

1649 Montreal Road & 741 Blair Road Transportation Impact Assessment

Step 1 Screening Report

Step 2 Scoping Report

Step 3 Forecasting Report

Step 4 Strategy Report

(Revised)

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Table of Contents

1	Screening	1
2	Existing and Planned Conditions	1
2.1	Proposed Development.....	1
2.2	Existing Conditions	3
2.2.1	Area Road Network.....	3
2.2.2	Existing Intersections	3
2.2.3	Existing Driveways	3
2.2.4	Cycling and Pedestrian Facilities.....	3
2.2.5	Existing Transit.....	5
2.2.6	Existing Area Traffic Management Measures.....	6
2.2.7	Existing Peak Hour Travel Demand.....	6
2.2.8	Collision Analysis.....	8
2.3	Planned Conditions.....	10
2.3.1	Changes to the Area Transportation Network	10
2.3.2	Other Study Area Developments	12
3	Study Area and Time Periods	12
3.1	Study Area	12
3.2	Time Periods	12
3.3	Horizon Years.....	12
4	Exemption Review	12
5	Development-Generated Travel Demand	13
5.1	Mode Shares.....	13
5.2	Trip Generation	13
5.3	Trip Distribution.....	14
5.4	Trip Assignment.....	15
6	Background Network Travel Demands.....	15
6.1	Transportation Network Plans	15
6.2	Background Growth.....	15
6.3	Other Developments	16
7	Demand Rationalization	16
7.1	2024 Future Background Operations	16
7.2	2029 Future Background Operations	18
7.3	Demand Rationalization Conclusions	19
8	Development Design	19
8.1	Design for Sustainable Modes.....	19
8.2	Circulation and Access.....	20
9	Parking.....	20
9.1	Parking Supply	20
10	Boundary Street Design.....	20
11	Access Intersections Design	20
11.1	Location and Design of Access.....	20
11.2	Intersection Control.....	21

11.3	Access Intersection Design	21
11.3.1	2024 Future Total Access Intersection Operations	21
11.3.2	2029 Future Total Access Intersection Operations	21
11.3.3	Access Intersection MMLOS	22
11.3.4	Recommended Design Elements.....	22
12	Transportation Demand Management	23
12.1	Context for TDM	23
12.2	Need and Opportunity.....	23
12.3	TDM Program	23
13	Neighbourhood Traffic Management.....	23
14	Transit.....	23
14.1	Route Capacity.....	23
14.2	Transit Priority	24
15	Network Intersection Design.....	24
15.1	Network Intersection Control.....	24
15.2	Network Intersection Design.....	24
15.2.1	2024 Future Total Network Intersection Operations	24
15.2.2	2029 Future Total Network Intersection Operations	25
15.2.3	Network Intersection MMLOS.....	26
15.2.4	Recommended Design Elements.....	27
16	Summary of Improvements Indicated and Modifications Options.....	27
17	Conclusion	30

List of Figures

Figure 1: Area Context Plan	1
Figure 2: Concept Plan.....	2
Figure 3: Study Area Pedestrian Facilities	4
Figure 4: Study Area Cycling Facilities	4
Figure 5: Existing Pedestrian Counts	5
Figure 6: Existing Cyclist Counts	5
Figure 7: Existing Study Area Transit Service.....	6
Figure 8: Existing Study Area Transit Stops	6
Figure 9: Existing Traffic Counts	7
Figure 10: Study Area Collision Records.....	9
Figure 11: Montreal-Blair Transit Priority EA Functional Design.....	11
Figure 12: New Site-Generated and Pass-By Auto Volumes	15
Figure 13: 2024 Future Background Volumes	17
Figure 14: 2029 Future Background Volumes	18
Figure 15: 2024 Future Total Volumes	21
Figure 16: 2029 Future Total Volumes	22

Table of Tables

Table 1: Intersection Count Date.....	7
Table 2: Existing Intersection Operations.....	7
Table 3: Study Area Collision Summary, 2016-2020	8
Table 4: Summary of Collision Locations, 2016-2020	9
Table 5: Montreal Road at Blair Road Collision Summary.....	9
Table 6: Exemption Review	12
Table 7: TRANS Trip Generation Manual Recommended Mode Shares – Beacon Hill	13
Table 8: Trip Generation Person Trip Rates by Peak Period.....	13
Table 9: Total Person Trip Generation by Peak Period.....	13
Table 10: Internal Capture Rates.....	14
Table 11: Trip Generation by Mode	14
Table 12: OD Survey Distribution – Beacon Hill	15
Table 13: TRANS Regional Model Projections – Study Area Growth Rates.....	16
Table 14: Applied Study Area Growth Rates	16
Table 15: 2024 Future Background Intersection Operations	17
Table 16: 2029 Future Background Intersection Operations	18
Table 17: Boundary Street MMLOS Analysis	20
Table 18: 2024 Future Total Access Intersection Operations	21
Table 19: 2029 Future Total Access Intersection Operations	22
Table 20: Trip Generation by Transit Mode	24
Table 21: 2024 Future Total Network Intersection Operations	24
Table 22: 2029 Future Total Network Intersection Operations	25
Table 23: Study Area Intersection MMLOS Analysis	26
Table 24: Turn Lane Storage Analysis.....	27

List of Appendices

Appendix A – TIA Screening Form and Certification Form
Appendix B – Turning Movement Count Data
Appendix C – Synchro Intersection Worksheets – Existing Conditions
Appendix D – Collision Data
Appendix E – Montreal-Blair Transit Priority EA – Study Area Signal Timing
Appendix F – TRANS Model Plots
Appendix G – Synchro Intersection Worksheets – 2024 Future Background Conditions
Appendix H – Synchro Intersection Worksheets – 2029 Future Background Conditions
Appendix I – MMLOS Analysis
Appendix J – Synchro Intersection Worksheets – 2024 Future Total Conditions
Appendix K – Synchro Intersection Worksheets – 2029 Future Total Conditions
Appendix L – TDM Checklist

1 Screening

This study has been prepared according to the City of Ottawa’s 2017 Transportation Impact Assessment (TIA) Guidelines. Accordingly, a Step 1 Screening Form has been prepared and is included as Appendix A, along with the Certification Form for the TIA Study PM. As shown in the Screening Form, a TIA is required including the Network Impact Component and the Design Review Component. This report accompanies a site plan application.

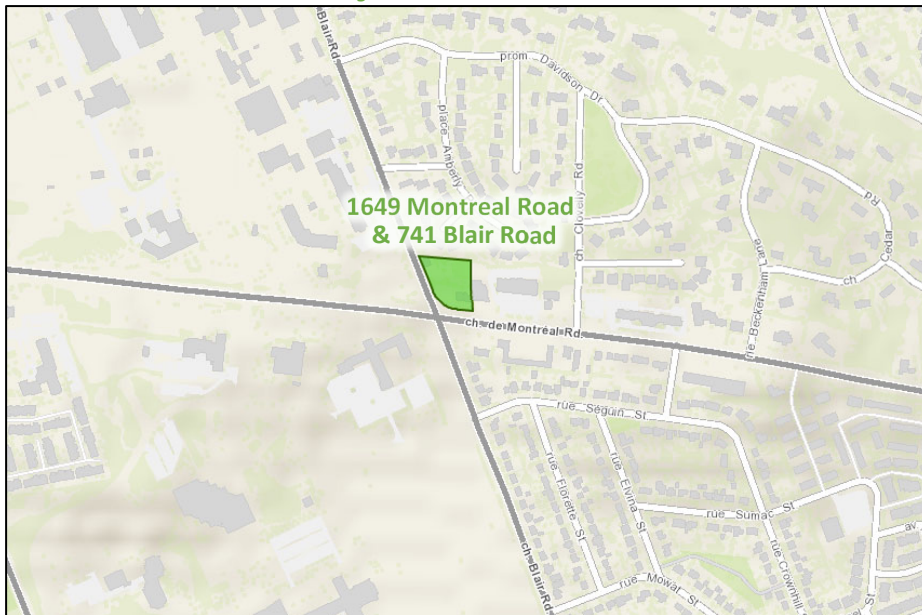
2 Existing and Planned Conditions

2.1 Proposed Development

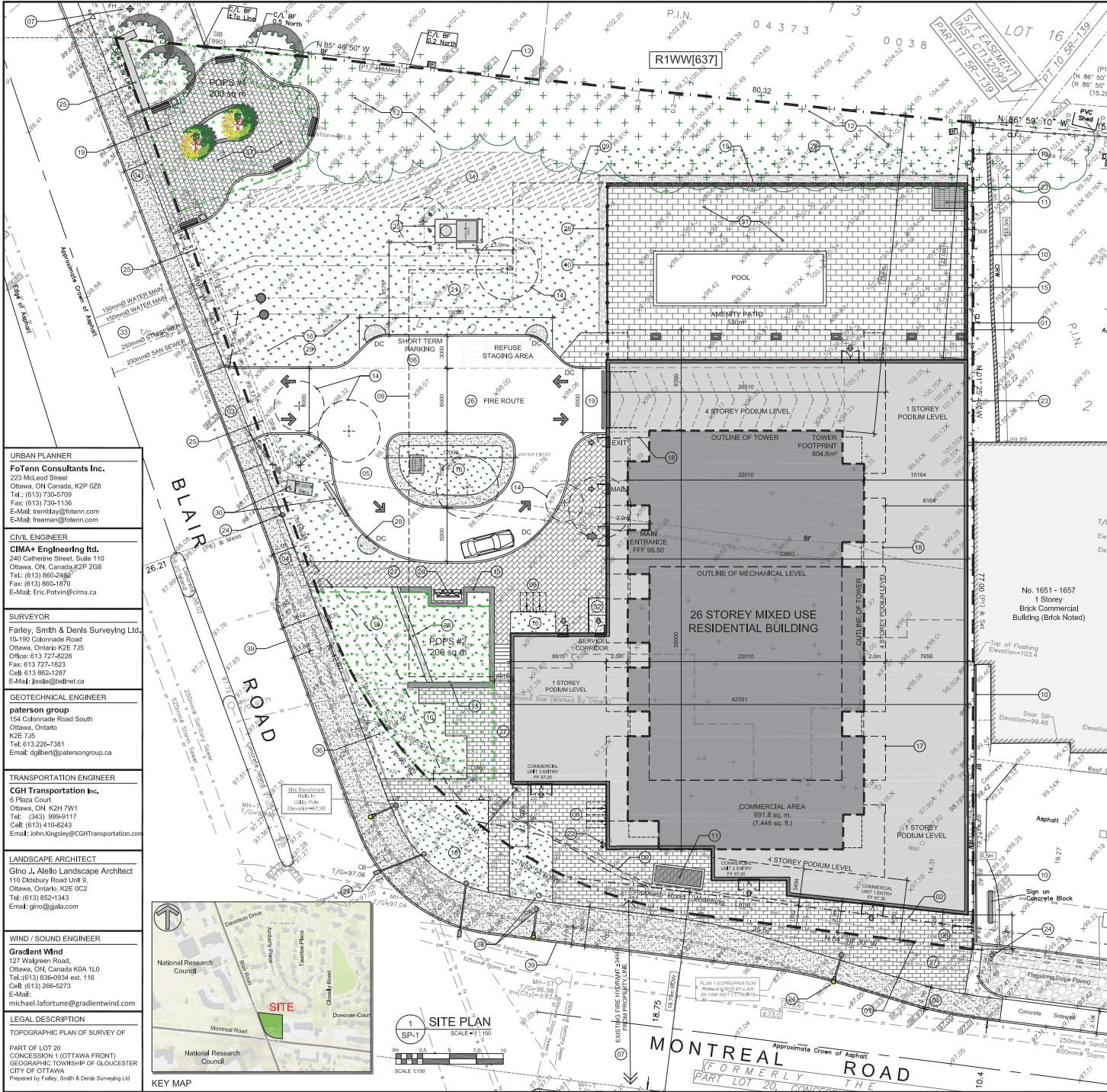
The subject site, currently zoned as Arterial Mainstreet (AM10[2199]) for the 1649 Montreal Road parcel and Residential Third Density (R3K[1631]) for the 741 Blair Road parcel, intersects the Montreal Arterial Mainstreet Design Priority Area and currently consists of a mostly treed residential lot with a single detached dwelling, and an auto garage with surface parking lot. The subject development proposes the construction of a 26-storey mixed-use building on a four-storey podium, massed mostly on the 1649 Montreal Road parcel, comprising 252 residential dwelling units and 7,446 ft² of ground floor commercial space. The site access is proposed as being a full-movement access onto Blair Road. A total of 246 vehicle parking spaces and 196 bicycle parking spaces are proposed, and the development is anticipated to be built-out in a single phase by 2024.

Figure 1 illustrates the Study Area Context. Figure 2 illustrates the proposed concept plan.

Figure 1: Area Context Plan



Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: February 10, 2021



PROJECT INFORMATION		
Zoning Bylaw 2008-250 Consideration	4810294 (S4)	SITE AREA (6,496 m ²)
4810294 (S4)	6,496 m ²	4,891.7 m ² (62,546 sq. ft.)
ZONING		
REQUIRED	PROVIDED	REMARKS
BUILDING HEIGHT	61.2m	26 STOREYS / 83.0m
GRADE (GEODETIC ELEVATION - ASL)	(GEOD. ELEV.) 104.53	(GEOD. ELEV.) 104.53
FRONT YARD SETBACK	2.1m	2.1m
CORNER SIDE YARD SETBACK	5.5m	5.5m
REAR YARD SETBACK	0.5m	0.5m
REAR YARD SETBACK	11.5m	11.5m
AMENITY AREA - TOTAL PER UNIT $+0.07$	1,510m ²	1,510m ²
AMENITY AREA - PER COMMERCIAL PER UNIT $+0.07$	755m ²	755m ²
AMENITY AREA - PER RESIDENTIAL AREA C (2.0 PER UNIT)	170	170
VEHICLE PARKING - VEHICULAR ONLY AREA C (2.0 PER UNIT)	10	10
VEHICLE PARKING - COMM. RETAIL / PERSONAL SERVICES (2.0 PER 100M ² OF GFA)	10	10
VEHICLE PARKING - RESIDENTIAL (2.0 PER UNIT)	100	100
VEHICLE PARKING - COMMERCIAL / PER 250M ² GFA	3	3
VEHICLE PARKING - COMMERCIAL / PER 250M ² GFA	3	3
ABLE A DRIVEWAY WIDTH / MAXIMUM WIDTH	6.0m / 6.7m	6.0m

DRAWING NOTES		
1	PROPERTY LINE	
2	PROPOSED ROAD / INTERSECTION MEASUREMENTS	
3	CITY CURB & SIDEWALK TO BE DEPRESSURED AND CONCRETE THROUGH DRIVEWAY	
4	REPLACE EXISTING DEPRESSURED CURB & SIDEWALK WITH NEW CURB AND SIDEWALK TO CITY STANDARDS	
5	REPLACE EXISTING DRIVEWAY WITH 200MM DEEP CYCLING PARKING SPACE	
6	EXISTING FIRE HYDRANT	
7	SHORT TERM PARKING	
8	OUTLINE OF UNDERGROUND PARKING LEVEL	
9	EXISTING RETAINING WALL	
10	EXISTING TREE TO BE REMOVED	
11	EXISTING TREE TO BE REMOVED	
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98	EXISTING TREE TO BE REMOVED	
99	EXISTING TREE TO BE REMOVED	
100	EXISTING TREE TO BE REMOVED	

PROJECT STATISTICS		
GROSS BUILDING AREAS		
PARKING LEVEL	60.0 m ²	60.0 m ²
GROUND FLOOR	67.8 m ²	67.8 m ²
2ND FLOOR	1,040.0 m ²	1,040.0 m ²
3RD & 4TH FLOOR	2,119.0 m ²	2,119.0 m ²
5TH FLOOR	8,883.0 m ²	8,883.0 m ²
6TH TO 26TH FLOOR	144,243.0 m ²	144,243.0 m ²
MECHANICAL LEVEL	50.0 m ²	50.0 m ²
TOTAL AREA	172,962.8 m ²	1,854.8 m ²
TOWER FOOTPRINT	804.6 m ²	8,061.0 m ²
UNIT STATISTICS		
STUDIO UNIT	64.5%	48
ONE BEDROOM UNIT	46.1%	101
TWO BEDROOM UNIT	17.2%	43
THREE BEDROOM UNIT	22.2%	50
TOTAL	100.0%	202
CAR PARKING		
REQUIRED BY ZONING BYLAW	-0.7 PER UNIT	176
PROVIDED	+0.2 PER UNIT	16
REMARKS	+3.4 PER 100M ² GFA	242
TOTAL		242
BICYCLE PARKING		
REQUIRED BY ZONING BYLAW	-0.7 PER UNIT	176
PROVIDED	+0.2 PER UNIT	16
REMARKS	+1.0 PER 250M ² GFA	5
TOTAL		242
AMENITY SPACE		
EXTERIOR AT GROUND LEVEL	420.0 m ²	420.0 m ²
EXTERIOR TERRACE LEVEL	200.0 m ²	200.0 m ²
PRIVATE TERRACE (2ND FLOOR)	300.0 m ²	300.0 m ²
PRIVATE TERRACE (3RD FLOOR)	300.0 m ²	300.0 m ²
PRIVATE TERRACE (4TH FLOOR)	120.0 m ²	120.0 m ²
PRIVATE BALCONY	1,000.0 m ²	1,000.0 m ²
TOTAL	2,340.0 m ²	2,340.0 m ²
REQUIRED $+0.07$ PER UNIT (202)	1,510.0 m ²	1,510.0 m ²
REQUIRED COMMERCIAL @ 50%	755.0 m ²	755.0 m ²
TOTAL	2,265.0 m ²	2,265.0 m ²
SOLID WASTE		
GARBAGE	0.210 Y ³ PER UNIT	28 Y ³
RECYCLING - GP	0.040 Y ³ PER UNIT	5 Y ³
RECYCLING - PER	1.000 Y ³ PER UNIT	10 Y ³
ORGANICS	1.240 Y ³ PER UNIT	155 Y ³
TOTAL	2.490 Y ³ PER UNIT	198 Y ³

SITE PLAN SYMBOLS		
	CONCRETE CURB PAVERS SURFACE	
	CONCRETE WALK	
	BRICKWORK - SEE CIVIL	
	SOFT LANDSCAPING	
	BIKE RACK	
	TWO-WAY VEHICLE CIRCULATION	
	MAIN ENTRANCE	
	COMMERCIAL DOOR / FIRE EXIT	
	PROPERTY LINE	
	CITY STREET LIGHTING	

PROJECT DEVELOPER		
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NOTATION SYMBOLS:		
	DETAIL REFERENCE PAGE	
	DETAIL CROSS REFERENCE PAGE	
	DETAIL CROSS REFERENCE PAGE	

2.2 Existing Conditions

2.2.1 Area Road Network

Montreal Road: Montreal Road is a City of Ottawa arterial road with a divided four-lane urban cross-section within the study area, with sidewalks on both sides of the road. The posted speed limit is 60 km/h and the Ottawa Official Plan reserves a 37.5-metre right of way within the study area. Montreal Road is a truck route.

Blair Road: Blair Road is a City of Ottawa arterial road south of Montreal Road, and a major collector road to the north, each with a two-lane cross-section. South of Nicol Street, Blair Road has a semi-urban cross-section curbed with a sidewalk and curbside bike lane on the east side of the road and with a paved shoulder on the west side of the road. North of Nicol Street, the cross-section is rural with paved shoulders on both sides of the road. The posted speed limit is 50 km/h, and the Ottawa Official Plan reserves a 30.0-metre right of way south of Montreal Road, where Blair Road is a truck route, and the measured right of way is 20.0 metres to the north.

Elwood Street: Elwood Street is a City of Ottawa local road with a two-lane urban cross-section. The posted speed limit is 40 km/h and the measured right of way is 20.0 metres.

2.2.2 Existing Intersections

The existing signalized area intersections within 400 metres of the site have been summarized below:

Montreal Road at Blair Road

The intersection of Montreal Road and Blair Road is a signalized intersection. The northbound approach consists of an auxiliary left-turn lane, a through lane, and an auxiliary right-turn lane and the southbound approach consists of an auxiliary left-turn lane, a shared through/channelized right-turn lane, and a bike lane. The eastbound approach consists of an auxiliary left-turn lane, two through lanes, and an auxiliary channelized right-turn lane and the westbound approach consists of an auxiliary left-turn lane, two through lanes, and a channelized auxiliary right-turn lane. No turn restrictions were noted.

Montreal Road at Elwood Street

The intersection of Montreal Road and Elwood Street is a signalized intersection. The northbound approach and the private southbound approach each consist of a shared all-movements. The eastbound and westbound approaches each consist of an auxiliary left-turn lane, a through lane, and a shared through/right-turn lane. No turn restrictions were noted.

2.2.3 Existing Driveways

Within 200 metres of the site access, on the east side of Blair Road, south of Montreal Street, there is a bank access, and three driveways to detached homes. Just beyond 200 metres south of the access is a driveway to a detached home. None of the driveways would provide access to significant traffic generators and would therefore have no impact on this TIA.

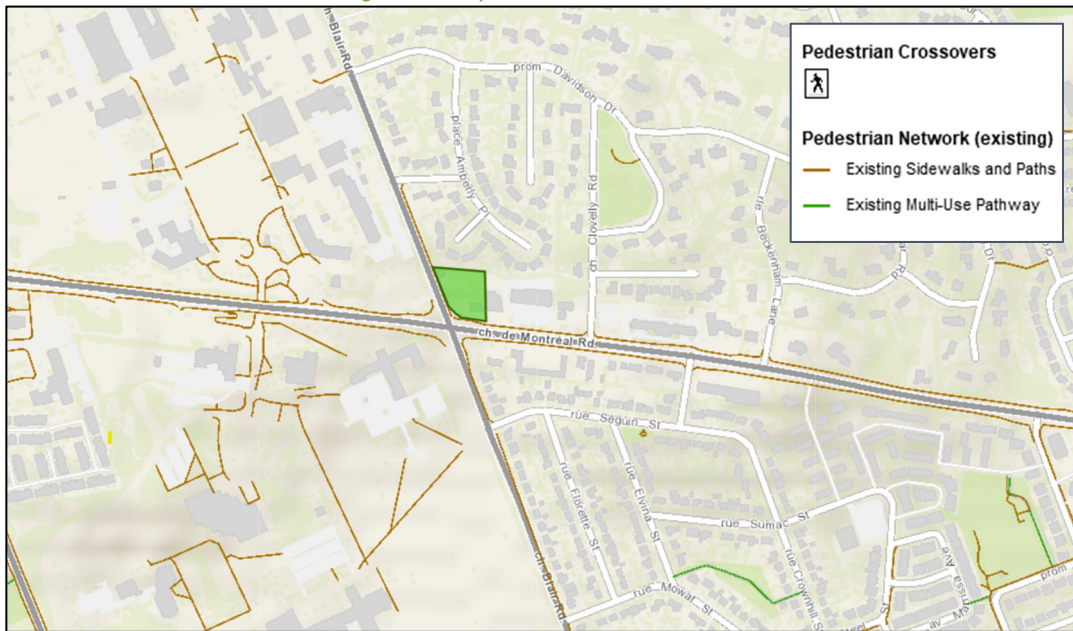
2.2.4 Cycling and Pedestrian Facilities

Figure 3 illustrates the pedestrian facilities in the study area and Figure 4 illustrates the cycling facilities.

Sidewalks are provided along both sides of Montreal Road and on the east side of Blair Road, and area cycling facilities include a bike lane on the east side of Blair Road and a paved shoulder on the west side of Blair Road

south of Nicol Street, and paved shoulders on both sides of Blair Road to the north. Montreal Road and Blair Road are spine cycling routes.

Figure 3: Study Area Pedestrian Facilities



Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: July 27, 2022

Figure 4: Study Area Cycling Facilities



Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: July 27, 2022

Pedestrian and cyclist volumes included in study area intersection counts, presented in Section 2.2.7 have been compiled and are illustrated in Figure 5 and Figure 6 respectively.

Figure 5: Existing Pedestrian Counts

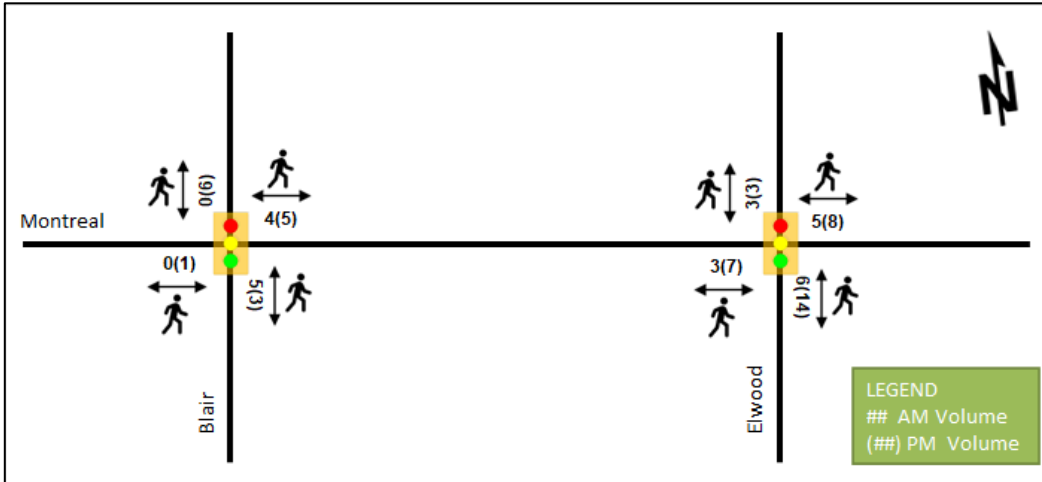
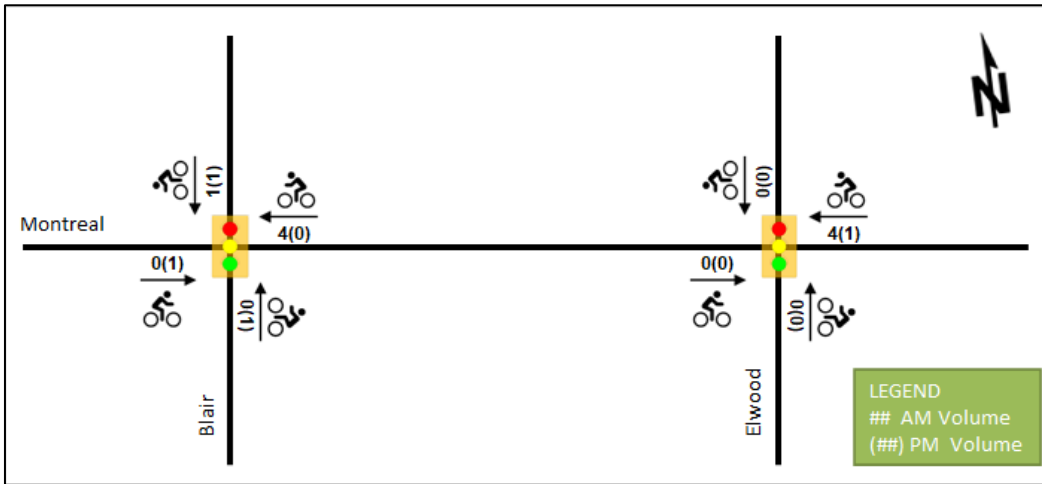


Figure 6: Existing Cyclist Counts



2.2.5 Existing Transit

Within the study area, the route #12, and currently the route #15, travel along Montreal Road with connections to Blair Station and Rideau Station, and route #23 loops through the neighbourhoods both north and south of Montreal Road, travelling along Blair Road to cross Montreal Road. The frequency of these routes within proximity of the proposed site currently are:

- Route # 12 – 15-minute service all day, 30-minute service early mornings and late nights
- Route # 15 – evening and weekend service within the study area during Montreal Road construction
- Route # 23 – 30-minute service at peak hours with two midday buses

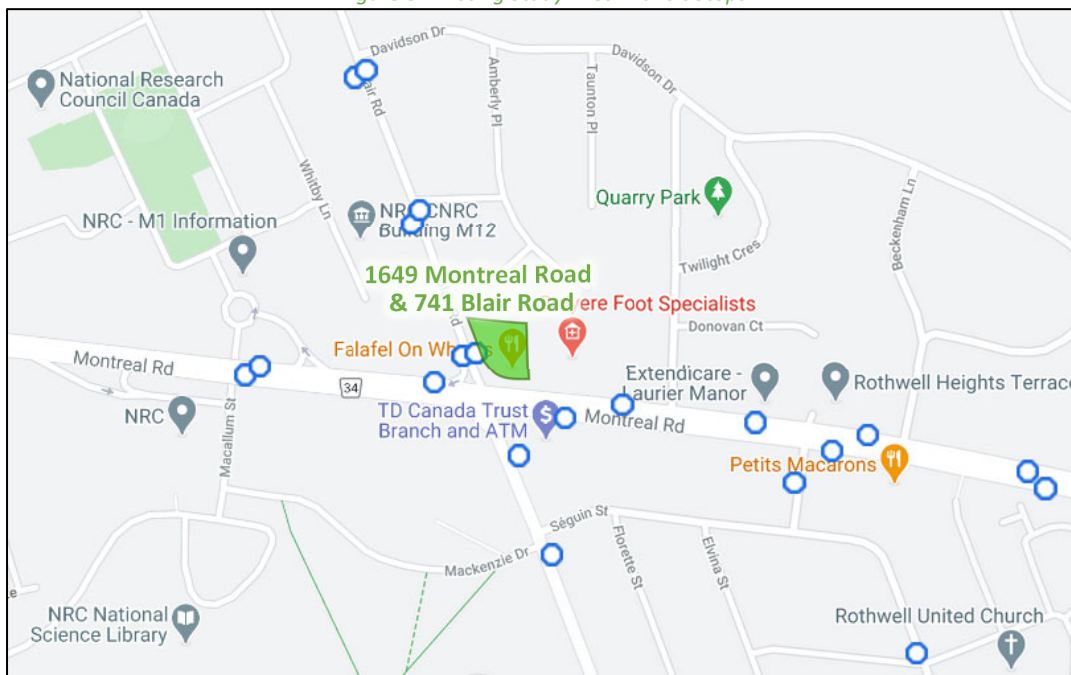
Figure 7 illustrates the transit system map in the study area and Figure 8 illustrates nearby transit stops.

Figure 7: Existing Study Area Transit Service



Source: <http://www.octranspo.com/> Accessed: July 27, 2022

Figure 8: Existing Study Area Transit Stops



Source: <http://www.octranspo.com/> Accessed: July 27, 2022

2.2.6 Existing Area Traffic Management Measures

There are no existing area traffic management measures within the study area other than on-road speed limit messaging on Blair Road south of Montreal Road.

2.2.7 Existing Peak Hour Travel Demand

Existing turning movement counts were acquired from the City of Ottawa for the existing Study Area intersections. Table 1 summarizes the intersection count dates.

Table 1: Intersection Count Date

Intersection	Count Date
Montreal Road at Blair Road	Thursday, November 15, 2018
Montreal Road at Elwood Street	Thursday, November 15, 2018

Figure 9 illustrates the existing traffic counts, balanced along Montreal Road, and Table 2 summarizes the existing intersection operations. The level of service for signalized intersections is based on volume to capacity ratio (v/c) calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection. Detailed turning movement count data is included in Appendix B and the Synchro worksheets are provided in Appendix C.

Figure 9: Existing Traffic Counts

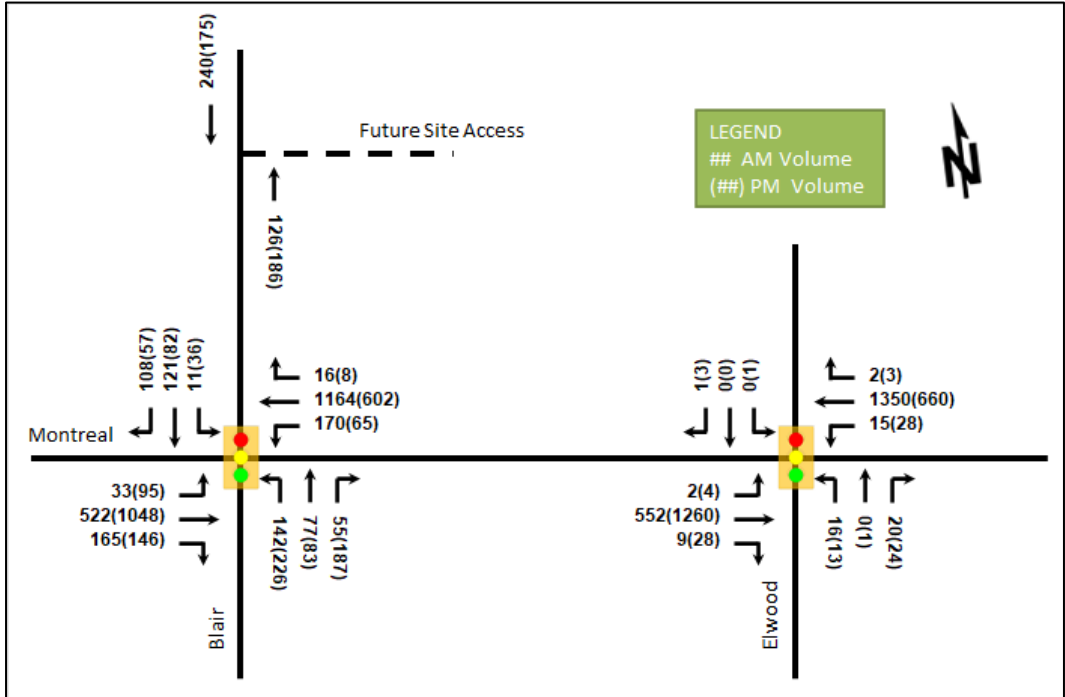


Table 2: Existing Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Montreal Road at Blair Road <i>Signalized</i>	EBL	A	0.23	17.9	13.4	A	0.30	17.1	27.0
	EBT	A	0.30	11.1	50.3	B	0.65	18.6	#126.7
	EBR	A	0.19	2.8	11.6	A	0.19	7.2	19.9
	WBL	A	0.42	14.8	28.2	A	0.43	33.0	#27.4
	WBT	B	0.66	14.3	#151.1	A	0.37	16.8	61.2
	WBR	A	0.02	3.0	m0.5	A	0.01	3.2	m0.8
	NBL	C	0.77	53.3	35.9	C	0.76	42.1	53.6
	NBT	A	0.21	24.8	17.3	A	0.18	21.5	18.3
	NBR	A	0.15	6.0	6.7	A	0.45	21.6	33.6
	SBL	A	0.05	20.4	4.3	A	0.13	20.3	9.9
	SBT/R	B	0.62	33.4	44.9	A	0.30	15.4	22.4
Overall		B	0.69	16.9	-	B	0.69	20.0	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Montreal Road at Elwood Street <i>Signalized</i>	EBL	A	0.01	10.0	m0.5	A	0.01	7.8	m0.5
	EBT/R	A	0.25	5.3	29.6	A	0.57	6.8	#160.4
	WBL	A	0.03	7.8	5.0	A	0.14	10.4	9.7
	WBT/R	A	0.58	9.9	#177.0	A	0.28	6.2	57.1
	NB	A	0.16	12.8	7.0	A	0.17	18.3	8.6
	SB	A	0.00	0.0	0.0	A	0.02	0.0	0.0
	Overall	A	0.55	8.6	-	A	0.54	6.8	-

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 0.90

Delay = average vehicle delay in seconds
m = metered queue
= volume for the 95th %ile cycle exceeds capacity

During both the AM and PM peak hours, the study area intersections operate well. No capacity issues are noted outside of queuing at the intersection of Montreal Road at Blair Road on the westbound through movement during the AM peak hour and on the eastbound through and westbound left movements during the PM peak hour, and at the intersection of Montreal Road at Elwood Street on the westbound through movement during the AM peak hour and on the eastbound through movement during the PM peak hour.

2.2.8 Collision Analysis

Collision data have been acquired from the City of Ottawa open data website (data.ottawa.ca) for five years prior to the commencement of this TIA for the surrounding study area road network. Table 3 summarizes the collision types and conditions in the study area, Figure 10 illustrates the intersections and segments analyzed, and Table 4 summarizes the total collisions for each of these locations. Collision data are included in Appendix D.

Table 3: Study Area Collision Summary, 2016-2020

		Number	%
Total Collisions		43	100%
Classification	Fatality	0	0%
	Non-Fatal Injury	12	28%
	Property Damage Only	31	72%
Initial Impact Type	Approaching	1	2%
	Angle	6	14%
	Rear end	21	49%
	Sideswipe	1	2%
	Turning Movement	9	21%
	SMV Other	4	9%
	Other	1	2%
Road Surface Condition	Dry	27	63%
	Wet	10	23%
	Loose Snow	2	5%
	Ice	4	9%
Pedestrian Involved		0	0%
Cyclists Involved		0	0%

Figure 10: Study Area Collision Records

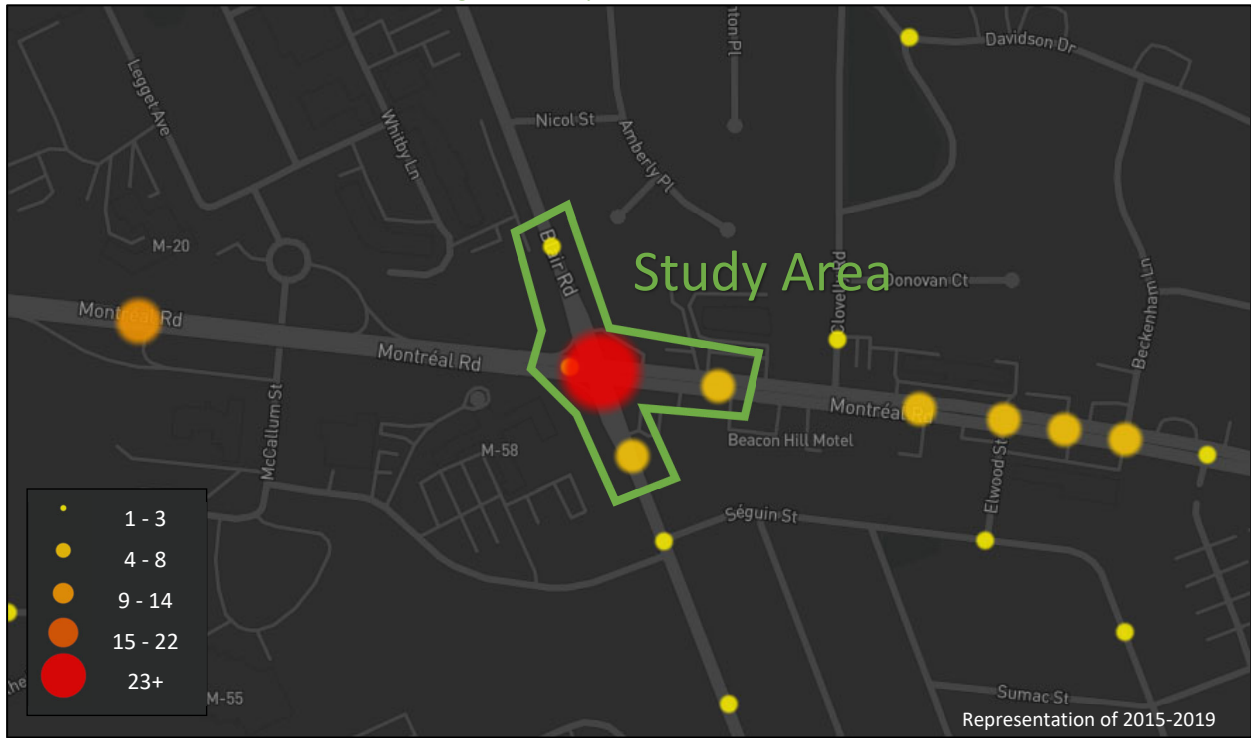


Table 4: Summary of Collision Locations, 2016-2020

Intersections / Segments	Number	%
Blair Road at Montreal Road	43	100%
Blair Road between Nicol Street and Montreal Road	2	5%
Blair Road between Montreal Road & Seguin Street	2	5%
Montreal Road between Blair Road & Clovelly Road	4	9%
Montreal Road between Montreal Road & Blair Road	1	2%

Within the study area, the intersection of Blair Road at Montreal Road is noted to have experienced higher collisions than other locations. Table 5 summarizes the collision types and conditions for the Blair Road at Montreal Road intersection.

Table 5: Montreal Road at Blair Road Collision Summary

Total Collisions		Number	%
		34	100%
Classification	Fatality	0	0%
	Non-Fatal Injury	10	29%
	Property Damage Only	24	71%
Initial Impact Type	Approaching	0	0%
	Angle	4	12%
	Rear end	18	53%
	Sideswipe	1	3%
	Turning Movement	9	26%
	SMV Other	1	3%
	Other	1	3%
Road Surface Condition	Dry	19	56%

		Number	%
Total Collisions		34	100%
	Wet	10	29%
	Loose Snow	1	3%
	Ice	4	12%
Pedestrian Involved		0	0%
Cyclists Involved		0	0%

The Montreal Road at Blair Road intersection had a total of 34 collisions during the 2016-2020 time period, with 24 involving property damage only and the remaining 10 having non-fatal injuries. The collision types are most represented by rear end with 18, followed by turning movement with nine, angle with four, and one each as sideswipe, SMV (other), and other. Rear end collisions are typically associated with congestion, and these collisions within the analysis period are clustered around the AM, PM, and mid-day peaks. The right-turn channels on the eastbound and southbound approaches may influence turning movement collisions and the City should consider their elimination or conversion to smart channels as part of the planned intersection redesign. Weather conditions may affect collisions at this location, particularly rear end collisions where half occurred with non-dry road surface conditions. The City may wish to investigate alternative paving treatments with the aim of reducing collisions at this intersection. No further collision review is required as part of this study.

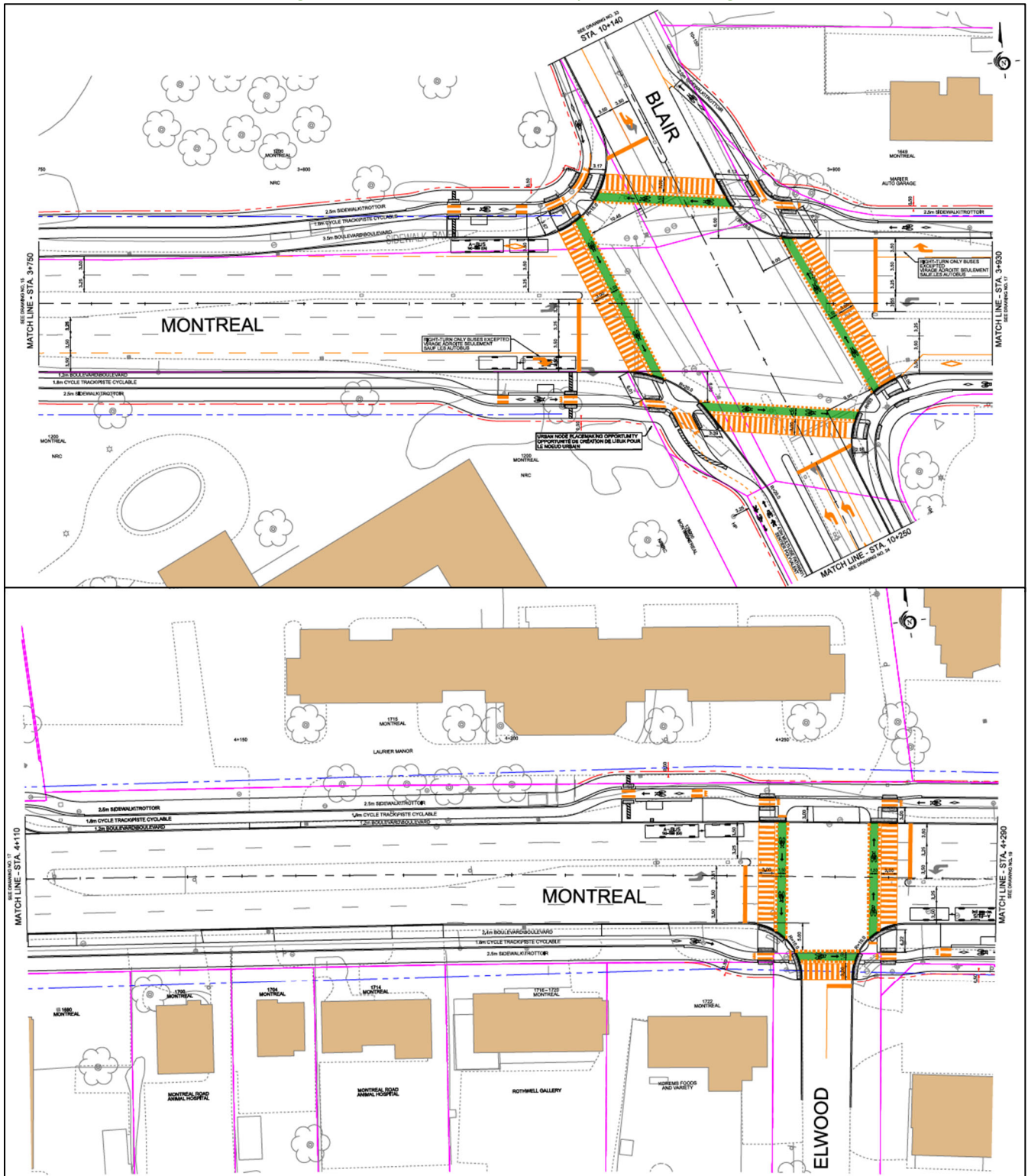
2.3 Planned Conditions

2.3.1 Changes to the Area Transportation Network

Within the Transportation Master Plan (TMP), the Rapid Transit and Transit Priority Network (RTTP) Affordable Network diagram shows a transit priority corridor along Montreal Road through the study area and along Blair Road south of Montreal Road.

Montreal-Blair Road Transit Priority Corridor Planning and Environmental Assessment Study proposes transit priority measures from St. Laurent Boulevard to Shefford Road, to be coordinated with the Montreal Road Revitalization Project. The functional design, excerpted in Figure 11, includes a focus on isolated transit priority measures and the enhancement of the pedestrian and cycling facilities within the corridor. The EA was completed in 2022 and the improvements are assumed as being implemented after 2024. Signal timing for the new intersections was provided by the EA team and is provided in Appendix E.

Figure 11: Montreal-Blair Transit Priority EA Functional Design



2.3.2 Other Study Area Developments

971 Montreal Road

The development application includes a site plan for a nine-storey mid-rise building with 78 units. The development is anticipated to be built-out by 2025, and to generate negligible traffic. (CGH, 2021)

3 Study Area and Time Periods

3.1 Study Area

The study area will include the intersections of Montreal Road at Blair Road and Montreal Road at Elwood Street, and the intersection of site access and Blair Road.

The boundary roads will be Montreal Road and Blair Road and no screenlines are present within proximity to the site.

3.2 Time Periods

As the proposed development is composed primarily of residential units the AM and PM peak hours will be examined.

3.3 Horizon Years

The anticipated build-out year is 2024. As a result, the full build-out plus five years horizon year is 2029.

4 Exemption Review

Table 6 summarizes the exemptions for this TIA.

Table 6: Exemption Review

Module	Element	Explanation	Exempt/Required
Design Review Component			
4.1 Development Design	4.1.2 Circulation and Access	Only required for site plans	Required
	4.1.3 New Street Networks	Only required for plans of subdivision	Exempt
4.2 Parking	4.2.1 Parking Supply	Only required for site plans	Required
	4.2.2 Spillover Parking	Only required for site plans where parking supply is 15% below unconstrained demand	Exempt
Network Impact Component			
4.5 Transportation Demand Management	All Elements	Not required for site plans expected to have fewer than 60 employees and/or students on location at any given time	Required
4.6 Neighbourhood Traffic Management	4.6.1 Adjacent Neighbourhoods	Only required when the development relies on local or collector streets for access and total volumes exceed ATM capacity thresholds	Required
4.8 Network Concept		Only required when proposed development generates more than 200 person-trips during the peak hour in excess of equivalent volume permitted by established zoning	Exempt

5 Development-Generated Travel Demand

5.1 Mode Shares

Examining the mode shares recommended in the TRANS Trip Generation Manual (2020) for the subject district, derived from the most recent National Capital Region Origin-Destination survey (OD Survey), the recommended district mode shares by land use for Beacon Hill have been summarized in Table 7.

Table 7: TRANS Trip Generation Manual Recommended Mode Shares – Beacon Hill

Travel Mode	Multi-Unit (High-Rise)		Commercial Generator	
	AM	PM	AM	PM
Auto Driver	48%	52%	67%	59%
Auto Passenger	9%	16%	12%	18%
Transit	30%	28%	8%	7%
Cycling	3%	0%	0%	1%
Walking	10%	4%	14%	13%
Total	100%	100%	100%	100%

5.2 Trip Generation

This TIA has been prepared using the vehicle and person trip rates for the residential dwellings using the TRANS Trip Generation Manual (2020) and the vehicle trip rates and derived person trip rates for the commercial component from the ITE Trip Generation Manual 11th Edition (2021) using the City-prescribed conversion factor of 1.28. Table 8 summarizes the person trip rates for the proposed residential land use for each peak period and the person trip rates for the commercial land use by peak hour.

Table 8: Trip Generation Person Trip Rates by Peak Period

Land Use	Land Use Code	Peak Period	Vehicle Trip Rate	Person Trip Rates
Multi-Unit High-Rise	221 & 222 (TRANS)	AM	-	0.80
		PM	-	0.90
Land Use	Land Use Code	Peak Hour	Vehicle Trip Rate	Person Trip Rates
Retail (< 40k sq. ft.)	822 (ITE)	AM	2.36	3.02
		PM	6.59	8.44

Using the above person trip rates, the total person trip generation has been estimated. Table 9 summarizes the total person trip generation for the residential land use by peak period and for the commercial land use by peak hour.

Table 9: Total Person Trip Generation by Peak Period

Land Use	Units	AM Peak Period			PM Peak Period		
		In	Out	Total	In	Out	Total
Multi-Unit High-Rise	252	63	139	202	132	95	227
Land Use	GFA (sq. ft.)	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Retail (< 40k sq. ft.)	7,446	13	9	22	32	32	63

Internal capture rates from the ITE Trip Generation Handbook 3rd Edition have been assigned to the development's retail component for mixed-use developments. The rates summarized in Table 10 represent the percentage of trips to/from the retail use based on the residential component.

Table 10: Internal Capture Rates

Land Use	AM		PM	
	In	Out	In	Out
Residential to/from Retail	17%	14%	10%	26%

Pass-by reductions applied to the retail trip generation at a rate of 40% have been included using the recommended value presented in the ITE Trip Generation Manual 11th Edition (2021) for the most similar land use with a recommended rate, “Retail (40k – 150k sq. ft.)”.

Using the district mode share targets by land use and the person trip rates, the person trips by mode have been projected. Trip generation by peak hour has been forecasted using the prescribed peak period conversion factors presented in the TRANS Trip Generation Manual (2020) for the residential component. Table 11 summarizes the residential and commercial trip generation by mode and peak hour.

Table 11: Trip Generation by Mode

Travel Mode		AM Peak Hour				PM Peak Hour			
		Mode Share	In	Out	Total	Mode Share	In	Out	Total
Multi-Unit (High-Rise)	Auto Driver	48%	14	33	47	52%	29	23	52
	Auto Passenger	9%	3	6	9	16%	9	7	16
	Transit	30%	10	24	34	28%	17	13	30
	Cycling	3%	1	2	3	0%	0	0	0
	Walking	10%	4	8	12	4%	3	2	5
	Total	100%	32	73	105	100%	58	45	103
Retail (< 40k sq. ft.)	Auto Driver	67%	3	2	5	59%	5	6	11
	Auto Passenger	12%	1	1	2	18%	5	5	10
	Transit	8%	1	1	2	7%	2	2	4
	Cycling	0%	0	0	0	1%	0	0	0
	Walking	14%	2	1	3	13%	4	4	8
	Pass-by	40%	-4	-3	-7	40%	-11	-11	-22
	Internal Capture	varies	-2	-1	-3	varies	-5	-4	-9
Total	100%	7	5	13	100%	16	17	33	
Total	Auto Driver	-	17	35	52	-	34	29	63
	Auto Passenger	-	4	7	11	-	14	12	26
	Transit	-	11	25	36	-	19	15	34
	Cycling	-	1	2	3	-	0	0	0
	Walking	-	6	9	15	-	7	6	13
	Total	-	39	78	118	-	74	62	136

As shown above, a total of 52 AM and 63 PM new peak hour two-way vehicle trips are projected as a result of the proposed development.

5.3 Trip Distribution

To understand the travel patterns of the subject development, the OD Survey has been reviewed to determine the existing district travel and these patterns were applied based on the build-out of Beacon Hill. Table 12 below summarizes the distributions.

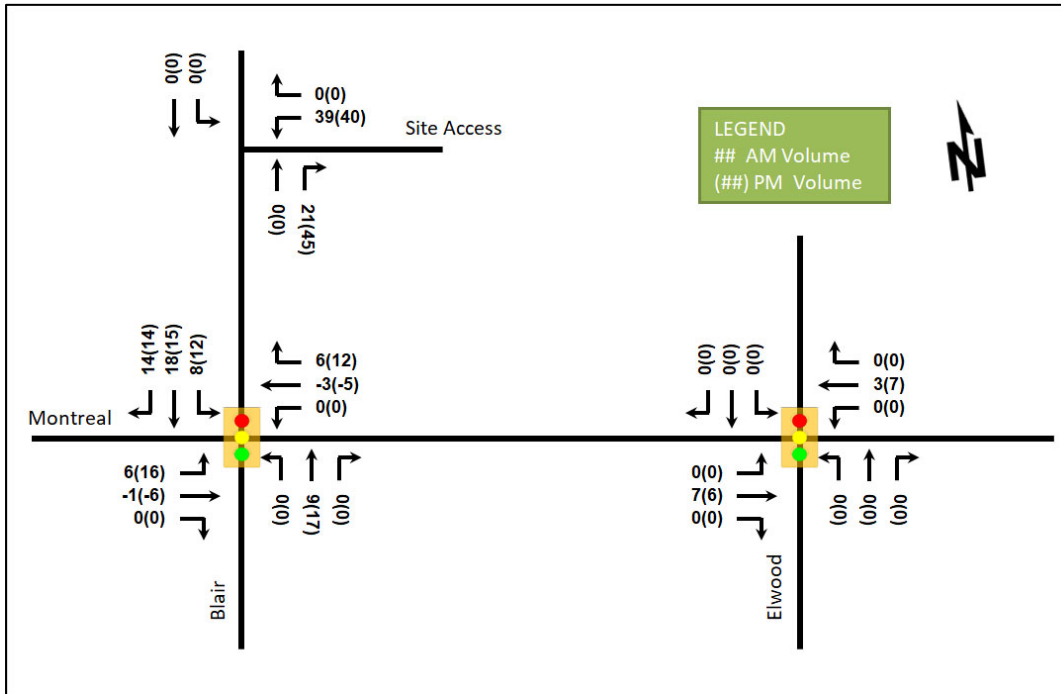
Table 12: OD Survey Distribution – Beacon Hill

To/From	% of Trips	Via
North	5%	Montreal Rd (W)
South	30%	Blair Rd
East	20%	Montreal Rd
West	45%	25% Montreal Rd, 20% Blair Rd
Total	100%	-

5.4 Trip Assignment

Using the distribution outlined above, turning movement splits, and access to major transportation infrastructure, the trips generated by the site have been assigned to the study area road network. Figure 12 illustrates the new site generated and pass-by volumes.

Figure 12: New Site-Generated and Pass-By Auto Volumes



6 Background Network Travel Demands

6.1 Transportation Network Plans

The transportation network plans were discussed in Section 2.3. The Montreal-Blair Road Transit Priority Corridor is the only confirmed project within the study expected to impact traffic operations. This work is assumed to be planned for completion between the TIA study horizons and will be modelled in the 2029 horizon.

6.2 Background Growth

A review of the background projections from the City’s TRANS Regional Model for the 2011 and 2031 horizons was completed to determine the background growth for each of the study area roadways. Table 13 summarizes the results of the model, and the projections are provided in Appendix F.

Table 13: TRANS Regional Model Projections – Study Area Growth Rates

Street	Direction Growth % from 2011 to 2031		Direction Growth % from Existing to 2031	
	Eastbound	Westbound	Eastbound	Westbound
Montreal Road	1.44%	0.36%	-0.81%	1.36%
	Northbound	Southbound	Northbound	Southbound
Blair Road	-1.52%	3.05%	-7.51%	4.83%

Volumes on the study area roadways are generally forecasted grow in the peak directions. When accounting for the existing volumes, it can be seen that the eastbound growth predicted during the AM peak hour on Montreal Road has been achieved. Growth rates from the existing volumes, rounded to the nearest 0.25%, have been applied to mainline volumes and major turning movements on Montreal Road and Blair Road and reversed in the PM peak hour, with negative growth rates taken as zero. Table 14 summarizes the applied growth rates.

Table 14: Applied Study Area Growth Rates

Street	AM Peak Hour		PM Peak Hour	
	Eastbound	Westbound	Eastbound	Westbound
Montreal Road	-	1.25%	1.25%	-
	Northbound	Southbound	Northbound	Southbound
Blair Road	-	4.75%	4.75%	-

6.3 Other Developments

As only a single development application anticipated to generate negligible traffic is present within the study area, all growth on the study area network is assumed to be captured by the background growth rates applied.

Traffic from the Wateridge Village development west of the site is understood to be captured within the 2031 horizon of the TRANS model. As background growth rates derived from these forecasted volumes have been applied to the future horizons, the Wateridge Village development is considered to be included the background conditions.

7 Demand Rationalization

7.1 2024 Future Background Operations

Figure 13 illustrates the 2024 background volumes and Table 15 summarizes the 2024 background intersection operations. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection. The synchro worksheets for the 2024 future background horizon are provided in Appendix G.

Figure 13: 2024 Future Background Volumes

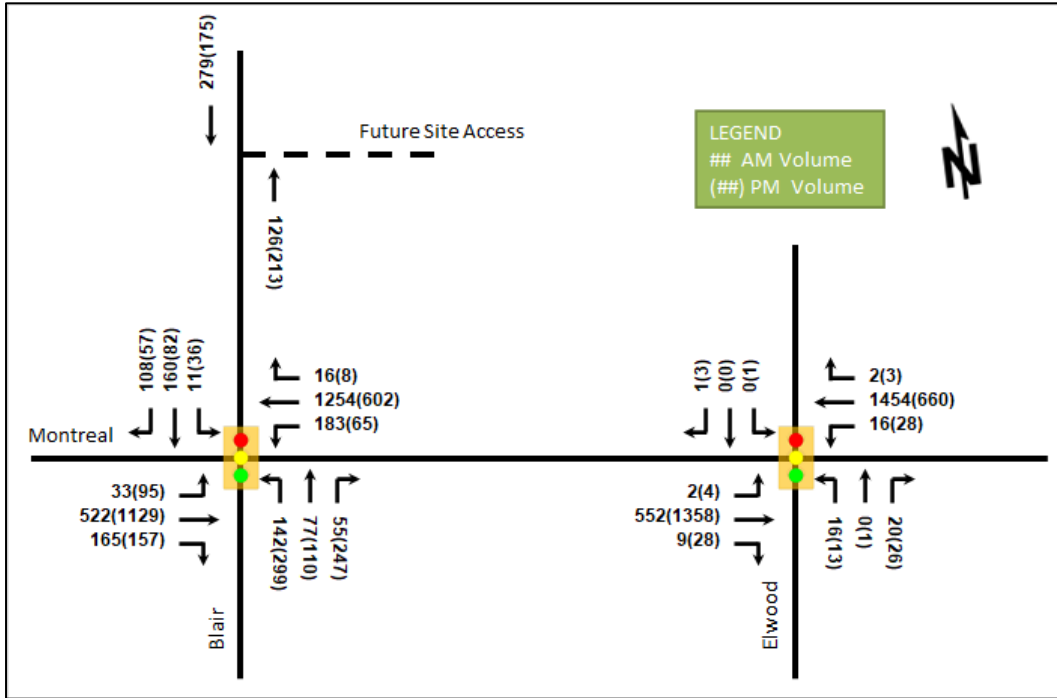


Table 15: 2024 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Montreal Road at Blair Road <i>Signalized</i>	EBL	A	0.19	16.2	11.7	A	0.27	17.7	23.7
	EBT	A	0.27	10.7	44.8	B	0.67	20.6	#122.8
	EBR	A	0.17	2.9	11.0	A	0.20	7.8	19.4
	WBL	A	0.38	13.9	27.5	A	0.42	34.3	#24.2
	WBT	B	0.64	13.8	#143.4	A	0.36	17.5	53.8
	WBR	A	0.02	2.6	m0.3	A	0.01	2.5	m0.6
	NBL	C	0.74	51.5	32.6	C	0.80	43.0	64.9
	NBT	A	0.19	24.6	15.8	A	0.20	20.2	20.8
	NBR	A	0.14	6.2	6.4	A	0.49	21.6	40.3
	SBL	A	0.04	20.5	4.1	A	0.11	18.3	9.0
	SBT/R	B	0.65	34.6	47.0	A	0.24	13.0	19.6
Overall	B	0.67	16.7	-	C	0.72	21.4	-	
Montreal Road at Elwood Street <i>Signalized</i>	EBL	A	0.01	8.0	m0.4	A	0.01	7.8	m0.5
	EBT/R	A	0.22	4.4	22.6	A	0.55	6.4	#65.1
	WBL	A	0.03	7.8	4.7	A	0.12	9.9	8.6
	WBT/R	A	0.56	9.6	#168.0	A	0.26	6.0	50.4
	NB	A	0.15	11.4	6.2	A	0.16	16.4	7.9
	SB	A	0.00	0.0	0.0	A	0.02	0.0	0.0
Overall	A	0.53	8.2	-	A	0.52	6.5	-	

Notes: Saturation flow rate of 1800 veh/h/lane
 Queue is measured in metres
 Peak Hour Factor = 1.00

Delay = average vehicle delay in seconds
 m = metered queue
 # = volume for the 95th %ile cycle exceeds capacity

During both the AM and PM peak hours, the study area intersections operate well and similarly to the existing conditions. No new capacity issues are noted.

7.2 2029 Future Background Operations

Figure 14 illustrates the 2029 background volumes and Table 16 summarizes the 2029 background intersection operations. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection. The synchro worksheets for the 2029 future background horizon are provided in Appendix H.

Figure 14: 2029 Future Background Volumes

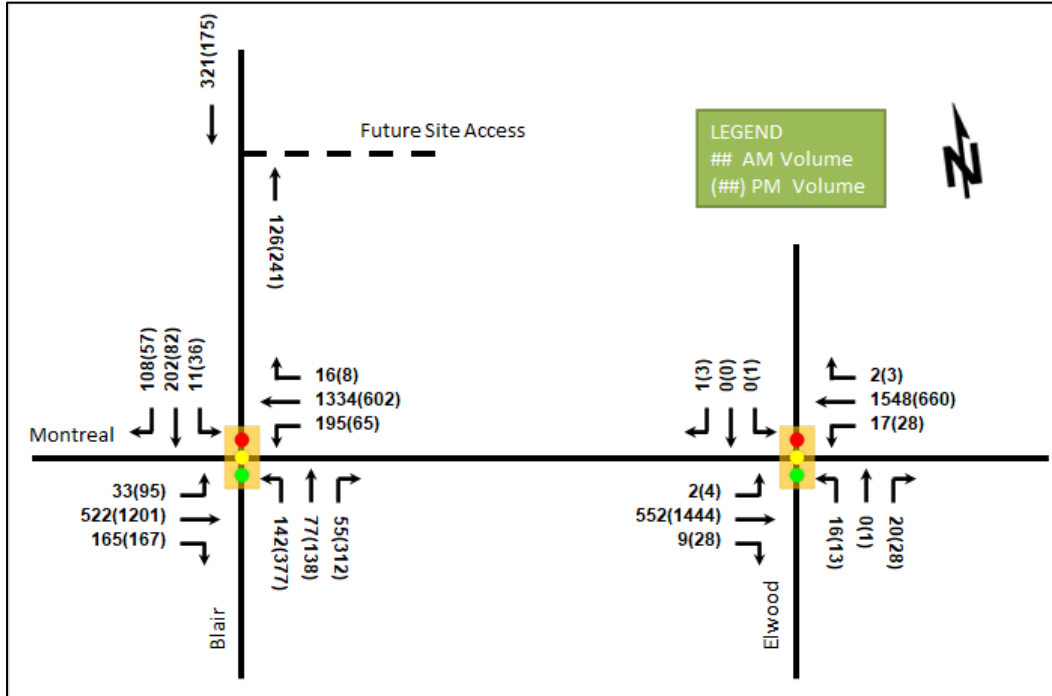


Table 16: 2029 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Montreal Road at Blair Road Signalized	EBL	A	0.30	55.5	16.5	B	0.70	76.0	#44.2
	EBT	A	0.47	29.6	60.9	F	1.05	75.9	#221.0
	EBR	A	0.32	28.5	43.2	A	0.32	31.1	49.7
	WBL	A	0.58	50.6	#101.9	A	0.52	63.3	27.5
	WBT	C	0.79	29.7	#239.8	A	0.56	34.1	80.3
	WBR	A	0.02	21.2	7.6	A	0.02	28.1	5.1
	NBL	C	0.78	66.0	47.2	D	0.90	58.9	#136.2
	NBT/R	A	0.35	35.3	35.9	C	0.79	42.5	#140.7
	SBL	A	0.05	26.8	5.3	A	0.20	26.7	13.8
	SBT/R	C	0.75	48.7	76.8	A	0.23	24.7	35.8
	Overall	D	0.86	35.4	-	E	1.00	55.5	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Montreal Road at Elwood Street <i>Signalized</i>	EBL	A	0.01	8.0	1.3	A	0.01	7.2	1.9
	EBT/R	A	0.22	5.3	39.3	A	0.58	9.1	#165.7
	WBL	A	0.03	6.9	4.6	A	0.14	9.5	8.4
	WBT/R	A	0.59	9.3	#177.0	A	0.25	5.4	47.1
	NB	A	0.18	32.9	11.4	A	0.21	33.5	12.7
	SB	A	0.00	27.0	1.2	A	0.02	28.2	2.8
	Overall	A	0.59	8.7	-	A	0.58	8.5	-

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00

Delay = average vehicle delay in seconds
m = metered queue
= volume for the 95th %ile cycle exceeds capacity

At the 2029 future background horizon, the intersection of Montreal Road at Blair Road is forecasted to see operations worsen with the proposed geometric changes associated with the Montreal-Blair Transit Priority EA.

At the intersection of Montreal Road at Blair Road, the westbound left-turn movement is anticipated to exhibit extended queues during the AM peak hour at this horizon. During the PM peak hour, the eastbound through movement is forecast to be over theoretical capacity, the eastbound left, northbound left, and northbound through/right movements are anticipated to exhibit extended queues, and the overall intersection is forecast to be over capacity.

It is noted that the signal timing employed within the EA does not include a fully protected northbound left-turn phase corresponding with the dual left turn lanes (one of which is transit only). Additionally, advance pedestrian walk time is considered extraneously to the overall required walk time and thus the operations shown are more conservative for the phasing shown. This timing will need to be revisited as part of future planning and it is recommended that given the advance walk and bus queue jumps employed, that lagging protected left-turn phases be investigated to permit concurrent through movements.

The intersection of Montreal Road at Elwood Street is anticipated to continue to operate well with extended queuing in the peak direction in each peak hour.

7.3 Demand Rationalization Conclusions

While capacity issues are noted in the PM peak hour at the intersection of Montreal Road at Blair Road, once the transit corridor is implemented, and Stage 2 LRT is fully operational, a modal shift of 2% from auto travel to transit, enough to relieve capacity issues modelled at this intersection, may occur. No rationalization for the site-generated travel demand is required.

8 Development Design

8.1 Design for Sustainable Modes

The proposed mixed-use development is a residential tower and podium above ground floor commercial space. Hard surface connections will be provided from all building entrances to the surrounding sidewalks on Blair Road and Montreal Road, and the drive aisle lane will support cyclists and vehicles.

Vehicle parking is proposed within a surface lot and across three underground parking levels. Bicycle parking is proposed via a surface rack and within open racks and a secure room within the underground parking levels.

Transit stops for all area routes described in Section 2.2.5 are located within 400 metres walking distance from the proposed site entrances.

8.2 Circulation and Access

Access to the site is proposed via a 6.0-metre-wide two-way connection to Blair Road. The ramp to underground parking is 6.0 metres wide and a one-way drop off loop is proposed on the south side of the site driveway. Space is provided on the north side of the drive aisle for a single short term parking space and as a refuse staging area.

To access the two-way aisle and reverse out of the site, garbage collection and emergency services require a 4.0-metre curb radius on the south side of the access.

9 Parking

9.1 Parking Supply

The site proposes bicycle parking of 196 spaces spread across three underground levels and a surface rack near the main entrance. From the parking zoning by-law, the minimum bicycle parking requirement is 126 for residents and three for commercial. The proposed bicycle parking meets the minimum zoning by-law requirements.

A total of 246 vehicle parking spaces are proposed, including 180 for residents, 50 for visitors, and 16 for the commercial space. Based on the established site-specific zoning, the minimum parking provision is 176 residential vehicle spaces, 50 visitor parking spaces, 16 commercial vehicle spaces. The proposed vehicle parking meets the minimum site-specific zoning requirements.

10 Boundary Street Design

summarizes the MMLOS analysis for the boundary streets of Montreal Road and Parkdale Avenue, and Blair Road. The existing and future conditions are considered in separate rows. The boundary street analysis is based on the land use designation of “Arterial Main Street” for Montreal Road and of “Employment Area” for Blair Road. The MMLOS worksheets has been provided in Appendix I.

Table 17: Boundary Street MMLOS Analysis

Segment		Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS	
		PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target
Montreal Road	Ex.	F	C	F	C	D	C	A	D
	Fut.	B	C	A	C	B	C	A	D
Blair Road	Ex.	C	C	C	C	D	D	B	D
	Fut.	A	C	C	C	D	D	B	D

The pedestrian, bicycle, and transit MMLOS targets are not met on Montreal Road in the existing conditions. All MMLOS targets will be met in the planned conditions and no further analysis is required.

11 Access Intersections Design

11.1 Location and Design of Access

The development access consists of a 6.0-metre-wide two-way drive aisle to Blair Road, extending 33 metres to the proposed site building. The sidewalk is depressed across the access with a depressed curb, and a 4.0-metre radius is required to facilitate garbage collection vehicles and emergency vehicles on the south side of the driveway.

The existing site access on Blair Road is to be removed and the associated curb and median cuts will be reinstated to full height as part of construction activities.

11.2 Intersection Control

The site access intersection is proposed as being minor stop controlled on the access approach.

11.3 Access Intersection Design

11.3.1 2024 Future Total Access Intersection Operations

The 2024 future total intersection volumes are illustrated in Figure 15 and the access intersection operations are summarized below in Table 18. The level of service is based average delay for individual lane movements and the overall intersection for unsignalized intersections. The synchro worksheets have been provided in Appendix J.

Figure 15: 2024 Future Total Volumes

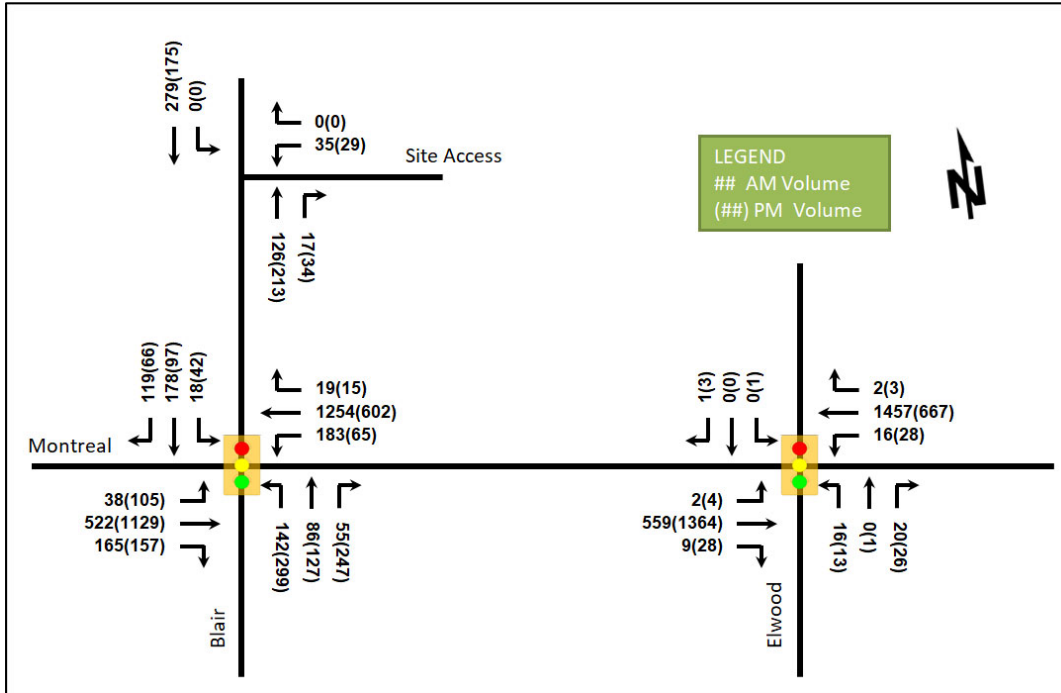


Table 18: 2024 Future Total Access Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay(s)	Q (95 th)	LOS	V/C	Delay(s)	Q (95 th)
Site Access and Blair Road Unsignalized	WBL/R	B	0.06	11.4	1.5	B	0.05	11.3	1.5
	NBT/R	-	-	-	-	-	-	-	-
	SBL/T	-	-	-	-	-	-	-	-
	Overall	A	-	0.9	-	A	-	0.7	-

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00

Delay = average vehicle delay in seconds
m = metered queue
= volume for the 95th %ile cycle exceeds capacity

The 2024 future total access intersections operate well. No capacity issues are noted.

11.3.2 2029 Future Total Access Intersection Operations

The 2029 future total intersection volumes are illustrated in Figure 16 and the access intersection operations are summarized below in Table 19. The level of service is based average delay for individual lane movements and the overall intersection for unsignalized intersections. The synchro worksheets have been provided in Appendix K.

Figure 16: 2029 Future Total Volumes

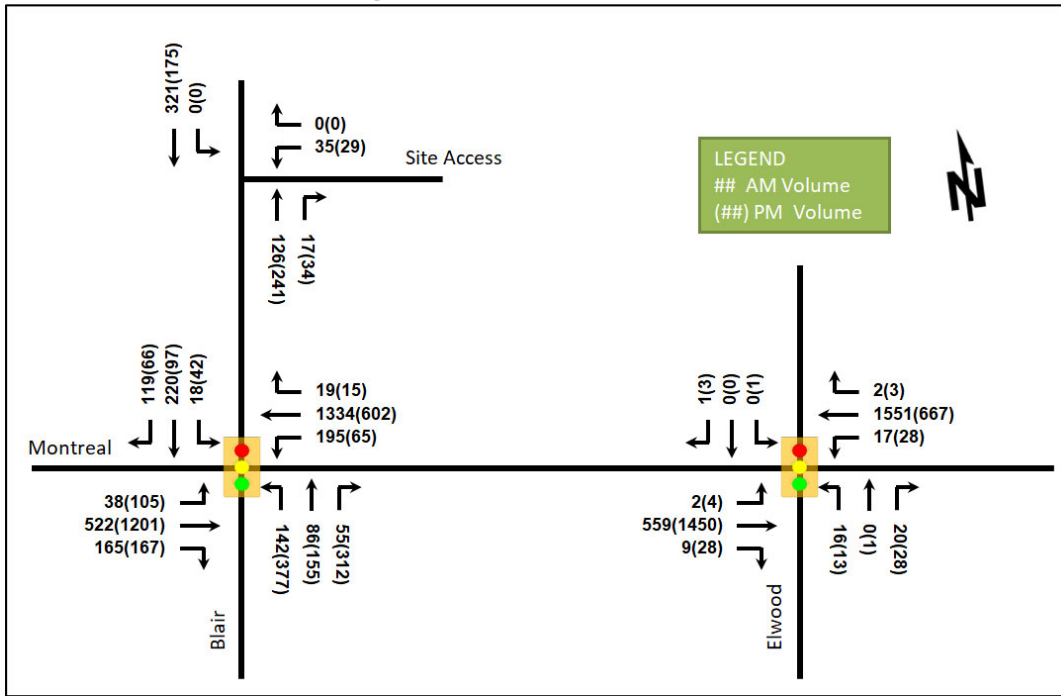


Table 19: 2029 Future Total Access Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay(s)	Q (95 th)	LOS	V/C	Delay(s)	Q (95 th)
Site Access and Blair Road Unsignalized	WBL/R	B	0.06	11.8	1.5	B	0.05	11.5	1.5
	NBT/R	-	-	-	-	-	-	-	-
	SBL/T	-	-	-	-	-	-	-	-
	Overall	A	-	0.8	-	A	-	0.7	-

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00

Delay = average vehicle delay in seconds
m = metered queue
= volume for the 95th %ile cycle exceeds capacity

The 2029 future total access intersections operate well. No capacity issues are noted.

11.3.3 Access Intersection MMLoS

As the site accesses are not signalized, no MMLoS analysis is required.

11.3.4 Recommended Design Elements

No design elements are proposed for the site access outside of the typical private approach considerations.

A throat length of 25 metres is recommended in the Geometric Design Guide for Canadian Roads (TAC, 2017) in table 8.9.3 for residential developments of over 200 units. The single short term parking space is parallel to the aisle and will have limited conflict with inbound vehicles. The one-way loop allows vehicles to enter unimpeded from Blair Road and the two-way aisle, and the exit of the loop is located at the end of the required throat length. Given the site constraints and the layout of the 33-metre-long drive aisle, the site plan is considered to provide adequate throat length.

12 Transportation Demand Management

12.1 Context for TDM

The mode shares used within the TIA represent the unmodified district modal shares. Given the plans for transit priority on the Montreal Road and Blair Road corridors, these transit mode shares are considered conservative moving beyond the construction of the transit priority measures. Supporting TDM measures should be provided to transition towards transit mode adoption within the development in advance of the implementation of the transit priority measures.

The subject site is within the Montreal Arterial Mainstreet Design Priority Area. The total bedroom count within the development is 354, including 150 one-bedroom units and 102 two-bedroom units, and no age restrictions are noted.

12.2 Need and Opportunity

The subject site has been assumed to rely predominantly on auto travel with no increase in transit ridership based upon the build-out horizon of the transit priority measures, and these assumptions have been carried through the analysis. The study area intersections are anticipated to have residual capacity, and as such, the risks from not achieving the 60% auto mode shares are low.

12.3 TDM Program

The “suite of post occupancy TDM measures” has been summarized in the TDM checklists for the residential land uses. The checklist is provided in Appendix L. The key TDM measures recommended include:

- Display local area pedestrian, cycling, and transit information at building entrances
- Provide a multimodal travel option information package
- Contract with provider to install on-site micromobility (e.g., scooter or bike share) station
- Inclusion of a 1-year Presto card for first time new townhome purchase and apartment rental, with a set time frame for this offer (e.g., 6-months) from the initial opening of the site
- Unbundle parking cost from purchase or rental costs

13 Neighbourhood Traffic Management

The proposed development will connect to the arterial road network at Montreal Road via Blair Road, which is a major collector road to the north of Montreal Road. Between the site access and Montreal Road, the two-way volumes at the 2029 future total horizon are forecasted as being 499 during the AM peak hour and 479 during the PM peak hour. These volumes are below the threshold of 600 vehicles during the peak hour from the TIA guidelines, and thus no further discussion is required.

14 Transit

14.1 Route Capacity

In Section 5.1 the trip generation by mode was estimated, including an estimate of the number of transit trips that will be generated by the proposed development. Table 20 summarizes the transit trip generation.

Table 20: Trip Generation by Transit Mode

Travel Mode	Residential Mode Share AM(PM)	AM Peak Period			PM Peak Period		
		In	Out	Total	In	Out	Total
Transit	30%(28%)	11	25	36	19	15	34

The proposed development is anticipated to generate an additional 36 AM peak hour transit trips and 34 PM peak hour transit trips using the unmodified district modal shares. Of these trips, 25 outbound AM trips and 19 inbound PM trips are anticipated. Assuming all northbound and southbound trips first travel west via the route #12, the resultant increase in ridership would be six riders per peak direction bus in the AM peak hour and five riders per peak direction bus in the PM peak hour. This increase in ridership is less than a half standard bus load per peak hour/direction.

14.2 Transit Priority

The City is planning implementation of a transit priority solution within the study area. Site-generated traffic is not anticipated to impact transit LOS at the study area intersections, and Blair Road north of Montreal Road is not part of the transit priority corridor, thus no transit priority impacts will result from the site access.

15 Network Intersection Design

15.1 Network Intersection Control

No change to the existing signalized control is recommended for the network intersections.

15.2 Network Intersection Design

15.2.1 2024 Future Total Network Intersection Operations

The 2024 future total volumes are illustrated in Figure 15 and the network intersection operations are summarized below in Table 21. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection. The synchro worksheets have been provided in Appendix J.

Table 21: 2024 Future Total Network Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Montreal Road at Blair Road Signalized	EBL	A	0.23	18.1	13.6	A	0.30	18.5	26.5
	EBT	A	0.27	11.2	44.8	B	0.68	21.0	#122.8
	EBR	A	0.17	2.9	11.0	A	0.20	7.9	19.4
	WBL	A	0.39	14.4	27.5	A	0.43	35.0	#24.5
	WBT	B	0.65	14.5	#143.4	A	0.36	17.7	54.1
	WBR	A	0.02	3.2	m0.6	A	0.02	5.7	1.2
	NBL	C	0.76	54.3	34.0	D	0.81	43.4	65.8
	NBT	A	0.20	24.1	17.3	A	0.37	20.0	34.3
	NBR	A	0.13	6.0	6.4	A	0.36	17.5	29.3
	SBL	A	0.07	20.9	5.6	A	0.14	18.7	10.2
	SBT/R	B	0.68	35.2	52.7	A	0.28	14.4	23.4
	Overall	B	0.68	17.6	-	C	0.73	21.4	-

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Montreal Road at Elwood Street <i>Signalized</i>	EBL	A	0.01	8.0	m0.4	A	0.01	8.0	m0.6
	EBT/R	A	0.22	4.4	23.3	A	0.55	6.6	#66.3
	WBL	A	0.03	7.8	4.7	A	0.12	9.9	8.7
	WBT/R	A	0.56	9.6	#168.3	A	0.26	6.0	51.0
	NB	A	0.15	11.4	6.2	A	0.16	16.8	8.0
	SB	A	0.00	0.0	0.0	A	0.02	0.0	0.0
Overall	A	0.53	8.2	-	A	0.53	6.6	-	

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00

Delay = average vehicle delay in seconds
m = metered queue
= volume for the 95th %ile cycle exceeds capacity

The network intersection operations for the 2024 future total horizon operate similarly to the 2024 future background conditions. No new capacity issues are noted.

15.2.2 2029 Future Total Network Intersection Operations

The 2029 future total volumes are illustrated in Figure 16 and the network intersection operations are summarized below in Table 22. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection. The synchro worksheets have been provided in Appendix K.

Table 22: 2029 Future Total Network Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 th)	LOS	V/C	Delay	Q (95 th)
Montreal Road at Blair Road <i>Signalized</i>	EBL	A	0.36	58.4	18.7	C	0.78	85.1	#50.0
	EBT	A	0.48	30.8	65.6	F	1.07	82.7	#221.0
	EBR	A	0.34	30.1	46.6	A	0.33	31.5	49.7
	WBL	C	0.73	64.0	#109.6	A	0.52	63.3	27.5
	WBT	D	0.87	37.8	#239.8	A	0.59	35.8	80.3
	WBR	A	0.03	24.7	8.4	A	0.03	29.3	7.4
	NBL	C	0.80	67.4	#49.7	E	0.93	64.2	#138.1
	NBT	A	0.33	32.2	36.9	D	0.83	46.4	#149.4
	SBL	A	0.07	25.6	7.6	A	0.25	28.4	16.1
	SBT/R	C	0.73	44.5	88.8	A	0.27	25.0	41.5
	Overall	E	0.92	39.9	-	F	1.02	59.5	-
Montreal Road at Elwood Street <i>Signalized</i>	EBL	A	0.01	8.0	1.3	A	0.01	9.2	1.9
	EBT/R	A	0.22	5.3	39.9	B	0.61	11.8	#166.8
	WBL	A	0.03	6.9	4.6	A	0.15	12.2	8.7
	WBT/R	A	0.59	9.4	#177.5	A	0.27	7.2	47.7
	NB	A	0.18	32.9	11.4	A	0.16	28.4	12.7
	SB	A	0.00	27.0	1.2	A	0.01	24.0	2.8
Overall	A	0.59	8.7	-	A	0.58	10.8	-	

Notes: Saturation flow rate of 1800 veh/h/lane
Queue is measured in metres
Peak Hour Factor = 1.00

Delay = average vehicle delay in seconds
m = metered queue
= volume for the 95th %ile cycle exceeds capacity

The network intersection operations for the 2029 future total horizon operate similarly to the 2029 future background conditions.

During the AM peak hour at the intersection of Montreal Road and Blair Road, the northbound left is anticipated to exhibit extended queues. During the PM peak hour, the intersection of Montreal Road at Blair Road is

forecasted to experience an increase in delay on the eastbound left-turn and eastbound through movements without any additional time allocated to the phase, and the overall intersection v/c has increased from 1.00 to 1.02 to score LOS F. As previously stated, given the advance walk and bus time, shifting the eastbound and westbound left-turns to lagging phases permitting concurrence with the through movement for part of the phase would allow for a shift of residual capacity from the westbound left and westbound through phases to the eastbound left and eastbound through phases, and thus the v/c would be anticipated to reduce to less than 1.00 for all movements and for the overall intersection. As noted in Section 7.3, an area shift in mode share from auto travel to transit may improve operations at this horizon.

15.2.3 Network Intersection MMLoS

Table 23 summarizes the MMLoS analysis for the network intersections of Montreal Road at Blair Road and Montreal Road at Elwood Street. Per the Montreal-Blair Road Transit Priority Corridor EA Study, the existing and future conditions for both intersections will differ and are considered in separate rows. The intersection analysis is based on the land use designation of “Employment Area” for the intersection of Montreal Road at Blair Road and of “Arterial Main Street” for the intersection of Montreal Road and Elwood Street. The MMLoS worksheets has been provided in Appendix I.

Table 23: Study Area Intersection MMLoS Analysis

Intersection	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS		Auto LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target	ALOS	Target
Montreal Rd & Blair Rd (Ex.)	F	C	F	C	D	C	C	B	C	D
Montreal Rd & Blair Rd (Fut.)	F	C	A	C	D	C	C	B	E	D
Montreal Rd & Elwood St (Ex.)	F	C	F	C	B	C	-	-	A	D
Montreal Rd & Elwood St (Fut.)	E	C	B	C	C	C	-	-	A	D

The MMLoS targets will not be met under the existing conditions for the pedestrian and bicycle LOS at both network intersections and for transit and truck LOS at the intersection of Montreal Road at Blair Road. In the future conditions, pedestrian, transit, truck, and auto LOS targets are forecast to not be met at the intersection of Montreal Road and Blair Road.

The pedestrian level of service would require a maximum of three lanes at a crossing to meet a LOS C. Based on the nature of arterial roadways the pedestrian LOS cannot be met at this intersection.

The truck LOS would require two receiving lanes on the south leg of the intersection of Montreal Road at Blair Road. The truck LOS targets are also higher for its land use designation than for the overridden land use designation of “Arterial Main Street” whose targets would be met by the intersection geometry. Furthermore, the employment area has major accesses onto Montreal Road and Ogilvie Road, and therefore the high targets for the intersection with Blair Road may be unnecessarily high given this arrangement.

Delays limit the transit LOS where delays on all approaches would need to be less than 20 seconds to meet targets, and meeting auto targets would require a v/c ratio of 0.90 or below. Auto and Transit LOS may be improved with reductions in area traffic based on shifts to transit by the 2029 future horizon.

As the City recently completed a functional design as part of the EA study, it is assumed that these LOS scores meet the City’s prioritized design objectives at both study area intersections.

15.2.4 Recommended Design Elements

A review of the turn lane storage lengths was requested by the City within this TIA. As such, the turn lane storage length considerations at the intersection of Montreal Road and Blair Road at the 2024 future total horizon are summarized in Table 24. The calculations are based both upon the equation 9.14.1 from Chapter 9 of the Geometric Design Guide for Canadian Roads manual (TAC, 2017) and the storage length calculation from the TIA guidelines assuming a 90 second cycle length.

Table 24: Turn Lane Storage Analysis

Movement	Existing Lane Length (m)	AM Peak Hour		PM Peak Hour	
		Length Per TIA Guidelines (m)	Length Per TAC Manual (m)	Length Per TIA Guidelines (m)	Length Per TAC Manual (m)
NBL	90	37.3	33.1	78.5	69.8
NBR	40	14.4	12.8	64.8	57.6
SBL	30	4.7	4.2	11.0	9.8
SBR	0	31.2	27.8	17.3	15.4
EBL	60	10.0	8.9	27.6	24.5
EBR	100	43.3	38.5	41.2	36.6
WBL	65	48.0	42.7	17.1	15.2
WBR	15	5.0	4.4	3.9	3.5

All minimum turn-lane storage lengths are met by the existing auxiliary lane lengths except for the northbound left-turn and northbound right-turn lane which site-generated traffic is not forecasted to rely upon. The northbound right-turn movement would be anticipated by 2024 to require a 65-metre storage length per the TIA guidelines, however the functional design from the EA does not include an auxiliary lane for this movement.

The functional design from the EA also does not include a southbound right-turn lane, and site-generated traffic is forecast to account for approximately 10% of the forecasted future total AM peak hour volumes on this movement. The inclusion of a southbound right-turn lane is not recommended or required to support the subject development.

16 Summary of Improvements Indicated and Modifications Options

The following summarizes the analysis and results presented in this TIA report:

Proposed Site and Screening

- The site is currently zoned as AM10 and R3K
- The proposed site includes 252 high-rise dwelling units and 7,446 ft² of ground floor commercial use
- A total of 246 vehicle parking spaces and 196 bicycle parking spaces are proposed
- Accesses is proposed on Blair Road via a full-moves access
- The development is proposed to be completed as a single phase by 2024
- The Trip Generation, Location, and Safety triggers were met for the TIA Screening
- This TIA accompanies a site plan application

Existing Conditions

- Montreal Road and Blair Road are arterial roads in the study area Where Blair Road is a major collector road north of Montreal Road

- Sidewalks are provided along both sides of Montreal Road and along the east side of Blair Road, and cycling facilities include paved shoulders on Blair Road, where Montreal Road and Blair Road are spine routes
- The high volumes roadways have produced a high number of collisions at the intersection of Montreal Road and Blair Road
- The collisions are predominantly rear end and turning collisions suggesting that they may be influenced by congestion and the turn channels
- Some queueing is noted on the peak directional through movements at both study area intersections during both peak hours

Development Generated Travel Demand

- The proposed development is forecasted to produce 118 two-way people trips during the AM peak hour and 136 two-way people trips during the PM peak hour
- Of the forecasted people trips, 52 two-way trips will be vehicle trips during the AM peak hour and 63 two-way trips will be vehicle trips during the PM peak hour based on a 48-52% residential auto mode share target
- Of the forecasted trips, 5% are anticipated to travel north, 30% to travel south, 20% to travel east, and 45% to travel west

Background Conditions

- No background developments were explicitly included in the background conditions, and a total background growth of 1.25% westbound on Montreal Road and 4.75% southbound on Blair Road in the AM peak hour were applied and to mainline volumes and major turning movements, reversed in the PM peak
- The Montreal-Blair Transit Priority EA proposes geometric changes to the study area intersections and road segments and includes accompanying signal timing adjustments
- The study area intersections at both horizons will operate similarly to the existing conditions at the 2024 horizon
- The intersection of Montreal Road and Blair Road is forecast to experience capacity issues during the PM peak hour at the 2029 future background horizon associated with the changes proposed by the EA
- Signal timing proposed as part of the EA may need review, and lagging turn phases are recommended for consideration
- Capacity issues at the intersection of Montreal Road at Blair Road may resolve with area mode shifts from auto travel to transit with the completion of Stage 2 LRT and the work proposed in the EA

Development Design

- Hard surface connections are proposed from building entrances to the surrounding sidewalks on Montreal Road and Blair Road
- Parking for vehicles and bicycles are proposed both on the surface and within underground parking levels
- The access is proposed as being 6.0 metres wide on Blair Road, the ramp to the parking is 6.0 metres wide
- Space is provided on the north side of the drive aisle for a short-term parking space and a refuse staging area, and a one-way drop-off loop is proposed on the south side of the aisle
- To access the two-way aisle and reverse out of the site, garbage collection and emergency services require a 4.0-metre curb radius on the south side of the access

Parking

- The development is proposed as including 196 bicycle parking spaces, which meets the zoning by-law requirements
- A total of 246 vehicle parking spaces are proposed, including 180 for residents, 50 for visitors, and 16 for commercial, which meet the site-specific zoning requirements

Boundary Street Design

- The boundary streets will meet all MMLOS targets in the future conditions with the improvements from the Montreal-Blair Transit Priority EA

Access Intersection Design

- The existing site access on Blair Road is to be removed and the curb and median cuts will be reinstated to full height as part of construction activities
- The site access intersections are forecast to operate well at both study horizons
- A clear throat length of 25 metres is recommended from the TAC Geometric Design Guide, which is functionally provided given the intended drive aisle operation

TDM

- Supportive TDM measures to be included within the proposed development should include:
 - Display local area pedestrian, cycling, and transit information at building entrances
 - Provide a multimodal travel option information package
 - Contract with provider to install on-site micromobility station
 - Inclusion of a 1-year Presto card for first time new townhome purchase and apartment rental, with a set time frame for this offer (e.g. 6-months) from the initial opening of the site
 - Unbundle parking cost from purchase or rental costs

NTM

- The major collector thresholds on Blair Road are not exceeded with the 2029 future total traffic

Transit

- Twenty-five outbound AM peak hour transit trips and 19 inbound PM peak hour transit trips are anticipated
- Peak-direction transit demands are the equivalent of less than half of a standard bus load per peak hour
- The City is implementing transit priority improvements within the study area, and the site is not anticipated to impact transit LOS
- No impacts on transit priority corridors will result from the site access as Blair Road is not a transit priority corridor north of Montreal Road

Network Intersection Design

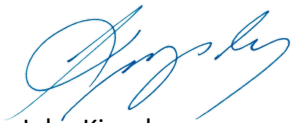
- Generally, the network intersections will operate similarly to the background conditions at both horizons
- High delays are anticipated on the eastbound left-turn movement with increases from site traffic during the PM peak hour at the 2029 future total horizon, and the overall intersection is forecast to be over theoretical capacity

- Changing signal phasing may improve conditions as may area mode shifts that are possible with the area transit projects' completion
- Despite the planned improvements, the MMLOS targets will not be met for the pedestrian LOS at both network intersections and the truck, transit, and auto LOS at the intersection of Montreal Road at Blair Road
- The pedestrian crossings would be required to be reduced to three or fewer lanes to meet LOS targets, and the south leg of the intersection of Montreal Road and Blair Road would require two receiving lanes to meet truck LOS
- Delays and capacity issues limit transit and auto LOS but these may improve future shifts in area mode share
- A southbound right-turn lane has not been included within the transit priority EA study functional design and may be warranted under existing conditions, however is not recommended or required to support the development; and a northbound right-turn lane is not included within the functional design

17 Conclusion

It is recommended that, from a transportation perspective, the proposed development applications proceed.

Prepared By:



John Kingsley
Transportation Engineering-Intern

Reviewed By:



Christopher Gordon P.Eng.
Senior Transportation Engineer

Appendix A

TIA Screening Form and PM Certification Form

City of Ottawa 2017 TIA Guidelines
Step 1 - Screening Form

Date: 16-Feb-20
Project Number: 2021-003
Project Reference: 1649 Montreal

1.1 Description of Proposed Development	
Municipal Address	1649 Montreal Road, 741 Blair Road
Description of Location	Northeast corner of Blair Road at Montreal Road
Land Use Classification	Arterial Mainstreet (AM10[2199]), Residential Third (R3K[1631])
Development Size	216 Units
Accesses	One all moves onto Blair Road, loading/garbage access onto Montreal Road, both at existing
Phase of Development	One phase
Buildout Year	2024
TIA Requirement	Full TIA Required

1.2 Trip Generation Trigger	
Land Use Type	Townhomes or apartments
Development Size	216 Units
Trip Generation Trigger	Yes

1.3 Location Triggers	
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 Spine Bicycle Networks?	No Existing access onto Montreal Road / Blair Road Spine routes
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?	Yes Montreal Arterial Mainstreet DPA
Location Trigger	Yes

1.4. Safety Triggers	
Are posted speed limits on a boundary street 80 km/hr or greater?	No
Are there any horizontal/vertical curvatures on a boundary street limits sight lines at a proposed driveway?	No
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)?	No Existing driveway within proximity to Montreal Road at Blair Road
Is the proposed driveway within auxiliary lanes of an intersection?	No Existing garbage/loading access proposed within the taper of the auxiliary WBR on Montreal Rd at Blair Rd
Does the proposed driveway make use of an existing median break that serves an existing site?	No
Is there is a documented history of traffic operations or safety concerns on the boundary streets within 500 m of the development?	Yes Montreal Rd at Blair Rd: 37 Collisions 2015-2019
Does the development include a drive-thru facility?	No
Safety Trigger	Yes



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

1. 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;
2. 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;
3. 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
4. I am either a licensed¹ or registered² professional in good standing, whose field of expertise [check appropriate field(s)] 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.


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Dated at Ottawa this 20 day of September, 2018.
(City)

Name: Andrew Harte
(Please Print)

Professional Title: Professional Engineer



Signature of Individual certifier that s/he meets the above four criteria

Office Contact Information (Please Print)
Address: 6 Plaza Court
City / Postal Code: Ottawa / K2H 7W1
Telephone / Extension: (613) 697-3797
E-Mail Address: Andrew.Harte@CGHTransportation.com



Appendix B

Turning Movement Counts



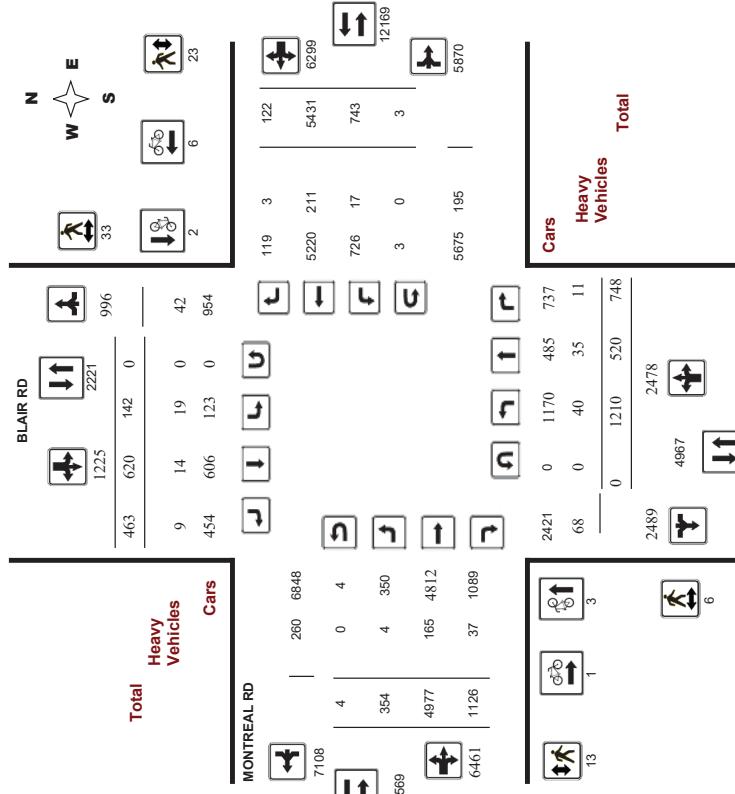
Transportation Services - Traffic Services
Turning Movement Count - Study Results

BLAIR RD @ MONTREAL RD

Survey Date: Thursday, November 15, 2018
Start Time: 07:00

WO No: 38125
Device: Miovision

Full Study Diagram



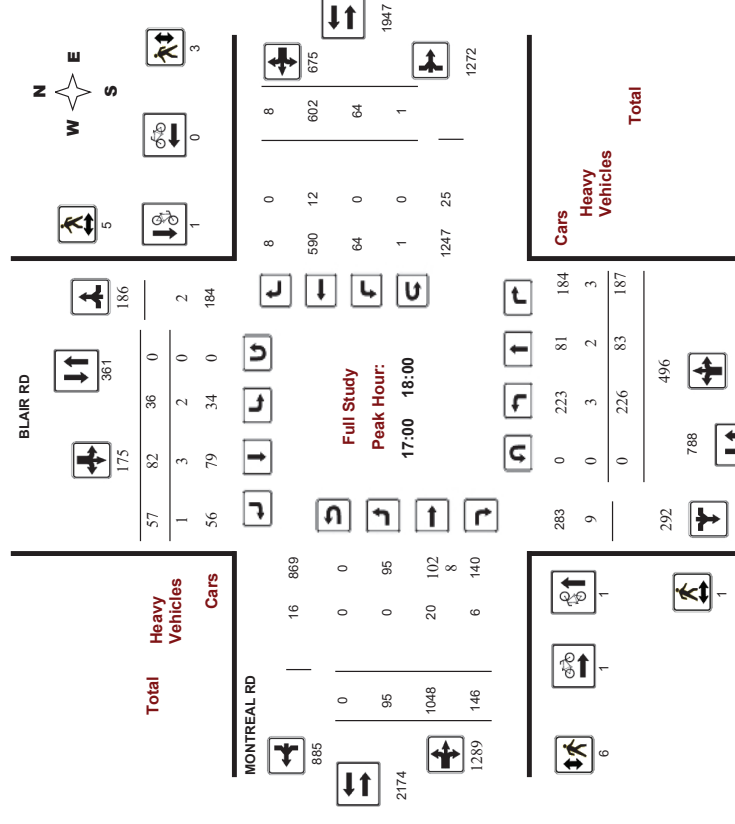
Transportation Services - Traffic Services
Turning Movement Count - Study Results

BLAIR RD @ MONTREAL RD

Survey Date: Thursday, November 15, 2018
Start Time: 07:00

WO No: 38125
Device: Miovision

Full Study Peak Hour Diagram





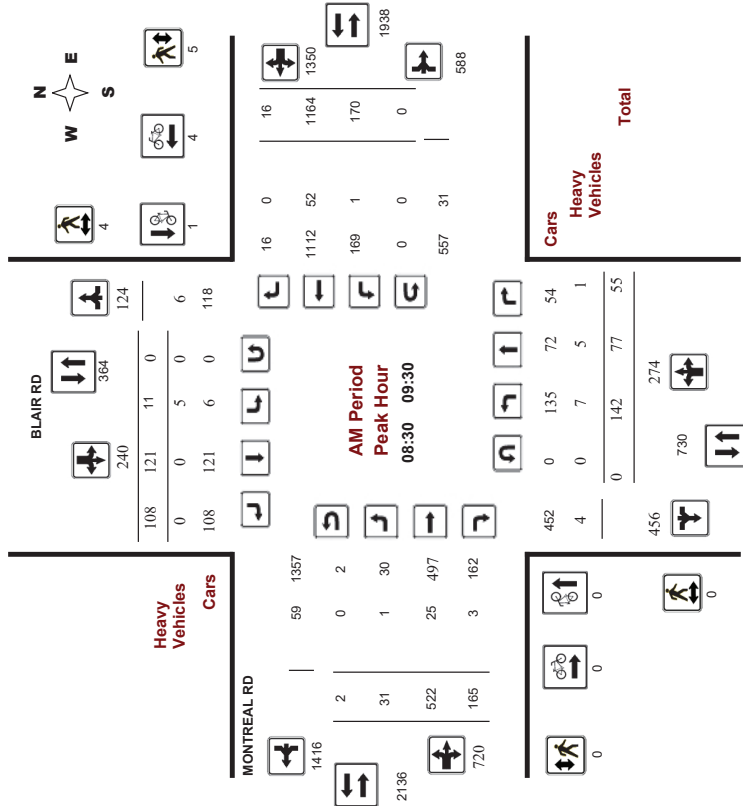
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BLAIR RD @ MONTREAL RD

Survey Date: Thursday, November 15, 2018
Start Time: 07:00

WO No: 38125
Device: Miovision



Comments



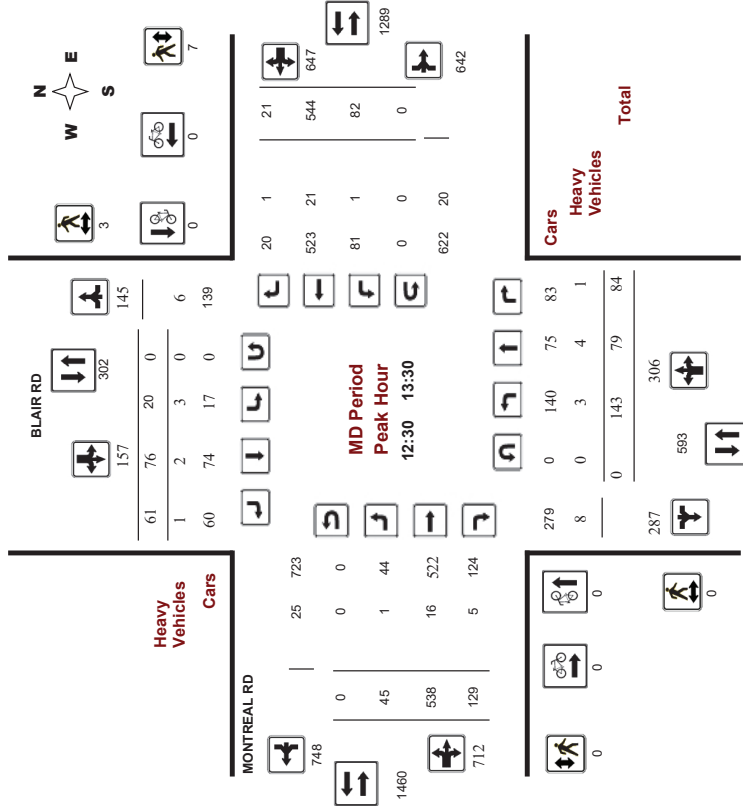
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BLAIR RD @ MONTREAL RD

Survey Date: Thursday, November 15, 2018
Start Time: 07:00

WO No: 38125
Device: Miovision



Comments



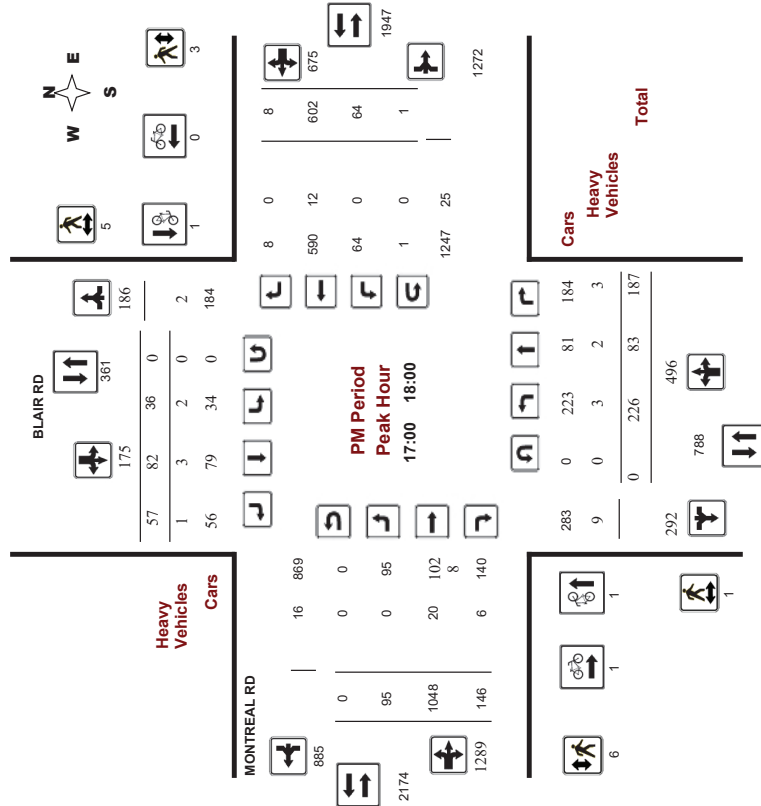
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BLAIR RD @ MONTREAL RD

Survey Date: Thursday, November 15, 2018
Start Time: 07:00

WO No: 38125
Device: Miovision



Transportation Services - Traffic Services

Turning Movement Count - Study Results

BLAIR RD @ MONTREAL RD

Survey Date: Thursday, November 15, 2018
Start Time: 07:00

WO No: 38125
Device: Miovision

Full Study Summary (8 HR Standard)

Survey Date: Thursday, November 15, 2018
Total Observed U-Turns: 90
AADT Factor: .90

Northbound: 0
 Southbound: 0
 Eastbound: 4
 Westbound: 3

Period	BLAIR RD				BLAIR RD				MONTREAL RD				MONTREAL RD						
	Northbound		Southbound		SB		EB		Westbound		Eastbound		WB		STR				
	LT	RT	LT	RT	TOT	TOT	TOT	TOT	LT	RT	LT	RT	LT	RT	TOT	TOT			
07:00-08:00	79	41	26	146	2	30	25	57	203	14	228	113	355	51	465	10	526	881	1084
08:00-09:00	154	67	51	272	12	93	89	194	466	27	491	137	655	162	1086	24	1272	1927	2393
09:00-10:00	136	82	55	273	16	105	74	195	488	36	520	196	752	144	994	20	1158	1910	2378
11:30-12:30	100	48	65	213	14	91	47	152	385	32	544	128	704	70	526	12	608	1312	1677
12:30-13:30	143	79	84	306	20	76	61	157	463	45	538	129	712	82	544	21	647	1359	1822
15:00-16:00	128	64	96	288	15	64	49	128	416	41	720	145	906	93	572	14	679	1585	2001
16:00-17:00	244	56	184	484	27	79	61	167	651	64	888	132	1084	77	642	13	732	1516	2467
17:00-18:00	226	83	187	496	36	82	57	175	671	95	1048	146	1289	64	602	8	674	1963	2634
Sub Total	1210	520	748	2478	142	620	463	1225	3703	354	4977	1126	6457	743	5431	122	6296	12753	16456
U-Turns	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	1210	520	748	2478	142	620	463	1225	3703	358	4977	1126	6461	746	5431	122	6299	12760	16463
EQ 12hr	1682	723	1040	3445	197	862	644	1703	5148	498	6918	1585	8881	1037	7549	170	8756	17737	22885
Note: These values are calculated by multiplying the totals by the appropriate expansion factor: 1.39																			
AVG 12hr	1514	651	936	3101	177	776	580	1533	4634	448	6226	1408	8062	933	6794	153	7880	15962	20596
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor: .90																			
AVG 24hr	1983	853	1226	4062	232	1017	760	2009	6071	587	8156	1844	10587	1222	8900	200	10322	20909	26980
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
BLAIR RD @ MONTREAL RD

Survey Date: Thursday, November 15, 2018
Start Time: 07:00

WO No: 38125
Device: Miovision

Full Study 15 Minute Increments
MONTREAL RD

Time Period	Northbound				Southbound				Eastbound				Westbound				W	STR	RT	TOT	Grand Total
	LT	ST	RT	TOT	LT	ST	RT	TOT	LT	ST	RT	TOT	LT	ST	RT	TOT					
07:00	9	4	6	19	0	1	1	2	21	32	21	54	8	52	1	61	115	136			
07:15	15	10	13	38	0	7	3	10	48	4	56	13	73	12	110	1	123	196	244		
07:30	07:45	31	9	3	43	1	11	10	22	65	3	73	35	111	12	127	2	141	252	317	
07:45	08:00	24	18	4	46	1	11	23	69	6	67	44	117	21	176	6	203	320	389		
08:00	08:15	39	13	4	56	4	14	18	36	92	8	90	30	128	35	218	11	264	382	484	
08:15	08:30	39	18	14	71	2	18	9	29	100	4	115	34	163	34	264	5	303	456	566	
08:30	08:45	42	16	15	73	3	29	22	54	127	7	129	35	171	43	287	2	332	503	630	
08:45	09:00	34	20	18	72	3	32	40	75	147	9	157	38	204	50	317	6	373	577	724	
09:00	09:15	29	17	9	55	2	24	54	109	10	96	44	150	34	303	3	340	490	599		
09:15	09:30	37	24	13	74	3	32	22	57	131	7	140	48	195	43	257	5	305	500	631	
09:30	09:45	32	24	13	69	7	21	14	42	111	11	150	48	209	39	209	5	253	482	573	
09:45	10:00	38	17	20	75	4	24	14	42	117	9	134	56	199	28	225	7	260	459	576	
10:00	10:15	16	6	10	32	4	34	15	53	85	6	131	39	176	21	130	7	158	334	419	
10:15	12:00	33	17	13	63	5	19	12	36	99	10	135	28	173	13	136	1	150	323	422	
12:00	12:15	28	14	19	61	4	17	12	33	94	8	139	31	178	15	132	1	148	326	420	
12:15	12:30	23	11	23	57	1	21	8	30	87	9	139	30	178	21	128	3	152	330	417	
12:30	12:45	32	20	13	65	5	22	14	41	106	7	122	37	166	22	124	5	151	317	423	
12:45	13:00	40	18	11	69	6	19	13	38	107	11	147	26	184	18	123	5	146	330	437	
13:00	13:15	40	23	32	95	4	23	18	45	140	16	140	36	192	21	136	3	160	352	490	
13:15	13:30	31	18	28	77	5	12	16	33	110	11	129	30	170	21	161	8	190	360	472	
15:00	15:15	28	23	23	74	2	18	9	29	103	9	179	32	220	16	113	3	132	352	455	
15:15	15:30	30	10	29	69	5	14	16	35	104	9	153	27	189	24	118	4	146	335	439	
15:30	15:45	35	15	17	67	3	14	13	30	97	11	193	44	248	29	171	4	204	452	549	
15:45	16:00	35	16	27	78	5	18	11	34	112	12	195	42	249	24	170	3	197	446	558	
16:00	16:15	72	12	44	128	3	17	15	35	163	16	239	37	292	31	167	1	199	491	654	
16:15	16:30	63	13	40	116	11	17	16	44	160	10	211	29	250	17	155	2	174	424	564	
16:30	16:45	45	15	54	114	7	19	14	40	154	16	223	39	278	16	153	4	173	451	605	
16:45	17:00	64	16	48	126	6	26	16	48	174	23	215	27	265	13	167	6	186	451	625	
17:00	17:15	59	9	52	120	11	28	16	55	175	16	292	45	353	13	139	0	152	505	660	
17:15	17:30	54	22	48	124	9	22	15	46	170	23	262	37	322	12	160	2	174	496	666	
17:30	17:45	55	26	50	131	8	9	13	30	161	23	258	29	308	19	144	3	166	474	635	
17:45	18:00	58	26	37	121	8	23	13	44	165	33	238	35	306	21	159	3	183	489	654	
Total:		1210	520	748	2478	142	620	463	1225	3703	368	4977	1126	6467	746	5431	122	6299	3703	16,463	

Note: U-Turns are included in Totals.



Transportation Services - Traffic Services
Turning Movement Count - Study Results
BLAIR RD @ MONTREAL RD

Survey Date: Thursday, November 15, 2018
Start Time: 07:00

WO No: 38125
Device: Miovision

Full Study Cyclist Volume
MONTREAL RD

Time Period	Northbound		Southbound		Street Total		Eastbound		Westbound		Street Total		Grand Total
	07:15	07:30	07:15	07:30	07:15	07:30	07:15	07:30	07:15	07:30	07:15	07:30	
07:00	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15	0	0	0	0	0	0	0	0	0	0	0	0	0
07:30	0	0	0	0	0	0	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0	0	0	0	0	0	0
08:00	0	0	0	0	0	0	0	0	0	0	0	0	0
08:15	0	0	0	0	0	0	0	0	0	0	0	0	0
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0
08:45	0	0	0	0	0	0	0	0	0	0	0	0	0
09:00	0	0	0	0	0	0	0	0	0	0	0	0	0
09:15	0	0	0	0	0	0	0	0	0	0	0	0	0
09:30	0	0	0	0	0	0	0	0	0	0	0	0	0
09:45	0	0	0	0	0	0	0	0	0	0	0	0	0
10:00	0	0	0	0	0	0	0	0	0	0	0	0	0
10:15	0	0	0	0	0	0	0	0	0	0	0	0	0
10:30	0	0	0	0	0	0	0	0	0	0	0	0	0
10:45	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00	2	2	0	0	0	0	0	0	0	0	0	0	0
12:15	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45	0	0	0	0	0	0	0	0	0	0	0	0	0
13:00	0	0	0	0	0	0	0	0	0	0	0	0	0
13:15	0	0	0	0	0	0	0	0	0	0	0	0	0
13:30	0	0	0	0	0	0	0	0	0	0	0	0	0
13:45	0	0	0	0	0	0	0	0	0	0	0	0	0
14:00	0	0	0	0	0	0	0	0	0	0	0	0	0
14:15	0	0	0	0	0	0	0	0	0	0	0	0	0
14:30	0	0	0	0	0	0	0	0	0	0	0	0	0
14:45	0	0	0	0	0	0	0	0	0	0	0	0	0
15:00	0	0	0	0	0	0	0	0	0	0	0	0	0
15:15	0	0	0	0	0	0	0	0	0	0	0	0	0
15:30	0	0	0	0	0	0	0	0	0	0	0	0	0
15:45	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00	0	0	0	0	0	0	0	0	0	0	0	0	0
16:15	0	0	0	0	0	0	0	0	0	0	0	0	0
16:30	0	0	0	0	0	0	0	0	0	0	0	0	0
16:45	0	0	0	0	0	0	0	0	0	0	0	0	0
17:00	0	0	0	0	0	0	0	0	0	0	0	0	0
17:15	0	0	0	0	0	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0
18:00	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3	3	2	2	5	5	1	1	6	6	7	7	12



Transportation Services - Traffic Services
Turning Movement Count - Study Results
BLAIR RD @ MONTREAL RD

Survey Date: Thursday, November 15, 2018
Start Time: 07:00

WO No: 38125
Device: Miovision

Full Study Pedestrian Volume
MONTREAL RD

Time Period	SB Approach (E or W Crossing)		EB Approach (N or S Crossing)		Total	Grand Total
	NB Approach (E or W Crossing)	WB Approach (N or S Crossing)	NB Approach (E or W Crossing)	WB Approach (N or S Crossing)		
07:00-07:15	0	0	0	0	0	0
07:15-07:30	1	0	1	1	1	2
07:30-07:45	0	1	1	0	0	1
07:45-08:00	0	1	1	0	1	2
08:00-08:15	0	1	1	0	0	1
08:15-08:30	0	1	1	0	1	2
08:30-08:45	0	0	0	0	0	0
08:45-09:00	0	2	0	2	2	4
09:00-09:15	0	1	1	0	1	2
09:15-09:30	0	1	0	2	2	3
09:30-09:45	1	3	2	2	2	5
09:45-10:00	0	2	1	2	3	5
10:00-10:15	0	1	0	0	0	1
10:15-10:30	0	3	0	0	0	3
10:30-10:45	0	0	0	0	0	0
10:45-11:00	0	3	0	0	0	3
11:00-11:15	0	0	0	0	0	0
11:15-11:30	0	0	0	0	0	0
11:30-11:45	0	0	0	0	0	0
11:45-12:00	0	3	0	0	0	3
12:00-12:15	0	0	0	0	0	0
12:15-12:30	0	0	0	0	0	0
12:30-12:45	0	2	0	3	3	5
12:45-13:00	0	0	0	0	0	0
13:00-13:15	0	1	0	1	1	2
13:15-13:30	0	0	0	2	2	2
13:30-13:45	0	3	1	0	1	4
13:45-14:00	1	0	0	0	0	1
14:00-14:15	0	0	0	0	0	0
14:15-14:30	0	0	0	0	0	0
14:30-14:45	0	0	0	0	0	0
14:45-15:00	0	1	1	0	0	1
15:00-15:15	0	0	0	0	0	0
15:15-15:30	0	1	1	0	0	1
15:30-15:45	0	0	0	0	0	0
15:45-16:00	0	1	1	0	0	1
16:00-16:15	0	1	1	0	0	1
16:15-16:30	0	1	1	1	1	3
16:30-16:45	1	3	0	2	2	6
16:45-17:00	0	3	3	1	4	7
17:00-17:15	0	0	0	0	0	0
17:15-17:30	1	1	2	1	3	5
17:30-17:45	0	1	1	1	2	3
17:45-18:00	0	6	13	23	36	75



Transportation Services - Traffic Services
Turning Movement Count - Study Results
BLAIR RD @ MONTREAL RD

Survey Date: Thursday, November 15, 2018
Start Time: 07:00

WO No: 38125
Device: Miovision

Full Study Heavy Vehicles
MONTREAL RD

Time Period	Northbound				Southbound				Eastbound				Westbound				W STR TOT	R STR TOT	Grand Total										
	BLAIR RD		MONTREAL RD		BLAIR RD		MONTREAL RD		BLAIR RD		MONTREAL RD		BLAIR RD		MONTREAL RD														
	LT	RT	LT	RT	LT	RT	LT	RT	LT	RT	LT	RT	LT	RT	LT	RT													
07:00-07:15	1	0	1	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	2	1	3	0	4	6	8		
07:15-07:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	
07:30-07:45	0	2	0	2	1	0	0	1	3	0	0	4	0	2	1	3	7	10	0	0	0	0	0	0	0	0	3	7	10
07:45-08:00	1	0	0	1	0	0	0	0	1	0	0	0	0	0	0	3	4	0	0	0	0	0	0	0	0	0	3	3	4
08:00-08:15	3	3	0	6	1	0	0	1	7	0	3	1	4	2	8	0	14	21	0	0	0	0	0	0	0	10	14	21	
08:15-08:30	3	2	0	5	2	1	0	3	8	0	2	1	3	1	13	0	14	17	25	0	0	0	0	0	0	14	17	25	
08:30-08:45	1	1	1	3	1	0	0	1	4	0	5	1	6	0	13	0	13	19	23	0	0	0	0	0	0	13	19	23	
08:45-09:00	3	2	0	5	2	0	0	2	7	0	8	1	9	0	13	0	13	22	29	0	0	0	0	0	0	13	22	29	
09:00-09:15	0	2	0	2	1	0	0	1	3	1	3	0	4	0	13	0	13	17	20	0	0	0	0	0	0	13	17	20	
09:15-09:30	3	0	0	3	1	0	0	1	4	0	9	1	10	1	13	0	14	24	28	0	0	0	0	0	0	10	19	24	
09:30-09:45	0	2	0	2	2	0	1	3	5	0	9	0	9	1	9	0	10	19	24	0	0	0	0	0	0	10	19	24	
09:45-10:00	2	1	0	3	1	0	0	1	4	0	6	2	8	1	10	0	11	19	23	0	0	0	0	0	0	11	19	23	
10:00-10:15	1	0	2	3	0	2	0	2	5	0	4	0	4	0	3	0	7	12	0	0	0	0	0	0	0	4	7	12	
10:15-10:30	5	4	0	9	0	1	0	1	10	0	5	1	6	0	4	0	10	20	0	0	0	0	0	0	0	4	10	20	
10:30-10:45	2	2	0	4	0	0	0	0	2	6	0	8	1	9	0	3	12	18	0	0	0	0	0	0	0	3	12	18	
10:45-11:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:00-11:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:15-11:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:30-11:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11:45-12:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:00-12:15	2	2	0	4	0	0	0	0	2	6	0	8	1	9	0	3	12	18	0	0	0	0	0	0	0	0	3	12	18
12:15-12:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:30-12:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12:45-13:00	3	1	0	4	1	0	0	1	5	0	1	1	2	0	6	0	6	8	13	0	0	0	0	0	0	0	6	8	13
13:00-13:15	0	1	0	1	0	0	0	0	1	1	0	1	1	1	1	0	1	1	1	0	0	0	0	0	0	0	1	1	1
13:15-13:30	0	2	1	3	1	0	0	1	4	0	6	1	7	0	4	1	5	12	16	0	0	0	0	0	0	0	5	10	11
13:30-13:45	0	2	1	3	1	0	0	1	4	0	6	1	7	0	4	1	5	12	16	0	0	0	0	0	0	0	5	10	11
13:45-14:00	4	1	0	5	0	0	0	0	5	1	9	1	11	3	7	0	10	21	26	0	0	0	0	0	0	10	21	26	
14:00-14:15	0	1	1	2	0	0	0	0	2	0	4	1	5	2	6	0	8	13	15	0	0	0	0	0	0	8	13	15	
14:15-14:30	0	1	0	1	0	0	0	0	1	1	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	1	1	0	0
14:30-14:45	0	1	0	1	0	0	0	0	1	1	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	1	1	0	0
14:45-15:00	0	1	0	1	0	0	0	0	1	1	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	1	1	0	0
15:00-15:15	0	1	0	1	0	0	0	0	1	1	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	1	1	0	0
15:15-15:30	0	1	0	1	0	0	0	0	1	1	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	1	1	0	0
15:30-15:45	0	1	0	1	0	0	0	0	1	1	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	1	1	0	0
15:45-16:00	0	1	0	1	0	0	0	0	1	1	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	1	1	0	0
16:00-16:15	2	0	1	3	0	0	0	1	4	0	5	2	7	3	9	0	12	19	23	0	0	0	0	0	0	6	14	18	
16:15-16:30	1	2	0	3	1	0	0	1	4	0	6	2	8	0	6	0	6	14	18	0	0	0	0	0	0	6	14	18	
16:30-16:45	0	2	0	2	0	0	0	1	3	0	8	2	10	0	7	0	7	17	20	0	0	0	0	0	0	7	17	20	
16:45-17:00	2	0	1	3	1	0	0	1	4	1	4	2	7	0	3	0	3	10	14	0	0	0	0	0	0	3	10	14	
17:00-17:15	1	0	2	3	0	1	1	2	5	0	7	3	10	0	4	0	4	14	19	0	0	0	0	0	0	4	14	19	
17:15-17:30	2	1	1	4	1	0	0	1	5	0	4	1	5	0	3	0	3	8	13	0	0	0	0	0	0	3	8	13	
17:30-17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17:45-18:00	0	1	0	1	1	2	0	0	3	4	0	6	2	8	0	4	12	12	0	0	0	0	0	0	0	4	12	12	
Total: None	40	35	11	86	1																								

Transportation Services - Traffic Services
Turning Movement Count - Study Results
BLAIR RD @ MONTREAL RD

Survey Date: Thursday, November 15, 2018
Start Time: 07:00

WO No: 38125
Device: Miovision

Full Study 15 Minute U-Turn Total
BLAIR RD

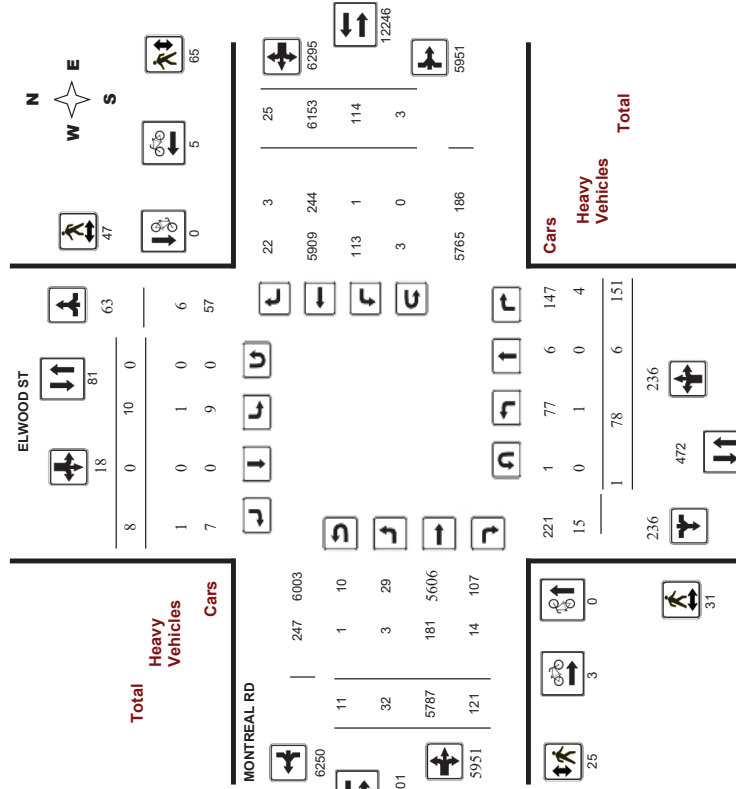
Time Period	Northbound		Southbound		Eastbound		Westbound		Total
	U-Turn Total	U-Turn Total	U-Turn Total	U-Turn Total	U-Turn Total	U-Turn Total	U-Turn Total		
07:00	0	0	0	0	0	0	1	1	0
07:15	0	0	0	0	0	0	0	0	0
07:30	0	0	0	0	0	0	0	0	0
07:45	0	0	0	0	0	0	0	0	0
08:00	0	0	0	0	0	0	1	1	0
08:15	0	0	0	0	0	0	0	0	0
08:30	0	0	0	0	0	0	0	0	0
08:45	0	0	0	0	0	0	0	0	0
09:00	0	0	0	0	1	0	0	0	1
09:15	0	0	0	0	0	0	0	0	0
09:30	0	0	0	0	0	0	0	0	0
09:45	0	0	0	0	0	0	0	0	0
10:00	0	0	0	0	0	0	0	0	0
11:30	0	0	0	0	0	0	0	0	0
11:45	0	0	0	0	0	0	0	0	0
12:00	0	0	0	0	0	0	0	0	0
12:15	0	0	0	0	0	0	0	0	0
12:30	0	0	0	0	1	0	0	0	1
12:45	0	0	0	0	0	0	0	0	0
13:00	0	0	0	0	0	0	0	0	0
13:15	0	0	0	0	0	0	0	0	0
13:30	0	0	0	0	0	0	0	0	0
15:00	0	0	0	0	0	0	0	0	0
15:15	0	0	0	0	0	0	0	0	0
15:30	0	0	0	0	0	0	0	0	0
15:45	0	0	0	0	0	0	0	0	0
16:00	0	0	0	0	0	0	0	0	0
16:15	0	0	0	0	0	0	0	0	0
16:30	0	0	0	0	0	0	0	0	0
16:45	0	0	0	0	1	0	0	0	1
17:00	0	0	0	0	0	0	0	0	0
17:15	0	0	0	0	0	0	0	0	0
17:30	0	0	0	0	0	0	0	0	0
17:45	0	0	0	0	0	0	1	1	0
18:00	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	4	0	3	7	7

Transportation Services - Traffic Services
Turning Movement Count - Study Results
ELWOOD ST @ MONTREAL RD

Survey Date: Thursday, November 15, 2018
Start Time: 07:00

WO No: 38124
Device: Miovision

Full Study Diagram





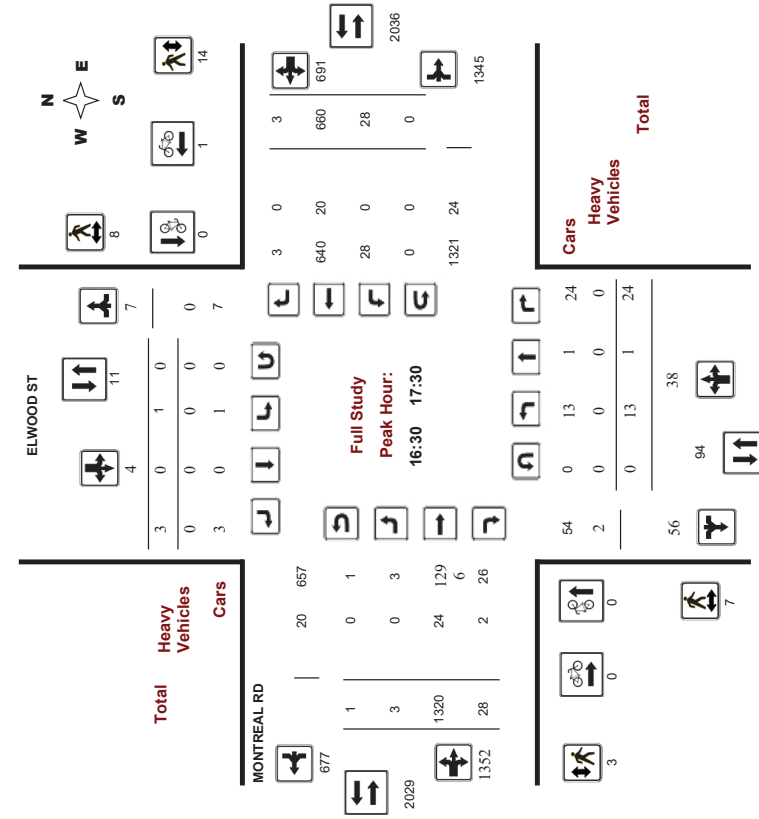
Transportation Services - Traffic Services
Turning Movement Count - Study Results

ELWOOD ST @ MONTREAL RD

Survey Date: Thursday, November 15, 2018
Start Time: 07:00

WO No: 38124
Device: Miovision

Full Study Peak Hour Diagram



Comments

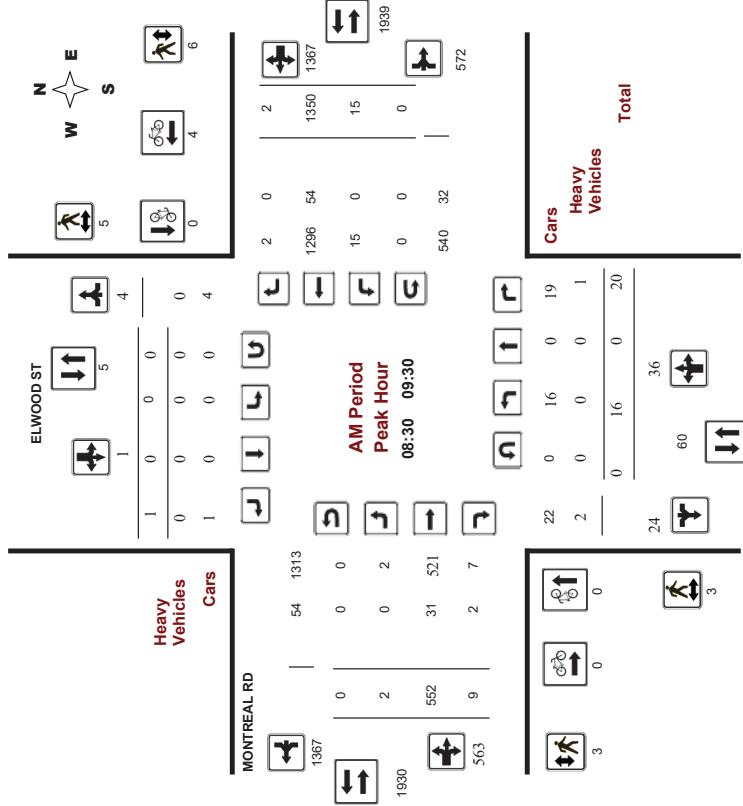


Transportation Services - Traffic Services
Turning Movement Count - Peak Hour Diagram

ELWOOD ST @ MONTREAL RD

Survey Date: Thursday, November 15, 2018
Start Time: 07:00

WO No: 38124
Device: Miovision



Comments



Transportation Services - Traffic Services
Turning Movement Count - Study Results
ELWOOD ST @ MONTREAL RD

Survey Date: Thursday, November 15, 2018
Start Time: 07:00

WO No: 38124
Device: Miovision

Full Study Summary (8 HR Standard)

Survey Date: Thursday, November 15, 2018
Total Observed U-Turns: 90
AADT Factor: 90

Northbound: 1 Southbound: 0
Eastbound: 11 Westbound: 3

Period	Northbound				Southbound				Eastbound				Westbound				WB TOT	STR TOT	Grand Total
	LT	ST	RT	TOT	LT	ST	RT	TOT	LT	ST	RT	TOT	LT	ST	RT	TOT			
07:00-08:00	2	1	6	9	0	0	0	0	9	8	198	5	211	1	460	5	466	677	686
08:00-09:00	9	0	17	26	0	0	1	1	27	1	468	9	478	4	1265	2	1271	1749	1776
09:00-10:00	9	0	20	29	0	0	1	1	30	2	562	8	572	22	1188	1	1211	1783	1813
11:30-12:30	5	0	20	25	0	0	0	0	25	0	592	8	600	16	600	2	618	1218	1243
12:30-13:30	16	1	13	30	1	0	0	1	31	4	643	14	661	14	635	1	650	1311	1342
15:00-16:00	14	1	25	40	5	0	3	8	48	7	798	18	823	9	635	10	654	1477	1525
16:00-17:00	14	3	24	41	4	0	2	6	47	5	1259	21	1285	24	689	2	715	2000	2047
17:00-18:00	9	0	26	35	0	0	1	1	36	5	1267	38	1310	24	681	2	707	2017	2053
Sub Total	78	6	151	235	10	0	8	18	253	32	5787	121	5940	114	6153	25	6292	12232	12485
U-Turns	1	0	0	1	0	0	0	0	11	11	3	3	3	3	14	15	3	14	15
Total	79	6	151	236	10	0	8	18	264	43	5790	121	5951	117	6153	25	6295	12246	12500
EQ 12hr	8	210	328	548	14	0	11	25	353	60	8044	168	8272	163	8553	35	8751	17023	17376

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

AVG 12hr 99 7 189 295 13 0 10 23 318 54 7240 151 7445 147 7698 32 7877 15322 15640

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

AVG 24hr 130 9 246 387 17 0 13 30 417 71 9484 198 9753 193 10084 42 10319 20072 20489

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

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



Transportation Services - Traffic Services
Turning Movement Count - Study Results
ELWOOD ST @ MONTREAL RD

Survey Date: Thursday, November 15, 2018
Start Time: 07:00

WO No: 38124
Device: Miovision

Full Study 15 Minute Increments

Time Period	Northbound				Southbound				Eastbound				Westbound				W TOT	STR TOT	Grand Total
	LT	ST	RT	TOT	LT	ST	RT	TOT	LT	ST	RT	TOT	LT	ST	RT	TOT			
07:00	0	0	0	0	0	0	0	0	4	33	0	37	1	60	1	62	99	99	99
07:15	0	3	4	7	0	0	0	0	6	43	2	51	0	90	2	92	143	147	147
07:30	0	0	2	2	0	0	0	0	2	58	0	60	0	133	2	135	195	195	197
07:45	0	1	3	4	0	0	0	0	4	64	3	71	0	177	0	177	248	251	251
08:00	0	0	1	1	0	0	0	0	0	68	0	68	4	249	0	253	321	322	322
08:15	0	0	5	5	0	0	0	0	5	105	3	108	1	321	0	322	430	435	435
08:30	0	0	2	2	0	0	0	0	8	143	4	148	0	317	1	318	466	474	474
08:45	0	0	9	9	0	0	0	0	13	152	2	154	0	378	1	379	553	546	546
09:00	0	0	4	4	0	0	0	0	4	137	0	137	6	343	0	349	487	491	491
09:15	0	0	5	5	0	0	0	0	12	120	3	123	9	312	0	321	444	456	456
09:30	0	0	6	6	0	0	0	0	7	164	2	167	3	275	1	279	446	453	453
09:45	0	0	7	7	0	0	0	0	7	141	3	145	4	258	0	262	407	414	414
10:00	0	0	6	6	0	0	0	0	0	149	3	152	7	157	0	164	316	323	323
11:30	0	0	4	4	0	0	0	0	0	161	1	162	3	151	2	156	318	322	322
12:00	0	0	5	5	0	0	0	0	8	145	1	146	2	137	0	139	285	283	283
12:15	0	0	5	5	0	0	0	0	6	137	3	140	6	155	0	161	301	307	307
12:30	0	0	7	7	0	0	0	0	12	145	1	146	6	138	0	144	290	302	302
12:45	0	0	3	3	0	0	0	0	9	183	4	188	3	150	0	153	341	350	350
13:00	0	0	3	3	0	0	0	0	6	157	4	161	2	168	1	171	332	338	338
13:15	0	0	4	4	0	0	0	0	4	158	5	163	3	179	0	182	348	352	352
15:00	0	0	9	9	0	0	0	0	12	182	3	186	3	131	5	139	325	337	337
15:15	0	0	5	5	0	0	0	0	9	203	5	211	3	143	4	150	361	370	370
15:30	0	0	5	5	0	0	0	0	3	195	7	205	1	179	0	180	385	396	396
15:45	0	0	6	6	0	0	0	0	16	218	3	222	2	182	1	185	407	423	423
16:00	0	0	5	5	0	0	0	0	9	309	5	317	5	187	1	193	510	519	519
16:15	0	0	7	7	0	0	0	0	15	300	6	308	5	169	0	174	482	497	497
16:30	0	0	6	6	0	0	0	0	12	321	6	328	9	154	0	163	491	503	503
16:45	0	0	6	6	0	0	0	0	2	329	4	333	5	179	1	185	518	530	530
17:00	0	0	7	7	0	0	0	0	11	320	11	331	7	176	1	184	515	526	526
17:15	0	0	5	5	0	0	0	0	7	350	7	360	7	151	1	159	519	526	526
17:30	0	0	5	5	0	0	0	0	7	311	7	319	7	163	0	170	489	496	496
17:45	0	0	9	9	0	0	0	0	11	286	13	300	3	191	0	194	484	505	505
Total:	79	6	151	236	10	0	8	18	254	43	5787	121	5951	117	6153	25	6295	1254	12,900

Note: U-Turns are included in Totals.



Transportation Services - Traffic Services
Turning Movement Count - Study Results
ELWOOD ST @ MONTREAL RD

Survey Date: Thursday, November 15, 2018
Start Time: 07:00

WO No: 38124
Device: Miovision

Full Study Cyclist Volume

Time Period	ELWOOD ST		MONTREAL RD		Grand Total
	Northbound	Southbound	Street Total	Westbound	
07:00 07:15	0	0	0	0	0
07:15 07:30	0	0	0	0	0
07:30 07:45	0	0	0	0	0
07:45 08:00	0	0	0	0	0
08:00 08:15	0	0	0	0	0
08:15 08:30	0	0	0	0	0
08:30 08:45	0	0	0	0	0
08:45 09:00	0	0	0	0	0
09:00 09:15	0	0	0	0	0
09:15 09:30	0	0	0	0	0
09:30 09:45	0	0	0	0	0
09:45 10:00	0	0	0	0	0
10:00 10:15	0	0	0	0	0
10:15 10:30	0	0	0	0	0
10:30 10:45	0	0	0	0	0
10:45 11:00	0	0	0	0	0
11:00 11:15	0	0	0	0	0
11:15 11:30	0	0	0	0	0
11:30 11:45	0	0	0	0	0
11:45 12:00	0	0	0	0	0
12:00 12:15	0	0	0	0	0
12:15 12:30	0	0	0	0	0
12:30 12:45	0	0	0	0	0
12:45 13:00	0	0	0	0	0
13:00 13:15	0	0	0	0	0
13:15 13:30	0	0	0	0	0
13:30 13:45	0	0	0	0	0
13:45 14:00	0	0	0	0	0
14:00 14:15	0	0	0	0	0
14:15 14:30	0	0	0	0	0
14:30 14:45	0	0	0	0	0
14:45 15:00	0	0	0	0	0
15:00 15:15	0	0	0	0	0
15:15 15:30	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	0	0	0
16:15 16:30	0	0	0	0	0
16:30 16:45	0	0	0	0	0
16:45 17:00	0	0	0	0	0
17:00 17:15	0	0	0	0	0
17:15 17:30	0	0	0	0	0
17:30 17:45	0	0	0	0	0
17:45 18:00	0	0	0	0	0
Total	0	0	0	0	0



Transportation Services - Traffic Services
Turning Movement Count - Study Results
ELWOOD ST @ MONTREAL RD

Survey Date: Thursday, November 15, 2018
Start Time: 07:00

WO No: 38124
Device: Miovision

Full Study Pedestrian Volume

Time Period	ELWOOD ST		MONTREAL RD		Grand Total
	NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	
07:00 07:15	0	2	0	1	3
07:15 07:30	1	4	2	1	8
07:30 07:45	0	1	1	0	2
07:45 08:00	1	2	3	2	6
08:00 08:15	1	0	1	1	3
08:15 08:30	0	0	0	0	0
08:30 08:45	1	1	3	1	6
08:45 09:00	0	1	1	3	5
09:00 09:15	0	2	2	0	4
09:15 09:30	2	1	3	2	8
09:30 09:45	1	1	2	1	5
09:45 10:00	1	2	3	1	7
10:00 10:15	0	2	2	1	5
10:15 10:30	1	1	2	1	5
10:30 10:45	1	1	2	2	6
10:45 11:00	0	0	0	0	0
11:00 11:15	0	0	0	0	0
11:15 11:30	1	3	4	1	9
11:30 11:45	0	3	4	3	10
11:45 12:00	0	3	3	0	6
12:00 12:15	0	0	0	0	0
12:15 12:30	1	2	4	1	8
12:30 12:45	0	3	3	0	6
12:45 13:00	0	0	0	0	0
13:00 13:15	1	3	4	5	13
13:15 13:30	2	2	4	3	11
13:30 13:45	1	0	1	3	5
13:45 14:00	1	1	2	2	6
14:00 14:15	1	1	2	2	6
14:15 14:30	0	0	1	0	1
14:30 14:45	0	1	1	2	4
14:45 15:00	0	0	0	0	0
15:00 15:15	4	2	6	6	18
15:15 15:30	2	1	3	7	12
15:30 15:45	5	2	7	3	17
15:45 16:00	0	5	5	0	10
16:00 16:15	1	0	1	0	2
16:15 16:30	1	0	1	6	8
16:30 16:45	1	1	2	5	9
16:45 17:00	0	0	0	0	0
17:00 17:15	0	0	0	0	0
17:15 17:30	1	1	2	6	10
17:30 17:45	0	0	0	0	0
17:45 18:00	2	1	3	1	6
Total	31	47	78	65	191

Appendix C

Synchro Intersection Worksheets – Existing Conditions

Lanes, Volumes, Timings
1: Blair & Montreal

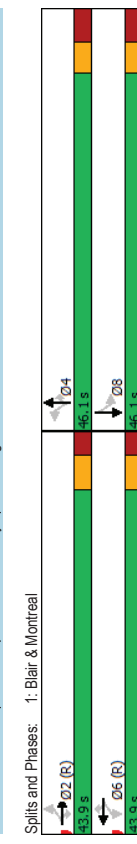
Existing AM Peak Hour
1649 Montreal Road

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	33	522	165	170	1164	16	142	77	55	11	121
Future Volume (vph)	33	522	165	170	1164	16	142	77	55	11	121
Lane Group Flow (vph)	37	580	183	189	1233	18	158	86	61	12	254
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases	2	2	2	6	6	6	4	4	4	4	8
Permitted Phases	2	2	2	6	6	6	4	4	4	4	8
Detector Phase											
Switch Phase											
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	33.4	33.4	33.4	33.4	33.4	33.4	46.1	46.1	46.1	46.1	46.1
Total Split (s)	43.9	43.9	43.9	43.9	43.9	43.9	46.1	46.1	46.1	46.1	46.1
Total Split (%)	48.8%	48.8%	48.8%	48.8%	48.8%	48.8%	51.2%	51.2%	51.2%	51.2%	51.2%
Maximum Green (s)	37.5	37.5	37.5	37.5	37.5	39.0	39.0	39.0	39.0	39.0	39.0
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.7	2.7	2.7	2.7	2.7	2.7	3.8	3.8	3.8	3.8	3.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4	7.1	7.1	7.1	7.1	7.1	7.1
Lead/Lag											
Lead-Lag Optimize?											
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	20.0	20.0	20.0	20.0	20.0	20.0	32.0	32.0	32.0	32.0	32.0
Pedestrian Calls (#/hr)	0	0	0	4	4	4	5	5	5	5	0
Act Effr Green (s)	54.3	54.3	54.3	54.3	54.3	54.3	22.2	22.2	22.2	22.2	22.2
Actuated G/C Ratio	0.60	0.60	0.60	0.60	0.60	0.60	0.25	0.25	0.25	0.25	0.25
v/c Ratio	0.23	0.30	0.19	0.42	0.66	0.02	0.77	0.21	0.15	0.05	0.62
Control Delay	17.9	11.1	2.8	14.8	14.3	3.0	53.3	24.8	6.0	20.4	33.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.9	11.1	2.8	14.8	14.3	3.0	53.3	24.8	6.0	20.4	33.4
LOS	B	B	A	B	B	A	D	C	A	C	C
Approach Delay	9.5			14.3				35.8			32.8
Approach LOS	A			B				D			C
Queue Length 50th (m)	2.5	21.6	0.0	8.7	31.3	0.0	26.3	12.2	0.0	1.6	38.1
Queue Length 95th (m)	13.4	50.3	11.6	28.2	#151.1	m0.5	35.9	17.3	6.7	4.3	44.9
Internal Link Dist (m)	757.9			347.8			602.6				757.9
Turn Bay Length (m)	60.0	30.0	65.0	15.0	25.0	15.0	25.0	30.0	30.0	25.0	25.0
Base Capacity (vph)	160	1944	967	448	1962	888	361	727	667	456	707
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.30	0.19	0.42	0.66	0.02	0.44	0.12	0.09	0.03	0.36
Intersection Summary											
Cycle Length: 90											
Actuated Cycle Length: 90											
Offset: 14 (16%), Referenced to phase 2EBTL and 6:WBTL, Start of Green											
Natural Cycle: 90											

Lanes, Volumes, Timings
1: Blair & Montreal

Existing AM Peak Hour
1649 Montreal Road

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.77	
Intersection Signal Delay: 16.9	Intersection LOS: B
Intersection Capacity Utilization 66.8%	ICU Level of Service E
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Lanes, Volumes, Timings
2: Elwood & Montreal

Lanes, Volumes, Timings
2: Elwood & Montreal

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	2	552	15	1350	16	0	0
Future Volume (vph)	2	552	15	1350	16	0	0
Lane Group Flow (vph)	2	623	17	1502	0	40	1
Turn Type	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	2	2	6	6	4	4	8
Permitted Phases	2	2	6	6	4	4	8
Detector Phase	2	2	6	6	4	4	8
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.6	22.6	39.6	40.7	40.7	40.7	40.7
Total Split (s)	49.3	49.3	49.3	40.7	40.7	40.7	40.7
Total Split (%)	54.8%	54.8%	54.8%	45.2%	45.2%	45.2%	45.2%
Maximum Green (s)	43.7	43.7	43.7	34.0	34.0	34.0	34.0
Yellow Time (s)	3.7	3.7	3.7	3.0	3.0	3.0	3.0
All-Red Time (s)	1.9	1.9	1.9	1.9	3.7	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.6	5.6	5.6	5.6	6.7	6.7	6.7
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	10.0	10.0	10.0
Flash Dont Walk (s)	10.0	10.0	10.0	10.0	24.0	24.0	24.0
Pedestrian Calls (#/hr)	3	3	5	5	6	6	3
Act Effr Green (s)	71.8	71.8	71.8	71.8	14.8	14.8	14.8
Actuated g/C Ratio	0.80	0.80	0.80	0.80	0.16	0.16	0.16
v/c Ratio	0.01	0.25	0.03	0.58	0.16	0.00	0.00
Control Delay	10.0	5.3	7.8	9.9	12.8	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.0	5.3	7.8	9.9	12.8	0.0	0.0
LOS	A	A	A	A	B	B	A
Approach Delay	5.3	9.9	9.9	12.8			
Approach LOS	A	A	A	B			
Queue Length 50th (m)	0.1	13.7	0.6	50.6	1.3	0.0	0.0
Queue Length 95th (m)	m0.5	29.6	5.0	#177.0	7.0	0.0	0.0
Internal Link Dist (m)	347.8		504.7		77.8	0.1	
Turn Bay Length (m)	35.0	15.0					
Base Capacity (vph)	196	2534	577	2595	528	582	582
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	0.25	0.03	0.58	0.08	0.00	0.00

Intersection Summary
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 7 (6%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 85

Control Type:	Actuated-Coordinated
Maximum v/c Ratio:	0.58
Intersection Signal Delay:	8.6
Intersection LOS:	A
ICU Level of Service:	B
Intersection Capacity Utilization:	62.4%
Analysis Period (min):	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Lanes, Volumes, Timings
1: Blair & Montreal

Existing PM Peak Hour
1649 Montreal Road

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	95	1048	146	65	602	8	226	83	187	36	82
Future Volume (vph)	95	1048	146	65	602	8	226	83	187	36	82
Lane Group Flow (vph)	106	1164	162	72	669	9	251	92	208	40	154
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases	2	2	2	6	6	6	4	4	4	4	8
Permitted Phases	2	2	2	6	6	6	4	4	4	4	8
Detector Phase											
Switch Phase											
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	33.4	33.4	33.4	33.4	33.4	33.4	46.1	46.1	46.1	46.1	46.1
Total Split (s)	43.0	43.0	43.0	43.0	43.0	43.0	47.0	47.0	47.0	47.0	47.0
Total Split (%)	47.8%	47.8%	47.8%	47.8%	47.8%	47.8%	52.2%	52.2%	52.2%	52.2%	52.2%
Maximum Green (s)	36.6	36.6	36.6	36.6	36.6	36.6	39.9	39.9	39.9	39.9	39.9
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.7	2.7	2.7	2.7	2.7	2.7	3.8	3.8	3.8	3.8	3.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4	6.4	7.1	7.1	7.1	7.1	7.1
Lead/Lag											
Lead-Lag Optimize?											
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	20.0	20.0	20.0	20.0	20.0	20.0	32.0	32.0	32.0	32.0	32.0
Pedestrian Calls (#/hr)	1	1	1	5	5	5	3	3	3	3	6
Act Effr Green (s)	49.7	49.7	49.7	49.7	49.7	49.7	26.8	26.8	26.8	26.8	26.8
Actuated G/C Ratio	0.55	0.55	0.55	0.55	0.55	0.55	0.30	0.30	0.30	0.30	0.30
v/c Ratio	0.30	0.65	0.19	0.43	0.37	0.01	0.76	0.18	0.45	0.13	0.30
Control Delay	17.1	18.6	7.2	33.0	16.8	3.2	42.1	21.5	21.6	20.3	15.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.1	18.6	7.2	33.0	16.8	3.2	42.1	21.5	21.6	20.3	15.4
LOS	B	B	A	C	B	A	D	C	C	C	B
Approach Delay	17.2			18.2			30.9				16.4
Approach LOS	B			B			C				B
Queue Length 50th (m)	9.1	68.4	5.6	5.5	26.8	0.0	39.5	11.9	23.1	5.1	13.5
Queue Length 95th (m)	27.0	#126.7	19.9	#27.4	61.2	m0.8	53.6	18.3	33.6	9.9	22.4
Internal Link Dist (m)	757.9			347.8			602.6				757.9
Turn Bay Length (m)	60.0		30.0	65.0		15.0	25.0		30.0		25.0
Base Capacity (vph)	352	1778	840	166	1795	818	493	744	465	670	465
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.65	0.19	0.43	0.37	0.01	0.51	0.12	0.31	0.09	0.21

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 90
Offset: 1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90

Lanes, Volumes, Timings
1: Blair & Montreal

Existing PM Peak Hour
1649 Montreal Road

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 20.0
Intersection LOS: B
Intersection Capacity Utilization: 87.5%
ICU Level of Service: E
Analysis Period (min): 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Splits and Phases: 1: Blair & Montreal

Lanes, Volumes, Timings
2: Elwood & Montreal

Existing PM Peak Hour
1649 Montreal Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	4	4	4	4	4	4	4	4
Traffic Volume (vph)	1260	28	660	13	1	1	1	0
Future Volume (vph)	1260	28	660	13	1	1	1	0
Lane Group Flow (vph)	1431	31	736	0	42	0	4	4
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	2	2	6	6	4	4	8	8
Permitted Phase	2	2	6	6	4	4	8	8
Detector Phase	2	2	6	6	4	4	8	8
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.6	22.6	39.6	40.7	40.7	40.7	40.7	40.7
Total Split (s)	49.3	49.3	49.3	49.3	40.7	40.7	40.7	40.7
Total Split (%)	54.8%	54.8%	54.8%	54.8%	45.2%	45.2%	45.2%	45.2%
Maximum Green (s)	43.7	43.7	43.7	34.0	34.0	34.0	34.0	34.0
Yellow Time (s)	3.7	3.7	3.7	3.0	3.0	3.0	3.0	3.0
All-Red Time (s)	1.9	1.9	1.9	1.9	3.7	3.7	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.6	5.6	5.6	5.6	6.7	6.7	6.7	6.7
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-Max	C-Max	C-Max	C-Max	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	10.0	10.0	10.0	10.0
Flash Dont Walk (s)	10.0	10.0	10.0	10.0	24.0	24.0	24.0	24.0
Pedestrian Calls (#/hr)	3	3	5	5	6	6	3	3
Act Effr Green (s)	71.8	71.8	71.8	71.8	14.8	14.8	14.8	14.8
Actuated g/C Ratio	0.80	0.80	0.80	0.80	0.16	0.16	0.16	0.16
v/c Ratio	0.01	0.57	0.14	0.28	0.17	0.02	0.02	0.02
Control Delay	7.8	6.8	10.4	6.2	18.3	0.0	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.8	6.8	10.4	6.2	18.3	0.0	0.0	0.0
LOS	A	A	B	A	B	A	A	A
Approach Delay	6.8	6.8	6.4	6.4	18.3			
Approach LOS	A	A	A	A	B			
Queue Length 50th (m)	0.1	29.2	1.2	17.2	3.3	3.3	0.0	0.0
Queue Length 95th (m)	m0.5	#160.4	9.7	57.1	8.6	8.6	0.0	0.0
Internal Link Dist (m)	347.8		504.7		77.8		0.1	
Turn Bay Length (m)	35.0	15.0						
Base Capacity (vph)	509	2528	215	2592	530	530	564	564
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.57	0.14	0.28	0.08	0.08	0.01	0.01

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 8 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	
Natural Cycle: 85	

Lanes, Volumes, Timings
2: Elwood & Montreal

Existing PM Peak Hour
1649 Montreal Road

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.57	
Intersection Signal Delay: 6.8	Intersection LOS: A
Intersection Capacity Utilization 63.8%	ICU Level of Service B
Analysis Period (min): 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Appendix D

Collision Data

Accident Date	Accident Year	Accident Time	Location	Environment Condition	Light	Traffic Control	Traffic Control Condition	Classification Of Accident	Initial Impact Type	Road Surface Condition	# Vehicles	# Motorcycles	# Bicycles	# Pedestrians
2016-11-11	2016	20:44	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	07 - Dark	01 - Traffic signal	01 - Functioning	02 - Non-fatal injury	02 - Angle	01 - Dry	2	0	0	0
2016-02-25	2016	18:13	BLAIR RD @ MONTREAL RD (0009277)	03 - Snow	05 - Dusk	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	06 - Ice	3	0	0	0
2016-02-25	2016	18:28	BLAIR RD @ MONTREAL RD (0009277)	06 - Strong wind	07 - Dark	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	06 - Ice	2	0	0	0
2016-02-26	2016	12:06	BLAIR RD @ MONTREAL RD (0009277)	02 - Rain	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	05 - Turning movement	06 - Ice	2	0	0	0
2016-03-02	2016	14:29	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	02 - Wet	2	0	0	0
2016-04-19	2016	8:27	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2016-08-26	2016	8:28	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	05 - Turning movement	01 - Dry	2	0	0	0
2017-10-14	2017	8:50	BLAIR RD @ MONTREAL RD (0009277)	02 - Rain	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	07 - SMV other	02 - Wet	1	0	0	0
2017-10-23	2017	15:30	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	99 - Other	01 - Dry	2	0	0	0
2017-11-21	2017	16:57	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	07 - Dusk	01 - Traffic signal	01 - Functioning	02 - Non-fatal injury	05 - Turning movement	01 - Dry	2	0	0	0
2017-12-05	2017	16:40	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	05 - Dusk	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	02 - Wet	2	0	0	0
2017-12-05	2017	16:54	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	05 - Dusk	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	02 - Wet	2	0	0	0
2017-02-01	2017	11:30	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	04 - Sideswipe	01 - Dry	2	0	0	0
2017-03-08	2017	13:30	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	02 - Angle	01 - Dry	2	0	0	0
2017-03-31	2017	14:56	BLAIR RD @ MONTREAL RD (0009277)	03 - Snow	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	05 - Turning movement	03 - Loose snow	2	0	0	0
2017-07-30	2017	16:28	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	02 - Angle	01 - Dry	2	0	0	0
2017-08-27	2017	16:00	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2017-09-28	2017	16:21	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2018-09-30	2018	19:38	BLAIR RD @ MONTREAL RD (0009277)	02 - Rain	07 - Dark	01 - Traffic signal	01 - Functioning	02 - Non-fatal injury	02 - Angle	02 - Wet	2	0	0	0
2018-11-02	2018	11:52	BLAIR RD @ MONTREAL RD (0009277)	02 - Rain	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	05 - Turning movement	02 - Wet	2	0	0	0
2018-11-05	2018	17:30	BLAIR RD @ MONTREAL RD (0009277)	02 - Rain	07 - Dark	01 - Traffic signal	01 - Functioning	03 - P.D. only	05 - Turning movement	02 - Wet	2	0	0	0
2018-03-26	2018	15:38	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	01 - Daylight	01 - Traffic signal	00 - Unknown	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2018-04-08	2018	13:52	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2018-09-20	2018	15:35	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	02 - Non-fatal injury	05 - Turning movement	01 - Dry	2	0	0	0
2018-09-19	2019	16:25	BLAIR RD @ MONTREAL RD (0009277)	02 - Rain	01 - Daylight	01 - Traffic signal	01 - Functioning	02 - Non-fatal injury	03 - Rear end	02 - Wet	2	0	0	0
2019-08-21	2019	9:30	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2019-10-17	2019	9:40	BLAIR RD @ MONTREAL RD (0009277)	02 - Rain	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	02 - Wet	2	0	0	0
2019-10-10	2019	12:52	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	02 - Non-fatal injury	03 - Rear end	01 - Dry	2	0	0	0
2019-01-22	2019	8:20	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	02 - Non-fatal injury	03 - Rear end	06 - Ice	2	0	0	0
2019-02-24	2019	7:16	BLAIR RD @ MONTREAL RD (0009277)	02 - Rain	03 - Dawn	01 - Traffic signal	01 - Functioning	02 - Non-fatal injury	03 - Rear end	02 - Wet	2	0	0	0
2019-05-24	2019	8:30	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	02 - Non-fatal injury	03 - Rear end	01 - Dry	2	0	0	0
2019-08-16	2019	20:29	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	07 - Dark	01 - Traffic signal	01 - Functioning	02 - Non-fatal injury	05 - Turning movement	01 - Dry	2	0	0	0
2020-07-24	2020	11:30	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2020-10-08	2020	11:09	BLAIR RD @ MONTREAL RD (0009277)	01 - Clear	01 - Daylight	01 - Traffic signal	01 - Functioning	03 - P.D. only	05 - Turning movement	01 - Dry	2	0	0	0
2016-09-16	2016	16:22	BLAIR RD btwn NICOL ST & MONTREAL RD (_32A7Y8)	01 - Clear	01 - Daylight	10 - No control	0	02 - Non-fatal injury	07 - SMV other	01 - Dry	1	1	0	0
2020-10-14	2020	13:56	BLAIR RD btwn NICOL ST & MONTREAL RD (_32A7Y8)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	01 - Approaching	01 - Dry	2	0	0	0
2016-10-06	2016	14:52	MONTREAL RD btwn BLAIR RD & CLOVELLY RD (_32AZD1)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2017-08-31	2017	18:35	MONTREAL RD btwn BLAIR RD & CLOVELLY RD (_32AZD1)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2018-04-03	2018	17:20	MONTREAL RD btwn BLAIR RD & CLOVELLY RD (_32AZD1)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	02 - Angle	01 - Dry	2	0	0	0
2018-06-28	2018	16:05	MONTREAL RD btwn BLAIR RD & CLOVELLY RD (_32AZD1)	01 - Clear	01 - Daylight	10 - No control	0	02 - Non-fatal injury	07 - SMV other	01 - Dry	1	0	0	0
2016-03-09	2016	16:30	MONTREAL RD btwn MONTREAL RD & BLAIR RD (_32AZD3)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	03 - Rear end	01 - Dry	2	0	0	0
2016-12-17	2016	16:03	BLAIR RD btwn MONTREAL RD & SEGUIN ST (_32AZE2)	03 - Snow	05 - Dusk	10 - No control	0	03 - P.D. only	07 - SMV other	03 - Loose snow	1	0	0	0
2017-10-21	2017	13:50	BLAIR RD btwn MONTREAL RD & SEGUIN ST (_32AZE2)	01 - Clear	01 - Daylight	10 - No control	0	03 - P.D. only	02 - Angle	01 - Dry	2	0	0	0

Appendix E

Montreal-Blair Transit Priority EA – Study Area Signal Timing

TRANS Regional Model

Version 2.15 - Assigned June 16, 2020

**AM Peak Hour Total Traffic Volume
Montreal and Blair Area**

2011 Model - Basecase

N/A

User Initials: TIMW
Plot Prepared: Feb 2, 2020
EMME Scenario: 21711



Legend

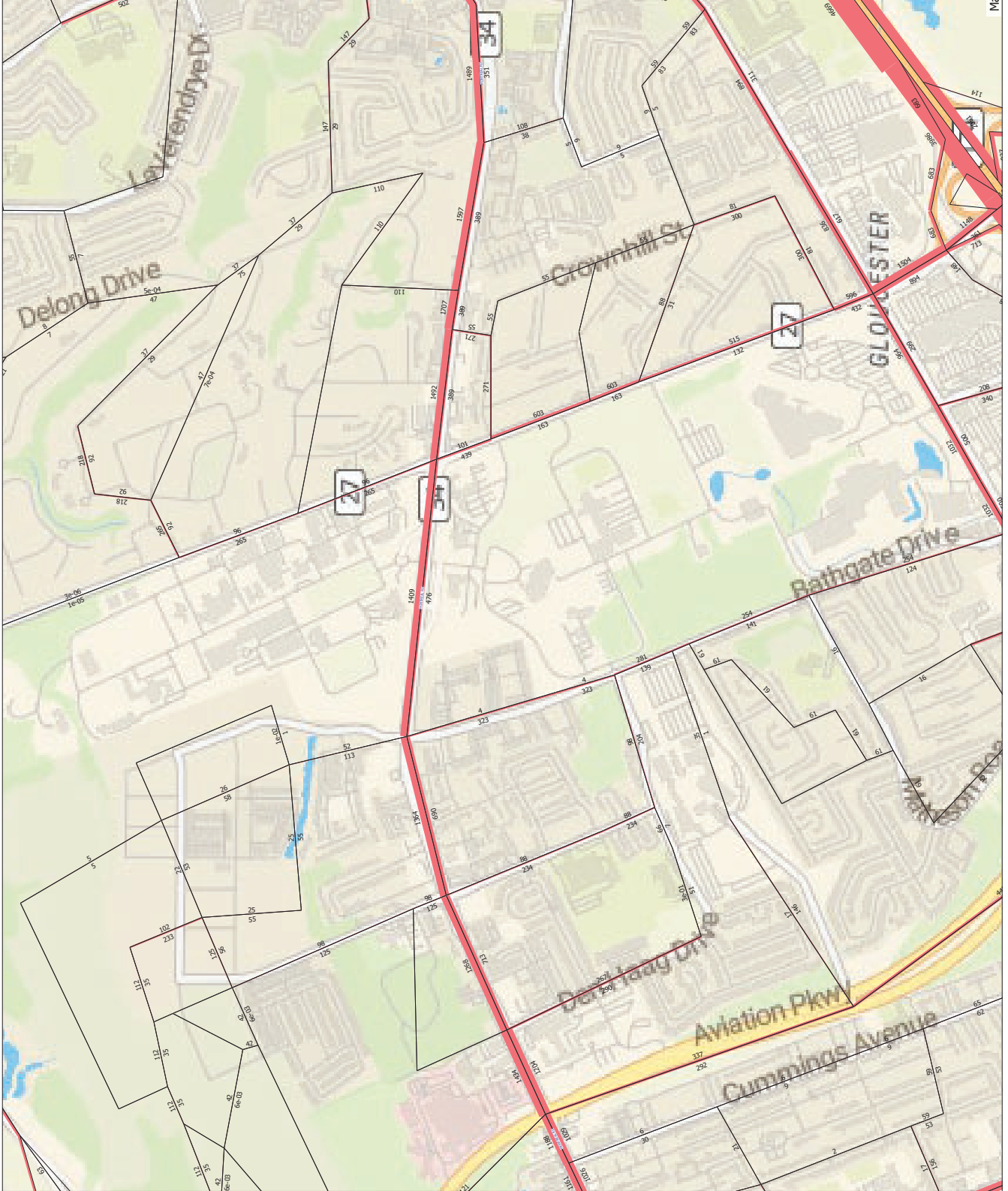
AM Peak Hour Total Traffic Volume



The TRANS model is continuously refined & maintained, and all information is provided in good faith. However, model outputs are provided "as is", and no warranty or guarantee is provided as to the accuracy, reliability, or reasonableness of the results. In using this data, you agree to accept any and all risks arising from any incorrect, incomplete, or misleading information.

Recipients are required to use caution and professional judgement in using and interpreting model outputs. In particular, caution should be used when focusing on a geographically limited area (such as a single road or intersection), as the model is primarily designed to simulate regional-scale phenomena and has been calibrated at a regional level.

As general good practice, it is recommended that the user confirm the network coding within the area of interest, and compare base year forecasts against traffic count data to assess the extent to which the model may be over- or under-estimating the travel demand.



TRANS Regional Model

Version 2.15 - Assigned June 16, 2020

AM Peak Hour Total Traffic Volume
Montreal and Blair Area

2031 Model - Basecase

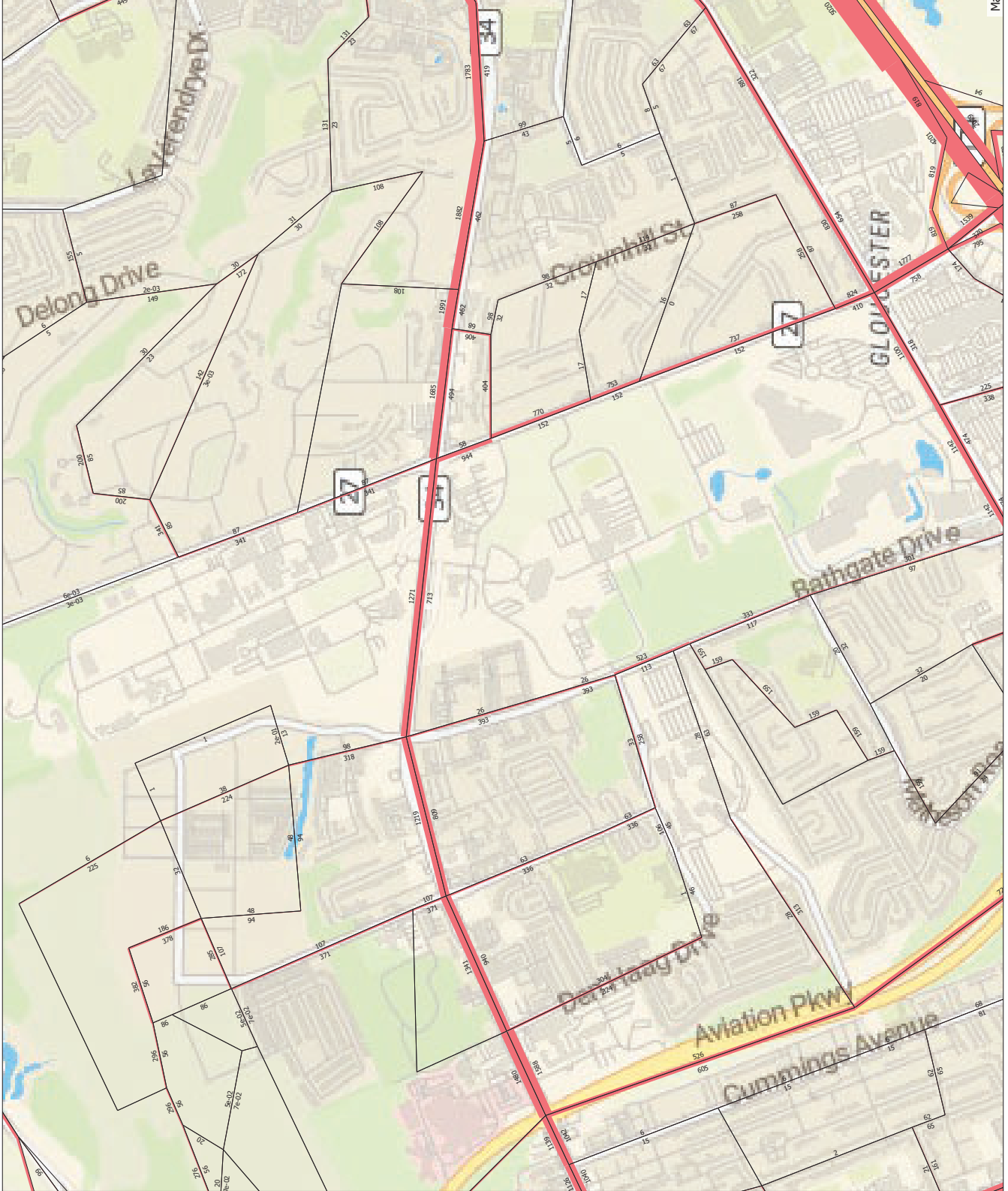
N/A

User Initials: TIMW
Plot Prepared: Feb 2, 2020
EMME Scenario: 21711



Legend

AM Peak Hour Total Traffic Volume



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As general good practice, it is recommended that the user confirm the network coding within the area of interest, and compare base year forecasts against traffic count data to assess the extent to which the model may be over- or under-estimating the travel demand.

Appendix F

TRANS Model Plots

Lanes, Volumes, Timings
13: Blair & Montreal Road

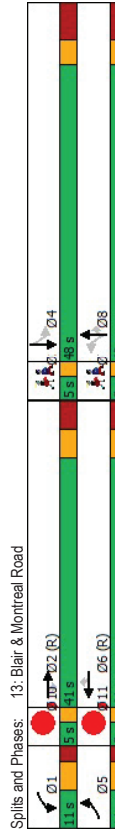
Lanes, Volumes, Timings
13: Blair & Montreal Road

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	Ø3
Lane Configurations	←	←	←	←	←	←	←	←	←	←	←	←
Traffic Volume (vph)	31	522	165	170	1467	16	142	77	55	11	121	
Future Volume (vph)	31	522	165	170	1467	16	142	77	55	11	121	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	Perm	Perm	Perm	NA	
Protected Phases	5	2	2	1	6							4
Permitted Phases	5	2	2	1	6	6	8	8	8	8	4	4
Detector Phase												
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	1.0
Minimum Split (s)	10.9	34.7	34.7	10.9	34.7	34.7	47.3	47.3	47.3	47.3	47.3	5.0
Total Split (s)	11.0	41.0	41.0	11.0	41.0	41.0	48.0	48.0	48.0	48.0	48.0	5.0
Total Split (%)	10.0%	37.3%	37.3%	10.0%	37.3%	37.3%	43.6%	43.6%	43.6%	43.6%	43.6%	5%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3	2.0
All-Red Time (s)	2.2	4.0	4.0	2.2	4.0	4.0	5.0	5.0	5.0	5.0	5.0	0.0
Lost Time Adjust (s)	1.8	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	7.7	7.7	7.7	7.7	7.7	7.7	8.3	8.3	8.3	8.3	8.3	8.3
Lead/Lag	Lead	Lead	Lead	Lead	Lead	Lead	Lag	Lag	Lag	Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None	None	None	None	None

Lane Group	Ø7	Ø10	Ø11
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Turn Type			
Protected Phases	7	10	11
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	1.0	1.0	1.0
Minimum Split (s)	5.0	5.0	5.0
Total Split (s)	5.0	5.0	5.0
Total Split (%)	5%	5%	5%
Yellow Time (s)	2.0	2.0	2.0
All-Red Time (s)	0.0	0.0	0.0
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes
Recall Mode	None	None	None

Intersection Summary
Cycle Length: 110
Actuated Cycle Length: 110
Offset: 14 (13%), Referenced to phase 2,EBT and 6,WBT, Start of Green
Natural Cycle: 115
Control Type: Actuated-Coordinated

Intersection Summary



Lanes, Volumes, Timings
13: Blair & Montreal Road

Lanes, Volumes, Timings
13: Blair & Montreal Road

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	Ø3
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	
Traffic Volume (vph)	95	1320	146	64	602	8	226	83	187	36	82	
Future Volume (vph)	95	1320	146	64	602	8	226	83	187	36	82	
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	Perm	Perm	Perm	NA	
Protected Phases	5	2	2	1	6						4	
Permitted Phases	5	2	2	1	6	6	8	8	8	8	4	
Detector Phase												
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	1.0
Minimum Split (s)	10.9	34.7	34.7	10.9	34.7	34.7	47.3	47.3	47.3	47.3	47.3	5.0
Total Split (s)	15.2	37.5	37.5	15.2	37.5	37.5	47.3	47.3	47.3	47.3	47.3	5.0
Total Split (%)	13.8%	34.1%	34.1%	13.8%	34.1%	34.1%	43.0%	43.0%	43.0%	43.0%	43.0%	5%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3	2.0
All-Red Time (s)	2.2	4.0	4.0	2.2	4.0	4.0	5.0	5.0	5.0	5.0	5.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	7.7	7.7	5.9	7.7	7.7	8.3	8.3	8.3	8.3	8.3	8.3
Lead/Lag	Lead	Lead	Lead	Lead	Lead	Lead	Lag	Lag	Lag	Lag	Lag	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None	None	None	None	None

Intersection Summary

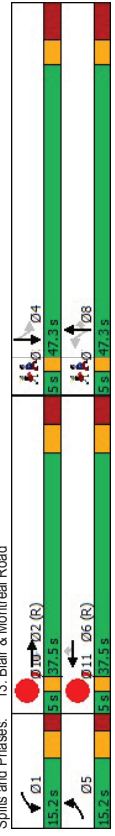
Cycle Length: 110

Actuated Cycle Length: 110

Offset: 1 (1%), Referenced to phase 2EBT and 6:WBT, Start of Green

Natural Cycle: 115

Control Type: Actuated-Coordinated

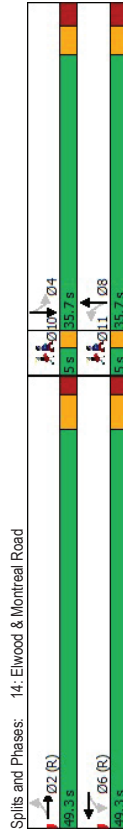


Lanes, Volumes, Timings
14: Elwood & Montreal Road

Lanes, Volumes, Timings
14: Elwood & Montreal Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	Ø10	Ø11
Lane Configurations	←	←	←	←	←	←	←		
Traffic Volume (vph)	2	552	15	1701	16	0	0		
Future Volume (vph)	2	552	15	1701	16	0	0		
Turn Type	Perm	NA	Perm	NA	Perm	NA	NA		
Protected Phases	2	2	6	6	8	8	4	10	11
Detector Phase	2	2	6	6	8	8	4		
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	1.0	1.0
Minimum Split (s)	22.9	22.9	22.9	22.9	35.7	35.7	35.7	5.0	5.0
Total Split (s)	49.3	49.3	49.3	49.3	35.7	35.7	35.7	5.0	5.0
Total Split (%)	54.8%	54.8%	54.8%	54.8%	39.7%	39.7%	39.7%	6%	6%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0	2.0	2.0
All-Red Time (s)	2.2	2.2	2.2	2.2	2.7	2.7	2.7	0.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.7	5.7	5.7		
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	C-Min	C-Min	C-Min	C-Min	None	None	None	None	None

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 7 (8%), Referenced to phase 2EBTL and 6WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated

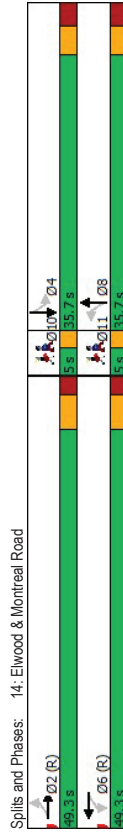


Lanes, Volumes, Timings
14: Elwood & Montreal Road

Lanes, Volumes, Timings
14: Elwood & Montreal Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	Ø10	Ø11
Lane Configurations	←	←	←	←	←	←	←		
Traffic Volume (vph)	3	1663	28	660	13	1	1		
Future Volume (vph)	3	1663	28	660	13	1	1		
Turn Type	Perm	NA	Perm	NA	Perm	NA	NA		
Protected Phases	2	2	6	6	8	8	4	10	11
Detector Phase	2	2	6	6	8	8	4		
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	1.0	1.0
Minimum Split (s)	22.9	22.9	22.9	22.9	35.7	35.7	35.7	5.0	5.0
Total Split (s)	49.2	49.2	49.2	49.2	35.8	35.8	35.8	5.0	5.0
Total Split (%)	54.7%	54.7%	54.7%	54.7%	39.8%	39.8%	39.8%	6%	6%
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0	2.0	2.0
All-Red Time (s)	2.2	2.2	2.2	2.2	2.7	2.7	2.7	0.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.7	5.7	5.7		
Lead/Lag									
Lead-Lag Optimize?									
Recall Mode	C-Min	C-Min	C-Min	C-Min	None	None	None	None	None

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 8 (9%), Referenced to phase 2EBTL and 6WBTL, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated



Appendix G

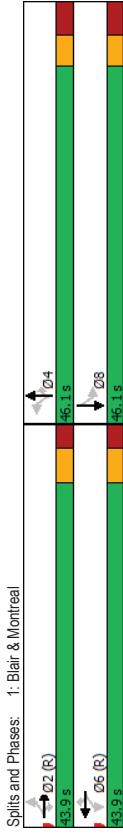
Synchro Intersection Worksheets – 2024 Future Background Conditions

Lanes, Volumes, Timings
1: Blair & Montreal

Lanes, Volumes, Timings
1: Blair & Montreal

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	33	522	165	183	1254	16	142	77	55	11	160
Future Volume (vph)	33	522	165	183	1254	16	142	77	55	11	160
Lane Group Flow (vph)	33	522	165	183	1254	16	142	77	55	11	268
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm
Protected Phases	2	2	2	6	6	6	4	4	4	4	8
Permitted Phases	2	2	2	6	6	6	4	4	4	4	8
Detector Phase											
Switch Phase											
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	33.4	33.4	33.4	33.4	33.4	33.4	46.1	46.1	46.1	46.1	46.1
Total Split (s)	43.9	43.9	43.9	43.9	43.9	43.9	46.1	46.1	46.1	46.1	46.1
Total Split (%)	48.8%	48.8%	48.8%	48.8%	48.8%	48.8%	51.2%	51.2%	51.2%	51.2%	51.2%
Maximum Green (s)	37.5	37.5	37.5	37.5	37.5	39.0	39.0	39.0	39.0	39.0	39.0
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.7	2.7	2.7	2.7	2.7	3.8	3.8	3.8	3.8	3.8	3.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4	7.1	7.1	7.1	7.1	7.1	7.1
Lead/Lag											
Lead-Lag Optimize?											
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	20.0	20.0	20.0	20.0	20.0	32.0	32.0	32.0	32.0	32.0	32.0
Pedestrian Calls (#/hr)	0	0	0	4	4	4	5	5	5	5	0
Act Effr Green (s)	54.5	54.5	54.5	54.5	54.5	22.0	22.0	22.0	22.0	22.0	22.0
Actuated G/C Ratio	0.61	0.61	0.61	0.61	0.61	0.24	0.24	0.24	0.24	0.24	0.24
v/c Ratio	0.19	0.27	0.17	0.38	0.64	0.02	0.74	0.19	0.14	0.04	0.65
Control Delay	16.2	10.7	2.9	13.9	13.8	2.6	51.5	24.6	6.2	20.5	34.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.2	10.7	2.9	13.9	13.8	2.6	51.5	24.6	6.2	20.5	34.6
LOS	B	B	A	B	B	A	D	C	A	C	C
Approach Delay	9.1			13.7			34.9				34.0
Approach LOS	A			B			C				C
Queue Length 50th (m)	2.1	18.8	0.0	8.4	30.3	0.0	23.5	11.0	0.0	1.5	40.5
Queue Length 95th (m)	11.7	44.8	11.0	27.5	#43.4	m0.3	32.6	15.8	6.4	4.1	47.0
Internal Link Dist (m)	757.9			347.8			602.6				757.9
Turn Bay Length (m)	60.0	30.0	65.0	15.0	25.0		15.0	25.0	30.0	25.0	25.0
Base Capacity (vph)	172	1950	963	485	1969	891	341	727	664	460	716
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.27	0.17	0.38	0.64	0.02	0.42	0.11	0.08	0.02	0.37
Intersection Summary											
Cycle Length: 90											
Actuated Cycle Length: 90											
Offset: 14 (16%), Referenced to phase 2EBTL and 6:WBTL, Start of Green											
Natural Cycle: 90											

Control Type	Actuated-Coordinated
Maximum v/c Ratio	0.74
Intersection Signal Delay	16.7
Intersection LOS	B
ICU Level of Service F	
Intersection Capacity Utilization	91.6%
Analysis Period (min)	15
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	



Splits and Phases: 1: Blair & Montreal

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	2	552	16	1454	16	0	0
Future Volume (vph)	2	552	16	1454	16	0	0
Lane Group Flow (vph)	2	561	16	1456	0	36	1
Turn Type	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	2	2	6	6	4	4	8
Permitted Phase	2	2	6	6	4	4	8
Detector Phase	2	2	6	6	4	4	8
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.6	22.6	39.6	39.6	40.7	40.7	40.7
Total Split (s)	49.3	49.3	49.3	49.3	40.7	40.7	40.7
Total Split (%)	54.8%	54.8%	54.8%	54.8%	45.2%	45.2%	45.2%
Maximum Green (s)	43.7	43.7	43.7	43.7	34.0	34.0	34.0
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0
All-Red Time (s)	1.9	1.9	1.9	1.9	3.7	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.6	5.6	5.6	5.6	6.7	6.7	6.7
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	10.0	10.0	10.0
Flash Dont Walk (s)	10.0	10.0	10.0	10.0	24.0	24.0	24.0
Pedestrian Calls (#/hr)	3	3	5	5	6	6	3
Act Effr Green (s)	71.8	71.8	71.8	71.8	14.8	14.8	14.8
Actuated g/C Ratio	0.80	0.80	0.80	0.80	0.16	0.16	0.16
v/c Ratio	0.01	0.22	0.03	0.56	0.15	0.00	0.00
Control Delay	8.0	4.4	7.8	9.6	11.4	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	34.0	0.0	0.0
Total Delay	8.0	4.4	7.8	9.6	11.4	0.0	0.0
LOS	A	A	A	A	B	A	A
Approach Delay	4.4	4.4	9.6	9.6	11.4		
Approach LOS	A	A	A	A	B		
Queue Length 50th (m)	0.1	12.0	0.6	47.7	0.6	0.0	0.0
Queue Length 95th (m)	m0.4	22.6	4.7	#168.0	6.2	0.0	0.0
Internal Link Dist (m)		347.8		504.7	77.8	0.1	
Turn Bay Length (m)		35.0		15.0			
Base Capacity (vph)	209	2534	613	2595	528	582	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.01	0.22	0.03	0.56	0.07	0.00	

Intersection Summary
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 7 (6%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 85

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.56
Intersection Signal Delay: 8.2
Intersection LOS: A
Intersection Capacity Utilization: 65.5%
IOU Level of Service: C
Analysis Period (min): 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

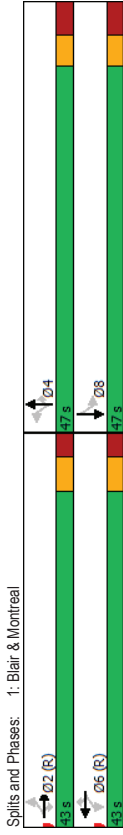


Lanes, Volumes, Timings
1: Blair & Montreal

Lanes, Volumes, Timings
1: Blair & Montreal

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	95	1129	157	65	602	8	299	110	247	36	82
Future Volume (vph)	95	1129	157	65	602	8	299	110	247	36	82
Lane Group Flow (vph)	95	1129	157	65	602	8	299	110	247	36	139
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	2	2	2	6	6	6	4	4	4	4	8
Permitted Phase	2	2	2	6	6	6	4	4	4	4	8
Detector Phase											
Switch Phase											
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	33.4	33.4	33.4	33.4	33.4	33.4	46.1	46.1	46.1	46.1	46.1
Total Split (s)	43.0	43.0	43.0	43.0	43.0	43.0	47.0	47.0	47.0	47.0	47.0
Total Split (%)	47.8%	47.8%	47.8%	47.8%	47.8%	47.8%	52.2%	52.2%	52.2%	52.2%	52.2%
Maximum Green (s)	36.6	36.6	36.6	36.6	36.6	36.6	39.9	39.9	39.9	39.9	39.9
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.7	2.7	2.7	2.7	2.7	2.7	3.8	3.8	3.8	3.8	3.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4	6.4	7.1	7.1	7.1	7.1	7.1
Lead/Lag											
Lead-Lag Optimize?											
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	20.0	20.0	20.0	20.0	20.0	20.0	32.0	32.0	32.0	32.0	32.0
Pedestrian Calls (#/hr)	1	1	1	5	5	5	3	3	3	3	6
Act Effr Green (s)	46.8	46.8	46.8	46.8	46.8	46.8	29.7	29.7	29.7	29.7	29.7
Actuated g/C Ratio	0.52	0.52	0.52	0.52	0.52	0.52	0.33	0.33	0.33	0.33	0.33
v/c Ratio	0.27	0.67	0.20	0.42	0.36	0.01	0.80	0.20	0.49	0.11	0.24
Control Delay	17.7	20.6	7.8	34.3	17.5	2.5	43.0	20.2	21.6	18.3	13.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.7	20.6	7.8	34.3	17.5	2.5	43.0	20.2	21.6	18.3	13.0
LOS	B	C	A	C	B	A	D	C	C	C	B
Approach Delay	18.9			18.9			31.1				14.1
Approach LOS	B			B			C				B
Queue Length 50th (m)	8.7	72.4	5.7	5.1	24.7	0.0	46.4	13.5	27.6	4.3	10.8
Queue Length 95th (m)	23.7	#122.8	19.4	#24.2	53.8	m0.6	64.9	20.8	40.3	9.0	19.6
Internal Link Dist (m)	757.9			347.8			602.6				757.9
Turn Bay Length (m)	60.0		30.0	65.0		15.0	25.0			30.0	25.0
Base Capacity (vph)	357	1675	796	156	1691	774	500	744	670	457	748
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.67	0.20	0.42	0.36	0.01	0.60	0.15	0.37	0.08	0.19
Intersection Summary											
Cycle Length: 90											
Actuated Cycle Length: 90											
Offset: 1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green											
Natural Cycle: 90											

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.80
Intersection Signal Delay: 21.4
Intersection LOS: C
Intersection Capacity Utilization 94.1%
IOU Level of Service F
Analysis Period (min): 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Splits and Phases: 1: Blair & Montreal

Lanes, Volumes, Timings
2: Elwood & Montreal

Future Background 2024PM Peak Hour
1649 Montreal Road

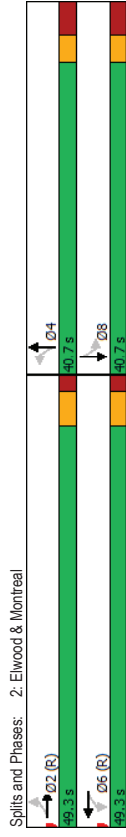
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔
Traffic Volume (vph)	4	1358	28	660	13	1	1	0
Future Volume (vph)	4	1358	28	660	13	1	1	0
Lane Group Flow (vph)	4	1386	28	663	0	40	0	4
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	2	2	6	6	4	4	8	8
Permitted Phases	2	2	6	6	4	4	8	8
Detector Phase								
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.6	22.6	39.6	39.6	40.7	40.7	40.7	40.7
Total Split (s)	49.3	49.3	49.3	49.3	40.7	40.7	40.7	40.7
Total Split (%)	54.8%	54.8%	54.8%	54.8%	45.2%	45.2%	45.2%	45.2%
Maximum Green (s)	43.7	43.7	43.7	43.7	34.0	34.0	34.0	34.0
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0
All-Red Time (s)	1.9	1.9	1.9	1.9	3.7	3.7	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.6	5.6	5.6	5.6	6.7	6.7	6.7	6.7
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-Max	C-Max	C-Max	C-Max	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	10.0	10.0	10.0	10.0
Flash Dont Walk (s)	10.0	10.0	10.0	10.0	24.0	24.0	24.0	24.0
Pedestrian Calls (#/hr)	3	3	5	5	6	6	3	3
Act Effr Green (s)	71.8	71.8	71.8	71.8	14.8	14.8	14.8	14.8
Actuated g/C Ratio	0.80	0.80	0.80	0.80	0.16	0.16	0.16	0.16
v/c Ratio	0.01	0.55	0.12	0.26	0.16	0.02	0.02	0.02
Control Delay	7.8	6.4	9.9	6.0	16.4	0.0	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	7.8	6.4	9.9	6.0	16.4	0.0	0.0	0.0
LOS	A	A	A	A	B	B	A	A
Approach Delay	6.4	6.4	6.2	6.2	16.4			
Approach LOS	A	A	A	A	B	B		
Queue Length 50th (m)	0.1	29.5	1.1	15.1	2.5	0.0	0.0	0.0
Queue Length 95th (m)	m0.5	#65.1	8.6	50.4	7.9	0.0	0.0	0.0
Internal Link Dist (m)	347.8		504.7		77.8			
Turn Bay Length (m)	35.0	15.0						
Base Capacity (vph)	553	2529	229	2592	534	564	564	564
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.55	0.12	0.26	0.07	0.01	0.01	0.01

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 8 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green	
Natural Cycle: 85	

Lanes, Volumes, Timings
2: Elwood & Montreal

Future Background 2024PM Peak Hour
1649 Montreal Road

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.55
Intersection Signal Delay: 6.5
Intersection LOS: A
Intersection Capacity Utilization: 66.6%
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.
m Volume for 95th percentile queue is metered by upstream signal.



Appendix H

Synchro Intersection Worksheets – 2029 Future Background Conditions

Lanes, Volumes, Timings
1: Blair & Montreal

Lanes, Volumes, Timings
1: Blair & Montreal

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	Ø1	Ø3
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔		
Traffic Volume (vph)	33	522	165	195	1334	16	142	77	11	202		
Future Volume (vph)	33	522	165	195	1334	16	142	77	11	202		
Lane Group Flow (vph)	33	522	165	195	1334	16	142	132	11	310		
Turn Type	Prot	NA	Perm	Prot	NA	Perm	NA	Perm	NA	NA		
Protected Phases	13	2	2	9	6	6	4	4	8	8	1	3
Permitted Phases	13	2	2	9	6	6	4	4	8	8		
Detector Phase												
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	1.0	1.0
Minimum Split (s)	10.9	34.7	34.7	10.9	34.7	34.7	42.3	42.3	42.3	42.3	5.0	5.0
Total Split (s)	11.0	41.0	41.0	11.0	41.0	41.0	48.0	48.0	48.0	48.0	5.0	5.0
Total Split (%)	10.0%	37.3%	37.3%	10.0%	37.3%	37.3%	43.6%	43.6%	43.6%	43.6%	5%	5%
Maximum Green (s)	5.1	33.3	33.3	5.1	33.3	33.3	39.7	39.7	39.7	39.7	3.0	3.0
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	2.0	2.0
All-Red Time (s)	2.2	4.0	4.0	2.2	4.0	4.0	5.0	5.0	5.0	5.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	7.7	7.7	5.9	7.7	7.7	8.3	8.3	8.3	8.3		
Lead/Lag	Lead	Lead	Lead	Lead	Lead	Lead	Lag	Lag	Lag	Lag		
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	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	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None	None	None	None	None
Walk Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0
Flash Dont Walk (s)	25.0	25.0	25.0	25.0	25.0	32.0	32.0	32.0	32.0	32.0	0.0	0.0
Pedestrian Calls (#/hr)	0	0	0	4	4	4	5	5	5	5	0	0
Act Effort Green (s)	7.4	38.3	38.3	22.2	56.9	56.9	26.6	26.6	27.6	27.6	0	0
Actuated G/C Ratio	0.07	0.35	0.35	0.20	0.52	0.52	0.24	0.24	0.25	0.25	0.25	0.25
v/c Ratio	0.30	0.47	0.32	0.58	0.79	0.02	0.78	0.35	0.05	0.75		
Control Delay	55.5	29.6	28.5	50.6	29.7	21.2	66.0	35.3	26.8	48.7		
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay	55.5	29.6	28.5	50.6	29.7	21.2	66.0	35.3	26.8	48.7		
LOS	E	C	C	D	C	C	E	D	C	D		
Approach Delay	30.5			32.2			51.2		48.0			
Approach LOS	C			C			D		D			
Queue Length 50th (m)	6.9	45.4	25.8	37.6	125.4	1.7	28.6	23.6	1.8	62.6		
Queue Length 95th (m)	16.5	60.9	43.2	#101.9	#239.8	7.6	47.2	35.9	5.3	76.8		
Internal Link Dist (m)	757.9			347.8			602.6		757.9			
Turn Bay Length (m)	60.0	100.0	100.0	65.0	15.0	90.0	30.0		30.0			
Base Capacity (vph)	110	1121	516	335	1682	742	272	572	334	588		
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	0.30	0.47	0.32	0.58	0.79	0.02	0.52	0.23	0.03	0.52		
Intersection Summary												
Cycle Length: 110												
Actuated Cycle Length: 110												
Offset: 0 (0%), Referenced to phase 2:EBT and 6:WBT, Start of Green												
Natural Cycle: 120												

Lane Group	Ø5	Ø7
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	5	7
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	1.0	1.0
Minimum Split (s)	5.0	5.0
Total Split (s)	5.0	5.0
Total Split (%)	5%	5%
Maximum Green (s)	3.0	3.0
Yellow Time (s)	2.0	2.0
All-Red Time (s)	0.0	0.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes
Vehicle Extension (s)	3.0	3.0
Recall Mode	None	None
Walk Time (s)	3.0	3.0
Flash Dont Walk (s)	0.0	0.0
Pedestrian Calls (#/hr)	4	0
Act Effort Green (s)		
Actuated G/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (m)		
Queue Length 95th (m)		
Internal Link Dist (m)		
Turn Bay Length (m)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		
Intersection Summary		

Lanes, Volumes, Timings
2: Elwood & Montreal

Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.59
 Intersection Signal Delay: 8.7
 Intersection LOS: A
 ICU Level of Service C
 Intersection Capacity Utilization 66.6%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.



Lanes, Volumes, Timings
1: Blair & Montreal

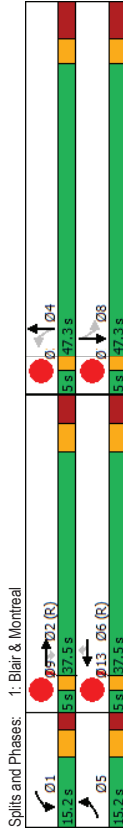
Future Background 2029PM Peak Hour
 1649 Montreal Road

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	Ø3	Ø7
Lane Configurations	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔		
Traffic Volume (vph)	95	1201	167	65	602	8	377	138	36	82		
Future Volume (vph)	95	1201	167	65	602	8	377	138	36	82		
Lane Group Flow (vph)	95	1201	167	65	602	8	377	450	36	139		
Turn Type	Prot	NA	Perm	Prot	NA	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	5	2	2	1	6	6	4	4	8	8	3	7
Permitted Phases	5	2	2	1	6	6	4	4	8	8		
Detector Phase												
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	1.0	1.0
Minimum Split (s)	10.9	34.7	34.7	10.9	34.7	34.7	42.3	42.3	42.3	42.3	5.0	5.0
Total Split (s)	15.2	37.5	37.5	15.2	37.5	37.5	47.3	47.3	47.3	47.3	5.0	5.0
Total Split (%)	13.8%	34.1%	34.1%	13.8%	34.1%	34.1%	43.0%	43.0%	43.0%	43.0%	5%	5%
Maximum Green (s)	9.3	29.8	29.8	9.3	29.8	29.8	39.0	39.0	39.0	39.0	3.0	3.0
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	2.0	2.0
All-Red Time (s)	2.2	4.0	4.0	2.2	4.0	4.0	5.0	5.0	5.0	5.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	7.7	7.7	5.9	7.7	7.7	8.3	8.3	8.3	8.3		
Lead/Lag	Lead	Lead	Lead	Lead	Lead	Lead	Lag	Lag	Lag	Lag	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	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	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None	None	None	None	None
Walk Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0
Flash Dont Walk (s)	25.0	25.0	25.0	25.0	25.0	25.0	32.0	32.0	32.0	32.0	0.0	0.0
Pedestrian Calls (#/hr)	1	1	1	5	5	5	3	3	3	3	6	6
Act Effct Green (s)	9.1	39.2	39.2	8.4	36.1	36.1	40.8	40.8	40.8	40.8	3.0	3.0
Actuated g/C Ratio	0.08	0.36	0.36	0.08	0.33	0.33	0.37	0.37	0.37	0.37	0.37	0.37
v/c Ratio	0.70	1.05	0.32	0.52	0.56	0.02	0.90	0.79	0.20	0.23		
Control Delay	76.0	75.9	31.1	63.3	34.1	28.1	58.9	42.5	26.7	24.7		
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay	76.0	75.9	31.1	63.3	34.1	28.1	58.9	42.5	26.7	24.7		
LOS	E	E	C	E	C	C	E	D	D	C		
Approach Delay	70.8			36.8			50.0			25.1		
Approach LOS	E			D			D			C		
Queue Length 50th (m)	20.2	~162.9	27.6	13.6	56.8	1.2	71.8	80.8	4.9	19.3		
Queue Length 95th (m)	#44.2	#221.0	49.7	27.5	80.3	5.1	#136.2	#140.7	13.8	35.8		
Internal Link Dist (m)	757.9			347.8			602.6			757.9		
Turn Bay Length (m)	60.0	100.0	100.0	65.0	15.0	90.0	15.0	90.0	30.0	30.0		
Base Capacity (vph)	141	1149	516	140	1067	472	427	579	183	616		
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	0.67	1.05	0.32	0.46	0.56	0.02	0.88	0.78	0.20	0.23		

Intersection Summary
 Cycle Length: 110
 Actuated Cycle Length: 110
 Offset: 100.5 (91%), Referenced to phase 2:EBT and 6:WBT, Start of Green
 Natural Cycle: 130

Lane Group	09	Ø13
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Lane Volume Flow (vph)		
Turn Type		
Protected Phases	9	13
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	1.0	1.0
Minimum Split (s)	5.0	5.0
Total Split (s)	5.0	5.0
Total Split (%)	5%	5%
Maximum Green (s)	3.0	3.0
Yellow Time (s)	2.0	2.0
All-Red Time (s)	0.0	0.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag	Lag	Lag
Lead-Lag Optimize?	Yes	Yes
Vehicle Extension (s)	3.0	3.0
Recall Mode	None	None
Walk Time (s)	3.0	3.0
Flash Dont Walk (s)	0.0	0.0
Pedestrian Calls (#/hr)	1	5
Act Effr Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (m)		
Queue Length 95th (m)		
Internal Link Dist (m)		
Turn Bay Length (m)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		
Intersection Summary		

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.05
Intersection Signal Delay: 55.5
Intersection LOS: E
Intersection Capacity Utilization: 100.9%
IOU Level of Service G
Analysis Period (min): 15
Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Lanes, Volumes, Timings
2: Elwood & Montreal

Lanes, Volumes, Timings
2: Elwood & Montreal

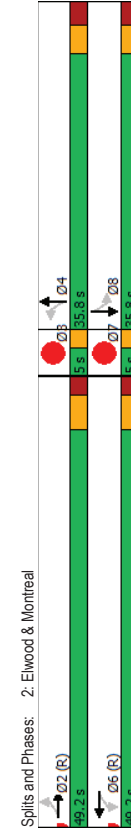
Future Background 2029PM Peak Hour
1649 Montreal Road

Future Background 2029PM Peak Hour
1649 Montreal Road

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	Ø3	Ø7
Lane Configurations	1	1	1	1	1	1	1	1	0	0
Traffic Volume (vph)	4	1444	28	660	13	1	1	1	0	0
Future Volume (vph)	4	1444	28	660	13	1	1	1	0	0
Lane Group Flow (vph)	4	1472	28	663	0	42	0	4	0	0
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	NA	NA
Protected Phases	2	2	6	6	4	4	8	8	3	7
Permitted Phase	2	2	6	6	4	4	8	8	0	0
Detector Phase	2	2	6	6	4	4	8	8	0	0
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	1.0	1.0
Minimum Split (s)	24.9	24.9	24.9	24.9	32.7	32.7	32.7	32.7	5.0	5.0
Total Split (s)	49.2	49.2	49.2	49.2	35.8	35.8	35.8	35.8	5.0	5.0
Total Split (%)	54.7%	54.7%	54.7%	54.7%	39.8%	39.8%	39.8%	39.8%	6%	6%
Maximum Green (s)	43.3	43.3	43.3	43.3	30.1	30.1	30.1	30.1	3.0	3.0
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0	2.0	2.0
All-Red Time (s)	2.2	2.2	2.2	2.2	2.7	2.7	2.7	2.7	0.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.7	5.7	5.7	5.7	0.0	0.0
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Min	C-Min	C-Min	C-Min	None	None	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	2.0	2.0	2.0	2.0	3.0	3.0
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	25.0	25.0	25.0	25.0	0.0	0.0
Pedestrian Calls (#/hr)	3	3	5	5	6	6	6	6	3	3
Act Effr Green (s)	72.6	72.6	72.6	72.6	13.4	13.4	13.4	13.4	0.15	0.15
Actuated G/C Ratio	0.01	0.01	0.01	0.01	0.21	0.21	0.21	0.21	0.02	0.02
v/c Ratio	7.2	9.1	9.5	5.4	33.5	28.2	28.2	28.2	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Length	7.2	9.1	9.5	5.4	33.5	28.2	28.2	28.2	0.0	0.0
LOS	A	A	A	A	C	C	C	C	A	A
Approach Delay	9.1	9.1	5.6	5.6	33.5	28.3	28.3	28.3	0.0	0.0
Approach LOS	A	A	A	A	C	C	C	C	A	A
Queue Length 50th (m)	0.1	47.6	1.0	14.4	6.8	6.8	6.8	6.8	0.6	0.6
Queue Length 95th (m)	1.9	#165.7	8.4	47.1	12.7	12.7	12.7	12.7	2.8	2.8
Internal Link Dist (m)	347.8	347.8	504.7	504.7	77.8	77.8	77.8	77.8	0.1	0.1
Turn Bay Length (m)	35.0	35.0	15.0	15.0	460	460	460	460	0.0	0.0
Base Capacity (vph)	560	2558	205	2621	460	460	460	460	0.0	0.0
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	0.01	0.58	0.14	0.25	0.09	0.09	0.09	0.09	0.01	0.01

Intersection Summary
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 8 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 90

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.58
Intersection Signal Delay: 8.5
Intersection LOS: A
IOU Level of Service C
Intersection Capacity Utilization 66.4%
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.



Appendix I

MMLOS Analysis

Multi-Modal Level of Service - Segments Form

Consultant	CGH Transportation Inc
Scenario	Existing/Future
Comments	

Project	2021-003
Date	2022-07-27

SEGMENTS			Montreal Existing	Blair Existing	Montreal Future	Blair Future
Pedestrian	Sidewalk Width	-	1.8 m	1.5 m	≥ 2 m	≥ 2 m
	Boulevard Width		< 0.5 m	0.5 - 2 m	> 2 m	0.5 - 2 m
	Avg Daily Curb Lane Traffic Volume		> 3000	≤ 3000	≤ 3000	≤ 3000
	Operating Speed		> 60 km/h	> 50 to 60 km/h	> 60 km/h	> 50 to 60 km/h
	On-Street Parking		no	no	no	no
	Exposure to Traffic PLoS		F	C	B	A
	Effective Sidewalk Width					
Pedestrian Volume						
Crowding PLoS	-	-	-	-		
Level of Service	-	-	-	-		
Bicycle	Type of Cycling Facility	F	Mixed Traffic	Curbside Bike Lane	Physically Separated	Curbside Bike Lane
	Number of Travel Lanes		4-5 lanes total	≤ 1 each direction	≤ 2 (no centreline)	≤ 1 each direction
	Operating Speed		≥ 60 km/h	>50 to 70 km/h	≥ 60 km/h	>50 to 70 km/h
	# of Lanes & Operating Speed LoS		F	C	A	C
	Bike Lane (+ Parking Lane) Width			≥1.5 to <1.8 m		≥1.5 to <1.8 m
	Bike Lane Width LoS		-	B	-	B
	Bike Lane Blockages			Rare		Rare
	Blockage LoS		-	A	-	A
	Median Refuge Width (no median = < 1.8 m)		< 1.8 m refuge	< 1.8 m refuge		< 1.8 m refuge
	No. of Lanes at Unsignalized Crossing		≤ 3 lanes	≤ 3 lanes		≤ 3 lanes
Sidestreet Operating Speed	≤ 40 km/h	≤ 40 km/h		≤ 40 km/h		
Unsignalized Crossing - Lowest LoS	A	A	A	A		
Level of Service	F	C	A	C		
Transit	Facility Type	D	Mixed Traffic	Mixed Traffic	Bus lane	Mixed Traffic
	Friction or Ratio Transit:Posted Speed		Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8	Cf ≤ 60	Vt/Vp ≥ 0.8
	Level of Service		D	D	B	D
Truck	Truck Lane Width	B	> 3.7 m	> 3.7 m	≤ 3.5 m	> 3.7 m
	Travel Lanes per Direction		> 1	1	> 1	1
	Level of Service		A	B	A	B

Multi-Modal Level of Service - Intersections Form

Consultant
Scenario
Comments

CGH Transportation Inc.
Existing/Future

Project
Date

2021-003	1649 Montreal
2021-08-30	

Unlocked Rows for Replicating

INTERSECTIONS		Montreal Rd & Blair Rd (Existing)				Montreal Rd & Elwood St (Existing)				Montreal Rd & Blair Rd (Future)				Montreal Rd & Elwood St (Future)				
Crossing Side		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	
Pedestrian	Lanes	6	8	10+	8	0 - 2	3	8	7	6	8	9	8	0 - 2	3	5	5	
	Median	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	
	Conflicting Left Turns	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	
	Conflicting Right Turns	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	
	Right Turns on Red (RTOR) ?	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	
	Ped Signal Leading Interval?	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	No	
	Right Turn Channel	No Channel	Conv'tl without Receiving Lane	No Channel	Conv'tl without Receiving Lane	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	
	Corner Radius	10-15m	15-25m	10-15m	15-25m	0-3m	5-10m	5-10m	0-3m	10-15m	15-25m	10-15m	10-15m	0-3m	10-15m	10-15m	0-3m	
	Crosswalk Type	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Std transverse markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	
	PETSI Score	20	-10	-45	-10	88	71	-11	7	23	-11	-26	-9	91	73	40	43	
	Ped. Exposure to Traffic LoS	F	F	#N/A	F	B	C	F	F	F	F	F	#N/A	F	A	C	E	E
	Cycle Length																	
Effective Walk Time																		
Average Pedestrian Delay																		
Pedestrian Delay LoS	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Level of Service	F	F	#N/A	F	B	C	F	F	F	F	F	#N/A	F	A	C	E	E	
	#N/A				F				#N/A				E					
Approach From		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	
Bicycle	Bicycle Lane Arrangement on Approach	Pocket Bike Lane	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	Mixed Traffic	Mixed Traffic	Curb Bike Lane, Cycletrack or MUP	Curb Bike Lane, Cycletrack or MUP	
	Right Turn Lane Configuration	≤ 50 m Introduced right turn lane	≤ 50 m	≤ 50 m	≤ 50 m					Not Applicable	Not Applicable	Not Applicable	Not Applicable			Not Applicable	Not Applicable	
	Right Turning Speed	>25 to 30 km/h	≤ 25 km/h	≤ 25 km/h	≤ 25 km/h					Not Applicable	Not Applicable	Not Applicable	Not Applicable			Not Applicable	Not Applicable	
	Cyclist relative to RT motorists	C	D	D	D	-	-	-	-	Not Applicable	Not Applicable	Not Applicable	Not Applicable	-	-	Not Applicable	Not Applicable	
	Separated or Mixed Traffic	Separated	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic	Separated	Separated	Separated	Separated	Mixed Traffic	Mixed Traffic	Separated	Separated	
	Left Turn Approach	1 lane crossed	One lane crossed	One lane crossed	One lane crossed	No lane crossed	No lane crossed	One lane crossed	One lane crossed	2-stage, LT box	2-stage, LT box	2-stage, LT box	2-stage, LT box	No lane crossed	No lane crossed	2-stage, LT box	2-stage, LT box	
	Operating Speed	> 50 to < 60 km/h	> 50 to < 60 km/h	≥ 60 km/h	≥ 60 km/h	≤ 40 km/h	> 40 to ≤ 50 km/h	≥ 60 km/h	≥ 60 km/h	> 50 to < 60 km/h	> 50 to < 60 km/h	≥ 60 km/h	≥ 60 km/h	≤ 40 km/h	> 40 to ≤ 50 km/h	≥ 60 km/h	≥ 60 km/h	
Left Turning Cyclist	D	E	F	F	B	B	F	F	A	A	A	A	B	B	A	A		
Level of Service	D	E	F	F	B	B	F	F	A	A	A	A	B	B	A	A		
	F				F				A				B					
Transit	Average Signal Delay	≤ 30 sec	≤ 30 sec	≤ 20 sec	≤ 20 sec			≤ 10 sec	≤ 10 sec	≤ 30 sec	≤ 20 sec	≤ 30 sec	≤ 30 sec			≤ 10 sec	≤ 20 sec	
	Level of Service	D	D	C	C	-	-	B	B	D	C	D	D	-	-	B	C	
	D				B				D				C					
Truck	Effective Corner Radius		10 - 15 m		> 15 m						> 15 m		> 15 m					
	Number of Receiving Lanes on Departure from Intersection		≥ 2		1						≥ 2		1					
Level of Service	-	B	-	C	-	-	-	-	-	A	-	C	-	-	-	-		
	C				-				C				-					
Auto	Volume to Capacity Ratio		0.61 - 0.70				0.0 - 0.60				> 1.00				0.0 - 0.60			
	Level of Service		B				A				F				A			

Appendix J

Synchro Intersection Worksheets – 2024 Future Total Conditions

Lanes, Volumes, Timings
1: Blair & Montreal

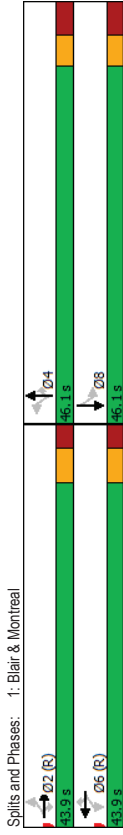
Future Total 2024AM Peak Hour
1649 Montreal Road

	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations	38	522	165	183	1254	19	142	86	55	18	178
Traffic Volume (vph)	38	522	165	183	1254	19	142	86	55	18	178
Future Volume (vph)	38	522	165	183	1254	19	142	86	55	18	178
Lane Group Flow (vph)	38	522	165	183	1254	19	142	86	55	18	297
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	2	2	2	6	6	6	4	4	4	4	8
Permitted Phases	2	2	2	6	6	6	4	4	4	4	8
Detector Phase	2	2	2	6	6	6	4	4	4	4	8
Switch Phase	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Initial (s)	33.4	33.4	33.4	33.4	33.4	33.4	46.1	46.1	46.1	46.1	46.1
Minimum Split (s)	43.9	43.9	43.9	43.9	43.9	43.9	46.1	46.1	46.1	46.1	46.1
Total Split (s)	48.8%	48.8%	48.8%	48.8%	48.8%	48.8%	51.2%	51.2%	51.2%	51.2%	51.2%
Total Split (%)	37.5	37.5	37.5	37.5	37.5	37.5	39.0	39.0	39.0	39.0	39.0
Maximum Green (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3
Yellow Time (s)	2.7	2.7	2.7	2.7	2.7	2.7	3.8	3.8	3.8	3.8	3.8
All-Red Time (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	6.4	6.4	6.4	6.4	6.4	6.4	7.1	7.1	7.1	7.1	7.1
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4	6.4	7.1	7.1	7.1	7.1	7.1
Lead/Lag											
Lead-Lag Optimize?	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Vehicle Extension (s)	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None
Recall Mode	20.0	20.0	20.0	20.0	20.0	20.0	32.0	32.0	32.0	32.0	32.0
Flash Dont Walk (s)	0	0	0	4	4	4	5	5	5	5	0
Pedestrian Calls (#/hr)	53.3	53.3	53.3	53.3	53.3	53.3	23.2	23.2	23.2	23.2	23.2
Act Effort Green (s)	0.59	0.59	0.59	0.59	0.59	0.59	0.26	0.26	0.26	0.26	0.26
Actuated g/C Ratio	0.23	0.27	0.17	0.39	0.65	0.02	0.76	0.20	0.13	0.07	0.68
v/c Ratio	18.1	11.2	2.9	14.4	14.5	3.2	54.3	24.1	6.0	20.9	35.2
Control Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Queue Delay	18.1	11.2	2.9	14.4	14.5	3.2	54.3	24.1	6.0	20.9	35.2
Total Delay	18.1	11.2	2.9	14.4	14.5	3.2	54.3	24.1	6.0	20.9	35.2
LOS	B	A	B	B	A	D	C	A	C	A	D
Approach Delay	9.7			14.4			35.7				34.4
Approach LOS	A			B			D				C
Queue Length 50th (m)	2.7	20.0	0.0	8.4	30.3	0.0	23.4	12.0	0.0	2.4	45.1
Queue Length 95th (m)	13.6	44.8	11.0	27.5	#143.4	m0.6	34.0	17.3	6.4	5.6	52.7
Internal Link Dist (m)	757.9			347.8			602.6				42.3
Turn Bay Length (m)	60.0	30.0	65.0	15.0	25.0	15.0	25.0	30.0	60.0	25.0	25.0
Base Capacity (vph)	163	1906	944	472	1924	871	312	727	664	456	716
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.23	0.27	0.17	0.39	0.65	0.02	0.46	0.12	0.08	0.04	0.41
Intersection Summary											
Cycle Length: 90											
Actuated Cycle Length: 90											
Offset: 14 (16%), Referenced to phase 2,EBTL and 6:WBTL, Start of Green											
Natural Cycle: 90											

Lanes, Volumes, Timings
1: Blair & Montreal

Future Total 2024AM Peak Hour
1649 Montreal Road

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 17.6
Intersection LOS: B
Intersection Capacity Utilization 93.3%
IOU Level of Service F
Analysis Period (min): 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.



Lanes, Volumes, Timings
2: Elwood & Montreal

Future Total 2024AM Peak Hour
1649 Montreal Road

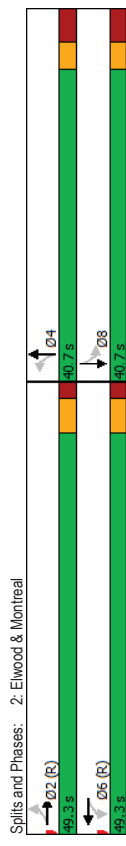
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT
Lane Configurations	1	1	1	1	1	1	1
Traffic Volume (vph)	2	559	16	1457	16	0	0
Future Volume (vph)	2	559	16	1457	16	0	0
Lane Group Flow (vph)	2	568	16	1459	0	36	1
Turn Type	Perm	NA	Perm	NA	Perm	NA	NA
Protected Phases	2	2	6	6	4	4	8
Permitted Phases	2	2	6	6	4	4	8
Detector Phase	2	2	6	6	4	4	8
Switch Phase							
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.6	22.6	39.6	39.6	40.7	40.7	40.7
Total Split (s)	49.3	49.3	49.3	49.3	40.7	40.7	40.7
Total Split (%)	54.8%	54.8%	54.8%	54.8%	45.2%	45.2%	45.2%
Maximum Green (s)	43.7	43.7	43.7	43.7	34.0	34.0	34.0
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0
All-Red Time (s)	1.9	1.9	1.9	1.9	3.7	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.6	5.6	5.6	5.6	6.7	6.7	6.7
Lead/Lag							
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	10.0	10.0	10.0
Flash Dont Walk (s)	10.0	10.0	10.0	10.0	24.0	24.0	24.0
Pedestrian Calls (#/hr)	3	3	5	5	6	6	3
Act Effr Green (s)	71.8	71.8	71.8	71.8	14.8	14.8	14.8
Actuated g/C Ratio	0.80	0.80	0.80	0.80	0.16	0.16	0.16
v/c Ratio	0.01	0.22	0.03	0.56	0.15	0.00	0.00
Control Delay	8.0	4.4	7.8	9.6	11.4	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.0	4.4	7.8	9.6	11.4	0.0	0.0
LOS	A	A	A	A	B	A	A
Approach Delay	4.4	4.4	9.6	9.6	11.4		
Approach LOS	A	A	A	A	B		
Queue Length 50th (m)	0.1	12.0	0.6	47.8	0.6	0.0	0.0
Queue Length 95th (m)	m0.4	23.3	4.7	#168.3	6.2	0.0	0.0
Internal Link Dist (m)	347.8		504.7		77.8	0.1	
Turn Bay Length (m)	35.0		15.0				
Base Capacity (vph)	207	2534	609	2595	528	582	
Starvation Cap Reductn	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	
Reduced v/c Ratio	0.01	0.22	0.03	0.56	0.07	0.00	

Intersection Summary	
Cycle Length: 90	
Actuated Cycle Length: 90	
Offset: 7 (8%), Referenced to phase 2,EBTL and 6,WBTL, Start of Green	
Natural Cycle: 85	

Lanes, Volumes, Timings
2: Elwood & Montreal

Future Total 2024AM Peak Hour
1649 Montreal Road

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.56	
Intersection Signal Delay: 8.2	Intersection LOS: A
Intersection Capacity Utilization 65.5%	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.	
m Volume for 95th percentile queue is metered by upstream signal.	



3: Blair
 HCM 2010 TWSC
 Future Total 2024AM Peak Hour
 1649 Montreal Road

Intersection	WBL	WBR	NBT	NBR	SBL	SBT
Int Delay, s/veh	0.9					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	W	T	T	T	T
Traffic Vol, veh/h	35	0	126	17	0	279
Future Vol, veh/h	35	0	126	17	0	279
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	35	0	126	17	0	279
Major/Minor	Minor1	Major1	Major2	Major2		
Conflicting Flow All	414	135	0	0	143	0
Stage 1	135	-	-	-	-	-
Stage 2	279	-	-	-	-	-
Critical Hwy	6.42	6.22	-	-	4.12	-
Critical Hwy Stg 1	5.42	-	-	-	-	-
Critical Hwy Stg 2	5.42	-	-	-	-	-
Follow-up Hwy	3.518	3.318	-	-	2.218	-
Pot Cap-1 Maneuver	595	914	-	-	1440	-
Stage 1	891	-	-	-	-	-
Stage 2	768	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	595	914	-	-	1440	-
Mov Cap-2 Maneuver	595	-	-	-	-	-
Stage 1	891	-	-	-	-	-
Stage 2	768	-	-	-	-	-
Approach	WB	NB	SB	SB		
HCM Control Delay, s	11.4	0	0	0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT	
Capacity (veh/h)	-	-	595	1440	-	
HCM Lane V/C Ratio	-	-	0.059	-	-	
HCM Control Delay (s)	-	-	11.4	0	-	
HCM Lane LOS	-	-	B	A	-	
HCM 95th %ile Q(veh)	-	-	0.2	0	-	

1: Blair & Montreal
 Future Total 2024PM Peak Hour
 1649 Montreal Road

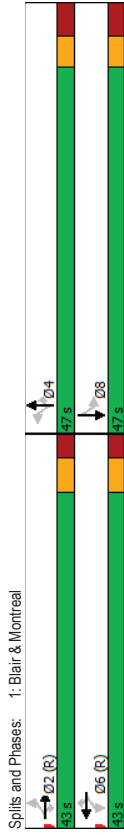
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Configurations	T	T	T	T	T	T	T	T	T	T	T
Traffic Volume (vph)	105	1129	157	65	602	15	299	127	247	42	97
Future Volume (vph)	105	1129	157	65	602	15	299	127	247	42	97
Lane Group Flow (vph)	105	1129	157	65	602	15	299	196	178	42	163
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	Perm	Perm	Perm	NA
Protected Phases	2	2	2	6	6	6	4	4	4	8	8
Permitted Phases	2	2	2	6	6	6	4	4	4	8	8
Detector Phase	2	2	2	6	6	6	4	4	4	8	8
Switch Phase											
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	33.4	33.4	33.4	33.4	33.4	33.4	46.1	46.1	46.1	46.1	46.1
Total Split (s)	43.0	43.0	43.0	43.0	43.0	43.0	47.0	47.0	47.0	47.0	47.0
Total Split (%)	47.8%	47.8%	47.8%	47.8%	47.8%	47.8%	52.2%	52.2%	52.2%	52.2%	52.2%
Maximum Green (s)	36.6	36.6	36.6	36.6	36.6	36.6	39.9	39.9	39.9	39.9	39.9
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.7	2.7	2.7	2.7	2.7	2.7	3.8	3.8	3.8	3.8	3.8
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.4	6.4	6.4	6.4	6.4	6.4	7.1	7.1	7.1	7.1	7.1
Lead/Lag Optimize?											
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	20.0	20.0	20.0	20.0	20.0	20.0	32.0	32.0	32.0	32.0	32.0
Pedestrian Calls (#/hr)	1	1	1	5	5	5	3	3	3	3	6
Ad Effort Green (s)	46.4	46.4	46.4	46.4	46.4	46.4	30.1	30.1	30.1	30.1	30.1
Actuated g/C Ratio	0.52	0.52	0.52	0.52	0.52	0.52	0.33	0.33	0.33	0.33	0.33
v/c Ratio	0.30	0.68	0.20	0.43	0.36	0.02	0.81	0.37	0.36	0.14	0.28
Control Delay	18.5	21.0	7.9	35.0	17.7	5.7	43.4	20.0	17.5	18.7	14.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.5	21.0	7.9	35.0	17.7	5.7	43.4	20.0	17.5	18.7	14.4
LOS	B	C	A	D	B	A	D	B	B	B	B
Approach Delay	19.3			19.1			29.7				15.3
Approach LOS	B			B			C				B
Queue Length 50th (m)	10.1	74.5	5.9	5.1	24.8	0.0	45.8	22.6	17.8	4.9	13.7
Queue Length 95th (m)	26.5	#122.8	19.4	#24.5	54.1	1.2	65.8	34.3	29.3	10.2	23.4
Internal Link Dist (m)	757.9			347.8			602.6				42.3
Turn Bay Length (m)	60.0	30.0	30.0	65.0	15.0	25.0	48.9	689	638	410	749
Base Capacity (vph)	353	1659	789	152	1675	767	489	689	638	410	749
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.30	0.68	0.20	0.43	0.36	0.02	0.61	0.28	0.28	0.10	0.22
Intersection Summary											
Cycle Length: 90											
Actuated Cycle Length: 90											
Offset: 1 (1%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green											
Natural Cycle: 90											

Lanes, Volumes, Timings
1: Blair & Montreal

Lanes, Volumes, Timings
2: Elwood & Montreal

Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.81
 Intersection Signal Delay: 21.4
 Intersection LOS: C
 ICU Level of Service F
 Intersection Capacity Utilization 95.3%
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Configurations	←	←	←	←	←	←	←	←
Traffic Volume (vph)	4	1364	28	667	13	1	1	0
Future Volume (vph)	4	1364	28	667	13	1	1	0
Lane Group Flow (vph)	4	1392	28	670	0	40	0	4
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA
Protected Phases	2	2	6	6	4	4	8	8
Detector Phase	2	2	6	6	4	4	8	8
Switch Phase								
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	22.6	22.6	39.6	39.6	40.7	40.7	40.7	40.7
Total Split (s)	49.3	49.3	49.3	49.3	40.7	40.7	40.7	40.7
Total Split (%)	54.8%	54.8%	54.8%	54.8%	45.2%	45.2%	45.2%	45.2%
Maximum Green (s)	43.7	43.7	43.7	43.7	34.0	34.0	34.0	34.0
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0
All-Red Time (s)	1.9	1.9	1.9	1.9	3.7	3.7	3.7	3.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.6	5.6	5.6	5.6	6.7	6.7	6.7	6.7
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-Max	C-Max	C-Max	C-Max	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	10.0	10.0	10.0	10.0
Flash Dont Walk (s)	10.0	10.0	10.0	10.0	24.0	24.0	24.0	24.0
Pedestrian Calls (#/hr)	3	3	5	5	6	6	3	3
Act Effort Green (s)	71.8	71.8	71.8	71.8	14.8	14.8	14.8	14.8
Actuated g/C Ratio	0.80	0.80	0.80	0.80	0.16	0.16	0.16	0.16
v/c Ratio	0.01	0.55	0.12	0.26	0.16	0.16	0.02	0.02
Control Delay	8.0	6.6	9.9	6.0	16.8	16.8	0.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.0	6.6	9.9	6.0	16.8	16.8	0.0	0.0
LOS	A	A	A	A	B	B	A	A
Approach Delay	6.6	6.6	6.2	6.2	16.8	16.8		
Approach LOS	A	A	A	A	B	B		
Queue Length 50th (m)	0.1	29.3	1.1	15.2	2.7	2.7	0.0	0.0
Queue Length 95th (m)	m0.6	#66.3	8.7	51.0	8.0	8.0	0.0	0.0
Internal Link Dist (m)	347.8		504.7		77.8		0.1	
Turn Bay Length (m)	35.0		15.0					
Base Capacity (vph)	549	2529	228	2592	533	533	564	564
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillover Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.55	0.12	0.26	0.08	0.08	0.01	0.01



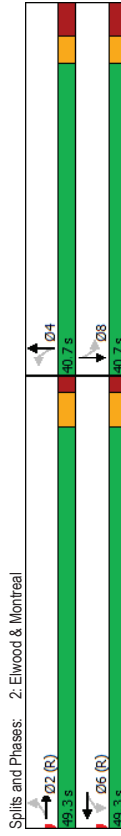
Intersection Summary

Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 8 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 85

Lanes, Volumes, Timings
2: Elwood & Montreal

Future Total 2024PM Peak Hour
1649 Montreal Road

Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.55
 Intersection Signal Delay: 6.6
 Intersection LOS: A
 Intersection Capacity Utilization 66.8%
 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.
 m Volume for 95th percentile queue is met by upstream signal.



HCM 2010 TWSC
3: Blair

Future Total 2024PM Peak Hour
1649 Montreal Road

Intersection	WBL	WBR	NBT	NBR	SBL	SBT
Int Delay, s/veh	0.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	W	T	T	T	T
Traffic Vol, veh/h	29	0	213	34	0	175
Future Vol, veh/h	29	0	213	34	0	175
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	29	0	213	34	0	175
Major/Minor	Minor1	Major1	Major1	Major2		
Conflicting Flow All	405	230	0	0	247	0
Stage 1	230	-	-	-	-	-
Stage 2	175	-	-	-	-	-
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	602	809	-	-	1,319	-
Stage 1	808	-	-	-	-	-
Stage 2	855	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	602	809	-	-	1,319	-
Mov Cap-2 Maneuver	602	-	-	-	-	-
Stage 1	808	-	-	-	-	-
Stage 2	855	-	-	-	-	-
Approach	WB	NB	SB	SB		
HCM Control Delay, s	11.3	0	0	0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT	
Capacity (veh/h)	-	-	602	1,319	-	
HCM Lane V/C Ratio	-	-	0.048	-	-	
HCM Control Delay (s)	-	-	11.3	0	-	
HCM Lane LOS	-	-	B	A	-	
HCM 95th %ile Q(veh)	-	-	0.2	0	-	

Appendix K

Synchro Intersection Worksheets – 2029 Future Total Conditions

Lanes, Volumes, Timings
1: Blair & Montreal

Future Total 2029AM Peak Hour
1649 Montreal Road

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBT	SBL	Ø1	Ø3
Lane Configurations	38	522	165	195	1334	19	142	86	18	220		
Traffic Volume (vph)	38	522	165	195	1334	19	142	86	18	220		
Future Volume (vph)	38	522	165	195	1334	19	142	86	18	220		
Lane Group Flow (vph)	38	522	165	195	1334	19	142	141	18	339		
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	Perm	NA		
Protected Phases	13	2	2	9	6	6	4	4	8	8	1	3
Permitted Phases	13	2	2	9	6	6	4	4	8	8		
Detector Phase												
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	1.0	1.0
Minimum Split (s)	10.9	34.7	34.7	10.9	34.7	34.7	42.3	42.3	42.3	42.3	5.0	5.0
Total Split (s)	11.0	41.0	41.0	11.0	41.0	41.0	48.0	48.0	48.0	48.0	5.0	5.0
Total Split (%)	10.0%	37.3%	37.3%	10.0%	37.3%	37.3%	43.6%	43.6%	43.6%	43.6%	5%	5%
Maximum Green (s)	5.1	33.3	33.3	5.1	33.3	33.3	39.7	39.7	39.7	39.7	3.0	3.0
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	2.0	2.0
All-Red Time (s)	2.2	4.0	4.0	2.2	4.0	4.0	5.0	5.0	5.0	5.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.9	7.7	7.7	5.9	7.7	7.7	8.3	8.3	8.3	8.3		
Lead/Lag											Lead	Lag
Lead-Lag Optimize?	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	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None	None	None	None	None
Walk Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0
Flash Dont Walk (s)	25.0	25.0	25.0	25.0	25.0	25.0	32.0	32.0	32.0	32.0	0.0	0.0
Pedestrian Calls (#/hr)	2	2	2	13	13	23	23	23	2	2	2	23
Act Effort Green (s)	7.2	37.3	37.3	17.8	51.7	51.7	30.0	30.0	31.0	31.0		
Actuated g/C Ratio	0.07	0.34	0.34	0.16	0.47	0.47	0.27	0.27	0.28	0.28		
v/c Ratio	0.36	0.48	0.34	0.73	0.87	0.03	0.80	0.33	0.07	0.73		
Control Delay	58.4	30.8	30.1	64.0	37.8	24.7	67.4	32.2	25.6	44.5		
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay	58.4	30.8	30.1	64.0	37.8	24.7	67.4	32.2	25.6	44.5		
LOS	E	C	C	E	D	C	E	C	C	C	D	D
Approach Delay	32.1			40.9			49.9				43.5	
Approach LOS	C			D			D				D	D
Queue Length 50th (m)	7.9	45.4	25.8	41.2	145.6	2.4	26.9	22.9	2.7	63.2		
Queue Length 95th (m)	18.7	65.6	46.6	#109.6	#239.8	8.4	#49.7	36.9	7.6	88.8		
Internal Link Dist (m)	757.9			347.8			602.6			42.3		
Turn Bay Length (m)	60.0	100.0	100.0	65.0	65.0	15.0	90.0	30.0	30.0	30.0		
Base Capacity (vph)	107	1092	491	267	1528	661	234	571	349	583		
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	0.36	0.48	0.34	0.73	0.87	0.03	0.61	0.25	0.05	0.57		
Intersection Summary												
Cycle Length: 110												
Actuated Cycle Length: 110												
Offset: 0 (0%), Referenced to phase 2,EBT and 6,WBT, Start of Green												
Natural Cycle: 120												

Lanes, Volumes, Timings
1: Blair & Montreal

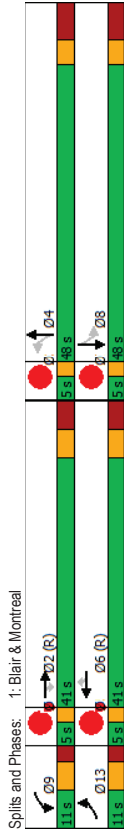
Future Total 2029AM Peak Hour
1649 Montreal Road

Lane Group	Ø5	Ø7
Lane Configurations		
Traffic Volume (vph)		
Future Volume (vph)		
Lane Group Flow (vph)		
Turn Type		
Protected Phases	5	7
Permitted Phases		
Detector Phase		
Switch Phase		
Minimum Initial (s)	1.0	1.0
Minimum Split (s)	5.0	5.0
Total Split (s)	5.0	5.0
Total Split (%)	5%	5%
Maximum Green (s)	3.0	3.0
Yellow Time (s)	2.0	2.0
All-Red Time (s)	0.0	0.0
Lost Time Adjust (s)		
Total Lost Time (s)		
Lead/Lag		Lag
Lead-Lag Optimize?	Yes	Yes
Vehicle Extension (s)	3.0	3.0
Recall Mode	None	None
Walk Time (s)	3.0	3.0
Flash Dont Walk (s)	0.0	0.0
Pedestrian Calls (#/hr)	13	2
Act Effort Green (s)		
Actuated g/C Ratio		
v/c Ratio		
Control Delay		
Queue Delay		
Total Delay		
LOS		
Approach Delay		
Approach LOS		
Queue Length 50th (m)		
Queue Length 95th (m)		
Internal Link Dist (m)		
Turn Bay Length (m)		
Base Capacity (vph)		
Starvation Cap Reductn		
Spillback Cap Reductn		
Storage Cap Reductn		
Reduced v/c Ratio		
Intersection Summary		

Lanes, Volumes, Timings
1: Blair & Montreal

Lanes, Volumes, Timings
2: Elwood & Montreal

Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.87
 Intersection Signal Delay: 39.9
 Intersection LOS: D
 Intersection Capacity Utilization 97.1%
 ICU Level of Service F
 Analysis Period (min) 15
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT	Ø3	Ø7
Lane Configurations	←	←	←	←	←	←	←		
Traffic Volume (vph)	2	559	17	1551	16	0	0		
Future Volume (vph)	2	559	17	1551	16	0	0		
Lane Group Flow (vph)	2	568	17	1553	0	36	1		
Turn Type	Perm	NA	Perm	NA	Perm	NA	NA		
Protected Phases	2	2	6	6	4	4	8	3	7
Permitted Phases	2	2	6	6	4	4	8		
Detector Phase	2	2	6	6	4	4	8		
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	1.0	1.0
Minimum Split (s)	24.9	24.9	24.9	24.9	32.7	32.7	32.7	5.0	5.0
Total Split (s)	49.3	49.3	49.3	49.3	35.7	35.7	35.7	5.0	5.0
Total Split (%)	54.8%	54.8%	54.8%	54.8%	39.7%	39.7%	39.7%	6%	6%
Maximum Green (s)	43.4	43.4	43.4	43.4	30.0	30.0	30.0	3.0	3.0
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0	2.0	2.0
All-Red Time (s)	2.2	2.2	2.2	2.2	2.7	2.7	2.7	0.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.7	5.7	5.7		
Lead/Lag									
Lead-Lag Optimize?	Yes	Yes	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
Recall Mode	C-Max	C-Max	C-Max	C-Max	None	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	2.0	2.0	2.0	3.0	3.0
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	25.0	25.0	25.0	0.0	0.0
Pedestrian Calls (#/hr)	5	5	5	5	7	7	7	4	4
Ad Effort Green (s)	72.6	72.6	72.6	72.6	13.4	13.4	13.4		
Actuated g/C Ratio	0.81	0.81	0.81	0.81	0.15	0.15	0.15		
v/c Ratio	0.01	0.22	0.03	0.59	0.18	0.00	0.00		
Control Delay	8.0	5.3	6.9	9.4	32.9	27.0	27.0		
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay	8.0	5.3	6.9	9.4	32.9	27.0	27.0		
LOS	A	A	A	A	C	C	C		
Approach Delay	5.3	9.3	9.3	32.9	27.0	27.0	27.0		
Approach LOS	A	A	A	A	C	C	C		
Queue Length 50th (m)	0.1	12.0	0.6	51.6	5.8	0.2	0.2		
Queue Length 95th (m)	1.3	39.9	4.6	#177.5	11.4	1.2	1.2		
Internal Link Dist (m)	347.8			504.7	77.8	0.1	0.1		
Turn Bay Length (m)	35.0		15.0						
Base Capacity (vph)	183	2562	615	2624	448	495	495		
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	0.22	0.03	0.59	0.08	0.00	0.00		
Intersection Summary									
Cycle Length: 90									
Actuated Cycle Length: 90									
Offset: 7 (8%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green									
Natural Cycle: 90									

Lanes, Volumes, Timings
2: Elwood & Montreal

Future Total 2029AM Peak Hour
1649 Montreal Road

Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 0.59
 Intersection Signal Delay: 8.7
 Intersection LOS: A
 Intersection Capacity Utilization 67.0%
 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.



Future Total 2029AM Peak Hour
1649 Montreal Road

3: Blair & Site Access

Intersection
 Int Delay, s/veh 0.8

Movement
 WBL WBR NBT NBR SBL SBT
 Lane Configurations W F 4
 Traffic Vol, veh/h 35 0 126 17 0 321
 Future Vol, veh/h 35 0 126 17 0 321
 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 35 0 126 17 0 321

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	456	135	0
Stage 1	321	-	-
Stage 2	321	-	-
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	562	914	-
Stage 1	891	-	-
Stage 2	735	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	562	914	-
Mov Cap-2 Maneuver	562	-	-
Stage 1	891	-	-
Stage 2	735	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.8	0	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR/WBLn1	SBL	SBT
Capacity (veh/h)	-	562	1440	-
HCM Lane V/C Ratio	-	0.062	-	-
HCM Control Delay (s)	-	11.8	0	-
HCM Lane LOS	-	B	A	-
HCM 95th %ile Q(veh)	-	0.2	0	-

Lanes, Volumes, Timings
1: Blair & Montreal

Lanes, Volumes, Timings
1: Blair & Montreal

Future Total 2029PM Peak Hour
1649 Montreal Road

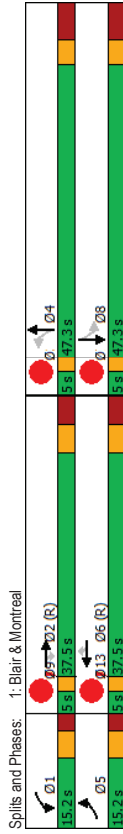
Future Total 2029PM Peak Hour
1649 Montreal Road

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT	Ø3	Ø7
Lane Configurations	↔↔	↔↔	↔↔	↔↔	↔↔	↔↔	↔↔	↔↔	↔↔	↔↔		
Traffic Volume (vph)	105	1201	167	65	602	15	377	155	42	97		
Future Volume (vph)	105	1201	167	65	602	15	377	155	42	97		
Lane Group Flow (vph)	105	1201	167	65	602	15	377	155	42	163		
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Perm	NA	Perm	NA		
Protected Phases	5	2	2	1	6	6	4	4	8	3		7
Permitted Phases	5	2	2	1	6	6	4	4	8	8		8
Detector Phase												
Switch Phase												
Minimum Initial (s)	5.0	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	1.0	1.0
Minimum Split (s)	10.9	34.7	34.7	10.9	34.7	34.7	42.3	42.3	42.3	42.3	5.0	5.0
Total Split (s)	15.2	37.5	37.5	15.2	37.5	37.5	47.3	47.3	47.3	47.3	5.0	5.0
Total Split (%)	13.8%	34.1%	34.1%	13.8%	34.1%	34.1%	43.0%	43.0%	43.0%	43.0%	5%	5%
Maximum Green (s)	9.3	29.8	29.8	9.3	29.8	29.8	39.0	39.0	39.0	39.0	3.0	3.0
Yellow Time (s)	3.7	3.7	3.7	3.7	3.7	3.7	3.3	3.3	3.3	3.3	2.0	2.0
All-Red Time (s)	2.2	4.0	4.0	2.2	4.0	4.0	5.0	5.0	5.0	5.0	0.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lost Time (s)	5.9	7.7	7.7	5.9	7.7	7.7	8.3	8.3	8.3	8.3		
Total Lost Time (s)												
Lead/Lag	Lead	Lead	Lead	Lead	Lead	Lead	Lag	Lag	Lag	Lag	Lead	Lead
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	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	3.0	3.0
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None	None	None	None	None
Walk Time (s)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	3.0
Flash Dont Walk (s)	25.0	25.0	25.0	25.0	25.0	25.0	32.0	32.0	32.0	32.0	0.0	0.0
Pedestrian Calls (#/hr)	2	2	2	13	13	18	18	18	7	7	18	7
Act Effort Green (s)	9.1	38.5	38.5	8.4	34.4	34.4	40.6	40.6	41.6	41.6		
Actuated g/C Ratio	0.08	0.35	0.35	0.08	0.31	0.31	0.37	0.37	0.38	0.38		
v/c Ratio	0.78	1.07	1.07	0.52	0.59	0.03	0.93	0.83	0.25	0.27		
Control Delay	85.1	82.7	31.5	63.3	35.8	29.3	64.2	46.4	28.4	25.0		
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay	85.1	82.7	31.5	63.3	35.8	29.3	64.2	46.4	28.4	25.0		
LOS	F	F	C	E	D	C	E	D	C	C		
Approach Delay		77.1		38.3			54.3		25.7			
Approach LOS		E		D			D		C			
Queue Length 50th (m)	22.4	~162.9	27.6	13.6	56.8	2.2	72.5	85.4	5.9	22.9		
Queue Length 95th (m)	#50.0	#221.0	49.7	27.5	80.3	7.4	#138.1	#149.4	16.1	41.5		
Internal Link Dist (m)		757.9		347.8			602.6		42.3			
Turn Bay Length (m)	60.0	100.0	100.0	65.0	140	1016	442	411	566	171	620	
Base Capacity (vph)	138	1127	505	140	1016	442	411	566	171	620		
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	1.07	0.33	0.46	0.59	0.03	0.92	0.83	0.25	0.26		
Intersection Summary												
Cycle Length: 110												
Actuated Cycle Length: 110												
Offset: 100.5 (91%), Referenced to phase 2:EBT and 6:WBT, Start of Green												
Natural Cycle: 140												

Lanes, Volumes, Timings
1: Blair & Montreal

Lanes, Volumes, Timings
2: Elwood & Montreal

Control Type: Actuated-Coordinated
 Maximum v/c Ratio: 1.07
 Intersection Signal Delay: 59.5
 Intersection LOS: E
 Intersection Capacity Utilization: 102.7%
 ICU Level of Service G
 Analysis Period (min): 15
 ~ Volume exceeds capacity, queue is theoretically infinite.
 Queue shown is maximum after two cycles.
 # 95th percentile volume exceeds capacity, queue may be longer.
 Queue shown is maximum after two cycles.



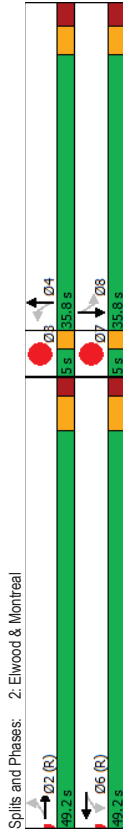
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT	Ø3	Ø7
Lane Configurations	←	←	←	←	←	←	←	←		
Traffic Volume (vph)	4	1450	28	667	13	1	1	0		
Future Volume (vph)	4	1450	28	667	13	1	1	0		
Lane Group Flow (vph)	4	1478	28	670	0	42	0	4		
Turn Type	Perm	NA	Perm	NA	Perm	NA	Perm	NA		
Protected Phases	2	2	6	6	4	4	8	3		
Permitted Phases	2	2	6	6	4	4	8	8		
Detector Phase	2	2	6	6	4	4	8	8		
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	1.0	1.0
Minimum Split (s)	24.9	24.9	24.9	24.9	32.7	32.7	32.7	32.7	5.0	5.0
Total Split (s)	49.2	49.2	49.2	49.2	35.8	35.8	35.8	35.8	5.0	5.0
Total Split (%)	54.7%	54.7%	54.7%	54.7%	39.8%	39.8%	39.8%	39.8%	6%	6%
Maximum Green (s)	43.3	43.3	43.3	43.3	30.1	30.1	30.1	30.1	3.0	3.0
Yellow Time (s)	3.7	3.7	3.7	3.7	3.0	3.0	3.0	3.0	2.0	2.0
All-Red Time (s)	2.2	2.2	2.2	2.2	2.7	2.7	2.7	2.7	0.0	0.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Lost Time (s)	5.9	5.9	5.9	5.9	5.7	5.7	5.7	5.7		
Total Lost Time (s)	5.9	5.9	5.9	5.9	5.7	5.7	5.7	5.7		
Lead/Lag										
Lead-Lag Optimize?										
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	C-Min	C-Min	C-Min	C-Min	None	None	None	None	None	None
Walk Time (s)	7.0	7.0	7.0	7.0	2.0	2.0	2.0	2.0	3.0	3.0
Flash Dont Walk (s)	12.0	12.0	12.0	12.0	25.0	25.0	25.0	25.0	0.0	0.0
Pedestrian Calls (#/hr)	8	8	9	9	14	14	3	3	14	3
Act Effort Green (s)	69.2	69.2	69.2	69.2	16.8	16.8	16.8	16.8		
Actuated g/C Ratio	0.77	0.77	0.77	0.77	0.19	0.19	0.19	0.19		
v/c Ratio	0.01	0.61	0.15	0.27	0.16	0.16	0.01	0.01		
Control Delay	9.2	11.8	12.2	7.2	28.4	28.4	24.0	24.0		
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total Delay	9.2	11.8	12.2	7.2	28.4	28.4	24.0	24.0		
LOS	A	B	B	A	C	C	C	C		
Approach Delay	11.8	7.4	7.4	28.4	24.0	24.0				
Approach LOS	B	A	A	C	C	C				
Queue Length 50th (m)	0.1	48.0	1.1	14.6	6.8	6.8	0.6	0.6		
Queue Length 95th (m)	1.9	#166.8	8.7	47.7	12.7	12.7	2.8	2.8		
Internal Link Dist (m)	347.8		504.7		77.8	77.8	0.1	0.1		
Turn Bay Length (m)	35.0		15.0							
Base Capacity (vph)	524	2439	182	2498	468	468	490	490		
Starvation Cap Reductn	0	0	0	0	0	0	0	0		
Spillback Cap Reductn	0	0	0	0	0	0	0	0		
Storage Cap Reductn	0	0	0	0	0	0	0	0		
Reduced v/c Ratio	0.01	0.61	0.15	0.27	0.09	0.09	0.01	0.01		

Intersection Summary
 Cycle Length: 90
 Actuated Cycle Length: 90
 Offset: 8 (9%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
 Natural Cycle: 90

Lanes, Volumes, Timings
2: Elwood & Montreal

Future Total 2029PM Peak Hour
1649 Montreal Road

Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.61
Intersection Signal Delay: 10.8
Intersection LOS: B
Intersection Capacity Utilization 66.5%
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: 2: Elwood & Montreal

HCM 2010 TWSC
3: Blair & Site Access

Future Total 2029PM Peak Hour
1649 Montreal Road

Intersection	WBL	WBR	NBT	NBR	SBL	SBT
Int Delay, s/veh	0.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	W	T	T	T	T
Traffic Vol, veh/h	29	0	241	34	0	175
Future Vol, veh/h	29	0	241	34	0	175
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	29	0	241	34	0	175
Major/Minor	Minor1	Major1	Major2	Major2		
Conflicting Flow All	433	258	0	0	275	0
Stage 1	258	-	-	-	-	-
Stage 2	175	-	-	-	-	-
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	580	781	-	-	1,288	-
Stage 1	785	-	-	-	-	-
Stage 2	855	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	580	781	-	-	1,288	-
Mov Cap-2 Maneuver	580	-	-	-	-	-
Stage 1	785	-	-	-	-	-
Stage 2	855	-	-	-	-	-
Approach	WB	NB	SB	SB		
HCM Control Delay, s	11.5	0	0	0		
HCM LOS	B					
Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT	
Capacity (veh/h)	-	-	580	1288	-	-
HCM Lane V/C Ratio	-	-	0.05	-	-	-
HCM Control Delay (s)	-	-	11.5	0	-	-
HCM Lane LOS	-	-	B	A	-	-
HCM 95th %ile Q(veh)	-	-	0.2	0	-	-

Appendix L

TDM Checklist

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	<input checked="" type="checkbox"/>
1.2 Travel surveys		
BETTER	1.2.1 Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	<input type="checkbox"/>
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	<input checked="" type="checkbox"/>
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	<input type="checkbox"/>
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)	<input type="checkbox"/>

TDM measures: *Non-residential developments*

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	<input checked="" type="checkbox"/>
BASIC	3.1.2 Provide online links to OC Transpo and STO information	<input checked="" type="checkbox"/>
BETTER	3.1.3 Provide real-time arrival information display at entrances	<input type="checkbox"/>
3.2 Transit fare incentives		
<i>Commuter travel</i>		
BETTER	3.2.1 Offer preloaded PRESTO cards to encourage commuters to use transit	<input type="checkbox"/>
BETTER ★	3.2.2 Subsidize or reimburse monthly transit pass purchases by employees	<input type="checkbox"/>
<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)	<input type="checkbox"/>
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)	<input type="checkbox"/>
<i>Visitor travel</i>		
BETTER	3.3.2 Contract with OC Transpo to provide enhanced transit services (e.g. for festivals, concerts, games)	<input type="checkbox"/>
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)	<input type="checkbox"/>
<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)	<input type="checkbox"/>

TDM measures: Non-residential developments		Check if proposed & add descriptions
4. RIDESHARING		
<i>Commuter travel</i>		
4.1	Ridematching service	<input type="checkbox"/>
BASIC	4.1.1 Provide a dedicated ridematching portal at OttawaRideMatch.com	<input type="checkbox"/>
4.2 Carpool parking price incentives		
<i>Commuter travel</i>		
BETTER	4.2.1 Provide discounts on parking costs for registered carpools	<input type="checkbox"/>
4.3 Vanpool service		
<i>Commuter travel</i>		
BETTER	4.3.1 Provide a vanpooling service for long-distance commuters	<input type="checkbox"/>
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	<input type="checkbox"/>
<i>Commuter travel</i>		
BETTER	5.1.2 Provide employees with bikeshare memberships for local business travel	<input type="checkbox"/>
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	<input type="checkbox"/>
BETTER	5.2.2 Provide employees with carshare memberships for local business travel	<input type="checkbox"/>
6. PARKING		
<i>Commuter travel</i>		
BASIC	6.1.1 Charge for long-term parking (daily, weekly, monthly)	<input checked="" type="checkbox"/>
BASIC	6.1.2 Unbundle parking cost from lease rates at multi-tenant sites	<input checked="" type="checkbox"/>
<i>Visitor travel</i>		
BETTER	6.1.3 Charge for short-term parking (hourly)	<input type="checkbox"/>

TDM measures: Non-residential developments		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	<input checked="" type="checkbox"/>
<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)	<input type="checkbox"/>
7.2 Personalized trip planning		
<i>Commuter travel</i>		
BETTER	7.2.1 Offer personalized trip planning to new/relocating employees	<input type="checkbox"/>
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	<input type="checkbox"/>
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	<input type="checkbox"/>
8.2 Alternative work arrangements		
<i>Commuter travel</i>		
BASIC	8.2.1 Encourage flexible work hours	<input type="checkbox"/>
BETTER	8.2.2 Encourage compressed workweeks	<input type="checkbox"/>
BETTER	8.2.3 Encourage telework	<input type="checkbox"/>
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	<input type="checkbox"/>
8.4 Commuter incentives		
<i>Commuter travel</i>		
BETTER	8.4.1 Offer employees a taxable, mode-neutral commuting allowance	<input type="checkbox"/>
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	<input type="checkbox"/>

**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: Residential developments		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	<input type="checkbox"/>
1.2 Travel surveys		
BETTER	1.2.1 Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	<input type="checkbox"/>
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 (multi-family, condominium)	<input checked="" type="checkbox"/>
2.2 Bicycle skills training		
BETTER	2.2.1 Offer on-site cycling courses for residents, or subsidize off-site courses	<input type="checkbox"/>

TDM measures: Residential developments		Check if proposed & add descriptions
3. TRANSIT		
3.1 Transit information		
BASIC	3.1.1 Display relevant transit schedules and route maps at entrances (multi-family, condominium)	<input checked="" type="checkbox"/>
BETTER	3.1.2 Provide real-time arrival information display at entrances (multi-family, condominium)	<input type="checkbox"/>
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	<input checked="" type="checkbox"/>
BETTER	3.2.2 Offer at least one year of free monthly transit passes on residence purchase/move-in	<input type="checkbox"/>
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 (subdivision)	<input type="checkbox"/>
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)	<input type="checkbox"/>
4. CARSHARING & BIKESHARING		
4.1 Bikeshare stations & memberships		
BETTER	4.1.1 Contract with provider to install on-site bikeshare station (multi-family)	<input checked="" type="checkbox"/>
BETTER	4.1.2 Provide residents with bikeshare memberships, either free or subsidized (multi-family)	<input type="checkbox"/>
4.2 Carshare vehicles & memberships		
BETTER	4.2.1 Contract with provider to install on-site carshare vehicles and promote their use by residents	<input type="checkbox"/>
BETTER	4.2.2 Provide residents with carshare memberships, either free or subsidized	<input type="checkbox"/>
5. PARKING		
5.1 Priced parking		
BASIC ★	5.1.1 Unbundle parking cost from purchase price (condominium)	<input checked="" type="checkbox"/>
BASIC ★	5.1.2 Unbundle parking cost from monthly rent (multi-family)	<input checked="" type="checkbox"/>

TDM measures: Residential developments		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	<input checked="" type="checkbox"/>
6.2 Personalized trip planning		
BETTER ★	6.2.1 Offer personalized trip planning to new residents	<input type="checkbox"/>

**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: Non-residential developments		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	<input checked="" type="checkbox"/>
BASIC	1.1.2 Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	<input checked="" type="checkbox"/>
BASIC	1.1.3 Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	<input checked="" type="checkbox"/>
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 (see <i>Official Plan policy 4.3.3</i>)	<input checked="" type="checkbox"/>
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 (see <i>Official Plan policy 4.3.12</i>)	<input checked="" type="checkbox"/>

TDM-supportive design & infrastructure measures: Non-residential developments		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 (see <i>Official Plan policy 4.3.10</i>)	<input checked="" type="checkbox"/>
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 (see <i>Official Plan policy 4.3.10</i>)	<input checked="" type="checkbox"/>
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 (see <i>Official Plan policy 4.3.11</i>)	<input type="checkbox"/>
BASIC	1.2.6 Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	<input checked="" type="checkbox"/>
BASIC	1.2.7 Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	<input type="checkbox"/>
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	<input type="checkbox"/>
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	<input type="checkbox"/>
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)	<input type="checkbox"/>

TDM-supportive design & infrastructure measures: Non-residential developments		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>)	<input checked="" type="checkbox"/>
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>)	<input checked="" type="checkbox"/>
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>)	<input checked="" type="checkbox"/>
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	<input type="checkbox"/>
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	<input type="checkbox"/>
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>)	<input type="checkbox"/>
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)	<input type="checkbox"/>
2.3 Shower & change facilities		
BASIC	2.3.1 Provide shower and change facilities for the use of active commuters	<input type="checkbox"/>
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	<input type="checkbox"/>
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)	<input type="checkbox"/>

TDM-supportive design & infrastructure measures: Non-residential developments		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	<input type="checkbox"/>
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	<input type="checkbox"/>
BETTER	3.1.3 Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	<input type="checkbox"/>
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	<input checked="" type="checkbox"/>
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	<input type="checkbox"/>
BETTER	4.2.2 At large developments, provide spaces for carpools in a separate, access-controlled parking area to simplify enforcement	<input type="checkbox"/>
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 (see <i>Zoning By-law Section 94</i>)	<input type="checkbox"/>
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	<input type="checkbox"/>

TDM-supportive design & infrastructure measures: Non-residential developments		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	<input checked="" type="checkbox"/>
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	<input type="checkbox"/>
BASIC	6.1.3 Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly (see <i>Zoning By-law Section 704</i>)	<input type="checkbox"/>
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 (see <i>Zoning By-law Section 111</i>)	<input type="checkbox"/>
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)	<input type="checkbox"/>
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	<input type="checkbox"/>

**TDM-Supportive Development Design and Infrastructure Checklist:
Residential Developments (multi-family or condominium)**

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: Residential developments		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	<input checked="" type="checkbox"/>
BASIC	1.1.2 Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	<input checked="" type="checkbox"/>
BASIC	1.1.3 Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	<input checked="" type="checkbox"/>
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 (see <i>Official Plan policy 4.3.3</i>)	<input checked="" type="checkbox"/>
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 (see <i>Official Plan policy 4.3.12</i>)	<input checked="" type="checkbox"/>

TDM-supportive design & infrastructure measures: <i>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 (see <i>Official Plan policy 4.3.10</i>)	<input checked="" type="checkbox"/>
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 (see <i>Official Plan policy 4.3.10</i>)	<input checked="" type="checkbox"/>
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 (see <i>Official Plan policy 4.3.11</i>)	<input type="checkbox"/>
BASIC	1.2.6 Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	<input checked="" type="checkbox"/>
BASIC	1.2.7 Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	<input type="checkbox"/>
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	<input type="checkbox"/>
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	<input type="checkbox"/>
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)	<input type="checkbox"/>

TDM-supportive design & infrastructure measures: <i>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>)	<input checked="" type="checkbox"/>
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>)	<input checked="" type="checkbox"/>
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>)	<input checked="" type="checkbox"/>
BASIC	2.1.4 Provide bicycle parking spaces equivalent to the expected number of resident-owned bicycles, plus the expected peak number of visitor cyclists	<input type="checkbox"/>
2.2 Secure bicycle parking		
REQUIRED	2.2.1 Where more than 50 bicycle parking spaces are provided for a single residential 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>)	<input checked="" type="checkbox"/>
BETTER	2.2.2 Provide secure bicycle parking spaces equivalent to at least the number of units at condominiums or multi-family residential developments	<input type="checkbox"/>
2.3 Bicycle repair station		
BETTER	2.3.1 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)	<input type="checkbox"/>
3. TRANSIT		
3.1 Customer amenities		
BASIC	3.1.1 Provide shelters, lighting and benches at any on-site transit stops	<input type="checkbox"/>
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	<input type="checkbox"/>
BETTER	3.1.3 Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	<input type="checkbox"/>

TDM-supportive design & infrastructure measures: <i>Residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
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	<input checked="" type="checkbox"/>
5. CARSHARING & BIKESHARING		
5.1 Carshare parking spaces		
BETTER	5.1.1 Provide up to three carshare parking spaces in an R3, R4 or RS Zone for specified residential uses (see <i>Zoning By-law Section 94</i>)	<input type="checkbox"/>
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	<input type="checkbox"/>
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	<input checked="" type="checkbox"/>
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	<input type="checkbox"/>
BASIC	6.1.3 Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly (see <i>Zoning By-law Section 104</i>)	<input type="checkbox"/>
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 (see <i>Zoning By-law Section 111</i>)	<input type="checkbox"/>
6.2 Separate long-term & short-term parking areas		
BETTER	6.2.1 Provide separate areas for short-term and long-term parking (using signage or physical barriers) to permit access controls and simplify enforcement (i.e. to discourage residents from parking in visitor spaces, and vice versa)	<input type="checkbox"/>