

TRAFFIC IMPACT STUDY UPDATE, PARKING STUDY, & SITE PLAN REVIEW (REVISED)

6th Submission,
Response to Town Comments

Proposed Oakville AVID Hotel Development,
North Service Road West / Kerr Street &
QEW Off-Ramp, Oakville, ON

May 2020

Prepared for
Empress Capital Group Inc.

c/o API Development Consultants



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May 7, 2020

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Our Project file: TPI-2019P169

Re: Proposed Oakville AVID Hotel Development, North Service Road West / Kerr Street & QEW Off-Ramp, Oakville, ON – Traffic Impact Study Update, Parking Study and Site Plan Review (Revised)

TRANS-PLAN has prepared this Traffic Impact Study Update, Parking Study and Site Plan Review (Revised) in support of the proposed AVID Hotel Development located at the North Service Road West / Kerr Street and Queen Elizabeth Way Off-Ramp, in the Town of Oakville, Ontario. This study has been prepared in response to Town of Oakville comments on our report, dated November 14, 2019. The parking study and site plan review have been revised and a TIS update (to the traffic study in the previous report by LMM) is provided.

The proposed hotel consists of a seven-storey building, containing 114 hotel rooms and a total GFA of 5,081.8 m². The proposed parking supply is 95 passenger vehicle parking spaces, provided on a surface lot.

Our traffic impact study findings indicate that the study area intersections are expected to operate acceptably in the future and no road improvements are required to accommodate the proposed development. The existing infrastructure and the capacity of the existing transit routes within the study area is expected to be sufficient for the site.

A Site Plan Review is also included, showing the onsite circulation, demonstrating that the design of site access (i.e. connection at North Service Road) would be acceptable for traffic operations. A vehicle turning template review is also provided to show the on-site circulation.

Our parking study includes a review of the Town of Oakville Zoning By-law 2014-014 for parking requirements and a parking demand analysis of other similar hotel developments in the region, in comparison to the development proposal. Based on our review, the proposed total parking supply is expected to be sufficient for the proposed development.

Sincerely,



Anil Seegobin, P.Eng.
Partner, Engineer

Trans-Plan Transportation Inc.
Transportation Consultants



Joseph Doran
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Transmittal Letter

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1. INTRODUCTION

TRANS-PLAN has been retained by API Development Consultants to update the following documents by LMM Engineering Inc. for the proposed Oakville AVID Hotel at the southwest quadrant of North Service Road West and the Queen Elizabeth Way (QEW) Off-Ramp in the Town of Oakville:

- Memorandum, dated September 5, 2018
- Traffic Impact Study, dated September 12, 2018
- Parking Study, dated August 1, 2018

The overall methods and results of the analysis of the LMM Traffic Impact Study report and Memorandum conducted for the proposed Oakville AVID Hotel development were reviewed by Trans-Plan and found to be reasonable.

The LMM TIS report included no mention of nearby background developments. However, our review of the Town of Oakville development applications shows one new development proposal in the vicinity. This application for the Glen Abbey Golf Course development has been refused previously and is currently under appeal to be heard in 2020. We consider this application unlikely to proceed within our project's completion thus we are not considering it further in our analysis.

Also, since the release of the LMM TIS report, the site plan has been updated presenting changes to the site access (for the proposed right-in/out driveway) and updated parking arrangement. An agreement for a shared access with Dorval Crossing plaza has not been reached to date.

The LMM Parking Study was limited by the inclusion of a proxy study that is in our opinion, too dissimilar to the proposed development and by using data from off-peak season surveys without accounting for hotel occupancy. Our analysis responded to this by including relevant proxy study sites and surveys conducted during a higher volume season and by factoring up the rate taking the actual occupancy of the hotel into account.

This Addendum Report for the proposed AVID Hotel Development located at North Service Road West / Kerr Street and Queen Elizabeth Way Off-Ramp, in the Town of Oakville, Ontario, includes the following components:

Traffic Impact Study Update

- A review of the site and development proposal.
- A review of existing and background conditions based on the previous report by LMM Engineering.
- An assessment of the impact of site-generated traffic on the study area intersections under future traffic conditions.
- An update of the future total traffic analysis for 2029 conditions based upon the LMM Engineering report and new hotel statistics and site access configuration.
- Recommendations to mitigate any identified traffic impacts on the boundary roadways, resulting from the proposed development.

Site Plan Review



- A vehicle swept path simulation analysis of the proposed site access location and circulation scheme of loading, waste collection and tour buses.
- A review of changes to the site access to allow safer movements throughout the site.

Parking Study (Revised)

- A review of the site parking supply and of the Town of Oakville Zoning By-law 2014-014 for hotel parking requirements.
- Parking demand surveys at nearby hotel proxy sites with similar number of storeys and with a similar site context.
- Confirmation that the proposed parking supply would be sufficient for the site based on our parking survey results.

The Development Application Guidelines for Traffic Impact Studies and Parking Studies provided on the Town of Oakville Terms of Reference website, as well as the Region of Halton Guidelines & Requirements for Traffic Impact Studies and the MTO General Guidelines for the Preparation of Traffic Impact Studies have been reviewed for this study.

2. TOWN OF OAKVILLE COMMENTS

The Town of Oakville gave the following comments regarding the 5th submission on February 26, 2020. Our responses are included below:

- 1. The traffic consultant –Trans Plan submitted a parking justification report and conducted parking utilization survey for the two proxy sites during the month of August and September. The justification for selecting the months and the period of the year to collect parking data at the hotel sites are not provided in the report.*

August and September were the two busiest months in terms of hotel occupancy in Ontario. The 2019 data provided by the Ontario Ministry of Heritage, Sport, Tourism and Culture Industries is shown in Appendix D.

- 2. Parking spaces required for the conference area at the proxy sites survey are not accounted for in the recommended number of parking spaces for AVID hotel site.*

The proxy sites surveyed contain ground floor public use areas of a similar size to the subject site, as a result the peak demands of the public areas were included in the overall parking rate. Notwithstanding, the proxy sites' public use areas are actual conference space, whereas this project will not include any conference space. Therefore, the observed parking rate can be considered conservative since the demand includes use of conference facilities. Section 11 describes the parking study with Section 12 detailing the specifics of the proxy sites.

- 3. Due to the curvature of the site driveway located at the North Service Road, the traffic accessing the site will have to make an immediate right turn maneuver to stay in the inbound lane, which will be difficult to maintain and could be a safety issue. The applicant is desired to reconsider the driveway configuration to make it functionally safe for the site traffic and resubmit the plan for review and comments from transportation strategy.*



The design of the entranceway has been widened to a 13.75 m curb cut as well as the curb radius on each side being increased to 7.65 m to allow inbound traffic to stay in lane. This can be seen on the revised site plan, dated March 26, 2020, included in Figure 2.

- 4. Results of the study area intersections analysis have not been provided in the traffic study for review and comments by the transportation staff, the traffic consultant should update the traffic report and resubmit for review and comments from the transportation staff.*

The capacity analysis has been expanded to include the boundary intersections, the summary of which is included in section 9 below.

3. SITE LOCATION AND SURROUNDING USES

The site, shown in Figure 1, is located along North Service Road West / Kerr Street in the Town of Oakville. North Service Road West is a major arterial roadway and continues along the north side of Queen Elizabeth Way / Highway 403. Kerr Street is also a major arterial roadway and continues to the southeast as a main retail street in the city. The proposed site is approximately 200 m from the Queen Elizabeth Way / Highway 403 to the south with the westbound off ramp running adjacent to the east side of the site. Nearby land uses include commercial properties to the east and west along Kerr Street / North Service Road West with a natural area zone to the north with residential neighbourhoods beyond.

4. PROPOSED DEVELOPMENT

The proposed site plan, prepared by API Development Consultants / Saplys Architects Inc., is shown in Figure 2. The proposed development consists of a seven-storey hotel building, containing 114 hotel rooms and a total GFA of 5,081.8 m². A total of 96 parking spaces are proposed on the surface lot, 95 passenger vehicle spaces and 1 bus space. There is also 1 loading space for garbage pick-up and receiving deliveries. The lot is accessed through one proposed one right-in, right-out (RIRO) access on North Service Road West.

TRAFFIC IMPACT STUDY & SITE REVIEW

5. EXISTING CONDITIONS

5.1 Road Network

The major roadways located in the study area and described in the LMM report remain unchanged:

Queen Elizabeth Way / Highway 403 is an east-west 400-series highway under the jurisdiction of the Ministry of Transport for Ontario (MTO). It consists of 8 lanes (four lanes per direction) including one High Occupancy Vehicle (HOV) lane in each direction. The posted speed limit is 100 km/h on the main highway and 40 km/h on the off-ramps. The westbound off-ramp splits around the site with one ramp connecting with Dorval Drive at a signalized intersection and the other connecting with Kerr Street / North Service Road at an unsignalized, stop control intersection.

Dorval Drive is a six-lane road under the jurisdiction of Halton Region. It runs in a north-south orientation, and has a posted speed limit of 60 km/h.



Kerr Street / North Service Road West is a four/five-lane major road under the jurisdiction of the Town of Oakville, and runs in an east-west orientation. The posted speed limit is 60 km/h on the North Service Road portion and 50 km/h on the Kerr Street portion.

The intersections included in the study are as follows

- North Service Road West at Dorval Drive,
- North Service Road West at Queen Elizabeth Way westbound ramps,
- North Service Road West at Queen Elizabeth Way eastbound ramps,
- North Service Road West at signalized Dorval Crossing commercial plaza driveway,
- North Service Road West / Kerr Street at QEW westbound off-ramp,
- Kerr Street at signalized Canadian Tire driveway.

The characteristics of the study area roadways are illustrated in Figure 3.

5.2 Traffic Counts

The traffic counts used in the LMM TIS report for the above-mentioned intersections are dated December 2017 and as a result are still considered to be valid for current analysis. The same raw TMC data, provided in the LMM report, was used for our analysis.

6. FUTURE BACKGROUND CONDITIONS

Future background traffic volumes for the horizon years 2024, 2029 and 2039 were considered in the LMM TIS report. A 2039 analysis is considered excessive for analysis. As a result, the 2029 conditions were considered as the ultimate horizon. The LMM TIS Report also utilised a traffic growth rate of two percent per annum. This is considered a typical conservative growth rate and is maintained in our capacity analysis. The future background traffic volumes for horizon year 2029, in the weekday AM and PM peak hours are shown in Figure 4.

Background Developments and Road Improvements were reviewed for any updates since the submission of the LMM TIS report.

6.1 Planned Background Developments

Based on a review of the development applications of the Town of Oakville, there is one notable background development in the study area for the Glen Abbey Golf Course development to the northwest of the site. This application is proposed to include 141 single detached homes, 299 townhouse units and 2782 apartment units as well as 5,429 m² of office space and 5,841 m² of retail space.

However, this application has been refused with an appeal pending for 2020. There is significant political and public opposition to the development and the site may be considered a heritage site. Therefore, it is not considered for further analysis.

6.2 Planned Roadway and Transit Improvements

There are planned improvements to Kerr Street to the east of our site. The roadway is to be widened and the road diverted underneath the rail lines to remove the at-grade crossing. This project is expected to



begin in 2020. However, these potential improvements are not likely to impact the study area except to improve traffic flow along Kerr Street.

There are no planned improvements to Oakville Transit routes in the study area at this time.

7. SITE TRAFFIC

7.1 Trip Generation

Site trips for the proposed hotel use were generated using the Institute of Transportation Engineers (ITE) Trip Generation manuals, 10th edition. The ITE Land Use Code (LUC) 310 – ‘Hotel’ was selected for determining suitable trip rates for the hotel use. The average rate was used by LMM which gave a higher peak number than the fitted curve equation thus, giving a more conservative peak traffic amount. The same predicted volumes from the LMM TIS report were used.

7.2 Trip Distribution and Assignment

Generated site trips for the proposed hotel were re-distributed and assigned to and from the site through the right-in / right-out access on North Service Road West and the boundary roadways based on existing traffic patterns obtained from the study area intersection counts and study area context.

The site traffic assignments for the weekday AM and PM peak hours are shown in Figure 5.

7.3 Recommendations for Westbound Approaching Site Traffic

Since the site access is right-in / right-out restricted, vehicles approaching from the east along Kerr Street may conduct a U-turn either at the Dorval Crossing commercial plaza intersection or further along North Service Road West in order to access the site. Site-bound traffic from the westbound direction of the QEW has been distributed toward the Dorval Drive intersection since wayfinding applications will likely direct drivers that way. However, some traffic may still approach from the eastern off-ramp or from along Kerr Street.

With some medians along the roadway of North Service Road West, a “U-turns Permitted” sign at the intersection of the Dorval Crossing commercial plaza may aid drivers to make safe movements at the intersection either during the left turn permitted phase or when it is safe to make a left turn. This would help to prevent drivers from attempting a mid-block U-turn further along North Service Road West, or from entering the commercial plazas on either side and recirculating back to approach the entrance from the west.

8. FUTURE TOTAL TRAFFIC CONDITIONS

Site traffic volumes were added to the future background traffic volumes to obtain future total traffic volumes for the peak hours. The future total traffic volumes for horizon year 2029, in the weekday AM and PM peak hours are shown in Figure 6.



9. CAPACITY ANALYSIS

9.1 Intersection Capacity Evaluation Methodology

To be consistent with the LMM TIS Report, the same methodology for evaluating traffic operations at each of the subject intersections was used. This was based on the criteria from the Transportation Research Board's Highway Capacity Manual, 2000 edition (HCM 2000). The same Synchro software was used for the analysis.

According to the Region of Halton Guidelines & Requirements for Traffic Impact Studies, dated January 2015, v/c ratios of less than 0.85 for through movements are considered acceptable. Additionally, v/c ratios less than 0.95 for exclusive movements are acceptable. Furthermore, an LOS threshold of D or better is acceptable. LOS definitions are supplied in Appendix A.

9.2 LMM Capacity Analysis for Boundary Intersections

The capacity analysis results of the existing, background and total conditions have determined that there are operational issues at the intersection of North Service Road W / Dorval Drive and at the intersection of North Service Road and the QEW Off-Ramp. The proposed intersection improvements as a result of the background traffic growth seem to be reasonable. Regardless of the excessive 20-year horizon period traffic analysis, the overall methodology of the existing and background conditions of the report is considered to be sufficient. This analysis for the 2029 horizon year is summarized and updated below to account for changes to the site plan.

9.3 Capacity Analysis for Boundary Intersections

North Service Road West and Dorval Drive

2029 Horizon Year

Under background conditions, the intersection will operate over capacity at an overall LOS of F in both the AM and PM weekday peak hours. During the weekday AM peak the southbound movements as well as the westbound left movement operate at an LOS of F with a maximum v/c up to 1.25 and delay of up to 158 seconds in the southbound through/right movement. During the weekday PM peak the eastbound left, westbound left and right, and northbound left and through movements all operate at an LOS of F with a maximum v/c up to 2.04 and delay of up to 525 seconds in the westbound right movement.

Under total conditions, the intersection operates with virtually the same LOS as the background conditions with minor increases to the northbound right movement, from v/c of 0.08 to 0.10 in the weekday AM peak and 0.14 to 0.18 in the weekday PM peak; and the southbound left movement, from v/c of 1.22 to 1.23 in the weekday AM peak and 0.79 to 0.80 in the weekday PM peak. This shows that there is very minimal impact from site generated traffic, given the comparison of background and total traffic conditions.

Similar to the findings of the LMM Engineering report, the North Service Road West / Dorval Drive intersection is already over capacity and fully developed. All directions have dual left turn lanes and right



turn lanes on the eastbound, westbound and northbound approaches. Signal timing improvements do not offer significant improvement to the level of service of all movements and adding a southbound right-turn lane only slightly reduces the overall delay of the intersection. A shift away from automobile use to more public transit use is the remaining option to alleviate traffic issues on this scale.

North Service Road West and Abbey Centre Access

2029 Horizon Year

Under background conditions, the intersection will continue to operate acceptably at an overall LOS of C with v/c of 0.41 and 0.74 and delays of 21 and 23 seconds in the weekday AM and PM peak hour respectively. All individual movements operate well within the guideline parameters.

Under total conditions, the intersection operates with virtually the same LOS as the background conditions with minimal increases to some of the individual movements' v/c but with no change to the Level of Service. This shows that there is very minimal impact from site generated traffic, given the comparison of background and total traffic conditions.

North Service Road West and QEW westbound Off Ramp

2029 Horizon Year

Under background conditions, the intersection will continue to operate acceptably with a worst-case LOS of D and delay of 34 seconds for the weekday AM peak hour for the northbound left movement. This is improved in the PM peak hour with an LOS of C and delay of 19 seconds.

Under total conditions, the intersection operates with virtually the same LOS as the background conditions with minimal increases to some of the individual movements' delay. The LOS for the northbound left movement does change to E but the delay is only 3 seconds greater than the background case at 37 seconds. This shows that there is very minimal impact from site generated traffic.

Kerr Street and Canadian Tire Access

2029 Horizon Year

Under background conditions, the intersection will continue to operate acceptably at an overall LOS of B with v/c of 0.42 and 0.45 and delays of 20 and 19 seconds in the weekday AM and PM peak hours respectively. All individual movements operate well within the guideline parameters.

Under total conditions, the intersection operates with virtually the same LOS as the background conditions with minimal increases to some of the individual movements' v/c but with no change to the Level of Service. This shows that there is very minimal impact from site generated traffic.



QEW westbound Off Ramp and Dorval Drive

2029 Horizon Year

Under background conditions, the intersection will continue to operate acceptably at an overall LOS of C in the weekday AM peak hour with v/c of 0.75 and delay of 26 seconds and all movements operating acceptably. The weekday PM peak hour has an overall LOS of D in the weekday PM peak hour with v/c of 0.85 and delay of 46 seconds. The westbound movements operate over capacity with an LOS of F, a maximum v/c of 1.12 and delay up to 105 seconds. These are improved by signal timing split optimizations to achieve LOS of C in all movements.

Under total conditions, the intersection operates with virtually the same LOS as the background conditions with minimal increases to some of the movements' v/c but with no change to the Level of Service. This shows that there is very minimal impact from site generated traffic.

QEW eastbound Off Ramp and Dorval Drive

2029 Horizon Year

Under background conditions, the intersection will continue to operate acceptably at an overall LOS of C with v/c of 0.76 and 0.91 and delays of 22 seconds in the weekday AM and PM peak hour respectively. The northbound right movement is slightly over capacity at a v/c of 0.99 but the LOS is still acceptable at D.

Under total conditions, the intersection operates with virtually the same LOS as the background conditions with minimal increases to some of the movements' v/c but with no change to the Level of Service. This shows that there is very minimal impact from site generated traffic.

9.4 North Service Road West and Site Access Capacity Analysis

Under future 2029 total conditions during the weekday AM and PM peak hours the RIRO access operates well with an LOS of A and a maximum v/c ratio of 0.39 for the westbound through traffic in PM peak hour. The maximum delay time in the AM and PM peak hours is expected to be 9 seconds.

The capacity analysis results for the 2018 Existing and 2029 Background and Total weekday AM and PM peak hours are shown in Table 1 and capacity analysis sheets are provided in Appendix B.

Table 1 – Capacity Analysis Results, 2029 Background and Total Conditions



Intersection	2029 Background Traffic Conditions						2029 Total Traffic Conditions						
	AM Peak			PM Peak			AM Peak			PM Peak			
	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS	
North Service Road West & Dorval Drive	1.04	94	F	1.52	177	F	1.04	94	F	1.52	176	F	
Eastbound Left	0.73	67	E	1.72	398	F	0.73	67	E	1.72	398	F	
Eastbound Through	0.42	41	D	0.44	41	D	0.42	41	D	0.44	41	D	
Eastbound Right	0.23	0	A	0.41	1	A	0.23	0	A	0.41	1	A	
Westbound Left	1.15	163	F	1.46	287	F	1.15	163	F	1.46	287	F	
Westbound Through	0.54	42	D	0.74	48	D	0.54	42	D	0.74	48	D	
Westbound Right	0.31	40	D	2.04	525	F	0.31	40	D	2.04	525	F	
Northbound Left	0.76	55	E	1.13	130	F	0.76	55	E	1.13	131	F	
Northbound Through	0.75	38	D	1.31	186	F	0.75	38	D	1.31	187	F	
Northbound Right	0.08	26	C	0.14	27	C	0.10	27	C	0.18	28	C	
Southbound Left	1.22	167	F	0.79	57	E	1.23	170	F	0.80	58	E	
Southbound Through / Right	1.25	158	F	0.97	58	E	1.25	158	F	0.97	58	E	
North Service Road West & Abbey Centre Access	0.41	21	C	0.74	23	C	0.42	21	C	0.74	23	C	
Eastbound Left	0.00	0	A	0.22	23	C	0.00	0	A	0.22	23	C	
Eastbound Through / Right	0.68	26	C	0.46	23	C	0.69	26	C	0.49	23	C	
Westbound Left	0.27	15	B	0.35	14	B	0.29	15	B	0.36	14	B	
Westbound Through / Right	0.42	16	B	0.77	22	C	0.42	16	B	0.77	22	C	
Northbound Left	0.14	17	B	0.70	32	C	0.14	17	B	0.70	32	C	
Northbound Through / Right	0.05	16	B	0.09	19	B	0.05	16	B	0.09	19	B	
Southbound Left	0.04	16	B	0.05	19	B	0.04	16	B	0.05	19	B	
Southbound Through / Right	0.01	15	B	0.05	19	B	0.01	16	B	0.05	19	B	
North Service Road West & QEW WB Off Ramp													
Eastbound Through		0	A		0	A		0	A		0	A	
Westbound Through		0	A		0	A		0	A		0	A	
Northbound Left		34	D		19	C		37	E		20	C	
Northbound Right		12	B		10	B		12	B		10	B	
Kerr Street & Canadian Tire Access	0.42	20	B	0.45	19	B	0.43	20	B	0.45	19	B	
Eastbound Through	0.69	23	C	0.58	23	C	0.71	23	C	0.60	23	C	
Eastbound Right	0.07	16	B	0.03	18	B	0.07	16	B	0.03	18	B	
Westbound Left	0.22	14	B	0.24	14	B	0.23	14	B	0.25	14	B	
Westbound Through	0.22	13	B	0.58	17	B	0.22	13	B	0.58	17	B	
Northbound Left	0.12	18	B	0.30	17	B	0.12	18	B	0.30	17	B	
Northbound Right	0.03	17	B	0.06	15	B	0.03	17	B	0.06	15	B	
QEW WB Off Ramp & Dorval Drive	0.75	26	C	0.85	46	D	0.75	27	C	0.85	47	D	
Westbound Left	0.88	45	D	1.10	98	F	0.90	47	D	1.10	98	F	
Westbound Left / Through / Right	0.91	49	D	1.12	105	F	0.91	49	D	1.13	108	F	
Westbound Right	0.79	37	D	1.06	83	F	0.80	38	D	1.07	88	F	
Northbound Through	0.43	17	B	0.58	19	B	0.44	17	B	0.59	19	B	
Northbound Right	0.23	15	B	0.21	15	B	0.24	15	B	0.22	15	B	
Southbound Through	0.63	20	B	0.63	20	B	0.63	20	B	0.63	20	B	
Southbound Right	0.18	15	B	0.21	15	B	0.18	15	B	0.21	15	B	
QEW EB Off Ramp & Dorval Drive	0.76	22	C	0.91	22	C	0.76	22	C	0.92	23	C	
Eastbound Left	0.80	35	D	0.71	33	C	0.80	35	C	0.72	33	C	
Eastbound Left / Through / Right	0.86	42	D	0.74	34	C	0.86	42	D	0.74	35	C	
Eastbound Right	0.82	38	D	0.71	33	C	0.83	38	D	0.71	33	C	
Northbound Through	0.36	13	B	0.51	11	B	0.36	13	B	0.52	11	B	
Northbound Right	0.69	21	C	0.99	44	D	0.70	22	C	1.01	49	D	
Southbound Through	0.66	17	B	0.60	12	B	0.67	18	B	0.60	12	B	
Southbound Right	0.53	17	B	0.59	14	B	0.53	17	B	0.59	14	B	
North Service Road West & Proposed Site Access													
Eastbound Through								0	A			0	A
Eastbound Through / Right								0	A			0	A
Westbound Through								0	A			0	A
Northbound Right								9	A			9	A



10. SITE PLAN REVIEW

10.1 Circulation Review

A site circulation review was completed using AutoTurn vehicle turning template software to demonstrate that loading trucks, waste collection vehicles, and buses are able to circulate the site and utilize their respective areas. All vehicles must enter and exit through the right-in / right-out (RIRO) access on North Service Road West. The findings of the site circulation review are summarized below by design vehicle:

- Figure 7 shows Medium Single Unit (MSU) vehicles (acting as loading trucks) entering and exiting the site and parking safely in the proposed hotel loading area.
- Figure 8 shows a typical bus entering the site and parking safely in the proposed hotel bus parking area.
- Figure 9 illustrates a 12-metre-long waste collection vehicle entering and exiting the site and navigating towards and from the deep well Molok garbage units.

10.2 Site Access Review

The maximum site access width requirement, according to the Town of Oakville Zoning By-law 2014-014, is “9.0 metres for a lot having frontage equal or greater than 18.0 metres.” This has been widened slightly to 9.60 m to allow a 13.75 m curb cut and curb radii of 7.65 m on both sides of the entranceway. This allows vehicles to safely manoeuvre across the cycle lane without conflicting with traffic in the adjacent lane while also allowing safe circulation throughout the site.

PARKING STUDY

11. PARKING REQUIREMENTS

A parking study was conducted to determine the parking demands of the proposed hotel development and to compare the demand with the parking supply and Town Zoning By-law requirements for parking.

The site parking requirements, based on the Town of Oakville Zoning By-law 2014-014 (see Appendix C) are summarized in Table 2.

Table 2 – Site Parking Requirements, as per the Town of Oakville Zoning By-law

Land Use	Size	Parking Requirement		Parking Supply (spaces)	Parking Deficiency (spaces)
		Parking Rate	Spaces		
Hotel	114 rooms	1 space / room	114 spaces		
	609 m ² net floor area (ground floor)	1 space / 30 m ² net floor area outside a lodging unit	20.3 spaces		
TOTAL			135 spaces	95 spaces	-40 spaces

The Town’s Zoning By-law parking requirement for the proposed hotel use is 135 passenger vehicle spaces, whereas 95 spaces are provided on-site, resulting in a shortfall of 40 parking spaces (i.e. 70% compliance).

Although the City’s Zoning By-law total parking supply requirements are not met, Trans-Plan is of the opinion that the proposed parking supply of 95 parking spaces is sufficient to support the proposed hotel based on our review of parking demands at existing hotels. Furthermore, the hotel development is not considered to be a major tourist destination (i.e. in contrast to a hotel in downtown Niagara Falls). The hotel would cater to guests for both business and leisure travel.

12. PROXY SITE SURVEYS

12.1 Review of Other Similar Hotel Developments

Trans-Plan conducted recent surveys in Oakville. The following two proxy sites were selected for analysis:

1. Fairfield Inn by Marriott Toronto / Oakville, 2937 Sherwood Heights Drive, Oakville, ON
2. Hilton Garden Inn Toronto / Oakville, 2774 South Sheridan Way, Oakville, ON

The proxy sites selected have a similar parking lot configuration (with surface parking), contain ground floor public use areas of a similar size to the subject site, and are in the Town of Oakville in the vicinity of the Queen Elizabeth Way. Site statistics for each hotel are summarized in Table 3.

Table 3 – Hotel Proxy Sites, Site Statistics and Amenities

Hotel	Parking Supply (spaces)	No. of Storeys	No. of Rooms	Supply Rate (spaces per room)	Public Use Area (m ² GFA)
<u>Subject Site:</u>					
AVID Hotel	95	7	114	0.83	609 ¹
<u>Proxy Sites:</u>					
1. Fairfield Inn by Marriott Toronto / Oakville	64	4	65	0.98	815 ²
2. Hilton Garden Inn Toronto / Oakville	122	5	127	0.96	190 ²

- Notes:
1. This value includes any public space in the hotel (e.g. corridor, lobby, conference room etc.), however the AVID Hotel site will not comprise any conference space.
 2. These values show only the conference space available at the proxy sites sourced from the hotel websites. The actual public use area is expected to be higher in these cases.

Trans-Plan conducted the parking utilization studies for both hotels on the following dates:

- August 30th through September 1st (Fri - Sun),
- September 13th through 15th (Fri - Sun),
- September 27th through 29th (Fri - Sun), 2019.

These dates are within the two months of highest hotel occupancy according to data provided by the Ontario Ministry of Heritage, Sport, Tourism and Culture Industries and represent the typical high season occupancy. This data is provided in Appendix D.

Detailed parking survey results are provided in Appendix D and are summarized in Table 4. As is typical with a hotel use, peak parking demands occurred overnight (as mainly noted in the detailed survey results for the Oakville hotels). The hotel occupancy was also obtained for each hotel at the time of the recordings.

Table 4 – Hotel Proxy Sites, Parking Survey Results

Hotel	Rooms	Parking Supply	Observed Peak Parking Rate (spaces per room at 100% occupancy)						Average Rate (spaces per room at 100% occupancy)
			Aug 31	Sep 1	Sep 14	Sep 15	Sep 28	Sep 29	
1. Fairfield Inn by Marriott Toronto / Oakville	65	64	0.89	0.82	0.82	- ¹	0.63	0.60	0.75
2. Hilton Garden Inn Toronto / Oakville	127	122	0.83	0.90	0.87	0.87	- ²	0.73	0.84
Average									0.80

- Notes: 1. Data for this date was not recorded.
2. Data for this date was not included due to most of the occupants arriving by bus.

In comparison to the Zoning By-law parking requirement of 1 parking space per room and 1 parking space per 30 m² of GFA, the results indicate an average peak parking demand (by taking the actual occupancy and factoring up to 100%) of 0.80 spaces per hotel room based on the proxy site hotels surveyed, which is less than the proposed rate for the proposed hotel.

Also, both proxy sites featured shared parking lots, whereby the overall parking supply is shared between all uses; serving overnight guests, staff and conference visitors. Thus, the observed parking rate above will include staff parking demand as well as guest parking demand. Further, the proxy sites' public use areas contain actual rentable conference space (see Table 3) for guest and non-guest use which would generate additional parking demand beyond that generated by guests and staff alone. In comparison, the AVID Hotel project will not include any conference space as part of the public use area and thus parking will only serve guests and staff. Therefore, the application of the observed parking rate to the AVID Hotel can also be considered a conservative approach, since the surveyed demand includes additional parking activity generated by conference facilities as well as a higher staff parking demand associated with such facilities.

12.2 Estimated Parking Demands for Subject Site

The hotel parking demands from the survey results were applied to the subject site, based on the number of rooms, as shown in Table 5.



Table 5 – Estimated Parking Demands for Proposed Hilton Garden Inn Hotel

Hotel Units	Estimated Parking Demands for Subject Site	
	Observed Rate (Average Peak)	Parking Demand
114 rooms	0.80 spaces per room	92 spaces

By applying the survey results to the subject site, the expected typical peak parking demand for the proposed hotel would be approximately 92 spaces which is met by the proposed parking supply of 95 parking spaces.

Given that the study area (surrounding areas of Oakville) are largely built out, and given the close proximity of the site to the existing hotels that were surveyed and to the proposed Marriott hotel development at 1051 North Service Road West in Oakville, it is a reasonable expectation that peak parking demands at the site would be at 0.80 spaces per room (i.e. parking demands at the existing hotels that were surveyed may reduce slightly due to competition). On holidays occurring in the summer months, at full occupancy, hotel staff could make alternative pick-up / shuttle arrangements for guests, as needed.

13. ALTERNATIVE MODES OF TRAVEL

13.1 Transit Service

The site is served by Oakville Transit, operated by the Town of Oakville, which provides public transit across the Town of Oakville, and providing connectivity to other city and intercity services (MiWay, Burlington Transit, GO Transit). The transit routes within close vicinity of the site are listed as follows:

Route 18, Glen Abbey South is a bus route that generally runs in an east-west orientation between Bronte GO station and Oakville GO station. The route runs along Wycroft Road, Third Line, Abbeywood Drive, Pilgrims Way, Nottingham Gate, North Service Road West, Kerr Street and Cross Avenue. The nearest stop is located at North Service Road West, east of Dorval Drive, directly north of the subject site.

Route 28, Glen Abbey North is a bus route that generally runs in an east-west orientation between Bronte GO station and Oakville GO station with a loop through the Glen Abbey neighbourhood. The route runs along Wycroft Road, Third Line, Heritage Way, Glen Abbey Gate, Pilgrims Way, Monastery Drive, Dorval Drive, Speers Road and Cross Avenue. The nearest stop is located at the northwest corner of North Service Road West and Dorval Drive, approximately 350 m west of the subject site.

The existing study area transit routes is provided in Figure 10 with Table 6 providing route service times and peak service frequencies.



Table 6 – Transit Service Frequencies in the Study Area

Route	No.	Nearest Transit Stop at Site	Approximate Service Times			Approximate Peak Service Frequency (min)		
			Mon-Fri	Sat	Sun	Mon-Fri	Sat	Sun
Glen Abbey South	18	North Service Road West, east of Dorval Drive	05:45 – 23:34	07:10 – 23:32	08:10 – 19:38	30	60	60
Glen Abbey North	28	North Service Road West & Dorval Drive	06:05 – 23:42	06:37 – 23:11	07:42 – 20:11	30	60	60

Increasing public transit use has many benefits such as protecting the environment, reducing traffic congestion on Regional roads, providing convenience, saving energy, strengthening communities and improving liveability.

13.2 Cycling

Encouraging more people to cycle, especially for utilitarian purposes, would result in taking more cars off the road during peak hours, helping to reduce traffic congestion and parking demands, and is more environmentally friendly.

The site parking requirements, based on the Town of Oakville Zoning By-law 2014-014 (see Appendix C) are summarized in

Table 7 below.

Table 7 – Site Bicycle Parking Requirements, as per the Town of Oakville Zoning By-law

Land Use	Size	Parking Requirement		Parking Supply (spaces)	Parking Deficiency
		Parking Rate	Spaces		
Hotel	114 rooms	2	2 spaces		
	609 m ²	0.25 space / 1000 m ² net floor area	0.15 spaces		
TOTAL			2.15 spaces	10 spaces	None

The subject site is proposing ten bicycle parking spaces, provided at a rate of one bicycle parking space per 11 hotel rooms.

North Service Road West / Kerr Street currently has dedicated cycle lanes both ways to the east and west of the subject site. In the future, the City's Active Transportation Master Plan proposes primary on-road cycling route expansion along Kerr Street to the east, and through many of the residential streets nearby.

Although hotel guests are unlikely to cycle to and from the site, the ten bicycle parking spaces may be utilized by hotel employees that live in the surrounding area. The City transit buses also provide bicycle racks for longer trips to further encourage cycling.



13.3 Rideshare Services

Ridesharing is another growing trend across the Province, allowing people without a vehicle to share a vehicle to their specified location. Uber was one of the first to start the ridesharing movement. The Town of Oakville requires their drivers to have photo identification, proof of insurance and undergo in-person police criminal background checks, and have annual vehicle safety to ensure proper regulation and safety of the service.

Uber is a popular transportation service that is generally seen as a more affordable alternative to taxis. Users request a ride using the smartphone application (app) and a nearby driver accepts the request. Many people choose to use Uber because the app allows riders to get information on drivers ahead of time and fares are charged to the Uber account. Uber and other ridesharing services offer riders the option of sharing their trips with other app users travelling in a similar direction for a discounted rate and a more sustainable city.

14. CONCLUSIONS & RECOMMENDATIONS

The conclusions and recommendations from our Traffic Impact Study, Site Plan Review and Parking Study for the proposed AVID Hotel Development located at North Service Road West / Kerr Street and Queen Elizabeth Way Off-Ramp in the Town of Oakville, are summarized as follows:

Traffic Impact Study & Site Plan Review

- The proposed AVID Hotel Development includes seven-storeys, 114 hotel rooms. 95 car parking spaces are provided on a surface lot (provided at a rate of 0.83 parking spaces per room), with one right-in / right-out (RIRO) site access proposed on North Service Road West.
- The single right-in / right-out access operates well Under Total 2024 and 2029 conditions, with an LOS of A and minimal delays of 9 seconds.
- The overall methods and results of the analysis of the LMM Traffic Impact Study report and Memorandum conducted for the proposed Oakville AVID Hotel development were reviewed by Trans-Plan and found to be reasonable.
- The original recommendations for improvements outlined in the LMM TIS report remain.
- A “U-turns Permitted” sign at the intersection of the Dorval Crossing commercial plaza may aid drivers approaching from the eastern QEW off-ramp or from along Kerr Street, and prevent mid-block U-turns or recirculation through the adjacent commercial plazas.
- The site circulation review indicates that the site access and parking layout is acceptable for movements of loading vehicles, buses and garbage trucks.

Parking Study

- Based on the Town of Oakville Zoning By-law 2014-014, the parking requirements for the subject site is a total of 135 parking spaces, resulting in a shortfall of 40 parking spaces.



- The By-law also requires 2.15 (rounded down to 2) bicycle parking spaces. The site plan shows ten bicycle parking spaces, which meets the requirement and encourages alternative modes of travel, with existing and future cycling routes along the nearby roadways.
- Trans-Plan reviewed two other similar hotel developments in the Town of Oakville. The results indicated an average peak parking demand of 0.80 spaces per room (for both guests and staff combined), which results in a peak parking demand of 92 parking spaces for the proposed 114 room hotel.
- To further support the proposed parking supply of 95 parking spaces, the subject site is situated nearby two transit routes, with the nearest transit stops located at the north end of the subject site. A bus parking space is also provided that could be used for shuttle parking, should shuttle services be added in the future. In the future more and more hotel guests are anticipated to utilize alternative modes of travel to arrive at the hotel which will have the effect of the lowering the amount of parking utilized and the effective rate.

In conclusion, the proposed AVID Hotel Development can be supported through the proposed parking supply of 95 parking spaces, based on our review of peak parking demands at similar hotels and existing service of alternative modes of travel within the study area.

Respectfully submitted,



Anil Seegobin, P.Eng.
Partner, Engineer



Joseph Doran
Transportation E.I.T.

Trans-Plan Transportation Inc.
Transportation Consultants

Figure 1 – Site Location



Source: Google Maps

Figure 3: Study Area Roadway Characteristics

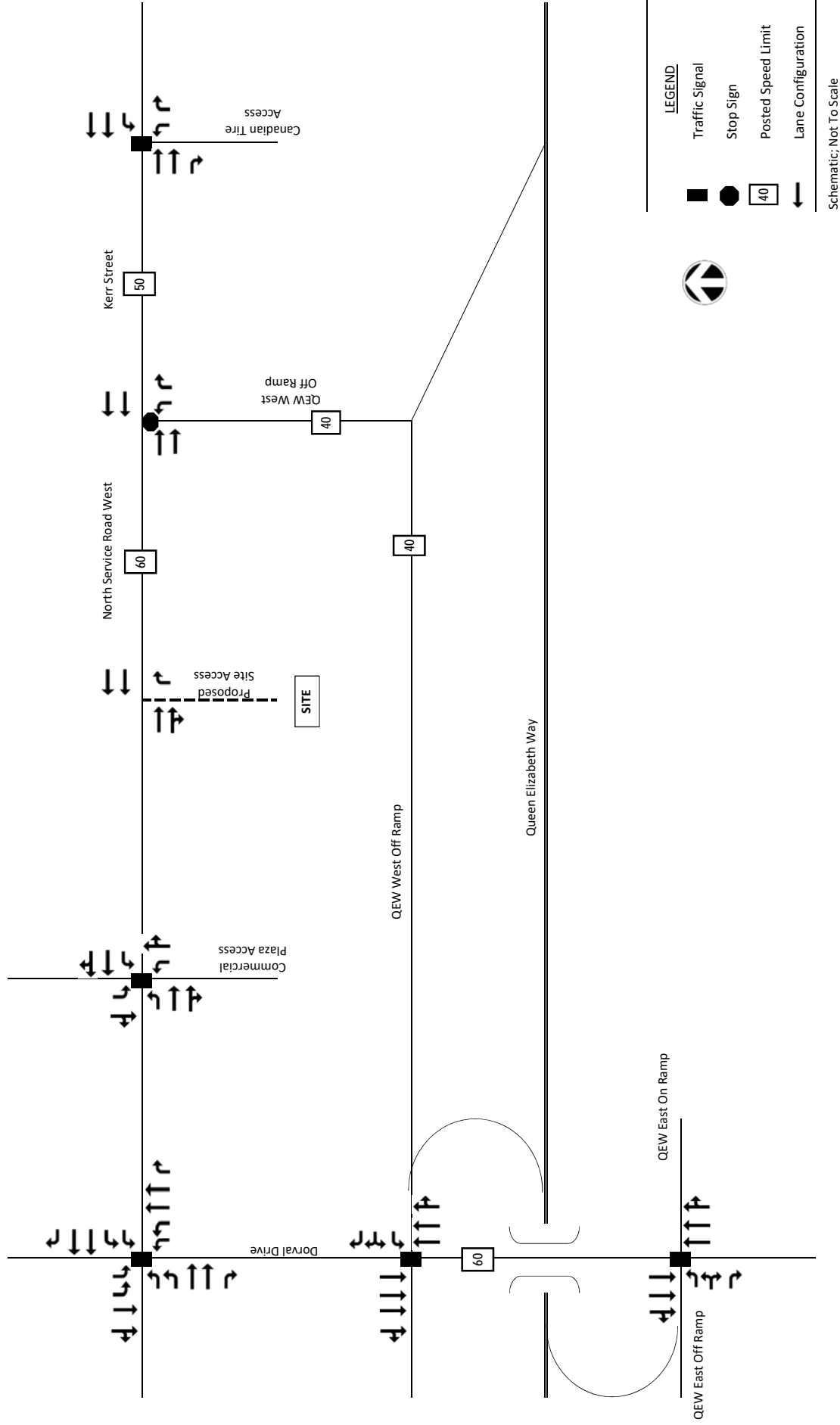


Figure 4: 2029 Background Traffic Volumes, Weekday AM and PM Peak Hours

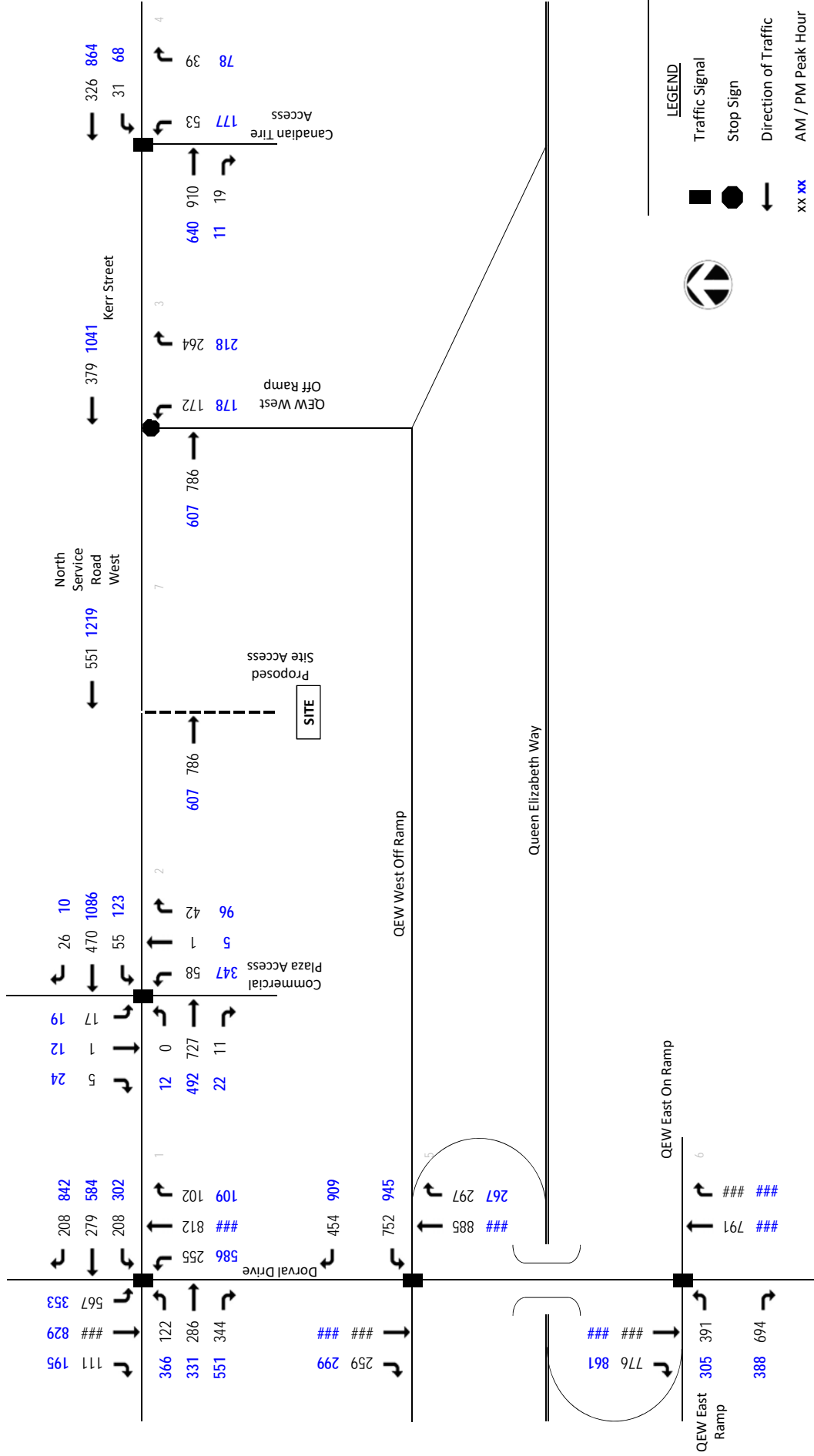
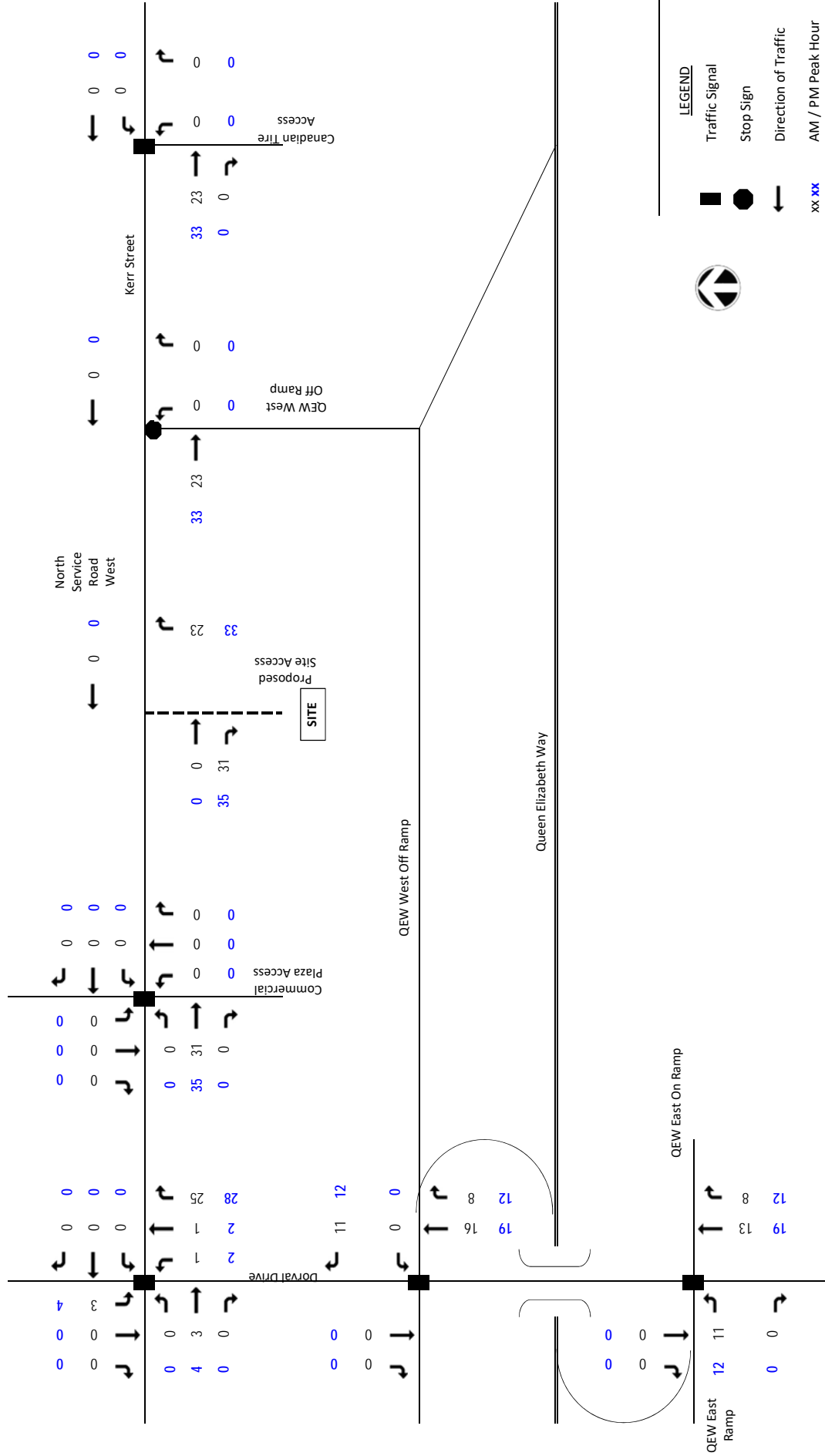


Figure 5: Site Traffic Assignment, Weekday AM and PM Peak Hours

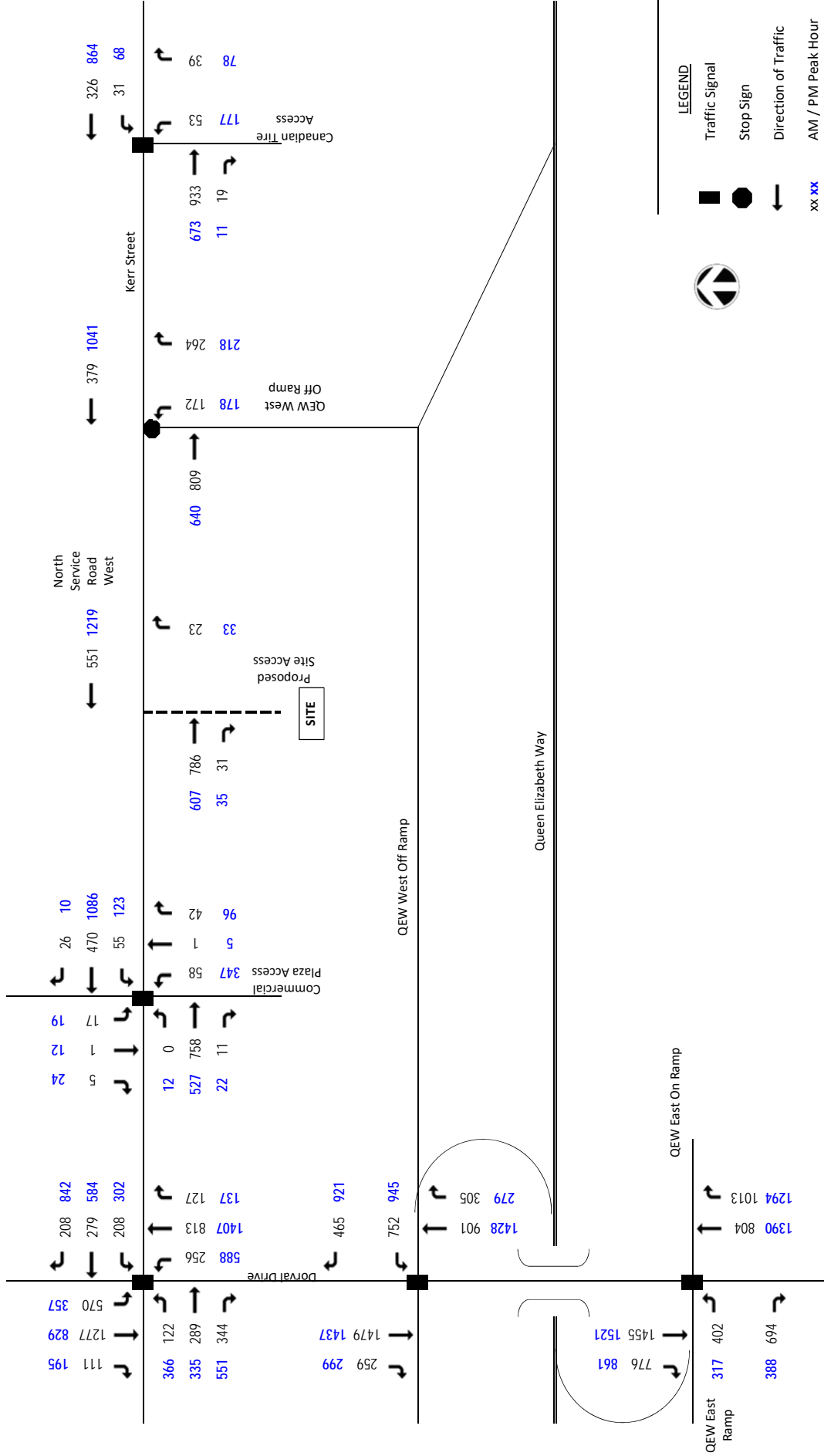


LEGEND

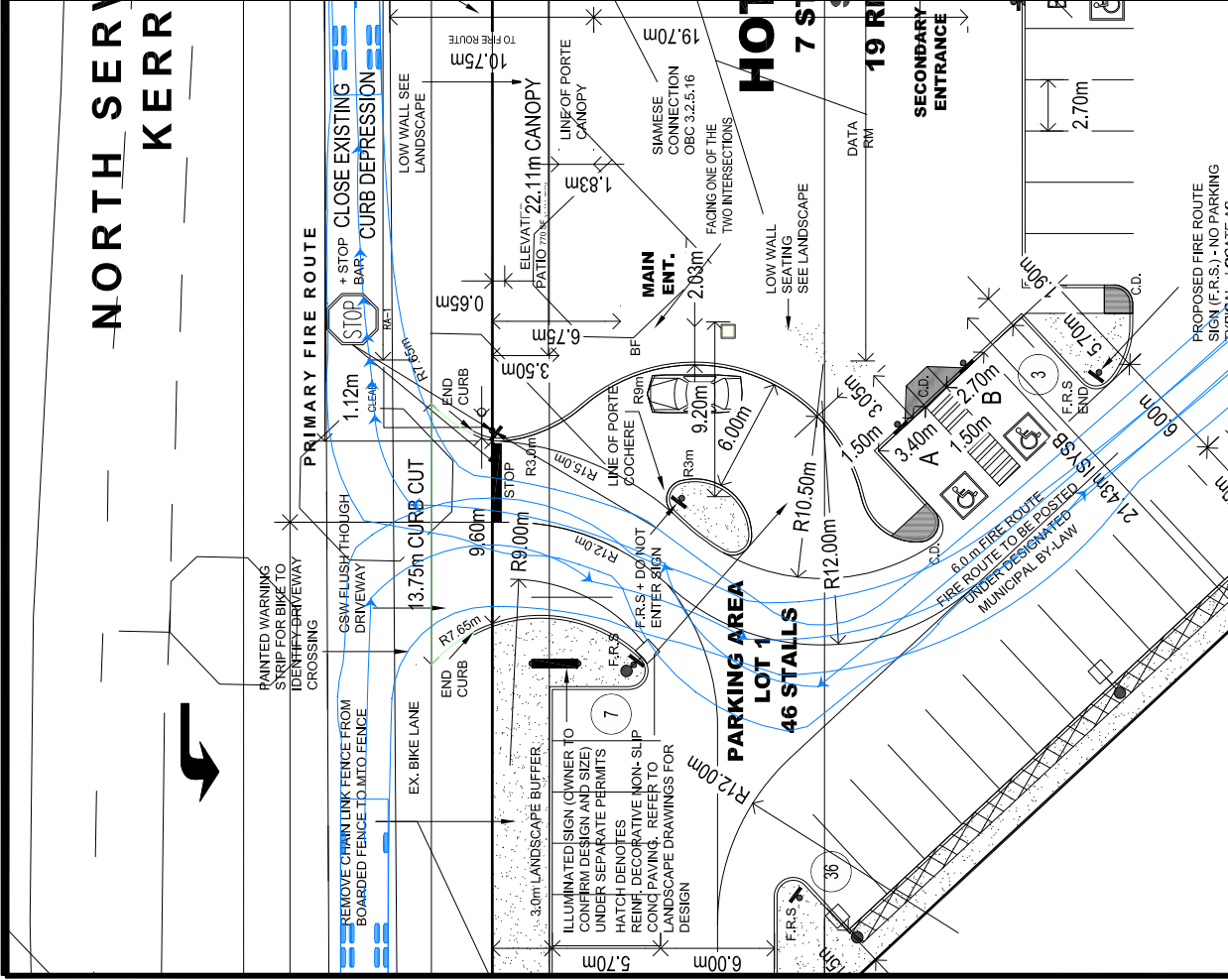
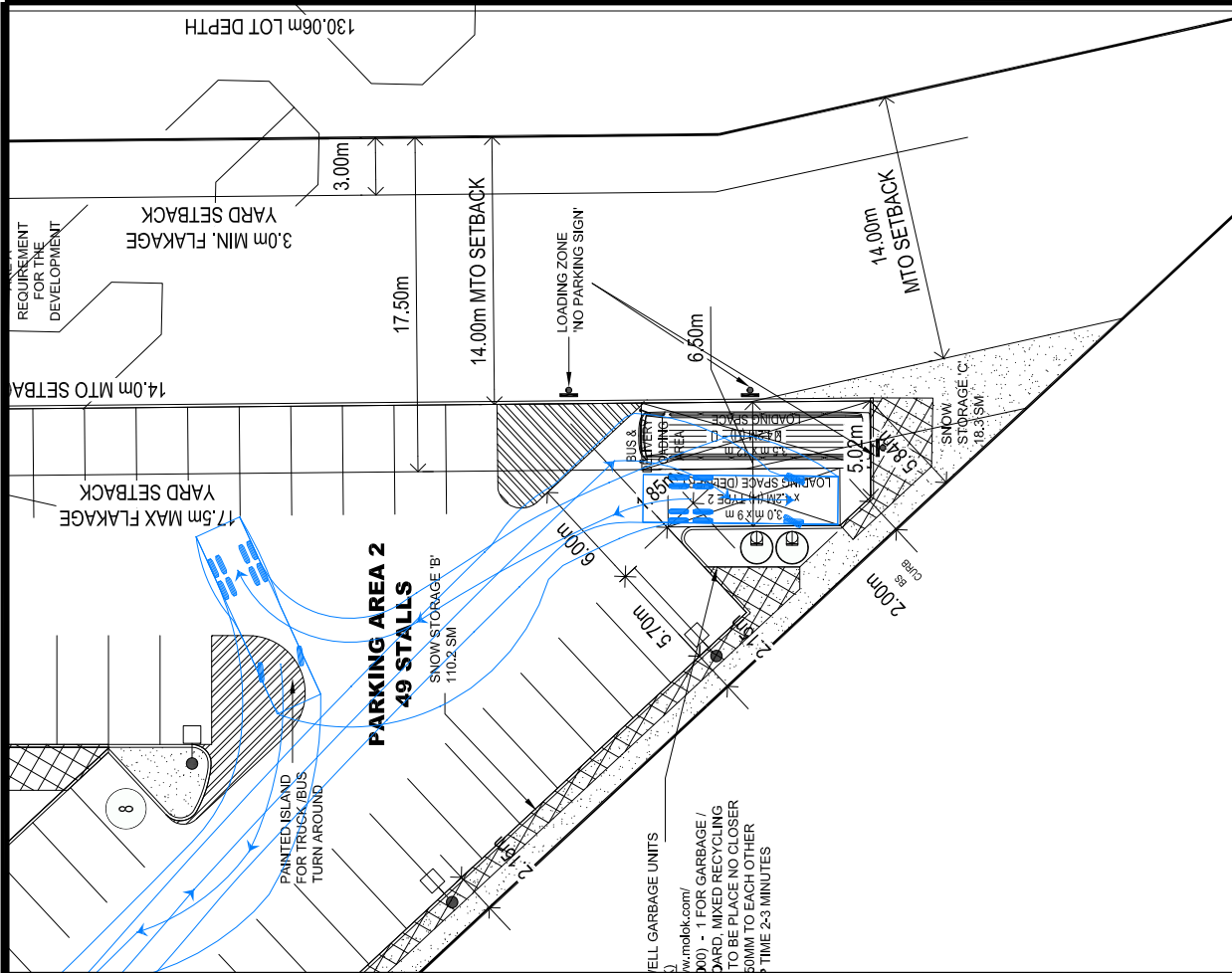
- Traffic Signal
- Stop Sign
- Direction of Traffic
- xx xx AM / PM Peak Hour

Schematic; Not To Scale

Figure 6: 2029 Total Traffic Volumes, Weekday AM and PM Peak Hours



Schematic; Not To Scale



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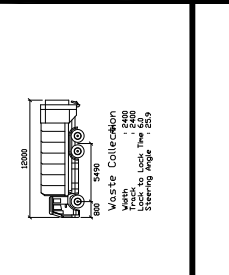
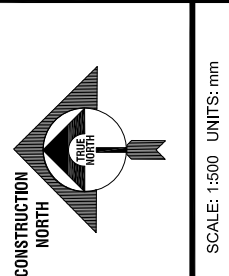
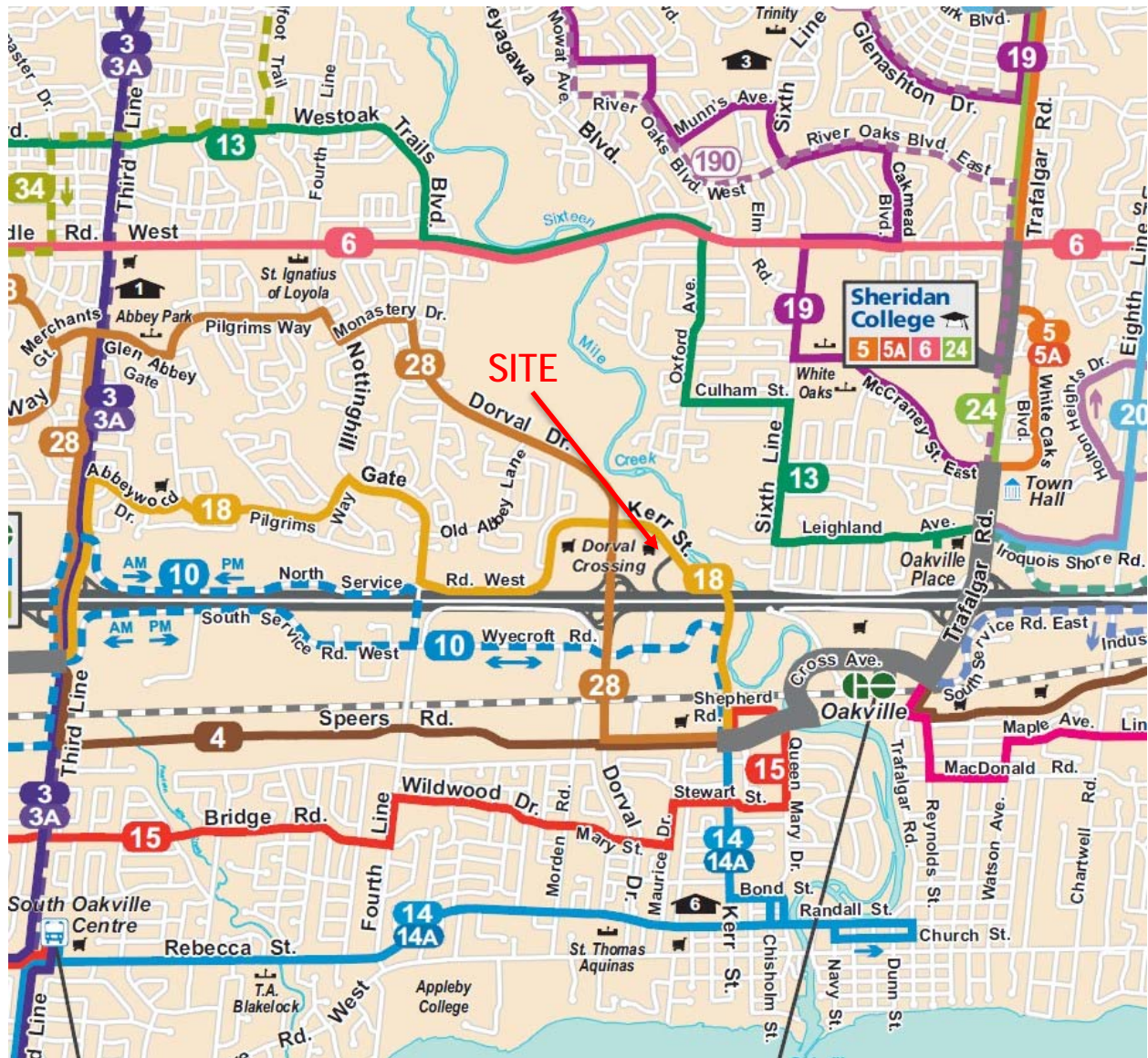


Figure 9 - Garbage Truck Entering & Exiting the Site and circulating the Loading Area

PROPOSED AVID HOTEL DEVELOPMENT,
 NORTH SERVICE ROAD WEST & QEW OFF-RAMP,
 OAKVILLE, ON

Source: Site Plan by API Development Consultants / Sapplys Architects Incorporated, dated March 26, 2020

Figure 10 – Study Area Transit Service



Source: Town of Oakville Transit Map



APPENDIX A

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:

<u>Level of Service</u>	<u>Features</u>	<u>Stopped Delay per Vehicle (sec)</u>
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.

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



APPENDIX B

Capacity Analysis Sheets

Queues
1: North Service Road West & Donval Drive

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group	172	345	366	277	436	239	418	944	128	683	1593
Lane Group Flow (vph)	0.73	0.42	0.23	1.15	0.54	0.49	0.76	0.75	0.20	1.22	1.25
v/c Ratio	74.5	42.0	0.3	155.9	44.5	17.0	59.0	38.8	5.3	158.7	152.2
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	74.5	42.0	0.3	155.9	44.5	17.0	59.0	38.8	5.3	158.7	152.2
Total Delay	22.4	39.4	0.0	-42.7	51.5	15.5	52.9	109.5	0.0	-109.8	-265.7
Queue Length 50th (m)	27.0	49.5	0.0	#54.1	46.4	37.9	45.5	126.6	9.2	#130.8	#300.0
Queue Length 95th (m)	123.2			263.1			284.3				114.7
Internal Link Dist (m)	48.0		50.0	45.0		25.0	48.0			30.0	
Turn Bay Length (m)	235	827	1599	240	803	492	553	1264	632	559	1278
Base Capacity (vph)	0	0	0	0	0	0	0	0	0	0	0
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.42	0.23	1.15	0.54	0.49	0.76	0.75	0.20	1.22	1.25

Intersection Summary

- Volume exceeds capacity, queue is theoretically infinite.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
1: North Service Road West & Donval Drive

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	122	286	344	208	279	208	255	812	102	567	1277	111
Lane Configurations	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Volume (vph)	5.5	5.5	4.0	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ideal Flow (vphpl)	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.95
Total Lost time (s)	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99	1.00
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00
Flt Protected	3400	3574	1599	3467	3471	1583	3467	3505	1524	3502	3526	
Satd. Flow (prot)	0.95	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00
Flt Permitted	3400	3574	1599	3467	3471	1583	3467	3505	1524	3502	3526	
Satd. Flow (perm)	0.71	0.83	0.94	0.75	0.64	0.87	0.61	0.86	0.80	0.83	0.88	0.78
Peak-hour factor, PHF	172	345	366	277	436	239	418	944	128	683	1451	142
Adj. Flow (vph)	0	0	0	0	0	0	126	0	0	82	0	6
RTOR Reduction (vph)	172	345	366	277	436	239	418	944	128	683	1451	142
Lane Group Flow (vph)	3%	1%	1%	1%	4%	2%	1%	3%	6%	0%	1%	1%
Heavy Vehicles (%)	Prot	7	4	Free	Prot	3	8	Prot	5	2	Prot	1
Turn Type	Permitted Phases	Free	Free	8	8	8	8	2	2	1	6	6
Protected Phases	Actuated Green, G (s)	8.5	28.4	122.8	8.5	28.4	28.4	19.6	44.3	44.3	19.6	44.3
Permitted Phases	Effective Green, g (s)	8.5	28.4	122.8	8.5	28.4	28.4	19.6	44.3	44.3	19.6	44.3
Actuated Green, G (s)	Actuated g/c Ratio	0.07	0.23	1.00	0.07	0.23	0.23	0.16	0.36	0.36	0.16	0.36
Effective Green, g (s)	Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Actuated g/c Ratio	Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Clearance Time (s)	Lane Grp Cap (vph)	235	827	1599	240	803	366	553	1264	550	559	1272
Vehicle Extension (s)	v/s Ratio Prot	0.05	0.10	0.23	c0.08	c0.13	0.07	0.12	0.27	c0.20	c0.45	
Lane Grp Cap (vph)	v/c Ratio	0.73	0.42	0.23	1.15	0.54	0.31	0.76	0.75	0.08	1.22	1.25
v/s Ratio Prot	Uniform Delay, d1	56.0	40.2	0.0	57.1	41.5	39.1	49.3	34.3	25.9	51.6	39.2
v/c Ratio	Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay, d1	Incremental Delay, d2	11.1	0.3	0.3	106.1	0.8	0.5	5.8	4.1	0.3	115.2	118.2
Progression Factor	Delay (s)	67.2	40.5	0.3	163.2	42.2	39.6	55.2	38.4	26.2	166.8	157.5
Incremental Delay, d2	Level of Service	E	D	A	F	D	D	E	D	C	F	F
Delay (s)	Approach Delay (s)	29.0			76.8			42.0			160.3	
Level of Service	Approach LOS	C			E			D			F	
Approach Delay (s)	Intersection Summary											
Approach LOS	HCM Average Control Delay	93.9								F		
Intersection Summary	HCM Volume to Capacity ratio	1.04										
HCM Average Control Delay	Actuated Cycle Length (s)	122.8								22.0		
HCM Volume to Capacity ratio	Intersection Capacity Utilization	104.3%								G		
Actuated Cycle Length (s)	Analysis Period (min)	15										
Intersection Capacity Utilization	c. Critical Lane Group											

Queues
2. North Service Road West & Abbey Centre Access

<Background> AM Peak
2020-04-01

	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	828	70	672	74	69	24	14
Lane Group Flow (vph)	0.67	0.24	0.43	0.14	0.10	0.04	0.02
v/c Ratio	26.8	12.9	16.4	19.3	6.3	18.5	12.0
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	26.8	12.9	16.4	19.3	6.3	18.5	12.0
Total Delay	63.6	6.0	38.6	7.8	0.4	2.4	0.4
Queue Length 50th (m)	85.3	10.8	40.7	17.2	0.0	6.7	0.4
Queue Length 95th (m)	263.1		38.3	84.0		91.2	
Internal Link Dist (m)	35.0						
Turn Bay Length (m)	1636	375	2271	543	682	548	694
Base Capacity (vph)	0	0	0	0	0	0	0
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.19	0.30	0.14	0.10	0.04	0.02

HCM Signalized Intersection Capacity Analysis
2. North Service Road West & Abbey Centre Access

<Background> AM Peak
2020-04-01

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	1	1	1	1	1	1	1	1	1	1	1	1	
Volume (vph)	0	727	11	55	470	26	58	1	42	17	1	5	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.6	3.0	6.6	3.0	6.6	6.2	6.2	6.2	6.2	6.2	6.2	6.2	
Lane Util. Factor	0.95	1.00	0.95	1.00	0.99	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Flt Protected	1.00	1.00	1.00	0.95	1.00	0.86	1.00	0.86	1.00	0.95	1.00	0.89	
Satd. Flow (prot)	3553	1770	3541	1703	3541	1703	1587	1587	1805	1805	1696	1696	
Flt Permitted	1.00	0.19	1.00	0.75	1.00	0.75	1.00	0.71	1.00	0.71	1.00	0.71	
Satd. Flow (perm)	3553	353	3541	1341	3541	1341	1587	1353	1696	1353	1696	1696	
Peak-hour factor, PHF	0.25	0.90	0.56	0.79	0.75	0.58	0.78	0.25	0.65	0.70	0.25	0.50	
Adj. Flow (vph)	0	808	20	70	627	45	74	4	65	24	4	10	
RTOR Reduction (vph)	0	2	0	0	6	0	0	39	0	0	6	0	
Lane Group Flow (vph)	0	826	0	70	666	0	74	30	0	24	8	0	
Heavy Vehicles (%)	0%	1%	11%	2%	1%	0%	6%	0%	3%	0%	0%	0%	
Turn Type	Perm	pm+pt	pm+pt	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	
Protected Phases	4	3	8	2	2	2	2	2	2	2	2	2	
Permitted Phases	4	8	8	2	2	2	2	2	2	2	2	2	
Actuated Green, G (s)	29.1	37.9	37.9	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	
Effective Green, g (s)	29.1	37.9	37.9	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	34.1	
Actuated g/C Ratio	0.34	0.45	0.45	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40	
Clearance Time (s)	6.6	3.0	6.6	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	6.2	
Vehicle Extension (s)	4.5	2.5	4.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
Lane Grp Cap (vph)	1219	255	1583	539	638	539	638	544	682	544	682	682	
v/s Ratio Prot	c0.23	0.02	c0.19	c0.06	c0.06	c0.06	c0.06	c0.06	c0.06	c0.06	c0.06	c0.06	
v/c Ratio	0.68	0.27	0.42	0.14	0.05	0.14	0.05	0.04	0.04	0.04	0.01	0.01	
Uniform Delay, d1	23.8	14.8	16.0	16.0	15.4	16.0	15.4	15.4	15.4	15.4	15.2	15.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	1.8	0.4	0.3	0.5	0.1	0.5	0.1	0.2	0.2	0.2	0.0	0.0	
Delay (s)	25.6	15.3	16.3	16.6	15.6	16.6	15.6	15.6	15.6	15.6	15.3	15.3	
Level of Service	C	B	B	B	B	B	B	B	B	B	B	B	
Approach Delay (s)	25.6	16.2	16.2	16.1	16.1	16.1	16.1	15.5	15.5	15.5	15.5	15.5	
Approach LOS	C	B	B	B	B	B	B	B	B	B	B	B	
Intersection Summary													
HCM Average Control Delay	20.6											HCM Level of Service	C
HCM Volume to Capacity ratio	0.41												
Actuated Cycle Length (s)	84.8											Sum of lost time (s)	19.4
Intersection Capacity Utilization	66.3%											ICU Level of Service	C
Analysis Period (min)	15												
c. Critical Lane Group													

3: North Service Road West & QEW WB Off Ramp

<Background> AM Peak
2020-04-01

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔↔			↔↔	↔↔	↔↔
Volume (veh/h)	786	0	0	379	172	264
Sign Control	Free			Free	Stop	
Grade	0%			0%		
Peak Hour Factor	0.93	0.92	0.92	0.80	0.69	0.80
Hourly flow rate (vph)	845	0	0	474	249	330
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)	147			212	0.82	0.81
pX platoon unblocked				0.81		
vC conflicting volume				845	1082	423
vC1 stage 1 conf vol						
vC2 stage 2 conf vol						
vCu unblocked vol				341	583	0
IC single (s)				4.1	6.8	6.9
IC 2 stage (s)						
IF (s)				2.2	3.5	3.3
p0 queue free %				100	31	62
cM capacity (veh/h)				984	362	879
Direction_Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	423	423	237	237	249	330
Volume Left	0	0	0	0	249	0
Volume Right	0	0	0	0	0	330
cSH	1700	1700	1700	1700	362	879
Volume to Capacity	0.25	0.25	0.14	0.14	0.69	0.38
Queue Length 95th (m)	0.0	0.0	0.0	0.0	39.4	14.1
Control Delay (s)	0.0	0.0	0.0	0.0	34.3	11.5
Lane LOS					D	B
Approach Delay (s)	0.0	0.0	0.0	21.3		
Approach LOS				C		
Intersection Summary						
Average Delay	6.5					
Intersection Capacity Utilization	44.7%					
Analysis Period (min)	15					
ICU Level of Service	A					

4: Kerr Street & Canadian Tire Access

<Background> AM Peak
2020-04-01

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1000	61	45	375	79	56
v/c Ratio	0.68	0.10	0.17	0.23	0.11	0.09
Control Delay	23.7	10.6	11.0	12.9	20.4	6.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.7	10.6	11.0	12.9	20.4	6.6
Queue Length 50th (m)	77.7	3.6	3.6	18.5	9.1	0.0
Queue Length 95th (m)	100.1	1.6	6.4	25.6	15.4	4.7
Internal Link Dist (m)	187.9			130.2	100.4	
Turn Bay Length (m)		23.0	20.0			
Base Capacity (vph)	1764	759	361	2360	692	653
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.57	0.08	0.12	0.16	0.11	0.09
Intersection Summary						

HCM Signalized Intersection Capacity Analysis
 4: Kerr Street & Canadian Tire Access

<Background> AM Peak
 2020-04-01

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	←←	←	←	←	←	←
Volume (vph)	910	19	31	326	53	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	3.0	5.8	6.0	6.0
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Flt	1.00	0.85	1.00	1.00	0.85	1.00
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3574	1509	1805	3505	1805	1615
Flt Permitted	1.00	1.00	0.15	1.00	0.95	1.00
Satd. Flow (perm)	3574	1509	279	3505	1805	1615
Peak-hour factor, PHF	0.91	0.31	0.69	0.87	0.67	0.70
Adj. Flow (vph)	1000	61	45	375	79	56
RTOR Reduction (vph)	0	17	0	0	0	35
Lane Group Flow (vph)	1000	44	45	375	79	21
Heavy Vehicles (%)	1%	7%	0%	3%	0%	0%
Turn Type	Perm	pm+pt	Perm	Perm	Perm	Perm
Protected Phases	4	3	8	2	2	
Permitted Phases	4	8			2	
Actuated Green, G (s)	34.5	34.5	41.4	41.4	32.4	32.4
Effective Green, g (s)	34.5	34.5	41.4	41.4	32.4	32.4
Actuated g/C Ratio	0.40	0.40	0.48	0.48	0.38	0.38
Clearance Time (s)	5.8	5.8	3.0	5.8	6.0	6.0
Vehicle Extension (s)	4.5	4.5	2.5	4.5	3.5	3.5
Lane Grp Cap (vph)	1440	608	204	1695	683	611
v/s Ratio Prot	c0.28	0.01	c0.11	c0.04		
v/s Ratio Perm	0.69	0.07	0.22	0.22	0.12	0.03
Uniform Delay, d1	21.2	15.7	13.8	12.8	17.3	16.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7	0.1	0.4	0.1	0.3	0.1
Delay (s)	22.9	15.8	14.2	12.9	17.6	16.9
Level of Service	C	B	B	B	B	B
Approach Delay (s)	22.5		13.0	17.3		
Approach LOS	C		B	B		
Intersection Summary						
HCM Average Control Delay	19.6		HCM Level of Service		B	
HCM Volume to Capacity ratio	0.42					
Actuated Cycle Length (s)	86.6		Sum of lost time (s)		17.6	
Intersection Capacity Utilization	43.9%		ICU Level of Service		A	
Analysis Period (min)	15					
c. Critical Lane Group						

Queues
 5: QEW WB On Ramp & Donval Drive

<Background> AM Peak
 2020-04-01

Lane Group	WBL	WBT	WBR	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	549	548	498	1093	371	1590	282
v/c Ratio	0.88	0.91	0.80	0.43	0.38	0.63	0.30
Control Delay	46.2	49.2	35.0	16.9	2.7	19.8	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	46.2	49.2	35.0	16.9	2.7	19.8	2.6
Queue Length 50th (m)	107.5	110.8	83.2	50.4	0.0	83.5	0.0
Queue Length 95th (m)	126.5	#185.9	88.6	53.8	8.1	99.2	13.0
Internal Link Dist (m)	74.0						
Turn Bay Length (m)							
Base Capacity (vph)	621	602	623	2517	987	2542	926
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.88	0.91	0.80	0.43	0.38	0.63	0.30
Intersection Summary							
# 95th percentile volume exceeds capacity, queue may be longer.							
Queue shown is maximum after two cycles.							

5: QEW WB On Ramp & Dorval Drive <Background> AM Peak 2020-04-01

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	752	0	454	0	885	297	0	1479	259
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Lane Util. Factor	0.95	0.91	0.95	0.91	0.95	0.91	1.00	0.91	1.00	0.91	1.00	0.85
Flt	1.00	0.96	1.00	0.96	1.00	0.96	1.00	1.00	1.00	0.96	1.00	0.85
FI Protected	0.95	0.96	1.00	0.95	0.96	1.00	1.00	1.00	1.00	0.95	1.00	0.85
Satd. Flow (prot)	1573	1493	1490	1573	1493	1490	5085	1615	1615	5136	1583	1583
Flt Permitted	0.95	0.96	1.00	0.95	0.96	1.00	1.00	1.00	1.00	0.95	1.00	0.85
Satd. Flow (perm)	1573	1493	1490	1573	1493	1490	5085	1615	1615	5136	1583	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.78	0.92	0.72	0.92	0.81	0.80	0.92	0.93	0.92
Adj. Flow (vph)	0	0	0	964	0	631	0	1093	371	0	1590	282
RTOR Reduction (vph)	0	0	0	11	34	0	0	187	0	0	142	0
Lane Group Flow (vph)	0	0	0	549	537	464	0	1093	184	0	1590	140
Heavy Vehicles (%)	2%	2%	2%	9%	2%	3%	2%	2%	0%	2%	1%	2%
Turn Type	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm
Protected Phases				8			2				6	
Permitted Phases				8			2				6	
Actuated Green, G (s)	39.5	39.5	39.5	39.5	39.5	39.5	49.5	49.5	49.5	49.5	49.5	49.5
Effective Green, g (s)	39.5	39.5	39.5	39.5	39.5	39.5	49.5	49.5	49.5	49.5	49.5	49.5
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40	0.40	0.50	0.50	0.50	0.50	0.50	0.50
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Lane Grp Cap (vph)	621	590	589	621	590	589	2517	799	799	2542	784	784
v/s Ratio Prot							0.21			0.31		
v/s Ratio Perm	0.35	0.36	0.31	0.88	0.91	0.79	0.43	0.23	0.63	0.18	0.63	0.18
v/c Ratio	0.88	0.91	0.79	0.88	0.91	0.79	0.43	0.23	0.63	0.18	0.63	0.18
Uniform Delay, d1	28.1	28.6	26.6	16.2	14.4	14.0	16.2	14.4	18.5	14.0	18.5	14.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	16.7	20.4	10.2	0.5	0.7	1.2	0.5	0.7	1.2	0.5	1.2	0.5
Delay (s)	44.9	49.0	36.8	16.8	15.1	19.6	16.8	15.1	19.6	14.5	19.6	14.5
Level of Service	D	D	D	D	D	D	B	B	B	B	B	B
Approach Delay (s)	0.0			43.7			16.4				18.9	
Approach LOS	A			D			B				B	
Intersection Summary												
HCM Average Control Delay	26.2 HCM Level of Service C											
HCM Volume to Capacity ratio	0.75											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 11.0											
Intersection Capacity Utilization	63.2% ICU Level of Service B											
Analysis Period (min)	15											
c Critical Lane Group												

6: QEW EB Off Ramp & Dorval Drive <Background> AM Peak 2020-04-01

Lane Group	EBL	EBT	EBR	NBL	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	481	453	441	965	1092	1732	843	843
v/c Ratio	0.80	0.86	0.82	0.36	0.81	0.66	0.66	0.68
Control Delay	38.8	44.9	40.8	14.0	6.8	18.4	4.3	4.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.8	44.9	40.8	14.0	6.8	18.4	4.3	4.3
Queue Length 50th (m)	86.8	86.0	78.6	41.4	0.1	93.1	0.0	0.0
Queue Length 95th (m)	88.5	#142.8	110.0	46.4	20.3	100.8	18.9	18.9
Internal Link Dist (m)	97.8 227.7 281.8							
Turn Bay Length (m)	698 612 624 271.4 1353 2611 1238							
Starvation Cap Reductn	0 0 0 0 0 0 0 0							
Spillback Cap Reductn	0 0 0 0 0 0 0 0							
Storage Cap Reductn	0 0 0 0 0 0 0 0							
Reduced v/c Ratio	0.69	0.74	0.71	0.36	0.81	0.66	0.68	0.68
Intersection Summary								
# 95th percentile volume exceeds capacity, queue may be longer.								
Queue shown is maximum after two cycles.								

6: OEV EB Off Ramp & Dorval Drive

7: North Service Road West & Proposed Site Access

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	391	0	694	0	0	0	0	791	1005	0	1455	776
Volume (veh/h)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Total Lost time (s)	0.95	0.91	0.95	1.00	0.88	0.85	1.00	0.85	1.00	0.85	1.00	1.00
Lane Util. Factor	1.00	0.88	0.85	1.00	0.88	0.85	1.00	0.85	1.00	0.85	1.00	1.00
FI Protected	1715	1489	1519	1715	1489	1519	1715	1489	1519	1715	1489	1519
Satd. Flow (prot)	0.95	0.99	1.00	0.95	0.99	1.00	0.95	0.99	1.00	0.95	0.99	1.00
FI Permitted	1715	1489	1519	1715	1489	1519	1715	1489	1519	1715	1489	1519
Satd. Flow (perm)	0.70	0.92	0.85	0.92	0.92	0.82	0.92	0.82	0.92	0.82	0.84	0.92
Peak-hour factor, PHF	559	0	816	0	0	0	965	1092	0	1732	843	843
Adj. Flow (vph)	0	6	6	0	0	0	0	509	0	0	393	393
RTOR Reduction (vph)	481	447	435	0	0	0	965	583	0	1732	450	450
Lane Group Flow (vph)	0%	2%	1%	2%	2%	2%	2%	2%	2%	2%	6%	2%
Heavy Vehicles (%)	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm
Turn Type	4	4	4	2	2	2	2	2	2	2	6	6
Permitted Phases	4	4	4	2	2	2	2	2	2	2	6	6
Actuated Green, G (s)	33.3	33.3	33.3	50.7	50.7	50.7	50.7	50.7	50.7	50.7	50.7	50.7
Effective Green, g (s)	33.3	33.3	33.3	50.7	50.7	50.7	50.7	50.7	50.7	50.7	50.7	50.7
Actuated g/C Ratio	0.35	0.35	0.35	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	601	522	532	2714	845	2611	845	2611	845	2611	845	845
v/s Ratio Prot	0.28	0.30	0.29	0.19	0.19	0.35	0.35	0.35	0.35	0.35	0.35	0.35
v/c Ratio	0.80	0.86	0.82	0.36	0.69	0.66	0.66	0.66	0.66	0.66	0.66	0.66
Uniform Delay, d1	27.8	28.6	28.1	12.7	16.4	16.0	16.4	16.0	16.4	16.0	16.4	16.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.5	12.9	9.4	0.4	4.6	4.6	4.6	4.6	4.6	4.6	4.6	4.6
Delay (s)	35.4	41.5	37.5	13.1	20.9	17.3	20.9	17.3	20.9	17.3	20.9	20.9
Level of Service	D	D	D	B	C	C	C	B	C	C	B	B
Approach Delay (s)	38.1	D	D	17.3	A	17.2	B	17.2	B	B	17.2	B
Approach LOS	D	D	D	B	A	B	B	B	B	B	B	B
Intersection Summary												
HCM Average Control Delay	22.0 HCM Level of Service C											
HCM Volume to Capacity ratio	0.76											
Actuated Cycle Length (s)	95.0											
Intersection Capacity Utilization	89.3%											
Analysis Period (min)	15											
c. Critical Lane Group												

6: OEV EB Off Ramp & Dorval Drive

Movement	EBT	EBR	WBT	WBR	NBT	NBR
Lane Configurations	786	0	0	551	0	0
Volume (veh/h)	Free	Free	Free	Stop	0%	0%
Sign Control	0%	0.92	0.92	0.92	0.92	0.92
Grade	0%	0	0	599	0	0
Peak Hour Factor	854	0	0	599	0	0
Hourly flow rate (vph)	854	0	0	599	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)	None	None	None	None	None	None
Median type	None	None	None	None	None	None
Median storage (veh)						
Upstream signal (m)	62	0.80	297	0.80	0.80	0.80
pX, platoon unblocked						
vC, conflicting volume	854	854	1154	427		
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	333	705	0			
IC, single (s)	4.1	6.8	6.9			
IC, 2 stage (s)						
IF (s)	2.2	3.5	3.3			
p0 queue free %	100	100	100			
GM capacity (veh/h)	984	298	872			
Direction, Lane #						
EB 1	EB 2	WB 1	WB 2	NB 1		
Volume Total	570	285	299	299	0	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	0.34	0.17	0.18	0.18	0.00	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	A	A	A	A	A
Approach Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Approach LOS	A	A	A	A	A	A
Intersection Summary						
Average Delay	0.0					
Intersection Capacity Utilization	25.1%					
ICU Level of Service	A					
Analysis Period (min)	15					

Queues
1: North Service Road West & Donval Drive

<Background> PM Peak
2020-04-01

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group	416	364	648	351	615	991	630	1693	131	441	1221
Lane Group Flow (vph)	1.72	0.44	0.41	1.46	0.74	1.65	1.13	1.31	0.21	0.79	0.97
v/c Ratio	374.4	42.4	0.8	269.3	50.2	322.6	124.7	180.3	13.3	60.8	56.9
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	374.4	42.4	0.8	269.3	50.2	322.6	124.7	180.3	13.3	60.8	56.9
Total Delay	-80.2	41.8	0.0	-62.8	76.8	-306.1	-95.4	-291.4	9.5	56.1	155.9
Queue Length 50th (m)	#110.2	57.4	0.0	#88.5	98.4	#353.9	#133.2	#295.8	20.7	65.2	#197.0
Queue Length 95th (m)	123.2			263.1			284.3				114.7
Internal Link Dist (m)	48.0			45.0			25.0	48.0		30.0	
Turn Bay Length (m)	242	827	1583	240	827	601	559	1289	630	559	1259
Base Capacity (vph)	0	0	0	0	0	0	0	0	0	0	0
Stavation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.72	0.44	0.41	1.46	0.74	1.65	1.13	1.31	0.21	0.79	0.97

Intersection Summary
 - Volume exceeds capacity, queue is theoretically infinite.
 - Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 - Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
1: North Service Road West & Donval Drive

<Background> PM Peak
2020-04-01

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF	FF
Volume (vph)	366	331	551	302	584	842	586	1405	109	353	829	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	4.0	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.95
Flt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3502	3574	1583	3467	3574	1615	3502	3574	1615	3502	3426	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3502	3574	1583	3467	3574	1615	3502	3574	1615	3502	3426	
Peak-hour factor, PHF	0.88	0.91	0.85	0.86	0.95	0.85	0.93	0.83	0.83	0.80	0.88	0.70
Adj. Flow (vph)	416	364	648	351	615	991	630	1693	131	441	942	279
RTOR Reduction (vph)	0	0	0	0	0	228	0	0	47	0	22	0
Lane Group Flow (vph)	416	364	648	351	615	763	630	1693	84	441	1199	0
Heavy Vehicles (%)	0%	1%	2%	1%	1%	0%	0%	1%	0%	0%	2%	1%
Turn Type	Prot	Free	Free	Prot	Prot	Prot	Prot	Prot	Prot	Prot	Prot	Prot
Protected Phases	7	4		3	8		5	2		1		6
Permitted Phases		Free			8				2			
Actuated Green, G (s)	8.5	28.4	122.8	8.5	28.4	28.4	19.6	44.3	44.3	19.6	44.3	44.3
Effective Green, g (s)	8.5	28.4	122.8	8.5	28.4	28.4	19.6	44.3	44.3	19.6	44.3	44.3
Actuated g/c Ratio	0.07	0.23	1.00	0.07	0.23	0.23	0.16	0.36	0.36	0.16	0.36	0.36
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	242	827	1583	240	827	374	559	1289	583	559	1236	
v/s Ratio Prot	c0.12	0.10	0.41	0.10	0.17		c0.18	c0.47		0.13	0.35	
v/c Ratio	1.72	0.44	0.41	1.46	0.74	2.04	1.13	1.31	0.14	0.79	0.97	
Uniform Delay, d1	57.1	40.4	0.0	57.1	43.8	47.2	51.6	39.2	26.5	49.6	38.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	340.5	0.4	0.8	229.6	3.6	477.8	78.1	146.7	0.5	7.3	19.3	
Delay (s)	397.6	40.8	0.8	286.8	47.5	525.0	129.7	185.9	27.0	56.9	57.9	
Level of Service	F	D	A	F	D	F	F	F	C	E	E	
Approach Delay (s)	126.6			332.2			163.0			57.6		
Approach LOS	F			F			F			E		
Intersection Summary												
HCM Average Control Delay				176.9			HCM Level of Service			F		
HCM Volume to Capacity ratio				1.52								
Actuated Cycle Length (s)				122.8			Sum of lost time (s)			22.0		
Intersection Capacity Utilization				115.2%			ICU Level of Service			H		
Analysis Period (min)				15								
c. Critical Lane Group												

Queues
2: North Service Road West & Abbey Centre Access

<Background> PM Peak
2020-04-01

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	19	591	145	1349	358	124	25	55
Lane Group Flow (vph)	0.22	0.46	0.33	0.78	0.70	0.18	0.05	0.08
v/c Ratio	27.8	23.4	12.8	22.6	35.2	6.2	21.6	10.5
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	27.8	23.4	12.8	22.6	35.2	6.2	21.6	10.5
Total Delay	2.4	42.5	13.0	102.9	55.6	1.2	2.9	1.9
Queue Length 50th (m)	5.7	60.2	21.0	109.7	#110.8	0.4	7.9	9.4
Queue Length 95th (m)								
Internal Link Dist (m)	263.1		35.0	38.3		84.0		91.2
Turn Bay Length (m)	32.0							
Base Capacity (vph)	103	1503	482	2094	509	675	478	652
Stavation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.39	0.30	0.64	0.70	0.18	0.05	0.08

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

HCM Signalized Intersection Capacity Analysis
2: North Service Road West & Abbey Centre Access

<Background> PM Peak
2020-04-01

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations	1	1	1	1	1	1	1	1	1	1	1	1	
Volume (vph)	12	492	22	123	1086	10	347	5	96	19	12	24	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Total Lost time (s)	6.6	6.6	6.6	3.0	6.6	6.6	6.2	6.2	6.2	6.2	6.2	6.2	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.99	1.00	1.00	1.00	1.00	0.86	1.00	0.95	1.00	0.89	1.00	
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3537	1805	1805	3565	1805	1623	1805	1623	1805	1688	1805	
Flt Permitted	0.13	1.00	0.32	1.00	0.32	1.00	0.72	1.00	0.68	1.00	0.68	1.00	
Satd. Flow (perm)	243	3537	617	3565	1370	1623	1287	1688					
Peak-hour factor, PHF	0.63	0.90	0.50	0.85	0.82	0.40	0.97	0.50	0.84	0.75	0.83	0.59	
Adj. Flow (vph)	19	547	44	145	1324	25	358	10	114	25	14	41	
RTOR Reduction (vph)	0	6	0	0	2	0	0	72	0	0	24	0	
Lane Group Flow (vph)	19	585	0	145	1347	0	358	52	0	25	31	0	
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	1%	0%	0%	0%	
Turn Type	Perm	Perm	pm+pt	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	
Protected Phases	4	3	8	2	6								
Permitted Phases	4	8	8	2	6								
Actuated Green, G (s)	32.7	32.7	44.6	44.6	44.6	34.0	34.0	34.0	34.0	34.0	34.0	34.0	
Effective Green, g (s)	32.7	32.7	44.6	44.6	44.6	34.0	34.0	34.0	34.0	34.0	34.0	34.0	
Actuated g/C Ratio	0.36	0.36	0.49	0.49	0.49	0.37	0.37	0.37	0.37	0.37	0.37	0.37	
Clearance Time (s)	6.6	6.6	6.6	6.6	6.6	6.2	6.2	6.2	6.2	6.2	6.2	6.2	
Vehicle Extension (s)	4.5	4.5	2.5	4.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	
Lane Grp Cap (vph)	87	1265	417	1740	510	604	479	628					
v/s Ratio Prot	0.17	0.03	c0.38		0.03								
v/s Ratio Perm	0.08	0.14		c0.26									
v/c Ratio	0.22	0.46	0.35	0.77	0.70	0.09	0.05	0.05	0.05	0.05	0.05	0.05	
Uniform Delay, d1	20.4	22.6	13.5	19.3	24.4	18.6	18.4	18.4	18.4	18.4	18.4	18.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	2.2	0.5	0.4	2.5	7.9	0.3	0.2	0.1	0.2	0.1	0.1	0.1	
Delay (s)	22.6	23.0	13.9	21.7	32.2	18.9	18.6	18.5					
Level of Service	C	C	B	C	C	B	B	B					
Approach Delay (s)	23.0		21.0		28.8		18.5						
Approach LOS	C		C		C		B						
Intersection Summary													
HCM Average Control Delay	22.8											HCM Level of Service	C
HCM Volume to Capacity ratio	0.74												
Actuated Cycle Length (s)	91.4											Sum of lost time (s)	12.8
Intersection Capacity Utilization	93.2%											ICU Level of Service	F
Analysis Period (min)	15												
c. Critical Lane Group													

3: North Service Road West & QEW WB Off Ramp

2020-04-01

<Background> PM Peak

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔↔	↔	↔	↔↔	↔	↔
Volume (veh/h)	607	0	0	1041	178	218
Sign Control	Free	Free	Free	S/Op	Free	S/Op
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.89	0.92	0.92	0.87	0.76	0.83
Hourly flow rate (vph)	682	0	0	1197	234	263
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)	147			212	0.86	0.89
pX platoon unblocked						
vC conflicting volume	682			1280		341
vC1 stage 1 conf vol						
vC2 stage 2 conf vol						
vCu unblocked vol	392			409		8
IC single (s)	4.1			6.8		6.9
IC 2 stage (s)						
IF (s)	2.2			3.5		3.3
p0 queue free %	100			52		72
cM capacity (veh/h)	1034			489		952
Direction_Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	341	341	598	598	234	263
Volume Left	0	0	0	0	234	0
Volume Right	0	0	0	0	0	263
cSH	1700	1700	1700	1700	489	952
Volume to Capacity	0.20	0.20	0.35	0.35	0.48	0.28
Queue Length 95th (m)	0.0	0.0	0.0	0.0	20.4	9.0
Control Delay (s)	0.0	0.0	0.0	0.0	18.9	10.2
Lane LOS					C	B
Approach Delay (s)	0.0	0.0	0.0	14.3		
Approach LOS				B		
Intersection Summary						
Average Delay	3.0					
Intersection Capacity Utilization	45.3%					
Analysis Period (min)	15					
ICU Level of Service	A					

4: Kerr Street & Canadian Tire Access

2020-04-01

<Background> PM Peak

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group	↔	↔	↔	↔	↔	↔
Lane Group Flow (vph)	703	24	74	949	213	99
v/c Ratio	0.58	0.04	0.21	0.59	0.29	0.14
Control Delay	24.2	11.5	12.3	18.1	18.2	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.2	11.5	12.3	18.1	18.2	4.5
Queue Length 50th (m)	48.9	1.0	6.0	57.0	21.5	0.0
Queue Length 95th (m)	67.8	2.1	12.6	74.5	39.3	7.0
Internal Link Dist (m)	187.9			130.2	100.4	
Turn Bay Length (m)		23.0	20.0			
Base Capacity (vph)	1865	850	428	2569	724	700
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.38	0.03	0.17	0.37	0.29	0.14
Intersection Summary						

4: Kerr Street & Canadian Tire Access

<Background> PM Peak
2020-04-01

HCM Signalized Intersection Capacity Analysis

<Background> PM Peak
2020-04-01

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	←←	←	←	←	←	←
Volume (vph)	640	11	68	864	177	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	3.0	5.8	6.0	6.0
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Flt	1.00	0.85	1.00	1.00	0.85	1.00
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3574	1615	1805	3610	1787	1583
Flt Permitted	1.00	1.00	0.25	1.00	0.95	1.00
Satd. Flow (perm)	3574	1615	466	3610	1787	1583
Peak-hour factor, PHF	0.91	0.45	0.92	0.91	0.83	0.79
Adj. Flow (vph)	703	24	74	949	213	99
RTOR Reduction (vph)	0	10	0	0	0	59
Lane Group Flow (vph)	703	14	74	949	213	40
Heavy Vehicles (%)	1%	0%	0%	0%	1%	2%
Turn Type	Perm	pm+pt	Perm	Perm	Perm	Perm
Protected Phases	4	3	8	2		
Permitted Phases	4	8		2		
Actuated Green, G (s)	27.0	27.0	35.9	32.1	32.1	32.1
Effective Green, g (s)	27.0	27.0	35.9	32.1	32.1	32.1
Actuated g/C Ratio	0.34	0.34	0.45	0.45	0.40	0.40
Clearance Time (s)	5.8	5.8	3.0	5.8	6.0	6.0
Vehicle Extension (s)	4.5	4.5	2.5	4.5	3.5	3.5
Lane Grp Cap (vph)	1209	546	309	1624	719	637
v/s Ratio Prot	0.20	0.02	c0.26	c0.12		
v/s Ratio Perm	0.01	0.09		0.03		
v/c Ratio	0.58	0.03	0.24	0.58	0.30	0.06
Uniform Delay, d1	21.7	17.6	13.4	16.4	16.2	14.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0	0.0	0.3	0.7	1.1	0.2
Delay (s)	22.7	17.7	13.7	17.1	17.2	14.8
Level of Service	C	B	B	B	B	B
Approach Delay (s)	22.6		16.9	16.5		
Approach LOS	C		B	B		
Intersection Summary						
HCM Average Control Delay	18.8					
HCM Volume to Capacity ratio	0.45					
Actuated Cycle Length (s)	79.8					
Intersection Capacity Utilization	49.0%					
Analysis Period (min)	15					
c Critical Lane Group	B					

5: QEW WB On Ramp & Donval Drive

<Background> PM Peak
2020-04-01

Lane Group	WBL	WBT	WBR	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	712	686	652	1483	334	1579	325
v/c Ratio	1.10	1.12	1.06	0.58	0.35	0.63	0.34
Control Delay	97.9	103.4	82.5	19.1	2.6	19.9	2.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	97.9	103.4	82.5	19.1	2.6	19.9	2.7
Queue Length 50th (m)	-175.0	-176.1	-152.2	75.6	0.0	82.9	0.0
Queue Length 95th (m)	#245.1	#255.0	#226.5	90.1	8.0	98.7	13.8
Internal Link Dist (m)	74.0						
Turn Bay Length (m)	281.8						
Base Capacity (vph)	645	613	617	2542	968	2517	948
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	1.10	1.12	1.06	0.58	0.35	0.63	0.34
Intersection Summary							
-	Volume exceeds capacity, queue is theoretically infinite.						
-	Queue shown is maximum after two cycles.						
#	95th percentile volume exceeds capacity, queue may be longer.						
-	Queue shown is maximum after two cycles.						

5. QEW WB On Ramp & Dorval Drive

<Background> PM Peak
2020-04-01

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations											
Volume (vph)	0	0	0	945	0	909	0	1409	267	0	1437
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Lane Util. Factor	0.95	0.91	0.95	0.91	0.95	0.91	1.00	0.91	1.00	0.91	1.00
F/I Protected	1.00	0.93	1.00	0.85	1.00	1.00	1.00	0.85	1.00	1.00	0.85
Satd. Flow (prot)	1633	1523	1534	5136	1615	5085	1583	5085	1583	5085	1583
F/I Permitted	0.95	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	1633	1523	1534	5136	1615	5085	1583	5085	1583	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.89	0.92	0.92	0.92	0.95	0.80	0.92	0.91	0.92
Adj. Flow (vph)	0	0	0	1062	0	988	0	1483	334	0	1579
RTOR Reduction (vph)	0	0	0	11	11	0	0	169	0	0	164
Group Flow (vph)	0	0	0	712	675	641	0	1483	165	0	1579
Heavy Vehicles (%)	2%	2%	2%	5%	0%	0%	2%	1%	0%	2%	2%
Turn Type	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm
Protected Phases	8	8	8	8	8	8	2	2	2	6	6
Permitted Phases	8	8	8	8	8	8	2	2	2	6	6
Actuated Green, G (s)	39.5	39.5	39.5	39.5	39.5	39.5	49.5	49.5	49.5	49.5	49.5
Effective Green, g (s)	39.5	39.5	39.5	39.5	39.5	39.5	49.5	49.5	49.5	49.5	49.5
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40	0.40	0.50	0.50	0.50	0.50	0.50
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Lane Grp Cap (vph)	645	602	606	2542	799	2517	784	2517	784	2517	784
v/s Ratio Prot	0.44	0.44	0.42	0.29	0.29	0.29	0.10	0.10	0.10	0.10	0.10
v/s Ratio Perm	1.10	1.12	1.06	0.58	0.21	0.63	0.21	0.63	0.21	0.63	0.21
Uniform Delay, d1	30.2	30.2	30.2	17.9	14.2	18.5	14.2	18.5	14.2	18.5	14.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	67.3	74.8	52.8	1.0	0.6	1.2	0.6	1.2	0.6	1.2	0.6
Delay (s)	97.6	105.1	83.1	18.9	14.8	19.7	14.8	19.7	14.8	19.7	14.8
Level of Service	F	F	F	B	B	B	B	B	B	B	B
Approach Delay (s)	0.0	0.0	0.0	18.2	18.2	18.9	18.2	18.9	18.2	18.9	18.2
Approach LOS	A	A	A	B	B	B	B	B	B	B	B
Intersection Summary											
HCM Average Control Delay	45.9 HCM Level of Service D										
HCM Volume to Capacity ratio	0.85										
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 11.0										
Intersection Capacity Utilization	73.9% ICU Level of Service D										
Analysis Period (min)	15										
c Critical Lane Group											

6. QEW EB Off Ramp & Dorval Drive

<Background> PM Peak
2020-04-01

Movement	EBL	EBT	EBR	NBL	NBT	NBR	SBL	SBR
Lane Group	EBL	EBT	EBR	NBL	NBT	NBR	SBL	SBR
Lane Group Flow (vph)	342	330	310	1540	1393	1728	936	936
v/c Ratio	0.72	0.74	0.71	0.51	0.51	0.60	0.71	0.71
Control Delay	36.3	37.5	36.1	12.1	29.3	13.4	4.4	4.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	36.3	37.5	36.1	12.1	29.3	13.4	4.4	4.4
Queue Length 50th (m)	55.4	54.7	48.6	52.2	37.0	63.2	0.0	0.0
Queue Length 95th (m)	48.4	86.1	71.4	87.2	#265.9	103.1	18.7	18.7
Internal Link Dist (m)	97.8 227.7 281.8							
Turn Bay Length (m)	774 715 698 3011 1401 2897 1319							
Base Capacity (vph)	0 0 0 0 0 0 0 0							
Starvation Cap Reductn	0 0 0 0 0 0 0 0							
Spillback Cap Reductn	0 0 0 0 0 0 0 0							
Storage Cap Reductn	0 0 0 0 0 0 0 0							
Reduced v/c Ratio	0.44 0.46 0.44 0.51 0.99 0.60 0.71							
Intersection Summary								
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.								

HCM Signalized Intersection Capacity Analysis
 6: OE/W EB Off Ramp & Dorval Drive

HCM Unsignalized Intersection Capacity Analysis
 7: North Service Road West & Proposed Site Access

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBR
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Volume (veh/h)	305	0	388	0	0	0	1371	1282	0	1521	861
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Lane Util. Factor	0.95	0.91	0.95	0.91	0.95	0.91	1.00	0.91	1.00	0.91	1.00
Flt Protected	1.00	0.93	0.85	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1715	1570	1534	1715	1570	1534	5085	1615	4893	1583	1583
Flt Permitted	0.95	0.97	1.00	0.95	0.97	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	1715	1570	1534	1715	1570	1534	5085	1615	4893	1583	1583
Peak-hour factor, PHF	0.58	0.92	0.85	0.92	0.92	0.92	0.89	0.92	0.92	0.88	0.92
Adj. Flow (vph)	526	0	456	0	0	0	1540	1393	0	1728	936
RTOR Reduction (vph)	0	7	7	0	0	0	0	445	0	0	381
Lane Group Flow (vph)	342	323	303	0	0	0	1540	948	0	1728	555
Heavy Vehicles (%)	0%	1%	0%	0%	0%	0%	2%	2%	0%	0%	2%
Turn Type	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm
Protected Phases	4	4	4	2	2	2	6	6	6	6	6
Permitted Phases	4	4	4	2	2	2	6	6	6	6	6
Actuated Green, G (s)	24.0	24.0	24.0	50.9	50.9	50.9	50.9	50.9	50.9	50.9	50.9
Effective Green, g (s)	24.0	24.0	24.0	50.9	50.9	50.9	50.9	50.9	50.9	50.9	50.9
Actuated g/C Ratio	0.28	0.28	0.28	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	479	439	429	3013	957	2899	938	938	938	938	938
v/s Ratio Prot	0.20	0.21	0.20	0.30	0.30	0.30	0.35	0.35	0.35	0.35	0.35
v/c Ratio	0.71	0.74	0.71	0.51	0.99	0.60	0.59	0.60	0.59	0.60	0.59
Uniform Delay, d1	27.9	28.1	27.8	10.2	17.3	11.0	11.0	11.0	11.0	11.0	11.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.0	6.3	5.2	0.6	27.0	0.9	2.7	2.7	2.7	2.7	2.7
Delay (s)	32.9	34.4	33.0	10.9	44.3	11.9	13.7	13.7	13.7	13.7	13.7
Level of Service	C	C	C	B	D	D	B	B	B	B	B
Approach Delay (s)	33.4	33.4	33.4	0.0	0.0	0.0	12.6	12.6	12.6	12.6	12.6
Approach LOS	C	C	C	A	A	A	B	B	B	B	B
Intersection Summary											
HCM Average Control Delay	22.0 HCM Level of Service C										
HCM Volume to Capacity ratio	0.91										
Actuated Cycle Length (s)	86.9 Sum of lost time (s) 11.0										
Intersection Capacity Utilization	100.0% ICU Level of Service G										
Analysis Period (min)	15										
c Critical Lane Group											

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔	↔	↔	↔	↔	↔
Volume (veh/h)	607	0	0	1219	0	0
Sign Control	Free	Free	Free	Stop	Free	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	660	0	0	1325	0	0
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None	None	None	None	None	None
Median storage (veh)						
Upstream signal (m)	62			297		
pX, platoon unblocked				0.88		0.88
vC, conflicting volume				660		1322
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol				338		508
IC, single (s)				4.1		6.8
IC, 2 stage (s)						
IF (s)				2.2		3.5
p0 queue free %				100		100
GM capacity (veh/h)				1071		441
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	
Volume Total	440	220	662	662	0	
Volume Left	0	0	0	0	0	
Volume Right	0	0	0	0	0	
cSH	1700	1700	1700	1700	1700	
Volume to Capacity	0.26	0.13	0.39	0.39	0.00	
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	
Lane LOS	A	A	A	A	A	
Approach Delay (s)	0.0	0.0	0.0	0.0	0.0	
Approach LOS	A	A	A	A	A	
Intersection Summary						
Average Delay	0.0					
Intersection Capacity Utilization	37.0%					
ICU Level of Service	A					
Analysis Period (min)	15					

Queues
1: North Service Road West & Donval Drive

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group	172	348	366	277	436	239	420	945	159	687	1593
Lane Group Flow (vph)	0.73	0.42	0.23	1.15	0.54	0.49	0.76	0.75	0.24	1.23	1.25
v/c Ratio	74.5	42.1	0.3	155.9	44.5	17.0	59.2	38.8	5.0	161.4	152.2
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	74.5	42.1	0.3	155.9	44.5	17.0	59.2	38.8	5.0	161.4	152.2
Total Delay	22.4	39.8	0.0	-42.7	51.5	15.5	53.2	109.6	0.0	-110.9	-265.7
Queue Length 50th (m)	27.0	50.1	0.0	#54.1	46.4	37.9	45.8	126.7	9.7	#131.9	#300.0
Queue Length 95th (m)	123.2			263.1			284.3				114.7
Internal Link Dist (m)	48.0	50.0	45.0	25.0	48.0	25.0	48.0	25.0	48.0	30.0	
Turn Bay Length (m)	235	827	1599	240	803	492	553	1264	651	559	1278
Base Capacity (vph)	0	0	0	0	0	0	0	0	0	0	0
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.73	0.42	0.23	1.15	0.54	0.49	0.76	0.75	0.24	1.23	1.25

Intersection Summary

- Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
1: North Service Road West & Donval Drive

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	122	289	344	208	279	208	256	813	127	570	1277	111
Volume (vph)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	5.5	5.5	4.0	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Total Lost time (s)	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.95
Lane Util. Factor	1.00	1.00	0.85	1.00	0.85	1.00	0.85	1.00	0.85	1.00	0.85	1.00
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3400	3574	1599	3467	3471	1583	3467	3505	1524	3502	3526	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	3400	3574	1599	3467	3471	1583	3467	3505	1524	3502	3526	
Peak-hour factor, PHF	0.71	0.83	0.94	0.75	0.64	0.87	0.61	0.86	0.80	0.83	0.88	0.78
Adj. Flow (vph)	172	348	366	277	436	239	420	945	159	687	1451	142
RTOR Reduction (vph)	0	0	0	0	0	126	0	0	102	0	0	0
Lane Group Flow (vph)	172	348	366	277	436	113	420	945	57	687	1887	0
Heavy Vehicles (%)	3%	1%	1%	1%	4%	2%	1%	3%	6%	0%	1%	1%
Turn Type	Prot	Free	Free	Prot	Prot	Perm	Prot	Prot	Perm	Prot	Prot	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases		Free			8				2			
Actuated Green, G (s)	8.5	28.4	122.8	8.5	28.4	28.4	19.6	44.3	44.3	19.6	44.3	
Effective Green, g (s)	8.5	28.4	122.8	8.5	28.4	28.4	19.6	44.3	44.3	19.6	44.3	
Actuated g/c Ratio	0.07	0.23	1.00	0.07	0.23	0.23	0.16	0.36	0.36	0.16	0.36	
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	235	827	1599	240	803	366	553	1264	550	559	1272	
v/s Ratio Prot	0.05	0.10	0.23	c0.08	c0.13		0.12	0.27		c0.20	c0.45	
v/c Ratio	0.73	0.42	0.23	1.15	0.54	0.31	0.76	0.75	0.10	1.23	1.25	
Uniform Delay, d1	56.0	40.2	0.0	57.1	41.5	39.1	49.3	34.4	26.1	51.6	39.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	11.1	0.3	0.3	106.1	0.8	0.5	5.9	4.1	0.4	118.1	118.2	
Delay (s)	67.2	40.5	0.3	163.2	42.2	39.6	55.3	38.4	26.5	169.7	157.5	
Level of Service	E	D	A	F	D	D	E	D	C	F	F	
Approach Delay (s)	29.1			76.8			41.8			161.2		
Approach LOS	C			E			D			F		
Intersection Summary												
HCM Average Control Delay				94.0			HCM Level of Service			F		
HCM Volume to Capacity ratio				1.04								
Actuated Cycle Length (s)				122.8			Sum of lost time (s)			22.0		
Intersection Capacity Utilization				104.3%			ICU Level of Service			G		
Analysis Period (min)				15								
c. Critical Lane Group												

Queues
2. North Service Road West & Abbey Centre Access

<Total> AM Peak
2020-04-01

	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	862	70	672	74	69	24	14
v/c Ratio	0.69	0.24	0.42	0.14	0.10	0.04	0.02
Control Delay	27.0	12.9	16.2	19.9	6.5	19.1	12.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	27.0	12.9	16.2	19.9	6.5	19.1	12.3
Queue Length 50th (m)	67.1	6.0	38.6	8.0	0.4	2.5	0.4
Queue Length 95th (m)	89.4	10.8	40.5	17.4	0.0	6.7	0.4
Internal Link Dist (m)	263.1		38.3		84.0		91.2
Turn Bay Length (m)	35.0						
Base Capacity (vph)	1624	367	2251	539	676	543	688
Station Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.53	0.19	0.30	0.14	0.10	0.04	0.02
Intersection Summary							

HCM Signalized Intersection Capacity Analysis
2. North Service Road West & Abbey Centre Access

<Total> AM Peak
2020-04-01

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Volume (vph)	0	758	11	55	470	26	58	1	42	17	1	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6			3.0	6.6		6.2		6.2		6.2	6.2
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	0.99	1.00	1.00	0.86	1.00	1.00	1.00
Flt Protected	1.00	1.00	1.00	0.95	1.00	0.99	1.00	0.86	1.00	0.95	1.00	0.89
Satd. Flow (prot)	3554	1770	3541	1703	3541	1703	1587	1587	1805	1696	1805	1696
Flt Permitted	1.00	1.00	1.00	0.18	1.00	0.18	0.75	1.00	0.71	1.00	0.71	1.00
Satd. Flow (perm)	3554	331	3541	331	3541	331	1341	1587	1353	1696	1353	1696
Peak-hour factor, PHF	0.25	0.90	0.56	0.79	0.75	0.58	0.78	0.25	0.65	0.70	0.25	0.50
Adj. Flow (vph)	0	842	20	70	627	45	74	4	65	24	4	10
RTOR Reduction (vph)	0	2	0	0	6	0	0	39	0	0	6	0
Lane Group Flow (vph)	0	860	0	70	666	0	74	30	0	24	8	0
Heavy Vehicles (%)	0%	1%	11%	2%	1%	0%	6%	0%	3%	0%	0%	0%
Turn Type	Perm	pm+pt	pm+pt	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm
Protected Phases		4		3	8		2					6
Permitted Phases	4			8			2					6
Actuated Green, G (s)	29.9			38.6			34.1					34.1
Effective Green, g (s)	29.9			38.6			34.1					34.1
Actuated g/C Ratio	0.35			0.45			0.40					0.40
Clearance Time (s)	6.6			3.0			6.2					6.2
Vehicle Extension (s)	4.5			2.5			3.5					3.5
Lane Grp Cap (vph)	1243			245			1599					676
v/s Ratio Prot	c0.24			0.02			c0.19					0.00
v/c Ratio	0.69			0.29			0.42					0.02
Uniform Delay, d1	23.8			14.9			15.8					15.5
Progression Factor	1.00			1.00			1.00					1.00
Incremental Delay, d2	1.9			0.5			0.3					0.2
Delay (s)	25.8			15.4			16.1					15.9
Level of Service	C			B			B					B
Approach Delay (s)	25.8			16.1			16.4					15.8
Approach LOS	C			B			B					B
Intersection Summary												
HCM Average Control Delay	20.8											
HCM Volume to Capacity ratio	0.42											
Actuated Cycle Length (s)	86.5											
Intersection Capacity Utilization	66.3%											
Analysis Period (min)	15											
c. Critical Lane Group	C											

3: North Service Road West & QEW WB Off Ramp

<Total> AM Peak
2020-04-01

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔↔	↔	↔	↔↔	↔	↔
Volume (veh/h)	809	0	0	379	172	264
Sign Control	Free	Free	Free	S/opp	Free	S/opp
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.93	0.92	0.92	0.80	0.69	0.80
Hourly flow rate (vph)	870	0	0	474	249	330
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)	147			212		
pX platoon unblocked	0.81			0.81		
vC conflicting volume	870			1107		
vC1 stage 1 conf vol						
vC2 stage 2 conf vol						
vCu unblocked vol	357			601		
IC single (s)	4.1			6.8		
IC 2 stage (s)						
IF (s)	2.2			3.5		
p0 queue free %	100			29		
cM capacity (veh/h)	966			351		
Direction_Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	435	435	237	237	249	330
Volume Left	0	0	0	0	249	0
Volume Right	0	0	0	0	0	330
cSH	1700	1700	1700	1700	351	874
Volume to Capacity	0.26	0.26	0.14	0.14	0.71	0.38
Queue Length 95th (m)	0.0	0.0	0.0	0.0	41.8	14.2
Control Delay (s)	0.0	0.0	0.0	0.0	36.9	11.6
Lane LOS					E	B
Approach Delay (s)	0.0	0.0	0.0	22.5		
Approach LOS				C		
Intersection Summary						
Average Delay	6.8					
Intersection Capacity Utilization	45.4%					
Analysis Period (min)	15					
ICU Level of Service	A					

4: Kerr Street & Canadian Tire Access

<Total> AM Peak
2020-04-01

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	1025	61	45	375	79	56
v/c Ratio	0.70	0.10	0.17	0.22	0.11	0.09
Control Delay	23.9	10.7	11.0	12.8	20.7	6.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	23.9	10.7	11.0	12.8	20.7	6.6
Queue Length 50th (m)	80.3	3.7	3.6	18.5	9.2	0.0
Queue Length 95th (m)	103.5	1.7	6.4	25.6	15.4	4.7
Internal Link Dist (m)	187.9			130.2	100.4	
Turn Bay Length (m)		23.0	20.0			
Base Capacity (vph)	1755	755	355	2347	688	650
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.08	0.13	0.16	0.11	0.09
Intersection Summary						

HCM Signalized Intersection Capacity Analysis
 4: Kerr Street & Canadian Tire Access

<Total> AM Peak
 2020-04-01

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	4	4	3	3	2	2
Volume (vph)	933	19	31	326	53	39
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	3.0	5.8	6.0	6.0
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3574	1509	1805	3505	1805	1615
Flt Permitted	1.00	1.00	0.14	1.00	0.95	1.00
Satd. Flow (perm)	3574	1509	265	3505	1805	1615
Peak-hour factor, PHF	0.91	0.31	0.69	0.87	0.67	0.70
Adj. Flow (vph)	1025	61	45	375	79	56
RTOR Reduction (vph)	0	16	0	0	0	35
Lane Group Flow (vph)	1025	45	45	375	79	21
Heavy Vehicles (%)	1%	7%	0%	3%	0%	0%
Turn Type	Perm	pm+pt	Perm	Perm	Perm	Perm
Protected Phases	4	3	8	2		
Permitted Phases	4	8		2		
Actuated Green, G (s)	35.0	35.0	41.9	41.9	32.4	32.4
Effective Green, g (s)	35.0	35.0	41.9	41.9	32.4	32.4
Actuated g/C Ratio	0.41	0.41	0.49	0.49	0.38	0.38
Clearance Time (s)	5.8	5.8	3.0	5.8	6.0	6.0
Vehicle Extension (s)	4.5	4.5	2.5	4.5	3.5	3.5
Lane Grp Cap (vph)	1453	613	199	1706	679	608
v/s Ratio Prot	c0.29	0.01	c0.11	c0.04		
v/s Ratio Perm	0.03	0.10		0.01		
v/c Ratio	0.71	0.07	0.23	0.22	0.12	0.03
Uniform Delay, d1	21.3	15.6	13.9	12.7	17.5	17.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.8	0.1	0.4	0.1	0.3	0.1
Delay (s)	23.1	15.7	14.4	12.8	17.9	17.1
Level of Service	C	B	B	B	B	B
Approach Delay (s)	22.7		13.0	17.5		
Approach LOS	C		B	B		
Intersection Summary						
HCM Average Control Delay	19.8		HCM Level of Service		B	
HCM Volume to Capacity ratio	0.43					
Actuated Cycle Length (s)	86.1		Sum of lost time (s)		17.6	
Intersection Capacity Utilization	44.0%		ICU Level of Service		A	
Analysis Period (min)	15					
c. Critical Lane Group						

Queues
 5: QEW WB On Ramp & Donval Drive

<Total> AM Peak
 2020-04-01

Lane Group	WBL	WBT	WBR	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	559	547	504	1112	381	1590	282
v/c Ratio	0.90	0.91	0.81	0.44	0.38	0.63	0.30
Control Delay	48.3	48.9	36.1	17.0	2.7	19.8	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.3	48.9	36.1	17.0	2.7	19.8	2.6
Queue Length 50th (m)	110.5	110.1	85.5	51.6	0.0	83.5	0.0
Queue Length 95th (m)	129.8	#185.1	91.0	54.8	8.1	99.2	13.0
Internal Link Dist (m)	74.0						
Turn Bay Length (m)							
Base Capacity (vph)	621	602	621	2517	992	2542	926
Starvation Cap Reductn	0						
Spillback Cap Reductn	0						
Storage Cap Reductn	0						
Reduced v/c Ratio	0.90	0.91	0.81	0.44	0.38	0.63	0.30
Intersection Summary							
# 95th percentile volume exceeds capacity, queue may be longer.							
Queue shown is maximum after two cycles.							

5: QEW WB On Ramp & Dorval Drive

<Total> AM Peak
2020-04-01

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	752	0	465	0	901	305	0	1479	259
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Lane Util. Factor	0.95	0.91	0.95	0.91	0.95	0.91	1.00	0.91	1.00	0.91	1.00	0.85
Frt	1.00	0.96	1.00	0.85	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
FI Protected	0.95	0.96	1.00	0.85	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1573	1491	1490	5085	1615	5136	1583	5136	1583	5136	1583	1583
FI Permitted	0.95	0.96	1.00	0.85	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	1573	1491	1490	5085	1615	5136	1583	5136	1583	5136	1583	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.78	0.92	0.72	0.92	0.81	0.80	0.92	0.93	0.92
Adj. Flow (vph)	0	0	0	964	0	646	0	1112	381	0	1590	282
RTOR Reduction (vph)	0	0	0	13	33	0	0	192	0	0	142	0
Lane Group Flow (vph)	0	0	0	559	534	471	0	1112	189	0	1590	140
Heavy Vehicles (%)	2%	2%	2%	9%	2%	3%	2%	2%	0%	2%	1%	2%
Turn Type	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm
Protected Phases				8			2				6	
Permitted Phases				8		8	2		2		6	
Actuated Green, G (s)	39.5	39.5	39.5	39.5	39.5	39.5	49.5	49.5	49.5	49.5	49.5	49.5
Effective Green, g (s)	39.5	39.5	39.5	39.5	39.5	39.5	49.5	49.5	49.5	49.5	49.5	49.5
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40	0.40	0.50	0.50	0.50	0.50	0.50	0.50
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Lane Grp Cap (vph)	621	589	589	2517	799	2542	784	2517	799	2542	784	784
v/s Ratio Prot												
v/s Ratio Perm	0.36	0.36	0.32	0.12	0.12	0.12	0.22	0.12	0.12	0.12	0.31	0.09
v/c Ratio	0.90	0.91	0.80	0.44	0.44	0.24	0.44	0.24	0.24	0.24	0.63	0.18
Uniform Delay, d1	28.4	28.5	26.8	16.3	14.4	14.0	16.3	14.4	14.0	14.0	18.5	14.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	18.5	20.1	10.9	0.6	0.7	1.2	0.5	0.6	0.7	1.2	0.5	0.5
Delay (s)	46.9	48.7	37.7	16.9	15.1	19.6	14.5	16.9	15.1	19.6	14.5	14.5
Level of Service	D	D	D	D	D	B	B	B	B	B	B	B
Approach Delay (s)	0.0			44.6			16.4				18.9	
Approach LOS	A			D			B				B	
Intersection Summary												
HCM Average Control Delay	26.5 HCM Level of Service C											
HCM Volume to Capacity ratio	0.75											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 11.0											
Intersection Capacity Utilization	63.3% ICU Level of Service B											
Analysis Period (min)	15											
c Critical Lane Group												

6: QEW EB Off Ramp & Dorval Drive

<Total> AM Peak
2020-04-01

Movement	EBL	EBT	EBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	482	459	449	980	1101	1732	843	843	843
v/c Ratio	0.80	0.86	0.83	0.36	0.36	0.81	0.67	0.67	0.68
Control Delay	38.6	45.1	41.7	14.1	14.1	7.1	18.6	4.3	4.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.6	45.1	41.7	14.1	14.1	7.1	18.6	4.3	4.3
Queue Length 50th (m)	87.1	87.6	80.7	42.7	42.7	1.0	94.5	0.0	0.0
Queue Length 95th (m)	88.8	#145.2	112.5	47.2	47.2	23.5	100.8	18.9	18.9
Internal Link Dist (m)	97.8								
Turn Bay Length (m)	695								
Base Capacity (vph)	612	622	622	2705	1353	2603	1237	1237	1237
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.75	0.72	0.36	0.36	0.81	0.67	0.67	0.68
Intersection Summary									
# 95th percentile volume exceeds capacity, queue may be longer.									
Queue shown is maximum after two cycles.									

6: OE/W EB Off Ramp & Dorval Drive

<Total> AM Peak
2020-04-01

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	4	4	4	0	0	0	0	0	0	0	0	0
Volume (veh/h)	402	0	694	0	0	0	804	1013	0	1455	776	776
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Lane Util. Factor	0.95	0.91	0.95	1.00	0.91	1.00	0.91	1.00	0.91	1.00	1.00	1.00
Flt Protected	1.00	0.88	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	1.00
Satd. Flow (prot)	1715	1495	1519	1715	1495	1519	1715	1495	1519	1715	1495	1519
Flt Permitted	0.95	0.99	1.00	1.00	1.00	0.99	1.00	1.00	0.99	1.00	1.00	1.00
Satd. Flow (perm)	1715	1495	1519	1715	1495	1519	1715	1495	1519	1715	1495	1519
Peak-hour factor, PHF	0.70	0.92	0.85	0.92	0.92	0.82	0.92	0.82	0.92	0.92	0.84	0.92
Adj. Flow (vph)	574	0	816	0	0	0	980	1101	0	1732	843	843
RTOR Reduction (vph)	0	6	6	0	0	0	0	511	0	0	0	395
Lane Group Flow (vph)	482	453	443	0	0	0	980	590	0	1732	448	448
Heavy Vehicles (%)	0%	2%	1%	2%	2%	2%	2%	2%	2%	2%	6%	2%
Turn Type	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm
Protected Phases	4	4	4	2	2	2	2	2	2	2	2	2
Permitted Phases	4	4	4	2	2	2	2	2	2	2	2	2
Actuated Green, G (s)	33.6	33.6	33.6	50.7	50.7	50.7	50.7	50.7	50.7	50.7	50.7	50.7
Effective Green, g (s)	33.6	33.6	33.6	50.7	50.7	50.7	50.7	50.7	50.7	50.7	50.7	50.7
Actuated g/C Ratio	0.35	0.35	0.35	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53	0.53
Clearance Time (s)	5.5	5.5	5.5	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	605	527	536	2705	842	2603	842	2603	842	2603	842	842
v/s Ratio Prot	0.28	0.30	0.29	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
v/s Ratio Perm	0.80	0.86	0.83	0.36	0.70	0.67	0.53	0.67	0.53	0.67	0.53	0.53
Uniform Delay, d1	27.8	28.6	28.2	12.9	16.6	16.2	14.6	16.2	14.6	16.2	14.6	14.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.2	13.1	10.0	0.4	4.8	1.4	2.4	4.8	1.4	2.4	2.4	2.4
Delay (s)	35.0	41.7	38.2	13.3	21.5	17.5	17.0	21.5	17.0	21.5	17.0	17.0
Level of Service	C	D	D	B	C	C	B	C	C	B	B	B
Approach Delay (s)	38.2	D	D	0.0	A	A	17.6	B	B	17.3	B	B
Approach LOS	D	D	D	A	A	A	B	B	B	B	B	B
Intersection Summary												
HCM Average Control Delay	22.2 HCM Level of Service C											
HCM Volume to Capacity ratio	0.76											
Actuated Cycle Length (s)	95.3 Sum of lost time (s) 11.0											
Intersection Capacity Utilization	90.1% ICU Level of Service E											
Analysis Period (min)	15											
c Critical Lane Group												

7: North Service Road West & Proposed Site Access

<Total> AM Peak
2020-04-01

Movement	EBT	EBR	WBT	WBR	NBT	NBR
Lane Configurations	↑↑	↑↑	↑↑	↑↑	↑↑	↑↑
Volume (veh/h)	786	31	0	551	0	23
Sign Control	Free	Free	Free	Free	Stop	Stop
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	854	34	0	599	0	25
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None	None	None	None	None	None
Median storage (veh)						
Upstream signal (m)	62			297		
pX, platoon unblocked				0.80		0.80
IC, conflicting volume				888		1171
VC1, stage 1 conf vol						
VC2, stage 2 conf vol						
vCu, unblocked vol				345		700
IC, single (s)				4.1		6.8
IC, 2 stage (s)						6.9
IF (s)				2.2		3.5
p0 queue free %				100		100
qM capacity (veh/h)				963		297
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	570	318	299	299	25	25
Volume Left	0	0	0	0	0	0
Volume Right	0	34	0	0	25	25
cSH	1700	1700	1700	1700	863	863
Volume to Capacity	0.34	0.19	0.18	0.18	0.03	0.03
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.7	0.7
Control Delay (s)	0.0	0.0	0.0	0.0	9.3	9.3
Lane LOS	A	A	A	A	A	A
Approach Delay (s)	0.0	0.0	0.0	9.3	A	A
Approach LOS	A	A	A	A	A	A
Intersection Summary						
Average Delay	0.2					
Intersection Capacity Utilization	32.7% ICU Level of Service A					
Analysis Period (min)	15					

Queues
1: North Service Road West & Donval Drive

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group	416	368	648	351	615	991	632	1695	165	446	1221
Lane Group Flow (vph)	1.72	0.44	0.41	1.46	0.74	1.65	1.13	1.31	0.26	0.80	0.97
v/c Ratio	374.4	42.5	0.8	269.3	50.2	322.6	125.9	181.0	13.4	61.4	56.9
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	374.4	42.5	0.8	269.3	50.2	322.6	125.9	181.0	13.4	61.4	56.9
Total Delay	-80.2	42.4	0.0	-62.8	76.8	-306.1	-95.9	-292.0	12.2	56.9	155.9
Queue Length 50th (m)	#110.2	58.0	0.0	#68.5	98.4	#353.9	#333.5	#296.4	24.7	66.0	#197.0
Queue Length 95th (m)	123.2			263.1		284.3					114.7
Internal Link Dist (m)	48.0			45.0		25.0	48.0			30.0	
Turn Bay Length (m)	242	827	1583	240	827	601	559	1289	642	559	1259
Base Capacity (vph)	0	0	0	0	0	0	0	0	0	0	0
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.72	0.44	0.41	1.46	0.74	1.65	1.13	1.31	0.26	0.80	0.97

Intersection Summary
 - Volume exceeds capacity, queue is theoretically infinite.
 - Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 - Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis
 1: North Service Road West & Donval Drive

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Movement	366	335	551	302	584	842	588	1407	137	357	829	195
Lane Configurations	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Volume (vph)	5.5	5.5	4.0	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Ideal Flow (vphpl)	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95	0.95
Total Lost time (s)	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.97	1.00
Lane Util. Factor	3502	3574	1583	3467	3574	1615	3502	3574	1615	3502	3426	
Satd. Flow (prot)	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Flt Protected	0.88	0.91	0.85	0.86	0.95	0.85	0.93	0.83	0.83	0.80	0.88	0.70
Peak-hour factor, PHF	416	368	648	351	615	991	632	1695	165	446	942	279
Adj. Flow (vph)	0	0	0	0	0	0	0	0	0	0	0	0
RTOR Reduction (vph)	416	368	648	351	615	991	632	1695	165	446	942	279
Lane Group Flow (vph)	0%	1%	2%	1%	1%	0%	0%	1%	0%	0%	0%	2%
Heavy Vehicles (%)	Prot	7	4	Free	Prot	3	8	Prot	5	2	Prot	1
Turn Type	Permitted Phases	Free	8	Permitted Phases	Free	8	Permitted Phases	Free	8	Permitted Phases	Free	8
Protected Phases	Actuated Green, G (s)	8.5	28.4	122.8	8.5	28.4	28.4	19.6	44.3	44.3	19.6	44.3
Permitted Phases	Effective Green, g (s)	8.5	28.4	122.8	8.5	28.4	28.4	19.6	44.3	44.3	19.6	44.3
Actuated Green, G (s)	Actuated g/c Ratio	0.07	0.23	1.00	0.07	0.23	0.23	0.16	0.36	0.36	0.16	0.36
Effective Green, g (s)	Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Actuated g/c Ratio	Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Clearance Time (s)	Lane Grp Cap (vph)	242	827	1583	240	827	374	559	1289	583	559	1236
Vehicle Extension (s)	v/s Ratio Prot	c0.12	0.10	0.10	0.17	0.17	c0.18	c0.47	0.13	0.13	0.35	
Lane Grp Cap (vph)	v/c Ratio	1.72	0.44	0.41	1.46	0.74	2.04	1.13	1.31	0.18	0.80	0.97
v/s Ratio Prot	Uniform Delay, d1	57.1	40.4	0.0	57.1	43.8	47.2	51.6	39.2	26.8	49.7	38.6
v/c Ratio	Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
v/c Ratio	Incremental Delay, d2	340.5	0.4	0.8	229.6	3.6	477.8	79.4	147.3	0.7	7.8	19.3
Uniform Delay, d1	Delay (s)	397.6	40.8	0.8	286.8	47.5	525.0	131.0	186.6	27.5	57.9	57.9
Progression Factor	Level of Service	F	D	A	F	D	F	F	F	C	E	E
Incremental Delay, d2	Approach Delay (s)	126.4			332.2		162.0			57.8		
Delay (s)	Approach LOS	F			F		F			F		
Level of Service	Intersection Summary											
Approach Delay (s)	HCM Average Control Delay	176.3			HCM Level of Service					F		
Approach LOS	HCM Volume to Capacity ratio	1.52										
	Actuated Cycle Length (s)	122.8			Sum of lost time (s)					22.0		
	Intersection Capacity Utilization	115.2%			ICU Level of Service					H		
	Analysis Period (min)	15										
	c. Critical Lane Group											

Queues
2. North Service Road West & Abbey Centre Access

<Total> PM Peak
2020-04-01

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group	19	630	145	1349	358	124	25	55
Lane Group Flow (vph)	0.22	0.50	0.34	0.78	0.70	0.18	0.05	0.08
v/c Ratio	27.8	24.0	13.1	22.6	35.2	6.2	21.6	10.5
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	2.78	24.0	13.1	22.6	35.2	6.2	21.6	10.5
Total Delay	2.4	46.1	13.0	102.9	55.6	1.2	2.9	1.9
Queue Length 50th (m)	5.7	64.7	21.0	109.7	#110.8	0.4	7.9	9.4
Queue Length 95th (m)								
Internal Link Dist (m)	263.1		38.3			84.0		91.2
Turn Bay Length (m)	32.0		35.0					
Base Capacity (vph)	103	1504	464	2094	509	675	478	652
Stavation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.18	0.42	0.31	0.64	0.70	0.18	0.05	0.08

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

HCM Signalized Intersection Capacity Analysis
2. North Service Road West & Abbey Centre Access

<Total> PM Peak
2020-04-01

	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	1	1	1	1	1	1	1	1	1
Volume (vph)	12	527	22	123	1086	10	347	5	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	6.6	6.6	3.0	6.6	6.6	6.2	6.2	6.2	6.2
Lane Util. Factor	1.00	0.95	1.00	0.95	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.99	1.00	1.00	1.00	0.86	1.00	0.95	1.00
Flt Protected	0.95	1.00	0.95	1.00	0.95	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1805	3539	1805	3565	1805	1623	1805	1688	1688
Flt Permitted	0.13	1.00	0.30	1.00	0.72	1.00	0.68	1.00	1.00
Satd. Flow (perm)	243	3539	572	3565	1370	1623	1287	1688	1688
Peak-hour factor, PHF	0.63	0.90	0.50	0.85	0.82	0.40	0.97	0.50	0.84
Adj. Flow (vph)	19	586	44	145	1324	25	358	10	114
RTOR Reduction (vph)	0	6	0	0	2	0	72	0	24
Lane Group Flow (vph)	19	624	0	145	1347	0	358	52	0
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%
Turn Type	Perm	4	pm+pt	8	8	Perm	2	Perm	6
Protected Phases	4		8			2		6	
Actuated Green, G (s)	32.7	32.7	44.6	44.6	44.6	34.0	34.0	34.0	34.0
Effective Green, g (s)	32.7	32.7	44.6	44.6	44.6	34.0	34.0	34.0	34.0
Actuated g/C Ratio	0.36	0.36	0.49	0.49	0.49	0.37	0.37	0.37	0.37
Clearance Time (s)	6.6	6.6	3.0	6.6	6.6	6.2	6.2	6.2	6.2
Vehicle Extension (s)	4.5	4.5	2.5	4.5	4.5	3.5	3.5	3.5	3.5
Lane Grp Cap (vph)	87	1266	399	1740	510	604	479	628	628
v/s Ratio Prot	0.18	0.04	c0.38		0.03			0.02	
v/c Ratio	0.08	0.49	0.36	0.77	0.70	0.09	0.05	0.05	0.05
Uniform Delay, d1	20.4	22.9	13.7	19.3	24.4	18.6	18.4	18.4	18.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.2	0.5	0.4	2.5	7.9	0.3	0.2	0.1	0.1
Delay (s)	22.6	23.4	14.1	21.7	32.2	18.9	18.6	18.5	18.5
Level of Service	C	C	B	C	C	B	B	B	B
Approach Delay (s)	23.4		21.0		28.8		18.5		
Approach LOS	C		C		C		B		
Intersection Summary									
HCM Average Control Delay	22.9		HCM Level of Service		C				
HCM Volume to Capacity ratio	0.74								
Actuated Cycle Length (s)	91.4		Sum of lost time (s)		12.8				
Intersection Capacity Utilization	93.2%		ICU Level of Service		F				
Analysis Period (min)	15								
c. Critical Lane Group									

3: North Service Road West & QEW WB Off Ramp

<Total> PM Peak
2020-04-01

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔↔	↔	↔	↔↔	↔	↔
Volume (veh/h)	640	0	0	1041	178	218
Sign Control	Free	Free	Free	S/opp	Free	S/opp
Grade	0%	0%	0%	0%	0%	0%
Peak Hour Factor	0.89	0.92	0.92	0.87	0.76	0.83
Hourly flow rate (vph)	719	0	0	1197	234	263
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (m)	147			212		
pX platoon unblocked	0.88			0.86		0.88
vC conflicting volume	719			1317		360
vC1 stage 1 conf vol						
vC2 stage 2 conf vol						
vCu unblocked vol	419			437		12
IC single (s)	4.1			6.8		6.9
IC 2 stage (s)						
IF (s)	2.2			3.5		3.3
p0 queue free %	100			50		72
cM capacity (veh/h)	1004			472		941
Direction_Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	360	360	598	598	234	263
Volume Left	0	0	0	0	234	0
Volume Right	0	0	0	0	0	263
cSH	1700	1700	1700	1700	472	941
Volume to Capacity	0.21	0.21	0.35	0.35	0.50	0.28
Queue Length 95th (m)	0.0	0.0	0.0	0.0	21.7	9.2
Control Delay (s)	0.0	0.0	0.0	0.0	19.9	10.3
Lane LOS					C	B
Approach Delay (s)	0.0	0.0	0.0	14.8		
Approach LOS				B		
Intersection Summary						
Average Delay	3.1					
Intersection Capacity Utilization	45.3%					
Analysis Period (min)	15					
ICU Level of Service	A					

4: Kerr Street & Canadian Tire Access

<Total> PM Peak
2020-04-01

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Group Flow (vph)	740	24	74	949	213	99
v/c Ratio	0.60	0.04	0.22	0.59	0.30	0.14
Control Delay	24.5	11.4	12.3	18.0	18.5	4.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	24.5	11.4	12.3	18.0	18.5	4.6
Queue Length 50th (m)	52.2	1.0	6.0	57.0	21.5	0.0
Queue Length 95th (m)	71.7	2.1	12.6	74.4	40.1	7.0
Internal Link Dist (m)	187.9		130.2	100.4		
Turn Bay Length (m)		23.0	20.0			
Base Capacity (vph)	1855	846	417	2556	720	697
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.03	0.18	0.37	0.30	0.14
Intersection Summary						

HCM Signalized Intersection Capacity Analysis
 4: Kerr Street & Canadian Tire Access

<Total> PM Peak
 2020-04-01

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	←←	←	←	←	←	←
Volume (vph)	673	11	68	864	177	78
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.8	5.8	3.0	5.8	6.0	6.0
Lane Util. Factor	0.95	1.00	1.00	0.95	1.00	1.00
Flt	1.00	0.85	1.00	1.00	0.85	1.00
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	3574	1615	1805	3610	1787	1583
Flt Permitted	1.00	1.00	0.23	1.00	0.95	1.00
Satd. Flow (perm)	3574	1615	433	3610	1787	1583
Peak-hour factor, PHF	0.91	0.45	0.92	0.91	0.83	0.79
Adj. Flow (vph)	740	24	74	949	213	99
RTOR Reduction (vph)	0	10	0	0	0	59
Lane Group Flow (vph)	740	14	74	949	213	40
Heavy Vehicles (%)	1%	0%	0%	0%	1%	2%
Turn Type	Perm	pm+pt	Perm	Perm	Perm	Perm
Protected Phases	4	3	8	2	2	
Permitted Phases	4	8		2		
Actuated Green, G (s)	27.5	27.5	36.3	32.1	32.1	
Effective Green, g (s)	27.5	27.5	36.3	32.1	32.1	
Actuated g/C Ratio	0.34	0.34	0.45	0.45	0.40	
Clearance Time (s)	5.8	5.8	3.0	5.8	6.0	
Vehicle Extension (s)	4.5	4.5	2.5	4.5	3.5	
Lane Grp Cap (vph)	1225	554	295	1634	715	634
v/s Ratio Prot	0.21	0.02	0.26	c0.12		
v/s Ratio Perm	0.01	0.10		0.03		
v/c Ratio	0.60	0.03	0.25	0.58	0.30	0.06
Uniform Delay, d1	21.8	17.5	13.5	16.3	16.4	14.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1	0.0	0.3	0.7	1.1	0.2
Delay (s)	23.0	17.5	13.8	17.0	17.4	15.0
Level of Service	C	B	B	B	B	B
Approach Delay (s)	22.8		16.8	16.7		
Approach LOS	C		B	B		
Intersection Summary						
HCM Average Control Delay	19.0					
HCM Volume to Capacity ratio	0.45					
Actuated Cycle Length (s)	80.2					
Intersection Capacity Utilization	49.0%					
Analysis Period (min)	15					
c. Critical Lane Group	A					

Queues
 5: QEW WB On Ramp & Donval Drive

<Total> PM Peak
 2020-04-01

Lane Group	WBL	WBT	WBR	NBT	NBR	SBT	SBR
Lane Group Flow (vph)	712	690	661	1503	349	1579	325
v/c Ratio	1.10	1.13	1.07	0.59	0.36	0.63	0.34
Control Delay	97.9	107.1	87.6	19.2	2.7	19.9	2.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	97.9	107.1	87.6	19.2	2.7	19.9	2.7
Queue Length 50th (m)	-175.0	-178.5	-156.6	77.0	0.0	82.9	0.0
Queue Length 95th (m)	#245.1	#257.0	#231.3	91.9	8.0	98.7	13.8
Internal Link Dist (m)	74.0						
Turn Bay Length (m)							
Base Capacity (vph)	645	611	616	2542	976	2517	948
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	1.10	1.13	1.07	0.59	0.36	0.63	0.34
Intersection Summary							
-	Volume exceeds capacity, queue is theoretically infinite.						
-	Queue shown is maximum after two cycles.						
#	95th percentile volume exceeds capacity, queue may be longer.						
-	Queue shown is maximum after two cycles.						

5. QEW WB On Ramp & Dorval Drive

<Total> PM Peak
2020-04-01

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	0	0	945	0	921	0	1428	279	0	1437	299
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Lane Util. Factor	0.95	0.91	0.95	0.91	0.95	0.91	1.00	0.85	1.00	0.85	1.00	0.85
Flt	0.95	0.98	1.00	0.95	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (prot)	1633	1523	1534	1633	1523	1534	5136	1615	5085	1615	5085	1583
Flt Permitted	0.95	0.98	1.00	0.95	0.98	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Satd. Flow (perm)	1633	1523	1534	1633	1523	1534	5136	1615	5085	1615	5085	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.89	0.92	0.92	0.92	0.95	0.80	0.92	0.91	0.92
Adj. Flow (vph)	0	0	0	1062	0	1001	0	1503	349	0	1579	325
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	712	680	651	0	1503	173	0	1579	161
Heavy Vehicles (%)	2%	2%	2%	5%	0%	0%	2%	1%	0%	2%	2%	2%
Turn Type	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm
Protected Phases	8	8	8	8	8	8	2	2	2	6	6	6
Permitted Phases	8	8	8	8	8	8	2	2	2	6	6	6
Actuated Green, G (s)	39.5	39.5	39.5	39.5	39.5	39.5	49.5	49.5	49.5	49.5	49.5	49.5
Effective Green, g (s)	39.5	39.5	39.5	39.5	39.5	39.5	49.5	49.5	49.5	49.5	49.5	49.5
Actuated g/C Ratio	0.40	0.40	0.40	0.40	0.40	0.40	0.50	0.50	0.50	0.50	0.50	0.50
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Lane Grp Cap (vph)	645	602	606	645	602	606	2542	799	2517	784	2517	784
v/s Ratio Prot							0.29				0.31	
v/s Ratio Perm	0.44	0.45	0.42	0.44	0.45	0.42	0.11				0.10	
v/c Ratio	1.10	1.13	1.07	1.10	1.13	1.07	0.59	0.22	0.63	0.21	0.63	0.21
Uniform Delay, d1	30.2	30.2	30.2	30.2	30.2	30.2	18.0	14.3	18.5	14.2	18.5	14.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	67.3	77.7	58.0	67.3	77.7	58.0	1.0	0.6	1.2	0.6	1.2	0.6
Delay (s)	97.6	107.9	88.2	97.6	107.9	88.2	19.0	14.9	19.7	14.8	19.7	14.8
Level of Service	F	F	F	F	F	F	B	B	B	B	B	B
Approach Delay (s)	0.0			98.0			18.3				18.9	
Approach LOS	A			F			B				B	
Intersection Summary												
HCM Average Control Delay	46.7 HCM Level of Service D											
HCM Volume to Capacity ratio	0.85											
Actuated Cycle Length (s)	100.0 Sum of lost time (s) 11.0											
Intersection Capacity Utilization	74.8% ICU Level of Service D											
Analysis Period (min)	15											
c Critical Lane Group												

6. QEW EB Off Ramp & Dorval Drive

<Total> PM Peak
2020-04-01

Movement	EBL	EBT	EBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group	EBL	EBT	EBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	350	338	315	1562	1407	1728	936		
v/c Ratio	0.72	0.75	0.71	0.52	1.00	0.60	0.71		
Control Delay	36.5	37.6	36.0	12.5	32.3	13.6	4.4		
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay	36.5	37.6	36.0	12.5	32.3	13.6	4.4		
Queue Length 50th (m)	57.1	56.4	49.6	53.9	60.6	64.0	0.0		
Queue Length 95th (m)	49.3	88.4	72.6	90.0	272.8	104.4	19.0		
Internal Link Dist (m)	97.8			227.7		281.8			
Turn Bay Length (m)									
Base Capacity (vph)	770	713	694	2995	1400	2882	1317		
Starvation Cap Reductn	0	0	0	0	0	0	0		
Spillback Cap Reductn	0	0	0	0	0	0	0		
Storage Cap Reductn	0	0	0	0	0	0	0		
Reduced v/c Ratio	0.45	0.47	0.45	0.52	1.00	0.60	0.71		
Intersection Summary									
- Volume exceeds capacity, queue is theoretically infinite.									
- Queue shown is maximum after two cycles.									
# 95th percentile volume exceeds capacity, queue may be longer.									
- Queue shown is maximum after two cycles.									

HCM Signalized Intersection Capacity Analysis
 6: OEV EB Off Ramp & Dorval Drive

<Total> PM Peak
 2020-04-01

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	317	0	388	0	0	0	1390	1294	0	1521	0	861
Volume (veh/h)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Ideal Flow (vphpl)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Total Lost time (s)	0.95	0.91	0.95	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Lane Util. Factor	1.00	0.94	0.85	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Flt Protected	1715	1575	1534	5085	1615	4893	1583	5085	1615	4893	1583	5085
Flt Permitted	0.58	0.92	0.85	0.92	0.92	0.89	0.92	0.92	0.92	0.88	0.92	0.88
Peak-hour factor, PHF	547	0	456	0	0	0	1562	1407	0	1728	936	936
Adj. Flow (vph)	0	7	7	0	0	0	448	0	0	384	0	384
RTOR Reduction (vph)	350	331	308	0	0	0	1562	959	0	1728	552	552
Lane Group Flow (vph)	0%	1%	0%	0%	0%	2%	0%	0%	0%	6%	2%	2%
Heavy Vehicles (%)	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm	Perm
Turn Type	4	2	6	2	6	2	6	2	6	2	6	2
Protected Phases	4	2	6	2	6	2	6	2	6	2	6	2
Permitted Phases	4	2	6	2	6	2	6	2	6	2	6	2
Actuated Green, G (s)	24.4	24.4	24.4	50.9	50.9	50.9	50.9	50.9	50.9	50.9	50.9	50.9
Effective Green, g (s)	24.4	24.4	24.4	50.9	50.9	50.9	50.9	50.9	50.9	50.9	50.9	50.9
Actuated g/C Ratio	0.28	0.28	0.28	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59	0.59
Clearance Time (s)	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	485	445	434	2999	953	2886	934	2886	934	2886	934	2886
v/s Ratio Prot	0.20	0.21	0.20	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31	0.31
v/c Ratio	0.72	0.74	0.71	0.52	1.01	0.60	0.59	0.60	0.59	0.60	0.59	0.60
Uniform Delay, d1	27.9	28.1	27.8	10.5	17.7	11.2	11.1	11.2	11.1	11.2	11.1	11.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	5.2	6.6	5.3	0.7	30.8	0.9	2.7	0.9	2.7	0.9	2.7	0.9
Delay (s)	33.1	34.7	33.0	11.1	48.5	12.2	13.9	12.2	13.9	12.2	13.9	12.2
Level of Service	C	C	C	B	D	B	B	D	B	D	B	B
Approach Delay (s)	33.6	33.6	33.6	0.0	28.8	12.8	12.8	12.8	12.8	12.8	12.8	12.8
Approach LOS	C	C	C	A	C	B	B	C	B	C	B	B
Intersection Summary												
HCM Average Control Delay	23.1 HCM Level of Service C											
HCM Volume to Capacity ratio	0.92											
Actuated Cycle Length (s)	86.3 Sum of lost time (s)											
Intersection Capacity Utilization	102.0% ICU Level of Service G											
Analysis Period (min)	15											
c Critical Lane Group												

HCM Unsignalized Intersection Capacity Analysis
 7: North Service Road West & Proposed Site Access

<Total> PM Peak
 2020-04-01

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	607	35	0	1219	0	33
Volume (veh/h)	Free	Free	Free	Free	Stop	Stop
Sign Control	0%	0%	0%	0%	0%	0%
Grade	0.92	0.92	0.92	0.92	0.92	0.92
Peak Hour Factor	660	38	0	1325	0	36
Hourly flow rate (vph)						
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)	None	None	None	None	None	None
Median storage (veh)						
Upstream signal (m)	62			297		
pX, platoon unblocked	0.87			0.90		0.87
vC, conflicting volume	698			1341		349
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	349			492		0
IC, single (s)	4.1			6.8		6.9
IC, 2 stage (s)						
IF (s)	2.2			3.5		3.3
p0 queue free %	100			100		96
GM capacity (veh/h)	1048			454		942
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	440	258	662	662	36	36
Volume Left	0	0	0	0	0	0
Volume Right	0	38	0	0	36	36
cSH	1700	1700	1700	1700	942	942
Volume to Capacity	0.26	0.15	0.39	0.39	0.04	0.04
Queue Length 95th (m)	0.0	0.0	0.0	0.0	0.0	0.9
Control Delay (s)	0.0	0.0	0.0	0.0	9.0	9.0
Lane LOS	A	A	A	A	A	A
Approach Delay (s)	0.0	0.0	0.0	9.0	9.0	9.0
Approach LOS	A	A	A	A	A	A
Intersection Summary						
Average Delay	0.2					
Intersection Capacity Utilization	37.0%					
ICU Level of Service	A					
Analysis Period (min)	15					



APPENDIX C

Town of Oakville Zoning By-law 2014-014

Parking, Loading, & Stacking Lane Provisions

Table 5.2.1: Ratios of Minimum Number of Parking Spaces	
Use	Minimum Number of Parking Spaces
<ul style="list-style-type: none"> School, private School, public 	a) For elementary schools, 1.5 per classroom, not including any portables b) For secondary schools, 4.0 per classroom, not including any portables
Open Space Uses	
Agriculture	No minimum requirement
Boarding kennel	1.0 per 35.0 m ² net floor area, to a maximum minimum requirement of 6 parking spaces
Cemetery	No minimum requirement
Conservation use	No minimum requirement
Golf course	a) 6.0 per hole; plus, b) 1.0 per 22.0 m ² net floor area for any accessory uses
Outdoor miniature golf course	1.0 per hole
<ul style="list-style-type: none"> Park, private Park, public 	No minimum requirement
Hospitality Uses	
Hotel	a) 1.0 per lodging unit; plus, b) 1.0 per 30.0 m ² net floor area outside of a lodging unit
Public hall	1.0 per 18.0 m ² net floor area
Motor Vehicle Uses	
Motor vehicle body shop	1.0 per 100.0 m ² net floor area
Motor vehicle dealership	1.0 per 100.0 m ² net floor area
Motor vehicle rental facility	1.0 per 100.0 m ² net floor area
Motor vehicle repair facility	1.0 per 100.0 m ² net floor area
Motor vehicle service station	1.0 per 100.0 m ² net floor area
Motor vehicle storage compound	1.0 per 100.0 m ² net floor area
Motor vehicle washing facility	1.0 per 100.0 m ² net floor area

A “classroom” includes teaching rooms such as a library or gymnasium.

Additional Regulations for Minimum Parking Ratios Table 5.2.1

(2017-025)

- Of the total number of parking spaces required, 0.25 of the parking spaces required per dwelling shall be designated as visitors parking spaces.
- The location of visitors parking spaces shall be in accordance with Section 5.1.9. (2017-025)
 - The visitors parking spaces for a multiple or townhouse dwelling shall only be required in a condominium and shall be located on a parcel of land tied to a common element condominium. (2017-025)

Inventory motor vehicles are not to be parked in required parking spaces, per Section 5.1.2 of this By-law.

Parking, Loading, & Stacking Lane Provisions

Table 5.4.1: Ratios of Minimum Number Bicycle Parking Spaces	
Use	Minimum Number of Bicycle Parking Spaces
<i>Long term care facility</i>	The lesser of 5 or 0.25 per <i>assisted living unit</i> or <i>dwelling unit</i> (1)
<i>Stacked townhouse dwelling</i>	1.0 per <i>dwelling</i> (1)(2)
Retail Uses	
<i>Retail store</i>	The greater of 2 or 1.0 per 1,000.0 m ² <i>net floor area</i>
Service Commercial Uses	
<i>Adult entertainment establishment</i>	No minimum requirement
<i>Commercial self-storage</i>	No minimum requirement
<i>Funeral home</i>	No minimum requirement
All other <i>uses</i> permitted in a <i>zone</i> under the heading <i>Service Commercial Uses</i>	The greater of 2 or 1.0 per 1,000.0 m ² <i>net floor area</i>
Office Uses	
<i>Business office</i>	The greater of 2 or 1.0 per 1,000.0 m ² <i>net floor area</i> (3)
<i>Medical office</i>	The greater of 2 or 1.0 per 1,000.0 m ² <i>net floor area</i>
Employment Uses	
All <i>uses</i> permitted in a <i>zone</i> under the heading <i>Employment Uses</i>	2, plus 0.25 per 1,000.0 square metres of <i>net floor area</i>
Institutional and Community Uses	
<i>Art gallery</i>	The greater of 2 or 1.0 per 1,000.0 m ² <i>net floor area</i>
<i>Marina</i>	No minimum requirement
<i>School, post-secondary</i>	The greater of 3 or 2.0 per 100.0 m ² of <i>net floor area</i>
<i>School, private and school, public</i>	a) For elementary schools, 0.25 per classroom, not including any portables. b) For secondary schools, 0.5 per classroom, not including any portables.
All other <i>uses</i> permitted in a <i>zone</i> under the heading <i>Institutional and Community Uses</i>	The greater of 2 or 1.0 per 500.0 m ² of <i>net floor area</i>

Additional Regulations for Minimum Bicycle Parking Ratios

Table 5.4.1

1. In a *building* having fewer than 20 *assisted living units* or *dwelling units*, the minimum number of *bicycle parking spaces* required shall be zero.
2. Of the total number of *bicycle parking spaces* required, 0.25 of the *bicycle parking spaces* required per *dwelling* shall be designated as visitors *bicycle parking spaces*
3. In the *Industrial E3 Zone*, the parking rate for the main permitted *use* shall apply to any *floor area* occupied by a *business office* provided the *business office* occupies an area equal to or less than 25% of the total *net floor area* on the *lot*. The *business office* ratio shall apply for all *net floor area* used for a *business office* where the *business office* occupies greater than 25% of the total *net floor area* on the *lot*.



APPENDIX D

Hotel Proxy Sites, Parking Survey Results & Occupancy Data



Hotel Proxy Sites, Parking Survey Results

		Date							
		31-Aug	01-Sep	14-Sep	15-Sep	28-Sep	29-Sep	Average	
Fairfield Inn	Time	0:00	3:00	0:00		0:00	0:00	0:00	Average
Rooms	65	97%	77%	75%		91%	92%	86%	
Parking Supply	64	56	41	40		37	36	42	
	Vehicles per room	0.86	0.63	0.62		0.57	0.55	0.65	
	100% occupancy rate	0.89	0.82	0.82		0.63	0.60	0.75	
Hilton Garden	Time	0:00	3:00	6:00	3:00	0:00	0:00	0:00	Average
Rooms	127	100%	100%	75%	75%	100%	61%	82%	
Parking Supply	122	106	114	83	83	46	56	88.40	
	Vehicles per room	0.83	0.90	0.65	0.65	0.36	0.44	0.70	
	100% occupancy rate	0.83	0.90	0.87	0.87	0.36	0.73	0.84	
Overall Average Rate									0.80

NOTE: Yellow highlighted data not included in average calculations as a bus delivered most of the occupants

2019 Monthly Average Occupancy Rate for Hotels in Ontario

Source: Ontario Ministry of Heritage, Sport, Tourism and Culture Industries
<http://www.mtc-currentperformance.com/Hotel.aspx>

