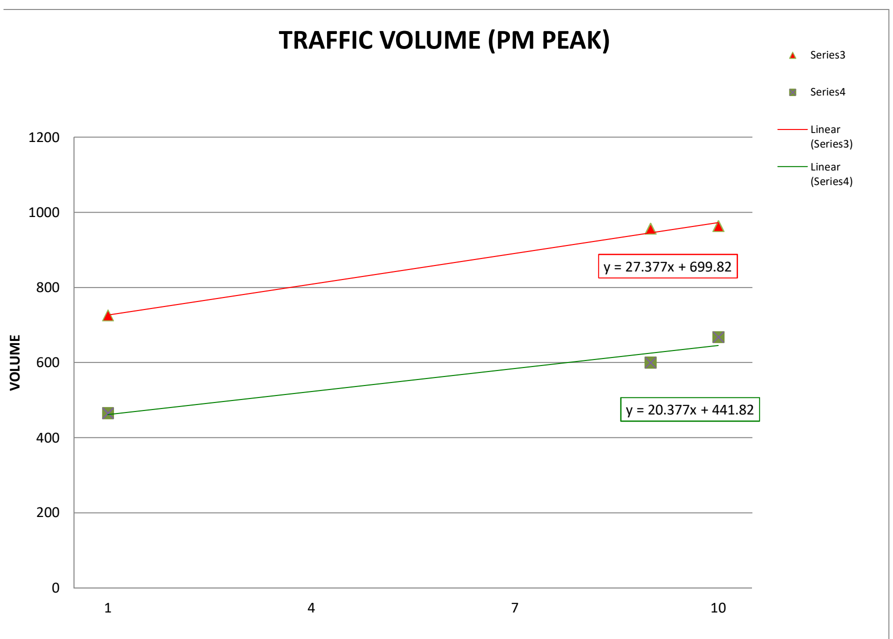


Year	X	Y
2008	1	377
2017	10	509
Year	X	Y
2008	1	675
2017	10	922

Growth/year EB	
13	3.51%

Growth/year WB	
25	3.66%

E-W Average	3.6%



Year	X	Y
2008	1	727
2017	10	974
Year	X	Y
2008	1	462
2017	10	646

Growth/year EB	
25	3.39%

Growth/year WB	
18	3.97%

E-W Average	3.7%

Background Traffic Growth/Decline Summary

Location: **Victoria Road Background Growth, South of Clair Road**
Time Period: **2008** to **2017**
Analyst: **IFC**

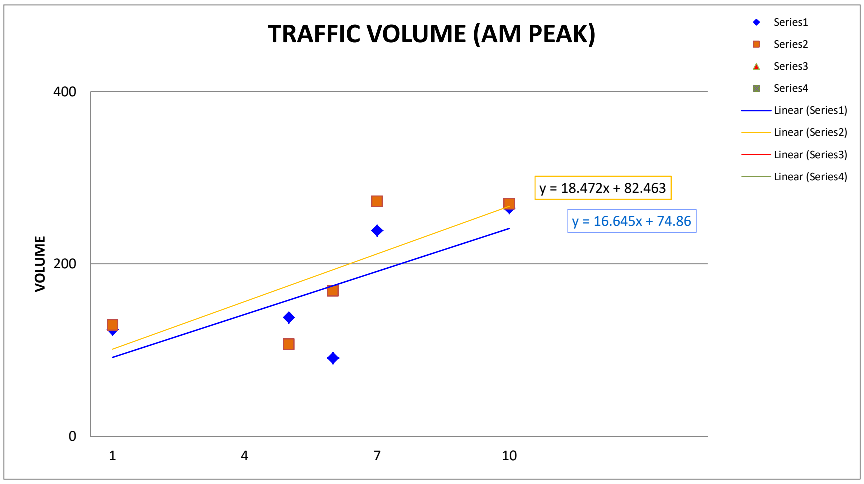
Weekday AM Peak Hour	
Direction	***Percent Change***
Northbound	16.37%
Southbound	16.47%
Eastbound	0.00%
Westbound	0.00%

Weekday PM Peak Hour	
Direction	***Percent Change***
Northbound	25.48%
Southbound	11.40%
Eastbound	0.00%
Westbound	0.00%

Victoria Road Background Growth, South of Clair Road

Victoria Road Background Growth, South of Clair Road

Movement	1		5		6		7		10	
	2008		2012		2013		2014		2017	
	am	pm	am	pm	am	pm	am	pm	am	pm
NBT	124	171	138	89	91	142	239	338	265	384
SBT	129	128	107	191	169	178	273	279	270	261

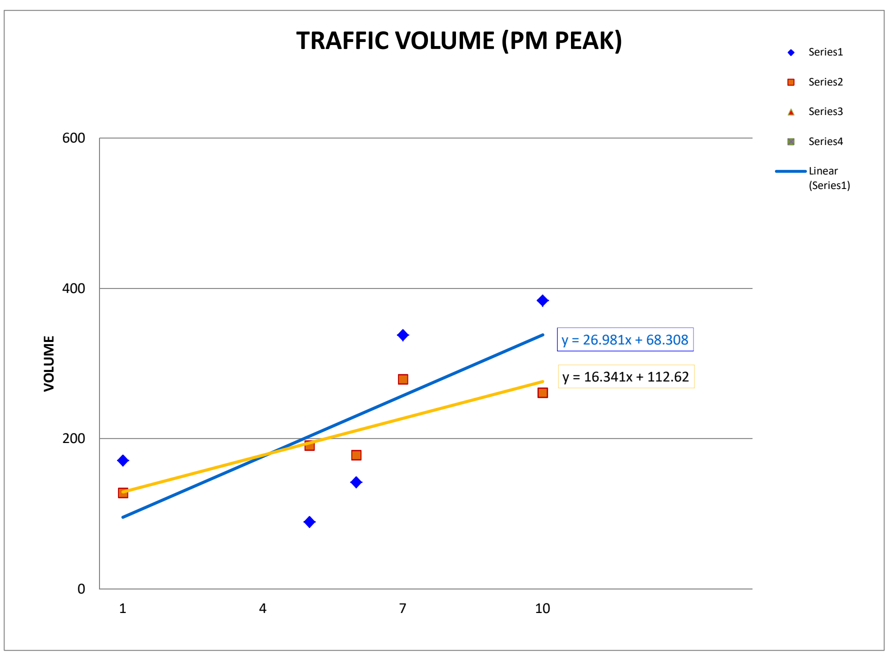


Year	X	Y
2008	1	92
2017	10	241
Year	**X**	**Y**
2008	1	101
2017	10	267

Growth/year NB	
15	16.37%

Growth/year SB	
17	16.47%

N-S Average	16%



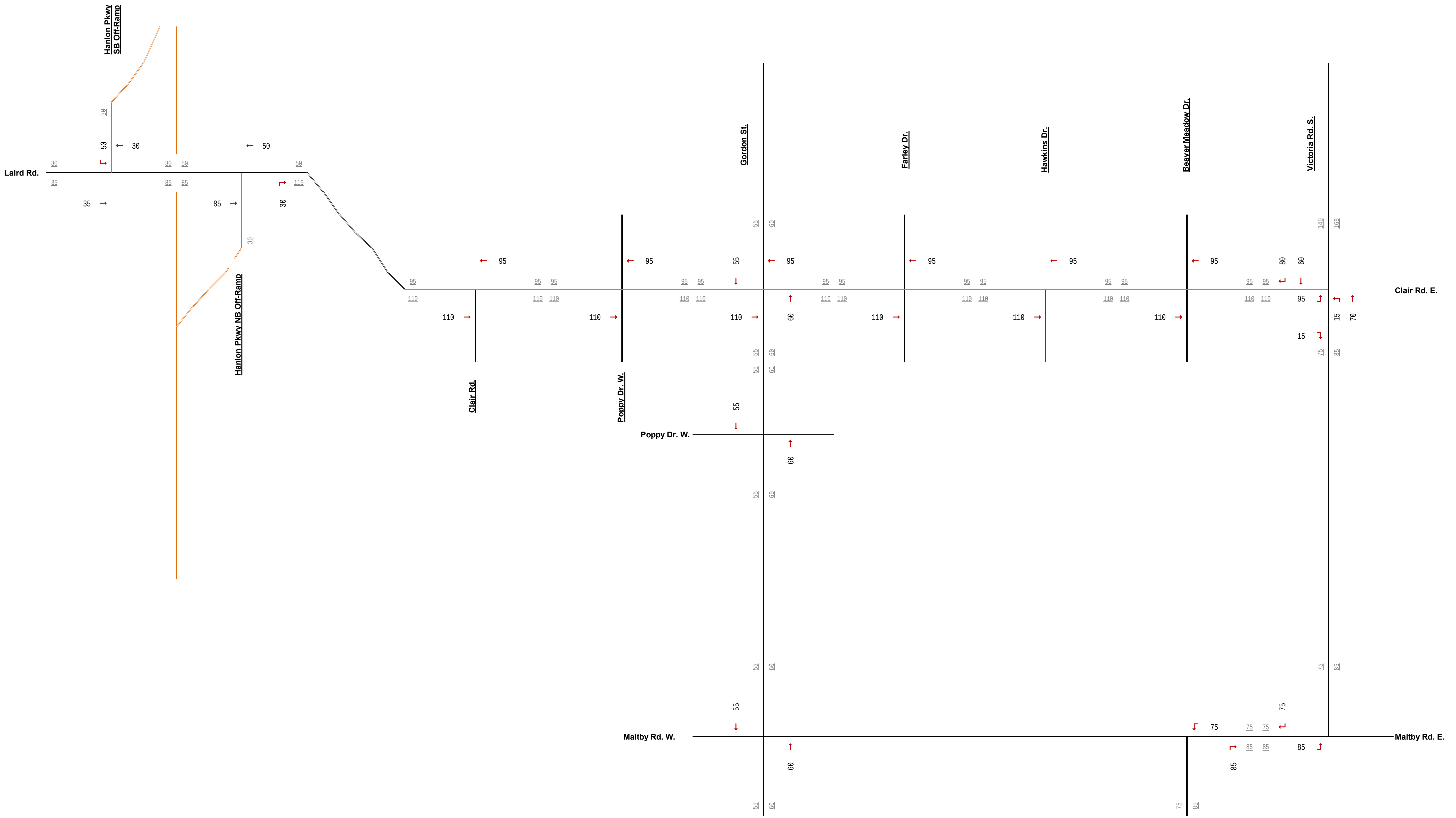
Year	X	Y
2008	1	95
2017	10	338
Year	**X**	**Y**
2008	1	129
2017	10	276

Growth/year NB	
24	25.48%

Growth/year SB	
15	11.40%

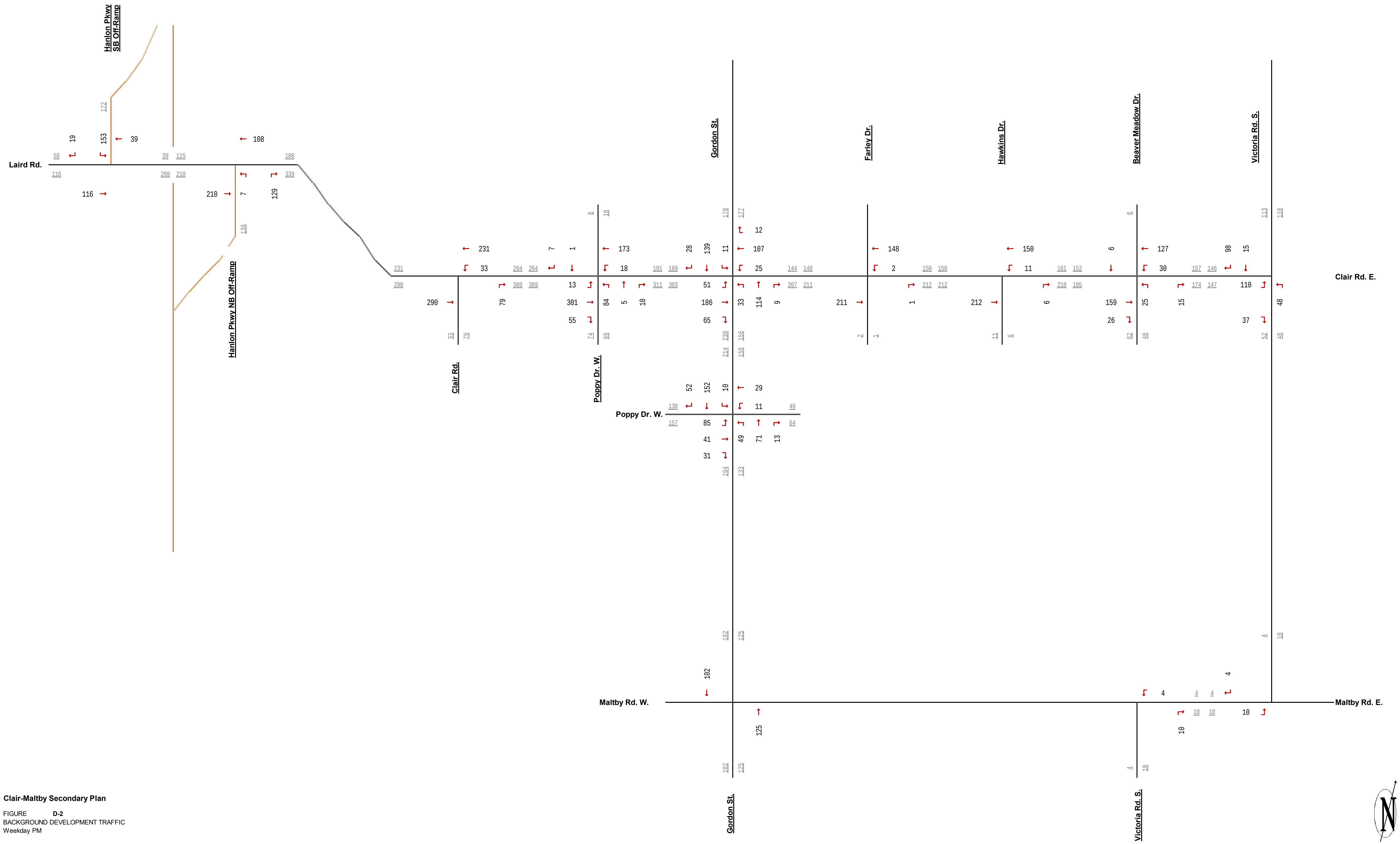
N-S Average	18%
E-W Average	0%
Total Average	9%

Appendix O – Background Traffic Volumes (Corridor Growth and Site-Specific Background Developments)



Clair-Maltby Secondary Plan

FIGURE D-1
Corridor Growth Traffic
Weekday PM



Clair-Maltby Secondary Plan

FIGURE **D-2**
BACKGROUND DEVELOPMENT TRAFFIC
Weekday PM

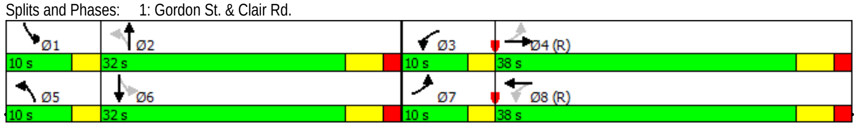
Appendix P – Synchro Analysis Results: Future Background Traffic Conditions

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	290	890	140	575	185	700	185	730
Future Volume (vph)	290	890	140	575	185	700	185	730
Lane Group Flow (vph)	290	1050	140	675	185	875	185	880
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	24.0	9.5	24.0	9.5	24.0	9.5	24.0
Total Split (s)	10.0	38.0	10.0	38.0	10.0	32.0	10.0	32.0
Total Split (%)	11.1%	42.2%	11.1%	42.2%	11.1%	35.6%	11.1%	35.6%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	0.0	2.0	0.0	2.0	0.0	2.0	0.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	C-Max	None	Max	None	Max
v/c Ratio	0.83	0.84	0.68	0.55	0.82	0.87	0.79	0.88
Control Delay	50.2	48.8	28.4	22.2	48.0	40.1	43.0	41.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	50.2	48.8	28.4	22.2	48.0	40.1	43.0	41.0
Queue Length 50th (m)	54.3	107.5	19.2	56.1	20.7	76.5	20.6	77.7
Queue Length 95th (m)	m#94.7	129.0	#35.4	69.5	#51.8	#110.8	#49.3	#112.5
Internal Link Dist (m)		775.0		194.1		153.6		314.0
Turn Bay Length (m)	75.0		25.0		50.0		140.0	
Base Capacity (vph)	351	1251	207	1231	225	1006	234	1004
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	0.83	0.84	0.68	0.55	0.82	0.87	0.79	0.88

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green, Master Intersection
Natural Cycle: 80
Control Type: Actuated-Coordinated
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Gordon St. & Clair Rd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	290	890	160	140	575	100	185	700	175	185	730	150
Future Volume (vph)	290	890	160	140	575	100	185	700	175	185	730	150
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		3.0	6.0		3.0	6.0		3.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.98		1.00	0.98		1.00	0.97		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)	1784	3475		1612	3418		1735	3400		1804	3411	
Flt Permitted	0.29	1.00		0.12	1.00		0.15	1.00		0.15	1.00	
Satd. Flow (perm)	550	3475		212	3418		281	3400		292	3411	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	290	890	160	140	575	100	185	700	175	185	730	150
RTOR Reduction (vph)	0	16	0	0	15	0	0	24	0	0	19	0
Lane Group Flow (vph)	290	1034	0	140	660	0	185	851	0	185	861	0
Confl. Peds. (#/hr)	17		7	7		17	2		11	11		2
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	1%	1%	2%	12%	3%	1%	4%	1%	8%	0%	2%	7%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	39.0	32.0		39.0	32.0		33.0	26.0		33.0	26.0	
Effective Green, g (s)	39.0	32.0		39.0	32.0		33.0	26.0		33.0	26.0	
Actuated g/C Ratio	0.43	0.36		0.43	0.36		0.37	0.29		0.37	0.29	
Clearance Time (s)	3.0	6.0		3.0	6.0		3.0	6.0		3.0	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)	334	1235		200	1215		216	982		224	985	
v/s Ratio Prot	c0.07	0.30		0.05	0.19		c0.07	0.25		0.06	c0.25	
v/s Ratio Perm	c0.31			0.25			0.25			0.24		
v/c Ratio	0.87	0.84		0.70	0.54		0.86	0.87		0.83	0.87	
Uniform Delay, d1	20.7	26.6		18.7	23.2		22.1	30.4		22.0	30.4	
Progression Factor	2.10	1.65		0.83	0.91		1.00	1.00		1.00	1.00	
Incremental Delay, d2	16.7	5.4		9.6	1.6		26.7	10.2		21.3	10.7	
Delay (s)	60.2	49.2		25.0	22.7		48.9	40.5		43.3	41.1	
Level of Service	E	D		C	C		D	D		D	D	
Approach Delay (s)		51.6			23.1			42.0			41.5	
Approach LOS		D			C			D			D	

Intersection Summary

HCM 2000 Control Delay	41.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	89.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	95	60	55	50	60	940	50	910
Future Volume (vph)	95	60	55	50	60	940	50	910
Lane Group Flow (vph)	0	190	0	145	60	1005	50	965
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA
Protected Phases		4		8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	4	4	8	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	9.5	24.0	9.5	24.0
Total Split (s)	30.0	30.0	30.0	30.0	10.0	50.0	10.0	50.0
Total Split (%)	33.3%	33.3%	33.3%	33.3%	11.1%	55.6%	11.1%	55.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.0		6.0	3.0	6.0	3.0	6.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	Max	None	Max
v/c Ratio		0.67		0.49	0.14	0.49	0.13	0.47
Control Delay		39.5		30.0	5.8	12.3	5.8	12.2
Queue Delay		0.0		0.0	0.0	0.0	0.0	0.0
Total Delay		39.5		30.0	5.8	12.3	5.8	12.2
Queue Length 50th (m)		27.0		17.9	2.6	49.7	2.1	47.2
Queue Length 95th (m)		48.8		35.6	8.1	83.6	7.0	79.3
Internal Link Dist (m)		247.7		256.4		171.0		153.6
Turn Bay Length (m)					65.0		27.0	
Base Capacity (vph)		440		450	428	2045	411	2043
Starvation Cap Reductn		0		0	0	0	0	0
Spillback Cap Reductn		0		0	0	0	0	0
Storage Cap Reductn		0		0	0	0	0	0
Reduced v/c Ratio		0.43		0.32	0.14	0.49	0.12	0.47

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 78.8
Natural Cycle: 60
Control Type: Actuated-Uncoordinated

Splits and Phases: 2: Gordon St. & Poppy Dr.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	95	60	35	55	50	40	60	940	65	50	910	55
Future Volume (vph)	95	60	35	55	50	40	60	940	65	50	910	55
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		3.0	6.0		3.0	6.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.98			0.96		1.00	0.99		1.00	0.99	
Flt Protected		0.98			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1772			1760		1770	3505		1770	3509	
Flt Permitted		0.77			0.79		0.25	1.00		0.23	1.00	
Satd. Flow (perm)		1406			1417		464	3505		436	3509	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	95	60	35	55	50	40	60	940	65	50	910	55
RTOR Reduction (vph)	0	10	0	0	17	0	0	5	0	0	4	0
Lane Group Flow (vph)	0	180	0	0	128	0	60	1000	0	50	961	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		15.4			15.4		49.6	45.9		49.6	45.9	
Effective Green, g (s)		15.4			15.4		49.6	45.9		49.6	45.9	
Actuated g/C Ratio		0.19			0.19		0.62	0.57		0.62	0.57	
Clearance Time (s)		6.0			6.0		3.0	6.0		3.0	6.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)		270			272		348	2010		332	2013	
v/s Ratio Prot							c0.01	c0.29		0.01	0.27	
v/s Ratio Perm		c0.13			0.09		0.10			0.09		
v/c Ratio		0.67			0.47		0.17	0.50		0.15	0.48	
Uniform Delay, d1		29.9			28.7		6.4	10.2		6.4	10.0	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		6.1			1.3		0.2	0.9		0.2	0.8	
Delay (s)		36.1			30.0		6.6	11.1		6.6	10.8	
Level of Service		D			C		A	B		A	B	
Approach Delay (s)		36.1			30.0			10.8			10.6	
Approach LOS		D			C			B			B	

Intersection Summary

HCM 2000 Control Delay	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	61.0%	ICU Level of Service	B
Analysis Period (min)	15		

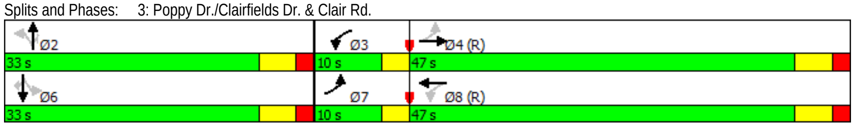
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	120	1215	25	700	95	10	10	20	5	80
Future Volume (vph)	120	1215	25	700	95	10	10	20	5	80
Lane Group Flow (vph)	120	1280	25	745	0	105	10	0	25	80
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4	3	8		2			6	
Permitted Phases	4		8		2		2	6		6
Detector Phase	7	4	3	8	2	2	2	6	6	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	24.0	9.5	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Total Split (s)	10.0	47.0	10.0	47.0	33.0	33.0	33.0	33.0	33.0	33.0
Total Split (%)	11.1%	52.2%	11.1%	52.2%	36.7%	36.7%	36.7%	36.7%	36.7%	36.7%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Total Lost Time (s)	3.0	6.0	3.0	6.0		6.0	6.0		6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	None	C-Max	Max	Max	Max	Max	Max	Max
v/c Ratio	0.30	0.69	0.11	0.46		0.26	0.02		0.06	0.15
Control Delay	9.8	19.4	12.1	23.6		26.0	0.1		23.0	6.5
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	9.8	19.4	12.1	23.6		26.0	0.1		23.0	6.5
Queue Length 50th (m)	8.6	77.2	2.9	58.8		14.4	0.0		3.2	0.0
Queue Length 95th (m)	16.0	128.5	m4.5	m73.5		28.1	0.0		9.2	10.1
Internal Link Dist (m)		186.5		775.0		114.2			150.9	
Turn Bay Length (m)	55.0		45.0				20.0			20.0
Base Capacity (vph)	404	1844	256	1610		408	526		450	530
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	0.69	0.10	0.46		0.26	0.02		0.06	0.15

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 86.4 (96%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 65
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Poppy Dr./Clairfields Dr. & Clair Rd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	1215	65	25	700	45	95	10	10	20	5	80
Future Volume (vph)	120	1215	65	25	700	45	95	10	10	20	5	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		3.0	6.0			6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	1.00
Frt	1.00	0.99		1.00	0.99			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.96	1.00
Satd. Flow (prot)	1770	3512		1770	3507			1782	1583		1791	1583
Flt Permitted	0.28	1.00		0.13	1.00			0.73	1.00		0.80	1.00
Satd. Flow (perm)	522	3512		242	3507			1359	1583		1499	1583
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	120	1215	65	25	700	45	95	10	10	20	5	80
RTOR Reduction (vph)	0	4	0	0	5	0	0	0	7	0	0	56
Lane Group Flow (vph)	120	1276	0	25	740	0	0	105	3	0	25	24
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	51.0	45.4		43.8	41.2			27.0	27.0		27.0	27.0
Effective Green, g (s)	51.0	45.4		43.8	41.2			27.0	27.0		27.0	27.0
Actuated g/C Ratio	0.57	0.50		0.49	0.46			0.30	0.30		0.30	0.30
Clearance Time (s)	3.0	6.0		3.0	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)	390	1771		161	1605			407	474		449	474
v/s Ratio Prot	c0.02	c0.36		0.00	0.21							
v/s Ratio Perm	0.15			0.07				c0.08	0.00		0.02	0.02
v/c Ratio	0.31	0.72		0.16	0.46			0.26	0.01		0.06	0.05
Uniform Delay, d1	9.8	17.4		13.6	16.8			23.9	22.1		22.4	22.4
Progression Factor	1.00	1.00		1.53	1.36			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.5	2.6		0.3	0.7			1.5	0.0		0.2	0.2
Delay (s)	10.3	19.9		21.2	23.5			25.4	22.1		22.7	22.6
Level of Service	B	B		C	C			C	C		C	C
Approach Delay (s)		19.1			23.5			25.1			22.6	
Approach LOS		B			C			C			C	

Intersection Summary

HCM 2000 Control Delay	20.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	65.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBT	NBL	NBR
Lane Configurations				
Traffic Volume (vph)	775	660	30	295
Future Volume (vph)	775	660	30	295
Lane Group Flow (vph)	775	660	30	295
Turn Type	NA	NA	Prot	Perm
Protected Phases	4	8	2	
Permitted Phases				2
Minimum Split (s)	24.0	24.0	25.0	25.0
Total Split (s)	34.0	34.0	46.0	46.0
Total Split (%)	42.5%	42.5%	57.5%	57.5%
Yellow Time (s)	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	7.0	7.0
Lead/Lag				
Lead-Lag Optimize?				
v/c Ratio	0.64	0.55	0.03	0.42
Control Delay	21.6	23.0	10.9	12.8
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	21.6	23.0	10.9	12.8
Queue Length 50th (m)	45.3	43.9	2.4	22.8
Queue Length 95th (m)	69.6	60.7	6.6	42.4
Internal Link Dist (m)	282.0	205.6	157.0	
Turn Bay Length (m)				100.0
Base Capacity (vph)	1203	1203	879	696
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.64	0.55	0.03	0.42

Intersection Summary

Cycle Length: 80

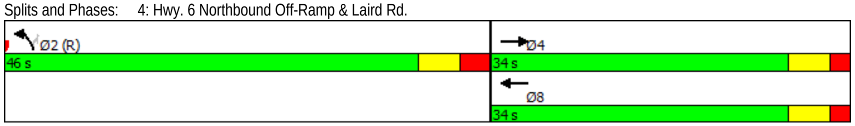
Actuated Cycle Length: 80

Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green

Natural Cycle: 50

Control Type: Pretimed

Splits and Phases: 4: Hwy. 6 Northbound Off-Ramp & Laird Rd.



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	775	0	0	660	30	295
Future Volume (vph)	775	0	0	660	30	295
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0			6.0	7.0	7.0
Lane Util. Factor	0.95			0.95	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3438			3438	1805	1369
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	3438			3438	1805	1369
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	775	0	0	660	30	295
RTOR Reduction (vph)	0	0	0	0	0	29
Lane Group Flow (vph)	775	0	0	660	30	266
Heavy Vehicles (%)	5%	2%	2%	5%	0%	18%
Turn Type	NA			NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases						2
Actuated Green, G (s)	28.0			28.0	39.0	39.0
Effective Green, g (s)	28.0			28.0	39.0	39.0
Actuated g/C Ratio	0.35			0.35	0.49	0.49
Clearance Time (s)	6.0			6.0	7.0	7.0
Lane Grp Cap (vph)	1203			1203	879	667
v/s Ratio Prot	c0.23			0.19	0.02	
v/s Ratio Perm						c0.19
v/c Ratio	0.64			0.55	0.03	0.40
Uniform Delay, d1	21.8			20.9	10.7	13.0
Progression Factor	0.86			1.00	1.00	1.00
Incremental Delay, d2	2.6			1.8	0.1	1.8
Delay (s)	21.3			22.7	10.8	14.8
Level of Service	C			C	B	B
Approach Delay (s)	21.3			22.7	14.5	
Approach LOS	C			C	B	

Intersection Summary			
HCM 2000 Control Delay	20.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		

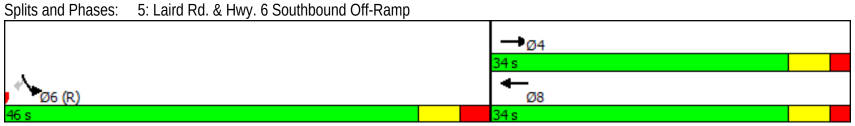
c Critical Lane Group

Lane Group	EBT	WBT	SBL	SBR
Lane Configurations				
Traffic Volume (vph)	365	435	500	60
Future Volume (vph)	365	435	500	60
Lane Group Flow (vph)	365	435	500	60
Turn Type	NA	NA	Prot	Perm
Protected Phases	4	8	6	
Permitted Phases				6
Minimum Split (s)	24.0	24.0	25.0	25.0
Total Split (s)	34.0	34.0	46.0	46.0
Total Split (%)	42.5%	42.5%	57.5%	57.5%
Yellow Time (s)	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	7.0	7.0
Lead/Lag				
Lead-Lag Optimize?				
v/c Ratio	0.30	0.35	0.31	0.08
Control Delay	19.7	29.8	13.1	3.5
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	19.7	29.8	13.1	3.5
Queue Length 50th (m)	21.9	25.1	23.6	0.0
Queue Length 95th (m)	32.7	40.0	33.8	5.8
Internal Link Dist (m)	199.6	282.0	265.0	
Turn Bay Length (m)				40.0
Base Capacity (vph)	1226	1250	1610	759
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.30	0.35	0.31	0.08

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 80
Offset: 0 (0%), Referenced to phase 2: and 6:SBL, Start of Green
Natural Cycle: 50
Control Type: Pretimed

Splits and Phases: 5: Laird Rd. & Hwy. 6 Southbound Off-Ramp



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	365	435	0	500	60
Future Volume (vph)	0	365	435	0	500	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		7.0	7.0
Lane Util. Factor		0.95	0.95		0.97	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3505	3574		3303	1495
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		3505	3574		3303	1495
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	365	435	0	500	60
RTOR Reduction (vph)	0	0	0	0	0	31
Lane Group Flow (vph)	0	365	435	0	500	29
Heavy Vehicles (%)	2%	3%	1%	2%	6%	8%
Turn Type		NA	NA		Prot	Perm
Protected Phases		4	8		6	
Permitted Phases						6
Actuated Green, G (s)		28.0	28.0		39.0	39.0
Effective Green, g (s)		28.0	28.0		39.0	39.0
Actuated g/C Ratio		0.35	0.35		0.49	0.49
Clearance Time (s)		6.0	6.0		7.0	7.0
Lane Grp Cap (vph)		1226	1250		1610	728
v/s Ratio Prot		0.10	c0.12		c0.15	
v/s Ratio Perm						0.02
v/c Ratio		0.30	0.35		0.31	0.04
Uniform Delay, d1		18.9	19.2		12.4	10.7
Progression Factor		1.00	1.50		1.00	1.00
Incremental Delay, d2		0.6	0.7		0.5	0.1
Delay (s)		19.5	29.5		12.9	10.8
Level of Service		B	C		B	B
Approach Delay (s)		19.5	29.5		12.7	
Approach LOS		B	C		B	

Intersection Summary			
HCM 2000 Control Delay	19.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.33		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	50.5%	ICU Level of Service	A
Analysis Period (min)	15		

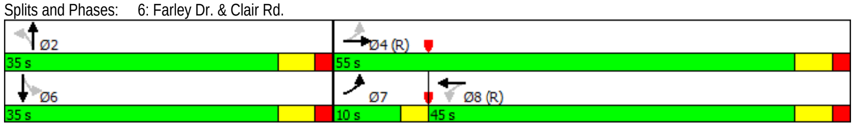
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↰	↑↱	↰	↑↱	↰	↱	↰	↱
Traffic Volume (vph)	235	815	45	595	115	65	55	50
Future Volume (vph)	235	815	45	595	115	65	55	50
Lane Group Flow (vph)	235	1005	45	650	115	100	55	190
Turn Type	pm+pt	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	7	4		8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	8	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Total Split (s)	10.0	55.0	45.0	45.0	35.0	35.0	35.0	35.0
Total Split (%)	11.1%	61.1%	50.0%	50.0%	38.9%	38.9%	38.9%	38.9%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead		Lag	Lag				
Lead-Lag Optimize?	Yes		Yes	Yes				
Recall Mode	None	C-Max	C-Max	C-Max	Max	Max	Max	Max
v/c Ratio	0.53	0.54	0.20	0.44	0.32	0.17	0.14	0.30
Control Delay	16.5	17.2	14.3	15.8	26.1	16.2	22.9	8.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.5	17.2	14.3	15.8	26.1	16.2	22.9	8.6
Queue Length 50th (m)	33.1	78.1	6.2	51.8	15.7	8.6	7.0	6.3
Queue Length 95th (m)	m38.7	m98.5	16.0	67.7	30.5	20.3	16.1	21.7
Internal Link Dist (m)		194.1		563.0		111.7		152.1
Turn Bay Length (m)	125.0		50.0		45.0		20.0	
Base Capacity (vph)	440	1870	227	1492	360	594	399	624
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	0.53	0.54	0.20	0.44	0.32	0.17	0.14	0.30

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 50.4 (56%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 6: Farley Dr. & Clair Rd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑↱		↰	↱		↰	↱	
Traffic Volume (vph)	235	815	190	45	595	55	115	65	35	55	50	140
Future Volume (vph)	235	815	190	45	595	55	115	65	35	55	50	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.99		1.00	0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.98	1.00		0.98	1.00	
Frt	1.00	0.97		1.00	0.99		1.00	0.95		1.00	0.89	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1803	3392		1796	3428		1738	1778		1702	1646	
Flt Permitted	0.32	1.00		0.28	1.00		0.61	1.00		0.69	1.00	
Satd. Flow (perm)	604	3392		525	3428		1119	1778		1240	1646	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	235	815	190	45	595	55	115	65	35	55	50	140
RTOR Reduction (vph)	0	22	0	0	8	0	0	22	0	0	95	0
Lane Group Flow (vph)	235	983	0	45	642	0	115	78	0	55	95	0
Confl. Peds. (#/hr)	6		8	8		6	16		15	15		16
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	3%	1%	0%	4%	0%	2%	0%	0%	4%	0%	0%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	7	4			8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	49.0	49.0		39.0	39.0		29.0	29.0		29.0	29.0	
Effective Green, g (s)	49.0	49.0		39.0	39.0		29.0	29.0		29.0	29.0	
Actuated g/C Ratio	0.54	0.54		0.43	0.43		0.32	0.32		0.32	0.32	
Clearance Time (s)	3.0	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)	422	1846		227	1485		360	572		399	530	
v/s Ratio Prot	0.04	c0.29			0.19			0.04			0.06	
v/s Ratio Perm	c0.26			0.09			c0.10			0.04		
v/c Ratio	0.56	0.53		0.20	0.43		0.32	0.14		0.14	0.18	
Uniform Delay, d1	11.4	13.2		15.8	17.8		23.0	21.6		21.6	21.9	
Progression Factor	1.46	1.31		0.74	0.85		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	0.6		1.9	0.9		2.3	0.5		0.7	0.7	
Delay (s)	17.5	17.8		13.6	15.9		25.4	22.1		22.4	22.7	
Level of Service	B	B		B	B		C	C		C	C	
Approach Delay (s)		17.8			15.8			23.9			22.6	
Approach LOS		B			B			C			C	

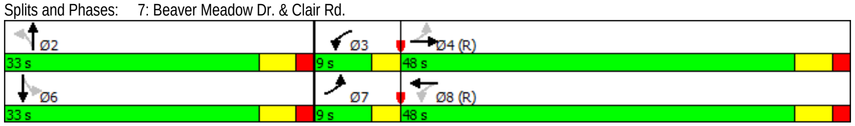
Intersection Summary			
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	74.3%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	110	855	55	615	45	5	15	15
Future Volume (vph)	110	855	55	615	45	5	15	15
Lane Group Flow (vph)	110	901	55	630	0	90	15	75
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	7	4	3	8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	3	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	24.0	9.5	24.0	24.0	24.0	24.0	24.0
Total Split (s)	9.0	48.0	9.0	48.0	33.0	33.0	33.0	33.0
Total Split (%)	10.0%	53.3%	10.0%	53.3%	36.7%	36.7%	36.7%	36.7%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0	3.0	6.0		6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	Max	Max	Max	Max
v/c Ratio	0.24	0.53	0.16	0.37		0.20	0.04	0.14
Control Delay	4.5	12.5	8.6	15.6		15.5	22.7	9.4
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	4.5	12.5	8.6	15.6		15.5	22.7	9.4
Queue Length 50th (m)	2.5	78.1	3.8	37.4		6.6	1.9	1.9
Queue Length 95th (m)	4.9	98.0	8.5	50.6		18.1	6.6	11.9
Internal Link Dist (m)		563.0		1233.2		183.8		182.6
Turn Bay Length (m)	55.0		30.0					
Base Capacity (vph)	465	1710	342	1716		461	414	527
Starvation Cap Reductn	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0		0	0	0
Reduced v/c Ratio	0.24	0.53	0.16	0.37		0.20	0.04	0.14

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 86.4 (96%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 7: Beaver Meadow Dr. & Clair Rd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	855	46	55	615	15	45	5	40	15	15	60
Future Volume (vph)	110	855	46	55	615	15	45	5	40	15	15	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		3.0	6.0			6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		0.99	1.00	
Frt	1.00	0.99		1.00	1.00			0.94		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00			0.98		0.95	1.00	
Satd. Flow (prot)	1769	3508		1769	3524			1684		1758	1618	
Flt Permitted	0.37	1.00		0.24	1.00			0.84		0.75	1.00	
Satd. Flow (perm)	687	3508		443	3524			1446		1383	1618	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	110	855	46	55	615	15	45	5	40	15	15	60
RTOR Reduction (vph)	0	4	0	0	2	0	0	28	0	0	42	0
Lane Group Flow (vph)	110	897	0	55	628	0	0	62	0	15	33	0
Confl. Peds. (#/hr)	2		1	1		2	3		3	3		3
Confl. Bikes (#/hr)			1			2						
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	48.0	43.2		48.0	43.2			27.0		27.0	27.0	
Effective Green, g (s)	48.0	43.2		48.0	43.2			27.0		27.0	27.0	
Actuated g/C Ratio	0.53	0.48		0.53	0.48			0.30		0.30	0.30	
Clearance Time (s)	3.0	6.0		3.0	6.0			6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	424	1683		306	1691			433		414	485	
v/s Ratio Prot	c0.01	c0.26		0.01	0.18						0.02	
v/s Ratio Perm	0.12			0.09				c0.04		0.01		
v/c Ratio	0.26	0.53		0.18	0.37			0.14		0.04	0.07	
Uniform Delay, d1	10.6	16.4		10.8	14.8			23.0		22.3	22.5	
Progression Factor	0.43	0.69		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.3	1.1		0.3	0.6			0.7		0.2	0.3	
Delay (s)	4.9	12.4		11.1	15.4			23.7		22.5	22.8	
Level of Service	A	B		B	B			C		C	C	
Approach Delay (s)		11.6			15.1			23.7			22.7	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	57.6%	ICU Level of Service	B
Analysis Period (min)	15		

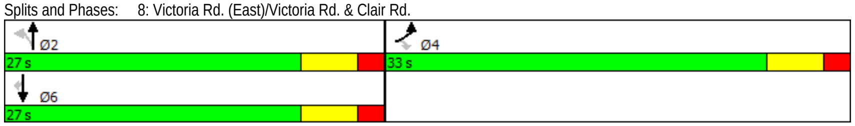
c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	620	105	140	380	280	520
Future Volume (vph)	620	105	140	380	280	520
Lane Group Flow (vph)	620	105	140	380	280	520
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Detector Phase	4	4	2	2	6	6
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0
Total Split (s)	33.0	33.0	27.0	27.0	27.0	27.0
Total Split (%)	55.0%	55.0%	45.0%	45.0%	45.0%	45.0%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	None	None	Min	Min	Min	Min
v/c Ratio	0.83	0.14	0.41	0.67	0.49	0.63
Control Delay	24.7	6.6	19.0	22.5	18.0	5.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.7	6.6	19.0	22.5	18.0	5.6
Queue Length 50th (m)	48.4	3.3	10.9	32.6	22.4	0.0
Queue Length 95th (m)	#114.6	11.4	25.3	60.1	42.8	17.9
Internal Link Dist (m)	1233.2			2005.5	465.2	
Turn Bay Length (m)		10.0	65.0			20.0
Base Capacity (vph)	961	930	482	802	818	954
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.65	0.11	0.29	0.47	0.34	0.55

Intersection Summary

Cycle Length: 60
Actuated Cycle Length: 49.9
Natural Cycle: 60
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 8: Victoria Rd. (East)/Victoria Rd. & Clair Rd.



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	620	105	140	380	280	520
Future Volume (vph)	620	105	140	380	280	520
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	6.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1703	1615	1805	1827	1863	1509
Flt Permitted	0.95	1.00	0.58	1.00	1.00	1.00
Satd. Flow (perm)	1703	1615	1098	1827	1863	1509
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	620	105	140	380	280	520
RTOR Reduction (vph)	0	23	0	0	0	358
Lane Group Flow (vph)	620	82	140	380	280	162
Heavy Vehicles (%)	6%	0%	0%	4%	2%	7%
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	22.0	22.0	15.4	15.4	15.4	15.4
Effective Green, g (s)	22.0	22.0	15.4	15.4	15.4	15.4
Actuated g/C Ratio	0.45	0.45	0.31	0.31	0.31	0.31
Clearance Time (s)	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
Lane Grp Cap (vph)	758	719	342	569	580	470
v/s Ratio Prot	c0.36			c0.21	0.15	
v/s Ratio Perm		0.05	0.13			0.11
v/c Ratio	0.82	0.11	0.41	0.67	0.48	0.34
Uniform Delay, d1	12.0	8.0	13.4	14.8	13.8	13.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.9	0.1	0.8	3.0	0.6	0.4
Delay (s)	18.8	8.1	14.2	17.7	14.4	13.6
Level of Service	B	A	B	B	B	B
Approach Delay (s)	17.3			16.8	13.9	
Approach LOS	B			B	B	

Intersection Summary			
HCM 2000 Control Delay	15.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	49.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

9: Clair Rd. & Laird Rd.

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	1200	5	65	810	1	195
Future Volume (Veh/h)	1200	5	65	810	1	195
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1200	5	65	810	1	195
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			1205		1738	602
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1205		1738	602
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			89		99	56
cM capacity (veh/h)			575		69	442

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NE 1
Volume Total	800	405	65	405	405	196
Volume Left	0	0	65	0	0	1
Volume Right	0	5	0	0	0	195
cSH	1700	1700	575	1700	1700	431
Volume to Capacity	0.47	0.24	0.11	0.24	0.24	0.46
Queue Length 95th (m)	0.0	0.0	3.0	0.0	0.0	18.6
Control Delay (s)	0.0	0.0	12.1	0.0	0.0	20.2
Lane LOS			B			C
Approach Delay (s)	0.0		0.9			20.2
Approach LOS						C

Intersection Summary			
Average Delay	2.1		
Intersection Capacity Utilization	59.1%	ICU Level of Service	B
Analysis Period (min)	15		

10: Gordon St. & Maltby Rd.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	30	10	50	5	5	0	35	1130	10	5	865	30
Future Volume (Veh/h)	30	10	50	5	5	0	35	1130	10	5	865	30
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)	30	10	50	5	5	0	35	1130	10	5	865	30
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	1528	2100	448	1702	2110	570	895			1140		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1528	2100	448	1702	2110	570	895			1140		
tC, single (s)	*4.8	*4.6	*4.4	*5.6	*5.0	6.9	4.2			4.5		
tC, 2 stage (s)												
tF (s)	*3.2	*3.0	*3.0	3.5	*3.5	3.3	2.2			2.4		
p0 queue free %	88	94	94	96	96	100	95			99		
cM capacity (veh/h)	249	164	832	128	122	470	748			515		

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	90	10	35	753	387	5	577	318
Volume Left	30	5	35	0	0	5	0	0
Volume Right	50	0	0	0	10	0	0	30
cSH	372	125	748	1700	1700	515	1700	1700
Volume to Capacity	0.24	0.08	0.05	0.44	0.23	0.01	0.34	0.19
Queue Length 95th (m)	7.5	2.1	1.2	0.0	0.0	0.2	0.0	0.0
Control Delay (s)	17.7	36.3	10.1	0.0	0.0	12.1	0.0	0.0
Lane LOS	C	E	B			B		
Approach Delay (s)	17.7	36.3	0.3			0.1		
Approach LOS	C	E						

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	44.1%	ICU Level of Service	A
Analysis Period (min)	15		

* User Entered Value

HCM Unsignalized Intersection Capacity Analysis — Future Background Traffic Conditions
11: Victoria Rd. (West) & Maltby Rd. — Weekday Afternoon Peak Hour

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	30	10	295	20	5	425
Future Volume (Veh/h)	30	10	295	20	5	425
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	30	10	295	20	5	425
Pedestrians					1	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			41		646	36
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			41		646	36
tC, single (s)			4.1		6.7	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.8	3.3
p0 queue free %			81		98	59
cM capacity (veh/h)			1574		317	1033

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	40	315	430
Volume Left	0	295	5
Volume Right	10	0	425
cSH	1700	1574	1006
Volume to Capacity	0.02	0.19	0.43
Queue Length 95th (m)	0.0	5.5	17.4
Control Delay (s)	0.0	7.4	11.2
Lane LOS		A	B
Approach Delay (s)	0.0	7.4	11.2
Approach LOS			B

Intersection Summary			
Average Delay	9.1		
Intersection Capacity Utilization	57.3%	ICU Level of Service	B
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis — Future Background Traffic Conditions
12: Maltby Rd. & Victoria Rd. (East) — Weekday Afternoon Peak Hour

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	440	15	10	30	35	310
Future Volume (Veh/h)	440	15	10	30	35	310
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	440	15	10	30	35	310
Pedestrians					1	
Lane Width (m)					3.6	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	41				921	26
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	41				921	26
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	72				84	70
cM capacity (veh/h)	1561				215	1049

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	455	40	345
Volume Left	440	0	35
Volume Right	0	30	310
cSH	1561	1700	752
Volume to Capacity	0.28	0.02	0.46
Queue Length 95th (m)	9.3	0.0	19.4
Control Delay (s)	8.0	0.0	13.8
Lane LOS	A		B
Approach Delay (s)	8.0	0.0	13.8
Approach LOS			B

Intersection Summary			
Average Delay	10.0		
Intersection Capacity Utilization	59.6%	ICU Level of Service	B
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	1	55	25	30	20	1010	105	890
Future Volume (vph)	1	55	25	30	20	1010	105	890
Lane Group Flow (vph)	0	66	0	110	20	1055	105	895
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Total Split (s)	25.0	25.0	25.0	25.0	65.0	65.0	65.0	65.0
Total Split (%)	27.8%	27.8%	27.8%	27.8%	72.2%	72.2%	72.2%	72.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.0		6.0	6.0	6.0	6.0	6.0
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio		0.17		0.29	0.06	0.46	0.37	0.39
Control Delay		27.2		19.5	6.1	8.3	11.5	7.7
Queue Delay		0.0		0.0	0.0	0.0	0.0	0.0
Total Delay		27.2		19.5	6.1	8.3	11.5	7.7
Queue Length 50th (m)		8.5		8.9	1.2	43.5	7.7	35.0
Queue Length 95th (m)		19.7		23.3	3.8	56.4	18.8	45.8
Internal Link Dist (m)		183.5		226.8		1642.2		171.0
Turn Bay Length (m)					50.0		50.0	
Base Capacity (vph)		391		378	355	2309	287	2318
Starvation Cap Reductn		0		0	0	0	0	0
Spillback Cap Reductn		0		0	0	0	0	0
Storage Cap Reductn		0		0	0	0	0	0
Reduced v/c Ratio		0.17		0.29	0.06	0.46	0.37	0.39

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Pretimed

Splits and Phases: 13: Gordon St. & Gosling Gardens

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	55	10	25	30	55	20	1010	45	105	890	5
Future Volume (vph)	1	55	10	25	30	55	20	1010	45	105	890	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.98			0.93		1.00	0.99		1.00	1.00	
Flt Protected		1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1823			1717		1770	3517		1770	3536	
Flt Permitted		1.00			0.92		0.29	1.00		0.24	1.00	
Satd. Flow (perm)		1819			1603		542	3517		438	3536	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1	55	10	25	30	55	20	1010	45	105	890	5
RTOR Reduction (vph)	0	7	0	0	40	0	0	3	0	0	0	0
Lane Group Flow (vph)	0	59	0	0	70	0	20	1052	0	105	895	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)		19.0			19.0		59.0	59.0		59.0	59.0	
Effective Green, g (s)		19.0			19.0		59.0	59.0		59.0	59.0	
Actuated g/C Ratio		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	
Lane Grp Cap (vph)		384			338		355	2305		287	2318	
v/s Ratio Prot								c0.30			0.25	
v/s Ratio Perm		0.03			c0.04		0.04			0.24		
v/c Ratio		0.15			0.21		0.06	0.46		0.37	0.39	
Uniform Delay, d1		28.9			29.3		5.5	7.6		7.0	7.1	
Progression Factor		1.00			1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		0.8			1.4		0.3	0.7		3.6	0.5	
Delay (s)		29.8			30.7		5.8	8.3		10.6	7.6	
Level of Service		C			C		A	A		B	A	
Approach Delay (s)		29.8			30.7			8.2			7.9	
Approach LOS		C			C			A			A	

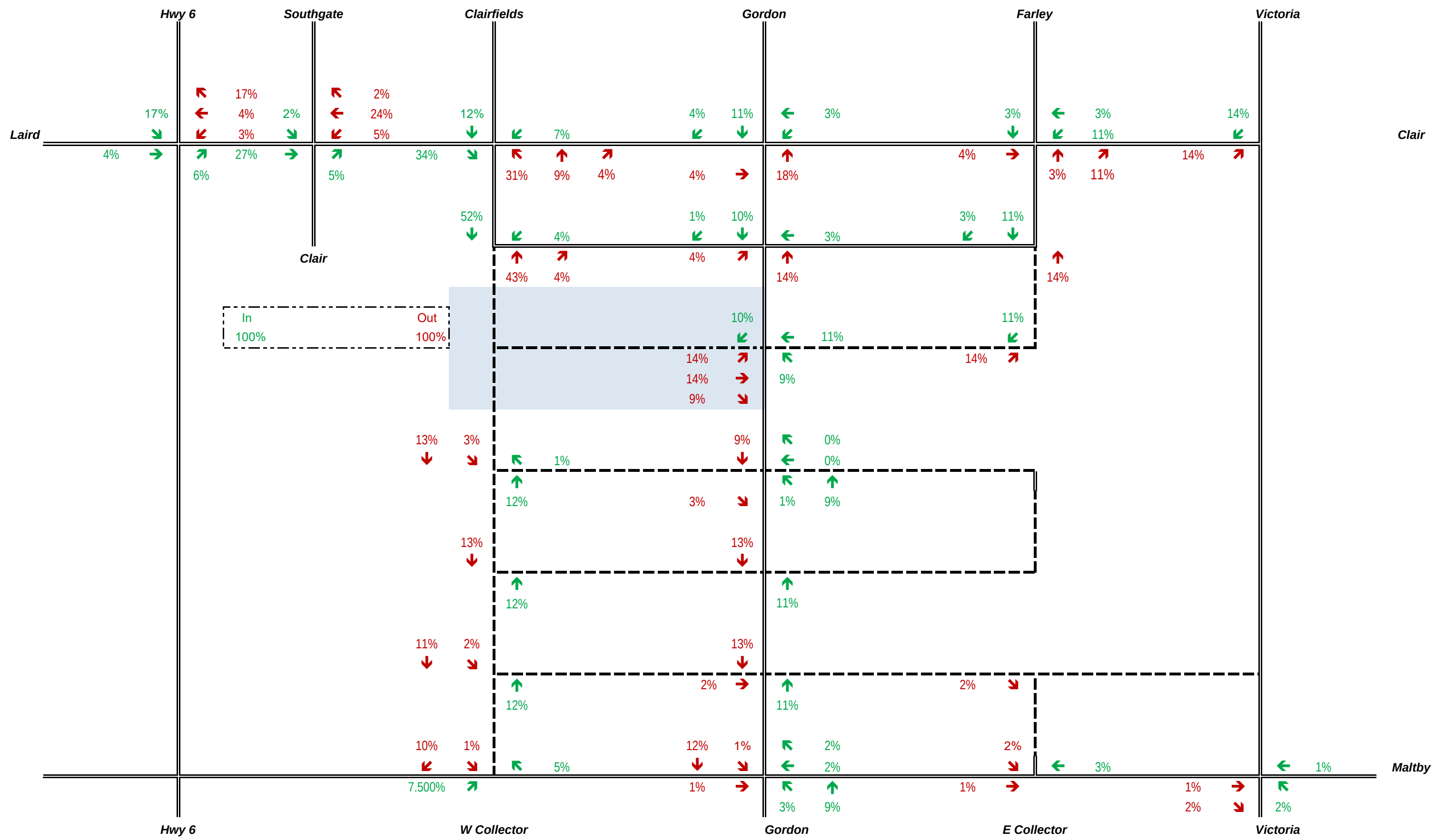
Intersection Summary

HCM 2000 Control Delay	9.8	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.40		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Appendix Q – CMSP Future Development Traffic Trip Assignment Calculations

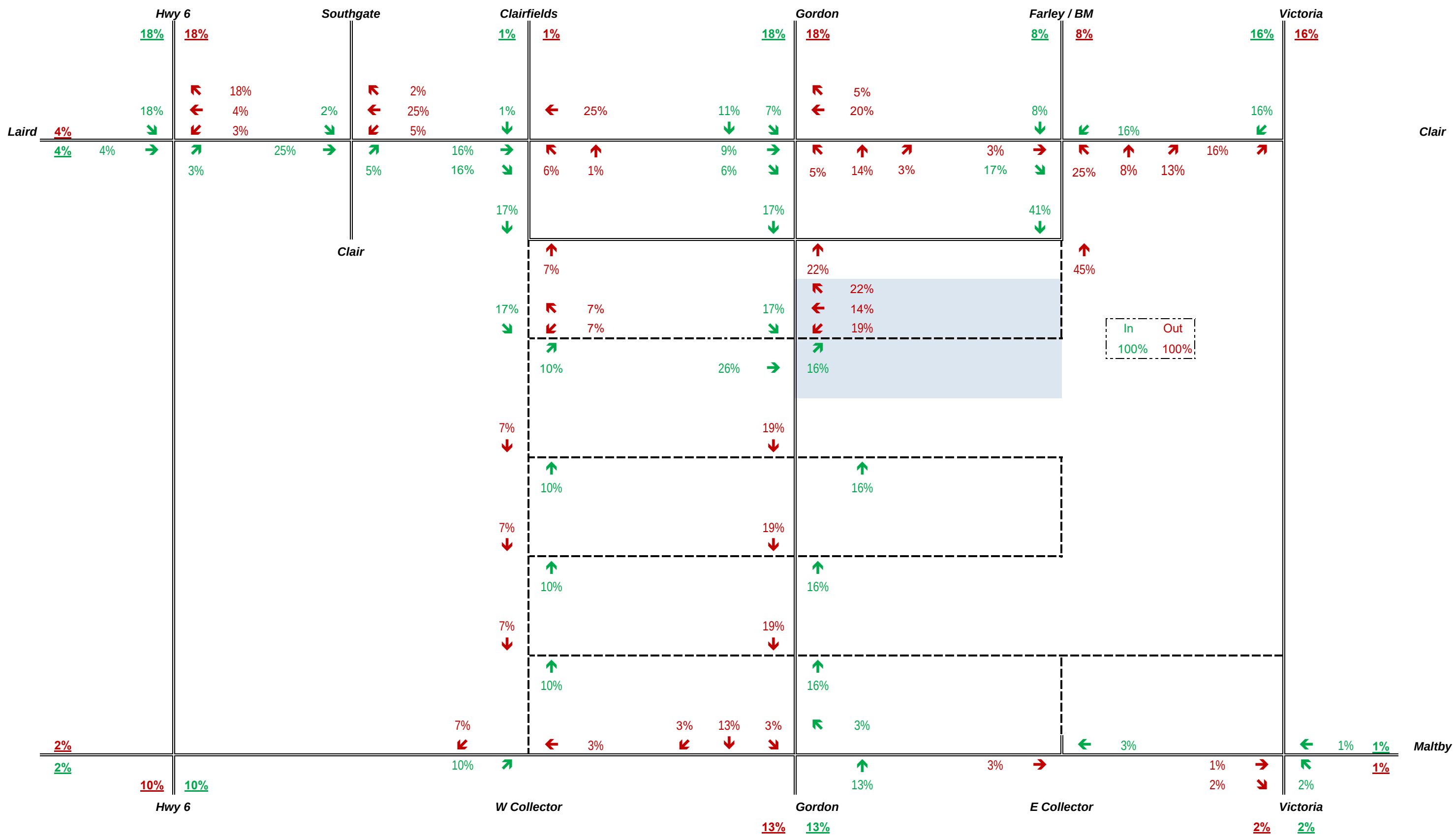
General Res. Distribution			
Orientation	Route	Peak Hr. In	Peak Hr. Out
N	Hwy.6	17%	17%
	Clairfields	12%	9%
	Gordon	15%	18%
	Hawkins	3%	3%
	Victoria	14%	14%
	Southgate	2%	2%
	Total	***63%***	***63%***
S	Hwy.6	11%	11%
	Gordon	12%	12%
	Victoria	2%	2%
	Total	***25%***	***25%***
E			
	Maltby	1%	1%
	Total	***1%***	***1%***
W	Laird	4%	4%
	Maltby	2%	2%
	Clair	5%	5%
	Total	***11%***	***11%***
		100%	100%

Zone 1 Distribution Map



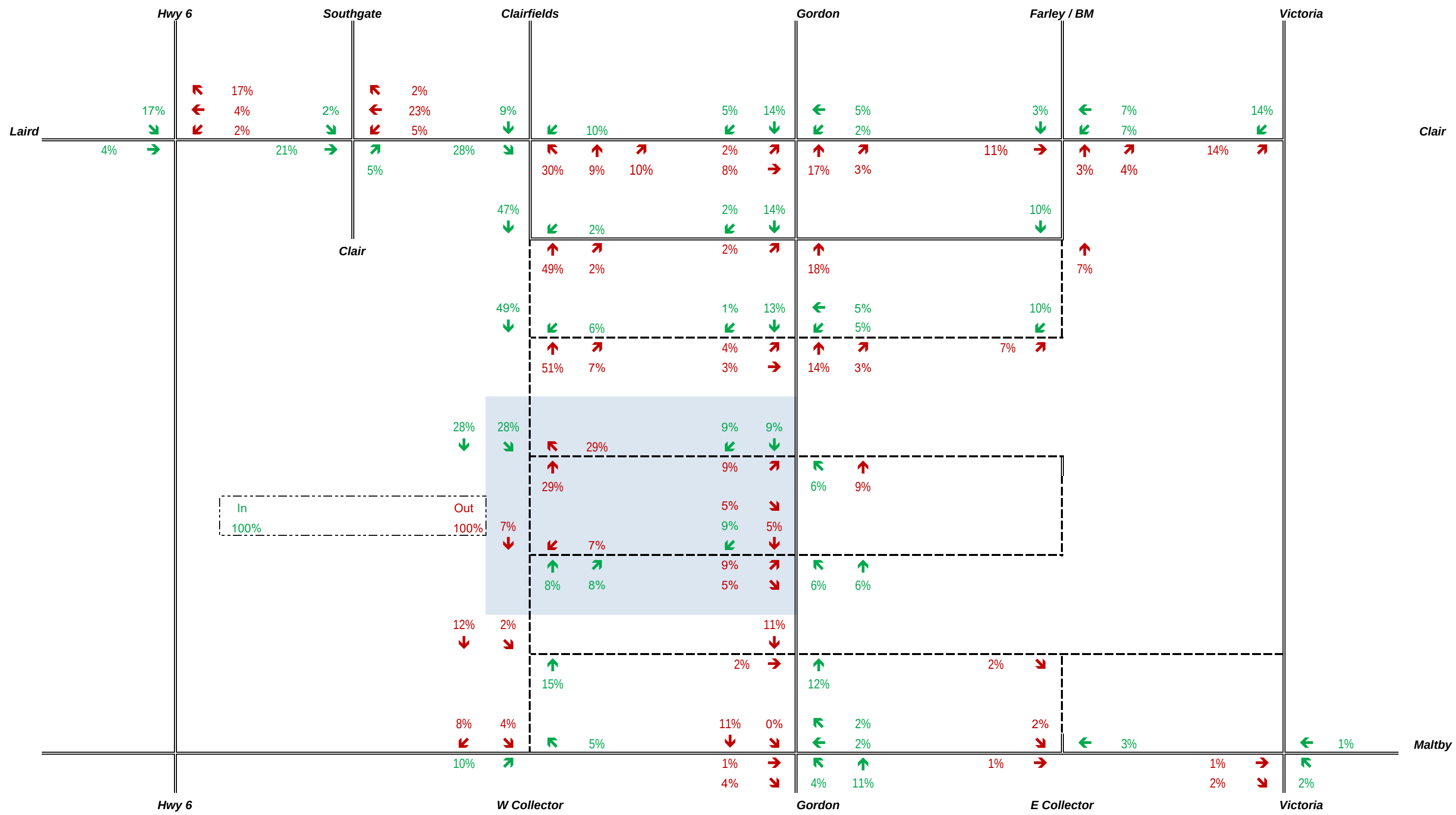
Zone 2 Distribution Map

General Res. Distribution			
Orientation	Route	Peak Hr. In	Peak Hr. Out
N	Hwy.6	18%	18%
	Clairfields	1%	1%
	Gordon	18%	18%
	Hawkins	8%	8%
	Victoria	16%	16%
	Southgate	2%	2%
	Total	***63%***	***63%***
S	Hwy.6	10%	10%
	Gordon	13%	13%
	Victoria	2%	2%
	Total	***25%***	***25%***
E			
	Maltby	1%	1%
	Total	***1%***	***1%***
W	Laird	4%	4%
	Maltby	2%	2%
	Clair	5%	5%
	Total	***11%***	***11%***
		100%	100%



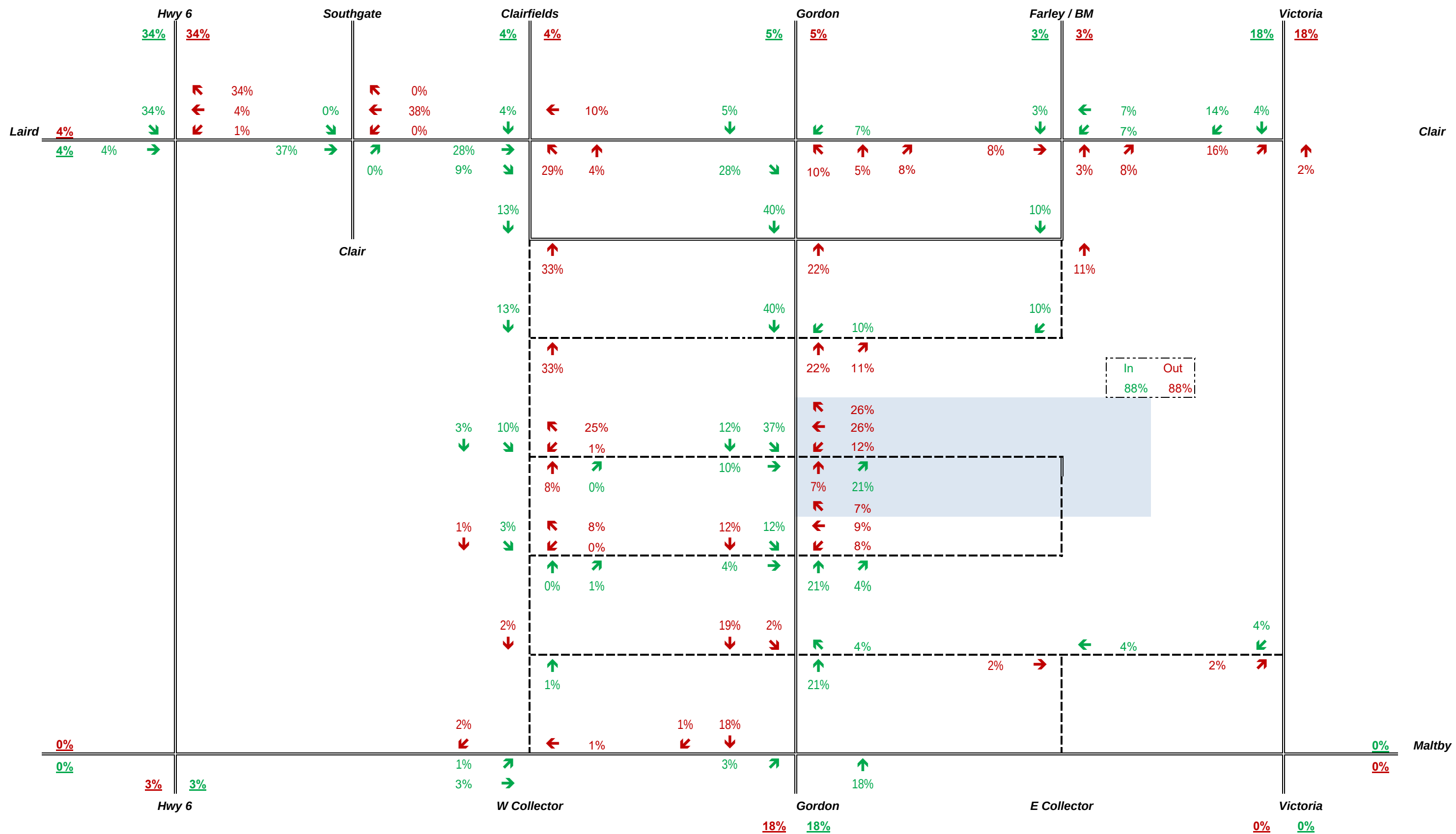
General Res. Distribution			
Orientation	Route	Peak Hr.	
		In	Out
N	Hwy.6	17%	17%
	Clairfields	9%	9%
	Gordon	19%	19%
	Hawkins	3%	3%
	Victoria	14%	14%
	Southgate	2%	2%
	Total	***64%***	***64%***
S	Hwy.6	10%	10%
	Gordon	14%	14%
	Victoria	2%	2%
	Total	***26%***	***26%***
E			
	Maltby	1%	1%
	Total	***1%***	***1%***
W	Laird	4%	4%
	Maltby	2%	2%
	Clair	5%	5%
	Total	***11%***	***11%***
		102%	102%

Zone 4 Distribution Map



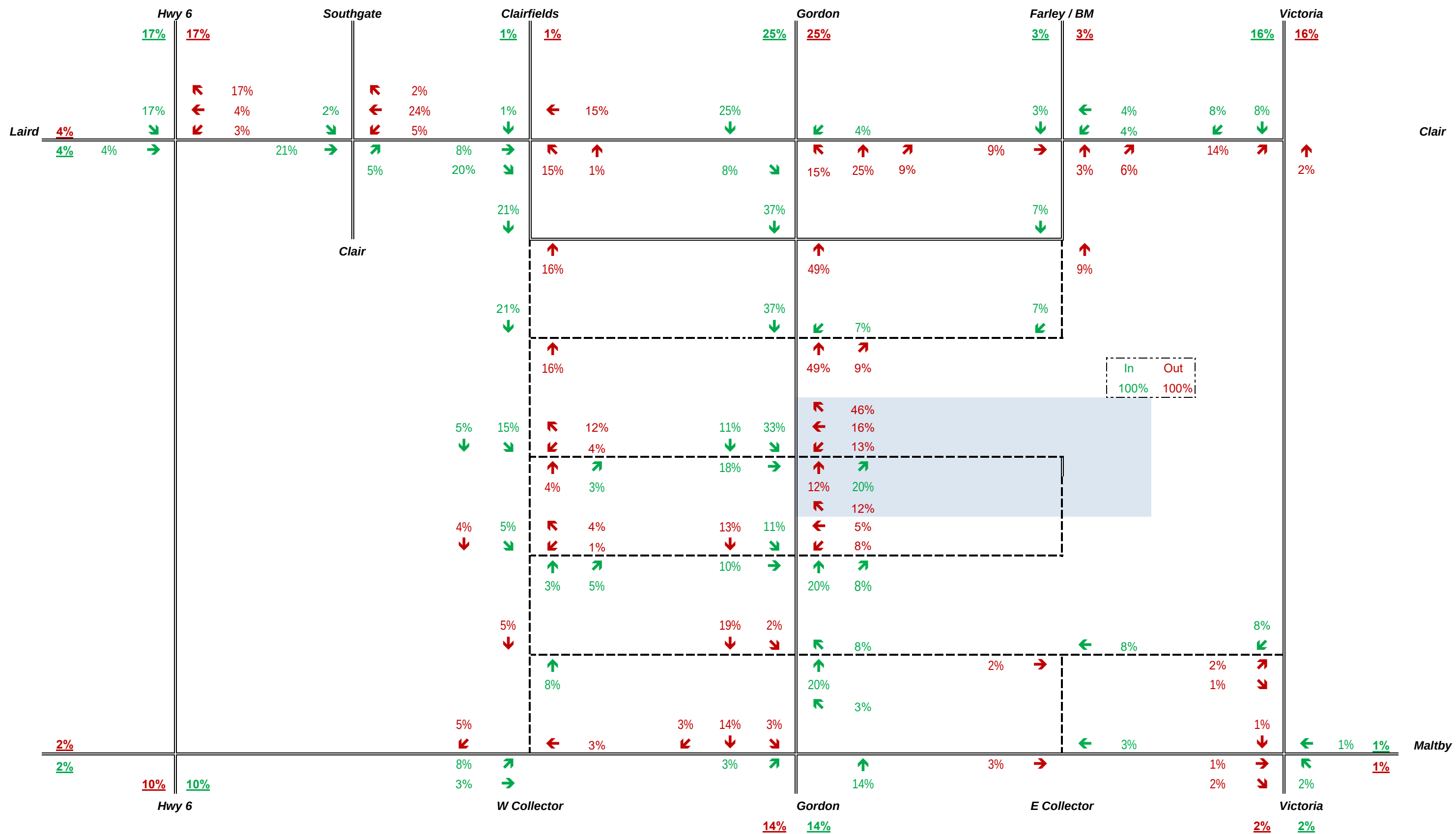
General Res. Distribution			
Orientation	Route	Peak Hr.	
		In	Out
N	Hwy.6	34%	34%
	Clairfields	4%	4%
	Gordon	5%	5%
	Hawkins	3%	3%
	Victoria	18%	18%
	Southgate	0%	0%
	Total	***63%***	***63%***
S	Hwy.6	3%	3%
	Gordon	18%	18%
	Victoria	0%	0%
	Total	***21%***	***21%***
E			
	Maltby	0%	0%
	Total	***0%***	***0%***
W	Laird	4%	4%
	Maltby	0%	0%
	Clair	0%	0%
	Total	***4%***	***4%***
		88%	88%

Zone 5 (EMPLOYMENT) Distribution Map



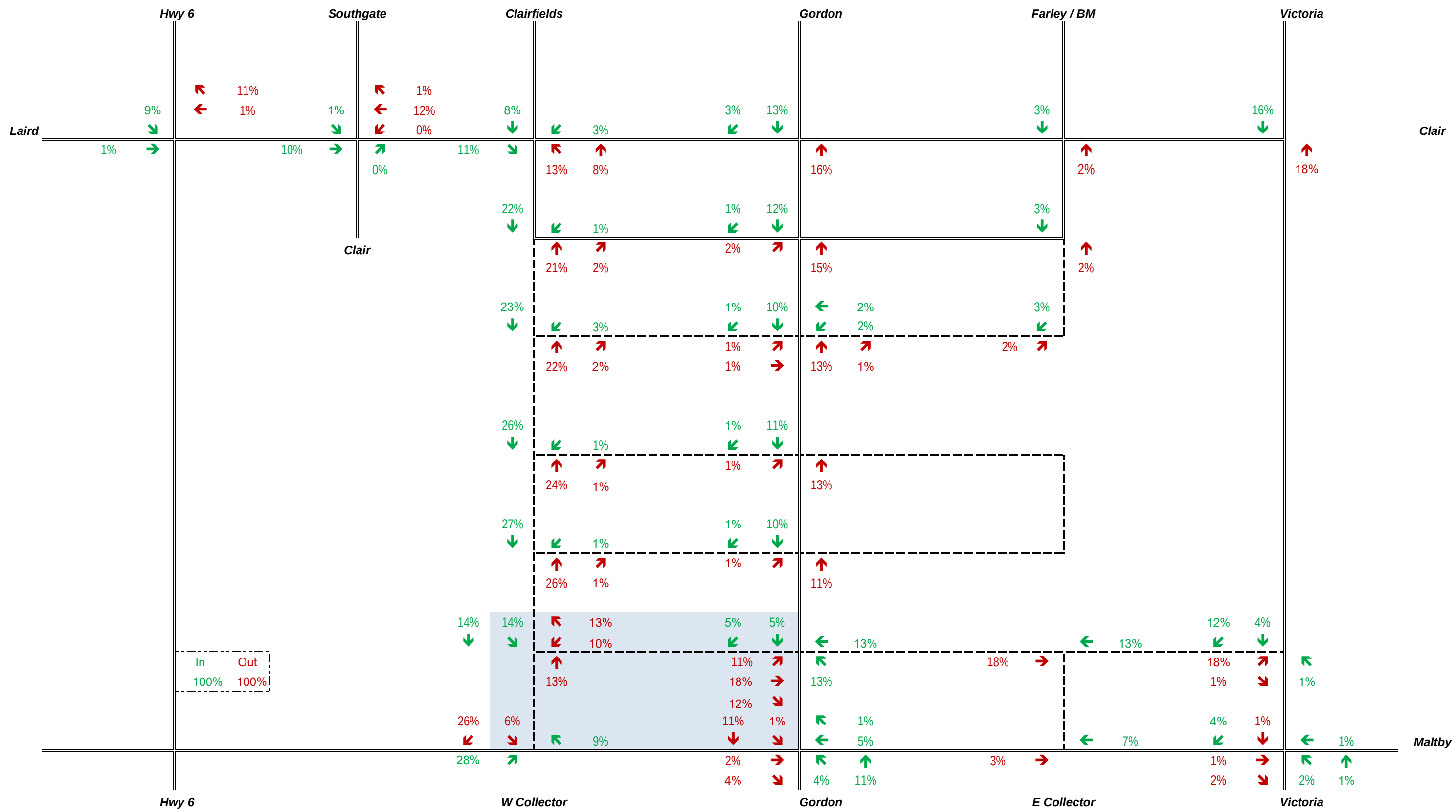
Zone 5 Distribution Map

General Res. Distribution			
Orientation	Route	Peak Hr.	
		In	Out
N	Hwy.6	17%	17%
	Clairfields	1%	1%
	Gordon	25%	25%
	Hawkins	3%	3%
	Victoria	16%	16%
	Southgate	2%	2%
	Total	***64%***	***64%***
S	Hwy.6	10%	10%
	Gordon	14%	14%
	Victoria	2%	2%
	Total	***26%***	***26%***
E			
	Maltby	1%	1%
	Total	***1%***	***1%***
W	Laird	4%	4%
	Maltby	2%	2%
	Clair	5%	5%
	Total	***11%***	***11%***
		102%	102%



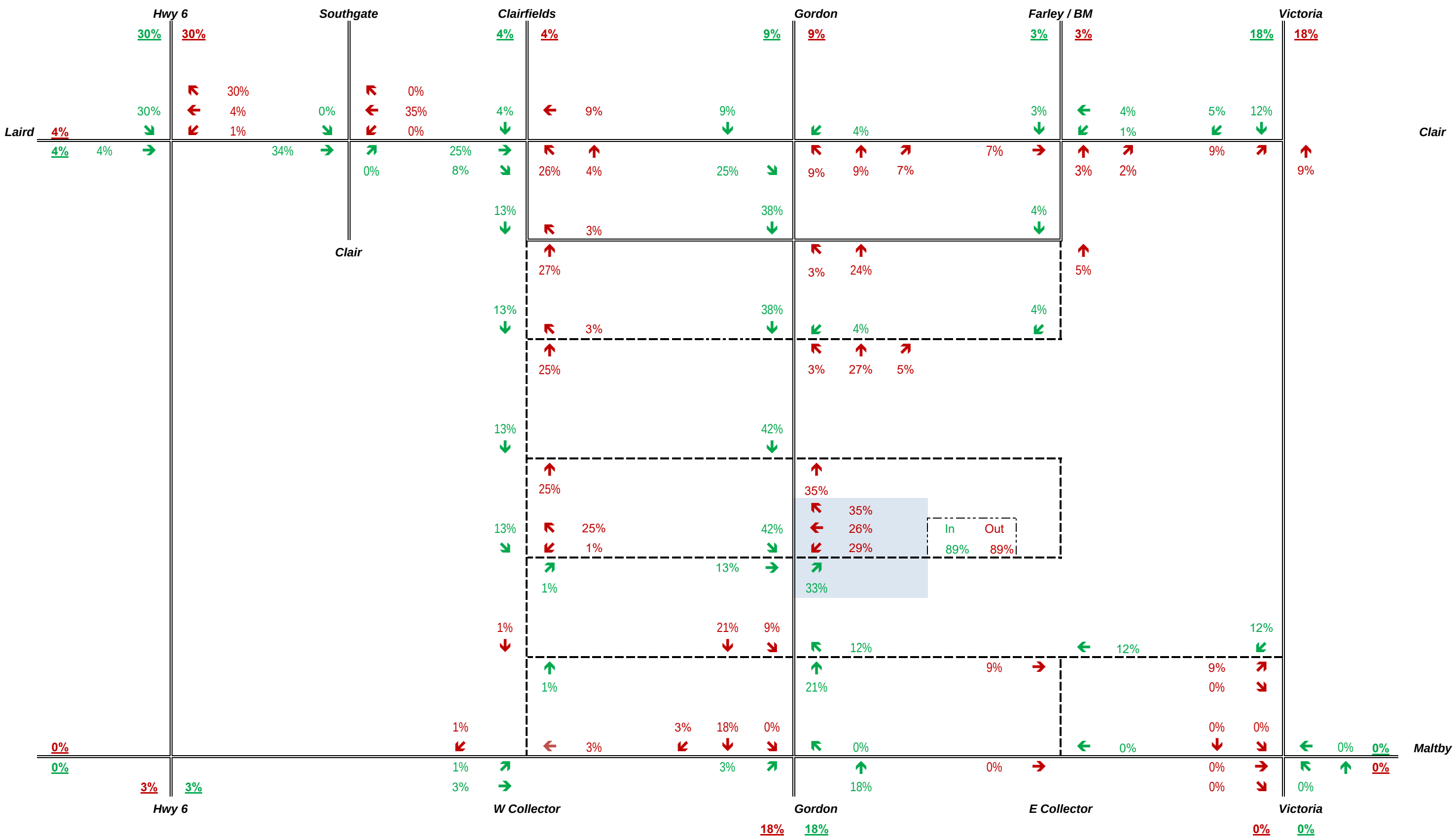
General Res. Distribution			
Orientation	Route	Peak Hr. In	Peak Hr. Out
N	Hwy.6	18%	18%
	Clairfields	8%	6%
	Gordon	16%	18%
	Hawkins	3%	3%
	Victoria	16%	16%
	Southgate	2%	2%
	Total	***63%***	***63%***
S	Hwy.6	8%	8%
	Gordon	15%	15%
	Victoria	2%	2%
	Total	***25%***	***25%***
E			
	Maltby	1%	1%
	Total	***1%***	***1%***
W	Laird	4%	4%
	Maltby	2%	2%
	Clair	5%	5%
	Total	***11%***	***11%***
		100%	100%

Zone 6 Distribution Map



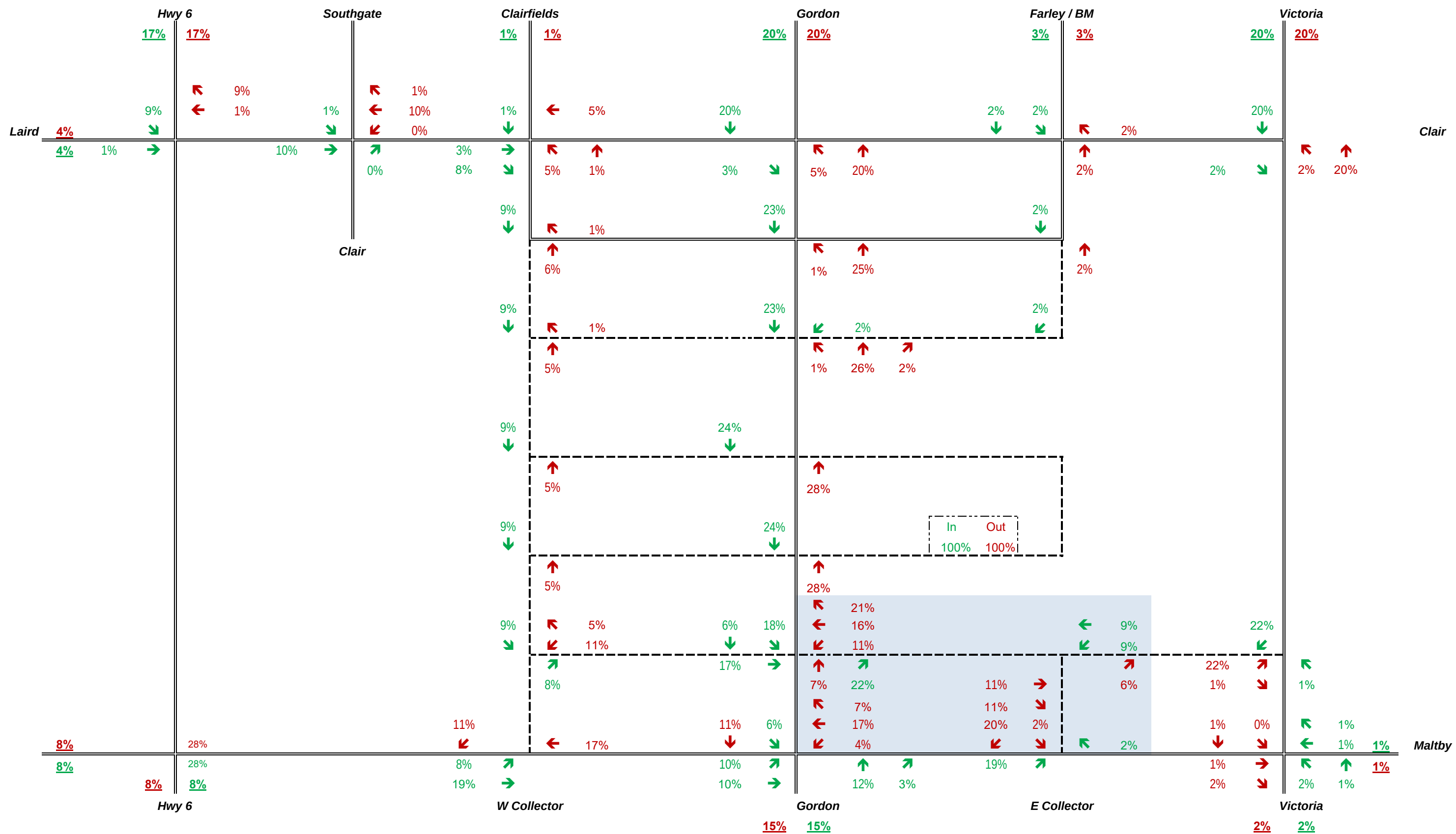
General Res. Distribution			
Orientation	Route	Peak Hr. In	Peak Hr. Out
N	Hwy.6	30%	30%
	Clairfields	4%	4%
	Gordon	9%	9%
	Hawkins	3%	3%
	Victoria	18%	18%
	Southgate		
	Total	***64%***	***64%***
S	Hwy.6	3%	3%
	Gordon	18%	18%
	Victoria		
	Total	***21%***	***21%***
E			
	Maltby		
	Total	***0%***	***0%***
W	Laird	4%	4%
	Maltby		
	Clair		
	Total	***4%***	***4%***
		89%	89%

Zone 7 Distribution Map



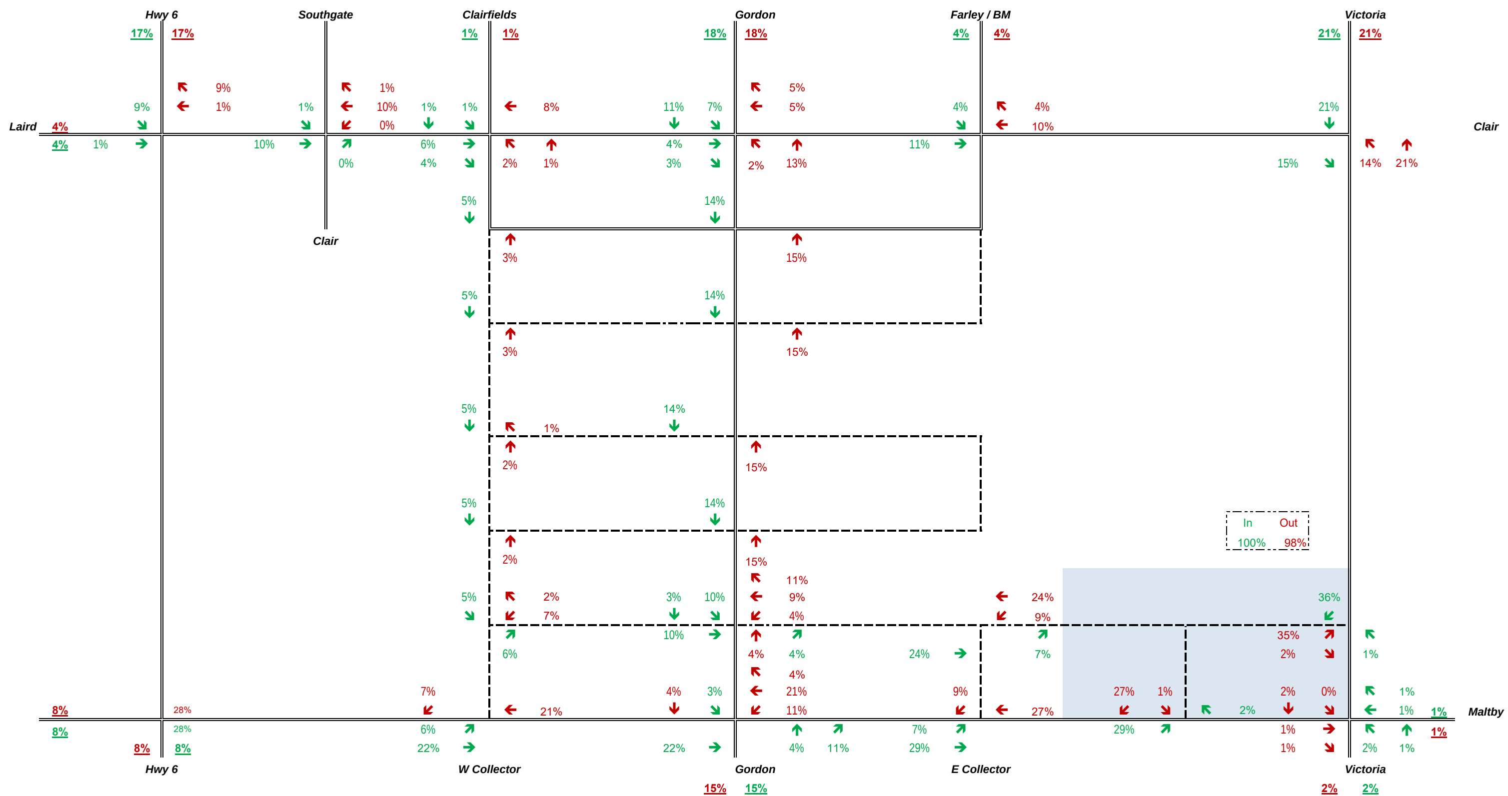
General Res. Distribution			
Orientation	Route	Peak Hr.	
		In	Out
N	Hwy.6	17%	17%
	Clairfields	1%	1%
	Gordon	20%	20%
	Hawkins	3%	3%
	Victoria	20%	20%
	Southgate	2%	2%
	Total	***63%***	***63%***
S	Hwy.6	8%	8%
	Gordon	15%	15%
	Victoria	2%	2%
	Total	***25%***	***25%***
E			
	Maltby	1%	1%
	Total	***1%***	***1%***
W	Laird	4%	4%
	Maltby	2%	2%
	Clair	5%	5%
	Total	***11%***	***11%***
		100%	100%

Zone 8 Distribution Map



General Res. Distribution			
Orientation	Route	Peak Hr. In	Peak Hr. Out
N	Hwy.6	17%	17%
	Clairfields	1%	1%
	Gordon	18%	18%
	Hawkins	4%	4%
	Victoria	21%	21%
	Southgate	2%	2%
	Total	***63%***	***63%***
S	Hwy.6	8%	8%
	Gordon	15%	15%
	Victoria	2%	2%
	Total	***25%***	***25%***
E			
	Maltby	1%	1%
	Total	***1%***	***1%***
W	Laird	4%	4%
	Maltby	2%	2%
	Clair	5%	5%
	Total	***11%***	***11%***
		100%	100%

Zone 9 Distribution Map



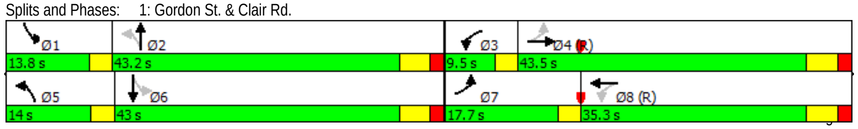
Appendix R – Synchro Analysis Results: Future Total Traffic Conditions

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	300	960	165	650	250	985	230	1160
Future Volume (vph)	300	960	165	650	250	985	230	1160
Lane Group Flow (vph)	300	1190	165	770	250	1195	230	1365
Turn Type	pm+pt	NA	pm+pt	NA	pm+pt	NA	pm+pt	NA
Protected Phases	7	4	3	8	5	2	1	6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	3	8	5	2	1	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	24.0	9.5	24.0	9.5	24.0	9.5	24.0
Total Split (s)	17.7	43.5	9.5	35.3	14.0	43.2	13.8	43.0
Total Split (%)	16.1%	39.5%	8.6%	32.1%	12.7%	39.3%	12.5%	39.1%
Yellow Time (s)	3.0	4.0	3.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	0.0	2.0	0.0	2.0	0.0	2.0	0.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0	3.0	6.0	3.0	6.0	3.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	C-Max	None	Max	None	Max
v/c Ratio	0.95	1.01	1.02	0.84	1.03	1.03	0.92	1.18
Control Delay	43.3	58.5	104.2	47.1	100.1	73.1	66.3	125.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Total Delay	43.3	58.5	104.2	47.1	100.1	73.1	66.3	126.3
Queue Length 50th (m)	69.0	~151.0	~22.4	84.8	~53.7	~110.3	34.0	~195.0
Queue Length 95th (m)	m61.2	m127.7	#67.4	#112.1	m#97.0	#158.2	#82.4	#239.6
Internal Link Dist (m)		775.0		194.1		153.6		314.0
Turn Bay Length (m)	75.0		25.0		50.0		140.0	
Base Capacity (vph)	315	1181	161	912	242	1160	249	1152
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	144
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.95	1.01	1.02	0.84	1.03	1.03	0.92	1.35

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green, Master Intersection
Natural Cycle: 110
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Gordon St. & Clair Rd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	300	960	230	165	650	120	250	985	210	230	1160	205
Future Volume (vph)	300	960	230	165	650	120	250	985	210	230	1160	205
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		3.0	6.0		3.0	6.0		3.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00		1.00	0.99		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.98		1.00	0.97		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)	1767	3409		1594	3373		1716	3381		1785	3388	
Flt Permitted	0.13	1.00		0.14	1.00		0.11	1.00		0.11	1.00	
Satd. Flow (perm)	246	3409		229	3373		194	3381		203	3388	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	300	960	230	165	650	120	250	985	210	230	1160	205
RTOR Reduction (vph)	0	19	0	0	14	0	0	17	0	0	13	0
Lane Group Flow (vph)	300	1171	0	165	756	0	250	1178	0	230	1352	0
Confl. Peds. (#/hr)	17		7	7		17	2		11	11		2
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	1%	1%	2%	12%	3%	1%	4%	1%	8%	0%	2%	7%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	47.0	37.5		35.8	29.3		48.2	37.2		47.8	37.0	
Effective Green, g (s)	47.0	37.5		35.8	29.3		48.2	37.2		47.8	37.0	
Actuated g/C Ratio	0.43	0.34		0.33	0.27		0.44	0.34		0.43	0.34	
Clearance Time (s)	3.0	6.0		3.0	6.0		3.0	6.0		3.0	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)	308	1162		155	898		237	1143		243	1139	
v/s Ratio Prot	c0.13	c0.34		c0.06	0.22		c0.11	0.35		0.09	c0.40	
v/s Ratio Perm	0.29			0.28			0.36			0.32		
v/c Ratio	0.97	1.01		1.06	0.84		1.05	1.03		0.95	1.19	
Uniform Delay, d1	29.1	36.2		34.3	38.2		30.3	36.4		28.6	36.5	
Progression Factor	1.39	1.40		1.00	1.00		1.78	1.22		1.00	1.00	
Incremental Delay, d2	10.1	9.9		90.5	9.4		64.4	30.8		42.7	93.1	
Delay (s)	50.7	60.8		124.8	47.6		118.2	75.4		71.3	129.6	
Level of Service	D	E		F	D		F	E		E	F	
Approach Delay (s)		58.7			61.2			82.8			121.2	
Approach LOS		E			E			F			F	

Intersection Summary

HCM 2000 Control Delay	83.7	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.11		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	112.3%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	115	60	55	55	65	1345	50	1425
Future Volume (vph)	115	60	55	55	65	1345	50	1425
Lane Group Flow (vph)	0	210	0	150	65	1410	50	1500
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA
Protected Phases		4		8	5	2	1	6
Permitted Phases	4		8		2		6	
Minimum Split (s)	24.0	24.0	24.0	24.0	9.5	24.0	9.5	24.0
Total Split (s)	30.0	30.0	30.0	30.0	10.0	70.0	10.0	70.0
Total Split (%)	27.3%	27.3%	27.3%	27.3%	9.1%	63.6%	9.1%	63.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.0		6.0	3.0	6.0	3.0	6.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes
v/c Ratio		0.73		0.47	0.30	0.70	0.21	0.74
Control Delay		54.5		39.1	15.7	41.7	3.7	10.5
Queue Delay		0.2		0.0	0.0	4.9	0.0	31.9
Total Delay		54.7		39.1	15.7	46.7	3.7	42.4
Queue Length 50th (m)		42.7		26.6	9.9	167.1	1.5	154.4
Queue Length 95th (m)		#77.3		47.6	m12.8	191.1	m1.3	m41.7
Internal Link Dist (m)		727.4		256.4		172.0		153.6
Turn Bay Length (m)					65.0		27.0	
Base Capacity (vph)		288		321	214	2025	236	2023
Starvation Cap Reductn		0		0	0	541	0	608
Spillback Cap Reductn		2		2	0	0	0	159
Storage Cap Reductn		0		0	0	0	0	0
Reduced v/c Ratio		0.73		0.47	0.30	0.95	0.21	1.06

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 61 (55%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Pretimed
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Gordon St. & Poppy Dr.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	115	60	35	55	55	40	65	1345	65	50	1425	75
Future Volume (vph)	115	60	35	55	55	40	65	1345	65	50	1425	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		3.0	6.0		3.0	6.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.98			0.96		1.00	0.99		1.00	0.99	
Flt Protected		0.97			0.98		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1753			1744		1750	3476		1750	3474	
Flt Permitted		0.72			0.80		0.09	1.00		0.11	1.00	
Satd. Flow (perm)		1295			1420		170	3476		206	3474	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	115	60	35	55	55	40	65	1345	65	50	1425	75
RTOR Reduction (vph)	0	6	0	0	12	0	0	3	0	0	3	0
Lane Group Flow (vph)	0	204	0	0	138	0	65	1407	0	50	1497	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		24.0			24.0		71.0	64.0		71.0	64.0	
Effective Green, g (s)		24.0			24.0		71.0	64.0		71.0	64.0	
Actuated g/C Ratio		0.22			0.22		0.65	0.58		0.65	0.58	
Clearance Time (s)		6.0			6.0		3.0	6.0		3.0	6.0	
Lane Grp Cap (vph)		282			309		210	2022		231	2021	
v/s Ratio Prot							c0.02	0.40		0.01	c0.43	
v/s Ratio Perm		c0.16			0.10		0.18			0.13		
v/c Ratio		0.72			0.45		0.31	0.70		0.22	0.74	
Uniform Delay, d1		39.9			37.3		12.3	16.2		10.8	16.9	
Progression Factor		1.00			1.00		2.45	2.46		0.67	0.60	
Incremental Delay, d2		14.9			4.6		2.8	1.5		0.2	0.2	
Delay (s)		54.8			41.9		32.9	41.2		7.4	10.3	
Level of Service		D			D		C	D		A	B	
Approach Delay (s)		54.8			41.9			40.8			10.2	
Approach LOS		D			D			D			B	

Intersection Summary

HCM 2000 Control Delay	27.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	77.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	85	180	60	55	160	65	80	1415	85	65	1065	40
Future Volume (Veh/h)	85	180	60	55	160	65	80	1415	85	65	1065	40
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)	85	180	60	55	160	65	80	1415	85	65	1065	40
Pedestrians		50			50			50			50	
Lane Width (m)		3.5			3.5			3.5			3.5	
Walking Speed (m/s)		1.2			1.2			1.2			1.2	
Percent Blockage		4			4			4			4	
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (m)											211	
pX, platoon unblocked	0.85	0.85	0.85	0.85	0.85		0.85					
vC, conflicting volume	2328	2975	652	2530	2952	850	1155			1550		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2208	2971	234	2446	2944	850	826			1550		
tC, single (s)	*4.8	*4.6	*4.4	*5.6	*5.0	6.9	4.2			4.5		
tC, 2 stage (s)												
tF (s)	*3.2	*3.0	*3.0	3.5	*3.5	3.3	2.2			2.4		
p0 queue free %	0	0	92	0	0	77	88			80		
cM capacity (veh/h)	0	40	775	0	29	284	647			333		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	85	240	55	225	80	943	557	65	710	395
Volume Left	85	0	55	0	80	0	0	65	0	0
Volume Right	0	60	0	65	0	0	85	0	0	40
cSH	0	53	0	39	647	1700	1700	333	1700	1700
Volume to Capacity	Err	4.56	Err	5.78	0.12	0.55	0.33	0.20	0.42	0.23
Queue Length 95th (m)	Err	Err	Err	Err	3.4	0.0	0.0	5.7	0.0	0.0
Control Delay (s)	Err	Err	Err	Err	11.4	0.0	0.0	18.4	0.0	0.0
Lane LOS	F	F	F	F	B			C		
Approach Delay (s)	Err		Err		0.6			1.0		
Approach LOS	F		F							

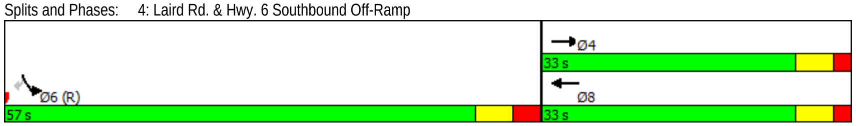
Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	77.2%	ICU Level of Service	D
Analysis Period (min)	15		

* User Entered Value

Lane Group	EBT	WBT	SBL	SBR
Lane Configurations				
Traffic Volume (vph)	435	480	865	60
Future Volume (vph)	435	480	865	60
Lane Group Flow (vph)	435	480	865	60
Turn Type	NA	NA	Prot	Perm
Protected Phases	4	8	6	
Permitted Phases				6
Minimum Split (s)	24.0	24.0	25.0	25.0
Total Split (s)	33.0	33.0	57.0	57.0
Total Split (%)	36.7%	36.7%	63.3%	63.3%
Yellow Time (s)	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	7.0	7.0
Lead/Lag				
Lead-Lag Optimize?				
v/c Ratio	0.42	0.45	0.48	0.07
Control Delay	26.7	15.1	13.2	2.9
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	26.7	15.1	13.2	2.9
Queue Length 50th (m)	33.2	13.8	45.9	0.0
Queue Length 95th (m)	47.1	18.4	60.6	5.3
Internal Link Dist (m)	199.6	282.0	265.0	
Turn Bay Length (m)				40.0
Base Capacity (vph)	1039	1060	1815	848
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.42	0.45	0.48	0.07

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2: and 6:SBL, Start of Green
Natural Cycle: 50
Control Type: Pretimed

Splits and Phases: 4: Laird Rd. & Hwy. 6 Southbound Off-Ramp



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	0	435	480	0	865	60
Future Volume (vph)	0	435	480	0	865	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0	6.0		7.0	7.0
Lane Util. Factor		0.95	0.95		0.97	1.00
Frt		1.00	1.00		1.00	0.85
Flt Protected		1.00	1.00		0.95	1.00
Satd. Flow (prot)		3466	3535		3267	1479
Flt Permitted		1.00	1.00		0.95	1.00
Satd. Flow (perm)		3466	3535		3267	1479
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	435	480	0	865	60
RTOR Reduction (vph)	0	0	0	0	0	27
Lane Group Flow (vph)	0	435	480	0	865	33
Heavy Vehicles (%)	2%	3%	1%	2%	6%	8%
Turn Type		NA	NA		Prot	Perm
Protected Phases		4	8		6	
Permitted Phases						6
Actuated Green, G (s)		27.0	27.0		50.0	50.0
Effective Green, g (s)		27.0	27.0		50.0	50.0
Actuated g/C Ratio		0.30	0.30		0.56	0.56
Clearance Time (s)		6.0	6.0		7.0	7.0
Lane Grp Cap (vph)		1039	1060		1815	821
v/s Ratio Prot		0.13	c0.14		c0.26	
v/s Ratio Perm						0.02
v/c Ratio		0.42	0.45		0.48	0.04
Uniform Delay, d1		25.2	25.5		12.1	9.1
Progression Factor		1.00	0.54		1.00	1.00
Incremental Delay, d2		1.2	1.3		0.9	0.1
Delay (s)		26.5	15.0		13.0	9.2
Level of Service		C	B		B	A
Approach Delay (s)		26.5	15.0		12.7	
Approach LOS		C	B		B	

Intersection Summary			
HCM 2000 Control Delay	16.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBT	WBT	NBL	NBR
Lane Configurations				
Traffic Volume (vph)	1215	725	30	310
Future Volume (vph)	1215	725	30	310
Lane Group Flow (vph)	1215	725	30	310
Turn Type	NA	NA	Prot	Perm
Protected Phases	4	8	2	
Permitted Phases				2
Minimum Split (s)	24.0	24.0	25.0	25.0
Total Split (s)	50.0	50.0	40.0	40.0
Total Split (%)	55.6%	55.6%	44.4%	44.4%
Yellow Time (s)	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	3.0	3.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	7.0	7.0
Lead/Lag				
Lead-Lag Optimize?				
v/c Ratio	0.73	0.44	0.05	0.60
Control Delay	22.9	16.0	18.7	25.8
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	22.9	16.0	18.7	25.8
Queue Length 50th (m)	95.8	43.1	3.5	39.3
Queue Length 95th (m)	126.7	57.7	9.3	67.8
Internal Link Dist (m)	282.0	205.6	157.0	
Turn Bay Length (m)				100.0
Base Capacity (vph)	1662	1662	654	520
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.73	0.44	0.05	0.60

Intersection Summary

Cycle Length: 90

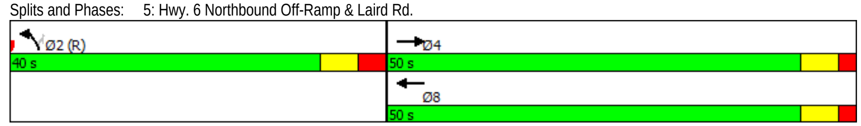
Actuated Cycle Length: 90

Offset: 0 (0%), Referenced to phase 2:NBL and 6:, Start of Green

Natural Cycle: 60

Control Type: Pretimed

Splits and Phases: 5: Hwy. 6 Northbound Off-Ramp & Laird Rd.



5: Hwy. 6 Northbound Off-Ramp & Laird Rd.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	1215	0	0	725	30	310
Future Volume (vph)	1215	0	0	725	30	310
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0			6.0	7.0	7.0
Lane Util. Factor	0.95			0.95	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	3400			3400	1785	1353
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	3400			3400	1785	1353
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1215	0	0	725	30	310
RTOR Reduction (vph)	0	0	0	0	0	24
Lane Group Flow (vph)	1215	0	0	725	30	286
Heavy Vehicles (%)	5%	2%	2%	5%	0%	18%
Turn Type	NA			NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases						2
Actuated Green, G (s)	44.0			44.0	33.0	33.0
Effective Green, g (s)	44.0			44.0	33.0	33.0
Actuated g/C Ratio	0.49			0.49	0.37	0.37
Clearance Time (s)	6.0			6.0	7.0	7.0
Lane Grp Cap (vph)	1662			1662	654	496
v/s Ratio Prot	c0.36			0.21	0.02	
v/s Ratio Perm						c0.21
v/c Ratio	0.73			0.44	0.05	0.58
Uniform Delay, d1	18.3			14.9	18.4	22.9
Progression Factor	1.09			1.00	1.00	1.00
Incremental Delay, d2	2.6			0.8	0.1	4.8
Delay (s)	22.5			15.8	18.5	27.7
Level of Service	C			B	B	C
Approach Delay (s)	22.5			15.8	26.9	
Approach LOS	C			B	C	

Intersection Summary			
HCM 2000 Control Delay	21.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	13.0
Intersection Capacity Utilization	63.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

6: Clair Rd. & Laird Rd.

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (veh/h)	1695	5	105	1165	1	265
Future Volume (Veh/h)	1695	5	105	1165	1	265
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	1695	5	105	1165	1	265
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			1700		2490	850
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1700		2490	850
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			72		94	13
cM capacity (veh/h)			371		17	304

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NE 1
Volume Total	1130	570	105	582	582	266
Volume Left	0	0	105	0	0	1
Volume Right	0	5	0	0	0	265
cSH	1700	1700	371	1700	1700	286
Volume to Capacity	0.66	0.34	0.28	0.34	0.34	0.93
Queue Length 95th (m)	0.0	0.0	9.2	0.0	0.0	70.5
Control Delay (s)	0.0	0.0	18.5	0.0	0.0	76.1
Lane LOS			C			F
Approach Delay (s)	0.0		1.5			76.1
Approach LOS						F

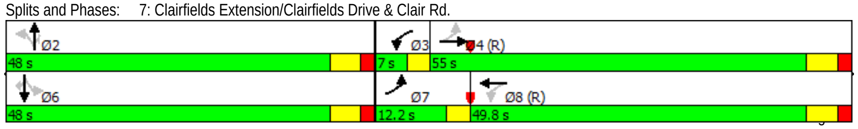
Intersection Summary			
Average Delay	6.9		
Intersection Capacity Utilization	79.3%	ICU Level of Service	D
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Traffic Volume (vph)	120	1315	120	800	390	95	55	25	145	80
Future Volume (vph)	120	1315	120	800	390	95	55	25	145	80
Lane Group Flow (vph)	120	1850	120	845	0	485	55	0	170	80
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4	3	8		2			6	
Permitted Phases	4		8		2		2	6		6
Detector Phase	7	4	3	8	2	2	2	6	6	6
Switch Phase										
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	24.0	9.5	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Total Split (s)	12.2	55.0	7.0	49.8	48.0	48.0	48.0	48.0	48.0	48.0
Total Split (%)	11.1%	50.0%	6.4%	45.3%	43.6%	43.6%	43.6%	43.6%	43.6%	43.6%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Total Lost Time (s)	3.0	6.0	3.0	6.0		6.0	6.0		6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag						
Lead-Lag Optimize?	Yes	Yes	Yes	Yes						
Recall Mode	None	C-Max	None	C-Max	Max	Max	Max	Max	Max	Max
v/c Ratio	0.39	1.21	0.89	0.60		1.08	0.08		0.30	0.12
Control Delay	16.6	128.6	61.2	44.3		98.9	1.8		25.6	4.5
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	16.6	128.6	61.2	44.3		98.9	1.8		25.6	4.5
Queue Length 50th (m)	12.9	~265.2	21.8	104.1		~122.3	0.0		26.5	0.0
Queue Length 95th (m)	22.7	#310.7	m23.6	m113.6		#187.4	3.4		44.3	8.5
Internal Link Dist (m)		186.5		775.0		156.4			150.9	
Turn Bay Length (m)	55.0		45.0				20.0			20.0
Base Capacity (vph)	316	1531	135	1409		450	652		563	652
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	0.38	1.21	0.89	0.60		1.08	0.08		0.30	0.12

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 150
Control Type: Actuated-Coordinated
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Clairfields Extension/Clairfields Drive & Clair Rd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	1315	535	120	800	45	390	95	55	25	145	80
Future Volume (vph)	120	1315	535	120	800	45	390	95	55	25	145	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		3.0	6.0			6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00	1.00		1.00	1.00
Frt	1.00	0.96		1.00	0.99			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.96	1.00		0.99	1.00
Satd. Flow (prot)	1750	3348		1750	3472			1771	1566		1829	1566
Flt Permitted	0.20	1.00		0.09	1.00			0.64	1.00		0.80	1.00
Satd. Flow (perm)	376	3348		166	3472			1181	1566		1476	1566
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	120	1315	535	120	800	45	390	95	55	25	145	80
RTOR Reduction (vph)	0	40	0	0	4	0	0	0	34	0	0	49
Lane Group Flow (vph)	120	1810	0	120	841	0	0	485	21	0	170	31
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2		2	6		6
Actuated Green, G (s)	56.0	49.0		48.5	44.5			42.0	42.0		42.0	42.0
Effective Green, g (s)	56.0	49.0		48.5	44.5			42.0	42.0		42.0	42.0
Actuated g/C Ratio	0.51	0.45		0.44	0.40			0.38	0.38		0.38	0.38
Clearance Time (s)	3.0	6.0		3.0	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)	297	1491		130	1404			450	597		563	597
v/s Ratio Prot	0.03	c0.54		c0.03	0.24							
v/s Ratio Perm	0.17			0.37				c0.41	0.01		0.12	0.02
v/c Ratio	0.40	1.21		0.92	0.60			1.08	0.04		0.30	0.05
Uniform Delay, d1	16.2	30.5		29.3	25.7			34.0	21.3		23.8	21.4
Progression Factor	1.00	1.00		2.35	1.68			1.00	1.00		1.00	1.00
Incremental Delay, d2	0.9	102.7		26.7	0.6			64.9	0.1		1.4	0.2
Delay (s)	17.1	133.2		95.5	43.8			98.9	21.4		25.1	21.6
Level of Service	B	F		F	D			F	C		C	C
Approach Delay (s)		126.1			50.3			91.0			24.0	
Approach LOS		F			D			F			C	

Intersection Summary

HCM 2000 Control Delay	94.5	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.14		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	114.0%	ICU Level of Service	H
Analysis Period (min)	15		

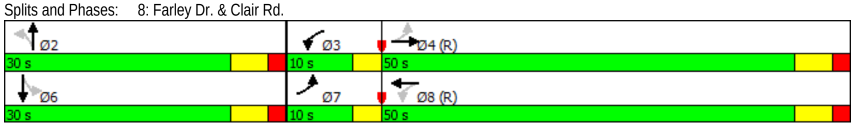
c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	235	945	155	695	130	105	85	115
Future Volume (vph)	235	945	155	695	130	105	85	115
Lane Group Flow (vph)	235	1150	155	765	130	200	85	255
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	7	4	3	8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	3	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	24.0	9.5	24.0	24.0	24.0	24.0	24.0
Total Split (s)	10.0	50.0	10.0	50.0	30.0	30.0	30.0	30.0
Total Split (%)	11.1%	55.6%	11.1%	55.6%	33.3%	33.3%	33.3%	33.3%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0	3.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	Max	Max	Max	Max
v/c Ratio	0.54	0.69	0.55	0.46	0.56	0.41	0.31	0.51
Control Delay	12.3	19.7	28.4	17.7	39.3	23.1	30.3	24.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.3	19.7	28.4	17.7	39.3	23.1	30.3	24.7
Queue Length 50th (m)	16.3	78.6	19.0	36.5	20.4	22.1	12.4	28.7
Queue Length 95th (m)	26.6	102.3	38.5	57.9	40.2	42.1	25.9	52.7
Internal Link Dist (m)		194.1		563.0		111.7		152.1
Turn Bay Length (m)	125.0		50.0		45.0		20.0	
Base Capacity (vph)	433	1667	286	1663	232	493	271	499
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	0.54	0.69	0.54	0.46	0.56	0.41	0.31	0.51

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated

Splits and Phases: 8: Farley Dr. & Clair Rd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	235	945	205	155	695	70	130	105	95	85	115	140
Future Volume (vph)	235	945	205	155	695	70	130	105	95	85	115	140
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		3.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	0.99		1.00	1.00		1.00	0.98		1.00	0.98	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		0.99	1.00		0.98	1.00	
Frt	1.00	0.97		1.00	0.99		1.00	0.93		1.00	0.92	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1783	3361		1785	3387		1724	1716		1689	1691	
Flt Permitted	0.30	1.00		0.15	1.00		0.48	1.00		0.57	1.00	
Satd. Flow (perm)	566	3361		283	3387		869	1716		1019	1691	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	235	945	205	155	695	70	130	105	95	85	115	140
RTOR Reduction (vph)	0	20	0	0	8	0	0	36	0	0	48	0
Lane Group Flow (vph)	235	1130	0	155	757	0	130	164	0	85	207	0
Confl. Peds. (#/hr)	6		8	8		6	16		15	15		16
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	0%	3%	1%	0%	4%	0%	2%	0%	0%	4%	0%	0%
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	51.1	44.1		50.9	44.0		24.0	24.0		24.0	24.0	
Effective Green, g (s)	51.1	44.1		50.9	44.0		24.0	24.0		24.0	24.0	
Actuated g/C Ratio	0.57	0.49		0.57	0.49		0.27	0.27		0.27	0.27	
Clearance Time (s)	3.0	6.0		3.0	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)	416	1646		275	1655		231	457		271	450	
v/s Ratio Prot	c0.04	c0.34		0.04	0.22			0.10			0.12	
v/s Ratio Perm	0.28			0.28			c0.15			0.08		
v/c Ratio	0.56	0.69		0.56	0.46		0.56	0.36		0.31	0.46	
Uniform Delay, d1	10.1	17.6		11.8	15.1		28.5	26.8		26.4	27.6	
Progression Factor	1.00	1.00		3.10	1.12		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	2.4		2.4	0.8		9.6	2.2		3.0	3.3	
Delay (s)	11.9	20.0		38.8	17.8		38.0	29.0		29.4	30.9	
Level of Service	B	B		D	B		D	C		C	C	
Approach Delay (s)		18.6			21.4			32.5			30.5	
Approach LOS		B			C			C			C	

Intersection Summary

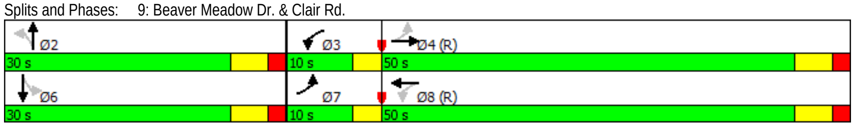
HCM 2000 Control Delay	22.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	82.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	110	1065	55	845	45	5	15	15
Future Volume (vph)	110	1065	55	845	45	5	15	15
Lane Group Flow (vph)	110	1110	55	860	0	90	15	75
Turn Type	pm+pt	NA	pm+pt	NA	Perm	NA	Perm	NA
Protected Phases	7	4	3	8		2		6
Permitted Phases	4		8		2		6	
Detector Phase	7	4	3	8	2	2	6	6
Switch Phase								
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	24.0	9.5	24.0	24.0	24.0	24.0	24.0
Total Split (s)	10.0	50.0	10.0	50.0	30.0	30.0	30.0	30.0
Total Split (%)	11.1%	55.6%	11.1%	55.6%	33.3%	33.3%	33.3%	33.3%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0	3.0	6.0		6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag				
Lead-Lag Optimize?	Yes	Yes	Yes	Yes				
Recall Mode	None	C-Max	None	C-Max	Max	Max	Max	Max
v/c Ratio	0.28	0.62	0.19	0.48		0.22	0.04	0.16
Control Delay	14.2	30.0	7.8	15.9		17.2	25.0	10.4
Queue Delay	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	14.2	30.0	7.8	15.9		17.2	25.0	10.4
Queue Length 50th (m)	11.9	96.2	3.4	53.3		6.9	2.0	2.0
Queue Length 95th (m)	m20.0	119.7	7.7	70.1		19.1	6.9	12.6
Internal Link Dist (m)		563.0		1233.2		183.8		182.6
Turn Bay Length (m)	55.0		30.0					
Base Capacity (vph)	392	1791	303	1784		409	365	470
Starvation Cap Reductn	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0	0	0		0	0	0
Storage Cap Reductn	0	0	0	0		0	0	0
Reduced v/c Ratio	0.28	0.62	0.18	0.48		0.22	0.04	0.16

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 86.4 (96%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 9: Beaver Meadow Dr. & Clair Rd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	1065	45	55	845	15	45	5	40	15	15	60
Future Volume (vph)	110	1065	45	55	845	15	45	5	40	15	15	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0		3.0	6.0			6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95		1.00	0.95			1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00			0.99		1.00	0.99	
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00			0.94		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00			0.98		0.95	1.00	
Satd. Flow (prot)	1750	3475		1750	3489			1674		1743	1600	
Flt Permitted	0.26	1.00		0.17	1.00			0.83		0.75	1.00	
Satd. Flow (perm)	483	3475		317	3489			1427		1372	1600	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	110	1065	45	55	845	15	45	5	40	15	15	60
RTOR Reduction (vph)	0	3	0	0	1	0	0	29	0	0	44	0
Lane Group Flow (vph)	110	1107	0	55	859	0	0	61	0	15	31	0
Confl. Peds. (#/hr)	2		1	1		2	3		3	3		3
Confl. Bikes (#/hr)			1			2						
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	7	4		3	8			2			6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	51.3	45.7		50.7	45.4			24.0		24.0	24.0	
Effective Green, g (s)	51.3	45.7		50.7	45.4			24.0		24.0	24.0	
Actuated g/C Ratio	0.57	0.51		0.56	0.50			0.27		0.27	0.27	
Clearance Time (s)	3.0	6.0		3.0	6.0			6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0		3.0	3.0	
Lane Grp Cap (vph)	354	1764		262	1760			380		365	426	
v/s Ratio Prot	c0.02	c0.32		0.01	0.25						0.02	
v/s Ratio Perm	0.16			0.11				c0.04		0.01		
v/c Ratio	0.31	0.63		0.21	0.49			0.16		0.04	0.07	
Uniform Delay, d1	9.5	16.0		10.3	14.7			25.3		24.5	24.7	
Progression Factor	1.92	1.76		1.00	1.00			1.00		1.00	1.00	
Incremental Delay, d2	0.4	1.4		0.4	1.0			0.9		0.2	0.3	
Delay (s)	18.5	29.5		10.7	15.6			26.2		24.7	25.0	
Level of Service	B	C		B	B			C		C	C	
Approach Delay (s)		28.5			15.3			26.2			25.0	
Approach LOS		C			B			C			C	

Intersection Summary

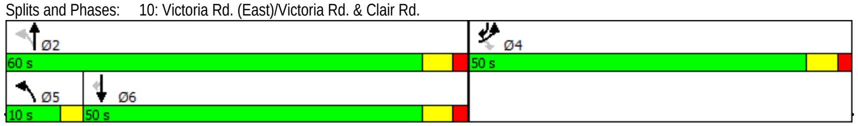
HCM 2000 Control Delay	23.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	755	190	190	565	585	695
Future Volume (vph)	755	190	190	565	585	695
Lane Group Flow (vph)	755	190	190	565	585	695
Turn Type	Prot	Perm	pm+pt	NA	NA	pm+ov
Protected Phases	4		5	2	6	4
Permitted Phases		4	2			6
Detector Phase	4	4	5	2	6	4
Switch Phase						
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	24.0	9.5	24.0	24.0	24.0
Total Split (s)	50.0	50.0	10.0	60.0	50.0	50.0
Total Split (%)	45.5%	45.5%	9.1%	54.5%	45.5%	45.5%
Yellow Time (s)	4.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	0.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	3.0	6.0	6.0	6.0
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Recall Mode	None	None	None	Min	Min	None
v/c Ratio	0.99	0.25	0.89	0.69	0.90	0.54
Control Delay	61.6	6.6	57.4	27.2	49.0	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	61.6	6.6	57.4	27.2	49.0	3.4
Queue Length 50th (m)	~159.2	4.8	22.2	91.4	114.4	20.0
Queue Length 95th (m)	#263.2	20.0	#54.7	130.1	162.1	32.8
Internal Link Dist (m)	1233.2			1674.8	465.2	
Turn Bay Length (m)			75.0			75.0
Base Capacity (vph)	763	773	214	954	792	1280
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.99	0.25	0.89	0.59	0.74	0.54

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 102.7
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
~ 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.

Splits and Phases: 10: Victoria Rd. (East)/Victoria Rd. & Clair Rd.



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	755	190	190	565	585	695
Future Volume (vph)	755	190	190	565	585	695
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0	3.0	6.0	6.0	6.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1773	1597	1785	1807	1842	1493
Flt Permitted	1.00	1.00	0.12	1.00	1.00	1.00
Satd. Flow (perm)	1773	1597	224	1807	1842	1493
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	755	190	190	565	585	695
RTOR Reduction (vph)	0	86	0	0	0	29
Lane Group Flow (vph)	755	104	190	565	585	666
Heavy Vehicles (%)	6%	0%	0%	4%	2%	7%
Turn Type	Prot	Perm	pm+pt	NA	NA	pm+ov
Protected Phases	4		5	2	6	4
Permitted Phases		4	2			6
Actuated Green, G (s)	44.2	44.2	46.5	46.5	36.5	80.7
Effective Green, g (s)	44.2	44.2	46.5	46.5	36.5	80.7
Actuated g/C Ratio	0.43	0.43	0.45	0.45	0.36	0.79
Clearance Time (s)	6.0	6.0	3.0	6.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	763	687	207	818	654	1260
v/s Ratio Prot	c0.43		c0.06	0.31	0.32	0.23
v/s Ratio Perm		0.07	c0.35			0.22
v/c Ratio	0.99	0.15	0.92	0.69	0.89	0.53
Uniform Delay, d1	29.0	17.8	22.5	22.4	31.3	4.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	29.6	0.1	40.0	2.5	14.7	0.4
Delay (s)	58.6	17.9	62.4	24.9	46.0	4.4
Level of Service	E	B	E	C	D	A
Approach Delay (s)	50.5			34.3	23.4	
Approach LOS	D			C	C	

Intersection Summary			
HCM 2000 Control Delay	34.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	102.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	96.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	1	55	25	30	20	1400	105	1405
Future Volume (vph)	1	55	25	30	20	1400	105	1405
Lane Group Flow (vph)	0	66	0	110	20	1445	105	1410
Turn Type	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA
Protected Phases		4		8		2	1	6
Permitted Phases	4		8		2		6	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	9.5	24.0
Total Split (s)	28.0	28.0	28.0	28.0	72.0	72.0	10.0	82.0
Total Split (%)	25.5%	25.5%	25.5%	25.5%	65.5%	65.5%	9.1%	74.5%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0
Lost Time Adjust (s)		0.0		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.0		6.0	6.0	6.0	3.0	6.0
Lead/Lag					Lag	Lag	Lead	
Lead-Lag Optimize?					Yes	Yes	Yes	
v/c Ratio		0.18		0.32	0.11	0.69	0.44	0.58
Control Delay		34.3		26.6	18.0	35.1	13.2	22.8
Queue Delay		0.0		1.0	0.0	48.7	0.0	4.3
Total Delay		34.3		27.7	18.0	83.7	13.2	27.0
Queue Length 50th (m)		11.1		13.2	3.6	178.0	12.4	169.5
Queue Length 95th (m)		23.6		29.8	m5.4	200.1	m14.5	192.3
Internal Link Dist (m)		118.2		132.0		118.1		172.0
Turn Bay Length (m)					30.0		30.0	
Base Capacity (vph)		365		349	184	2091	239	2415
Starvation Cap Reductn		0		0	0	820	0	910
Spillback Cap Reductn		0		102	0	173	0	0
Storage Cap Reductn		0		0	0	0	0	0
Reduced v/c Ratio		0.18		0.45	0.11	1.14	0.44	0.94

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 70
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: Gordon St. & Gosling Gardens

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1	55	10	25	30	55	20	1400	45	105	1405	5
Future Volume (vph)	1	55	10	25	30	55	20	1400	45	105	1405	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		6.0			6.0		6.0	6.0		3.0	6.0	
Lane Util. Factor		1.00			1.00		1.00	0.95		1.00	0.95	
Frt		0.98			0.93		1.00	1.00		1.00	1.00	
Flt Protected		1.00			0.99		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1803			1698		1750	3484		1750	3498	
Flt Permitted		1.00			0.92		0.17	1.00		0.11	1.00	
Satd. Flow (perm)		1799			1585		308	3484		195	3498	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1	55	10	25	30	55	20	1400	45	105	1405	5
RTOR Reduction (vph)	0	6	0	0	33	0	0	2	0	0	0	0
Lane Group Flow (vph)	0	60	0	0	77	0	20	1443	0	105	1410	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)		22.0			22.0		66.0	66.0		76.0	76.0	
Effective Green, g (s)		22.0			22.0		66.0	66.0		76.0	76.0	
Actuated g/C Ratio		0.20			0.20		0.60	0.60		0.69	0.69	
Clearance Time (s)		6.0			6.0		6.0	6.0		3.0	6.0	
Lane Grp Cap (vph)		359			317		184	2090		233	2416	
v/s Ratio Prot								c0.41		0.03	c0.40	
v/s Ratio Perm		0.03			c0.05		0.06			0.28		
v/c Ratio		0.17			0.24		0.11	0.69		0.45	0.58	
Uniform Delay, d1		36.4			37.0		9.4	15.0		11.2	8.8	
Progression Factor		1.00			1.00		1.69	2.19		1.99	2.46	
Incremental Delay, d2		1.0			1.8		0.9	1.5		4.1	0.7	
Delay (s)		37.4			38.8		16.9	34.5		26.4	22.4	
Level of Service		D			D		B	C		C	C	
Approach Delay (s)		37.4			38.8			34.2			22.6	
Approach LOS		D			D			C			C	

Intersection Summary

HCM 2000 Control Delay	28.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	45	65	85	80	30	1405	15	1365
Future Volume (vph)	45	65	85	80	30	1405	15	1365
Lane Group Flow (vph)	45	80	85	95	30	1465	15	1405
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Total Split (s)	30.0	30.0	30.0	30.0	80.0	80.0	80.0	80.0
Total Split (%)	27.3%	27.3%	27.3%	27.3%	72.7%	72.7%	72.7%	72.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.18	0.21	0.33	0.24	0.17	0.63	0.09	0.60
Control Delay	37.2	32.4	40.4	34.4	15.8	25.2	12.1	11.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	49.0	0.0	0.5
Total Delay	37.2	32.4	40.4	34.4	15.8	74.2	12.1	12.1
Queue Length 50th (m)	8.3	13.0	16.3	16.3	4.6	183.3	1.1	55.5
Queue Length 95th (m)	18.8	26.7	31.7	31.3	m7.0	207.3	m2.6	85.1
Internal Link Dist (m)		725.3		381.8		529.0		118.1
Turn Bay Length (m)	30.0		30.0		50.0		50.0	
Base Capacity (vph)	256	390	260	392	176	2326	160	2335
Starvation Cap Reductn	0	0	0	0	0	0	0	451
Spillback Cap Reductn	0	0	0	2	0	1086	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.21	0.33	0.24	0.17	1.18	0.09	0.75

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 65 (59%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 12: Gordon St. & Street B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	65	15	85	80	15	30	1405	60	15	1365	40
Future Volume (vph)	45	65	15	85	80	15	30	1405	60	15	1365	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.98		1.00	0.98		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	0.92	1.00		0.92	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.97		1.00	0.98		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1609	1756		1606	1770		1750	3454		1750	3468	
Flt Permitted	0.70	1.00		0.70	1.00		0.14	1.00		0.13	1.00	
Satd. Flow (perm)	1178	1756		1192	1770		261	3454		237	3468	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	45	65	15	85	80	15	30	1405	60	15	1365	40
RTOR Reduction (vph)	0	8	0	0	6	0	0	3	0	0	2	0
Lane Group Flow (vph)	45	72	0	85	89	0	30	1462	0	15	1403	0
Confl. Peds. (#/hr)	50		50	50		50	50		50	50		50
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)	24.0	24.0		24.0	24.0		74.0	74.0		74.0	74.0	
Effective Green, g (s)	24.0	24.0		24.0	24.0		74.0	74.0		74.0	74.0	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		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	
Lane Grp Cap (vph)	257	383		260	386		175	2323		159	2333	
v/s Ratio Prot		0.04			0.05			c0.42			0.40	
v/s Ratio Perm	0.04			c0.07			0.11			0.06		
v/c Ratio	0.18	0.19		0.33	0.23		0.17	0.63		0.09	0.60	
Uniform Delay, d1	35.0	35.1		36.2	35.4		6.7	10.2		6.3	9.9	
Progression Factor	1.00	1.00		1.00	1.00		1.94	2.34		1.63	1.06	
Incremental Delay, d2	1.5	1.1		3.3	1.4		1.5	0.9		1.0	1.0	
Delay (s)	36.4	36.1		39.5	36.8		14.5	24.9		11.2	11.4	
Level of Service	D	D		D	D		B	C		B	B	
Approach Delay (s)		36.3			38.1			24.7			11.4	
Approach LOS		D			D			C			B	

Intersection Summary			
HCM 2000 Control Delay	20.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.56		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	65.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	40	65	30	45	45	1350	115	1285
Future Volume (vph)	40	65	30	45	45	1350	115	1285
Lane Group Flow (vph)	40	95	30	150	45	1420	115	1350
Turn Type	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA
Protected Phases		4		8		2	1	6
Permitted Phases	4		8		2		6	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	9.5	24.0
Total Split (s)	30.0	30.0	30.0	30.0	68.0	68.0	12.0	80.0
Total Split (%)	27.3%	27.3%	27.3%	27.3%	61.8%	61.8%	10.9%	72.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	3.0	6.0
Lead/Lag					Lag	Lag	Lead	
Lead-Lag Optimize?					Yes	Yes	Yes	
v/c Ratio	0.16	0.24	0.11	0.34	0.24	0.72	0.45	0.58
Control Delay	37.0	30.1	35.8	16.5	20.8	22.7	16.8	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay	37.0	30.1	35.8	16.5	20.8	22.8	16.8	3.4
Queue Length 50th (m)	7.4	14.1	5.5	9.5	5.0	83.3	6.2	12.0
Queue Length 95th (m)	17.4	29.0	14.0	27.8	m9.4	150.9	m14.5	13.5
Internal Link Dist (m)		719.7		611.7		130.0		529.0
Turn Bay Length (m)	30.0		30.0		50.0		50.0	
Base Capacity (vph)	245	397	279	436	191	1962	255	2341
Starvation Cap Reductn	0	0	0	0	0	43	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.24	0.11	0.34	0.24	0.74	0.45	0.58

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 70
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 13: Gordon St. & Street C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	65	30	30	45	105	45	1350	70	115	1285	65
Future Volume (vph)	40	65	30	30	45	105	45	1350	70	115	1285	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		3.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.95		1.00	0.90		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	1755		1750	1649		1750	3474		1750	3475	
Flt Permitted	0.61	1.00		0.70	1.00		0.18	1.00		0.10	1.00	
Satd. Flow (perm)	1126	1755		1281	1649		339	3474		181	3475	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	40	65	30	30	45	105	45	1350	70	115	1285	65
RTOR Reduction (vph)	0	15	0	0	77	0	0	3	0	0	3	0
Lane Group Flow (vph)	40	80	0	30	73	0	45	1417	0	115	1347	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	24.0	24.0		24.0	24.0		62.0	62.0		74.0	74.0	
Effective Green, g (s)	24.0	24.0		24.0	24.0		62.0	62.0		74.0	74.0	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.56	0.56		0.67	0.67	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		3.0	6.0	
Lane Grp Cap (vph)	245	382		279	359		191	1958		250	2337	
v/s Ratio Prot		c0.05			0.04			c0.41		0.04	c0.39	
v/s Ratio Perm	0.04			0.02			0.13			0.27		
v/c Ratio	0.16	0.21		0.11	0.20		0.24	0.72		0.46	0.58	
Uniform Delay, d1	34.9	35.2		34.4	35.2		12.1	17.7		12.9	9.6	
Progression Factor	1.00	1.00		1.00	1.00		1.39	1.16		1.90	0.26	
Incremental Delay, d2	1.4	1.2		0.8	1.3		2.4	2.0		4.9	0.9	
Delay (s)	36.3	36.5		35.2	36.5		19.2	22.4		29.4	3.3	
Level of Service	D	D		D	D		B	C		C	A	
Approach Delay (s)		36.4			36.3			22.3			5.4	
Approach LOS		D			D			C			A	

Intersection Summary

HCM 2000 Control Delay	16.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	77.2%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	40	35	40	30	40	1370	45	1230
Future Volume (vph)	40	35	40	30	40	1370	45	1230
Lane Group Flow (vph)	40	55	40	80	40	1405	45	1295
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	24.0	24.0
Total Split (s)	30.0	30.0	30.0	30.0	80.0	80.0	80.0	80.0
Total Split (%)	27.3%	27.3%	27.3%	27.3%	72.7%	72.7%	72.7%	72.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.14	0.14	0.14	0.20	0.19	0.60	0.26	0.55
Control Delay	36.4	25.4	36.3	17.5	6.5	6.4	6.2	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.3
Total Delay	36.4	25.4	36.3	17.5	6.5	6.4	6.2	5.0
Queue Length 50th (m)	7.4	6.4	7.3	5.4	2.1	41.4	2.2	59.6
Queue Length 95th (m)	17.2	17.5	17.2	18.5	m2.8	45.7	m5.3	87.9
Internal Link Dist (m)		715.4		532.4		581.1		130.0
Turn Bay Length (m)	30.0		30.0		50.0		50.0	
Base Capacity (vph)	283	395	289	403	207	2346	176	2339
Starvation Cap Reductn	0	0	0	0	0	0	0	397
Spillback Cap Reductn	0	0	0	1	0	104	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.14	0.14	0.14	0.20	0.19	0.63	0.26	0.67

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 8 (7%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 14: Gordon St. & Street D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	40	35	20	40	30	50	40	1370	35	45	1230	65
Future Volume (vph)	40	35	20	40	30	50	40	1370	35	45	1230	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.95		1.00	0.91		1.00	1.00		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	1742		1750	1669		1750	3487		1750	3474	
Flt Permitted	0.70	1.00		0.72	1.00		0.17	1.00		0.14	1.00	
Satd. Flow (perm)	1299	1742		1328	1669		308	3487		261	3474	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	40	35	20	40	30	50	40	1370	35	45	1230	65
RTOR Reduction (vph)	0	16	0	0	39	0	0	2	0	0	4	0
Lane Group Flow (vph)	40	39	0	40	41	0	40	1403	0	45	1291	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)	24.0	24.0		24.0	24.0		74.0	74.0		74.0	74.0	
Effective Green, g (s)	24.0	24.0		24.0	24.0		74.0	74.0		74.0	74.0	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		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	
Lane Grp Cap (vph)	283	380		289	364		207	2345		175	2337	
v/s Ratio Prot		0.02			0.02			c0.40			0.37	
v/s Ratio Perm	c0.03			0.03			0.13			0.17		
v/c Ratio	0.14	0.10		0.14	0.11		0.19	0.60		0.26	0.55	
Uniform Delay, d1	34.7	34.4		34.7	34.5		6.8	9.9		7.1	9.4	
Progression Factor	1.00	1.00		1.00	1.00		0.67	0.56		0.41	0.42	
Incremental Delay, d2	1.0	0.5		1.0	0.6		1.4	0.8		3.0	0.8	
Delay (s)	35.7	34.9		35.7	35.1		6.0	6.3		5.9	4.7	
Level of Service	D	C		D	D		A	A		A	A	
Approach Delay (s)		35.3			35.3			6.3			4.8	
Approach LOS		D			D			A			A	

Intersection Summary			
HCM 2000 Control Delay	7.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	57.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	30	195	45	130	55	1285	155	1120
Future Volume (vph)	30	195	45	130	55	1285	155	1120
Lane Group Flow (vph)	30	225	45	260	55	1410	155	1140
Turn Type	Perm	NA	Perm	NA	Perm	NA	pm+pt	NA
Protected Phases		4		8		2	1	6
Permitted Phases	4		8		2		6	
Minimum Split (s)	24.0	24.0	24.0	24.0	24.0	24.0	9.5	24.0
Total Split (s)	30.0	30.0	30.0	30.0	68.0	68.0	12.0	80.0
Total Split (%)	27.3%	27.3%	27.3%	27.3%	61.8%	61.8%	10.9%	72.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	3.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	3.0	6.0
Lead/Lag					Lag	Lag	Lead	
Lead-Lag Optimize?					Yes	Yes	Yes	
v/c Ratio	0.19	0.57	0.25	0.64	0.21	0.72	0.61	0.49
Control Delay	39.0	43.6	39.8	40.9	14.6	20.1	26.4	11.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.0	43.6	39.8	40.9	14.6	20.1	26.4	11.1
Queue Length 50th (m)	5.6	44.4	8.5	45.0	5.8	115.6	22.7	74.5
Queue Length 95th (m)	14.7	70.2	19.5	74.1	14.0	142.9	42.9	101.5
Internal Link Dist (m)		709.2		605.3		187.1		581.1
Turn Bay Length (m)	30.0		30.0		50.0		50.0	
Base Capacity (vph)	155	398	183	404	258	1953	256	2348
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	0.19	0.57	0.25	0.64	0.21	0.72	0.61	0.49

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 70
Control Type: Pretimed

Splits and Phases: 15: Gordon St. & Street E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	195	30	45	130	130	55	1285	125	155	1120	20
Future Volume (vph)	30	195	30	45	130	130	55	1285	125	155	1120	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		6.0	6.0		3.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	0.93		1.00	0.99		1.00	1.00	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	1805		1750	1704		1750	3453		1750	3491	
Flt Permitted	0.39	1.00		0.46	1.00		0.25	1.00		0.10	1.00	
Satd. Flow (perm)	711	1805		840	1704		459	3453		185	3491	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	30	195	30	45	130	130	55	1285	125	155	1120	20
RTOR Reduction (vph)	0	5	0	0	33	0	0	7	0	0	1	0
Lane Group Flow (vph)	30	220	0	45	227	0	55	1403	0	155	1139	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		pm+pt	NA	
Protected Phases		4			8			2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	24.0	24.0		24.0	24.0		62.0	62.0		74.0	74.0	
Effective Green, g (s)	24.0	24.0		24.0	24.0		62.0	62.0		74.0	74.0	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.56	0.56		0.67	0.67	
Clearance Time (s)	6.0	6.0		6.0	6.0		6.0	6.0		3.0	6.0	
Lane Grp Cap (vph)	155	393		183	371		258	1946		252	2348	
v/s Ratio Prot		0.12			c0.13			c0.41		c0.05	0.33	
v/s Ratio Perm	0.04			0.05			0.12			0.36		
v/c Ratio	0.19	0.56		0.25	0.61		0.21	0.72		0.62	0.49	
Uniform Delay, d1	35.1	38.3		35.5	38.8		11.9	17.6		14.1	8.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.83	1.18	
Incremental Delay, d2	2.8	5.7		3.2	7.4		1.9	2.3		9.3	0.6	
Delay (s)	37.9	44.0		38.7	46.2		13.8	20.0		35.2	10.9	
Level of Service	D	D		D	D		B	B		D	B	
Approach Delay (s)		43.3			45.1			19.8			13.8	
Approach LOS		D			D			B			B	

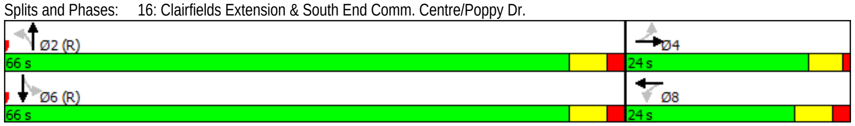
Intersection Summary				
HCM 2000 Control Delay	21.6		HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68			
Actuated Cycle Length (s)	110.0		Sum of lost time (s)	15.0
Intersection Capacity Utilization	85.4%		ICU Level of Service	E
Analysis Period (min)	15			
c Critical Lane Group				

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	45	55	25	60	15	430	5	720
Future Volume (vph)	45	55	25	60	15	430	5	720
Lane Group Flow (vph)	0	105	25	130	15	450	5	795
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Minimum Split (s)	22.5	22.5	24.0	24.0	24.0	24.0	24.0	24.0
Total Split (s)	24.0	24.0	24.0	24.0	66.0	66.0	66.0	66.0
Total Split (%)	26.7%	26.7%	26.7%	26.7%	73.3%	73.3%	73.3%	73.3%
Yellow Time (s)	3.5	3.5	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		4.5	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio		0.32	0.10	0.34	0.05	0.37	0.01	0.65
Control Delay		31.9	30.7	20.5	5.7	7.6	5.2	12.0
Queue Delay		0.0	0.0	0.0	0.0	0.0	0.0	1.5
Total Delay		31.9	30.7	20.5	5.7	7.6	5.2	13.4
Queue Length 50th (m)		15.7	3.7	11.1	0.8	31.4	0.3	74.2
Queue Length 95th (m)		30.8	10.7	27.2	3.0	47.6	1.4	111.8
Internal Link Dist (m)		84.0		727.4		311.0		156.4
Turn Bay Length (m)			30.0		30.0		30.0	
Base Capacity (vph)		333	254	385	315	1221	576	1214
Starvation Cap Reductn		0	0	0	0	0	0	234
Spillback Cap Reductn		0	0	0	0	0	0	0
Storage Cap Reductn		0	0	0	0	0	0	0
Reduced v/c Ratio		0.32	0.10	0.34	0.05	0.37	0.01	0.81

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Pretimed

Splits and Phases: 16: Clairfields Extension & South End Comm. Centre/Poppy Dr.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	55	5	25	60	70	15	430	20	5	720	75
Future Volume (vph)	45	55	5	25	60	70	15	430	20	5	720	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.5		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Util. Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt		0.99		1.00	0.92		1.00	0.99		1.00	0.99	
Flt Protected		0.98		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)		1792		1750	1693		1750	1830		1750	1816	
Flt Permitted		0.83		0.69	1.00		0.26	1.00		0.47	1.00	
Satd. Flow (perm)		1527		1270	1693		474	1830		864	1816	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	45	55	5	25	60	70	15	430	20	5	720	75
RTOR Reduction (vph)	0	2	0	0	46	0	0	2	0	0	4	0
Lane Group Flow (vph)	0	103	0	25	84	0	15	448	0	5	791	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)		19.5		18.0	18.0		60.0	60.0		60.0	60.0	
Effective Green, g (s)		19.5		18.0	18.0		60.0	60.0		60.0	60.0	
Actuated g/C Ratio		0.22		0.20	0.20		0.67	0.67		0.67	0.67	
Clearance Time (s)		4.5		6.0	6.0		6.0	6.0		6.0	6.0	
Lane Grp Cap (vph)		330		254	338		316	1220		576	1210	
v/s Ratio Prot					0.05			0.24			c0.44	
v/s Ratio Perm		c0.07		0.02			0.03			0.01		
v/c Ratio		0.31		0.10	0.25		0.05	0.37		0.01	0.65	
Uniform Delay, d1		29.6		29.4	30.3		5.2	6.6		5.0	8.9	
Progression Factor		1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2		2.4		0.8	1.7		0.3	0.9		0.0	2.8	
Delay (s)		32.1		30.2	32.0		5.4	7.5		5.1	11.6	
Level of Service		C		C	C		A	A		A	B	
Approach Delay (s)		32.1			31.7			7.4			11.6	
Approach LOS		C			C			A			B	

Intersection Summary

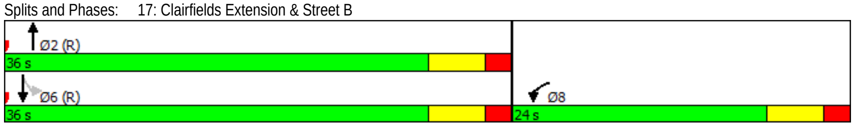
HCM 2000 Control Delay	13.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	90.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	NBT	SBL	SBT
Lane Configurations				
Traffic Volume (vph)	60	375	20	585
Future Volume (vph)	60	375	20	585
Lane Group Flow (vph)	70	420	18	587
Turn Type	Prot	NA	Perm	NA
Protected Phases	8	2		6
Permitted Phases			6	
Minimum Split (s)	24.0	24.0	24.0	24.0
Total Split (s)	24.0	36.0	36.0	36.0
Total Split (%)	40.0%	60.0%	60.0%	60.0%
Yellow Time (s)	4.0	4.0	4.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0
Lead/Lag				
Lead-Lag Optimize?				
v/c Ratio	0.13	0.46	0.04	0.67
Control Delay	14.5	10.6	8.2	16.1
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	14.5	10.6	8.2	16.1
Queue Length 50th (m)	5.0	42.3	1.0	49.6
Queue Length 95th (m)	13.0	62.1	4.0	84.0
Internal Link Dist (m)	725.3	531.6		311.0
Turn Bay Length (m)	50.0		50.0	
Base Capacity (vph)	526	915	405	874
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.13	0.46	0.04	0.67

Intersection Summary

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

Splits and Phases: 17: Clairfields Extension & Street B



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	60	10	375	45	20	585
Future Volume (vph)	60	10	375	45	20	585
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		6.0	6.0
Lane Util. Factor	1.00		1.00		0.95	0.95
Frt	0.98		0.99		1.00	1.00
Flt Protected	0.96		1.00		0.95	1.00
Satd. Flow (prot)	1732		1815		1662	1750
Flt Permitted	0.96		1.00		0.46	1.00
Satd. Flow (perm)	1732		1815		810	1748
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	60	10	375	45	20	585
RTOR Reduction (vph)	7	0	7	0	0	0
Lane Group Flow (vph)	63	0	413	0	18	587
Turn Type	Prot		NA		Perm	NA
Protected Phases	8		2			6
Permitted Phases					6	
Actuated Green, G (s)	18.0		30.0		30.0	30.0
Effective Green, g (s)	18.0		30.0		30.0	30.0
Actuated g/C Ratio	0.30		0.50		0.50	0.50
Clearance Time (s)	6.0		6.0		6.0	6.0
Lane Grp Cap (vph)	519		907		405	874
v/s Ratio Prot	c0.04		0.23			
v/s Ratio Perm					0.02	c0.34
v/c Ratio	0.12		0.46		0.04	0.67
Uniform Delay, d1	15.3		9.7		7.7	11.3
Progression Factor	1.00		0.93		1.00	1.00
Incremental Delay, d2	0.5		1.5		0.2	4.1
Delay (s)	15.7		10.5		7.9	15.4
Level of Service	B		B		A	B
Approach Delay (s)	15.7		10.5			15.2
Approach LOS	B		B			B

Intersection Summary

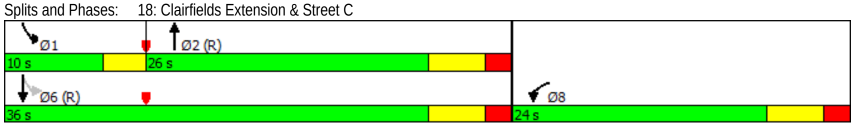
HCM 2000 Control Delay	13.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.47		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	37.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	WBL	NBT	SBL	SBT
Lane Configurations				
Traffic Volume (vph)	15	290	245	425
Future Volume (vph)	15	290	245	425
Lane Group Flow (vph)	175	305	245	425
Turn Type	Prot	NA	pm+pt	NA
Protected Phases	8	2	1	6
Permitted Phases			6	
Minimum Split (s)	24.0	24.0	9.5	24.0
Total Split (s)	24.0	26.0	10.0	36.0
Total Split (%)	40.0%	43.3%	16.7%	60.0%
Yellow Time (s)	4.0	4.0	3.0	4.0
All-Red Time (s)	2.0	2.0	0.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	3.0	6.0
Lead/Lag		Lag	Lead	
Lead-Lag Optimize?		Yes	Yes	
v/c Ratio	0.32	0.50	0.45	0.46
Control Delay	5.8	19.2	4.1	3.4
Queue Delay	0.0	0.0	0.0	0.0
Total Delay	5.8	19.2	4.1	3.4
Queue Length 50th (m)	1.2	27.2	3.1	5.6
Queue Length 95th (m)	13.4	48.0	m4.9	8.5
Internal Link Dist (m)	719.7	130.0		531.6
Turn Bay Length (m)	30.0		30.0	
Base Capacity (vph)	549	610	543	921
Starvation Cap Reductn	0	0	0	0
Spillback Cap Reductn	0	0	0	0
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.32	0.50	0.45	0.46

Intersection Summary

Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 60
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 18: Clairfields Extension & Street C



Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	15	160	290	15	245	425
Future Volume (vph)	15	160	290	15	245	425
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		6.0		3.0	6.0
Lane Util. Factor	1.00		1.00		1.00	1.00
Frpb, ped/bikes	0.91		0.99		1.00	1.00
Flpb, ped/bikes	1.00		1.00		0.98	1.00
Frt	0.88		0.99		1.00	1.00
Flt Protected	1.00		1.00		0.95	1.00
Satd. Flow (prot)	1458		1821		1716	1842
Flt Permitted	1.00		1.00		0.45	1.00
Satd. Flow (perm)	1458		1821		805	1842
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	15	160	290	15	245	425
RTOR Reduction (vph)	112	0	3	0	0	0
Lane Group Flow (vph)	63	0	302	0	245	425
Confl. Peds. (#/hr)	50	50		50	50	
Turn Type	Prot		NA		pm+pt	NA
Protected Phases	8		2		1	6
Permitted Phases					6	
Actuated Green, G (s)	18.0		20.0		30.0	30.0
Effective Green, g (s)	18.0		20.0		30.0	30.0
Actuated g/C Ratio	0.30		0.33		0.50	0.50
Clearance Time (s)	6.0		6.0		3.0	6.0
Lane Grp Cap (vph)	437		607		508	921
v/s Ratio Prot	c0.04		0.17		c0.06	0.23
v/s Ratio Perm					c0.18	
v/c Ratio	0.14		0.50		0.48	0.46
Uniform Delay, d1	15.4		16.0		9.0	9.7
Progression Factor	1.00		1.00		0.26	0.20
Incremental Delay, d2	0.7		2.9		2.6	1.3
Delay (s)	16.1		18.9		5.0	3.3
Level of Service	B		B		A	A
Approach Delay (s)	16.1		18.9			3.9
Approach LOS	B		B			A

Intersection Summary			
HCM 2000 Control Delay	9.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.38		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	58.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

19: Clairfields Extension & Street E

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	80	60	215	70	150	155
Future Volume (vph)	80	60	215	70	150	155
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	80	60	215	70	150	155

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	140	285	305
Volume Left (vph)	80	0	150
Volume Right (vph)	60	70	0
Hadj (s)	-0.11	-0.11	0.13
Departure Headway (s)	5.2	4.5	4.7
Degree Utilization, x	0.20	0.36	0.40
Capacity (veh/h)	632	763	729
Control Delay (s)	9.4	10.1	10.9
Approach Delay (s)	9.4	10.1	10.9
Approach LOS	A	B	B

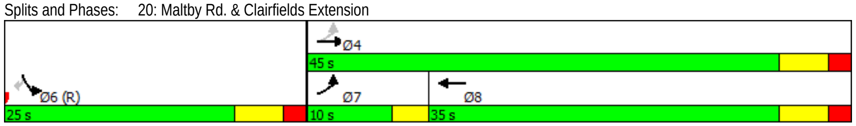
Intersection Summary			
Delay	10.3		
Level of Service	B		
Intersection Capacity Utilization	55.7%	ICU Level of Service	B
Analysis Period (min)	15		

20: Maltby Rd. & Clairfields Extension

Lane Group	EBL	EBT	WBT	SBL	SBR
Lane Configurations					
Traffic Volume (vph)	325	310	195	35	200
Future Volume (vph)	325	310	195	35	200
Lane Group Flow (vph)	325	310	280	35	200
Turn Type	pm+pt	NA	NA	Prot	Perm
Protected Phases	7	4	8	6	
Permitted Phases	4				6
Minimum Split (s)	9.5	24.0	24.0	24.0	24.0
Total Split (s)	10.0	45.0	35.0	25.0	25.0
Total Split (%)	14.3%	64.3%	50.0%	35.7%	35.7%
Yellow Time (s)	3.0	4.0	4.0	4.0	4.0
All-Red Time (s)	0.0	2.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead		Lag		
Lead-Lag Optimize?	Yes		Yes		
v/c Ratio	0.53	0.30	0.38	0.07	0.38
Control Delay	10.6	9.3	14.1	19.6	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	10.6	9.3	14.1	19.6	5.9
Queue Length 50th (m)	19.5	20.7	22.0	3.6	0.0
Queue Length 95th (m)	32.8	34.6	40.0	10.1	14.3
Internal Link Dist (m)		695.6	711.4	191.8	
Turn Bay Length (m)	50.0			50.0	
Base Capacity (vph)	612	1026	728	475	521
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.53	0.30	0.38	0.07	0.38

Intersection Summary
Cycle Length: 70
Actuated Cycle Length: 70
Offset: 0 (0%), Referenced to phase 2: and 6:SBL, Start of Green
Natural Cycle: 60
Control Type: Pretimed

Splits and Phases: 20: Maltby Rd. & Clairfields Extension



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	325	310	195	85	35	200
Future Volume (vph)	325	310	195	85	35	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0	6.0		6.0	6.0
Lane Util. Factor	1.00	1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.97		1.00	0.88
Flpb, ped/bikes	0.97	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.96		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1702	1842	1705		1750	1385
Flt Permitted	0.50	1.00	1.00		0.95	1.00
Satd. Flow (perm)	903	1842	1705		1750	1385
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	325	310	195	85	35	200
RTOR Reduction (vph)	0	0	22	0	0	146
Lane Group Flow (vph)	325	310	258	0	35	54
Confl. Peds. (#/hr)	50			50	50	50
Turn Type	pm+pt	NA	NA		Prot	Perm
Protected Phases	7	4	8		6	
Permitted Phases	4					6
Actuated Green, G (s)	39.0	39.0	29.0		19.0	19.0
Effective Green, g (s)	39.0	39.0	29.0		19.0	19.0
Actuated g/C Ratio	0.56	0.56	0.41		0.27	0.27
Clearance Time (s)	3.0	6.0	6.0		6.0	6.0
Lane Grp Cap (vph)	583	1026	706		475	375
v/s Ratio Prot	c0.06	0.17	0.15		0.02	
v/s Ratio Perm	c0.25					c0.04
v/c Ratio	0.56	0.30	0.37		0.07	0.14
Uniform Delay, d1	8.8	8.3	14.1		19.0	19.3
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	3.8	0.8	1.5		0.3	0.8
Delay (s)	12.6	9.0	15.6		19.3	20.1
Level of Service	B	A	B		B	C
Approach Delay (s)		10.9	15.6		20.0	
Approach LOS		B	B		C	

Intersection Summary			
HCM 2000 Control Delay	13.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	70.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	63.0%	ICU Level of Service	B
Analysis Period (min)	15		

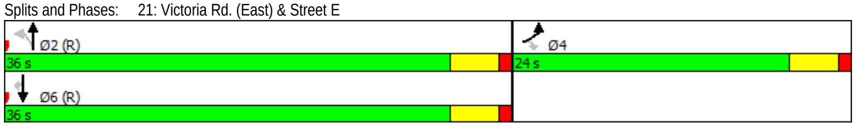
c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	235	10	10	510	410	375
Future Volume (vph)	235	10	10	510	410	375
Lane Group Flow (vph)	235	10	10	510	410	375
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	24.0	24.0	36.0	36.0	36.0	36.0
Total Split (%)	40.0%	40.0%	60.0%	60.0%	60.0%	60.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
v/c Ratio	0.41	0.02	0.02	0.53	0.42	0.38
Control Delay	18.5	8.3	7.1	11.9	10.4	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.5	8.3	7.1	11.9	10.4	2.2
Queue Length 50th (m)	20.8	0.0	0.5	35.3	26.4	0.0
Queue Length 95th (m)	38.1	2.7	2.4	59.0	44.7	10.5
Internal Link Dist (m)	617.1			306.7	1674.8	
Turn Bay Length (m)	50.0		50.0			50.0
Base Capacity (vph)	568	515	442	967	967	1000
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.41	0.02	0.02	0.53	0.42	0.38

Intersection Summary

Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 21: Victoria Rd. (East) & Street E



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	235	10	10	510	410	375
Future Volume (vph)	235	10	10	510	410	375
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1750	1566	1750	1842	1842	1566
Flt Permitted	0.95	1.00	0.46	1.00	1.00	1.00
Satd. Flow (perm)	1750	1566	842	1842	1842	1566
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	235	10	10	510	410	375
RTOR Reduction (vph)	0	7	0	0	0	178
Lane Group Flow (vph)	235	3	10	510	410	197
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	19.5	19.5	31.5	31.5	31.5	31.5
Effective Green, g (s)	19.5	19.5	31.5	31.5	31.5	31.5
Actuated g/C Ratio	0.32	0.32	0.52	0.52	0.52	0.52
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Grp Cap (vph)	568	508	442	967	967	822
v/s Ratio Prot	c0.13			c0.28	0.22	
v/s Ratio Perm		0.00	0.01			0.13
v/c Ratio	0.41	0.01	0.02	0.53	0.42	0.24
Uniform Delay, d1	15.8	13.7	6.9	9.4	8.7	7.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.2	0.0	0.1	2.1	1.4	0.7
Delay (s)	18.0	13.7	6.9	11.4	10.1	8.4
Level of Service	B	B	A	B	B	A
Approach Delay (s)	17.8			11.3	9.3	
Approach LOS	B			B	A	

Intersection Summary			
HCM 2000 Control Delay	11.3	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)	9.0
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	435	30	35	35	35	335
Future Volume (Veh/h)	435	30	35	35	35	335
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	435	30	35	35	35	335
Pedestrians					1	
Lane Width (m)					3.5	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	71				954	54
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	71				954	54
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	71				83	67
cM capacity (veh/h)	1522				204	1013

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	465	70	370
Volume Left	435	0	35
Volume Right	0	35	335
cSH	1522	1700	737
Volume to Capacity	0.29	0.04	0.50
Queue Length 95th (m)	9.5	0.0	22.8
Control Delay (s)	7.9	0.0	14.7
Lane LOS	A		B
Approach Delay (s)	7.9	0.0	14.7
Approach LOS			B

Intersection Summary			
Average Delay	10.1		
Intersection Capacity Utilization	61.6%	ICU Level of Service	B
Analysis Period (min)	15		

23: Victoria Rd. (West) & Maltby Rd.

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	45	35	300	60	55	430
Future Volume (Veh/h)	45	35	300	60	55	430
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	45	35	300	60	55	430
Pedestrians					1	
Lane Width (m)					3.5	
Walking Speed (m/s)					1.2	
Percent Blockage					0	
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume			81		724	64
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			81		724	64
tC, single (s)			4.1		6.7	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.8	3.3
p0 queue free %			80		80	57
cM capacity (veh/h)			1522		281	997

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	80	360	485
Volume Left	0	300	55
Volume Right	35	0	430
cSH	1700	1522	774
Volume to Capacity	0.05	0.20	0.63
Queue Length 95th (m)	0.0	5.9	35.9
Control Delay (s)	0.0	6.9	17.1
Lane LOS		A	C
Approach Delay (s)	0.0	6.9	17.1
Approach LOS			C

Intersection Summary			
Average Delay	11.7		
Intersection Capacity Utilization	62.7%	ICU Level of Service	B
Analysis Period (min)	15		

24: Clairfields Extension & Street D

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Stop			Stop
Traffic Volume (vph)	35	30	205	70	20	265
Future Volume (vph)	35	30	205	70	20	265
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	35	30	205	70	20	265

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total (vph)	65	275	285
Volume Left (vph)	35	0	20
Volume Right (vph)	30	70	0
Hadj (s)	-0.14	-0.12	0.05
Departure Headway (s)	5.0	4.3	4.4
Degree Utilization, x	0.09	0.33	0.35
Capacity (veh/h)	649	823	793
Control Delay (s)	8.5	9.3	9.7
Approach Delay (s)	8.5	9.3	9.7
Approach LOS	A	A	A

Intersection Summary			
Delay	9.4		
Level of Service	A		
Intersection Capacity Utilization	40.9%	ICU Level of Service	A
Analysis Period (min)	15		

25: Maltby Rd. & Traffic Zone 8 North-South Collector

Weekday Afternoon Peak Hour

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	130	200	165	10	20	90
Future Volume (Veh/h)	130	200	165	10	20	90
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	130	200	165	10	20	90
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	175				630	170
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	175				630	170
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	91				95	90
cM capacity (veh/h)	1401				404	874

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	130	200	175	110
Volume Left	130	0	0	20
Volume Right	0	0	10	90
cSH	1401	1700	1700	721
Volume to Capacity	0.09	0.12	0.10	0.15
Queue Length 95th (m)	2.4	0.0	0.0	4.3
Control Delay (s)	7.8	0.0	0.0	10.9
Lane LOS	A			B
Approach Delay (s)	3.1		0.0	10.9
Approach LOS				B

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	33.2%	ICU Level of Service	A
Analysis Period (min)	15		

26: Maltby Rd. & Traffic Zone 9 North-South Collector

Weekday Afternoon Peak Hour

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	155	40	80	10	5	85
Future Volume (Veh/h)	155	40	80	10	5	85
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	155	40	80	10	5	85
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	90				435	85
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	90				435	85
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	90				99	91
cM capacity (veh/h)	1505				519	974

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	155	40	90	90
Volume Left	155	0	0	5
Volume Right	0	0	10	85
cSH	1505	1700	1700	929
Volume to Capacity	0.10	0.02	0.05	0.10
Queue Length 95th (m)	2.7	0.0	0.0	2.6
Control Delay (s)	7.7	0.0	0.0	9.3
Lane LOS	A			A
Approach Delay (s)	6.1		0.0	9.3
Approach LOS				A

Intersection Summary			
Average Delay	5.4		
Intersection Capacity Utilization	27.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Stop			Stop	Stop	
Traffic Volume (vph)	220	45	75	205	5	55
Future Volume (vph)	220	45	75	205	5	55
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Hourly flow rate (vph)	220	45	75	205	5	55

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total (vph)	265	280	60
Volume Left (vph)	0	75	5
Volume Right (vph)	45	0	55
Hadj (s)	-0.07	0.09	-0.50
Departure Headway (s)	4.3	4.4	4.6
Degree Utilization, x	0.31	0.34	0.08
Capacity (veh/h)	823	793	703
Control Delay (s)	9.2	9.7	8.0
Approach Delay (s)	9.2	9.7	8.0
Approach LOS	A	A	A

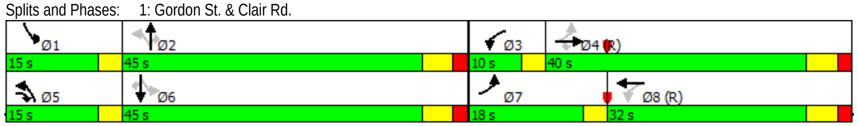
Intersection Summary			
Delay	9.3		
Level of Service	A		
Intersection Capacity Utilization	42.9%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Traffic Volume (vph)	300	960	230	165	650	250	985	210	230	1160	205
Future Volume (vph)	300	960	230	165	650	250	985	210	230	1160	205
Lane Group Flow (vph)	300	960	230	165	770	250	985	210	230	1160	205
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4	5	3	8	5	2		1	6	
Permitted Phases	4		4	8		2		2	6		6
Detector Phase	7	4	5	3	8	5	2	2	1	6	6
Switch Phase											
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	24.0	9.5	9.5	24.0	9.5	24.0	24.0	9.5	24.0	24.0
Total Split (s)	18.0	40.0	15.0	10.0	32.0	15.0	45.0	45.0	15.0	45.0	45.0
Total Split (%)	16.4%	36.4%	13.6%	9.1%	29.1%	13.6%	40.9%	40.9%	13.6%	40.9%	40.9%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	4.0	4.0	3.0	4.0	4.0
All-Red Time (s)	0.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	0.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0	3.0	3.0	6.0	3.0	6.0	6.0	3.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Max	None	None	C-Max	None	Max	Max	None	Max	Max
v/c Ratio	0.95	0.88	0.32	0.98	0.95	0.97	0.78	0.35	0.82	0.94	0.34
Control Delay	62.7	52.0	33.3	91.1	62.4	83.8	45.1	20.3	44.8	49.0	12.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.8	0.0
Total Delay	62.7	52.0	33.3	91.1	62.4	83.8	45.2	20.3	44.8	58.8	12.3
Queue Length 50th (m)	69.1	122.2	45.7	23.3	88.7	52.8	90.0	19.0	28.7	131.9	12.6
Queue Length 95th (m)	m#90.0	m#141.0	m55.0	#63.8	#128.3	#94.5	112.5	m32.7	#69.9	#176.7	31.3
Internal Link Dist (m)		775.0			194.1		153.6			314.0	
Turn Bay Length (m)	75.0		50.0	25.0		50.0		50.0	140.0		50.0
Base Capacity (vph)	315	1092	717	169	811	258	1263	607	284	1240	600
Starvation Cap Reductn	0	0	0	0	0	0	3	0	0	0	0
Spillback Cap Reductn	0	0	2	0	0	0	0	0	0	83	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.95	0.88	0.32	0.98	0.95	0.97	0.78	0.35	0.81	1.00	0.34

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green, Master Intersection
Natural Cycle: 90
Control Type: Actuated-Coordinated
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 1: Gordon St. & Clair Rd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	300	960	230	165	650	120	250	985	210	230	1160	205
Future Volume (vph)	300	960	230	165	650	120	250	985	210	230	1160	205
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0	3.0	3.0	6.0		3.0	6.0	6.0	3.0	6.0	6.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	0.95	1.00	1.00	0.95	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	0.99		1.00	1.00	0.97	1.00	1.00	0.98
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1767	3535	1537	1593	3373		1716	3535	1431	1785	3500	1469
Flt Permitted	0.14	1.00	1.00	0.15	1.00		0.10	1.00	1.00	0.12	1.00	1.00
Satd. Flow (perm)	257	3535	1537	258	3373		184	3535	1431	234	3500	1469
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	300	960	230	165	650	120	250	985	210	230	1160	205
RTOR Reduction (vph)	0	0	35	0	14	0	0	0	96	0	0	79
Lane Group Flow (vph)	300	960	195	165	756	0	250	985	114	230	1160	126
Confl. Peds. (#/hr)	17		7	7		17	2		11	11		2
Confl. Bikes (#/hr)									1			
Heavy Vehicles (%)	1%	1%	2%	12%	3%	1%	4%	1%	8%	0%	2%	7%
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	Perm
Protected Phases	7	4	5	3	8		5	2		1	6	
Permitted Phases	4		4	8			2		2	6		6
Actuated Green, G (s)	44.0	34.0	46.0	33.0	26.0		51.3	39.3	39.3	50.7	39.0	39.0
Effective Green, g (s)	44.0	34.0	46.0	33.0	26.0		51.3	39.3	39.3	50.7	39.0	39.0
Actuated g/C Ratio	0.40	0.31	0.42	0.30	0.24		0.47	0.36	0.36	0.46	0.35	0.35
Clearance Time (s)	3.0	6.0	3.0	3.0	6.0		3.0	6.0	6.0	3.0	6.0	6.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	308	1092	642	162	797		252	1262	511	272	1240	520
v/s Ratio Prot	c0.13	0.27	0.03	0.06	0.22		c0.11	0.28		0.09	0.33	
v/s Ratio Perm	c0.26		0.09	0.24			c0.35		0.08	0.30		0.09
v/c Ratio	0.97	0.88	0.30	1.02	0.95		0.99	0.78	0.22	0.85	0.94	0.24
Uniform Delay, d1	29.9	36.1	21.3	34.6	41.3		30.8	31.5	24.7	22.3	34.3	25.1
Progression Factor	1.26	1.26	2.47	1.00	1.00		1.66	1.30	2.26	1.00	1.00	1.00
Incremental Delay, d2	32.6	6.4	0.2	75.7	21.6		46.5	3.6	0.8	20.8	14.2	1.1
Delay (s)	70.2	51.7	52.9	110.2	63.0		97.7	44.5	56.5	43.0	48.4	26.2
Level of Service	E	D	D	F	E		F	D	E	D	D	C
Approach Delay (s)		55.6			71.3			55.5			44.8	
Approach LOS		E			E			E			D	

Intersection Summary			
HCM 2000 Control Delay	55.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	101.3%	ICU Level of Service	G
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	115	60	55	55	65	1345	50	1425
Future Volume (vph)	115	60	55	55	65	1345	50	1425
Lane Group Flow (vph)	115	95	55	95	65	1410	50	1500
Turn Type	Perm	NA	Perm	NA	pm+pt	NA	pm+pt	NA
Protected Phases		4		8	5	2	1	6
Permitted Phases	4		8		2		6	
Minimum Split (s)	24.0	24.0	24.0	24.0	9.5	24.0	9.5	24.0
Total Split (s)	30.0	30.0	30.0	30.0	10.0	70.0	10.0	70.0
Total Split (%)	27.3%	27.3%	27.3%	27.3%	9.1%	63.6%	9.1%	63.6%
Yellow Time (s)	4.0	4.0	4.0	4.0	3.0	4.0	3.0	4.0
All-Red Time (s)	2.0	2.0	2.0	2.0	0.0	2.0	0.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	3.0	6.0	3.0	6.0
Lead/Lag					Lead	Lag	Lead	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes
v/c Ratio	0.41	0.24	0.20	0.24	0.30	0.70	0.21	0.74
Control Delay	42.2	28.2	37.4	26.3	15.8	41.8	3.8	8.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	4.7	0.0	22.8
Total Delay	42.2	28.2	37.4	26.3	15.8	46.5	3.8	31.6
Queue Length 50th (m)	22.5	13.2	10.2	12.0	9.9	167.0	0.4	10.0
Queue Length 95th (m)	40.6	28.0	22.0	26.8	m13.2	191.0	m1.1	m176.1
Internal Link Dist (m)		727.4		256.4		172.0		153.6
Turn Bay Length (m)	30.0		30.0		65.0		27.0	
Base Capacity (vph)	279	398	279	400	214	2025	236	2023
Starvation Cap Reductn	0	0	0	0	0	537	0	575
Spillback Cap Reductn	0	3	1	0	0	0	0	159
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.41	0.24	0.20	0.24	0.30	0.95	0.21	1.04

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 61 (55%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 75
Control Type: Pretimed
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 2: Gordon St. & Poppy Dr.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	115	60	35	55	55	40	65	1345	65	50	1425	75
Future Volume (vph)	115	60	35	55	55	40	65	1345	65	50	1425	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0	6.0		6.0	6.0		3.0	6.0		3.0	6.0	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.94		1.00	0.94		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	1740		1750	1726		1750	3476		1750	3474	
Flt Permitted	0.70	1.00		0.70	1.00		0.09	1.00		0.11	1.00	
Satd. Flow (perm)	1281	1740		1281	1726		170	3476		206	3474	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	115	60	35	55	55	40	65	1345	65	50	1425	75
RTOR Reduction (vph)	0	19	0	0	23	0	0	3	0	0	3	0
Lane Group Flow (vph)	115	76	0	55	72	0	65	1407	0	50	1497	0
Turn Type	Perm	NA		Perm	NA		pm+pt	NA		pm+pt	NA	
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8			2			6		
Actuated Green, G (s)	24.0	24.0		24.0	24.0		71.0	64.0		71.0	64.0	
Effective Green, g (s)	24.0	24.0		24.0	24.0		71.0	64.0		71.0	64.0	
Actuated g/C Ratio	0.22	0.22		0.22	0.22		0.65	0.58		0.65	0.58	
Clearance Time (s)	6.0	6.0		6.0	6.0		3.0	6.0		3.0	6.0	
Lane Grp Cap (vph)	279	379		279	376		210	2022		231	2021	
v/s Ratio Prot		0.04			0.04		c0.02	0.40		0.01	c0.43	
v/s Ratio Perm	c0.09			0.04			0.18			0.13		
v/c Ratio	0.41	0.20		0.20	0.19		0.31	0.70		0.22	0.74	
Uniform Delay, d1	36.9	35.2		35.1	35.1		12.3	16.2		10.8	16.9	
Progression Factor	1.00	1.00		1.00	1.00		2.45	2.46		0.54	0.44	
Incremental Delay, d2	4.4	1.2		1.6	1.1		2.9	1.5		1.1	1.3	
Delay (s)	41.4	36.4		36.7	36.2		33.0	41.2		6.9	8.7	
Level of Service	D	D		D	D		C	D		A	A	
Approach Delay (s)		39.1			36.4			40.9			8.6	
Approach LOS		D			D			D			A	

Intersection Summary

HCM 2000 Control Delay	25.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.63		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	72.3%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations								
Traffic Volume (vph)	85	180	55	160	80	1415	65	1065
Future Volume (vph)	85	180	55	160	80	1415	65	1065
Lane Group Flow (vph)	85	240	55	225	80	1500	65	1105
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases		4		8		2		6
Permitted Phases	4		8		2		6	
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	32.0	32.0	32.0	32.0	78.0	78.0	78.0	78.0
Total Split (%)	29.1%	29.1%	29.1%	29.1%	70.9%	70.9%	70.9%	70.9%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag								
Lead-Lag Optimize?								
v/c Ratio	0.46	0.54	0.29	0.50	0.32	0.66	0.53	0.49
Control Delay	44.8	38.6	38.4	36.9	11.8	12.5	26.7	6.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.8	38.6	38.4	36.9	11.8	12.5	26.7	6.0
Queue Length 50th (m)	16.4	44.2	10.1	40.1	6.9	95.2	2.5	21.7
Queue Length 95th (m)	33.4	70.2	22.6	64.9	16.4	117.5	m#30.0	22.6
Internal Link Dist (m)		711.4		659.2		165.0		187.1
Turn Bay Length (m)	50.0		50.0		50.0		50.0	
Base Capacity (vph)	183	447	190	449	253	2270	122	2271
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	0.46	0.54	0.29	0.50	0.32	0.66	0.53	0.49

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 107 (97%), Referenced to phase 2:NBTL and 6:SBTL, Start of Green
Natural Cycle: 65
Control Type: Pretimed
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Gordon St. & Maltby Rd.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	85	180	60	55	160	65	80	1415	85	65	1065	40
Future Volume (vph)	85	180	60	55	160	65	80	1415	85	65	1065	40
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	0.97		1.00	0.97		1.00	0.99		1.00	0.99	
Flpb, ped/bikes	0.95	1.00		0.95	1.00		0.98	1.00		1.00	1.00	
Frt	1.00	0.96		1.00	0.96		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1536	1745		1694	1745		1696	3394		1487	3394	
Flt Permitted	0.45	1.00		0.43	1.00		0.21	1.00		0.12	1.00	
Satd. Flow (perm)	734	1745		763	1745		380	3394		183	3394	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	85	180	60	55	160	65	80	1415	85	65	1065	40
RTOR Reduction (vph)	0	11	0	0	14	0	0	4	0	0	2	0
Lane Group Flow (vph)	85	229	0	55	212	0	80	1496	0	65	1103	0
Confl. Peds. (#/hr)	50		50	50		50	50		50	50		50
Heavy Vehicles (%)	10%	0%	4%	0%	0%	0%	3%	3%	8%	20%	4%	3%
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)	27.5	27.5		27.5	27.5		73.5	73.5		73.5	73.5	
Effective Green, g (s)	27.5	27.5		27.5	27.5		73.5	73.5		73.5	73.5	
Actuated g/C Ratio	0.25	0.25		0.25	0.25		0.67	0.67		0.67	0.67	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Grp Cap (vph)	183	436		190	436		253	2267		122	2267	
v/s Ratio Prot		c0.13			0.12			c0.44			0.32	
v/s Ratio Perm	0.12			0.07			0.21			0.36		
v/c Ratio	0.46	0.52		0.29	0.49		0.32	0.66		0.53	0.49	
Uniform Delay, d1	35.0	35.6		33.4	35.2		7.7	10.8		9.4	9.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		0.94	0.58	
Incremental Delay, d2	8.2	4.5		3.8	3.8		3.3	1.5		14.1	0.7	
Delay (s)	43.3	40.1		37.2	39.0		10.9	12.4		22.9	5.9	
Level of Service	D	D		D	D		B	B		C	A	
Approach Delay (s)		40.9			38.7			12.3			6.9	
Approach LOS		D			D			B			A	

Intersection Summary			
HCM 2000 Control Delay	15.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	9.0
Intersection Capacity Utilization	80.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBT	WBL	WBT	NEL	NER
Lane Configurations					
Traffic Volume (vph)	1695	105	1165	1	265
Future Volume (vph)	1695	105	1165	1	265
Lane Group Flow (vph)	1700	105	1165	1	265
Turn Type	NA	pm+pt	NA	Prot	pm+ov
Protected Phases	4	3	8	2	3
Permitted Phases		8			2
Detector Phase	4	3	8	2	3
Switch Phase					
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	24.0	9.5	24.0	24.0	9.5
Total Split (s)	72.0	10.0	82.0	28.0	10.0
Total Split (%)	65.5%	9.1%	74.5%	25.5%	9.1%
Yellow Time (s)	4.0	3.0	4.0	4.0	3.0
All-Red Time (s)	2.0	0.0	2.0	2.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	3.0	6.0	6.0	3.0
Lead/Lag	Lag	Lead			Lead
Lead-Lag Optimize?	Yes	Yes			Yes
Recall Mode	None	None	None	Min	None
v/c Ratio	0.82	0.37	0.45	0.01	0.60
Control Delay	14.6	6.6	4.0	34.0	28.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	14.6	6.6	4.0	34.0	28.7
Queue Length 50th (m)	83.2	2.1	23.5	0.1	27.2
Queue Length 95th (m)	110.6	7.9	31.7	1.8	#70.4
Internal Link Dist (m)	795.3		198.1	144.4	
Turn Bay Length (m)		50.0			50.0
Base Capacity (vph)	3276	299	3441	579	456
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.52	0.35	0.34	0.00	0.58

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 67.8
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Clair Rd. & Laird Rd.

Movement	EBT	EBR	WBL	WBT	NEL	NER
Lane Configurations						
Traffic Volume (vph)	1695	5	105	1165	1	265
Future Volume (vph)	1695	5	105	1165	1	265
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.0		3.0	6.0	6.0	3.0
Lane Util. Factor	0.95		1.00	0.95	1.00	1.00
Frt	1.00		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3498		1750	3500	1750	1566
Flt Permitted	1.00		0.09	1.00	0.95	1.00
Satd. Flow (perm)	3498		171	3500	1750	1566
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1695	5	105	1165	1	265
RTOR Reduction (vph)	0	0	0	0	0	20
Lane Group Flow (vph)	1700	0	105	1165	1	245
Turn Type	NA		pm+pt	NA	Prot	pm+ov
Protected Phases	4		3	8	2	3
Permitted Phases			8			2
Actuated Green, G (s)	40.2		49.8	49.8	5.7	12.3
Effective Green, g (s)	40.2		49.8	49.8	5.7	12.3
Actuated g/C Ratio	0.60		0.74	0.74	0.08	0.18
Clearance Time (s)	6.0		3.0	6.0	6.0	3.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2083		280	2582	147	285
v/s Ratio Prot	c0.49		0.04	0.33	0.00	c0.08
v/s Ratio Perm			0.24			0.07
v/c Ratio	0.82		0.38	0.45	0.01	0.86
Uniform Delay, d1	10.7		8.3	3.5	28.3	26.8
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	2.6		0.8	0.1	0.0	22.4
Delay (s)	13.3		9.2	3.6	28.3	49.1
Level of Service	B		A	A	C	D
Approach Delay (s)	13.3			4.1	49.1	
Approach LOS	B			A	D	

Intersection Summary			
HCM 2000 Control Delay	12.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	67.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		

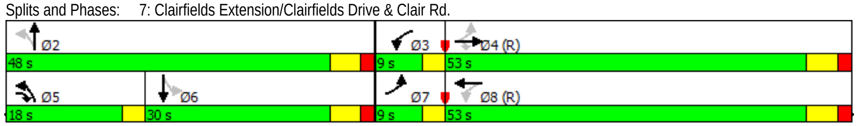
c Critical Lane Group

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations									
Traffic Volume (vph)	120	1315	535	120	800	390	95	25	145
Future Volume (vph)	120	1315	535	120	800	390	95	25	145
Lane Group Flow (vph)	120	1315	535	120	845	390	150	25	225
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+pt	NA	Perm	NA
Protected Phases	7	4	5	3	8	5	2		6
Permitted Phases	4		4	8		2		6	
Detector Phase	7	4	5	3	8	5	2	6	6
Switch Phase									
Minimum Initial (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Minimum Split (s)	9.5	24.0	9.5	9.5	24.0	9.5	24.0	24.0	24.0
Total Split (s)	9.0	53.0	18.0	9.0	53.0	18.0	48.0	30.0	30.0
Total Split (%)	8.2%	48.2%	16.4%	8.2%	48.2%	16.4%	43.6%	27.3%	27.3%
Yellow Time (s)	3.0	4.0	3.0	3.0	4.0	3.0	4.0	4.0	4.0
All-Red Time (s)	0.0	2.0	0.0	0.0	2.0	0.0	2.0	2.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	6.0	3.0	3.0	6.0	3.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead		Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes		Yes	Yes
Recall Mode	None	C-Max	None	None	C-Max	None	Max	Max	Max
v/c Ratio	0.42	0.88	0.48	0.72	0.57	0.88	0.22	0.09	0.57
Control Delay	17.4	37.2	3.9	48.2	48.6	49.3	19.0	35.6	40.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.4	37.2	3.9	48.2	48.6	49.3	19.0	35.6	40.6
Queue Length 50th (m)	12.9	140.5	10.6	24.7	103.6	65.8	17.6	4.5	40.9
Queue Length 95th (m)	22.7	173.1	27.8	m28.1	m113.0	#120.5	32.8	12.2	66.6
Internal Link Dist (m)		186.5			775.0		156.4		150.9
Turn Bay Length (m)	55.0		200.0	45.0		100.0		50.0	
Base Capacity (vph)	288	1495	1125	166	1486	442	683	265	398
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.88	0.48	0.72	0.57	0.88	0.22	0.09	0.57

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 4:EBTL and 8:WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Clairfields Extension/Clairfields Drive & Clair Rd.



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	1315	535	120	800	45	390	95	55	25	145	80
Future Volume (vph)	120	1315	535	120	800	45	390	95	55	25	145	80
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	3.0	6.0	3.0	3.0	6.0		3.0	6.0		6.0	6.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.94		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1750	3500	1566	1750	3472		1750	1741		1750	1744	
Flt Permitted	0.23	1.00	1.00	0.09	1.00		0.41	1.00		0.66	1.00	
Satd. Flow (perm)	423	3500	1566	157	3472		747	1741		1219	1744	
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	120	1315	535	120	800	45	390	95	55	25	145	80
RTOR Reduction (vph)	0	0	180	0	3	0	0	19	0	0	18	0
Lane Group Flow (vph)	120	1315	355	120	842	0	390	131	0	25	207	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA		Perm	NA	
Protected Phases	7	4	5	3	8		5	2			6	
Permitted Phases	4		4	8			2			6		
Actuated Green, G (s)	53.0	47.0	62.0	53.0	47.0		42.0	42.0		24.0	24.0	
Effective Green, g (s)	53.0	47.0	62.0	53.0	47.0		42.0	42.0		24.0	24.0	
Actuated g/C Ratio	0.48	0.43	0.56	0.48	0.43		0.38	0.38		0.22	0.22	
Clearance Time (s)	3.0	6.0	3.0	3.0	6.0		3.0	6.0		6.0	6.0	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	276	1495	882	162	1483		421	664		265	380	
v/s Ratio Prot	0.02	c0.38	0.05	c0.04	0.24		c0.13	0.08			0.12	
v/s Ratio Perm	0.19		0.17	0.32			c0.23			0.02		
v/c Ratio	0.43	0.88	0.40	0.74	0.57		0.93	0.20		0.09	0.54	
Uniform Delay, d1	17.1	28.9	13.5	22.4	23.8		29.9	22.7		34.3	38.2	
Progression Factor	1.00	1.00	1.00	2.27	2.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.1	7.7	0.3	9.0	0.8		26.2	0.7		0.7	5.5	
Delay (s)	18.2	36.6	13.8	59.7	48.4		56.1	23.4		35.0	43.7	
Level of Service	B	D	B	E	D		E	C		D	D	
Approach Delay (s)		29.3			49.8			47.0			42.8	
Approach LOS		C			D			D			D	

Intersection Summary

HCM 2000 Control Delay	38.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	93.8%	ICU Level of Service	F
Analysis Period (min)	15		

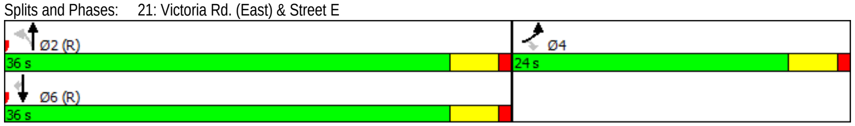
c Critical Lane Group

Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	235	10	10	510	410	375
Future Volume (vph)	235	10	10	510	410	375
Lane Group Flow (vph)	235	10	10	510	410	375
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Minimum Split (s)	22.5	22.5	22.5	22.5	22.5	22.5
Total Split (s)	24.0	24.0	36.0	36.0	36.0	36.0
Total Split (%)	40.0%	40.0%	60.0%	60.0%	60.0%	60.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lead/Lag						
Lead-Lag Optimize?						
v/c Ratio	0.41	0.02	0.02	0.53	0.42	0.38
Control Delay	18.5	8.3	7.1	11.9	10.4	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.5	8.3	7.1	11.9	10.4	2.2
Queue Length 50th (m)	20.8	0.0	0.5	35.3	26.4	0.0
Queue Length 95th (m)	38.1	2.7	2.4	59.0	44.7	10.5
Internal Link Dist (m)	617.1			306.7	1674.8	
Turn Bay Length (m)	50.0		50.0			50.0
Base Capacity (vph)	568	515	442	967	967	1000
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.41	0.02	0.02	0.53	0.42	0.38

Intersection Summary

Cycle Length: 60
Actuated Cycle Length: 60
Offset: 0 (0%), Referenced to phase 2:NBTL and 6:SBT, Start of Green
Natural Cycle: 45
Control Type: Pretimed

Splits and Phases: 21: Victoria Rd. (East) & Street E



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	235	10	10	510	410	375
Future Volume (vph)	235	10	10	510	410	375
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	0.95	1.00	0.95	1.00	1.00	1.00
Satd. Flow (prot)	1750	1566	1750	1842	1842	1566
Flt Permitted	0.95	1.00	0.46	1.00	1.00	1.00
Satd. Flow (perm)	1750	1566	842	1842	1842	1566
Peak-hour factor, PHF	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	235	10	10	510	410	375
RTOR Reduction (vph)	0	7	0	0	0	178
Lane Group Flow (vph)	235	3	10	510	410	197
Turn Type	Prot	Perm	Perm	NA	NA	Perm
Protected Phases	4			2	6	
Permitted Phases		4	2			6
Actuated Green, G (s)	19.5	19.5	31.5	31.5	31.5	31.5
Effective Green, g (s)	19.5	19.5	31.5	31.5	31.5	31.5
Actuated g/C Ratio	0.32	0.32	0.52	0.52	0.52	0.52
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5
Lane Grp Cap (vph)	568	508	442	967	967	822
v/s Ratio Prot	c0.13			c0.28	0.22	
v/s Ratio Perm		0.00	0.01			0.13
v/c Ratio	0.41	0.01	0.02	0.53	0.42	0.24
Uniform Delay, d1	15.8	13.7	6.9	9.4	8.7	7.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.2	0.0	0.1	2.1	1.4	0.7
Delay (s)	18.0	13.7	6.9	11.4	10.1	8.4
Level of Service	B	B	A	B	B	A
Approach Delay (s)	17.8			11.3	9.3	
Approach LOS	B			B	A	

Intersection Summary			
HCM 2000 Control Delay	11.3	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)	9.0
Intersection Capacity Utilization	47.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Appendix S – Roundabout Analysis Results

Junctions 9
ARCADY 9 - Roundabout Module
Version: 9.0.1.4646 [] © Copyright TRL Limited, 2019
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Filename: Gordon and Maltby - FT_PM.j9
Path: P:\59\76\06 Clair Maltby SP\Traffic Analysis\Phase 2\5. Roundabout Analysis
Report generation date: 2019-02-13 3:12:23 PM

Summary of intersection performance

	Weekday Afternoon Peak Hour						
	Queue (Veh)	**95% Queue (Veh)**	**Delay (s)**	**V/C Ratio**	**LOS**	**Intersection Delay (s)**	**Intersection LOS**
	Gordon Street / Maltby Road - Future Total Traffic						
1 - Maltby Road East (East Leg)	1.4	6.9	17.12	0.59	C	7.74	A
2 - Gordon Street (North Leg)	1.5	2.0	4.13	0.60	A		
3 - Maltby Road East (West Leg)	0.6	3.0	6.53	0.39	A		
4 - Gordon Street (South Leg)	4.3	16.9	9.01	0.81	A		

There are warnings associated with this model run - see the 'Data Errors and Warnings' tables.

Values shown are the highest values encountered over all time segments. Delay is the maximum value of average delay per arriving vehicle. Intersection LOS and Intersection Delay are demand-weighted averages.

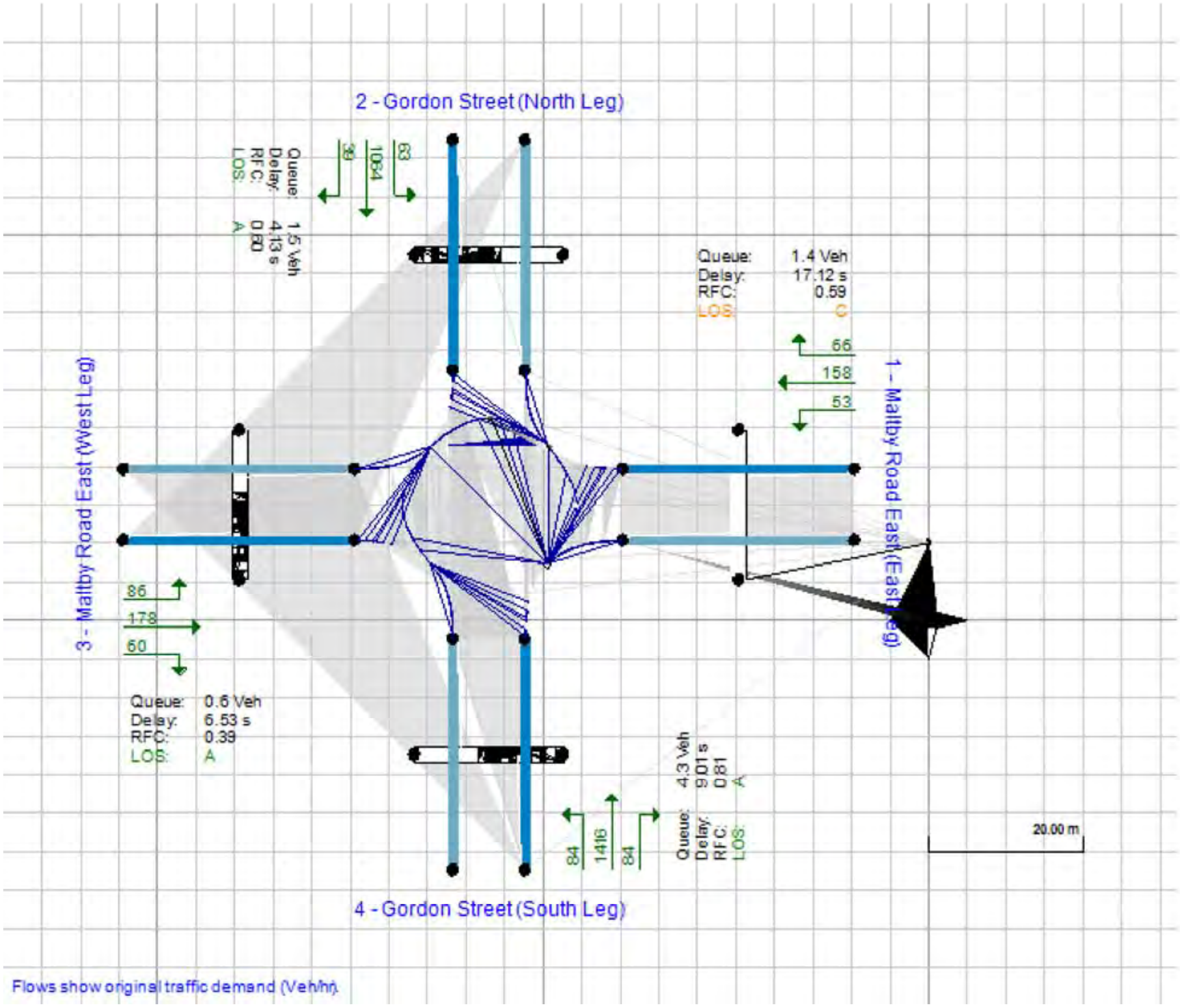
File summary

File Description

Title	Future Total Traffic Conditions
Location	Erb St. W. / Ira Needles Blvd.
Site number	1
Date	2017-04-26
Version	
Status	Weekday Afternoon Peak Hour
Identifier	
Client	
Jobnumber	
Analyst	BACTOR\ifc
Description	

Units

Distance units	Speed units	Traffic units input	Traffic units results	Flow units	Average delay units	Total delay units	Rate of delay units
m	kph	Veh	Veh	perHour	s	-Min	perMin



The intersection diagram reflects the last run of Intersections.

Analysis Options

Calculate Queue Percentiles	Calculate residual capacity	V/C Ratio Threshold	Average Delay threshold (s)	Queue threshold (PCE)
✓		0.85	36.00	20.00

Analysis Set Details

ID	Name	Network flow scaling factor (%)
A2	Gordon Street / Maltby Road	100.000

Demand Set Details

ID	Scenario name	Time Period name	Traffic profile type	Start time (HH:mm)	Finish time (HH:mm)	Time segment length (min)
D2	Future Total Traffic	Weekday Afternoon Peak Hour	ONE HOUR	15:45	17:15	15

Gordon Street / Maltby Road - Future Total Traffic, Weekday Afternoon Peak Hour

Data Errors and Warnings

Severity	Area	Item	Description
Last Run	Last Run	1 - Maltby Road East (East Leg) - Capacity	Pedestrian Crossing causes blocking on previous leg due to traffic queing to leave the intersection in 6 timesegment(s).
Last Run	Last Run	3 - Maltby Road East (West Leg) - Capacity	Pedestrian Crossing causes blocking on previous leg due to traffic queing to leave the intersection in 6 timesegment(s).
Warning	Queue variations	Analysis Options	Queue percentiles may be unreliable if the mean queue in any time segment is very low or very high.

Intersection Network

Intersections

Intersection	Name	Intersection Type	Intersection Delay (s)	Intersection LOS
2	Gordon Street / Maltby Road	Standard Roundabout	7.74	A

Intersection Network Options

Driving side	Lighting
Right	Normal/unknown

Legs

Legs

Leg	Name	Description
1	Maltby Road East (East Leg)	
2	Gordon Street (North Leg)	
3	Maltby Road East (West Leg)	
4	Gordon Street (South Leg)	

Roundabout Geometry

Leg	V - Approach road half-width (m)	E - Entry width (m)	I' - Effective flare length (m)	R - Entry radius (m)	D - Inscribed circle diameter (m)	PHI - Conflict (entry) angle (deg)	Exit only
1 - Maltby Road East (East Leg)	3.70	8.00	25.0	50.0	60.0	20.0	
2 - Gordon Street (North Leg)	7.00	8.00	15.0	60.0	60.0	30.0	
3 - Maltby Road East (West Leg)	3.70	8.00	25.0	50.0	60.0	20.0	
4 - Gordon Street (South Leg)	7.00	8.00	15.0	60.0	60.0	30.0	

Unsignalled Pedestrian Crossing Crossings

Leg	Space between crossing and intersection entry (Unsignalled Pedestrian Crossing) (PCE)	Vehicles queueing on exit (Unsignalled Pedestrian Crossing) (PCE)	Central Refuge	Crossing data type	Crossing length (entry side) (m)	Crossing time (entry side) (s)	Crossing length (exit side) (m)	Crossing time (exit side) (s)
1 - Maltby Road East (East Leg)	2.00	2.00	✓	Distance	3.70	2.64	3.70	2.64
2 - Gordon Street (North Leg)	2.00	2.00	✓	Distance	7.00	5.00	7.00	5.00
3 - Maltby Road East (West Leg)	2.00	2.00	✓	Distance	3.70	2.64	3.70	2.64
4 - Gordon Street (South Leg)	2.00	2.00	✓	Distance	7.00	5.00	7.00	5.00

Slope / Intercept / Capacity

Roundabout Slope and Intercept used in model

Leg	Final slope	Final intercept (PCE/hr)
1 - Maltby Road East (East Leg)	0.641	2087

2 - Gordon Street (North Leg)	0.695	2448
3 - Maltby Road East (West Leg)	0.641	2087
4 - Gordon Street (South Leg)	0.695	2448

The slope and intercept shown above include any corrections and adjustments.

Traffic Demand

Vehicle mix source	PCE Factor for a Truck (PCE)
Truck Percentages	2.00

Demand overview (Traffic)

Leg	Linked leg	Use O-D data	Average Demand (Veh/hr)	Scaling Factor (%)
1 - Maltby Road East (East Leg)		✓	277	100.000
2 - Gordon Street (North Leg)		✓	1166	100.000
3 - Maltby Road East (West Leg)		✓	324	100.000
4 - Gordon Street (South Leg)		✓	1584	100.000

Demand overview (Pedestrians)

Leg	Average pedestrian flow (Ped/hr)
1 - Maltby Road East (East Leg)	15.00
2 - Gordon Street (North Leg)	100.00
3 - Maltby Road East (West Leg)	15.00
4 - Gordon Street (South Leg)	15.00

Origin-Destination Data

Demand (Veh/hr)

		To			
		1 - Maltby Road East (East Leg)	2 - Gordon Street (North Leg)	3 - Maltby Road East (West Leg)	4 - Gordon Street (South Leg)
From	1 - Maltby Road East (East Leg)	0	66	158	53
	2 - Gordon Street (North Leg)	63	0	39	1064
	3 - Maltby Road East (West Leg)	178	86	0	60
	4 - Gordon Street (South Leg)	84	1416	84	0

Vehicle Mix

Truck Percentages

		To			
		1 - Maltby Road East (East Leg)	2 - Gordon Street (North Leg)	3 - Maltby Road East (West Leg)	4 - Gordon Street (South Leg)
From	1 - Maltby Road East (East Leg)	2	2	2	2
	2 - Gordon Street (North Leg)	2	2	2	2
	3 - Maltby Road East (West Leg)	2	2	2	2
	4 - Gordon Street (South Leg)	2	2	2	2

Results

Results Summary for whole modelled period

Leg	Max V/C Ratio	Max delay (s)	Max Queue (Veh)	Max 95th percentile Queue (Veh)	Max LOS
1 - Maltby Road East (East Leg)	0.59	17.12	1.4	6.9	C
2 - Gordon Street (North Leg)	0.60	4.13	1.5	2.0	A
3 - Maltby Road East (West Leg)	0.39	6.53	0.6	3.0	A
4 - Gordon Street (South Leg)	0.81	9.01	4.3	16.9	A

Main Results for each time segment

15:45 - 16:00

Leg	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Pedestrian demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - Maltby Road East (East Leg)	209	1189	11.29	968	0.215	207	0.3	4.727	A
2 - Gordon Street (North Leg)	878	221	75.29	2239	0.392	875	0.6	2.636	A
3 - Maltby Road East (West Leg)	244	886	11.29	1260	0.194	243	0.2	3.535	A
4 - Gordon Street (South Leg)	1193	245	11.29	2227	0.535	1188	1.1	3.449	A

16:00 - 16:15

Leg	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Pedestrian demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - Maltby Road East (East Leg)	249	1423	13.48	767	0.325	248	0.5	6.914	A
2 - Gordon Street (North Leg)	1048	264	89.90	2204	0.476	1047	0.9	3.108	A
3 - Maltby Road East (West Leg)	291	1060	13.48	1108	0.263	291	0.4	4.402	A
4 - Gordon Street (South Leg)	1424	294	13.48	2192	0.650	1421	1.8	4.655	A

16:15 - 16:30

Leg	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Pedestrian demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - Maltby Road East (East Leg)	305	1737	16.52	521	0.586	301	1.4	16.173	C
2 - Gordon Street (North Leg)	1284	322	110.10	2157	0.595	1282	1.5	4.103	A
3 - Maltby Road East (West Leg)	357	1296	16.52	910	0.392	356	0.6	6.476	A
4 - Gordon Street (South Leg)	1744	359	16.52	2143	0.814	1735	4.2	8.631	A

16:30 - 16:45

Leg	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Pedestrian demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - Maltby Road East (East Leg)	305	1746	16.52	515	0.593	305	1.4	17.120	C
2 - Gordon Street (North Leg)	1284	325	110.10	2155	0.596	1284	1.5	4.132	A
3 - Maltby Road East (West Leg)	357	1299	16.52	908	0.393	357	0.6	6.528	A
4 - Gordon Street (South Leg)	1744	360	16.52	2142	0.814	1744	4.3	9.012	A

16:45 - 17:00

Leg	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Pedestrian demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - Maltby Road East (East Leg)	249	1435	13.48	758	0.329	253	0.5	7.179	A
2 - Gordon Street (North Leg)	1048	269	89.90	2201	0.476	1050	0.9	3.132	A
3 - Maltby Road East (West Leg)	291	1064	13.48	1105	0.264	292	0.4	4.436	A
4 - Gordon Street (South Leg)	1424	295	13.48	2191	0.650	1434	1.9	4.814	A

17:00 - 17:15

Leg	Total Demand (Veh/hr)	Circulating flow (Veh/hr)	Pedestrian demand (Ped/hr)	Capacity (Veh/hr)	V/C Ratio	Throughput (Veh/hr)	End queue (Veh)	Delay (s)	LOS
1 - Maltby Road East (East Leg)	209	1197	11.29	962	0.217	209	0.3	4.792	A
2 - Gordon Street (North Leg)	878	223	75.29	2238	0.392	879	0.6	2.651	A
3 - Maltby Road East (West Leg)	244	890	11.29	1257	0.194	244	0.2	3.559	A
4 - Gordon Street (South Leg)	1193	247	11.29	2226	0.536	1195	1.2	3.501	A

Queue Variation Results for each time segment

15:45 - 16:00

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - Maltby Road East (East Leg)	0.27	0.00	0.00	0.27	0.27			N/A	N/A
2 - Gordon Street (North Leg)	0.64	0.55	1.00	1.40	1.45			N/A	N/A
3 - Maltby Road East (West Leg)	0.24	0.00	0.00	0.24	0.24			N/A	N/A

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
4 - Gordon Street (South Leg)	1.14	0.55	1.00	1.40	1.45			N/A	N/A

16:00 - 16:15

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - Maltby Road East (East Leg)	0.48	0.04	0.41	1.25	1.37			N/A	N/A
2 - Gordon Street (North Leg)	0.90	0.06	0.76	1.63	2.03			N/A	N/A
3 - Maltby Road East (West Leg)	0.35	0.00	0.00	0.35	0.35			N/A	N/A
4 - Gordon Street (South Leg)	1.83	0.04	0.43	4.91	8.42			N/A	N/A

16:15 - 16:30

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - Maltby Road East (East Leg)	1.36	0.03	0.27	1.36	2.87			N/A	N/A
2 - Gordon Street (North Leg)	1.45	0.03	0.26	1.45	1.45			N/A	N/A
3 - Maltby Road East (West Leg)	0.64	0.03	0.25	0.64	0.64			N/A	N/A
4 - Gordon Street (South Leg)	4.16	0.03	0.30	4.16	16.95			N/A	N/A

16:30 - 16:45

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - Maltby Road East (East Leg)	1.41	0.03	0.30	1.90	6.87			N/A	N/A
2 - Gordon Street (North Leg)	1.46	0.03	0.26	1.46	1.46			N/A	N/A
3 - Maltby Road East (West Leg)	0.64	0.03	0.30	1.04	3.04			N/A	N/A
4 - Gordon Street (South Leg)	4.27	0.03	0.27	4.27	5.55			N/A	N/A

16:45 - 17:00

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - Maltby Road East (East Leg)	0.50	0.04	0.43	1.27	1.39			N/A	N/A
2 - Gordon Street (North Leg)	0.91	0.51	0.99	1.42	1.48			N/A	N/A
3 - Maltby Road East (West Leg)	0.36	0.00	0.00	0.36	0.36			N/A	N/A
4 - Gordon Street (South Leg)	1.88	0.06	0.86	4.72	6.98			N/A	N/A

17:00 - 17:15

Leg	Mean (Veh)	Q05 (Veh)	Q50 (Veh)	Q90 (Veh)	Q95 (Veh)	Percentile message	Marker message	Probability of reaching or exceeding marker	Probability of exactly reaching marker
1 - Maltby Road East (East Leg)	0.28	0.03	0.30	0.87	1.20			N/A	N/A
2 - Gordon Street (North Leg)	0.65	0.08	0.78	1.36	1.43			N/A	N/A
3 - Maltby Road East (West Leg)	0.24	0.00	0.00	0.24	0.24			N/A	N/A
4 - Gordon Street (South Leg)	1.16	0.04	0.38	2.94	5.22			N/A	N/A