250 Besserer Avenue

Transportation Impact Assessment

Step 1 Screening Report

Step 2 Scoping Report

Step 3 Forecasting Report

Step 4 Strategy Report

Prepared for:

HSH Limited Partnership
22 St. Clair Ave East, Suite 1200
Toronto, Ontario, M4T 2S3

Prepared by:

CGH TRANSPORTATION
13 Markham Avenue
Nepean, ON K2G 3Z1

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1 Screening

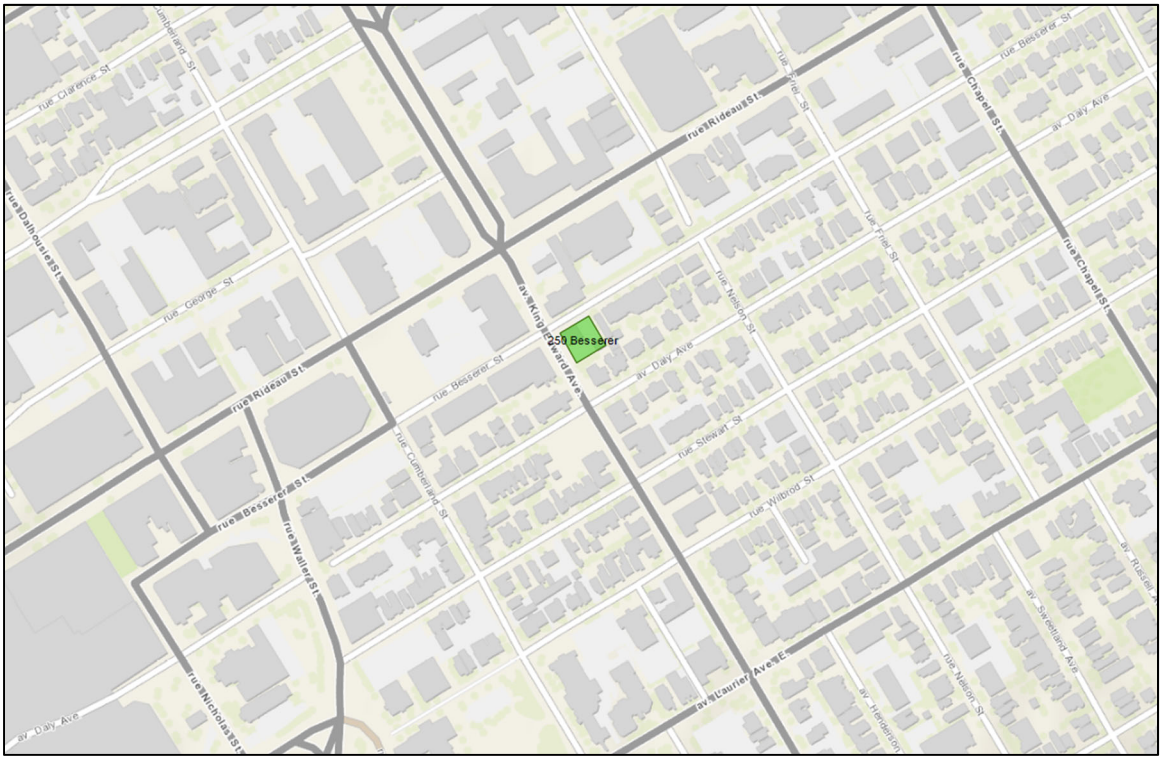
This study has been prepared according to the City of Ottawa's 2017 Transportation Impact Assessment (TIA) Guidelines. Accordingly, a Step 1 Screening Form has been prepared and is included as Appendix A, along with the Certification Form for TIA Study PM. As shown in the Screening Form, a TIA is required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

2 Existing and Planned Conditions

2.1 Proposed Development

The proposed development, located at 250 Besserer Street, is currently zoned as Residential Fifth Density Zone (R5B). The property has an existing 2.5 storey building and a structure on the rear property line. The proposed development would include a total of 99 apartment units and 9 surface visitor parking spaces and 111 bike parking spaces (61 interior, 38 exterior, 12 public rack). The existing depressed curb access on Besserer Street will continue to be used for the access. The depressed curb along King Edward Avenue will be removed. The anticipated full build-out and occupancy horizon is 2021. Figure 1 illustrates the Study Area Context. Figure 2 illustrates the proposed concept plan.

Figure 1: Area Context Plan



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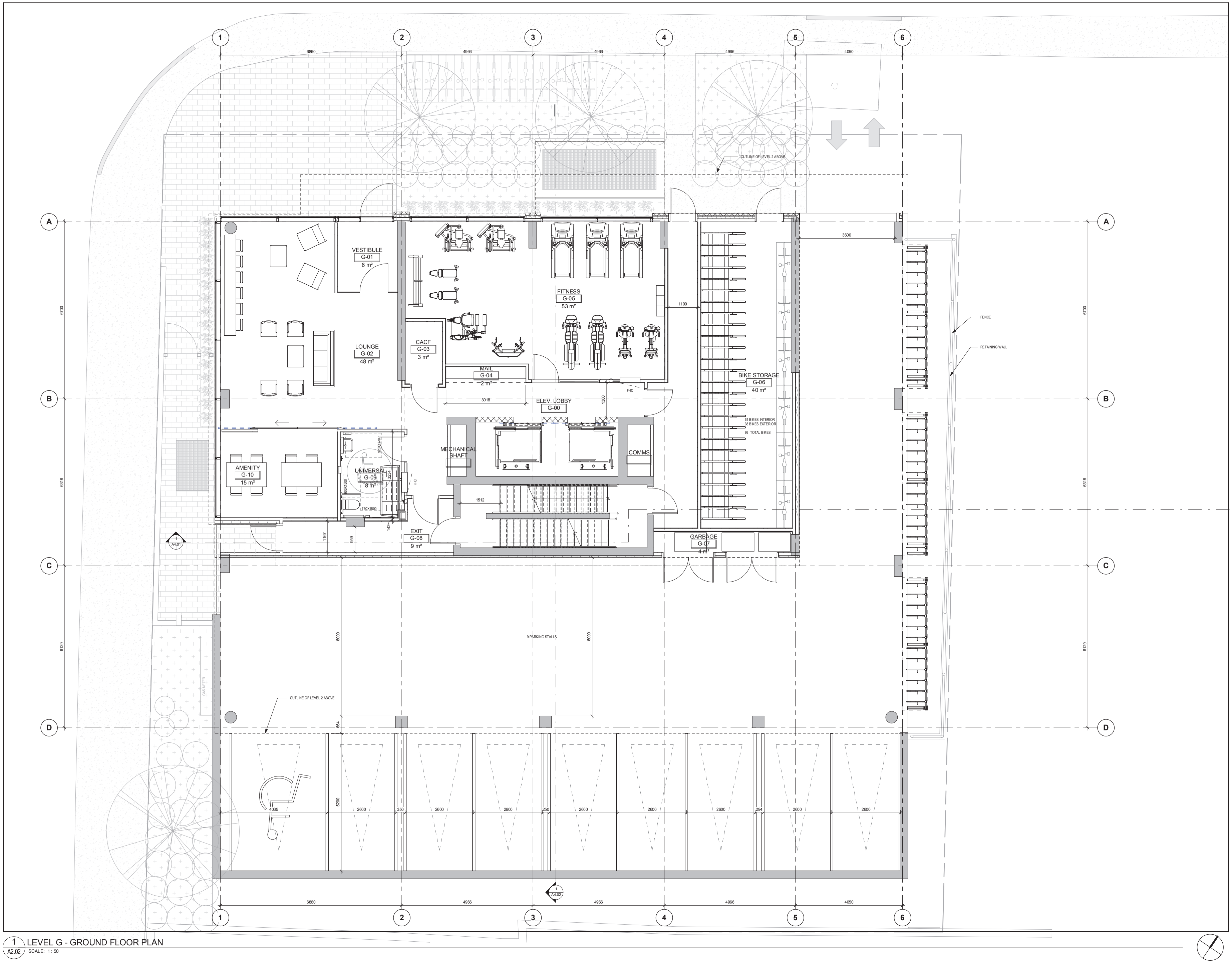

1 LEVEL G - GROUND FLOOR PLAN
A2.02 SCALE: 1 : 50

no.	date	revision
A	190506	Issued for Site Plan Application

It is the responsibility of the appropriate contractor to check and verify all dimensions on site and report all errors and/or omissions to the engineer.

All contractors must comply with all

Do not scale drawings.

This drawing may not be used for construction until signed.

Hobin Architecture Incorporated
63 Pamilla Street
Ottawa, Ontario
Canada K1S 3K7
T: 613-238-7200
F: 613-235-2005
E: mail@hobinarc.com
hobinarc.com
HOBIN ARCHITECTURE

PROJECT
250 BESSERER STREET
250 BESSERER STREET

DRAWING TITLE
GROUND FLOORPLAN

DRAWN	DATE	SCALE
WIK	XX/XX/XXXX	1 : 50

PROJECT 1917

DRAWING NO. A2.02

REVISION NO. A

DXX-XX-XX-XXXX
XXXXX

2.2 Existing Conditions

2.2.1 Area Road Network

King Edward Avenue: King Edward Avenue is a City of Ottawa arterial road with a divided four-lane urban cross-section and bus lanes north of Rideau Street, transitioning to an undivided four-lane road south of Rideau, and becoming a two-lane road south of Laurier Avenue. Sidewalks are provided on both sides of the road and the posted speed limit is 40 km/h. The Ottawa Official Plan reserves a 40.0 metre right of way north of Rideau Street and the existing right-of-way provided south of Rideau Street is 20.0 metres.

Rideau Street: Rideau Street is a City of Ottawa arterial road with a two-lane urban cross-section including dedicated bus lanes and sidewalks. The unposted speed limit is 50 km/h and the Ottawa Official Plan reserves a 30.0 metre right of way west of King Edward Avenue and 26.0 metre right-of-way to the east of King Edward Avenue.

Besserer Street: Besserer Street is a City of Ottawa local road with a two-lane urban cross-section, including sidewalks and on-street parking. The unposted speed is 50 km/h and the existing right-of-way is 16.0 to 18.0 metres. West of King Edward Avenue, Besserer Street is a two-lane one-way street in the eastbound direction, including a parking lane on the north side and on-street parking on the south side.

Nelson Street: Nelson Street is a City of Ottawa local road with a two-lane urban cross-section, including sidewalks and on-street parking. The unposted speed limit is 50 km/h and the existing right-of-way is 18.0 metres.

Daly Avenue: Daly Avenue is a City of Ottawa local road with a two-lane urban cross-section, including sidewalks and on-street parking. The unposted speed limit is 50 km/h and the existing right-of-way is 18.0 metres.

2.2.2 Existing Intersections

King Edward Avenue / Besserer Street — The intersection of King Edward Avenue and Besserer Street is a signalized intersection. The northbound approach consists of a shared left-turn/through and through/right-turn lanes, and the southbound approach consists through lane and shared through/right-turn lane. The westbound approach is a right-turn movement only, and the eastbound approach is a left-turn lane and shared left-turn/through lane. The through movement is restricted in the eastbound direction along Besserer Street and the westbound left-turn is restricted.

2.2.3 Existing Driveways

Driveways are present along the south side of Besserer Street to the east of the site and are present on both sides of the road to the west of King Edward Avenue. Along King Edward Avenue, driveways are present on both sides of the roadway north of Besserer Street, and south of Daly Avenue.

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 the roadways in the study area. The cycling network consists of bikes lanes along Cumberland Street between George Street and Besserer Street, Stewart Street (westbound), and Wilbrod Street (eastbound).

Figure 3: Study Area Pedestrian Facilities

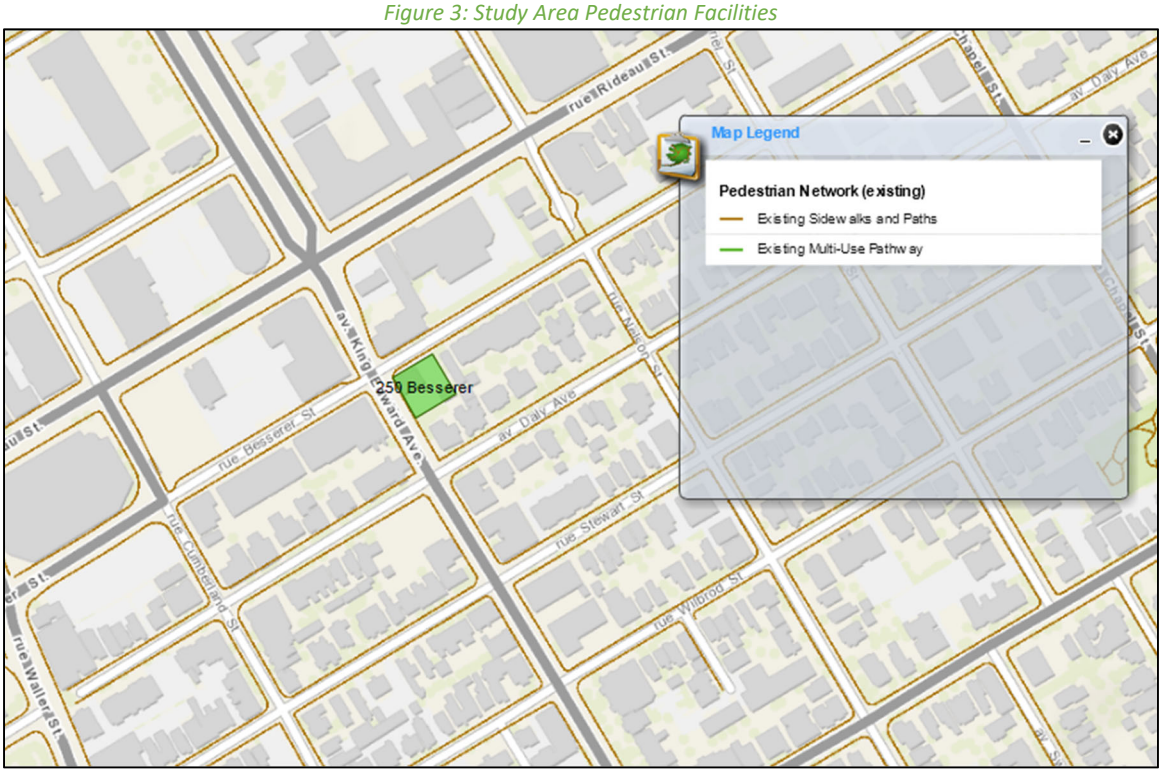

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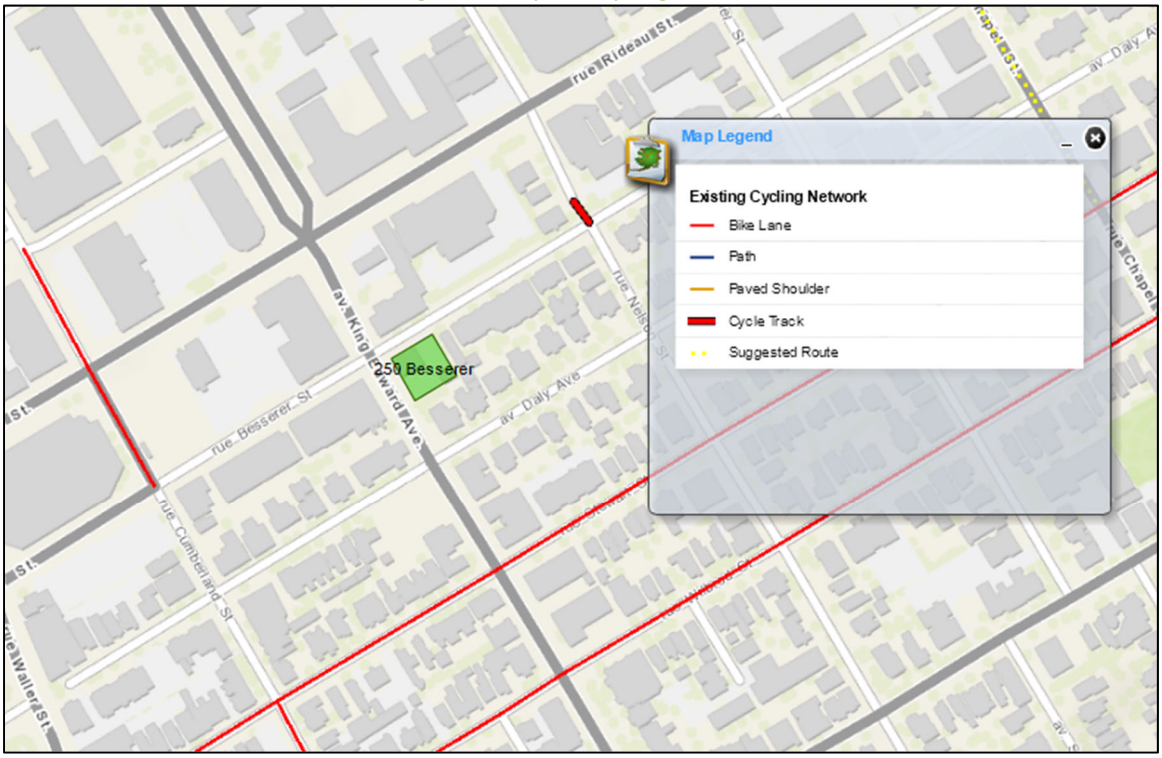
Figure 4: Study Area Cycling Facilities



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: April 3, 2019

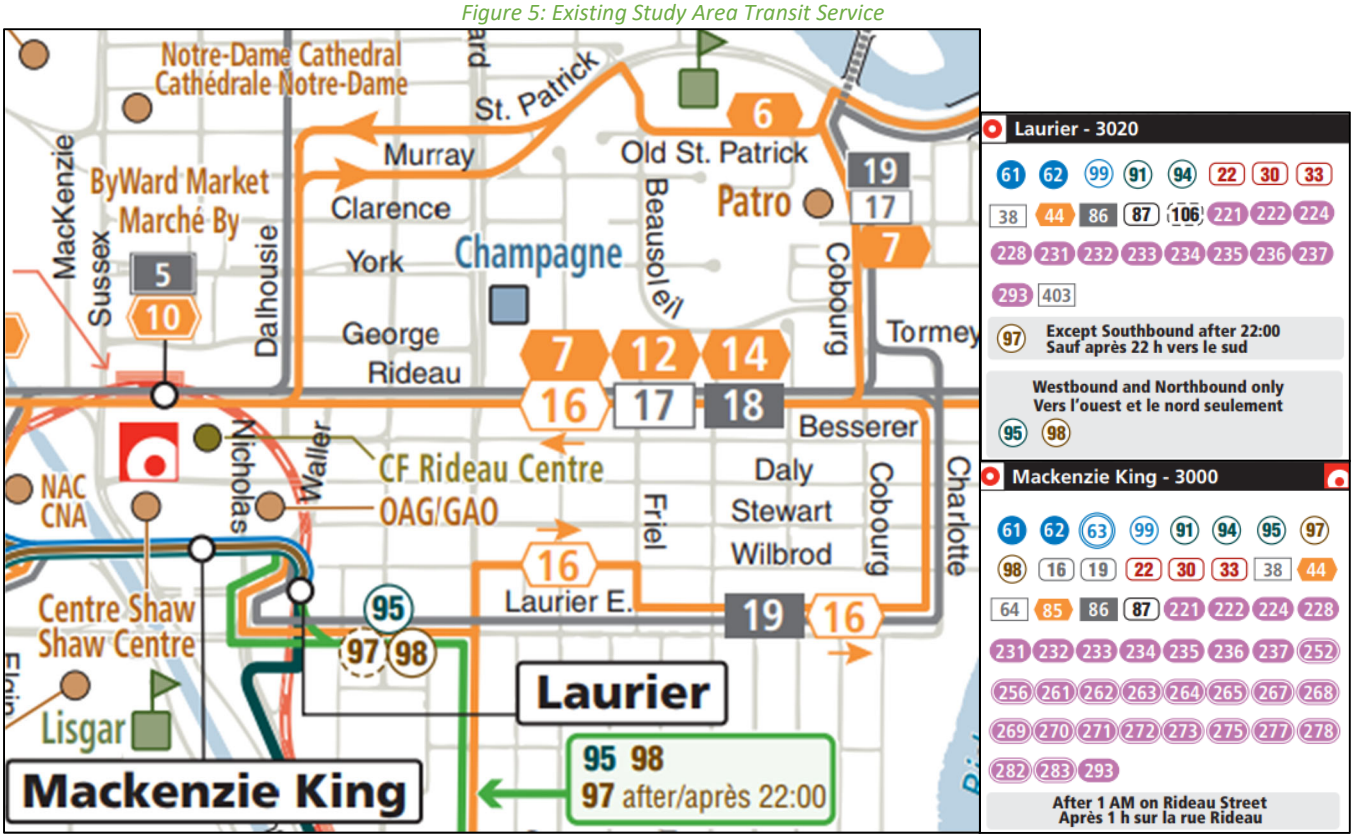
2.2.5 Existing Transit

Within the study area, the routes #7, 12, 14, 16, 17, and 18 stop along Rideau Street. Stops are located on the southeast and northwest quadrants of the Rideau Street and King Edward Avenue, to the west of Cumberland Street, and on the southwest and northeast quadrant of the Rideau Street and Nelson Street intersection. The frequency of these routes within proximity of the proposed site currently are:

- Route #7 – every 5-10 minutes in the peak hours, and 15 minutes or 30 minutes in the off-peak times
- Route #12 – every 5-10 minutes in the peak direction, and 15-20 minutes in the off-peak direction and off-peak times
- Route #14 – every 15-20 minutes
- Route #16 – every 20- 30 minutes
- Route #17 – every 15 minutes in the peak direction, and 15 minutes or 30 minutes in the off-peak times
- Route #18 – every 30 minutes in the peak direction only

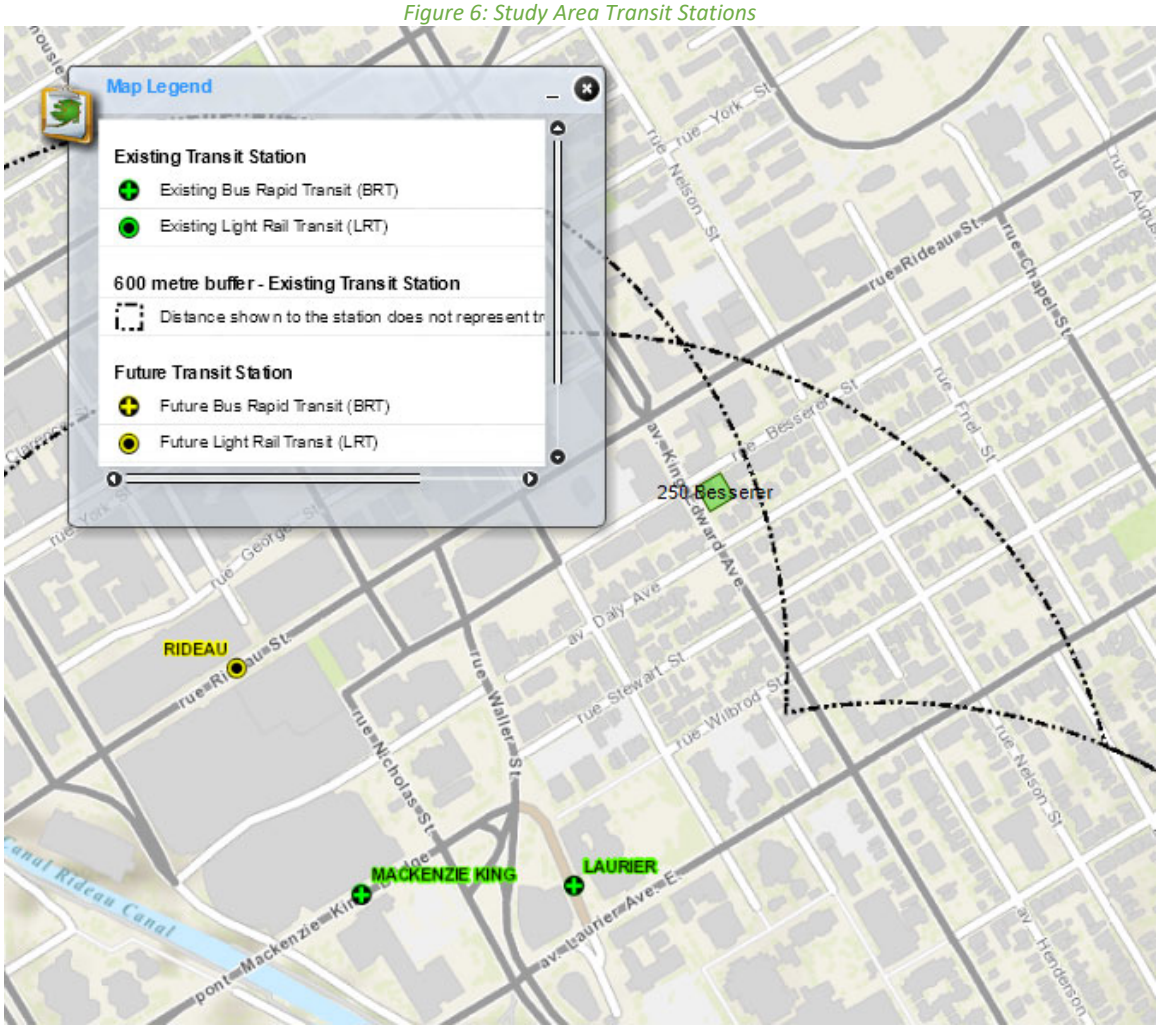
Figure 5 illustrates the transit system map in the study area and Figure 6 illustrates the 600-metre walking distance for the Confederation LRT and Transitway Stations.

Figure 5: Existing Study Area Transit Service



Source: http://www.octranspo.com/ Accessed: April 3, 2019

Figure 6: Study Area Transit Stations



Source: http://maps.ottawa.ca/geoOttawa/ Accessed: April 3, 2019

2.2.6 Existing Area Traffic Management Measures

Seasonal traffic calming measures are present along Besserer Street, east of Nelson Street. No other traffic calming measures were documented in the area.

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
King Edward Avenue and Besserer Street	November 27, 2018

Figure 7 illustrates the existing traffic counts (restricted turns in red) and Table 2 summarizes the existing intersection operations. The level of service is based on the HCM criteria for average delay at signalized intersections. Detailed turning movement count data is included in Appendix B and the synchro worksheets are provided in Appendix C.

Figure 7: Existing Traffic Volumes

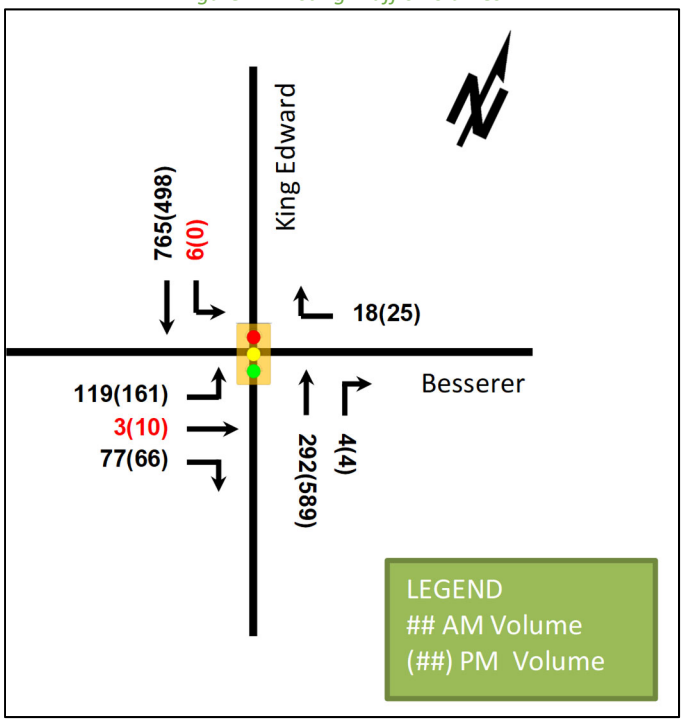


Table 2: Existing Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	Delay	V/C	Q (95th)	LOS	Delay	V/C	Q (95th)
King Edward Avenue & Besserer Street *Signalized*	EBL	D	39.1	0.33	41.4	B	15.9	0.27	23.2
	EBL/R	B	12.6	0.27	18.9	A	8.5	0.24	14.7
	WBR	A	0.1	0.03	0.0	A	0.3	0.06	0.0
	NBT/R	A	6.8	0.15	18.2	B	10.7	0.42	33.3
	SBT	A	8.8	0.40	53.0	B	10.1	0.35	27.5
	Overall	**B**	**11.0**	-	-	**B**	**10.5**	-	-

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 0.90

The existing intersection operations generally operate satisfactorily during the peak hours.

2.2.8 Collision Analysis

Collision data has 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 are road network. Table 3 summarizes the collisions types and conditions in the study area, Figure 8 illustrates the intersections and segments analyzed, and Table 4 summarizes the total collisions for each of these locations. Collision data is included in Appendix D.

Table 3: Study Area Collision Summary, 2013-2017

		Number	%
Total Collisions		**148**	**100%**
Classification	**Fatality**	0	0%
	Non-Fatal Injury	22	15%
	Property Damage Only	126	85%
Initial Impact Type	**Approaching**	1	1%
	Angle	37	25%
	Rear end	37	25%
	Sideswipe	29	20%
	Turning Movement	16	11%
	SMV Unattended	6	4%
	SMV Other	15	10%
	Other	7	5%
Road Surface Condition	**Dry**	102	69%
	Wet	21	14%
	Loose Snow	13	9%
	Slush	5	3%
	Packed Snow	2	1%
	Ice	5	3%
Pedestrian Involved		11	7%
Cyclists Involved		3	2%

Figure 8: Study Area Collision Records – Representation of 2014-2016

Table 4: Summary of Collision Locations, 2013-2017

	Number	%
Intersections / Segments	**148**	**100%**
Besserer St @ King Edward Ave	28	19%
Besserer St @ Nelson St	1	1%
Daly Ave @ King Edward Ave	20	14%
Daly Ave @ Nelson St	5	3%
King Edward Ave @ Rideau St	77	52%
Besserer St btwn King Edward Ave & Nelson St	3	2%
King Edward Ave btwn Besserer St & Daly Ave	5	3%
King Edward Ave btwn Rideau St & Besserer St	7	5%
Nelson St btwn Besserer St & Daly Ave	2	1%

Within the study area, the intersections along King Edward Avenue at Besserer Street, Daly Avenue, and Rideau Street are noted to have significantly higher collision rates than the other study area intersections. Table 5, Table 6 and Table 7 summarize the collision types and conditions for each of the intersections along King Edward Avenue.

Table 5: Besserer Street at King Edward Avenue Collision Summary, 2013-2017

		Number	%
Total Collisions		**28**	**100%**
Classification	Fatality	0	0%
	Non-Fatal Injury	3	11%
	Property Damage Only	25	89%
Initial Impact Type	Angle	10	36%
	Rear end	9	32%
	Sideswipe	4	14%
	Turning Movement	1	4%
	SMV Other	2	7%
	SMV Unattended	1	4%
	Other	1	4%
Road Surface Condition	Dry	21	75%
	Wet	2	7%
	Loose Snow	1	4%
	Slush	2	7%
	Ice	2	7%
Pedestrian Involved		1	4%
Cyclists Involved		1	4%

The Besserer Street and King Edward Avenue intersection had a total of 28 collisions during the 2013-2017 time period, with 25 involving property damage only and the remaining 3 having non-fatal injuries. The rear end collisions (9 or 32%) would indicate congestion being a factor, and the angled collisions (10 or 36%) are likely due to the one-way nature of Besserer Street to the west of King Edward Avenue, with the double left turn. Weather conditions are not considered to have factored into the recorded collisions.

Table 6: Daly Avenue at King Edward Avenue Collision Summary, 2013-2017

		Number	%
Total Collisions		**20**	**100%**
Classification	Fatality	0	0%
	Non-Fatal Injury	1	5%
	Property Damage Only	19	95%
Initial Impact Type	Angle	13	65%
	Rear end	3	15%
	Turning Movement	2	10%
	SMV Other	1	5%
	Other	1	5%
Road Surface Condition	Dry	18	90%
	Wet	1	5%
	Loose Snow	1	5%
Pedestrian Involved		1	5%
Cyclists Involved		1	5%

The Daly Avenue and King Edward Avenue intersection has predominantly experienced property damage only collisions (19 or 20 total) and are angled collisions. This would indicate left-turn movements through congested conditions. Weather conditions are not considered to have factored into the recorded collisions and the intersection is located at the crest of the hill and sight lines are not considered an issue.

Table 7: King Edward Avenue at Rideau Street Collision Summary, 2013-2017

		Number	%
Total Collisions		**77**	**100%**
Classification	Fatality	0	0%
	Non-Fatal Injury	16	21%
	Property Damage Only	61	79%
Initial Impact Type	Angle	8	10%
	Rear end	22	29%
	Sideswipe	19	25%
	Approaching	1	1%
	Turning Movement	13	17%
	SMV Other	9	12%
	Other	5	6%
Road Surface Condition	Dry	50	65%
	Wet	14	18%
	Loose Snow	8	10%
	Slush	2	3%
	Packed Snow	1	1%
	Ice	2	3%
Pedestrian Involved		7	9%
Cyclists Involved		0	0%

The intersection of King Edward Avenue and Rideau Street has a total of 77 collisions during the 2013-2017 time period, with 61 involving property damage only and the remaining 16 having non-fatal injuries. Rear end (22 or 29%) and sideswipe (19 or 25%) represent over half of the total collisions and are representative of congested conditions. A total of 7 pedestrian related collisions have been recorded at this intersection, likely being contributed to by congestion and long crossing distances on all legs. Of these pedestrian related collisions, 5 were

during 2014-15 and only 1 per year has occurred in 2016-17. Overall, weather conditions are not considered to have a major factor in the recorded collisions.

2.3 Planned Conditions

2.3.1 Changes to the Area Transportation Network

The subject development is within 600 metre radius of the new Confederation LRT station at Rideau. No other network changes are anticipated for the adjacent area network.

2.3.2 Other Study Area Developments

168 Daly Avenue

A zoning bylaw amendment has been submitted for the repurposing of an existing residential house to become the Estonian Embassy. The site plane has not been completed.

122 Daly Avenue – TC United

The construction of a 4-storey residential building was completed in 2018. The site consisted of 8 units with no car parking and 6 bike parking spaces provided.

211 Besserer Street/256 Rideau Street – DCR Phoenix

A 27-storey residential building is currently under construction with frontage on Rideau Street and Besserer Street. The access to underground parking is provided on Besserer Street. In total, the site will include 205 residential units, 112 bike parking spaces, and 106 car parking spaces.

245 Rideau Street – Claridge

Submitted and registered in 2015, the site proposes a total of 224 hotel rooms, 443 residential units and 76,542 sq. ft. of ground floor retail. A combined 395 car parking spaces and 271 bike parking spaces will be provided on site. The current site is still in operation as a Metro.

3 Study Area and Time Periods

3.1 Study Area

The study area will include the intersections of Besserer Street and King Edward Avenue. Besserer Street and King Edward Avenue are noted as the boundary roads for the site.

The TRANS screenline SL-37 is located along King Edward Avenue, SL-36 is located to the south along Laurier Avenue, and SL 38 is located to the north along Clarence Street to the west of King Edward Avenue. These screenlines will not be reviewed as part of this study.

3.2 Time Periods

The AM and PM peak hours will be examined for the proposed development.

3.3 Horizon Years

The anticipated build-out year is 2021. As a result, the full build-out plus five years horizon year is 2026.

4 Exemption Review

Table 8 summarizes the exemptions for this TIA.

Table 8: 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.	Required
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	Exempt
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

As the Screening Form does not identify the need for a TIA, Table 9 summarizes additional exemptions recommended for this TIA.

Table 9: Recommended Additional Exemptions

Module	Element	Explanation
Network Impact Components		
4.4 Access Intersections	4.4.2 Intersection Control	No roadway intersections serve as access to the development sites.
	4.4.3 Intersection Design	No roadway intersections serve as access to the development sites.

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). Table 10 summarizes the person trip rates for the proposed land uses.

Table 10: TRANS Trip Generation Person Trip Rates

Dwelling Type	ITE LUC	Peak Hour	Vehicle Trip Rate	Mode Share			Person Trip Rates
				Vehicle	Transit	Non-Motorized	
Mid-Rise Apartment	231	AM	0.24	37%	41%	11%	0.65
		PM	0.28	40%	37%	12%	0.70

LUC – Land Use Code

Using the above Person Trip rates, the total person trip generation has been estimated. Table 11 summarizes the total person trip generation by phase and dwelling type.

Table 11: Total Person Trip Generation

Land Use	Units	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Mid-Rise Apartments	99	15	49	64	43	26	69

LUC – Land Use Code

With consultation with the City of Ottawa, the most recent National Capital Region Origin-Destination survey (OD Survey) mode shares were modified to reflect the Ottawa Centre and a higher transit modal share, and have been summarized in Table 12.

Table 12: OD Survey Existing Mode Share – Ottawa Inner

Travel Mode	Existing Inner Area	City Recommendation (Centre District)
Auto Driver	40%	15%
Auto Passenger	10%	5%
Transit	25%	35%
Non-Auto	25%	45%
Total	100%	100%

Using the above mode shares and person trip rates the person trips by mode have been projected. Table 13 summarizes the trip generation by mode.

Table 13: Trip Generation by Mode

Travel Mode	Mode Share	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Auto Driver	15%	2	8	10	6	4	10
Auto Passenger	5%	1	2	3	2	1	3
Transit	35%	5	17	22	15	9	24
Non-Auto Modes	45%	7	22	29	19	12	31
Total	100%	15	49	64	42	26	68

As shown above, 10 AM and 10 PM peak hour two-way vehicle trips are projected as a result of the proposed development.

No trip reductions factors (i.e. synergy, pass-by, etc.) have been applied as the subject sites are composed entirely of residential units.

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 14 below summarizes the distribution.

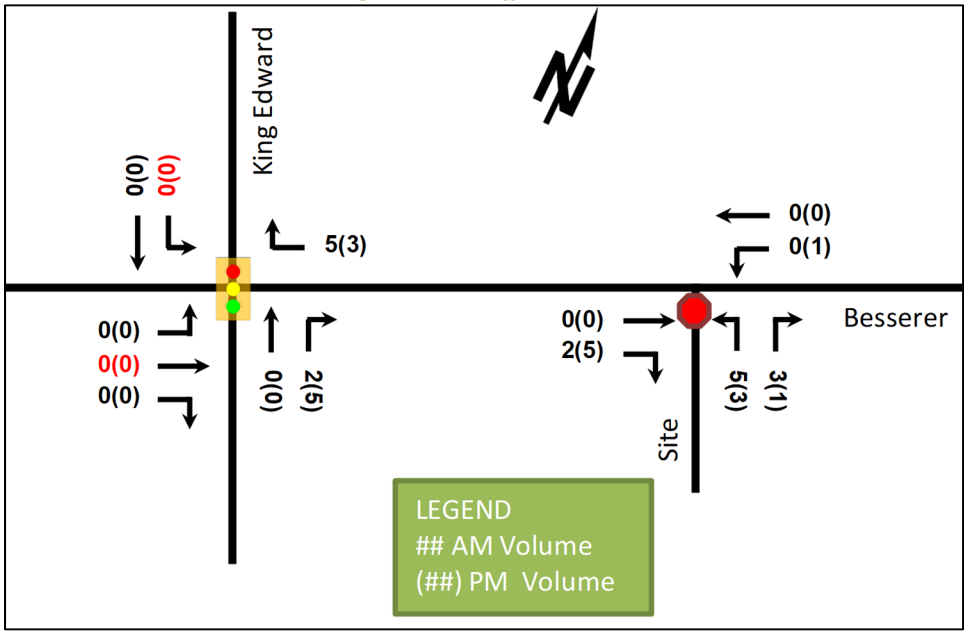
Table 14: OD Survey Distribution – Ottawa Inner

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: Site Traffic Volumes



6 Background Network Travel Demands

6.1 Transportation Network Plans

There are no planned changes to the Study Area Transportation Network that would influence the Study Area.

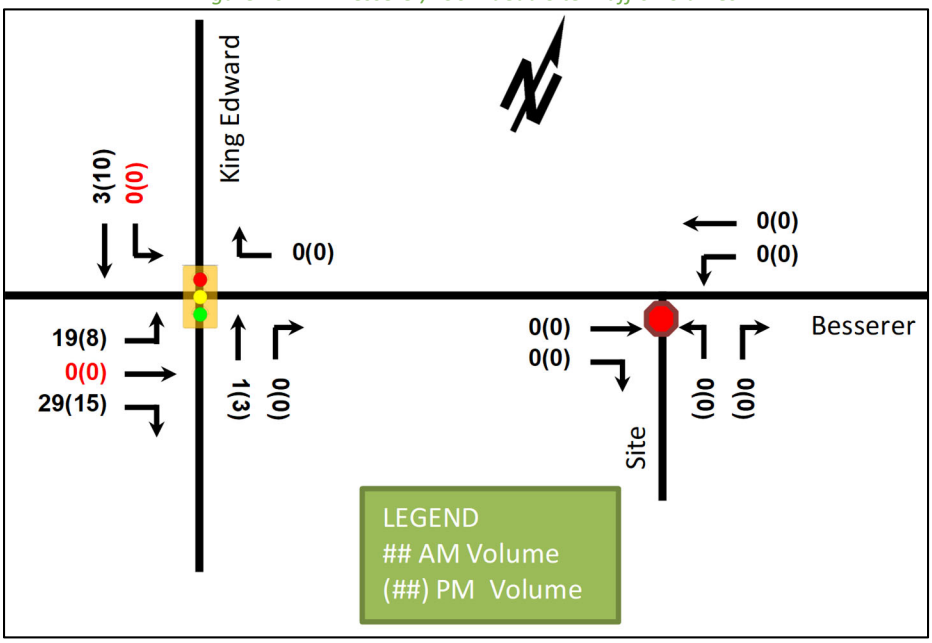
6.2 Background Growth

No additional background growth has been accounted for along King Edward Avenue or Besserer Street as the Inner Area and Centre have experienced a negative vehicle growth rate.

6.3 Other Developments

At the time of this report, the only development anticipated to be operational during the proposed development horizons is the DCR Phoenix 27-storey residential building at 211 Besserer Street/256 Rideau Street. The development traffic forecasted in the subject site TIA are illustrated in Figure 10.

Figure 10: 211 Besserer/256 Rideau Site Traffic Volumes



7 Demand Rationalization

7.1 Future Background Conditions

Figure 11 illustrates the future background traffic counts and Table 15 summarizes the intersection operations. As no background growth has been assumed for the subject roadways, the volumes and operations are similar for both the 2021 and 2026 horizons. The level of service is based on the HCM criteria for average delay at signalized intersections. The synchro worksheets are provided in Appendix E.

Figure 11: Future Background Traffic Volumes

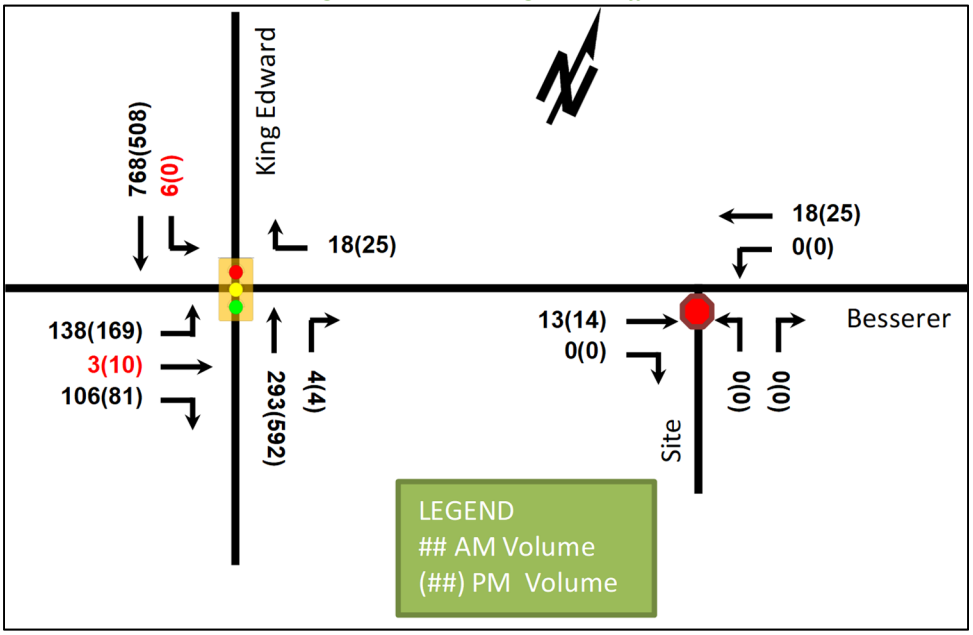


Table 15: Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	Delay	V/C	Q (95th)	LOS	Delay	V/C	Q (95th)
King Edward Avenue & Besserer Street *Signalized*	EBL	D	39.6	0.36	44.1	B	15.9	0.27	23.1
	EBL/R	B	11.5	0.31	19.5	A	7.7	0.24	13.8
	WBR	A	0.1	0.02	00	A	0.2	0.05	0.0
	NBT/R	A	6.7	0.13	16.6	B	10.3	0.38	29.8
	SBT	A	8.4	0.36	46.6	B	9.8	0.33	25.2
	Overall	**B**	**11.1**	**-**	**-**	**B**	**10.3**	**-**	**-**

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00

The future background intersection operates satisfactorily, like the existing intersection operations.

8 Demand Rationalization

The new vehicle volumes forecasted to be generated by the new site are minimal and no demand rationalization is required for the proposed site and study area.

9 Development Design

9.1 Design for Sustainable Modes

The proposed development is a residential site plan with perpendicular visitor parking at the rear of the building and a combination of internal bicycle parking (61 spaces), external bicycle parking (38 spaces) at the side of the building, and public bicycle parking (12 spaces) along Besserer Street. Existing sidewalks are provided along the frontage of the site and hard surface connections are provide to the building entrances.

9.2 Circulation and Access

The access is located at an existing curb depression and no issues are noted for access on Besserer Street. The drive aisle on the west side of the site, rear parking aisle and proposed parking stall sizes meet the by-law requirements.

Garbage pick up will be at curb edge and not require vehicles to enter the site.

10 Parking

10.1 Parking Supply

The City has provided guidance on the modal shares for the site (less than 15% auto modes) as it is on the edge of the Centre District and applicable to TOD related design features. As such, an effort has been made to reduce resident parking to zero and provide visitor parking only. This is a similar parking arrangement as other developments sites in this area of Ward 12.

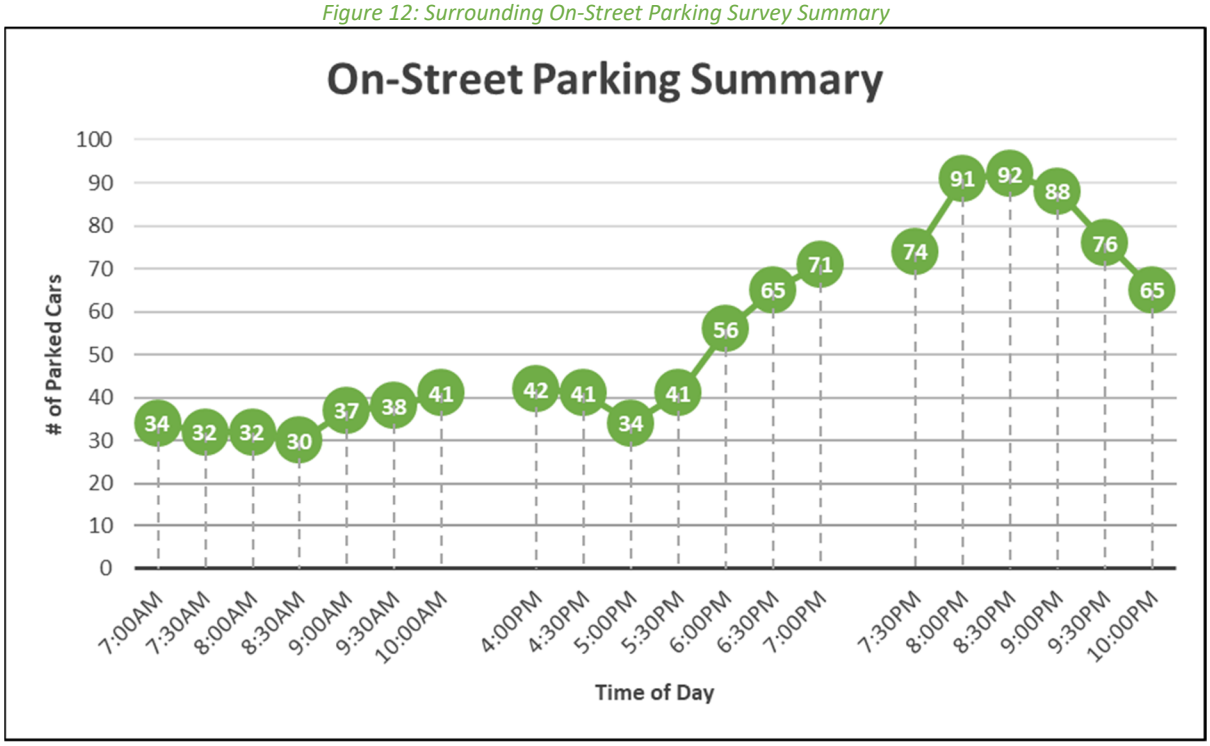
To compensate for providing no on-site resident parking, the bike parking has been provided at a rate of over 1.0 spaces per unit.

10.2 Parking Spillover

An on-street parking survey was conducted on the adjacent roadways to document the existing on-street parking utilization and residual parking capacity. Figure 12 illustrates the number of cars observed to be parked on-street

within the survey area, and a total of 101 on-street parking spaces were documented. The parking survey results are provided in Appendix F.

Figure 12: Surrounding On-Street Parking Survey Summary



The survey illustrates that the parking is lower during the overnight/morning and increases in demand over the day. In the evening when parking demand is at the highest, approximately 19 of 101 parking spaces are available on-street within the surveyed area. Using the 7:00AM count as a proxy for the overnight parking, approximately 67 on-street spaces are available for area residents.

Overall, the residual on-street parking capacity is sufficient to support the proposed site.

It is noted that within the survey, two areas were observed with cars parking in "No Parking" or "No Stopping" zones:

- On the north side of Daly Avenue, between King Edward Avenue and Nelson Street
- On the north and south sides of Besserer Street between Cumberland Avenue and King Edward Avenue

Beyond the site and adjacent on-street parking, public garages are available in the area. For example, the Parksafe Garage located 290 Rideau Street has 80 spots available, with peak daily utilization of 80% or 16 free parking spaces. This utilization was provided by Parksafe Inc.

11 Boundary Street Design

Table 16 summarizes the MMLOS analysis for the boundary roads of Besserer Street and King Edward Avenue. The existing and future conditions are the same and have been provided as a single line. The MMLOS worksheet has been provided in Appendix G.

Table 16: Boundary Street MMLOS Analysis

Segment	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target
Besserer Street (600m to transit)	B	A	B	D	D	N/A	C	N/A
King Edward Avenue (600m to transit)	C	A	E	D	D	D	A	E

Besserer Street and King Edward Avenue do not meet the pedestrian level of service, predominantly a function of the vehicle volumes along the frontage, and lack of boulevard between the sidewalks and the roadway. King Edward Avenue also does not meet the bicycle level of service due to the 4-lane cross-section. No mitigation is possible to meet these targets within the MMLOS framework and no further analysis or recommendations are provided.

12 Access Intersection Design

12.1 Location and Design of Access

The proposed access to the site is located on Besserer Street at an existing curb depression 20-metres east of the King Edward Avenue intersection. The site will provide a 4-metre wide access at Besserer Street and have a throat length of 7.4-metres to the corner of the building.

The adjacent property access for 256 Besserer Street is at the property line, which will be approximately 2.2-metres from the proposed site access.

13 Transportation Demand Management

13.1 Context for TDM

The mode shares used within the TIA represent the City guidance for this area of the City, decreasing the auto mode share for the site. Therefore, the parking on site has been reduced to match and the bike parking spaces have been increased for tenants.

A total of 117 bedrooms are anticipated within the development with a mix of bachelor, 1-bedroom and 2-bedroom units. No age restrictions are noted.

13.2 Need and Opportunity

The subject site has been assumed to rely predominantly on transit and active modes and those assumptions have been carried through the analysis.

13.3 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 H.

The key TDM measures recommended include:

- Enhanced connectivity of pedestrians and cyclists to the adjacent network
- Bike parking locations at each building in proximity to the entrances
- Inclusion of a 1-month Presto card for first time new rentals, with a set time frame for this offer (e.g. 6-months) from the initial opening of the site

14 Transit

14.1 Route Capacity

The proposed development is anticipated to generate an additional 22 AM peak hour transit trips and 24 PM peak hour transit trips. The additional transit service along Rideau Street, at Rideau Station and at Mackenzie King Bridge Station would require 30% of a single bus (23% of an articulated or 18% of a double decker) in the peak direction to accommodate the development. The direction split of the trips would see a third of these volumes traveling from east, west and south of the site. This is not anticipated to impact the existing transit service for service routes along dedicated bus lanes or the LRT.

14.2 Transit Priority

No additional transit priority was considered for the study area.

15 Network Intersection Design

15.1 Network Intersection Control

No change to the existing signalized control is recommended for the intersection of Besserer Street and King Edward Avenue.

15.2 Network Intersection Design

15.2.1 Future Total Network Intersection Operations

Figure 13 illustrates the future background traffic counts and Table 17 summarizes the intersection operations. As no background growth has been assumed for the subject roadways, the volumes and operations are similar for both the 2021 and 2026 horizons. The level of service is based on the HCM criteria for average delay at signalized intersections. The synchro worksheets are provided in Appendix I.

Figure 13: Future Total Traffic Volumes

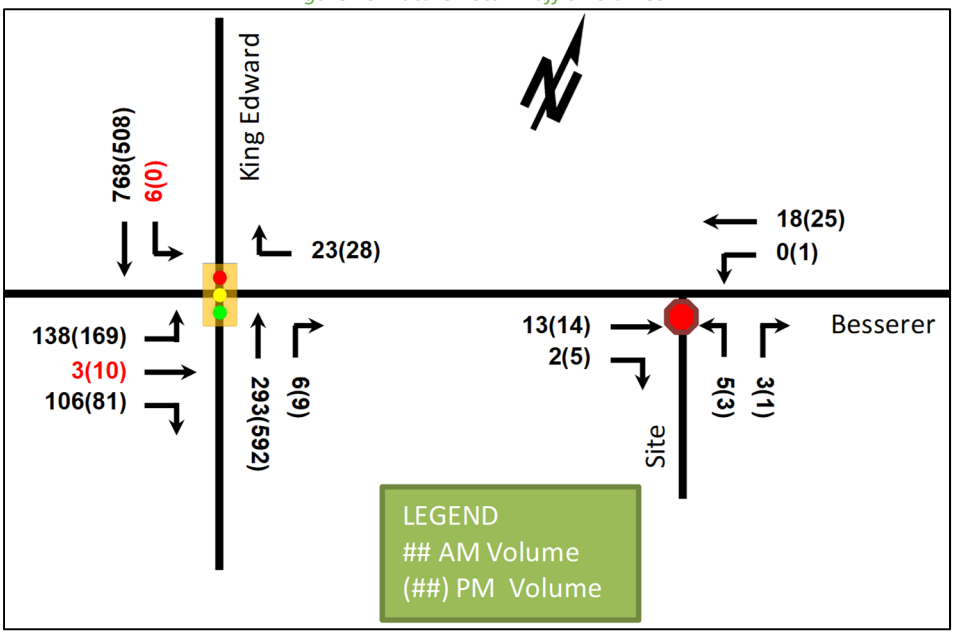


Table 17: Future Total Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	Delay	V/C	Q (95th)	LOS	Delay	V/C	Q (95th)
Besserer Street & King Edward Avenue *Signalized*	EBL	D	39.1	0.33	41.4	B	15.9	0.27	23.1
	EBL/R	B	13.9	0.28	20.4	A	7.7	0.24	13.8
	WBR	A	0.1	0.03	0.0	A	0.2	0.06	0.0
	NBT/R	A	6.7	0.13	16.7	B	10.3	0.39	30.2
	SBT	A	8.4	0.36	46.6	A	9.8	0.33	25.2
	Overall	**B**	**11.0**	**-**	**-**	**B**	**10.3**	**-**	**-**

Notes: Saturation flow rate of 1800 veh/h/lane
PHF = 1.00

The future total intersection operates satisfactorily, like the existing intersection operations.

15.2.2 Network Intersection MMLOS

Table 18 summarizes the MMLOS analysis for the network intersection of Besserer Street and King Edward Avenue. The existing and future conditions are the same and have been provided as a single line. The MMLOS worksheet has been provided in Appendix G

Table 18: Network Intersection MMLOS Analysis

Segment	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS		Auto LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target	ALOS	Target
Besserer Street and King Edward Avenue (600m to transit)	**AM – E** **PM – C**	A	N/A	D	**AM – E** **PM – C**	D	**F**	E	A	E

The intersection of Besserer Street and King Edward Avenue does not meet the targets for pedestrian level of service, transit level of service and truck level of service. The pedestrian level of service is governed by the crossing distance on the south side of the intersection and cannot be mitigated unless King Edward Avenue is narrowed. As the intersection does not have any transit service or is designated as a truck route, no mitigation is recommended for the transit and truck levels of service deficiencies.

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 proposed site is located at 250 Besserer Street and will include 99 apartment units
- Access will be provided directly to Besserer Street as full movement private approach
- The site will include 9 visitor parking spaces, 38 outdoor bike parking spaces, 61 interior bike parking spaces, and a public bike racks with an additional 12 spaces
- The developments are proposed to be completed by 2021
- The Trip Generation, and Safety triggers were met for the TIA Screening

Existing Conditions

- Besserer Street is a local road with an unposted speed limit of 50km/h, and King Edward Avenue is an arterial road with a posted speed limit of 40 km/h
- Sidewalks are located on both sides of the area roadways
- The intersection of Besserer Street and King Edward Avenue currently operates acceptably

- No collision issues were noted in the study area

Development Generated Travel Demand

- The proposed redevelopment is forecasted to generate 64 people two-way trips during the AM peak and 69 people two-way trips during the PM peak
- Based on the modal shares provided by the City, a total of 10 two-way vehicle trips will be generated during AM and PM peak hours
- 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

- The adjacent development at 211 Besserer Street has been included in the background conditions
- The background growth within the Inner Area and Centre District is currently decreasing and has been assumed at 0% as a conservative estimate
- The intersection of Besserer Street and King Edward Avenue is expected to operate like the existing conditions during the future background horizons

Development Design

- Visitor parking (9 spaces) is provided for the site, bicycle parking (99 spaces combined interior and exterior) is provided for each unit, and 12 public bicycle parking spaces are provided
- The exterior bicycle parking is provided on the side of the building
- Existing sidewalks are provided along the frontage of Besserer Street and King Edward Avenue, with multiple new connections from the building
- The proposed access uses the existing curb depression along Besserer Street

Parking

- Visitor parking is provided and meets zoning requirements
- No tenant parking is provided, consistent with the area modal shares as a TOD site and recent Ward 12 development trends
- The adjacent on-street parking was surveyed, with a total of 101 spaces
- On-street parking peaks during the evening with approximately 90 spaces used, and approximately 35 spaces used for over night parking
- Garbage pick up will be at curb edge and not require vehicles to access the site

Boundary Street Design

- The existing and future Besserer Street and King Edward Avenue pedestrian level of service targets are not met due to the vehicle volume along King Edward Avenue and lack of boulevard space on both Besserer Street and King Edward Street
- The existing and future King Edward Avenue bicycle level of service targets are not met due the 4-lane cross-section
- No changes are proposed for the boundary streets and no mitigation is required for the existing/future target deficiencies

Access Intersection Design

- Access to the site will be provided via a private approach on Besserer Avenue and 7.4m throat length is provided from the edge of the building to the sidewalk
- The access will be 4 metres wide at the street edge and narrow to 3.6 metres at the building

TDM

- Supportive TDM measures to be included within the proposed development should include:
  - Enhanced connectivity of pedestrians and cyclists to the adjacent network on Besserer Street and King Edward Avenue
  - Bike parking locations at each building in proximity to the entrances
  - Inclusion of a 1-month Presto card for first time new rentals, with a set time frame for this offer (e.g. 6-months) from the initial opening of the site

Transit

- A total of 22 AM peak hour transit trips (5 inbound, 17 outbound) and 24 PM peak hour transit trips (15 inbound, 9 outbound) are forecasted from the site
- Given the directional split, the anticipate trips would be 5-6 trips in the peak direction from the east, west, and south, and are not anticipated to impact transit service capacity
- No additional transit priority measures are recommended

Network Intersection Design

- The intersection of Besserer Street and King Edward Avenue is expected to operate like the existing conditions during the future total horizons
- No mitigation is required

17 Conclusion

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

Prepared By:

Andrew Harte, P.Eng.
Senior Transportation Engineer

Christopher Gordon, P.Eng.
Senior Transportation Engineer

Appendix A

TIA Screening Form and PM Certification Form

13 Markham Avenue
Nepean ON K2G 3Z1

City of Ottawa 2017 TIA Guidelines
Step 1 - Screening Form

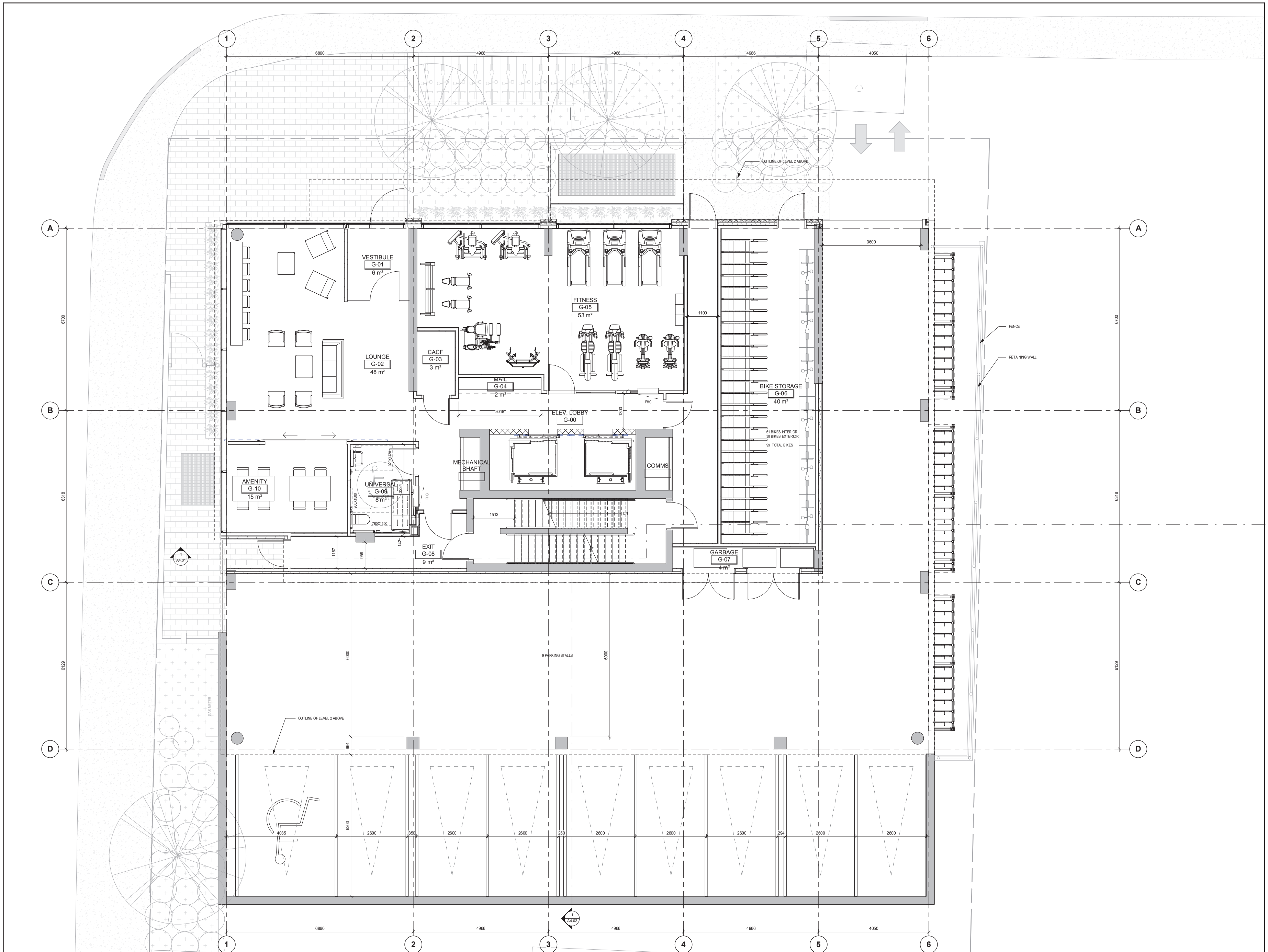
Date: 03-May-19
Project Number: 2019-11
Project Reference: 250 Besserer Street

1.1 Description of Proposed Development	
Municipal Address	250 Besserer Street
Description of Location	042110035 PLAN 6 LOT 12 PLAN 6 W PT LOT 13
Land Use Classification	Residential Third Density (R5B)
Development Size	99 Units, 9 parking spaces, 111 bicycle spaces
Accesses	Single access to Besserer, existing curb depression
Phase of Development	Single Phase
Buildout Year	2021
TIA Requirement	Full TIA Required

1.2 Trip Generation Trigger		
Land Use Type	Townhomes or apartments	
Development Size	99	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
Is the development in a Design Priority Area (DPA) or Transit-oriented Development (TOD) zone?	No
Location Trigger	No

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)?	Yes
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?	Yes
Does the development include a drive-thru facility?	No
Safety Trigger	Yes



1 LEVEL G - GROUND FLOOR PLAN
A2.02 SCALE : 1 : 50

no.	date	revision
A	190506	Issued for Site Plan Application

It is the responsibility of the appropriate contractor to check and verify all dimensions on site and report all errors and/ or omissions to the engineer.

All contractors must comply with all

Do not scale drawings.

This drawing may not be used for construction until signed.

Hobin Architecture Incorporated
63 Pamilla Street
Ottawa, Ontario
Canada K1S 3K7
T: 613-238-7200
F: 613-235-2005
E: mail@hobinarc.com
hobinarc.com

HOBIN ARCHITECTURE

PROJECT
250 BESSERER STREET
250 BESSERER STREET

DRAWING TITLE
GROUND FLOORPLAN

DRAWN	DATE	SCALE
WIK	XX/XX/XXXX	1 : 50

PROJECT 1917

DRAWING NO.
A2.02

REVISION NO. A

ONTARIO ASSOCIATION OF ARCHITECTS
J. HOBIN
LICENCE 3049

DXX-XX-XX-XXXX
XXXXX

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 licensed[1] or registered[2] 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.

City Of Ottawa
Infrastructure Services and Community Sustainability
Planning and Growth Management
110 Laurier Avenue West, 4th fl.
Ottawa, ON K1P 1J1
Tel. : 613-580-2424
Fax: 613-560-6006

Ville d'Ottawa
Services d 'infrastructure et Viabilité des collectivités
Urbanisme et Gestion de la croissance
110, avenue Laurier Ouest
Ottawa (Ontario) K1P 1J1
Tél. : 613-580-2424
Télécopieur: 613-560-6006

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

Appendix B

Turning Movement Counts

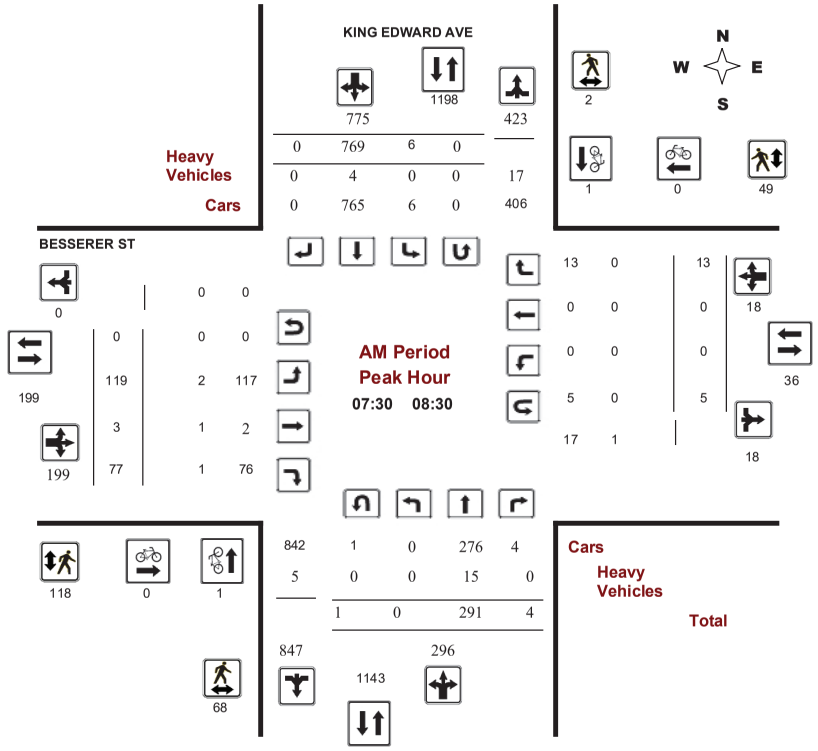
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BESSERER ST @ KING EDWARD AVE

Survey Date: Tuesday, November 27, 2018 **WO No:** 38160

Start Time: 07:00 **Device:** Miovision



Comments

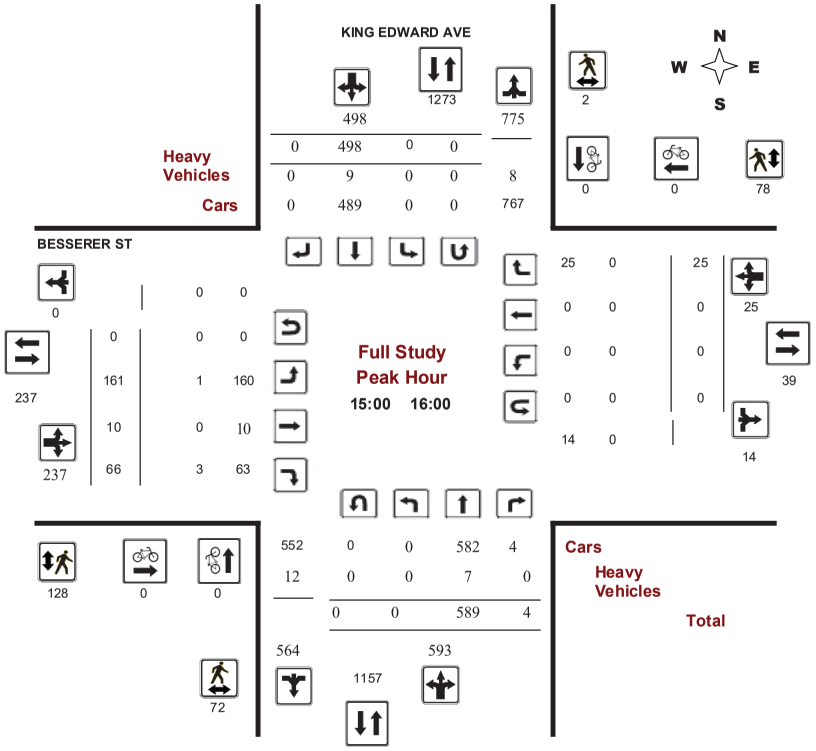
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BESSERER ST @ KING EDWARD AVE

Survey Date: Tuesday, November 27, 2018 **WO No:** 38160

Start Time: 07:00 **Device:** Miovision



Comments

![Ottawa]

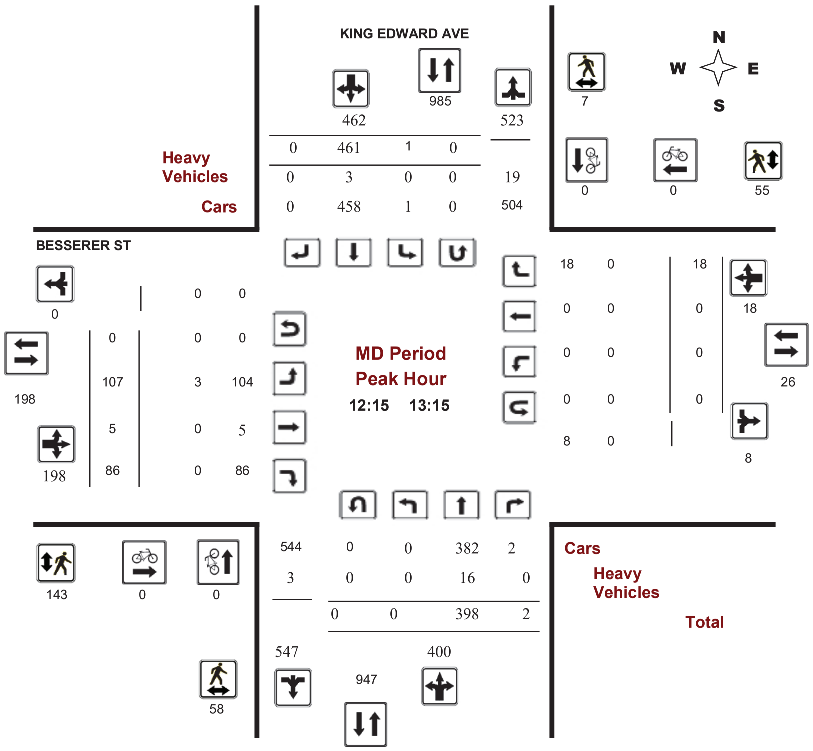
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BESSERER ST @ KING EDWARD AVE

Survey Date: Tuesday, November 27, 2018 **WO No:** 38160

Start Time: 07:00 **Device:** Miovision



Comments

![Ottawa]

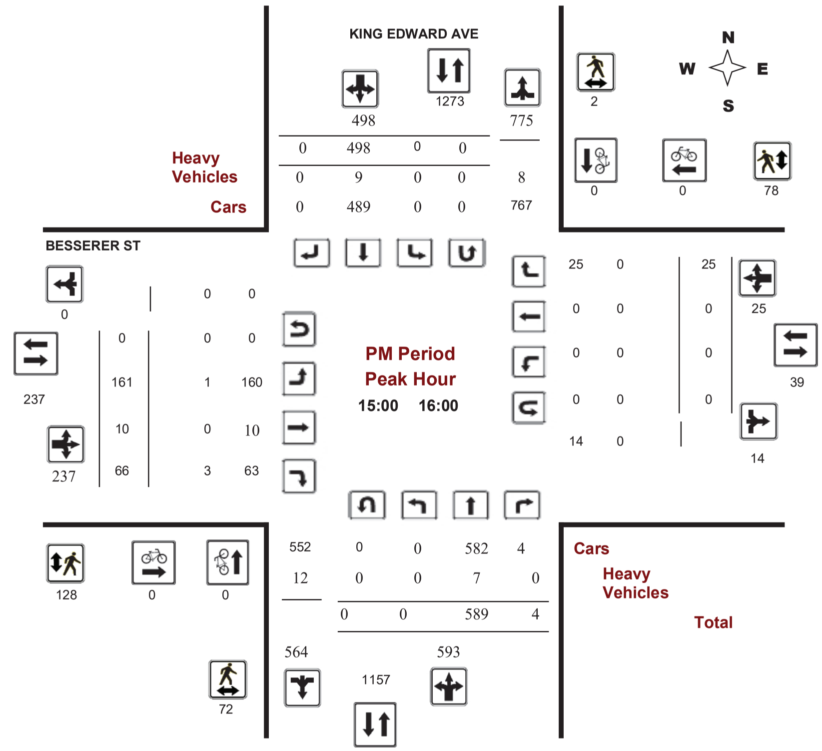
Transportation Services - Traffic Services

Turning Movement Count - Peak Hour Diagram

BESSERER ST @ KING EDWARD AVE

Survey Date: Tuesday, November 27, 2018 **WO No:** 38160

Start Time: 07:00 **Device:** Miovision



Comments

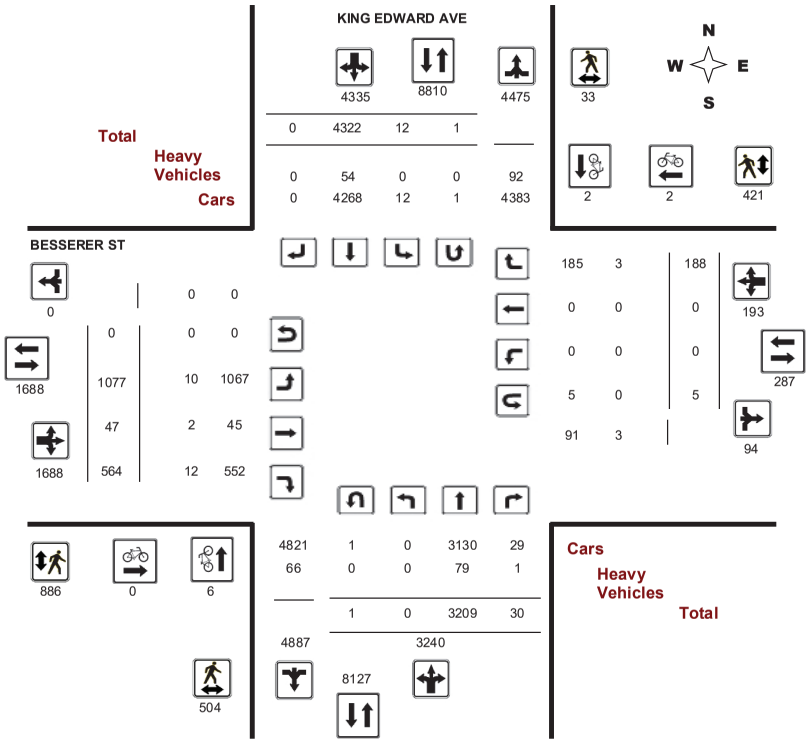
Transportation Services - Traffic Services

Turning Movement Count - Full Study Diagram

BESSERER ST @ KING EDWARD AVE

Survey Date: Tuesday, November 27, 2018 **WO#:** 38160

Device: Miovision



Comments

Transportation Services - Traffic Services

Work Order 38160

Turning Movement Count - Full Study Summary Report

BESSERER ST @ KING EDWARD AVE

Survey Date: Tuesday, November 27, 2018

Total Observed U-Turns

Northbound: 1 Southbound: 1

Eastbound: 0 Westbound: 5

AADT Factor 1.00

Full Study

	KING EDWARD AVE									BESSERER ST									
	Northbound				Southbound					Eastbound				Westbound					
Period	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT	STR TOT	Grand Total
07:00 08:00	0	266	3	**269**	0	703	0	**703**	**972**	88	4	61	**153**	0	0	8	**8**	**161**	**1133**
08:00 09:00	0	285	2	**287**	8	697	0	**705**	**992**	133	1	75	**209**	0	0	27	**27**	**236**	**1228**
09:00 10:00	0	332	4	**336**	3	587	0	**590**	**926**	113	3	66	**182**	0	0	22	**22**	**204**	**1130**
11:30 12:30	0	388	3	**391**	0	405	0	**405**	**796**	106	5	66	**177**	0	0	16	**16**	**193**	**989**
12:30 13:30	0	382	3	**385**	1	472	0	**473**	**858**	103	8	83	**194**	0	0	19	**19**	**213**	**1071**
15:00 16:00	0	589	4	**593**	0	498	0	**498**	**1091**	161	10	66	**237**	0	0	25	**25**	**262**	**1353**
16:00 17:00	0	505	7	**512**	0	452	0	**452**	**964**	148	13	75	**236**	0	0	41	**41**	**277**	**1241**
17:00 18:00	0	462	4	**466**	0	508	0	**508**	**974**	225	3	72	**300**	0	0	30	**30**	**330**	**1304**
Sub Total	0	3209	30	**3239**	12	4322	0	**4334**	**7573**	1077	47	564	**1688**	0	0	188	**188**	**1876**	**9449**
U Turns				**1**				**1**	**2**				**0**				**5**	**5**	**7**
Total	0	3209	30	**3240**	12	4322	0	**4335**	**7575**	1077	47	564	**1688**	0	0	188	**193**	**1881**	**9456**
EQ 12Hr	0	4461	42	**4504**	17	6008	0	**6026**	**10530**	1497	65	784	**2346**	0	0	261	**268**	**2614**	**13144**
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.													**1.39**						
AVG 12Hr	0	4461	42	**4504**	17	6008	0	**6026**	**10530**	1497	65	784	**2346**	0	0	261	**268**	**2614**	**13144**
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.													**1.00**						
AVG 24Hr	0	5843	55	**5900**	22	7870	0	**7894**	**13794**	1961	86	1027	**3074**	0	0	342	**351**	**3425**	**17219**
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.													**1.31**						

Comments:

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

Transportation Services - Traffic Services

W.O. 38160

Turning Movement Count - 15 Minute Summary Report

BESSERER ST @ KING EDWARD AVE

Survey Date: Tuesday, November 27, 2018

Total Observed U-Turns

Northbound: 1 Southbound: 1

Eastbound: 0 Westbound: 5

		KING EDWARD AVE								BESSERER ST									
		Northbound				Southbound				Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	07:15	0	59	1	**60**	0	159	0	**159**	**219**	11	1	9	**21**	0	0	1	**1**	**22**	**241**
07:15	07:30	0	54	0	**54**	0	165	0	**165**	**219**	20	0	12	**32**	0	0	2	**2**	**34**	**253**
07:30	07:45	0	81	1	**82**	0	185	0	**185**	**267**	27	1	19	**47**	0	0	5	**5**	**52**	**319**
07:45	08:00	0	72	1	**73**	0	194	0	**194**	**267**	30	2	21	**53**	0	0	0	**0**	**53**	**320**
08:00	08:15	0	75	1	**76**	0	213	0	**213**	**289**	30	0	19	**49**	0	0	4	**9**	**58**	**347**
08:15	08:30	0	63	1	**65**	6	177	0	**183**	**248**	32	0	18	**50**	0	0	4	**4**	**54**	**302**
08:30	08:45	0	73	0	**73**	1	150	0	**151**	**224**	38	1	17	**56**	0	0	6	**6**	**62**	**286**
08:45	09:00	0	74	0	**74**	1	157	0	**158**	**232**	33	0	21	**54**	0	0	13	**13**	**67**	**299**
09:00	09:15	0	80	1	**81**	2	169	0	**171**	**252**	25	3	17	**45**	0	0	2	**2**	**47**	**299**
09:15	09:30	0	86	1	**87**	0	141	0	**141**	**228**	19	0	16	**35**	0	0	6	**6**	**41**	**269**
09:30	09:45	0	89	1	**90**	1	145	0	**146**	**236**	34	0	20	**54**	0	0	6	**6**	**60**	**296**
09:45	10:00	0	77	1	**78**	0	132	0	**132**	**210**	35	0	13	**48**	0	0	8	**8**	**56**	**266**
11:30	11:45	0	105	2	**107**	0	104	0	**104**	**211**	25	3	18	**46**	0	0	6	**6**	**52**	**263**
11:45	12:00	0	99	1	**100**	0	117	0	**117**	**217**	24	1	12	**37**	0	0	5	**5**	**42**	**259**
12:00	12:15	0	83	0	**83**	0	92	0	**92**	**175**	32	1	17	**50**	0	0	1	**1**	**51**	**226**
12:15	12:30	0	101	0	**101**	0	92	0	**92**	**193**	25	0	19	**44**	0	0	4	**4**	**48**	**241**
12:30	12:45	0	88	0	**88**	1	140	0	**141**	**229**	21	4	31	**56**	0	0	6	**6**	**62**	**291**
12:45	13:00	0	86	2	**88**	0	116	0	**116**	**204**	33	1	24	**58**	0	0	5	**5**	**63**	**267**
13:00	13:15	0	123	0	**123**	0	113	0	**113**	**236**	28	0	12	**40**	0	0	3	**3**	**43**	**279**
13:15	13:30	0	85	1	**86**	0	103	0	**104**	**190**	21	3	16	**40**	0	0	5	**5**	**45**	**235**
15:00	15:15	0	160	0	**160**	0	127	0	**127**	**287**	45	5	23	**73**	0	0	5	**5**	**78**	**365**
15:15	15:30	0	147	2	**149**	0	114	0	**114**	**263**	36	1	18	**55**	0	0	3	**3**	**58**	**321**
15:30	15:45	0	126	1	**127**	0	128	0	**128**	**255**	39	1	12	**52**	0	0	7	**7**	**59**	**314**
15:45	16:00	0	156	1	**157**	0	129	0	**129**	**286**	41	3	13	**57**	0	0	10	**10**	**67**	**353**
16:00	16:15	0	159	1	**160**	0	92	0	**92**	**252**	40	1	25	**66**	0	0	15	**15**	**81**	**333**
16:15	16:30	0	130	0	**130**	0	120	0	**120**	**250**	38	5	13	**56**	0	0	10	**10**	**66**	**316**
16:30	16:45	0	113	1	**114**	0	126	0	**126**	**240**	26	3	17	**46**	0	0	9	**9**	**55**	**295**
16:45	17:00	0	103	5	**108**	0	114	0	**114**	**222**	44	4	20	**68**	0	0	7	**7**	**75**	**297**
17:00	17:15	0	88	0	**88**	0	137	0	**137**	**225**	60	1	18	**79**	0	0	10	**10**	**89**	**314**
17:15	17:30	0	120	1	**121**	0	135	0	**135**	**256**	61	0	15	**76**	0	0	8	**8**	**84**	**340**
17:30	17:45	0	130	0	**130**	0	131	0	**131**	**261**	54	1	21	**76**	0	0	5	**5**	**81**	**342**
17:45	18:00	0	124	3	**127**	0	105	0	**105**	**232**	50	1	18	**69**	0	0	7	**7**	**76**	**308**
TOTAL:		0	3209	30	**3240**	12	4322	0	**4335**	**7575**	1077	47	564	**1688**	0	0	188	**193**	**1881**	**9456**

Note: U-Turns are included in Totals.

Comment:

Transportation Services - Traffic Services

Turning Movement Count - Cyclist Volume Report

Work Order 38160

BESSERER ST @ KING EDWARD AVE

Count Date: Tuesday, November 27, 2018 **Start Time:** 07:00

	KING EDWARD AVE			BESSERER ST			
Time Period	Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	Grand Total
07:00 08:00	0	0	**0**	0	0	**0**	**0**
08:00 09:00	2	2	**4**	0	1	**1**	**5**
09:00 10:00	0	0	**0**	0	0	**0**	**0**
11:30 12:30	2	0	**2**	0	0	**0**	**2**
12:30 13:30	0	0	**0**	0	0	**0**	**0**
15:00 16:00	0	0	**0**	0	0	**0**	**0**
16:00 17:00	1	0	**1**	0	0	**0**	**1**
17:00 18:00	1	0	**1**	0	1	**1**	**2**
Total	6	2	**8**	0	2	**2**	**10**

Comment:

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

Transportation Services - Traffic Services

W.O. 38160

Turning Movement Count - Heavy Vehicle Report

BESSERER ST @ KING EDWARD AVE

Survey Date: Tuesday, November 27, 2018

		KING EDWARD AVE									BESSERER ST									
		Northbound				Southbound					Eastbound				Westbound					
Time Period		LT	ST	RT	N TOT	LT	ST	RT	S TOT	STR TOT	LT	ST	RT	E TOT	LT	ST	RT	W TOT	STR TOT	Grand Total
07:00	08:00	0	9	0	**9**	0	3	0	**3**	**12**	1	1	3	**5**	0	0	0	**0**	**5**	**17**
08:00	09:00	0	13	0	**13**	0	7	0	**7**	**20**	3	0	0	**3**	0	0	1	**1**	**4**	**24**
09:00	10:00	0	18	1	**19**	0	14	0	**14**	**33**	2	0	1	**3**	0	0	0	**0**	**3**	**36**
11:30	12:30	0	13	0	**13**	0	10	0	**10**	**23**	1	0	1	**2**	0	0	0	**0**	**2**	**25**
12:30	13:30	0	11	0	**11**	0	4	0	**4**	**15**	2	0	3	**5**	0	0	1	**1**	**6**	**21**
15:00	16:00	0	7	0	**7**	0	9	0	**9**	**16**	1	0	3	**4**	0	0	0	**0**	**4**	**20**
16:00	17:00	0	4	0	**4**	0	4	0	**4**	**8**	0	1	1	**2**	0	0	1	**1**	**3**	**11**
17:00	18:00	0	4	0	**4**	0	3	0	**3**	**7**	0	0	0	**0**	0	0	0	**0**	**0**	**7**
Sub Total		0	79	1	**80**	0	54	0	**54**	**134**	10	2	12	**24**	0	0	3	**3**	**27**	**161**
U-Turns (Heavy Vehicles)					**0**				**0**	**0**				**0**				**0**	**0**	**0**
Total		0	79	1	**0**	0	54	0	**54**	**134**	10	2	12	**24**	0	0	3	**3**	**27**	**161**

Heavy Vehicles include Buses, Single-Unit Trucks and Articulated Trucks. Further, they ARE included in the Turning Movement Count Summary.

Transportation Services - Traffic Services

Work Order 38160

Turning Movement Count - Pedestrian Volume Report

BESSERER ST @ KING EDWARD AVE

Count Date: Tuesday, November 27, 2018 **Start Time:** 07:00

Time Period		NB Approach (E or W Crossing)	SB Approach (E or W Crossing)	Total	EB Approach (N or S Crossing)	WB Approach (N or S Crossing)	Total	Grand Total
07:00	07:15	3	0	**3**	6	2	**8**	**11**
07:15	07:30	8	0	**8**	4	3	**7**	**15**
07:30	07:45	10	2	**12**	16	6	**22**	**34**
07:45	08:00	28	0	**28**	18	7	**25**	**53**
07:00	08:00	49	2	**51**	44	18	**62**	**113**
08:00	08:15	13	0	**13**	43	15	**58**	**71**
08:15	08:30	17	0	**17**	41	21	**62**	**79**
08:30	08:45	24	0	**24**	20	10	**30**	**54**
08:45	09:00	13	1	**14**	17	5	**22**	**36**
08:00	09:00	67	1	**68**	121	51	**172**	**240**
09:00	09:15	17	0	**17**	17	5	**22**	**39**
09:15	09:30	16	3	**19**	22	13	**35**	**54**
09:30	09:45	9	1	**10**	30	8	**38**	**48**
09:45	10:00	20	1	**21**	28	10	**38**	**59**
09:00	10:00	62	5	**67**	97	36	**133**	**200**
11:30	11:45	13	1	**14**	27	10	**37**	**51**
11:45	12:00	12	5	**17**	19	8	**27**	**44**
12:00	12:15	13	1	**14**	26	9	**35**	**49**
12:15	12:30	8	2	**10**	28	11	**39**	**49**
11:30	12:30	46	9	**55**	100	38	**138**	**193**
12:30	12:45	21	0	**21**	40	15	**55**	**76**
12:45	13:00	9	3	**12**	41	11	**52**	**64**
13:00	13:15	20	2	**22**	34	18	**52**	**74**
13:15	13:30	12	0	**12**	18	11	**29**	**41**
12:30	13:30	62	5	**67**	133	55	**188**	**255**
15:00	15:15	19	0	**19**	24	18	**42**	**61**
15:15	15:30	16	1	**17**	30	10	**40**	**57**
15:30	15:45	21	1	**22**	34	22	**56**	**78**
15:45	16:00	16	0	**16**	40	28	**68**	**84**
15:00	16:00	72	2	**74**	128	78	**206**	**280**
16:00	16:15	24	1	**25**	35	30	**65**	**90**
16:15	16:30	18	1	**19**	36	15	**51**	**70**
16:30	16:45	11	1	**12**	26	17	**43**	**55**
16:45	17:00	23	1	**24**	41	18	**59**	**83**
16:00	17:00	76	4	**80**	138	80	**218**	**298**
17:00	17:15	23	1	**24**	32	20	**52**	**76**
17:15	17:30	14	1	**15**	36	19	**55**	**70**
17:30	17:45	19	2	**21**	36	6	**42**	**63**
17:45	18:00	14	1	**15**	21	20	**41**	**56**
17:00	18:00	70	5	**75**	125	65	**190**	**265**
Total	.....	504	33	**537**	886	421	**1307**	**1844**

Comment:

Transportation Services - Traffic Services

Work Order
38160

Turning Movement Count - 15 Min U-Turn Total Report

BESSERER ST @ KING EDWARD AVE

Survey Date: Tuesday, November 27, 2018

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	5	5
08:15	08:30	1	0	0	0	1
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
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	1	0	0	1
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		1	1	0	5	7

Appendix C

Synchro Intersection Worksheets – Existing Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	119	3	77	0	0	18	0	292	4	6	765	0
Future Volume (vph)	119	3	77	0	0	18	0	292	4	6	765	0
Satd. Flow (prot)	1575	1442	0	0	0	1510	0	3309	0	0	3316	0
Flt Permitted	0.950	0.992									0.952	
Satd. Flow (perm)	1575	1442	0	0	0	1510	0	3309	0	0	3157	0
Satd. Flow (RTOR)		86				588						
Lane Group Flow (vph)	116	105	0	0	0	20	0	328	0	0	857	0
Turn Type	Perm	NA				Perm		NA		Perm	NA	
Protected Phases		4						2			6	
Permitted Phases	4					8				6		
Detector Phase	4	4				8		2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0				10.0		10.0		10.0	10.0	
Minimum Split (s)	22.6	22.6				15.8		31.1		31.1	31.1	
Total Split (s)	30.0	30.0				15.8		80.0		80.0	80.0	
Total Split (%)	27.3%	27.3%				14.4%		72.7%		72.7%	72.7%	
Yellow Time (s)	3.3	3.3				3.5		3.5		3.5	3.5	
All-Red Time (s)	2.3	2.3				2.3		2.6		2.6	2.6	
Lost Time Adjust (s)	0.0	0.0				0.0		0.0			0.0	
Total Lost Time (s)	5.6	5.6				5.8		6.1			6.1	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max				None		C-Max		C-Max	C-Max	
Act Effct Green (s)	24.4	24.4				15.7		73.9			73.9	
Actuated g/C Ratio	0.22	0.22				0.14		0.67			0.67	
v/c Ratio	0.33	0.27				0.03		0.15			0.40	
Control Delay	39.1	12.6				0.1		6.8			8.8	
Queue Delay	0.0	0.0				0.0		0.0			0.0	
Total Delay	39.1	12.6				0.1		6.8			8.8	
LOS	D	B				A		A			A	
Approach Delay		26.6			0.1			6.8			8.8	
Approach LOS		C			A			A			A	
Queue Length 50th (m)	23.3	3.5				0.0		12.8			41.4	
Queue Length 95th (m)	41.4	18.9				0.0		18.2			53.0	
Internal Link Dist (m)		100.3			122.3			81.5			45.1	
Turn Bay Length (m)												
Base Capacity (vph)	349	386				790		2223			2120	
Starvation Cap Reductn	0	0				0		0			0	
Spillback Cap Reductn	0	0				0		0			0	
Storage Cap Reductn	0	0				0		0			0	
Reduced v/c Ratio	0.33	0.27				0.03		0.15			0.40	

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.40

Intersection Signal Delay: 11.0	Intersection LOS: B
Intersection Capacity Utilization 44.8%	ICU Level of Service A
Analysis Period (min) 15	

Description: Per City signal plans to represent "Note: EB must turn right or left. WB must turn right, and faces a red signal."

Splits and Phases: 1: King Edward & Besserer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	161	10	66	0	0	25	0	589	4	0	498	0
Future Volume (vph)	161	10	66	0	0	25	0	589	4	0	498	0
Satd. Flow (prot)	1575	1490	0	0	0	1510	0	3312	0	0	3316	0
Flt Permitted	0.950	0.983										
Satd. Flow (perm)	1575	1490	0	0	0	1510	0	3312	0	0	3316	0
Satd. Flow (RTOR)		73				176						
Lane Group Flow (vph)	136	127	0	0	0	28	0	658	0	0	553	0
Turn Type	Perm	NA				Perm		NA			NA	
Protected Phases		4						2			6	
Permitted Phases	4					8						
Detector Phase	4	4				8		2			6	
Switch Phase												
Minimum Initial (s)	10.0	10.0				10.0		10.0			10.0	
Minimum Split (s)	22.6	22.6				15.8		31.1			31.1	
Total Split (s)	23.0	23.0				15.8		32.0			32.0	
Total Split (%)	41.8%	41.8%				28.7%		58.2%			58.2%	
Yellow Time (s)	3.3	3.3				3.5		3.5			3.5	
All-Red Time (s)	2.3	2.3				2.3		2.6			2.6	
Lost Time Adjust (s)	0.0	0.0				0.0		0.0			0.0	
Total Lost Time (s)	5.6	5.6				5.8		6.1			6.1	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max				None		C-Max			C-Max	
Act Effct Green (s)	17.4	17.4				11.4		25.9			25.9	
Actuated g/C Ratio	0.32	0.32				0.21		0.47			0.47	
v/c Ratio	0.27	0.24				0.06		0.42			0.35	
Control Delay	15.9	8.5				0.3		10.7			10.1	
Queue Delay	0.0	0.0				0.0		0.0			0.0	
Total Delay	15.9	8.5				0.3		10.7			10.1	
LOS	B	A				A		B			B	
Approach Delay		12.4			0.3			10.7			10.1	
Approach LOS		B			A			B			B	
Queue Length 50th (m)	10.9	4.1				0.0		22.2			17.9	
Queue Length 95th (m)	23.2	14.7				0.0		33.3			27.5	
Internal Link Dist (m)		100.3			122.3			81.5			45.1	
Turn Bay Length (m)												
Base Capacity (vph)	498	521				593		1559			1561	
Starvation Cap Reductn	0	0				0		0			0	
Spillback Cap Reductn	0	0				0		0			0	
Storage Cap Reductn	0	0				0		0			0	
Reduced v/c Ratio	0.27	0.24				0.05		0.42			0.35	

Intersection Summary

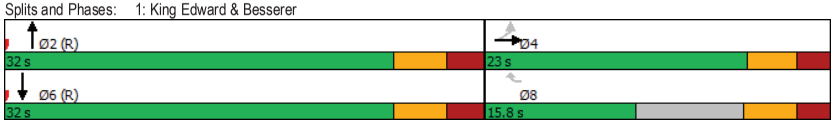
Cycle Length: 55
Actuated Cycle Length: 55
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.42

Intersection Signal Delay: 10.5	Intersection LOS: B
Intersection Capacity Utilization 48.6%	ICU Level of Service A
Analysis Period (min) 15	

Description: Per City signal plans to represent "Note: EB must turn right or left. WB must turn right, and faces a red signal."

Splits and Phases: 1: King Edward & Besserer



Appendix D

Collision Data

Record	Location	X	Y	Date	Time	Environment	Road_Surface	Traffic_Control	Collision_Location	Light	Collision_Classification	Impact_type
13-672	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	1:39	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	07 - Dark	03 - P.D. only	99 - Other
13-1239	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	17:38	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	05 - Dusk	03 - P.D. only	99 - Other
13-1262	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	10:54	03 - Snow	03 - Loose snow	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
13-1320	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	16:35	03 - Snow	03 - Loose snow	01 - Traffic signal	01 - Non intersection	01 - Daylight	03 - P.D. only	04 - Sideswipe
13-1502	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	16:56	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	05 - Dusk	03 - P.D. only	04 - Sideswipe
13-2242	KING EDWARD AVE btwn BESSERER ST & DALY AVE	##########	##########	########	16:26	03 - Snow	03 - Loose snow	10 - No control	02 - Intersection related	01 - Daylight	03 - P.D. only	07 - SMV other
13-2314	DALY AVE @ NELSON ST	##########	##########	########	17:50	03 - Snow	03 - Loose snow	02 - Stop sign	01 - Non intersection	05 - Dusk	03 - P.D. only	02 - Angle
13-2342	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	12:15	01 - Clear	02 - Wet	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	03 - Rear end
13-2345	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	12:36	01 - Clear	02 - Wet	01 - Traffic signal	01 - Non intersection	01 - Daylight	03 - P.D. only	03 - Rear end
13-3959	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	10:12	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	05 - Turning movement
13-4945	BESSERER ST @ KING EDWARD AVE	##########	##########	########	3:10	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	07 - Dark	03 - P.D. only	02 - Angle
13-4947	BESSERER ST @ KING EDWARD AVE	##########	##########	########	6:20	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	03 - Rear end
13-5041	BESSERER ST @ KING EDWARD AVE	##########	##########	########	12:50	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	05 - Turning movement
13-5618	KING EDWARD AVE btwn BESSERER ST & DALY AVE	##########	##########	########	14:00	01 - Clear	01 - Dry	10 - No control	03 - At intersection	01 - Daylight	03 - P.D. only	06 - SMV unattended vehicle
13-6267	KING EDWARD AVE btwn BESSERER ST & DALY AVE	##########	##########	########	22:04	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	07 - Dark	02 - Non-fatal injury	07 - SMV other
13-6611	DALY AVE @ KING EDWARD AVE	##########	##########	########	10:21	01 - Clear	01 - Dry	02 - Stop sign	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
13-7394	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	15:10	01 - Clear	01 - Dry	01 - Traffic signal	01 - Non intersection	01 - Daylight	03 - P.D. only	99 - Other
13-8575	BESSERER ST @ KING EDWARD AVE	##########	##########	########	16:19	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
13-8667	DALY AVE @ KING EDWARD AVE	##########	##########	########	13:45	01 - Clear	01 - Dry	02 - Stop sign	01 - Non intersection	01 - Daylight	03 - P.D. only	03 - Rear end
13-9419	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	11:56	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
13-9860	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	12:30	02 - Rain	02 - Wet	01 - Traffic signal	01 - Non intersection	01 - Daylight	03 - P.D. only	04 - Sideswipe
13-10118	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	9:23	01 - Clear	01 - Dry	01 - Traffic signal	04 - At/near private drive	01 - Daylight	03 - P.D. only	03 - Rear end
13-10503	NELSON ST btwn BESSERER ST & DALY AVE	##########	##########	########	12:43	01 - Clear	01 - Dry	10 - No control	02 - Intersection related	01 - Daylight	03 - P.D. only	06 - SMV unattended vehicle
13-10506	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	14:09	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	05 - Turning movement
13-10793	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	3:56	02 - Rain	02 - Wet	01 - Traffic signal	03 - At intersection	07 - Dark	03 - P.D. only	04 - Sideswipe
13-12296	BESSERER ST @ KING EDWARD AVE	##########	##########	########	8:09	01 - Clear	01 - Dry	01 - Traffic signal	01 - Non intersection	01 - Daylight	03 - P.D. only	03 - Rear end
13-13375	DALY AVE @ NELSON ST	##########	##########	########	19:49	01 - Clear	03 - Loose snow	02 - Stop sign	02 - Intersection related	07 - Dark	03 - P.D. only	02 - Angle
662	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	15:07	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	02 - Non-fatal injury	07 - SMV other
1157	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	15:50	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	07 - SMV other
1746	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	21:59	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	07 - Dark	02 - Non-fatal injury	07 - SMV other
2362	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	13:27	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	03 - Rear end
2412	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	20:02	03 - Snow	02 - Wet	01 - Traffic signal	02 - Intersection related	07 - Dark	02 - Non-fatal injury	03 - Rear end
2722	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	9:15	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	04 - Sideswipe
2897	DALY AVE @ NELSON ST	##########	##########	########	21:15	01 - Clear	06 - Ice	02 - Stop sign	02 - Intersection related	07 - Dark	03 - P.D. only	03 - Rear end
2903	BESSERER ST @ KING EDWARD AVE	##########	##########	########	23:45	04 - Freezing Ra	06 - Ice	01 - Traffic signal	02 - Intersection related	07 - Dark	03 - P.D. only	07 - SMV other
3297	BESSERER ST @ KING EDWARD AVE	##########	##########	########	16:10	01 - Clear	06 - Ice	01 - Traffic signal	02 - Intersection related	05 - Dusk	03 - P.D. only	03 - Rear end
4000	BESSERER ST @ KING EDWARD AVE	##########	##########	########	8:39	03 - Snow	03 - Loose snow	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	03 - Rear end
4601	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	11:18	03 - Snow	03 - Loose snow	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
5195	KING EDWARD AVE btwn RIDEAU ST & BESSERER ST	##########	##########	########	10:45	01 - Clear	02 - Wet	10 - No control	04 - At/near private drive	01 - Daylight	03 - P.D. only	02 - Angle
6203	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	13:19	01 - Clear	02 - Wet	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
6614	BESSERER ST @ KING EDWARD AVE	##########	##########	########	14:02	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	06 - SMV unattended vehicle
7257	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	10:23	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	05 - Turning movement
8426	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	20:48	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	07 - Dark	03 - P.D. only	02 - Angle
9408	BESSERER ST @ KING EDWARD AVE	##########	##########	########	12:19	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
9749	DALY AVE @ KING EDWARD AVE	##########	##########	########	17:31	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	01 - Daylight	03 - P.D. only	05 - Turning movement
10046	BESSERER ST @ KING EDWARD AVE	##########	##########	########	15:00	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	04 - Sideswipe
10329	KING EDWARD AVE btwn RIDEAU ST & BESSERER ST	##########	##########	########	15:12	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	04 - Sideswipe
11253	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	17:50	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	99 - Other
12221	DALY AVE @ KING EDWARD AVE	##########	##########	########	12:46	01 - Clear	01 - Dry	02 - Stop sign	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
12467	DALY AVE @ KING EDWARD AVE	##########	##########	########	15:55	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
12896	DALY AVE @ KING EDWARD AVE	##########	##########	########	11:56	01 - Clear	01 - Dry	02 - Stop sign	02 - Intersection related	01 - Daylight	03 - P.D. only	99 - Other
13425	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	11:11	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	04 - Sideswipe
13450	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	17:46	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
13461	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	12:45	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	04 - Sideswipe
14285	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	16:58	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	04 - Sideswipe
14419	DALY AVE @ NELSON ST	##########	##########	########	17:25	02 - Rain	02 - Wet	02 - Stop sign	03 - At intersection	07 - Dark	03 - P.D. only	02 - Angle
14424	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	14:00	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	01 - Approaching
14518	KING EDWARD AVE btwn RIDEAU ST & BESSERER ST	##########	##########	########	16:28	04 - Freezing Ra	04 - Slush	10 - No control	01 - Non intersection	05 - Dusk	03 - P.D. only	04 - Sideswipe
14596	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	6:31	03 - Snow	02 - Wet	01 - Traffic signal	02 - Intersection related	07 - Dark	03 - P.D. only	03 - Rear end
14795	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	18:48	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	07 - Dark	03 - P.D. only	03 - Rear end
661	BESSERER ST @ KING EDWARD AVE	##########	##########	########	21:59	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	07 - Dark	02 - Non-fatal injury	02 - Angle
755	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	0:54	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	07 - Dark	02 - Non-fatal injury	07 - SMV other
1084	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	15:45	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	04 - Sideswipe
1509	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	19:30	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	02 - Non-fatal injury	02 - Angle
2495	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	22:20	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	07 - Dark	02 - Non-fatal injury	07 - SMV other
2539	DALY AVE @ KING EDWARD AVE	##########	##########	########	19:25	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	07 - Dark	02 - Non-fatal injury	07 - SMV other
2877	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	18:18	04 - Freezing Ra	06 - Ice	01 - Traffic signal	02 - Intersection related	07 - Dark	02 - Non-fatal injury	03 - Rear end
4190	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	14:40	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	04 - Sideswipe
4257	BESSERER ST @ KING EDWARD AVE	##########	##########	########	16:18	03 - Snow	04 - Slush	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
4912	BESSERER ST @ KING EDWARD AVE	##########	##########	########	15:30	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	99 - Other

5040	KING EDWARD AVE btwn RIDEAU ST & BESSERER ST	##########	##########	########	15:01	01 - Clear	01 - Dry	10 - No control	04 - At/near private drive	01 - Daylight	03 - P.D. only	02 - Angle
5096	DALY AVE @ KING EDWARD AVE	##########	##########	########	17:16	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	05 - Dusk	03 - P.D. only	02 - Angle
5590	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	15:06	03 - Snow	03 - Loose snow	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
5880	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	12:10	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	04 - Sideswipe
6077	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	15:51	03 - Snow	05 - Packed snow	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
6487	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	7:16	03 - Snow	04 - Slush	01 - Traffic signal	02 - Intersection related	03 - Dawn	03 - P.D. only	03 - Rear end
6965	BESSERER ST @ KING EDWARD AVE	##########	##########	########	11:17	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
7171	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	0:15	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	07 - Dark	03 - P.D. only	04 - Sideswipe
7905	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	18:26	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
7971	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	22:16	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	07 - Dark	03 - P.D. only	05 - Turning movement
9061	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	12:02	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	02 - Angle
9102	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	11:51	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	02 - Angle
9774	BESSERER ST @ KING EDWARD AVE	##########	##########	########	21:14	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	05 - Dusk	03 - P.D. only	02 - Angle
10135	BESSERER ST @ KING EDWARD AVE	##########	##########	########	16:47	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	04 - Sideswipe
10322	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	15:22	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	04 - Sideswipe
10790	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	7:20	01 - Clear	02 - Wet	01 - Traffic signal	03 - At intersection	03 - Dawn	03 - P.D. only	03 - Rear end
11098	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	11:36	01 - Clear	02 - Wet	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	04 - Sideswipe
12095	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	8:45	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	04 - Sideswipe
12126	BESSERER ST @ KING EDWARD AVE	##########	##########	########	16:21	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	04 - Sideswipe
12483	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	1:06	07 - Fog, mist, s	02 - Wet	01 - Traffic signal	03 - At intersection	07 - Dark	03 - P.D. only	05 - Turning movement
12702	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	11:27	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	99 - Other
12790	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	13:15	03 - Snow	03 - Loose snow	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	03 - Rear end
14613	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	0:26	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	07 - Dark	03 - P.D. only	05 - Turning movement
14614	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	20:15	03 - Snow	03 - Loose snow	01 - Traffic signal	03 - At intersection	07 - Dark	03 - P.D. only	05 - Turning movement
14794	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	20:32	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	07 - Dark	03 - P.D. only	05 - Turning movement
1740	BESSERER ST @ KING EDWARD AVE	##########	##########	########	18:42	01 - Clear	02 - Wet	01 - Traffic signal	03 - At intersection	07 - Dark	02 - Non-fatal injury	07 - SMV other
1741	BESSERER ST @ KING EDWARD AVE	##########	##########	########	11:30	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	02 - Non-fatal injury	02 - Angle
1742	BESSERER ST @ KING EDWARD AVE	##########	##########	########	15:24	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
1743	BESSERER ST @ KING EDWARD AVE	##########	##########	########	15:53	06 - Strong winc	04 - Slush	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	04 - Sideswipe
1771	BESSERER ST btwn KING EDWARD AVE & NELSON ST	##########	##########	########	10:00	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	06 - SMV unattended vehicle
1772	BESSERER ST btwn KING EDWARD AVE & NELSON ST	##########	##########	########	16:50	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	03 - Rear end
4117	DALY AVE @ KING EDWARD AVE	##########	##########	########	19:23	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
4118	DALY AVE @ KING EDWARD AVE	##########	##########	########	15:36	01 - Clear	01 - Dry	02 - Stop sign	02 - Intersection related	01 - Daylight	03 - P.D. only	02 - Angle
8490	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	7:17	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	02 - Non-fatal injury	02 - Angle
8491	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	15:20	01 - Clear	03 - Loose snow	01 - Traffic signal	03 - At intersection	01 - Daylight	02 - Non-fatal injury	07 - SMV other
8492	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	10:20	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	04 - Sideswipe
8493	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	12:07	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	05 - Turning movement
8494	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	15:00	01 - Clear	02 - Wet	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	04 - Sideswipe
8495	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	10:54	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
8496	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	21:57	03 - Snow	04 - Slush	01 - Traffic signal	02 - Intersection related	07 - Dark	03 - P.D. only	05 - Turning movement
8542	KING EDWARD AVE btwn BESSERER ST & DALY AVE	##########	##########	########	0:08	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	07 - Dark	02 - Non-fatal injury	07 - SMV other
8543	KING EDWARD AVE btwn BESSERER ST & DALY AVE	##########	##########	########	21:15	02 - Rain	02 - Wet	10 - No control	01 - Non intersection	07 - Dark	03 - P.D. only	04 - Sideswipe
8557	KING EDWARD AVE btwn RIDEAU ST & BESSERER ST	##########	##########	########	9:12	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	04 - Sideswipe
4119	DALY AVE @ NELSON ST	##########	##########	########	15:37	01 - Clear	05 - Packed snow	02 - Stop sign	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
10297	NELSON ST btwn BESSERER ST & DALY AVE	##########	##########	########	0:00	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	00 - Unknown	03 - P.D. only	06 - SMV unattended vehicle
1770	BESSERER ST @ KING EDWARD AVE	##########	##########	########	3:30	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	07 - Dark	03 - P.D. only	02 - Angle
1771	BESSERER ST @ KING EDWARD AVE	##########	##########	########	16:35	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
1772	BESSERER ST @ KING EDWARD AVE	##########	##########	########	16:19	02 - Rain	02 - Wet	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
1773	BESSERER ST @ KING EDWARD AVE	##########	##########	########	15:16	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
1774	BESSERER ST @ KING EDWARD AVE	##########	##########	########	14:25	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
1775	BESSERER ST @ KING EDWARD AVE	##########	##########	########	23:23	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	07 - Dark	03 - P.D. only	03 - Rear end
1798	BESSERER ST btwn KING EDWARD AVE & NELSON ST	##########	##########	########	0:00	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	00 - Unknown	03 - P.D. only	06 - SMV unattended vehicle
4271	DALY AVE @ KING EDWARD AVE	##########	##########	########	8:58	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
4272	DALY AVE @ KING EDWARD AVE	##########	##########	########	18:50	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
4273	DALY AVE @ KING EDWARD AVE	##########	##########	########	18:23	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
4274	DALY AVE @ KING EDWARD AVE	##########	##########	########	16:10	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
4275	DALY AVE @ KING EDWARD AVE	##########	##########	########	18:10	01 - Clear	01 - Dry	02 - Stop sign	02 - Intersection related	01 - Daylight	03 - P.D. only	02 - Angle
4276	DALY AVE @ KING EDWARD AVE	##########	##########	########	12:32	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
4277	DALY AVE @ KING EDWARD AVE	##########	##########	########	15:44	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	01 - Daylight	03 - P.D. only	05 - Turning movement
4278	DALY AVE @ KING EDWARD AVE	##########	##########	########	19:40	03 - Snow	02 - Wet	02 - Stop sign	03 - At intersection	07 - Dark	03 - P.D. only	02 - Angle
4279	DALY AVE @ KING EDWARD AVE	##########	##########	########	5:08	01 - Clear	01 - Dry	02 - Stop sign	03 - At intersection	07 - Dark	03 - P.D. only	02 - Angle
4280	DALY AVE @ KING EDWARD AVE	##########	##########	########	15:16	03 - Snow	03 - Loose snow	02 - Stop sign	03 - At intersection	01 - Daylight	03 - P.D. only	02 - Angle
9012	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	11:46	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	07 - SMV other
9013	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	16:40	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
9014	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	1:15	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	07 - Dark	02 - Non-fatal injury	07 - SMV other
9015	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	13:12	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	05 - Turning movement
9016	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	13:39	01 - Clear	01 - Dry	01 - Traffic signal	03 - At intersection	01 - Daylight	03 - P.D. only	04 - Sideswipe
9017	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	7:50	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	02 - Non-fatal injury	03 - Rear end
9018	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	18:15	03 - Snow	03 - Loose snow	01 - Traffic signal	03 - At intersection	07 - Dark	03 - P.D. only	05 - Turning movement
9019	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	19:58	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	07 - Dark	03 - P.D. only	03 - Rear end
9020	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	21:28	02 - Rain	02 - Wet	01 - Traffic signal	03 - At intersection	07 - Dark	02 - Non-fatal injury	07 - SMV other

9021	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	14:17	01 - Clear	01 - Dry	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
9022	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	20:32	02 - Rain	02 - Wet	01 - Traffic signal	03 - At intersection	07 - Dark	03 - P.D. only	05 - Turning movement
9023	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	16:14	02 - Rain	02 - Wet	01 - Traffic signal	02 - Intersection related	05 - Dusk	03 - P.D. only	04 - Sideswipe
9024	KING EDWARD AVE @ RIDEAU ST	##########	##########	########	12:40	03 - Snow	06 - Ice	01 - Traffic signal	02 - Intersection related	01 - Daylight	03 - P.D. only	03 - Rear end
9069	KING EDWARD AVE btwn RIDEAU ST & BESSERER ST	##########	##########	########	19:17	01 - Clear	01 - Dry	10 - No control	01 - Non intersection	01 - Daylight	03 - P.D. only	04 - Sideswipe
9070	KING EDWARD AVE btwn RIDEAU ST & BESSERER ST	##########	##########	########	6:58	01 - Clear	01 - Dry	10 - No control	04 - At/near private drive	01 - Daylight	03 - P.D. only	03 - Rear end
1776	BESSERER ST @ NELSON ST	##########	##########	########	16:00	02 - Rain	02 - Wet	02 - Stop sign	02 - Intersection related	01 - Daylight	03 - P.D. only	04 - Sideswipe

Appendix E

Synchro Intersection Worksheets – Future Background Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	138	3	106	0	0	18	0	293	4	6	768	0
Future Volume (vph)	138	3	106	0	0	18	0	293	4	6	768	0
Satd. Flow (prot)	1575	1435	0	0	0	1510	0	3309	0	0	3316	0
Flt Permitted	0.950	0.994									0.953	
Satd. Flow (perm)	1575	1435	0	0	0	1510	0	3309	0	0	3160	0
Satd. Flow (RTOR)		106				625						
Lane Group Flow (vph)	124	123	0	0	0	18	0	297	0	0	774	0
Turn Type	Perm	NA				Perm		NA		Perm	NA	
Protected Phases		4						2			6	
Permitted Phases	4					8				6		
Detector Phase	4	4				8		2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0				10.0		10.0		10.0	10.0	
Minimum Split (s)	22.6	22.6				15.8		31.1		31.1	31.1	
Total Split (s)	30.0	30.0				15.8		80.0		80.0	80.0	
Total Split (%)	27.3%	27.3%				14.4%		72.7%		72.7%	72.7%	
Yellow Time (s)	3.3	3.3				3.5		3.5		3.5	3.5	
All-Red Time (s)	2.3	2.3				2.3		2.6		2.6	2.6	
Lost Time Adjust (s)	0.0	0.0				0.0		0.0			0.0	
Total Lost Time (s)	5.6	5.6				5.8		6.1			6.1	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max				None		C-Max		C-Max	C-Max	
Act Effct Green (s)	24.4	24.4				15.7		73.9			73.9	
Actuated g/C Ratio	0.22	0.22				0.14		0.67			0.67	
v/c Ratio	0.36	0.31				0.02		0.13			0.36	
Control Delay	39.6	11.5				0.1		6.7			8.4	
Queue Delay	0.0	0.0				0.0		0.0			0.0	
Total Delay	39.6	11.5				0.1		6.7			8.4	
LOS	D	B				A		A			A	
Approach Delay		25.6			0.1			6.7			8.4	
Approach LOS		C			A			A			A	
Queue Length 50th (m)	25.0	3.1				0.0		11.4			36.1	
Queue Length 95th (m)	44.1	19.5				0.0		16.6			46.6	
Internal Link Dist (m)		100.3			122.3			81.5			45.1	
Turn Bay Length (m)												
Base Capacity (vph)	349	400				819		2223			2122	
Starvation Cap Reductn	0	0				0		0			0	
Spillback Cap Reductn	0	0				0		0			0	
Storage Cap Reductn	0	0				0		0			0	
Reduced v/c Ratio	0.36	0.31				0.02		0.13			0.36	

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.36
Intersection Signal Delay: 11.1 Intersection LOS: B
Intersection Capacity Utilization 44.9% ICU Level of Service A
Analysis Period (min) 15
Description: Per City signal plans to represent "Note: EB must turn right or left. WB must turn right, and faces a red signal."

Splits and Phases: 1: King Edward & Besserer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	169	10	81	0	0	25	0	592	4	0	508	0
Future Volume (vph)	169	10	81	0	0	25	0	592	4	0	508	0
Satd. Flow (prot)	1575	1478	0	0	0	1510	0	3312	0	0	3316	0
Flt Permitted	0.950	0.987										
Satd. Flow (perm)	1575	1478	0	0	0	1510	0	3312	0	0	3316	0
Satd. Flow (RTOR)		81				211						
Lane Group Flow (vph)	135	125	0	0	0	25	0	596	0	0	508	0
Turn Type	Perm	NA				Perm		NA			NA	
Protected Phases		4						2			6	
Permitted Phases	4					8						
Detector Phase	4	4				8		2			6	
Switch Phase												
Minimum Initial (s)	10.0	10.0				10.0		10.0			10.0	
Minimum Split (s)	22.6	22.6				15.8		31.1			31.1	
Total Split (s)	23.0	23.0				15.8		32.0			32.0	
Total Split (%)	41.8%	41.8%				28.7%		58.2%			58.2%	
Yellow Time (s)	3.3	3.3				3.5		3.5			3.5	
All-Red Time (s)	2.3	2.3				2.3		2.6			2.6	
Lost Time Adjust (s)	0.0	0.0				0.0		0.0			0.0	
Total Lost Time (s)	5.6	5.6				5.8		6.1			6.1	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max				None		C-Max			C-Max	
Act Effct Green (s)	17.4	17.4				11.4		25.9			25.9	
Actuated g/C Ratio	0.32	0.32				0.21		0.47			0.47	
v/c Ratio	0.27	0.24				0.05		0.38			0.33	
Control Delay	15.9	7.7				0.2		10.3			9.8	
Queue Delay	0.0	0.0				0.0		0.0			0.0	
Total Delay	15.9	7.7				0.2		10.3			9.8	
LOS	B	A				A		B			A	
Approach Delay		12.0			0.2			10.3			9.8	
Approach LOS		B			A			B			A	
Queue Length 50th (m)	10.9	3.3				0.0		19.6			16.2	
Queue Length 95th (m)	23.1	13.8				0.0		29.8			25.2	
Internal Link Dist (m)		100.3			122.3			81.5			45.1	
Turn Bay Length (m)												
Base Capacity (vph)	498	522				617		1559			1561	
Starvation Cap Reductn	0	0				0		0			0	
Spillback Cap Reductn	0	0				0		0			0	
Storage Cap Reductn	0	0				0		0			0	
Reduced v/c Ratio	0.27	0.24				0.04		0.38			0.33	

Intersection Summary

Cycle Length: 55
Actuated Cycle Length: 55
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.38
Intersection Signal Delay: 10.3 Intersection LOS: B
Intersection Capacity Utilization 48.7% ICU Level of Service A
Analysis Period (min) 15
Description: Per City signal plans to represent "Note: EB must turn right or left. WB must turn right, and faces a red signal."

Splits and Phases: 1: King Edward & Besserer

Appendix F

Parking Survey

On-Street Parking Usage

Sandy Hill On-Street Parking Usage Survey

Besserer Street, Daly Avenue, & Nelson Street

Besserer Street

Between Cumberland Street & Nelson Street

Day: Wednesday Date: 20 March 2019 Survey Hours 0700-1000 & 1600-2200

Weather: Cloudy -5ºC (AM) & Partly Cloudy +7ºC (PM) Surveyor (s): Carmody

Cumberland St. to King Edward Ave.

NORTH SIDE				SOUTH SIDE			
Time	Parked Vehicles			Time	Parked Vehicles		
	Number of Parked Vehicles	Usage by Time Period			Number of Parked Vehicles	Usage by Time Period	
0700	3	75.0%		0700	2	12.5%	
0730	1	25.0%		0730	4	25.0%	
0800	1	25.0%		0800	5	31.3%	
0830	0	0.0%		0830	3	18.8%	
0900	1	25.0%		0900	4	25.0%	
0930	0	0.0%		0930	6	37.5%	
1000	0	0.0%		1000	5	31.3%	
1600	3	75.0%		1600	4	25.0%	
1630	3	75.0%		1630	6	37.5%	
1700	1	25.0%		1700	4	25.0%	
1730	2	50.0%		1730	9	56.3%	
1800	3	75.0%	2 in No Pkg Area	1800	10	62.5%	
1830	5	125.0%	1 in No Pkg Area	1830	16	100.0%	1 in No Stopping
1900	4	100.0%	1 in No Pkg Area	1900	17	106.3%	1 in No Stopping
1930	5	125.0%	1 in No Pkg Area	1930	16	100.0%	
2000	5	125.0%	1 in No Pkg Area	2000	17	106.3%	1 in No Stopping
2030	5	125.0%	1 in No Pkg Area	2030	18	112.5%	2 in No Stopping
2100	4	100.0%		2100	15	93.8%	1 in No Stopping
2130	5	125.0%		2130	12	75.0%	
2200	5	125.0%		2200	10	62.5%	
Legal Spaces	4			Legal Spaces	16		

King Edward Ave. to Nelson St.

NORTH SIDE			SOUTH SIDE		
Time	Parked Vehicles		Time	Parked Vehicles	
	Number of Parked Vehicles	Usage by Time Period		Number of Parked Vehicles	Usage by Time Period
0700	1	5.0%	0700	0	N/A
0730	2	10.0%	0730	0	N/A
0800	2	10.0%	0800	0	N/A
0830	3	15.0%	0830	0	N/A
0900	3	15.0%	0900	0	N/A
0930	3	15.0%	0930	0	N/A
1000	3	15.0%	1000	0	N/A
			No Legal Parking		
1600	5	25.0%	1600	0	N/A
1630	5	25.0%	1630	1	N/A
1700	4	20.0%	1700	0	N/A
1730	5	25.0%	1730	0	N/A
1800	10	50.0%	1800	0	N/A
1830	10	50.0%	1830	0	N/A
1900	11	55.0%	1900	0	N/A
			No Legal Parking		
1930	11	55.0%	1930	0	N/A
2000	17	85.0%	2000	0	N/A
2030	16	80.0%	2030	0	N/A
2100	17	85.0%	2100	0	N/A
2130	16	80.0%	2130	0	N/A
2200	11	55.0%	2200	0	N/A
Legal Spaces	20		Legal Spaces	0	

Several parking spaces on north side of Besserer east of Cumberland are blocked by construction. Where usage exceeds 100%, vehicles were parked in 'No Parking' or 'No Stopping' zones.

Besserer Street

On-Street Parking Usage

Sandy Hill On-Street Parking Usage Survey

Besserer Street, Daly Avenue, & Nelson Street

Besserer Street

Between Nelson Street and Friel Street

Day: Wednesday Date: 20 March 2019 Survey Hours 0700-1000 & 1600-2200

Weather: Cloudy -5ºC (AM) & Partly Cloudy +7ºC (PM) Surveyor (s): Carmody

Nelson St. to Friel St.

NORTH SIDE			SOUTH SIDE		
Time	Parked Vehicles		Time	Parked Vehicles	
	Number of Parked Vehicles	Usage by Time Period		Number of Parked Vehicles	Usage by Time Period
0700	7	50.0%	0700	0	N/A
0730	7	50.0%	0730	0	N/A
0800	7	50.0%	0800	0	N/A
0830	9	64.3%	0830	0	N/A
0900	10	71.4%	0900	0	N/A
0930	7	50.0%	0930	0	N/A
1000	8	57.1%	1000	0	N/A
			No Legal Parking		
1600	5	35.7%	1600	0	N/A
1630	5	35.7%	1630	0	N/A
1700	6	42.9%	1700	1	N/A
1730	5	35.7%	1730	0	N/A
1800	9	64.3%	1800	0	N/A
1830	9	64.3%	1830	0	N/A
1900	10	71.4%	1900	0	N/A
			No Legal Parking		
1930	9	64.3%	1930	0	N/A
2000	14	100.0%	2000	0	N/A
2030	13	92.9%	2030	0	N/A
2100	13	92.9%	2100	0	N/A
2130	11	78.6%	2130	0	N/A
2200	9	64.3%	2200	0	N/A
Legal Spaces	14		Legal Spaces	0	

Besserer Street

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On-Street Parking Usage

Sandy Hill On-Street Parking Usage Survey

Besserer Street, Daly Avenue, & Nelson Street

Daly Avenue

Between Cumberland Avenue & Nelson Street

Day: Wednesday Date: 20 March 2019 Survey Hours 0700-1000 & 1600-2200

Weather: Cloudy -5ºC (AM) & Partly Cloudy +7ºC (PM) Surveyor (s): Carmody

Between Cumberland St. & King Edward Ave.

NORTH SIDE

Time	Parked Vehicles: Number of Parked Vehicles	Parked Vehicles: Loading Zone Swiss Hotel	Parked Vehicles: Usage by Time Period
0700	6	0	85.7%
0730	6	0	85.7%
0800	6	0	85.7%
0830	4	0	57.1%
0900	6	0	85.7%
0930	7	0	100.0%
1000	7	0	100.0%
1600	6	0	85.7%
1630	5	0	71.4%
1700	3	0	42.9%
1730	4	0	57.1%
1800	5	0	71.4%
1830	6	0	85.7%
1900	6	0	85.7%
1930	6	0	85.7%
2000	6	0	85.7%
2030	6	0	85.7%
2100	6	0	85.7%
2130	5	0	71.4%
2200	4	0	57.1%
Legal Spaces			7

SOUTH SIDE

Time	Parked Vehicles: Number of Parked Vehicles	Parked Vehicles: Usage by Time Period
0700	4	57.1%
0730	4	57.1%
0800	4	57.1%
0830	5	71.4%
0900	6	85.7%
0930	6	85.7%
1000	7	100.0%
1600	7	100.0%
1630	5	71.4%
1700	5	71.4%
1730	4	57.1%
1800	6	85.7%
1830	7	100.0%
1900	7	100.0%
1930	7	100.0%
2000	7	100.0%
2030	7	100.0%
2100	7	100.0%
2130	4	57.1%
2200	4	57.1%
Legal Spaces		7

Between King Edward Ave. & Nelson St.

NORTH SIDE

Time	Parked Vehicles: Number of Parked Vehicles	Parked Vehicles: Usage by Time Period	
0700	2	15.4%	
0730	2	15.4%	
0800	2	15.4%	
0830	2	15.4%	
0900	3	23.1%	
0930	4	30.8%	
1000	6	46.2%	
1600	5	38.5%	
1630	5	38.5%	
1700	6	46.2%	(*)
1730	6	46.2%	(*)
1800	6	46.2%	(*)
1830	5	38.5%	
1900	8	61.5%	
1930	10	76.9%	
2000	12	92.3%	
2030	13	100.0%	
2100	12	92.3%	
2130	12	92.3%	
2200	11	84.6%	
Legal Spaces		13	

SOUTH SIDE

Time	Parked Vehicles: Number of Parked Vehicles	Parked Vehicles: Usage by Time Period
0700	0	N/A
0730	0	N/A
0800	0	N/A
0830	0	N/A
0900	0	N/A
0930	0	N/A
1000	0	N/A
No Legal Parking		
1600	0	N/A
1630	0	N/A
1700	0	N/A
1730	0	N/A
1800	0	N/A
1830	0	N/A
1900	0	N/A
No Legal Parking		
1930	0	N/A
2000	0	N/A
2030	0	N/A
2100	0	N/A
2130	0	N/A
2200	0	N/A
Legal Spaces		0

(*) - one vehicle in each time period parked in 'No Parking' area.

Daly Avenue

On-Street Parking Usage

Sandy Hill On-Street Parking Usage Survey

Besserer Street, Daly Avenue, & Nelson Street

Daly Avenue

Between Nelson Street & Friel Street

Day: Wednesday Date: 20 March 2019 Survey Hours 0700-1000 & 1600-2200

Weather: Cloudy -5ºC (AM) & Partly Cloudy +7ºC (PM) Surveyor (s): Carmody

Between Nelson St. & Friel St.

NORTH SIDE

Time	Parked Vehicles: Number of Parked Vehicles	Parked Vehicles: Usage by Time Period
0700	3	30.0%
0730	2	20.0%
0800	2	20.0%
0830	1	10.0%
0900	1	10.0%
0930	1	10.0%
1000	2	20.0%
1600	3	30.0%
1630	3	30.0%
1700	1	10.0%
1730	3	30.0%
1800	3	30.0%
1830	4	40.0%
1900	4	40.0%
1930	4	40.0%
2000	4	40.0%
2030	4	40.0%
2100	5	50.0%
2130	5	50.0%
2200	5	50.0%
Legal Spaces		10

SOUTH SIDE

Time	Parked Vehicles: Number of Parked Vehicles	Parked Vehicles: Usage by Time Period
0700	0	N/A
0730	0	N/A
0800	0	N/A
0830	0	N/A
0900	0	N/A
0930	0	N/A
1000	0	N/A
No Legal Parking		
1600	0	N/A
1630	0	N/A
1700	0	N/A
1730	0	N/A
1800	0	N/A
1830	0	N/A
1900	0	N/A
No Legal Parking		
1930	0	N/A
2000	0	N/A
2030	0	N/A
2100	0	N/A
2130	0	N/A
2200	0	N/A
Legal Spaces		0

Daly Avenue

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On-Street Parking Usage

Sandy Hill On-Street Parking Usage Survey

Besserer Street, Daly Avenue, & Nelson Street

Nelson Street

Between Besserer Street & Stewart Street

Day: Wednesday **Date:** 20 March 2019 **Survey Hours** 0700-1000 & 1600-2200

Weather: Cloudy -5°C (AM) & Partly Cloudy +7°C (PM) **Surveyor (s):** Carmody

Between Besserer Street & Daly Avenue

EAST SIDE

Time	Parked Vehicles	
	Number of Parked Vehicles	Usage by Time Period
0700	0	N/A
0730	0	N/A
0800	0	N/A
0830	0	N/A
0900	0	N/A
0930	0	N/A
1000	0	N/A
No Legal Parking		
1600	0	N/A
1630	0	N/A
1700	0	N/A
1730	0	N/A
1800	0	N/A
1830	0	N/A
1900	0	N/A
No Legal Parking		
1930	0	N/A
2000	0	N/A
2030	0	N/A
2100	0	N/A
2130	0	N/A
2200	0	N/A

Legal Spaces 0

WEST SIDE

Time	Parked Vehicles	
	Number of Parked Vehicles	Usage by Time Period
0700	1	20.0%
0730	1	20.0%
0800	0	0.0%
0830	0	0.0%
0900	0	0.0%
0930	0	0.0%
1000	0	0.0%
1600	2	40.0%
1630	1	20.0%
1700	1	20.0%
1730	1	20.0%
1800	1	20.0%
1830	0	0.0%
1900	0	0.0%
1930	1	20.0%
2000	4	80.0%
2030	5	100.0%
2100	5	100.0%
2130	3	60.0%
2200	3	60.0%

Legal Spaces 5

Between Daly Avenue & Stewart Street

EAST SIDE

Time	Parked Vehicles	
	Number of Parked Vehicles	Usage by Time Period
0700	0	N/A
0730	0	N/A
0800	0	N/A
0830	0	N/A
0900	0	N/A
0930	0	N/A
1000	0	N/A
No Legal Parking		
1600	0	N/A
1630	0	N/A
1700	0	N/A
1730	0	N/A
1800	0	N/A
1830	0	N/A
1900	0	N/A
No Legal Parking		
1930	0	N/A
2000	0	N/A
2030	0	N/A
2100	0	N/A
2130	0	N/A
2200	0	N/A

Legal Spaces 0

WEST SIDE

Time	Parked Vehicles	
	Number of Parked Vehicles	Usage by Time Period
0700	5	100.0%
0730	3	60.0%
0800	3	60.0%
0830	3	60.0%
0900	3	60.0%
0930	4	80.0%
1000	3	60.0%
1600	2	40.0%
1630	2	40.0%
1700	2	40.0%
1730	2	40.0%
1800	3	60.0%
1830	3	60.0%
1900	4	80.0%
1930	5	100.0%
2000	5	100.0%
2030	5	100.0%
2100	4	80.0%
2130	3	60.0%
2200	3	60.0%

Legal Spaces 5

Nelson Street

Appendix G

MMLOS Analysis

Multi-Modal Level of Service - Intersections Form

Consultant	**CGH Transportation Inc**	**Project**	**2019-11 - 250 Besserer**
Scenario	**Existing / Future**	**Date**	**02-May-19**
Comments	**If AM and PM values differ, PM will be provided in second column**		

	INTERSECTIONS	**Besserer / King Edward**				**Besserer / King Edward**			
	Crossing Side	**NORTH**	**SOUTH**	**EAST**	**WEST**	**NORTH**	**SOUTH**	**EAST**	**WEST**
Pedestrian	Lanes		4	0 - 2	0 - 2		4	0 - 2	0 - 2
	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
	Conflicting Left Turns		No left turn / Prohib.	No left turn / Prohib.	No left turn / Prohib.		No left turn / Prohib.	No left turn / Prohib.	No left turn / Prohib.
	Conflicting Right Turns		Permissive or yield control	Permissive or yield control	No right turn		Permissive or yield control	Permissive or yield control	No right turn
	Right Turns on Red (RToR) ?		RTOR prohibited	RTOR allowed	RTOR allowed		RTOR prohibited	RTOR allowed	RTOR allowed
	Ped Signal Leading Interval?		No	No	No		No	No	No
	Right Turn Channel		No Channel	Conv'tl without Receiving Lane	No Channel		No Channel	Conv'tl without Receiving Lane	No Channel
	Corner Radius		3-5m	3-5m	3-5m		3-5m	3-5m	3-5m
	Crosswalk Type		Zebra stripe hi-vis markings	Std transverse markings	Std transverse markings		Zebra stripe hi-vis markings	Std transverse markings	Std transverse markings
	PETSI Score		**69**	**99**	**100**		**69**	**99**	**100**
	Ped. Exposure to Traffic LoS	-	**C**	**A**	**A**	-	**C**	**A**	**A**
	Cycle Length		110	110	110		55	55	55
	Effective Walk Time		10	25	25		10	25	25
	Average Pedestrian Delay		**45**	**33**	**33**		**18**	**8**	**8**
	Pedestrian Delay LoS	-	**E**	**D**	**D**	-	**B**	**A**	**A**
	Level of Service	**-**	**E**	**D**	**D**	**-**	**C**	**A**	**A**
		E				**C**			
	Approach From	**NORTH**	**SOUTH**	**EAST**	**WEST**	**NORTH**	**SOUTH**	**EAST**	**WEST**
Bicycle	Bicycle Lane Arrangement on Approach	Mixed Traffic	Mixed Traffic	Mixed Traffic	Mixed Traffic				
	Right Turn Lane Configuration								
	Right Turning Speed		≤ 25 km/h	≤ 25 km/h	≤ 25 km/h				
	Cyclist relative to RT motorists	**#N/A**	**#N/A**	**#N/A**	**#N/A**	-	-	-	-
	Separated or Mixed Traffic	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**	**Mixed Traffic**	-	-	-	-
	Left Turn Approach				No lane crossed				
	Operating Speed				> 40 to ≤ 50 km/h				
	Left Turning Cyclist	-	-	-	**B**	-	-	-	-
	Level of Service	**#N/A**	**#N/A**	**#N/A**	**#N/A**	**-**	**-**	**-**	**-**
		#N/A				**-**			
Transit	Average Signal Delay	≤ 10 sec	≤ 10 sec	≤ 10 sec	≤ 40 sec	≤ 10 sec	≤ 20 sec	≤ 10 sec	≤ 20 sec
	Level of Service	**B**	**B**	**B**	**E**	**B**	**C**	**B**	**C**
		E				**C**			
Truck	Effective Corner Radius		< 10 m	< 10 m	< 10 m				
	Number of Receiving Lanes on Departure from Intersection		1	≥ 2	≥ 2				
	Level of Service	**-**	**F**	**D**	**D**	**-**	**-**	**-**	**-**
		F				**-**			
Auto	Volume to Capacity Ratio			0.0 - 0.60					
	Level of Service	**A**				**-**			

Multi-Modal Level of Service - Segments Form

Consultant	**CGH Transportation Inc**	**Project**	**2019-11 - 250 Besserer**
Scenario	**Existing / Future**	**Date**	**02-May-19**
Comments			

SEGMENTS		**Street A**	Besserer	King Edward	Section
			1	2	3
Pedestrian	Sidewalk Width Boulevard Width	**C**	1.8 m < 0.5 m	≥ 2 m < 0.5	
	Avg Daily Curb Lane Traffic Volume		≤ 3000	> 3000	
	Operating Speed On-Street Parking		> 30 to 50 km/h yes	> 30 to 50 km/h no	
	Exposure to Traffic PLoS		**B**	**C**	**-**
	Effective Sidewalk Width		1.5 m	2.5 m	
	Pedestrian Volume		250 ped/hr	250 ped/hr	
	Crowding PLoS		**B**	**B**	**-**
	Level of Service		**B**	**C**	**-**
Bicycle	Type of Cycling Facility	**E**	Mixed Traffic	Mixed Traffic	
	Number of Travel Lanes		≤ 2 (no centreline)	4-5 lanes total	
	Operating Speed		>40 to <50 km/h	>40 to <50 km/h	
	# of Lanes & Operating Speed LoS		**B**	**E**	**-**
	Bike Lane (+ Parking Lane) Width				
	Bike Lane Width LoS		**-**	**-**	**-**
	Bike Lane Blockages				
	Blockage LoS		**-**	**-**	**-**
	Median Refuge Width (no median = < 1.8 m)		< 1.8 m refuge	< 1.8 m refuge	
	No. of Lanes at Unsignalized Crossing		≤ 3 lanes	≤ 3 lanes	
	Sidestreet Operating Speed		>40 to 50 km/h	>40 to 50 km/h	
	Unsignalized Crossing - Lowest LoS		**B**	**A**	**-**
	Level of Service		**B**	**E**	**-**
Transit	Facility Type	**D**	Mixed Traffic	Mixed Traffic	
	Friction or Ratio Transit:Posted Speed		Vt/Vp ≥ 0.8	Vt/Vp ≥ 0.8	
	Level of Service		**D**	**D**	**-**
Truck	Truck Lane Width	**C**	≤ 3.5 m	> 3.7 m	
	Travel Lanes per Direction		1	> 1	
	Level of Service		**C**	**A**	**-**
Auto	**Level of Service**	**Not Applicable**			

Appendix H

TDM Checklist

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	☑ Site corrdinator
	1.2	**Travel surveys**	
BETTER	1.2.1	Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	☐
	2.	**WALKING AND CYCLING**	
	2.1	**Information on walking/cycling routes & destinations**	
BASIC	2.1.1	Display local area maps with walking/cycling access routes and key destinations at major entrances *(multi-family, condominium)*	☑
	2.2	**Bicycle skills training**	
BETTER	2.2.1	Offer on-site cycling courses for residents, or subsidize off-site courses	☐

TDM Measures Checklist City of Ottawa
Version 1.0 (30 June 2017)

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

			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	☑
		6.2	**Personalized trip planning**	
BETTER	★	6.2.1	Offer personalized trip planning to new residents	☐

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	☑
BASIC	1.1.2	Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	☑
BASIC	1.1.3	Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	☑
	1.2	**Facilities for walking & cycling**	
REQUIRED	1.2.1	Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations *(see Official Plan policy 4.3.3)*	☑
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)*	☑

		TDM-supportive design & infrastructure measures: *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 Official Plan policy 4.3.10)*	☑
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 Official Plan policy 4.3.10)*	☑
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 Official Plan policy 4.3.11)*	☐ N/A
BASIC	1.2.6	Provide safe, direct and attractive walking routes from building entrances to nearby transit stops	☐
BASIC	1.2.7	Ensure that walking routes to transit stops are secure, visible, lighted, shaded and wind-protected wherever possible	☐
BASIC	1.2.8	Design roads used for access or circulation by cyclists using a target operating speed of no more than 30 km/h, or provide a separated cycling facility	☐
	1.3	**Amenities for walking & cycling**	
BASIC	1.3.1	Provide lighting, landscaping and benches along walking and cycling routes between building entrances and streets, sidewalks and trails	☐
BASIC	1.3.2	Provide wayfinding signage for site access (where required, e.g. when multiple buildings or entrances exist) and egress (where warranted, such as when directions to reach transit stops/stations, trails or other common destinations are not obvious)	☐

		TDM-supportive design & infrastructure measures: *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)*	☑
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)*	☑
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)*	☑
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	☑
	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)*	☑
BETTER	2.2.2	Provide secure bicycle parking spaces equivalent to at least the number of units at condominiums or multi-family residential developments	☐
	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)	☑
	3.	**TRANSIT**	
	3.1	**Customer amenities**	
BASIC	3.1.1	Provide shelters, lighting and benches at any on-site transit stops	☐
BASIC	3.1.2	Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	☐
BETTER	3.1.3	Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	☐

		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	☐
	5.	**CARSHARING & BIKESHARING**	
	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)*	☐
	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	☐
	6.	**PARKING**	
	6.1	**Number of parking spaces**	
REQUIRED	6.1.1	Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	☑
BASIC	6.1.2	Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	☐
BASIC	6.1.3	Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly *(see Zoning By-law Section 104)*	☐
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)*	☐
	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)	☐

Appendix I

Synchro Intersection Worksheets – Future Total Conditions

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	138	3	81	0	0	23	0	293	6	6	768	0
Future Volume (vph)	138	3	81	0	0	23	0	293	6	6	768	0
Satd. Flow (prot)	1575	1453	0	0	0	1510	0	3306	0	0	3316	0
Flt Permitted	0.950	0.990									0.953	
Satd. Flow (perm)	1575	1453	0	0	0	1510	0	3306	0	0	3160	0
Satd. Flow (RTOR)		81				625						
Lane Group Flow (vph)	116	106	0	0	0	23	0	299	0	0	774	0
Turn Type	Perm	NA				Perm		NA		Perm	NA	
Protected Phases		4						2			6	
Permitted Phases	4					8				6		
Detector Phase	4	4				8		2		6	6	
Switch Phase												
Minimum Initial (s)	10.0	10.0				10.0		10.0		10.0	10.0	
Minimum Split (s)	22.6	22.6				15.8		31.1		31.1	31.1	
Total Split (s)	30.0	30.0				15.8		80.0		80.0	80.0	
Total Split (%)	27.3%	27.3%				14.4%		72.7%		72.7%	72.7%	
Yellow Time (s)	3.3	3.3				3.5		3.5		3.5	3.5	
All-Red Time (s)	2.3	2.3				2.3		2.6		2.6	2.6	
Lost Time Adjust (s)	0.0	0.0				0.0		0.0			0.0	
Total Lost Time (s)	5.6	5.6				5.8		6.1			6.1	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max				None		C-Max		C-Max	C-Max	
Act Effct Green (s)	24.4	24.4				15.7		73.9			73.9	
Actuated g/C Ratio	0.22	0.22				0.14		0.67			0.67	
v/c Ratio	0.33	0.28				0.03		0.13			0.36	
Control Delay	39.1	13.9				0.1		6.7			8.4	
Queue Delay	0.0	0.0				0.0		0.0			0.0	
Total Delay	39.1	13.9				0.1		6.7			8.4	
LOS	D	B				A		A			A	
Approach Delay		27.1			0.1			6.7			8.4	
Approach LOS		C			A			A			A	
Queue Length 50th (m)	23.3	4.7				0.0		11.5			36.1	
Queue Length 95th (m)	41.4	20.4				0.0		16.7			46.6	
Internal Link Dist (m)		100.3			122.3			81.5			45.1	
Turn Bay Length (m)												
Base Capacity (vph)	349	385				819		2221			2122	
Starvation Cap Reductn	0	0				0		0			0	
Spillback Cap Reductn	0	0				0		0			0	
Storage Cap Reductn	0	0				0		0			0	
Reduced v/c Ratio	0.33	0.28				0.03		0.13			0.36	

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBTL, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.36

Intersection Signal Delay: 11.0	Intersection LOS: B
Intersection Capacity Utilization 44.9%	ICU Level of Service A
Analysis Period (min) 15	

Description: Per City signal plans to represent "Note: EB must turn right or left. WB must turn right, and faces a red signal."

Splits and Phases: 1: King Edward & Besserer

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	169	10	81	0	0	28	0	592	9	0	508	0
Future Volume (vph)	169	10	81	0	0	28	0	592	9	0	508	0
Satd. Flow (prot)	1575	1478	0	0	0	1510	0	3309	0	0	3316	0
Flt Permitted	0.950	0.987										
Satd. Flow (perm)	1575	1478	0	0	0	1510	0	3309	0	0	3316	0
Satd. Flow (RTOR)		81				211						
Lane Group Flow (vph)	135	125	0	0	0	28	0	601	0	0	508	0
Turn Type	Perm	NA				Perm		NA			NA	
Protected Phases		4						2			6	
Permitted Phases	4					8						
Detector Phase	4	4				8		2			6	
Switch Phase												
Minimum Initial (s)	10.0	10.0				10.0		10.0			10.0	
Minimum Split (s)	22.6	22.6				15.8		31.1			31.1	
Total Split (s)	23.0	23.0				15.8		32.0			32.0	
Total Split (%)	41.8%	41.8%				28.7%		58.2%			58.2%	
Yellow Time (s)	3.3	3.3				3.5		3.5			3.5	
All-Red Time (s)	2.3	2.3				2.3		2.6			2.6	
Lost Time Adjust (s)	0.0	0.0				0.0		0.0			0.0	
Total Lost Time (s)	5.6	5.6				5.8		6.1			6.1	
Lead/Lag												
Lead-Lag Optimize?												
Recall Mode	Max	Max				None		C-Max			C-Max	
Act Effct Green (s)	17.4	17.4				11.4		25.9			25.9	
Actuated g/C Ratio	0.32	0.32				0.21		0.47			0.47	
v/c Ratio	0.27	0.24				0.06		0.39			0.33	
Control Delay	15.9	7.7				0.2		10.3			9.8	
Queue Delay	0.0	0.0				0.0		0.0			0.0	
Total Delay	15.9	7.7				0.2		10.3			9.8	
LOS	B	A				A		B			A	
Approach Delay		12.0			0.2			10.3			9.8	
Approach LOS		B			A			B			A	
Queue Length 50th (m)	10.9	3.3				0.0		19.8			16.2	
Queue Length 95th (m)	23.1	13.8				0.0		30.2			25.2	
Internal Link Dist (m)		100.3			122.3			81.5			45.1	
Turn Bay Length (m)												
Base Capacity (vph)	498	522				617		1558			1561	
Starvation Cap Reductn	0	0				0		0			0	
Spillback Cap Reductn	0	0				0		0			0	
Storage Cap Reductn	0	0				0		0			0	
Reduced v/c Ratio	0.27	0.24				0.05		0.39			0.33	

Intersection Summary
Cycle Length: 55
Actuated Cycle Length: 55
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 55
Control Type: Actuated-Coordinated

Maximum v/c Ratio: 0.39

Intersection Signal Delay: 10.3	Intersection LOS: B
Intersection Capacity Utilization 48.8%	ICU Level of Service A
Analysis Period (min) 15	

Description: Per City signal plans to represent "Note: EB must turn right or left. WB must turn right, and faces a red signal."

Splits and Phases: 1: King Edward & Besserer