TRAFFIC IMPACT STUDY (UPDATE)

Proposed Residential and Commercial Development
Greenly Drive
Town of Cobourg, ON

April 2020

Prepared for
VANDYK Group of Companies

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Transportation Engineering

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April 21, 2020

Mr. Justin Mamone, BES, MCIP, RPP
VANDYK Group of Companies
1944 Fowler Drive
Mississauga, ON L5K 0A1

Re: Proposed Residential and Commercial Development, Greenly Drive, Cobourg, ON – Traffic Impact Study (Update)

Dear Mr. Mamone,

TRANS-PLAN is pleased to submit this Traffic Impact Study (Update) in support of the proposed residential and commercial development located at Greenly Drive in the Town of Cobourg. The proposed development consists of two land parcels, consisting of residential dwellings on the south parcel and a commercial plaza on the north parcel.

The study findings indicate that the surrounding road network can accommodate the traffic generated by the proposed development. The residential parcel is expected to have minimal impacts on the surrounding road network. The east and west approaches at the Greenly Drive and private condominium laneway intersection (located south of the site) are recommended to operate as a minor road (stop-controlled); and the north and south approaches operate as a major road (free-flow).

The future commercial site traffic can be accommodated by the proposed driveway and surrounding road network. Traffic activity at the Elgin Street West and Rogers Road is expected to function in an acceptable manner after build-out of the proposed development. No roadway improvements (other than the proposed design features) or signal timing adjustments were found necessary. Details are provided herein.

Sincerely,

Anil Seegobin, P.Eng.
Partner, Engineer

Trans-Plan Transportation Inc.
Transportation Consultants

Jonathan Li, B.Eng.
Transportation E.I.T.

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Transmittal Letter

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1. INTRODUCTION

Trans-Plan has been retained by VANDYK Group of Companies to complete a Traffic Impact Study (Update) for a proposed residential and commercial development located at Greenly Drive in the Town of Cobourg. This Traffic Impact Study (Update) includes the following study components:

- A review and assessment of the existing road network
- An assessment of boundary roadway operations under future background conditions, including a review of traffic growth, area developments and planned roadway improvements in the study area
- An assessment of site-generated traffic impacts on the study area intersections under future background and total traffic conditions
- Recommendations to mitigate any identified traffic impacts on the boundary roadways, resulting from the proposed development
- The determination of roadway and intersection improvements, as required, to accommodate the proposed development

This study is an update to the previous Traffic Impact Study submission, dated July 10, 2013; prepared by Trans-Plan for the subject development proposal. It reflects the Terms of Reference comments received from the Town of Cobourg and Northumberland County for the previous study.

2. STUDY AREA CONTEXT

2.1 Site Location

The subject site, shown in Figure 1, is a vacant parcel of land located along the south side of Elgin Street West. It is located approximately 300m west of the Elgin Street West and Rogers Road major intersection. The site is bounded by private residential laneways and local municipal roadways to the south. Greenly Drive currently forms a termination point at the southern site boundary.

The surrounding land uses mainly consist of low-density residential dwellings, located south and west of the site. Adjacent east of the site is a Canadian Tire retail (commercial) store. The lands north of the site, opposite from Elgin Street West, are vacant.

2.2 Road Network

The study area roadways in the immediate vicinity of the site are described as follows:

Elgin Street West, also known as **County Road 2**, is an arterial road under the jurisdiction of Northumberland County. It runs in an east-west direction and has four travel lanes: two in each direction. The posted speed limit within the vicinity of the study area is 50km/h.

Wilkins Gate and **Carlisle Street** are local roadways under the jurisdiction of the Town of Cobourg. Wilkins Gate runs in a north-south direction and Carlisle Street runs in an east-west direction. Both roadways have two travel lanes: one in each direction. The speed limit is not posted and is assumed to be 50km/h.

Rogers Road is a local roadway under the jurisdiction of the Town of Cobourg. It runs in a north-south direction and has two travel lanes: one in each direction, plus a two-way centre left turn lane. The speed limit is not posted and is assumed to be 50km/h.

3. PROPOSED DEVELOPMENT

The site plans, prepared by Husson Engineering + Management, are shown in Figure 2 and Figure 3. The proposed development consists of two land parcels; one for low-density residential dwellings and one for a commercial plaza. The proposed commercial plaza is located on the north parcel, along Elgin Road West. The proposed residential dwellings are located on the south parcel.

The development statistics are as follows:

- 72 residential dwelling units, provided by 13 townhouse buildings and 5 semi-detached buildings
- Three (3) commercial buildings, as follows:
  - Building A (Retail Use): 2,900 sq.ft. of GFA
  - Building B (Retail Use): 6,300 sq.ft. of GFA
  - Building C (Fast-Food Restaurant with Drive-Thru): 2,200 sq.ft. of GFA
- One (1) new municipal roadway, known as Cowin Circle, that is designed as a ring road

The residential dwelling driveways are proposed on Cowin Circle. Greenly Drive is proposed to be extended beyond its existing northerly termination point to connect with Cowin Circle. The proposed commercial plaza is accessed via two driveways: one proposed right-in / right-out ("RIRO") access on Elgin Street West and an internal connection with the adjacent Canadian Tire property.

As shown in the site plan, an auxiliary eastbound right turn lane is proposed on Elgin Street West to serve the proposed RIRO driveway and the adjacent Canadian Tire driveway. The auxiliary lane will begin prior to the RIRO driveway and terminate at the Canadian Tire driveway.

The laneway connecting the residential and commercial parcels (shown as "access lane" on the site plan) is intended to be an emergency access only and regular vehicular traffic is not permitted. It can be utilized as a pedestrian connection however.

4. EXISTING CONDITIONS

The existing roadway characteristics of the study area are shown in Figure 4, and were confirmed based on a site visit conducted by Trans-Plan on Wednesday March 18, 2020. The historical (2013) and existing (2020) traffic volumes, for the weekday AM and PM and SAT peak hours, are shown in Figure 5 and Figure 6, respectively.

4.1 Study Area Intersections and Driveways

The study area intersections and driveways reviewed in our analysis are as follows:

1. Elgin Street West and Wilkins Gate (unsignalized / stop-controlled intersection)
2. Elgin Street West and Proposed Commercial Site Driveway (unsignalized / stop-controlled driveway)
3. Elgin Street West and Canadian Tire Driveway (unsignalized / stop-controlled driveway)
4. Elgin Street West and Rogers Road (signalized intersection)
5. Carlisle Street and Greenly Drive / Cowin Circle (unsignalized / stop-controlled driveway)

4.2 Traffic Counts

Given the COVID-19 pandemic at the time of this report, it was not possible conduct new turning movement counts ("TMC") due to the irregular traffic patterns. The traffic counts from the following sources were referenced to establish the existing traffic volumes at the study area intersections and driveways:

- Traffic Impact Study, Proposed Retail and Residential Development (Canadian Tire Lands), Elgin Street West, East of Wilkins Gate, dated July 10, 2013; prepared by Trans-Plan.
- Transportation Impact Study, Proposed Driveway Relocation and Commercial Addition, Northumberland Mall, Town of Cobourg, dated July 17th, 2019; prepared by LEA Consulting Ltd. *(obtained from the Town's website*).

The traffic count sources, dates, times and peak hours are shown in Table 1. The detailed TMC data is provided in Appendix A.

Table 1 – Intersection Turning Movement Count Details

Location	Source	Count Date	Count Hours	Peak Hours
Intersections				
Elgin Street West and Wilkins Gate	Trans-Plan	Tuesday May 28, 2013	7:00am – 9:30am 3:30pm – 6:00pm	8:30am – 9:30am 3:30am – 4:30pm
	Trans-Plan	Saturday May 25, 2013	11:30am – 3:30pm	12:45pm – 1:45pm
Carlisle Street and Greenly Drive	Trans-Plan	Tuesday May 28, 2013	7:00am – 9:30am 3:30pm – 6:00pm	8:15am – 9:15am 3:45pm – 4:45pm
	Trans-Plan	Saturday May 25, 2013	11:30am – 3:30pm	12:00pm – 1:00pm
Elgin Street West and Rogers Road	Trans-Plan	Tuesday May 28, 2013	7:00am – 9:30am 3:30pm – 6:00pm	8:00am – 9:00am 3:30pm – 4:30pm
	Trans-Plan	Saturday May 25, 2013	11:30am – 3:30pm	11:45pm – 12:45pm
	LEA Consulting	Friday May 24, 2019	3:00pm – 7:00pm	3:45pm – 4:45pm
	LEA Consulting	Saturday May 25, 2019	10:00am – 4:00pm	10:45am – 11:45am
Driveways				
Elgin Street West and Canadian Tire Driveway	Trans-Plan	Tuesday May 28, 2013	7:00am – 9:30am 3:30pm – 6:00pm	8:00am – 9:00am 3:30pm – 4:30pm
	Trans-Plan	Saturday May 25, 2013	11:30am – 3:30pm	11:30pm – 12:30pm

4.3 Traffic Growth Adjustment Factor

We note that the intersection of Elgin Street West at Rogers Road, for which a current (2019) count was obtained, is the most critical intersection in the study area; given that it is signalized and would be most impacted by the traffic volumes generated by the development. The intersection at Elgin Road and Wilkins

Gate is secondary (approximately 200m west of the site) and the remaining two intersections are residential and serve the local area only.

Notwithstanding, the historical (2013) and recent (2019) counts conducted at Elgin Street West and Rogers Road were compared to determine a growth factor, for the purpose of scaling up all of the study area TMCs to current (2020) traffic conditions. The traffic growth adjustment factor is calculated in Table 2.

Table 2 – Traffic Growth Adjustment Factor, Years 2013 to 2019, Elgin Street West and Rogers Road

Time Period	Total Volumes, All Approaches (vehicles)		Traffic Growth Adjustment Factor
	Year 2013	Year 2019	
Weekday AM Peak Hour	1,076	n/a	n/a
Weekday PM Peak Hour	1,546	1,771	2019 count is 15% higher
SAT Peak Hour	1,964	1,619	2019 count is 18% lower

To obtain the existing (2020) traffic volumes, an adjustment factor of +15 percent was applied to the historical (2013) weekday AM and PM peak hour volumes for the following intersections:

- Elgin Street West and Rogers Road (weekday AM peak hour only)
- Elgin Street West and Wilkins Gate
- Carlisle Street and Greenly Drive
- Elgin Street West and Canadian Tire Driveway

No adjustment factor was applied to the historical Saturday ("SAT") peak hour volumes (to be conservative), because the 2019 counts had lower all approach volumes than the 2013 counts. The Elgin Street West and Rogers Road counts, for the weekday PM and SAT peak hours, conducted by LEA Consulting Ltd. in May 2019, were carried forward into the existing (2020) traffic model.

The existing (2020) traffic volumes shown in Figure 6 were balanced (increased in comparison to the traffic counts), where appropriate, for corridor volume consistency.

4.4 Signal Timing Plans

The signal timing plan for the Elgin Street West and Rogers Road signalized intersection was obtained from Northumberland County.

4.5 Peak Hour Factors

A conservative peak hour factor ("PHF") of 0.92 was applied to the study area intersections and driveways in our analysis.

5. FUTURE CONDITIONS

The future study area roadway characteristics, with the inclusion of the proposed auxiliary lane on Elgin Street West, is shown in Figure 7. The future background traffic volumes, for the weekday AM and PM and SAT peak hours, are shown in Figure 8 and were determined based on review of the following:

- Horizon Year(s)

- Background Growth Rate along the Elgin Street West Corridor
- Background Developments within or nearby the study area
- Planned Roadway Improvements within the study area

The site trip assignments and pass-by trip adjustment, for the weekday AM and PM and SAT peak hours, are shown in Figure 9 through to Figure 11. The future total traffic volumes, shown in Figure 12, were calculated by summing the future background volumes, site trip assignment and pass-by adjustment volumes.

5.1 Horizon Years

A 5-year horizon period (i.e. year 2025) was utilized for our analysis of future traffic conditions.

5.2 Background Growth Rate

The County Road 2 Class EA for Hamilton Road to William Street / Burnham Street ("EA Study"), dated May 2016 and prepared by HDR Inc., indicated a growth rate of 1.8 percent per annum for the Elgin Street West corridor. An excerpt of the EA Study is provided in Appendix B. The growth rate (compounded annually) was applied to the Elgin Street West corridor in our analysis of future conditions.

5.3 Background Developments

The Town of Cobourg website was consulted for nearby development applications. Two notable background developments that are incomplete were found near the study area and are shown in Table 3. The background development details and trip generation / distribution are provided in Appendix C.

Table 3 – Background Developments, Nearby the Study Area

No.	Location / Description	Land Use	Development Size	Build-out Status*	Trip Generation Source
1	New Amherst Residential Development	Residential	665 dwelling units	~50%	ITE Trip Generation Manuals, 10th Edition
2	Northumberland Mall (1111 Elgin Street West, Cobourg)	Commercial	One-storey building addition with 930 sq.m. of GFA and driveway relocation	0%	Transportation Impact Study, dated July 17th, 2019; prepared by LEA Consulting Ltd.

Note: (*) Based on Trans-Plan's site visit conducted on Wednesday March 18, 2020

The New Amherst Residential Development is an on-going background development located along New Amherst Boulevard, west of the study area. Based on Trans-Plan's site visit conducted on Wednesday March 18, 2020; the development is estimated to be about 50 percent complete (i.e. 332 dwelling units incomplete). For our analysis, approximately 40 percent of the trips generated by the 332 incomplete units were assumed to access the study area intersections along Elgin Street West.

A one-storey building addition is proposed at Northumberland Mall, located on the southeast corner of Elgin Street West and Rogers Road. The Transportation Impact Study, dated July 17th, 2019; prepared by LEA Consulting Ltd. (obtained from the Town's website) was referenced to obtain the trip generation and distribution for our analysis.

5.4 Roadway Improvements

The Elgin Road West corridor (also known as County Road 2), within the study area and beyond, is planned to undergo roadway improvements. The construction timeline is unavailable, based on review of the Northumberland County website, but the roadway improvements were included into our analysis of future conditions. The conceptual plan and profile drawings provided in the County Road 2 Class EA for Hamilton Road to William Street / Burnham Street ("EA Study"), dated May 2016 and prepared by HDR Inc., were reviewed. The drawing excerpts are provided in Appendix B.

Based on the drawings in the EA Study, in contrast to the existing roadway characteristics, the following design features are planned:

- **Elgin Street West and Wilkins Gate:** The addition of an exclusive eastbound right-turn lane, compared to a shared through / right turn lane in existing conditions.
- **Elgin Street West beyond 75m west of Wilkins Gate:** An additional through lane for each direction (two through lanes total per direction), compared to the one through lane per direction in existing conditions.

As shown in the site plan, an auxiliary eastbound right-turn lane is also proposed on Elgin Street West at the proposed commercial site driveway and the adjacent Canadian Tire driveway. The future study area roadway characteristics are shown in Figure 7 and were incorporated into the analysis of future traffic conditions.

5.5 Trip Generation

The site trips for the proposed development were generated using the Institute of Transportation Engineers ("ITE") Trip Generation manuals, 10th Edition. The site trip generation using the applicable ITE Land Use Codes ("LUC") are shown in Table 4.

Table 4 – Site Trip Generation, Residential and Commercial Parcels

Land Use	Size	Weekday AM Peak Hour			Weekday PM Peak Hour			SAT Peak Hour		
		In	Out	Total	In	Out	Total	In	Out	Total
Residential Parcel										
Multifamily Housing (Low-Rise) LUC 220	72 units									
	Distribution	23%	77%	100%	63%	37%	100%	50%(1)	50%(1)	100%
	Equation	Ln(T) = 0.95Ln(X) – 0.51			Ln(T) = 0.89Ln(X) – 0.02			T = 1.08(X) – 33.24		
	Rate	0.12	0.37	0.49	0.38	0.23	0.61	0.31	0.32	0.63
	Residential Trips	**8**	**27**	**35**	**28**	**16**	**44**	**22**	**23**	**45**
Commercial Parcel										
Shopping Centre LUC 820 *(Buildings A & B)*	9.2 x 1,000 sq.ft.									
	Distribution	54%	46%	100%	50%	50%	100%	52%	48%	100%
	Equation	T = 2.76(X) + 77.28(2)			Ln(T) = 0.72Ln(X) + 3.02			Ln(T) = 0.79Ln(X) + 2.79		
	Rate	6.05	5.15	11.20	5.49	5.49	10.98	5.31	4.91	10.22
	Total Trips	56	47	103	50	51	101	49	45	94
	Trip Reduction (5%)	-3	-2	-4	-2	-3	-4	-3	-2	-5
	Reduced Trips	53	45	98	48	48	96	46	43	89
	Pass-by Trips (25%)	12	12	24	12	12	24	11	11	22
	New Trips	41	33	74	36	36	72	35	32	67
Fast-Food with Drive-Thru LUC 934 *(Building C)*	2.2 x 1,000 sq.ft.									
	Distribution	51%	49%	100%	52%	48%	100%	51%	49%	100%
	Equation	Not Given			Not Given			Not Given		
	Rate	20.50	19.69	40.19	16.99	15.68	32.67	27.98	26.88	54.86
	Total Trips	45	43	88	37	35	72	62	59	121
	Trip Reduction (5%)	-2	-2	-4	-2	-2	-4	-3	-3	-6
	Reduced Trips	43	41	84	35	33	68	59	56	115
	Pass-by Trips (50%)	21	21	42	17	17	34	29	29	58
	New Trips	22	20	42	18	16	34	30	27	57
Total New Commercial Trips		**63**	**53**	**116**	**54**	**52**	**106**	**65**	**59**	**124**
Total Pass-by Commercial Trips		**33**	**33**	**66**	**29**	**29**	**58**	**40**	**40**	**80**

Note:
(1) Directional distribution was unavailable in the ITE Manual and was assumed
(2) Based on the equation provided for the "Peak Hour of Generator"

The residential parcel is expected to generate approximately 35, 44 and 45 two-way trips in the weekday AM and PM and Saturday ("SAT") peak hours, respectively, as shown in Figure 9.

A minor trip reduction of 5 percent was applied due to internal interactions with the proposed residential dwelling units and the adjacent commercial properties. The commercial parcel is expected to generate approximately 116, 106 and 124 new two-way trips in the weekday AM and PM and SAT peak hours, respectively, as shown in Figure 10.

Pass-by trip percentages of 25 percent and 50 percent, respectively, were applied to LUC 820 (i.e. Buildings A & B) and LUC 934 (i.e. Building C). The percentages were approximated based on the pass-by trip data in the ITE Trip Generation Handbook, 3rd Edition. The commercial parcel is expected to generate approximately 66, 58 and 80 two-way pass-by trips in the weekday AM and PM and SAT peak hours, respectively, as shown in Figure 11.

5.6 Trip Distribution and Assignment

The commercial site trips were distributed to Elgin Street West utilizing existing travel patterns. A portion of the commercial site trips were distributed to the adjacent Canadian Tire driveways, as a result of the proposed internal connection. The existing directional split on Elgin Street West at the proposed commercial site driveway is approximately 50 percent eastbound / 50 percent westbound during the weekday AM and PM, and SAT peak hours.

Higher delays are typical of left-turn movements from driveway connections onto arterial roadways. As a result, it is likely that some future outbound commercial trips would prefer utilizing the Elgin Street West at Rogers Road signal to travel westbound after leaving the site.

The residential site trips were distributed to Carlisle Street and beyond based on existing travel patterns. The existing directional split on Carlisle Street at Greenly Drive (connecting to the proposed residential parcel) is as follows:

- Weekday AM Peak Hour: 59 percent eastbound / 41 percent westbound
- Weekday PM Peak Hour: 43 percent eastbound / 57 percent westbound
- Saturday Peak Hour: 46 percent eastbound / 54 percent westbound

Similarly, it is likely that future residential outbound trips would prefer utilizing the Elgin Street West at New Amherst Boulevard / Loveshin Road signal (located west of the study area) to travel westbound after leaving the site.

6. CAPACITY ANALYSIS

6.1 Analysis Methodology

A capacity analysis was performed for the study area intersections and driveways using Synchro 10 analysis software. The following traffic conditions, during the weekday AM and PM and Saturday (“SAT”) peak hours, were analyzed:

- Existing Traffic Conditions (2020)
- Future Background Traffic Conditions (2025)
- Future Total Traffic Conditions (2025)

According to the Northumberland County Transportation Master Plan, dated March 2017, a v/c ratio of 0.7 or LOS of D is generally considered as the threshold for traffic congestion. The congested movements have been identified.

6.2 Analysis Results

The detailed capacity analysis results are shown in Table 5 and the congested movements are discussed below. The Synchro 10 output sheets and level of service ("LOS") definitions are provided in Appendix D and Appendix E, respectively.

The results for each study area intersection and driveway are summarized as follows:

Elgin Street West & Wilkins Gate

Existing Conditions

The northbound left movement (stop-controlled approach) currently operates acceptably with a LOS of C or better and delays of up to 22 seconds, during the peak periods.

Future Conditions – Horizon Year 2025

The northbound left movement (stop-controlled approach) is expected to operate with a LOS of D and delays of up to 27 seconds, under future background conditions. With the inclusion of the site traffic, the movement is expected to operate with a LOS of D and delays of up to 29 seconds. The Elgin Street West and New Amherst Boulevard / Loveshin Road traffic signal can provide a more efficient alternative for left-turning vehicles as the delays increase.

Elgin Street West & Proposed Commercial Site Driveway

Future Conditions – Horizon Year 2025

The proposed commercial site driveway is expected to operate with a good LOS of B and minimal delays of up to 11 seconds for outbound vehicles.

Elgin Street West & Canadian Tire Driveway

Existing Conditions

The northbound left movement (outbound approach) currently operates acceptably with a LOS of C or and delays up to 20 seconds, during the weekday AM peak hour. The movement operates with a LOS of D and a delay of 30 seconds, during the weekday PM and SAT peak hours.

Future Conditions – Horizon Year 2025

Under future background conditions, the northbound left movement (outbound approach) is expected to operate acceptably with a LOS of C during the weekday AM peak hour, but with a LOS of E and delays of up to 41 seconds during the weekday PM and SAT peak hours.

With the inclusion of future site traffic, the northbound left movement (outbound approach) is expected to operate with a LOS of E and a delay of 44 seconds during the weekday AM peak hour. The movement is expected to operate with a LOS of F with delay of 98 seconds and 145 seconds, respectively, in the weekday PM and SAT peak hours.

However, a feasible alternative is for some site traffic to utilize the Elgin Street West and Rogers Road signalized intersection to conduct left turn movements. The northbound left turn movement at Elgin Street West and Rogers Road is expected to operate with v/c ratios of 0.70 and 0.54, respectively, during the weekday PM and SAT peak hours. Therefore, the movement has reserve capacity and can

accommodate additional traffic volumes. A v/c ratio of 0.70 is acceptable and well under the critical threshold in other municipalities and counties (i.e. a v/c ratio of 0.85).

Elgin Street West & Rogers Road

Existing Conditions

The overall intersection currently operates acceptably during the peak hours, with an overall LOS of A and v/c ratios of up to 0.52. All individual movements operate with reserve capacity.

Future Conditions – Horizon Year 2025

The intersection is expected to continue operating acceptably in the weekday AM and PM and SAT peak hours, under future total traffic conditions. In the weekday PM peak hour, the overall intersection is expected to operate with a v/c ratio of 0.68 and the northbound left turn movement is expected to operate with a v/c ratio of 0.70. During the SAT peak hour, the overall intersection is expected to operate with a LOS of 0.67 and the westbound left turn movement is expected to operate with a v/c ratio of 0.70.

While the movements are considered congested, a v/c ratio of 0.70 is generally acceptable and well under the critical threshold in other municipalities and counties (i.e. a v/c ratio of 0.85).

Carlisle Street & Greenly Drive / Cowin Circle

Existing Conditions

The intersection currently operates well with a LOS of A and minimal delays across all movements, during the weekday AM and PM, and SAT peak hours.

Future Conditions – Horizon Year 2025

With the inclusion of future site traffic, the intersection is expected to continue operating with minimal delays and a LOS of A for all movements, during the peak hours. Overall, the residential portion of the development is expected to have minimal traffic impacts on the intersection and the surrounding road network.

Table 5 – Capacity Analysis Results, Existing and Future Traffic Conditions

Intersection Movement	Existing Traffic Conditions									2025 Background Traffic Conditions									2025 Total Traffic Conditions								
	Weekday AM Peak Hour			Weekday PM Peak Hour			SAT Peak Hour			Weekday AM Peak Hour			Weekday PM Peak Hour			SAT Peak Hour			Weekday AM Peak Hour			Weekday PM Peak Hour			SAT Peak Hour		
	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS
Elgin Street West & Wilkins Gate																											
Eastbound Through		0	A		0	A		0	A		0	A		0	A		0	A		0	A		0	A		0	A
Eastbound Right		0	A		0	A		0	A		0	A		0	A		0	A		0	A		0	A		0	A
Westbound Left / Through		1	A		1	A		1	A		1	A		1	A		1	A		1	A		1	A		1	A
Westbound Through		0	A		0	A		0	A		0	A		0	A		0	A		0	A		0	A		0	A
Northbound Left		16	C		22	C		18	C		19	C		27	D		22	C		20	C		29	D		24	C
Northbound Right		10	A		11	B		10	B		11	B		11	B		11	B		11	B		11	B		11	B
Elgin Street West & Proposed Commercial Site Driveway																											
Eastbound Through		-	-		-	-		-	-		0	A		0	A		0	A		0	A		0	A		0	A
Eastbound Right		-	-		-	-		-	-		0	A		0	A		0	A		0	A		0	A		0	A
Westbound Through		-	-		-	-		-	-		0	A		0	A		0	A		0	A		0	A		0	A
Northbound Right		-	-		-	-		-	-		0	A		0	A		0	A		11	B		11	B		11	B
Elgin Street West & Canadian Tire Driveway																											
Eastbound Through		0	A		0	A		0	A		0	A		0	A		0	A		0	A		0	A		0	A
Eastbound Right		0	A		0	A		0	A		0	A		0	A		0	A		0	A		0	A		0	A
Westbound Left		9	A		9	A		9	A		9	A		10	A		10	A		9	A		10	B		10	B
Westbound Through		0	A		0	A		0	A		0	A		0	A		0	A		0	A		0	A		0	A
Northbound Left		20	C		30	D		30	D		25	C		41	E		45	E		44	E		98	F		145	F
Northbound Right		10	B		11	B		11	B		10	B		12	B		11	B		10	B		12	B		11	B
Elgin Street West & Rogers Road	**0.33**	**9**	**A**	**0.52**	**10**	**A**	**0.51**	**10**	**A**	**0.40**	**9**	**A**	**0.63**	**11**	**B**	**0.63**	**10**	**B**	**0.42**	**9**	**A**	**0.68**	**11**	**B**	**0.67**	**11**	**B**
Eastbound Through	0.18	4	A	0.24	5	A	0.21	4	A	0.23	5	A	0.29	5	A	0.25	5	A	0.24	5	A	0.30	5	A	0.27	5	A
Eastbound Right	0.03	4	A	0.09	4	A	0.08	4	A	0.03	4	A	0.10	4	A	0.09	4	A	0.03	4	A	0.10	4	A	0.09	4	A
Westbound Left	0.34	6	A	0.51	9	A	0.53	9	A	0.42	8	A	0.63	12	B	0.66	13	B	0.43	8	A	0.68	14	B	0.70	15	B
Westbound Through	0.19	4	A	0.22	5	A	0.21	5	A	0.22	5	A	0.29	5	A	0.26	5	A	0.23	5	A	0.30	5	A	0.28	5	A
Northbound Left	0.30	24	C	0.60	28	C	0.45	25	C	0.32	24	C	0.67	31	C	0.50	26	C	0.36	24	C	0.70	33	C	0.54	27	C
Northbound Right	0.17	23	C	0.19	23	C	0.20	23	C	0.18	23	C	0.38	25	C	0.30	24	C	0.19	23	C	0.47	25	C	0.41	25	C
Carlisle Street & Greenly Drive																											
Eastbound Left / Through / Right		0	A		0	A		1	A		0	A		0	A		0	A		1	A		2	A		2	A
Westbound Left / Through / Right		0	A		2	A		1	A		0	A		2	A		1	A		0	A		2	A		1	A
Northbound Left / Through / Right		9	A		9	A		9	A		9	A		9	A		9	A		9	A		9	A		9	A
Southbound Left / Through / Right		9	A		10	A		9	A		9	A		10	A		9	A		9	A		9	A		9	A

TRANS-PLAN
transportation engineering

7. RECOMMENDED TRANSPORTATION IMPROVEMENTS

Further to the proposed design features, it is recommended that the east and west approaches of the private condominium laneway intersection with Greenly Drive (located between the southerly site boundary and Carlisle Street) to operate as a minor street (stop-controlled). The north and south approaches at the intersection shall operate as the major street (free-flow).

8. SUMMARY AND CONCLUSIONS

8.1 Summary

This Traffic Impact Study (Update), prepared in support of the proposed residential and commercial development at Greenly Drive, Cobourg, is summarized as follows:

Proposed Development & Site Statistics

- Two (2) land parcels are proposed; the south parcel consists of low-density residential dwellings and the north parcel consists of a commercial plaza.
- 72 residential dwelling units, provided by 13 townhouse buildings and 5 semi-detached buildings, are proposed on the residential parcel.
- Three (3) commercial buildings are proposed on the commercial parcel, as follows:
  - Building A (Retail Use): 2,900 sq.ft. of GFA
  - Building B (Retail Use): 6,300 sq.ft. of GFA
  - Building C (Fast-Food Restaurant with Drive-Thru): 2,200 sq.ft. of GFA
- One (1) new municipal roadway, known as Cowin Circle, is designed as a ring road on the residential parcel. The dwelling unit driveways are proposed on Cowin Circle. The new municipal roadway is proposed to connect with the existing northerly termination point of Greenly Drive.
- One (1) right-in / right-out driveway is proposed on Elgin Street West to provide vehicular access to the proposed commercial plaza. An internal connection is also proposed to connect the commercial plaza with the adjacent Canadian Tire property.
- An auxiliary eastbound right turn lane is proposed on Elgin Street West to serve the proposed RIRO driveway and the adjacent Canadian Tire driveway. The auxiliary lane will begin prior to the RIRO driveway and terminate at the Canadian Tire driveway.

Traffic Impact Study

- The study area TMCs conducted in 2013 were factored up to current (2020) traffic conditions. A +15 percent adjustment factor was applied to the weekday AM and PM peak hour volumes. No adjustment was applied to the SAT peak hour volumes, because the 2019 counts had lower all approach volumes than the 2013 counts.
- A background growth rate of 1.8 percent per annum was applied to the Elgin Street West (also known as County Road 2) corridor, based on review of the County Road 2 Class EA from Hamilton Road to William Street / Burnham Street.
- Two (2) notable background developments were found nearby the study area, based on review of the Town of Cobourg website. The estimated trips generated by the developments were included into our analysis of future conditions.

- The planned roadway improvements noted in the County Road 2 Class EA for Hamilton Road to William Street / Burnham Street were incorporated into the analysis of future traffic conditions. The proposed eastbound right-turn auxiliary lane at the proposed commercial site driveway and the adjacent Canadian Tire driveway was also included.
- The site trips were generated utilizing the formulas in the Institute of Transportation Engineers ("ITE") Trip Generation manuals, 10th Edition. Pass-by trip adjustments were applied to the proposed commercial buildings. The trips were distributed to the surrounding road network based on existing travel patterns, with consideration of nearby traffic signals, etc.
- The proposed residential dwellings are expected to have minimal traffic impacts on the surrounding road network. The Carlisie Street and Greenly Drive intersection is expected to operate with minimal delays under future traffic conditions.
- The proposed right-in / right-out commercial site driveway is expected to operate with minimal delays under future traffic conditions.
- The Elgin Street West and Rogers Road intersection is expected to operate acceptably under future traffic conditions. The northbound left and westbound left movements, respectively, are expected to approach the threshold for congestion (i.e. v/c ratio of 0.70) in the weekday PM and SAT peak hours. However, a v/c ratio of 0.70 is generally acceptable and well under the critical threshold in other municipalities and counties (i.e. a v/c ratio of 0.85).
- The northbound left movement (outbound approach) at the Elgin Street West and Canadian Tire driveway is expected to operate with higher delays in the SAT peak hour. However, a feasible alternative is for some site traffic to utilize the Elgin Street West and Rogers Road signalized intersection to conduct left turn movements. The northbound left turn movement at Elgin Street West and Rogers Road is expected to operate with reserve capacity and can accommodate additional traffic volumes.
- It is recommended that the east and west approaches of the Greenly Drive and private condominium laneway (located between the southerly site boundary and Carlisle Street) operate as a minor street (stop-controlled).

8.2 Conclusions

Overall, the surrounding road network can operate acceptably under future traffic conditions, with the inclusion of the additional site traffic. The proposed residential dwellings are expected to have minimal impacts on the surrounding road network. It is recommended that the east and west approaches of the Greenly Drive and private condominium laneway intersection (located between the southerly site boundary and Carlisle Street) operate as a minor street (stop-controlled).

While the adjacent Canadian Tire driveway is expected to experience higher delays, due to the added commercial site traffic, a feasible alternative is for some site traffic to utilize the Elgin Street West and Rogers Road signalized intersection to conduct left turn movements. The northbound left movement at the intersection is expected to operate with reserve capacity under future conditions, and can accommodate additional traffic. No signal timing adjustments or roadway improvements (other than the proposed design features) were found necessary to accommodate the future commercial site traffic.

Respectfully submitted,

Anil Seegobin, P.Eng.
Partner, Engineer

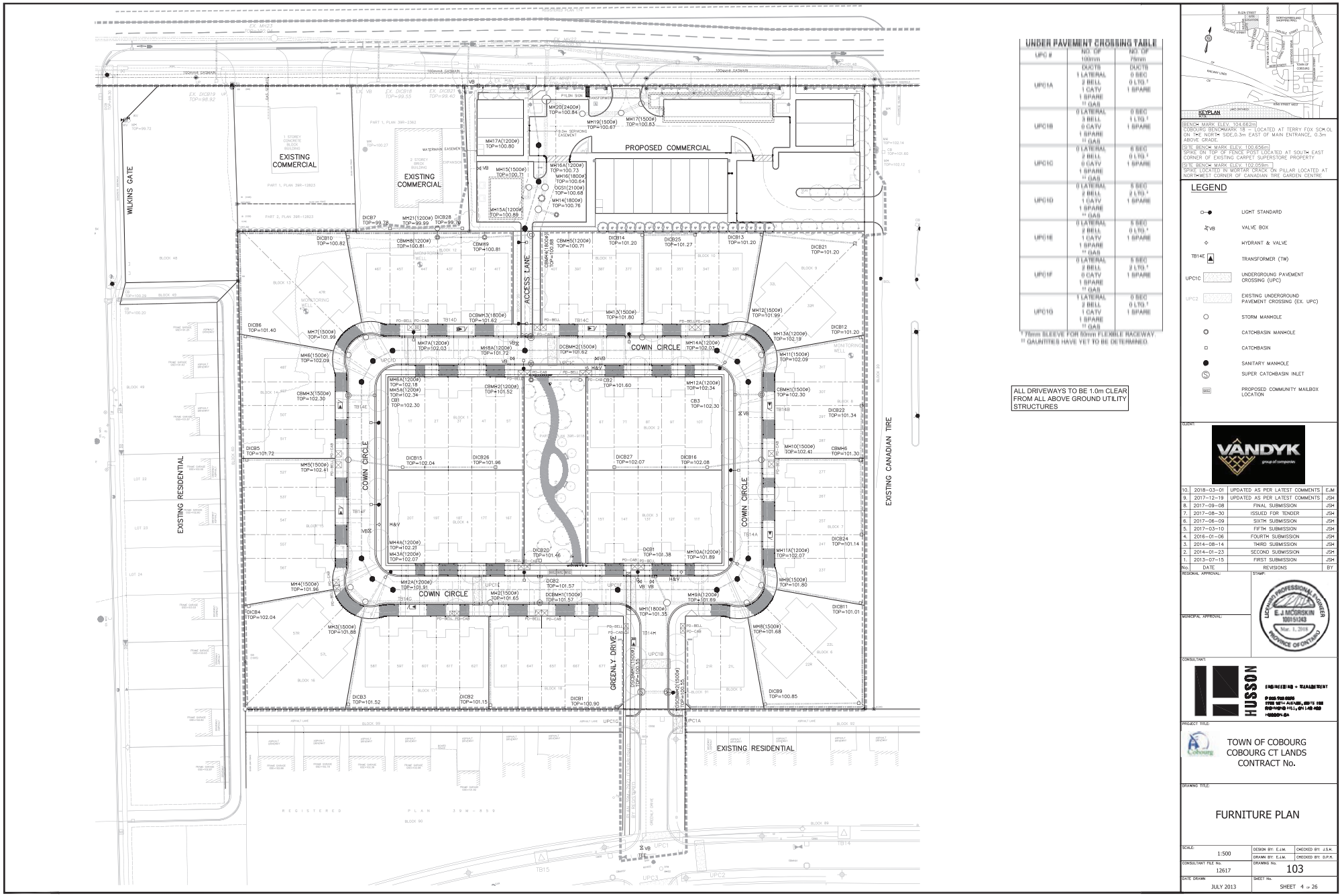
Jonathan Li, B.Eng.
Transportation E.I.T.

Trans-Plan Transportation Inc.
Transportation Consultants

Figure 1 – Site Location

Source: Google Earth

Figure 2 - Site Plan 1



CLIENT: VANDYK group of companies

No.	DATE	REVISIONS	BY
10.	2018-03-01	UPDATED AS PER LATEST COMMENTS	EJM
9.	2017-12-19	UPDATED AS PER LATEST COMMENTS	JSH
8.	2017-09-08	FINAL SUBMISSION	JSH
7.	2017-08-30	ISSUED FOR TENDER	JSH
6.	2017-06-09	SIXTH SUBMISSION	JSH
5.	2017-03-10	FIFTH SUBMISSION	JSH
4.	2016-01-06	FOURTH SUBMISSION	JSH
3.	2014-08-14	THIRD SUBMISSION	JSH
2.	2014-01-23	SECOND SUBMISSION	JSH
1.	2013-07-15	FIRST SUBMISSION	JSH

REGIONAL APPROVAL:
MUNICIPAL APPROVAL:
STAMP: LICENSED PROFESSIONAL ENGINEER E.J. MCGRISKIN 100151243 Mar. 8, 2018 PROVINCE OF ONTARIO

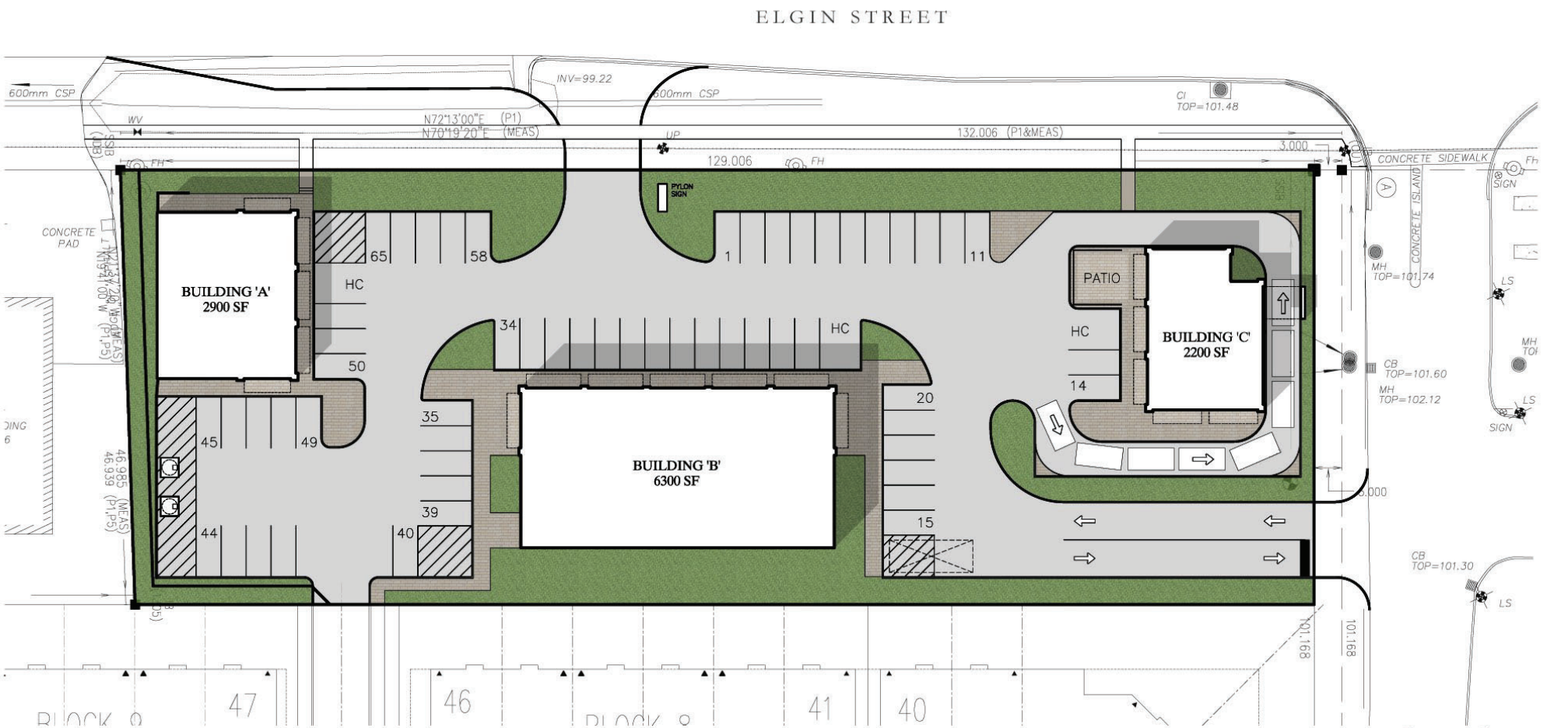
CONSULTANT: HUSSON ENGINEERING + MANAGEMENT

PROJECT TITLE:
TOWN OF COBOURG
COBOURG CT LANDS
CONTRACT No.

DRAWING TITLE:
FURNITURE PLAN

SCALE: 1:500	DESIGN BY: E.J.M.	CHECKED BY: J.S.H.
	DRAWN BY: E.J.M.	CHECKED BY: D.P.H.
CONSULTANT FILE No. 12617	DRAWING No. 103	
DATE DRAWN JULY 2013	SHEET No. SHEET 4 OF 26	

Figure 3 - Site Plan 2



Westpark Plaza

Cobourg, Ontario - September 26, 2013

Figure 4 – Existing Study Area Roadway Characteristics

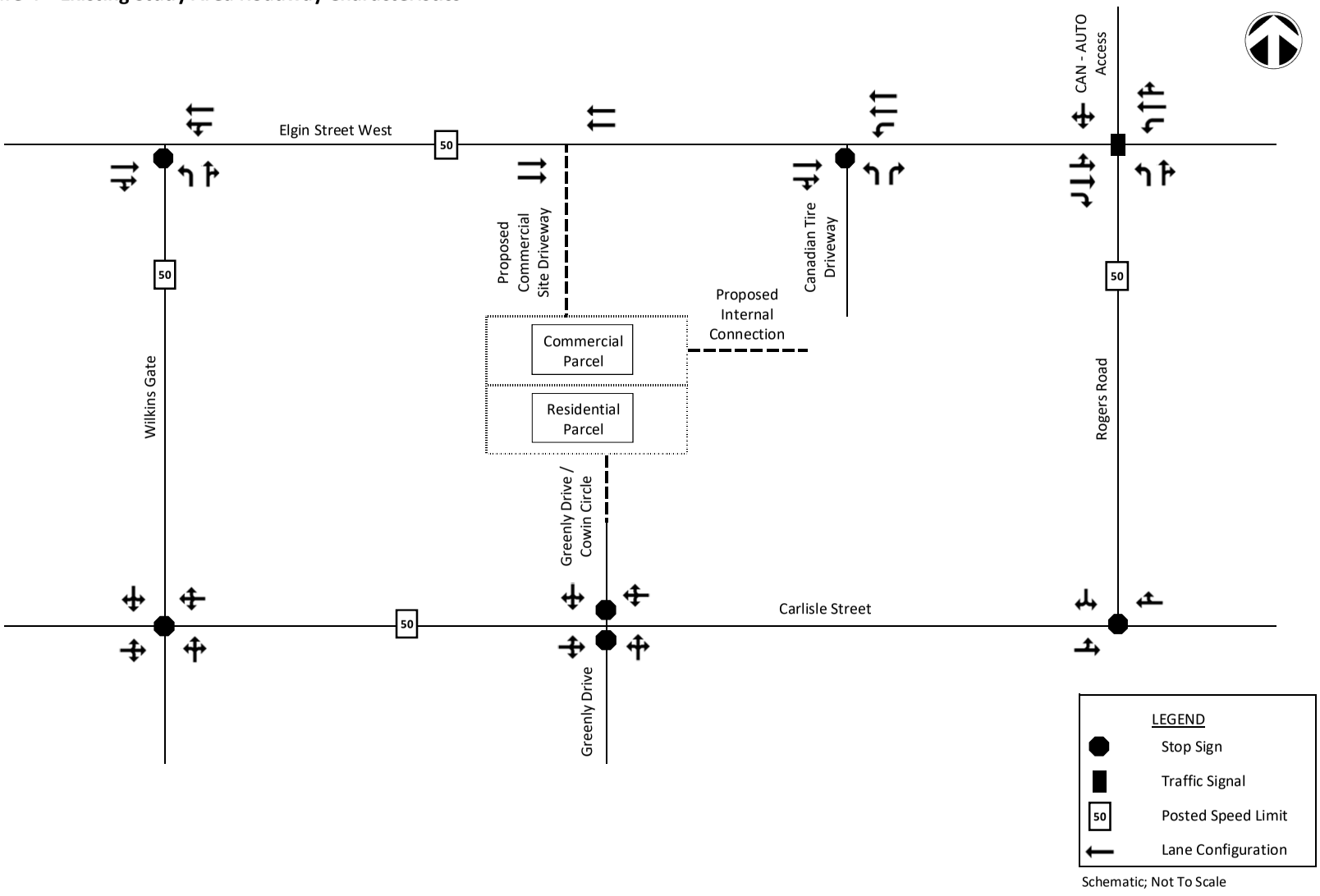


Figure 5 – Historical (2013) Traffic Volumes, Weekday AM and PM and SAT Peak Hours

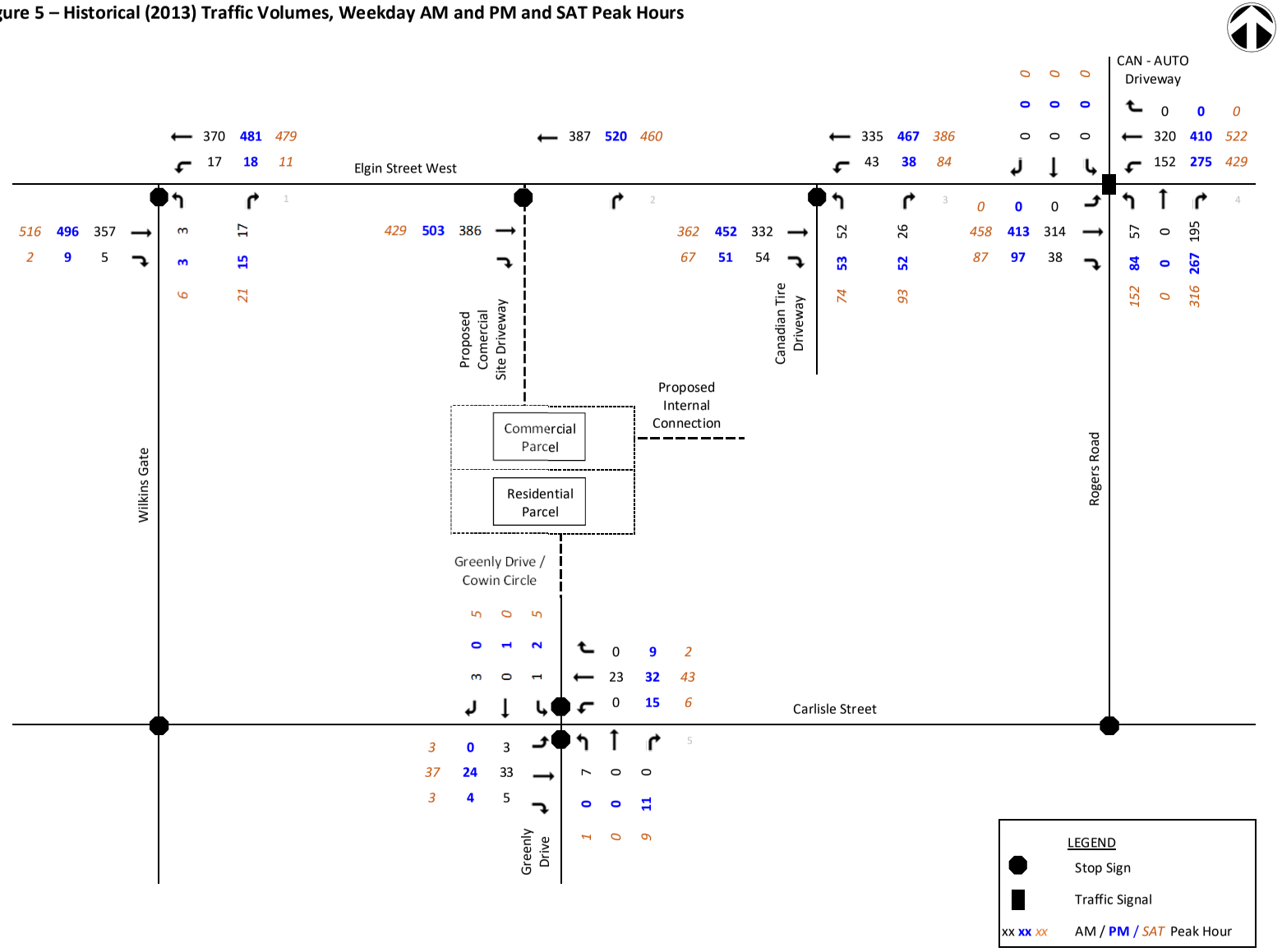


Figure 6 – Existing (2020) Traffic Volumes, Weekday AM and PM and SAT Peak Hours

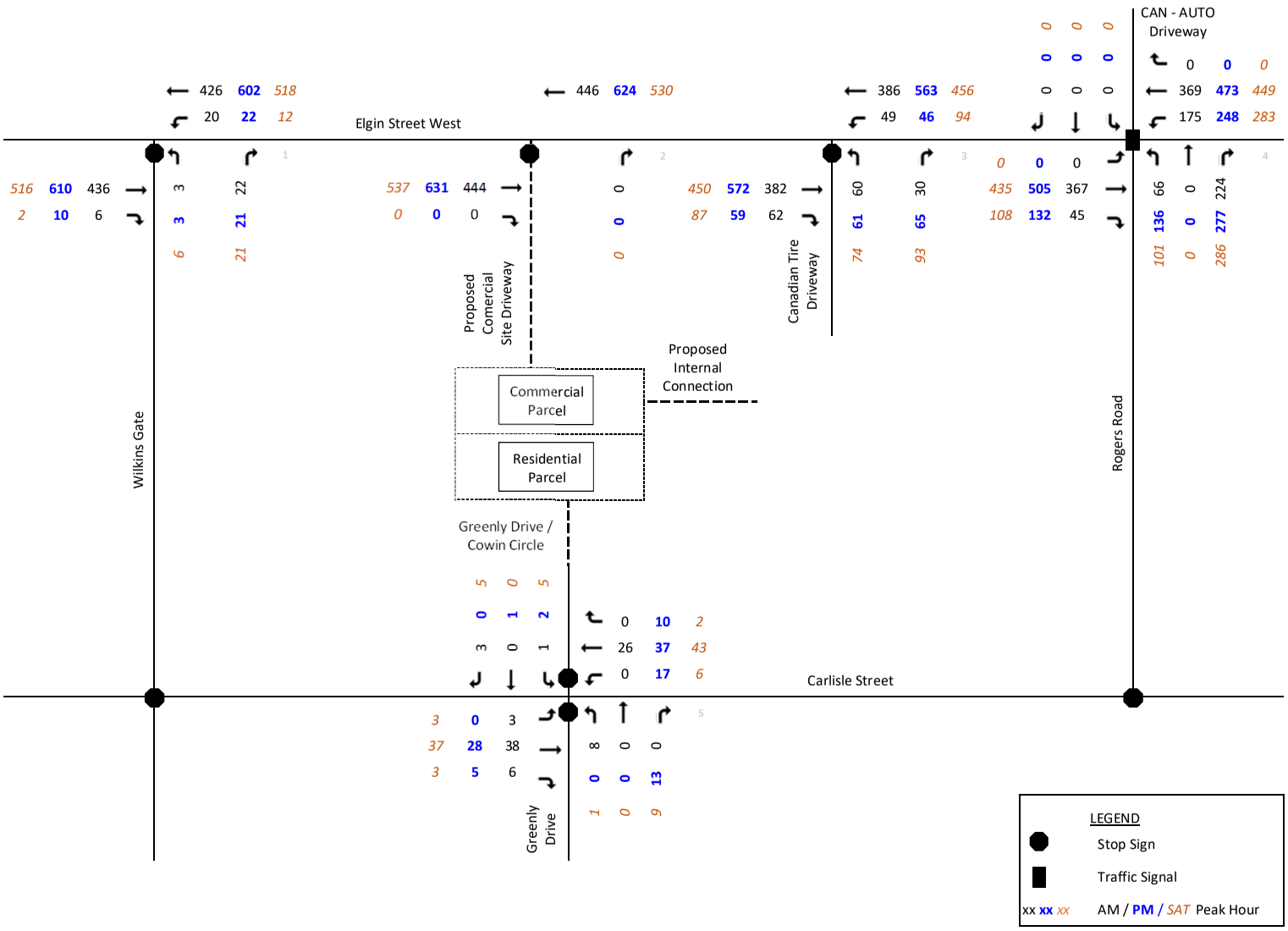


Figure 7 – Future Study Area Roadway Characteristics

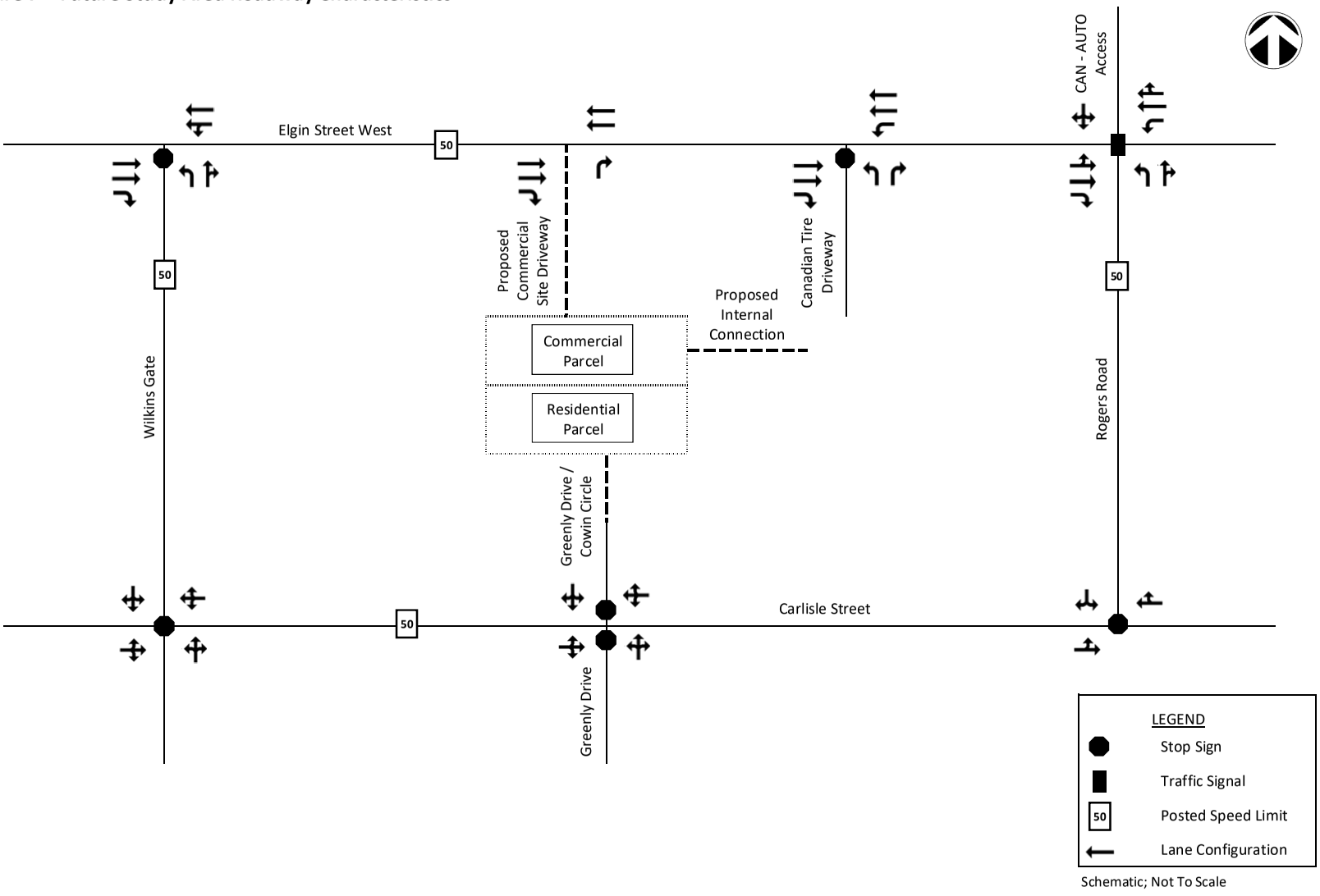


Figure 8 – 2025 Background Traffic Volumes, Weekday AM and PM and SAT Peak Hours

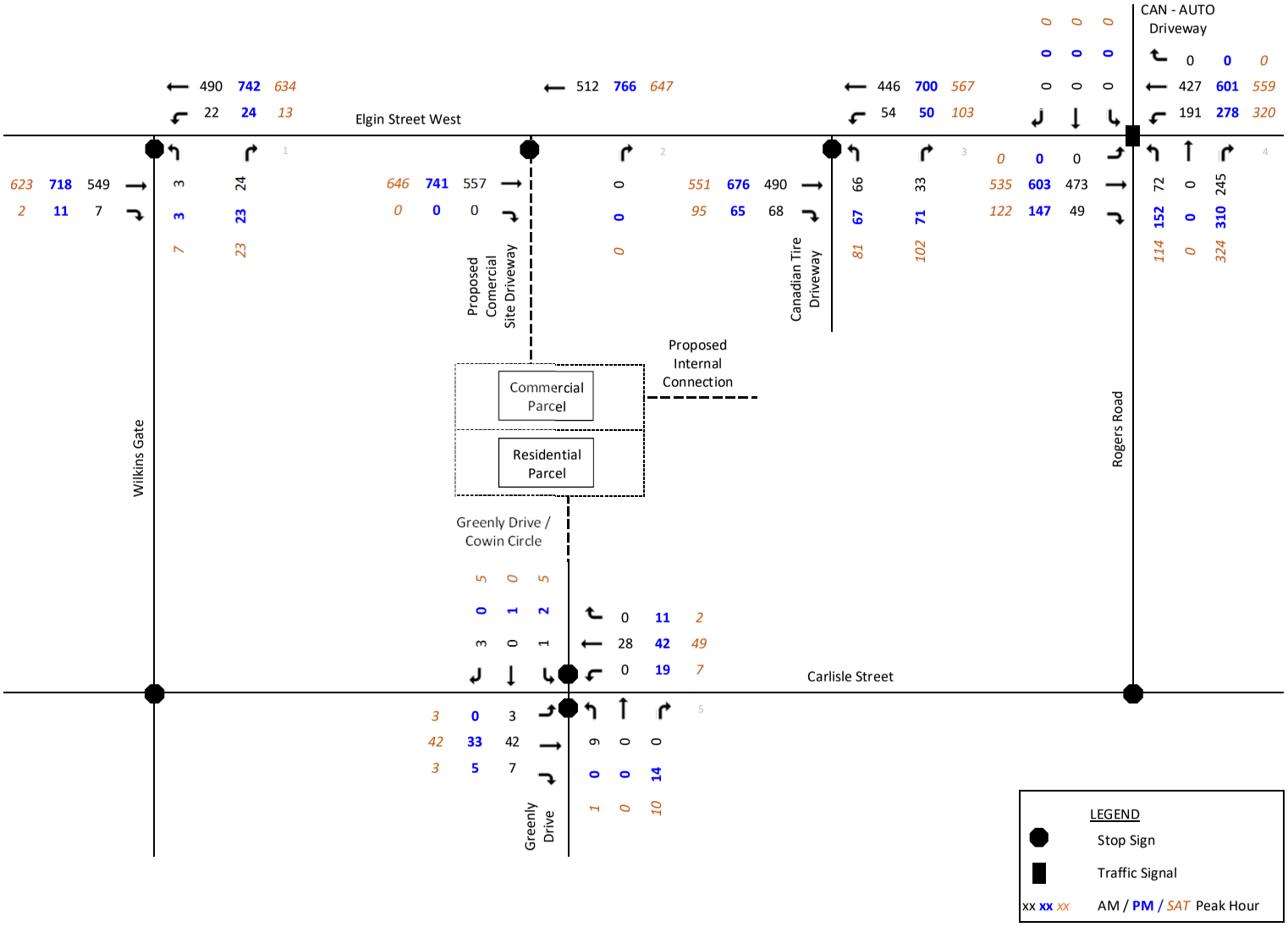


Figure 9 – Residential Site Traffic Assignment, Weekday AM and PM and SAT Peak Hours

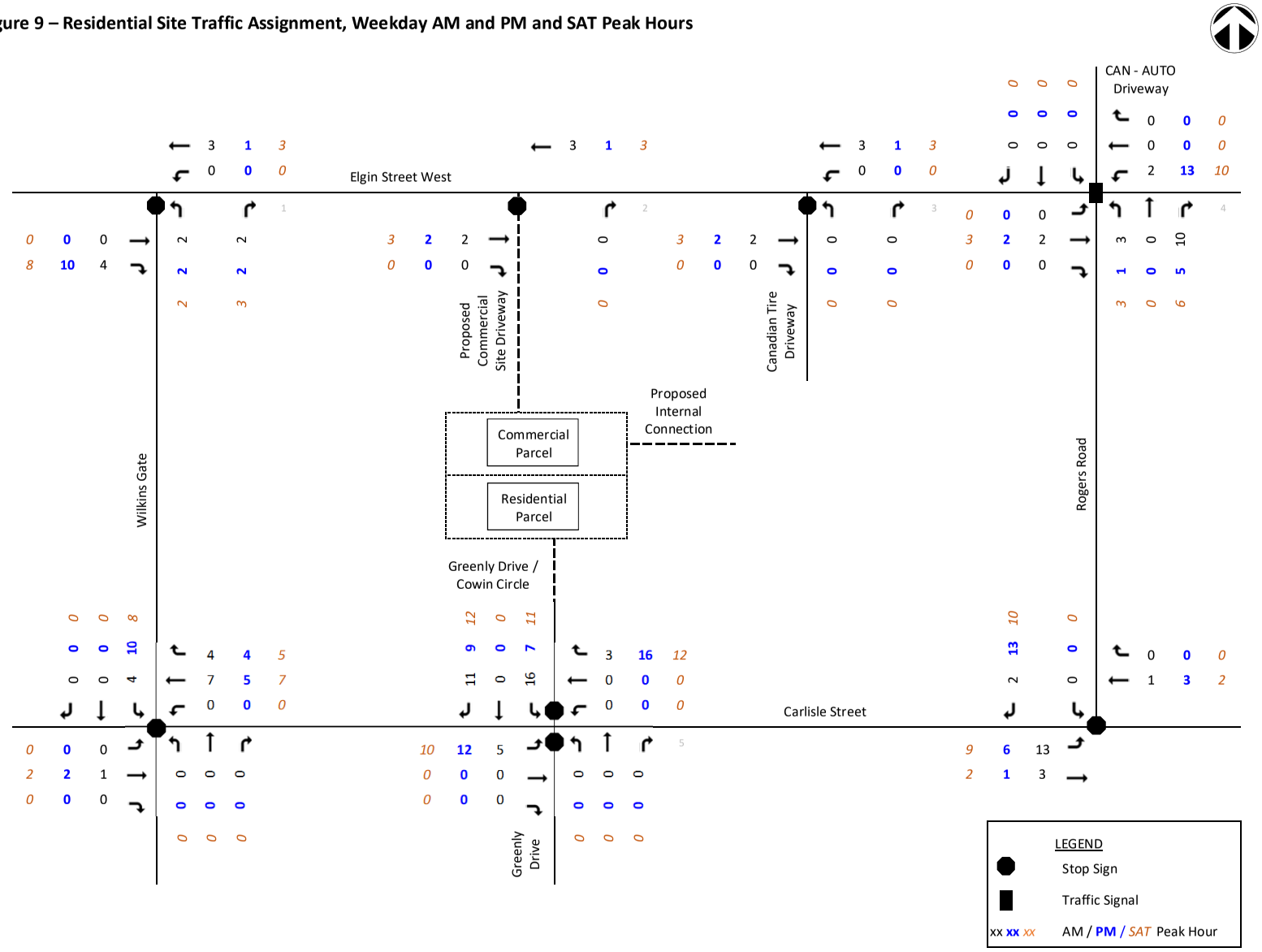


Figure 10 – Commercial New Site Traffic Assignment, Weekday AM and PM and SAT Peak Hours

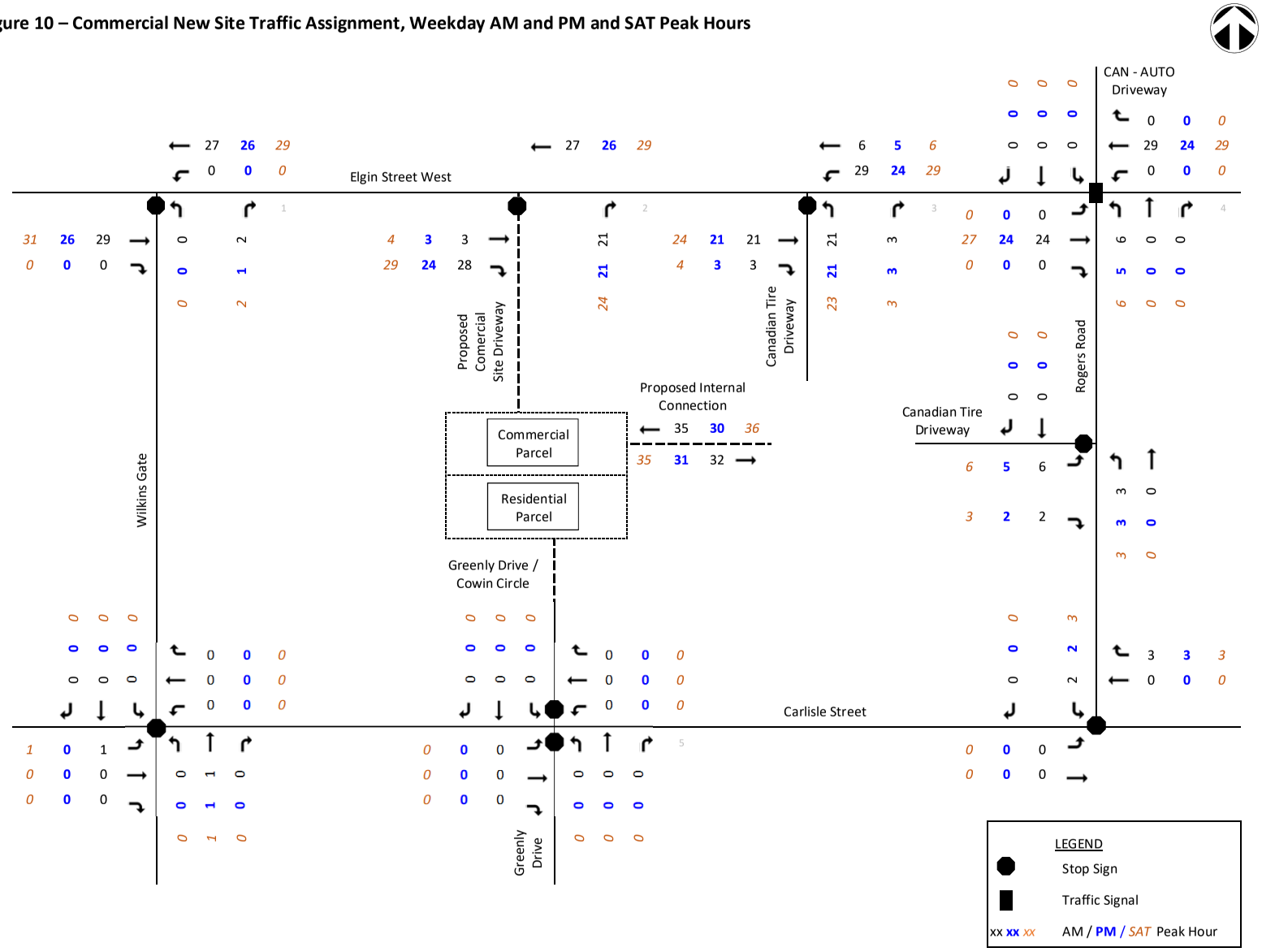


Figure 11 – Commercial Pass-by Trip Adjustment, Weekday AM and PM and SAT Peak Hours

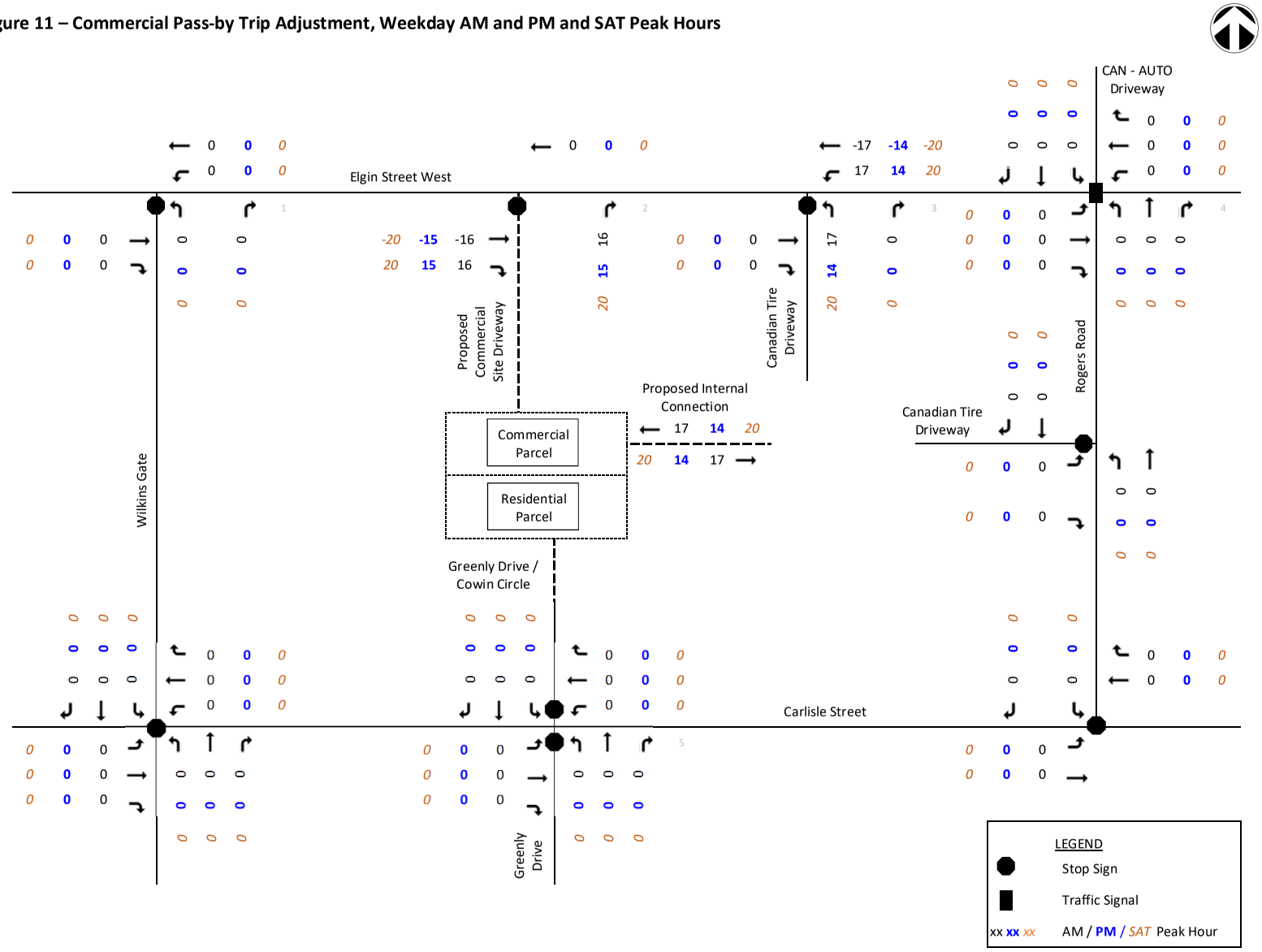
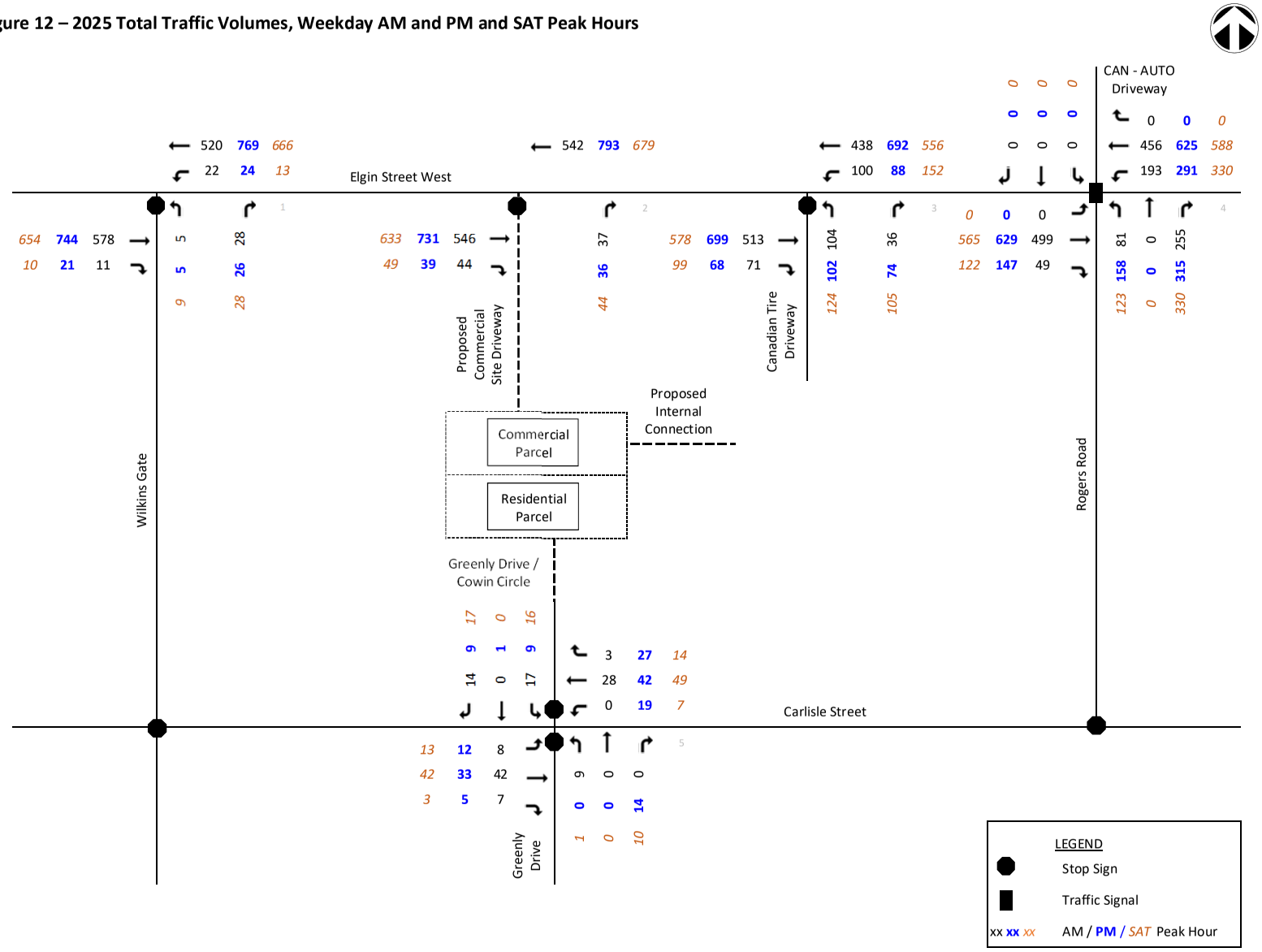


Figure 12 – 2025 Total Traffic Volumes, Weekday AM and PM and SAT Peak Hours



APPENDICES

Appendix A – Turning Movement Counts and Signal Timing Plans

Appendix B – County Road 2 Class EA, Excerpts

Appendix C – Background Development Information

Appendix D – Capacity Analysis Sheets

Appendix E – Level of Service Definitions

APPENDIX A

Turning Movement Counts and Signal Timing Plans

Intersection Peak Hour

8:15 AM - 9:15 AM

	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Vehicle Total	0	23	0	23	7	0	0	7	3	33	5	41	1	0	3	4	75

Peak Hour Vehicle Summary

Vehicle	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Car	0	23	0	23	7	0	0	7	3	33	5	41	1	0	3	4	75
Truck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Peak Hour Pedestrians

	North East			North West			South West			South East			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	1	0	1	0	1	1	3	0	3	0	0	0	5

Intersection Peak Hour

8:00 AM - 9:00 AM

	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Vehicle Total	0	0	0	0	43	335	0	378	52	0	26	78	0	332	54	386	842

Peak Hour Vehicle Summary

Vehicle	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Car	0	0	0	0	42	305	0	347	49	0	25	74	0	318	54	372	793
Truck	0	0	0	0	1	30	0	31	3	0	1	4	0	14	0	14	49

Peak Hour Pedestrians

	North East			North West			South West			South East			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	0	0	1	0	1	0	1	1	2	0	2	4

Intersection Peak Hour

8:00 AM - 9:00 AM

	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Vehicle Total	0	0	0	0	152	320	0	472	57	0	195	252	0	314	38	352	1076

Peak Hour Vehicle Summary

Vehicle	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Car	0	0	0	0	132	292	0	424	57	0	182	239	0	304	36	340	1003
Truck	0	0	0	0	20	28	0	48	0	0	13	13	0	10	2	12	73

Peak Hour Pedestrians

	North East			North West			South West			South East			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	0	0	0	0	0	0	0	0	0	1	1	1

Intersection Peak Hour

8:30 AM - 9:30 AM

	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Vehicle Total	0	0	0	0	17	370	0	387	3	0	17	20	0	357	5	362	769

Peak Hour Vehicle Summary

Vehicle	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Car	0	0	0	0	17	343	0	360	3	0	16	19	0	345	4	349	728
Truck	0	0	0	0	0	27	0	27	0	0	1	1	0	12	1	13	41

Peak Hour Pedestrians

	North East			North West			South West			South East			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	0	0	0	0	0	0	1	1	0	0	0	1

Intersection Peak Hour

3:45 PM - 4:45 PM

	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Vehicle Total	0	24	4	28	2	1	0	3	15	32	9	56	0	0	11	11	98

Peak Hour Vehicle Summary

Vehicle	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Car	0	24	4	28	2	1	0	3	15	32	9	56	0	0	11	11	98
Truck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Peak Hour Pedestrians

	North East			North West			South West			South East			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	1	1	0	0	0	1	0	1	0	0	0	2

Intersection Peak Hour

3:30 PM - 4:30 PM

	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Vehicle Total	0	0	0	0	38	467	0	505	53	0	52	105	0	452	51	503	1113

Peak Hour Vehicle Summary

Vehicle	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Car	0	0	0	0	37	456	0	493	53	0	50	103	0	437	51	488	1084
Truck	0	0	0	0	1	11	0	12	0	0	2	2	0	15	0	15	29

Peak Hour Pedestrians

	North East			North West			South West			South East			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	1	1	0	0	0	0	1	1	1	0	1	3

Intersection Peak Hour

3:30 PM - 4:30 PM

	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Vehicle Total	0	0	0	0	275	410	0	685	84	0	267	351	0	413	97	510	1546

Peak Hour Vehicle Summary

Vehicle	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Car	0	0	0	0	261	401	0	662	83	0	252	335	0	404	95	499	1496
Truck	0	0	0	0	14	9	0	23	1	0	15	16	0	9	2	11	50

Peak Hour Pedestrians

	North East			North West			South West			South East			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

3:30 PM - 4:30 PM

	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Vehicle Total	0	0	0	0	18	481	0	499	3	0	15	18	0	496	9	505	1022

Peak Hour Vehicle Summary

Vehicle	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Car	0	0	0	0	18	470	0	488	3	0	15	18	0	484	8	492	998
Truck	0	0	0	0	0	11	0	11	0	0	0	0	0	12	1	13	24

Peak Hour Pedestrians

	North East			North West			South West			South East			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	1	1	0	0	0	0	1	1	0	0	0	2

Intersection Peak Hour

11:30 AM - 12:30 PM

	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Vehicle Total	0	0	0	0	84	386	0	470	74	0	93	167	0	362	67	429	1066

Peak Hour Vehicle Summary

Vehicle	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Car	0	0	0	0	84	383	0	467	74	0	93	167	0	356	67	423	1057
Truck	0	0	0	0	0	3	0	3	0	0	0	0	0	6	0	6	9

Peak Hour Pedestrians

	North East			North West			South West			South East			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	0	0	0	0	0	0	0	0	0	0	0	0

Intersection Peak Hour

12:00 PM - 1:00 PM

	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Vehicle Total	5	0	5	10	6	43	2	51	1	0	9	10	3	37	3	43	114

Peak Hour Vehicle Summary

Vehicle	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Car	5	0	5	10	6	43	2	51	1	0	9	10	3	37	3	43	114
Truck	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Peak Hour Pedestrians

	North East			North West			South West			South East			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	0	0	2	1	3	0	2	2	1	0	1	6

Intersection Peak Hour

11:45 AM - 12:45 PM

	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Vehicle Total	0	0	0	0	429	522	0	951	152	0	316	468	0	458	87	545	1964

Peak Hour Vehicle Summary

Vehicle	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Car	0	0	0	0	423	519	0	942	150	0	312	462	0	449	86	535	1939
Truck	0	0	0	0	6	3	0	9	2	0	4	6	0	9	1	10	25

Peak Hour Pedestrians

	North East			North West			South West			South East			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	0	0	0	0	0	0	5	5	0	0	0	5

Intersection Peak Hour

12:45 PM - 1:45 PM

	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Vehicle Total	0	0	0	0	11	479	0	490	6	0	21	27	0	516	2	518	1035

Peak Hour Vehicle Summary

Vehicle	SouthBound				WestBound				NorthBound				EastBound				Total
	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	Left	Thru	Right	B. Total	
Car	0	0	0	0	11	473	0	484	6	0	21	27	0	507	2	509	1020
Truck	0	0	0	0	0	6	0	6	0	0	0	0	0	9	0	9	15

Peak Hour Pedestrians

	North East			North West			South West			South East			Total
	Left	Right	Total	Left	Right	Total	Left	Right	Total	Left	Right	Total	
Pedestrians	0	2	2	0	0	0	0	2	2	2	0	2	6

Programmed EPAC Data

5/30/200
10:13:40P

Intersection Name: Elgin and Northumberland Mall **Intersection Alias: 100**

Access Code: 9999 Channel: 5 Address: 0 Revision: 3.30d

Access Data

Port 2 Comm :1200 Baud
Port 3 Comm :1200 Baud

Phase Data

Vehical Basic Timings

Phase	Min_Grn	Passage	Max1	Max2	Yellow	All Red
2	20	5.0	45	45	4.1	2.1
4	8	5.0	15	15	4.1	2.4
6	20	5.0	45	45	4.1	2.1

Vehical Density Timings

Added Initial	Max_Initial	Time B4 Reduction	Cars Before Reduction	Time To Reduce	Min_Gap
0.0	0	0	0	0	0.0
0.0	0	0	0	0	0.0
0.0	0	0	0	0	0.0

Pedestrian Timing

Phase	Walk	Ped Clear	Flashing Walk	Extended Ped Clear	Actuated Rest in Walk
2	10	15	No	0	Yes
4	0	0	No	0	No
6	10	15	No	0	Yes

General Control

Initialize	Non-Act Response	Veh Recall	Ped Recall	Recall Delay
Yellow	NonActI	Max	Non	0
Inactive	None	None	None	0
Yellow	NonActI	Max	Non	0

Miscellaneous

Non Lock	Dual Entry	Last Car Passage	Conditional Service	No Simultaneous Gap Out
Yes	Yes	No	No	No
Yes	Yes	No	No	No
No	Yes	No	No	No

Special Sequence
Default Data

Vehical Detector Phase Assignment

Assigned Phase	Mode	Switched Phase	Extend	Delay

Default Data

Pedestrian Detector
Default Data

Special Detector Phase Assignment

Assign Phase	Mode	Switched Phase	Extend	Delay

Default Data

Unit Data

General Control

Startup Time: 5sec Startup State: Flash Red Revert: 4sec
Auto Ped Clear: Yes Stop Time Reset: No Alternate Sequence: 0
ABC connector Input Modes: 0
ABC connector Output Modes: 0
D connector Input Modes: 0
D connector Output Modes: 0

Ring	Input Respons	Output Selection
1	Ring 1	Ring 1
2	Ring 2	Ring 2
3	None	None
4	None	None

Remote Flash
Test A = Flash

Phase	Flash Entry Phase	Flash Exit Phase

Default Data - No Flash

Channel	Flash Color	Flash Alternat

Default Data - No Flash

Overlaps

Overlaps

Phase(s)	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Trail Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trail Yellow	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Trail Red	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Plus Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minus Green	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Ring

Phase	Ring	Next Phase
2	1	3
4	1	1
6	2	7

Concurrent Phases

Phase(s)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	1	2	3	4	1	1	3	3	9	1	1	1	1	1	1	1
	5	5	7	7	2	2	4	4								
	6	6	8	8	5	6	7	8								

LEA Consulting Ltd.
625 Cochrane Drive

Markam, Ontario, Canada L3R 9R9
905-470-0015 x240 akung@LEA.ca

Count Name: 20045_RogersRd&ElginStW-FRI
Site Code: 20045
Start Date: 05/24/2019

Turning Movement Peak Hour Data (3:45 PM)

Start Time	CAN-AUTO driveway Southbound						Elgin Street West Westbound						Rogers Road Northbound						Elgin Street West Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
3:45 PM	0	0	0	0	0	0	0	123	55	0	0	178	68	0	41	0	0	109	25	112	0	0	0	137	424
4:00 PM	0	0	0	0	0	0	0	120	64	0	0	184	67	0	34	0	0	101	34	154	0	0	0	188	473
4:15 PM	0	0	0	0	0	0	0	110	66	0	0	176	73	0	28	0	0	101	33	122	0	0	0	155	432
4:30 PM	0	0	0	0	0	0	0	120	63	0	0	183	69	0	33	0	3	102	40	117	0	0	0	157	442
Total	0	0	0	0	0	0	0	473	248	0	0	721	277	0	136	0	3	413	132	505	0	0	0	637	1771
Approach %	0.0	0.0	0.0	0.0	-	-	0.0	65.6	34.4	0.0	-	-	67.1	0.0	32.9	0.0	-	-	20.7	79.3	0.0	0.0	-	-	-
Total %	0.0	0.0	0.0	0.0	-	0.0	0.0	26.7	14.0	0.0	-	40.7	15.6	0.0	7.7	0.0	-	23.3	7.5	28.5	0.0	0.0	-	36.0	-
PHF	0.000	0.000	0.000	0.000	-	0.000	0.000	0.961	0.939	0.000	-	0.980	0.949	0.000	0.829	0.000	-	0.947	0.825	0.820	0.000	0.000	-	0.847	0.936
Lights	0	0	0	0	-	0	0	460	242	0	-	702	275	0	135	0	-	410	131	497	0	0	-	628	1740
% Lights	-	-	-	-	-	-	-	97.3	97.6	-	-	97.4	99.3	-	99.3	-	-	99.3	99.2	98.4	-	-	-	98.6	98.2
Buses	0	0	0	0	-	0	0	5	3	0	-	8	0	0	0	0	-	0	0	0	0	0	-	0	8
% Buses	-	-	-	-	-	-	-	1.1	1.2	-	-	1.1	0.0	-	0.0	-	-	0.0	0.0	0.0	-	-	-	0.0	0.5
Trucks	0	0	0	0	-	0	0	8	3	0	-	11	2	0	1	0	-	3	0	7	0	0	-	7	21
% Trucks	-	-	-	-	-	-	-	1.7	1.2	-	-	1.5	0.7	-	0.7	-	-	0.7	0.0	1.4	-	-	-	1.1	1.2
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	1	1	0	0	-	2	2
% Bicycles on Road	-	-	-	-	-	-	-	0.0	0.0	-	-	0.0	0.0	-	0.0	-	-	0.0	0.8	0.2	-	-	-	0.3	0.1
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	3	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-

LEA Consulting Ltd.
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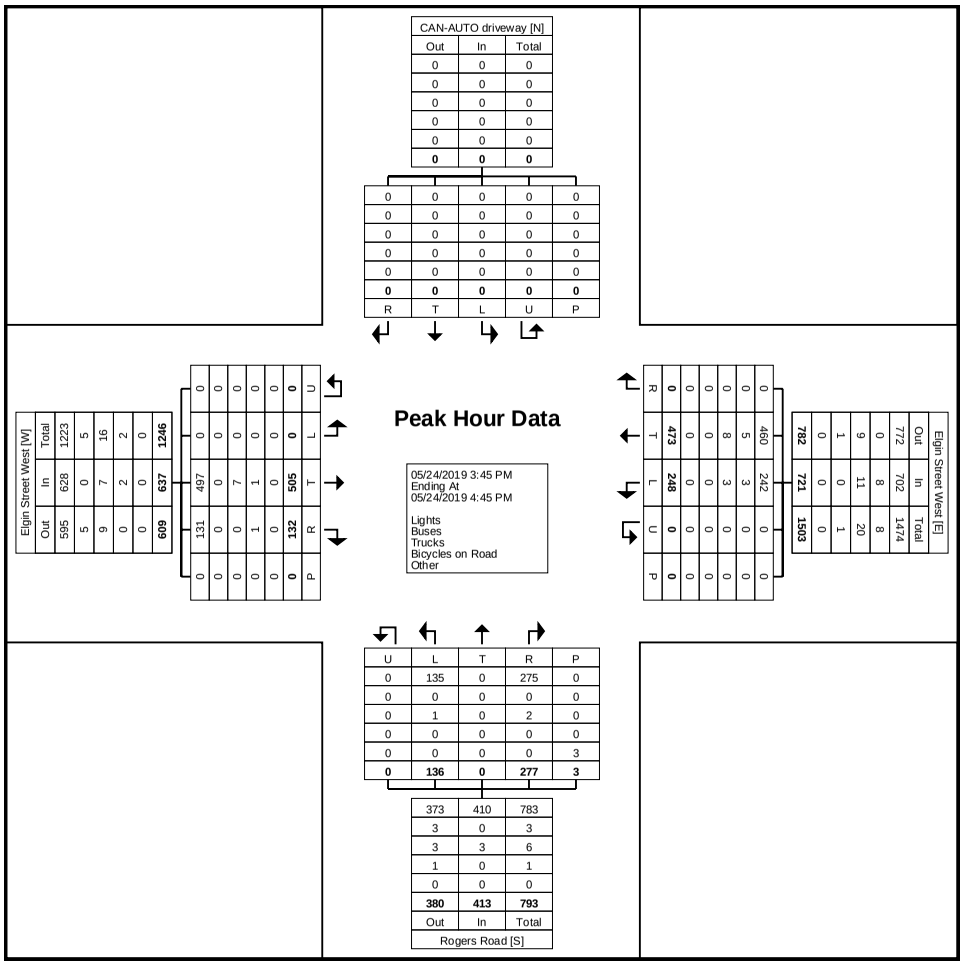

Turning Movement Peak Hour Data Plot (3:45 PM)

LEA Consulting Ltd.
625 Cochrane Drive

Markam, Ontario, Canada L3R 9R9
905-470-0015 x240 akung@LEA.ca

Count Name: 20045_RogersRd&ElginStW-SAT
Site Code: 20045
Start Date: 05/25/2019

Turning Movement Peak Hour Data (10:45 AM)

Start Time	CAN-AUTO Driveway Southbound						Elgin Street West Westbound						Rogers Road Northbound						Elgin Street West Eastbound						Int. Total
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
10:45 AM	0	0	0	0	1	0	0	104	70	0	0	174	65	0	25	0	0	90	32	84	0	0	1	116	380
11:00 AM	0	0	0	0	0	0	0	116	67	0	0	183	77	0	16	1	2	94	29	93	0	0	0	122	399
11:15 AM	0	0	0	0	0	0	0	125	71	0	0	196	74	0	32	0	0	106	16	121	0	0	0	137	439
11:30 AM	0	0	0	0	0	0	0	104	75	0	0	179	70	0	28	0	0	98	23	101	0	0	0	124	401
Total	0	0	0	0	1	0	0	449	283	0	0	732	286	0	101	1	2	388	100	399	0	0	1	499	1619
Approach %	0.0	0.0	0.0	0.0	-	-	0.0	61.3	38.7	0.0	-	-	73.7	0.0	26.0	0.3	-	-	20.0	80.0	0.0	0.0	-	-	-
Total %	0.0	0.0	0.0	0.0	-	0.0	0.0	27.7	17.5	0.0	-	45.2	17.7	0.0	6.2	0.1	-	24.0	6.2	24.6	0.0	0.0	-	30.8	-
PHF	0.000	0.000	0.000	0.000	-	0.000	0.000	0.898	0.943	0.000	-	0.934	0.929	0.000	0.789	0.250	-	0.915	0.781	0.824	0.000	0.000	-	0.911	0.922
Lights	0	0	0	0	-	0	0	445	280	0	-	725	285	0	101	1	-	387	100	395	0	0	-	495	1607
% Lights	-	-	-	-	-	-	-	99.1	98.9	-	-	99.0	99.7	-	100.0	100.0	-	99.7	100.0	99.0	-	-	-	99.2	99.3
Buses	0	0	0	0	-	0	0	1	3	0	-	4	0	0	0	0	-	0	0	0	0	0	-	0	4
% Buses	-	-	-	-	-	-	-	0.2	1.1	-	-	0.5	0.0	-	0.0	0.0	-	0.0	0.0	0.0	-	-	-	0.0	0.2
Trucks	0	0	0	0	-	0	0	3	0	0	-	3	1	0	0	0	-	1	0	4	0	0	-	4	8
% Trucks	-	-	-	-	-	-	-	0.7	0.0	-	-	0.4	0.3	-	0.0	0.0	-	0.3	0.0	1.0	-	-	-	0.8	0.5
Bicycles on Road	0	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	-	-	0.0	0.0	-	0.0	0.0	-	0.0	0.0	0.0	-	-	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

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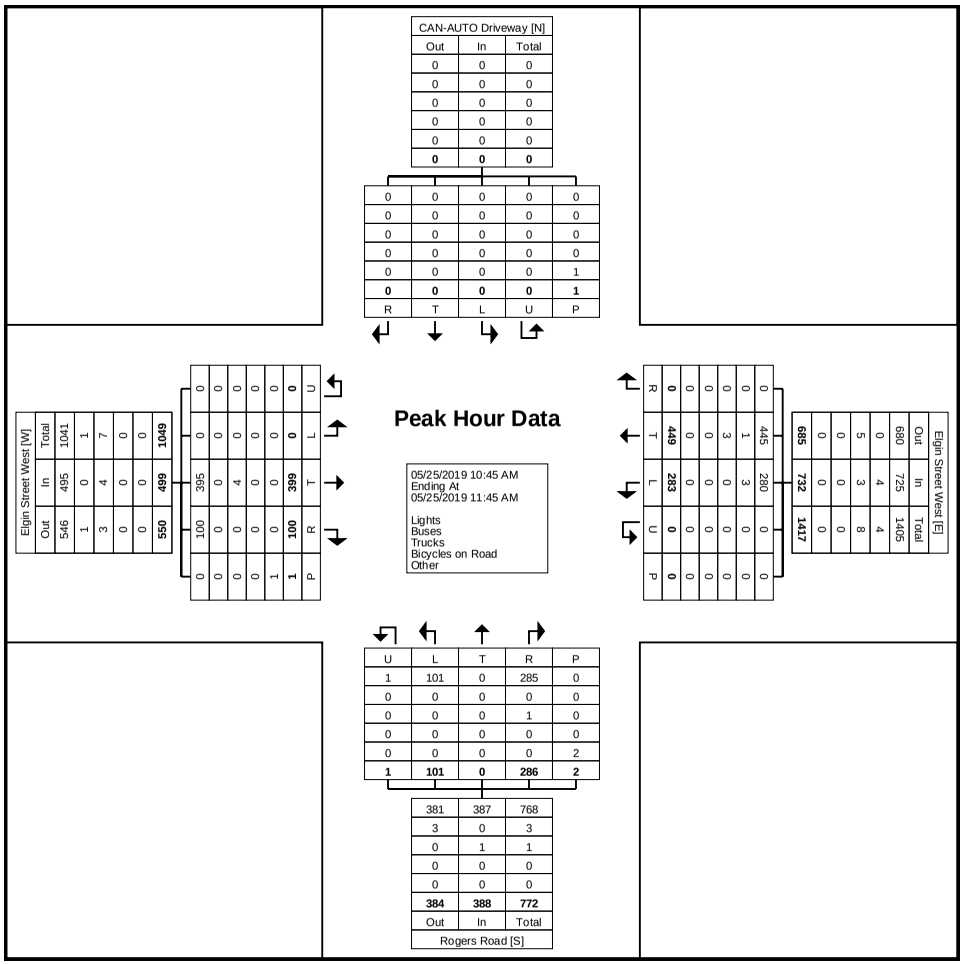


Turning Movement Peak Hour Data Plot (10:45 AM)

APPENDIX B

County Road 2 Class EA, Excerpts

lane per direction. The annual growth rate used is 1.8% to reflect average growth based on the observed traffic patterns.

2.1.3 Future Conditions

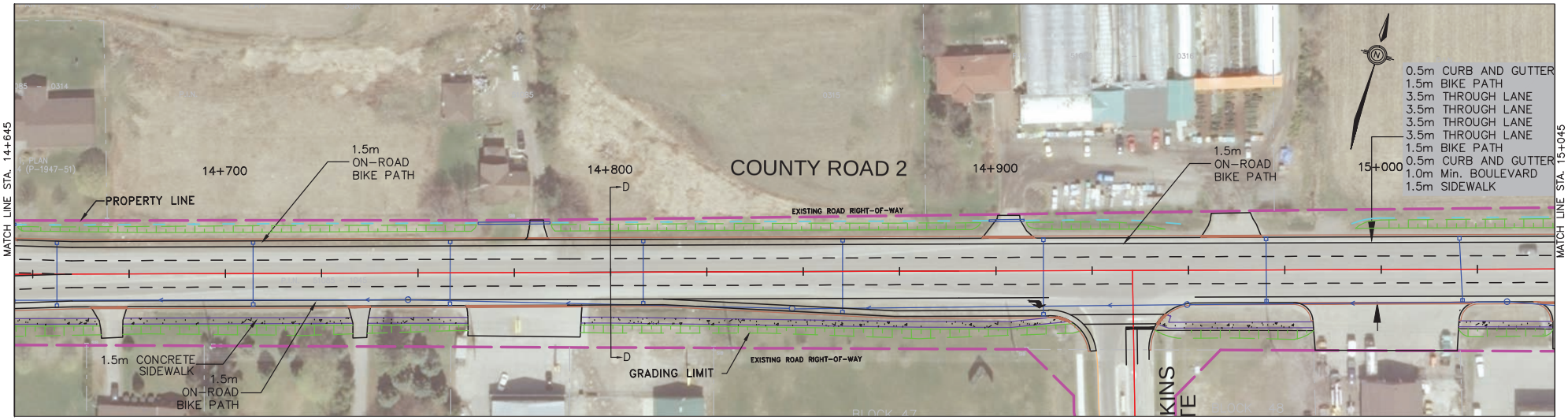
The future traffic conditions were forecast for 2021 and 2031. Using the same methodology for existing conditions and applying a growth rate of 1.8% per annum, future traffic volumes were forecast and analyzed. The 1.8% per annum growth rate was modelled based on existing travel demand on County Road 2, which is considered a more representative estimate for the study corridor than using aggregated population forecasts for the entire County.

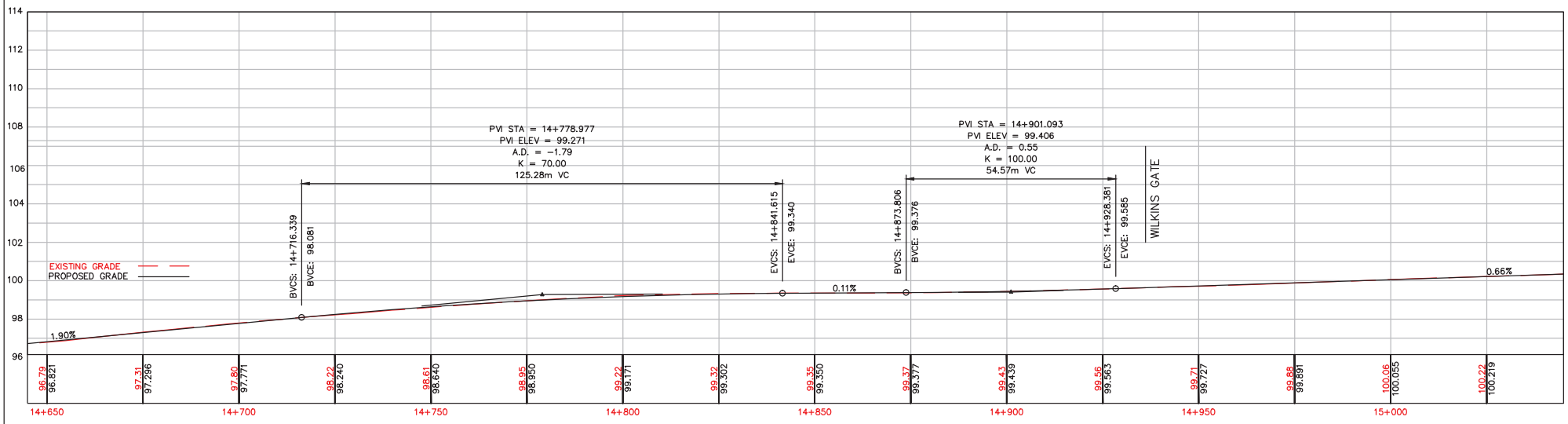
2.1.3.1 2031 AADT Forecasts

With 1.8% growth rate maintained over the next 20 years, the AADT traffic will increase by 175% and County Road 2 will approach the 0.85 volume to capacity threshold in the PM peak period from 2:00PM to 4:00PM. This is shown in **Table 2-2**.

2.1.3.2 2031 SADT Forecasts

The assessment of the SADT traffic reveals a similar pattern. A 1.8% growth rate was applied to the SADT conditions for the 2031 traffic forecast as presented in **Table 2-3**. The 2031 summer traffic forecast shows deterioration in traffic performance. County Road 2 will be congested in the afternoon peak period from 12:00 to 4:00 PM with the volume to capacity ratios reaching 0.88, which just exceeds the 0.85 threshold at the end of the 20 year horizon.





LEGEND

- Ditch
- Grassed Swales
- New Culvert
- Existing Storm Sewer
- Rip Rap
- Proposed Storm Sewer & Manhole
- Catchbasin
- Property Requirement
- Impacted Utility
- Dropped Curb
- Paved Shoulder
- Multi-Use Trail
- Curb and Gutter

No.	DATE	REVISIONS	BY

SCALES
5m 0 10m Horizontal
1m 0 2m Vertical

Northumberland county

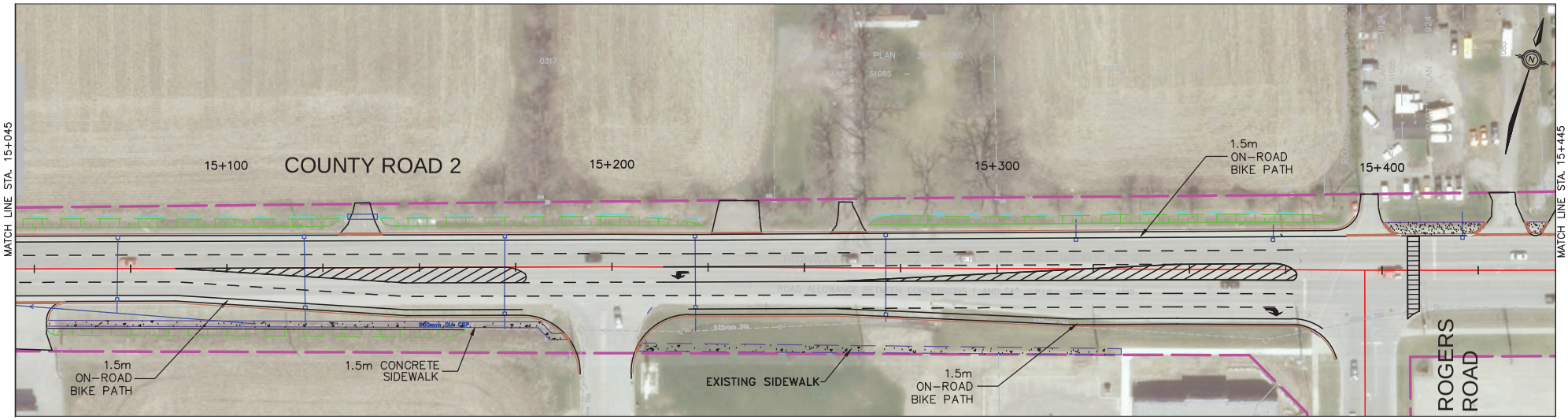
HDR

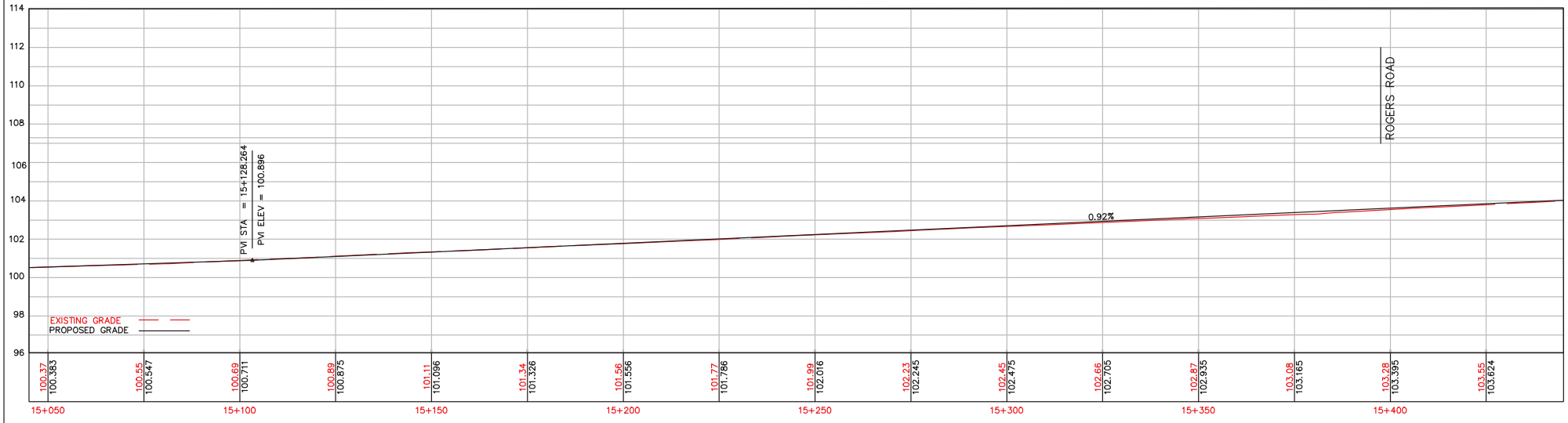
DESIGN	Y.P
DRAWN	Y.C
CHECKED	A.R

CONCEPTUAL DESIGN

County Road 2 Class EA
Hamilton Rd to William St

PLATE NO. 13





LEGEND

- Ditch
- Grassed Swales
- New Culvert
- Existing Storm Sewer
- Rip Rap
- Proposed Storm Sewer & Manhole
- Catchbasin
- Property Requirement
- Impacted Utility
- Dropped Curb
- Paved Shoulder
- Multi-Use Trail
- Curb and Gutter

No.	DATE	REVISIONS	BY

SCALES
5m 0 10m Horizontal
1m 0 2m Vertical

Northumberland county

HDR

DESIGN	P.Y
DRAWN	Y.C
CHECKED	A.R

CONCEPTUAL DESIGN

County Road 2 Class EA
Hamilton Rd to William St

PLATE NO. 14

APPENDIX C

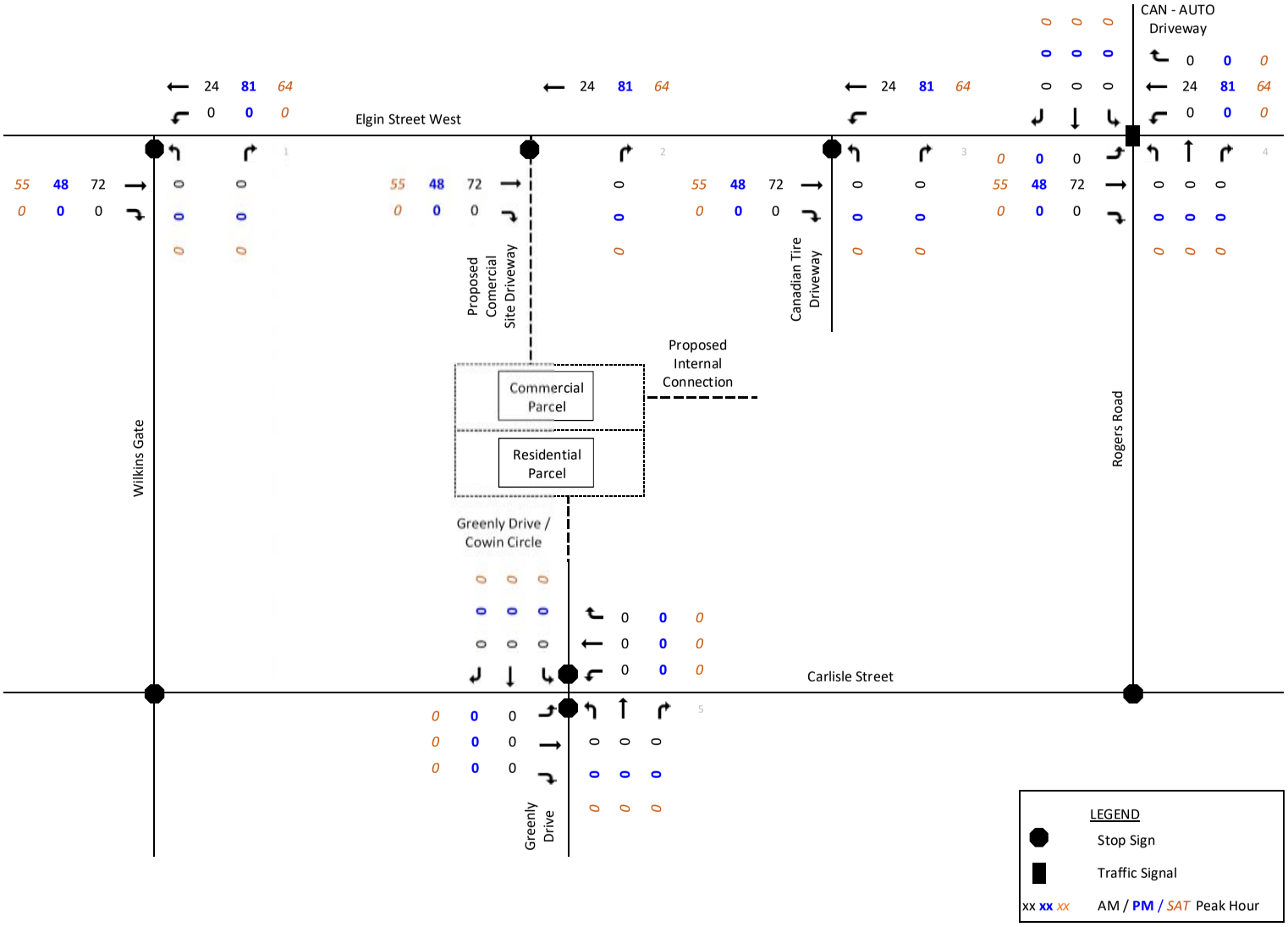
Background Traffic Information

DEV 1 – New Amherst Residential Development, Town of Cobourg

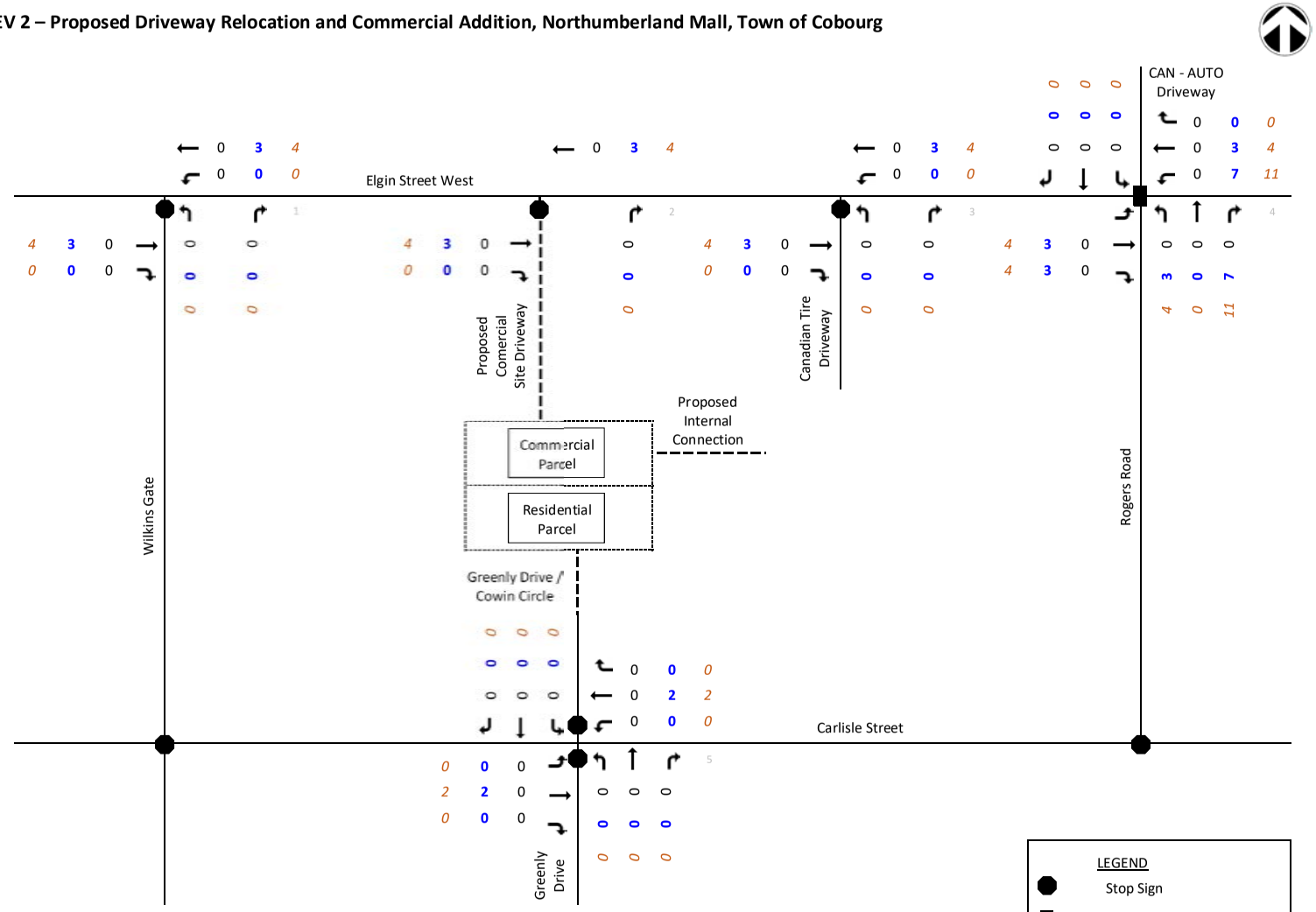
Dwelling Type	Size		Weekday AM Peak Hour			Weekday PM Peak Hour			SAT Peak Hour		
			In	Out	Total	In	Out	Total	In	Out	Total
Single-Family Detached Housing	332 units	Distribution	25%	75%	100%	63%	37%	100%	54%	46%	100%
		Equation	T = 0.71(X) + 4.80			Ln(T) = 0.96 Ln(X) + 0.20			T = 0.84(X) + 17.99		
LUC 210		Rate	0.18	0.55	0.73	0.61	0.36	0.97	0.48	0.41	0.89
		Trips	60	181	241	202	119	321	160	137	297
Trips Accessing the Study Area Intersections along Elgin Street West (40%)			**24**	**72**	**96**	**81**	**48**	**128**	**64**	**55**	**119**

TRANS-PLAN
transportation engineering

DEV 1 – New Amherst Residential Development, Town of Cobourg



DEV 2 – Proposed Driveway Relocation and Commercial Addition, Northumberland Mall, Town of Cobourg

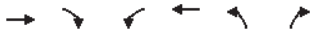


Source: Transportation Impact Study, Proposed Driveway Relocation and Commercial Addition, Northumberland Mall, Town of Cobourg, dated July 17th, 2019; prepared by LEA Consulting Ltd.

Note: The weekday AM peak hour volumes were unavailable from the study prepared by LEA Consulting Ltd., thus the development was assumed to have negligible traffic impacts during the weekday AM peak hour

APPENDIX D

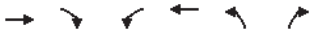
Capacity Analysis Sheets



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	436	6	20	426	3	22
Future Volume (Veh/h)	436	6	20	426	3	22
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	474	7	22	463	3	24
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			482		754	242
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			482		754	242
tC, single (s)			4.1		6.8	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.4
p0 queue free %			98		99	97
cM capacity (veh/h)			1090		342	747

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	316	165	176	309	3	24
Volume Left	0	0	22	0	3	0
Volume Right	0	7	0	0	0	24
cSH	1700	1700	1090	1700	342	747
Volume to Capacity	0.19	0.10	0.02	0.18	0.01	0.03
Queue Length 95th (m)	0.0	0.0	0.5	0.0	0.2	0.8
Control Delay (s)	0.0	0.0	1.2	0.0	15.6	10.0
Lane LOS			A		C	A
Approach Delay (s)	0.0		0.4		10.6	
Approach LOS					B	

Intersection Summary					
Average Delay			0.5		
Intersection Capacity Utilization			36.5%	ICU Level of Service	A
Analysis Period (min)			15		



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	444	0	0	446	0	0
Future Volume (Veh/h)	444	0	0	446	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	483	0	0	485	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				288		
pX, platoon unblocked						
vC, conflicting volume			483		726	242
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			483		726	242
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			1076		360	759

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1
Volume Total	242	242	0	242	242	0
Volume Left	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.14	0.14	0.00	0.14	0.14	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS						A
Approach Delay (s)	0.0			0.0		0.0
Approach LOS						A

Intersection Summary					
Average Delay			0.0		
Intersection Capacity Utilization			15.7%	ICU Level of Service	A
Analysis Period (min)			15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	382	62	49	386	60	30
Future Volume (Veh/h)	382	62	49	386	60	30
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	415	67	53	420	65	33
Pedestrians					3	
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)				194		
pX, platoon unblocked						
vC, conflicting volume			485		768	244
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			485		768	244
tC, single (s)			4.1		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.3
p0 queue free %			95		79	96
cM capacity (veh/h)			1072		313	749

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	277	205	53	210	210	65	33
Volume Left	0	0	53	0	0	65	0
Volume Right	0	67	0	0	0	0	33
cSH	1700	1700	1072	1700	1700	313	749
Volume to Capacity	0.16	0.12	0.05	0.12	0.12	0.21	0.04
Queue Length 95th (m)	0.0	0.0	1.2	0.0	0.0	6.1	1.1
Control Delay (s)	0.0	0.0	8.5	0.0	0.0	19.5	10.0
Lane LOS			A			C	B
Approach Delay (s)	0.0		1.0			16.3	
Approach LOS						C	

Intersection Summary				
Average Delay	1.9			
Intersection Capacity Utilization	29.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	367	45	175	369	66	224
Future Volume (vph)	367	45	175	369	66	224
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2	6			4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	20.0	20.0	20.0	20.0	8.0	8.0
Minimum Split (s)	31.2	31.2	31.2	31.2	14.5	14.5
Total Split (s)	45.0	45.0	45.0	45.0	15.0	15.0
Total Split (%)	75.0%	75.0%	75.0%	75.0%	25.0%	25.0%
Yellow Time (s)	4.1	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	2.1	2.1	2.1	2.1	2.4	2.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None
Act Effct Green (s)	39.1	39.1	39.1	39.1	8.2	8.2
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.14	0.14
v/c Ratio	0.18	0.05	0.34	0.19	0.30	0.59
Control Delay	4.4	1.5	6.8	4.4	26.8	10.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.4	1.5	6.8	4.4	26.8	10.6
LOS	A	A	A	A	C	B
Approach Delay	4.1			5.2	14.3	
Approach LOS	A			A	B	

Intersection Summary			
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Natural Cycle: 50			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.59			
Intersection Signal Delay: 6.9		Intersection LOS: A	
Intersection Capacity Utilization 55.8%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 4: Rogers Road & Elgin Street West

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	367	45	175	369	66	224
Future Volume (vph)	367	45	175	369	66	224
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	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	0.95	1.00
Satd. Flow (prot)	3466	1521	1580	3275	1785	1471
Flt Permitted	1.00	1.00	0.52	1.00	0.95	1.00
Satd. Flow (perm)	3466	1521	859	3275	1785	1471
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	399	49	190	401	72	243
RTOR Reduction (vph)	0	17	0	0	0	210
Lane Group Flow (vph)	399	32	190	401	72	33
Confl. Peds. (#/hr)						1
Heavy Vehicles (%)	3%	5%	13%	9%	0%	7%
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2	6			4
Actuated Green, G (s)	39.1	39.1	39.1	39.1	8.2	8.2
Effective Green, g (s)	39.1	39.1	39.1	39.1	8.2	8.2
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.14	0.14
Clearance Time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2258	991	559	2134	243	201
v/s Ratio Prot	0.12			0.12	c0.04	
v/s Ratio Perm		0.02	c0.22			0.02
v/c Ratio	0.18	0.03	0.34	0.19	0.30	0.17
Uniform Delay, d1	4.1	3.7	4.7	4.1	23.3	22.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1	1.6	0.2	0.7	0.4
Delay (s)	4.3	3.8	6.3	4.3	24.0	23.3
Level of Service	A	A	A	A	C	C
Approach Delay (s)	4.2			5.0	23.4	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	9.0	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.33			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.7	
Intersection Capacity Utilization	55.8%	ICU Level of Service	B	
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)	3	38	6	0	26	0	8	0	0	1	0	3
Future Volume (Veh/h)	3	38	6	0	26	0	8	0	0	1	0	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	41	7	0	28	0	9	0	0	1	0	3
Pedestrians								1			4	
Lane Width (m)								3.5			3.5	
Walking Speed (m/s)								1.2			1.2	
Percent Blockage								0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	32			49			82	84	46	82	87	32
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	32			49			82	84	46	82	87	32
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			99	100	100	100	100	100
cM capacity (veh/h)	1588			1570			902	806	1029	903	802	1044

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	51	28	9	4
Volume Left	3	0	9	1
Volume Right	7	0	0	3
cSH	1588	1570	902	1005
Volume to Capacity	0.00	0.00	0.01	0.00
Queue Length 95th (m)	0.0	0.0	0.2	0.1
Control Delay (s)	0.4	0.0	9.0	8.6
Lane LOS	A		A	A
Approach Delay (s)	0.4	0.0	9.0	8.6
Approach LOS			A	A

Intersection Summary				
Average Delay	1.5			
Intersection Capacity Utilization	15.2%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	610	10	22	602	3	21
Future Volume (Veh/h)	610	10	22	602	3	21
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	663	11	24	654	3	23
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			675		1044	338
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			675		1044	338
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		99	97
cM capacity (veh/h)			925		222	663

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	442	232	242	436	3	23
Volume Left	0	0	24	0	3	0
Volume Right	0	11	0	0	0	23
cSH	1700	1700	925	1700	222	663
Volume to Capacity	0.26	0.14	0.03	0.26	0.01	0.03
Queue Length 95th (m)	0.0	0.0	0.6	0.0	0.3	0.9
Control Delay (s)	0.0	0.0	1.1	0.0	21.5	10.6
Lane LOS			A		C	B
Approach Delay (s)	0.0		0.4		11.9	
Approach LOS					B	

Intersection Summary					
Average Delay			0.4		
Intersection Capacity Utilization			42.7%	ICU Level of Service	A
Analysis Period (min)			15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	631	0	0	624	0	0
Future Volume (Veh/h)	631	0	0	624	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	686	0	0	678	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				288		
pX, platoon unblocked						
vC, conflicting volume			686		1025	343
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			686		1025	343
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			904		231	653

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1
Volume Total	343	343	0	339	339	0
Volume Left	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.20	0.20	0.00	0.20	0.20	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS						A
Approach Delay (s)	0.0			0.0		0.0
Approach LOS						A

Intersection Summary					
Average Delay			0.0		
Intersection Capacity Utilization			20.8%	ICU Level of Service	A
Analysis Period (min)			15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	572	59	46	563	61	65
Future Volume (Veh/h)	572	59	46	563	61	65
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	622	64	50	612	66	71
Pedestrians					2	
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)				194		
pX, platoon unblocked						
vC, conflicting volume			688		1062	345
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			688		1062	345
tC, single (s)			4.2		6.8	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			94		68	89
cM capacity (veh/h)			894		209	644

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	415	271	50	306	306	66	71
Volume Left	0	0	50	0	0	66	0
Volume Right	0	64	0	0	0	0	71
cSH	1700	1700	894	1700	1700	209	644
Volume to Capacity	0.24	0.16	0.06	0.18	0.18	0.32	0.11
Queue Length 95th (m)	0.0	0.0	1.4	0.0	0.0	10.3	3.0
Control Delay (s)	0.0	0.0	9.3	0.0	0.0	30.0	11.3
Lane LOS			A			D	B
Approach Delay (s)	0.0		0.7			20.3	
Approach LOS						C	

Intersection Summary					
Average Delay	2.2				
Intersection Capacity Utilization	34.4%	ICU Level of Service		A	
Analysis Period (min)	15				

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	505	132	248	473	136	277
Future Volume (vph)	505	132	248	473	136	277
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2	6			4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	20.0	20.0	20.0	20.0	8.0	8.0
Minimum Split (s)	31.2	31.2	31.2	31.2	14.5	14.5
Total Split (s)	45.0	45.0	45.0	45.0	15.0	15.0
Total Split (%)	75.0%	75.0%	75.0%	75.0%	25.0%	25.0%
Yellow Time (s)	4.1	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	2.1	2.1	2.1	2.1	2.4	2.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None
Act Effct Green (s)	38.9	38.9	38.9	38.9	8.4	8.4
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.14	0.14
v/c Ratio	0.24	0.13	0.51	0.22	0.60	0.63
Control Delay	4.7	1.2	9.7	4.7	35.9	10.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.7	1.2	9.7	4.7	35.9	10.1
LOS	A	A	A	A	D	B
Approach Delay	4.0			6.4	18.6	
Approach LOS	A			A	B	

Intersection Summary			
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Natural Cycle: 55			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.63			
Intersection Signal Delay: 8.4		Intersection LOS: A	
Intersection Capacity Utilization 56.6%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 4: Rogers Road & Elgin Street West

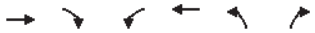
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	505	132	248	473	136	277
Future Volume (vph)	505	132	248	473	136	277
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3535	1597	1750	3535	1767	1581
Flt Permitted	1.00	1.00	0.45	1.00	0.95	1.00
Satd. Flow (perm)	3535	1597	823	3535	1767	1581
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	549	143	270	514	148	301
RTOR Reduction (vph)	0	50	0	0	0	259
Lane Group Flow (vph)	549	93	270	514	148	42
Heavy Vehicles (%)	1%	0%	2%	1%	1%	1%
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2	6			4
Actuated Green, G (s)	38.9	38.9	38.9	38.9	8.4	8.4
Effective Green, g (s)	38.9	38.9	38.9	38.9	8.4	8.4
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.14	0.14
Clearance Time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2291	1035	533	2291	247	221
v/s Ratio Prot	0.16			0.15	c0.08	
v/s Ratio Perm		0.06	c0.33			0.03
v/c Ratio	0.24	0.09	0.51	0.22	0.60	0.19
Uniform Delay, d1	4.4	3.9	5.5	4.3	24.2	22.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.2	3.4	0.2	3.9	0.4
Delay (s)	4.6	4.1	8.9	4.6	28.1	23.2
Level of Service	A	A	A	A	C	C
Approach Delay (s)	4.5			6.1	24.8	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	9.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.7
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
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)	0	28	5	17	37	10	0	0	13	2	1	0
Future Volume (Veh/h)	0	28	5	17	37	10	0	0	13	2	1	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	30	5	18	40	11	0	0	14	2	1	0
Pedestrians								2			2	
Lane Width (m)								3.5			3.5	
Walking Speed (m/s)								1.2			1.2	
Percent Blockage								0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	53			37			116	124	34	130	120	48
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	53			37			116	124	34	130	120	48
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	100	99	100	100	100
cM capacity (veh/h)	1563			1584			853	759	1043	825	762	1026

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	35	69	14	3
Volume Left	0	18	0	2
Volume Right	5	11	14	0
cSH	1563	1584	1043	803
Volume to Capacity	0.00	0.01	0.01	0.00
Queue Length 95th (m)	0.0	0.3	0.3	0.1
Control Delay (s)	0.0	2.0	8.5	9.5
Lane LOS		A	A	A
Approach Delay (s)	0.0	2.0	8.5	9.5
Approach LOS			A	A

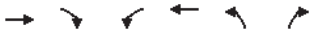
Intersection Summary				
Average Delay	2.3			
Intersection Capacity Utilization	20.4%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	516	2	12	518	6	21
Future Volume (Veh/h)	516	2	12	518	6	21
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	561	2	13	563	7	23
Pedestrians					4	
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			567		874	286
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			567		874	286
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			99		98	97
cM capacity (veh/h)			1012		288	715

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	374	189	201	375	7	23
Volume Left	0	0	13	0	7	0
Volume Right	0	2	0	0	0	23
cSH	1700	1700	1012	1700	288	715
Volume to Capacity	0.22	0.11	0.01	0.22	0.02	0.03
Queue Length 95th (m)	0.0	0.0	0.3	0.0	0.6	0.8
Control Delay (s)	0.0	0.0	0.7	0.0	17.8	10.2
Lane LOS			A		C	B
Approach Delay (s)	0.0		0.2		12.0	
Approach LOS					B	

Intersection Summary				
Average Delay	0.4			
Intersection Capacity Utilization	32.9%	ICU Level of Service		A
Analysis Period (min)	15			



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	537	0	0	530	0	0
Future Volume (Veh/h)	537	0	0	530	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	584	0	0	576	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				288		
pX, platoon unblocked						
vC, conflicting volume			584		872	292
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			584		872	292
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			987		290	704

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1
Volume Total	292	292	0	288	288	0
Volume Left	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.17	0.17	0.00	0.17	0.17	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS						A
Approach Delay (s)	0.0			0.0		0.0
Approach LOS						A

Intersection Summary				
Average Delay	0.0			
Intersection Capacity Utilization	18.2%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	450	87	94	456	74	93
Future Volume (Veh/h)	450	87	94	456	74	93
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	489	95	102	496	80	101
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				194		
pX, platoon unblocked						
vC, conflicting volume			584		988	292
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			584		988	292
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			90		64	86
cM capacity (veh/h)			1001		222	710

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	326	258	102	248	248	80	101
Volume Left	0	0	102	0	0	80	0
Volume Right	0	95	0	0	0	0	101
cSH	1700	1700	1001	1700	1700	222	710
Volume to Capacity	0.19	0.15	0.10	0.15	0.15	0.36	0.14
Queue Length 95th (m)	0.0	0.0	2.7	0.0	0.0	12.4	4.0
Control Delay (s)	0.0	0.0	9.0	0.0	0.0	30.0	10.9
Lane LOS			A			D	B
Approach Delay (s)	0.0		1.5			19.4	
Approach LOS						C	

Intersection Summary				
Average Delay	3.2			
Intersection Capacity Utilization	34.5%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	435	108	283	449	101	286
Future Volume (vph)	435	108	283	449	101	286
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2	6			4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	20.0	20.0	20.0	20.0	8.0	8.0
Minimum Split (s)	31.2	31.2	31.2	31.2	14.5	14.5
Total Split (s)	45.0	45.0	45.0	45.0	15.0	15.0
Total Split (%)	75.0%	75.0%	75.0%	75.0%	25.0%	25.0%
Yellow Time (s)	4.1	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	2.1	2.1	2.1	2.1	2.4	2.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None
Act Effct Green (s)	39.0	39.0	39.0	39.0	8.3	8.3
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.14	0.14
v/c Ratio	0.21	0.11	0.53	0.21	0.45	0.64
Control Delay	4.5	1.2	9.7	4.6	30.0	10.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.5	1.2	9.7	4.6	30.0	10.2
LOS	A	A	A	A	C	B
Approach Delay	3.9			6.6	15.4	
Approach LOS	A			A	B	

Intersection Summary			
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Natural Cycle: 55			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.64			
Intersection Signal Delay: 7.7		Intersection LOS: A	
Intersection Capacity Utilization 59.9%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 4: Rogers Road & Elgin Street West

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	435	108	283	449	101	286
Future Volume (vph)	435	108	283	449	101	286
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frpb, ped/bikes	1.00	0.97	1.00	1.00	1.00	1.00
Flpb, ped/bikes	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	0.95	1.00
Satd. Flow (prot)	3535	1556	1779	3535	1785	1597
Flt Permitted	1.00	1.00	0.48	1.00	0.95	1.00
Satd. Flow (perm)	3535	1556	901	3535	1785	1597
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	473	117	308	488	110	311
RTOR Reduction (vph)	0	41	0	0	0	268
Lane Group Flow (vph)	473	76	308	488	110	43
Confl. Peds. (#/hr)		5	5			
Heavy Vehicles (%)	1%	0%	0%	1%	0%	0%
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2	6			4
Actuated Green, G (s)	39.0	39.0	39.0	39.0	8.3	8.3
Effective Green, g (s)	39.0	39.0	39.0	39.0	8.3	8.3
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.14	0.14
Clearance Time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2297	1011	585	2297	246	220
v/s Ratio Prot	0.13			0.14	c0.06	
v/s Ratio Perm		0.05	c0.34			0.03
v/c Ratio	0.21	0.08	0.53	0.21	0.45	0.20
Uniform Delay, d1	4.2	3.9	5.6	4.3	23.7	22.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1	3.4	0.2	1.3	0.4
Delay (s)	4.4	4.0	9.0	4.5	25.0	23.3
Level of Service	A	A	A	A	C	C
Approach Delay (s)	4.4			6.2	23.8	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	9.7	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.51			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.7	
Intersection Capacity Utilization	59.9%	ICU Level of Service	B	
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)	3	37	3	6	43	2	1	0	9	5	0	5
Future Volume (Veh/h)	3	37	3	6	43	2	1	0	9	5	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	40	3	7	47	2	1	0	10	5	0	5
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	49			43			114	110	42	120	111	48
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	49			43			114	110	42	120	111	48
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			100	100	99	99	100	100
cM capacity (veh/h)	1558			1559			859	778	1035	848	778	1027

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	46	56	11	10
Volume Left	3	7	1	5
Volume Right	3	2	10	5
cSH	1558	1559	1016	929
Volume to Capacity	0.00	0.00	0.01	0.01
Queue Length 95th (m)	0.0	0.1	0.3	0.3
Control Delay (s)	0.5	0.9	8.6	8.9
Lane LOS	A	A	A	A
Approach Delay (s)	0.5	0.9	8.6	8.9
Approach LOS			A	A

Intersection Summary				
Average Delay	2.1			
Intersection Capacity Utilization	14.2%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	549	7	22	490	3	24
Future Volume (Veh/h)	549	7	22	490	3	24
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	597	8	24	533	3	26
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			606		912	300
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			606		912	300
tC, single (s)			4.1		6.8	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.4
p0 queue free %			98		99	96
cM capacity (veh/h)			981		270	684

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	NB 2
Volume Total	298	298	8	202	355	3	26
Volume Left	0	0	0	24	0	3	0
Volume Right	0	0	8	0	0	0	26
cSH	1700	1700	1700	981	1700	270	684
Volume to Capacity	0.18	0.18	0.00	0.02	0.21	0.01	0.04
Queue Length 95th (m)	0.0	0.0	0.0	0.6	0.0	0.3	0.9
Control Delay (s)	0.0	0.0	0.0	1.3	0.0	18.5	10.5
Lane LOS				A		C	B
Approach Delay (s)	0.0			0.5		11.3	
Approach LOS						B	

Intersection Summary				
Average Delay	0.5			
Intersection Capacity Utilization	39.7%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	557	0	0	512	0	0
Future Volume (Veh/h)	557	0	0	512	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	605	0	0	557	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				288		
pX, platoon unblocked						
vC, conflicting volume			605		884	302
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			605		884	302
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			969		285	694

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1
Volume Total	302	302	0	278	278	0
Volume Left	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.18	0.18	0.00	0.16	0.16	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS						A
Approach Delay (s)	0.0			0.0		0.0
Approach LOS						A

Intersection Summary				
Average Delay	0.0			
Intersection Capacity Utilization	18.7%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	490	68	54	446	66	33
Future Volume (Veh/h)	490	68	54	446	66	33
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	533	74	59	485	72	36
Pedestrians					3	
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)				194		
pX, platoon unblocked						
vC, conflicting volume			610		896	270
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			610		896	270
tC, single (s)			4.1		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.3
p0 queue free %			94		72	95
cM capacity (veh/h)			962		255	721

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	266	266	74	59	242	242	72	36
Volume Left	0	0	0	59	0	0	72	0
Volume Right	0	0	74	0	0	0	0	36
cSH	1700	1700	1700	962	1700	1700	255	721
Volume to Capacity	0.16	0.16	0.04	0.06	0.14	0.14	0.28	0.05
Queue Length 95th (m)	0.0	0.0	0.0	1.6	0.0	0.0	9.0	1.3
Control Delay (s)	0.0	0.0	0.0	9.0	0.0	0.0	24.6	10.3
Lane LOS				A			C	B
Approach Delay (s)	0.0			1.0			19.8	
Approach LOS							C	

Intersection Summary				
Average Delay	2.1			
Intersection Capacity Utilization	30.5%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	473	49	191	427	72	245
Future Volume (vph)	473	49	191	427	72	245
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2	6			4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	20.0	20.0	20.0	20.0	8.0	8.0
Minimum Split (s)	31.2	31.2	31.2	31.2	14.5	14.5
Total Split (s)	45.0	45.0	45.0	45.0	15.0	15.0
Total Split (%)	75.0%	75.0%	75.0%	75.0%	25.0%	25.0%
Yellow Time (s)	4.1	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	2.1	2.1	2.1	2.1	2.4	2.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None
Act Effct Green (s)	39.1	39.1	39.1	39.1	8.2	8.2
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.14	0.14
v/c Ratio	0.23	0.05	0.42	0.22	0.32	0.62
Control Delay	4.6	1.5	8.2	4.6	27.3	10.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.6	1.5	8.2	4.6	27.3	10.8
LOS	A	A	A	A	C	B
Approach Delay	4.3			5.7	14.5	
Approach LOS	A			A	B	

Intersection Summary			
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Natural Cycle: 50			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.62			
Intersection Signal Delay: 7.1		Intersection LOS: A	
Intersection Capacity Utilization 55.8%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 4: Rogers Road & Elgin Street West

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	473	49	191	427	72	245
Future Volume (vph)	473	49	191	427	72	245
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	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	0.95	1.00
Satd. Flow (prot)	3466	1521	1580	3275	1785	1471
Flt Permitted	1.00	1.00	0.46	1.00	0.95	1.00
Satd. Flow (perm)	3466	1521	769	3275	1785	1471
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	514	53	208	464	78	266
RTOR Reduction (vph)	0	18	0	0	0	230
Lane Group Flow (vph)	514	35	208	464	78	36
Confl. Peds. (#/hr)						1
Heavy Vehicles (%)	3%	5%	13%	9%	0%	7%
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2	6			4
Actuated Green, G (s)	39.1	39.1	39.1	39.1	8.2	8.2
Effective Green, g (s)	39.1	39.1	39.1	39.1	8.2	8.2
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.14	0.14
Clearance Time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2258	991	501	2134	243	201
v/s Ratio Prot	0.15			0.14	c0.04	
v/s Ratio Perm		0.02	c0.27			0.02
v/c Ratio	0.23	0.03	0.42	0.22	0.32	0.18
Uniform Delay, d1	4.3	3.7	5.0	4.2	23.4	22.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.2	0.1	2.5	0.2	0.8	0.4
Delay (s)	4.5	3.8	7.5	4.5	24.2	23.4
Level of Service	A	A	A	A	C	C
Approach Delay (s)	4.4			5.4	23.5	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	9.0	HCM 2000 Level of Service	A	
HCM 2000 Volume to Capacity ratio	0.40			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.7	
Intersection Capacity Utilization	55.8%	ICU Level of Service	B	
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)	3	42	7	0	28	0	9	0	0	1	0	3
Future Volume (Veh/h)	3	42	7	0	28	0	9	0	0	1	0	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	46	8	0	30	0	10	0	0	1	0	3
Pedestrians								1			4	
Lane Width (m)								3.5			3.5	
Walking Speed (m/s)								1.2			1.2	
Percent Blockage								0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	34			55			90	91	51	90	95	34
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	34			55			90	91	51	90	95	34
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			100			99	100	100	100	100	100
cM capacity (veh/h)	1585			1562			892	798	1022	893	794	1042

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	57	30	10	4
Volume Left	3	0	10	1
Volume Right	8	0	0	3
cSH	1585	1562	892	1000
Volume to Capacity	0.00	0.00	0.01	0.00
Queue Length 95th (m)	0.0	0.0	0.3	0.1
Control Delay (s)	0.4	0.0	9.1	8.6
Lane LOS	A		A	A
Approach Delay (s)	0.4	0.0	9.1	8.6
Approach LOS			A	A

Intersection Summary				
Average Delay	1.5			
Intersection Capacity Utilization	15.4%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	718	11	24	742	3	23
Future Volume (Veh/h)	718	11	24	742	3	23
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	780	12	26	807	3	25
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			793		1236	391
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			793		1236	391
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		98	96
cM capacity (veh/h)			836		166	613

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	NB 2
Volume Total	390	390	12	295	538	3	25
Volume Left	0	0	0	26	0	3	0
Volume Right	0	0	12	0	0	0	25
cSH	1700	1700	1700	836	1700	166	613
Volume to Capacity	0.23	0.23	0.01	0.03	0.32	0.02	0.04
Queue Length 95th (m)	0.0	0.0	0.0	0.8	0.0	0.4	1.0
Control Delay (s)	0.0	0.0	0.0	1.2	0.0	27.1	11.1
Lane LOS				A		D	B
Approach Delay (s)	0.0			0.4		12.8	
Approach LOS						B	

Intersection Summary				
Average Delay	0.4			
Intersection Capacity Utilization	47.9%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	741	0	0	766	0	0
Future Volume (Veh/h)	741	0	0	766	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	805	0	0	833	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				288		
pX, platoon unblocked						
vC, conflicting volume			805		1222	402
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			805		1222	402
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			815		172	597

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1
Volume Total	402	402	0	416	416	0
Volume Left	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.24	0.24	0.00	0.24	0.24	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS						A
Approach Delay (s)	0.0			0.0		0.0
Approach LOS						A

Intersection Summary				
Average Delay	0.0			
Intersection Capacity Utilization	24.5%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	676	65	50	700	67	71
Future Volume (Veh/h)	676	65	50	700	67	71
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	735	71	54	761	73	77
Pedestrians					2	
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)				194		
pX, platoon unblocked					0.97	
vC, conflicting volume			808		1226	370
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			808		1176	370
tC, single (s)			4.2		6.8	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			93		57	88
cM capacity (veh/h)			805		170	621

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	368	368	71	54	380	380	73	77
Volume Left	0	0	0	54	0	0	73	0
Volume Right	0	0	71	0	0	0	0	77
cSH	1700	1700	1700	805	1700	1700	170	621
Volume to Capacity	0.22	0.22	0.04	0.07	0.22	0.22	0.43	0.12
Queue Length 95th (m)	0.0	0.0	0.0	1.7	0.0	0.0	15.6	3.4
Control Delay (s)	0.0	0.0	0.0	9.8	0.0	0.0	41.3	11.6
Lane LOS				A			E	B
Approach Delay (s)	0.0			0.6			26.1	
Approach LOS							D	

Intersection Summary				
Average Delay	2.5			
Intersection Capacity Utilization	35.7%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	603	147	278	601	152	310
Future Volume (vph)	603	147	278	601	152	310
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2	6			4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	20.0	20.0	20.0	20.0	8.0	8.0
Minimum Split (s)	31.2	31.2	31.2	31.2	14.5	14.5
Total Split (s)	45.0	45.0	45.0	45.0	15.0	15.0
Total Split (%)	75.0%	75.0%	75.0%	75.0%	25.0%	25.0%
Yellow Time (s)	4.1	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	2.1	2.1	2.1	2.1	2.4	2.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None
Act Effct Green (s)	38.9	38.9	38.9	38.9	8.4	8.4
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.14	0.14
v/c Ratio	0.29	0.15	0.63	0.29	0.67	0.71
Control Delay	5.0	1.2	13.7	5.0	40.1	15.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.0	1.2	13.7	5.0	40.1	15.5
LOS	A	A	B	A	D	B
Approach Delay	4.2			7.7	23.6	
Approach LOS	A			A	C	

Intersection Summary			
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.71			
Intersection Signal Delay: 10.0		Intersection LOS: A	
Intersection Capacity Utilization 57.5%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 4: Rogers Road & Elgin Street West

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	603	147	278	601	152	310
Future Volume (vph)	603	147	278	601	152	310
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Lane Util. Factor	0.95	1.00	1.00	0.95	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	0.95	1.00
Satd. Flow (prot)	3535	1597	1750	3535	1767	1581
Flt Permitted	1.00	1.00	0.40	1.00	0.95	1.00
Satd. Flow (perm)	3535	1597	742	3535	1767	1581
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	655	160	302	653	165	337
RTOR Reduction (vph)	0	56	0	0	0	252
Lane Group Flow (vph)	655	104	302	653	165	85
Heavy Vehicles (%)	1%	0%	2%	1%	1%	1%
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2	6			4
Actuated Green, G (s)	38.9	38.9	38.9	38.9	8.4	8.4
Effective Green, g (s)	38.9	38.9	38.9	38.9	8.4	8.4
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.14	0.14
Clearance Time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2291	1035	481	2291	247	221
v/s Ratio Prot	0.19			0.18	c0.09	
v/s Ratio Perm		0.06	c0.41			0.05
v/c Ratio	0.29	0.10	0.63	0.29	0.67	0.38
Uniform Delay, d1	4.6	4.0	6.3	4.6	24.5	23.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.2	6.1	0.3	6.7	1.1
Delay (s)	4.9	4.2	12.3	4.9	31.2	24.6
Level of Service	A	A	B	A	C	C
Approach Delay (s)	4.7			7.2	26.7	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	10.6	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.63			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.7	
Intersection Capacity Utilization	57.5%	ICU Level of Service	B	
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)	0	33	5	19	42	11	0	0	14	2	1	0
Future Volume (Veh/h)	0	33	5	19	42	11	0	0	14	2	1	0
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	36	5	21	46	12	0	0	15	2	1	0
Pedestrians								2			2	
Lane Width (m)								3.5			3.5	
Walking Speed (m/s)								1.2			1.2	
Percent Blockage								0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	60			43			135	142	40	150	139	54
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	60			43			135	142	40	150	139	54
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	100	99	100	100	100
cM capacity (veh/h)	1554			1576			828	740	1035	799	743	1017

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	41	79	15	3
Volume Left	0	21	0	2
Volume Right	5	12	15	0
cSH	1554	1576	1035	780
Volume to Capacity	0.00	0.01	0.01	0.00
Queue Length 95th (m)	0.0	0.3	0.4	0.1
Control Delay (s)	0.0	2.0	8.5	9.6
Lane LOS		A	A	A
Approach Delay (s)	0.0	2.0	8.5	9.6
Approach LOS			A	A

Intersection Summary				
Average Delay	2.3			
Intersection Capacity Utilization	20.8%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	623	2	13	634	7	23
Future Volume (Veh/h)	623	2	13	634	7	23
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	677	2	14	689	8	25
Pedestrians					4	
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			683		1054	342
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			683		1054	342
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		96	96
cM capacity (veh/h)			917		221	657

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	NB 2
Volume Total	338	338	2	244	459	8	25
Volume Left	0	0	0	14	0	8	0
Volume Right	0	0	2	0	0	0	25
cSH	1700	1700	1700	917	1700	221	657
Volume to Capacity	0.20	0.20	0.00	0.02	0.27	0.04	0.04
Queue Length 95th (m)	0.0	0.0	0.0	0.4	0.0	0.9	0.9
Control Delay (s)	0.0	0.0	0.0	0.7	0.0	21.9	10.7
Lane LOS				A		C	B
Approach Delay (s)	0.0			0.2		13.4	
Approach LOS						B	

Intersection Summary				
Average Delay	0.4			
Intersection Capacity Utilization	36.8%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	646	0	0	647	0	0
Future Volume (Veh/h)	646	0	0	647	0	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	702	0	0	703	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				288		
pX, platoon unblocked						
vC, conflicting volume			702		1054	351
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			702		1054	351
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	100
cM capacity (veh/h)			891		221	645

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1
Volume Total	351	351	0	352	352	0
Volume Left	0	0	0	0	0	0
Volume Right	0	0	0	0	0	0
cSH	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.21	0.21	0.00	0.21	0.21	0.00
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.0
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS						A
Approach Delay (s)	0.0			0.0		0.0
Approach LOS						A

Intersection Summary				
Average Delay	0.0			
Intersection Capacity Utilization	21.2%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	551	95	103	567	81	102
Future Volume (Veh/h)	551	95	103	567	81	102
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	599	103	112	616	88	111
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				194		
pX, platoon unblocked						
vC, conflicting volume			702		1131	300
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			702		1131	300
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			88		50	84
cM capacity (veh/h)			905		175	703

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	300	300	103	112	308	308	88	111
Volume Left	0	0	0	112	0	0	88	0
Volume Right	0	0	103	0	0	0	0	111
cSH	1700	1700	1700	905	1700	1700	175	703
Volume to Capacity	0.18	0.18	0.06	0.12	0.18	0.18	0.50	0.16
Queue Length 95th (m)	0.0	0.0	0.0	3.4	0.0	0.0	19.7	4.5
Control Delay (s)	0.0	0.0	0.0	9.5	0.0	0.0	44.6	11.1
Lane LOS				A			E	B
Approach Delay (s)	0.0			1.5			25.9	
Approach LOS							D	

Intersection Summary				
Average Delay	3.8			
Intersection Capacity Utilization	35.4%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	535	122	320	559	114	324
Future Volume (vph)	535	122	320	559	114	324
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2	6			4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	20.0	20.0	20.0	20.0	8.0	8.0
Minimum Split (s)	31.2	31.2	31.2	31.2	14.5	14.5
Total Split (s)	45.0	45.0	45.0	45.0	15.0	15.0
Total Split (%)	75.0%	75.0%	75.0%	75.0%	25.0%	25.0%
Yellow Time (s)	4.1	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	2.1	2.1	2.1	2.1	2.4	2.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None
Act Effct Green (s)	39.0	39.0	39.0	39.0	8.3	8.3
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.14	0.14
v/c Ratio	0.25	0.13	0.66	0.26	0.50	0.69
Control Delay	4.8	1.2	14.4	4.8	31.7	12.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.8	1.2	14.4	4.8	31.7	12.6
LOS	A	A	B	A	C	B
Approach Delay	4.1			8.3	17.6	
Approach LOS	A			A	B	

Intersection Summary			
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.69			
Intersection Signal Delay: 9.0		Intersection LOS: A	
Intersection Capacity Utilization 61.0%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 4: Rogers Road & Elgin Street West

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	535	122	320	559	114	324
Future Volume (vph)	535	122	320	559	114	324
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frpb, ped/bikes	1.00	0.97	1.00	1.00	1.00	1.00
Flpb, ped/bikes	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	0.95	1.00
Satd. Flow (prot)	3535	1556	1780	3535	1785	1597
Flt Permitted	1.00	1.00	0.43	1.00	0.95	1.00
Satd. Flow (perm)	3535	1556	811	3535	1785	1597
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	582	133	348	608	124	352
RTOR Reduction (vph)	0	47	0	0	0	287
Lane Group Flow (vph)	582	86	348	608	124	65
Confl. Peds. (#/hr)		5	5			
Heavy Vehicles (%)	1%	0%	0%	1%	0%	0%
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2	6			4
Actuated Green, G (s)	39.0	39.0	39.0	39.0	8.3	8.3
Effective Green, g (s)	39.0	39.0	39.0	39.0	8.3	8.3
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.14	0.14
Clearance Time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2297	1011	527	2297	246	220
v/s Ratio Prot	0.16			0.17	c0.07	
v/s Ratio Perm		0.06	c0.43			0.04
v/c Ratio	0.25	0.09	0.66	0.26	0.50	0.30
Uniform Delay, d1	4.4	3.9	6.4	4.4	23.9	23.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.2	6.4	0.3	1.6	0.8
Delay (s)	4.7	4.1	12.8	4.7	25.6	24.0
Level of Service	A	A	B	A	C	C
Approach Delay (s)	4.6			7.7	24.4	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	10.3	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.63			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.7	
Intersection Capacity Utilization	61.0%	ICU Level of Service	B	
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)	3	42	3	7	49	2	1	0	10	5	0	5
Future Volume (Veh/h)	3	42	3	7	49	2	1	0	10	5	0	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	46	3	8	53	2	1	0	11	5	0	5
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	55			49			128	124	48	134	125	54
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	55			49			128	124	48	134	125	54
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	100			99			100	100	99	99	100	100
cM capacity (veh/h)	1550			1551			840	764	1027	828	764	1019

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	52	63	12	10
Volume Left	3	8	1	5
Volume Right	3	2	11	5
cSH	1550	1551	1009	914
Volume to Capacity	0.00	0.01	0.01	0.01
Queue Length 95th (m)	0.0	0.1	0.3	0.3
Control Delay (s)	0.4	1.0	8.6	9.0
Lane LOS	A	A	A	A
Approach Delay (s)	0.4	1.0	8.6	9.0
Approach LOS			A	A

Intersection Summary				
Average Delay	2.0			
Intersection Capacity Utilization	14.9%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	578	11	22	520	5	28
Future Volume (Veh/h)	578	11	22	520	5	28
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	628	12	24	565	5	30
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			641		960	315
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			641		960	315
tC, single (s)			4.1		6.8	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.4
p0 queue free %			97		98	96
cM capacity (veh/h)			952		252	669

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	NB 2
Volume Total	314	314	12	212	377	5	30
Volume Left	0	0	0	24	0	5	0
Volume Right	0	0	12	0	0	0	30
cSH	1700	1700	1700	952	1700	252	669
Volume to Capacity	0.18	0.18	0.01	0.03	0.22	0.02	0.04
Queue Length 95th (m)	0.0	0.0	0.0	0.6	0.0	0.5	1.1
Control Delay (s)	0.0	0.0	0.0	1.2	0.0	19.6	10.6
Lane LOS				A		C	B
Approach Delay (s)	0.0			0.4		11.9	
Approach LOS						B	

Intersection Summary				
Average Delay	0.5			
Intersection Capacity Utilization	40.5%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	546	44	0	542	0	37
Future Volume (Veh/h)	546	44	0	542	0	37
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	593	48	0	589	0	40
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				288		
pX, platoon unblocked						
vC, conflicting volume			641		888	296
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			641		888	296
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	94
cM capacity (veh/h)			939		283	700

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1
Volume Total	296	296	48	294	294	40
Volume Left	0	0	0	0	0	0
Volume Right	0	0	48	0	0	40
cSH	1700	1700	1700	1700	1700	700
Volume to Capacity	0.17	0.17	0.03	0.17	0.17	0.06
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	1.5
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	10.5
Lane LOS						B
Approach Delay (s)	0.0			0.0		10.5
Approach LOS						B

Intersection Summary				
Average Delay	0.3			
Intersection Capacity Utilization	25.1%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	513	71	100	438	104	36
Future Volume (Veh/h)	513	71	100	438	104	36
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	558	77	109	476	113	39
Pedestrians					3	
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)				194		
pX, platoon unblocked						
vC, conflicting volume			638		1017	282
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			638		1017	282
tC, single (s)			4.1		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.3
p0 queue free %			88		44	94
cM capacity (veh/h)			939		200	707

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	279	279	77	109	238	238	113	39
Volume Left	0	0	0	109	0	0	113	0
Volume Right	0	0	77	0	0	0	0	39
cSH	1700	1700	1700	939	1700	1700	200	707
Volume to Capacity	0.16	0.16	0.05	0.12	0.14	0.14	0.56	0.06
Queue Length 95th (m)	0.0	0.0	0.0	3.1	0.0	0.0	24.3	1.4
Control Delay (s)	0.0	0.0	0.0	9.3	0.0	0.0	44.0	10.4
Lane LOS				A			E	B
Approach Delay (s)	0.0			1.7			35.4	
Approach LOS							E	

Intersection Summary				
Average Delay	4.7			
Intersection Capacity Utilization	35.5%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	499	49	193	456	81	255
Future Volume (vph)	499	49	193	456	81	255
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2	6			4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	20.0	20.0	20.0	20.0	8.0	8.0
Minimum Split (s)	31.2	31.2	31.2	31.2	14.5	14.5
Total Split (s)	45.0	45.0	45.0	45.0	15.0	15.0
Total Split (%)	75.0%	75.0%	75.0%	75.0%	25.0%	25.0%
Yellow Time (s)	4.1	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	2.1	2.1	2.1	2.1	2.4	2.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None
Act Effct Green (s)	39.0	39.0	39.0	39.0	8.3	8.3
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.14	0.14
v/c Ratio	0.24	0.05	0.43	0.23	0.36	0.63
Control Delay	4.7	1.5	8.6	4.7	28.0	10.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.7	1.5	8.6	4.7	28.0	10.8
LOS	A	A	A	A	C	B
Approach Delay	4.4			5.8	15.0	
Approach LOS	A			A	B	

Intersection Summary			
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Natural Cycle: 50			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.63			
Intersection Signal Delay: 7.3		Intersection LOS: A	
Intersection Capacity Utilization 55.8%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 4: Rogers Road & Elgin Street West

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	499	49	193	456	81	255
Future Volume (vph)	499	49	193	456	81	255
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	0.99
Flpb, ped/bikes	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	0.95	1.00
Satd. Flow (prot)	3466	1521	1580	3275	1785	1471
Flt Permitted	1.00	1.00	0.45	1.00	0.95	1.00
Satd. Flow (perm)	3466	1521	748	3275	1785	1471
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	542	53	210	496	88	277
RTOR Reduction (vph)	0	19	0	0	0	239
Lane Group Flow (vph)	542	34	210	496	88	38
Confl. Peds. (#/hr)						1
Heavy Vehicles (%)	3%	5%	13%	9%	0%	7%
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2	6			4
Actuated Green, G (s)	39.0	39.0	39.0	39.0	8.3	8.3
Effective Green, g (s)	39.0	39.0	39.0	39.0	8.3	8.3
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.14	0.14
Clearance Time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2252	988	486	2128	246	203
v/s Ratio Prot	0.16			0.15	c0.05	
v/s Ratio Perm		0.02	c0.28			0.03
v/c Ratio	0.24	0.03	0.43	0.23	0.36	0.19
Uniform Delay, d1	4.4	3.8	5.1	4.3	23.4	22.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.1	2.8	0.3	0.9	0.5
Delay (s)	4.6	3.8	7.9	4.6	24.3	23.3
Level of Service	A	A	A	A	C	C
Approach Delay (s)	4.5			5.6	23.6	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	9.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.42		
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.7
Intersection Capacity Utilization	55.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	8	42	7	0	28	3	9	0	0	17	0	14
Future Volume (Veh/h)	8	42	7	0	28	3	9	0	0	17	0	14
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	46	8	0	30	3	10	0	0	18	0	15
Pedestrians								1			4	
Lane Width (m)								3.5			3.5	
Walking Speed (m/s)								1.2			1.2	
Percent Blockage								0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	37			55			116	106	51	104	108	36
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	37			55			116	106	51	104	108	36
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			99	100	100	98	100	99
cM capacity (veh/h)	1582			1562			846	780	1022	872	778	1040

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	63	33	10	33
Volume Left	9	0	10	18
Volume Right	8	3	0	15
cSH	1582	1562	846	941
Volume to Capacity	0.01	0.00	0.01	0.04
Queue Length 95th (m)	0.1	0.0	0.3	0.9
Control Delay (s)	1.1	0.0	9.3	9.0
Lane LOS	A		A	A
Approach Delay (s)	1.1	0.0	9.3	9.0
Approach LOS			A	A

Intersection Summary			
Average Delay	3.3		
Intersection Capacity Utilization	19.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	744	21	24	769	5	26
Future Volume (Veh/h)	744	21	24	769	5	26
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	809	23	26	836	5	28
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			833		1280	406
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			833		1280	406
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		97	95
cM capacity (veh/h)			808		155	600

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	NB 2
Volume Total	404	404	23	305	557	5	28
Volume Left	0	0	0	26	0	5	0
Volume Right	0	0	23	0	0	0	28
cSH	1700	1700	1700	808	1700	155	600
Volume to Capacity	0.24	0.24	0.01	0.03	0.33	0.03	0.05
Queue Length 95th (m)	0.0	0.0	0.0	0.8	0.0	0.8	1.2
Control Delay (s)	0.0	0.0	0.0	1.2	0.0	29.0	11.3
Lane LOS				A		D	B
Approach Delay (s)	0.0			0.4		14.0	
Approach LOS						B	

Intersection Summary				
Average Delay	0.5			
Intersection Capacity Utilization	48.6%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	731	39	0	793	0	36
Future Volume (Veh/h)	731	39	0	793	0	36
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	795	42	0	862	0	39
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				288		
pX, platoon unblocked						
vC, conflicting volume			837		1226	398
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			837		1226	398
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	94
cM capacity (veh/h)			793		171	602

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1
Volume Total	398	398	42	431	431	39
Volume Left	0	0	0	0	0	0
Volume Right	0	0	42	0	0	39
cSH	1700	1700	1700	1700	1700	602
Volume to Capacity	0.23	0.23	0.02	0.25	0.25	0.06
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	1.7
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	11.4
Lane LOS						B
Approach Delay (s)	0.0			0.0		11.4
Approach LOS						B

Intersection Summary				
Average Delay	0.3			
Intersection Capacity Utilization	30.2%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	699	68	87	692	102	74
Future Volume (Veh/h)	699	68	87	692	102	74
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	760	74	95	752	111	80
Pedestrians					2	
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)				194		
pX, platoon unblocked					0.98	
vC, conflicting volume			836		1328	382
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			836		1289	382
tC, single (s)			4.2		6.8	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			88		18	87
cM capacity (veh/h)			786		136	609

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	380	380	74	95	376	376	111	80
Volume Left	0	0	0	95	0	0	111	0
Volume Right	0	0	74	0	0	0	0	80
cSH	1700	1700	1700	786	1700	1700	136	609
Volume to Capacity	0.22	0.22	0.04	0.12	0.22	0.22	0.82	0.13
Queue Length 95th (m)	0.0	0.0	0.0	3.3	0.0	0.0	40.8	3.6
Control Delay (s)	0.0	0.0	0.0	10.2	0.0	0.0	97.7	11.8
Lane LOS				B			F	B
Approach Delay (s)	0.0			1.1			61.7	
Approach LOS							F	

Intersection Summary				
Average Delay	6.8			
Intersection Capacity Utilization	39.8%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	629	147	291	624	158	315
Future Volume (vph)	629	147	291	624	158	315
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2	6			4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	20.0	20.0	20.0	20.0	8.0	8.0
Minimum Split (s)	31.2	31.2	31.2	31.2	14.5	14.5
Total Split (s)	45.0	45.0	45.0	45.0	15.0	15.0
Total Split (%)	75.0%	75.0%	75.0%	75.0%	25.0%	25.0%
Yellow Time (s)	4.1	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	2.1	2.1	2.1	2.1	2.4	2.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None
Act Effct Green (s)	38.9	38.9	38.9	38.9	8.4	8.4
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.14	0.14
v/c Ratio	0.30	0.15	0.68	0.30	0.70	0.75
Control Delay	5.0	1.2	16.4	5.0	42.1	18.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	5.0	1.2	16.4	5.0	42.1	18.6
LOS	A	A	B	A	D	B
Approach Delay	4.3			8.6	26.5	
Approach LOS	A			A	C	

Intersection Summary			
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.75			
Intersection Signal Delay: 11.0		Intersection LOS: B	
Intersection Capacity Utilization 58.6%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 4: Rogers Road & Elgin Street West

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	629	147	291	624	158	315
Future Volume (vph)	629	147	291	624	158	315
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Lane Util. Factor	0.95	1.00	1.00	0.95	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	0.95	1.00
Satd. Flow (prot)	3535	1597	1750	3535	1767	1581
Flt Permitted	1.00	1.00	0.39	1.00	0.95	1.00
Satd. Flow (perm)	3535	1597	721	3535	1767	1581
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	684	160	316	678	172	342
RTOR Reduction (vph)	0	56	0	0	0	237
Lane Group Flow (vph)	684	104	316	678	172	105
Heavy Vehicles (%)	1%	0%	2%	1%	1%	1%
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2	6			4
Actuated Green, G (s)	38.9	38.9	38.9	38.9	8.4	8.4
Effective Green, g (s)	38.9	38.9	38.9	38.9	8.4	8.4
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.14	0.14
Clearance Time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2291	1035	467	2291	247	221
v/s Ratio Prot	0.19			0.19	c0.10	
v/s Ratio Perm		0.06	c0.44			0.07
v/c Ratio	0.30	0.10	0.68	0.30	0.70	0.47
Uniform Delay, d1	4.6	4.0	6.6	4.6	24.6	23.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.2	7.7	0.3	8.3	1.6
Delay (s)	4.9	4.2	14.3	4.9	32.8	25.4
Level of Service	A	A	B	A	C	C
Approach Delay (s)	4.8			7.9	27.9	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	11.1	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.68			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.7	
Intersection Capacity Utilization	58.6%	ICU Level of Service	B	
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)	12	33	5	19	42	27	0	0	14	9	1	9
Future Volume (Veh/h)	12	33	5	19	42	27	0	0	14	9	1	9
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	13	36	5	21	46	29	0	0	15	10	1	10
Pedestrians								2			2	
Lane Width (m)								3.5			3.5	
Walking Speed (m/s)								1.2			1.2	
Percent Blockage								0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	77			43			180	186	40	184	174	62
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	77			43			180	186	40	184	174	62
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			100	100	99	99	100	99
cM capacity (veh/h)	1532			1576			762	695	1035	754	705	1006

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	54	96	15	21
Volume Left	13	21	0	10
Volume Right	5	29	15	10
cSH	1532	1576	1035	853
Volume to Capacity	0.01	0.01	0.01	0.02
Queue Length 95th (m)	0.2	0.3	0.4	0.6
Control Delay (s)	1.8	1.7	8.5	9.3
Lane LOS	A	A	A	A
Approach Delay (s)	1.8	1.7	8.5	9.3
Approach LOS			A	A

Intersection Summary				
Average Delay	3.1			
Intersection Capacity Utilization	21.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	654	10	13	666	9	28
Future Volume (Veh/h)	654	10	13	666	9	28
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	711	11	14	724	10	30
Pedestrians					4	
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			726		1105	360
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			726		1105	360
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		95	95
cM capacity (veh/h)			883		204	641

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1	NB 2
Volume Total	356	356	11	255	483	10	30
Volume Left	0	0	0	14	0	10	0
Volume Right	0	0	11	0	0	0	30
cSH	1700	1700	1700	883	1700	204	641
Volume to Capacity	0.21	0.21	0.01	0.02	0.28	0.05	0.05
Queue Length 95th (m)	0.0	0.0	0.0	0.4	0.0	1.2	1.2
Control Delay (s)	0.0	0.0	0.0	0.7	0.0	23.5	10.9
Lane LOS				A		C	B
Approach Delay (s)	0.0			0.2		14.1	
Approach LOS						B	

Intersection Summary				
Average Delay	0.5			
Intersection Capacity Utilization	37.7%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	632	50	0	679	0	44
Future Volume (Veh/h)	632	50	0	679	0	44
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	687	54	0	738	0	48
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				288		
pX, platoon unblocked						
vC, conflicting volume			741		1056	344
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			741		1056	344
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	93
cM capacity (veh/h)			862		221	652

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	NB 1
Volume Total	344	344	54	369	369	48
Volume Left	0	0	0	0	0	0
Volume Right	0	0	54	0	0	48
cSH	1700	1700	1700	1700	1700	652
Volume to Capacity	0.20	0.20	0.03	0.22	0.22	0.07
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	1.9
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	11.0
Lane LOS						B
Approach Delay (s)	0.0			0.0		11.0
Approach LOS						B

Intersection Summary				
Average Delay	0.3			
Intersection Capacity Utilization	27.5%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	578	98	153	556	124	105
Future Volume (Veh/h)	578	98	153	556	124	105
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	628	107	166	604	135	114
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (m)				194		
pX, platoon unblocked						
vC, conflicting volume			735		1262	314
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			735		1262	314
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			81		0	83
cM capacity (veh/h)			879		134	688

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	314	314	107	166	302	302	135	114
Volume Left	0	0	0	166	0	0	135	0
Volume Right	0	0	107	0	0	0	0	114
cSH	1700	1700	1700	879	1700	1700	134	688
Volume to Capacity	0.18	0.18	0.06	0.19	0.18	0.18	1.01	0.17
Queue Length 95th (m)	0.0	0.0	0.0	5.5	0.0	0.0	57.6	4.7
Control Delay (s)	0.0	0.0	0.0	10.0	0.0	0.0	145.2	11.3
Lane LOS				B			F	B
Approach Delay (s)	0.0			2.2			83.9	
Approach LOS							F	

Intersection Summary				
Average Delay	12.9			
Intersection Capacity Utilization	41.3%	ICU Level of Service		A
Analysis Period (min)	15			

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	565	122	330	589	123	330
Future Volume (vph)	565	122	330	589	123	330
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2	6			4
Detector Phase	2	2	6	6	4	4
Switch Phase						
Minimum Initial (s)	20.0	20.0	20.0	20.0	8.0	8.0
Minimum Split (s)	31.2	31.2	31.2	31.2	14.5	14.5
Total Split (s)	45.0	45.0	45.0	45.0	15.0	15.0
Total Split (%)	75.0%	75.0%	75.0%	75.0%	25.0%	25.0%
Yellow Time (s)	4.1	4.1	4.1	4.1	4.1	4.1
All-Red Time (s)	2.1	2.1	2.1	2.1	2.4	2.4
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Lead/Lag						
Lead-Lag Optimize?						
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None
Act Effct Green (s)	39.0	39.0	39.0	39.0	8.3	8.3
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.14	0.14
v/c Ratio	0.27	0.13	0.71	0.28	0.54	0.73
Control Delay	4.9	1.2	17.0	4.9	32.9	16.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.9	1.2	17.0	4.9	32.9	16.1
LOS	A	A	B	A	C	B
Approach Delay	4.2			9.3	20.7	
Approach LOS	A			A	C	

Intersection Summary			
Cycle Length: 60			
Actuated Cycle Length: 60			
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.73			
Intersection Signal Delay: 10.1		Intersection LOS: B	
Intersection Capacity Utilization 61.7%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 4: Rogers Road & Elgin Street West

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	565	122	330	589	123	330
Future Volume (vph)	565	122	330	589	123	330
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Frpb, ped/bikes	1.00	0.97	1.00	1.00	1.00	1.00
Flpb, ped/bikes	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	0.95	1.00
Satd. Flow (prot)	3535	1556	1780	3535	1785	1597
Flt Permitted	1.00	1.00	0.42	1.00	0.95	1.00
Satd. Flow (perm)	3535	1556	786	3535	1785	1597
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	614	133	359	640	134	359
RTOR Reduction (vph)	0	47	0	0	0	268
Lane Group Flow (vph)	614	86	359	640	134	91
Confl. Peds. (#/hr)		5	5			
Heavy Vehicles (%)	1%	0%	0%	1%	0%	0%
Turn Type	NA	Perm	Perm	NA	Prot	Perm
Protected Phases	2			6	4	
Permitted Phases		2	6			4
Actuated Green, G (s)	39.0	39.0	39.0	39.0	8.3	8.3
Effective Green, g (s)	39.0	39.0	39.0	39.0	8.3	8.3
Actuated g/C Ratio	0.65	0.65	0.65	0.65	0.14	0.14
Clearance Time (s)	6.2	6.2	6.2	6.2	6.5	6.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	2297	1011	510	2297	246	220
v/s Ratio Prot	0.17			0.18	c0.08	
v/s Ratio Perm		0.06	c0.46			0.06
v/c Ratio	0.27	0.09	0.70	0.28	0.54	0.41
Uniform Delay, d1	4.4	3.9	6.8	4.5	24.1	23.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3	0.2	7.9	0.3	2.5	1.3
Delay (s)	4.7	4.1	14.7	4.8	26.5	24.9
Level of Service	A	A	B	A	C	C
Approach Delay (s)	4.6			8.3	25.3	
Approach LOS	A			A	C	

Intersection Summary				
HCM 2000 Control Delay	10.8	HCM 2000 Level of Service	B	
HCM 2000 Volume to Capacity ratio	0.67			
Actuated Cycle Length (s)	60.0	Sum of lost time (s)	12.7	
Intersection Capacity Utilization	61.7%	ICU Level of Service	B	
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)	13	42	3	7	49	14	1	0	10	16	0	17
Future Volume (Veh/h)	13	42	3	7	49	14	1	0	10	16	0	17
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	46	3	8	53	15	1	0	11	17	0	18
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	68			49			170	160	48	163	154	60
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	68			49			170	160	48	163	154	60
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			99			100	100	99	98	100	98
cM capacity (veh/h)	1533			1551			775	726	1027	789	731	1010

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	63	76	12	35
Volume Left	14	8	1	17
Volume Right	3	15	11	18
cSH	1533	1551	1000	889
Volume to Capacity	0.01	0.01	0.01	0.04
Queue Length 95th (m)	0.2	0.1	0.3	1.0
Control Delay (s)	1.7	0.8	8.6	9.2
Lane LOS	A	A	A	A
Approach Delay (s)	1.7	0.8	8.6	9.2
Approach LOS			A	A

Intersection Summary				
Average Delay	3.2			
Intersection Capacity Utilization	18.8%	ICU Level of Service	A	
Analysis Period (min)	15			

APPENDIX E

Level of Service Definitions

LEVEL OF SERVICE ANALYSIS AT SIGNALIZED INTERSECTIONS

To assist in clarifying the arithmetic analysis associated with traffic engineering, it is often useful to refer to "Level of Service". The term Level of Service implies a qualitative measure of traffic flow at an intersection. It is dependent upon vehicle delay and vehicle queue lengths at the approaches. Specifically, Level of Service criteria are stated in terms of the average stopped delay per vehicle for a 15-minute analysis period. The following table describes the characteristics of each level:

Level of Service	Features	Stopped Delay per Vehicle (sec)
A	At this level of service, almost no signal phase is fully utilized by traffic. Very seldom does a vehicle wait longer than one red indication. The approach appears open, turning movements are easily made and drivers have freedom of operation.	≤ 5.0
B	At this level, an occasional signal phase is fully utilized and many phases approach full use. Many drivers begin to feel somewhat restricted within platoons of vehicles approaching the intersection.	> 5.0 and ≤ 15.0
C	At this level, the operation is stable though with more frequent fully utilized signal phases. Drivers feel more restricted and occasionally may have to wait more than one red signal indication, and queues may develop behind turning vehicles. This level is normally employed in urban intersection design.	> 15.0 and ≤ 25.0
D	At this level, the motorist experiences increasing restriction and instability of flow. There are substantial delays to approaching vehicles during short peaks within the peak period, but there are enough cycles with lower demand to permit occasional clearance of developing queues and prevent excessive backups.	> 25.0 and ≤ 40.0
E	At this level, capacity is reached. There are long queues of vehicles waiting upstream of the intersection and delays to vehicles may extend to several signal cycles.	> 40.0 and ≤ 60.0
F	At this level, saturation occurs, with vehicle demand exceeding the available capacity.	> 60.0

LEVEL OF SERVICE ANALYSIS AT UNSIGNALIZED INTERSECTIONS[1]

The term "level of service" implies a qualitative measure of traffic flow at an intersection. It is dependent upon the vehicle delay and vehicle queue lengths at approaches. The level of service at unsignalized intersections is often related to the delay accumulated by flows on the minor streets, caused by all other conflicting movements. The following table describes the characteristics of each level.

Level of Service	Features
A	Little or no traffic delay occurs. Approaches appear open, turning movements are easily made, and drivers have freedom of operation.
B	Short traffic delays occur. Many drivers begin to feel somewhat restricted in terms of freedom of operation.
C	Average traffic delays occur. Operations are generally stable, but drivers emerging from the minor street may experience difficulty in completing their movement. This may occasionally impact on the stability of flow on the major street.
D	Long traffic delays occur. Motorists emerging from the minor street experience significant restriction and frustration. Drivers on the major street will experience congestion and delay as drivers emerging from the minor street interfere with the major through movements.
E	Very long traffic delays occur. Operations approach the capacity of the intersection.
F	Saturation occurs, with vehicle demand exceeding the available capacity. Very long traffic delays occur.

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(1) Highway Capacity Manual - Special Report No. 209, Transportation Research Board, 1985.