

Transportation Impact Assessment

2180 Montreal Road





Certification Form for TIA Study PM

TIA Plan Reports

On 14 June 2017, the Council of the City of Ottawa adopted new Transportation Impact Assessment (TIA) Guidelines. In adopting the guidelines, Council established a requirement for those preparing and delivering transportation impact assessments and reports to sign a letter of certification.

Individuals submitting TIA reports will be responsible for all aspects of development-related transportation assessment and reporting, and undertaking such work, in accordance and compliance with the City of Ottawa's Official Plan, the Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines.

By submitting the attached TIA report (and any associated documents) and signing this document, the individual acknowledges that s/he meets the four criteria listed below.

CERTIFICATION



I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan, and the Transportation Impact Assessment (2017) Guidelines;



I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;



I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering, or traffic operations; and



I am either a licensed¹ or registered² professional in good standing, whose field of expertise.



is either transportation engineering



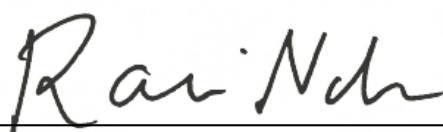
or transportation planning.

^{1,2} License of registration body that oversees the profession is required to have a code of conduct and ethics guidelines that will ensure appropriate conduct and representation for transportation planning and/or transportation engineering works.

Dated at Ottawa this 23 day of May, 2023.
(City)

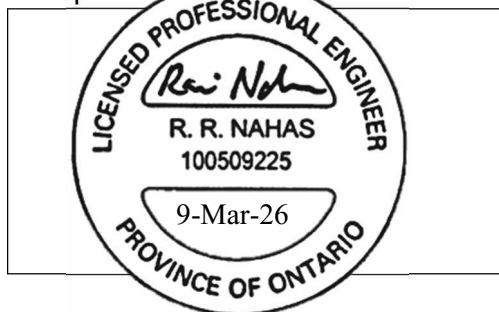
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1.0 Introduction

J.L. Richards & Associates Limited (JLR) has been retained by Q9 Planning & Design on behalf of Suncor Energy to undertake a Transportation Impact Assessment in support of a Minor Zoning By-law Amendment (ZBLA) and Site Plan Control (SPC) application for a proposed commercial development to be located at 2180 Montreal Road in the Beacon Hill neighbourhood of Ottawa.

The following study has been prepared in accordance with the City of Ottawa's Transportation Impact Assessment (TIA) Guidelines (as revised in June 2023). Through this process, a total of three separate submissions are required for City review/approval. Each submission comprises a portion of the study, resulting in the submission of a complete TIA report in support of the above noted development application(s). The required submissions are as follows:

- *Step 1 – Screening*
- *Step 2 – Scoping*
- *Step 3 – TIA Submission* (i.e., Findings and Recommendations)

2.0 Screening

An initial screening was completed to confirm the need for a Transportation Impact Assessment by reviewing the following three triggers:



Trip Generation: Based on the magnitude of the proposed development, the minimum development size threshold has been exceeded and therefore the Trip Generation trigger is satisfied.



Location: The subject site is located along a Transit Priority Corridor (Montreal Road) and, as such, the Location trigger is satisfied.



Safety: Boundary street conditions were reviewed to determine if there is an elevated potential for safety concerns adjacent the site. Given the high posted speeds on Montreal Road, the proximity of one of the proposed accesses to the Montreal/Shefford intersection, and the inclusion of a drive-through facility, there may be a potential for safety concerns and therefore the Safety trigger is satisfied.

As the proposed development meets the Trip Generation, Location and Safety triggers, the need to undertake a full Transportation Impact Assessment is confirmed.

A copy of the Screening Form is provided in **Appendix A**.

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3.0 Scoping

3.1 Proposed Development

Suncor Energy is seeking City approval for the redevelopment of an existing service station located at 2180 Montreal Road. Currently, a gas station, car wash and convenience store (155 square meters) exists at this site. An adjacent residential property (972 Shefford Road) has recently been acquired and the parcels will be merged providing additional space for a reconfiguration of the site.

The planned configuration of the site retains the existing car wash, however, will include a reconstructed convenience store (305 square metres) with an additional drive-through for a fast-food restaurant (A&W Restaurant) with indoor seating. The vehicle fuelling area will also be relocated and increased in size from 12 to 16 fuelling positions. As the existing car wash will remain, the drive-through queuing lane associated with it will be re-routed and increased in length to accommodate the other planned uses on the site. The overall parking supply will increase slightly from 10 to 15 spaces. Access to the proposed redeveloped site will be maintained through the existing private approaches: one right-in/right-out driveway on Montreal Road and one full movement access to Shefford Road.

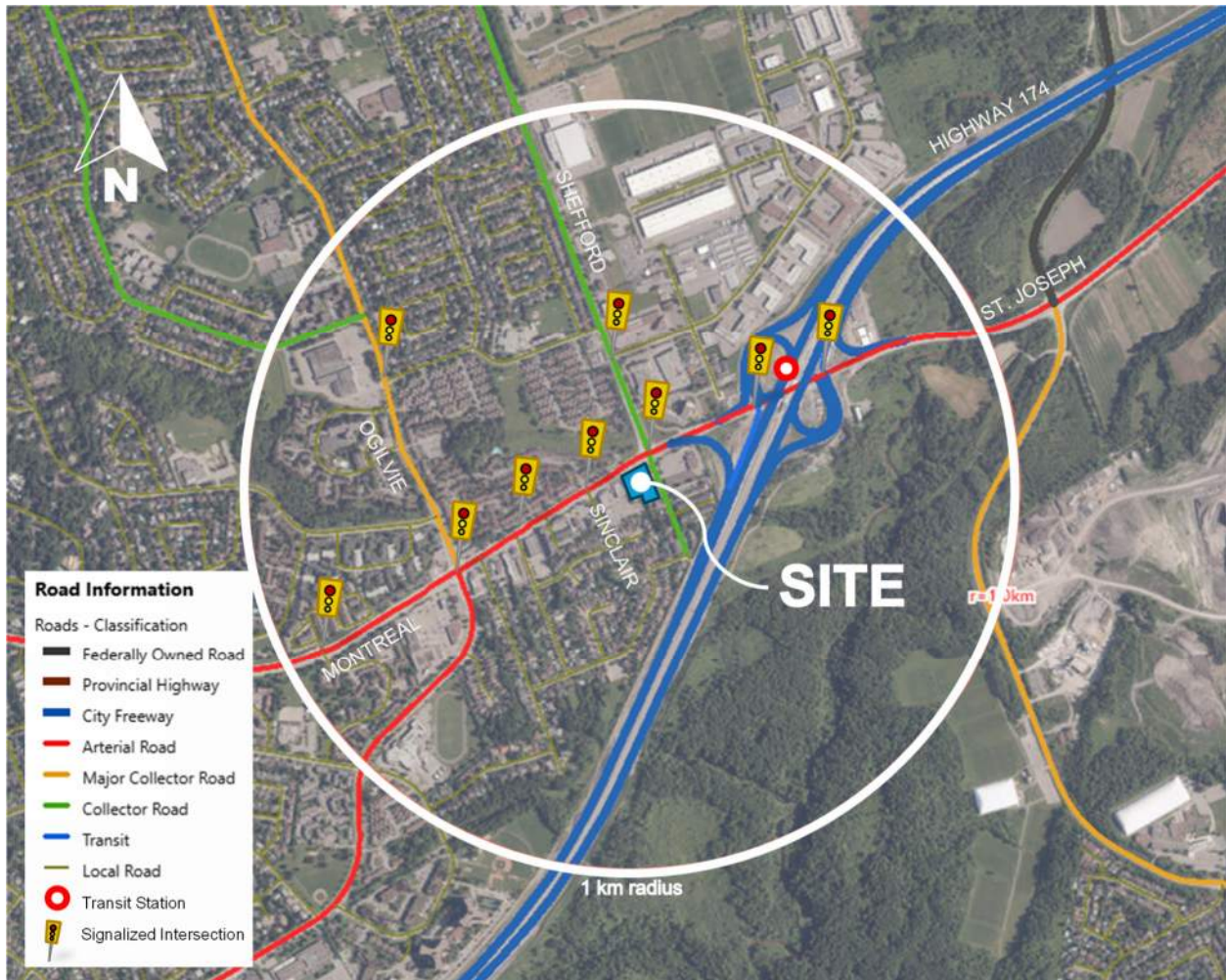
The subject site is currently zoned as Arterial Mainstreet AM10[2199] and is located in the southwest quadrant of the Montreal Road & Shefford Road intersection. The site is also located within 600 metres of the Montreal Road LRT station (located between the Highway 174 Montreal Road On- and Off-ramps) which is expected to begin full revenue service within the timeframe of this study. The subject development will be constructed in a single phase, with an estimated build-out year of 2027.

The local context surrounding the subject development site is depicted in the following **Figure 1**, and the proposed Site Plan is depicted in the subsequent **Figure 2**.

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Figure 1: Transportation Context Area





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3.2 Existing Conditions

3.2.1 Area Road Network

All major and relevant local roads, within the context area of the site are outlined in **Figure 1** above and described as follows:

Highway 174 is a four-lane east-west municipal freeway (i.e., two travel lanes per direction) that extends from Highway 417 in the west to Canaan Road in the east, where it continues as Highway 17. Within the vicinity of the subject development site, the posted speed limit is 100 km/h. Highway 174 is a designated truck route for full loads.

Montréal Road is an east-west arterial roadway. Generally, the roadway has a 4-lane cross section (two travel lanes in each direction), however has a 6-lane cross-section adjacent to the site (three travel lanes per direction). It extends from North River Road in the west to Highway 174 in the east. Within the subject development site, the posted speed limit is 60 km/h. Montréal Road is a designated truck route for full loads.

Shefford Road is a two-lane north-south collector roadway (i.e., two travel lanes per direction). It extends from Casey Avenue in the north to Brillia Private in the south. Within the vicinity of the subject development site, the posted speed limit is 40 km/h. On-street parking is permitted on the west side of the roadway. Trucks are not permitted on Shefford Road south of Montreal Road beyond the existing commercial access driveways.

Ogilvie Road is an east-west four-lane arterial roadway (i.e., two travel lanes per direction) until Montreal Road where it turns north and continues as a north-south collector roadway. It extends from St. Laurent Road in the west to Quincy Avenue in the north where it terminates in a dead-end. The posted speed limit is 50 km/h.

Sinclair Street is a north-south two-lane (i.e., two travel lanes per direction) local roadway south of Montreal Road and a private roadway north of Montreal Road. It extends from Lerner Way in the south to Montreal Road in the north where it continues as a private roadway. The unposted speed limit is understood to be 50 km/h.

3.2.2 Pedestrian / Cycling Network

Within the context area, pedestrian facilities are generally provided on both sides of arterial roadways (e.g., Montreal Road and Ogilvie Road) and collector street (e.g., Shefford Road north of Montreal Road). However, on local streets such as Shefford Road south of Montreal Road, there are no sidewalks provided except along the side street frontages of most commercial properties.

Within the context area, existing cycling facilities include cycle tracks on Montreal Road and east of Ogilvie Road. Additionally, there are several multi-use pathways (MUPs) within the context area: a MUP that follows the westbound on-ramp and travels along the north side of Highway 174 providing community access to Montreal Station, a MUP on the east side of Shefford Road north of Montreal Road with extends to the Ottawa River Pathway, and a MUP on the east side of Ogilvie Road, south of Montreal Road.

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Montreal Road is the main active transportation corridor through the context area, while Shefford Road is a suggested cycling route, despite it having no exclusive facilities south of Montreal Road. A map of the existing pedestrian/cycling network within the vicinity of the subject site, and how it connects to the greater network is depicted in the following **Figure 3** as sourced from GeoOttawa.

Figure 3: Existing Pedestrian and Cycling Network



3.2.3 Transit Network

Table 1 provides information on the OC Transpo bus routes currently operating along the frontage the site. It is important to note that the Montreal Road LRT station is located within a 300-metre walking distance from the site and provides access to the city-wide transit network. Transit stop locations nearest the site are shown in **Figure 4**.

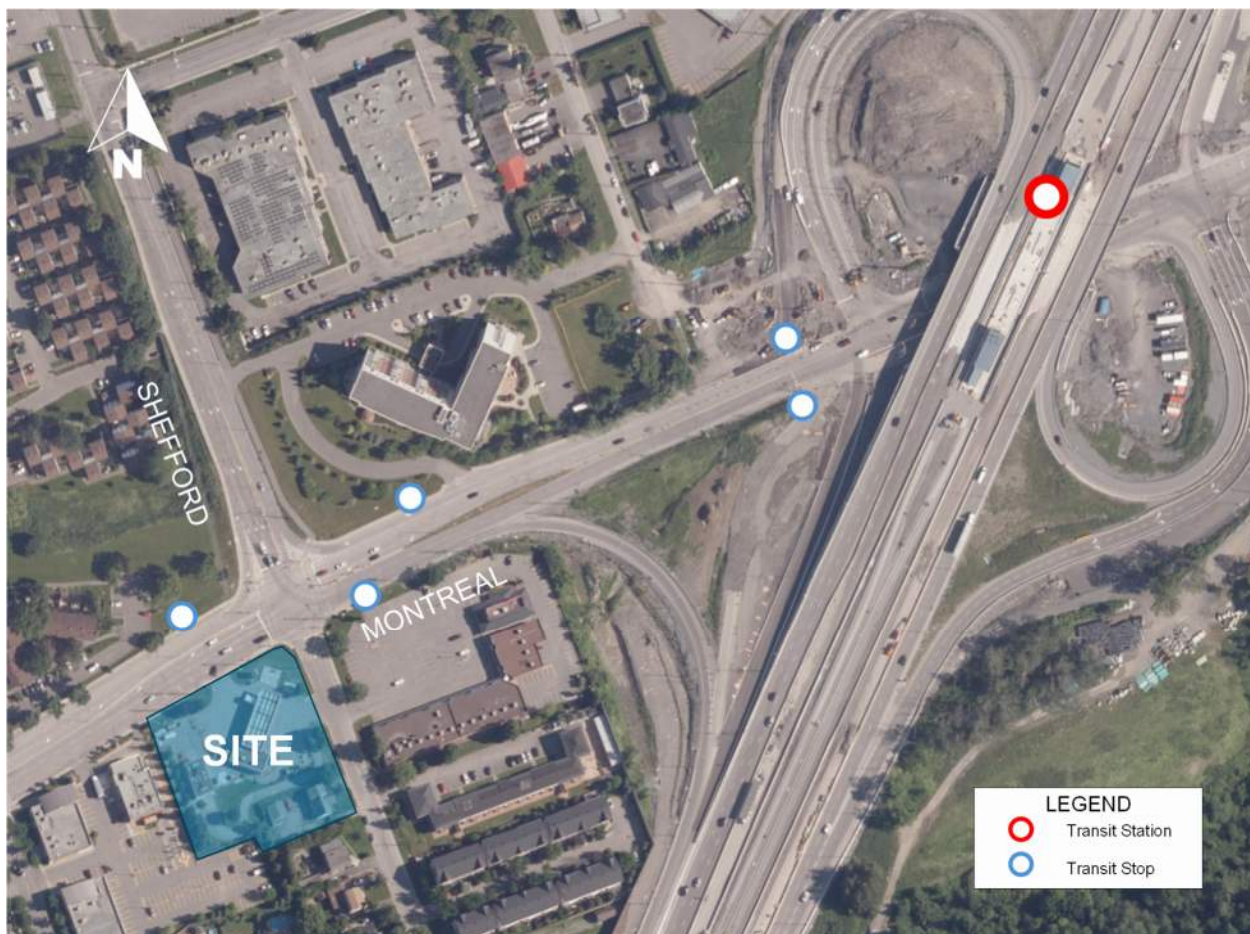
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Table 1: Existing Transit Routes

Route	Origin/Destination	Service Type	Peak Hour Peak Direction Headway AM Peak (PM Peak)
21	Canotek ↔ Blair	Local	N/A ¹ (60 mins.)
24	Chapel Hill ↔ St. Laurent	Local	30 mins. (30 mins.)
619 ²	Louis Riel ↔ Blair	Limited Service	Mon. – Fri. Peak Periods Only
Notes: 1. This route does not run in the morning 2. Routes numbered in the 600's are designated school routes and OC Transpo does not consider these routes as part of regular service.			

Figure 4: Transit Stop Locations



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3.3 Planned Conditions

3.3.1 Study Area Transportation Network Changes

Transit Projects

Montreal Road BRT Environmental Assessment (2022)

The Montreal Road BRT Environmental Assessment (EA) was completed in 2022 by Parsons and recommended continuous transit lanes along Montreal Road between St. Laurent Boulevard and Blair Road. While these lanes terminate west of the subject site, a functional plan was developed as part of the EA for intersections along Montreal Road from St. Laurent Boulevard to the Highway 174 Eastbound Off-Ramp. The concept plans for the intersections nearest subject site are included in **Appendix B**.

Transportation Master Plan (2025)

The Transportation Master Plan's Needs-Based and Priority Transit Network maps (Maps A1 and A2) indicate that there are no additional future transit projects planned directly adjacent to the proposed development.

Stage 2 LRT – Confederation Line East Extension

A notable transportation network change is the Confederation Line East extension to Ottawa's Light Rail Transit (LRT) system, which will continue east from Blair Road to Trim Road. This O-Train extension will add 12 kilometers of rail and 5 new stations, including one at Montreal Road, which is located approximately 300 m walking distance from the subject site. The Montreal LRT Station is anticipated to begin full revenue service in 2026. **Figure 5** illustrates the future Stage 2 LRT network.

Road Projects

The Transportation Master Plan's Needs-Based and Priority Road network maps (Maps B1 and B2) indicate that there are no road projects planned adjacent to the proposed development. The only planned road projects within the vicinity of the subject development site, as sourced from the City's Construction and Infrastructure Projects website, is the resurfacing of Montreal Road, east of Shefford Road. This resurfacing is planned to start within the next 2 – 3 years.

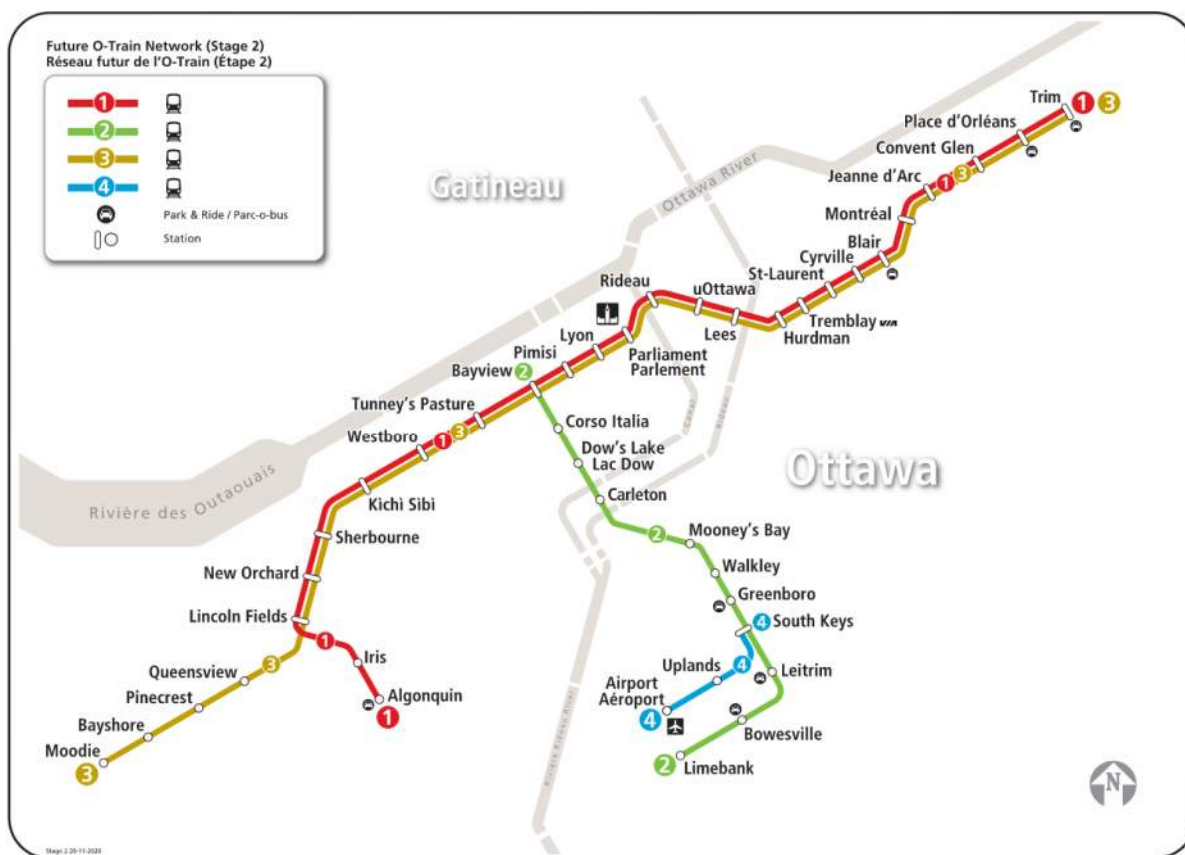
2024 City-Wide and Area-Specific Development Charges Background Study

There are no infrastructure projects identified within the context area within the 2024 Development Charges Background Study.

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Figure 5: Stage 2 LRT Network



Source: <https://www.octranspo.com/images/files/stage2/future-otrain-network-map.pdf>, accessed 2023-04-18

3.3.2 Other Area Development

Based on the City's online Development Application search tool, there are no other planned developments in the context area of this development. As such, the future traffic scenarios analyzed in this study only provision for background traffic growth and no surrounding development traffic.

3.4 Analysis Periods

Traffic generation associated with the proposed land use is directly related to the traffic patterns of the adjacent streets. Given the proposed land-use and surrounding road network typically experience the heaviest volumes during the weekday morning and afternoon peak hours, only these two periods have been considered in this study to isolate the net impact of the proposed development such that an appropriate mitigation strategy can be established.

3.5 Analysis Years

This study considers the following two analysis years:

- **2027** – Estimated full build-out of the subject development
- **2032** – 5-year horizon beyond full build-out, required under the City's TIA Guidelines

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3.6 Study Area

With consideration of the information presented thus far, a study area bound by Montreal Road to the north, Shefford Road to the east and Sinclair Street to the west will provide a sufficient assessment of the development's impact on the adjacent transportation network. As the proposed development will generate a high proportion of pass-by traffic, the impacts are expected to be localized and thus the study will only include the Montreal/Shefford intersection and the Montreal/Sinclair intersection.

As a functional design exists for Montreal Road with the defined study area, neither an intersection-based or segment-based Multi-Modal Level of Service (MMLOS) evaluation is required for this road corridor. Segment-based MMLOS analysis will be undertaken for the portion of Shefford Road adjacent to the site, however.

3.6.1 Study Area Intersections

Montreal/Shefford

The Montreal/Shefford intersection is a signalized four-legged intersection. The northbound approach consists of an auxiliary left-turn lane and a shared through/right-turn lane. The southbound approach consists of dual auxiliary left-turn lanes, a through lane, and a channelized right-turn lane. The eastbound approach consists of an auxiliary left-turn lane, two through lanes, and a shared through/right-turn lane. The westbound approaches consist of an auxiliary left-turn lane, two through lanes, and a channelized right-turn lane.

All movements are permitted at this junction; however, the northbound and southbound approaches operate as a split signal phase. No advanced cyclist signal phase is provided at the intersection, nor are there any provisions to facilitate single-stage left-turns by cyclists at the intersection, thereby requiring cyclists to dismount and walk at the crosswalk.



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Montreal/Sinclair

The Montreal/Sinclair intersection is a signalized four-legged intersection. The northbound approach consists of an auxiliary left-turn lane and a shared through/right-turn lane. The southbound approach is a private access and consists of a single all-movements lane. The eastbound and westbound approaches consist of an auxiliary left-turn lane, a through lane, and a shared through/right-turn lane.

Although cycling facilities are provided on Montreal Road, there are no special accommodations for cyclists at the intersection such as advance bicycle signals, or 'bike boxes' to facilitate left-turns. Signage requiring right-turning vehicles to yield to through cycling traffic is absent.



3.6.2 Area Traffic Management

Below are the existing area traffic management measures within the study area:

- Municipal Speed cameras on Montreal Road, west of the site (although no longer in use).
- Truck restrictions on Shefford Road south of the existing site access.

Other than the above noted measures, there are no notable traffic-calming measures within the context area with any relevance to the subject development.

3.6.3 Peak Hour Travel Demands

The following weekday morning and afternoon peak hour turning movement counts were obtained from the City of Ottawa:

- Weekday:
 - Montreal/Shefford (January 16th, 2024)
 - Montreal/Sinclair (April 11th, 2017)

To ensure the volumes represent existing conditions, a growth rate of 2% has been applied to the eastbound and westbound through volumes at the Montreal/Shefford intersection. The volumes were then balanced with the upstream Montreal/Sinclair intersection. Despite the age of the Montreal/Sinclair count, side street volumes are not expected to have changed significantly.

Figure 6 depicts the observed weekday morning and afternoon peak hour vehicular volumes at study area intersections based on the raw data noted above and with consideration of an annual growth rate. **Figure 7** provides an estimate of existing pedestrian and cyclist volumes during the same peak hours. Detailed traffic volume data is provided as **Appendix C**.

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Figure 6: Existing Peak Hour Traffic Volumes

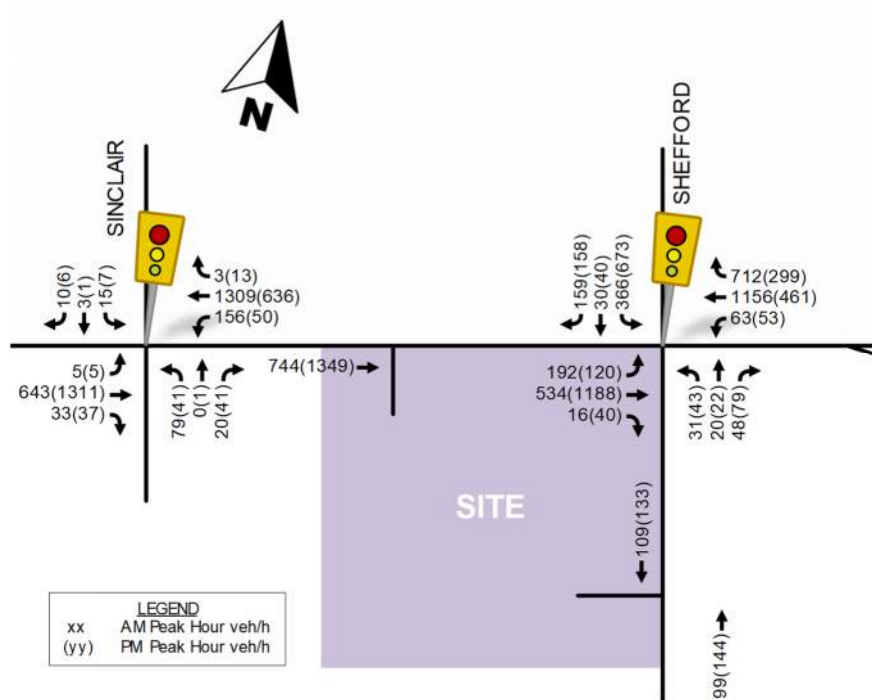
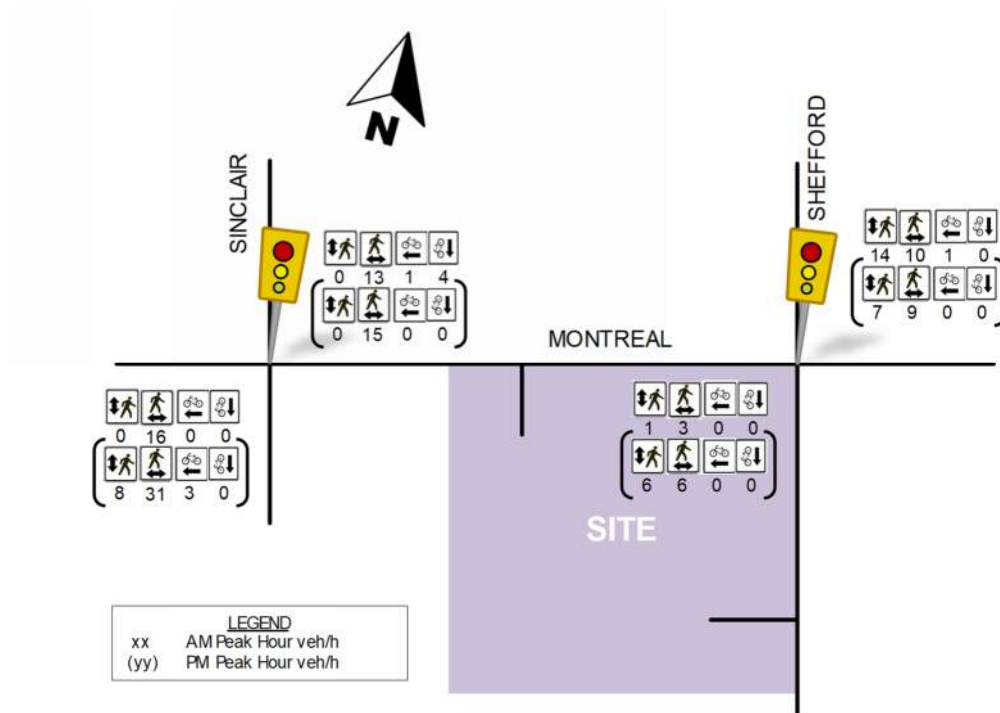


Figure 7: Existing Peak Hour Active Mode Volumes



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3.6.4 Existing Driveways to Adjacent Development

As illustrated in **Figure 8**, there are four (4) driveway connections along Montreal Road and seventeen (17) driveway connections along Shefford Road within 200 metres of the site. The driveways adjacent to the subject development on Montreal Road provide access/egress to mostly commercial developments, while those on Shefford Road mainly serve residential dwellings. It is noted that the existing commercial access on Shefford Road is slightly offset by about 4 metres from the existing access to the subject site, though there are no known operational concerns with this configuration.

Figure 8: Adjacent Driveways



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3.6.5 Existing Road Safety Conditions

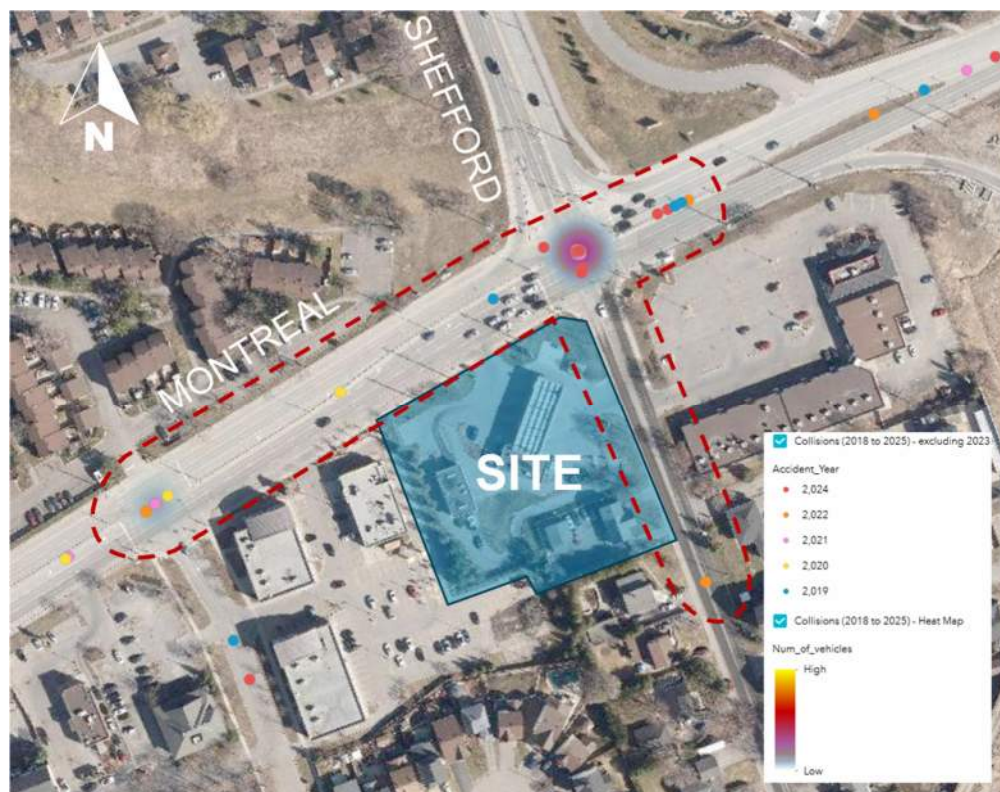
The most recent collision history for the past five (5) years was obtained from the City (i.e., available reported collision data for the years 2019 to 2024, inclusive). It should be noted that the 2023 collision data is currently unavailable on the City's Open Data website. The collision data includes all collisions occurring at intersections and roadway segments within the study area.

Based on the most recent available historical collision data, the five-year total number of recorded collisions within the study area is 86 collisions. Most of the collisions within the study area resulted in property damage only (a total of 65 collisions, or 76%), non-fatal injuries (a total of 17 collisions, or 20%) and non-reportable collisions (a total of 4 collisions, or 5%). The most frequent types of collisions, as cited by police records, were rear-end (36%), turning movement (26%), sideswipe (19%), and angle (12%) type collisions within the study area.

Two collisions involved vulnerable road users: one with a pedestrian and one with a cyclist. Both these collisions resulted in non-fatal injuries. The collision with the cyclist occurred in 2020 at the Montreal/Shefford intersection and was classified as an angle collision type. The collision with the pedestrian occurred in 2024 at the Montreal/Sinclair intersection and was classified as a single moving vehicle (other) collision type. The Montreal Road BRT EA plan includes upgraded pedestrian and cyclist facilities at these subject intersections which will help mitigate collisions with vulnerable road users in the future.

Figure 9 is a map that depicts the location and year of collisions within the study area.

Figure 9: Collision Frequency



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The source collision data is provided in **Appendix D**, and a more detail collision analysis will be included in the subsequent Analysis Report.

3.7 Demand Rationalization

The purpose of this section is to rationalize future travel demands within the study area to account for potential capacity limitations in the transportation network and its ability to effectively accommodate the additional demand generated by a new development. The results of the demand rationalization exercise will be used to inform the existing capacity constraints of the adjacent road network and define the site-generated trip characteristics for the proposed development.

3.7.1 Description of Capacity Issues

Table 2 below summarizes the existing traffic operational performance at the study area intersections based on the Existing (2025) Traffic volumes, presented previously in **Figure 6**.

Note that the intersection capacity analysis is based on locally specific parameters as described in the TIA Guidelines and incorporates existing signal timing plans obtained from the City of Ottawa. As prescribed in the TIA Guidelines, a peak hour factor (PHF) of 0.90 has been considered in the analysis of existing conditions.

The Synchro output files have been provided in **Appendix E**.

Table 2: Intersection Capacity Analysis: Existing Traffic

Intersection	AM Peak		PM Peak	
	Overall	Critical Movement	Overall	Critical Movement
Shefford & Montreal	D (0.84)	EBL (0.94)	B (0.68)	SBL (0.91)
Sinclair & Montreal	A (0.52)	WBTR (0.52)	A (0.51)	EBTR (0.51)

As outlined in **Table 2**, the study area intersections ‘as a whole’ operate overall with an LOS ‘D’ or better during the morning and afternoon peak hours. With regard to critical movements, they are operating at an LOS ‘E’ or better during the morning and afternoon peak hours.

3.7.2 Adjustment to Background Network Demands

Under existing conditions, the analysis of observed (i.e., processed) volumes cannot result in a condition that exceeds an intersection’s theoretical capacity (i.e., $v/c > 1.0$). In situations where projected traffic demand results in volumes that exceed capacity, it is expected that the traffic demand will either spread out over a greater period of time (i.e., peak spreading) or shift to alternatives modes of transportation such as transit. In the analysis of future conditions, a peak hour factor (PHF) of 1.0 is therefore utilized in accordance with the City of Ottawa TIA Guidelines.

The Confederation Line Extension is expected to be fully implemented in advance of the site’s earliest occupancy with Montreal Station located approximately 300-meter walking distance from the proposed development. This places the site in a Transit-Oriented Development (TOD) policy

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area and therefore future conditions can be evaluated against an acceptable threshold of LOS 'E' for vehicles in accordance with the Multi-Modal Level of Service (MMLOS) Guidelines.

3.7.3 Adjustment to Development Generated Demands

Given the nature of the proposed land use, it is less likely to be influenced by the proximity to rapid transit, with the exception of travel to/from the site by employees, though this is expected to be insignificant. As there are limited routes available to access the site, the distribution of site-generated traffic is unlikely to change based on congestion conditions on the adjacent road network. As such, no adjustments to development-generated demands have been considered in this analysis.

3.8 Development Generated Traffic

3.8.1 Trip Generation

Site-generated traffic was estimated using appropriate trip generation rates from the 12th Edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual. As previously described, the Site Plan illustrates that the proposed redevelopment will result in an increase to the number of fuelling positions from 12 to 16, an increase in the convenience store's gross floor area from 150 square metres to 185 square metres, and the construction of a 120 square metre fast-food restaurant with drive-through. The drive-through car wash that exists on site will remain. As many of the site's components are already in operation, only the net increase in trips will be reviewed. To ensure the net increase in trips is estimated in the most reliable manner, this study considers the difference in ITE rates between the existing and future land use statistics.

Table 3 summarizes the appropriate trip generation rates for estimating the net increase of site-generated traffic.

Table 3: ITE Peak Hour Trip Generation Rates

Land Use	ITE Land Use Code	AM Peak Hour	PM Peak Hour
Fast Food Restaurant with Drive-Through Window	ITE 934 General Urban/Suburban Vehicle Trips	$T_A = 33.24(X)$; $T_F = n/a$	$T_A = 31.60(X)$; $T_F = n/a$
Automated Car Wash	ITE 948 General Urban/Suburban Vehicle Trips	$T_A = 14.89(X)$; $T_F = n/a$	$T_A = 24.40(X)$; $T_F = n/a$
Gas Station with Convenience Store	ITE 945 General Urban/Suburban Vehicle Trips	$T_A = 13.65(Y)$; $T_F = n/a$	$T_A = 15.85(Y)$; $T_F = n/a$
Notes: T_A = Average Vehicle Trips T_F = Vehicle Trips by Fitted Curve X = 1,000 ft ² of Gross Floor Area (GFA) Y = number of vehicle fueling stations (VFS)			

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With respect to ITE trip generation rates, the data used to develop these rates only include vehicle trips (i.e., walking, cycling and transit trips are not captured in this data). To properly consider the multi-modal trips generated by the proposed development, projected site-generated traffic (estimated using the ITE trip generation rates) must be converted to person-trips, which can then be subdivided by mode based on local travel characteristics of the specific area of the city, based on the 2022 TRANS Origin-Destination Study.

To convert projected ITE vehicle trips to person trips, an auto occupancy factor and non-auto trip factor is applied to the ITE trip generation rates. With respect to the City's TIA Guidelines, the typical modal share of non-auto person trips is approximately 10% and the typical auto occupancy is 1.15. Therefore, when combined, a factor of 1.28 is used to convert vehicle trips to person trips.

It should also be noted that given trip generation rates are predominantly developed using standalone land uses, it can be expected that a mixed-use development will generate multi-purpose trips. For example, someone going to a gas station may also go to the fast-food restaurant on the same site (i.e., a single trip with multiple purposes). Given multi-purpose trips often do not require individuals to leave and return to a site (to visit two different land uses on the same site), a multi-purpose trip is observed as a single trip. In order to account for multi-purpose trips for mixed-use developments, a percent reduction is applied to the total projected site-generated trips. This approach mitigates "double counting" when using trip generation rates that are predominantly developed using standalone land uses. This is considered a standard industry practice. Given the proposed development is considered mixed-use, a 'multi-purpose' trip reduction of 9% was applied based on the NCHRP 684 Internal Trip Capture Estimation Tool to account for the internal trips between the different commercial land uses. The estimation tool is included in **Appendix F**.

Based on the foregoing, the projected weekday morning and afternoon peak hour person trip generation for the existing and proposed development is summarized in **Table 4** and **Table 5**, respectively, with the net change outlined in **Table 6**.

Table 4: Modified Peak Period Person Trips – Existing

Land Use	Area / Units	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
		In	Out	Total	In	Out	Total
Car Wash	1,600 ft ²	17	14	31	24	26	50
Gas Station with Convenience Store	12 VFS	105	105	210	121	122	243
Total Person Trips		122	119	241	145	148	293
9% Multi-Purpose Trip Reduction		-11	-11	-22	-13	-13	-26
Total Existing Person Trips		111	108	219	132	135	267

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Table 5: Modified Peak Period Person Trips – Future

Land Use	Area / Units	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
		In	Out	Total	In	Out	Total
Fast Food Restaurant with Drive-Through Window	1,300 ft ²	28	27	55	27	25	52
Car Wash	1,600 ft ²	17	14	31	24	26	50
Gas Station with Convenience Store	16 VFS	140	140	280	162	163	325
Total Person Trips		185	181	366	213	214	427
9% Multi-Purpose Trip Reduction		-17	-16	-33	-19	-19	-38
Total Future Person Trips		168	165	333	194	195	389

Table 6: Modified Peak Period Person Trips – Net Change

Scenario	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
	In	Out	Total	In	Out	Total
Existing Site Configuration	111	109	220	132	135	267
Proposed Site Configuration	167	165	332	194	195	389
Net Change Person Trips	56	56	112	62	60	122

As summarized in **Table 6**, the proposed development is projected to generate an approximate two-way total increase of 112 and 122 person trips/h during the weekday morning and afternoon peak hours, respectively.

3.8.2 Travel Mode Shares

With respect to the TRANS Trip Generation Manual Summary Report (2020), the proposed development is located in the Beacon Hill district and the AM/PM peak period modal splits within this district, indicate person trips are generally comprised of 70% auto drivers, 15% auto passengers, 5% transit and 10% non-motorized (e.g., pedestrians and cyclists) modes of travel. Note that these mode shares will be used solely for the fast restaurant land-use. As the gas station and car wash land uses primarily serve auto drivers, these proposed mode shares will include a higher auto driver mode share percentage and lower transit and non-motorized percentages. The target mode shares for each land use are summarized in the following **Table 7**.

While the site is located in close proximity to a future LRT station, the proposed land uses (gas station, car wash, drive-through restaurant) are predominantly car-oriented. As such, these mode shares are applicable to all future analysis years.

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Table 7: Target Mode Shares

Mode	Land Use		
	Fast Food Restaurant	Car Wash	Gas Station
Auto Driver	70%	95%	80%
Auto Passenger	15%	5%	10%
Transit	5%	0%	5%
Non-motorized	10%	0%	5%

Based on the above mode share values for each land uses, the existing and projected site-generated person trips were subdivided into separate travel modes. The trip generation for each land-use for the existing and future scenarios are included in **Appendix G**. The total trips for the existing, future, and net change are summarized in the following **Table 8**, **Table 9**, and **Table 10** below.

Given the nature of the proposed land uses, it should be noted that a high percentage of the projected site-generated trips can be attributed to 'pass-by' traffic (i.e., a quick diversion to/from the subject development on someone's otherwise routine daily commute). This additional 'pass-by' traffic does not impact overall network capacity, as this traffic already exists and is using the adjacent transportation network; however, 'pass-by' trips do impact the performance of turning movements at intersections within close proximity to the proposed development, typically where development site access/egress is provided. Based on rates outlined in the Trip Generation Handbook 3rd Edition, 50% and 55% of projected site-generated traffic will be comprised of 'pass-by' trips for both peak hours for the proposed fast-food restaurant and gas station land uses, respectively.

Table 8: Total Projected Site Generated Trips – Existing

Travel Mode	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
	In	Out	Total	In	Out	Total
Auto Driver	92	90	182	109	112	221
Auto Passenger	10	10	20	12	13	25
Transit	5	5	10	6	5	11
Non-motorized	4	4	8	5	5	10
Total Person Trips	111	109	220	132	135	267
<i>Less Pass-by 50% / 55%*</i>	-42	-42	-84	-49	-49	-98
Total 'Existing' Vehicle Trips	50	48	98	60	63	123
<i>Notes: The pass-by rate for the fast-food land use is 50% for both peak periods The pass-by rate for the gas station land use is 55% for both peak periods</i>						

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Table 9: Total Projected Site Generated Trips – Future

Travel Mode	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
	In	Out	Total	In	Out	Total
Auto Driver	135	133	268	157	159	316
Auto Passenger	17	17	34	20	19	39
Transit	7	7	14	8	8	16
Non-motorized	8	8	16	9	9	18
Total Person Trips	167	165	332	194	195	389
<i>Less Pass-by 50% / 55%</i>	-65	-65	-130	-74	-74	-148
Total 'Future' Vehicle Trips	70	68	138	83	85	168
<i>Notes: The pass-by rate for the fast-food land use is 50% for both peak periods The pass-by rate for the gas station land use is 55% for both peak periods</i>						

Table 10: Total Projected Site Generated Trips – Net Change

Travel Mode	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
	In	Out	Total	In	Out	Total
Auto Driver	43	43	86	48	47	95
Auto Passenger	7	7	14	8	6	14
Transit	2	2	4	2	3	5
Non-motorized	4	4	8	4	4	8
Total Person Trips	56	56	112	62	60	122
<i>Less Pass-by 50% / 55%</i>	-23	-23	-46	-25	-25	-50
Total Net Change Vehicle Trips	20	20	40	23	22	45
<i>Notes: The pass-by rate for the fast-food land use is 50% for both peak periods The pass-by rate for the gas station land use is 55% for both peak periods</i>						

As shown in **Table 10**, the net change in vehicle trips illustrates an increase in two-way vehicle volumes of 40 veh/h and 45 veh/h during weekday morning and afternoon peak hours, respectively.

Regarding active modes, the proposed development is projected to generate approximately 8 additional two-way person trips during both weekday morning and afternoon peak hours, respectively. Transit trips are projected to increase by 4 to 5 person-trips, during the weekday morning and afternoon peak hours, respectively.

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3.8.3 Trip Distribution

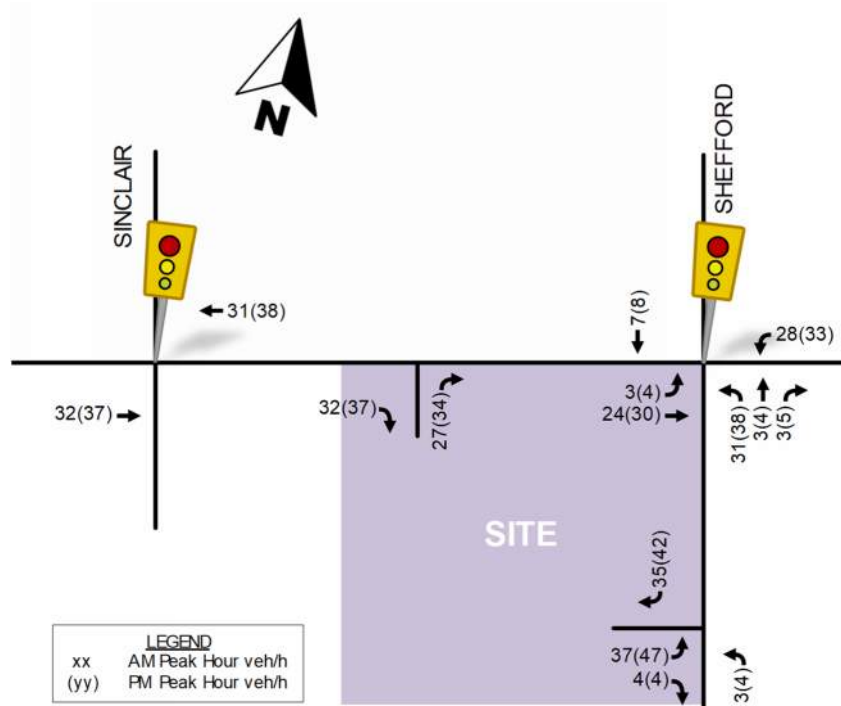
The projected distribution of site-generated traffic was derived based on existing travel patterns, the site's connections to/from the surrounding road network, our local area knowledge (e.g., the location and proximity of employment, other area shopping, communities, recreational opportunities, etc.). The following approximate distribution of projected site-generated traffic was assumed based on existing traffic patterns:

10%	to/from the north via Shefford Road;
45%	to/from the east via Montreal Road;
40%	to/from the west via Montreal Road; and,
+ 5%	to/from the south via Shefford Road;
100%	

3.8.4 Trip Assignment

Based on the above assumed distribution, projected 'future' site-generated traffic, outlined in **Table 9**, was assigned to the study area network and is depicted in the following **Figure 10**. Similarly, projected 'pass-by' site-generated traffic, which represents existing traffic temporarily diverted to/from the subject site, is depicted in the following **Figure 11**.

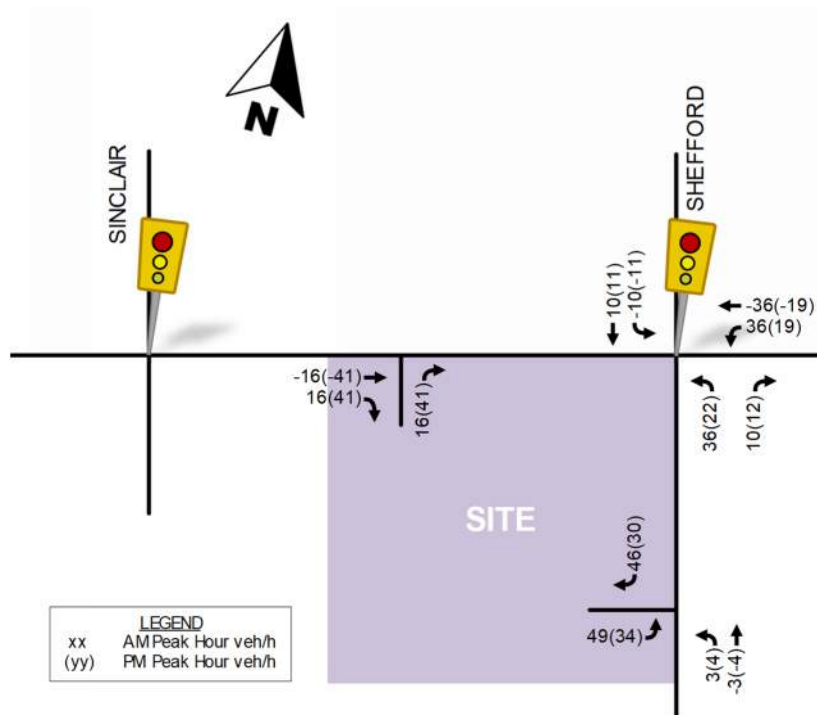
Figure 10: 'Future' Projected Site-Generated Traffic



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Figure 11: Future 'Pass-By' Projected Site-Generated Traffic



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3.9 Exemptions Review

Given the size and nature of the proposed subject development, **Table 11** outlines which elements identified in the 2017 Transportation Impact Assessment Guidelines that can be exempt from this analysis.

Table 11: Module Exemption Review

Module	Element	Exemption Criteria	Exemption Status
<i>Design Review</i>			
4.1 Development Design	4.1.2 Circulation and Access	Required for Site Plans	<i>Required</i>
	4.1.3 New Street Network	Required for Plans of Subdivisions	Exempt
<i>Network Impact</i>			
4.6 Neighborhood Traffic Management	4.6.1 Adjacent Neighborhoods	Required when the development relies on local or collector streets for access and total volumes exceed ATM capacity thresholds	Exempt
4.7 Transit	4.7.1 Transit Route Capacity	Required when projected site new site transit trips are greater than 75	Exempt
	4.7.2 Transit Priority Requirements	Required when projected site new site auto trips are greater than 75	Exempt
4.8 Network Concept	All Elements	Required when development is projected to generate more than 200 person-trips during the peak hour in excess of the equivalent volume permitted by established zoning	Exempt
4.9 Intersection Design	All Elements	Required when projected site new site auto trips are greater than 75	Exempt

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4.0 Analysis

4.1 Background Network Travel Demands

4.1.1 Transportation Network Plans

As outlined in **Section 3.3.1**, the Montreal Road BRT EA was completed in 2022. While the results of this EA included a functional design along the site's frontage, the TMP identifies the project limits between St. Laurent Boulevard and Blair Road. As such, the existing roadway geometry will be used in the subsequent intersection analysis outlined in **Section 4.10.2**.

4.1.2 Other Area Developments

As outlined in **Section 3.3.2**, there are no planned developments within influence of the proposed redevelopment.

4.1.3 Background Growth

As there are no other surrounding development applications, a 2% per annum background traffic growth rate was assumed for study area intersections in the absence of any locally available information regarding historical growth. This growth rate is assumed only along Montreal Road for the eastbound through and westbound through movements as the lands along Shefford Road are fully developed.

4.2 Traffic Volume Summary

4.2.1 Future Background Traffic Volumes

Based on a 2% per annum background traffic growth rate, the following **Figure 12** and **Figure 13** depict total projected 'background' traffic volumes for the 2027 and 2032 horizon years.

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Figure 12: Background Traffic, 2027

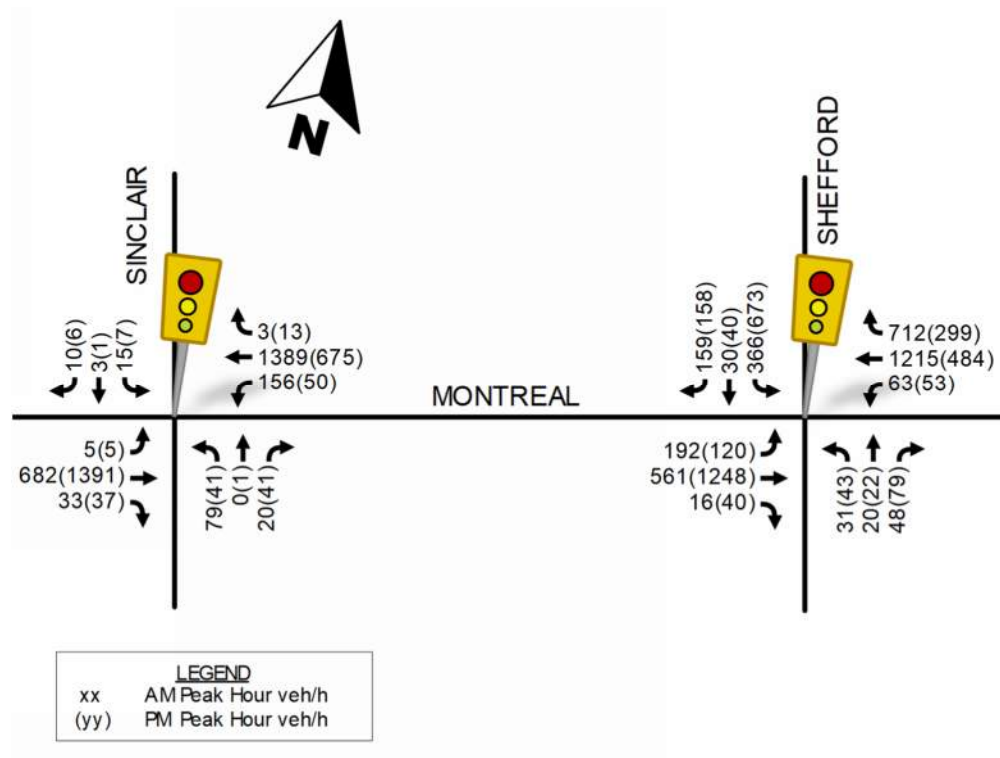
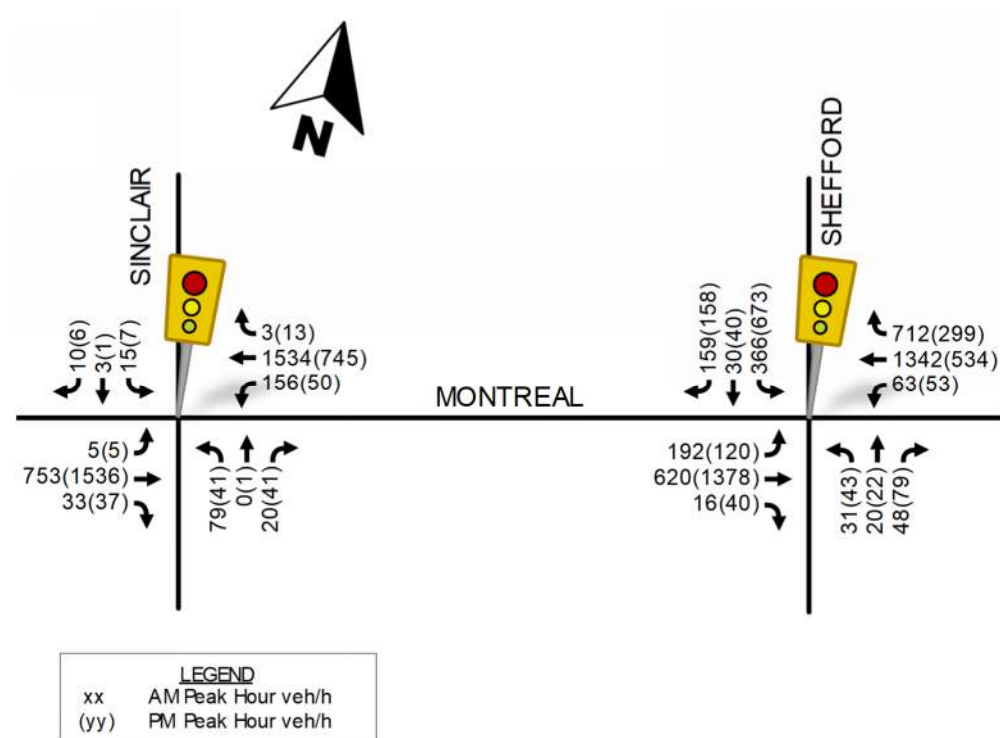


Figure 13: Background Traffic, 2032



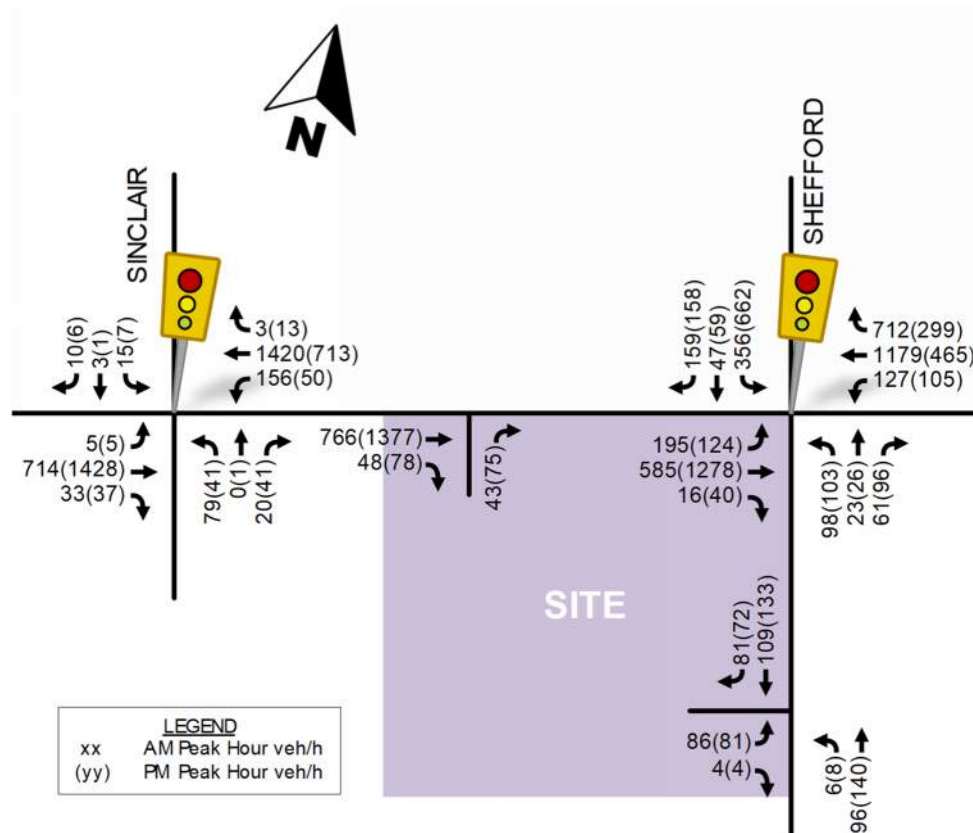
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4.2.2 Future Total Traffic Volumes

The following **Figure 14** and **Figure 15** depicts 'total' projected volumes for the analysis years of 2027 and 2032, which were derived by superimposing site-generated traffic volumes (i.e. 'new' and 'pass-by' trips) onto projected background traffic volumes

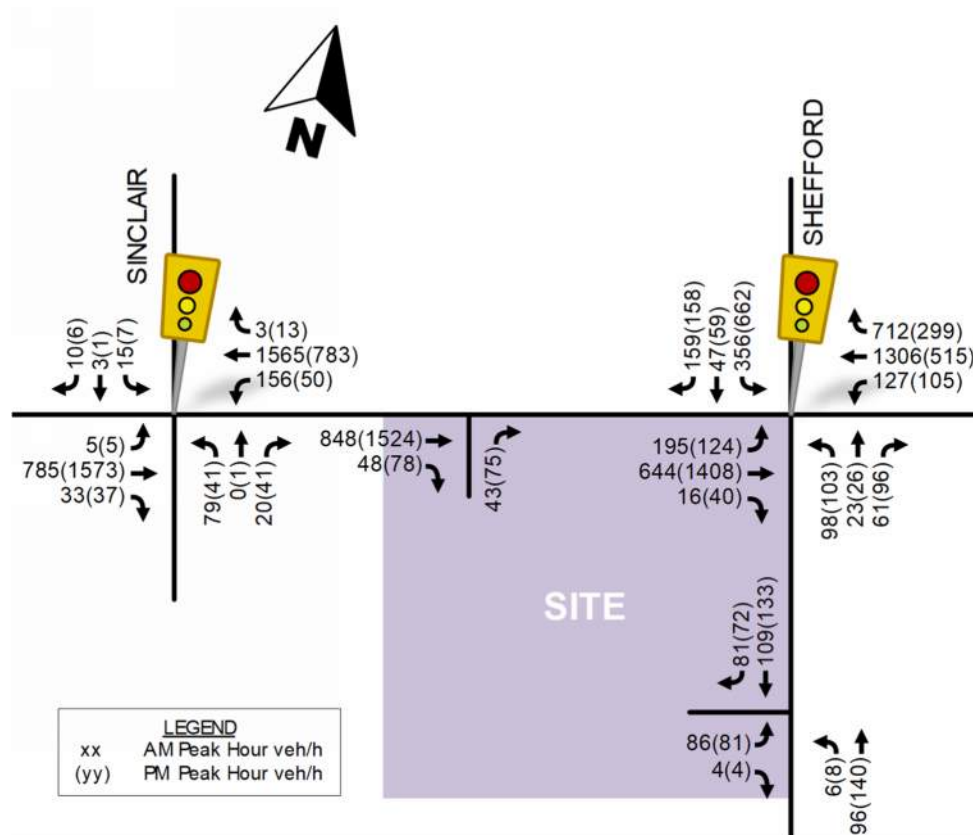
Figure 14: Future Total Traffic, 2027



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Figure 15: Future Total Traffic, 2032



4.3 Development Design

4.3.1 Design for Sustainable Modes

The pedestrian network within the vicinity of the subject site is currently comprised of concrete sidewalks along both sides of Montreal Road and the west side of Shefford Road, north of Montreal Road. On Shefford Road south of Montreal Road, there are no sidewalks provided except along the side street frontages of most commercial properties. With the redevelopment of the site, concrete sidewalks are proposed on the west side of Shefford Road along the site's frontage.

Within the site, there are pedestrian connections provided to both Montreal Road and Shefford Road in the form of painted zebra crosswalks. This internal pedestrian network allows for safe connection with surrounding pedestrian facilities and to transit stops located along Montreal Road.

With respect to the City's TIA Guidelines, design for these facilities is in accordance with the *TDM – Supportive Development Design and Infrastructure*. This TDM checklist is provided in **Appendix H** and is further discussed in **Section 4.5**.

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4.3.2 Circulation and Access

The two existing site accesses are expected to remain with no geometric changes: one right-in/right-out driveway on Montreal Road and one full movement access to Shefford Road. Currently, fuel trucks enter the site from the Shefford Road access and exit the site via the Montreal Road access. This swept path is illustrated on the site plan in **Figure 2**.

Regarding on-site drive-thrus, the re-aligned car wash drive-thru lane provides storage for 11 vehicles queueing before the wash bay, satisfying the minimum requirement outlined in the Zoning By-Law. The fast-food restaurant drive-thru lane provides storage for 8 vehicles from the order board with additional 3 spaces from the drive-thru window, also satisfying the minimum requirement outlined in the Zoning By-Law.

4.3.3 New Street Networks

With respect to the City's TIA Guidelines, this module is exempt.

4.4 Parking

As outlined in **Table 12**, the current proposal includes 15 vehicle parking spaces. Of the 15 vehicle parking spaces, 1 accessible parking space is provided, and 2 vacuum parking spaces are provided. There are 6 short-term bicycle parking spaces provided.

It is important to note that, Ottawa City Council had approved an update the City's zoning-by-law in January 2026 which have significant impacts to parking requirements, though the bylaw is not yet in effect. **Table 12** below compares the site's parking requirements under the current by-law and new by-law requirements, with the proposed statistics.

Table 12: Parking Requirements (2180 Montreal Road)

Parking Type	Existing By-Law Requirements	New By-Law Requirements	Current Proposal
Vehicle Parking Minimum – Total ¹	Restaurant: 10 C-Store: 7 Car Wash: 0	0	Restaurant: 6 C-Store: 7 Car Wash: 2 vacuum spaces
Vehicle Parking – Maximum ¹	C-Store: 8	C-Store: 7 Restaurant: 4	
Bicycle Parking – Short Term ²	N/A	Restaurant: 2 Gas Bar: 2	6
<i>1 – This number includes all parking spaces provided on site 2 – Note that the existing Zoning By-law does not differentiate between long-term and short-term bicycle parking and as such, this is the minimum number required for the entirety of the proposed site.</i>			

Spillover Parking

With respect to the City's TIA Guidelines, this module is exempt.

4.5 Transportation Demand Management (TDM)

TDM measures associated with this development relate to the development design and its interface with municipal infrastructure, as well post-occupancy measures to incentivize and promote the use of sustainable travel modes. These post-occupancy measures are aimed to

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encourage employees who will support the use of sustainable modes and who are less reliant on private automobiles for their daily mobility needs. The two TDM checklists have therefore been provided (see **Appendix H**) which describe the specific measures planned for this development.

The *TDM Infrastructure* and *TDM Measures* checklists include the following measures:

- Confirmation that there are convenient and direct connections to adjacent sidewalks, cycling facilities, and transit facilities.
- A designated TDM internal coordinator, or contract with an external TDM coordinator will be provided.
- Multi-modal travel option information and personalized trip planning provided to new employees in on-boarding package.
- Discounts provided to employees for on-site amenities.

4.6 Collision Analysis

For the purpose of a road safety review, collision records for boundary streets were examined to determine if locations exhibit any collision trends that might be mitigated by engineering intervention. Whenever changes are being made to the road environment, it is an opportunity to examine whether a safety intervention could result in meaningful safety benefits. Where there are identifiable safety trends, it is worthwhile to mitigate those, such that the added traffic from a new development does not increase the risk of new collisions.

Based on the same most recent five (5) years of historical collision data, the following **Table 13** summarizes the number and rate of collisions within the vicinity of the subject development site, at the study area intersection (i.e. collisions and collisions per million entering vehicles). While the number of collisions appears to be high, the collisions/MEV is less than 1.0, generally indicating if the rate of collisions is significant compared to other intersections. Furthermore, both study area intersections will be reconstructed as part of the Montreal Road BRT which will likely address any existing safety concerns.

Table 13: Historical Collision Data Summary by Intersection

Intersection	Total Collisions (5-year Total)	Rate (C/MEV)	Classification			
			Property Damage	Non-fatal Injury	Non-reportable	Fatal Injury
Montreal/Shefford	62	0.65	46	12	4	0
Montreal/Sinclair	14	0.24	5	1	0	0
Notes: C/MEV = Collisions per Million Entering Vehicles						

4.7 Neighbourhood Traffic Calming

With respect to the City's TIA Guidelines, this module is exempt.

4.8 Transit

With respect to the City's TIA Guidelines, this module is exempt.

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4.9 Review of Network Concept

With respect to the City's TIA Guidelines, this module is exempt.

4.10 Intersection Operational Review

4.10.1 Access Intersection Review

The two existing site accesses will be maintained for the proposed redevelopment: one right-in/right-out access to Montreal Road and one full movement connection to Shefford Road. A review of the private approach by-law indicated the site meets the requirements regarding the Number of accesses per site frontage and the distance from the existing accesses to the Montreal/Shefford intersection. Both accesses however are wider than the 9 m by-law requirement to support truck ingress and egress movements. However, the aid in narrowing the access width for general traffic, a painted 2.9 m median is proposed at the Montreal Road access, and a concrete truck apron is proposed at the Shefford Road access.

Throat Length Discussion

In addition to the *Step 1 – Screening and Scoping Report* submitted December 22nd, 2025, a memo reviewing the throat length of the site accesses was submitted December 23rd, 2025, supplementary to the Step 1 report. This memo reviewed maintaining the existing throat length as part of the redevelopment of the site. A review of the TAC Guidelines was completed, which suggests minimum throat lengths based on road classification and development size—typically at least 25 metres for fast-food restaurants. However, the guidelines are considered conservative for urban locations, and site-specific operational data can justify deviations.

Additionally, the memo reviewed comparative operations of sites with similar land-uses (i.e., combination gas bar, carwash, and drive-through restaurant). Regarding the fast-food restaurant with drive-through facility, a stacking study at a comparable fast-food restaurant found that queues rarely exceed four to seven vehicles, and as the proposed design accommodates up to eleven queued vehicles, this ensures ample space during peak times. Gas station usage based on reports from similar locations indicated that fueling demand seldom reached pump capacity and did not create significant queuing or circulation issues. Regarding carwash operations, with an observed peak queue of approximately six vehicles and a processing time of roughly 4.5 minutes, there is sufficient queue storage provided. Comparisons with similar sites also indicated that projected trip generation values are within expected ranges.

The access on Montreal Road currently operates as a right-in/right-out, which helps limit queue buildup and keeps critical internal conflict points infrequent and manageable. Adhering strictly to TAC's 25 m or 40 m throat length would require significant and impractical site redesign, potentially impeding tanker truck manoeuvrability to underground tanks and thereby affecting operational viability.

In conclusion, the current entrance design is appropriate for anticipated traffic and circulation demands. The site configuration is expected to accommodate the projected peak queues without operational issues.

The detailed throat length memo is included in **Appendix I**.

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4.10.2 Intersection Capacity Analysis

Using the intersection capacity analysis software Synchro (v11), the study area intersections were assessed in terms of vehicle delay (seconds), 95th percentile queues (meters), a volume-to-capacity ratio (V/C ratio) and a corresponding Level of Service (LOS). Each movement is assigned an LOS based on delay and the overall intersection level of service for unsignalized intersections is represented by the worst performing movement. Note that for background and future total conditions, a peak hour factor (PHF) of 1.0 is applied, consistent with the City of Ottawa's TIA Guidelines.

Table 14 below summarizes the performance of study area intersections under existing, background and future conditions for the 2025, 2027, and 2032 horizon years.

Table 14: Intersection Operations – 2025, 2027, 2032 Horizon Years

Intersection	Traffic Control	AM Peak		PM Peak	
		Overall LOS (delay)	Critical Movement (delay)	Overall LOS (delay)	Critical Movement (delay)
Existing Conditions 2025					
Montreal/Shefford	Signalized	D (0.89)	WBT (0.92)	B (0.68)	SBL (0.91)
Montreal/Sinclair	Signalized	A (0.52)	WBTR (0.52)	A (0.40)	EBTR (0.40)
Background 2027					
Montreal/Shefford	Signalized	C (0.79)	WBT (0.80)	B (0.62)	SBL (0.86)
Montreal/Sinclair	Signalized	A (0.49)	WBTR (0.49)	A (0.49)	EBTR (0.49)
Background 2032					
Montreal/Shefford	Signalized	D (0.86)	WBT (0.88)	B (0.67)	SBL (0.86)
Montreal/Sinclair	Signalized	A (0.54)	WBTR (0.54)	A (0.54)	EBTR (0.54)
Future Total 2027					
Montreal/Shefford	Signalized	D (0.84)	WBT (0.86)	B (0.70)	SBL (0.86)
Montreal/Sinclair	Signalized	A (0.50)	WBTR (0.50)	A (0.50)	EBTR (0.50)
Montreal/Site	Unsignalized	B (12.8s)	NBR (12.8s)	C (20.0s)	NBR (20.0s)
Shefford/Site	Unsignalized	B (10.6s)	EBRL (10.6s)	B (11.1s)	EBRL (11.1s)
Future Total 2032					
Montreal/Shefford	Signalized	E (0.92)	WBT (0.96)	C (0.74)	SBL (0.86)
Montreal/Sinclair	Signalized	A (0.56)	WBTR (0.56)	A (0.55)	EBTR (0.55)
Montreal/Site	Unsignalized	B (13.3s)	NBR (13.3s)	C (22.4s)	NBR (22.4s)
Shefford/Site	Unsignalized	B (10.6s)	EBRL (10.6s)	B (11.1s)	EBRL (11.1s)

As indicated in **Table 14**, study area intersections currently operate with a LOS 'D' or better during the morning and afternoon peak hour. However, during the morning peak hour, the westbound through movement and the southbound left-turn movement operate at 92% and 91% capacity, respectively.

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With the addition of background traffic, study area intersections in 2027 are projected to operate with a LOS 'C' or better during peak hours. Critical movements are noted to be projected to operate with a v/c of 0.86, or better. In the 2032 analysis year, the intersection performance will degrade slightly with intersections projected to operate at an LOS 'D' or better with critical movements projected to operate with a v/c of 0.88 or better.

With the addition of the projected new site generated traffic, intersection performance at the signalized intersections is noted to deteriorate slightly when compared with the background analysis years despite the westbound-through volume being lower under Total Traffic conditions (as a result of diverted pass-by trips). The Montreal/Shefford intersection is projected to operate with an overall LOS 'E' and the critical westbound through movement with a v/c of 0.96. In both future scenarios, despite the slight reduction of the westbound through volume due to the diverted trips, this requires more green time for the side street movement. However, this is still within the acceptable level of service targets for a signalized intersection within 600 m of a rapid transit station as outlined in Exhibit 2 of the MMLOS Guidelines.

Detailed Synchro output sheets are provided in **Appendix J**.

4.11 Multimodal Level of Service (MMLOS) Analysis

The City has prepared a complete street concept for Montreal Road from St. Laurent Boulevard to Highway 174 as part of the Montreal Road BRT Environmental Assessment as described in **Section 3.3.1** and therefore, a MMLOS is not required as part of this report with the exception of the Shefford Road frontage. With respect to the City of Ottawa's 2025 MMLOS Guidelines, target MMLOS values were obtained from Exhibit 2 of the Guidelines. Note that the transit level of service has not been included as there is no transit service provided on Shefford Road. The detailed MMLOS assessment is included as **Appendix K**.

Shefford Road is a collector road that consists of the following features within the study area:

- Two-lane roadway (i.e., one travel lane per direction)
- 1.8 m sidewalk on the east side of the roadway, terminating approximately 35 m south of Montreal Road
- No on-street parking provided
- 3.5 m wide lanes (total pavement width of 11.0 metres)
- Posted speed limit of 40 km/h
- Less than 3000 average daily curb lane traffic

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Table 15: Segment MMLOS – Shefford Road, Existing Conditions

Road Segment	Travel Mode	Side	Majority	Critical	Target LOS	Deviation
Shefford Road	Pedestrian (PLOS)	West	F	-	A	-5
		East	B	F		-1, -5
	Bicycle (BLOS)	West	C	-	B	-1
		East	C	-		-1
	Public Realm (PRLOS)	Both sides	B	-	B	0

Table 15 below summarizes the existing levels of service for non-auto modes and the public realm. As shown, only the target public realm level of service (PRLOS) is met. The deviation from the target BLOS on both sides of the roadway is -1 and the deviation from the PLOS target on the ranges from -1 to -5 on the east side if the road and is -5 on the west side if the road. However, as illustrated in **Figure 2**, the proposed development provides a 1.8 m sidewalk along the site's frontage of Shefford Road. However, due to the existing hydro poles on the west side of the road, it is not possible at this time to provide an adequate boulevard. This improvement along the site's frontage results in a PLOS 'B' for the majority of the west side of the road, thus resulting in a deviation of -1 from the target PLOS.

5.0 Findings and Recommendations

J.L. Richards and Associates Limited has completed a review of the projected impacts of the fast-food restaurant and summarized the findings within this Transportation Impact Assessment. The following findings and recommendations are noted.

- Given the local context and nature of the proposed development, the site is expected to be largely automobile-oriented despite the site's proximity to rapid transit and planned improvements to active transportation facilities.
- Study area intersections currently operating overall at an acceptable LOS 'D' or better during the weekday morning and afternoon peak hours.
- The proposed development is projected to generate 'new' two-way vehicles volumes of 40 veh/h and 45 veh/h during weekday morning and afternoon peak hours, respectively.
- The proposed parking supply for the subject development is proposed to meet minimum existing By-Law requirements.
- The City has prepared a complete streets concept of the Montreal/Shefford and Montreal/Sinclair intersections as part of the Montreal Road BRT EA project.
- Based on the projected volumes, intersection capacity analysis, and complete street concepts, additional network modifications are not warranted as study area intersections

Transportation Impact Assessment 2180 Montreal Road

are projected to operate with acceptable levels of service as outlined in the MMLOS Guidelines.

- The overall layout of the site has been verified and is expected to operate acceptably based on the projected traffic demands.

Based on the information presented in this report, it is overall conclusion of J.L. Richards & Associates that the proposed development can be safely accommodated by the adjacent road network.

J.L. RICHARDS & ASSOCIATES LIMITED

Prepared by:



Rani Nahas, P.Eng.
Transportation Engineer

Reviewed by:

A handwritten signature in black ink, appearing to read "D Hook", written over a light blue grid background.

David Hook, P.Eng.
Practice Lead, Transportation Planning

Transportation Impact Assessment

2180 Montreal Road

Disclaimer

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Appendix A

Screening Form

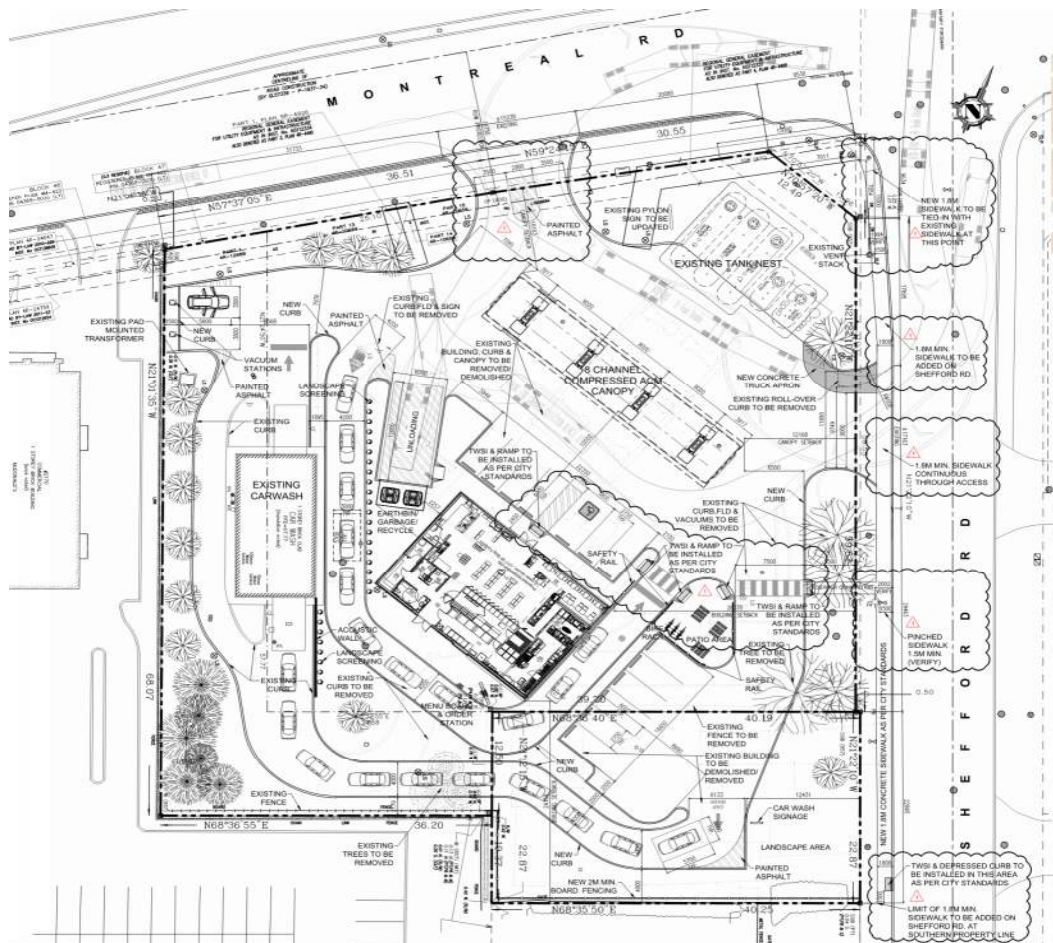
City of Ottawa 2017 TIA Guidelines Screening Form

*Revised per City of Ottawa update to the TIA Guidelines, effective June 14, 2023

1. Description of Proposed Development

Municipal Address	
Description of Location	Montreal Road located in the southwest corner of the Shefford/Montreal signalized intersection.
Land Use Classification	Commercial
Development Size (units)	N/A
Development Size (m ²)	280 sq. m
Number of Accesses and Locations	Retaining existing accesses: one right-in/right-out access to Montreal Road, one full-movement access to Shefford Road
Phase of Development	One
Buildout Year	2027 (assumed)

If available, please attach a sketch of the development or site plan to this form.



2. Trip Gen Trigger

Considering the Development's Land Use Type and Size (as filled out in the previous section), please refer to the Trip Generation Trigger checks below.

Land Use Type*	Minimum Development Size (60 person trips)	
Single-Detached ¹	60 units	
Multi-Use Family (Low-Rise) ¹	90 units	
Multi-Use Family (High-Rise) ¹	150 Units	
Office ²	1,400 m ²	
Industrial ²	7,000 m ²	
Fast-food restaurant or coffee shop ²	110 m ²	✓
Destination Retail ²	1,800 m ²	
Gas Station or convenience market ²	90 m ²	✓

*If the development has a land use type other than what is presented in the table above, estimates of person trip generation may be made based on average trip generation characteristics represented in the current edition of the Institute of Transportation Engineers (ITE) Trip Generation Manual.

¹ Table 2, Table 3 & Table 4 TRANS Trip Generation Summary Report

² ITE Trip Generation Manual 11.1 Ed.

Based on the above, the Trip Generation Trigger is satisfied.

3. Location Triggers

	Yes	No
Does the development propose a new driveway to a boundary street that is designated as part of the City's Transit Priority, Rapid Transit or Cross-Town Bikeways?	✓	
Is the development in a Design Priority Area (DPA), Transit-oriented Development (TOD) zone or Hub?*		✓

*DPA and TOD are identified in the City of Ottawa Official Plan (DPA in Section 2.5.1 and Schedules A and B; TOD in Annex 6) See Chapter 4 for a list of City of Ottawa Planning and Engineering documents that support the completion of TIA.

Hubs are identified as Protected Major Transit Station Areas (PMTSAs) and identified in Schedule C1-Protected Major Transit Station Areas (PMTSAs).

Based on the above, the Location Trigger is satisfied.

4. Safety Triggers

	Yes	No
Are posted speed limits on a boundary street 80km/hr or greater?		✓
Are there any horizontal/vertical curvatures on a boundary street that limit sight lines at a proposed driveway?		✓
Is the proposed driveway within the area of influence of an adjacent traffic signal or roundabout (i.e. within 300 m of intersection in rural conditions, or within 150 m of intersection in urban/suburban conditions?)	✓	
Is the proposed driveway within auxiliary lanes of an intersection?	✓	
Does the proposed driveway make use of an existing median break that serves an existing site?		✓
Is there a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?	✓	
Does the development include a drive-thru facility?	✓	

Based on the above, the Safety Trigger is satisfied.

5. Summary

	Yes	No
Does the development satisfy the Trip Generation Trigger?		
Does the development satisfy the Location Trigger?	✓	
Does the development satisfy the Safety Trigger?	✓	

Based on the results of the TIA Screening Form, the Location and Safety Triggers are satisfied. As such, a TIA is required for the proposed development.

Appendix B

Montreal Road BRT – Intersection
Concept Plans

KEY PLAN



LEGEND

- EXISTING PROPERTY LINE
- EXISTING ROW PROTECTION
- PROPOSED PROPERTY LINE
- EXISTING CONDITIONS
- PROPOSED FUNCTIONAL DESIGN
- PAVEMENT MARKINGS

PARSONS

20 August 2017

Project Manager: [Name]

Checked By: [Name]

Drawn By: [Name]

Scale: 1" = 100'

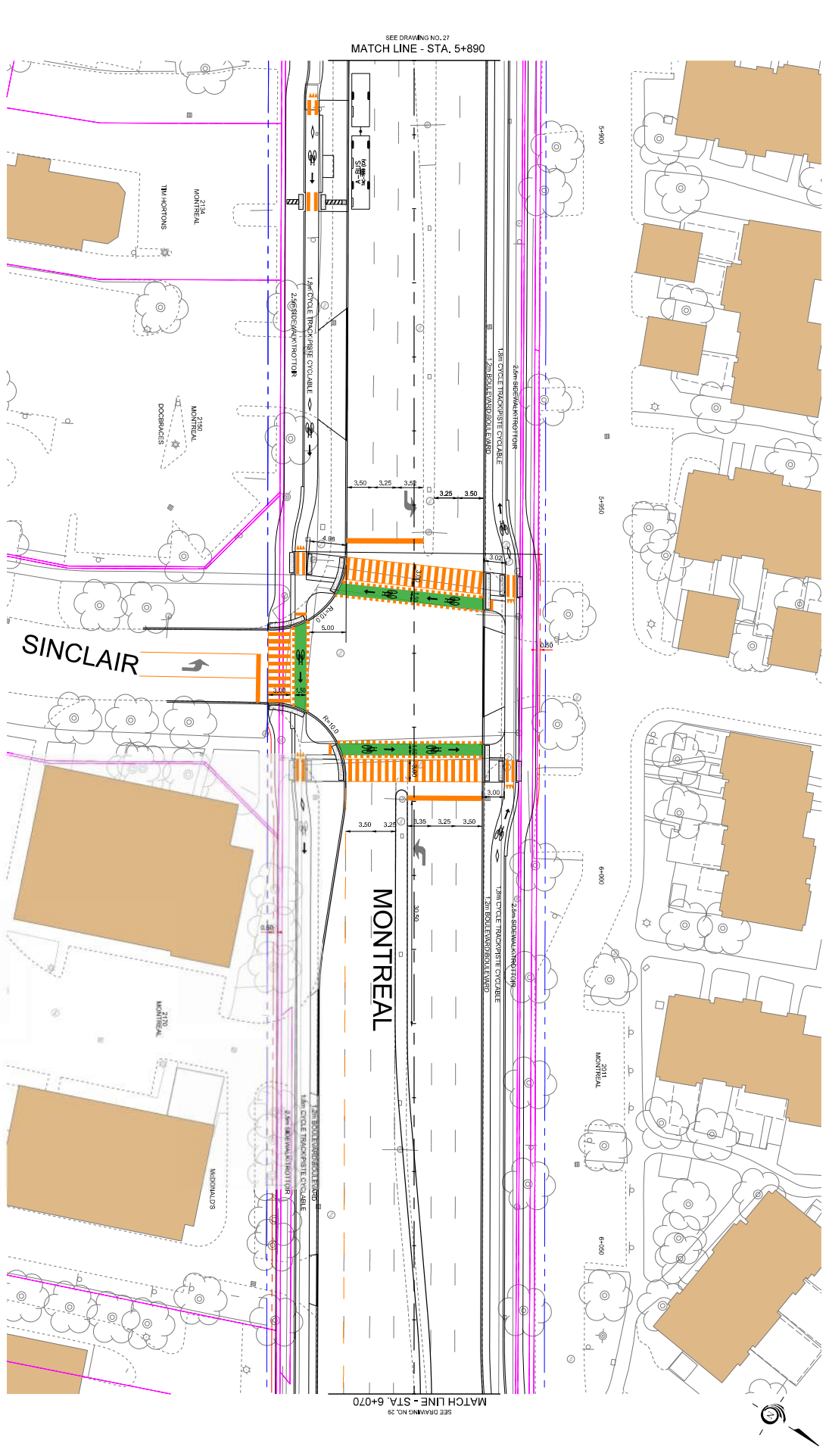
Scale: 1" = 100'

Scale: 1" = 100'

MONTREAL - BLVD TRANSIT PRIORITY CORRIDOR

STA 5+890 to STA 6+070

Sheet 28 of 28



SEE DRAWING NO. 27
MATCH LINE - STA. 5+890

SEE DRAWING NO. 29
MATCH LINE - STA. 6+070

Appendix C
Traffic Data

Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SHEFFORD RD

Survey Date: Tuesday, January 16, 2024

Start Time: 07:00

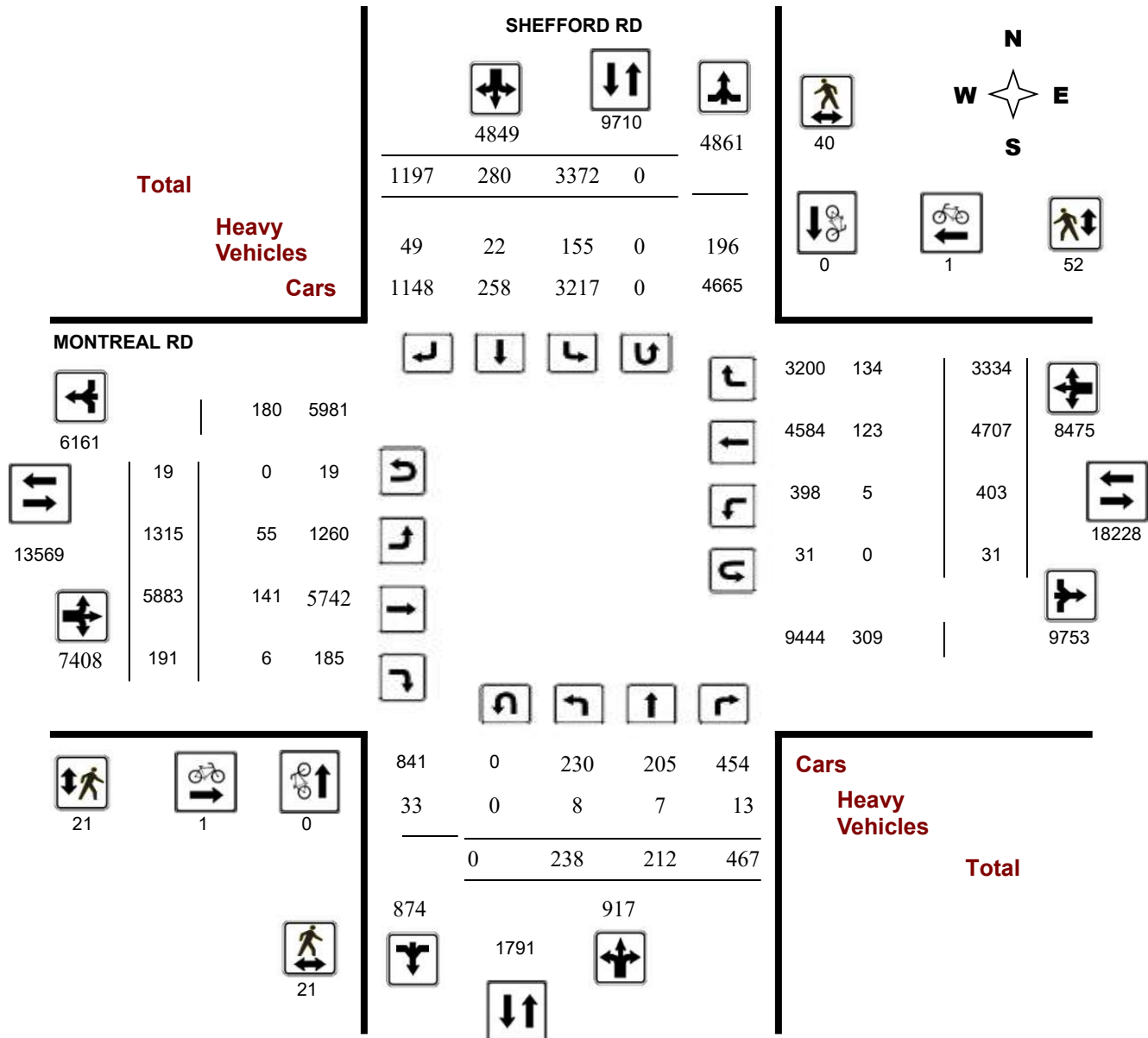
WO No:

41523

Device:

Miovision

Full Study Diagram



Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SHEFFORD RD

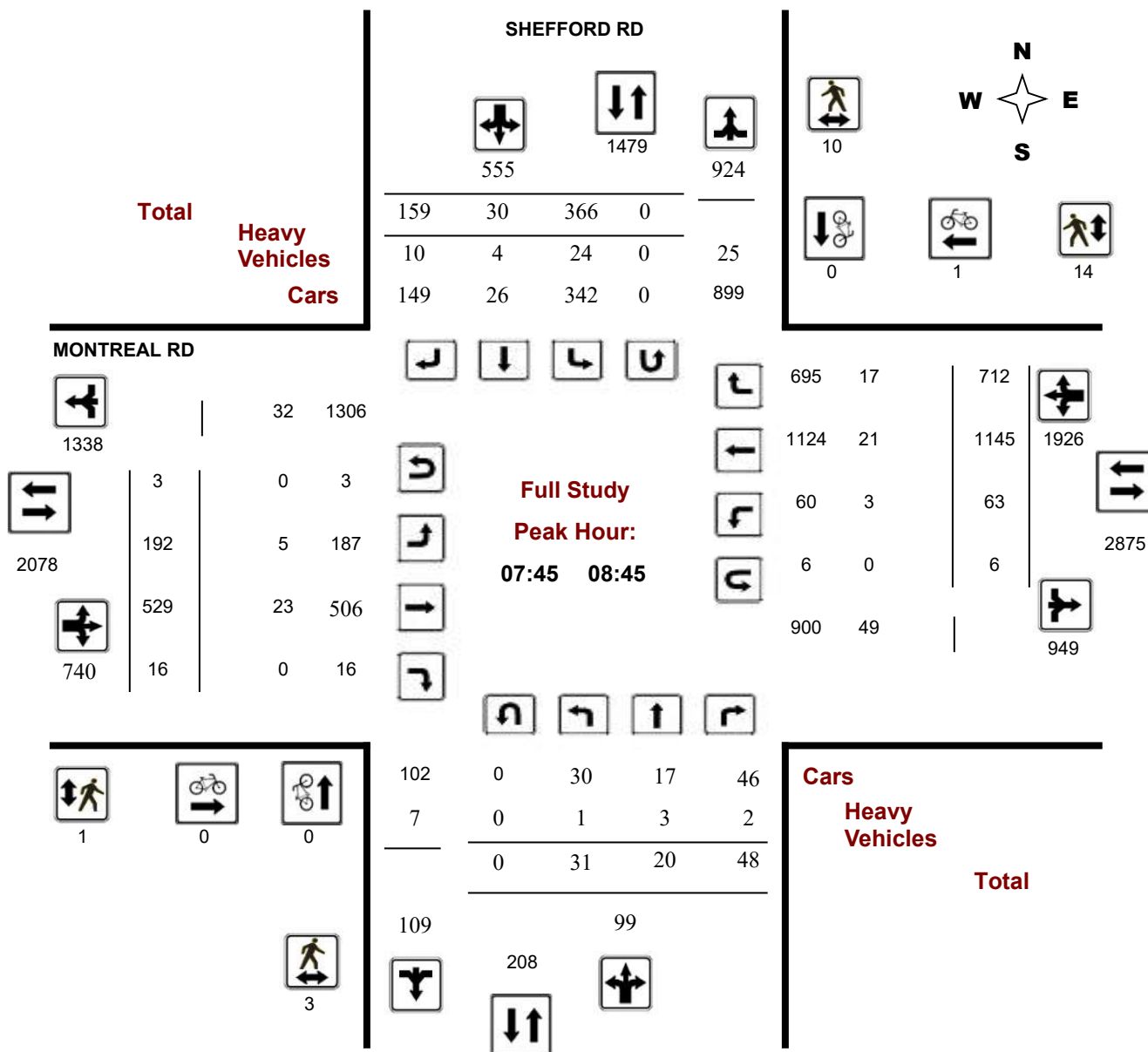
Survey Date: Tuesday, January 16, 2024

WO No: 41523

Start Time: 07:00

Device: Miovision

Full Study Peak Hour Diagram



Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SHEFFORD RD

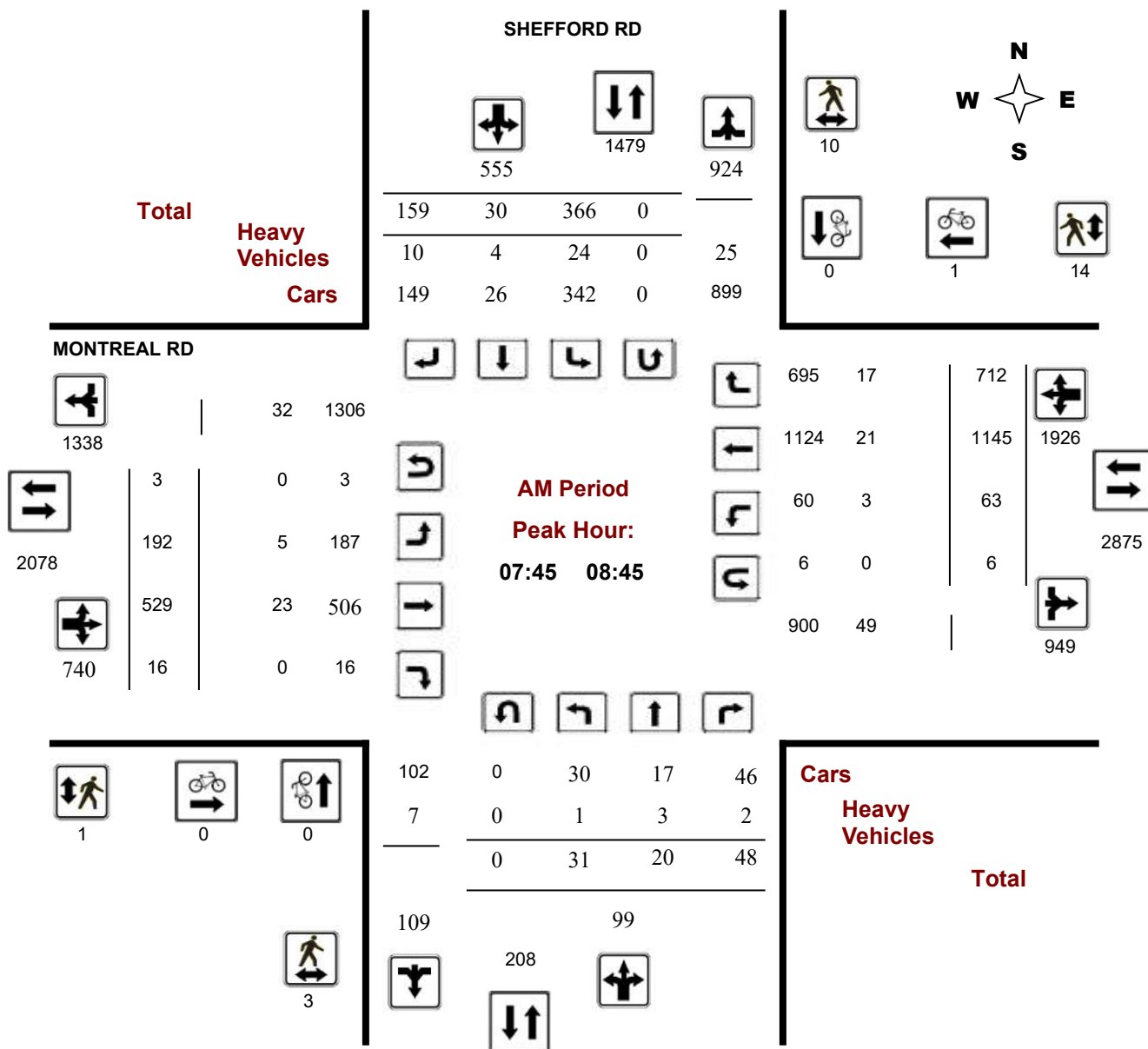
Survey Date: Tuesday, January 16, 2024

WO No: 41523

Start Time: 07:00

Device: Miovision

AM Period Peak Hour Diagram



Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SHEFFORD RD

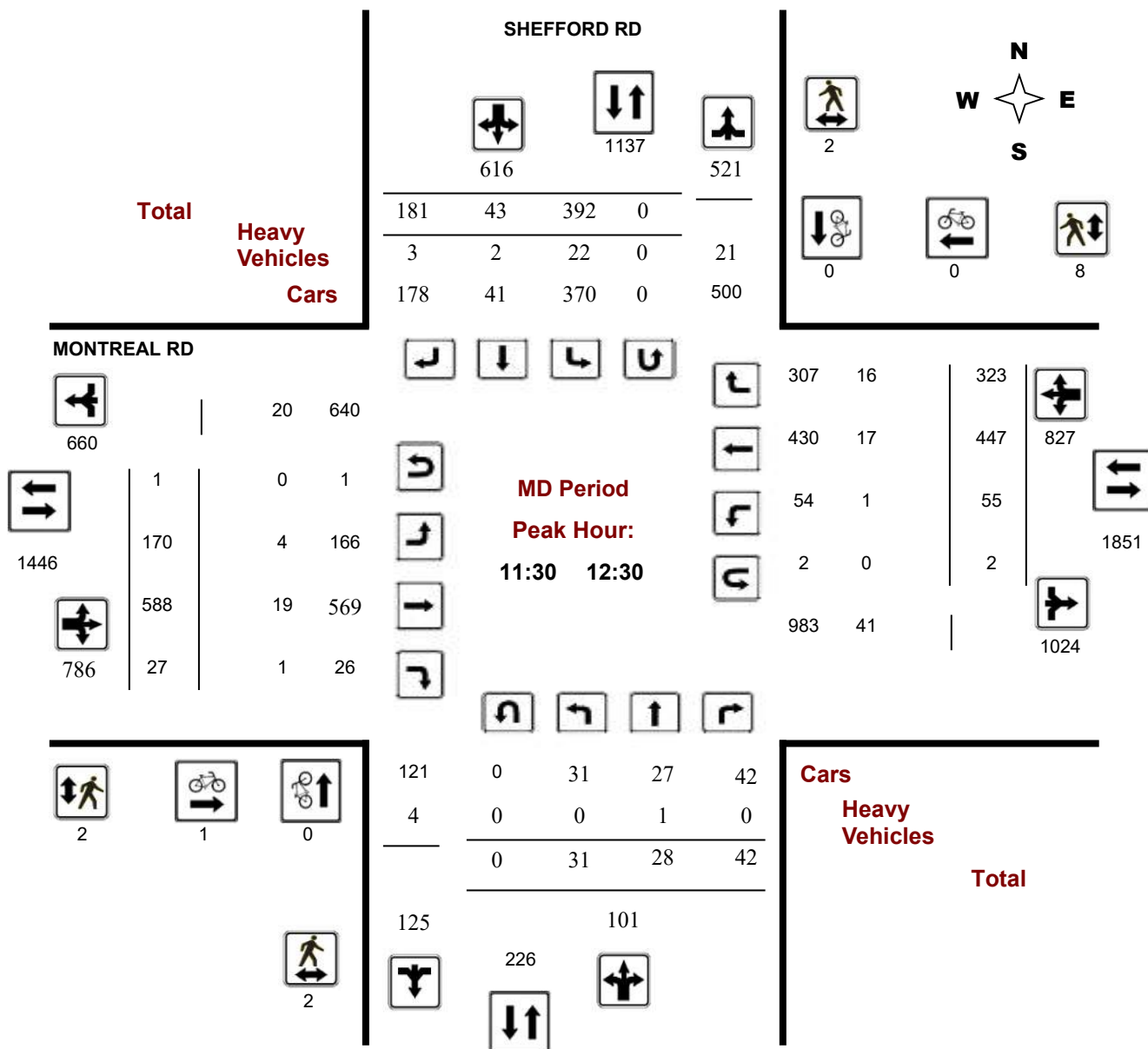
Survey Date: Tuesday, January 16, 2024

WO No: 41523

Start Time: 07:00

Device: Miovision

MD Period Peak Hour Diagram



Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SHEFFORD RD

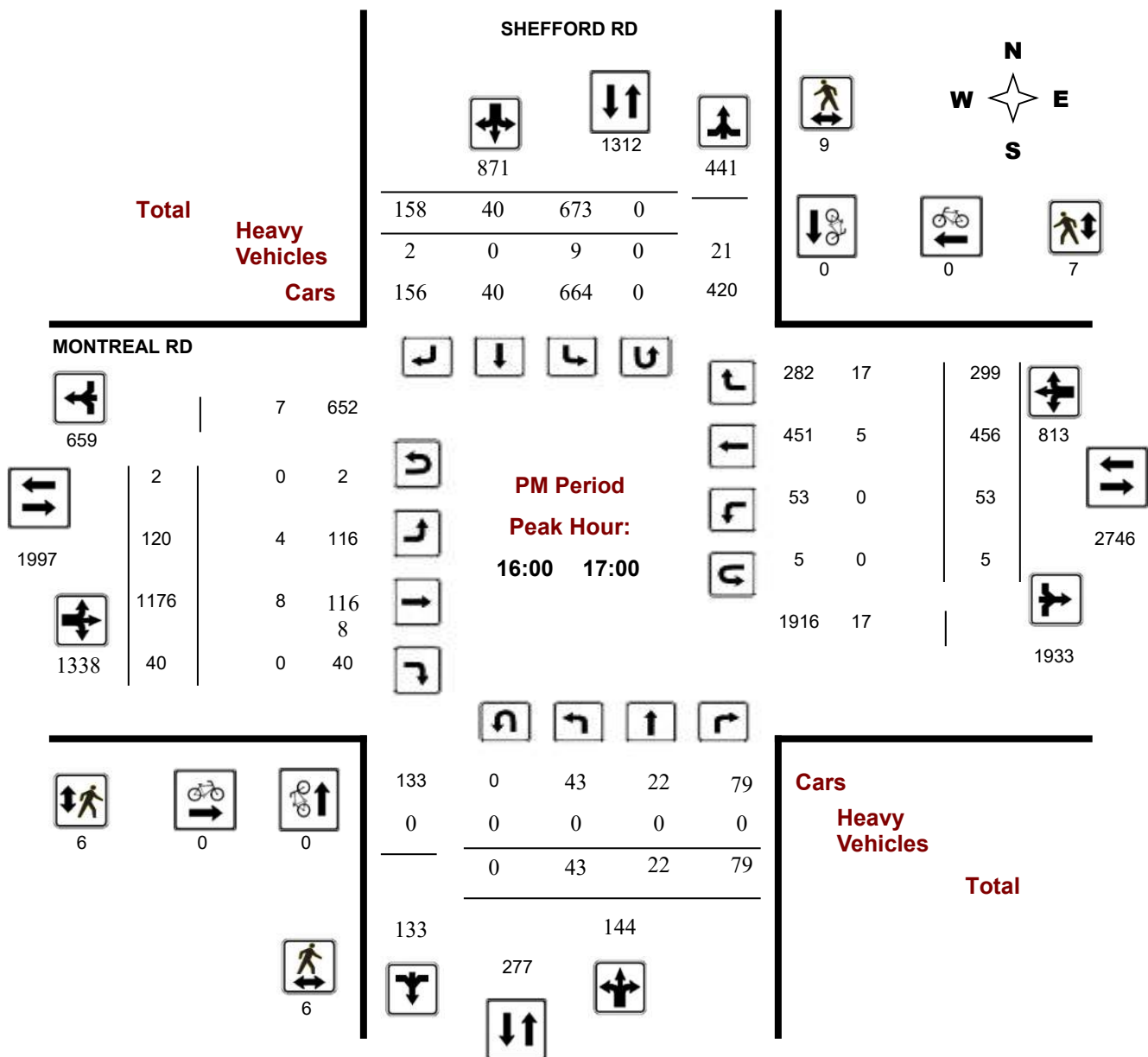
Survey Date: Tuesday, January 16, 2024

WO No: 41523

Start Time: 07:00

Device: Miovision

PM Period Peak Hour Diagram



Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SHEFFORD RD

Survey Date: Tuesday, January 16, 2024

WO No: 41523

Start Time: 07:00

Device: Miovision

Full Study Summary (8 HR Standard)

Survey Date: Tuesday, January 16, 2024

Total Observed U-Turns

AADT Factor

Northbound: 0 Southbound: 0
Eastbound: 19 Westbound: 31

1.10

SHEFFORD RD

MONTREAL RD

		Northbound				Southbound				Eastbound				Westbound						Grand Total				
Period		LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT					
07:00	08:00	17	25	36	78	255	21	128	404	482	192	462	9	663	45	1010	559	1614	2277	2759				
08:00	09:00	33	13	44	90	351	24	143	518	608	190	519	13	722	61	1004	720	1785	2507	3115				
09:00	10:00	22	14	51	87	305	31	135	471	558	168	546	13	727	48	487	554	1089	1816	2374				
11:30	12:30	31	28	42	101	392	43	181	616	717	170	588	27	785	55	447	323	825	1610	2327				
12:30	13:30	28	58	56	142	303	52	160	515	657	234	679	35	948	45	358	241	644	1592	2249				
15:00	16:00	33	20	76	129	591	28	150	769	898	108	982	30	1120	51	543	319	913	2033	2931				
16:00	17:00	43	22	79	144	673	40	158	871	1015	120	1176	40	1336	53	456	299	808	2144	3159				
17:00	18:00	31	32	83	146	502	41	142	685	831	133	931	24	1088	45	402	319	766	1854	2685				
Sub Total		238	212	467	917	3372	280	1197	4849	5766	1315	5883	191	7389	403	4707	3334	8444	15833	21599				
U Turns		0				0				0				19				31				50	50	
Total		238	212	467	917	3372	280	1197	4849	5766	1315	5883	191	7408	403	4707	3334	8475	15883	21649				
EQ 12Hr		331	295	649	1275	4687	389	1664	6740	8015	1828	8177	265	10297	560	6543	4634	11780	22077	30092				
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.															1.39									
AVG 12Hr		364	324	714	1402	5156	561	2398	7414	8816	2011	8995	292	11327	616	7197	5097	12958	24285	33101				
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.															1.10									
AVG 24Hr		477	424	935	1837	6754	735	3141	9712	11549	2634	11783	383	14838	807	9428	6677	16975	31813	43362				
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.															1.31									
Note: U-Turns provided for approach totals. Refer to 'U-Turn' Report for specific breakdown.																								

Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SHEFFORD RD

Survey Date: Tuesday, January 16, 2024

WO No: 41523

Start Time: 07:00

Device: Miovision

Full Study 15 Minute Increments

SHEFFORD RD

MONTREAL RD

Northbound

Southbound

Eastbound

Westbound

Time Period	LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total	
07:00	07:15	2	1	1	4	55	2	23	80	84	35	85	1	121	5	136	100	242	363	447
07:15	07:30	2	5	14	21	59	4	30	93	114	42	111	1	154	10	233	130	375	529	643
07:30	07:45	5	7	4	16	63	5	30	98	114	51	126	2	180	16	289	152	457	637	751
08:45	09:00	10	5	13	28	63	4	29	96	124	62	130	2	195	12	211	185	408	603	727
09:00	09:15	3	5	13	21	72	3	41	116	137	36	128	3	167	15	145	142	304	471	608
09:45	10:00	9	3	8	20	71	11	36	118	138	52	141	4	198	9	83	147	239	437	575
12:00	12:15	10	10	8	28	101	17	48	166	194	44	159	9	212	16	116	78	210	422	616
12:30	12:45	6	18	7	31	81	11	38	130	161	50	172	7	229	9	88	36	134	363	524
12:45	13:00	6	15	17	38	59	17	43	119	157	71	158	12	242	12	94	56	164	406	563
15:15	15:30	10	4	8	22	150	3	41	194	216	35	244	9	289	16	153	101	272	561	777
16:15	16:30	14	8	21	43	188	9	33	230	273	25	300	6	331	11	118	53	183	514	787
07:45	08:00	8	12	17	37	78	10	45	133	170	64	140	5	210	14	352	177	545	755	925
08:00	08:15	9	7	14	30	111	8	53	172	202	46	123	8	177	15	256	172	444	621	823
08:15	08:30	10	0	7	17	84	4	31	119	136	34	114	1	149	21	276	166	465	614	750
08:30	08:45	4	1	10	15	93	8	30	131	146	48	152	2	204	13	261	197	472	676	822
09:15	09:30	4	2	12	18	86	8	24	118	136	40	142	4	188	9	146	154	309	497	633
09:30	09:45	6	4	18	28	76	9	34	119	147	40	135	2	179	15	113	111	239	418	565
11:30	11:45	6	3	11	20	96	8	40	144	164	38	120	6	165	8	120	107	236	401	565
11:45	12:00	8	5	9	22	111	8	47	166	188	43	136	6	185	12	116	89	218	403	591
12:15	12:30	7	10	14	31	84	10	46	140	171	45	173	6	224	19	95	49	163	387	558
13:00	13:15	10	10	15	35	82	17	38	137	172	65	194	10	270	11	85	56	152	422	594
13:15	13:30	6	15	17	38	81	7	41	129	167	48	155	6	210	13	91	93	199	409	576
15:00	15:15	8	7	20	35	131	5	41	177	212	22	220	6	249	15	129	74	220	469	681
15:30	15:45	9	2	26	37	162	8	28	198	235	23	259	8	290	8	145	62	215	505	740
15:45	16:00	6	7	22	35	148	12	40	200	235	28	259	7	294	12	116	82	210	504	739
16:00	16:15	4	5	19	28	196	11	47	254	282	26	260	8	295	14	112	68	195	490	772
17:00	17:15	4	8	32	44	180	12	56	248	292	25	254	10	289	10	90	67	167	456	748
17:15	17:30	12	5	20	37	139	12	35	186	223	34	219	5	259	18	94	71	185	444	667
17:30	17:45	7	9	14	30	94	12	29	135	165	33	263	4	300	9	98	83	192	492	657
17:45	18:00	8	10	17	35	89	5	22	116	151	41	195	5	241	8	120	98	226	467	618
16:30	16:45	13	4	21	38	167	8	32	207	245	41	307	13	361	17	115	82	216	577	822
16:45	17:00	12	5	18	35	122	12	46	180	215	28	309	13	351	11	111	96	219	570	785
Total:		238	212	467	917	3372	280	1197	4849	5766	1315	5883	191	7408	403	4707	3334	8475	15883	21,649

Note: U-Turns are included in Totals, cyclist volume is not included in totals. For cyclist volumes refer to Cyclist Volume report.



Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SHEFFORD RD

Survey Date: Tuesday, January 16, 2024

WO No: 41523

Start Time: 07:00

Device: Miovision

Full Study Cyclist Volume

		SHEFFORD RD			MONTREAL RD			Grand Total
Time Period		Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	
07:00	07:15	0	0	0	0	0	0	0
07:15	07:30	0	0	0	0	0	0	0
07:30	07:45	0	0	0	0	0	0	0
08:45	09:00	0	0	0	0	0	0	0
09:00	09:15	0	0	0	0	0	0	0
09:45	10:00	0	0	0	0	0	0	0
12:00	12:15	0	0	0	0	0	0	0
12:30	12:45	0	0	0	0	0	0	0
12:45	13:00	0	0	0	0	0	0	0
15:15	15:30	0	0	0	0	0	0	0
16:15	16:30	0	0	0	0	0	0	0
07:45	08:00	0	0	0	0	0	0	0
08:00	08:15	0	0	0	0	1	1	1
08:15	08:30	0	0	0	0	0	0	0
08:30	08:45	0	0	0	0	0	0	0
09:15	09:30	0	0	0	0	0	0	0
09:30	09:45	0	0	0	0	0	0	0
11:30	11:45	0	0	0	1	0	1	1
11:45	12:00	0	0	0	0	0	0	0
12:15	12:30	0	0	0	0	0	0	0
13:00	13:15	0	0	0	0	0	0	0
13:15	13:30	0	0	0	0	0	0	0
15:00	15:15	0	0	0	0	0	0	0
15:30	15:45	0	0	0	0	0	0	0
15:45	16:00	0	0	0	0	0	0	0
16:00	16:15	0	0	0	0	0	0	0
17:00	17:15	0	0	0	0	0	0	0
17:15	17:30	0	0	0	0	0	0	0
17:30	17:45	0	0	0	0	0	0	0
17:45	18:00	0	0	0	0	0	0	0
16:30	16:45	0	0	0	0	0	0	0
16:45	17:00	0	0	0	0	0	0	0
Total		0	0	0	1	1	2	2

Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SHEFFORD RD

Survey Date: Tuesday, January 16, 2024

WO No: 41523

Start Time: 07:00

Device: Miovision

Full Study Pedestrian Volume

SHEFFORD RD

MONTREAL RD

Time Period	NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00 07:15	1	1	2	0	1	1	3
07:15 07:30	0	4	4	0	0	0	4
07:30 07:45	0	2	2	2	3	5	7
08:45 09:00	0	1	1	0	0	0	1
09:00 09:15	0	0	0	0	0	0	0
09:45 10:00	1	1	2	0	1	1	3
12:00 12:15	0	1	1	1	4	5	6
12:30 12:45	0	0	0	0	4	4	4
12:45 13:00	1	1	2	0	3	3	5
15:15 15:30	0	1	1	5	0	5	6
16:15 16:30	1	1	2	0	3	3	5
07:45 08:00	2	5	7	0	5	5	12
08:00 08:15	0	2	2	0	7	7	9
08:15 08:30	1	3	4	1	1	2	6
08:30 08:45	0	0	0	0	1	1	1
09:15 09:30	0	0	0	0	2	2	2
09:30 09:45	0	0	0	1	2	3	3
11:30 11:45	1	0	1	0	2	2	3
11:45 12:00	1	1	2	1	0	1	3
12:15 12:30	0	0	0	0	2	2	2
13:00 13:15	2	3	5	3	2	5	10
13:15 13:30	5	0	5	0	1	1	6
15:00 15:15	0	2	2	1	2	3	5
15:30 15:45	0	2	2	0	2	2	4
15:45 16:00	0	1	1	0	0	0	1
16:00 16:15	2	5	7	3	2	5	12
17:00 17:15	0	0	0	0	0	0	0
17:15 17:30	0	0	0	0	0	0	0
17:30 17:45	0	0	0	0	0	0	0
17:45 18:00	0	0	0	0	0	0	0
16:30 16:45	3	2	5	3	2	5	10
16:45 17:00	0	1	1	0	0	0	1
Total	21	40	61	21	52	73	134

Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SHEFFORD RD

Survey Date: Tuesday, January 16, 2024

WO No: 41523

Start Time: 07:00

Device: Miovision

Full Study Heavy Vehicles

SHEFFORD RD

MONTREAL RD

Northbound

Southbound

Eastbound

Westbound

Time Period	LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00 07:15	0	0	0	0	10	0	4	14	14	4	2	0	6	0	4	5	9	15	29
07:15 07:30	0	0	1	1	6	1	3	10	11	3	4	0	7	0	2	7	9	16	27
07:30 07:45	2	0	0	2	4	0	6	10	12	4	5	0	9	0	3	6	9	18	30
08:45 09:00	4	0	1	5	10	2	2	14	19	3	5	0	8	0	4	8	12	20	39
09:00 09:15	0	0	2	2	7	0	6	13	15	0	10	0	10	0	8	4	12	22	37
09:45 10:00	0	0	0	0	6	1	3	10	10	2	6	0	8	0	4	8	12	20	30
12:00 12:15	0	1	0	1	6	0	0	6	7	2	2	1	5	0	3	5	8	13	20
12:30 12:45	0	0	0	0	7	1	0	8	8	4	7	0	11	0	4	0	4	15	23
12:45 13:00	0	0	0	0	4	2	2	8	8	4	3	1	8	0	6	4	10	18	26
15:15 15:30	0	0	1	1	7	0	0	7	8	0	4	1	5	1	6	2	9	14	22
16:15 16:30	0	0	0	0	3	0	0	3	3	1	0	0	1	0	3	1	4	5	8
07:45 08:00	0	3	0	3	8	1	4	13	16	3	8	0	11	0	4	4	8	19	35
08:00 08:15	0	0	0	0	8	1	3	12	12	0	3	0	3	0	5	3	8	11	23
08:15 08:30	1	0	1	2	5	1	1	7	9	0	4	0	4	2	4	5	11	15	24
08:30 08:45	0	0	1	1	3	1	2	6	7	2	8	0	10	1	8	5	14	24	31
09:15 09:30	0	0	0	0	5	4	1	10	10	4	10	1	15	0	5	8	13	28	38
09:30 09:45	0	1	2	3	6	2	1	9	12	2	8	1	11	0	9	6	15	26	38
11:30 11:45	0	0	0	0	10	0	1	11	11	2	9	0	11	0	8	3	11	22	33
11:45 12:00	0	0	0	0	1	2	0	3	3	0	2	0	2	0	2	2	4	6	9
12:15 12:30	0	0	0	0	5	0	2	7	7	0	6	0	6	1	4	6	11	17	24
13:00 13:15	0	1	1	2	6	1	1	8	10	5	5	1	11	0	5	2	7	18	28
13:15 13:30	0	0	1	1	4	0	3	7	8	1	8	0	9	0	6	9	15	24	32
15:00 15:15	0	1	1	2	5	0	0	5	7	0	2	0	2	0	6	1	7	9	16
15:30 15:45	0	0	1	1	0	1	0	1	2	1	3	0	4	0	4	3	7	11	13
15:45 16:00	0	0	0	0	3	0	1	4	4	2	3	0	5	0	3	3	6	11	15
16:00 16:15	0	0	0	0	3	0	2	5	5	1	5	0	6	0	1	4	5	11	16
17:00 17:15	0	0	0	0	3	0	0	3	3	0	0	0	0	0	0	2	2	2	5
17:15 17:30	1	0	0	1	1	1	1	3	4	2	1	0	3	0	1	2	3	6	10
17:30 17:45	0	0	0	0	4	0	0	4	4	0	4	0	4	0	0	3	3	7	11
17:45 18:00	0	0	0	0	2	0	0	2	2	1	1	0	2	0	0	1	1	3	5
16:30 16:45	0	0	0	0	3	0	0	3	3	1	2	0	3	0	1	6	7	10	13
16:45 17:00	0	0	0	0	0	0	0	0	0	1	1	0	2	0	0	6	6	8	8
Total: None	8	7	13	28	155	22	49	226	254	55	141	6	202	5	123	134	262	464	718

Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SHEFFORD RD

Survey Date: Tuesday, January 16, 2024

WO No: 41523

Start Time: 07:00

Device: Miovision

Full Study 15 Minute U-Turn Total

SHEFFORD RD

MONTREAL RD

Time Period		Northbound U-Turn Total	Southbound U-Turn Total	Eastbound U-Turn Total	Westbound U-Turn Total	Total
07:00	07:15	0	0	0	1	1
07:15	07:30	0	0	0	2	2
07:30	07:45	0	0	1	0	1
08:45	09:00	0	0	1	0	1
09:00	09:15	0	0	0	2	2
09:45	10:00	0	0	1	0	1
12:00	12:15	0	0	0	0	0
12:30	12:45	0	0	0	1	1
12:45	13:00	0	0	1	2	3
15:15	15:30	0	0	1	2	3
16:15	16:30	0	0	0	1	1
07:45	08:00	0	0	1	2	3
08:00	08:15	0	0	0	1	1
08:15	08:30	0	0	0	2	2
08:30	08:45	0	0	2	1	3
09:15	09:30	0	0	2	0	2
09:30	09:45	0	0	2	0	2
11:30	11:45	0	0	1	1	2
11:45	12:00	0	0	0	1	1
12:15	12:30	0	0	0	0	0
13:00	13:15	0	0	1	0	1
13:15	13:30	0	0	1	2	3
15:00	15:15	0	0	1	2	3
15:30	15:45	0	0	0	0	0
15:45	16:00	0	0	0	0	0
16:00	16:15	0	0	1	1	2
17:00	17:15	0	0	0	0	0
17:15	17:30	0	0	1	2	3
17:30	17:45	0	0	0	2	2
17:45	18:00	0	0	0	0	0
16:30	16:45	0	0	0	2	2
16:45	17:00	0	0	1	1	2
Total		0	0	19	31	50

Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SINCLAIR ST

Survey Date: Tuesday, April 11, 2017

Start Time: 07:00

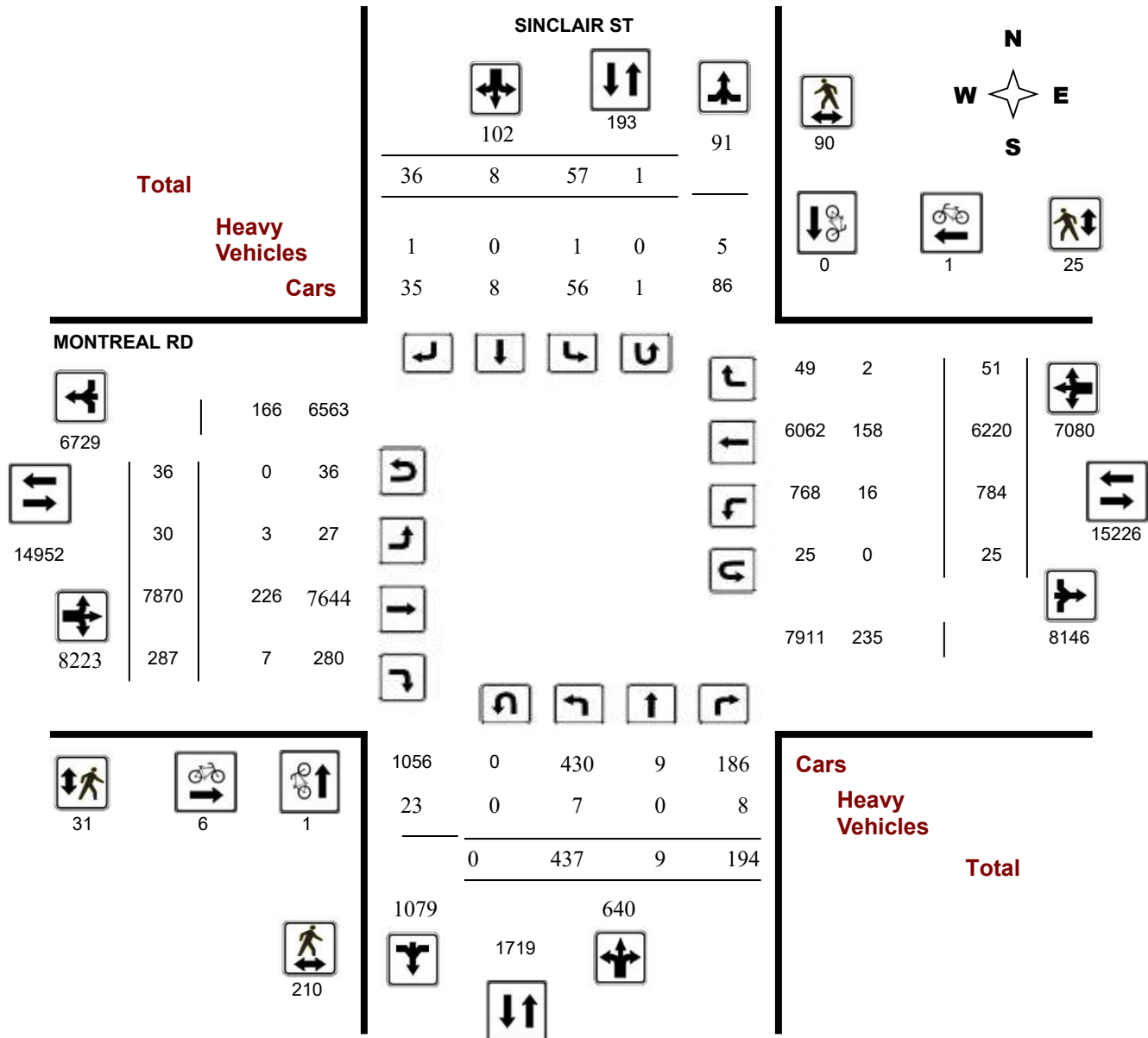
WO No:

36896

Device:

Miovision

Full Study Diagram



Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SINCLAIR ST

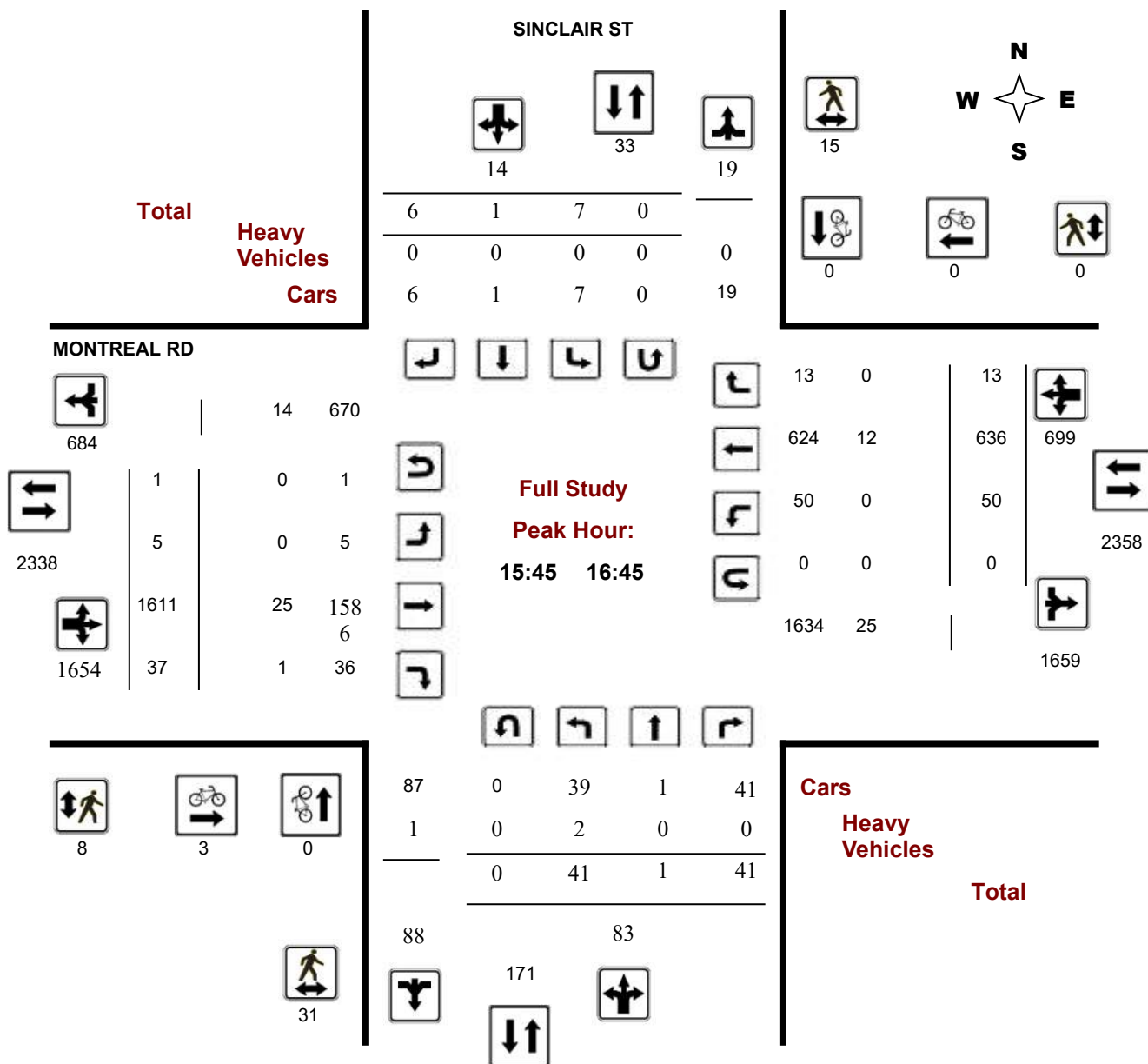
Survey Date: Tuesday, April 11, 2017

WO No: 36896

Start Time: 07:00

Device: Miovision

Full Study Peak Hour Diagram



Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SINCLAIR ST

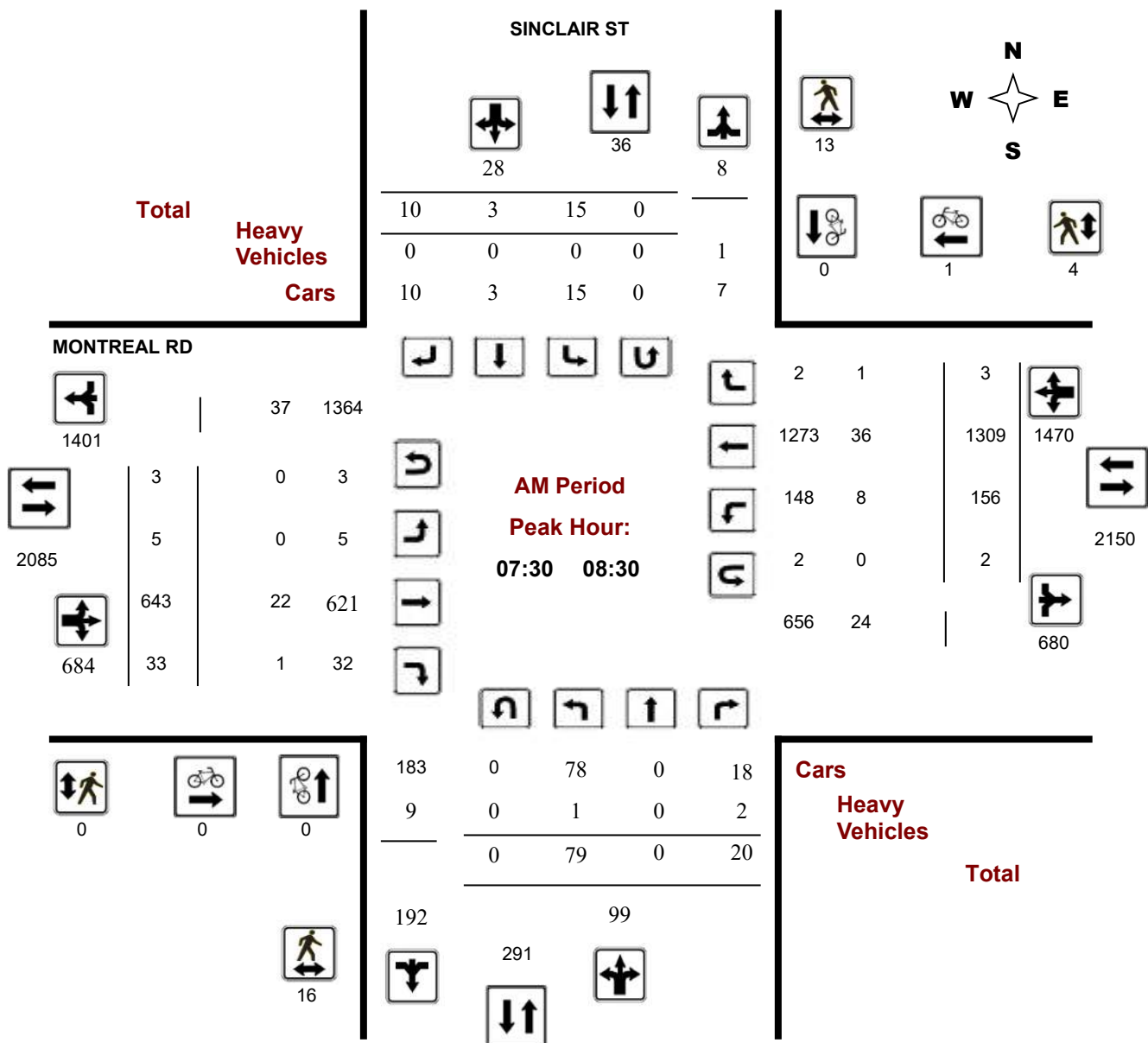
Survey Date: Tuesday, April 11, 2017

WO No: 36896

Start Time: 07:00

Device: Miovision

AM Period Peak Hour Diagram



Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SINCLAIR ST

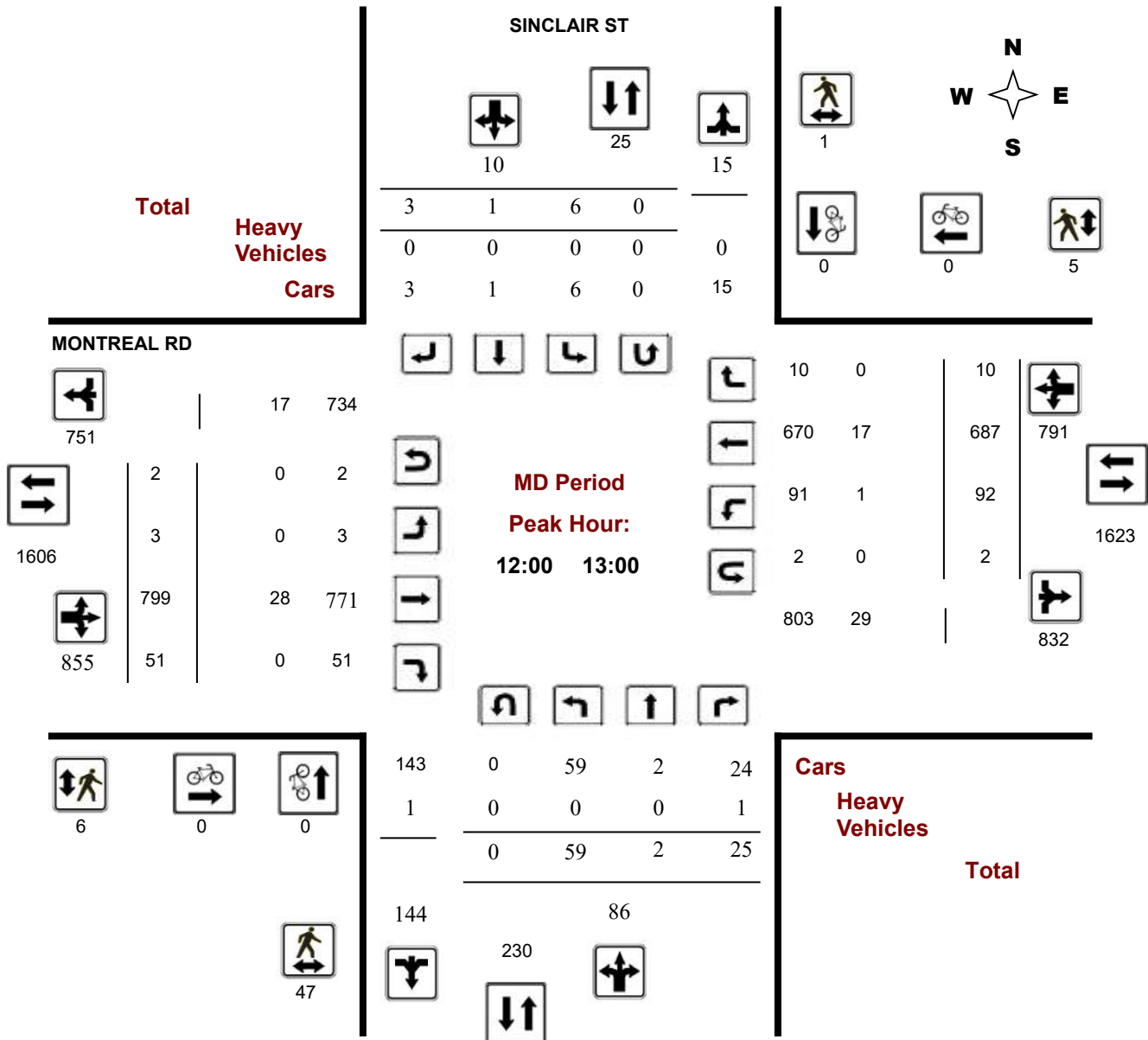
Survey Date: Tuesday, April 11, 2017

WO No: 36896

Start Time: 07:00

Device: Miovision

MD Period Peak Hour Diagram



Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SINCLAIR ST

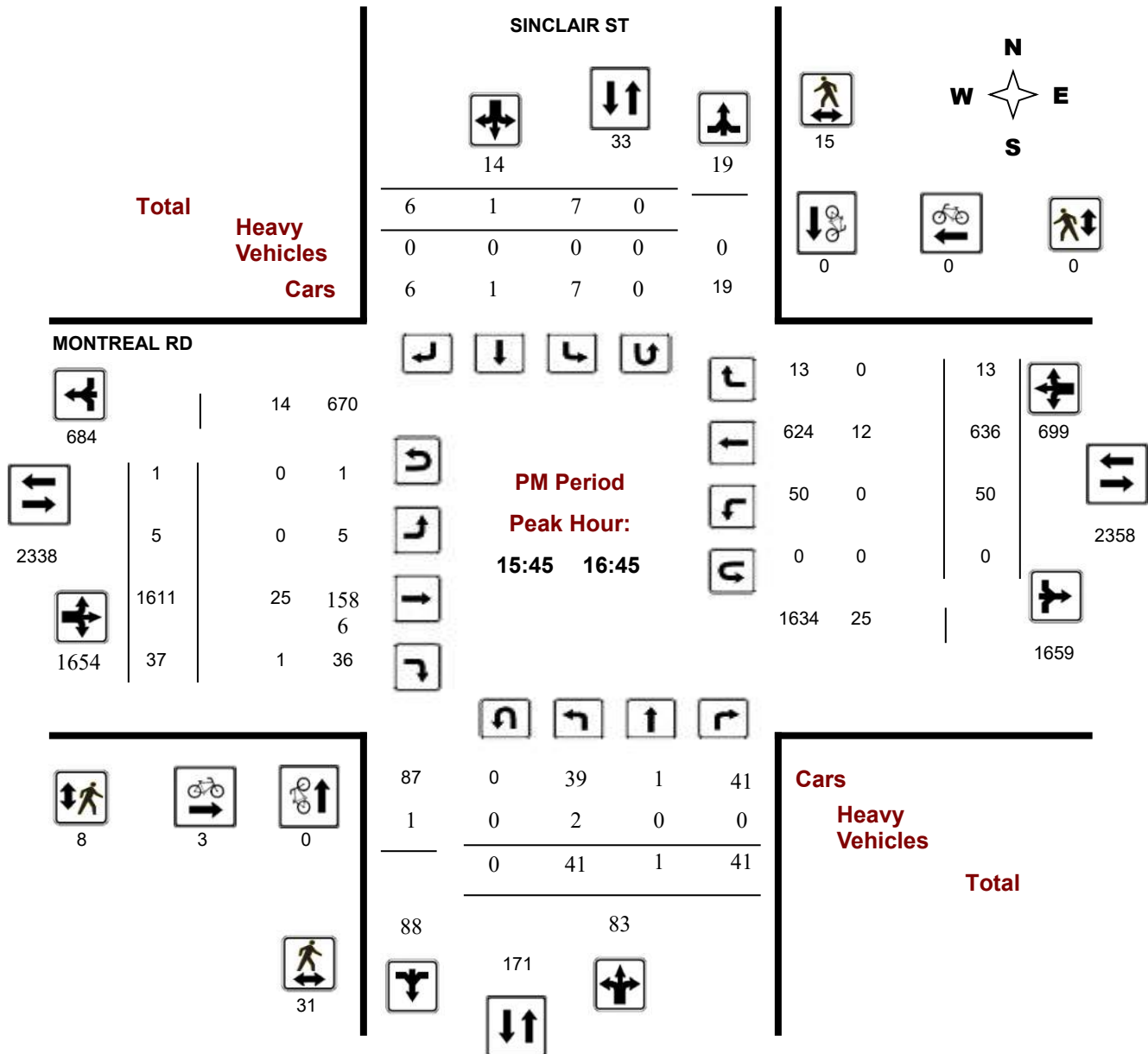
Survey Date: Tuesday, April 11, 2017

WO No: 36896

Start Time: 07:00

Device: Miovision

PM Period Peak Hour Diagram



Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SINCLAIR ST

Survey Date: Tuesday, April 11, 2017

WO No: 36896

Start Time: 07:00

Device: Miovision

Full Study Summary (8 HR Standard)

Survey Date: Tuesday, April 11, 2017

Total Observed U-Turns

AADT Factor

Northbound: 0 Southbound: 1
Eastbound: 36 Westbound: 25
.90

SINCLAIR ST

MONTREAL RD

		SINCLAIR ST								MONTREAL RD								Grand Total		
		Northbound				Southbound				Eastbound				Westbound						
Period		LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00	08:00	74	0	15	89	11	1	7	19	108	2	553	37	592	169	1180	3	1352	1944	2052
08:00	09:00	71	0	18	89	17	3	9	29	118	7	762	36	805	136	1093	3	1232	2037	2155
09:00	10:00	57	3	23	83	4	2	4	10	93	4	725	38	767	141	753	1	895	1662	1755
11:30	12:30	53	1	27	81	4	1	1	6	87	2	807	40	849	90	664	6	760	1609	1696
12:30	13:30	63	1	19	83	4	0	3	7	90	2	790	45	837	85	667	10	762	1599	1689
15:00	16:00	38	1	28	67	6	0	2	8	75	8	1349	35	1392	63	652	7	722	2114	2189
16:00	17:00	40	2	35	77	9	1	6	16	93	1	1641	34	1676	47	621	10	678	2354	2447
17:00	18:00	41	1	29	71	2	0	4	6	77	4	1243	22	1269	53	590	11	654	1923	2000
Sub Total		437	9	194	640	57	8	36	101	741	30	7870	287	8187	784	6220	51	7055	15242	15983
U Turns					0				1	1				36				25	61	62
Total		437	9	194	640	57	8	36	102	742	30	7870	287	8223	784	6220	51	7080	15303	16045
EQ 12Hr		607	13	270	890	79	11	50	142	1031	42	10939	399	11430	1090	8646	71	9841	21271	22303

Note: These values are calculated by multiplying the totals by the appropriate expansion factor.

1.39

AVG 12Hr	546	12	243	801		71	13	59	128	928	38	9845	359	10287		981	7781	64	8857	19144	20073
-----------------	-----	----	-----	-----	--	----	----	----	-----	-----	----	------	-----	-------	--	-----	------	----	------	-------	-------

Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.

.90

AVG 24Hr	715	16	318	1049		93	17	77	168	1216	50	12897	470	13476		1285	10193	84	11603	25079	26296
-----------------	-----	----	-----	------	--	----	----	----	-----	------	----	-------	-----	-------	--	------	-------	----	-------	-------	-------

Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.

1.31

Note: U-Turns provided for approach totals. Refer to 'U-Turn' Report for specific breakdown.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SINCLAIR ST

Survey Date: Tuesday, April 11, 2017

WO No: 36896

Start Time: 07:00

Device: Miovision

Full Study 15 Minute Increments

SINCLAIR ST

MONTREAL RD

Northbound

Southbound

Eastbound

Westbound

Time Period	LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total	
07:00	07:15	14	0	2	16	1	1	2	4	20	0	107	6	115	44	206	2	253	368	388
07:15	07:30	20	0	3	23	5	0	1	6	29	0	138	10	150	40	296	0	338	488	517
07:30	07:45	22	0	3	25	2	0	2	4	29	0	133	9	144	41	354	0	395	539	568
12:30	12:45	15	0	4	19	0	0	0	0	19	0	188	10	198	22	198	3	223	421	440
13:15	13:30	13	0	5	18	1	0	0	1	19	0	213	6	221	12	143	4	160	381	400
15:00	15:15	16	0	8	24	0	0	1	1	25	2	262	8	274	16	169	3	189	463	488
15:15	15:30	5	0	2	7	3	0	0	3	10	0	327	6	336	12	183	1	196	532	542
16:45	17:00	9	1	5	15	3	0	0	3	18	1	416	9	426	11	149	0	161	587	605
17:45	18:00	9	0	6	15	0	0	1	1	16	1	256	3	262	19	128	2	150	412	428
07:45	08:00	18	0	7	25	3	0	2	5	30	2	175	12	189	44	324	1	369	558	588
08:00	08:15	22	0	5	27	5	1	4	10	37	2	150	4	157	38	333	1	373	530	567
08:15	08:30	17	0	5	22	5	2	2	9	31	1	185	8	194	33	298	1	333	527	558
08:30	08:45	16	0	3	19	4	0	1	5	24	1	224	13	240	35	251	0	286	526	550
08:45	09:00	16	0	5	21	3	0	2	6	27	3	203	11	218	30	211	1	242	460	487
09:00	09:15	15	0	6	21	0	1	0	1	22	0	181	10	195	38	200	0	238	433	455
09:15	09:30	8	1	4	13	2	1	0	3	16	0	190	8	198	55	216	0	275	473	489
09:30	09:45	19	1	7	27	2	0	1	3	30	1	190	9	202	31	185	0	216	418	448
09:45	10:00	15	1	6	22	0	0	3	3	25	3	164	11	179	17	152	1	171	350	375
11:30	11:45	14	0	7	21	0	0	0	0	21	0	198	7	206	24	163	1	191	397	418
11:45	12:00	16	0	6	22	0	0	0	0	22	1	204	5	213	21	169	0	191	404	426
12:00	12:15	9	1	6	16	2	1	1	4	20	1	192	15	209	22	176	3	202	411	431
12:15	12:30	14	0	8	22	2	0	0	2	24	0	213	13	226	23	156	2	182	408	432
12:45	13:00	21	1	7	29	2	0	2	4	33	2	206	13	222	25	157	2	184	406	439
13:00	13:15	14	0	3	17	1	0	1	2	19	0	183	16	199	26	169	1	196	395	414
15:30	15:45	7	1	7	15	2	0	1	3	18	1	374	9	384	21	136	0	157	541	559
15:45	16:00	10	0	11	21	1	0	0	1	22	5	386	12	403	14	164	3	181	584	606
16:00	16:15	10	1	6	17	0	0	3	3	20	0	405	6	412	12	171	5	188	600	620
16:15	16:30	15	0	14	29	2	0	0	2	31	0	414	9	423	11	157	1	169	592	623
16:30	16:45	6	0	10	16	4	1	3	8	24	0	406	10	416	13	144	4	161	577	601
17:00	17:15	11	1	6	18	0	0	1	1	19	1	362	2	365	9	168	3	182	547	566
17:15	17:30	12	0	8	20	0	0	2	2	22	1	359	6	366	15	160	3	181	547	569
17:30	17:45	9	0	9	18	2	0	0	2	20	1	266	11	281	10	134	3	147	428	448
Total:		437	9	194	640	57	8	36	102	742	30	7870	287	8223	784	6220	51	7080	15303	16,045

Note: U-Turns are included in Totals, cyclist volume is not included in totals. For cyclist volumes refer to Cyclist Volume report.

Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SINCLAIR ST

Survey Date: Tuesday, April 11, 2017

WO No: 36896

Start Time: 07:00

Device: Miovision

Full Study Cyclist Volume

		SINCLAIR ST			MONTREAL RD			Grand Total
Time Period		Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	
07:00	07:15	0	0	0	0	0	0	0
07:15	07:30	0	0	0	0	0	0	0
07:30	07:45	0	0	0	0	0	0	0
12:30	12:45	0	0	0	0	0	0	0
13:15	13:30	0	0	0	0	0	0	0
15:00	15:15	0	0	0	0	0	0	0
15:15	15:30	0	0	0	0	0	0	0
16:45	17:00	0	0	0	1	0	1	1
17:45	18:00	0	0	0	0	0	0	0
07:45	08:00	0	0	0	0	0	0	0
08:00	08:15	0	0	0	0	0	0	0
08:15	08:30	0	0	0	0	1	1	1
08:30	08:45	0	0	0	0	0	0	0
08:45	09:00	0	0	0	0	0	0	0
09:00	09:15	0	0	0	0	0	0	0
09:15	09:30	0	0	0	0	0	0	0
09:30	09:45	0	0	0	0	0	0	0
09:45	10:00	0	0	0	0	0	0	0
11:30	11:45	0	0	0	0	0	0	0
11:45	12:00	0	0	0	0	0	0	0
12:00	12:15	0	0	0	0	0	0	0
12:15	12:30	0	0	0	0	0	0	0
12:45	13:00	0	0	0	0	0	0	0
13:00	13:15	0	0	0	0	0	0	0
15:30	15:45	1	0	1	1	0	1	2
15:45	16:00	0	0	0	2	0	2	2
16:00	16:15	0	0	0	0	0	0	0
16:15	16:30	0	0	0	0	0	0	0
16:30	16:45	0	0	0	1	0	1	1
17:00	17:15	0	0	0	1	0	1	1
17:15	17:30	0	0	0	0	0	0	0
17:30	17:45	0	0	0	0	0	0	0
Total		1	0	1	6	1	7	8

Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SINCLAIR ST

Survey Date: Tuesday, April 11, 2017

WO No: 36896

Start Time: 07:00

Device: Miovision

Full Study Pedestrian Volume

SINCLAIR ST

MONTREAL RD

Time Period	NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00 07:15	2	2	4	0	0	0	4
07:15 07:30	4	1	5	1	0	1	6
07:30 07:45	2	5	7	0	0	0	7
12:30 12:45	12	0	12	0	2	2	14
13:15 13:30	9	5	14	4	0	4	18
15:00 15:15	3	1	4	0	1	1	5
15:15 15:30	9	11	20	3	5	8	28
16:45 17:00	3	6	9	1	0	1	10
17:45 18:00	9	2	11	1	0	1	12
07:45 08:00	3	1	4	0	0	0	4
08:00 08:15	3	5	8	0	2	2	10
08:15 08:30	8	2	10	0	2	2	12
08:30 08:45	4	3	7	2	0	2	9
08:45 09:00	1	0	1	0	0	0	1
09:00 09:15	7	1	8	0	1	1	9
09:15 09:30	4	1	5	1	1	2	7
09:30 09:45	2	1	3	0	1	1	4
09:45 10:00	2	0	2	1	1	2	4
11:30 11:45	20	4	24	0	0	0	24
11:45 12:00	4	6	10	0	2	2	12
12:00 12:15	13	1	14	1	0	1	15
12:15 12:30	15	0	15	2	3	5	20
12:45 13:00	7	0	7	3	0	3	10
13:00 13:15	5	4	9	1	2	3	12
15:30 15:45	13	8	21	0	1	1	22
15:45 16:00	9	2	11	2	0	2	13
16:00 16:15	12	3	15	2	0	2	17
16:15 16:30	5	7	12	4	0	4	16
16:30 16:45	5	3	8	0	0	0	8
17:00 17:15	4	2	6	2	0	2	8
17:15 17:30	5	2	7	0	0	0	7
17:30 17:45	6	1	7	0	1	1	8
Total	210	90	300	31	25	56	356

Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SINCLAIR ST

Survey Date: Tuesday, April 11, 2017

WO No: 36896

Start Time: 07:00

Device: Miovision

Full Study Heavy Vehicles

SINCLAIR ST

MONTREAL RD

Northbound

Southbound

Eastbound

Westbound

Time Period	LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00 07:15	0	0	0	0	0	0	0	0	0	0	5	0	5	0	6	0	6	11	11
07:15 07:30	0	0	0	0	0	0	0	0	0	0	3	0	3	1	9	0	10	13	13
07:30 07:45	1	0	0	1	0	0	0	0	1	0	5	1	6	3	10	0	13	19	20
12:30 12:45	0	0	0	0	0	0	0	0	0	0	6	0	6	0	5	0	5	11	11
13:15 13:30	0	0	1	1	0	0	0	0	1	0	10	0	10	1	6	1	8	18	19
15:00 15:15	0	0	0	0	0	0	0	0	0	1	9	0	10	0	5	0	5	15	15
15:15 15:30	0	0	1	1	1	0	0	1	2	0	9	1	10	0	6	0	6	16	18
16:45 17:00	1	0	0	1	0	0	0	0	1	0	4	0	4	0	4	0	4	8	9
17:45 18:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45 08:00	0	0	1	1	0	0	0	0	1	0	7	0	7	3	12	0	15	22	23
08:00 08:15	0	0	0	0	0	0	0	0	0	0	1	0	1	2	8	0	10	11	11
08:15 08:30	0	0	1	1	0	0	0	0	1	0	9	0	9	0	6	1	7	16	17
08:30 08:45	0	0	0	0	0	0	0	0	0	0	15	2	17	0	5	0	5	22	22
08:45 09:00	0	0	1	1	0	0	1	1	2	2	14	0	16	0	3	0	3	19	21
09:00 09:15	0	0	0	0	0	0	0	0	0	0	12	0	12	0	11	0	11	23	23
09:15 09:30	0	0	0	0	0	0	0	0	0	0	4	0	4	1	7	0	8	12	12
09:30 09:45	1	0	0	1	0	0	0	0	1	0	7	1	8	2	6	0	8	16	17
09:45 10:00	0	0	1	1	0	0	0	0	1	0	9	0	9	0	8	0	8	17	18
11:30 11:45	0	0	0	0	0	0	0	0	0	0	11	0	11	0	3	0	3	14	14
11:45 12:00	1	0	0	1	0	0	0	0	1	0	8	0	8	0	4	0	4	12	13
12:00 12:15	0	0	0	0	0	0	0	0	0	0	6	0	6	0	6	0	6	12	12
12:15 12:30	0	0	0	0	0	0	0	0	0	0	7	0	7	0	4	0	4	11	11
12:45 13:00	0	0	1	1	0	0	0	0	1	0	9	0	9	1	2	0	3	12	13
13:00 13:15	1	0	0	1	0	0	0	0	1	0	7	0	7	0	2	0	2	9	10
15:30 15:45	0	0	0	0	0	0	0	0	0	0	11	1	12	2	2	0	4	16	16
15:45 16:00	1	0	0	1	0	0	0	0	1	0	7	1	8	0	5	0	5	13	14
16:00 16:15	0	0	0	0	0	0	0	0	0	0	6	0	6	0	3	0	3	9	9
16:15 16:30	1	0	0	1	0	0	0	0	1	0	5	0	5	0	3	0	3	8	9
16:30 16:45	0	0	0	0	0	0	0	0	0	0	7	0	7	0	1	0	1	8	8
17:00 17:15	0	0	0	0	0	0	0	0	0	0	6	0	6	0	5	0	5	11	11
17:15 17:30	0	0	1	1	0	0	0	0	1	0	1	0	1	0	1	0	1	2	3
17:30 17:45	0	0	0	0	0	0	0	0	0	0	6	0	6	0	0	0	0	6	6
Total: None	7	0	8	15	1	0	1	2	17	3	226	7	236	16	158	2	176	412	429

Transportation Services - Traffic Services

Turning Movement Count - Study Results

MONTREAL RD @ SINCLAIR ST

Survey Date: Tuesday, April 11, 2017

WO No: 36896

Start Time: 07:00

Device: Miovision

Full Study 15 Minute U-Turn Total

SINCLAIR ST

MONTREAL RD

Time Period		Northbound U-Turn Total	Southbound U-Turn Total	Eastbound U-Turn Total	Westbound U-Turn Total	Total
07:00	07:15	0	0	2	1	3
07:15	07:30	0	0	2	2	4
07:30	07:45	0	0	2	0	2
12:30	12:45	0	0	0	0	0
13:15	13:30	0	0	2	1	3
15:00	15:15	0	0	2	1	3
15:15	15:30	0	0	3	0	3
16:45	17:00	0	0	0	1	1
17:45	18:00	0	0	2	1	3
07:45	08:00	0	0	0	0	0
08:00	08:15	0	0	1	1	2
08:15	08:30	0	0	0	1	1
08:30	08:45	0	0	2	0	2
08:45	09:00	0	1	1	0	2
09:00	09:15	0	0	4	0	4
09:15	09:30	0	0	0	4	4
09:30	09:45	0	0	2	0	2
09:45	10:00	0	0	1	1	2
11:30	11:45	0	0	1	3	4
11:45	12:00	0	0	3	1	4
12:00	12:15	0	0	1	1	2
12:15	12:30	0	0	0	1	1
12:45	13:00	0	0	1	0	1
13:00	13:15	0	0	0	0	0
15:30	15:45	0	0	0	0	0
15:45	16:00	0	0	0	0	0
16:00	16:15	0	0	1	0	1
16:15	16:30	0	0	0	0	0
16:30	16:45	0	0	0	0	0
17:00	17:15	0	0	0	2	2
17:15	17:30	0	0	0	3	3
17:30	17:45	0	0	3	0	3
Total		0	1	36	25	62

Appendix D

Collision Data

Total Area

Classification of Accident	01 - Approaching	02 - Angle	03 - Rear end	04 - Sideswipe	05 - Turning movement	06 - SMV unattended vehicle	07 - SMV other	99 - Other	Total
04 - Non-reportable	0	0	2	1	1	0	0	0	4
03 - P.D. only	0	5	25	15	14	0	3	3	65
02 - Non-fatal injury	0	5	4	0	7	0	1	0	17
01 - Fatal injury	0	0	0	0	0	0	0	0	0
Total	0	10	31	16	22	0	4	3	86
	#7 or 0%	#4 or 12%	#1 or 36%	#3 or 19%	#2 or 26%	#7 or 0%	#5 or 5%	#6 or 3%	

5%
76%
20%
0%
95%

MONTREAL RD @ SHEFFORD RD

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2019-2024	62	n/a	2190	n/a

Classification of Accident	01 - Approaching	02 - Angle	03 - Rear end	04 - Sideswipe	05 - Turning movement	06 - SMV unattended vehicle	07 - SMV other	99 - Other	Total
04 - Non-reportable	0	0	2	1	1	0	0	0	4
03 - P.D. only	0	3	18	11	12	0	0	2	46
02 - Non-fatal injury	0	3	2	0	7	0	0	0	12
01 - Fatal injury	0	0	0	0	0	0	0	0	0
Total	0	6	22	12	20	0	0	2	62
	0%	10%	35%	19%	32%	0%	0%	3%	

74%
19%
0%
94%

MONTREAL RD @ SINCLAIR ST

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2019-2024	14	n/a	2190	n/a

Classification of Accident	01 - Approaching	02 - Angle	03 - Rear end	04 - Sideswipe	05 - Turning movement	06 - SMV unattended vehicle	07 - SMV other	99 - Other	Total
04 - Non-reportable	0	0	0	0	0	0	0	0	0
03 - P.D. only	0	1	4	2	2	0	1	0	10
02 - Non-fatal injury	0	2	1	0	0	0	1	0	4
01 - Fatal injury	0	0	0	0	0	0	0	0	0
Total	0	3	5	2	2	0	2	0	14
	0%	21%	36%	14%	14%	0%	14%	0%	

71%
29%
0%
100%

MONTREAL RD btwn SHEFFORD RD & OR174

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2019-2024	6	n/a	2190	n/a

Classification of Accident	01 - Approaching	02 - Angle	03 - Rear end	04 - Sideswipe	05 - Turning movement	06 - SMV unattended vehicle	07 - SMV other	99 - Other	Total
04 - Non-reportable	0	0	0	0	0	0	0	0	0
03 - P.D. only	0	0	2	2	0	0	1	0	5
02 - Non-fatal injury	0	0	1	0	0	0	0	0	1
01 - Fatal injury	0	0	0	0	0	0	0	0	0
Total	0	0	3	2	0	0	1	0	6
	0%	0%	50%	33%	0%	0%	17%	0%	

83%
17%
0%
100%

MONTREAL RD btwn SINCLAIR ST & SHEFFORD RD

Years	Total # Collisions	24 Hr AADT Veh Volume	Days	Collisions/MEV
2019-2024	4	n/a	2190	n/a

Classification of Accident	01 - Approaching	02 - Angle	03 - Rear end	04 - Sideswipe	05 - Turning movement	06 - SMV unattended vehicle	07 - SMV other	99 - Other	Total
04 - Non-reportable	0	0	0	0	0	0	0	0	0
03 - P.D. only	0	1	1	0	0	0	1	1	4
02 - Non-fatal injury	0	0	0	0	0	0	0	0	0
01 - Fatal injury	0	0	0	0	0	0	0	0	0
Total	0	1	1	0	0	0	1	1	4
	0%	25%	25%	0%	0%	0%	25%	25%	

100%
0%
0%
100%

X_Coordinate	Y_Coordinate	ID	Geo_ID	Accident_Year	Accident_Desc	Location	Classification_Of_Accident	Initial_Impact_Type	Road_1_Surface	Environment	C_Light	Traffic_Control	Num_of_vehicle
376124.8298	5034852.137	2021-61231	12423	2021	2021-09-28	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	05 - Turning movement	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376124.7414	5034853.094	2024-103553	12423	2024	2024-01-27	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	03 - Rear end	06 - Ice	01 - Clear	01 - Daylight	01 - Traffic sign	2
376126.3808	5034852	2021-62687	12423	2021	2021-11-18	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	04 - Sideswipe	01 - Dry	01 - Clear	05 - Dusk	01 - Traffic sign	2
376124.642	5034853.503	2022-75076	12423	2022	2022-11-09	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	04 - Sideswipe	01 - Dry	01 - Clear	07 - Dark	01 - Traffic sign	2
376125.1204	5034853.839	2021-62046	12423	2021	2021-10-28	MONTREAL RD @ SHEFFORD RD	02 - Non-fatal injury	05 - Turning movement	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	3
376125.7267	5034853.587	2024-104816	12423	2024	2024-03-05	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	04 - Sideswipe	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7273	5034853.588	2024-104060	12423	2024	2024-02-13	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	03 - Rear end	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7277	5034853.588	2024-113280	12423	2024	2024-11-20	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	04 - Sideswipe	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7277	5034853.588	2024-101521	12423	2024	2024-09-23	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	05 - Turning movement	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	3
376125.7278	5034853.588	2024-102792	12423	2024	2024-01-12	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	02 - Angle	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7278	5034853.588	2024-109563	12423	2024	2024-08-02	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	05 - Turning movement	01 - Dry	01 - Clear	05 - Dusk	01 - Traffic sign	2
376125.7279	5034853.588	2020-50674	12423	2020	2020-07-31	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	05 - Turning movement	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2022-107177	12423	2024	2024-05-20	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	04 - Sideswipe	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2024-100621	12423	2024	2024-06-09	MONTREAL RD @ SHEFFORD RD	02 - Non-fatal injury	05 - Turning movement	01 - Dry	01 - Clear	07 - Dark	01 - Traffic sign	3
376125.7279	5034853.588	2020-53113	12423	2020	2020-11-20	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	03 - Rear end	01 - Dry	01 - Clear	07 - Dark	01 - Traffic sign	3
376125.7279	5034853.588	2019-40821	12423	2019	2019-11-05	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	03 - Rear end	02 - Wet	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2022-69090	12423	2022	2022-05-06	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	04 - Sideswipe	01 - Dry	01 - Clear	07 - Dark	01 - Traffic sign	2
376125.7279	5034853.588	2022-70126	12423	2022	2022-06-10	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	03 - Rear end	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2021-57143	12423	2021	2021-03-11	MONTREAL RD @ SHEFFORD RD	02 - Non-fatal injury	05 - Turning movement	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	5
376125.7279	5034853.588	2024-112084	12423	2024	2024-10-20	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	02 - Angle	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2021-57205	12423	2021	2021-03-14	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	04 - Sideswipe	01 - Dry	01 - Clear	07 - Dark	01 - Traffic sign	2
376125.7279	5034853.588	2021-58122	12423	2021	2021-04-20	MONTREAL RD @ SHEFFORD RD	02 - Non-fatal injury	03 - Rear end	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2020-52136	12423	2020	2020-10-08	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	04 - Sideswipe	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2019-33221	12423	2019	2019-04-08	MONTREAL RD @ SHEFFORD RD	02 - Non-fatal injury	02 - Angle	02 - Wet	02 - Rain	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2019-33545	12423	2019	2019-04-17	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	04 - Sideswipe	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2020-51211	12423	2020	2020-08-26	MONTREAL RD @ SHEFFORD RD	02 - Non-fatal injury	02 - Angle	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2020-47869	12423	2020	2020-02-23	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	03 - Rear end	01 - Dry	01 - Clear	07 - Dark	01 - Traffic sign	2
376125.7279	5034853.588	2019-33994	12423	2019	2019-05-02	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	05 - Turning movement	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2019-36978	12423	2019	2019-07-25	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	03 - Rear end	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2021-60764	12423	2021	2021-09-12	MONTREAL RD @ SHEFFORD RD	02 - Non-fatal injury	05 - Turning movement	01 - Dry	01 - Clear	07 - Dark	01 - Traffic sign	2
376125.7279	5034853.588	2021-63165	12423	2021	2021-12-02	MONTREAL RD @ SHEFFORD RD	02 - Non-fatal injury	03 - Rear end	02 - Wet	02 - Rain	05 - Dusk	01 - Traffic sign	2
376125.7279	5034853.588	2020-46742	12423	2020	2020-01-29	MONTREAL RD @ SHEFFORD RD	02 - Non-fatal injury	02 - Angle	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2024-109807	12423	2024	2024-08-13	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	03 - Rear end	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2021-60856	12423	2021	2021-09-16	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	99 - Other	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2019-29530	12423	2019	2019-01-14	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	03 - Rear end	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2021-62274	12423	2021	2021-11-04	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	04 - Sideswipe	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2019-33236	12423	2019	2019-04-08	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	03 - Rear end	02 - Wet	01 - Clear	07 - Dark	01 - Traffic sign	2
376125.7279	5034853.588	2019-31210	12423	2019	2019-02-11	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	05 - Turning movement	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2024-109823	12423	2024	2024-08-14	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	05 - Turning movement	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2021-59755	12423	2021	2021-07-22	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	03 - Rear end	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2024-108576	12423	2024	2024-07-03	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	05 - Turning movement	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2024-112761	12423	2024	2024-11-04	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	03 - Rear end	02 - Wet	02 - Rain	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2020-51640	12423	2020	2020-09-15	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	05 - Turning movement	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2020-54310	12423	2020	2020-06-04	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	04 - Sideswipe	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2019-35248	12423	2019	2019-06-06	MONTREAL RD @ SHEFFORD RD	02 - Non-fatal injury	05 - Turning movement	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2024-108994	12423	2024	2024-07-17	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	99 - Other	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2024-109725	12423	2024	2024-08-11	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	05 - Turning movement	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2019-30949	12423	2019	2019-02-05	MONTREAL RD @ SHEFFORD RD	02 - Non-fatal injury	05 - Turning movement	02 - Wet	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2019-42238	12423	2019	2019-12-05	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	02 - Angle	01 - Dry	01 - Clear	07 - Dark	01 - Traffic sign	2
376125.7279	5034853.588	2021-61181	12423	2021	2021-09-27	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	03 - Rear end	02 - Wet	02 - Rain	01 - Daylight	01 - Traffic sign	3
376125.7279	5034853.588	2019-30143	12423	2019	2019-01-23	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	03 - Rear end	04 - Slush	03 - Snow	07 - Dark	01 - Traffic sign	2
376125.7279	5034853.588	2019-38978	12423	2019	2019-09-20	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	03 - Rear end	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7279	5034853.588	2024-101181	12423	2024	2024-08-24	MONTREAL RD @ SHEFFORD RD	02 - Non-fatal injury	05 - Turning movement	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.728	5034853.588	2024-108975	12423	2024	2024-07-16	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	03 - Rear end	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7285	5034853.588	2024-103280	12423	2024	2024-01-19	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	05 - Turning movement	05 - Packed snc	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7272	5034853.589	2024-110389	12423	2024	2024-08-28	MONTREAL RD @ SHEFFORD RD	04 - Non-reportable	04 - Sideswipe	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376125.7281	5034853.589	2024-105380	12423	2024	2024-03-25	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	05 - Turning movement	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376126.3668	5034853.235	2021-61786	12423	2021	2021-10-19	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	03 - Rear end	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2

375972.2398	5034759.14	2022-75041	8675	2022	2022-11-08	MONTREAL RD @ SINCLAIR ST	03 - P.D. only	03 - Rear end	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	3
375971.94	5034759.085	2019-41246	8675	2019	2019-11-13	MONTREAL RD @ SINCLAIR ST	02 - Non-fatal injury	03 - Rear end	02 - Wet	01 - Clear	01 - Daylight	01 - Traffic sign	3
375971.94	5034759.085	2021-60710	8675	2021	2021-09-10	MONTREAL RD @ SINCLAIR ST	03 - P.D. only	03 - Rear end	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
375971.94	5034759.085	2021-55683	8675	2021	2021-01-12	MONTREAL RD @ SINCLAIR ST	03 - P.D. only	02 - Angle	02 - Wet	03 - Snow	07 - Dark	01 - Traffic sign	2
375971.94	5034759.085	2022-65537	8675	2022	2022-01-14	MONTREAL RD @ SINCLAIR ST	02 - Non-fatal injury	02 - Angle	02 - Wet	01 - Clear	01 - Daylight	01 - Traffic sign	3
375971.94	5034759.085	2019-42089	8675	2019	2019-12-03	MONTREAL RD @ SINCLAIR ST	03 - P.D. only	05 - Turning movement	01 - Dry	01 - Clear	07 - Dark	01 - Traffic sign	2
375971.94	5034759.085	2022-67146	8675	2022	2022-02-25	MONTREAL RD @ SINCLAIR ST	03 - P.D. only	07 - SMV other	06 - Ice	01 - Clear	07 - Dark	01 - Traffic sign	1
375971.94	5034759.085	2022-68064	8675	2022	2022-03-25	MONTREAL RD @ SINCLAIR ST	03 - P.D. only	03 - Rear end	01 - Dry	01 - Clear	07 - Dark	01 - Traffic sign	2
375971.94	5034759.085	2020-54080	8675	2020	2020-12-24	MONTREAL RD @ SINCLAIR ST	03 - P.D. only	04 - Sideswipe	02 - Wet	02 - Rain	07 - Dark	01 - Traffic sign	2
375971.94	5034759.085	2019-41613	8675	2019	2019-11-21	MONTREAL RD @ SINCLAIR ST	03 - P.D. only	03 - Rear end	01 - Dry	01 - Clear	07 - Dark	01 - Traffic sign	2
375971.94	5034759.085	2021-63882	8675	2021	2021-12-21	MONTREAL RD @ SINCLAIR ST	02 - Non-fatal injury	02 - Angle	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
375971.9399	5034759.085	2024-101601	8675	2024	2024-09-30	MONTREAL RD @ SINCLAIR ST	02 - Non-fatal injury	07 - SMV other	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	1
375968.7471	5034756.385	2022-69275	8675	2022	2022-05-13	MONTREAL RD @ SINCLAIR ST	03 - P.D. only	04 - Sideswipe	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
375968.5889	5034756.666	2022-71376	8675	2022	2022-07-27	MONTREAL RD @ SINCLAIR ST	03 - P.D. only	05 - Turning movement	01 - Dry	01 - Clear	07 - Dark	01 - Traffic sign	2
376154.2167	5034867.165	2024-101819	__3Z053Y	2024	2024-10-25	MONTREAL RD btwn SHEFFORD RD & OR174	03 - P.D. only	07 - SMV other	01 - Dry	01 - Clear	07 - Dark	10 - No control	1
376157.8242	5034868.889	2024-114415	__3Z053Y	2024	2024-12-14	MONTREAL RD btwn SHEFFORD RD & OR174	03 - P.D. only	03 - Rear end	01 - Dry	01 - Clear	01 - Daylight	10 - No control	3
376160.4268	5034870.13	2019-37143	__3Z053Y	2019	2019-07-29	MONTREAL RD btwn SHEFFORD RD & OR174	03 - P.D. only	04 - Sideswipe	01 - Dry	01 - Clear	07 - Dark	10 - No control	2
376161.1958	5034870.497	2021-57276	__3Z053Y	2021	2021-03-19	MONTREAL RD btwn SHEFFORD RD & OR174	03 - P.D. only	04 - Sideswipe	01 - Dry	01 - Clear	01 - Daylight	10 - No control	2
376162.9716	5034871.343	2019-42476	__3Z053Y	2019	2019-12-11	MONTREAL RD btwn SHEFFORD RD & OR174	03 - P.D. only	03 - Rear end	01 - Dry	01 - Clear	01 - Daylight	10 - No control	2
376165.2498	5034872.402	2022-65555	__3Z053Y	2022	2022-01-14	MONTREAL RD btwn SHEFFORD RD & OR174	02 - Non-fatal injury	03 - Rear end	01 - Dry	01 - Clear	05 - Dusk	10 - No control	2
376094.56	5034835.618	2019-41322	__3Z08XM	2019	2019-11-15	MONTREAL RD btwn SINCLAIR ST & SHEFFORD RD	03 - P.D. only	02 - Angle	02 - Wet	01 - Clear	01 - Daylight	10 - No control	2
376039.2005	5034801.065	2020-50495	__3Z08XM	2020	2020-07-23	MONTREAL RD btwn SINCLAIR ST & SHEFFORD RD	03 - P.D. only	99 - Other	01 - Dry	01 - Clear	01 - Daylight	10 - No control	2
376124.7208	5034853.034	2024-102345	__3Z08XM	2024	2024-12-25	MONTREAL RD btwn SINCLAIR ST & SHEFFORD RD	03 - P.D. only	07 - SMV other	03 - Loose snow	01 - Clear	01 - Daylight	10 - No control	2
375976.7267	5034762.073	2020-52727	__3Z08XM	2020	2020-11-04	MONTREAL RD btwn SINCLAIR ST & SHEFFORD RD	03 - P.D. only	03 - Rear end	01 - Dry	01 - Clear	07 - Dark	10 - No control	2
376126.687	5034845.49	2024-105197		2024	2024-03-18	MONTREAL RD @ SHEFFORD RD	04 - Non-reportable	05 - Turning movement	01 - Dry	01 - Clear	03 - Dawn	10 - No control	2
376126.687	5034845.49	2024-106523		2024	2024-04-28	MONTREAL RD @ SHEFFORD RD	04 - Non-reportable	03 - Rear end	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376112.958	5034854.502	2024-104876		2024	2024-03-07	MONTREAL RD @ SHEFFORD RD	04 - Non-reportable	03 - Rear end	01 - Dry	01 - Clear	01 - Daylight	01 - Traffic sign	2
376126.944	5034847.004	2024-114755		2024	2024-12-23	MONTREAL RD @ SHEFFORD RD	03 - P.D. only	03 - Rear end	05 - Packed snow	03 - Snow	07 - Dark	01 - Traffic sign	2

Appendix E

Existing Synchro Output Files

1: Shefford & Montreal
Existing AM

Baseline
Default

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			 			 		 		
Traffic Volume (vph)	192	534	16	63	1156	712	31	20	48	366	30	159
Future Volume (vph)	192	534	16	63	1156	712	31	20	48	366	30	159
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		0.0	50.0		100.0	30.0		0.0	0.0		30.0
Storage Lanes	1		0	1		0	1		0	2		1
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.996				0.850		0.894				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5065	0	1770	3539	1583	1770	1665	0	3433	1863	1583
Flt Permitted	0.080			0.410			0.950			0.950		
Satd. Flow (perm)	149	5065	0	764	3539	1583	1770	1665	0	3433	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4				527		53				177
Link Speed (k/h)		60			60			40			50	
Link Distance (m)		91.3			294.7			71.0			192.4	
Travel Time (s)		5.5			17.7			6.4			13.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	213	593	18	70	1284	791	34	22	53	407	33	177
Shared Lane Traffic (%)												
Lane Group Flow (vph)	213	611	0	70	1284	791	34	75	0	407	33	177
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2			6		6						4
Detector Phase	5	2		1	6	6	8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.0	27.0		11.0	27.0	27.0	33.5	33.5		34.1	34.1	34.1
Total Split (s)	15.0	33.0		15.0	33.0	33.0	33.0	33.0		34.0	34.0	34.0
Total Split (%)	13.0%	28.7%		13.0%	28.7%	28.7%	28.7%	28.7%		29.6%	29.6%	29.6%
Maximum Green (s)	9.0	27.0		9.0	27.0	27.0	26.5	26.5		27.9	27.9	27.9
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.3	3.3		3.3	3.3	3.3
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	3.2	3.2		2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.5	6.5		6.1	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None		None	None	None
Walk Time (s)		7.0			7.0	7.0	7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)		14.0			14.0	14.0	20.0	20.0		21.0	21.0	21.0
Pedestrian Calls (#/hr)		15			15	15	5	5		5	5	5
Act Effect Green (s)	65.3	55.4		52.9	45.5	45.5	13.3	13.3		19.9	19.9	19.9
Actuated g/C Ratio	0.57	0.48		0.46	0.40	0.40	0.12	0.12		0.17	0.17	0.17
v/c Ratio	0.72	0.25		0.17	0.92	0.84	0.17	0.31		0.69	0.10	0.42
Control Delay	43.0	18.0		17.3	46.1	21.0	45.0	20.5		50.2	38.3	8.6
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	43.0	18.0		17.3	46.1	21.0	45.0	20.5		50.2	38.3	8.6

1: Shefford & Montreal
Existing AM

Baseline
Default

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	B		B	D	C	D	C		D	D	A
Approach Delay		24.4			35.9			28.1			37.7	
Approach LOS		C			D			C			D	
Queue Length 50th (m)	30.9	31.3		6.7	149.9	60.6	7.6	4.9		47.6	6.7	0.0
Queue Length 95th (m)	#105.3	35.4		21.2	#269.5	#173.6	15.2	16.8		58.7	14.5	17.6
Internal Link Dist (m)		67.3			270.7			47.0			168.4	
Turn Bay Length (m)	75.0			50.0		100.0	30.0					30.0
Base Capacity (vph)	296	2443		440	1399	944	407	424		832	451	518
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.72	0.25		0.16	0.92	0.84	0.08	0.18		0.49	0.07	0.34

Intersection Summary

Area Type: Other

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 29 (25%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 33.4

Intersection LOS: C

Intersection Capacity Utilization 78.5%

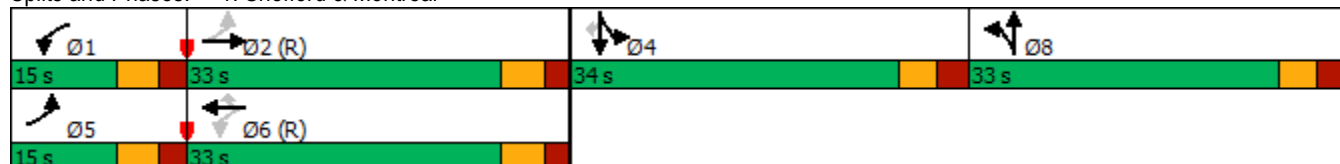
ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Shefford & Montreal



2: Sinclair & Montreal Existing AM

Baseline
Default

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	643	33	156	1309	3	79	0	20	15	3	10
Future Volume (vph)	5	643	33	156	1309	3	79	0	20	15	3	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	55.0		0.0	65.0		0.0	25.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.993						0.850			0.952	
Flt Protected	0.950			0.950			0.950				0.973	
Satd. Flow (prot)	1770	3514	0	1770	3539	0	1770	1583	0	0	1725	0
Flt Permitted	0.154			0.361			0.737				0.841	
Satd. Flow (perm)	287	3514	0	672	3539	0	1373	1583	0	0	1491	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8						241			11	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		144.2			85.9			105.3			75.0	
Travel Time (s)		8.7			5.2			7.6			5.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	6	714	37	173	1454	3	88	0	22	17	3	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	6	751	0	173	1457	0	88	22	0	0	31	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.0	24.0		24.0	24.0		38.0	38.0		38.0	38.0	
Total Split (s)	77.0	77.0		77.0	77.0		38.0	38.0		38.0	38.0	
Total Split (%)	67.0%	67.0%		67.0%	67.0%		33.0%	33.0%		33.0%	33.0%	
Maximum Green (s)	71.0	71.0		71.0	71.0		32.0	32.0		32.0	32.0	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		25.0	25.0		25.0	25.0	
Pedestrian Calls (#/hr)	15	15		15	15		5	5		5	5	
Act Effect Green (s)	91.4	91.4		91.4	91.4		16.0	16.0			16.0	
Actuated g/C Ratio	0.79	0.79		0.79	0.79		0.14	0.14			0.14	
v/c Ratio	0.03	0.27		0.32	0.52		0.46	0.05			0.14	
Control Delay	6.8	5.2		4.3	4.5		51.0	0.2			29.4	
Queue Delay	0.0	0.0		0.0	0.2		0.0	0.0			0.0	
Total Delay	6.8	5.2		4.3	4.6		51.0	0.2			29.4	

2: Sinclair & Montreal Existing AM

Baseline
Default

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A		A	A		D	A			C	
Approach Delay		5.2			4.6			40.8			29.4	
Approach LOS		A			A			D			C	
Queue Length 50th (m)	0.3	20.6		4.5	20.7		20.2	0.0			4.4	
Queue Length 95th (m)	2.4	53.5		m4.2	m75.4		30.4	0.0			11.3	
Internal Link Dist (m)		120.2			61.9			81.3			51.0	
Turn Bay Length (m)	55.0			65.0			25.0					
Base Capacity (vph)	228	2793		533	2811		382	614			422	
Starvation Cap Reductn	0	0		0	475		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	0.03	0.27		0.32	0.62		0.23	0.04			0.07	

Intersection Summary

Area Type: Other

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 31 (27%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.52

Intersection Signal Delay: 6.6

Intersection LOS: A

Intersection Capacity Utilization 67.9%

ICU Level of Service C

Analysis Period (min) 15

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

Splits and Phases: 2: Sinclair & Montreal



5: Site & Montreal Existing AM

Baseline
Default

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑↱			↑↑		↱
Traffic Volume (vph)	744	0	0	1348	0	0
Future Volume (vph)	744	0	0	1348	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.91	0.91	1.00	0.95	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	5085	0	0	3539	0	1863
Flt Permitted						
Satd. Flow (perm)	5085	0	0	3539	0	1863
Link Speed (k/h)	60			60	50	
Link Distance (m)	85.9			91.3	68.9	
Travel Time (s)	5.2			5.5	5.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	827	0	0	1498	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	827	0	0	1498	0	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	40.6%			ICU Level of Service A		
Analysis Period (min)	15					

5: Site & Montreal Existing AM

Baseline
Default

Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑			↑↑		↗
Traffic Vol, veh/h	744	0	0	1348	0	0
Future Vol, veh/h	744	0	0	1348	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	827	0	0	1498	0	0
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	-	-	-	414
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	-	-	0	-	0	502
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	502
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	0		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	-	-	-	-		
HCM Lane V/C Ratio	-	-	-	-		
HCM Control Delay (s)	0	-	-	-		
HCM Lane LOS	A	-	-	-		
HCM 95th %tile Q(veh)	-	-	-	-		

6: Shefford & Site
Existing AM

Baseline
Default

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	99	109	0
Future Volume (vph)	0	0	0	99	109	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1863	0	0	1863	1863	0
Flt Permitted						
Satd. Flow (perm)	1863	0	0	1863	1863	0
Link Speed (k/h)	50			40	50	
Link Distance (m)	62.6			91.1	71.0	
Travel Time (s)	4.5			8.2	5.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	110	121	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	110	121	0
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 9.1%	ICU Level of Service A					
Analysis Period (min) 15						

6: Shefford & Site
Existing AM

Baseline
Default

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	99	109	0
Future Vol, veh/h	0	0	0	99	109	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	110	121	0
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	231	121	-	0	-	0
Stage 1	121	-	-	-	-	-
Stage 2	110	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	757	930	0	-	-	-
Stage 1	904	-	0	-	-	-
Stage 2	915	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	757	930	-	-	-	-
Mov Cap-2 Maneuver	757	-	-	-	-	-
Stage 1	904	-	-	-	-	-
Stage 2	915	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	0	0		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR		
Capacity (veh/h)	-	-	-	-		
HCM Lane V/C Ratio	-	-	-	-		
HCM Control Delay (s)	-	0	-	-		
HCM Lane LOS	-	A	-	-		
HCM 95th %tile Q(veh)	-	-	-	-		

1: Shefford & Montreal
Existing PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			 			 		 		
Traffic Volume (vph)	120	1188	40	53	461	299	43	22	79	673	40	158
Future Volume (vph)	120	1188	40	53	461	299	43	22	79	673	40	158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		0.0	50.0		100.0	30.0		0.0	0.0		30.0
Storage Lanes	1		0	1		0	1		0	2		1
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.995				0.850		0.882				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5060	0	1770	3539	1583	1770	1643	0	3433	1863	1583
Flt Permitted	0.370			0.116			0.950			0.950		
Satd. Flow (perm)	689	5060	0	216	3539	1583	1770	1643	0	3433	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4				332		88				176
Link Speed (k/h)		60			60			40			50	
Link Distance (m)		91.3			294.7			71.0			192.4	
Travel Time (s)		5.5			17.7			6.4			13.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	133	1320	44	59	512	332	48	24	88	748	44	176
Shared Lane Traffic (%)												
Lane Group Flow (vph)	133	1364	0	59	512	332	48	112	0	748	44	176
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2			6		6						4
Detector Phase	5	2		1	6	6	8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.0	27.0		11.0	27.0	27.0	33.5	33.5		34.1	34.1	34.1
Total Split (s)	15.0	44.0		15.0	44.0	44.0	33.0	33.0		38.0	38.0	38.0
Total Split (%)	11.5%	33.8%		11.5%	33.8%	33.8%	25.4%	25.4%		29.2%	29.2%	29.2%
Maximum Green (s)	9.0	38.0		9.0	38.0	38.0	26.5	26.5		31.9	31.9	31.9
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.3	3.3		3.3	3.3	3.3
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	3.2	3.2		2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.5	6.5		6.1	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None		None	None	None
Walk Time (s)		7.0			7.0	7.0	7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)		14.0			14.0	14.0	20.0	20.0		21.0	21.0	21.0
Pedestrian Calls (#/hr)		15			15	15	5	5		5	5	5
Act Effect Green (s)	63.9	55.9		59.0	51.5	51.5	13.4	13.4		31.0	31.0	31.0
Actuated g/C Ratio	0.49	0.43		0.45	0.40	0.40	0.10	0.10		0.24	0.24	0.24
v/c Ratio	0.32	0.63		0.32	0.37	0.40	0.26	0.45		0.91	0.10	0.34
Control Delay	19.3	32.1		23.0	30.1	4.9	55.1	21.1		64.5	38.8	7.5
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	19.3	32.1		23.0	30.1	4.9	55.1	21.1		64.5	38.8	7.5

1: Shefford & Montreal Existing PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	B	C		C	C	A	E	C		E	D	A
Approach Delay		31.0			20.4			31.3			53.0	
Approach LOS		C			C			C			D	
Queue Length 50th (m)	17.4	100.0		7.4	49.6	0.0	12.5	6.2		100.9	9.2	0.0
Queue Length 95th (m)	42.0	#161.8		19.1	78.1	22.7	22.3	22.1		#134.5	19.6	18.6
Internal Link Dist (m)		67.3			270.7			47.0			168.4	
Turn Bay Length (m)	75.0			50.0		100.0	30.0					30.0
Base Capacity (vph)	420	2177		208	1402	827	360	404		843	458	521
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.32	0.63		0.28	0.37	0.40	0.13	0.28		0.89	0.10	0.34

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 20 (15%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 34.3

Intersection LOS: C

Intersection Capacity Utilization 69.0%

ICU Level of Service C

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Shefford & Montreal

														
Ø1	Ø2 (R)		Ø4			Ø8								
15 s	44 s		38 s			33 s								
Ø5	Ø6 (R)													
15 s	44 s													

2: Sinclair & Montreal

Existing PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	1311	37	50	636	13	41	1	41	7	1	6
Future Volume (vph)	5	1311	37	50	636	13	41	1	41	7	1	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	55.0		0.0	65.0		0.0	25.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.997			0.853			0.941	
Flt Protected	0.950			0.950			0.950				0.976	
Satd. Flow (prot)	1770	3525	0	1770	3529	0	1770	1589	0	0	1711	0
Flt Permitted	0.375			0.152			0.747				0.854	
Satd. Flow (perm)	699	3525	0	283	3529	0	1391	1589	0	0	1497	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			3			46			7	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		144.2			85.9			105.3			75.0	
Travel Time (s)		8.7			5.2			7.6			5.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	6	1457	41	56	707	14	46	1	46	8	1	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	6	1498	0	56	721	0	46	47	0	0	16	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.0	24.0		24.0	24.0		38.0	38.0		38.0	38.0	
Total Split (s)	92.0	92.0		92.0	92.0		38.0	38.0		38.0	38.0	
Total Split (%)	70.8%	70.8%		70.8%	70.8%		29.2%	29.2%		29.2%	29.2%	
Maximum Green (s)	86.0	86.0		86.0	86.0		32.0	32.0		32.0	32.0	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		25.0	25.0		25.0	25.0	
Pedestrian Calls (#/hr)	15	15		15	15		5	5		5	5	
Act Effect Green (s)	107.7	107.7		107.7	107.7		14.7	14.7			14.7	
Actuated g/C Ratio	0.83	0.83		0.83	0.83		0.11	0.11			0.11	
v/c Ratio	0.01	0.51		0.24	0.25		0.29	0.21			0.09	
Control Delay	5.2	6.2		20.5	11.7		54.6	14.7			33.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	5.2	6.2		20.5	11.7		54.6	14.7			33.6	

2: Sinclair & Montreal

Existing PM

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A		C	B		D	B			C	
Approach Delay		6.2			12.4			34.5			33.6	
Approach LOS		A			B			C			C	
Queue Length 50th (m)	0.2	48.6		9.3	62.9		12.1	0.3			2.3	
Queue Length 95th (m)	2.1	137.6		23.1	81.9		20.9	10.3			8.2	
Internal Link Dist (m)		120.2			61.9			81.3			51.0	
Turn Bay Length (m)	55.0			65.0			25.0					
Base Capacity (vph)	579	2921		234	2924		342	425			373	
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	0.01	0.51		0.24	0.25		0.13	0.11			0.04	

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 110 (85%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.51

Intersection Signal Delay: 9.5

Intersection LOS: A

Intersection Capacity Utilization 59.9%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 2: Sinclair & Montreal



5: Site & Montreal

Existing PM

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑↱			↑↑		↱
Traffic Volume (vph)	1349	0	0	664	0	0
Future Volume (vph)	1349	0	0	664	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.91	0.91	1.00	0.95	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	5085	0	0	3539	0	1863
Flt Permitted						
Satd. Flow (perm)	5085	0	0	3539	0	1863
Link Speed (k/h)	60			60	50	
Link Distance (m)	85.9			91.3	68.9	
Travel Time (s)	5.2			5.5	5.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	1499	0	0	738	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1499	0	0	738	0	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	29.4%			ICU Level of Service A		
Analysis Period (min)	15					

5: Site & Montreal

Existing PM

Intersection

Int Delay, s/veh 0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑			↑↑		↑
Traffic Vol, veh/h	1349	0	0	664	0	0
Future Vol, veh/h	1349	0	0	664	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1499	0	0	738	0	0

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	- - - 750
Stage 1	-	-	- - -
Stage 2	-	-	- - -
Critical Hdwy	-	-	- - - 7.14
Critical Hdwy Stg 1	-	-	- - -
Critical Hdwy Stg 2	-	-	- - -
Follow-up Hdwy	-	-	- - - 3.92
Pot Cap-1 Maneuver	-	-	0 - 0 304
Stage 1	-	-	0 - 0
Stage 2	-	-	0 - 0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	- - - 304
Mov Cap-2 Maneuver	-	-	- - -
Stage 1	-	-	- - -
Stage 2	-	-	- - -

Approach	EB	WB	NB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-
HCM Control Delay (s)	0	-	-	-
HCM Lane LOS	A	-	-	-
HCM 95th %tile Q(veh)	-	-	-	-

6: Shefford & Site

Existing PM

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	144	133	0
Future Volume (vph)	0	0	0	144	133	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1863	0	0	1863	1863	0
Flt Permitted						
Satd. Flow (perm)	1863	0	0	1863	1863	0
Link Speed (k/h)	50			40	50	
Link Distance (m)	62.6			91.1	71.0	
Travel Time (s)	4.5			8.2	5.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	160	148	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	160	148	0
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	10.9%			ICU Level of Service A		
Analysis Period (min)	15					

6: Shefford & Site

Existing PM

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	144	133	0
Future Vol, veh/h	0	0	0	144	133	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	160	148	0
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	308	148	-	0	-	0
Stage 1	148	-	-	-	-	-
Stage 2	160	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	684	899	0	-	-	-
Stage 1	880	-	0	-	-	-
Stage 2	869	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	684	899	-	-	-	-
Mov Cap-2 Maneuver	684	-	-	-	-	-
Stage 1	880	-	-	-	-	-
Stage 2	869	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	0	0		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT EBLn1		SBT	SBR		
Capacity (veh/h)	-	-	-	-		
HCM Lane V/C Ratio	-	-	-	-		
HCM Control Delay (s)	-	0	-	-		
HCM Lane LOS	-	A	-	-		
HCM 95th %tile Q(veh)	-	-	-	-		

Appendix F

NCHRP 684 Internal Trip Capture
Estimation Tool

NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	2180 Montreal Road TIA			Organization:	JLR
Project Location:	Ottawa, ON			Performed By:	R. Nahas
Scenario Description:	Projected Trip Generation			Date:	2026-02-13
Analysis Year:				Checked By:	D. Hook
Analysis Period:	AM Street Peak Hour			Date:	46066

Table 1-A: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips ³		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail				311	157	154
Restaurant				55	28	27
Cinema/Entertainment				0		
Residential				0		
Hotel				0		
All Other Land Uses ²				0		
				366	185	181

Table 2-A: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% Transit	% Non-Motorized
Office						
Retail	1.15	5%	5%	1.15	5%	5%
Restaurant	1.15	5%	10%	1.15	5%	10%
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses ²						

Table 3-A: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-A: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		16	0	0	0
Restaurant	0	4		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-A: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	421	213	208
Internal Capture Percentage	10%	9%	10%
External Vehicle-Trips ⁵	295	149	146
External Transit-Trips ⁶	19	10	9
External Non-Motorized Trips ⁶	22	11	11

Table 6-A: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	2%	9%
Restaurant	50%	13%
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

¹Land Use Codes (LUCs) from *Trip Generation Manual*, published by the Institute of Transportation Engineers.

²Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.

³Enter trips assuming no transit or non-motorized trips (as assumed in ITE *Trip Generation Manual*).

⁴Enter vehicle occupancy assumed in Table 1-A vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be made to Tables 5-A, 9-A (O and D). Enter transit, non-motorized percentages that will result with proposed mixed-use project complete.

⁵Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A.

⁶Person-Trips

*Indicates computation that has been rounded to the nearest whole number.

Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

Project Name:	2180 Montreal Road TIA
Analysis Period:	AM Street Peak Hour

Table 7-A: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-A (D): Entering Trips			Table 7-A (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.15	157	181	1.15	154	177
Restaurant	1.15	28	32	1.15	27	31
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	0	0	1.00	0	0

Table 8-A (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	51		23	0	25	0
Restaurant	10	4		0	1	1
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 8-A (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		58	7	0	0	0
Retail	0		16	0	0	0
Restaurant	0	14		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	31	6	0		0
Hotel	0	7	2	0	0	

Table 9-A (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	4	177	181	138	9	9
Restaurant	16	16	32	11	1	2
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-A (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	16	161	177	126	8	8
Restaurant	4	27	31	20	1	3
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-A

²Person-Trips

³Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

NCHRP 684 Internal Trip Capture Estimation Tool					
Project Name:	2180 Montreal Road TIA			Organization:	JLR
Project Location:	Ottawa, ON			Performed By:	R. Nahas
Scenario Description:	Projected Trip Generation			Date:	2026-02-13
Analysis Year:				Checked By:	D. Hook
Analysis Period:	PM Street Peak Hour			Date:	2026-02-13

Table 1-P: Base Vehicle-Trip Generation Estimates (Single-Use Site Estimate)						
Land Use	Development Data (For Information Only)			Estimated Vehicle-Trips ³		
	ITE LUCs ¹	Quantity	Units	Total	Entering	Exiting
Office				0		
Retail				375	186	189
Restaurant				52	27	25
Cinema/Entertainment				0		
Residential				0		
Hotel				0		
All Other Land Uses ²				0		
				427	213	214

Table 2-P: Mode Split and Vehicle Occupancy Estimates						
Land Use	Entering Trips			Exiting Trips		
	Veh. Occ. ⁴	% Transit	% Non-Motorized	Veh. Occ. ⁴	% Transit	% Non-Motorized
Office						
Retail	1.15	5%	5%	1.15	5%	5%
Restaurant	1.15	5%	10%	1.15	5%	10%
Cinema/Entertainment						
Residential						
Hotel						
All Other Land Uses ²						

Table 3-P: Average Land Use Interchange Distances (Feet Walking Distance)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office						
Retail						
Restaurant						
Cinema/Entertainment						
Residential						
Hotel						

Table 4-P: Internal Person-Trip Origin-Destination Matrix*						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	0		9	0	0	0
Restaurant	0	12		0	0	0
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 5-P: Computations Summary			
	Total	Entering	Exiting
All Person-Trips	491	245	246
Internal Capture Percentage	9%	9%	9%
External Vehicle-Trips ⁵	350	175	175
External Transit-Trips ⁶	22	11	11
External Non-Motorized Trips ⁶	24	12	12

Table 6-P: Internal Trip Capture Percentages by Land Use		
Land Use	Entering Trips	Exiting Trips
Office	N/A	N/A
Retail	6%	4%
Restaurant	29%	41%
Cinema/Entertainment	N/A	N/A
Residential	N/A	N/A
Hotel	N/A	N/A

¹ Land Use Codes (LUCs) from <i>Trip Generation Manual</i> , published by the Institute of Transportation Engineers.
² Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator.
³ Enter trips assuming no transit or non-motorized trips (as assumed in ITE <i>Trip Generation Manual</i>).
⁴ Enter vehicle occupancy assumed in Table 1-P vehicle trips. If vehicle occupancy changes for proposed mixed-use project, manual adjustments must be
⁵ Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P.
⁶ Person-Trips
*Indicates computation that has been rounded to the nearest whole number.
Estimation Tool Developed by the Texas A&M Transportation Institute - Version 2013.1

Project Name:	2180 Montreal Road TIA
Analysis Period:	PM Street Peak Hour

Table 7-P: Conversion of Vehicle-Trip Ends to Person-Trip Ends						
Land Use	Table 7-P (D): Entering Trips			Table 7-P (O): Exiting Trips		
	Veh. Occ.	Vehicle-Trips	Person-Trips*	Veh. Occ.	Vehicle-Trips	Person-Trips*
Office	1.00	0	0	1.00	0	0
Retail	1.15	186	214	1.15	189	217
Restaurant	1.15	27	31	1.15	25	29
Cinema/Entertainment	1.00	0	0	1.00	0	0
Residential	1.00	0	0	1.00	0	0
Hotel	1.00	0	0	1.00	0	0

Table 8-P (O): Internal Person-Trip Origin-Destination Matrix (Computed at Origin)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		0	0	0	0	0
Retail	4		63	9	56	11
Restaurant	1	12		2	5	2
Cinema/Entertainment	0	0	0		0	0
Residential	0	0	0	0		0
Hotel	0	0	0	0	0	

Table 8-P (D): Internal Person-Trip Origin-Destination Matrix (Computed at Destination)						
Origin (From)	Destination (To)					
	Office	Retail	Restaurant	Cinema/Entertainment	Residential	Hotel
Office		17	1	0	0	0
Retail	0		9	0	0	0
Restaurant	0	107		0	0	0
Cinema/Entertainment	0	9	1		0	0
Residential	0	21	4	0		0
Hotel	0	4	2	0	0	

Table 9-P (D): Internal and External Trips Summary (Entering Trips)						
Destination Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	12	202	214	158	10	10
Restaurant	9	22	31	17	1	2
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

Table 9-P (O): Internal and External Trips Summary (Exiting Trips)						
Origin Land Use	Person-Trip Estimates			External Trips by Mode*		
	Internal	External	Total	Vehicles ¹	Transit ²	Non-Motorized ²
Office	0	0	0	0	0	0
Retail	9	208	217	163	10	10
Restaurant	12	17	29	12	1	2
Cinema/Entertainment	0	0	0	0	0	0
Residential	0	0	0	0	0	0
Hotel	0	0	0	0	0	0
All Other Land Uses ³	0	0	0	0	0	0

¹Vehicle-trips computed using the mode split and vehicle occupancy values provided in Table 2-P

²Person-Trips

³Total estimate for all other land uses at mixed-use development site is not subject to internal trip capture computations in this estimator

*Indicates computation that has been rounded to the nearest whole number.

Appendix G

Trip Generation Tables

EXISTING TRIPS

Car Wash (Existing)

Travel Mode	Mode Share	AM Peak			PM Peak		
		In	Out	Total	In	Out	Total
Auto Driver	95%	14	11	25	19	20	39
Auto Passenger	5%	0	0	0	0	1	1
Transit	0%	0	0	0	0	0	0
Non-motorized	0%	0	0	0	0	0	0
Total Person Trips	100%	14	11	25	19	21	40
Less Pass-by (0%)		0	0	0	0	0	0
Total 'New' Car Wash (Existing) Auto Trips		14	11	25	19	20	39

Gas Station w Convenience (Existing)

Travel Mode	Mode Share	AM Peak			PM Peak		
		In	Out	Total	In	Out	Total
Auto Driver	80%	68	68	136	78	79	157
Auto Passenger	10%	8	8	16	10	10	20
Transit	5%	4	4	8	5	5	10
Non-motorized	5%	4	4	8	4	4	8
Total Person Trips	100%	84	84	168	97	98	195
Less Pass-by (0%)		-37	-37	-74	-43	-43	-86
Total 'New' Gas Station w Convenience (Existing) Auto Trips		31	31	62	35	36	71

Total:

Travel Mode	AM Peak			PM Peak		
	In	Out	Total	In	Out	Total
Auto Driver	82	79	161	97	99	196
Auto Passenger	8	8	16	10	11	21
Transit	4	4	8	5	5	10
Non-motorized	4	4	8	4	4	8
Total Person Trips	98	95	193	116	119	235
Less Pass-by (0%)	-37	-37	-74	-43	-43	-86
Total 'New' Total: Auto Trips	45	42	87	54	56	110

Total

FUTURE TRIPS

Fast Food w Drive Thru (New)

Travel Mode	Mode Share	AM Peak			PM Peak		
		In	Out	Total	In	Out	Total
Auto Driver	70%	16	16	32	16	14	30
Auto Passenger	15%	3	3	6	3	3	6
Transit	5%	1	1	2	1	1	2
Non-motorized	10%	2	2	4	2	2	4
Total Person Trips	100%	22	22	44	22	20	42
Less Pass-by (50%)		-8	-8	-16	-8	-8	-16
Total 'New' Fast Food w Drive Thru (New) Auto Trips		8	8	16	8	6	14

Car Wash (Existing)

Travel Mode	Mode Share	AM Peak			PM Peak		
		In	Out	Total	In	Out	Total
Auto Driver	95%	14	11	25	19	20	39
Auto Passenger	5%	0	0	0	0	1	1
Transit	0%	0	0	0	0	0	0
Non-motorized	0%	0	0	0	0	0	0
Total Person Trips	100%	14	11	25	19	21	40
Less Pass-by (0%)		0	0	0	0	0	0
Total 'New' Car Wash (Existing) Auto Trips		14	11	25	19	20	39

Gas Station w Convenience (New)

Travel Mode	Mode Share	AM Peak			PM Peak		
		In	Out	Total	In	Out	Total
Auto Driver	80%	90	90	180	104	104	208
Auto Passenger	10%	12	12	24	13	13	26
Transit	5%	5	5	10	7	7	14
Non-motorized	5%	5	5	10	6	6	12
Total Person Trips	100%	112	112	224	130	130	260
Less Pass-by (55%)		-50	-50	-100	-57	-57	-114
Total 'New' Gas Station w Convenience (New) Auto Trips		40	40	80	47	47	94

Total:

Travel Mode	AM Peak			PM Peak		
	In	Out	Total	In	Out	Total
Auto Driver	120	117	237	139	138	277
Auto Passenger	15	15	30	16	17	33
Transit	6	6	12	8	8	16
Non-motorized	7	7	14	8	8	16
Total Person Trips	148	145	293	171	171	342
Less Pass-by (0%)	-58	-58	-116	-65	-65	-130
Total 'New' Total: Auto Trips	62	59	121	74	73	147

NET CHANGE

Person Trips

Scenario	AM Peak Hour (Person Trips/h)			PM Peak Hour (Person Trips/h)		
	In	Out	Total	In	Out	Total
Existing	98	95	193	116	119	235
Proposed	148	145	293	171	171	342
Net Change	50	50	100	55	52	107

Total Trips

Travel Mode	AM Peak			PM Peak		
	In	Out	Total	In	Out	Total
Auto Driver	38	38	76	42	39	81
Auto Passenger	7	7	14	6	6	12
Transit	2	2	4	3	3	6
Non-motorized	3	3	6	4	4	8
Total Person Trips	50	50	100	55	52	107
Less Pass-by (0%)	-21	-21	-42	-22	-22	-44
'New' NET CHANGE Auto Trips	17	17	34	20	17	37

Appendix H

TDM Checklists

TDM Measures Checklist:

Non-Residential Developments (office, institutional, retail or industrial)

Legend	
BASIC	The measure is generally feasible and effective, and in most cases would benefit the development and its users
BETTER	The measure could maximize support for users of sustainable modes, and optimize development performance
★	The measure is one of the most dependably effective tools to encourage the use of sustainable modes

TDM measures: <i>Non-residential developments</i>		Check if proposed & add descriptions
1. TDM PROGRAM MANAGEMENT		
1.1 Program coordinator		
BASIC ★	1.1.1 Designate an internal coordinator, or contract with an external coordinator	☒ Suncor assigned coordinator
1.2 Travel surveys		
BETTER	1.2.1 Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☐
2. WALKING AND CYCLING		
2.1 Information on walking/cycling routes & destinations		
BASIC	2.1.1 Display local area maps with walking/cycling access routes and key destinations at major entrances	☐
2.2 Bicycle skills training		
<i>Commuter travel</i>		
BETTER ★	2.2.1 Offer on-site cycling courses for commuters, or subsidize off-site courses	☐
2.3 Valet bike parking		
<i>Visitor travel</i>		
BETTER	2.3.1 Offer secure valet bike parking during public events when demand exceeds fixed supply (e.g. for festivals, concerts, games)	☐

TDM measures: <i>Non-residential developments</i>		Check if proposed & add descriptions
3. TRANSIT		
3.1 Transit information		
BASIC	3.1.1 Display relevant transit schedules and route maps at entrances	☐
BASIC	3.1.2 Provide online links to OC Transpo and STO information	☐
BETTER	3.1.3 Provide real-time arrival information display at entrances	☐
3.2 Transit fare incentives		
<i>Commuter travel</i>		
BETTER	3.2.1 Offer preloaded PRESTO cards to encourage commuters to use transit	☐
BETTER ★	3.2.2 Subsidize or reimburse monthly transit pass purchases by employees	☐
<i>Visitor travel</i>		
BETTER	3.2.3 Arrange inclusion of same-day transit fare in price of tickets (e.g. for festivals, concerts, games)	☐
3.3 Enhanced public transit service		
<i>Commuter travel</i>		
BETTER	3.3.1 Contract with OC Transpo to provide enhanced transit services (e.g. for shift changes, weekends)	☐
<i>Visitor travel</i>		
BETTER	3.3.2 Contract with OC Transpo to provide enhanced transit services (e.g. for festivals, concerts, games)	☐
3.4 Private transit service		
<i>Commuter travel</i>		
BETTER	3.4.1 Provide shuttle service when OC Transpo cannot offer sufficient quality or capacity to serve demand (e.g. for shift changes, weekends)	☐
<i>Visitor travel</i>		
BETTER	3.4.2 Provide shuttle service when OC Transpo cannot offer sufficient quality or capacity to serve demand (e.g. for festivals, concerts, games)	☐

TDM measures: <i>Non-residential developments</i>		Check if proposed & add descriptions
4. RIDESHARING		
4.1 Ridematching service		
<i>Commuter travel</i>		
BASIC	★ 4.1.1 Provide a dedicated ridematching portal at OttawaRideMatch.com	☐
4.2 Carpool parking price incentives		
<i>Commuter travel</i>		
BETTER	4.2.1 Provide discounts on parking costs for registered carpools	☐
4.3 Vanpool service		
<i>Commuter travel</i>		
BETTER	4.3.1 Provide a vanpooling service for long-distance commuters	☐
5. CARSHARING & BIKESHARING		
5.1 Bikeshare stations & memberships		
BETTER	5.1.1 Contract with provider to install on-site bikeshare station for use by commuters and visitors	☐
<i>Commuter travel</i>		
BETTER	5.1.2 Provide employees with bikeshare memberships for local business travel	☐
5.2 Carshare vehicles & memberships		
<i>Commuter travel</i>		
BETTER	5.2.1 Contract with provider to install on-site carshare vehicles and promote their use by tenants	☐
BETTER	5.2.2 Provide employees with carshare memberships for local business travel	☐
6. PARKING		
6.1 Priced parking		
<i>Commuter travel</i>		
BASIC	★ 6.1.1 Charge for long-term parking (daily, weekly, monthly)	☐
BASIC	6.1.2 Unbundle parking cost from lease rates at multi-tenant sites	☐
<i>Visitor travel</i>		
BETTER	6.1.3 Charge for short-term parking (hourly)	☐

TDM measures: <i>Non-residential developments</i>			Check if proposed & add descriptions
7. TDM MARKETING & COMMUNICATIONS			
7.1 Multimodal travel information			
<i>Commuter travel</i>			
BASIC	★	7.1.1 Provide a multimodal travel option information package to new/relocating employees and students	☒ Provided in on-boarding package
<i>Visitor travel</i>			
BETTER	★	7.1.2 Include multimodal travel option information in invitations or advertising that attract visitors or customers (e.g. for festivals, concerts, games)	☐
7.2 Personalized trip planning			
<i>Commuter travel</i>			
BETTER	★	7.2.1 Offer personalized trip planning to new/relocating employees	☒ Provided in on-boarding package and by manager
7.3 Promotions			
<i>Commuter travel</i>			
BETTER		7.3.1 Deliver promotions and incentives to maintain awareness, build understanding, and encourage trial of sustainable modes	☐
8. OTHER INCENTIVES & AMENITIES			
8.1 Emergency ride home			
<i>Commuter travel</i>			
BETTER	★	8.1.1 Provide emergency ride home service to non-driving commuters	☐
8.2 Alternative work arrangements			
<i>Commuter travel</i>			
BASIC	★	8.2.1 Encourage flexible work hours	☐
BETTER		8.2.2 Encourage compressed workweeks	☐
BETTER	★	8.2.3 Encourage telework	☐
8.3 Local business travel options			
<i>Commuter travel</i>			
BASIC	★	8.3.1 Provide local business travel options that minimize the need for employees to bring a personal car to work	☒ Provided in on-boarding package and by manager
8.4 Commuter incentives			
<i>Commuter travel</i>			
BETTER		8.4.1 Offer employees a taxable, mode-neutral commuting allowance	☐
8.5 On-site amenities			
<i>Commuter travel</i>			
BETTER		8.5.1 Provide on-site amenities/services to minimize mid-day or mid-commute errands	☒ Provides discounts for on-site amenities

TDM Measures Checklist:
Residential Developments (multi-family, condominium or subdivision)

Legend	
BASIC	The measure is generally feasible and effective, and in most cases would benefit the development and its users
BETTER	The measure could maximize support for users of sustainable modes, and optimize development performance
★	The measure is one of the most dependably effective tools to encourage the use of sustainable modes

TDM measures: <i>Residential developments</i>		Check if proposed & add descriptions
1. TDM PROGRAM MANAGEMENT		
1.1 Program coordinator		
BASIC ★	1.1.1 Designate an internal coordinator, or contract with an external coordinator	☐
1.2 Travel surveys		
BETTER	1.2.1 Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☐
2. WALKING AND CYCLING		
2.1 Information on walking/cycling routes & destinations		
BASIC	2.1.1 Display local area maps with walking/cycling access routes and key destinations at major entrances (<i>multi-family, condominium</i>)	☐
2.2 Bicycle skills training		
BETTER	2.2.1 Offer on-site cycling courses for residents, or subsidize off-site courses	☐

TDM measures: <i>Residential developments</i>		Check if proposed & add descriptions
3. TRANSIT		
3.1 Transit information		
BASIC	3.1.1 Display relevant transit schedules and route maps at entrances (<i>multi-family, condominium</i>)	☐
BETTER	3.1.2 Provide real-time arrival information display at entrances (<i>multi-family, condominium</i>)	☐
3.2 Transit fare incentives		
BASIC ★	3.2.1 Offer PRESTO cards preloaded with one monthly transit pass on residence purchase/move-in, to encourage residents to use transit	☐
BETTER	3.2.2 Offer at least one year of free monthly transit passes on residence purchase/move-in	☐
3.3 Enhanced public transit service		
BETTER ★	3.3.1 Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels (<i>subdivision</i>)	☐
3.4 Private transit service		
BETTER	3.4.1 Provide shuttle service for seniors homes or lifestyle communities (e.g. scheduled mall or supermarket runs)	☐
4. CARSHARING & BIKESHARING		
4.1 Bikeshare stations & memberships		
BETTER	4.1.1 Contract with provider to install on-site bikeshare station (<i>multi-family</i>)	☐
BETTER	4.1.2 Provide residents with bikeshare memberships, either free or subsidized (<i>multi-family</i>)	☐
4.2 Carshare vehicles & memberships		
BETTER	4.2.1 Contract with provider to install on-site carshare vehicles and promote their use by residents	☐
BETTER	4.2.2 Provide residents with carshare memberships, either free or subsidized	☐
5. PARKING		
5.1 Priced parking		
BASIC ★	5.1.1 Unbundle parking cost from purchase price (<i>condominium</i>)	☐
BASIC ★	5.1.2 Unbundle parking cost from monthly rent (<i>multi-family</i>)	☐

TDM measures: <i>Residential developments</i>		Check if proposed & add descriptions
6. TDM MARKETING & COMMUNICATIONS		
6.1 Multimodal travel information		
BASIC ★	6.1.1 Provide a multimodal travel option information package to new residents	☐
6.2 Personalized trip planning		
BETTER ★	6.2.1 Offer personalized trip planning to new residents	☐

TDM-Supportive Development Design and Infrastructure Checklist: *Non-Residential Developments (office, institutional, retail or industrial)*

Legend	
REQUIRED	The Official Plan or Zoning By-law provides related guidance that must be followed
BASIC	The measure is generally feasible and effective, and in most cases would benefit the development and its users
BETTER	The measure could maximize support for users of sustainable modes, and optimize development performance

TDM-supportive design & infrastructure measures: <i>Non-residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
1. WALKING & CYCLING: ROUTES		
1.1 Building location & access points		
BASIC	1.1.1 Locate building close to the street, and do not locate parking areas between the street and building entrances	☒
BASIC	1.1.2 Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	☒
BASIC	1.1.3 Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	☒
1.2 Facilities for walking & cycling		
REQUIRED	1.2.1 Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations (<i>see Official Plan policy 4.3.3</i>)	☒
REQUIRED	1.2.2 Provide safe, direct and attractive pedestrian access from public sidewalks to building entrances through such measures as: reducing distances between public sidewalks and major building entrances; providing walkways from public streets to major building entrances; within a site, providing walkways along the front of adjoining buildings, between adjacent buildings, and connecting areas where people may congregate, such as courtyards and transit stops; and providing weather protection through canopies, colonnades, and other design elements wherever possible (<i>see Official Plan policy 4.3.12</i>)	☒

TDM-supportive design & infrastructure measures: <i>Non-residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
REQUIRED	1.2.3 Provide sidewalks of smooth, well-drained walking surfaces of contrasting materials or treatments to differentiate pedestrian areas from vehicle areas, and provide marked pedestrian crosswalks at intersection sidewalks (<i>see Official Plan policy 4.3.10</i>)	☒
REQUIRED	1.2.4 Make sidewalks and open space areas easily accessible through features such as gradual grade transition, depressed curbs at street corners and convenient access to extra-wide parking spaces and ramps (<i>see Official Plan policy 4.3.10</i>)	☒
REQUIRED	1.2.5 Include adequately spaced inter-block/street cycling and pedestrian connections to facilitate travel by active transportation. Provide links to the existing or planned network of public sidewalks, multi-use pathways and on-road cycle routes. Where public sidewalks and multi-use pathways intersect with roads, consider providing traffic control devices to give priority to cyclists and pedestrians (<i>see Official Plan policy 4.3.11</i>)	☒
BASIC	1.2.6 Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	☐
BASIC	1.2.7 Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	☐
BASIC	1.2.8 Design roads used for access or circulation by cyclists using a target operating speed of no more than 30 km/h, or provide a separated cycling facility	☐
1.3 Amenities for walking & cycling		
BASIC	1.3.1 Provide lighting, landscaping and benches along walking and cycling routes between building entrances and streets, sidewalks and trails	☐
BASIC	1.3.2 Provide wayfinding signage for site access (where required, e.g. when multiple buildings or entrances exist) and egress (where warranted, such as when directions to reach transit stops/stations, trails or other common destinations are not obvious)	☐

TDM-supportive design & infrastructure measures: <i>Non-residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
2. WALKING & CYCLING: END-OF-TRIP FACILITIES		
2.1 Bicycle parking		
REQUIRED	2.1.1 Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible (see <i>Official Plan policy 4.3.6</i>)	☐
REQUIRED	2.1.2 Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas (see <i>Zoning By-law Section 111</i>)	☐
REQUIRED	2.1.3 Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored (see <i>Zoning By-law Section 111</i>)	☐
BASIC	2.1.4 Provide bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met), plus the expected peak number of customer/visitor cyclists	☐
BETTER	2.1.5 Provide bicycle parking spaces equivalent to the expected number of commuter and customer/visitor cyclists, plus an additional buffer (e.g. 25 percent extra) to encourage other cyclists and ensure adequate capacity in peak cycling season	☐
2.2 Secure bicycle parking		
REQUIRED	2.2.1 Where more than 50 bicycle parking spaces are provided for a single office building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers (see <i>Zoning By-law Section 111</i>)	☐
BETTER	2.2.2 Provide secure bicycle parking spaces equivalent to the expected number of commuter cyclists (assuming the cycling mode share target is met)	☐
2.3 Shower & change facilities		
BASIC	2.3.1 Provide shower and change facilities for the use of active commuters	☐
BETTER	2.3.2 In addition to shower and change facilities, provide dedicated lockers, grooming stations, drying racks and laundry facilities for the use of active commuters	☐
2.4 Bicycle repair station		
BETTER	2.4.1 Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	☐

TDM-supportive design & infrastructure measures: <i>Non-residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
3. TRANSIT		
3.1 Customer amenities		
BASIC	3.1.1 Provide shelters, lighting and benches at any on-site transit stops	☐
BASIC	3.1.2 Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	☐
BETTER	3.1.3 Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	☐
4. RIDESHARING		
4.1 Pick-up & drop-off facilities		
BASIC	4.1.1 Provide a designated area for carpool drivers (plus taxis and ride-hailing services) to drop off or pick up passengers without using fire lanes or other no-stopping zones	☐
4.2 Carpool parking		
BASIC	4.2.1 Provide signed parking spaces for carpools in a priority location close to a major building entrance, sufficient in number to accommodate the mode share target for carpools	☐
BETTER	4.2.2 At large developments, provide spaces for carpools in a separate, access-controlled parking area to simplify enforcement	☐
5. CARSHARING & BIKESHARING		
5.1 Carshare parking spaces		
BETTER	5.1.1 Provide carshare parking spaces in permitted non-residential zones, occupying either required or provided parking spaces (<i>see Zoning By-law Section 94</i>)	☐
5.2 Bikeshare station location		
BETTER	5.2.1 Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection	☐

TDM-supportive design & infrastructure measures: <i>Non-residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
6. PARKING		
6.1 Number of parking spaces		
REQUIRED	6.1.1 Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	☐
BASIC	6.1.2 Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	☐
BASIC	6.1.3 Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly (<i>see Zoning By-law Section 104</i>)	☐
BETTER	6.1.4 Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking (<i>see Zoning By-law Section 111</i>)	☐
6.2 Separate long-term & short-term parking areas		
BETTER	6.2.1 Separate short-term and long-term parking areas using signage or physical barriers, to permit access controls and simplify enforcement (i.e. to discourage employees from parking in visitor spaces, and vice versa)	☐
7. OTHER		
7.1 On-site amenities to minimize off-site trips		
BETTER	7.1.1 Provide on-site amenities to minimize mid-day or mid-commute errands	☐

Appendix I

Throat Length Memo

Date: January 23, 2026
To: Josiane Gervais, P.Eng., City of Ottawa
From: Rani Nahas, P.Eng., JLR
David Hook, P.Eng., JLR
CC: Dayna Edwards, MCIP RPP M.PI, Q9 Planning + Design
Subject: 2180 Montreal Road – Throat Length Requirements
JLR No.: 34023-000

Introduction

Following the pre-consultation meeting with the City of Ottawa held on May 30, 2024, City staff provided the following comments on the throat length of the existing driveway connections to Montreal Road and Shefford Road.

“Clear throat requirements for access from an arterial is 40 m and from a collector is 15m. Ensure this length is provided. The clear throat length is measured from the ends of the driveway curb return radii at the roadway and the point of first conflict on-site. Note the minimum throat length provided must be maintained with the future ROW protection (as applicable).”

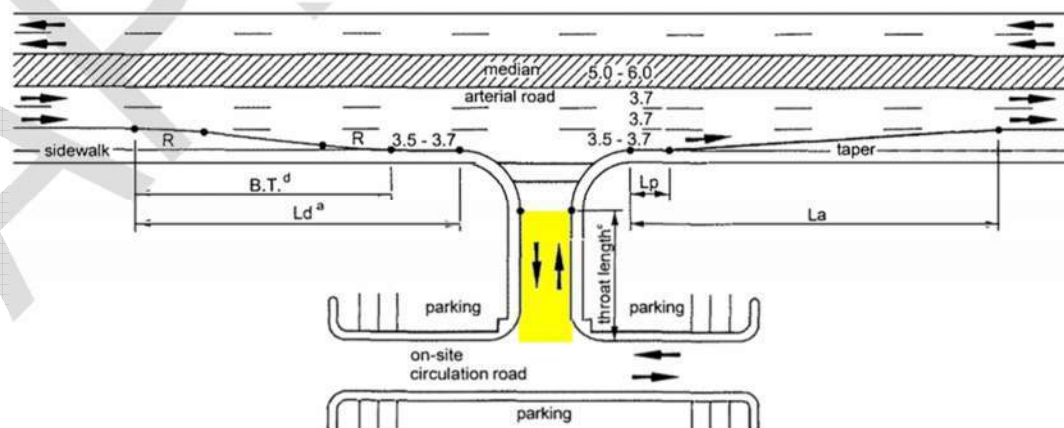
The purpose of this memo is to provide the City with additional rationale for maintaining the existing throat length and access configuration for the proposed redevelopment at 2180 Montreal Road.

The planned configuration of the site retains the existing car wash, however, will include a reconstructed convenience store (305 square metres) with an additional drive-through for a fast-food restaurant (A&W Restaurant) with indoor seating. The vehicle fueling area will also be relocated and increased in size from 12 to 16 fueling positions.

TAC Guidelines

As described in *Chapter 8 – Access* of the TAC Guidelines, a clear throat length for driveways is measured from the ends of the driveway curb return radii furthest from the roadway and the point of first conflict within the site, as shown in Figure 8.5.2 within the TAC Guidelines (depicted below).

Figure 8.5.2: Auxiliary Lane Mid-Block Access for Major Developments



The TAC Guidelines base the recommended clear throat length on the size and type of development, and the road classification the driveway is connected to. As shown in Table 8.9.3 within these guidelines (depicted below), there is no specific value suggested for service stations, however, a suggested minimum throat length is stated as being at least 25 metres for a fast-food restaurant of approximately 120 square metres Gross Floor Area.

It is important to note that these Guidelines were developed as a national standard, taking into account rural communities and higher-speed roadways. The values presented in Table 8.9.3 below, which only distinguish between collector and arterial roads, are described as 'suggestions' rather than strict minimums, reflecting the varied contexts of site development. As a result, TAC generally errs on the conservative side, particularly for rural sites where higher speeds pose greater safety risks, and the guidelines are widely considered conservative in urban settings.

Table 8.9.3: Suggested Minimum Clear Throat Lengths for Major Driveways¹⁴

Land Use	Development Size	Minimum Clear Throat Length (m)	
		Collector	Arterial
Light Industrial	<10,000 m ²	8	15
	10,000 – 45,000 m ²	15	30
	>45,000 m ²	15	60
Discount Store	>3,000 m ²	8	15-25
Shopping Centre	<25,000 m ²	8	15
	25,000 – 45,000 m ²	15	25
	45,001 – 70,000 m ²	25	60
	>70,000 m ²	40	75
Supermarket	<2,000 m ²	15	25
	>2,000 m ²	25	40
Apartments	<100 units	8	15
	100 – 200 units	15	25
	>200 units	25	40
Quality restaurant	<1,500 m ²	8	15
	>1,500 m ²	8	25
Fast food restaurant	<200 m ²	8	25
	>200 m ²	15	40
General office	<5,000 m ²	8	15
	5,000 – 10,000 m ²	8	25
	10,001 – 20,000 m ²	15	30
	20,001 – 45,000 m ²	30	45
	>40,000 m ²	40	75
Motel	<150 rooms	8	25
	>150 rooms	8	30

- Notes
1. Refer to Figure 8.5.2 for method of measurement
 2. For major developments, it is desirable to determine throat lengths and queue on the basis of a site-specific traffic study

As stated in the footnotes of Table 8.9.3, a site-specific traffic study can form the basis for determining a practical throat length. As such, the following review will serve as the basis for determining the functional needs of this site to avoid any potential hazard resulting from traffic spilling back onto the adjacent arterial road. No throat length is suggested for access from local roads as the safety risk is significantly reduced due to lower traffic speeds and volumes.

Projected Operations

Restaurant Operations

In 2016, A&W Food Services of Canada Inc. conducted a Drive-Through Stacking Study in support of a proposed A&W restaurant located at 751 Strasburg Road, Kitchener, ON (included as **Attachment A**). This study analyzed the drive-through operations of three (3) proxy sites to determine the drive-through demand and vehicle queue lengths of typical high-volume A&W restaurants in Ontario during peak periods. Vehicle queue surveys were conducted during lunch and dinner peak periods, specifically from 11:30 AM to 1:30 PM and from 5:00 PM to 7:00 PM, respectively.

From the study, it was observed that all three drive-through facilities had an average maximum of four (4) vehicles in queue between the pick-up window and the drive-through entrance at any time interval. The highest recorded maximum queue length was seven (7) vehicles which occurred at only one of the sites, as measured from the pick-up window.

The latest Site Plan for the subject development at 2180 Montreal Road provides space for 11 vehicles in total between the pick-up window and the drive-through entrance. Based on this, it can be concluded that the proposed development provides sufficient vehicle space to accommodate the maximum vehicle queues for a typical A&W restaurant.

Gas Station Operations

Consultation with the operators of c-store/gas station developments at 500 Eagleson Road and 8605 Campeau Drive confirmed that demand for fueling pumps does not typically surpass the number of available pumps, except for exceptional circumstances. Consequently, on-site queueing for vehicle fueling stations is unlikely and will ensure that site circulation remains unaffected by demand for this element of the site.

Car Wash Operations

Regarding the car wash, the number of drive-through queueing spaces provided exceeds the bylaw requirement while still allowing vehicle circulation within the parking area in the case of exceptional seasonal demand. Suncor has indicated that the carwash processing time is approximately 4.5 minutes at the existing 2180 Montreal car wash. Based on the ITE Trip Generation for a carwash (LUC 948), the existing carwash on site is assumed to generate up to 19 vehicle trips arriving during the critical weekday afternoon peak hour. This is equivalent to approximately one vehicle trip arriving approximately every 3 minutes, while the departure rate is regulated to the car wash cycle length. Based on the ITE trip generation and the observed cycle length at 2180 Montreal Road, a queue accumulation of approximately 6 vehicles is calculated for the weekday afternoon the peak hour.

Operations at Similar Sites

Suncor provided the average and peak annual vehicle trips for gas station, car wash, and restaurant land-uses for similar multi-use sites within the City of Ottawa (500 Eagleson Road and 8605 Campeau Drive) for which existing data was available, as summarized in **Table 1** and included in **Attachment B**. The 500 Eagleson site consists of 12 vehicle fueling stations, a Neighbours' Coffee drive-through, and an on-site car wash. The 8605 Campeau Drive site consists of 12 vehicle fueling stations, an A&W drive-through, and an on-site car wash.

Table 1: Proxy Site Observed Trip Generation

Land-Use	500 Eagleson Road		8605 Campeau Drive	
	Average Observed Hourly Vehicle Trip Arrivals	Maximum Observed Hourly Vehicle Trip Arrivals	Average Observed Hourly Vehicle Trip Arrivals	Maximum Observed Hourly Vehicle Trip Arrivals
Restaurant	12	30	12	25
Gas Station	30	60	40	80
Car Wash	6	14	6	30
Total	48	104	58	135

As shown in **Table 1**, the observed average peak hour vehicle trip rate is between 48 to 58 veh/h and the maximum observed hourly vehicle trip rate is between 104 to 135 veh/h. In comparison, ITE trip generation rates project 74 veh/h inbound during the critical afternoon peak hour, which is up to 35% more than the average observed vehicle trips per hour and up to 50% less than the maximum observed vehicle trips per hour.

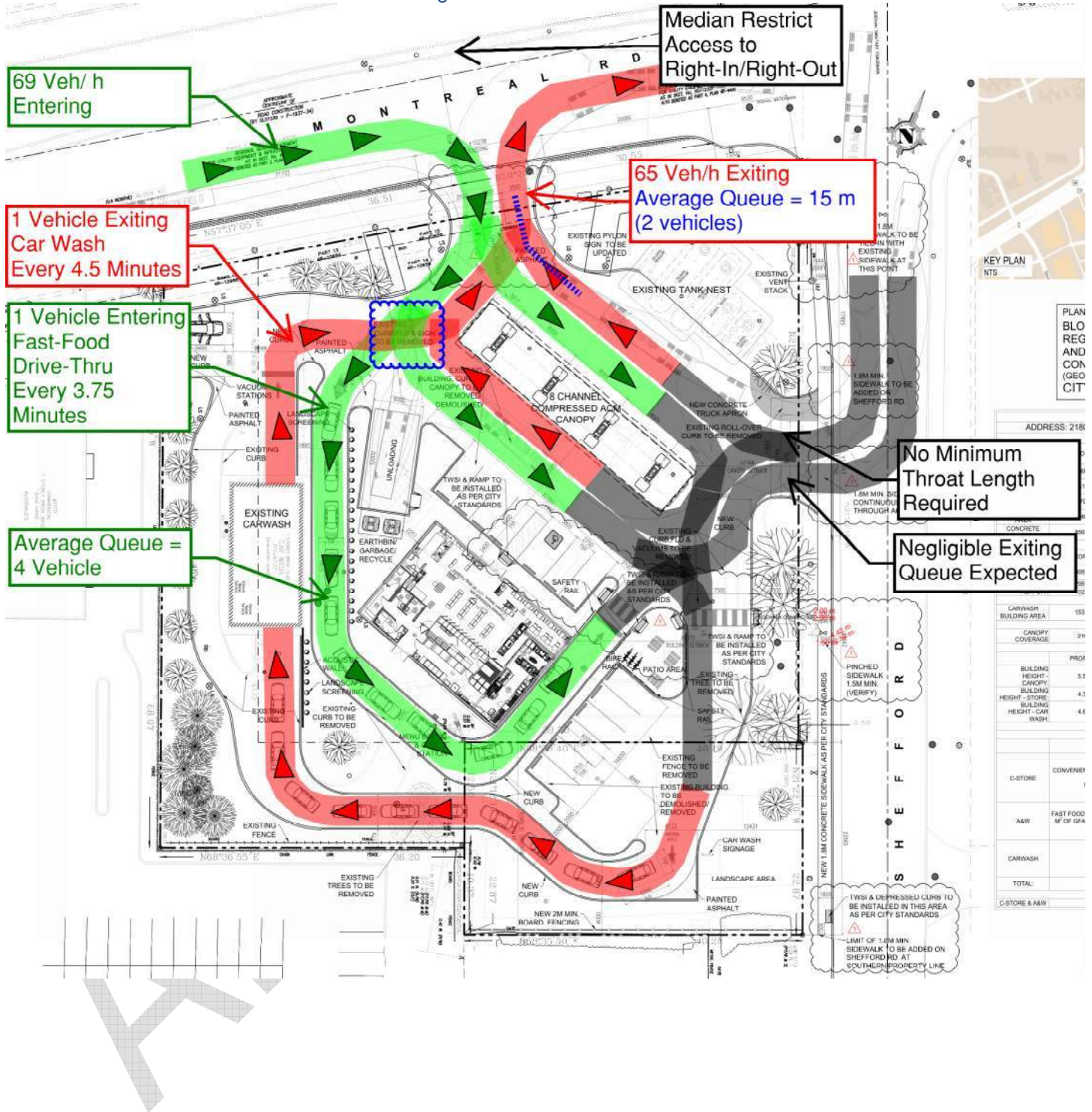
Site Circulation

Figure 1 illustrates the circulation paths for vehicles entering and exiting the site via the Montreal Road access. The green line indicates the entry path, while the red line denotes the exit route. Trip generation and assignment analyses project that 69 veh/h will enter, and 65 veh/h will exit the site via this driveway during the critical afternoon peak period. In this particular context, it is also important to note that the existing driveway connection to Montreal Road (arterial road) is restricted to right-in/right-out, thus the number of vehicles entering the site via this access and the potential for queue accumulation within the site is greatly reduced as compared to a full-movement access.

A critical area of the site is noted as being the location where the drive-thru entry and exit lanes confluence at the northwestern area of the site, as indicated in blue in **Figure 1** below. It is estimated that one vehicle will exit the carwash every 4.5 minutes, and another will enter the fast-food drive-through lane approximately every 3.75 minutes. As the vehicle fueling stations are located centrally within the site, vehicles do not need to travel through the critical area for fuel pump access. As such, any occurrence of conflicts within this area where vehicles cross paths are therefore expected to be infrequent and manageable. Furthermore, as the observed average peak hour vehicle trips of similar sites are significantly less than the projected ITE vehicle trips, this conflict is even less likely to occur.

The second most critical area within the site that could pose a risk to site circulation is at the Montreal Road access which could result if a significant queue were to develop. A high-level SimTraffic assessment of site operations for the 2032 analysis year (build-out plus five years) anticipates an average queue length of 15 meters (equivalent to two vehicles) at the site egress onto Montreal Road. As a result, no on-site circulation issues are expected, as vehicles will be able to access the site without restriction. Furthermore, significant queues are unlikely to develop at the Montreal Road access as delays egressing the site via Shefford Road are expected to have notably lower delays.

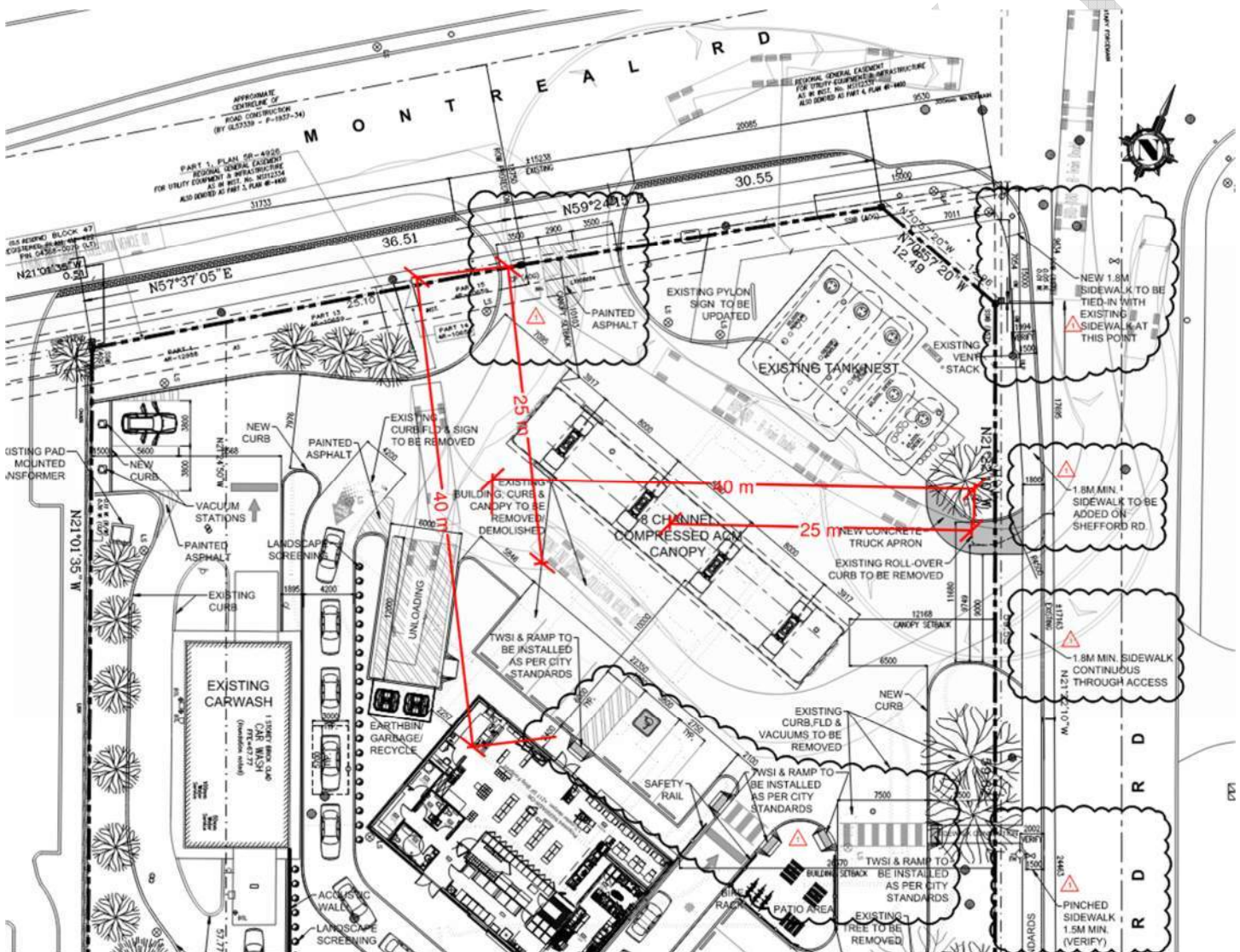
Figure 1: On-site Circulation



Site Constraints

With respect to the TAC Guidelines, **Figure 2** below depicts what the impact of a 25 m and 40 m clear throat length would have on what is considered a typically sized site for this land use and is often not practical even in suburban or rural service station sites. As illustrated, implementation of a 25 m or 40 m throat length would require complete reconfiguration of the site which is not practical.

Figure 2: Clear Throat Lengths – Measured from the Curb Return Radii



Furthermore, extending the throat length would significantly increase the operational challenges for fueling trucks attempting to access the underground tanks. These tanks are presently situated in the northeast corner of the site, with trucks currently entering from the Montreal entrance and exiting via the Shefford entrance. Increasing the throat length may render tanker truck access unfeasible or necessitate substantial modifications to the existing building to accommodate continued access.

Conclusions

From a transportation perspective and based on the foregoing analysis, the existing entrance locations and configuration of the site expected to sufficiently accommodate the expected traffic demands while ensuring fluid traffic circulation. In summary, the following are the main points for justification:

- The TAC Guidelines were developed as a national standard and take into consideration rural communities and higher speed roadways. As such, TAC Guidelines are commonly regarded as being conservative, as there are no separate criteria for urban vs. rural contexts, high vs. low-speed roadways, right-in/right-out vs. full-movement driveways, etc.
- Based on data collected at three existing proxy sites, with similar land uses as the proposed development (i.e., existing A&W sites), the amount of proposed drive-through storage will be more than sufficient to accommodate the maximum queue lengths (i.e., conflicts generated by drive-through queues are not anticipated for the proposed development).
- Vehicle entry and exit patterns at the Montreal Road access are well managed, with projected peak-hour traffic volumes and queue lengths indicating no expected circulation issues, as long as key access areas remain clear.
- Increasing the throat length will result in significant geometric changes within the site to accommodate the gas tanker movements navigating the site to access the underground storage tanks.

If required, post-development monitoring can be provided. If post-development operations prove to be problematic, possible mitigation measures can be discussed with City staff for their consideration at that time.

J.L. RICHARDS & ASSOCIATES LIMITED

Prepared by:

Reviewed by:

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Practice Lead

Attachment A – A&W Stacking Study
Attachment B – Proxy Site Trip Generation

DH:rn

Appendix J

Synchro Output

1: Shefford & Montreal
Existing Conditions AM Peak

Existing Geometry
Default

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			 					 		
Traffic Volume (vph)	192	534	16	63	1156	712	31	20	48	366	30	159
Future Volume (vph)	192	534	16	63	1156	712	31	20	48	366	30	159
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		0.0	50.0		100.0	30.0		0.0	0.0		30.0
Storage Lanes	1		0	1		0	1		0	2		1
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.996				0.850		0.894				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5065	0	1770	3539	1583	1770	1665	0	3433	1863	1583
Flt Permitted	0.080			0.410			0.950			0.950		
Satd. Flow (perm)	149	5065	0	764	3539	1583	1770	1665	0	3433	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4				527		53				177
Link Speed (k/h)		60			60			40			50	
Link Distance (m)		91.3			294.7			71.0			192.4	
Travel Time (s)		5.5			17.7			6.4			13.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	213	593	18	70	1284	791	34	22	53	407	33	177
Shared Lane Traffic (%)												
Lane Group Flow (vph)	213	611	0	70	1284	791	34	75	0	407	33	177
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2			6		6						4
Detector Phase	5	2		1	6	6	8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.0	27.0		11.0	27.0	27.0	33.5	33.5		34.1	34.1	34.1
Total Split (s)	15.0	33.0		15.0	33.0	33.0	33.0	33.0		34.0	34.0	34.0
Total Split (%)	13.0%	28.7%		13.0%	28.7%	28.7%	28.7%	28.7%		29.6%	29.6%	29.6%
Maximum Green (s)	9.0	27.0		9.0	27.0	27.0	26.5	26.5		27.9	27.9	27.9
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.3	3.3		3.3	3.3	3.3
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	3.2	3.2		2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.5	6.5		6.1	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None		None	None	None
Walk Time (s)		7.0			7.0	7.0	7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)		14.0			14.0	14.0	20.0	20.0		21.0	21.0	21.0
Pedestrian Calls (#/hr)		15			15	15	5	5		5	5	5
Act Effect Green (s)	65.3	55.4		52.9	45.5	45.5	13.3	13.3		19.9	19.9	19.9
Actuated g/C Ratio	0.57	0.48		0.46	0.40	0.40	0.12	0.12		0.17	0.17	0.17
v/c Ratio	0.72	0.25		0.17	0.92	0.84	0.17	0.31		0.69	0.10	0.42
Control Delay	43.0	18.0		17.3	46.1	21.0	45.0	20.5		50.2	38.3	8.6
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	43.0	18.0		17.3	46.1	21.0	45.0	20.5		50.2	38.3	8.6

1: Shefford & Montreal
Existing Conditions AM Peak

Existing Geometry
Default

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	B		B	D	C	D	C		D	D	A
Approach Delay		24.4			35.9			28.1			37.7	
Approach LOS		C			D			C			D	
Queue Length 50th (m)	30.9	31.3		6.7	149.9	60.6	7.6	4.9		47.6	6.7	0.0
Queue Length 95th (m)	#105.3	35.4		21.2	#269.5	#173.6	15.2	16.8		58.7	14.5	17.6
Internal Link Dist (m)		67.3			270.7			47.0			168.4	
Turn Bay Length (m)	75.0			50.0		100.0	30.0					30.0
Base Capacity (vph)	296	2443		440	1399	944	407	424		832	451	518
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.72	0.25		0.16	0.92	0.84	0.08	0.18		0.49	0.07	0.34

Intersection Summary

Area Type: Other

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 29 (25%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.92

Intersection Signal Delay: 33.4

Intersection LOS: C

Intersection Capacity Utilization 78.5%

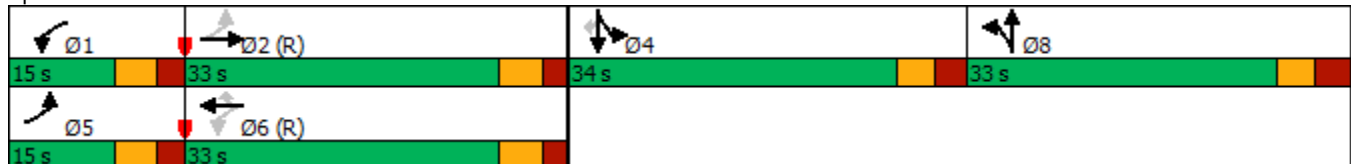
ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Shefford & Montreal



2: Sinclair & Montreal

Existing Conditions AM Peak

Existing Geometry

Default

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	643	33	156	1309	3	79	0	20	15	3	10
Future Volume (vph)	5	643	33	156	1309	3	79	0	20	15	3	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	55.0		0.0	65.0		0.0	25.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.993						0.850			0.952	
Flt Protected	0.950			0.950			0.950				0.973	
Satd. Flow (prot)	1770	3514	0	1770	3539	0	1770	1583	0	0	1725	0
Flt Permitted	0.154			0.361			0.737				0.841	
Satd. Flow (perm)	287	3514	0	672	3539	0	1373	1583	0	0	1491	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8						241			11	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		144.2			85.9			105.3			75.0	
Travel Time (s)		8.7			5.2			7.6			5.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	6	714	37	173	1454	3	88	0	22	17	3	11
Shared Lane Traffic (%)												
Lane Group Flow (vph)	6	751	0	173	1457	0	88	22	0	0	31	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.0	24.0		24.0	24.0		38.0	38.0		38.0	38.0	
Total Split (s)	77.0	77.0		77.0	77.0		38.0	38.0		38.0	38.0	
Total Split (%)	67.0%	67.0%		67.0%	67.0%		33.0%	33.0%		33.0%	33.0%	
Maximum Green (s)	71.0	71.0		71.0	71.0		32.0	32.0		32.0	32.0	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		25.0	25.0		25.0	25.0	
Pedestrian Calls (#/hr)	15	15		15	15		5	5		5	5	
Act Effect Green (s)	91.4	91.4		91.4	91.4		16.0	16.0			16.0	
Actuated g/C Ratio	0.79	0.79		0.79	0.79		0.14	0.14			0.14	
v/c Ratio	0.03	0.27		0.32	0.52		0.46	0.05			0.14	
Control Delay	6.8	5.2		4.3	4.5		51.0	0.2			29.4	
Queue Delay	0.0	0.0		0.0	0.2		0.0	0.0			0.0	
Total Delay	6.8	5.2		4.3	4.6		51.0	0.2			29.4	

2: Sinclair & Montreal

Existing Conditions AM Peak

Existing Geometry
Default

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A		A	A		D	A			C	
Approach Delay		5.2			4.6			40.8			29.4	
Approach LOS		A			A			D			C	
Queue Length 50th (m)	0.3	20.6		4.5	20.7		20.2	0.0			4.4	
Queue Length 95th (m)	2.4	53.5		m4.2	m75.4		30.4	0.0			11.3	
Internal Link Dist (m)		120.2			61.9			81.3			51.0	
Turn Bay Length (m)	55.0			65.0			25.0					
Base Capacity (vph)	228	2793		533	2811		382	614			422	
Starvation Cap Reductn	0	0		0	475		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	0.03	0.27		0.32	0.62		0.23	0.04			0.07	

Intersection Summary

Area Type: Other

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 31 (27%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.52

Intersection Signal Delay: 6.6

Intersection LOS: A

Intersection Capacity Utilization 67.9%

ICU Level of Service C

Analysis Period (min) 15

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

Splits and Phases: 2: Sinclair & Montreal



5: Site & Montreal
Existing Conditions AM Peak

Existing Geometry
Default

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑↱			↑↑		↱
Traffic Volume (vph)	744	0	0	1348	0	0
Future Volume (vph)	744	0	0	1348	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.91	0.91	1.00	0.95	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	5085	0	0	3539	0	1863
Flt Permitted						
Satd. Flow (perm)	5085	0	0	3539	0	1863
Link Speed (k/h)	60			60	50	
Link Distance (m)	85.9			91.3	68.9	
Travel Time (s)	5.2			5.5	5.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	827	0	0	1498	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	827	0	0	1498	0	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	40.6%			ICU Level of Service A		
Analysis Period (min)	15					

5: Site & Montreal
Existing Conditions AM Peak

Existing Geometry
Default

Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑			↑↑		↗
Traffic Vol, veh/h	744	0	0	1348	0	0
Future Vol, veh/h	744	0	0	1348	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	827	0	0	1498	0	0
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	-	-	-	414
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	-	-	0	-	0	502
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	502
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	0		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	-	-	-	-		
HCM Lane V/C Ratio	-	-	-	-		
HCM Control Delay (s)	0	-	-	-		
HCM Lane LOS	A	-	-	-		
HCM 95th %tile Q(veh)	-	-	-	-		

6: Shefford & Site
Existing Conditions AM Peak

Existing Geometry
Default

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	99	109	0
Future Volume (vph)	0	0	0	99	109	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1863	0	0	1863	1863	0
Flt Permitted						
Satd. Flow (perm)	1863	0	0	1863	1863	0
Link Speed (k/h)	50			40	50	
Link Distance (m)	62.6			91.1	71.0	
Travel Time (s)	4.5			8.2	5.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	110	121	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	110	121	0
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	9.1%			ICU Level of Service A		
Analysis Period (min)	15					

6: Shefford & Site
Existing Conditions AM Peak

Existing Geometry
Default

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	99	109	0
Future Vol, veh/h	0	0	0	99	109	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	110	121	0
Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	231	121	-	0	-	0
Stage 1	121	-	-	-	-	-
Stage 2	110	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	757	930	0	-	-	-
Stage 1	904	-	0	-	-	-
Stage 2	915	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	757	930	-	-	-	-
Mov Cap-2 Maneuver	757	-	-	-	-	-
Stage 1	904	-	-	-	-	-
Stage 2	915	-	-	-	-	-
Approach	EB	NB	SB			
HCM Control Delay, s	0	0	0			
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR		
Capacity (veh/h)	-	-	-	-		
HCM Lane V/C Ratio	-	-	-	-		
HCM Control Delay (s)	-	0	-	-		
HCM Lane LOS	-	A	-	-		
HCM 95th %tile Q(veh)	-	-	-	-		

1: Shefford & Montreal
Existing Conditions PM Peak

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			 					 		
Traffic Volume (vph)	120	1188	40	53	461	299	43	22	79	673	40	158
Future Volume (vph)	120	1188	40	53	461	299	43	22	79	673	40	158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		0.0	50.0		100.0	30.0		0.0	0.0		30.0
Storage Lanes	1		0	1		0	1		0	2		1
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.995				0.850		0.882				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5060	0	1770	3539	1583	1770	1643	0	3433	1863	1583
Flt Permitted	0.370			0.116			0.950			0.950		
Satd. Flow (perm)	689	5060	0	216	3539	1583	1770	1643	0	3433	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4				332		88				176
Link Speed (k/h)		60			60			40			50	
Link Distance (m)		91.3			294.7			71.0			192.4	
Travel Time (s)		5.5			17.7			6.4			13.9	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	133	1320	44	59	512	332	48	24	88	748	44	176
Shared Lane Traffic (%)												
Lane Group Flow (vph)	133	1364	0	59	512	332	48	112	0	748	44	176
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2			6		6						4
Detector Phase	5	2		1	6	6	8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.0	27.0		11.0	27.0	27.0	33.5	33.5		34.1	34.1	34.1
Total Split (s)	15.0	44.0		15.0	44.0	44.0	33.0	33.0		38.0	38.0	38.0
Total Split (%)	11.5%	33.8%		11.5%	33.8%	33.8%	25.4%	25.4%		29.2%	29.2%	29.2%
Maximum Green (s)	9.0	38.0		9.0	38.0	38.0	26.5	26.5		31.9	31.9	31.9
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.3	3.3		3.3	3.3	3.3
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	3.2	3.2		2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.5	6.5		6.1	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None		None	None	None
Walk Time (s)		7.0			7.0	7.0	7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)		14.0			14.0	14.0	20.0	20.0		21.0	21.0	21.0
Pedestrian Calls (#/hr)		15			15	15	5	5		5	5	5
Act Effect Green (s)	63.9	55.9		59.0	51.5	51.5	13.4	13.4		31.0	31.0	31.0
Actuated g/C Ratio	0.49	0.43		0.45	0.40	0.40	0.10	0.10		0.24	0.24	0.24
v/c Ratio	0.32	0.63		0.32	0.37	0.40	0.26	0.45		0.91	0.10	0.34
Control Delay	23.5	34.2		23.0	30.1	4.9	55.1	21.1		64.5	38.8	7.5
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	23.5	34.2		23.0	30.1	4.9	55.1	21.1		64.5	38.8	7.5

1: Shefford & Montreal
Existing Conditions PM Peak

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	C	C		C	C	A	E	C		E	D	A
Approach Delay		33.3			20.4			31.3			53.0	
Approach LOS		C			C			C			D	
Queue Length 50th (m)	17.4	93.5		7.4	49.6	0.0	12.5	6.2		100.9	9.2	0.0
Queue Length 95th (m)	47.6	#162.7		19.1	78.1	22.7	22.3	22.1		#134.5	19.6	18.6
Internal Link Dist (m)		67.3			270.7			47.0			168.4	
Turn Bay Length (m)	75.0			50.0		100.0	30.0					30.0
Base Capacity (vph)	420	2177		208	1402	827	360	404		843	458	521
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.32	0.63		0.28	0.37	0.40	0.13	0.28		0.89	0.10	0.34

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 20 (15%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.91

Intersection Signal Delay: 35.3

Intersection LOS: D

Intersection Capacity Utilization 69.0%

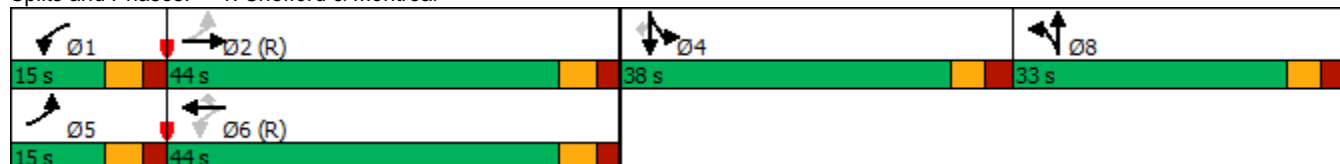
ICU Level of Service C

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Shefford & Montreal



2: Sinclair & Montreal
Existing Conditions PM Peak

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	1011	37	50	636	13	41	1	41	7	1	6
Future Volume (vph)	5	1011	37	50	636	13	41	1	41	7	1	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	55.0		0.0	65.0		0.0	25.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.995			0.997			0.853			0.941	
Flt Protected	0.950			0.950			0.950				0.976	
Satd. Flow (prot)	1770	3522	0	1770	3529	0	1770	1589	0	0	1711	0
Flt Permitted	0.375			0.228			0.747				0.854	
Satd. Flow (perm)	699	3522	0	425	3529	0	1391	1589	0	0	1497	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		6			3			46			7	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		144.2			85.9			105.3			75.0	
Travel Time (s)		8.7			5.2			7.6			5.4	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	6	1123	41	56	707	14	46	1	46	8	1	7
Shared Lane Traffic (%)												
Lane Group Flow (vph)	6	1164	0	56	721	0	46	47	0	0	16	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.0	24.0		24.0	24.0		38.0	38.0		38.0	38.0	
Total Split (s)	92.0	92.0		92.0	92.0		38.0	38.0		38.0	38.0	
Total Split (%)	70.8%	70.8%		70.8%	70.8%		29.2%	29.2%		29.2%	29.2%	
Maximum Green (s)	86.0	86.0		86.0	86.0		32.0	32.0		32.0	32.0	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		25.0	25.0		25.0	25.0	
Pedestrian Calls (#/hr)	15	15		15	15		5	5		5	5	
Act Effect Green (s)	107.7	107.7		107.7	107.7		14.7	14.7			14.7	
Actuated g/C Ratio	0.83	0.83		0.83	0.83		0.11	0.11			0.11	
v/c Ratio	0.01	0.40		0.16	0.25		0.29	0.21			0.09	
Control Delay	5.2	5.1		12.4	9.3		54.6	14.7			33.6	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	5.2	5.1		12.4	9.3		54.6	14.7			33.6	

2: Sinclair & Montreal

Existing Conditions PM Peak

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A		B	A		D	B			C	
Approach Delay		5.1			9.5			34.5			33.6	
Approach LOS		A			A			C			C	
Queue Length 50th (m)	0.2	32.3		1.5	57.4		12.1	0.3			2.3	
Queue Length 95th (m)	2.1	92.6		26.4	107.0		20.9	10.3			8.2	
Internal Link Dist (m)		120.2			61.9			81.3			51.0	
Turn Bay Length (m)	55.0			65.0			25.0					
Base Capacity (vph)	579	2919		352	2924		342	425			373	
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	0.01	0.40		0.16	0.25		0.13	0.11			0.04	

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 110 (85%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 65

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.40

Intersection Signal Delay: 8.3

Intersection LOS: A

Intersection Capacity Utilization 59.9%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 2: Sinclair & Montreal



5: Site & Montreal
Existing Conditions PM Peak

Existing Geometry

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	  			 		
Traffic Volume (vph)	1349	0	0	664	0	0
Future Volume (vph)	1349	0	0	664	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.91	0.91	1.00	0.95	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	5085	0	0	3539	0	1863
Flt Permitted						
Satd. Flow (perm)	5085	0	0	3539	0	1863
Link Speed (k/h)	60			60	50	
Link Distance (m)	85.9			91.3	68.9	
Travel Time (s)	5.2			5.5	5.0	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	1499	0	0	738	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1499	0	0	738	0	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type: Unsignalized						
Intersection Capacity Utilization 29.4%				ICU Level of Service A		
Analysis Period (min) 15						

5: Site & Montreal
Existing Conditions PM Peak

Existing Geometry

Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑			↑↑		↗
Traffic Vol, veh/h	1349	0	0	664	0	0
Future Vol, veh/h	1349	0	0	664	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1499	0	0	738	0	0
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	-	-	-	750
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	-	-	0	-	0	304
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	304
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	0		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	-	-	-	-		
HCM Lane V/C Ratio	-	-	-	-		
HCM Control Delay (s)	0	-	-	-		
HCM Lane LOS	A	-	-	-		
HCM 95th %tile Q(veh)	-	-	-	-		

6: Shefford & Site
Existing Conditions PM Peak

Existing Geometry

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	144	133	0
Future Volume (vph)	0	0	0	144	133	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1863	0	0	1863	1863	0
Flt Permitted						
Satd. Flow (perm)	1863	0	0	1863	1863	0
Link Speed (k/h)	50			40	50	
Link Distance (m)	62.6			91.1	71.0	
Travel Time (s)	4.5			8.2	5.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	0	0	160	148	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	160	148	0
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	10.9%			ICU Level of Service A		
Analysis Period (min)	15					

6: Shefford & Site
Existing Conditions PM Peak

Existing Geometry

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	144	133	0
Future Vol, veh/h	0	0	0	144	133	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	90	90	90	90	90	90
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	160	148	0
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	308	148	-	0	-	0
Stage 1	148	-	-	-	-	-
Stage 2	160	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	684	899	0	-	-	-
Stage 1	880	-	0	-	-	-
Stage 2	869	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	684	899	-	-	-	-
Mov Cap-2 Maneuver	684	-	-	-	-	-
Stage 1	880	-	-	-	-	-
Stage 2	869	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	0	0		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT EBLn1		SBT	SBR		
Capacity (veh/h)	-		-	-		
HCM Lane V/C Ratio	-		-	-		
HCM Control Delay (s)	-		0	-		
HCM Lane LOS	-		A	-		
HCM 95th %tile Q(veh)	-		-	-		

1: Shefford & Montreal
Background 2027 AM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			 			 		 	 	
Traffic Volume (vph)	192	561	16	63	1215	712	31	20	48	366	30	159
Future Volume (vph)	192	561	16	63	1215	712	31	20	48	366	30	159
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		0.0	50.0		100.0	30.0		0.0	0.0		30.0
Storage Lanes	1		0	1		0	1		0	2		1
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.996				0.850		0.894				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5065	0	1770	3539	1583	1770	1665	0	3433	1863	1583
Flt Permitted	0.074			0.424			0.950			0.950		
Satd. Flow (perm)	138	5065	0	790	3539	1583	1770	1665	0	3433	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3				501		48				159
Link Speed (k/h)		60			60			40			50	
Link Distance (m)		91.3			294.7			71.0			192.4	
Travel Time (s)		5.5			17.7			6.4			13.9	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	192	561	16	63	1215	712	31	20	48	366	30	159
Shared Lane Traffic (%)												
Lane Group Flow (vph)	192	577	0	63	1215	712	31	68	0	366	30	159
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2			6		6						4
Detector Phase	5	2		1	6	6	8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.0	27.0		11.0	27.0	27.0	33.5	33.5		34.1	34.1	34.1
Total Split (s)	15.0	33.0		15.0	33.0	33.0	33.0	33.0		34.0	34.0	34.0
Total Split (%)	13.0%	28.7%		13.0%	28.7%	28.7%	28.7%	28.7%		29.6%	29.6%	29.6%
Maximum Green (s)	9.0	27.0		9.0	27.0	27.0	26.5	26.5		27.9	27.9	27.9
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.3	3.3		3.3	3.3	3.3
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	3.2	3.2		2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.5	6.5		6.1	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None		None	None	None
Walk Time (s)		7.0			7.0	7.0	7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)		14.0			14.0	14.0	20.0	20.0		21.0	21.0	21.0
Pedestrian Calls (#/hr)		15			15	15	5	5		5	5	5
Act Effect Green (s)	66.5	56.8		56.6	49.4	49.4	13.3	13.3		18.7	18.7	18.7
Actuated g/C Ratio	0.58	0.49		0.49	0.43	0.43	0.12	0.12		0.16	0.16	0.16
v/c Ratio	0.76	0.23		0.14	0.80	0.74	0.15	0.29		0.66	0.10	0.41
Control Delay	48.5	17.3		16.6	35.9	15.1	44.6	20.6		50.2	39.0	9.0
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	48.5	17.3		16.6	35.9	15.1	44.6	20.6		50.2	39.0	9.0

1: Shefford & Montreal
Background 2027 AM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	B		B	D	B	D	C		D	D	A
Approach Delay		25.1			27.9			28.2			37.8	
Approach LOS		C			C			C			D	
Queue Length 50th (m)	26.7	28.4		5.9	130.1	39.2	7.0	4.5		42.9	6.2	0.0
Queue Length 95th (m)	#95.0	45.2		19.5	#251.1	#142.1	14.2	15.8		52.8	13.5	17.0
Internal Link Dist (m)		67.3			270.7			47.0			168.4	
Turn Bay Length (m)	75.0			50.0		100.0	30.0					30.0
Base Capacity (vph)	253	2501		478	1520	966	407	420		832	451	504
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.76	0.23		0.13	0.80	0.74	0.08	0.16		0.44	0.07	0.32

Intersection Summary

Area Type: Other

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 29 (25%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 130

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 28.9

Intersection LOS: C

Intersection Capacity Utilization 78.5%

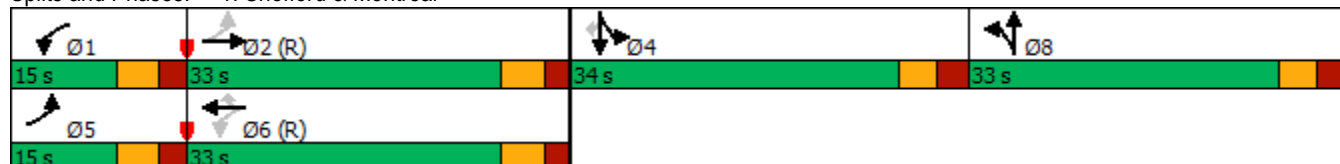
ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Shefford & Montreal



2: Sinclair & Montreal
Background 2027 AM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	682	33	156	1389	3	79	0	20	15	3	10
Future Volume (vph)	5	682	33	156	1389	3	79	0	20	15	3	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	55.0		0.0	65.0		0.0	25.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.993						0.850			0.952	
Flt Protected	0.950			0.950			0.950				0.974	
Satd. Flow (prot)	1770	3514	0	1770	3539	0	1770	1583	0	0	1727	0
Flt Permitted	0.168			0.377			0.739				0.847	
Satd. Flow (perm)	313	3514	0	702	3539	0	1377	1583	0	0	1502	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8						259			10	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		144.2			85.9			105.3			75.0	
Travel Time (s)		8.7			5.2			7.6			5.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	682	33	156	1389	3	79	0	20	15	3	10
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	715	0	156	1392	0	79	20	0	0	28	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.0	24.0		24.0	24.0		38.0	38.0		38.0	38.0	
Total Split (s)	77.0	77.0		77.0	77.0		38.0	38.0		38.0	38.0	
Total Split (%)	67.0%	67.0%		67.0%	67.0%		33.0%	33.0%		33.0%	33.0%	
Maximum Green (s)	71.0	71.0		71.0	71.0		32.0	32.0		32.0	32.0	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		25.0	25.0		25.0	25.0	
Pedestrian Calls (#/hr)	15	15		15	15		5	5		5	5	
Act Effect Green (s)	91.8	91.8		91.8	91.8		15.6	15.6			15.6	
Actuated g/C Ratio	0.80	0.80		0.80	0.80		0.14	0.14			0.14	
v/c Ratio	0.02	0.25		0.28	0.49		0.42	0.05			0.13	
Control Delay	6.4	5.0		3.4	4.3		50.1	0.2			29.4	
Queue Delay	0.0	0.0		0.0	0.1		0.0	0.0			0.0	
Total Delay	6.4	5.0		3.4	4.4		50.1	0.2			29.4	

2: Sinclair & Montreal Background 2027 AM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A		A	A		D	A			C	
Approach Delay		5.0			4.3			40.0			29.4	
Approach LOS		A			A			D			C	
Queue Length 50th (m)	0.2	18.6		3.8	18.5		18.1	0.0			3.9	
Queue Length 95th (m)	2.1	50.5		4.2	69.2		27.7	0.0			10.5	
Internal Link Dist (m)		120.2			61.9			81.3			51.0	
Turn Bay Length (m)	55.0			65.0			25.0					
Base Capacity (vph)	249	2806		560	2824		383	627			425	
Starvation Cap Reductn	0	0		0	423		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	0.02	0.25		0.28	0.58		0.21	0.03			0.07	

Intersection Summary

Area Type: Other

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 31 (27%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.49

Intersection Signal Delay: 6.3

Intersection LOS: A

Intersection Capacity Utilization 70.2%

ICU Level of Service C

Analysis Period (min) 15

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

Splits and Phases: 2: Sinclair & Montreal



5: Site & Montreal
Background 2027 AM

Existing Geometry

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑↱			↑↑		↱
Traffic Volume (vph)	782	0	0	1417	0	0
Future Volume (vph)	782	0	0	1417	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.91	0.91	1.00	0.95	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	5085	0	0	3539	0	1863
Flt Permitted						
Satd. Flow (perm)	5085	0	0	3539	0	1863
Link Speed (k/h)	60			60	50	
Link Distance (m)	85.9			91.3	68.9	
Travel Time (s)	5.2			5.5	5.0	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	782	0	0	1417	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	782	0	0	1417	0	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	42.5%			ICU Level of Service A		
Analysis Period (min)	15					

Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑			↑↑		↗
Traffic Vol, veh/h	782	0	0	1417	0	0
Future Vol, veh/h	782	0	0	1417	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	782	0	0	1417	0	0
Major/Minor	Major1	Major2		Minor1		
Conflicting Flow All	0	0	-	-	-	391
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	-	-	0	-	0	519
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	519
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB		NB		
HCM Control Delay, s	0	0		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	-	-	-	-		
HCM Lane V/C Ratio	-	-	-	-		
HCM Control Delay (s)	0	-	-	-		
HCM Lane LOS	A	-	-	-		
HCM 95th %tile Q(veh)	-	-	-	-		

6: Shefford & Site
Background 2027 AM

Existing Geometry

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	99	109	0
Future Volume (vph)	0	0	0	99	109	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1863	0	0	1863	1863	0
Flt Permitted						
Satd. Flow (perm)	1863	0	0	1863	1863	0
Link Speed (k/h)	50			40	50	
Link Distance (m)	62.6			91.1	71.0	
Travel Time (s)	4.5			8.2	5.1	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	0	99	109	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	99	109	0
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 9.1%	ICU Level of Service A					
Analysis Period (min) 15						

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	99	109	0
Future Vol, veh/h	0	0	0	99	109	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	99	109	0
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	208	109	-	0	-	0
Stage 1	109	-	-	-	-	-
Stage 2	99	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	780	945	0	-	-	-
Stage 1	916	-	0	-	-	-
Stage 2	925	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	780	945	-	-	-	-
Mov Cap-2 Maneuver	780	-	-	-	-	-
Stage 1	916	-	-	-	-	-
Stage 2	925	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	0	0		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT EBLn1		SBT	SBR		
Capacity (veh/h)	-		-	-		
HCM Lane V/C Ratio	-		-	-		
HCM Control Delay (s)	-		0	-		
HCM Lane LOS	-		A	-		
HCM 95th %tile Q(veh)	-		-	-		

1: Shefford & Montreal
Background 2027 PM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			 			 		 		
Traffic Volume (vph)	120	1248	40	53	484	299	43	22	79	673	40	158
Future Volume (vph)	120	1248	40	53	484	299	43	22	79	673	40	158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		0.0	50.0		100.0	30.0		0.0	0.0		30.0
Storage Lanes	1		0	1		0	1		0	2		1
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.995				0.850		0.883				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5060	0	1770	3539	1583	1770	1645	0	3433	1863	1583
Flt Permitted	0.395			0.137			0.950			0.950		
Satd. Flow (perm)	736	5060	0	255	3539	1583	1770	1645	0	3433	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4				299		79				158
Link Speed (k/h)		60			60			40			50	
Link Distance (m)		91.3			294.7			71.0			192.4	
Travel Time (s)		5.5			17.7			6.4			13.9	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	120	1248	40	53	484	299	43	22	79	673	40	158
Shared Lane Traffic (%)												
Lane Group Flow (vph)	120	1288	0	53	484	299	43	101	0	673	40	158
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2			6		6						4
Detector Phase	5	2		1	6	6	8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.0	27.0		11.0	27.0	27.0	33.5	33.5		34.1	34.1	34.1
Total Split (s)	15.0	44.0		15.0	44.0	44.0	33.0	33.0		38.0	38.0	38.0
Total Split (%)	11.5%	33.8%		11.5%	33.8%	33.8%	25.4%	25.4%		29.2%	29.2%	29.2%
Maximum Green (s)	9.0	38.0		9.0	38.0	38.0	26.5	26.5		31.9	31.9	31.9
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.3	3.3		3.3	3.3	3.3
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	3.2	3.2		2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.5	6.5		6.1	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None		None	None	None
Walk Time (s)		7.0			7.0	7.0	7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)		14.0			14.0	14.0	20.0	20.0		21.0	21.0	21.0
Pedestrian Calls (#/hr)		15			15	15	5	5		5	5	5
Act Effect Green (s)	65.2	57.5		60.8	53.5	53.5	13.3	13.3		29.6	29.6	29.6
Actuated g/C Ratio	0.50	0.44		0.47	0.41	0.41	0.10	0.10		0.23	0.23	0.23
v/c Ratio	0.27	0.57		0.26	0.33	0.36	0.24	0.42		0.86	0.09	0.33
Control Delay	18.7	30.5		21.3	28.7	4.8	54.5	21.3		60.2	39.1	7.7
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	18.7	30.5		21.3	28.7	4.8	54.5	21.3		60.2	39.1	7.7

1: Shefford & Montreal
Background 2027 PM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	B	C		C	C	A	D	C		E	D	A
Approach Delay		29.5			19.7			31.2			49.7	
Approach LOS		C			B			C			D	
Queue Length 50th (m)	15.4	94.1		6.5	45.6	0.0	11.2	5.7		88.9	8.4	0.0
Queue Length 95th (m)	40.6	150.0		17.4	73.7	21.6	20.6	20.6		111.4	18.5	17.7
Internal Link Dist (m)		67.3			270.7			47.0			168.4	
Turn Bay Length (m)	75.0			50.0		100.0	30.0					30.0
Base Capacity (vph)	445	2241		227	1455	827	360	398		842	457	507
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.27	0.57		0.23	0.33	0.36	0.12	0.25		0.80	0.09	0.31

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 20 (15%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 32.5

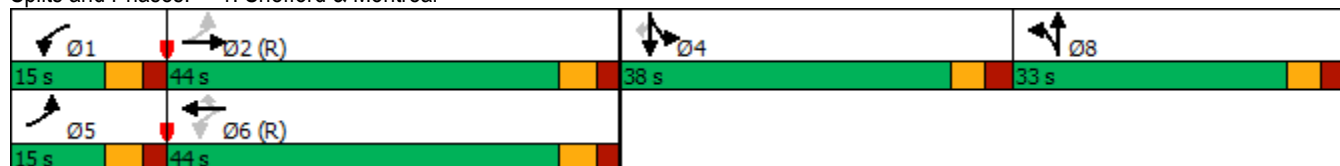
Intersection LOS: C

Intersection Capacity Utilization 70.1%

ICU Level of Service C

Analysis Period (min) 15

Splits and Phases: 1: Shefford & Montreal



2: Sinclair & Montreal Background 2027 PM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	1391	37	50	675	13	41	1	41	7	1	6
Future Volume (vph)	5	1391	37	50	675	13	41	1	41	7	1	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	55.0		0.0	65.0		0.0	25.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.997			0.854			0.942	
Flt Protected	0.950			0.950			0.950				0.976	
Satd. Flow (prot)	1770	3525	0	1770	3529	0	1770	1591	0	0	1713	0
Flt Permitted	0.389			0.166			0.748				0.860	
Satd. Flow (perm)	725	3525	0	309	3529	0	1393	1591	0	0	1509	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			3			41			6	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		144.2			85.9			105.3			75.0	
Travel Time (s)		8.7			5.2			7.6			5.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	1391	37	50	675	13	41	1	41	7	1	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	1428	0	50	688	0	41	42	0	0	14	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.0	24.0		24.0	24.0		38.0	38.0		38.0	38.0	
Total Split (s)	92.0	92.0		92.0	92.0		38.0	38.0		38.0	38.0	
Total Split (%)	70.8%	70.8%		70.8%	70.8%		29.2%	29.2%		29.2%	29.2%	
Maximum Green (s)	86.0	86.0		86.0	86.0		32.0	32.0		32.0	32.0	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		25.0	25.0		25.0	25.0	
Pedestrian Calls (#/hr)	15	15		15	15		5	5		5	5	
Act Effect Green (s)	107.8	107.8		107.8	107.8		14.6	14.6			14.6	
Actuated g/C Ratio	0.83	0.83		0.83	0.83		0.11	0.11			0.11	
v/c Ratio	0.01	0.49		0.20	0.24		0.26	0.20			0.08	
Control Delay	5.2	5.9		20.3	13.4		53.8	15.3			34.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	5.2	5.9		20.3	13.4		53.8	15.3			34.1	

2: Sinclair & Montreal Background 2027 PM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A		C	B		D	B			C	
Approach Delay		5.9			13.8			34.3			34.1	
Approach LOS		A			B			C			C	
Queue Length 50th (m)	0.2	44.8		8.1	60.4		10.7	0.3			2.0	
Queue Length 95th (m)	1.9	127.0		22.4	91.8		18.8	9.9			7.3	
Internal Link Dist (m)		120.2			61.9			81.3			51.0	
Turn Bay Length (m)	55.0			65.0			25.0					
Base Capacity (vph)	601	2924		256	2927		342	422			375	
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	0.01	0.49		0.20	0.24		0.12	0.10			0.04	

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 110 (85%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.49

Intersection Signal Delay: 9.7

Intersection LOS: A

Intersection Capacity Utilization 59.9%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 2: Sinclair & Montreal



						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑↱			↑↑		↱
Traffic Volume (vph)	1418	0	0	697	0	0
Future Volume (vph)	1418	0	0	697	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.91	0.91	1.00	0.95	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	5085	0	0	3539	0	1863
Flt Permitted						
Satd. Flow (perm)	5085	0	0	3539	0	1863
Link Speed (k/h)	60			60	50	
Link Distance (m)	85.9			91.3	68.9	
Travel Time (s)	5.2			5.5	5.0	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1418	0	0	697	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1418	0	0	697	0	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	30.7%			ICU Level of Service A		
Analysis Period (min)	15					

Intersection						
Int Delay, s/veh	0					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑↓			↑↑		↗
Traffic Vol, veh/h	1418	0	0	697	0	0
Future Vol, veh/h	1418	0	0	697	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1418	0	0	697	0	0
Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	-	-	-	709
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	-	-	0	-	0	323
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	323
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB	WB	NB			
HCM Control Delay, s	0	0	0			
HCM LOS	A					
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	-	-	-	-		
HCM Lane V/C Ratio	-	-	-	-		
HCM Control Delay (s)	0	-	-	-		
HCM Lane LOS	A	-	-	-		
HCM 95th %tile Q(veh)	-	-	-	-		

6: Shefford & Site
Background 2027 PM

Existing Geometry

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	144	133	0
Future Volume (vph)	0	0	0	144	133	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1863	0	0	1863	1863	0
Flt Permitted						
Satd. Flow (perm)	1863	0	0	1863	1863	0
Link Speed (k/h)	50			40	50	
Link Distance (m)	62.6			91.1	71.0	
Travel Time (s)	4.5			8.2	5.1	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	0	144	133	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	144	133	0
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	10.9%			ICU Level of Service A		
Analysis Period (min)	15					

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	144	133	0
Future Vol, veh/h	0	0	0	144	133	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	144	133	0
Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	277	133	-	0	-	0
Stage 1	133	-	-	-	-	-
Stage 2	144	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	713	916	0	-	-	-
Stage 1	893	-	0	-	-	-
Stage 2	883	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	713	916	-	-	-	-
Mov Cap-2 Maneuver	713	-	-	-	-	-
Stage 1	893	-	-	-	-	-
Stage 2	883	-	-	-	-	-
Approach	EB	NB	SB			
HCM Control Delay, s	0	0	0			
HCM LOS	A					
Minor Lane/Major Mvmt	NBT	EBLn1	SBT	SBR		
Capacity (veh/h)	-	-	-	-		
HCM Lane V/C Ratio	-	-	-	-		
HCM Control Delay (s)	-	0	-	-		
HCM Lane LOS	-	A	-	-		
HCM 95th %tile Q(veh)	-	-	-	-		

1: Shefford & Montreal
Background 2032 AM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			 			 		 		
Traffic Volume (vph)	192	620	16	63	1342	712	31	20	48	366	30	159
Future Volume (vph)	192	620	16	63	1342	712	31	20	48	366	30	159
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		0.0	50.0		100.0	30.0		0.0	0.0		30.0
Storage Lanes	1		0	1		0	1		0	2		1
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.996				0.850		0.894				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5065	0	1770	3539	1583	1770	1665	0	3433	1863	1583
Flt Permitted	0.074			0.399			0.950			0.950		
Satd. Flow (perm)	138	5065	0	743	3539	1583	1770	1665	0	3433	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3				454		48				159
Link Speed (k/h)		60			60			40			50	
Link Distance (m)		91.3			294.7			71.0			192.4	
Travel Time (s)		5.5			17.7			6.4			13.9	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	192	620	16	63	1342	712	31	20	48	366	30	159
Shared Lane Traffic (%)												
Lane Group Flow (vph)	192	636	0	63	1342	712	31	68	0	366	30	159
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2			6		6						4
Detector Phase	5	2		1	6	6	8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.0	27.0		11.0	27.0	27.0	33.5	33.5		34.1	34.1	34.1
Total Split (s)	15.0	33.0		15.0	33.0	33.0	33.0	33.0		34.0	34.0	34.0
Total Split (%)	13.0%	28.7%		13.0%	28.7%	28.7%	28.7%	28.7%		29.6%	29.6%	29.6%
Maximum Green (s)	9.0	27.0		9.0	27.0	27.0	26.5	26.5		27.9	27.9	27.9
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.3	3.3		3.3	3.3	3.3
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	3.2	3.2		2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.5	6.5		6.1	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None		None	None	None
Walk Time (s)		7.0			7.0	7.0	7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)		14.0			14.0	14.0	20.0	20.0		21.0	21.0	21.0
Pedestrian Calls (#/hr)		15			15	15	5	5		5	5	5
Act Effect Green (s)	66.5	56.8		56.6	49.4	49.4	13.3	13.3		18.7	18.7	18.7
Actuated g/C Ratio	0.58	0.49		0.49	0.43	0.43	0.12	0.12		0.16	0.16	0.16
v/c Ratio	0.76	0.25		0.15	0.88	0.76	0.15	0.29		0.66	0.10	0.41
Control Delay	47.5	17.4		16.7	40.4	17.8	44.6	20.6		50.2	39.0	9.0
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	47.5	17.4		16.7	40.4	17.8	44.6	20.6		50.2	39.0	9.0

1: Shefford & Montreal
Background 2032 AM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	B		B	D	B	D	C		D	D	A
Approach Delay		24.4			32.1			28.2			37.8	
Approach LOS		C			C			C			D	
Queue Length 50th (m)	25.8	31.8		5.9	152.0	51.6	7.0	4.5		42.9	6.2	0.0
Queue Length 95th (m)	#95.0	34.9		19.5	#284.5	#160.5	14.2	15.8		52.8	13.5	17.0
Internal Link Dist (m)		67.3			270.7			47.0			168.4	
Turn Bay Length (m)	75.0			50.0		100.0	30.0					30.0
Base Capacity (vph)	253	2501		457	1520	939	407	420		832	451	504
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.76	0.25		0.14	0.88	0.76	0.08	0.16		0.44	0.07	0.32

Intersection Summary

Area Type: Other

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 29 (25%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.88

Intersection Signal Delay: 31.1

Intersection LOS: C

Intersection Capacity Utilization 79.9%

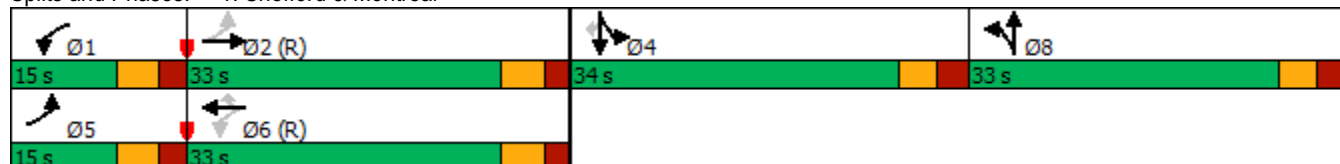
ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Shefford & Montreal



2: Sinclair & Montreal
Background 2032 AM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	753	33	156	1534	3	79	0	20	15	3	10
Future Volume (vph)	5	753	33	156	1534	3	79	0	20	15	3	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	55.0		0.0	65.0		0.0	25.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.994						0.850			0.952	
Flt Protected	0.950			0.950			0.950				0.974	
Satd. Flow (prot)	1770	3518	0	1770	3539	0	1770	1583	0	0	1727	0
Flt Permitted	0.139			0.348			0.739				0.847	
Satd. Flow (perm)	259	3518	0	648	3539	0	1377	1583	0	0	1502	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7						222			10	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		144.2			85.9			105.3			75.0	
Travel Time (s)		8.7			5.2			7.6			5.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	753	33	156	1534	3	79	0	20	15	3	10
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	786	0	156	1537	0	79	20	0	0	28	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.0	24.0		24.0	24.0		38.0	38.0		38.0	38.0	
Total Split (s)	77.0	77.0		77.0	77.0		38.0	38.0		38.0	38.0	
Total Split (%)	67.0%	67.0%		67.0%	67.0%		33.0%	33.0%		33.0%	33.0%	
Maximum Green (s)	71.0	71.0		71.0	71.0		32.0	32.0		32.0	32.0	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		25.0	25.0		25.0	25.0	
Pedestrian Calls (#/hr)	15	15		15	15		5	5		5	5	
Act Effect Green (s)	91.8	91.8		91.8	91.8		15.6	15.6			15.6	
Actuated g/C Ratio	0.80	0.80		0.80	0.80		0.14	0.14			0.14	
v/c Ratio	0.02	0.28		0.30	0.54		0.42	0.05			0.13	
Control Delay	6.6	5.1		3.6	4.1		50.1	0.2			29.4	
Queue Delay	0.0	0.0		0.0	0.2		0.0	0.0			0.0	
Total Delay	6.6	5.1		3.6	4.3		50.1	0.2			29.4	

2: Sinclair & Montreal Background 2032 AM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A		A	A		D	A			C	
Approach Delay		5.1			4.2			40.0			29.4	
Approach LOS		A			A			D			C	
Queue Length 50th (m)	0.2	21.1		2.7	14.2		18.1	0.0			3.9	
Queue Length 95th (m)	2.1	56.5		m3.6	90.2		27.7	0.0			10.5	
Internal Link Dist (m)		120.2			61.9			81.3			51.0	
Turn Bay Length (m)	55.0			65.0			25.0					
Base Capacity (vph)	206	2809		517	2824		383	600			425	
Starvation Cap Reductn	0	0		0	401		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	0.02	0.28		0.30	0.63		0.21	0.03			0.07	

Intersection Summary

Area Type: Other

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 31 (27%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 6.1

Intersection LOS: A

Intersection Capacity Utilization 74.2%

ICU Level of Service D

Analysis Period (min) 15

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

Splits and Phases: 2: Sinclair & Montreal



						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑↱			↑↑		↱
Traffic Volume (vph)	864	0	0	1564	0	0
Future Volume (vph)	864	0	0	1564	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.91	0.91	1.00	0.95	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	5085	0	0	3539	0	1863
Flt Permitted						
Satd. Flow (perm)	5085	0	0	3539	0	1863
Link Speed (k/h)	60			60	50	
Link Distance (m)	85.9			91.3	68.9	
Travel Time (s)	5.2			5.5	5.0	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	864	0	0	1564	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	864	0	0	1564	0	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	46.6%			ICU Level of Service A		
Analysis Period (min)	15					

Intersection

Int Delay, s/veh 0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑			↑↑		↑
Traffic Vol, veh/h	864	0	0	1564	0	0
Future Vol, veh/h	864	0	0	1564	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	864	0	0	1564	0	0

Major/Minor	Major1	Major2	Minor1	
Conflicting Flow All	0	0	-	432
Stage 1	-	-	-	-
Stage 2	-	-	-	-
Critical Hdwy	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-
Follow-up Hdwy	-	-	-	3.92
Pot Cap-1 Maneuver	-	0	0	489
Stage 1	-	0	0	-
Stage 2	-	0	0	-
Platoon blocked, %	-	-	-	-
Mov Cap-1 Maneuver	-	-	-	489
Mov Cap-2 Maneuver	-	-	-	-
Stage 1	-	-	-	-
Stage 2	-	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-
HCM Control Delay (s)	0	-	-	-
HCM Lane LOS	A	-	-	-
HCM 95th %tile Q(veh)	-	-	-	-

6: Shefford & Site
Background 2032 AM

Existing Geometry

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	99	109	0
Future Volume (vph)	0	0	0	99	109	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1863	0	0	1863	1863	0
Flt Permitted						
Satd. Flow (perm)	1863	0	0	1863	1863	0
Link Speed (k/h)	50			40	50	
Link Distance (m)	62.6			91.1	71.0	
Travel Time (s)	4.5			8.2	5.1	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	0	99	109	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	99	109	0
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization 9.1%	ICU Level of Service A					
Analysis Period (min) 15						

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	99	109	0
Future Vol, veh/h	0	0	0	99	109	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	99	109	0
Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	208	109	-	0	-	0
Stage 1	109	-	-	-	-	-
Stage 2	99	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	780	945	0	-	-	-
Stage 1	916	-	0	-	-	-
Stage 2	925	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	780	945	-	-	-	-
Mov Cap-2 Maneuver	780	-	-	-	-	-
Stage 1	916	-	-	-	-	-
Stage 2	925	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	0	0		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT EBLn1		SBT	SBR		
Capacity (veh/h)	-		-	-		
HCM Lane V/C Ratio	-		-	-		
HCM Control Delay (s)	-		0	-		
HCM Lane LOS	-		A	-		
HCM 95th %tile Q(veh)	-		-	-		

1: Shefford & Montreal
Background 2033 PM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	120	1378	40	53	534	299	43	22	79	673	40	158
Future Volume (vph)	120	1378	40	53	534	299	43	22	79	673	40	158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		0.0	50.0		100.0	30.0		0.0	0.0		30.0
Storage Lanes	1		0	1		0	1		0	2		1
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.996				0.850		0.883				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5065	0	1770	3539	1583	1770	1645	0	3433	1863	1583
Flt Permitted	0.364			0.107			0.950			0.950		
Satd. Flow (perm)	678	5065	0	199	3539	1583	1770	1645	0	3433	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3				299		79				158
Link Speed (k/h)		60			60			40			50	
Link Distance (m)		91.3			294.7			71.0			192.4	
Travel Time (s)		5.5			17.7			6.4			13.9	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	120	1378	40	53	534	299	43	22	79	673	40	158
Shared Lane Traffic (%)												
Lane Group Flow (vph)	120	1418	0	53	534	299	43	101	0	673	40	158
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2			6		6						4
Detector Phase	5	2		1	6	6	8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.0	27.0		11.0	27.0	27.0	33.5	33.5		34.1	34.1	34.1
Total Split (s)	15.0	44.0		15.0	44.0	44.0	33.0	33.0		38.0	38.0	38.0
Total Split (%)	11.5%	33.8%		11.5%	33.8%	33.8%	25.4%	25.4%		29.2%	29.2%	29.2%
Maximum Green (s)	9.0	38.0		9.0	38.0	38.0	26.5	26.5		31.9	31.9	31.9
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.3	3.3		3.3	3.3	3.3
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	3.2	3.2		2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.5	6.5		6.1	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None		None	None	None
Walk Time (s)		7.0			7.0	7.0	7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)		14.0			14.0	14.0	20.0	20.0		21.0	21.0	21.0
Pedestrian Calls (#/hr)		15			15	15	5	5		5	5	5
Act Effect Green (s)	65.2	57.5		60.8	53.5	53.5	13.3	13.3		29.6	29.6	29.6
Actuated g/C Ratio	0.50	0.44		0.47	0.41	0.41	0.10	0.10		0.23	0.23	0.23
v/c Ratio	0.29	0.63		0.29	0.37	0.36	0.24	0.42		0.86	0.09	0.33
Control Delay	17.6	31.5		22.4	29.2	4.8	54.5	21.3		60.2	39.1	7.7
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	17.6	31.5		22.4	29.2	4.8	54.5	21.3		60.2	39.1	7.7

1: Shefford & Montreal
Background 2033 PM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	B	C		C	C	A	D	C		E	D	A
Approach Delay		30.4			20.6			31.2			49.7	
Approach LOS		C			C			C			D	
Queue Length 50th (m)	16.4	110.4		6.5	51.2	0.0	11.2	5.7		88.9	8.4	0.0
Queue Length 95th (m)	33.0	#175.2		17.4	81.7	21.6	20.6	20.6		111.4	18.5	17.7
Internal Link Dist (m)		67.3			270.7			47.0			168.4	
Turn Bay Length (m)	75.0			50.0		100.0	30.0					30.0
Base Capacity (vph)	421	2243		204	1455	827	360	398		842	457	507
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.29	0.63		0.26	0.37	0.36	0.12	0.25		0.80	0.09	0.31

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 20 (15%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 32.8

Intersection LOS: C

Intersection Capacity Utilization 72.6%

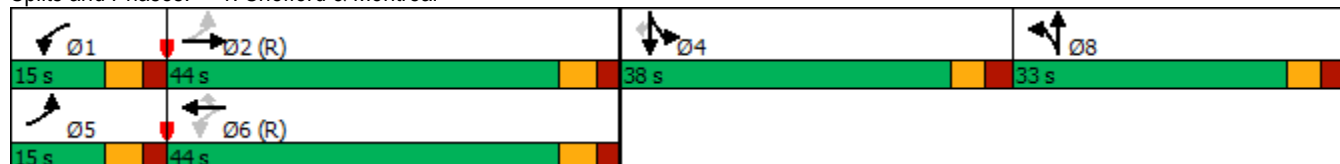
ICU Level of Service C

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Shefford & Montreal



2: Sinclair & Montreal
Background 2033 PM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	1536	37	50	745	13	41	1	41	7	1	6
Future Volume (vph)	5	1536	37	50	745	13	41	1	41	7	1	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	55.0		0.0	65.0		0.0	25.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.997			0.854			0.942	
Flt Protected	0.950			0.950			0.950				0.976	
Satd. Flow (prot)	1770	3525	0	1770	3529	0	1770	1591	0	0	1713	0
Flt Permitted	0.361			0.138			0.748				0.860	
Satd. Flow (perm)	672	3525	0	257	3529	0	1393	1591	0	0	1509	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			3			41			6	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		144.2			85.9			105.3			75.0	
Travel Time (s)		8.7			5.2			7.6			5.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	1536	37	50	745	13	41	1	41	7	1	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	1573	0	50	758	0	41	42	0	0	14	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.0	24.0		24.0	24.0		38.0	38.0		38.0	38.0	
Total Split (s)	92.0	92.0		92.0	92.0		38.0	38.0		38.0	38.0	
Total Split (%)	70.8%	70.8%		70.8%	70.8%		29.2%	29.2%		29.2%	29.2%	
Maximum Green (s)	86.0	86.0		86.0	86.0		32.0	32.0		32.0	32.0	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		25.0	25.0		25.0	25.0	
Pedestrian Calls (#/hr)	15	15		15	15		5	5		5	5	
Act Effect Green (s)	107.8	107.8		107.8	107.8		14.6	14.6			14.6	
Actuated g/C Ratio	0.83	0.83		0.83	0.83		0.11	0.11			0.11	
v/c Ratio	0.01	0.54		0.23	0.26		0.26	0.20			0.08	
Control Delay	5.2	6.4		20.5	11.5		53.8	15.3			34.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	5.2	6.4		20.5	11.5		53.8	15.3			34.1	

2: Sinclair & Montreal Background 2033 PM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A		C	B		D	B			C	
Approach Delay		6.4			12.0			34.3			34.1	
Approach LOS		A			B			C			C	
Queue Length 50th (m)	0.2	53.0		8.5	69.3		10.7	0.3			2.0	
Queue Length 95th (m)	1.9	149.7		17.9	66.3		18.8	9.9			7.3	
Internal Link Dist (m)		120.2			61.9			81.3			51.0	
Turn Bay Length (m)	55.0			65.0			25.0					
Base Capacity (vph)	557	2924		213	2927		342	422			375	
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	0.01	0.54		0.23	0.26		0.12	0.10			0.04	

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 110 (85%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.54

Intersection Signal Delay: 9.3

Intersection LOS: A

Intersection Capacity Utilization 62.0%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 2: Sinclair & Montreal



5: Site & Montreal
Background 2033 PM

Existing Geometry

	→	↘	↙	←	↖	↗
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑↱			↑↑		↗
Traffic Volume (vph)	1565	0	0	770	0	0
Future Volume (vph)	1565	0	0	770	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.91	0.91	1.00	0.95	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	5085	0	0	3539	0	1863
Flt Permitted						
Satd. Flow (perm)	5085	0	0	3539	0	1863
Link Speed (k/h)	60			60	50	
Link Distance (m)	85.9			91.3	68.9	
Travel Time (s)	5.2			5.5	5.0	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1565	0	0	770	0	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1565	0	0	770	0	0
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	33.6%			ICU Level of Service A		
Analysis Period (min)	15					

Intersection

Int Delay, s/veh 0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑↓			↑↑		↑
Traffic Vol, veh/h	1565	0	0	770	0	0
Future Vol, veh/h	1565	0	0	770	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1565	0	0	770	0	0

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	- - - 783
Stage 1	-	-	- - -
Stage 2	-	-	- - -
Critical Hdwy	-	-	- - - 7.14
Critical Hdwy Stg 1	-	-	- - -
Critical Hdwy Stg 2	-	-	- - -
Follow-up Hdwy	-	-	- - - 3.92
Pot Cap-1 Maneuver	-	-	0 - 0 289
Stage 1	-	-	0 - 0
Stage 2	-	-	0 - 0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	- - - 289
Mov Cap-2 Maneuver	-	-	- - -
Stage 1	-	-	- - -
Stage 2	-	-	- - -

Approach	EB	WB	NB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-
HCM Control Delay (s)	0	-	-	-
HCM Lane LOS	A	-	-	-
HCM 95th %tile Q(veh)	-	-	-	-

6: Shefford & Site
Background 2033 PM

Existing Geometry

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	0	0	0	144	133	0
Future Volume (vph)	0	0	0	144	133	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt						
Flt Protected						
Satd. Flow (prot)	1863	0	0	1863	1863	0
Flt Permitted						
Satd. Flow (perm)	1863	0	0	1863	1863	0
Link Speed (k/h)	50			40	50	
Link Distance (m)	62.6			91.1	71.0	
Travel Time (s)	4.5			8.2	5.1	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	0	0	0	144	133	0
Shared Lane Traffic (%)						
Lane Group Flow (vph)	0	0	0	144	133	0
Sign Control	Stop			Free	Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	10.9%			ICU Level of Service A		
Analysis Period (min)	15					

Intersection						
Int Delay, s/veh	0					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	0	0	0	144	133	0
Future Vol, veh/h	0	0	0	144	133	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	0	0	144	133	0
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	277	133	-	0	-	0
Stage 1	133	-	-	-	-	-
Stage 2	144	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	-	-
Pot Cap-1 Maneuver	713	916	0	-	-	-
Stage 1	893	-	0	-	-	-
Stage 2	883	-	0	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	713	916	-	-	-	-
Mov Cap-2 Maneuver	713	-	-	-	-	-
Stage 1	893	-	-	-	-	-
Stage 2	883	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	0	0		0		
HCM LOS	A					
Minor Lane/Major Mvmt	NBT EBLn1		SBT	SBR		
Capacity (veh/h)	-		-	-		
HCM Lane V/C Ratio	-		-	-		
HCM Control Delay (s)	-		0	-		
HCM Lane LOS	-		A	-		
HCM 95th %tile Q(veh)	-		-	-		

1: Shefford & Montreal
Future 2027 AM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	195	585	16	127	1179	712	98	23	61	356	47	159
Future Volume (vph)	195	585	16	127	1179	712	98	23	61	356	47	159
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		0.0	50.0		100.0	30.0		0.0	0.0		30.0
Storage Lanes	1		0	1		0	1		0	2		1
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.996				0.850		0.891				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5065	0	1770	3539	1583	1770	1660	0	3433	1863	1583
Flt Permitted	0.082			0.414			0.950			0.950		
Satd. Flow (perm)	153	5065	0	771	3539	1583	1770	1660	0	3433	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3				516		61				159
Link Speed (k/h)		60			60			40			50	
Link Distance (m)		91.3			294.7			71.0			192.4	
Travel Time (s)		5.5			17.7			6.4			13.9	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	195	585	16	127	1179	712	98	23	61	356	47	159
Shared Lane Traffic (%)												
Lane Group Flow (vph)	195	601	0	127	1179	712	98	84	0	356	47	159
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2			6		6						4
Detector Phase	5	2		1	6	6	8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.0	27.0		11.0	27.0	27.0	33.5	33.5		34.1	34.1	34.1
Total Split (s)	15.0	33.0		15.0	33.0	33.0	33.0	33.0		34.0	34.0	34.0
Total Split (%)	13.0%	28.7%		13.0%	28.7%	28.7%	28.7%	28.7%		29.6%	29.6%	29.6%
Maximum Green (s)	9.0	27.0		9.0	27.0	27.0	26.5	26.5		27.9	27.9	27.9
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.3	3.3		3.3	3.3	3.3
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	3.2	3.2		2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.5	6.5		6.1	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None		None	None	None
Walk Time (s)		7.0			7.0	7.0	7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)		14.0			14.0	14.0	20.0	20.0		21.0	21.0	21.0
Pedestrian Calls (#/hr)		15			15	15	5	5		5	5	5
Act Effect Green (s)	61.8	48.8		53.1	44.4	44.4	14.4	14.4		18.6	18.6	18.6
Actuated g/C Ratio	0.54	0.42		0.46	0.39	0.39	0.13	0.13		0.16	0.16	0.16
v/c Ratio	0.74	0.28		0.30	0.86	0.77	0.45	0.32		0.64	0.16	0.41
Control Delay	45.3	20.6		18.2	41.6	15.9	51.4	19.0		49.8	40.1	9.0
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	45.3	20.6		18.2	41.6	15.9	51.4	19.0		49.8	40.1	9.0

1: Shefford & Montreal
Future 2027 AM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	C		B	D	B	D	B		D	D	A
Approach Delay		26.6			31.0			36.4			37.5	
Approach LOS		C			C			D			D	
Queue Length 50th (m)	26.2	31.5		12.6	128.0	36.5	22.4	5.0		41.8	9.9	0.0
Queue Length 95th (m)	#96.1	43.4		35.1	#241.7	#136.2	34.5	17.5		51.4	18.9	17.0
Internal Link Dist (m)		67.3			270.7			47.0			168.4	
Turn Bay Length (m)	75.0			50.0		100.0	30.0					30.0
Base Capacity (vph)	264	2150		441	1367	928	407	429		832	451	504
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.74	0.28		0.29	0.86	0.77	0.24	0.20		0.43	0.10	0.32

Intersection Summary

Area Type: Other

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 29 (25%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 130

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 31.3

Intersection LOS: C

Intersection Capacity Utilization 78.6%

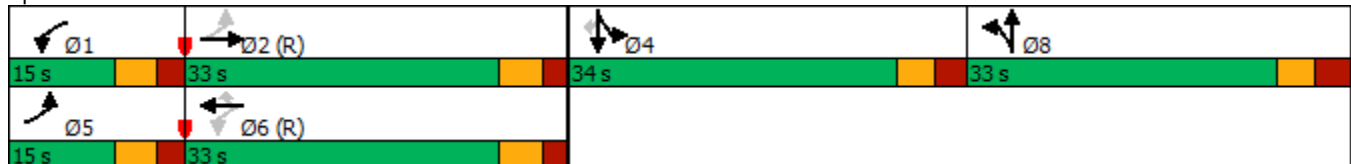
ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Shefford & Montreal



2: Sinclair & Montreal
Future 2027 AM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	714	33	156	1420	3	79	0	20	15	3	10
Future Volume (vph)	5	714	33	156	1420	3	79	0	20	15	3	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	55.0		0.0	65.0		0.0	25.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.993						0.850			0.952	
Flt Protected	0.950			0.950			0.950				0.974	
Satd. Flow (prot)	1770	3514	0	1770	3539	0	1770	1583	0	0	1727	0
Flt Permitted	0.162			0.363			0.739				0.847	
Satd. Flow (perm)	302	3514	0	676	3539	0	1377	1583	0	0	1502	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		8						241			10	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		144.2			85.9			105.3			75.0	
Travel Time (s)		8.7			5.2			7.6			5.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	714	33	156	1420	3	79	0	20	15	3	10
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	747	0	156	1423	0	79	20	0	0	28	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.0	24.0		24.0	24.0		38.0	38.0		38.0	38.0	
Total Split (s)	77.0	77.0		77.0	77.0		38.0	38.0		38.0	38.0	
Total Split (%)	67.0%	67.0%		67.0%	67.0%		33.0%	33.0%		33.0%	33.0%	
Maximum Green (s)	71.0	71.0		71.0	71.0		32.0	32.0		32.0	32.0	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		25.0	25.0		25.0	25.0	
Pedestrian Calls (#/hr)	15	15		15	15		5	5		5	5	
Act Effect Green (s)	91.8	91.8		91.8	91.8		15.6	15.6			15.6	
Actuated g/C Ratio	0.80	0.80		0.80	0.80		0.14	0.14			0.14	
v/c Ratio	0.02	0.27		0.29	0.50		0.42	0.05			0.13	
Control Delay	6.4	5.0		3.9	4.1		50.1	0.2			29.4	
Queue Delay	0.0	0.0		0.0	0.2		0.0	0.0			0.0	
Total Delay	6.4	5.0		3.9	4.2		50.1	0.2			29.4	

2: Sinclair & Montreal
Future 2027 AM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A		A	A		D	A			C	
Approach Delay		5.0			4.2			40.0			29.4	
Approach LOS		A			A			D			C	
Queue Length 50th (m)	0.2	19.7		3.6	17.6		18.1	0.0			3.9	
Queue Length 95th (m)	2.1	53.1		6.3	59.7		27.7	0.0			10.5	
Internal Link Dist (m)		120.2			61.9			81.3			51.0	
Turn Bay Length (m)	55.0			65.0			25.0					
Base Capacity (vph)	241	2806		539	2824		383	614			425	
Starvation Cap Reductn	0	0		0	460		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	0.02	0.27		0.29	0.60		0.21	0.03			0.07	

Intersection Summary

Area Type: Other

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 31 (27%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.50

Intersection Signal Delay: 6.2

Intersection LOS: A

Intersection Capacity Utilization 71.0%

ICU Level of Service C

Analysis Period (min) 15

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

Splits and Phases: 2: Sinclair & Montreal



						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑↱			↑↑		↱
Traffic Volume (vph)	766	48	0	1417	0	43
Future Volume (vph)	766	48	0	1417	0	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.91	0.91	1.00	0.95	1.00	1.00
Frt	0.991					0.865
Flt Protected						
Satd. Flow (prot)	5040	0	0	3539	0	1611
Flt Permitted						
Satd. Flow (perm)	5040	0	0	3539	0	1611
Link Speed (k/h)	60			60	50	
Link Distance (m)	85.9			91.3	68.9	
Travel Time (s)	5.2			5.5	5.0	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	766	48	0	1417	0	43
Shared Lane Traffic (%)						
Lane Group Flow (vph)	814	0	0	1417	0	43
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	42.5%			ICU Level of Service A		
Analysis Period (min)	15					

Intersection

Int Delay, s/veh 0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑↓			↑↑		↗
Traffic Vol, veh/h	766	48	0	1417	0	43
Future Vol, veh/h	766	48	0	1417	0	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	766	48	0	1417	0	43

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	- - - 407
Stage 1	-	-	- - -
Stage 2	-	-	- - -
Critical Hdwy	-	-	- - - 7.14
Critical Hdwy Stg 1	-	-	- - -
Critical Hdwy Stg 2	-	-	- - -
Follow-up Hdwy	-	-	- - - 3.92
Pot Cap-1 Maneuver	-	-	0 - 0 507
Stage 1	-	-	0 - 0 -
Stage 2	-	-	0 - 0 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	- - - 507
Mov Cap-2 Maneuver	-	-	- - -
Stage 1	-	-	- - -
Stage 2	-	-	- - -

Approach	EB	WB	NB
HCM Control Delay, s	0	0	12.8
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	507	-	-	-
HCM Lane V/C Ratio	0.085	-	-	-
HCM Control Delay (s)	12.8	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.3	-	-	-

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	86	4	6	96	109	81
Future Volume (vph)	86	4	6	96	109	81
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.994	0.942				
Flt Protected	0.954	0.997				
Satd. Flow (prot)	1766	0	0	1857	1755	0
Flt Permitted	0.954	0.997				
Satd. Flow (perm)	1766	0	0	1857	1755	0
Link Speed (k/h)	50	40 50				
Link Distance (m)	62.6	91.1 71.0				
Travel Time (s)	4.5	8.2 5.1				
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	86	4	6	96	109	81
Shared Lane Traffic (%)						
Lane Group Flow (vph)	90	0	0	102	190	0
Sign Control	Stop	Free			Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	22.4%			ICU Level of Service A		
Analysis Period (min)	15					

Intersection						
Int Delay, s/veh	2.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	86	4	6	96	109	81
Future Vol, veh/h	86	4	6	96	109	81
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	86	4	6	96	109	81
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	258	150	190	0	-	0
Stage 1	150	-	-	-	-	-
Stage 2	108	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	731	896	1384	-	-	-
Stage 1	878	-	-	-	-	-
Stage 2	916	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	727	896	1384	-	-	-
Mov Cap-2 Maneuver	727	-	-	-	-	-
Stage 1	874	-	-	-	-	-
Stage 2	916	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	10.6	0.4		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1384	-	733	-	-	
HCM Lane V/C Ratio	0.004	-	0.123	-	-	
HCM Control Delay (s)	7.6	-	10.6	-	-	
HCM Lane LOS	A	-	B	-	-	
HCM 95th %tile Q(veh)	0	-	0.4	-	-	

1: Shefford & Montreal
Background 2027 PM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			 			 		 		
Traffic Volume (vph)	124	1278	40	105	465	299	103	26	96	662	59	158
Future Volume (vph)	124	1278	40	105	465	299	103	26	96	662	59	158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		0.0	50.0		100.0	30.0		0.0	0.0		30.0
Storage Lanes	1		0	1		0	1		0	2		1
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.995				0.850		0.882				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5060	0	1770	3539	1583	1770	1643	0	3433	1863	1583
Flt Permitted	0.422			0.113			0.950			0.950		
Satd. Flow (perm)	786	5060	0	210	3539	1583	1770	1643	0	3433	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4				299		96				158
Link Speed (k/h)		60			60			40			50	
Link Distance (m)		91.3			294.7			71.0			192.4	
Travel Time (s)		5.5			17.7			6.4			13.9	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	124	1278	40	105	465	299	103	26	96	662	59	158
Shared Lane Traffic (%)												
Lane Group Flow (vph)	124	1318	0	105	465	299	103	122	0	662	59	158
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2			6		6						4
Detector Phase	5	2		1	6	6	8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.0	27.0		11.0	27.0	27.0	33.5	33.5		34.1	34.1	34.1
Total Split (s)	15.0	44.0		15.0	44.0	44.0	33.0	33.0		38.0	38.0	38.0
Total Split (%)	11.5%	33.8%		11.5%	33.8%	33.8%	25.4%	25.4%		29.2%	29.2%	29.2%
Maximum Green (s)	9.0	38.0		9.0	38.0	38.0	26.5	26.5		31.9	31.9	31.9
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.3	3.3		3.3	3.3	3.3
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	3.2	3.2		2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.5	6.5		6.1	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None		None	None	None
Walk Time (s)		7.0			7.0	7.0	7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)		14.0			14.0	14.0	20.0	20.0		21.0	21.0	21.0
Pedestrian Calls (#/hr)		15			15	15	5	5		5	5	5
Act Effect Green (s)	61.6	52.3		60.5	51.8	51.8	15.0	15.0		29.3	29.3	29.3
Actuated g/C Ratio	0.47	0.40		0.47	0.40	0.40	0.12	0.12		0.23	0.23	0.23
v/c Ratio	0.28	0.65		0.52	0.33	0.37	0.50	0.44		0.86	0.14	0.33
Control Delay	19.5	34.3		28.5	29.9	5.0	61.1	19.7		59.9	40.1	7.8
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	19.5	34.3		28.5	29.9	5.0	61.1	19.7		59.9	40.1	7.8

1: Shefford & Montreal
Background 2027 PM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	B	C		C	C	A	E	B		E	D	A
Approach Delay		33.0			21.1			38.6			49.2	
Approach LOS		C			C			D			D	
Queue Length 50th (m)	16.7	97.4		14.0	45.3	0.0	27.0	6.5		87.5	12.6	0.0
Queue Length 95th (m)	40.1	153.1		30.7	70.7	21.6	41.3	23.2		109.5	24.6	17.7
Internal Link Dist (m)		67.3			270.7			47.0			168.4	
Turn Bay Length (m)	75.0			50.0		100.0	30.0					30.0
Base Capacity (vph)	448	2037		212	1409	810	360	411		842	457	507
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.28	0.65		0.50	0.33	0.37	0.29	0.30		0.79	0.13	0.31

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 20 (15%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 34.5

Intersection LOS: C

Intersection Capacity Utilization 79.1%

ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 1: Shefford & Montreal

					
Ø1	Ø2 (R)		Ø4		Ø8
15 s	44 s		38 s		33 s
					
Ø5	Ø6 (R)				
15 s	44 s				

2: Sinclair & Montreal
Background 2027 PM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	1428	37	50	713	13	41	1	41	7	1	6
Future Volume (vph)	5	1428	37	50	713	13	41	1	41	7	1	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	55.0		0.0	65.0		0.0	25.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.996			0.997			0.854			0.942	
Flt Protected	0.950			0.950			0.950				0.976	
Satd. Flow (prot)	1770	3525	0	1770	3529	0	1770	1591	0	0	1713	0
Flt Permitted	0.374			0.158			0.748				0.860	
Satd. Flow (perm)	697	3525	0	294	3529	0	1393	1591	0	0	1509	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			3			41			6	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		144.2			85.9			105.3			75.0	
Travel Time (s)		8.7			5.2			7.6			5.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	1428	37	50	713	13	41	1	41	7	1	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	1465	0	50	726	0	41	42	0	0	14	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.0	24.0		24.0	24.0		38.0	38.0		38.0	38.0	
Total Split (s)	92.0	92.0		92.0	92.0		38.0	38.0		38.0	38.0	
Total Split (%)	70.8%	70.8%		70.8%	70.8%		29.2%	29.2%		29.2%	29.2%	
Maximum Green (s)	86.0	86.0		86.0	86.0		32.0	32.0		32.0	32.0	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		25.0	25.0		25.0	25.0	
Pedestrian Calls (#/hr)	15	15		15	15		5	5		5	5	
Act Effect Green (s)	107.8	107.8		107.8	107.8		14.6	14.6			14.6	
Actuated g/C Ratio	0.83	0.83		0.83	0.83		0.11	0.11			0.11	
v/c Ratio	0.01	0.50		0.20	0.25		0.26	0.20			0.08	
Control Delay	5.2	6.0		16.4	10.3		53.8	15.3			34.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	5.2	6.0		16.4	10.3		53.8	15.3			34.1	

2: Sinclair & Montreal Background 2027 PM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A		B	B		D	B			C	
Approach Delay		6.0			10.7			34.3			34.1	
Approach LOS		A			B			C			C	
Queue Length 50th (m)	0.2	46.7		7.0	55.5		10.7	0.3			2.0	
Queue Length 95th (m)	1.9	132.3		19.1	79.4		18.8	9.9			7.3	
Internal Link Dist (m)		120.2			61.9			81.3			51.0	
Turn Bay Length (m)	55.0			65.0			25.0					
Base Capacity (vph)	578	2924		244	2927		342	422			375	
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	0.01	0.50		0.20	0.25		0.12	0.10			0.04	

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 110 (85%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 75

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.50

Intersection Signal Delay: 8.7

Intersection LOS: A

Intersection Capacity Utilization 59.9%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 2: Sinclair & Montreal



5: Site & Montreal
Background 2027 PM

Existing Geometry

						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑↱			↑↑		↱
Traffic Volume (vph)	1377	78	0	697	0	75
Future Volume (vph)	1377	78	0	697	0	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.91	0.91	1.00	0.95	1.00	1.00
Frt	0.992					0.865
Flt Protected						
Satd. Flow (prot)	5045	0	0	3539	0	1611
Flt Permitted						
Satd. Flow (perm)	5045	0	0	3539	0	1611
Link Speed (k/h)	60			60	50	
Link Distance (m)	85.9			91.3	68.9	
Travel Time (s)	5.2			5.5	5.0	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1377	78	0	697	0	75
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1455	0	0	697	0	75
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	39.7%			ICU Level of Service A		
Analysis Period (min)	15					

Intersection						
Int Delay, s/veh	0.7					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑			↑↑		↗
Traffic Vol, veh/h	1377	78	0	697	0	75
Future Vol, veh/h	1377	78	0	697	0	75
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1377	78	0	697	0	75
Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	-	-	-	728
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Critical Hdwy	-	-	-	-	-	7.14
Critical Hdwy Stg 1	-	-	-	-	-	-
Critical Hdwy Stg 2	-	-	-	-	-	-
Follow-up Hdwy	-	-	-	-	-	3.92
Pot Cap-1 Maneuver	-	-	0	-	0	314
Stage 1	-	-	0	-	0	-
Stage 2	-	-	0	-	0	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	-	-	-	314
Mov Cap-2 Maneuver	-	-	-	-	-	-
Stage 1	-	-	-	-	-	-
Stage 2	-	-	-	-	-	-
Approach	EB		WB		NB	
HCM Control Delay, s	0		0		20	
HCM LOS					C	
Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT		
Capacity (veh/h)	314	-	-	-		
HCM Lane V/C Ratio	0.239	-	-	-		
HCM Control Delay (s)	20	-	-	-		
HCM Lane LOS	C	-	-	-		
HCM 95th %tile Q(veh)	0.9	-	-	-		

6: Shefford & Site
Background 2027 PM

Existing Geometry

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	81	4	8	140	133	72
Future Volume (vph)	81	4	8	140	133	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.994	0.953				
Flt Protected	0.955	0.997				
Satd. Flow (prot)	1768	0	0	1857	1775	0
Flt Permitted	0.955	0.997				
Satd. Flow (perm)	1768	0	0	1857	1775	0
Link Speed (k/h)	50	40 50				
Link Distance (m)	62.6	91.1 71.0				
Travel Time (s)	4.5	8.2 5.1				
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	81	4	8	140	133	72
Shared Lane Traffic (%)						
Lane Group Flow (vph)	85	0	0	148	205	0
Sign Control	Stop	Free			Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	25.3%			ICU Level of Service A		
Analysis Period (min)	15					

Intersection						
Int Delay, s/veh	2.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	81	4	8	140	133	72
Future Vol, veh/h	81	4	8	140	133	72
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	81	4	8	140	133	72
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	325	169	205	0	-	0
Stage 1	169	-	-	-	-	-
Stage 2	156	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	669	875	1366	-	-	-
Stage 1	861	-	-	-	-	-
Stage 2	872	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	665	875	1366	-	-	-
Mov Cap-2 Maneuver	665	-	-	-	-	-
Stage 1	856	-	-	-	-	-
Stage 2	872	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	11.1	0.4		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1366	-	673	-	-	
HCM Lane V/C Ratio	0.006	-	0.126	-	-	
HCM Control Delay (s)	7.7	-	11.1	-	-	
HCM Lane LOS	A	-	B	-	-	
HCM 95th %tile Q(veh)	0	-	0.4	-	-	

1: Shefford & Montreal
Future 2033 AM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			 			 		 		
Traffic Volume (vph)	195	644	16	127	1306	712	98	23	61	356	47	159
Future Volume (vph)	195	644	16	127	1306	712	98	23	61	356	47	159
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		0.0	50.0		100.0	30.0		0.0	0.0		30.0
Storage Lanes	1		0	1		0	1		0	2		1
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.996				0.850		0.891				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5065	0	1770	3539	1583	1770	1660	0	3433	1863	1583
Flt Permitted	0.082			0.390			0.950			0.950		
Satd. Flow (perm)	153	5065	0	726	3539	1583	1770	1660	0	3433	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3				466		61				159
Link Speed (k/h)		60			60			40			50	
Link Distance (m)		91.3			294.7			71.0			192.4	
Travel Time (s)		5.5			17.7			6.4			13.9	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	195	644	16	127	1306	712	98	23	61	356	47	159
Shared Lane Traffic (%)												
Lane Group Flow (vph)	195	660	0	127	1306	712	98	84	0	356	47	159
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2			6		6						4
Detector Phase	5	2		1	6	6	8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.0	27.0		11.0	27.0	27.0	33.5	33.5		34.1	34.1	34.1
Total Split (s)	15.0	33.0		15.0	33.0	33.0	33.0	33.0		34.0	34.0	34.0
Total Split (%)	13.0%	28.7%		13.0%	28.7%	28.7%	28.7%	28.7%		29.6%	29.6%	29.6%
Maximum Green (s)	9.0	27.0		9.0	27.0	27.0	26.5	26.5		27.9	27.9	27.9
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.3	3.3		3.3	3.3	3.3
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	3.2	3.2		2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.5	6.5		6.1	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None		None	None	None
Walk Time (s)		7.0			7.0	7.0	7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)		14.0			14.0	14.0	20.0	20.0		21.0	21.0	21.0
Pedestrian Calls (#/hr)		15			15	15	5	5		5	5	5
Act Effect Green (s)	61.8	48.8		53.1	44.4	44.4	14.4	14.4		18.6	18.6	18.6
Actuated g/C Ratio	0.54	0.42		0.46	0.39	0.39	0.13	0.13		0.16	0.16	0.16
v/c Ratio	0.74	0.31		0.31	0.96	0.79	0.45	0.32		0.64	0.16	0.41
Control Delay	44.5	21.0		18.4	51.3	19.3	51.4	19.0		49.8	40.1	9.0
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	44.5	21.0		18.4	51.3	19.3	51.4	19.0		49.8	40.1	9.0

1: Shefford & Montreal
Future 2033 AM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	D	C		B	D	B	D	B		D	D	A
Approach Delay		26.4			38.8			36.4			37.5	
Approach LOS		C			D			D			D	
Queue Length 50th (m)	25.6	35.1		12.6	149.9	50.2	22.4	5.0		41.8	9.9	0.0
Queue Length 95th (m)	#95.5	38.7		35.1	#275.2	#155.8	34.5	17.5		51.4	18.9	17.0
Internal Link Dist (m)		67.3			270.7			47.0			168.4	
Turn Bay Length (m)	75.0			50.0		100.0	30.0					30.0
Base Capacity (vph)	264	2150		424	1367	897	407	429		832	451	504
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.74	0.31		0.30	0.96	0.79	0.24	0.20		0.43	0.10	0.32

Intersection Summary

Area Type: Other

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 29 (25%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 140

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.96

Intersection Signal Delay: 35.6

Intersection LOS: D

Intersection Capacity Utilization 78.8%

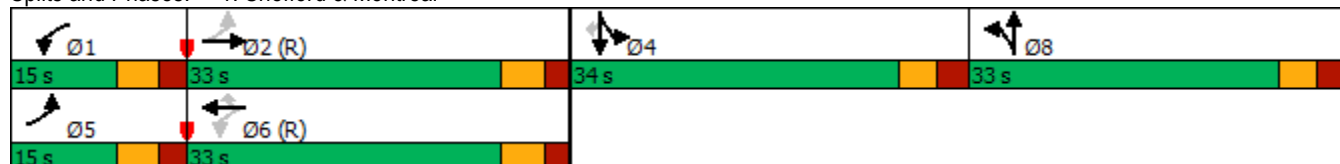
ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Shefford & Montreal



2: Sinclair & Montreal
Future 2033 AM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	785	33	156	1565	3	79	0	20	15	3	10
Future Volume (vph)	5	785	33	156	1565	3	79	0	20	15	3	10
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	55.0		0.0	65.0		0.0	25.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.994						0.850			0.952	
Flt Protected	0.950			0.950			0.950				0.974	
Satd. Flow (prot)	1770	3518	0	1770	3539	0	1770	1583	0	0	1727	0
Flt Permitted	0.133			0.335			0.739				0.847	
Satd. Flow (perm)	248	3518	0	624	3539	0	1377	1583	0	0	1502	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7						207			10	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		144.2			85.9			105.3			75.0	
Travel Time (s)		8.7			5.2			7.6			5.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	785	33	156	1565	3	79	0	20	15	3	10
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	818	0	156	1568	0	79	20	0	0	28	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.0	24.0		24.0	24.0		38.0	38.0		38.0	38.0	
Total Split (s)	77.0	77.0		77.0	77.0		38.0	38.0		38.0	38.0	
Total Split (%)	67.0%	67.0%		67.0%	67.0%		33.0%	33.0%		33.0%	33.0%	
Maximum Green (s)	71.0	71.0		71.0	71.0		32.0	32.0		32.0	32.0	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		25.0	25.0		25.0	25.0	
Pedestrian Calls (#/hr)	15	15		15	15		5	5		5	5	
Act Effect Green (s)	91.8	91.8		91.8	91.8		15.6	15.6			15.6	
Actuated g/C Ratio	0.80	0.80		0.80	0.80		0.14	0.14			0.14	
v/c Ratio	0.03	0.29		0.31	0.56		0.42	0.05			0.13	
Control Delay	6.6	5.2		3.9	4.6		50.1	0.2			29.4	
Queue Delay	0.0	0.0		0.0	0.2		0.0	0.0			0.0	
Total Delay	6.6	5.2		3.9	4.8		50.1	0.2			29.4	

2: Sinclair & Montreal
Future 2033 AM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A		A	A		D	A			C	
Approach Delay		5.2			4.7			40.0			29.4	
Approach LOS		A			A			D			C	
Queue Length 50th (m)	0.2	22.2		2.4	13.0		18.1	0.0			3.9	
Queue Length 95th (m)	2.1	59.3		m5.3	m75.8		27.7	0.0			10.5	
Internal Link Dist (m)		120.2			61.9			81.3			51.0	
Turn Bay Length (m)	55.0			65.0			25.0					
Base Capacity (vph)	198	2809		498	2824		383	589			425	
Starvation Cap Reductn	0	0		0	441		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	0.03	0.29		0.31	0.66		0.21	0.03			0.07	

Intersection Summary

Area Type: Other

Cycle Length: 115

Actuated Cycle Length: 115

Offset: 31 (27%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.56

Intersection Signal Delay: 6.4

Intersection LOS: A

Intersection Capacity Utilization 75.0%

ICU Level of Service D

Analysis Period (min) 15

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

Splits and Phases: 2: Sinclair & Montreal



						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑↱			↑↑		↱
Traffic Volume (vph)	848	48	0	1564	0	43
Future Volume (vph)	848	48	0	1564	0	43
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.91	0.91	1.00	0.95	1.00	1.00
Frt	0.992					0.865
Flt Protected						
Satd. Flow (prot)	5045	0	0	3539	0	1611
Flt Permitted						
Satd. Flow (perm)	5045	0	0	3539	0	1611
Link Speed (k/h)	60			60	50	
Link Distance (m)	85.9			91.3	68.9	
Travel Time (s)	5.2			5.5	5.0	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	848	48	0	1564	0	43
Shared Lane Traffic (%)						
Lane Group Flow (vph)	896	0	0	1564	0	43
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	46.6%			ICU Level of Service A		
Analysis Period (min)	15					

Intersection

Int Delay, s/veh 0.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑			↑↑		↗
Traffic Vol, veh/h	848	48	0	1564	0	43
Future Vol, veh/h	848	48	0	1564	0	43
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	848	48	0	1564	0	43

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	- - - 448
Stage 1	-	-	- - -
Stage 2	-	-	- - -
Critical Hdwy	-	-	- - - 7.14
Critical Hdwy Stg 1	-	-	- - -
Critical Hdwy Stg 2	-	-	- - -
Follow-up Hdwy	-	-	- - - 3.92
Pot Cap-1 Maneuver	-	-	0 - 0 477
Stage 1	-	-	0 - 0
Stage 2	-	-	0 - 0
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	- - - 477
Mov Cap-2 Maneuver	-	-	- - -
Stage 1	-	-	- - -
Stage 2	-	-	- - -

Approach	EB	WB	NB
HCM Control Delay, s	0	0	13.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	477	-	-	-
HCM Lane V/C Ratio	0.09	-	-	-
HCM Control Delay (s)	13.3	-	-	-
HCM Lane LOS	B	-	-	-
HCM 95th %tile Q(veh)	0.3	-	-	-

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	86	4	6	96	109	81
Future Volume (vph)	86	4	6	96	109	81
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.994	0.942				
Flt Protected	0.954	0.997				
Satd. Flow (prot)	1766	0	0	1857	1755	0
Flt Permitted	0.954	0.997				
Satd. Flow (perm)	1766	0	0	1857	1755	0
Link Speed (k/h)	50	40 50				
Link Distance (m)	62.6	91.1 71.0				
Travel Time (s)	4.5	8.2 5.1				
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	86	4	6	96	109	81
Shared Lane Traffic (%)						
Lane Group Flow (vph)	90	0	0	102	190	0
Sign Control	Stop	Free			Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	22.4%			ICU Level of Service A		
Analysis Period (min)	15					

Intersection						
Int Delay, s/veh	2.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	86	4	6	96	109	81
Future Vol, veh/h	86	4	6	96	109	81
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	86	4	6	96	109	81
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	258	150	190	0	-	0
Stage 1	150	-	-	-	-	-
Stage 2	108	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	731	896	1384	-	-	-
Stage 1	878	-	-	-	-	-
Stage 2	916	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	727	896	1384	-	-	-
Mov Cap-2 Maneuver	727	-	-	-	-	-
Stage 1	874	-	-	-	-	-
Stage 2	916	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	10.6	0.4		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1384	-	733	-	-	
HCM Lane V/C Ratio	0.004	-	0.123	-	-	
HCM Control Delay (s)	7.6	-	10.6	-	-	
HCM Lane LOS	A	-	B	-	-	
HCM 95th %tile Q(veh)	0	-	0.4	-	-	

1: Shefford & Montreal
Future 2033 PM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		  			 			 		 		
Traffic Volume (vph)	124	1408	40	105	515	299	103	26	96	662	59	158
Future Volume (vph)	124	1408	40	105	515	299	103	26	96	662	59	158
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	75.0		0.0	50.0		100.0	30.0		0.0	0.0		30.0
Storage Lanes	1		0	1		0	1		0	2		1
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.91	0.91	1.00	0.95	1.00	1.00	1.00	1.00	0.97	1.00	1.00
Frt		0.996				0.850		0.882				0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	5065	0	1770	3539	1583	1770	1643	0	3433	1863	1583
Flt Permitted	0.388			0.085			0.950			0.950		
Satd. Flow (perm)	723	5065	0	158	3539	1583	1770	1643	0	3433	1863	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		3				299		96				158
Link Speed (k/h)		60			60			40			50	
Link Distance (m)		91.3			294.7			71.0			192.4	
Travel Time (s)		5.5			17.7			6.4			13.9	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	124	1408	40	105	515	299	103	26	96	662	59	158
Shared Lane Traffic (%)												
Lane Group Flow (vph)	124	1448	0	105	515	299	103	122	0	662	59	158
Turn Type	pm+pt	NA		pm+pt	NA	Perm	Split	NA		Split	NA	Perm
Protected Phases	5	2		1	6		8	8		4	4	
Permitted Phases	2			6		6						4
Detector Phase	5	2		1	6	6	8	8		4	4	4
Switch Phase												
Minimum Initial (s)	5.0	10.0		5.0	10.0	10.0	10.0	10.0		10.0	10.0	10.0
Minimum Split (s)	11.0	27.0		11.0	27.0	27.0	33.5	33.5		34.1	34.1	34.1
Total Split (s)	15.0	44.0		15.0	44.0	44.0	33.0	33.0		38.0	38.0	38.0
Total Split (%)	11.5%	33.8%		11.5%	33.8%	33.8%	25.4%	25.4%		29.2%	29.2%	29.2%
Maximum Green (s)	9.0	38.0		9.0	38.0	38.0	26.5	26.5		31.9	31.9	31.9
Yellow Time (s)	3.7	3.7		3.7	3.7	3.7	3.3	3.3		3.3	3.3	3.3
All-Red Time (s)	2.3	2.3		2.3	2.3	2.3	3.2	3.2		2.8	2.8	2.8
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0		6.0	6.0	6.0	6.5	6.5		6.1	6.1	6.1
Lead/Lag	Lead	Lag		Lead	Lag	Lag						
Lead-Lag Optimize?	Yes	Yes		Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None		None	None	None
Walk Time (s)		7.0			7.0	7.0	7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)		14.0			14.0	14.0	20.0	20.0		21.0	21.0	21.0
Pedestrian Calls (#/hr)		15			15	15	5	5		5	5	5
Act Effect Green (s)	61.6	52.3		60.5	51.8	51.8	15.0	15.0		29.3	29.3	29.3
Actuated g/C Ratio	0.47	0.40		0.47	0.40	0.40	0.12	0.12		0.23	0.23	0.23
v/c Ratio	0.30	0.71		0.58	0.37	0.37	0.50	0.44		0.86	0.14	0.33
Control Delay	18.3	35.8		34.7	30.4	5.0	61.1	19.7		59.9	40.1	7.8
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0
Total Delay	18.3	35.8		34.7	30.4	5.0	61.1	19.7		59.9	40.1	7.8

1: Shefford & Montreal
Future 2033 PM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	B	D		C	C	A	E	B		E	D	A
Approach Delay		34.4			22.6			38.6			49.2	
Approach LOS		C			C			D			D	
Queue Length 50th (m)	18.1	116.2		14.0	51.0	0.0	27.0	6.5		87.5	12.6	0.0
Queue Length 95th (m)	30.0	#177.8		#37.5	78.6	21.6	41.3	23.2		109.5	24.6	17.7
Internal Link Dist (m)		67.3			270.7			47.0			168.4	
Turn Bay Length (m)	75.0			50.0		100.0	30.0					30.0
Base Capacity (vph)	423	2038		191	1409	810	360	411		842	457	507
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	0
Reduced v/c Ratio	0.29	0.71		0.55	0.37	0.37	0.29	0.30		0.79	0.13	0.31

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 20 (15%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 110

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.86

Intersection Signal Delay: 35.3

Intersection LOS: D

Intersection Capacity Utilization 81.6%

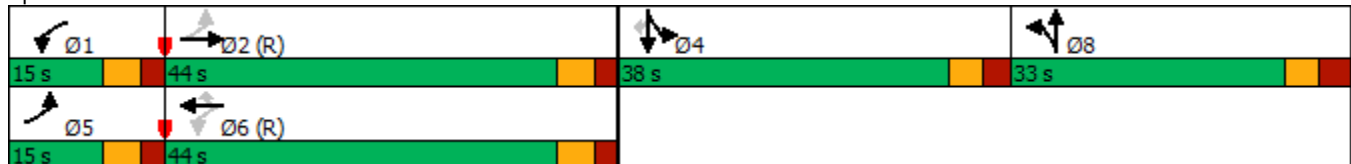
ICU Level of Service D

Analysis Period (min) 15

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

Queue shown is maximum after two cycles.

Splits and Phases: 1: Shefford & Montreal



2: Sinclair & Montreal
Future 2033 PM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	1573	37	50	783	13	41	1	41	7	1	6
Future Volume (vph)	5	1573	37	50	783	13	41	1	41	7	1	6
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (m)	55.0		0.0	65.0		0.0	25.0		0.0	0.0		0.0
Storage Lanes	1		0	1		0	1		0	0		0
Taper Length (m)	7.5			7.5			7.5			0.0		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.997			0.998			0.854			0.942	
Flt Protected	0.950			0.950			0.950				0.976	
Satd. Flow (prot)	1770	3529	0	1770	3532	0	1770	1591	0	0	1713	0
Flt Permitted	0.346			0.132			0.748				0.860	
Satd. Flow (perm)	645	3529	0	246	3532	0	1393	1591	0	0	1509	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4			3			41			6	
Link Speed (k/h)		60			60			50			50	
Link Distance (m)		144.2			85.9			105.3			75.0	
Travel Time (s)		8.7			5.2			7.6			5.4	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	5	1573	37	50	783	13	41	1	41	7	1	6
Shared Lane Traffic (%)												
Lane Group Flow (vph)	5	1610	0	50	796	0	41	42	0	0	14	0
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Detector Phase	2	2		6	6		8	8		4	4	
Switch Phase												
Minimum Initial (s)	10.0	10.0		10.0	10.0		10.0	10.0		10.0	10.0	
Minimum Split (s)	24.0	24.0		24.0	24.0		38.0	38.0		38.0	38.0	
Total Split (s)	92.0	92.0		92.0	92.0		38.0	38.0		38.0	38.0	
Total Split (%)	70.8%	70.8%		70.8%	70.8%		29.2%	29.2%		29.2%	29.2%	
Maximum Green (s)	86.0	86.0		86.0	86.0		32.0	32.0		32.0	32.0	
Yellow Time (s)	3.7	3.7		3.7	3.7		3.3	3.3		3.3	3.3	
All-Red Time (s)	2.3	2.3		2.3	2.3		2.7	2.7		2.7	2.7	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Lost Time (s)	6.0	6.0		6.0	6.0		6.0	6.0			6.0	
Lead/Lag												
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	C-Min	C-Min		C-Min	C-Min		None	None		None	None	
Walk Time (s)	7.0	7.0		7.0	7.0		7.0	7.0		7.0	7.0	
Flash Dont Walk (s)	11.0	11.0		11.0	11.0		25.0	25.0		25.0	25.0	
Pedestrian Calls (#/hr)	15	15		15	15		5	5		5	5	
Act Effect Green (s)	107.8	107.8		107.8	107.8		14.6	14.6			14.6	
Actuated g/C Ratio	0.83	0.83		0.83	0.83		0.11	0.11			0.11	
v/c Ratio	0.01	0.55		0.25	0.27		0.26	0.20			0.08	
Control Delay	5.2	6.6		17.0	8.8		53.8	15.3			34.1	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0			0.0	
Total Delay	5.2	6.6		17.0	8.8		53.8	15.3			34.1	

2: Sinclair & Montreal
Future 2033 PM

Existing Geometry

												
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	A	A		B	A		D	B			C	
Approach Delay		6.6			9.3			34.3			34.1	
Approach LOS		A			A			C			C	
Queue Length 50th (m)	0.2	55.3		7.7	66.8		10.7	0.3			2.0	
Queue Length 95th (m)	1.9	156.0		14.6	50.9		18.8	9.9			7.3	
Internal Link Dist (m)		120.2			61.9			81.3			51.0	
Turn Bay Length (m)	55.0			65.0			25.0					
Base Capacity (vph)	534	2927		204	2929		342	422			375	
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	0.01	0.55		0.25	0.27		0.12	0.10			0.04	

Intersection Summary

Area Type: Other

Cycle Length: 130

Actuated Cycle Length: 130

Offset: 110 (85%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green

Natural Cycle: 80

Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.55

Intersection Signal Delay: 8.5

Intersection LOS: A

Intersection Capacity Utilization 63.0%

ICU Level of Service B

Analysis Period (min) 15

Splits and Phases: 2: Sinclair & Montreal



						
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑↱			↑↑		↱
Traffic Volume (vph)	1524	78	0	770	0	75
Future Volume (vph)	1524	78	0	770	0	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	0.91	0.91	1.00	0.95	1.00	1.00
Frt	0.993					0.865
Flt Protected						
Satd. Flow (prot)	5050	0	0	3539	0	1611
Flt Permitted						
Satd. Flow (perm)	5050	0	0	3539	0	1611
Link Speed (k/h)	60			60	50	
Link Distance (m)	85.9			91.3	68.9	
Travel Time (s)	5.2			5.5	5.0	
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	1524	78	0	770	0	75
Shared Lane Traffic (%)						
Lane Group Flow (vph)	1602	0	0	770	0	75
Sign Control	Free			Free	Stop	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	42.5%			ICU Level of Service A		
Analysis Period (min)	15					

Intersection

Int Delay, s/veh 0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑↑↑↓			↑↑		↑
Traffic Vol, veh/h	1524	78	0	770	0	75
Future Vol, veh/h	1524	78	0	770	0	75
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1524	78	0	770	0	75

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	- - - 801
Stage 1	-	-	- - -
Stage 2	-	-	- - -
Critical Hdwy	-	-	- - - 7.14
Critical Hdwy Stg 1	-	-	- - -
Critical Hdwy Stg 2	-	-	- - -
Follow-up Hdwy	-	-	- - - 3.92
Pot Cap-1 Maneuver	-	- 0	- 0 281
Stage 1	-	- 0	- 0 -
Stage 2	-	- 0	- 0 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	- - - 281
Mov Cap-2 Maneuver	-	-	- - -
Stage 1	-	-	- - -
Stage 2	-	-	- - -

Approach	EB	WB	NB
HCM Control Delay, s	0	0	22.4
HCM LOS			C

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBT
Capacity (veh/h)	281	-	-	-
HCM Lane V/C Ratio	0.267	-	-	-
HCM Control Delay (s)	22.4	-	-	-
HCM Lane LOS	C	-	-	-
HCM 95th %tile Q(veh)	1	-	-	-

						
Lane Group	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (vph)	81	4	8	140	133	72
Future Volume (vph)	81	4	8	140	133	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	0.994	0.953				
Flt Protected	0.955	0.997				
Satd. Flow (prot)	1768	0	0	1857	1775	0
Flt Permitted	0.955	0.997				
Satd. Flow (perm)	1768	0	0	1857	1775	0
Link Speed (k/h)	50	40 50				
Link Distance (m)	62.6	91.1 71.0				
Travel Time (s)	4.5	8.2 5.1				
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00
Adj. Flow (vph)	81	4	8	140	133	72
Shared Lane Traffic (%)						
Lane Group Flow (vph)	85	0	0	148	205	0
Sign Control	Stop	Free			Free	
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	25.3%			ICU Level of Service A		
Analysis Period (min)	15					

Intersection						
Int Delay, s/veh	2.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	81	4	8	140	133	72
Future Vol, veh/h	81	4	8	140	133	72
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	81	4	8	140	133	72
Major/Minor	Minor2	Major1		Major2		
Conflicting Flow All	325	169	205	0	-	0
Stage 1	169	-	-	-	-	-
Stage 2	156	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	669	875	1366	-	-	-
Stage 1	861	-	-	-	-	-
Stage 2	872	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	665	875	1366	-	-	-
Mov Cap-2 Maneuver	665	-	-	-	-	-
Stage 1	856	-	-	-	-	-
Stage 2	872	-	-	-	-	-
Approach	EB	NB		SB		
HCM Control Delay, s	11.1	0.4		0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1366	-	673	-	-	
HCM Lane V/C Ratio	0.006	-	0.126	-	-	
HCM Control Delay (s)	7.7	-	11.1	-	-	
HCM Lane LOS	A	-	B	-	-	
HCM 95th %tile Q(veh)	0	-	0.4	-	-	

Appendix K

MMLOS Analysis

Multi-Modal Level of Service - Segments Form

Project: 2180 Montreal Road TIA
Consultant: JL Richards
Date: Mar 4, 2026
Scenario: Existing and Future Conditions

Segment Name		Shefford Road - Existing				Shefford Road - Future			
OP Transect / Policy Area		Within 600m of a rapid transit station				Within 600m of a rapid transit station			
Segment Component		Majority (>50%)		Critical		Majority (>50%)		Critical	
Side of Street		W	E	W	E	W	E	W	E
Pedestrian	PLOS Inputs								
	Posted Speed (km/h)	40 km/h		40 km/h		40 km/h		40 km/h	
	Two-Way ADT	3,761		3,761		3,761		3,761	
	Pedestrian Facility	None	Sidewalk		None	Sidewalk	Sidewalk		None
	Does the facility meet the TMP Sidewalk or MUP Policy? If not, for MUPs, does the location have a low volume of peak daily users AND are pedestrian volumes likely less than 20% of total users?	No	Yes		No	Yes	Yes		No
	Facility Width (m)	-	1.80m		-	1.80m	1.80m		-
	Offset from Motor Vehicle Travel Lanes (m)	< 0.5m	< 0.5m		< 0.5m	< 0.5m	< 0.5m		< 0.5m
	Presence of Adjacent Parking?	-	-		-	-	-		-
	General Purpose Curb Lane ADT	≤ 3000	≤ 3000		≤ 3000	≤ 3000	≤ 3000		≤ 3000
	Max. Distance between Controlled Crossings (m)	-	≤ 200m		-	≤ 200m	≤ 200m		-
Score		0.003.50		-0.00		3.503.50		-0.00	
PLOS		F B		- F		B B		- F	
Target PLOS		A				A			
Bicycle	BLOS Inputs								
	Cycling Route Classification	Elsewhere				Elsewhere			
	Cycling Facility	Shared Operating Space	Shared Operating Space	Input PLOS First		Shared Operating Space	Shared Operating Space	Input PLOS First	
	Is the minimum level of separation provided according to OTM Book 18 Pre-Selection Nomograph - Rural Context (Figure 5.6)? (for paved shoulders)	-	-			-	-		
	Facility Operation	-	-			-	-		
	Pedestrian/Cyclist Volume	-	-			-	-		
	Facility Width	-	-			-	-		
	Boulevard/Buffer Width (excluding curb)	-	-			-	-		
	Unsignalized Roadway Crossing Type (where cyclists are required to yield)	Cross-Street	Cross-Street			Cross-Street	Cross-Street		
	Number of Travel Lanes at Crossing	≤ 2	≤ 2			≤ 2	≤ 2		
	Crossing includes Median Refuge (≥ 2.7m)	No	No			No	No		
	Cross-street Posted Speed (km/h)	≤ 30 km/h	≤ 30 km/h			≤ 30 km/h	≤ 30 km/h		
	Cycling Path Blockages (e.g. bus stops and/or loading zones)	Rare	Rare			Rare	Rare		
Score		2.902.90		--		2.902.90		--	
BLOS		C C		--		C C		--	
Target BLOS		B				B			
Transit	TLOS Inputs								
	Transit Facility	Select Transit Designation				Select Transit Designation			
	Facility Type								
	Expected Transit Running Time								
	Transit Travel Speed (if available)								
	TLOS	-	-	-		-			
Target TLOS		-		-					
Public Realm	PRLOS Inputs								
	Context	Other Streets	Other Streets			Other Streets	Other Streets		
	Inner Boulevard Width	≤ 0.6m	≤ 0.6m			≤ 0.6m	≤ 0.6m		
	Middle Boulevard Width	≤ 0.5m	≤ 0.5m			≤ 0.5m	≤ 0.5m		
	Outer Boulevard (Frontage) Width	≥ 3.0m	≥ 3.0m			≥ 3.0m	≥ 3.0m		
	Transit Route on Segment?	No	No			No	No		
	Bus Stop Elements	-	-			-	-		
	Number of Midblock Traffic Lanes (both travel directions)	≤ 2		≤ 2					
	Score		15.0024.00		24.0024.00				
PRLOS		D B		B B					
		C		B					

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