

# 112-134 Nelson Street

## Transportation Impact Assessment

Step 1 Screening Report

Step 2 Scoping Report

Step 3 Forecasting Report

Step 4 Strategy Report

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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 the TIA Study PM. As shown in the Screening Form, a TIA is required including the Design Review component and the Network Impact Component. This report accompanies a site plan application.

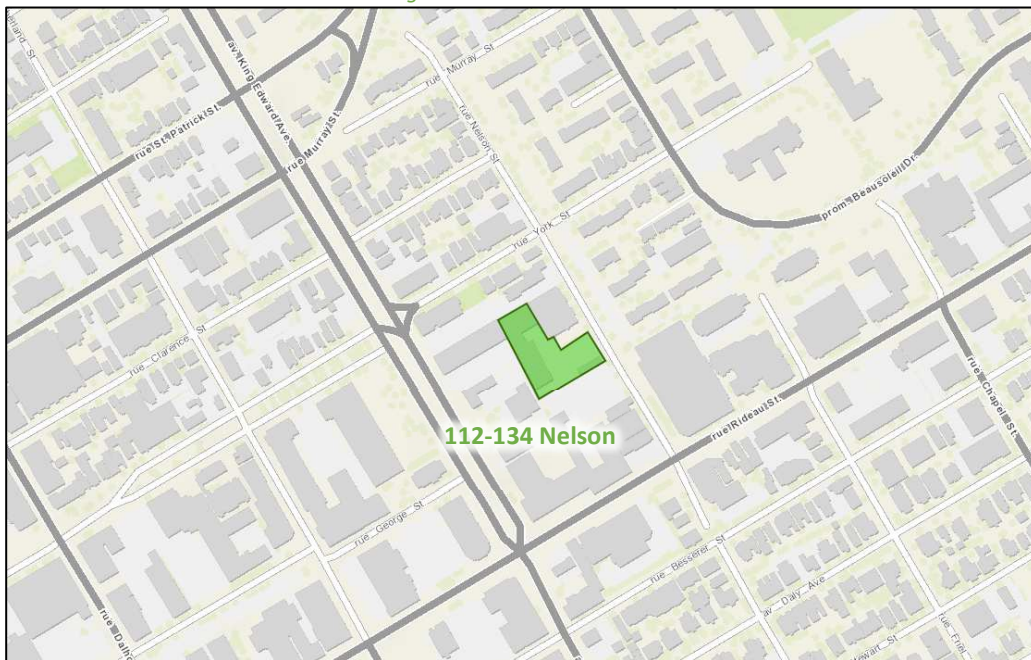
## 2 Existing and Planned Conditions

### 2.1 Proposed Development

The existing site, zoned as Residential Fifth Density (R5B[2664] S421-h) and General Industrial (IG1 H(11)) presently contains a low-rise commercial building and surface parking lot on the 112 Nelson Street parcel, and a restaurant and rear surface lot on the 134 Nelson Street parcel, is proposed as being redeveloped with a nine-storey residential building comprising 421 dwelling units. Access to underground parking comprising 18 tenant vehicle spaces, 17 visitor vehicle spaces, five carshare spaces, nine scooter spaces, and 482 bicycle spaces is proposed via a full-movement access onto Nelson Street. The development is anticipated to be built out in a single phase by 2024.

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

Figure 1: Area Context Plan



Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: November 11, 2022





## 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 six-lane urban cross-section to the north, and a divided four-lane urban cross-section to the south of Rideau Street, with sidewalks on both sides of the road. North of Rideau Street, the southbound curb lane is a shared cycling/transit priority lane during the PM peak period (3:30PM-5:30PM), and on-street parking is permitted on the west side of the road (no stopping 7:00AM-9:00AM & 3:00PM-5:30PM) and on the east side of the road (no stopping 3:30PM-5:30PM to the south and 7:00AM-9:00AM & 3:00PM-5:30PM to the north of York Street). 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 measured right of way is 20.0 metres south of Rideau Street. King Edward Avenue is a truck route.

**Rideau Street:** Rideau Street is a City of Ottawa arterial road with a four-lane urban cross-section with sidewalks on both sides of the road. Within the study area, the outside lanes are designated for transit, taxis, and cyclists during peak periods (7:00AM-9:00AM & 3:30-5:30PM) and on-street parking is permitted outside of these times. The posted speed limit is 40 km/h and the Ottawa Official Plan reserves a 30.0-metre right of way to the west and a 26.0-metre right of way to the east of King Edward Avenue. Rideau Street is a truck route.

**Nelson Street:** Nelson Street is a City of Ottawa local road with a two-lane urban cross-section with sidewalks on both sides of the road. South of Rideau Street, Nelson Street is discontinuous with only bicycle and pedestrian access permitted to Besserer Street. North of Rideau Street, on-street parking is permitted on the west side of the road along the 152 Nelson Street frontage and is permitted on the east side of the road between the Loblaws' truck access and Murray Street. On-street parking is also permitted on both sides of the road north of Murray Street and on the west side of the road south of Besserer Street. The unposted speed limit is assumed to be 50 km/h and the measured right of way is 18.5 metres to the north of Rideau Street and varies between 18.5 metres and 20.0 metres to the south of Rideau street.

**Friel Street:** Friel Street is a City of Ottawa local road with a two-lane urban cross-section with sidewalks on both sides of the road. On-street parking is permitted on the east side of the road north of Rideau Street, in two bays on the east side of the road between Rideau Street and Besserer Street, and on the west side of the road south of Besserer Street. The unposted speed limit is assumed to be 50 km/h and the measured right of way is 20.0 metres.

**York Street:** York Street is a City of Ottawa local road with a divided four-lane urban cross-section west of King Edward Avenue within the study area and with a two-lane urban cross-section to the east. Sidewalks are provided on both sides of the road. The unposted speed limit is assumed to be 50 km/h and the measured right of way is 38.0 metres to the west and is 20.0 metres to the east of King Edward Avenue.

### 2.2.2 Existing Intersections

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

#### *York Street at King Edward Avenue*

The intersection of York Street at King Edward Avenue is a signalized intersection. The northbound approach consists of an auxiliary left-turn lane, two through lanes, and a shared through/right-turn lane and the southbound approach consists of two through lanes and a shared through/right-turn lane that operates as a shared transit priority through/auxiliary right-turn lane weekdays from 3:00PM-5:30PM. The eastbound and westbound approaches each consist of a right-turn lane. Northbound U-turns, southbound left turns, and eastbound left turns and through movements are restricted and

directional measures furthermore prevent left turns and through movements on the eastbound approach.

*York Street at Nelson Street*

The intersection of York Street at Nelson is an all-way stop-controlled intersection. All approaches consist of a shared all-movements lane. Northbound left-turns and westbound through movements are restricted weekdays from 3:30PM-5:30PM, bicycles excepted.

*Rideau Street at King Edward Avenue*

The intersection of Rideau Street at King Edward Avenue is a signalized intersection. The northbound approach consists of two through lanes and an auxiliary right-turn lane, and the southbound approach consists of an auxiliary left-turn lane, two through lanes, and a right-turn lane. The eastbound approach consists of an auxiliary left-turn lane, a through lane, and a shared through/right-turn lane and the westbound approach consists of a through lane and a shared through/right-turn lane. The curb lanes on the eastbound and westbound approach operate as shared transit priority through/right-turn lanes weekdays from 7:00AM-9:00AM and 3:30-5:30PM. Northbound and westbound left turns are prohibited, and southbound and westbound right turns on red are prohibited from 7:00AM-7:00PM.

*Rideau Street at Nelson Street*

The intersection of Rideau Street at Nelson Street is a signalized intersection. The northbound and southbound approaches each consist of a shared all-movements lane. The eastbound and westbound approaches each consist of an auxiliary left-turn lane, a through lane, and a shared through/right-turn lane. The curb lanes on the eastbound and westbound approach operate as shared transit priority through/right-turn lanes weekdays from 7:00AM-9:00AM and 3:30-5:30PM. No turn restrictions were noted.

*Rideau Street at Friel Street*

The intersection of Rideau Street at Friel Street is a signalized intersection. The northbound and southbound approaches each consist of a shared all-movements lane. The eastbound and westbound approaches each consist of a shared left-turn/through lane, and a shared through/right-turn lane. The curb lanes on the eastbound and westbound approach operate as shared transit priority through/right-turn lanes weekdays from 7:00AM-9:00AM and 3:30-5:30PM. Eastbound and westbound left turns are restricted from 7:00AM-9:00AM, bicycles excepted.

### 2.2.3 Existing Driveways

Within 200 metres of the site access, driveways to a rear parking lot for a hotel, to a mid-rise residential building, to a paid parking lot and an auto garage, to single residences, and to a restaurant exist on the west side of Nelson Street. Two driveways to parking lots for attached housing, a driveway to a grocery store loading area and one to its underground parking exist on the east side of Nelson Street. South of Rideau Street, a driveway to a community health centre is on the east side of Nelson Street, and driveways to a restaurant and to low-rise residential land uses are present on the west side of the road.



On Rideau Street, within 200 metres of the site access, driveways to a hotel, and to a convenience store are present on the north side of the road, and driveways to a drug store, to detached commercial and restaurant land uses, to rear parking for a commercial strip, are present as well as an inlet to a restaurant on the south side of the road.

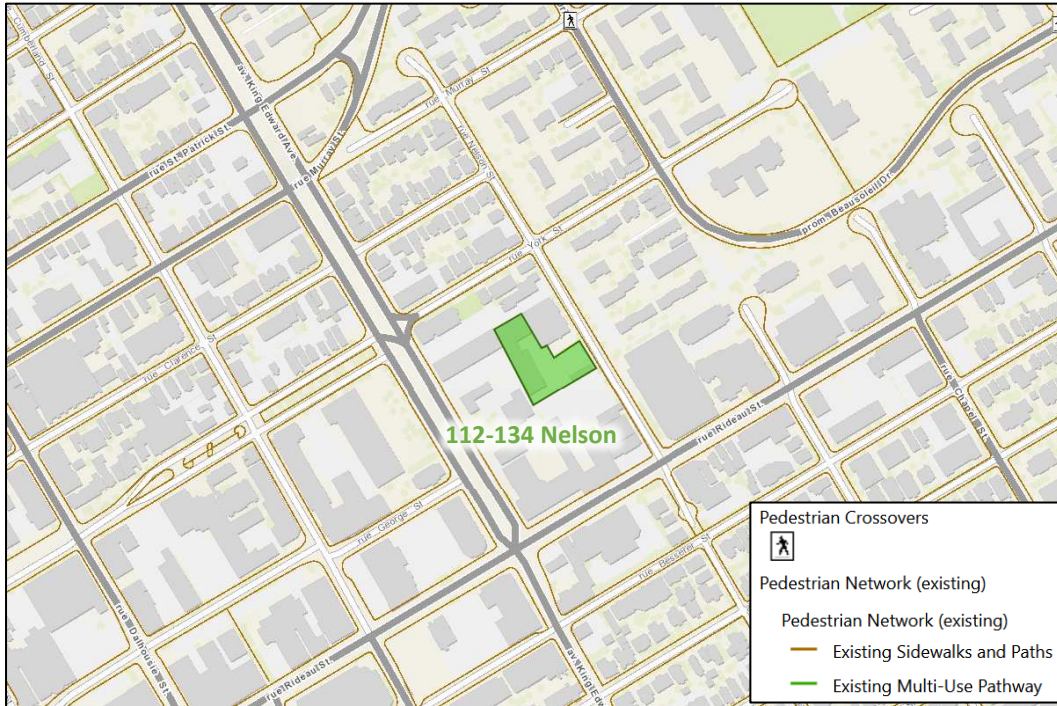
2.2.4 Cycling and Pedestrian Facilities

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

Sidewalks are provided along both sides of all study area roadways. Cycling facilities include a curbed bike lane on Cumberland Street between Besserer Street and George Street and a bike lane on Stewart Street, Wilbrod Street, and St. Patrick Street.

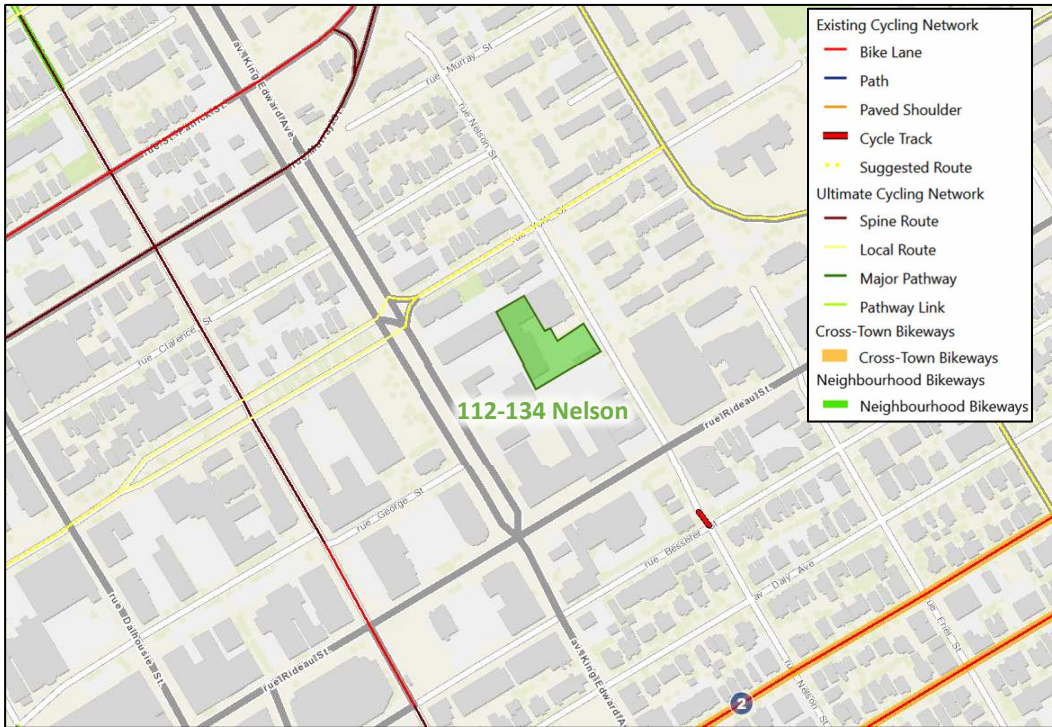
St. Patrick Street, Murray Street, Stewart Street, Wilbrod Street, and Cumberland Street south of St. Andrew Street are spine routes. York Street, Beausoleil Drive, Laurier Street, Cumberland Street north of St. Andrew Street and Chapel Street are local routes. Stewart Street east of Cumberland Street, Wilbrod Street, and Cumberland Street south of Stewart Street are cross-town bikeways, and Cumberland Street north of Guigues Avenue is a neighbourhood bikeway.

Figure 3: Study Area Pedestrian Facilities



Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: November 11, 2022

Figure 4: Study Area Cycling Facilities



Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: November 11, 2022

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

Figure 5: Existing Pedestrian Volumes

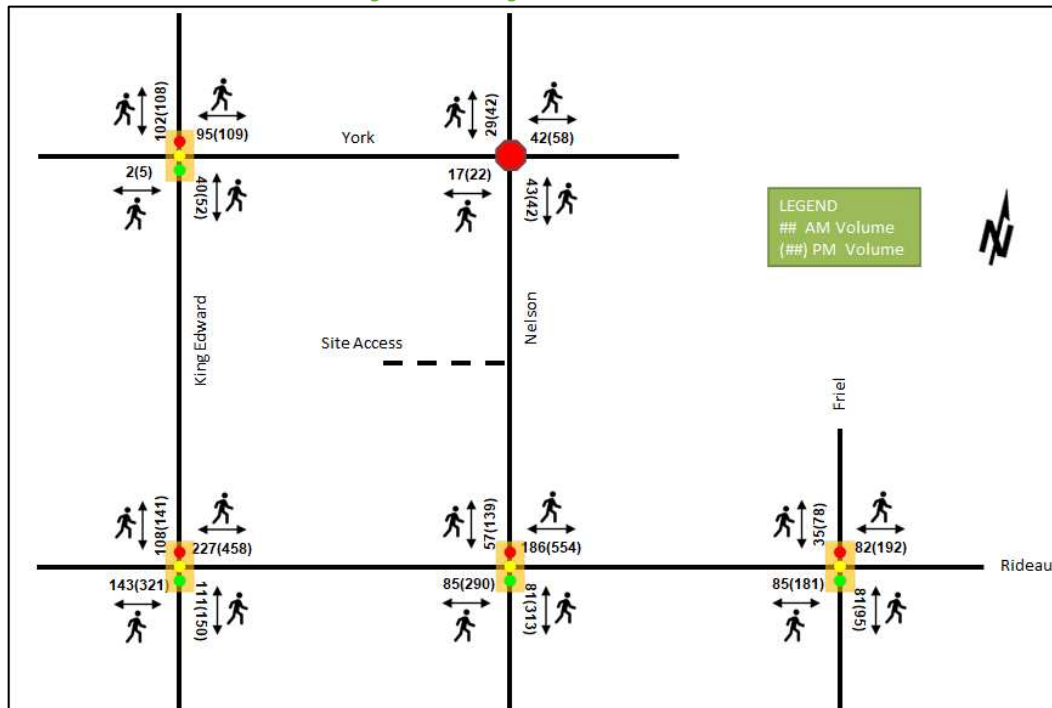
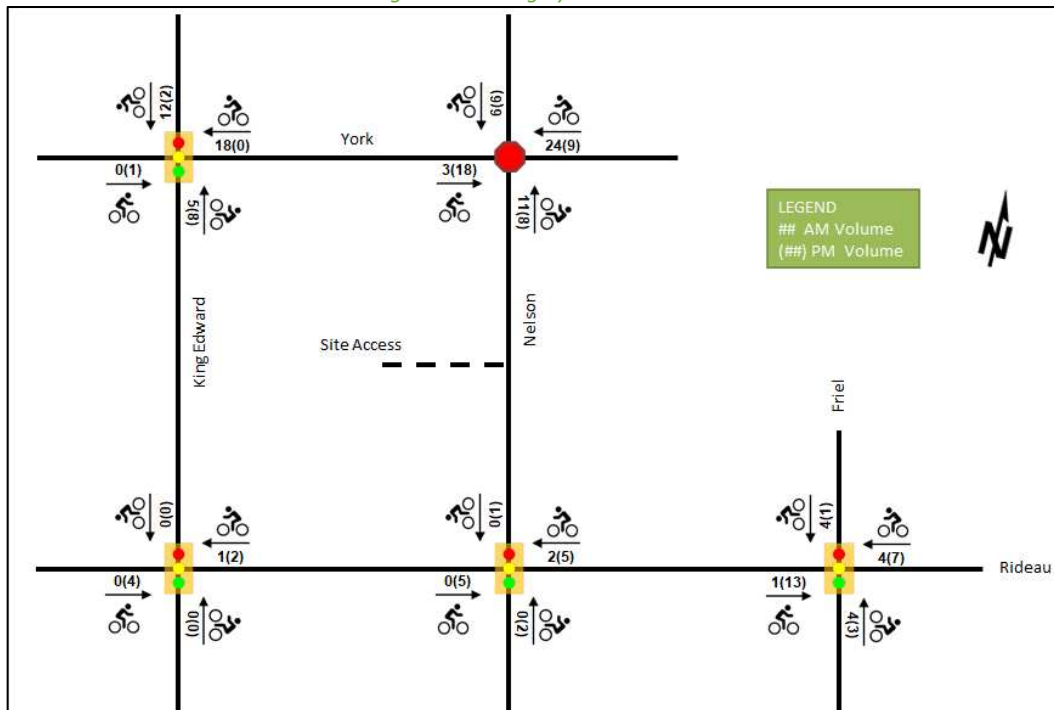


Figure 6: Existing Cyclist Volumes



### 2.2.5 Existing Transit

Figure 7 illustrates the transit system map in the study area and Figure 8 illustrates nearby transit stops. All transit information is from November 11, 2022, and is included for general information purposes and context to the surrounding area.

Within the study area, the route #56 travels along King Edward Avenue, and the routes #7, #12, #14, #15, #17, and #18 travel along Rideau Street. The site lies just over 800 metres walking distance from the Rideau Station LRT terminal. The frequency of these routes within proximity of the proposed site based on November 11, 2022 service levels are:

- Route # 7 – 5-10 minute service during the peak periods, and 15-30 minute during the off-peak times
- Route # 12 – 15-minute service all day
- Route # 14 – 15-minute daytime service, 30-minute service after 7:00PM
- Route # 15 – 5-10-minute service during the peak periods, and 15-30 minute during the off-peak times
- Route # 18 – 30-minute service all day
- Route # 56 – 15-minute service in the peak period/direction, 30-minute service during the peak period in the off-peak direction

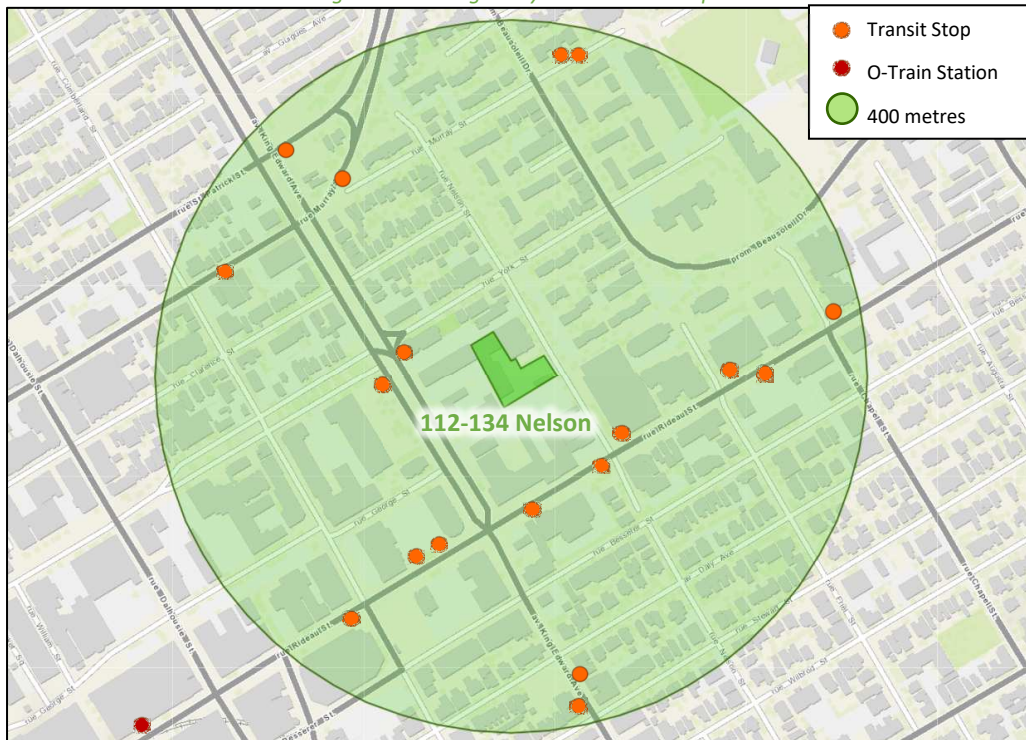


Figure 7: Existing Study Area Transit Service



Source: <http://www.octranspo.com/> Accessed: November 11, 2022

Figure 8: Existing Study Area Transit Stops



Source: <http://maps.ottawa.ca/geoOttawa/> Accessed: November 11, 2022

2.2.6 Existing Area Traffic Management Measures

Bulb-outs on local roads intersecting Rideau Street, on-road speed limit messaging pavement markings on King Edward Avenue, vehicular directional closures on York Street, and vehicle access closures on Nelson Street constitute the primary traffic management measures within the study 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
York Street at King Edward Avenue	Wednesday, September 21, 2016
York Street at Nelson Street	Wednesday, September 21, 2016
Rideau Street at King Edward Avenue	Tuesday, January 14, 2020
Rideau Street at Nelson Street	Tuesday, January 14, 2020
Rideau Street at Friel Street	Tuesday, May 9, 2017

Figure 9 illustrates the existing traffic counts, balanced along King Edward Avenue, and Table 2 summarizes the existing intersection operations. Additionally, given the turn restrictions at the intersection of York Street and Nelson Street were not in effect at the time of the traffic counts, these volumes have been removed along York Street. The level of service for signalized intersections is based on volume to capacity ratio (v/c) calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and average delay for unsignalized intersections. Detailed turning movement count data is included in Appendix B and the Synchro worksheets are provided in Appendix C.

Figure 9: Existing Traffic Counts

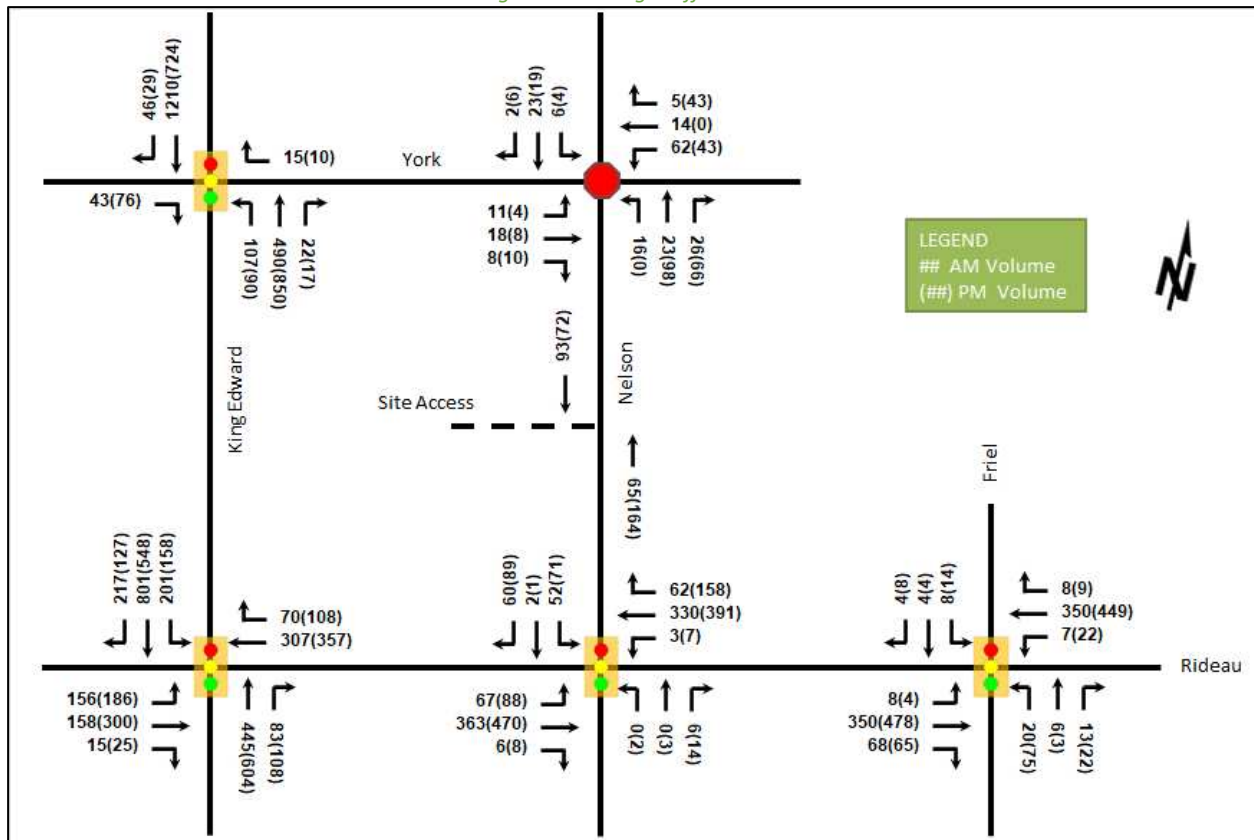


Table 2: Existing Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 <sup>th</sup> )	LOS	V/C	Delay	Q (95 <sup>th</sup> )
York Street at King Edward Avenue <i>Signalized</i>	EBR	A	0.03	0.0	0.0	A	0.06	0.1	0.0
	WBR	A	0.03	0.1	0.0	A	0.02	0.1	0.0
	NBL	A	0.19	1.4	0.4	A	0.13	0.8	0.4
	NBT/R	A	0.19	9.9	25.1	A	0.33	11.3	44.9
	SBT(/R) <sup>†</sup>	A	0.48	13.0	71.4	A	0.39	12.2	59.1
	SBR <sup>†</sup>	-	-	-	-	A	0.05	2.8	3.5
	<b>Overall</b>	<b>A</b>	<b>0.39</b>	<b>11.2</b>	<b>-</b>	<b>A</b>	<b>0.34</b>	<b>10.8</b>	<b>-</b>
York Street at Nelson Street <i>Unsignalized</i>	EB	A	0.05	7.4	0.8	A	0.03	7.4	0.8
	WB	A	0.11	7.8	3.0	A	0.11	7.7	3.0
	NB	A	0.08	7.4	2.3	A	0.20	8.0	5.3
	SB	A	0.04	7.5	0.8	A	0.04	7.4	0.8
	<b>Overall</b>	<b>A</b>	<b>-</b>	<b>7.6</b>	<b>-</b>	<b>A</b>	<b>-</b>	<b>7.8</b>	<b>-</b>
Rideau Street at King Edward Avenue <i>Signalized</i>	EBL	A	0.48	43.0	53.9	B	0.66	52.6	66.4
	EBT/R	A	0.10	9.1	13.1	A	0.20	11.7	26.0
	WBT/R	A	0.45	31.8	52.2	A	0.58	34.5	66.0
	NBT	B	0.61	40.5	66.9	B	0.70	39.2	87.6
	NBR	A	0.28	2.2	0.0	A	0.37	3.3	0.0
	SBL	D	0.84	68.5	#78.0	D	0.83	71.5	#61.2
	SBT	C	0.72	33.6	108.1	A	0.46	25.7	65.4
	<b>Overall</b>	<b>C</b>	<b>0.71</b>	<b>33.4</b>	<b>-</b>	<b>C</b>	<b>0.79</b>	<b>31.9</b>	<b>-</b>
Rideau Street at Nelson Street <i>Signalized</i>	EBL	A	0.15	8.5	10.9	A	0.26	9.5	12.8
	EBT	A	0.34	9.0	47.1	A	0.50	12.8	70.8
	EBR	A	0.01	0.0	0.0	A	0.02	0.1	0.0
	WBL	A	0.01	6.7	m0.5	A	0.03	10.3	m1.1
	WBT	A	0.31	7.3	30.6	A	0.50	12.9	39.8
	WBR	A	0.11	1.9	3.1	A	0.56	9.5	8.7
	NB	A	0.01	0.0	0.0	A	0.09	14.6	6.2
	SB	A	0.38	16.2	20.9	B	0.63	29.2	#40.5
	<b>Overall</b>	<b>A</b>	<b>0.34</b>	<b>8.6</b>	<b>-</b>	<b>A</b>	<b>0.59</b>	<b>14.2</b>	<b>-</b>
Rideau Street at Friel Street <i>Signalized</i>	EBL/T	A	0.36	5.1	11.3	A	0.48	5.0	23.2
	EBR	A	0.09	0.5	0.3	A	0.13	0.9	m1.0
	WBL/T	A	0.36	10.4	50.9	A	0.49	11.5	72.2
	WBR	A	0.01	0.0	0.0	A	0.02	0.2	0.3
	NB	A	0.12	16.2	10.2	A	0.41	28.5	27.8
	SB	A	0.05	17.6	5.7	A	0.10	20.2	9.1
	<b>Overall</b>	<b>A</b>	<b>0.30</b>	<b>7.6</b>	<b>-</b>	<b>A</b>	<b>0.46</b>	<b>9.8</b>	<b>-</b>

Notes: Saturation flow rate of 1800 veh/h/lane  
 Queue is measured in metres  
 Peak Hour Factor = 0.90  
<sup>†</sup>Per Section 2.2.2, curb lane is a SBT/R during AM peak and a transit/right-turn lane during PM peak

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

During both the AM and PM peak hours, the study area intersections operate well as modelled. Extended queuing is noted on the southbound left movement during both peak hours at the intersection of Rideau Street and King Edward Avenue, and on the southbound movement at the intersection of Rideau Street and Nelson Street.

2.2.8 Collision Analysis

Collision data have been acquired from the City of Ottawa open data website (data.ottawa.ca) for five years prior to the commencement of this TIA for the surrounding study area road network. Table 3 summarizes the collisions



types and conditions in the study area, Figure 10 illustrates the intersections and segments analyzed, and Table 4 summarizes the total collisions for each of these locations. Collision data are included in Appendix D.

Table 3: Study Area Collision Summary, 2016-2020

		Number	%
<b>Total Collisions</b>		77	<b>100%</b>
<b>Classification</b>	<b>Fatality</b>	0	0%
	<b>Non-Fatal Injury</b>	20	26%
	<b>Property Damage Only</b>	57	74%
<b>Initial Impact Type</b>	<b>Approaching</b>	1	1%
	<b>Angle</b>	11	14%
	<b>Rear end</b>	11	14%
	<b>Sideswipe</b>	14	18%
	<b>Turning Movement</b>	17	22%
	<b>SMV Unattended</b>	9	12%
	<b>SMV Other</b>	10	13%
	<b>Other</b>	4	5%
<b>Road Surface Condition</b>	<b>Dry</b>	57	74%
	<b>Wet</b>	13	17%
	<b>Loose Snow</b>	4	5%
	<b>Slush</b>	1	1%
	<b>Ice</b>	2	3%
<b>Pedestrian Involved</b>		7	9%
<b>Cyclists Involved</b>		3	4%

Figure 10: Study Area Collision Records

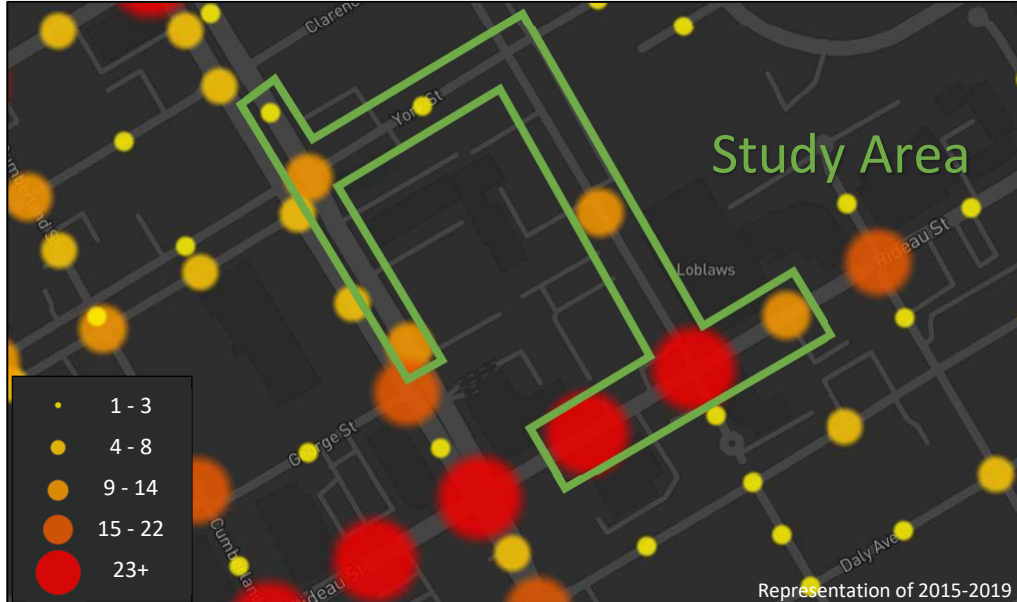


Table 4: Summary of Collision Locations, 2016-2020

	Number	%
<b>Intersections / Segments</b>	<b>77</b>	<b>100%</b>
Rideau St @ Nelson St	20	26%
Rideau St between Nelson St & Friel St	12	16%
York St @ King Edward Ave	11	14%
Rideau St between King Edward Ave & Nelson St	11	14%
Nelson St between York St & Rideau St	9	12%
King Edward Ave NB between York St & Rideau St	7	9%
King Edward Ave NB between Clarence St & York St	6	8%
York St between Turn Lane & Nelson St	1	1%

Within the study area, the intersection of Rideau Street at Nelson Street and the segments of Rideau Street between Nelson Street and Friel Street are noted to have experienced higher collisions than other locations. Table 5 and Table 6 summarize the collision types and conditions for each location.

Table 5: Rideau Street at Nelson Street Collision Summary

		Number	%
<b>Total Collisions</b>		<b>20</b>	<b>100%</b>
<b>Classification</b>	<b>Fatality</b>	0	0%
	<b>Non-Fatal Injury</b>	8	40%
	<b>Property Damage Only</b>	12	60%
<b>Initial Impact Type</b>	<b>Angle</b>	1	5%
	<b>Rear end</b>	2	10%
	<b>Sideswipe</b>	5	25%
	<b>Turning Movement</b>	7	35%
	<b>SMV Other</b>	4	20%
	<b>Other</b>	1	5%
<b>Road Surface Condition</b>	<b>Dry</b>	18	90%
	<b>Wet</b>	2	10%
<b>Pedestrian Involved</b>		4	20%
<b>Cyclists Involved</b>		2	10%

The Rideau Street at Nelson Street intersection had a total of 20 collisions during the 2016-2020 time period, with 12 involving property damage only and the remaining eight having non-fatal injuries. The collision types are most represented by turning movement with seven collisions, followed by sideswipe with five, four as SMV (other), two as rear end and one each as angle and other. The City's Cycling Safety Review of High-Volume Intersections (March 2020) completed a review of this intersection for pedestrian and cycling-related observations and movements. The report suggested improvements such as the reduction of the skew on the west leg crosswalk and of the north-south horizontal offset, and the removal of the turn lanes for the inclusion of cycle tracks at the intersection, which may help address a variety of collisions noted at this intersection. Weather conditions do not affect collisions at this location. No further analysis and no local improvements are required as part of this study.

Table 6: Rideau Street between Nelson Street and Friel Street Collision Summary

		Number	%
<b>Total Collisions</b>		<b>12</b>	<b>100%</b>
<b>Classification</b>	<b>Fatality</b>	0	0%
	<b>Non-Fatal Injury</b>	3	25%
	<b>Property Damage Only</b>	9	75%
<b>Initial Impact Type</b>	<b>Approaching</b>	1	8%
	<b>Rear end</b>	2	17%
	<b>Sideswipe</b>	1	8%
	<b>Turning Movement</b>	3	25%
	<b>SMV Unattended</b>	2	17%
	<b>SMV Other</b>	2	17%
	<b>Other</b>	1	8%
<b>Road Surface Condition</b>	<b>Dry</b>	5	42%
	<b>Wet</b>	4	33%
	<b>Loose Snow</b>	2	17%
	<b>Ice</b>	1	8%
<b>Pedestrian Involved</b>		1	8%
<b>Cyclists Involved</b>		0	0%

The segment of Rideau Street between Nelson Street and Friel Street had a total of 12 collisions during the 2016-2020 time period, with nine involving property damage only and the remaining three having non-fatal injuries. The collision types are most represented by turning movement with three collisions, followed by rear end, SMV (unattended), and SMV (other) with two each, and approaching, sideswipe and other with one each. No collision type is disproportionately represented in this time period. Weather conditions do not affect collisions at this location. No further collision review is required as part of this study.

## 2.3 Planned Conditions

### 2.3.1 Changes to the Area Transportation Network

The subject development is not within a CDP Area and no changes are listed within the Planned Construction Projects portal.

Within the Transportation Master Plan, the Rapid Transit and Transit Priority (RTTP) Network's Network Concept diagram shows a continuous measures transit priority corridor along King Edward Avenue north of Rideau Street, however it is not included in the Affordable Network. Both networks include a continuous measures transit priority corridor along Rideau Street and an isolated measures transit priority corridor along Murray Street and St. Patrick Street north of the study area.

### 2.3.2 Other Study Area Developments

#### *261-277 King Edward Avenue, 260 Murray Street*

The proposed development application includes a site plan for the construction of a mixed-use building comprising 23 residential dwelling units and 5,500 ft<sup>2</sup> of retail space. The expected build-out date is unknown, and the development is anticipated to generate only a marginal traffic increase. (Novatech, 2016)

#### *216 Murray Street*

The proposed development application includes a zoning by-law amendment to permit the construction of an eight-storey, 48-unit mixed-use supportive housing development. A memo is included with the application addressing development design elements only. (WSP, 2021)

*250 Besserer Street*

The proposed development application includes a site plan for the construction of a residential building comprising 99 units. The development is anticipated to be built out in 2021 and to generate 10 new AM and PM peak hour two-way auto trips. (CGH, 2019)

*110 York Street, 137 George Street*

The proposed development application includes a zoning by-law amendment to permit the expansion of a proposed hotel by 128 rooms. The development is anticipated to be built out in 2021 and to generate 31 new AM and 36 new PM peak hour two-way auto trips. (Novatech, 2018)

*141 George Street*

The proposed development application includes a site plan for a temporary surface parking lot. No TIA is available for this development.

*78-80 Nelson Street, 253-257 York Street*

The proposed development application includes a zoning by-law amendment to permit the construction of a four-storey addition and a three-storey addition to the two existing buildings on the properties. No TIA is available for this development.

*197, 200, 201 Wilbrod Steet*

The proposed development application a site plan for the construction of a four-storey building including a total of 19-units. No TIA is available for this development.

*360 Friel Street*

The proposed development application a site plan for construction of a three-storey addition (17 units) to the existing 2.5-storey residential building. No TIA is required for this development.

*280 Laurier Avenue*

The proposed development application a zoning by-law amendment and site plan for construction of a three-storey addition (18 units) to the existing building. No TIA is available for this development.

*29 Russell Avenue*

The proposed development application a zoning by-law amendment and site plan for construction of a three-storey addition (7 units) to the existing heritage building. No TIA is available for this development.

## 3 Study Area and Time Periods

### 3.1 Study Area

The study area will include the intersections of:

- York Street at:
  - King Edward Avenue
  - Nelson Street
- Rideau Street at:
  - King Edward Avenue
  - Nelson Street
  - Friel Street

The boundary road will be Nelson Street, and TRANS Screenline SL37, while not reviewed within this report, is within proximity to the site along King Edward Avenue.

### 3.2 Time Periods

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

### 3.3 Horizon Years

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

## 4 Exemption Review

Table 7 summarizes the exemptions for this TIA.

*Table 7: Exemption Review*

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

## 5 Development-Generated Travel Demand

### 5.1 Mode Shares

Examining the mode shares recommended in the TRANS Trip Generation Manual (2020) for the subject district, derived from the most recent National Capital Region Origin-Destination survey (OD Survey), the existing average district mode shares by land use for Ottawa Inner have been summarized in Table 8.

Table 8: TRANS Trip Generation Manual Recommended Mode Shares – Ottawa Inner

Travel Mode	Multi-Unit (High-Rise)	
	AM	PM
Auto Driver	26%	25%
Auto Passenger	6%	8%
Transit	28%	21%
Cycling	5%	6%
Walking	35%	40%
<b>Total</b>	<b>100%</b>	<b>100%</b>

The development is proposing only 18 vehicle spaces for tenants and 17 for visitors, thereby limiting the opportunity for auto trips. It proposes secure bicycle parking at one space per unit as Transportation Demand Management (TDM) measures. The development is also situated approximately 120 metres walk from Rideau Street which has a high density of supportive land uses, including a large grocery store at the corner of Rideau Street and Nelson Street, and continuous lanes transit priority connecting to Rideau Station on the Confederation LRT line which is additionally 850 metres-walk from the development. Given the foregoing, a unique mode share breakdown is additionally presented for the development. The modified mode share targets proposed for the development are summarized in Table 9.

Table 9: Proposed Development Mode Shares

Travel Mode	Multi-Unit (High-Rise)	
	AM	PM
Auto Driver	17%	16%
Auto Passenger	5%	7%
Transit	33%	26%
Cycling	5%	6%
Walking	40%	45%
<b>Total</b>	<b>100%</b>	<b>100%</b>

## 5.2 Trip Generation

This TIA has been prepared using the vehicle and person trip rates for the residential dwellings using the TRANS Trip Generation Manual (2020). Table 10 summarizes the person trip rates for the proposed residential land uses for each peak period.

Table 10: Trip Generation Person Trip Rate in Peak Period

Land Use	Land Use Code	Peak	Person Trip Rates
Multi-Unit (High-Rise)	221 & 222 (TRANS)	AM	0.80
		PM	0.90

Using the above person trip rates, the total person trip generation has been estimated. Table 11 summarizes the total person trip generation.

Table 11: Total Person Trip Generation

Land Use	Units	AM Peak Period			PM Peak Period		
		In	Out	Total	In	Out	Total
Multi-Unit (High-Rise)	421	104	233	337	220	159	379



Trip generation by peak hour has been forecasted using the prescribed peak period conversion factors presented in the TRANS Trip Generation Manual (2020) for the residential component. Table 12 summarizes the residential trip generation by mode and peak hour.

*Table 12: Trip Generation by Mode*

Travel Mode		AM Peak Hour				PM Peak Hour			
		Mode Share	In	Out	Total	Mode Share	In	Out	Total
Multi-Unit (High-Rise)	Auto Driver	17%	9	19	28	16%	15	11	26
	Auto Passenger	5%	2	6	8	7%	7	5	12
	Transit	33%	19	42	61	26%	27	19	46
	Cycling	5%	3	7	10	6%	6	5	11
	Walking	40%	24	54	78	45%	51	37	89
	<b>Total</b>	<b>100%</b>	<b>57</b>	<b>128</b>	<b>184</b>	<b>100%</b>	<b>106</b>	<b>77</b>	<b>186</b>

As shown above, a total of 28 AM and 26 PM new peak hour two-way vehicle trips are projected as a result of the proposed development.

### 5.3 Trip Distribution

To understand the travel of the subject development, the OD Survey has been reviewed to determine the district residential travel patterns which were then applied based on the build-out of Ottawa Inner. Table 13 below summarizes the distributions.

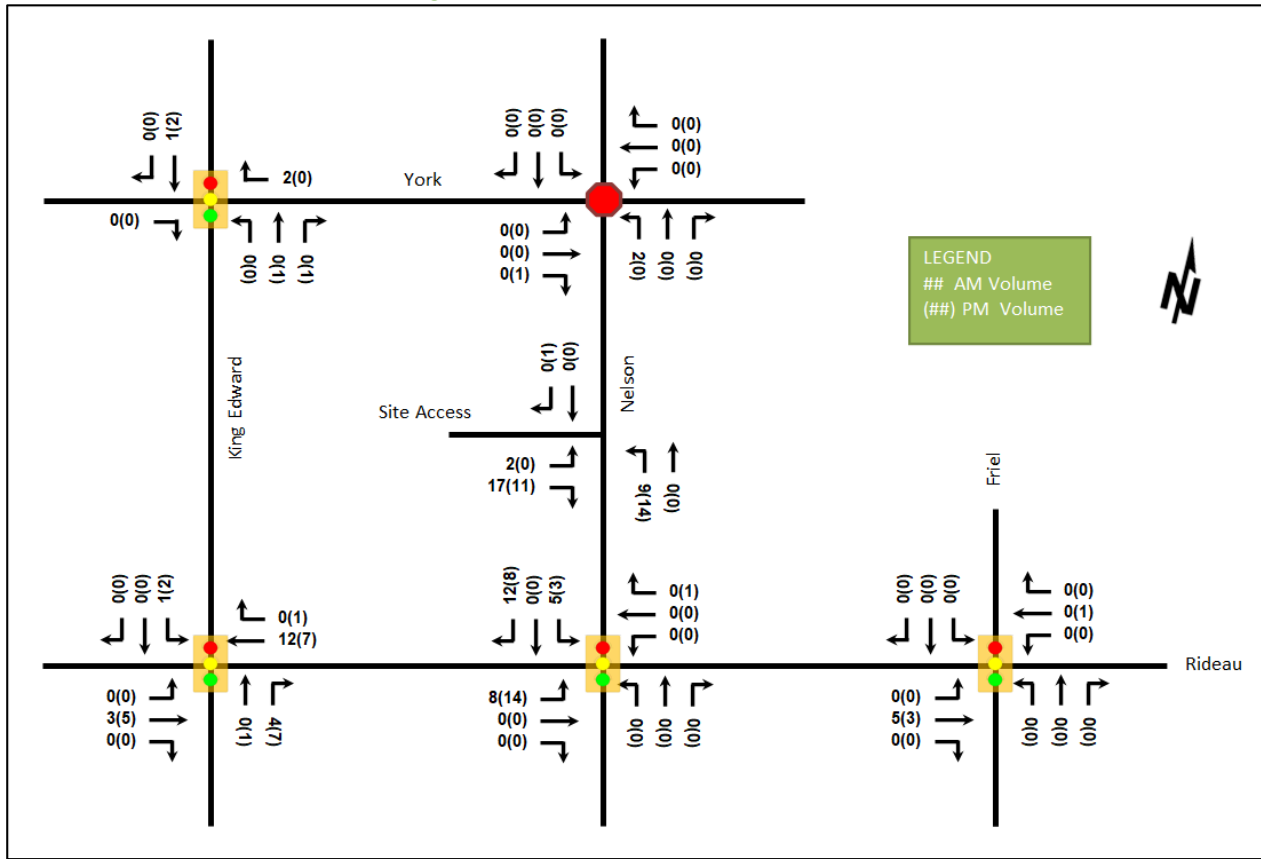
*Table 13: OD Survey Distribution – Ottawa Inner*

To/From	Residential % of Trips	Inbound Via	Outbound Via
North	10%	King Edward Ave	King Edward Ave
South	40%	King Edward Ave	25% Rideau St(W), 15% Rideau St (E)
East	10%	Rideau St	Rideau St
West	40%	10% King Edward Ave (S), 30% Rideau St	Rideau St
<b>Total</b>	<b>100%</b>	-	-

### 5.4 Trip Assignment

Using the distribution outlined above, turning movement splits, and access to major transportation infrastructure, the trips generated by the site have been assigned to the study area road network. Figure 11 illustrates the new site generated volumes.

Figure 11: New Site Generation Auto Volumes



## 6 Background Network Travel Demands

### 6.1 Transportation Network Plans

The transportation network plans were discussed in Section 2.3. None of the projects listed are expected to occur within the TIA horizons or to have any notable impact on the study area traffic volumes and travel patterns.

### 6.2 Background Growth

A review of the background projections from the City’s TRANS Regional Model for the 2011 and 2031 horizons was completed to determine the background growth for each of the study area roadways. Table 14 summarizes the results of the model, and the projections are provided in Appendix E.

Table 14: TRANS Regional Model Projections – Study Area Growth Rates

Street	Direction Growth % from 2011 to 2031		Direction Growth % from 2011 to Existing	
	Eastbound	Westbound	Eastbound	Westbound
Rideau St	0.61%	0.50%	-5.63%	-4.49%
King Edward Ave	Northbound	Southbound	Northbound	Southbound
	0.16%	0.53%	-3.29%	-5.65%

A review of the 2011 and 2031 TRANS model horizons anticipated that a slight increase in network volumes would be observed in the area. Noting discrepancy from these forecasted trends through the examination of the existing volumes, it was concluded that a comparison of the existing volumes to the TRANS 2011 horizon was required to determine the extent of the historic trends. The last columns of Table 14 summarize this growth, showing a

significant decrease in volumes on the study area arterials. As such, no background growth will be applied to the study area roadways.

### 6.3 Other Developments

As the only active files with TIAs and non-negligible traffic generation within the study area, the background developments explicitly considered in the background conditions (Section 6.2) include:

- 250 Besserer Street
- 110 York Street, 137 George Street

Both of these developments are anticipated to be completed prior to 2024 and are included in the background volumes in Section 7.1. The background development volumes within the study area have been provided in Appendix F.

## 7 Demand Rationalization

### 7.1 2024 and 2029 Future Background Operations

Figure 12 illustrates the 2024 and 2029 background volumes and Table 15 summarizes the 2024 and 2029 background intersection operations. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and average delay for unsignalized intersections. The synchro worksheets for the 2024 and 2029 future background horizon are provided in Appendix G.

Figure 12: 2024 and 2029 Future Background Volumes

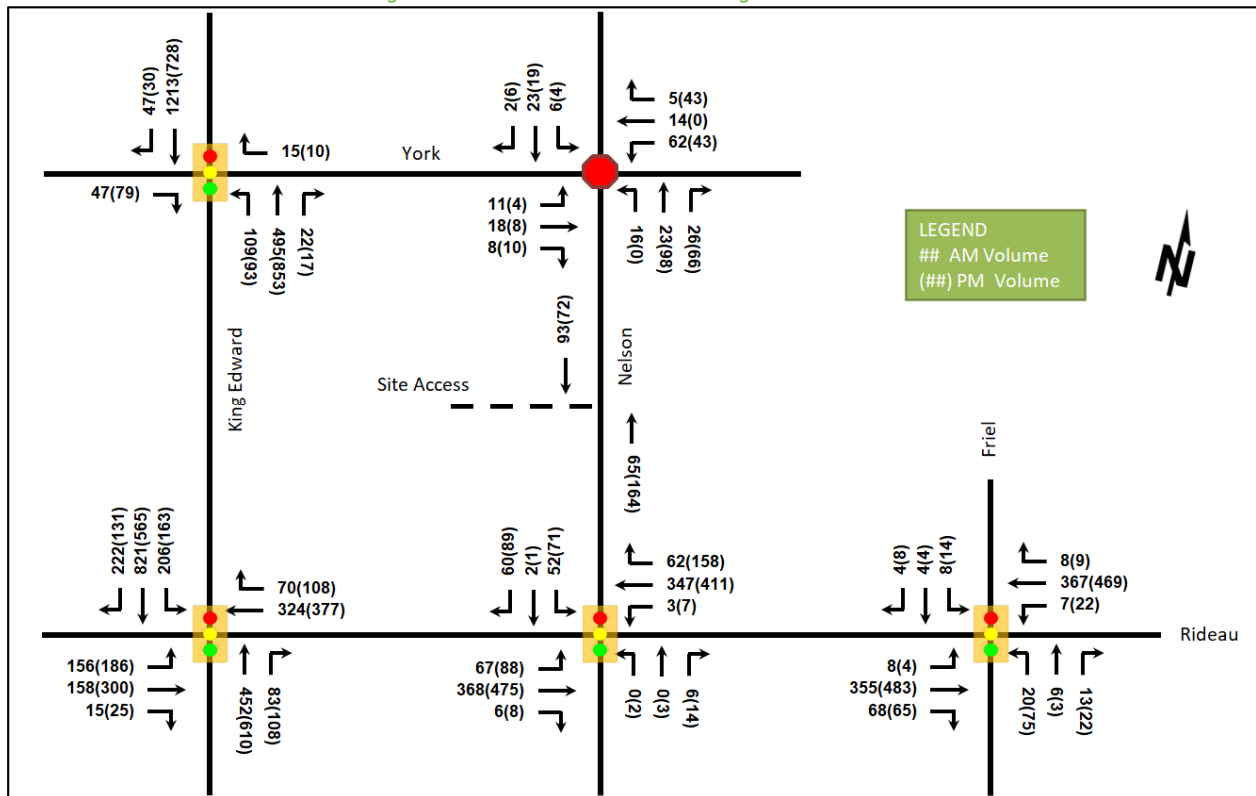


Table 15: 2024 and 2029 Future Background Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 <sup>th</sup> )	LOS	V/C	Delay	Q (95 <sup>th</sup> )
York Street at King Edward Avenue <i>Signalized</i>	EBR	A	0.03	0.0	0.0	A	0.05	0.1	0.0
	WBR	A	0.03	0.1	0.0	A	0.02	0.1	0.0
	NBL	A	0.17	1.1	0.4	A	0.11	0.7	0.3
	NBT/R	A	0.18	9.8	22.7	A	0.30	11.0	39.9
	SBT(/R) <sup>†</sup>	A	0.43	12.4	62.4	A	0.36	11.8	52.4
	SBR <sup>†</sup>	-	-	-	-	A	0.04	2.6	3.1
	<b>Overall</b>	<b>A</b>	<b>0.35</b>	<b>10.7</b>	<b>-</b>	<b>A</b>	<b>0.28</b>	<b>10.1</b>	<b>-</b>
York Street at Nelson Street <i>Unsignalized</i>	EB	A	0.04	7.3	0.8	A	0.03	7.3	0.8
	WB	A	0.10	7.8	2.3	A	0.10	7.6	2.3
	NB	A	0.07	7.4	1.5	A	0.18	7.8	4.5
	SB	A	0.04	7.4	0.8	A	0.03	7.4	0.8
	<b>Overall</b>	<b>A</b>	<b>-</b>	<b>7.5</b>	<b>-</b>	<b>A</b>	<b>-</b>	<b>7.7</b>	<b>-</b>
Rideau Street at King Edward Avenue <i>Signalized</i>	EBL	A	0.44	41.8	49.2	A	0.59	49.6	60.0
	EBT/R	A	0.09	9.0	11.8	A	0.18	11.5	23.4
	WBT/R	A	0.43	31.3	48.8	A	0.54	33.6	61.3
	NBT	A	0.56	39.3	61.0	B	0.63	37.4	78.7
	NBR	A	0.25	1.9	0.0	A	0.34	2.8	0.0
	SBL	C	0.74	55.3	#63.0	B	0.70	54.7	#48.4
	SBT	B	0.66	32.0	97.7	A	0.43	25.1	60.2
	<b>Overall</b>	<b>B</b>	<b>0.65</b>	<b>31.4</b>	<b>-</b>	<b>B</b>	<b>0.70</b>	<b>29.9</b>	<b>-</b>
Rideau Street at Nelson Street <i>Signalized</i>	EBL	A	0.12	8.1	9.6	A	0.22	8.9	11.7
	EBT	A	0.31	8.7	42.2	A	0.45	11.5	62.5
	EBR	A	0.01	0.0	0.0	A	0.02	0.1	0.0
	WBL	A	0.01	6.7	m0.6	A	0.02	10.1	m1.0
	WBT	A	0.30	7.2	29.0	A	0.48	12.6	37.4
	WBR	A	0.10	2.0	3.0	A	0.50	8.0	7.6
	NB	A	0.01	0.0	0.0	A	0.08	15.1	5.9
	SB	A	0.35	15.9	19.3	A	0.57	25.6	34.5
	<b>Overall</b>	<b>A</b>	<b>0.31</b>	<b>8.4</b>	<b>-</b>	<b>A</b>	<b>0.50</b>	<b>13.0</b>	<b>-</b>
Rideau Street at Friel Street <i>Signalized</i>	EBL/T	A	0.33	4.8	9.6	A	0.44	4.8	21.1
	EBR	A	0.08	0.5	0.2	A	0.12	0.8	m0.8
	WBL/T	A	0.33	10.2	47.3	A	0.46	11.0	66.1
	WBR	A	0.01	0.0	0.0	A	0.02	0.1	0.1
	NB	A	0.11	16.0	9.5	A	0.37	27.1	25.4
	SB	A	0.04	17.4	5.5	A	0.09	20.1	8.4
	<b>Overall</b>	<b>A</b>	<b>0.28</b>	<b>7.5</b>	<b>-</b>	<b>A</b>	<b>0.43</b>	<b>9.3</b>	<b>-</b>

**Notes:** Saturation flow rate of 1800 veh/h/lane  
 Queue is measured in metres  
 Peak Hour Factor = 1.00  
<sup>†</sup>Per Section 2.2.2, curb lane is a SBT/R during AM peak and a transit/right-turn lane during PM peak

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

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

## 7.2 Modal Share Sensitivity and Demand Rationalization Conclusions

Given that no capacity constraints have been identified within the study area, increases in site-generated traffic from forecasted through failure to meet the target mode shares are not anticipated to have to impact the study area intersections. Therefore, no rationalization for adjusted demand is required for this TIA.

## 8 Development Design

### 8.1 Design for Sustainable Modes

The proposed development is a residential building with the main entrance and parking garage entrance located on the Nelson Street frontage. A hard surface connection is proposed from the main entrance to the sidewalk on Nelson Street. Bicycles are proposed as accessing the parking garage ramp to three secure bicycle storage rooms on the parking level.

### 8.2 Circulation and Access

Garbage collection is proposed as taking place on Nelson Street, and emergency services are proposed as accessing the site via the Nelson Street frontage, without circulating the site parking facilities via the ramp.

## 9 Parking

### 9.1 Parking Supply

The site proposes 18 vehicle parking spaces for residents, 17 vehicle parking spaces for guests, five carshare spaces, nine scooter spaces, and 482 bicycle parking spaces, all located below ground. From the zoning by-law, the required parking for the proposed site is 164 vehicle spaces for tenants, 30 vehicle spaces for visitors and 211 bicycle spaces.

The proposed vehicle parking is under the by-law requirement of 194 and the reduced parking spaces will serve as a TDM measure for the site.

### 9.2 Spillover Parking

As the proposed parking provision is more than 15% below that prescribed by the by-law, spillover parking should be considered. The zoning by-law prescribes a total of 194 vehicle parking spaces and the site plan proposes 35 vehicle spaces excluding scooter and carshare spaces, leaving 159 spaces fewer than otherwise required.

#### 9.2.1 Site Design and Tenant Factors

A number of mitigating factors are present within the proposed development, however, chief among them will be the composition of the tenancy, and the marketing of units as not to have access to parking. Another mitigating factor includes the site's context of being 120 metres-walk from Rideau Street, which includes a transit priority corridor and a high density of supportive land uses. Rideau Station on the Confederation LRT line is 850 metres-walk from the building entrance.

The building is marketed to prospective tenants who work in the market, attend school nearby, or generally have an urban lifestyle. Furthermore, making these prospective tenants aware that they will have no parking space early in the process of engagement will select for tenants who do not require regular use of a car, especially given over one bike parking space per unit is being provided, and the site's proximity to transit. Finally, five carshare spaces are being provided which may satisfy many tenants' occasional requirements for a vehicle. Overall, only a minority of prospective tenants with vehicles might proceed to lease a unit with no access to parking and, coupled with the low rate of personal auto access, the resultant overall potential for spillover parking will be low.

9.2.2 Local Area Parking Studies

Notwithstanding the site and tenant factors reducing the likelihood of spill over parking, a review the adjacent parking conditions and area parking studies was completed to gain an understanding of the residual capacity in the area. It is noted that no parking surveys could be completed during the current pandemic and a desktop review was completed.

On-street parking on Nelson Street, York Street east of Nelson Street, is restricted to one hour, and York Street is within a parking permitting area. On-street parking on York Street west of Nelson Street is restricted to two hours. On-street parking on King Edward Avenue is restricted to one hour on the east side with no stopping during the weekday PM peak period, and to three hours on the west side with no stopping during both weekday peak periods. On-street parking on Rideau Street is restricted to two hours, with no stopping during the weekday peak periods. Three-hour on-street parking is permitted on Murray Street east of King Edward Avenue.

The parking restrictions for all but Murray Street are considered to discourage their use as spillover parking for the site users. Furthermore, within the immediate site context, private paid off-street parking is available to the public within the Loblaws grocer across the street from the site, and within a surface lot that shares the north and much of the west property lines of the building.

No local area parking studies are available for the immediate project area but are available for several areas within 400 metres-walk of the site. The ByWard Market Local Area Parking Study (LAPS) was completed in 2011 for an area north of George Street and west of King Edward Avenue, and the Downtown Rideau Local Area Parking Study (LAPS) was completed in 2011 for an area south of George Street and west of King Edward Avenue. The Downtown Rideau LAPS found an average occupancy rate of 57%, a peak occupancy rate of 77%, and an average duration of 2.9 hours within its study area, notably with a peak on-street parking occupancy rate of over 100%. The Byward Market LAPS found an average occupancy rate of 61%, a peak occupancy rate of 84%, and an average duration of 3.0 hours within its study area, notably with a peak on-street parking occupancy rate of over 91%. Some residual parking capacity may be available to site-generated autos in the off-street parking facilities in these study areas.

Should the adjacent community remain concerned with the potential spillover parking, it is recommended through the public consultation process that further permitting areas can be created to assist in area enforcement or signed parking be modified to further restrict parking beyond the existing stipulations. It should be noted, however, that these measures are not without impact on the residents of the concerned community and should be considered when discussing with City Staff and the Ward Councillor.

10 Boundary Street Design

Table 16 summarizes the MMLOS analysis for the boundary streets of Nelson Street. The existing and future conditions for both streets will be the same and are considered in one row. The boundary street analysis is based on the policy area of “Within 300m of a school” as the segment of Nelson Street analyzed is within this distance of York Street Public School. The MMLOS worksheets has been provided in Appendix H.

Table 16: Boundary Street MMLOS Analysis

Segment	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target
Nelson Street	C	A	D	D	-	-	-	-

Nelson Street does not meet the pedestrian LOS targets given the high target set by the policy area of being within 300 metres of a school. To meet this target, a boulevard of 0.5-to-2.0 metres would need to be introduced within the cross-section. Given the relatively short site frontage of approximately 18.5 metres and the context of the



existing facilities, implementing this treatment would be considered inappropriate and the existing facilities are considered adequate.

## 11 Access Intersections Design

### 11.1 Location and Design of Access

The development proposes access to Nelson Street via a full-moves two-way access. The two-way access is proposed being approximately 6.7-metres-wide and proposes a 16% grade on the ramp. The outbound lane is proposed as being separated from the adjacent property line by approximately 1.4 metres.

From the private approach by-law, a setback of three metres from an adjacent property line is required, for which an exemption would be required.

### 11.2 Intersection Control

The site access is proposed as being stop-controlled on its approach with Nelson Street operating under free-flow conditions.

### 11.3 Access Intersection Design

#### 11.3.1 2024 and 2029 Future Total Access Intersection Operations

The 2024 and 2029 future total intersection volumes are illustrated in Figure 13 and the access intersection operations are summarized below in Table 17. The level of service is based on HCM average delay for unsignalized intersections. The synchro worksheets have been provided in Appendix I.

Figure 13: 2024 and 2029 Future Total Volumes

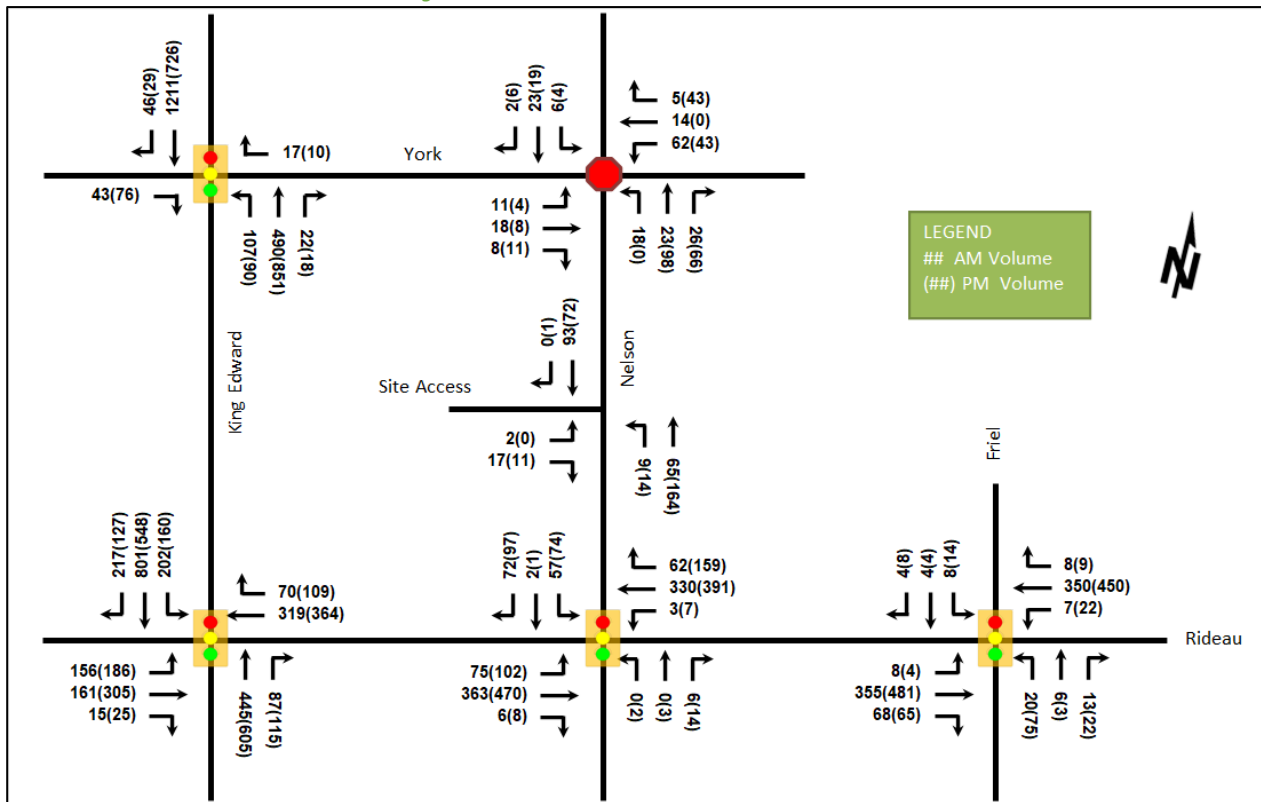


Table 17: 2024 and 2029 Future Total Access Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 <sup>th</sup> )	LOS	V/C	Delay	Q (95 <sup>th</sup> )
Site Access and Nelson Street <i>Signalized</i>	EBL/R	A	0.02	8.9	0.8	A	0.01	8.7	0.0
	NBL/T	A	0.01	7.4	0.0	A	0.01	7.4	0.0
	SBT/R	-	-	-	-	-	-	-	-
	<b>Overall</b>	<b>A</b>	-	<b>1.3</b>	-	<b>A</b>	-	<b>0.8</b>	-

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

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

The access intersection at the 2024 and 2029 future total horizon operates well. No capacity issues are noted.

### 11.3.2 Access Intersection MMLOS

As the access intersection is not signalized, no access intersection MMLOS analysis has been conducted.

### 11.3.3 Recommended Design Elements

The site would require an exemption to the private approach by-law based upon the distance from the driveway to the adjacent property line.

## 12 Transportation Demand Management

### 12.1 Context for TDM

The mode shares used within the TIA represent a shift from auto modes to transit and walking modes. Given the characteristics of the residents discussed within Section 9.2, the modal shares are likely to be achieved and supporting TDM measures should be provided to ensure this outcome.

The subject site is not within a design priority area and no age restrictions are noted. The total bedroom count within the development is 421 across 376 studio or one-bedroom units, eight two-bedroom units, and 37 three-bedroom units.

### 12.2 Need and Opportunity

The subject site has been assumed to rely predominantly on active modes and transit based upon the proximity to supportive land uses and high order transit. The increase in these sustainable modes was additionally arrived at by the composition of the tenancy having a low level of access to personal auto travel. The study area intersections are anticipated to have residual capacity and the increase in sustainable modes is considered achievable.

### 12.3 TDM Program

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

- Display area walking, cycling, and transit maps with route schedules
- Provide a multimodal travel option information package to new residents
- Provide a permanent bicycle repair station adjacent to secure bicycle parking area
- Contract with provider to install on-site bikeshare (or other micromobility, e.g. scooter) station
- Contract with provider to install on-site carshare vehicles and promote their use by residents
- Inclusion of a 1-month Presto card for first time new townhome purchase and apartment rental, with a set time frame for this offer (e.g. 6-months) from the initial opening of the site

- Unbundle parking cost from purchase or rental cost

## 13 Neighbourhood Traffic Management

The proposed development will connect to the arterial road network at Rideau Street via Nelson Street (a local road) and King Edward Avenue via Nelson Street and York Street (a local road) except during the PM peak hour where the outbound link is broken by turn restrictions. The TIA guidelines have outlined thresholds for two-way traffic on local and have been found to be too low for the purposes of this analysis. City Staff have noted that these thresholds are under review and will be updated in the future.

In general, York Street east of King Edward Street is anticipated to convey between 38 to 39 vehicles during the peak hours. Nelson Street north of Rideau Street is anticipated to convey between 268 to 436 vehicles during the peak hours, of which site traffic constitutes between 9.7% and 5.7% of volumes. No changes to the roadway classifications or proposed road network are resultant from the addition of site traffic.

## 14 Transit

### 14.1 Route Capacity

In Section 5.1 the trip generation by mode was estimated, including an estimate of the number of transit trips that will be generated by the proposed development. Table 18 summarizes the transit trip generation.

Table 18: Trip Generation by Transit Mode

Travel Mode	Mode Share	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Transit	33% (26%)	19	42	61	27	19	46

The proposed development is anticipated to generate an additional 61 AM and 46 PM peak hour two-way transit trips. From the trip distribution found in section 5.3, these values can be further broken down. Table 19 summarizes forecasted site-generated transit ridership trips by direction and the equivalent bus loads.

Table 19: Forecasted Site-Generated Transit Ridership

Direction	AM Peak Hour		PM Peak Hour		Service Type	Approximate Equivalent Peak Hour/Direction Bus Loads
	In	Out	In	Out		
North	2	4	3	2	Bus	Negligible
South	8	17	11	8	LRT, Bus	Half of a standard bus
East	2	4	3	2	Bus	Negligible
West	8	17	11	8	LRT, Bus	Half of a standard bus

### 14.2 Transit Priority

The site does not propose a driveway onto the Rideau Street transit priority corridor. No delays or other impacts from site turning movements are anticipated to affect transit priority or transit level of service.

## 15 Network Intersection Design

### 15.1 Network Intersection Control

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

## 15.2 Network Intersection Design

### 15.2.1 2024 and 2029 Future Total Network Intersection Operations

The 2024 and 2029 future total network intersection operations are summarized below in Table 20. The level of service for signalized intersections is based on v/c calculations for individual lane movements and HCM 2000 v/c calculations for the overall intersection, and average delay for unsignalized intersections. The synchro worksheets have been provided in Appendix I.

Table 20: 2024 and 2029 Future Total Network Intersection Operations

Intersection	Lane	AM Peak Hour				PM Peak Hour			
		LOS	V/C	Delay	Q (95 <sup>th</sup> )	LOS	V/C	Delay	Q (95 <sup>th</sup> )
York Street at King Edward Avenue <i>Signalized</i>	EBR	A	0.03	0.0	0.0	A	0.05	0.1	0.0
	WBR	A	0.03	0.1	0.0	A	0.02	0.1	0.0
	NBL	A	0.17	1.1	0.4	A	0.11	0.7	0.3
	NBT/R	A	0.18	9.8	22.5	A	0.30	11.0	39.9
	SBT/(R)†	A	0.43	12.4	62.1	A	0.35	11.8	52.3
	SBR†	-	-	-	-	A	0.04	2.5	3.1
<b>Overall</b>	<b>A</b>	<b>0.35</b>	<b>10.7</b>	<b>-</b>	<b>A</b>	<b>0.28</b>	<b>10.1</b>	<b>-</b>	
York Street at Nelson Street <i>Unsignalized</i>	EB	A	0.08	7.4	1.5	A	0.18	7.8	4.5
	WB	A	0.04	7.3	0.8	A	0.03	7.3	0.8
	NB	A	0.10	7.8	2.3	A	0.10	7.6	2.3
	SB	A	0.04	7.4	0.8	A	0.03	7.4	0.8
	<b>Overall</b>	<b>A</b>	<b>-</b>	<b>7.5</b>	<b>-</b>	<b>A</b>	<b>-</b>	<b>7.7</b>	<b>-</b>
Rideau Street at King Edward Avenue <i>Signalized</i>	EBL	A	0.44	41.8	49.2	A	0.59	49.6	60.0
	EBT/R	A	0.10	9.1	12.1	A	0.19	11.5	23.7
	WBT/R	A	0.42	31.2	48.3	A	0.53	33.4	59.7
	NBT	A	0.55	39.2	60.1	B	0.63	37.3	77.8
	NBR	A	0.27	2.0	0.0	A	0.37	3.4	0.0
	SBL	C	0.71	53.3	#59.9	B	0.68	53.0	#46.1
	SBT	B	0.65	31.5	94.6	A	0.41	24.9	58.1
	SBR	A	0.33	12.2	32.1	A	0.21	10.9	19.2
<b>Overall</b>	<b>B</b>	<b>0.64</b>	<b>31.0</b>	<b>-</b>	<b>B</b>	<b>0.69</b>	<b>29.6</b>	<b>-</b>	
Rideau Street at Nelson Street <i>Signalized</i>	EBL	A	0.16	8.6	11.0	A	0.26	9.4	13.2
	EBT	A	0.34	9.1	41.4	A	0.45	11.4	61.5
	EBR	A	0.01	0.0	0.0	A	0.02	0.1	0.0
	WBL	A	0.01	6.7	m0.5	A	0.02	10.3	m1.1
	WBT	A	0.31	7.6	27.8	A	0.45	12.3	36.3
	WBR	A	0.10	2.0	2.9	A	0.53	8.8	7.4
	NB	A	0.01	0.0	0.0	A	0.08	15.1	5.9
	SB	A	0.39	15.7	20.9	B	0.63	28.3	#38.0
<b>Overall</b>	<b>A</b>	<b>0.32</b>	<b>8.9</b>	<b>-</b>	<b>A</b>	<b>0.51</b>	<b>13.4</b>	<b>-</b>	
Rideau Street at Friel Street <i>Signalized</i>	EBL/T	A	0.33	5.0	10.3	A	0.44	4.8	21.5
	EBR	A	0.09	0.5	0.3	A	0.12	0.8	m0.7
	WBL/T	A	0.32	10.0	44.9	A	0.44	10.7	62.7
	WBR	A	0.01	0.0	0.0	A	0.02	0.1	0.1
	NB	A	0.11	16.0	9.5	A	0.37	27.1	25.5
	SB	A	0.04	17.4	5.5	A	0.09	20.1	8.4
<b>Overall</b>	<b>A</b>	<b>0.27</b>	<b>7.4</b>	<b>-</b>	<b>A</b>	<b>0.41</b>	<b>9.2</b>	<b>-</b>	

Notes: Saturation flow rate of 1800 veh/h/lane  
 Queue is measured in metres  
 Peak Hour Factor = 1.00  
 †Per Section 2.2.2, curb lane is a SBT/R during AM peak and a transit/right-turn lane during PM peak

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

During both the AM and PM peak hours, the study area intersections at the 2024 and 2029 future total horizon operate well and similarly to 2024 and 2029 future background conditions except for the southbound movement at the intersection of Rideau Street at Nelson Street, where the queue is expected to increase 3.5 metres compared to the background conditions.

A SimTraffic review was completed to examine queuing on the southbound movement at Rideau Street at Nelson Street during the PM peak hour at the 2024 and 2029 future total horizon. The 95th percentile queue length is forecasted to be 45.3 metres during the PM peak hour, which is shorter than the approximately 57-metre distance from this approach to the access intersection. SimTraffic reports are provided in Appendix K.

No mitigation for this condition is required based on site traffic.

### 15.2.2 Network Intersection MMLOS

Table 21 summarizes the MMLOS analysis for the network intersections of York Street at King Edward Avenue and Rideau Street at King Edward Avenue, Rideau Street at Nelson Street, and Rideau Street at Friel Street. The existing and future conditions for the intersections will be the same and are considered in one row. The intersection analysis is based on the land use designation “Central Area” for the intersections of York Street at King Edward Avenue and Rideau Street at King Edward Avenue, and on the policy area of “Within 300m of a school” for the intersections of Rideau Street at Nelson Street and Rideau Street at Friel Street, as each are within this distance of York Street Public School. The MMLOS worksheets has been provided in Appendix H.

*Table 21: Study Area Intersection MMLOS Analysis*

Intersection	Pedestrian LOS		Bicycle LOS		Transit LOS		Truck LOS		Auto LOS	
	PLOS	Target	BLOS	Target	TLOS	Target	TrLOS	Target	ALOS	Target
York Street at King Edward Avenue	F	A	F	B	C	D	-	-	B	E
Rideau Street at King Edward Avenue	F	A	F	D	E	C	A	D	B	E
Rideau Street at Nelson Street	E	A	E	D	C	C	-	-	B	E
Rideau Street at Friel Street	D	A	E	D	C	C	-	-	A	E

The MMLOS targets will not be met for the pedestrian and bicycle LOS at all study area intersections, and transit LOS at the intersection of Rideau Street and King Edward Avenue.

To meet pedestrian LOS targets, the maximum crossing distance on all pedestrian crossings would need to be reduced to two lane-widths.

Bicycle LOS is limited by the mixed-flow left-turn conditions and would require two-stage left turns or bike boxes on all approaches that permit left turns. Bicycle LOS is also limited by the mixed-flow right-turn conditions at the intersection of Rideau Street and King Edward Avenue, and would require separated facilities on the north and southbound approaches on King Edward Avenue.

Transit LOS at the intersection of Rideau Street and King Edward Avenue is limited by delays on the northbound, southbound and westbound approaches, which would need to be below 20 seconds to meet targets.

### 15.2.3 Recommended Design Elements

No study area intersection design elements are proposed as part of this study.

## 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 includes 421 apartment units, 35 vehicle parking spaces, five carshare parking spaces and nine scooter spaces
- Accesses will be provided to Nelson Street via a full-moves access
- The development is proposed to be completed as a single phase by 2024
- The Trip Generation and Safety triggers were met for the TIA Screening
- This report supports a site plan application

### Existing Conditions

- King Edward Avenue and Rideau Street are arterial roads in the study area
- Sidewalks are provided on both sides of the study area roadways, a curbed bike lane is on Cumberland Street and bike lanes are on Stewart Street, Wilbrod Street, and St. Patrick Street
- St. Patrick Street, Murray Street, Stewart Street, Wilbrod Street, and Cumberland Street south of St. Andrew Street are spine routes. York Street, Beausoleil Drive, Laurier Street, Cumberland Street north of St. Andrew Street and Chapel Street are local routes. Stewart Street east of Cumberland Street, Wilbrod Street, and Cumberland Street south of Stewart Street are cross-town bikeways, and Cumberland Street north of Guigues Avenue is a neighbourhood bikeway
- The high volumes roadways have produced a high number of collisions at the study area intersections, primarily at the Rideau Street at Nelson Street intersection, which was studied as part of the City's Cycling Safety Review of High-Volume Intersections
- Some queueing is noted on the southbound left movement at the Rideau Street at King Edward Avenue intersection, but the study area intersections generally operate well

### Development Generated Travel Demand

- The proposed development is forecasted produce 184 two-way people trips during the AM peak hour and 186 two-way people trips during the PM peak hour
- Of the forecasted people trips, 28 two-way trips will be vehicle trips during the AM peak hour and 26 two-way trips will be vehicle trips during the PM peak hour
- Of the forecasted auto trips, 10% are anticipated to travel each north and east, and 40% to travel each west and south

### Background Conditions

- Through examining historical trends for the study area roadways, no growth was identified in or applied to the network
- The background developments were explicitly included in the background conditions
- All study area intersections will operate similarly to the existing conditions

### Development Design

- The bike and auto parking areas are to be located underground
- Pedestrian connections will be made from the building entrance to Nelson Street



- Emergency vehicles and garbage collection vehicles are anticipated to access the Nelson Street frontage, and not to circulate the site

### **Parking**

- 18 vehicle spaces for residents, 17 for visitors are proposed, along with five carshare spaces, nine scooter spaces, and 482 bicycle spaces
- Required tenant parking from the zoning by-law is not being met
- Mitigating factors such as the site context and access to transit and marketing the units as not having access to parking would select for tenants who do not rely on personal auto travel, and carshare is provided to enable occasional use of personal auto travel
- Off-street parking availability has been demonstrated within 400 metres-walk of the site, off-street private paid parking is available in close proximity to the site, and signed on-street parking in the neighbourhood is generally restricted to one or two hours
- Spillover parking is not anticipated to be an issue, but local residents can request permitting areas or further time restrictions to area parking if desirable

### **Boundary Street Design**

- The boundary streets will not meet the high pedestrian LOS targets for being within 300 metres of a school
- To meet targets, a boulevard would have to be introduced along the site's limited frontage which would be inconsistent with area facilities which are generally considered adequate, thus no improvements are recommended as part of this study

### **Access Intersections Design**

- A full-moves approximately 6.7-metre-wide two-way access with a 16% grade accessing the underground, is proposed 1.4 metres offset from the southern property line of the site's Nelson Street frontage
- The separation from the property line does not meet minimums from the private approach by-law
- The access intersection will be stop-controlled on the minor approach of the site driveway, with Nelson Street operating under free flow conditions
- Access intersection operations are forecast to be good at the future total horizons
- An exemption will need to be sought for the separation from the adjacent property line

### **TDM**

- To further support the reduced parking beyond the inherent function and context of the development, supportive TDM measures should be included as part of the development
- Supportive TDM measures to be included within the proposed development should include:
  - Display area walking, cycling, and transit maps with route schedules
  - Provide a multimodal travel option information package to new residents
  - Provide a permanent bicycle repair station adjacent to secure bicycle parking area
  - Contract with provider to install on-site bikeshare (or other micromobility, e.g. scooter) station
  - Contract with provider to install on-site carshare vehicles and promote their use by residents
  - Inclusion of a 1-month Presto card for first time new townhome purchase and apartment rental, with a set time frame for this offer (e.g. 6-months) from the initial opening of the site
  - Unbundle parking cost from purchase or rental costs

## NTM

- York Street east of King Edward Street is anticipated to convey between 38 to 39 vehicles during the peak hours and Nelson Street north of Rideau Street is anticipated to convey between 268 to 436 vehicles during the peak hours, of which site traffic constitutes between 9.7% and 5.7% of volumes
- No changes to the roadway classifications or proposed road network are proposed for the site

## Transit

- The proposed development is anticipated to generate an additional 61 AM and 46 PM peak hour two-way transit trips
- Peak hour increases in transit ridership resulting from the site equate to half of a standard bus load southerly and westerly of the site, and negligible impact northerly and easterly of the site, a standard bus load of the site
- Transit priority is not anticipated to be affected by the development either via newly proposed driveways or from turning movements on the priority corridor

## Network Intersection Design

- Generally, the network intersections will operate similarly to the background conditions with the addition of site traffic
- The MMLOS targets will not be met for the pedestrian and cycling LOS at all study area intersections, and transit LOS at the intersection of Rideau Street at King Edward Avenue
- Pedestrian LOS targets cannot be met without reducing all study area crossings to two lane-widths and cycling LOS targets require left-turn configurations out of mixed flow for all permitted left turn movements and separated facilities for the northbound and southbound approaches at the intersection of Rideau Street at King Edward Avenue
- Transit LOS would require reduction in delay on the northbound southbound and westbound approaches at the intersection of Rideau Street at King Edward Avenue

## 17 Conclusion

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

Prepared By:



John Kingsley, EIT  
Transportation Engineering Intern

Reviewed By:



Andrew Harte, P.Eng.  
Senior Transportation Engineer

# Appendix A

TIA Screening Form and PM Certification Form

City of Ottawa 2017 TIA Guidelines  
Step 1 - Screening Form

Date: 13-Oct-20  
Project Number: 2020-88  
Project Reference: 112 Nelson

1.1 Description of Proposed Development	
Municipal Address	112 Nelson Street
Description of Location	L-shaped parcel fronting Nelson Street between Rideau Street and York Street
Land Use Classification	R5 application approved 2018-07-11
Development Size	320 residential dwelling units
Accesses	One onto Nelson St
Phase of Development	Single
Buildout Year	2024
TIA Requirement	Full TIA Required

1.2 Trip Generation Trigger	
Land Use Type	Townhomes or apartments
Development Size	320 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 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?	No
Does the development include a drive-thru facility?	No
Safety Trigger	Yes



## **TIA Plan Reports**

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

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

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

### **CERTIFICATION**

1. I have reviewed and have a sound understanding of the objectives, needs and requirements of the City of Ottawa's Official Plan, Transportation Master Plan and the Transportation Impact Assessment (2017) Guidelines;
2. I have a sound knowledge of industry standard practice with respect to the preparation of transportation impact assessment reports, including multi modal level of service review;
3. I have substantial experience (more than 5 years) in undertaking and delivering transportation impact studies (analysis, reporting and geometric design) with strong background knowledge in transportation planning, engineering or traffic operations; and
4. I am either a licensed<sup>1</sup> or registered<sup>2</sup> professional in good standing, whose field of expertise [check  appropriate field(s)] is either transportation engineering  or transportation planning .

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


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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

<b>Office Contact Information (Please Print)</b>
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# Appendix B

Turning Movement Counts





# Transportation Services - Traffic Services

## Turning Movement Count - Study Results

### KING EDWARD AVE @ YORK ST

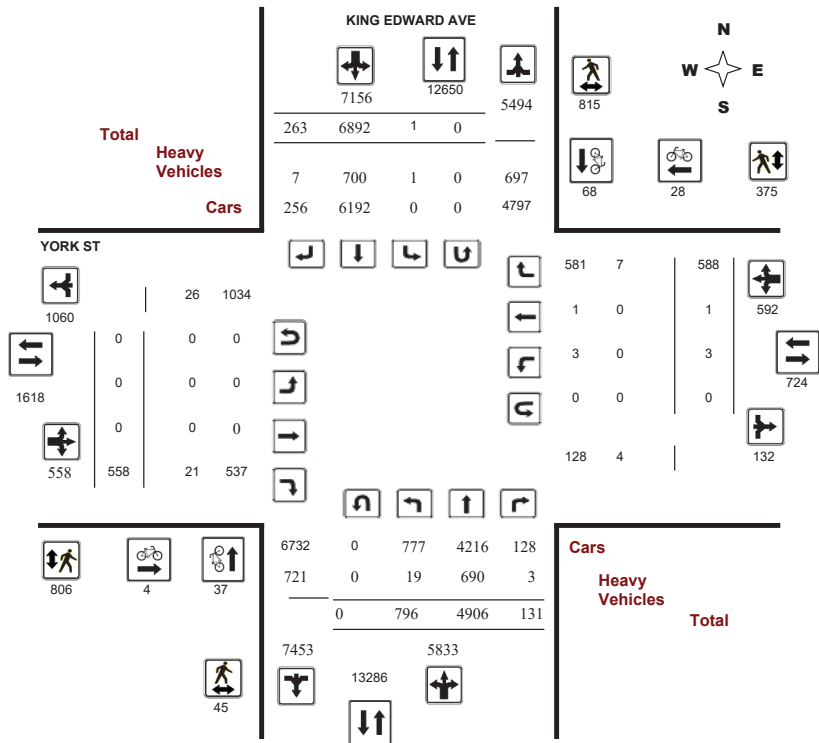
Survey Date: Wednesday, September 21, 2016

WO No: 36337

Start Time: 07:00

Device: Miovision

#### Full Study Diagram



# Transportation Services - Traffic Services

## Turning Movement Count - Study Results

### KING EDWARD AVE @ YORK ST

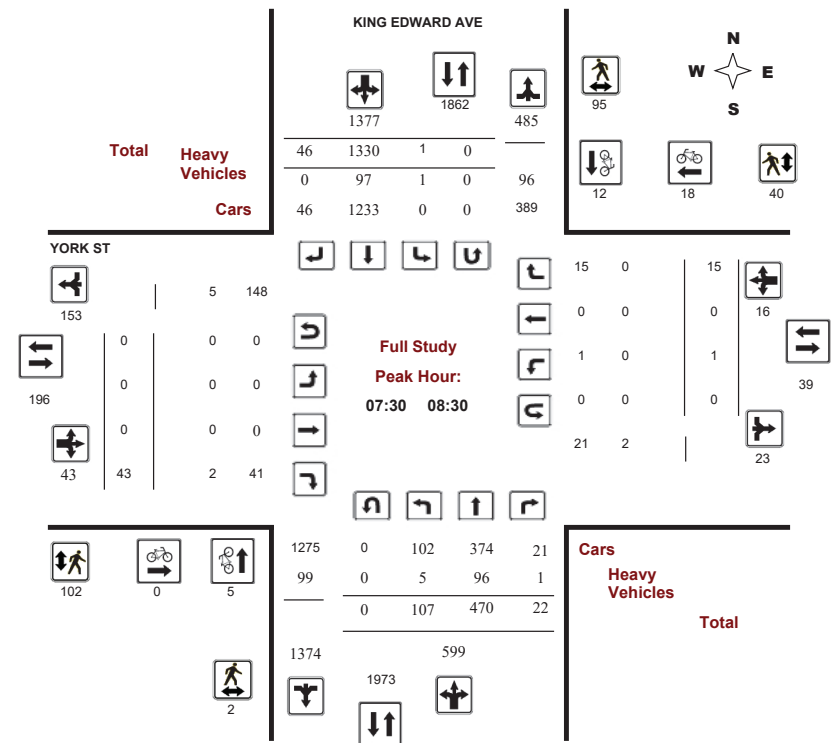
Survey Date: Wednesday, September 21, 2016

WO No: 36337

Start Time: 07:00

Device: Miovision

#### Full Study Peak Hour Diagram





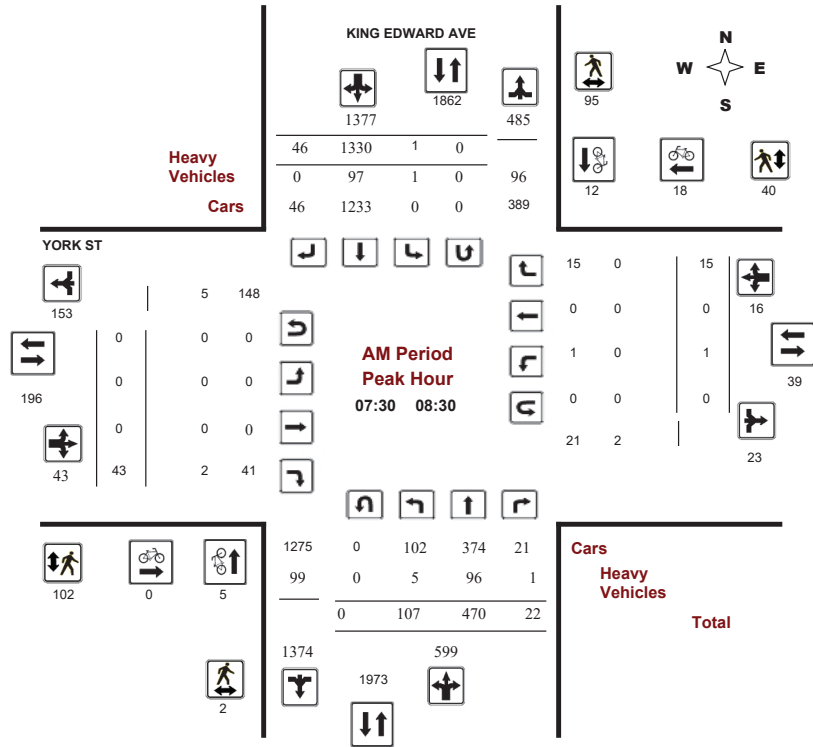
# Transportation Services - Traffic Services

## Turning Movement Count - Peak Hour Diagram

### KING EDWARD AVE @ YORK ST

Survey Date: Wednesday, September 21, 2016  
Start Time: 07:00

WO No: 36337  
Device: Miovision



Comments



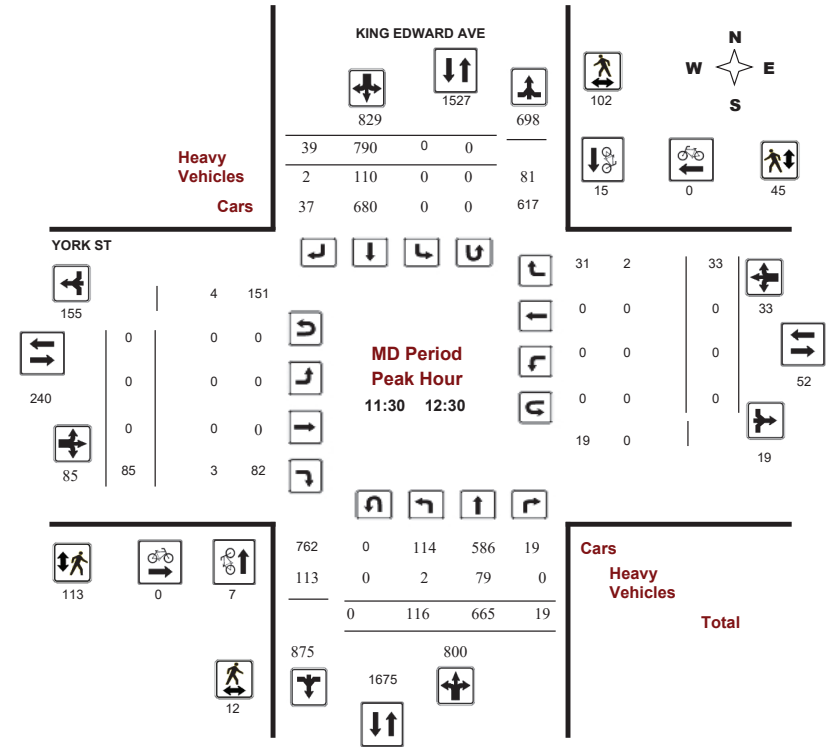
# Transportation Services - Traffic Services

## Turning Movement Count - Peak Hour Diagram

### KING EDWARD AVE @ YORK ST

Survey Date: Wednesday, September 21, 2016  
Start Time: 07:00

WO No: 36337  
Device: Miovision



Comments



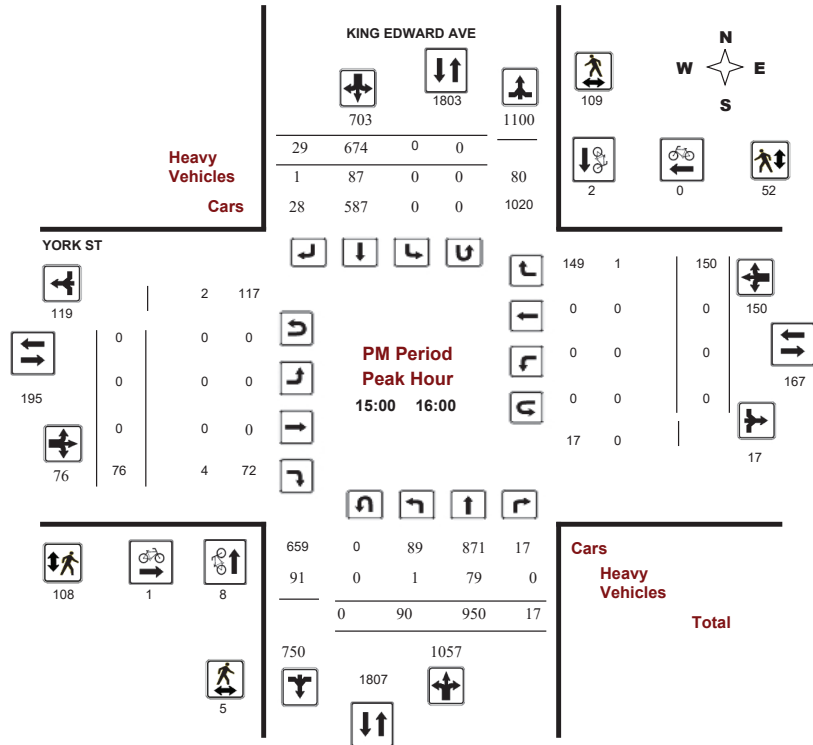
# Transportation Services - Traffic Services

## Turning Movement Count - Peak Hour Diagram

### KING EDWARD AVE @ YORK ST

Survey Date: Wednesday, September 21, 2016  
Start Time: 07:00

WO No: 36337  
Device: Miovision



Comments



# Transportation Services - Traffic Services

## Turning Movement Count - Study Results

### KING EDWARD AVE @ YORK ST

Survey Date: Wednesday, September 21, 2016  
Start Time: 07:00

WO No: 36337  
Device: Miovision

### Full Study Summary (8 HR Standard)

Survey Date: Wednesday, September 21, 2016

**Total Observed U-Turns**  
Northbound: 0 Southbound: 0  
Eastbound: 0 Westbound: 0

**AADT Factor**  
1.00

Period	KING EDWARD AVE								YORK ST								Grand Total		
	Northbound				Southbound				Eastbound				Westbound						
	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	LT	ST	RT	EB TOT	LT	ST	RT	WB TOT			
07:00-08:00	97	460	23	580	0	1200	30	1230	1810	0	0	40	40	1	0	10	11	51	1861
08:00-09:00	102	494	26	622	1	1203	51	1255	1877	0	0	40	40	0	0	18	18	58	1935
09:00-10:00	124	546	10	680	0	975	46	1021	1701	0	0	61	61	0	1	19	20	81	1782
11:30-12:30	116	665	19	800	0	790	39	829	1629	0	0	85	85	0	0	33	33	118	1747
12:30-13:30	127	640	12	779	0	782	19	801	1580	0	0	82	82	2	0	24	26	108	1688
15:00-16:00	90	950	17	1057	0	674	29	703	1760	0	0	76	76	0	0	150	150	226	1986
16:00-17:00	58	437	10	505	0	633	25	658	1163	0	0	91	91	0	0	185	185	276	1439
17:00-18:00	82	714	14	810	0	635	24	659	1469	0	0	83	83	0	0	149	149	232	1701
<b>Sub Total</b>	796	4906	131	5833	1	6892	263	7156	12989	0	0	558	558	3	1	588	592	1150	14139
<b>U Turns</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	796	4906	131	5833	1	6892	263	7156	12989	0	0	558	558	3	1	588	592	1150	14139
<b>EQ 12Hr</b>	1106	6819	182	8107	1	9580	366	9947	18054	0	0	776	776	4	1	817	822	1598	19652
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.																			
<b>1.39</b>																			
<b>AVG 12Hr</b>	1106	6819	182	8107	1	9580	366	9947	18054	0	0	776	776	4	1	817	822	1598	19652
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.																			
<b>1.00</b>																			
<b>AVG 24Hr</b>	1449	8933	238	10620	1	12550	479	13030	23650	0	0	1017	1017	5	1	1070	1076	2093	25743
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.																			
<b>1.31</b>																			
Note: U-Turns provided for approach totals. Refer to 'U-Turn' Report for specific breakdown.																			



Transportation Services - Traffic Services

Turning Movement Count - Study Results

KING EDWARD AVE @ YORK ST

Survey Date: Wednesday, September 21, 2016

WO No: 36337

Start Time: 07:00

Device: Miovision

Full Study 15 Minute Increments

Table with columns for Time Period, Northbound (LT, ST, RT, N TOT, STR TOT), Southbound (LT, ST, RT, S TOT, STR TOT), Eastbound (LT, ST, RT, E TOT, STR TOT), Westbound (LT, ST, RT, W TOT, STR TOT), and Grand Total. Rows represent 15-minute intervals from 07:00 to 18:00.

Note: U-Turns are included in Totals.



Transportation Services - Traffic Services

Turning Movement Count - Study Results

KING EDWARD AVE @ YORK ST

Survey Date: Wednesday, September 21, 2016

WO No: 36337

Start Time: 07:00

Device: Miovision

Full Study Cyclist Volume

Table with columns for Time Period, KING EDWARD AVE (Northbound, Southbound, Street Total), YORK ST (Eastbound, Westbound, Street Total), and Grand Total. Rows represent 15-minute intervals from 07:00 to 18:00.



Transportation Services - Traffic Services

Turning Movement Count - Study Results

KING EDWARD AVE @ YORK ST

Survey Date: Wednesday, September 21, 2016

WO No: 36337

Start Time: 07:00

Device: Miovision

Full Study Pedestrian Volume

KING EDWARD AVE YORK ST

Table with columns: Time Period, NB Approach, SB Approach, Total, EB Approach, WB Approach, Total, Grand Total. Rows show pedestrian counts from 07:00 to 17:45.



Transportation Services - Traffic Services

Turning Movement Count - Study Results

KING EDWARD AVE @ YORK ST

Survey Date: Wednesday, September 21, 2016

WO No: 36337

Start Time: 07:00

Device: Miovision

Full Study Heavy Vehicles

KING EDWARD AVE YORK ST

Table with columns: Time Period, Northbound (LT, ST, RT, N TOT, STR TOT), Southbound (LT, ST, RT, S TOT, STR TOT), Eastbound (LT, ST, RT, E TOT), Westbound (LT, ST, RT, W TOT, STR TOT), Grand Total. Rows show heavy vehicle counts from 07:00 to 17:45.



Transportation Services - Traffic Services

Turning Movement Count - Study Results

KING EDWARD AVE @ YORK ST

Survey Date: Wednesday, September 21, 2016

WO No: 36337

Start Time: 07:00

Device: Miovision

Full Study 15 Minute U-Turn Total

Time Period		Northbound U-Turn Total	Southbound U-Turn Total	Eastbound U-Turn Total	Westbound U-Turn Total	Total
07:00	07:15	0	0	0	0	0
07:15	07:30	0	0	0	0	0
07:30	07:45	0	0	0	0	0
07:45	08:00	0	0	0	0	0
08:00	08:15	0	0	0	0	0
08:15	08:30	0	0	0	0	0
08:30	08:45	0	0	0	0	0
08:45	09:00	0	0	0	0	0
09:00	09:15	0	0	0	0	0
09:15	09:30	0	0	0	0	0
09:30	09:45	0	0	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	0	0	0	0
15:00	15:15	0	0	0	0	0
15:15	15:30	0	0	0	0	0
15:30	15:45	0	0	0	0	0
15:45	16:00	0	0	0	0	0
16:00	16:15	0	0	0	0	0
16:15	16:30	0	0	0	0	0
16:30	16:45	0	0	0	0	0
16:45	17:00	0	0	0	0	0
17:00	17:15	0	0	0	0	0
17:15	17:30	0	0	0	0	0
17:30	17:45	0	0	0	0	0
17:45	18:00	0	0	0	0	0
Total		0	0	0	0	0



Transportation Services - Traffic Services

Turning Movement Count - Study Results

KING EDWARD AVE @ RIDEAU ST

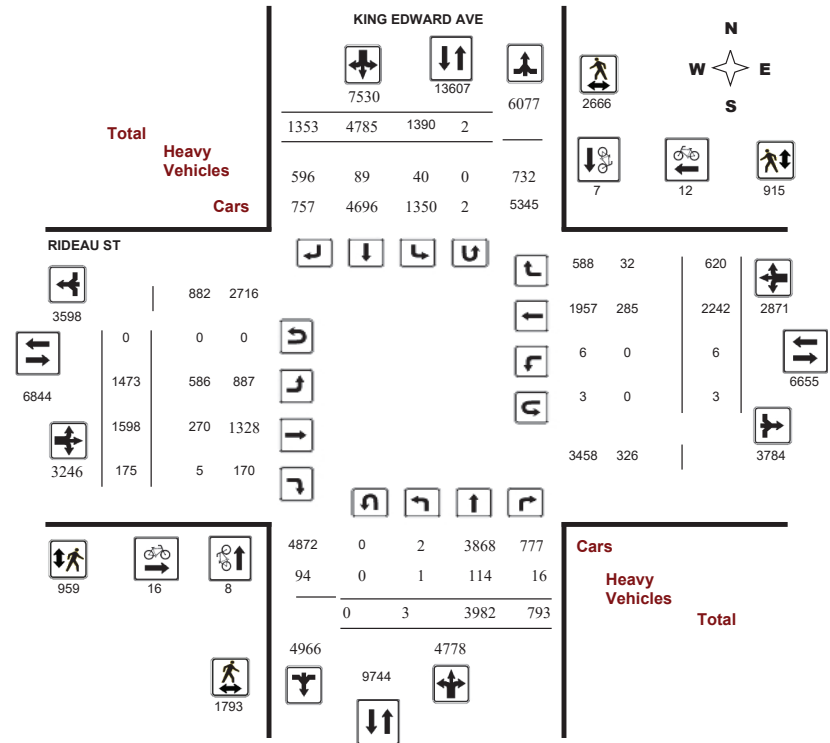
Survey Date: Tuesday, January 14, 2020

WO No: 39318

Start Time: 07:00

Device: Miovision

Full Study Diagram



5470795 - TUE JAN 14, 2020 - 8HRS - LORETTA



# Transportation Services - Traffic Services

## Turning Movement Count - Study Results

### KING EDWARD AVE @ RIDEAU ST

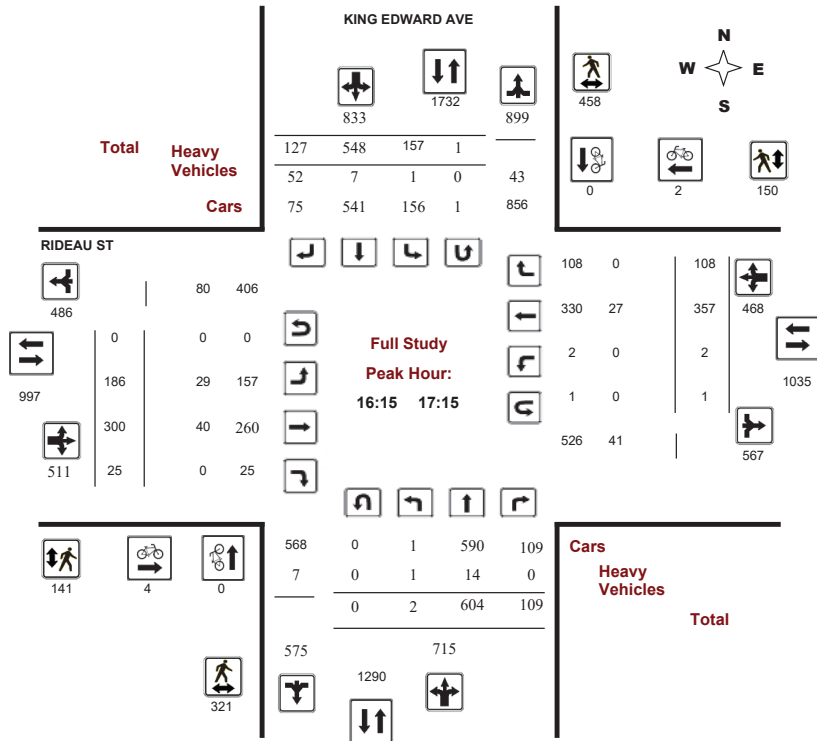
Survey Date: Tuesday, January 14, 2020

WO No: 39318

Start Time: 07:00

Device: Miovision

### Full Study Peak Hour Diagram



5470795 - TUE JAN 14, 2020 - 8HRS - LORETTA



# Transportation Services - Traffic Services

## Turning Movement Count - Peak Hour Diagram

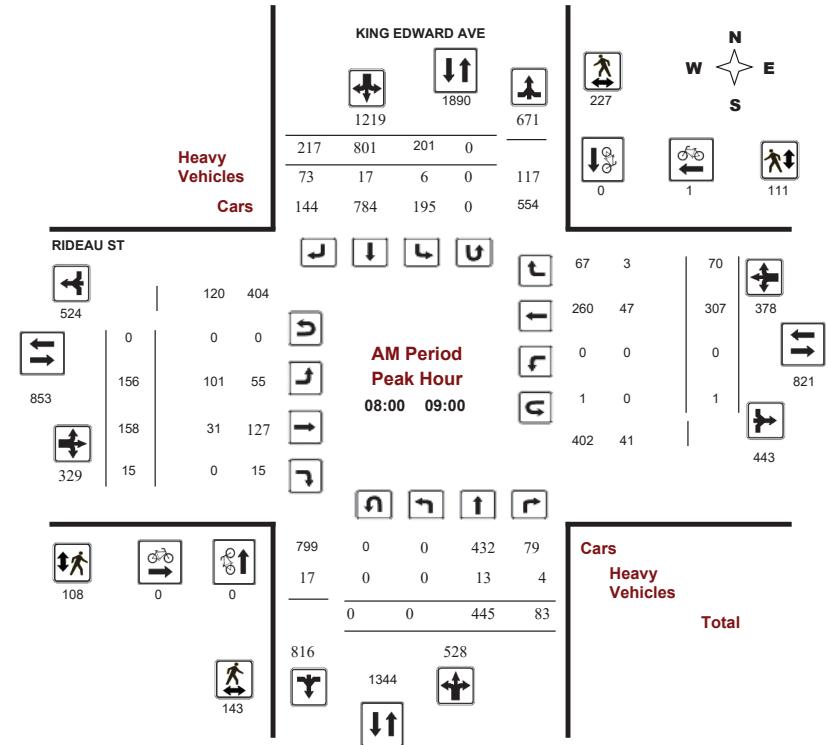
### KING EDWARD AVE @ RIDEAU ST

Survey Date: Tuesday, January 14, 2020

WO No: 39318

Start Time: 07:00

Device: Miovision



Comments 5470795 - TUE JAN 14, 2020 - 8HRS - LORETTA





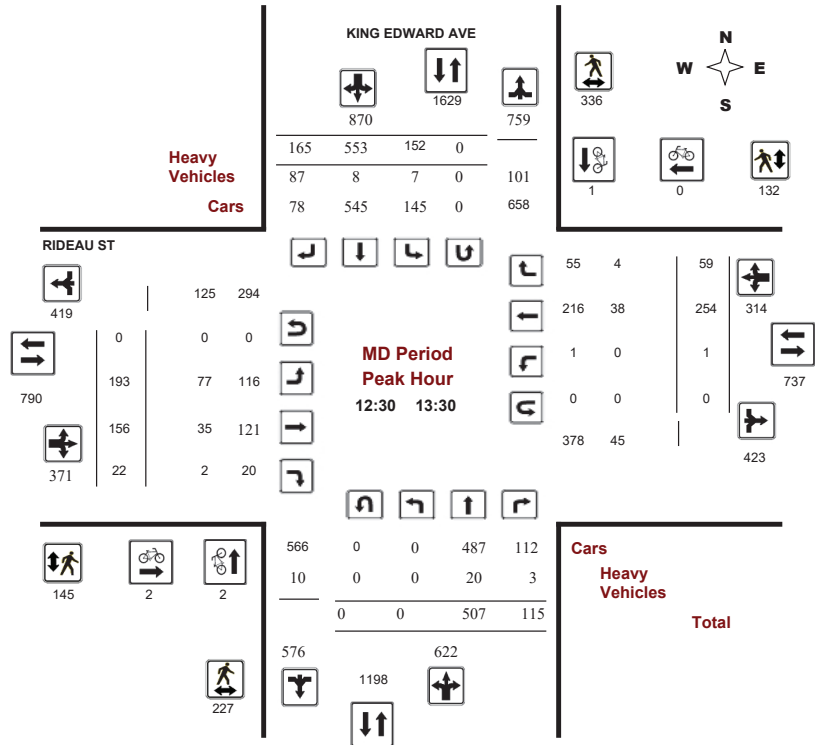
### Transportation Services - Traffic Services

#### Turning Movement Count - Peak Hour Diagram

#### KING EDWARD AVE @ RIDEAU ST

Survey Date: Tuesday, January 14, 2020  
Start Time: 07:00

WO No: 39318  
Device: Miovision



Comments 5470795 - TUE JAN 14, 2020 - 8HRS - LORETTA



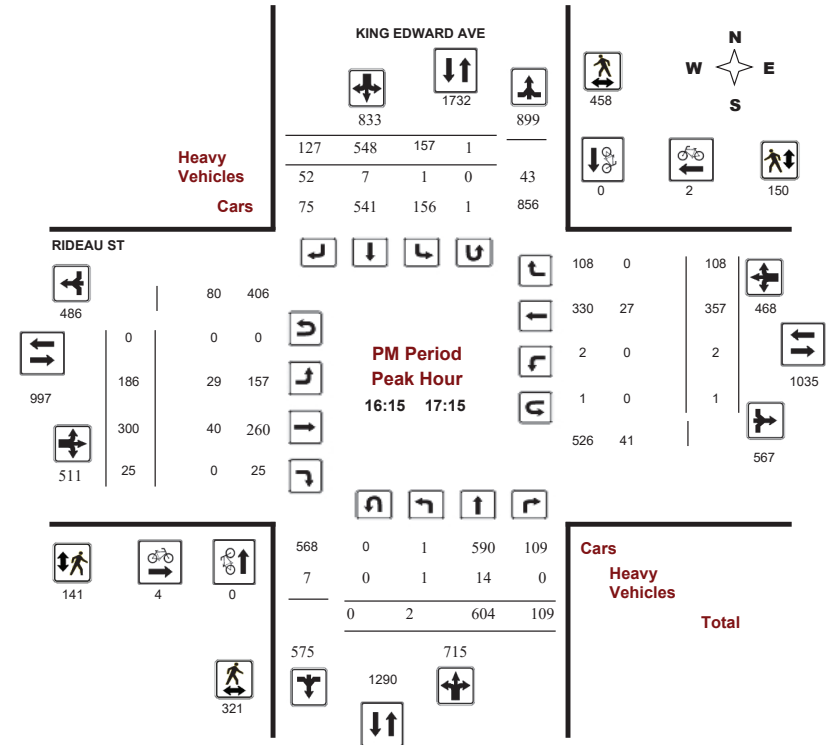
### Transportation Services - Traffic Services

#### Turning Movement Count - Peak Hour Diagram

#### KING EDWARD AVE @ RIDEAU ST

Survey Date: Tuesday, January 14, 2020  
Start Time: 07:00

WO No: 39318  
Device: Miovision



Comments 5470795 - TUE JAN 14, 2020 - 8HRS - LORETTA



Transportation Services - Traffic Services

Turning Movement Count - Study Results

KING EDWARD AVE @ RIDEAU ST

Survey Date: Tuesday, January 14, 2020

WO No: 39318

Start Time: 07:00

Device: Miovision

Full Study Summary (8 HR Standard)

Survey Date: Tuesday, January 14, 2020

Total Observed U-Turns

AADT Factor

Northbound: 0 Southbound: 2
Eastbound: 0 Westbound: 3

1.10

Table with columns for Period, Northbound, Southbound, Eastbound, Westbound, and Grand Total. Rows include time intervals from 07:00 to 17:00 and summary rows for Sub Total, U Turns, EQ 12Hr, and AVG 24Hr.

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

1.39

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

1.10

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

1.31

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



Transportation Services - Traffic Services

Turning Movement Count - Study Results

KING EDWARD AVE @ RIDEAU ST

Survey Date: Tuesday, January 14, 2020

WO No: 39318

Start Time: 07:00

Device: Miovision

Full Study 15 Minute Increments

Large table with columns for Time Period, Northbound, Southbound, Eastbound, Westbound, and Grand Total. Rows include 15-minute time intervals from 07:00 to 18:00 and a Total row.

Note: U-Turns are included in Totals.



Transportation Services - Traffic Services

Turning Movement Count - Study Results

KING EDWARD AVE @ RIDEAU ST

Survey Date: Tuesday, January 14, 2020

WO No: 39318

Start Time: 07:00

Device: Miovision

Full Study Cyclist Volume

Table with columns: Time Period, Northbound, Southbound, Street Total, Eastbound, Westbound, Street Total, Grand Total. Rows show cyclist counts for various time intervals from 07:00 to 18:00.



Transportation Services - Traffic Services

Turning Movement Count - Study Results

KING EDWARD AVE @ RIDEAU ST

Survey Date: Tuesday, January 14, 2020

WO No: 39318

Start Time: 07:00

Device: Miovision

Full Study Pedestrian Volume

Table with columns: Time Period, NB Approach, SB Approach, Total, EB Approach, WB Approach, Total, Grand Total. Rows show pedestrian counts for various time intervals from 07:00 to 18:00.

5470795 - TUE JAN 14, 2020 - 8HRS - LORETTA



Transportation Services - Traffic Services

Turning Movement Count - Study Results

KING EDWARD AVE @ RIDEAU ST

Survey Date: Tuesday, January 14, 2020

WO No: 39318

Start Time: 07:00

Device: Miovision

Full Study Heavy Vehicles

Table with columns for Time Period, Northbound (LT, ST, RT, N TOT, STR TOT), Southbound (LT, ST, RT, S TOT, STR TOT), Eastbound (LT, ST, RT, E TOT), Westbound (LT, ST, RT, W TOT, STR TOT), and Grand Total. Rows represent 15-minute intervals from 07:00 to 18:00.



Transportation Services - Traffic Services

Turning Movement Count - Study Results

KING EDWARD AVE @ RIDEAU ST

Survey Date: Tuesday, January 14, 2020

WO No: 39318

Start Time: 07:00

Device: Miovision

Full Study 15 Minute U-Turn Total

Table with columns for Time Period, Northbound U-Turn Total, Southbound U-Turn Total, Eastbound U-Turn Total, Westbound U-Turn Total, and Total. Rows represent 15-minute intervals from 07:00 to 18:00.



# Transportation Services - Traffic Services

## Turning Movement Count - Study Results

### NELSON ST @ RIDEAU ST

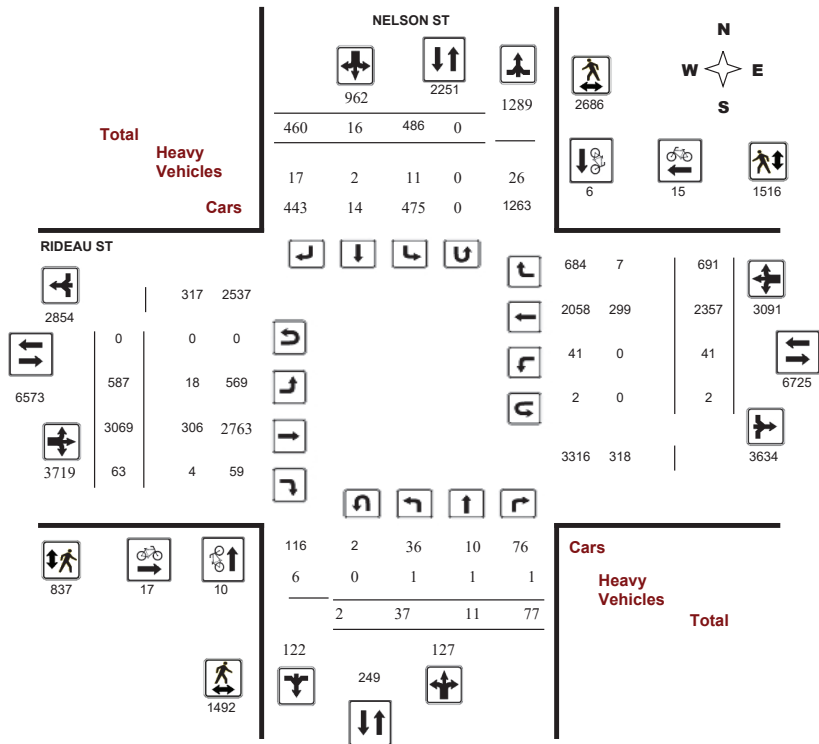
Survey Date: Tuesday, January 14, 2020

WO No: 39319

Start Time: 07:00

Device: Miovision

#### Full Study Diagram



5470796 - TUE JAN 14, 2020 - 8HRS - LORETTA



# Transportation Services - Traffic Services

## Turning Movement Count - Study Results

### NELSON ST @ RIDEAU ST

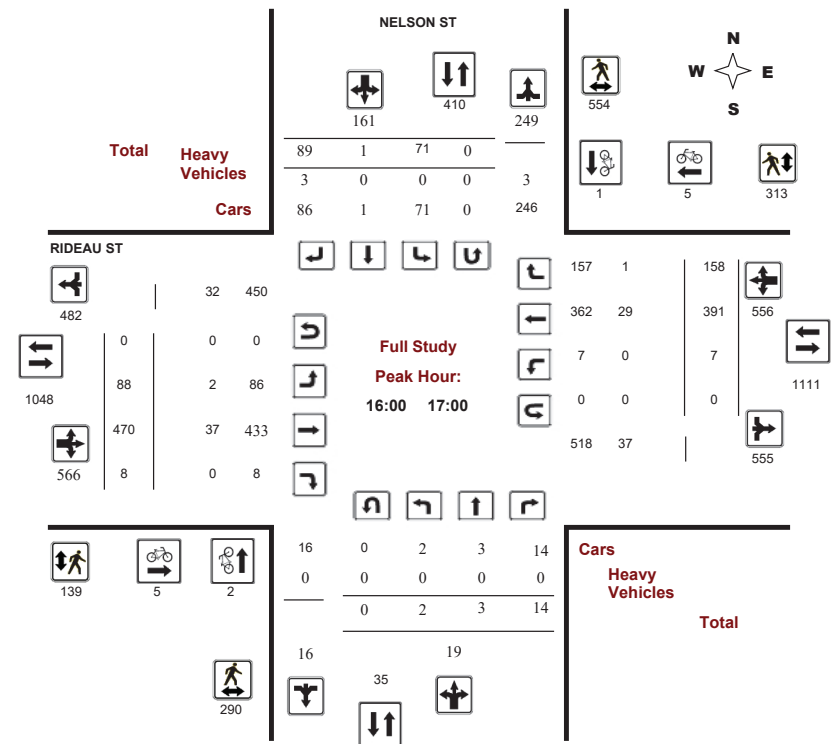
Survey Date: Tuesday, January 14, 2020

WO No: 39319

Start Time: 07:00

Device: Miovision

#### Full Study Peak Hour Diagram



5470796 - TUE JAN 14, 2020 - 8HRS - LORETTA



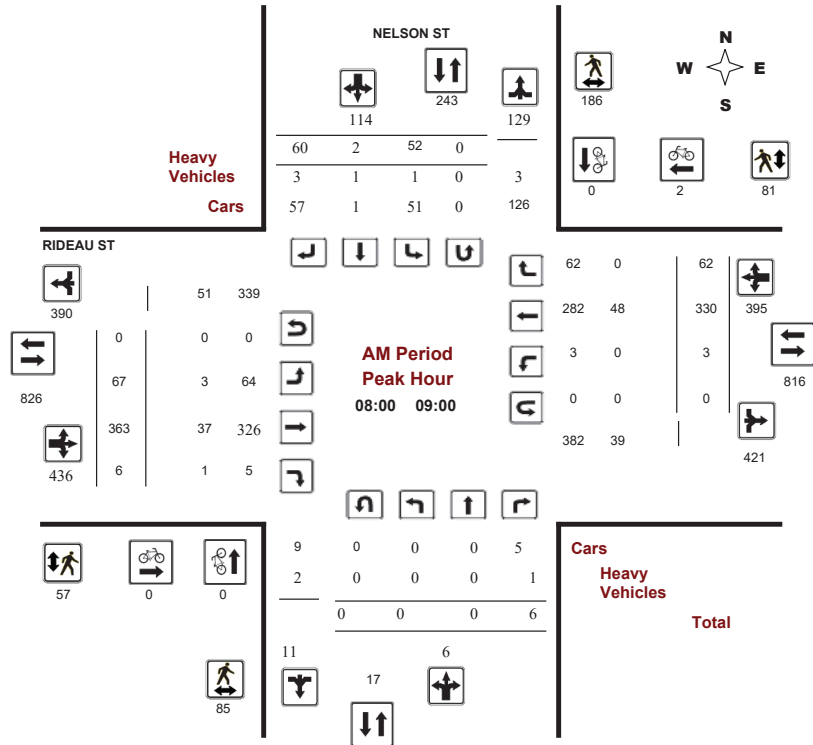
# Transportation Services - Traffic Services

## Turning Movement Count - Peak Hour Diagram

### NELSON ST @ RIDEAU ST

Survey Date: Tuesday, January 14, 2020  
Start Time: 07:00

WO No: 39319  
Device: Miovision



Comments 5470796 - TUE JAN 14, 2020 - 8HRS - LORETTA



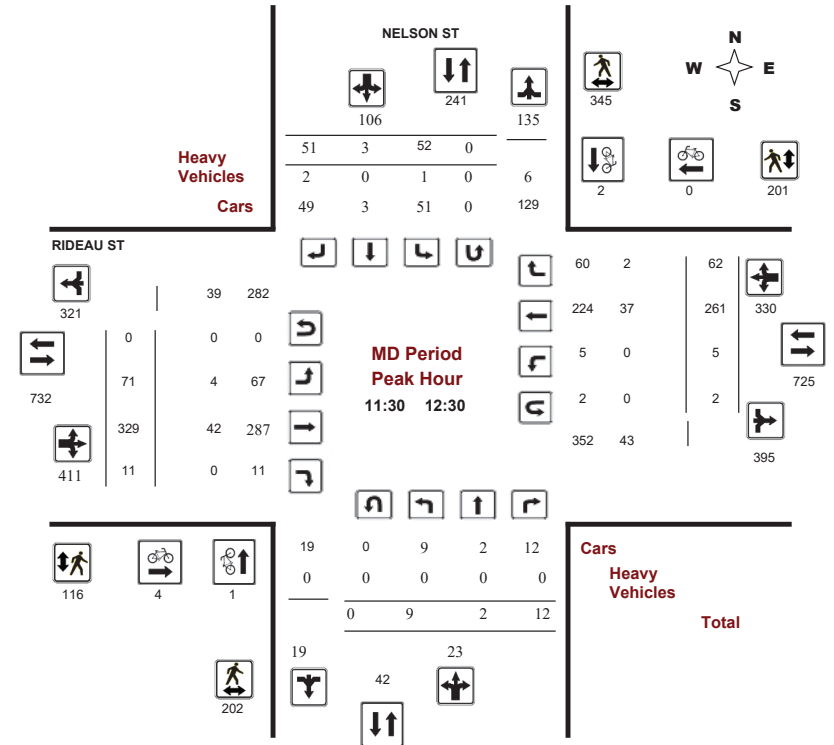
# Transportation Services - Traffic Services

## Turning Movement Count - Peak Hour Diagram

### NELSON ST @ RIDEAU ST

Survey Date: Tuesday, January 14, 2020  
Start Time: 07:00

WO No: 39319  
Device: Miovision



Comments 5470796 - TUE JAN 14, 2020 - 8HRS - LORETTA



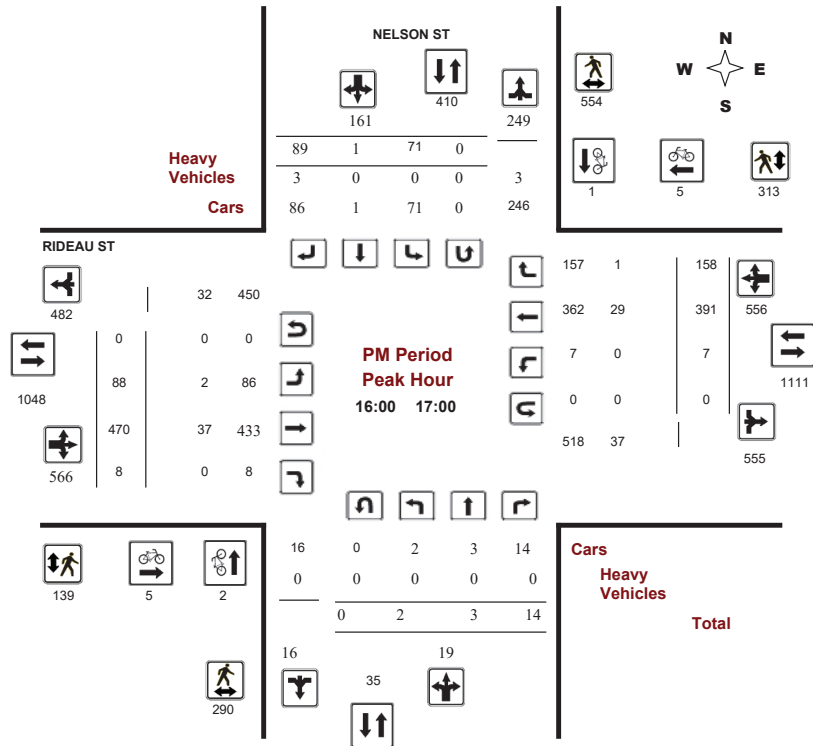
# Transportation Services - Traffic Services

## Turning Movement Count - Peak Hour Diagram

### NELSON ST @ RIDEAU ST

Survey Date: Tuesday, January 14, 2020  
Start Time: 07:00

WO No: 39319  
Device: Miovision



Comments 5470796 - TUE JAN 14, 2020 - 8HRS - LORETTA



# Transportation Services - Traffic Services

## Turning Movement Count - Study Results

### NELSON ST @ RIDEAU ST

Survey Date: Tuesday, January 14, 2020  
Start Time: 07:00

WO No: 39319  
Device: Miovision

### Full Study Summary (8 HR Standard)

Survey Date: Tuesday, January 14, 2020

Total Observed U-Turns  
Northbound: 2 Southbound: 0  
Eastbound: 0 Westbound: 2

AADT Factor  
1.10

Period	NELSON ST				RIDEAU ST				Grand Total										
	Northbound		Southbound		Eastbound		Westbound												
	LT	ST	RT	NB TOT	LT	ST	RT	SB TOT	STR TOT	LT	ST	RT	EB TOT	WB TOT	STR TOT	Grand Total			
07:00-08:00	0	0	4	4	34	1	32	67	71	74	348	4	426	1	248	41	290	716	787
08:00-09:00	0	0	6	6	52	2	60	114	120	67	363	6	436	3	330	62	395	831	951
09:00-10:00	7	0	6	13	35	2	43	80	93	58	366	9	433	4	221	46	271	704	797
11:30-12:30	9	2	12	23	52	3	51	106	129	71	329	11	411	5	261	62	328	739	868
12:30-13:30	9	0	13	22	49	4	45	98	120	59	336	10	405	10	254	59	323	728	848
15:00-16:00	8	3	12	23	115	1	73	189	212	96	400	11	507	3	337	146	486	993	1205
16:00-17:00	2	3	14	19	71	1	89	161	180	88	470	8	566	7	391	158	556	1122	1302
17:00-18:00	2	3	10	15	78	2	67	147	162	74	457	4	535	8	315	117	440	975	1137
<b>Sub Total</b>	<b>37</b>	<b>11</b>	<b>77</b>	<b>125</b>	<b>486</b>	<b>16</b>	<b>460</b>	<b>962</b>	<b>1087</b>	<b>587</b>	<b>3069</b>	<b>63</b>	<b>3719</b>	<b>41</b>	<b>2357</b>	<b>691</b>	<b>3089</b>	<b>6808</b>	<b>7895</b>
<b>U Turns</b>	<b>2</b>			<b>2</b>	<b>0</b>			<b>0</b>	<b>2</b>	<b>0</b>			<b>0</b>	<b>2</b>			<b>2</b>	<b>2</b>	<b>4</b>
<b>Total</b>	<b>39</b>	<b>11</b>	<b>77</b>	<b>127</b>	<b>486</b>	<b>16</b>	<b>460</b>	<b>962</b>	<b>1089</b>	<b>587</b>	<b>3069</b>	<b>63</b>	<b>3719</b>	<b>43</b>	<b>2357</b>	<b>691</b>	<b>3091</b>	<b>6810</b>	<b>7899</b>
<b>EQ 12Hr</b>	<b>54</b>	<b>15</b>	<b>107</b>	<b>176</b>	<b>676</b>	<b>22</b>	<b>639</b>	<b>1337</b>	<b>1513</b>	<b>816</b>	<b>4266</b>	<b>88</b>	<b>5170</b>	<b>60</b>	<b>3276</b>	<b>960</b>	<b>4296</b>	<b>9466</b>	<b>10979</b>
Note: These values are calculated by multiplying the totals by the appropriate expansion factor.															<b>1.39</b>				
<b>AVG 12Hr</b>	<b>59</b>	<b>16</b>	<b>118</b>	<b>193</b>	<b>744</b>	<b>24</b>	<b>703</b>	<b>1471</b>	<b>1664</b>	<b>898</b>	<b>4693</b>	<b>97</b>	<b>5688</b>	<b>66</b>	<b>3604</b>	<b>1056</b>	<b>4726</b>	<b>10414</b>	<b>12078</b>
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor.															<b>1.10</b>				
<b>AVG 24Hr</b>	<b>77</b>	<b>21</b>	<b>155</b>	<b>253</b>	<b>975</b>	<b>31</b>	<b>921</b>	<b>1927</b>	<b>2180</b>	<b>1176</b>	<b>6148</b>	<b>127</b>	<b>7451</b>	<b>86</b>	<b>4721</b>	<b>1383</b>	<b>6190</b>	<b>13641</b>	<b>15821</b>
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor.															<b>1.31</b>				
Note: U-Turns provided for approach totals. Refer to 'U-Turn' Report for specific breakdown.																			





Transportation Services - Traffic Services

Turning Movement Count - Study Results

NELSON ST @ RIDEAU ST

Survey Date: Tuesday, January 14, 2020

WO No: 39319

Start Time: 07:00

Device: Miovision

Full Study 15 Minute Increments

Table with columns for Time Period, Northbound, Southbound, Eastbound, Westbound, and Grand Total. Rows show 15-minute intervals from 07:00 to 18:00.

Note: U-Turns are included in Totals.



Transportation Services - Traffic Services

Turning Movement Count - Study Results

NELSON ST @ RIDEAU ST

Survey Date: Tuesday, January 14, 2020

WO No: 39319

Start Time: 07:00

Device: Miovision

Full Study Cyclist Volume

Table with columns for Time Period, Nelson St, Rideau St, and Grand Total. Rows show 15-minute intervals from 07:00 to 18:00.



Transportation Services - Traffic Services

Turning Movement Count - Study Results

NELSON ST @ RIDEAU ST

Survey Date: Tuesday, January 14, 2020

WO No: 39319

Start Time: 07:00

Device: Miovision

Full Study Pedestrian Volume

NELSON ST RIDEAU ST

Table with columns: 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. Rows show pedestrian volume data from 07:00 to 17:45.

5470796 - TUE JAN 14, 2020 - 8HRS - LORETTA



Transportation Services - Traffic Services

Turning Movement Count - Study Results

NELSON ST @ RIDEAU ST

Survey Date: Tuesday, January 14, 2020

WO No: 39319

Start Time: 07:00

Device: Miovision

Full Study Heavy Vehicles

NELSON ST RIDEAU ST

Table with columns: Time Period, Northbound (LT, ST, RT, N TOT, STR TOT), Southbound (LT, ST, RT, S TOT, STR TOT), Eastbound (LT, ST, RT, E TOT), Westbound (LT, ST, RT, W TOT, STR TOT), Grand Total. Rows show heavy vehicle volume data from 07:00 to 17:45.



# Transportation Services - Traffic Services

## Turning Movement Count - Study Results

### NELSON ST @ RIDEAU ST

Survey Date: Tuesday, January 14, 2020

WO No: 39319

Start Time: 07:00

Device: Miovision

### Full Study 15 Minute U-Turn Total NELSON ST RIDEAU ST

Time Period	Northbound U-Turn Total	Southbound U-Turn Total	Eastbound U-Turn Total	Westbound U-Turn Total	Total
07:00 - 07:15	0	0	0	0	0
07:15 - 07:30	0	0	0	0	0
07:30 - 07:45	0	0	0	0	0
07:45 - 08:00	0	0	0	0	0
08:00 - 08:15	0	0	0	0	0
08:15 - 08:30	0	0	0	0	0
08:30 - 08:45	0	0	0	0	0
08:45 - 09:00	0	0	0	0	0
09:00 - 09:15	1	0	0	0	1
09:15 - 09:30	0	0	0	0	0
09:30 - 09:45	0	0	0	0	0
09:45 - 10:00	1	0	0	0	1
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	1	1
12:15 - 12:30	0	0	0	1	1
12:30 - 12:45	0	0	0	0	0
12:45 - 13:00	0	0	0	0	0
13:00 - 13:15	0	0	0	0	0
13:15 - 13:30	0	0	0	0	0
15:00 - 15:15	0	0	0	0	0
15:15 - 15:30	0	0	0	0	0
15:30 - 15:45	0	0	0	0	0
15:45 - 16:00	0	0	0	0	0
16:00 - 16:15	0	0	0	0	0
16:15 - 16:30	0	0	0	0	0
16:30 - 16:45	0	0	0	0	0
16:45 - 17:00	0	0	0	0	0
17:00 - 17:15	0	0	0	0	0
17:15 - 17:30	0	0	0	0	0
17:30 - 17:45	0	0	0	0	0
17:45 - 18:00	0	0	0	0	0
<b>Total</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>4</b>



# Transportation Services - Traffic Services

## Turning Movement Count - Study Results

### FRIEL ST @ RIDEAU ST

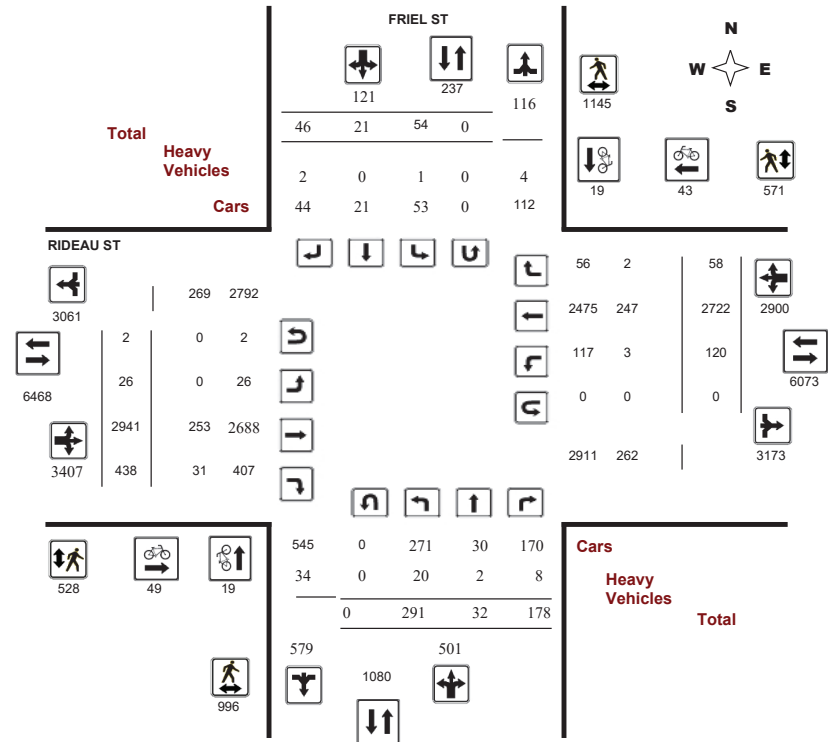
Survey Date: Tuesday, May 09, 2017

WO No: 37008

Start Time: 07:00

Device: Miovision

### Full Study Diagram





# Transportation Services - Traffic Services

## Turning Movement Count - Study Results

### FRIEL ST @ RIDEAU ST

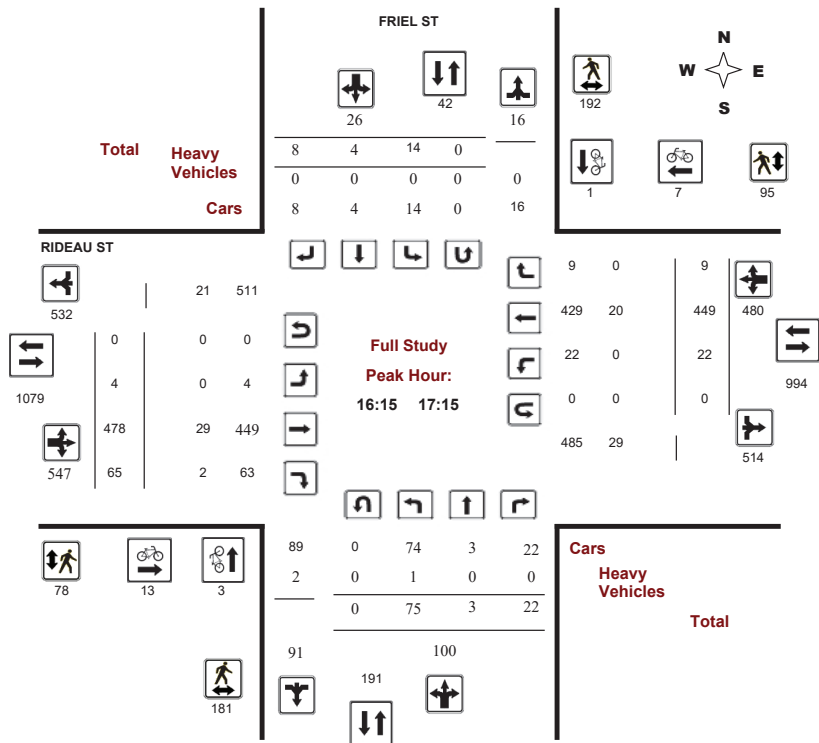
Survey Date: Tuesday, May 09, 2017

WO No: 37008

Start Time: 07:00

Device: Miovision

### Full Study Peak Hour Diagram



# Transportation Services - Traffic Services

## Turning Movement Count - Peak Hour Diagram

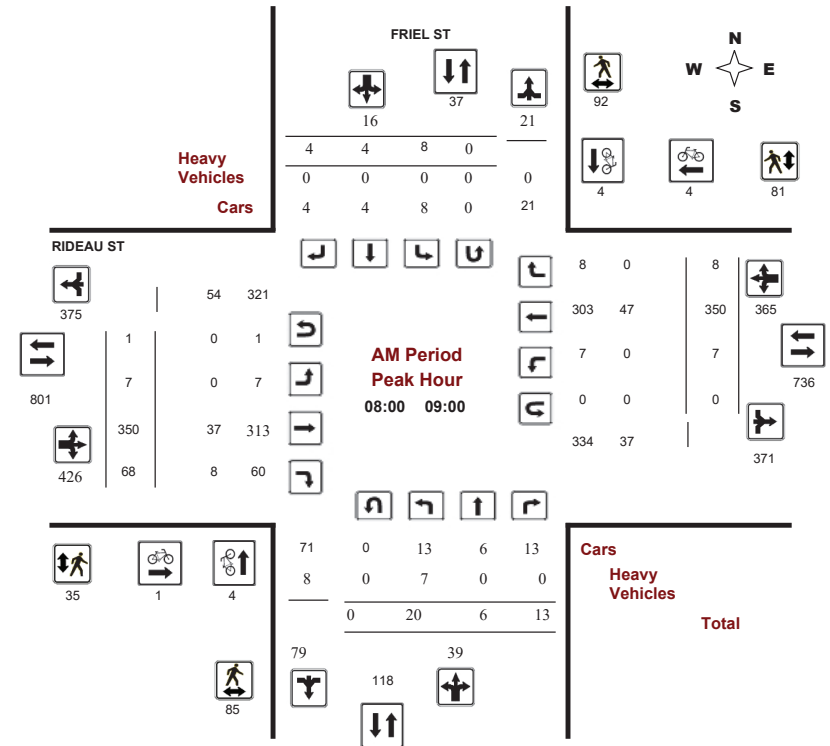
### FRIEL ST @ RIDEAU ST

Survey Date: Tuesday, May 09, 2017

WO No: 37008

Start Time: 07:00

Device: Miovision



Comments



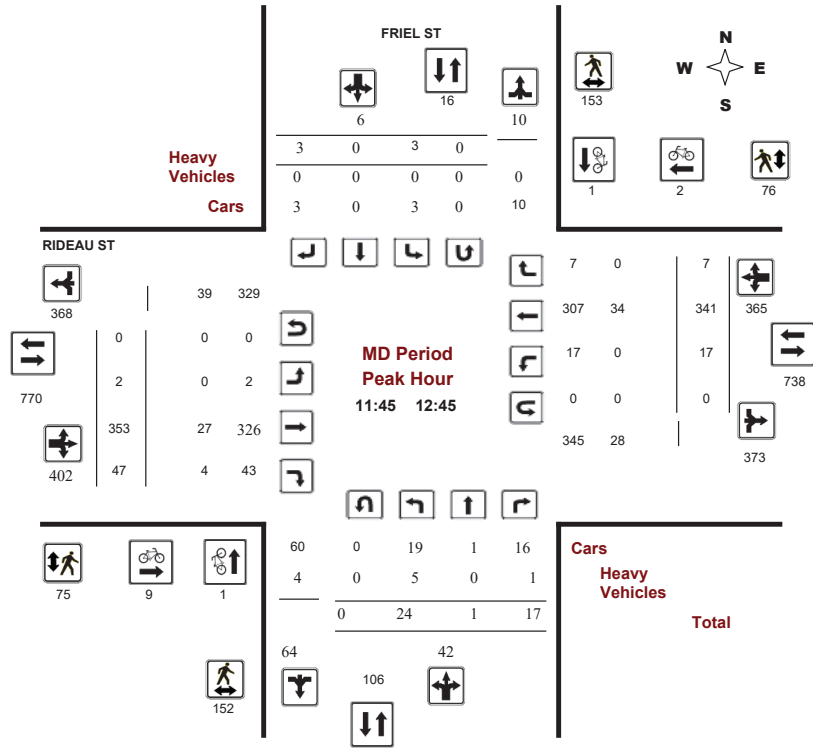
# Transportation Services - Traffic Services

## Turning Movement Count - Peak Hour Diagram

### FRIEL ST @ RIDEAU ST

Survey Date: Tuesday, May 09, 2017  
Start Time: 07:00

WO No: 37008  
Device: Miovision



Comments



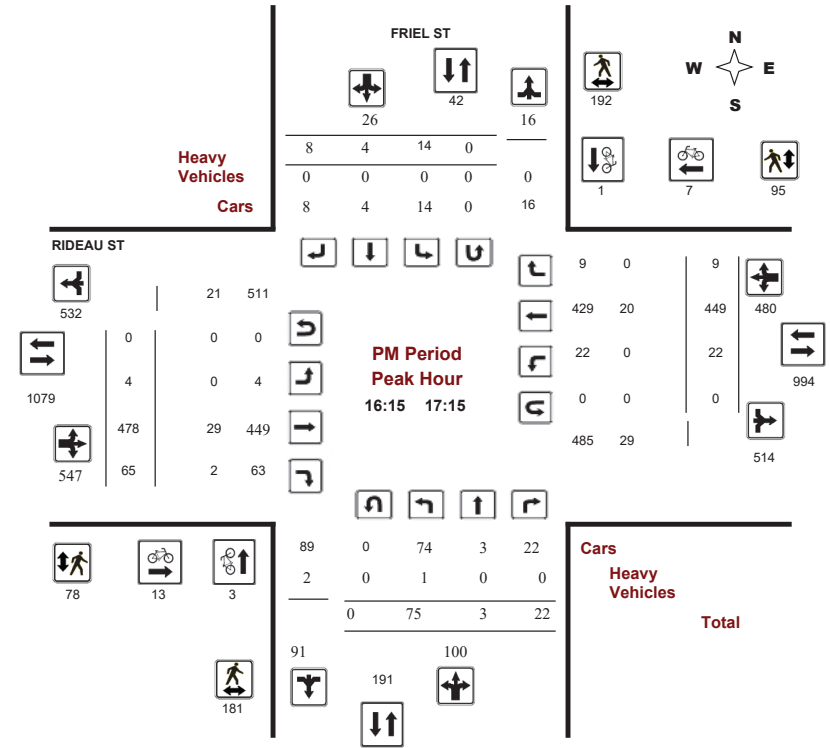
# Transportation Services - Traffic Services

## Turning Movement Count - Peak Hour Diagram

### FRIEL ST @ RIDEAU ST

Survey Date: Tuesday, May 09, 2017  
Start Time: 07:00

WO No: 37008  
Device: Miovision



Comments



Transportation Services - Traffic Services

Turning Movement Count - Study Results

FRIEL ST @ RIDEAU ST

Survey Date: Tuesday, May 09, 2017

WO No: 37008

Start Time: 07:00

Device: Miovision

Full Study Summary (8 HR Standard)

Survey Date: Tuesday, May 09, 2017

Total Observed U-Turns AADT Factor
Northbound: 0 Southbound: 0 Eastbound: 2 Westbound: 0 .90

Table with columns for FRIEL ST (Northbound, Southbound) and RIDEAU ST (Eastbound, Westbound). Rows show traffic volume for various time periods (07:00-17:00) and sub-totals.

Note: These values are calculated by multiplying the totals by the appropriate expansion factor. 1.39

AVG 12Hr 364 40 222 626 68 26 58 152 778 35 3679 548 4262 150 3406 73 3629 7891 8669
Note: These volumes are calculated by multiplying the Equivalent 12 hr. totals by the AADT factor. .90

AVG 24Hr 477 52 291 820 89 34 76 199 1019 46 4819 718 5583 196 4462 96 4754 10337 11356
Note: These volumes are calculated by multiplying the Average Daily 12 hr. totals by 12 to 24 expansion factor. 1.31

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



Transportation Services - Traffic Services

Turning Movement Count - Study Results

FRIEL ST @ RIDEAU ST

Survey Date: Tuesday, May 09, 2017

WO No: 37008

Start Time: 07:00

Device: Miovision

Full Study 15 Minute Increments

Table with columns for FRIEL ST (Northbound, Southbound) and RIDEAU ST (Eastbound, Westbound). Rows show traffic volume for 15-minute increments from 07:00 to 18:00, including Grand Total.

Note: U-Turns are included in Totals.





Transportation Services - Traffic Services

Turning Movement Count - Study Results

FRIEL ST @ RIDEAU ST

Survey Date: Tuesday, May 09, 2017

WO No: 37008

Start Time: 07:00

Device: Miovision

Full Study Cyclist Volume

Time Period	FRIEL ST			RIDEAU ST			Grand Total
	Northbound	Southbound	Street Total	Eastbound	Westbound	Street Total	
07:00 07:15	0	0	0	1	0	1	1
07:15 07:30	0	0	0	1	1	2	2
07:30 07:45	2	2	4	0	4	4	8
07:45 08:00	2	0	2	0	2	2	4
08:00 08:15	2	2	4	0	2	2	6
08:15 08:30	0	1	1	0	0	0	1
08:30 08:45	1	0	1	0	2	2	3
08:45 09:00	1	1	2	1	0	1	3
09:00 09:15	1	1	2	1	2	3	5
09:15 09:30	1	1	2	0	1	1	3
09:30 09:45	0	1	1	2	0	2	3
09:45 10:00	0	0	0	0	0	0	0
11:30 11:45	0	1	1	1	1	2	3
11:45 12:00	1	0	1	2	0	2	3
12:00 12:15	0	0	0	2	1	3	3
12:15 12:30	0	0	0	5	1	6	6
12:30 12:45	0	1	1	0	0	0	1
12:45 13:00	0	1	1	4	2	6	7
13:00 13:15	1	0	1	1	2	3	4
13:15 13:30	0	0	0	2	1	3	3
15:00 15:15	0	1	1	0	1	1	2
15:15 15:30	1	0	1	3	2	5	6
15:30 15:45	0	2	2	1	2	3	5
15:45 16:00	0	1	1	1	3	4	5
16:00 16:15	2	0	2	2	3	5	7
16:15 16:30	0	0	0	5	2	7	7
16:30 16:45	0	0	0	1	0	1	1
16:45 17:00	2	1	3	2	0	2	5
17:00 17:15	1	0	1	5	5	10	11
17:15 17:30	0	1	1	1	2	3	4
17:30 17:45	1	1	2	2	1	3	5
17:45 18:00	0	0	0	3	0	3	3
<b>Total</b>	<b>19</b>	<b>19</b>	<b>38</b>	<b>49</b>	<b>43</b>	<b>92</b>	<b>130</b>



Transportation Services - Traffic Services

Turning Movement Count - Study Results

FRIEL ST @ RIDEAU ST

Survey Date: Tuesday, May 09, 2017

WO No: 37008

Start Time: 07:00

Device: Miovision

Full Study Pedestrian Volume

Time Period	FRIEL ST			RIDEAU ST			Grand Total
	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	
07:00 07:15	7	7	14	0	6	6	20
07:15 07:30	7	19	26	5	13	18	44
07:30 07:45	13	13	26	11	11	22	48
07:45 08:00	19	17	36	13	15	28	64
08:00 08:15	19	18	37	1	24	25	62
08:15 08:30	19	24	43	13	16	29	72
08:30 08:45	25	26	51	10	16	26	77
08:45 09:00	22	24	46	11	25	36	82
09:00 09:15	17	29	46	8	17	25	71
09:15 09:30	23	30	53	5	17	22	75
09:30 09:45	15	29	44	12	8	20	64
09:45 10:00	18	21	39	29	9	38	77
11:30 11:45	23	29	52	19	7	26	78
11:45 12:00	35	34	69	22	19	41	110
12:00 12:15	29	40	69	18	19	37	106
12:15 12:30	44	37	81	20	15	35	116
12:30 12:45	44	42	86	15	23	38	124
12:45 13:00	42	36	78	35	12	47	125
13:00 13:15	34	29	63	10	12	22	85
13:15 13:30	29	40	69	14	13	27	96
15:00 15:15	34	55	89	24	14	38	127
15:15 15:30	35	34	69	18	23	41	110
15:30 15:45	39	60	99	25	40	65	164
15:45 16:00	52	38	90	17	22	39	129
16:00 16:15	38	57	95	13	20	33	128
16:15 16:30	47	34	81	22	28	50	131
16:30 16:45	40	52	92	12	20	32	124
16:45 17:00	47	54	101	23	16	39	140
17:00 17:15	47	52	99	21	31	52	151
17:15 17:30	43	60	103	30	24	54	157
17:30 17:45	38	55	93	26	15	41	134
17:45 18:00	52	50	102	26	21	47	149
<b>Total</b>	<b>996</b>	<b>1145</b>	<b>2141</b>	<b>528</b>	<b>571</b>	<b>1099</b>	<b>3240</b>



Transportation Services - Traffic Services

Turning Movement Count - Study Results

FRIEL ST @ RIDEAU ST

Survey Date: Tuesday, May 09, 2017

WO No: 37008

Start Time: 07:00

Device: Miovision

Full Study Heavy Vehicles

		FRIEL ST						RIDEAU 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	0	0	0	0	0	0	0	0	12	1	13	0	8	0	8	21	21		
07:15	07:30	0	0	1	1	0	0	0	0	1	0	10	2	12	0	7	0	7	19	20	
07:30	07:45	0	0	0	0	0	0	0	0	0	7	3	10	0	12	0	12	22	22		
07:45	08:00	1	0	0	1	0	0	1	1	2	0	8	1	9	0	11	1	12	21	23	
08:00	08:15	1	0	0	1	0	0	0	0	1	0	13	2	15	0	9	0	9	24	25	
08:15	08:30	2	0	0	2	0	0	0	0	2	0	8	2	10	0	11	0	11	21	23	
08:30	08:45	3	0	0	3	0	0	0	0	3	0	6	1	7	0	13	0	13	20	23	
08:45	09:00	1	0	0	1	0	0	0	0	1	0	10	3	13	0	14	0	14	27	28	
09:00	09:15	1	0	0	1	0	0	0	0	1	0	8	3	11	1	10	0	11	22	23	
09:15	09:30	2	0	0	2	0	0	0	0	2	0	7	3	10	0	9	0	9	19	21	
09:30	09:45	2	0	0	2	0	0	0	0	2	0	8	1	9	0	8	0	8	17	19	
09:45	10:00	1	0	0	1	0	0	0	0	1	0	9	1	10	0	8	0	8	18	19	
11:30	11:45	0	0	1	1	0	0	0	0	1	0	8	1	9	0	4	0	4	13	14	
11:45	12:00	1	0	0	1	0	0	0	0	1	0	6	1	7	0	9	0	9	16	17	
12:00	12:15	2	0	0	2	0	0	0	0	2	0	9	2	11	0	11	0	11	22	24	
12:15	12:30	2	0	0	2	0	0	0	0	2	0	5	0	5	0	4	0	4	9	11	
12:30	12:45	0	0	1	1	0	0	0	0	1	0	7	1	8	0	10	0	10	18	19	
12:45	13:00	0	0	0	0	0	0	0	0	0	0	8	1	9	0	4	0	4	13	13	
13:00	13:15	0	0	0	0	0	0	0	0	0	0	6	0	6	0	7	0	7	13	13	
13:15	13:30	0	0	0	0	0	0	0	0	0	0	7	0	7	0	9	0	9	16	16	
15:00	15:15	0	0	2	2	1	0	0	1	3	0	6	0	6	1	4	0	5	11	14	
15:15	15:30	0	0	1	1	0	0	0	0	1	0	4	0	4	0	8	0	8	12	13	
15:30	15:45	0	0	0	0	0	0	0	0	0	0	8	0	8	0	5	0	5	13	13	
15:45	16:00	0	0	1	1	0	0	0	0	1	0	7	0	7	1	12	0	13	20	21	
16:00	16:15	0	2	1	3	0	0	1	1	4	0	9	0	9	0	4	1	5	14	18	
16:15	16:30	1	0	0	1	0	0	0	0	1	0	10	1	11	0	4	0	4	15	16	
16:30	16:45	0	0	0	0	0	0	0	0	0	0	7	1	8	0	6	0	6	14	14	
16:45	17:00	0	0	0	0	0	0	0	0	0	0	5	0	5	0	4	0	4	9	9	
17:00	17:15	0	0	0	0	0	0	0	0	0	0	7	0	7	0	6	0	6	13	13	
17:15	17:30	0	0	0	0	0	0	0	0	0	0	8	0	8	0	5	0	5	13	13	
17:30	17:45	0	0	0	0	0	0	0	0	0	0	11	0	11	0	5	0	5	16	16	
17:45	18:00	0	0	0	0	0	0	0	0	0	0	9	0	9	0	6	0	6	15	15	
Total:	None	20	2	8	30	1	0	2	3	33	0	253	31	284	3	247	2	252	536	569	



Transportation Services - Traffic Services

Turning Movement Count - Study Results

FRIEL ST @ RIDEAU ST

Survey Date: Tuesday, May 09, 2017

WO No: 37008

Start Time: 07:00

Device: Miovision

Full Study 15 Minute U-Turn Total

		FRIEL ST		RIDEAU ST			
		Northbound	Southbound	Eastbound	Westbound		
Time Period		U-Turn Total	U-Turn Total	U-Turn Total	U-Turn Total	Total	
07:00	07:15	0	0	0	0	0	
07:15	07:30	0	0	0	0	0	
07:30	07:45	0	0	0	0	0	
07:45	08:00	0	0	0	0	0	
08:00	08:15	0	0	0	0	0	
08:15	08:30	0	0	0	0	0	
08:30	08:45	0	0	0	0	0	
08:45	09:00	0	0	0	0	0	
09:00	09:15	0	0	1	0	1	
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	1	0	1	
13:15	13:30	0	0	0	0	0	
15:00	15:15	0	0	0	0	0	
15:15	15:30	0	0	0	0	0	
15:30	15:45	0	0	0	0	0	
15:45	16:00	0	0	0	0	0	
16:00	16:15	0	0	0	0	0	
16:15	16:30	0	0	0	0	0	
16:30	16:45	0	0	0	0	0	
16:45	17:00	0	0	0	0	0	
17:00	17:15	0	0	0	0	0	
17:15	17:30	0	0	0	0	0	
17:30	17:45	0	0	0	0	0	
17:45	18:00	0	0	0	0	0	
Total		0	0	2	0	2	

# Appendix C

Synchro Intersection Worksheets – Existing Conditions

Lanes, Volumes, Timings  
1: King Edward & York

Existing AM Peak Hour  
112 Nelson Street

	EBR	WBR	NBL	NBT	SBT
Lane Group	EBR	WBR	NBL	NBT	SBT
Lane Configurations	↖ ↗	↖ ↗	↖ ↗	↕	↕
Traffic Volume (vph)	43	15	107	490	1210
Future Volume (vph)	43	15	107	490	1210
Lane Group Flow (vph)	48	17	119	568	1395
Turn Type	Free	Perm	pm+pt	NA	NA
Protected Phases			8	2	6
Permitted Phases	Free	8	2		
Detector Phase		8	8	2	6
Switch Phase					
Minimum Initial (s)		10.0	10.0	10.0	10.0
Minimum Split (s)		39.8	39.8	32.0	32.0
Total Split (s)		39.8	39.8	80.2	80.2
Total Split (%)		33.2%	33.2%	66.8%	66.8%
Maximum Green (s)		33.0	33.0	74.2	74.2
Yellow Time (s)		3.3	3.3	3.0	3.0
All-Red Time (s)		3.5	3.5	3.0	3.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0
Total Lost Time (s)		6.8	6.8	6.0	6.0
Lead/Lag					
Lead-Lag Optimize?					
Vehicle Extension (s)		3.0	3.0	3.0	3.0
Recall Mode		None	None	C-Max	C-Max
Walk Time (s)		25.0	25.0	18.0	18.0
Flash Dont Walk (s)		8.0	8.0	8.0	8.0
Pedestrian Calls (#/hr)		95	95	40	102
Act Effct Green (s)	120.0	33.0	106.4	74.2	74.2
Actuated g/C Ratio	1.00	0.28	0.89	0.62	0.62
v/c Ratio	0.03	0.03	0.19	0.19	0.48
Control Delay	0.0	0.1	1.4	9.9	13.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	0.0	0.1	1.4	9.9	13.0
LOS	A	A	A	A	B
Approach Delay				8.5	13.0
Approach LOS				A	B
Queue Length 50th (m)	0.0	0.0	0.2	19.4	60.6
Queue Length 95th (m)	0.0	0.0	0.4	25.1	71.4
Internal Link Dist (m)				218.1	130.8
Turn Bay Length (m)			85.0		
Base Capacity (vph)	1491	576	613	2918	2907
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	0.03	0.03	0.19	0.19	0.48

**Intersection Summary**  
 Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 95 (79%), Referenced to phase 2:NBL and 6:SBT, Start of Green  
 Natural Cycle: 75

Lanes, Volumes, Timings  
1: King Edward & York

Existing AM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.48  
 Intersection Signal Delay: 11.2  
 Intersection LOS: B  
 Intersection Capacity Utilization 59.0%  
 ICU Level of Service B  
 Analysis Period (min) 15

Splits and Phases: 1: King Edward & York



Lanes, Volumes, Timings  
2: King Edward & Rideau

Existing AM Peak Hour  
112 Nelson Street



Lane Group	EBL	EBT	WBT	NBT	NBR	SBL	SBT	SBR	Ø1	Ø2	Ø3	Ø5
Lane Configurations	↔	↕	↕	↕	↕	↔	↕	↕				
Traffic Volume (vph)	156	158	307	445	83	201	801	217				
Future Volume (vph)	156	158	307	445	83	201	801	217				
Lane Group Flow (vph)	173	193	419	494	92	223	890	241				
Turn Type	Prot	NA	NA	NA	custom	custom	NA	custom				
Protected Phases	11	12	5 6	3 4		13	7 8	11	1	2	3	5
Permitted Phases					4	8		8				
Detector Phase	11	12	5 6	3 4	4	13	7 8	11				
Switch Phase												
Minimum Initial (s)	5.0				10.0	5.0	5.0		1.0	10.0	1.0	1.0
Minimum Split (s)	11.2				23.7	9.5	11.2		5.0	29.8	5.0	5.0
Total Split (s)	30.0				24.0	14.0	30.0		5.0	62.0	5.0	5.0
Total Split (%)	27.3%				21.8%	12.7%	27.3%		5%	56%	5%	5%
Maximum Green (s)	23.8				17.3	9.5	23.8		3.0	55.2	3.0	3.0
Yellow Time (s)	3.3				3.0	3.5	3.3		2.0	3.3	2.0	2.0
All-Red Time (s)	2.9				3.7	1.0	2.9		0.0	3.5	0.0	0.0
Lost Time Adjust (s)	0.0				0.0	0.0	0.0					
Total Lost Time (s)	6.2				6.7	4.5	6.2					
Lead/Lag					Lag				Lead	Lag	Lead	Lead
Lead-Lag Optimize?					Yes				Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0				3.0	3.0	3.0		3.0	3.0	3.0	3.0
Recall Mode	Max				Max	Max	Max		Max	C-Max	Max	Max
Walk Time (s)					2.0				3.0	2.0	3.0	3.0
Flash Dont Walk (s)					15.0				0.0	21.0	0.0	0.0
Pedestrian Calls (#/hr)					111				143	143	111	227
Act Effct Green (s)	23.8	65.0	35.0	27.0	17.3	33.5	41.0	55.6				
Actuated g/C Ratio	0.22	0.59	0.32	0.25	0.16	0.30	0.37	0.51				
v/c Ratio	0.48	0.10	0.45	0.61	0.28	0.84	0.72	0.36				
Control Delay	43.0	9.1	31.8	40.5	2.2	68.5	33.6	12.6				
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Delay	43.0	9.1	31.8	40.5	2.2	68.5	33.6	12.6				
LOS	D	A	C	D	A	E	C	B				
Approach Delay		25.2	31.8	34.5			35.6					
Approach LOS		C	C	C			D					
Queue Length 50th (m)	32.7	8.1	37.5	49.6	0.0	38.4	85.2	22.6				
Queue Length 95th (m)	53.9	13.1	52.2	66.9	0.0	#78.0	108.1	35.8				
Internal Link Dist (m)		125.5	140.5	133.0			218.1					
Turn Bay Length (m)	65.0				20.0	105.0						
Base Capacity (vph)	358	1848	922	813	326	264	1235	665				
Starvation Cap Reductn	0	0	0	0	0	0	0	0				
Spillback Cap Reductn	0	0	0	0	0	0	0	0				
Storage Cap Reductn	0	0	0	0	0	0	0	0				
Reduced v/c Ratio	0.48	0.10	0.45	0.61	0.28	0.84	0.72	0.36				

Intersection Summary

Cycle Length: 110  
 Actuated Cycle Length: 110  
 Offset: 92 (84%), Referenced to phase 2:EBT and 6:WBT, Start of Green  
 Natural Cycle: 90

Lanes, Volumes, Timings  
2: King Edward & Rideau

Existing AM Peak Hour  
112 Nelson Street

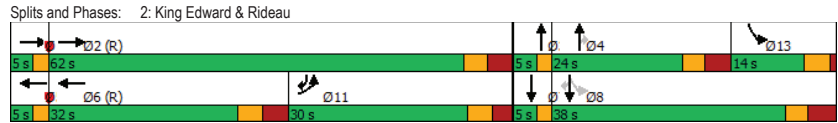
Lane Group	Ø6	Ø7	Ø8
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	6	7	8
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	10.0	1.0	10.0
Minimum Split (s)	31.8	5.0	25.9
Total Split (s)	32.0	5.0	38.0
Total Split (%)	29%	5%	35%
Maximum Green (s)	25.2	3.0	31.1
Yellow Time (s)	3.3	2.0	3.0
All-Red Time (s)	3.5	0.0	3.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	C-Max	Max	Max
Walk Time (s)	2.0	3.0	2.0
Flash Dont Walk (s)	23.0	0.0	17.0
Pedestrian Calls (#/hr)	227	108	108
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (m)			
Queue Length 95th (m)			
Internal Link Dist (m)			
Turn Bay Length (m)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			

Intersection Summary

Lanes, Volumes, Timings  
2: King Edward & Rideau

Existing AM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.84  
 Intersection Signal Delay: 33.4 Intersection LOS: C  
 Intersection Capacity Utilization 60.4% ICU Level of Service B  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.



Lanes, Volumes, Timings  
3: Nelson & Rideau

Existing AM Peak Hour  
112 Nelson Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBT	SBL	SBT
Lane Configurations	↔	↑	↔	↔	↑	↔	↔	↔	↔
Traffic Volume (vph)	67	363	6	3	330	62	0	52	2
Future Volume (vph)	67	363	6	3	330	62	0	52	2
Lane Group Flow (vph)	74	403	7	3	367	69	7	0	127
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		2			6		4		8
Permitted Phases	2		2	6		6		8	
Detector Phase	2	2	2	6	6	6	4	8	8
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	26.8	26.8	26.8	26.8	26.8	26.8	27.0	27.0	27.0
Total Split (s)	53.0	53.0	53.0	53.0	53.0	53.0	27.0	27.0	27.0
Total Split (%)	66.3%	66.3%	66.3%	66.3%	66.3%	66.3%	33.8%	33.8%	33.8%
Maximum Green (s)	47.2	47.2	47.2	47.2	47.2	47.2	21.0	21.0	21.0
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5	2.5	2.5	2.5	2.5	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.0	6.0	6.0
Lead/Lag									
Lead-Lag Optimize?									
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None
Walk Time (s)	15.0	15.0	15.0	15.0	15.0	15.0	7.0	7.0	7.0
Flash Dont Walk (s)	6.0	6.0	6.0	6.0	6.0	6.0	14.0	14.0	14.0
Pedestrian Calls (#/hr)	85	85	85	186	186	186	81	57	57
Act Effct Green (s)	53.8	53.8	53.8	53.8	53.8	53.8	18.8	18.8	18.8
Actuated g/C Ratio	0.67	0.67	0.67	0.67	0.67	0.67	0.24	0.24	0.24
v/c Ratio	0.15	0.34	0.01	0.01	0.31	0.11	0.01	0.38	0.38
Control Delay	8.5	9.0	0.0	6.7	7.3	1.9	0.0	16.2	16.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.5	9.0	0.0	6.7	7.3	1.9	0.0	16.2	16.2
LOS	A	A	A	A	A	A	A	B	B
Approach Delay		8.8			6.4				16.2
Approach LOS		A			A				B
Queue Length 50th (m)	4.7	29.7	0.0	0.2	21.1	0.1	0.0	7.1	7.1
Queue Length 95th (m)	10.9	47.1	0.0	m0.5	30.6	3.1	0.0	20.9	20.9
Internal Link Dist (m)		140.5			117.5		126.5	219.1	
Turn Bay Length (m)	40.0		20.0	10.0		20.0			
Base Capacity (vph)	494	1172	832	537	1172	652	556	363	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.15	0.34	0.01	0.01	0.31	0.11	0.01	0.35	

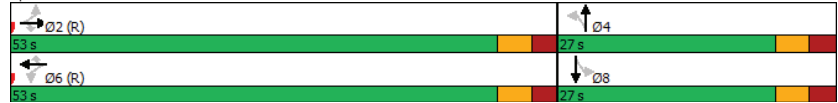
**Intersection Summary**  
 Cycle Length: 80  
 Actuated Cycle Length: 80  
 Offset: 34 (43%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green  
 Natural Cycle: 55

Lanes, Volumes, Timings  
3: Nelson & Rideau

Existing AM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.38	
Intersection Signal Delay: 8.6	Intersection LOS: A
Intersection Capacity Utilization 60.4%	ICU Level of Service B
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 3: Nelson & Rideau



Lanes, Volumes, Timings  
4: Friel & Rideau

Existing AM Peak Hour  
112 Nelson Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations		↕	↕		↕	↕		↕		↕
Traffic Volume (vph)	8	350	68	7	350	8	20	6	8	4
Future Volume (vph)	8	350	68	7	350	8	20	6	8	4
Lane Group Flow (vph)	0	398	76	0	397	9	0	43	0	17
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	NA
Protected Phases		2		6		6	4		8	
Permitted Phases	2		2		6		4		8	
Detector Phase	2	2	2	6	6	6	4	4	8	8
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.7	25.7	25.7	25.7	25.7	25.7	29.8	29.8	29.8	29.8
Total Split (s)	50.0	50.0	50.0	50.0	50.0	50.0	30.0	30.0	30.0	30.0
Total Split (%)	62.5%	62.5%	62.5%	62.5%	62.5%	62.5%	37.5%	37.5%	37.5%	37.5%
Maximum Green (s)	44.3	44.3	44.3	44.3	44.3	44.3	24.2	24.2	24.2	24.2
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.5
Lost Time Adjust (s)		0.0	0.0		0.0	0.0		0.0		0.0
Total Lost Time (s)		5.7	5.7		5.7	5.7		5.8		5.8
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None
Walk Time (s)	13.0	13.0	13.0	13.0	13.0	13.0	12.0	12.0	12.0	12.0
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0	7.0	12.0	12.0	12.0	12.0
Pedestrian Calls (#/hr)	85	85	85	82	82	82	81	81	35	35
Act Effct Green (s)		51.6	51.6		51.6	51.6		21.2		21.2
Actuated g/C Ratio		0.64	0.64		0.64	0.64		0.26		0.26
v/c Ratio		0.36	0.09		0.36	0.01		0.12		0.05
Control Delay		5.1	0.5		10.4	0.0		16.2		17.6
Queue Delay		0.0	0.0		0.0	0.0		0.0		0.0
Total Delay		5.1	0.5		10.4	0.0		16.2		17.6
LOS		A	A		B	A		B		B
Approach Delay		4.3			10.2			16.2		17.6
Approach LOS		A			B			B		B
Queue Length 50th (m)		6.4	0.1		32.1	0.0		3.1		1.4
Queue Length 95th (m)		11.3	0.3		50.9	0.0		10.2		5.7
Internal Link Dist (m)		117.5			103.0			131.9		64.0
Turn Bay Length (m)			20.0			20.0				
Base Capacity (vph)		1113	802		1114	795		417		419
Starvation Cap Reductn		0	0		0	0		0		0
Spillback Cap Reductn		0	0		0	0		0		0
Storage Cap Reductn		0	0		0	0		0		0
Reduced v/c Ratio		0.36	0.09		0.36	0.01		0.10		0.04

Intersection Summary

Cycle Length: 80  
 Actuated Cycle Length: 80  
 Offset: 50 (63%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green  
 Natural Cycle: 60



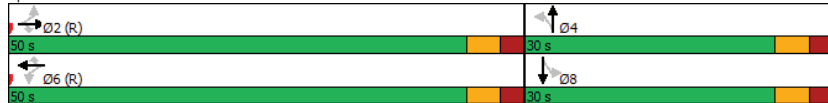
Lanes, Volumes, Timings  
4: Friel & Rideau

Existing AM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated  
Maximum v/c Ratio: 0.36  
Intersection Signal Delay: 7.6  
Intersection LOS: A  
Intersection Capacity Utilization 70.1%  
Analysis Period (min) 15

Intersection LOS: A  
ICU Level of Service C

Splits and Phases: 4: Friel & Rideau



HCM 2010 AWSC  
5: Nelson & York

Existing AM Peak Hour  
112 Nelson Street

Intersection

Intersection Delay, s/veh 7.6  
Intersection LOS A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	11	18	8	62	14	5	16	23	26	6	23	2
Future Vol, veh/h	11	18	8	62	14	5	16	23	26	6	23	2
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	12	20	9	69	16	6	18	26	29	7	26	2
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	1			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			1		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			1			1		
HCM Control Delay	7.4			7.8			7.4			7.5		
HCM LOS	A			A			A			A		

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	25%	30%	77%	19%
Vol Thru, %	35%	49%	17%	74%
Vol Right, %	40%	22%	6%	6%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	65	37	81	31
LT Vol	16	11	62	6
Through Vol	23	18	14	23
RT Vol	26	8	5	2
Lane Flow Rate	72	41	90	34
Geometry Grp	1	1	1	1
Degree of Util (X)	0.08	0.047	0.107	0.04
Departure Headway (Hd)	3.998	4.119	4.268	4.218
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	884	859	833	837
Service Time	2.077	2.192	2.325	2.305
HCM Lane V/C Ratio	0.081	0.048	0.108	0.041
HCM Control Delay	7.4	7.4	7.8	7.5
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.3	0.1	0.4	0.1

Lanes, Volumes, Timings  
1: King Edward & York

Existing PM Peak Hour  
112 Nelson Street

Lane Group	EBR	WBR	NBL	NBT	SBT	SBR
Lane Configurations	↖	↖	↖	↕	↕	↖
Traffic Volume (vph)	76	10	90	850	724	29
Future Volume (vph)	76	10	90	850	724	29
Lane Group Flow (vph)	84	11	100	963	804	32
Turn Type	Free	Perm	pm+pt	NA	NA	Perm
Protected Phases			8	2	6	
Permitted Phases	Free	8	2			6
Detector Phase		8	8	2	6	6
Switch Phase						
Minimum Initial (s)		10.0	10.0	10.0	10.0	10.0
Minimum Split (s)		39.8	39.8	32.0	32.0	32.0
Total Split (s)		39.8	39.8	80.2	80.2	80.2
Total Split (%)		33.2%	33.2%	66.8%	66.8%	66.8%
Maximum Green (s)		33.0	33.0	74.2	74.2	74.2
Yellow Time (s)		3.3	3.3	3.0	3.0	3.0
All-Red Time (s)		3.5	3.5	3.0	3.0	3.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.8	6.8	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0
Recall Mode		None	None	C-Max	C-Max	C-Max
Walk Time (s)		25.0	25.0	18.0	18.0	18.0
Flash Dont Walk (s)		8.0	8.0	8.0	8.0	8.0
Pedestrian Calls (#/hr)		109	109	52	108	108
Act Effct Green (s)	120.0	33.0	106.4	74.2	74.2	74.2
Actuated g/C Ratio	1.00	0.28	0.89	0.62	0.62	0.62
v/c Ratio	0.06	0.02	0.13	0.33	0.39	0.05
Control Delay	0.1	0.1	0.8	11.3	12.2	2.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	0.1	0.1	0.8	11.3	12.2	2.8
LOS	A	A	A	B	B	A
Approach Delay				10.3	11.9	
Approach LOS				B	B	
Queue Length 50th (m)	0.0	0.0	0.2	37.0	46.9	0.0
Queue Length 95th (m)	0.0	0.0	0.4	44.9	59.1	3.5
Internal Link Dist (m)				218.1	130.8	
Turn Bay Length (m)			85.0			30.0
Base Capacity (vph)	1489	445	764	2930	2050	687
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.06	0.02	0.13	0.33	0.39	0.05

**Intersection Summary**  
 Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 58 (48%), Referenced to phase 2:NBL and 6:SBT, Start of Green  
 Natural Cycle: 75

Lanes, Volumes, Timings  
1: King Edward & York

Existing PM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.39  
 Intersection Signal Delay: 10.5  
 Intersection LOS: B  
 Intersection Capacity Utilization 59.3%  
 ICU Level of Service B  
 Analysis Period (min) 15

Splits and Phases: 1: King Edward & York



Lanes, Volumes, Timings  
2: King Edward & Rideau

Existing PM Peak Hour  
112 Nelson Street

Lane Group	EBL	EBT	WBT	NBT	NBR	SBL	SBT	SBR	Ø1	Ø2	Ø3	Ø5
Lane Configurations	↔	↕↔	↕↔	↕↔	↕	↕	↕↔	↕↔				
Traffic Volume (vph)	186	300	357	604	108	158	548	127				
Future Volume (vph)	186	300	357	604	108	158	548	127				
Lane Group Flow (vph)	207	361	517	671	120	176	609	141				
Turn Type	Prot	NA	NA	NA	custom	custom	NA	custom				
Protected Phases	11	12	5 6	3 4			13	7 8	1	2	3	5
Permitted Phases					4	8		8				
Detector Phase	11	12	5 6	3 4	4	13	7 8	11				
Switch Phase												
Minimum Initial (s)	5.0				10.0	5.0		5.0	1.0	10.0	1.0	1.0
Minimum Split (s)	11.2				23.7	9.5		11.2	5.0	29.8	5.0	5.0
Total Split (s)	27.0				29.0	12.0		27.0	5.0	59.0	5.0	5.0
Total Split (%)	24.5%				26.4%	10.9%		24.5%	5%	54%	5%	5%
Maximum Green (s)	20.8				22.3	7.5		20.8	3.0	52.2	3.0	3.0
Yellow Time (s)	3.3				3.0	3.5		3.3	2.0	3.3	2.0	2.0
All-Red Time (s)	2.9				3.7	1.0		2.9	0.0	3.5	0.0	0.0
Lost Time Adjust (s)	0.0				0.0	0.0		0.0				
Total Lost Time (s)	6.2				6.7	4.5		6.2				
Lead/Lag					Lag				Lead	Lag	Lead	Lead
Lead-Lag Optimize?					Yes				Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0				3.0	3.0		3.0	3.0	3.0	3.0	3.0
Recall Mode	Max				Max	Max		Max	Max	C-Max	Max	Max
Walk Time (s)					2.0			3.0	2.0	3.0	3.0	3.0
Flash Dont Walk (s)					15.0			0.0	21.0	0.0	0.0	0.0
Pedestrian Calls (#/hr)					150			321	321	150	458	458
Act Effct Green (s)	20.8	62.0	35.0	32.0	22.3	36.5	44.0	55.6				
Actuated g/C Ratio	0.19	0.56	0.32	0.29	0.20	0.33	0.40	0.51				
v/c Ratio	0.66	0.20	0.58	0.70	0.37	0.83	0.46	0.22				
Control Delay	52.6	11.7	34.5	39.2	3.3	71.5	25.7	11.0				
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Delay	52.6	11.7	34.5	39.2	3.3	71.5	25.7	11.0				
LOS	D	B	C	D	A	E	C	B				
Approach Delay		26.6	34.5	33.8			32.1					
Approach LOS		C	C	C			C					
Queue Length 50th (m)	41.6	18.2	48.6	67.3	0.0	28.1	49.7	12.3				
Queue Length 95th (m)	66.4	26.0	66.0	87.6	0.0	#61.2	65.4	21.2				
Internal Link Dist (m)		125.5	140.5	133.0			218.1					
Turn Bay Length (m)	65.0				20.0	105.0		95.0				
Base Capacity (vph)	313	1774	890	964	321	212	1326	631				
Starvation Cap Reductn	0	0	0	0	0	0	0	0				
Spillback Cap Reductn	0	0	0	0	0	0	0	0				
Storage Cap Reductn	0	0	0	0	0	0	0	0				
Reduced v/c Ratio	0.66	0.20	0.58	0.70	0.37	0.83	0.46	0.22				

Intersection Summary

Cycle Length: 110  
 Actuated Cycle Length: 110  
 Offset: 92 (84%), Referenced to phase 2:EBT and 6:WBT, Start of Green  
 Natural Cycle: 90

Lanes, Volumes, Timings  
2: King Edward & Rideau

Existing PM Peak Hour  
112 Nelson Street

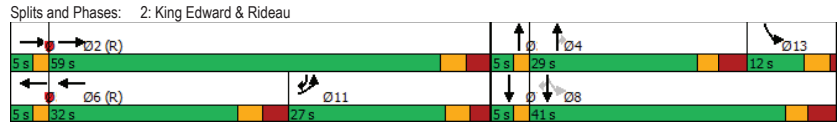
Lane Group	Ø6	Ø7	Ø8
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	6	7	8
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	10.0	1.0	10.0
Minimum Split (s)	31.8	5.0	25.9
Total Split (s)	32.0	5.0	41.0
Total Split (%)	29%	5%	37%
Maximum Green (s)	25.2	3.0	34.1
Yellow Time (s)	3.3	2.0	3.0
All-Red Time (s)	3.5	0.0	3.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	C-Max	Max	Max
Walk Time (s)	2.0	3.0	2.0
Flash Dont Walk (s)	23.0	0.0	17.0
Pedestrian Calls (#/hr)	458	141	141
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (m)			
Queue Length 95th (m)			
Internal Link Dist (m)			
Turn Bay Length (m)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			

Intersection Summary

Lanes, Volumes, Timings  
2: King Edward & Rideau

Existing PM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.83  
 Intersection Signal Delay: 31.9 Intersection LOS: C  
 Intersection Capacity Utilization 67.8% ICU Level of Service C  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.



Lanes, Volumes, Timings  
3: Nelson & Rideau

Existing PM Peak Hour  
112 Nelson Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	↔	↑	↔	↔	↑	↔		↕		↕
Traffic Volume (vph)	88	470	8	7	391	158	2	3	71	1
Future Volume (vph)	88	470	8	7	391	158	2	3	71	1
Lane Group Flow (vph)	98	522	9	8	434	176	0	21	0	179
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	NA
Protected Phases	5	2			6			4		8
Permitted Phases	2		2	6		6	4		8	
Detector Phase	5	2	2	6	6	6	4	4	8	8
Switch Phase										
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	10.8	26.8	26.8	26.8	26.8	26.8	27.0	27.0	27.0	27.0
Total Split (s)	12.0	60.0	60.0	48.0	48.0	48.0	30.0	30.0	30.0	30.0
Total Split (%)	13.3%	66.7%	66.7%	53.3%	53.3%	53.3%	33.3%	33.3%	33.3%	33.3%
Maximum Green (s)	6.2	54.2	54.2	42.2	42.2	42.2	24.0	24.0	24.0	24.0
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5	2.5	2.5	2.5	2.5	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.0	6.0	6.0	6.0
Lead/Lag	Lead			Lag	Lag	Lag				
Lead-Lag Optimize?	Yes			Yes	Yes	Yes				
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	C-Max	C-Max	C-Max	Max	Max	Max	Max
Walk Time (s)	15.0	15.0	15.0	15.0	15.0	15.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)	6.0	6.0	6.0	6.0	6.0	6.0	14.0	14.0	14.0	14.0
Pedestrian Calls (#/hr)		290	290	500	500	500	313	313	139	139
Act Effct Green (s)	54.2	54.2	54.2	44.6	44.6	44.6		24.0		24.0
Actuated g/C Ratio	0.60	0.60	0.60	0.50	0.50	0.50		0.27		0.27
v/c Ratio	0.26	0.50	0.02	0.03	0.50	0.56		0.09		0.63
Control Delay	9.5	12.2	0.1	10.3	12.7	9.5		14.6		29.2
Queue Delay	0.0	0.6	0.0	0.0	0.2	0.0		0.0		0.0
Total Delay	9.5	12.8	0.1	10.3	12.9	9.5		14.6		29.2
LOS	A	B	A	B	B	A		B		C
Approach Delay		12.1			11.9			14.6		29.2
Approach LOS		B			B			B		C
Queue Length 50th (m)	6.6	46.9	0.0	0.4	28.8	1.5		0.6		16.6
Queue Length 95th (m)	12.8	70.8	0.0	m1.1	39.8	8.7		6.2		#40.5
Internal Link Dist (m)		140.5			117.5			126.5		218.8
Turn Bay Length (m)	40.0		20.0	10.0		20.0				
Base Capacity (vph)	372	1050	429	303	864	316		245		283
Starvation Cap Reductn	0	220	0	0	73	0		0		0
Spillback Cap Reductn	0	0	0	0	0	0		0		0
Storage Cap Reductn	0	0	0	0	0	0		0		0
Reduced v/c Ratio	0.26	0.63	0.02	0.03	0.55	0.56		0.09		0.63

**Intersection Summary**  
 Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 52 (58%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green  
 Natural Cycle: 65

Lanes, Volumes, Timings  
3: Nelson & Rideau

Existing PM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.63	
Intersection Signal Delay: 14.2	Intersection LOS: B
Intersection Capacity Utilization 69.6%	ICU Level of Service C
Analysis Period (min) 15	
# 95th percentile volume exceeds capacity, queue may be longer.	
Queue shown is maximum after two cycles.	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 3: Nelson & Rideau



Lanes, Volumes, Timings  
4: Friel & Rideau

Existing PM Peak Hour  
112 Nelson Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations		↗	↘		↖	↗		↕		↕
Traffic Volume (vph)	4	478	65	22	449	9	75	3	14	4
Future Volume (vph)	4	478	65	22	449	9	75	3	14	4
Lane Group Flow (vph)	0	535	72	0	523	10	0	110	0	29
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	NA
Protected Phases		2			6			4		8
Permitted Phases	2		2	6		6	4		8	
Detector Phase	2	2	2	6	6	6	4	4	8	8
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.7	25.7	25.7	25.7	25.7	25.7	29.8	29.8	29.8	29.8
Total Split (s)	60.0	60.0	60.0	60.0	60.0	60.0	30.0	30.0	30.0	30.0
Total Split (%)	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	33.3%	33.3%	33.3%	33.3%
Maximum Green (s)	54.3	54.3	54.3	54.3	54.3	54.3	24.2	24.2	24.2	24.2
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.5
Lost Time Adjust (s)		0.0	0.0		0.0	0.0		0.0		0.0
Total Lost Time (s)		5.7	5.7		5.7	5.7		5.8		5.8
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None
Walk Time (s)	13.0	13.0	13.0	13.0	13.0	13.0	12.0	12.0	12.0	12.0
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0	7.0	12.0	12.0	12.0	12.0
Pedestrian Calls (#/hr)	181	181	181	192	192	192	95	95	78	78
Act Effct Green (s)		57.3	57.3		57.3	57.3		21.2		21.2
Actuated g/C Ratio		0.64	0.64		0.64	0.64		0.24		0.24
v/c Ratio		0.48	0.13		0.49	0.02		0.41		0.10
Control Delay		4.9	0.9		11.5	0.2		28.5		20.2
Queue Delay		0.1	0.0		0.0	0.0		0.0		0.0
Total Delay		5.0	0.9		11.5	0.2		28.5		20.2
LOS		A	A		B	A		C		C
Approach Delay		4.5			11.3			28.5		20.2
Approach LOS		A			B			C		C
Queue Length 50th (m)		15.7	0.2		47.4	0.0		13.2		2.6
Queue Length 95th (m)		23.2	m1.0		72.2	0.3		27.8		9.1
Internal Link Dist (m)		117.5			103.0			131.9		64.0
Turn Bay Length (m)			20.0			20.0				
Base Capacity (vph)		1106	562		1065	535		307		338
Starvation Cap Reductn		53	0		0	0		0		0
Spillback Cap Reductn		0	0		0	0		0		0
Storage Cap Reductn		0	0		0	0		0		0
Reduced v/c Ratio		0.51	0.13		0.49	0.02		0.36		0.09

Intersection Summary

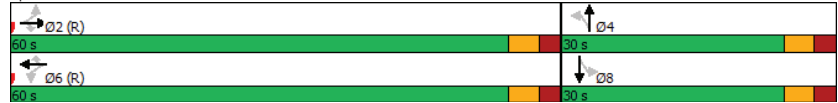
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 48 (53%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 60

Lanes, Volumes, Timings  
4: Friel & Rideau

Existing PM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.49	
Intersection Signal Delay: 9.8	Intersection LOS: A
Intersection Capacity Utilization 77.3%	ICU Level of Service D
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 4: Friel & Rideau



HCM 2010 AWSC  
5: Nelson & York

Existing PM Peak Hour  
112 Nelson Street

<b>Intersection</b>	
Intersection Delay, s/veh	7.8
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	4	8	10	43	0	43	0	98	66	4	19	6
Future Vol, veh/h	4	8	10	43	0	43	0	98	66	4	19	6
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	9	11	48	0	48	0	109	73	4	21	7
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
<b>Approach</b>	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	1			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			1		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			1			1		
HCM Control Delay	7.4			7.7			8			7.4		
HCM LOS	A			A			A			A		

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	0%	18%	50%	14%
Vol Thru, %	60%	36%	0%	66%
Vol Right, %	40%	45%	50%	21%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	164	22	86	29
LT Vol	0	4	43	4
Through Vol	98	8	0	19
RT Vol	66	10	43	6
Lane Flow Rate	182	24	96	32
Geometry Grp	1	1	1	1
Degree of Util (X)	0.199	0.029	0.109	0.037
Departure Headway (Hd)	3.926	4.257	4.125	4.188
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	904	846	855	841
Service Time	1.993	2.257	2.218	2.284
HCM Lane V/C Ratio	0.201	0.028	0.112	0.038
HCM Control Delay	8	7.4	7.7	7.4
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.7	0.1	0.4	0.1

# Appendix D

Collision Data





# Appendix E

Synchro Intersection Worksheets – 2022 Future Background Conditions

## TRANS Regional Model

Version 2.15 - Assigned June 16, 2020

**AM Peak Hour Total Traffic Volume**

**112 Nelson**

2011 Model - Basecase

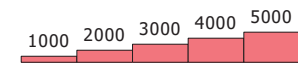
N/A

User Initials: TIMW  
Plot Prepared: March 25, 2021  
EMME Scenario: 21711



### Legend

AM Peak Hour Total Traffic Volume



Distance (m)

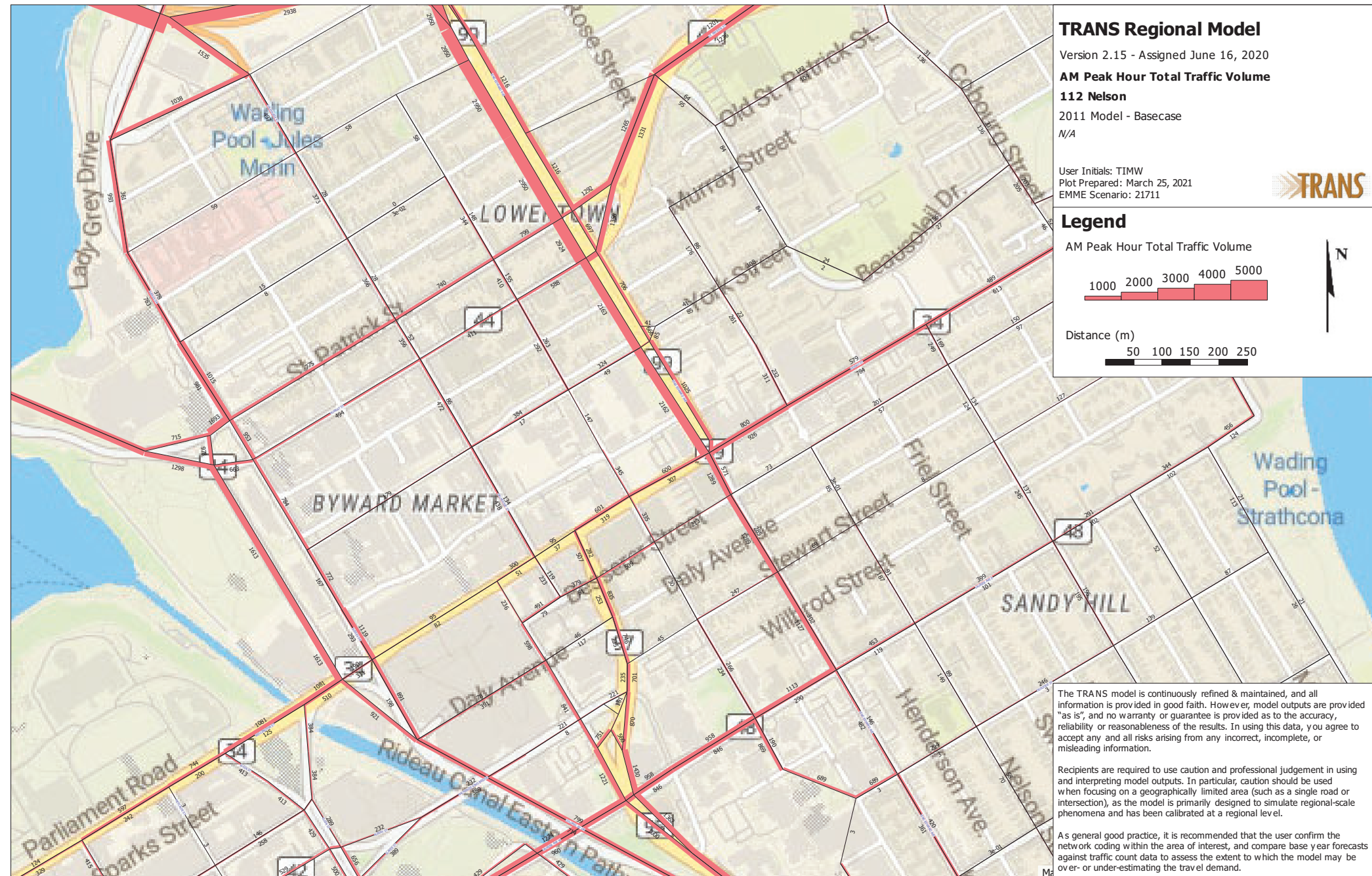


The TRANS model is continuously refined & maintained, and all information is provided in good faith. However, model outputs are provided "as is", and no warranty or guarantee is provided as to the accuracy, reliability or reasonableness of the results. In using this data, you agree to accept any and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

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

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

M4



# TRANS Regional Model

Version 2.15 - Assigned June 16, 2020

**AM Peak Hour Total Traffic Volume**

**112 Nelson**

2031 Model - Basecase

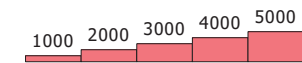
N/A

User Initials: TIMW  
Plot Prepared: March 25, 2021  
EMME Scenario: 21711

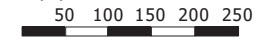


## Legend

AM Peak Hour Total Traffic Volume



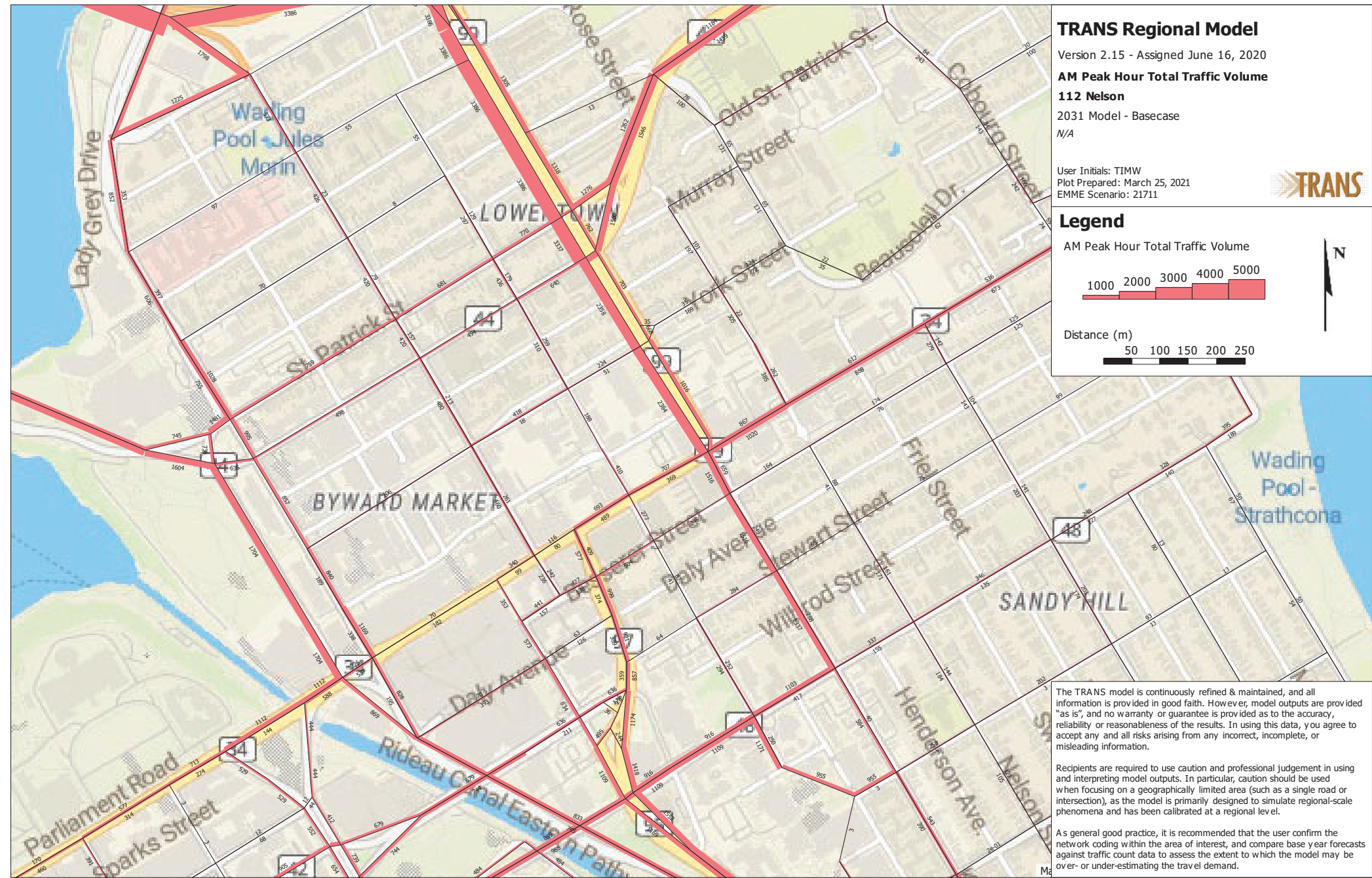
Distance (m)



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

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

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



# Appendix F

Background Development Volumes

Figure 8: Total Site-Generated Traffic

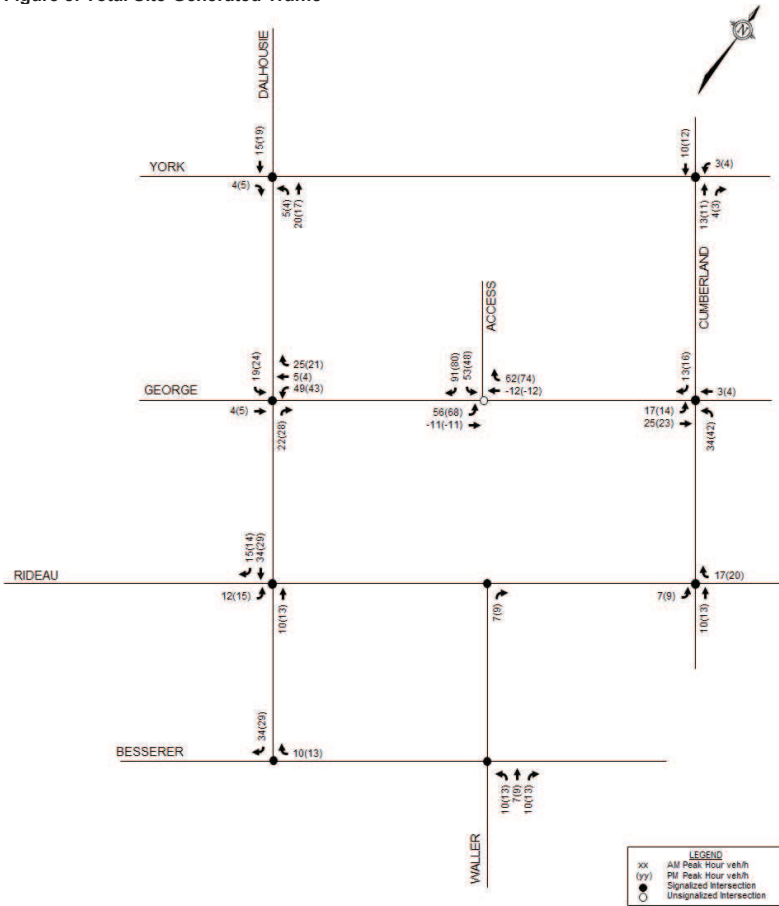
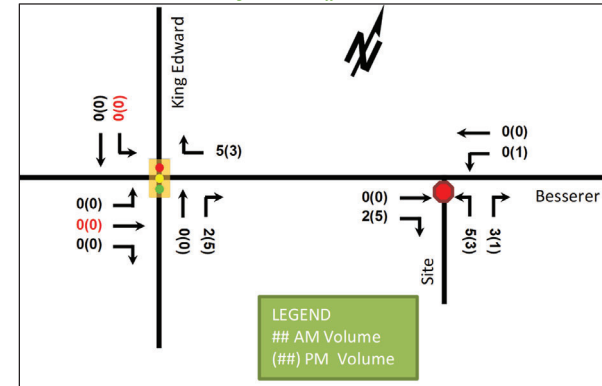


Figure 9: Site Traffic Volumes



# Appendix G

Synchro Intersection Worksheets – Future Background 2024 & 2029

Lanes, Volumes, Timings  
1: King Edward & York

Future Background 2024 & 2029AM Peak Hour  
112 Nelson Street

Lane Group	EBR	WBR	NBL	NBT	SBT
Lane Configurations	↖ ↗	↖ ↗	↖ ↗	↕	↕
Traffic Volume (vph)	47	15	109	495	1213
Future Volume (vph)	47	15	109	495	1213
Lane Group Flow (vph)	47	15	109	517	1260
Turn Type	Free	Perm	pm+pt	NA	NA
Protected Phases			8	2	6
Permitted Phases	Free	8	2		
Detector Phase		8	8	2	6
Switch Phase					
Minimum Initial (s)		10.0	10.0	10.0	10.0
Minimum Split (s)		39.8	39.8	32.0	32.0
Total Split (s)		39.8	39.8	80.2	80.2
Total Split (%)		33.2%	33.2%	66.8%	66.8%
Maximum Green (s)		33.0	33.0	74.2	74.2
Yellow Time (s)		3.3	3.3	3.0	3.0
All-Red Time (s)		3.5	3.5	3.0	3.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0
Total Lost Time (s)		6.8	6.8	6.0	6.0
Lead/Lag					
Lead-Lag Optimize?					
Vehicle Extension (s)		3.0	3.0	3.0	3.0
Recall Mode		None	None	C-Max	C-Max
Walk Time (s)		25.0	25.0	18.0	18.0
Flash Dont Walk (s)		8.0	8.0	8.0	8.0
Pedestrian Calls (#/hr)		95	95	40	102
Act Effct Green (s)	120.0	33.0	106.4	74.2	74.2
Actuated g/C Ratio	1.00	0.28	0.89	0.62	0.62
v/c Ratio	0.03	0.03	0.17	0.18	0.43
Control Delay	0.0	0.1	1.1	9.8	12.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	0.0	0.1	1.1	9.8	12.4
LOS	A	A	A	A	B
Approach Delay				8.3	12.4
Approach LOS				A	B
Queue Length 50th (m)	0.0	0.0	0.2	17.5	52.6
Queue Length 95th (m)	0.0	0.0	0.4	22.7	62.4
Internal Link Dist (m)				218.1	130.8
Turn Bay Length (m)			85.0		
Base Capacity (vph)	1491	599	642	2918	2903
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	0.03	0.03	0.17	0.18	0.43

**Intersection Summary**  
 Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 95 (79%), Referenced to phase 2:NBL and 6:SBT, Start of Green  
 Natural Cycle: 75

Lanes, Volumes, Timings  
1: King Edward & York

Future Background 2024 & 2029AM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.43  
 Intersection Signal Delay: 10.7  
 Intersection Capacity Utilization 59.0%  
 Analysis Period (min) 15  
 Intersection LOS: B  
 ICU Level of Service B

Splits and Phases: 1: King Edward & York





Lanes, Volumes, Timings  
2: King Edward & Rideau

Future Background 2024 & 2029AM Peak Hour  
112 Nelson Street



Lane Group	EBL	EBT	WBT	NBT	NBR	SBL	SBT	SBR	Ø1	Ø2	Ø3	Ø5
Lane Configurations	↔	↕	↕	↕	↕	↔	↕	↕				
Traffic Volume (vph)	156	158	324	452	83	206	821	222				
Future Volume (vph)	156	158	324	452	83	206	821	222				
Lane Group Flow (vph)	156	173	394	452	83	206	821	222				
Turn Type	Prot	NA	NA	NA	custom	custom	NA	custom				
Protected Phases	11	12	5 6	3 4			13	7 8	1	2	3	5
Permitted Phases					4	8		8				
Detector Phase	11	12	5 6	3 4	4	13	7 8	11				
Switch Phase												
Minimum Initial (s)	5.0				10.0	5.0		5.0	1.0	10.0	1.0	1.0
Minimum Split (s)	11.2				23.7	9.5		11.2	5.0	29.8	5.0	5.0
Total Split (s)	30.0				24.0	14.0		30.0	5.0	62.0	5.0	5.0
Total Split (%)	27.3%				21.8%	12.7%		27.3%	5%	56%	5%	5%
Maximum Green (s)	23.8				17.3	9.5		23.8	3.0	55.2	3.0	3.0
Yellow Time (s)	3.3				3.0	3.5		3.3	2.0	3.3	2.0	2.0
All-Red Time (s)	2.9				3.7	1.0		2.9	0.0	3.5	0.0	0.0
Lost Time Adjust (s)	0.0				0.0	0.0		0.0				
Total Lost Time (s)	6.2				6.7	4.5		6.2				
Lead/Lag					Lag				Lead	Lag	Lead	Lead
Lead-Lag Optimize?					Yes				Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0				3.0	3.0		3.0	3.0	3.0	3.0	3.0
Recall Mode	Max				Max	Max		Max	Max	C-Max	Max	Max
Walk Time (s)					2.0				3.0	2.0	3.0	3.0
Flash Dont Walk (s)					15.0				0.0	21.0	0.0	0.0
Pedestrian Calls (#/hr)					111				143	143	111	227
Act Effct Green (s)	23.8	65.0	35.0	27.0	17.3	33.5	41.0	55.6				
Actuated g/C Ratio	0.22	0.59	0.32	0.25	0.16	0.30	0.37	0.51				
v/c Ratio	0.44	0.09	0.43	0.56	0.25	0.74	0.66	0.33				
Control Delay	41.8	9.0	31.3	39.3	1.9	55.3	32.0	12.3				
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Delay	41.8	9.0	31.3	39.3	1.9	55.3	32.0	12.3				
LOS	D	A	C	D	A	E	C	B				
Approach Delay		24.6	31.3	33.5			32.3					
Approach LOS		C	C	C			C					
Queue Length 50th (m)	29.2	7.2	34.9	44.7	0.0	35.0	76.4	20.6				
Queue Length 95th (m)	49.2	11.8	48.8	61.0	0.0	#63.0	97.7	32.8				
Internal Link Dist (m)		125.5	140.5	133.0			218.1					
Turn Bay Length (m)	65.0				20.0	105.0						
Base Capacity (vph)	358	1849	927	813	326	280	1235	665				
Starvation Cap Reductn	0	0	0	0	0	0	0	0				
Spillback Cap Reductn	0	0	0	0	0	0	0	0				
Storage Cap Reductn	0	0	0	0	0	0	0	0				
Reduced v/c Ratio	0.44	0.09	0.43	0.56	0.25	0.74	0.66	0.33				

Intersection Summary

Cycle Length: 110  
 Actuated Cycle Length: 110  
 Offset: 92 (84%), Referenced to phase 2:EBT and 6:WBT, Start of Green  
 Natural Cycle: 90

Lanes, Volumes, Timings  
2: King Edward & Rideau

Future Background 2024 & 2029AM Peak Hour  
112 Nelson Street

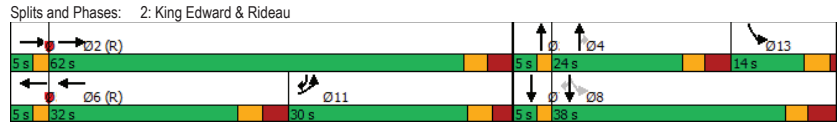
Lane Group	Ø6	Ø7	Ø8
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	6	7	8
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	10.0	1.0	10.0
Minimum Split (s)	31.8	5.0	25.9
Total Split (s)	32.0	5.0	38.0
Total Split (%)	29%	5%	35%
Maximum Green (s)	25.2	3.0	31.1
Yellow Time (s)	3.3	2.0	3.0
All-Red Time (s)	3.5	0.0	3.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	C-Max	Max	Max
Walk Time (s)	2.0	3.0	2.0
Flash Dont Walk (s)	23.0	0.0	17.0
Pedestrian Calls (#/hr)	227	108	108
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (m)			
Queue Length 95th (m)			
Internal Link Dist (m)			
Turn Bay Length (m)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			

Intersection Summary

Lanes, Volumes, Timings  
2: King Edward & Rideau

Future Background 2024 & 2029AM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated  
Maximum v/c Ratio: 0.74  
Intersection Signal Delay: 31.4 Intersection LOS: C  
Intersection Capacity Utilization 61.3% ICU Level of Service B  
Analysis Period (min) 15  
# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.



Lanes, Volumes, Timings  
3: Nelson & Rideau

Future Background 2024 & 2029AM Peak Hour  
112 Nelson Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBT	SBL	SBT
Lane Configurations	↔	↑	↔	↔	↑	↔	↔	↔	↔
Traffic Volume (vph)	67	368	6	3	347	62	0	52	2
Future Volume (vph)	67	368	6	3	347	62	0	52	2
Lane Group Flow (vph)	67	368	6	3	347	62	6	0	114
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		2			6		4		8
Permitted Phases	2		2	6		6		8	
Detector Phase	2	2	2	6	6	6	4	8	8
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	26.8	26.8	26.8	26.8	26.8	26.8	27.0	27.0	27.0
Total Split (s)	53.0	53.0	53.0	53.0	53.0	53.0	27.0	27.0	27.0
Total Split (%)	66.3%	66.3%	66.3%	66.3%	66.3%	66.3%	33.8%	33.8%	33.8%
Maximum Green (s)	47.2	47.2	47.2	47.2	47.2	47.2	21.0	21.0	21.0
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5	2.5	2.5	2.5	2.5	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.0	6.0	6.0
Lead/Lag									
Lead-Lag Optimize?									
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None
Walk Time (s)	15.0	15.0	15.0	15.0	15.0	15.0	7.0	7.0	7.0
Flash Dont Walk (s)	6.0	6.0	6.0	6.0	6.0	6.0	14.0	14.0	14.0
Pedestrian Calls (#/hr)	85	85	85	186	186	186	81	57	57
Act Effct Green (s)	53.8	53.8	53.8	53.8	53.8	53.8	18.8	18.8	18.8
Actuated g/C Ratio	0.67	0.67	0.67	0.67	0.67	0.67	0.24	0.24	0.24
v/c Ratio	0.13	0.31	0.01	0.01	0.30	0.10	0.01	0.35	0.35
Control Delay	8.3	8.7	0.0	6.7	7.2	2.0	0.0	15.9	15.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.3	8.7	0.0	6.7	7.2	2.0	0.0	15.9	15.9
LOS	A	A	A	A	A	A	A	B	B
Approach Delay		8.5			6.4			15.9	
Approach LOS		A			A			B	
Queue Length 50th (m)	4.2	26.4	0.0	0.2	19.5	0.0	0.0	6.3	6.3
Queue Length 95th (m)	9.8	42.2	0.0	m0.6	29.0	3.0	0.0	19.3	19.3
Internal Link Dist (m)		140.5			117.5		126.5	219.1	
Turn Bay Length (m)	40.0		20.0	10.0		20.0			
Base Capacity (vph)	503	1172	832	560	1172	650	575	360	360
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.13	0.31	0.01	0.01	0.30	0.10	0.01	0.32	0.32

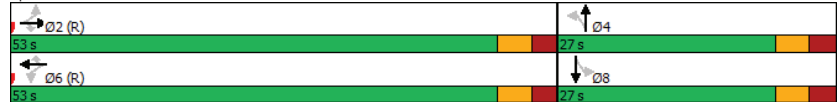
**Intersection Summary**  
Cycle Length: 80  
Actuated Cycle Length: 80  
Offset: 34 (43%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green  
Natural Cycle: 55

Lanes, Volumes, Timings  
3: Nelson & Rideau

Future Background 2024 & 2029AM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.35	
Intersection Signal Delay: 8.4	Intersection LOS: A
Intersection Capacity Utilization 60.7%	ICU Level of Service B
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 3: Nelson & Rideau



Lanes, Volumes, Timings  
4: Friel & Rideau

Future Background 2024 & 2029AM Peak Hour  
112 Nelson Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations		↕	↕		↕	↕		↕		↕
Traffic Volume (vph)	8	355	68	7	367	8	20	6	8	4
Future Volume (vph)	8	355	68	7	367	8	20	6	8	4
Lane Group Flow (vph)	0	363	68	0	374	8	0	39	0	16
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	NA
Protected Phases		2		6		6	4		8	
Permitted Phases	2		2	6		6	4		8	
Detector Phase	2	2	2	6	6	6	4	4	8	8
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.7	25.7	25.7	25.7	25.7	25.7	29.8	29.8	29.8	29.8
Total Split (s)	50.0	50.0	50.0	50.0	50.0	50.0	30.0	30.0	30.0	30.0
Total Split (%)	62.5%	62.5%	62.5%	62.5%	62.5%	62.5%	37.5%	37.5%	37.5%	37.5%
Maximum Green (s)	44.3	44.3	44.3	44.3	44.3	44.3	24.2	24.2	24.2	24.2
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.5
Lost Time Adjust (s)		0.0	0.0		0.0	0.0		0.0		0.0
Total Lost Time (s)		5.7	5.7		5.7	5.7		5.8		5.8
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None
Walk Time (s)	13.0	13.0	13.0	13.0	13.0	13.0	12.0	12.0	12.0	12.0
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0	7.0	12.0	12.0	12.0	12.0
Pedestrian Calls (#/hr)	85	85	85	82	82	82	81	81	35	35
Act Effct Green (s)		51.6	51.6		51.6	51.6		21.2		21.2
Actuated g/C Ratio		0.64	0.64		0.64	0.64		0.26		0.26
v/c Ratio		0.33	0.08		0.33	0.01		0.11		0.04
Control Delay		4.8	0.5		10.2	0.0		16.0		17.4
Queue Delay		0.0	0.0		0.0	0.0		0.0		0.0
Total Delay		4.8	0.5		10.2	0.0		16.0		17.4
LOS		A	A		B	A		B		B
Approach Delay		4.1			10.0			16.0		17.4
Approach LOS		A			A			B		B
Queue Length 50th (m)		5.6	0.1		29.7	0.0		2.8		1.3
Queue Length 95th (m)		9.6	0.2		47.3	0.0		9.5		5.5
Internal Link Dist (m)		117.5			103.0			131.9		64.0
Turn Bay Length (m)			20.0			20.0				
Base Capacity (vph)		1114	802		1117	795		417		424
Starvation Cap Reductn		0	0		0	0		0		0
Spillback Cap Reductn		0	0		0	0		0		0
Storage Cap Reductn		0	0		0	0		0		0
Reduced v/c Ratio		0.33	0.08		0.33	0.01		0.09		0.04

Intersection Summary

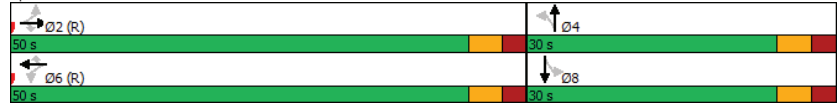
Cycle Length: 80
Actuated Cycle Length: 80
Offset: 50 (63%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 60

Lanes, Volumes, Timings  
4: Friel & Rideau

Future Background 2024 & 2029AM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.33	
Intersection Signal Delay: 7.5	Intersection LOS: A
Intersection Capacity Utilization 70.4%	ICU Level of Service C
Analysis Period (min) 15	

Splits and Phases: 4: Friel & Rideau



HCM 2010 AWSC  
5: Nelson & York

Future Background 2024 & 2029AM Peak Hour  
112 Nelson Street

<b>Intersection</b>	
Intersection Delay, s/veh	7.5
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	11	18	8	62	14	5	16	23	26	6	23	2
Future Vol, veh/h	11	18	8	62	14	5	16	23	26	6	23	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	18	8	62	14	5	16	23	26	6	23	2
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.3	7.8	7.4	7.4
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	25%	30%	77%	19%
Vol Thru, %	35%	49%	17%	74%
Vol Right, %	40%	22%	6%	6%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	65	37	81	31
LT Vol	16	11	62	6
Through Vol	23	18	14	23
RT Vol	26	8	5	2
Lane Flow Rate	65	37	81	31
Geometry Grp	1	1	1	1
Degree of Util (X)	0.072	0.042	0.096	0.036
Departure Headway (Hd)	3.972	4.094	4.247	4.189
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	891	867	839	844
Service Time	2.043	2.158	2.297	2.266
HCM Lane V/C Ratio	0.073	0.043	0.097	0.037
HCM Control Delay	7.4	7.3	7.8	7.4
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.1	0.3	0.1

Lanes, Volumes, Timings  
1: King Edward & York

Future Background 2024 & 2029PM Peak Hour  
112 Nelson Street

Lane Group	EBR	WBR	NBL	NBT	SBT	SBR
Lane Configurations	↖	↖	↖	↕	↕	↖
Traffic Volume (vph)	79	10	93	853	728	30
Future Volume (vph)	79	10	93	853	728	30
Lane Group Flow (vph)	79	10	93	870	728	30
Turn Type	Free	Perm	pm+pt	NA	NA	Perm
Protected Phases			8	2	6	
Permitted Phases	Free	8	2			6
Detector Phase		8	8	2	6	6
Switch Phase						
Minimum Initial (s)		10.0	10.0	10.0	10.0	10.0
Minimum Split (s)		39.8	39.8	32.0	32.0	32.0
Total Split (s)		39.8	39.8	80.2	80.2	80.2
Total Split (%)		33.2%	33.2%	66.8%	66.8%	66.8%
Maximum Green (s)		33.0	33.0	74.2	74.2	74.2
Yellow Time (s)		3.3	3.3	3.0	3.0	3.0
All-Red Time (s)		3.5	3.5	3.0	3.0	3.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.8	6.8	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0
Recall Mode		None	None	C-Max	C-Max	C-Max
Walk Time (s)		25.0	25.0	18.0	18.0	18.0
Flash Dont Walk (s)		8.0	8.0	8.0	8.0	8.0
Pedestrian Calls (#/hr)		109	109	52	108	108
Act Effct Green (s)	120.0	33.0	106.4	74.2	74.2	74.2
Actuated g/C Ratio	1.00	0.28	0.89	0.62	0.62	0.62
v/c Ratio	0.05	0.02	0.12	0.30	0.36	0.04
Control Delay	0.1	0.1	0.8	11.0	11.8	2.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	0.1	0.1	0.8	11.0	11.8	2.6
LOS	A	A	A	B	B	A
Approach Delay				10.0	11.4	
Approach LOS				A	B	
Queue Length 50th (m)	0.0	0.0	0.2	32.6	41.2	0.0
Queue Length 95th (m)	0.0	0.0	0.3	39.9	52.4	3.1
Internal Link Dist (m)				218.1	130.8	
Turn Bay Length (m)			85.0			30.0
Base Capacity (vph)	1489	464	792	2930	2050	687
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.02	0.12	0.30	0.36	0.04

Intersection Summary

Cycle Length: 120  
Actuated Cycle Length: 120  
Offset: 58 (48%), Referenced to phase 2:NBL and 6:SBT, Start of Green  
Natural Cycle: 75

Lanes, Volumes, Timings  
1: King Edward & York

Future Background 2024 & 2029PM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated  
Maximum v/c Ratio: 0.36  
Intersection Signal Delay: 10.1  
Intersection LOS: B  
Intersection Capacity Utilization 59.3%  
ICU Level of Service B  
Analysis Period (min) 15

Splits and Phases: 1: King Edward & York



Lanes, Volumes, Timings  
2: King Edward & Rideau

Future Background 2024 & 2029PM Peak Hour  
112 Nelson Street



Lane Group	EBL	EBT	WBT	NBT	NBR	SBL	SBT	SBR	Ø1	Ø2	Ø3	Ø5
Lane Configurations	↔	↕↕	↕↕	↕↕	↕	↕	↕↕	↕				
Traffic Volume (vph)	186	300	377	610	108	163	565	131				
Future Volume (vph)	186	300	377	610	108	163	565	131				
Lane Group Flow (vph)	186	325	485	610	108	163	565	131				
Turn Type	Prot	NA	NA	NA	custom	custom	NA	custom				
Protected Phases	11	12	5 6	3 4			13	7 8	1	2	3	5
Permitted Phases					4	8		8				
Detector Phase	11	12	5 6	3 4	4	13	7 8	11				
Switch Phase												
Minimum Initial (s)	5.0				10.0	5.0		5.0	1.0	10.0	1.0	1.0
Minimum Split (s)	11.2				23.7	9.5		11.2	5.0	29.8	5.0	5.0
Total Split (s)	27.0				29.0	12.0		27.0	5.0	59.0	5.0	5.0
Total Split (%)	24.5%				26.4%	10.9%		24.5%	5%	54%	5%	5%
Maximum Green (s)	20.8				22.3	7.5		20.8	3.0	52.2	3.0	3.0
Yellow Time (s)	3.3				3.0	3.5		3.3	2.0	3.3	2.0	2.0
All-Red Time (s)	2.9				3.7	1.0		2.9	0.0	3.5	0.0	0.0
Lost Time Adjust (s)	0.0				0.0	0.0		0.0				
Total Lost Time (s)	6.2				6.7	4.5		6.2				
Lead/Lag					Lag				Lead	Lag	Lead	Lead
Lead-Lag Optimize?					Yes				Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0				3.0	3.0		3.0	3.0	3.0	3.0	3.0
Recall Mode	Max				Max	Max		Max	Max	C-Max	Max	Max
Walk Time (s)					2.0			3.0	2.0	3.0	3.0	3.0
Flash Dont Walk (s)					15.0			0.0	21.0	0.0	0.0	0.0
Pedestrian Calls (#/hr)					150			321	321	150	458	458
Act Effct Green (s)	20.8	62.0	35.0	32.0	22.3	36.5	44.0	55.6				
Actuated g/C Ratio	0.19	0.56	0.32	0.29	0.20	0.33	0.40	0.51				
v/c Ratio	0.59	0.18	0.54	0.63	0.34	0.70	0.43	0.21				
Control Delay	49.6	11.5	33.6	37.4	2.8	54.7	25.1	10.9				
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Delay	49.6	11.5	33.6	37.4	2.8	54.7	25.1	10.9				
LOS	D	B	C	D	A	D	C	B				
Approach Delay		25.4	33.6	32.2			28.6					
Approach LOS		C	C	C			C					
Queue Length 50th (m)	36.8	16.1	44.9	59.8	0.0	25.8	45.4	11.3				
Queue Length 95th (m)	60.0	23.4	61.3	78.7	0.0	#48.4	60.2	19.8				
Internal Link Dist (m)		125.5	140.5	133.0			218.1					
Turn Bay Length (m)	65.0				20.0	105.0		95.0				
Base Capacity (vph)	313	1774	897	964	321	233	1326	631				
Starvation Cap Reductn	0	0	0	0	0	0	0	0				
Spillback Cap Reductn	0	0	0	0	0	0	0	0				
Storage Cap Reductn	0	0	0	0	0	0	0	0				
Reduced v/c Ratio	0.59	0.18	0.54	0.63	0.34	0.70	0.43	0.21				

Intersection Summary

Cycle Length: 110  
 Actuated Cycle Length: 110  
 Offset: 92 (84%), Referenced to phase 2:EBT and 6:WBT, Start of Green  
 Natural Cycle: 90

Lanes, Volumes, Timings  
2: King Edward & Rideau

Future Background 2024 & 2029PM Peak Hour  
112 Nelson Street

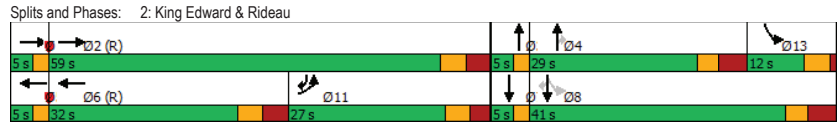
Lane Group	Ø6	Ø7	Ø8
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	6	7	8
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	10.0	1.0	10.0
Minimum Split (s)	31.8	5.0	25.9
Total Split (s)	32.0	5.0	41.0
Total Split (%)	29%	5%	37%
Maximum Green (s)	25.2	3.0	34.1
Yellow Time (s)	3.3	2.0	3.0
All-Red Time (s)	3.5	0.0	3.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	C-Max	Max	Max
Walk Time (s)	2.0	3.0	2.0
Flash Dont Walk (s)	23.0	0.0	17.0
Pedestrian Calls (#/hr)	458	141	141
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (m)			
Queue Length 95th (m)			
Internal Link Dist (m)			
Turn Bay Length (m)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			

Intersection Summary

Lanes, Volumes, Timings  
2: King Edward & Rideau

Future Background 2024 & 2029PM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated  
Maximum v/c Ratio: 0.70  
Intersection Signal Delay: 29.9 Intersection LOS: C  
Intersection Capacity Utilization 68.7% ICU Level of Service C  
Analysis Period (min) 15  
# 95th percentile volume exceeds capacity, queue may be longer.  
Queue shown is maximum after two cycles.



Lanes, Volumes, Timings  
3: Nelson & Rideau

Future Background 2024 & 2029PM Peak Hour  
112 Nelson Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	↔	↕	↔	↔	↕	↕	↔	↕	↔	↕
Traffic Volume (vph)	88	475	8	7	411	158	2	3	71	1
Future Volume (vph)	88	475	8	7	411	158	2	3	71	1
Lane Group Flow (vph)	88	475	8	7	411	158	0	19	0	161
Turn Type	pm+pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	NA
Protected Phases	5	2			6			4		8
Permitted Phases	2		2	6		6	4		8	
Detector Phase	5	2	2	6	6	6	4	4	8	8
Switch Phase										
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	10.8	26.8	26.8	26.8	26.8	26.8	27.0	27.0	27.0	27.0
Total Split (s)	12.0	60.0	60.0	48.0	48.0	48.0	30.0	30.0	30.0	30.0
Total Split (%)	13.3%	66.7%	66.7%	53.3%	53.3%	53.3%	33.3%	33.3%	33.3%	33.3%
Maximum Green (s)	6.2	54.2	54.2	42.2	42.2	42.2	24.0	24.0	24.0	24.0
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5	2.5	2.5	2.5	2.5	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.0	6.0	6.0	6.0
Lead/Lag	Lead			Lag	Lag	Lag				
Lead-Lag Optimize?	Yes			Yes	Yes	Yes				
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	C-Max	C-Max	C-Max	Max	Max	Max	Max
Walk Time (s)	15.0	15.0	15.0	15.0	15.0	15.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		6.0	6.0	6.0	6.0	6.0	14.0	14.0	14.0	14.0
Pedestrian Calls (#/hr)		290	290	500	500	500	313	313	139	139
Act Effct Green (s)	54.2	54.2	54.2	44.6	44.6	44.6		24.0		24.0
Actuated g/C Ratio	0.60	0.60	0.60	0.50	0.50	0.50		0.27		0.27
v/c Ratio	0.23	0.45	0.02	0.02	0.48	0.50		0.08		0.57
Control Delay	9.1	11.5	0.1	10.1	12.4	8.0		15.1		25.6
Queue Delay	0.0	0.0	0.0	0.0	0.2	0.0		0.0		0.0
Total Delay	9.1	11.5	0.1	10.1	12.6	8.0		15.1		25.6
LOS	A	B	A	B	B	A		B		C
Approach Delay		11.0			11.3			15.1		25.6
Approach LOS		B			B			B		C
Queue Length 50th (m)	5.9	41.1	0.0	0.4	26.7	1.1		0.6		13.6
Queue Length 95th (m)	11.7	62.5	0.0	m1.0	37.4	7.6		5.9		34.5
Internal Link Dist (m)		140.5			117.5			126.5		218.8
Turn Bay Length (m)	40.0		20.0	10.0		20.0				
Base Capacity (vph)	379	1050	429	310	864	313		250		283
Starvation Cap Reductn	0	0	0	0	76	0		0		0
Spillback Cap Reductn	0	0	0	0	0	0		0		0
Storage Cap Reductn	0	0	0	0	0	0		0		0
Reduced v/c Ratio	0.23	0.45	0.02	0.02	0.52	0.50		0.08		0.57

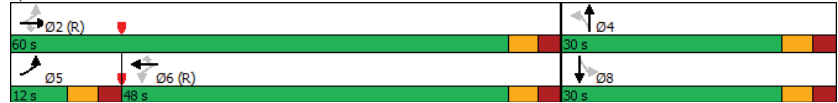
**Intersection Summary**  
Cycle Length: 90  
Actuated Cycle Length: 90  
Offset: 52 (58%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green  
Natural Cycle: 65

Lanes, Volumes, Timings  
3: Nelson & Rideau

Future Background 2024 & 2029PM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.57	
Intersection Signal Delay: 13.0	Intersection LOS: B
Intersection Capacity Utilization 69.8%	ICU Level of Service C
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 3: Nelson & Rideau



Lanes, Volumes, Timings  
4: Friel & Rideau

Future Background 2024 & 2029PM Peak Hour  
112 Nelson Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations		↕	↕		↕	↕		↕		↕
Traffic Volume (vph)	4	483	65	22	469	9	75	3	14	4
Future Volume (vph)	4	483	65	22	469	9	75	3	14	4
Lane Group Flow (vph)	0	487	65	0	491	9	0	100	0	26
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	NA
Protected Phases		2			6			4		8
Permitted Phases	2		2	6		6	4		8	
Detector Phase	2	2	2	6	6	6	4	4	8	8
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.7	25.7	25.7	25.7	25.7	25.7	29.8	29.8	29.8	29.8
Total Split (s)	60.0	60.0	60.0	60.0	60.0	60.0	30.0	30.0	30.0	30.0
Total Split (%)	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	33.3%	33.3%	33.3%	33.3%
Maximum Green (s)	54.3	54.3	54.3	54.3	54.3	54.3	24.2	24.2	24.2	24.2
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.5
Lost Time Adjust (s)		0.0	0.0		0.0	0.0		0.0		0.0
Total Lost Time (s)		5.7	5.7		5.7	5.7		5.8		5.8
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None
Walk Time (s)	13.0	13.0	13.0	13.0	13.0	13.0	12.0	12.0	12.0	12.0
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0	7.0	12.0	12.0	12.0	12.0
Pedestrian Calls (#/hr)	181	181	181	192	192	192	95	95	78	78
Act Effct Green (s)		57.3	57.3		57.3	57.3		21.2		21.2
Actuated g/C Ratio		0.64	0.64		0.64	0.64		0.24		0.24
v/c Ratio		0.44	0.12		0.46	0.02		0.37		0.09
Control Delay		4.7	0.8		11.0	0.1		27.1		20.1
Queue Delay		0.1	0.0		0.0	0.0		0.0		0.0
Total Delay		4.8	0.8		11.0	0.1		27.1		20.1
LOS		A	A		B	A		C		C
Approach Delay		4.3			10.8			27.1		20.1
Approach LOS		A			B			C		C
Queue Length 50th (m)		13.9	0.1		43.3	0.0		11.7		2.3
Queue Length 95th (m)		21.1	m0.8		66.1	0.1		25.4		8.4
Internal Link Dist (m)		117.5			103.0			131.9		64.0
Turn Bay Length (m)			20.0			20.0				
Base Capacity (vph)		1105	562		1070	535		308		343
Starvation Cap Reductn		88	0		0	0		0		0
Spillback Cap Reductn		0	0		0	0		0		0
Storage Cap Reductn		0	0		0	0		0		0
Reduced v/c Ratio		0.48	0.12		0.46	0.02		0.32		0.08

Intersection Summary

Cycle Length: 90  
Actuated Cycle Length: 90  
Offset: 48 (53%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green  
Natural Cycle: 60

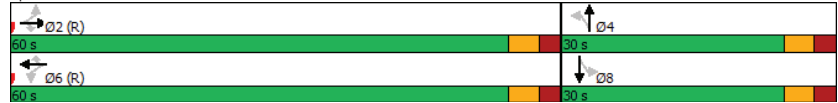


Lanes, Volumes, Timings  
4: Friel & Rideau

Future Background 2024 & 2029PM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.46	
Intersection Signal Delay: 9.3	Intersection LOS: A
Intersection Capacity Utilization 77.6%	ICU Level of Service D
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 4: Friel & Rideau



HCM 2010 AWSC  
5: Nelson & York

Future Background 2024 & 2029PM Peak Hour  
112 Nelson Street

<b>Intersection</b>	
Intersection Delay, s/veh	7.7
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	4	8	10	43	0	43	0	98	66	4	19	6
Future Vol, veh/h	4	8	10	43	0	43	0	98	66	4	19	6
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	8	10	43	0	43	0	98	66	4	19	6
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	7.3	7.6	7.8	7.4
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	0%	18%	50%	14%
Vol Thru, %	60%	36%	0%	66%
Vol Right, %	40%	45%	50%	21%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	164	22	86	29
LT Vol	0	4	43	4
Through Vol	98	8	0	19
RT Vol	66	10	43	6
Lane Flow Rate	164	22	86	29
Geometry Grp	1	1	1	1
Degree of Util (X)	0.178	0.025	0.098	0.033
Departure Headway (Hd)	3.902	4.101	4.086	4.152
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	912	858	865	851
Service Time	1.961	2.197	2.166	2.235
HCM Lane V/C Ratio	0.18	0.026	0.099	0.034
HCM Control Delay	7.8	7.3	7.6	7.4
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.6	0.1	0.3	0.1

# Appendix H

MMLOS Analysis

# Multi-Modal Level of Service - Segments Form

Consultant Scenario Comments	CGH Transportation Inc.	Project Date	2020-88
	Existing/Future		2022-11-15

SEGMENTS			Nelson Street		
Pedestrian	Sidewalk Width	C	≥ 2 m		
	Boulevard Width		< 0.5		
	Avg Daily Curb Lane Traffic Volume		≤ 3000		
	Operating Speed		> 50 to 60 km/h		
	On-Street Parking		no		
	<b>Exposure to Traffic PLoS</b>		<b>C</b>	-	-
	Effective Sidewalk Width				
Pedestrian Volume					
<b>Crowding PLoS</b>	<b>A</b>	-	-		
<b>Level of Service</b>	<b>C</b>	-	-		
Bicycle	Type of Cycling Facility	D	Mixed Traffic		
	Number of Travel Lanes		≤ 2 (no centreline)		
	Operating Speed		≥ 50 to 60 km/h		
	<b># of Lanes &amp; Operating Speed LoS</b>		<b>D</b>	-	-
	Bike Lane (+ Parking Lane) Width				
	<b>Bike Lane Width LoS</b>		-	-	-
	Bike Lane Blockages				
	<b>Blockage LoS</b>		-	-	-
	Median Refuge Width (no median = < 1.8 m)		< 1.8 m refuge		
	No. of Lanes at Unsignalized Crossing		≤ 3 lanes		
Sidestreet Operating Speed	≤ 40 km/h				
<b>Unsignalized Crossing - Lowest LoS</b>	<b>A</b>	-	-		
<b>Level of Service</b>	<b>D</b>	-	-		
Transit	Facility Type	-			
	Friction or Ratio Transit:Posted Speed				
<b>Level of Service</b>		-	-	-	
Truck	Truck Lane Width	-			
	Travel Lanes per Direction				
<b>Level of Service</b>		-	-	-	

**Multi-Modal Level of Service - Intersections Form**

Consultant	CGH Transportation Inc.	Project	2020-88
Scenario	Existing/Future	Date	2022-11-15
Comments			

INTERSECTIONS		York St at King Edward Ave				Rideau St at King Edward Ave				Rideau St at Nelson St				Rideau St at Friel St			
Crossing Side		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Pedestrian	Lanes	8		3	0 - 2	8	8	6	6	0 - 2	0 - 2	5	5	0 - 2	0 - 2	5	5
	Median	Median > 2.4 m		No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m	No Median - 2.4 m
	Conflicting Left Turns	No left turn / Prohib.		No left turn / Prohib.	Permissive	Protected	No left turn / Prohib.	Protected/ Permissive	No left turn / Prohib.	Protected/ Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive	Permissive
	Conflicting Right Turns	Permissive or yield control		Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Protected/ Permissive	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control	Permissive or yield control
	Right Turns on Red (RTOR) ?	RTOR allowed		RTOR allowed	RTOR allowed	RTOR prohibited	RTOR allowed	RTOR prohibited	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed	RTOR allowed
	Ped Signal Leading Interval?	No		No	No	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No
	Right Turn Channel	No Channel		No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel	No Channel
	Corner Radius	5-10m		10-15m	10-15m	>25m	15-25m	5-10m	10-15m	5-10m	5-10m	5-10m	5-10m	5-10m	5-10m	5-10m	5-10m
	Crosswalk Type	Zebra stripe hi-vis markings		Std transverse markings	Std transverse markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings	Zebra stripe hi-vis markings
	<b>PETSI Score</b>		7		78	85	1	-1	29	33	89	89	41	41	89	89	41
<b>Ped. Exposure to Traffic LoS</b>		F	-	B	B	F	F	F	E	B	B	E	E	B	B	E	E
Cycle Length																	
Effective Walk Time																	
<b>Average Pedestrian Delay</b>																	
<b>Pedestrian Delay LoS</b>		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<b>Level of Service</b>		F	-	B	B	F	F	F	E	B	B	E	E	B	B	E	E
		<b>F</b>				<b>F</b>				<b>E</b>				<b>E</b>			
Approach From		NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST	NORTH	SOUTH	EAST	WEST
Bicycle	Bicycle Lane Arrangement on Approach					Mixed Traffic	Mixed Traffic										
	Right Turn Lane Configuration					> 50 m	≤ 50 m										
	Right Turning Speed					≤ 25 km/h	≤ 25 km/h										
	<b>Cyclist relative to RT motorists</b>	-	A	-	-	F	D	-	A	A	A	A	A	A	A	A	A
	<b>Separated or Mixed Traffic</b>	-	-	-	-	Mixed Traffic	Mixed Traffic	-	-	-	-	-	-	-	-	-	-
	Left Turn Approach		≥ 2 lanes crossed			≥ 2 lanes crossed			One lane crossed	No lane crossed	No lane crossed	One lane crossed	One lane crossed	No lane crossed	No lane crossed	One lane crossed	One lane crossed
Operating Speed		> 50 to < 60 km/h			> 50 to < 60 km/h			> 50 to < 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	> 50 to < 60 km/h	> 50 to < 60 km/h	> 40 to ≤ 50 km/h	> 40 to ≤ 50 km/h	> 50 to < 60 km/h	> 50 to < 60 km/h	
<b>Left Turning Cyclist</b>	-	F	-	-	F	A	-	E	B	B	E	E	B	B	E	E	
<b>Level of Service</b>	-	F	-	-	F	D	-	E	B	B	E	E	B	B	E	E	
		<b>F</b>				<b>F</b>				<b>E</b>				<b>E</b>			
Transit	Average Signal Delay	≤ 10 sec	≤ 20 sec			≤ 40 sec	≤ 40 sec	≤ 40 sec	≤ 20 sec			≤ 20 sec	≤ 20 sec			≤ 10 sec	≤ 20 sec
	<b>Level of Service</b>	B	C	-	-	E	E	E	C	-	-	C	C	-	-	B	C
		<b>C</b>				<b>E</b>				<b>C</b>				<b>C</b>			
Truck	Effective Corner Radius					> 15 m		> 15 m	> 15 m								
	Number of Receiving Lanes on Departure from Intersection					≥ 2		≥ 2	≥ 2								
<b>Level of Service</b>	-	-	-	-	A	-	A	A	-	-	-	-	-	-	-	-	
		<b>-</b>				<b>A</b>				<b>-</b>				<b>-</b>			
Auto	Volume to Capacity Ratio		0.61 - 0.70				0.61 - 0.70				0.61 - 0.70				0.0 - 0.60		
	<b>Level of Service</b>		<b>B</b>				<b>B</b>				<b>B</b>				<b>A</b>		

# Appendix I

Synchro Intersection Worksheets – Future Total 2024 & 2029

Lanes, Volumes, Timings  
1: King Edward & York

Future Total 2024 & 2029AM Peak Hour  
112 Nelson Street

Lane Group	EBR	WBR	NBL	NBT	SBT
Lane Configurations	↖	↖	↖	↕	↕
Traffic Volume (vph)	43	17	107	490	1211
Future Volume (vph)	43	17	107	490	1211
Lane Group Flow (vph)	43	17	107	512	1257
Turn Type	Free	Perm	pm+pt	NA	NA
Protected Phases			8	2	6
Permitted Phases	Free	8	2		
Detector Phase		8	8	2	6
Switch Phase					
Minimum Initial (s)		10.0	10.0	10.0	10.0
Minimum Split (s)		39.8	39.8	32.0	32.0
Total Split (s)		39.8	39.8	80.2	80.2
Total Split (%)		33.2%	33.2%	66.8%	66.8%
Maximum Green (s)		33.0	33.0	74.2	74.2
Yellow Time (s)		3.3	3.3	3.0	3.0
All-Red Time (s)		3.5	3.5	3.0	3.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0
Total Lost Time (s)		6.8	6.8	6.0	6.0
Lead/Lag					
Lead-Lag Optimize?					
Vehicle Extension (s)		3.0	3.0	3.0	3.0
Recall Mode		None	None	C-Max	C-Max
Walk Time (s)		25.0	25.0	18.0	18.0
Flash Dont Walk (s)		8.0	8.0	8.0	8.0
Pedestrian Calls (#/hr)		112	112	57	102
Act Effct Green (s)	120.0	33.0	106.4	74.2	74.2
Actuated g/C Ratio	1.00	0.28	0.89	0.62	0.62
v/c Ratio	0.03	0.03	0.17	0.18	0.43
Control Delay	0.0	0.1	1.1	9.8	12.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	0.0	0.1	1.1	9.8	12.4
LOS	A	A	A	A	B
Approach Delay				8.3	12.4
Approach LOS				A	B
Queue Length 50th (m)	0.0	0.0	0.2	17.2	52.4
Queue Length 95th (m)	0.0	0.0	0.4	22.5	62.1
Internal Link Dist (m)				218.1	130.8
Turn Bay Length (m)			85.0		
Base Capacity (vph)	1491	577	643	2913	2907
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	0.03	0.03	0.17	0.18	0.43

Intersection Summary

Cycle Length: 120  
 Actuated Cycle Length: 120  
 Offset: 95 (79%), Referenced to phase 2:NBTL and 6:SBT, Start of Green  
 Natural Cycle: 75

Lanes, Volumes, Timings  
1: King Edward & York

Future Total 2024 & 2029AM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.43  
 Intersection Signal Delay: 10.7  
 Intersection LOS: B  
 Intersection Capacity Utilization 59.4%  
 ICU Level of Service B  
 Analysis Period (min) 15

Splits and Phases: 1: King Edward & York



Lanes, Volumes, Timings  
2: King Edward & Rideau

Future Total 2024 & 2029AM Peak Hour  
112 Nelson Street



Lane Group	EBL	EBT	WBT	NBT	NBR	SBL	SBT	SBR	Ø1	Ø2	Ø3	Ø5
Lane Configurations	↔	↕↕	↕↕	↕↕	↕	↔	↕↕	↕				
Traffic Volume (vph)	156	161	319	445	87	202	801	217				
Future Volume (vph)	156	161	319	445	87	202	801	217				
Lane Group Flow (vph)	156	176	389	445	87	202	801	217				
Turn Type	Prot	NA	NA	NA	custom	custom	NA	custom				
Protected Phases	11	12	5 6	3 4		13	7 8	11	1	2	3	5
Permitted Phases					4	8		8				
Detector Phase	11	12	5 6	3 4	4	13	7 8	11				
Switch Phase												
Minimum Initial (s)	5.0				10.0	5.0	5.0	1.0	10.0	1.0	1.0	
Minimum Split (s)	11.2				23.7	9.5	11.2	5.0	29.8	5.0	5.0	
Total Split (s)	30.0				24.0	14.0	30.0	5.0	62.0	5.0	5.0	
Total Split (%)	27.3%				21.8%	12.7%	27.3%	5%	56%	5%	5%	
Maximum Green (s)	23.8				17.3	9.5	23.8	3.0	55.2	3.0	3.0	
Yellow Time (s)	3.3				3.0	3.5	3.3	2.0	3.3	2.0	2.0	
All-Red Time (s)	2.9				3.7	1.0	2.9	0.0	3.5	0.0	0.0	
Lost Time Adjust (s)	0.0				0.0	0.0	0.0					
Total Lost Time (s)	6.2				6.7	4.5	6.2					
Lead/Lag					Lag			Lead	Lag	Lead	Lead	
Lead-Lag Optimize?					Yes			Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0				3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	Max				Max	Max	Max	Max	C-Max	Max	Max	
Walk Time (s)					2.0			3.0	2.0	3.0	3.0	
Flash Dont Walk (s)					15.0			0.0	21.0	0.0	0.0	
Pedestrian Calls (#/hr)					146			182	182	146	306	
Act Effct Green (s)	23.8	65.0	35.0	27.0	17.3	33.5	41.0	55.6				
Actuated g/C Ratio	0.22	0.59	0.32	0.25	0.16	0.30	0.37	0.51				
v/c Ratio	0.44	0.10	0.42	0.55	0.27	0.71	0.65	0.33				
Control Delay	41.8	9.1	31.2	39.2	2.0	53.3	31.5	12.2				
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Delay	41.8	9.1	31.2	39.2	2.0	53.3	31.5	12.2				
LOS	D	A	C	D	A	D	C	B				
Approach Delay		24.4	31.2	33.1			31.7					
Approach LOS		C	C	C			C					
Queue Length 50th (m)	29.2	7.3	34.4	44.0	0.0	34.3	73.9	20.0				
Queue Length 95th (m)	49.2	12.1	48.3	60.1	0.0	#59.9	94.6	32.1				
Internal Link Dist (m)		125.5	140.5	133.0			218.1					
Turn Bay Length (m)	65.0				20.0	105.0						
Base Capacity (vph)	358	1850	926	813	326	283	1235	665				
Starvation Cap Reductn	0	0	0	0	0	0	0	0				
Spillback Cap Reductn	0	0	0	0	0	0	0	0				
Storage Cap Reductn	0	0	0	0	0	0	0	0				
Reduced v/c Ratio	0.44	0.10	0.42	0.55	0.27	0.71	0.65	0.33				

Intersection Summary

Cycle Length: 110  
 Actuated Cycle Length: 110  
 Offset: 92 (84%), Referenced to phase 2:EBT and 6:WBT, Start of Green  
 Natural Cycle: 90

Lanes, Volumes, Timings  
2: King Edward & Rideau

Future Total 2024 & 2029AM Peak Hour  
112 Nelson Street

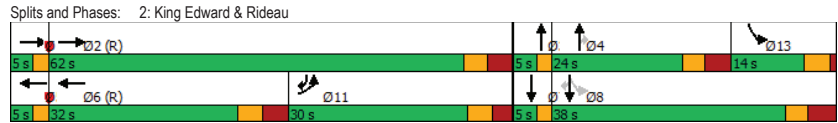
Lane Group	Ø6	Ø7	Ø8
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	6	7	8
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	10.0	1.0	10.0
Minimum Split (s)	31.8	5.0	25.9
Total Split (s)	32.0	5.0	38.0
Total Split (%)	29%	5%	35%
Maximum Green (s)	25.2	3.0	31.1
Yellow Time (s)	3.3	2.0	3.0
All-Red Time (s)	3.5	0.0	3.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	C-Max	Max	Max
Walk Time (s)	2.0	3.0	2.0
Flash Dont Walk (s)	23.0	0.0	17.0
Pedestrian Calls (#/hr)	306	128	128
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (m)			
Queue Length 95th (m)			
Internal Link Dist (m)			
Turn Bay Length (m)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			

Intersection Summary

Lanes, Volumes, Timings  
2: King Edward & Rideau

Future Total 2024 & 2029AM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.71  
 Intersection Signal Delay: 31.0 Intersection LOS: C  
 Intersection Capacity Utilization 60.8% ICU Level of Service B  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.



Lanes, Volumes, Timings  
3: Nelson & Rideau

Future Total 2024 & 2029AM Peak Hour  
112 Nelson Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBT	SBL	SBT
Lane Configurations	↔	↕	↔	↔	↕	↔	↕	↔	↕
Traffic Volume (vph)	75	363	6	3	330	62	0	57	2
Future Volume (vph)	75	363	6	3	330	62	0	57	2
Lane Group Flow (vph)	75	363	6	3	330	62	6	0	131
Turn Type	Perm	NA	Perm	Perm	NA	Perm	NA	Perm	NA
Protected Phases		2		6	6		4		8
Permitted Phases	2		2			6		8	
Detector Phase	2	2	2	6	6	6	4	8	8
Switch Phase									
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	26.8	26.8	26.8	26.8	26.8	26.8	27.0	27.0	27.0
Total Split (s)	53.0	53.0	53.0	53.0	53.0	53.0	27.0	27.0	27.0
Total Split (%)	66.3%	66.3%	66.3%	66.3%	66.3%	66.3%	33.8%	33.8%	33.8%
Maximum Green (s)	47.2	47.2	47.2	47.2	47.2	47.2	21.0	21.0	21.0
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5	2.5	2.5	2.5	2.5	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8	6.0	6.0	6.0
Lead/Lag									
Lead-Lag Optimize?									
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None
Walk Time (s)	15.0	15.0	15.0	15.0	15.0	15.0	7.0	7.0	7.0
Flash Dont Walk (s)	6.0	6.0	6.0	6.0	6.0	6.0	14.0	14.0	14.0
Pedestrian Calls (#/hr)	89	89	89	225	225	225	89	88	88
Act Effct Green (s)	49.4	49.4	49.4	49.4	49.4	49.4	18.8	18.8	18.8
Actuated g/C Ratio	0.62	0.62	0.62	0.62	0.62	0.62	0.24	0.24	0.24
v/c Ratio	0.16	0.34	0.01	0.01	0.31	0.10	0.01	0.01	0.39
Control Delay	8.6	9.1	0.0	6.7	7.6	2.0	0.0	0.0	15.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	8.6	9.1	0.0	6.7	7.6	2.0	0.0	0.0	15.7
LOS	A	A	A	A	A	A	A	A	B
Approach Delay		8.9			6.7				15.7
Approach LOS		A			A				B
Queue Length 50th (m)	4.7	25.9	0.0	0.2	17.9	0.2	0.0	0.0	6.9
Queue Length 95th (m)	11.0	41.4	0.0	m0.5	27.8	2.9	0.0	0.0	20.9
Internal Link Dist (m)		140.5			117.5		126.5		88.4
Turn Bay Length (m)	40.0		20.0	10.0		20.0			
Base Capacity (vph)	464	1077	766	512	1077	602	577		369
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.34	0.01	0.01	0.31	0.10	0.01	0.01	0.36

**Intersection Summary**  
 Cycle Length: 80  
 Actuated Cycle Length: 80  
 Offset: 34 (43%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green  
 Natural Cycle: 55

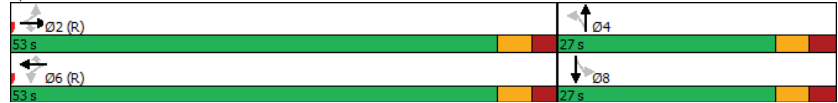


Lanes, Volumes, Timings  
3: Nelson & Rideau

Future Total 2024 & 2029AM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.39	
Intersection Signal Delay: 8.9	Intersection LOS: A
Intersection Capacity Utilization 60.6%	ICU Level of Service B
Analysis Period (min) 15	
m Volume for 95th percentile queue is metered by upstream signal.	

Splits and Phases: 3: Nelson & Rideau



Lanes, Volumes, Timings  
4: Friel & Rideau

Future Total 2024 & 2029AM Peak Hour  
112 Nelson Street

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations		↕	↕		↕	↕		↕		↕
Traffic Volume (vph)	8	355	68	7	350	8	20	6	8	4
Future Volume (vph)	8	355	68	7	350	8	20	6	8	4
Lane Group Flow (vph)	0	363	68	0	357	8	0	39	0	16
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	NA
Protected Phases		2		6		6	4		8	
Permitted Phases	2		2	6		6	4		8	
Detector Phase	2	2	2	6	6	6	4	4	8	8
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.7	25.7	25.7	25.7	25.7	25.7	29.8	29.8	29.8	29.8
Total Split (s)	50.0	50.0	50.0	50.0	50.0	50.0	30.0	30.0	30.0	30.0
Total Split (%)	62.5%	62.5%	62.5%	62.5%	62.5%	62.5%	37.5%	37.5%	37.5%	37.5%
Maximum Green (s)	44.3	44.3	44.3	44.3	44.3	44.3	24.2	24.2	24.2	24.2
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.5
Lost Time Adjust (s)		0.0	0.0		0.0	0.0		0.0		0.0
Total Lost Time (s)		5.7	5.7		5.7	5.7		5.8		5.8
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None
Walk Time (s)	13.0	13.0	13.0	13.0	13.0	13.0	12.0	12.0	12.0	12.0
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0	7.0	12.0	12.0	12.0	12.0
Pedestrian Calls (#/hr)	85	85	85	82	82	82	81	81	35	35
Act Effct Green (s)		51.6	51.6		51.6	51.6		21.2		21.2
Actuated g/C Ratio		0.64	0.64		0.64	0.64		0.26		0.26
v/c Ratio		0.33	0.09		0.32	0.01		0.11		0.04
Control Delay		5.0	0.5		10.0	0.0		16.0		17.4
Queue Delay		0.0	0.0		0.0	0.0		0.0		0.0
Total Delay		5.0	0.5		10.0	0.0		16.0		17.4
LOS		A	A		B	A		B		B
Approach Delay		4.3			9.8			16.0		17.4
Approach LOS		A			A			B		B
Queue Length 50th (m)		6.0	0.1		28.1	0.0		2.8		1.3
Queue Length 95th (m)		10.3	0.3		44.9	0.0		9.5		5.5
Internal Link Dist (m)		117.5			103.0			131.9		64.0
Turn Bay Length (m)			20.0			20.0				
Base Capacity (vph)		1113	793		1116	780		415		423
Starvation Cap Reductn		0	0		0	0		0		0
Spillback Cap Reductn		0	0		0	0		0		0
Storage Cap Reductn		0	0		0	0		0		0
Reduced v/c Ratio		0.33	0.09		0.32	0.01		0.09		0.04

Intersection Summary

Cycle Length: 80
Actuated Cycle Length: 80
Offset: 50 (63%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 60

Lanes, Volumes, Timings  
4: Friel & Rideau

Future Total 2024 & 2029AM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated  
Maximum v/c Ratio: 0.33  
Intersection Signal Delay: 7.4  
Intersection Capacity Utilization 70.4%  
Analysis Period (min) 15

Intersection LOS: A  
ICU Level of Service C

Splits and Phases: 4: Friel & Rideau



HCM 2010 AWSC  
5: Nelson & York

Future Total 2024 & 2029AM Peak Hour  
112 Nelson Street

Intersection

Intersection Delay, s/veh 7.5  
Intersection LOS A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	11	18	8	62	14	5	18	23	26	6	23	2
Future Vol, veh/h	11	18	8	62	14	5	18	23	26	6	23	2
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	11	18	8	62	14	5	18	23	26	6	23	2
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	1			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			1		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			1			1		
HCM Control Delay	7.3			7.8			7.4			7.4		
HCM LOS	A			A			A			A		

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	27%	30%	77%	19%
Vol Thru, %	34%	49%	17%	74%
Vol Right, %	39%	22%	6%	6%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	67	37	81	31
LT Vol	18	11	62	6
Through Vol	23	18	14	23
RT Vol	26	8	5	2
Lane Flow Rate	67	37	81	31
Geometry Grp	1	1	1	1
Degree of Util (X)	0.074	0.042	0.096	0.036
Departure Headway (Hd)	3.983	4.098	4.25	4.191
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	889	865	838	844
Service Time	2.054	2.162	2.301	2.268
HCM Lane V/C Ratio	0.075	0.043	0.097	0.037
HCM Control Delay	7.4	7.3	7.8	7.4
HCM Lane LOS	A	A	A	A
HCM 95th-tile Q	0.2	0.1	0.3	0.1

HCM 2010 TWSC  
6: Nelson & Site Access

Future Total 2024 & 2029AM Peak Hour  
112 Nelson Street

Intersection						
Int Delay, s/veh	1.3					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔		↕		↕	
Traffic Vol, veh/h	2	17	9	65	93	0
Future Vol, veh/h	2	17	9	65	93	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	2	17	9	65	93	0
Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	176	93	93	0	-	0
Stage 1	93	-	-	-	-	-
Stage 2	83	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	814	964	1501	-	-	-
Stage 1	931	-	-	-	-	-
Stage 2	940	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	809	964	1501	-	-	-
Mov Cap-2 Maneuver	809	-	-	-	-	-
Stage 1	925	-	-	-	-	-
Stage 2	940	-	-	-	-	-
Approach	EB	NB	SB			
HCM Control Delay, s	8.9	0.9	0			
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1501	-	945	-	-	
HCM Lane V/C Ratio	0.006	-	0.02	-	-	
HCM Control Delay (s)	7.4	0	8.9	-	-	
HCM Lane LOS	A	A	A	-	-	
HCM 95th %tile Q(veh)	0	-	0.1	-	-	

Lanes, Volumes, Timings  
1: King Edward & York

Future Total 2024 & 2029PM Peak Hour  
112 Nelson Street

Lane Group	EBR	WBR	NBL	NBT	SBT	SBR
Lane Configurations	↔		↕		↕	
Traffic Volume (vph)	76	10	90	851	726	29
Future Volume (vph)	76	10	90	851	726	29
Lane Group Flow (vph)	76	10	90	869	726	29
Turn Type	Free	Perm	pm+pt	NA	NA	Perm
Protected Phases			8	2	6	
Permitted Phases	Free	8	2			6
Detector Phase		8	8	2	6	6
Switch Phase						
Minimum Initial (s)		10.0	10.0	10.0	10.0	10.0
Minimum Split (s)		39.8	39.8	32.0	32.0	32.0
Total Split (s)		39.8	39.8	80.2	80.2	80.2
Total Split (%)		33.2%	33.2%	66.8%	66.8%	66.8%
Maximum Green (s)		33.0	33.0	74.2	74.2	74.2
Yellow Time (s)		3.3	3.3	3.0	3.0	3.0
All-Red Time (s)		3.5	3.5	3.0	3.0	3.0
Lost Time Adjust (s)		0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)		6.8	6.8	6.0	6.0	6.0
Lead/Lag						
Lead-Lag Optimize?						
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0
Recall Mode		None	None	C-Max	C-Max	C-Max
Walk Time (s)		25.0	25.0	18.0	18.0	18.0
Flash Dont Walk (s)		8.0	8.0	8.0	8.0	8.0
Pedestrian Calls (#/hr)		127	127	70	108	108
Act Effct Green (s)	120.0	33.0	106.4	74.2	74.2	74.2
Actuated g/C Ratio	1.00	0.28	0.89	0.62	0.62	0.62
v/c Ratio	0.05	0.02	0.11	0.30	0.35	0.04
Control Delay	0.1	0.1	0.7	11.0	11.8	2.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	0.1	0.1	0.7	11.0	11.8	2.5
LOS	A	A	A	B	B	A
Approach Delay			10.0	11.4		
Approach LOS			B	B		
Queue Length 50th (m)	0.0	0.0	0.2	32.6	41.1	0.0
Queue Length 95th (m)	0.0	0.0	0.3	39.9	52.3	3.1
Internal Link Dist (m)			218.1	130.8		
Turn Bay Length (m)			85.0	30.0		
Base Capacity (vph)	1489	465	793	2930	2050	686
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.02	0.11	0.30	0.35	0.04

Intersection Summary	
Cycle Length:	120
Actuated Cycle Length:	120
Offset:	58 (48%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle:	75

Lanes, Volumes, Timings  
1: King Edward & York

Future Total 2024 & 2029PM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.35	
Intersection Signal Delay: 10.1	Intersection LOS: B
Intersection Capacity Utilization 59.3%	ICU Level of Service B
Analysis Period (min) 15	

Splits and Phases: 1: King Edward & York



Lanes, Volumes, Timings  
2: King Edward & Rideau

Future Total 2024 & 2029PM Peak Hour  
112 Nelson Street

Lane Group	EBL	EBT	WBT	NBT	NBR	SBL	SBT	SBR	Ø1	Ø2	Ø3	Ø5
Lane Configurations	↔	↕	↕	↕	↕	↔	↕	↕				
Traffic Volume (vph)	186	305	364	605	115	160	548	127				
Future Volume (vph)	186	305	364	605	115	160	548	127				
Lane Group Flow (vph)	186	330	473	605	115	160	548	127				
Turn Type	Prot	NA	NA	NA	custom	custom	NA	custom				
Protected Phases	11	12	5 6	3 4		13	7 8	11	1	2	3	5
Permitted Phases					4	8		8				
Detector Phase	11	12	5 6	3 4	4	13	7 8	11				
Switch Phase												
Minimum Initial (s)	5.0				10.0	5.0		5.0	1.0	10.0	1.0	1.0
Minimum Split (s)	11.2				23.7	9.5		11.2	5.0	29.8	5.0	5.0
Total Split (s)	27.0				29.0	12.0		27.0	5.0	59.0	5.0	5.0
Total Split (%)	24.5%				26.4%	10.9%		24.5%	5%	54%	5%	5%
Maximum Green (s)	20.8				22.3	7.5		20.8	3.0	52.2	3.0	3.0
Yellow Time (s)	3.3				3.0	3.5		3.3	2.0	3.3	2.0	2.0
All-Red Time (s)	2.9				3.7	1.0		2.9	0.0	3.5	0.0	0.0
Lost Time Adjust (s)	0.0				0.0	0.0		0.0				
Total Lost Time (s)	6.2				6.7	4.5		6.2				
Lead/Lag					Lag				Lead	Lag	Lead	Lead
Lead-Lag Optimize?					Yes				Yes	Yes	Yes	Yes
Vehicle Extension (s)	3.0				3.0	3.0		3.0	3.0	3.0	3.0	3.0
Recall Mode	Max				Max	Max		Max	Max	C-Max	Max	Max
Walk Time (s)					2.0			3.0	2.0	3.0	3.0	3.0
Flash Dont Walk (s)					15.0			0.0	21.0	0.0	0.0	0.0
Pedestrian Calls (#/hr)					186				362	362	186	500
Act Effct Green (s)	20.8	62.0	35.0	32.0	22.3	36.5	44.0	55.6				
Actuated g/C Ratio	0.19	0.56	0.32	0.29	0.20	0.33	0.40	0.51				
v/c Ratio	0.59	0.19	0.53	0.63	0.37	0.68	0.41	0.21				
Control Delay	49.6	11.5	33.4	37.3	3.4	53.0	24.9	10.9				
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
Total Delay	49.6	11.5	33.4	37.3	3.4	53.0	24.9	10.9				
LOS	D	B	C	D	A	D	C	B				
Approach Delay		25.2	33.4	31.9			28.2					
Approach LOS		C	C	C			C					
Queue Length 50th (m)	36.8	16.4	43.6	59.2	0.0	25.3	43.7	10.9				
Queue Length 95th (m)	60.0	23.7	59.7	77.8	0.0	#46.1	58.1	19.2				
Internal Link Dist (m)		125.5	140.5	133.0			218.1					
Turn Bay Length (m)	65.0				20.0	105.0		95.0				
Base Capacity (vph)	313	1778	890	964	311	235	1326	614				
Starvation Cap Reductn	0	0	0	0	0	0	0	0				
Spillback Cap Reductn	0	0	0	0	0	0	0	0				
Storage Cap Reductn	0	0	0	0	0	0	0	0				
Reduced v/c Ratio	0.59	0.19	0.53	0.63	0.37	0.68	0.41	0.21				

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 92 (84%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 90

Lanes, Volumes, Timings  
2: King Edward & Rideau

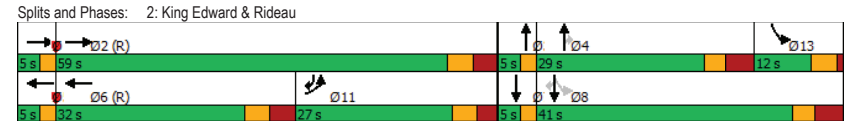
Future Total 2024 & 2029PM Peak Hour  
112 Nelson Street

Lane Group	Ø6	Ø7	Ø8
Lane Configurations			
Traffic Volume (vph)			
Future Volume (vph)			
Lane Group Flow (vph)			
Turn Type			
Protected Phases	6	7	8
Permitted Phases			
Detector Phase			
Switch Phase			
Minimum Initial (s)	10.0	1.0	10.0
Minimum Split (s)	31.8	5.0	25.9
Total Split (s)	32.0	5.0	41.0
Total Split (%)	29%	5%	37%
Maximum Green (s)	25.2	3.0	34.1
Yellow Time (s)	3.3	2.0	3.0
All-Red Time (s)	3.5	0.0	3.9
Lost Time Adjust (s)			
Total Lost Time (s)			
Lead/Lag	Lag	Lead	Lag
Lead-Lag Optimize?	Yes	Yes	Yes
Vehicle Extension (s)	3.0	3.0	3.0
Recall Mode	C-Max	Max	Max
Walk Time (s)	2.0	3.0	2.0
Flash Dont Walk (s)	23.0	0.0	17.0
Pedestrian Calls (#/hr)	500	162	162
Act Effct Green (s)			
Actuated g/C Ratio			
v/c Ratio			
Control Delay			
Queue Delay			
Total Delay			
LOS			
Approach Delay			
Approach LOS			
Queue Length 50th (m)			
Queue Length 95th (m)			
Internal Link Dist (m)			
Turn Bay Length (m)			
Base Capacity (vph)			
Starvation Cap Reductn			
Spillback Cap Reductn			
Storage Cap Reductn			
Reduced v/c Ratio			
Intersection Summary			

Lanes, Volumes, Timings  
2: King Edward & Rideau

Future Total 2024 & 2029PM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.68  
 Intersection Signal Delay: 29.6  
 Intersection LOS: C  
 Intersection Capacity Utilization 68.3%  
 ICU Level of Service C  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.



Lanes, Volumes, Timings  
3: Nelson & Rideau

Future Total 2024 & 2029PM Peak Hour  
112 Nelson Street

	↖	→	↘	↙	←	↖	↙	↑	↘	↓
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	↖	↑	↘	↙	↑	↖		↕	↘	↕
Traffic Volume (vph)	102	470	8	7	391	159	2	3	74	1
Future Volume (vph)	102	470	8	7	391	159	2	3	74	1
Lane Group Flow (vph)	102	470	8	7	391	159	0	19	0	172
Turn Type	pm-pt	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	NA
Protected Phases	5	2			6			4		8
Permitted Phases	2		2	6		6	4		8	
Detector Phase	5	2	2	6	6	6	4	4	8	8
Switch Phase										
Minimum Initial (s)	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	10.8	26.8	26.8	26.8	26.8	26.8	27.0	27.0	27.0	27.0
Total Split (s)	12.0	60.0	60.0	48.0	48.0	48.0	30.0	30.0	30.0	30.0
Total Split (%)	13.3%	66.7%	66.7%	53.3%	53.3%	53.3%	33.3%	33.3%	33.3%	33.3%
Maximum Green (s)	6.2	54.2	54.2	42.2	42.2	42.2	24.0	24.0	24.0	24.0
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.5	2.5	2.5	2.5	2.5	2.5	2.7	2.7	2.7	2.7
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Lost Time (s)	5.8	5.8	5.8	5.8	5.8	5.8		6.0		6.0
Lead/Lag	Lead			Lag	Lag	Lag				
Lead-Lag Optimize?	Yes			Yes	Yes	Yes				
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	C-Max	C-Max	C-Max	Max	Max	Max	Max
Walk Time (s)		15.0	15.0	15.0	15.0	15.0	7.0	7.0	7.0	7.0
Flash Dont Walk (s)		6.0	6.0	6.0	6.0	6.0	14.0	14.0	14.0	14.0
Pedestrian Calls (#/hr)		294	294	500	500	500	322	322	171	171
Act Effct Green (s)	54.2	54.2	54.2	44.6	44.6	44.6		24.0		24.0
Actuated g/C Ratio	0.60	0.60	0.60	0.50	0.50	0.50		0.27		0.27
v/c Ratio	0.27	0.45	0.02	0.02	0.45	0.53		0.08		0.63
Control Delay	9.4	11.4	0.1	10.3	12.3	8.8		15.1		28.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0		0.0
Total Delay	9.4	11.4	0.1	10.3	12.3	8.8		15.1		28.3
LOS	A	B	A	B	B	A		B		C
Approach Delay		10.9				11.3		15.1		28.3
Approach LOS		B				B		B		C
Queue Length 50th (m)	6.9	40.4	0.0	0.4	25.8	1.0		0.6		15.0
Queue Length 95th (m)	13.2	61.5	0.0	m1.1	36.3	7.4		5.9		#38.0
Internal Link Dist (m)		140.5			117.5			126.5		91.5
Turn Bay Length (m)	40.0		20.0	10.0		20.0				
Base Capacity (vph)	383	1050	426	310	864	302		247		275
Starvation Cap Reductn	0	0	0	0	0	0		0		0
Spillback Cap Reductn	0	0	0	0	0	0		0		0
Storage Cap Reductn	0	0	0	0	0	0		0		0
Reduced v/c Ratio	0.27	0.45	0.02	0.02	0.45	0.53		0.08		0.63

Intersection Summary

Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 52 (58%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green  
 Natural Cycle: 65

Lanes, Volumes, Timings  
3: Nelson & Rideau

Future Total 2024 & 2029PM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.63  
 Intersection Signal Delay: 13.4  
 Intersection LOS: B  
 Intersection Capacity Utilization 70.6%  
 ICU Level of Service C  
 Analysis Period (min) 15  
 # 95th percentile volume exceeds capacity, queue may be longer.  
 Queue shown is maximum after two cycles.  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 3: Nelson & Rideau



Lanes, Volumes, Timings  
4: Friel & Rideau

Future Total 2024 & 2029PM Peak Hour  
112 Nelson Street

	↖	→	↘	↙	←	↖	↙	↑	↘	↓
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations		↕	↕		↕	↕		↕	↕	↕
Traffic Volume (vph)	4	481	65	22	450	9	75	3	14	4
Future Volume (vph)	4	481	65	22	450	9	75	3	14	4
Lane Group Flow (vph)	0	485	65	0	472	9	0	100	0	26
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Perm	NA	Perm	NA
Protected Phases		2			6			4		8
Permitted Phases	2		2	6		6	4		8	
Detector Phase	2	2	2	6	6	6	4	4	8	8
Switch Phase										
Minimum Initial (s)	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Minimum Split (s)	25.7	25.7	25.7	25.7	25.7	25.7	29.8	29.8	29.8	29.8
Total Split (s)	60.0	60.0	60.0	60.0	60.0	60.0	30.0	30.0	30.0	30.0
Total Split (%)	66.7%	66.7%	66.7%	66.7%	66.7%	66.7%	33.3%	33.3%	33.3%	33.3%
Maximum Green (s)	54.3	54.3	54.3	54.3	54.3	54.3	24.2	24.2	24.2	24.2
Yellow Time (s)	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3	3.3
All-Red Time (s)	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.5
Lost Time Adjust (s)		0.0	0.0		0.0	0.0		0.0		0.0
Total Lost Time (s)		5.7	5.7		5.7	5.7		5.8		5.8
Lead/Lag										
Lead-Lag Optimize?										
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Recall Mode	C-Max	C-Max	C-Max	C-Max	C-Max	C-Max	None	None	None	None
Walk Time (s)	13.0	13.0	13.0	13.0	13.0	13.0	12.0	12.0	12.0	12.0
Flash Dont Walk (s)	7.0	7.0	7.0	7.0	7.0	7.0	12.0	12.0	12.0	12.0
Pedestrian Calls (#/hr)	185	185	185	201	201	201	95	95	82	82
Act Effct Green (s)		57.3	57.3		57.3	57.3		21.2		21.2
Actuated g/C Ratio		0.64	0.64		0.64	0.64		0.24		0.24
v/c Ratio		0.44	0.12		0.44	0.02		0.37		0.09
Control Delay		4.7	0.8		10.7	0.1		27.1		20.1
Queue Delay		0.1	0.0		0.0	0.0		0.0		0.0
Total Delay		4.8	0.8		10.7	0.1		27.1		20.1
LOS		A	A		B	A		C		C
Approach Delay		4.3			10.5			27.1		20.1
Approach LOS		A			B			C		C
Queue Length 50th (m)		14.2	0.1		40.9	0.0		11.7		2.3
Queue Length 95th (m)		21.5	0.7		62.7	0.1		25.5		8.4
Internal Link Dist (m)		117.5			103.0			131.9		64.0
Turn Bay Length (m)			20.0			20.0				
Base Capacity (vph)		1105	554		1068	516		306		342
Starvation Cap Reductn		92	0		0	0		0		0
Spillback Cap Reductn		0	0		0	0		0		0
Storage Cap Reductn		0	0		0	0		0		0
Reduced v/c Ratio		0.48	0.12		0.44	0.02		0.33		0.08

Intersection Summary

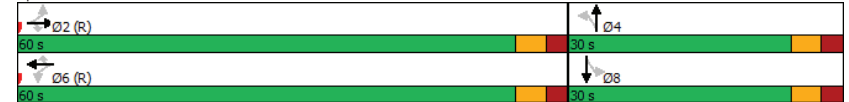
Cycle Length: 90  
 Actuated Cycle Length: 90  
 Offset: 48 (53%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green  
 Natural Cycle: 60

Lanes, Volumes, Timings  
4: Friel & Rideau

Future Total 2024 & 2029PM Peak Hour  
112 Nelson Street

Control Type: Actuated-Coordinated  
 Maximum v/c Ratio: 0.44  
 Intersection Signal Delay: 9.2  
 Intersection LOS: A  
 Intersection Capacity Utilization 77.5%  
 ICU Level of Service D  
 Analysis Period (min) 15  
 m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 4: Friel & Rideau



HCM 2010 AWSC  
5: Nelson & York

Future Total 2024 & 2029PM Peak Hour  
112 Nelson Street

Intersection												
Intersection Delay, s/veh	7.7											
Intersection LOS	A											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↔			↕			↕			↔		
Traffic Vol, veh/h	4	8	11	43	0	43	0	98	66	4	19	6
Future Vol, veh/h	4	8	11	43	0	43	0	98	66	4	19	6
Peak Hour Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	4	8	11	43	0	43	0	98	66	4	19	6
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Approach	EB			WB			NB			SB		
Opposing Approach	WB			EB			SB			NB		
Opposing Lanes	1			1			1			1		
Conflicting Approach Left	SB			NB			EB			WB		
Conflicting Lanes Left	1			1			1			1		
Conflicting Approach Right	NB			SB			WB			EB		
Conflicting Lanes Right	1			1			1			1		
HCM Control Delay	7.3			7.6			7.8			7.4		
HCM LOS	A			A			A			A		
Lane	NBLn1	EBLn1	WBLn1	SBLn1								
Vol Left, %	0%	17%	50%	14%								
Vol Thru, %	60%	35%	0%	66%								
Vol Right, %	40%	48%	50%	21%								
Sign Control	Stop	Stop	Stop	Stop								
Traffic Vol by Lane	164	23	86	29								
LT Vol	0	4	43	4								
Through Vol	98	8	0	19								
RT Vol	66	11	43	6								
Lane Flow Rate	164	23	86	29								
Geometry Grp	1	1	1	1								
Degree of Util (X)	0.178	0.026	0.098	0.033								
Departure Headway (Hd)	3.902	4.085	4.086	4.152								
Convergence, Y/N	Yes	Yes	Yes	Yes								
Cap	910	861	865	850								
Service Time	1.963	2.181	2.167	2.237								
HCM Lane V/C Ratio	0.18	0.027	0.099	0.034								
HCM Control Delay	7.8	7.3	7.6	7.4								
HCM Lane LOS	A	A	A	A								
HCM 95th-tile Q	0.6	0.1	0.3	0.1								

HCM 2010 TWSC  
6: Nelson & Site Access

Future Total 2024 & 2029PM Peak Hour  
112 Nelson Street

Intersection						
Int Delay, s/veh	0.8					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↔			↕	↕	
Traffic Vol, veh/h	0	11	14	164	72	1
Future Vol, veh/h	0	11	14	164	72	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	100	100	100	100	100	100
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	0	11	14	164	72	1
Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	265	73	73	0	-	0
Stage 1	73	-	-	-	-	-
Stage 2	192	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	724	989	1527	-	-	-
Stage 1	950	-	-	-	-	-
Stage 2	841	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	717	989	1527	-	-	-
Mov Cap-2 Maneuver	717	-	-	-	-	-
Stage 1	941	-	-	-	-	-
Stage 2	841	-	-	-	-	-
Approach	EB	NB	SB			
HCM Control Delay, s	8.7	0.6	0			
HCM LOS	A					
Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR	
Capacity (veh/h)	1527	-	989	-	-	
HCM Lane V/C Ratio	0.009	-	0.011	-	-	
HCM Control Delay (s)	7.4	0	8.7	-	-	
HCM Lane LOS	A	A	A	-	-	
HCM 95th %tile Q(veh)	0	-	0	-	-	



# Appendix J

TDM Checklist

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

Legend	
<b>BASIC</b>	The measure is generally feasible and effective, and in most cases would benefit the development and its users
<b>BETTER</b>	The measure could maximize support for users of sustainable modes, and optimize development performance
<b>★</b>	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
<b>1. TDM PROGRAM MANAGEMENT</b>		
<b>1.1 Program coordinator</b>		
<b>BASIC</b> ★	1.1.1 Designate an internal coordinator, or contract with an external coordinator	<input type="checkbox"/>
<b>1.2 Travel surveys</b>		
<b>BETTER</b>	1.2.1 Conduct periodic surveys to identify travel-related behaviours, attitudes, challenges and solutions, and to track progress	<input type="checkbox"/>
<b>2. WALKING AND CYCLING</b>		
<b>2.1 Information on walking/cycling routes &amp; destinations</b>		
<b>BASIC</b>	2.1.1 Display local area maps with walking/cycling access routes and key destinations at major entrances ( <i>multi-family, condominium</i> )	<input checked="" type="checkbox"/>
<b>2.2 Bicycle skills training</b>		
<b>BETTER</b>	2.2.1 Offer on-site cycling courses for residents, or subsidize off-site courses	<input type="checkbox"/>

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

TDM measures: Residential developments		Check if proposed & add descriptions
<b>6. TDM MARKETING &amp; COMMUNICATIONS</b>		
<b>6.1 Multimodal travel information</b>		
BASIC ★	6.1.1 Provide a multimodal travel option information package to new residents	<input checked="" type="checkbox"/>
<b>6.2 Personalized trip planning</b>		
BETTER ★	6.2.1 Offer personalized trip planning to new residents	<input type="checkbox"/>

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

Legend	
<b>REQUIRED</b>	The Official Plan or Zoning By-law provides related guidance that must be followed
<b>BASIC</b>	The measure is generally feasible and effective, and in most cases would benefit the development and its users
<b>BETTER</b>	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
<b>1. WALKING &amp; CYCLING: ROUTES</b>		
<b>1.1 Building location &amp; access points</b>		
BASIC	1.1.1 Locate building close to the street, and do not locate parking areas between the street and building entrances	<input checked="" type="checkbox"/>
BASIC	1.1.2 Locate building entrances in order to minimize walking distances to sidewalks and transit stops/stations	<input checked="" type="checkbox"/>
BASIC	1.1.3 Locate building doors and windows to ensure visibility of pedestrians from the building, for their security and comfort	<input checked="" type="checkbox"/>
<b>1.2 Facilities for walking &amp; cycling</b>		
REQUIRED	1.2.1 Provide convenient, direct access to stations or major stops along rapid transit routes within 600 metres; minimize walking distances from buildings to rapid transit; provide pedestrian-friendly, weather-protected (where possible) environment between rapid transit accesses and building entrances; ensure quality linkages from sidewalks through building entrances to integrated stops/stations (see <i>Official Plan policy 4.3.3</i> )	<input checked="" type="checkbox"/>
REQUIRED	1.2.2 Provide safe, direct and attractive pedestrian access from public sidewalks to building entrances through such measures as: reducing distances between public sidewalks and major building entrances; providing walkways from public streets to major building entrances; within a site, providing walkways along the front of adjoining buildings, between adjacent buildings, and connecting areas where people may congregate, such as courtyards and transit stops; and providing weather protection through canopies, colonnades, and other design elements wherever possible (see <i>Official Plan policy 4.3.12</i> )	<input checked="" type="checkbox"/>

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

TDM-supportive design & infrastructure measures: <i>Residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
<b>2. WALKING &amp; CYCLING: END-OF-TRIP FACILITIES</b>		
<b>2.1 Bicycle parking</b>		
REQUIRED	2.1.1 Provide bicycle parking in highly visible and lighted areas, sheltered from the weather wherever possible (see <i>Official Plan policy 4.3.6</i> )	<input checked="" type="checkbox"/>
REQUIRED	2.1.2 Provide the number of bicycle parking spaces specified for various land uses in different parts of Ottawa; provide convenient access to main entrances or well-used areas (see <i>Zoning By-law Section 111</i> )	<input checked="" type="checkbox"/>
REQUIRED	2.1.3 Ensure that bicycle parking spaces and access aisles meet minimum dimensions; that no more than 50% of spaces are vertical spaces; and that parking racks are securely anchored (see <i>Zoning By-law Section 111</i> )	<input checked="" type="checkbox"/>
BASIC	2.1.4 Provide bicycle parking spaces equivalent to the expected number of resident-owned bicycles, plus the expected peak number of visitor cyclists	<input type="checkbox"/>
<b>2.2 Secure bicycle parking</b>		
REQUIRED	2.2.1 Where more than 50 bicycle parking spaces are provided for a single residential building, locate at least 25% of spaces within a building/structure, a secure area (e.g. supervised parking lot or enclosure) or bicycle lockers (see <i>Zoning By-law Section 111</i> )	<input checked="" type="checkbox"/>
BETTER	2.2.2 Provide secure bicycle parking spaces equivalent to at least the number of units at condominiums or multi-family residential developments	<input checked="" type="checkbox"/>
<b>2.3 Bicycle repair station</b>		
BETTER	2.3.1 Provide a permanent bike repair station, with commonly used tools and an air pump, adjacent to the main bicycle parking area (or secure bicycle parking area, if provided)	<input checked="" type="checkbox"/>
<b>3. TRANSIT</b>		
<b>3.1 Customer amenities</b>		
BASIC	3.1.1 Provide shelters, lighting and benches at any on-site transit stops	<input type="checkbox"/>
BASIC	3.1.2 Where the site abuts an off-site transit stop and insufficient space exists for a transit shelter in the public right-of-way, protect land for a shelter and/or install a shelter	<input type="checkbox"/>
BETTER	3.1.3 Provide a secure and comfortable interior waiting area by integrating any on-site transit stops into the building	<input type="checkbox"/>

TDM-supportive design & infrastructure measures: <i>Residential developments</i>		Check if completed & add descriptions, explanations or plan/drawing references
<b>4. RIDESHARING</b>		
<b>4.1 Pick-up &amp; drop-off facilities</b>		
BASIC	4.1.1 Provide a designated area for carpool drivers (plus taxis and ride-hailing services) to drop off or pick up passengers without using fire lanes or other no-stopping zones	<input type="checkbox"/>
<b>5. CARSHARING &amp; BIKESHARING</b>		
<b>5.1 Carshare parking spaces</b>		
BETTER	5.1.1 Provide up to three carshare parking spaces in an R3, R4 or R5 Zone for specified residential uses (see <i>Zoning By-law Section 94</i> )	<input checked="" type="checkbox"/>
<b>5.2 Bikeshare station location</b>		
BETTER	5.2.1 Provide a designated bikeshare station area near a major building entrance, preferably lighted and sheltered with a direct walkway connection	<input checked="" type="checkbox"/>
<b>6. PARKING</b>		
<b>6.1 Number of parking spaces</b>		
REQUIRED	6.1.1 Do not provide more parking than permitted by zoning, nor less than required by zoning, unless a variance is being applied for	<input type="checkbox"/>
BASIC	6.1.2 Provide parking for long-term and short-term users that is consistent with mode share targets, considering the potential for visitors to use off-site public parking	<input checked="" type="checkbox"/>
BASIC	6.1.3 Where a site features more than one use, provide shared parking and reduce the cumulative number of parking spaces accordingly (see <i>Zoning By-law Section 104</i> )	<input type="checkbox"/>
BETTER	6.1.4 Reduce the minimum number of parking spaces required by zoning by one space for each 13 square metres of gross floor area provided as shower rooms, change rooms, locker rooms and other facilities for cyclists in conjunction with bicycle parking (see <i>Zoning By-law Section 111</i> )	<input type="checkbox"/>
<b>6.2 Separate long-term &amp; short-term parking areas</b>		
BETTER	6.2.1 Provide separate areas for short-term and long-term parking (using signage or physical barriers) to permit access controls and simplify enforcement (i.e. to discourage residents from parking in visitor spaces, and vice versa)	<input type="checkbox"/>

# Appendix K

SimTraffic Intersection Worksheets – Future Total 2024 & 2029

Summary of All Intervals

Run Number	1	2	3	Avg
Start Time	8:00	8:00	8:00	8:00
End Time	9:00	9:00	9:00	9:00
Total Time (min)	60	60	60	60
Time Recorded (min)	30	30	30	30
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	1518	1484	1548	1516
Vehs Exited	1510	1492	1545	1517
Starting Vehs	74	76	84	76
Ending Vehs	82	68	87	75
Travel Distance (km)	830	815	852	832
Travel Time (hr)	39.7	38.7	41.5	40.0
Total Delay (hr)	19.2	18.5	20.3	19.3
Total Stops	2069	2045	2146	2087
Fuel Used (l)	94.8	92.2	98.2	95.1

Interval #0 Information Seeding

Start Time	8:00
End Time	8:30
Total Time (min)	30
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	8:30			
End Time	9:00			
Total Time (min)	30			
Volumes adjusted by Growth Factors.				
Run Number	1	2	3	Avg
Vehs Entered	1518	1484	1548	1516
Vehs Exited	1510	1492	1545	1517
Starting Vehs	74	76	84	76
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Travel Distance (km)	830	815	852	832
Travel Time (hr)	39.7	38.7	41.5	40.0
Total Delay (hr)	19.2	18.5	20.3	19.3
Total Stops	2069	2045	2146	2087
Fuel Used (l)	94.8	92.2	98.2	95.1

Intersection: 3: Nelson & Rideau

Movement	EB	EB	EB	WB	WB	WB	NB	SB
Directions Served	L	T	R	L	T	R	LTR	LTR
Maximum Queue (m)	54.6	89.1	17.6	6.0	60.4	34.9	8.7	51.3
Average Queue (m)	17.0	40.3	1.8	1.2	29.9	16.1	2.4	21.9
95th Queue (m)	43.5	80.0	11.2	6.2	53.4	33.4	7.7	45.3
Link Distance (m)	142.2		128.1			138.4		98.8
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (m)	40.0		20.0		10.0		20.0	
Storage Blk Time (%)	16		3		33		1	
Queuing Penalty (veh)	17		14		54		5	