

951 Gladstone Avenue and 145 Loretta Avenue North

Transportation Impact Assessment

Step 1 & 2 Screening and Scoping Report

Step 3: Forecasting Report

Step 4: Strategy Report (Draft)

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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	Existing Cycling and Pedestrian Facilities	4
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.....	9
2.3.1	Changes to the Area Transportation Network	9
2.3.2	Other Study Area Developments.....	10
3	Study Area and Time Periods	10
3.1	Study Area	10
3.2	Time Periods.....	11
3.3	Horizon Years.....	11
4	Exemption Review	11
5	Development-Generated Travel Demand	11
5.1	Trip Generation and Mode Shares	11
5.2	Trip Distribution.....	13
5.3	Trip Assignment.....	13
6	Background Network Travel Demands.....	15
6.1	Transportation Network Plans	15
6.2	Background Growth.....	15
6.3	Other Developments	15
7	Demand Rationalization	15
8	Transportation Demand Management.....	16
8.1	Context for TDM	16
8.2	Need and Opportunity.....	16
8.3	TDM Program	16
9	Neighbourhood Traffic Management.....	16
10	Transit.....	17
10.1	Route Capacity.....	17
10.2	Transit Priority	17
11	Review of Network Concept.....	17
12	Network Intersection Design.....	17
12.1	Intersection Control.....	17
12.2	Intersection Design.....	17
12.2.1	Total Future Conditions	17

12.2.2	Design Elements	18
13	Summary of Improvements Indicated and Modifications Options.....	19
14	Next Steps.....	20

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	5
Figure 5:	Existing Study Area Transit Service.....	6
Figure 6:	Existing Traffic Volumes	7
Figure 7:	Study Area Collision Records.....	9
Figure 8:	Gladstone Station District CDP Vision & Concept Options Report – Preferred Option: Perspective Looking North-East	10
Figure 9:	Traffic Assignment (%).....	14
Figure 10:	New Site Generation Auto Volumes.....	14
Figure 11:	Future Total Traffic Volumes	18

Table of Tables

Table 1:	Intersection Count Date.....	6
Table 9:	Existing Intersection Operations.....	7
Table 2:	Study Area Collision Summary.....	8
Table 3:	Exemption Review	11
Table 4:	Trip Generation Person Trip Rates.....	12
Table 5:	Total Person Trip Generation	12
Table 6:	TOD Mode Share.....	12
Table 7:	Internal Capture Rates.....	12
Table 8:	Trip Generation by Mode	13
Table 9:	OD Survey Existing Mode Share – Ottawa Inner	13
Table 9:	SL-29 Screenline Summary	15
Table 9:	Future Total Access Intersection Operations	18

List of Appendices

Appendix A –	TIA Screening Form and Certification Form
Appendix B –	Turning Movement Count Data
Appendix C –	Existing Synchro Worksheets
Appendix D –	Collision Data
Appendix E –	TDM Checklist
Appendix F –	TAC Signal Warrant
Appendix G –	Future Total Synchro Worksheets

1 Screening

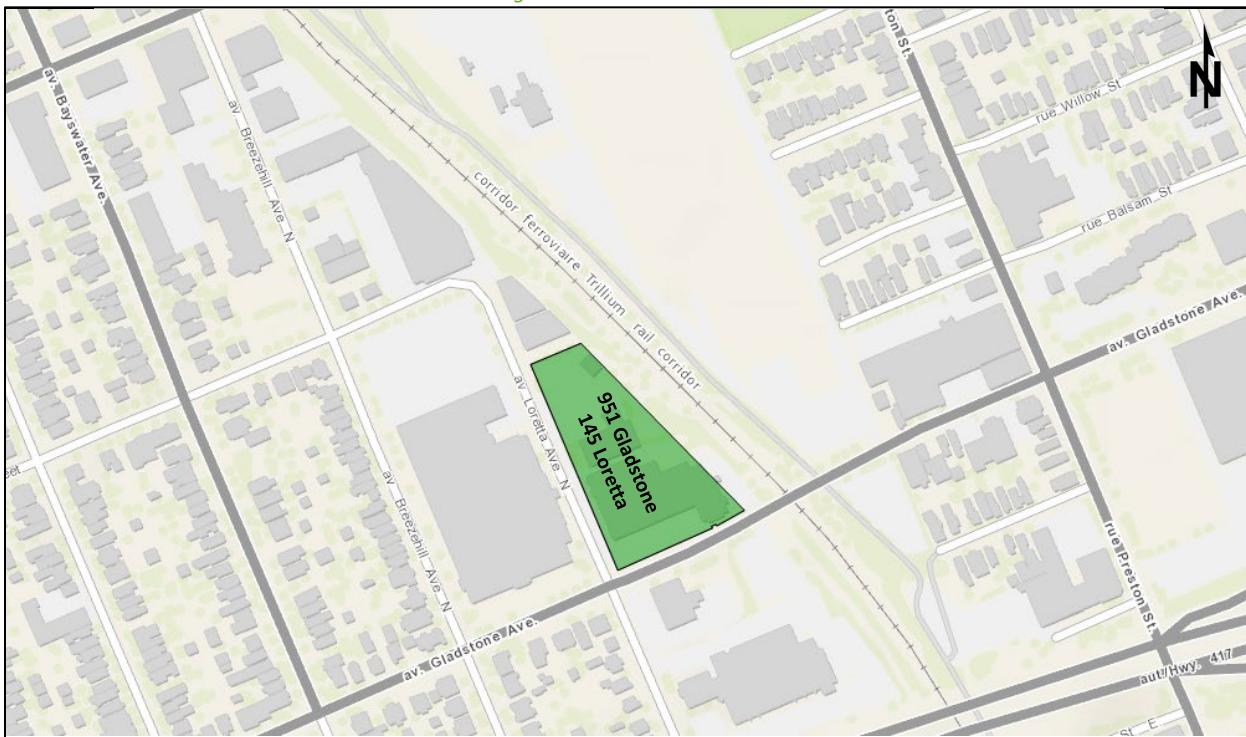
This study has been prepared according to the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines. Accordingly, a Step 1 Screening Form has been prepared and is included as Appendix A, along with the Certification Form for TIA Study PM. As shown in the Screening Form, a TIA is required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

2 Existing and Planned Conditions

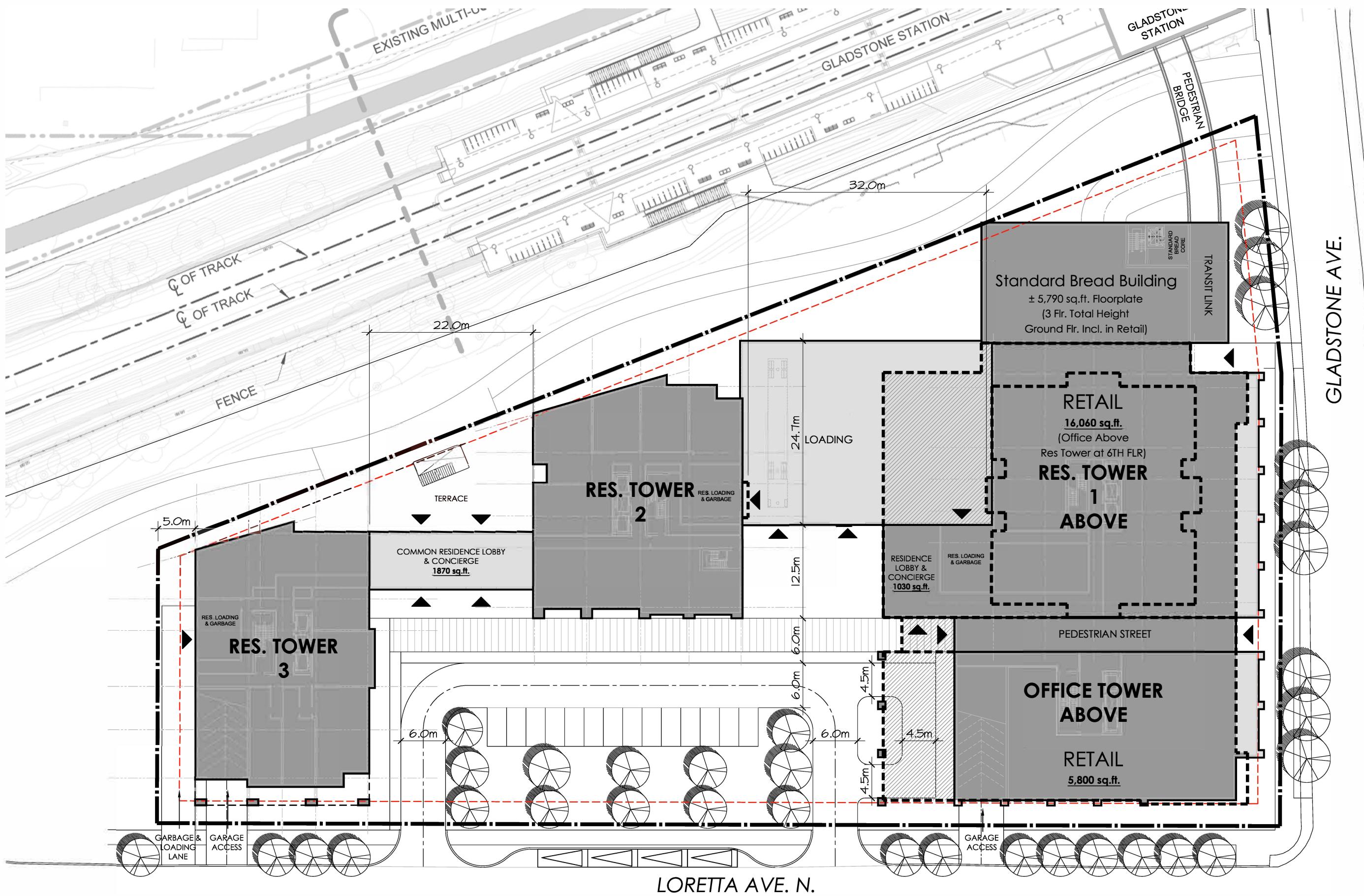
2.1 Proposed Development

The proposed development, located at 951 Gladstone Avenue and 145 Loretta Avenue North, is currently zoned general industrial. The existing land uses include brewery, jujitsu club, cross-fit gym, glass blowing, art studio, beer and wine supply, bread bakery, and other assorted industrial uses. The proposed Official Plan and Zoning By-Law Amendments would allow for high-rise residential and commercial/retail uses. The proposed development would include apartments totalling 931 units, 141,750 sq. ft. of office space, and 21,686 sq. ft. of retail space. The existing access on Gladstone Avenue will remain, and a one-way access loop along Loretta Avenue North. The frontage along Loretta Avenue North would formalize the curb edge and remove the paved shoulder and open access along the building frontage. A pedestrian bridge is proposed on the east side of the development, adjacent to Gladstone Avenue, to connect directly with the future Gladstone Trillium Line Station. The anticipated full build-out and occupancy horizon is 2023. 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: October 5, 2018



2.2 Existing Conditions

2.2.1 Area Road Network

Gladstone Avenue: Gladstone Avenue is a City of Ottawa major collector road with a two-lane urban cross-section including sidewalks and a posted speed limit of 40 km/h. The current right-of-way is 20.0 metres, with additional width provided in proximity to the rail corridor.

Loretta Avenue North/Laurel Street: Loretta Avenue N is a City of Ottawa local road with a two-lane urban cross-section including paved shoulders on the east side and a sidewalk on the west side. The posted speed is 40 km/h and the right-of-way is 20.0 metres.

Breezehill Avenue: Breezehill Avenue is a City of Ottawa local road with a two-lane urban cross-section, including sidewalks, and parking on the east side of the road. The posted speed limit is 40 km/h and the right-of-way is 20.0 metres.

Bayswater Avenue: Bayswater Avenue is a City of Ottawa collector road with a two-lane urban cross-section, including sidewalks and on-street parking. The unposted speed limit is 50 km/h and the right-of-way is 25.0 metres.

Preston Street: Preston Street is a City of Ottawa arterial road with a two-lane urban cross-section, including parking lanes and auxiliary lanes at major intersections. The unposted speed limit is 50 km/h and the Ottawa Official Plan reserves a 23.0 metre right-of-way.

Somerset Street West: Somerset Street West is a City of Ottawa arterial road with a two-lane cross-section, including sidewalks and on street parking. The unposted speed limit is 50 km/h and the right-of-way is 20.0 metres. East of Breezehill Avenue, bike lanes are provided.

2.2.2 Existing Intersections

Gladstone Avenue / Bayswater Avenue

The intersection of Gladstone Avenue and Bayswater Avenue is a signalized intersection with shared all movement lanes on each approach. No turn restrictions were noted.

Gladstone Avenue / Preston Street

The intersection of Gladstone Avenue and Preston Street is a signalized intersection with auxiliary left-turn lanes on the northbound, westbound, and southbound approaches. No turn restrictions were noted.

Somerset Street West / Breezehill Avenue

The intersection of Somerset Street West and Breezehill Avenue is a minor stop-controlled intersection with shared movement lanes on all approaches. Bike lanes along Somerset Street West start/end on the east side of the intersection. No turn restrictions were noted.

2.2.3 Existing Driveways

Along Gladstone Avenue, a driveway to the City of Ottawa yard (175 Loretta Avenue North) is located opposite the existing site access adjacent to the Trillium Rail Corridor, and an access to 950 Gladstone Avenue within 5.0 metres of the Loretta Avenue North intersection. Between Loretta Avenue North and Breezehill Avenue, an access

loop is located on the north side of Gladstone Avenue to the Canadian Bank Note Limited, and five driveways are located on the south side.

Along Loretta Avenue North, two accesses are provided on the west side of the road for the Canadian Bank Note Limited site, and a single access is located north of the proposed site for 131 Loretta Avenue North. The paved shoulder is used for perpendicular parking along Loretta Avenue North as well.

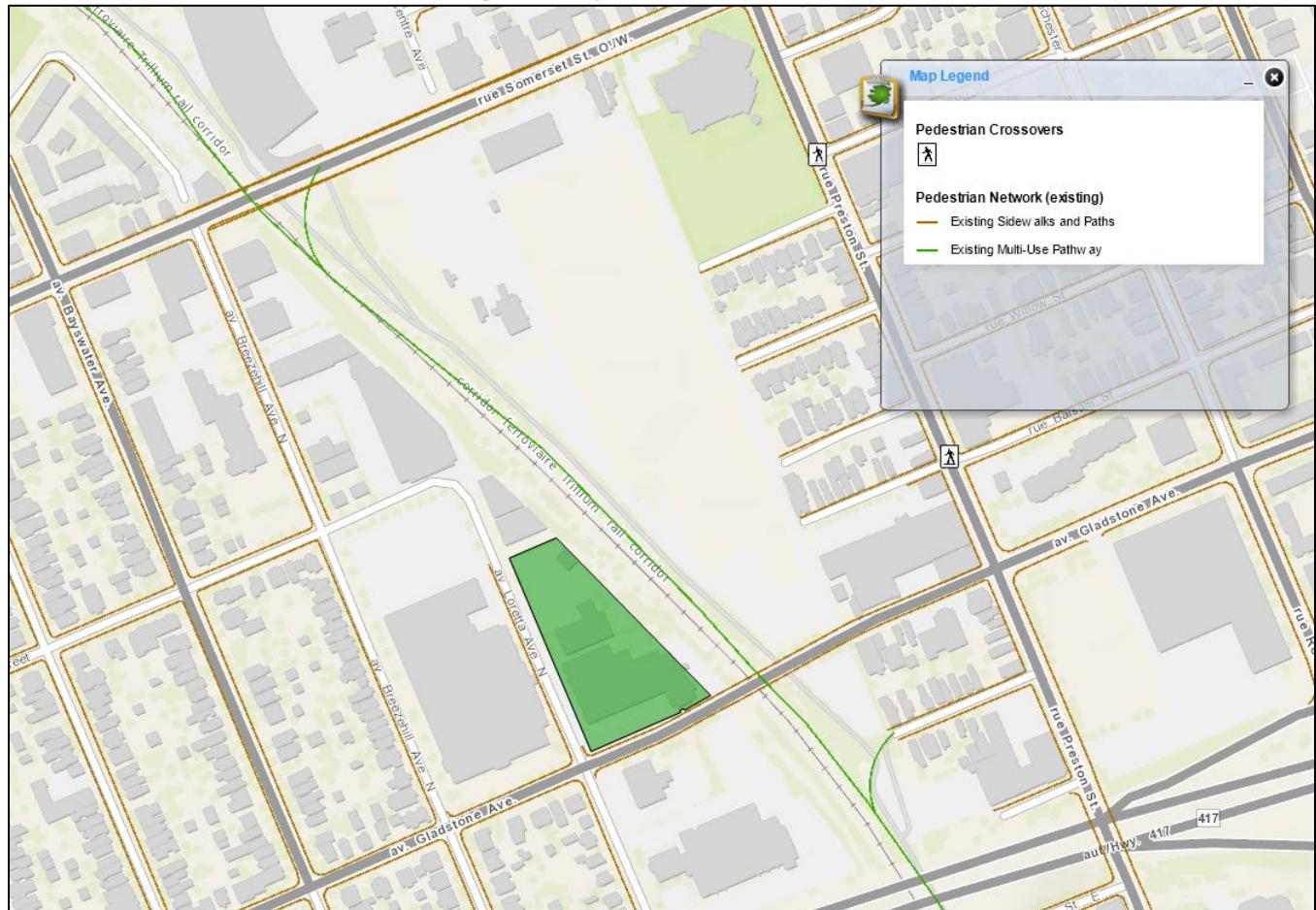
2.2.4 Existing Cycling and Pedestrian Facilities

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

Sidewalks are provided along both sides of the roadways in the study area with the exception of the east side of Breezehill Avenue between Gladstone Avenue and Laurel Street, on both sides of Laurel Street, and the east side of Loretta Avenue North. The Trillium Pathway is a multi-use pathway along the east side of the Trillium Rail Corridor.

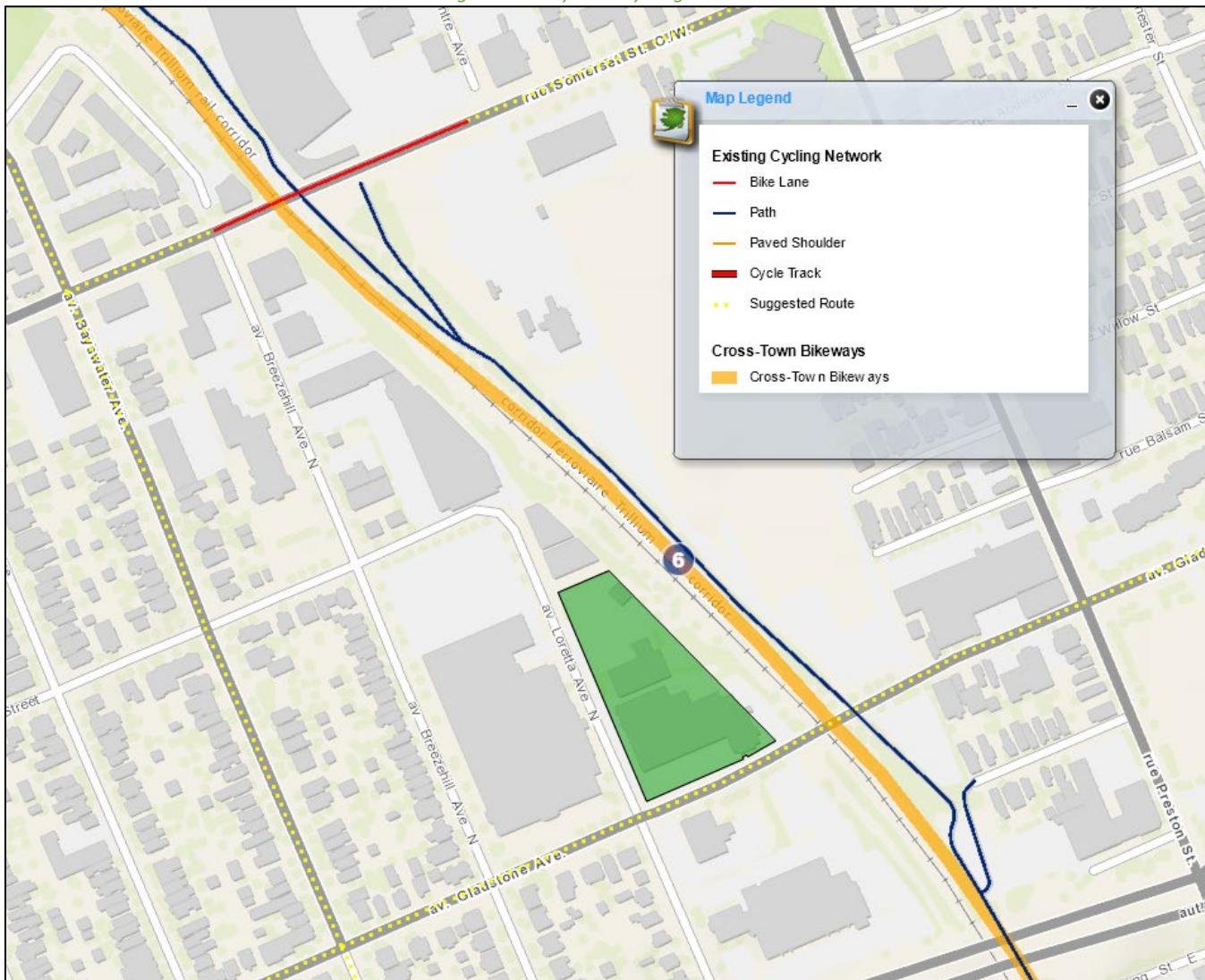
The cycling network consists of the Trillium Pathway as a cross-town bikeway, suggested biking routes along Gladstone Avenue, Bayswater Avenue and Somerset Street W, including bike lanes on the bridge over the Trillium Rail Corridor.

Figure 3: Study Area Pedestrian Facilities



Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: October 5, 2018

Figure 4: Study Area Cycling Facilities



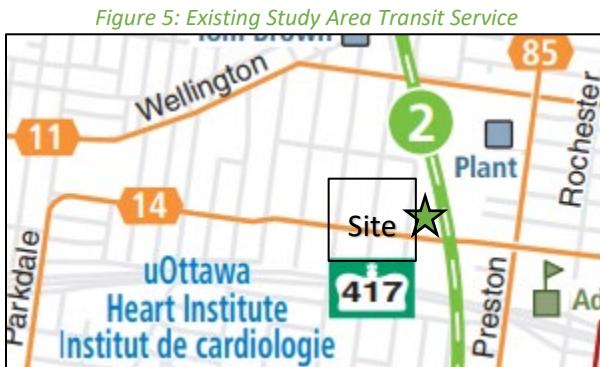
Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: October 5, 2018

2.2.5 Existing Transit

Within the study area, Route #14 operates along Gladstone Avenue, Route #11 along Somerset Street W, and Route #85 along Preston Street. Figure 5 illustrates the transit routes in the study area. The frequency of these routes within proximity to the proposed site is currently:

- Route #11 - every 15-30 minutes, with higher frequency during the commuter peaks and day time
- Route #14 – every 30 minutes, with higher frequency during the commuter peaks and day time
- Route #85 - every 15-30 minutes, with higher frequency during the commuter peaks and day time

The Trillium Station at Carling Avenue is located approximately 1.0 km walking distance to the south and the Bayview Station is approximately 1.1 km walking distance to the north.



Source: <http://www.octranspo.com/> Accessed: October 5, 2018

2.2.6 Existing Area Traffic Management Measures

Within the study area, vertical centreline stake bollards are located along Gladstone Avenue, Breezehill Avenue, and Bayswater Avenue.

2.2.7 Existing Peak Hour Travel Demand

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

Table 1: Intersection Count Date

Intersection	Count Date
Gladstone Avenue and Bayswater Avenue	Wednesday July 27, 2016
Gladstone Avenue and Preston Street	Tuesday June 20, 2017
Somerset Street West and Breezehill Avenue	Thursday August 12, 2015

The intersections were not assigned any growth to estimate the 2018 adjusted traffic counts and Table 9 summarizes the existing study area intersection operations. Figure 6 illustrates the existing traffic volumes.

Detailed turning movement count data is included in Appendix B, and the synchro worksheets are provided in Appendix C.

Figure 6: Existing Traffic Volumes

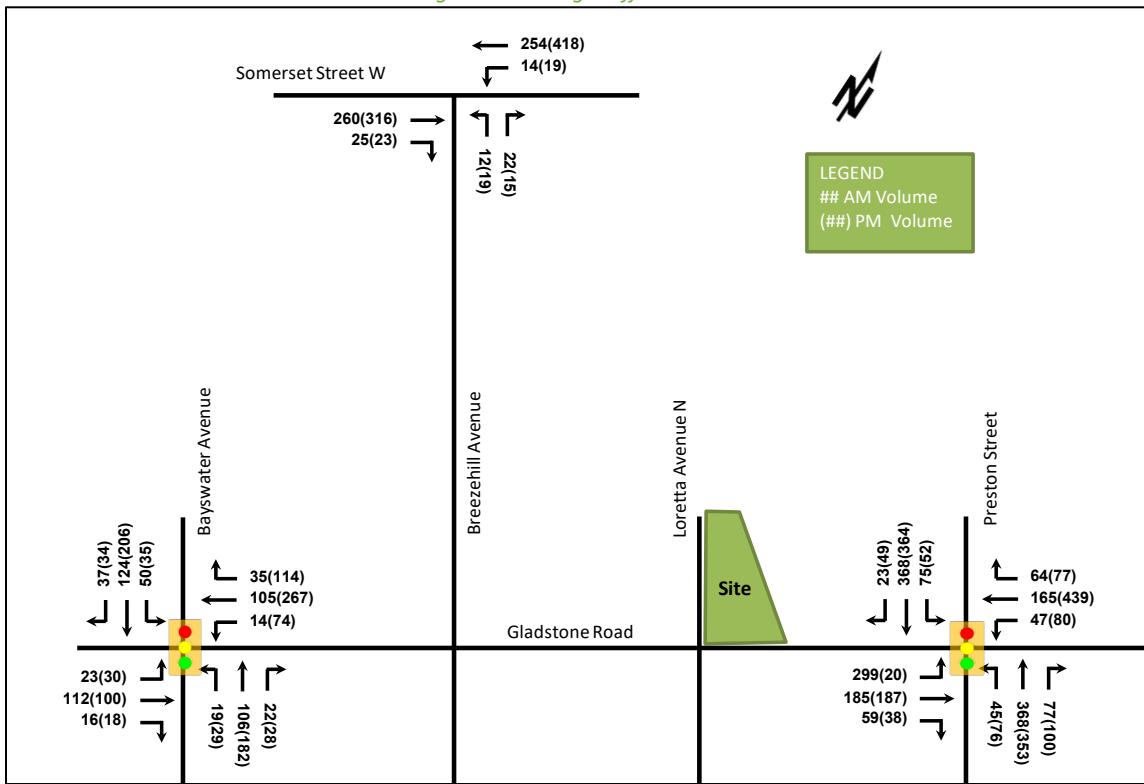


Table 2: Existing Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	Delay	V/C	Q (95 th)	LOS	Delay	V/C	Q (95 th)
Gladstone Avenue & Preston Street Signalized	EB	F	491.6	2.02	#171.3	B	19.7	0.52	41.4
	WBL	C	22.9	0.21	12.5	B	17.4	0.26	16.2
	WBT/R	C	25.5	0.56	43.0	D	44.9	0.93	#115.5
	NBL	A	8.1	0.11	6.8	B	15.4	0.28	14.9
	NBT/R	B	11.5	0.52	53.0	B	19.0	0.65	72.3
	SBL	A	9.4	0.21	10.9	B	14.6	0.21	10.9
	SBT/R	B	10.8	0.46	45.5	B	17.9	0.59	64.3
	Overall	F	160.3	-	-	C	25.8	-	-
Gladstone Avenue & Bayswater Avenue Signalized	EB	C	25.0	0.52	25.9	B	10.5	0.27	15.6
	WB	C	21.7	0.49	24.3	C	24.3	0.80	57.4
	NB	A	5.4	0.15	13.8	B	15.9	0.40	38.7
	SB	A	5.8	0.23	20.0	B	16.9	0.46	45.6
	Overall	B	13.8	-	-	B	18.8	-	-
Somerset Street W & Breezehill Avenue Unsignalized	EB	A	0.0	0.00	0.0	A	0.0	0.00	0.0
	WB	A	0.4	0.01	0.0	A	0.4	0.02	0.1
	NB	B	11.4	0.06	0.2	B	14.6	0.10	0.3
	Overall	A	0.8	-	-	A	0.8	-	-

The existing intersection operations predominantly operate with high levels of service except for the eastbound approach at the Gladstone Avenue and Preston Street during the AM peak hour. The modelled intersection delay is approximately 7 cycle lengths. The left-turn movement currently is approximately 300 vehicles, more than both the through and right turn volumes combined and requires an auxiliary turn lane. The constrained nature of Gladstone Avenue (right-of-way of approximately 15.0m) at Preston Road does not allow the widening of the eastbound approach.

The queue in the westbound through/right-turn lane at the Gladstone Avenue and Preston Street intersection may extend beyond the adjacent private approach accesses.

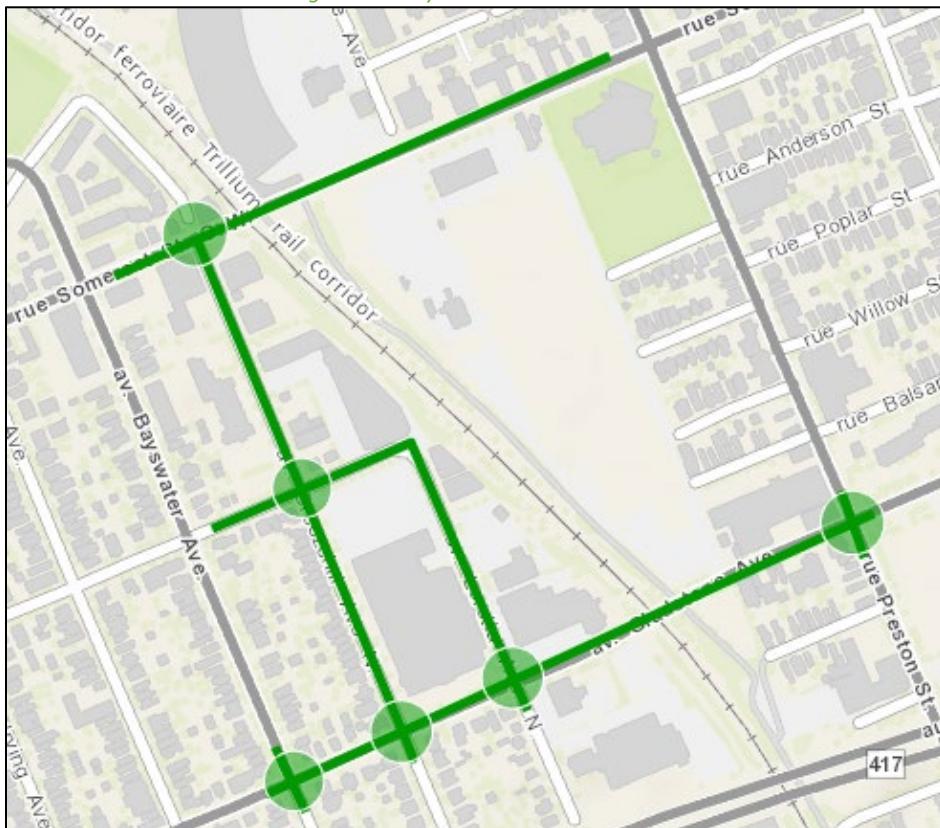
2.2.8 Collision Analysis

Collision data has been acquired from the City of Ottawa open data website (data.ottawa.ca) for four years prior to the commencement of this TIA for the surrounding study area road network. Table 2 summarizes the collisions documented in the study area and Figure 7 illustrates the intersections and segments analyzed.

Table 3: Study Area Collision Summary

		Number	%
Total Collisions		53	100%
Classification	Fatality	0	0%
	Non-Fatal Injury	19	36%
	Property Damage Only	34	64%
Initial Impact Type	Angle	14	26%
	Rear end	10	19%
	Sideswipe	4	8%
	Turning Movement	13	25%
	SMV Other	4	8%
	SMV Unattended	6	11%
	Other	2	4%
Road Surface Condition	Dry	36	68%
	Wet	13	25%
	Loose Snow	2	4%
	Slush	1	2%
	Packed Snow	0	0%
	Ice	1	2%
Pedestrian Involved		0	0%
Cyclists Involved		7	13%

Figure 7: Study Area Collision Records



Of the collisions noted above, 18 collisions occurred at the Gladstone Avenue and Preston Street intersection, and 11 collisions occurred on Somerset Street West between Breezehill Avenue and Preston Street. Along the frontage of the proposed site, a single collision was noted at the Gladstone Avenue and Loretta Avenue North intersection and 2 collisions on Gladstone Avenue between Loretta Avenue North and Preston Street. The other location of note is the Gladstone Avenue and Bayswater Avenue that had a total of 8 collisions.

With respect to the cyclist and pedestrian collisions, the cyclist collisions were all noted at the Gladstone Avenue/Preston Street intersection (4) and the Somerset Street West segment between Breezehill Avenue and Preston Street (3).

Collision data is included in Appendix D.

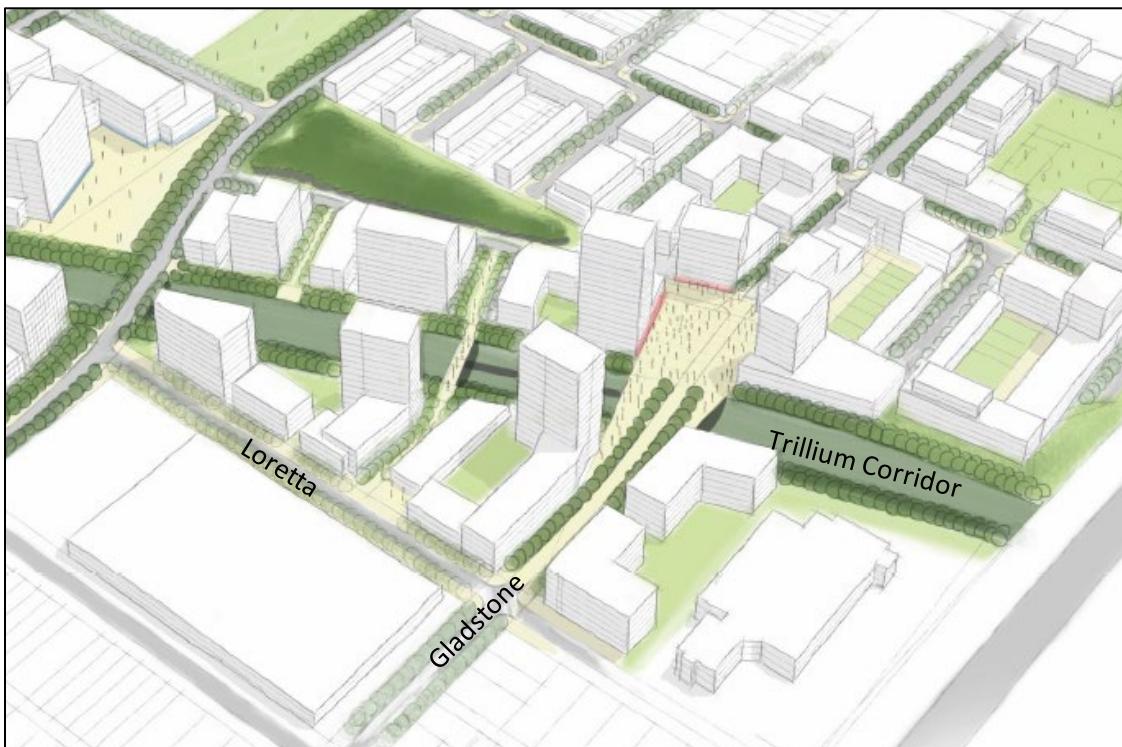
2.3 Planned Conditions

2.3.1 Changes to the Area Transportation Network

The subject development is within the Gladstone Station District CDP (2014) and as such, is subject to the development and planning vision outlined with the CDP. The CDP visioning option for the transit-oriented development node, illustrated in Figure 8, has the following new transportation infrastructure elements:

- Trillium LRT station plaza identified as a node/landmark/gateway for the community
- a multi-use crossing is proposed over the rail line between Gladstone Avenue and Laurel Street W
- a new road connection across the rail line between Laurel Street W and Oak Street

Beyond the station plaza, these improvements are not identified in the City's affordable network and not time frame is available for their construction.

Figure 8: Gladstone Station District CDP Vision & Concept Options Report – Preferred Option: Perspective Looking North-East

2.3.2 Other Study Area Developments

1040 and 1050 Somerset Street

The combined site would include a 32-storey residential building between the Trillium Rail corridor and Breezehill Avenue, and a 23-storey residential building on the west side of Breezehill Avenue. Both sites would include ground floor commercial/retail and provide underground parking. Access to the 1040 site was proposed along Breezehill Avenue and a laneway access on Somerset Street West was proposed for the 1050 site. These files have not advanced since 2013.

989 Somerset Street

The proposed development consists of a mixed-use building with ground floor retail and 127 residential units above. The transportation impact of this site will be primarily on Somerset Street West and Preston Street. In addition, this file has not advanced since 2014.

3 Study Area and Time Periods

3.1 Study Area

The study area will include the intersections of Gladstone Avenue and Bayswater Avenue, Gladstone Avenue and Preston Street, and Somerset Street West and Breezehill Avenue. Gladstone Avenue and Loretta Avenue North are noted as the boundary roads for the site.

The TRANS screenline SL-29 will need to be reviewed along the Trillium rail corridor, for the Gladstone Avenue and Somerset Street W bridge crossings.

3.2 Time Periods

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

3.3 Horizon Years

The anticipated build-out year is 2023. As a result, the full build-out plus five years horizon year is 2028.

4 Exemption Review

Table 3 summarizes the exemptions for this TIA.

Table 4: 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
	4.2.3 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	Required

5 Development-Generated Travel Demand

5.1 Trip Generation and Mode Shares

This TIA has been prepared using the vehicle and person trip rates for the residential components using the TRANS Trip Generation Study Report (2009) and person trip rates for general office and the vehicle trip rates for the retail components using the ITE Trip Generation Manual (10th Edition). To estimate person trip generation for the retail component, a factor of 1.28 has been applied to the ITE rates. Table 4 summarizes the person trip rates for the proposed land uses.

Table 5: Trip Generation Person Trip Rates

Dwelling Type	Land Use Code	Peak Hour	Vehicle Trip Rate	Person Trip Rates
High-rise condominiums (3+ floors)	232 (TRANS)	AM	-	1.03
		PM	-	0.85
General Office (Dense Multi-Use)	710	AM	-	1.51
		PM	-	1.57
Shopping Centre (Dense Multi-Use)	820	AM	2.41	3.08
		PM	4.92	6.3

Using the above Person Trip rates, the total person trip generation has been estimates. Table 5 below illustrates the total person trip generation by dwelling type.

Table 6: Total Person Trip Generation

Land Use	Units / GFA	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
High-rise condominiums	931	268	688	956	459	332	791
General Office	141.75	53	161	214	140	83	223
Shopping Centre	21.69	15	52	67	86	51	137
Total Person Trips	336	901	1,237		685	466	1,151

As the proposed development is within a transit-oriented development zone, TOD mode shares will be applied for the development and are summarized in Table 6.

Table 7: TOD Mode Share

Travel Mode	Mode Share
Auto Driver	15%
Auto Passenger	5%
Transit	65%
Non-Auto	15%
Total	100%

Internal capture rates from the ITE Trip Generation Handbook 3rd Edition assigned to the development for the office and retail components for mixed-use developments. The rates summarized in Table 7 represent the percentage of trips to/from the retail or office uses based on the residential component.

Table 8: Internal Capture Rates

Land Use	AM		PM	
	In	Out	Total	In
General Office	3%	1%	57%	2%
Shopping Centre	17%	14%	10%	26%

Using the above mode shares, person trip rates, and the internal capture rates the person trips by mode have been projected. Table 8 summarizes the trip generation by mode.

Table 9: Trip Generation by Mode

Travel Mode	Mode Share	In	Out	Total	In	Out	Total
Auto Driver	15%	50	134	184	90	68	157
Auto Passenger	5%	17	44	62	30	23	53
Transit	65%	215	579	795	387	294	681
Non-Auto Modes	15%	50	134	184	90	68	157
Internal Capture		5	9	14	89	15	104
Total	100%	336	901	1,237	685	466	1,151

As shown above, 184 AM and 157 PM peak hour two-way vehicle trips are projected as a result of the proposed development.

5.2 Trip Distribution

To understand the travel patterns of the subject development the OD Survey has been reviewed to determine the existing travel patterns. Table 9 below summarizes the distribution.

Table 10: OD Survey Existing Mode Share – Ottawa Inner

To/From	Percent of Trips
North	20%
South	35%
East	25%
West	20%
Total	100%

5.3 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 9: Traffic Assignment (%)

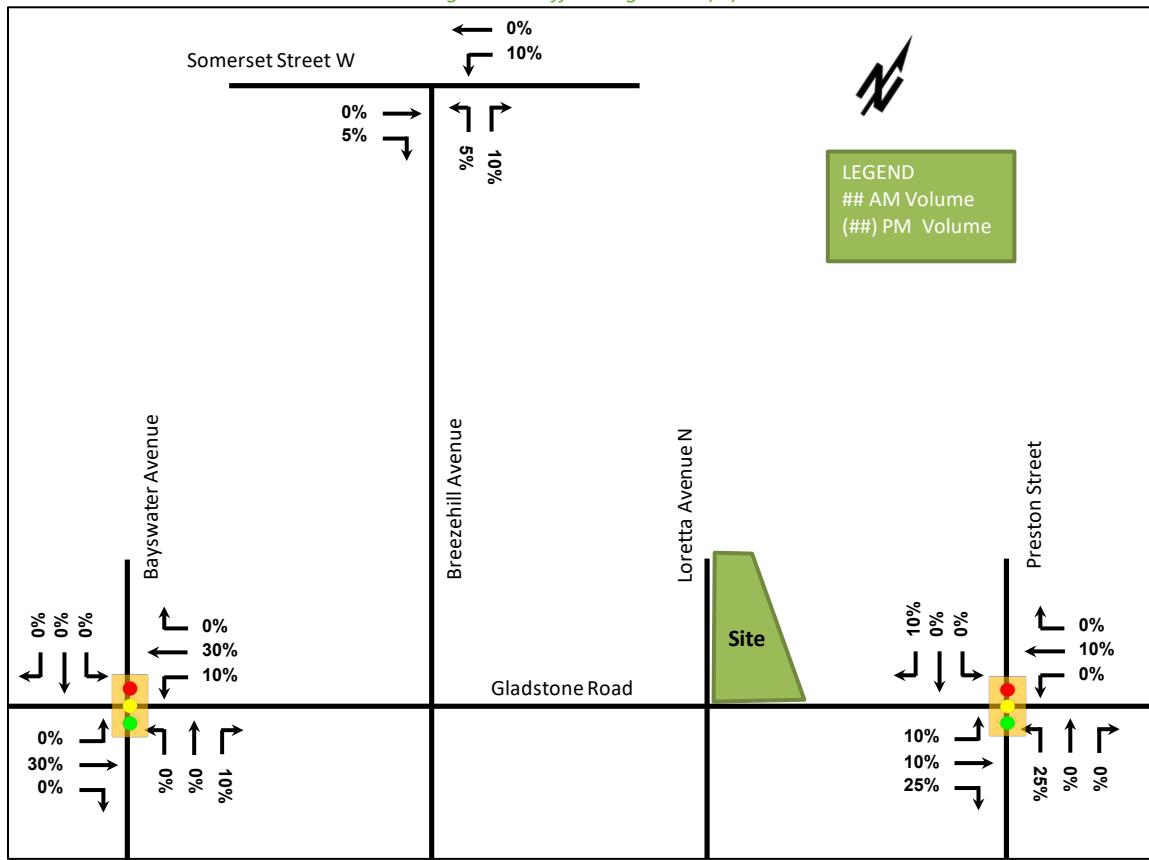
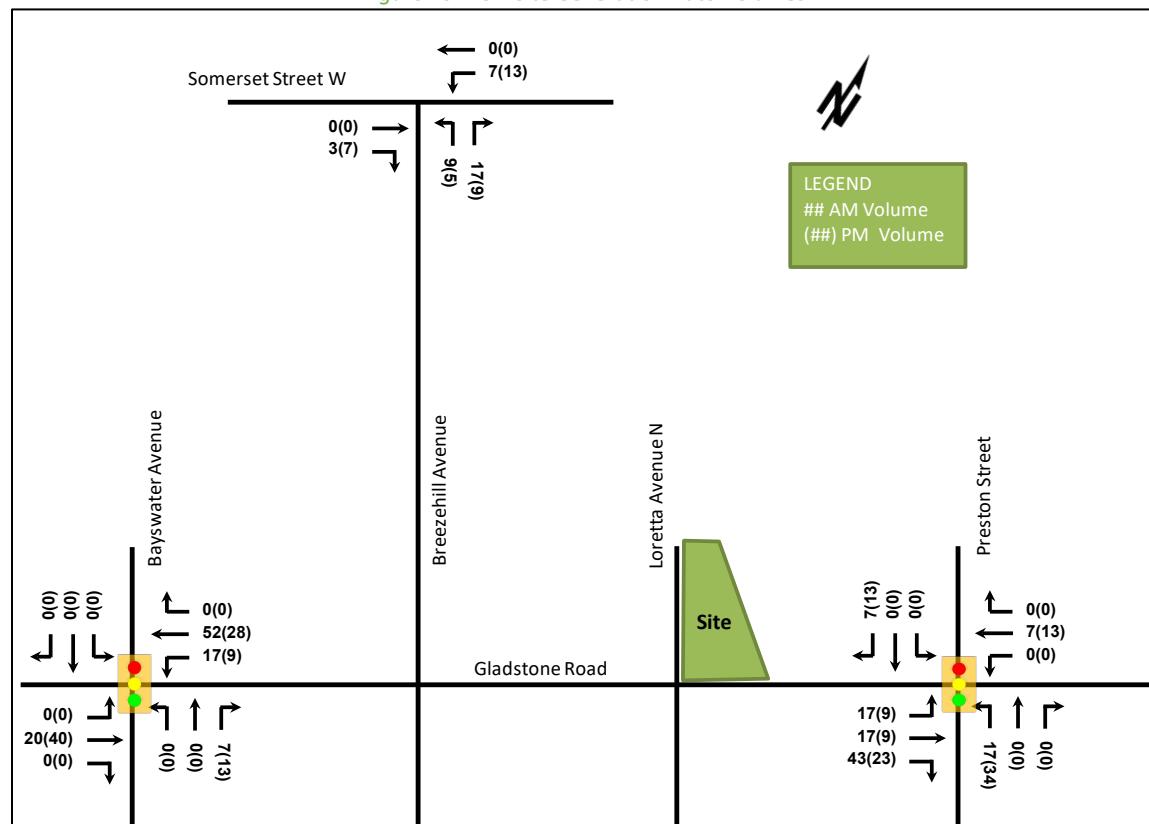


Figure 10: New Site Generation Auto Volumes



6 Background Network Travel Demands

6.1 Transportation Network Plans

The transportation network plans were discussed in Section 2.3.1. Beyond the opening of the Trillium LRT Gladstone Station, no addition network changes have been included the preparation of this TIA.

6.2 Background Growth

The auto demand within the inner area of Ottawa has been documented as decreasing over the past 10 years, resulting in reduced demand on many roadways. As such, no growth has been applied to the study area intersections.

6.3 Other Developments

No background developments were explicitly considered as part of this TIA.

The future background traffic volumes are anticipated to remain the same as the existing conditions and no improvements are recommended.

7 Demand Rationalization

The existing SL-29 screenline two-way volumes, by mode, along the Trillium rail corridor for the Gladstone Avenue and Somerset Street W crossings has been summarized in Table 9. The auto volumes are approximately 60% to the east during the AM peak and 70% to the west during the PM peak. The theoretical capacity of these roadways could range between 700-900 vehicles per lane, which would provide approximately 30% or more residual capacity in the peak direction for each of these roadways, or be the equivalent to a level of service B.

Table 11: SL-29 Screenline Summary

Vehicle/Mode	Gladstone Bridge		Somerset Bridge	
	AM	PM	AM	PM
	404	676	494	850
	72	61	120	135
	57	65	168	264
	91	86	88	41
	9	10	10	9

Based on the capacity analysis and screenline data, no capacity constraints are currently noted for the area and rationalization for adjusted demand is not required for this TIA.

8 Transportation Demand Management

8.1 Context for TDM

The mode shares used within the TIA represent the planning level targets for a transit-oriented design (TOD). Should these mode shares not be reached, the subject site accesses Loretta Avenue, connecting to Gladstone Avenue and Breezehill Avenue, will see an impact on the adjacent residential land-uses. If the travel modes match the existing Ottawa West area mode shares, this would increase the vehicular traffic by over 3 times the TOD mode shares.

The subject site is within a TOD area. Tenants have not been finalized at this time, therefore any relocations from within Ottawa-Gatineau or the specific business operations cannot be confirmed until the tenants are known.

For the residential land use, total bedrooms within the development is subject to final owner purchasing preferences and no age restrictions are noted. The retail and office land uses will be determined by lease options and are entirely dependant on tenants to determine the number and occupation of employees, and clients/customers travelling from the Ottawa-Gatineau area and within 2.0km of the site.

8.2 Need and Opportunity

The subject site has been assumed to rely predominantly on transit due to the proximity to the future Gladstone LRT Station. As mentioned above, a decrease in the assumed 65% transit mode share to the existing 50% auto mode share for the area, would see an increase of over 3 times the auto trips from the proposed development.

The development is planned to coincide with the Gladstone Station construction. The convenience of the transit station should provide the opportunity to reach the forecast transit mode share, although incentives for new residential tenants exists within the TDM framework. Hard measures, such as reduced parking provisions, would limit the risk of higher auto mode shares being produced from the site.

8.3 TDM Program

The “suite of post occupancy TDM measures” has been summarized in the TDM checklists for both the residential and non-residential land uses. The checklist is provided in Appendix E.

The key TDM measures recommended include:

- Enhanced connectivity of pedestrians and cyclists to the adjacent network and adjacent Gladstone LRT station
- Engagement with local bike share programs (e.g. VeloGO) to include onsite space for bike rack/storage
- Posting of pedestrian, cycling, and transit information and maps at primary entrances/exits
- Inclusion of a 1-month Presto card for first time new residential tenants, along with a set time frame for this offer (e.g. 6-months) from the ‘opening’ of the building/tower.

9 Neighbourhood Traffic Management

The existing (and future background) volumes along Gladstone Avenue at Preston Avenue are approximately 550 vehicles during the peak hours in the peak direction. This exceeds the TIA Guidelines threshold of 300 vehicles during the peak hour. This threshold is too low for collector roadways and is not considered to be an existing or background issue, and the increase of approximately 60-70 vehicles during the peak hours in the peak direction from the subject site is not considered significant for a collector roadway.

10 Transit

10.1 Route Capacity

The existing Trillium line provides capacity for 1,000 passengers per direction per hour on a 15-minute service schedule. The future plans include a study increase in service time to 8-minutes (1,750 passengers per direction per hour) as demand increases.

Based on the trip distribution and forecasted transit trips for the site, an upper limit of 375 northbound and 200 southbound outbound trips during the AM peak, and 200 northbound and 135 southbound inbound trips during the PM peak could be expected on the Trillium LRT. The range of the impacts are 13.5-37.5% of the existing service capacity of the Trillium LRT. Therefore, a revised service time schedule of 10-12 minutes may be required to support this development.

If a maximum of 10% of the transit mode share utilizes the existing route #14, this may see the need for an additional single bus (55-person capacity) during the peak hours to accommodate the additional demand.

10.2 Transit Priority

No transit priority is required/considered for the study area.

11 Review of Network Concept

The background and forecasted site trips do not exceed the anticipated lane capacities on the boundary road network. The construction and connectivity to the future Gladstone LRT Station is a priority to ensure the transit modal share is achieved and there is a minimal impact on the road network.

12 Network Intersection Design

12.1 Intersection Control

The operation of the Somerset Street W and Breezehill Avenue intersection does not warrant signalization. The warrant calculation has been provided in Appendix F.

12.2 Intersection Design

12.2.1 Total Future Conditions

The future total future traffic volumes for both the 2023 and 2028 horizons are the same and have been illustrated in Figure 11 and the intersection operations are summarized in Table 9. The level of service is based on the HCM criteria for average delay at unsignalized and signalized intersections. The synchro worksheets have been provided in Appendix G.

Figure 11: Future Total Traffic Volumes

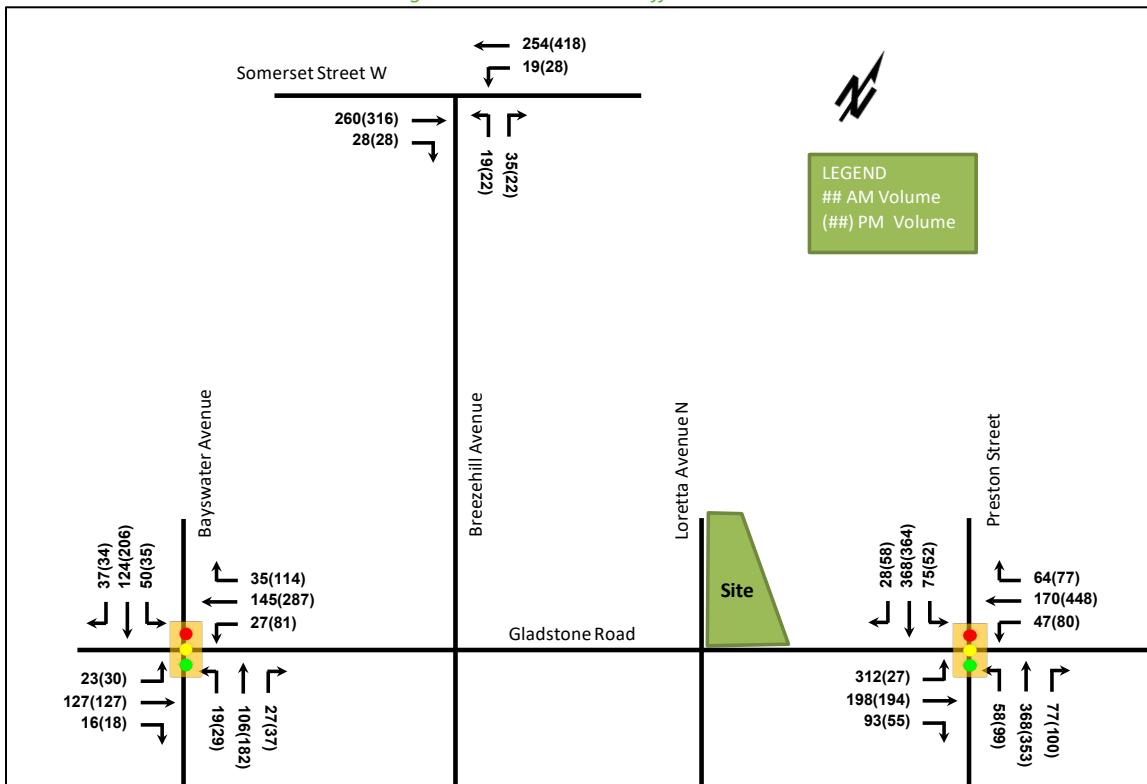


Table 12: Future Total Access Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	Delay	V/C	Q (95 th)	LOS	Delay	V/C	Q (95 th)
Gladstone Avenue & Preston Street Signalized	EB	F	423.6	1.87	#167.5	C	20.5	0.55	41.6
	WBL	C	22.9	0.20	11.7	B	17.5	0.25	14.8
	WBT/R	C	24.3	0.52	39.4	D	39.4	0.89	#101.1
	NBL	A	8.1	0.12	7.6	B	15.0	0.28	16.8
	NBT/R	B	10.6	0.47	45.7	B	16.5	0.57	62.3
	SBL	A	8.8	0.17	9.6	B	13.2	0.16	9.5
	SBT/R	B	10.2	0.42	40.4	B	16.0	0.53	57.5
	Overall	F	146.4	-	-	C	23.2	-	-
Gladstone Avenue & Bayswater Avenue Signalized	EB	C	22.6	0.47	24.3	B	11.4	0.30	16.9
	WB	C	24.5	0.57	29.2	C	24.0	0.79	53.6
	NB	A	5.9	0.16	13.7	B	14.8	0.36	35.6
	SB	A	6.6	0.23	19.3	B	15.6	0.40	40.2
	Overall	B	15.1	-	-	B	18.2	-	-
Somerset Street W & Breezehill Avenue Unsignalized	EB	A	0.0	0.00	0.0	A	0.0	0.00	0.0
	WB	A	0.5	0.02	0.0	A	0.5	0.02	0.1
	NB	B	11.2	0.09	0.3	B	13.6	0.10	0.3
	Overall	A	1.2	-	-	A	1.0	-	-

The future total intersection operations are similar to the existing conditions.

No signal timing changes have been applied due to the coordinated timing of the corridors through the study area.

12.2.2 Design Elements

No intersection modifications are recommended for the study area intersections.

13 Summary of Improvements Indicated and Modifications Options

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

Proposed Site and Screening

- The proposed site includes 931 residential units, 141,750 sq. ft of office space, and 21,686 sq. ft. of retail space and is located on the northeast quadrant of the Gladstone Avenue and Loretta Avenue N intersection
- A one-way access loop will be provided along Loretta Avenue N and the existing access on Gladstone Avenue will continue to be used
- A pedestrian connect to the future Gladstone LRT Station is also proposed
- The development is proposed to be completed as a single phase by 2023
- The Trip Generation, Location, and Safety triggers were all met for the TIA Screening

Existing Conditions

- Gladstone Avenue (collector), Loretta Avenue N, Breezehill Avenue, Bayswater Avenue (collector), Preston Street (arterial), and Somerset Street W (arterial) are the local road ways, posted at 40km/h or unposted at 50 km/h
- The study area roads have sidewalks on at least one side of the local roads and both sides of the collectors and arterials
- Bike lanes are provided on Somerset Street W, east of Breezehill Avenue, and Gladstone Avenue, Bayswater Avenue and Somerset Street W are suggested bike routes
- The Trillium Pathway runs along the east side of the Trillium LRT corridor
- The existing transit route #14 travels along Gladstone Avenue, route #11 along Somerset Street W and #85 along Preston Street
- The Carling and Bayview Trillium LRT Stations are within a 1.1km walk from the site
- The eastbound approach of the Gladstone Avenue and Preston Street intersection may be experience significant delays during the AM peak
- No other operational issues are noted for the study area intersections

Development Generated Travel Demand

- The proposed development is forecasted to generate 1,237 people two-way trips during the AM peak and 1,151 people two-way trips during the PM peak
- Based on the transit-oriented design area mode shares, a total of 184 two-way vehicle trips will be generated during the AM peak and 157 two-way vehicles trips during the PM peak
- The distribution of the site trips is estimated to be 20% to the north, 35% to the south, 25% to the east, and 20% to the west

Background Conditions

- Adjacent developments have either been on hold for extended periods of time with an unknown horizon, or are too small to have a noticeable impact on the adjacent road network
- Additionally, the background growth in the Ottawa core has been decreasing and a 0% growth was assumed for the area
- The future background intersection operations are the same as the existing intersections

Design Review Component

- The review of the Development Design, Parking, Boundary Street Design, and Access Intersection Design will be completed during the Site Plan submission

TDM

- The development is planned to be completed along side the future Gladstone LRT Station and is the primary supportive infrastructure element to achieve the assumed mode shares and site success
- Additional supportive TDM measures include:
 - Enhanced connectivity of pedestrians and cyclists to the adjacent network and adjacent Gladstone LRT station
 - Engagement with local bike share programs (e.g. VeloGO) to include onsite space for bike rack/storage
 - Posting of pedestrian, cycling, and transit information and maps at primary entrances/exits
 - Inclusion of a 1-month Presto card for first time new residential tenants, along with a set time frame for this offer (e.g. 6-months) from the 'opening' of the building/tower.

Neighbourhood Traffic Management

- The TIA thresholds are met for the existing and background conditions for collector roadways on Gladstone Avenue
- The forecasted site traffic will be minimal and it is not considered an issue for the adjacent neighbourhood

Transit

- The forecasted transit trips will include 795 two-way trips during the AM peak and 681 two-way trips during the PM peak
- An additional peak hour bus for route #14 may be required to support the proposed development
- The Trillium LRT service time may need to be increased, reducing the 15-minute service time to a 10-12-minute service time to support the proposed development
- No transit priority measures are recommended

Review of Network Concept

- The site is not anticipated to impact the transportation network concepts

Network Intersection Design

- No improvements for the study area intersection are required to support the proposed development
- The existing operational issues are not exacerbated by the additional site auto traffic

14 Next Steps

Following the circulation and review of this OPA/ZBA Forecasting report, any outstanding comments, within the context of an OPA/ZBA submission, will be addressed. Once confirmed, an updated TIA report will be completed for the Site Plan submission, pending developer timelines. This updated report will update the forecasting report modules and provide the Design Review Component analysis of the TIA guidelines.

Appendix A

TIA Screening Form and PM Certification Form



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.

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: 13 Markham Avenue
City / Postal Code: Ottawa / K2G 3Z1
Telephone / Extension: (613) 697-3797
E-Mail Address: Andrew.Harte@CGHTransportation.com



City of Ottawa 2017 TIA Guidelines

Step 1 - Screening Form

Date: Oct. 5, 2018

Project Number: 2018-36
Project Reference: Trinity - Gladstone-Loretta

1.1 Description of Proposed Development	
Municipal Address	951 Gladstone Ave, 145 Loretta Ave N
Description of Location	PLAN 73 BLK C LOTS 2 AND 3;PT LOT 1 WCA LOTS 1 TO 4 ELA;PT BLK C PT CHAMPAGNE AVE; PLAN 73 BLK C LOTS 5 TO 8
Land Use Classification	Apartments (Bachelor-3 Bdrm), Office, Retail
Development Size	Apartments: 931 units, Office: 141,750 sq. ft, Retail 21,686 sq.ft
Accesses	2 accesses, Loretta Ave
Phase of Development	Single Phase
Buildout Year	2023
TIA Requirement	Full TIA Required

1.2 Trip Generation Trigger		
Land Use Type	Townhomes or apartments	
Development Size	931	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?	Yes
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?	Yes
Location Trigger	Yes

1.4. Safety Triggers	
Are posted speed limits on a boundary street are 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
Is the proposed driveway within auxiliary lanes of an intersection?	No
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?	No
Does the development include a drive-thru facility?	No
Safety Trigger	No

Appendix B

Turning Movement Counts



Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

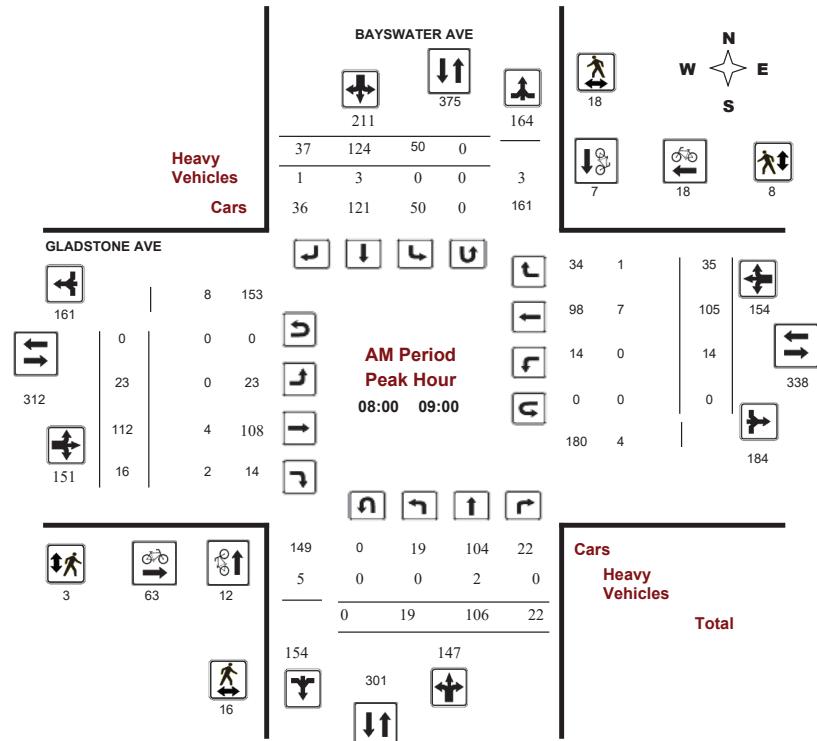
BAYSWATER AVE @ GLADSTONE AVE

Survey Date: Wednesday, July 27, 2016

Start Time: 07:00

WO No: 36100

Device: Miovision



Comments



Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

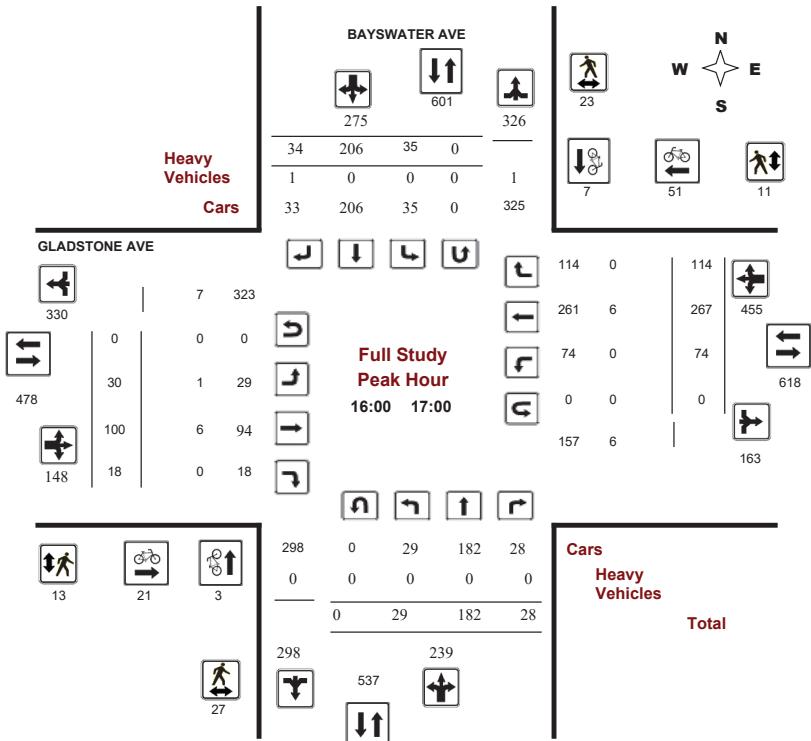
BAYSWATER AVE @ GLADSTONE AVE

Survey Date: Wednesday, July 27, 2016

Start Time: 07:00

WO No: 36100

Device: Miovision



Comments



Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

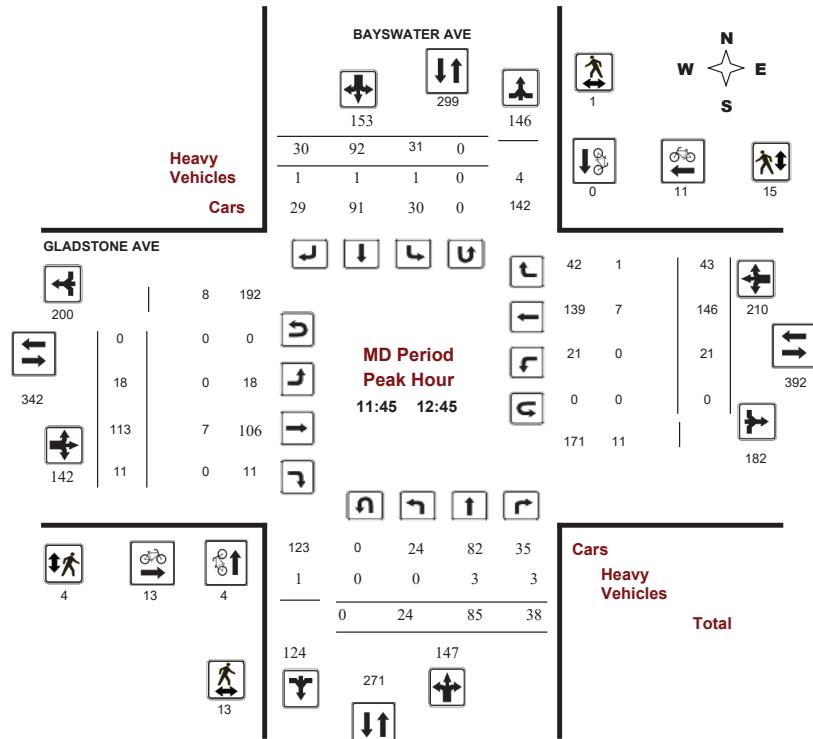
BAYSWATER AVE @ GLADSTONE AVE

Survey Date: Wednesday, July 27, 2016

Start Time: 07:00

WO No: 36100

Device: Miovision



Comments



Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

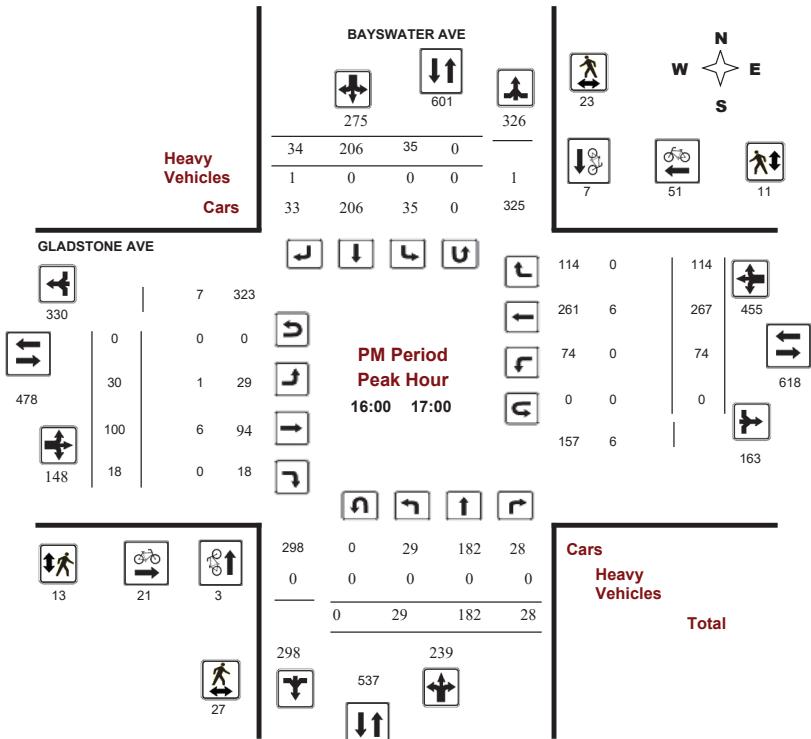
BAYSWATER AVE @ GLADSTONE AVE

Survey Date: Wednesday, July 27, 2016

Start Time: 07:00

WO No: 36100

Device: Miovision



Comments



Transportation Services - Traffic Services
Turning Movement Count - Cyclist Volume Report

Work Order
35301

BREEZEYHILL AVE @ SOMERSET ST

Count Date: Thursday, August 13, 2015

Start Time: 07:00

BREEZEYHILL AVE			SOMERSET ST			Grand Total	
Time Period	Northbound	Southbound	Street Total	Eastbound	Westbound		
07:00 08:00	6	0	6	38	24	62	68
08:00 09:00	17	0	17	99	39	138	155
09:00 10:00	6	0	6	33	28	61	67
11:30 12:30	4	0	4	28	25	53	57
12:30 13:30	2	0	2	21	30	51	53
15:00 16:00	3	0	3	41	34	75	78
16:00 17:00	3	0	3	50	79	129	132
17:00 18:00	4	0	4	59	101	160	164
Total	45	0	45	369	360	729	774

Comment:



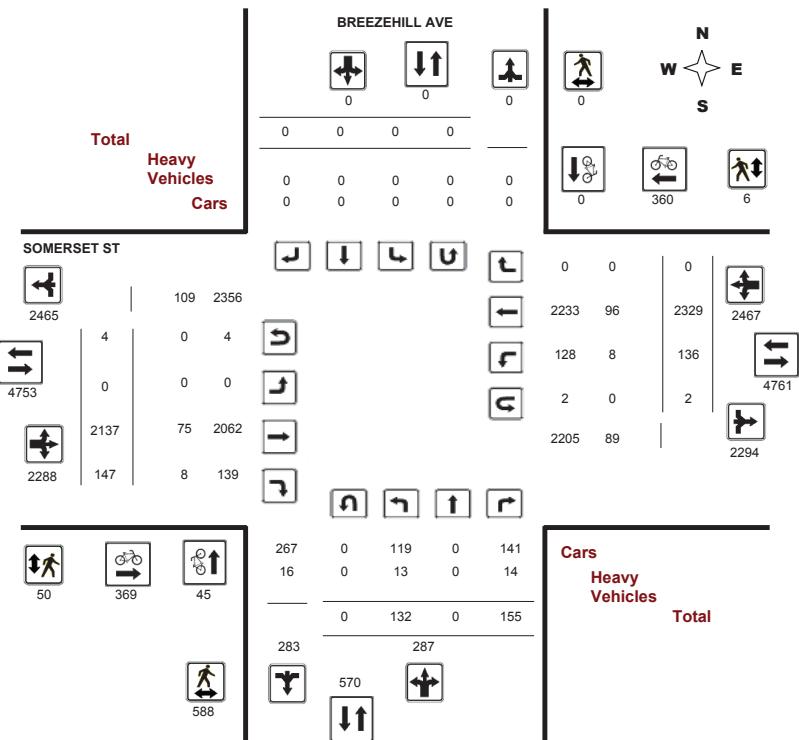
Transportation Services - Traffic Services
Turning Movement Count - Full Study Diagram

BREEZEYHILL AVE @ SOMERSET ST

Survey Date: Thursday, August 13, 2015

WO#: 35301

Device: Mivision



Comments

Note: These volumes consists of bicycles only (no mopeds or motorcycles) and ARE NOT included in the Turning Movement Count Summary.

2018-Sep-27

Page 1 of 1

2018-Sep-27

Page 1 of 1



Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

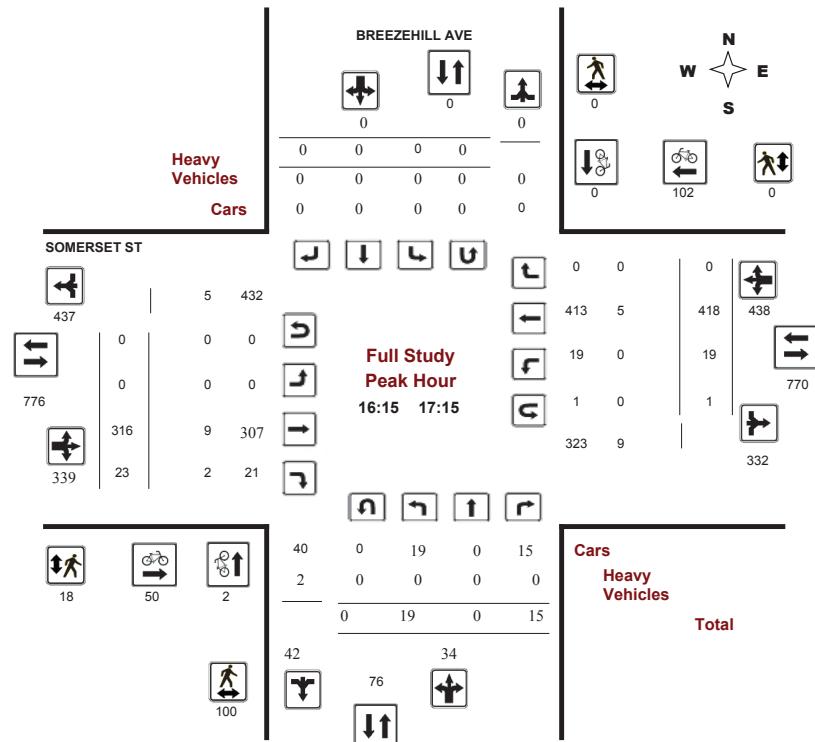
BREEZEYHILL AVE @ SOMERSET ST

Survey Date: Thursday, August 13, 2015

Start Time: 07:00

WO No: 35301

Device: Miovision



Comments



Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

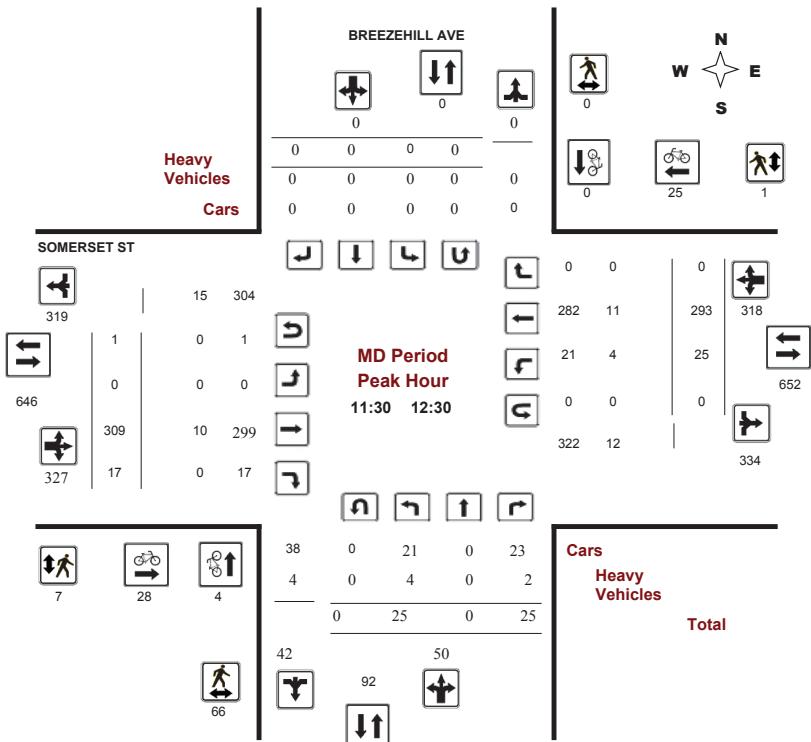
BREEZEYHILL AVE @ SOMERSET ST

Survey Date: Thursday, August 13, 2015

Start Time: 07:00

WO No: 35301

Device: Miovision



Comments



Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

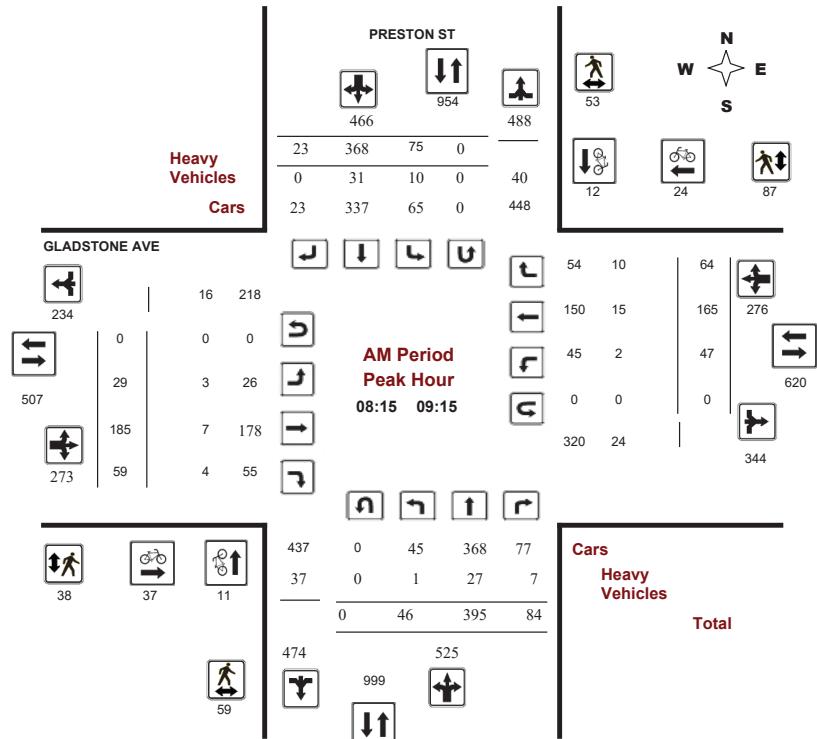
GLADSTONE AVE @ PRESTON ST

Survey Date: Tuesday, June 20, 2017

Start Time: 07:00

WO No: 37132

Device: Miovision



Comments



Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

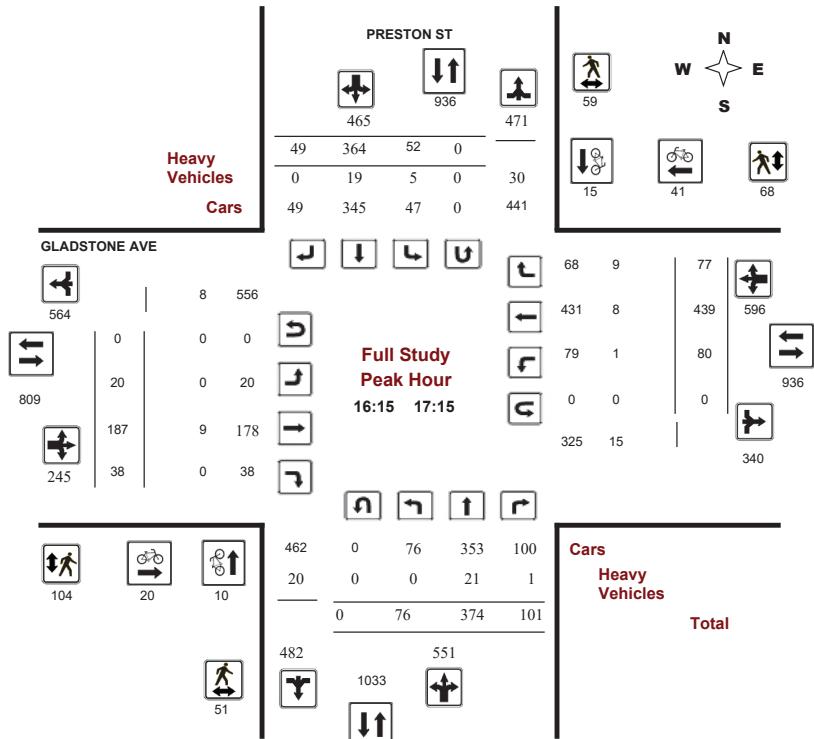
GLADSTONE AVE @ PRESTON ST

Survey Date: Tuesday, June 20, 2017

Start Time: 07:00

WO No: 37132

Device: Miovision



Comments



Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

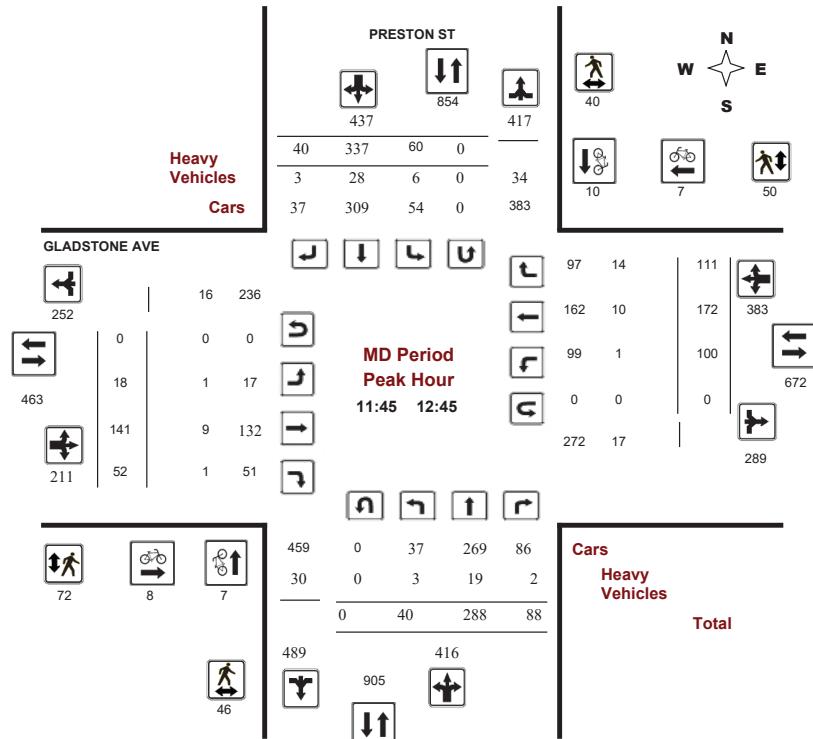
GLADSTONE AVE @ PRESTON ST

Survey Date: Tuesday, June 20, 2017

Start Time: 07:00

WO No: 37132

Device: Miovision



Comments



Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

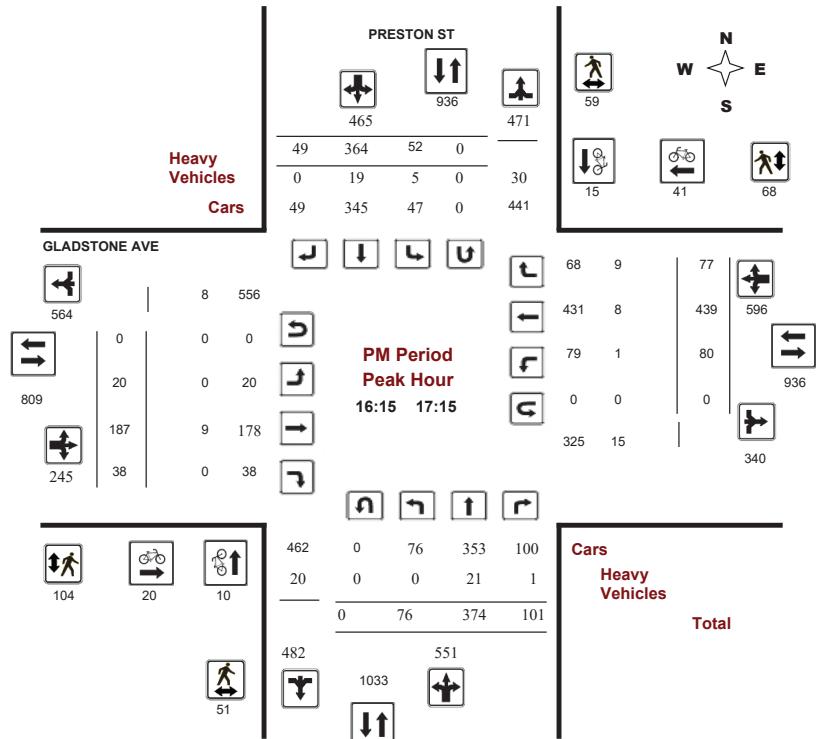
GLADSTONE AVE @ PRESTON ST

Survey Date: Tuesday, June 20, 2017

Start Time: 07:00

WO No: 37132

Device: Miovision



Comments



Transportation Services - Traffic Services

Work Order
37132

Turning Movement Count - 15 Min U-Turn Total Report

GLADSTONE AVE @ PRESTON ST

Survey Date: Tuesday, June 20, 2017

Time Period	Northbound U-Turn Total	Southbound U-Turn Total	Eastbound U-Turn Total	Westbound U-Turn Total	Total
07:00 - 07:15	0	0	0	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	1	0	1
09:45 - 10:00	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
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	1	0	1

Appendix C

Existing Synchro Worksheets

Lanes, Volumes, Timings	
1: Preston & Gladstone	
Maximum v/c Ratio: 0.83	
Intersection Signal Delay: 25.8	Intersection LOS: C
Intersection Capacity Utilization: 80.8%	ICU Level of Service: D
Analysis Period (min) 15	# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.	
Splits and Phases:	1: Preston & Gladstone
37s (R)	33s (G) 04s (Y) 06s (R)
37s	33s (G) 08s 33s (R)

Lanes, Volumes, Timings	
2: Bayswater & Gladstone	
11-12-2018	11-12-2018
Lane Group	
Lane Configurations	
Traffic Volume (vph)	30
Future Volume (vph)	30
Satd. Flow (prot)	0
Flt Permitted	0.874
Satd. Flow (perm)	0
Satd. Flow (RTOR)	17
Lane Group Flow (vph)	0
Turn Type	
Permitted Phases	4
Permitted Phases	4
Detector Phase	4
Switch Phase	
Minimum Initial (%)	100
Minimum Split (s)	21.5
Minimum Split (s)	21.5
Total Split (%)	60.0%
Yellow Time (s)	3.0
All-Red Time (s)	2.5
Lost Time Adjust (s)	0.0
Total Lost Time (s)	5.5
Lead/Lag	
Lead-Lag Optimize?	
Recall Mode	None
Act Effect Green (s)	24.0
Actuated g/C Ratio	0.40
v/c Ratio	0.27
Control Delay	10.5
Queue Delay	0.0
Total Delay	10.5
LOS	B
Approach Delay	10.5
Approach LOS	B
Queue Length 50th (m)	9.3
Queue Length 95th (m)	15.6
Internal Link Dist (m)	86.5
Turn Bay Length (m)	
Base Capacity (vph)	754
Starvation Cap Reductn	0
Spillback Cap Reductn	0
Storage Cap Reductn	0
Reduced v/c Ratio	0.22
Intersection Summary	
Cycle Length: 60	
Actuated Cycle length: 60	
Offset: 55 (88%) Referenced to phase 2:NBTL and 6:SBTL, Start of Green	
Natural Cycle: 50	
Control Type: Actuated-Coordinated	

Synchro 10 Light Report
Page 2

Synchro 10 Light Report
Page 3

Lanes, Volumes, Timings
2: Baywater & Gladstone

11-12-2018

HCM 2010 TWSC
3: Breezehill & Somerset

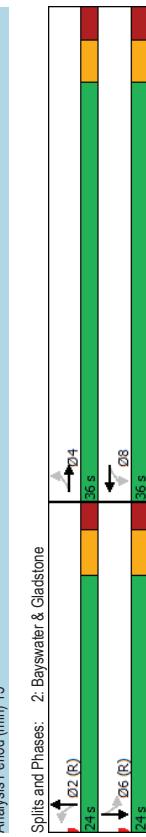
11-12-2018

Maximum v/c Ratio: 0.80
Intersection Capacity Utilization 63.3%
Analysis Period (min) 15

Spills and Phases: 2: Baywater & Gladstone
24 s → 02 (R)
24 s ← 06 (R)
36 s → 04
36 s ← 08
56 s → 06 (R)
56 s ← 04

Intersection LOS: B
ICU Level of Service B

Intersection LOS: B
ICU Level of Service B



Intersection
Int Delay/s/veh 0.3

Movement EBT EBR WBL WBT NBL NBR
Lane Configurations ↗ 316 23 19 418 19 15
Traffic Vol/veh/h 316 23 19 418 19 15
Conflicting Peds. #/hr 0 0 0 0 0 0
Sign Control Free Free Free Stop Stop
RT Channelized - None - None - None - None
Storage Length - - - - 0 0
Veh in Median Storage # 0 0 0 0 0 0
Grade, % - - - - 0 0
Peak Hour Factor 90 90 90 90 90 90
Heavy Vehicles, % 2 2 2 2 2 2
Wmrt Flow 351 26 21 464 21 17

Major/Major	Major1	Major2	Minor1	
Conflicting Flow All	0	0	377 0 870 364	
Stage 1	-	-	- 364 -	
Stage 2	-	-	- 506 -	
Critical Hwy	-	-	- 4.12 - 6.42 6.22	
Critical Hwy Sig 1	-	-	- 5.42 -	
Critical Hwy Sig 2	-	-	- 5.42 -	
Follow-up Hwy	-	-	- 2.218 - 3.518 3.318	
Pot Cap-Maneuver	-	-	- 1181 - 322 681	
Stage 1	-	-	- 703 -	
Stage 2	-	-	- 606 -	
Platoon blocked, %	-	-	-	
Mov Cap:1 Maneuver	-	-	- 1181 - 314 681	
Mov Cap:2 Maneuver	-	-	- 314 -	
Stage 1	-	-	- 703 -	
Stage 2	-	-	- 591 -	
Approach	EB	WB	NB	
HCM Control Delay, s	0	0.4	146	
HCM LOS			B	
Minor Lane/Major Mwmt	NBln1	EBR	WBL	WBT
Capacity (veh/h)	412	-	- 1181 -	
HCM Lane v/c Ratio	0.092	-	- 0.018 -	
HCM Control Delay(s)	14.6	-	- 8.1 0	
HCM Lane LOS	B	-	- A A	
HCM 95th %tile Q(veh)	0.3	-	- 0.1 -	

Appendix D

Collision Data

Appendix E

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
BETTER ★	The measure is one of the most dependable effective tools to encourage the use of sustainable modes

TDM measures: Non-residential developments Check if proposed & add descriptions

1. TDM PROGRAM MANAGEMENT

1.1 Program coordinator

BASIC	Designate an internal coordinator, or contract with an external coordinator	<input checked="" type="checkbox"/>
--------------	---	-------------------------------------

1.2 Travel surveys

BETTER	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	Display local area maps with walking/cycling access routes and key destinations at major entrances	<input checked="" type="checkbox"/>
--------------	--	-------------------------------------

2.2 Bicycle skills training

BETTER ★	Offer on-site cycling courses for commuters, or subsidize off-site courses	<input type="checkbox"/>
-----------------	--	--------------------------

2.3 Valet bike parking

BETTER	Offer secure valet bike parking during public events when demand exceeds fixed supply (e.g. for festivals, concerts, games)	<input type="checkbox"/>
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TDM measures: Non-residential developments Check if proposed & add descriptions		
3. TRANSIT		
3.1 Transit information		
BASIC	Display relevant transit schedules and route maps at entrances	<input checked="" type="checkbox"/>
BASIC	Provide online links to OC Transpo and STO information	<input checked="" type="checkbox"/>
BETTER	Provide real-time arrival information display at entrances	<input checked="" type="checkbox"/>
3.2 Transit fare incentives		
<i>Commuter travel</i>		
BETTER	Offer preloaded PRESTO cards to encourage commuters to use transit	<input checked="" type="checkbox"/>
BETTER ★	Subsidize or reimburse monthly transit pass purchases by employees	<input type="checkbox"/>
<i>Visitor travel</i>		
BETTER	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	Contract with OC Transpo to provide enhanced transit services (e.g. for shift changes, weekends)	<input type="checkbox"/>
<i>Visitor travel</i>		
BETTER	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	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	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		
4.1 Ridematching service		
BASIC	4.1.1 Provide a dedicated ridematching portal at OttawaRideMatch.com	<input type="checkbox"/>
BETTER	4.2 Carpool parking price incentives	
BETTER	4.2.1 Provide discounts on parking costs for registered car pools	<input checked="" type="checkbox"/>
BETTER	4.3 Vanpool service	
BETTER	4.3.1 Provide a vanpooling service for long-distance commuters	<input type="checkbox"/>
5. CARSHARING & BIKE SHARING		
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 checked="" type="checkbox"/>
BETTER	5.1.2 Provide employees with bikeshare memberships for local business travel	<input type="checkbox"/>
5.2 Carshare vehicles & memberships		
BETTER	5.2.1 Contract with provider to install on-site carshare vehicles and promote their use by tenants	<input checked="" type="checkbox"/>
BETTER	5.2.2 Provide employees with carshare memberships for local business travel	<input type="checkbox"/>
6. PARKING		
6.1 Priced parking		
BASIC	6.1.1 Charge for long-term parking (daily, weekly, monthly)	<input type="checkbox"/>
BASIC	6.1.2 Unbundle parking cost from lease rates at multi-tenant sites	<input checked="" type="checkbox"/>
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		
Commuter travel	7.1.1 Provide a multimodal travel option information package to new/relocating employees and students	<input checked="" type="checkbox"/>
Visitor travel	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		
Commuter travel	7.2.1 Offer personalized trip planning to new/relocating employees	<input type="checkbox"/>
7.3 Promotions		
Commuter travel	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		
Commuter travel	8.1.1 Provide emergency ride home service to non-driving commuters	<input type="checkbox"/>
8.2 Alternative work arrangements		
Commuter travel	8.2.1 Encourage flexible work hours	<input type="checkbox"/>
BASIC	8.2.2 Encourage compressed workweeks	<input type="checkbox"/>
BETTER	8.2.3 Encourage telework	<input type="checkbox"/>
8.3 Local business travel options		
Commuter travel	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		
Commuter travel	8.4.1 Offer employees a taxable, mode-neutral commuting allowance	<input type="checkbox"/>
8.5 On-site amenities		
Commuter travel	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** ★ Designate an internal coordinator, or contract with an external coordinator

1.2 Travel surveys

- BETTER** Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress

2. WALKING AND CYCLING

2.1 Information on walking/cycling routes & destinations

- BASIC** ★ Display local area maps with walking/cycling access routes and key destinations at major entrances (*multi-family, condominium*)

2.2 Bicycle skills training

- BETTER** Offer on-site cycling courses for residents, or subsidize off-site courses

4. CARSHARING & BIKE SHARING

4.1 Bikeshare stations & memberships

- BETTER** ★ Contract with OC Transpo to provide early transit services until regular services are warranted by occupancy levels (*subdivision*)

4.2 Carshare vehicles & memberships

- BETTER** Provide shuttle service for seniors homes or lifestyle communities (e.g. scheduled mall or supermarket runs)

5. PARKING

5.1 Priced parking

- BASIC** ★ Unbundle parking cost from purchase price (*condominium*)

- BASIC** ★ Unbundle parking cost from monthly rent (*multi-family*)

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 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		
REQUIRED	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 Official Plan/policy 4.3.3)	<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 Official Plan policy 4.3.12)	<input checked="" type="checkbox"/>

TDM-supportive design & infrastructure measures:		Check if completed & add descriptions, explanations or plan/drawing references
Non-residential developments		
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 checked="" 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 checked="" 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 checked="" 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 checked="" 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 checked="" type="checkbox"/>

TDM-supportive design & infrastructure measures:		Check if completed & add descriptions, explanations or plan/drawing references
Non-residential developments		
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 11</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 11</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 11</i>)	<input checked="" 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 checked="" 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 checked="" 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 Development Design and Infrastructure Checklist
Version 1.0 (30 June 2017)

TDM-Supportive Development Design and Infrastructure Checklist
City of Ottawa
Version 1.0 (30 June 2017)

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 checked="" 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 checked="" 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 checked="" 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 & BIKE SHARING		
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 checked="" 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 104</i>)	<input checked="" 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"/>
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 checked="" 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 checked="" type="checkbox"/>

TDM-supportive design & infrastructure measures: Residential developments		Check if completed & add descriptions, explanations or plan/drawing references
REQUIRED	1.2.3 Provide 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 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 checked="" 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 whenever possible	<input checked="" 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 checked="" 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 checked="" 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 checked="" type="checkbox"/>

TDM-supportive design & infrastructure measures: 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 Official Plan policy 4.3.6)		<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 Zoning By-law Section 111)		<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 Zoning By-law Section 111)		<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 Zoning By-law Section 111)		<input checked="" type="checkbox"/>	
BETTER 2.2.2 Provide secure bicycle parking spaces equivalent to at least the number of units in condominiums or multi-family residential developments		<input checked="" 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 checked="" type="checkbox"/>	
3. TRANSIT			
3.1 Customer amenities			
BASIC 3.1.1 Provide shelters, lighting and benches at any on-site transit stops		<input checked="" 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 checked="" 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 checked="" type="checkbox"/>	

TDM-supportive design & infrastructure measures: Residential / developments		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 & BIKE SHARING			
5.1 Carshare parking spaces			
BETTER 5.1.1 Provide up to three carshare parking spaces in an R3, R4 or R5 Zone for specified residential uses (see Zoning By-law Section 94)		<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 checked="" 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 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 checked="" 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 Zoning By-law Section 104)		<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 Zoning By-law Section 111)		<input checked="" type="checkbox"/>	
6.2 Separate long-term & short-term parking areas			
6.2.1			
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 checked="" type="checkbox"/>	

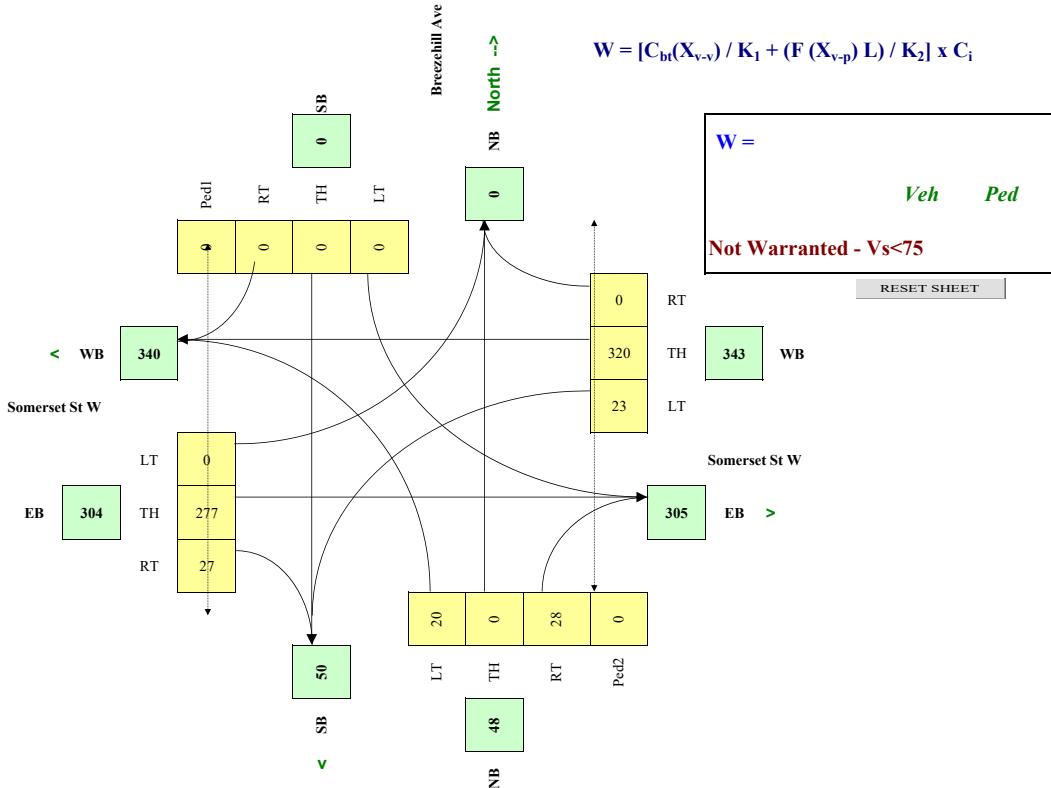
Appendix F

TAC Signal Warrant

City of Ottawa Canadian Matrix Traffic Signal Warrant Analysis

Main Street (name)	Somerset St W			Direction (EW or NS)	EW		Road Authority:	City of Ottawa								
Side Street (name)	Breezehill Ave			Direction (EW or NS)	NS		City:	City of Ottawa								
Quadrant / Int #				Comments Enter Comments about the analysis here.		Analysis Date:										
CHECK SHEET																
press 'CHECK SHEET' button to calculate results																
Lane Configuration		Excl LT	Th & LT	Through	Th+RT+LT	Th& RT	Excl RT	UpStream Signal(m)	# of Thru Lanes							
		Somerset St W	WB	—		Th+RT+LT	Th& RT	Excl RT	455	1						
Somerset St W		EB			1			105	1							
Breezehill Ave		NB		1												
Breezehill Ave		SB														
Demographics																
Elem. School/Mobility Impaired (y/n)																
Senior's Complex (y/n)																
Pathway to School (y/n)																
Metro Area Population (#)																
Central Business District (y/n)																
Set Peak Hours																
Traffic Input	NB			SB			WB			EB						
	LT	Th	RT	LT	Th	RT	LT	Th	RT	LT	Th	RT	W Side	Ped1 NS	Ped2 NS	Ped3 EW
press 'Set Peak Hours' button to set the peak hour periods	17	0	32	0	0	0	17	229	0	0	234	25				
	19	0	35	0	0	0	19	254	0	0	260	28				
	22	0	41	0	0	0	22	298	0	0	305	33				
	17	0	17	0	0	0	22	323	0	0	244	22				
	22	0	22	0	0	0	28	418	0	0	316	28				
	21	0	21	0	0	0	27	399	0	0	302	27				
	Total (6-hour peak)	118	0	168	0	0	0	135	1,921	0	0	1,661	163	0	0	0
Average (6-hour peak)	20	0	28	0	0	0	23	320	0	0	277	27	0	0	0	0

Average 6-hour Peak Turning Movements

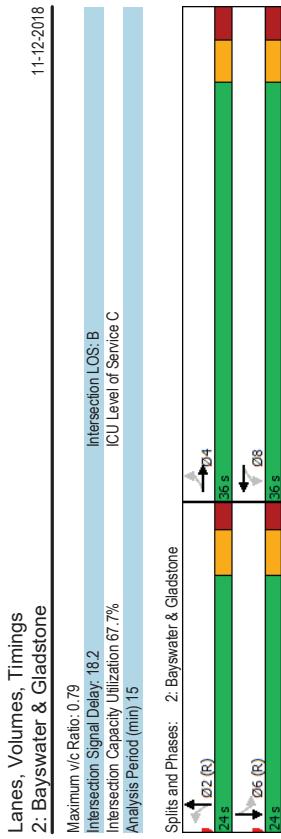


Appendix G

Future Total Synchro Worksheets

Lanes, Volumes, Timings	
1: Preston & Gladstone	
Maximum v/c Ratio: 0.89	
Intersection Signal Delay: 23.2	Intersection LOS: C
Intersection Capacity Utilization: 87.2%	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.	
Splits and Phases:	1: Preston & Gladstone
37s (R)	33s (Y) 0.4
37s	33s (G) 0.5
37s (R)	33s (Y) 0.6
37s	33s (G)

Lanes, Volumes, Timings	
2: Bayswater & Gladstone	
11-12-2018	11-12-2018
Lane Group	EBL EBT EBR WBL WBT WBR
Lane Configurations	4 3 2 1 0 0
Traffic Volume (vph)	30 127 18 81 287 114 29
Future Volume (vph)	30 127 18 81 287 114 29
Std. Flow (prot)	0 1669 0 0 1638 0 0
Flt Permitted	0.893
Satd. Flow (perm)	0 1502 0 0 1508 0 0
Satd. Flow (RTOR)	14 38 15 15 1578 0 0
Lane Group Flow (vph)	0 175 0 0 482 0 0
Turn Type	Perm NA Perm NA Perm NA
Protected Phases	4 4 8 8 2 2 6
Permitted Phases	4 4 8 8 2 2 6
Detector Phase	4 4 8 8 2 2 6
Switch Phase	
Minimum Initial (s)	10.0 10.0 10.0 10.0 10.0 10.0 10.0
Minimum Split (s)	21.5 21.5 21.5 21.5 20.3 20.3 20.3
Maximum Split (s)	36.0 36.0 36.0 36.0 24.0 24.0 24.0
Total Split (%)	60.0% 60.0% 60.0% 60.0% 40.0% 40.0% 40.0%
Yellow Time (s)	3.0 3.0 3.0 3.0 3.3 3.3 3.3
All-Red Time (s)	2.5 2.5 2.5 2.5 2.0 2.0 2.0
Lost Time Adjust (s)	0.0 0.0 0.0 0.0 0.0 0.0 0.0
Total Lost Time (s)	5.5 5.5 5.5 5.5 5.3 5.3 5.3
Lead/Lag	
Lead-Lag Optimized?	
Recall Mode	None
Act Effect Green (s)	23.4
Actuated g/C Ratio	0.39
v/c Ratio	0.30
Control Delay	11.4
Queue Delay	0.0
Total Delay	11.4
LOS	B
Approach Delay	11.4
Approach LOS	B
Queue Length 50th (m)	10.5
Queue Length 95th (m)	16.9
Internal Link Dist (m)	86.5
Turn Bay Length (m)	
Base Capacity (vph)	770
Starvation Cap Reduction	0
Spillback Cap Reduction	0
Storage Cap Reduction	0
Reduced v/c Ratio	0.23
Intersection Summary	
Cycle Length: 60	
Actuated Cycle length: 60	
Offset: 55 (88%), Referenced to phase 2:NBTI and 6:SBTL, Start of Green	
Natural Cycle: 55	
Control Type: Actuated-Coordinated	



HCM 2010 TWSC
3: Breezehill & Somerset

11-12-2018

Intersection		Int Delay /s/veh	1						
Movement		EBT	EBR	WBL	VBL	NBL	NBR		
Lane Configurations		↑							
Traffic Vol. veh/h	316	28	28	418	22	22	22		
Future Vol. veh/h	316	28	28	418	22	22	22		
Conflicting Peds. #/hr	0	0	0	0	0	0	0		
Sign Control	Free	Free	Free	Stop	Stop	Stop	Stop		
RT Channelized	-	None	-	None	-	None	-		
Storage Length	-	-	-	-	-	0	-		
Veh in Median Storage, #	0	-	-	0	0	0	-		
Grade, %	0	-	-	0	0	0	-		
Peak Hour Factor	100	100	100	100	100	100	100		
Heavy Vehicles, %	2	2	2	2	2	2	2		
Wmrt Flow	316	28	28	418	22	22	22		
Major/Major		Major1	Major2	Minor1					
Conflicting Flow All	0	0	344	0	804	330			
Stage 1	-	-	-	-	330	-			
Stage 2	-	-	-	-	474	-			
Critical Hwy	-	-	4.12	-	6.42	6.22			
Critical Hwy Sig 1	-	-	-	-	5.42	-			
Critical Hwy Sig 2	-	-	-	-	5.42	-			
Follow-up Hwy	-	2.218	-	-	3.518	3.318			
Pot Cap-Maneuver	-	-	1215	-	352	712			
Stage 1	-	-	-	-	728	-			
Stage 2	-	-	-	-	626	-			
Platoon blocked, %	-	-	-	-	-	-			
Mov Cap:1 Maneuver	-	-	1215	-	341	712			
Mov Cap:2 Maneuver	-	-	-	-	341	-			
Stage 1	-	-	-	-	728	-			
Stage 2	-	-	-	-	607	-			
Approach	EB	WB	NB						
HCM Control Delay, s	0	0.5	13.6						
HCM LOS		B							
Minor Lane/Major Mvmt		NBln1	EBT	EBR	WBL	WBT			
Capacity (veh/h)	461	-	-	1215	-	-			
HCM Lane V/C Ratio	0.095	-	-	0.023	-	-			
HCM Control Delay (s)	13.6	-	-	8	0	-			
HCM Lane LOS	B	-	-	A	A	-			
HCM 95th %tile Q(veh)	0.3	-	-	0.1	-	-			